

Ingeniously simple and reliable
level measurement for



Solids and Liquids



UWT - the level measurement experts since 1977

Catalogue

Valid until 31.03.2021



Wolf Process Automation Limited
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Web: www.wpa.ie

UWT Update

Our new innovative products at a glance



Fit for liquids

With over 40 years level measurement experience and more than one million successfully solved bulk solids applications we are now heading to new shores and are ready to enter the liquids market with exciting new products. We are expanding our portfolio with four smart capacitive sensors as well as an innovative guided wave radar.

Come and meet the new members of the UWT sensor family.



Capacitance sensors for liquids

With our new capacitive product series we offer suitable solutions for a wide variety of **liquids, pastes and foam** - whether to be used for aggressive chemical applications, within the demanding food industry or in wastewater handling. All devices are equipped with potted electronics and work with the unique "Inverse Frequency Shift" technology. They feature a robust and certified construction.

Capanivo®

Compact & flexible

Smart versions for a variety of applications. Use in non-metallic containers possible.

CN 7000

The pocket-sized one

- Compact design
- Enclosure version or integral cable version
- Synthetic version available
- Chemical resistance
- Optional PVDF probe
- SensGuard protective sleeve
- 2-wire instrument

Tip Sensitivity Technology



CN 8000

The allrounder

- Pipe and cable extension
- Range of process connections
- High safety standard
- Hygiene versions
- Very high sensitivity
- Digital version with LCD

RFnivo®

Innovative & robust

Accurate results even under difficult process conditions

RF 8000

The resilient one

- Rod and metal rope extension
- Robust design
- Pressure-resistant ≤ 507.6 psi
- Wide temperature range -40°C to +752°F
- Active build-up compensation
- PFA isolation for high chemical resistance
- Digital version with LCD

Active Shield Technology

NivoCapa®

Precise & versatile

Continuous level measurement

NC 8000

The one for pinpoint accuracy

- Rod and metal rope extension
- Use in conductive and non-conductive materials
- PFA isolation for high chemical resistance
- LCD display with control buttons
- Diagnostic function
- Very user-friendly
- 2-wire instrument

New - Guided wave radar (TDR) for solids and liquids

NivoGuide®



customizable probe lengths

Precise & universal

Smart radar with high-frequency microwave pulses for versatile use in silos, tanks and pipes. The intelligent software guarantees precise measurement results and a well monitored probe

NG 3000

Guided wave radar for level measurement in all kinds of **bulk solids**

- Rod and metal rope extension up to 246 feet - can be shortened
- Two-wire electronics 4 ... 20 mA / Hart
- Pressure resistant ≤ 580 psi
- Process temperature from -40.. 392°F
- Precise results unaffected by dust and buildup
- PA coating
- Intelligent Software
- Simple, time-saving commissioning
- ATEX, IECEx and FM approval



NG 8000

Guided wave radar for level and interface measurement for **liquids & interface**

- Rod and metal rope extension up to 246 feet - can be shortened
- Coaxial version available
- Two-wire electronics 4 ... 20 mA / Hart
- Pressure resistant ≤ 5801.5 psi
- Process temperature from -321..842°F
- Precise results unaffected by vapour, condensation, buildup
- Intelligent Software
- Simple, time-saving commissioning
- ATEX, IECEx and FM approval



UWT sensors provide solutions for the most challenging conditions

Benefit from our experience and you will find a suitable product for all types of application

Product Matrix Solids		Level Limit Measurement					Continuous Measurement			
Product	Rotonivo® RN 3/4/6	Vibranivo® VN 1/2/4/5/6	Mononivo® MN 4	RFnivo® RF 3	Capanivo® CN 4	Nivobob® NB 3	Nivobob® NB 4	NivoRadar® NR 3	NivoGuide® NG 3	
Measuring principle	Rotation	Vibration	Vibration	Capacitive	Capacitive	Lot System	Lot System	Radar	Guided Radar (TDR)	
Material properties	Granulate/powder	✓	✓	✓	✓	✓	✓	✓	✓	
	Solids in liquid	-	✓	-	-	✓	-	-	-	
	Material prone to caking	✓	-	-	●	✓	✓	●	●	
	Abrasive Material	✓	✓	✓	●	-	✓	✓	●	
Process conditions	Sensitivity (bulk density/DK)	≥ 0.94 lb/ft³	< 0.312 lb/ft³**	≥ 1.25 lb/ft³	DK ≥ 1.5	DK ≥ 1.6	≥ 1.25 lb/ft³	≥ 1.25 lb/ft³	DK ≥ 1.6	DK ≥ 1.5
	Process temperature	-40..2012 °F	-40..302 °F	-40..302 °F	-40..932 °F	-40..356 °F	-40..482 °F	-40..176 °F	-40..392 °F	-40..392 °F
	Process pressure	145 psi	232 psi	232 psi	362.6 psi	362.6 psi	25 psi	2.9 psi	43.5 psi	580 psi
	High mechanical load	✓	●	●	✓	-	●	●	●	●
Certification*	High humidity	✓	-	-	✓	✓	✓	✓	●	●
	Vibration in process	●	✓	●	✓	●	●	●	✓	●
	EHEDG	-	-	-	✓	-	-	-	-	-
	SIL	✓	-	-	-	-	-	-	-	✓
Sensor Material	EX certification	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Sensor Material	83 gal	83 gal	83 gal	83 gal/PPS/Ceramic	PPS	304/303/316	Al/303/316	316L/PEEK	316L/PEEK

*further certificates available on request

** capable of measuring the lightest of material lower than 0.312 lb/ft³

Product matrix Liquids		Level Limit Measurement			Continuous Measurement		
Product	Capanivo® CN 7	Capanivo® CN 8	RFnivo® RF 8	Nivobob® NB 3	NivoCapa® NC 8	NivoGuide® NG 8	
Measuring principle	Capacitive	Capacitive	Capacitive	Lot System	Capacitive	Guided Radar (TDR)	
Material properties	Waterbased	✓	✓	✓	✓	✓	
	Oil/viscose Media	✓	✓	✓	✓	✓	
	Foam	✓	✓	✓	✓	✓	
	Material prone to caking	✓	✓	✓	✓	●	
Process conditions	Sensitivity (DK)	DK ≥ 1.5	DK ≥ 1.5	DK ≥ 1.5	N/A	DK ≥ 1.5	DK ≥ 1.4
	Process temperature	-22..212 °F	-40..257 °F	-40..752 °F	-40..176 °F	-40..392 °F	-321..842 °F
	Process pressure	145 psi	362.6 psi	507.6 psi	25 psi	507.6 psi	5801.5 psi
	High mechanical load	●	●	●	●	●	●
Certification*	Immersion length (max.)	4 in	1181 in	984 in	1968 in	984 in	2952 in
	Vibration in process	✓	●	●	✓	●	●
	Moving surface (e.g. wave)	●	✓	✓	✓	✓	✓
	EHEDG	-	-	-	-	-	-
Wetted parts	SIL	-	✓	-	-	-	✓
	Lloyd's Register	✓	✓	✓	-	✓	-
	EX certification	✓	✓	✓	✓	✓	✓
	Wetted parts	316L/PPS/PVDF	316L/PPS/PVDF	316L/PFA/PEEK/Ceramic	301/303/PA/PP	316L/PFA/PEEK	316L/PEEK/Ceramic

*further certificates available on request

The information in the catalogue is subject to modifications or amendments.

Please note that our general terms and conditions apply (www.uwt.de).

- ✓ perfect choice
- can be used (details to be clarified)
- not recommended



Rotonivo® 3000 / 6000

Rotating level limit switch

The trusted, multifunctional and maintenance free unit for reliable level monitoring of bulk goods – versatile, modular structure; for application in hazardous locations (gas and dust). RN 6000 series SIL 2 compliant.



Rotonivo® 3000 / 6000



- Suitable for virtually all bulk goods
- Insensitive to dust, electrical charge, adhesion, temperature and pressure
- Simple and reliable measuring principle, easy and fast installation

Application: Rotonivo® paddle switches can be used as full, demand or empty detectors in bulk good silos. They are suitable for applications in a wide variety of materials. Rotonivo switches are available with international certificates for applications in hazardous locations (gas and dust).

Types of Rotonivo flanges:

Rotonivo ..002

Full detector with rope extension or protection tube, vertical installation



Rotonivo ..001

Standard design, vertical, horizontal and oblique installation



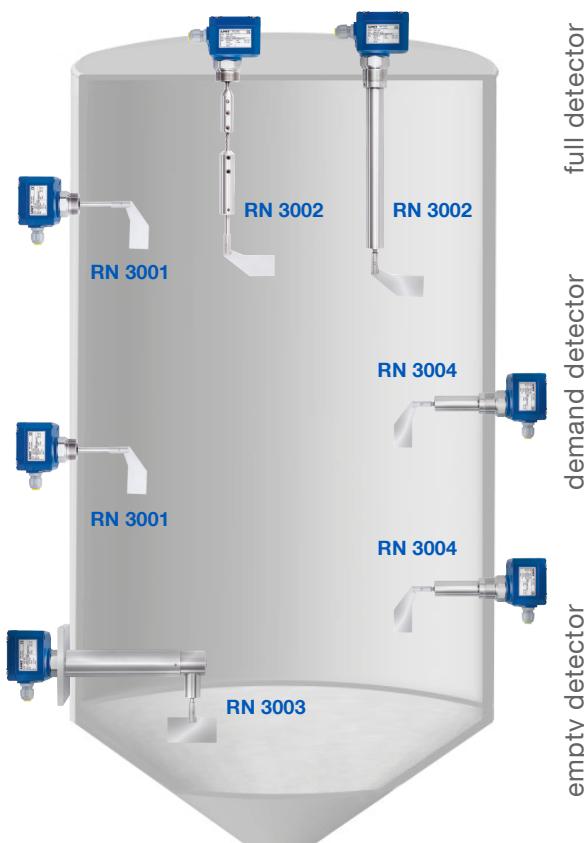
Rotonivo ..003

Design with protection tube and angled extension, horizontal installation



Rotonivo ..004

Design with protection tube, vertical, horizontal and oblique installation



Technical Data

Housing

Aluminium IP 66 / NEMA Type 4

Pressure range

-0.9 up to +10 bar (-13.1 up to +145 psi)

Supply voltage

Universal Voltage Electronic
AC: 24V / 48V / 115V / 230V, DC: 24V

Signal output

Microswitch or Relais
SPDT / DPDT contact

Versions with certificates

ATEX II 1/2D and II 2G, INMETRO
FM Cl. I, II, III, Div.1 Gr. A-G; Zone 1
CSA Cl. I, II, III Div.1 Gr. B-G; Zone 1
TR-CU, IEC Ex, NEPSI-Ex

Process temperature range

-40°C up to +1100°C (3001 / 3002)
(-40°F up to +2012°F) (3001 / 3002)

Bearing

Encapsulated ball bearing with shaft sealing

Process connection

G 1", 1½" and 1¼";
NPT 1½" and 1¼";
M30x1,5 and M32x1,5;
various flanges available

Material

Aluminium or stainless steel 1.4305 (SS303)
or 1.4404 (SS316L)

Material measuring vane and shaft

Stainless steel 1.4301 (SS304)
or 1.4404 (SS316L)

Housing types

RN 3000 standard



RN 6000 standard



RN 6000 flameproof

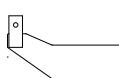


RN 6000 flameproof, increased safety

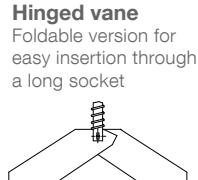


Various measuring vanes and special solutions

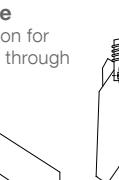
Boot shaped vane



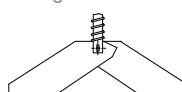
Rotonivo® 3005 extra compact version for installation in loading bellow



Hinged vane



Foldable version for easy insertion through a long socket



Rubber vane



For lightweight materials (e.g. carbon black, styrofoam, etc.)

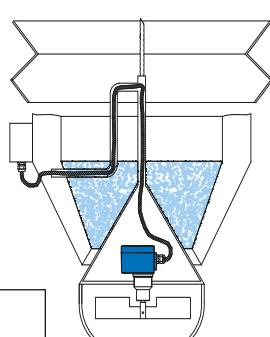
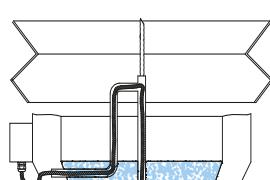
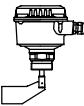
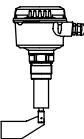
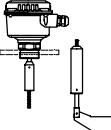
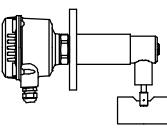
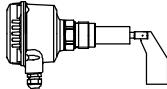
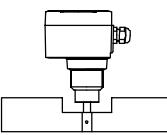


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Subject to change.

Valid: From 01.04.2020 until 31.03.2021, unless otherwise agreed.

All dimensions in mm (inches).

By publishing this selection list all other lists become invalid.

All prices in Euro (€) or USD (\$),
excluding VAT.

We assume no liability for typing errors.

All EURO prices are EXW Betzigau,
all USD prices are EXW Memphis,
excluding packaging costs.

Different variations to those specified are possible.
Please contact our technical consultants.

Overview

- Level limit detection in bulk goods/ solids
- Compact unit
- Very robust and reliable sensors
- Wide range of applications, no maintenance
- Full-, demand-, empty detector
- ATEX, IEC-Ex , FM, CSA, TR-CU, INMETRO
- SIL 2
- 1935/2004/EC
- 2011/65/EU
- Gas Ex and Dust Ex approvals
- Functional safety
- Food grade material
- RoHS Conform

Series	RN 3000	RN 6000
	ATEX/ IEC-Ex/ TR-CU/ INMETRO Small housing Sensitivity >15 g/l (0.9 lb/ft³)	ATEX/ IEC-Ex/ FM/ CSA/ TR-CU/ INMETRO/ SIL 2 Spacious housing Sensitivity >15 g/l (0.9 lb/ft³)



RN ..001 Short extension length	RN 3001 	RN 6001
RN ..002 Pipe extension vertical	RN 3002 	RN 6002

Overview

	RN 3002-rope	RN 6002-rope
RN ..002-rope Rope extension	A vertical level switch with a black rectangular sensor head at the top, connected by a cable to a metal housing with two mounting holes. A rope and pulley assembly hangs from the bottom of the housing.	A vertical level switch with a black rectangular sensor head at the top, connected by a cable to a metal housing with two mounting holes. A rope and pulley assembly hangs from the bottom of the housing.
RN ..003 Angled extension	A horizontal level switch with a black rectangular sensor head at the top, connected by a cable to a metal housing. The housing is angled downwards to the right, with a small grey rectangular base plate at the bottom right.	A horizontal level switch with a black rectangular sensor head at the top, connected by a cable to a metal housing. The housing is angled downwards to the right, with a small grey rectangular base plate at the bottom right.
RN ..004 Pipe extension horizontal	A horizontal level switch with a black rectangular sensor head at the top, connected by a cable to a metal housing. The housing is horizontal and angled upwards to the right, with a small grey rectangular base plate at the bottom right.	A horizontal level switch with a black rectangular sensor head at the top, connected by a cable to a metal housing. The housing is horizontal and angled upwards to the right, with a small grey rectangular base plate at the bottom right.
RN 3005 Extra short version for use in loading bellow	A very compact horizontal level switch with a black rectangular sensor head at the top, connected by a cable to a small metal housing. It is designed to fit into a narrow U-shaped opening.	

Specifications

Series	RN 3000	RN 6000					
Approvals							
CE	•	•					
ATEX/ IEC-Ex/ INMETRO:							
Zone 20/21	Dust Ignition Proof	•					
Zone 1	Flameproof/ Increased Safety	•					
FM/ CSA:							
Ordinary Locations		•					
Cl. II, III Div. 1	Dust Ignition Proof	•					
Cl. I Div. 1	Explosionproof	•					
Zone 1	Flameproof/ Increased Safety	•					
TR-CU:							
Ordinary Locations	•						
Zone 20/21	Dust Ignition Proof	•					
Zone 1	Flameproof/ Increased Safety	•					
Functional safety	SIL 2 (IEC 61508)	•					
Technical data							
Ambient temperature	-20°C .. +70°C (-4°F .. +158°F) CE -20°C .. +60°C (-4°F .. +140°F) EX -40°C (-40°F) with heating	-20°C .. +50°C (-4°F .. +122°F) -40°C (-40°F) with heating					
Type of protection	IP66 and NEMA Type 4/4X (RN6000)						
Material housing	Aluminium or plastics PA6 (RN3000, optional)						
Process connection material	Aluminium or 1.4305 (303)/ 1.4541 (321) or 1.4404 (316L)						
Material of measuring vane and shaft	1.4301 (SS 304)/ 1.4305 (303) or 1.4404 (316L)						
Electronics							
RN 3000							
Power supply	Output signal						
	SPDT ⁽¹⁾	DPDT	PNP	FSH/ FSL ⁽²⁾	Adjustable delay	Fail safe alarm	
AC version	•	-	-	-	-	-	
DC version	•	-	-	-	-	-	
DC version	-	-	•	•	•	-	
Universal voltage	24 V DC/ 22 .. 230 V AC	•	-	-	•	option	
RN 6000							
Power supply	Output signal						
	SPST	SPDT ⁽¹⁾	DPDT	PNP	FSH/ FSL ⁽²⁾	Adjustable delay	Fail safe alarm
AC version	-	•	-	-	-	-	-
DC version	-	•	-	-	-	-	-
Universal voltage	24 V DC/ 22 .. 230 V AC	-	• ⁽³⁾	-	•	•	option
Universal voltage SIL 2	24 V DC/ 22 .. 230 V AC	•	• ⁽⁴⁾	-	-	•	-

(1) Micro switch, with Universal voltage Relais

(2) Switchable signal output (Fail safe high/ low)

(3) For Ex approval "Increased safety" (pos.2 C,R,S) not in combination with option Fail safe alarm

(4) Additional output, without SIL

Specifications

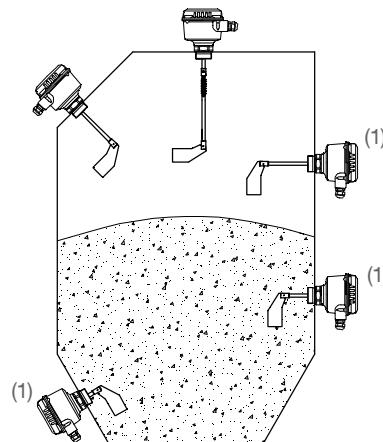
RN .001	Process temperature	-40/ -25 .. +80/ 150/ 250/ 350/ 600/ 1,100°C (-40/ -13 .. +176/ 302/ 482/ 662/ 1,112/ 2,012°F)
	Process pressure	-0.9 .. +0.8bar; -0.9 .. +5/ 10 bar (-13.1 .. +11.6; -13.1 .. +72.5/ 145 psi)
	Length of extension	
	Full detector vertical from the top	70 .. 1,000 mm (2.76 .. 39.4")
	Full detector with pendulum shaft, vertical from the top	300 .. 1,000 mm (11.8 .. 39.4")
	Full detector oblique from the top	70 .. 300 mm (2.76 .. 11.8")
	Full detector horizontal	70 .. 300 mm (2.76 .. 11.8")
	Demand or empty detector horizontal	70 .. 150 mm (2.76 .. 5.9") *
RN .002	Empty detector oblique from the bottom	70 .. 150 mm (2.76 .. 5.9") *
	Process temperature	-40/ -25 .. +80/ 150/ 250/ 350/ 600/ 1,100°C (-40/ -13 .. +176/ 302/ 482/ 662/ 1,112/ 2,012°F)
	Process pressure	-0.9 .. +0.8 bar; -0.9 .. +5/ 10 bar (-13.1 .. +11.6; -13.1 .. +72.5/ 145 psi)
	Length of extension	
	Full detector vertical from the top	250 .. 3,000 mm (9.84 .. 118")/ 4,000 mm (158") with support of the extension pipe
Extensions	Full detector oblique from the top	250 .. 3,000 mm (9.84 .. 118") with option "Bearing at tube end"
	Process temperature	-40/ -25 .. +80/ 150/ 250/ 350/ 600°C (-40/ -13 .. +176/ 302/ 482/ 662/ 1,112°F)
	Process pressure	-0.9 .. +0.8 bar; -0.9 .. +5/ 10 bar (-13.1 .. +11.6; -13.1 .. +72.5/ 145 psi)
	Length of extension	
RN..002-rope	Full detector vertical from the top	500 .. 10,000 mm (19.7 .. 394") (observe max. traction)
	Process temperature	-40/ -25 .. +80/ 150/ 250°C (-40/ -13 .. +176/ 302/ 482°F)
RN ..003	Process pressure	-0.9 .. +0.8 bar; -0.9 .. +5/ 10 bar (-13.1 .. +11.6; -13.1 .. +72.5/ 145 psi)
	Length of extension	
	Demand or empty detector horizontal	125 .. 600 mm (4.92 .. 23.6")
	Empty detector oblique from the bottom	125 .. 600 mm (4.92 .. 23.6")
	Process temperature	-40/ -25 .. +80/ 150/ 250/ 350/ 600°C (-40/ -13 .. +176/ 302/ 482/ 662/ 1,112°F)
RN ..004	Process pressure	-0.9 .. +0.8 bar; -0.9 .. +5/ 10 bar (-13.1 .. +11.6; -13.1 .. +72.5/ 145 psi)
	Length of extension	
	Full detector vertical from the top	150 .. 600 mm (5.90 .. 23.6")
	Full detector oblique from the top	150 .. 300 mm (5.90 .. 11.8")
	Full detector horizontal	150 .. 300 mm (5.90 .. 11.8")
	Demand or empty detector horizontal	150 .. 300 mm (5.90 .. 11.8") *
	Empty detector oblique from the bottom	150 .. 300 mm (5.90 .. 11.8") *
RN 3005	Process temperature	-40/ -25 .. +80°C (-40/ -13 .. +176°F)
	Process pressure	-0.9 .. +0.8 bar (-13.1 .. +11.6 psi)
	Length of extension	
	Application "Loading bellow"	90 mm (3.5")

* A protective canopy is recommended for applications with high mechanical loads

Applications

RN ..001

Short extension length



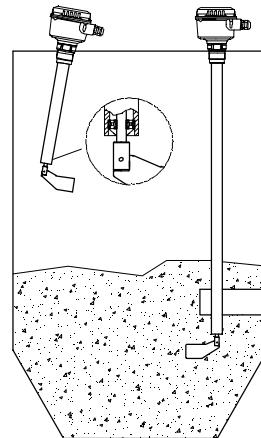
Extension for vertical instalation with pendulum shaft

(1) Not for version 1,100°C

Horizontal mounting:
 Boot shaped vane
 recommended
 (min. mech. loading as
 the vane aligns itself to
 the material flow).

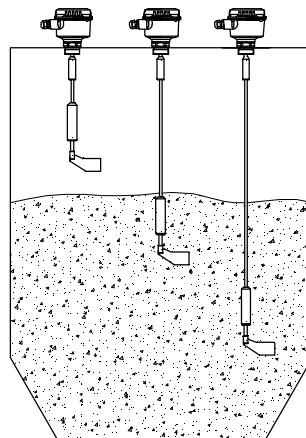
RN ..002

Pipe extension vertical



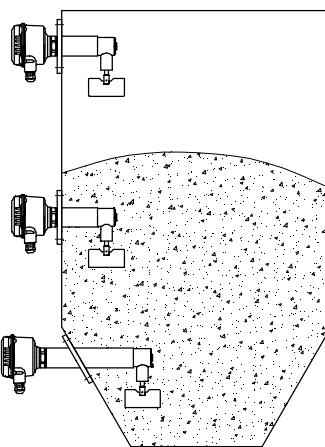
Deviation up to max.
 10° from vertical
 installation only with
 option „bearing at
 tube end“ possible

RN ..002 - rope
 Rope extension

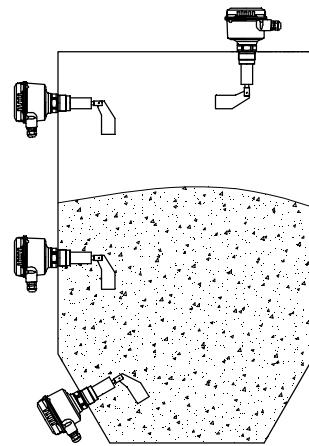


Applications

RN ..003
Angled extension

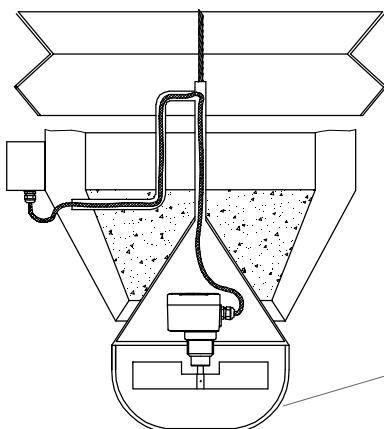


RN ..004
Pipe extension horizontal



Horizontal mounting:
Boot shaped vane
recommended
(min. mech. loading as
the vane aligns itself to
the material flow).

RN 3005
Extra short version



Application
„Loading bellow“

mechanical
protection for
sensor

RN ..001 Short extension length

RN 3001



RN 6001



Housings RN 6001



Standard



d (flameproof)



de
(flameproof/
increased safety)

Cable entries (by default)

Depending on model selected, the following cable entries will be delivered (options see pos.28 on page 20):

Version:	Cable entries:
ATEX/ IEC-Ex flameproof (pos.2 T) FM and CSA (pos.2 M,N,S,U) All other versions	M20 x 1.5 (1x open conduit + 1x blind plug) NPT $\frac{1}{2}$ " tapered ANSI B1.20.1 (1x open conduit + 1x blind plug) M20 x 1.5 (1x screwed cable gland + 1x blind plug)

Dimensions see pages 24 - 28

Basic Type

RN 3001	.....		
RN 6001	.....		
pos.2	Certificate		(detailed Ex-markings: see page 29)	
Certificate	Zone/ Div		Protection method	
	Dust	Gas		
0 CE/ TR-CU	-	-		
W ATEX	Zone 20/21	-	Dust Ignition Proof	
R ATEX	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	
T ATEX	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	
A IEC-Ex/ INMETRO	Zone 20/21	-	Dust Ignition Proof	
C IEC-Ex/ INMETRO	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	
D IEC-Ex/ INMETRO	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	
M FM/ CSA	-	-	General purpose	
N FM/ CSA	Cl. II, III, Div.1 CSA A 20/21	-	Dust Ignition Proof	
S FM/ CSA	Cl. II, III, Div.1 CSA A 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	
U FM/ CSA	Cl. II, III, Div.1 CSA A 20/21	Cl. I Div.1/ Zone 1	Explosion Proof/ Dust Ignition Proof	
E TR-CU	Zone 20/21	-	Dust Ignition Proof	
K TR-CU	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	
L TR-CU	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	
pos.3	Process temperature			
1	max. +80°C (176°F)	.....	
2	max. +150°C (302°F)	.....	
3	max. +250°C (482°F)	.....	
4	max. +350°C (662°F)	.....	(not for pos.10 K,S in 1.4404; not for Ex, only with pos.4 1, L min=200 mm)	.
5	max. +600°C (1,112°F)	.....	(not for pos.10 K,S in 1.4404; not for Ex, only with pos.4 1)	.....
6	max. +1,100°C (2,012°F)	.....	Installation vertical/ obliquely downward	on request
pos.4	Process overpressure			
1	max. 0.8 bar (11.6 psi)	.....	(0.1 bar (1.45 psi) with Pos.3 5 and pos.3 6)	
2	max. 5 bar (73 psi)	.....	
3	max. 10 bar (145 psi)	.....	



RN ..001 Short extension length

pos.5	Power supply	
• •	A / S 230 V AC 50 - 60 Hz	Motor Speed: A=1/min S=5/min
• •	B / T 115 V AC 50 - 60 Hz	Motor Speed: B=1/min T=5/min
• •	C / U 48 V AC 50 - 60 Hz	Motor Speed: C=1/min U=5/min
• •	D / V 24 V AC 50 - 60 Hz	Motor Speed: D=1/min V=5/min
• •	E / W 24 V DC	Motor Speed: E=1/min W=5/min
• •	G / H 24 V DC PNP	Motor Speed: G=1/min H=5/min
• •	F / X 24 V DC/ 22 .. 230 V AC universal voltage	Motor Speed: F=1/min X=5/min
pos.6	Process connection	
• •	A thread G 1½", DIN 228	• • •
• •	B thread G 1¼", DIN 228	(max. 250°C (482°F))
• •	C thread G 1", DIN 228 (max. 250°C (482°F); not for pos.2 C,D,L,K,R,S,T,U)	• • •
• •	D thread M32 x 1.5 (max. 0.8 bar (11.6psi)/ 250°C (482°F); nor for pos.2 C,D,L,K,R,S,T,U)	• • •
• •	E thread M30 x 1.5 (max. 0.8 bar (11.6psi)/ 80°C (176°F); nor for pos.2 C,D,L,K,R,S,T,U)	• • •
• •	F thread NPT 1½", conical ANSI B1.20.1	• • •
• •	Q thread NPT 1¼", conical ANSI B1.20.1	(max. 250°C (482°F))
• •	G thread NPT 1", conical ANSI B1.20.1 (max. 250°C (482°F); not for pos.2 C,D,L,K,R,S,T,U)	• • •
• •	P Triclamp 2" (DN50) ISO 2852	(max. 250°C (482°F))
• •	H flange 150x150, 4x ø18 LK-ø170	(max. 0.8 bar (11.6psi))
• •	I flange 150x150, 4x ø14 LK-ø170	(max. 0.8 bar (11.6psi))
• •	K flange DN32 PN6, EN 1092-1	(max. 5 bar (73psi)/ 250°C (482°F))
• •	N flange DN50 PN16, EN 1092-1	• • •
• •	L flange DN100 PN6, EN 1092-1	(max. 5 bar (73 psi))
• •	M flange DN100 PN16, EN 1092-1	• • •
• •	S flange 2" 150lbs ANSI B16.5	• • •
• •	T flange 3" 150lbs ANSI B16.5	• • •
• •	U flange 4" 150lbs ANSI B16.5	• • •
pos.7	Material Process connection	
• •	1 aluminium	(max. 0.8 bar (11.6psi)/ 80°C (176°F))
• •	3 stainless steel 1.4305 (303) A-G/ 1.4301 (304) P-I/ 1.4541 (321) K-U	
• •	7 stainless steel 1.4404 (316L)	(only with pos.9 7)
pos.8	Length of extension "L"	
• •	K 70 mm (2.76")	(only with vane P)
• •	A 100 mm (3.93")	(only with vane A,D,R,J,B,C,E)
• •	B 150 mm (5.90")	• • •
• •	C 200 mm (7.87")	• • •
• •	D 250 mm (9.84")	• • •
• •	E 300 mm (11.8")	• • •
• •	Z other lengths price per 50 mm (1.97") or part thereof (starting from 0 mm) min. 350 mm (13.8"), max. 1,000 mm (39.4")	• • •
pos.9	Material of extension "L"	
• •	3 stainless steel 1.4305 (303)	
• •	7 stainless steel 1.4404 (316L)	(only with pos.7 7 and 10 A,D,R,F,K,S,P)
pos.10	Measuring vane	
• •	A boot-shaped ⁽¹⁾ 40 x 98 mm (1.57 x 3.86") for 1½" socket (with pos.9 7 L=10 mm longer)	• •
• •	D boot-shaped ⁽¹⁾ 35 x 106 mm (1.38 x 4.17") for 1¼" socket (L=10 mm longer)	• •
• •	R boot-shaped ⁽¹⁾ 28 x 98 mm (1.10 x 3.86") for 1" and M32 socket	• •
• •	J boot-shaped ⁽¹⁾ 26 x 77 mm (1.02 x 3.03") for M30 socket	• •
• •	B rectangular 50 x 98 mm (1.97 x 3.86")	• •
• •	C rectangular 50 x 150 mm (1.97 x 5.90")	• •
• •	E rectangular 50 x 250 mm (1.97 x 9.84")	• •
• •	F rectangular 98 x 98 mm (3.86 x 3.86")	• •
• •	G rectangular 98 x 150 mm (3.86 x 5.90")	• •
• •	I rectangular 98 x 250 mm (3.86 x 9.84")	• •
• •	K hinged vane 98 x 200 mm (3.86 x 7.87") double sided (L=10mm longer) 1.4301/ 1.4404	• / • (1.4404)
• •	S hinged vane 98 x 100 mm (3.86 x 3.93") single sided (L=10mm longer) 1.4301/ 1.4404	• / • (1.4404)
• •	M rubber vane 98 x 250 mm (3.86 x 9.84")	(max. 80°C (176°F))
• •	P notched 40 x 80 mm (1.57 x 3.15")	(only with pos.8 K) 1.4301/ 1.4404
• •	Y without	including splint pin for fixation

Basic type

Further options and accessories: see page 20

	A								
Position	1	2	3	4	5	6	7	8	9

← **Order code**

All positions are available in special design (use code "Z").

⁽¹⁾ maximum length of socket 40mm



RN ..002 Pipe extension vertical

RN 3002



RN 6002



Without sealing and bearing at tube end (see also option pos.32)

Housings RN 6002



Standard



d (flameproof)



de
(flameproof/
increased safety)

Cable entries (by default)

Depending on model selected, the following cable entries will be delivered (options see pos.28 on page 20):

Version:	Cable entries:
ATEX/ IEC-Ex flameproof (pos.2 T)	M20 x 1.5 (1x open conduit + 1x blind plug)
FM and CSA (pos.2 M,N,S,U)	NPT 1/2" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)
All other versions	M20 x 1.5 (1x screwed cable gland + 1x blind plug)

Dimensions

see pages 24 - 28

Basic Type

RN 3002	.....	•
RN 6002	.....	•

pos.2	Certificate	(detailed Ex-markings: see page 29)		
		Dust	Gas	Protection method
••	0 CE/ TR-CU	-	-	
••	W ATEX	Zone 20/21	-	Dust Ignition Proof
•	R ATEX	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof
••	T ATEX	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof
••	A IEC-Ex/ INMETRO	Zone 20/21	-	Dust Ignition Proof
•	C IEC-Ex/ INMETRO	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof
•	D IEC-Ex/ INMETRO	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof
•	M FM/ CSA	-	-	General purpose
•	N FM/ CSA	Cl. II, III, Div.1	-	Dust Ignition Proof
•	CSA	A 20/21		
•	S FM/ CSA	Cl. II, III, Div.1	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof
•	CSA	A 20/21		
•	U FM/ CSA	Cl. II, III, Div.1	Cl. I Div.1/ Zone 1	Explosion Proof/ Dust Ignition Proof
•	CSA	A 20/21		
••	E TR-CU	Zone 20/21	-	Dust Ignition Proof
••	K TR-CU	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof
••	L TR-CU	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof

RN ..002 Pipe extension vertical

pos.3	Process temperature	
1	max. +80°C (176°F)	•
2	max. +150°C (302°F)	•
3	max. +250°C (482°F)	•
5	max. +600°C (1,112°F) (not for pos.10 K,S in 1.4404; not for Ex, only with pos.4 1)	•
6	max. +1,100°C (2,012°F) Installation vertical/ obliquely downward on request	•
pos.4	Process overpressure	
1	max. 0.8 bar (11.6 psi) (0.1 bar (1.45 psi) with pos.3 5, pos.3 6)	•
2	max. 5 bar (73 psi)	•
3	max. 10 bar (145 psi)	•
pos.5	Power supply	
A / S	230 V AC 50 - 60 Hz	Motor Speed: A=1/min S=5/min
B / T	115 V AC 50 - 60 Hz	Motor Speed: B=1/min T=5/min
C / U	48 V AC 50 - 60 Hz	Motor Speed: C=1/min U=5/min
D / V	24 V AC 50 - 60 Hz	Motor Speed: D=1/min V=5/min
E / W	24 V DC	Motor Speed: E=1/min W=5/min
G / H	24 V DC PNP	Motor Speed: G=1/min H=5/min
F / X	24 V DC/ 22 .. 230 V AC universal voltage	Motor Speed: F=1/min X=5/min
pos.6	Process connection	
A	thread G 1½", DIN 228	•
B	thread G 1¼", DIN 228	(max. 250°C (482°F))
F	thread NPT 1½", conical ANSI B1.20.1	•
Q	thread NPT 1¼", conical ANSI B1.20.1	(max. 250°C (482°F))
P	Triclamp 2" (DN50) ISO 2852	(max. 250°C (482°F))
H	flange 150x150, 4x ø18 LK-ø170	(max. 0.8 bar (11.6 psi))
I	flange 150x150, 4x ø14 LK-ø170	(max. 0.8 bar (11.6 psi))
K	flange DN32 PN6, EN 1092-1	(max. 5 bar (73 psi) /250°C (482°F))
N	flange DN50 PN16, EN 1092-1	•
L	flange DN100 PN6, EN 1092-1	(max. 5 bar (73 psi))
M	flange DN100 PN16, EN 1092-1	•
S	flange 2" 150lbs ANSI B16.5	•
T	flange 3" 150lbs ANSI B16.5	•
U	flange 4" 150lbs ANSI B16.5	•
pos.7	Material Process connection	
1	aluminium	(max. 0.8 bar (11.6 psi)/ 80°C (176°F))
3	stainless steel 1.4305 (303) A-Q/ 1.4301 (304) P-I/ 1.4541 (321) K-U	
7	stainless steel 1.4404 (316L)	(only with pos.9 7)
pos.8	Length of extension "L"	
Z	price per 100 mm (3.94") or part thereof (starting from 0 mm) min. 250 mm (9.84"), max. 4,000 mm (158")	•
pos.9	Material of extension "L"	
1	aluminium	(max. 0.8 bar (11.6psi)/ 250°C (482°F))
3	stainless steel 1.4305 (303)/ 1.4301 (304)	
7	stainless steel 1.4404 (316L)	(only with pos.7 7 and 10 A,D,F,K,S and 32x)
pos.10	Measuring vane	
A	boot-shaped ⁽¹⁾ 40 x 98 mm (1.57 x 3.86") for 1½" socket (with pos.9 7 L=10 mm)	•
D	boot-shaped ⁽¹⁾ 35 x 106 mm (1.38 x 4.17") for 1¼" socket (L=10 mm longer)	•
B	rectangular 50 x 98 mm (1.97 x 3.86")	•
C	rectangular 50 x 150 mm (1.97 x 5.90")	•
E	rectangular 50 x 250 mm (1.97 x 9.84")	•
F	rectangular 98 x 98 mm (3.86 x 3.86")	•
G	rectangular 98 x 150 mm (3.86 x 5.90")	•
I	rectangular 98 x 250 mm (3.86 x 9.84")	•
K	hinged vane 98 x 200 mm (3.86 x 7.87") double sided (L=10 mm longer) 1.4301/ 1.4404	• / • (1.4404)
S	hinged vane 98 x 100 mm (3.86 x 3.93") single sided (L=10 mm longer) 1.4301/ 1.4404	• / • (1.4404)
M	rubber vane 98 x 250 mm (3.86 x 9.84") (max.80°C (176°F))	•
Y	without including splint pin for fixation	•

Basic Type

Further options and accessories: see page 20

All positions are available in special design (use code "Z")

⁽¹⁾ maximum length of socket 40 mm



RN ..002-rope Rope extension

RN 3002 - rope



RN 6002 - rope



Housings RN 6002-rope



Standard



d (flameproof)



de
(flameproof/
increased safety)

Cable entries (by default)

Depending on model selected, the following cable entries will be delivered (options see pos.28 on page 20):

Version:	Cable entries:
ATEX/ IEC-Ex flameproof (pos.2 T)	M20 x 1.5 (1x open conduit + 1x blind plug)
FM and CSA (pos.2 M,N,S,U)	NPT ½" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)
All other versions	M20 x 1.5 (1x screwed cable gland + 1x blind plug)

Dimensions

see pages 24 - 28

Basic Type

	RN 3002-Rope	.....	•
	RN 6002-Rope	.....	•
	Types		
	C Standard (max. 4 kN load)	.....	•
	H Strengthened (max. 28 kN load) (max. 80°C (176°F), only with pos.7.3 and pos.2.0,W,A,M,N,E)	.....	•
	pos.2 Certificate (detailed Ex-markings: see page 29)		
	Certificate	Zone/ Div	Protection method
		Dust	Gas
	0 CE/ TR-CU	-	-
	W ATEX	Zone 20/21	-
	R ATEX	Zone 20/21	Zone 1
	T ATEX	Zone 20/21	Zone 1
	A IEC-Ex/ INMETRO	Zone 20/21	-
	C IEC-Ex/ INMETRO	Zone 20/21	Zone 1
	D IEC-Ex/ INMETRO	Zone 20/21	Zone 1
	M FM/ CSA	-	-
	N FM/ CSA	Cl. II, III, Div.1	-
		CSA	A 20/21
	S FM/ CSA	Cl. II, III, Div.1	Zone 1
		CSA	A 20/21
	U FM/ CSA	Cl. II, III, Div.1	Cl. I Div.1/ Zone 1
		CSA	A 20/21
	E TR-CU	Zone 20/21	-
	K TR-CU	Zone 20/21	Zone 1
	L TR-CU	Zone 20/21	Zone 1

RN ..002-rope Rope extension

	Process temperature		
• •	1 max. +80°C (176°F)	•	•
• •	2 max. +150°C (302°F)	•	•
• •	3 max. +250°C (482°F)	•	•
• •	5 max. +600°C (1,112°F) (not for pos.10 K,S in 1.4404; not for Ex, only with pos.4 1)	•	•
	Process overpressure		
• •	1 max. 0.8 bar (11.6 psi) (0.1 bar (1.45 psi) with pos.3 5)	•	•
• •	2 max. 5 bar (73 psi)	•	•
• •	3 max. 10 bar (145 psi)	•	•
	Power supply		
• •	A / S 230 V AC 50 - 60 Hz Motor Speed: A=1/min S=5/min	•	/ •
• •	B / T 115 V AC 50 - 60 Hz Motor Speed: B=1/min T=5/min	•	/ •
• •	C / U 48 V AC 50 - 60 Hz Motor Speed: C=1/min U=5/min	•	/ •
• •	D / V 24 V AC 50 - 60 Hz Motor Speed: D=1/min V=5/min	•	/ •
• •	E / W 24 V DC Motor Speed: E=1/min W=5/min	•	/ •
• •	G / H 24 V DC PNP Motor Speed: G=1/min H=5/min	•	/ •
• •	F / X 24 V DC/22 .. 230 V AC universal voltage Motor Speed: F=1/min X=5/min	•	/ •
	Process connection		
• •	A thread G 1½", DIN 228	•	•
• •	B thread G 1¼", DIN 228 (max. 250°C (482°F))	•	•
• •	F thread NPT 1½", conical ANSI B1.20.1	•	•
• •	Q thread NPT 1¼", conical ANSI B1.20.1 (max. 250°C (482°F))	•	•
• •	H flange 150x150, 4x ø18 LK-ø170 (max. 0.8 bar (11.6 psi))	•	•
• •	I flange 150x150, 4x ø14 LK-ø170 (max. 0.8 bar (11.6 psi))	•	•
• •	K flange DN32 PN6, EN 1092-1 (max. 5 bar (73 psi)/ 250°C (482°F))	•	•
• •	N flange DN50 PN16, EN 1092-1	•	•
• •	L flange DN100 PN6, EN 1092-1 (max. 5 bar (73 psi))	•	•
• •	M flange DN100 PN16, EN 1092-1	•	•
• •	S flange 2" 150lbs ANSI B16.5	•	•
• •	T flange 3" 150lbs ANSI B16.5	•	•
• •	U flange 4" 150lbs ANSI B16.5	•	•
	Material Process connection		
• •	1 aluminium (max. 0.8 bar (11.6 psi)/ 80°C (176°F))	•	•
• •	3 stainless steel 1.4305 (303) A-Q/ 1.4301 (304) P-I/ 1.4541 (321) K-U	•	•
	Length of extension "L"		
• •	Z price per 100 mm (3.94") or part thereof (starting from 0 mm)	•	•
• •	pos.1 C min. 500 mm (19.69")/ pos.1 H min. 1,000 mm (39.4"); max. 10,000 mm (394")	•	•
• •	Y without rope (incl. rope fixing parts) (only with pos.1 C)	•	•
	Measuring vane		
• •	A boot-shaped ⁽¹⁾ 40 x 98 mm (1.57 x 3.86") for 1½" socket	•	•
• •	D boot-shaped ⁽¹⁾ 35 x 106 mm (1.38 x 4.17") for 1¼" socket (L=10 mm longer)	•	•
• •	B rectangular 50 x 98 mm (1.97 x 3.86")	•	•
• •	C rectangular 50 x 150 mm (1.97 x 5.90")	•	•
• •	E rectangular 50 x 250 mm (1.97 x 9.84")	•	•
• •	F rectangular 98 x 98 mm (3.86 x 3.86")	•	•
• •	G rectangular 98 x 150 mm (3.86 x 5.90")	•	•
• •	I rectangular 98 x 250 mm (3.86 x 9.84")	•	•
• •	K hinged vane 98 x 200 mm (3.86 x 7.87") double sided (L=10 mm)	•	•
• •	S hinged vane 98 x 100 mm (3.86 x 3.93") single sided (L=10 mm longer)	•	•
• •	M rubber vane 98 x 250 mm (3.86 x 9.84") (max.80°C (176°F))	•	•
• •	Y without including splint pin for fixation	•	•

Further options and accessories: see page 20

Basic Type

Position	1	2	3	4	5	6	7	8	9	10	Z	3	—	L =	mm	←	Order code
----------	---	---	---	---	---	---	---	---	---	----	---	---	---	-----	----	---	------------

All positions are available in special design (use code "Z").

⁽¹⁾ maximum length of socket 40 mm

RN ..003 Angled extension

RN 3003



RN 6003



Housings RN 6003



Cable entries (by default)

Depending on model selected, the following cable entries will be delivered (options see pos.28 on page 20):

Version:	Cable entries:
ATEX/ IEC-Ex flameproof (pos.2 T)	M20 x 1.5 (1x open conduit + 1x blind plug)
FM and CSA (pos.2 M,N,S,U)	NPT 1/2" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)
All other versions	M20 x 1.5 (1x screwed cable gland + 1x blind plug)

Dimensions

see pages 24 - 28

Basic Type

	RN 3003	•
	RN 6003	•

pos.2	Certificate	(detailed Ex-markings: see page 29)		
		Zone/ Div		Protection method
	Certificate	Dust	Gas	
• •	0 CE/ TR-CU	-	-	
• •	W ATEX	Zone 20/21	-	Dust Ignition Proof
• •	R ATEX	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof
• •	T ATEX	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof
• •	A IEC-Ex/ INMETRO	Zone 20/21	-	Dust Ignition Proof
• •	C IEC-Ex/ INMETRO	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof
• •	D IEC-Ex/ INMETRO	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof
• •	M FM/ CSA	-	-	General purpose
• •	N FM/ CSA	Cl. II, III, Div.1	-	Dust Ignition Proof
• •	CSA	A 20/21		
• •	S FM/ CSA	Cl. II, III, Div.1	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof
• •	CSA	A 20/21		
• •	U FM/ CSA	Cl. II, III, Div.1	Cl. I Div.1/ Zone 1	Explosion Proof/ Dust Ignition Proof
• •	CSA	A 20/21		
• •	E TR-CU	Zone 20/21	-	Dust Ignition Proof
• •	K TR-CU	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof
• •	L TR-CU	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof

RN ..003 Angled extension

• •	pos.3	Process temperature									
• •		1 max. +80°C (176°F)	•								
• •		2 max. +150°C (302°F)	•								
• •		3 max. +250°C (482°F)	•								
• •	pos.4	Process overpressure									
• •		1 max. 0.8 bar (11.6 psi)	•								
• •		2 max. 5 bar (73 psi)	•								
• •		3 max. 10 bar (145 psi)	•								
• •	pos.5	Power supply									
• •		A / S 230 V AC 50 - 60 Hz	Motor Speed: A=1/min S=5/min	•	/	•					
• •		B / T 115 V AC 50 - 60 Hz	Motor Speed: B=1/min T=5/min	•	/	•					
• •		C / U 48 V AC 50 - 60 Hz	Motor Speed: C=1/min U=5/min	•	/	•					
• •		D / V 24 V AC 50 - 60 Hz	Motor Speed: D=1/min V=5/min	•	/	•					
• •		E / W 24 V DC	Motor Speed: E=1/min W=5/min	•	/	•					
• •		G / H 24 V DC PNP	Motor Speed: G=1/min H=5/min	•	/	•					
• •		F / X 24 V DC/ 20 .. 230 AC universal voltage	Motor Speed: F=1/min X=5/min	•	/	•					
• •	pos.6	Process connection									
• •		H flange 150x150, 4x ø18 LK-ø170	(max. 0.8 bar (11.6 psi))	•		•					
• •		I flange 150x150, 4x ø14 LK-ø170	(max. 0.8 bar (11.6 psi))	•		•					
• •		L flange DN100 PN6, EN 1092-1	(max. 5 bar (73 psi))	•		•					
• •		M flange DN100 PN16, EN 1092-1		•		•					
• •		U flange 4" 150lbs ANSI B16.5		•		•					
• •	pos.7	Material Process connection									
• •		1 aluminium	(max. 0.8 bar (11.6 psi)/ 80°C (176°F))	•		•					
• •		3 stainless steel	1.4301 (304)/ 1.4541 (321)	•		•					
• •	pos.8	Length of extension "L"									
• •		1 125 mm (4.92")	•		•	•					
• •		2 150 mm (5.90")	•		•	•					
• •		3 200 mm (7.87")	•		•	•					
• •		4 250 mm (9.84")	•		•	•					
• •		5 300 mm (11.8")	•		•	•					
• •		Z other lengths	Price per 50 mm (1.97") or part thereof (starting from 0 mm) min. 350 mm (13.8"), max. 600 mm (23.6")	•		•					
• •	pos.9	Material of extension "L"									
• •		(must be the same material as pos.7)									
• •		1 aluminium	•		•	•					
• •		3 stainless steel 1.4305 (303)/ 1.4301 (304)	•		•	•					
• •	pos.10	Measuring vane									
• •		A boot-shaped ⁽¹⁾ 40 x 98 mm (1.57 x 3.86")	•		•	•					
• •		B rectangular 50 x 98 mm (1.97 x 3.86")	•		•	•					
• •		C rectangular 50 x 150 mm (1.97 x 5.90")	•		•	•					
• •		E rectangular 50 x 250 mm (1.97 x 9.84")	•		•	•					
• •		F rectangular 98 x 98 mm (3.86 x 3.86")	•		•	•					
• •		G rectangular 98 x 150 mm (3.86 x 5.90")	•		•	•					
• •		I rectangular 98 x 250 mm (3.86 x 9.84")	•		•	•					
• •		K hinged vane 98 x 200 mm (3.86 x 7.87") double sided	•		•	•					
• •		S hinged vane 98 x 100 mm (3.86 x 3.93") single sided	•		•	•					
• •		M rubber vane 98 x 250 mm (3.86 x 9.84")	(max. 80°C (176°F))	•		•					
• •		Y without	including splint pin for fixation	•		•					

Further options and accessories: see page 20

Basic Type

	D									
Position	1	2	3	4	5	6	7	8	9	10

← Order code

All positions are available in special design (use code "Z").

⁽¹⁾ maximum length of socket 40 mm

RN ..004 Pipe extension horizontal

RN 3004



RN 6004



Housings RN 6004



Standard



d (flameproof)



de (flameproof/
increased safety)

Cable entries (by default)

Depending on model selected, the following cable entries will be delivered (options see pos.28 on page 20):

Version:	Cable entries:
ATEX/ IEC-Ex flameproof (pos.2 T)	M20 x 1.5 (1x open conduit + 1x blind plug)
FM and CSA (pos.2 M,N,S,U)	NPT 1/2" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)
All other versions	M20 x 1.5 (1x screwed cable gland + 1x blind plug)

Dimensions

see pages 24 - 28

Basic Type

RN 3004	.....	•
RN 6004	.....	•

pos.2

Certificate

(detailed Ex-markings: see page 29)

Certificate	Zone/ Div		Protection method
	Dust	Gas	
0 CE/ TR-CU	-	-	
W ATEX	Zone 20/21	-	Dust Ignition Proof
R ATEX	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof
T ATEX	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof
A IEC-Ex/ INMETRO	Zone 20/21	-	Dust Ignition Proof
C IEC-Ex/ INMETRO	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof
D IEC-Ex/ INMETRO	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof
M FM/ CSA	-	-	General purpose
N FM/ CSA	Cl. II, III, Div.1	-	Dust Ignition Proof
	CSA		
	A 20/21		
S FM/ CSA	Cl. II, III, Div.1	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof
	CSA		
	A 20/21		
U FM/ CSA	Cl. II, III, Div.1	Cl. I Div.1/ Zone 1	Explosion Proof/ Dust Ignition Proof
	CSA		
	A 20/21		
E TR-CU	Zone 20/21	-	Dust Ignition Proof
K TR-CU	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof
L TR-CU	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof

RN ..004 Pipe extension horizontal

pos.3	Process temperature	
1	max. +80°C (176°F)	•
2	max. +150°C (302°F)	•
3	max. +250°C (482°F)	•
4	max. +350°C (662°F) (not for pos.10 K,S in 1.4404; not for Ex, only with pos.4 1) (L min=200 mm)	•
5	max. +600°C (1,112°F) (not for pos.10 K,S in 1.4404; not for Ex, only with pos.4 1)	•
pos.4	Process overpressure	
1	max. 0.8 bar (11.6 psi) (0.1 bar (1.45 psi) with pos.3 5)	•
2	max. 5 bar (73 psi)	•
3	max. 10 bar (145 psi)	•
pos.5	Power supply	
A / S	230 V AC 50 - 60 Hz	Motor Speed: A=1/min S=5/min
B / T	115 V AC 50 - 60 Hz	Motor Speed: B=1/min T=5/min
C / U	48 V AC 50 - 60 Hz	Motor Speed: C=1/min U=5/min
D / V	24 V AC 50 - 60 Hz	Motor Speed: D=1/min V=5/min
E / W	24 V DC	Motor Speed: E=1/min W=5/min
G / H	24 V DC PNP	Motor Speed: G=1/min H=5/min
F / X	24 V DC/22 .. 230 V AC universal voltage	Motor Speed: F=1/min X=5/min
pos.6	Process connection	
A	thread G 1½", DIN 228	•
B	thread G 1¼", DIN 228	(max. 250°C (482°F))
F	thread NPT 1½", conical ANSI B1.20.1	•
Q	thread NPT 1¼", conical ANSI B1.20.1	(max. 250°C (482°F))
P	Triclamp 2" (DN50) ISO 2852	(max. 250°C (482°F))
H	flange 150x150, 4x ø18 LK-ø170	(max. 0.8 bar (11.6 psi))
I	flange 150x150, 4x ø14 LK-ø170	(max. 0.8 bar (11.6 psi))
K	flange DN32 PN6, EN 1092-1	(max. 5 bar/ 250°C)
N	flange DN50 PN16, EN 1092-1	•
L	flange DN100 PN6, EN 1092-1	(max. 5 bar (73 psi))
M	flange DN100 PN16, EN 1092-1	•
S	flange 2" 150lbs ANSI B16.5	•
T	flange 3" 150lbs ANSI B16.5	•
U	flange 4" 150lbs ANSI B16.5	•
pos.7	Material Process connection	
1	aluminium	(max. 0.8 bar (11.6psi)/ 80°C (176°F))
3	stainless steel 1.4305 (303) A-Q/ 1.4301 (304) P-I/ 1.4541 (321) K-U	
7	stainless steel 1.4404 (316L)	(only with Pos.9 7)
pos.8	Length of extension "L"	
N	150 mm (5.90") (only with vane A, D, B, C, E)	•
P	200 mm (7.87")	•
Q	250 mm (9.84")	•
R	300 mm (11.8")	•
Z	other lengths	Price per 50 mm (1.97") or part thereof (starting from 0 mm) min. 350 mm (13.8"), max. 600 mm (23.6")
pos.9	Material of extension "L"	
1	aluminium	(max. 0.8 bar/ 80°C)
3	stainless steel 1.4305 (303)/1.4301 (304)	
7	stainless steel 1.4404 (316L)	(only with pos.7 7 and pos.10 A,D,F,K,S)
pos.10	Measuring vane	
A	boot-shaped ⁽¹⁾ 40 x 98 mm (1.57 x 3.86") for 1½" socket (with pos.9 7 L=10 mm)	•
D	boot-shaped ⁽¹⁾ 35 x 106 mm (1.38 x 4.17")	for 1¼" socket (L=10 mm longer)
B	rectangular 50 x 98 mm (1.97 x 3.86")	•
C	rectangular 50 x 150 mm (1.97 x 5.90")	•
E	rectangular 50 x 250 mm (1.97 x 9.84")	•
F	rectangular 98 x 98 mm (3.86 x 3.86")	•
G	rectangular 98 x 150 mm (3.86 x 5.90")	•
I	rectangular 98 x 250 mm (3.86 x 9.84")	•
K	hinged vane 98 x 200 mm (3.86 x 7.87") double sided (L=10 mm longer) 1.4301/ 1.4404	• / • 1.4404
S	hinged vane 98 x 100 mm (3.86 x 3.93") single sided (L=10 mm longer) 1.4301/ 1.4404	• / • 1.4404
M	rubber vane 98 x 250 mm (3.86 x 9.84")	(max. 80°C (176°F))
Y	without	including splint pin for fixation

Basic Type

Further options and accessories:

see page 20

Order code

⁽¹⁾ maximum length of socket 40 mm

All positions are available in special design (use code "Z").



RN 3005 Extra short version

RN 3005



RN 6005
not available

Cable entries (by default)
M20 x 1.5 (1x screwed cable gland + 1x blind plug)
Options see pos.28 on page 20

Dimensions see pages 24 - 28

RN 3005 Extra short version

Basic Type

RN 3005

pos.2

Certificate

- 0 CE ⁽¹⁾
- W ATEX Zone 20/21 Dust Ignition Proof (ATEX II 1/2D)
- A IEC-Ex ⁽²⁾ Zone 20/21 Dust Ignition Proof (ta/tb IIIC)
- E TR-CU Zone 20/21 Dust Ignition Proof (DIP A20/ A21)

pos.5

Power supply

- | | | | | |
|---|------------------------------------|---|---|---|
| A / S 230 V AC 50 - 60 Hz | Motor Speed: A=1/min S=5/min | • | / | • |
| B / T 115 V AC 50 - 60 Hz | Motor Speed: B=1/min T=5/min | • | / | • |
| C / U 48 V AC 50 - 60 Hz | Motor Speed: C=1/min U=5/min | • | / | • |
| D / V 24 V AC 50 - 60 Hz | Motor Speed: D=1/min V=5/min | • | / | • |
| E / W 24 V DC | Motor Speed: E=1/min W=5/min | • | / | • |
| G / H 24 V DC PNP | Motor Speed: G=1/min H=5/min | • | / | • |
| F / X 24 V DC/ 22 .. 230 V AC universal voltage | Motor Speed: F=1/min X=5/min | • | / | • |

pos.6

Process connection

- A thread G 1½", DIN 228
- F thread NPT 1½", conical ANSI B1.20.1

pos.7

Material process connection

- 1 aluminium
- 3 stainless steel (1.4305/ 303)

pos.10

Measuring vane

- N VT-vane
- others on request

Further options and accessories: see page 20

Basic Type

RN 3005 | F | 1 | 1 | | | A | 3 | |

Position 1 2 3 4 5 6 7 8 9 10

← Order code

All positions are available in special design (use code "Z").

⁽¹⁾ TR-CU (Ordinary Locations) included

⁽²⁾ INMETRO included

Options

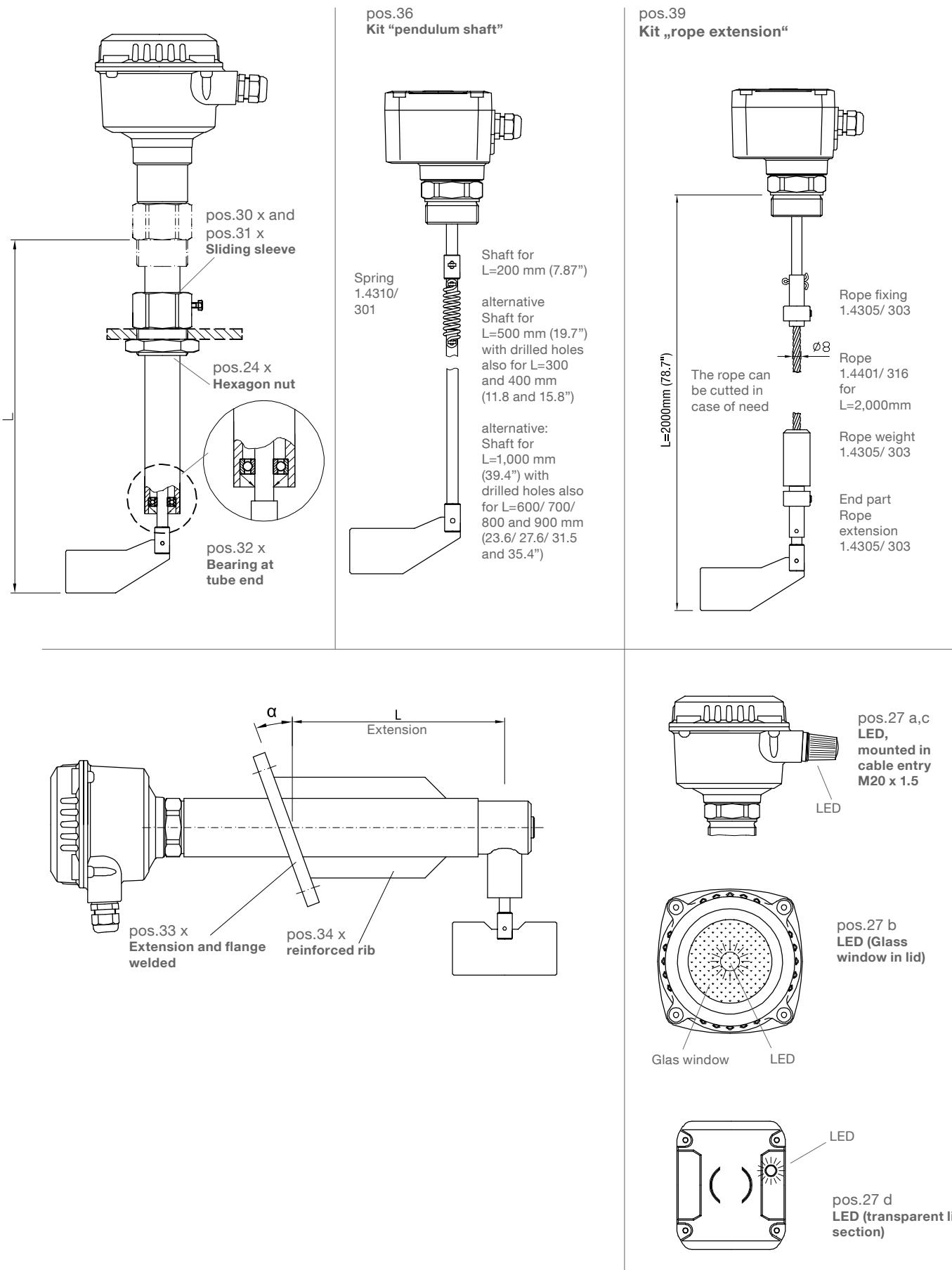
RN 3001	RN 6001	RN 3002	RN 6002	RN 3002-rope	RN 6002-rope	RN 3003	RN 6003	RN 3004	RN 6004	RN 3005	
1	1	1	1	1	1	1	1	1	1	1	pos.11x Guarantee extension to 5 years
•	•	•	•	•	•	•	•	•	•	•	Flat gasket (max. 250°C) for process connection thread 1½", incl. sealing face in aluminium
•	•	•	•	•	•	•	•	•	•	•	pos.15 a for process connection thread 1½", incl. sealing face in 1.4404 (316L)
•	•	•	•	•	•	•	•	•	•	•	pos.15 b for process connection thread 1¼"/ 1" M32 x 1.5/ M30 x 1.5
•	•	•	•	•	•	•	•	•	•	•	pos.15 c for process connection thread 1¼"/ 1" M32 x 1.5/ M30 x 1.5
2	2	2	2	2	2	2	2	2	2	2	pos.16 a Material of housing plastics PA6
3	3	3	3	3	3	3	3	3	3	3	pos.17 a FPM (Viton)
4	4	4	4	4	4	4	4	4	4	4	pos.17 b PTFE (Teflon)
5	5	5	5	5	5	•	•	5	5	•	pos.18 x Stainless steel ball bearing for RN ..001/ RN ..002/ RN ..004/ RN ..005
											for RN ..003
6	6	6	6	6	6	6	6	6	6	6	pos.21 x Weather protection cover (for Ex, only for Zone 2/22/Div. 2)
											Mounting set for flange mounting
•	•	•	•	•	•	•	•	•	•	•	for flange
•	•	•	•	•	•	•	•	•	•	•	for counter flange with
											consists of
											screws* nuts* washers* sealing**
•	•	•	•	•	•	•	•	•	•	•	H hole ø18 4x M16 x 50 4x M16 4 pcs 1 piece
•	•	•	•	•	•	•	•	•	•	•	H thread M16 4x M16 x 30 4x M16 4 pcs 1 piece
•	•	•	•	•	•	•	•	•	•	•	L hole ø18 4x M16 x 60 4x M16 4 pcs 1 piece
•	•	•	•	•	•	•	•	•	•	•	L thread M16 4x M16 x 40 4x M16 4 pcs 1 piece
•	•	•	•	•	•	•	•	•	•	•	M hole ø18 8x M16 x 60 8x M16 8 pcs 1 piece
•	•	•	•	•	•	•	•	•	•	•	M thread M16 8x M16 x 40 8x M16 8 pcs 1 piece
											* material stainless A2 **max. 350°C
											Hexagon nut
•	•	•	•	•	•	•	•	•	•	•	aluminium 1 pc
•	•	•	•	•	•	•	•	•	•	•	aluminium 2 pcs
•	•	•	•	•	•	•	•	•	•	•	stainless steel 1.4305 (303) 1 pc
•	•	•	•	•	•	•	•	•	•	•	stainless steel 1.4305 (303) 2 pcs
8	8	8	8	8	8	8	8	8	8	8	pos.25 a Functional safety SIL 2 (IEC 61508)
•	9	•	9	•	9	•	9	•	9	•	pos.25 x Fail safe alarm (for 24 V DC/ 22 .. 230 V AC universal voltage)
10	10	10	10	10	10	10	10	10	10	10	pos.26 x Heating of housing 2.5 watts for ambient/ process temp. to -40°C (-40°F)
											Signal lamp
11	11	11	11	11	11	11	11	11	11	11	pos.27 a LED, mounted in cable entry M20 x 1.5, green
11	11	11	11	11	11	11	11	11	11	11	Pos.27 c LED, mounted in cable entry M20 x 1.5, red
12		12		12		12		12		12	pos.27 b LED (glass window in lid)
13	13	13	13	13	13	13	13	13	13	13	pos.27 d LED (transparent lid section)
											Cable entry optionally available: Selection of the following options only necessary, if a deviation from the default cable gland/ conduit is required:
•	14	•	14	•	14	•	14	•	14	•	pos.28 x M20 x 1.5 2x screwed cable gland
15		15		15		15		15		15	pos.28 d M20 x 1.5 1x screwed cable gland +1x blind plug
•	16	•	16	•	16	•	16	•	16	•	pos.28 a NPT ½" tapered ANSI B1.20.1 (1x conduit + 1x blind plug)
•		•		•		•		•		•	pos.28 c NPT ¾" tapered ANSI B1.20.1 (1x conduit + 1x blind plug)
											on request
17	17	17	17			17	17	17	17	17	pos.29 y Food grade materials (in contact with process)
											(according to 1935/2004/EC, with FDA conform sealing)
18	18	18	18			18	18			pos.29 a Process connection G 1½" (without flush welding socket)	
18	18	18	18			18	18			pos.29 b Process connection flush welding socket ø69/ G 1½" made of Aluminium	
18	18	18	18			18	18			pos.29 c Process connection flush welding socket ø69/ G 1½" made of 1.4301 (304)	
18	18	18	18			18	18			pos.29 d Process connection flush welding socket ø69/ G 1½" made of 1.4404 (316L)	

Options

	19 19				pos.30 x	Sliding sleeve for applications without process overpressure	•
	20 20				pos.31 x	Sliding sleeve for applications with process overpressure	•
					pos.32 x	Bearing at tube end max. +80°C (176°F)	•
	21 21					max. +150°C (302°F)	•
	21 21					max. +250°C (482°F)	•
	21 21					max. +600°C (1,112°F)	•
	21 21					max. +1,100°C (2,012°F)	on request
	• •				pos.33 x	Extension and flange welded $\alpha = \square^\circ$ min. 0° max. 45° for aluminium (see pos.7/ 9)	•
		• •				for stainless steel (1.4305 (303)) (see pos.7/ 9)	•
			22 22		pos.34 x	Reinforced rib	•
						Plug Valve connector (incl. mating plug) 4-pole (incl. PE) max. 230 V	•
	23 23	23 23	23 23	23 23	pos.35 x	M12 (without mating plug) 4-pole max. 25 V	•
	23 23	23 23	23 23	23 23	pos.35 a	M12 (without mating plug) 5-pole (incl. PE) max. 60 V	•
	23 23	23 23	23 23	23 23	pos.35 b	Harting Han 4A (incl. mating plug) 5-pole (incl. PE) max. 230 V	•
	23 23	23 23	23 23	23 23	pos.35 c		•
						Kit pendulum shaft Max. pulling force 400 N, only with pos.8 A	•
						For vertical and horizontal installation: L=200 mm (7.87")	•
	24 24				pos.36 w	For vertical installation: L=500 mm (19.7") (drilled holes also for 300 and 400 mm (11.8 and 15.8"))	•
	24 24				pos.36 x	L=1,000 mm (39.4") (drilled holes also for 600/ 700/ 800 and 900 mm (23.6/ 27.6/ 31.5 and 35.4"))	•
	24 24				pos.36 y		•
	• •				pos.39 x	Kit rope extension L=2 m, only available as full detector, only with pos.2 O,W,A,M,N,E	•

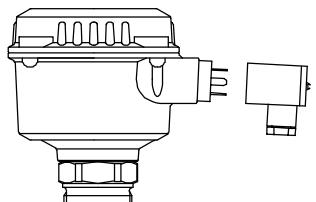
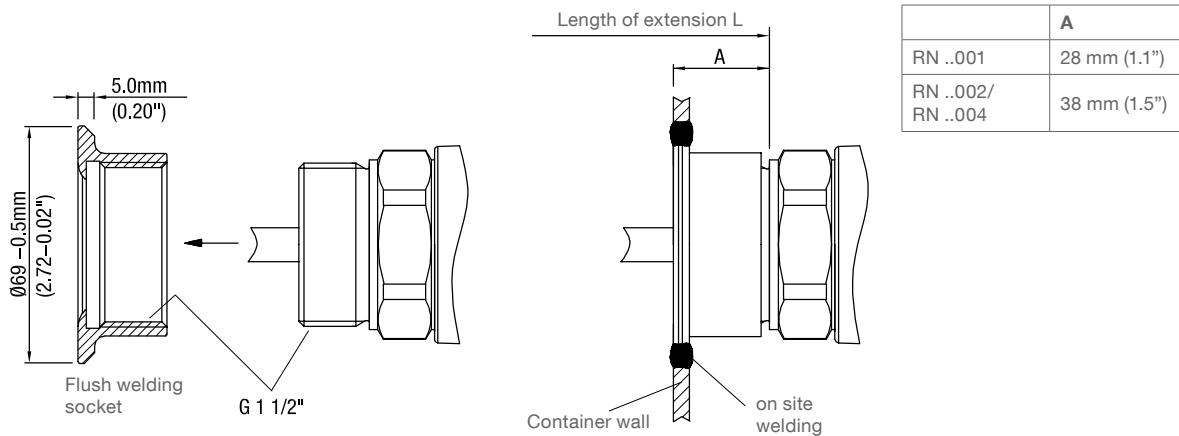
- 1 Available for temperatures up to 250°C (pos.3 1,2,3).
- 2 Available for certificat CE, ATEX, IEC-Ex and TR-CU dust explosionproof (pos.2 O,W,A,E). Not with cable entry NPT (pos.28 a,c) and control lamp LED (pos.27 b). For ATEX, IEC-Ex and TR-CU the min. ambient temperature is -20°C (-4°F).
- 3 Available for temp. up to 80°C and for pressure up to 0.8 bar, except M30 x 1.5 (pos.6 E). Note: 150°C version including FPM as standard.
- 4 Available for temp. up to 150°C and for pressure up to 0.8 bar, except M30 x 1.5 (pos.6 E). Note: 250°C and 5 bar/ 10 bar PTFE included as standard.
- 5 Available for temperature up to 250°C except M30 x 1.5 (pos.6 E), not for RN3002-rope strengthened (pos.1 H).
All bearings mounted in the extension are made of stainless steel.
- 6 Available for all versions except explosionproof/ flameproof version (pos.2 R,T,C,D,S,U,K,L). Not with plug Harting Han 4A (pos.35 c).
- 8 Available with universal voltage (pos.5 F,X). Not for CSA. Not in combination with fail safe alarm pos.25 x.
- 9 Not with Ex-certification "increased safety" (pos.2 R,C,S,K).
- 10 Available with universal voltage (pos.5 F,X) and PNP (pos.5 G,H). Consider reduced switching sensitivity (see technical data).
Note: For temperatures down to -20°C (-4°F) the electronic "universal voltage" and "PNP" have "heating of housing" implemented by default (in this case option pos.26 x is not required).
- 11 Available for CE (pos.2 O), not in combination with weather protection cover (pos.21 x) and cable entries pos.28 x,a,c.
In combination with universal voltage (pos.5 F, X) 2 LED's (24V, 80-260V) will be delivered.
Connection of signal lamp wires with internal terminals: without (standard) or according to customer specification.
- 12 Available for all versions except explosionproof/ flameproof version (pos.2 R,T,C,D,S,U,K,L), not in combination with power supply AC (pos.5 A,B,C,D,S,T,U,V), not in combination with weather protection cover (pos.21 x).
- 13 Available for certificate CE (pos. 2,0), not in combination with power supply AC (pos.5 A,B,C,D,S,T,U,V).
- 14 Available for all versions except flameproof version (pos.2 T,D,U,L) not in combination with power supply AC (pos.5 A,B,C,D,S,T,U,V).
- 15 Available for FM/ CSA versions (pos.2 M,N,S) except flameproof version (pos.2 T,D,U,L).
- 16 Available for CE, ATEX, IEC-Ex, TR-CU (pos.2 O,W,R,T,A,C,D,E,K,L)
- 17 Available up to max. 250°C. Not for M30 x 1.5 (pos.6 E), vane (pos.10 M), flange sealings (pos.22). RN 3002/ RN 6002 only with option bearing with tube end (pos.32 x). The option does not automatically implement a food conform design (food conform gaps and radiiuses).
- 18 Certificate only valid with the use of the "flush welding socket". With pos.29 a this socket must be manufactured on site. Available up to max. 150°C (pos.3 1,2) and for process overpressure max. 0.8 bar (pos.4 1). Only for G 1½" (pos.6 A). Length of extension min. 100mm. Only with vane pos.10 D. RN 3002/ RN 6002 only with bearing at tube end (pos.32 x). Not in combination with options pos.15, 17b, 22, 24, 29y, 30, 31, 36, 39.
- 19 Available for CE (pos.2 O). Process connection and material as choosen in pos.6 and 7.
- 20 Available for temperatures up to 250°C. Process connection as choosen in pos.6. Not with material process connection alu (pos.7 1).
- 21 Available for length L>300 mm (pos.8 Z).
- 22 Available only with pos.33, max. $\alpha = 30^\circ$, min. length "L"=150mm, with material aluminium (pos.9.1) max. lenght "L"=300mm.
- 23 Available for CE (pos.2 O). Without connection of stranded wires for installation and internal terminals (standard) or according to customer specification.
- 24 Available with material 1.4305 (pos.9.3). Available with extension 100mm (pos.8 A) and vane pos.10 A,D,R,J,B,C,E,Y. Available with extension 150mm (pos.8 B) and vane pos.10 F,G,I,K,S,M.

Options

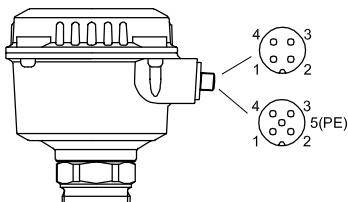


Options

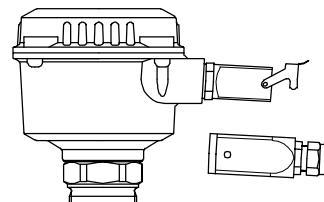
pos.29
 EHEDG approval



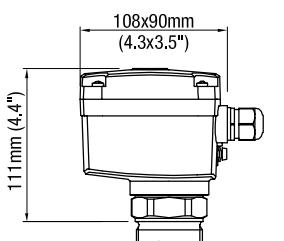
pos.35 x
Valve connector
 Enclosure plastic
 Protection IP65



pos.35 a,b
Plug M12
 Enclosure brass
 Protection IP67

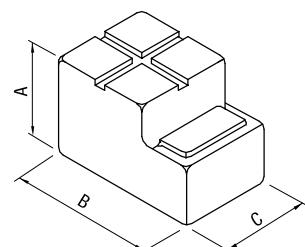


pos.35 c
Plug Han 4A
 Enclosure zinc
 Protection IP65



pos.16 a
 Material of housing
 Plastics PA6

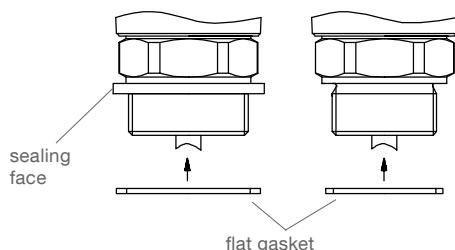
pos.21 x
Weather protection cover



pos.15
Flat gasket

pos.15 a,b

pos.15 c

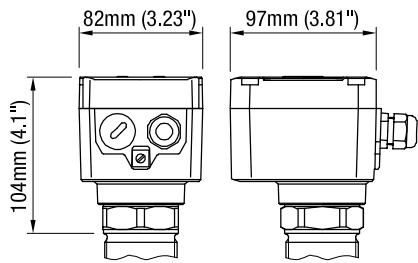


	RN 3000	RN 6000
A	100 mm (3.9")	130 mm (5.1")
B	165 mm (6.5")	200 mm (7.9")
C	95 mm (3.7")	125 mm (4.9")

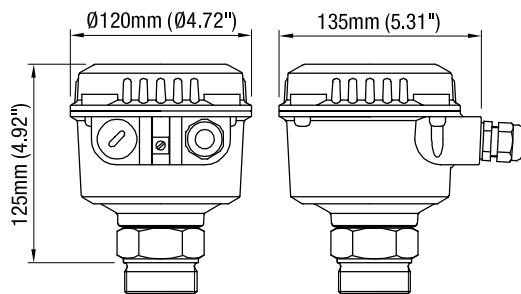
Dimensions

Housing versions

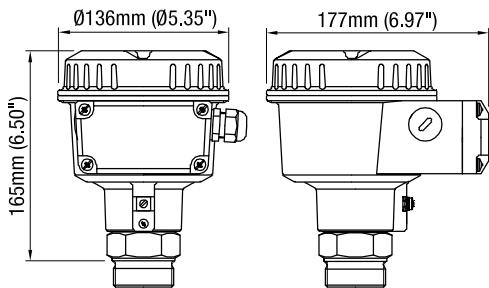
Series RN 3000
 Standard



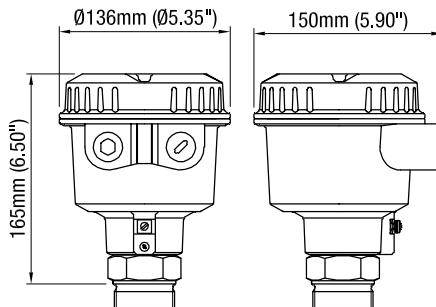
Series RN 6000
 Standard



Series RN 6000
 de explosionproof with increased safety terminal box

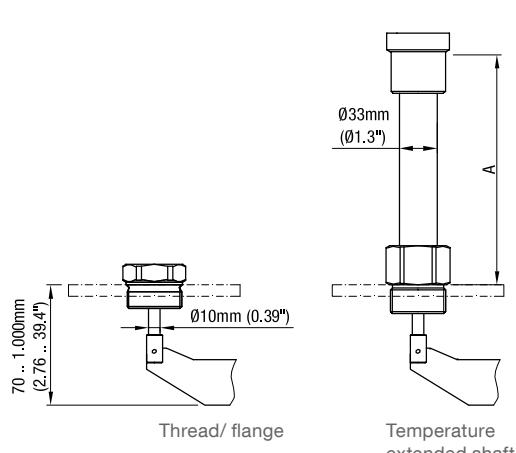


Series RN 6000
 d flameproof/ explosionproof

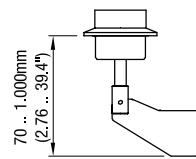


Extensions

RN ..001



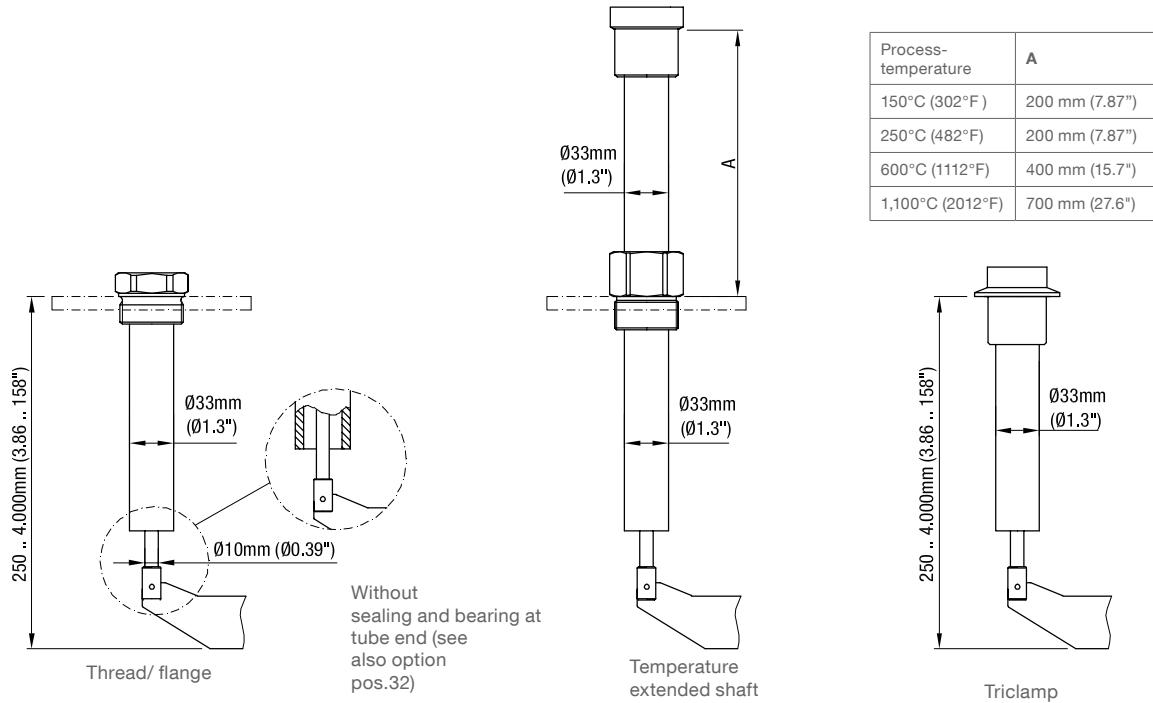
Process-temperature	A
150°C (302°F)	200 mm (7.87")
250°C (482°F)	200 mm (7.87")
350°C (662°F)	300 mm (11.8")
600°C (1,112°F)	400 mm (15.7")
1,100°C (2,012°F)	700 mm (27.6")



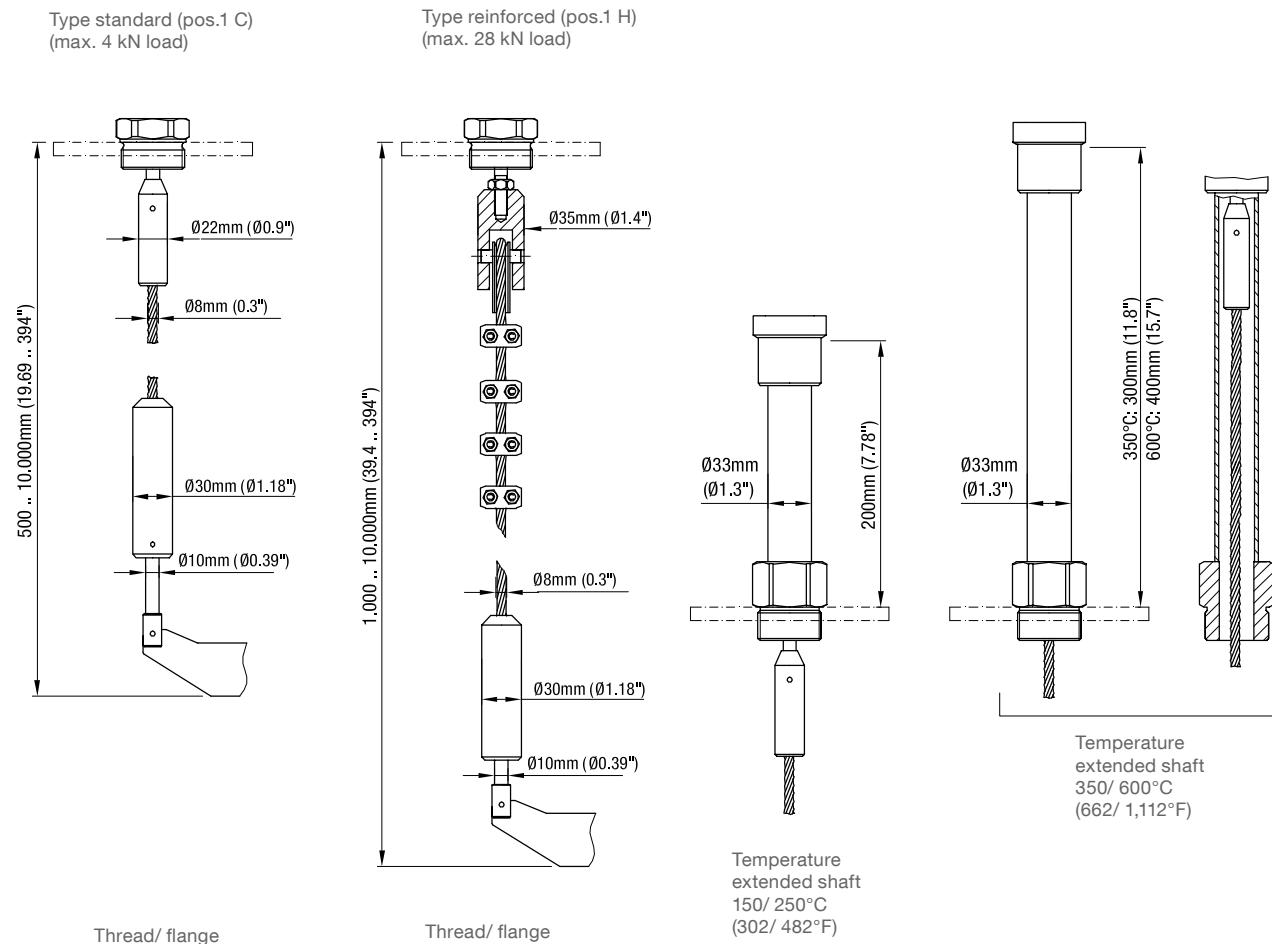
Triclamp

Dimensions

RN ..002

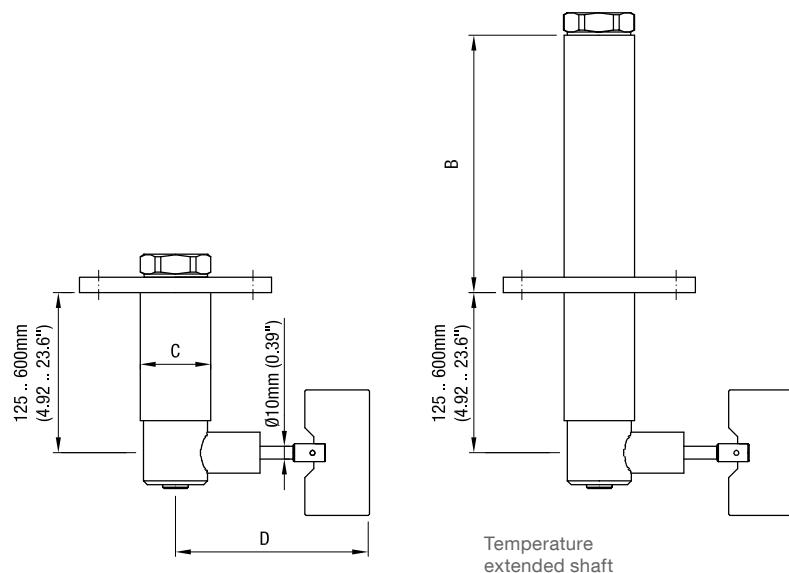


RN ..002 rope



Dimensions

RN ..003

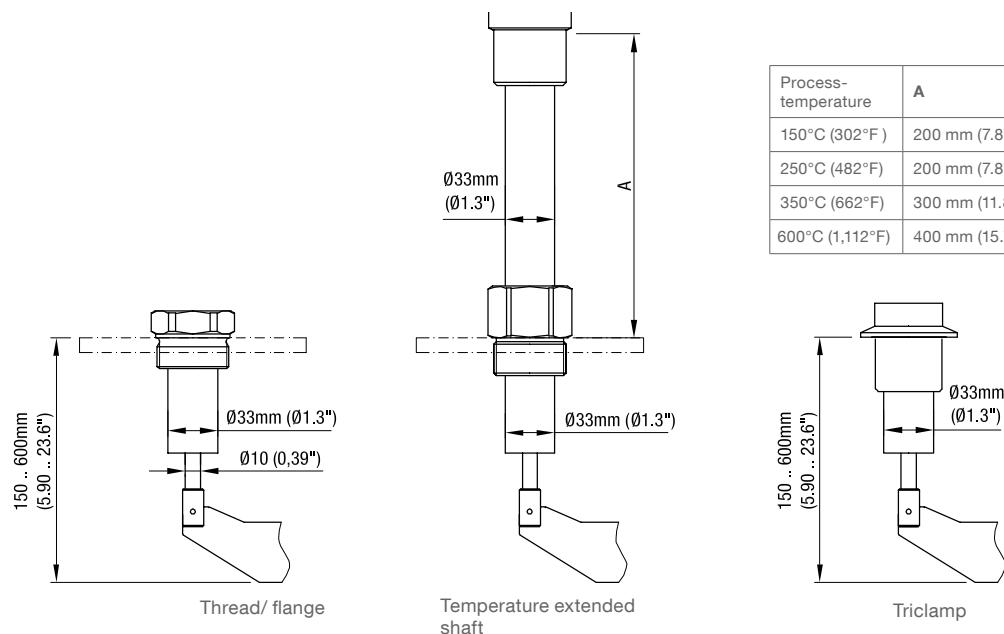


Process temperature	B
80°C (176°F) 0.8 bar (11.6 psi)	10 mm (0.39")
80°C (176°F) 5/ 10bar (73/ 145 psi)	75 mm (2.95")
150/ 250°C (302/ 482°F) 0.8/ 5/ 10 bar (11.6/ 73/ 145 psi)	210 mm (8.27")

Material	C
steel	ø55 mm (2.17")
aluminium	ø60 mm (2.36")

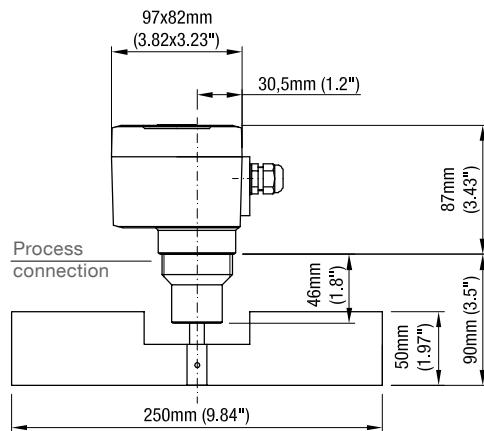
Vane	D
50 mm x .. mm (1.97" x ..")	139 mm (5.47")
98 mm x .. mm (3.86" x ..")	187 mm (7.36")

RN ..004



Process-temperature	A
150°C (302°F)	200 mm (7.87")
250°C (482°F)	200 mm (7.87")
350°C (662°F)	300 mm (11.8")
600°C (1,112°F)	400 mm (15.7")

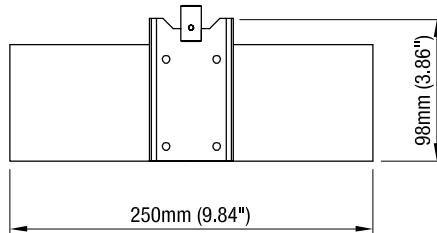
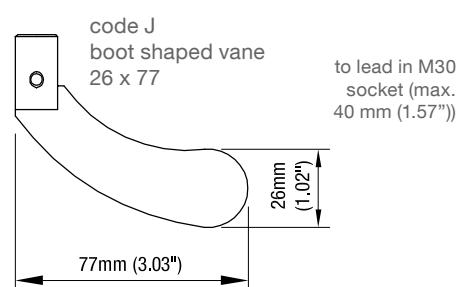
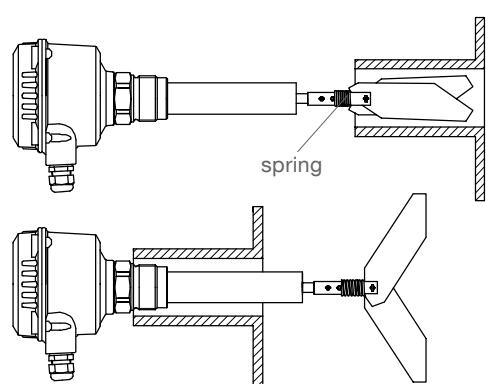
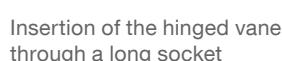
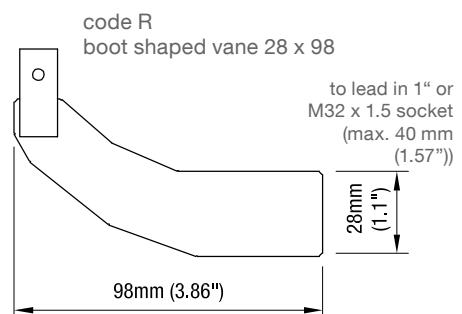
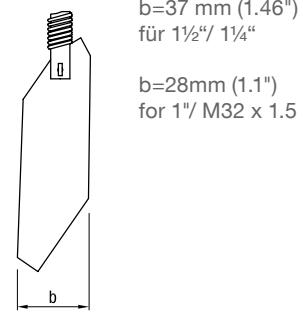
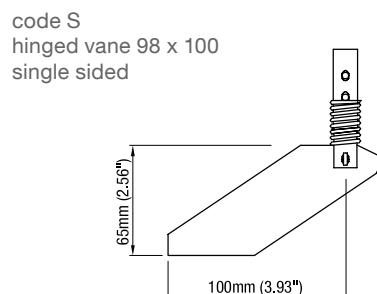
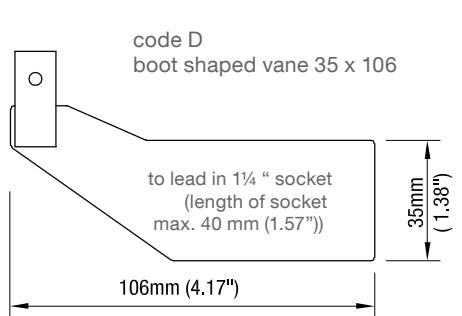
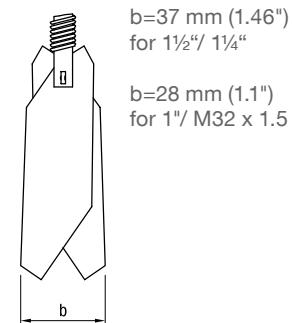
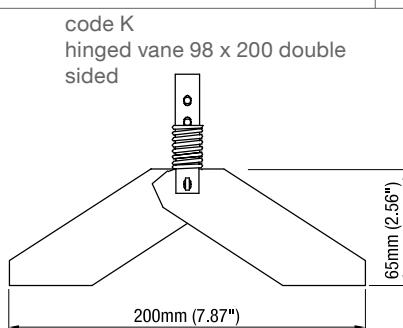
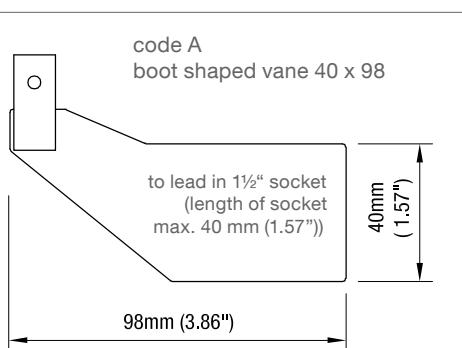
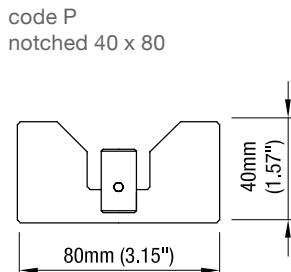
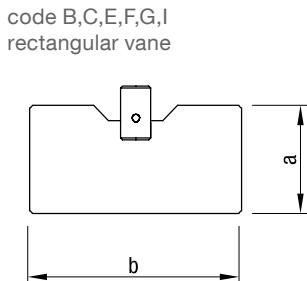
RN 3005



Dimensions

Measuring vanes

code	type	a	b
B	rectangular	50 mm (1.97")	98 mm (3.86")
C	rectangular	50 mm (1.97")	150 mm (5.90")
E	rectangular	50 mm (1.97")	250 mm (9.84")
F	rectangular	98 mm (3.86")	98 mm (3.86")
G	rectangular	98 mm (3.86")	150 mm (5.90")
I	rectangular	98 mm (3.86")	250 mm (9.84")



Dimensions

Sensitivity

The table shows approximate values for the minimum densities, at which a normal function should be possible.

Vane	*Minimum density in g/l = kg/m ³ (lb/ft ³) (without guarantee)			
	Vane completely covered with bulk material		Bulk material covers vane up to 100 mm (3.9")	
	Spring adjustment		Spring adjustment	
	fine	medium (factory setting)	fine	medium (factory setting)
Boot shaped vane 40 x 98	200 (12)	300 (18)	100 (60)	150 (9)
Boot shaped vane 35 x 106	200 (12)	300 (18)	100 (60)	150 (9)
Boot shaped vane 28 x 98	300 (18)	500 (30)	150 (9)	200 (12)
Boot shaped 26 x 77	350 (21)	560 (33)	200 (12)	250 (15)
Vane 50 x 98	300 (18)	500 (30)	150 (9)	250 (15)
Vane 50 x 150	80 (4.8)	120 (7.2)	40 (2.4)	60 (3.6)
Vane 50 x 250	30 (1.8)	50 (3)	15 (0.9)	25 (1.5)
Vane 98 x 98	100 (60)	150 (9)	50 (3)	75 (4.5)
Vane 98 x 150	30 (1.8)	50 (3)	15 (0.9)	25 (15)
Vane 98 x 250	20 (1.2)	30 (1.8)	15 (0.9)	15 (0.9)
Hinged vane 98 x 200 b=37 double sided	70 (4.2)	100 (60)	35 (2.16)	50 (3)
Hinged vane 98 x 200 b=28 double sided	100 (60)	150 (9)	50 (3)	75 (4.5)
Hinged vane 98 x 100 b=37 single sided	200 (12)	300 (18)	100 (60)	150 (9)
Hinged vane 98 x 100 b=28 single sided	300 (18)	500 (30)	150 (9)	250 (15)

The above mentioned data is a guideline and is for loose, non compacted material.

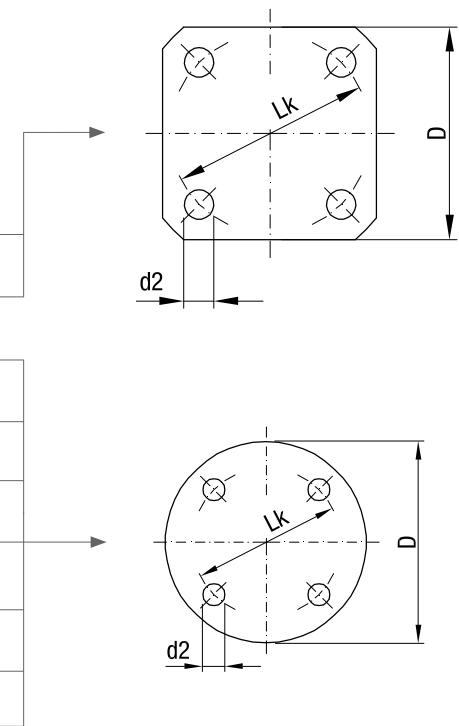
During the filling the bulk density can change (e. g. for fluidised material).

*For versions with option 26 (heating of housing) the above mentioned data must be multiplied by 1.5.

Dimensions / Detailed Ex-markings

Flanges

Code	Type	Number of holes	d2	Lk	D	T (thickness)
H	flange 150x150	4	18 mm (0.71")	170 mm (6.69")	150 mm (5.90")	10 mm (0.39")
I	flange 150x150	4	14 mm (0.55")	170 mm (6.69")	150 mm (5.90")	10 mm (0.39")
K	flange DN32 PN6	4	14 mm (0.55")	90 mm (3.54")	120 mm (4.72")	14 mm (0.55")
N	flange DN50 PN16	4	18 mm (0.71")	125 mm (4.92")	165 mm (6.50")	18 mm (0.71")
L	flange DN100 PN6	4	18 mm (0.71")	170 mm (6.69")	210 mm (8.27")	16 mm (0.63")
M	flange DN100 PN16	8	18 mm (0.71")	180 mm (7.09")	220 mm (8.66")	20 mm (0.79")
S	flange 2" 150lbs	4	19.1 mm (0.75")	120.7 mm (4.75")	152.4 mm (6.01")	19.1 mm (0.75")
T	flange 3" 150lbs	4	19.1 mm (0.75")	152.4 mm (6.01")	190.5 mm (7.5")	23.9 mm (0.94")
U	flange 4" 150lbs	8	19.1 mm (0.75")	190.5 mm (7.5")	228.6 mm (9.0")	23.9 mm (0.94")



Detailed Ex-markings

pos.2

Certificate		Housing
0	CE	Standard
W	ATEX II 1/2D Ex ta/tb IIIC T! Da/Db	Standard
R	ATEX II 2G Ex db eb IIC T! Gb and ATEX II 1/2D Ex ta/tb IIIC T! Da/Db	de
T	ATEX II 2G Ex db IIC T! Gb and ATEX II 1/2D Ex ta/tb IIIC T! Da/Db	d
A	IEC-Ex ta/tb IIIC T! Da/Db	Standard
C	IEC-Ex db eb IIC T! Gb and IEC-Ex ta/tb IIIC T! Da/Db	de
D	IEC-Ex db IIC T! Gb and IEC-Ex ta/tb IIIC T! Da/Db	d
M	FM/ CSA general purpose	Standard
N	FM/ CSA DIP Cl. II, III Div. 1 Gr. E,F,G CSA Ex DIP A20/21	Standard
S	FM Cl. I Zone 1 AEx de IIC and FM/ CSA DIP Cl. II,III Div. 1 Gr. E,F,G CSA Cl. I Zone 1 Ex de IIC and CSA Ex DIP A20/21	de
U	FM XP Cl. I,II,III Div. 1 Gr. B-G and FM Cl. I Zone 1 AEx d IIC CSA XP Cl. I,II,III Div. 1 Gr. B-G CSA Cl. I Zone 1 Ex d IIC and CSA Ex DIP A20/21	d
E	TR-CU Ex ta/tb IIIC T! Da/Db X	Standard
K	TR-CU Ex de IIC T! Gb X Ex ta/tb IIIC T! Da/Db X	de
L	TR-CU Ex d IIC T! Gb X Ex ta/tb IIIC T! Da/Db X	d

Electrical installation Series RN 3000

Version:

- AC
- DC
- Universal voltage

Power supply:

• AC version:

24 V or 48 V or 115 V or 230 V 50/ 60 Hz max. 4 VA

All voltages $\pm 10\%$ ⁽¹⁾

Supply voltage as selected.

External fuse: max. 10 A, fast or slow, HBC, 250 V

• DC version:

24 V DC $\pm 15\%$ ⁽¹⁾ max. 2.5 W

External fuse: not required

• Universal voltage:

24 V DC $\pm 15\%$ ⁽¹⁾ max. 4 W

22 .. 230 V 50/ 60 Hz $\pm 10\%$ ⁽¹⁾ max. 10 VA

External fuse: not required

⁽¹⁾ including $\pm 10\%$ of EN 61010

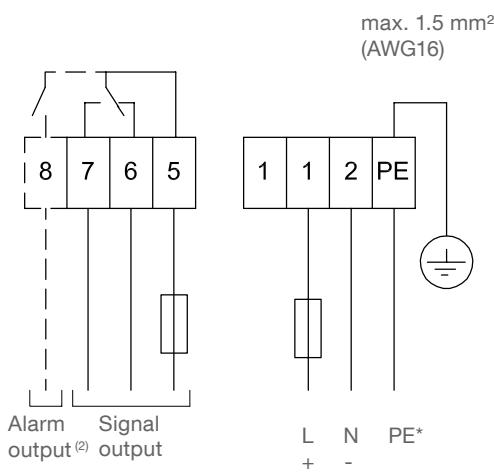
Signal and alarm output:

Micro switch or relay, SPDT contact

max. 250 V AC, 2 A, 500 VA ($\cos\phi = 1$)

max. 300 V DC, 2 A, 60 W

External fuse: max. 10 A, fast or slow, HBC, 250 V



⁽²⁾ With option Fail safe alarm (rotation control)
 Contact open when de-energised

Version:

- PNP

Power supply:

24 V DC $\pm 15\%$ ⁽¹⁾

⁽¹⁾ including $\pm 10\%$ of EN 61010

Input current: max. 0.6 A

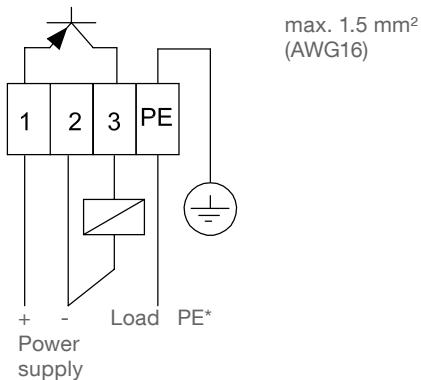
Signal output:

Load max. 0.4 A

Output voltage equal to input voltage, drop <2.5 V

Open collector

Protected against short circuit and overload



* Protection against static charge:

The PE terminal of the unit must be grounded to avoid static charging of the unit.

This is particularly important for applications with pneumatic conveying.

Electrical installation Series RN 6000

Version:

- AC
- DC

Power supply:

• AC version:

24 V or 48 V or 115 V or 230 V 50/ 60 Hz max. 4 VA
 All voltages $\pm 10\%$ ⁽¹⁾
 Supply voltage as selected.
 External fuse: max. 10 A, fast or slow, HBC, 250 V

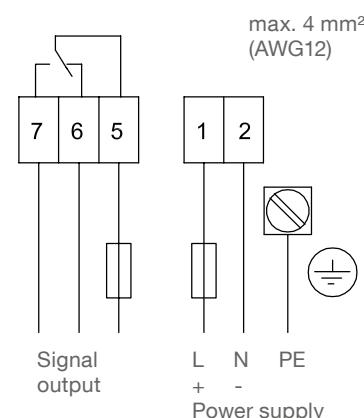
• DC version:

24 V DC $\pm 15\%$ ⁽¹⁾ max. 2.5 W
 External fuse: not required

⁽¹⁾ including $\pm 10\%$ of EN 61010

Signal output:

Micro switch, SPDT contact
 max. 250 V AC, 5 A, non inductive
 max. 30 V DC, 4 A, non inductive
 External fuse: max. 10 A, fast or slow, HBC, 250 V



Version:

- Universal voltage
 (ohne SIL 2)

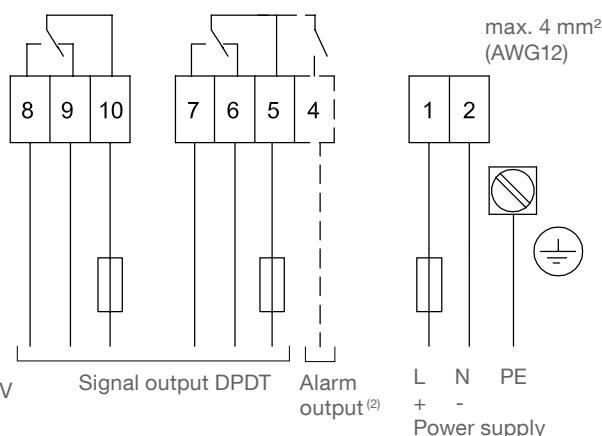
Power supply:

24 V DC $\pm 15\%$ ⁽¹⁾ max. 4 W
 22 .. 230 V 50/ 60 Hz $\pm 10\%$ ⁽¹⁾ max. 10 VA

⁽¹⁾ including $\pm 10\%$ of EN 61010

Signal and alarm output:

Relay DPDT contact
 max. 250 V AC, 5 A, non inductive;
 max. 30 V DC, 4 A, non inductive
 External fuse: max. 10 A, fast or slow, HBC, 250 V



⁽²⁾ With option Fail safe alarm (rotation control)
 Contact open when de-energised

Version:

- Universal voltage
 SIL 2

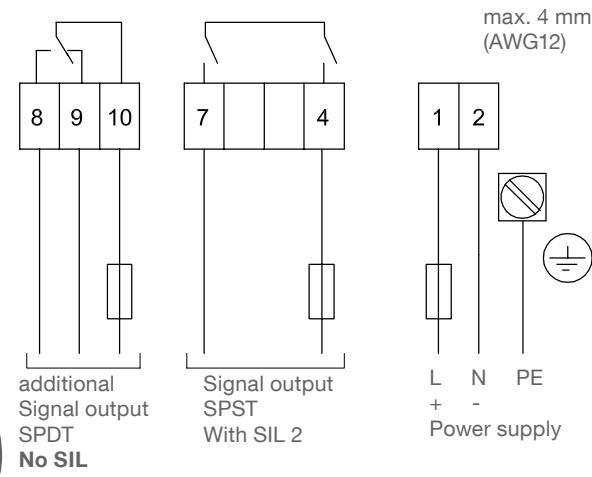
Power supply:

24 V DC $\pm 15\%$ ⁽¹⁾ max. 4 W
 22 .. 230 V 50/ 60 Hz $\pm 10\%$ ⁽¹⁾ max. 10 VA

⁽¹⁾ including $\pm 10\%$ of EN 61010

Signal output:

Relay SPST/ SPDT
 max. 250 V AC, 5 A, non inductive;
 max. 30 V DC, 4 A, non inductive
 External fuse:
 max. 10 A, fast or slow, HBC, 250 V



* Protection against static charge:

- The PE terminal of the unit must be grounded to avoid static charging of the unit.
- This is particularly important for applications with pneumatic conveying.

Spare parts

Minimum order value for separate orders of spare parts or accessories is 75 €.

Series RN 3000 Motor/ PCB

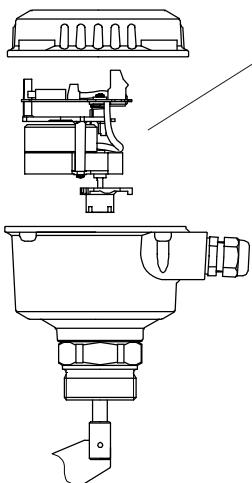
Order code	Pos.5 Power supply	Pos.25 x Fail safe alarm	Pos.26 x Heating of housing	Voltage	Motor Speed	Spare part Articel number
A	-	-	-	230 V AC	1/min	gm402000
S	-	-	-		5/min	gm403000
B	-	-	-	115 V AC	1/min	gm402005
T	-	-	-		5/min	gm403005
C	-	-	-	48 V AC	1/min	gm402015
U	-	-	-		5/min	gm403015
D	-	-	-	24 V AC	1/min	gm402010
V	-	-	-		5/min	gm403010
E	-	-	-	24 V DC	1/min	gm402020
W	-	-	-		5/min	gm403020
G	-	-	-	24 V DC PNP	1/min	gm402026*
H	-	-	-		5/min	gm403026*
F	-	-	-	24 V DC/ 22 .. 230 V AC Universal voltage	1/min	gm402038*
F	x	-	-		1/min	gm404038* **
F	-	x	-		1/min	gm402039*
F	x	x	-		1/min	gm404039* **
X	-	-	-		5/min	gm403038*
X	x	-	-		5/min	gm405038* **
X	-	x	-		5/min	gm403039*
X	x	x	-		5/min	gm405039* **

* This module requires a higher housing lid than the other modules. Therefore it can not be mounted into a housing, where a different module was present before.

** This module requires a sensor to detect the motor rotation, which is mounted inside the housing. Therefore it can not be mounted into a housing where a different module was present before.

Spare parts

Minimum order value for separate orders of spare parts or accessories is 75 €.



Series RN 6000 Motor/ PCB

Equipment code				Voltage	Motor Speed	Spare part Article number
Pos.5 Power supply	Pos.25 b SIL 2**	Pos.25 x Fail safe alarm	Pos.26 x Heating of housing			
A	-	-	-	230V AC	1/min	gm412000
S	-	-	-		5/min	gm413000
B	-	-	-	115V AC	1/min	gm412005
T	-	-	-		5/min	gm413005
C	-	-	-	48V AC	1/min	gm412015
U	-	-	-		5/min	gm413015
D	-	-	-	24V AC	1/min	gm412010
V	-	-	-		5/min	gm413010
E	-	-	-	24V DC	1/min	gm412020
W	-	-	-		5/min	gm413020
F	-	-	-	24V DC/ 22 ... 230V AC Universal voltage	1/min	gm412038
F	-	x	-		1/min	gm414038*
F	-	-	x		1/min	gm412039
F	-	x	x		1/min	gm414039*
X	-	-	-		5/min	gm413038
X	-	x	-	24V DC/ 22 ... 230V AC Universal voltage	5/min	gm415038*
X	-	-	x		5/min	gm413039
X	-	x	x		5/min	gm415039*

* This module requires a sensor to detect the motor rotation, which is mounted inside the housing. Therefore it can not be mounted into a housing where a different module was present before.

** Moduls for units with SIL certificate must be replaced by the manufacturer.

Spare parts

Minimum order value for separate orders of spare parts or accessories is 75 €.

Fitting to unit/ model code	Description see page	Spare part Article number
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Measuring vane (delivery incl. cotter pin)

Boot shaped 40 x 98 mm (1.4305)	Pos.10 A with pos.9 3	P27	fg400605
Boot shaped 40 x 98 mm (1.4404)	Pos.10 A with pos.9 7	P27	fg400502
Boot shaped 35 x 106 mm (1.4305)	Pos.10 D with pos.9 3	P27	fg400508
Boot shaped 35 x 106 mm (1.4404)	Pos.10 D with pos.9 7	P27	fg400509
Boot shaped 28 x 98 mm (1.4305)	Pos.10 R with pos.9 3	P27	fg400603
Boot shaped 28 x 98 mm (1.4404)	Pos.10 R with pos.9 7	P27	fg400604
Boot shaped 26 x 77 mm	Pos.10 J	P27	fg400607
Rectangular 50 x 98 mm	Pos.10 B	P27	fg400610
Rectangular 50 x 150 mm	Pos.10 C	P27	fg400620
Rectangular 50 x 250 mm	Pos.10 E	P27	fg400630
Rectangular 98 x 98 mm (1.4305)	Pos.10 F with pos.9 3	P27	fg400635
Rectangular 98 x 98 mm (1.4404)	Pos.10 F with pos.9 7	P27	fg400032
Rectangular 98 x 150 mm	Pos.10 G	P27	fg400637
Rectangular 98 x 250 mm	Pos.10 I	P27	fg400650
Hinged vane 98 x 200 mm double sided (37 mm for G 1½" and G 1¼") (1.4305, max. 250°C)	Pos.10 K with pos.9 3	P27	fg400081
Hinged vane 98 x 200 mm double sided (37 mm for G 1½" and G 1¼") (1.4404, max. 250°C)	Pos.10 K with pos.9 7	P27	fg400087
Hinged vane 98 x 200 mm double sided (28 mm for G 1" and M32) (1.4305, max. 250°C)	Pos.10 K with pos.9 3	P27	fg400085
Hinged vane 98 x 100 mm single sided (37 mm for G 1½" and G 1¼") (1.4305, max. 250°C)	Pos.10 S with pos.9 3	P27	fg400084
Hinged vane 98 x 100 mm single sided (37 mm for G 1½" and G 1¼") (1.4404, max. 250°C)	Pos.10 S with pos.9 7	P27	fg400088
Hinged vane 98 x 100 mm single sided (28 mm for G 1" and M32) (1.4305, max. 250°C)	Pos.10 S with pos.9 3	P27	fg400086
Rubber vane 98 x 250 mm	Pos.10 M	P27	fg400565
Notched 40 x 80 mm	Pos.10 P	P27	fg400614
VT-vane	Pos.10 N	P18	fg400026

Extension parts

Extension shaft ø10 mm: (delivery incl. fixing parts)	by 50 mm by 100 mm by 150 mm by 200 mm	RN 3001/ 6001 RN 3001/ 6001 RN 3001/ 6001 RN 3001/ 6001	- - - -	we400005 we401023 we401025 we401026
Pendular shaft L=500 mm (delivery incl. fixing parts)		RN 3001/6001/pos.36	P22	zu400131
Pendular shaft L=1,000 mm (delivery incl. fixing parts)		RN 3001/6001/pos.36	P22	zu400132
Kit rope extension L=2,000 mm (implements 2 m single rope (zu400729) and rope fixing parts (zu400110))		RN 3001/6001/pos.39	P22	zu400100
Single rope ø8 mm, tail welded, price per meter		RN 3002/ 6002-rope RN3001/ RN6001/ pos.39	P25 P22	zu400729
Rope fixing parts, usable for kit rope extension		RN3001/ RN6001/ pos.39	P22	zu400110
Rope weight ø30 mm (delivery incl. fixing parts)		RN 3002/ 6002-rope	P25 below	we400720
Rope holder ø22 mm (for version Pos.1 C) (delivery incl. fixing parts)		RN 3002/ 6002-rope	P25 below	we400700

Spare parts

Minimum order value for separate orders of spare parts or accessories is 75 €.

Fitting to unit/ model code	Description see page	Spare part Article number
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Hexagon nut

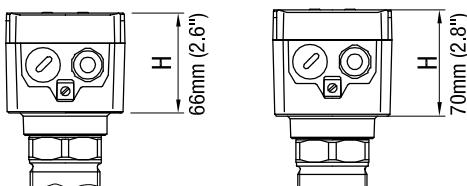
1½" aluminium	Pos.6 A	P22	zu300170
1½" stainless steel 1.4305	Pos.6 A	P22	zu300180
1¼" aluminium	Pos.6 B	P22	zu300171
1¼" stainless steel 1.4305	Pos.6 B	P22	zu300181
1" aluminium	Pos.6 C	P22	zu200150
1" stainless steel 1.4305	Pos.6 C	P22	zu200160
M32 aluminium	Pos.6 D	P22	zu200120
M32 stainless steel 1.4305	Pos.6 D	P22	zu200130
M30 aluminium	Pos.6 E	P22	zu200170
M30 stainless steel 1.4305	Pos.6 E	P22	zu200180

Flush welding socket

Flush welding socket ø69/ G 1½" made of Aluminium	Pos.29 b	P23	bu400500
Flush welding socket ø69/ G 1½" made of 1.4301 (304)	Pos.29 c	P23	bu400501
Flush welding socket ø69/ G 1½" made of 1.4404 (316L)	Pos.29 d	P23	bu400502

Weather protection cover

RN 3000 (for lower housing, dimension H=66 mm)	Pos.21 x	P23	zu300230
RN 3000 (for higher housing, dimension H=70 mm)	Pos.21 x	P23	zu300232
RN 6000 standard housing	Pos.21 x	P23	zu300240





Rotonivo® 4000

Rotating level limit switch

The reliable solution with a plastic housing –
versatile, robust construction, also for applications in hazardous locations



Rotonivo® 4000



- Plastic version
- Suitable for nearly all bulk goods
- Simple and reliable measuring principle, easy, fast installation

Application: The Rotonivo® 4000 can be used as a full, demand or empty detector in bulk good silos depending on needs. It is mainly suited for lower mechanical loads in a variety of materials, e.g. cement, detergent, feed, chalk, grains, plastic granulate and much more.

RN 4001 Standard

Full, demand, empty detector

Standard design, vertical, horizontal and oblique installation
Extension up to 1000 mm



RN 4001 Pend. Shaft

Full detector

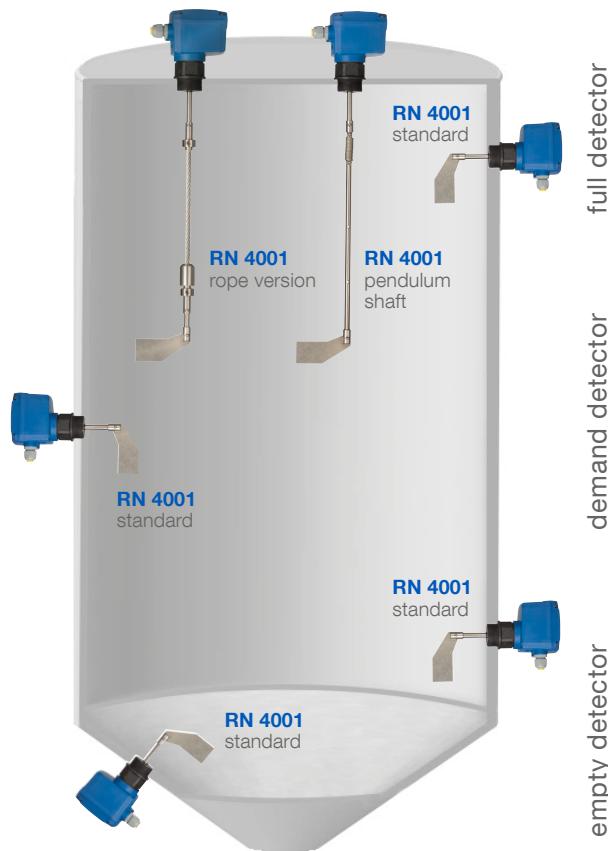
Design with option pendulum shaft, vertical installation



RN 4001 Rope

Full detector

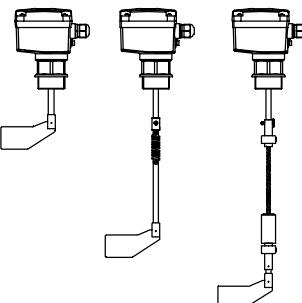
Design with rope extension, vertical installation



Technical Data

Housing	Plastic PA 6 GF, IP 66
Certificates	ATEX II 1/2D, IECEx, TR-CU
Process temperature	-40°C up to +80°C (-40°F up to +176°F)
Pressure	-0.9 up to +0.8 bar (-13.1 up to 11.6 psi)
Sensitivity	From 100g/l (6lb/ft³) – adjustable in 3 steps
Mains voltage	Universal-Voltage-Electronic AC: 24V / 48V / 115V / 230V, DC: 24V
Process connection	G 1", G 1½" and G 2", M30x1.5, M32x1.5 incl. sealing face
Bearing	Process connection aluminium: ball bearing, dust tight Process connection plastics: slide bearing (maintenance-free, high-quality)
Material	Process connection: aluminium Shaft: Stainless steel 1.4305 Paddles: Stainless steel 1.4301 Plastic PP

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<hr/>	
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Subject to change.

Valid: From 01.04.2020 until 31.03.2021, unless otherwise agreed.

All dimensions in mm (inches).

By publishing this selection list all other lists become invalid.

All prices in Euro (€) or USD (\$),
excluding VAT.

We assume no liability for typing errors.

All EURO prices are EXW Betzigau,
all USD prices are EXW Memphis,
excluding packaging costs.

Different variations to those specified are possible.
Please contact our technical consultants.

Overview / Specification / Applications

- Level limit detection in bulk goods/ solids
- Compact unit
- Wide range of applications, no maintenance
- Full-, demand-, empty detector
- Flexible extensions (kits)
- ATEX/ IEC-Ex/ INMETRO approvals (Dust Ex)
- TR-CU
- 2011/65/EU RoHS conform

Approvals	CE	
	ATEX/ IEC-Ex/ INMETRO	Zone 20/21 (Dust Ignition Proof)
	TR-CU	Ordinary Locations Dust Ignition Proof



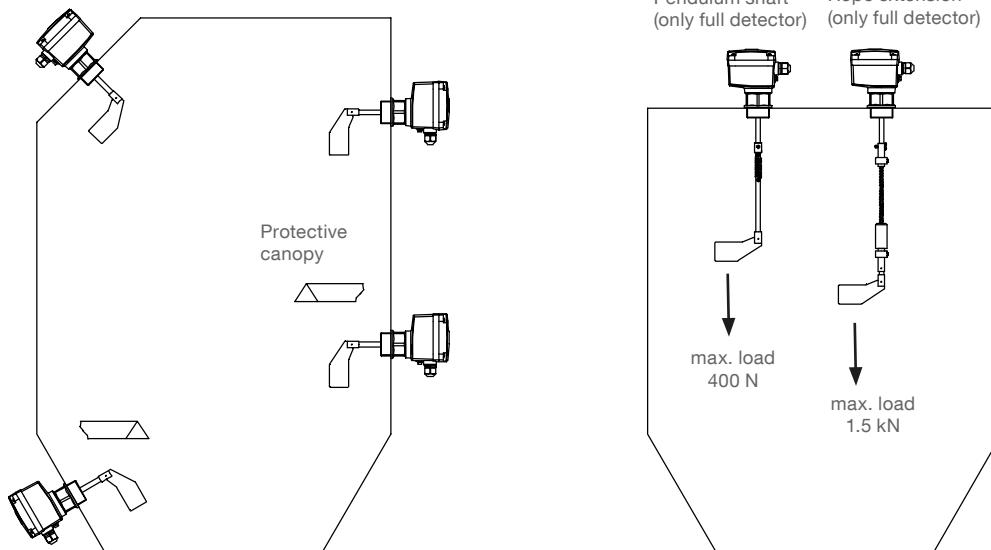
Technical data	Ambient temperature	-20 .. +60°C (-4 .. +140°F) -40 .. +60°C (-40 .. +140°F) with *heating *for certificate CE
	Process temperature	-20 .. +80°C (-4 .. +176°F) -40 .. +80°C (-40 .. +176°F) with *heating *for certificate CE
	Process pressure	-0.9 .. +0.8 bar (-13.1 .. 11.6 psi)
	Type of protection	IP66
	Material housing	Plastics PA6
	Material process connection	Aluminum or plastics PA6
	Material of measuring vane/ shaft/ extensions	1.4301 (SS304)/ 1.4305 (SS303)

Supply	Signal output				
	SPDT (¹)	PNP	FSH/ FSL ⁽²⁾	Adjust. delay	Fail safe alarm
AC version	24 V or 48 V or 115 V or 230 V AC	•	-	-	-
DC version	24 V DC	•	-	-	-
DC version	24 V DC PNP	-	•	•	-
Universal voltage	24 V DC/ 22 .. 230 V AC	•	-	•	option

(¹) Micro switch, Relais for universal voltage

(²) Switchable signal output (Fail safe high/ low)

Applications



Selection

Basic type RN 4001

pos.2	Certificate		
0	CE ⁽¹⁾	•
W	ATEX II 1/2D Ex ta/tb IIIC T! Da/Db	.....	•
A	IEC-Ex ta/tb IIIC T! Da/Db ⁽²⁾	•
E	TR-CU Ex ta/tb IIIC T! Da/Db x	.....	•
pos.3	Power supply		
A / S	230 V AC 50 - 60 Hz	Motor Speed: A=1/min S=5/min	• / •
B / T	115 V AC 50 - 60 Hz	Motor Speed: B=1/min T=5/min	• / •
C / U	48 V AC 50 - 60 Hz	Motor Speed: C=1/min U=5/min	• / •
D / V	24 V AC 50 - 60 Hz	Motor Speed: D=1/min V=5/min	• / •
E / W	24 V DC	Motor Speed: E=1/min W=5/min	• / •
G / H	24 V DC PNP	Motor Speed: G=1/min H=5/min	• / •
F / X	24 V DC / 22 .. 230 V AC universal voltage	Motor Speed: F=1/min X=5/min	• / •
pos.4	Process connection		
A	thread G 1½", DIN 228	.....	•
B	thread G 1¼", DIN 228	.....	•
C	thread G 1", DIN 228	.....	•
D	thread M32 x 1.5	.....	•
E	thread M30 x 1.5	.....	•
pos.5	Material process connection		
1	Plastics PA6	.....	•
2	Aluminium	.....	•
pos.6	Measuring vane		
A	boot-shaped ⁽³⁾	40 x 98 mm 1.4301/ 304 ... L=130 ⁽⁴⁾	for 1½" socket
D	boot-shaped ⁽³⁾	35 x 106 mm 1.4301/ 304 .. L=140 ⁽⁴⁾	for 1¼" socket
R	boot-shaped ⁽³⁾	28 x 98 mm 1.4301/ 304 ... L=130 ⁽⁴⁾	for 1" and M32 x 1.5 socket
J	boot shaped ⁽³⁾	26 x 77 mm 1.4301/ 304 L=130 ⁽⁴⁾	for M30 socket
K	hinged vane	98 x 200 mm 1.4301/ 304 ... L=190 ⁽⁴⁾ double sided	.....
S	hinged vane	98 x 100 mm 1.4301/ 304 ... L=190 ⁽⁴⁾ single sided	.....
U	universal vane	27 x 150 mm plastics L=140 ⁽⁴⁾
Y	without	.....	including fixing splint
pos.7	Length of extension "L"		
	For material process connection plastics:		
S	standard (see length L under vane)	.....	•
	For material process connection aluminium:		
A	100 mm	(110 mm with vane D, U; not with vane K, S)	.....
B	150 mm	(160 mm with vane D, K, S, U)	.....
C	200 mm	(210 mm with vane D, K, S, U)	.....
D	250 mm	(260 mm with vane D, K, S, U)	.....
E	300 mm	(310 mm with vane D, K, S, U)	.....
Z	other lengths	price per 50 mm or part thereof (starting from 0 mm) min. 350 mm, max. 1,000 mm	•

RN 4001	A					
Position	1	2	3	4	5	6

← Order code

All positions are available in special design (use code "Z")

⁽¹⁾ TR-CU (Ordinary Locations) included

⁽²⁾ INMETRO included

⁽³⁾ Maximum length of socket 40 mm

⁽⁴⁾ Specification of length valid with process connection material plastics

Options

pos.11	x Guarantee extension to 5 years	•
pos.15	Flat gasket	
	a for process connection thread G 1½" aluminium (pos.4 A, pos.5 2), incl. sealing face	•
	b for all other process connections	•
pos.21	x Weather protection cover	•
pos.23	a Vane extension plastics, for universal vane pos.6 U	•
pos.24	Hexagon nut	
	a aluminium 1 piece	•
	b aluminium 2 pieces	•
	e stainless steel (1.4305/ 303) 1 piece	•
	f stainless steel (1.4305/ 303) 2 pieces	•
pos.25	x Fail safe alarm ¹ (for 24 V DC/ 22 .. 230 V AC universal voltage)	•
pos.26	x Heating of housing ² 2.5 watt for ambient-/ process temperature to -40°C (-40°F)	•
pos.27	Control lamp ³	
	a LED, mounted in cable entry M20 x 1.5, green	•
	c LED, mounted in cable entry M20 x 1.5, red	•
	d LED (transparent lid section) ⁵	•
pos.28	x Second screwed cable gland M20 x 1.5 (not mounted)	•
pos.39	Kit "rope extension" (only available as full detector)	
	x L=2.000 mm	•
pos.40	Kit "pendulum shaft"	
	max. tension 400 N, only with pos.7 A	
	For vertical and horizontal installation:	
w	L=200 mm	•
	For vertical installation:	
a	L=500 mm (drilled holes as well for 300 and 400 mm)	•
b	L=1,000 mm (drilled holes as well for 600, 700, 800 and 900 mm)	•

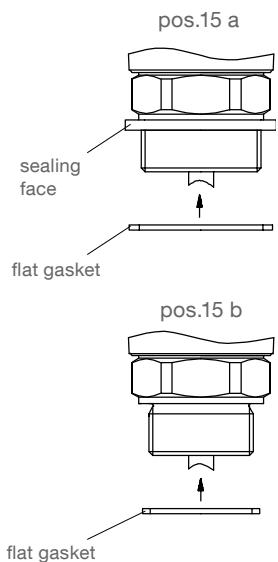
1 Available with universal voltage (pos.3 F, X)

2 Available with CE (pos.2 0) and universal voltage (pos.3 F,X) and PNP (pos.3 G,H). Consider reduced switching sensitivity (see technical data). Note: For temperatures down to -20°C (-4°F) the electronic "universal voltage" and "PNP" have a "heating of housing" implemented by default (in this case option pos.26 x is not needed).

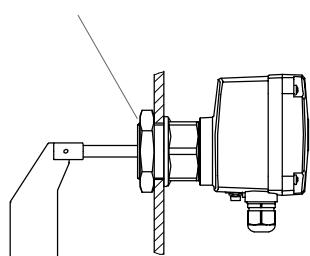
3 Available for CE (pos.2 0), not in combination with weather protection cover (pos.21 x). In combination with universal voltage (pos.5 F, X) 2 LED's (24V, 80-260V) will be delivered. Connection of signal lamp wires with internal terminals: without (standard) or according to customer specification.

Options

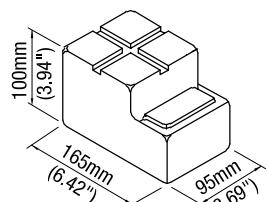
pos.15
Flat gasket



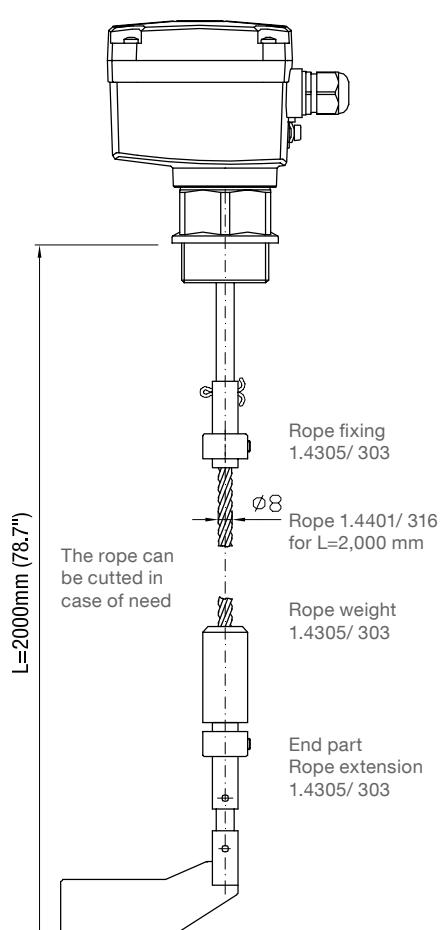
pos.24
Hexagon nut



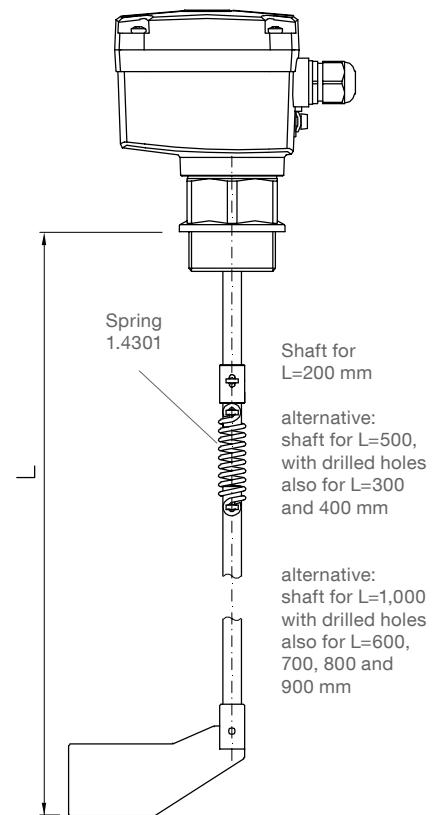
pos.21
Weather protection cover



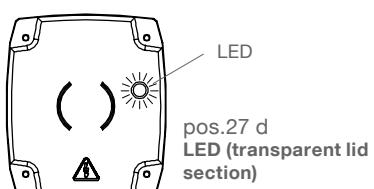
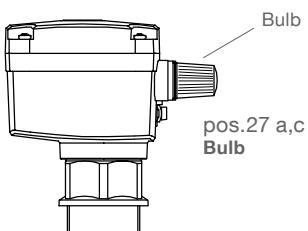
pos.39
Kit „rope extension“



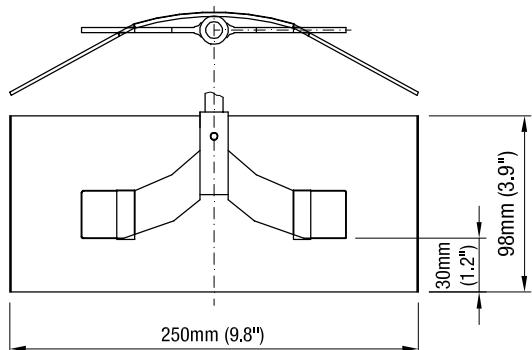
pos.40
Kit „pendulum shaft“



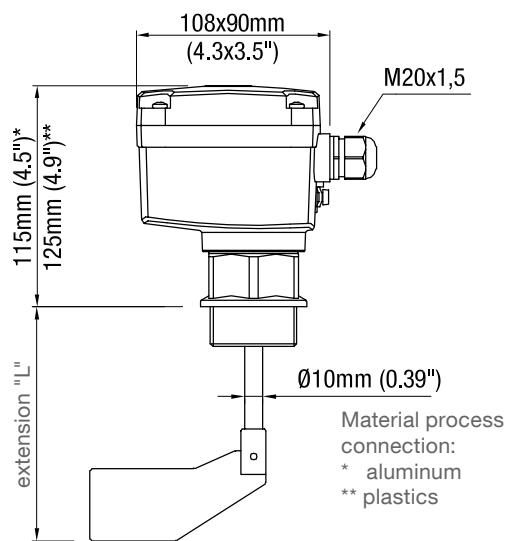
pos.27
Control lamp



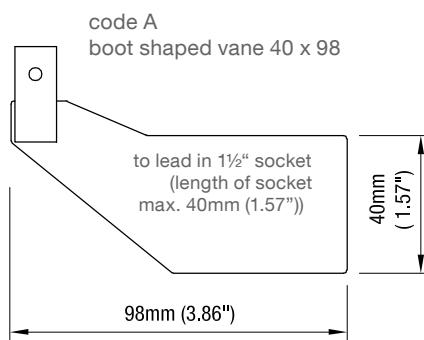
pos.23 a
Vane extension (plastics)



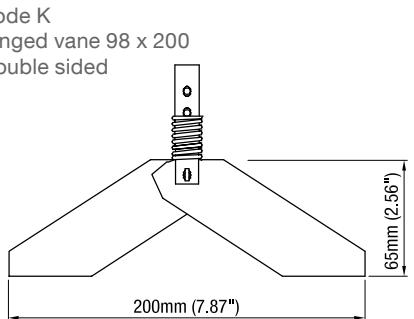
Dimension



Measuring vanes



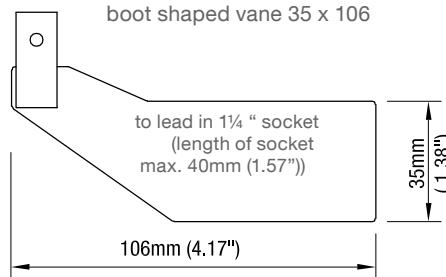
code K
hinged vane 98 x 200
double sided



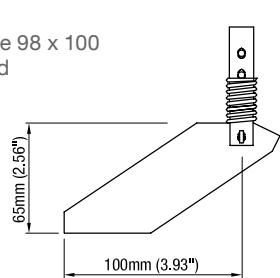
b=37 mm (1.46")
for 1½" / 1¼"

b=28 mm (1.1")
for 1" / M32 x 1.5

code D
boot shaped vane 35 x 106



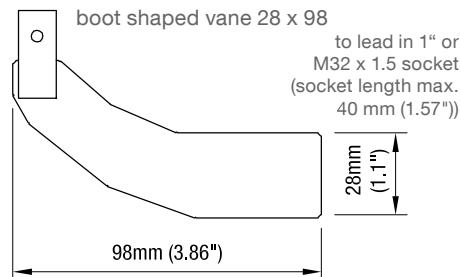
code S
hinged vane 98 x 100
single sided



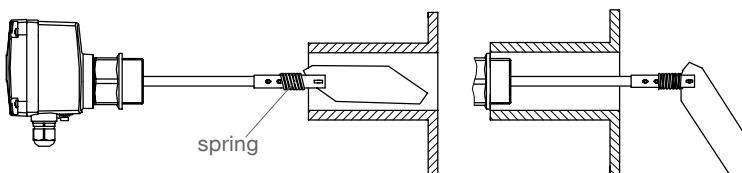
b=37 mm (1.46")
für 1½" / 1¼"

b=28 mm (1.1")
for 1" / M32 x 1.5

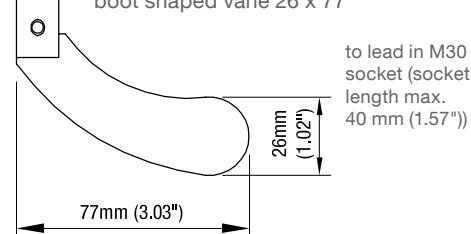
code R
boot shaped vane 28 x 98



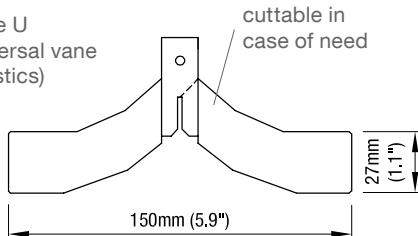
Insertion of the hinged vane through a long socket



code J
boot shaped vane 26 x 77



code U
universal vane
(plastics)



Dimension

Sensitivity

The table shows approximate values for the minimum densities, at which a normal function should be possible.

Vane	*Minimum density in g/l = kg/m ³ (lb/ft ³) (without guarantee)			
	Vane completely covered with bulk material		Bulk material covers vane up to 100 mm (3.93")	
	Spring adjustment		Spring adjustment	
	fine	medium (Factory setting)	fine	medium (Factory setting)
Boot shaped vane 40 x 98	200 (12)	300 (18)	100 (60)	150 (9)
Boot shaped vane 35 x 106	200 (12)	300 (18)	100 (60)	150 (9)
Boot shaped vane 28 x 98	300 (18)	500 (30)	150 (9)	200 (12)
Boot shaped vane 26 x 77	350 (21)	560 (33)	200 (12)	250 (15)
Hinged vane 98 x 200 b=37 double sided	70 (4.2)	100 (60)	35 (2.16)	50 (3)
Hinged vane 98 x 200 b=28 double sided	100 (60)	150 (9)	50 (3)	75 (4.5)
Hinged vane 98 x 100 b=37 single sided	200 (12)	300 (18)	100 (60)	150 (9)
Hinged vane 98 x 100 b=28 single sided	300 (18)	500 (30)	150 (9)	250 (15)

The above mentioned data is a guideline and is for loose, non compacted material.

During the filling the bulk density can change (e. g. for fluidised material).

*For versions with option 26 (heating of housing) the above mentioned data must be multiplied by 1.5.

Electrical installation

Version:

- AC
- DC
- Universal voltage

Power supply:

• AC version:

24 V or 48 V or 115 V or 230 V 50/ 60 Hz max. 4 VA

All voltages $\pm 10\%$ ⁽¹⁾

Supply voltage as selected.

External fuse: max. 10 A, fast or slow, HBC, 250 V

• DC version:

24 V DC $\pm 15\%$ ⁽¹⁾ max. 2.5 W

External fuse: not required

• Universal voltage:

24 V DC $\pm 15\%$ ⁽¹⁾ max. 4 W

22 .. 230 V 50/60 Hz $\pm 10\%$ ⁽¹⁾ max. 10 VA

External fuse: not required

⁽¹⁾ including $\pm 10\%$ of EN 61010

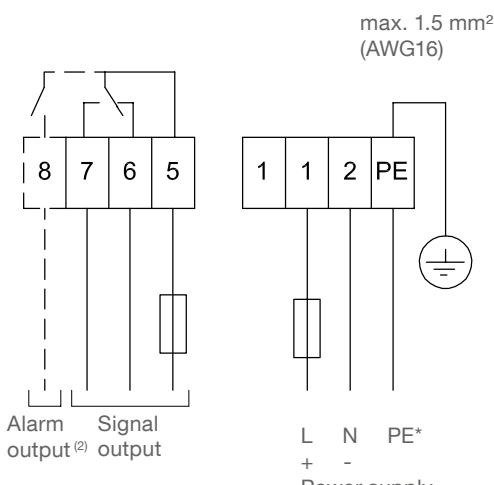
Signal and alarm output:

Micro switch or relay, SPDT contact

max. 250 V AC, 2 A, 500 VA ($\cos\phi = 1$)

max. 300 V DC, 2 A, 60 W

External fuse: max. 10 A, fast or slow, HBC, 250 V



⁽²⁾ With option Fail safe alarm (rotation control)
Contact open when de-energised

Version:

- PNP

Power supply:

24 V DC $\pm 15\%$ ⁽¹⁾

⁽¹⁾ including $\pm 10\%$ of EN 61010

Input current: max. 0.6 A

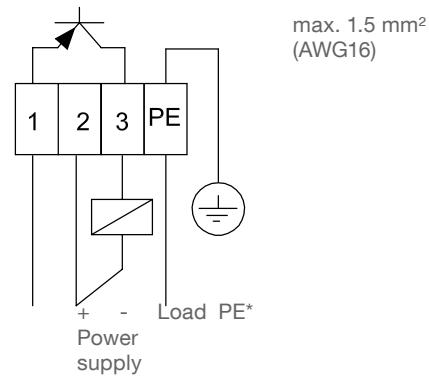
Signal output:

Load max. 0.4 A

Output voltage equal to input voltage, drop <2.5 V

Open collector

Protected against short circuit and overload



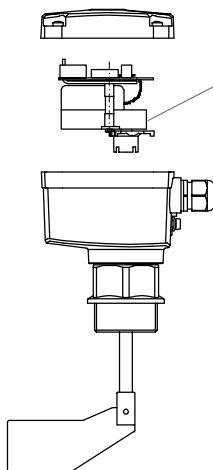
* Protection against static charge:

The PE terminal of the unit must be grounded to avoid static charging of the unit.

This is particularly important for applications with pneumatic conveying.

Spare parts

Minimum order value for separate orders of spare parts or accessories is 75 €.



Motor/ PCB

Order code			Voltage	Motor Speed	Spare part Articel number
Pos.3 Power supply	Pos.25 x Fail safe alarm	Pos.26 x Heating of housing			
A	-	-	230 V AC	1/min	gm402000
S	-	-		5/min	gm403000
B	-	-	115 V AC	1/min	gm402005
T	-	-		5/min	gm403005
C	-	-	48 V AC	1/min	gm402015
U	-	-		5/min	gm403015
D	-	-	24 V AC	1/min	gm402010
V	-	-		5/min	gm403010
E	-	-	24 V DC	1/min	gm402020
W	-	-		5/min	gm403020
G	-	-	24 V DC PNP	1/min	gm402026
H	-	-		5/min	gm403026
F	-	-	24 V DC/ 22 .. 230 V AC Universal voltage	1/min	gm402038
F	x	-		1/min	gm404038 **
F	-	x		1/min	gm402039
F	x	x		1/min	gm404039 **
X	-	-		5/min	gm403038
X	x	-		5/min	gm405038 **
X	-	x		5/min	gm403039
X	x	x		5/min	gm405039 **

** This module requires a sensor to detect the motor rotation, which is mounted inside the housing. Therefore it can not be mounted into a housing, where a different module was present before.

Spare parts

Minimum order value for separate orders of spare parts or accessories is 75 €.

Fitting to unit/ model code	Description see page	Spare part Article number
--------------------------------	-------------------------	------------------------------

Measuring vane (delivery incl. cotter pin)

Boot shaped 40 x 98 mm	Pos.6 A	6	fg400605	•
Boot shaped 35 x 106 mm	Pos.6 D	6	fg400508	•
Boot shaped 28 x 98 mm	Pos.6 R	6	fg400603	•
Hinged vane 98 x 200 mm double sided (37 mm for G 1½" and G 1¼")	Pos.6 K	6	fg400081	•
Hinged vane 98 x 200 mm double sided (28 mm for G 1" and M32)	Pos.6 K	6	fg400085	•
Hinged vane 98 x 100 mm single sided (37 mm for G 1½" and G 1¼")	Pos.6 S	6	fg400084	•
Hinged vane 98 x 100 mm single sided (28 mm for G 1" and M32)	Pos.6 S	6	fg400086	•
Boot shaped 26 x 77 mm	Pos.6 J	6	fg400607	•
Universal vane 27 x 150 mm	Pos.6 U	6	fg402010	•
Vane extension for universal vane 98 x 250 mm	Pos.23	5	fg200070	•

Extension parts

Extension shaft ø10 mm: (delivery incl. fixing parts)	by 50 mm	RN 4001	-	we400005	•
	by 100 mm	RN 4001	-	we401023	•
	by 150 mm	RN 4001	-	we401025	•
	by 200 mm	RN 4001	-	we401026	•
Kit Pendular shaft L=500 mm (delivery incl. fixing parts)	Pos.40	5	zu400130		•
Kit Pendular shaft L=1,000 mm (delivery incl. fixing parts)	Pos.40	5	zu400140		•
Kit rope extension L=2,000 mm (implements 2 m single rope (zu400729) and rope fixing parts (zu400110))	Pos.39	22	zu400100		•
Single rope ø8 mm, tail welded, price per meter	Pos.39	5	zu400729		•
Rope fixing parts, usable for kit rope extension	Pos.39	5	zu400110		•

Hexagon nut

1½" aluminium	Pos.24 A	5	zu300170	•
1½" stainless steel 1.4305	Pos.24 A	5	zu300180	•
1¼" aluminium	Pos.24 B	5	zu300171	•
1¼" stainless steel 1.4305	Pos.24 B	5	zu300181	•
1" aluminium	Pos.24 C	5	zu200150	•
1" stainless steel 1.4305	Pos.24 C	5	zu200160	•
M32 aluminium	Pos.24 D	5	zu200120	•
M32 stainless steel 1.4305	Pos.24 D	5	zu200130	•
M30 aluminium	Pos.24 E	5	zu200170	•
M30 stainless steel 1.4305	Pos.24 E	5	zu200180	•

Weather protection cover

For standard housing (plastic and aluminium)	Pos.21 x	5	zu300232	•
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Vibranivo® 1000 / 5000

Vibration level limit switch

The universal unit for reliable level monitoring of granulated and powdered bulk goods – versatile, suitable especially for applications with high mechanical loading and measurement of bulk goods in liquids; certified for hazardous locations (gas and dust)



Vibranivo® 1000 / 5000

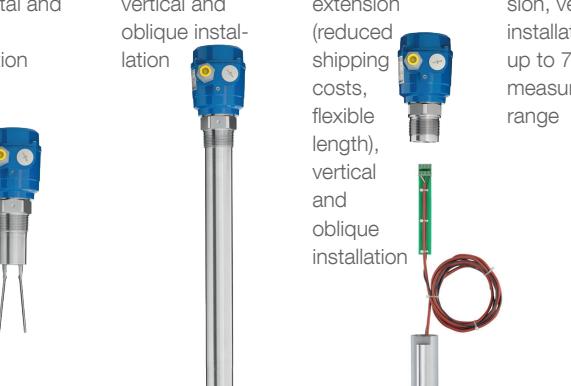


- Modular and simple design
 - For applications with high mechanical loading
 - Particularly suitable for interface measurement
 - Absolutely maintenance free

Application: Vibranivo® probes can be used as full, demand or empty detectors in bulk good silos. They are especially suited for use in all solids which are conveyed or stored under extreme conditions as well as for interface measurement. The short fork design allows mounting in containers with very limited space. Vibranivo vibration forks are available with international certificates for applications in hazardous locations (gas and dust).

Types of Vibranivo demand, full and empty detectors:

Vibranivo ..020	Vibranivo ..030	Vibranivo ..040	Vibranivo ..050
Short extension length, vertical, horizontal and oblique installation	Design with pipe extension, vertical and oblique installation	Delivery without pipe extension (reduced shipping costs, flexible length), vertical and oblique installation	Model with cable extension, vertical installation up to 7m measuring range





Technical Data

Housing	Aluminium IP66 / NEMA Type 4X	
Pressure range	-1 up to +16 bar (-14.5 up to +145 psi)	
Supply voltage/	Relay SPDT	19..230V AC, 19..55V DC
Signal output	Relay DPDT	19..230V AC, 19..36V/55V DC
	PNP	18..50V DC 3-wire
	2-wire without contact	19..230V AC/DC
	8/16mA; 4-20mA	12,5-30/36V DC 2-wire
Versions with certificates	ATEX II 1/2D ATEX II 1G and 1/2G Ex ia IIC ATEX II 2G Ex de [ia] IIC, Ex d [ia] IIC FM Cl. I., II, III, Div.1 Gr. A-G; Zone 0 CSA Cl. I., II, III Div.1 Gr. A-G; Zone 0 TR-CU, IEC Ex	
Process temperature	-40°C up to +150°C (-40°F up to +302°F)	
Sensitivity	From 50g/l (3lb/ft ³) adjustable in 2 steps	
Process connection	R 1½" conical; NPT 1½"; various flanges available	
Vibration fork/extension	Stainless steel 1.4301 (SS304) or 1.4404 (SS316L) various lengths available	

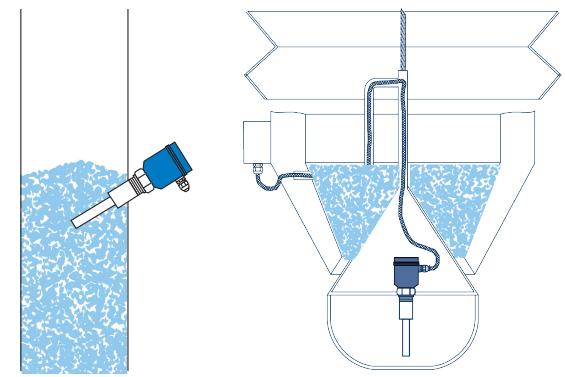
Housing types

The image displays four cylindrical blue pressure transmitters arranged horizontally. From left to right: 1) VN 1000 Standard, featuring a single top-mounted port. 2) VN 5000 Standard, featuring two top-mounted ports (one yellow, one grey). 3) VN 5000 Flameproof, featuring a side-mounted flange with a yellow valve. 4) VN 5000 Intrinsically Safe, featuring a side-mounted flange with a yellow valve and a small 'CE' marking.

Installation

Mounting in downpipe
as back up switch

Mounting in loading bellow as full detector





Vibranivo® 2000 / 6000

Vibration level limit switch

The universal unit for reliable level monitoring of granulated and powdered bulk goods – versatile, especially suitable for light media; certified for hazardous locations (gas and dust); complies with NAMUR standard



Vibranivo® 2000 / 6000



- Modular and simple design
- Suitable for virtually all bulk goods
- Absolutely maintenance-free

Application: Vibranivo® probes can be used as full, demand or empty detectors in bulk good silos. They are especially suited for use in all fine grain and powdered solids, including very light materials with a density below 5g/l. Vibranivo® vibration forks are available with international certificates for applications in hazardous locations (gas and dust).

Types of Vibranivo demand, full and empty detectors:

Vibranivo ..020

Short extension length, vertical, horizontal and oblique installation



Vibranivo ..030

Design with pipe extension, vertical and oblique installation



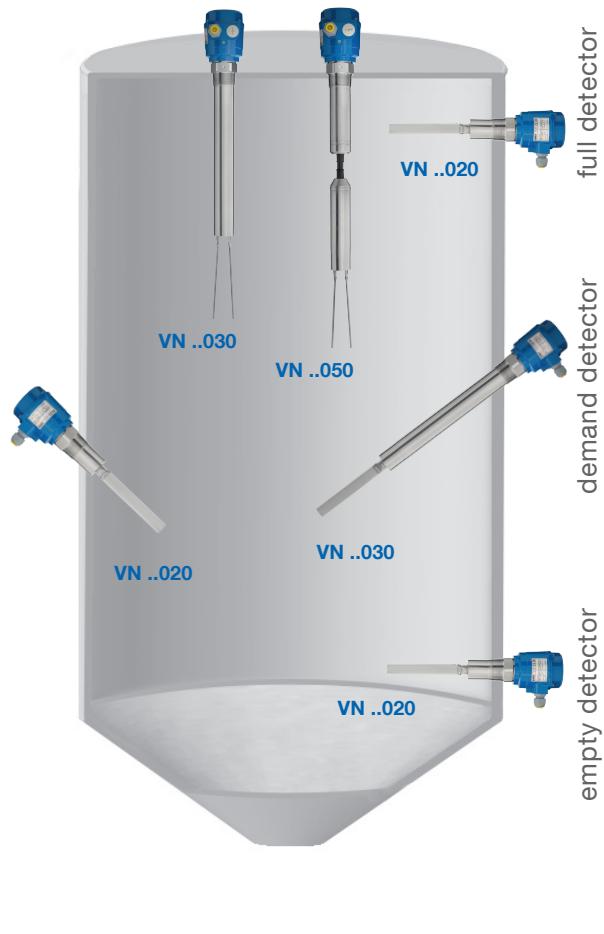
Vibranivo ..040

Delivery without pipe extension (reduced shipping costs, flexible length), vertical and oblique installation



Vibranivo ..050

Model with cable extension, vertical installation up to 20m measuring range



Technical Data

Housing	Aluminium IP 66 / NEMA Type 4X
Pressure range	-1 up to +16 bar (-14.5 up to +145 psi)
Supply voltage/ Signal output	Relay SPDT 19..230V AC, 19..55V DC, Relay DPDT 19..230V AC, 19..36V/55V DC PNP 18..50V DC 3-wire, 2-wire without contact 19..230V AC/DC NAMUR IEC 60947-5-6 2-wire 8/16mA; 4-20mA 12,5-30/36V DC 2-wire
Versions with certificates	ATEX II 1/2D ATEX II 1G and 1/2G Ex ia IIC ATEX II 2G Ex de [ia] IIC, Ex d [ia] IIC FM Cl. I, II, III, Div.1 Gr. A-G; Zone 0 CSA Cl. I, II, III Div.1 Gr. A-G; Zone 0 TR-CU, IEC Ex
Process temperature	-40°C up to +150°C (-40°F up to + 302°F)
Sensitivity	from 5g/l (0.3lb/ft³) adjustable in 2 steps
Process connection	R 1½" conical; NPT 1½"; various flanges available
Vibration fork/extension	Stainless steel 1.4301 (SS304) or 1.4404 (SS316L), various lengths available

Housing types

VN 2000
Standard



VN 6000
Standard



VN 6000
Flameproof



VN 6000
Flameproof, intrinsically safe



Vibrasil®-probe for Silicic acid

For very light and pneumatically conveyed solids. This specially designed Vibranivo vibration fork with enhanced sensitivity and an immediate switching reaction provides perfect measuring results e.g. in fluidized silica with a **bulk density less than 5g/l.**

**Vibranivo
Vibrasil 70**

Specially for flow control in material with a high percentage of air (extremely low bulk density)



**Vibranivo
Vibrasil 90**

Level limit switch for all kinds of silicic acid containers (low bulk density)

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Subject to change.

Valid: From 01.04.2020 until 31.03.2021, unless otherwise agreed.

All dimensions in mm (inches).

By publishing this selection list all other lists become invalid.

All prices in Euro (€) or USD (\$),
excluding VAT.

We assume no liability for typing errors.

All EURO prices are EXW Betzigau,
all USD prices are EXW Memphis,
excluding packaging costs.

Different variations to those specified are possible.
Please contact our technical consultants.

Overview

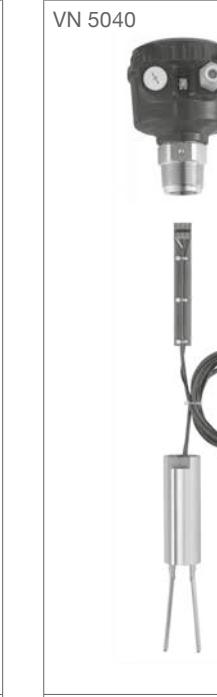
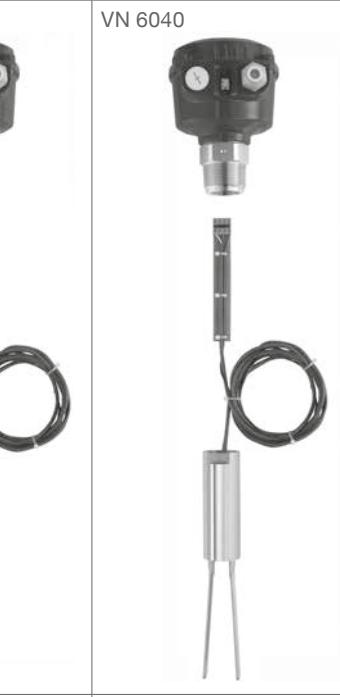
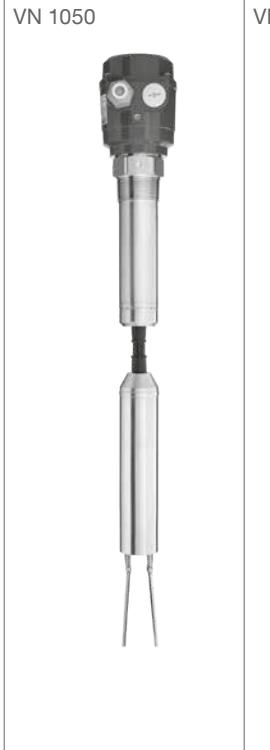
- Level limit detection in bulk goods/ solids
- Compact unit
- Die-casted housing aluminium
- Wide range of applications, no maintenance
- Full, demand, empty detector

- ATEX, IEC-Ex, FM, CSA, TR-CU, INMETRO
- 1935/2004/EC
- 2011/65/EU

- Gas Ex and Dust Ex approvals
 Food grade materials
 RoHS conform

Series	VN 1000	VN 2000	VN 5000	VN 6000
	ATEX/ IEC-Ex/ TR-CU/ INMETRO	ATEX/ IEC-Ex/ TR-CU/ INMETRO	ATEX/ IEC-Ex/ FM/ CSA/ TR-CU/ INMETRO	ATEX/ IEC-Ex/ FM/ CSA/ TR-CU/ INMETRO
Housing	Small housing Short oscillating rods Sensitivity >50 g/l (3 lb/ft ³) For extreme mech. load For mounting in down pipes Advantageous design to avoid bridges Also for interface applications	Small housing Standard oscillating rods Sensitivity >20 g/l (1.2 lb/ft ³) Option >5g/l (0.3 lb/ft ³) Vibrasil®<5 g/l (0.3 lb/ft ³)	Spacious housing Short oscillating rods Sensitivity >50 g/l (3 lb/ft ³) For extreme mech. load For mounting in down pipes Advantageous design to avoid bridges Also for interface applications	Spacious housing Standard oscillating rods Sensitivity >20 g/l (1.2 lb/ft ³) Option >5g/l (0.3 lb/ft ³) Vibrasil®<5 g/l (0.3 lb/ft ³)
VN ..020 Short extension length	Standard		Standard	
VN ..030 Pipe extension				

Overview

<p>VN ..040 Pipe extension (screwed)</p> <p>Custom made pipe for flexible length</p> 	<p>VN 1040</p> 	<p>VN 2040</p> 	<p>VN 5040</p> 	<p>VN 6040</p> 
<p>VN ..050 Cable extension</p> 	<p>VN 1050</p> 	<p>VN 2050</p> 	<p>VN 5050</p> 	<p>VN 6050</p> 

Specifications

Series

	VN 1000	VN 2000	VN 5000	VN 6000
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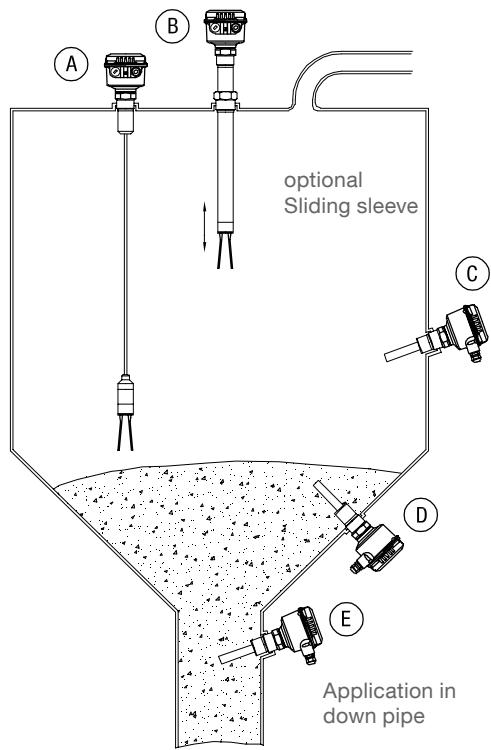
Approvals	CE	•	•	•	•
	ATEX/ IEC-Ex/ INMETRO:				
	Zone 20/21	Dust Ignition Proof	•	•	•
	Zone 0	Intrinsic Safe	•	•	•
	Zone 1	Flameproof/ Increased Safety		•	•
	FM/ CSA:				
	General purp.			•	•
	Cl. II, III Div. 1	Dust Ignition Proof		•	•
	Cl. I Div. 1	Intrinsic Safe		•	•
	Cl. I Div. 1	Explosionproof		•	•
	Zone 0	Intrinsic Safe		•	•
	Zone 1	Flameproof/ Increased Safety		•	•
	TR-CU:				
	Ordinary Locations	•	•	•	•
	Zone 20/21	Dust Ignition Proof	•	•	
	Zone 0	Intrinsic Safe	•	•	
	Zone 1	Flameproof/ Increased Safety		•	•
Electronics	Relais SPDT	19 .. 230 V AC 19 .. 55 V DC	•	•	•
	Relais DPDT	19 .. 230 V AC 19 .. 36 V/ 55 V DC	•	•	•
	PNP	18 .. 50 V DC	•	•	•
	2-wire without contact	19 .. 230 V AC/ DC	•	•	•
	NAMUR	IEC 60947-5-6 2-wire		•	•
	8/16 mA or 4-20 mA	12.5-30/36 V DC 2-wire	•	•	•

Extensions	VN ..020	Length of extension	165 mm (6.47")	235 mm (9.25")	165 mm (6.47")	235 mm (9.25")
		Ambient temperature		-40 .. +60°C (-40 .. +140°F)		
		Process temperature		-40 .. +150°C (-40 .. +302°F)		
		Process pressure		-1 .. +16 bar (-14.5 .. +232 psi)		
		Process connection material/ Extension ¹	1.4301 (304)/ 1.4541 (321) or 1.4404 (SS316L)/ (food grade)			
VN ..030		Length of extension	300 .. 4,000 mm (11.8 .. 157")			
		Ambient temperature	-40 .. +60°C (-40 .. +140°F)			
		Process temperature	-40 .. +150°C (-40 .. +302°F)			
		Process pressure	-1 .. +16bar (-14.5 .. +232 psi)			
		Process connection material/ Extension ¹	1.4301 (304)/ 1.4541 (321) or 1.4404 (SS316L)/ (food grade)			
VN ..040		Length of extension	1,500 mm (59") or 4,000 mm (157")			
		Ambient temperature	-40 .. +60°C (-40 .. +140°F)			
		Process temperature	-40 .. +150°C (-40 .. +302°F)			
		Process pressure	-1 .. +16bar (-14.5 .. +232 psi)			
		Process connection material/ Extension ¹	1.4305 (303)/ 1.4541 (321) or 1.4404 (SS316L)/ (food grade)			
VN ..050		Length of extension	750 ... 20,000 mm (27.6" .. 787")			
		Ambient temperature	-25 .. +60°C (-13 .. +140°F)			
		Process temperature	-25 .. +80°C (-13 .. +176°F)			
		Process pressure	-1 .. +6 bar (-14.5 .. +87 psi)			
		Process connection material/ Extension ¹	1.4305 (303)/ 1.4541 (321) Cable isolation: PUR (no food grade)			

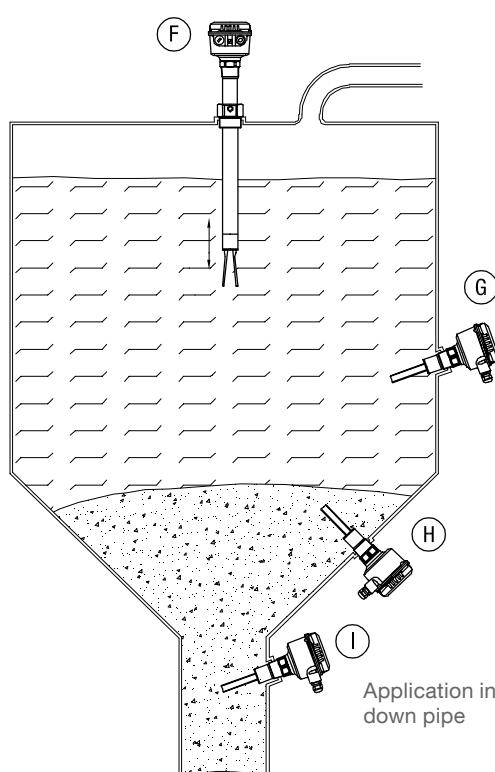
¹ The listed or higher-quality corrosion-resistant materials can be used.
 Filler materials are not listed.

Applications

Detection of solids



Detection of solids in water



	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
VN 1020			•	•	•		•	•	•
VN 1030		•	•			•	•		
VN 1040		•	•						
VN 1050	•								
VN 2020			•	•	•				
VN 2030		•	•						
VN 2040		•	•						
VN 2050	•								
VN 5020			•	•	•	•	•	•	•
VN 5030		•	•			•	•		
VN 5040		•	•						
VN 5050	•								
VN 6020			•	•	•				
VN 6030		•	•						
VN 6040		•	•						
VN 6050	•								

VN ..020 Short extension length

VN 1020



VN 2020



VN 5020



VN 6020



Housings VN 5020/ 6020



Standard

d (flameproof)

de (flameproof/
increased safety)

Food grade materials

Cable entries (by default)

Depending on model selected, the following cable entries are supported (options see pos.23 on page 14):

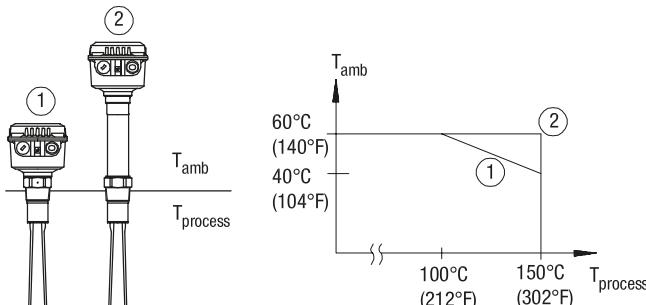
Version:	Cable entries:
ATEX/IEC-Ex flameproof (pos.2 T,D)	M20 x 1.5 (1x open conduit + 1x blind plug)
FM and CSA (pos.2 M,N,P,S,U)	NPT ½" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)
All other versions	M20 x 1.5 (1x screwed cable gland + 1x blind plug)

Dimensions

see pages 17 - 20

pos.3
 Temperature extended shaft
 applications up to 150°C (302°F)

- 1 without
- 2 with



VN ..030 Pipe extension

VN 1030



VN 2030



VN 5030



VN 6030



Housings VN 5030/ 6030



Food grade materials

Standard

d (flameproof)

de (flameproof/
increased safety)

Cable entries (by default)

Depending on model selected, the following cable entries are supported (options see pos.23 on page 14):

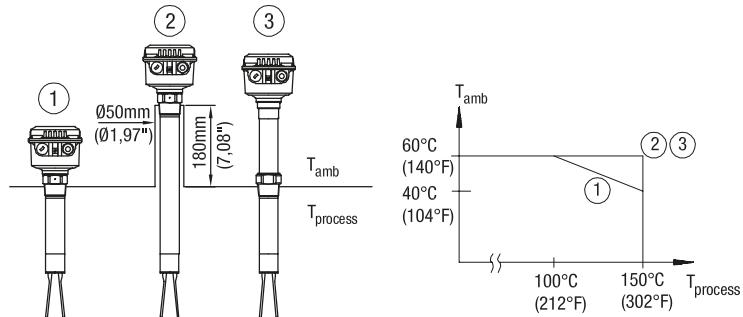
Version:	Cable entries:
ATEX/IEC-Ex flameproof (pos.2 T,D)	M20 x 1.5 (1x open conduit + 1x blind plug)
FM and CSA (pos.2 M,N,P,S,U)	NPT ½" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)
All other versions	M20 x 1.5 (1x screwed cable gland + 1x blind plug)

Dimensions see pages 17 - 20

pos.3

Temperature extended shaft
applications up to 150°C (302°F)

- 1 without
- 2 without and with extended socket
- 3 with



VN ..030 Pipe extension

Basic type



- VN 1030**
- VN 2030**
- VN 5030**
- VN 6030**

pos.2

Certificate (detailed Ex-markings: see page 20)

		Dust	Gas	Protection method	
• • • •	0 CE/ TR-CU	-	-		•
• • • •	W ATEX	Zone 20/21	-	Dust Ignition Proof	•
• • • •	Y ATEX	Zone 20/21	Zone 0 and 0/1	Intrinsic Safe/ Dust Ignition Proof	•
• • • •	R ATEX	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	•
• • • •	T ATEX	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	•
• • • •	A IEC-Ex/ INMETRO	Zone 20/21	-	Dust Ignition Proof	•
• • • •	B IEC-Ex/ INMETRO	Zone 20/21	Zone 0 and 0/1	Intrinsic Safe/ Dust Ignition Proof	•
• • • •	C IEC-Ex/ INMETRO	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	•
• • • •	D IEC-Ex/ INMETRO	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	•
• • • •	M FM/ CSA	-	-	General purpose	•
• • • •	N FM/ CSA	Cl. II, III, Div.1	-	Dust Ignition Proof	•
• • • •	CSA	A 20/21			•
• • • •	P FM/ CSA	Cl. II, III, Div.1	Cl. I Div.1/ Zone 0	Intrinsic Safe/ Dust Ignition Proof	•
• • • •	CSA	A 20/21			•
• • • •	S FM/ CSA	Cl. II, III, Div.1	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	•
• • • •	CSA	A 20/21			•
• • • •	U FM/ CSA	Cl. II, III, Div.1	Cl. I Div.1/ Zone 1	Explosion Proof/ Dust Ignition Proof	•
• • • •	CSA	A 20/21			•
• • • •	E TR-CU	Zone 20/21	-	Dust Ignition Proof	•
• • • •	V TR-CU	Zone 20/21	Zone 0 and 0/1	Intrinsic Safe/ Dust Ignition Proof	•
• • • •	K TR-CU	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	•
• • • •	L TR-CU	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	•

pos.3

Temperature extended shaft

- 1 without (up to $T_{process} = 150^\circ\text{C}$ (302°F) at $T_{amb} < 40^\circ\text{C}$ (104°F) or with extended socket)
- 2 with (up to $T_{process} = 150^\circ\text{C}$ (302°F) at $T_{amb} > 40^\circ\text{C}$ (104°F) without extended socket)

pos.4

Electronic module

- E Relay SPDT 19 .. 230 V AC 19 .. 55 V DC
- L Relay DPDT 19 .. 230 V AC 19 .. 55 V DC
- 19 .. 230 V AC 19 .. 36 V DC
- D PNP 18 .. 50 V DC
- K 2-wire without contact 19 .. 230 V AC/ DC
- M NAMUR IEC 60947-5-6 2-wire
- N 8/16 mA or 4-20 mA 12.5 .. 36 V* DC 2-wire
- N 8/16 mA 12.5 .. 36 V DC 2-wire

Available for certificates (pos.2)									
0	W/A/E	Y/B/V	R/C/K	T/D/L	M	N	P	S	U
• •	•	•	•	•	•	•	•	•	•
• •	(1)				(1)				
• •	(2)	•	•		(2)	•	•	•	•
• •	•	•	•	•	•	•	•	•	•
• •	•	•	•	•	•	•	•	•	•
• •	(1)	•							
• •	(2)	•	•						

(1) without pos.26 1/2

(2) with pos.26 1/2

pos.5

Process connection

- A Thread R 1½", conical EN 10226
- B Thread NPT 1½", conical ANSI B1.20.1
- P Triclamp 2" (DN50) ISO 2852
- L Flange DN100 PN6, EN 1092-1 (max. 6 bar (87 psi))
- M Flange DN100 PN16, EN 1092-1
- S Flange 2" 150lbs ANSI B16.5 (max. 10 bar (145 psi))
- T Flange 3" 150lbs ANSI B16.5 (max. 10 bar (145 psi))
- U Flange 4" 150lbs ANSI B16.5 (max. 10 bar (145 psi))

pos.7

Length of extension "L"

- Z (starting from 0 mm) per 100 mm (3.94") or part thereof; min. 300 mm (11.8"), max. 4,000 mm (157")

pos.8

Material of process connection/ extension "L"

- 1 Stainless steel 1.4301 (304)/ Flange in 1.4541 (321)
 - 2 Stainless steel 1.4404 (316L)
- Vibrating rods polished, Ra ≤ 0.75 µm; Teflon coating on request

Basic type

	B				3	Z		-	L =	mm	←	Order code
Position	1	2	3	4	5	6	7	8				

All positions are available with special design (use code "Z").

VN ..040 Pipe extension (screwed)

VN 1040



VN 2040



VN 5040



VN 6040



Housings VN 5040/ 6040



Standard



d (flameproof)



de (flameproof/
increased safety)

Food grade materials

Cable entries (by default)

Depending on model selected, the following cable entries are supported (options see pos.23 on page 14):

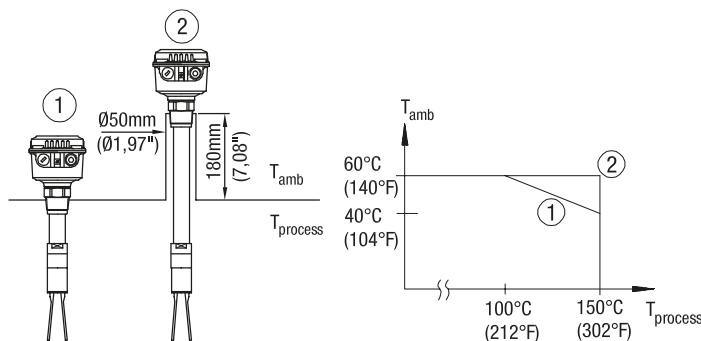
Version:	Cable entries:
ATEX/ IEC-Ex flameproof (pos.2 T,D)	M20 x 1.5 (1x open conduit + 1x blind plug)
FM and CSA (pos.2 M,N,P,S,U)	NPT 1/2" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)
All other versions	M20 x 1.5 (1x screwed cable gland + 1x blind plug)

Dimensions

see pages 17 - 20

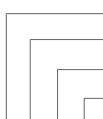
applications up to 150°C
 (302°F)

- 1 without extended socket
- 2 with extended socket



VN ..040 Pipe extension (screwed)

Basic type



- VN 1040**
- VN 2040**
- VN 5040**
- VN 6040**

	pos.2	Certificate (detailed Ex-markings: see page 20)			
		0 CE/ TR-CU	Dust	Gas	
• • • •	W ATEX	-	-		Dust Ignition Proof
• • • •	Y ATEX	Zone 20/21	Zone 0 and 0/1		Intrinsic Safe/ Dust Ignition Proof
• • • •	R ATEX	Zone 20/21	Zone 1		Flameproof/ Increased Safety/ Dust Ignition Proof
• • • •	T ATEX	Zone 20/21	Zone 1		Flameproof/ Dust Ignition Proof
• • • •	A IEC-Ex/ INMETRO	Zone 20/21	-		Dust Ignition Proof
• • • •	B IEC-Ex/ INMETRO	Zone 20/21	Zone 0 and 0/1		Intrinsic Safe/ Dust Ignition Proof
• • • •	C IEC-Ex/ INMETRO	Zone 20/21	Zone 1		Flameproof/ Increased Safety/ Dust Ignition Proof
• • • •	D IEC-Ex/ INMETRO	Zone 20/21	Zone 1		Flameproof/ Dust Ignition Proof
• • • •	M FM/ CSA	-	-		General purpose
• • • •	N FM/ CSA	Cl. II, III, Div.1 CSA A 20/21	-		Dust Ignition Proof
• • • •	P FM/ CSA	Cl. II, III, Div.1 CSA A 20/21	Cl. I Div.1/ Zone 0		Intrinsic Safe/ Dust Ignition Proof
• • • •	S FM/ CSA	Cl. II, III, Div.1 CSA A 20/21	Zone 1		Flameproof/ Increased Safety/ Dust Ignition Proof
• • • •	U FM/ CSA	Cl. II, III, Div.1 CSA A 20/21	Cl. I Div.1/ Zone 1		Explosion Proof/ Dust Ignition Proof
• • • •	E TR-CU	Zone 20/21	-		Dust Ignition Proof
• • • •	V TR-CU	Zone 20/21	Zone 0 and 0/1		Intrinsic Safe/ Dust Ignition Proof
• • • •	K TR-CU	Zone 20/21	Zone 1		Flameproof/ Increased Safety/ Dust Ignition Proof
• • • •	L TR-CU	Zone 20/21	Zone 1		Flameproof/ Dust Ignition Proof
	pos.4	Electronic module			Available for certificates (pos.2)
		E Relay SPDT	19 .. 230 V AC	19 .. 55 V DC	0 W/A/E Y/B/V R/C/K T/D/L M N P S U
• • • •	L Relay DPDT	19 .. 230 V AC	19 .. 55 V DC	19 .. 36 V DC	• • • • • • • •
• • • •	D PNP	18 .. 50 V DC			• • • • • • • •
• • • •	K 2-wire without contact	19 .. 230 V AC/ DC			• • • • • • • •
• • • •	M NAMUR IEC 60947-5-6 2-wire				• • • • • • • •
• • • •	N 8/16 mA or 4-20 mA 12.5 .. 36 V* DC 2-wire				• • • • • • • •
• • • •	N 8/16 mA 12.5 .. 36 V DC 2-wire				• • • • • • • •
*30 V intrinsic safe					
	pos.5	Process connection			
		A Thread R 1½", conical EN 10226			
• • • •	B Thread NPT 1½", conical ANSI B1.20.1				• • • •
• • • •	P Triclamp 2" (DN50) ISO 2852				• • • •
• • • •	L Flange DN100 PN6, EN 1092-1 (max. 6 bar (87 psi))				• • • •
• • • •	M Flange DN100 PN16, EN 1092-1				• • • •
• • • •	S Flange 2" 150lbs ANSI B16.5 (max. 10 bar (145 psi))				• • • •
• • • •	T Flange 3" 150lbs ANSI B16.5 (max. 10 bar (145 psi))				• • • •
• • • •	U Flange 4" 150lbs ANSI B16.5 (max. 10 bar (145 psi))				• • • •
	pos.7	Length of extension "L"			
		L 1.500 mm (59") (cuttable cable length)			
• • • •	M 4.000 mm (157") (cuttable cable length)				• • • •
	pos.8	Material of process connection/ extension "L"			
		1 Stainless steel 1.4305 (303)/ Flange in 1.4541 (321)			
• • • •	2 Stainless steel 1.4404 (316L)				
Vibrating rods polished, Ra ≤ 0.75 µm; Teflon coating on request					

Basic type

Further options and accessories: see page 14 - 16

	C	1		3		
Position	1	2	3	4	5	6

← Order code

All positions are available with special design (use code "Z").

VN ..050 Cable extension

VN 1050



VN 2050



VN 5050



VN 6050



Housings VN 5050/ 6050



Standard



d (flameproof)



de (flameproof/
increased safety)

Cable entries (by default)

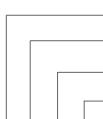
Depending on model selected, the following cable entries are supported (options see pos.23 on page 14):

Version:	Cable entries:
ATEX/ IEC-Ex flameproof (pos.2 T,D)	M20 x 1.5 (1x open conduit + 1x blind plug)
FM and CSA (pos.2 M,N,P,S,U)	NPT ½" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)
All other versions	M20 x 1.5 (1x screwed cable gland + 1x blind plug)

Dimensions see pages 17 - 20

VN ..050 Cable extension

Basic type



- VN 1050**
- VN 2050**
- VN 5050**
- VN 6050**

pos.2

Certificate (detailed Ex-markings: see page 20)

		Dust	Gas	Protection method	
• • • •	0 CE/ TR-CU	-	-		•
• • • •	W ATEX	Zone 20/21	-	Dust Ignition Proof	•
• • • •	Y ATEX	Zone 20/21	Zone 0 and 0/1	Intrinsic Safe/ Dust Ignition Proof	•
• • • •	R ATEX	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	•
• • • •	T ATEX	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	•
• • • •	A IEC-Ex/ INMETRO	Zone 20/21	-	Dust Ignition Proof	•
• • • •	B IEC-Ex/ INMETRO	Zone 20/21	Zone 0 and 0/1	Intrinsic Safe/ Dust Ignition Proof	•
• • • •	C IEC-Ex/ INMETRO	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	•
• • • •	D IEC-Ex/ INMETRO	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	•
• • • •	M FM/ CSA	-	-	General purpose	•
• • • •	N FM/ CSA	Cl. II, III, Div.1 CSA A 20/21	-	Dust Ignition Proof	•
• • • •	P FM/ CSA	Cl. II, III, Div.1 CSA A 20/21	Cl. I Div.1/ Zone 0	Intrinsic Safe/ Dust Ignition Proof	•
• • • •	S FM/ CSA	Cl. II, III, Div.1 CSA A 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	•
• • • •	U FM/ CSA	Cl. II, III, Div.1 CSA A 20/21	Cl. I Div.1/ Zone 1	Explosion Proof/ Dust Ignition Proof	•
• • • •	E TR-CU	Zone 20/21	-	Dust Ignition Proof	•
• • • •	V TR-CU	Zone 20/21	Zone 0 and 0/1	Intrinsic Safe/ Dust Ignition Proof	•
• • • •	K TR-CU	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	•
• • • •	L TR-CU	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	•

pos.4

Electronic module

- E Relay SPDT 19 .. 230 V AC 19 .. 55 V DC
- L Relay DPDT 19 .. 230 V AC 19 .. 55 V DC
- 19 .. 230 V AC 19 .. 36 V DC
- D PNP 18 .. 50 V DC
- K 2-wire without contact 19 .. 230 V AC/ DC
- M NAMUR IEC 60947-5-6 2-wire
- N 8/16 mA or 4-20 mA 12.5 .. 36 V* DC 2-wire
- N 8/16 mA 12.5 .. 36 V DC 2-wire

*30 V intrinsic safe

0	Available for certificates (pos.2)								
	W/A/E	Y/B/V	R/C/K	T/D/L	M	N	P	S	U
•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•

pos.5

Process connection

- A Thread R 1½", conical EN 10226
- B Thread NPT 1½", conical ANSI B1.20.1
- L Flange DN100 PN6, EN 1092-1 (max. 6 bar (87 psi))
- M Flange DN100 PN16, EN 1092-1
- S Flange 2" 150lbs ANSI B16.5
- T Flange 3" 150lbs ANSI B16.5
- U Flange 4" 150lbs ANSI B16.5

pos.7

Length of extension "L"

- Z ((starting from 0 mm) per 100 mm (3.94") or part thereof; min./ max. see below

pos.8

Material of process connection/ extension "L"

- 1 Stainless steel 1.4305 (303)/ Flange in 1.4541 (321)
 - 2 Stainless steel 1.4404 (316L)
- Vibrating rods polished, Ra ≤ 0.75 µm; Teflon coating on request

Further options and accessories: see page 14 - 16

Extension "L":
min. 750 mm (29,6")
max. 7,000 mm (276") for VN 1050/ 5050
max. 20,000 mm (787") for VN 2050/ 6050
max. 10,000 mm (394") for VN 2050/ 6050 with pos.4 M

Basic type

	D	1		3	Z	1	-	L =	mm	Order code
Position	1	2	3	4	5	6	7	8		

All positions are available with special design (use code "Z").



Options

VN 1020	VN 1030	VN 1040	VN 1050
VN 2020	VN 2030	VN 2040	VN 2050
VN 5020	VN 5030	VN 5040	VN 5050
VN 6020	VN 6030	VN 6040	VN 6050
• • • • •	• • • • •	• • • • •	• • • • •
• • 1 1	• • 1 1	• • 1 1	• • 1 1
• • • • •	• • • • •	• • • • •	• • • • •
• • • • •	• • • • •	• • • • •	• • • • •
• • 2 2 3 3	• • 2 2 3 3	• • 2 2 3 3	• • 2 2 3 3
• • 4 4	• • 4 4	• • 4 4	• • 4 4
• • • • •	• • • • •	• • • • •	• • • • •
• • • • •	• • • • •	• • • • •	• • • • •
6 6 6 6 6	6 6 6 6 6	6 6 6 6 6	6 6 6 6 6
• • 7 7 7	• • 7 7 7	• • 7 7 7	• • 7 7 7
• • 7 7 7	• • 7 7 7	• • 7 7 7	• • 7 7 7
• • 7 7 7	• • 7 7 7	• • 7 7 7	• • 7 7 7
8 8 8 8 8	8 8 8 8 8	8 8 8 8 8	8 8 8 8 8
8 8 8 8 8	8 8 8 8 8	8 8 8 8 8	8 8 8 8 8
9 9 9 9 9	9 9 9 9 9	9 9 9 9 9	9 9 9 9 9
10 10 10 10 10	10 10 10 10 10	10 10 10 10 10	10 10 10 10 10

pos.11 x **Guarantee extension to 5 years**

pos.21 Weather protection cover

(for Ex only approved for Zone 2 or 22 or

Mounting set for flange mounting					
process connection flange	for counter flange with	consists of			
		screws*	nuts*	washers*	sealing**
L	hole ø18	4x M16x60	4x M16	4 pcs	1 piece
L	thread M16	4x M16x40		4 pcs	1 piece
M	hole ø18	8x M16x60	8x M16	8 pcs	1 piece
M	thread M16	8x M16x40		8 pcs	1 piece

* material stainless steel A2 **max. 250°C (482°F) material not food grade

Cable entry

Selection of the following options only necessary, if a deviation from the default cable gland/conduit is required:

• • 2 2	• • 2 2	• • 2 2	• • 2 2	pos.23 x M20 x 1.5 2x screwed cable gland
3 3	3 3	3 3	3 3	pos.23 y M20 x 1.5 1x screwed cable gland +1x blind plug
• • 4 4	• • 4 4	• • 4 4	• • 4 4	pos.23 a NPT ½" tapered ANSI B1.20.1 (1x conduit +1x Ex-d blind plug)
• • •	• • •	• • •	• • •	pos.23 b NPT ¾" tapered ANSI B1.20.1 (1x conduit +1x Ex-d blind plug)

Sliding sleeve (max. 16 bar (232 psi), max. 150°C (302°F))

process connection as follows or flange as chosen; with Triclamp on request
Not for Ex applications Zone 0/1 (Cat. 1/2), with separation wall

Not for Ex applications Zone 0 & I (Cat: 1/2) with Separation Wall			
pos.25 w	G2" ISO 228	material 1.4305 (303)	.....
pos.25 x	G2" ISO 228	material 1.4404 (316L)	.....
pos.25 u	NPT 2" ANSI B1.20.1	material 1.4305 (303)	.....
pos.25 v	NPT 2" ANSI B1.20.1	material 1.4404 (316L)	.....
pos.25 t	Flange 1.4305/ 1.4541 (303/321)	.....	.....
pos.25 s	Flange 1.4404 (316L)	.....	.....

Special versions

Enhanced sensitivity (>5 g/l (0.3 lb/ft ³))
Vibrasil 70 (sensitivity <5 g/l (0.3 lb/ft ³))
Vibrasil 90 (sensitivity <5g/l (0.3 lb/ft ³))
Adjustable sensitivity for interface applications (only with CE)
Separate housing cable length 1.5 m (59") including hexagon nut
Separate housing cable length 4.0 m (157") including hexagon nut
Separate housing cable length 1.5 m (59") including hexagon nut and angle bracket (aluminium)
Separate housing cable length 4.0 m (157") including hexagon nut and angle bracket (aluminium)

Signal lamp

pos.27 a	LED, mounted in cable entry M20 x 1.5, green	.....
pos.27 c	LED, mounted in cable entry M20 x 1.5, red	.....
pos.27 b	LED (glass window in lid)	.....

Plug

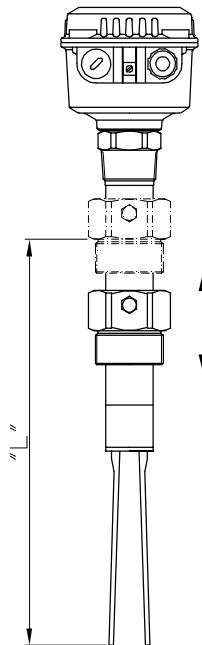
pos.29 x Valve connector (incl. mating plug) 4-pole (incl. PE) max. 230 V

- 1 Available for all versions except explosionproof/ flameproof and increased safety versions (pos.2 C,D,K,L,R,T,S,U).
 - 2 Available for all versions except flameproof version (pos.2 D,L,T,U).
 - 3 Available for FM/ CSA versions (pos.2 M,N,P,S) except flameproof version (pos.2 U).
 - 4 Available for CE, ATEX, IEC-Ex, INMETRO, TR-CU (pos.2 0,W,Y,R,T,A,B,C,D,E,V,K,L).
 - 5 Flange and material as selected in pos.5 and pos.8. For FM/ CSA on request.
 - 6 Available only with electronic module "Relais SPDT" (pos.4 E), Vibrasil 70 only with flange DN100/4".
 - 7 Available for all versions. Electronic module "8/16 mA" and "8/16 mA or 4-20 mA" (pos.4 N) not for FM/ CSA.
 - 8 Available for CE (pos.2 0), not in combination with weather protection cover (pos.21) and cable entries pos.23 x,a,b.
For electronic module Relais SPDT and DPDT (pos.4 E,L) 2 LED's (24V, 80-260V) will be delivered. For PNP (pos.4 D) a 24 V LED will be delivered. For other electronics on request.
 - 9 Available for all versions except explosionproof/ flameproof version (pos.2 C,D,K,L,R,T,S,U), not with weather protection cover (pos.21).
 - 10 Available only for CE (pos.2 0).

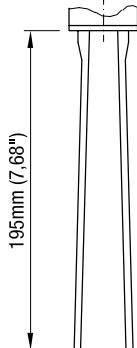


Options

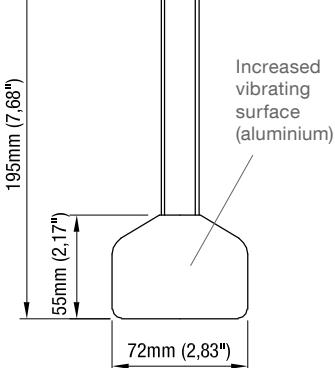
pos.25
Sliding sleeve



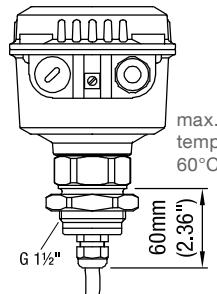
pos.26 x
Enhanced
sensitivity



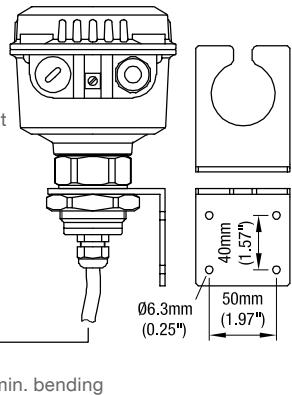
pos.26 a
Vibrasil® 70



pos.26 1/2
Separate housing
without angle bracket



pos.26 3/4
Separate housing
with angle bracket

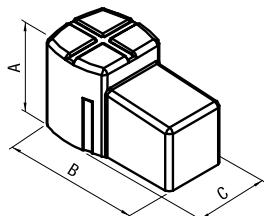


min. bending
radius of cable:
50 mm (2")

grounding terminal
for version with
Ex approval

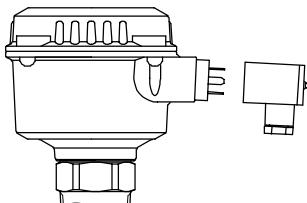
max. Process temperature:
150°C (302°F)
(Ex 110°C (230°F))

pos.21
Weather protection
cover



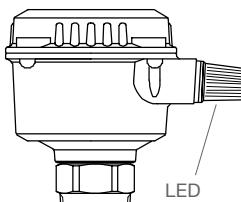
	VN 10..0	VN 50..0
A	100 mm (3.94")	130 mm (5.12")
B	165 mm (6.5")	200 mm (7.87")
C	88 mm (3.46")	125 mm (4.92")

pos.29
Valve connector

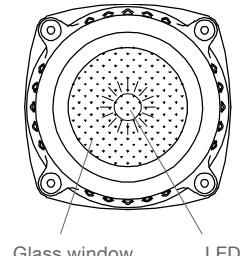


Signal lamp

pos.27 a,c
LED, mounted in cable
entry M20 x 1.5



pos.27 b
LED (glass window
in lid)



Glass window LED

Options / Accessories

Accessories

Minimum order value for separate orders of spare parts or accessories is 75 €.



NAMUR Isolating Switching Amplifier Protection method [EEx ia] IIC
 (for Electronic module pos.4 M)

Terminal housing. Switchable signal output logic. Each channel has one independent output.

Channels	Signal output	Monito-ring*	Supply	Manufacturer/ Type
				Turck
1	Relay (2x SPST)	x	20 - 125 V DC, 20 - 250 V AC	IM1-12EX-R
	2 transistor outputs (short-circuit proof, floating)	x		IM1-12EX-T
2	Relay (2x SPST)	x	20 - 125 V DC, 20 - 250 V AC	IM1-22EX-R
	2 transistor outputs (short-circuit proof, floating)	x		IM1-22EX-T
4	Relais (4x SPST)	x	20 - 125 V DC, 20 - 250 V AC	IM1-451EX-R
	4 transistor outputs (short-circuit proof, floating)	x		IM1-451EX-T

* Input circuit monitoring for wire-break, partial for short-circuit.
 Partial additional monitoring signal output.

Price on request



8/16 mA Limit Value Monitor
 (for Electronic module pos.4 N)

Limit Value Monitor Type IM43-13-R

Input: 1 channel 4-20 mA

Output: 3 Limit Value Relays for monitoring of 3 limit values of a current signal.

Terminal housing. Supply: 20 - 125 V DC, 20 - 250 V AC. Manufacturer: Turck.

Use in Hazardous Locations only with additional connected Isolating Transducer IM33.

Isolating Transducer Type IM33-11Ex-Hi/ 24 V DC (1 channel)

Isolating Transducer Type IM33-11Ex-Hi/ 24 V DC (2 channels)

Protection method [EEx ia] IIC.

Terminal housing.

Input/ output: 0/4-20 mA (galvanic isolated). Supply: 19 - 29 V DC.

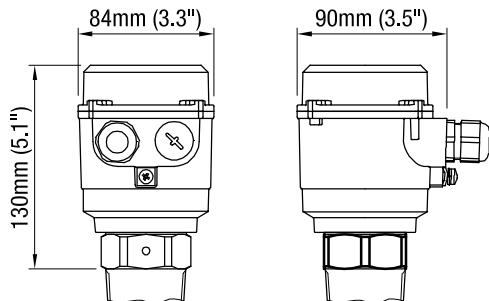
Price on request

Dimensions

Housing versions

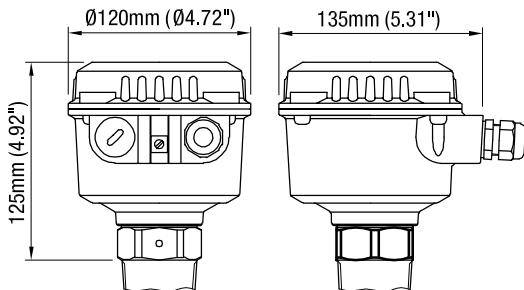
**Series VN 1000/
2000**

Standard



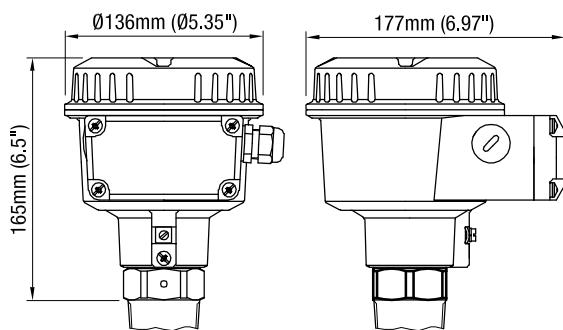
**Series VN 5000/
6000**

Standard



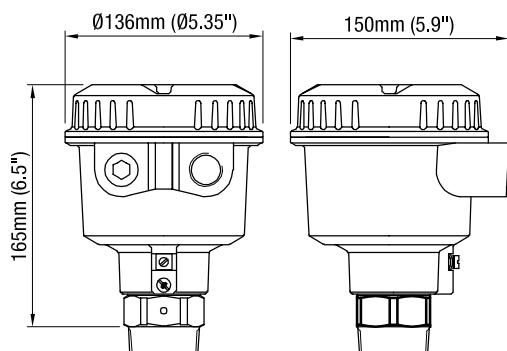
de

Explosionproof with
increased safety
terminal box



d

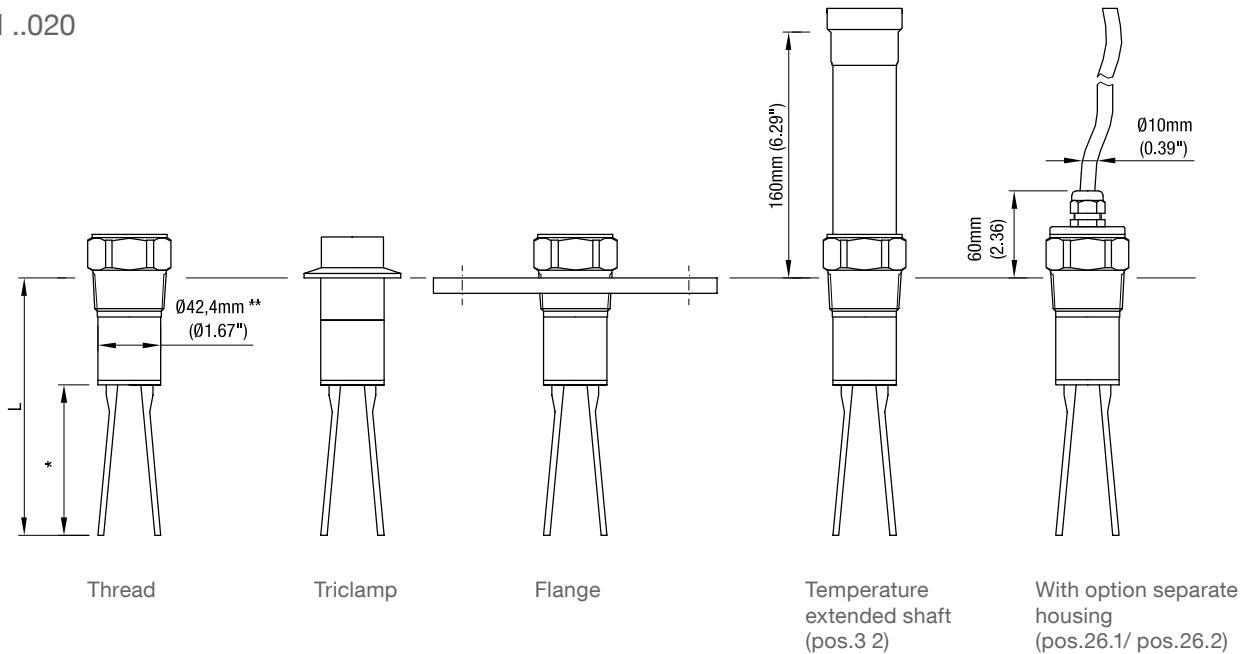
Flameproof/
explosionproof



Dimensions

Extensions

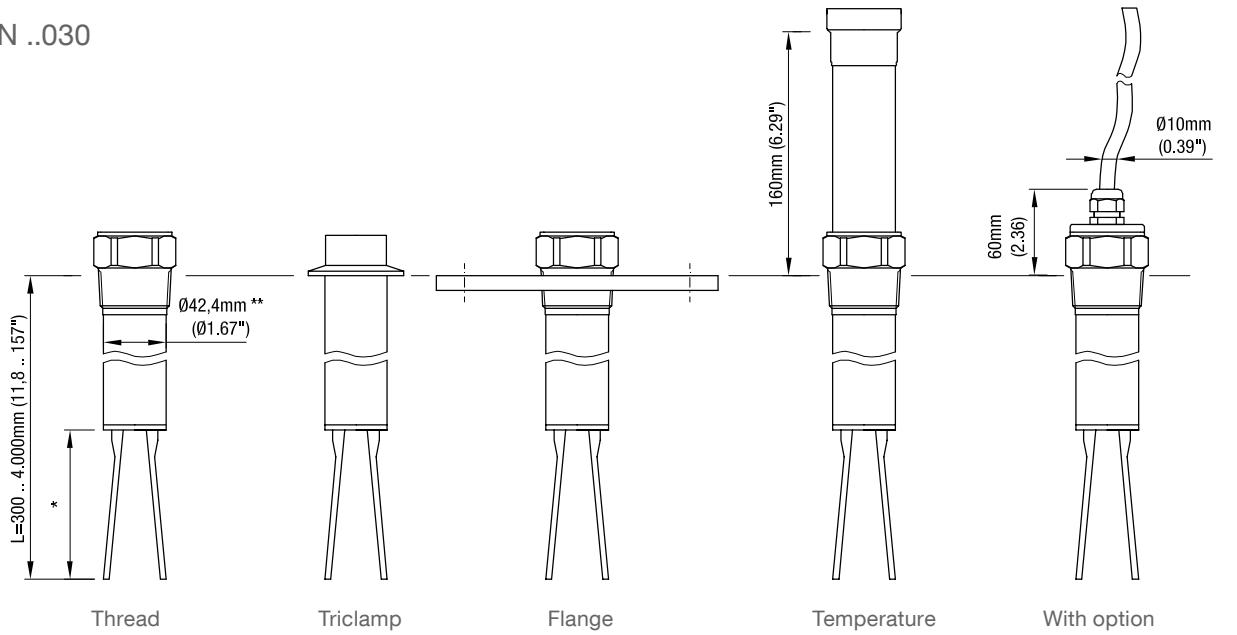
VN ..020



	L	
	without option	with option: Enhanced sensitivity (pos.26 x) Vibrasil® 70 (pos.26 a) Vibrasil® 90 (pos.26 b)
VN 1020 VN 5020	165 mm (6.5")	
VN 2020 VN 6020	235 mm (9.25")	260 mm (10.24")

* see page 19 bottom right
 ** welding seam max. Ø43.8 mm (1.72")

VN ..030

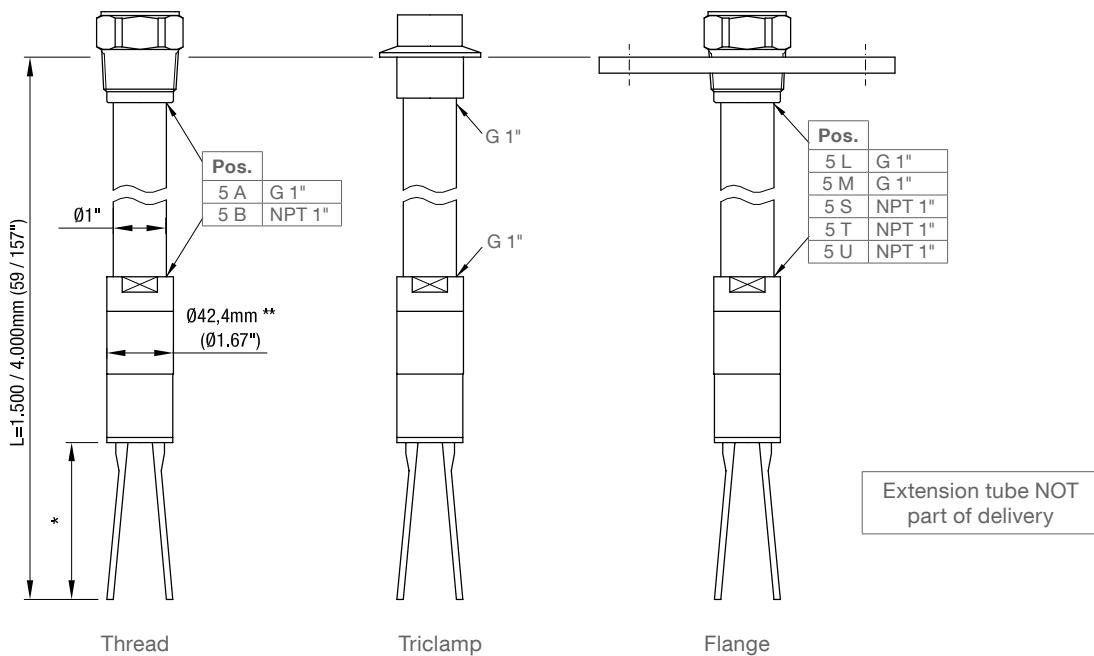


* see page 19 bottom right
 ** welding seam max. Ø43.8 mm (1.72")

Cap nut: see page 16

Dimensions

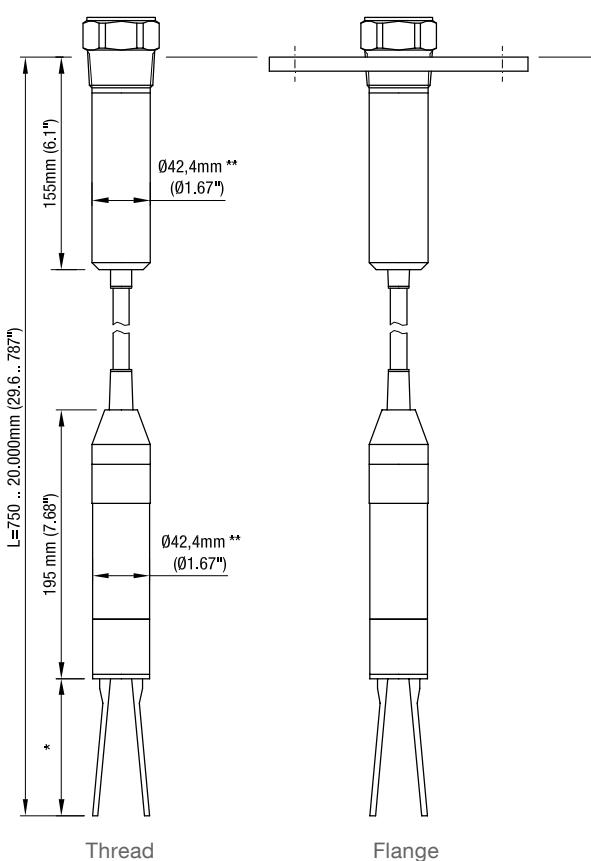
VN ..040



* see below right

** welding seam max. Ø43.8 mm (1.72")

VN ..050



* see below right

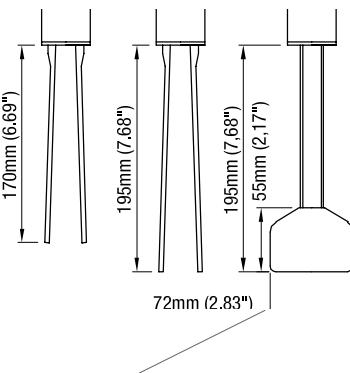
** welding seam max. Ø43.8 mm (1.72")

* Length of oscillating rods

VN 10..0
VN 50..0



VN 20..0
VN 60..0

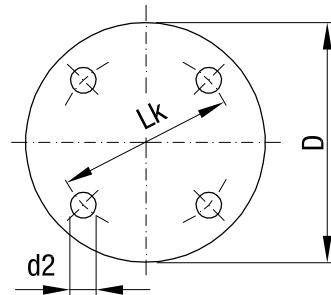


with option
Enhanced sensitivity (pos.26 x)
Vibrasil® 70 (pos.26 a)
Vibrasil® 90 (pos.26 b)

Dimensions

Flanges

Code	type	number of holes	d2	Lk	D	T (thickness)
L	Flange DN100 PN6	4	18 mm (0.71")	170 mm (6.69")	210 mm (8.27")	16 mm (0.63")
M	Flange DN100 PN16	8	18 mm (0.71")	180 mm (7.09")	220 mm (8.66")	20 mm (0.79")
S	Flange 2" 150lbs	4	19.1 mm (0.75")	120.7 mm (4.75")	152.4 mm (6.01")	19.1 mm (0.75")
T	Flange 3" 150lbs	4	19.1 mm (0.75")	152.4 mm (6.01")	190.5 mm (7.5")	23.9 mm (0.94")
U	Flange 4" 150lbs	8	19.1mm (0.75")	190.5mm (7.5")	228.6mm (9")	23.9mm (0.94")



Detailed Ex-markings

pos.2

Certificate

Housing

0	CE	Standard
W	ATEX II 1/2D Ex ta/tb IIIC T! Da/Db	Standard
Y	ATEX II 1G Ex ia IIC T! Ga and 1/2G Ex ia IIC T! Ga/Gb ATEX II 1/2D Ex ta/tb IIIC T! Da/Db	Standard
R	ATEX II 2G Ex db eb [ia Ga]* IIC T! Gb and ATEX II 1/2D Ex ta/tb IIIC T! Da/Db	de
T	ATEX II 2G Ex db [ia Ga]* IIC T! Gb and ATEX II 1/2D Ex ta/tb IIIC T! Da/Db	d
A	IEC-Ex ta/tb IIIC T! Da/Db	Standard
B	IEC-Ex ia IIC T! Ga and Ex ia IIC T! Ga/Gb	Standard
C	IEC-Ex db eb [ia Ga]* IIC T! Gb and IEC-Ex ta/tb IIIC T! Da/Db	de
D	IEC-Ex db [ia Ga]* IIC T! Gb and IEC-Ex ta/tb IIIC T! Da/Db	d
M	FM/ CSA general purpose	Standard
N	FM/ CSA DIP Cl. II, III Div. 1 Gr. E,F,G CSA Ex DIP A20/21	Standard
P	FM/ CSA IS Cl. I, II, III Div. 1 Gr. A-G FM Cl. I Zone 0 und 0/1 AEx ia IIC CSA Cl. I Zone 0 und 0/1 Ex ia IIC and CSA Ex DIP A20 und A20/21	Standard
S	FM Cl. I Zone 1 AEx de [ia]* IIC and FM/ CSA Cl. II,III Div. 1 Gr. E,F,G CSA Cl. I Zone 1 Ex de [ia]* IIC and CSA Ex DIP A20/21	de
U	FM XP-IS Cl. I,II,III Div. 1 Gr. B-G* and FM Cl. I Zone 1 AEx d [ia] IIC* CSA XP-IS Cl. I,II,III Div. 1 Gr. B-G* CSA Cl. I Zone 1 Ex d [ia]* IIC and CSA Ex DIP A20/21	d
E	TR-CU Ex ta/tb IIIC T! Da/Db X	Standard
V	TR-CU Ex ia IIC T! Ga X and Ex ia IIC T! Ga/Gb X TR-CU Ex ta/tb IIIC T! Da/Db X	Standard
K	TR-CU Ex de [ia] IIC T! Gb X and Ex ta/tb IIIC T! Da/Db X	de
L	TR-CU Ex d [ia]* IIC T! Gb X and Ex ta/tb IIIC T! Da/Db X	d

* [ia] or IS is not available for versions VN ..020 without temperature extended shaft (pos.3 1). In this case no intrinsic safe connection between Electronic module and Vibrating fork is used).

Electrical installation

Universal voltage

Relay SPDT

Power supply:

19 .. 230 V 50 - 60 Hz +10% 8 VA
 19 .. 55 V DC +10% 1.5 W

Signal output:

Floating relay SPDT

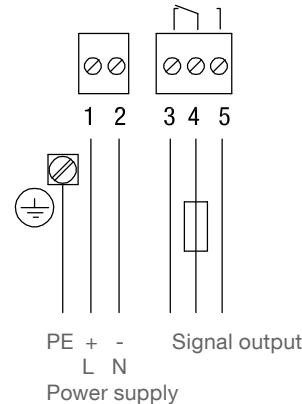
VN 1000/ 2000:

AC max. 253 V, 4 A, 500 VA at cos Phi = 1
 DC max. 253 V, 4 A, 60 W

VN 5000/ 6000:

AC max. 250 V, 8 A, non inductive
 DC max. 30 V, 5 A, non inductive

Fuse: max. 10 A, slow or fast, HBC, 250 V



Universal voltage

Relay DPDT

Power supply::

19 .. 230 V 50 - 60 Hz +10% 18 VA
 19 .. 55 V (36 V*) DC +10% 2 W

Signal output:

Floating relay DPDT

VN 1000/ 2000:

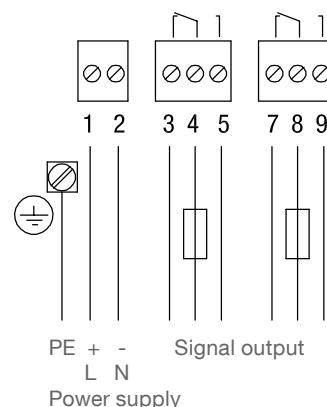
AC max. 253 V, 4 A, 500 VA at cos Phi = 1
 DC max. 253 V, 4 A, 60 W

VN 5000/ 6000:

AC max. 250 V, 8 A, non inductive
 DC max. 30 V, 5 A, non inductive

Fuse: max. 10 A, slow or fast, HBC, 250 V

* Version with intrinsic safe connection
 between electronic module and vibration
 fork (see pos.4 in price list)



3-wire

PNP

Power supply:

18 .. 50 V DC +10% 1.5 W

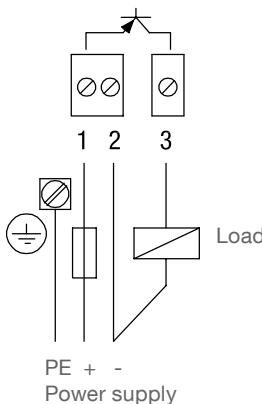
Fuse: max. 4 A, slow or fast, HBC, 250 V

Signal output:

max. 0.4 A

Load for example:

PLC, relay, contactor, bulb



Electrical installation

2-wire

without contact

Power supply:

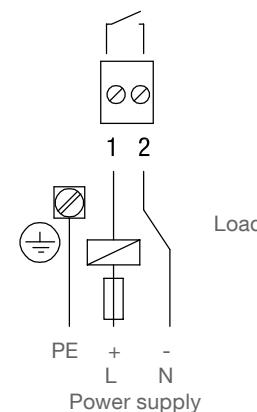
19 .. 230V 50/ 60 Hz +10% 1.5 VA
19 .. 230V DC +10% 1 W

Load:

min. 10 mA
max. 0.5 A permanent
(detailed ratings see
“Technical data”)

Load for example:
relay, contactor, bulb

Fuse: max. 4 A, slow or fast, HBC, 250 V



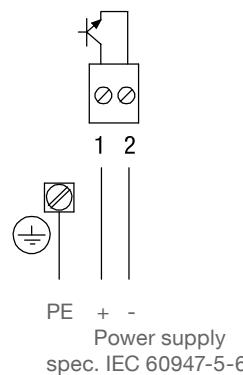
NAMUR

IEC 60947-5-6

Power supply:

ca. 7 .. 9 V DC
intrinsic safe
(spec. IEC 60947-5-6)

<1mA or >2.2 mA
(spec. IEC 60947-5-6)



8/16 mA or 4-20 mA

Power supply:

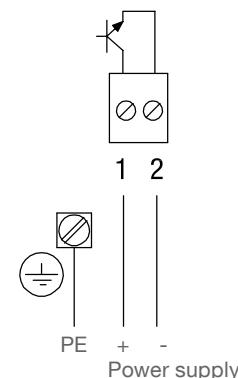
Non intrinsic safe version:
12.5 .. 36 V DC +0%

Intrinsic safe version:
12.5 .. 30 V DC +0%

Signal output

Setting 8/16 mA:
8 mA or 16 mA

Setting 4-20 mA:
Output current depends on the
vibration amplitude of the fork: 6 mA for
dampened vibration and 20 mA for full
vibration.



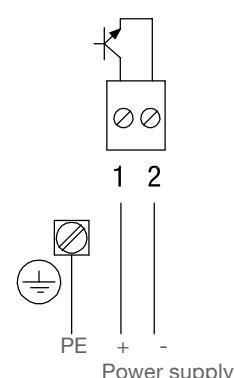
8/16 mA

Power supply:

12.5 .. 36 V DC +0%

Signal output

8 mA or 16 mA



Spare parts

Electronic modules VN 1000/ VN 5000

Minimum order value for separate orders of spare parts or accessories is 75 €.

Electronic module	Electronic module number	vn 1020 vn 1020 vn 1030 separate housing	vn 1030 vn 1040	vn 1050	vn 5020 temp. extended shaft	vn 5020 vn 5030 separate housing	vn 5030 vn 5040	vn 5050
Electronic modules are used for following certificates (see pos.2 of price list):								
Relay (SPDT) 19 .. 230V AC 19 .. 55 V DC	p1400932	0, W, A, E	0	0, W, A, E	O, M, W, A, N, R, C, S, T, D, U	O, M, W, A, N	O, M, W, A, N	0, M
	p1400120 *		W, A, E		R, C, S, T, D, U	W, A, N, R, C, S, T, D, U	R, C, S, T, D, U	W, A, N, R, C, S, T, D, U
Relay (DPDT) 19 .. 230V AC 19 .. 55 V DC	p1400247	0, W, A, E	0	0, W, A, E	O, M, W, A, N, R, C, S, T, D, U	O, M, W, A, N	O, M, W, A, N	0, M
	p1400052 *		W, A, E		R, C, S, T, D, U	W, A, N, R, C, S, T, D, U	R, C, S, T, D, U	W, A, N, R, C, S, T, D, U
PNP 18 .. 50 V DC	p1400246	0, W, A, E	0	0, W, A, E	O, M, W, A, N, R, C, S, T, D, U	O, M, W, A, N	O, M, W, A, N	0, M
	p1400123*		W, A, E		R, C, S, T, D, U	W, A, N, R, C, S, T, D, U	R, C, S, T, D, U	W, A, N, R, C, S, T, D, U
2-wire without contact 19 .. 230V AC/DC	p1400242	0, W, A, E	0	0, W, A, E				•
	p1400122				O, M, W, A, N, R, C, S, T, D, U	O, M, W, A, N	O, M, W, A, N	0, M
	p1400122 *		W, A, E		R, C, S, T, D, U	W, A, N, R, C, S, T, D, U	R, C, S, T, D, U	W, A, N, R, C, S, T, D, U
8/16 mA 2-wire	p1400062*		W, A, E		W, A, R, C, T, D	W, C, T, D	R, C, T, D	W, A, R, C, T, D
	p1400093	0	0	0	0	0	0	0
8/16 mA or 4-20 mA 2-wire intrinsic safe	p1400090 **	W, A, Y, B, E	Y, B	W, A, Y, B, E	W, A, Y, B	Y, B	W, A, Y, B	Y, B

* Intrinsic safe connection between Electronic module and Vibrating fork

** Intrinsic safe from supply and intrinsic safe between Electronic module and Vibrating fork

Spare parts

Electronic modules VN 2000/ VN 6000

Minimum order value for separate orders of spare parts or accessories is 75 €.

Elektronikmodul	Sensitivity (see pos. 26)	Electronic module number	VN 2020	VN 2020 VN 2030 separate housing	VN 2030 VN2040	VN 2050	VN 6020	VN 6020 temp. extended shaft	VN 6020 VN 6030 separate housing	VN 6030 VN 6040	VN 6050	Prices Electronic module
Electronic modules are used for following certificates (see pos. 2 of price lists):												
Relay (SPDT) 19 .. 230 VAC 19 .. 55 VDC	20 g/l (1,2 lb/ft³) 5 g/l (0,3 lb/ft³)	p|400930	0, W, A, E	0	0, W, A, E	0	0, M, W, A, N, R, C, S, T, D, U	0, M, W, A, N, R, C, S, T, D, U	0, M, W, A, N	0, M, W, A, N	0, M, W, A, N	•
Vibrasii® 70	p|400312	0, W, A, E	0, W, A, E	0	0, W, A, E	0	0, M, W, A, N, R, C, S, T, D, U	0, M, W, A, N, R, C, S, T, D, U	0, M, W, A, N	0, M, W, A, N	0, M, W, A, N	•
Vibrasii® 90	p|400310	20 g/l (1,2 lb/ft³) 5 g/l (0,3 lb/ft³)	p|400124 *	W, A, E	W, A, E	W, A, E	R, C, S, T, D, U	W, A, N, R, C, S, T, D, U	R, C, S, T, D, U	R, C, S, T, D, U	R, C, S, T, D, U	•
	p|400128 *	20 g/l (1,2 lb/ft³) 5 g/l (0,3 lb/ft³)	p|400193	0, W, A, E	0	0, W, A, E	0, M, W, A, N, R, C, S, T, D, U	0, M, W, A, N, R, C, S, T, D, U	0, M, W, A, N	0, M, W, A, N	0, M, W, A, N	•
Relay (DPDT) 19 .. 230 VAC 19 .. 55 VDC	20 g/l (1,2 lb/ft³) 5 g/l (0,3 lb/ft³)	p|400194	0, W, A, E	0	0, W, A, E	0	0, M, W, A, N, R, C, S, T, D, U	0, M, W, A, N, R, C, S, T, D, U	0, M, W, A, N	0, M, W, A, N	0, M, W, A, N	•
	p|400050 *	20 g/l (1,2 lb/ft³) 5 g/l (0,3 lb/ft³)	p|400051 *	W, A, E	W, A, E	W, A, E	R, C, S, T, D, U	W, A, N, R, C, S, T, D, U	R, C, S, T, D, U	R, S, T, U	W, N, R, S, T, U	•
	p|400176	20 g/l (1,2 lb/ft³) 5 g/l (0,3 lb/ft³)	p|400173	0, W, A, E	0	0, W, A, E	0, M, W, A, N, R, C, S, T, D, U	0, M, W, A, N, R, C, S, T, D, U	0, M, W, A, N	0, M, W, N	0, M, W, N	•
	p|400127 *	20 g/l (1,2 lb/ft³) 5 g/l (0,3 lb/ft³)	p|400131 *	W, A, E	W, A, E	W, A, E	R, C, S, T, D, U	W, A, N, R, C, S, T, D, U	R, C, S, T, D, U	R, C, S, T, D, U	R, C, S, T, D, U	•
PNP 18 .. 50 VDC	20 g/l (1,2 lb/ft³) 5 g/l (0,3 lb/ft³)	p|400182	0, W, A, E	0	0, W, A, E	0	0, M, W, A, N, R, C, S, T, D, U	0, M, W, A, N, R, C, S, T, D, U	0, M, W, A, N	0, M, W, A, N	0, M, W, A, N	•
	p|400187	20 g/l (1,2 lb/ft³) 5 g/l (0,3 lb/ft³)	p|400126	W, A, E	W, A, E	W, A, E	R, C, S, T, D, U	W, A, N, R, C, S, T, D, U	R, C, S, T, D, U	R, S, T, U	W, N, R, S, T, U	•
	p|400130	20 g/l (1,2 lb/ft³) 5 g/l (0,3 lb/ft³)	p|400126 *	W, A, E	W, A, E	W, A, E	R, C, S, T, D, U	W, A, N, R, C, S, T, D, U	R, C, S, T, D, U	R, C, S, T, D, U	R, C, S, T, D, U	•
2-wire without contact 19 .. 230 VAC/DC	20 g/l (1,2 lb/ft³) 5 g/l (0,3 lb/ft³)	p|400130 *	Y, B	Y, B	Y, B	Y, B	0, M, W, A, N, R, C, S, T, D, U	0, M, W, A, N, R, C, S, T, D, U	0, M, W, A, N	0, M, W, A, N	0, M, W, A, N	•
	p|400126	20 g/l (1,2 lb/ft³) 5 g/l (0,3 lb/ft³)	p|400081 **	W, A, E	W, A, E	W, A, E	R, C, S, T, D, U	W, A, N, R, C, S, T, D, U	R, C, S, T, D, U	R, S, T, U	W, N, R, S, T, U	•
	p|400082 **	20 g/l (1,2 lb/ft³) 5 g/l (0,3 lb/ft³)	p|400060 *	W, A, E	W, A, E	W, A, E	Y, B, P	Y, B, P	Y, B, P	Y, B, P	Y, B, P	•
	p|400061 *	20 g/l (1,2 lb/ft³) 5 g/l (0,3 lb/ft³)	p|400094	0	0	0	0	0	0	0	0	•
NAMUR EC 60947-5-6 2-wire intrinsic safe	20 g/l (1,2 lb/ft³) 5 g/l (0,3 lb/ft³)	p|400098	W, A, Y, R, C, T, D	W, A, Y, R, C, T, D	W, A, Y, R, C, T, D	W, A, Y, R, C, T, D	W, A, R, C, T, D	W, A, R, C, T, D	W, A, R, C, T, D	W, A, R, C, T, D	W, A, R, C, T, D	•
8/16 mA or 4-20 mA 2-wire	20 g/l (1,2 lb/ft³) 5 g/l (0,3 lb/ft³)	p|400091 **	W, A, Y, R, C, T, D	W, A, Y, R, C, T, D	W, A, Y, R, C, T, D	W, A, Y, R, C, T, D	W, A, R, C, T, D	W, A, R, C, T, D	W, A, R, C, T, D	W, A, R, C, T, D	W, A, R, C, T, D	•
8/16 mA or 4-20 mA 2-wire intrinsic safe	20 g/l (1,2 lb/ft³) 5 g/l (0,3 lb/ft³)	p|400092 **	W, A, Y, R, C, T, D	W, A, Y, R, C, T, D	W, A, Y, R, C, T, D	W, A, Y, R, C, T, D	W, A, Y, R, C, T, D	W, A, Y, R, C, T, D	W, A, Y, R, C, T, D	W, A, Y, R, C, T, D	W, A, Y, R, C, T, D	•

* Intrinsic safe connection between Electronic module and Vibrating fork

** Intrinsic safe from supply and intrinsic safe between Electronic module and Vibrating fork



Vibranivo® 4000

Vibration level limit switch

The economic solution for reliable level monitoring of bulk goods.
Versatile and maintenance-free. Certified for hazardous locations (dust).



Vibranivo® 4000



- Sensational price-performance ratio
- Wide range of applications
- Maintenance-free

Application: Depending on the requirements, the Vibranivo® 4000 can be used as a full, demand or empty detector in bulk good silos. It is suitable for use in all fine grained and powdered materials that do not tend to form heavy deposits.

VN 4020

Full, demand, empty detector

Installation vertical, horizontal and oblique, also in limited spaces (e.g. downpipes)

VN 4030

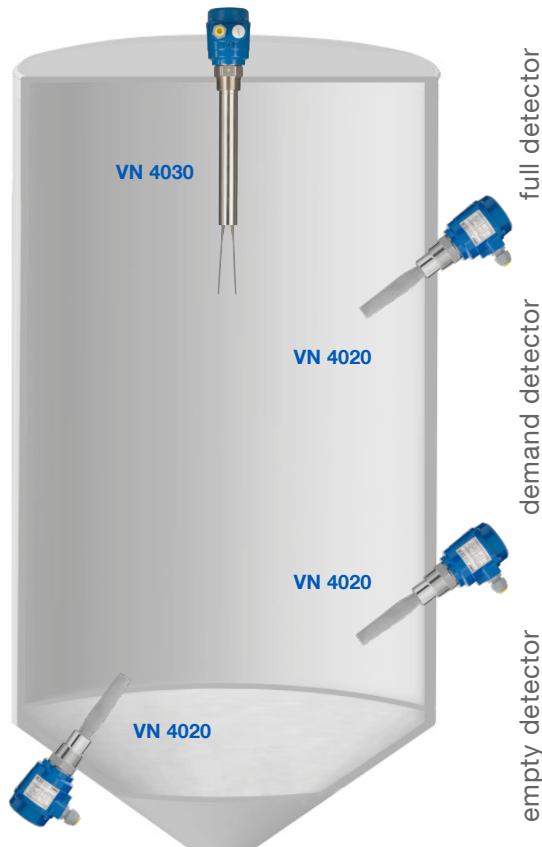
Full, demand, empty detector

Design with extension tube, vertical installation, sliding sleeve option

VN 4040

Full, demand, empty detector

Delivery without pipe extension (reduced shipping costs, flexible length), vertical and oblique installation



Technical Data

Housing	Aluminium IP 67 / NEMA Type 4X
Certificates	ATEX II 1/2D; FM/ CSA Cl. II, III Div. 1 IEC Ex, TR-CU
Process temperature	-40°C up to +150°C (-40°F bis +302°F)
Pressure	-1 up to +16 bar (-14.5 up to +145 psi)
Sensitivity	Adjustable in 2 settings: 30g/l (1.9lb/ft³) or 150g/l (9.5lb/ft³)
Supply voltage	19-230V AC, 19-40V DC relay, 18-50V DC PNP 3-wire
Process connection	R 1½" conical, NPT 1½" or NPT 1¼"
Vibration fork/ Extension	Stainless steel 1.4581 (SS316) / 1.4301 (SS304) or 1.4404 (SS316L)

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VN 4030 Pipe extension	6
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VN 4040 Pipe extension (screwed)	8
<hr/>	
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Electrical installation	14

Subject to change.

Valid: From 01.04.2019 until 31.03.2020, unless otherwise agreed.

All dimensions in mm (inches).

By publishing this selection list all other lists become invalid.

All prices in Euro (€) or USD (\$),
excluding VAT.

We assume no liability for typing errors.

All EURO prices are EXW Betzigau,
all USD prices are EXW Memphis,
excluding packaging costs.

Different variations to those specified are possible.
Please contact our technical consultants.

Specifications

- Level limit detection in bulk goods/ solids
- Compact unit
- Die-casted housing aluminium
- Wide range of applications, no maintenance
- Full-, demand-, empty detector
- Sensitivity > 30 g/l (1.9lb/ft³)
- ATEX, IEC-Ex, FM, CSA, TR-CU approvals (DustEx)
- 1935/2004/EC Food grade materials
- 2011/65/EU RoHS conform

	CE	
	ATEX/ IEC-Ex	Zone 20/21 (Dust Ignition Proof)
Approvals	FM/ CSA	Ordinary Locations
		Cl. II, III Div. 1 (Dust Ignition Proof)
	TR-CU	Ordinary Locations
Electro-nics	Relay DPDT	19 .. 230 V AC 19 .. 40 V DC ±10%
	PNP	18 .. 50 V DC ±10%

VN 4020	Length of extension	170 mm (6.68")
	Ambient temperature	-40 .. +60°C (-40 .. +140°F)
	Process temperature	-40 .. +150°C (-40 .. +302°F)
	Process pressure	-1 .. +16 bar (-14.5 .. +232 psi)
	Process connection material/ Extension ¹	1.4581 or 1.4541 (321) (food grade)

VN 4020



VN 4040



VN 4030



VN 4030	Length of extension	300 .. 4,000 mm (11.8 .. 157")
	Ambient temperature	-40 .. +60°C (-40 .. +140°F)
	Process temperature	-40 .. +150°C (-40 .. +302°F)
	Process pressure	-1 .. +16 bar (-14.5 .. +232 psi)
	Process connection material/ Extension ¹	1.4301 (304)/ 1.4541 (321) or 1.4581/ 1.4404 (316L) (food grade)

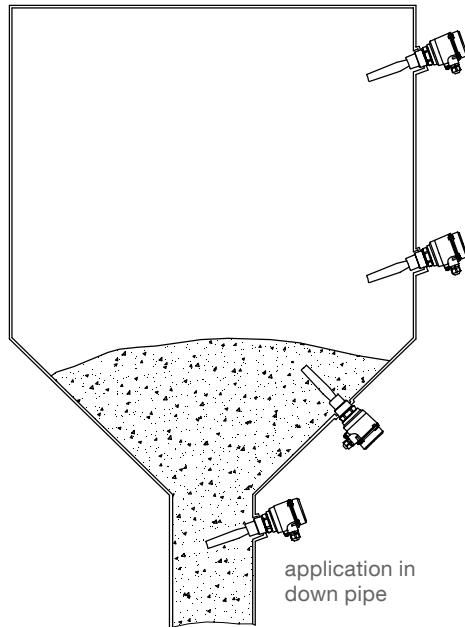
VN 4040	Length of extension	max. 1,500 mm (59") or 4,000 mm (157")
	Ambient temperature	-40 .. +60°C (-40 .. +140°F)
	Process temperature	-40 .. +150°C (-40 .. +302°F)
	Process pressure	-1 .. +16 bar (-14.5 .. +232 psi)
	Process connection material/ Extension ¹	1.4305 (303)/ 1.4541 (321) or 1.4581/ 1.4404 (316L) (food grade)

¹ The listed or higher-quality corrosion-resistant materials can be used.
 Filler materials are not listed.

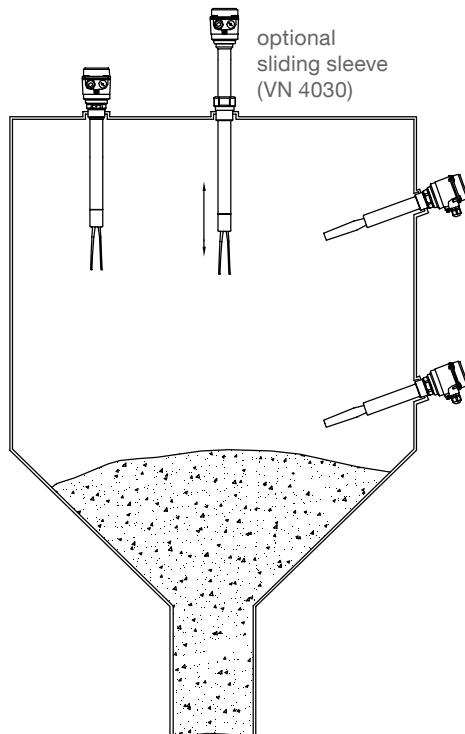
Applications

Detection of solids

VN 4020



VN 4030
VN 4040



VN 4020 Short extension length



Food grade materials

Cable entries (by default)

Depending on model selected the following cable entries are supported (options see pos.23 on page 10):

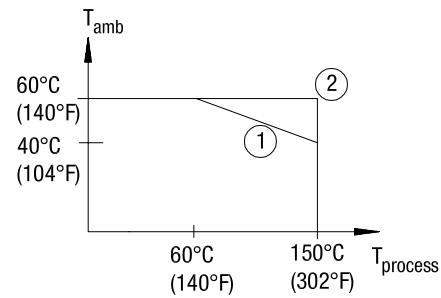
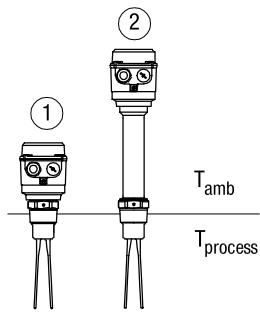
Version:	Cable entries:
CE/ ATEX/ IEC-Ex/ TR-CU (pos.2 0,W,F,E)	M20 x 1.5 (1x cable gland + 1x blind plug)
FM and CSA (pos.2 M,N)	NPT 1/2" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)

Dimensions see page 12

pos.3
 Temperature extended shaft

Application up to 150°C
 (302°F)

- 1 without
 2 with



VN 4020 Short extension length

Basic type

VN 4020

pos.2

Certificate

- 0 CE⁽¹⁾
- W ATEX II 1/2D Ex ta/tb IIIC T! Da/Db
- A IEC-Ex ta/tb IIIC T! Da/Db
- M FM/ CSA General Purpose
- N FM/ CSA DIP Cl. II, III Div.1 Group E, F, G and CSA DIP A20/21
- E TR-CU Ex ta/tb IIIC T! Da/Db X

pos.3

Temperature extended shaft

- 1 without (up to $T_{process} = 150^{\circ}\text{C}$ (302°F) at $T_{amb} < 40^{\circ}\text{C}$ (104°F))
- 2 with (up to $T_{process} = 150^{\circ}\text{C}$ (302°F) at $T_{amb} > 40^{\circ}\text{C}$ (104°F))

pos.4

Electronic module

- L Relay DPDT 19 .. 230 V AC 19 .. 40 V DC
- D PNP 18 .. 50 V DC

pos.5

Process connection

- A Thread R 1½", conical EN 10226
- B Thread NPT 1½", conical ANSI B1.20.1
- D Thread NPT 1¼", conical ANSI B1.20.1
- P Triclamp 2" (DN50) ISO 2852
- L Flange DN100 PN6, EN 1092-1 (max. 6 bar (87 psi))
- M Flange DN100 PN16, EN 1092-1
- S Flange 2" 150lbs ANSI B16.5 (max. 10 bar (145 psi))
- T Flange 3" 150lbs ANSI B16.5 (max. 10 bar (145 psi))
- U Flange 4" 150lbs ANSI B16.5 (max. 10 bar (145 psi))

pos.8

Material of process connection/ extension "L"

- 1 Stainless steel 1.4541 (321)
- 2 Stainless steel 1.4581/ 1.4404 (316L)

Further options: see page 10

VN 4020	A				3	1	
position	1	2	3	4	5	6	7 8

← Order code

All positions are available in special design (use code "Z").

⁽¹⁾ TR-CU (general purpose) included

VN 4030 Pipe extension



Food grade materials

Cable entries (by default)

Depending on model selected the following cable entries are supported (options see pos.23 on page 10):

Version:	Cable entries:
CE/ ATEX/ IEC-Ex/ TR-CU (pos.2 O,W,F,E)	M20 x 1.5 (1x cable gland + 1x blind plug)
FM and CSA (pos.2 M,N)	NPT 1/2" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)

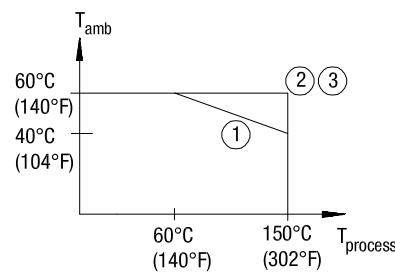
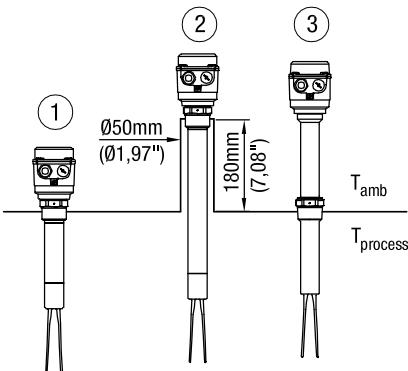
Dimensions

see page 12

pos.3
 Temperature extended shaft

Application up to 150°C (302°F)

- 1 without
- 2 without and with extended socket
- 3 with



VN 4030 Pipe extension

Basic type

VN 4030

pos.2

Certificate

- 0 CE ⁽¹⁾
- W ATEX II 1/2D Ex ta/tb IIIC T! Da/Db
- A IEC-Ex ta/tb IIIC T! Da/Db
- M FM/ CSA General Purpose
- N FM/ CSA DIP Cl. II, III Div.1 Group E, F, G and CSA DIP A20/21
- E TR-CU Ex ta/tb IIIC T! Da/Db X

pos.3

Temperature extended shaft

- 1 without (up to $T_{process} = 150^{\circ}\text{C}$ (302°F) at $T_{amb} < 40^{\circ}\text{C}$ (104°F))
- 2 with (up to $T_{process} = 150^{\circ}\text{C}$ (302°F) at $T_{amb} > 40^{\circ}\text{C}$ (104°F))

pos.4

Electronic module

- L Relay DPDT 19 .. 230 V AC 19 .. 40 V DC
- D PNP 18 .. 50 V DC

pos.5

Process connection

- A Thread R 1½", conical EN 10226
- B Thread NPT 1½", conical ANSI B1.20.1
- D Thread NPT 1¼", conical ANSI B1.20.1
- P Triclamp 2" (DN50) ISO 2852
- L Flange DN100 PN6, EN 1092-1 (max. 6 bar (87 psi))
- M Flange DN100 PN16, EN 1092-1
- S Flange 2" 150lbs ANSI B16.5 (max. 10 bar (145 psi))
- T Flange 3" 150lbs ANSI B16.5 (max. 10 bar (145 psi))
- U Flange 4" 150lbs ANSI B16.5 (max. 10 bar (145 psi))

pos.7

Length of extension "L"

- Z from 0 mm per 100 mm (3.94") and part thereof; min. 300 mm (11.8"), max. 4,000 mm (157")

pos.8

Material of process connection/ extension "L"

- 1 Stainless steel 1.4301 (304)/ Flange 1.4541 (321)
- 2 Stainless steel 1.4581/ 1.4404 (316L)

Further options: see page 10

VN 4030	B				3	Z		-	L =	mm	←	Order code
position	1	2	3	4	5	6	7	8				

All positions are available in special design (use code "Z").

⁽¹⁾ TR-CU (general purpose) included

VN 4040 Pipe extension (screwed)



Food grade materials

Cable entries (by default)

Depending on model selected the following cable entries are supported (options see pos 23 on page 10):

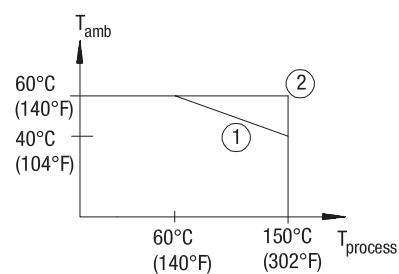
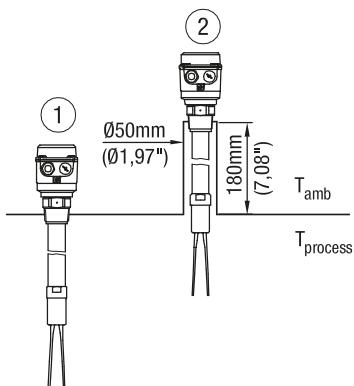
Version:	Cable entries:
CE/ ATEX/ IEC-Ex/ TR-CU (pos.2 0,W,A,E)	M20 x 1.5 (1x cable gland + 1x blind plug)
FM (pos.2 M,N)	NPT ½" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)

Dimensions

see page 13

Application up to 150°C (302°F)

- 1 without exteded socket
- 2 with extended socket



VN 4040 Pipe extension (screwed)

Basic type

VN 4040

pos.2

Certificate

- 0 CE⁽¹⁾
- W ATEX II 1/2D Ex ta/tb IIIC T1 Da/Db
- A IEC-Ex ta/tb IIIC T1 Da/Db
- M FM General Purpose
- N FM DIP Cl. II, III Div.1 Group E, F, G
- E TR-CU Ex ta/tb IIIC T1 Da/Db X

pos.4

Electronic module

- L Relay DPDT 19 .. 230 V AC 19 .. 40 V DC
- D PNP 18 .. 50 V DC

pos.5

Process connection

- A Thread R 1½", conical EN 10226
- B Thread NPT 1½", conical ANSI B1.20.1
- P Triclamp 2" (DN50) ISO 2852
- L Flange DN100 PN6, EN 1092-1 (max. 6 bar (87 psi))
- M Flange DN100 PN16, EN 1092-1
- S Flange 2" 150lbs ANSI B16.5 (max. 10 bar (145 psi))
- T Flange 3" 150lbs ANSI B16.5 (max. 10 bar (145 psi))
- U Flange 4" 150lbs ANSI B16.5 (max. 10 bar (145 psi))

pos.7

Length of extension "L"

- L 1,500 mm (59") (cutable cable length)
- M 4,000 mm (157") (cutable cable length)

pos.8

Material of process connection/ extension "L"

- 1 Stainless steel 1.4305 (303)/ Flange 1.4541 (321)
- 2 Stainless steel 1.4581/ 1.4404 (316L)

Further options: see page 10

VN 4040	C		1		3		
position	1	2	3	4	5	6	8

← Order code

All positions are available in special design (use code "Z").

⁽¹⁾ TR-CU (general purpose) included

Options

pos.11 x **Guarantee extension to 5 years**



pos.21 **Weather protection cover**

(for Ex only approved for Zone 22 or Div. 2)



Mounting set for flange mounting

process connection flange	for counter flange with	consists of			
		screws*	nuts*	washers*	sealing**
pos.22 c	L	hole ø18	4x M16 x 60	4x M16	4 pcs
pos.22 d	L	thread M16	4x M16 x 40	4x M16	4 pcs
pos.22 e	M	hole ø18	8x M16 x 60	8x M16	8 pcs
pos.22 f	M	thread M16	8x M16 x 40	8x M16	8 pcs

* material stainless steel A2 **max. 125°C (256°F), material not food grade

Cable entry

Selection of the following options only necessary, if a deviation from the default cable gland/ conduit is required:

- pos.23 x M20 x 1.5 2x screwed cable gland
- pos.23 y M20 x 1.5 1x screwed cable gland +1x blind plug
- pos.23 a NPT ½" tapered ANSI B1.20.1 (1x conduit + 1x blind plug)
- pos.23 b NPT ¾" tapered ANSI B1.20.1 (1x conduit + 1x blind plug) on request



Sliding sleeve⁶

Process connection as follows or flange as chosen

³ For applications without overpressure, max. 150°C (302°F)

- pos.25 a R 1½" EN 10226 material 1.4301 (304)
- pos.25 b NPT 1½" ANSI B1.20.1 material 1.4301 (304)
- pos.25 c Flange⁵ material 1.4301 (304)/ 1.4541 (321)



For applications with overpressure max. 16 bar (232 psi), max. 150°C (302°F)

- pos.25 e R 1½" EN 10226 material 1.4404 (316L)
- pos.25 f NPT 1½" ANSI B1.20.1 material 1.4404 (316L)
- pos.25 g Flange⁵ material 1.4404 (316L)



Signal lamp

- pos.27 a LED, mounted in cable entry M20 x 1.5, green¹
- pos.27 c LED, mounted in cable entry M20 x 1.5, red¹
- pos.27 b LED (glass window in lid)⁴



- pos.29 **Plug 4-pole² (incl. PE)**



¹ Available for CE (pos.2 0), not in combination with weather protection cover (pos.21) and cable entries pos.23 x,a,b. For electronic module Relais DPDT (pos.4 L) 2 LED's (24V, 80-260V) will be delivered. For PNP (pos.4 D) a 24 V LED will be delivered.

² Available for CE (pos.2 0).

³ Available for CE and FM/ CSA general purpose (pos.2 0,M).

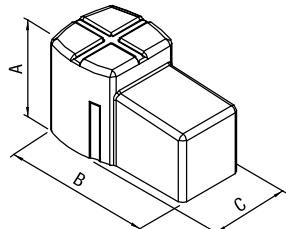
⁴ Not in combination with weather protection cover (pos.21).

⁵ Flange as selected in pos.5.

⁶ Available for VN 4030.

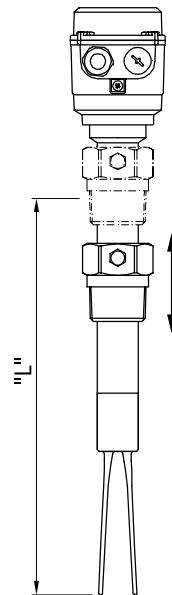
Options

pos.21
 Weather protection
 cover

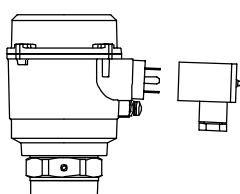


A	100 mm (3.94")
B	165 mm (6.5")
C	88 mm (3.46")

pos.25
 Sliding sleeve

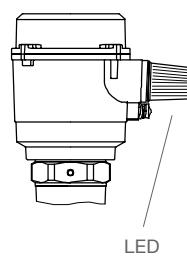


pos.29
 Plug 4-pole

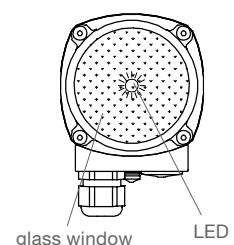


Signal lamp

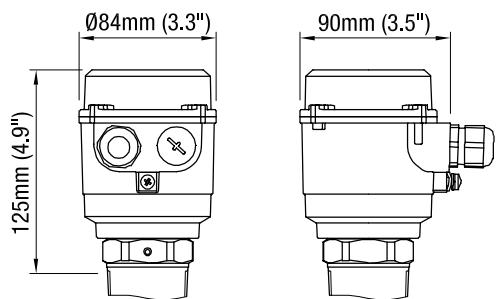
pos.27 a,c
 LED, mounted in cable
 entry M20 x 1.5



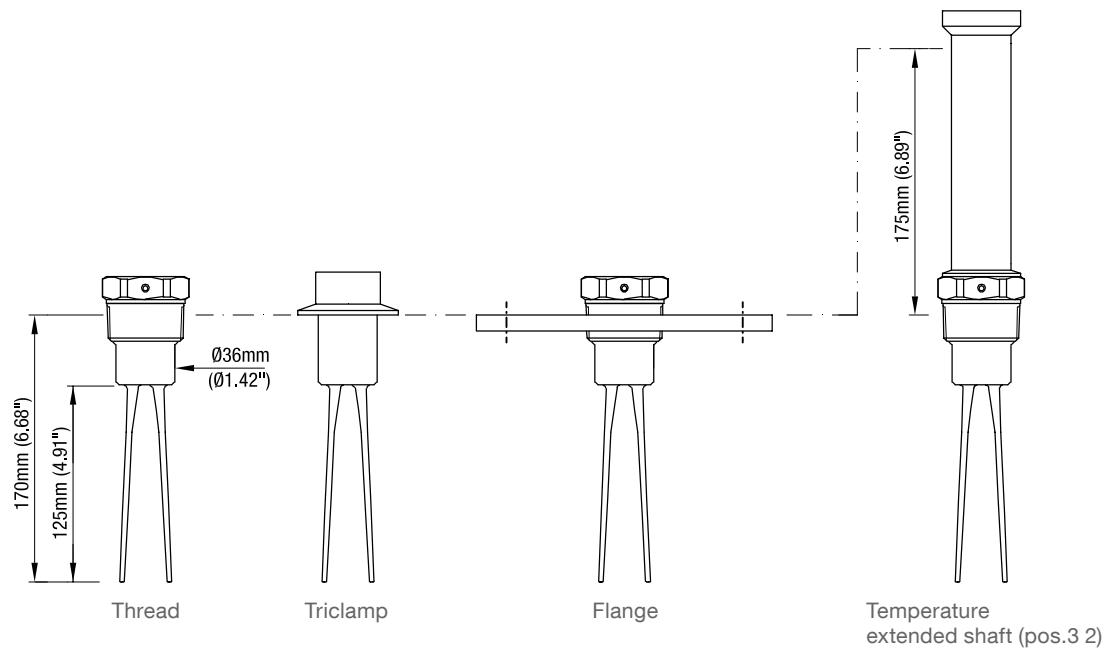
pos.27 b
 LED (glass window in lid)



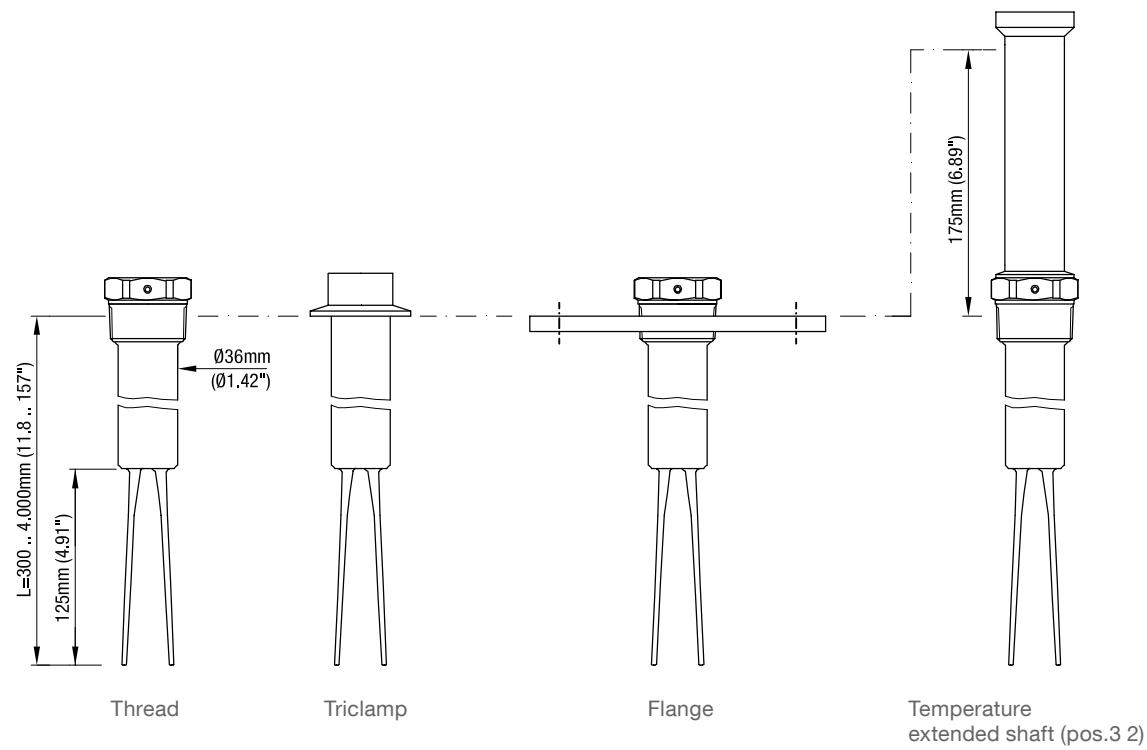
Dimensions



VN 4020

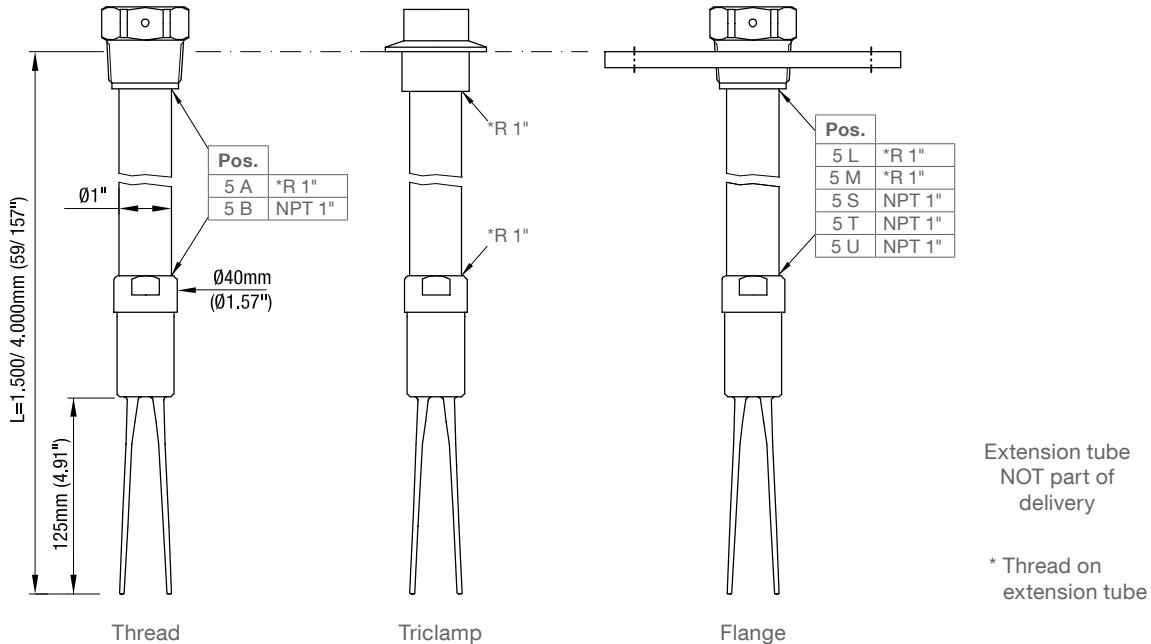


VN 4030



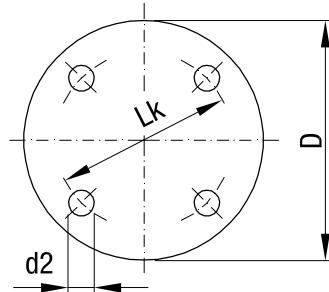
Dimensions / Spare parts

VN 4040



Flanges

code	type	number of holes	d2	Lk	D	T (thickness)
L	flange DN100 PN6	4	18 mm (0.71")	170 mm (6.69")	210 mm (8.27")	16 mm (0.63")
M	flange DN100 PN16	8	18 mm (0.71")	180 mm (7.09")	220 mm (8.66")	20 mm (0.79")
S	flange 2" 150lbs	4	19.1 mm (0.75")	120.7 mm (4.75")	152.4 mm (6.01")	19.1 mm (0.75")
T	flange 3" 150lbs	4	19.1 mm (0.75")	152.4 mm (6.01")	190.5 mm (7.5")	23.9 mm (0.94")
U	flange 4" 150lbs	8	19.1 mm (0.75")	190.5 mm (7.5")	228.6 mm (9.0")	23.9 mm (0.94")



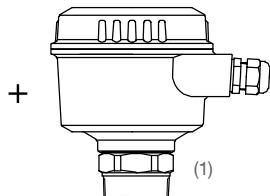
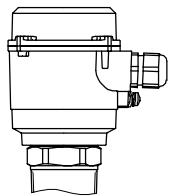
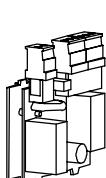
Spare parts

Minimum order value for separate orders of spare parts or accessories is 75 €.

Electronic board

Fitting for housing

Electronic board	Article number	Price
Relais DPDT 19 .. 230 V AC 9 .. 50 V DC	pl408265	•
PNP 18 .. 50 V DC	pl408266	•



(1) Adapting plate included

Electrical installation

Universal voltage

Relay DPDT

Power supply:

19 .. 230 V 50 - 60 Hz $\pm 10\%$ * 22 VA
 19 .. 40 V DC $\pm 10\%$ * 2 W
 *incl. $\pm 10\%$ of EN 61010

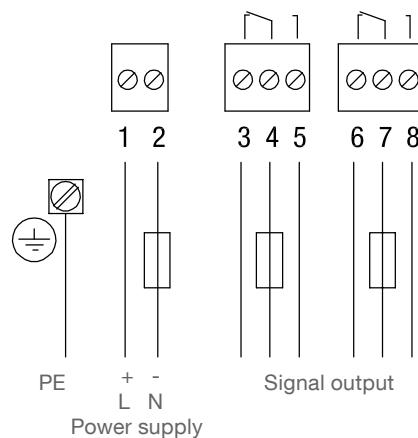
Fuse on power supply:
 max. 10 A, fast or slow, HBC, 250 V

Signal output:

Floating relay DPDT

AC max. 250 V, 8 A, non inductive
 DC max. 30 V, 5 A, non inductive

Fuse on signal output:
 max. 10 A, fast or slow, HBC, 250 V



3-wire

PNP

Power supply:

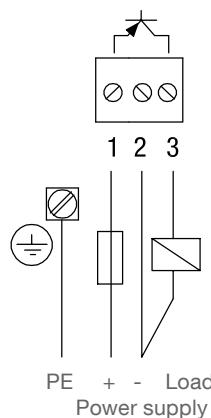
18 .. 50 V DC $\pm 10\%$ *
 *incl. $\pm 10\%$ of EN 61010
 Input current: max. 0.5 A

Fuse:
 max. 4 A, fast or slow, 250 V

Signal output:

max. 0.4 A
 Output voltage equal to input voltage, drop <2.5 V

Load for example:
 PLC, relay, contactor, bulb





Mononivo® 4000

Vibration level limit switch

The vibrating rod for reliable level detection for all bulk materials.
Versatile and maintenance-free. Certified for hazardous locations.



Mononivo® 4000



- Compact limit switch with threads from 1" available
- Adjustable sensitivity suitable for light bulk solids from 20g/l
- Easy installation and commissioning

Application: The Mononivo® 4000 can be used in silos and tanks as a full, demand or empty detector. The unit is also appropriate as an overfill detector within pipes and shafts. The MN 4000 handles even powdery material with strong caking properties as well as coarse-grained granulate.

MN 4020

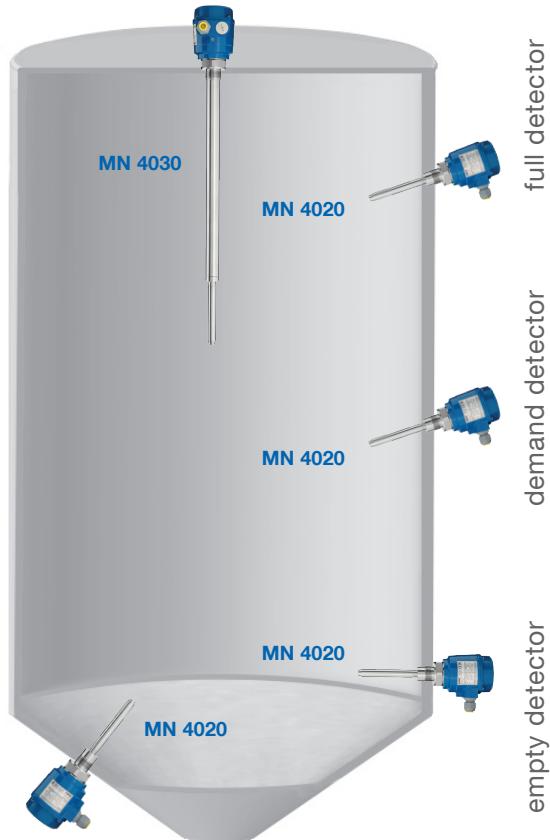
Full, demand, empty detector
Installation vertical, horizontal and oblique, also within limited spaces (e.g. downpipes)

MN 4030

Full, demand, empty detector
Design with extension tube, vertical installation, sliding sleeve option

MN 4040

Full, demand, empty detector
Delivery available without pipe extension (for reduced shipping costs/flexible length), vertical and oblique installation



Technical Data

Housing	Aluminium IP 67 / NEMA Type 4X
Certificates	ATEX II 1/2D Ex ta/tb IIIC T1 Da/Db IP6X TR-CU Ex ta/tb IIIC T1 Da/Db X IEC-Ex ta/tb IIIC T1 Da/Db IP6X FM/FMc DIP Cl. II, III Div.1 Group E, F, G
Process temperature	-40°C up to +150°C (-40°F up to +302°F)
Pressure	-1 up to +16 bar (-14.5 up to +232 psi)
Sensitivity	Adjustable in 4 settings: from 20g/l (1.25lb/ft³)
Supply voltage	21-230V AC, 19-40V DC relay, 20-40V DC PNP 3-wire
Process connection	G 1"; G 1½"; NPT 1"; NPT 1¼"; NPT 1½" Triclamp 2"; various flanges available
Material Extension	Stainless steel 1.4301 (SS304) / 1.4541 (SS321) or 1.4404 (SS316L)

Table of contents

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<hr/>	
MN 4020 Short extension length	4
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MN 4040 Pipe extension (screwed)	8
<hr/>	
Options	10
Dimensions	12
Spare parts	13
Electrical installation	14

Subject to change.

Valid: From 01.04.2019 until 31.03.2020, unless otherwise agreed.

All dimensions in mm (inches).

By publishing this selection list all other lists become invalid.

All prices in Euro (€) or USD (\$),
excluding VAT.

We assume no liability for typing errors.

All EURO prices are EXW Betzigau,
all USD prices are EXW Memphis,
excluding packaging costs.

Different variations to those specified are possible.
Please contact our technical consultants.

Specifications

- Level limit detection in bulk goods/ solids
- Compact unit
- Die-casted housing aluminium
- Wide range of applications, no maintenance
- Full-, demand-, empty detector
- Sensitivity > 20 g/l (1.25 lb/ft³)
- 4 sensitivity settings selectable
- ATEX, IEC-Ex, FM approvals (DustEx)
- 1935/2004/EC Food grade materials
- 2011/65/EU RoHS conform

Approvals	CE	
	ATEX/ IEC-Ex	Zone 20/21 (Dust Ignition Proof)
	FM / FMc	Ordinary Locations
		Cl. II, III Div. 1 (Dust Ignition Proof)
	TR-CU	Ordinary Locations
		Zone 20/21 (Dust Ignition Proof)
Electro-nics	Relay DPDT	21 .. 230 V AC 22 .. 45 V DC ±10%
	PNP	20 .. 40 V DC ±10%

MN 4020	Length of extension	160 mm (6.3")
	Ambient temperature	-40 .. +60°C (-40 .. +140°F)
	Process temperature	-40 .. +150°C (-40 .. +302°F)
	Process pressure	-1 .. +16 bar (-14.5 .. +232 psi)
	Process connection material/ Extension ¹	1.4305 (303)/ 1.4541 (321) or 1.4404 (316L) (food grade)

MN 4030	Length of extension	200 .. 4,000 mm (7.9 .. 157")
	Ambient temperature	-40 .. +60°C (-40 .. +140°F)
	Process temperature	-40 .. +150°C (-40 .. +302°F)
	Process pressure	-1 .. +16 bar (-14.5 .. +232 psi)
	Process connection material/ Extension ¹	1.4305 (303)/ 1.4541 (321) or 1.4404 (316L) (food grade)

MN 4040	Length of extension	max. 1,500 mm (59") or 4,000 mm (157")
	Ambient temperature	-40 .. +60°C (-40 .. +140°F)
	Process temperature	-40 .. +150°C (-40 .. +302°F)
	Process pressure	-1 .. +16 bar (-14.5 .. +232 psi)
	Process connection material/ Extension ¹	1.4305 (303)/ 1.4541 (321) or 1.4404 (316L) (food grade)

MN 4020



MN 4040



MN 4030

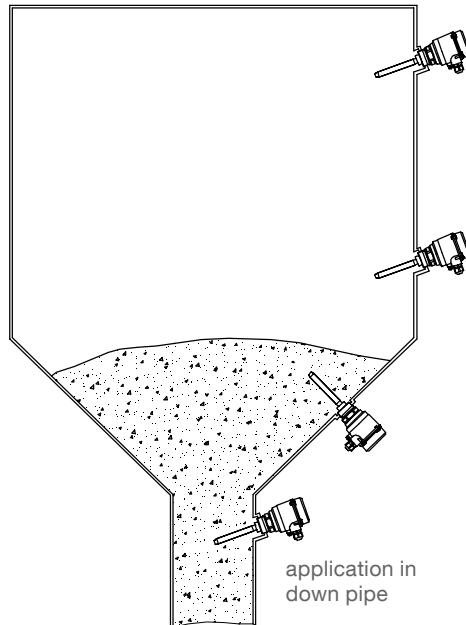


¹ The listed or higher-quality corrosion-resistant materials can be used.
 Filler materials are not listed.

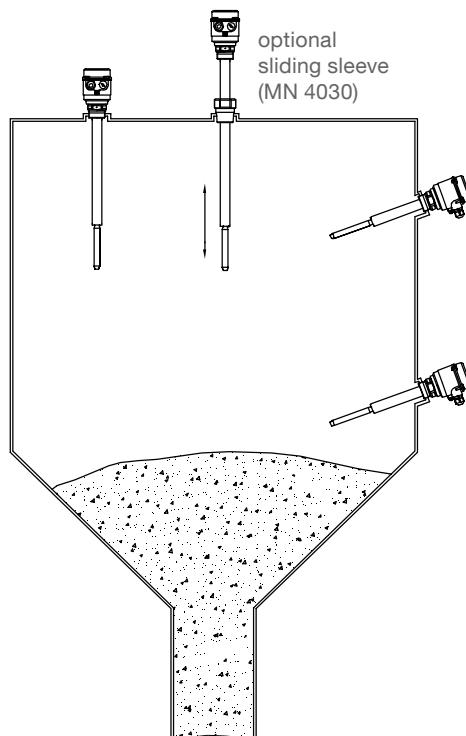
Applications

Detection of solids

MN 4020



MN 4030
MN 4040



MN 4020 Short extension length



Materials inside process: Food grade

Cable entries (by default)

Depending on model selected the following cable entries are supported (options see pos.23 on page 10):

Version:	Cable entries:
CE/ ATEX/ IEC-Ex/ TR-CU (pos.2 0,W,A,E)	M20 x 1.5 (1x cable gland + 1x blind plug)
FM (pos.2 M,N)	NPT 1/2" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)

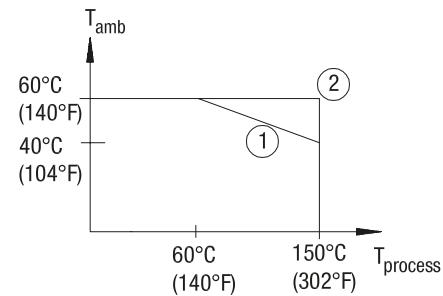
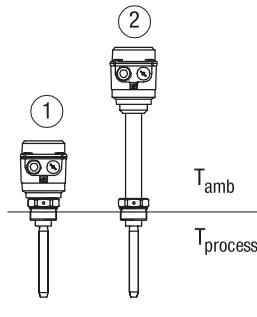
Dimensions see page 12

pos.3

Temperature extended shaft

Application up to 150°C (302°F)

- 1 without
- 2 with



MN 4020 Short extension length

Basic type

MN 4020

pos.2

Certificate

- 0 CE (1)
- W ATEX II 1/2D Ex ta/tb IIIC T! Da/Db
- A IEC-Ex ta/tb IIIC T! Da/Db
- M FM/FMc General Purpose
- N FM/FMc DIP Cl. II, III Div.1 Group E, F, G
- E TR-CU Ex ta/tb IIIC T! Da/Db X

pos.3

Temperature extended shaft

- 1 without (up to $T_{process} = 150^\circ\text{C}$ (302°F) at $T_{amb} < 40^\circ\text{C}$ (104°F))
- 2 with (up to $T_{process} = 150^\circ\text{C}$ (302°F) at $T_{amb} > 40^\circ\text{C}$ (104°F))

pos.4

Electronic module

- L Relay DPDT 21 .. 230 V AC 22 .. 45 V DC
- D PNP 20 .. 40 V DC

pos.5

Process connection

- A Thread G 1½" DIN 228
- B Thread G 1¼" DIN 228
- C Thread G 1" DIN 228
- F Thread NPT 1½" conical ANSI B1.20.1
- Q Thread NPT 1¼" conical ANSI B1.20.1
- G Thread NPT 1" conical ANSI B1.20.1
- P Triclamp 2" (DN50) ISO 2852
- L Flange DN100 PN6, EN 1092-1 (max. 6 bar (87 psi))
- M Flange DN100 PN16, EN 1092-1
- S Flange 2" 150lbs ANSI B16.5 (max. 10 bar (145 psi))
- T Flange 3" 150lbs ANSI B16.5 (max. 10 bar (145 psi))
- U Flange 4" 150lbs ANSI B16.5 (max. 10 bar (145 psi))

pos.8

Material of process connection/ extension "L"

- 1 Stainless steel 1.4305 (303)/ Flange 1.4541 (321)
- 2 Stainless steel 1.4404 (316L)

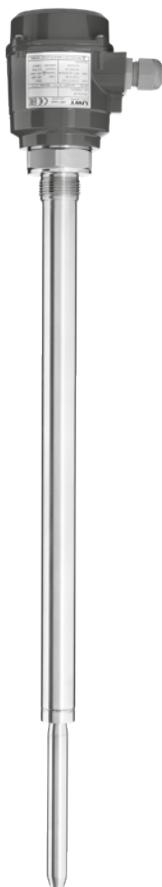
Further options: see page 10

MN 4020	A					3	1		←	Order code
position	1	2	3	4	5	6	7	8		

All positions are available in special design (use code "Z").

(1) TR-CU (general purpose) included

MN 4030 Pipe extension



Materials inside process: Food grade

Cable entries (by default)

Depending on model selected the following cable entries are supported (options see pos.23 on page 10):

Version:	Cable entries:
CE/ ATEX/ IEC-Ex/ TR-CU (pos.2 O,W,A,E)	M20 x 1.5 (1x cable gland + 1x blind plug)
FM (pos.2 M,N)	NPT 1/2" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)

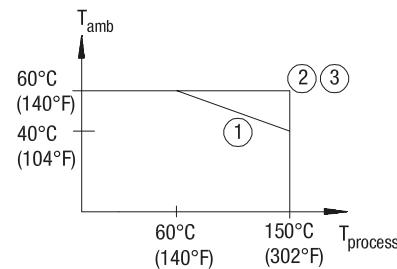
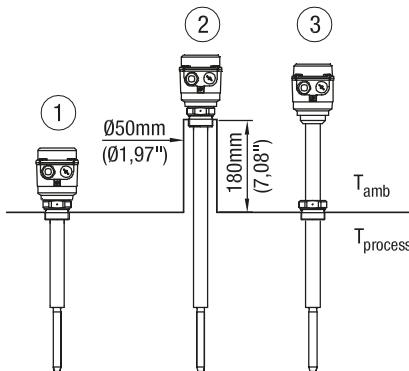
Dimensions

see page 12

pos.3
 Temperature extended shaft

Application up to 150°C (302°F)

- 1 without
- 2 without and with extended socket
- 3 with



MN 4030 Pipe extension

Basic type

MN 4030

pos.2

Certificate

- 0 CE (1)
- W ATEX II 1/2D Ex ta/tb IIIC T! Da/Db
- A IEC-Ex ta/tb IIIC T! Da/Db
- M FM/FMc General Purpose
- N FM/FMc DIP Cl. II, III Div.1 Group E, F, G
- E TR-CU Ex ta/tb IIIC T! Da/Db X

pos.3

Temperature extended shaft

- 1 without (up to $T_{process} = 150^{\circ}\text{C}$ (302°F) at $T_{amb} < 40^{\circ}\text{C}$ (104°F))
- 2 with (up to $T_{process} = 150^{\circ}\text{C}$ (302°F) at $T_{amb} > 40^{\circ}\text{C}$ (104°F))

pos.4

Electronic module

- L Relay DPDT 21 .. 230 V AC 22 .. 45 V DC
- D PNP 20 .. 40 V DC

pos.5

Process connection

- A Thread G 1½" DIN 228
- B Thread G 1¼" DIN 228
- C Thread G 1" DIN 228
- F Thread NPT 1½" conical ANSI B1.20.1
- Q Thread NPT 1¼" conical ANSI B1.20.1
- G Thread NPT 1" conical ANSI B1.20.1
- P Triclamp 2" (DN50) ISO 2852
- L Flange DN100 PN6, EN 1092-1 (max. 6 bar (87 psi))
- M Flange DN100 PN16, EN 1092-1
- S Flange 2" 150lbs ANSI B16.5 (max. 10 bar (145 psi))
- T Flange 3" 150lbs ANSI B16.5 (max. 10 bar (145 psi))
- U Flange 4" 150lbs ANSI B16.5 (max. 10 bar (145 psi))

pos.7

Length of extension "L"

- Z from 0 mm per 100 mm (3.94") and part thereof; min. 200 mm (7.9"), max. 4,000 mm (157")

pos.8

Material of process connection/ extension "L"

- 1 Stainless steel 1.4305 (303)/ Flange 1.4541 (321)
- 2 Stainless steel 1.4404 (316L)

Further options: see page 10

MN 4030	B				3	Z		-	L =	mm	←	Order code
position	1	2	3	4	5	6	7	8				

All positions are available in special design (use code "Z").

(1) TR-CU (general purpose) included

MN 4040 Pipe extension (screwed)



Materials inside process: Food grade

Cable entries (by default)

Depending on model selected the following cable entries are supported (options see pos.23 on page 10):

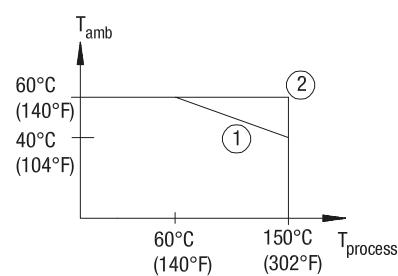
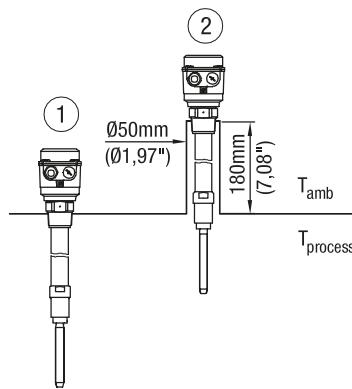
Version:	Cable entries:
CE/ ATEX/ IEC-Ex/ TR-CU (pos.2 O,W,A,E)	M20 x 1.5 (1x cable gland + 1x blind plug)
FM (pos.2 M,N)	NPT 1/2" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)

Dimensions

see page 13

Application up to 150°C (302°F)

- 1 without exteded socket
- 2 with extended socket



MN 4040 Pipe extension (screwed)

Basic type

MN 4040

pos.2

Certificate

- | | | | |
|---|--|-------|---|
| 0 | CE (1) | ..... | • |
| W | ATEX II 1/2D Ex ta/tb IIIC T1 Da/Db | ..... | • |
| A | IEC-Ex ta/tb IIIC T1 Da/Db | ..... | • |
| M | FM/FMc General Purpose | ..... | • |
| N | FM/FMc DIP Cl. II, III Div.1 Group E, F, G | ..... | • |
| E | TR-CU Ex ta/tb IIIC T1 Da/Db X | ..... | • |

pos.4

Electronic module

- | | | | | | |
|---|------------|----------------|---------------|-------|---|
| L | Relay DPDT | 21 .. 230 V AC | 22 .. 45 V DC | | • |
| D | PNP | 20 .. 40 V DC | | • | |

pos.5

Process connection

- | | | | | | |
|---|---|----------------------|-------|---|---|
| A | Thread G 1½" | DIN 228 | ..... | • | • |
| F | Thread NPT 1½" | conical ANSI B1.20.1 | ..... | • | • |
| P | Triclamp 2" (DN50) ISO 2852 | ..... | • | • | • |
| L | Flange DN100 PN6, EN 1092-1 (max. 6 bar (87 psi)) | ..... | • | • | • |
| M | Flange DN100 PN16, EN 1092-1 | ..... | • | • | • |
| S | Flange 2" 150lbs ANSI B16.5 (max. 10 bar (145 psi)) | ..... | • | • | • |
| T | Flange 3" 150lbs ANSI B16.5 (max. 10 bar (145 psi)) | ..... | • | • | • |
| U | Flange 4" 150lbs ANSI B16.5 (max. 10 bar (145 psi)) | ..... | • | • | • |

pos.7

Length of extension "L"

- | | | | |
|---|--|-------|---|
| L | 1,500 mm (59") (cutable cable length) | ..... | • |
| M | 4,000 mm (157") (cutable cable length) | ..... | • |

pos.8

Material of process connection/ extension "L"

- | | | |
|---|---|-------|
| 1 | Stainless steel 1.4305 (303)/ Flange 1.4541 (321) | ..... |
| 2 | Stainless steel 1.4404 (316L) | ..... |

Further options: see page 10

MN 4040	C		1		3		
position	1	2	3	4	5	6	7 8

← Order code

All positions are available in special design (use code "Z").

(1) TR-CU (general purpose) included

Options

pos.11 x **Guarantee extension to 5 years**



pos.21 **Weather protection cover**

(for Ex only approved for Zone 22 or Div. 2)



Mounting set for flange mounting

process connection flange	for counter flange with	consists of			
		screws*	nuts*	washers*	sealing**
pos.22 c	L	hole ø18	4x M16 x 60	4x M16	4 pcs
pos.22 d	L	thread M16	4x M16 x 40		1 piece
pos.22 e	M	hole ø18	8x M16 x 60	8x M16	4 pcs
pos.22 f	M	thread M16	8x M16 x 40		1 piece

* material stainless steel A2 **max. 125°C (256°F), material not food grade

Cable entry

Selection of the following options only necessary, if a deviation from the default cable gland/ conduit is required:

pos.23 x M20 x 1.5 2x screwed cable gland ⁷



pos.23 a NPT ½" tapered ANSI B1.20.1 (1x conduit + 1x blind plug)



pos.23 b NPT ¾" tapered ANSI B1.20.1 (1x conduit + 1x blind plug)

on request

Sliding sleeve ⁶

Process connection as follows or flange as chosen

³ For applications without overpressure, max. 150°C (302°F)

pos.25 a G 1½ " DIN 228 material 1.4305 (303)



pos.25 b NPT 1½ inch ANSI B1.20.1 material 1.4305 (303)



pos.25 c Flange ⁵ material 1.4305 (303)/1.4541 (321)



For applications with overpressure max. 16 bar (232 psi), max. 150°C (302°F)

pos.25 e G 1½ " DIN 228 material 1.4404 (316L)



pos.25 f NPT 1½ inch ANSI B1.20.1 material 1.4404 (316L)



pos.25 g Flange ⁵ material 1.4404 (316L)



Signal lamp

pos.27 a LED, mounted in cable entry M20 x 1.5, green ¹



pos.27 c LED, mounted in cable entry M20 x 1.5, red ¹



pos.27 b LED (glass window in lid) ⁴



pos.29 **Plug 4-pole ² (incl. PE)**



¹ Available for CE (pos.2 0), not in combination with weather protection cover (pos.21) and cable entries pos.23 x,a,b. For electronic module Relais DPDT (pos.4 L) 2 LED's (24V, 80-260V) will be delivered. For PNP (pos.4 D) a 24 V LED will be delivered.

² Available for CE (pos.2 0).

³ Available for CE and FM/FMc general purpose (pos.2 0,M).

⁴ Not in combination with weather protection cover (pos.21).

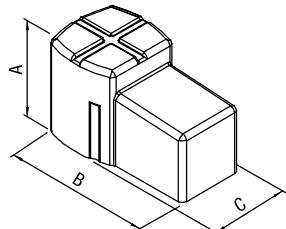
⁵ Flange as selected in pos.5.

⁶ Available for MN 4030. Length of extension "L" is min. 300mm.

⁷ Not for FM/FMc (pos.2 M,N).

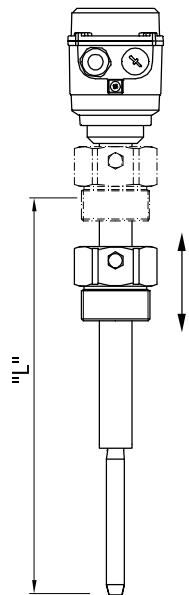
Options

pos.21
 Weather protection
 cover

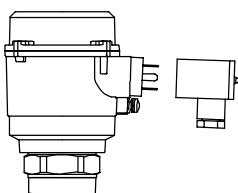


A	100 mm (3.94")
B	165 mm (6.5")
C	88 mm (3.46")

pos.25
 Sliding sleeve

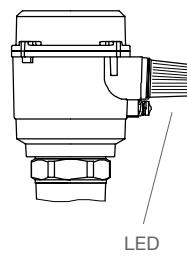


pos.29
 Plug 4-pole

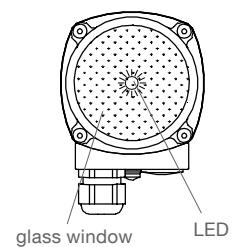


Signal lamp

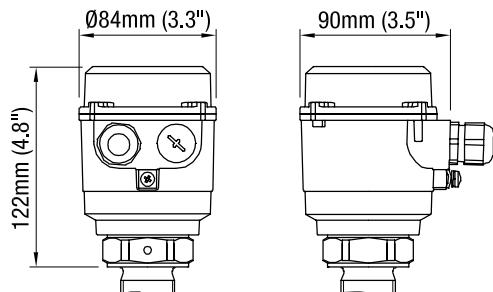
pos.27 a,c
 LED, mounted
 in cable entry M20 x 1.5



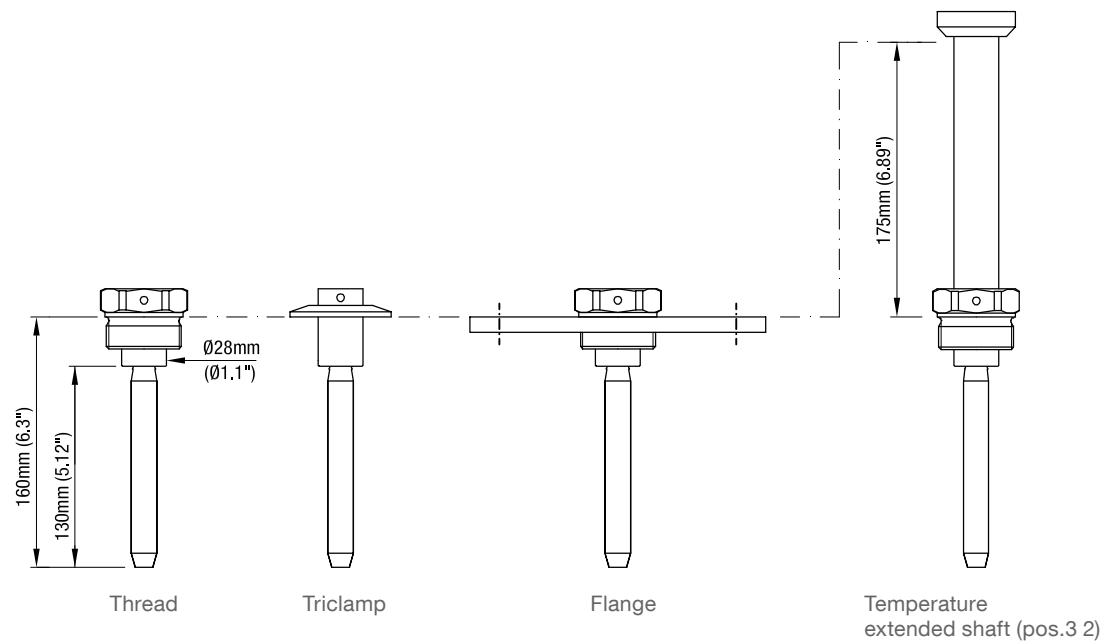
pos.27 b
 LED (glass window in lid)



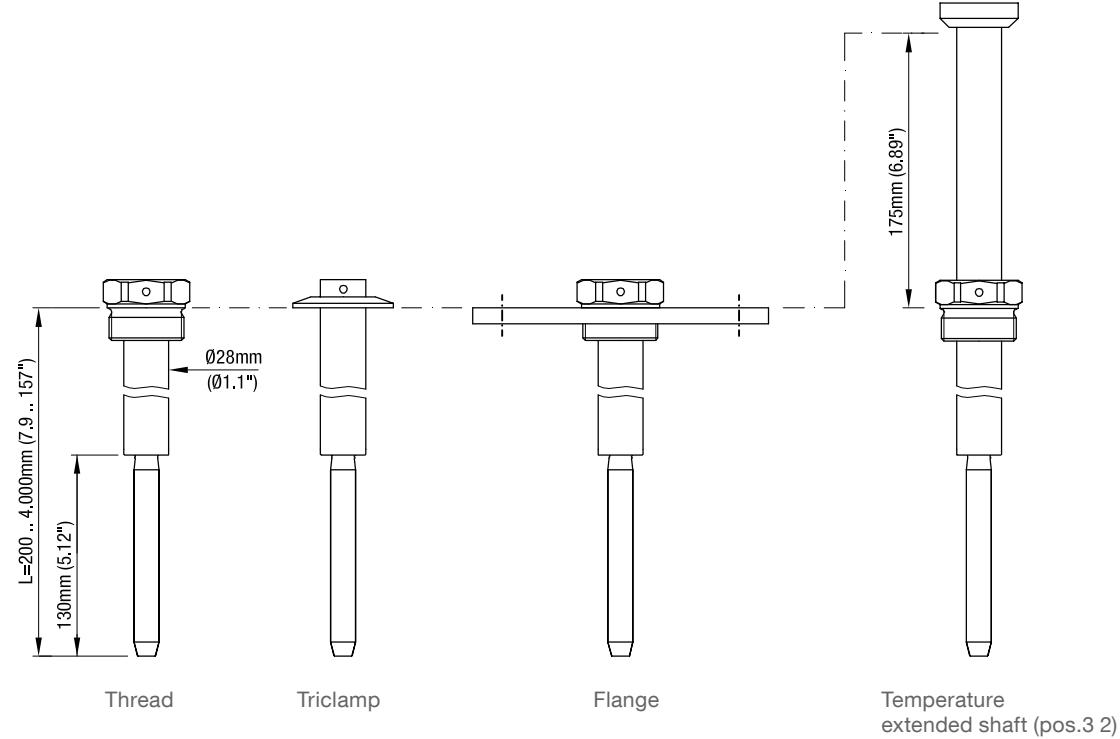
Dimensions



MN 4020

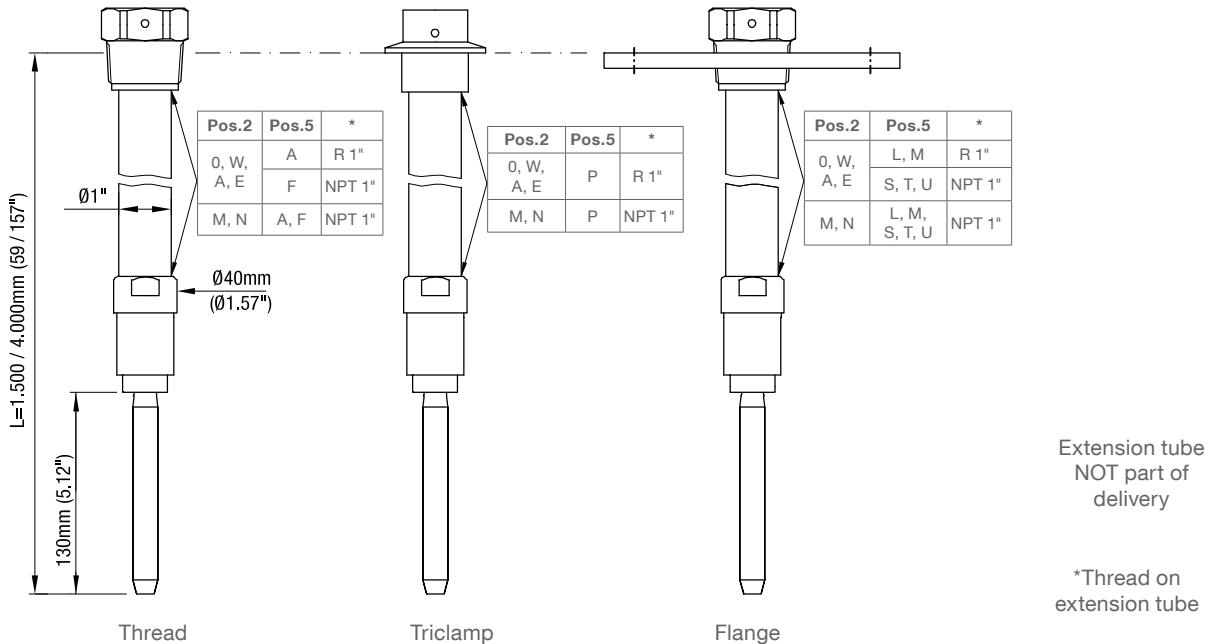


MN 4030



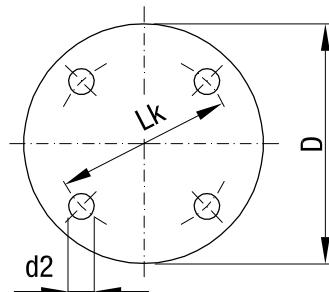
Dimensions / Spare parts

MN 4040



Flanges

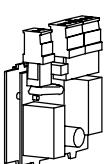
code	type	number of holes	d2	Lk	D	T (thickness)
L	flange DN100 PN6	4	18 mm (0.71")	170 mm (6.69")	210 mm (8.27")	16 mm (0.63")
M	flange DN100 PN16	8	18 mm (0.71")	180 mm (7.09")	220 mm (8.66")	20 mm (0.79")
S	flange 2" 150lbs	4	19.1 mm (0.75")	120.7 mm (4.75")	152.4 mm (6.01")	19.1 mm (0.75")
T	flange 3" 150lbs	4	19.1 mm (0.75")	152.4 mm (6.0")	190.5 mm (7.5")	23.9 mm (0.94")
U	flange 4" 150lbs	8	19.1 mm (0.75")	190.5 mm (7.5")	228.6 mm (9.0")	23.9 mm (0.94")



Spare parts

Minimum order value for separate orders of spare parts or accessories is 75 €.

Electronic board	Article number	Price
Relais DPDT 21..230V AC 22..45V DC	pl405265	•
PNP 20..40V DC	pl405266	•



Electrical installation

Universal voltage

Relay DPDT

Power supply:

21 .. 230 V 50 - 60 Hz $\pm 10\%^*$ 22 VA
 22 .. 45 V DC $\pm 10\%^*$ 2 W
 *incl. $\pm 10\%$ of EN 61010

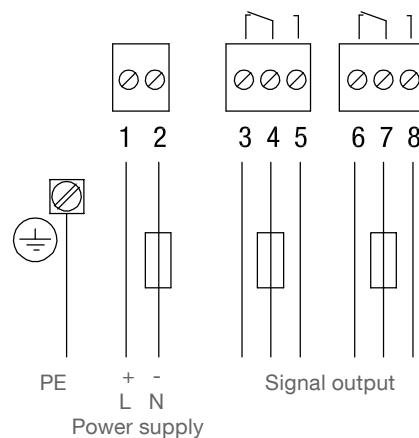
Fuse on power supply:
 max. 10 A, fast or slow, HBC, 250 V

Signal output:

Floating relay DPDT

AC max. 250 V, 8 A, non inductive
 DC max. 30 V, 5 A, non inductive

Fuse on signal output:
 max. 10 A, fast or slow, HBC, 250 V



3-wire

PNP

Power supply:

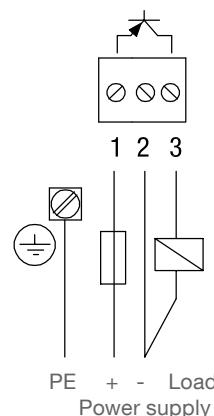
20 .. 40 V DC $\pm 10\%^*$
 *incl. $\pm 10\%$ of EN 61010
 Input current: max. 0.5 A

Fuse:
 max. 4 A, fast or slow, 250 V

Signal output:

max. 0.4 A
 Output voltage equal to input voltage, drop <2.5 V

Load for example:
 PLC, relay, contactor, bulb





RFnivo® 3000

Capacitive level limit switch

Capacitive limit detection for nearly all types of bulk material.
Certified for hazardous locations.



RFnivo® 3000



- Quick and easy setup with automatic calibration
- Maintenance free: Active Shield Technology against material build-up ensures high functional safety
- Suitable for use in applications with high pressure - up to 25bar and with temperatures of up to 500°C

Applications: RFnivo® 3000 is certified for all bulk solids applications such as flour, grain, sugar, cement, granulate, carbon black and also for slurry and liquids.

RF 3100 Standard

Full, demand, empty detector
Vertical, horizontal and oblique installation



RF 3100 version
with PFA coating
available

RF 3200 Heavy Duty

Full, demand, empty detector
Vertical, horizontal and oblique installation



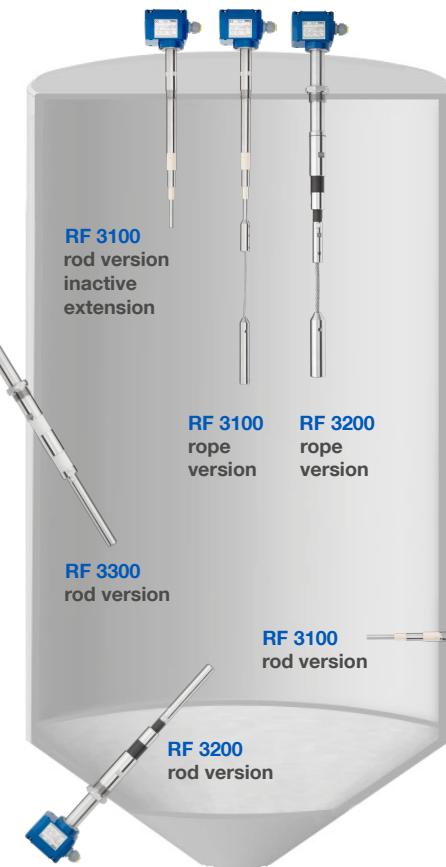
RF 3300 High Temperature

Full, demand, empty detector
Vertical, horizontal and oblique installation



Remote Version

Full, demand, empty detector
Vertical, horizontal and oblique installation, ie for applications with vibration



full detector

demand detector

empty detector

Housing types

RF 3000
standard



RF 3000
flameproof



RF 3000
flameproof, increased safety



Technical Data

Housing Aluminium IP 67, NEMA Type 4X

Versions with certificates ATEX II 1/2D, II 2G Ex d, II 2G Ex de IEC-Ex ia/tb IIIC Da Db, d IIC Gb, de IIC Gb FM Cl. I, II, III Div. 1 TR-CU, EHEDG

Process temperature -40°C to +500°C (-40°F to +932°F)

Pressure -1 ... +25 bar (-14.5 ... +363 psi)

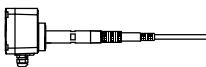
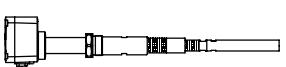
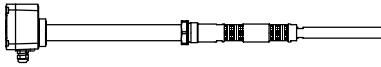
Sensitivity DK value > 1.5

Supply voltage 21..230V AC/21..230V DC Relay DPDT

Process connection M30, M32, G 3/4", G 1", G 1 1/2" NPT 3/4", NPT 1", NPT 1 1/4", NPT 1 1/2"

Material probe 1.4301 (SS304) / 1.4305 (SS303) or 1.4404 (SS316L); Isolation PPS or ceramic FDA and 1935/2004 EC conform

Table of content

	Page	
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RF 3100 Standard version		6
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RF 3200 Heavy Duty version		8
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RF 3300 High temperature version		10
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Options	12	
Dimensions	17	
Detailed Ex-markings	22	
Electrical installation	23	
Spare parts	24	

Subject to change.

Valid: From 01.04.2020 until 31.03.2021, unless otherwise agreed.

All dimensions in mm (inches).

By publishing this selection list all other lists become invalid.

All prices in Euro (€) or USD (\$),
excluding VAT.

We assume no liability for typing errors.

All EURO prices are EXW Betzigau,
all USD prices are EXW Memphis,
excluding packaging costs.

Different variations to those specified are possible.
Please contact our technical consultants.

Overview

- Level limit detection in bulk goods/ solids
- Compact unit
- Wide range of applications
- No maintenance
- Full, demand, empty detector
- Aluminium or plastics housing
- RF technology
- Active shield technology
- Self diagnostics
- Auto calibration
- ATEX, IEC-Ex, FM, FMc, TR-CU GasEx and DustEx approvals
- FDA and 1935/2004/EC Food grade materials

Approvals	
CE	
ATEX/ IEC-Ex	
Zone 20/21	Dust Ignition Proof
Zone 1	Flameproof/ Increased Safety
FM/ FMc	
General purp.	
FM	
Cl. II, III Div. 1	Dust Ignition Proof
Cl. I Div. 1 Cl. I Zone 1	Explosionproof
TR-CU	
Zone 20/21	Dust Ignition Proof
Zone 1	Flameproof/ Increased Safety

Electronics	Supply voltage/ Signal output	21 .. 230 V AC/ DC ±10% Relais DPDT
	Technology	RF with active shield
	Signal output delay	0.5 .. 60 sec
	Measuring range/ max.s ensitivty	3 .. 100 pF/ 0.5 pF 3 .. 400 pF/ 2 pF
	Preset sensitivty	2 pF default, other sensitivty optional
	Calibration	Auto power up calibration at first time operation Auto recalibration with uncovered probe Push button calibration Manual calibration
	Display	4 digit LCD Display of actual measured capacitance, signal output state and self diagnostics
	Self diagnostics	Auto or manual function test Over and Under Range Actual calibrated switchpoint capacitance Min. and max. electronics temperature

Housings		
Standard Aluminium	d Aluminium	de Aluminium

Overview

RF 3100 Standard version

Total length L	200 .. 2,500 mm (7.9 .. 98.4") rod 450 .. 20,000 mm (17.7 .. 787") rope
Active rod/ rope diameter	Rod ø10 mm (ø0.39") Rope ø4 mm (ø0.16")
Ambient temperature	-40 .. +70°C (-40 .. 158°F) Ex flameproof/XP +60°C (140°F)
Process temperature	-40 .. +240°C (-40 .. +464°F)
Process pressure	-1 .. +25 bar (-14.5 .. +363 psi)
Lateral load (rod version)	max. 20 Nm (ø10 mm probe), max. 125 Nm (ø22 mm pipe)
Tensile load (rope version)	max. 4 kN
Process connection material/ Extension material	1.4301/ 1.4305/ 1.4541 (SS303/ 304/ 321) or 1.4404/ 1.4401 (SS316L/ 316)
Probe isolation material	PPS reinforced FDA and 1935/2004/EC conform
Probe gasket material	FKM

Rod version
Shortest length



Rod version
Inactive
extension



Rope version
Inactive
extension



Remote version



Overview / Applications

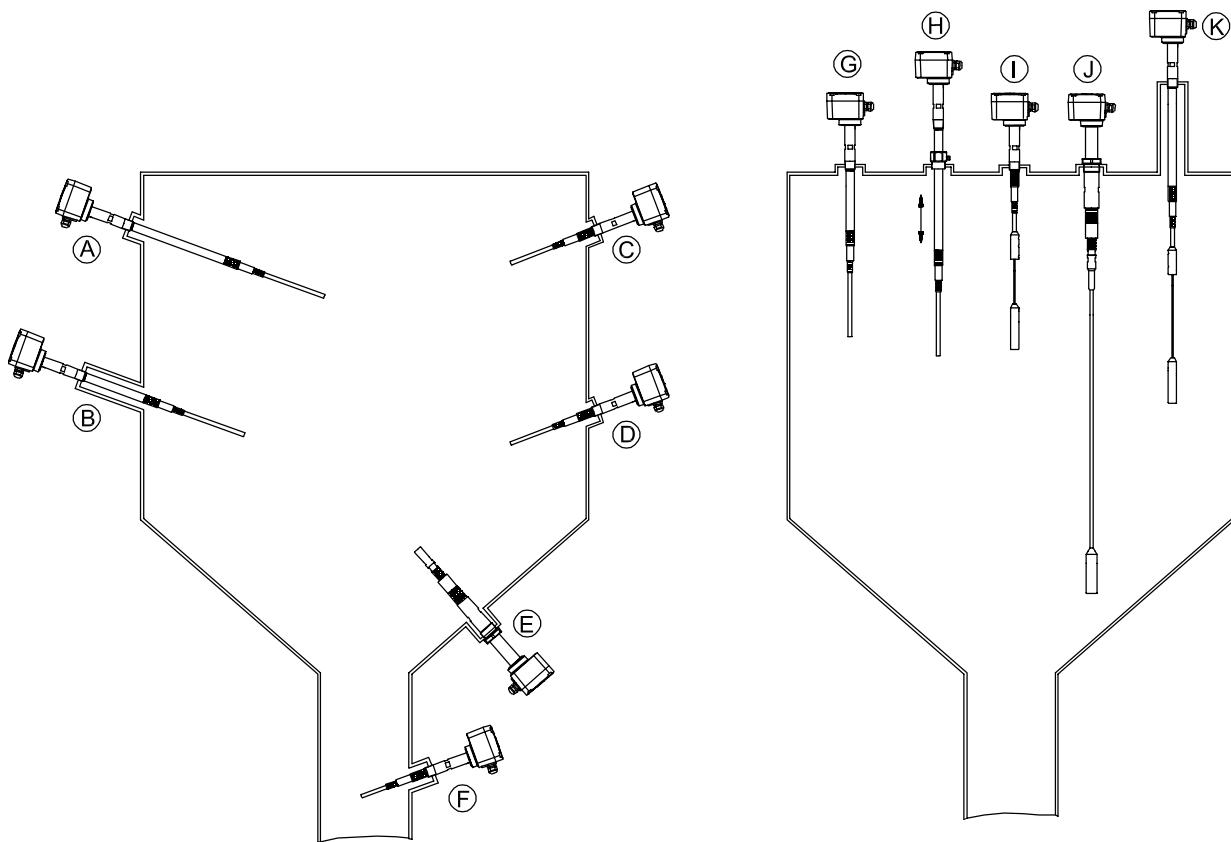
RF 3200 Heavy Duty version	
Total length L	300 .. 2,500 mm (11.8 .. 98.4") rod 550 .. 20,000 mm (21.7 .. 787") rope
Active rod/ rope diameter	Rod ø22 mm (ø0.87") Rope ø8 mm (ø0.31")
Ambient temperature	-40 .. +70°C (-40 .. +158°F) Ex flameproof/XP +60°C (140°F)
Process temperature	-40 .. +240°C (-40 .. +464°F)
Process pressure	-1 .. +25 bar (-14.5 .. +363 psi)
Lateral load (rod version)	max. 90 Nm (ø22 mm probe), max. 525 Nm (ø33 mm pipe)
Tensile load (rope version)	max. 40 kN
Process connection material/ Extension material	1.4301/ 1.4305/ 1.4541 (SS303/ 304/ 321) or 1.4404/ 1.4401 (SS316L/ 316)
Probe isolation material	PPS reinforced FDA and 1935/2004/EC conform
Probe gasket material	FKM or FFKM



RF 3300 High temperature version	
Total length L	320 ... 2,500 mm (12.6 .. 98.4") rod 570 .. 20,000 mm (22.4 .. 787") rope
Active rod/ rope diameter	Rod ø22 mm (ø0.39") Rope ø8 mm (ø0.16")
Ambient temperature	-40 .. +70°C (-40 .. +158°F) Ex flameproof/XP +60°C (140°F)
Process temperature	-40 .. +500°C (-40 .. +932°F) Ex versions: +445°C (833°F)
Process pressure	-1 .. +10bar (-14.5 .. +145 psi)
Lateral load (rod version)	max. 20 Nm (ø22 mm probe), max. 525 Nm (ø33 mm pipe)
Tensile load (rope version)	max. 10 kN
Process connection material/ Extension material	1.4301/ 1.4305/ 1.4541 (SS303/ 304/ 321) or 1.4404/ 1.4401 (SS316L/ 316)
Probe isolation material	Ceramic FDA and 1935/2004/EC conform
Probe gasket material	Graphite

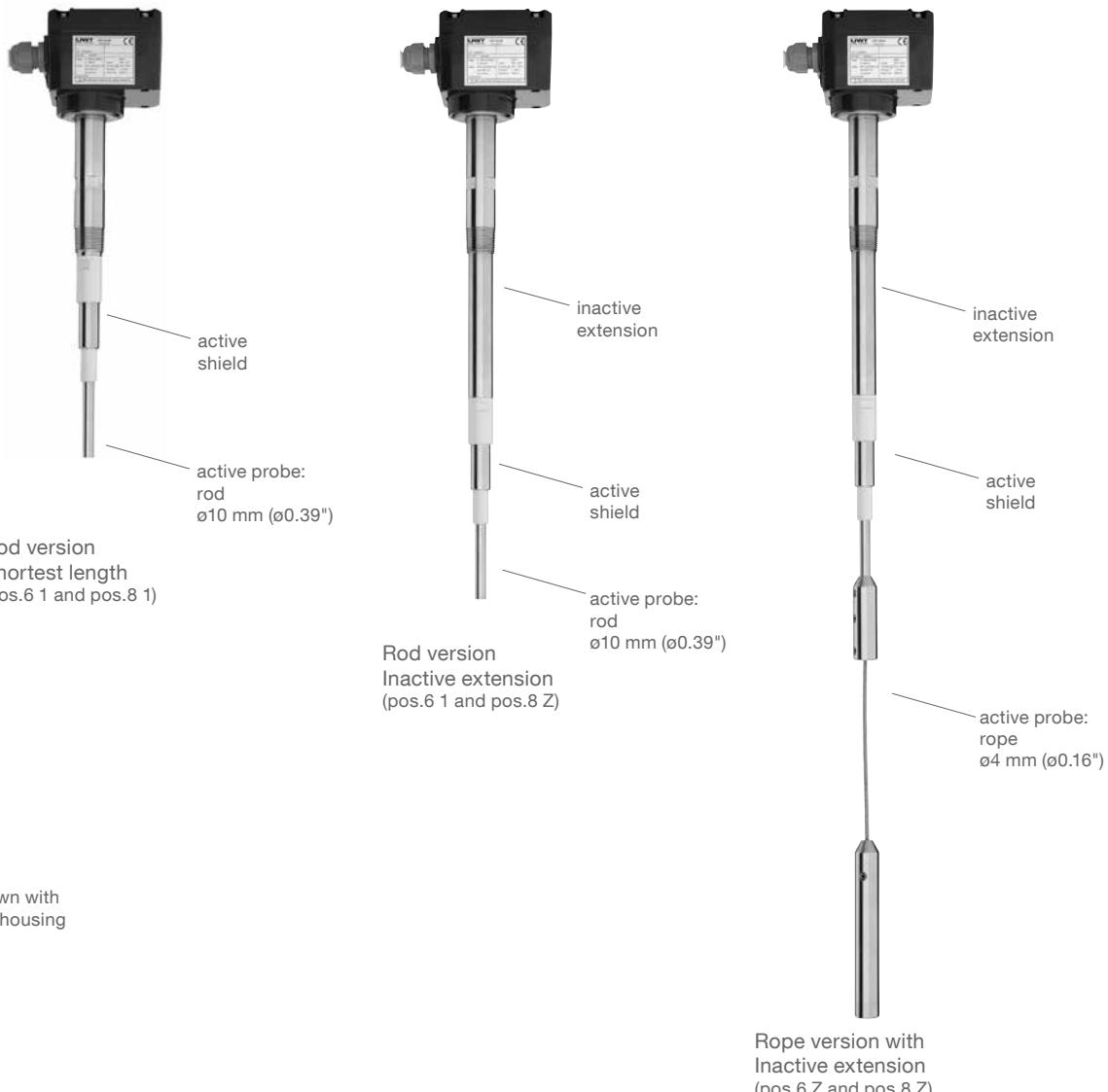


Applications



		RF 3100	RF 3200	RF 3300
(A)	Inactive length to reach distance from silo wall	•	•	•
(B)	Inactive length due to long mounting nozzle	•	•	•
(C)	Full detector with short length	•	•	•
(D)	Demand detector with short length, observe max. load	•	•	•
(E)	Empty detector with short length, observe max. load	•	•	•
(F)	Application in down pipe, observe max. load	•	•	•
(G)	Inactive length to bring active probe to required level	•	•	•
(H)	Inactive length and sliding sleeve for adjustable height	•	•	
(I)	Full detector, rope version	•	•	•
(J)	Empty detector, rope version, observe max. load	•	•	•
(K)	Inactive length due to long mounting nozzle	•	•	•

RF 3100 Standard version



Cable entries (by default)

Depending on model selected, the following cable entries are supported (options see pos.33 on page 13):

Version:	Cable entries:
ATEX/IEC-Ex flameproof (pos.2 T,D,L)	M20 x 1.5 (1x open conduit + 1x blind plug)
FM/FMc (pos.2 M,N,U)	NPT ½" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)
All other versions	M20 x 1.5 (1x screwed cable gland + 1x blind plug)

Length L1

Rod version,
horizontal mounting

DK*
<1.5
≥1.6
≥1.8
≥2.2
≥10

*see external DK table

L1 (pos.6)/ mm (inch)
n.a.
≥300 (11.8")
≥200 (7.9")
≥100 (3.9")
≥50 (2.0")

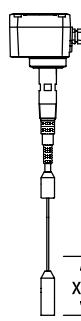
With stated L1 the unit works with factory setted sensitivity (2 pF). For shorter L1 see option pos.16

Switchpoint

Rope version

x mm (inch)
n.a.
≤300 (11.8")
≤200 (7.9")
≤100 (3.9")
≤50 (2.0")

The table states the switchpoint with factory setted sensitivity (2 pF). For smaller x see option pos.16



Dimensions see pages 17, 18

RF 3100 Standard version

Basic type

RF 3100

pos.2 **Certificate** (detailed Ex-markings: see page 22)

		Dust	Gas	Protection method	
0	CE/ TR-CU	-	-		•
W	ATEX	Zone 20/21	-	Dust Ignition Proof	•
R	ATEX	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	•
T	ATEX	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	•
A	IEC-Ex	Zone 20/21	-	Dust Ignition Proof	•
C	IEC-Ex	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	•
D	IEC-Ex	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	•
M	FM/ FMc	-	-	General purpose	•
N	FM	Cl. II, III, Div.1	-	Dust Ignition Proof	•
U	FM	Cl. II, III, Div.1	Cl. I Div.1/ Zone 1	Explosion Proof/ Dust Ignition Proof	•
E	TR-CU	Zone 20/21	-	Dust Ignition Proof	•
K	TR-CU	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	•
L	TR-CU	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	•

pos.4 **Electronic module**

L Relay DPDT 21 ... 230 V AC/ DC

pos.5 **Process connection**

A Thread G 1½", DIN 228	.....	•	•
B Thread G 1¼", DIN 228	.....	•	•
C Thread G 1", DIN 228	.....	•	•
W Thread G ¾", DIN 228	.....	•	•
D Thread M32 x 1.5	.....	•	•
E Thread M30 x 1.5	.....	•	•
F Thread NPT 1½", conical ANSI B1.20.1	.....	•	•
Q Thread NPT 1¼", conical ANSI B1.20.1	.....	•	•
G Thread NPT 1", conical ANSI B1.20.1	.....	•	•
J Thread NPT ¾", conical ANSI B1.20.1	.....	•	•
P Triclamp 2" (DN50) ISO 2852	.....	•	•
R Triclamp 1" (DN25) and 1½" (DN40) ISO 2852	.....	•	•
L Flange DN100 PN6, EN 1092-1 (max. 6 bar (87 psi))	.....	•	•
M Flange DN100 PN16, EN 1092-1 (max. 16 bar (232 psi))	.....	•	•
S Flange 2" 150lbs ANSI B16.5 (max. 10 bar (145 psi))	.....	•	•
T Flange 3" 150lbs ANSI B16.5 (max. 10 bar (145 psi))	.....	•	•
U Flange 4" 150lbs ANSI B16.5 (max. 10 bar (145 psi))	.....	•	•

pos.6 **Active Probe length L1⁽¹⁾**

1 Rod, L1=100 mm (3.94")	.....	•	•
2 Rod, L1=200 mm (7.87")	.....	•	•
3 Rod , L1=300 mm (11.8")	.....	•	•
Y Rod, L1=custom specified	Price per 100 mm (3.94") or part thereof (starting from 0 mm) min. L1=50 mm (1.97"), max. L1=2,000 mm (78.7")	•	•
Z Rope, Base price	Price per 100 mm (3.94") or part thereof (starting from 0 mm) min. L1=350 mm (13.8"), max. L1=20,000 mm (787"), observe max. load	•	•

pos.8 **Inactive extension length L2^(2,3)**

1 Without	.....	•	•
Z L2=custom specified	Base price Price per 100 mm (3.94") or part thereof (starting from 0 mm) Rod version: min. L2=50 mm (1.97"), max. L2=2,400 mm (94.5") - L1 Rope version: min. L2=50 mm (1.97"), max. L2=1,900 mm (74.8")	•	•

pos.9 **Material of process connection and extension "L"**

- 1 Stainless steel 1.4301/ 1.4305/ 1.4541 (303/ 304/ 321) and PPS, gaskets FKM
2 Stainless steel 1.4404 (316L), 1.4401 (316) for rope, PPS, gaskets FKM

Further options: see page 12

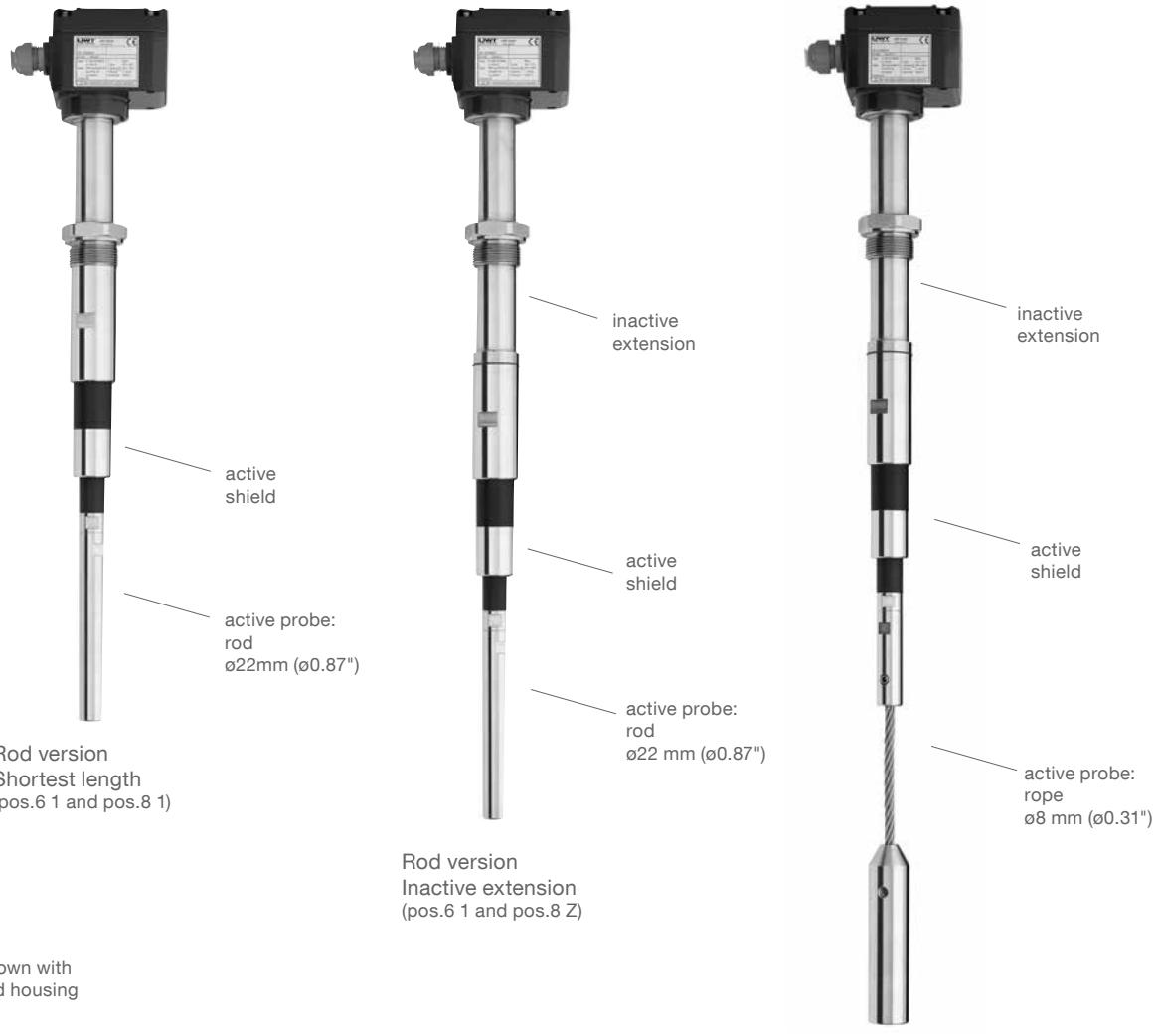
- (1) See recommendations on page before
(2) Inactive extension: the active probe shall have at least 50 mm (1.97") distance to the vessel wall
(3) Total length L = L1 + L2 + 100 mm (3.94")

RF 3100	A	3	L	A			L1 = mm	←	Order code
Position	1	2	3	4	5	6	7	8	9

All positions are available with special design (use code "Z").



RF 3200 Heavy Duty version



Units shown with
Standard housing

Cable entries (by default)

Depending on model selected, the following cable entries are supported (options see pos.33 on page 13):

Version:	Cable entries:
ATEX/IEC-Ex flameproof (pos.2 T,D,L)	M20 x 1.5 (1x open conduit + 1x blind plug)
FM/FMc (pos.2 M,N,U)	NPT ½" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)
All other versions	M20 x 1.5 (1x screwed cable gland + 1x blind plug)

Dimensions see pages 17, 18

Length L1
Rod version,
horizontal mounting

DK*
<1.5
≥1.6
≥1.8
≥2.2
≥10

*see external
DK table

L1 (pos.6)/ mm (inch)
n.a.
≥300 (11.8")
≥200 (7.9")
≥100 (3.9")
≥50 (2.0")

With stated L1 the unit works with factory setted sensitivity (2 pF). For shorter L1 see option pos.16

Switchpoint
Rope version

x mm (inch)
n.a.
≤300 (11.8")
≤200 (7.9")
≤100 (3.9")
≤50 (2.0")

The table states the switchpoint with factory setted sensitivity (2 pF). For smaller x see option pos.16



RF 3200 Heavy Duty version**Basic type****RF 3200**pos.2 **Certificate** (detailed Ex-markings: see page 22)

		Dust	Gas	Protection method	
0	CE/ TR-CU	-	-		•
W	ATEX	Zone 20/21	-	Dust Ignition Proof	•
R	ATEX	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	•
T	ATEX	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	•
A	IEC-Ex	Zone 20/21	-	Dust Ignition Proof	•
C	IEC-Ex	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	•
D	IEC-Ex	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	•
M	FM/ FMc	-	-	General purpose	•
N	FM	Cl. II, III, Div.1	-	Dust Ignition Proof	•
U	FM	Cl. II, III, Div.1	Cl. I Div.1/ Zone 1	Explosion Proof/ Dust Ignition Proof	•
E	TR-CU	Zone 20/21	-	Dust Ignition Proof	•
K	TR-CU	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	•
L	TR-CU	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	•

pos.4 **Electronic module**

L Relay DPDT 21 .. 230 V AC/ DC

pos.5 **Process connection**

A Thread G 1½", DIN 228	.....	•	•
B Thread G 1¼", DIN 228	.....	•	•
F Thread NPT 1½", conical ANSI B1.20.1	.....	•	•
Q Thread NPT 1¼", conical ANSI B1.20.1	.....	•	•
L Flange DN100 PN6, EN 1092-1 (max. 6 bar (87 psi))	.....	•	•
M Flange DN100 PN16, EN 1092-1 (max. 16 bar (232 psi))	.....	•	•
S Flange 2" 150lbs ANSI B16.5 (max. 10 bar (145 psi))	.....	•	•
T Flange 3" 150lbs ANSI B16.5 (max. 10 bar (145 psi))	.....	•	•
U Flange 4" 150lbs ANSI B16.5 (max. 10 bar (145 psi))	.....	•	•

pos.6 **Active Probe length L1 (1)**

1 Rod, L1=100 mm (3.94")	.....	•	•
2 Rod, L1=200 mm (7.87")	.....	•	•
3 Rod , L1=300 mm (11.8")	.....	•	•
Y Rod, L1=custom specified	Price per 100 mm (3.94") or part thereof (starting from 0 mm) min. L1=100 mm (3.94"), max. L1=2,000 mm (78.7")	•	•
Z Rope, Base price L1=custom specified	Price per 100 mm (3.94") or part thereof (starting from 0 mm) min. L1=350 mm (13.8"), max. L1=20,000 mm (787")	•	•

pos.8 **Inactive extension length L2 (2,3)**

1 Without	.....	•	•
Z L2=custom specified	Price per 100 mm (3.94") or part thereof (starting from 0 mm) Rod version: min. L2=100 mm (3.93"), max. L2=2,300 mm (90.6") - L1 Rope version: min. L2=100 mm (3.93"), max. L2=1,800 mm (70.9")	•	•

pos.9 **Material of process connection and extension "L"**

- 1 Stainless steel 1.4301/ 1.4305/1 .4541 (303/ 304/ 321) and PPS, gaskets FKM
2 Stainless steel 1.4404 (316L), 1.4401 (316) for rope, PPS , gaskets FKM

Further options: see page 12

(1) See recommendations on page before

(2) Inactive extension: the active probe shall have at least 50 mm (1.97") distance to the vessel wall

(3) Total length L = L1 + L2 + 200 mm (7.87")

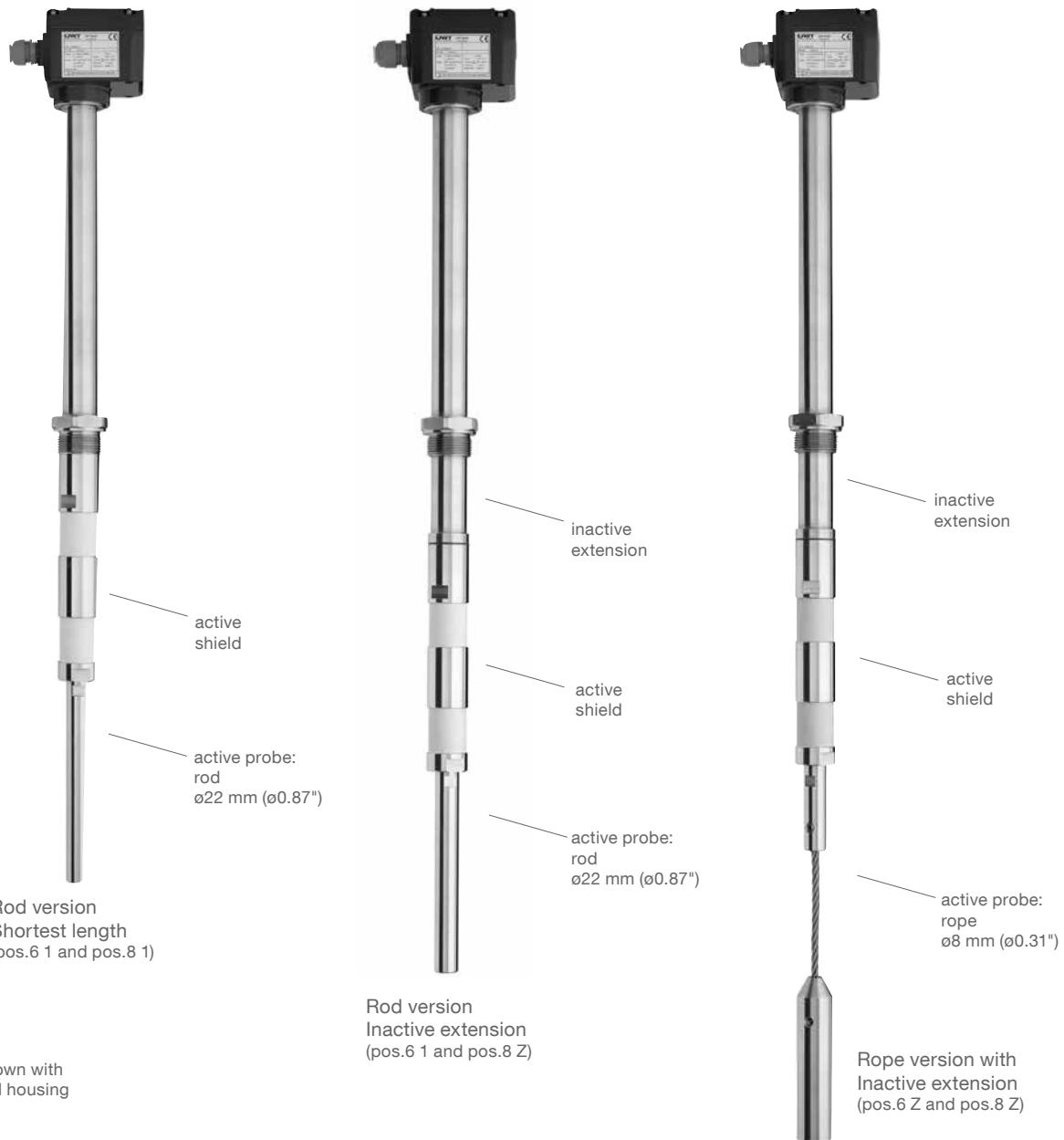
RF 3200	B	3	L		A				
Position	1	2	3	4	5	6	7	8	9

L1 =	mm
L2 =	mm

← Order code

All positions are available with special design (use code "Z").

RF 3300 High Temperature version (500°C)



Cable entries (by default)

Depending on model selected, the following cable entries are supported (options see pos.33 on page 13):

Version:	Cable entries:
ATEX/IEC-Ex flameproof (pos.2 T,D,L)	M20 x 1.5 (1x open conduit + 1x blind plug)
FM/FMc (pos.2 M,N,U)	NPT ½" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)
All other versions	M20 x 1.5 (1x screwed cable gland + 1x blind plug)

Length L1

Rod version,
horizontal mounting

DK*
<1.5
≥1.6
≥1.8
≥2.2
≥10

*see external DK table

L1 (pos.6)/ mm (inch)
n.a.
≥300 (11.8")
≥200 (7.9")
≥100 (3.9")
≥50 (2.0")

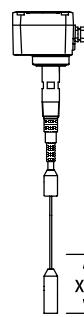
With stated L1 the unit works with factory setted sensitivity (2 pF). For shorter L1 see option pos.16

Switchpoint

Rope version

x mm (inch)
n.a.
≤300 (11.8")
≤200 (7.9")
≤100 (3.9")
≤50 (2.0")

The table states the switchpoint with factory setted sensitivity (2 pF). For smaller x see option pos.16



Dimensions see pages 17, 28

RF 3300 High Temperature version (500°C)**Basic type****RF 3300****pos.2 Certificate⁽¹⁾ (detailed Ex-markings: see page 22)**

		Dust	Gas	Protection method	
0	CE/ TR-CU	-	-		•
W	ATEX	Zone 20/21	-	Dust Ignition Proof	•
R	ATEX	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	•
T	ATEX	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	•
A	IEC-Ex	Zone 20/21	-	Dust Ignition Proof	•
C	IEC-Ex	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	•
D	IEC-Ex	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	•
M	FM/ FMc	-	-	General purpose	•
N	FM	Cl. II, III, Div.1	-	Dust Ignition Proof	•
U	FM	Cl. II, III, Div.1	Cl. I Div.1/ Zone 1	Explosion Proof/ Dust Ignition Proof	•
E	TR-CU	Zone 20/21	-	Dust Ignition Proof	•
K	TR-CU	Zone 20/21	Zone 1	Flameproof/ Increased Safety/ Dust Ignition Proof	•
L	TR-CU	Zone 20/21	Zone 1	Flameproof/ Dust Ignition Proof	•

pos.4 Electronic module

L Relay DPDT 21 .. 230 V AC/ DC

pos.5 Process connection

A Thread G 1½", DIN 228	.....	•	•
B Thread G 1¼", DIN 228	.....	•	•
F Thread NPT 1½", conical ANSI B1.20.1	.....	•	•
Q Thread NPT 1¼", conical ANSI B1.20.1	.....	•	•
L Flange DN100 PN6, EN 1092-1 (max. 6 bar (87 psi))	.....	•	•
M Flange DN100 PN16, EN 1092-1	.....	•	•
S Flange 2" 150lbs ANSI B16.5	.....	•	•
T Flange 3" 150lbs ANSI B16.5	.....	•	•
U Flange 4" 150lbs ANSI B16.5	.....	•	•

pos.6 Active Probe length L1⁽²⁾

1 Rod, L1=100 mm (3.94")	.....	•	•
2 Rod, L1=200 mm (7.87")	.....	•	•
3 Rod , L1=300 mm (11.8")	.....	•	•
Y Rod, L1=custom specified	Price per 100 mm (3.94") or part thereof (starting from 0 mm) min. L1=100 mm (3.94"), max. L1=1,000 mm (39.4")	•	•
Z Rope, Base price L1=custom specified	Price per 100 mm (3.94") or part thereof (starting from 0 mm) min. L1=350 mm (13.8"), max. L1=20,000 mm (787")	•	•

pos.8 Inactive extension length L2^(3,4)

1 Without	.....	•	•
Z L2=custom specified	Price per 100 mm (3.94") or part thereof (starting from 0 mm) Rod version: min. L2=100 mm (3.93"), max. L2=2,300 mm (90.6") - L1 Rope version: min. L2=100 mm (3.93"), max. L2=1,800 mm (70.9")	•	•

pos.9 Material of process connection and extension "L"

- 1 Stainless steel 1.4301/ 1.4305/ 1.4541 (303/ 304/ 321) and ceramic, gaskets graphite
2 Stainless steel 1.4404 (316L), 1.4401 (316) for rope, ceramic, gaskets graphite

Further options: see page 12

(1) Max. process temperature for Ex versions limited to 445°C

(2) See recommendations on page before

(3) Inactive extension: the active probe shall have at least 50 mm (1.97") distance to the vessel wall

(4) Total length L = L1 + L2 + 220 mm (8.66")

RF 3300	C	5	L		A		
Position	1	2	3	4	5	6	7

L1 =	mm
L2 =	mm

Order code

All positions are available with special design (use code "Z").

Options

RF 3100
RF 3200
RF 3300

• •	pos.11 x	Guarantee extension to 5 years	•
Remote version:			
• • •	pos.12 x	Remote version	•
		Including hexagon nut, not including remote cable and angle bracket	
• • •	pos.13 a	Remote cable, both sides wired	•
		Spezial Triaxial cable, min. 1,000 mm (39.4"), max. 20,000 mm (65ft)	
		Basic price	•
• • •	pos.13 x	Remote cable, not wired specify cable length, price per 1,000 mm (39.4")	•
		Special triaxial cable, no other cable permitted, max. 20,000 mm (65ft)	•
• • •	pos.14 x	Angle bracket aluminium	•
Electronics:			
Presetted sensitivity			
		Standard calibration is 2 pF, other sensitivities as follows:	
• • •	pos.16 a	0.5 pF	•
• • •	pos.16 b	1 pF	•
• • •	pos.16 c	4 pF	•
• • •	pos.16 d	10 pF	•
Probes:			
Probe gaskets			
• •	pos.17 a	Material FFKM, for increased requirements (such as superheated steam applications)	on request
Coating (coating material PFA)			
1	pos.18 a	Coating of active probe (rod version)	•
2	pos.18 b	Coating of complete probe (rod version) L1=50...400 mm (1.97...15.7"), L2=50...360mm (1.97...14.2")	•
2	pos.18 d	Coating of complete probe (rod version) L1=50...400 mm (1.97...15.7"), L2=361...1000mm (14.2...39.4")	•
3	pos.18 c	Coating of rope (rope version), price per meter or part thereof	•
Rod extension kit, rigid			
4	pos.19 a	For ø10 mm (ø0.39") rod, length 400 mm (15.7"), 1.4404 (316L)	•
• •	pos.19 b	For ø22 mm (ø0.87") rod, length 400 mm (15.7"), 1.4404 (316L)	•
Rod extension kit, flexible (pendulum rod)			
4	pos.20 a	For ø10 mm (ø0.39") rod, length 1,000 mm (39.4"), 1.4301/ 1.4305 (304/303)	•
Rope extension kit			
4	pos.21 a	For ø10 mm (ø0.39") rod, rope ø4 mm (ø0.16"), length 2,000 mm (78.7"), 1.4301/ 1.4305 (304/ 303)	•
4	pos.21 b	For ø10 mm (ø0.39") rod, rope ø4 mm (ø0.16"), length 2,000 mm (78.7"), 1.4404 (316L)/ rope 1.4401(316)	•
• •	pos.21 c	For ø22 mm (ø0.87") rod, rope ø8 mm (ø0.31"), length 2,000 mm (78.7"), 1.4404 (316L)/ rope 1.4401(316)	•
Fixing hole in probe rod			
•	pos.22 x	For ø10 mm (ø0.39") rod, for fixing of the extensions. Not with pos.18 and pos.25	•
Mounting:			
Sliding sleeve			
5 5	pos.24 a	Material 1.4305/ 1.4541 (303/321)	•
5 5	pos.24 b	Material 1.4404 (316L)	•
EHEDG approval (Type ED)			
6	pos.25 a	Process connection G 1½" (without flush welding socket)	•
6	pos.25 b	Process connection flush welding socket ø69/ G 1½" made of aluminium	•
6	pos.25 c	Process connection flush welding socket ø69/ G 1½" made of 1.4301 (304)	•
6	pos.25 d	Process connection flush welding socket ø69/ G 1½" made of 1.4404 (316L)	•

Options

Mounting set for flange mounting									
	process connection flange	for counter flange with	consists of						
			screws*	nuts*	washers*	sealing**			
• • •	pos.26 c	L	hole ø18	4x M16 x 60	4x M16	4 pcs	1 pc	.....	•
• • •	pos.26 d	L	thread M16	4x M16 x 40		4 pcs	1 pc	.....	•
• • •	pos.26 e	M	hole ø18	8x M16 x 60	8x M16	8 pcs	1 pc	.....	•
• • •	pos.26 f	M	thread M16	8x M16 x 40		8 pcs	1 pc	.....	•

* material stainless steel 1.4301 (304) **max. 240°C (464°F), material not food grade

Hexagon nut

• • • pos.27 e For thread G 1½", G 1¼", G 1", G ¾", 1.4305 (303), 1 pc

• • • pos.27 f For thread G 1½", G 1¼", G 1", G ¾", 1.4305 (303), 2 pcs

Flat sealing

• • • pos.28 x For process connection thread G 1½", G 1¼", G 1", G ¾", M32 x 1.5, M30 x 1.5, max. 240°C (464°F)

Housing:

7 7 7	pos.31 a	Housing material Plastics PA6 reinforced .....	.....	.....	.....	•
8 8 8	pos.32 x	Weather protection cover (for Ex approved for Zone 2 or 22 or Div. 2)	.....	.....	.....	•

Cable entry

Selection of the following options only necessary, if a deviation from the default cable gland/ conduit is required:

9 9 9	pos.33 x	M20 x 1.5 2x screwed cable gland .....	.....	.....	.....	•
10 10 10	pos.33 d	M20 x 1.5 1x screwed cable gland +1x blind plug .....	.....	.....	.....	•
11 11 11	pos.33 a	NPT ½" tapered ANSI B1.20.1 (1x conduit + 1x Ex-d blind plug) .....	.....	.....	.....	•
12 12 12	pos.33 c	NPT ¾" tapered ANSI B1.20.1 (1x conduit + 1x Ex-d blind plug) .....	.....	.....	.....	•

Signal lamp

13 13 13	pos.34 a	LED, mounted in cable gland M20 x 1.5, green .....	.....	.....	.....	•
13 13 13	pos.34 c	LED, mounted in cable gland M20 x 1.5, red .....	.....	.....	.....	•
14 14 14	pos.34 d	LED (transparent lid section) .....	.....	.....	.....	•

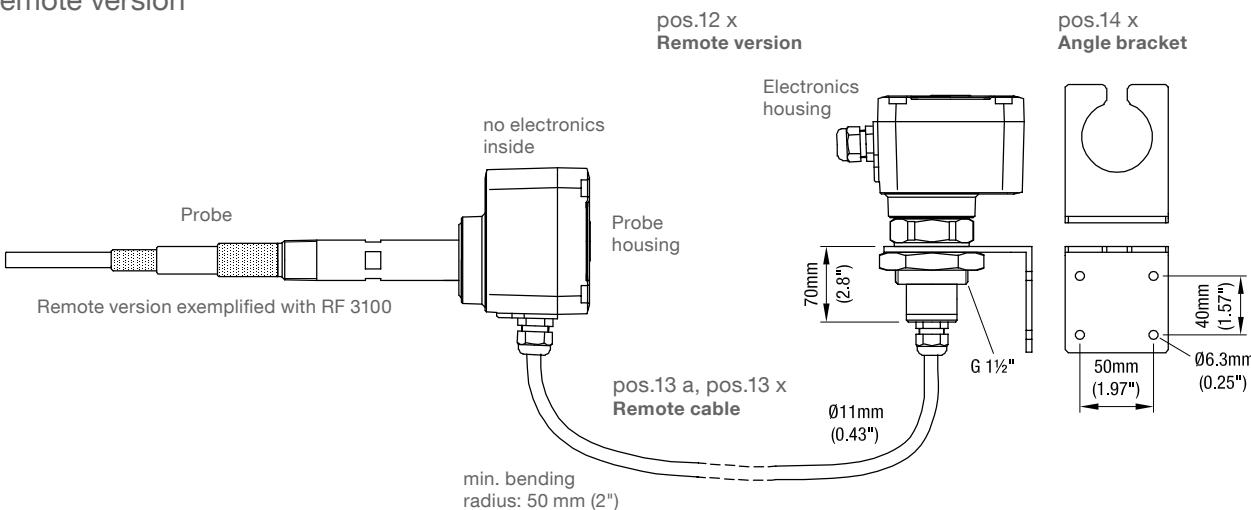
Plug

15 15 15	pos.35 x	Valve connector (incl. mating plug)	4-pole (incl. PE)	max. 230 V	.....	•
15 15 15	pos.35 a	M12 (without mating plug)	4-pole	max. 25 V	.....	•
15 15 15	pos.35 b	M12 (without mating plug)	5-pole (incl. PE)	max. 60 V	.....	•
15 15 15	pos.35 c	Harting Han 4A (incl. mating plug)	5-pole (incl. PE)	max. 230 V	.....	•

- 1 Recommended with excessive, mainly conductive material buildup and for reduction of abrasion.
Available for CE/ TR-CU and FM General purpose (pos.2 0,M). Max. length L1=700 mm (27.6").
- 2 Recomended with corrosive materials. Available for CE/ TR-CU and FM General purpose (pos.2 0,M). Process connection NPT 1½", G 1½". Only with inactive extension length L2 (pos.8 Z)
- 3 Recommended with excessive material buildup and for reduction of abrasion. Available for CE/ TR-CU and FM General purpose (pos.2 0,M).
- 4 Available for rode version with active probe length pos.6 1,2,3. Not with PFA coating.(pos.18).
- 5 Process connection as selected in pos.5. Material must be the same as selected in pos.9. RF 3100 available with NPT 1¼", NPT 1½", G 1¼", G 1½". RF 3200 available with NPT 1½", G 1½". Not with coating of complete probe (pos.18 b, d).
- 6 Certificate only valid with the use of the "flush welding socket". With pos.25 a this socket must be manufactured on site.
Only for G 1½" (pos.5 A). Not in combination with rope version (pos.6 Z). Not in combination with options pos.18,19,20,21,24,26,27,28.
Selected length "L" is increased by 9 mm (0.35").
- 7 Available for CE and ATEX/ IEC-Ex/ TR-CU Dust Ignition proof (pos.2 0,W,A,E). Ambient temperature for ATEX/ IEC-Ex/ TR-CU: -20°C (-4°F).
- 8 Available for all versions except flameproof/ increased safety versions (pos.2 R,T,C,D,U,K,L)
- 9 Available for all versions except flameproof version (pos.2 T,U,D,L)
- 10 Available for FM version (pos.2 M,N) except flameproof version (pos.2 U)
- 11 Available for all versions except FM (pos.2 M,N,U)
- 12 Available for all versions except pos.2 0,W,A,M,N,E
- 13 Available for CE/ TR-CU (pos.2 0), not in combination with weather protection cover (pos.32 x) and cable entries pos.33 x,a,c.
2 LED's (24V, 80-260V) will be delivered. Without connection of LED wires to internal terminals (standard) or according to customer specification.
- 14 Available for CE/ TR-CU (pos.2 0).
- 15 Available for CE/ TR-CU (pos.2 0). Without connection of plug wires to internal terminals (standard) or according to customer specification.

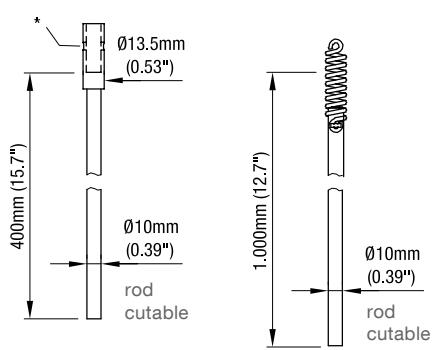
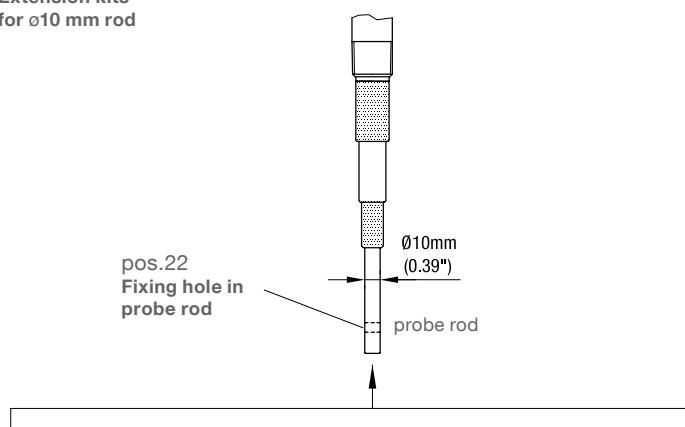
Options

Remote version



Probes

Extension kits
for Ø10 mm rod

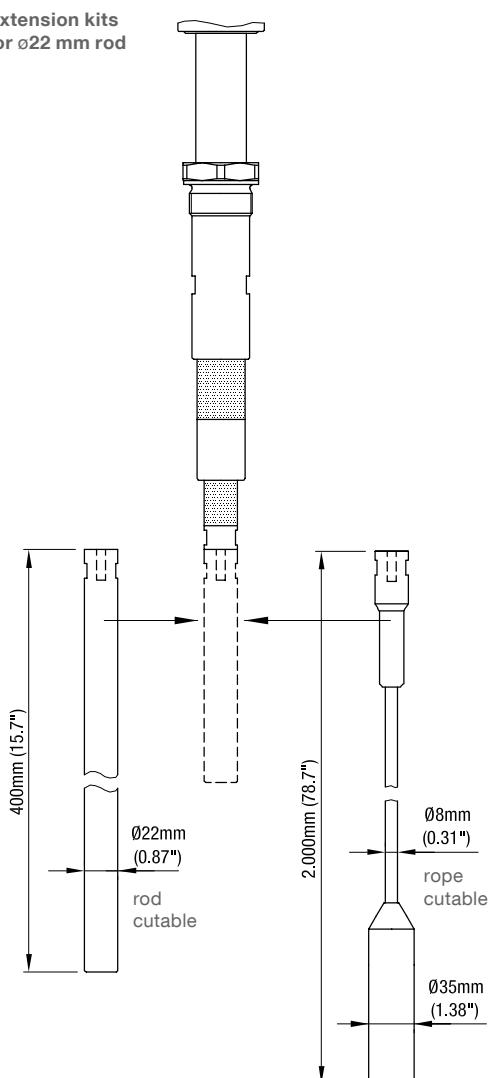


pos.19 a
Rod extension
kit, rigid

pos.20 a
Rod extension
kit, flexible
(pendulum rod)

* Fixing by drilling a hole through the probe rod and fixing with a split pin

Extension kits
for Ø22 mm rod

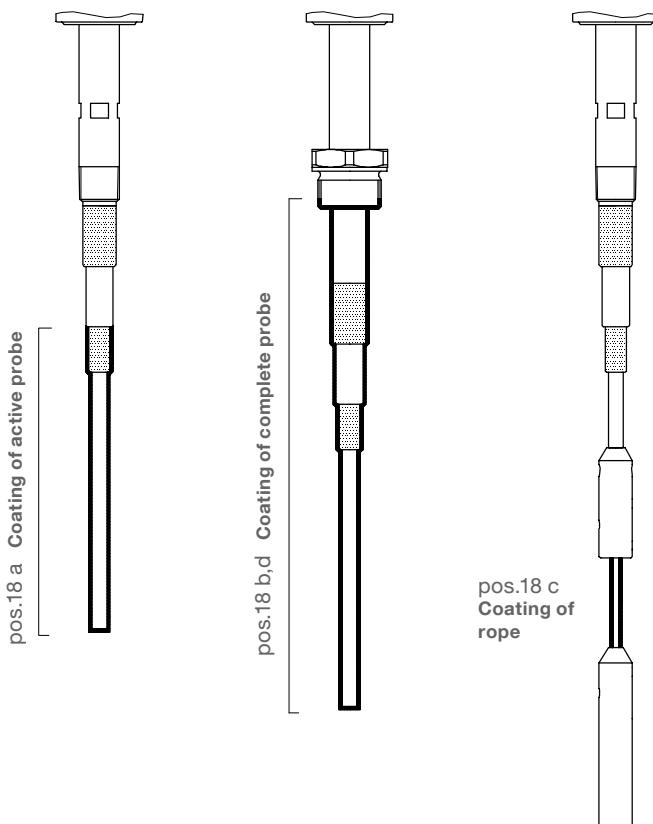


pos.19 b
Rod extension kit,
rigid

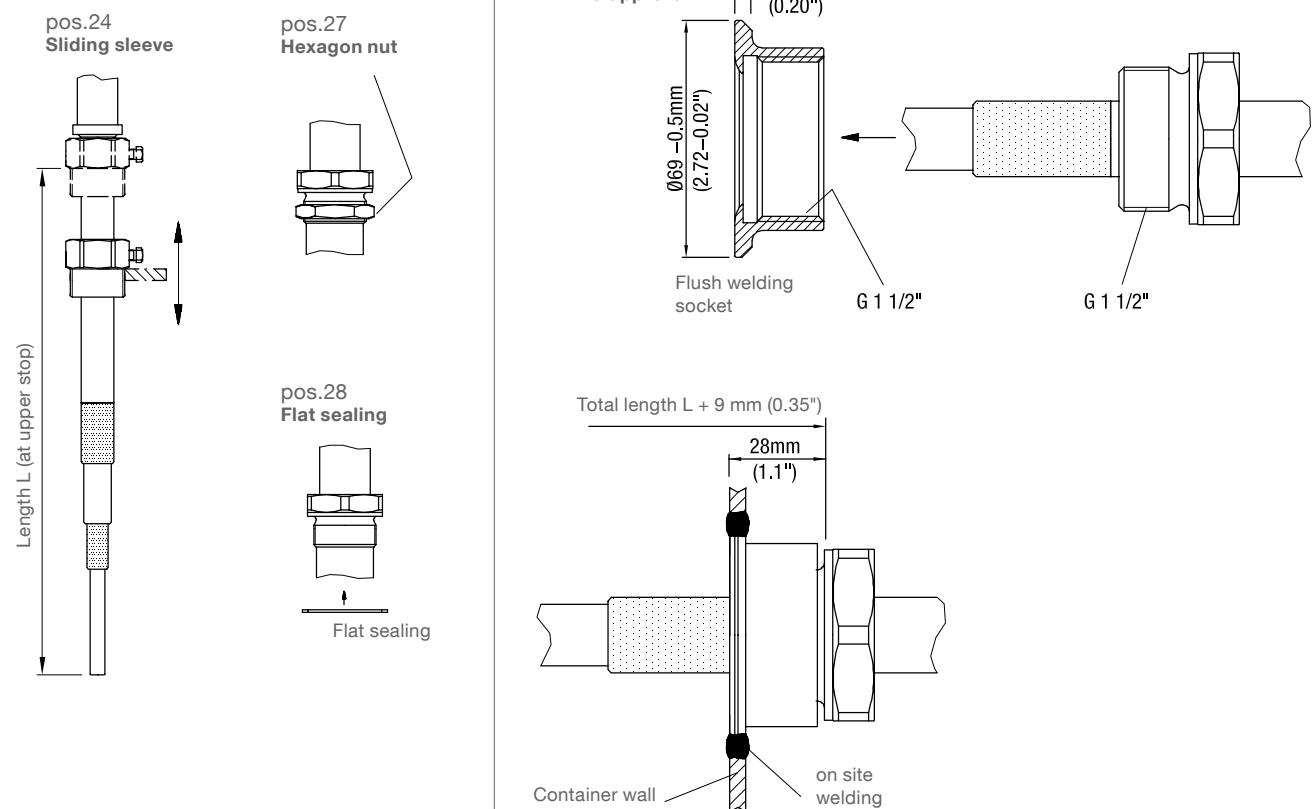
pos.21 c
Rope extension
kit

Options

Coatings

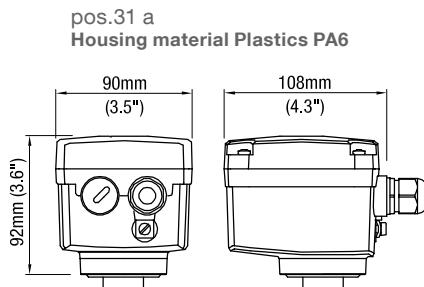


Mounting

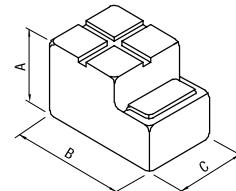


Options

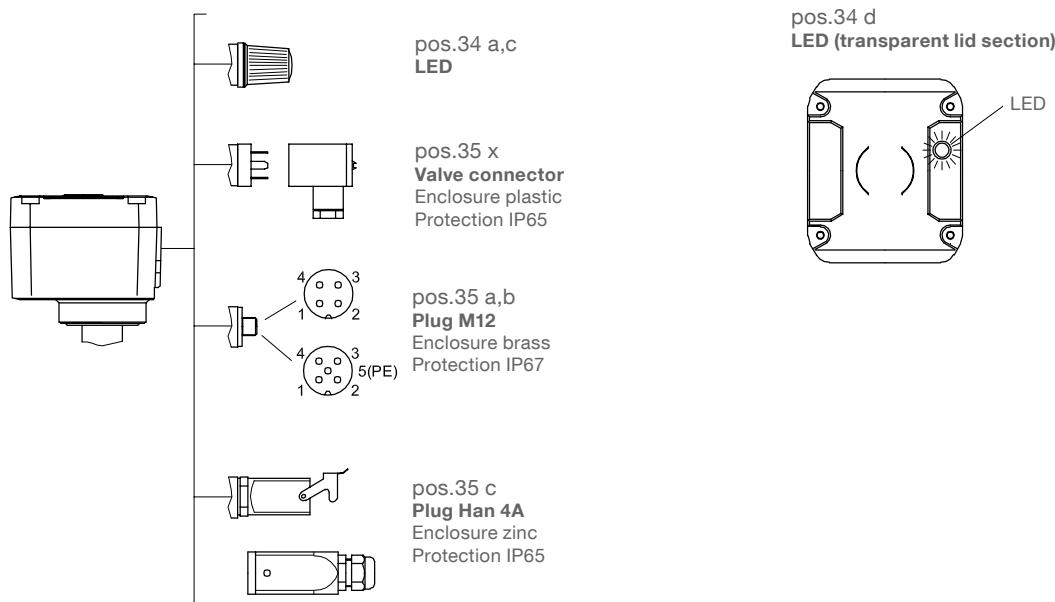
Housing



pos.32 x
 Weather protection cover



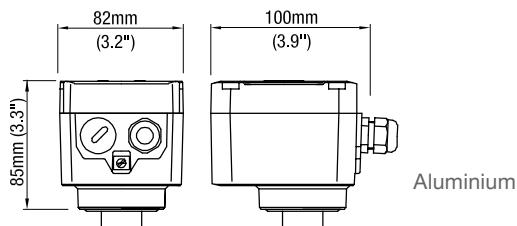
A	100 mm (3.94")
B	165 mm (6.5")
C	95 mm (3.7")



Dimensions

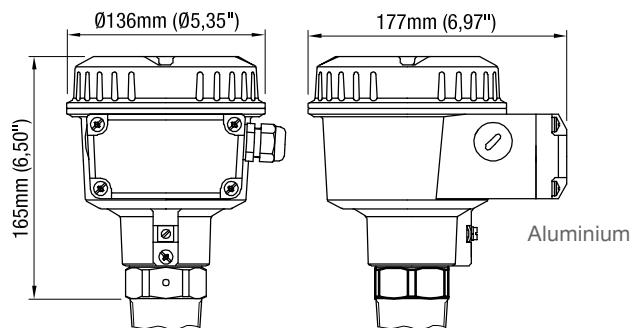
Housing versions

Standard

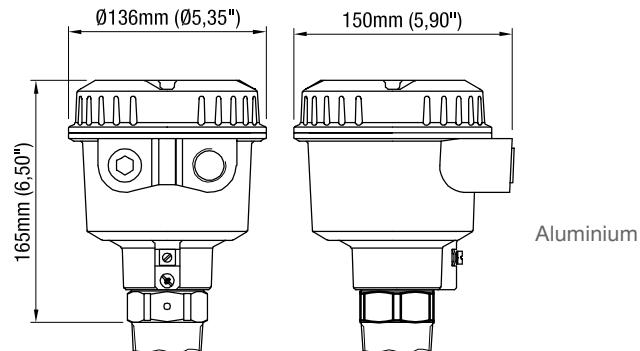


de

Explosionproof with increased safety terminal box



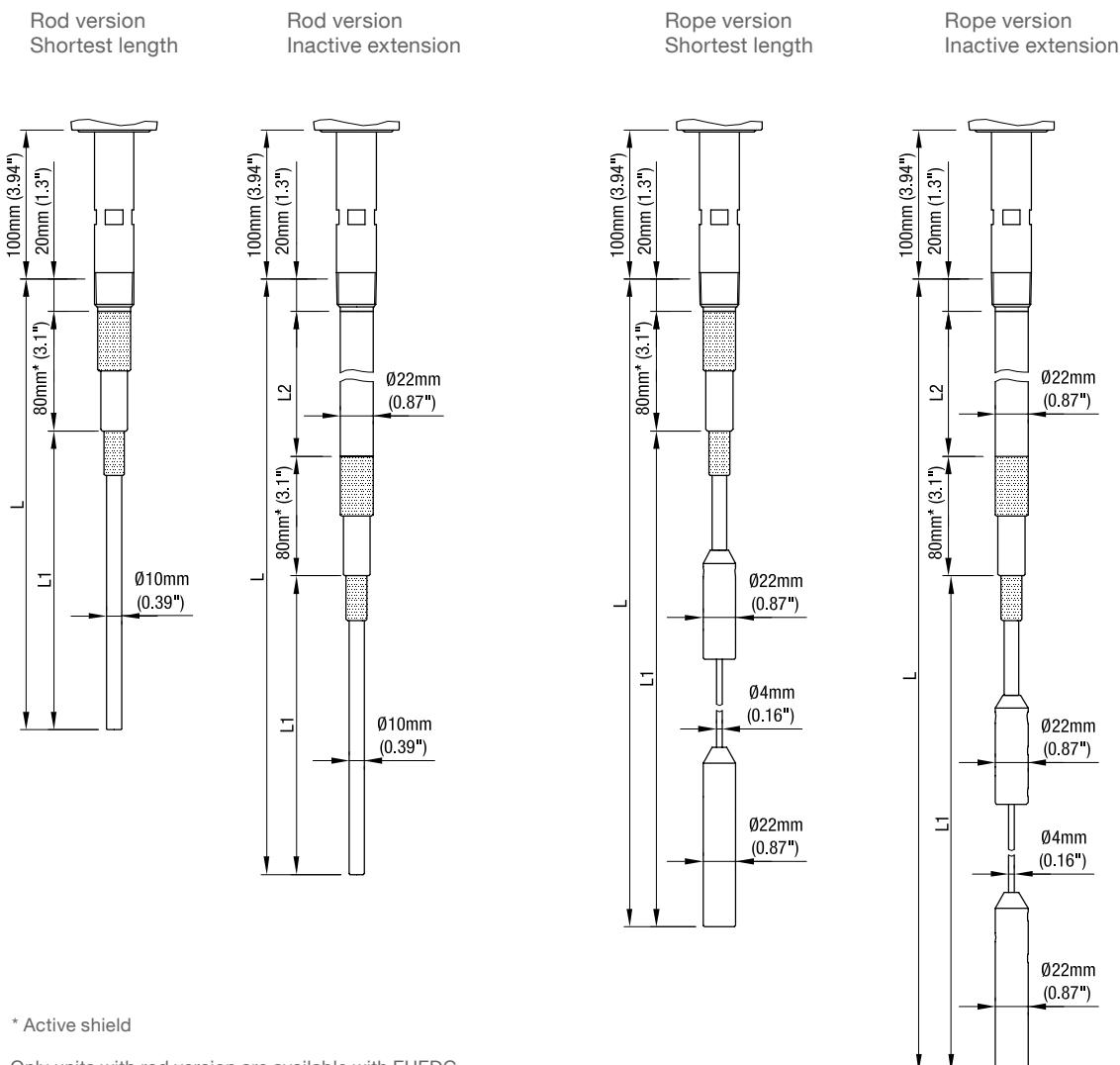
d

Flameproof/
explosionproof

Dimensions

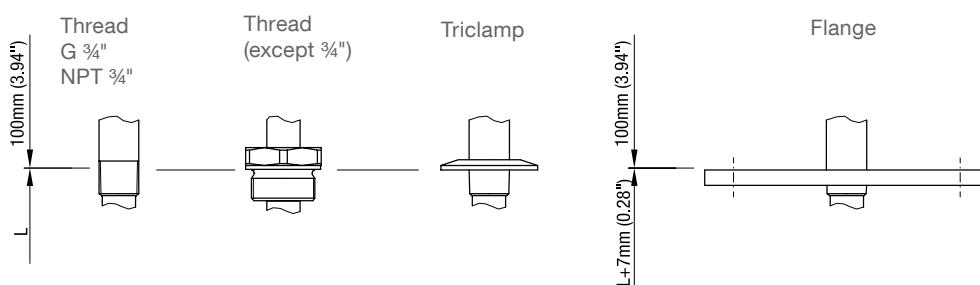
Probes

RF 3100 Standard version



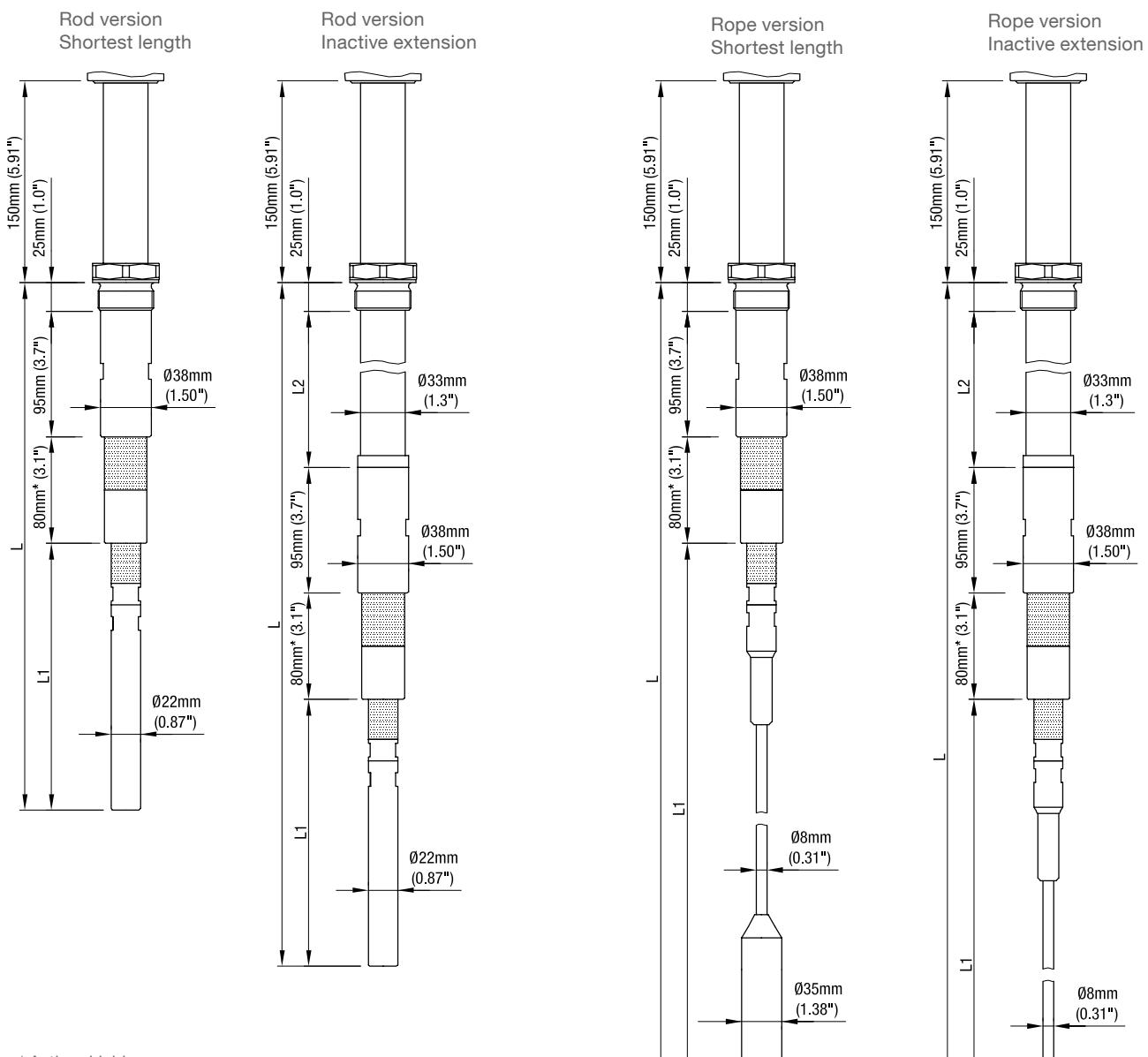
Only units with rod version are available with EHEDG Certificate. On rod versions with EHEDG Certificate the length "L" is increased by 9 mm (0.35")

Process connections:



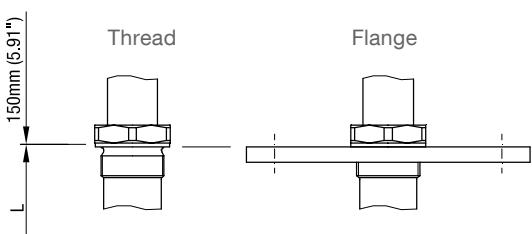
Dimensions

RF 3200 Heavy Duty version



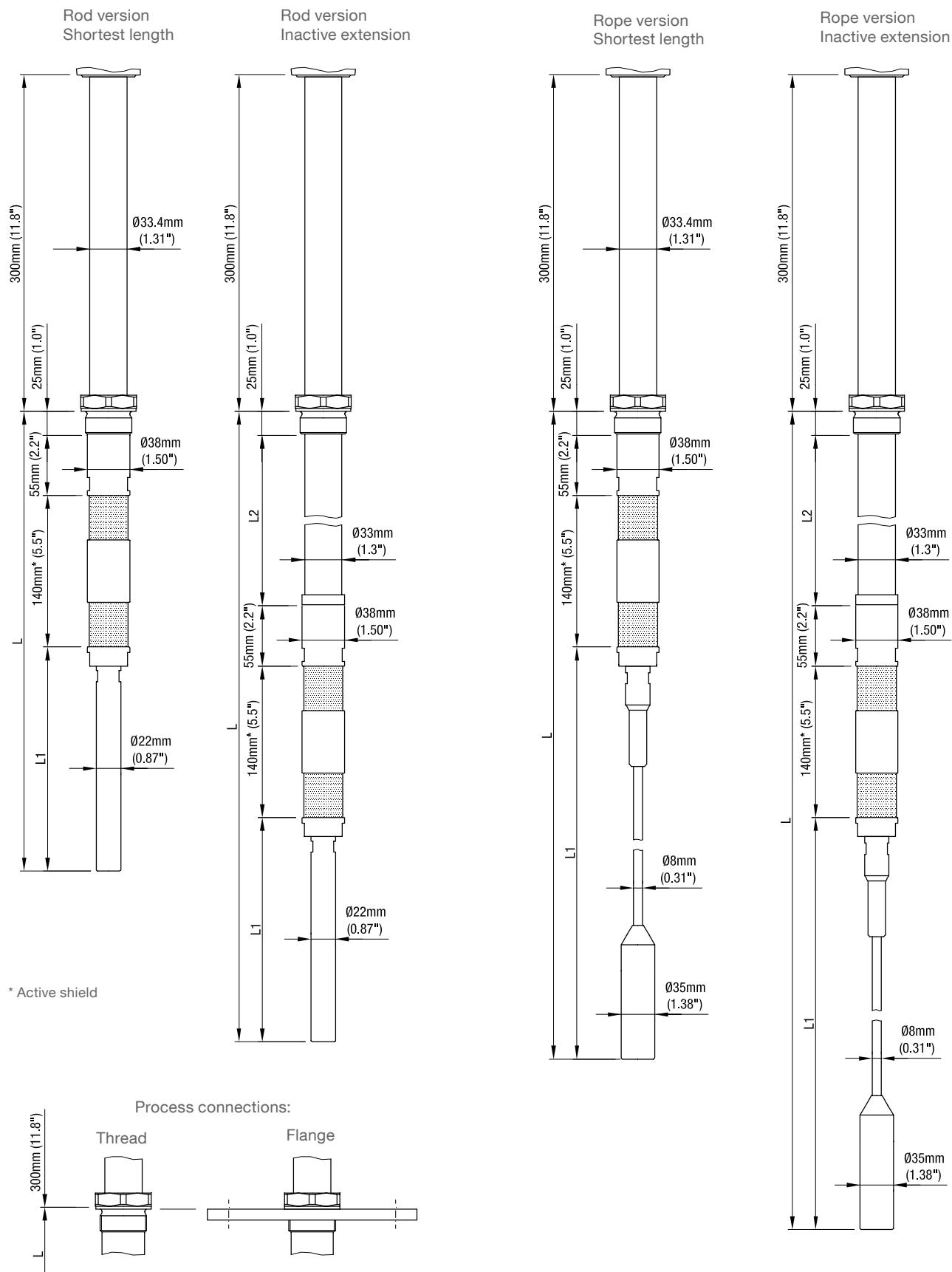
* Active shield

Process connections:



Dimensions

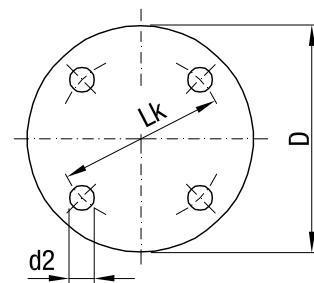
RF 3300 High temperature version



Dimensions

Flanges

Code	type	number of holes	d2	Lk	D	T (thickness)
L	Flange DN100 PN6	4	18 mm (0.71")	170 mm (6.69")	210 mm (8.27")	16 mm (0.63")
M	Flange DN100 PN16	8	18 mm (0.71")	180 mm (7.09")	220 mm (8.66")	20 mm (0.79")
S	Flange 2" 150lbs	4	19.1 mm (0.75")	120.7 mm (4.75")	152.4 mm (6.01")	19.1 mm (0.75")
T	Flange 3" 150lbs	4	19.1 mm (0.75")	152.4 mm (6.01")	190.5 mm (7.5")	23.9 mm (0.94")
U	Flange 4" 150lbs	8	19.1 mm (0.75")	190.5 mm (7.5")	228.6 mm (9.0")	23.9 mm (0.94")



Detailed Ex-markings

Compact version (without pos.12 x)

pos.2	Certificate	Housing	
0	CE	Standard	
W	ATEX II 1/2D	Ex ia/tb IIIC T! Da/Db	Standard
R	ATEX II 2G ATEX II 1/2D	Ex db eb ia IIC T! Gb and Ex ia/tb IIIC T! Da/Db	de
T	ATEX II 2G ATEX II 1/2D	Ex db ia IIC T! Gb and Ex ia/tb IIIC T! Da/Db	d
A	IEC	Ex ia/tb IIIC T! Da/Db	Standard
C	IEC	Ex db eb ia IIC T! Gb and Ex ia/tb IIIC T! Da/Db	de
D	IEC	Ex db ia IIC T! Gb and Ex ia/tb IIIC T! Da/Db	d
M	FM/ FMc	General purpose	Standard
N	FM	Cl. II, III Div.1 Gr. E,F,G	Standard
U	FM	XP-IS Cl. I,II,III Div.1 Gr. B-G and Cl. I Zone 1 Gr. IIB+H2 and DIP-IS Cl. II; III Div.1 Gr. E,F,G	d
E	TR-CU	Ex ia/tb IIIC T! Da/Db X	Standard
K	TR-CU	1Ex de ia IIC T! Gb X and Ex ia/tb IIIC T! Da/Db X	de
L	TR-CU	1Ex d ia IIC T! Gb X and Ex ia/tb IIIC T! Da/Db X	d

Remote Version (with pos.12 x)

pos.2	Certificate electronic housing	Electronic housing	Certificate Probe/ Probe housing		
0	CE/ TR-CU	Standard	CE/ TR-CU		
W	ATEX II 2D	Ex tb [ia Da] IIIC T! Db	Standard	ATEX II 1/2D	Ex ia/tb IIIC T! Da/Db
R	ATEX II 2G ATEX II 2D	Ex db eb [ia Ga] IIC T! Gb and Ex tb [ia Da] IIIC T! Db	de	ATEX II 2G ATEX II 1/2D	Ex ia IIC T! Gb and Ex ia/tb IIIC T! Da/Db
T	ATEX II 2G ATEX II 2D	Ex db [ia Ga] IIC T! Gb and Ex tb [ia Da] IIIC T! Db	d		
A	IEC	Ex tb [ia Da] IIIC T! Db	Standard	IEC	Ex ia/tb IIIC T! Da/Db
C	IEC	Ex db eb [ia Ga] IIC T! Gb and Ex tb [ia Da] IIIC T! Db	de	IEC	Ex ia IIC T! Gb and Ex ia/tb IIIC T! Da/Db
D	IEC	Ex db [ia Ga] IIC T! Gb and Ex tb [ia Da] IIIC T! Db	d		
M	FM/ FMc	General purpose	Standard	-	
N	FM	Cl. II, III Div.1 Gr. E,F,G	Standard	FM	DIP-IS Cl. II, III Div.1 Gr. E,F,G
U	FM	XP-IS Cl. I,II,III Div.1 Gr. B-G and Cl. I Zone 1 Gr. IIB+H2 and DIP-IS Cl. II; III Div.1 Gr. E,F,G	d	FM	IS Cl. I Div.1 Gr. B,C,D and Cl. I Zone 1 Gr. IIB+H2 and DIP-IS Cl. II, III Div.1 Gr. E,F,G
E	TR-CU	Ex tb [ia] IIIC T! Db X	Standard	TR-CU	Ex ia/tb IIIC T! Da/Db X
K	TR-CU	1Ex de [ia] IIC T! Gb X and Ex tb [ia] IIIC T! Db X	de	TR-CU	1Ex ia IIC T! Gb X and Ex ia/tb IIIC T! Da/Db X
L	TR-CU	1Ex d [ia] IIC T! Gb X and Ex tb [ia] IIIC T! Db X	d		

Electrical installation

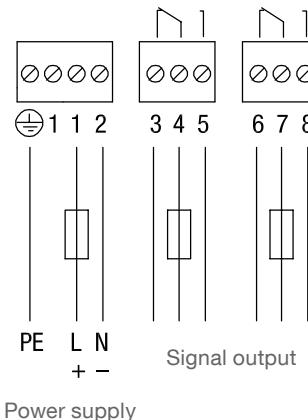
Universal voltage

Relay DPDT

Power supply:

21 .. 230 V 50/60 Hz or DC ±10%
1.5 VA or 1.5 WFuse on power supply:
max. 10 A, 250 V, HBC, fast or slow

Signal output:

Floating relay DPDT
AC max. 250 V, 8 A, non inductive
DC max. 30 V, 5 A, non inductiveFuse on signal output:
max. 10 A, 250 V, HBC, fast or slow

Power supply

Spare parts

Minimum order value for separate orders of spare parts or accessories is 75 €.

Fitting to unit/ model code	Description see page	Spare part Article number
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Electronics

Universal voltage, Relais DPDT	pos.3 L	7, 9, 11	pl407100
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Remote version

Remote cable (special Triaxial cable), price per 1,000 mm (39.4")	pos.13 x	12, 14	zu400700
Angle bracket, 1.4301 (304)	pos.14 x	12, 14	zu400701

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Rod extension kit, rigid

For ø10 mm (ø0.39") rod, length 400 mm (15.7"), 1.4404 (316L)	pos.19 a	12, 14	zu400710
For ø22 mm (ø0.87") rod, length 400 mm (15.7"), 1.4404 (316L)	pos.19 b	12, 14	zu400711

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Rod extension kit, flexible (pendulum rod)

For ø10 mm (ø0.39") rod, length 1.000 mm (39.4"), 1.4301/ 1.4305 (304/303)	pos.20 a	12, 14	zu400720
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Rope extension kit

For ø10 mm (ø0.39") rod, rope ø4 mm (ø0.16"), length 2,000 mm (78.7"), 1.4301/ 1.4305 (304/303)	pos.21 a	12, 14	zu400730
For ø10mm (ø0.39") rod, rope ø4 mm (ø0.16"), length 2,000 mm (78.7"), 1.4404 (316L)/ rope 1.4401(316)	pos.21 b	12, 14	zu400731
For ø22 mm (ø0.87") rod, rope ø8 mm (ø0.31"), length 2,000 mm (78.7"), 1.4404 (316L)/ rope 1.4401(316)	pos.21 c	12, 14	zu400732

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Single parts for rope version

Rope ø4 mm (ø0.16"), 1.4401 (316), not coated, price per 1,000 mm (39.4")	RF 3100	18	zu400740
Rope ø4 mm (ø0.16"), 1.4401 (316), coated, price per 1,000 mm (39.4")	RF 3100	18	zu400741
Rope weight ø22 mm (ø0.87"), 1.4301/ 1.4305 (304/ 303) *	RF 3100	18	zu400742
Rope weight ø22 mm (ø0.87"), 1.4404 (316L) *	RF 3100	18	zu400743
Rope holder ø22 mm (ø0.87"), 1.4301/ 1.4305 (304/303) *	RF 3100	18	zu400744
Rope holder ø22 mm (ø0.87"), 1.4404 (316L) *	RF 3100	18	zu400745
Rope ø8 mm (ø0.31"), 1.4401 (316), not coated, price per 1,000 mm (39.4")	RF 3200, RF 3300	19, 20	zu400746
Rope weight ø35 mm (ø1.38"), 1.4301/ 1.4305 (304/ 303) *	RF 3200, RF 3300	19, 20	zu400747
Rope weight ø35 mm (ø1.38"), 1.4404 (316L) *	RF 3200, RF 3300	19, 20	zu400748
Rope holder ø22 mm (ø0.87"), 1.4301/ 1.4305 (304/ 303) *	RF 3200, RF 3300	19, 20	zu400749
Rope holder ø22 mm (ø0.87"), 1.4404 (316L) *	RF 3200, RF 3300	19, 20	zu400750

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*delivery including fixing parts

Hexagon nut

G 1½" 1.4305 (303)	pos.27	13, 15	zu300180
G 1¼" 1.4305 (303)	pos.27	13, 15	zu300181
G 1" 1.4305 (303)	pos.27	13, 15	zu200160
G ¾" 1.4305 (303)	pos.27	13, 15	zu200140
M32 x 1.5 1.4305 (303)	pos.27	13, 15	zu200130
M30 x 1.5 1.4305 (303)	pos.27	13, 15	zu200180

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Weather protection cover

For standard housing	pos.32 x	13, 16	zu300232
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RFnivo® 8000

Capacitance Level Switch

Capacitive level detection for all kinds of liquids.
Accurate results even in difficult applications.



RFnivo® 8000

Inverse Frequency Shift Technology



- Digital electronics with integrated display and operating menu, programmable
- Potted electronics, "Active Shield Technology" against material build-up ensures high functional safety
- Robust design, PFA isolation for high chemical resistance

Applications: RFnivo® 8000 is suitable for liquids, pastes, foam and slurry as well as for interface measurement.

RF 8100 Standard Rod

Full, demand, empty detector
Version with rod extension,
Sliding sleeve option,
Vertical, horizontal and oblique
installation



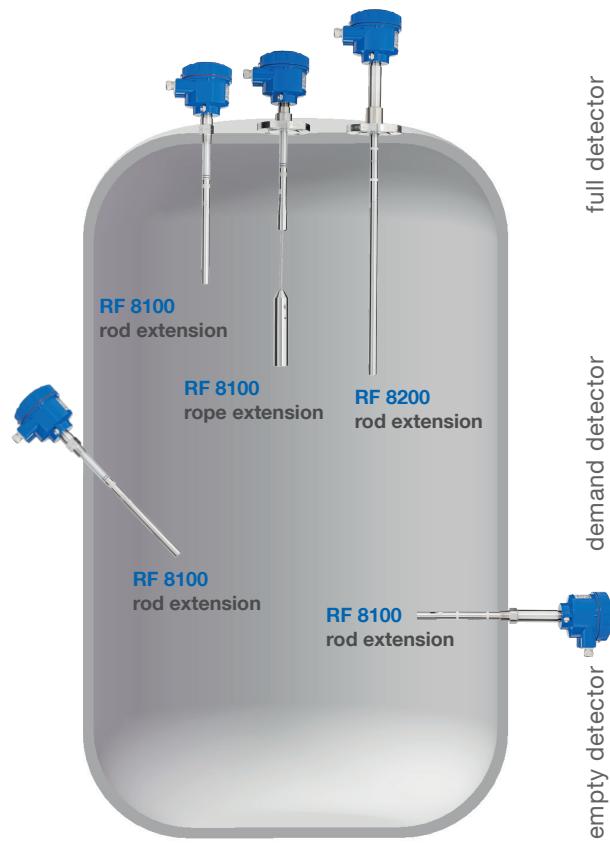
RF 8100 Standard Rope

Full, demand, empty detector
Version with rope extension,
Up to 25m,
Vertical installation



RF 8200 Temp. Rod

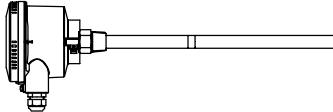
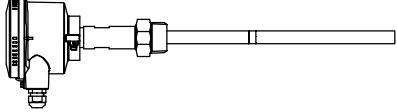
Full, demand, empty detector
Version with rod extension,
Sliding sleeve option,
Vertical, horizontal and oblique
installation



Technical Data

Housing	Aluminium powder coated, IP68/NEMA 4	
Certificates	ATEX, FM/CSA, TR-CU, INMETRO, WHG, Lloyd's	
Shaft length	Rod version	max. 1m
Process temp. range	Rope version (-40°F to +752°F)	
Pressure range	-40°C to +400°C (-40°F to +752°F)	
Sensitivity	-1 to +35 bar (-14,5 to +507,6 psi) DK value ≥1.5	
Supply voltage	12..250V AC/DC 12..30V DC Profibus PA	
Process connection	≥ NPT ¾", ≥ R ¾", ≥ G ¾", range of flanges	
Process con. material	1.4404 (316L)	
Probe material	1.4404 (316L), isolation PEEK, insulation PFA, wetted seals FKM or FFKM temperature version with ceramic isolation	
Signal output	Relay switch SPDT/solid state switch, Profibus PA/solid state switch	
Signal delay	Integrated adjustable time delay of the signal output	

Table of content

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Electrical installation	14
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Subject to change.

Valid: From 01.04.2020 until 31.03.2021, unless otherwise agreed.

All dimensions in mm (inches).

By publishing this selection list all other lists become invalid.

All prices in Euro (€) or USD (\$),
excluding VAT.

We assume no liability for typing errors.

All EURO prices are EXW Betzigau,
all USD prices are EXW Memphis,
excluding packaging costs.

Different variations to those specified are possible.
Please contact our technical consultants.

Overview

- Level limit detection in liquids, slurries, foam, interfaces and solids
- Compact unit
- Wide range of applications
- No maintenance
- Full-, demand-, empty detector
- Extended rod version or rope version
- High pressure and high temperature
- High chemical resistance on probes
- RF technology with active shield
- Sensitivity: dielectric constant ≥ 1.5
- Simple modification of probe possible on site

- Standard electronics with:
- Universal power supply
 - Solid-state switch and Relay output
- Digital electronics with:
- Communication via Profibus PA
 - Integrated Local User Interface
 - Self diagnostics
 - Multiple approvals available
 - 2011/65/EU RoHS conform

CE		
ATEX	Zone 0	Intrinsically Safe
	Zone 0/1	Flameproof
	Zone 20/21	Dust Ignition Proof or Intrinsically Safe
FM / CSA	General purp.	
	Cl. I Div. 1	Intrinsically Safe
	Cl. I Div. 1	Explosionproof
TR-CU	Cl. II, III Div. 1	Dust Ignition Proof
	Ordinary Locations, Intrinsically Safe, Flameproof, Dust Ignition Proof	
	INMETRO	
Lloyds	Flameproof, Dust Ignition Proof	
WHG	Categories ENV1, ENV2, ENV3 and ENV5	
	Overfill protection	

		Electronic module Standard	Electronic module Digital
Electronics	Supply voltage	12 .. 250 V AC/ DC (0 .. 60 Hz)	12 .. 30 V DC (24 V for IS version)
	Signal output	Relais SPDT Solid-state switch (30 V DC/ AC peak, 82 mA)	Profibus PA Solid-state switch (30 V DC/ AC peak, 82 mA)
	Signal output delay	Rise time or Fall time 1 .. 60 sec.	Rise time 0 .. 100 sec. Fall time 0 .. 100 sec.
	Failsafe	High or Low	High or Low
	User interface	Potentiometer, switches, 3 LED indicator	LCD local user interface or Profibus PA
	Diagnostics	-	Over and Under Range Electronics temperature Function check Maintenance alarm Internal electronic self check

Housing	Material	Aluminium, powder-coated
	Ingress protection	Type 4/ NEMA 4/ IP68
	Temperature extended shaft	Option for RF 8100, standard for RF 8200: Material 1.4404 (SS316L)
	Ambient temperature	-40 .. 85°C (-40 .. 185°F) With ATEX approval: -40 .. 80°C (-40 .. 176°F) with Flameproof or Dust Ignition Proof -40 .. 60°C (-40 .. 140°F) with Intrinsically safe

Overview

RF 8100 Standard version			
Mechanics and Process	Length of extension "L"	Rod Rope	350 .. 1,000 mm (13.78 .. 39.37") 550 .. 25,000 mm (19.7 .. 984.3")
	Active shield length	Threaded Flanged	125 .. 400 mm (4.92 .. 15.75") 105 .. 380 mm (4.13 .. 14.96")
	Diameter of rod/ rope	Rod Rope	ø19 mm (ø0.75") ø6 mm (ø0.3")
	Materials	Process connection Active shield area Rod Rope Rope insulation Probe isolators Wetted seals	1.4404 (SS316L) PFA coated 1.4404 (SS316L) 1.4404 (SS316L) PFA (optional) PEEK FKM or FFKM
	Process temperature	Without temperature extended shaft: -40 .. 85°C (-40 .. 185°F)	
		With temperature extended shaft: -40 .. 200°C (-40 .. 392°F)	
	Process pressure	-1 .. 35 bar g (-14.6 .. 511 psi g) nominal Observe Pressure versus Temperature Curves	
	Tensile load	max. 18.5 kN (rope version)	

Rod version
threaded



Rope version
flanged



RF 8200 High temperature version (400°C)			
Mechanics and Process	Length of extension "L"	Rod	350 .. 1,000 mm (13.78 .. 39.37")
	Active shield length	Threaded Flanged	125 .. 400 mm (4.92 .. 15.75") 105 .. 380 mm (4.13 .. 14.96")
	Diameter	Rod	ø19 mm (ø0.75")
	Materials	Process connection Rod Probe isolators Wetted seals	1.4404 (SS316L) 1.4404 (SS316L) Ceramic Graphite
	Process temperature	-40 .. 400°C (-40 .. 752°F)	
	Process pressure	-1 .. 35 bar g (-14.6 .. 511 psi g) nominal Observe Pressure versus Temperature Curves	

Rod version
Threaded



Rod version
Flanged



RF 8100 Standard version



Rod version
 (pos.5/6 0A and 8 A)



Rope version
 (pos.5/6 5D and 8 Z)

Cable entries (by default)

Depending on model selected, the following cable entries are supported (options see pos.33 on page 8):

Version:	Cable entries:
Flameproof (pos.2 T,D)	M20 x 1.5 (1x open conduit + 1x blind plug)
FM/ CSA (pos.2 M,U,P,N)	NPT 1/2" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)
All other versions	M20 x 1.5 (1x screwed cable gland + 1x blind plug)

Dimensions see page 10 - 13

Basic type

RF 8100

pos.2

Certificate (detailed Ex-markings: see page 13)

	Gas	Dust	Protection method	
0	CE ⁽⁴⁾	-	-	General purpose
Q	CE/ FM/ CSA ^(1, 4)	-	-	Flameproof, Dust Ignition Proof
T	ATEX ^(2, 4)	Zone 0/1	Zone 20/21	Intrinsically Safe
Y	ATEX ^(2, 5)	Zone 0	Zone 20/21	Dust Ignition Proof
W	ATEX ^(2, 4)	-	Zone 20/21	General purpose
M	FM/ CSA ⁽⁴⁾	-	-	Explosion Proof, Dust Ignition Proof
U	FM/ CSA ⁽⁴⁾	Cl. I Div. 1	Cl. II, III Div. 1	Intrinsically Safe
P	FM/ CSA ⁽⁵⁾	Cl. I Div. 1	Cl. II, III Div. 1	Dust Ignition Proof
N	FM/ CSA ⁽⁴⁾	-	Cl. II, III Div. 1	Flameproof, Dust Ignition Proof
D	INMETRO	Zone 1	Zone 21	

pos.3

Temperature extended shaft

- 1 without (for process temperature <85°C (185°F))
- 2 with (for process temperature >85°C (185°F))

pos.4

Electronic module

- E Standard: Relay SPDT/ Solid State 12 ... 250 V AC/ DC⁽⁶⁾
- F Digital: Profibus PA/ Solid State 12 ... 30 V DC (24 V intrinsic safe) LCD display⁽⁷⁾

pos.5+6

Process connection

- 0A Thread 3/4" NPT taper, ANSI/ASME B1.20.1⁽⁸⁾
- 0B Thread 1" NPT taper, ANSI/ASME B1.20.1⁽⁸⁾
- 0C Thread 1/4" NPT taper, ANSI/ASME B1.20.1
- 0D Thread 1 1/2" NPT taper, ANSI/ASME B1.20.1
- 1A Thread R 3/4" BSPT, EN 10226/PT (JIS-T), JIS B 0203⁽⁸⁾
- 1B Thread R 1" BSPT, EN 10226/PT (JIS-T), JIS B 0203⁽⁸⁾
- 1D Thread R 1 1/2" BSPT, EN 10226/PT (JIS-T), JIS B 0203
- 3A Thread G 3/4" BSPP, EN ISO 228-1/PF (JIS-P), JIS B 0202⁽⁸⁾
- 3B Thread G 1" BSPP, EN ISO 228-1/PF (JIS-P), JIS B 0202⁽⁸⁾
- 3D Thread G 1 1/2" BSPP, EN ISO 228-1/PF (JIS-P), JIS B 0202

RF 8100 Standard version

5A	Flange 1"	150 lbs	ASME B16.5, raised face ⁽⁸⁾	●
5B	Flange 1"	300 lbs	ASME B16.5, raised face ⁽⁸⁾	●
5C	Flange 1"	600 lbs	ASME B16.5, raised face ⁽⁸⁾	●
5D	Flange 1½"	150 lbs	ASME B16.5, raised face	●
5E	Flange 1½"	300 lbs	ASME B16.5, raised face	●
5F	Flange 1½"	600 lbs	ASME B16.5, raised face	●
5G	Flange 2"	150 lbs	ASME B16.5, raised face	●
5H	Flange 2"	300 lbs	ASME B16.5, raised face	●
5J	Flange 2"	600 lbs	ASME B16.5, raised face	●
5K	Flange 3"	150 lbs	ASME B16.5, raised face	●
5L	Flange 3"	300 lbs	ASME B16.5, raised face	●
5M	Flange 3"	600 lbs	ASME B16.5, raised face	●
5N	Flange 4"	150 lbs	ASME B16.5, raised face	●
5P	Flange 4"	300 lbs	ASME B16.5, raised face	●
5Q	Flange 4"	600 lbs	ASME B16.5, raised face	●
6A	Flange DN25, PN16	EN 1092-1 type A flat faced ⁽⁸⁾		●
6B	Flange DN25, PN40	EN 1092-1 type A flat faced ⁽⁸⁾		●
6C	Flange DN40, PN16	EN 1092-1 type A flat faced		●
6D	Flange DN40, PN40	EN 1092-1 type A flat faced		●
6E	Flange DN50, PN16	EN 1092-1 type A flat faced		●
6F	Flange DN50, PN40	EN 1092-1 type A flat faced		●
6G	Flange DN80, PN16	EN 1092-1 type A flat faced		●
6H	Flange DN80, PN40	EN 1092-1 type A flat faced		●
6J	Flange DN100, PN16	EN 1092-1 type A flat faced		●
6K	Flange DN100, PN40	EN 1092-1 type A flat faced		●
pos.8	Length of extension "L"			
	A	Rod, 350 mm (13.78")		●
	B	Rod, 500 mm (19.69")		●
	C	Rod, 750 mm (29.53")		●
	D	Rod, 1,000 mm (39.37")		●
Y	Rod, "L"= customer specified			
	Price per 100 mm (3.94") of part thereof (starting from 0 mm)			
	min. 250 mm (9.8"), max. 999 mm (39.3")			
P	Rope, 3,000 mm (118.11"), length can be shortened by customer			
	Q Rope, 6,000 mm (236.22"), length can be shortened by customer			
Z	Rope, "L"= customer specified			
	Base price			
	Price per 100 mm (3.94") of part thereof (starting from 0 mm)			
pos.9	min. 550 mm (19.7"), max. 25,000 mm (984.3")			
	Active Shield length			
	A	125 mm threaded/ 105 mm flanged		●
pos.10	B	250 mm threaded/ 230 mm flanged ⁽⁹⁾		●
	C	400 mm threaded/ 380 mm flanged ⁽¹⁰⁾		●
	Material of process connection and extension "L"			
2	Stainless steel 1.4404 (316L), isolation parts PEEK, active shield coated with PFA			
	3 Stainless steel 1.4404 (316L), isolation parts PEEK, active shield and rope coated with PFA ⁽¹¹⁾			

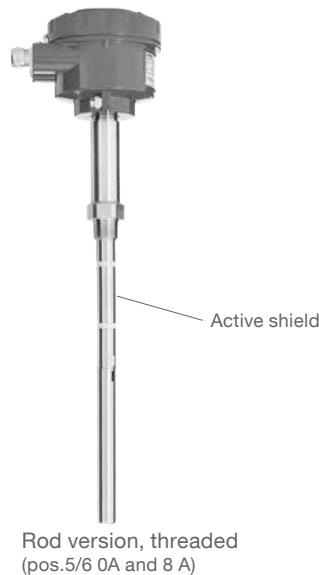
Further options: see page 8

- (1) Included is: TR-CU (Ordinary Locations)
- (2) Included is: TR-CU
- (4) Included is: Lloyds
- (5) Intrinsically safe barrier required
- (6) Not available in combination with Intrinsically safe pos.2 Y,P
- (7) Not available with certificate Lloyds
- (8) Not available with rope version (pos.8 P,Q,Z)
- (9) Available with Length of extension "L": Rod min. 500 mm (19.69"), Rope min. 1,000 mm (39.37")
- (10) Available with Length of extension "L": Rod min. 750 mm (29.53"), Rope min. 1,000 mm (39.37")
- (11) Available only with rope version (pos.8 P,Q,Z)

RF 8100	A				1				L = mm	←	Order code
Position	1	2	3	4	5+6	7	8	9	10		

All positions are available with special design (use code "Z").

RF 8200 High temperature version (400°)

Rod version, threaded
(pos.5/6 0A and 8 A)Rod version, flanged
(pos.5/6 5D and 8 Y)**Dimensions** see page 10**Cable entries** (by default)

Depending on model selected, the following cable entries are supported (options see pos.33 on page 8):

Version:	Cable entries:
Flameproof (pos.2 T,D)	M20 x 1.5 (1x open conduit + 1x blind plug)
FM/ CSA (pos.2 M,U,P,N)	NPT 1/2" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)
All other versions	M20 x 1.5 (1x screwed cable gland + 1x blind plug)

Basic type**RF 8200**

pos.2

Certificate (detailed Ex-markings: see page 13)

	Gas	Dust	Protection method	
0	CE ⁽⁴⁾	-	-	General purpose
Q	CE/ FM/ CSA ^(1, 4)	-	-	Flameproof, Dust Ignition Proof
T	ATEX ^(2, 4)	Zone 0/1	Zone 20/21	Intrinsically Safe
Y	ATEX ^(2, 5)	Zone 0	Zone 20/21	Dust Ignition Proof
W	ATEX ^(2, 4)	-	Zone 20/21	General purpose
M	FM/ CSA ⁽⁴⁾	-	-	Explosion Proof, Dust Ignition Proof
U	FM/ CSA ⁽⁴⁾	Cl. I Div. 1	Cl. II, III Div. 1	Intrinsically Safe
P	FM/ CSA ⁽⁵⁾	Cl. I Div. 1	Cl. II, III Div. 1	Dust Ignition Proof
N	FM/ CSA ⁽⁴⁾	-	Cl. II, III Div. 1	Flameproof, Dust Ignition Proof
D	INMETRO	Zone 1	Zone 21	

pos.4

Electronic module

- E Standard: Relay SPDT/ Solid State 12 ... 250 V AC/ DC ⁽⁶⁾
 F Digital: Profibus PA/ Solid State 12 ... 30 V DC (24 V intrinsic safe) LCD display ⁽⁷⁾

pos.5+6

Process connection

- 0A Thread 3/4" NPT taper, ANSI/ASME B1.20.1
 0B Thread 1" NPT taper, ANSI/ASME B1.20.1
 0C Thread 1 1/4" NPT taper, ANSI/ASME B1.20.1
 0D Thread 1 1/2" NPT taper, ANSI/ASME B1.20.1
 1A Thread R 3/4" BSPT, EN 10226/PT (JIS-T), JIS B 0203
 1B Thread R 1" BSPT, EN 10226/PT (JIS-T), JIS B 0203
 1D Thread R 1 1/2" BSPT, EN 10226/PT (JIS-T), JIS B 0203
 3A Thread G 3/4" BSPP, EN ISO 228-1/PF (JIS-P), JIS B 0202
 3B Thread G 1" BSPP, EN ISO 228-1/PF (JIS-P), JIS B 0202
 3D Thread G 1 1/2" BSPP, EN ISO 228-1/PF (JIS-P), JIS B 0202

RF 8200 High temperature version (400°)

5A	Flange 1"	150 lbs	ASME B16.5, raised face	●
5B	Flange 1"	300 lbs	ASME B16.5, raised face	●
5C	Flange 1"	600 lbs	ASME B16.5, raised face	●
5D	Flange 1½"	150 lbs	ASME B16.5, raised face	●
5E	Flange 1½"	300 lbs	ASME B16.5, raised face	●
5F	Flange 1½"	600 lbs	ASME B16.5, raised face	●
5G	Flange 2"	150 lbs	ASME B16.5, raised face	●
5H	Flange 2"	300 lbs	ASME B16.5, raised face	●
5J	Flange 2"	600 lbs	ASME B16.5, raised face	●
5K	Flange 3"	150 lbs	ASME B16.5, raised face	●
5L	Flange 3"	300 lbs	ASME B16.5, raised face	●
5M	Flange 3"	600 lbs	ASME B16.5, raised face	●
5N	Flange 4"	150 lbs	ASME B16.5, raised face	●
5P	Flange 4"	300 lbs	ASME B16.5, raised face	●
5Q	Flange 4"	600 lbs	ASME B16.5, raised face	●
6A	Flange DN25, PN16		EN 1092-1 type A flat faced	●
6B	Flange DN25, PN40		EN 1092-1 type A flat faced	●
6C	Flange DN40, PN16		EN 1092-1 type A flat faced	●
6D	Flange DN40, PN40		EN 1092-1 type A flat faced	●
6E	Flange DN50, PN16		EN 1092-1 type A flat faced	●
6F	Flange DN50, PN40		EN 1092-1 type A flat faced	●
6G	Flange DN80, PN16		EN 1092-1 type A flat faced	●
6H	Flange DN80, PN40		EN 1092-1 type A flat faced	●
6J	Flange DN100, PN16		EN 1092-1 type A flat faced	●
6K	Flange DN100, PN40		EN 1092-1 type A flat faced	●
pos.8	Length of extension "L"			
	A	Rod, 350 mm (13.78") .....	.....	●
	B	Rod, 500 mm (19.69") .....	.....	●
	C	Rod, 750 mm (29.53") .....	.....	●
	D	Rod, 1,000 mm (39.37") .....	.....	●
pos.9	Y	Rod, "L"= customer specified Price per 100 mm (3.94") of part thereof (starting from 0 mm) min. 250 mm (9.8"), max. 999 mm (39.3") .....	.....	●
				●
pos.10	Active Shield length			
	A	125 mm threaded/ 105 mm flanged .....	.....	●
	B	250 mm threaded/ 230 mm flanged ⁽⁸⁾	●
	C	400 mm threaded/ 380 mm flanged ⁽⁹⁾	●
				●
pos.10	Material of process connection and extension "L"			
	4	Stainless steel 1.4404 (316L), isolation parts ceramic .....	.....	●

Further options: see page 8

- (1) Included is: TR-CU (Ordinary Locations).
- (2) Included is: TR-CU.
- (4) Included is: Lloyds.
- (5) Intrinsically safe barrier required.
- (6) Not available in combination with Intrinsically safe pos.2 Y,P.
- (7) Not available with certificate Lloyds.
- (8) Available with Length of extension "L" min. 500 mm (19.69").
- (9) Available with Length of extension "L" min. 750 mm (29.53").

RF 8200	B	2		1		4	L = mm	Order code	
Position	1	2	3	4	5+6	7	8	9	10

All positions are available with special design (use code "Z").

Options

Options

pos.11 x	Guarantee extension to 5 years	.....	•
pos.17 x	FFKM wetted seals ⁽¹⁾	•	
pos.23 x	WHG approval ⁽²⁾	•	
pos.25 x	Inspection certificate	.....	•
	Type 3.1 (EN 10204)			
pos.26 x	Manufacturer's Test Certificate	.....	•
	M to DIN 55350, Part 18 and to ISO 9000			
pos.30 x	Stainless steel tag	.....	•
	Measuring point number/ identification (max. 27 characters)			
Cable entry				
	Selection of the following options only necessary, if a deviation from default is required:			
pos.33 x	M20 x 1.5 2x screwed cable gland	⁽³⁾	•	
pos.33 e	M20 x 1.5 1x screwed cable gland + 1x blind plug	⁽⁴⁾	•	
pos.33 a	NPT 1/2" tapered ANSI B1.20.1 (1x conduit + 1x blind plug)	⁽⁵⁾	•	
Signal lamp ^(6, 9)				
pos.34 a	LED, mounted in cable gland M20 x 1.5, green	.....	•
pos.34 b	LED, mounted in cable gland M20 x 1.5, red	.....	•
Plug ^(7, 9)				
pos.35 x	Valve connector (incl. mating plug)	4-pole (incl. PE)	max. 230 V	•
pos.35 a	M12 (without mating plug)	4-pole	max. 25 V	•
pos.35 b	M12 (without mating plug)	5-pole (incl. PE)	max. 60 V	•
pos.35 c	Harting Han 4A (incl. mating plug)	5-pole (incl. PE)	max. 230 V	•
pos.36 x	Glass window in lid ⁽⁸⁾	•	

(1) Available for RF 8100. Process temperature limited to -20°C (-4°F).

(2) Available with certificate CE (pos.2 O,Q) or ATEX Flameproof (pos.2 T). Only with electronic module Standard (pos.4 E).

(3) Available for all versions except flameproof/ explosion proof version (pos.2 T,U,D).

(4) Available for FM/ CSA version (pos.2 M,P,N) except explosion proof version (pos.2 U).

(5) Available for all versions except FM/ CSA (pos.2 M,U,P,N).

(6) Available for CE (pos.2 O) and electronic module standard (pos.4 E). Not in combination with cable entries pos.33 x.

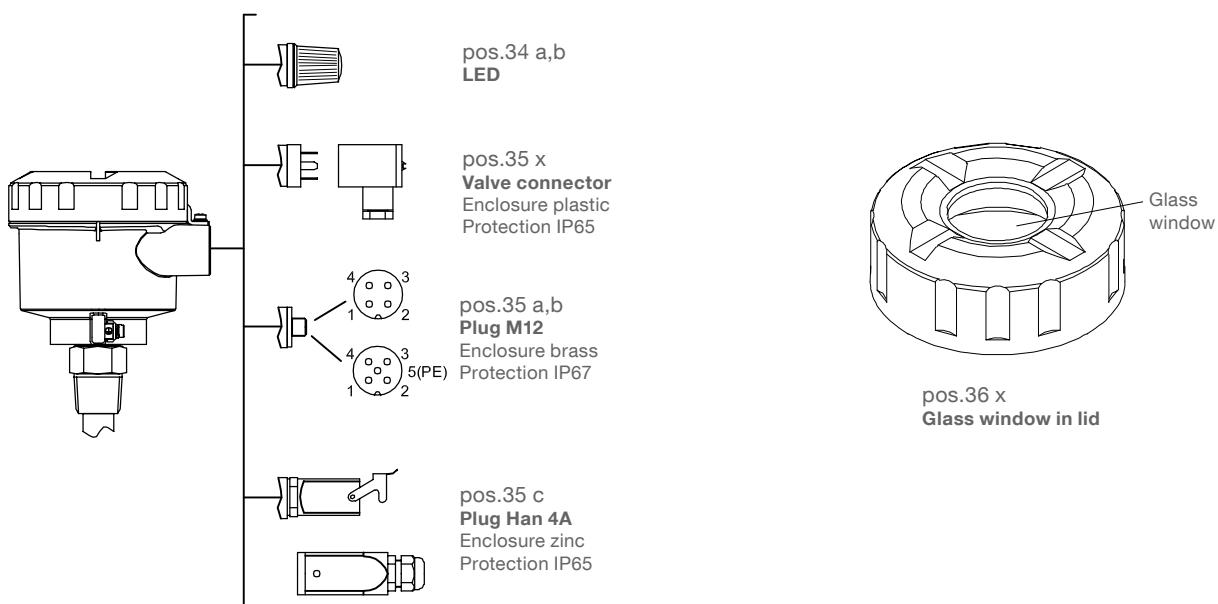
2 LED's (24V, 80-260V) will be delivered. Connection of wires to internal terminals according to customer specification.

(7) Available for CE (pos.2 O). Not in combination with cable entries pos.33 x,e,a. Connection of plug wires to internal terminals according to customer specification.

(8) Available for electronic module digital (pos.4 F).

(9) Not available with certificate Lloyds.

Options/ Accessories



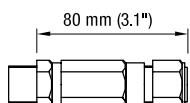
Accessories

Minimum order value for separate orders of spare parts or accessories is 75 €.

em440041 Cable gland M20 x 1.5 Ex-d

•

Cable gland M20 x 1.5 Ex-d



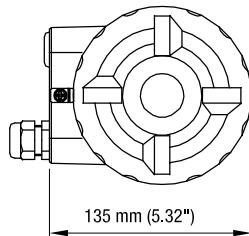
For use with version
 ATEX flameproof (pos.2 T).
 Type: Stahl T3CDS 246560

Dimensions

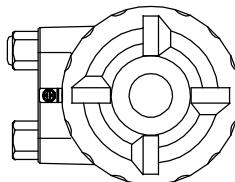
Enclosure

Top view

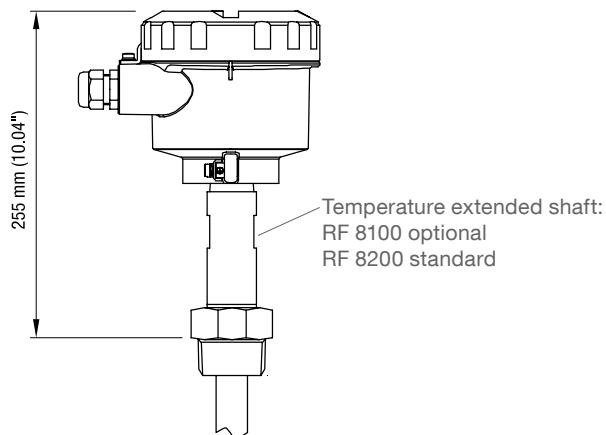
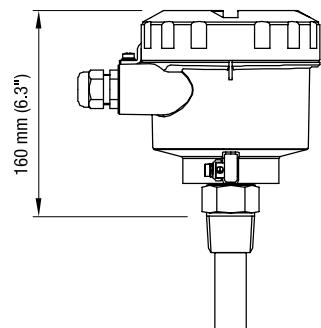
M20 x 1.5 cable gland



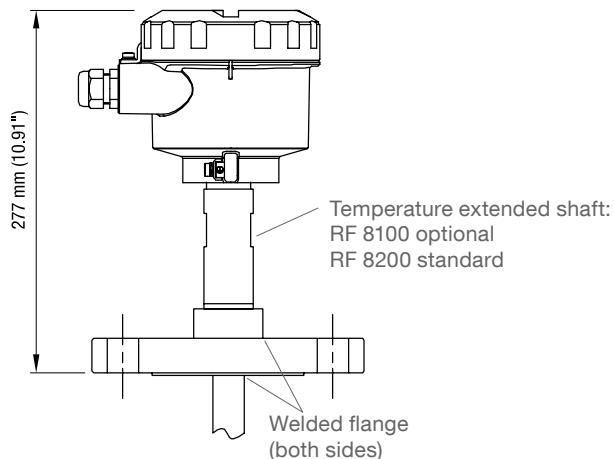
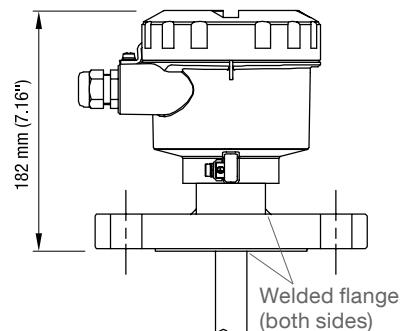
NPT 1/2" conduit



Threaded process connection



Flanged process connection

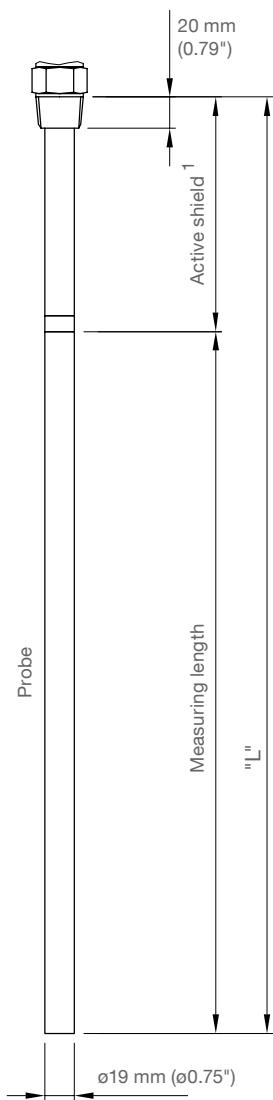


Dimensions

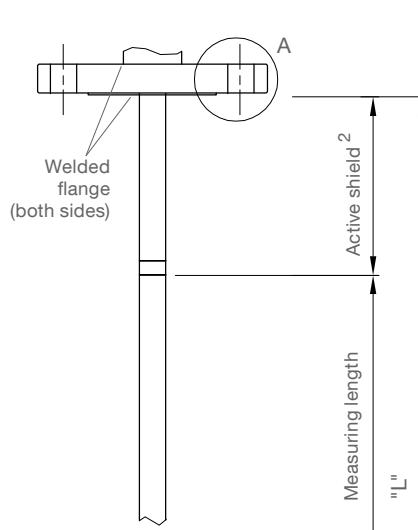
RF 8100 Rod version

RF 8200 Rod version (high temperature)

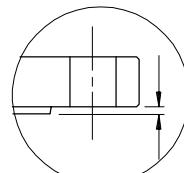
Threaded process connection



Flanged process connection



Detail "A"



"L" does not include any raised face (see page 13)

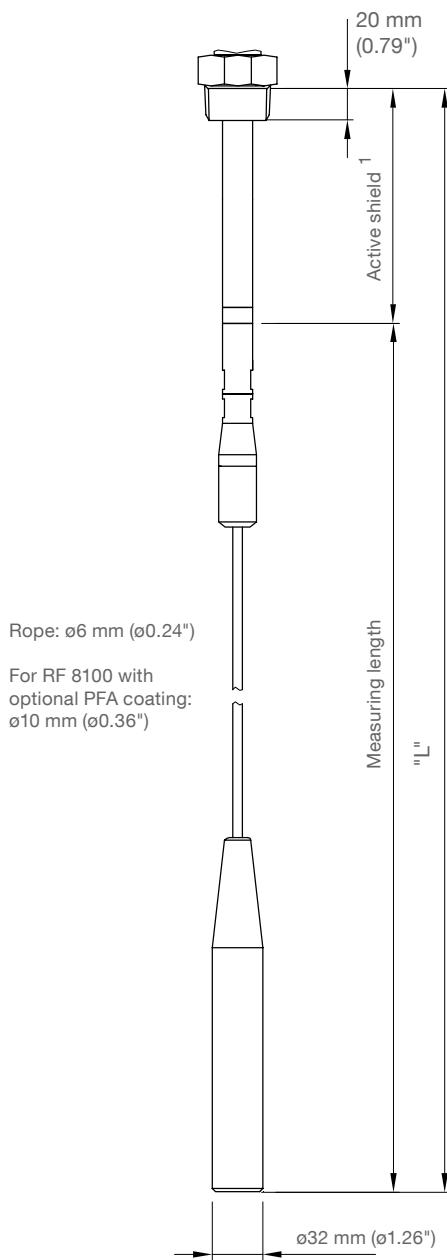
¹ For RF 8100 coated with PFA
Standard 125 mm (4.92")
Optional 250 mm (9.84") or
400 mm (15.75")

² For RF 8100 coated with PFA
Standard 105 mm (4.13")
Optional 230 mm (9.06") or
380 mm (14.96")

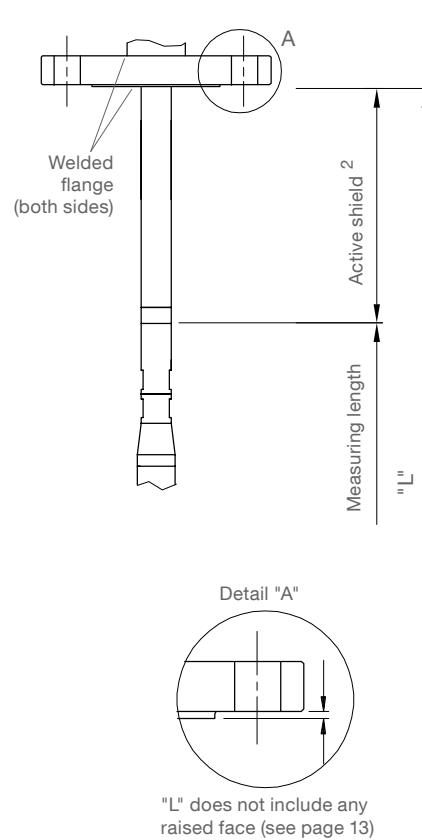
Dimensions

RF 8100 Rope version

Threaded process connection



Flanged process connection



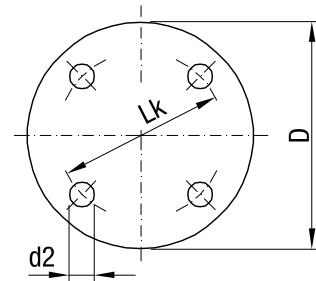
¹ Coated with PFA
 Standard 125 mm (4.92")
 Optional 250 mm (9.84") or
 400 mm (15.75")

² Coated with PFA
 Standard 105 mm (4.13")
 Optional 230 mm (9.06") or
 380 mm (14.96")

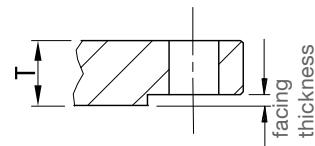
Dimensions/ Detailed Ex-markings

Flanges

	Code	Type	Number of holes	d2 mm (inch)	Lk mm (inch)	D mm (inch)	T thickness mm (inch)
ASME B16.5, raised face	5A	1" 150 lbs	4	15.9 (0.63)	79.3 (3.12)	108.0 (4.25)	14.3 (0.56)
	5B	1" 300 lbs	4	19.1 (0.75)	88.9 (3.5)	123.8 (4.87)	17.5 (0.69)
	5C	1" 600 lbs	4	19.1 (0.75)	88.9 (3.5)	123.8 (4.87)	17.5 (0.69)
	5D	1½" 150 lbs	4	15.9 (0.63)	98.6 (3.88)	127.0 (5.0)	17.5 (0.69)
	5E	1½" 300 lbs	4	22.2 (0.87)	114.3 (4.5)	155.6 (6.13)	20.6 (0.81)
	5F	1½" 600 lbs	4	22.2 (0.87)	114.3 (4.5)	155.6 (6.13)	22.4 (0.88)
	5G	2" 150 lbs	4	19.1 (0.75)	120.7 (4.75)	152.4 (6.01)	19.1 (0.75)
	5H	2" 300 lbs	8	19.1 (0.75)	127.0 (5.0)	165.1 (6.5)	22.2 (0.87)
	5J	2" 600 lbs	8	19.1 (0.75)	127.0 (5.0)	165.1 (6.5)	25.4 (1.0)
	5K	3" 150 lbs	4	19.1 (0.75)	152.4 (6.01)	190.5 (7.5)	23.9 (0.94)
	5L	3" 300 lbs	8	22.2 (0.87)	168.2 (6.62)	209.6 (8.25)	28.6 (1.13)
	5M	3" 600 lbs	8	22.2 (0.87)	168.2 (6.62)	209.6 (8.25)	31.7 (1.25)
	5N	4" 150 lbs	8	19.1 (0.75)	190.5 (7.5)	228.6 (9.0)	23.9 (0.94)
	5P	4" 300 lbs	8	22.2 (0.87)	200.0 (7.87)	254.0 (10.0)	31.7 (1.25)
	5Q	4" 600 lbs	8	25.4 (1.0)	215.9 (8.5)	273.1 (10.75)	38.1 (1.5)
EN 1092-1 type A, flat faced	6A	DN25 PN16	4	14.0 (0.55)	85.0 (3.35)	115.0 (4.53)	18.0 (0.71)
	6B	DN25 PN40	4	14.0 (0.55)	85.0 (3.35)	115.0 (4.53)	18.0 (0.71)
	6C	DN40 PN16	4	18.0 (0.71)	110.0 (4.33)	150.0 (5.91)	18.0 (0.71)
	6D	DN40 PN40	4	18.0 (0.71)	110.0 (4.33)	150.0 (5.91)	18.0 (0.71)
	6E	DN50 PN16	4	18.0 (0.71)	125.0 (4.92)	165.0 (6.5)	18.0 (0.71)
	6F	DN50 PN40	4	18.0 (0.71)	125.0 (4.92)	165.0 (6.5)	20.0 (0.79)
	6G	DN80 PN16	8	18.0 (0.71)	160.0 (6.3)	200.0 (7.87)	20.0 (0.79)
	6H	DN80 PN40	8	18.0 (0.71)	160.0 (6.3)	200.0 (7.87)	24.0 (0.94)
	6J	DN100 PN16	8	18.0 (0.71)	180.0 (7.09)	220.0 (8.66)	20.0 (0.79)
	6K	DN100 PN40	8	22.0 (0.87)	190.0 (7.48)	235.0 (9.25)	24.0 (0.94)



Raised face



Type	Facing thickness
ASME 150 lbs	2 mm (0.08")
ASME 300 lbs	7 mm (0.28")

Detailed Ex-markings

pos.2	Certificate	Protection method
T	ATEX II 1/2G ATEX II 1/2D	Ex ia/db [ia Ga] IIC T Δ Ga/Gb Ex ia/tb [ia Da] IIIC T Δ Da/Db
Y	ATEX II 1G ATEX II 1/2D	Ex ia IIC T Δ Ga Ex ia IIIC T Δ Da/Db
W	ATEX II 1/2D	Ex ia/tb [ia Da] IIIC T Δ Da/Db
U	FM/ CSA	XP-IS Class I, Div.1, Gr. A, B, C, D DIP-IS Class II, Div.1, Gr. E, F, G DIP-IS Class III T4
P	FM/ CSA	IS Class I, Div.1, Gr. A, B, C, D IS Class II, Div.1, Gr. E, F, G IS Class III T4
N	FM/ CSA	DIP-IS Class II, Div.1, Gr. E, F, G DIP-IS Class III T4
D	INMETRO	Ex d [ia Ga] IIC T6...T1 Gb Ex tb IIIC T85°C... 100°C Db IP65/IP68

Electrical installation

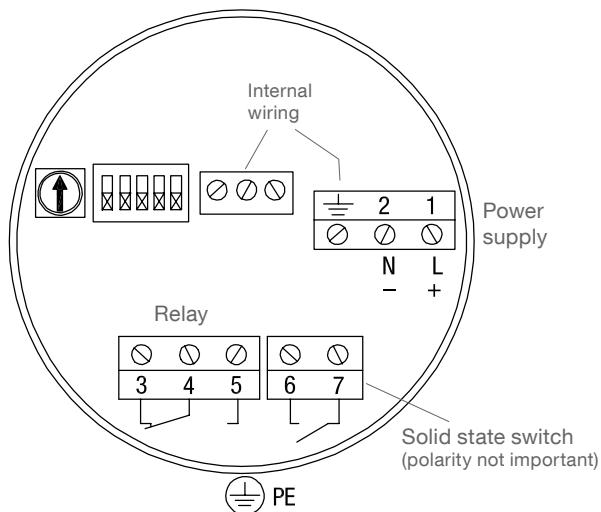
Standard

Power supply:
Relay SPDT/
Solid state switch
12 .. 250 V AC/ DC (0 .. 60 Hz)
2 W max.

Signal output:

Relay:
Floating relay SPDT
AC max. 250 V, 8 A, 2000 VA, non inductive
DC max. 30 V, 5 A, 150 W, non inductive

Solid state switch:
30 V DC or 30 V AC (peak), 82 mA
Observe protection (see below)



Digital

Power supply:
Profibus PA/
Solid state switch
12 .. 30 V DC, 12.5 mA

Intrinsically Safe:
12 .. 24 V DC, 12.5 mA

Intrinsically safe barrier required
For ATEX:
 $U_i = 24 \text{ V}$ $I_i = 380 \text{ mA}$ $P_i = 5.32 \text{ W}$ $C_i = 5 \text{ nF}$ $L_i = 10 \mu\text{H}$

For FM/ CSA:
See "Connection drawing" in the
Instruction Manual

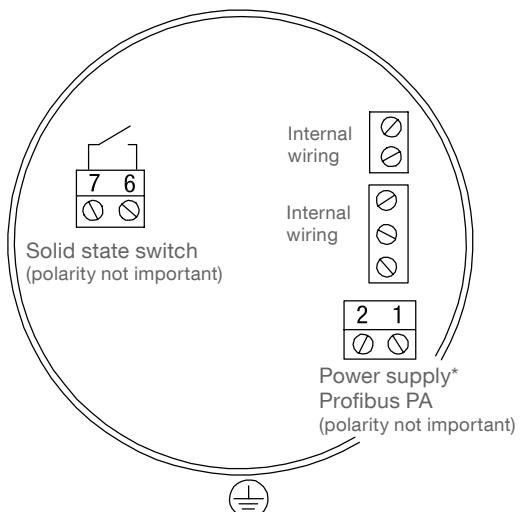
Signal output:

Solid state switch:
30 V DC or 30 V AC (peak), 82 mA
Observe protection (see below)

With Intrinsically safe:
Intrinsically safe barrier required

For ATEX: $U_i = 30 \text{ V}$ $I_i = 200 \text{ mA}$ $P_i = 350 \text{ mW}$ $C_i = 0$ $L_i = 0$

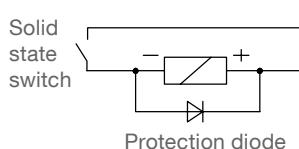
For FM/ CSA:
See "Connection drawing" in the Instruction Manual



* With use of Profibus the wiring must be according to Profibus PA standards.
If Profibus is not used, a shielded cable is recommended to ensure stable measurement.

Protection of Solid State Switch

Observe a Protection diode in case of connecting an external relay to the Solid state switch.



Spare parts

Minimum order value for separate orders of spare parts or accessories is 75 €.

Fitting to model code	Spare part Article number
-----------------------	---------------------------

Electronic module

Standard: Relay SPDT/ Solid State 12 ... 250 V AC/ DC
Digital: Profibus PA/ Solid State 12 ... 30 V DC (24 V intrinsic safe) LCD display

Electronic module Standard	For all rod versions and for rope version "L"≤5 m	pos.4 E	pl440200
Electronic module Standard	For rope version "L">>5 m	pos.4 E pos.8 Q,Z (>5 m)	pl440210
Electronic module Digital	For all rod versions and for rope version "L"≤5 m	pos.4 F	pl440220
Electronic module Digital	For rope version "L">>5 m	pos.4 F pos.8 Q,Z (>5 m)	pl440230
Internal Safety barrier (required for Ex approvals)		pos.4 E,F pos.2 T,W,U,N,D	pl440060

Rod extension kit

1.4404 (SS316L), including fixing parts. Rod can be shortened by customer.
Stated Length of extension "L" is with use of active shield length 125 mm.
If required the rod extension kit can simply be mounted on a unit where a rope extension is present.

"L"=350 mm (13.8")	Rod length=180 mm (7.1")	pos.8 A	zu440010
"L"=500 mm (19.7")	Rod length=330 mm (13.0")	pos.8 B	zu440020
"L"=750 mm (29.5")	Rod length=580 mm (22.8")	pos.8 C	zu440030
"L"=1,000 mm (39.4")	Rod length=830 mm (32.7")	pos.8 D	zu440040

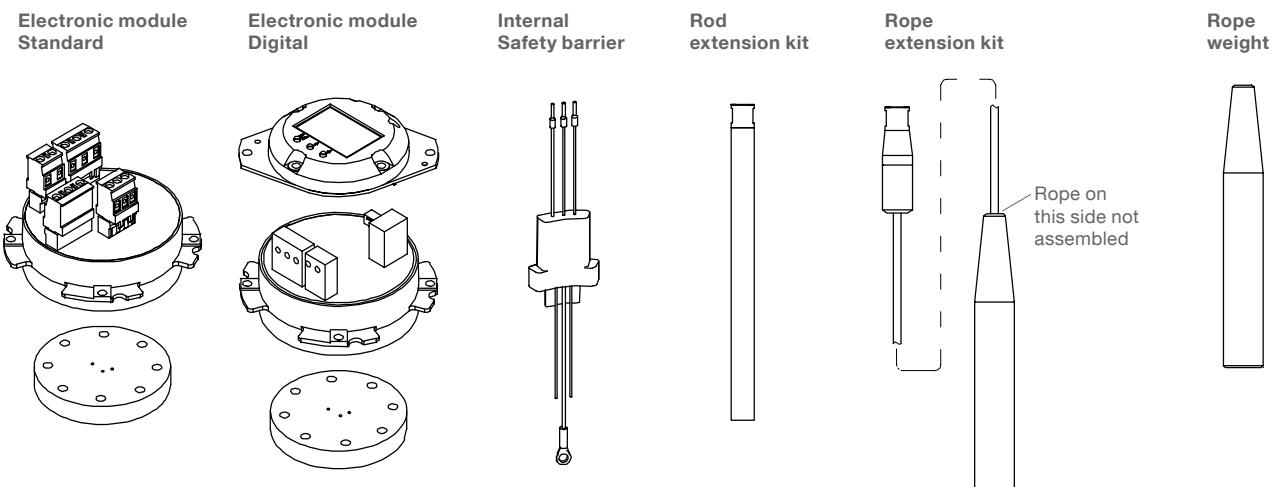
Rope extension kit

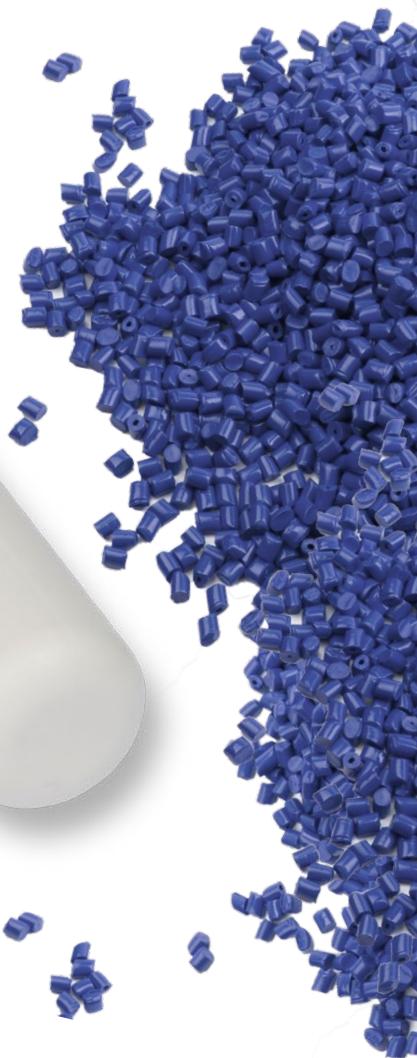
1.4404 (SS316L), including fixing parts. Rope can be shortened by customer.
Stated Length of extension "L" is with use of active shield length 125 mm.
If required the rope extension kit can simply be mounted on a unit where a rod extension is present.

"L"=1 m (39.4")	Rope not PFA coated	pos.8 P,Q,Z	pos.10 2	zu440100
"L"=5 m (197")	Rope not PFA coated	pos.8 P,Q,Z	pos.10 2	zu440110
"L"=10 m (394")	Rope not PFA coated	pos.8 P,Q,Z	pos.10 2	zu440120
"L"=20 m (787")	Rope not PFA coated	pos.8 P,Q,Z	pos.10 2	zu440130
"L"=1 m (39.4")	Rope PFA coated	pos.8 P,Q,Z	pos.10 3	zu440200
"L"=5 m (197")	Rope PFA coated	pos.8 P,Q,Z	pos.10 3	zu440210
"L"=10 m (394")	Rope PFA coated	pos.8 P,Q,Z	pos.10 3	zu440220
"L"=20 m (787")	Rope PFA coated	pos.8 P,Q,Z	pos.10 3	zu440230

Rope weight

Single part, 1.4404 (SS316L), for use with rope not PFA coated and PFA coated	pos.8 P,Q,Z	zu440350
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Capanivo® 4000

Capacitive level limit switch

Precise and reliable capacitive limit detection, constant even with varying material properties. Certified for hazardous locations (Dust Ex).



Capanivo® 4000



- Simple setup with no further adjustment necessary
- Maintenance-free, corrosion resistant, wide application range
- Versatile extensions and high temperatures (180°C)

Application: Capanivo® 4000 is certified for all solids applications with variables such as high temperature, high pressure and material residues such as flour, grain, cement, granulate, carbon black.

CN 4020

Full, demand, empty detector

Installation vertical, horizontal and oblique, also with limited space



CN 4020 / 180°C

Full, demand, empty detector

Installation vertical, horizontal and oblique



CN 4030

Full, demand, empty detector

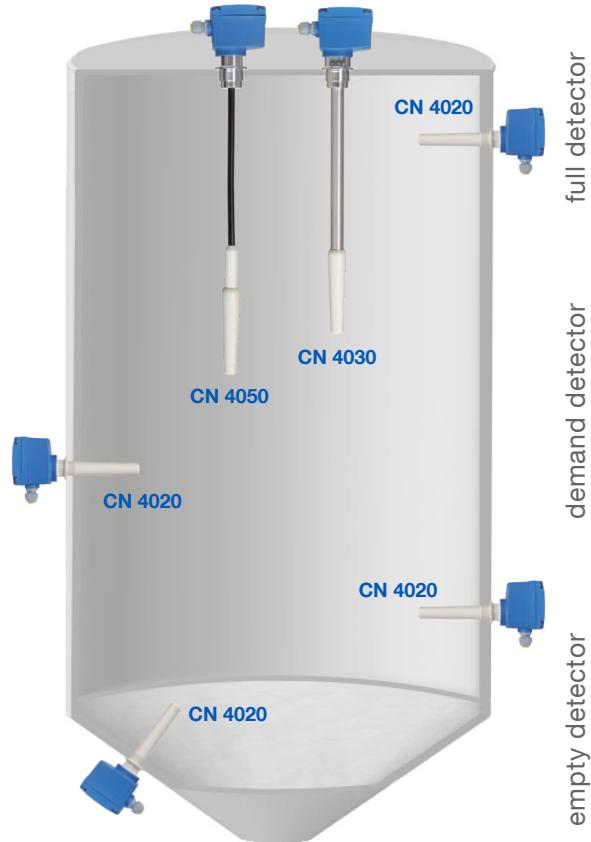
Design with pipe extension, vertical installation, sliding sleeve option



CN 4050

Full, demand, empty detector

Design with extension cable up to 6m, vertical installation



Technical Data

Housing Plastics PA 6 or Aluminum IP 66

Certificates ATEX II 1/2D, TR-CU, IEC-Ex

Process temperature - 40°C to + 180°C
(- 40°F to + 356°F)

Pressure - 1 .. +25 bar (- 14.5 .. + 363 psi)

Sensitivity DK value ≥ 1,6

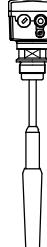
Supply voltage 21.. 27V DC Relay SPDT
21.. 230V AC/21..45V DC Relay DPDT
20.. 40V DC PNP

Process connection G 1", G 1½"
NPT 1¼", NPT 1½"

Material probe Plastics PPS, FDA listed, food grade material

Material process conn. Plastics PPS, 1.4305 (SS 303), aluminium

Table of contents

	Page
Specifications	2
Applications	4
<hr/>	
CN 4020 Short extension length	 5
<hr/>	
CN 4030 Pipe extension	 7
<hr/>	
CN 4050 Cable extension	 8
<hr/>	
Options/ accessories	9
Dimensions	11
Electrical installation	12
Spare parts	13

Subject to change.

All dimensions in mm (inches).

All prices in Euro (€) or USD (\$),
excluding VAT.

All EURO prices are EXW Betzigau,
all USD prices are EXW Memphis,
excluding packaging costs.

Valid: From 01.04.2020 until 31.03.2021, unless otherwise agreed.

By publishing this selection list all other lists become invalid.

We assume no liability for typing errors.

Different variations to those specified are possible.
Please contact our technical consultants.

Specifications

- Level limit detection in bulk goods/ solids
- Compact unit
- Wide range of applications, no maintenance
- Full-, demand-, empty detector
- Capacitive technology with active shield
- Plastic or aluminium housing
- Sensitivity: dielectric constant ≥ 1.6
- Precalibration allows measurement of most applications without calibration on site
- FSL/ FSH switch
- Output with adjustable delay
- 1935/2004/EC food grade material
- 2011/65/EU RoHS conform

Approvals	CE	
	ATEX/ IEC-Ex	Zone 20/21 (Dust Ignition Proof)
	TR-CU	Ordinary Locations Zone 20/21 (Dust Ignition Proof)

Electro-nics	Relay SPDT	21 .. 27 V DC $\pm 10\%$
	Relay DPDT	21 .. 230 V AC 21 .. 45 V DC $\pm 10\%$
	PNP	20 .. 40 V DC $\pm 10\%$

Housing	Material	Plastics PA6 (glass fibre reinforced) or Aluminium
	Type of protection	IP66

CN 4020 (version 120°C)	Length of extension	155 mm (6.1")
	Ambient temperature	-40 .. +60°C (-40 .. +140°F) -20 .. +60°C (-4 .. +140°F) (Ex)
	Process temperature	-40 .. +120°C (-40 .. +248°F) -30 .. +120°C (-22 .. +248°F) (Ex)
	Process pressure	-1 .. +25 bar (-14.5 .. +363 psi)
	Process connection	G 1" (with flat gasket) G 1½"/ NPT 1¼"/ NPT 1½" (adapter)
	Material of process connection/ probe	Plastics PPS (glass fibre reinforced) FDA listed, food grade



CN 4020 (version 180°C)	Length of extension	190 mm (7.5") or 400 mm (15.7")
	Ambient temperature	-40 .. +60°C (-40 .. +140°F)
	Process temperature	-40 .. +180°C (-40 .. +356°F) -30 .. +180°C (-22 .. +356°F) (Ex)
	Process pressure	-1 .. +16 bar (-14.5 .. +232 psi)
	Process connection	G 1½" (with flat gasket)
	Material of process connection/ extension	1.4305 (SS 303), food grade
	Material of probe	Plastics PPS (glass fibre reinforced) FDA listed, food grade



Specifications

CN 4030	Length of extension	210 .. 3,000 mm (8.3 .. 118")
	Ambient temperature	-40 .. +60°C (-40 .. +140°F) -20 .. +60°C (-4 .. +140°F) (Ex)
	Process temperature	-40 .. +110°C (-40 .. +230°F) -30 .. +110°C (-22 .. +230°F) (Ex)
	Process pressure	-1 .. +16 bar (-14.5 .. +232 psi)
	Process connection	G 1½" (with flat gasket)
	Material of process connection/ extension	Aluminium or 1.4305 (SS 303), food grade
	Material of probe	Plastics PPS (glass fibre reinforced) FDA listed, food grade



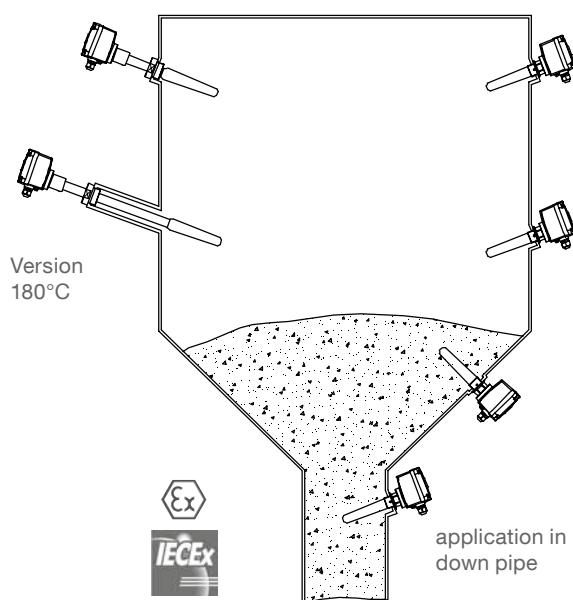
CN 4050	Length of extension	350 .. 6,000 mm (13.8 .. 236")
	Ambient temperature	-20 .. +60°C (-4 .. +140°F)
	Process temperature	-30 .. +80°C (-22 .. +176°F)
	Process pressure	-1 .. +6 bar (-14.5 .. +87 psi)
	Process connection	G 1½" (with flat gasket)
	Material of process connection	Aluminium or 1.4305 (SS 303)
	Material of cable isolation	PE, not food grade
	Material of probe	Plastics PPS (glass fibre reinforced) FDA listed, food grade



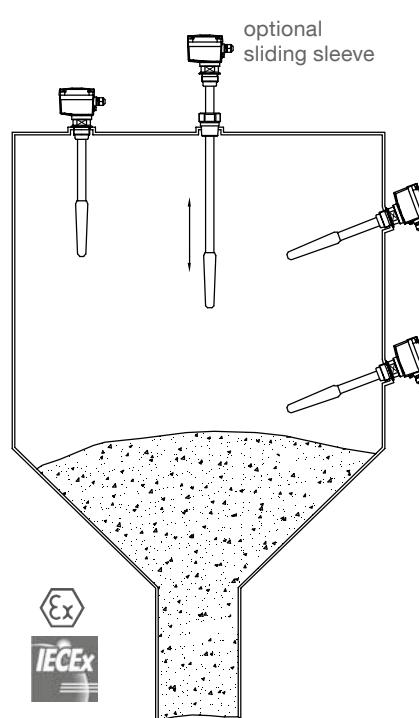
Applications

Detection of solids

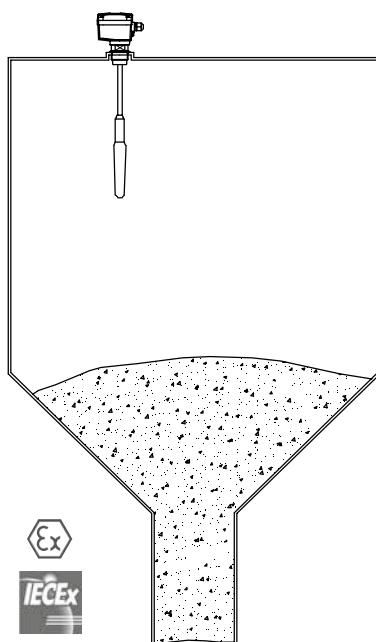
CN 4020



CN 4030



CN 4050



CN 4020 (120°C) Short extension length



Version: 120°C, G 1", L=155 mm, PPS (food grade)
Dimensions: see page 11
Cable entries: M20 x 1.5 (1x cable gland + 1x blind plug)*
Housing material: Plastics PA6*

*Options see page 9

Basic type

CN 4020 (120°C) •

pos.2	Certificate	•
0	CE ⁽¹⁾	•
W	ATEX II 1/2D	•
A	IEC-Ex ta/tb IIIC Da Db	•
E	TR-CU Ex ta/tb IIIC T! Da Db X	•

pos.4	Electronic module	•
E	Relay SPDT 21 .. 27 V DC	•
D	PNP 20 .. 40 V DC	•
L	Relay DPDT 21 .. 230 V AC 21 .. 45 V DC	•

Further options: see page 9

CN 4020	A		1		A	A	1	A	← Order code
position	1	2	3	4	5	6	7	8	

All positions are available in special design (use code "Z").

⁽¹⁾TR-CU (Ordinary Locations) included

CN 4020 (180°C) Short extension length



Version:
Dimensions:
Cable entries:
Housing material:

180°C, G 1½", 1.4305/ PPS (food grade)
 see page 11
 M20 x 1.5 (1x cable gland + 1x blind plug)*
 Plastics PA6*

*Options see page 9

Basic type

CN 4020 (180°C)

pos.2	Certificate	•
0	CE ⁽¹⁾	•
W	ATEX II 1/2D	•
A	IEC-Ex ta/tb IIC Da Db	•
E	TR-CU Ex ta/tb IIC T! Da Db X	•
pos.4	Electronic module	•
D	PNP 20..40 V DC	•
L	Relay DPDT 21..230 V AC 21..45 V DC	•
pos.7	Length of extension "L"	•
2	190 mm (7.5")	•
3	400 mm (15.7")	•

Further options: see page 9

CN 4020	A	2	B	3	3		← Order code
position	1	2	3	4	5	6	7 8

All positions are available in special design (use code "Z").

⁽¹⁾ TR-CU (Ordinary Locations) included

CN 4030 Pipe extension



Version:
Dimensions:
Cable entries:
Housing material:

G 1½", Aluminium/ 1.4305/ PPS (food grade)
 see page 11
 M20 x 1.5 (1x cable gland + 1x blind plug)*
 Plastics PA6*

*Options see page 9

Basic type

CN 4030

pos.2 **Certificate**

- | | | | |
|---|-------------------------------|-------|---|
| 0 | CE ⁽¹⁾ | | • |
| W | ATEX II 1/2D | ..... | • |
| A | IEC-Ex ta/tb IIC Da Db | ..... | • |
| E | TR-CU Ex ta/tb IIC T! Da Db X | ..... | • |

pos.4 **Electronic module**

- | | | | |
|---|---|-------|---|
| D | PNP 20 .. 40 V DC | ..... | • |
| L | Relay DPDT 21 .. 230 V AC 21 .. 45 V DC | ..... | • |

pos.6 **Material of process connection**

- | | | | |
|---|------------------------------|-------|---|
| 1 | Aluminium | ..... | • |
| 3 | Stainless steel 1.4305 (303) | ..... | • |

pos.7 **Length of extension "L"**

- | | | | |
|---|---|-------|---|
| A | 300 mm (11.8") | ..... | • |
| B | 500 mm (19.7") | ..... | • |
| C | 1,000 mm (39.4") | ..... | • |
| D | 1,500 mm (59.1") | ..... | • |
| Z | Price per 100 mm (3.94") or part thereof (starting from 0 mm)
min. 210 mm (8.3"), max. 3,000 mm (118") | | • |

pos.8 **Material of extension "L"**

- must be the same material as pos.6
- | | | | |
|---|--|-------|---|
| 1 | Aluminium (probe: plastics PPS) | ..... | • |
| 3 | Stainless steel 1.4305 (303) (probe: plastics PPS) | ..... | • |

Further options: see page 9

CN 4030	B		1		B		
position	1	2	3	4	5	6	7 8

← Order code

⁽¹⁾ TR-CU (Ordinary Locations) included

All positions are available in special design (use code "Z").

CN 4050 Cable extension



Version: G 1½", extension PE/ PPS
Dimensions: see page 11
Cable entries: M20 x 1.5 (1x cable gland + 1x blind plug)*
Housing material: Plastics PA6*

Cable length can be shortened at site

*Options see page 9

Basic type

CN 4050

pos.2

Certificate

- | | | | |
|---|------------------------------------|-------|---|
| 0 | CE ⁽¹⁾ | | • |
| W | ATEX II 1/2D | ..... | • |
| A | IEC-Ex ia/tb IIIC Da Db | ..... | • |
| E | TR-CU Ex ia/tb IIIC T135°C Da Db X | ..... | • |

pos.4

Electronic module

- | | | | |
|---|---|-------|---|
| D | PNP 20 .. 40 V DC | ..... | • |
| L | Relay DPDT 21 .. 230 V AC 21 .. 45 V DC | ..... | • |

pos.6

Material of process connection

- | | | | |
|---|------------------------------|-------|---|
| 1 | Aluminium | ..... | • |
| 3 | Stainless steel 1.4305 (303) | ..... | • |

pos.7

Length of extension "L"

- | | | | |
|---|--|-------|---|
| P | 500 mm (19.7") | ..... | • |
| Q | 1,000 mm (39.4") | ..... | • |
| R | 1,500 mm (59.1") | ..... | • |
| T | 2,500 mm (98.4") | ..... | • |
| U | 6,000 mm (236") | ..... | • |
| Z | Price per 100 mm (3.94") or part thereof (starting from 0 mm)
min. 380 mm (15.0"), max. 6,000 mm (236") | | • |

Further options: see page 9

CN 4050	D		1		B			B	←	Order code
position	1	2	3	4	5	6	7	8		

All positions are available in special design (use code "Z").

(1) TR-CU (Ordinary Locations) included

Options / Accessories

Options

pos.11 x	Guarantee extension to 5 years	.....	•
pos.21	Weather-protection cover	.....	•
	(for Ex only approved for Zone 22)			
pos.22 a	Housing material	.....	•
	Aluminium			
	Cable entry			
	Selection of the following options only necessary, if a deviation from the default cable gland is required:			
pos.23 x	M20 x 1.5 2x screwed cable gland	.....	•
pos.23 a	¹ NPT 1/2" tapered ANSI B1.20.1 (1x conduit + 1x blind plug)	.....	•
pos.24 a	Hexagon nut	.....	•
pos.24 b	aluminium 1 pcs	.....	•
pos.24 e	aluminium 2 pcs	.....	•
pos.24 f	stainless steel 1.4305 (303) 1 pcs	.....	•
pos.24 g	stainless steel 1.4305 (303) 2 pcs	.....	•
pos.25 a	Sliding sleeve	.....	•
	² For applications without overpressure			
pos.25 a	G 1½" DIN 228 material 1.4305 (303)	.....	•
pos.25 e	For applications with overpressure max. 16 bar (232 psi):			
pos.25 e	G 1½" DIN 228 material 1.4305 (303)	.....	•
pos.27 a	³ Signal lamp	.....	•
pos.27 a	LED, mounted in cable entry M20 x 1.5, green	.....	•
pos.27 c	LED, mounted in cable entry M20 x 1.5, red	.....	•
pos.35 x	⁴ Plug			
pos.35 a	Valve connector (incl. mating plug)	4-pole (incl. PE)	max. 230 V	•
pos.35 a	M12 (without mating plug)	4-pole	max. 25 V	•
pos.35 b	M12 (without mating plug)	5-pole (incl. PE)	max. 60 V	•
pos.35 c	Harting Han 4A (incl. mating plug)	5-pole (incl. PE)	max. 230 V	•
pos.36 x	⁵ Grounding	.....	•
	Without metal grounding pin inside the plastics process connection	.....	
	For applications with corrosive liquids			

¹ Available only for aluminium housing (pos.22 a).

² Available only for CE (pos.2 0)

³ Available only for CE (pos.2 0), not in combination with weather protection cover (pos.21) and cable entries pos.23 x,a,b.

For electronic module Relais DPDT (pos.4 L) 2 LED's (24V, 80-260V) will be delivered. For PNP (pos.4 D) a 24 V LED will be delivered.

⁴ Available only for CE (pos.2 0). Without connection of stranded wires for installation and internal terminals (standard) or according to customer specification.

⁵ Available only for CN4020 version 120°C.

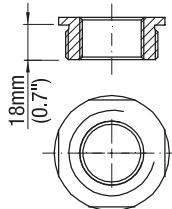
Accessories

Minimum order value for separate orders of spare parts or accessories is 75 €.

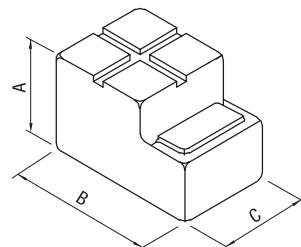
	Adapter G 1" to G 1½"		
bu400606	Aluminium	.....	•
bu400607	1.4305 (303)	.....	•
	Adapter G 1" to NPT 1½"		
bu400618	Aluminium	.....	•
bu400619	1.4305 (303)	.....	•
	Adapter G 1" to NPT 1½"		
bu400610	Aluminium	.....	•
bu400611	1.4305 (303)	.....	•
zu400200	Shortening kit for CN4050 cable	.....	•

Options / Accessories

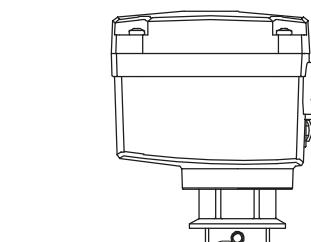
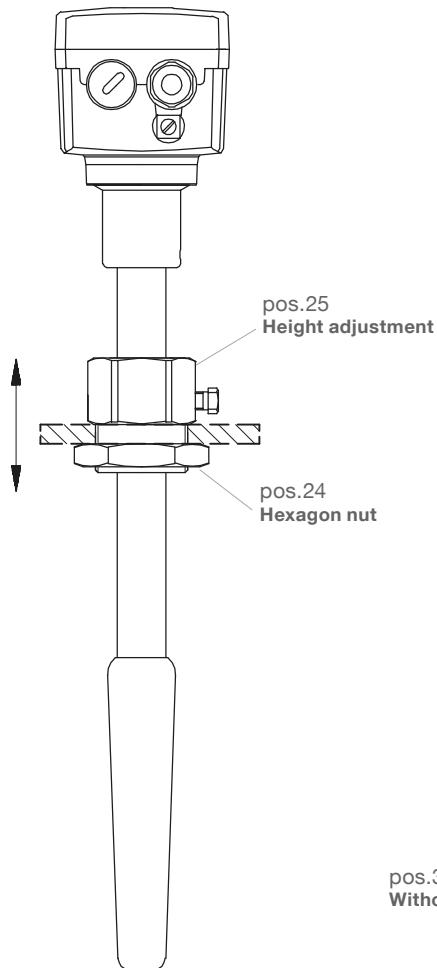
Adapter
 G 1" to G 1½"



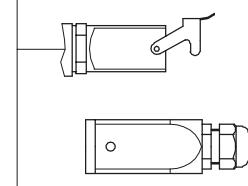
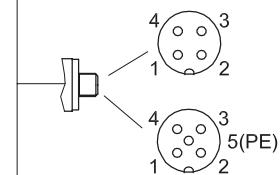
pos.21
Weather protection cover



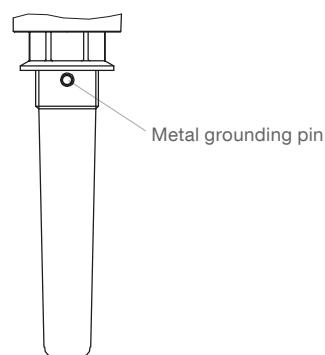
A	100 mm (3.94")
B	165 mm (6.30")
C	95 mm (3.54")



pos.35 x
Valve connector
 Enclosure plastic
 Protection IP65

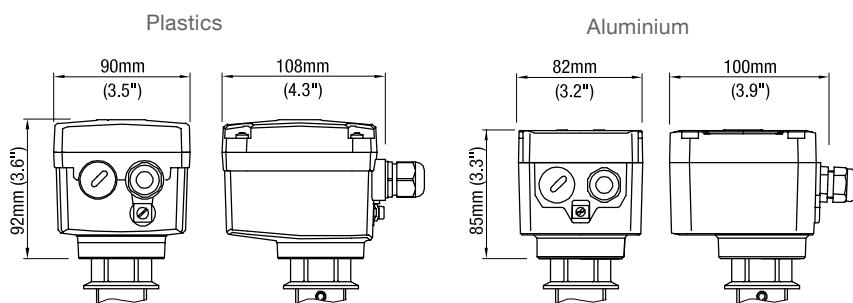


pos.36 x
Without metal grounding pin

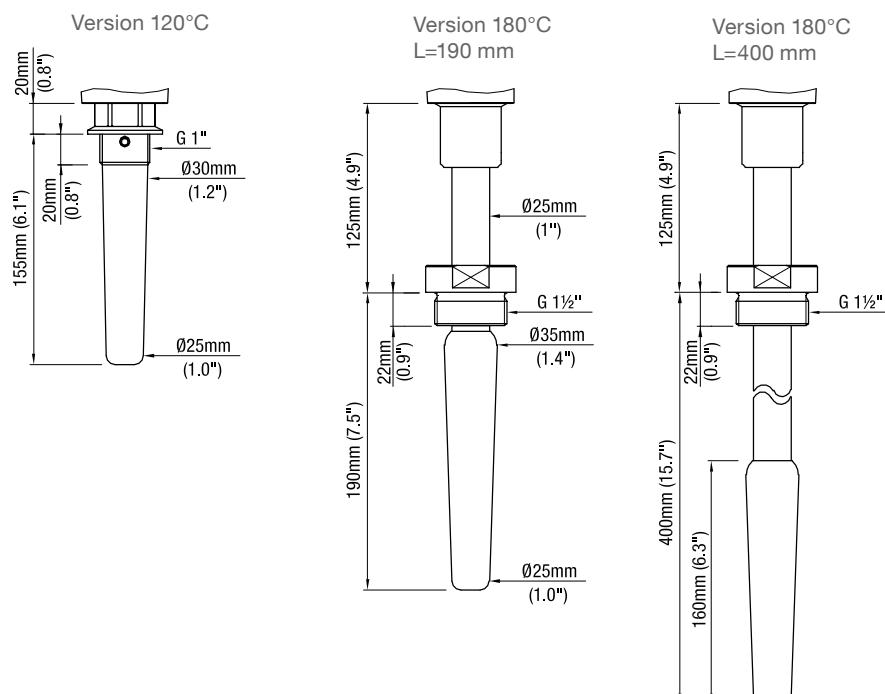


Dimensions

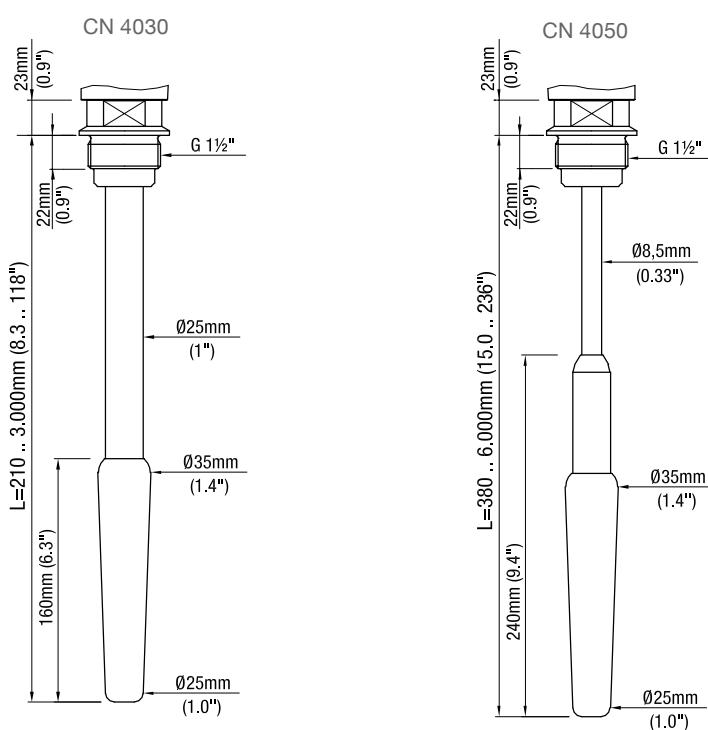
Housing versions



CN 4020



CN 4030 CN 4050



Electrical installation

Relay SPDT

Power supply:

21 .. 27 V DC $\pm 10\%^*$ 1.5 W
 *incl. 10% of EN 61010

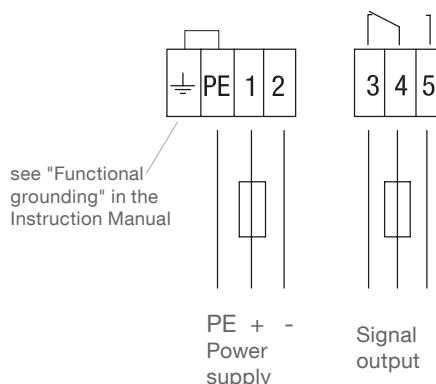
Fuse on power supply:
 max. 10 A, fast or slow, HBC, 250 V

Signal output:

Floating relay SPDT

AC max. 250 V, 3 A, non inductive
 DC max. 30 V, 5 A, non inductive

Fuse on signal output:
 max. 5 A, fast or slow, HBC, 250 V



Relay DPDT

Universal voltage

Power supply:

21 .. 230 V 50 - 60 Hz $\pm 10\%^*$ 18 VA
 21 .. 45 V DC $\pm 10\%^*$ 2 W
 *incl. 10% of EN 61010

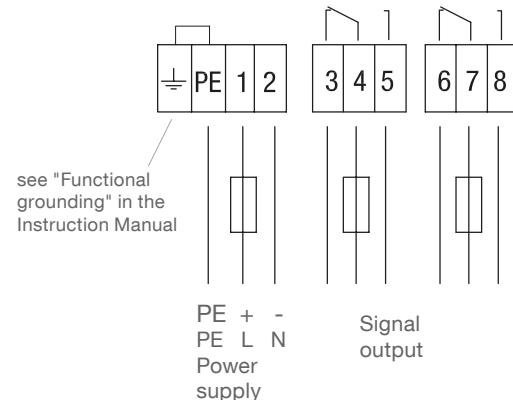
Fuse on power supply:
 max. 10 A, fast or slow, HBC, 250 V

Signal output:

Floating relay DPDT

AC max. 250 V, 8 A, non inductive
 DC max. 30 V, 5 A, non inductive

Fuse on signal output:
 max. 10 A, fast or slow, HBC, 250 V



PNP

3-wire

Power supply:

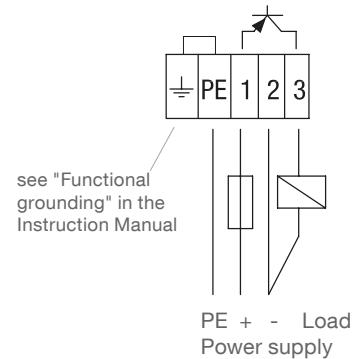
20 .. 40 V DC $\pm 10\%^*$ 0.5 A
 *incl. 10% of EN 61010

Fuse:
 max. 4 A, fast or slow, 250V, HBC

Signal output:

max. 0.4 A

Load for example:
 PLC, relay, contactor, bulb



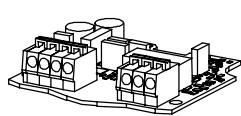
Approved power supply with reinforced insulation to mains is required

Spare parts

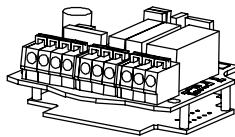
Minimum order value for spare parts or accessories is 75 €.

For type	Electronics	Article number
CN 4020 Version 120°C	Relay SPDT 21 .. 27 V DC	pl406100
	Relay DPDT 21 .. 230 V AC 21 .. 45 V DC	pl406110
	PNP 20 .. 40 V DC	pl406120
CN 4020 Version 180°C	Relay DPDT 21 .. 230 V AC 21 .. 45 V DC	pl406111
	PNP 20 .. 40 V DC	pl406121
CN 4030 CN 4050	For these types a non changeable electronic is located inside the probe. No spare parts are stated.	

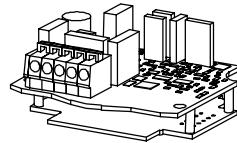
Relay SPDT



Relay DPDT



PNP





Capanivo® 7000

Capacitance Level Switch

Capacitive level detection for all kinds of liquids.

Very compact for flexible use in a variety of applications.



Capanivo® 7000

- Flexible use, compact design with threads from $\frac{3}{4}$ ", enclosure- or integral version
- Potted electronics, "Tip Sensitivity" against material build-up ensures high functional safety
- Chemical resistance, optional PVDF probe, SensGuard protective sleeve

Inverse Frequency Shift Technology



Applications: Capanivo® 7000 is suitable for liquids, pastes, foam and slurry as well as for interface measurement.

CN 7100 Enclosure Version

Full, demand, empty detector

Compact enclosure version

Vertical, horizontal and oblique installation



CN 7100 Synthetic Version

Full, demand, empty detector

Compact synthetic version

Vertical, horizontal and oblique installation

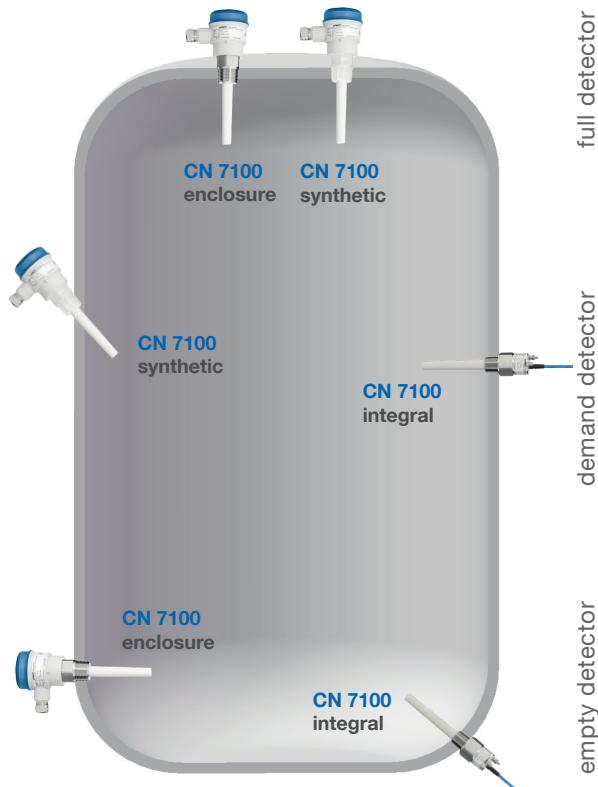


CN 7100 Integrated Cable Version

Full, demand, empty detector

Integrated cable version

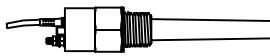
Vertical, horizontal and oblique installation



Technical Data

Housing	Enclosure version VALOX® (polyester), lid polycarbonate (PC), IP68
Certificates	ATEX, FM/CSA, TR-CU, INMETRO, WHG, Lloyd's
Process temp. range	-30°C to +100°C (-22°F to +212°F)
Pressure range	-1 to +10 bar (-14,5 to +145 psi)
Sensitivity	DK value $\geq 1,5$ adjustable with potentiometer
Supply voltage	12..33V DC
Process connection	NPT $\frac{3}{4}$ ", R 1", G 1"
Process con. material	Plastic PPS (reinforced glass fibre), FDA listed, food grade material, 316L
Probe material	Plastic PPS (reinforced glass fibre), FDA listed, food grade material, PVDF
Signal output	2-wire 4/20mA, solid state switch, relay switch

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<hr/>	
CN 7100 	3
<hr/>	
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Accessories	4
Detailed Ex-markings	4
Dimensions	5
Electrical installation	6

Subject to change.

All dimensions in mm (inches).

All prices in Euro (€) or USD (\$),
excluding VAT.

All EURO prices are EXW Betzigau,
all USD prices are EXW Memphis,
excluding packaging costs.

Valid: From 01.04.2020 until 31.03.2021, unless otherwise agreed.

By publishing this selection list all other lists become invalid.

We assume no liability for typing errors.

Different variations to those specified are possible.
Please contact our technical consultants.

Specifications

- Level limit detection in liquids, slurries, foam, interfaces and solids
- Compact unit
- Wide range of applications
- No maintenance
- Full-, demand-, empty detector
- Integral cable version or Enclosure version
- Corrosion resistant construction
- Capacitive technology
- Sensitivity: dielectric constant ≥ 1.5
- 2-wire 4/ 20 mA switch
- Non-polarized, solid-state switch or relay output
- FSL/ FSH selectable
- 2011/65/EU RoHS conform

Approvals	CE	
	ATEX	Intrinsically Safe
	FM/CSA	Intrinsically Safe
	INMETRO	Intrinsically Safe
	TR-CU	Ordinary Locations, Intrinsically Safe
	Lloyds	Categories ENV1, ENV2, ENV3 and ENV5
	WHG	Overfill protection

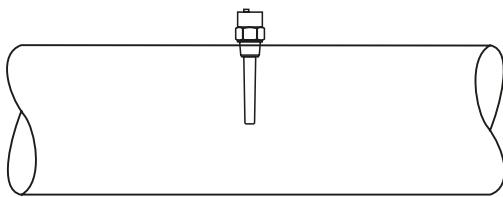
Electronics	Power supply	12 - 33 V DC ⁽²⁾
	Output	4/ 20 mA or 20/ 4 mA, 2-wire current loop detection
		Solid-state switch 30 V DC max, Relay 60 V DC or 30 V AC max ⁽²⁾

(2) Reduces values present for intrinsically safe version and for wet locations

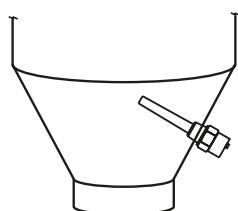
Mechanics and Process	Integral cable version	Enclosure version
	Housing/ lid	316L stainless steel
	Ingress protection	Type 4/ NEMA 4/ IP65
	Length of extension	120 mm (4.7")
	Ambient temperature	-30 .. +85°C (-22 .. +185°F) -30 .. +85°C (-22 .. +185°F) with SS process connection
	Process temperature	-30 .. +100°C (-22 .. +212°F) With ATEX approval: -30 .. +85°C (-22 .. +185°F) With PPS process connection: -10 .. +100°C (+14 .. +212°F) With stainless steel process connection: -30 .. +100°C (-22 .. +212°F) With ATEX approval: -30 .. +85°C (-22 .. +185°F)
	Process pressure	-1 .. 10 bar (146 psi) gauge, nominal
	Process connection	Stainless steel 1.4404 (316L): ¾" NPT or R 1" (BSPT) or G 1" (BSP) PPS (Fully synthetic): ¾" NPT or R 1" (BSPT)
	Material of sensor	PPS or PVDF
	Material of seal (probe)	FKM or FFKM
	Connecting cable	1 m (3.3 ft) of 4 conductor, 22 AWG, shielded, polyester jacket
		-

Applications

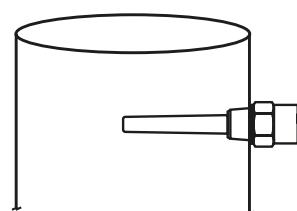
Vertical



Angle



Horizontal



CN 7100



Integral cable version



Enclosure version

Dimensions:

see page 5

Cable entries:

M20 x 1.5 (1x cable gland, attached) for Process connection R and G

NPT 1/2" (1x open conduit) for Process connection NPT

Options see page 4

Basic type

CN 7100

pos.2 **Certificate** (detailed Ex-markings: see page 4)

	Gas	Dust	Protection method
0 CE (5)	-	-	General purpose
Q CE / FM/ CSA (1, 5)	-	-	General purpose
Y ATEX/ FM/ CSA (2, 3, 5)	Zone 0 and 0/1, Cl. I Div.1	Zone 20 and 20/21, Cl. II, III, Div.1	Intrinsically Safe
B INMETRO (3)	Zone 0	Zone 21	Intrinsically Safe

pos.3 **Device version**

- 1 Integral cable
- 2 Enclosure

pos.4 **Electronic module**

- A 2-wire 4/ 20 mA, solid state or relay switch (4)

pos.5 **Material of sensor**

- A PPS
- B PVDF

pos.6 **Process connection**

- A Thread 3/4" NPT
- E Thread R 1"
- J Thread G 1"

pos.7 **Material of process connection**

- 1 PPS
- 2 Stainless steel 1.4404 (316L)

Further options: see page 4

(1) Included is: TR-CU (Ordinary Locations).

(2) Included is: TR-CU.

(3) Intrinsically safe barrier required.

(4) Implemented is relay switch with PPS (pos.7 1), solid state switch with stainless steel (pos.7 2).

(5) Included is: Lloyds.

CN 7100	A		A			
Position	1	2	3	4	5	6

← Order code

All positions are available with special design (use code "Z").

Options / Accessories

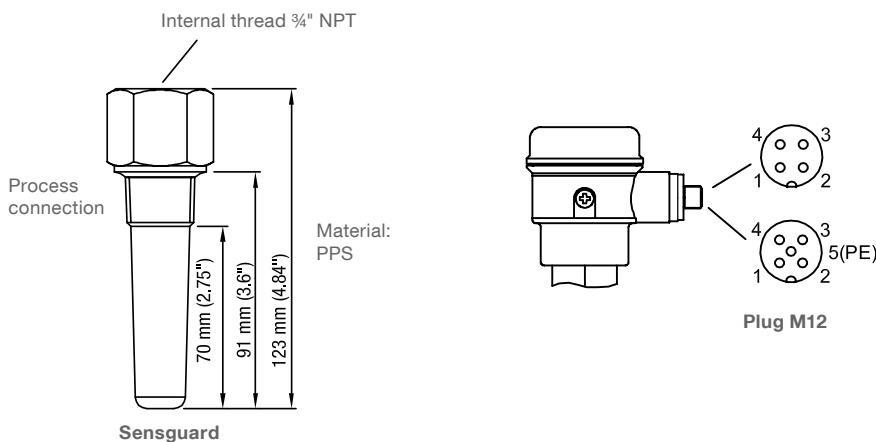
Options

- pos.11 x **Guarantee extension to 5 years** •
- pos.17 x **FFKM wetted seals** ⁽¹⁾ •
- pos.23 x **WHG approval** •
- pos.25 x **Inspection certificate** •
Type 3.1 (EN 10204)
- pos.30 x **Stainless steel tag** •
Measuring point number/ identification (max. 27 characters)
- Cable entry** ⁽²⁾
Selection of the following options only necessary, if a deviation from the default cable entry is required:
 - pos.33 x M20 x 1.5 (1x cable gland, attached) •
 - pos.33 a NPT 1/2" tapered ANSI B1.20.1 (1x open conduit) •

Accessories

Minimum order value for separate orders of spare parts or accessories is 75 €.

- cl440102 Sensguard (PPS) Process connection 3/4" NPT ⁽³⁾ •
- cl440103 Sensguard (PPS) Process connection 1" BSPT ⁽³⁾ •
- em440318 Plug M12 (without mating plug), 4-pole, max. 25 V ^(4, 5) •
- em440319 Plug M12 (without mating plug), 5-pole (incl. PE), max. 60 V ^(4, 5) •



(1) Not available with PPS process connection (pos.7 1). Ambient- and process temperature limited to -20°C (-4°F).

(2) Available with Device version Enclosure (pos.3 2).

(3) Requires unit with process connection 3/4" NPT (pos.6 A).

(4) Available for CE (pos.2 0). Connection of plug wires to internal terminals by customer.

(5) Not available with certificate Lloyds.

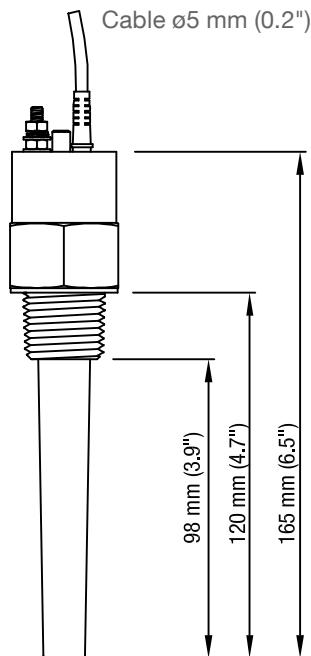
Detailed Ex-markings

Certificate

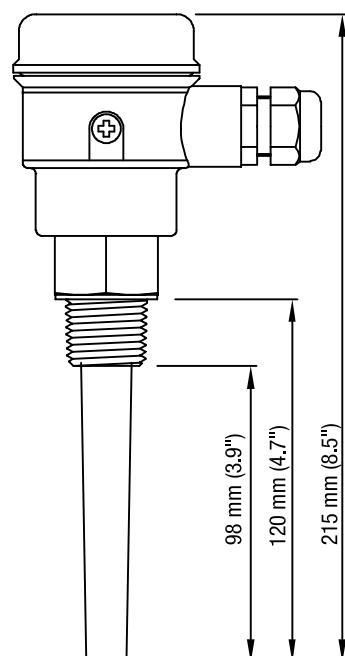
pos.2	Y	ATEX II 1 G Ex ia IIC T Δ Ga ATEX II 1/2 G Ex ia IIC T Δ Ga/Gb ATEX II 1 D Ex ia IIIC T Δ Da ATEX II 1/2 D Ex ia IIIC T Δ Da/Db FM IS Cl. I, II, III Div.1 Gr. A-G CSA Cl. I, II, III Div.1 Gr. A-G Intrinsic safe
pos.2	B	INMETRO Ex ia IIC T6 Ga, Ex tb IIIC T62 °C Db, IP68 Ta ≤ +40 °C Ex ia IIC T4 Ga, Ex tb IIIC T107 °C Db, IP68 Ta ≤ +85 °C

Dimensions

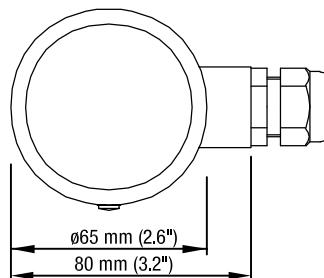
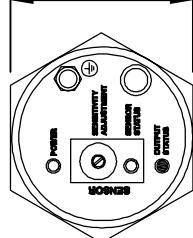
Integral Cable version



Enclosure version

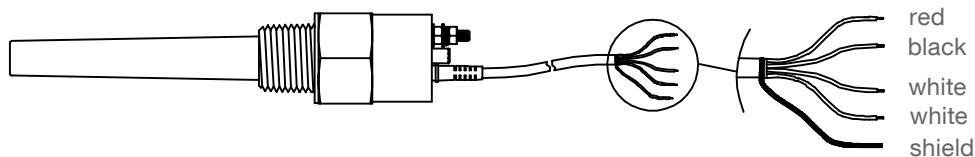


¾" NPT: 36 mm (1.4")
 R 1": 36 mm (1.4")
 G 1": 41 mm (1.6")

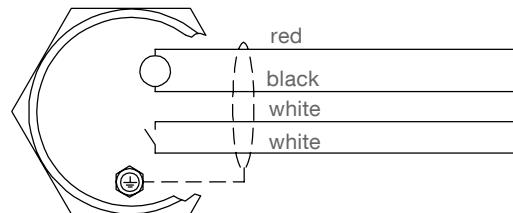


Electrical installation

Integral Cable Version



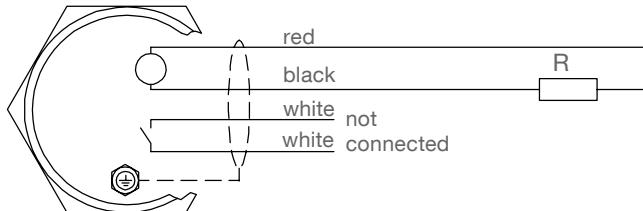
Operation with solid state switch/ relay



Shield is internal connected to ground.
It is recommended to use a shielded cable for stable measurement.

red/ black	white/ white
Supply: 12 - 33 V DC 10 - 30 V DC intrinsic safe*	Output: Solid state switch* Observe protection (see below). Max. 30 V DC/ 30 V AC, 82 mA Limited to 30 V DC/ 16 V AC, 82 mA in wet locations.
Polarity determines output logic, see table below	
* For intrinsic safe operation an intrinsic safety barrier is required. Ratings U_i I_i P_i C_i L_i see instruction manual.	

Operation with 4/ 20 mA loop



Shield is internal connected to ground.
It is recommended to use a shielded cable for stable measurement.

Supply: 12 - 33 V DC 10 - 30 V DC intrinsic safe* Polarity determines output logic, see table below
* For intrinsic safe operation an intrinsic safety barrier is required. Ratings U_i I_i P_i C_i L_i see instruction manual.

$$R_{max} = (V_{supply} - 12 V) / 20 \text{ mA}$$

Example: 24 V supply allows R_{max} of 600 Ohms

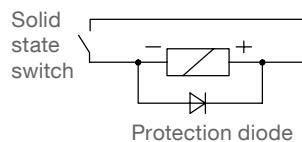
Output logic

Yellow LED	○	●		
Status	FSL	FSH	FSL	FSH
Supply polarity (cable colour)	red + black -	red - black +	red + black -	red - black +
Red LED	○	●	●	○
Solid state switch				
4/ 20 mA loop	4 mA	20 mA	20 mA	4 mA

FSL = Fail safe low FSH = Fail safe high

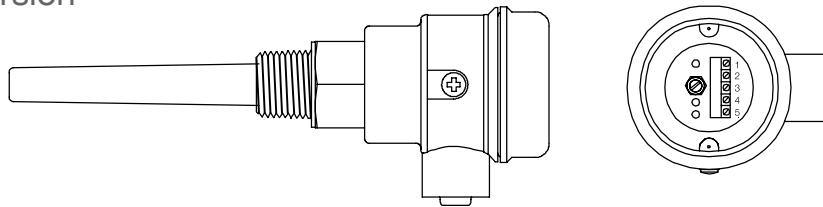
Protection of Solid State Switch

Observe a Protection diode in case of connecting an external relay to the Solid state switch

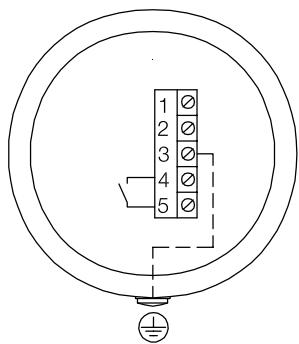


Electrical installation

Enclosure Version



Operation with solid state switch/ relay

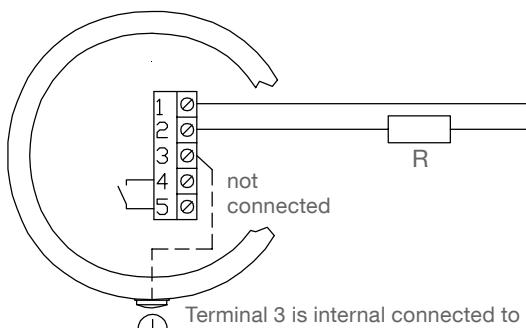


Terminal 3 is internal connected to ground. It is recommended to use a shielded cable for stable measurement.

Terminal 1, 2	Terminal 3	Terminal 4, 5
Supply: 12 - 33 V DC 10 - 30 V DC intrinsic safe* Polarity determines output logic, see table below	cable shield connection connect to ground	Output: Solid state switch * Present with stainless steel process connection. Observe protection (see below). Max. 30 V DC/30 V AC, 82 mA, limited to 30 V DC/ 16 V AC, 82 mA in wet locations

* For intrinsic safe operation an intrinsic safety barrier is required.
 Ratings U_i I_i P_i C_i L_i see instruction manual.

Operation with 4/20 mA loop



Terminal 3 is internal connected to ground.
 It is recommended to use a shielded cable for stable measurement.

$$R_{\max} = (V_{\text{supply}} - 12 \text{ V}) / 20 \text{ mA}$$

Example: 24 V supply allows R_{\max} of 600 Ohms

Supply: 12 - 33V DC 10 - 30V DC intrinsic safe* Polarity determines output logic, see table below
* For intrinsic safe operation an intrinsic safety barrier is required. Ratings U_i I_i P_i C_i L_i see instruction manual.

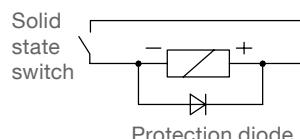
Output logic

Yellow LED	○	●	—	—
Status	FSL	FSH	FSL	FSH
Supply polarity (Terminal)	1 + 2 -	1 - 2 +	1 + 2 -	1 - 2 +
Red LED	○	●	●	○
Solid state switch	—	—	—	—
4/ 20 mA loop	4 mA	20 mA	20 mA	4 mA

FSL = Fail safe low FSH = Fail safe high

Protection of Solid State Switch

Observe a Protection diode in case of connecting an external relay to the Solid state switch



Protection diode



Capanivo® 8000

Capacitance Level Switch

Capacitive level detection for all kinds of liquids.
Versatile smart versions to suit a variety of applications.



Capanivo® 8000

- Flexible use, range of process connections, hygiene versions, digital version with LCD
- Potted electronics, "Tip Sensitivity" against material build-up ensures high functional safety
- High safety standard

Inverse Frequency Shift Technology



Applications: Capanivo® 8000 is suitable for liquids, pastes, foam and slurry as well as for interface measurement.

CN 8100 Compact

Full, demand, empty detector
Compact version,
Vertical, horizontal and oblique
installation



CN 8100 Pipe

Full, demand, empty detector
Version with pipe extension,
Sliding sleeve option,
Vertical, horizontal and oblique
installation



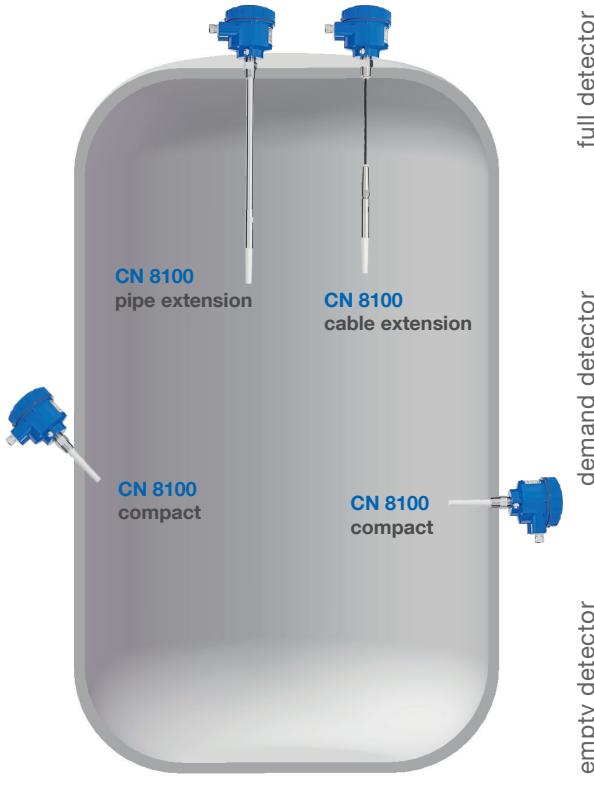
CN 8100 Cable

Full, demand, empty detector
Version with cable extension,
Up to 30m,
Vertical installation



Remote Version

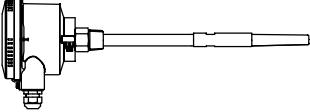
Full, demand, empty detector
Remote version ie for
applications with vibration,
Vertical, horizontal and oblique
installation



Technical Data

Housing	Aluminium powder coated, IP68/NEMA 4	
Certificates	ATEX, FM/CSA, TR-CU, INMETRO, WHG, Lloyd's	
Shaft length	Rod version	max. 5.5m
	Rope version	max. 30m
Process temp. range	-40°C to +125°C (-40°F to +257°F)	
Pressure range	-1 to +25 bar (-14,5 to +362,5 psi)	
Sensitivity	DK value ≥ 1.5	
Supply voltage	12..250V AC/DC 12..30V DC Profibus PA	
Process connection	\geq NPT $\frac{3}{4}$ ", \geq R $\frac{3}{4}$ ", \geq G $\frac{3}{4}$ ", range of flanges, triclamp	
Process con. material	1.4404 (316L)	
Probe material	Plastic PPS (reinforced glass fibre), FDA listed, PVDF, cable version: FEP jacketed cable	
Signal output	Relay switch SPDT/solid state switch, Profibus PA/solid state switch	
Signal delay	Integrated adjustable time delay of the signal output	

Table of content

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Subject to change.

Valid: From 01.04.2020 until 31.03.2021, unless otherwise agreed.

All dimensions in mm (inches).

By publishing this selection list all other lists become invalid.

All prices in Euro (€) or USD (\$),
excluding VAT.

We assume no liability for typing errors.

All EURO prices are EXW Betzigau,
all USD prices are EXW Memphis,
excluding packaging costs.

Different variations to those specified are possible.
Please contact our technical consultants.

Overview

- Level limit detection in liquids, slurries, foam, interfaces and solids
 - Compact unit
 - Wide range of applications
 - No maintenance
 - Full-, demand-, empty detector
 - Extended pipe version or cable version
 - High chemical resistance on probes
 - Capacitive technology
 - Level detection independent of tank wall/ pipe
 - Sensitivity: dielectric constant ≥ 1.5
- Standard electronics with:
- Universal power supply
 - Solid-state switch and Relay output
- Digital electronics with:
- Communication via PROFIBUS PA
 - Integrated Local User Interface
 - Self diagnostics
- Multiple approvals available
 - 2011/65/EU RoHS conform

Approvals	CE	
	ATEX	Zone 0 Intrinsically Safe
		Zone 0/1 Flameproof
		Zone 2 Type of protection n
		Zone 20/21 Dust Ignition Proof or Intrinsically Safe
	FM/ CSA	General purp.
		Cl. I Div. 1 Intrinsically Safe
		Cl. I Div. 1 Explosionproof
		Cl. I Div. 2 Non incendive
		Cl. II, III Div. 1 Dust Ignition Proof
	TR-CU	Ordinary Locations, Intrinsically Safe, Flameproof, Dust Ignition Proof
	INMETRO	Flameproof, Dust Ignition Proof
	Lloyds	Categories ENV1, ENV2, ENV3 and ENV5
	WHG	Overfill protection

Electronics	Electronic module Standard	Electronic module Digital
	Supply voltage	12 .. 250 V AC/ DC (0 .. 60 Hz)
	Signal output	Relais SPDT Solid-state switch (30 V DC or AC peak, 82 mA)
	Signal output delay	Rise time or Fall time 1 .. 60 sec.
	Failsafe	High or Low
	User interface	Potentiometer, switches, 3 LED indicator
	Diagnostics	Over and Under Range Electronics temperature Function check Maintenance alarm Internal electronic self check

Housing	Material of housing	Aluminium, powder-coated
	Ingress protection	Type 4/ NEMA 4/ IP68
	Material of Temperature extended shaft	1.4404 (SS316L), option
	Ambient temperature	-40 .. 85°C (-40 .. 185°F) With ATEX approval: -40 .. 80°C (-40 .. 176°F) with Flameproof or Dust Ignition Proof -40 .. 60°C (-40 .. 140°F) or Type of protection n with Intrinsically safe

Overview

Mechanics and Process	Length of extension "L"	Short extension threaded Short extension flanged/ Triclamp Pipe extension Cable extension	120 .. 5,500 mm (4.72 .. 216.5") 98 .. 5,500 mm (3.86 .. 216.5") 210 .. 5,500 mm (8.27 .. 216.5") 500 .. 30,000 mm (19.69 .. 1,181")
	Diameter of pipe/ cable extension	Pipe extension Cable	ø20 mm (ø0.79") ø6 mm (ø0.3")
	Materials	Process connection Pipe extension Cable insulation Probe (sensor) Wetted seals	1.4404 (SS316L) 1.4404 (SS316L) FEP PPS or PVDF, FDA and 1935/2004/EC conform FKM or FFKM
	Process temperature	Without temp. extended shaft With temp. extended shaft	-40 .. 85°C (-40 .. 185°F) -40 .. 125°C (-40 .. 257°F)
	Process pressure*	Pipe version Cable/ sliding coupling	-1 .. 25 bar g (-14.6 .. 365 psi g) nominal -1 .. 10 bar g (-14.6 .. 150 psi g) nominal *Observe Pressure versus Temperature Curves
	Tensile load (cable version)	max. 1,750 N	

Short extension length



Pipe version extended



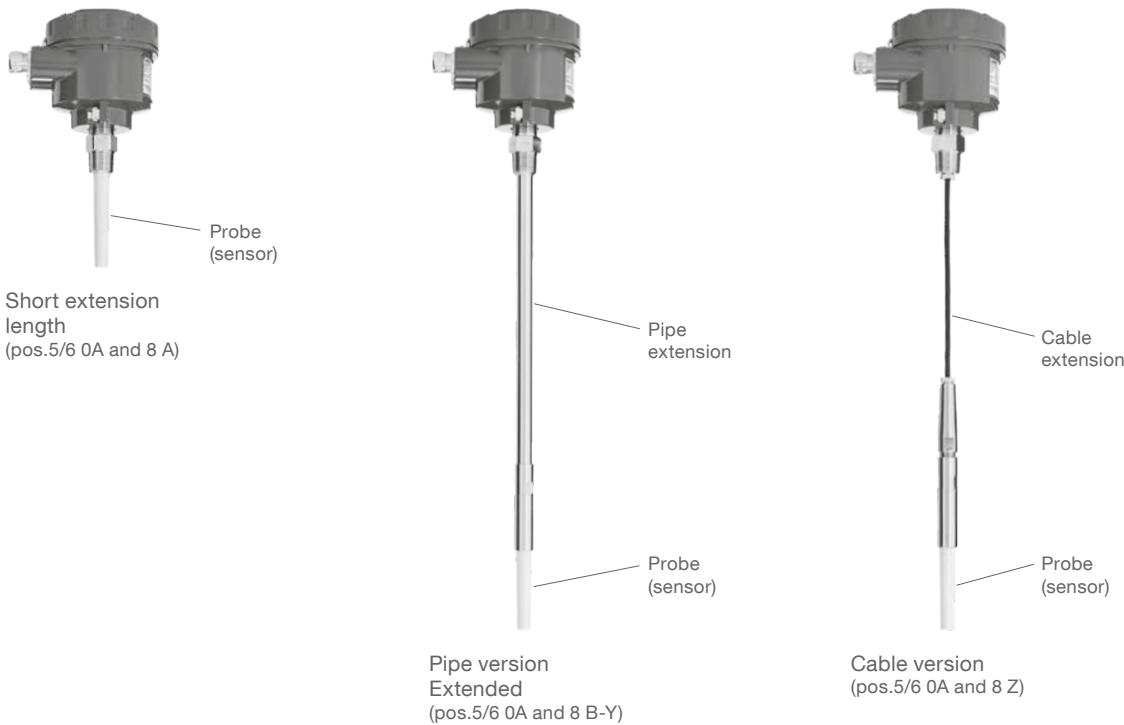
Cable version



Remote version



CN 8100



Dimensions see pages 9 - 11

Cable entries (by default)

Depending on model selected, the following cable entries are supported (options see pos.33 on page 7):

Version:	Cable entries:
Flameproof (pos.2 T,D)	M20 x 1.5 (1x open conduit + 1x Ex-d blind plug)
FM/ CSA (pos.2 M,H,U,P,N)	NPT 1/2" tapered ANSI B1.20.1 (1x open conduit + 1x Ex-d blind plug)
All other versions	M20 x 1.5 (1x screwed cable gland + 1x blind plug)

CN 8100

Basic type

CN 8100

pos.2

Certificate (detailed Ex-markings: see page 12)

	Gas	Dust	Protection method
0	CE ⁽⁴⁾	-	-
Q	CE/ FM/ CSA ^(1, 4)	-	General purpose
G	ATEX ⁽⁴⁾	Zone 2	Type of protection n
T	ATEX ^(2, 4)	Zone 0/1	Flameproof, Dust Ignition Proof
Y	ATEX ^(2, 6)	Zone 0	Intrinsically Safe
W	ATEX ^(2, 4)	-	Dust Ignition Proof
M	FM/ CSA ⁽⁴⁾	-	General purpose
H	FM/ CSA ⁽⁴⁾	Cl. I Div. 2	Non incendive
U	FM/ CSA ⁽⁴⁾	Cl. I Div. 1	Explosion Proof, Dust Ignition Proof
P	FM/ CSA ⁽⁶⁾	Cl. I Div. 1	Intrinsically Safe
N	FM/ CSA ⁽⁴⁾	-	Dust Ignition Proof
D	INMETRO	Zone 1	Flameproof, Dust Ignition Proof
		Zone 21	

pos.3

Temperature extended shaft

- 1 without (for process temperature <85°C (185°F))
- 2 with (for process temperature >85°C (185°F))

pos.4

Electronic module

- E Standard: Relay SPDT/ Solid State 12 ... 250 V AC/ DC⁽⁷⁾
- F Digital: Profibus PA/ Solid State 12 ... 30 V DC (24 V intrinsic safe) LCD display⁽⁸⁾

pos.5+6

Process connection

0A	Thread 3/4" NPT	taper, ANSI/ ASME B1.20.1	.....	●
0B	Thread 1" NPT	taper, ANSI/ ASME B1.20.1	.....	●
0C	Thread 1 1/4" NPT	taper, ANSI/ ASME B1.20.1	.....	●
0D	Thread 1 1/2" NPT	taper, ANSI/ ASME B1.20.1	.....	●
1A	Thread R 3/4"	BSPT, EN 10226/ PT (JIS-T), JIS B 0203	.....	●
1B	Thread R 1"	BSPT, EN 10226/ PT (JIS-T), JIS B 0203	.....	●
1D	Thread R 1 1/2"	BSPT, EN 10226/ PT (JIS-T), JIS B 0203	.....	●
3A	Thread G 1/4"	BSPP, EN ISO 228-1/ PF (JIS-P), JIS B 0202	.....	●
3B	Thread G 1"	BSPP, EN ISO 228-1/ PF (JIS-P), JIS B 0202	.....	●
3D	Thread G 1 1/2"	BSPP, EN ISO 228-1/ PF (JIS-P), JIS B 0202	.....	●
5A	Flange 1"	150 lbs ASME B16.5, raised face	.....	●
5B	Flange 1"	300 lbs ASME B16.5, raised face	.....	●
5C	Flange 1"	600 lbs ASME B16.5, raised face	.....	●
5D	Flange 1 1/2"	150 lbs ASME B16.5, raised face	.....	●
5E	Flange 1 1/2"	300 lbs ASME B16.5, raised face	.....	●
5F	Flange 1 1/2"	600 lbs ASME B16.5, raised face	.....	●
5G	Flange 2"	150 lbs ASME B16.5, raised face	.....	●
5H	Flange 2"	300 lbs ASME B16.5, raised face	.....	●
5J	Flange 2"	600 lbs ASME B16.5, raised face	.....	●
5K	Flange 3"	150 lbs ASME B16.5, raised face	.....	●
5L	Flange 3"	300 lbs ASME B16.5, raised face	.....	●
5M	Flange 3"	600 lbs ASME B16.5, raised face	.....	●
5N	Flange 4"	150 lbs ASME B16.5, raised face	.....	●
5P	Flange 4"	300 lbs ASME B16.5, raised face	.....	●
5Q	Flange 4"	600 lbs ASME B16.5, raised face	.....	●
6A	Flange DN25, PN16	EN 1092-1 type A flat faced	.....	●
6B	Flange DN25, PN40	EN 1092-1 type A flat faced	.....	●
6C	Flange DN40, PN16	EN 1092-1 type A flat faced	.....	●
6D	Flange DN40, PN40	EN 1092-1 type A flat faced	.....	●
6E	Flange DN50, PN16	EN 1092-1 type A flat faced	.....	●
6F	Flange DN50, PN40	EN 1092-1 type A flat faced	.....	●
6G	Flange DN80, PN16	EN 1092-1 type A flat faced	.....	●
6H	Flange DN80, PN40	EN 1092-1 type A flat faced	.....	●
6J	Flange DN100, PN16	EN 1092-1 type A flat faced	.....	●
6K	Flange DN100, PN40	EN 1092-1 type A flat faced	.....	●
8A	Triclamp 1"	ISO2852 ⁽⁹⁾	●
8B	Triclamp 1 1/2"	ISO2852 ⁽⁹⁾	●
8C	Triclamp 2"	ISO2852 ⁽⁹⁾	●
8D	Triclamp 2 1/2"	ISO2852 ⁽⁹⁾	●
8E	Triclamp 3"	ISO2852 ⁽⁹⁾	●

CN 8100

pos.8 Length of extension "L"

A	Short extension length, 120 mm (4.72") threaded/ 98 mm (3.86") flanged or Triclamp	●
B	Pipe, 250 mm (9.84")	●
C	Pipe, 350 mm (13.78")	●
D	Pipe, 500 mm (19.69")	●
E	Pipe, 750 mm (29.53")	●
F	Pipe, 1,000 mm (39.37")	●
G	Pipe, 1,250 mm (49.21")	●
H	Pipe, 1,350 mm (53.15")	●
J	Pipe, 1,500 mm (59.06")	●
K	Pipe, 1,750 mm (68.90")	●
L	Pipe, 2,000 mm (78.74")	●

Y Pipe, "L"= customer specified

Base price	●
Price per 100 mm (3.94") of part thereof (starting from 0 mm) min. 210 mm (8.3"), max. 5,500 mm (216.5")	●

P Cable, 3,000 mm (118.11"), length can be shortened by customer, probe side not assembled

Q Cable, 6,000 mm (236.22"), length can be shortened by customer, probe side not assembled

Z Cable, "L"= customer specified

Base price	●
Price per 100 mm (3.94") of part thereof (starting from 0 mm) min. 500 mm (19.46"), max. 30,000 mm (1,181")	●

pos.9 Material of process connection and extension "L"

2 Stainless steel 1.4404 (316L), FEP jacketed cable with cable version

pos.10 Material of probe (sensor)

A	PPS	●
B	PVDF	●

Further options: see page 7

- (1) Included is: TR-CU (Ordinary Locations)
- (2) Included is: TR-CU
- (4) Included is: Lloyds.
- (6) Intrinsically safe barrier required
- (7) Not available in combination with Intrinsically safe pos.2 Y,P, type of protection n/ non incendive pos.2 G,H
- (8) Not available with certificate Lloyds.
- (9) Available with pipe version pos.8 A-L, Y

CN 8100	A	 	 	 	 	1	 	2	 	L = mm	← Order code
Position	1	2	3	4	5+6	7	8	9	10		

All positions are available with special design (use code "Z").

Options

pos.11 x	Guarantee extension to 5 years	.....	•
Remote version⁽¹⁾			
pos.12 a	2 m remote cable (both sides wired), including mounting bracket	.....	•
pos.12 b	5 m remote cable (both sides wired), including mounting bracket	.....	•
FFKM wetted seals⁽²⁾			
pos.19 x	Sliding coupling⁽³⁾	•
pos.23 x	WHG approval⁽⁴⁾	•
pos.24 x	Functional safety SIL 2 (IEC 61508)⁽⁵⁾	•
Overspill, Declaration of Conformity			
pos.25 x	Inspection certificate .....	.....	•
Type 3.1 (EN 10204)			
pos.26 x	Manufacturer's Test Certificate .....	.....	•
M to DIN 55350, Part 18 and to ISO 9000			
pos.30 x	Stainless steel tag .....	.....	•
Measuring point number/ identification (max. 27 characters)			
Cable entry			
Selection of the following options only necessary, if a deviation from default is required:			
pos.33 x	M20 x 1.5 2x screwed cable gland ⁽⁶⁾	•
pos.33 e	M20 x 1.5 1x screwed cable gland + 1x blind plug ⁽⁷⁾	•
pos.33 a	NPT 1/2" tapered ANSI B1.20.1 (1x conduit + 1x blind plug) ⁽⁸⁾	•
Signal lamp^(9, 12)			
pos.34 a	LED, mounted in cable entry M20 x 1.5, green .....	.....	•
pos.34 b	LED, mounted in cable entry M20 x 1.5, red .....	.....	•
Plug^(10, 12)			
pos.35 x	Valve connector (incl. mating plug) 4-pole (incl. PE) max. 230 V .....	.....	•
pos.35 a	M12 (without mating plug) 4-pole max. 25 V .....	.....	•
pos.35 b	M12 (without mating plug) 5-pole (incl. PE) max. 60 V .....	.....	•
pos.35 c	Harting Han 4A (incl. mating plug) 5-pole (incl. PE) max. 230 V .....	.....	•
pos.36 x	Glass window in lid⁽¹¹⁾	•

(1) Dimensions see page 11.

(2) Process temperature limited to -20°C (-4°F). For sealing of cable (cable version pos.8 P,Q,Z) and sealing of sliding coupling (pos.19 x) as well PTFE sealings are used.

(3) Available with pipe version with min. lenght of extension L=350 mm (pos.8 C-Y), and process connection thread (pos.5+6 0A-3D). Dimensions see page 11.

(4) Available with certificate CE (pos.2 0, Q) or ATEX flameproof (pos.2 T). Only with electronic module standard (pos.4 E).

(5) Available with electronic module standard (pos.4 E).

(6) Available for all versions except flameproof/ explosion proof version (pos.2 T,U,D).

(7) Available for FM/ CSA version (pos.2 M,H,P,N) except explosion proof version (pos.2 U).

(8) Available for all versions except FM/ CSA (pos.2 M,H,U,P,N).

(9) Available for CE (pos.2 0) and electronic module standard (pos.4 E). Not in combination with cable entries pos.33 x.

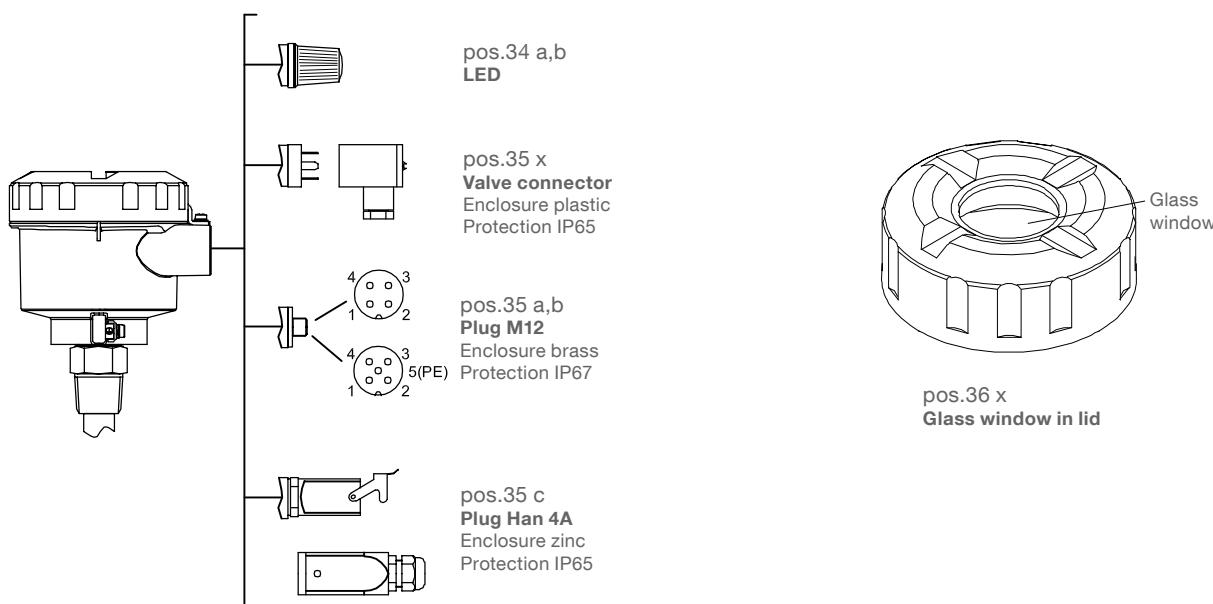
2 LED's (24V, 80-260V) will be delivered. Connection of wires to internal terminals according to customer specification.

(10) Available for CE (pos.2 0). Not in combination with cable entries pos.33 x,e,a. Connection of plug wires to internal terminals according to customer specification.

(11) Available for electronic module digital (pos.4 F).

(12) Not available with certificate Lloyds.

Options/ Accessories

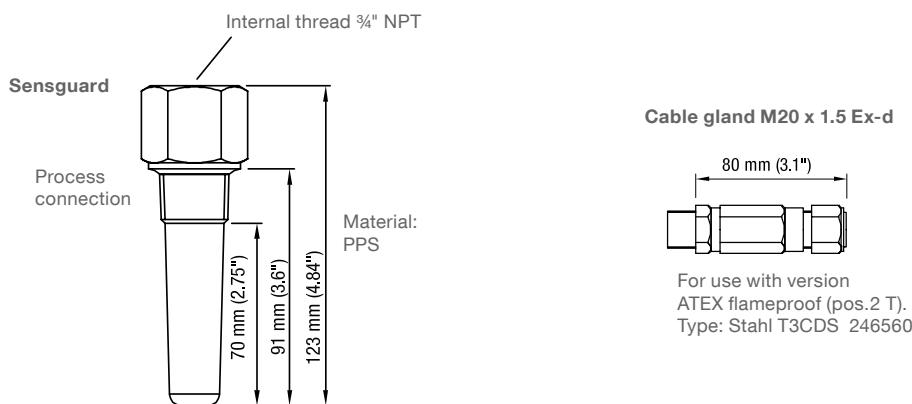


Accessories

Minimum order value for separate orders of spare parts or accessories is 75 €.

cl440102	Sensguard process connection 3/4" NPT (PPS) ⁽¹⁾
cl440103	Sensguard process connection 1" BSPT (PPS) ⁽¹⁾
em440041	Cable gland M20 x 1.5 Ex-d	.....

•
•
•



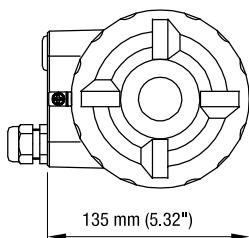
(1) Requires unit with process connection 3/4" NPT (pos.5+6 0A).

Dimensions

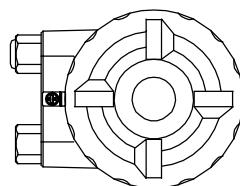
Enclosure

Top view

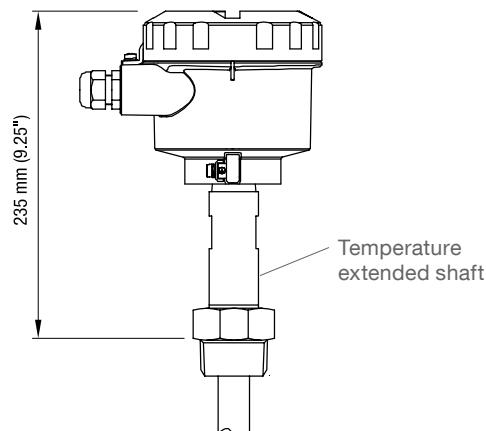
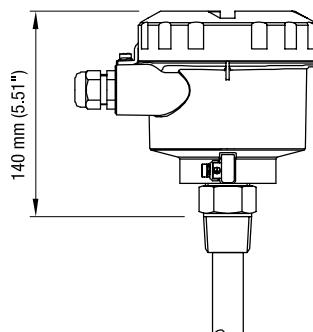
M20 x 1.5 cable gland



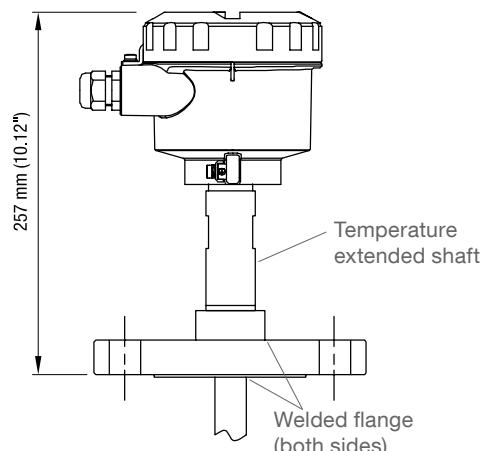
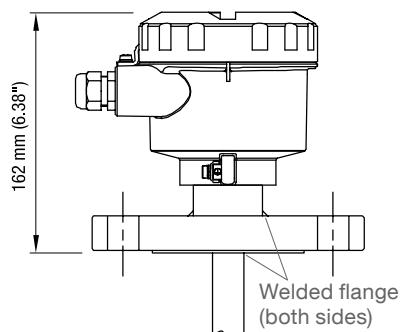
NPT 1/2" conduit



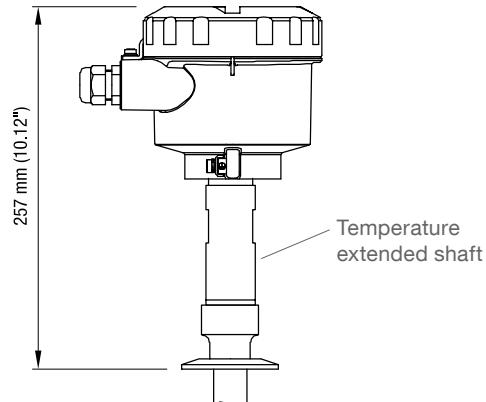
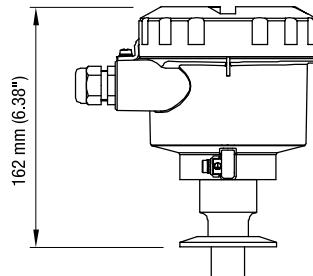
Threaded process connection



Flanged process connection

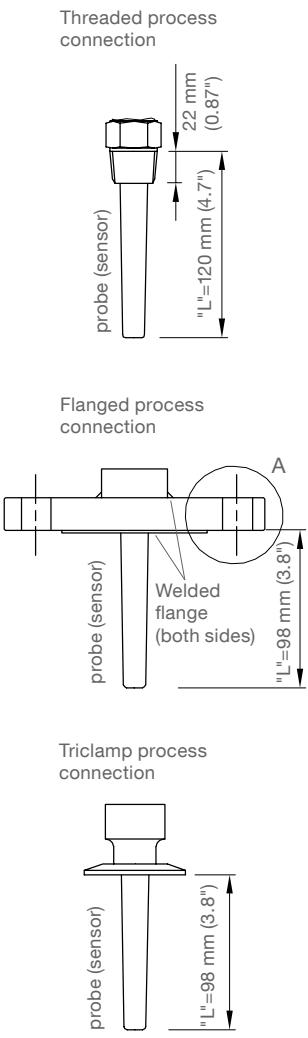


Triclamp process connection

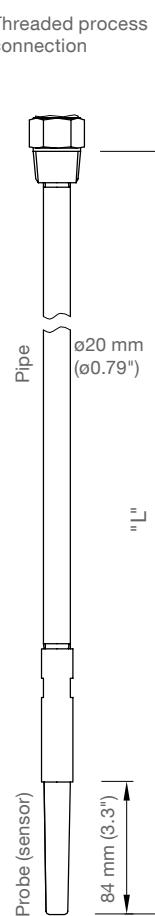


Dimensions

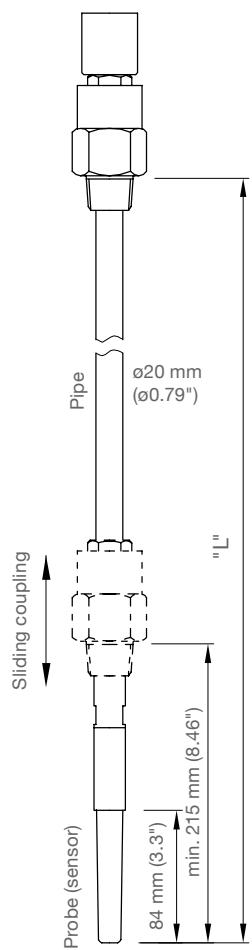
Short extension length Shortest lenght



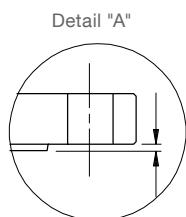
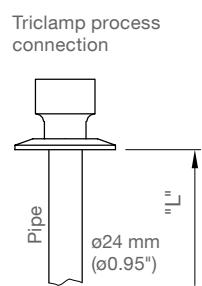
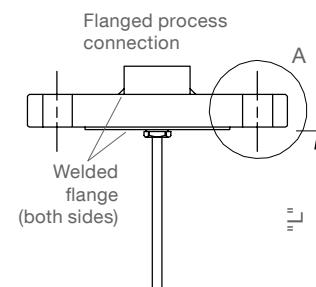
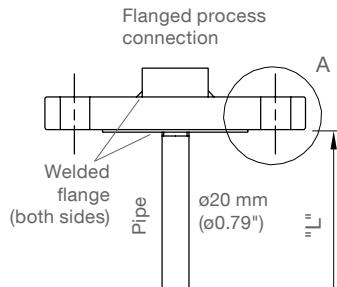
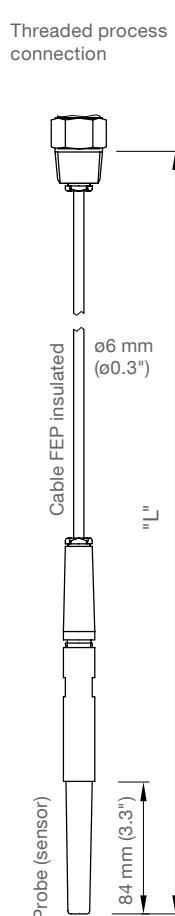
Pipe version Extended



Pipe version Extended, with sliding coupling (pos.19)



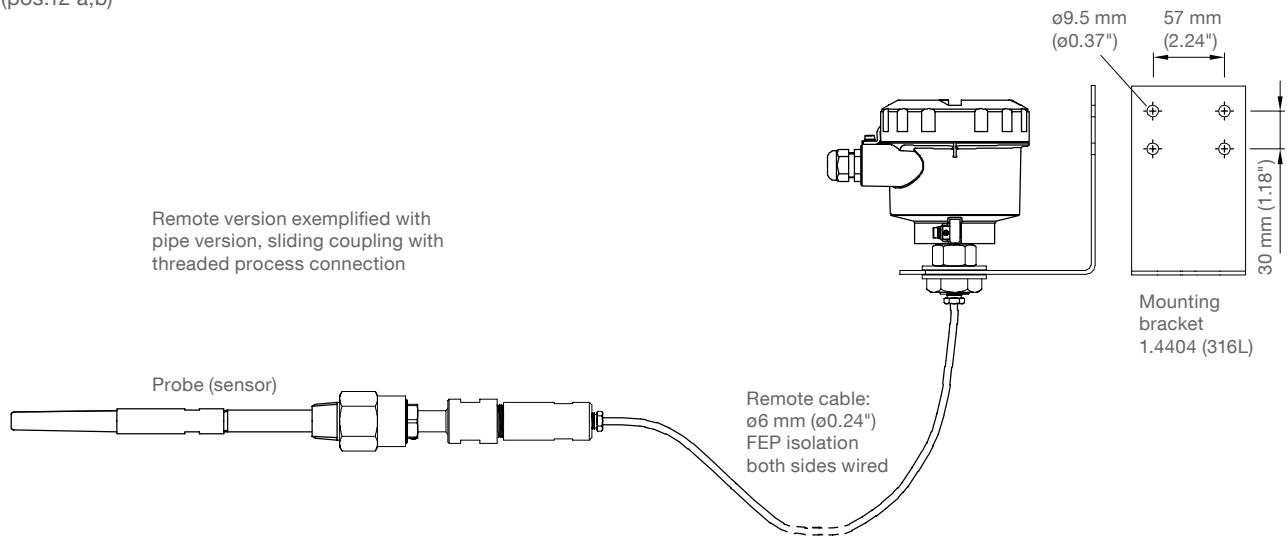
Cable version



"L" does not include any raised face (see page 11)

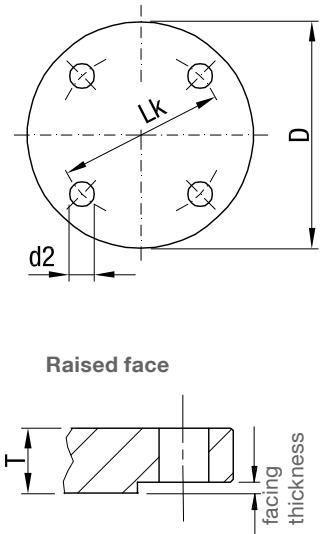
Dimensions

Remote version (pos.12 a,b)



Flanges

Code	Type	Number of holes	d2 mm (inch)	Lk mm (inch)	D mm (inch)	T thickness mm (inch)
ASME B16.5, raised face	5A 1" 150 lbs	4	15.9 (0.63)	79.3 (3.12)	108.0 (4.25)	14.3 (0.56)
	5B 1" 300 lbs	4	19.1 (0.75)	88.9 (3.5)	123.8 (4.87)	17.5 (0.69)
	5C 1" 600 lbs	4	19.1 (0.75)	88.9 (3.5)	123.8 (4.87)	17.5 (0.69)
	5D 1½" 150 lbs	4	15.9 (0.63)	98.6 (3.88)	127.0 (5.0)	17.5 (0.69)
	5E 1½" 300 lbs	4	22.2 (0.87)	114.3 (4.5)	155.6 (6.13)	20.6 (0.81)
	5F 1½" 600 lbs	4	22.2 (0.87)	114.3 (4.5)	155.6 (6.13)	22.4 (0.88)
	5G 2" 150 lbs	4	19.1 (0.75)	120.7 (4.75)	152.4 (6.01)	19.1 (0.75)
	5H 2" 300 lbs	8	19.1 (0.75)	127.0 (5.0)	165.1 (6.5)	22.2 (0.87)
	5J 2" 600 lbs	8	19.1 (0.75)	127.0 (5.0)	165.1 (6.5)	25.4 (1.0)
	5K 3" 150 lbs	4	19.1 (0.75)	152.4 (6.01)	190.5 (7.5)	23.9 (0.94)
	5L 3" 300 lbs	8	22.2 (0.87)	168.2 (6.62)	209.6 (8.25)	28.6 (1.13)
	5M 3" 600 lbs	8	22.2 (0.87)	168.2 (6.62)	209.6 (8.25)	31.7 (1.25)
	5N 4" 150 lbs	8	19.1 (0.75)	190.5 (7.5)	228.6 (9.0)	23.9 (0.94)
	5P 4" 300 lbs	8	22.2 (0.87)	200.0 (7.87)	254.0 (10.0)	31.7 (1.25)
	5Q 4" 600 lbs	8	25.4 (1.0)	215.9 (8.5)	273.1 (10.75)	38.1 (1.5)
EN 1092-1 type A, flat faced	6A DN25 PN16	4	14.0 (0.55)	85.0 (3.35)	115.0 (4.53)	18.0 (0.71)
	6B DN25 PN40	4	14.0 (0.55)	85.0 (3.35)	115.0 (4.53)	18.0 (0.71)
	6C DN40 PN16	4	18.0 (0.71)	110.0 (4.33)	150.0 (5.91)	18.0 (0.71)
	6D DN40 PN40	4	18.0 (0.71)	110.0 (4.33)	150.0 (5.91)	18.0 (0.71)
	6E DN50 PN16	4	18.0 (0.71)	125.0 (4.92)	165.0 (6.5)	18.0 (0.71)
	6F DN50 PN40	4	18.0 (0.71)	125.0 (4.92)	165.0 (6.5)	20.0 (0.79)
	6G DN80 PN16	8	18.0 (0.71)	160.0 (6.3)	200.0 (7.87)	20.0 (0.79)
	6H DN80 PN40	8	18.0 (0.71)	160.0 (6.3)	200.0 (7.87)	24.0 (0.94)
	6J DN100 PN16	8	18.0 (0.71)	180.0 (7.09)	220.0 (8.66)	20.0 (0.79)
	6K DN100 PN40	8	22.0 (0.87)	190.0 (7.48)	235.0 (9.25)	24.0 (0.94)



Type	Facing thickness
ASME 150 lbs	2 mm (0.08")
ASME 300 lbs	7 mm (0.28")

Detailed Ex-markings

pos.2	Certificate		Protection method
G	ATEX II 3G	Ex ic nA IIC T Gc	Type of protection n
T	ATEX II 1/2G ATEX II 1/2D	Ex ia/db [ia Ga] IIC T Ga/Gb Ex ia/tb [ia Da] IIIC T Da/Db	Flameproof, Dust Ignition Proof
Y	ATEX II 1G ATEX II 1/2D	Ex ia IIC T Ga Ex ia IIIC T Da/Db	Intrinsically Safe
W	ATEX II 1/2D	Ex ia/tb [ia Da] IIIC T Da/Db	Dust Ignition Proof
H	FM/ CSA	NI Class I, Div.2, Gr. A, B, C, D Class II, Div.2, Gr. F, G Class III T4 or T6	Non incendive
U	FM/ CSA	XP-IS Class I, Div.1, Gr. A, B, C, D DIP-IS Class II, Div.1, Gr. E, F, G DIP-IS Class III T4	Explosion Proof, Dust Ignition Proof
P	FM/ CSA	IS Class I, Div.1, Gr. A, B, C, D IS Class II, Div.1, Gr. E, F, G IS Class III T4	Intrinsically Safe
N	FM/ CSA	DIP-IS Class II, Div.1, Gr. E, F, G DIP-IS Class III T4	Dust Ignition Proof
D	INMETRO	Ex d [ia Ga] IIC T6...T4 Gb Ex tb IIIC T85°C...T100°C Db IP65/IP68	Flameproof, Dust Ignition Proof

Deviation in Ex-markings with Remote version (pos.12 a,b)

pos.2	Certificate electronic housing		Certificate probe (sensor)		Protection method
T	ATEX II 2(1)G ATEX II 2(1)D	Ex db ia [ia Ga] IIC T Gb Ex ia tb [ia Da] IIIC T Db	ATEX II 1G ATEX II 1D ATEX II 1/2D	Ex ia IIC T Ga Ex ia IIIC T Da Ex ia IIIC T Da/Db	Flameproof, Dust Ignition Proof
Y	ATEX II 1G ATEX II 2D	Ex ia IIC T Ga Ex ia IIIC T Db	ATEX II 1G ATEX II 1D ATEX II 1/2D	Ex ia IIC T Ga Ex ia IIIC T Da Ex ia IIIC T Da/Db	Intrinsically Safe
W	ATEX II 2(1)D	Ex ia tb [ia Da] IIIC T Db	ATEX II 1D ATEX II 1/2D	Ex ia IIIC T Da Ex ia IIIC T Da/Db	Dust Ignition Proof
D	INMETRO	Ex d [ia Ga] IIC T6 Gb Ex tb IIIC T85°C...T100°C Db IP65/IP68	INMETRO	Ex ia IIC T6 ... T4 Ga Ex tb IIIC T85°C...T100°C Db IP65/IP68	Flameproof, Dust Ignition Proof

Electrical installation

Standard

Relay SPDT/
Solid state switch

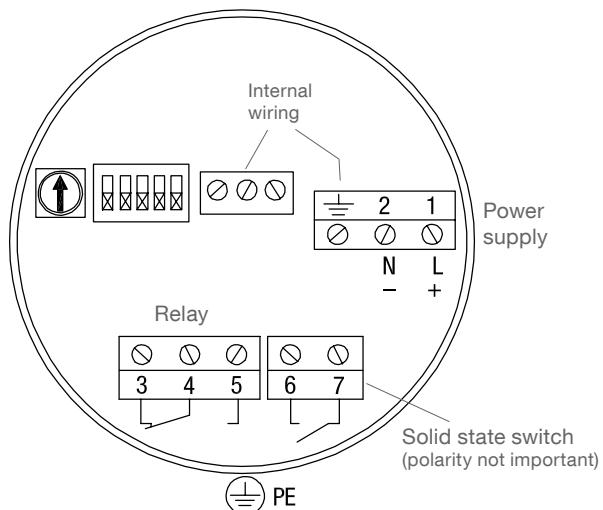
Power supply:

12 .. 250 V AC/ DC (0 .. 60 Hz)
2 W max.

Signal output:

Relay:
Floating relay SPDT
AC max. 250 V, 8 A, 2000 VA, non inductive
DC max. 30 V, 5 A, 150 W, non inductive

Solid state switch:
30 V DC or 30 V AC (peak), 82 mA
Observe protection (see below)



Digital

Profibus PA/
Solid state switch

Power supply:

12 .. 30 V DC, 12.5 mA

Intrinsically Safe:
12 .. 24 V DC, 12.5 mA

Intrinsically safe barrier required
For ATEX:

$U_i=24\text{ V}$, $I_i=380\text{ mA}$, $P_i=5.32\text{ W}$, $C_i=5\text{ nF}$, $L_i=10\text{ uH}$

For FM/ CSA:
See "Connection drawing" in the
Instruction Manual

Signal output:

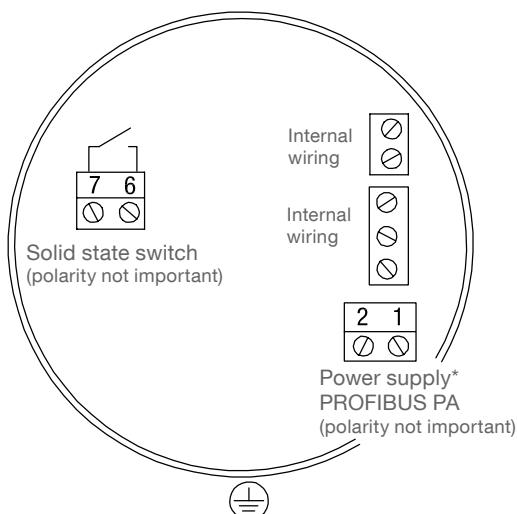
Solid state switch:
30 V DC or 30 V AC (peak), 82 mA
Observe protection (see below)

Intrinsically safe:
Intrinsically safe barrier required

For ATEX:

$U_i=30\text{ V}$, $I_i=200\text{ mA}$, $P_i=350\text{ mW}$, $C_i=0$, $L_i=0$

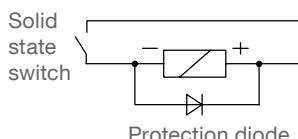
For FM/ CSA:
See "Connection drawing" in the Instruction Manual



* With use of Profibus the wiring must be according to Profibus PA standards.
If Profibus is not used, a shielded cable is recommended to ensure stable measurement.

Protection of Solid State Switch

Observe a protection diode in case of connecting an external relay to the Solid state switch



Spare parts

Minimum order value for separate orders of spare parts or accessories is 75 €.

Fitting to unit/ model code	Spare part Article number
--------------------------------	------------------------------

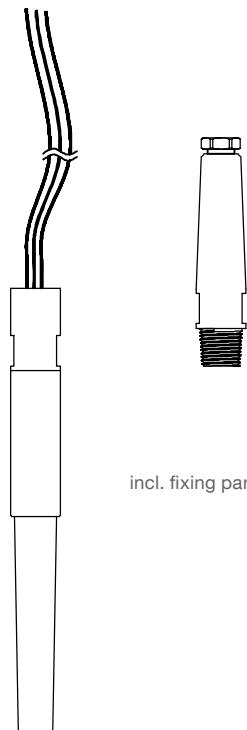
Electronics

Splitted electronics is present inside probe and inside housing. Please contact manufacturer.		
--	--	--

Sensor kit for cable units

Fitting to: Standard electronic	PPS probe	FKM sealing	pos.4 E 8 P,Q,Z 10 A	pl440100	•
Fitting to: Standard electronic	PVDF probe	FKM sealing	pos.4 E 8 P,Q,Z 10 B	pl440110	•
Fitting to: Standard electronic	PPS probe	FFKM sealing	pos.4 E 8 P,Q,Z 10 A 17 x	pl440120	•
Fitting to: Standard electronic	PVDF probe	FFKM sealing	pos.4 E 8 P,Q,Z 10 B 17 x	pl440130	•
Fitting to: Digital electronic	PPS probe	FKM sealing	pos.4 F 8 P,Q,Z 10 A	pl440140	•
Fitting to: Digital electronic	PVDF probe	FKM sealing	pos.4 F 8 P,Q,Z 10 B	pl440150	•
Fitting to: Digital electronic	PPS probe	FFKM sealing	pos.4 F 8 P,Q,Z 10 A 17 x	pl440160	•
Fitting to: Digital electronic	PVDF probe	FFKM sealing	pos.4 F 8 P,Q,Z 10 B 17 x	pl440170	•

Sensor kit for
cable units



incl. fixing parts



Nivobob® 3000

Microprocessor controlled level measuring system

The multifunctional unit for discontinuous level monitoring in bulk goods and for interface applications – very precise, even suitable for problematic media, also for use in hazardous locations

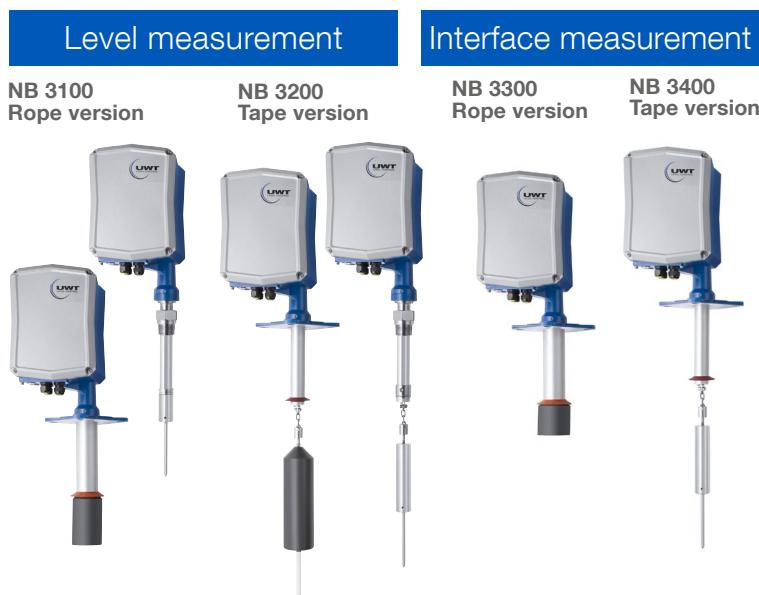


Nivobob® 3000



- Microprocessor controlled measurement, intelligent monitoring
- Easy installation; variety of process connections (flange and thread)
- Unaffected by material properties such as conductivity, dust, di-electricity

Application: Nivobob® is used for discontinuous level measurement in silos and vessels. It provides extremely reliable measuring results in solids as well as in interface applications. Nivobob® offers different output signals: 0/4-20mA or communication via Modbus or Profibus DP.



Technical Data

Model	NB 3100 / 3200	NB 3300 / 3400
Housing		Aluminium IP66 (Type 4)
Pressure		Max. +1.7 bar (+25 psi)
Supply voltage	AC version: 98...253 V 50-60 Hz DC version 20...28 V	
Measuring range	Rope version max. 30 m; tape version max. 50 m	
Signal output/ Communication		0/4-20 mA; relay counting pulse; Modbus; Profibus DP
Certificates	CE; ATEX II 1/2 D FM Cl. II, III, Div. 1, TR-CU	CE; FM general purpose
Process temperature	-40°C up to +250°C (-40°F up to +482°F)	-40°C up to +80°C (-40°F up to +176°F)
Sensitivity	From 20 g/l (1.2 lb/ft³) depending on sensor weight	-
Process connection	Flange DN100 PN16 Flange 4" 150 lbs Flange 2" and 3" 150 lbs Thread R 1½" Thread NPT 1½" Thread NPT 3"	Flange DN100 PN16 Flange 4" 150 lbs

Interior view



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Applications	4	

NB 3000	Solids measurement	6

NB 3000	Interface measurement (solids in water)	8

Accessories	10	

Dimensions	11	

Spare parts	14	

Electrical installation	16	

Subject to change.

Valid: From 01.04.2020 until 31.03.2021, unless otherwise agreed.

All dimensions in mm (inches).

By publishing this selection list all other lists become invalid.

All prices in Euro (€) or USD (\$),
excluding VAT.

We assume no liability for typing errors.

All EURO prices are EXW Betzigau,
all USD prices are EXW Memphis,
excluding packaging costs.

Different variations to those specified are possible.
Please contact our technical consultants.

Overview

Features

Continuous level measurement of solids and interface applications

Process

- Independent of bulk material properties
- Very accurate measurement

Service

- Simple installation and commissioning
- Rope, tape and (optional) motor with increased service life
- Low maintenance

Approvals

- Approval for use in Hazardous Areas
- 2011/65/EU RoHS conform

Mechanics

- Measurement range up to 50 m (164 ft)
- 1½" process connection possible
- Internal tape cleaner for difficult materials
- Window in lid and outside start button (optional)

Electronics

- Micro processor controlled measurement
- Comprehensive diagnostic possibilities
- Output 0/ 4-20 mA/ Modbus/ Profibus DP/ counting pulses
- Programmable Relais (can be used as level limit switch outputs)

Solids measurement



NB 3100

Rope version
(fig. with process connection thread and stainless steel weight)



NB 3200

Tape version
(fig. with process connection thread and stainless steel weight)

Interface measurement



NB 3300
Rope version



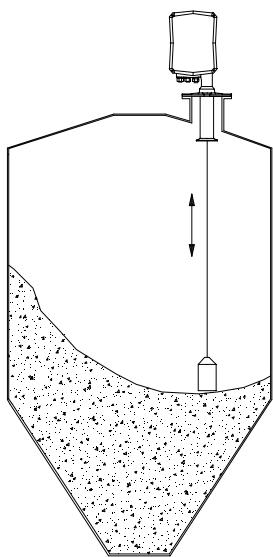
NB 3400
Tape version

Specifications

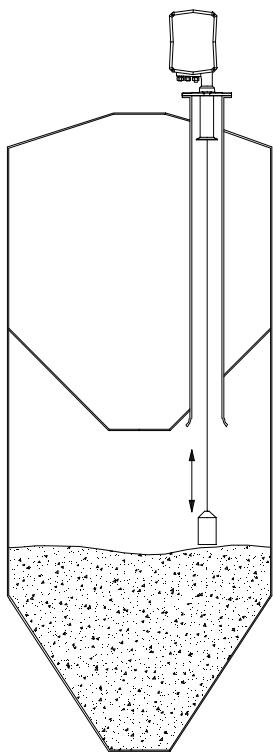
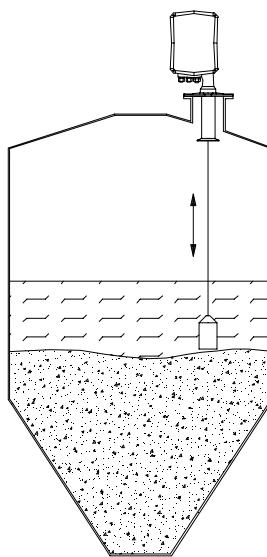
				NB 3100/ 3200 Solids measurement	NB 3300/ 3400 Interface measurement
Process	Measurement range	Rope version	30 m (98.4 ft)	•	•
		Tape version	40 m (131 ft)/ 50 m (164 ft)	•	•
	Process temperature		80°C (176°F)	•	•
			150°C (302°F)	•	
			250°C (482°F)	•	
	Process overpressure		-0.3 .. +0.3 bar (-4.35 .. + 4.35 psi)	•	•
			-0.5 .. +1.7 bar (-7.3 .. +25 psi)	•	•
Electronics	Power supply	AC version	98 .. 253 V 50 - 60 Hz	•	•
		DC version	20 .. 28 V	•	•
	Output		0/ 4-20 mA	•	•
			4 relais	•	•
			Modbus RTU	•	•
			Profibus DP	•	•
Approvals	Dust Ex		ATEX 1/2D	•	•
			FM Cl. II, III Div. 1	•	•
			TR-CU	•	•
	Ordinary Locations		CE, FM, TR-CU	•	•

Applications

Solids measurement



Interface measurement
(solids in water)



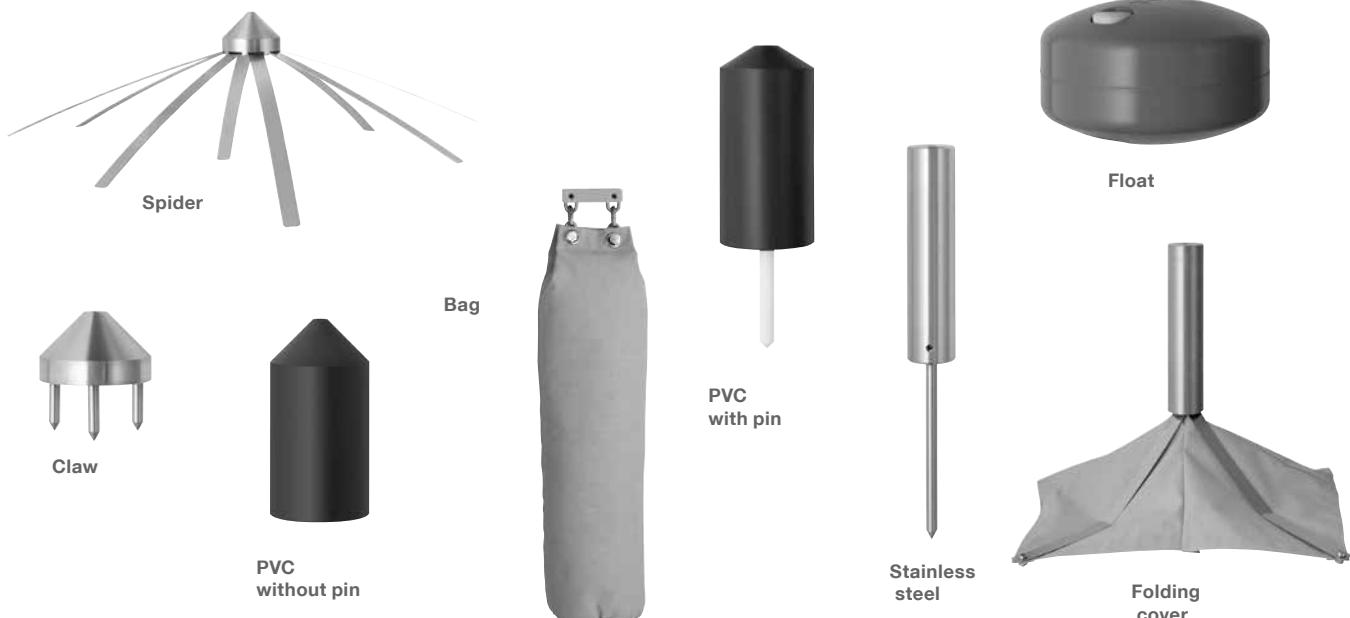
For measurements through a long pipe in a double chamber silo we recommend the use of NB 3200 (tape version).

Applications

Sensor weight guide (solids measurement)

Sensor weight	Application				Note	Fits through mounting hole					
	* Material density g/l (lb/ft³)	Material consistence	Angle of repose	Max. process temp.		Thread		Flange			
						1½"	3"	2"	3"	DN100 / 4"	
PVC without pin	>300 (18)	granulate	flat	80°C (176°F)	Standard weight					•	
PVC with pin	>300 (18)	granulate, powder	steep	80°C (176°F)	The pin penetrates into the material and avoids slipping or tilting of the sensor weight on the steep bulk surface.					•	
Stainl. steel	>300 (18)	granulate, powder	flat, steep	250°C (482°F)	The pin penetrates into the material and avoids slipping or tilting of the sensor weight on the steep bulk surface.	•	•	•	•	•	
Claw	>200 (12)	coarse (e.g. stones)	steep	250°C (482°F)	Avoids slipping or tilting on the steep bulk surface.					•	
Folding cover	>20 (1.2)	light powder	flat, steep	80°C (176°F)	Big surface prevents the sensor weight from sinking into the material.	•	•	•	•	•	
Spider	>40 (1.4)	light powder	flat, steep	250°C (482°F)	Big surface prevents the sensor weight from sinking into the material.					•	
Bag	>300 (18)	granulate, powder	flat	80°C (176°F)	Prevents damage of the conveying screw. To be filled with bulk material.					•	
Float	-	liquids only	-	80°C (176°F)	To be filled with material.						

* The above mentioned data is a guideline and is valid for material which has settled after filling.
 During the filling the bulk density can change (e. g. for fluidised material).



Solids measurement

NB 3100
 Rope version



NB 3200
 Tape version



Cable entries (by default)

Depending on selected version (options see pos.31):

CE, ATEX, Screwed cable gland: 2x M20 x 1.5 and 1x M25 x 1.5
 TR-CU Blindplug: 2x M20 x 1.5

FM Open conduit ANSI B1.20.1: 1x NPT 3/4" and 2x NPT 1/2"
 Blindplug: 2x NPT 1/2"

Dimensions see page 12

pos.1	Basic type		
C	NB 3100 Rope version (30 m)	•	
D	NB 3200 Tape version (40 m)	•	
pos.2	Certificate		
0	CE ⁽¹⁾	•	
W	ATEX II 1/2 D	•	
M	FM general purpose	•	
N	FM Class II, III Div.1 Group E-G	•	
E	TR-CU Ex ta/tb IIIC T! Da/Db X	•	
pos.3	Process temperature		
A	max. +80°C (176°F)	•	
S	max. +150°C (302°F)	•	
T	max. +250°C (482°F)	•	
pos.4	Power supply		
1	98 .. 253 V 50 - 60 Hz	•	
3	20 .. 28 V DC	•	
pos.5	Signal output		
D	0/4-20 mA Modbus	Relay counting pulse (5 cm 10 cm 1/6 ft 1/3 ft)	•
B	0/4-20 mA Modbus	Electronic counting pulse (1 cm 2.5 cm 1/20 ft 1/10 ft)	•
E	0/4-20 mA Profibus DP	Relay counting pulse (5 cm 10 cm 1/6 ft 1/3 ft)	•
pos.6	Process connection		
X	Flange DN100 PN16 (EN 1092-1) and flange 4" 150lbs ANSI B16.5 (unit is fitting to this flange)	•	
Y	Flange 2" and flange 3" 150 lbs ANSI B16.5 (unit is fitting to this flange)	•	
A	Thread R 1 1/2"	tapered EN 10226-1	•
B	Thread NPT 1 1/2"	tapered ANSI B1.20.1	•
C	Thread NPT 3"	tapered ANSI B1.20.1	•

Solids measurement

pos.7	Motor for high measurement frequency ⁽¹⁾	
1	Standard	.....
2	Brushless motor ⁽²⁾
pos.8	Sensor weight ^(3,4)	
Y	without ⁽⁵⁾
A	PVC without pin	only with rope version pos.1 C, max. 80°C
B	PVC with pin	max. 80°C
C	Stainless steel	.....
D	Claw	stainless steel
E	Folding cover	max. 80°C, stainless steel, PA canvas
F	Spider	stainless steel
G	Bag	max. 80°C, PA canvas
H	Float	max. 80°C, PP

NB 3.00									← Order code
Position	1	2	3	4	5	6	7	8	

All positions are available in special design (use code "Z").

(1) TR-CU (Ordinary Locations) included

(2) Motor with increased service life

(3) For use in Hazardous Locations (Dust Ex): It must be ensured, that no static discharge from the material surface can occur. Sensor weights, which can be used in case of possible static discharge, on request.

(4) See Sensor weight guide on page 5

(5) Including mounting set for sensor weight (see page 14: Sensor weights)

Options

pos.11	x Guarantee extension to 5 years	.....	•
	Wear and tear parts rope/tape and standard motor pos.7 1 not included		
pos.21	Weather protection cover	.....	•
	For Ex only approved for Zone 22 or Division 2		
pos.23	Measurement range 50 m	.....	•
	Available with tape version pos.1 D, not with sensor weight pos.8 G,H		
pos.25	Window in lid and external start button	.....	•
pos.26	Internal heater	.....	•
	Needed for: ambient temp. < -20°C (-4°F) or condense water inside silo or wet process atmosphere (Note: < -20°C (-4°F) with ATEX, FM Class II or TR-CU possible on request)		
pos.27	Length of socket pipe	.....	•
A	500 mm (19.7")	.....	•
B	1,000 mm (39.4")	.....	•
pos.28	Compressed air connector	.....	•
	Quick coupling including counter part, for hose diameter 9 mm (0.35")		
pos.29	Increased corrosion resistance	.....	•
	All metal parts on process side coated, rope with plastic coating, use of stainless steel bearings Available with: Rope version (pos.1 C), CE or FM gen.purp. (pos.2 0,M), 80°C (pos.3 A), PVC weight (pos.8 A,B)		
pos.30	Increased process overpressure	.....	•
	-0.5 to 1.7 bar (-7.3 to 25 psi) (for CE and ATEX, pos.2 0,W) -0.5 to 1.1 bar (-7.3 to 16 psi) (for FM general purpose, pos.2 M)		
pos.31	Cable entry	.....	•
	Selection of the following options only necessary, if a deviation from the default cable gland/ conduit is required:		
O	Screwed cable gland 1x M25 x 1.5 + 2x M20 x 1.5 + blindplug 2x M20 x 1.5	.....	•
A	Conduit 1x NPT ¾" + 2x NPT ½" + blindplug 2x NPT ½"	.....	•
pos.33	Preset fieldbus address (Modbus)	.....	•
	Enables easy commissioning with Nivotec Level Monitoring System Preset from address = "1" to "amount of ordered units". Address label on enclosure. Termination resistor set on unit with highest address. Other addresses possible on request.		

Interface measurement (solids in water)

NB 3300
Rope version

For applications with soft/ muddy
or compact material surface



NB 3400
Tape version

For applications with
compact material surface



Implemented

- Internal heater
- Rope/ tape roller with rubber coating to avoid slipping
- Plastic coated steel weight (rope version)
- Adjustment possibility for applications with soft/muddy material surface (rope version)

Cable entries (by default)

Depending on selected version (options see pos. 31):

CE, ATEX, Screwed cable gland: 2x M20 x 1.5 and 1x M25 x 1.5
TR-CU Blindplug: 2x M20 x 1.5

FM Open conduit ANSI B1.20.1: 1x NPT ¾" and 2x NPT ½"
 Blindplug: 2x NPT ½"

Dimensions see page 12

Interface measurement (solids in water)

pos.1	Basic unit							
	E NB 3300	Rope version (30 m) incl. sensor weight	.....	•			
	F NB 3400	Tape version (40 m) incl. sensor weight	.....	•			
pos.2	Certificate							
	0 CE ⁽¹⁾	•					
	W ATEX II 1/2 D	.....	•				
	M FM general purpose	.....	•				
	N FM Class II, III Div.1 Group E-G	.....	•				
	E TR-CU Ex ta/tb IIIC T! Da/Db X	.....	•				
pos.4	Power supply							
	1 98 .. 253 V 50 - 60 Hz	.....	•				
	3 20 .. 28 V DC	.....	•				
pos.5	Signal output							
	D 0/4-20 mA Modbus	Relay counting pulse (5 cm 10 cm 1/6 ft 1/3 ft)	.....	•			
	B 0/4-20 mA Modbus	Electronic counting pulse (1 cm 2.5 cm 1/20 ft 1/10 ft)	.....	•			
	E 0/4-20 mA Profibus DP	Relay counting pulse (5 cm 10 cm 1/6 ft 1/3 ft)	.....	•			
pos.6	Process connection							
	X Flange DN100 PN16, EN 1092-1 and flange 4" 150lbs ANSI B16.5 (unit is fitting to this flange)	.....	•				
pos.7	Motor for high measurement frequency							
	1 Standard	.....	•				
	2 Brushless motor ⁽²⁾	•					

NB 3..00 A X 1 ← **Order code**

Basic type 1 2 3 4 5 6 7 8

All positions are available in special design (use code "Z").

⁽¹⁾ TR-CU (Ordinary Locations) included

⁽²⁾ Motor with increased service life

Options

pos.11	x Warranty extension to 5 years	.....	•
	Wear and tear parts rope/ tape and standard motor pos.7 1 not included		
pos.21	Weather protection cover	.....	•
	For Ex only approved for Zone 22 or Division 2		
pos.25	Window in lid and external start button	.....	•
pos.27	Length of socket pipe		•
	A 500 mm (19.7")	.....	•
	B 1,000 mm (39.4")	.....	•
pos.28	Compressed air connector	.....	•
	Quick coupling including counter part, for hose diameter 9 mm (0.35")		
pos.29	Increased corrosion resistance	.....	•
	All metal parts on process side coated, rope with plastic coating, use of stainless steel bearings		
	Available with rope version (pos.1 E), CE or FM gen.purp. (pos.2 0,M)		
pos.30	Increased process overpressure	.....	•
	-0.5 to 1.7 bar (-7.3 to 25 psi) (for CE, pos.2 0)		
	-0.5 to 1.1 bar (-7.3 to 16 psi) (for FM general purpose, pos.2 M)		
pos.31	Cable entry		•
	Selection of the following options only necessary, if a deviation from the default cable gland/ conduit is required:		
	0 Screwed cable gland 1x M25 x 1.5 + 2x M20 x 1.5 + blindplug 2x M20 x 1.5	.....	•
	A Conduit 1x NPT ¾" + 2x NPT ½" + blindplug 2x NPT ½"	.....	•
pos.33	Preset fieldbus address (Modbus)	.....	•
	Enables easy commissioning with Nivotec Level Monitoring System.		
	Preset from address = "1" to "amount of ordered units". Address label on enclosure.		
	Termination resistor set on unit with highest address. Other addresses possible on request.		

Accessories

Minimum order value for separate orders of spare parts or accessories is 75 €.

Mounting Kit

Bolts, washers and nuts for mounting the unit on a flange

	material	bolts	washers	nuts	
zu107000	stainless steel/ A2	4 pieces M16 x 60	8 pieces	4 pieces •

Flange sealings

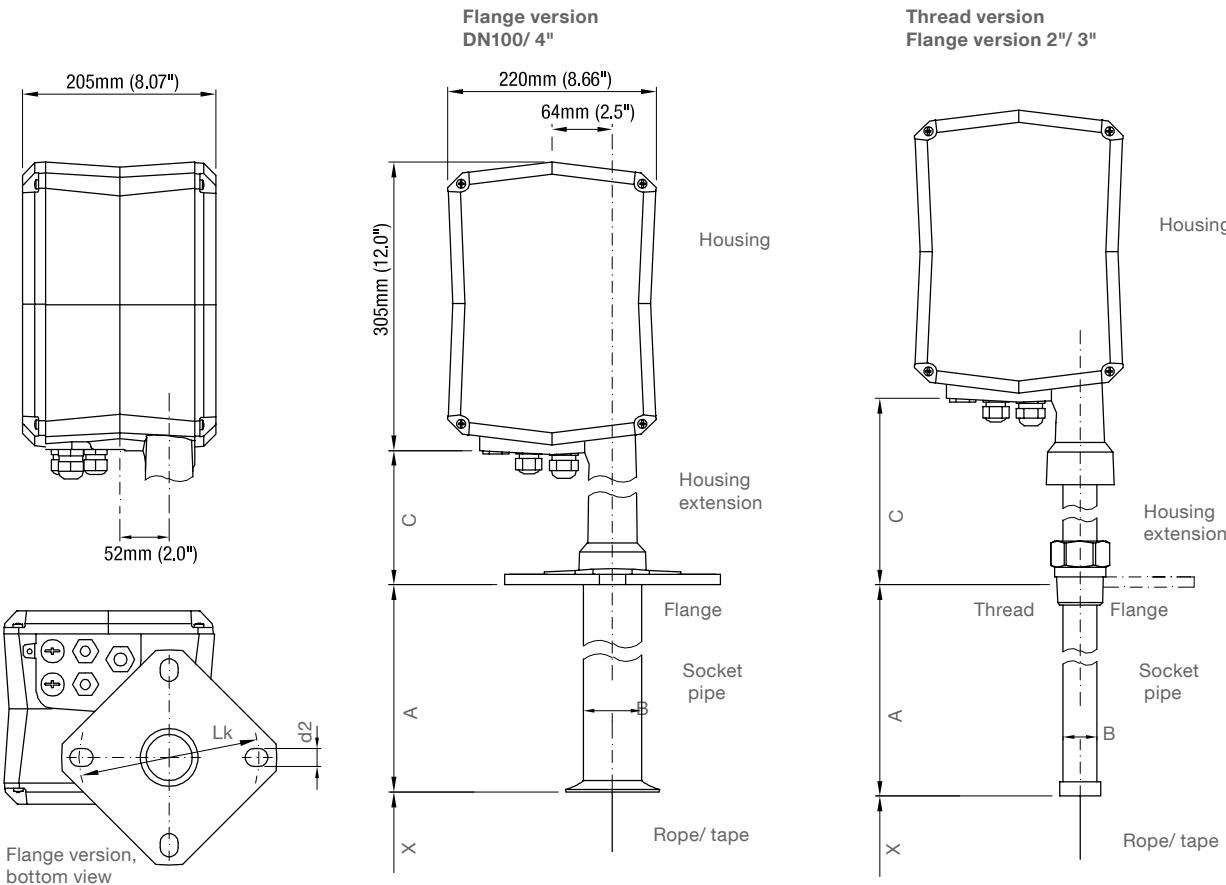
Sealings for mounting the unit on a flange.

Material: neoprene (85°C), temperature resistive plastic AFM30 (250°C)

	suitable for flanges	max. temp.	suitable mounting kit	
di300125	DN100 PN16/ 4"	+85°C (185°F)	zu107000	•
di300108	DN100 PN16/ 4"	+250°C (482°F)	zu107000	•
di300127	2"/ 3" 150lbs	+85°C (185°F)	zu107000	•
di300128	2"/ 3" 150lbs	+250°C (482°F)	zu107000	•

Dimensions

Basic type



Dimensions

X = Length to bottom of sensor weight
 (in upper stop position): see next page

A = Length of socket pipe

200 mm (7.9")
 Optional 500 mm (19.7")/ 1,000 mm (39.4")

B = Diameter of socket pipe

Rope version with Flange DN100/ 4"	ø60 mm (ø2.36")
------------------------------------	-----------------

All other versions	ø40 mm (ø1.57")
--------------------	-----------------

C = Housing extension

Flange version DN 100/4"	80°C/ 150°C	95 mm (3.74")
--------------------------	-------------	---------------

	250°C	340 mm (13.4")
--	-------	----------------

Other Versions	80°C/ 150°C	160 mm (6.3")
----------------	-------------	---------------

	250°C	340 mm (13.4")
--	-------	----------------

Rope	ø1.0 mm (ø0.04")
-------------	------------------

Tape	12 x 0.2 mm (0.47 x 0.008")
-------------	-----------------------------

Flanges

fitting to: DN100 PN16/ 4" 150lbs	Lk = ø180 - 190.5 mm (ø7.1 - 7.5") slot d2 = ø19 mm (ø0.75")
--------------------------------------	---

fitting to: 2"/ 3" 150lbs	Lk = ø120.7 - 152.4 mm (ø4.75 - 6.0") slot d2 = ø19 mm (ø0.75")
------------------------------	--

Materials

Housing outside	Aluminium, powder coated
Housing inside	Aluminium
Housing extension	Aluminium, powder coated or 1.4305 (303)
Flange	80°C/ 150°C: Aluminium, powder coated 250°C: 1.4305 (303)
Thread	1.4301 (304)
Socket pipe	Flange version DN100/ 4", 80°C/ 150°C: Aluminium All other versions: 1.4301 (304)
Rope	1.4401 (316)
Tape	1.4310 (301)

With option "Increased corrosion resistance":

All metal parts in contact with the process are coated.

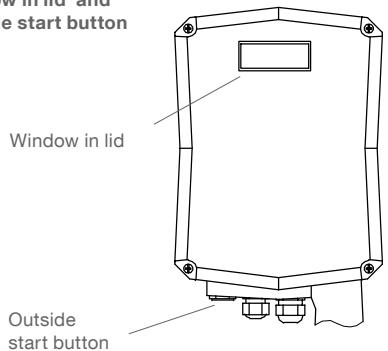
The rope is plastic coated with PA.

The internal bearings are made of stainless steel.

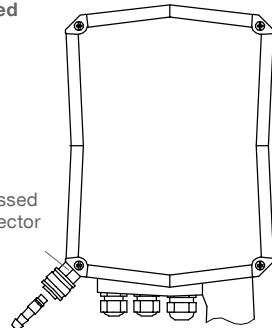
Dimensions

Options and Accessories

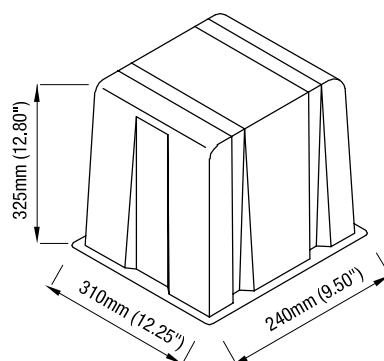
pos.25
 Window in lid and outside start button



pos.28
 Compressed air connector



pos.21
 Weather protection cover

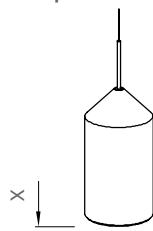


Sensor weights

Solids measurement: Rope version

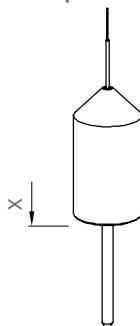
All weights ca. 1.0 kg (2.2 lbs)

PVC without pin



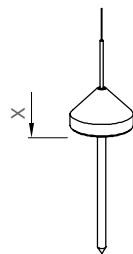
Ø81 mm (ø3.2")
 X = 137 mm (5.4")
 Material: PVC

PVC with pin



Ø81 mm (ø3.2")
 X = 137 mm (5.4")
 Pin: 130 mm (5.1")
 Material: PVC (pin POM)

Stainless steel

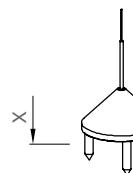


Material:
 1.4305 (303)

Version with
 Flange DN100/ 4"
 Ø75 mm (ø3.0")
 X = 25 mm (1.0")
 Pin: 130 mm (5.1")

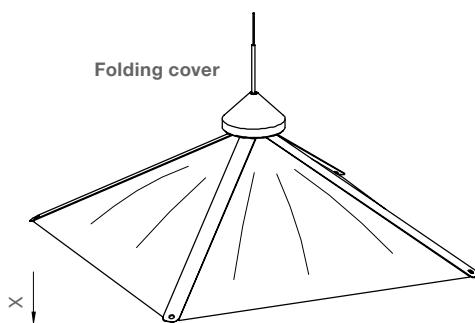
All other versions
 Ø42 mm (ø1.65")
 X = 81 mm (3.19")
 Pin: 130 mm (5.1")

Claw



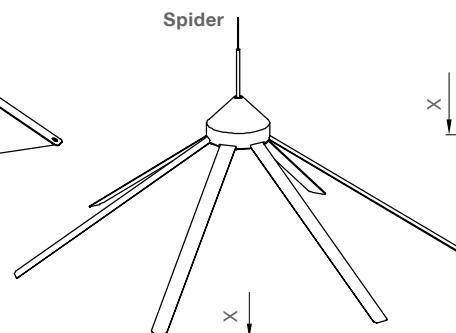
Ø95 mm (ø3.7")
 X = 71 mm (2.8")
 Material: 1.4305 (303)

Folding cover



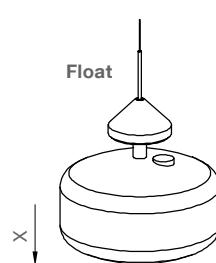
Ø380 x 380 mm (15 x 15")
 X = 150 mm (5.9")
 Material: 1.4310 (301) / 1.4305 (303)
 PA canvas

Spider



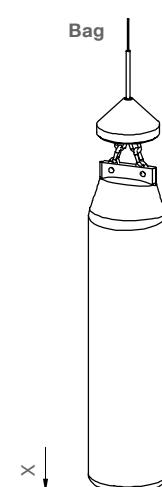
Ø600 mm (ø23.6")
 X = 160 mm (6.3")
 Material: 1.4301 (304) / 1.4305 (303)
 1.4310 (301)

Float



Ø190 mm (ø7.5")
 X = 175 mm (6.9")
 Material: Float PP,
 Cone: aluminium

Bag

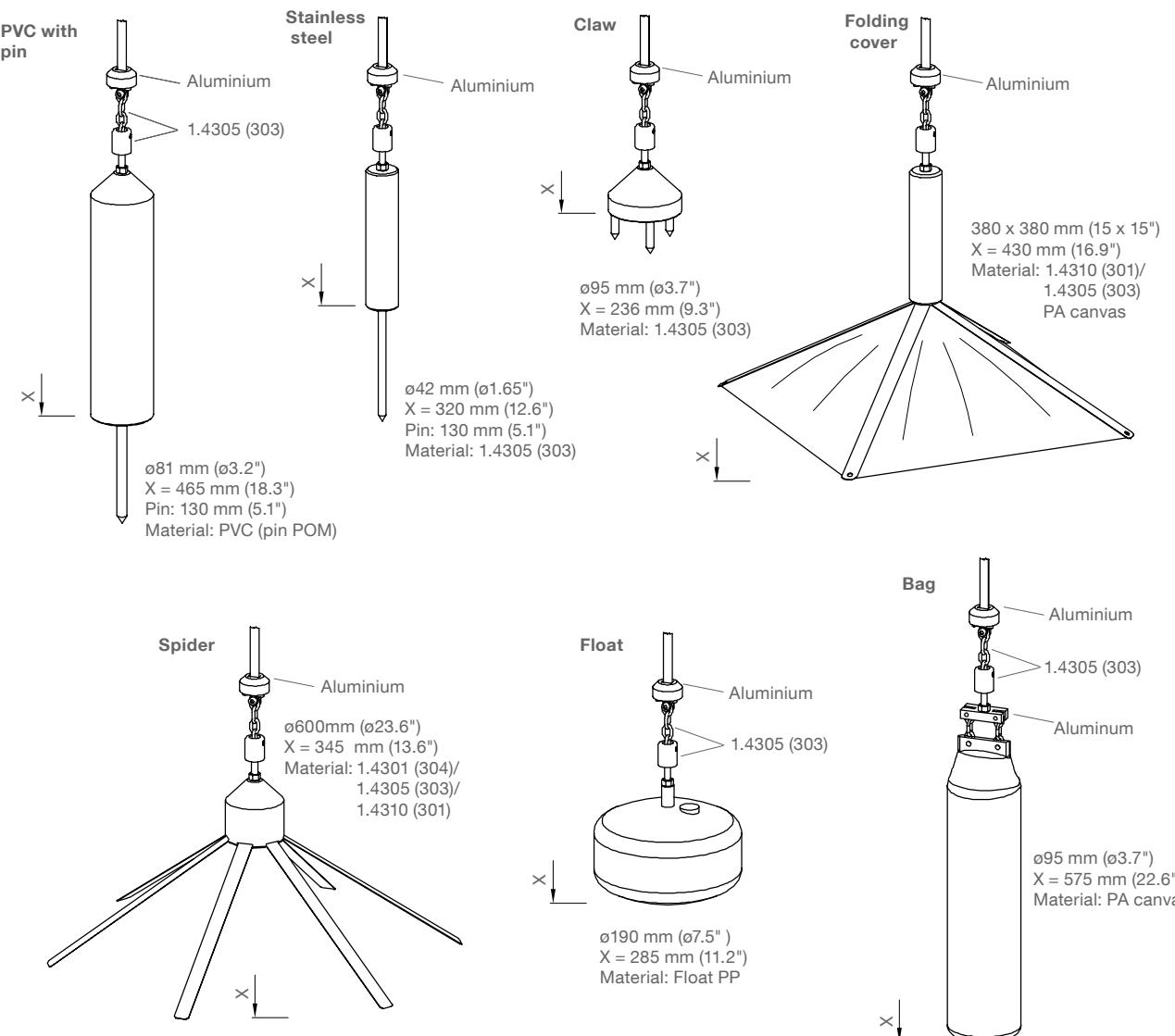


Ø95 mm (ø3.7")
 X = 460 mm (18.1")
 Material: PA canvas,
 Chain: 1.4305 (303)
 Cone: aluminium

Dimensions

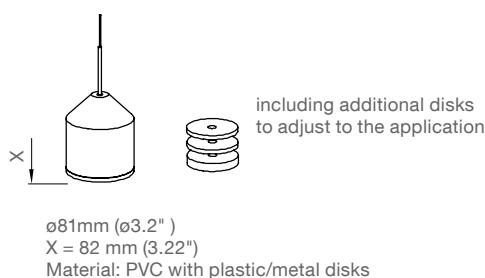
Solids measurement: Tape version

All weights ca. 2.1 kg (4.6 lbs)



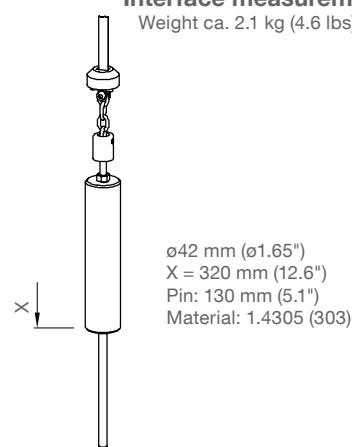
Interface measurement: Rope version

Weight ca. 1.0 kg (2.2 lbs)



Interface measurement: Tape version

Weight ca. 2.1 kg (4.6 lbs)



Spare parts

Minimum order value for separate orders of spare parts or accessories is 75 €.

Rope roller

sl102243	Rope roller with 30 m rope (13 mm* rope chamber) Process temperature max. 80°C	•
sl102240	Rope roller with 30 m rope (33 mm* rope chamber) Process temperature max. 80°C	•
sl102242	Rope roller with 30 m rope for increased corrosion resistance (plastic coated)	•

*For safe function 13 mm and 33 mm rope chamber must be substituted only by the same type.

Tape roller

sb102240	Tape roller with 40 m tape	•
-----------------	----------------------------------	---

Sensor weights

All sensor weights are delivered incl. mounting set for proper fixing to the rope/tape and excl. rope/tape

Solid measurement

sl102220	Sensor weight for rope	PVC without pin	•
sl102221	Sensor weight for rope	PVC with pin	•
sl102222	Sensor weight for rope	Stainless steel ø75 mm (ø3.0")	•
sl102228	Sensor weight for rope	Stainless steel ø42 mm (ø1.65")	•
sl102223	Sensor weight for tape	Claw	•
sl102224	Sensor weight for rope	Folding cover	•
sl102225	Sensor weight for rope	Spider	•
sl102226	Sensor weight for rope	Bag	•
sl102227	Sensor weight for rope	Float	•
sb102221	Sensor weight for tape 40 m	PVC with pin	•
sb102222	Sensor weight for tape 40 m	Stainless steel	•
sb102223	Sensor weight for tape 40 m	Claw	•
sb102224	Sensor weight for tape 40 m	Folding cover	•
sb102225	Sensor weight for tape 40 m	Spider	•
sb102226	Sensor weight for tape 40 m	Bag	•
sb102227	Sensor weight for tape 40 m	Float	•

Interface measurement

sl102230	Sensor weight for rope	PVC with metal core	•
sb102230	Sensor weight for tape	Stainless steel	•

Mounting set without sensor weights

sl100270	For rope version 80°C	•
zu108030	For tape version	•

Motor

gm102202	Motor standard version	•
gm102211	Motor brushless version	•

Electronics

pl102691	Electronics 98 .. 253 V 50 -60 Hz 0/ 4-20 mA Modbus	Relay counting pulse (5 cm 10 cm 1/6 ft 1/3 ft)	•
pl102690	Electronics 98 .. 253 V 50 - 60 Hz 0/ 4-20 mA Modbus	Electr. counting pulse (1 cm 2.5 cm 1/20ft 1/10 ft)	•
pl102692	Electronics 98 .. 253 V 50 - 60 Hz 0/ 4-20 mA Profibus DP	Relay counting pulse (5 cm 10 cm 1/6 ft 1/3 ft)	•
pl102696	Electronics 20 .. 28 V DC 0/ 4-20 mA Modbus	Relay counting pulse (5 cm 10 cm 1/6 ft 1/3 ft)	•
pl102695	Electronics 20 .. 28 V DC 0/ 4-20 mA Modbus	Electr. counting pulse (1 cm 2.5 cm 1/20 ft 1/10 ft)	•
pl102697	Electronics 20 .. 28 V DC 0/ 4-20 mA Profibus DP	Relay counting pulse (5 cm 10 cm 1/6 ft 1/3 ft)	•

Required information: Rope or Tape version. Evt. further menue preseetings.

Internal Heater

em100372	220 Ohms	For power supply 98 .. 253 V 50 - 60 Hz	•
em100371	8 Ohms	For power supply 20 .. 28 V DC	•

Weather protection cover

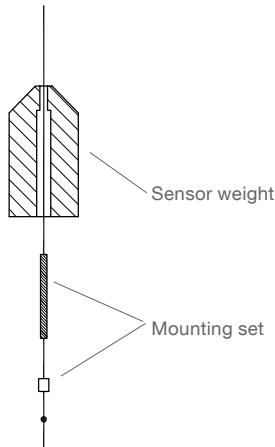
zu400215	•
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Spare parts

Sensor weights/ Mounting set

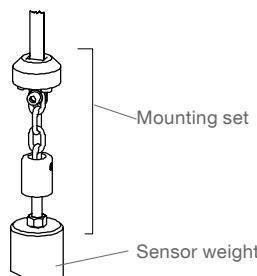
All sensor weights are delivered including stated parts for proper fixing to the rope/ tape

Solids measurement: rope version

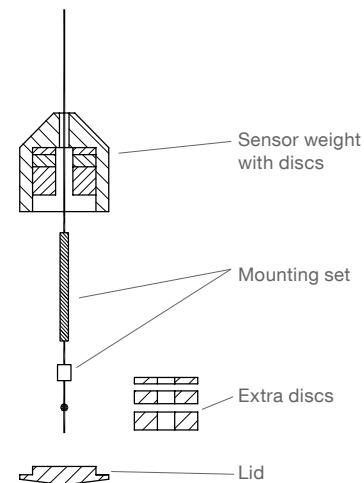


Solids measurement: tape version

Interface measurement: tape version

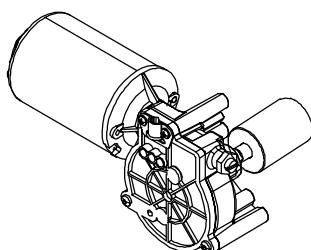


Interface measurement: rope version

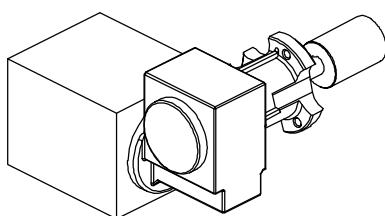


Motor

Standard

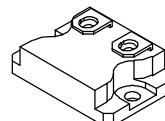


Brushless motor



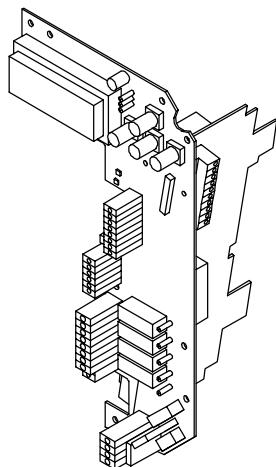
Delivery including: cable,
plug, sealing, mounting tools

Heater

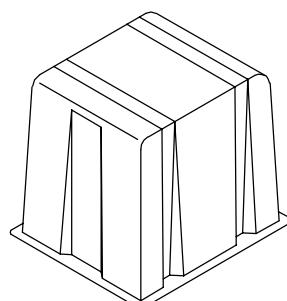


Delivery including
cable and plug

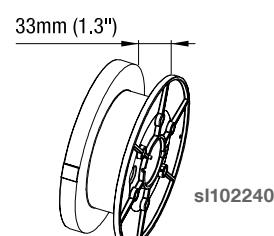
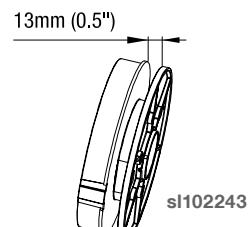
Electronics



Weather protection cover

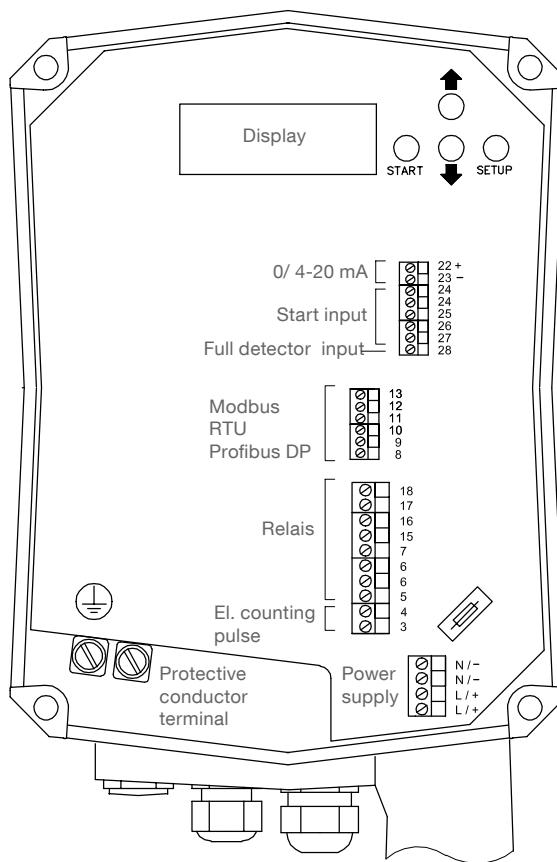


Rope roller



Electrical installation

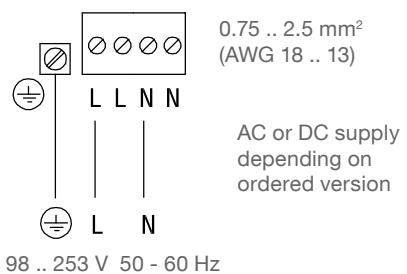
Terminal location



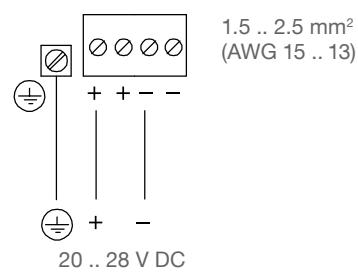
Power supply and Signal input/ output

Power supply

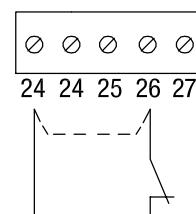
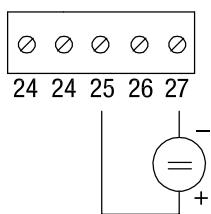
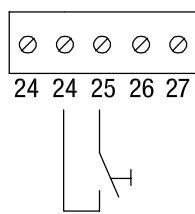
AC version



DC version



Signal input: Start of measurement



Start contact

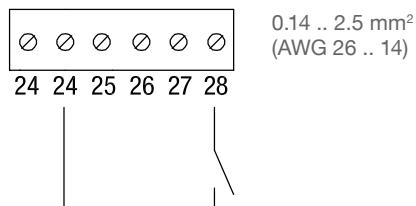
alternative

Start +24 V

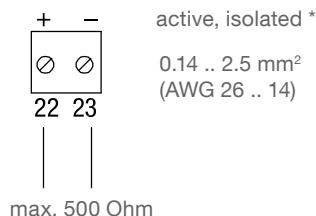
Measurement interruption
 in case of filling. If used, remove
 factory provided connection.

Electrical installation

Signal input:
 Full detector

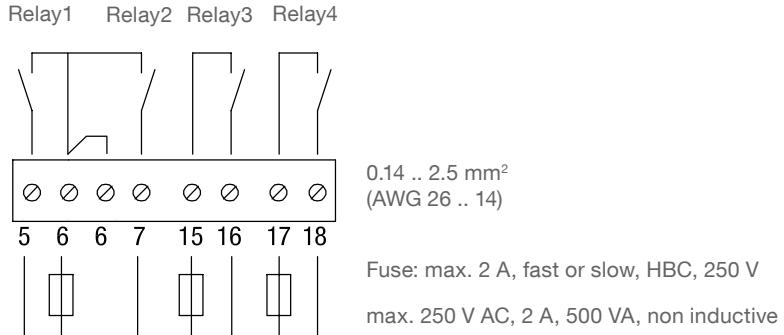


Signal output:
 0/4-20 mA

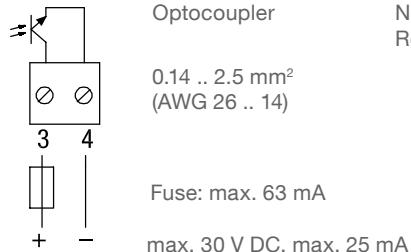


* CAUTION:
 If connecting to a PLC with isolated (floating)
 4-20 mA input, the "-" line must be connected
 to ground of the PLC. See user manual of the PLC.

Signal output:
 Relay



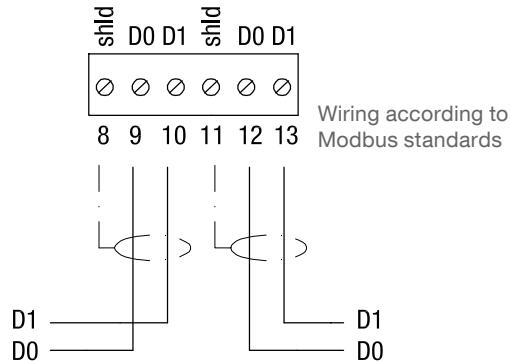
Signal output:
 Electronic counting
 pulse



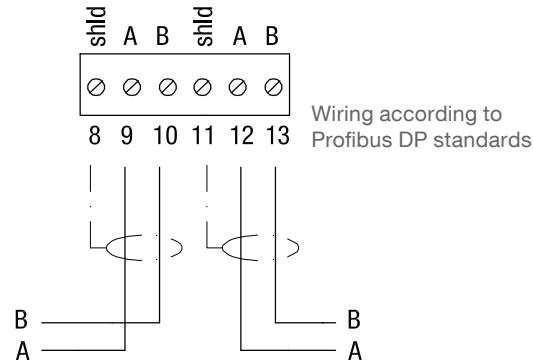
Note:
 Reset pulse is done with Relay 2

Electrical installation

Modbus network



Profibus DP network





Nivobob® 4000

Microprocessor controlled level measuring system

Cost-effective level measurement system for reliable level monitoring in bulk goods - for different materials; also for use in hazardous locations



Nivobob® 4000



- Sensational cost/performance ratio
- Unaffected by material properties such as conductivity, dust, di-electricity
- Easy installation - also for direct mounting on an inclined silo roof
- Maintenance free

Application: Nivobob® 4000 is used in many various bulk goods. It is particularly suitable for the building, animal feed and grain industry.

Types of Nivobob® flanges for level measurement:

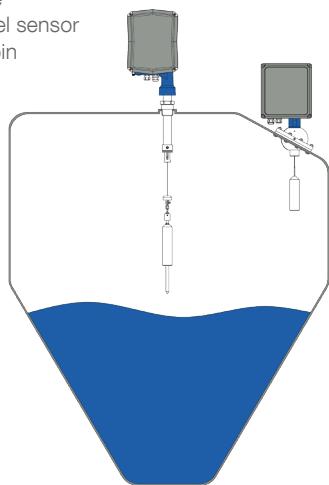
NB 4100
Rope version
DN 100 flange
PVC sensor weight



NB 4200
Tape version
Thread connection
Stainless steel sensor weight



NB 4100
Rope version
Aiming flange
Stainless steel sensor weight with pin



Technical Data

Type	NB 4100 / NB 4200 (rope / tape version)
Housing	Aluminium IP66 (Type 4)
Pressure	Max. +0.2 bar (+3.0 psi)
Supply voltage	AC version: 230 V or 115V 50-60 Hz DC version: 20...28 V
Measuring range	Max. 30 m
Signal output/ Communication	4-20 mA; relay for counting pulse; Modbus; Upper stop position, error
Approvals	CE; ATEX II 1/2 D; TR-CU; FM General Purpose and FM Cl. II, III, Div. 1
Process temperature range	-40°C up to +80°C (-40°F up to +176°F)
Sensitivity	From 20 g/l (1.2 lb/ft³) dep. on sensor weight
Process connection	Flange DN100 PN16 Flange 4" 150 lbs Flange 2" and 3" 150 lbs Flange R 1½" Thread NPT 1½" Thread NPT 3" (adapter) Aiming flange 0° - 50°

Interior view

Rope/tape chamber



Electronic chamber



Sensor weights



Aiming flange



Table of contents

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NB 4000	4

Options/ Accessories	6

Dimensions/ materials	7

Spare parts	9

Electrical installation	11

Subject to change.

Valid: From 01.04.2020 until 31.03.2021, unless otherwise agreed.

All dimensions in mm (inches).

By publishing this selection list all other lists become invalid.

All prices in Euro (€) or USD (\$),
excluding VAT.

We assume no liability for typing errors.

All EURO prices are EXW Betzigau,
all USD prices are EXW Memphis,
excluding packaging costs.

Different variations to those specified are possible.
Please contact our technical consultants.

Overview

Features

Continuous level measurement of solids applications

Process

- Independent of bulk material properties
- Accurate measurement

Service

- Simple installation and commissioning
- Rope and tape version with long service life
- Low maintenance

Approvals

- Approval for use in Hazardous Areas
- 2011/65/EU RoHS conform

Mechanics

- Measurement range up to 30 m (100 ft)
- 1½" process connection possible
- Aiming flange to be mounted directly on a flat silo roof
- Internal tape cleaner for difficult materials

Electronics

- Micro processor controlled measurement
- Diagnostic possibilities
- Output 4-20 mA/ Modbus
- Two programmable Relay
(can be used as Counting/ reset pulse output or as Failure/ Upper stop position)



NB 4100

Rope version
Fig. with flange DN100
and PVC sensor weight

NB 4200

Tape version
Fig. with thread connection
and stainless steel sensor weight

NB 4100

Rope version
Fig. with aiming flange and
stainless steel sensor weight
with pin

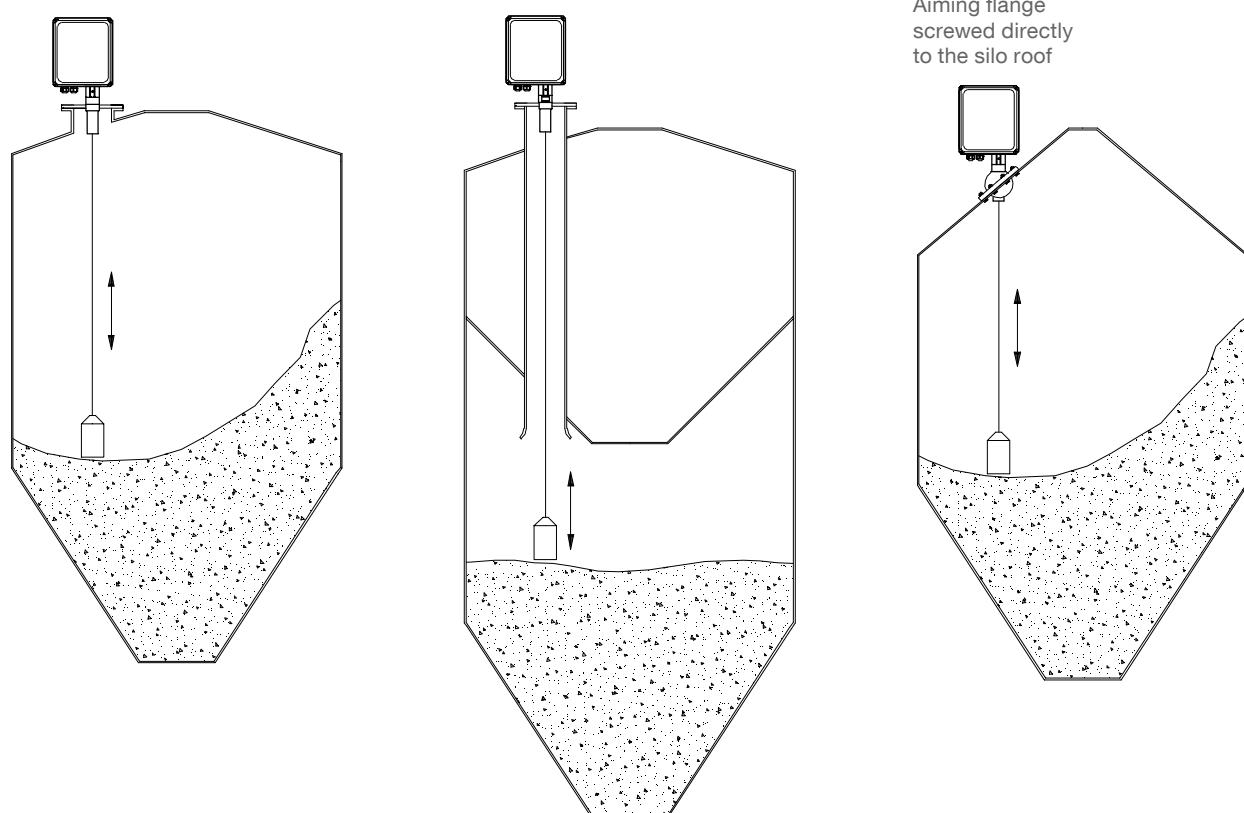
Specification / application

Specification

Process	Measurement range	15 m (50 ft) or 30 m (100 ft)
	Process temperature	80°C (176°F)
	Process overpressure	-0.2 .. +0.2 bar (-3.0 .. + 3.0 psi)
	Min. powder density	>300 g/l (18 lb/ft³)
Electronics	Power supply	AC version 115 V or 230 V 50 - 60 Hz DC version 20 .. 28 V
	Output	4-20 mA
		2 relais (optional)
		Modbus RTU
Approvals	Dust Ex	ATEX 1/2D
		FM Cl. II, III Div. 1, TR-CU
	Ordinary Location	CE, FM, TR-CU

Application

Solids measurement



For measurements through a long pipe in a double chamber silo we recommend the use of NB 4200 (tape version).

NB 4000

NB 4100

Rope version
(fig. with flange DN100
and PVC sensor weight)



NB 4200

Tape version
(fig. with thread connection
and stainless steel sensor
weight)



Cable entries (by default)

Depending on selected version (options see pos.26):

CE, ATEX, Screwed cable gland: 1x M25 x 1.5 and 1x M20 x 1.5
TR-CU Blindplug: 1x M25 x 1.5 and 1x M20 x 1.5

FM Open conduit ANSI B1.20.1: 1x NPT 3/4" and 1x NPT 1/2"
 Blindplug: 1x NPT 3/4" and 1x NPT 1/2"

Dimensions see page 7

NB 4000

pos.1	Basic type	
C	NB 4100	Rope version
D	NB 4200	Tape version
pos.2	Certificate	
0	CE ⁽¹⁾	•
W	ATEX II 1/2 D	•
M	FM general purpose	•
N	FM Class II, III Div.1 Group E-G	•
E	TR-CU Ex ta/tb IIIC T! Da/Db X	•
pos.3	Measurement range	
1	15 m (50 ft)	•
2	30 m (100 ft)	•
pos.4	Power supply/ Signal output	
1	230 V 50 - 60Hz 4-20 mA	•
4	230 V 50 - 60Hz Modbus	•
2	115 V 50 - 60Hz 4-20 mA	•
5	115 V 50 - 60Hz Modbus	•
3	20 .. 28 V DC 4-20 mA	•
pos.5	Process connection	
A	Thread R 1½" tapered EN 10226-1	•
B	Thread NPT 1½" tapered ANSI B1.20.1	•
X	Flange DN100 PN16 (EN 1092-1) and flange 4" 150lbs ANSI B16.5 (unit is fitting to this flange)	•
Y	Flange 2" and flange 3" 150lbs ANSI B16.5 (unit is fitting to this flange)	•
W	Aiming flange (to be mounted directly to the silo roof) ⁽⁵⁾	•
pos.6	Sensor weight ⁽²⁾	
Y	without ⁽³⁾	•
A	PVC ⁽⁴⁾	•
C	Stainless steel	•
E	Folding cover	•

Basic type

NB 4.00	<input type="checkbox"/>				
Position	1	2	3	4	5

← Order code

All positions are available in special design (use code "Z").

- (1) TR-CU (Ordinary Locations) included
- (2) For use in Hazardous Locations (Dust Ex): It must be ensured, that no static discharge from the material surface can occur. Sensor weights, which can be used in case of possible static discharge, on request.
- (3) Only for tape version. Including mounting set for sensor weight (see page 9: Sensor weights).
- (4) Does not fit through a 1½" nozzle, must be mounted after fixing the unit to the silo.
- (5) Mounting without a socket. Including fixing material (screws, sealing etc.).

Options / Accessories

Options

pos.11	<input checked="" type="checkbox"/> Guarantee extension to 5 years	Wear and tear parts rope/ tape and motor not included	•
pos.21	<input checked="" type="checkbox"/> Weather protection cover	For Ex only approved for Zone 22 or Division 2	•
pos.22	<input checked="" type="checkbox"/> Internal heater	Needed for: ambient temp. < -20°C (-4°F) or condense water inside silo or wet process atmosphere (Note: < -20°C (-4°F) with ATEX, FM Class II or TR-CU on request possible)	•
pos.23	<input checked="" type="checkbox"/> Length of socket pipe		
1	200 mm (7.87")	•	
2	500 mm (19.7")	•	
3	1,000 mm (39.4")	•	
pos.24	<input checked="" type="checkbox"/> Pin for sensor weight	POM or stainless steel (in accordance to selected sensor weight material, not for pos.6 E)	•
pos.25	<input checked="" type="checkbox"/> Relais output	Two relais (possible indication; Failure, reset pulse, counting pulse, upper stop position) Nicht für Modbus (pos.4 4,5)	•
pos.26	<input checked="" type="checkbox"/> Cable entry	Selection of the following options only necessary, if a deviation from the default cable gland/ conduit is required:	
0	Screwed cable gland 1x M25 x 1.5 + 1x M20 x 1.5 + blindplug 1x M25 x 1.5 + 1x M20 x 1.5	•	
A	Conduit 1x NPT ¾" + 1x NPT ½" + blindplug 1x NPT ¾" + 1x NPT ½"	•	
pos.27	<input checked="" type="checkbox"/> Preset fieldbus address (Modbus)	Enables easy commissioning with Nivotec Level Monitoring System. Preset from address = "1" to "amount of ordered units". Address label on enclosure. Termination resistor set on unit with highest address. Other addresses possible on request.	•

Accessories

Minimum order value for separate orders of spare parts or accessories is 75 €.

Fixing material for mounting the unit on a flange

zu107000	4 bolts M16 x 60, 8 washers, 4 nuts. Stainless steel.	•
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Sealings for mounting the unit on a flange

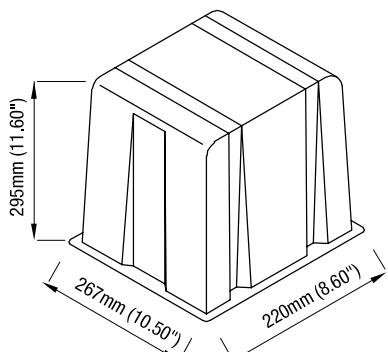
di300125	Flange sealing for DN100 PN16/ 4" (neoprene)	•
di300127	Flange sealing for 2" / 3" 150lbs (neoprene)	•

Adapter NPT 1½" to NPT 3"

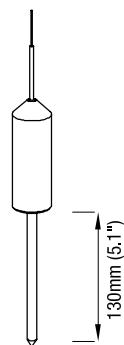
zu103100	Thread tapered ANSI B1.20.1, aluminium	•
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Cable gland

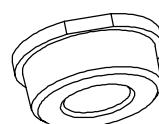
em400589	Cable gland with 2 inputs. M25 x 1.5, clamping range 2x ø4.5-7 mm, -20 .. +70°C	•
em400573	Cable gland, M20 x 1.5, clamping range ø6-12 mm, -40 .. +70°C.	•



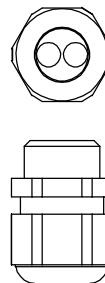
Weather protection cover



Pin for sensor weight
POM or 1.4305 (303)



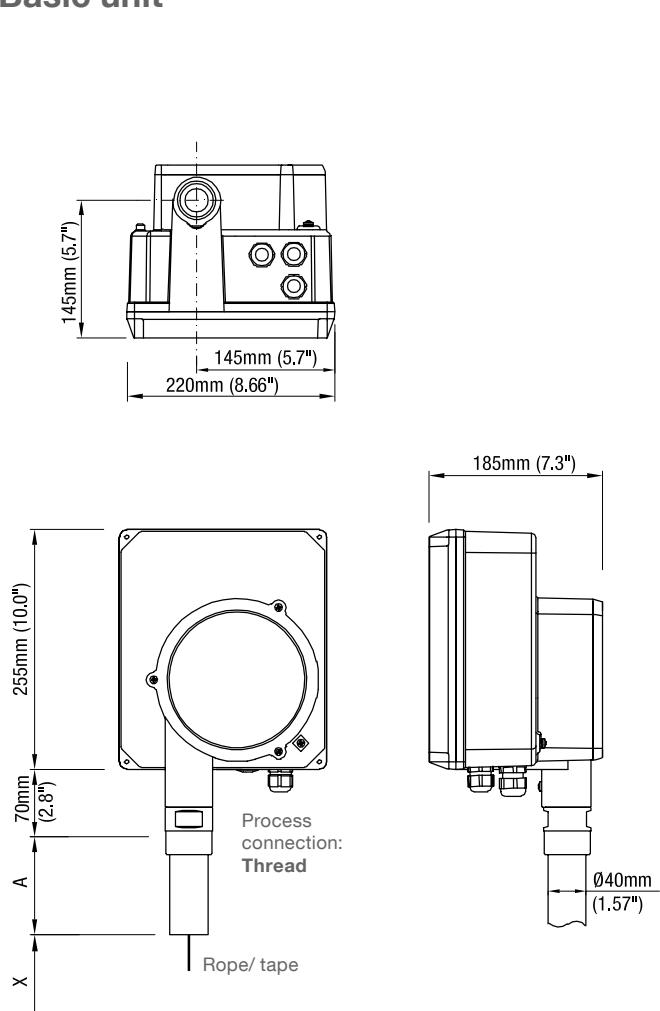
Adapter NPT 1½" to NPT 3"



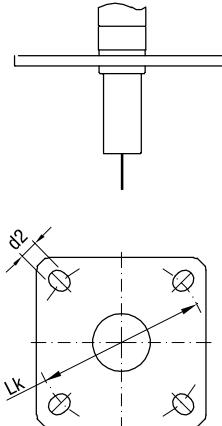
Cable gland
with 2 inputs

Dimensions and materials

Basic unit

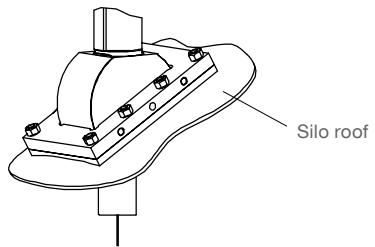


Process connection: Flange



Process connection: Aiming flange

To be screwed directly to the silo roof
 0° - 50° adjustable
 Including screws, nuts and sealing



Flange plate outside dimensions:
 Width x Height: 120 mm x 180 mm (4.7" x 7.1")

Dimensions

X = Length to bottom of sensor weight (in upper stop position, see next page)	
A = Length of socket pipe 100 mm (3.9") Optional 200 mm (7.9")/ 500 mm (19.7")/ 1,000 mm (39.4")	
Flanges	
fitting to: DN100 PN16/ 4" 150lbs	Lk = Ø180 - 190.5 mm (Ø7.1 - 7.5") slot d2 = Ø19 mm (Ø0.75")
fitting to: 2" / 3" 150lbs	Lk = Ø120.7 - 152.4 mm (Ø4.75 - 6.0") slot d2 = Ø19 mm (Ø0.75")
Rope	Ø1.0 mm (Ø0.04")
Tape	12 x 0.2 mm (0.47 x 0.008")

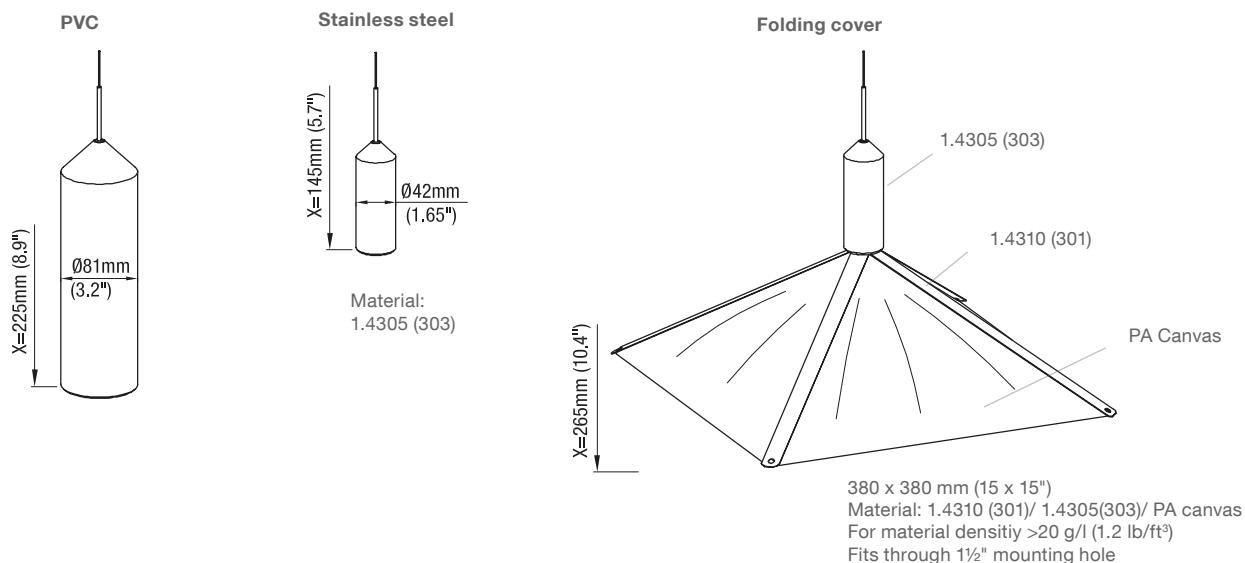
Materials

Housing outside	Aluminium, powder coated
Housing inside	Aluminium
Thread/ flange	Aluminium
Aiming flange	Aluminium/ 1.4301 (301)
Rope	1.4401 (316)
Tape	1.4310 (301)

Dimensions and materials

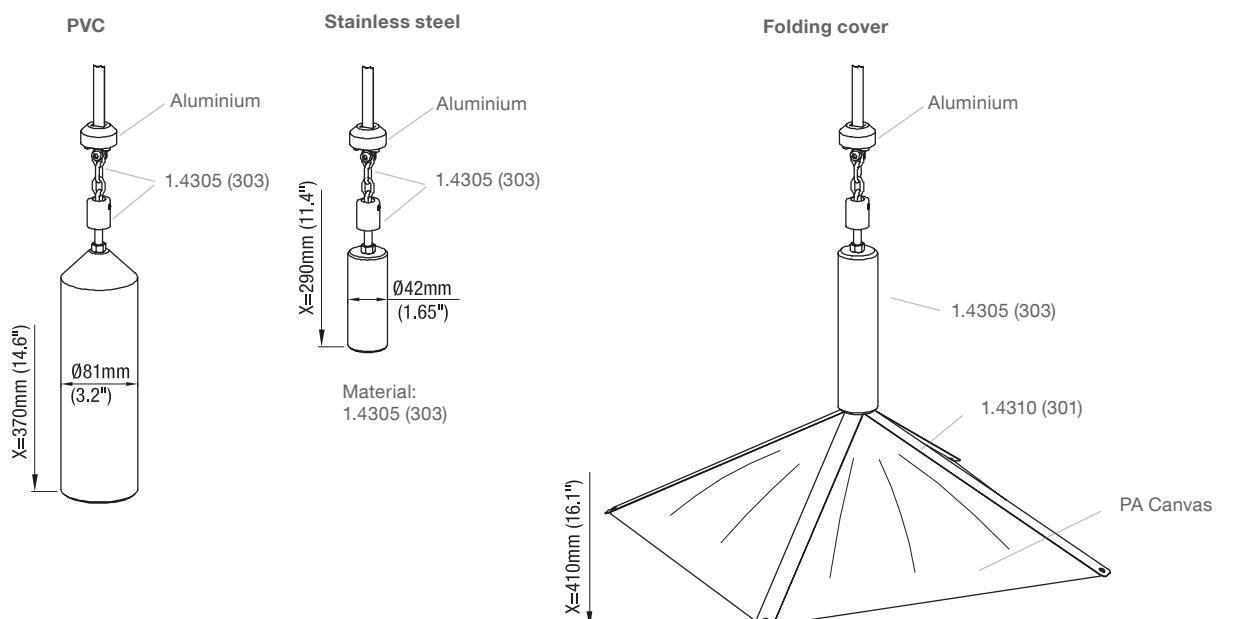
Sensor weights

Rope version



All sensor weights:
 1,6 kg (3.5 lbs)

Tape version



Fixing elements between tape and sensor
 weight: aluminium/ 1.4305 (303)

All sensor weights:
 1.6 kg (3.5 lbs)

Spare parts

Minimum order value for separate orders of spare parts or accessories is 75 €.

Roller

sl103239	Rope roller with 15 m rope	•
sl103240	Rope roller with 30 m rope	•
sb103239	Tape roller with 15 m tape	•
sb103240	Tape roller with 30 m tape	•

Sensor weights

All sensor weights are delivered incl. mounting parts for proper fixing to the rope/ tape and excl. rope/ tape

For rope version:

sl103231	PVC without pin	•
sl103232	PVC with pin	•
sl103233	Stainless steel without pin	•
sl103234	Stainless steel with pin	•
sl103235	Folding cover	•

For tape version:

sb103231	PVC without pin	•
sb103232	PVC with pin	•
sb103233	Stainless steel without pin	•
sb103234	Stainless steel with pin	•
sb103235	Folding cover	•

Mouting set without sensor weight

sl100280	For rope version	•
zu108030	For tape version	•

Motor

gm103202	Motor	•
-----------------	-------------	---

Electronics

pl103690	230 V 50 - 60 Hz	4-20 mA	without 2 Relais ⁽¹⁾	•
pl103691	230 V 50 - 60 Hz	4-20 mA	with 2 Relais ⁽¹⁾	•
pl103696	230 V 50 - 60 Hz	Modbus	without 2 Relais ⁽¹⁾	•
pl103692	115 V 50 - 60 Hz	4-20 mA	without 2 Relais ⁽¹⁾	•
pl103693	115 V 50 - 60 Hz	4-20 mA	with 2 Relais ⁽¹⁾	•
pl103697	115 V 50 - 60 Hz	Modbus	without 2 Relais ⁽¹⁾	•
pl103694	20 .. 28 V DC	4-20 mA	without 2 Relais ⁽¹⁾	•
pl103695	20 .. 28 V DC	4-20 mA	with 2 Relais ⁽¹⁾	•

Required information: Rope or Tape version; measuring range 15 m or 30 m; evt. further menue preseetings.

Internal Heater ⁽²⁾

em100373	680 Ohms	For power supply 230 V 50 - 60 Hz	•
em100374	220 Ohms	For power supply 115 V 50 - 60 Hz	•
em100375	8.2 Ohms	For power supply 20 .. 28 V DC	•

Weather protection cover

zu400217	•
-----------------	-------	---

(1) Implements the electronic components needed to control the Internal Heater (needed for option pos.22)

(2) Used for replacement for already mounted heater.

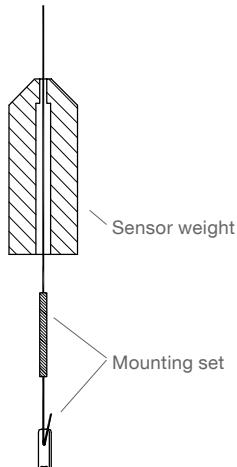
In case of re-fitting the Internal Heater, the electronics must include components for the Internal Heater Control (please contact factory).

Spare parts

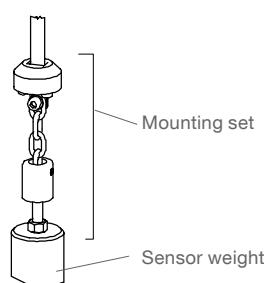
Sensor weights/ Mounting set

All sensor weights are delivered including stated parts for proper fixing to the rope/ tape

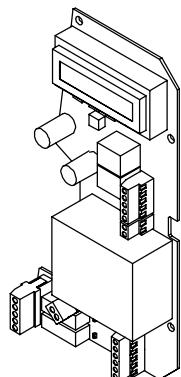
Rope version



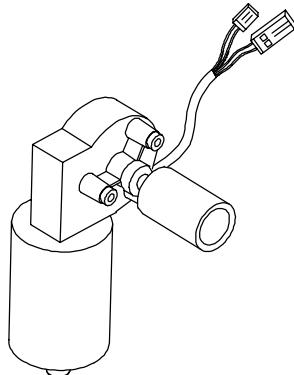
Tape version



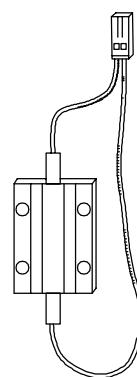
Electronics



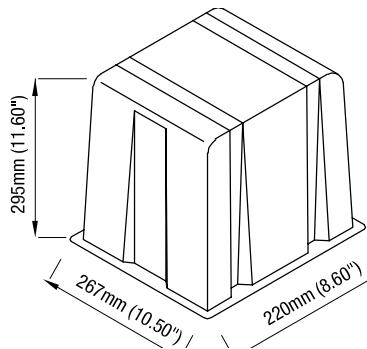
Motor



Internal heater



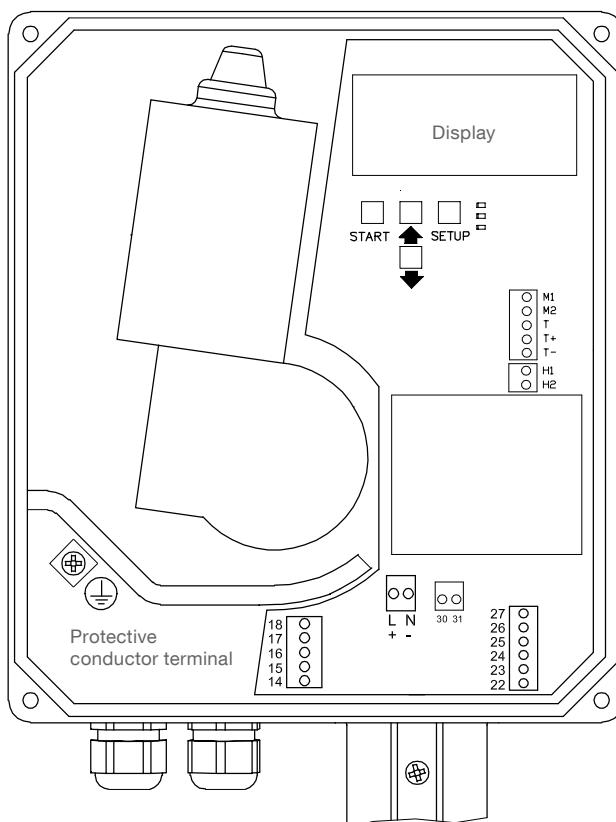
Weather protection cover



Electrical installation

Version 4-20 mA

Terminal location



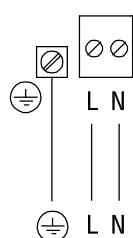
Internal terminals for motor and heater

- Terminals for:
 - Power supply
 - Signal input:
 - Start of measurement
 - Measurement interruption
- Signal output:
 - 4-20 mA
 - Relais

Note: Terminal 30 and 31 not used

Power supply

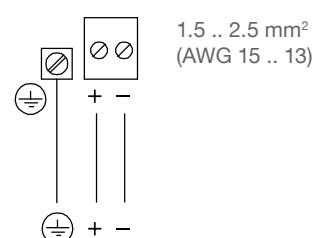
AC version



0.75 .. 2.5 mm²
 (AWG 18 .. 13)

230 V or 115 V 50 - 60 Hz

DC version

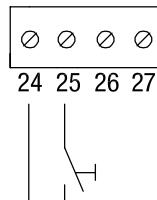


1.5 .. 2.5 mm²
 (AWG 15 .. 13)

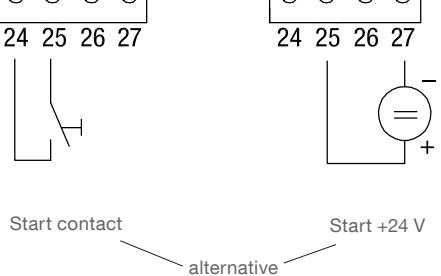
20 .. 28 V DC

Signal input:

Start of measurement



Measurement interruption



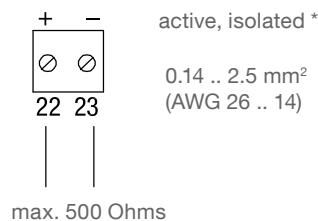
0.14 .. 2.5 mm²
 (AWG 26 .. 14)

Measurement interruption in case of filling. If used, remove factory provided connection.

Electrical installation

Signal output:

4-20 mA



active, isolated *

0.14 .. 2.5 mm²
 (AWG 26 .. 14)

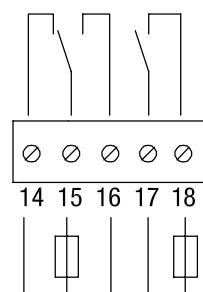
* CAUTION:

If connecting to a PLC with isolated (floating)
 4-20 mA input, the "-" line must be connected to
 ground of the PLC. See user manual of the PLC.

Signal output:

Relais
 (optional)

Relay1 Relay2

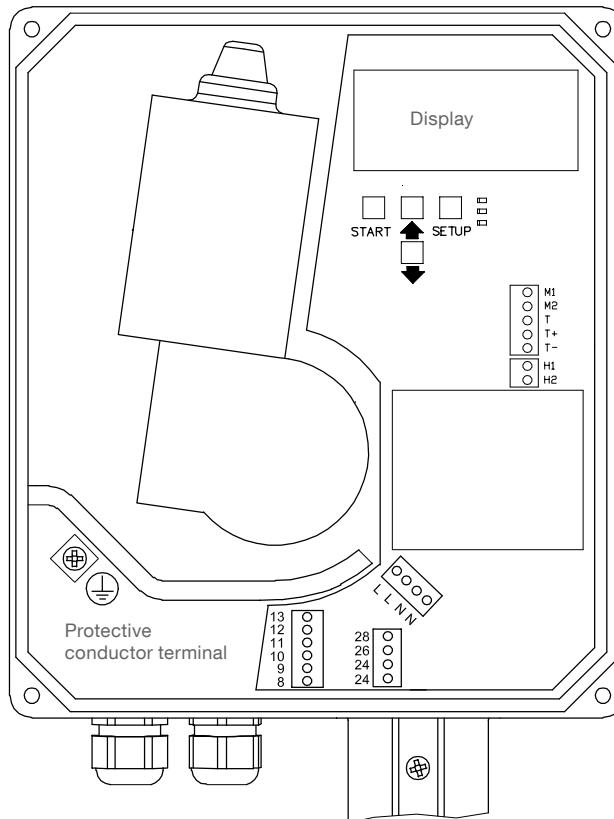


0.14 .. 2.5 mm²
 (AWG 26 .. 14)

max. 250 V AC, 2 A, 500 VA, non inductive

Version Modbus

Terminal location



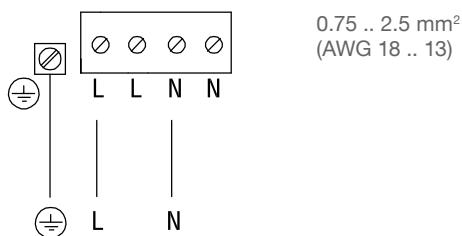
Internal terminals for
 motor and heater

Terminals for:

- Power supply
- Signal input:
 Measurement interruption
- Signal output:
 Modbus

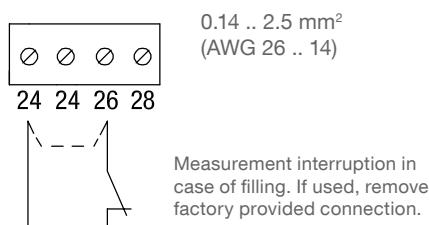
Electrical installation

Power supply



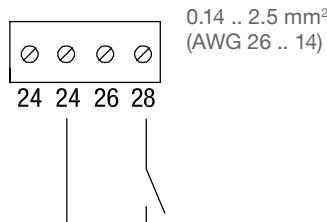
230 V or 115 V 50 - 60 Hz

Signal input: Measurement inter- ruption

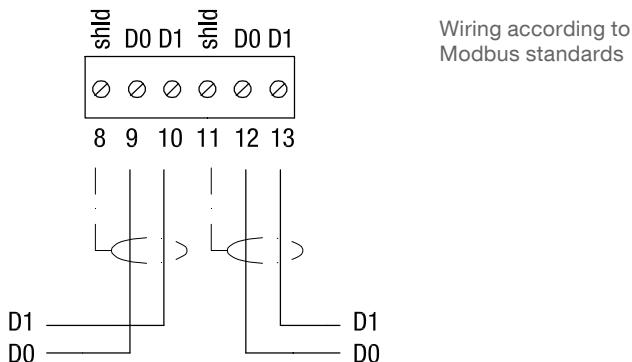


Measurement interruption in
case of filling. If used, remove
factory provided connection.

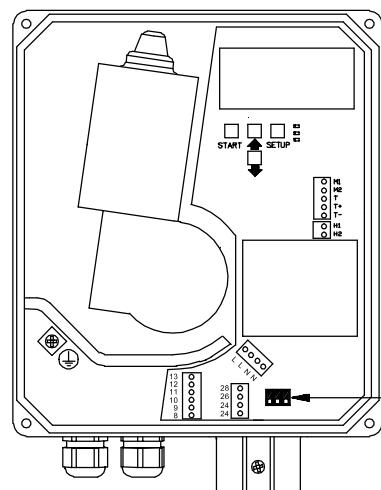
Signal input: Full detector



Modbus network



Wiring according to
Modbus standards



Setting Biasing and Termination Resistor

For use of NB 4000 units in a external Modbus network, it is possible to set Biasing and Termination Resistor on each unit as required.

Biasing	OFF*	OFF	ON	ON
Termination Resistor	OFF*	ON	OFF	ON

*factory provided

DIP Switch position:

Top view Side view



NivoRadar® 3000

Radar level transmitter

The multifunctional FMCW radar level transmitter for continuous monitoring of solids and liquids with two-wire technology – total reliability, even within difficult media. Certified for hazardous locations.

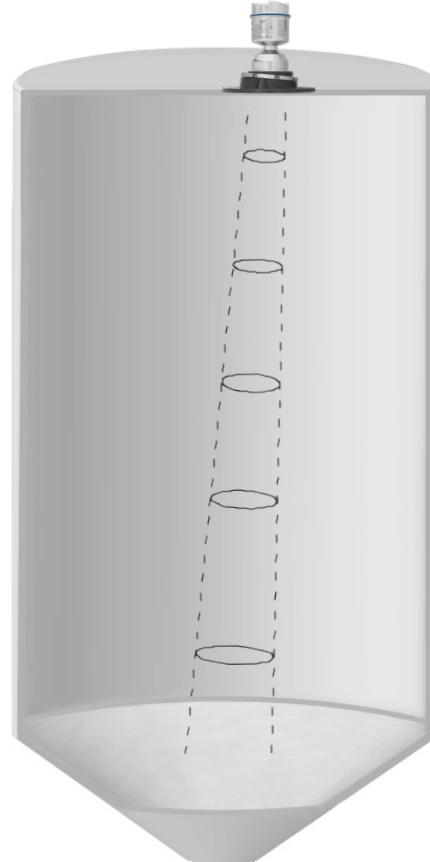


NivoRadar® 3000



- 78GHz Technology
- 4° beam angle
- Measuring range up to 100m
- High precision measurement
- Easy to install and setup
- Process temperature up to 200°C
- Lens antenna and mounting flange are flush
- Integrated lens cleaner
- Simple, six-step commissioning

Application: The robust stainless steel construction makes the NR 3000 extremely suitable for all kinds of industrial applications. The unit operates at a high frequency of 78 GHz thus achieving a very small beam angle which eliminates any signal interference at the flange but allows optimum reflection of the bulk solids material. The aiming flanges can be adjusted to ensure a perfect positioning of the NR 3000, ie the angle of the beam can be set to a specific point, for example the outlet of the silo. The lens antenna is highly resistant to material deposits and offers a self-clean function for extremely sticky solids using an air flush connection. The plug in display allows programming and diagnostics on-site making the installation and operation of the unit as easy as child's play.



Non-contact level transmitter

Flat flange



Aiming flange



Technical Detail

Housing	Stainless steel 1.4404 IP 68 (316L)
Measuring range/ tolerance	40m or 100m ±0.25%
Pressure range	3bar g (40 psi g) max.
Supply voltage	24 V DC (max. DC 30 V)
Process connection	Flat flange stainless steel 316L 80-150mm (3" - 6"), aiming flange aluminium diecast 80-150mm (3" - 6")
Process temperature range	-40°C up to +200°C
Signal output	4...20mA, 2-conductor
Communication	HART
Sensitivity	From DC value 1.6
Material lens antenna	PEI, PEEK
Frequency	78-79GHz FMCW

Table of contents

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NR 3100	4
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Dimensions	7
Electrical installation	9
Spare parts	10

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Different variations to those specified are possible.
Please contact our technical consultants.

Overview

Features

Continuous level measurement of solids and liquids applications with 78 GHz FMCW radar

Measurement range

- Up to 100 m (329 ft)

Mechanic

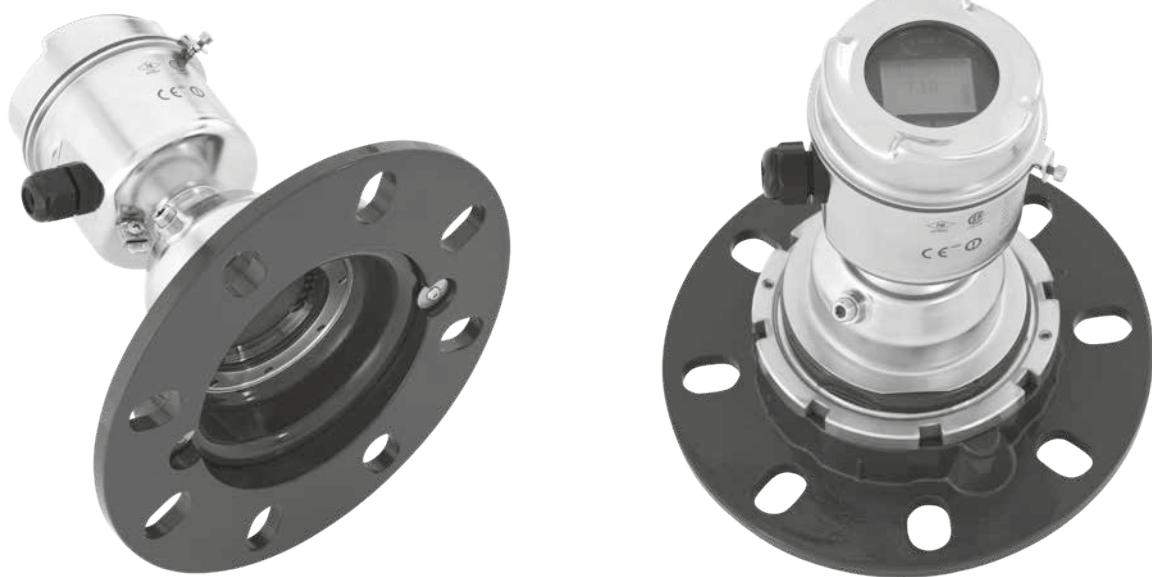
- Lens antenna and flange for quick and easy positioning
- Stainless steel housing
- Plane flanges and Easy aim flanges

Service

- Plug and play system, simple installation and commissioning
- Configuration with only 6 parameters on display with push buttons
- Alternative configuration via HART possible.

Approvals

- Approval for use in Hazardous Locations
- 2011/65/EU RoHS conform

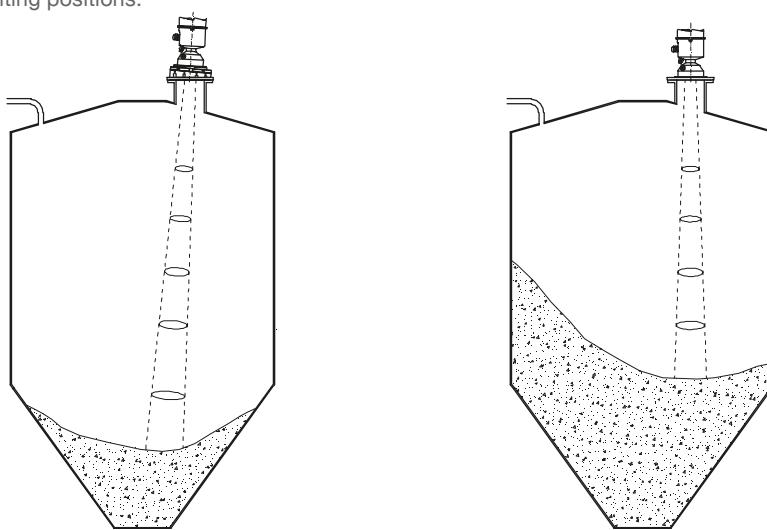


Application

Solids measurement

Aiming is strongly suggested for solid measurement.
It helps to optimize the echo signal (mainly for low material level in the cone) and helps to solve not perfect mounting positions.

For proper mounting positions vertical installation without aiming is possible.



Specification

Specification

Process	Measurement range	40 m (131 ft) or 100 m (328 ft)
	Min. detectable distance	400 mm (15.7") from sensor reference point
	Process temperature	-40 .. +100°C (-40 .. 121°F) or -40 .. +200°C (-40 .. 392°F)
	Process overpressure	-1 .. +0.5 bar (-14.5 .. +43 psi) or -1 .. +3.0 bar (-14.5 .. +43 psi)
Performance	Frequency	78 .. 79 GHz FMCW
	Beam angle	4°
	Accuracy of measurement	5 mm (0.2")
	Update time	Maximum 10 seconds (Response Rate (2.4.1.) set to FAST)
	Dielectric constant of material measured	For ranges up to 20 m (65.6 ft): min. DK = 1.6 For ranges up to 100 m (328 ft): min. DK = 2.5
Mechanics	Ingress protection	Type 4X/NEMA 4X, Type 6/NEMA 6, IP68
	Enclosure	316L/ 1.4404 Lid with window (window material polycarbonate)
	Lens antenna	Material: 40 m version: PEI 100 m version: PEEK
	Air Purge Connection	Female 1/8" NPT fitting Non return valve for 6 mm tube (optional)
Electronics	Power supply/ Communication	4-20 mA loop power Nominal 24V DC (16.5 .. 30 V DC) Protocol HART, Version 6.0
	Plug on display (inside housing)	Removeable graphic LCD, with bar graph representing level
Approvals	CE	
	ATEX/ IEC-Ex	
	Zone 20 and Zone 20/21	Dust ignition proof
	Zone 2	Non-sparking/ Energy Limited
	FM/ CSA	
	General purpose	
	Cl. II, III Div.1	Dust ignition proof
	Cl. I Div.2	Non-incendive
	Radio	
	R&TTE (Europe) FCC Conformity (US) Industry Canada	

NR 3100



Version with plane flange
Fig. states plane flange 100 mm/ 4"



Version with Easy Aimer flange
Fig. states Easy Aimer flange 100 mm/ 4"



Plug on Display
With push buttons.

For programing of the unit.
Once programmed, the Plug on Display can
be removed if desired and used to copy
parameters to multiple units.

Dimensions see page 7

NR 3100

Basic type

NR 3100

pos.2

Certificate⁽¹⁾ (detailed Ex-markings: see page 8)

		Dust	Gas	Protection method
0	CE	-	-	-
	FM/ CSA	-	-	General purpose
F	ATEX/ IEC-Ex	Zone 20 and 20/21	-	Dust Ignition Proof
	ATEX/ IEC-Ex	-	Zone 2	Non-sparking/ Energy Limited
	FM/ CSA	Cl. II, III, Div.1	-	Dust Ignition Proof
	FM/ CSA		Cl. I Div.2	Non-incendive

pos.3

Process temperature

- 1 max. 100°C
- 2 max. 200°C⁽²⁾

pos.4

Process pressure

- 1 0.5 bar
- 2 3 bar

pos.5

Electronic module

- A 2-wire 4-20mA, HART

pos.6

Process connection⁽³⁾

A	Flange 80 mm/ 3"	plane	1.4301 (304)	max. 3 bar/ 200°C
B	Flange 80 mm/ 3"	plane	1.4404 (316L)	max. 3 bar/ 200°C
C	Flange 80 mm/ 3"	Easy Aimer	aluminium ⁽⁴⁾	max. 3 bar(\leq 120°C), max. 0.5 bar (>120 .. 200°C)
D	Flange 100 mm/ 4"	plane	1.4301 (304)	max. 3 bar/ 200°C
E	Flange 100 mm/ 4"	plane	1.4404 (316L)	max. 3 bar/ 200°C
F	Flange 100 mm/ 4"	Easy Aimer	aluminium ⁽⁴⁾	max. 3 bar(\leq 120°C), max. 0.5 bar (>120 .. 200°C)
G	Flange 150 mm/ 6"	plane	1.4301 (304)	max. 3 bar/ 200°C
H	Flange 150 mm/ 6"	plane	1.4404 (316L)	max. 3 bar/ 200°C
I	Flange 150 mm/ 6"	Easy Aimer	aluminium ⁽⁴⁾	max. 3 bar(\leq 120°C), max. 0.5 bar (>120 .. 200°C)

pos.7

Measurement range

- 1 max. 40 m
- 2 max. 100 m⁽²⁾

pos.8

Cable entry

- A M20 x 1.5 cable gland
- B NPT ½" conduit

pos.9

Plug on Display

- 1 Without display
- 2 With display

Basic type

NR 3100	A								
Position	1	2	3	4	5	6	7	8	9

← Order code

All positions are available in special design (use code "Z").

(1) 0 and F including radio approvals R&TTE , FCC, Industry Canada

(2) Only available as combination 200°C and 100 m range

(3) Fitting to ANSI/DIN/JIS standards

(4) Painted

Accessories

Accessories

Minimum order value for separate orders of spare parts or accessories is 75 €.

zu400500	Adapter M20 x 1.5 to NPT 1/2" conduit	•
zu400510	Sun shield cover stainless steel 1.4301/ 304	•
zu400520	Non return valve For purge inlet. Stainless steel. Connection of 6mm tube diameter. Opens at ca. 0.5 bar (7.25 psi).	•
zu400530	HART Modem USB HART Interface to connect a PC with the NR 3000 for commissioning and servicing.	•

Protector plate for sensor lense

Protection of the lense against condensation, dust, buildup, crystallisation.
 Mounting between unit flange and silo flange.
 Material PTFE. Available up to 100°C, 0,5bar, 40m range. Not in combination with Non return valve.

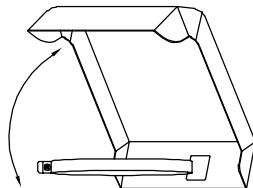
zu400450	Fitting to flange 80 mm/ 3"	•
zu400451	Fitting to flange 100 mm/ 4"	•
zu400452	Fitting to flange 150 mm/ 6"	•

Fixing material for mounting the unit on a flange

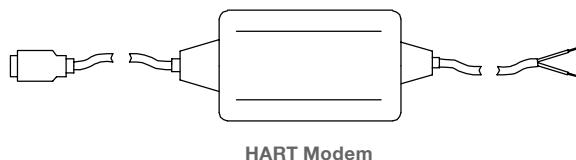
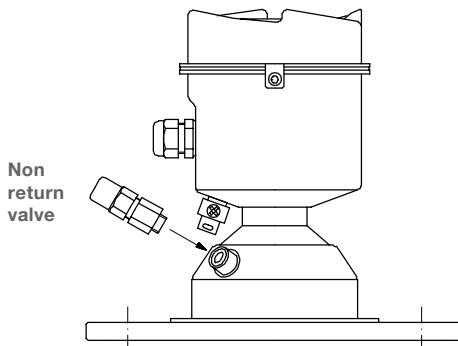
zu107010	8 bolts M16 x 60, 16 washers, 8 nuts. Stainless steel. Fitting for 80 mm/ 3" and 100 mm/ 4" flanges	•
zu107020	8 bolts M20 x 60, 16 washers, 8 nuts. Stainless steel. Fitting for 150 mm/ 6" flanges	•

Sealings for mounting the unit on a flange

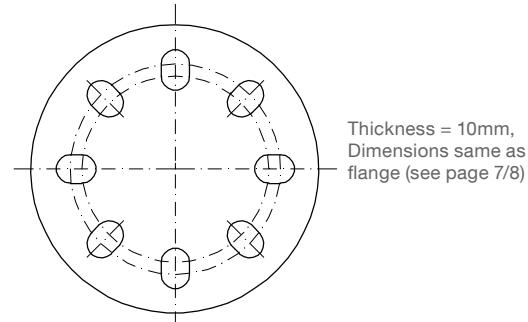
di300135	Flange sealing fitting for plane flange or Easy Aimer flange, EN 1092-1 (PN16), ASME B16.5 (150 lb), JIS 2220 (10K) Material AFM30, max. 250°C	•
di300136	80 mm/ 3"	•
di300137	100 mm/ 4"	•
	150 mm/ 6"	•



Sun protection cover



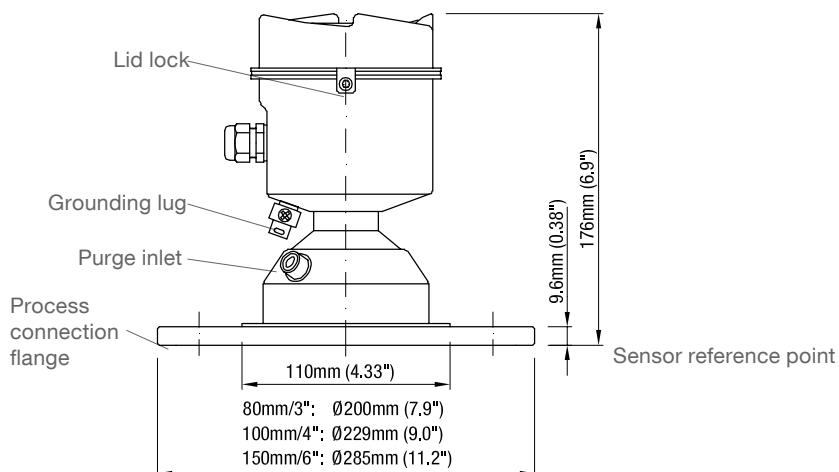
HART Modem



Protector plate for sensor lense

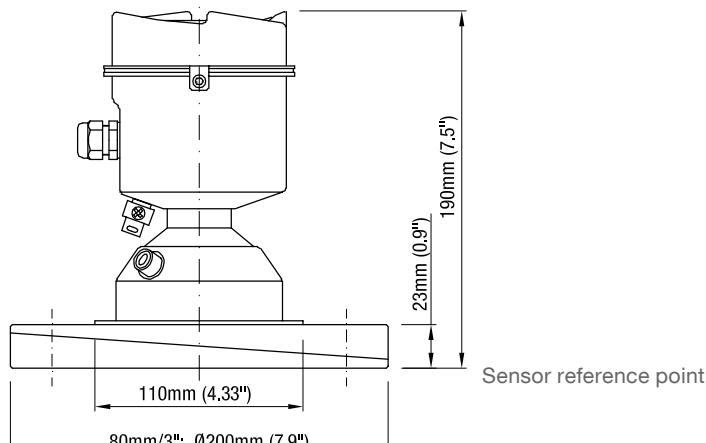
Dimensions

Plane flange version



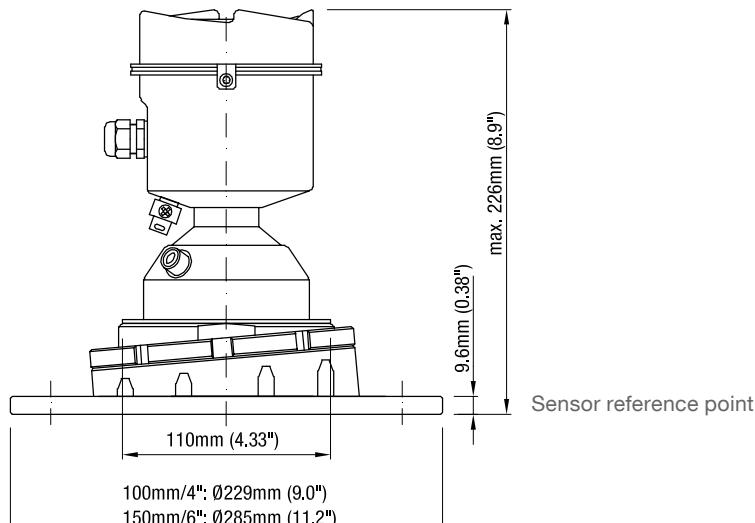
Bolt holes: see next page

Easy Aimer flange version
 80 mm/ 3"



Bolt holes: see next page

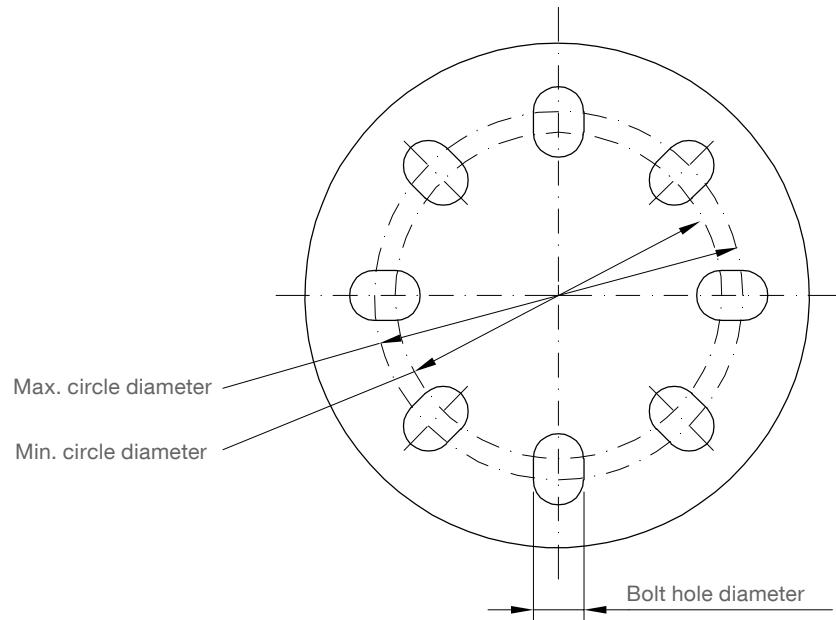
Easy Aimer flange version
 100 mm/ 4"
 150 mm/ 6"



Bolt holes: see next page

Dimensions

Flanges



Universal flange (plane flange and Easy aimer flange) mates with bolt hole pattern of:
 EN 1092-1 (PN16)
 ASME B16.5 (150 lb)
 JIS 2220 (10K)

Pipe size	Max. circle diameter	Min. circle diameter	Bolt hole diameter	Number of bolt holes
80 mm/ 3"	160 mm (6.30")	150 mm (5.91")	19.3 mm (0.76")	8
100 mm/ 4"	191 mm (7.52")	175 mm (6.89")	19.3 mm (0.76")	8
150 mm/ 6"	242 mm (9.53")	240 mm (9.45")	23 mm (0.90")	8

Detailed Ex-markings

pos.2

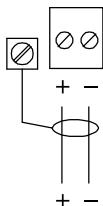
Certificate

0	CE FM/ CSA	General purpose
F	ATEX IEC-Ex ATEX IEC-Ex FM/ CSA FM/ CSA	ATEX II 1D, 1/2D, 2D Ex ta IIIC Ex ta IIIC T139°C Da ATEX II 3G Ex nA II T4 Gc, Ex nL IIC T4 Gc Ex nA II T4 Gc, nL IIC T4 Gc DIP Class II, Div.1, Gr. E, F, G, Class III NI Class I, Div.2, Gr. A,B,C,D

Electrical installation

4-20 mA

The terminals are located below the display. To connect the unit, remove the display by gently turning the display a quarter turn counter-clockwise until it is free.



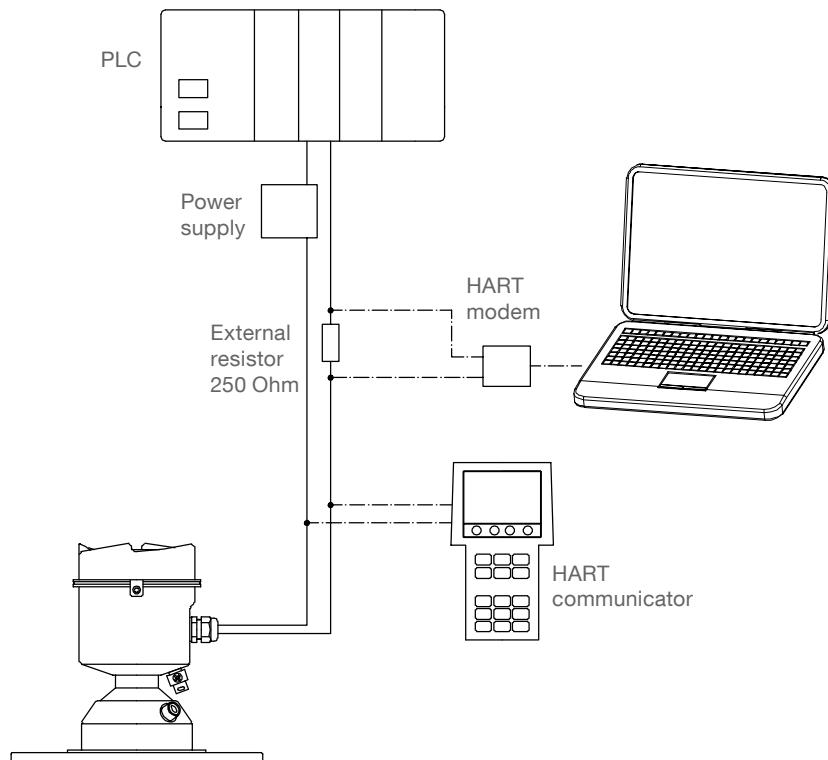
Use twisted pair cable: 0.34 mm² to 2.5 mm² (AWG 22 to 14)
 Connect cable shield to ground terminal

24 V DC/ 4-20 mA loop

4-20 mA HART

Typical PLC/mA configuration with HART:

- Depending on the system design, the power supply may be separate from the PLC, or integral to it.
- HART resistance (total loop resistance, that is, cable resistance plus 250 Ohm (external resistor) must be less than 550 Ohm @24V supply for the device to function properly.
- The external resistor is not required, if the PLC has an integral 250 Ohm resistor.



Spare parts

Minimum order value for separate orders of spare parts or accessories is 75 €.

Spare part Article number

Electronics

Plug on display	pl400500	•
Electronic module, measurement range max. 40 m	pl400501	•
Electronic module, measurement range max. 100 m	pl400502	•

Sealings

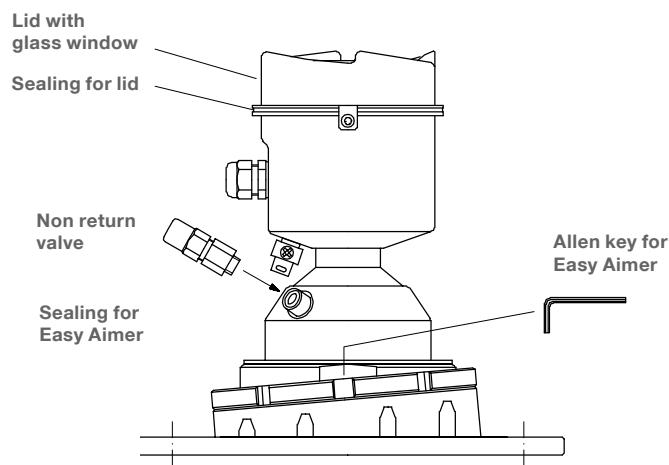
Sealing for lid	zu400505	•
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Housing

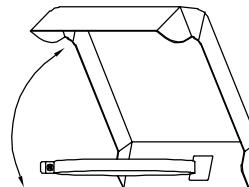
Lid with glas window	zu400509	•
Sun protection cover (stainless steel 1.4301/ 304)	zu400510	•

Diverse

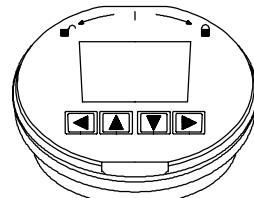
Non return valve	zu400520	•
Wrench for 100 mm/ 4" and 150 mm/ 6" Easy Aimer	zu400521	•
Allen key 3 mm for 100 mm/ 4" and 150 mm/ 6" Easy Aimer	zu400522	•



Sun protection cover



Plug on display





NivoGuide® 3000

Guided Wave Radar

Guided wave sensor for continuous level measurement of bulk solids. The sensor is reliable and accurate and suitable for use in many different industries and applications. The intelligent software ensures that the sensor delivers precise measurement values.



NivoGuide® 3000

- For use in silos and process containers suitable for a variety of industrial applications
- Precise measurement values even in applications with strong dust generation, condensation or buildup
- Comprehensive diagnostic functions

Customizable extensions



Applications: The NivoGuide® 3000 can be used for continuous level measurement of virtually any kind of bulk solid material.

NG 3100 Rod version

Extension max. 6m
Customizable rod lengths



NG 3100 Rope version

Extension max. 75m
Customizable metal rope lengths



Technical Data

Housing	Aluminium IP 68, Stainless steel
Certificates	ATEX, FM
Measuring range	Rod version max. 6m (236 inch) Rope version max. 75m (2952 inch)
Process temp. range	-40°C to +200°C (-40°F to +392°F)
Pressure range	-1 to +40 bar (-14,5 to +580 psig)
Sensitivity	DK value ≥1.5
Supply voltage	9.6..35V DC, 2-wire
Meas. signal	4 - 20 mA/ HART
Process connection	Thread from G¾, ¾ NPT range of flanges
Process connect. material	1.4404 (SS316L) / 1.4435 (SS316L)
Probe material	Stainless Steel 1.4404 (SS316L) / 1.4401 (SS316) Coating PA Isolation FKM / FFKM / EPDM

Housing types



Integrated display and adjustment module

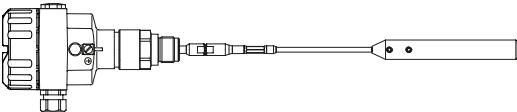


Plug-in display module



- Comprehensive diagnostic functions
- Display of latest measured values, operating parameters and diagnostic data
- Parameters entered can be transferred to other devices (optional)

Table of content

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Overview	2
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NG 3100 	4
<hr/>	
Options/ Accessories	7
Dimensions	8
Detailed Ex-markings	10
Electrical installation	11

Subject to change.

Valid: From 01.04.2020 until 31.03.2021, unless otherwise agreed.

All dimensions in mm (inches).

By publishing this selection list all other lists become invalid.

All prices in Euro (€) or USD (\$),
excluding VAT.

We assume no liability for typing errors.

All EURO prices are EXW Betzigau,
all USD prices are EXW Memphis,
excluding packaging costs.

Different variations to those specified are possible.
Please contact our technical consultants.

Overview

- TDR sensor for continuous level measurement of solids
 - Works in applications with buildup, dust generation or condensation
 - Compact unit
 - Wide range of applications
 - Maintenance free
 - Rod or rope version
 - Cutable probes
 - High pressure and high temperature versions
 - High chemical resistance of the probe
- TDR technology (guided microwave)
 - Electronic 2-wire 4 - 20 mA, HART
 - Integrated Display and Adjustment Module
 - Extensive Diagnostics
 - Multiple approvals available
 - 2011/65/EU RoHS conform

	CE		
Approvals	ATEX / IEC-Ex	Zone 0 and 0/1	Intrinsically Safe
		Zone 1 and 0/1	Flameproof
		Zone 20 and 20/21	Dust Ignition Proof
FM	FM	General purp.	
		Cl. I, II, III Div. 1	Intrinsically Safe
		Cl. I Div. 1	Explosionproof
		Cl. I, II, III Div. 2	Non incendive
		Cl. II, III Div. 1	Dust Ignition Proof
	Functional safety	IEC 61508	SIL 2 single-channel / SIL 3 multi-channel

Electronics	Operating voltage	9.6 ... 35 V DC, 2-wire loop Limited voltage range for Ex ia and with Display and Adjustment Module, see page 11
	Measuring signal	Current loop 4 - 20 mA according to NAMUR NE 43, HART
	Display and Adjustment Module	<ul style="list-style-type: none"> • LCD-display with background light • Display of actual measurement • Display of setup parameters (e.g. min. and max adjustment, material properties, damping, linearisation, false signal suppression) • After programming the display can be removed. The setted parameters can be copied to other units. • Display of diagnostics data (e.g. temperature, echo curve, trailing pointer) simulation of level) • Operation via push buttons

Housing	Material, version	Aluminium, single- or double chamber (powder coated) Stainless steel, single chamber (electro polished)
	Ingress protection	Type 6P/ IP66/ IP68 (0.2 bars)
	Temperature adapter	Temperature adapter for version 200°C
	Ambient temperature	-40 ... +80 °C (-40 ... +176 °F)

Overview

Mechanics and Process	Diameter rod /rope, Length of extension "L"	Rod ø16 mm (ø0.63") Rope ø4 mm (ø0.16") Rope ø6 mm (ø0.24") Rope ø11 mm (ø0.43")	300 .. 6,000 mm (11.81 .. 236") 500 .. 75,000 mm (19.7 .. 2,953") 500 .. 75,000 mm (19.7 .. 2,953") 500 .. 65,000 mm (19.7 .. 2,559"), PA coated 500 .. 65,000 mm (19.7 .. 2,559"), PA coated
	Measuring range (blocking distance)	Upper / lower blocking distance (no measurement is possible within this area)	
		Upper blocking distance: 80 mm (water) 150 mm (oil)	Lower blocking distance: 0 mm (water) 50 - 150 mm (oil)
			Measuring range
	Material	Rod Rope Rope, PA coated Gravity weight Lead-through of probe to process side (rope-/ rod lead-through): Process connection	1.4404 (SS316L) 1.4401 (SS316) Steel galvanized/ PA 1.4404 (SS316L) Isolation material PEEK or PPS Sealing selectable FKM, FFKM, EPDM Thread 1.4404 (SS316L) with sealing Klingsersil C-4400 Flange 1.4435 (SS316L), welded
	Process temperature (thread- or flange temperatur)	Depending on lead-through of probe to process side (rope-/ rod lead-through): Sealing FKM, EPDM: Sealing FFKM:	-40 ... +150°C (-40 ... +302°F) with isolation material PEEK -40 ... +80°C (-40 ... +176°F) with isolation material PPS -20 ... +150°C (-4 ... +302°F) with isolation material PEEK -20 ... +200°C (-4 ... +392°F) with isolation material PEEK and temperature adapter
	Process pressure	Depending on lead-through lead-through of probe to process side (rope-/ rod lead-through): With isolation material PEEK -1 .. 40 bar (-14.5 ... +580 psi g) With isolation material PPS -1 .. 6 bar (-14.5 ... +87 psi g) For flanges the max. pressure rating of the flange must be additionally observed	
	Lateral load / tensile load	Max. lateral load (torque): Rod: ø16 mm Max. tensile load Rope: ø4 mm Rope: ø6 mm Rope: ø6 mm, PA coated Rope: ø11 mm, PA coated	30 Nm (22.13 lbf ft) 12 KN (2,698 lbf) 30 KN (6,744 lbf) 8 KN (1,798 lbf) 30 KN (6,744 lbf)
	Min. dielectric constant of the medium	DK ≥1.5 Applications with DK values between 1,5 ... ca. 2,0 must be individually checked	

NG 3100



Rod version
 (pos.8 H, pos.5+6 3D)



Rope version
 (pos.8 F, pos.5+6 3D)

Cable entries (by default)

Depending on model selected, the following cable entries are supported (details and options see pos.13 on page 7):

Version:	Cable entries:
CE, ATEX, IEC-Ex	M20 x 1.5 1x screwed cable gland + 1x blind plug
FM	NPT 1/2" tapered ANSI B1.20.1 1x open conduit + 1x blind plug

Housing

Standard housing is aluminium single chamber.
 Alternative housings see option pos.16 on page 7.



Display and
 Adjustment Module
 (pos. 9)

NG 3100

Basic type

NG 3100

pos.2

Certificate (detailed Ex-markings: see page 10)

		Gas	Dust	Protection method	
0	CE	-	-		•
S	ATEX	Zone 0 and 0/1	-	Intrinsically Safe	•
T	ATEX	Zone 1 and 0/1	Zone 20 and 20/21	Flameproof, Dust Ignition Proof	•
V	ATEX	Zone 1 and 0/1	-	Flameproof	•
W	ATEX	-	Zone 20 and 20/21	Dust Ignition Proof	•
B	IEC Ex	Zone 0 and 0/1	-	Intrinsically Safe	•
D	IEC Ex	Zone 1 and 0/1	Zone 20 and 20/21	Flameproof, Dust Ignition Proof	•
C	IEC Ex	Zone 1 and 0/1	-	Flameproof	•
A	IEC Ex	-	Zone 20 and 20/21	Dust Ignition Proof	•
M	FM	-	-	General purpose	•
H	FM	Cl. I Div. 2	Cl. II, III Div. 2	Non incendive	•
P	FM	Cl. I Div. 1	Cl. II, III Div. 1	Intrinsically Safe	•
U	FM	Cl. I Div. 1	-	Explosionproof	•
N	FM	-	Cl. II, III Div. 1	Dust Ignition Proof	•

pos.3

Process temperature/ Lead-through of probe to process side

	Process-temperature	Sealing Lead-through of probe	Isolation Lead-through of probe	
A	-40...+80°C (1)	FKM	PPS	•
F	-40...+150°C (2)	FKM	PEEK	•
K	-20...+200°C (2)	FFKM	PEEK	•
B	-40...+80°C (1)	EPDM	PPS	•
H	-40...+150°C (2)	EPDM	PEEK	•

pos.4

Electronic module

- A 2-wire 4 - 20 mA, HART
- B 2-wire 4 - 20 mA, HART , with SIL 2/3

pos.5+6

Process connection

0A	Thread 3/4" NPT	PN40, tapered, ANSI/ ASME B1.20.1	.....	•
0B	Thread 1" NPT	PN40, tapered, ANSI/ ASME B1.20.1	.....	•
0D	Thread 1½" NPT	PN40, tapered, ANSI/ ASME B1.20.1	.....	•
3A	Thread G ¾"	PN40, DIN3852-A	.....	•
3B	Thread G 1"	PN40, DIN3852-A	.....	•
3D	Thread G 1½"	PN40, DIN3852-A	.....	•
5D	Flange 1½" 150 lbs	RF, ASME B16.5	.....	•
5G	Flange 2" 150 lbs	RF, ASME B16.5	.....	•
5H	Flange 2" 300 lbs	RF, ASME B16.5	.....	•
5K	Flange 3" 150 lbs	RF, ASME B16.5	.....	•
5L	Flange 3" 300 lbs	RF, ASME B16.5	.....	•
5N	Flange 4" 150 lbs	RF, ASME B16.5	.....	•
5P	Flange 4" 300 lbs	RF, ASME B16.5	.....	•
6F	Flange DN50, PN40	EN 1092-1 Form B1	.....	•
6H	Flange DN80, PN40	EN 1092-1 Form B1	.....	•
6L	Flange DN100, PN6	EN 1092-1 Form B1	.....	•
6J	Flange DN100, PN16	EN 1092-1 Form B1	.....	•

pos.8

Type and length of extension "L" (3)

- H Rod ø16 mm (0.)⁽⁵⁾ Base price
Price per 100 mm (3.94") of part thereof (starting from 0 mm), min. 300 mm (11.81"), max. 6,000 mm (236")
- A Rope ø4 mm (0.") with gravity weight ⁽⁴⁾
Price per 100 mm (3.94") of part thereof (starting from 0 mm), min. 500 mm (19.7"), max. 75,000 mm (2,953")
- F Rope ø6 mm (0.") with gravity weight ⁽⁵⁾ Base price
Price per 100 mm (3.94") of part thereof (starting from 0 mm), min. 500 mm (19.7"), max. 75,000 mm (2,953")
- E Rope ø6 mm (0.") with gravity weight, PA coated ⁽⁴⁾ Base price
Price per 100 mm (3.94") of part thereof (starting from 0mm), min. 500 mm (19.7"), max.65,000 mm (2,559")
- G Rope ø11 mm (0.") with gravity weight, PA coated ⁽⁵⁾ Base price
Price per 100 mm (3.94") of part thereof (starting from 0 mm), min. 500 mm (19.7"), max.65,000 mm (2,559")

pos.9

Display and Adjustment Module/ Inspection window in lid

- O without Display and Adjustment Module, without inspection window in lid
- F without Display and Adjustment Module, with inspection window in lid ⁽⁶⁾
- A with Display and Adjustment Module, with inspection window in lid
- B with Display and Adjustment Module (laterally in housing alu double chamber), with inspection window in lid ⁽⁷⁾ ...

NG 3100

- (1) Available only with PA-coating (pos.8 E, G), not with FM certificate (pos.2 H, P, U, N).
- (2) Not available with PA-coating (pos.8 E, G).
- (3) Rope / rod can be cut and changed.
- (4) Not available with flange DN100 PN6 (pos.5+6 6L).
- (5) Available with following process connections: all threads 1½", flange ASME 2" or bigger, flange DN50 or bigger.
- (6) Available with certificates pos.2 O, S, B, M, N, U.
- (7) Not available with certificates FM non incendive (pos.2 H), available with housing double chamber (pos.16 D).

NG 3100	A					1		
position	1	2	3	4	5+6	7	8	9

L = mm ← Order code

All positions are available with special design (use code "Z").

Options / Accessories

Options

- pos.11 x **Inspection Certificate** •
3.1 according to EN 10204
- pos.12 **Measurement loop identification label**
1 of stainless steel •
2 of foil •
- pos.13 **Cable entry**
Selection of the following options only necessary,
if a deviation from default is required:
D M20 x 1.5 1x screwed cable gland PA black (ø5-9 mm), 1x blind plug •
E M20 x 1.5 1x screwed cable gland brass nickel plated (ø6-12 mm), 1x blind plug •
F M20 x 1.5 1x screwed cable gland brass nickel plated (ø5-9 mm), 1x blind plug •
A ½" NPT 1x conduit, 1x blind plug •
B ½" NPT 1x screwed cable gland brass nickel plated (ø6-12 mm), 1x blind plug •
C ½" NPT 1x screwed cable gland brass nickel plated; for shielded cable (ø9-13 mm), 1x blind plug •
- pos.14 **Language of operating instruction**
Number of instructions: 1 piece. Standard is DE -German, available in other languages:
2 EN - Englisch •
3 FR - French •
4 RU - Russian •
5 ES - Spanish •
6 PT - Portuguese •
7 ZH - Chinese •
- pos.16 **Housing**
D Aluminium - double chamber •
N Stainless steel - single chamber (electropolished) •

(1) Available cable entries:

Cable entry	Available with certificate pos.2						
	0	S,B	T,W,D,A	V,C	P	M	H,U,N
D	x				•	•	
E	•			x			
F	•	•	x	•	•	•	
A	•	•	•	•	x	x	x
B	•			•		•	
C	•			•			

• = Cable entry optional selectable
 x = Default cable entry (option pos.13 not selectable)

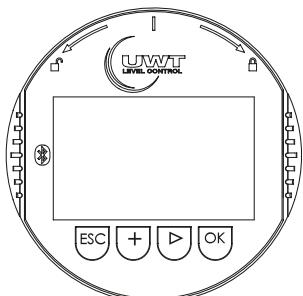
(2) Available without Ex-certificate (pos.2 0,M) or with intrinsically safe version (pos.2 S, B, P), not with cable entry pos.13 E.

Accessories

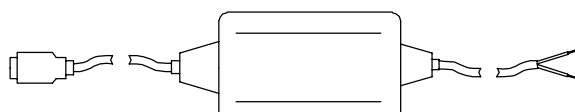
Minimum order value for separate orders of spare parts or accessories is 75 €.

- pl400510 **Display and Adjustment Module** (plug on) •
- zu400530 **HART Modem** •
USB HART interface to connect a PC with the NG 3000, for commissioning and servicing.

Display and
Adjustment Module

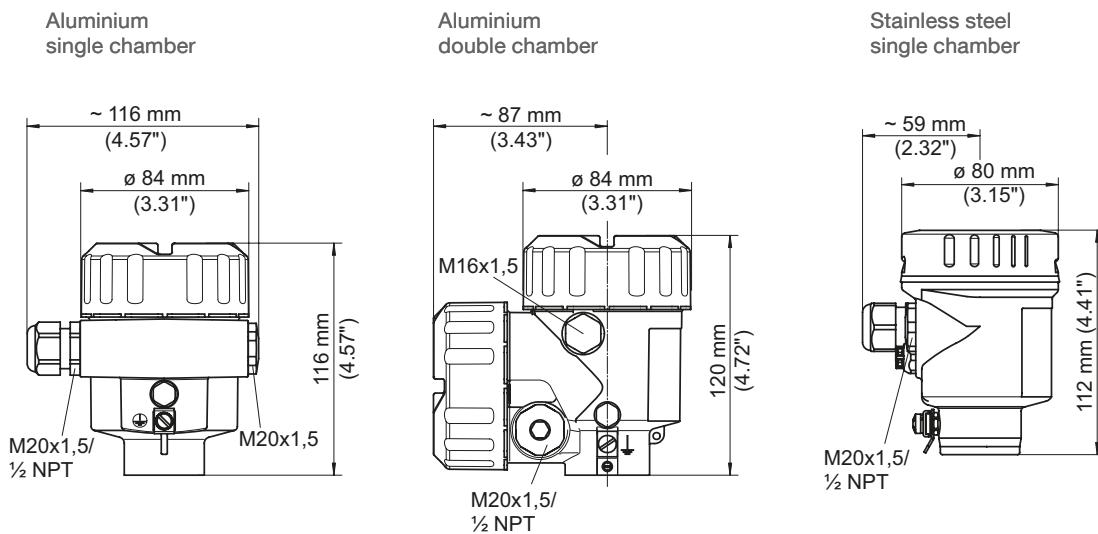


HART Modem



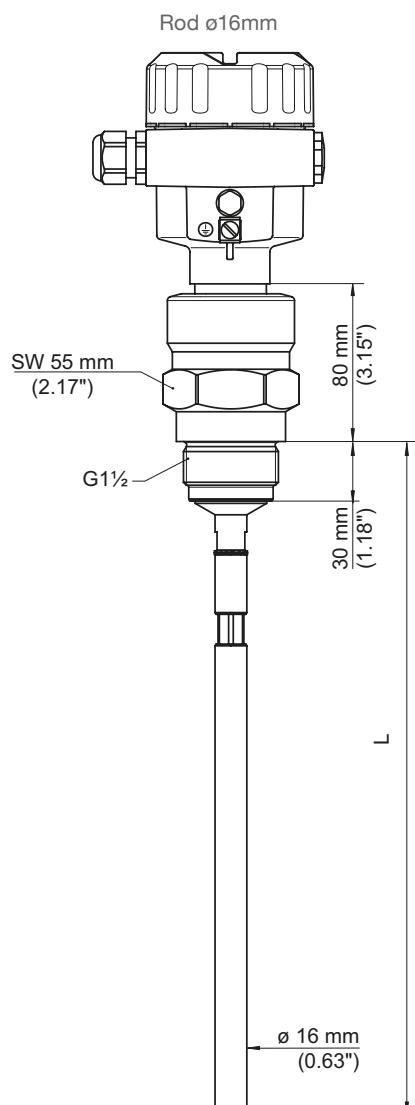
Dimensions

Housing



Rod version

Process connection: thread

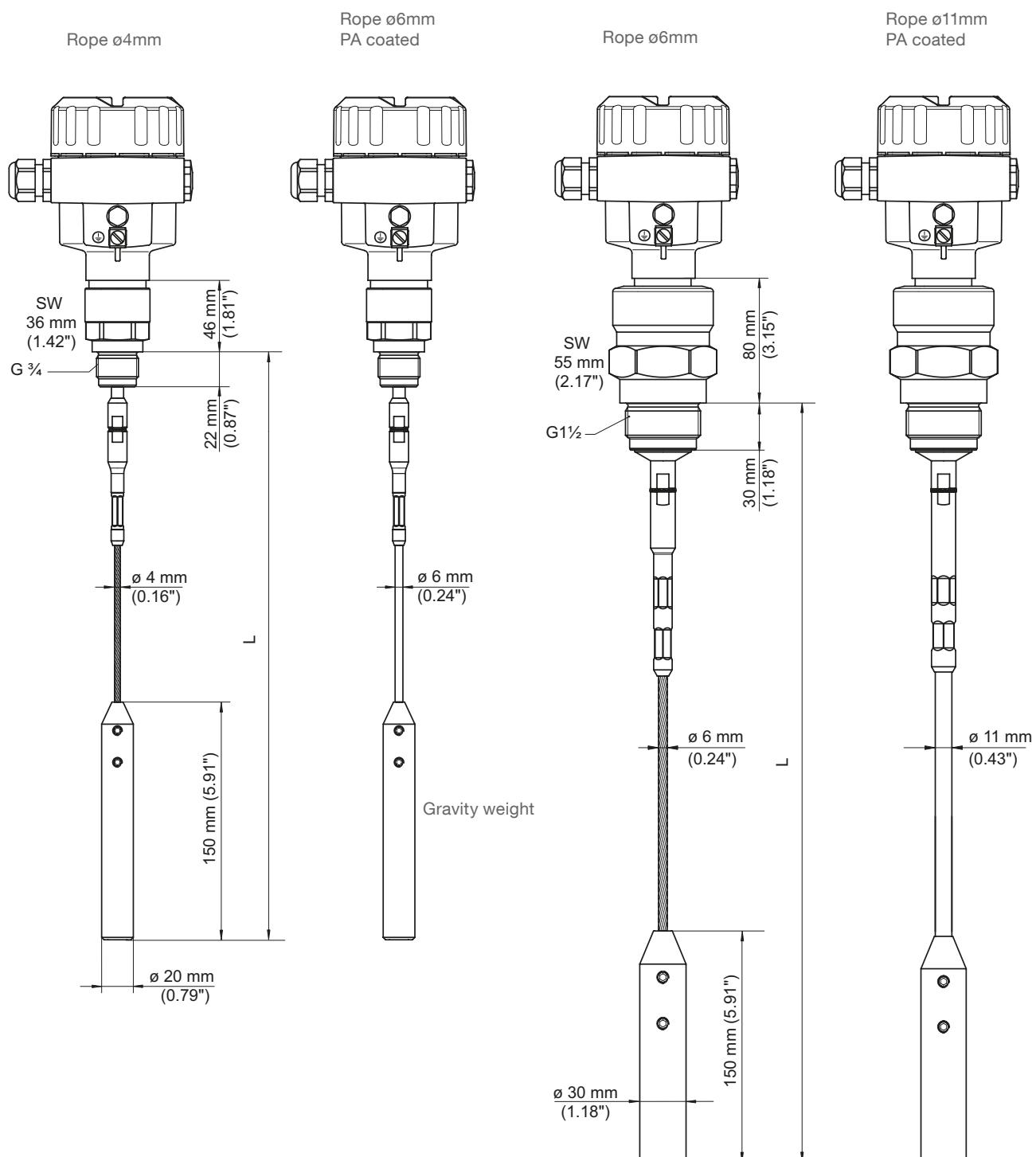


Flange
welded

Dimensions

Rope version

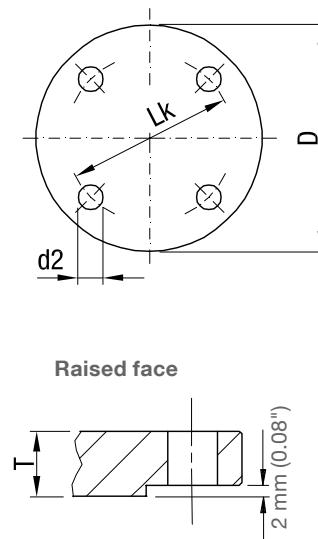
Process connection: thread



Dimensions / Detailed Ex-markings

Flanges

	Code	Type	Number of holes	d2 mm (inch)	Lk mm (inch)	D mm (inch)	T thickness mm (inch)
ASME B16.5, raised face	5D	1½" 150 lbs	4	15.9 (0.63)	98.6 (3.88)	127.0 (5.0)	17.5 (0.69)
	5G	2" 150 lbs	4	19.1 (0.75)	120.7 (4.75)	152.4 (6.01)	19.1 (0.75)
	5H	2" 300 lbs	8	19.1 (0.75)	127.0 (5.0)	165.1 (6.5)	20.6 (0.81)
	5K	3" 150 lbs	4	19.1 (0.75)	152.4 (6.01)	190.5 (7.5)	23.9 (0.94)
	5L	3" 300 lbs	8	22.2 (0.87)	168.2 (6.62)	209.6 (8.25)	26.9 (1.06)
	5N	4" 150 lbs	8	19.1 (0.75)	190.5 (7.5)	228.6 (9.0)	23.9 (0.94)
	5P	4" 300 lbs	8	22.2 (0.87)	200.2 (7.88)	254.0 (10.0)	30.2 (1.19)
EN 1092-1 Form B1, raised face	6F	DN50 PN40	4	18.0 (0.71)	125.0 (4.92)	165.0 (6.5)	20.0 (0.79)
	6H	DN80 PN40	8	18.0 (0.71)	160.0 (6.3)	200.0 (7.87)	24.0 (0.94)
	6L	DN100 PN6	4	18.0 (0.71)	170.0 (6.69)	210.0 (8.27)	16.0 (0.63)
	6J	DN100 PN16	8	18.0 (0.71)	180.0 (7.09)	220.0 (8.66)	20.0 (0.79)



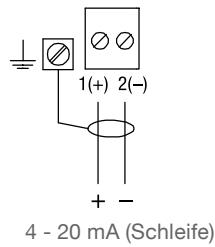
Detailed Ex-markings

Pos.2	Certificate	Protection method
S	ATEX II 1G ATEX II 1/2G	Ex ia IIC T6..T1 Ga Ex ia IIC T6..T1 Ga/Gb
T	ATEX II 1/2G ATEX II 2G ATEX II 1D ATEX II 1/2D	Ex d IIC T6...T1 Ga/Gb Ex d IIC T6...T1 Gb Ex ta IIIC T! Da Ex ta/tb IIIC T! Da/Db
V	ATEX II 1/2G ATEX II 2G	Ex d IIC T6...T1 Ga/Gb Ex d IIC T6...T1 Gb
W	ATEX II 1D ATEX II 1/2D	Ex ta IIIC T! Da Ex ta/tb IIIC T! Da/Db
B	IEC Ex	Ex ia IIC T6..T1 Ga Ex ia IIC T6..T1 Ga/Gb
D	IEC Ex	Ex d IIC T6...T1 Ga/Gb Ex d IIC T6...T1 Gb Ex ta IIIC T! Da Ex ta/tb IIIC T! Da/Db
C	IEC Ex	Ex d IIC T6...T1 Ga/Gb Ex d IIC T6...T1 Gb
A	IEC Ex	Ex ta IIIC T! Da Ex ta/tb IIIC T! Da/Db
H	FM	NI Class I,II,III Div.2, Gr. A,B,C,D,F,G
P	FM	IS Class I, II, III Div.1, Gr. A-G
U	FM	XP Class I Div.1, Gr. A-D
N	FM	DIP Class II,III Div.1, Gr. E,F,G

Electrical Installation

4 - 20 mA

The terminals are located below the Display and Adjustment Module. To connect the unit, remove the display by gently turning the display counter-clockwise until it is free.



Wire cross-section (spring-loaded terminals) :

Massive wire, stranded wire 0.2 ... 2.5 mm² (AWG 24 ... 14)

Stranded wire with end sleeve 0.2 ... 1.5 mm² (AWG 24 ... 16)

Connect cable shield to ground terminal.

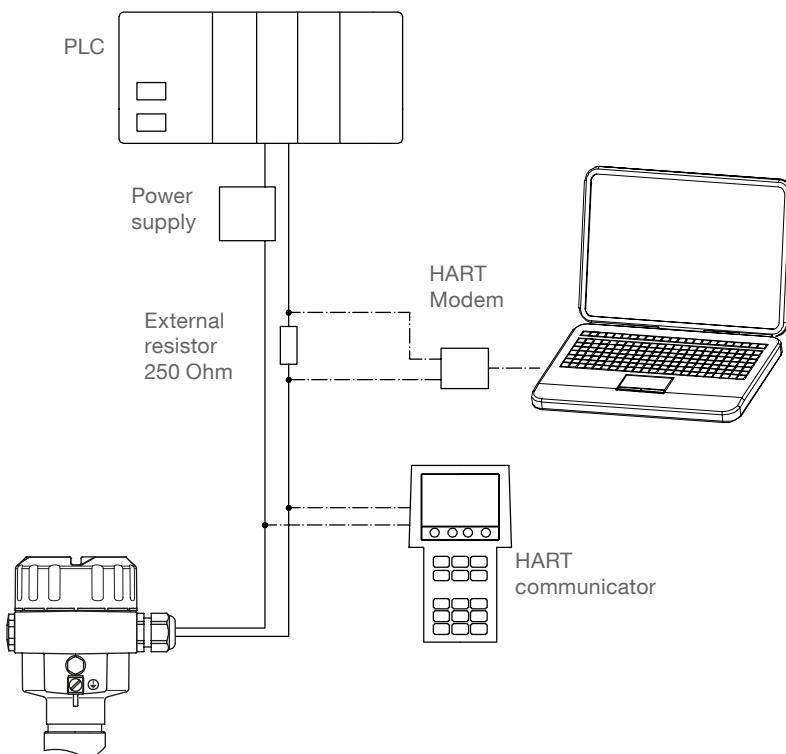
Operating voltage (voltage present at terminals):

Version	Display and Adjustment Module (illuminated)	Operating voltage
Non-Ex, Ex d	without	9,6 ... 35 V DC
	with	16 ... 35 V DC
Ex ia	without	9,6 ... 30 V DC
	without	16 ... 30 V DC

4 - 20 mA HART

Typical PLC/ mA configuration with HART:

- Depending on the system design, the power supply may be separate from the PLC, or integral to it.
- HART resistance (total loop resistance, that is, cable resistance plus 250 Ohm [external resistor]) must be limited to a certain value, to ensure a proper function.
 $\text{Max. loop resistance} = (\text{supply voltage} - \text{min. voltage present at terminals}) / 22\text{mA}$
 Example: CE-unit with 24 V DC supply: Max. loop resistance = $(24 \text{ V} - 9.6 \text{ V}) / 22 \text{ mA} = 655 \Omega$
- The external resistor is not required, if the PLC has an integral 250 Ohm resistor.





NivoGuide® 8000

Guided Wave Radar

Guided radar for continuous level and interface measurement of all kinds of liquids. The sensor is reliable and accurate and suitable for use in many different industries and applications. The intelligent software ensures that the sensor delivers precise measurement values.



NivoGuide® 8000

- For use in tanks and pipes
- Coaxial version
- Precise measurement values even in applications with buildup, foam formation or condensation
- Second line of defense (optional)
- Comprehensive diagnostic functions

Applications: The NivoGuide® 8000 can be used for continuous level and interface measurement of all kinds of liquids, pastes, foam and sludge.



Customizable
extensions



Technical Data

Housing	Aluminium IP 68, Stainless Steel
Certificates	ATEX, FM
Measuring range	Rod version max. 6m (236 inch) Rope version max. 75m (2952 inch)
Process temp. range	-196°C to +450°C (-321°F to +842°F)
Pressure range	-1 to +400 bar (-14,5 to +5801.5 psig)
Sensitivity	DK value ≥ 1.4
Supply voltage	9.6..35V DC, 2-wire
Meas. signal	4 - 20 mA/ HART
Process connection	Thread from G $\frac{3}{4}$, $\frac{3}{4}$ NPT range of flanges
Process connect. material	1.4404 (SS316L) / 1.4435 (SS316L)
Probe material	Stainless Steel 1.4404 (SS316L) / 1.4401 (SS316) Coating PA Isolation FKM / FFKM / EPDM / Silicone FEP jacketed Temperature version with ceramic isolation

Housing types



Integrated display and adjustment module



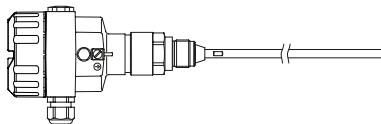
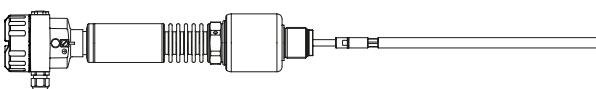
Plug-in display module



Lid with
viewing
window

- Comprehensive diagnostic functions
- Display of latest measured values, operating parameters and diagnostic data
- Parameters entered can be transferred to other devices (optional)

Table of content

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Detailed Ex-markings	19
Electrical installation	20

Subject to change.

All dimensions in mm (inches).

All prices in Euro (€) or USD (\$),
excluding VAT.

All EURO prices are EXW Betzigau,
all USD prices are EXW Memphis,
excluding packaging costs.

Valid: From 01.12.20 until 31.03.2021, unless otherwise agreed.

By publishing this selection list all other lists become invalid.

We assume no liability for typing errors.

Different variations to those specified are possible.
Please contact our technical consultants.

Overview

- Guided microwave for continuous level and interface measurement of liquids
- TDR technology
- Works in applications with steam, buildup, foam generation or condensation
- Wide range of applications
- Maintenance free
- Compact unit
- Standard version
- High temperature and high pressure version
- Rod, rope or coax version
- Cutable probes
- High chemical resistance of the probe
- Second line of defense (optional)
- Electronic 2-wire 4 - 20 mA, HART
- Integrated Display and Adjustment Module
- Extensive Diagnostics
- Multiple approvals available
- 2011/65/EU RoHS conform

	CE		
ATEX / IEC-Ex	Zone 0 and 0/1	Intrinsically Safe	
	Zone 0 and 0/1	Flameproof	
	Zone 20 and 20/21	Dust Ignition Proof	
FM	General purp.		
	Cl. I, II, III Div. 1	Intrinsically Safe	
	Cl. I Div. 1	Explosionproof	
	Cl. I, II, III Div. 2	Non incendive	
	Cl. II, III Div. 1	Dust Ignition Proof	
	Functional safety	IEC 61508	SIL2 single-channel / SIL3 multi-channel

	Operating voltage	9.6 ... 35 V DC, 2-wire loop Limited voltage range for Ex ia and with Display and Adjustment Module, see page 20
	Measuring signal	Current loop 4 - 20 mA according to NAMUR NE 43, HART
Electronics	Display and Adjustment Module	<ul style="list-style-type: none"> • LCD-display with background light • Display of actual measurement • Display of setup parameters (e.g. min. and max adjustment, material properties, damping, linearisation, false signal suppression) • After programming the display can be removed. The setted parameters can be copied to other units. • Display of diagnostics data (e.g. temperature, echo curve, trailing pointer) simulation of level) • Operation via push buttons

	Material, version	Aluminium, single- or double chamber (powder coated) Stainless steel, single chamber (electro polished)
	Ingress protection	Type 6P/ IP66/ IP68 (0.2 bar)
Housing	Ambient temperature	-40 ... +80 °C (-40 ... +176 °F)

	Upper/ lower blocking distance	No measurement is possible within this area. Observe increased deviation of measurement value next to the blocking distance (details see Operating instructions).																		
Blocking distance		<table border="1"> <thead> <tr> <th>(in mm)</th> <th>Rope /Rod</th> <th>Coaxl</th> </tr> </thead> <tbody> <tr> <td>Water</td> <td>80</td> <td>30</td> </tr> <tr> <td>Oil</td> <td>150</td> <td>100</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>(in mm)</th> <th>Rope /Rod</th> <th>Coaxl</th> </tr> </thead> <tbody> <tr> <td>Water</td> <td>0</td> <td>0</td> </tr> <tr> <td>Oil</td> <td>50-200</td> <td>50</td> </tr> </tbody> </table>	(in mm)	Rope /Rod	Coaxl	Water	80	30	Oil	150	100	(in mm)	Rope /Rod	Coaxl	Water	0	0	Oil	50-200	50
(in mm)	Rope /Rod	Coaxl																		
Water	80	30																		
Oil	150	100																		
(in mm)	Rope /Rod	Coaxl																		
Water	0	0																		
Oil	50-200	50																		

Overview

NG 8100 Standard version

Length of extension "L"	Rod Rope Coax	300 .. 6,000 mm (11.81 .. 236") 500 .. 75,000 mm (19.7 .. 2,953") 300 .. 6,000 mm (11.81 .. 236")
Diameter	Rod Rope Coax	ø8 mm (ø0.31") ø12 mm (ø0.47") ø2 mm (ø0.08") ø4 mm (ø0.16") ø21.3 mm (ø0.84") ø42.2 mm (ø1.67")
Material	Rod Rope Gravity weight Coax	1.4404 (SS316L) 1.4401 (SS316) 1.4404 (SS316L) 1.4404 (SS316L)/ PFA
		Lead-through of probe to process side (rod/ rope/ coax lead-through): Isolation material: PEEK or PPS Sealing: FKM, FFKM, EPDM or silicone FEP coated
		Process connection: Thread 1.4404 (SS316L) with sealing Klingsersil C-4400 Flange 1.4435 (SS316L), welded
		Second line of defense* (optional): Borosilicate glass GPC 540 / 316L
Process temperature (thread- or flange temperatur)		Depending on lead-through lead-through of probe to process side (rod/ rope/ coax lead-through): Sealing FKM, EPDM or silicone FEP coated: -40 ... +150°C (-40 ... +302°F) with isolation material PEEK -40 ... +80°C (-40 ... +176°F) with isolation material PPS Sealing FFKM: -20 ... +150°C (-4 ... +302°F) with isolation material PEEK -20 ... +200°C (-4 ... +392°F) with isolation material PEEK and temperature adapter
Process pressure		Depending on lead-through lead-through of probe to process side (rod/ rope/ coax lead-through): -1 .. 40 bar (-14.5 ... +580 psi g) with isolation material PEEK -1 .. 6 bar (-14.5 ... +87 psi g) with isolation material PPS For flanges the max. pressure rating of the flange must be additionally observed.
Lateral load/ tensile load		Max. lateral load (torque): Rod ø8 mm 10 Nm (7.38 lbf ft) Rod ø12 mm 30 Nm (22.13 lbf ft) Coax ø21.3 mm 60 Nm (44 lbf ft) Coax ø42.2 mm 300 Nm (221 lbf ft) Max. tensile load: Rope ø2 mm 1.5 KN (337 lbf) Rope ø4 mm 2.5 KN (562 lbf)
Dielectric constant of the medium	Rope / Rod Coax	DK ≥1.6 DK ≥1.4



* The Second Line of Defense is a second level of the process separation in the form of a gas-tight feedthrough in the lower part of the housing, preventing product from penetrating into the housing.

Overview

NG 8200 High temperature and high pressure version

Length of extension "L"	Rod Rope Coax	300 .. 6,000 mm (11.81 .. 236") 500 .. 60,000 mm (19.7 .. 2,362") 300 .. 6,000 mm (11.81 .. 236")
Diameter	Rod Rope Coax	ø8 mm (ø0.31") ø16 mm (ø0.63") ø2 mm (ø0.08") ø4 mm (ø0.16") ø21.3 mm (ø0.84") ø42.2 mm (ø1.67")
Material	Rod Rope Gravity weight Coax	1.4404 (SS316L) 1.4401 (SS316) 1.4404 (SS316L) 1.4404 (SS316L)
	Lead-through of probe to process side (rod/ rope/ coax lead-through): Version: Isolation material: Sealing: 250°C PEEK FFKM 280°C/450°C Ceramic Graphite	
	Process connection: Thread 1.4404 (SS316L) For 250°C version with sealing Klingsersil C-4400 Flange 1.4435 (SS316L), welded	
	Second line of defense* (optional): Borosilikate glas GPC 540 / 316L	
Process temperature (thread- or flange temperatur)	Selectable	-20 ... +250°C (-4 ... +482°F) -196 ... +280°C (-321 ... +536°F) -196 ... +450°C (-321 ... +842°F)
Process pressure	250°C version 280°C/450°C version	-1 .. 100 bar (-14.5 .. +1.450 psi g) -1 .. 400 bar (-14.5 .. +5.800 psi g)
	For flanges the max. pressure rating of the flange must be additionally observed. Derating of max. pressure with temperature must be observed (details see operating instructions).	
Lateral load/ tensile load	Max. lateral load (torque): Rod ø8 mm 4 Nm (3 lbf ft) Rod ø16 mm 30 Nm (22.13 lbf ft) Coax ø21.3 mm 60 Nm (44 lbf ft) Coax ø42.2 mm 300 Nm (221 lbf ft) Max. tensile load: Rope ø2 mm 1.5 KN (337 lbf) Rope ø4 mm 2.5 KN (562 lbf)	
Dielectric constant of the medium	Rope / Rod Coax	DK ≥1.6 DK ≥1.4

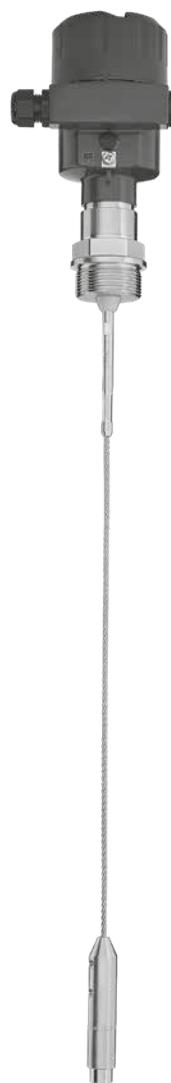


* The Second Line of Defense is a second level of the process separation in the form of a gas-tight feedthrough in the lower part of the housing, preventing product from penetrating into the housing.

NG 8100 Standard version



Rod version
 (pos.8 E, pos.5+6 3D)



Rope version
 (pos.8 A, pos.5+6 3D)



Coax version
 (pos.8 L, pos.5+6 3D)

Cable entries (by default)

Depending on model selected, the following cable entries are supported (details and options see pos.13 on page 11):

Version:	Cable entry:
CE, ATEX, IEC-Ex	M20 x 1.5 1x screwed cable gland, 1x blind plug
FM	NPT 1/2" tapered ANSI B1.20.1 1x open conduit + 1x blind plu



Display and
 Adjustment Module
 (pos. 9)

Housing

Standard housing is aluminium single chamber.
 Alternative housings see option pos.16 on page 11.

NG 8100 Standard version

Basic type

NG 8100

pos.2

Certificate (detailed Ex-markings: see page 19)

	Gas	Dust	Protection method	
0	CE	-	-	
Q	ATEX	Zone 0 and 0/1	-	Intrinsically Safe
Y	ATEX	Zone 0 and 0/1	Zone 20 and 20/21	Intrinsically Safe, Dust Ignition Proof
V	ATEX	Zone 1 and 0/1	-	Flameproof
W	ATEX	-	Zone 20 and 20/21	Dust Ignition Proof
B	IEC Ex	Zone 0 and 0/1	-	Intrinsically Safe
D	IEC Ex	Zone 0 and 0/1	Zone 20 and 20/21	Intrinsically Safe, Dust Ignition Proof
C	IEC Ex	Zone 1 and 0/1	-	Flameproof
A	IEC Ex	-	Zone 20 and 20/21	Dust Ignition Proof
M	FM	-	-	General purpose
H	FM	Cl. I Div. 2	Cl. II, III Div. 2	Non incendive
P	FM	Cl. I Div. 1	Cl. II, III Div. 1	Intrinsically Safe
U	FM	Cl. I Div. 1	-	Explosionproof
N	FM	-	Cl. II, III Div. 1	Dust Ignition Proof

pos.3

Process temperature/ Second line of defense / Lead-through of probe to process side

Process-temperature	Second line of defense	Lead-through of probe		Available with certificate pos.2			
		Sealing	Isolation	0,Q, B,M	V,C, U	Y,W, D,A	P,H, N
A	-40 ... +80°C	without	FKM	PPS (9)	•	•	•
F	-40 ... +150°C	without	FKM	PEEK	•	•	•
Q	-40 ... +80°C	with	FKM	PPS (9)	•	•	•
G	-40 ... +150°C	with	FKM	PEEK	•	•	•
D	-20 ... +150°C	without	FFKM	PEEK	•	•	•
K	-20 ... +200°C	without	FFKM	PEEK	•	•	•
P	-20 ... +150°C	with	FFKM	PEEK	•	•	•
L	-20 ... +200°C	with	FFKM	PEEK	•	•	•
B	-40 ... +80°C	without	EPDM	PPS (9)	•	•	•
H	-40 ... +150°C	without	EPDM	PEEK	•	•	•
R	-40 ... +80°C	with	EPDM	PPS (9)	•	•	•
M	-40 ... +150°C	with	EPDM	PEEK	•	•	•
C	-40 ... +80°C	without	Silicon	PPS (9)	•	•	•
E	-40 ... +150°C	without	Silicon	PEEK	•	•	•
S	-40 ... +80°C	with	Silicon	PPS (9)	•	•	•
N	-40 ... +150°C	mit	Silicon	PEEK	•	•	•

pos.4

Electronic module

A	2-wire 4 - 20 mA, HART	.....	•
B	2-wire 4 - 20 mA, HART, with SIL 2/3	.....	•

pos.5+6

Process connection

1E	Thread M30 x 1.5	PN40, DIN3852-A	.....	•
0S	Thread 3/4" NPT	PN6, tapered, ANSI/ ASME B1.20.1 (1)	.....	•
0A	Thread 3/4" NPT	PN40, tapered, ANSI/ ASME B1.20.1	.....	•
0B	Thread 1" NPT	PN40, tapered, ANSI/ ASME B1.20.1	.....	•
0D	Thread 1 1/2" NPT	PN40, tapered, ANSI/ ASME B1.20.1	.....	•
3S	Thread G 3/4"	PN6, DIN3852-A (1)	.....	•
3A	Thread G 3/4"	PN40, DIN3852-A	.....	•
3B	Thread G 1"	PN40, DIN3852-A	.....	•
3D	Thread G 1 1/2"	PN40, DIN3852-A	.....	•
5A	Flange 1" 150 lbs	RF, ASME B16.5	.....	•
5B	Flange 1" 300 lbs	RF, ASME B16.5	.....	•
5C	Flange 1" 600 lbs	RF, ASME B16.5	.....	•
5D	Flange 1 1/2" 150 lbs	RF, ASME B16.5	.....	•
5E	Flange 1 1/2" 300 lbs	RF, ASME B16.5	.....	•
5F	Flange 1 1/2" 600 lbs	RF, ASME B16.5	.....	•
5G	Flange 2" 150 lbs	RF, ASME B16.5	.....	•
5H	Flange 2" 300 lbs	RF, ASME B16.5	.....	•
5J	Flange 2" 600 lbs	RF, ASME B16.5	.....	•
5K	Flange 3" 150 lbs	RF, ASME B16.5	.....	•
5L	Flange 3" 300 lbs	RF, ASME B16.5	.....	•
5M	Flange 3" 600 lbs	RF, ASME B16.5	.....	•

continuation flanges: see next page

NG 8100 Standard version

5N	Flange 4"	150 lbs	RF, ASME B16.5	•
5P	Flange 4"	300 lbs	RF, ASME B16.5	•
5Q	Flange 4"	600 lbs	RF, ASME B16.5	•
6B	Flange DN25, PN40		EN 1092-1 Form B1	•
6D	Flange DN40, PN40		EN 1092-1 Form B1	•
6E	Flange DN50, PN16		EN 1092-1 Form B1 ⁽²⁾	•
6F	Flange DN50, PN40		EN 1092-1 Form B1	•
6G	Flange DN65, PN40		EN 1092-1 Form B1 ⁽²⁾	•
6H	Flange DN80, PN40		EN 1092-1 Form B1	•
6J	Flange DN100, PN16		EN 1092-1 Form B1	•
6K	Flange DN100, PN40		EN 1092-1 Form B1	•
6L	Flange DN150, PN16		EN 1092-1 Form B1	•
6M	Flange DN150, PN40		EN 1092-1 Form B1	•
6N	Flange DN200, PN10		EN 1092-1 Form B1	•
6P	Flange DN200, PN40		EN 1092-1 Form B1	•
pos.8 Type and length of extension "L" (3)				
E	Rod ø8 mm (0.31")		Price per 100mm (3.94") of part thereof (starting from 0mm), min. 300mm (11.81"), max. 6,000mm (236")	•
F	Rod ø12 mm (0.47") ⁽⁴⁾		Price per 100mm (3.94") of part thereof (starting from 0mm), min. 300mm (11.81"), max. 6,000mm (236")	•
B	Rope ø2 mm (0.08") with gravity weight		Price per 100mm (3.94") of part thereof (starting from 0mm), min. 500mm (19.7"), max. 75,000mm (2,953")....	•
U	Rope ø4 mm (0.16") without gravity weight		Price per 100mm (3.94") of part thereof (starting from 0mm), min. 500mm (19.7"), max. 75,000mm (2,953")....	•
A	Rope ø4 mm (0.16") with gravity weight		Price per 100mm (3.94") of part thereof (starting from 0mm), min. 500mm (19.7"), max. 75,000mm (2,953")....	•
K	Coax ø21.3mm (0.84") with single hole ^(7,8)	Base price	Price per 100mm (3.94") of part thereof (starting from 0mm), min. 300mm (11.81"), max. 6,000mm (236")	•
L	Coax ø21.3mm (0.84") with multiple hole ^(7,8)	Base price	Price per 100mm (3.94") of part thereof (starting from 0mm), min. 300mm (11.81"), max. 6,000mm (236")	•
P	Coax ø42.2mm (1.67") with multiple hole ^(4,7)	Base price	Price per 100mm (3.94") of part thereof (starting from 0mm), min. 300mm (11.81"), max. 6,000mm (236")	•
pos.9 Display and Adjustment Module / Inspection window in lid				
O	without Display and Adjustment Module, without inspection window in lid			•
F	without Display and Adjustment Module, with inspection window in lid ⁽⁵⁾			•
A	with Display and Adjustment Module, with inspection window in lid			•
B	with Display and Adjustment Module (laterally in housing alu double chamber), with inspection window in lid ⁽⁶⁾			•
pos.10 Length of rigid part "L1"				
O	without (for rod and coax version)			•
Z	L1 = customer specified (for rope version)		Price per 100mm (3.94") of part thereof (starting from 0mm), min. 100 mm (3.94"), max. L - 300mm (11.8") or 1,000 mm (39.4")	•

(1) Process temperature (pos.3) max. 80°C.

(2) Available with rod ø12mm (pos.8 F).

(3) Rope / rod can be cut and changed.

(4) Available with following process connections: all threads 1½", flange ASME 2" or bigger, flange DN50 or bigger,
not with flange DN150 PN40 and DN200 PN40.

(5) Available with certificates pos.2 O, Q, B, M, N, U.

(6) Not available with certificates FM non incendive (pos.2 H), available with housing double chamber (pos.16 D).

(7) Not available with process temperature 80°C pos.3 A, Q, B, R, C, S.

(8) Not available with process connections pos.5+6 1E, 0S, 3S, 6E, 6G.

(9) Available with process connections threads ¾" PN6 (Pos.5+6 0S, 3S).

NG 8100	A					1			
position	1	2	3	4	5+6	7	8	9	10

L =	mm
L1 =	mm

← Order code

All positions are available with special design (use code "Z").

NG 8200 High temperatur- and high pressure version



Cable entries (by default)

Depending on model selected, the following cable entries are supported (details and options see pos.13 on page 11):

Version:	Cable entry:
CE, ATEX, IEC-Ex	M20 x 1.5 1x screwed cable gland, 1x blind plug
FM	NPT 1/2" tapered ANSI B1.20.1 1x open conduit + 1x blind plu



Display and
Adjustment Module
(pos. 9)

Housing

Standard housing is aluminium single chamber.
 Alternative housings see option pos.16 on page 11.

NG 8200 High temperatur- and high pressure version

Basic type

NG 8200

Certificate (detailed Ex-markings: see page 19)			
	Gas	Dust	Protection method
O	CE	-	-
Q	ATEX	Zone 0 and 0/1	-
Y	ATEX	Zone 0 and 0/1	Zone 20 and 20/21
V	ATEX	Zone 1 and 0/1	-
W	ATEX	-	Zone 20 and 20/21
B	IEC Ex	Zone 0 and 0/1	-
D	IEC Ex	Zone 0 and 0/1	Zone 20 and 20/21
C	IEC Ex	Zone 1 and 0/1	-
A	IEC Ex	-	Zone 20 and 20/21
M	FM	-	-
H	FM	Cl. I Div. 2	Cl. II, III Div. 2
P	FM	Cl. I Div. 1	Cl. II, III Div. 1
U	FM	Cl. I Div. 1	-
N	FM	-	Cl. II, III Div. 1

pos.3	Process temperature/ Second line of defense / Lead-through of probe to process side			
	Process-temperature	Second line of defense	Lead-through of probe	
			Sealing	Isolation
3	-20 ... +250°C ⁽¹⁾	with	FFKM	PEEK
1	-196 ... +280°C ⁽²⁾	with	Graphite	Ceramic
2	-196 ... +450°C ⁽²⁾	with	Graphite	Ceramic

pos.4 **Electronic module**

A 2-wire 4 - 20 mA, HART
 B 2-wire 4 - 20 mA, HART, with SIL 2/3

Process connection			Available with type of extension pos.8					
			E	H	B	A	L	P
0A	Thread ¾" NPT	PN100, tapered, ANSI/ ASME B1.20.1						●
0B	Thread 1" NPT	PN100, tapered, ANSI/ ASME B1.20.1	●	●	●	●	●	
0D	Thread 1½" NPT	PN100, tapered, ANSI/ ASME B1.20.1	●	●	●	●	●	
0E	Thread 1½" NPT	PN400, tapered, ANSI/ ASME B1.20.1		●	●	●	●	●
0F	Thread 2" NPT	PN100, tapered, ANSI/ ASME B1.20.1	●	●	●	●	●	
3A	Thread G ¾"	PN100, DIN3852-A						●
3B	Thread G 1"	PN100, DIN3852-A	●	●	●	●	●	
3D	Thread G 1½"	PN100, DIN3852-A	●	●	●	●	●	
3E	Thread G 1½"	PN400, DIN3852-A		●	●	●	●	●
3F	Thread G 2"	PN100, DIN3852-A						●
5A	Flange 1" 150 lbs	RF, ASME B16.5						●
5B	Flange 1" 300 lbs	RF, ASME B16.5						●
5C	Flange 1" 600 lbs	RF, ASME B16.5						●
5D	Flange 1½" 150 lbs	RF, ASME B16.5						●
5E	Flange 1½" 300 lbs	RF, ASME B16.5						●
5F	Flange 1½" 600 lbs	RF, ASME B16.5						●
5G	Flange 2" 150 lbs	RF, ASME B16.5	●	●	●	●	●	●
5H	Flange 2" 300 lbs	RF, ASME B16.5	●	●	●	●	●	●
5J	Flange 2" 600 lbs	RF, ASME B16.5	●	●	●	●	●	●
5R	Flange 2" 1500 lbs	RF, ASME B16.5	●	●	●	●	●	●
5K	Flange 3" 150 lbs	RF, ASME B16.5	●	●	●	●	●	●
5L	Flange 3" 300 lbs	RF, ASME B16.5	●	●	●	●	●	●
5M	Flange 3" 600 lbs	RF, ASME B16.5	●	●	●	●	●	●
5S	Flange 3" 1500 lbs	RF, ASME B16.5	●	●	●	●	●	●
5N	Flange 4" 150 lbs	RF, ASME B16.5	●	●	●	●	●	●
5P	Flange 4" 300 lbs	RF, ASME B16.5	●	●	●	●	●	●
5Q	Flange 4" 600 lbs	RF, ASME B16.5	●	●	●	●	●	●
5T	Flange 4" 1500 lbs	RF, ASME B16.5	●	●	●	●	●	●
6B	Flange DN25, PN40	EN 1092-1 Form B1						●
6Q	Flange DN40, PN100	EN 1092-1 Form B1						●
6F	Flange DN50, PN40	EN 1092-1 Form B1	●	●	●	●	●	●
6R	Flange DN50, PN100	EN 1092-1 Form B1	●	●	●	●	●	●
6T	Flange DN65, PN160	EN 1092-1 Form B1			●	●	●	
6H	Flange DN80, PN40	EN 1092-1 Form B1	●	●	●	●	●	●
6U	Flange DN80, PN100	EN 1092-1 Form B1	●	●	●	●	●	●
6J	Flange DN100, PN16	EN 1092-1 Form B1	●	●	●	●	●	●
6K	Flange DN100, PN40	EN 1092-1 Form B1	●	●	●	●	●	●
6L	Flange DN150, PN16	EN 1092-1 Form B1	●	●	●	●	●	●
6V	Flange DN200, PN16	EN 1092-1 Form B1	●	●	●	●	●	●
6P	Flange DN200, PN40	EN 1092-1 Form B1	●	●	●	●	●	●



NG 8200 High temperatur- and high pressure version

pos.8	Type and length of extension "L" (3)	
E	Rod ø8 mm (0.31") (4) Price per 100mm (3.94") of part thereof (starting from 0mm), min. 300 mm (11.81"), max. 6.000 mm (236") ...	•
H	Rod ø16 mm (0.63") (5) Price per 100mm (3.94") of part thereof (starting from 0mm), min. 300 mm (11.81"), max. 6.000 mm (236") ...	•
B	Rope ø2 mm (0.08") with gravity weight Price per 100mm (3.94") of part thereof (starting from 0mm), min. 500 mm (19.7"), max. 60.000 mm (2.362")	•
A	Rope ø4 mm (0.16") with gravity weight Price per 100mm (3.94") of part thereof (starting from 0mm), min. 500 mm (19.7"), max. 60.000 mm (2.362")	•
L	Coax ø21.3mm (0.84") with multiple hole (4) Base price Price per 100mm (3.94") of part thereof (starting from 0mm), min. 300 mm (11.81"), max. 6.000 mm (236") ...	• •
P	Coax ø42.2mm (1.67") with multiple hole (5) Base price Price per 100mm (3.94") of part thereof (starting from 0mm), min. 300 mm (11.81"), max. 6.000 mm (236") ...	• •
Q	Coax ø42.2mm (1.67") with multiple hole and reference distance 260 mm (10.23") (5) Base price Price per 100mm (3.94") of part thereof (starting from 0mm), min. 1000 mm (39.37"), max. 6.000 mm (236")	• •
R	Coax ø42.2mm (1.67") with multiple hole and reference distance 500 mm (19.68") (5) Base price Price per 100mm (3.94") of part thereof (starting from 0mm), min. 1250 mm (49.21"), max. 6.000 mm (236")	• •
S	Coax ø42.2mm (1.67") with multiple hole and reference distance 750 mm (29.53") (5) Base price Price per 100mm (3.94") of part thereof (starting from 0mm), min. 1500 mm (59.06"), max. 6.000 mm (236")	• •
pos.9	Display and Adjustment Module / Inspection window in lid	
O	without Display and Adjustment Module, without inspection window in lid	•
F	without Display and Adjustment Module, with inspection window in lid (6)	•
A	with Display and Adjustment Module, with inspection window in lid	•
B	with Display and Adjustment Module (laterally in housing alu double chamber), with inspection window in lid (7)	•

(1) Not available with process connections threads 1½" PN400, flange DN65 PN160, DN80 PN100 and DN200 PN40 (pos.5+6 0E, 3E, 6T, 6U, 6P).

(2) Available with following process connections: all threads 1½" PN400, flange ASME 2" or bigger, flange DN50 or bigger.

(3) Rope / rod can be cut and changed.

(4) Available with 250°C version (pos.3 3).

(5) Available with 280°C / 450°C version (pos.3 1, 2).

(6) Available with certificates pos.2 0, Q, B, M, U, N.

(7) Not available with certificates FM non incendive (pos.2 H), available with housing double chamber (pos.16 D).

NG 8200	B				1		0	L = mm	← Order code
position	1	2	3	4	5+6	7	8	9	10

All positions are available with special design (use code "Z").

Options / Accessories

Options

- pos.11 **Inspection Certificate** •
3.1 according to EN 10204
- pos.12 **Measurement loop identification label** •
1 of stainless steel •
2 of foil •
- pos.13 **Cable entry** ⁽¹⁾ •
Selection of the following options only necessary,
if a deviation from default is required:
D M20 x 1.5 1x screwed cable gland PA black (ø5-9mm), 1x blind plug •
E M20 x 1.5 1x screwed cable gland brass nickel plated (ø6-12mm), 1x blind plug •
F M20 x 1.5 1x screwed cable gland brass nickel plated (ø5-9mm), 1x blind plug •
A 1/2" NPT 1x conduit, 1x blind plug •
B 1/2" NPT 1x screwed cable gland brass nickel plated (ø6-12mm), 1x blind plug •
C 1/2" NPT 1x screwed cable gland brass nickel plated; for shielded cable (ø9-13mm), 1x blind plug •
- pos.14 **Language of operating instruction** •
Number of instructions: 1 piece. Standard is DE -German, available other languages:
2 EN - Englisch •
3 FR - French •
4 RU - Russian •
5 ES - Spanish •
6 PT - Portuguese •
7 ZH - Chinese •
- pos.15 **Approval for steam boiler** ⁽²⁾ •
according to EN12952-11, EN12953-9
- pos.16 **Housing** •
D Aluminium - double chamber •
N Stainless steel - single chamber (electropolished) ⁽³⁾ •

(1) Available cable entries:

Cable entry	Available with certificate pos.2						
	0	Q,B	Y,W,D,A	V,C	P	M	H,U,N
D	x	x			•	•	
E	•			x			
F	•	•	x		•	•	
A	•	•	•	•	x	x	x
B	•			•		•	
C	•			•		•	

• = Cable entry optional selectable

x = Default cable entry (option pos.13 not selectable)

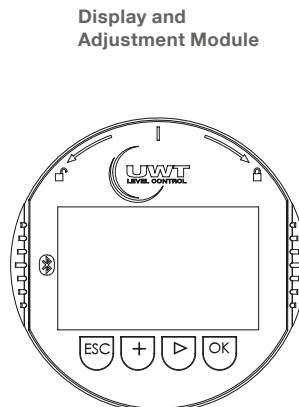
(2) Available with NG8200 with electronic SIL (pos.4 B) and with extension with reference distance (pos.8 Q, R, S)

(3) Available without Ex-certificate (pos. 2 0,M) or with intrinsically safe version (pos.2 Q, B, P), not with cable entry pos.13 E.

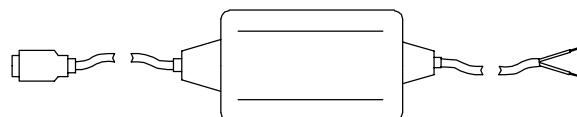
Accessories

Minimum order value for separate orders of spare parts or accessories is 75 €.

- pl400510 **Display and Adjustment Module** (plug on) •
- zu400530 **HART Modem** •
USB HART interface to connect of a PC with the NG 8000, for commissioning and servicing.

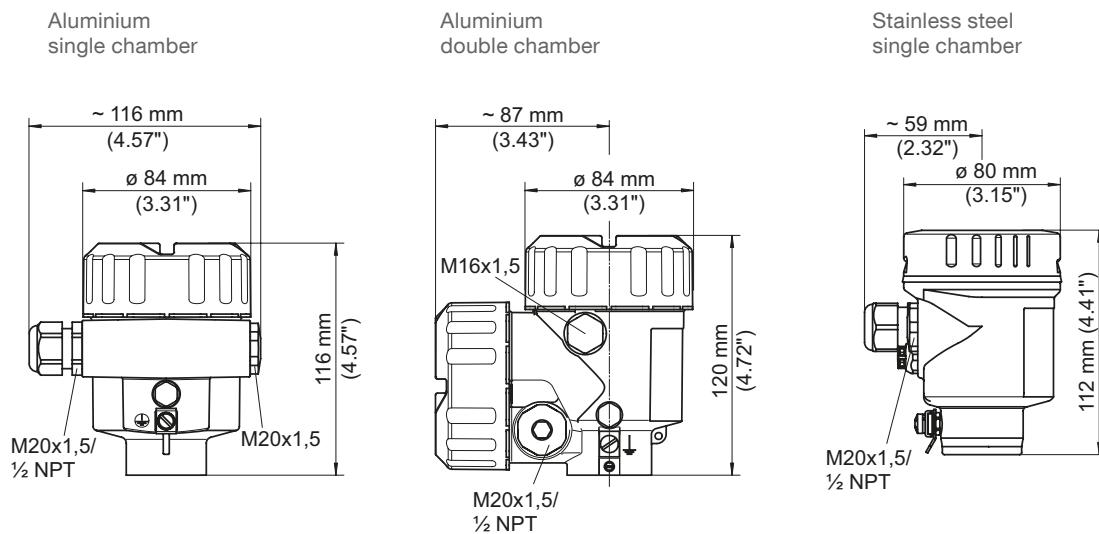


HART Modem

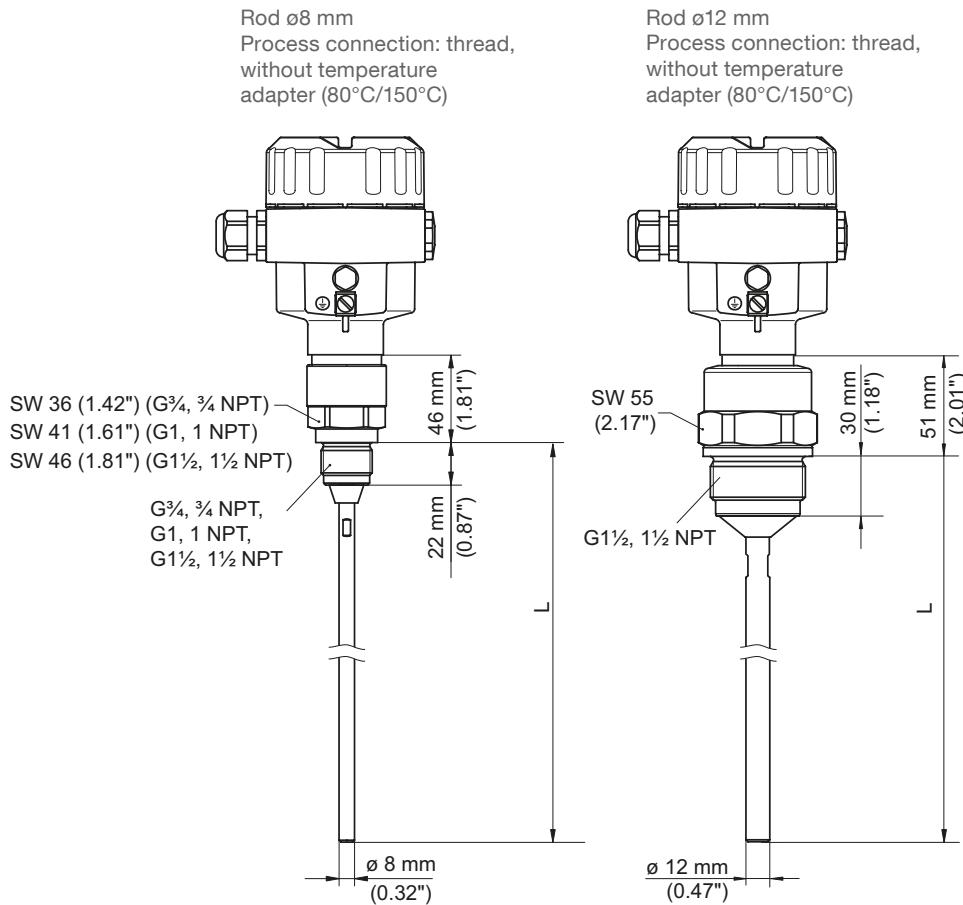


Dimensions

NG 8100 / NG 8200 Housing

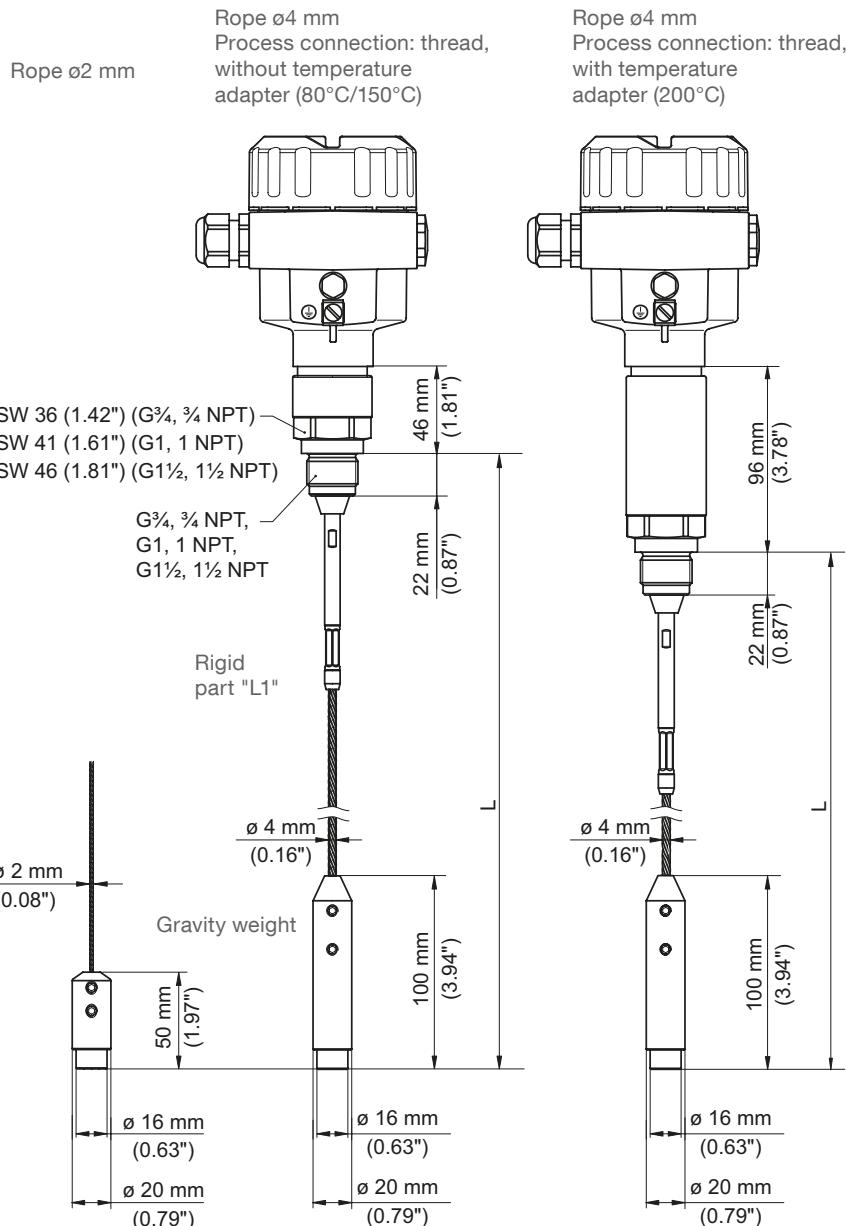


NG 8100 Rod version



Dimensions

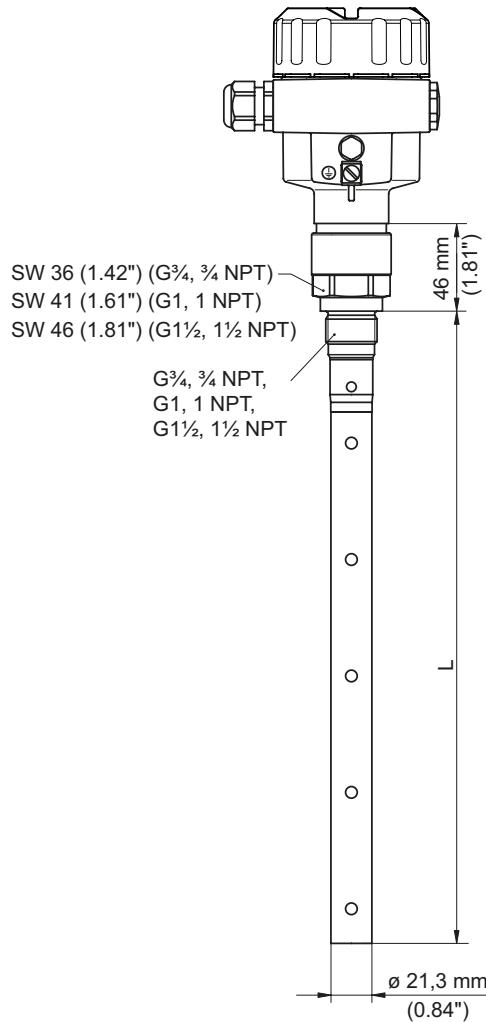
NG 8100 Rope version



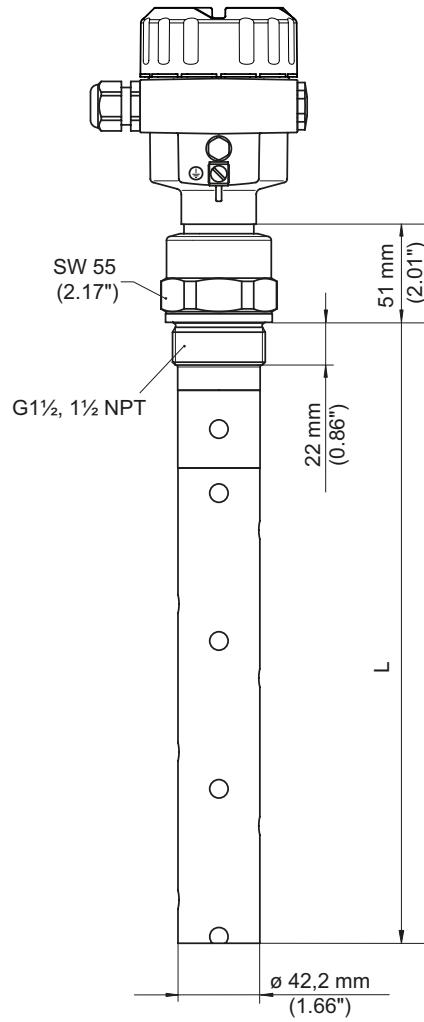
Dimensions

NG 8100 Coax version

Coax ø21.3 mm
 Process connection: thread,
 without temperature
 adapter (80°C/150°C)



Coax ø42.2 mm
 Process connection: thread,
 without temperature
 adapter (80°C/150°C)



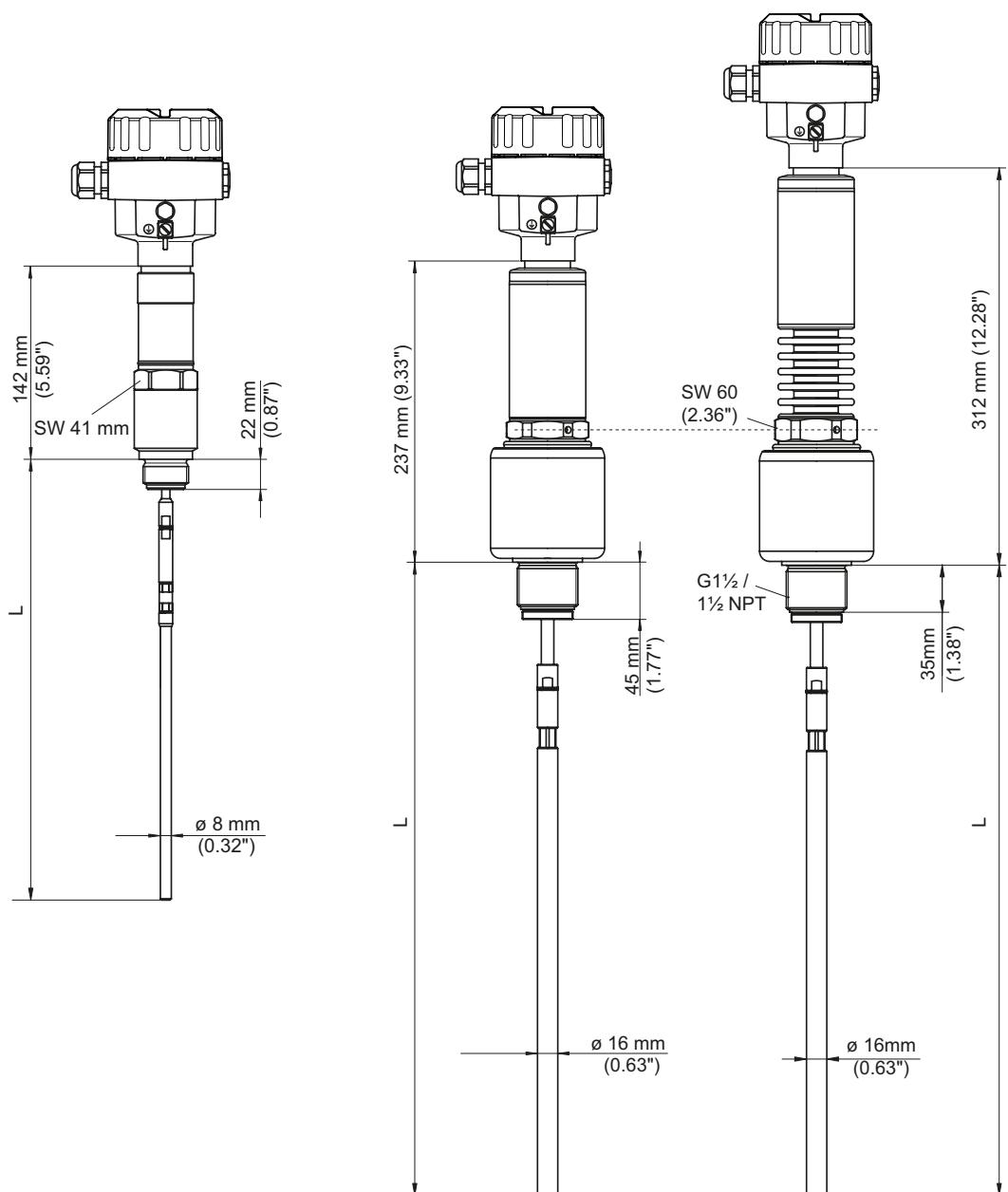
Dimensions

NG 8200 Rod version

Process temp. 250°C
 Rod ø8 mm
 Process connection: thread

Process temp. 280°C
 Rod ø16 mm
 Process connection: thread

Process temp. 450°C
 Rod ø16 mm
 Process connection: thread



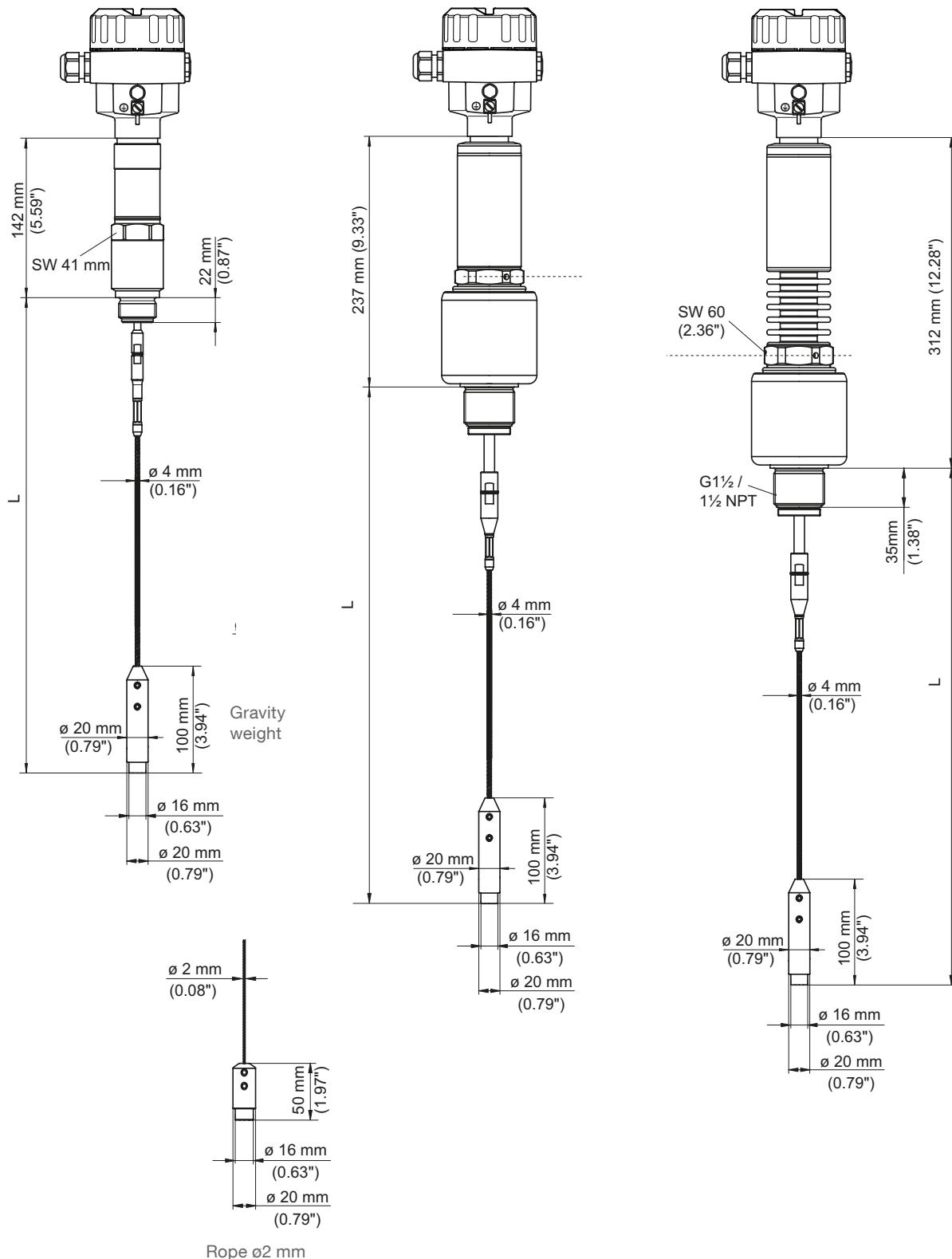
Dimensions

NG 8200 Rope version

Process temp. 250°C
 Rope ø4 mm
 Process connection: thread

Process temp. 280°C
 Rope ø4 mm
 Process connection: thread

Process temp. 450°C
 Rope ø4 mm
 Process connection: thread



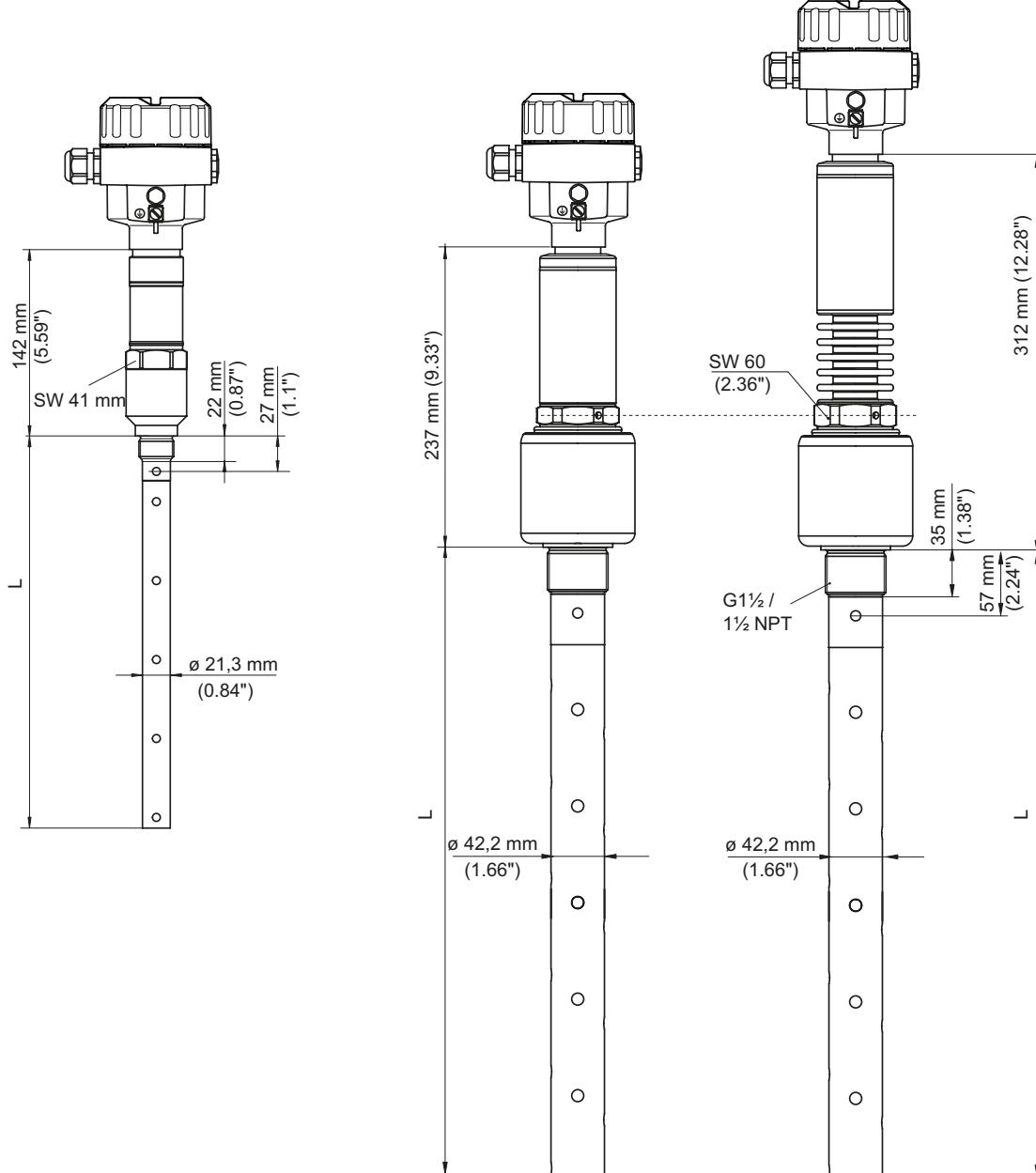
Dimensions

NG 8200 Coax version

Process temp. 250°C
 Coax ø21.3 mm
 Process connection: thread

Process temp. 280°C
 Coax ø42.2 mm
 Process connection: thread

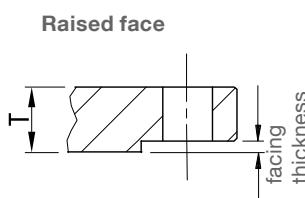
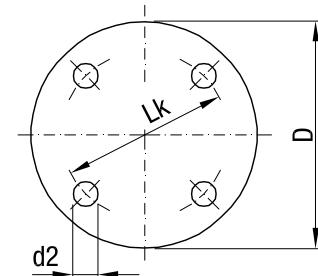
Process temp. 450°C
 Coax ø42.2 mm
 Process connection: thread



Dimensions

Flanges

Code	Type	Number of holes	d2 mm (inch)	Lk mm (inch)	D mm (inch)	T thickness mm (inch)
ASME B16.5, raised face	5A	1" 150 lbs	4	15.9 (0.63)	79.3 (3.12)	108.0 (4.25)
	5B	1" 300 lbs	4	19.1 (0.75)	88.9 (3.5)	124.0 (4.88)
	5C	1" 600 lbs	4	19.1 (0.75)	88.9 (3.5)	124.0 (4.88)
	5D	1½" 150 lbs	4	15.9 (0.63)	98.6 (3.88)	127.0 (5.0)
	5E	1½" 300 lbs	4	22.2 (0.87)	114.3 (4.5)	155.5 (6.12)
	5F	1½" 600 lbs	4	22.2 (0.87)	114.3 (4.5)	155.5 (6.12)
	5G	2" 150 lbs	4	19.1 (0.75)	120.7 (4.75)	152.4 (6.01)
	5H	2" 300 lbs	8	19.1 (0.75)	127.0 (5.0)	165.1 (6.5)
	5J	2" 600 lbs	8	19.1 (0.75)	127.0 (5.0)	165.1 (6.5)
	5R	2" 1500 lbs	8	25.4 (1.0)	165.1 (6.5)	215.9 (8.5)
	5K	3" 150 lbs	4	19.1 (0.75)	152.4 (6.01)	190.5 (7.5)
	5L	3" 300 lbs	8	22.2 (0.87)	168.2 (6.62)	209.6 (8.25)
	5M	3" 600 lbs	8	22.2 (0.87)	168.2 (6.62)	209.6 (8.25)
	5S	3" 1500 lbs	8	38.1 (1.5)	203.2 (8.0)	266.7 (10.5)
	5N	4" 150 lbs	8	19.1 (0.75)	190.5 (7.5)	228.6 (9.0)
	5P	4" 300 lbs	8	22.2 (0.87)	200.2 (7.88)	254.0 (10.0)
	5Q	4" 600 lbs	8	25.4 (1.0)	215.9 (8.5)	273.1 (10.75)
	5T	4" 1500 lbs	8	35.1 (1.38)	241.3 (9.5)	311.2 (12.25)
EN 1092-1 type B1, raised face	6A	DN25 PN16	4	14.0 (0.55)	85.0 (3.35)	115.0 (4.53)
	6B	DN25 PN40	4	14.0 (0.55)	85.0 (3.35)	115.0 (4.53)
	6C	DN40 PN16	4	18.0 (0.71)	110.0 (4.33)	150.0 (5.91)
	6D	DN40 PN40	4	18.0 (0.71)	110.0 (4.33)	150.0 (5.91)
	6Q	DN40 PN100	4	22.0 (0.87)	125.0 (4.92)	170.0 (6.69)
	6E	DN50 PN16	4	18.0 (0.71)	125.0 (4.92)	165.0 (6.5)
	6F	DN50 PN40	4	18.0 (0.71)	125.0 (4.92)	165.0 (6.5)
	6R	DN50 PN100	4	26.0 (1.02)	145.0 (5.71)	195.0 (7.68)
	6T	DN65 PN160	8	26.0 (1.02)	170.0 (6.69)	220.0 (8.66)
	6G	DN80 PN16	8	18.0 (0.71)	160.0 (6.3)	200.0 (7.87)
	6H	DN80 PN40	8	18.0 (0.71)	160.0 (6.3)	200.0 (7.87)
	6U	DN80 PN100	8	26.0 (1.02)	180.0 (7.09)	230.0 (9.06)
	6J	DN100 PN16	8	18.0 (0.71)	180.0 (7.09)	220.0 (8.66)
	6K	DN100 PN40	8	22.0 (0.87)	190.0 (7.48)	235.0 (9.25)
	6L	DN150 PN16	8	22.0 (0.87)	240.0 (9.45)	285.0 (11.2)
	6M	DN150 PN40	8	26.0 (1.02)	250.0 (9.84)	300.0 (11.8)
	6N	DN200 PN10	8	22.0 (0.87)	295.0 (11.6)	340.0 (13.4)
	6V	DN200 PN16	12	22.0 (0.87)	295.0 (11.6)	340.0 (13.4)
	6P	DN200 PN40	12	30.0 (1.18)	320.0 (12.6)	375.0 (14.8)
						36.0 (1.42)



Type	Facing thickness
DN25 - DN200 ASME 150 lbs ASME 300 lbs	2 mm (0.08")
ASME 600 lbs ASME 1500 lbs	7 mm (0.28")

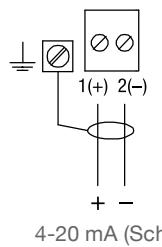
Detailed Ex-markings

pos.2	Certificate		Protection method
Q	ATEX II 1G ATEX II 1/2G	Ex ia IIC T6..T1 Ga Ex ia IIC T6..T1 Ga/Gb	Intrinsically Safe
Y	ATEX II 1G ATEX II 1/2G	Ex ia IIC T6..T1 Ga Ex ia IIC T6..T1 Ga/Gb	Intrinsically Safe
	ATEX II 1D ATEX II 1/2D	Ex ta IIIC T! Da Ex ta/tb IIIC T! Da/Db	Dust Ignition Proof
V	ATEX II 1/2G ATEX II 2G	Ex d IIC T6...T1 Ga/Gb Ex d IIC T6...T1 Gb	Flameproof
W	ATEX II 1D ATEX II 1/2D	Ex ta IIIC T! Da Ex ta/tb IIIC T! Da/Db	Dust Ignition Proof
B	IEC Ex	Ex ia IIC T6..T1 Ga Ex ia IIC T6..T1 Ga/Gb	Intrinsically Safe
D	IEC Ex	Ex ia IIC T6..T1 Ga Ex ia IIC T6..T1 Ga/Gb	Intrinsically Safe
		Ex ta IIIC T! Da Ex ta/tb IIIC T! Da/Db	Dust Ignition Proof
C	IEC Ex	Ex d IIC T6...T1 Ga/Gb Ex d IIC T6...T1 Gb	Flameproof
A	IEC Ex	Ex ta IIIC T! Da Ex ta/tb IIIC T! Da/Db	Dust Ignition Proof
H	FM	NI Class I,II,III Div.2, Gr. A,B,C,D,F,G	Non incendive
P	FM	IS Class I, II, III Div.1, Gr. A-G	Intrinsically Safe
U	FM	XP Class I Div.1, Gr. A-D	Explosionproof
N	FM	DIP Class II,III Div.1, Gr. E,F,G	Dust Ignition Proof

Electrical Installation

4-20 mA

The terminals are located below the Display and Adjustment Module. To connect the unit, remove the display by gently turning the display counter-clockwise until it is free.



Wire cross-section (spring-loaded terminals) :
 Massive wire, stranded wire 0,2 ... 2,5 mm² (AWG 24 ... 14)
 Stranded wire with end sleeve 0,2 ... 1,5 mm² (AWG 24 ... 16)
 Connect cable shield to ground terminal.

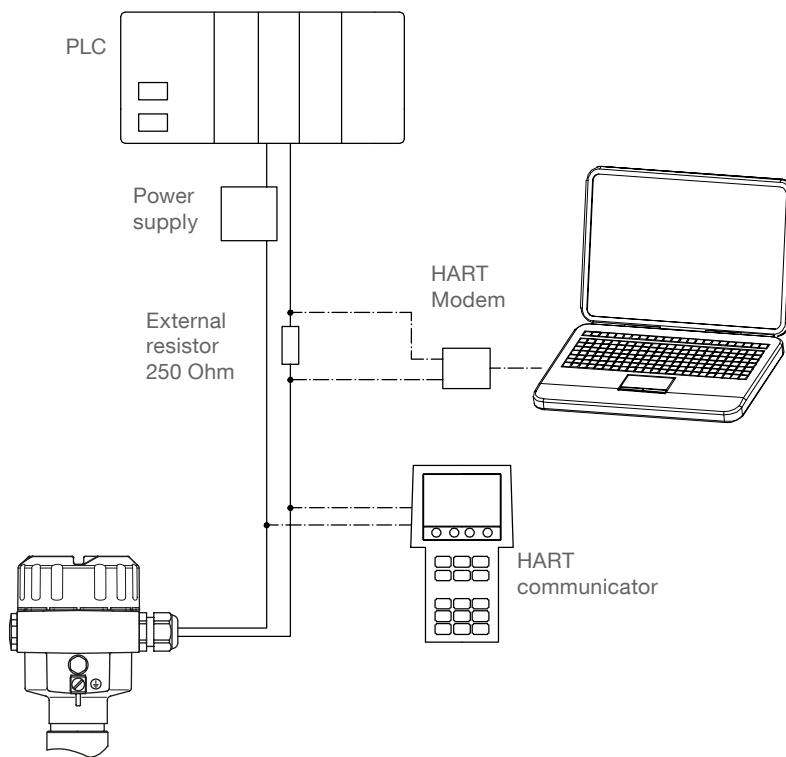
Operating voltage (voltage present at terminals):

Version	Display and Adjustment Module (illuminated)	Operating voltage
Non-Ex,	without	9,6 ... 35 V DC
Ex d	with	16 ... 35 V DC
Ex ia	without	9,6 ... 30 V DC
	with	16 ... 30 V DC

4-20 mA HART

Typical PLC/ mA configuration with HART:

- Depending on the system design, the power supply may be separate from the PLC, or integral to it.
- HART resistance (total loop resistance, that is, cable resistance plus 250 Ohm (external resistor) must be limited to a certain value, to ensure a proper function.
 $\text{Max. loop resistance} = (\text{supply voltage} - \text{min. voltage present at terminals}) / 22\text{mA}$
 Example: CE-unit with 24 V DC supply: Max. loop resistance = $(24 \text{ V} - 9,6 \text{ V}) / 22 \text{ mA} = 655 \Omega$
- The external resistor is not required, if the PLC has an integral 250 Ohm resistor.





NivoCapa® 8000

Capacitance Level Transmitter

Capacitive continuous measurement for all kinds of liquids.

High precision level monitoring of conductive and non-conductive materials.



NivoCapa® 8000

- Very user-friendly through LCD display with control buttons and diagnostic function
- Potted electronics, "Active Shield Technology" against material build-up ensures high functional safety
- PFA isolation for high chemical resistance

Inverse Frequency Shift Technology

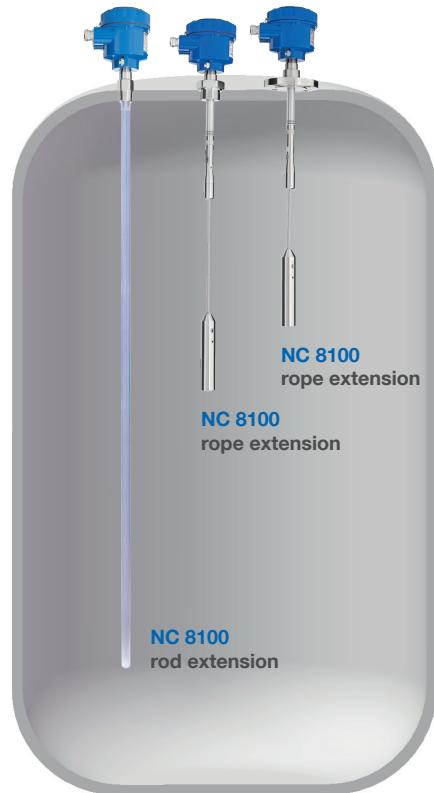


Applications: NivoCapa® 8000 is suitable for liquids, pastes, foam and slurry.

NC 8100 Rod



NC 8100 Coax



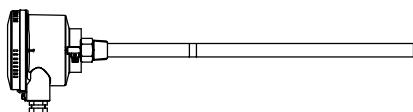
NC 8100 Rope



Technical Data

Housing	Aluminium powder coated, IP68/NEMA 4
Certificates	ATEX, FM/CSA, TR-CU, INMETRO, Lloyd's
Shaft length	Rod version max. 5m Cable version max. 25m
Process temp. range	-40°C to +200°C (-40°F to +392°F)
Pressure range	-1 to +35 bar (-14.5 to +507.6 psi)
Sensitivity	DK value ≥1.5
Supply voltage	12...24V DC, 2-wire current loop
Measurement signal	Current loop 4 - 20 mA or 20 - 4 mA according to NAMUR NE 43
Measurement range	1.66 ... 3.300 pF
Process connection	≥ NPT ¾", ≥ R ¾", ≥ G ¾", range of flanges
Process con. material	1.4404 (316L)
Probe material	1.4404 (316L), isolation PEEK, coating PFA, wetted seals FKM or FFKM

Table of content

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<hr/>	
NC 8100 	4
<hr/>	
Options/ Accessories	6
Dimensions	7
Detailed Ex-markings	10
Electrical installation	11
Spare parts	12

Subject to change.

Valid: From 01.04.2020 until 31.03.2021, unless otherwise agreed.

All dimensions in mm (inches).

By publishing this selection list all other lists become invalid.

All prices in Euro (€) or USD (\$),
excluding VAT.

We assume no liability for typing errors.

All EURO prices are EXW Betzigau,
all USD prices are EXW Memphis,
excluding packaging costs.

Different variations to those specified are possible.
Please contact our technical consultants.

Overview

- Continuous level measurement in liquids, slurries and solids.
Performs viscous materials (conductive or nonconductive), even in challenging environments involving vapour and dust.
- Compact unit
- Wide range of applications
- No maintenance
- Rod and rope versions
- High pressure and temperature
- High chemical resistance on probes
- RF technology with active shield
- Sensitivity: dielectric constant ≥ 1.5
- 2-wire 4 - 20 mA electronics
- Integrated Local User Interface
- Self diagnostics
- Multiple approvals available
- 2011/65/EU RoHS conform

Approvals	CE	
	ATEX	Zone 0/1 Flameproof
		Zone 20/21 Dust Ignition Proof
	FM/ CSA	General purp.
		Cl. I Div. 1 Explosionproof
		Cl. II, III Div. 1 Dust Ignition Proof
	TR-CU	Ordinary Locations, Flameproof, Dust Ignition Proof
	INMETRO	Flameproof, Dust Ignition Proof
	Lloyds	Categories ENV1, ENV2, ENV3 and ENV5

Electronics	Supply voltage	12 .. 30 V DC, 2-wire current loop
	Measurement signal	Current loop 4 - 20 mA or 20 - 4 mA according to NAMUR NE 43
	Measurement range	1.66 .. 3,300 pF
	User interface	7 segment LCD display, displays the actual measurement in pF Pushbuttons and rotary switch
	Settings	Upper and lower measurement range Output delay (damping) Loop current
	Diagnostics	Over- and Under Range Internal electronic self check

Housing	Material	Aluminium, powder-coated
	Ingress protection	Type 4/ NEMA 4/ IP68
	Temperature extended shaft	1.4404 (SS316L), option
	Ambient temperature	-40 .. 85°C (-40 .. 185°F) With ATEX approval: -40 .. 80°C (-40 .. 176°F)

Overview

Mechanics and Process	Length of extension "L"	Rod Rope	300 .. 5,000 mm (11.81 .. 196.9") 1,000 .. 25,000 mm (39.37 .. 984.3")
	Diameter of rod/ rope	Rod Rope	ø19 mm (ø0.75") ø6 mm (ø0.3")
	Materials	Rod version Rope version Process connection Probe Isolators Wetted seals	Probe and active shield 1.4404 (SS316L), PFA coated Probe (rope) 1.4404 (SS316L), Optional PFA coated (for conductive media) Active shield 1.4404 (SS316L), PFA coated 1.4404 (SS316L) PEEK FKM or FFKM
	Process temperature		Without temperature extended shaft: -40 .. 85°C (-40 .. 185°F) With temperature extended shaft: -40 .. 200°C (-40 .. 392°F)
	Process pressure		-1 .. 35 bar g (-14.6 .. 511 psi g) nominal Observe Pressure versus Temperature Curves
	Tensile load/ torque	Rope Rod	max. 18.5 kN max. 30 Nm (horizontal load)

Rod version



Rope version



NC 8100



Rod version
 (pos.5/6 0A and 8 Y)



Rope version
 (pos.5/6 5D and 8 Z)

Cable entries (by default)

Depending on model selected, the following cable entries are supported (options see pos.33 on page 6):

Version:	Cable entries:
Flameproof (pos.2 T,D)	M20 x 1.5 (1x open conduit + 1x blind plug)
FM/ CSA (pos.2 M,U,N)	NPT 1/2" tapered ANSI B1.20.1 (1x open conduit + 1x blind plug)
All other versions	M20 x 1.5 (1x screwed cable gland + 1x blind plug)

Dimensions see pages 7 - 10

Basic type

NC 8100

pos.2

Certificate (detailed Ex-markings: see page 10)

	Gas	Dust	Protection method
0	CE ⁽⁴⁾	-	-
Q	CE/ FM/ CSA ^(1, 4)	-	-
T	ATEX ^(2, 4)	Zone 0/1	Zone 20/21
W	ATEX ^(2, 4)	-	Zone 20/21
M	FM/ CSA ⁽⁴⁾	-	-
U	FM/ CSA ⁽⁴⁾	Cl. I Div. 1	Cl. II, III Div. 1
N	FM/ CSA ⁽⁴⁾	-	Cl. II, III Div. 1
D	INMETRO	Zone 1	Zone 21

pos.3

Temperature extended shaft

- 1 without (for process temperature <85°C (185°F))
- 2 with (for process temperature >85°C (185°F))

pos.4

Electronic module

- A 2-wire 4 - 20 mA

NC 8100

pos.5+6

Process connection

0A	Thread ¾" NPT	taper, ANSI/ ASME B1.20.1 ⁽⁵⁾	•
0B	Thread 1" NPT	taper, ANSI/ ASME B1.20.1 ⁽⁵⁾	•
0C	Thread 1¼" NPT	taper, ANSI/ ASME B1.20.1	.....	•
0D	Thread 1½" NPT	taper, ANSI/ ASME B1.20.1	.....	•
1A	Thread R ¾"	BSPT, EN 10226/ PT (JIS-T), JIS B 0203 ⁽⁵⁾	•
1B	Thread R 1"	BSPT, EN 10226/ PT (JIS-T), JIS B 0203 ⁽⁵⁾	•
1D	Thread R 1½"	BSPT, EN 10226/ PT (JIS-T), JIS B 0203	.....	•
3A	Thread G ¾"	BSPP, EN ISO 228-1/ PF (JIS-P), JIS B 0202 ⁽⁵⁾	•
3B	Thread G 1"	BSPP, EN ISO 228-1/ PF (JIS-P), JIS B 0202 ⁽⁵⁾	•
3D	Thread G 1½"	BSPP, EN ISO 228-1/ PF (JIS-P), JIS B 0202	.....	•
5A	Flange 1"	150 lbs ASME B16.5, raised face ⁽⁵⁾	•
5B	Flange 1"	300 lbs ASME B16.5, raised face ⁽⁵⁾	•
5C	Flange 1"	600 lbs ASME B16.5, raised face ⁽⁵⁾	•
5D	Flange 1½"	150 lbs ASME B16.5, raised face	.....	•
5E	Flange 1½"	300 lbs ASME B16.5, raised face	.....	•
5F	Flange 1½"	600 lbs ASME B16.5, raised face	.....	•
5G	Flange 2"	150 lbs ASME B16.5, raised face	.....	•
5H	Flange 2"	300 lbs ASME B16.5, raised face	.....	•
5J	Flange 2"	600 lbs ASME B16.5, raised face	.....	•
5K	Flange 3"	150 lbs ASME B16.5, raised face	.....	•
5L	Flange 3"	300 lbs ASME B16.5, raised face	.....	•
5M	Flange 3"	600 lbs ASME B16.5, raised face	.....	•
5N	Flange 4"	150 lbs ASME B16.5, raised face	.....	•
5P	Flange 4"	300 lbs ASME B16.5, raised face	.....	•
5Q	Flange 4"	600 lbs ASME B16.5, raised face	.....	•
6A	Flange DN25, PN16	EN 1092-1 type A flat faced ⁽⁵⁾	•
6B	Flange DN25, PN40	EN 1092-1 type A flat faced ⁽⁵⁾	•
6C	Flange DN40, PN16	EN 1092-1 type A flat faced	.....	•
6D	Flange DN40, PN40	EN 1092-1 type A flat faced	.....	•
6E	Flange DN50, PN16	EN 1092-1 type A flat faced	.....	•
6F	Flange DN50, PN40	EN 1092-1 type A flat faced	.....	•
6G	Flange DN80, PN16	EN 1092-1 type A flat faced	.....	•
6H	Flange DN80, PN40	EN 1092-1 type A flat faced	.....	•
6J	Flange DN100, PN16	EN 1092-1 type A flat faced	.....	•
6K	Flange DN100, PN40	EN 1092-1 type A flat faced	.....	•

pos.8

Length of extension "L"

Y Rod, "L"= customer specified

Price per 100 mm (3.94") of part thereof (starting from 0 mm)
 min. 300 mm (11.81"), max. 5,000 mm (196.9")

Z Rope, "L"= customer specified

Base price
 Price per 100 mm (3.94") of part thereof (starting from 0 mm)
 min. 1,000 mm (39.37"), max. 25,000 mm (984.3") ⁽⁶⁾

pos.9

Material of process connection and extension "L"

2 Rod version: 1.4404 (SS316L), rod PFA coated ⁽⁷⁾

2 Rope version: 1.4404 (SS316L), rope not PFA coated ⁽⁸⁾

3 Rope version: 1.4404 (SS316L), rope PFA coated ⁽⁹⁾

Further options: see page 6

(1) Included is: TR-CU (Ordinary Locations).

(2) Included is: TR-CU.

(4) Included is: Lloyds.

(5) Not available with rope version (pos.8 Z).

(6) "L">15,000 mm (591") available for application in non conductive media.

(7) Probe and active shield are throughout PFA coated.

(8) Applicable for isolating (non conductive) media only. Active shield is PFA coated.

(9) Available with rope version (pos.8 Z). Applicable for conductive and non conductive media. Active shield is PFA coated.

NC 8100	A				1		L = mm	← Order code
Position	1	2	3	4	5+6	7	8	9

All positions are available with special design (use code "Z").

Options/ Accessories

Options

pos.11 x	Guarantee extension to 5 years	.....	•
pos.17 x	FFKM wetted seals ⁽¹⁾	•
pos.18 x	Mounting eye ⁽²⁾	•
pos.25 x	Inspection certificate	.....	•
	Type 3.1 (EN 10204)		
pos.26 x	Manufacturer's Test Certificate	.....	•
	M to DIN 55350, Part 18 and to ISO 9000		
pos.30 x	Stainless steel tag	.....	•
	Measuring point number/ identification (max. 27 characters)		

Cable entry

Selection of the following options only necessary,
 if a deviation from default is required:

pos.33 x	M20 x 1.5 2x screwed cable gland ⁽³⁾	•
pos.33 e	M20 x 1.5 1x screwed cable gland +1x blind plug ⁽⁴⁾	•
pos.33 a	NPT 1/2" tapered ANSI B1.20.1 (1x conduit + 1x blind plug) ⁽⁵⁾	•

Plug ^(6, 8)

pos.35 x	Valve connector (incl. mating plug)	4-pole (incl. PE)	.....	•
pos.35 a	M12 (without mating plug)	4-pole	.....	•
pos.35 b	M12 (without mating plug)	5-pole (incl. PE)	.....	•
pos.35 c	Harting Han 4A (incl. mating plug)	5-pole (incl. PE)	•

pos.36 x	Glass window in lid ⁽⁷⁾	•
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(1) Process temperature limited to -20°C (-4°F), not with FM/CSA General Purpose (pos.2 Q,M) and FM/CSA Dust Ignition Proof (Pos.2 N).

(2) Available for rope version with PFA coated rope (pos.8 Z with pos.9 3). See drawing on page 9.

(3) Available for all versions except flameproof/ explosion proof version (pos.2 T,U,D).

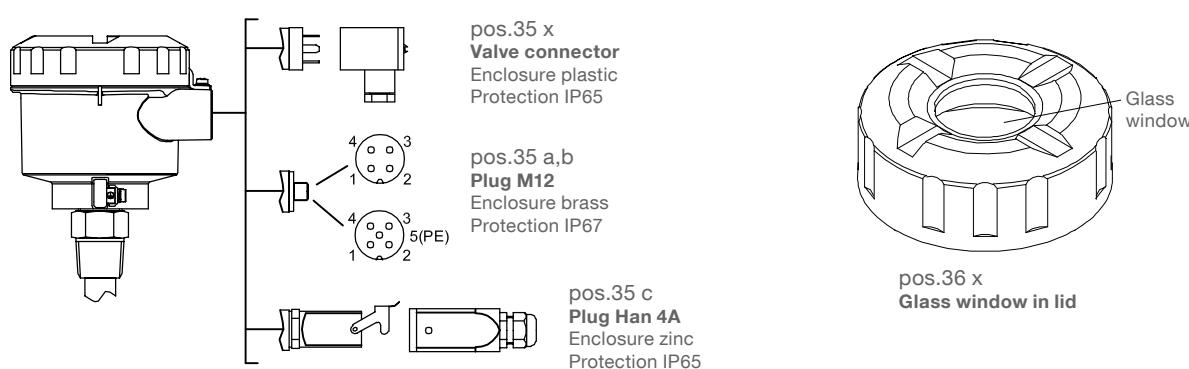
(4) Available for FM/ CSA version (pos.2 M,N) except explosion proof version (pos.2 U).

(5) Available for all versions except FM/ CSA (pos.2 M,U,N).

(6) Available for CE (pos.2 O). Not in combination with cable entries pos.33 x,e, a. Connection of plug wires to internal terminals according to customer specification.

(7) Available for CE (pos.2 O) and ATEX (pos.2 W,T).

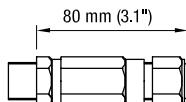
(8) Not available with certificate Lloyds.



Accessories

Minimum order value for separate orders of spare parts or accessories is 75 €.

em440041	Cable gland M20 x 1.5 Ex-d	•
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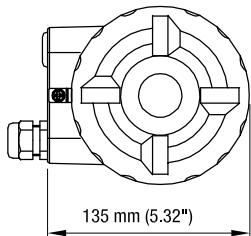
For use with version
 ATEX flameproof (pos.2 T).
 Type: Stahl T3CDS 246560

Dimensions

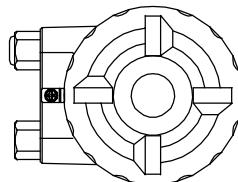
Enclosure

Top view

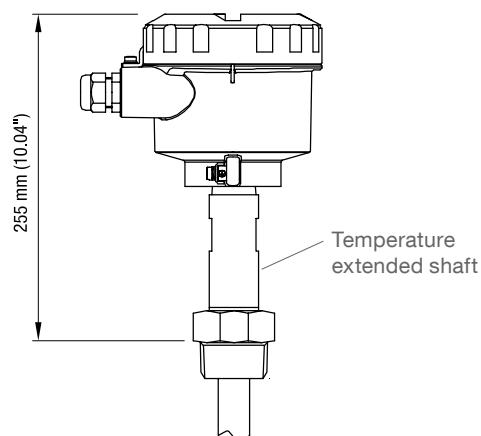
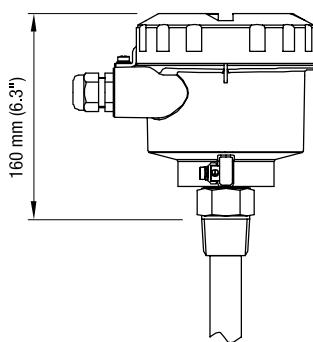
M20 x 1.5 cable gland



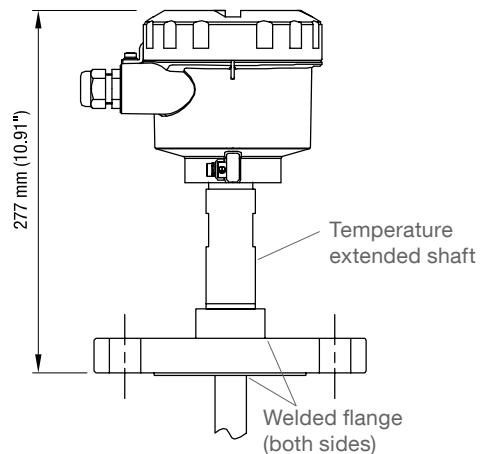
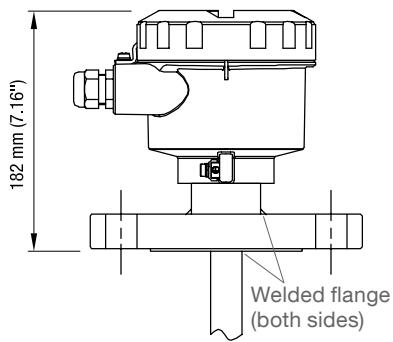
NPT 1/2" conduit



Threaded process connection

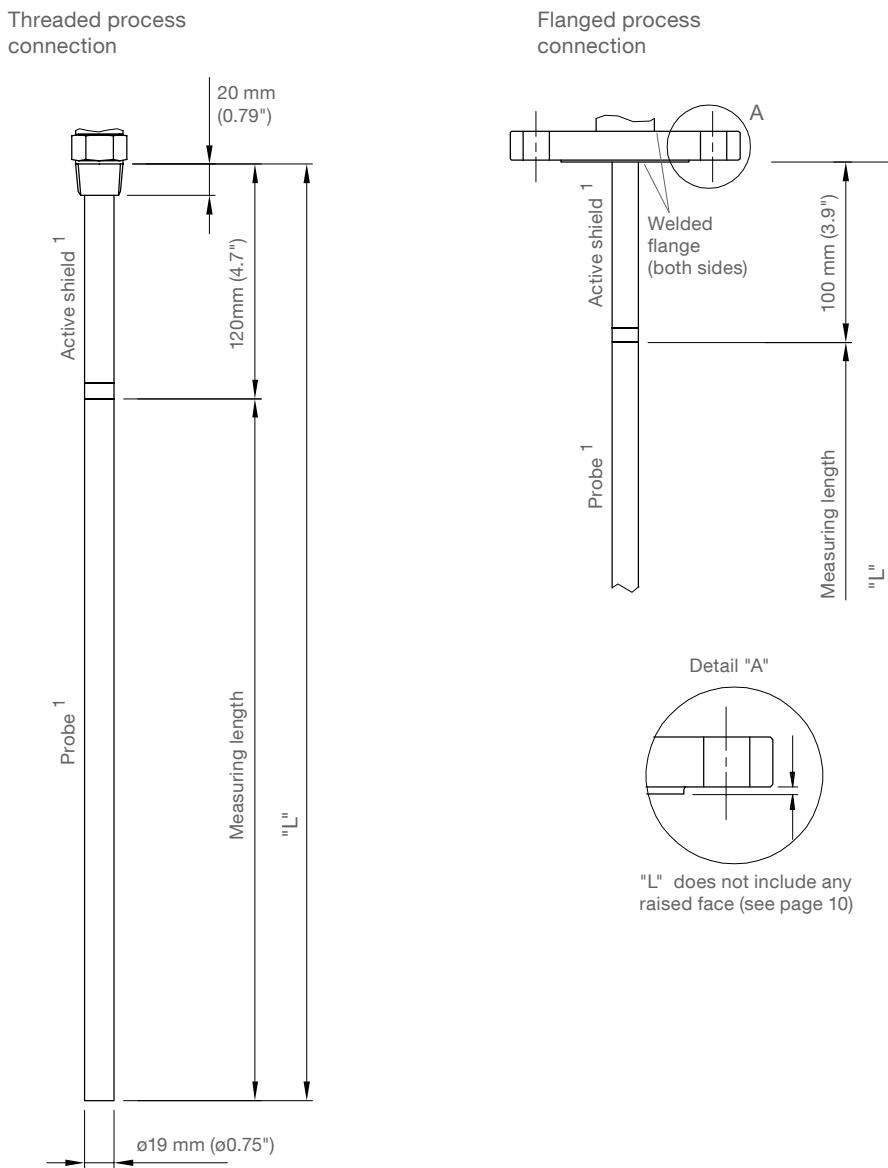


Flanged process connection



Dimensions

Rod version



¹ Active shield and probe is PFA coated

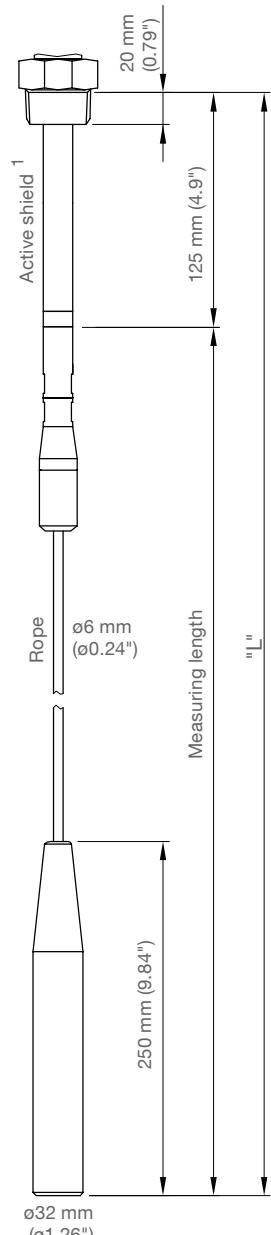
Dimensions

Rope version

Rope not PFA coated

Applicable for isolating (non conductive) media only

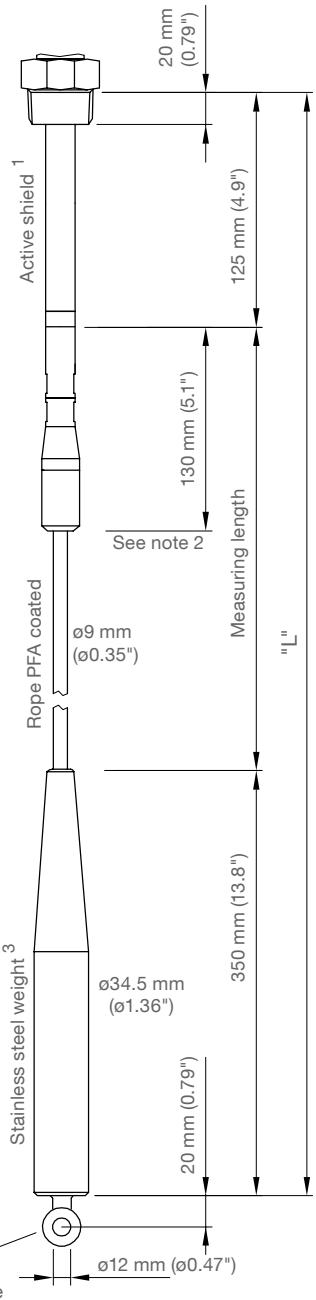
Threaded process connection



Applicable for isolating (non conductive) media only.

Rope PFA coated

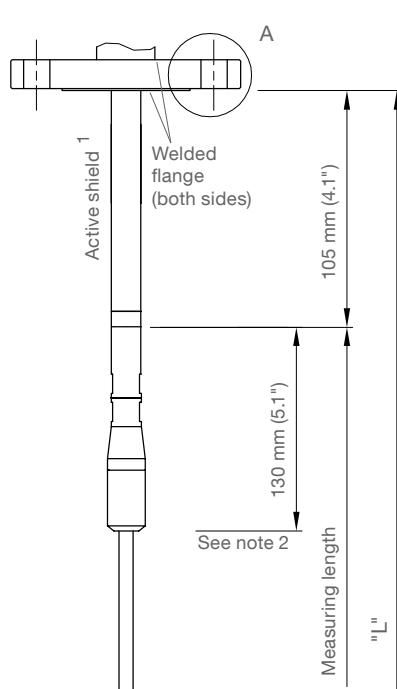
Threaded process connection



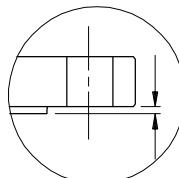
See note 2

Welded flange (both sides)

Flanged process connection



Detail "A"



"L" does not include any raised face (see page 10)

¹ Active shield is PFA coated

² For version with PFA coated rope:

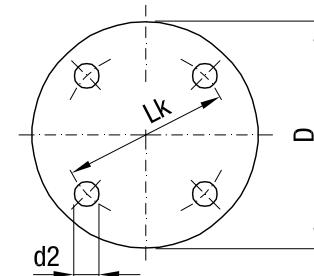
For conductive materials, the measuring length includes the exposed PFA coated rope only. Any fluid contact with the upper rod assembly (level above PFA rope) will result in a short circuit and incorrect readings.

³ Weight is electrically isolated from rope, but not PFA coated

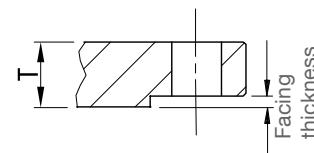
Dimensions/ Detailed Ex-markings

Flanges

Code	Type	Number of holes	d2 mm (inch)	Lk mm (inch)	D mm (inch)	T thickness mm (inch)
ASME B16.5, raised face	5A 1" 150 lbs	4	15.9 (0.63)	79.3 (3.12)	108.0 (4.25)	14.3 (0.56)
	5B 1" 300 lbs	4	19.1 (0.75)	88.9 (3.5)	123.8 (4.87)	17.5 (0.69)
	5C 1" 600 lbs	4	19.1 (0.75)	88.9 (3.5)	123.8 (4.87)	17.5 (0.69)
	5D 1½" 150 lbs	4	15.9 (0.63)	98.6 (3.88)	127.0 (5.0)	17.5 (0.69)
	5E 1½" 300 lbs	4	22.2 (0.87)	114.3 (4.5)	155.6 (6.13)	20.6 (0.81)
	5F 1½" 600 lbs	4	22.2 (0.87)	114.3 (4.5)	155.6 (6.13)	22.4 (0.88)
	5G 2" 150 lbs	4	19.1 (0.75)	120.7 (4.75)	152.4 (6.01)	19.1 (0.75)
	5H 2" 300 lbs	8	19.1 (0.75)	127.0 (5.0)	165.1 (6.5)	22.2 (0.87)
	5J 2" 600 lbs	8	19.1 (0.75)	127.0 (5.0)	165.1 (6.5)	25.4 (1.0)
	5K 3" 150 lbs	4	19.1 (0.75)	152.4 (6.01)	190.5 (7.5)	23.9 (0.94)
	5L 3" 300 lbs	8	22.2 (0.87)	168.2 (6.62)	209.6 (8.25)	28.6 (1.13)
	5M 3" 600 lbs	8	22.2 (0.87)	168.2 (6.62)	209.6 (8.25)	31.7 (1.25)
	5N 4" 150 lbs	8	19.1 (0.75)	190.5 (7.5)	228.6 (9.0)	23.9 (0.94)
	5P 4" 300 lbs	8	22.2 (0.87)	200.0 (7.87)	254.0 (10.0)	31.7 (1.25)
	5Q 4" 600 lbs	8	25.4 (1.0)	215.9 (8.5)	273.1 (10.75)	38.1 (1.5)
EN 1092-1 type A, flat faced	6A DN25 PN16	4	14.0 (0.55)	85.0 (3.35)	115.0 (4.53)	18.0 (0.71)
	6B DN25 PN40	4	14.0 (0.55)	85.0 (3.35)	115.0 (4.53)	18.0 (0.71)
	6C DN40 PN16	4	18.0 (0.71)	110.0 (4.33)	150.0 (5.91)	18.0 (0.71)
	6D DN40 PN40	4	18.0 (0.71)	110.0 (4.33)	150.0 (5.91)	18.0 (0.71)
	6E DN50 PN16	4	18.0 (0.71)	125.0 (4.92)	165.0 (6.5)	18.0 (0.71)
	6F DN50 PN40	4	18.0 (0.71)	125.0 (4.92)	165.0 (6.5)	20.0 (0.79)
	6G DN80 PN16	8	18.0 (0.71)	160.0 (6.3)	200.0 (7.87)	20.0 (0.79)
	6H DN80 PN40	8	18.0 (0.71)	160.0 (6.3)	200.0 (7.87)	24.0 (0.94)
	6J DN100 PN16	8	18.0 (0.71)	180.0 (7.09)	220.0 (8.66)	20.0 (0.79)
	6K DN100 PN40	8	22.0 (0.87)	190.0 (7.48)	235.0 (9.25)	24.0 (0.94)



Raised face



Type	Facing thickness
ASME 150 lbs	2 mm (0.08")
ASME 300 lbs	7 mm (0.28")

Detailed Ex-markings

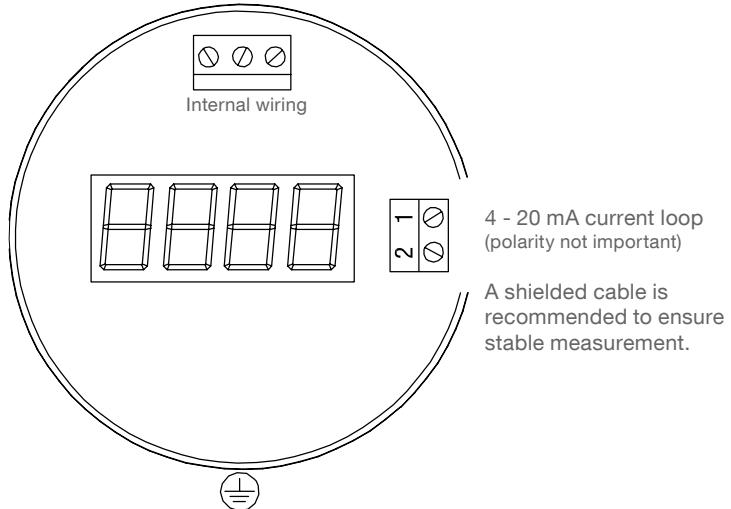
pos.2	Certificate	Protection method
T	ATEX II 1/2G ATEX II 1/2D	Ex ia/db [ia Ga] IIC T Δ Ga/Gb Ex ia/tb [ia Da] IIIC T Δ Da/Db
W	ATEX II 1/2D	Ex ia/tb [ia Da] IIIC T Δ Da/Db
U	FM/ CSA	XP-IS Class I, Div.1, Gr. A, B, C, D DIP-IS Class II, Div.1, Gr. E, F, G DIP-IS Class III T4
N	FM/ CSA	DIP-IS Class II, Div.1, Gr. E, F, G DIP-IS Class III T4
D	INMETRO	Ex d [ia Ga] IIC T6...T1 Gb Ex tb IIIC T85°C... 100°C Db IP65/IP68

Electrical installation

Electrical installation

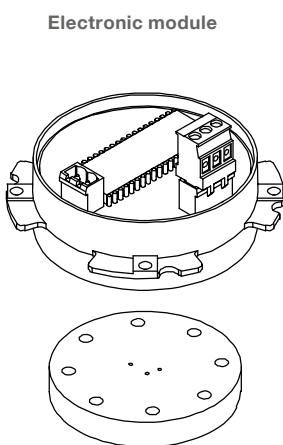
Power supply/ signal output:

12 - 30 V DC
2-wire current loop 4 - 20 mA
max. resistance value 550 Ω @ 24 V DC

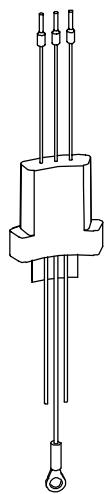


Spare parts

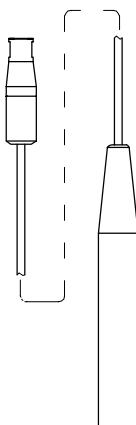
Minimum order value for separate orders of spare parts or accessories is 75 €.	Fitting to model code	Spare part Article number	
Electronic module			
Electronic module 2-wire 4 - 20 mA	pos.4 A	pl440300	•
Internal Safety barrier (required for Ex approvals)	pos.4 A pos.2 T,W,U,N,D	pl440060	•
Rope extension kit			
1.4404 (SS316L), including fixing parts.			
"L"=1 m (39.4") Rope not PFA coated (rope can be shortened by customer)	pos.8 Z pos.9 2	zu440100	•
"L"=5 m (197") Rope not PFA coated (rope can be shortened by customer)	pos.8 Z pos.9 2	zu440110	•
"L"=10 m (394") Rope not PFA coated (rope can be shortened by customer)	pos.8 Z pos.9 2	zu440120	•
"L"=20 m (787") Rope not PFA coated (rope can be shortened by customer)	pos.8 Z pos.9 2	zu440130	•
"L"=1 m (39.4") Rope PFA coated (rope can <u>not</u> be shortened by customer)	pos.8 Z pos.9 3	zu440300	•
"L"=5 m (197") Rope PFA coated (rope can <u>not</u> be shortened by customer)	pos.8 Z pos.9 3	zu440310	•
"L"=10 m (394") Rope PFA coated (rope can <u>not</u> be shortened by customer)	pos.8 Z pos.9 3	zu440320	•
"L"=20 m (787") Rope PFA coated (rope can <u>not</u> be shortened by customer)	pos.8 Z pos.9 3	zu440330	•
Rope weight			
Single part, 1.4404 (SS316L), for use with rope versions (for not PFA coated rope only)	pos.8 Z pos.9 2	zu440350	•
Mounting eye			
Single part, 1.4404 (SS316L), for use with rope versions (for PFA coated rope only)	pos.8 Z pos.9 3 pos.18 x	zu440360	•



Internal Safety barrier



Rope extension kit



Rope weight



Mounting eye





Nivotec®

Level monitoring and visualisation

Complete system for fill level display, trend display, data storage and remote level enquiries

Level monitoring and visualisation

Nivotec® NT 2000

- Display of the silo fill level on LED digital displays
- Fill monitoring via alarm signal
- Signal evaluation 4-20 mA
- Easy to use fill monitoring via lorry module
- Complete system with project specific electrical plans

Nivotec® NT 3500 / 4500

- Fill level visualisation via web server module
- Password protected access on standard browser software via Ethernet
- Data storage and download including trend data via software
- Worldwide access via remote enquiry
- Fill monitoring via alarm signal, shut off valve control and tank wagon coupling detection
- Easy to use fill monitoring via truck module
- Fill level data and alarm signal can be sent via email
- Signal evaluation of 4-20 mA analogical
- Interfaces Modbus RTU and Ethernet TCP
- Complete system with project specific electrical plans (NT 3500)

Nivotec® NT 4600

- Visualisation and operation via 7" touch panel
- Data in percentage, height, volume or weight
- Trend display, data storage
- Evaluation of 4-20 mA and Modbus RTU of the UWT systems
- Touch Panel supplied in installation housing or premounted in electrical control cabinet

Nivotec® NT 4700

- Evaluation of 4-20 mA
- LED-Display in percentage, height, volume or weight (implements NT 4900)
- Version for Nivobob NB 3000/NB 4000 implements start button and indicator lamp when sensor weight is in the upper position

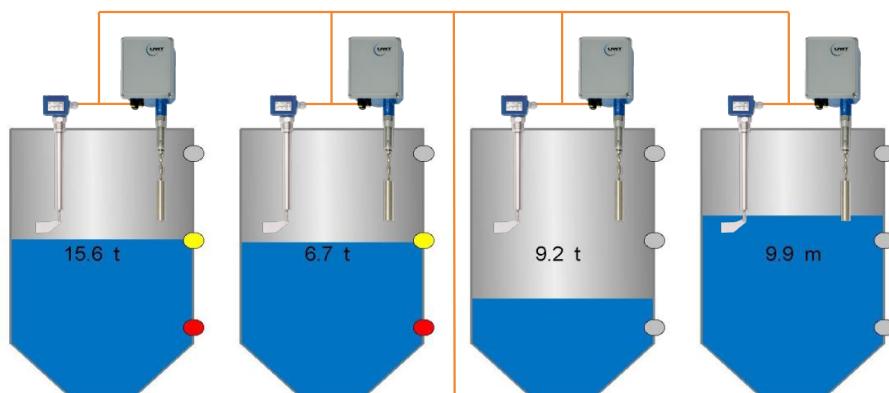
Nivotec® NT 4900

- Level display in percentage, height, volume or weight, freely programmable
- LED display, 4 digits, 7 segment, yellow
- Operation via front buttons
- 4-20mA input

Example of a complete visualization system for NT 3500 / 4500:

- fill level display
- trend display
- data storage
- remote level enquiries

Sensor System Modbus RTU, 4-20mA, supply voltage AC/DC



Visualisation



Ethernet

Nivotec®

Internet / GSM

Remote access



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NT 2000 Level monitoring via control cabinet visualisation	4
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NT 3500 Level monitoring via web server visualisation (via Ethernet)	6

Subject to change.

Valid: From 01.04.2020 until 31.03.2021, unless otherwise agreed.

All dimensions in mm (inches).

By publishing this selection list all other lists become invalid.

All prices in Euro (€) or USD (\$),
excluding VAT.

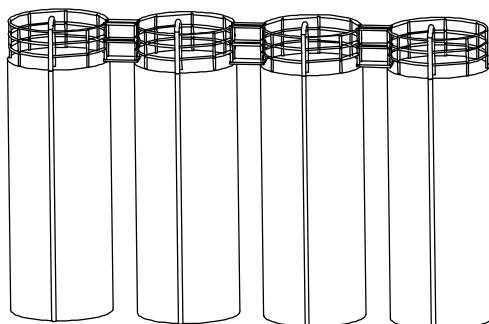
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all USD prices are EXW Memphis,
excluding packaging costs.

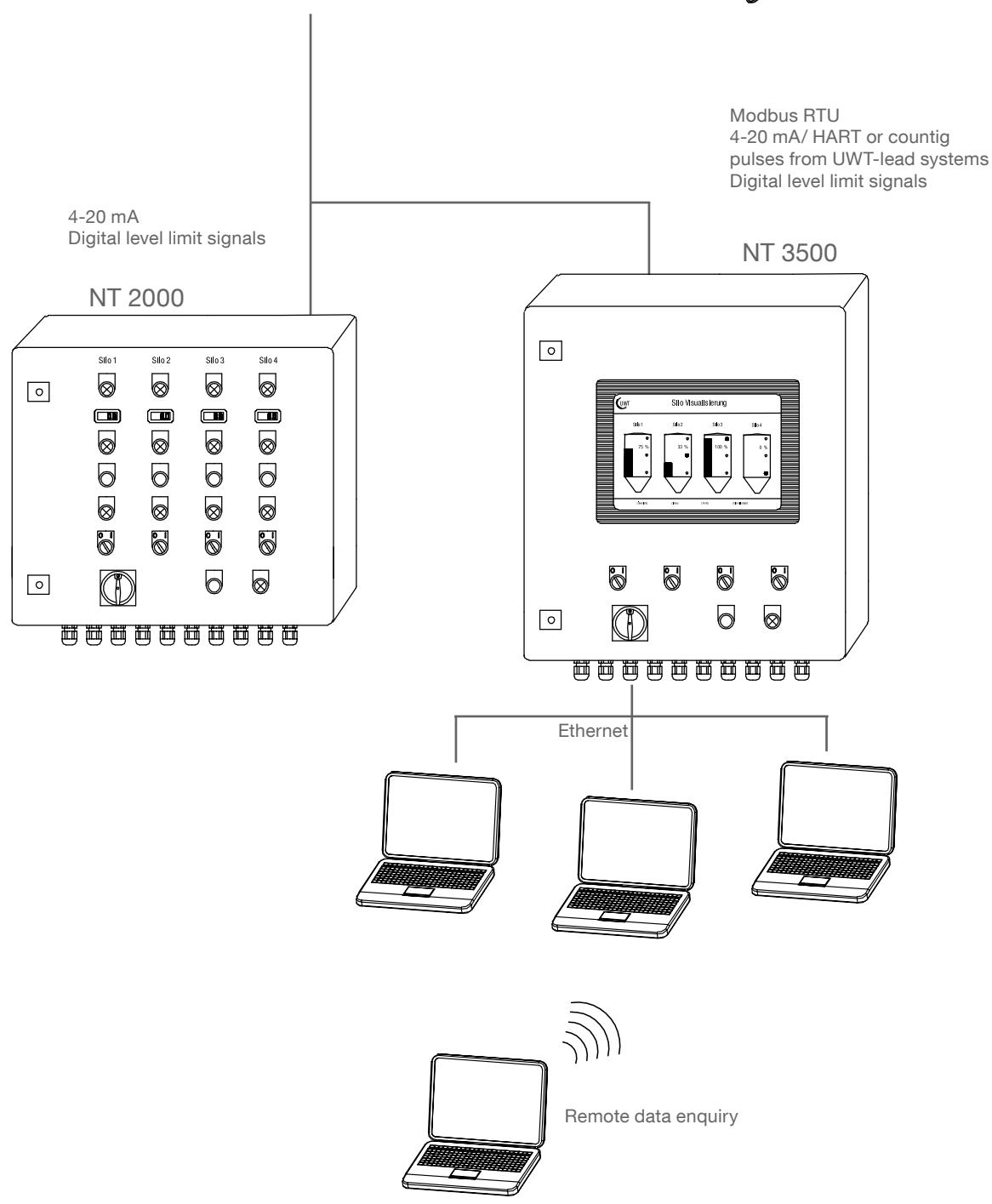
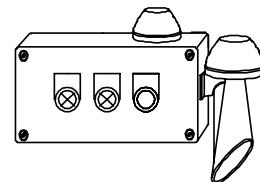
Different variations to those specified are possible.
Please contact our technical consultants.

Overview

Silo plant with continuous level measurement technology, level limit sensors and shut off valves in the filling pipes.



Truck module



Overview

	NT 2000	NT 3500
		
System	Control cabinet system for display and monitoring of contents with digital instrumentation and LEDs for level limits.	Control cabinet system for display and monitoring of contents and levels. The self contained system works with visualisation software on a web server.
Number of silos	Max. 10 (more are possible on request)	Max. 50 (more are possible on request)
Software	Not available	Licence free visualisation software in HTML form. Password-protected access on alle Ethernet PCs.
Control cabinet	Standard equipment	Standard equipment or pre-mounted on cap rail
Input signal	Analogue inputs (4-20 mA)	<ul style="list-style-type: none"> - Modbus RTU of Nivobob® 3000 - Analogue inputs (4-20 mA) - Counting inputs (from electromechanical lead systems) - Profibus available on request
Alarm signal Silo-„full“	Optional - Full signal available as a flashing light with buzzer	Optional - Full signal available as a buzzer
Display in the control cabinet door	<ul style="list-style-type: none"> - Digital display for silo level - LED for full and empty signal 	<ul style="list-style-type: none"> - Touch panel 10", 4" or 15" - Digital display for silo level - LED for full and empty signal
Remote data request	Not available	Via Internet (VPN tunnel) or GSM Modem
Trend data	Not available	The recording of the level data is made internal as a ring buffer. These can be exported and processed as .csv.
Truck module	Optional - Silo Mounting - Display Silo "full" via LED and flashing light with buzzer - Reset by push button	Optional - Silo Mounting equipment - Display Silo "full" via LED and flashing light with buzzer - Reset by push button
Pinch valve control	Not available	Optional - Automatic in case of silo full detection - Release via key switch/ PC/ Touchpanel
Interfaces	Not available	<ul style="list-style-type: none"> - Modbus RTU - Ethernet - Profibus on request

Technical data

Dimensions	Depending on the number of silos
Material , degree of protection, ambient temperature	Control cabinet: steel plate, IP54, 0 .. 50°C Truck module: steel plate, IP65, -25 .. +60°C Terminal box NT50: steel plate, IP65, -25 .. +60°C
Supply voltage	230 V 50 Hz
Supply power	Depending on the number of silos and connected sensors

NT 2000

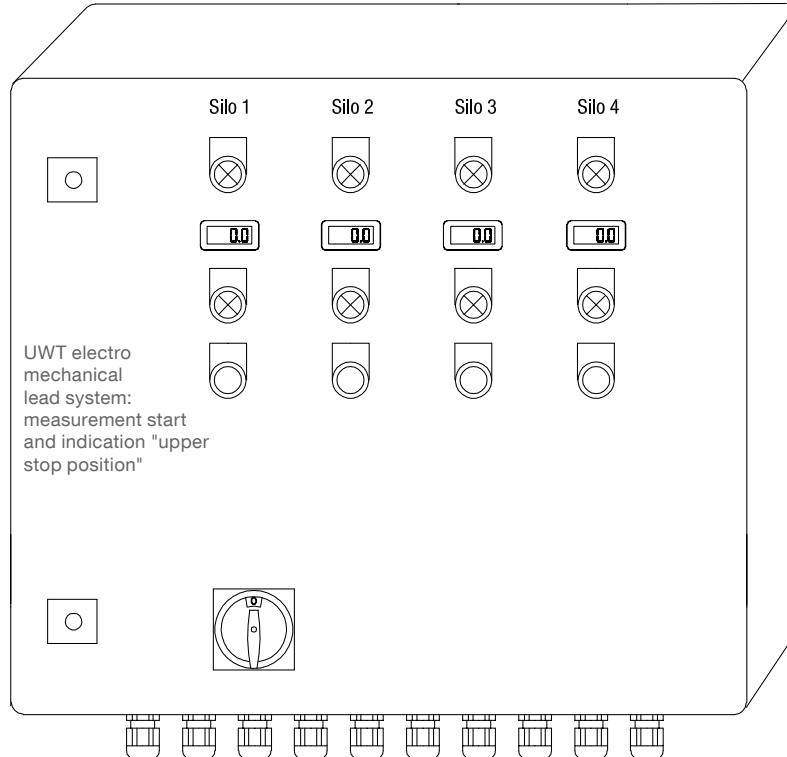
Features

- Fill level indication on an LED display in percentage, height, volume or weight
- Simple and easy handling of the various display elements
- Evaluation of the analogue 4-20 mA signals of any sensors
- Fill control via full alarm signal
- Separate truck module for comfortable monitoring during silo filling

NT 2000 control cabinet

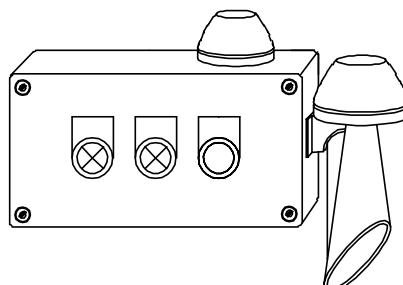
The NT 2000 offers the level indication modules and monitoring functions integrated in a control cabinet.

The fill level is displayed via the Nivotec® NT 4900 digital display, the level limits via full and empty LEDs. 4-20 mA signals are evaluated. It is possible to integrate an alarm signal with a buzzer which signals when the silo becomes full during filling. The buzzer can be mounted directly on the silo. The NT 2000 is a complete system which also provides the supply voltage for the sensors. It is delivered with project specific electrical plans.



Truck module

For use with one silo.
 Mounting directly on the silo frame.
 Indication of empty and full level with LEDs.
 Reset of alarm "Silo full".



Example: Truck module with full/empty LEDs, push button for reset of alarm "Silo full"

NT 2000

Level monitoring system

Nivotec NT 2000

pos.1 Basic configuration

NT 2000

Price including monitoring of the first silo	Extra price for each additional silo monitoring
--	---

pos.2 Measurement technology

With use of electro mechanical lead systems: supply voltage lead system 230 V AC

- A 4-20 mA (active or passive)
- B 4-20 mA from NB 3000/ NB4000
incl. start button for measurement, display "upper stop position" and "failure"

•	•
---	---

pos.3 Integration of level limit sensors

LED display in control cabinet

Level limit sensor supply/ signal output as follows:

- 0 without
- 1 Full level sensor (230 V AC/ floating)
- 2 Full and empty level sensor (230 V AC/ floating)
- 3 Full level sensor (24 V DC/ floating or PNP)
- 4 Full and empty level sensor (24 V DC/ floating or PNP)

•	•
---	---

pos.4 Alarm "silo full"

1x buzzer, 1x reset button Alarm "silo full" (for outside mounting):

with pos.5 0 buzzer delivery in loose parts (reset button inside a surface mounting housing)
with pos.5 L buzzer delivery in loose parts (reset button mounted in the truck module)

- 0 without
- A with

•	•
---	---

pos.5 Truck module (only with pos.4 A)

Delivery of one separate truck module per silo

- 0 without
- L with

•	•
---	---

pos.7 Number of vessels/ silos (max. 10, more are possible on request)

Basic configuration	Position						Order code
NT 2000	1	2	3	4	5	6	7
				0			

NT 3500

Features

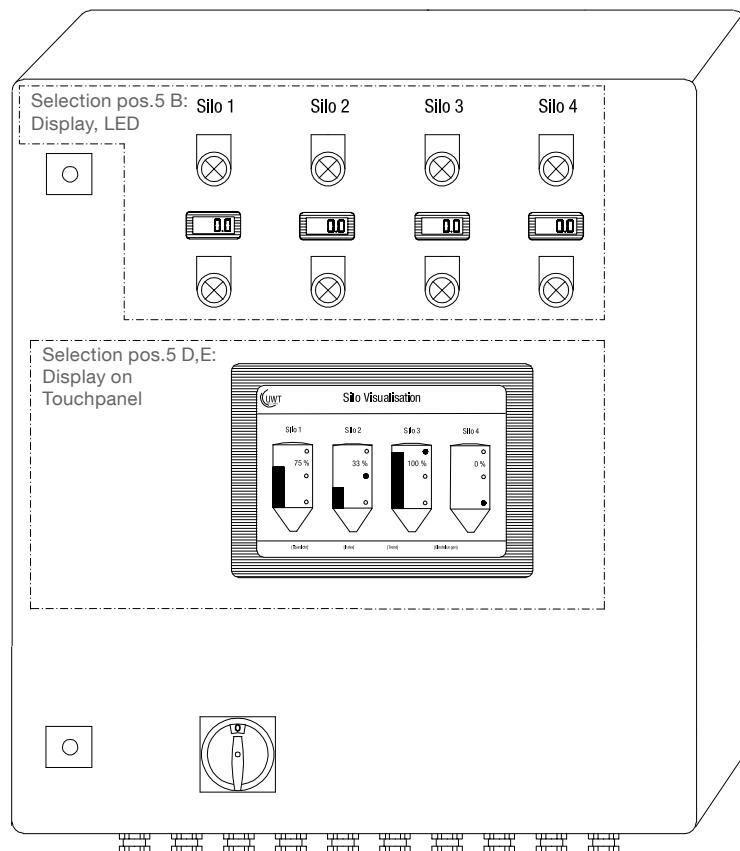
- Fill level visualisation via HTTP-web server
- Visualisation via standard Internet browser software on all Ethernet PCs
- Password protected
- Worldwide remote enquiry of the level password protected - on request
- Software operation additional via a touch panel in the control cabinet or via fill level LEDs
- Data in percentage, height, volume or weight
- Trend display, data storage, export via .csv
- Evaluation of the analogue 4-20 mA signals of any sensors, as well as Modbus RTU of the UWT-systems
- Different input signals within the same system is possible
- Fill control via full alarm signals and shut off valves
- Separate truck module for safe and comfortable monitoring during silo filling

NT 3500 control cabinet

The heart of the NT 3500 is a web server module, which the visualisation software uses. All fill level control and display functions can be operated via the visualisation on a PC or a Touch panel with backlight. An Ethernet interface ensures that the visualisation can be simultaneously operated from all PCs which are connected to the interface. Access is password protected. Additionally the control cabinet can be equipped with operating and display elements. Either the 10.4" or 15" touch panel or the digital level display with full and empty LEDs can be chosen. The electromechanical lead system can be started by the visualisation or by a push button. A buzzer for alarm "silo full" can be mounted directly on the silo. Control for pinch valves to stop the filling is available. The NT 3500 is a complete system which also provides the supply voltage for the sensors. The system is delivered with project specific electrical plans.

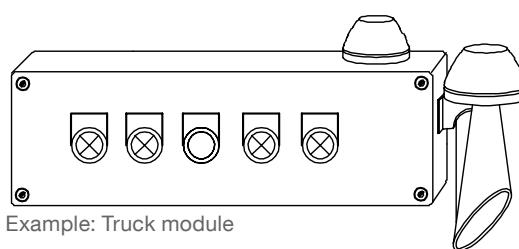
Functionality of alarm "silo full" and control of the pinch valves:

1. The filling (opening of the pinch valve) is enabled either via the hose coupling when connecting the filling hose, via a key switch on the cabinet or on the truck module or via PC/ Touch panel.
2. In case of an alarm "silo full" the pinch valve closes, the LED "silo full" and the buzzer is switched on, the reset button is blinking. After reset of the alarm the pinch valve opens for ca. 5 min to enable the expulsion of the filling pipe, then it is closed again. Independend from this control the pinch valve can be opened or closed by an authorized user at any time.



Truck module

- One module for a defined number of silos (depending on the project)
- Mounting directly at the silo frame
- Display silo full/ empty and pinch valve status with LEDs
- Reset of alarm "silo full"
- Key switch for pinch valve control



NT 3500

Level monitoring system Nivotec NT 3500

NT 3500

Price
for the
first silo
•
Extra price
for each
additional
silo
•

pos.1	Visualisation system - HTTP web server
incl. 24 V DC power supply (used also for supply of the level limit sensors)	
A	Completely wired in a control cabinet max. 25 silos/ vessels
B	No control cabinet, pre-wired on a top hat rail max. 25 silos/ vessels
C	Completely wired in a control cabinet max. 50 silos/ vessels
D	No control cabinet, pre-wired on a top hat rail max. 50 silos/ vessels

pos.2	Input signals of level sensors
With use of NB 3000/ NB4000: supply voltage of NB 3000/ NB4000= 230 V AC	
1	Modbus RTU (NB 3000/ NB4000)
2	4-20 mA active (NB 3000/ NB4000)
3	Counting pulses (NB 3000)
4	4-20 mA/ 2-wire (NivoRadar NR 3000)

pos.3	Integration of level limit switches incl. alarm "silo full"
1x buzzer, 1x reset button alarm "silo full" (for outside mounting):	
with pos.4 0 buzzer delivery in loose parts, reset button inside a surface mounting housing	
with pos.4 1 buzzer delivery in loose parts, reset button mounted in the truck module	
0	Level limit sensor supply/ signal output as follows:
A	without
B	Full level sensor (230 V AC/ floating) wired on NB/ Modbus
C	Full level sensor (24 V DC/ floating or PNP)
D	Full and empty level sensor (24 V DC/ floating or PNP)
E	Full and empty level sensor (230 V AC/ floating)
F	Full and empty level sensor (230 V AC/ floating)

pos.4	Truck module
0	without
1	with

pos.5	Visualisation at control cabinet
only with pos.1 A, C	
0	without
B	Digital level display and LED full or full/ empty (only with pos.2. 4)
C	Digital level display and LED full or full/ empty (only with pos.2. 2) for NB 3000/ NB4000, incl. start button, display "upper stop position" and "failure"
D	10.4" 800 x 600 Touch panel
E	15" 1024 x 768 Touch panel

pos.6	Pinch valve control (only with pos.4 1)
Shut off in case of silo full detection, possibility of expulsion of the filing pipes	
Display and operating elements located on the truck module	
0	without
1	Filling enabled via mouse click on the PC and on Touch panel
2	Filling enable by key switch on the truck module
3	Filling enable by key switch on the cabinet

pos.7/ 8 **Number of vessels/ silos** (max. 25/ 50)

pos.9	Remote enquiry
A	via Internet (with furnished VPN tunnel)
B	via GSM Modem on request

pos.10	Hose coupling switch
0	not present
1	connected to NB 3000/ NB4000 (terminal 24/ 26)
2	connected to Nivotec

Basic configuration Position

NT 3500									
1	2	3	4	5	6	7/8	9	10	

← Order code

NT 3500

Further options (on request)

Ethernet gateway Connection with only one Ethernet line between silo areas which are far located from each other.

Radio-relay system Connection by radio communication between silo areas which are far located from each other (max. 1800 m).

Minimum order value for separate orders of spare parts or accessories is 75 €.

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Level monitoring and visualisation via web server	
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NT 4600	6
Level monitoring and visualisation via touch panel	
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NT 4700	8
Level display for one silo	
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NT 4900	9
Digital display	
<hr/>	
Accessories	10

Subject to change.

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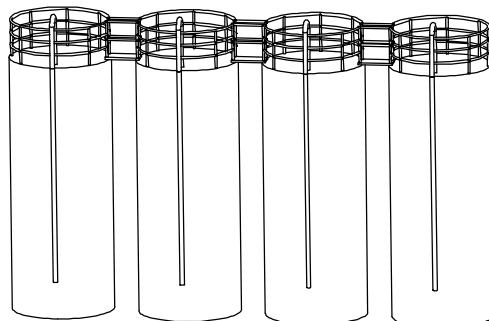
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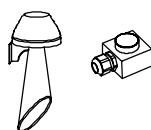
Overview NT 4500 / NT 4600

Standardized Level monitoring system up to 30 silos

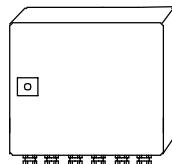
Silo plant with continuous level measurement technology and full detectors



Alarm "Silo full"



Modbus converter

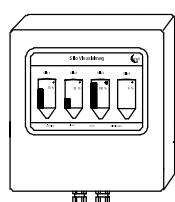


4-20 mA,
full detector signal

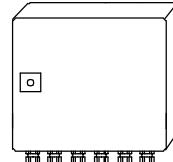
Modbus RTU

alternative*

NT 4600
Visualisation
with
touch panel



NT 4500
Webserver



Ethernet



Remote data enquiry

Visualisation with PC via standard internet browser

* Mixed use of NT 4500 and NT 4600
is not possible

Overview NT 4500 / NT 4600

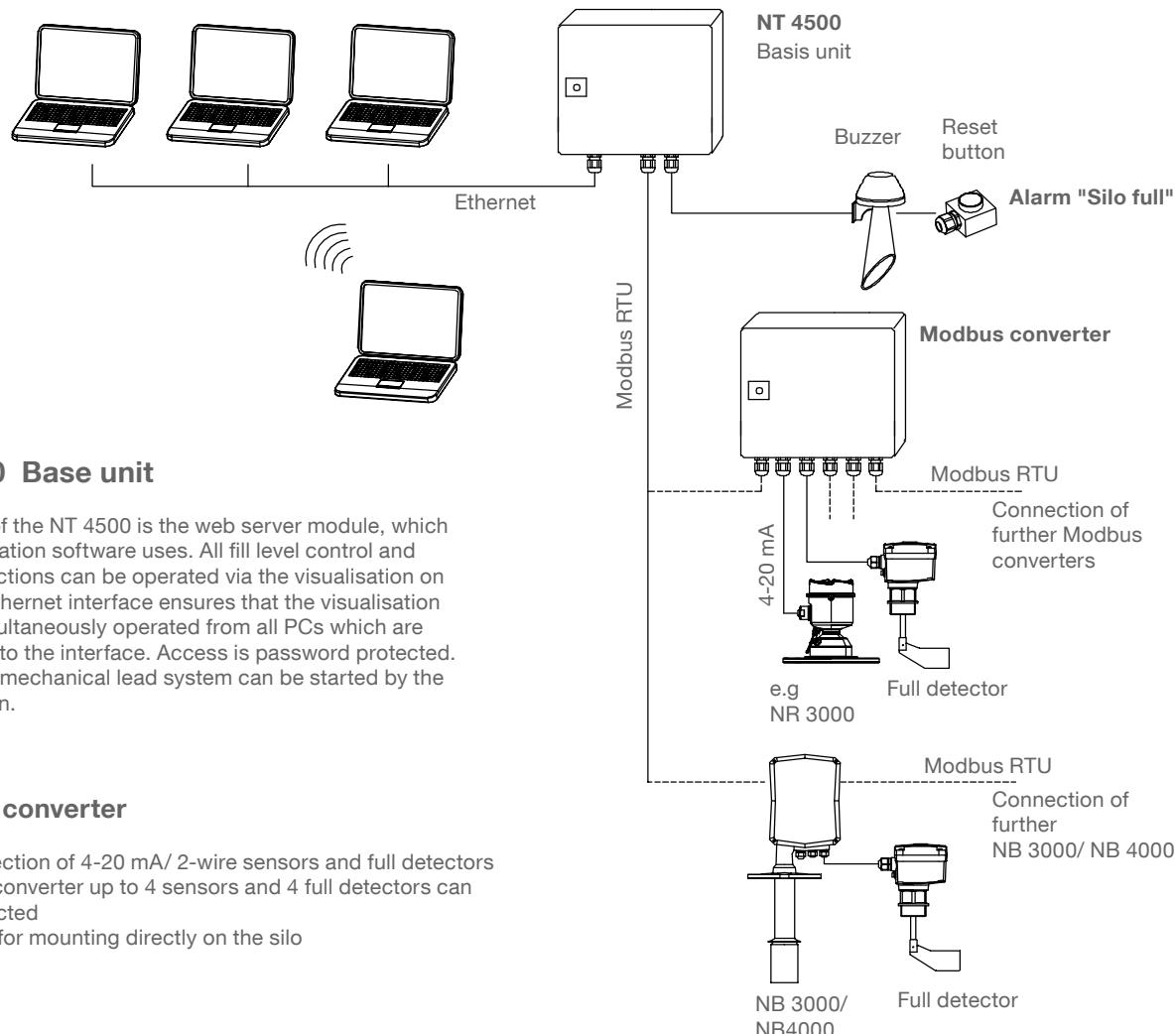
Technical data

Dimensions	NT 4500/ NT 4600, Modbus converter: 300 x 300 x 155 mm (W x H x D)	
Mounting	NT 4500/ NT 4600, Modbus converter: wall mounting	
Material	NT 4500/ NT 4600, Modbus converter: steel plate	
Ingress protection	NT 4500/ NT 4600, Modbus converter: IP65	
Ambient temperature	NT 4500:	0 .. +55°C
	NT 4600:	0 .. +50°C
	Modbusumsetzer:	-25 .. +70°C
Power supply	NT 4500/ NT 4600, Modbus converter: 115 V or 230 V 50/ 60 Hz (integrated power converter 24 V DC) NR 3000: supplied by Modbus converter NB 3000/ NB 4000: 15 V or 230 V AC, connection is made on site Full detector: converter. In this case the supply voltage must be equal to NB 3000/ NB 4000 resp. Modbus converter. Alternative it is possible to connect on site.	
Power consumption	NT 4500/ NT 4600, Modbus converter: 20 VA	
	Connected level sensors:	see documentation of the respective sensors
Signal output full detector	Floating contact is required	

NT 4500

Level monitoring and visualisation via web server

- Standardised system up to 50 silos
- Visualisation and operation via standard internet browser software
- Software language: German or English
- Password protected
- Worldwide remote enquiry of the level
- Data in percentage, height, volume or weight
- Trend display, data storage, export via .csv
- Evaluation of the analogue 4-20 mA signals of any sensors, as well as Modbus RTU of the UWT-systems
- Different input signals within the same system is possible
- Implementation of full detectors
- Fill control via full alarm signal (buzzer)



Technical data
see page 3

NT 4500

Basic unit

NT 4500

pos.1

Control cabinet - max. number of silos

- A Webserver without control cabinet, pre-wired on a top hat rail - max. 25 silos
- B Webserver without control cabinet, pre-wired on a top hat rail - max. 50 silos
- C Webserver in a control cabinet - max. 25 silos
- D Webserver in a control cabinet - max. 50 silos

pos.2

Input signals of level sensors

- 1 Modbus RTU (NB 3000/ NB 4000)
- 2 4-20 mA 2-wire (e.g. NivoRadar NR 3000), use of Modbus converter
Price for each 4 silos
- 3 Mixed used: Modbus RTU/ 4-20 mA 2-wire
Price for each 4 silos with 4-20 mA units

pos.3

Integration of full detector incl. alarm "silo full"

- 0 without
- A with

pos.4

Software language

- A German
- B English

pos.5/ 6

Number of silos (max. 25/ 50)

Basic unit	Position	Order code
NT 4500		
	1	
	2	
	3	
	4	
	5/6	



NT 4600

Level monitoring and visualisation via touch panel

- Standardised system up to 15 silos
- Visualisation and operation via 7" touch panel (coloured, 800 x 480 pixel)
- Software language: German or English
- Password protected
- Data in percentage, height, volume or weight
- Trend display, data storage
- Evaluation of the analogue 4-20 mA signals of any sensors, as well as Modbus RTU of the UWT-systems
- Different input signals within the same system is possible
- Implementation of full detectors
- Fill control via full alarm signal (Buzzer)

NT 4600 Base unit

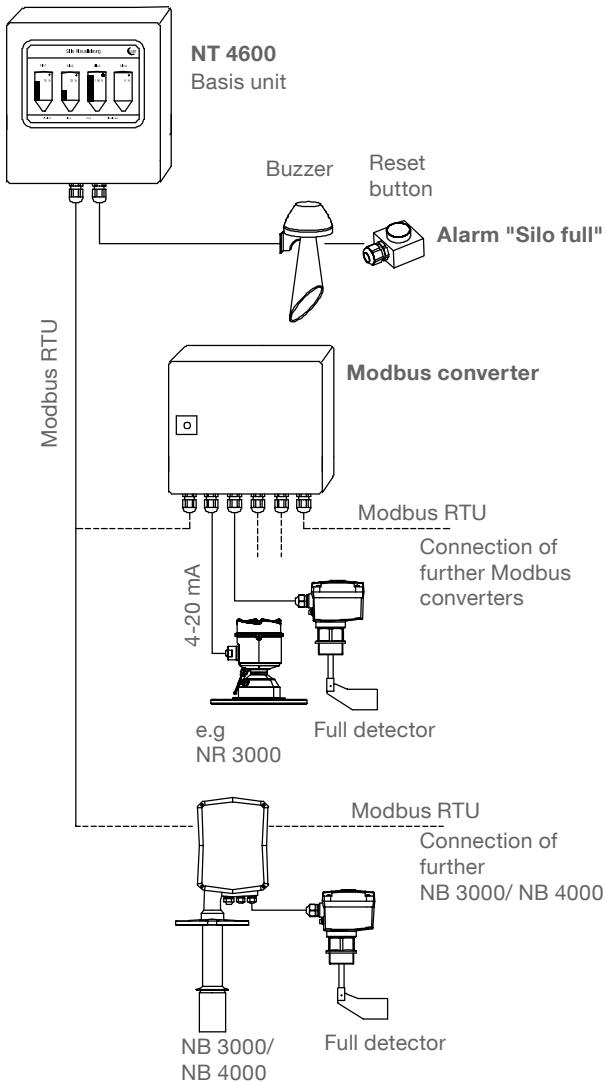
The heart of the NT 4600 is a touch panel, which runs the visualisation software. All fill level control and display functions can be operated via the touch panel. Access is password protected. The electromechanical lead system can be started by the visualisation software.

Modbus converter

- For connection of 4-20 mA/ 2-wire sensors and full detectors
- On each converter up to 4 sensors and 4 full detectors can be connected
- Provided for mounting directly on the silo

Integration of full detector incl. alarm "silo full"

- Buzzer with reset button (supplied loose, for outdoor mounting)
- One unit for all connected silos
- Alarm happens, if one of the silos gets full
- Reset of the alarm
- Provided for mounting directly on the silo



Technical data see page 3

NT 4600

Basic unit

NT 4600

pos.1

Control cabinet

- A Touch panel without control cabinet
- B Touch panel completely wired in a control cabinet

pos.2

Input signals of level sensors

- 1 Modbus RTU (NB 3000/ NB 4000)
- 2 4-20 mA 2-wire (e.g. NivoRadar NR 3000), use of Modbus converter
Price for each 4 silos
- 3 Mixed used: Modbus RTU/ 4-20 mA 2-wire
Price for each 4 silos with 4-20 mA units

pos.3

Integration of full detector incl. alarm "silo full"

- 0 without
- A with

pos.4

Software language

- A German
- B English

pos.5/ 6

Number of silos (max. 15)

Basic unit Position

NT 4600				
1	2	3	4	5/6

Order code



¹ Delivery touch panel fpr panel mounting as follows:

Dimensions 200 x 146 x 34 mm

Panel cutout 192 x 138 mm,

Required supply 24V DC ±20%, 350 mA

Sub D plug (female) 9 pole for Modbus connection

In combination with pos.3 A a Modbus I/O module for conneting of the buzzer/ reset button will will delivered as follows:

Dimensions 98 x 52 x 27 mm, for mounting on top hat rail

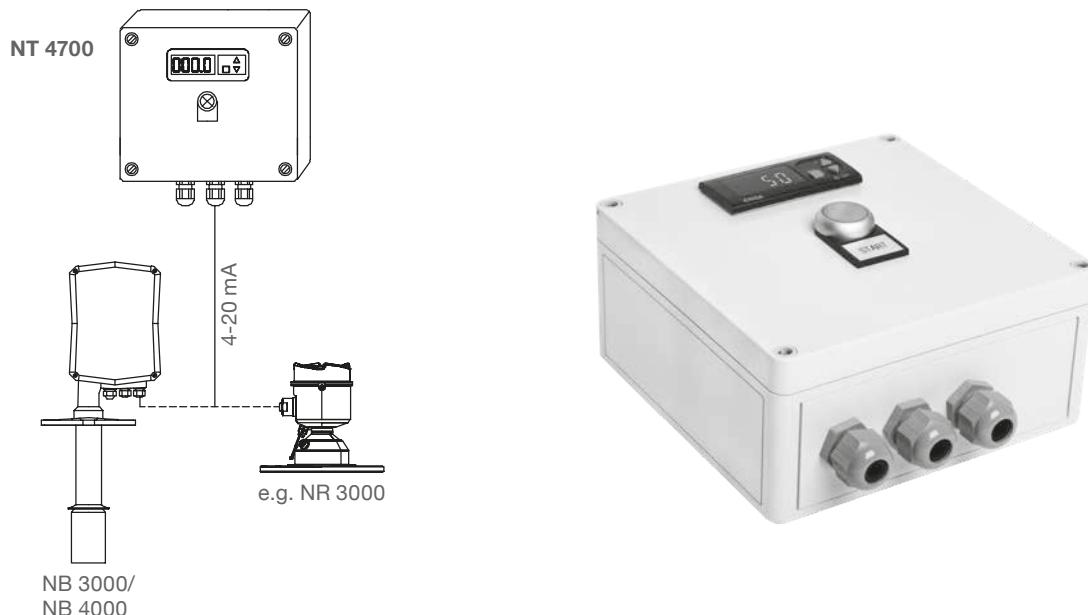
Supply 10 .. 30 V DC, 0,5 W

Terminals for Modbus connection

NT 4700

Level display for one silo

- Evaluation of the analogue 4-20 mA signal of any sensor
- LED-Display in percentage, height, volume or weight (implements NT 4900)
- Version for Nivobob NB 3000/ NB 4000 implements start button and indicator lamp when sensor weight is in the upper position
- Simple operation



Technical data

Dimensions	182 x 180 x 90 mm (W x H x D)	
Mounting	Wall mounting	
Material	Polycarbonat	
Ingress protection	IP65	
Ambient temperature	0 .. +50°C	
Power supply	NT 4700-1/ NT 4700-2: NT 4700-5/ NT 4700-6: NT 4700-3/ NT 4700-4:	230 V 50/ 60 Hz 115 V 50/ 60 Hz 24 V DC
	NB 3000/ NB 4000:	230 V 50/ 60 Hz or 115 V 50/ 60 Hz or 24 V DC, connection is made on site
	2-wire 4-20 mA :	supplied by NT 4700-2 (integrated power converter 24 V DC) or NT 4700-4 or NT 4700-6
Power consumption	NT 4700: Connected level sensor:	10 VA see documentation of the respective sensor

NT 4700-1	Art.nr. zz110824 for NB 3000/ NB 4000,with start button and indicator lamp "upper stop position", 230 V supply	•
NT 4700-5	Art.nr. zz110836 for NB 3000/ NB 4000,with start button and indicator lamp "upper stop position", 115 V supply	•
NT 4700-3	Art.nr. zz110828 for NB 3000/ NB 4000,with start button and indicator lamp "upper stop position", 24 VDC supply	•
NT 4700-2	Art.nr. zz110825 for 2-wire 4-20 mA (e.g. NivoRadar NR 3000), 230 V supply	•
NT 4700-6	Art.nr. zz110837 for 2-wire 4-20 mA (e.g. NivoRadar NR 3000), 115 V supply	•
NT 4700-4	Art.nr. zz110829 for 2-wire 4-20 mA (e.g. NivoRadar NR 3000), 24 V DC supply	•

NT 4900

Digital display

- Level display in percentage, height, volume or weight, freely programmable
- LED display, 4 digits, 7 segment, yellow
- Operation via front buttons
- 4-20 mA input



Technical data

Dimensions	77 x 35 x 71 mm (W x H x D)
Panel cut out	71 x 29 mm
Material	Polycarbonat
Ingress protection	IP65
Ambient temperature	0 .. +50°C
Power supply	NT 4900-1: 24 V DC/ AC (9 - 30 V DC, 7 - 24V 50/ 60 Hz) NT 4900-2: 230 V 50/ 60 Hz (+10% -20%) (Terminal 1 = L/+, Terminal 2 = N/-)
Power consumption	7 VA
Signal input	4-20 mA aktiv (Terminal 11 = +, Terminal 12 = GND)

Programming example:

4mA relates to a display of 0,0 tons, 20 mA to 60,0 tons

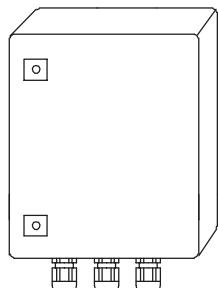
Following parameters are changed from the presets (procedure see external programming manual):
d.CnF -> i.Typ = 4-20 mA
U.oPt -> d.Pnt set on first digit from right side (decimal dot setting)
L.SCL -> 0 (lower scale value 0 tons at 4 mA)
H.SCL -> 60.0 (upper scale value 60,0 tons at 20 mA)

NT 4900-1 (Art.no. eb100370) 24 V DC/ AC •
NT 4900-2 (Art.no. eb100380) 230 V AC •

Accessories

Terminal box

Intermediate terminals for the wires leading to the silo (mounting e.g. on the silo frame).
Applicable for cables of level (Modbus or 4-20 mA), limit switch, buzzer, reset button



Technical data

Dimensions	200 x 300 x 120 mm (W x H x D), for wall mounting
Material	steel plate
Ingress protection	IP65
Ambient temperature	-25 .. +60°C
Terminal blocks	15 pieces grey, 5 pieces blue, 5 pieces green/ yellow; each terminal implements 3 cable inlets 2.5 mm ² , mounted on top hat rail
Cable glands	6 pieces M20 x 1.5 2 pieces M25 x 1.5

zz110835

Minimum order value for separate orders of spare parts or accessories is 75 €.

Cable recommendations for Modbus network

Shielded cable

Functionality up to 50 m

Manufacturer: Lapp, Type UNITRONIC LiYCY 2x 0.34, Art.no: 0034502

Twisted pair cable

Functionality up to 1,000 m

Manufacturer: Lapp, Type UNITRONIC BUS CAN 1x 2x 0.34, Art.no: 2170263

UV-protection hose with threaded hose coupling M20 x 1.5

UV protection for Modbus cable

Manufacturer: Flexa, Type Rohrflex PA6, Art.no: 0233.202.012 and Type RQG1-M, Art.no: 5020.055.018

ATEX-protection hose with threaded hose coupling M20 x 1.5

For installation of Modbus cable in ATEX Zone 21

Manufacturer: PMA, Type ESX, Art.no: ESXT-12B.50 and Type END, Art.no: BEND-M202GT



Technical Information

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Signal and alarm output	25
Setting/ Sensitivity	28
Maintenance	29
Notes for use in Hazardous Locations	30
Disposal	32

Subject to technical change
All dimensions in mm (inches).

We assume no liability for typing errors.
Different variations than specified are possible.
Please contact our technical consultants.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning may be accomplished only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.

Special attention must be paid to warnings and notes as follows:

WARNING



Relates to a caution symbol on the product: A failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.

WARNING



Relates to a caution symbol on the product: Risk of electric shock

WARNING



A failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product	Description
	CAUTION: refer to accompanying documents (manual) for details.
	Earth (ground) Terminal
	Protective Conductor Terminal

Technical support

Please contact your local supplier (for address see www.uwt.de). Otherwise you can contact:

UWT GmbH
Westendstr. 5
D-87488 Betzigau

Tel.: 0049 (0)831 57123-0
Fax: 0049 (0)831 76879
info@uwt.de
www.uwt.de

Introduction

Applications

The ROTONIVO is an electromechanical Level limit switch and is used for level monitoring of bulk goods.

The units can be delivered with a wide range of Ex-approvals for use in Hazardous Areas.

They can be equipped for process over- and lowpressure and also for very high or low process temperatures.

Selected applications:

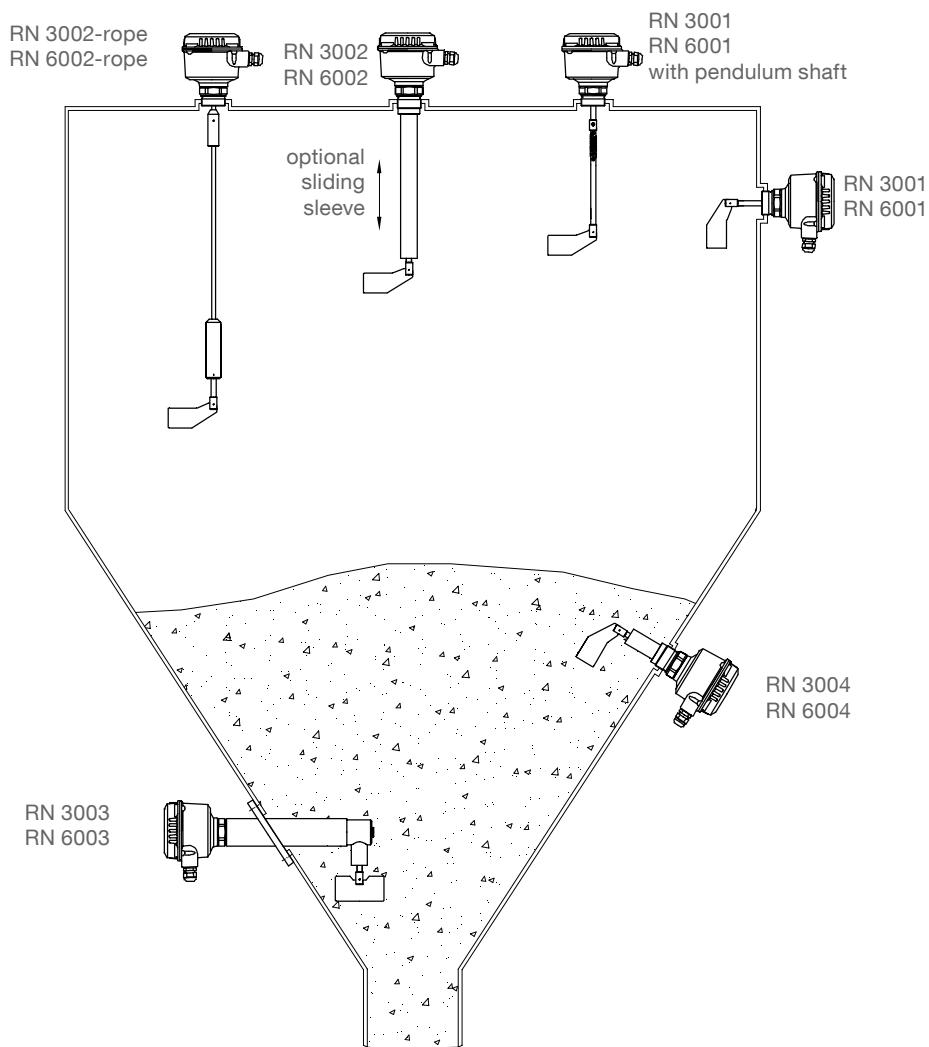
- **building materials industry**
lime, styrofoam, moulding sand, etc.
- **food industry**
milk powder, flour, salt, etc.
- **plastics industry**
plastics granules etc.
- **timber industry**
- **chemical industry**
- **mechanical engineering**

The ROTONIVO is normally screwed into the lateral container wall so that it is in level with the filling height to be registered and monitored.

The device can also be mounted from the top of the container. In this case an extension piece is used to mount the probe level with the height to be registered.

The length of the probe can be up to 4 m (158") with an extension tube or up to 10 m (394") with an extension rope.

The use of a sliding sleeve for the version RN 3002/ RN 6002 is recommended so that the switch point can be changed easily during operation of the device.



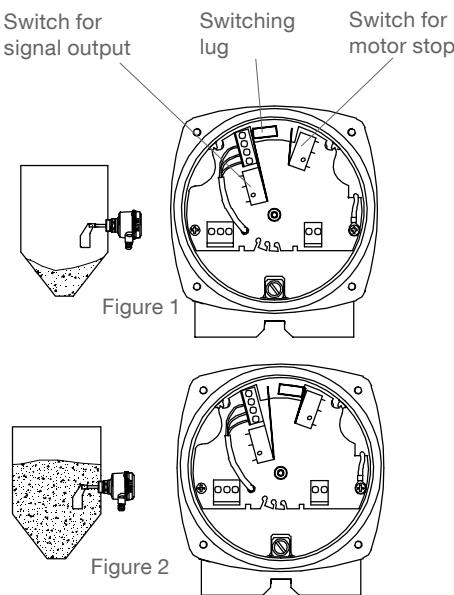
Function

A measuring vane is driven by a synchronous motor. The bearing of the motor inside the housing allows it to swing. The motor is fixed to a switching lug.

If the vane is uncovered, a spring pulls the motor and switching lug to the left position (figure 1).

When material covers the vane and thus stops the rotation, the motor and switching lug swings to the right position (figure 2). The signal output indicates "covered" and the motor is stopped.

When the vane becomes uncovered due to falling material, the spring pulls the motor and switching lug back to the left position (figure 1). The motor is started and the signal output indicates "uncovered".



Fail safe alarm

With the option fail safe alarm it is possible to recognize a fault of the unit in time and to initiate an alarm relay. The following faults are observed:

- Motor
- Gear
- Electronic for motor power supply
- Supply voltage failure
- Defect of the connecting wires

Functional safety SIL2 (IEC 61508)

With option Functional safety the unit observes the motor, gear and electronic. The result of this diagnostics is present on the signal output, which states the full/ empty condition.

Switchable signal output (Fail safe high/ low)

With version "Universal voltage", "PNP" and optional "AC" a switchable signal output FSH/ FSL is integrated.

Signal output delay:

The version "Universal voltage" and "PNP" has an integrated adjustable delay for the signal output.

Selection guide

	RN 3001 RN 6001	RN 3001 RN 6001 pendulum shaft	RN 3002 RN 6002	RN 3002-rope RN 6002-rope	RN 3003 RN 6003	RN 3004 RN 6004
Full detector	x	x*	x	x	x	x
Demand detector	x			x*	x	x
Empty detector	x			x*	x	x
Vertical mounting	x	x	x	x*		x
Oblique from the top	x		x**			x
Horizontal mounting	x				x	x
Oblique from the bottom	x					x

* consider max. permitted mech. traction force

** only with option "bearing at tube end"

Function

Shaft sealing and metal material

Application	Sealing material ⁽¹⁾			Metal		Bearing
	NBR	FPM (Viton)	PTFE (Teflon)	Aluminium	Stainless steel ⁽²⁾ 1.4301/ SS 304	Stainless steel
Animal feed press			x		x	x
Synthetic granules, powders	x			x		
Salt			x		x	x
Dust filter (temp. up to 392°F)			x		x	
Dust filter (temp. up to 302°F)		x			x	
Bitumen			x		x	
Cement	x			x		
Wood chip dryer			x		x	
Pressure conveying vessel, 8 bar			x		x	
Sugar	x			x		
Flour	x			x		
Carbon black	x			x		

⁽¹⁾ Delivered in version with process temperature and process pressure as following (see also option pos.17):

NBR: max. 80°C and max. 0.8 bar

FPM (Viton): max. 150°C and max. 0.8 bar

PTFE (Teflon): max. 250°C and max. 0.8 bar

max. 80°C/ 150°C/ 250°C and max. 5 bar/ 10 bar

⁽²⁾ In particular cases 1.4404 (SS316L) is recommended

Electronic

RN 3000							
Power supply		Output signal					
		SPDT ⁽¹⁾	DPDT	PNP	FSH/ FSL ⁽²⁾	Adjustable delay	Fail safe alarm
AC version	24 V or 48 V or 115 V or 230 V AC	•	-	-	-	-	-
DC version	24 V DC	•	-	-	-	-	-
DC version	24 V DC PNP	-	-	•	•	•	-
Universal voltage	24 V DC/ 22 .. 230 V AC	•	-	-	•	•	option
RN 6000							
Power supply		Output signal					
		SPST	SPDT ⁽¹⁾	DPDT	PNP	FSH/ FSL ⁽²⁾	Adjustable delay
AC version	24 V or 48 V or 115 V or 230 V AC	-	•	-	-	-	-
DC version	24 V DC	-	•	-	-	-	-
Universal voltage	24 V DC/ 22 .. 230 V AC	-	-	• ⁽³⁾	-	•	•
Universal voltage SIL2	24 V DC/ 22 .. 230 V AC	•	• ⁽⁴⁾	-	-	•	-

⁽¹⁾ Microswitch, with Universal voltage Relais

⁽²⁾ Switchable signal output (Fail safe high/ low)

⁽³⁾ For Ex approval "Increased safety" (pos.2 C,R,S) not in combination with option Fail safe alarm

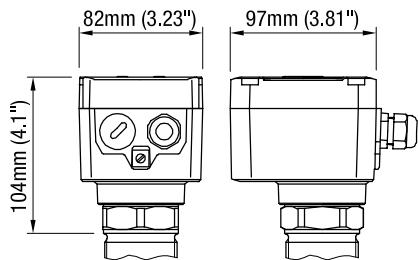
⁽⁴⁾ Additional output, not SIL conform

Technical Data

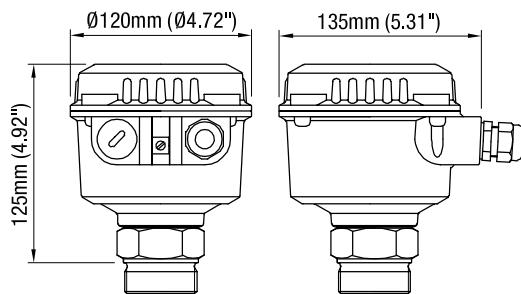
Dimensions

Housing versions

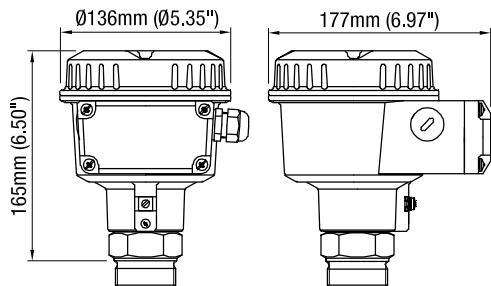
Series RN 3000
 Standard



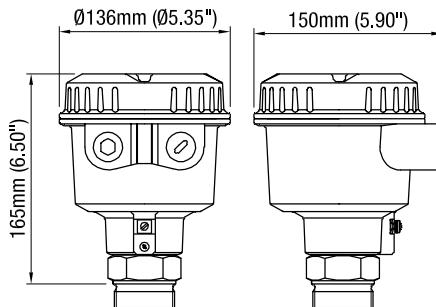
Series RN 6000
 Standard



Series RN 6000
 de explosionproof with increased safety terminal box

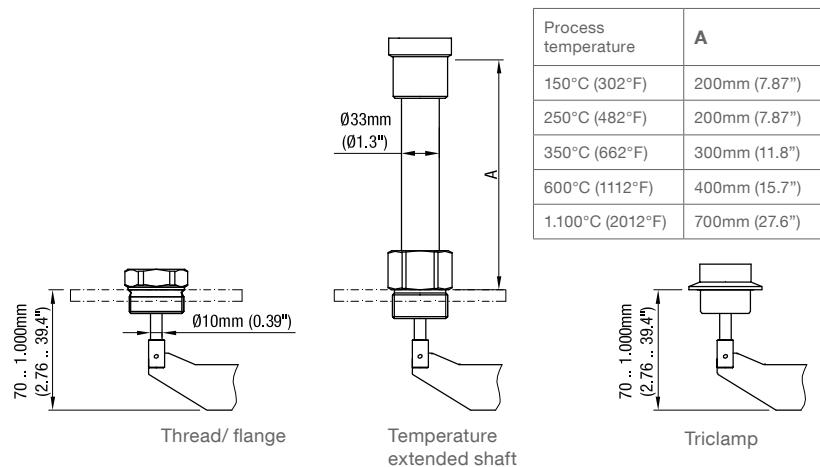


Series RN 6000
 d flameproof/ explosionproof



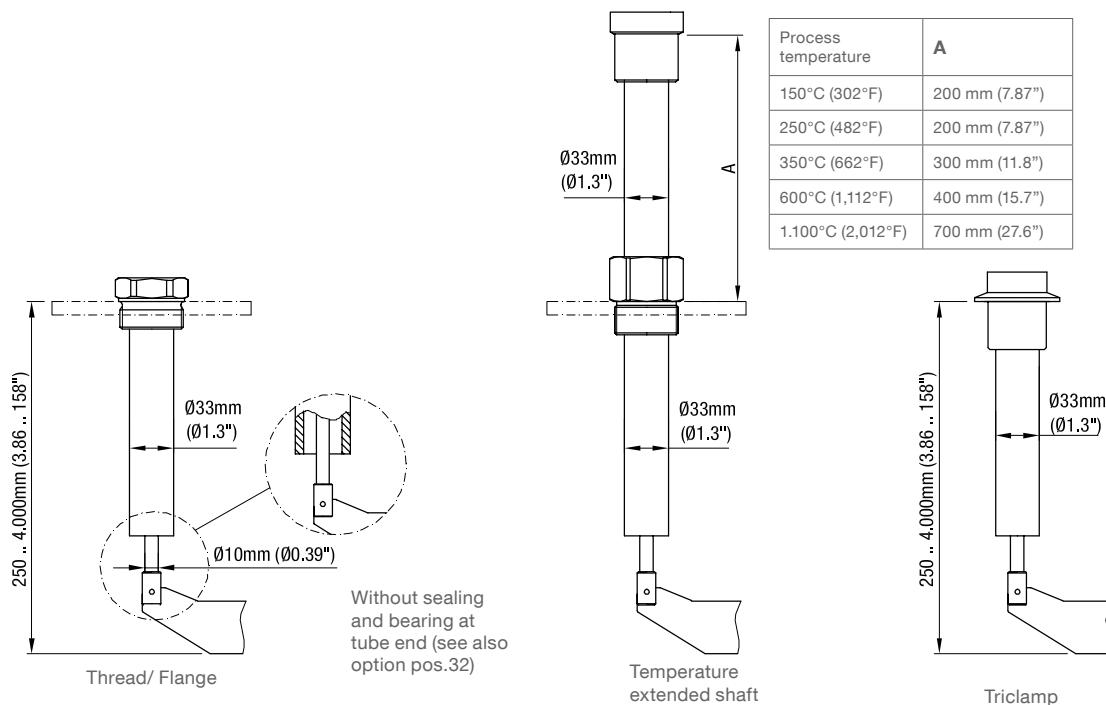
Extensions

RN ..001



Technical Data

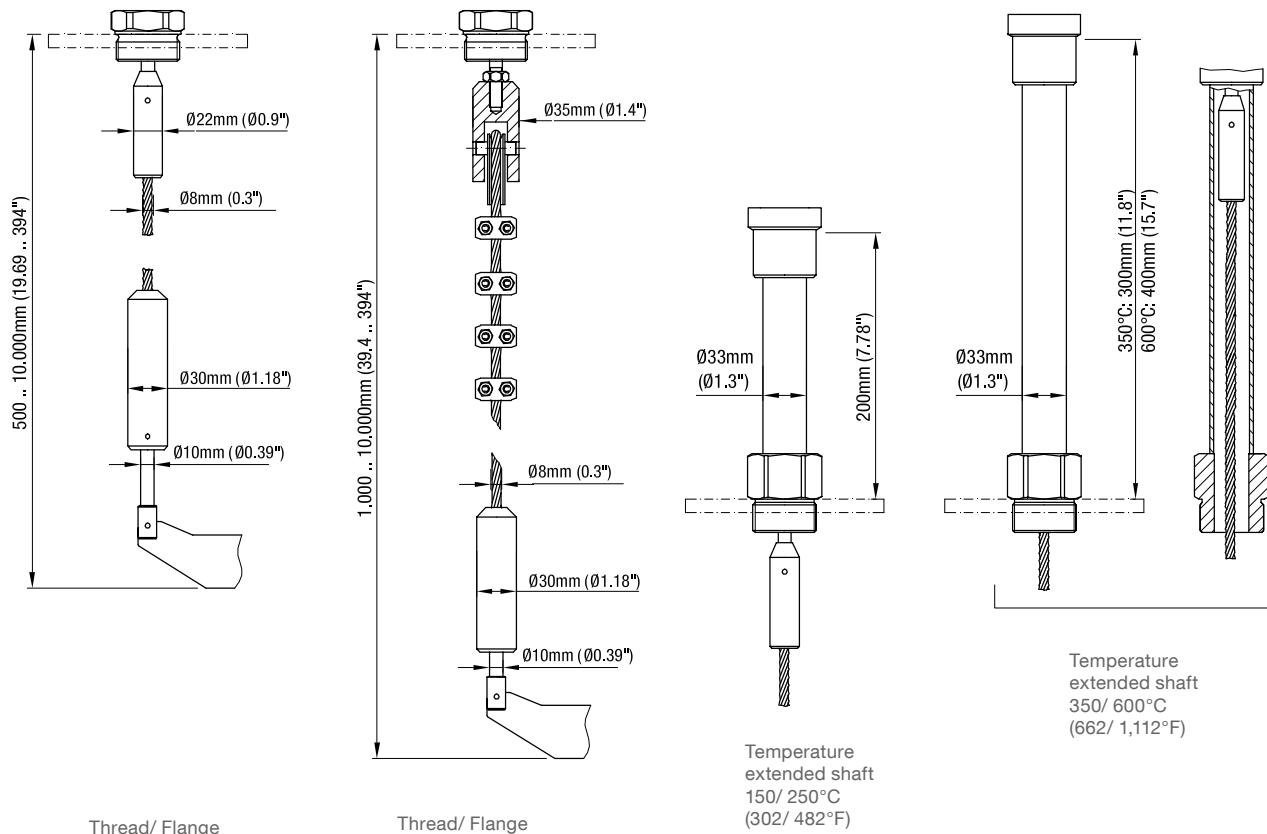
RN ..002



RN ..002 rope

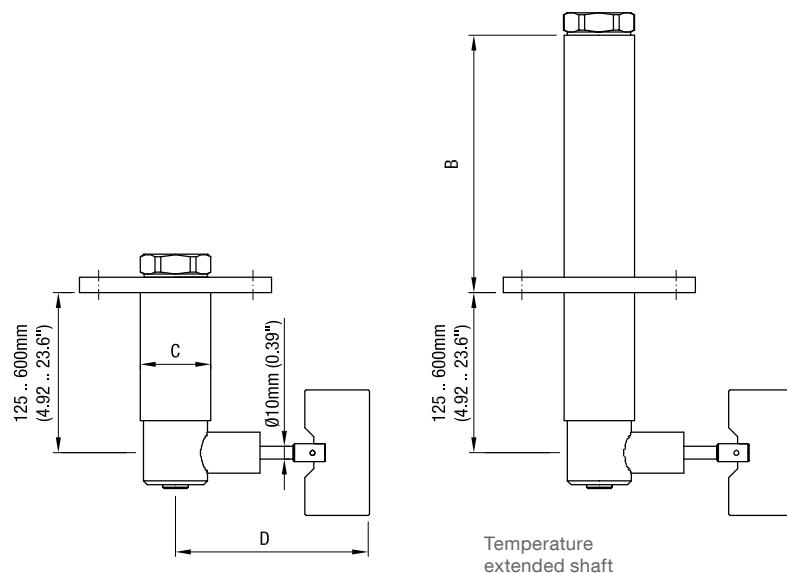
Type standard (pos.1 C)
(max. 4 kN load)

Type reinforced (pos.1 H)
(max. 28 kN load)



Technical Data

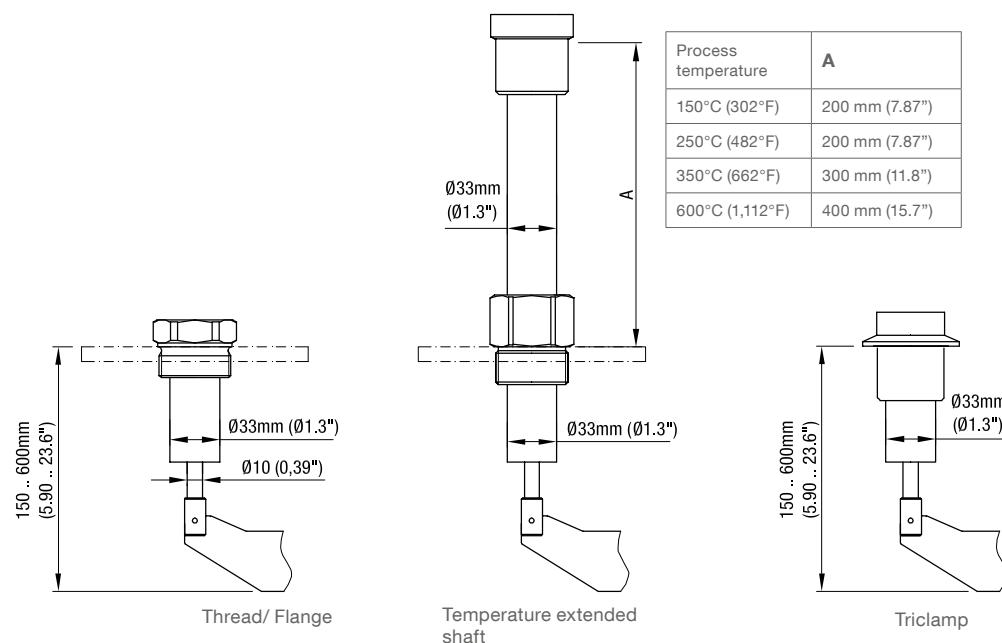
RN ..003



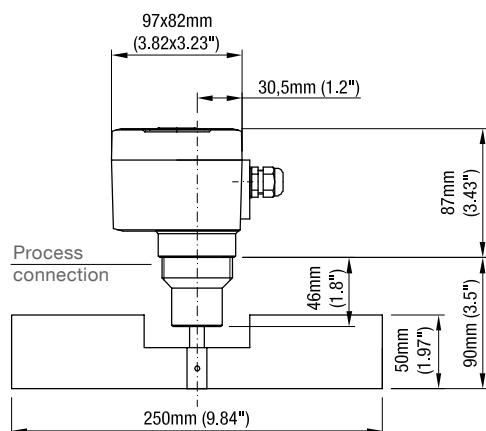
Material	C
steel	Ø55 mm (Ø2.17")
aluminium	Ø60 mm (Ø2.36")

Vane	D
50 mm x .. mm (1.97" x ..")	139 mm (5.47")
98 mm x .. mm (3.86" x ..")	187 mm (7.36")

RN ..004



RN 3005

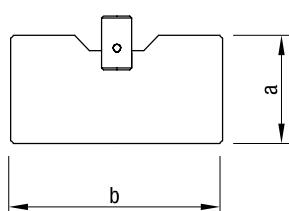


Technical Data

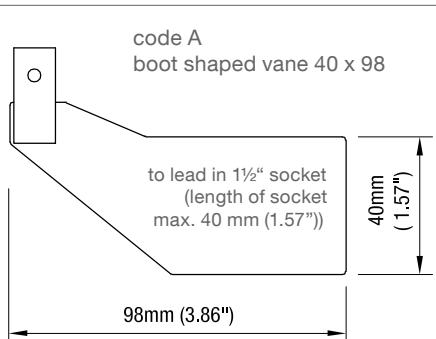
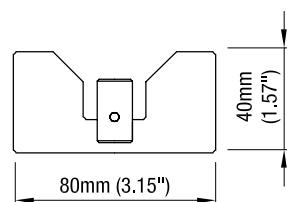
Measuring vanes

code	type	a	b
B	rectangular	50 mm (1.97")	98 mm (3.86")
C	rectangular	50 mm (1.97")	150 mm (5.90")
E	rectangular	50 mm (1.97")	250 mm (9.84")
F	rectangular	98 mm (3.86")	98 mm (3.86")
G	rectangular	98 mm (3.86")	150 mm (5.90")
I	rectangular	98 mm (3.86")	250 mm (9.84")

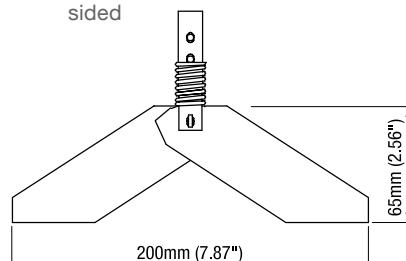
code B,C,E,F,G,I
 rectangular vane



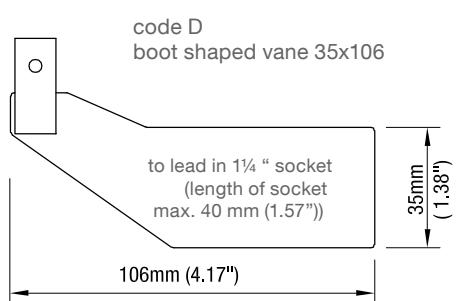
code P
 notched 40 x 80



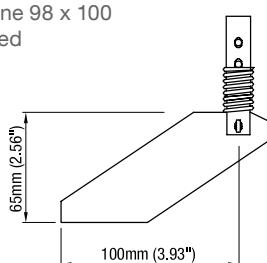
code K
 hinged vane 98 x 200 double sided



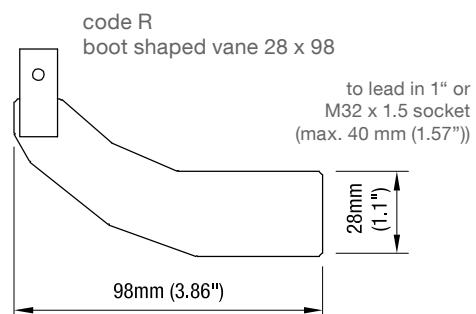
b=37 mm (1.46")
 für 1½"/ 1¼"
 b=28 mm (1.1")
 for 1"/ M32 x 1.5



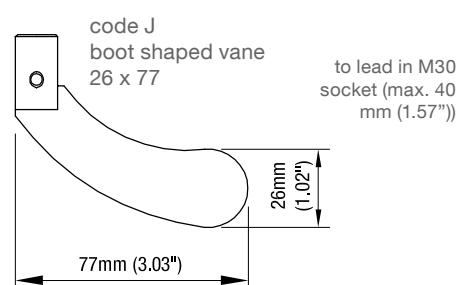
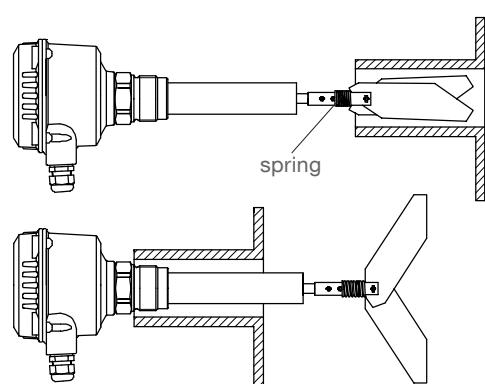
code S
 hinged vane 98 x 100
 single sided



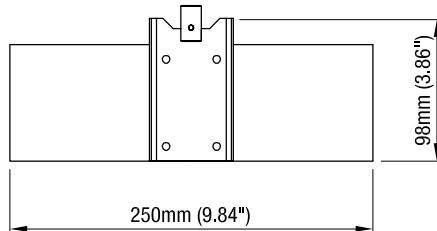
b=37 mm (1.46")
 für 1½"/ 1¼"
 b=28 mm (1.1")
 for 1"/ M32 x 1.5



Insertion of the hinged vane through a long socket



code M
 rubber vane 98 x 250



Technical Data

Electrical data

Connection terminals	see page 23/ 24
Cable entry	M20 x 1.5 screwed cable gland NPT 1/2" conduit connection NPT 3/4" conduit connection (only RN 6000)
	Clamping range (diameter) of the factory provided cable glands: M20 x 1.5: 6 .. 12 mm (0.24 .. 0.47")
Protection class	I III (Version 24 V DC PNP)
Oversupply category	II
Pollution degree	2 (inside housing)
Power supply	see page 23/ 24
Installed load	see page 23/ 24
Signal and alarm output	see page 23/ 24
Isolation	Power to signal and alarm output: 2,225 Vrms Signal output to signal output (DPDT): 2,225 Vrms
Indicating light	By built-in LED (apart from AC version)

Mechanical data

Housing	Aluminium housing, powdercoated, RAL 5010 gentian blue RN3000: optional plastic PA6 GF, RAL 5010 gentian blue Seal between housing and lid: NBR Seal between housing and process connection: NBR Nameplate: polyester film
Degree of protection	RN 3000: IP66* RN 6000: IP66* Types with process connection and extension in stainless steel: IP66*, NEMA Type 4X (not for: RN 600x with process temperature $\geq 150^{\circ}\text{C}$ (302°F)), RN 6002 with sliding sleeve, RN 6003
Material process connection (options available)	* IEC/EN/NBR 60529 Thread: 1.4305 (303) or 1.4404 (316L) or aluminium Triclamp: 1.4305 (303) or 1.4404 (316L) Flange rectangle: 1.4301 (304) or aluminium Flange DN/ ANSI: 1.4541 (321) or 1.4404 (316L), DN32 also made of aluminium
Material extension (options available)	RN x001: 1.4301 (304) / 1.4305 (303) or 1.4404 (316L) RN x002 pipe: 1.4301 (304) / 1.4305 (303) or 1.4404 (316L) or aluminium RN x002 rope: 1.4305 (303) / 1.4401 (316) RN x003: 1.4301 (304) or aluminium RN x004: 1.4301 (304) / 1.4305 (303) or 1.4404 (316L) or aluminium RN 3005: 1.4305 (303) or 1.4404 (316L)
Material vane shaft	1.4301 (304) / 1.4305 (303) or 1.4404 (316L)
Material measuring vane incl. socket (options available)	boot-shaped and rectangular vane: 1.4301 (304) or 1.4404 (316L) hinged vane 1.4301 (304) / 1.4305 (303) / 1.4310 (301) or 1.4404 (316L) rubber vane 1.4301 (304) / rubber SBR
Tolerance length "L"	$\pm 10 \text{ mm} (\pm 0.39")$
Bearing	Ball bearing, dust-tight
Sealing	Radial rotary shaft sealing Material: NBR (Acrylnitril-Butadien-rubber) FPM (Viton) PTFE (Teflon) Graphite based (version 350°C (662°F) and 600°C ($1,112^{\circ}\text{F}$))

See also selection guide on page 5.

Technical Data

Friction clutch Protects the gear unit against impacts of the measuring vane

Speed of measuring vane 1 rotation or 5 rotations per minute

Sound level max. 50 dBA

**Overall weight
(ca.)**

RN 3000	Version				Extension	
	80°C (176°F)		150/ 250/ 350/ 600°C (302/ 482/ 662/ 1,112°F)	1,100°C (2,012°F)		
	Aluminium *	Stainl. steel *			Aluminium	Stainl. steel *
RN 3001	1.2 kg (2.6 lbs)	1.5 kg (3.3 lbs)	+1.2 kg (+2.6 lbs)	+2.8 kg (+6.2 lbs)	-	-
RN 3002	1.3 kg (2.9 lbs)	1.6 kg (3.5 lbs)	+1.2 kg (+2.6 lbs)	+2.8 kg (+6.2 lbs)	+1.3 kg/m (+2.9 lbs per 39.3")	+2.7 kg/m (+5.9 lbs per 39.3")
RN 3002-rope	2.1 kg (4.6 lbs)	2.4 kg (5.3 lbs)	+1.2 kg (+2.6 lbs)		-	+0.25 kg/m (+0.6 lbs per 39.3")
RN 3003	3.7 kg** (8.1 lbs)	6.1 kg** (13.4 lbs)	+1.2 kg (+2.6 lbs)		+0.4 kg/ 100mm (+0.9 lbs per 3.93")	+0.6 kg/ 100 mm (+1.3 lbs per 3.93")
RN 3004	1.3 kg (2.9 lbs)	1.6 kg (3.5 lbs)	+1.2 kg (+2.6 lbs)		+0.15 kg/ 100 mm (+0.3 lbs per 3.93")	+0.3 kg/ 100 mm (+0.7 lbs per 3.93")
RN 3005	1.3 kg (2.9 lbs)	1.6 kg (3.5 lbs)				

* Process connection

** Version with flange 150x150x12mm (5.9x5.9x0.47"), L=250mm (9.84")

All weights are without flanges (except RN 3003) and smallest measuring vane.

RN 6000	Version				Extension	
	80°C (176°F)		150/ 250/ 350/ 600°C (302/ 482/ 662/ 1,112°F)	1,100°C (2,012°F)		
	Aluminium *	Stainl. steel *			Aluminium	Stainl. steel *
RN 6001	1.5 kg (3.3 lbs)	1.8 kg (4.0 lbs)	+12 kg (+2.6 lbs)	+2.8 kg (+6.2 lbs)	-	-
RN 6002	1.6 kg (3.5 lbs)	1.9 kg (4.2 lbs)	+1.2 kg (+2.6 lbs)	+2.8 kg (+6.2 lbs)	+1.3 kg/m (+2.9 lbs per 39.3")	+2.7 kg/m (+5.9 lbs per 39.3")
RN 6002-rope	2.4kg (5.3 lbs)	2.7 kg (5.9 lbs)	+1.2 kg (+2.6 lbs)		-	+0.25 kg/m (+0.6 lbs per 39.3")
RN 6003	4.0 kg** (8.8 lbs)	6.4 kg** (14.1 lbs)	+1.2 kg (+2.6 lbs)		+0.4 kg/ 100 mm (+0.9 lbs per 3.93")	+0.6 kg/ 100 mm (+1.3 lbs per 3.93")
RN 6004	1.6 kg (3.5 lbs)	1.9 kg (4.2 lbs)	+1.2 kg (+2.6 lbs)		+0.15 kg/ 100 mm (+0.3 lbs per 3.93")	+0.3 kg/ 100 mm (+0.7 lbs per 3.93")

All mentioned weights are with Standard-housing.

By use of de-housing: +1.4 kg (+3.1 lbs)
d-housing: +1.0 kg (+2.2 lbs)

* Process connection

** Version with flange 150 x 150 x 12 mm (5.9 x 5.9 x 0.47"), L=250 mm (9.84")

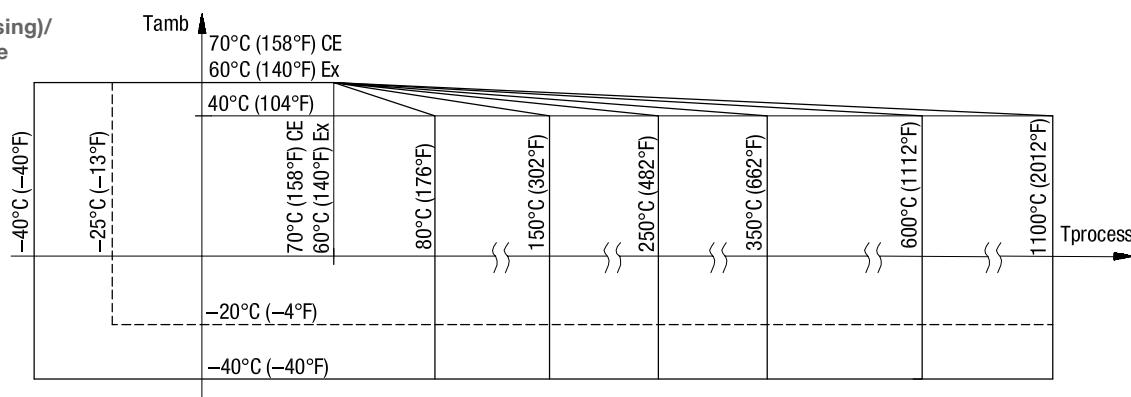
All weights are without flanges (except RN 6003) and smallest measuring vane.

Technical Data

Operating conditions

RN 3000:

Ambient temp. (housing)/
 process temperature



-40°C (-40°F) ambient and process temperature for version with heating of housing (pos.26)

-40°C (-40°F) ambient temperature not for version with plastic housing in Ex Version

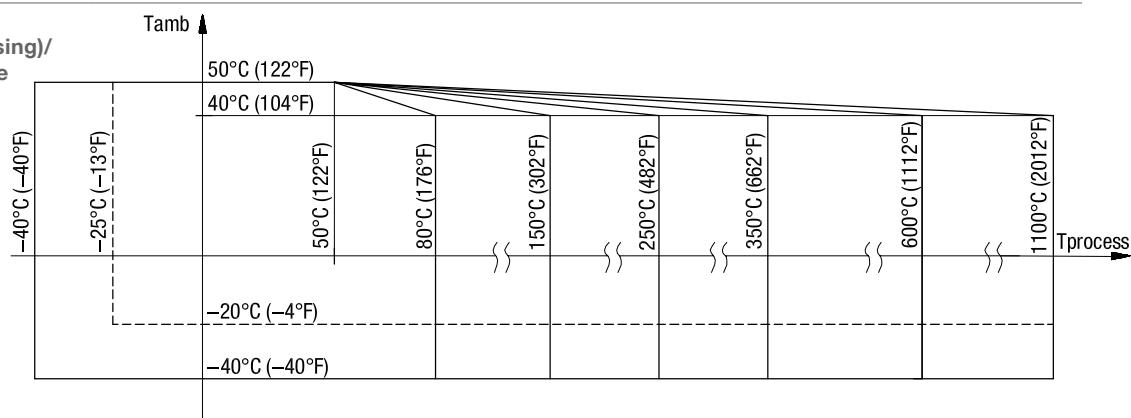
+350/ 600°C (+662/ 1,112°F) process temperature not for version RN 3003, not for Ex-approvals

+1,100°C (2,012°F) process temperature for version RN 3001, RN 3002, not for Ex-approvals

For versions with Ex-approvals: see remarks on page 31.

RN 6000:

Ambient temp. (housing)/
 process temperature



-40°C (-40°F) ambient and process temperature for version with heating of housing (pos.26)

+350/ 600°C (+662/ 1,112°F) process temperature not for version RN6003, not for Ex-approvals

+1,100°C (2,012°F) process temperature for version RN 6001, RN 6002, not for Ex-approvals

For versions with Ex-approvals: see remarks on page 31.

Ventilation

Ventilation is not required

Min. powder density/ sensitivity

see section "Sensitivity" on page 28

Output signal delay

Version

Sensor free -> covered*

Sensor covered -> free

AC, DC

ca. 1.3 sec

ca. 0.2 sec

Universal voltage

ca. 1.5 sec + 0 .. 20 sec adjustable

ca. 0.2 sec + 0 .. 60 sec adjustable

*after blocking of the measuring vane

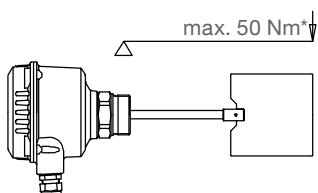
Features of bulk material

Hardly any limitations.

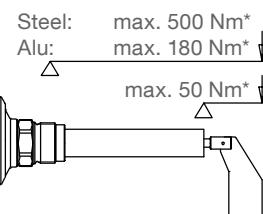
Technische Daten

Max. permitted mechanical torque

RN 3001/ 6001:

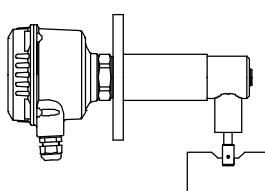


RN 3002/ 6002
 RN 3004/ 6004:



RN 3003/ 6003:

Steel: max. 600 Nm*
 Alu: max. 250 Nm*



* at 40°C

For version with reinforced rib on request

Protective measures in case of high load: mounting of a protective canopy above the probe (horizontal installation) or fixing of the extension tube.

Max. tractive force

RN 3001/ 6001 pendulum shaft:

400 N (only applicable as full detector)

RN 3002/ 6002-rope:

4 kN (type standard)

28 kN (type reinforced)

Max. process pressure

-0.9 .. +0.8 bar (-13.1 .. 11.6 psi) or -0.9 .. +5 bar (-13.1 .. 73 psi) or -0.9 .. +10 bar (-13.1 .. 145 psi)
 -0.1 .. +0.1 bar (-1.5 .. 1.5 psi) for 600°C (1,112°F) and 1,100°C (2,012°F) version

For pressure over 0.8 bar (11.6 psi) the Teflon sealing is used.
 For versions with Ex-approvals: see remarks on page 30.

Vibration

1.5 (m/s²)²/ Hz according to EN 60068-2-64

Relative Humidity

0 - 100%, suitable for outdoor use

Altitude

max. 2,000 m (6,562 ft)

Expected product lifetime

Following parameters have a negative influence on the expected product lifetime:
 High ambient- and process temperature, corrosive environment, high vibration, high flow rate of abrasive bulk material passing the sensor element, high amount of measurement cycles..

Transport and storage

Transport

Observe the instructions as stated on the transport packing, otherwise the products may get damaged.

Transport temperature: -40 .. +80°C (-40 .. +176°F)
 Transport humidity: 20 .. 85%

Transport incoming inspections must be carried out to check for possible transport damage.

Storage

Products must be stored at a dry and clean place.

They must be protected from influence of corrosive environment, vibration and exposure to direct sunlight.

Storage temperature: -40 .. +80°C (-40 .. +176°F)
 Storage humidity: 20 .. 85%

Approvals

* Depending on selected version



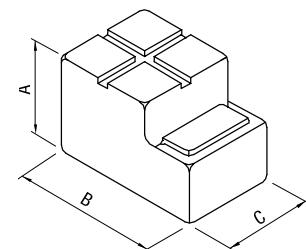
Options

Weather protection cover

If the measuring device is used outdoors, the use of the weather protection cover is recommended. It protects the device from all atmospheric influences such as:

- rain water
- condensation water
- excessively high temperatures due to insolation
- excessively low temperatures in winter

Material: PE, weather and temperature stable



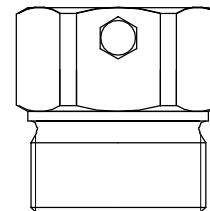
Not available for housing version d and de.
 For use in Hazardous Locations: only permitted for zone 2 and 22 or Division 2.

Sliding sleeve

RN 3002/ 6002 Process connection and material as chosen

Version with selection code pos.30:
 Only for applications without process pressure.
 Not available for Ex-approvals.

Version with selection code pos.31: For applications with process pressure. Sealing material to the extension tube: viton.



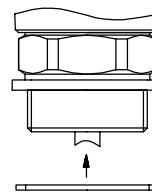
Mounting set

Screws and washers for fixing the unit on a flange.

Flat gasket

On the face sealing of the process connection thread.
 Incl. sealing face for version with G 1½" thread.

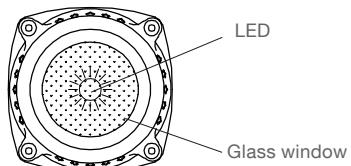
Max. 250°C



LED (Glass window in lid)

To see the indicating light on the electronic module from outside.

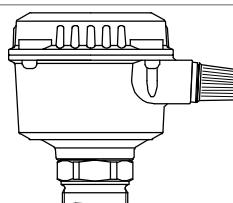
Not available for housing version d and de.



Bulb

Bright indicating light seen from outside.

Not available for use in Hazardous Locations.



Plug

Used instead of cable gland.

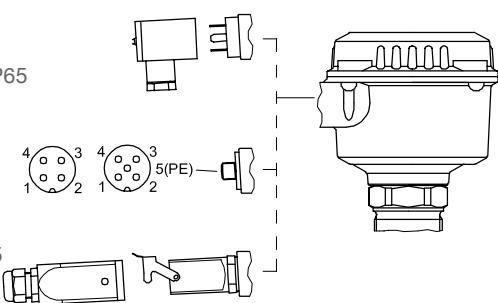
Not available for use in Hazardous Locations and FM/ CSA general purpose.

Connection of the plug wires to the internal terminals of the unit must be done on site or according to customer demands.

Valve connector (incl. mating plug)
 4-pole (incl. PE), max. 230 V, enclosure plastic, IP65

Plug M12 (without mating plug)
 4-pole, max. 25 V or 5-pole, max. 60 V
 Enclosure brass, IP67

Plug Han 4A (incl. mating plug)
 5-pole (incl. PE), max. 230 V, enclosure zinc, IP65



Options / Mounting

EHEDG approval	<p>EHEDG conform design (material and construction in contact with the process).</p> <p>Approved with flush welding socket Material: aluminium or 1.4301 (304) or 1.4404 (316L) (details see: mounting instructions EHEDG version, page 17).</p>	
Food grade material	<p>Food grade material in contact with the process food (sealing and grease FDA conform). The option does not automatically implement a food conform design (food conform gaps, surface and radiiuses).</p>	

Mounting

! General Safety Instructions

Process pressure	Improper installation may result in loss of process pressure.
Chemical resistance against the medium	Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.
Mechanical load	The torque at the fastening spot must not exceed the specified ratings. See page 12 for details.
Mounting location	Keep away from incoming material and from silo walls. The installation has to be carried out, that the sensor elements cannot hit the wall of the silo. The flow of the medium and fixtures in the container must be considered. This is especially important for extension length of more than 3000 mm (118")
Sliding sleeve	Tighten both straining screws M8 with 20 Nm to obtain resistance against pressure
Flange mounting	A plastic seal must be used to tighten the flange.
EHEDG-approval/ Food grade material	The materials are available for the use under normal and predictable applications (according to directive 1935/2004 Art.3). Other conditions can influence the safety.

! Additional Safety Instructions for Hazardous Locations

Installation regulations	For devices to be used in Hazardous Locations the respective valid installation regulations must be observed.
Sparks	The installation has to be done in a way, that mechanical friction or impact does not cause sparks between the aluminium enclosure and steel.

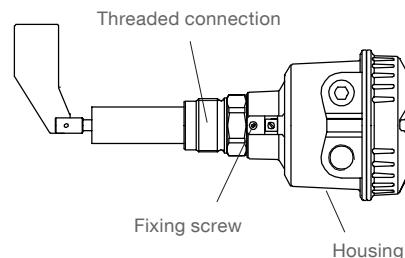
Mounting

Mounting instructions

Rotatable housing

The housing can be rotated against the threaded connection after mounting.

RN 6000: For the d- and de- housing:
 Fixing screw must be unfastened to enable rotation. Fix the screw again, when the housing has the right position.

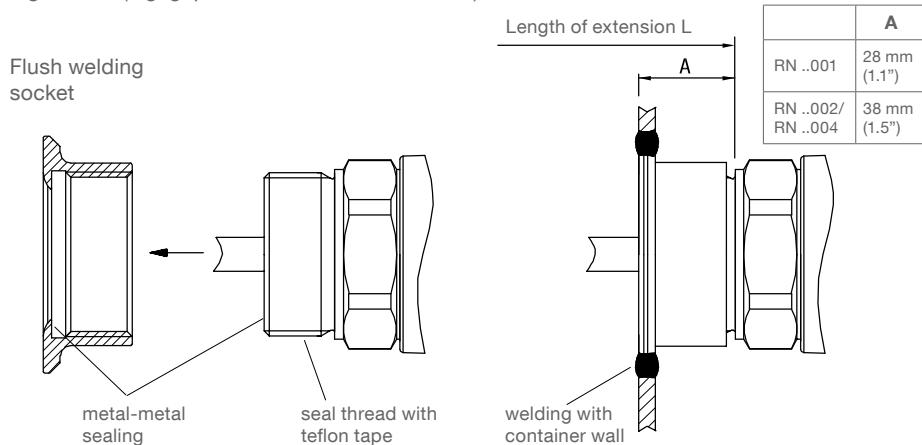


Direction of the cable glands	When the unit is mounted from the side, ensure, that the cable glands face downwards and are closed to avoid water penetration into the housing.
--------------------------------------	--

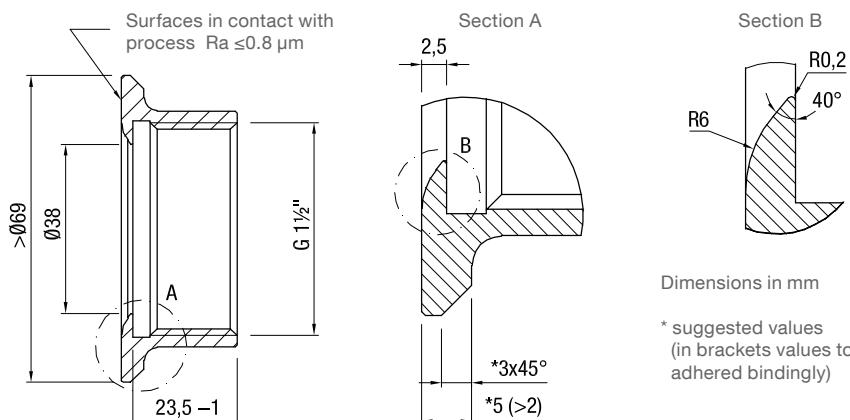
Sealing	Seal the process connection thread with teflon tape against process pressure. Alternative use of a flat gasket is possible (option pos. 15)
----------------	--

Precaution for later dismounting/ Service	<ul style="list-style-type: none"> Use teflon tape to avoid seizing of aluminium process connection thread with the socket Grease the screws of the lid if corrosive atmosphere is present (e.g. close to sea)
--	--

EHEDG-Approval	Seal the thread with teflon tape against process pressure. Metal-metal sealing: <ul style="list-style-type: none"> The support muß be plane and without any gap. No teflon tape (or similar) is allowed to be in between. Fixing torque 100 Nm The quality of the welding with the container wall must be according to the respective regulations (e.g. gaps, transitions, surface finish).
-----------------------	---

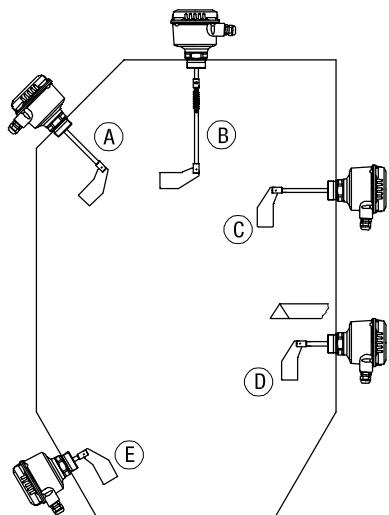


Dimension of flush welding socket (for optional on site manufacturing):



Mounting

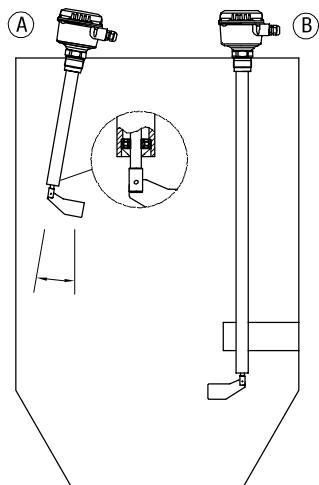
RN 3001
RN 6001



- A Full detector vertical and oblique from the top max. „L“=600 mm (23.62")
- B With pendulum shaft or rope extension: Full detector vertical from the top. Observe max. pulling force.
- C Full detector horizontal max. „L“=300 mm (11.8")
- D Demand or empty detector horizontal max. „L“=150 mm (5.9")
Protective angle recommended depending on load.
- E Empty detector oblique from the bottom max. „L“=150 mm (5.9")
Protective angle recommended depending on load.

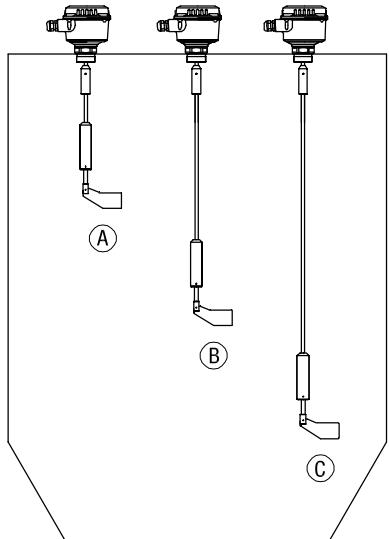
Horizontal mounting: Boot shaped vane recommended (min. mech. load, because the vane aligns to the movement of the material).

RN 3002
RN 6002



- A Full detector vertical from the top max. „L“=3,000 mm (118")
- Remark:
Deviation up to max. 10° from vertical installation with option „Bearing at tube end“ possible.
- B Full detector vertical from the top max. „L“=4,000 mm (158")
Support from side recommended.

RN 3002-Rope
RN 6002-Rope

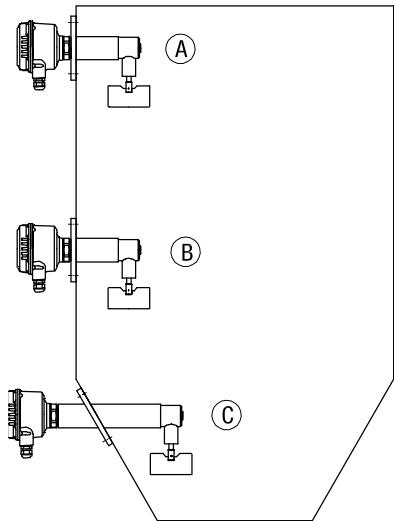


- A Full detector vertical
- B Demand detector vertical
- C Empty detector vertical

max. „L“=10,000 mm (394")
Observe max. tractive force.

Mounting

RN 3003
RN 6003



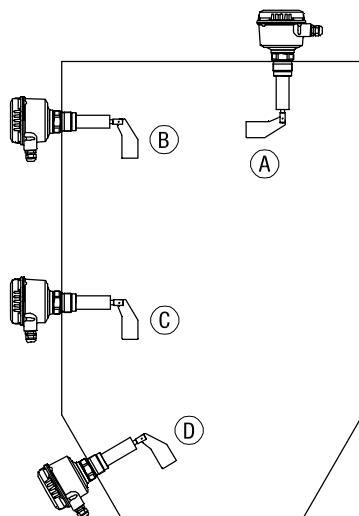
A Full detector horizontal

B Demand detector horizontal

C Empty detector horizontal

Protective angle recommended depending on load.

RN 3004
RN 6004



A Full detector vertical and oblique from the top

B Full detector horizontal

C Demand or empty detector horizontal
 Protective angle recommended depending on load.

D Empty detector oblique from the bottom
 Protective angle recommended depending on load.

Horizontal mounting: Boot shaped vane recommended
(min. mech. load, for the vane aligns to the movement of the material).

Electrical installation

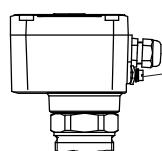
! General Safety Instructions

Handling	In the case of improper handling or handling malpractice, the electric safety of the device cannot be guaranteed.
Installation regulations	The local regulations or VDE 0100 (Regulations of German Electrotechnical Engineers) must be observed. With use of 24 V supply voltage, an approved power supply with reinforced insulation to mains is required.
Fuse	Use a fuse as stated in the connection diagrams (see pages 23 and 24).
RCCB protection	In the case of a fault, the supply voltage must be automatically switched off by a RCCB protection switch to protect against indirect contact with dangerous voltages.
Power supply switch	A voltage disconnection switch must be provided near the device.
Wiring diagram	The electrical connections are made in accordance with the wiring diagram.
Supply voltage	Compare the supply voltage applied with the specifications given on the electronic module and name plate before switching the device on.
Cable gland	The screwed cable gland and closing element must have following specifications: Ingress protection IP66, temperature range from -40°C to +70°C, UL or VDE or INMETRO certified (depending on the country where the unit is installed), pull relief. Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion). Cable glands that are not used have to be sealed with a blanking element. The diameter of the field wiring cable has to match to the clamping range of the used cable gland.
Conduit system	In case of using a conduit system (with NPT thread) instead of a cable gland the regulations of the country, where the unit is installed, must be observed. The conduit must have a tapered thread either NPT ½" or NPT ¾" in accordance with the unit and ANSI B 1.20.1. Not used inlets must be closed tight with a metal blanking element.
Field wiring cables	<ul style="list-style-type: none"> • The diameter has to match to the clamping range of the used cable gland. • The cross section has to match with the clamping range of the connection terminals and consider the max. current. • All field wirings must have insulation suitable for at least 250 V AC. • The temperature rating must be at least 90°C (194°F). • If higher immunity interferences as specified in the stated EMC standards are present (see chapter approval), a shielded cable is required, otherwise an unshielded instrumentation cable is satisfactory.
Guiding the cables in the terminal box	Cut the field wiring cables to appropriate length to fit properly into the terminal box.
Microswitch protection	Provide protection for microswitch contacts to protect the device against inductive load surges.
Protection against static charging	The housing of the unit must be grounded to avoid static charging of the unit. This is particularly important for applications with pneumatic conveying and non-metallic containers.

! Additional Safety Instructions for Hazardous Locations

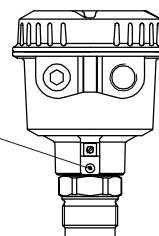
External equipotential bonding terminal

RN 3000



Connect to equipotential bonding of the plant

RN 6000



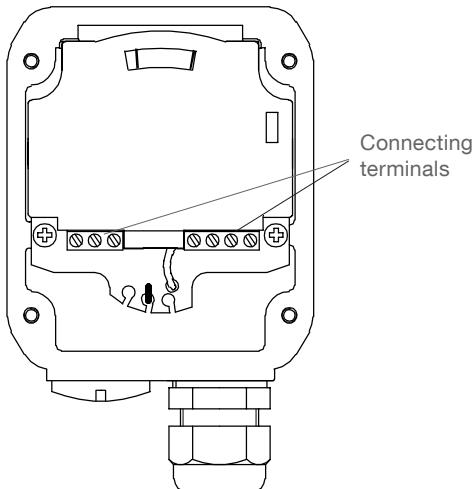
Electrical installation

Field wiring	A strain relief must be provided for the field wiring cables, when the device is installed with the factory provided cable glands.
Field wiring terminals for "de" housing	Fixing torque : 0.5 - 0.6 Nm Remove wire isolation: 9 mm
Cable glands and conduit system for ATEX/ IEC-Ex INMETRO/ TR-CU (Dust and Gas Hazardous Locations)	Installation according to the regulations of the country, where the product is installed. Not used entries have to be closed with blanking elements certified for this purpose. Where available the factory provided parts must be used. A strain relief must be provided for the field wiring cables, when the device is installed with the factory provided cable glands. The diameter of the field wiring cable must match to the clamping range of the cable clamp. If other than the factory provided parts are used, following must be ensured: The parts must have an approval adequate to the approval of the level sensor (certificate and type of protection). The approved temperature range must be from the min. ambient temperature of the level sensor to the max. ambient temperature of the level sensor increased by 10 Kelvin. The parts must be mounted according to the instructions of the supplier.
Conduit system for FM and CSA (Dust and Gas Hazardous Locations)	Installation of a flameproof/ explosion proof enclosure with a conduit system: In a conduit system single electric conductors are installed in a certified pipe system. This pipe system is in a flameproof/ explosion proof construction as well. The flameproof/ explosion proof enclosure and the pipe system needs to be sealed from each other by a certified flameproof seal of a type "d" or explosion proof of a type "XP". This seals shall be installed directly in or at the conduit entries of the flameproof/ explosion proof enclosure. Not used entries have to be closed with blanking elements certified for this purpose (flameproof type "d" or explosion proof type "XP").
Commissioning	Commissioning only with closed lid.
Opening the lid	Units with Dust Explosion approval: Before opening the lid take care, that no dust deposits or whirlings are present. Do not remove the lid (cover) while circuits are alive. RN 6000: Units with flameproof GasExplosion approval (d-housing): To prevent ignition of hazardous atmospheres, do not remove the lid (cover) while circuits are alive.

Electrical installation

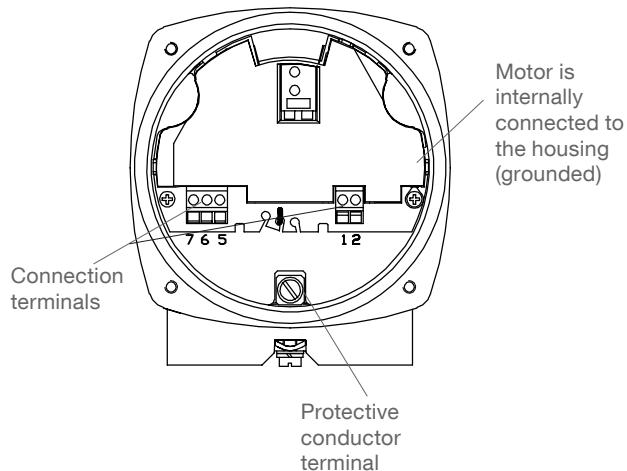
Connection

RN 3000: Standard housing



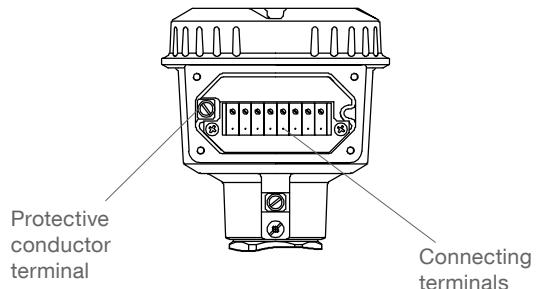
RN 6000: Standard and d-housing

Connection is done directly on the PCB



de-housing

Connection is done on the terminals inside the increased safety area.



Electrical installation Series RN 3000

Version:
 - AC
 - DC
 - Universal voltage

Power supply:

• **AC version:**

24 V or 48V or 115 V or 230 V 50/ 60 Hz max. 4 VA

All voltages $\pm 10\%$ ⁽¹⁾

Supply voltage as selected.

External fuse: max. 10 A, fast or slow, HBC, 250 V

• **DC version:**

24 V DC $\pm 15\%$ ⁽¹⁾ max. 2.5 W

External fuse: not required

• **Universal voltage:**

24 V DC $\pm 15\%$ ⁽¹⁾ max. 4 W

22 .. 230V 50/ 60 Hz $\pm 10\%$ ⁽¹⁾ max. 10 VA

External fuse: not required

⁽¹⁾ including $\pm 10\%$ of EN 61010

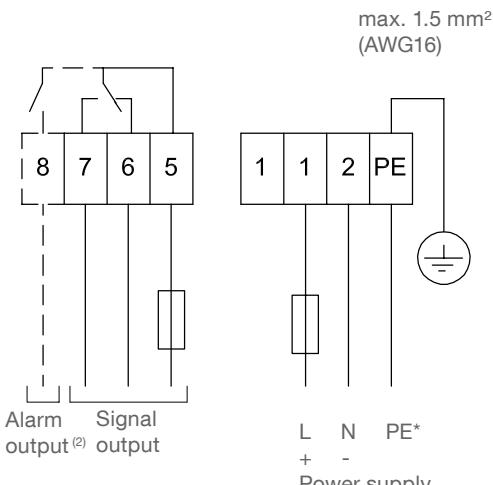
Signal and alarm output:

Micro switch or relay, SPDT contact

max. 250 V AC, 2 A, 500 VA ($\cos\phi = 1$)

max. 300 V DC, 2A, 60 W

External fuse: max. 10 A, fast or slow, HBC, 250 V



⁽²⁾ With option Fail safe
 alarm (rotation control)
 Contact open when de-energised

Version:
 - PNP

Power supply:

24 V DC $\pm 15\%$ ⁽¹⁾

⁽¹⁾ including $\pm 10\%$ of EN 61010

Input current: max. 0.6 A

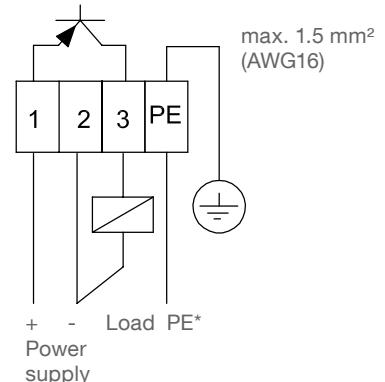
Signal output:

Load max. 0.4 A

Output voltage equal to input voltage, drop <2.5 V

Open collector

Protected against short circuit and overload



* Protection against static charge:

The PE terminal of the unit must be grounded to avoid static charging of the unit.

This is particularly important for applications with pneumatic conveying.

Electrical installation Series RN 6000

Version:

- AC
- DC

Power supply:

• AC version:

24 V or 48 V or 115 V or 230V 50/ 60 Hz max. 4 VA

All voltages $\pm 10\%$ ⁽¹⁾

Supply voltage as selected.

External fuse: max. 10 A, fast or slow, HBC, 250 V

• DC version:

24 V DC $\pm 15\%$ ⁽¹⁾ max. 2.5 W

External fuse: not required

⁽¹⁾ including $\pm 10\%$ of EN 61010

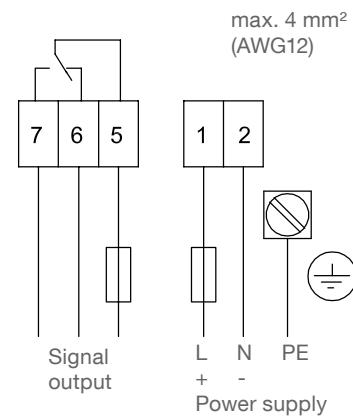
Signal output:

Micro switch, SPDT contact

max. 250 V AC, 5 A, non inductive

max. 30 V DC, 4 A, non inductive

External fuse: max. 10 A, fast or slow, HBC, 250 V



Version:

- Universal voltage
(without SIL 2)

Power supply:

24 V DC $\pm 15\%$ ⁽¹⁾ max. 4 W

22 .. 230 V 50/ 60 Hz $\pm 10\%$ ⁽¹⁾ max. 10 VA

⁽¹⁾ including $\pm 10\%$ of EN 61010

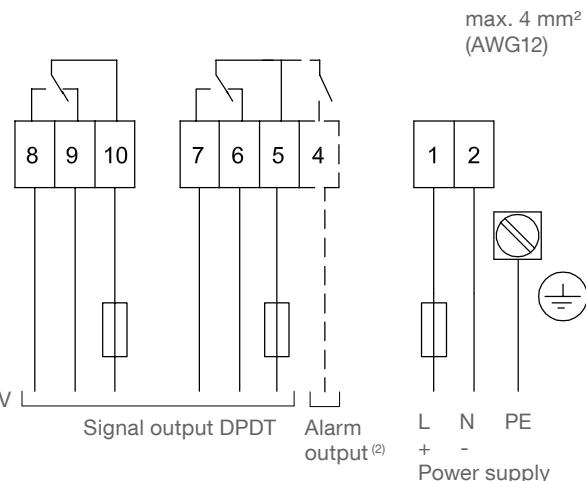
Signal and alarm output:

Relay DPDT contact

max. 250 V AC, 5 A, non inductive;

max. 30 V DC, 4 A, non inductive

External fuse: max. 10 A, fast or slow, HBC, 250 V



⁽²⁾ With option Fail safe alarm (rotation control)
 Contact open when de-energised

Version:

- Universal voltage
SIL 2

Power supply:

24 V DC $\pm 15\%$ ⁽¹⁾ max. 4 W

22 .. 230 V 50/ 60 Hz $\pm 10\%$ ⁽¹⁾ max. 10 VA

⁽¹⁾ including $\pm 10\%$ of EN 61010

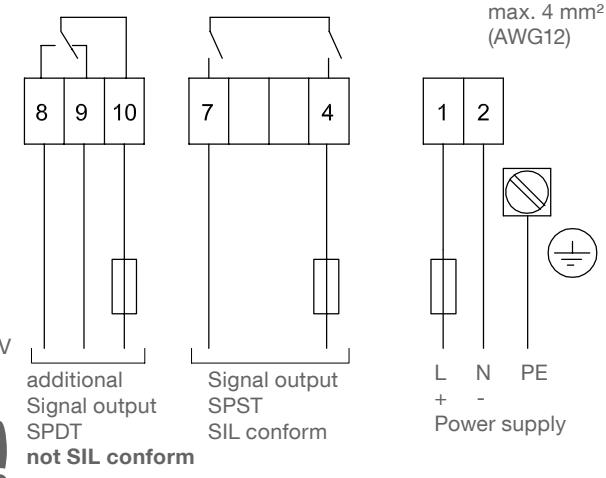
Signal output:

Relay SPST/ SPDT

max. 250 V AC, 5 A, non inductive;

max. 30 V DC, 4 A, non inductive

External fuse: max. 10 A, fast or slow, HBC, 250 V



* Protection against static charge:

The PE terminal of the unit must be grounded to avoid static charging of the unit.

This is particularly important for applications with pneumatic conveying.

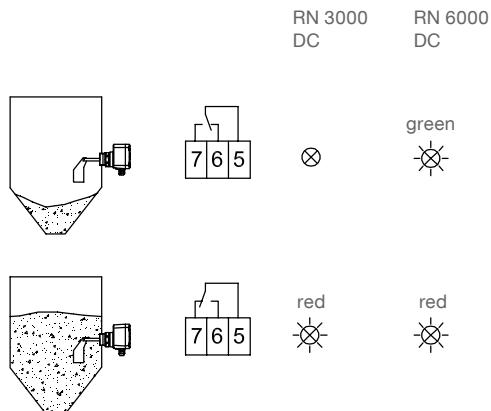
Signal and alarm output

Overview

Overview of signal and alarm output for the different electronic versions: see page 5

Signal output: Switching logic

- Version • RN 3000: AC, DC
- RN 6000: AC, DC



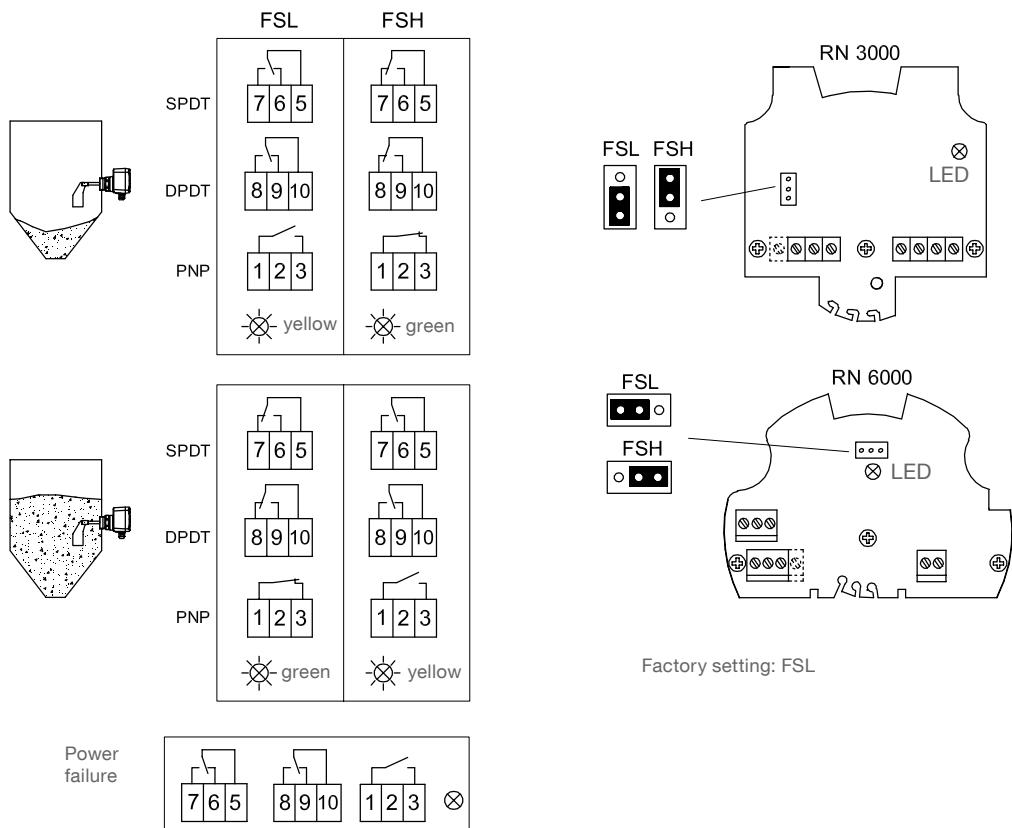
- Version • RN 3000: Universal voltage, PNP**
 • RN 6000: Universal voltage (without SIL 2)

FSH: Use this setting when sensor is used as a full detector.

Power failure or line break is regarded as „full“ signal (protection against overfilling).

FSL: Use this setting when sensor is used as an empty detector.

Power failure or line break is regarded as „empty“ signal (protection against running dry).



Signal and alarm output

Version

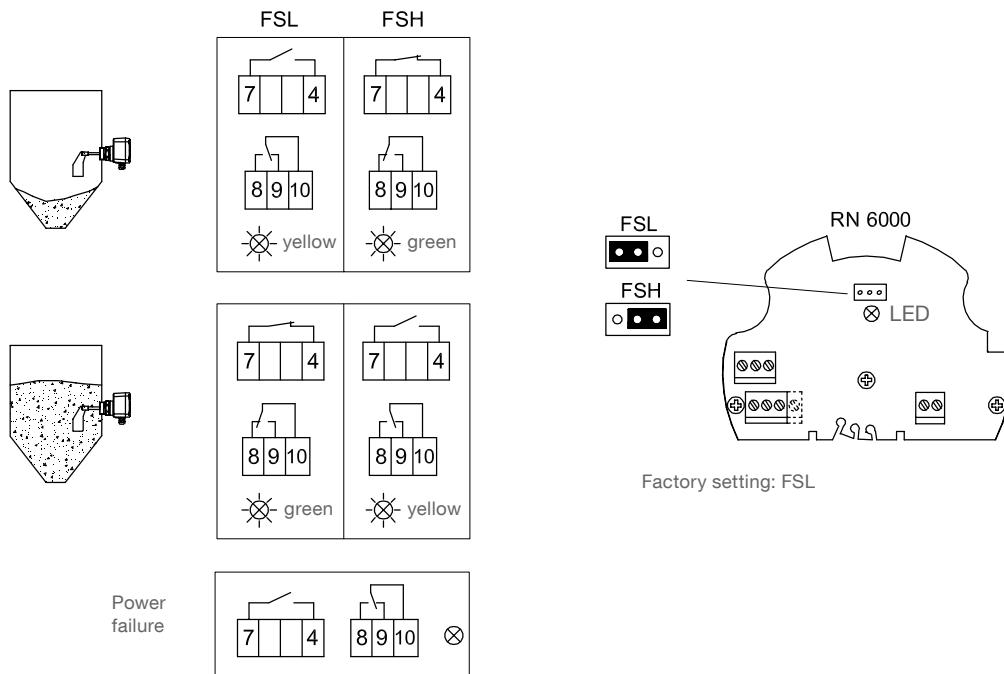
- **RN 6000: Universal voltage SIL 2**

FSH: Use this setting when sensor is used as a full detector.

Power failure or line break is regarded as „full“ signal (protection against overfilling).

FSL: Use this setting when sensor is used as an empty detector.

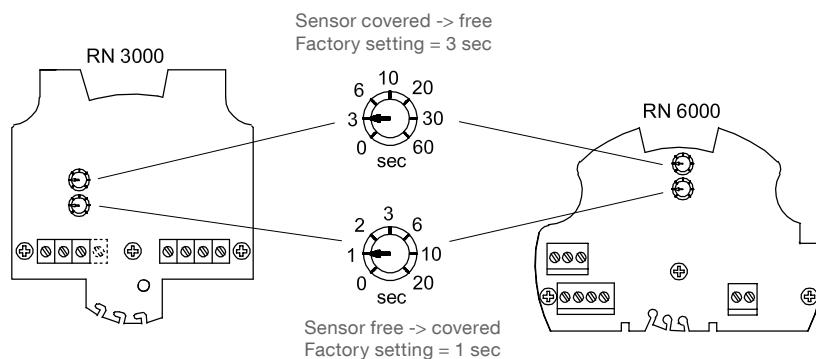
Power failure or line break is regarded as „empty“ signal (protection against running dry).



Signal and alarm output

Signal output:

Delay



Alarm output

(Fail safe alarm,
 Rotation control)

Switching and timing behaviour:

If the sensor is not covered, the rotating paddle shaft will send pulses at 20 sec intervals. In case of fault, the pulses are missed. After 30 sec the alarm relay will open.

RN 3000 Universal voltage

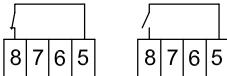
yellow or green
 (see page before)



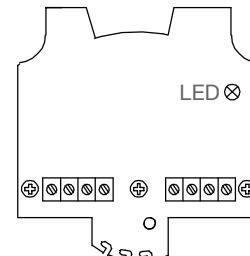
red



No fault



Fault



RN 6000 Universal voltage (without SIL 2)

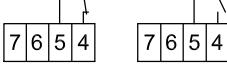
yellow or green
 (see page before)



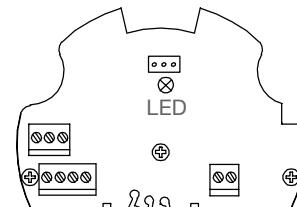
red



No fault



Fault

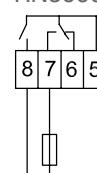


Connection example:

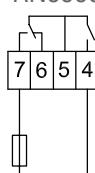
Full detector with maximum safety:
 The output signal opens in case of:

- full signal or
- failure of supply voltage or
- defect of the connection wires or
- defective unit

RN3000



RN6000



Signal output

Settings: Sensitivity

Adjustment of the spring

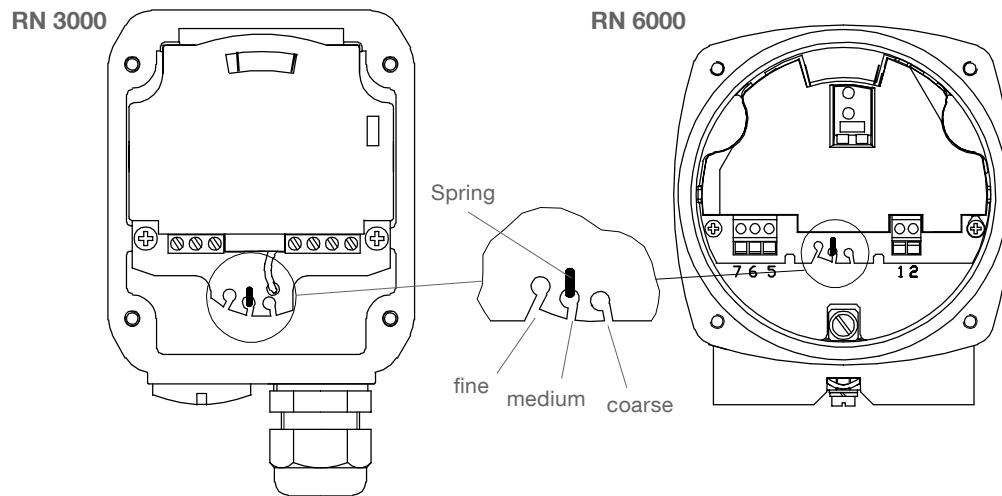
The spring is adjustable in 3 positions. It should be changed only if necessary.

„Fine“: for light material

„Medium“: suitable for nearly every material (factory setting)

„Coarse“: for very sticky material

The spring can be changed via a small plier.



Sensitivity

The table shows approximate values for the minimum densities, at which a normal function should be possible.

Vane	*Minimum density in g/l = kg/m ³ (lb/ft ³) (without guarantee)			
	Vane completely covered with bulk material		Bulk material covers vane up to 100 mm (3.93")	
	Spring adjustment		Spring adjustment	
	fine	medium (factory setting)	fine	medium (factory setting)
Boot shaped vane 40 x 98	200 (12)	300 (18)	100 (60)	150 (9)
Boot shaped vane 35 x 106	200 (12)	300 (18)	100 (60)	150 (9)
Boot shaped vane 28 x 98	300 (18)	500 (30)	150 (9)	200 (12)
Boot shaped 26 x 77	350 (21)	560 (33)	200 (12)	250 (15)
Vane 50 x 98	300 (18)	500 (30)	150 (9)	250 (15)
Vane 50 x 150	80 (4.8)	120 (7.2)	40 (2.4)	60 (3.6)
Vane 50 x 250	30 (1.8)	50 (3)	15 (0.9)	25 (1.5)
Vane 98 x 98	100 (60)	150 (9)	50 (3)	75 (4.5)
Vane 98 x 150	30 (1.8)	50 (3)	15 (0.9)	25 (15)
Vane 98 x 250	20 (1.2)	30 (1.8)	15 (0.9)	15 (0.9)
Hinged vane 98 x 200 b=37 double sided	70 (4.2)	100 (60)	35 (2.16)	50 (3)
Hinged vane 98 x 200 b=28 double sided	100 (60)	150 (9)	50 (3)	75 (4.5)
Hinged vane 98 x 100 b=37 single sided	200 (12)	300 (18)	100 (60)	150 (9)
Hinged vane 98 x 100 b=28 single sided	300 (18)	500 (30)	150 (9)	250 (15)

The above mentioned data is a guideline and is for loose, non compacted material.

During the filling the bulk density can change (e. g. for fluidised material).

*For versions with option 26 (heating of housing) the above mentioned data must be multiplied by 1.5.

Maintenance

Opening the lid (cover)



Before opening the lid for maintenance reasons observe following items:

- Do not remove the lid while circuits are live.
- No dust deposits or whirlings are present.
- No rain can enter into the housing.

Frequent check of the unit



To ensure durable safety in hazardous locations and with electrical safety, following items must be checked frequently depending on the application:

- Mechanical damage or corrosion of any components (housing side and sensor side) and of the field wiring cables.
- Tight sealing of the process connection, cable glands and enclosure lid..
- Properly connected external PE cable (if present).

Cleaning



If cleaning is required by the application, following must be observed:

- Cleaning agent must comply with the materials of the unit (chemical resistance). Mainly the shaft sealing, lid sealing, cable gland and the surface of the unit must be considered.



The cleaning process must be done in a way, that:

- The cleaning agent cannot enter into the unit through the shaft sealing, lid sealing or cable gland.
- No mechanical damage of the shaft sealing, lid sealing, cable gland or other parts can happen.

Units with EHEDG certification, which are used in the respective EHEDG applications, must be cleaned dry only (Type ED). Furthermore the respective regulations must be observed.

A possible accumulation of dust on the unit does not increase the maximum surface temperature and must therefore not be removed for purposes of maintaining the surface temperature in hazardous locations.

Function test



A frequent function test may be required depending on the application.

- Observe all relevant safety precautions related with a safe work depending on the application (e.g. hazardous locations, hazardous bulk material, electrical safety, process pressure).

This test does not proof if the sensor is sensitive enough to measure the material of the application.



Function test is done by stopping the rotating paddle with appropriate means and monitor if a correct change of the signal output from uncovered to covered happens.

Production date

The production date can be traced by the serial number on the typeplate. Please contact the manufacturer or your local distributor.

Spare parts

All available spare parts are stated in the selection list.

Repair of flamepath

Repair of flamepath on units with Ex d, Ex de or XP approvals is not intended.
Please contact manufacturer.

Notes for use in Hazardous Locations

Zone classification

	Useable in zone	ATEX Category	IEC-Ex/ INMETRO Equipement Protection Level (EPL)	
Dust applications	20, 21, 22	1 D	Da	*) in case of conductive dust additional requirements for the installation are necessary.
	21, 22	2 D	Db	
	22	3 D *	Dc	
Gas applications	0, 1, 2	1 G	Ga	*) in case of conductive dust additional requirements for the installation are necessary.
	1, 2	2 G	Gb	
	2	3 G	Gc	

General Notes

Marking

Devices with Ex approval are marked on name plate.

Process pressure

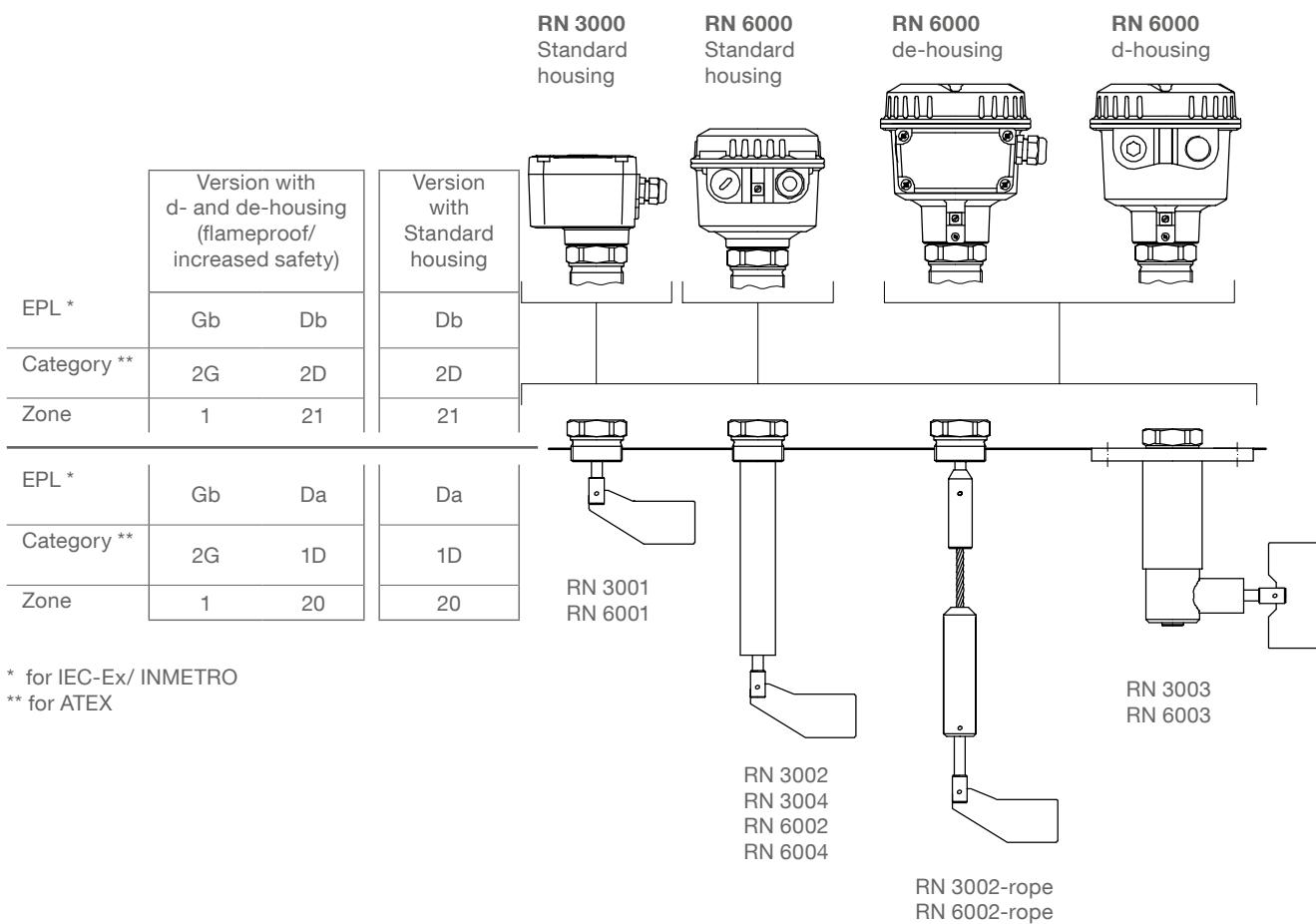


The device construction allows process over-pressure up to 0.8/ 5/ 10 bar (11.6/ 73/ 145 psi) (see name plate). These pressures are allowed for test purposes. The definition of the Ex approvals are only valid for a container-over-pressure between -0.2 .. +0.1 bar (-2.9 .. +1.45 psi). For higher or lower pressures the approvals are not valid.

Process and ambient temperature

The permitted temperature ranges are marked on the name plate.

Permitted zones for mounting in partition wall



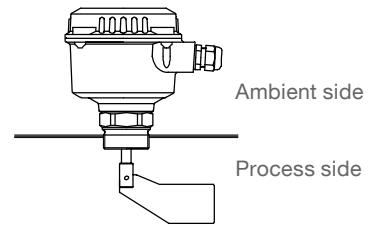
Notes for use in Hazardous Locations

Max. Surface Temperature and Temperature Code

The temperature marking on the name plate refers to the instruction manual.
 In the following tables the relevant temperature ratings are shown.

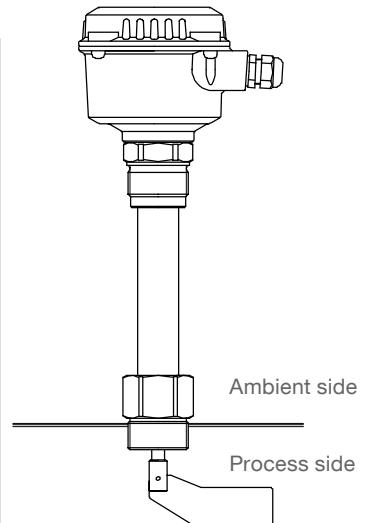
The maximum surface temperature (resp. temperature class) is the warmest temperature of the unit which could occur during malfunction (according to Ex-definition).

Enclosure directly mounted to the process connection				
Max. ambient temperature*	Max. process temperature	Max. surface temperature	Temperature class (Division system)	Temperature class (Zone system)
30°C (86°F)	50°C (122°F)	90°C (194°F) 120°C (248°F) ⁽¹⁾	T5 T4A ⁽¹⁾	T5 T4 ⁽¹⁾
40°C (104°F)	60°C (140°F)	100°C (212°F) 120°C (248°F) ⁽¹⁾	T5 T4A ⁽¹⁾	T4
50°C (122°F)	70°C (158°F)	110°C (230°F) 120°C (248°F) ⁽¹⁾	T4A	T4
RN 3000: 60°C (140°F) RN 6000: 50°C (122°F)	80°C (176°F)	120°C (248°F)	T4A	T4



* Ambient temperature derating see page 12

Enclosure mounted offset to the process connection				
Max. ambient temperature	Max. process temperature	Max. surface temperature	Temperature class (Division system)	Temperature class (Zone system)
RN 3000: 60°C (140°F) RN 6000: 50°C (122°F)	90°C (194°F)	120°C (248°F)	T4A	T4
	100°C (212°F)	120°C (248°F)	T4A	T4
	110°C (230°F)	120°C (248°F)	T4A	T4
	120°C (248°F)	120°C (248°F)	T4A	T4
	130°C (266°F)	130°C (266°F)	T4	T4
	140°C (284°F)	140°C (284°F)	T3C	T3
	150°C (302°F)	150°C (302°F)	T3C	T3
	160°C (320°F)	160°C (320°F)	T3C	T3
	170°C (338°F)	170°C (338°F)	T3A	T3
	180°C (356°F)	180°C (356°F)	T3A	T3
	190°C (374°F)	190°C (374°F)	T3	T3
	200°C (392°F)	200°C (392°F)	T3	T2
	210°C (410°F)	210°C (410°F)	T2D	T2
	220°C (428°F)	220°C (428°F)	T2C	T2
	230°C (446°F)	230°C (446°F)	T2C	T2
	240°C (464°F)	240°C (464°F)	T2B	T2
	250°C (482°F)	250°C (482°F)	T2B	T2



⁽¹⁾ With use of electronic "Universal voltage"

Disposal

The product consists of materials which can be recycled, details of the used materials see chapter "Technical data - mechanical data". Recycling must be done by a specialised recycling company.
Since the product is not subject to the WEEE directive 2002/96/EG, it is not permitted to bring it to a public recycling station.

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Disposal	20

Subject to technical change

We assume no liability for typing errors.

All dimensions in mm (inches).

Different variations than specified are possible.
Please contact our technical consultants.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning must be carried out only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.

Special attention must be paid to warnings and notes as follows:

WARNING



Relates to a caution symbol on the product: A failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.

WARNING



Relates to a caution symbol on the product: Risk of electric shock

WARNING



A failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product	Description
	CAUTION: refer to accompanying documents (manual) for details.
	Earth (ground) Terminal
	Protective Conductor Terminal

Technical support

Please contact your local supplier (address details at www.uwt.de). Otherwise please contact:

UWT GmbH
Westendstr. 5
87488 Betzigau
Germany

Tel. 0049-(0)831/ 57123-0
Fax. 0049-(0)831/ 76879
info@uwt.de
www.uwt.de

Introduction

Applications

The ROTONIVO is an electromechanical Level limit switch and is used for level monitoring of bulk goods.

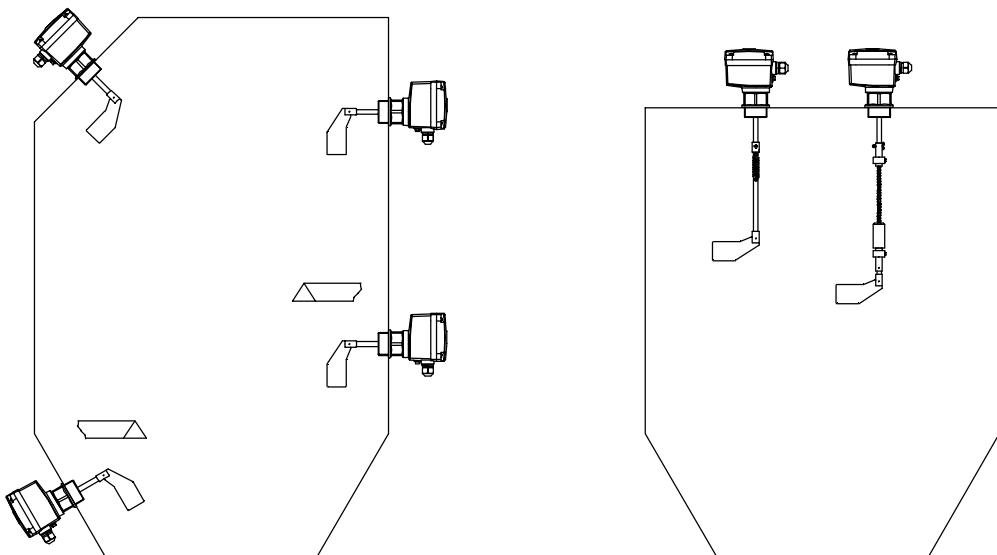
The units can be delivered with Ex-approvals for use in Hazardous Areas.

Selected applications:

- **building materials industry**
lime, styrofoam, moulding sand, etc.
- **plastics industry**
plastics granules etc.
- **timber industry**
- **chemical industry**
- **mechanical engineering**

The ROTONIVO is normally screwed into the lateral container wall so that it is level with the filling height to be registered and monitored.

The device can also be mounted from the top of the container. In this case an extension piece is used to mount the probe level with the height to be registered (full detector).



Function

A measuring vane is driven by a synchronous motor. The bearing of the motor inside the housing allows it to swing. The motor is fixed to a switching lug.

If the vane is uncovered, a spring pulls the motor and switching lug to the left position (figure 1).

When material covers the vane and thus stops the rotation, the motor and switching lug swings to the right position (figure 2). The signal output indicates "covered" and the motor is stopped.

When the vane becomes uncovered due to falling material, the spring pulls the motor and switching lug back to the left position (figure 1). The motor is started and the signal output indicates "uncovered".

Signal output delay

The version "universal voltage" and "PNP" has an integrated adjustable delay for the signal output.

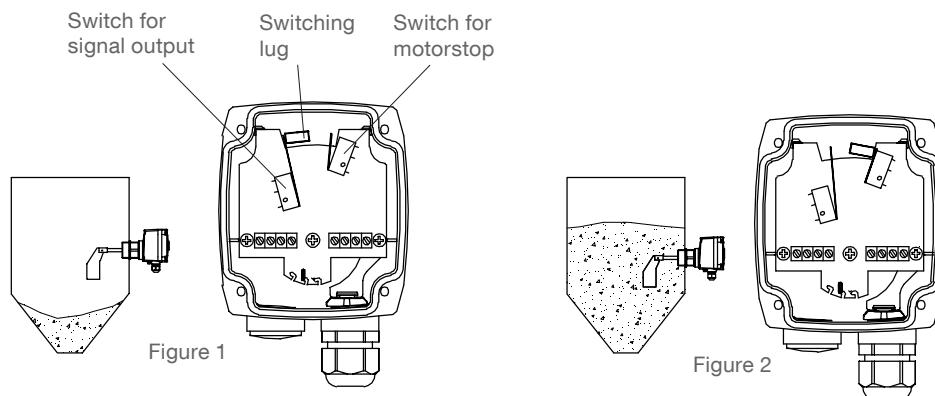
Option fail safe alarm

With the fail safe alarm it is possible to recognize a fault of the unit in time and to initiate an alarm relay. The following faults are observed:

- Motor
- Gear
- Electronic for motor power supply
- Supply voltage failure
- Defect of the connecting wires

Switchable signal output (Fail safe high/ low)

With version "Universal voltage" and "PNP" a switchable signal output FSH/ FSL is integrated.

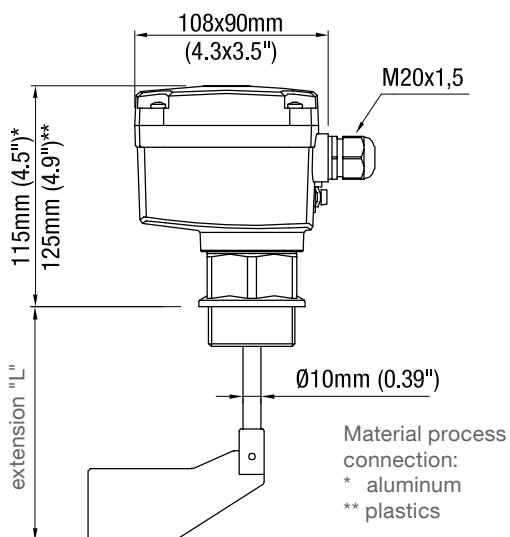


Electronics		Signal output				
Supply		SPDT (1)	PNP	FSH/ FSL ⁽²⁾	Adjust. delay	Fail safe alarm
AC version	24 V or 48 V or 115 V or 230 V AC	•	-	-	-	-
DC version	24 V DC	•	-	-	-	-
DC version	24 V DC PNP	-	•	•	•	-
Universal voltage	24V DC/ 22 .. 230 V AC	•	-	•	•	option

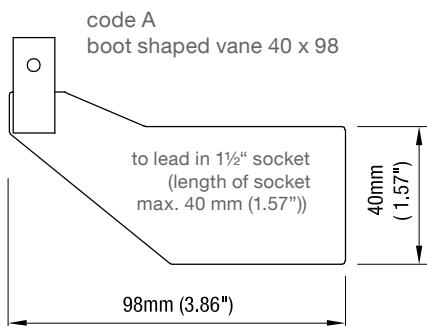
⁽¹⁾ Micro switch, Relais for universal voltage

⁽²⁾ Switchable signal output (Fail safe high/ low)

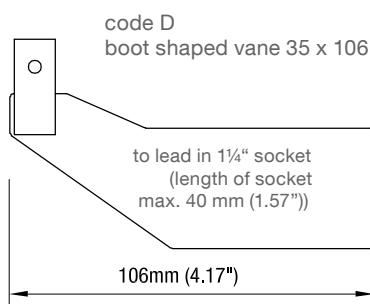
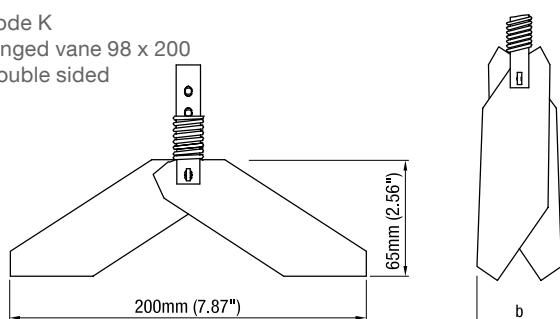
Technical Data



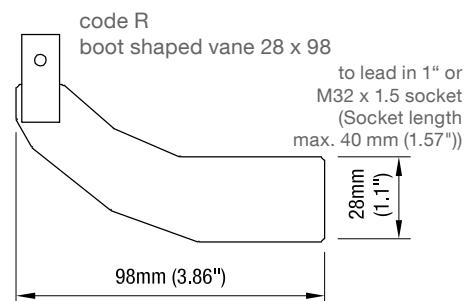
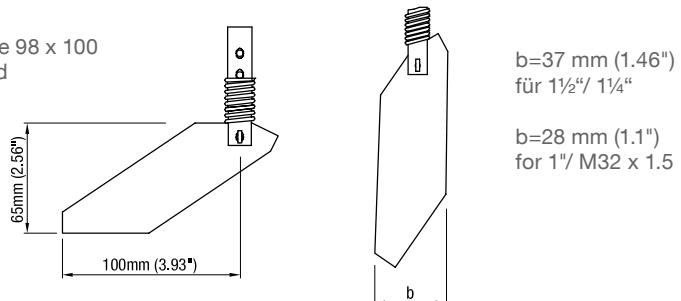
Measuring vanes



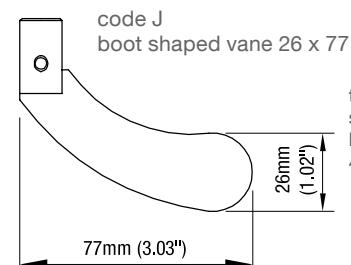
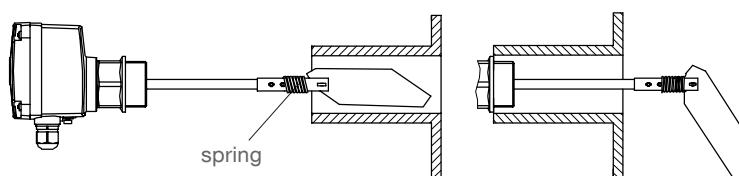
code K
 hinged vane 98 x 200
 double sided



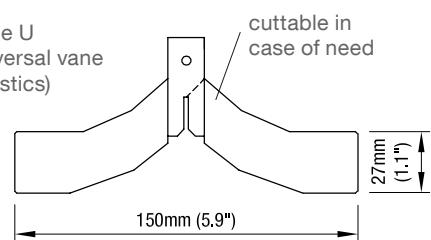
code S
 hinged vane 98 x 100
 single sided



Insertion of the hinged vane through a long socket



code U
 universal vane
 (plastics)



Technical Data

Electrical data

Connection terminals	max. 1.5 mm ² (AWG 16)
Cable entry	M20 x 1.5 screwed cable gland Clamping range (diameter) of the factory provided cable glands: M20 x 1.5: 6 .. 12 mm (0.24 .. 0.47")
Protection class	I III (Version 24V DC PNP)
Overvoltage category	II
Pollution degree	2 (inside housing)
Power supply	see page 14
Installed load	see page 14
Signal and alarm output	see page 14
Isolation	Power to signal and alarm output: 2,225 Vrms
Indicating light	By built-in LED (not with AC version)

Mechanical data

Housing	Plastics PA6 GF, RAL 5010 gentian blue Seal between housing and lid: NBR Seal between housing and process connection: NBR Nameplate: polyester film
Degree of protection	IP66 (IEC/EN/NBR 60529)
Process connection	Aluminium or plastics PA6 GF Thread: Metric or G (DIN 228) according to selection
Vane shaft and measuring vane	Material: stainless steel 1.4301 (304)/ 1.4305 (303), Universal vane in plastics PP
Tolerance length "L"	±10 mm (±0.39")
Bearing	Process connection aluminium: ball bearing, dust tight Process connection plastics: slide bearing (maintenance-free, high-quality)
Sealing	Radial rotary shaft sealing. Material: NBR (Acrylnitril-Butadien-rubber)
Friction clutch	Protects the gear unit against impacts of the measuring vane
Speed of measuring vane	1 rotation or 5 rotations per minute
Sound level	max. 50 dBA

Technical Data

Operating conditions

Ambient temp. (housing)	-20 .. +60°C (-4 .. +140°F) -40 .. +60°C (-40 .. +140°F) Version with heating of housing (pos.26)		
Process temperature	-20 .. +80°C (-4 .. +176°F) -40 .. +80°C (-40 .. +176°F) Version with heating of housing (pos.26)		
Ventilation	Ventilation is not required		
Min. powder density/ Sensitivity	see section "Sensitivity" on page 17		
Signal delay	Version Sensor free -> covered* Sensor covered -> free	AC, DC, Multivoltage ca. 1.3 sec ca. 0.2 sec	Universal voltage ca. 1.5 sec + 0 .. 20 sec adjustable ca. 0.2 sec + 0 .. 60 sec adjustable
*after blocking of the measuring vane			
Features of bulk material	Hardly any limitations		
Max. permitted mechanical torque (lateral)	Process connection aluminium: Process connection plastics:	max. 50 Nm max. 25 Nm	Protective measures in case of high loading: mounting of an protective canopy above the probe.
Max. tractive force	Pendulum shaft: Rope extension:	400 N (applicable only as full detector) 1.5 kN (applicable only as full detector)	
Max. process pressure	-0.9 .. +0.8 bar (-13.1 .. +11.6 psi) Versions with Ex-approvals: see remarks on page 19.		
Vibration	1.5 (m/s ²) ² /Hz according to EN 60068-2-64		
Relative Humidity	0 - 100%, suitable for outdoor use		
Altitude	max. 2,000 m (6,562 ft)		
Expected product lifetime	Following parameters have a negative influence on the expected product lifetime: High ambient- and process temperature, corrosive environment, high vibration, high flow rate of abrasive bulk material passing the sensor element, high amount of measurement cycles.		

Transport and Storage

Transport	Observe the instructions as stated on the transport packaging, otherwise the products may get damaged. Transport temperature: -40 .. +80°C (-40 .. +176°F) Transport humidity: 20 .. 85% Transport incoming inspections must be carried out to check for possible transport damage.
Storage	Products must be stored at a dry and clean place. They must be protected from influence of corrosive environment, vibration and exposure to direct sunlight. Storage temperature: -40 .. +80°C (-40 .. +176°F) Storage humidity: 20 .. 85%

Approvals

Non-hazardous Locations	CE TR-CU	EN 61010-1 (IEC/CB)		
Hazardous Locations *	ATEX IEC-Ex TR-CU INMETRO	Dust explosion Dust explosion Dust explosion Dust explosion	ATEX II 1/2 D Ex t IIIC T! Da/Db IP6X IEC-Ex t IIIC T! Da/Db IP6X DIP A20/A21 Ex t IIIC T! Da/Db IP6X	
EMC	EN 61326 - A1			
RoHS conform	According to directive 2011/65/EU			
Pressure Equipment Directive (2014/68/EU)	<p>The units are not subject to this directive, because they are classified as „pressure-keeping equipment“ and do not have a pressurized housing (see Art.1, clause 2.1.4). The units are designed and manufactured in accordance to the Pressure Equipment Directive.</p> <p>The unit is NOT intended for use as a "equipment part with safety function" (Art.1, clause 2.1.3). If the units should be used as "equipment part with safety function", please contact the manufacturer.</p>			



* Depending on selected version

Options

Weather protection cover

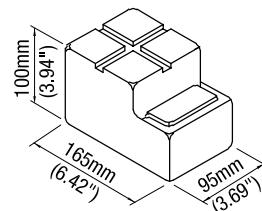
If the measuring device is used outdoors, the use of the weather-protection-cover is recommended. It protects the device from all atmospheric influences such as:

- rain water
- condensation water
- excessively high temperatures due to insolation
- excessively low temperatures in winter

Material: PE, weather and temperature stable

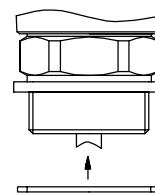


For use in Hazardous Locations:
 only permitted for zone 22



Flat gasket

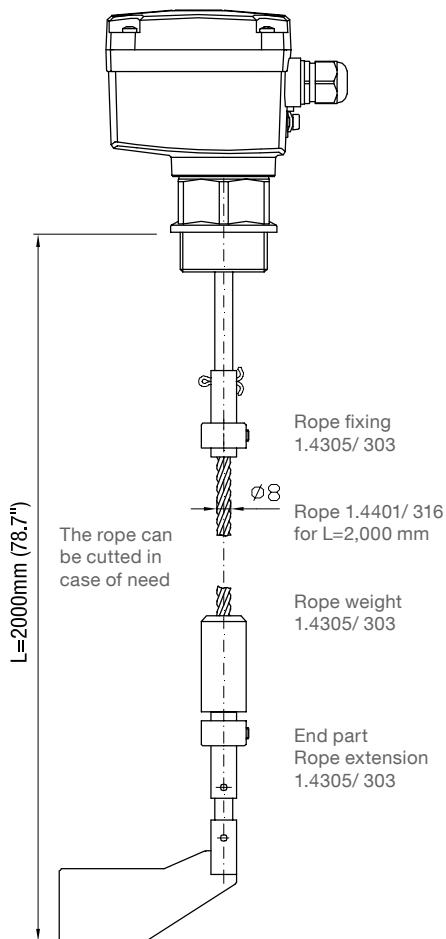
On the face sealing of the process connection thread.
 Incl. sealing face for version with process connection
 G 1½" thread aluminium.



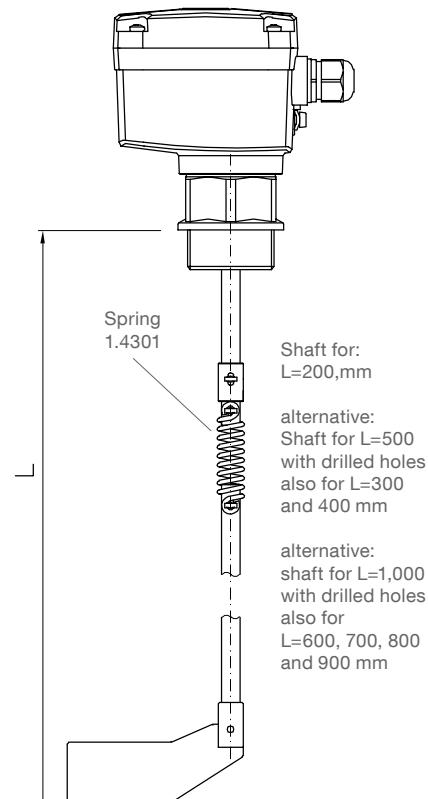
Extensions

(Kits, application only as full detector)

Rope extension



Pendulum shaft



Mounting

! General Safety Instructions

Process pressure	Improper installation may result in loss of process pressure.
Chemical resistance against the medium	Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.
Mechanical load	The torque at the fastening spot must not exceed the specified ratings. See page 7 for details.
Mounting location	Keep away from incoming material and from silo walls. The installation has to be carried out, that the sensor elements cannot hit the wall of the silo. The flow of the medium and fixtures in the container must be considered.

! Additional Safety Instructions for Hazardous Locations

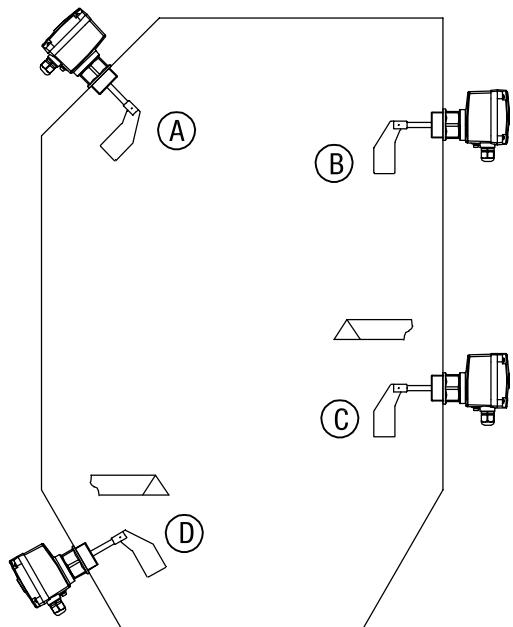
Installation regulations	For devices to be used in Hazardous Locations the respective valid installation regulations must be observed.
---------------------------------	---

Mounting instructions

Rotatable housing	The housing can be rotated against the threaded connection after mounting.
Direction of the cable glands	When the unit is mounted from the side, ensure, that the cable glands face downwards and are closed to avoid water penetration into the housing.
Sealing	Seal the process connection thread with Teflon tape or a flat gasket against process pressure.
Precaution for later dismounting	Use teflon tape to avoid seizing of aluminium process connection thread with the socket

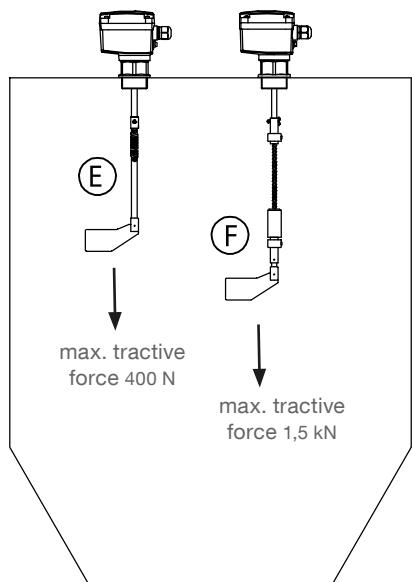
Mounting/Electrical Installation

Mounting



- A Full detector vertical and oblique from the top
- B Full detector horizontal
- C Demand or empty detector horizontal
Protective angle recommended, depending on load
- D Empty detector oblique from the bottom
Protective angle recommended, depending on load

Horizontal mounting (except full detector) : Boot shaped vane recommended (min. mech. load, because the vane aligns to the movement of the material).



- E With pendulum shaft: Full detector vertical from the top
Observe max. tractive force.
- F With rope extension: Full detector vertical from the top
Observe max. tractive force.

Electrical Installation

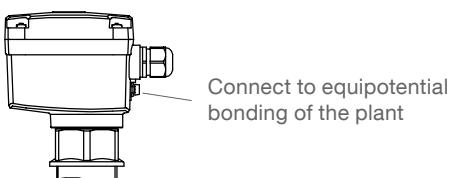
! General Safety Instructions

Handling	In the case of improper handling or handling malpractice, the electric safety of the device cannot be guaranteed.
Installation regulations	The local regulations or VDE 0100 (Regulations of German Electrotechnical Engineers) must be observed. With use of 24 V supply voltage, an approved power supply with reinforced isolation to mains is required
Fuse	Use a fuse as stated in the connection diagrams (see pages 14).
RCCB protection	In the case of a fault, the supply voltage must be automatically switched off by a RCCB protection switch to protect against indirect contact with dangerous voltages.
Power supply switch	A voltage disconnection switch must be provided near the device.
Wiring diagram	The electrical connections are made in accordance with the wiring diagram.
Supply voltage	Compare the supply voltage applied with the specifications given on the electronic module and name plate before switching the device on.
Cable gland	The screwed cable gland and closing element must have following specifications: Ingress protection IP66, temperature range from -40°C to +70°C, UL or VDE or INMETRO certified (depending on the country where the unit is installed), pull relief. Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion). Cable glands that are not used have to be sealed with a blanking element.
Field wiring cables	<ul style="list-style-type: none"> • The diameter has to match to the clamping range of the used cable gland. • The cross section has to match with the clamping range of the connection terminals and consider the max. current. • All field wirings must have insulation suitable for at least 250 V AC. • The temperature rating must be at least 90°C (194°F). • If higher immunity interferences as specified in the stated EMC standards are present (see chapter approval), a shielded cable is required, otherwise an unshielded instrumentation cable is satisfactory.
Guiding the cables in the terminal box	Cut the field wiring cables to appropriate length to fit properly into the terminal box.
Microswitch protection	Provide protection for microswitch contacts to protect the device against inductive load surges.
Protection against static charging	The housing of the unit must be grounded to avoid static charging of the unit. This is particularly important for applications with pneumatic conveying and non-metallic containers.

Electrical installation

! Additional Safety Instructions for Hazardous Locations

External equipotential bonding terminal



Field wiring A strain relief must be provided for the field wiring cables, when the device is installed with the factory provided cable glands.

Cable glands for ATEX/ IEC-Ex/ INMETRO/ TR-CU Installation according to the regulations of the country, where the product is installed.
 Not used entries have to be closed with blanking elements certified for this purpose.

Where applicable the factory provided parts must be used.

A strain relief must be provided for the field wiring cables, when the device is installed with the factory provided cable glands.

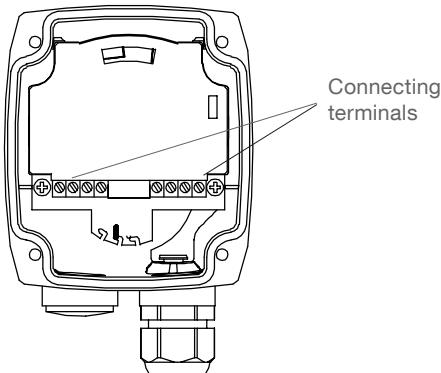
The diameter of the field wiring cable must match to the clamping range of the cable clamp.

If other than the factory provided parts are used, following must be ensured:
 The parts must have an approval adequate to the approval of the level sensor (certificate and type of protection).
 The approved temperature range must be from the min. ambient temperature of the level sensor to the max. ambient temperature of the level sensor increased by 10 K.
 The parts must be mounted according to the instructions of the supplier.

Commissioning Commissioning only with closed lid.

Opening the lid Before opening the lid take care, that no dust deposits or whirlings are present.
 Do not remove the lid (cover) while circuits are alive.

Connection



Electrical installation

Version:

- AC
- DC
- Universal voltage

Power supply:

• AC version:

24 V or 48 V or 115 V or 230 V 50/ 60 Hz max. 4 VA

All voltages $\pm 10\%$ ⁽¹⁾

Supply voltage as selected.

External fuse: max. 10 A, fast or slow, HBC, 250 V

• DC version:

24 V DC $\pm 15\%$ ⁽¹⁾ max. 2.5 W

External fuse: not required

• Universal voltage:

24 V DC $\pm 15\%$ ⁽¹⁾ max. 4 W

22 .. 230 V 50/ 60 Hz $\pm 10\%$ ⁽¹⁾ max. 10 VA

External fuse: not required

⁽¹⁾ including $\pm 10\%$ of EN 61010

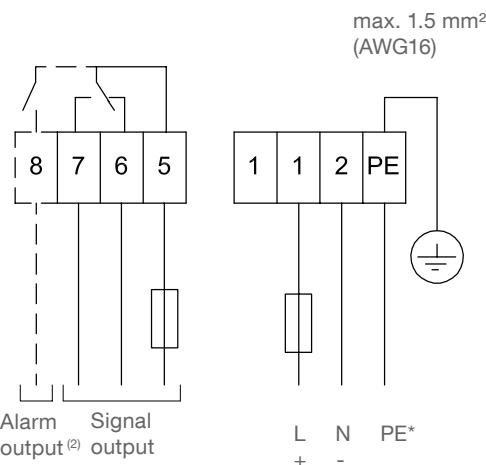
Signal and alarm output:

Micro switch or relay, SPDT contact

max. 250 V AC, 2 A, 500 VA ($\cos \varphi = 1$)

max. 300 V DC, 2 A, 60 W

External fuse: max. 10 A, fast or slow, HBC, 250 V



⁽²⁾ With option Fail safe alarm (rotation control)
 Contact open when de-energised

Version:

- PNP

Power supply:

24 V DC $\pm 15\%$ ⁽¹⁾

⁽¹⁾ including $\pm 10\%$ of EN 61010

Input current: max. 0.6 A

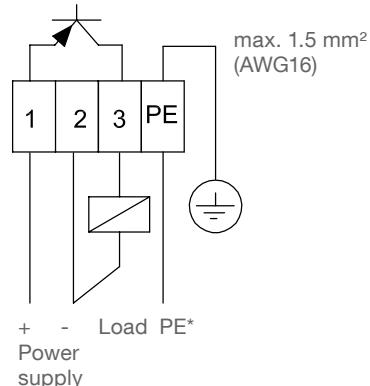
Signal output:

Load max. 0.4 A

Output voltage equal to input voltage, drop <2.5 V

Open collector

Protected against short circuit and overload



* Protection against static charge:

- ! The PE terminal of the unit must be grounded to avoid static charging of the unit.
 This is particularly important for applications with pneumatic conveying.

Signal and alarm output

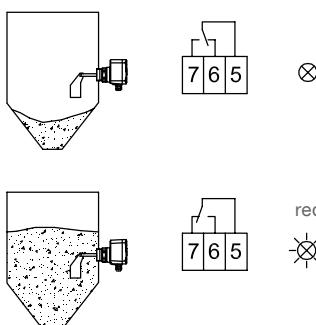
Overview

Overview of signal and alarm output for the different electronics versions: see page 4

Signal output: Switching logic

Versions

- AC
- DC



Versions

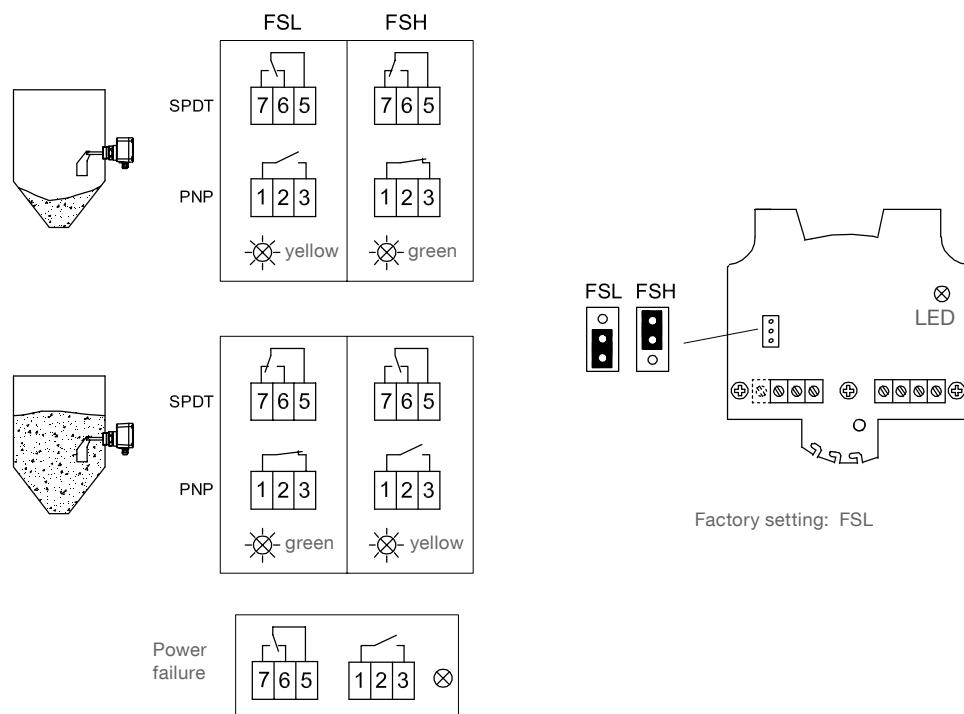
- PNP
- Universal voltage

FSH: Set in case of using the sensor as a full detector.

Power failure or line break is regarded as „full“ signal (protection against overfilling).

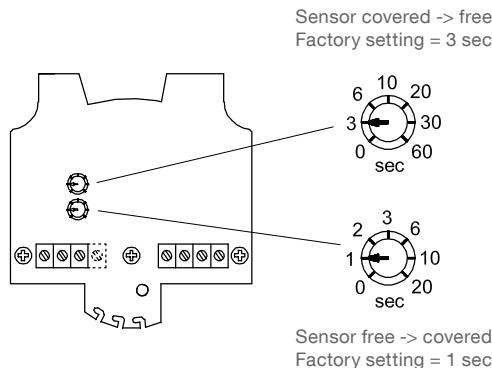
FSL: Set in case of using the sensor as an empty detector.

Power failure or line break is regarded as „empty“ signal (protection against running dry).



Signal and alarm output

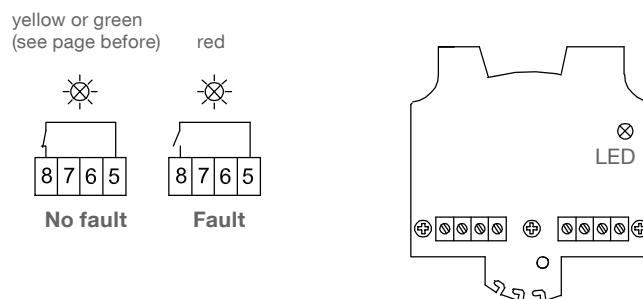
Signal output: Delay



Alarm output (Fail safe alarm)

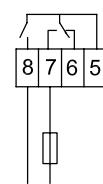
Switching and timing behaviour:

If the sensor is not covered, the rotating paddle shaft will send pulses at 20 sec intervals. In case of fault, the pulses are missed. After 30 sec the alarm relay will open.



Connection example:

Full detector with maximum safety:
 The output signal opens in case of:
 • full signal or
 • failure of supply voltage or
 • defect of the connection wires or
 • defective unit



Signal output

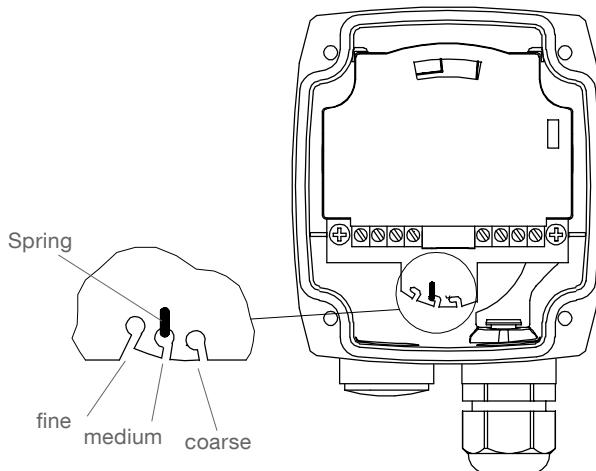
Settings: Sensitivity

Adjustment of the spring

The spring is adjustable in 3 positions. It should be changed only if necessary.

- „Fine“: for light material
- „Medium“: suitable for nearly every material (factory setting)
- „Coarse“: for very sticky material

The spring can be changed via a small plier.



Sensitivity

The table shows approximate values for the minimum densities, at which a normal function should be possible.

Vane	*Minimum density in g/l = kg/m³ (lb/ft³) (without guarantee)			
	Vane completely covered with bulk material		Bulk material covers vane up to 100 mm (3.93")	
	Spring adjustment		Spring adjustment	
	fine	medium (Factory setting)	fine	medium (Factory setting)
Boot shaped vane 40 x 98	200 (12)	300 (18)	100 (60)	150 (9)
Boot shaped vane 35 x 106	200 (12)	300 (18)	100 (60)	150 (9)
Boot shaped vane 28 x 98	300 (18)	500 (30)	150 (9)	200 (12)
Boot shaped vane 26 x 77	350 (21)	560 (33)	200 (12)	250 (15)
Hinged vane 98 x 200 b=37 double sided	70 (4.2)	100 (60)	35 (2.16)	50 (3)
Hinged vane 98 x 200 b=28 double sided	100 (60)	150 (9)	50 (3)	75 (4.5)
Hinged vane 98 x 100 b=37 single sided	200 (12)	300 (18)	100 (60)	150 (9)
Hinged vane 98 x 100 b=28 single sided	300 (18)	500 (30)	150 (9)	250 (15)

The above mentioned data is a guideline and is for loose, non compacted material.

During the filling the bulk density can change (e. g. for fluidised material).

*For versions with option 26 (heating of housing) the above mentioned data must be multiplied by 1.5.

Maintenance

Opening the lid (cover)	<p>! Before opening the lid for maintenance reasons observe following items:</p> <ul style="list-style-type: none">• Do not remove the lid while circuits are alive.• No dust deposits or whirlings are present.• No rain can enter into the housing.
Frequent check of the unit	<p>! To ensure durable safety in hazardous locations and with electrical safety, following items must be checked frequently depending on the application:</p> <ul style="list-style-type: none">• Mechanical damage or corrosion of any components (housing side and sensor side) and of the field wiring cables.• Tight sealing of the process connection, cable glands and enclosure lid.• Properly connected external PE cable (if present).
Cleaning	<p>! If cleaning is required by the application, following must be observed:</p> <ul style="list-style-type: none">• Cleaning agent must comply with the materials of the unit (chemical resistance). Mainly the shaft sealing, lid sealing, cable gland and the surface of the unit must be considered. <p>! The cleaning process must be done in a way, that:</p> <ul style="list-style-type: none">• The cleaning agent cannot enter into the unit through the shaft sealing, lid sealing or cable gland.• No mechanical damage of the shaft sealing, lid sealing, cable gland or other parts can happen. <p>A possible accumulation of dust on the unit does not increase the maximum surface temperature and must therefore not be removed for purposes of maintaining the surface temperature in hazardous locations.</p>
Function test	<p>A frequent function test may be required depending on the application.</p> <p>! Observe all relevant safety precautions related with a safe work depending on the application (e.g. hazardous locations, hazardous bulk material, electric safety, process pressure).</p> <p>! This test does not proof if the sensor is sensitive enough to measure the material of the application.</p> <p>! Function test is done by stopping the rotating paddle with appropriate means and monitor if a correct change of the signal output from uncovered to covered happens.</p>
Production date	The production date can be traced by the serial number on the typeplate. Please contact the manufacturer or your local distributor.
Spare parts	All available spare parts are stated in the selection list

Notes for use in Hazardous Locations

Zone classification

	Useable in zone	ATEX Category	IEC-Ex/ INMETRO Equipement Protection Level (EPL)
Dust applications	20, 21, 22	1 D	Da
	21, 22	2 D	Db
	22	3 D *	Dc

* in case of conductive dust additional requirements for the installation are necessary.

General Notes

Marking

Devices with Ex approval are marked on name plate.

Process pressure for ATEX/ IEC-Ex

! The device construction allows process over-pressure upto 0.8 bar (11.6 psi). These pressures are allowed for test purposes. The definition of the ATEX and IEC-Ex is only valid for a container-over-pressure between -0.2 .. +0.1 bar (-2.9 .. +1.45 psi). For higher or lower pressures the approval is not valid.

Process and ambient temperature

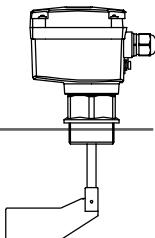
The permitted temperature ranges are marked on the name plate.

Permitted zones for mounting in partition wall

EPL*	Db
Category**	2D
Zone	21
EPL*	Da
Category**	1D
Zone	20

* For IEC-Ex/ INMETRO

** For ATEX

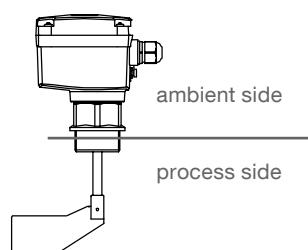


Max. Surface Temperature and Temperature Code

The temperature marking on the name plate refers to the instruction manual. In the following tables the relevant temperature ratings are shown.

The maximum surface temperature (resp. temperature class) is the warmest temperature of the unit which could occur during malfunction (according to Ex-definition).

Max. ambient temperature	Max. process temperature	Max. surface temperature	Temperature class
40°C (104°F)	60°C (140°F)	100°C (212°F) 120°C (248°F) ⁽¹⁾	T5 T4 ⁽¹⁾
50°C (122°F)	70°C (158°F)	110°C (230°F) 120°C (248°F) ⁽¹⁾	T4
60°C (140°F)	80°C (176°F)	120°C (248°F)	T4



⁽¹⁾ With use of electronic "Universal voltage"

Disposal

The product consists of materials which can be recycled, details of the used materials see chapter "Technical data - mechanical data".

Recycling must be done by a specialised recycling company.

Since the product is not subject to the WEEE directive 2002/96/EG, it is not permitted to bring it to a public recycling station.

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Subject to technical change and price
change.

We assume no liability for typing errors.

All dimensions in mm (inches).

Different variations to those specified are
possible.
Please contact our technical consultants.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning must be carried out only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.

Special attention must be paid to warnings and notes as follows:



WARNING

Relates to a caution symbol on the product and means, that a failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.



WARNING

Relates to a caution symbol on the product: Risk of electric shock



WARNING

Relates to a caution symbol on the product and means, that a failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product	Description
	CAUTION: refer to accompanying documents (manual) for details.
	Earth (ground) Terminal
	Protective Conductor Terminal

Technical support

Please contact your local supplier (see www.uwt.de for address). Otherwise you can contact:

UWT GmbH
Westendstr. 5
87488 Betzigau
Germany

Tel. 0049 (0)831 57123-0
Fax. 0049 (0)831 76879
info@uwt.de
www.uwt.de

Introduction

Applications

The device is used for level monitoring in all types of containers and silos.

It can be used with all powdery and granulated bulk materials that do not show a strong tendency to form crusts or deposits. Detection of solids in water is also possible.

The units can be delivered with a wide range of Ex-approvals for use in Gas and Dust Hazardous Areas.

A selection of fields of application:

- **Building materials industry**
lime, styrofoam, moulding sand, etc.
- **Food industry**
milk powder, flour, salt, etc.
- **Plastics industry**
plastics granules etc.
- **Timber industry**
- **Chemical industry**
- **Mechanical engineering**

The VIBRANIVO oscillating probe is normally screwed into the lateral container wall so that it is level with the filling height to be registered and monitored.

The device can also be mounted from the top of the container. In this case an extension piece is used to mount the probe level with the height to be registered.

The length of the probe can be up to 4 m (157") with an extension tube (VN ..030) or up to 20 m (787") with an extension rope (VN 2050/ 6050).

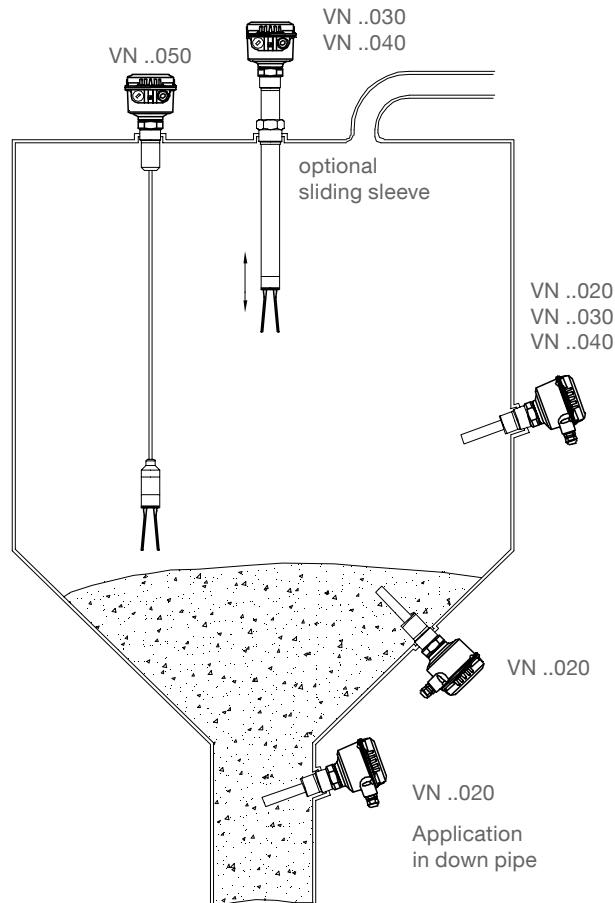
The use of a sliding sleeve is recommended so that the switch point can be changed easily during operation of the device.

Function

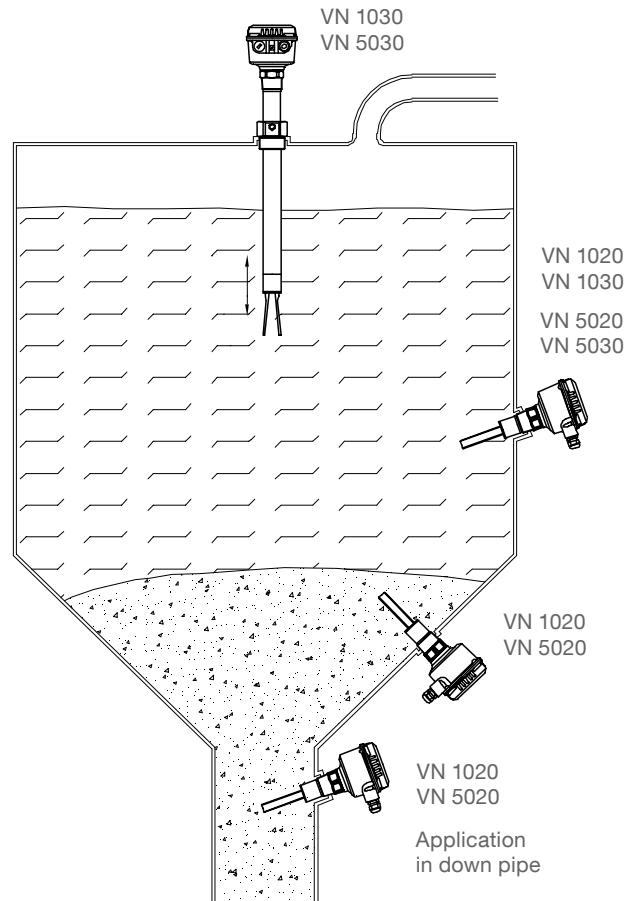
The piezo-electrically stimulated oscillating fork vibrates at its mechanical resonance frequency. If the probe is covered by the bulk material, the damping thus generated is registered electronically and a corresponding signal output is actuated.

The oscillation of the fork ensures a certain self-cleaning.

Detection of solids



Detection of solids in water

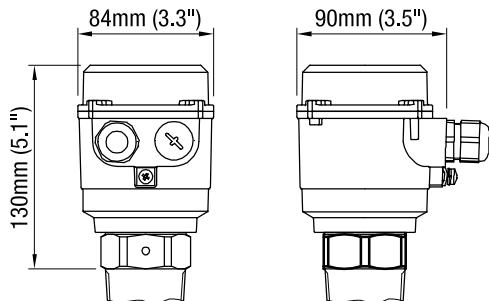


Technical data

Housing versions

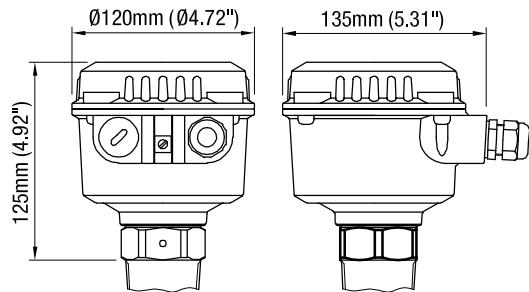
Series VN 1000/ 2000

Standard



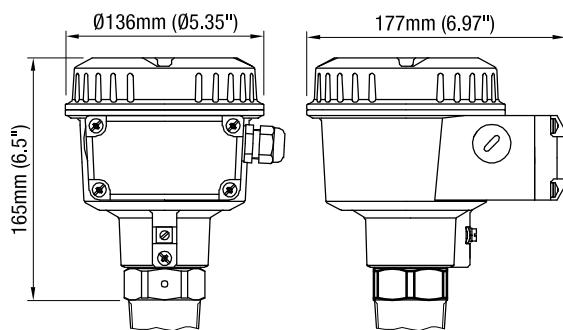
Series VN 5000/ 6000

Standard



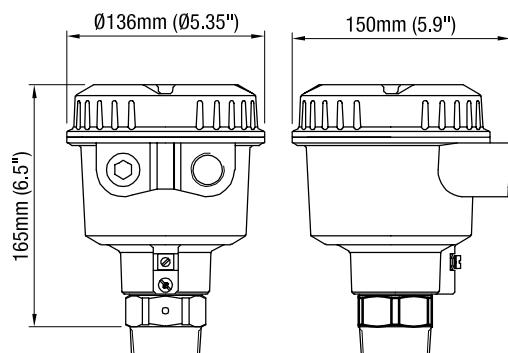
de

Explosionproof with increased safety terminal box



d

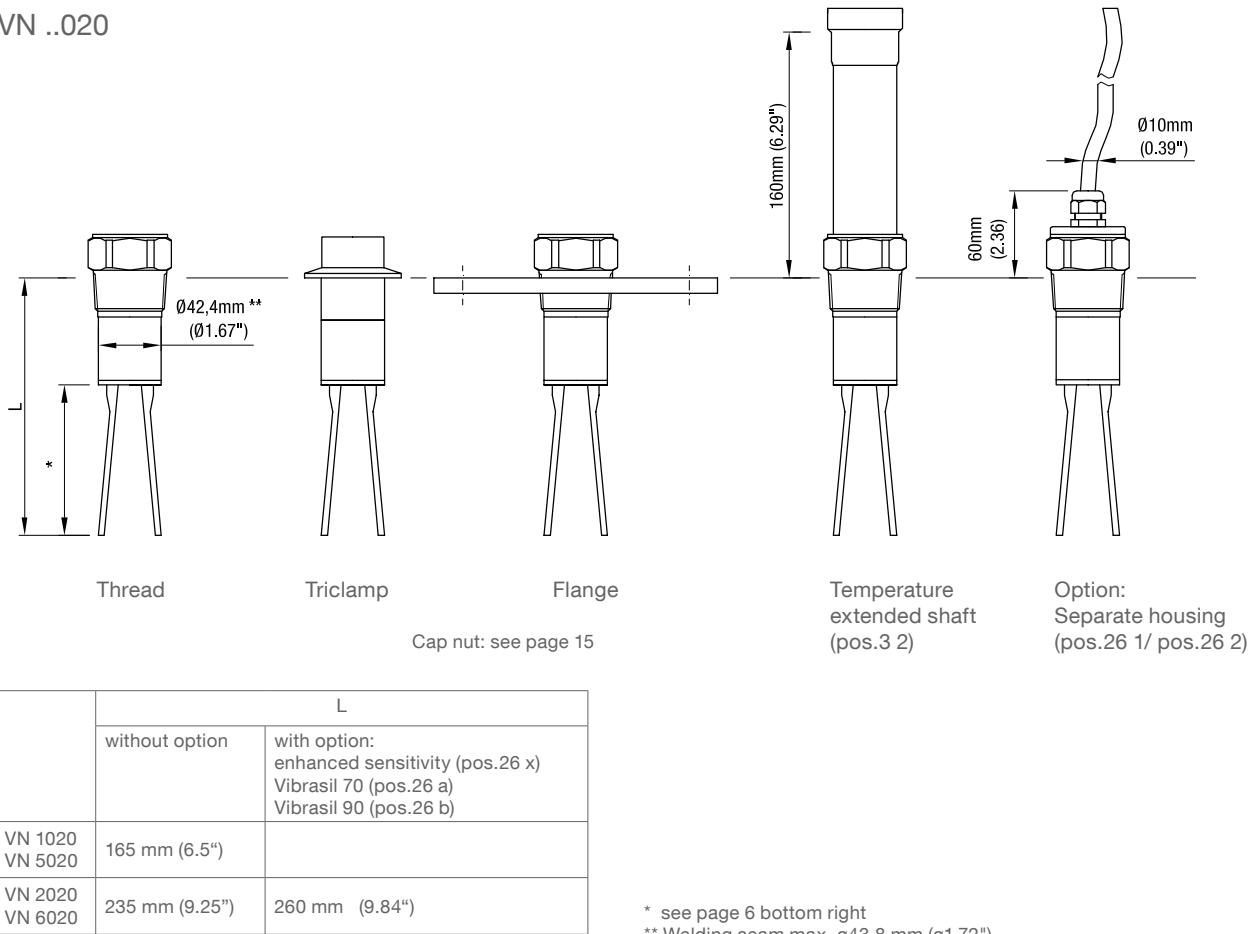
Flameproof/explosionproof



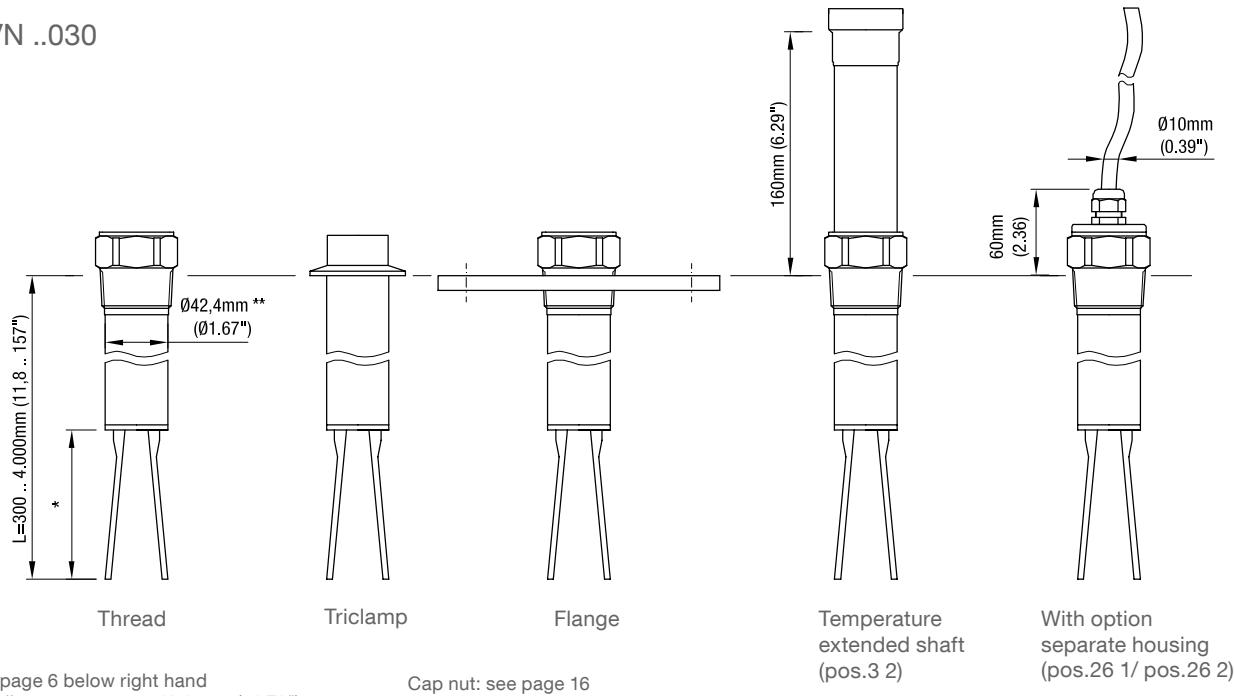
Technical Data

Extensions

VN ..020

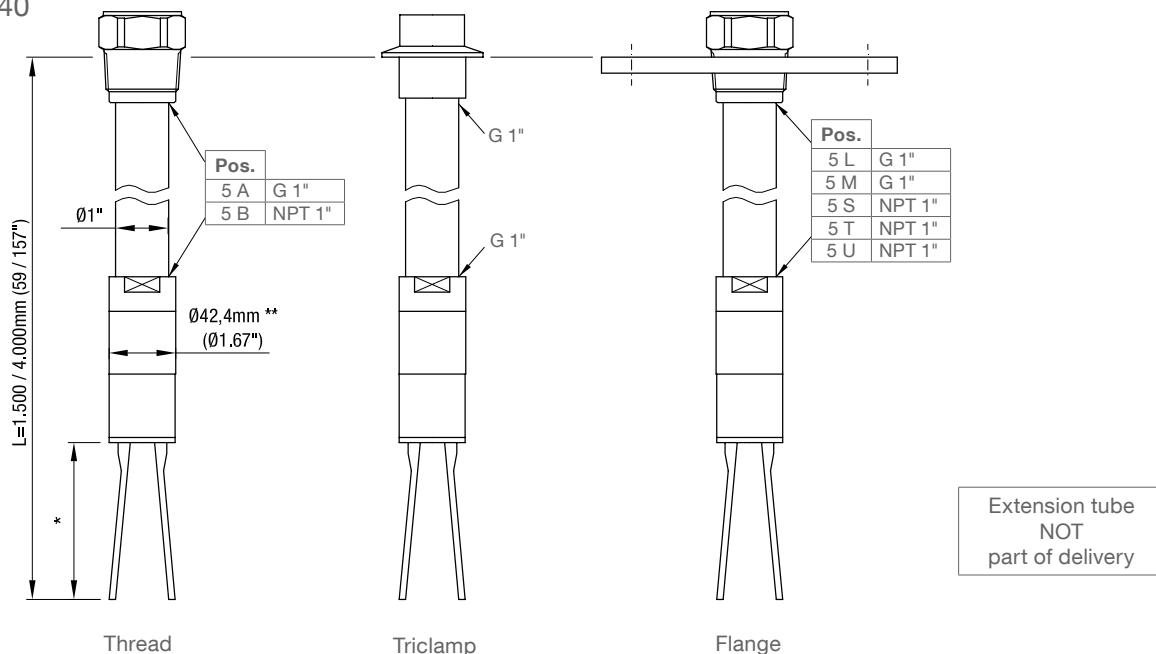


VN ..030



Technical data

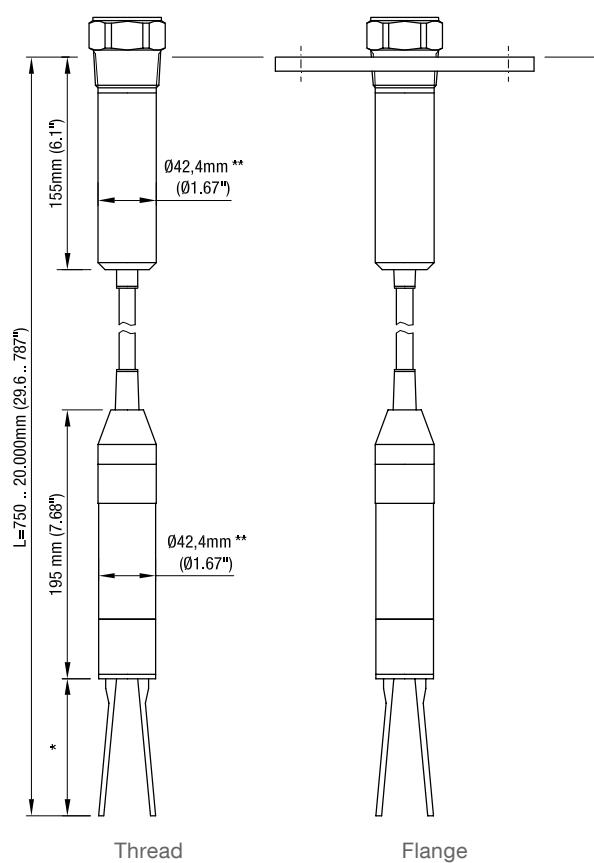
VN ..040



* see bottom right

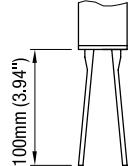
** Welding seam max. Ø 43,8 mm (Ø 1,72")

VN ..050

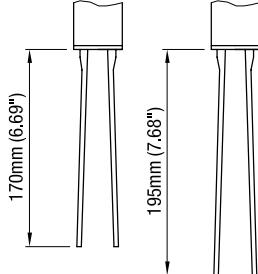


* Length of oscillating rods

VN 10..0
VN 50..0



VN 20..0
VN 60..0



with option
 Enhanced sensitivity (pos.26 x)
 Vibrasil® 70 (pos.26 a)
 Vibrasil® 90 (pos.26 b)

* see right

** Welding seam max. Ø 43,8 mm (Ø 1,72")

Technical data

Electrical data

Connection terminals	max. 4 mm ² (AWG 12)
Cable entry	M20 x 1.5 screwed cable gland NPT 1/2" conduit connection NPT 3/4" conduit connection (only VN 5000/ 6000) Clamping range (diameter) of the factory provided cable glands: M20 x 1.5: 6 .. 12 mm (0.24 .. 0.47")
Signal delay	Sensor free -> covered ca. 1 sec Sensor covered -> free ca. 1 .. 2 sec On the electronic module "Universal voltage Relay DPDT" is an electronic delay, adjustable up to 30 sec.
Safety operation (FSL,FSH)	Switchable for minimum or maximum safety
Sensitivity	Adjustable in 2 levels (A/ B)
Vibration frequency	VN 1000/ 5000: ca. 350 Hz VN 2000/ 6000: ca. 125 Hz ca. 90 Hz (enhanced sensitivity)
Installation category	II
Pollution degree	2 (inside housing)

Electronic modules	Universal voltage Relay SPDT (VN 1000/ 2000/ 5000/ 6000)	Universal voltage Relay DPDT (VN 1000/ 2000/ 5000/ 6000)	3-wire PNP (VN 1000/ 2000/ 5000/ 6000)
Power supply	19 .. 230 V AC 50 - 60 Hz 19 .. 55 V DC +10%	19 .. 230 V AC 50 - 60 Hz 19 .. 55 V (36 V*) DC +10% * Version with intrinsic safe connection between Electronic module and Vibrating fork (see pos.4 in the selection list)	18 .. 50 V DC +10%
Max. ripple of power supply	7 V _{ss} at DC	7 V _{ss} at DC	7 V _{ss}
Installed load	max. 8 VA/ 1.5 W	max. 18 VA/ 2 W	max. 1.5 W
Signal output	Floating relay SPDT VN 1000/ 2000: AC max. 253 V, 4 A, 500 VA at cos Phi = 1 DC max. 253 V, 4A, 60 W VN 5000/ 6000: AC max. 250 V, 8 A non inductive DC max. 30 V, 5 A non inductive	Floating relay DPDT VN 1000/ 2000: AC max. 253V, 4 A, 500 VA at cos Phi = 1 DC max. 253 V, 4 A, 60 W VN 5000/ 6000: AC max. 250 V, 8 A non inductive DC max. 30 V, 5 A non inductive	Open Collector: permanent load max. 0.4 A short-circuit and overload protected turn-on voltage: max. 50 V (reverse protection)
Intrinsic safe ratings	-	-	-
Indicating light	Status of signal output by built-in LED	Status of signal output by built-in LED	Status of signal output by built-in LED
Isolation	Power supply to signal output: 2225 Vrms	Power supply to signal output: 2225 Vrms Signal output to signal output (DPDT): 2225 Vrms	-
Protection class	I	I	III

Technical data

Electronic modules	2-wire without contact (VN 1000/ 2000/ 5000/ 6000)	NAMUR IEC 60947-5-6 (VN 2000/ 6000)	8/16 mA or 4-20 mA (VN 1000/ 2000/ 5000/ 6000)	8/16 mA (VN 1000/2000/ 5000/ 6000)
Power supply	19 .. 230 V 50/ 60 Hz/ DC +10%	ca. 7 .. 9 V DC (spec. IEC 60947-5-6)	Non intrinsic safe version: 12.5 .. 36 V DC +0% Intrinsic safe version: 12.5 .. 30V DC +0%	12.5 .. 36 V DC +0%
Max. ripple of power supply	7 V _{ss} at DC	-	-	-
Installed load	max. 1.5 VA/ 1 W	max. 30 mA (for non intrinsic safe application)	max. 0.8 W	max. 0.8 W
Signal output	Load current: min. 10 mA max. 500 mA permanent max. 2 A <200 ms max. 5 A <50 ms Voltage drop on the electronic module: max. 7 V with closed electric circuit. Cutoff current with open electric circuit: max. 5 mA.	<1 mA or >2.2 mA (spec. IEC 60947-5-6)	Setting 8/16 mA: 8 mA or 16 mA ±0.5 mA. Setting 4-20 mA: Output current depends on the vibration amplitude of the fork between 6 mA for damped vibration and 20 mA for full vibration. Resolution is 0.1 mA.	8 mA or 16 mA ±1 mA
	To enable a safe opening of relay contacts, the cutoff current will be set for some milliseconds to 0, when opening the electric circuit.			
	Short-circuit- and overload-protected.			
Intrinsic safe ratings	-	U _i 20 V I _i 67 mA P _i 0.17 W C _i negligible small L _i negligible small	Intrinsic safe version: U _i 30 V I _i 130 mA P _i 0.8 W C _i negligible small L _i negligible small	-
Indicating light	Status of signal output by built-in LED	Status of signal output and diagnostics of vibration by built-in LED	Status of signal output and diagnostics of vibration by built-in LED	Status of signal output by built-in LED
Protection class	I	III	III	III

Technical data

Mechanical data

Housing	Aluminium housing, powder coated RAL 5010 gentian blue Seal between housing and lid: NBR Seal between housing and process connection: NBR Nameplate: polyester film																																								
Cable for separate housing	Silicone elastomer, ø10 mm (ø0.39"), surface resistance <10 ⁹ Ohm, UV-resistant, min. bending radius 50 mm (1.97")																																								
Degree of protection	VN 1000/ 2000: IP66* VN 5000/ 6000: NEMA Type 4X, IP66*																																								
* IEC/ EN 60529																																									
Process connection/ extension L	VN ..020/ ..030/ ..050: Stainless steel 1.4301 (304)* or 1.4404 (316L) VN ..40: Stainless steel 1.4305 (303)* or 1.4404 (316L) *Flanges 1.4541 (321) Extension cable VN ..050: PUR with carbon black (no food grade) Thread: R 1½" tapered EN 10226 or NPT 1½" tapered ANSI B 1.20.1 Triclamp: Stainless steel 1.4301 (304) or 1.4404 (316L) 2" (DN50) ISO 2852 Flanges according to selection																																								
Oscillator	Material: stainless steel 1.4404/ 1.4581 (316L) (food grade) Surface treatment of vibrating rods: polished, Ra ≤ 0.75 µm; teflon (on request)																																								
Sound level	max. 50 dBA																																								
Overall weight (ca.)	<table border="1"> <thead> <tr> <th>VN 1000/ 2000</th> <th>Standard housing</th> <th>Extension</th> </tr> </thead> <tbody> <tr> <td>VN 1020/ 2020:</td> <td>1.6 kg (3.5 lbs)</td> <td>-</td> </tr> <tr> <td>VN 1030/ 2030:</td> <td>1.6 kg (3.5 lbs)</td> <td>+2.5 kg/m (+5.5 lbs per 39.3")</td> </tr> <tr> <td>VN 1040/ 2040:</td> <td>2.0 kg (4.4 lbs)</td> <td>delivery without extension tube</td> </tr> <tr> <td>VN 1050/ 2050:</td> <td>4.0 kg (8.8 lbs)</td> <td>+0.5 kg/m (+1.1 lbs per 39.3")</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>VN 5000/ 6000</th> <th>Standard housing</th> <th>de-housing</th> <th>d-housing</th> <th>Extension</th> </tr> </thead> <tbody> <tr> <td>VN 5020/ 6020:</td> <td>2.1 kg (4.6 lbs)</td> <td>3.2 kg (7 lbs)</td> <td>2.8 kg (6.2 lbs)</td> <td>-</td> </tr> <tr> <td>VN 5030/ 6030:</td> <td>2.1 kg (4.6 lbs)</td> <td>3.2 kg (7 lbs)</td> <td>2.8 kg (6.2 lbs)</td> <td>+2.5 kg/m (+5.5 lbs per 39.3")</td> </tr> <tr> <td>VN 5040/ 6040:</td> <td>2.5 kg (5.5 lbs)</td> <td>3.6 kg (7.9 lbs)</td> <td>3.2 kg (7 lbs)</td> <td>delivery without extension tube</td> </tr> <tr> <td>VN 5050/ 6050:</td> <td>4.5 kg (9.9 lbs)</td> <td>5.6 kg (12.3 lbs)</td> <td>5.2 kg (11.4 lbs)</td> <td>+0.5 kg/m (+1.1 lbs per 39.3")</td> </tr> </tbody> </table>	VN 1000/ 2000	Standard housing	Extension	VN 1020/ 2020:	1.6 kg (3.5 lbs)	-	VN 1030/ 2030:	1.6 kg (3.5 lbs)	+2.5 kg/m (+5.5 lbs per 39.3")	VN 1040/ 2040:	2.0 kg (4.4 lbs)	delivery without extension tube	VN 1050/ 2050:	4.0 kg (8.8 lbs)	+0.5 kg/m (+1.1 lbs per 39.3")	VN 5000/ 6000	Standard housing	de-housing	d-housing	Extension	VN 5020/ 6020:	2.1 kg (4.6 lbs)	3.2 kg (7 lbs)	2.8 kg (6.2 lbs)	-	VN 5030/ 6030:	2.1 kg (4.6 lbs)	3.2 kg (7 lbs)	2.8 kg (6.2 lbs)	+2.5 kg/m (+5.5 lbs per 39.3")	VN 5040/ 6040:	2.5 kg (5.5 lbs)	3.6 kg (7.9 lbs)	3.2 kg (7 lbs)	delivery without extension tube	VN 5050/ 6050:	4.5 kg (9.9 lbs)	5.6 kg (12.3 lbs)	5.2 kg (11.4 lbs)	+0.5 kg/m (+1.1 lbs per 39.3")
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Technical data

Operating conditions

Ambient temp. (housing)	-40°C .. +60°C (-40 .. +140°F) -25°C .. +60°C (-13 .. +140°F)	VN ..020/ VN ..030 and VN ..040 VN ..050
Process temperature	-40°C .. +150°C (-40 .. +302°F)	VN ..020/ VN ..030 and VN ..040
	-40°C .. +110°C (-40 .. +230°F)	Mounting for process temperature up to 150°C (302°F): see drawing
	-25°C .. +80°C (-13 .. +176°F)	VN ..020/ VN ..030 with Ex approval and separate housing (price list option 26.1, 26.2) VN ..050

For versions with Ex-approvals: see remarks on page 33.

Ventilation	Ventilation is not required		
Min. powder density	Setting B VN 1000/ 5000: ca. 50 g/l (3 lb/ft ³)	Setting A ca. 150 g/l (9 lb/ft ³)	
	Setting B VN 2000/ 6000: ca. 20 g/l (1.2 lb/ft ³) ca. 5 g/l (0.3 lb/ft ³)	Setting A ca. 75 g/l (4.5 lb/ft ³) ca. 20 g/l (1.2 lb/ft ³)	Standard version Enhanced sensitivity
Features of bulk material	No strong caking tendencies Max. grain size 10 mm (0.39")		
Max. mechanical load	600 N laterally (on oscillator rods) Recommended protection in case of high material load: mounting of a protective canopy above the probe.		
Max. mechanical torque	300 Nm 100 Nm	VN ..030 VN ..040	
Max. tractive force	2 kN	VN ..050	
Max. process pressure	16 bar (232 psi) 16 bar (232 psi) 6 bar (87 psi)	VN ..020, VN ..030 VN ..040 (depending on the quality of the local mounted sealing of the extension tube)	
	The max. process pressure may be reduced with use of flanges. Observe flange standards for pressure rating and pressure derating with higher temperature.		
	For versions with Ex-approvals: see remarks on page 31.		

Vibration	1.5 (m/s ²) ² /Hz according to EN 60068-2-64
Relative Humidity	0 - 100%, suitable for outdoor use
Altitude	max. 2,000 m (6,562 ft)
Expected product lifetime	Following parameters have a negative influence on the expected product lifetime: High ambient- and process temperature, corrosive environment, high vibration, high flow rate of abrasive bulk material passing the sensor element.

Technical data

Transport and Storage

Transport Observe the instructions as stated on the transport packaging, otherwise the products may get damaged.
Transport temperature: -40 .. +80°C (-40 .. +176°F)
Transport humidity: 20 .. 85%
Transport incoming inspections must be carried out to check for possible transport damage

Storage Products must be stored at a dry and clean place. They must be protected from influence of corrosive environment, vibration and exposure to direct sunlight.
Storage temperature: -40 .. +80°C (-40 .. +176°F)
Storage humidity: 20 .. 85%

Approvals

	VN 1000	VN 2000	VN 5000	VN 6000				
Ordinary Locations*	• • • •	CE FM/ CSA TR-CU	EN 61010-1					
Hazardous Locations *	• • • •	ATEX	Dust explosion		ATEX II 1D Ex t IIIC T! Da IP6X and 1/2 D Ex t IIIC T! Da/Db IP6X			
	• • • •		Gas explosion	Intrinsic safe	ATEX II 1G Ex ia IIC T! Ga and 1/2G Ex ia IIC T! Ga/Gb			
	• •			Flameproof	ATEX II 2G Ex d [ia] IIC T! Gb			
	• •			Flameproof/ increased safety	ATEX II 2G Ex de [ia] IIC T! Gb			
	• • • •	IEC-Ex	Dust explosion		IEC-Ex t IIIC T! Da IP6X and t IIIC T! Da/Db IP6X			
	• • • •		Gas explosion	Intrinsic safe	IEC-Ex ia IIC T! Ga and Ga/Gb			
	• •			Flameproof	IEC-Ex d [ia] IIC T! Gb			
	• •			Flameproof/ increased safety	IEC-Ex de [ia] IIC T! Gb			
	• •	FM	Dust explosion		Cl. II, III Div. 1 Gr. E,F,G			
	• •		Gas explosion	Intrinsic safe	IS Cl. I Div. 1 Gr. A-D			
	• •			Flameproof	Cl. I Zone 0 and 0/1 AEx ia IIC			
	• •		Gas explosion	Flameproof/ increased safety	XP-IS Cl. I Div. 1 Gr. B-D			
	• •	CSA	Dust explosion		Cl. I Zone 1 AEx d [ia] IIC			
	• •		Gas explosion	Intrinsic safe	Cl. I Zone 1 AEx de [ia] IIC			
	• •			Flameproof	Cl. II, III Div. 1 Gr. E,F,G			
	• •		Gas explosion	Flameproof	Ex DIP A20 and A20/21			
	• •			Flameproof/ increased safety	IS Cl. I Div. 1 Gr. A-D			
	• •	TR-CU	Dust explosion		Cl. I Zone 0 and Zone 0/1 Ex ia IIC			
	• •		Gas explosion	Intrinsic safe	XP-IS Cl. I Div. 1 Gr. B-D			
	• •			Flameproof	Cl. I Zone 1 Ex d [ia] IIC			
	• •		Gas explosion	Flameproof/ increased safety	Cl. I Zone 1 Ex de [ia] IIC			
	• •	INMETRO	Dust explosion		Ex ta IIIC T! Da X and			
	• •		Gas explosion	Intrinsic safe	Ex ta/tb IIIC T! Da/Db X			
	• •			Flameproof	Ex ia IIC T! Ga X and			
	• •		Gas explosion	Flameproof/ increased safety	Ex ia IIC T! Ga/Gb X			
	• •				Ex d [ia] IIC T! Gb X			
	• •				Ex de [ia] IIC T! Gb X			
	• • • •				Ex ta IIIC T! Da IP6x and			
	• • • •				Ex ta/tb IIIC T! Da/Db IP6X			
	• • • •				Ex ia IIC T! Ga/Gb and			
	• • • •				Ex ia IIC T! Ga			
	• • • •				Ex d IIC T! Gb			
	• • • •				Ex d [ia Ga] IIC T! Gb			
	• • • •				Ex de IIC T! Gb			
	• • • •				Ex d e [ia Ga] IIC T! Gb			
EMC	• • • •	EN 61326 -A1						
RoHS conform	• • • •	According to directive 2011/65/EU						
Food grade material	• • • •	According to directive 1935/2004/EC						

Pressure Equipment Directive
 (2014/68/EU)

The units are not subject to this directive, because they are classified as „pressure-keeping equipment“ and do not have a pressurized housing (see Art.1, clause 2.1.4).

- ! The units are designed and manufactured in accordance to the Pressure Equipment Directive.
- ! The units are NOT intended for use as a “equipment part with safety function (Art.1, clause 2.1.3).
- If the units should be used as „equipment part with safety function, please contact the manufacturer.

* depending on selected version in the selection list.

Options

Weather protection-cover

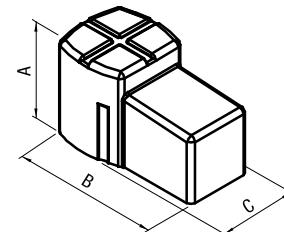
When the measuring device is used outdoor, the use of the weather protection-cover is recommended. It protects the device from all atmospheric influences such as:

- rain water
- condensation of water
- excessively high temperatures due to insolation
- excessively low temperatures in winter

Material: PE, weather and temperature stable



Not available for housing version d and de.
 For use in Hazardous Locations: only permitted for zone 2 and 22 or Division 2.



Sliding sleeve

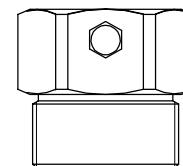
VN ..030 G2" ISO 228 or 2" NPT ANSI B 1.20.1

Material: 1.4301 (304) or
 1.4404 (316L)

Sealing material to the extension tube: viton

VN ..040 Because the outer diameters of the locally mounted 1" tube may differ, sliding sleeve on request.

Not for Hazardous Locations.



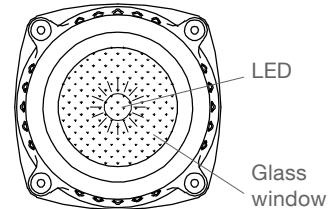
Mounting set

Screws and washers for fixing the unit on a flange.

Glass window in lid

To see the indicating light on the electronic module from outside.

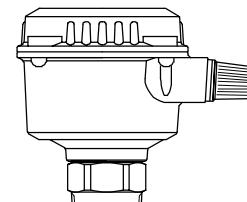
Not available for housing version d and de.



Bulb

Bright indicating light seen from outside.

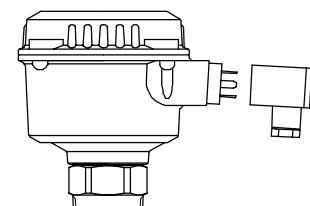
Not available for use in Hazardous Locations.



Plug 4-pole (incl. PE)

Used instead of cable gland.

Not available for use in Hazardous Locations and FM/ CSA general Purpose.



Mounting

! General Safety Instructions

Detection of solids in water

CAUTION:

Detection of solids in water only permitted with types VN 1020/ 1030/ 5020/ 5030.
 Other types on request.

Process pressure

Improper installation may result in loss of process pressure.

Chemical resistance against the medium

Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.

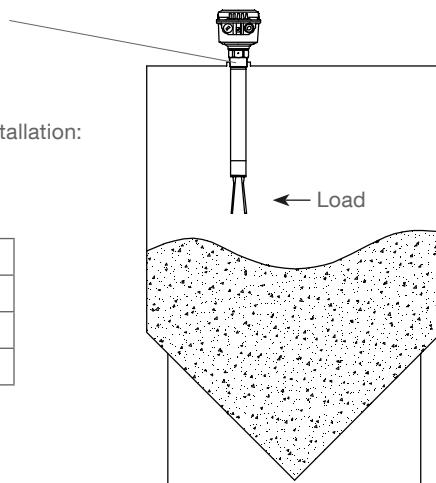
VN ..050:

Consider the chemical compatibility of the extension cable (material PUR) and the rubber seals on both ends of the extension cable (material neoprene).

Mechanical load

The torque at the fastening spot must not exceed
 300 Nm (VN ..030) or
 100 Nm (VN ..040)

Maximum length „L“ in relation
 to the deviation (in degrees) from vertical installation:



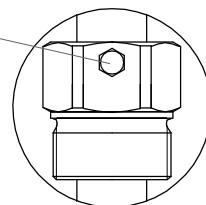
Max. deviation	Max. length "L"
5°	4,000 mm (157.5")
45°	1,200 mm (47.24")
>45°	600 mm (23.62")

Mounting location

Comply with distance from incoming material and from the silo wall.
 The installation has to be done in a way, that the sensor elements cannot hit the wall of the silo. The flow of the medium and fixtures in the container must be considered. This is especially important for extension lengths of more than 3 m (118.1").

2" sliding sleeve

Tighten both locking screws M8 with 20 Nm
 to obtain resistance against pressure.



Flange mounting

A plastic sealing must be used to tighten the flange.

Fastening of the 1½" process connection

Mounting torque for the 1½" thread may not exceed 80 Nm.
 Use a 50 mm (1.97") open-end wrench (do not turn the housing).

Food grade material

The materials are available for the use under normal and predictable applications (according to directive 1935/2004 Art.3). Other conditions can influence the safety.

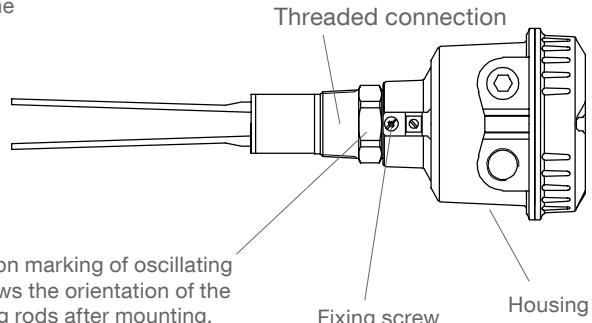
Mounting

! Additional Safety Instructions for Hazardous Locations

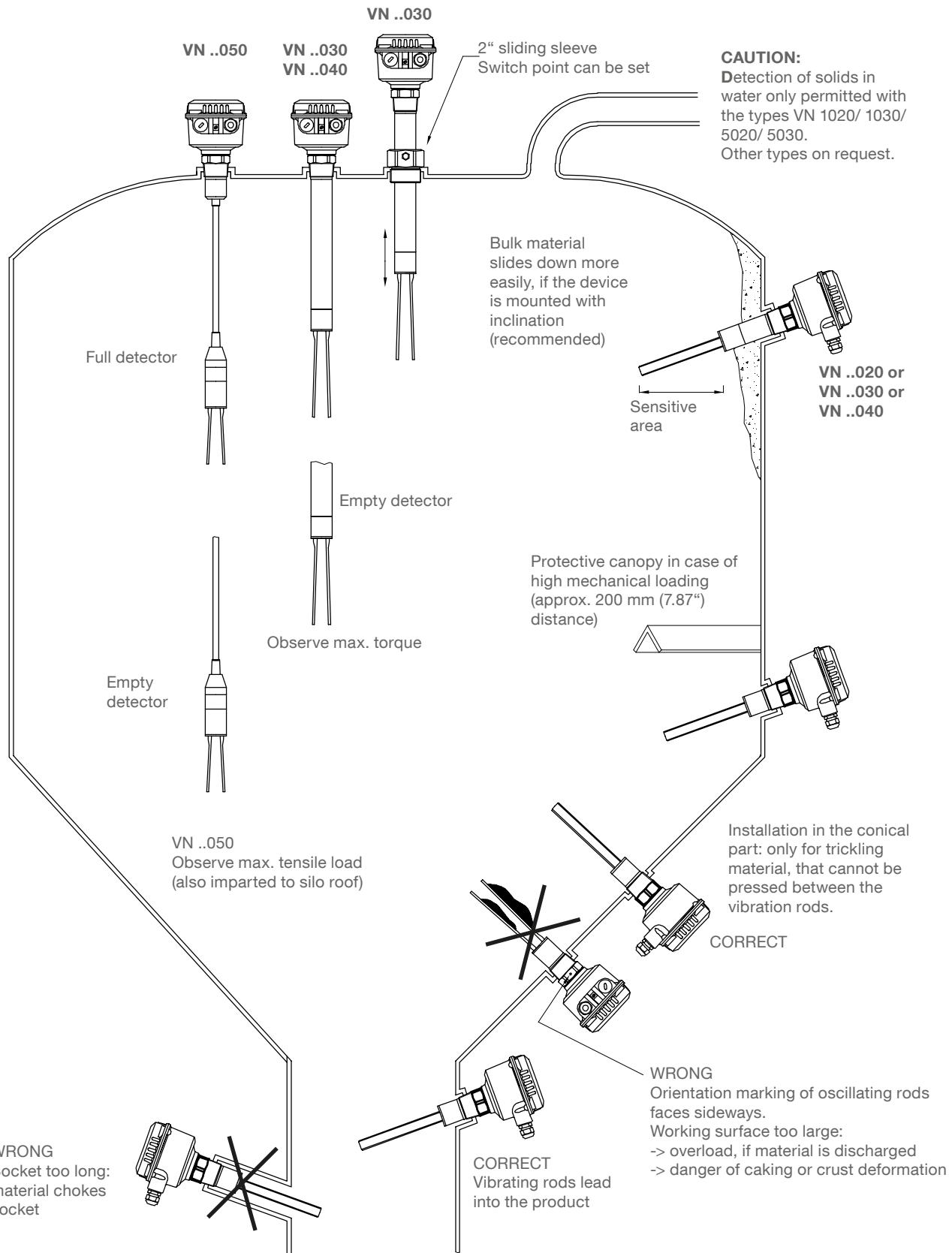
Installation regulations	For the use of devices in Hazardous Locations the respectively valid installation regulations must be observed.
Sparks	The installation has to be carried out in a way, that mechanical friction or impact does not cause sparks between the aluminium enclosure and steel.
Mounting in application with Partition wall, that separates Zone 0 (Cat. 1G) from Zone 1 (Cat 2G).	VN ..030 with sliding sleeve: The use of the sliding sleeve is not allowed. VN ..040 and VN ..050: The unit has no safe separation between Zone 0 and Zone 1. It must be considered, that gas can pass from Zone 0 through the unit to Zone 1.

Mounting instructions

Oscillating rods	Do not bend, shorten or extend the oscillating rods since this will destroy the device.
Rotatable housing and orientation marking of oscillating rods	The housing can be rotated against the threaded connection after mounting. For the d- and de- housing: Fixing screw must be unfastened to enable rotation. Fix the screw again, when the housing has the right position.
Direction of the cable glands	When the unit is mounted from the side, ensure, that the cable glands are closed and face downwards to avoid water penetrating the housing.
Sealing	Seal the 1½" thread with Teflon tape in case of process pressure
Precaution for later dismounting/ Service	Grease the screws of the lid if corrosive atmosphere is present (e.g. close to sea)
Switching point	Heavy bulk material -> the signal output switches, when the oscillating rods are covered a few mm. Light bulk material -> the signal output switches, when the oscillating rods are covered a few cm.



Mounting



Electrical installation

! General Safety Instructions

Handling	In case of inexpert handling or handling malpractice, the electric safety of the device cannot be guaranteed.
Installation regulations	The local regulations or VDE 0100 (Regulations of German Electrotechnical Engineers) must be observed. With use of 24 V supply voltage, an approved power supply with reinforced insulation to mains is required.
Fuse	Use a fuse as stated in the connection diagrams (page 22 and 23).
RCCB protection	In the case of a defect, the distribution voltage must automatically be cut off by a RCCB protection switch to protect the user of the device from indirect contact with dangerous electric tensions.
Power supply switch	A voltage-disconnecting switch must be provided near the device.
Wiring diagram	The electrical connections are made in accordance with the wiring diagram.
Supply voltage	Compare the supply voltage applied with the specifications given on the electronic module and name plate before switching the device on.
Cable gland	Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion). Cable glands that are not used have to be locked with a closing element.
Conduit system	In case of using a conduit system (with NPT thread) instead of a cable gland the regulations of the country, where the unit is installed, must be observed. The conduit must have a tapered thread either NPT 1/2" or NPT 3/4" in accordance with the unit and ANSI B 1.20.1. Not used inlets must be closed tight with a metal closing element.
Field wiring cables	<ul style="list-style-type: none"> • The diameter has to match to the clamping range of the used cable gland. • The cross section has to match with the clamping range of the connection terminals and consider the max. current. • All field wirings must have insulation suitable for at least 250V AC. • The temperature rating must be at least 90°C (194°F). • If higher immunity interferences as specified in the stated EMC standards are present (see chapter approval), a shielded cable is required, otherwise an unshielded instrumentation cable is satisfactory.
Connecting the terminals	Make sure that max. 8 mm (0.31") of the pigtails are bared (danger of contact with live parts).
Guiding the cables in the terminal box	Cut the field wiring cables to appropriate length to fit properly into the terminal box.
Relay and transistor protection	Provide protection for relay contacts and output transistors to protect the device against inductive load surges.
Protection against static charging	The housing of the unit (and for the version with separate housing also the vibrating fork part) must be grounded to avoid static charging of the unit. This is particularly important for applications with pneumatic conveying and non-metallic containers .

Electrical installation

! Additional Safety Instructions for Hazardous Locations

Installation in Zone 20 If installing the whole unit in zone 20, the power supply shall be rated for a prospective short circuit current of not more than 10 kA. Details of EN 60079-14/ ABNT NBR IEC 60079-14 must be obeyed.

**Installation in Zone 0
 (Electronics: „NAMUR“
 and “8/16mA or 4-20mA”)** The intrinsic safe supply circuit must have galvanic isolation to non intrinsic safe part. Otherwise measures for protection against lightning must be taken. See EN 60079-14/ ABNT NBR IEC 60079-14.

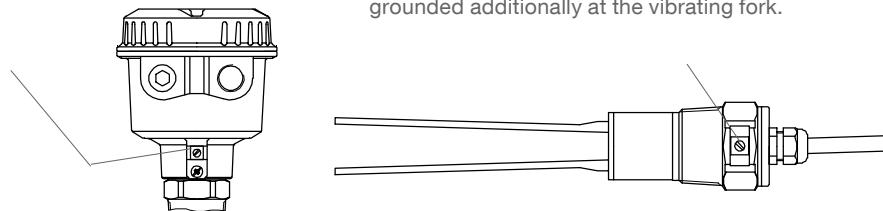
**Power supply
 (Electronics: „NAMUR“
 and “8/16mA or 4-20mA”)** The type of protection (intrinsic safe) is only valid when connecting to a certified intrinsic safe power supply (associated apparatus).

**Field wiring terminals for
 “de” housing** Fixing torque : 0,5-0,6 Nm
 Remove wire isolation: 9 mm

Field wiring A strain relief must be provided for the field wiring cables, when the device is installed with the factory provided cable glands.

External equipotential bonding terminal Connect with equipotential bonding to the plant

Version with separate housing must be grounded additionally at the vibrating fork.



**Cable glands and conduit system for ATEX/
 IEC-Ex/ TR-CU
 (Dust and Gas Hazardous Locations)** Installation according to the regulations of the country, where the product is installed.
 Not used entries have to be closed with blanking elements certified for this purpose.
 Where available the factory provided parts must be used.

A strain relief must be provided for the field wiring cables, when the device is installed with the factory provided cable glands.

The diameter of the field wiring cable must match to the clamping range of the cable clamp.

If other than the factory provided parts are used, following must be ensured:
 The parts must have an approval adequate to the approval of the level sensor (certificate and type of protection).
 The approved temperature range must be from the min. ambient temperature of the level sensor to the max. ambient temperature of the level sensor increased by 10 Kelvin.
 The parts must be mounted according to the instructions of the supplier.

Installation of a flameproof/ explosion proof enclosure with a conduit system:
 In a conduit system single electric conductors are installed in a certified pipe system. This pipe system is in a flameproof/ explosion proof construction as well. The flameproof/ explosion proof enclosure and the pipe system needs to be sealed from each other by a certified flameproof seal of a type “d” or explosion proof of a type “XP”. This seal shall be installed directly in or at the conduit entries of the flameproof/ explosion proof enclosure. Not used entries have to be closed with blanking elements certified for this purpose (flameproof type “d” or explosion proof type “XP”).

Electrical installation

Conduit system for FM and CSA
(Dust and Gas Hazardous Locations)

General requirements:

In addition the regulations of the country must be observed. The used flameproof seals and blanking elements must have an adequate type approval and a temperature range of at least -40°C (-40°F) to +80°C (176°F). In addition they shall be suitable for the conditions and correctly installed. Where available the provided original parts of the manufacturer must be used.

Installation of a flameproof enclosure "d" with a conduit system:

In a conduit system single electric conductors are installed in a certified pipe system. This pipe system is in a flameproof construction as well. The flameproof enclosure "d" and the pipe system needs to be sealed from each other by a certified flameproof seal. Conduit entries of a flameproof enclosure "d" shall have installed the flameproof seal within 18 inches from the enclosure wall. Not used entries have to be closed with adequate blanking elements of a certified flameproof type AEx Cl.1 Div.1 A.

Commissioning

Commissioning only with closed lid.

Exception: Units with protection method Intrinsic safety ("NAMUR" and "8/16 mA or 4-20 mA")

Opening the lid

Units with flameproof GasExplosion approval (d-housing):

To prevent ignition of hazardous atmospheres, do not remove the lid (cover) while circuits are alive.

Units with Dust Explosion approval:

Before opening the lid ensure, that no dust deposits or cloudss are present.

Do not remove the lid (cover) when the power is live.

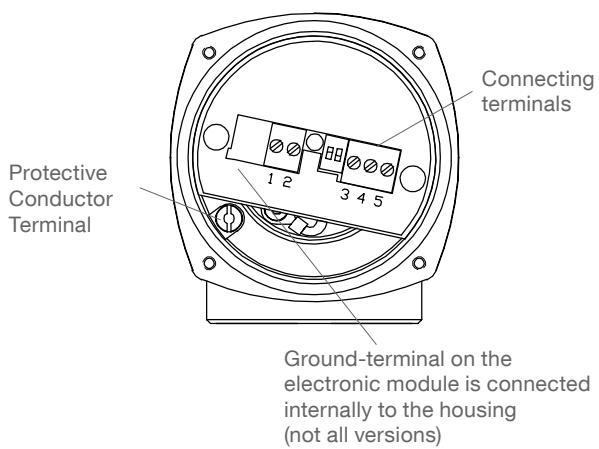
Units with protection method Intrinsic safety ("NAMUR" and "8/16 mA or 4-20 mA"):

The lid can be removed when the power is live.

Electrical installation

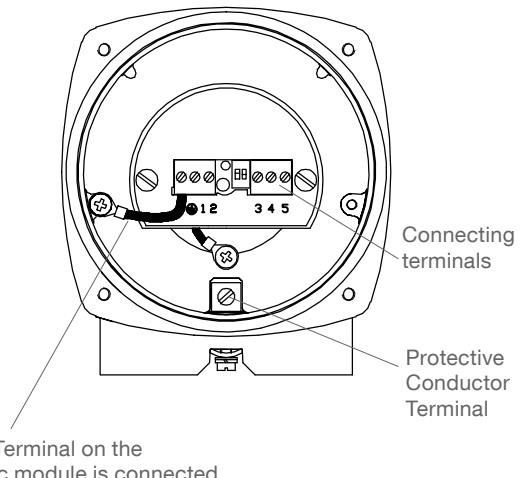
Connection

VN 1000/ 2000: Standard-housing



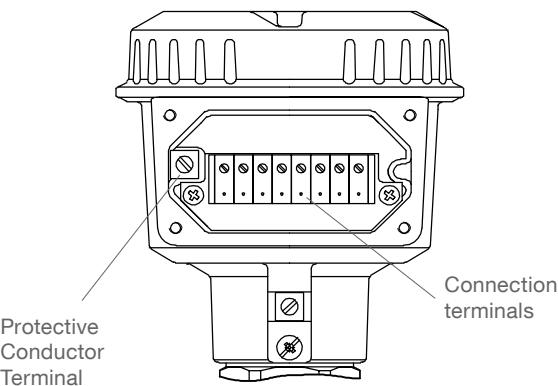
VN 5000/ 6000: Standard- and d-housing

Connection is done directly on the Electronic module



de-housing

Connection via the terminals inside the increased safety area.



Ground-Terminal on the electronic module is connected internally to the housing (not all versions)

Electrical installation

Universal voltage

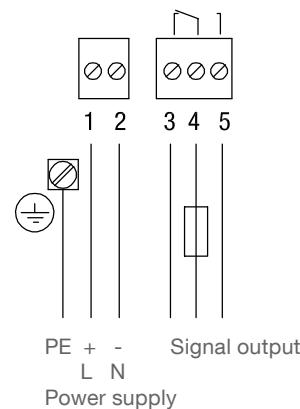
Relay SPDT

Power supply:

19 .. 230V 50 - 60 Hz +10% 8 VA
 19 .. 55 V DC +10% 1.5 W

Signal output:

Floating relay SPDT



VN 1000/ 2000:
 AC max. 253 V, 4 A, 500 VA at cos Phi = 1
 DC max. 253 V, 4 A, 60 W

VN 5000/ 6000:
 AC max. 250 V, 8 A, non inductive
 DC max. 30 V, 5 A, non inductive

Fuse on signal output: max. 10 A,
 slow or fast, HBC, 250 V

Universal voltage

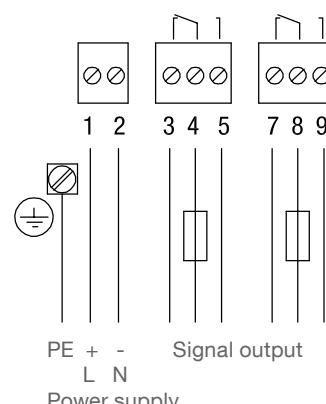
Relay DPDT

Power supply:

19 .. 230 V 50 - 60 Hz +10% 18 VA
 19 .. 55 V (36 V*) DC +10% 2 W

Signal output:

Floating relay DPDT



VN 1000/ 2000:
 AC max. 253 V, 4 A, 500 VA at cos Phi = 1
 DC max. 253 V, 4 A, 60 W

VN 5000/ 6000:
 AC max. 250 V, 8 A, non inductive
 DC max. 30 V, 5 A, non inductive

Fuse on signal output: max. 10 A,
 slow or fast, HBC, 250 V

* Version with intrinsic safe connection
 between electronic module and vibration
 fork (see pos.4 in the selection list)

3-wire

PNP

Power supply:

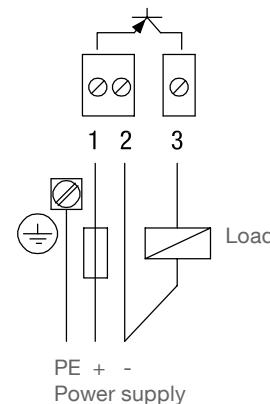
18 .. 50 V DC +10% 1.5 W

Fuse: max. 4 A, slow or fast, HBC, 250 V

Signal output:

max. 0.4 A

Load for example:
 PLC, relay, contactor, bulb



Electrical installation

2-wire

without contact

Power supply:

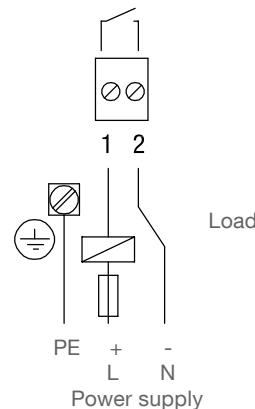
19 .. 230 V 50/60 Hz +10% 1.5 VA
 19 .. 230 V DC +10% 1 W

Load:

min. 10 mA
 max. 0.5 A permanent
 (detailed ratings see
 "Technical data")

Load for example:
 relay, contactor, bulb

Fuse: max. 4 A, slow or fast, HBC, 250 V



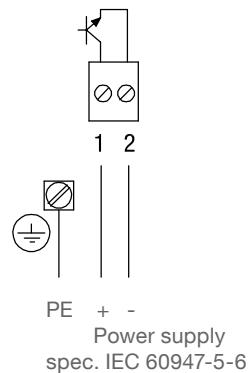
NAMUR

IEC 60947-5-6

Power supply:

ca. 7 .. 9 V DC
 intrinsic safe
 (spec. IEC 60947-5-6)

<1 mA or >2.2 mA
 (spec. IEC 60947-5-6)



8/16mA or 4-20mA

Power supply:

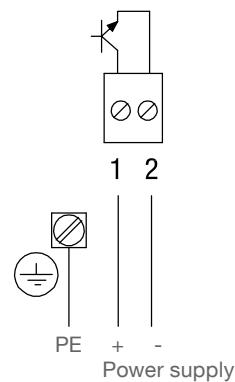
Non intrinsic safe version:
 12.5 .. 36 V DC +0%

Intrinsic safe version:
 12.5 .. 30 V DC +0%

Signal output

Setting 8/16 mA:
 8 mA or 16 mA

Setting 4-20 mA:
 Output current depends on the vibration
 amplitude of the fork: 6mA for damped
 vibration and 20 mA for full vibration.



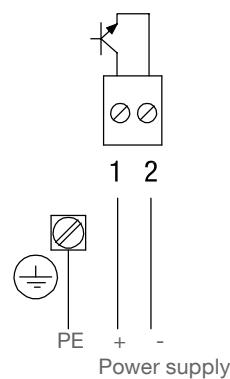
8/16mA

Power supply:

12.5 .. 36 V DC +0%

Signal output

8 mA or 16 mA



Signal output

Electronic modules:

Universal voltage
 (Relay SPDT and DPDT)

3-wire PNP

2-wire without contact

8/16mA

NAMUR
 (IEC 60947-5-6)

FSL/ FSH or Characteristic Setting

Remark: „FSH/ FSL“ is used for electronic modules:
 Universal voltage, 3-wire, 2-wire
 "Characteristic" is used for electronic module:
 NAMUR

FSH

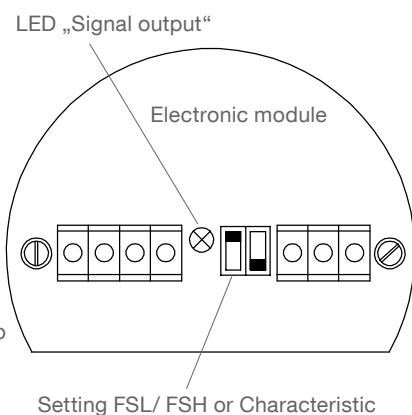


If the sensor is used to indicate full load, set to Fail Safe High or Falling Characteristic.
 Power failure or line break is regarded as „full“ signal (protection against overcharging).

FSL

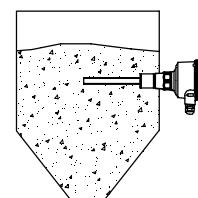
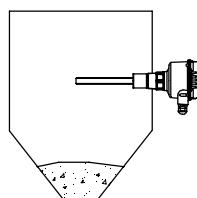


If the sensor is used to indicate empty load, set to Fail Safe Low or Rising Characteristic. Power failure or line break is regarded as „empty“ signal (protection against running dry).



		Signal output		Signal output	
		FSL	FSH	FSL	FSH
Relay SPDT					
Relay DPDT					
3-wire PNP					
2-wire without contact					
8/16mA		I = 16 mA	I = 8 mA	I = 8 mA	I = 16 mA
LED „Signal output“					

Setting		
NAMUR IEC 60947-5-6		
LED „Signal output“		



Signal output delay / Diagnosis

Signal output delay

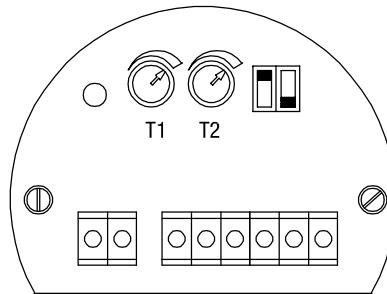
Electronic module
Universal voltage
 (Relay DPDT)

Signal output delay

The signal output can be delayed, adjustable from 0 up to ca. 30 seconds. Clockwise turning of the potentiometer increases the delay time.

Potentiometer T1:
 Delay when output switches from sensor covered -> free

Potentiometer T2:
 Delay when output switches from sensor free -> covered



Diagnostics

Electronic module
NAMUR
 (IEC 60947-5-6)

“TEST” Button

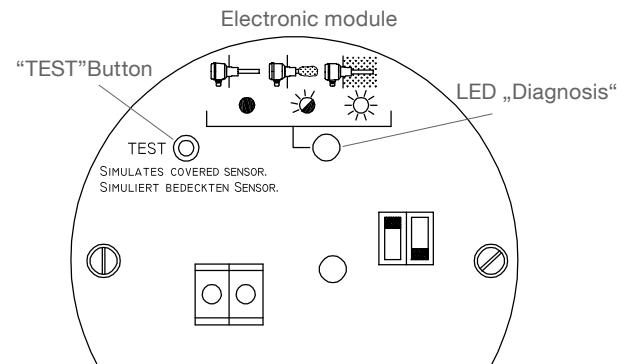
If the sensor is not covered with material:

By pressing this button, the vibration will stop and the signal output will switch to indicate “covered sensor”. This allows to test the vibration and the electronics for function without removing the sensor from the silo.

Remark: By pressing the button, the internal signal from the piezo-element, that indicates the vibration of the fork, is shortened. The electronics miss the vibration signal and indicates “covered sensor”.

If the sensor is covered with material:

Pressing of this button has no effect.



Weak vibration Diagnosis: LED “Diagnosis”

The quality of the measurement is related to the vibration amplitude of the sensor and can be evaluated by the internal LED „Diagnostics“ as follows:

- **Safe measurement, clean fork (LED is off):**

The vibration amplitude is strong. There is enough safety to the switching point.

- **Weak vibration amplitude (LED is blinking):**

The sensor is still working but it can happen that gradually the amplitude decreases further (maybe by increasing material build up) and the measurement fails. If low vibration amplitude is indicated the sensitivity setting should be changed from „20g/l“ to „75 g/l“ (or from „5g/l“ to „20g/l“ on version with enhanced sensitivity) if material density is not too low and the fork should be cleaned from material.

Remark: By shifting the setting to „75g/l“ (or to „20g/l“ on version with enhanced sensitivity), the internal amplification of the vibration signal in the electronic is increased. This allows more build up of material.

- **Fork fully covered (LED is on):**

The sensor is fully covered with material. The vibration has stopped.

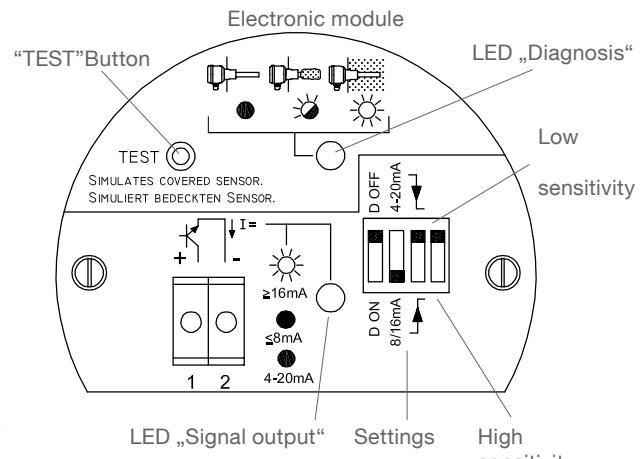
Signal output and Diagnosis

Electronic module 8/16 mA or 4-20 mA

The output can either be set to give 8/16 mA or to give 4-20 mA. On setting 4-20 mA the output depends on the amplitude of the vibration of the fork.

Characteristic setting

- ↓ If the sensor is used to indicate full load, set to Falling Characteristic. Power failure or line break is regarded as „full“ signal (protection against overcharging).
- ↑ If the sensor is used to indicate empty load, set to Rising Characteristic. Power failure or line break is regarded as „empty“ signal (protection against running dry).



	Low sensitivity	High sensitivity
VN 1000/ 5000	150 g/l (9 lb/ft³)	50 g/l (3 lb/ft³)
VN 2000/ 6000	75 g/l (4.5 lb/ft³)	20 g/l (1.2 lb/ft³)
VN 2000/ 6000 with enhanced sensitivity	20 g/l (1.2 lb/ft³)	5 g/l (0.3 lb/ft³)

Weak vibration diagnosis

The quality of the measurement is related to the vibration amplitude of the sensor and can be evaluated by the output current and by the internal LED „Diagnosis“ as follows:

- **Safe measurement (clean fork):**
The vibration amplitude is strong. There is enough safety to the switching point.
- **Weak vibration amplitude:**
A fork with so much material build up, that a weak vibration amplitude is indicated. The sensor is still working, but it can happen, that gradually the amplitude decreases further (maybe by increasing material build up) and the measurement fails. If low vibration amplitude is indicated, the sensitivity setting should be changed from „High sensitivity“ to „Low sensitivity“, if material density is not too low, and the fork should be cleaned from material. Remark: By shifting the setting to „Low sensitivity“, the internal amplification of the vibration signal in the electronic is increased. This allows more build up of material.
- **Fork fully covered:**
The sensor is fully covered with material. The vibration has stopped.

“TEST” Button

If the sensor is not covered with material:

By pressing this button, the vibration will stop and the signal output will switch to indicate “covered sensor”. This allows to test the vibration and the electronic for function without removing the sensor from the silo.

Remark: By pressing the button, the internal signal from the piezo-element, that indicates the vibration of the fork, is shortened. The electronic misses the vibration signal and indicates “covered sensor”.

If the sensor is covered with material:

Pressing of this button has no effect.

Factory provided settings

- D OFF
- 8/16 mA
-
- High sensitivity

Signal output and Diagnosis

Electronic module
8/16 mA or 4-20 mA

Output setting: 8/16 mA

The figure illustrates the output current depending on the situation with:

- Safe measurement (clean fork).
 - Weak vibration amplitude: a fork with so much material build up, that a weak vibration is indicated.
 - Fork fully covered.

The output current can indicate the weak vibration with diagnostics setting „D ON“.

Diagnosis off (setting „D OFF“):
The output changes between 8 mA and 16mA.

Diagnosis on (setting „D ON“):
The output will change from 16 mA to 20 mA and from 8 mA to 6 mA, if the vibration is weak. This enables a evaluation on an external 4-20 mA power supply. There is an internal delay of 10 seconds, until the change from 16mA to 20 mA and from 8 mA to 6 mA happens, so that the external power supply does not indicate „weak vibration“, when the vibration is stopped and is started during normal (safe) measurement operation.

Characteristic setting				
D setting	D ON D OFF	$I=16\text{ mA}$	$I=8\text{ mA}$	$I=8\text{ mA}$
LED „Signal output“			$I=20\text{ mA}$	$I=6\text{ mA}$
LED „Diagnosis“				

Example of evaluating the diagnosis of weak vibration amplitude:

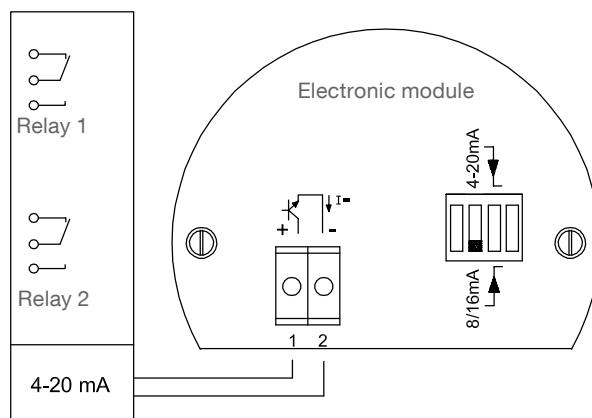
Connection of an external Limit Value Monitor with 4-20 mA input and two relay outputs.
(Fitting units can be ordered as accessories, see price list)

Relay 1 indicates the situation: Full/ empty.

Relay 2 works as a diagnostics output to indicate: Safe measurement/ Non safe measurement (weak vibration).

Full/ empty
Set switching point to **10 mA**.

- Relay 2:
 - Diagnosis
 - Set switching point to:
 - ▼ **18 mA** for setting "falling characteristic"
 - ▲ **7 mA** for setting "rising characteristic"



External Limit Value Monitor
with 4-20 mA input and two
relay outputs.



Signal output and Diagnosis

Electronic module Output setting: 4-20 mA

8/16 mA or

4-20 mA

The output states the quality of the vibration signal (amplitude) of the sensor. With the 4-20 mA setting it is possible, to recognize material build up on the vibrating fork by evaluation with a PLC. Furthermore it is possible to evaluate the vibration behaviour for critical applications by using a 4-20 mA Data logger or PLC.

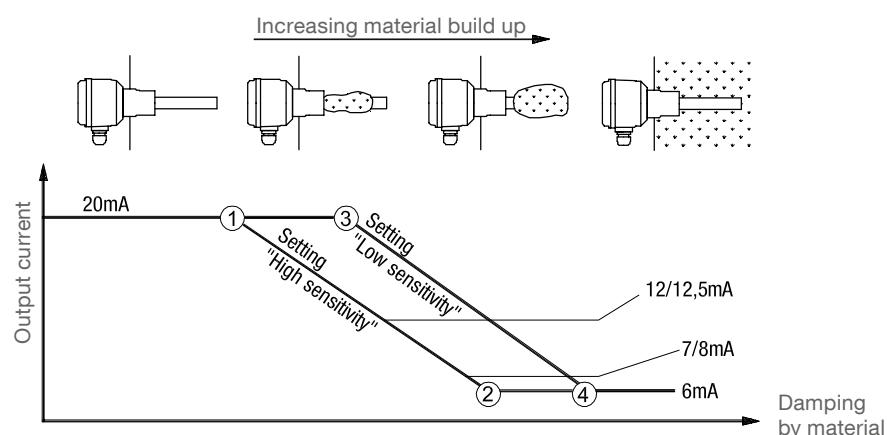
Remark

In this mode:

- The switch „D ON“ or „D OFF“ has no influence.
- The LED „Signal output“ is off.

Output current:

- 20 mA:
The vibration amplitude is strong (safe measurement, clean fork). With interface measurement (VN 10..0 und VN 50..0) a max. vibration amplitude of approx. 15 mA occurs.
- < 20mA and >12/ 12.5mA:
The vibration amplitude is decreased by material build up or mechanical influence. On setting „Low sensitivity“ the material build up must be more to decrease the output current compared to setting „High sensitivity“.
- <12/12.5 mA and >7/8 mA:
The recommended range indicate a weak vibration. This is also the range, where the internal LED „Diagnosis“ starts blinking to indicate a weak vibration. Depending on the application this value can be changed in the PLC.
The evaluation in the PLC should be done so, that a window between 12/12.5 mA and 7/8 mA is set.
The reaction to indicate „weak vibration“ should be delayed for approx. 10 seconds, so that the indicator does not happen when the vibration is stopped and is started during normal and safe measurement operation.
A lag of 0.5 mA (between 12 mA and 12.5 mA) should be considered to avoid jittering of the output.
- 7/8 mA:
The recommended point to indicate a covered sensor. The point is close to the stop of the vibration at 6 mA.
Depending on the application this point can be changed in the PLC.
A delay of 1 mA (between 7mA and 8mA) should be considered to avoid jittering of output.
- 6 mA:
The vibration has fully stopped.



With setting „High sensitivity“:

- ① Amplitude is 100%
- ② Amplitude is 0%

With setting „Low sensitivity“:

- ③ Amplitude is 100%
- ④ Amplitude is 0%

Setting: Sensitivity

All Electronic modules Sensitivity

All sensors are factory preset. Normally it is not necessary to change the settings. If the bulk material has a strong tendency to cake or deposit the setting switch can be set to position „A“ to decrease the sensitivity of the probe (factory presetting = position „B“).

Approximate min. bulk density on setting:

	A Low sensitivity	B High sensitivity
VN 1000/ 5000	150 g/l (9 lb/ft ³)	50 g/l (3 lb/ft ³)
VN 2000/ 6000	75 g/l (4.5 lb/ft ³)	20 g/l (1.2 lb/ft ³)
VN 2000/ 6000 with enhanced sensitivity	20 g/l (1.2 lb/ft ³)	5g/l (0.3 lb/ft ³)

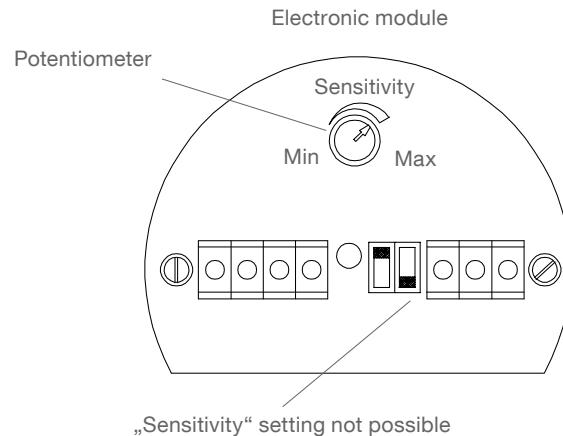
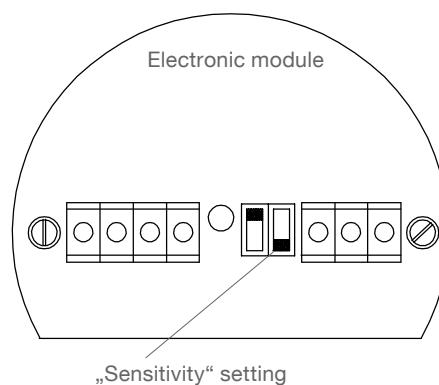
VN 1000/ 5000:

For measurement of solids in water setting „A“ is recommended or to take the electronic with potentiometer.

Option interface measurement (Sensitivity adjustable with potentiometer)

Turn to Min: Vibrating fork gets less sensitive

Turn to Max: Vibrating fork gets more sensitive



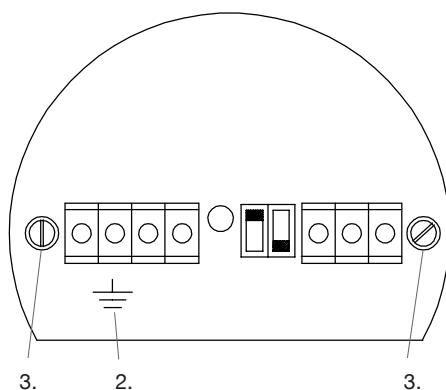
Maintenance

Opening the lid (cover)	Before opening the lid for maintenance reasons observe following items: <ul style="list-style-type: none"> • Do not remove the lid while circuits are alive. • No dust deposits or whirlings are present. • No rain can enter into the housing.
Frequent check of the unit	! Frequent check of the unit To ensure durable safety in hazardous locations and with electrical safety, following items must be checked frequently depending on the application: <ul style="list-style-type: none"> • Mechanical damage or corrosion of any components (housing side and sensor side) and of the field wiring cables. • Tight sealing of the process connection, cable glands and enclosure lid. • Properly connected external PE cable (if present).
Cleaning	! Cleaning If cleaning is required by the application, following must be observed: <ul style="list-style-type: none"> • Cleaning agent must comply with the materials of the unit (chemical resistance). Mainly the lid sealing, cable gland and the surface of the unit must be considered. ! The cleaning process must be done in a way, that: <ul style="list-style-type: none"> • The cleaning agent cannot enter into the unit through the lid sealing or cable gland. • No mechanical damage of the lid sealing, cable gland or other parts can happen. A possible accumulation of dust on the unit does not increase the maximum surface temperature and must therefore not be removed for purposes of maintaining the surface temperature in hazardous locations.
Function test	A frequent function test may be required depending on the application. Observe all relevant safety precautions related with a safe work depending on the application (e.g. hazardous locations, hazardous bulk material, electric safety, process pressure).
Production date	This test does not proof if the sensor is sensitive enough to measure the material of the application. ! Function test is done by stopping the vibration of the vibrating rods with appropriate means and monitor if a correct change of the signal output from uncovered to covered happens.
Spare parts	The production date can be traced by the serial number on the typeplate. Please contact the manufacturer or your local distributor. All available spare parts are stated in the selection list

Changing the Electronic module

! Intrinsic safe marked Electronic modules are not allowed to be exchanged with Electronic modules without Intrinsic safe marking. Observe warning labels inside the housing and Ex marking on the name plate.

1. Open the housing lid, remove the pigtails from the device.
2. Disconnect internal wire for earth connection (not on all versions).
3. Unscrew two fastening screws of the electronic module.
4. Pull out the Electronic module.
5. Insert a new Electronic module (until it locks into place) and tighten fastening screws.
6. Connect internal wire for earth connection (not on all versions).
7. Connect the pigtails to the device.



Repair of flamepath

Repair of flamepath on units with Ex d, Ex de or XP approvals is not intended.
 Please contact manufacturer.

Notes for use in Hazardous Locations

Zone classification

	usable in zone	ATEX category	IEC-Ex Equipement Protection Level (EPL)
Dust applications	20, 21, 22	1 D	Da
	21, 22	2 D	Db
	22	3 D *	Dc
Gas applications	0, 1, 2	1 G	Ga
	1, 2	2 G	Gb
	2	3 G	Gc

* in case of conductive dust additional requirements for the installation may be necessary

General Notes

Marking

Devices with Ex approval are marked on the name plate.

Process pressure



The device construction allows process over-pressure up to 6/ 16 bar (87/ 232 psi) (see name plate). These pressures are allowed for test purposes. The definition of the Ex approvals are only valid for a container-over-pressure between -0.2 .. +0.1 bar (-2.9 .. +1.45 psi). For higher or lower pressures the approvals are not valid.

Process and ambient temperature

The permitted temperature ranges are marked on the name plate.



Specific condition of use

Electrostatic charge

Because the enclosure of the equipment is made of aluminium alloy, the apparatus must be installed so, that even in the event of rare incidents, an ignition source due to impact or friction between the enclosure and iron/steel is excluded, when used in a potentially explosive atmosphere requiring apparatus of equipment category 1 G. Cleaning of the equipment should be done only with a damp cloth.

Notes for use in Hazardous Locations

Permitted zones (categories) for mounting in partition wall

Version with standard-housing

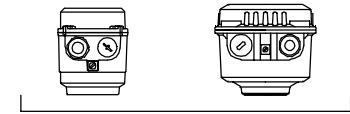
(VN 1000/ 2000/ 5000/ 6000)

With use of Electronic module:

Universal voltage Relay SPDT
 Universal voltage Relay DPDT

3-wire PNP
 2-wire without contact
 8/16 mA or 4-20 mA
 (non intrinsic safe)

NAMUR IEC 60947-5-6
 (intrinsic safe)*
 8/16 mA or 4-20 mA
 (intrinsic safe)*



EPL (IEC-Ex)
 Category (ATEX)
 Zone

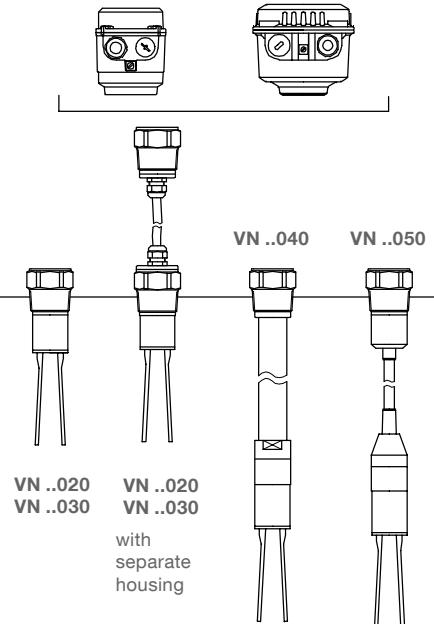
	Da	Db
1D	2D	
20	21	

	Da	Db	Ga	Gb **
1D	2D	1G	2G **	
20	21	0	1	

EPL (IEC-Ex)
 Category (ATEX)
 Zone

	Da	Da
1D	1D	
20	20	

	Da	Da	Ga	Ga
1D	1D	1G	1G	
20	20	0	0	



* The units are marked on the name plate with "1G" and "1D" (ATEX) resp. "Ga" and "Da" (IEC-Ex). They can be also be mounted in a partition wall with specification zone 0/1 and zone 20/21.

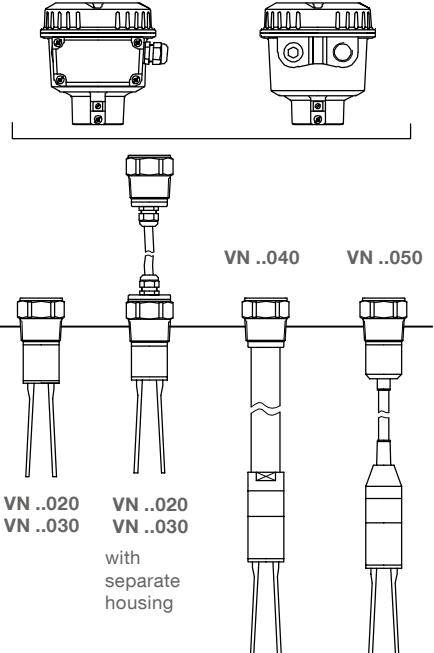


** VN ..040 and VN ..050:
 When mounting the units in a partition wall, that separates Zone 0 from Zone 1: The units have no safe separation between Zone 0 and Zone 1. It must be considered, that gas can pass from Zone 0 through the unit to Zone 1.

Version with d- and de-housing

(VN 5000/ 6000 ; flameproof/ increased safety)

With use of all Electronic modules:



EPL (IEC-Ex)
 Category (ATEX)
 Zone

	Gb	Db
2G	2D	
1	21	

EPL (IEC-Ex)
 Category (ATEX)
 Zone

	Gb	Da
2G	1D	
1	20	

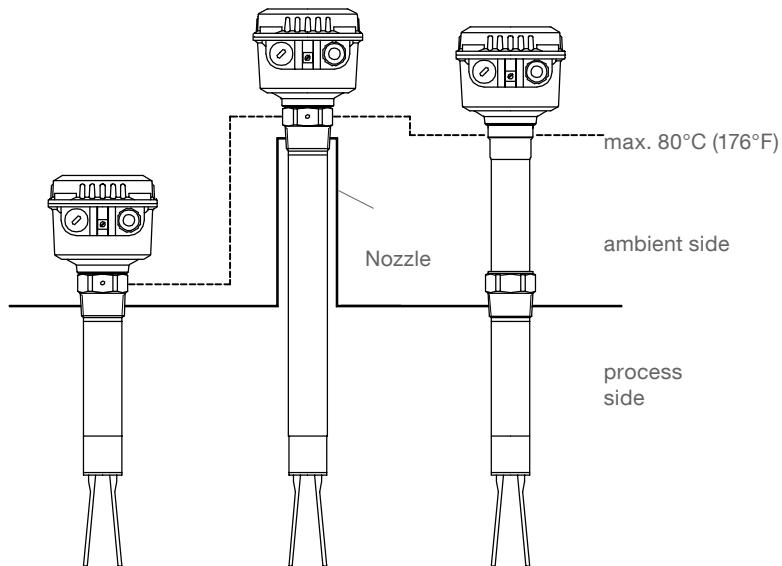
Notes for use in Hazardous Locations

Max. Surface Temperature and Temperature Class



The temperature marking on the name plate refers to the instruction manual.
 On the following tables the relevant temperature ratings are shown.

The maximum surface temperature (resp. temperature class) is the warmest temperature of the unit which could occur during malfunction (according to Ex-definition).



Versions with intrinsic safe electronic modules:

NAMUR IEC 60947-5-6
 8/16 mA or 4-20 mA

Max. ambient temperature	Max. process-temperature	Max. surface temperature	Temperature class (Division System)	Temperature class (Zone System)
50°C (122°F)	70°C (158°F)	80°C (176°F)	T6	T6
	80°C (176°F)	85°C (185°F)	T6	T5
	90°C (194°F)	90°C (194°F)	T5	T5
	100°C (212°F)	100°C (212°F)	T5	T4
	110°C (230°F)	110°C (230°F)	T4A	T4
	120°C (248°F)	120°C (248°F)	T4A	T4
	130°C (266°F)	130°C (266°F)	T4	T4
	140°C (284°F)	140°C (284°F)	T3C	T3
	150°C (302°F)	150°C (302°F)	T3C	T3

Versions with non intrinsic safe electronic modules:

Universal voltage Relay SPDT
 Universal voltage Relay DPDT
 3-wire PNP
 2-wire without contact
 8/16 mA or 4-20 mA

Max. ambient temperature	Max. process-temperature	Max. surface temperature	Temperature class (Division System)	Temperature class (Zone System)
60°C (140°F)	80°C (176°F)	120°C (248°F)	T4A	T4
	90°C (194°F)	120°C (248°F)	T4A	T4
	100°C (212°F)	120°C (248°F)	T4A	T4
	110°C (230°F)	120°C (248°F)	T4A	T4
	120°C (248°F)	120°C (248°F)	T4A	T4
	130°C (266°F)	130°C (266°F)	T4	T4
	140°C (284°F)	140°C (284°F)	T3C	T3
	150°C (302°F)	150°C (302°F)	T3C	T3

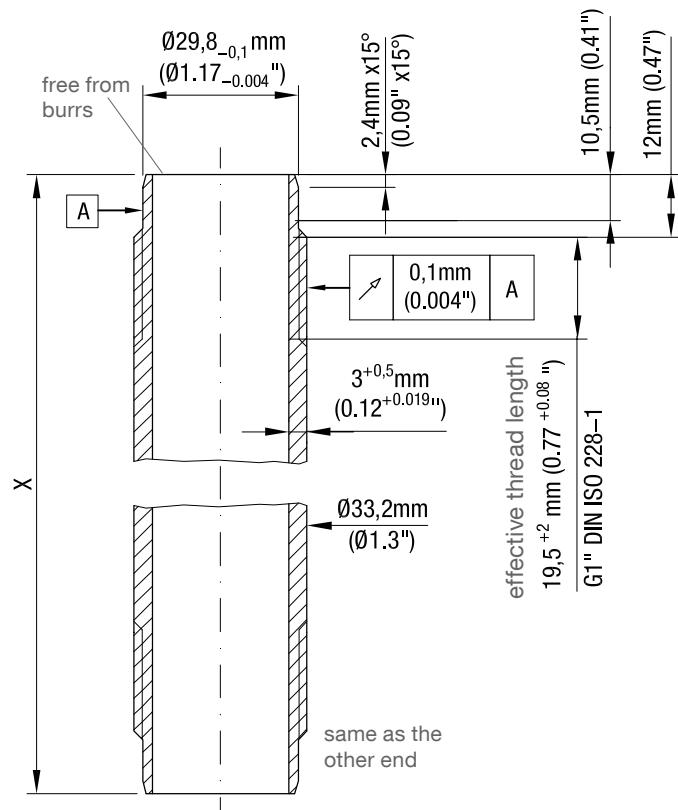
Assembly VN ..040

Manufacturing of the Extension tube

! Obtain instruction manual for proper manufacturing of the extension tube. In case of deviation from the instruction manual the unit is not safe for use in Hazardous Locations.

Demands on the Extension tube	<p>Material: Stainless steel 1.4301 (SS304) or 1.4305 (SS301) or 1.4571 (SS316Ti) or 1.4404 (SS316L)</p> <p>The tube must be manufactured from one single piece. It is not allowed to weld two or more pieces together.</p> <p>Carefully observe max. length, diameter, wall thickness, thread, tolerances as specified in the drawing.</p> <p>All sharp edges must be removed to protect the cable and sealing rings.</p>
Thread testing	<p>Each thread must be tested with no-go ring gauge according to standard DIN ISO 228-1 (G1") (G-version) or ANSI B 1.20.1 (NPT 1") (NPT version)</p>

Version with G1" (DIN ISO 228-1) thread
 (selection price list pos.5 A,L,M)



Pipe length X:

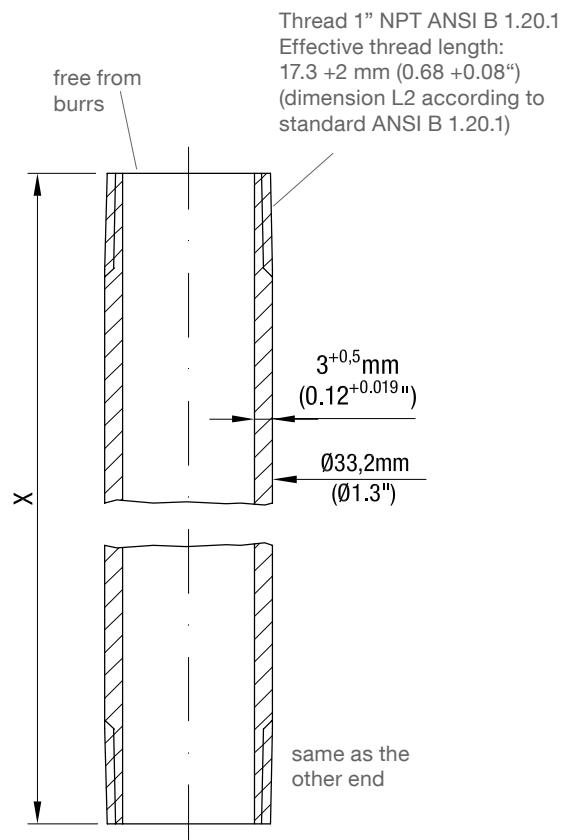
VN 1040: X = L - 180 mm (X = L - 7.1")

VN 2040: X = L - 250 mm (X = L - 9.8")

VN 2040 with pos.26 x,a,b: X = L - 275 mm (X = L - 10.8")

Note: L is the total extension length

Version with 1" (ANSI B 1.20.1) NPT thread
 (selection price list pos.5 B,S,T,U)



Pipe length X:

VN 1040: X = L - 190 mm (X = L - 7.5")

VN 2040: X = L - 260 mm (X = L - 10.2")

VN 2040 with pos.26 x,a,b: X = L - 285 mm (X = L - 11.2")

Note: L is the total extension length

Assembly VN ..040 with standard housing

Assembly of the unit

1. Mounting of the Extension tube

! The tube must be assembled very carefully to ensure permanent sealing and mechanical stability.
 Observe the follow mounting instructions.

! Make sure that the thread of the extension tube and the thread of the screwed piece/ oscillating piece is the same type (do not mix G and NPT thread).

1.1. Feed the connecting wire through the 1" Extension tube and the screwed piece. Use a separate taut wire for easy working.

1.2. Screw the 1" Extension tube into the oscillating piece and the screwed piece.

Tightening torque 50 Nm.

Use a 36 mm (1.42") open-end wrench to attach the fork piece (do not use the forks).

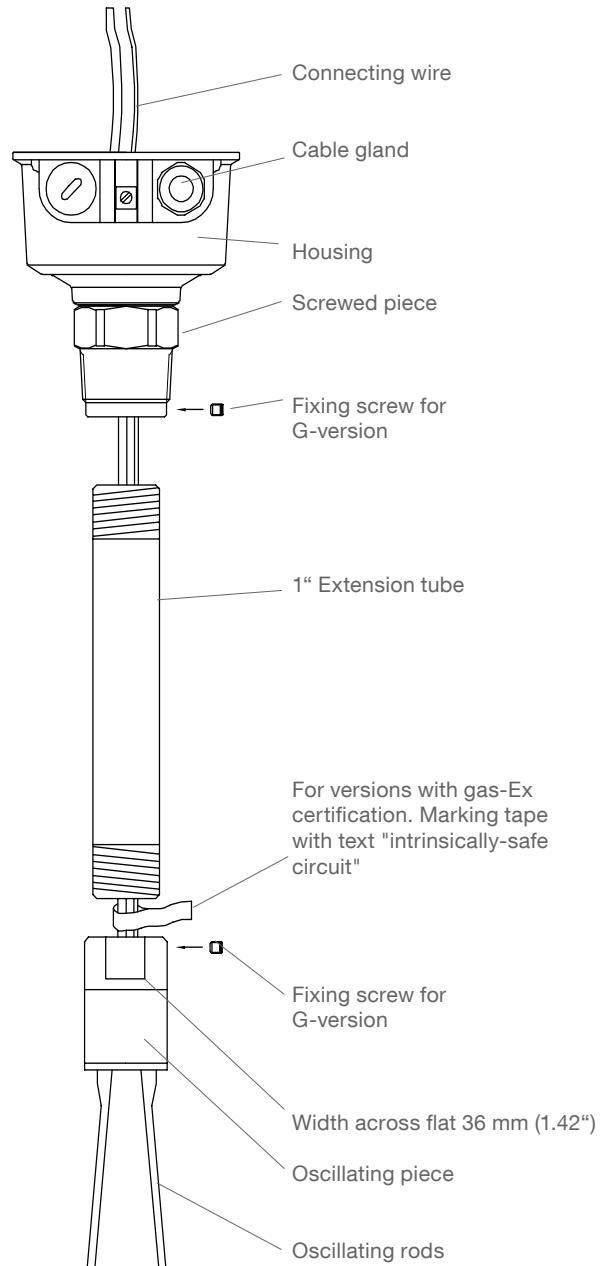
G version: Tighten the 2 fixing screws.

Requirements for sealing:

There must be tight connections at both ends of the extension tube (IP67 or NEMA 4).

G version: An O-ring is required at both ends to ensure proper sealing and must not be damaged. Only original O-rings from the manufacturer are allowed to be used.

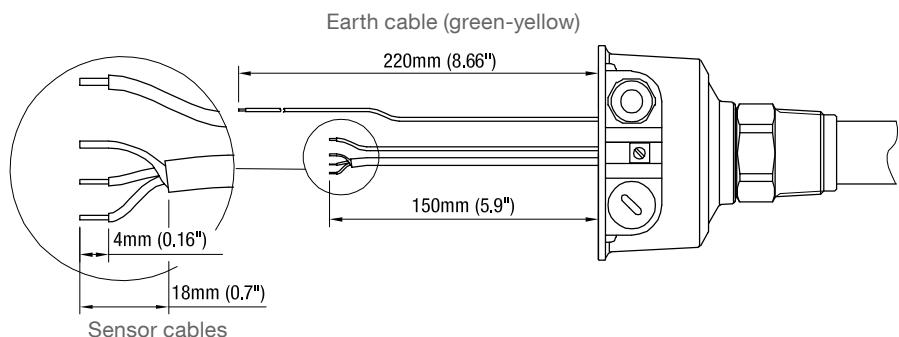
NPT version: The threads must be sealed with temperature resistant sealing for 150°C (302°F). Max. thickness of the sealing is 0.2 mm (0.008").



Assembly VN .040 with standard housing

2. Preparing the cables

Shorten the earth cable to 220 mm (8.66") and sensor cables to 150 mm (5.9"). Prepare cables as shown.

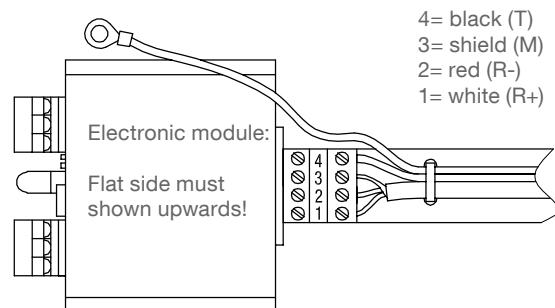
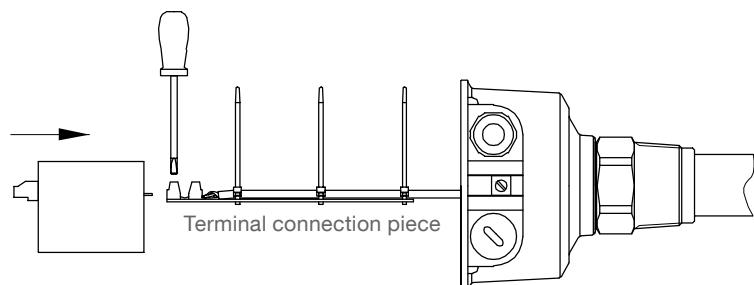


3. Connecting the cables

Connect sensor cables to the terminal connection piece. Fix the cables with cable clamps. Connect electronic module and terminal connection piece. Be sure that all terminals are tightly screwed in.

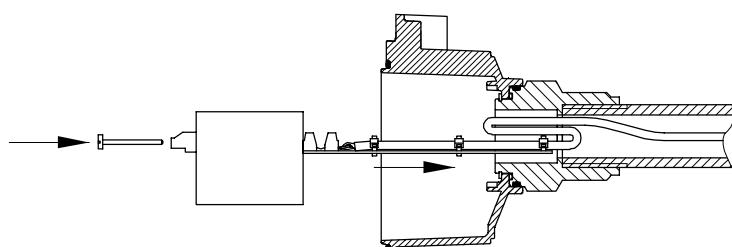
Take care that the non isolated shield wire (M) does not touch other metal parts (keep wire short or isolate with a hose)

Connect the earth cable from the vibrating fork to the housing (see figure at the bottom of this page).

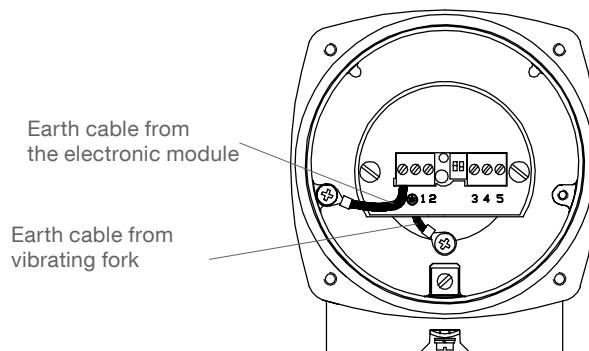


4. Fixing the electronic module

Insert electronic module into housing. The terminal connection piece is used to guide the cables. Fold connection cables as shown. Use cylinder head screws to fix the electronic module.



Connect the earth cable from the electronic module to the housing (not on all versions).



Assembly VN 5040/ 6040 with d or de-housing

Assembly of the unit

1. Mounting of the Extension tube to oscillating piece and preparing cables

- ! The tube must be assembled very carefully to ensure permanent sealing and mechanical stability. Observe the follow mounting instruction.
- ! Make sure, that the thread of the extension tube and the thread of the screwed piece/ oscillating piece is the same type (do not mix G and NPT thread).

1.1. Feed the connecting wire through the 1" Extension tube. Use a separate taut wire for easy working.

1.2. Screw the 1" Extension tube into the oscillating piece. Tightening torque 50 Nm.
 Use a 36 mm (1.42") open-end wrench, do not turn the oscillating rods.

G version: Tighten the Fixing screw

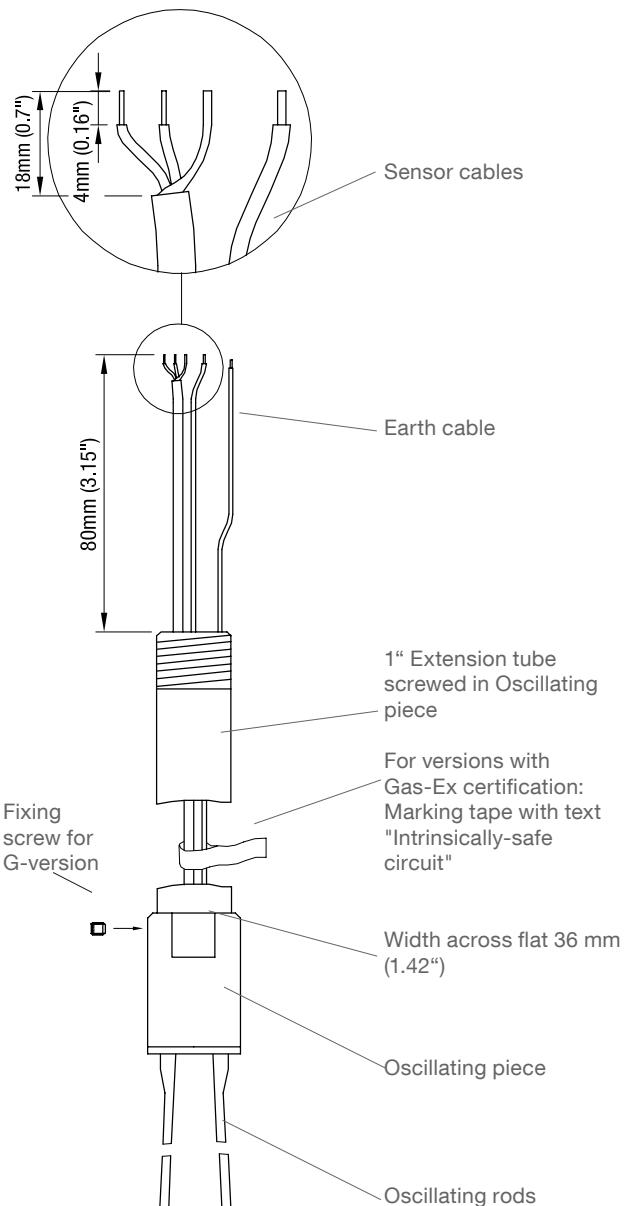
Requirements for sealing:

There must be a seal connection between the 1" tube and the screwed piece and the oscillating piece (IP67 or NEMA 4).

G version: An O-ring is required at both ends to ensure proper sealing and must not be damaged. Only original O-rings from the manufacturer are allowed to be used.

NPT version: The thread must be sealed with temperature resistant sealing for 150°C (302°F). Max. thickness of the sealing is 0.2 mm (0.008").

1.3. Shorten all cables to 80 mm (3.15"). Prepare cables as shown.



Assembly VN 5040 / 6040 with d or de-housing

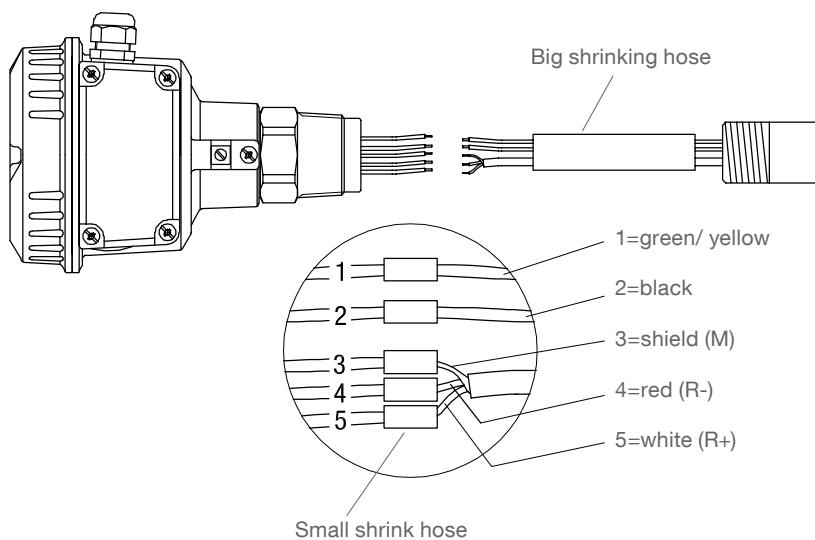
2. Soldering the cables

Guide the big shrink hose over all cables.

Guide the small shrink hose over each cable.

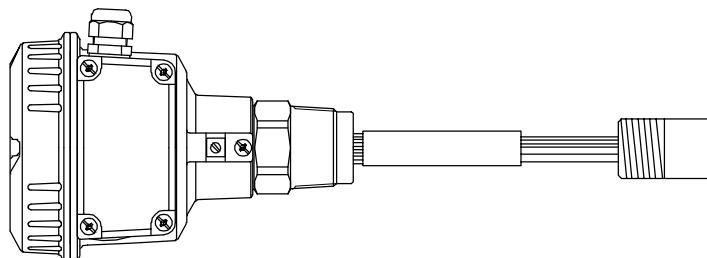
Solder the cables as shown.

Shrink the small shrink hose with a hot air blower. Ensure that the exposed wires are all covered with shrink hose



3. Shrinking all cables

Push the big shrink hose over the small shrink hoses and shrink with a hot air blower.



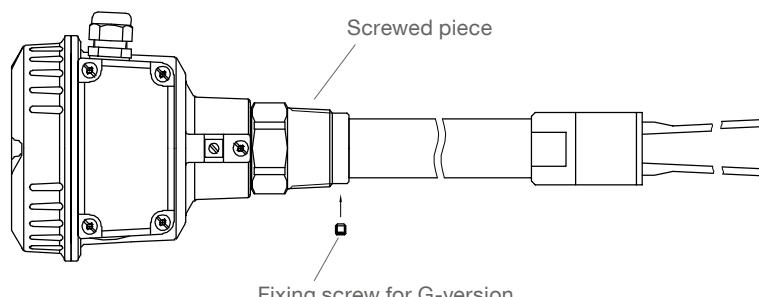
4. Mounting of the extension tube to housing side

Push the cables carefully into the extension tube.

Screw the 1" Extension tube into the screwed piece. Use a 36 mm (1.42") open-end wrench, do not turn the oscillating rods.

G version: Tighten the fixing screw

Sealing: see 1.2



Assembly: VN ..020 / ..030 with separate housing

Remove and reassemble of the connection cable

The units with separate housing are factory delivered completely assembled.

Should it be required to remove the connection cable from the housing due to shortening the cable or leading the cable through a pipe or wall, observe following items.

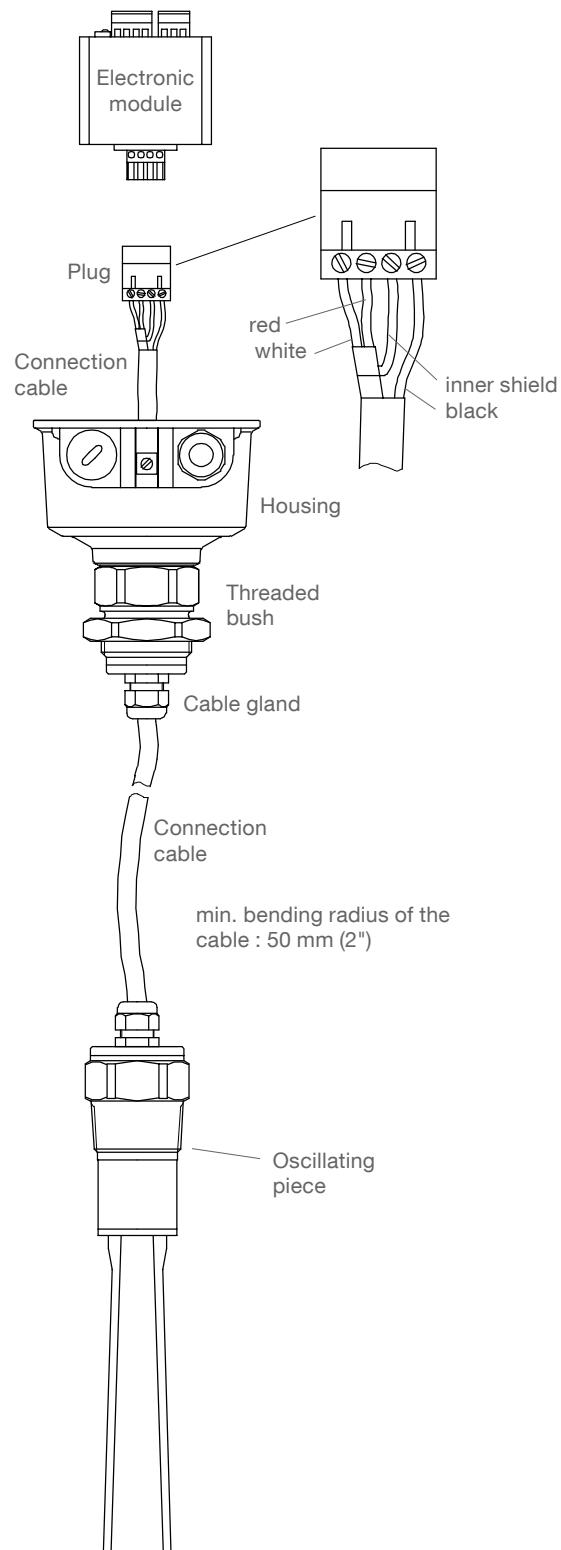
Before planning to shorten the cable, check if it is possible to loop the cable between housing and oscillating piece (prefered solution).

! Remove the cable only on the housing side, never on the oscillating piece side.

! For reassembling observe following items:

- After cutting the cable, use the factory provided cable situation as a sample.
- Connect the outer shield of the connection cable to the cable gland.
- Obtain right connecting sequence on the plug (see drawing).
- Cut present cables, which are not required.
- Isolate the inner shield with an isolation hose to avoid that it may touch any other metal parts.
- Fix the electronic module into the housing with 2 screws. To do this, guide the connecting cable that it rests in the threaded bush and is not clamped between electronic module and housing. Take care, that the plug is not removing from the electronic module.

! The cable gland cable must be closed tightly to reach ingress protection IP67 or NEMA 4.



Assembly: VN ..020 / ..030 with separate d- or de- housing

Remove and reassemble of the connection cable

The units with separate housing are factory delivered completely assembled.

Should it be required to remove the connection cable from the housing due to shortening the cable or leading the cable through a pipe or wall, observe following items.

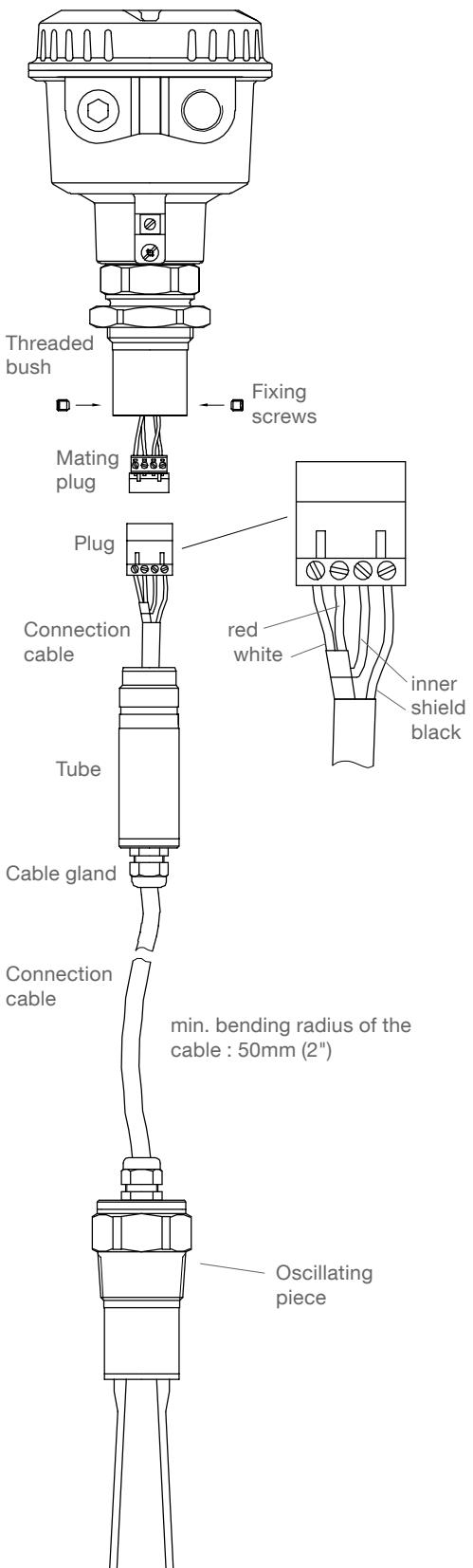
Before planning to shorten the cable, check if it is possible to loop the cable between housing and oscillating piece (prefered solution).

! Remove the cable only on the housing side, never on the oscillating piece side.

! For reassembling observe following items:

- After cutting the cable, use the factory provided cable situation as a sample.
- Connect the outer shield of the connection cable to the cable gland.
- Obtain right connecting sequence on the plug (see drawing).
- Cut present cables, which are not required.
- Isolate the inner shield with an isolation hose to avoid that it may touch any other metal parts.
- Connect plug and mating plug.
- Screw the tube into the threaded bush.
Before screwing check that inside the threaded bush a seal ring is present which seals the tube to the threaded bush.
While screwing, the cable gland must be open to avoid, that the connection cable is being twisted. Take care, that the plug is not removing from the mating plug.
- Fasten the two fixing screws.

! The cable gland cable must be closed tightly to reach ingress protection IP67 or NEMA 4.



Disposal

The product consists of materials which can be recycled, details of the used materials see chapter "Technical data - mechanical data".

Recycling must be done by a specialised recycling company. Since the product is not subject to the WEEE directive 2002/96/EG, it is not permitted to bring it to a public recycling station.

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Assembly VN 4040	20

Disposal	23

Subject to technical change.

All dimensions in mm (inch).

We assume no liability for typing errors.

Different variations than specified are possible.

Please contact our technical consultants.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning may be accomplished only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.

Special attention must be paid to warnings and notes as follows:

WARNING



Relates to a caution symbol on the product: A failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.

WARNING



Relates to a caution symbol on the product: Risk of electric shock

WARNING



A failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product	Description
	CAUTION: refer to accompanying documents (manual) for details.
	Earth (ground) Terminal
	Protective Conductor Terminal

Technical support

Please contact your local supplier (for address see www.uwt.de). Otherwise you can contact:

UWT GmbH
Westendstr. 5
D-87488 Betzigau

Tel.: 0049 (0)831 57123-0
Fax: 0049 (0)831 76879
info@uwt.de
www.uwt.de

Introduction

Applications

The device is used for level monitoring in all types of containers and silos.

It can be used with all powdery and granulated bulk materials with a density greater than 30 g/l (1.9 lb/ft³) that do not show a strong tendency to form crusts or deposits.

The units can be delivered with Ex-approvals for use in Dust Hazardous Areas.

A selection of fields of application:

- **Building materials industry**
lime, moulding sand, etc.
- **Food industry**
milk powder, flour, salt, etc.
- **Plastics industry**
plastics granules etc.
- **Timber industry**
- **Chemical industry**
- **Mechanical engineering**

The VIBRANIVO oscillating probe is normally screwed into the lateral container wall so that it is level with the filling height to be registered and monitored.

The device can also be mounted from the top of the container. In this case an extension piece is used to mount the probe level with the height to be registered.

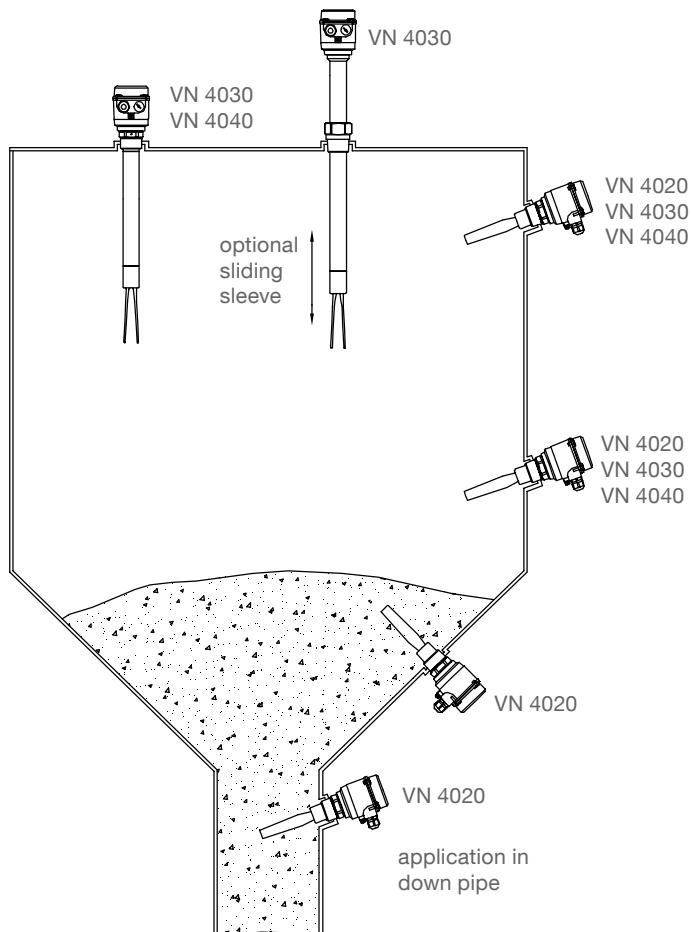
The length of the probe can be up to 4 m (157") with an extension tube (VN 4030, VN 4040).

The use of a sliding sleeve is recommended so that the switch point can be changed continuously during operation of the device.

Function

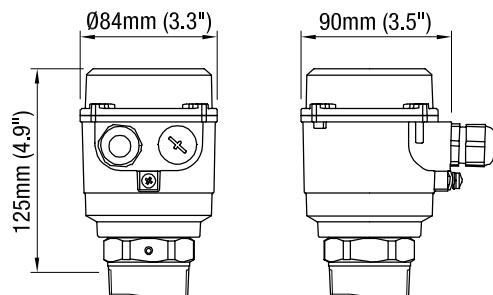
The piezo-electrically stimulated oscillating fork vibrates at its mechanical resonance frequency. If the probe is covered by the bulk material, the damping thus generated is registered electronically and a corresponding signal output is actuated.

The oscillation of the fork ensures a certain self-cleaning effect..

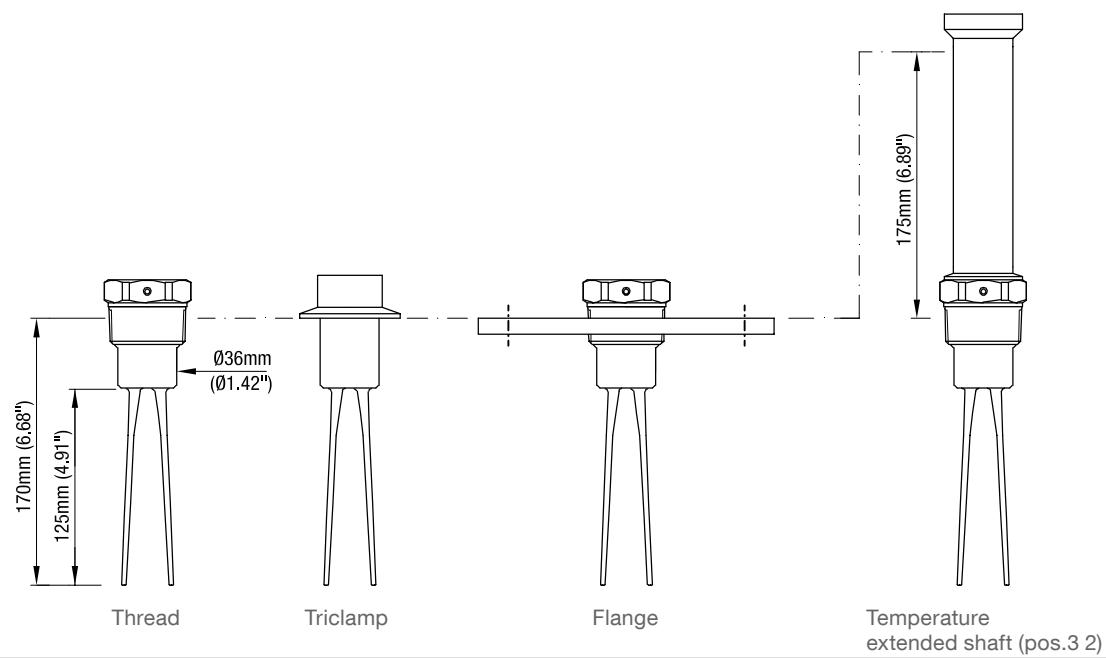


Technical data

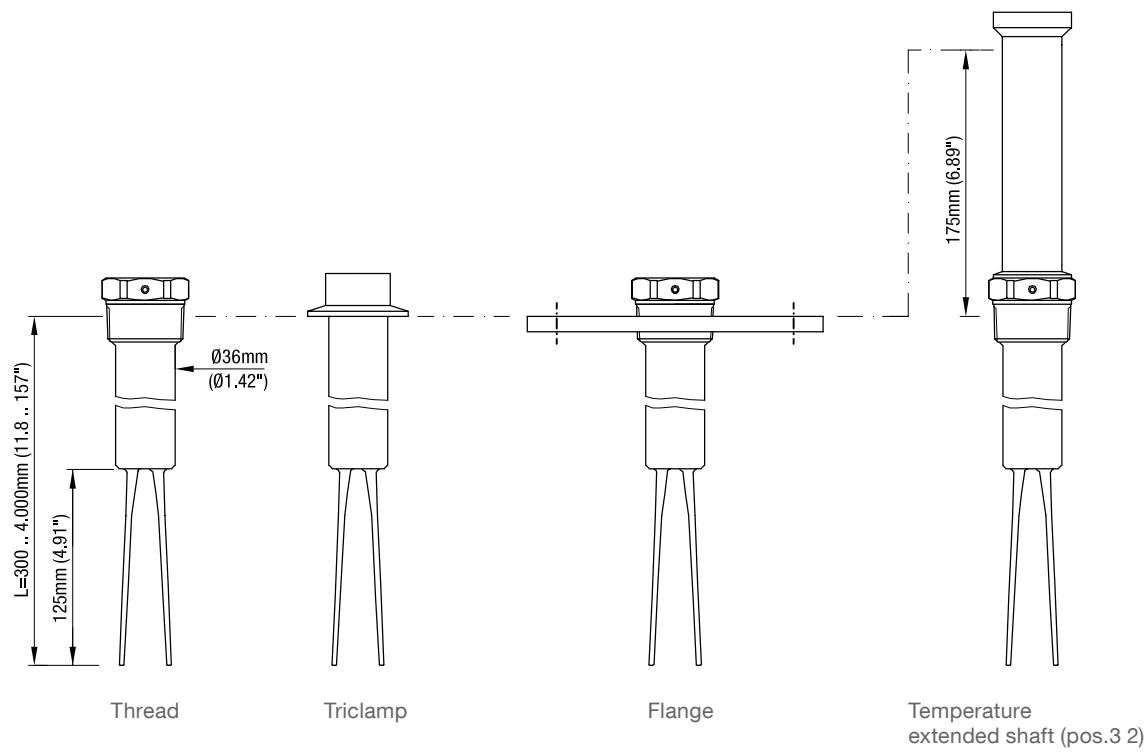
Dimensions



VN 4020

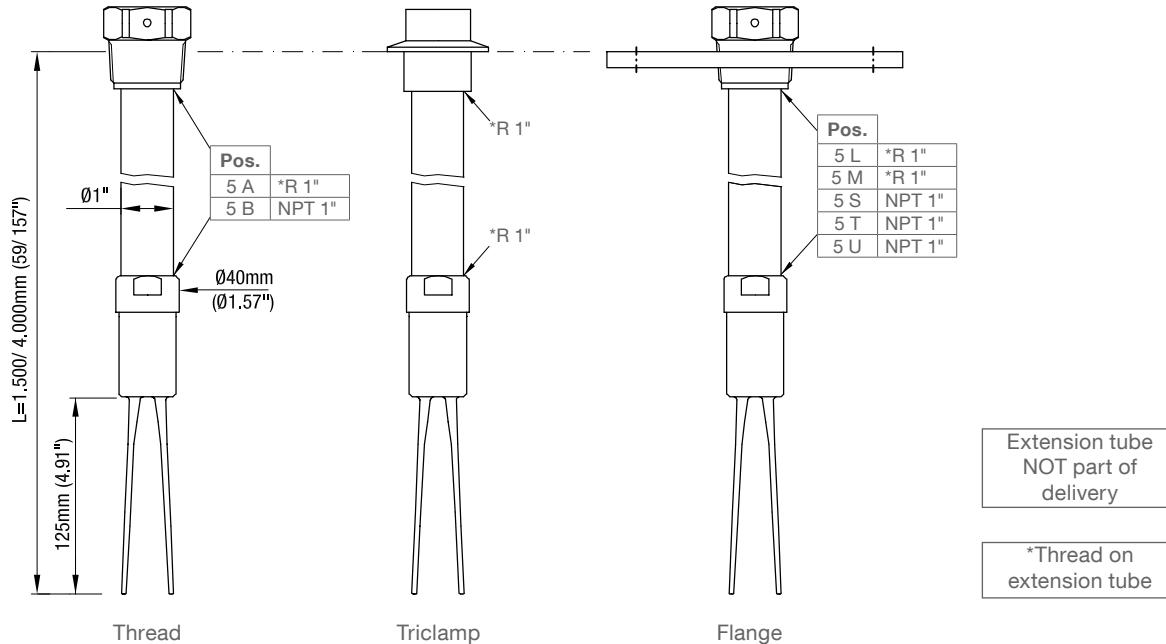


VN 4030



Technical data

VN 4040



Technical data

Electrical data

Connection terminals	0.14 - 2.5 mm ² (AWG 26-14)		
Cable entry	M20 x 1.5 screwed cable gland NPT 1/2" conduit connection NPT 3/4" conduit connection		
Clamping range (diameter) of the factory provided cable glands: M20 x 1.5: 6 .. 12 mm (0.24 .. 0.47")			
Signal delay	Sensor free -> covered ca. 1 sec Sensor covered -> free ca. 1 .. 2 sec		
Safety operation (FSL,FSH)	Switchable for minimum or maximum safety		
Vibration frequency	ca. 200 Hz		
Overvoltage category	II		
Pollution degree	2 (inside housing)		
Electronics	Universal voltage Relay DPDT	3-wire PNP	
Power supply	19 .. 230 V 50 - 60Hz 19 .. 40 V DC	±10%*	18V .. 50 V DC *incl. ±10% of EN 61010
incl. ±10% of EN 61010		±10%	
Max. ripple of power supply	7 V _{ss} at DC		7 V _{ss}
Installed load/ input current	max. 22 VA/ 2 W		max. 0.5 A
Signal output	Floating relay DPDT AC max. 250 V, 8 A non inductive DC max. 30 V, 5 A non inductive	Open Collector: Permanent load max. 0.4 A Short-circuit, overload and reverse polarity protected Output voltage equal to input voltage, drop <2.5 V	
Indicating light	Status of signal output by built-in LED		Status of signal output by built-in LED
Isolation	Power supply to signal output: 2,225 Vrms Signal output to signal output: 2,225 Vrms		-
Protection class	I	III	

Mechanical data

Housing	Aluminium housing, powder coated RAL 5010 gentian blue Seal between housig and lid: NBR Seal between housing and process connection: NBR Nameplate: polyester film
Degree of protection	IP67 (EN 60529), NEMA Type 4X
Process connection	Material: VN 4020: stainless steel 1.4581 (316) VN 4030/4040: stainless steel 1.4305 (303) or 1.4571 (316TI) (process connection and tube extension) Thread: R 1 1/2" tapered EN 10226 or NPT 1 1/2" or NPT 1 1/4" tapered ANSI B 1.20.1 Flanges: according to selection 1.4541 (321) or 1.4404 (316L) Triclamp: stainless steel 1.4301 (304) or 1.4404 (316L) 2" (DN50) ISO 2852 All material food grade

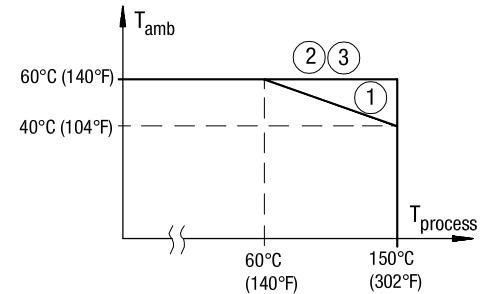
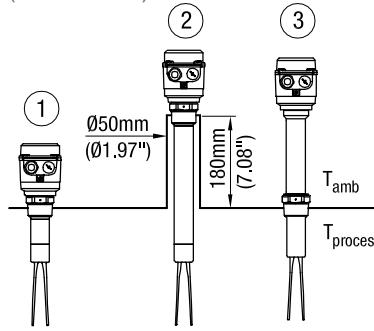
Technical data

Oscillator	Material: stainless steel 1.4581 (316) (food grade)
Sound level	max. 50 dBA
Overall weight (ca.)	VN 4020: 1.7 kg (3.7 lbs) VN 4030: 1.7 kg (3.7 lbs) +1.9 kg/m (+4.2 lbs per 39.3") extension VN 4040: 2.1 kg (4.6 lbs) +1.9 kg/m (+4.2 lbs per 39.3") extension

Operating conditions

Ambient temp. (housing) -40°C .. +60°C (-40 .. +140°F)

Process temperature -40°C .. +150°C (-40 .. +302°F)



For versions with Ex-approvals: see remarks on page 19.

Ventilation	Ventilation is not required
Min. powder density	Setting A ca. 150 g/l (9.5lb/ft³) Setting B ca. 30 g/l (1.9lb/ft³)
Features of bulk material	No strong tendency to cake or deposit Max. grain size 8mm (0.31")
Max. mechanical load	500 N laterally (on oscillator rods) Recommended protection in case of high material load: mounting of an protective angle above the probe
Max. mechanical torque	VN 4030: 250 Nm VN 4040: 100 Nm
Max. process pressure	16 bar (232 psi) For versions with "sliding sleeve without process overpressure" (option pos.25 a, b): unpressurized. The max. process pressure may be reduced with use of flanges. Observe flange standards for pressure rating and pressure derating with higher temperature. For versions with Ex-approvals: see remarks on page 18.
Vibration	1.5 (m/s²)²/Hz according to EN 60068-2-64
Relative Humidity	0 - 100%, suitable for outdoor use
Altitude	max. 2,000 m (6,562 ft)
Expected product lifetime	Following parameters have a negative influence on the expected product lifetime: High ambient- and process temperature, corrosive environment, high vibration, high flow rate of abrasive bulk material passing the sensor element.

Technical data / Approvals

Transport and Storage

Transport Observe the instructions as stated on the transport packaging, otherwise the products may get damaged.

Transport temperature: -40 .. +80°C (-40 .. +176°F)
Transport humidity: 20 .. 85%

Transport incoming inspections must be carried out to check for possible transport damage.

Storage Products must be stored at a dry and clean place. They must be protected from influence of corrosive environment, vibration and exposure to direct sunlight.

Storage temperature: -40 .. +80°C (-40 .. +176°F)
Storage humidity: 20 .. 85%

Approvals

General Purpose (Ordinary Locations) Depending on selected version in price list.	CE FM CSA TR-CU	EN 61010-1 (IEC/CB)	
Hazardous Locations Depending on selected version in price list.	ATEX IEC-Ex FM CSA TR-CU	Dust explosion Dust explosion Dust explosion Dust explosion Dust explosion	ATEX II 1/2 D Ex ta/tb IIIC T! Da Db IEC-Ex ta/tb IIIC T! Da Db Cl. II, III Div. 1 Gr. E,F,G Cl. II, III Div. 1 Gr. E,F,G Ex DIP A20/21 Ex ta/tb IIIC T! Da Db X Detailed allocation of types and electronics to approvals: see selection list.
EMC	EN 61326 - A1		
Food grade material	According to directive 1935/2004/EC		
RoHS conform	According to directive 2011/65/EU		
Pressure Equipment Directive (2014/68/EU)	<p>The units are not subject to this directive, because they are classified as „pressure-keeping equipment“ and do not have a pressurized housing (see Art.1, Abs. 2.1.4). The units are designed and manufactured in accordance to the Pressure Equipment Directive. The unit is NOT intended for use as an “equipment part with safety function (Art.1, Abs. 2.1.3). If the units should be used as „equipment part with safety function“ please contact the manufacturer.</p>		

Options

Weather protection cover

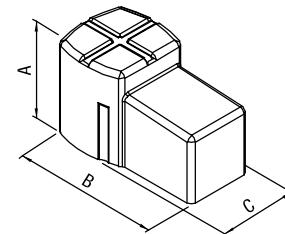
When the measuring device is used outdoor, the use of the weather protection cover is recommended. It protects the device from all atmospheric influences such as:

- rain water
- condensation of water
- excessively high temperatures due to insulation
- excessively low temperatures in winter

Material: PE, weathering and temperature stable

Not available for housing version d and de.

- For use in Hazardous Locations: only permitted for Category 3 (zone 22) or Division 2.

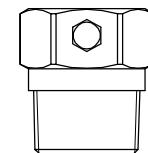


A	100 mm (3.94")
B	165 mm (6.5")
C	88 mm (3.46")

Sliding sleeve

VN 4030

G 1½" ISO 228 or
 1½" NPT ANSI B 1.20.1
 or flanges
 Material: 1.4301 (304) or 1.4571 (316TI)
 Sealing material to the extension tube:
 viton or NBR

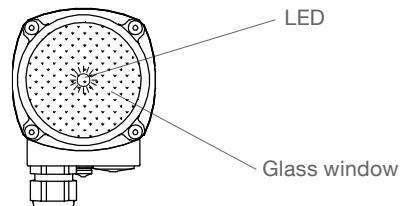


Mounting set

Screws and washers for fixing the unit on a flange.

Glass window in lid

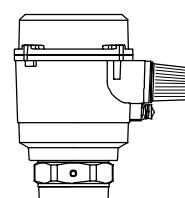
To see the indicating light on the electronic from outside.



Bulb

Bright indicating light seen from outside.

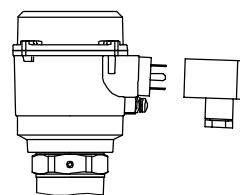
Not available for use in Hazardous Locations and FM/CSA general purpose.



Plug 4-pole (incl. PE)

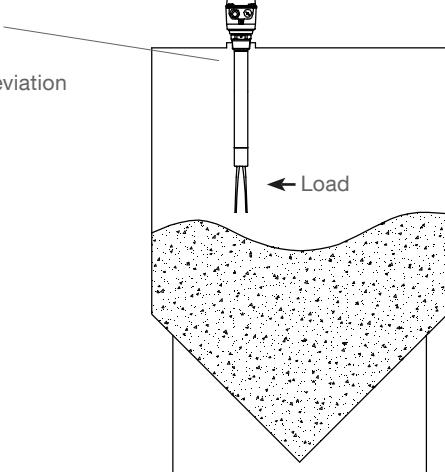
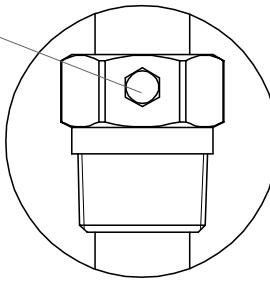
Used instead of cable gland.

Not available for use in Hazardous Locations and FM/CSA general purpose.



Mounting

General Safety Instructions

Process pressure	!	Improper installation may result in loss of process pressure.								
Chemical resistance against the medium	!	Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.								
Temperature range	!	The range of the ambient and process temperature of the device must be observed (see page 6 and for Ex-approvals page 17)								
Mechanical load	!	<p>The torque at the fastening spot must not exceed 300 Nm VN 4030/ (100 Nm VN 4040).</p> <p>Maximum length „L“ in dependence on the deviation (in degrees) from vertical installation:</p>  <table border="1"> <thead> <tr> <th>Max. deviation</th> <th>Max. length "L"</th> </tr> </thead> <tbody> <tr> <td>5°</td> <td>4,000 mm (157.5")</td> </tr> <tr> <td>45°</td> <td>1,200 mm (47.24")</td> </tr> <tr> <td>>45°</td> <td>600 mm (23.62")</td> </tr> </tbody> </table>	Max. deviation	Max. length "L"	5°	4,000 mm (157.5")	45°	1,200 mm (47.24")	>45°	600 mm (23.62")
Max. deviation	Max. length "L"									
5°	4,000 mm (157.5")									
45°	1,200 mm (47.24")									
>45°	600 mm (23.62")									
Mounting location		<p>Keep distance to incoming material and to the silo wall. The installation has to be done in a way, that the sensor elements cannot hit the wall of the silo. The flow of the medium and fixtures in the container must be considered. This is especially important for extension length more than 3 m (118.1").</p>								
Sliding sleeve		<p>“Pressure tight” version (pos.25 e, f): Tighten both straining screws M8 with 20 Nm to obtain resistance against pressure.</p> 								
Flange mounting		A plastic sealing must be used to tighten the flange.								
Fastening of the threaded process connection		Mounting torque for the thread may not exceed 80 Nm. Use a 50 mm (1.97"), for units with sliding sleeve use a 55 mm (2.17"), open-end wrench. Do not fasten by turning the housing .								
Food grade material		The materials are available for the use under normal and predictable applications (according to directive 1935/2004 Art.3). Other conditions can influence the safety.								

Mounting

! Additional Safety Instructions for Hazardous Locations

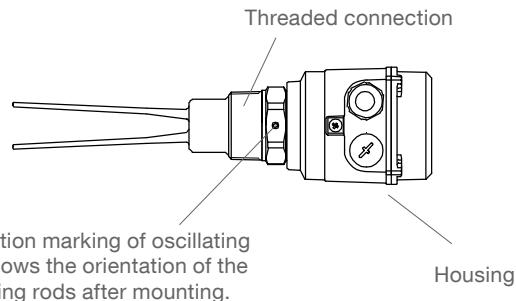
Installation regulations For devices to use in hazardous locations the respectively valid installation regulations must be observed.

Sparks The installation has to be done in a way mechanical friction or impact can not cause sparks between the aluminium enclosure and steel.

Mounting instructions

Oscillating rods Do not bend, shorten or extend the oscillating rods since this will destroy the device.

Rotatable housing and orientation marking of oscillating rods The housing can be rotated against the threaded connection after mounting.



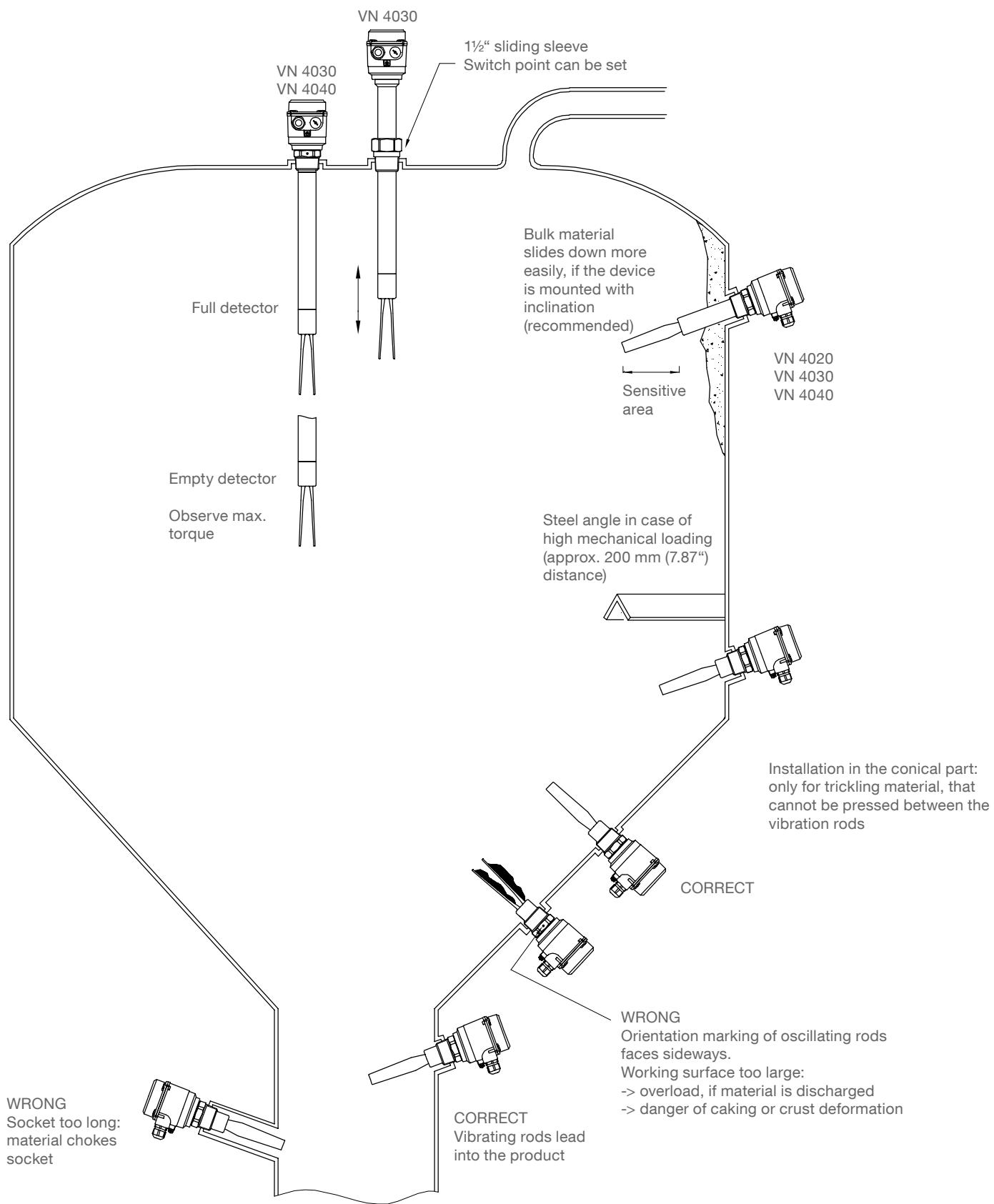
Direction of the cable glands When the unit is mounted from the side, ensure, that the cable glands faces downwards and are closed to avoid water penetration into the housing.

Sealing Seal the process thread with Teflon tape in case of process pressure

Precaution for later dismounting/ Service Grease the screws of the lid if corrosive atmosphere is present (e.g. close to sea)

Switching point Heavy bulk material -> the signal output switches when the oscillating rods are covered a few mm
 Light bulk material -> the signal output switches, when the oscillating rods are covered a few cm

Mounting



Electrical installation

General Safety Instructions

Handling ! In the case of inexpert handling or handling malpractice the electric safety of the device cannot be guaranteed.

Protective earthing Before any electrical installation, the device must be connected to the protective earthing terminal inside the housing.

Installation regulations The local regulations or VDE 0100 (Regulations of German Electro technical Engineers) must be observed.
With use of 24 V supply voltage, an approved power supply with reinforced insulation to mains is required.

Fuse Use a fuse as stated in the connection diagrams (page 15).

RCCB protection In the case of a defect, the distribution voltage must automatically be cut off by a RCCB protection switch so as to protect the user of the device from indirect contact with dangerous electric tensions.

Power supply switch A Power-supply-disconnecting switch must be provided and marked near the device.

Wiring diagram The electrical connections have to be made according to the wiring diagram.

Supply voltage Compare the supply voltage applied with the specifications given on the electronic and name plate before switching the device on.

Cable gland/ closing element The screwed cable gland and closing element must have following specifications:
Ingress protection IP67, temperature range from -40°C to +70°C, UL or VDE certified (depending on the country where the unit is installed), pull relief.
Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion). Cable glands that are not used have to be locked with a closing element.

Conduit system In case of using a conduit system (with NPT thread) instead of a cable gland the regulations of the country where the unit is installed must be observed. The conduit must have a tapered thread either NPT ½" or NPT ¾" in accordance with the unit and ANSI B 1.20.1. Not used inlets must be closed tight with a metal closing element.

Field wiring cables

- The diameter has to match to the clamping range of the used cable gland.
- The cross section has to match with the clamping range of the connection terminals and consider the max. current.
- All field wirings must have insulation suitable for at least 250 V AC.
- The temperature rating must be at least 90°C (194°F).
- If higher immunity interferences as specified in the stated EMC standards are present (see chapter approval), a shielded cable is required, otherwise an unshielded instrumentation cable is satisfactory.

Connecting the terminals Make sure that max. 8 mm (0.31") of the pigtails are bared (danger of contact with live parts).

Guiding the cables in the terminal box Cut the field wiring cables to appropriate length to fit properly into the terminal box.

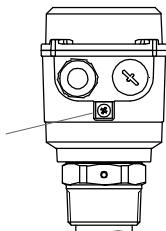
Relay and transistor protection Provide protection for relay contacts and output transistors to protect the device against spikes with inductive loads.

Protection against static charging The housing of the unit must be grounded in any case to avoid static charging of the unit on applications with pneumatic conveying and non-metallic containers.

Electrical installation

! Additional Safety Instructions for Hazardous Locations

External equipotential bonding terminal



Connect with equipotential bonding of the plant

Field wiring

A pull relief must be provided for the field wiring cables, when the device is installed with the factory provided cable glands.

Cable glands and conduit system for ATEX/ IEC-Ex/ TR-CU Installation according to the regulations of the country, where the product is installed.

Not used entries have to be closed with blanking elements certified for this purpose.

Where available the factory provided parts must be used.

A strain relief must be provided for the field wiring cables, when the device is installed with the factory provided cable glands.

The diameter of the field wiring cable must match to the clamping range of the cable clamp.

If other than the factory provided parts are used, following must be ensured:

The parts must have an approval adequate to the approval of the level sensor (certificate and type of protection).

The approved temperature range must be from the min. ambient temperature of the level sensor to the max. ambient temperature of the level sensor increased by 10 K.

The parts must be mounted according to the instructions of the supplier.

Conduit system for FM and CSA

In addition the regulations of the country must be observed. The used flameproof seals and blanking elements must have an adequate type approval and a temperature range of at least -40°C (-40°F) to +80°C (176°F). In addition they shall be suitable for the conditions and correctly installed. Where available the provided original parts of the manufacturer must be used.

Commissioning

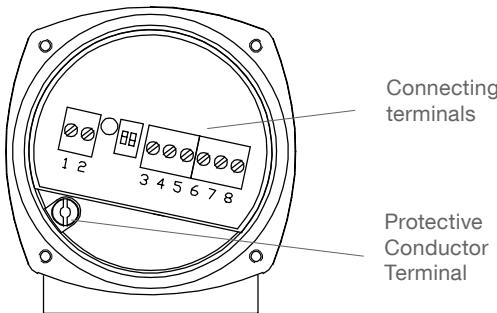
Commissioning only with closed lid.

Opening the lid

Before opening the lid take care, that no dust deposits or whirlings are present.
 Do not remove the lid (cover) while circuits are alive.

Electrical installation

Connection



Universal voltage

Relay DPDT

Power supply:

19 .. 230 V 50 - 60Hz $\pm 10\%$ * 22 VA

19 .. 40 V DC $\pm 10\%$ * 2 W

*incl. $\pm 10\%$ of EN 61010

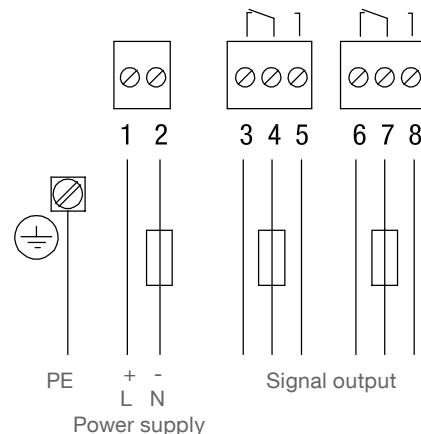
Fuse on power supply:
 max. 10 A, fast or slow, HBC, 250 V

Signal output:

Floating relay DPDT

AC max. 250 V, 8 A, non inductive
 DC max. 30 V, 5 A, non inductive

Fuse on signal output:
 max. 10 A, fast or slow, HBC, 250 V



3-wire PNP

Power supply:

18 .. 50 V DC $\pm 10\%$ *

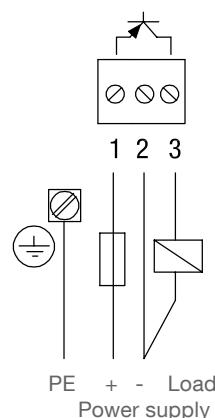
*incl. $\pm 10\%$ of EN 61010

Input current: max. 0.5 A

Fuse:
 max. 4 A, fast or slow, 250 V

Signal output:
 max. 0.4 A
 Output voltage equal to input
 voltage, drop <2.5 V

Load for example:
 PLC, relay, contactor, bulb



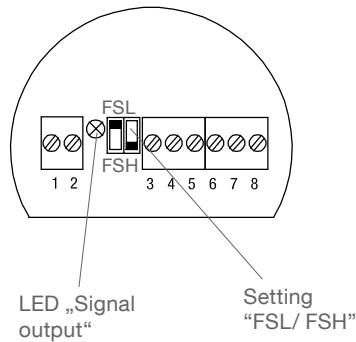
Signal output / Sensitivity setting

Signal output

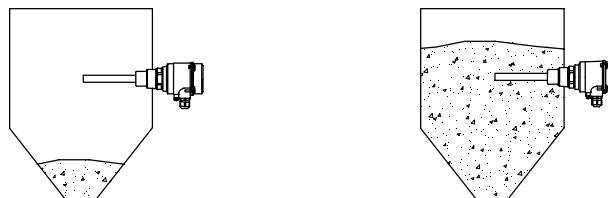
FSL/ FSH Setting

FSH If the sensor is used to indicate full load, set to Fail Safe High. Power failure or line break is regarded as „full“ signal (protection against overcharging).

FSL If the sensor is used to indicate empty load, set to Fail Safe Low. Power failure or line break is regarded as „empty“ signal (protection against running dry).



	Signal output		Signal output	
Setting	FSL	FSH	FSL	FSH
Relay DTPT				
3-wire PNP				
LED „Signal output“				

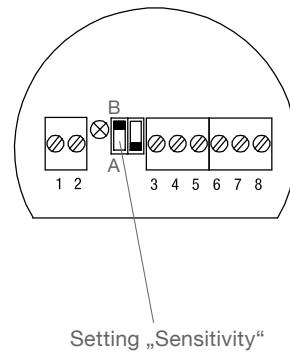


Sensitivity setting

All sensors are factory setted. Therefore, they usually do not have to be re-setted. If the bulk material has a strong tendency to cake or deposit, the setting switch can be set to position „A“ so as to decrease the sensitivity of the probe (Factory presetting = position „B“).

Approximate min. bulk density on setting:

A Low sensitivity	B High sensitivity
150 g/l (9.5 lb/ft³)	30 g/l (1.9 lb/ft³)



Please contact manufacturer if you intend to use the device for special purposes.

Maintenance

Opening the lid (cover)



Before opening the lid for maintenance reasons observe following items:

- Do not remove the lid while circuits are alive.
- No dust deposits or whirlings are present.
- No rain can enter into the housing.

Frequent check of the unit



To ensure durable safety in hazardous locations and with electrical safety, following items must be checked frequently depending on the application:

- Mechanical damage or corrosion of any components (housing side and sensor side) and of the field wiring cables.
- Tight sealing of the process connection, cable glands and enclosure lid.
- Properly connected external PE cable (if present).

Cleaning

If cleaning is required by the application, following must be observed:

- Cleaning agent must comply with the materials of the unit (chemical resistance). Mainly the lid sealing, cable gland and the surface of the unit must be considered.

The cleaning process must be done in a way, that:

- The cleaning agent cannot enter into the unit through the lid sealing or cable gland.
- No mechanical damage of the lid sealing, cable gland or other parts can happen.

A possible accumulation of dust on the unit does not increase the maximum surface temperature and must therefore not be removed for purposes of maintaining the surface temperature in hazardous locations.

Function test

A frequent function test may be required depending on the application.



Observe all relevant safety precautions related with a safe work depending on the application (e.g. hazardous locations, hazardous bulk material, electric safety, process pressure).

- This test does not proof if the sensor is sensitive enough to measure the material of the application.

Function test is done by stopping the vibration of the vibrating rods with appropriate means and monitor if a correct change of the signal output from uncovered to covered happens.

Production date

The production date can be traced by the serial number on the typeplate. Please contact the manufacturer or your local distributor.

Spare parts

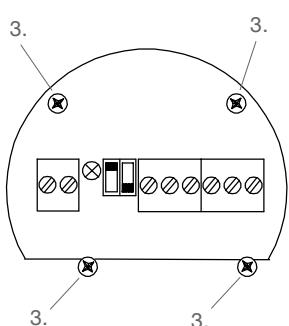
All available spare parts are stated in the selection list.

Change of the electronic board:

Deenergise device and secure against being switched on again.

Version small housing:

1. Open the housing lid
2. Remove the field wiring cables/ plug
3. Unscrew the cover plate
4. Take out the electronic board and remove internal plug
5. Insert a new electronic board in reverse sequence
6. Connect the field wiring cables

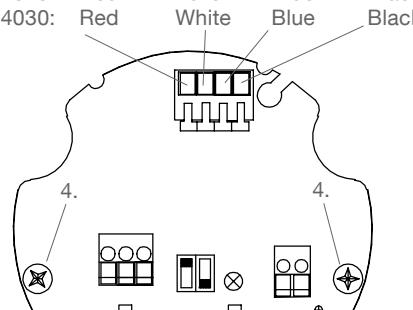


Version big housing:

1. Open the housing lid
2. Remove the field wiring cables
3. Remove the sensor cables
4. Unscrew the two fastening screws of the electronic board
5. Take out the electronic board
6. Insert a new electronic board and tighten fastening screws
7. Connect the sensor cables and field wire cable (see drawing)

Sensor cables

Version VN 4020: Red
 Version VN 4030: Red
 Yellow
 White
 Blue
 Black
 Black



Notes for use in Hazardous Locations

Zone classification

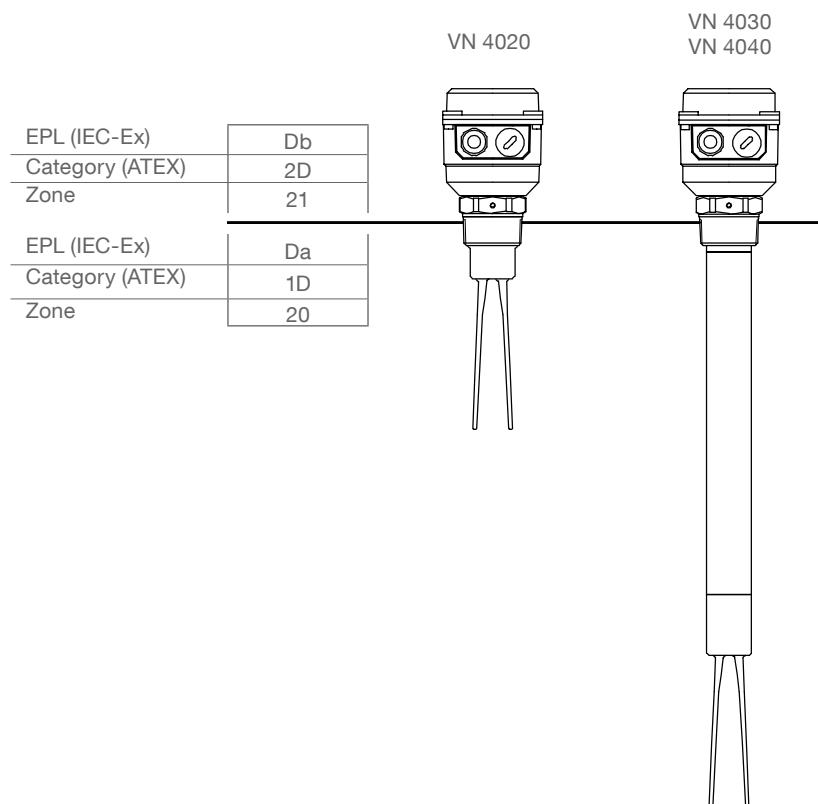
	Usable in zone	ATEX category	IEC-Ex Equipment Protection Level (EPL)
Dust applications	20, 21, 22	1 D	Da
	21, 22	2 D	Db
	22	3 D*	Dc

* in case of conductive dust additional demands for the installation are possible.

General Notes

Marking	Devices with EX approval are marked on the name plate.
Process pressure	<p>The device construction allows process over-pressure up to 16 bar (232 psi). These pressures are allowed for test purposes. The definition of the Ex approval are only valid for a container-over-pressure between -0.2 .. +0.1 bar (-2.9 .. +1.45 psi).</p> <ul style="list-style-type: none"> ● For higher or lower pressures the approvals are not valid.
Process and ambient temperature	<p>The permitted temperature ranges are marked on the name plate. The max. permitted ambient and process temperatures (including temperature derating) stated in this manual must be observed.</p>

Permitted zones for mounting in partition wall



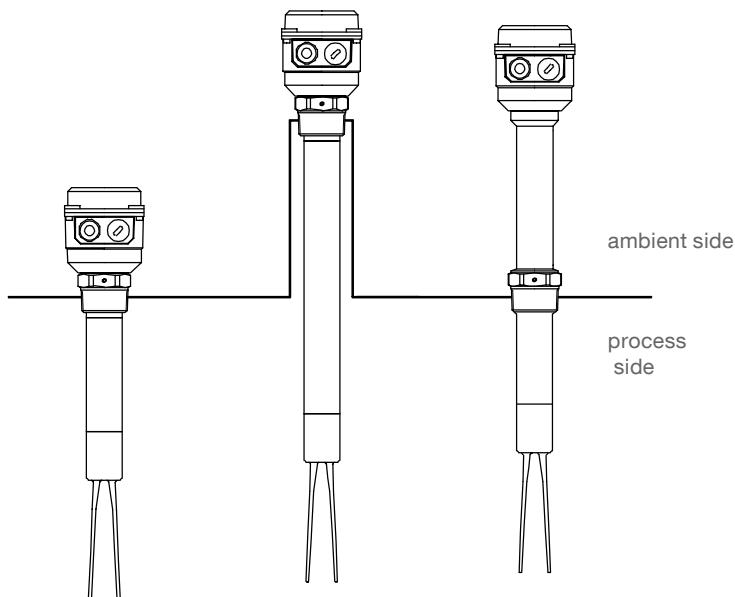
Notes for use in Hazardous Locations

Max. Surface Temperature and Temperature Class



The temperature marking on the type plate refers to the instruction manual.
 In the following table the relevant temperature ratings are shown.

The maximum surface temperature (resp. temperature class) is the warmest temperature of the unit which could occur during malfunction (according to Ex-definition)..



Max. ambient temperature	Max. process temperature	Max. surface temperature	Temperature class (Division System)	Temperature class (Zone System)
60°C (140°F)	110°C (230°F)	115°C (239°F)	T4A	T4
	120°C (248°F)	120°C (248°F)	T4	T4
	130°C (266°F)	130°C (266°F)	T4	T4
	140°C (284°F)	140°C (284°F)	T3C	T3
	150°C (302°F)	150°C (302°F)	T3C	T3

Assembly VN 4040

Manufacturing of the Extension tube



Obtain instruction manual for proper manufacturing of the extension tube. In case of deviation from the instruction manual the unit is not safe for use in Hazardous Locations.

Demands on the Extension tube

Material: Stainless steel 1.4301 (SS304) or 1.4305 (SS301) or 1.4571 (SS316Ti) or 1.4404 (SS316L)

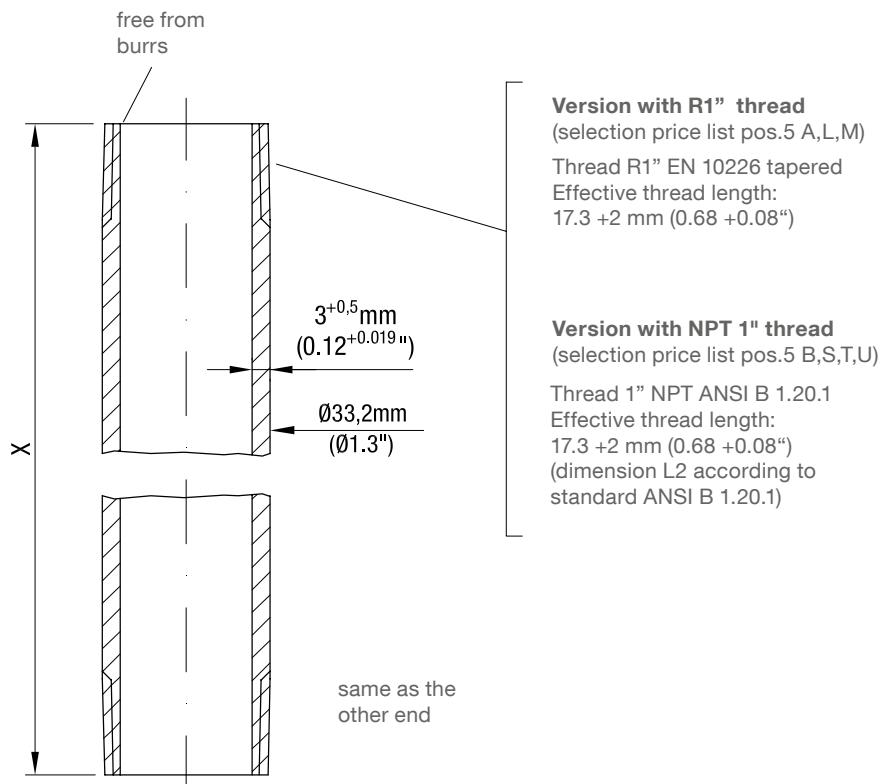
The tube must be manufactured from one single piece. It is not allowed to weld two or more pieces together.

Carefully observe max. length, diameter, wall thickness, thread, tolerances as specified in the drawing.

All sharp edges must be removed to protect the cable.

Thread testing

Each thread must be tested with go and no-go ring gauge according to standard EN 10226 (R1" version) or ANSI B 1.20.1 (NPT 1" version)



Pipe length X = L - 200 mm (7.9")
 Min. L = 250 mm (9.9")
 Max. L = 1,500 mm (59") with pos.7 L
 or 4,000 mm (157") with pos.7 M
 Note: L is the total extension length

Assembly VN 4040

Assembly of the unit

1. Mounting of the Extension tube

! The tube must be assembled very carefully to ensure permanent sealing, electrical grounding and mechanical stability. Observe the follow mounting instructions.

! Make sure that the thread of the extension tube and the thread of the screwed piece/ oscillating piece is the same type (do not mix R and NPT thread).

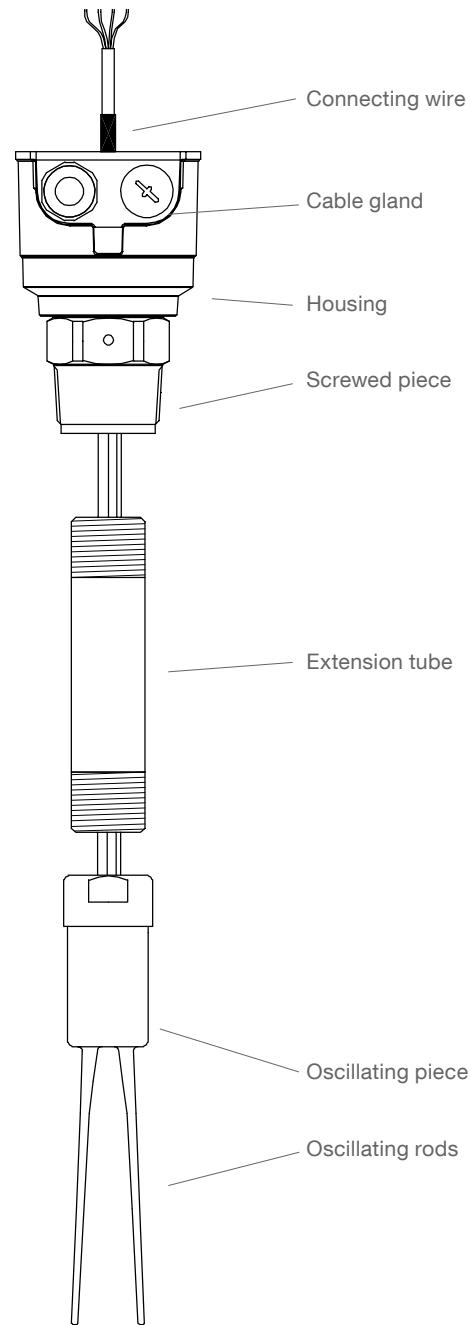
1.1. Feed the connecting wire through the 1" Extension tube and the screwed piece. Use a separate taut wire for easy working.

1.2. Screw the 1" Extension tube into the oscillating piece and the screwed piece.

Requirements for proper sealing and electrical grounding:

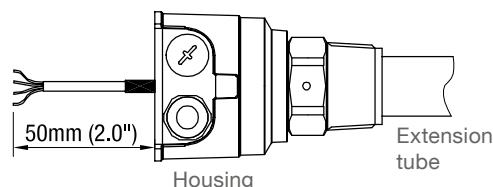
Sealing must satisfy IP67 or NEMA Type 4 at both sides of the extension tube. To reach this, the threads must be sealed with temperature resistant sealing for 150°C (302°F). Max. thickness of the sealing is 0.2 mm (0.008").

The threads must be fixed with 50 Nm. Use a open-end wrench to attach the oscillating piece (do not use the oscillating rods).



2. Checking the cable length

Push back the cable into the extension tube until the stated length is present. Take care that no cable is winded up inside the housing.
 If the cables are too long to be pushed back, goto step 3, otherwise goto step 4.

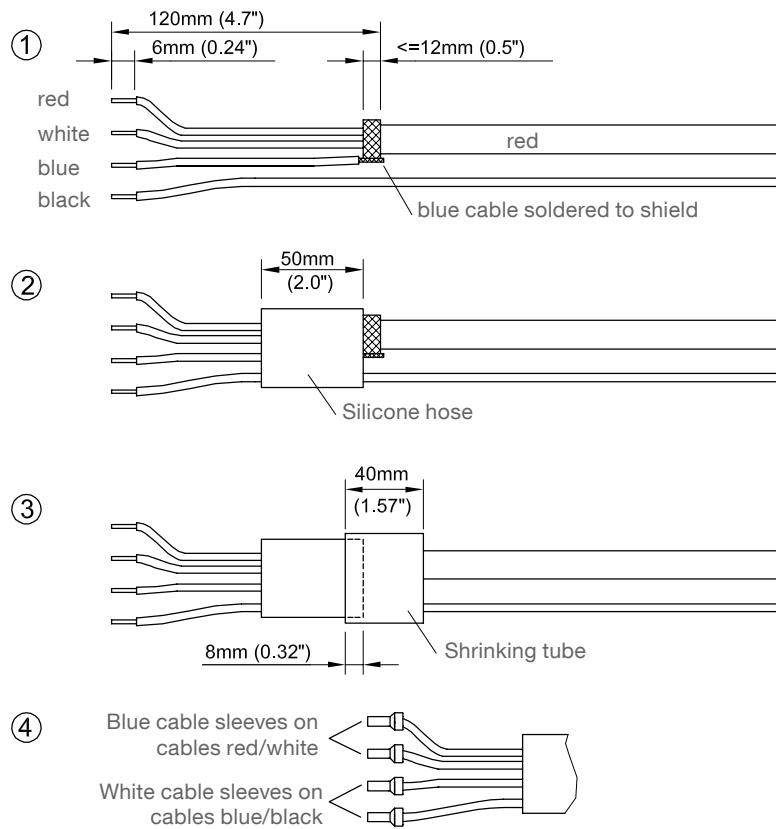


Assembly VN 4040

3. Cutting the cables

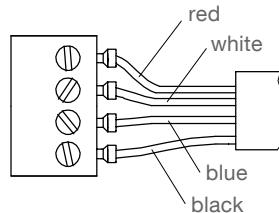
(if required)

If the cables are too long to be pushed back into the extension tube, shorten the cable to the length as stated in step 2.
 Prepare the cables as shown.
 Use the attached hoses and cable sleeves for proper mounting.



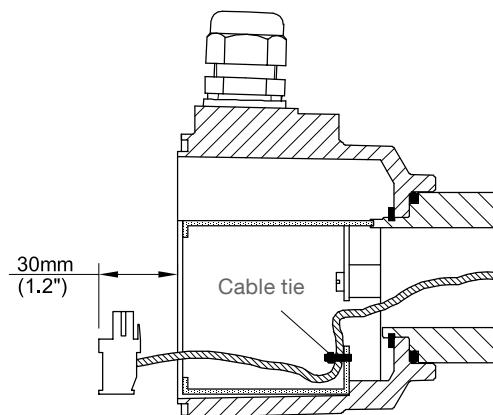
4. Connecting the plug

Observe correct sequence



5. Fixing the cable tie

Before fixing the cable tie observe correct cable length as stated and that no cable is winded up inside the housing.



6. Insert electronics

Insert the plug into the electronic, insert the electronic into the housing and fix the electronic plastic cover with 4 screws.

Disposal

The product consists of materials which can be recycled, details of the used materials see chapter "Technical data - mechanical data".

Recycling must be done by a specialised recycling company. Since the product is not subject to the WEEE directive 2002/96/EG, it is not permitted to bring it to a public recycling station.

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Subject to technical change.

All dimensions in mm (inch).

We assume no liability for typing errors.

Different variations than specified are possible.

Please contact our technical consultants.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning may be accomplished only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.

Special attention must be paid to warnings and notes as follows:

WARNING



Relates to a caution symbol on the product: A failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.

WARNING



Relates to a caution symbol on the product: Risk of electric shock

WARNING



A failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product	Description
	CAUTION: refer to accompanying documents (manual) for details.
	Earth (ground) Terminal
	Protective Conductor Terminal

Technical support

Please contact your local supplier (for address see www.uwt.de). Otherwise you can contact:

UWT GmbH
Westendstr. 5
D-87488 Betzigau

Tel.: 0049 (0)831 57123-0
Fax: 0049 (0)831 76879
info@uwt.de
www.uwt.de

Introduction

Applications

The device is used for level monitoring in all types of containers and silos.

It can be used with all powdery and granulated bulk materials with a density greater than 20 g/l (1.25 lb/ft³) that do not show a strong tendency to form crusts or deposits.

The units can be delivered with Ex-approvals for use in Dust Hazardous Areas.

A selection of fields of application:

- **Building materials industry**
lime, moulding sand, etc.
- **Food industry**
milk powder, flour, salt, etc.
- **Plastics industry**
plastics granules etc.
- **Timber industry**
- **Chemical industry**
- **Mechanical engineering**

The Mononivo oscillating probe is normally screwed into the lateral container wall so that it is level with the filling height to be registered and monitored.

The device can also be mounted from the top of the container. In this case an extension piece is used to mount the probe level with the height to be registered.

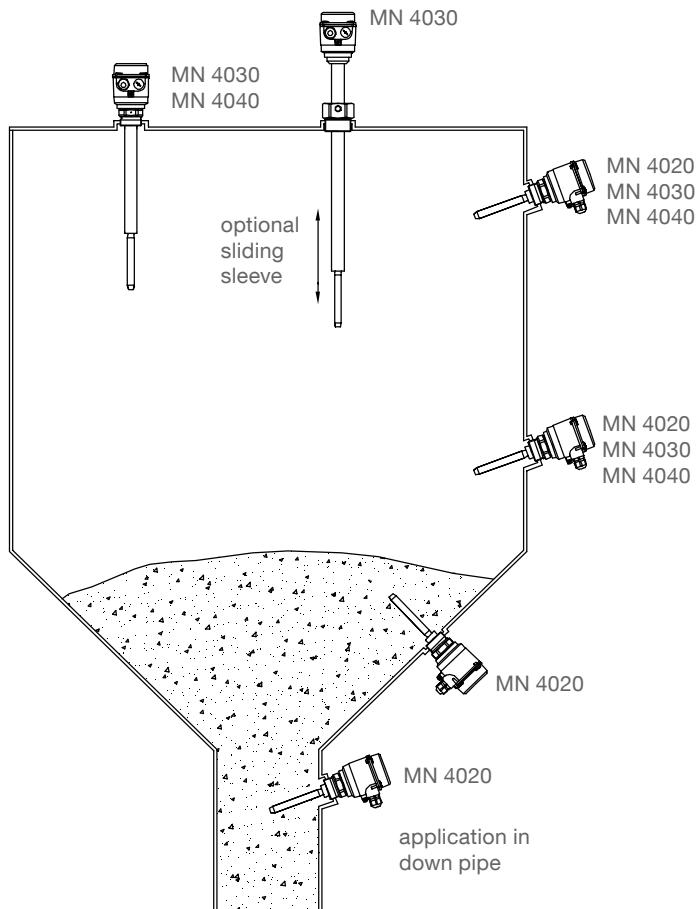
The length of the probe can be up to 4 m (157") with an extension tube (MN 4030, MN 4040).

The use of a sliding sleeve is recommended so that the switch point can be changed continuously during operation of the device.

Function

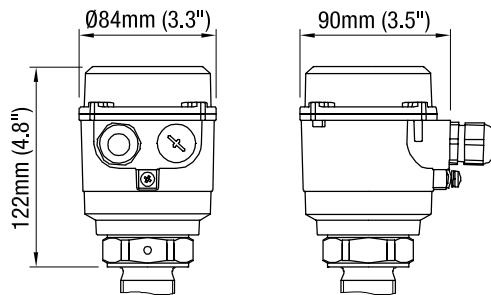
The piezo-electrically stimulated oscillating rod vibrates at its mechanical resonance frequency. If the probe is covered by the bulk material, the damping thus generated is registered electronically and a corresponding signal output is actuated.

The oscillation of the rod ensures a certain self-cleaning effect.

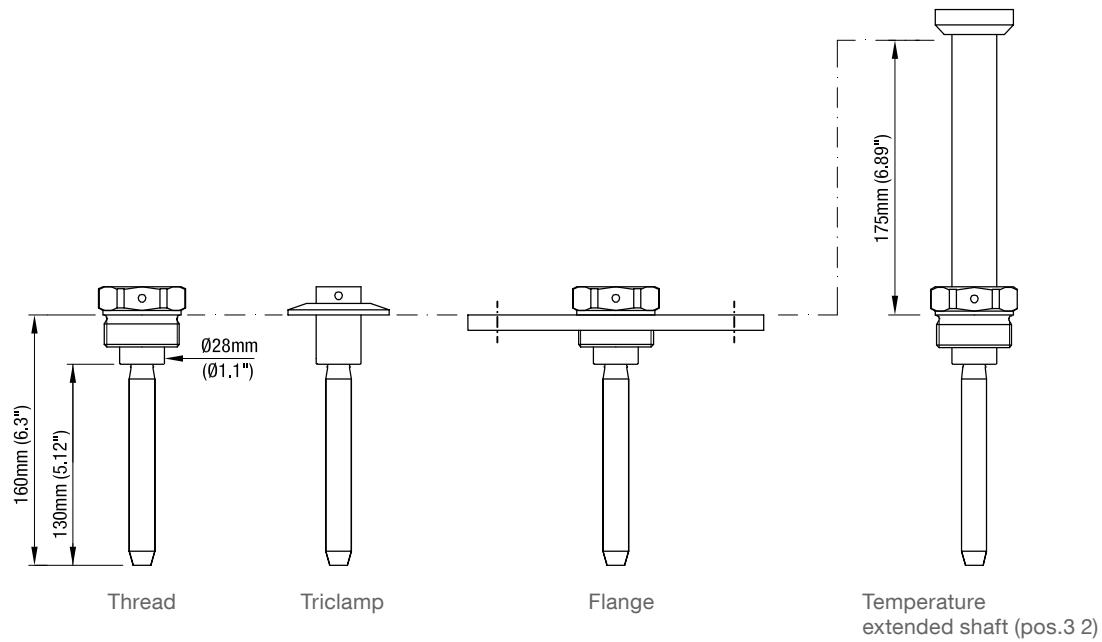


Technical data

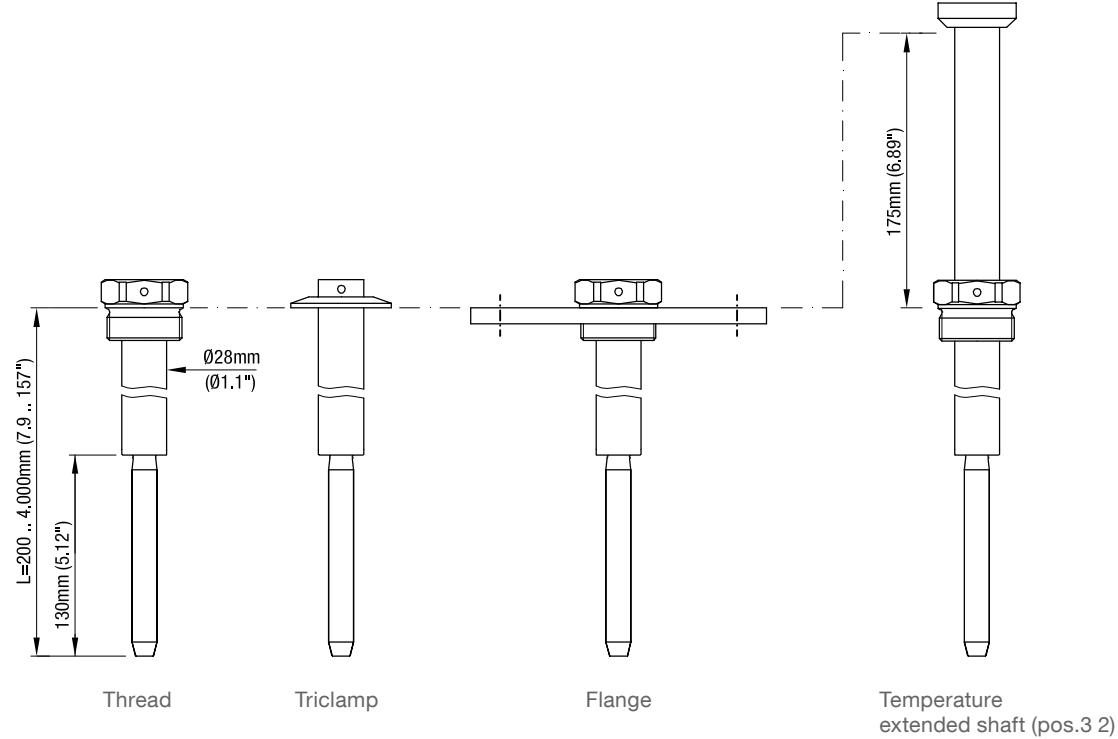
Dimensions



MN 4020

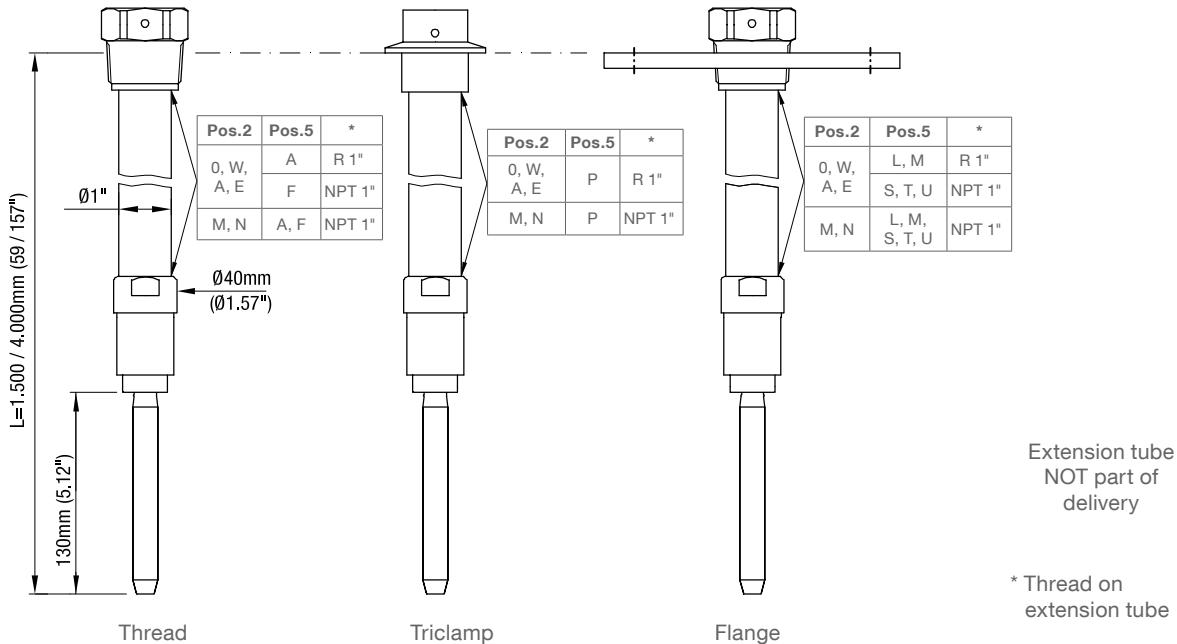


MN 4030



Technical data

MN 4040



Technical data

Electrical data

Connection terminals	0.14 - 2.5 mm ² (AWG 26 - 14)		
Cable entry	M20 x 1.5 screwed cable gland NPT 1/2" conduit connection NPT 3/4" conduit connection		
Clamping range (diameter) of the factory provided cable glands: M20 x 1.5: 6 .. 12 mm (0.24 .. 0.47")			
Signal delay	Sensor free -> covered ca. 1 sec Sensor covered -> free ca. 1 .. 2 sec		
Safety operation (FSL,FSH)	Switchable for minimum or maximum safety		
Vibration frequency	ca. 330 Hz		
Overvoltage category	II		
Pollution degree	2 (inside housing)		
Electronics	Universal voltage Relay DPDT	3-wire PNP	
Power supply	21 V .. 230 V 50 - 60 Hz 22 V .. 45 V DC	±10%*	20 V .. 40 V DC ±10%* *incl. ±10% of EN 61010
Max. ripple of power supply	7 V _{ss} at DC	7 V _{ss}	
Installed load/ input current	max. 22 VA/ 2 W		
Signal output	Floating relay DPDT AC max. 250 V, 8 A non inductive DC max. 30 V, 5 A non inductive	Open Collector: Permanent load max. 0.4 A Short-circuit, overload and reverse polarity protected Output voltage equal to input voltage, drop <2.5 V	
Indicating light	Status of signal output by built-in LED	Status of signal output by built-in LED	
Isolation	Power supply to signal output: 2,225 Vrms Signal output to signal output: 2,225 Vrms		-
Protection class	I	III	

Mechanical data

Housing	Aluminium housing, powder coated RAL 5010 gentian blue Seal between housig and lid: NBR Seal between housing and process connection: NBR Nameplate: polyester film
Degree of protection	IP67 (EN 60529), NEMA Type 4X
Process connection	Material: MN 4020: stainless steel 1.4301 (304)/ 1.4541 (321) or 1.4404 (316L) MN 4030/ 4040: stainless steel 1.4301 (304)/ 1.4541 (321) or 1.4404 (316L) (process connection and tube extension) Thread: G 1", G 1 1/4", G 1 1/2" DIN 228; NPT 1", NPT 1 1/4", NPT 1 1/2" ANSI B 1.20.1 Flange: according to selection 1.4541 (321) or 1.4404 (316L) Triclamp: stainless steel 1.4301 (304) or 1.4404 (316L) 2" (DN50) ISO 2852 All material food grade

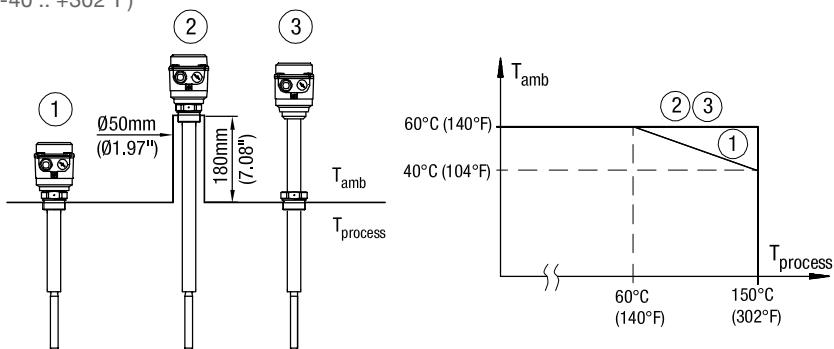
Technical data

Oscillator	Material: stainless steel 1.4404 (316L) (food grade)
Sound level	max. 50 dBA
Overall weight (ca.)	MN 4020: 1.3 kg (2.9 lbs) MN 4030: 1.3 kg (2.9 lbs) +1.3 kg/m (+2.9 lbs per 39.3") extension MN 4040: 1.8 kg (4.0 lbs) +1.3 kg/m (+2.9 lbs per 39.3") extension

Operating conditions

Ambient temp. (housing) -40°C .. +60°C (-40 .. +140°F)

Process temperature -40°C .. +150°C (-40 .. +302°F)



For versions with Ex-approvals: see remarks on page 19.

Ventilation	Ventilation is not required
Min. powder density	Setting I Min. powder density (ca.) I 20 g/l (1.25 lb/ft ³) II 80 g/l (5 lb/ft ³) III 150 g/l (9.4 lb/ft ³) IV 300 g/l (18.7 lb/ft ³)
Features of bulk material	No strong tendency to cake or deposit
Max. mechanical load	400 N (@40°C, 104°F) laterally (on oscillator rod) Recommended protection in case of high material load: mounting of an protective angle above the probe
Max. mechanical torque	MN 4030: 180 Nm (@40°C, 104°F) MN 4040: 100 Nm (@40°C, 104°F)
Max. process pressure	16 bar (232 psi) For versions with "sliding sleeve without process overpressure" (option pos.25 a,b,c): unpressurized. The max. process pressure may be reduced with use of flanges. Observe flange standards for pressure rating and pressure derating with higher temperature.
Vibration	1.5 (m/s ²) ² /Hz according to EN 60068-2-64
Relative Humidity	0 - 100%, suitable for outdoor use
Altitude	max. 2,000 m (6,562 ft)
Expected product lifetime	Following parameters have a negative influence on the expected product lifetime: High ambient- and process temperature, corrosive environment, high vibration, high flow rate of abrasive bulk material passing the sensor element.

Technical data / Approvals

Transport and Storage

Transport Observe the instructions as stated on the transport packaging, otherwise the products may get damaged.

Transport temperature: -40 .. +80°C (-40 .. +176°F)
Transport humidity: 20 .. 85%

Transport incoming inspections must be carried out to check for possible transport damage.

Storage Products must be stored at a dry and clean place. They must be protected from influence of corrosive environment, vibration and exposure to direct sunlight.

Storage temperature: -40 .. +80°C (-40 .. +176°F)
Storage humidity: 20 .. 85%

Approvals

General Purpose (Ordinary Locations) Depending on selected version in price list.	CE FM TR-CU	EN 61010-1 (IEC/CB)	
Hazardous Locations Depending on selected version in price list.	ATEX IEC-Ex FM TR-CU	Dust explosion Dust explosion Dust explosion Dust explosion	ATEX II 1/2 D Ex ta/tb IIIC T! Da/Db IEC-Ex ta/tb IIIC T! Da/Db Cl. II, III Div. 1 Gr. E,F,G Ex ta/tb IIIC T! Da/Db X
Detailed allocation of types and electronics to approvals: see selection list.			
EMC	EN 61326 - A1		
Food grade material	According to directive 1935/2004/EC		
RoHS conform	According to directive 2011/65/EU		
Pressure Equipment Directive (2014/68/EU)	<p>The units are not subject to this directive, because they are classified as „pressure-keeping equipment“ and do not have a pressurized housing (see Art.1, Abs. 2.1.4). The units are designed and manufactured in accordance to the Pressure Equipment Directive. The unit is NOT intended for use as an “equipment part with safety function (Art.1, Abs. 2.1.3). If the units should be used as „equipment part with safety function“ please contact the manufacturer.</p>		

Options

Weather protection cover

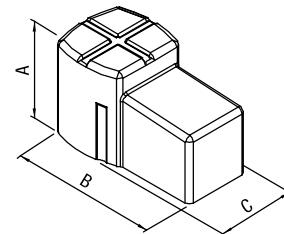
When the measuring device is used outdoor, the use of the weather protection cover is recommended. It protects the device from all atmospheric influences such as:

- rain water
- condensation of water
- excessively high temperatures due to insulation
- excessively low temperatures in winter

Material: PE, weathering and temperature stable

Not available for housing version d and de.

- For use in Hazardous Locations: only permitted for Category 3 (zone 22) or Division 2.



A	100 mm (3.94")
B	165 mm (6.5")
C	88 mm (3.46")

Sliding sleeve

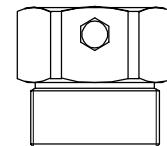
MN 4030

G 1½" ISO 228 or
1½" NPT ANSI B 1.20.1

or flanges

Material: 1.4301 (304) or 1.4404 (316L)

Sealing material to the extension tube:
FKM or NBR

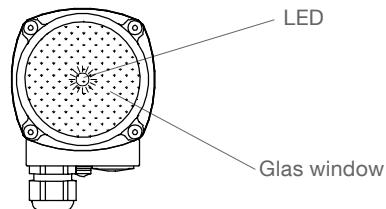


Mounting set

Screws and washers for fixing the unit on a flange.

Glass window in lid

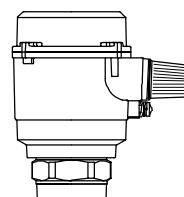
To see the indicating light on the electronic from outside.



Bulb

Bright indicating light seen from outside.

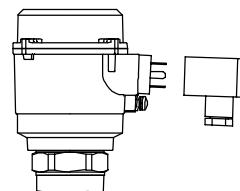
Not available for use in Hazardous Locations and FM general purpose.



Plug 4-pole (incl. PE)

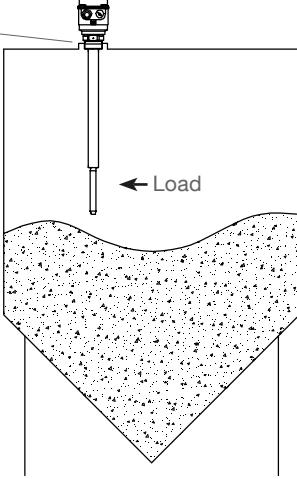
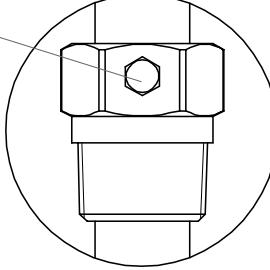
Used instead of cable gland.

Not available for use in Hazardous Locations and FM general purpose.



Mounting

General Safety Instructions

Process pressure	!	Improper installation may result in loss of process pressure.								
Chemical resistance against the medium	!	Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.								
Temperature range	!	The range of the ambient and process temperature of the device must be observed (see page 6 and for Ex-approvals page 17)								
Mechanical load	!	The torque at the fastening spot must not exceed 180 Nm MN 4030/ 100 Nm MN 4040								
		Maximum length „L“ in dependence on the deviation (in degrees) from vertical installation:								
		<table border="1"> <thead> <tr> <th>Max. deviation</th> <th>Max. length “L”</th> </tr> </thead> <tbody> <tr> <td>5°</td> <td>4,000 mm (157.5“)</td> </tr> <tr> <td>45°</td> <td>1,200 mm (47.24“)</td> </tr> <tr> <td>>45°</td> <td>600 mm (23.62“)</td> </tr> </tbody> </table> 	Max. deviation	Max. length “L”	5°	4,000 mm (157.5“)	45°	1,200 mm (47.24“)	>45°	600 mm (23.62“)
Max. deviation	Max. length “L”									
5°	4,000 mm (157.5“)									
45°	1,200 mm (47.24“)									
>45°	600 mm (23.62“)									
Mounting location	Keep distance to incoming material and to the silo wall. The installation has to be done in a way, that the sensor elements cannot hit the wall of the silo. The flow of the medium and fixtures in the container must be considered. This is especially important for extension length more than 3 m (118.1“).									
Sliding sleeve	“Pressure tight” version (pos.25 e,f,g): Tighten both straining screws M8 with 20 Nm to obtain resistance against pressure.									
										
Flange mounting	A plastic sealing must be used to tighten the flange.									
Fastening of the threaded process connection	Mounting torque for the thread may not exceed 80 Nm. Use a 50 mm (1.97“), for units with sliding sleeve use a 55 mm (2.17“), open-end wrench. Do not fasten by turning the housing .									
Food grade material	The materials are available for the use under normal and predictable applications (according to directive 1935/2004 Art.3). Other conditions can influence the safety.									

Mounting

! Additional Safety Instructions for Hazardous Locations

Installation regulations For devices to use in hazardous locations the respectively valid installation regulations must be observed.

Sparks The installation has to be done in a way mechanical friction or impact can not cause sparks between the aluminium enclosure and steel.

Mounting instructions

Oscillating rod Do not bend, shorten or extend the oscillating rod since this will destroy the device.

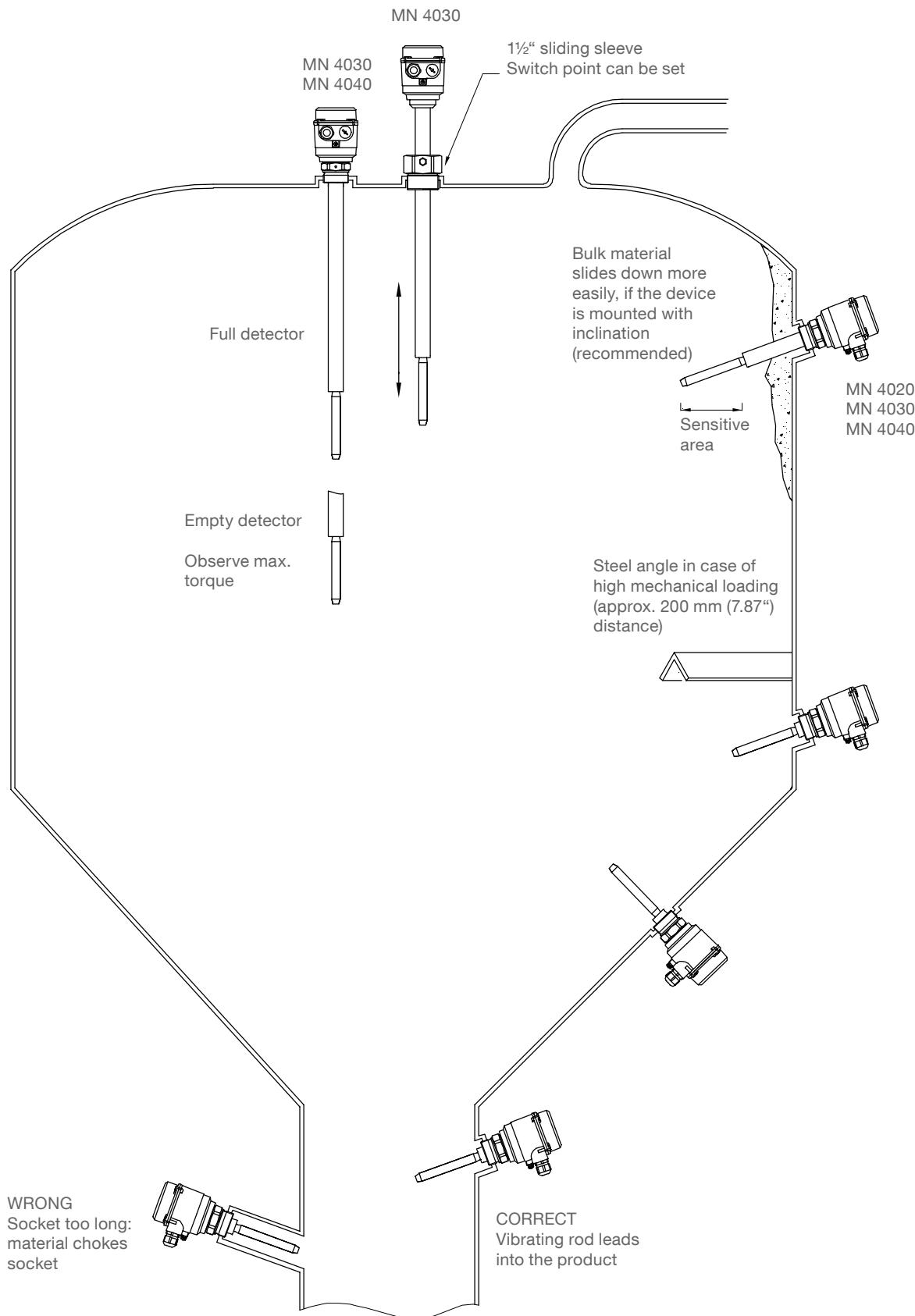
Direction of the cable glands When the unit is mounted from the side, ensure, that the cable glands faces downwards and are closed to avoid water penetration into the housing. The housing can be rotated against the threaded connection after mounting.

Sealing Seal the process thread with Teflon tape in case of process pressure

Precaution for later dismounting/ Service Grease the screws of the lid if corrosive atmosphere is present (e.g. close to sea)

Switching point Heavy bulk material -> the signal output switches when the oscillating rod is covered a few mm
Light bulk material -> the signal output switches, when the oscillating rod is covered a few cm

Mounting



Electrical installation

General Safety Instructions

Handling ! In the case of inexpert handling or handling malpractice the electric safety of the device cannot be guaranteed.

Protective earthing Before any electrical installation, the device must be connected to the protective earthing terminal inside the housing.

Installation regulations The local regulations or VDE 0100 (Regulations of German Electro technical Engineers) must be observed.
With use of 24 V supply voltage, an approved power supply with reinforced insulation to mains is required.

Fuse Use a fuse as stated in the connection diagrams (page 15).

RCCB protection In the case of a defect, the distribution voltage must automatically be cut off by a RCCB protection switch so as to protect the user of the device from indirect contact with dangerous electric tensions.

Power supply switch A Power-supply-disconnecting switch must be provided and marked near the device.

Wiring diagram The electrical connections have to be made according to the wiring diagram.

Supply voltage Compare the supply voltage applied with the specifications given on the electronic and name plate before switching the device on.

Cable gland/ closing element The screwed cable gland and closing element must have following specifications:
Ingress protection IP67, temperature range from -40°C to +70°C, UL or VDE certified (depending on the country where the unit is installed), pull relief.
Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion). Cable glands that are not used have to be locked with a closing element.

Conduit system In case of using a conduit system (with NPT thread) instead of a cable gland the regulations of the country where the unit is installed must be observed. The conduit must have a tapered thread either NPT ½" or NPT ¾" in accordance with the unit and ANSI B 1.20.1. Not used inlets must be closed tight with a metal closing element.

Field wiring cables

- The diameter has to match to the clamping range of the used cable gland.
- The cross section has to match with the clamping range of the connection terminals and consider the max. current.
- All field wirings must have insulation suitable for at least 250 V AC.
- The temperature rating must be at least 90°C (194°F).
- If higher immunity interferences as specified in the stated EMC standards are present (see chapter approval), a shielded cable is required, otherwise an unshielded instrumentation cable is satisfactory.

Connecting the terminals Make sure that max. 8 mm (0.31") of the pigtails are bared (danger of contact with live parts).

Guiding the cables in the terminal box Cut the field wiring cables to appropriate length to fit properly into the terminal box.

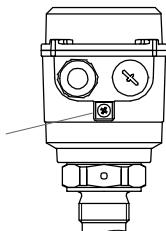
Relay and transistor protection Provide protection for relay contacts and output transistors to protect the device against spikes with inductive loads.

Protection against static charging The housing of the unit must be grounded in any case to avoid static charging of the unit on applications with pneumatic conveying and non-metallic containers .

Electrical installation

! Additional Safety Instructions for Hazardous Locations

External equipotential bonding terminal



Connect with equipotential bonding of the plant

Field wiring	A pull relief must be provided for the field wiring cables, when the device is installed with the factory provided cable glands.
---------------------	--

Cable glands and conduit system for ATEX/ IEC-Ex/ TR-CU	Installation according to the regulations of the country, where the product is installed. Not used entries have to be closed with blanking elements certified for this purpose.
--	--

Where available the factory provided parts must be used.

A strain relief must be provided for the field wiring cables, when the device is installed with the factory provided cable glands.

The diameter of the field wiring cable must match to the clamping range of the cable clamp.

If other than the factory provided parts are used, following must be ensured:

The parts must have an approval adequate to the approval of the level sensor (certificate and type of protection).

The approved temperature range must be from the min. ambient temperature of the level sensor to the max. ambient temperature of the level sensor increased by 10 Kelvin.

The parts must be mounted according to the instructions of the supplier.

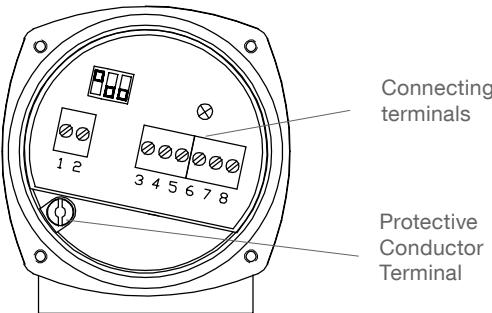
Conduit system for FM	In addition the regulations of the country must be observed. The used flameproof seals and blanking elements must have an adequate type approval and a temperature range of at least -40°C (-40°F) to +80°C (176°F). In addition they shall be suitable for the conditions and correctly installed. Where available the provided original parts of the manufacturer must be used.
------------------------------	---

Commissioning	Commissioning only with closed lid.
----------------------	-------------------------------------

Opening the lid	Before opening the lid take care, that no dust deposits or whirlings are present. Do not remove the lid (cover) while circuits are alive.
------------------------	--

Electrical installation

Connection



Universal voltage

Relay DPDT

Power supply:

21 V .. 230 V 50 - 60Hz $\pm 10\%$ * 22 VA

22 V .. 45 V DC $\pm 10\%$ * 2 W

*incl. $\pm 10\%$ of EN 61010

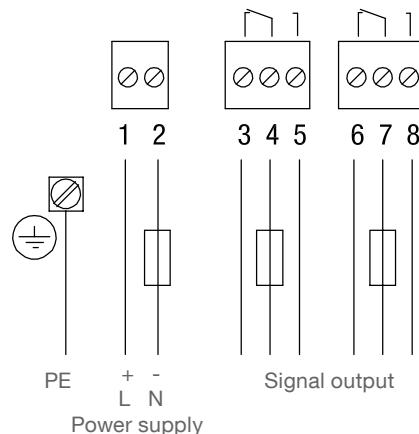
Fuse on power supply:
 max. 10 A, fast or slow, HBC, 250 V

Signal output:

Floating relay DPDT

AC max. 250 V, 8 A, non inductive
 DC max. 30 V, 5 A, non inductive

Fuse on signal output:
 max. 10 A, fast or slow, HBC, 250 V



3-wire PNP

Power supply:

20 .. 40 V DC $\pm 10\%$ *

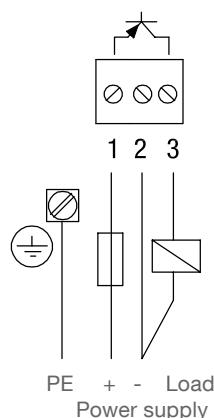
*incl. $\pm 10\%$ of EN 61010

Input current: max. 0.5 A

Fuse:
 max. 4 A, fast or slow, 250 V

Signal output:
 max. 0.4 A
 Output voltage equal to input
 voltage, drop <2.5 V

Load for example:
 PLC, relay, contactor, bulb



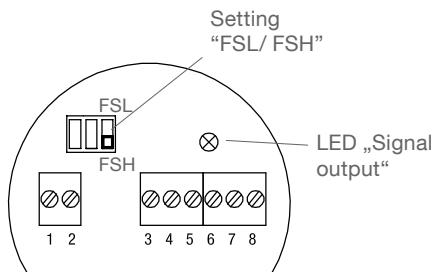
Signal output / Sensitivity setting

Signal output

FSL/ FSH Setting

FSH If the sensor is used to indicate full load, set to Fail Safe High. Power failure or line break is regarded as „full“ signal (protection against overcharging).

FSL If the sensor is used to indicate empty load, set to Fail Safe Low. Power failure or line break is regarded as „empty“ signal (protection against running dry).



	Signal output		Signal output	
Setting	FSL	FSH	FSL	FSH
Relay DTPT				
3-wire PNP				
LED „Signal output“				



Sensitivity setting

All sensors are factory setted to position "III" to cover the majority of applications.

If the bulk material is heavy and has a strong tendency to cake or deposit, the setting can be set to position „IV“ so as to decrease the sensitivity of the probe.

If the bulk material is light and has few or no tendency to cake or deposit, the setting can be set to position „II“ or "I" so as to increase the sensitivity of the probe.

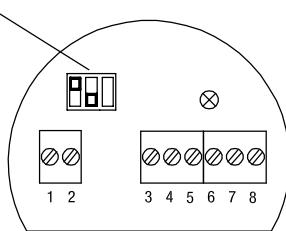
The table indicates the approximate min. bulk density depending on the settings.

Please contact manufacturer if you intend to use the device for special purposes.

Setting	Sensitivity/ Powder density (ca.)
I	High >20 g/l (1.25 lb/ft ³)
II	Medium high >80 g/l (5 lb/ft ³)
III *	Medium low >150 g/l (9.4 lb/ft ³)
IV	Low >300 g/l (18.7 lb/ft ³)

* factory preset

Setting „Sensitivity“



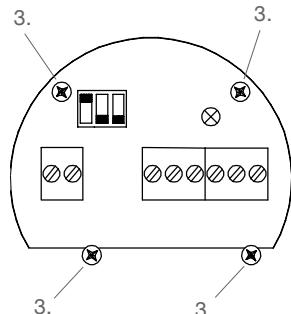
Maintenance

Opening the lid (cover)	<p>Before opening the lid for maintenance reasons observe following items:</p> <ul style="list-style-type: none"> • Do not remove the lid while circuits are alive. • No dust deposits or whirlings are present. • No rain can enter into the housing.
Frequent check of the unit	<p>To ensure durable safety in hazardous locations and with electrical safety, following items must be checked frequently depending on the application:</p> <ul style="list-style-type: none"> • Mechanical damage or corrosion of any components (housing side and sensor side) and of the field wiring cables. • Tight sealing of the process connection, cable glands and enclosure lid. • Properly connected external PE cable (if present).
Cleaning	<p>If cleaning is required by the application, following must be observed:</p> <ul style="list-style-type: none"> • Cleaning agent must comply with the materials of the unit (chemical resistance). Mainly the lid sealing, cable gland and the surface of the unit must be considered. <p>The cleaning process must be done in a way, that:</p> <ul style="list-style-type: none"> • The cleaning agent cannot enter into the unit through the lid sealing or cable gland. • No mechanical damage of the lid sealing, cable gland or other parts can happen. <p>A possible accumulation of dust on the unit does not increase the maximum surface temperature and must therefore not be removed for purposes of maintaining the surface temperature in hazardous locations.</p>
Function test	<p>A frequent function test may be required depending on the application.</p> <p>Observe all relevant safety precautions related with a safe work depending on the application (e.g. hazardous locations, hazardous bulk material, electric safety, process pressure).</p> <p>This test does not proof if the sensor is sensitive enough to measure the material of the application.</p> <p>Function test is done by stopping the vibration of the vibrating rod with appropriate means and monitor if a correct change of the signal output from uncovered to covered happens.</p>
Production date	<p>The production date can be traced by the serial number on the typeplate. Please contact the manufacturer or your local distributor.</p>
Spare parts	<p>All available spare parts are stated in the selection list.</p>

Change of the electronic board:

Deenergise device and secure against being switched on again.

1. Open the housing lid
2. Remove the field wiring cables/ plug
3. Unscrew the cover plate
4. Take out the electronic board and remove internal plug
5. Insert a new electronic board in reverse sequence
6. Connect the field wiring cables



Notes for use in Hazardous Locations

Zone classification

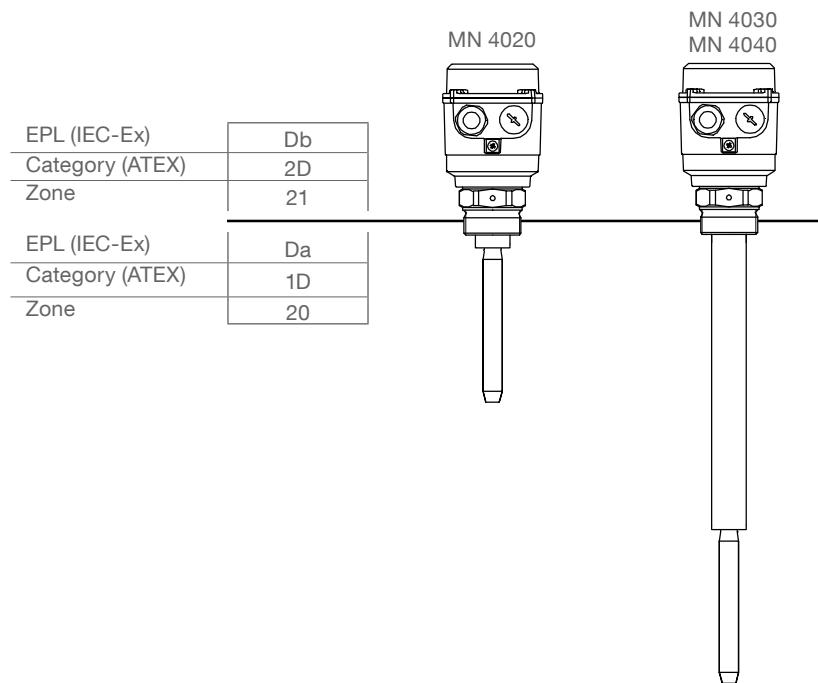
	Usable in zone	ATEX category	IEC-Ex Equipment Protection Level (EPL)
Dust applications	20, 21, 22	1 D	Da
	21, 22	2 D	Db
	22	3 D*	Dc

* in case of conductive dust additional demands for the installation are possible.

General Notes

Marking	Devices with EX approval are marked on the name plate.
Process pressure	<p>The device construction allows process over-pressure up to 16 bar (232 psi). These pressures are allowed for test purposes. The definition of the Ex approval are only valid for a container-over-pressure between -0.2 .. +0.1 bar (-2.9 .. +1.45 psi).</p> <ul style="list-style-type: none"> ● For higher or lower pressures the approvals are not valid.
Process and ambient temperature	<p>The permitted temperature ranges are marked on the name plate. The max. permitted ambient and process temperatures (including temperature derating) stated in this manual must be observed.</p>

Permitted zones for mounting in partition wall

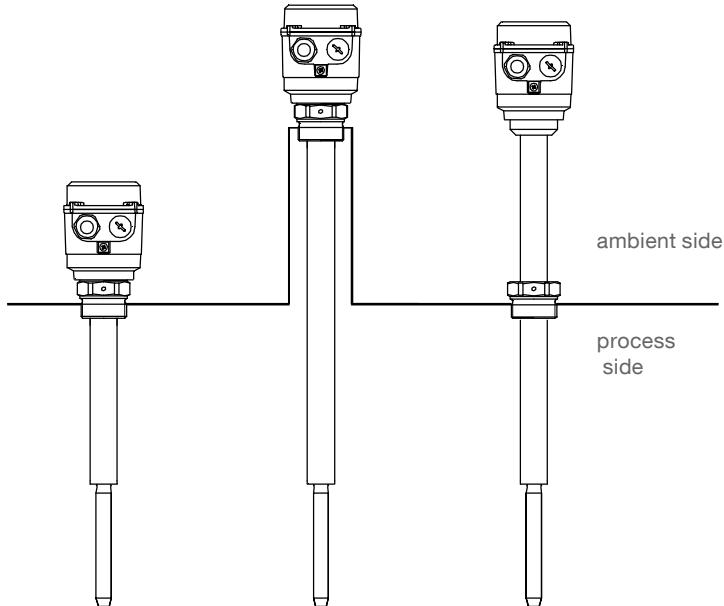


Notes for use in Hazardous Locations

Max. Surface Temperature and Temperature Class

The temperature marking on the type plate refers to the instruction manual.
 In the following table the relevant temperature ratings are shown.

The maximum surface temperature (resp. temperature class) is the warmest temperature of the unit which could occur during malfunction (according to Ex-definition).



Max. ambient temperature	Max. process temperature	Max. surface temperature	Temperature class (Division System)	Temperature class (Zone System)
60°C (140°F)	120°C (248°F)	120°C (248°F)	T4	T4
	130°C (266°F)	130°C (266°F)	T4	T4
	140°C (284°F)	140°C (284°F)	T3C	T3
	150°C (302°F)	150°C (302°F)	T3C	T3

Assembly MN 4040

Manufacturing of the Extension tube



Obtain instruction manual for proper manufacturing of the extension tube. In case of deviation from the instruction manual the unit is not safe for use in Hazardous Locations.

Demands on the Extension tube

Material: Stainless steel 1.4301 (SS304) or 1.4305 (SS301) or 1.4571 (SS316Ti) or 1.4404 (SS316L)

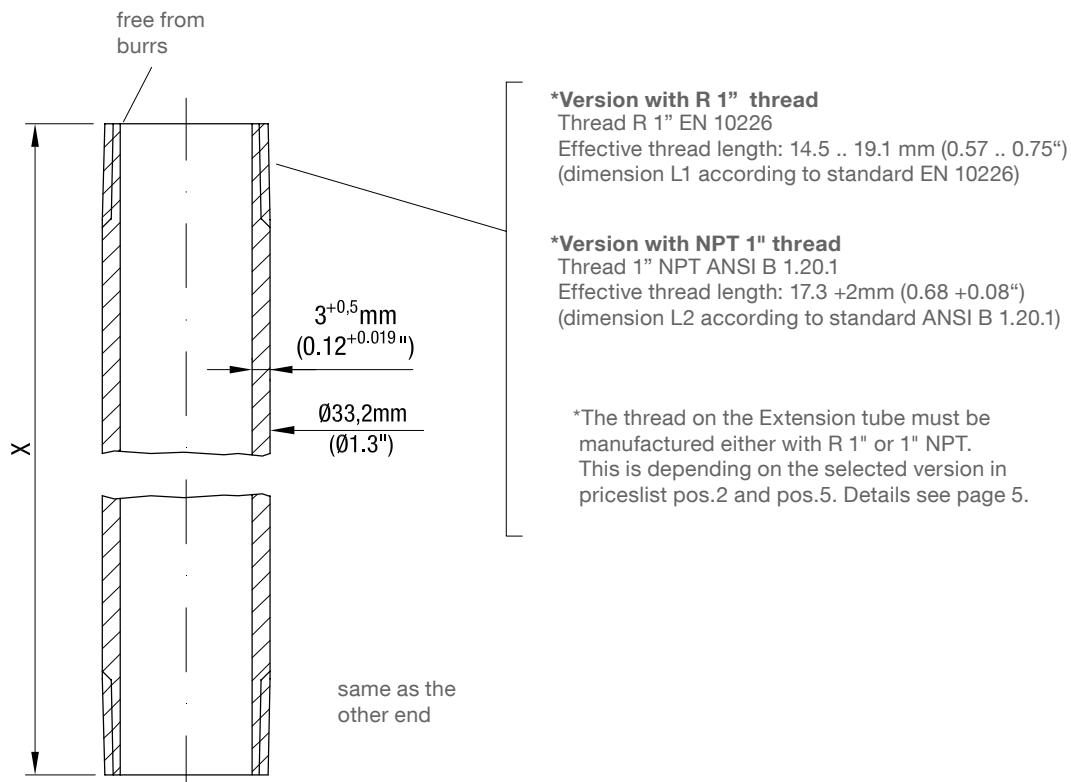
The tube must be manufactured from one single piece. It is not allowed to weld two or more pieces together.

Carefully observe max. length, diameter, wall thickness, thread, tolerances as specified in the drawing.

All sharp edges must be removed to protect the cable.

Thread testing

Each thread must be tested with go and no-go ring gauge according to standard EN 10226 (R 1" version) or ANSI B 1.20.1 (NPT 1" version)



Pipe length X = L - 190 mm (7.5")
 Min. L = 250 mm (9.9")
 Max. L = 1,500 mm (59") with pos.7 L
 or 4,000 mm (157") with pos.7 M
 Note: L is the total extension length

In case of FM approved Units:

The MN 4040 extension tube is constructed using Industry Electrical conduit installed by Qualified personnel per NFPA 70 National Electrical Code.

In case of CSA approved Units:

The MN 4040 extension tube is constructed using Industry Electrical conduit installed by Qualified personnel per C22.1 Canadian Electrical Code.

Assembly MN 4040

Assembly of the unit

1. Mounting of the Extension tube

! The tube must be assembled very carefully to ensure permanent sealing, electrical grounding and mechanical stability. Observe the follow mounting instructions.

! Make sure that the thread of the extension tube and the thread of the screwed piece/ oscillating piece is the same type (do not mix R and NPT thread).

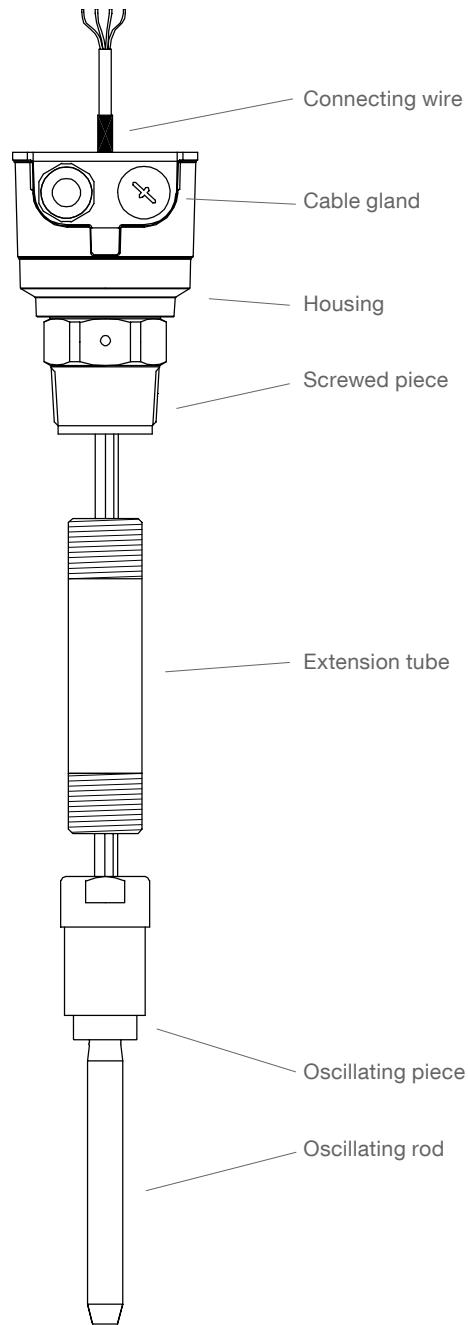
1.1. Feed the connecting wire through the 1" Extension tube and the screwed piece. Use a separate taut wire for easy working.

1.2. Screw the 1" Extension tube into the oscillating piece and the screwed piece.

Requirements for proper sealing and electrical grounding:

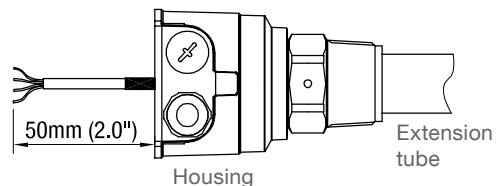
Sealing must satisfy IP67 or NEMA Type 4 at both sides of the extension tube. To reach this, the threads must be sealed with temperature resistant sealing for 150°C (302°F). Max. thickness of the sealing is 0.2 mm (0.008").

The threads must be fixed with 50 Nm. Use a open-end wrench to attach the oscillating piece (do not use the oscillating rods).



2. Checking the cable length

Push back the cable into the extension tube until the stated length is present. Take care that no cable is winded up inside the housing.
 If the cables are too long to be pushed back, goto step 3, otherwise goto step 4.

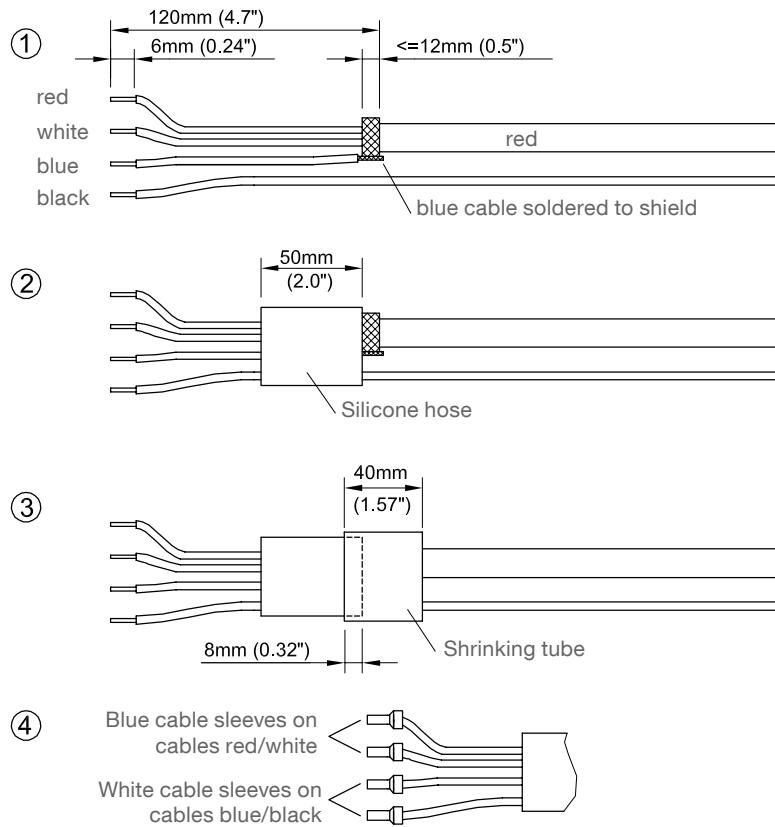


Assembly MN 4040

3. Cutting the cables

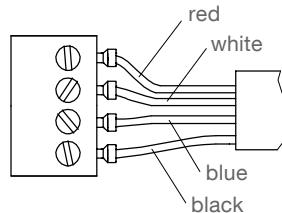
(if required)

If the cables are too long to be pushed back into the extension tube, shorten the cable to the length as stated in step 2.
 Prepare the cables as shown.
 Use the attached hoses and cable sleeves for proper mounting.



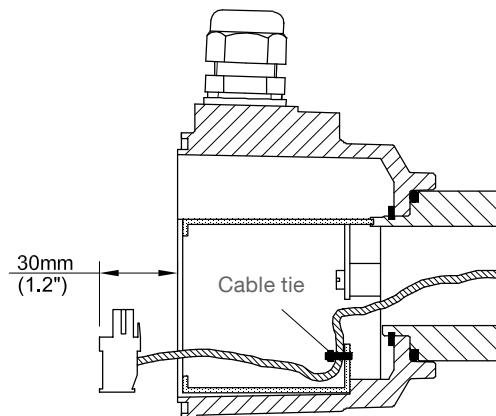
4. Connecting the plug

Observe correct sequence



5. Fixing the cable tie

Before fixing the cable tie observe correct cable length as stated and that no cable is winded up inside the housing.



6. Insert electronics

Insert the plug into the electronic, insert the electronic into the housing and fix the electronic plastic cover with 4 screws.

Disposal

The product consists of materials which can be recycled, details of the used materials see chapter "Technical data - mechanical data".

Recycling must be done by a specialised recycling company. Since the product is not subject to the WEEE directive 2002/96/EG, it is not permitted to bring it to a public recycling station.

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Subject to technical change.	We assume no liability for typing errors.
All dimensions in mm (inch).	Different variations than specified are possible.
	Please contact our technical consultants.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning may be accomplished only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.

Special attention must be paid to warnings and notes as follows:

WARNING



Relates to a caution symbol on the product: A failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.

WARNING



Relates to a caution symbol on the product: Risk of electric shock

WARNING



A failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product	Description
	CAUTION: refer to accompanying documents (manual) for details.
	Earth (ground) Terminal
	Protective Conductor Terminal

Technical support

Please contact your local supplier (for address see www.uwt.de). Otherwise you can contact:

UWT GmbH
Westendstr. 5
D-87488 Betzigau

Tel.: 0049 (0)831 57123-0
Fax: 0049 (0)831 76879
info@uwt.de
www.uwt.de

Introduction

Applications

The device is used for level monitoring in all types of containers and silos.

It can be used with all powdery and granulated bulk materials, slurry and liquids.

The units can be delivered with Ex-approvals for use in Dust and Gas Hazardous Areas.

A selection of fields of application:

- **Building materials industry**
lime, moulding sand, etc.
- **Food industry**
sugar, flour, salt, etc.
- **Plastics industry**
plastics granules etc.
- **Chemical industry**
pigments
- **Mechanical engineering**

The RFnivo is normally screwed into the lateral container wall at a position, where the material shall be measured.

The device can also be mounted from the top of the container. In this case an extension piece is used to mount the probe level with the height to be measured.

The length of the probe can be up to 2.5 m (98.4") with rod extension or 20 m (787") with rope extension.

The use of a sliding sleeve is recommended so that the switch point can be changed continuously during operation of the device.

Function

The unit detects the capacitance between the probe and the container wall.

The performance allows to use the unit in a wide range of even difficult applications combined with simple handling:

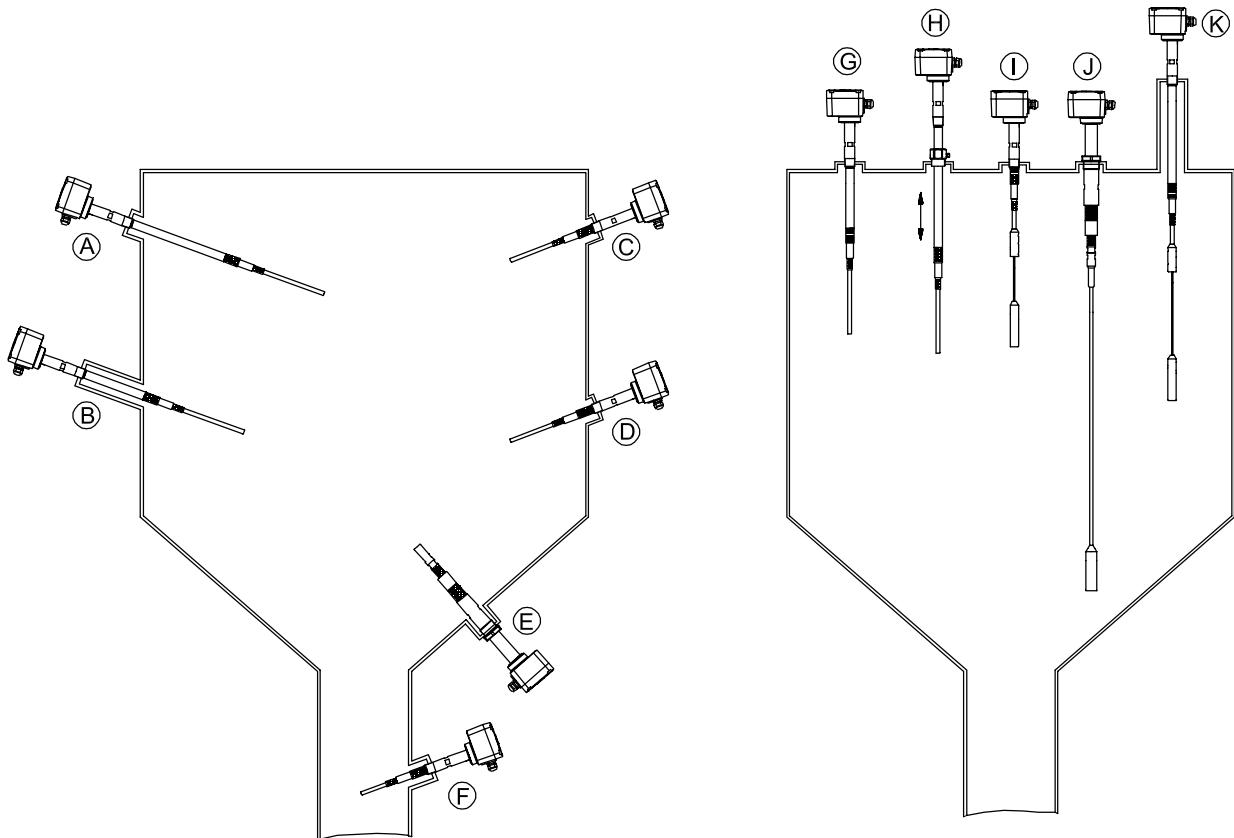
- Active shield technology
The powerful active shield technology allows to ignore material build up on the probe. Even the influence of conductive build up on the probe is electronically compensated and thus ignored. This allows to measure with high sensitivity in combination with material build up.
- Self diagnostics
The unit is able to check the internal electronic for proper functionality. This can be done by setting a frequent auto test or by pressing a manual test button.
- Auto calibration
The unit will auto calibrate to uncovered state after first time power up.

It allows to set for auto recalibration to uncovered state. This is useful in case of a covered probe during power up. An auto recalibration is done when the probe becomes uncovered.

- Manual recalibration to uncovered state can be done by simply pressing a push button.
- Full manual calibration can be selected as well.

The sensitivity is preselected to work in most applications and can be changed if required.

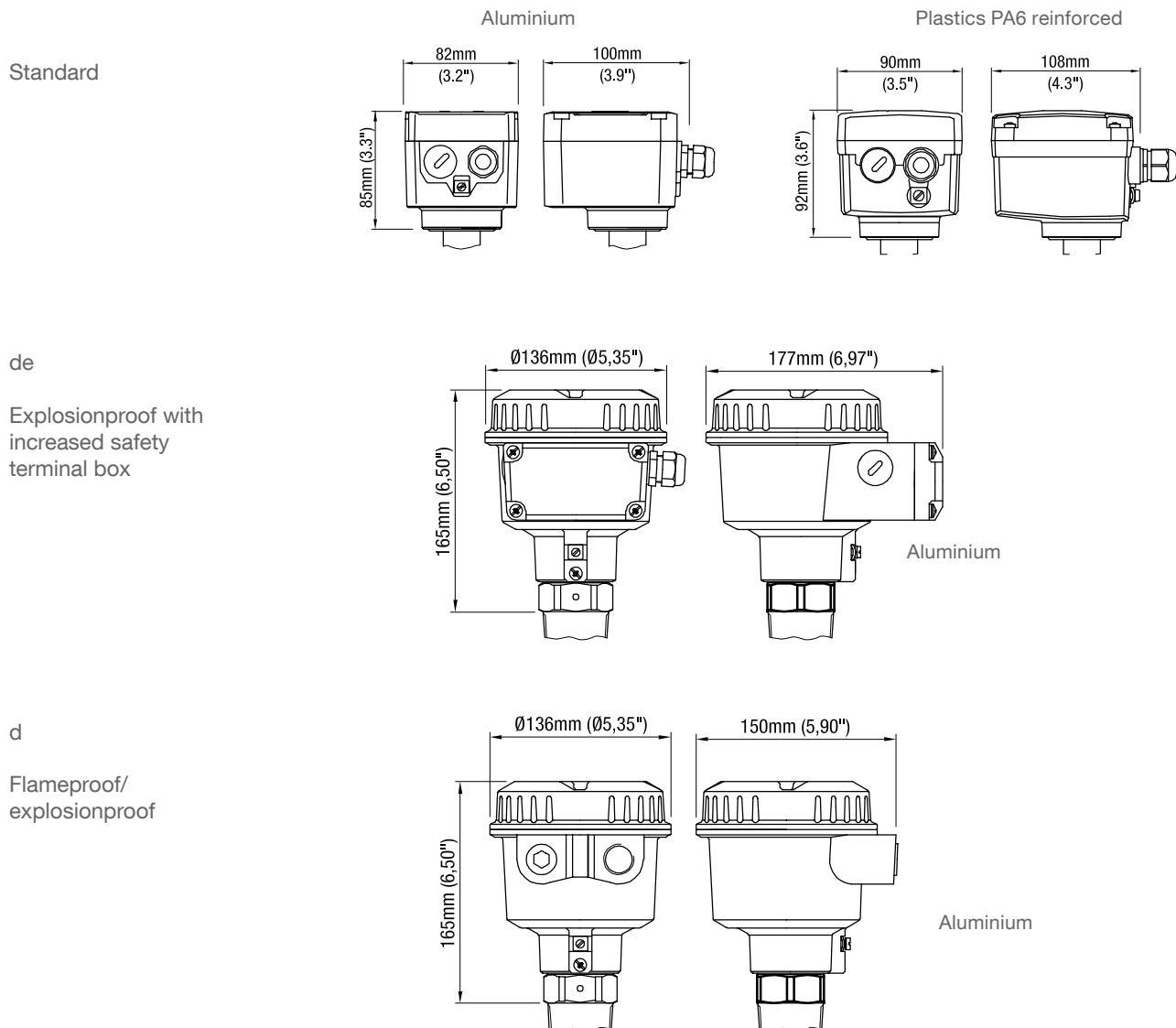
Applications



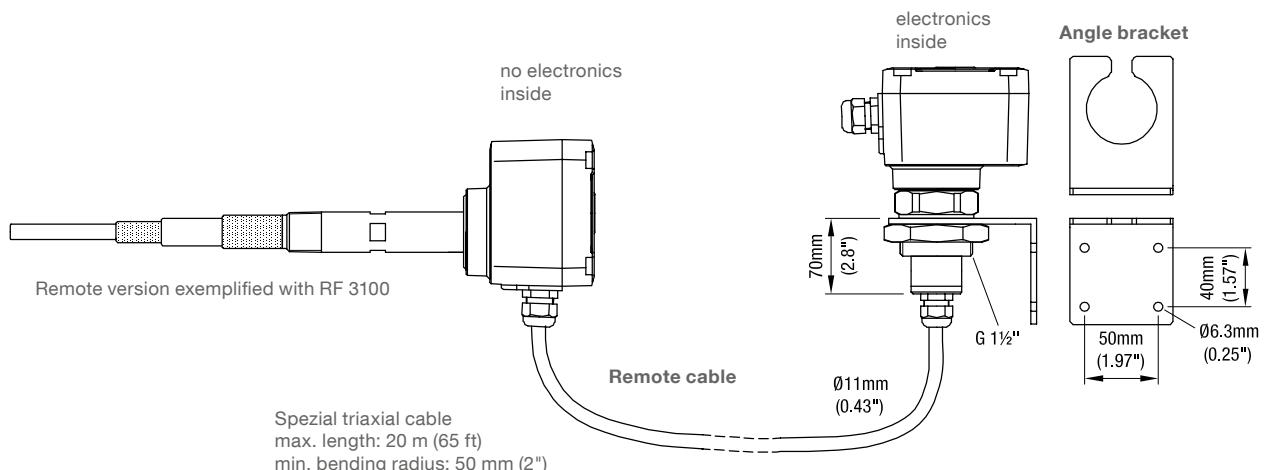
	RF 3100	RF 3200	RF 3300
(A) Inactive length to reach distance from silo wall	•	•	•
(B) Inactive length due to long mounting nozzle	•	•	•
(C) Full detector with short length	•	•	•
(D) Demand detector with short length, observe max. load	•	•	•
(E) Empty detector with short length, observe max. load	•	•	•
(F) Application in down pipe, observe max. load	•	•	•
(G) Inactive length to bring active probe to required level	•	•	•
(H) Inactive length and sliding sleeve for adjustable height	•	•	
(I) Full detector, rope version	•	•	•
(J) Empty detector, rope version, observe max. load	•	•	•
(K) Inactive length due to long mounting nozzle	•	•	•

Technical data - Dimensions

Housing versions



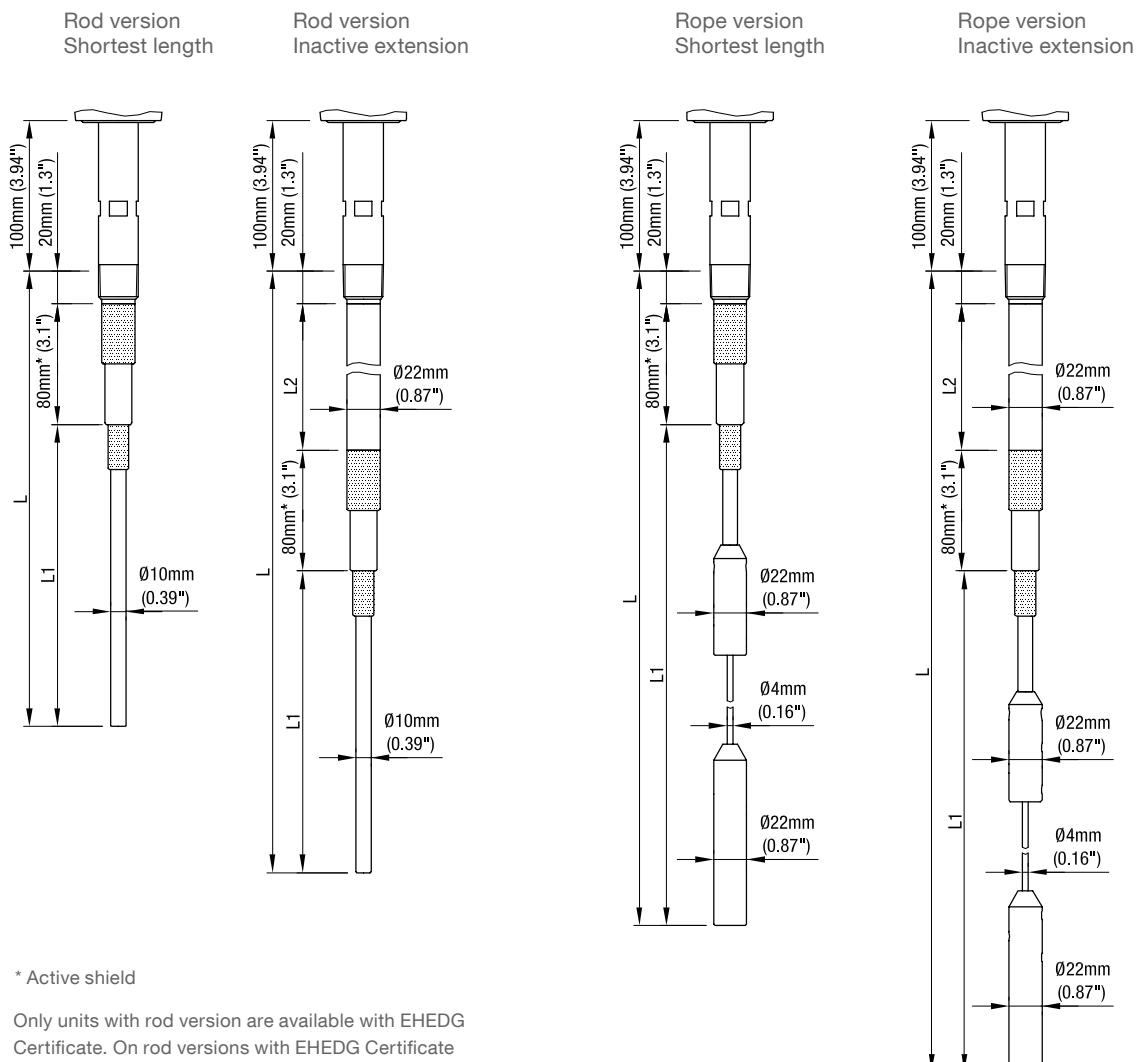
Remote version



Technical data - Dimensions

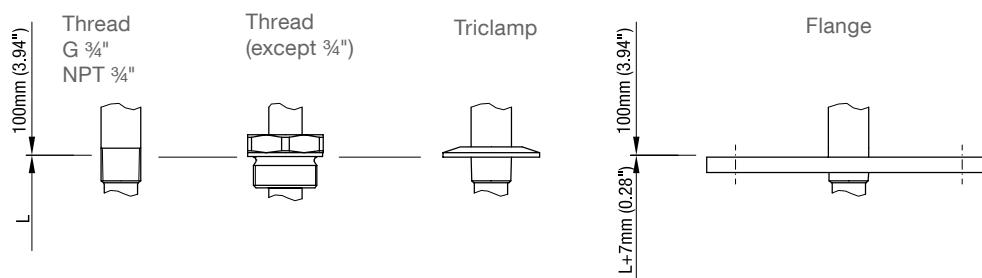
Probes

RF 3100 Standard version



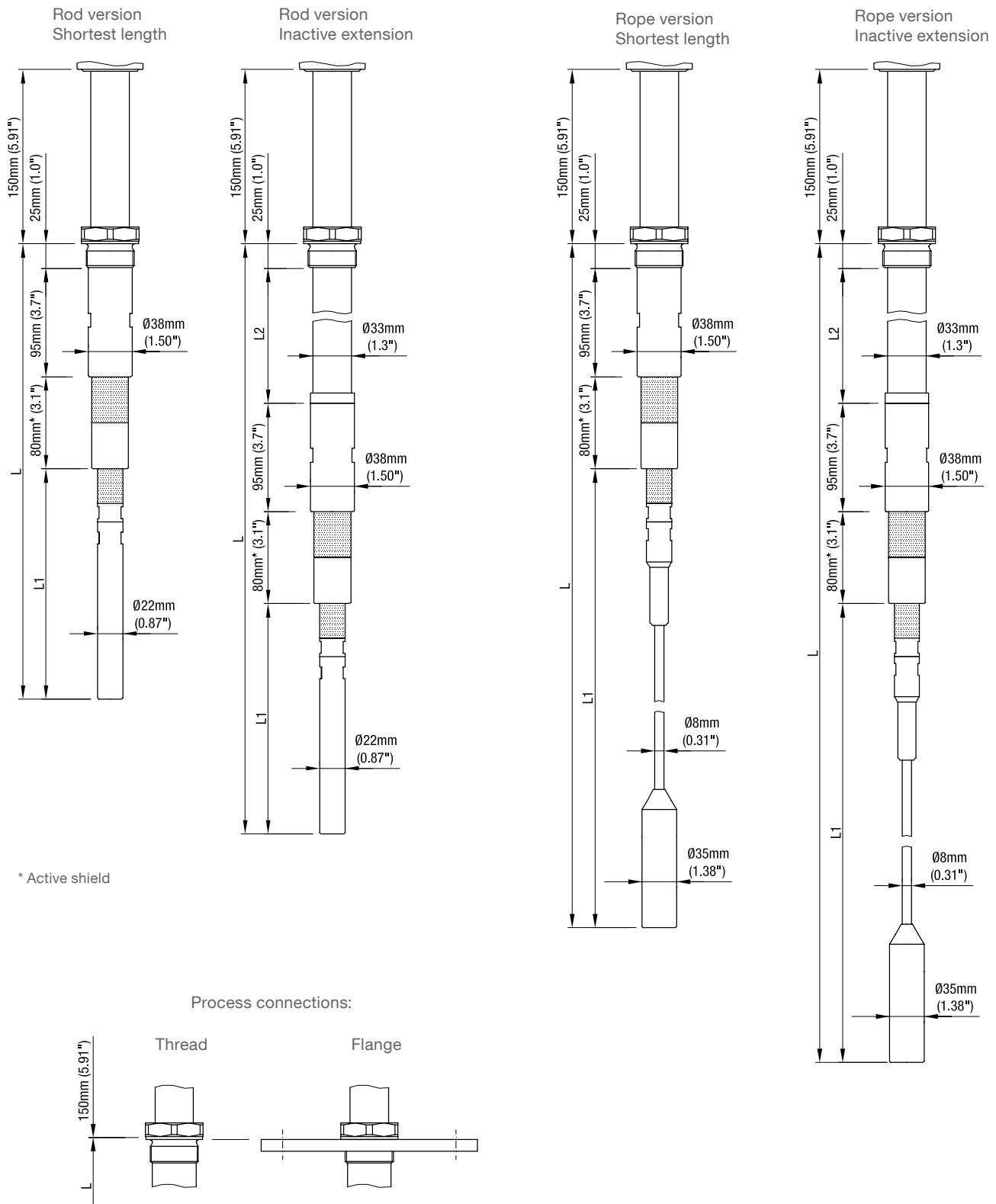
Only units with rod version are available with EHEDG Certificate. On rod versions with EHEDG Certificate the length "L" is increased by 9 mm (0.35")

Process connections:



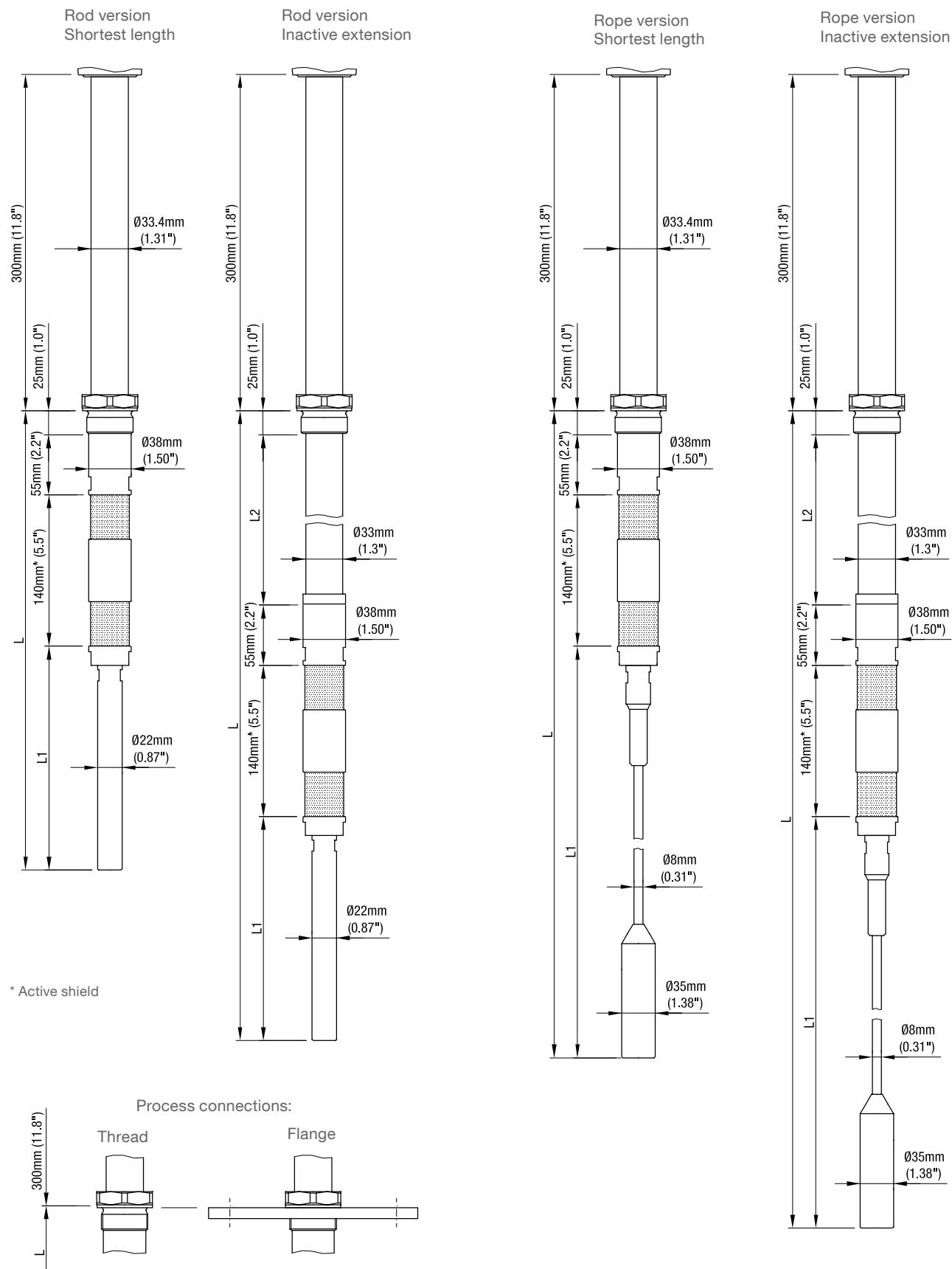
Technical data - Dimensions

RF 3200 Heavy Duty version



Technical data - Dimensions

RF 3300 High temperature version



Technical data - Electrical data

Electrical data

Connection terminals	0.14 - 2.5 mm ² (AWG 26 - 14)
Cable entry	M20 x 1.5 screwed cable gland NPT 1/2" conduit connection NPT 3/4" conduit connection
	Clamping range (diameter) of the factory provided cable glands: M20 x 1.5: 6 .. 12 mm (0.24 .. 0.47")
Signal delay	Sensor uncovered -> covered or covered -> uncovered or covered <-> uncovered: adjustable ca. 0.5 to 60 sec
Safety operation (FSL,FSH)	Switchable for minimum or maximum safety
Operation frequency	ca. 100 kHz
Oversupply category	II
Pollution degree	2 (inside housing)

Electronics	Universal voltage Relay DPDT
Power supply	21 .. 230 V 50 - 60 Hz or DC ±10%* *incl. ±10% of EN 61010
Max. ripple of power supply	7 V _{ss} at DC supply
Installed load	max. 1.5 VA or 1.5 W
Signal output	Floating relay DPDT AC max. 250 V, 8 A non inductive DC max. 30 V, 5 A non inductive
Display	4 digit LCD Display of actual measured capacitance, signal output state and self diagnostics Min. operating temperature: -30°C (-22°F)
Indicating light	Status by 3 colour built-in LED (according to NE44): Power on, signal output, failure/ maintenance
Data storage	Nonvolatile EPROM for Menu settings and calibration data
Isolation	Power supply to signal output: 2,225 Vrms Signal output to signal output: 2,225 Vrms
Protection class	I

Technical data - Mechanical Data

Mechanical data

Housing	Aluminium, powder coated RAL 5010 gentian blue Optional: Plastics PA6 reinforced Seal between housing and lid: NBR Seal between housing and process connection: NBR Nameplate: polyester film																																								
Degree of protection	IP67 (EN 60529), NEMA Type 4X																																								
Process connection/ probes	<p>RF 3100: Material: Stainless steel 1.4301 (304)/ 1.4305 (303) or 1.4404 (316L)/ 1.4401(316) for rope Probe isolation PPS reinforced Probe gaskets FKM or FFKM Coating of probe/rope (optional) PFA Thread: G ¾", 1", 1¼", 1½" DIN 228, M30 x 1.5, M32 x 1.5, NPT ¾", 1", 1¼", 1½" tapered ANSI B 1.20.1 Triclamp: 1" (DN25), 1½" (DN40), 2" (DN50) ISO 2852</p> <p>RF 3200: Material: Stainless steel 1.4301 (304)/ 1.4305 (303) or 1.4404 (316L)/ 1.4401(316) for rope Probe isolation PPS reinforced Probe gaskets FKM or FFKM Thread: G 1¼, 1½" DIN 228, NPT 1¼", 1½" tapered ANSI B 1.20.1</p> <p>RF 3300: Material: Stainless steel 1.4301 (304)/ 1.4305 (303) or 1.4404 (316L)/ 1.4401(316) for rope Probe isolation ceramic Probe gaskets graphite Thread: G 1¼, 1½" DIN 228, NPT 1¼", 1½" tapered ANSI B 1.20.1</p> <p>Flanges according to selection 1.4541 (321) or 1.4404 (316L) All material food grade</p>																																								
Sound level	max. 40 dBA																																								
Overall weight (ca.)	<table border="1"> <thead> <tr> <th>Standard housing</th> <th>de-housing</th> <th>d-housing</th> <th>Active probe length: L1**</th> <th>Inactive length: L2**</th> </tr> <tr> <th colspan="3">Basic weight*</th> <th colspan="2"> </th> </tr> </thead> <tbody> <tr> <td>RF 3100 rod version</td> <td>1.7 kg (3.7 lbs)</td> <td>2.7 kg (6.0 lbs)</td> <td>3.0 kg (6.6 lbs)</td> <td>+0.62 kg/m (1.37 lbs/ 39.3")</td> </tr> <tr> <td>RF 3100 rope version</td> <td>2.3 kg (5.1 lbs)</td> <td>3.3 kg (7.3 lbs)</td> <td>3.6 kg (8.0 lbs)</td> <td>+0.06 kg/m (0.13 lbs/ 39.3")</td> </tr> <tr> <td>RF 3200 rod version</td> <td>2.8 kg (6.2 lbs)</td> <td>3.8 kg (8.4 lbs)</td> <td>4.1 kg (9.0 lbs)</td> <td>+3.0 kg/m (6.61 lbs/ 39.3")</td> </tr> <tr> <td>RF 3200 rope version</td> <td>4.0 kg (8.8 lbs)</td> <td>5.0 kg (11 lbs)</td> <td>5.3 kg (12 lbs)</td> <td>+0.26 kg/m (0.57 lbs/ 39.3")</td> </tr> <tr> <td>RF 3300 rod version</td> <td>3.6 kg (8.0 lbs)</td> <td>4.6 kg (10 lbs)</td> <td>4.9 kg (11 lbs)</td> <td>+3.0 kg/m (6.61 lbs/ 39.3")</td> </tr> <tr> <td>RF 3300 rope version</td> <td>4.8 kg (11 lbs)</td> <td>5.8 kg (13 lbs)</td> <td>6.1 kg (13 lbs)</td> <td>+0.26 kg/m (0.57 lbs/ 39.3")</td> </tr> </tbody> </table>	Standard housing	de-housing	d-housing	Active probe length: L1**	Inactive length: L2**	Basic weight*					RF 3100 rod version	1.7 kg (3.7 lbs)	2.7 kg (6.0 lbs)	3.0 kg (6.6 lbs)	+0.62 kg/m (1.37 lbs/ 39.3")	RF 3100 rope version	2.3 kg (5.1 lbs)	3.3 kg (7.3 lbs)	3.6 kg (8.0 lbs)	+0.06 kg/m (0.13 lbs/ 39.3")	RF 3200 rod version	2.8 kg (6.2 lbs)	3.8 kg (8.4 lbs)	4.1 kg (9.0 lbs)	+3.0 kg/m (6.61 lbs/ 39.3")	RF 3200 rope version	4.0 kg (8.8 lbs)	5.0 kg (11 lbs)	5.3 kg (12 lbs)	+0.26 kg/m (0.57 lbs/ 39.3")	RF 3300 rod version	3.6 kg (8.0 lbs)	4.6 kg (10 lbs)	4.9 kg (11 lbs)	+3.0 kg/m (6.61 lbs/ 39.3")	RF 3300 rope version	4.8 kg (11 lbs)	5.8 kg (13 lbs)	6.1 kg (13 lbs)	+0.26 kg/m (0.57 lbs/ 39.3")
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Total weight = Basic weight + active probe length L1 + inactive length L2

All weights with 1¼" NPT process connection and without flanges

* Rode version with shortest length L1=100 mm (3.9"), rope version without rope

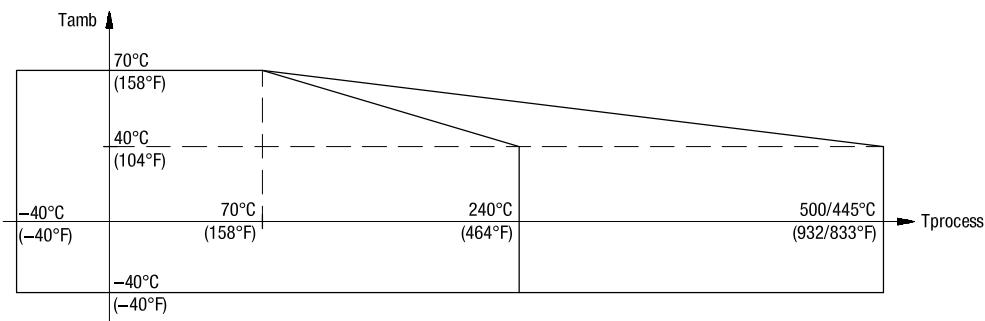
**Refer to dimension drawings on page 6 - 8

Technical data - Operating conditions

Operating conditions

Ambient temp. (housing)	-40°C .. +70°C (-40 .. +158°F) Standard housing. Plastics housing without Ex approvals -20°C .. +70°C (-4 .. +158°F) Plastics housing with Ex approvals -40°C .. +60°C (-40 .. +140°F) de- and d-housing
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Process temperature	RF 3100/ 3200: -40°C .. +240°C (-40 .. +464°F) RF 3300: -40°C .. +500°C (-40 .. +932°F), versions with Ex-approvals: +445°C (+833°F)
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For versions with Ex-approvals: see remarks on page 42.

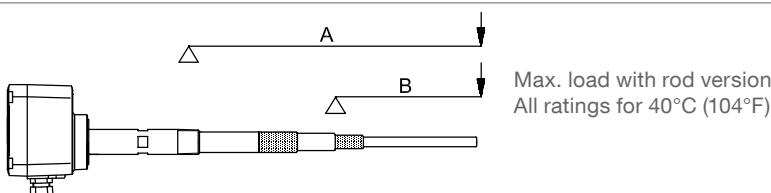
Ventilation	Ventilation is not required
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Max. range/ max sensitivity	3 .. 100 pF/ 0.5 pF 3 .. 400 pF/ 2 pF
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Spark protection	Robust build in protection against static discharge of the bulk material.
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Features of bulk material	Min. DK depending on selected probe length L1 and probe diameter. See tables on page 25 and 32.
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Max. mechanical load

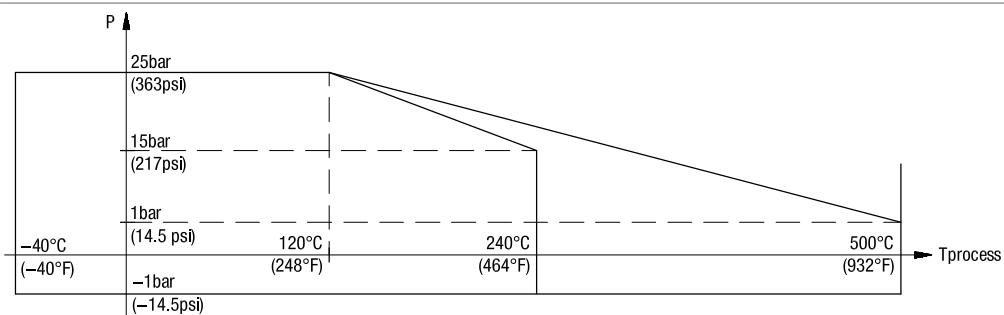


RF 3100 Rod version: A: 125 Nm B: 20 Nm
Rope version: 4 kN tensile load

RF 3200 Rod version: A: 525 Nm B: 90 Nm
Rope version: 40 kN tensile load

RF 3300 Rod version: A: 525 Nm B: 20 Nm
Rope version: 10 kN tensile load

Max. process pressure



The max. process pressure may be reduced with use of flanges. Observe flange standards for pressure rating and pressure derating with higher temperature.

For versions with Ex-approvals: Further see remarks on page 41.

Technical data - Operating conditions

Vibration	1.5 (m/s ²) ² / Hz according to EN 60068-2-64
Relative Humidity	0 - 100%, suitable for outdoor use
Altitude	max. 2,000 m (6,562 ft)
Expected product lifetime	Following parameters have a negative influence on the expected product lifetime: High ambient- and process temperature, corrosive environment, high vibration, high flow rate of abrasive bulk material passing the sensor element.

Transport and Storage

Transport	Observe the instructions as stated on the transport packaging, otherwise the products may get damaged. Transport temperature: -40 .. +80°C (-40 .. +176°F) Transport humidity: 20 .. 85% Transport incoming inspections must be carried out to check for possible transport damage.
Storage	Products must be stored at a dry and clean place. They must be protected from influence of corrosive environment, vibration and exposure to direct sunlight. Storage temperature: -40 .. +80°C (-40 .. +176°F) Storage humidity: 20 .. 85%

Approvals / Options

Approvals

General Purpose * (Ordinary Locations)	CE FM/ FMc TR-CU	EN 61010-1			
Hazardous Locations*	ATEX	Dust explosion	Protection by enclosure	II 1/2D Ex ia/tb IIIC T! Da/Db	
		Gas explosion	Flameproof Flameproof/ increased safety	II 2G Ex d ia IIC T! Gb	II 2G Ex de ia IIC T! Gb
	IEC-Ex	Dust explosion	Protection by enclosure	Ex ia/tb IIIC T! Da/Db	
		Gas explosion	Flameproof Flameproof/ increased safety	Ex d ia IIC T! Gb	Ex de ia IIC T! Gb
	FM/ FMc	Dust explosion	Protection by enclosure	DIP-IS Cl. II, III Div.1 Gr. E,F,G	
		Gas explosion	Flameproof	XP-IS Cl. I Div.1 Gr. B,C,D Cl. I Zone 1 Gr. IIB+H2	
	TR-CU	Dust explosion	Protection by enclosure	Ex ia/tb IIIC T! Da/Db X	
		Gas explosion	Flameproof Flameproof/ increased safety	Ex d ia IIC T! Gb X	Ex de ia IIC T! Gb X
Detailed allocation of types and electronic modules to approvals: see selection list.					
EMC	EN 61326 - A1				
Hygiene*	EHEDG (Type ED)				
Food grade material	According to directive 1935/2004/EC				
Pressure Equipment Directive (2014/68/EU)	<p>The units are not subject to this directive, because they are classified as „pressure-keeping equipment“ and do not have a pressurized housing (see Art.1, clause 2.1.4). The units are designed and manufactured in accordance to the Pressure Equipment Directive.</p> <p>The unit is NOT intended for use as a “equipment part with safety function (Art.1, clause 2.1.3). If the units should be used as „equipment part with safety function, please contact the manufacturer.</p>				

* depending on selected version in the selection list.

Options

Various options are available, see pricelist for more details:

- Remote version** • Probe and electronic housing separated (cable length up to 20 m (65 ft))

- Electronics** • Preselected sensitivity (factory setting of switching sensitivity)

- Probes** • Coating rod version
• Coating rope version (rope)
• Extension kits (rigid or flexible rod extension, rope extension)

- Mounting** • Sliding sleeve (flexible height adjustment of the probe)
• EHEDG approval (Type ED)
• Mounting sets: Screws, washers, sealings for fixing the unit on a flange.

- Housing** • Housing material plastics PA6
• Weather protection cover (PE, weathering and temperature stable)
• Cable entry (metric or NPT with different size)
• Signal lamp (indication of signal output state from outside)
• Plugs (valve connector, M12 plug, Harting)



Mounting

! General Safety Instructions

Process pressure	Improper installation may result in loss of process pressure. Seal the process thread with Teflon tape in case of process pressure A plastic sealing must be used to tighten the flange.
Fastening of the threaded process connection	Mounting torque for the thread may not exceed 80 Nm. Use a fitting open-end wrench. Do not fasten by turning the housing. Sliding sleeve: Tighten both straining screws M8 with 20 Nm to obtain resistance against pressure.
Precaution for later dismantling/ Service	Grease the screws of the lid if corrosive atmosphere is present (e.g. close to sea)
Direction of the cable glands	When the unit is mounted from the side, ensure, that the cable glands faces downwards and are closed to avoid water penetration into the housing. The housing can be rotated against the process connection after mounting.
Chemical resistance against the medium	Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.
Temperature range	The range of the ambient and process temperature of the device must be observed.
Mechanical load	The rated values must not be exceeded.
EHEDG/ Food grade material	The materials are available for the use under normal and predictable applications (according to directive 1935/2004 Art.3). Other conditions can influence the safety.

! Additional Safety Instructions for Hazardous Locations

Installation regulations	For devices to use in hazardous locations the respectively valid installation regulations must be observed.
Sparks	The installation has to be done in a way mechanical friction or impact can not cause sparks between the aluminium enclosure and steel.
Weather protection cover	The weather protection cover is approved for Zone 2, 22 and Div.2

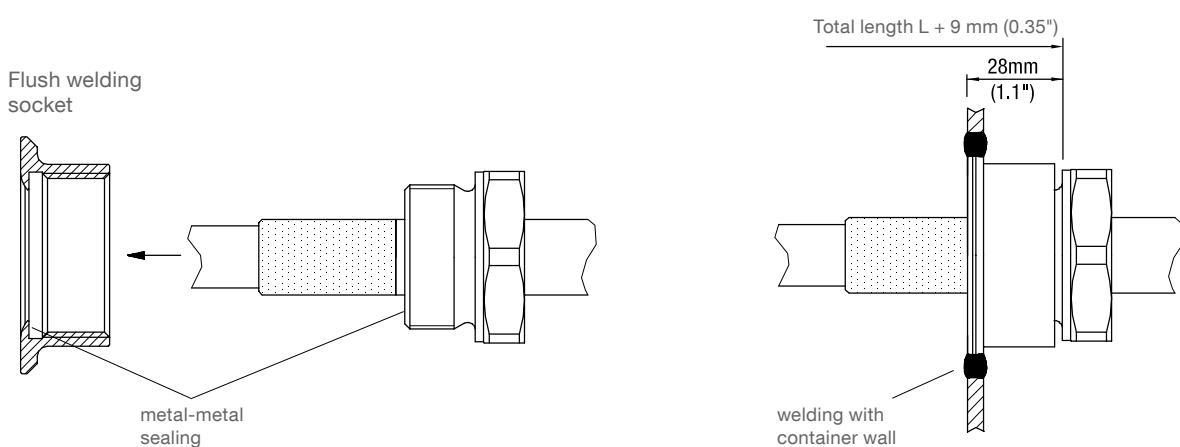
Mounting

EHEDG Approval

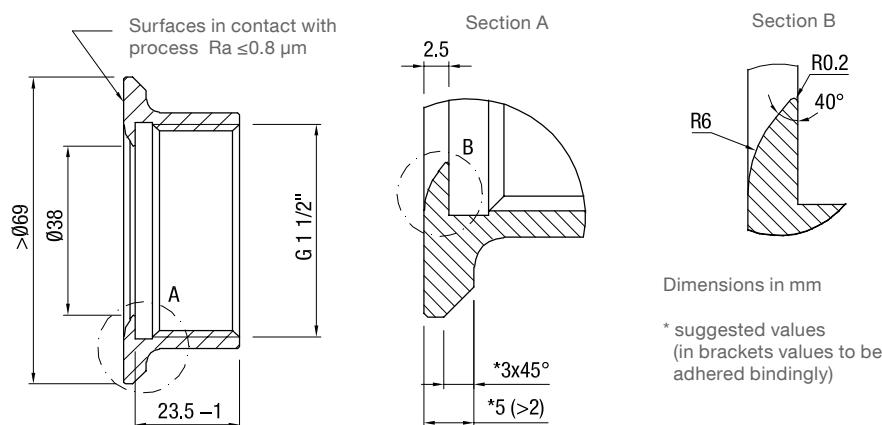
Metal-metal sealing:

- The support must be plane and without any gap. No teflon tape (or similar) is allowed to be in between.
- Fixing torque 100 Nm

The quality of the welding with the container wall must be according to the respective regulations (e.g. gaps, transitions, surface finish).



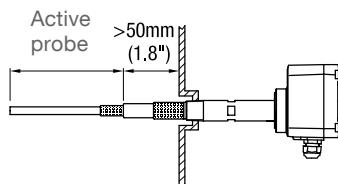
Dimension of flush welding socket (for optional on site manufacturing):



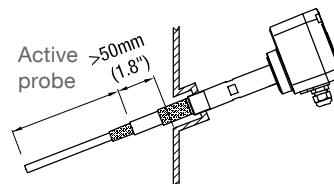
Mounting

Mounting: Rod version

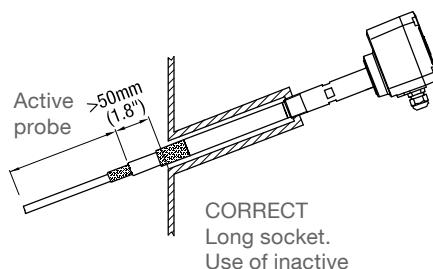
Observe distance to active probe



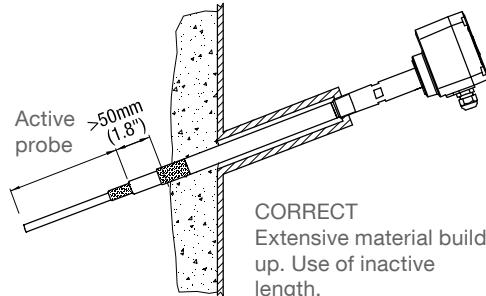
CORRECT
Horizontal mounting



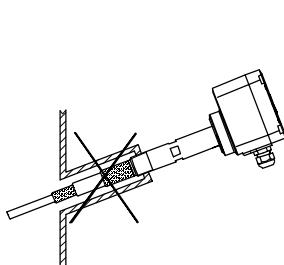
CORRECT
Oblique mounting
Helps remaining material to fall off



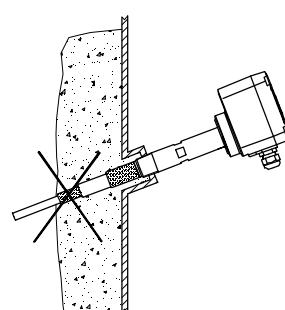
CORRECT
Long socket.
Use of inactive
length.



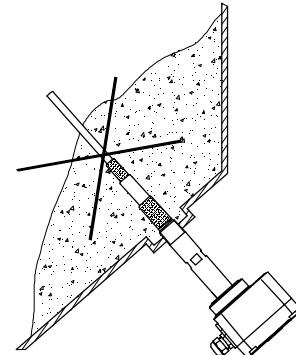
CORRECT
Extensive material build
up. Use of inactive
length.



WRONG
Active probe inside
socket.



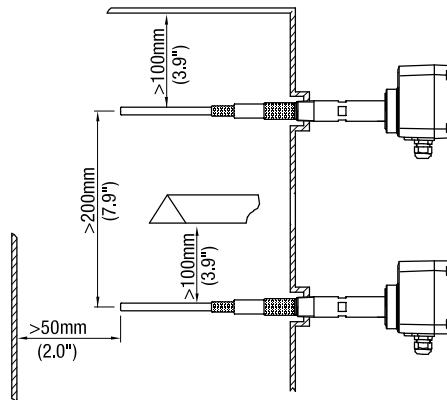
WRONG
Active probe inside
material build up.



WRONG:
Active probe inside intersection between
cylindric and conical part of the silo
(material may stay when silo is empty)

Mounting

Observe min. distance between two sensors, to metal silo wall and to protective angle.



Grounding reference with non metal silos	The inner or outer PE terminal must be connected to reach a grounding reference.
---	--

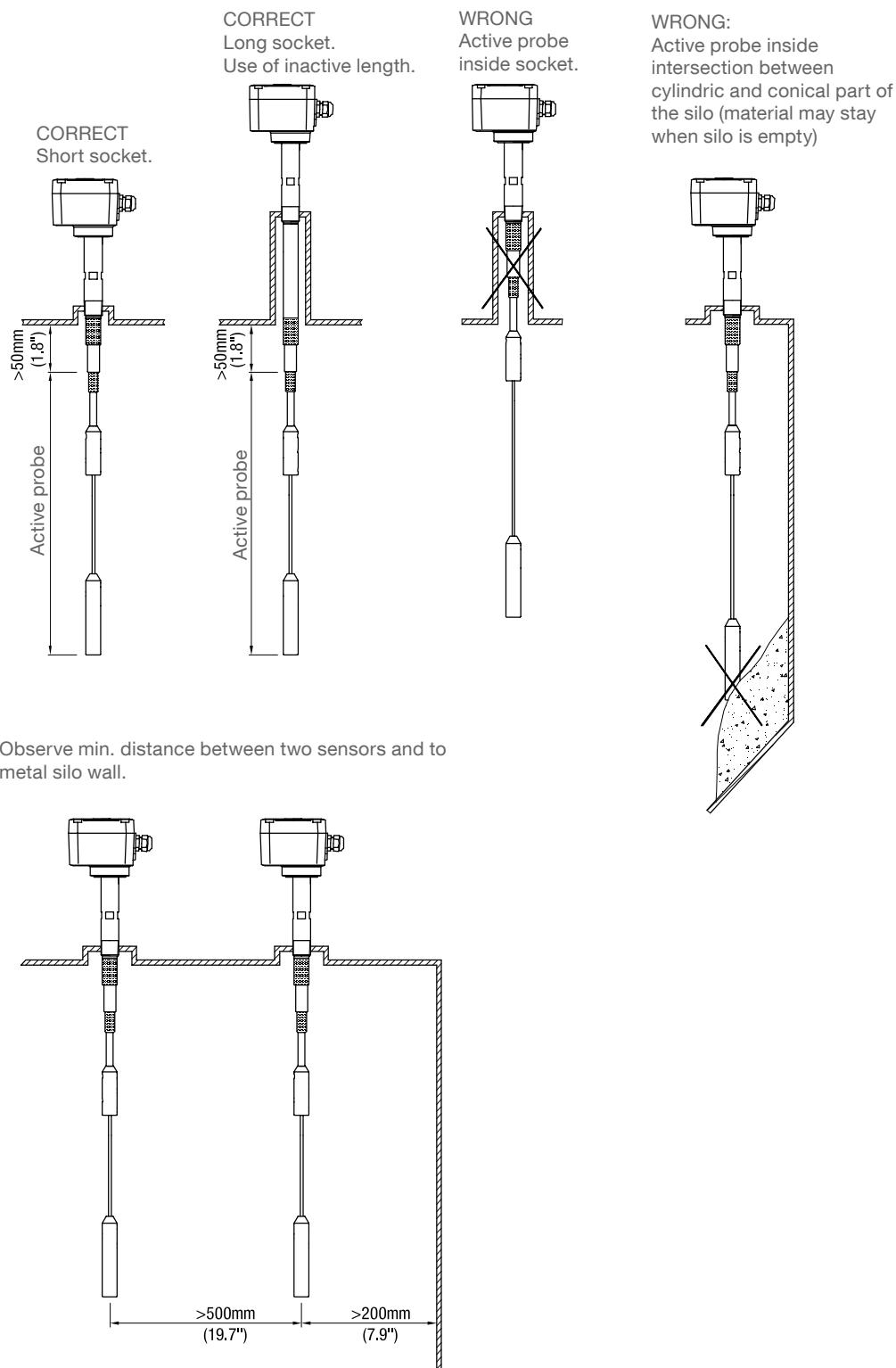
Further mounting requirements	<ul style="list-style-type: none">• Observe distance to material flow (filling).• Protective angle recommended depending on mechanical load and abrasion of the material.
--------------------------------------	--

Switching point	With proper calibration the signal output switches when the active probe is covered by material.
------------------------	--

Mounting

Mounting: Rope version

Observe distance to active probe



Grounding reference with non metal silos

The inner or outer PE terminal must be connected to reach a grounding reference.

Further mounting requirements

- Observe distance to material flow (filling).
- Empty detector: Do not mount above the center of the silo outlet due to high traction force.
- Unit must be installed vertical.

Electrical installation

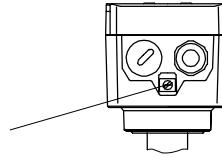
! General Safety Instructions

Handling	In the case of inexpert handling or handling malpractice the electric safety of the device cannot be guaranteed.
Protective earthing	Before any electrical installation, the terminal inside the housing must be connected to the protective earth.
Installation regulations	The local regulations or VDE 0100 (Regulations of German Electro technical Engineers) must be observed. With use of 24 V supply voltage, an approved power supply with reinforced insulation to mains is required.
Fuse	Use a fuse as stated in the connection diagrams.
RCCB protection	In the case of a defect, the distribution voltage must automatically be cut off by a RCCB protection switch so as to protect the user of the device from indirect contact with dangerous electric tensions.
Power supply switch	A Power-supply-disconnecting switch must be provided and marked near the device.
Wiring diagram	The electrical connections have to be made according to the wiring diagram.
Supply voltage	Compare the supply voltage applied with the specifications given on the electronic and name plate before switching the device on.
Cable gland/ closing element	<p>The screwed cable gland and closing element must have following specifications:</p> <p>Ingress protection IP67, temperature range from -40°C to +80°C, UL or VDE certified (depending on the country where the unit is installed), pull relief.</p> <p>Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion).</p> <p>Cable glands that are not used have to be locked with a closing element.</p> <p>A strain relief must be provided for the field wiring cables, when the device is installed with the factory provided cable glands.</p>
Conduit system	In case of using a conduit system (with NPT thread) instead of a cable gland the regulations of the country where the unit is installed must be observed. The conduit must have a tapered thread either NPT 1/2" or NPT 3/4" in accordance with the unit and ANSI B 1.20.1. Not used inlets must be closed tight with a metal closing element.
Field wiring cables	<ul style="list-style-type: none"> • The diameter has to match to the clamping range of the used cable gland. • The cross section has to match with the clamping range of the connection terminals and consider the max. current. • All field wirings must have insulation suitable for at least 250 V AC. • The temperature rating must be at least 90°C (194°F). • If higher immunity interferences as specified in the stated EMC standards are present (see chapter approval), a shielded cable is required, otherwise an unshielded instrumentation cable is satisfactory.
Connecting the terminals	Make sure that max. 8 mm (0.31") of the pigtails are bared (danger of contact with live parts).
Guiding the cables in the terminal box	Cut the field wiring cables to appropriate length to fit properly into the terminal box.
Remote housing	The remote cable must be installed separated from power supply lines to avoid immunity interferences. The min. bending radius of 50 mm (2") must be observed.

Electrical installation

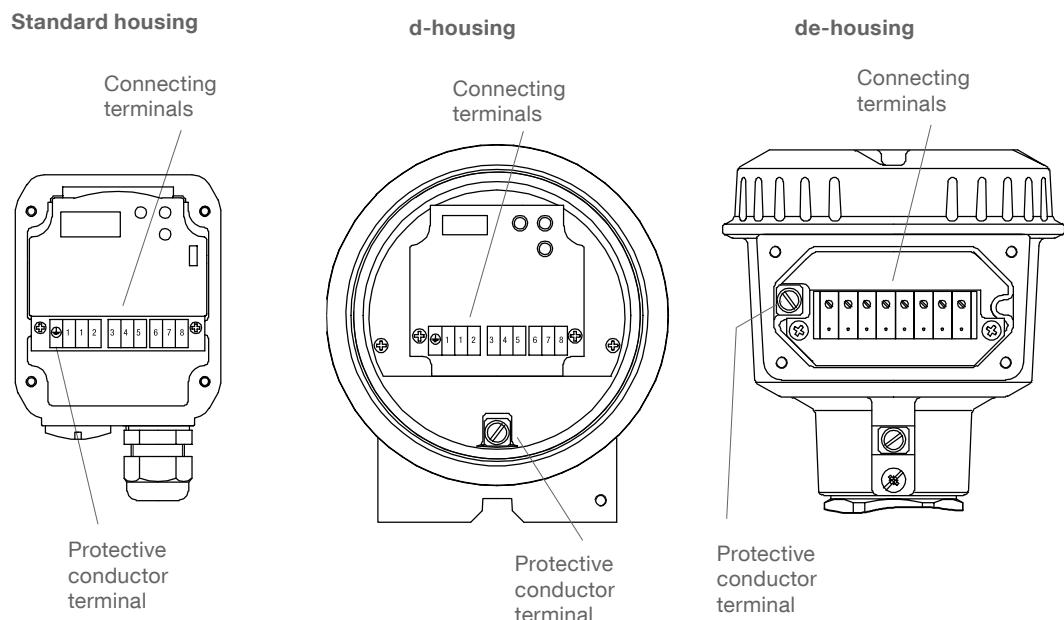
Relay protection	Provide protection for relay contacts to protect the device against spikes with inductive loads.
Protection against static charging	The housing of the unit must be grounded in any case to avoid static charging of the unit on applications with pneumatic conveying and non-metallic containers .
Opening the lid	Before opening the lid take care, that the unit is clean and no water or dirt can enter into the housing.

! Additional Safety Instructions for Hazardous Locations

External equipotential bonding terminal	<p>Connect with equipotential bonding of the plant</p> 
Field wiring	A pull relief must be provided for the field wiring cables, when the device is installed with the factory provided cable glands.
Field wiring terminals for "de" housing	<p>Fixing torque : 0.5 - 0.6 Nm Remove wire isolation: 9 mm (0.35")</p>
Cable glands and conduit system for ATEX/ IEC-Ex/ TR-CU (Dust and Gas Hazardous Locations)	<p>Installation according to the regulations of the country, where the product is installed. Not used entries have to be closed with blanking elements certified for this purpose. Where available the factory provided parts must be used. A strain relief must be provided for the field wiring cables, when the device is installed with the factory provided cable glands. If other than the factory provided parts are used, following must be ensured: The parts must have an approval adequate to the approval of the level sensor (certificate and type of protection). The approved temperature range must be from the min. ambient temperature of the level sensor to the max. ambient temperature of the level sensor increased by 10 Kelvin. The parts must be mounted according to the instructions of the supplier.</p>
Conduit system for FM (Dust and Gas Hazardous Locations)	<p>General requirements: In addition the regulations of the country must be observed. The used flameproof seals and blanking elements must have an adequate type approval and a temperature range of at least -40°C (-40°F) to +80°C (176°F). In addition they shall be suitable for the conditions and correctly installed. Where available the provided original parts of the manufacturer must be used. Installation of a flameproof enclosure "d" with a conduit system: In a conduit system single electric conductors are installed in a certified pipe system. This pipe system is in a flameproof construction as well. The flameproof enclosure "d" and the pipe system needs to be sealed from each other by a certified flameproof seal. Conduit entries of a flameproof enclosure "d" shall have installed the flameproof seal within 18 inches from the enclosure wall. Not used entries have to be closed with adequate blanking elements of a certified flameproof type Cl.1 Div.1 A.</p>
Opening the lid	<p>Units with Dust Explosion approval: Before opening the lid take care, that no dust deposits or whirlings and no hazardous atmosphere is present.</p> <p>Units with flameproof Gas Explosion approval (d-housing): To prevent ignition of hazardous atmospheres, do not remove the lid (cover) while circuits are alive.</p>

Electrical installation

Connection



Universal voltage

Relay DPDT

Power supply:

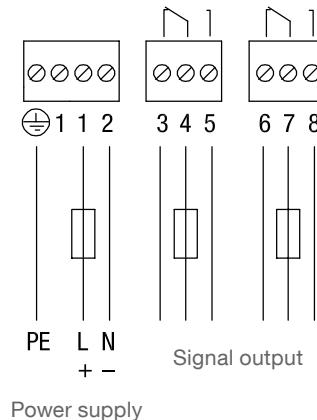
21 .. 230 V 50/ 60 Hz or DC ±10%
1.5 VA or 1.5 W

Fuse on power supply:
max. 10 A, 250 V, HBC, fast or slow

Signal output:

Floating relay DPDT
AC max. 250 V, 8 A, non inductive
DC max. 30 V, 5 A, non inductive

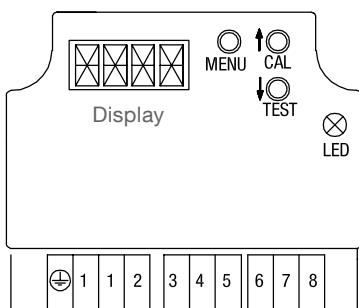
Fuse on signal output:
max. 10 A, 250 V, HBC, fast or slow



Quickstart

Quickstart

User interface



LEDs:

Green = relay activated
 Yellow = relay idle
 Red = maintenance (blinking), error (on)

Power up calibration at first time operation

Behaviour after first time power up (factory setting).

If unit is switched OFF and then again ON, this calibration will NOT be repeated.

1. Ensure material level is well below the probe.	Ensure that the unit is properly mounted and the material level is well below the probe , since the unit will calibrate to an uncovered probe.	
2. Power up calibration	After first time power up, the unit will automatically calibrate. During calibration (ca. 45 seconds) display states "CAL", red LED is blinking. After calibration display states the actual measured capacitance followed by "u" for "Signal output states uncovered". If other statements on the display are present, see Trouble shooting, page 37.	
3. Checking Quickstart settings	If required to change the factory settings for Fail Safe High/ Low, Signal output delay or Sensitivity, use Quickstart menu (see page 24).	
Unit is ready to work		

Measurement mode

The unit states the actual measured capacitance and the state of the signal output

Display	LED	Explanation
XXX u XXX c	green/ yellow*	Actual measured capacitance in pF. Actual signal output: states uncovered probe "u" or covered probe "c" Resolution is 0.1 pF (<100 pF) or 0.5pF (>100 pF). If values are >100 pF, a dot behind the number means 0.5 pF (e.g. 100. means 100.5 pF) Note: If the actual measured capacitance is higher than electronic can measure (>400pF with sensitivity setting ≥ 2 pF or >100 pF with sensitivity setting ≤ 1 pF), the unit will state "400c" or "100c". The measurement is valid, since the actual capacitance is well above the calibrated switchpoint. Signal output states covered probe "c" in any case.

* Green or yellow depending on FSH/ FSL setting, see page 24.

If other statements on the display are present, see Trouble shooting, page 37.

Quickstart

Quickstart menu

Note: Red LED is blinking during Menu setting



- When the unit is in Measurement mode, press MENU button for 3 sec to enter in Quickstart menu.
 Note: If "Code" is displayed, a Lock Code is required. Set the code number with the arrow buttons and confirm with the Menu button. Then press again the Menu button for 3 sec to enter in Quickstart menu.
- Press for 3 sec to return to Measurement mode.
- Press for <1 sec to store setted value and jump to next menu item.



- Arrow buttons increase/ decrease the value to be setted

Display	Explanation	Menu item
A. FSH * FSL	Fail Safe High Fail Safe Low	Signal output, Fail safe setting
B. ALL * C-U U-C	Covered probe <-> Uncovered probe Covered probe -> Uncovered probe Uncovered probe -> Covered probe	Signal output, Delay direction
C. 0,5 * 2 5 to 60	seconds	Signal output, Delay time Adjustable in steps (increment is 5 seconds)
D. 0,5 1 2 ** 4 10 15 25 35	pF	<p>Sensitivity Required capacitance increase between uncovered probe (after calibration) and switch to output "covered probe".</p> <p>Change presetted value only if required by the application, see calibration guide on page 25.</p> <p>Note: Menu item D is not valid and will not be shown on the display, if Manual calibration (Menu item G) is set to ON.</p>

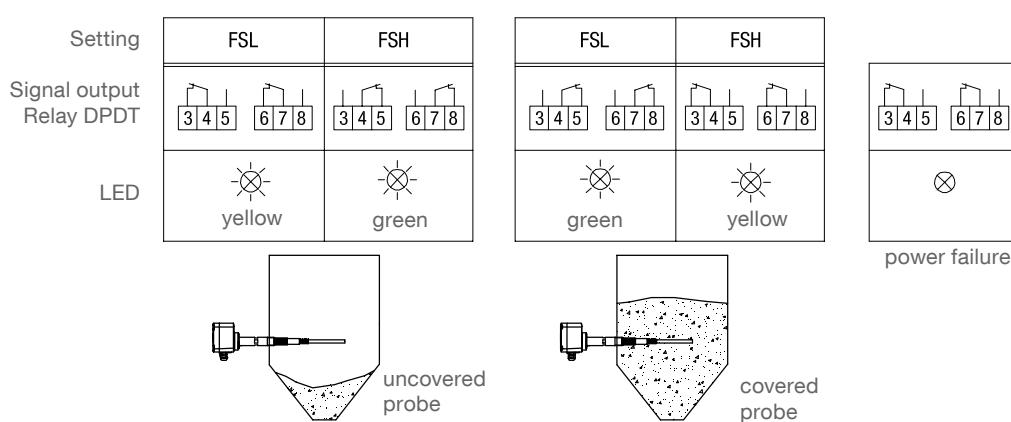
* Factory setting

** Standard Factory setting is 2 pF. Optional other setting is present (depending on order)

FSH/ FSL Setting

FSH: Set as full detector. Power failure or line break is stated as "full" signal (protection against overcharging).

FSL: Set as empty detector. Power failure or line break is stated as "empty" signal (protection against dry running).



Quickstart

Push button calibration - Calibration guide

Push button calibration needs to be done, if "Power up calibration at first time operation" was not successful or unit was changed to another location or a significant change of DK was present after changing of material.

• Calibration with uncovered probe only:

This method is most simple and thus recommended to be done if ever possible.

A proper selection of the active probe length is necessary to reach a satisfactory change of capacitance between uncovered and covered probe (see recommendations in the external selection list). If these recommendations are observed, the standard sensitivity of 2 pF can be used in most cases.

If a too small change of capacitance between uncovered and covered probe is present, a higher sensitivity can be selected (1 pF or 0.5 pf). This is not possible if remote version with remote cable length >10 m (33 ft) is installed outdoors (temperature drift).

For higher change of capacitance and evt. excessive buildup, the sensitivity can be reduced (4 pF or more).

Calibration procedure see page 26.

• Calibration with uncovered and covered probe:

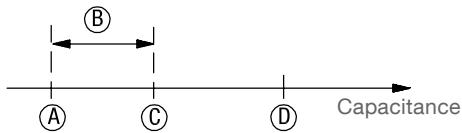
This method is most safe, since it sets the switchpoint in the middle between uncovered and covered probe capacitance. This ensures the max. switching distance to both uncovered and covered probe capacitance and thus ensures the max. tolerance against e.g. material buildup. The method is required for lower DK values which give a lower change of capacitance. The DK value of the material is not required to be known.

Calibration procedure see page 27.

Quickstart

Push button calibration - Calibration procedure - Uncovered probe only

Explanation of calibration procedure:



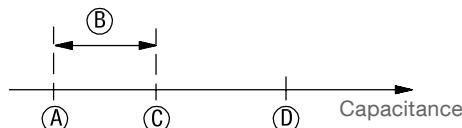
- A Capacitance Uncovered probe
- B Sensitivity
- C Switchpoint
- D Capacitance Covered probe

1. Ensure material level is well below the probe.	Ensure that the unit is properly mounted and the material level is well below the probe , since the unit will calibrate to an uncovered probe.	
2. Set Sensitivity	Only if required (see page 25) Set the Sensitivity in the Quickstart Menu, item "D", see page 24.	
3. Press CAL button for 3 seconds	<p></p> <p>During calibration the display states "CAL", the red LED is blinking. Wait until calibration is finished (ca. 10 seconds). Then display states the actual measured capacitance followed by "u" for "Probe uncovered".</p> <p>Note: If "Code" is displayed, a Lock Code is required. Set the code number with the arrow buttons and confirm with the Menu button. Then press again the CAL button for 3sec to start calibration.</p> <p>If other statements on the display are present, see Troubleshooting, page 37.</p>	
Unit is ready to work.		

Quickstart

Push button calibration - Calibration procedure - Uncovered and covered probe

Explanation of calibration procedure:



- A Capacitance Uncovered probe
- B Sensitivity
- C Switchpoint
- D Capacitance Covered probe

1. Ensure material level is well below the probe.	Ensure that the unit is properly mounted and the material level is well below the probe , since the unit will calibrate to an uncovered probe.																																									
2. Press CAL button for 3 seconds	<p> Display states "CAL", the red LED is blinking. Wait until calibration is finished (ca. 10 seconds). Then display states the actual measured capacitance followed by "u" for "Probe uncovered".</p> <p>Note: If "Code" is displayed, a Lock Code is required. Set the code number with the arrow buttons and confirm with the Menu button. Then press again the CAL button for 3 sec to start calibration.</p> <p>If other statements on the display are present, see Trouble shooting, page 37.</p>																																									
3. Note actual measured capacitance (uncovered probe)	Note the actual measured capacitance as stated in the display for uncovered probe.																																									
4. Note actual measured capacitance (covered probe)	<p>For vertical mounting (rope version) the material level shall cover the probe weight by 10 - 20 cm (4 - 8").</p> <p>Note the actual measured capacitance as stated in the display for covered probe.</p>																																									
5. Set Sensitivity	<p>Calculate the capacitance difference between uncovered and covered probe. Set sensitivity as follows (Quickstart Menu item "D"):</p> <table border="1"> <thead> <tr> <th colspan="2">Horizontal mounting</th> <th colspan="2">Vertical mounting (rope version)</th> </tr> <tr> <th>Capacitance difference uncovered-covered</th> <th>Sensitivity*</th> <th>Capacitance difference uncovered-covered</th> <th>Sensitivity**</th> </tr> </thead> <tbody> <tr> <td>0.8 .. 1.5 pF</td> <td>0,5 pF***</td> <td>0.5 .. 1.0 pF</td> <td>0.5 pF***</td> </tr> <tr> <td>1.5 .. 3 pF</td> <td>1 pF***</td> <td>1.0 .. 2 pF</td> <td>1 pF***</td> </tr> <tr> <td>3 .. 6 pF</td> <td>2 pF</td> <td>2 .. 4 pF</td> <td>2 pF</td> </tr> <tr> <td>6 .. 15 pF</td> <td>4 pF</td> <td>4 .. 10 pF</td> <td>4 pF</td> </tr> <tr> <td>15 .. 23 pF</td> <td>10 pF</td> <td>10 .. 15 pF</td> <td>10 pF</td> </tr> <tr> <td>23 .. 38 pF</td> <td>15 pF</td> <td>15 .. 25 pF</td> <td>15 pF</td> </tr> <tr> <td>38 .. 53 pF</td> <td>25 pF</td> <td>25 .. 35 pF</td> <td>25 pF</td> </tr> <tr> <td>> 53 pF</td> <td>35 pF</td> <td>> 35 pF</td> <td>35 pF</td> </tr> </tbody> </table> <p>* The difference uncovered to covered should be well above the setted sensitivity (ca. >50%). ** The difference uncovered to covered does not need to be above the setted sensitivity, since with raising material the capacitance will increase and thus lead to a save switching. *** Not possible with remote version with remote cable length >10 m (33 ft) and outdoor installation (temperature drift).</p> <p>Note: If different materials needs to be measured in the same bin without recalibration, the Sensitivity must be set for the material with the lowest DK.</p>	Horizontal mounting		Vertical mounting (rope version)		Capacitance difference uncovered-covered	Sensitivity*	Capacitance difference uncovered-covered	Sensitivity**	0.8 .. 1.5 pF	0,5 pF***	0.5 .. 1.0 pF	0.5 pF***	1.5 .. 3 pF	1 pF***	1.0 .. 2 pF	1 pF***	3 .. 6 pF	2 pF	2 .. 4 pF	2 pF	6 .. 15 pF	4 pF	4 .. 10 pF	4 pF	15 .. 23 pF	10 pF	10 .. 15 pF	10 pF	23 .. 38 pF	15 pF	15 .. 25 pF	15 pF	38 .. 53 pF	25 pF	25 .. 35 pF	25 pF	> 53 pF	35 pF	> 35 pF	35 pF	
Horizontal mounting		Vertical mounting (rope version)																																								
Capacitance difference uncovered-covered	Sensitivity*	Capacitance difference uncovered-covered	Sensitivity**																																							
0.8 .. 1.5 pF	0,5 pF***	0.5 .. 1.0 pF	0.5 pF***																																							
1.5 .. 3 pF	1 pF***	1.0 .. 2 pF	1 pF***																																							
3 .. 6 pF	2 pF	2 .. 4 pF	2 pF																																							
6 .. 15 pF	4 pF	4 .. 10 pF	4 pF																																							
15 .. 23 pF	10 pF	10 .. 15 pF	10 pF																																							
23 .. 38 pF	15 pF	15 .. 25 pF	15 pF																																							
38 .. 53 pF	25 pF	25 .. 35 pF	25 pF																																							
> 53 pF	35 pF	> 35 pF	35 pF																																							
Unit is ready to work.																																										

Quickstart

Calibration - general items

Reset to "Power up calibration at first time operation"

It may be required, that an already calibrated unit shall do a new Power up calibration when the supply voltage is switched on (e.g. if the unit shall be installed in a different bin or shall be pesetted and afterwards send to the end user). To do this, press the CAL button for 3 seconds to initiate a Push button calibration. While the calibration is running ("CAL" is displayed), switch off the supply voltage. Since the calibration was startet, but not sucessfully finished, it will automatically start again when power is back.

Note: Only the calibration is affected, the settings in the menus will not change.

Data storage of last valid calibration values

If power supply is switched off, the last valid calibration values are stored and are still valid when power is switched on again.

Manual Function Test (proof test)

General items

The unit allows to test the internal electronics and the external connected signal evaluation.

Test procedure

In Measurement mode:
Start the test by pressing the TEST button for 3 seconds.

Note: If "Code" is displayed, a Lock Code is required. Set the code number with the arrow buttons and confirm with the Menu button. Then press again the TEST button for 3 sec to start test procedure.

Test runs for ca. 20 seconds. Display states "TST". Signal output and yellow status LED will change state for ca. 10 sec and then return to former state (relais on-off-on or off-on-off).

If test result is not okay, the display states "ERR", red LED is on, Relais is set to de-energized. Electronic is defect and must be changed.

Advanced programming

Advanced programming - Advanced menu

Advanced menu

Note: Red LED is blinking during Menu setting

- MENU
- When the unit is in Measurement mode, press MENU button for 10 sec to enter in Advanced menu (keep pressed, ignore when unit goes after 3 sec to Quickstart Menue and A.FSx is displayed).
Note: If "Code" is displayed, a Lock Code is required. Set the code number with the arrow buttons and confirm with the Menu button. Then press again the Menu button for 10 sec to enter in Advanced menu.
 - Press for 3 sec to return to Measurement mode.
 - Press for <1 sec to store setted value and jump to next menu item.

- CAL TEST
- Arrow buttons increase/ decrease the value to be setted

Display	Explanation	Menu item
Auto recalibration		
F.	OFF * ON	<p>Auto recalibration to uncovered probe. If may be required to do commissioning in an already filled silo (covered probe). With covered probe a proper calibration is not possible. A solution can be to cause the unit to do a auto calibration when the silo becomes empty (uncovered probe).</p> <p>To do this, set Auto recalibration to "ON" and do a push button calibration with a covered probe (press the CAL button for 3 seconds).</p> <p>The unit will recalibrate to uncovered probe automatically after 2 minutes, if the measured capacitance becomes 50% of the setted sensitivity (Menu item D) lower than the calibrated capacitance. During calibration "CAL" is displayed.</p> <p>Do not set to "ON" if excessive material build up is present, since this build up may decrease the measured capacitance and causes a wrong calibration.</p> <p>Note: Menu item F is not valid and will not be shown on the display, if Manual calibration (Menu item G) is set to "ON".</p>
Manual calibration The unit allows Manual calibration similar to conventional potentiometer calibration, but using a comfortable display and menu. Procedure for Manual calibration see page 32 to 34.		
G.	OFF * ON	<p>Manual calibration ON/OFF If set to ON: - Menu items H-P appear. - Menu items D (Sensitivity in Quicksart Menu) and F (Auto recalibration) are no more valid and will be hidden. - Push button calibration is no more possible (if CAL button is pressed, the display states G.ON")</p>
H.	LO * HI	<p>Sensitivity range Low sensitivity range allows to detect a capacitance change of ≥ 2 pF High sensitivity range allows to detect a capacitance change of ≥ 0.5 pF See also calibration guide on page 32</p>

* Factory setting

Continuation next page

Advanced programming - Advanced menu

K.	xxx	pF	<p>Switchpoint covered -> uncovered</p> <p>Explanation of switchpoints:</p> <p>A Capacitance uncovered probe C Switchpoint covered -> uncovered (Menu item K) D Hysteresis (Menu item L) E Switchpoint uncovered -> covered F Capacitance covered probe</p> <p>Factory setting is lowest pF value (3 pF). Resolution is 0.1 pF (<100 pF) or 0.5 pF (>100 pF). If values are >100 pF, a dot behind the number means 0.5 pF (e.g. 100. means 100.5 pF)</p>
L.	xxx	pF	<p>Hysteresis Hysteresis can be adjusted if unstable capacitance is present with covered probe (e.g. moving liquid surface with vertical mounting) to avoid nervous switching of signal output. Minimum value (= factory setting) is 0.5/ 0.2 pF (for Low/ High sensitivity). Maximum value is limited by the max. measurable capacitance. Resolution see "Switchpoint covered -> uncovered".</p>

Diagnostics

M.	ON * OFF		<p>Auto Function Test The unit allows to permanently auto test the internal electronics. The test runs in the background and does not influence the functionality of the measurement. If a failure is detected, the display states "ERR", the red LED is on and the relais is set to de-energized. Electronic is defect and must be changed.</p>
N.	xxx	pF	<p>Actual calibrated Switchpoint covered -> uncovered If "OR" or "UR" is stated, there is no valid calibration (see Troubleshooting page 37)</p>
P.	xxx	pF	<p>Actual calibrated Switchpoint uncovered -> covered If "OR" or "UR" is stated, there is no valid calibration (see Troubleshooting page 37)</p>
Q.	xxx	°C	Min. stored electronics temperature
R.	xxx	°C	Max. stored electronics temperature
S.	xxx		Software version
T.	xxx		<p>Service values The values are manufacturer internal and not be stated in detail with this user manual</p>

Divers

V.	xxx		<p>Lock code The Lock code can be set to protect entering in any Menu or doing a Push Button Calibration or a Manual Function Test. Any number from 1 to 999 can be set. With setting "000" the Lock Code is not active (factory setting). If a Lock code was set and forgotten, call manufacturer to get the release code.</p>
W.	NO* YES		<p>Factory reset First all parameters will be reset to factory settings (as stated with an "*"). Second the unit will automatically start a new calibration.</p>

* Factory setting

Advanced programming - Manual calibration

Manual calibration - Calibration guide

Manual calibration is recommended for special purposes.

The numbers in the table below are applicable for most applications. Some critical applications (e.g. excessive buildup, special mounting) may be considered different.

A proper selection of the active probe length is necessary in any case to reach a satisfactory change of capacitance between uncovered and covered probe, see recommendations in the selection list (pricelist). The table below is based on a proper active probe length.

- Calibration with uncovered probe only:

This method is more easy to realise than calibration with uncovered and covered probe and thus recommended to be done if ever possible. It is applicable for higher DK values which give a higher change of capacitance between uncovered and covered probe. The DK value of the material is required to be known to be able to set the sensitivity range and the increase to switchpoint. See external list for dielectric constant (DK) of different materials.

- Calibration with uncovered and covered probe:

This method is most safe, since it sets the switchpoint in the middle between uncovered and covered probe. This ensures the max. distance to both uncovered and covered probe and thus ensures the max. tolerance against e.g. material buildup. It is required for lower DK values which give a lower change of capacitance. The DK value of the material is roughly required to be known to be able to set the sensitivity range. See external list for dielectric constant (DK) of different materials.

Manual Calibration - Calibration guide

DK	Sensitivity range	Calibration: Uncovered probe only	Increase to Switchpoint	Calibration: Uncovered and covered probe
<1.5	-	-	-	-
1.5 .. 1.6	High	-	-	A
1.7 .. 1.9	High	B	+1 pF*	C
2.0 .. 2.9	Low	B	+2 pF	C
3.0 .. 4.9	Low	B	+4 pF	C
5.0 .. 10	Low	B	+10 pF	C
>10	Low	B	+15 pF	C
		Calibration procedure see page 33		Calibration procedure see page 34

A = Required

B = Recommended (most simple calibration method)

C = Possible as an alternative

- = Not applicable

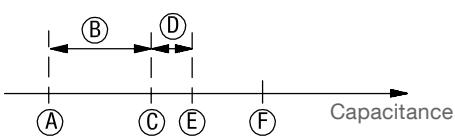
* Not possible with remote version with remote cable length >10 m (33 ft) and outdoor installation (temperature drift).

Advanced programming - Manual calibration

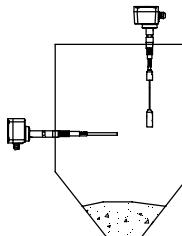
Manual calibration - Calibration procedure - Uncovered probe only

Note: Manual calibration must be set to ON (Advanced menu, item G)

Explanation of calibration procedure:



- A Capacitance uncovered probe
- B Increase to switchpoint
- C Switchpoint covered -> uncovered
- D Hysteresis
- E Switchpoint uncovered -> covered
- F Capacitance covered probe

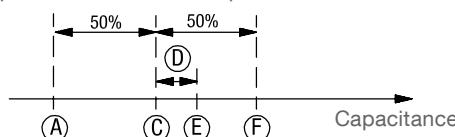
1. Ensure material level is well below the probe.	Ensure that the unit is properly mounted and the material level is well below the probe , since the unit will calibrate to an uncovered probe. 
2. Set Sensitivity range	Check for the required Sensitivity range (low or high) depending on the material to be measured, use calibration guide on page 32. Set the Sensitivity range in the Advanced Menu item "H", see page 30.
3. Find capacitance of uncovered probe	Goto Advanced Menu item "K". Start with lowest capacitance (factory setting is ca. 3 pF). Unit states covered. Increase the displayed capacitance, until the output just changes from covered to uncovered. Notes: <ul style="list-style-type: none"> - The signal output delay should be set to 0.5 sec. - In measurement mode the actual measured capacitance is displayed. This gives an indication, at which capacitance the output will change from covered to uncovered. - If the output has once changed to uncovered and shall change back to covered, the value must be decreased by the setted Hysteresis (Menu item "L"). If the actual measured capacitance is close to the limits of what the electronic can measure (400 pF with sensitivity setting "Low" or 100 pF with sensitivity setting "High"), see Troubleshooting, page 37.
4. Set switchpoint covered -> uncovered	In Advanced Menu item "K". Set the Switchpoint covered -> uncovered as follows: Capacitance of uncovered probe (see step 3 above) + Increase to switchpoint (see table on page 32)
5. Hysteresis	Advanced Menu item "L". Factory setting is normally not required to be changed.
Unit is ready to work.	Return to measurement mode.

Advanced programming - Manual calibration

Manual calibration - Calibration procedure - Uncovered and covered probe

Note: Manual calibration must be set to ON (Advanced menu, item K)

Explanation of calibration procedure:



- A Capacitance uncovered probe
- C Switchpoint covered -> uncovered
- D Hysteresis
- E Switchpoint uncovered -> covered
- F Capacitance covered probe

1. Set Sensitivity range	<p>Check for the required Sensitivity range (low or high) depending on the material to be measured, use calibration guide on page 32.</p> <p>Set the Sensitivity range in the Advanced Menu item "H", see page 30.</p>
2. Note actual measured capacitance (uncovered probe)	<p>Ensure that the unit is properly mounted and the material level is well below the probe.</p> <p>In Measurement mode: Note the actual measured capacitance as stated in the display.</p> <p>If the actual measured capacitance is close to the limits of what the electronic can measure (400pF with sensitivity setting "Low" or 100pF with sensitivity setting "High"), see Troubleshooting, page 37.</p>
3. Note actual measured capacitance (covered probe)	<p>Ensure that the material level is above the probe.</p> <p>For vertical mounting (rope version): The material level shall cover the probe weight by 10 - 20 cm (4 - 8").</p> <p>In Measurement mode: Note the actual measured capacitance as stated in the display.</p>
4. Set Switchpoint covered -> uncovered	<p>Goto Advanced Menu item "K". Set to the middle between capacitance of uncovered and covered probe as follows:</p> $\text{Switchpoint covered -> uncovered} = \text{uncovered } ^{(1)} + 0.5 \times (\text{covered } ^{(2)} - \text{uncovered } ^{(1)})$ <p>⁽¹⁾ Capacitance uncovered probe (see step 2 above) ⁽²⁾ Capacitance covered probe (see step 3 above)</p> <p>With Low sensitivity range (Advanced Menu item "H"): If the difference between uncovered and covered probe is smaller than 4 pF, set either to High sensitivity or use a more sensitive probe (longer active probe). For rope version only a setting to High sensitivity range is possible.</p> <p>With High sensitivity range (Advanced Menu item "H"): If the difference between uncovered and covered probe is smaller than 1 pF, use a more sensitive probe (longer active probe). For rope version call factory.</p> <p>* For remote version with remote cable length >10 m (33 ft) and outdoor installation the difference between uncovered and covered probe must be at least 4 pF (temperature drift).</p>
5. Hysteresis	Advanced Menu item "L". Factory setting is normally not required to be changed.
Unit is ready to work.	Return to measurement mode.

Probe modifications



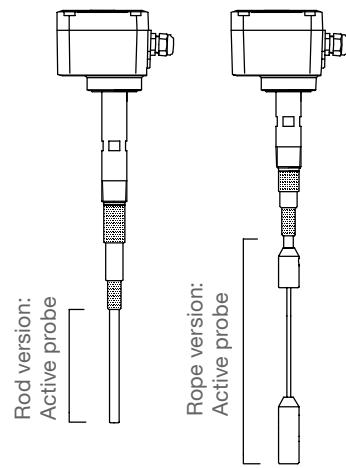
- Modifications on units with explosion approvals (Hazardous Locations) are not permitted. Consult factory.
- Modifications may change the technical data (mechanical stability).

CAUTION:

- Never do modifications on other than the active part of the probe. This will destroy the probe.
- Electronics must be removed in any case (see page 39).
- Take care not to overheat the plastic parts of the probe during welding or cutting.
- Use same material as the probe when welding to the probe.

- Recalibration is required after any modification on the probe.

Probe	Modification	Note
Rod version	Shortening	This will reduce the sensitivity (critical for material with low DK)
	Extending	Consider high mechanical load (rod bending) from bulk material
Rope version	Shortening	Proper fixing of the rope weight after rope cutting is required
	Extending	Consider high mechanical load (traction) from bulk material and reduced stability of a rope, if it is not made from one piece



Assembly - Remote version / FM Control drawing

- ! All cable glands used for the remote cable must be closed tightly to reach ingress protection.
- The cable glands must be protected against mechanical damage.
- Original remote cable from the supplier must be used.

For Hazardous Locations:
 Remote cable has intrinsically safe circuit.
 Substitution of components may impair intrinsic safety.

Assembly instruction:

Probe side:

Connect remote cable.
 Obtain right connecting sequence.
 The inner conductor and both shield conductors of the remote cable must not touch other metal parts. The delivered isolation hoses must be assembled according to the delivered instruction.

Electronic side:

1. Feed remote cable though the cable gland at the tube.

2. Connect remote cable to the plug.
 See notes above.

3. Check wiring electrically:

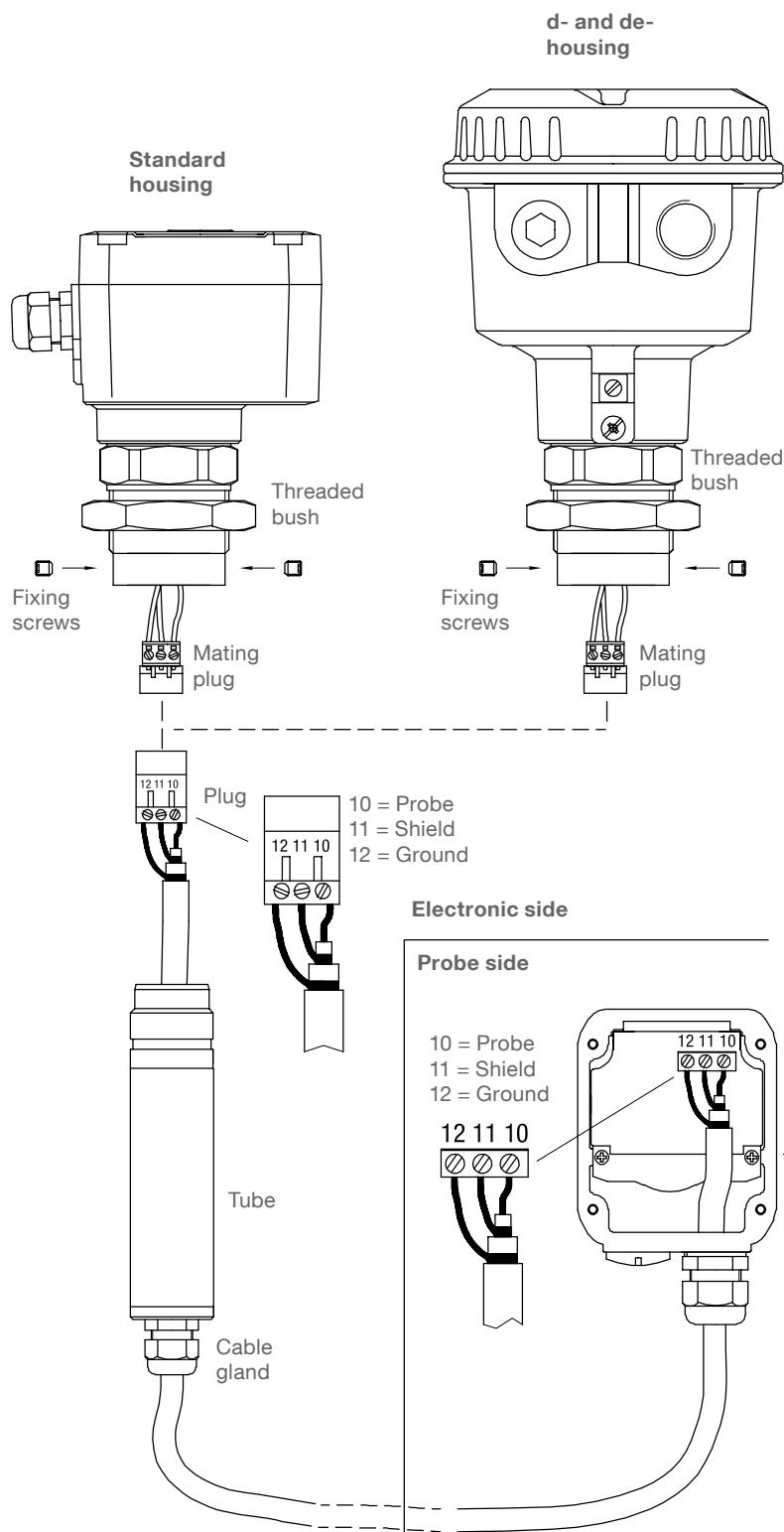
No short circuit must be present between terminal 10 and 11, 10 and 12, 11 and 12.

4. Connect plug and mating plug.

5. Screw the tube into the threaded bush. While doing this, move the remote cable downwards. Take care, that the plug is not getting loose. While screwing, the cable gland must be open to avoid, that the wires are being twisted. Note: Inside the threaded bush is a seal ring which seals the tube to the threaded bush.

6. Tighten the cable gland on the tube.

7. Fasten the two fixing screws.



Versions (for FM, FMc):

Standard housing:
 Model RF 3*00 * N with option pos.12 x Cl. II, III Div.1 Gr. E,F,G

"d"-housing:
 Model RF 3*00 * U with option pos.12 x XP-IS Cl. I,II,III Div.1 Gr. B-G and Cl. I Zone 1 Gr. IIB+H2

Remote cable:
 Special triaxial cable
 Length max. 20 m (65 ft)
 Min. bending radius: 50 mm (2")

Troubleshooting

Maintenance and error messages

Display	LED	Explanation	Possible Reason/ Solution
---------	-----	-------------	---------------------------

In Measurement Mode:

UR	red blinking	Under Range. Actual measured capacitance is lower than 3 pF.	<ul style="list-style-type: none"> Probe is defect or defect/ incorrect probe wiring. The signal output relay will be de-energized.
OR	rot blinkend	Over Range. After changing the Sensitivity from ≥ 2 pF to ≤ 1 pF.	<ul style="list-style-type: none"> Actual calibrated capacitance is higher than 100 pF and can not be measured with Sensitivity setting ≤ 1 pF. Change to Sensitivity 2 pF if DK of the material is high enough or recalibrate.
ERR	red on	Auto or Manual Function Test error.	<ul style="list-style-type: none"> Electronic is defect. Change of electronic. The signal output relay will be de-energized.

During Power up calibration at first time operation or during Push button calibration:

OR	red blinking	Over Range. Actual measured capacitance is higher than 400 pF (Sensitivity set to ≥ 2 pF) or 100 pF (Sensitivity set to ≤ 1 pF). Calibration not possible.	<ul style="list-style-type: none"> A long rope version in an empty silo may exceed 100 pF capacitance. Change to Sensitivity 2 pF if DK of the material is high enough. Probe may be covered with material. Ensure that probe is uncovered. Check if Probe is defect or defect/ incorrect probe wiring.
UR	red blinking	Under Range. Actual measured capacitance is lower than 3 pF. Calibration not possible.	<ul style="list-style-type: none"> Probe is defect or defect/ incorrect probe wiring. The signal output relay will be de-energized.
G.ON	red blinking	CAL button pressed with Manual calibration setted to "ON". Push button calibration is not possible.	<ul style="list-style-type: none"> If Push button calibration is required, set Manual calibration to "OFF".

During Manual calibration (when probe is uncovered):

Close to 100 or 100	yellow/ green	With sensitivity range setting "High" Actual measured capacitance is close to or higher than 100 pF (what the electronic can measure). Calibration not possible.	<ul style="list-style-type: none"> A long rope version in an empty silo may exceed 100 pF capacitance. Change to Sensitivity range "Low" if DK of the material is high enough. Probe may be covered with material. Ensure that probe is uncovered. Check if Probe is defect or defect/ incorrect probe wiring.
Close to 400 or 400	yellow/ green	With sensitivity range setting "Low" Actual measured capacitance is close to or higher than 400 pF (what the electronic can measure). Calibration not possible.	<ul style="list-style-type: none"> Probe may be covered with material. Ensure that probe is uncovered. Check if Probe is defect or defect/ incorrect probe wiring.

Troubleshooting

General items

Situation	Behaviour of the electronic	Possible Reason	Possible Solution
Signal output states covered while material is below the probe	The actual measured capacitance (1) is more than the actual calibrated Switchpoint uncovered -> covered (2)	Unit not properly calibrated	<ul style="list-style-type: none"> • Recalibrate (4)
		Excessive material build up on active probe	<ul style="list-style-type: none"> • Increase distance to wall (longer inactive length) • Change position • Recalibrate with less sensitivity (4)
		Defect or incorrect probe wiring.	<ul style="list-style-type: none"> • Check probe wiring (see below)
Signal output states uncovered while material is above the probe	The actual measured capacitance (1) is less than the actual calibrated Switchpoint covered -> uncovered (3)	Calibration was done with covered probe	<ul style="list-style-type: none"> • Recalibrate with uncovered probe (4)
		Calibrated was done with too less sensitivity	<ul style="list-style-type: none"> • Recalibrate with higher sensitivity (4) • Increase active probe length and recalibrate (4)
		Defect or incorrect probe wiring.	<ul style="list-style-type: none"> • Check probe wiring (see below)

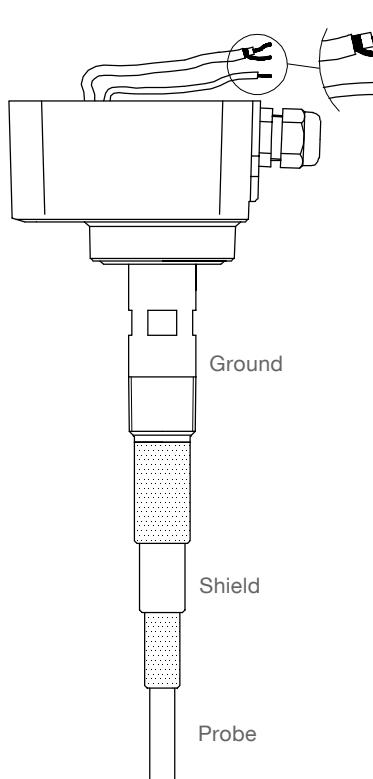
(1) Value can be seen in the display in Measurement mode (see page 23)

(2) Value can be seen in Advanced Menu, item P (see page 31)

(3) Value can be seen in Advanced Menu, item N (see page 31)

(4) See calibration guide, page 25 or 32

Checking probe wiring



1. Clean the probe from material

2. Take out the electronic board and remove internal wires (see chapter "Maintenance")

3. Check with Multimeter as follows (see drawing):

Less than 5 Ohm must be present between:

- Wire orange and Probe
- Wire yellow and Shield
- Wire green/ yellow and Ground

More than 1 MOhm resistance must be present between:

- Wire orange and wire yellow
- Wire orange and wire green/ yellow

If other values are present, the probe or probe wiring is defect.

Maintenance

General items

Opening the lid (cover)	<p>! Before opening the lid for maintenance reasons observe following items:</p> <ul style="list-style-type: none">• Do not remove the lid while circuits are alive.• No dust deposits or whirlings are present.• No rain can enter into the housing.
Frequent check of the unit	<p>! To ensure durable safety in hazardous locations and with electrical safety, following items must be checked frequently depending on the application:</p> <ul style="list-style-type: none">• Mechanical damage or corrosion of any components (housing side and sensor side) and of the field wiring cables.• Tight sealing of the process connection, cable glands and enclosure lid.• Properly connected external PE cable (if present).• For process temperatures over 230°C the delivered sealings of the flanges and of the sliding sleeve must be checked regularly for good order and condition.
Cleaning	<p>! If cleaning is required by the application, following must be observed:</p> <ul style="list-style-type: none">• Cleaning agent must comply with the materials of the unit (chemical resistance). Mainly the lid sealing, cable gland and the surface of the unit must be considered. <p>! The cleaning process must be done in a way, that:</p> <ul style="list-style-type: none">• The cleaning agent cannot enter into the unit through the lid sealing or cable gland.• No mechanical damage of the lid sealing, cable gland or other parts can happen. <p>Units with EHEDG certification, which are used in the respective EHEDG applications, must be cleaned dry only (Type ED). Furthermore the respective regulations must be observed.</p> <p>A possible accumulation of dust on the unit does not increase the maximum surface temperature and must therefore not be removed for purposes of maintaining the surface temperature in hazardous locations.</p>
Function test	A frequent function test may be required depending on the application. Execution of function test see page 29
Production date	The production date can be traced by the serial number on the typeplate. Please contact the manufacturer or your local distributor.
Spare parts	All available spare parts are stated in the selection list.

Maintenance

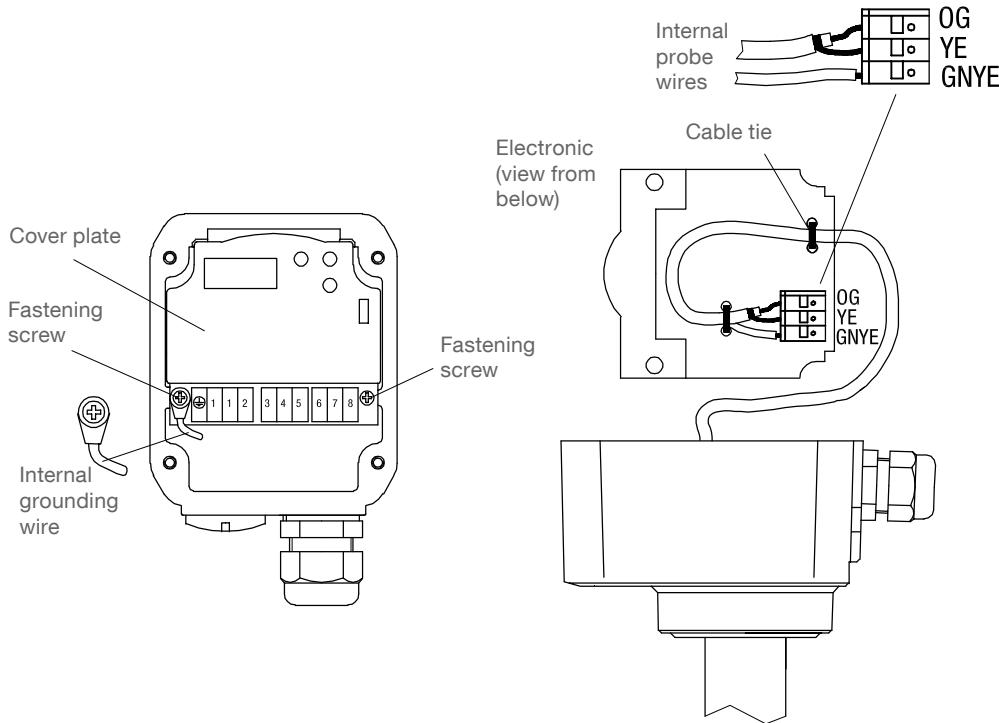
Change of electronic board

- ! • Opening the lid (cover): see safety notes on page before
• Hazardous Locations: The unit must have always an electronic board inserted and connected to the probe. If the electronic board is not connected to the probe, the probe acts as an isolated capacitance. The risk of static charge and thus possible explosion is present.

1. Open the housing lid
2. Remove the field wiring cables
3. Remove the two fastening screws
4. Take out the electronic board, remove cable ties and internal wires
5. Mount a new electronic board in reverse sequence

CAUTION:

- Observe right sequence of internal probe wires
- Observe to reconnect the internal grounding wire



Repair of flamepath

Repair of flamepath on units with Ex d, Ex de or XP approvals is not intended.
Please contact manufacturer.

Notes for use in Hazardous Locations

Zone classification

	usable in zone	ATEX category	IEC-Ex Equipement Protection Level (EPL)	
Dust applications	20, 21, 22	1 D	Da	* in case of conductive dust additional requirements for the installation may be necessary.
	21, 22	2 D	Db	
	22	3 D *	Dc	
Gas applications	0, 1, 2	1 G	Ga	
	1, 2	2 G	Gb	
	2	3 G	Gc	

General Notes

Marking

Devices with Ex approval are marked on the name plate.

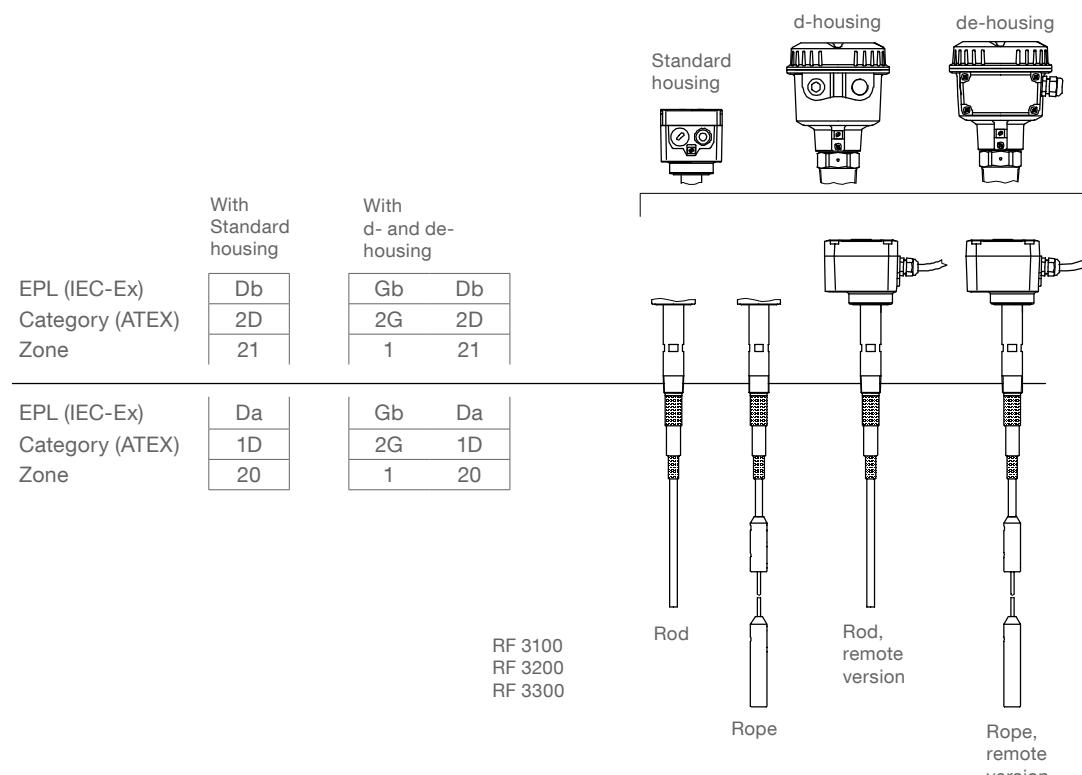
Process pressure

! The device construction allows process over-pressure up to 25 bar (363 psi). These pressure is allowed for test purposes. The definition of the Ex approvals are only valid for a container-over-pressure between -0.2 .. +0.1 bar (-2.9 .. +1.45 psi). For higher or lower pressures the approvals are not valid.

Process and ambient temperature

The permitted temperature ranges are marked on the name plate.

Permitted zones (categories) for mounting in partition wall



Notes for use in Hazardous Locations

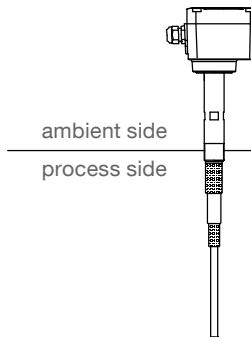
Max. Surface Temperature and Temperature Class

The temperature marking on the name plate  refers to the instruction manual.

On the following tables the relevant temperature ratings are shown.

The maximum surface temperature (resp. temperature class) is the warmest temperature of the unit which could occur during malfunction (according to Ex-definition).

Max. ambient temperature	Max. process-temperature	Max. Surface temperature	Temperature class
70°C (158°F)	≤120°C (248°F)	120°C (248°F)	T4
	≤130°C (266°F)	(1)	T4
	≤195°C (383°F)	(1)	T3
	≤240°C (464°F)	(1)	T2
	≤295°C (563°F) (2)	(1)	T2
	≤445°C (833°F) (2)	(1)	T1
(1) The max. surface temperature is the same as the max. process temperature (2) Only with RF 3300			

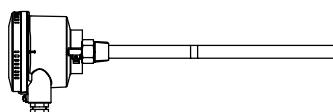
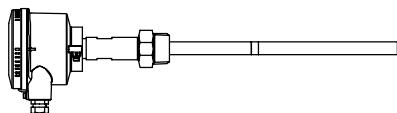


Disposal

The product consists of materials which can be recycled, details of the used materials see chapter "Technical data - Mechanical data".

Recycling must be done by a specialised recycling company. Since the product is not subject to the WEEE directive 2002/96/EG, it is not permitted to bring it to a public recycling station.

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Subject to technical change.
All dimensions in mm (inch).

We assume no liability for typing errors.
Different variations than specified are possible.
Please contact our technical consultants.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning may be accomplished only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.
- This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications.

Special attention must be paid to warnings and notes as follows:

WARNING



Relates to a caution symbol on the product: A failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.

WARNING



Relates to a caution symbol on the product: Risk of electric shock

WARNING



A failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product	Description
	CAUTION: refer to accompanying documents (manual) for details.
	Earth (ground) Terminal
	Protective Conductor Terminal

Technical support

Please contact your local supplier (for address see www.uwt.de). Otherwise you can contact:

UWT GmbH
Westendstr. 5
D-87488 Betzigau

Tel.: 0049 (0)831 57123-0
Fax: 0049 (0)831 76879
info@uwt.de
www.uwt.de

Introduction

Applications

RF 8000 is designed for level detection and simple pump control in a variety of applications:

- Liquids, solids (powder and granules), slurries, interface detection (for example, oil/ water), and foam detection
- Foods and pharmaceuticals
- Chemical and petrochemical
- High pressure and temperature

Function

RF 8000 is a versatile capacitance switch, ideal for level detection of interfaces, solids, liquids, slurries, and foam, and for simple pump control.

The switch responds to the presence of any material with a relative dielectric constant of 1.5 or more by detecting a change in capacitance, which is registered as a change in oscillating frequency.

The switch can be set to detect before contact or on contact with the probe. The RF 8000 requires a connection to earth/ground for effective capacitance measurement.

The power supply is galvanically isolated.

The materials used in the probe construction provide a high level of chemical resistance, and an excellent temperature rating on the process wetted portion of the probe: up to 400 °C (752 °F).

RF 8000 is available in two models: the standard model, and the digital model with integral local display.

Features

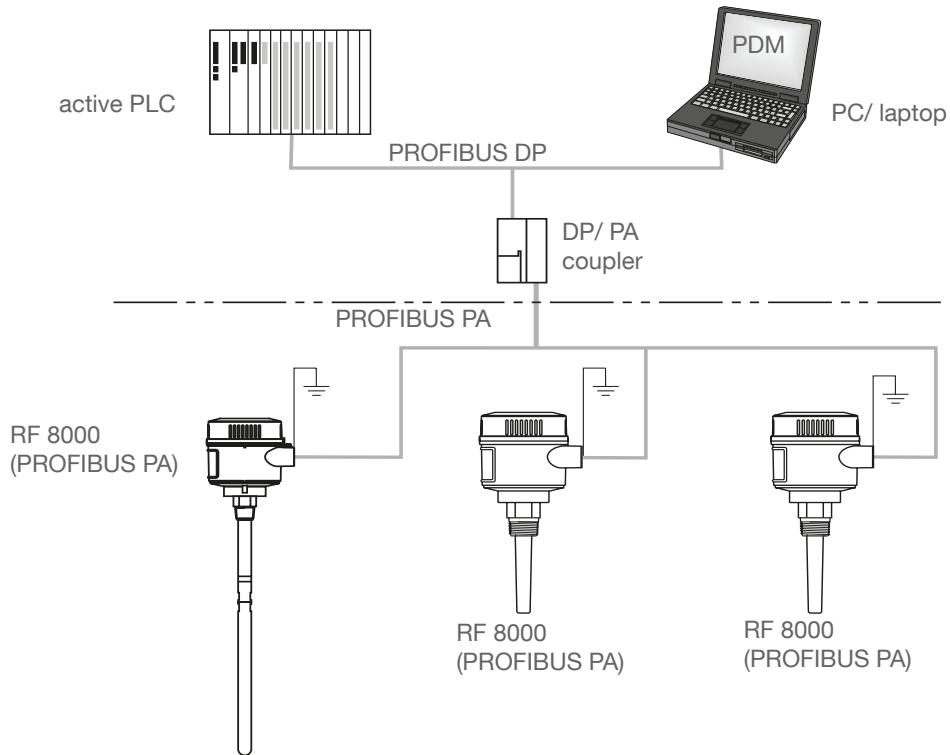
- Potted construction protects components from shock, vibration, humidity, and/or condensation
- High chemical resistance on probes
- Freely programmable set up covers wide range of applications/materials
- Integrated Local User Interface (LUI) for ease of use
- Rod and rope versions available
- Active Shield minimizes the effect of product build-up at the sensor mounting point
- Communication via PROFIBUS PA (profile version 3.0, Class B)
- Intrinsically Safe (IS) transmitter design for hazardous areas (requires external barrier or IS power supply)

Introduction

Profibus PA - System Implementation

RF 8000 supports PROFIBUS communication protocol, and SIMATIC PDM software.

Basic PLC configuration with PROFIBUS PA



Programming

RF 8000 carries out its level measurement function according to the set of built-in parameters. You can make parameter changes locally via the local user interface, or from a remote location via a PC using SIMATIC PDM software.

RF 8000 Digital can be used either:

- as a standalone unit, programmed locally using the local user interface, or
- installed as part of a network, programmed remotely using SIMATIC PDM on Profibus PA network (or locally using the Local User Interface).

Alarm signalling

The solid-state switch can be set to react either to a diagnosed fault in the instrument, or to a change in the process level.

Fault Signalling

RF 8000 can actively report information on its own status via PROFIBUS PA when used as part of a network, or by means of a pre-defined output status at the solid state switch and on the Local User Interface (LUI).

Technical data - Dimensions

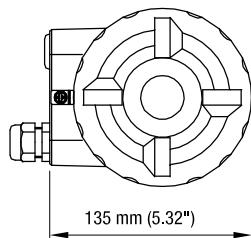
Enclosure

RF 8100

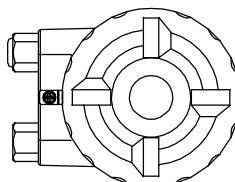
RF 8200

Top view

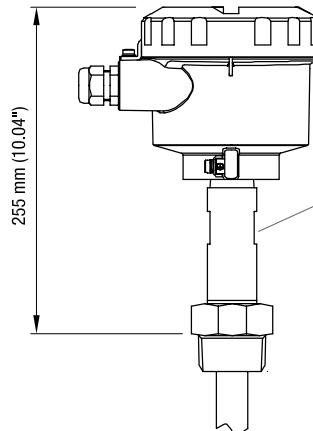
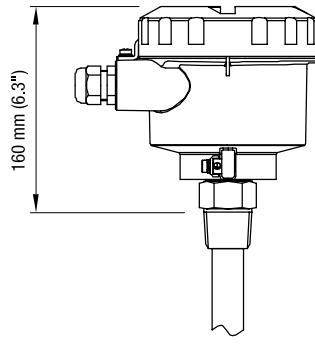
M20x1.5 cable gland



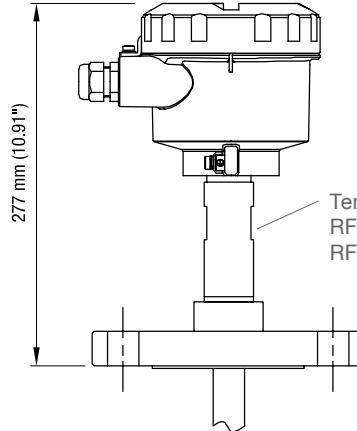
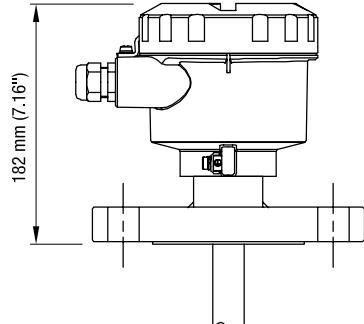
NPT 1/2" conduit



RF 8100
RF 8200
Threaded
process connection



RF 8100
RF 8200
Flanged
process connection

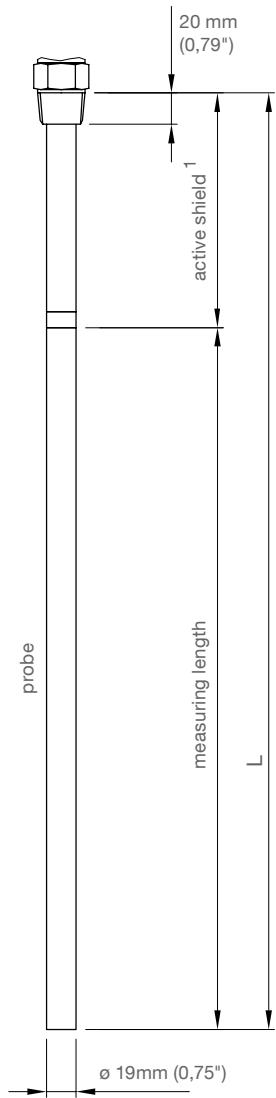


Technical data - Dimensions

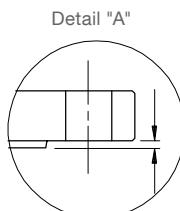
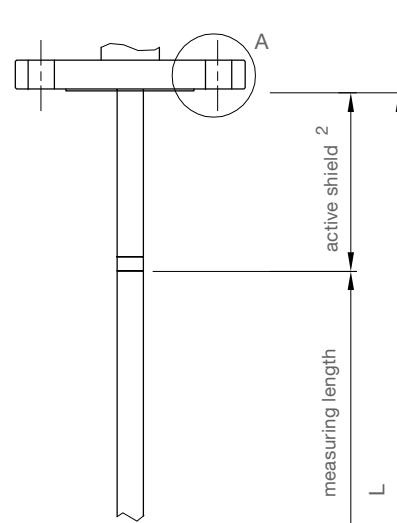
RF 8100 Rod version

RF 8200 Rod version (high temperature)

Threaded process connection



Flanged process connection



Detail "A"
L does not include any raised face (see page 8)

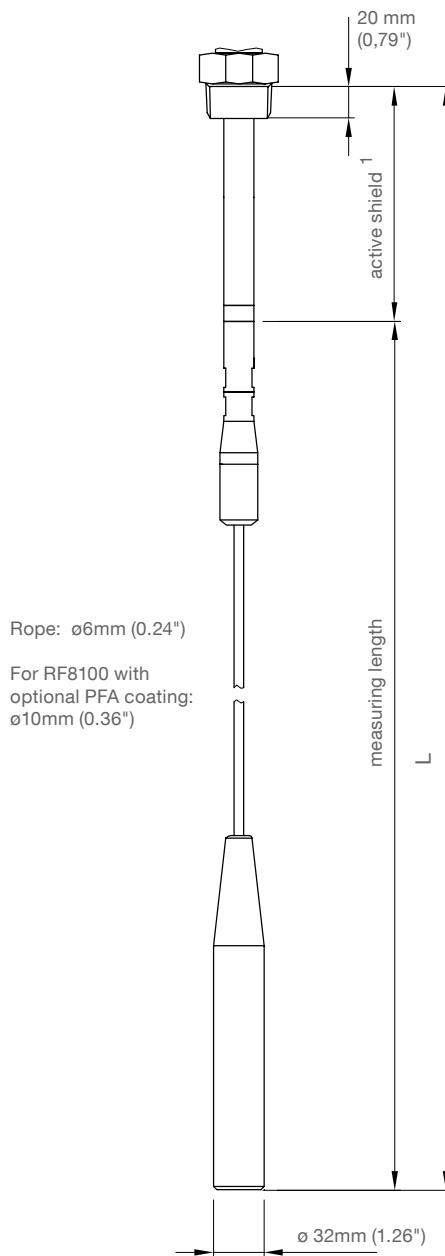
¹ For RF8100 coated with PFA
Standard 125mm (4.92")
Optional 250 mm (9.84") or
400 mm (15.75")

² For RF8100 coated with PFA
Standard 105 mm (4.13")
Optional 230 mm (9.06") or
380 mm (14.96")

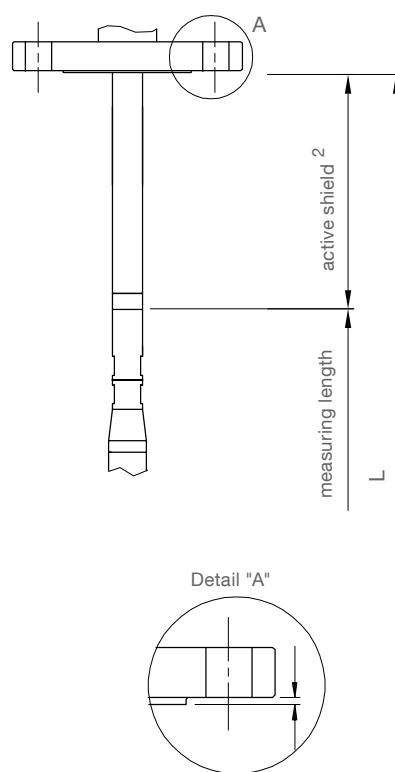
Technical data - Dimensions

RF 8100 Rope version

Threaded process connection



Flanged process connection



L does not include any raised face (see page 8)

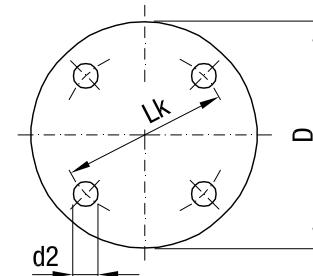
¹ Coated with PFA
 Standard 125mm (4.92")
 Optional 250 mm (9.84") or
 400 mm (15.75")

² Coated with PFA
 Standard 105 mm (4.13")
 Optional 230 mm (9.06") or
 380 mm (14.96")

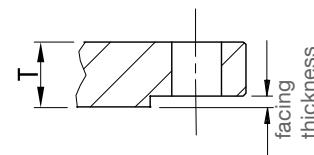
Technical data - Dimensions

Flanges

Code	Type	Number of holes	d2 mm (inch)	Lk mm (inch)	D mm (inch)	T thickness mm (inch)
ASME B16.5, raised face	5A 1" 150 lbs	4	15.9 (0.63)	79.3 (3.12)	108.0 (4.25)	14.3 (0.56)
	5B 1" 300 lbs	4	19.1 (0.75)	88.9 (3.5)	123.8 (4.87)	17.5 (0.69)
	5C 1" 600 lbs	4	19.1 (0.75)	88.9 (3.5)	123.8 (4.87)	17.5 (0.69)
	5D 1½" 150 lbs	4	15.9 (0.63)	98.6 (3.88)	127.0 (5.0)	17.5 (0.69)
	5E 1½" 300 lbs	4	22.2 (0.87)	114.3 (4.5)	155.6 (6.13)	20.6 (0.81)
	5F 1½" 600 lbs	4	22.2 (0.87)	114.3 (4.5)	155.6 (6.13)	22.4 (0.88)
	5G 2" 150 lbs	4	19.1 (0.75)	120.7 (4.75)	152.4 (6.01)	19.1 (0.75)
	5H 2" 300 lbs	8	19.1 (0.75)	127.0 (5.0)	165.1 (6.5)	22.2 (0.87)
	5J 2" 600 lbs	8	19.1 (0.75)	127.0 (5.0)	165.1 (6.5)	25.4 (1.0)
	5K 3" 150 lbs	4	19.1 (0.75)	152.4 (6.01)	190.5 (7.5)	23.9 (0.94)
	5L 3" 300 lbs	8	22.2 (0.87)	168.2 (6.62)	209.6 (8.25)	28.6 (1.13)
	5M 3" 600 lbs	8	22.2 (0.87)	168.2 (6.62)	209.6 (8.25)	31.7 (1.25)
	5N 4" 150 lbs	8	19.1 (0.75)	190.5 (7.5)	228.6 (9.0)	23.9 (0.94)
	5P 4" 300 lbs	8	22.2 (0.87)	200.0 (7.87)	254.0 (10.0)	31.7 (1.25)
	5Q 4" 600 lbs	8	25.4 (1.0)	215.9 (8.5)	273.1 (10.75)	38.1 (1.5)
EN 1092-1 type A, flat faced	6A DN25 PN16	4	14.0 (0.55)	85.0 (3.35)	115.0 (4.53)	18.0 (0.71)
	6B DN25 PN40	4	14.0 (0.55)	85.0 (3.35)	115.0 (4.53)	18.0 (0.71)
	6C DN40 PN16	4	18.0 (0.71)	110.0 (4.33)	150.0 (5.91)	18.0 (0.71)
	6D DN40 PN40	4	18.0 (0.71)	110.0 (4.33)	150.0 (5.91)	18.0 (0.71)
	6E DN50 PN16	4	18.0 (0.71)	125.0 (4.92)	165.0 (6.5)	18.0 (0.71)
	6F DN50 PN40	4	18.0 (0.71)	125.0 (4.92)	165.0 (6.5)	20.0 (0.79)
	6G DN80 PN16	8	18.0 (0.71)	160.0 (6.3)	200.0 (7.87)	20.0 (0.79)
	6H DN80 PN40	8	18.0 (0.71)	160.0 (6.3)	200.0 (7.87)	24.0 (0.94)
	6J DN100 PN16	8	18.0 (0.71)	180.0 (7.09)	220.0 (8.66)	20.0 (0.79)
	6K DN100 PN40	8	22.0 (0.87)	190.0 (7.48)	235.0 (9.25)	24.0 (0.94)



Raised face



Type	Facing thickness
ASME 150 lb	2 mm (0.08")
ASME 300 lb	7 mm (0.28")

Technical data - Electrical data

Electronic module: Standard (Relay SPDT / Solid State)

Power

Supply	12 to 250 V AC/DC (0 to 60 Hz)
Ex approvals	Max. voltage which does not invalidate the intrinsically safe protection of the sensor (probe): Um = 250V AC
Power consumption	2 W max.

Performance

Repeatability	±1% of measurement
---------------	--------------------

User Interface

Configuration	Locally, using dip switches and potentiometers
Local display	3 LED indicators
Output	Relay contact and solid-state switch
Polarity-independent	Yes
Failsafe	Relay and solid-state switch can be de-energized in the absence of a sensor signal

Signal Outputs

Relay	1 Form C (SPDT) contact (selectable NC or NO contact) max. switching voltage/ current (DC): 30 V DC/ 5 A max. switching voltage/ current (AC): 250 V AC/ 8 A (resistive load)
Solid-state switch	Rated 30 V DC or peak 30 V AC, 82 mA
Time delay	ON/OFF alarm, duration selectable 1 to 42 seconds / 1 to 100 seconds
Hysteresis	Dependent on DK: max. 2 mm (0.08") @ DK = 1.5
Failsafe operation	Failsafe High or Failsafe Low
Delay timers	2: Alarm ON to OFF and Alarm OFF to ON

Electronic module: Digital (Profibus PA/ Solid State)

Power

Bus voltage	12 to 30 V DC, 12.5 mA
- General purpose	
- Intrinsically Safe	12 to 24 V DC, 12.5 mA, FISCO Field Device Intrinsically safe barrier required for ATEX: $U_i=24\text{ V}$ $I_i=380\text{ mA}$ $P_i=5.32\text{ W}$ $C_i=5\text{ nF}$ $L_i=10\text{ }\mu\text{H}$ for FM/CSA: see page 23
Ex approvals	Max. voltage which does not invalidate the intrinsically safe protection of the sensor (probe): Um = 250V AC
Starting current < current of normal operation	Yes
Fault current (max. uninterrupted current minus current of normal operation)	0 mA
Fault disconnect equipment (FDE)	Yes
Auxiliary source	Bus powered
Separate supply necessary	No

Performance

Repeatability	Approx. ± 2 mm for a conductive fluid
---------------	---------------------------------------

Technical data - Electrical data

User Interface

Configuration

Locally, using local user interface (LUI), for standalone operation, or
 Remotely, using SIMATIC PDM on a Profibus PA network

Local Digital Display	LCD
Output (bus)	PROFIBUS PA (IEC 61158 CPF3 CP3/2) Bus physical layer: IEC 61158-2 MBP(-IS)
Polarity-independent	yes
Simultaneous communication with Master Class 2	4 (max.)
Cyclic User data (normal operation)	
Byte output	2 bytes representing one value
Byte input	0
Device profile	PROFIBUS PA Profile for Process Control Devices Version 3.0, Class B
Function blocks	1
Discrete input	1
Logical inversion	Parameterizable
Simulation functions	
Output	yes
Input	yes
Failsafe	Parameterizable (last usable value, substitute value, erroneous value)
Block Structure	
Physical block	1
Transducer block	1
Transducer block discrete input	Yes
Monitoring measuring limits	Yes
Alarm Output	
Solid-state switch	Galvanically isolated, non-polarity sensitive transistor Rated 30V DC or peak AC max., 82mA max Voltage drop below 1 V typical @ 50 mA With Intrinsically safe: barrier required for ATEX: $U_i = 30V$ $I_i = 200mA$ $P_i = 350mW$ $C_i = 0$ $L_i = 0$ for FM/CSA: see page 23
Time delay	Controlled by software (2 delay timers: alarm ON delay and alarm OFF delay)
Hysteresis	100% adjustable
Failsafe operation	Failsafe High or Failsafe Low
Terminal	Removable terminal block, 2.5 mm ² max.

Diagnostics

Input Reed contact: for test function

Technical data - Mechanical data

Probe

Model	Length (max)	Process Connections	Tensile (max)	Wetted Parts
Rod (19 mm/ 0.75" dia.)	1,000 mm/ 40"	<ul style="list-style-type: none"> Threaded: ¾" 1" 1 ½" BSPT (R), BSPP (G) ¾" 1" 1 ¼" 1 ½" NPT Welded flange: ASME: 1" 1 ½" 2" 3" 4" DN 25 40 50 80 100 	n/a	<ul style="list-style-type: none"> 1.4404 (316L) FKM seals (optional FFKM) PFA lining on Active Shield PEEK isolators
Rope	25,000 mm/ 985"	<ul style="list-style-type: none"> Threaded: ¾" 1" 1 ½" BSPT (R), BSPP (G) ¾" 1" 1 ¼" 1 ½" NPT Welded flange: ASME: 1" 1 ½" 2" 3" 4" DN 25 40 50 80 100 	1,900 kg/ 4,188 lbs	<ul style="list-style-type: none"> 1.4404 (316L) Active Shield and cable weight 1.4404 (316L) cable (optional PFA jacketed cable) FKM seals (optional FFKM) PEEK isolators
High Temperature version	1,000 mm/ 40"	<ul style="list-style-type: none"> Threaded: ¾" 1" 1 ½" BSPT (R), BSPP (G) ¾" 1" 1 ¼" 1 ½" NPT Welded flange: ASME: 1" 1 ½" 2" 3" 4" DN 25 40 50 80 100 	n/a	<ul style="list-style-type: none"> 1.4404 (316L) Ceramic isolators

Active Shield Length			Minimum length of extension "L"		
Active Shield	Threaded	Flanged	Rod version	Rope version	High Temp. version
Standard length	125 mm/4.92"	105 mm/4.13"	350 mm/13.78"	500 mm/19.69"	350 mm/13.78"
Extended shield	250 mm/9.84"	230 mm/9.06"	500 mm/19.69"	1000 mm/40"	500 mm/19.69"
Extended shield	400 mm/15.75"	380 mm/14.96"	750 mm/29.53"	1000 mm/40"	750 mm/29.53"

Enclosure

Termination	Removable terminal block, 2.5 mm ² max.
Construction	Powder-coated aluminum with gasket
Optional thermal isolator	1.4404 (316L) stainless steel
Cable entry	2 x M20 thread (option: 1 x ½" NPT thread with adaptor)
	With ATEX approval: - Default: 2x M20x1.5 - With selection of option Pos.33a: 2x NPT ½" tapered ANSI B1.20.1
Ingress protection	Type 4 / IP65 or IP68 (depending on Cable Entry option)
	Note: The use of approved watertight conduit hubs/glands is required for Type 4 / IP65 or IP68 (outdoor applications).
Separation between Zone 0 and Zone 1 (ATEX II 1/2G)	Material of the separation element (partition wall) - Stainless steel, 1.4404 (316L) - Glass, Inconel 600 (Glass seal)

Weight

Weight varies based on configuration. For example:

- Compact, 100 mm (4") insertion length, ¾" process connection 1 kg (2.20 lb.) approx.

Technical data - Operating conditions

Environmental

Location	Indoor/outdoor
Altitude	2,000 m (6,562 ft.) max.
Ambient temperature	<p>-40 to 85°C (-40 to 185°F)</p> <p>With ATEX approval: Depending on Surface Temperature and Temperature Class, details see page 35.</p>
LUI (local user interface)	-30 to 85°C (-22 to 185°F)
Storage temperature	-40 to 85°C (-40 to 185°F)
Relative humidity	Suitable for outdoor
Installation category	II (Electronic module: Standard) I (Electronic module: Digital)
Pollution degree	4

Process

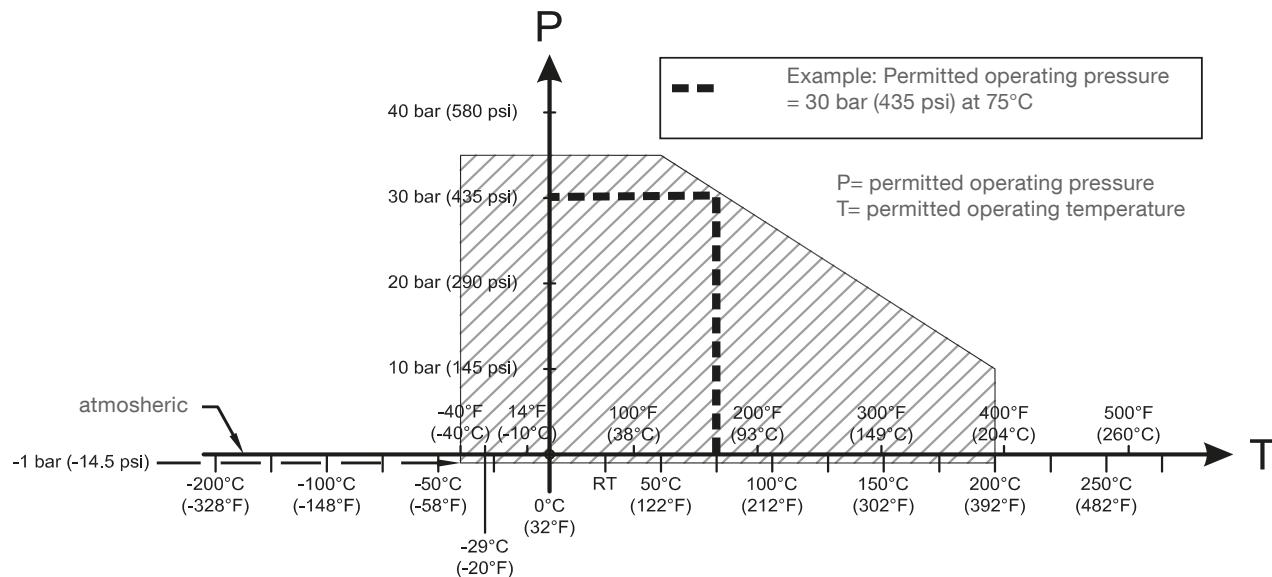
Relative dielectric constant	1.5 minimum
Temperature at process connection	
- Rod / rope version	<p>Without temperature extended shaft: -40 to 85°C (-40 to 185°F) -20 to 85°C (-4 to +185°F) with option FFKM seal O-ring</p> <p>With temperature extended shaft: -40 to 200°C (-40 to 392°F) -20 to 200°C (-4 to +392°F) with option FFKM seal O-ring</p>
- High temperature version	-40 to 400°C (-40 to 752°F)
	<p>With ATEX approval: Depending on Surface Temperature and Temperature Class, details see page 35.</p>
Pressure (vessel)	-1 to 35 bar g / -14.6 to 511 psi g (nominal)

note: please see Pressure versus Temperature Curves on next pages.

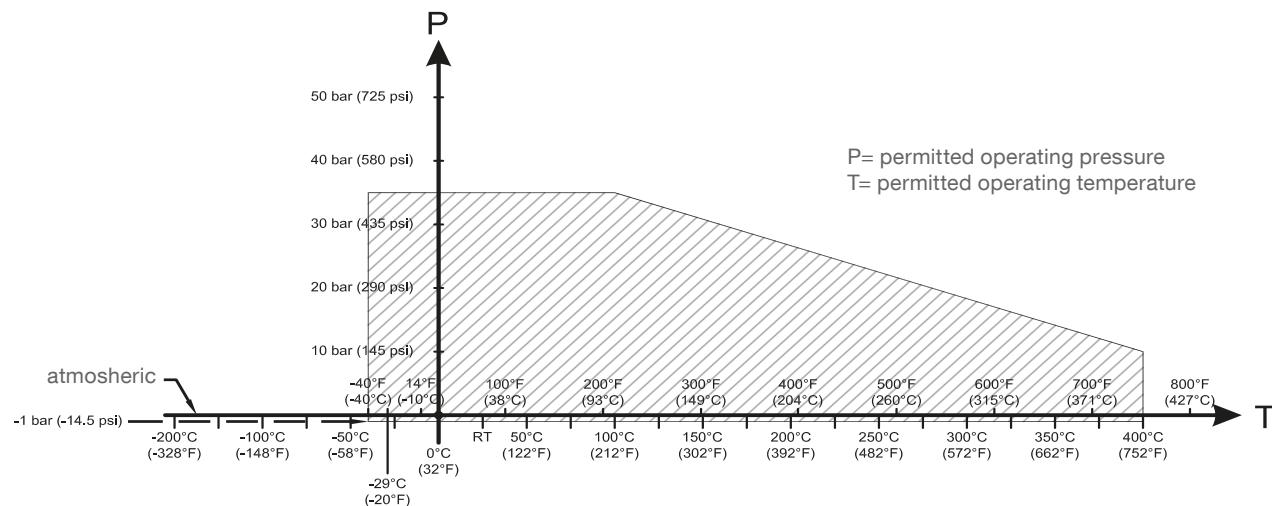
Technical data - Operating conditions

Pressure versus Temperature Curves

Extended rod and rope versions, threaded

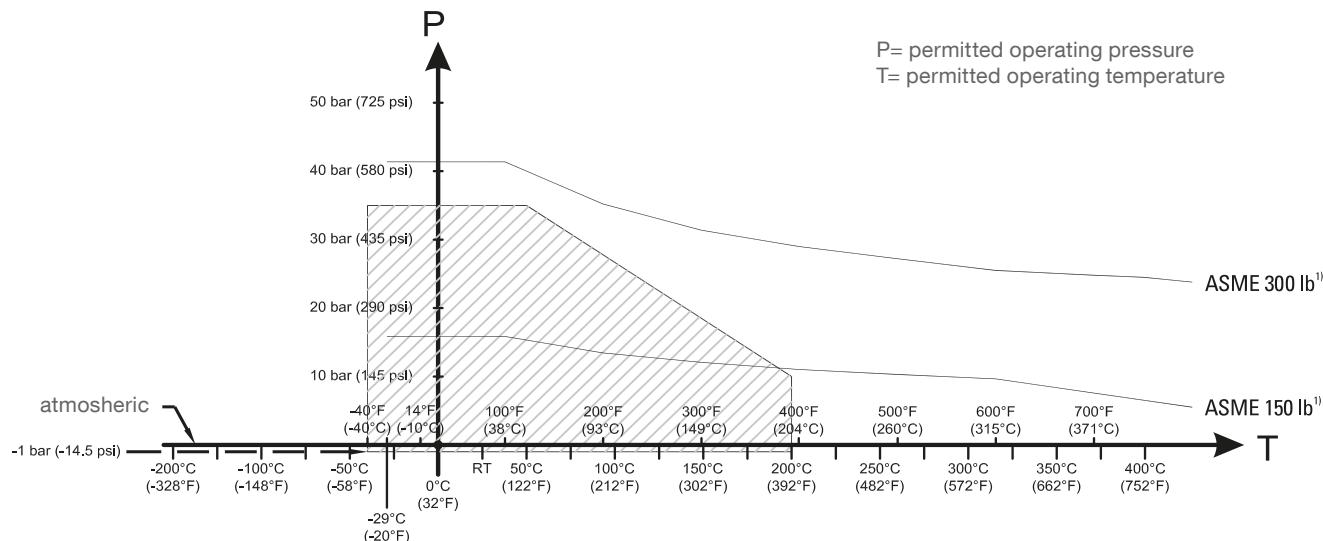


High temperature rod version, threaded

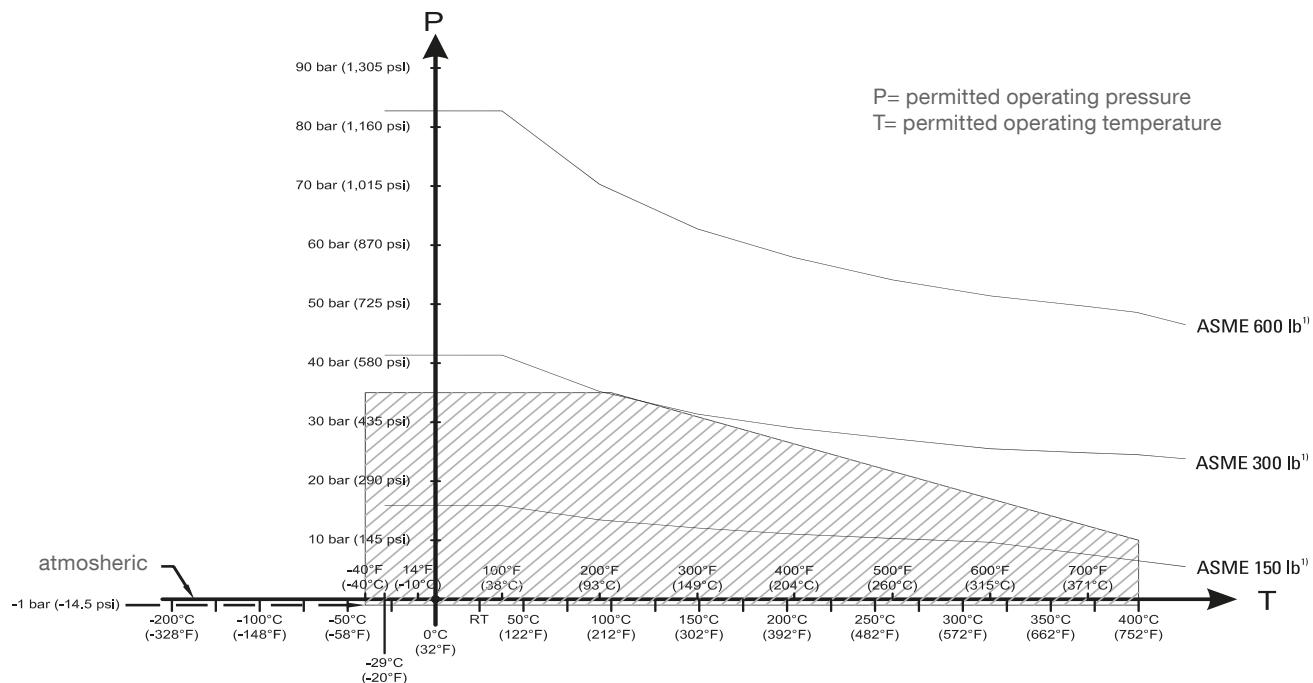


Technical data - Operating conditions

Extended rod and rope versions, ASME welded flange



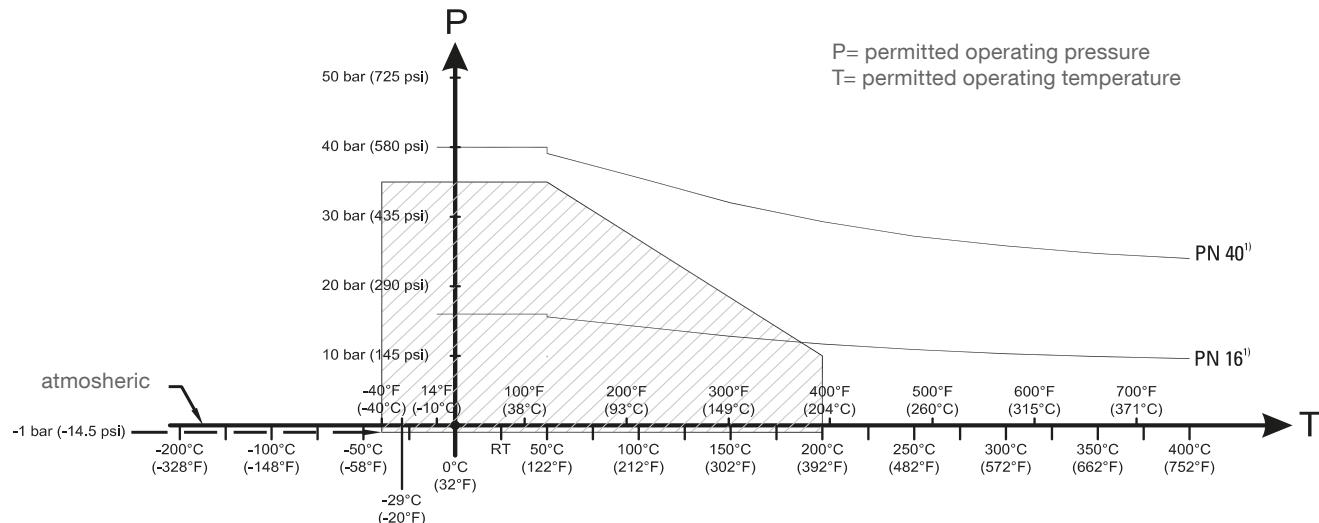
High temperature rod version, ASME welded flange



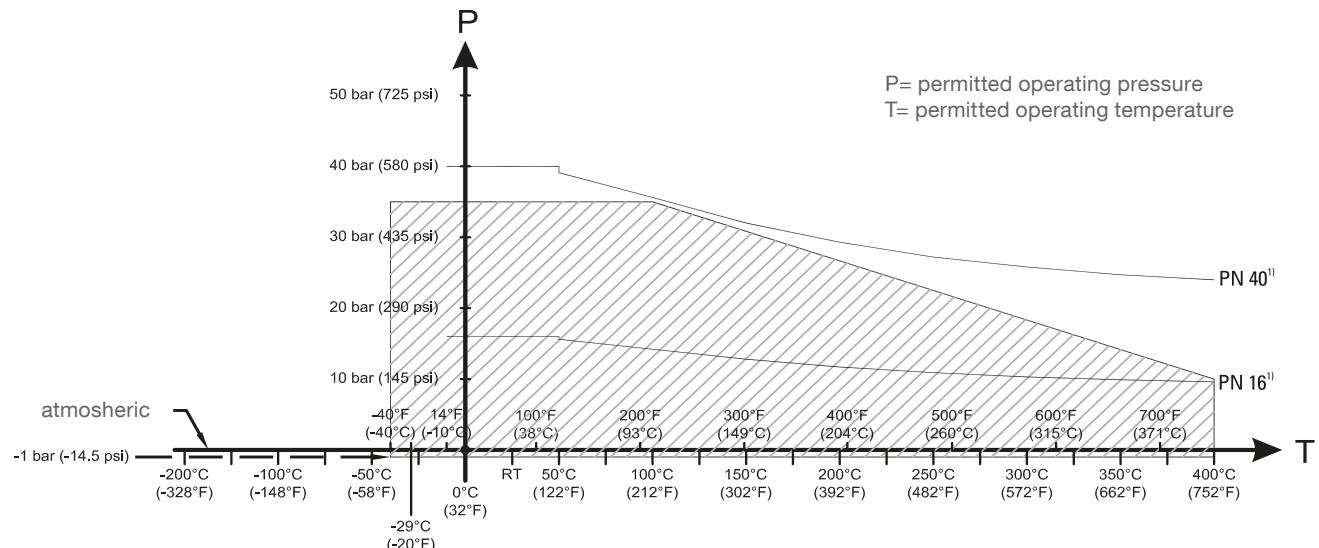
1) The curve denote the minimum allowable flange class for the shaded area below.

Technical data - Operating conditions

Extended rod and rope versions, EN welded flange



High temperature rod version, EN welded flange



1) The curve denote the minimum allowable flange class for the shaded area below.

Approvals

Electronic module: Standard (Relay SPDT / Solid State)

General Purpose	CE, CSA, FM, TR-CU
Dust Ignition Proof	ATEX II 1/2D, IIIC CSA/FM Class II, Div. 1, Gr. E, F, G Class III TR-CU INMETRO
Flame Proof / Explosion Proof	ATEX II 1/2G, IIC CSA/FM Class I, Div. 1, Gr. A, B, C, D TR-CU INMETRO
Marine	Lloyds Register of Shipping, Categories ENV1, ENV2 and ENV5
Overfill Protection	WHG

Electronic module: Digital (Profibus PA / Solid State)

General Purpose	CE, CSA, FM, TR-CU
Dust Ignition Proof	ATEX II 1/2D, IIIC CSA/FM Class II, Div. 1, Gr. E, F, G Class III TR-CU INMETRO
Flame Proof / Explosion Proof	ATEX II 1/2G, IIC CSA/FM Class I, Div. 1, Gr. A, B, C, D TR-CU INMETRO
Intrinsically Safe ¹	ATEX II 1G, IIC CSA/FM Class I, Div. 1, Gr. A, B, C, D
Marine	Lloyds Register of Shipping, Categories ENV1, ENV2 and ENV5

¹ Barrier or Intrinsically Safe power supply required for Intrinsically Safe protection

Note: EN61326 (CE EMC) testing was conducted on the RF 8000 rod version while mounted in a metallic vessel and wired using shielded cable. Units with flange process connections were tested while mounted in a metallic vessel with a metallic gasket and with shielded cables.

Mounting

! General Safety Instructions

- Installation shall only be performed by qualified personnel and in accordance with local governing regulations.
- This product is susceptible to electrostatic shock. Follow proper grounding procedures.
- The housing may only be opened for maintenance, local operation, or electrical installation.
- Before installing the instrument, verify that the environment complies with any restrictions specified on the product nameplate.
- To comply with CE EMC regulations, where applicable, the RF 8000 should be installed in accordance with the testing details on page 16.

! Additional Safety Instructions for Hazardous Locations

see page 31ff

Location

Recommended:

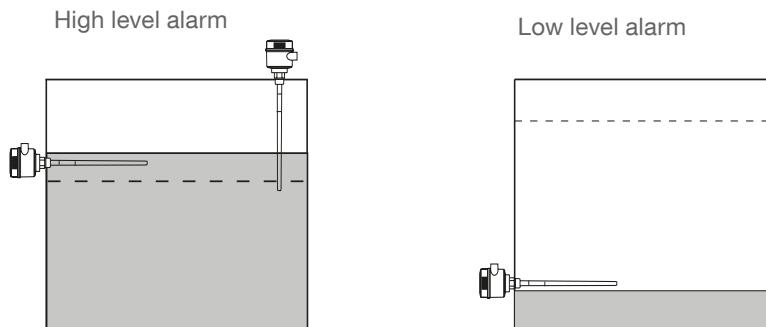
- Provide a sun shield to protect the transmitter from direct heat radiation.

Precautions:

- Avoid mounting RF 8000 in locations subject to strong vibrations in the vicinity, whenever possible.
- Do not exceed the permissible ambient temperature limits (see Environmental on page 12 for details).

Mounting

RF 8000 typical configuration:



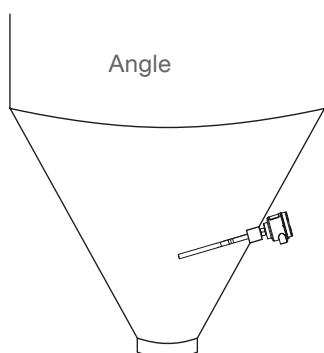
For high level alarm (level exceeds normal process level):

- normally mounted into the vessel top, or
- mounted through the tank wall at the detection level

For low level alarm (level drops below normal process level):

- mounted through the tank wall at the detection level

Angled mounting:



RF 8000 rope version:

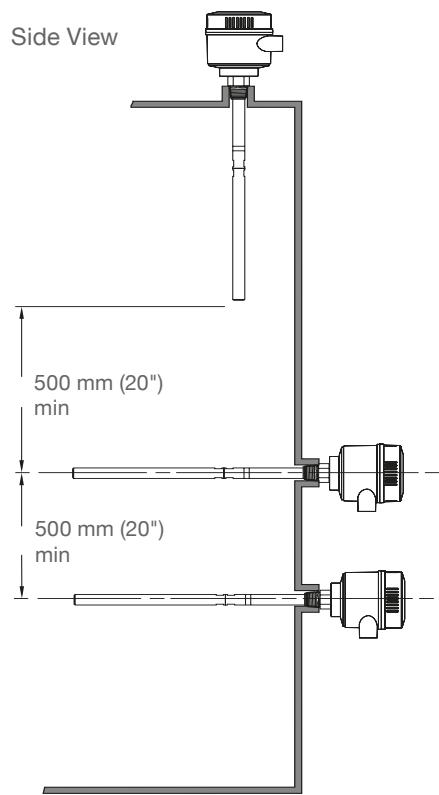
The rope version is designed for top mounting. The cable suspends vertically so that it reaches into the process at the desired detection level (high or low detection alarm).

Mounting

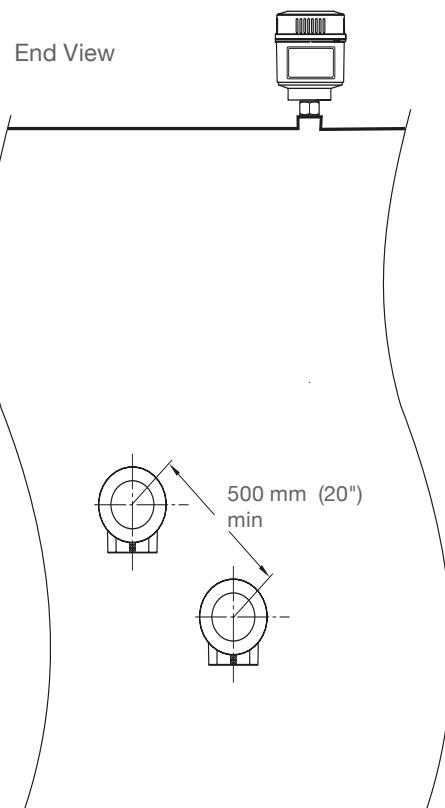
Mounting Restrictions

- ! • Keep the sensor at least 50 mm (2") away from any nozzle or tank wall.
• If multiple units are used, allow at least 500 mm (20") between them, to prevent interference.

Multiple Units:

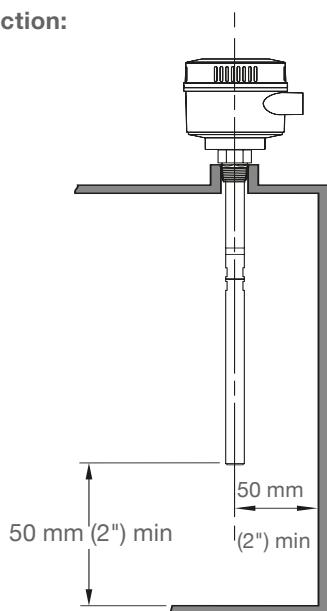


Sensors must be 500 mm (20") apart.



Mount diagonally if space is restricted.

Wall Restriction:

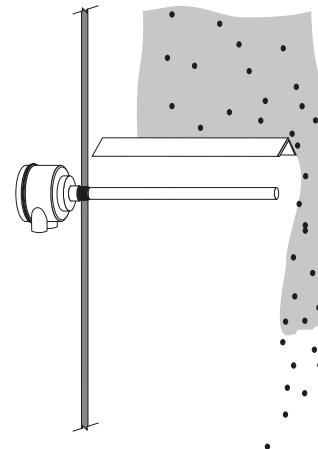
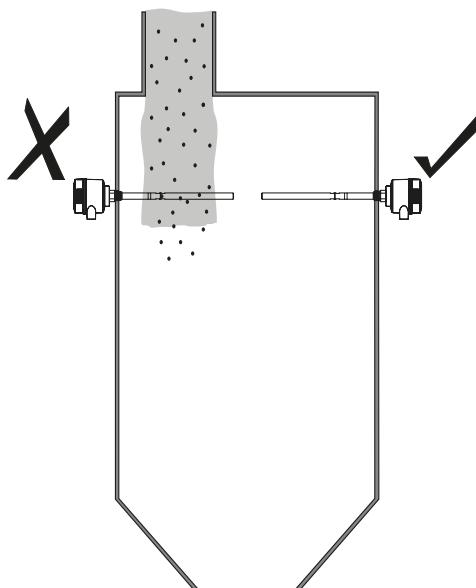


Mounting

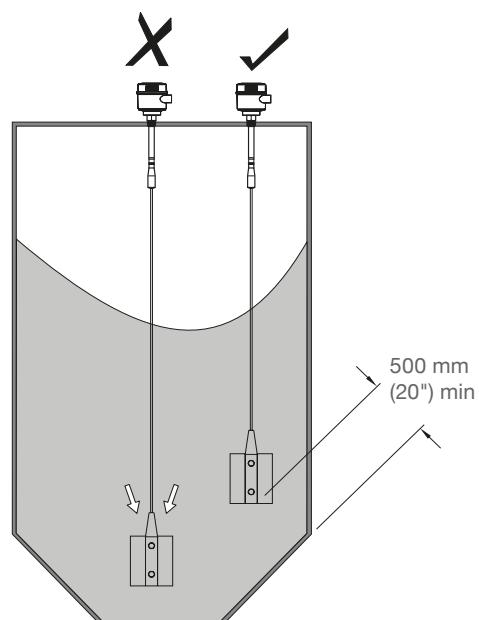
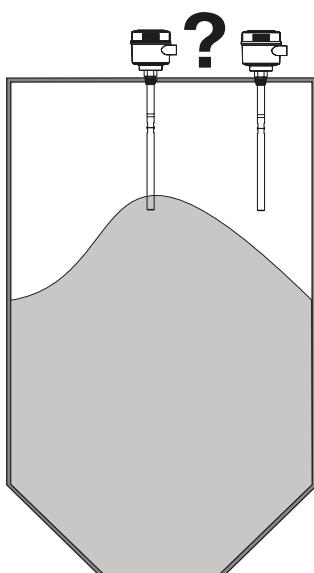
! Process Cautions for solids

In Hazardous Locations: Observe Specific condition of use for electrostatic charge (see page 33)

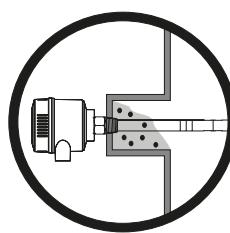
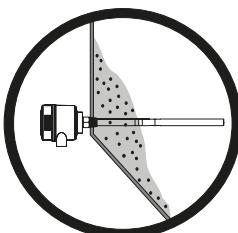
- The maximum allowable torque on a horizontally installed rod is 15 Nm.
- Keep unit out of path of falling material, or protect probe from falling material.



- Consider material surface configuration when installing unit.
- Tensile load must not exceed probe or vessel rating.



Note: Buildup of material in Active Shield area does not affect switch operation.



Electrical installation

! General Safety Instructions

Electronic module: Standard (Relay SPDT / Solid State)

WARNING:

- All field wiring must have insulation suitable for at least 250 V.
- Only qualified personnel are authorized to install and operate this equipment in accordance with established safety practices and standards.
- The Protective Earth Terminal indicated by  must be connected to reliable ground. In case of non-metallic vessels, the external earth wire should be connected to an earthed component which is earthed near the vessel.
- All wiring must be done by qualified personnel in accordance with all governing regulations.
- The equipment must be protected by a 15A fuse or circuit breaker in the building installation.
- A circuit breaker or switch in the building installation, marked as a disconnect switch, shall be in close proximity to the equipment and within easy reach of the operator.
- Use shielded cable, wire gauge 20 AWG to 14 AWG (0.5 mm² to 2.0 mm²). For CE installations use a cable with a braided metallic shield (or armoured cable where applicable).
- Maximum working voltage between adjacent relay contacts is 250 V.
- Relay contact terminals are for use with equipment which has no accessible live parts and wiring which has insulation suitable for at least 250 V.
- Cable entry devices and closing elements of unused apertures must meet a temperature range from min. -40°C to 10 K above max. ambient temperature.

Electronic module: Digital (Profibus PA / Solid State)

WARNING:

- Observe the specifications of the examination certificate valid in your country.
- Observe the laws and regulations valid in your country for electrical installations in potentially explosive atmospheres.
- Refer to Hazardous Area Installation on page 31 if applicable.
- Ensure that the available power supply complies with the power supply specified on the product nameplate and specified in the examination certificate valid in your country.
- Shipping plugs in the cable inlets must be replaced by suitable screwtype glands or dummy plugs, which are appropriately certified for transmitters with explosion-proof protection.
- For CE installations, use a cable with a braided metallic shield (or armoured cable where applicable).
- The lid must not be opened in wet locations while the unit is powered. (A wet location is a location where water or another conductive fluid may be present and is likely to increase the risk of electric shock.)
- Cable entry devices and closing elements of unused apertures must meet a temperature range from min. -40°C to 10 K above max. ambient temperature.

Notes:

- Lay PROFIBUS PA cable separately from power cable with voltages greater than 60 V.
- Avoid locating the unit near large electrical equipment wherever possible.
- Connect the cable shield to earth (for example, to the housing by means of a metallic screwed gland).

! Additional Safety Instructions for Hazardous Locations

see page 31ff

Electrical installation

Electronic module: Standard (Relay SPDT / Solid State)

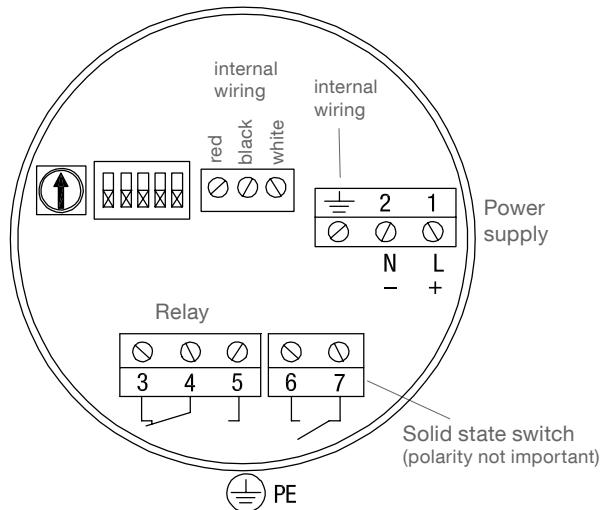
Power supply:

12 to 250 V AC/DC (0 to 60 Hz)
 2W max.

Signal output:

Relay:
 Floating relay SPDT
 AC max. 250V, 8A, 2000VA, non inductive
 DC max. 30V, 5A, 150W, non inductive

Solid state switch:
 30 V DC or 30 V AC (peak), 82 mA
 Observe protection (see below)



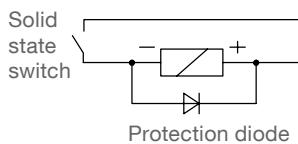
1. Loosen the lid clip and remove the lid to access the connectors and electronics.
2. Connect the wires to the terminals
3. Ground the instrument according to local regulations.
4. Tighten the gland to form a good seal.

Connect protective earth wire to terminal provided in housing and marked with

Use crimp type cable socket for 4 mm screw diameter, ring form or U-form (e. g. DIN 46234).

Protection of Solid State Switch

Observe a Protection diode in case of connecting an external relay to the Solid state switch



Note: Switch and potentiometer settings are for illustration purposes only.

Electrical installation

Electronic module: Digital (Profibus PA / Solid State)

Power supply:

12 .. 30 V DC, 12.5 mA

Intrinsically Safe:

12 .. 24 V DC, 12.5 mA

Intrinsically safe barrier required

For ATEX: $U_i=24$ V, $I_i=380$ mA, $P_i=5.32$ W, $C_i=5$ nF, $L_i=10$ uH

For FM/ CSA: See "Connection drawing on page 23"

Signal output:

Solid state switch:

30 V DC or 30 V AC (peak), 82 mA

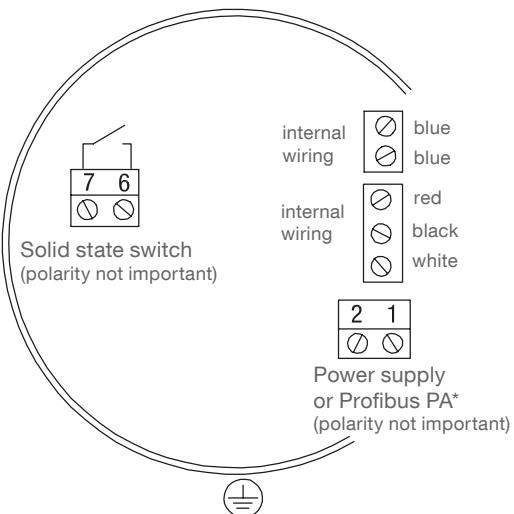
Observe protection (see below)

Intrinsically safe:

Intrinsically safe barrier required

For ATEX: $U_i=30$ V, $I_i=200$ mA, $P_i=350$ mW, $C_i=0$, $L_i=0$

For FM/ CSA: See "Connection drawing on page 23"



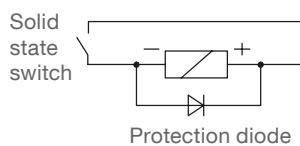
* With use of Profibus PA the wiring must be according to Profibus PA standards.
 If Profibus PA is not used, a shielded cable is recommended to ensure stable measurement.

Connect protective earth wire to terminal provided in housing and marked with

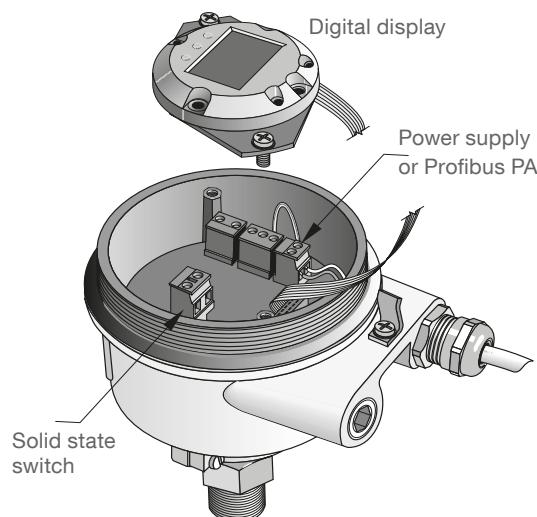
Use crimp type cable socket for 4 mm screw diameter, ring form or U-form (e. g. DIN 46234).

Protection of Solid State Switch:

Observe a Protection diode in case of connecting an external relay to the Solid state switch



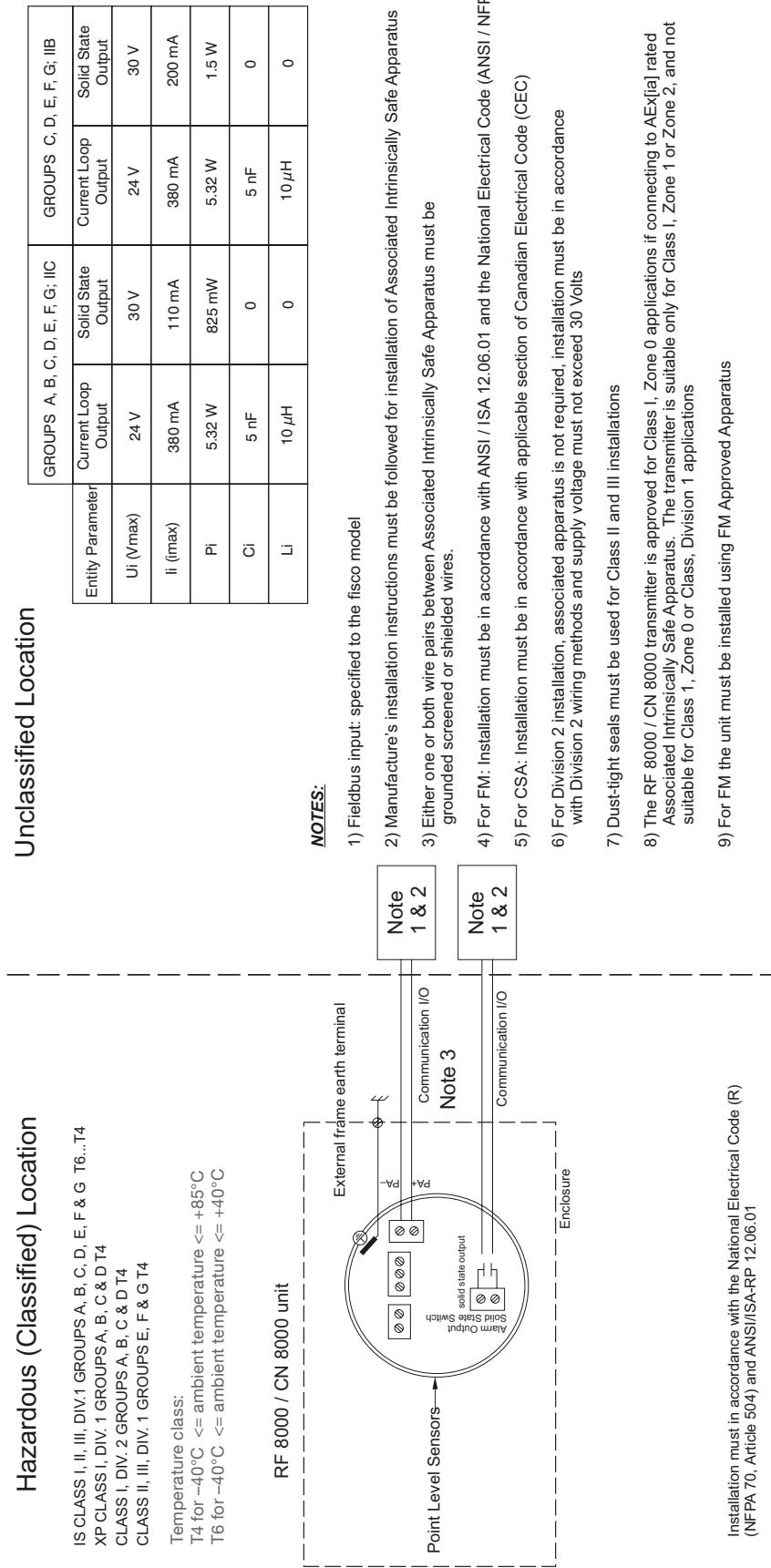
Connecting the electronic module:



1. Loosen the lid clip and unscrew the lid of the enclosure.
2. Unscrew and lift up the digital display (loosen each screw two turns before completely loosening both, to keep the rubber retaining rings in place.)
3. Connect the wires to the terminals
4. Ground the instrument according to local regulations.
5. Tighten the cable gland to form a good seal.
6. Fix the digital display.
7. To adjust the transmitter locally, using the keypad, go to Programming via the Local User Interface (LUI). After adjustment, replace the enclosure lid and tighten the lid clip.

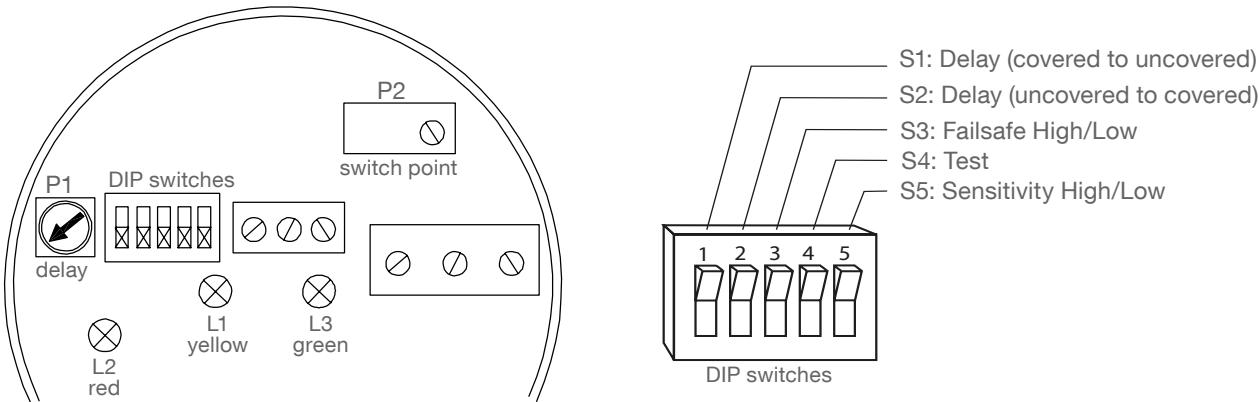
Electrical installation

FM/CSA approval Connection drawing



Operation - Electronic module: Standard

Settings



LEDs

- L1: Sensor status (yellow)
 ON if sensor is detected as covered (capacitance on sensor is greater than setted switch point)
- L2: Signal output (red)
 ON if Relay is activated / Solid state switch is closed.
- L3: Power supply (green)
 ON if power is present

S1 / S2: Signal output delay

Use the delay function to slow the signal output response, and compensate for turbulence or false readings.

S1		Signal output delay: Sensor covered to uncovered 	P1 Delay time / seconds
S2		Signal output delay: Sensor uncovered to covered 	P1 Delay time / seconds

*Factory setting

*Factory setting

S3: Failsafe High / Low

Failsafe Mode	S3		
Failsafe High			
Failsafe Low*			

*Factory setting

Operation - Electronic module: Standard

S4: Test

Allows to test the setted signal output delay time without the need to change the sensor from covered to uncovered or from uncovered to covered.

S4		Normal operation*	
S4		<p>Test mode</p> <p>If sensor is uncovered: Setting S4 to Test mode simulates a covered probe. After the setted delay time "Sensor uncovered to covered" (see DIP switch S2) has passed, the signal output and LED2 (red) are switching.</p> <p>If sensor is covered: Setting S4 to Test mode simulates a uncovered probe. After the setted delay time "Sensor covered to uncovered" (see DIP switch S1) has passed, the signal output and LED2 (red) are switching.</p>	

*Factory setting

S5: Sensitivity setting

S5		Low sensitivity	This setting is prefered for measuring conductive liquids, or viscous conductive solids that can build up on the sensor.
S5		High sensitivity*	Use this setting for measuring dry solids or nonconductive liquids.

*Factory setting

Operation - Electronic module: Standard

Switchpoint Adjustment

Select the switchpoint adjustment according to the application as follows:

Application	Material	Adjustment conditions
General	<ul style="list-style-type: none"> Dry solids Low viscosity liquids 	Sensor uncovered
Demanding	<ul style="list-style-type: none"> Hygroscopic / wet solids High viscosity and high conductivity liquids 	Sensor immersed and then uncovered, retaining max. possible material buildup
Interface detection	<ul style="list-style-type: none"> Ignoring liquid A / detecting liquid B Ignoring foam / detecting liquid 	Immerse sensor in liquid A or foam

General applications

1. Ensure material level is well below the probe	The unit will calibrate to an uncovered probe.									
2. Set to high sensitivity	Set dip switch S5 to high sensitivity									
3. Adjust switchpoint with poti P2	<p>If LED L1 (yellow) is OFF, turn poti P2 counter clockwise until L1 is ON.</p> <p>Turn P2 clockwise until L1 just stops glowing.</p> <p>Turn P2 further clockwise:</p> <table border="1"> <tr> <th>Dielectric constant of material</th> <th>Number of turns</th> </tr> <tr> <td>< 2</td> <td>1/8</td> </tr> <tr> <td>2 ... 4</td> <td>1/4</td> </tr> <tr> <td>> 4</td> <td>1/2</td> </tr> </table> <p>Depending on the application and the required switchpoint the number of turns can be varied.</p>	Dielectric constant of material	Number of turns	< 2	1/8	2 ... 4	1/4	> 4	1/2	
Dielectric constant of material	Number of turns									
< 2	1/8									
2 ... 4	1/4									
> 4	1/2									
Switchpoint adjustment is finished										

Operation - Electronic module: Standard

Demanding applications

1. Ensure material level is well above the probe.	In case of top mounting with rope extension the vessel should be filled up.									
2. Turn poti P2 to most sensitve position	Turn P2 fully counter clockwise									
3. Set sensitivity low or high	<p>Set dip switch S5 to low sensitivity. L1 should glow.</p> <p>If L1 (yellow) does not glow, set S5 to high sensitivity. L1 should glow.</p> <p>Note: The appropriate position of S5 depends on the dielectric properties of the material.</p>	 								
4. Ensure material level is well below the probe	It is important that as much material buildup as possible is retaining on the sensor.									
5. Adjust switchpoint with poti P2	<p>Turn P2 clockwise until L1 just stops glowing.</p> <p>Turn P2 further clockwise:</p> <table border="1"> <thead> <tr> <th>Dielectric constant of material</th> <th>Number of turns</th> </tr> </thead> <tbody> <tr> <td>< 2</td> <td>1/8</td> </tr> <tr> <td>2 ... 4</td> <td>1/4</td> </tr> <tr> <td>> 4</td> <td>1/2</td> </tr> </tbody> </table> <p>Depending on the application and the required switchpoint the number of turns can be varied.</p>	Dielectric constant of material	Number of turns	< 2	1/8	2 ... 4	1/4	> 4	1/2	
Dielectric constant of material	Number of turns									
< 2	1/8									
2 ... 4	1/4									
> 4	1/2									
Switchpoint adjustment is finished										

Operation - Electronic module: Standard

Interface detection

1. Immerse probe in liquid A or in foam which should NOT be detected	<p>Ensure that liquid A or foam (which should NOT be detected) is covering the probe.</p> <p>Liquid A or foam must have a lower dielectric constant than liquid B, which should be detected.</p>	<p>see note below for top mounted sensors *</p>								
2. Turn poti P2 to most sensitive position	Turn P2 fully counter clockwise									
3. Set sensitivity low or high	<p>Set dip switch S5 to low sensitivity. L1 should glow.</p> <p>If L1 (yellow) does not glow, set S5 to high sensitivity. L1 should glow.</p> <p>Note: The appropriate position of S5 depends on the dielectric properties of the material.</p>									
4. Adjust switchpoint with poti P2	<p>Turn P2 clockwise until L1 just stops glowing.</p> <p>Turn P2 further clockwise:</p> <table border="1"> <thead> <tr> <th>Dielectric constant of material</th> <th>Number of turns</th> </tr> </thead> <tbody> <tr> <td>< 2</td> <td>1/8</td> </tr> <tr> <td>2 ... 4</td> <td>1/4</td> </tr> <tr> <td>> 4</td> <td>1/2</td> </tr> </tbody> </table> <p>Depending on the application and the required switchpoint the number of turns can be varied.</p> <p>Note: The sensitivity is now setted thus that liquid A or foam is NOT detected.</p>	Dielectric constant of material	Number of turns	< 2	1/8	2 ... 4	1/4	> 4	1/2	
Dielectric constant of material	Number of turns									
< 2	1/8									
2 ... 4	1/4									
> 4	1/2									
5. Immerse probe in liquid B which should be detected	<p>Ensure that liquid B (which should be detected) is covering the probe.</p> <p>L1 should glow.</p>	<p>L1 yellow</p>								
Switchpoint adjustment is finished										

* Interface detection with top mounted sensors is possible with detection of oil over water, since oil has a much lower dielectric constant compared to water. For other applications please contact manufacturer.

Operation - Electronic module: Standard

Troubleshooting

Symptom	Observation	Action
No Alarm Response	L3 (green) off.	Check power supply voltage.
Alarm doesn't switch when sensor is uncovered.	L1 (yellow) doesn't respond when sensor is uncovered. L1 (yellow) responds when sensor is uncovered.	Check sensitivity switch S5. Readjust trip point potentiometer P2. Check that relay changes state when S3 is toggled ON and OFF.
Alarm doesn't switch on when sensor is covered.	L1 (yellow) doesn't respond when sensor is covered. L1 (yellow) responds when sensor is covered. L1 (yellow) flashes when material level approaches the alarm setpoint.	Check sensitivity switch S5. Readjust trip point potentiometer P2. Check that relay changes state when S3 is toggled ON and OFF.

Operation - Electronic module: Digital

See separate "Operating Manual (Digital Electronic)"

Notes for use in Hazardous Locations

Use of this Manual

For use and assembly, refer to the instructions in this Manual. It does contain all instruction as required by ATEX Directive 2014_34_EU, Annex II, 1/0/6 and Ordinance INMETRO n° 179/2010

General notes

Refer to appropriate certificate for application in specific hazardous environment.

The equipment has not been assessed as a safety related device (as referred to by Directive 2014_34_EU Annex II, clause 1.5).

The certificate numbers have an 'X' suffix, which indicates that specific condition of use apply. Those installing or inspecting this equipment must have access to the certificates.

Qualification of personnel / Servicing / Repair

Installation and inspection of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (ABNT NBR IEC/EN 60079-14 and ABNT/NBR IEC/EN 60079-17 in Europe).

Repair of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (e.g. ABNT NBR IEC/EN 60079-19 within Europe).

Repair of flameproof path is not intended.

Components to be incorporated into or used as replacements in the equipment shall be fitted by suitably trained personnel in accordance with the manufacturer's documentation.

In potentially explosive atmospheres open the enclosure only when RF 8000 is not energized.

Turn off power before servicing any device (the transmitter is in operation when the power supply is switched on). In case of removing the unit from vessel, take care of process pressure and material passing the opening.

ATEX: Certificates / List of Standards

Certificate numbers: DEKRA 18ATEX0045 X and DEKRA 18ATEX0046 X

See www.uwt.de for the latest certificates

See EU - Declaration of conformity for the list of standards valid for ATEX certificates

ATEX: Year of manufacturing

Marking on the name plate is done according to IEC 60062 as follows:

Year of manufacturing	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Marking code	K	L	M	N	P	R	S	T	U	V	W	X

Notes for use in Hazardous Locations

ATEX: Ex-Marking

- Devices with ATEX approval are marked on the name plate as follows.
- If both Flameproof and Dust ignition proof are present on the same nameplate, a tick box is present where the end user needs to select (mark) the protection method used at the time of installation.

Dust Ignition Proof with intrinsically safe output to probe (Typecode Pos.2 W)

Electronic module: Standard and Digital

RF 8100: II 1/2 D Ex ia/tb [ia Da] IIIC TX Da/Db

RF 8200 High temp version: II 1/2 D Ex ia/tb [ia Da] IIIC TX Da/Db

Flameproof / Dust Ignition Proof with intrinsically safe output to probe (Typecode Pos.2 T)

Electronic module: Standard and Digital

RF 8100: II 1/2 G Ex ia/db [ia Ga] IIC TX Ga/Gb

II 1/2 D Ex ia/tb [ia Da] IIIC TX Da/Db

RF 8200 High temp version: II 1/2 G Ex ia/db [ia Ga] IIC TX Ga/Gb

II 1/2 D Ex ia/tb [ia Da] IIIC TX Da/Db

Intrinsically Safe (Typecode Pos.2 Y)

Electronic module: Digital

RF 8100: II 1 G Ex ia IIC TX Ga

II 1/2 D Ex ia IIIC TX Da/Db

RF 8200 High temp version: II 1 G Ex ia IIC TX Ga

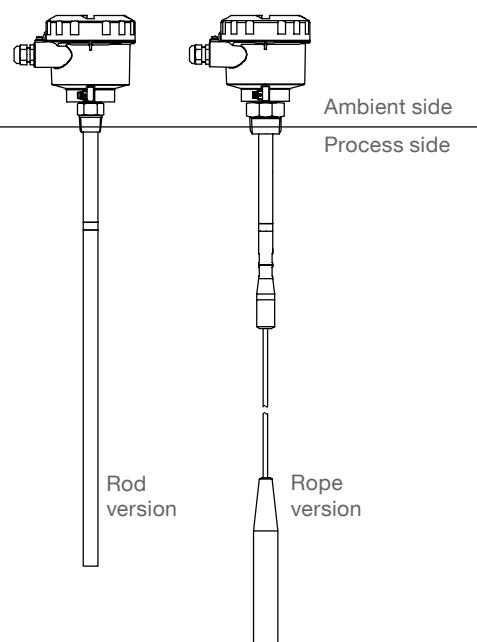
II 1/2 D Ex ia IIIC TX Da/Db

! ATEX: Permitted zones for installation

Devices can be installed as follows:

Dust applications		Gas applications	
	marking Da/Db	marking Ga/Gb	marking Ga
EPL Category Zone	Db	Gb	Ga
	2D	2G	1G
	21	1	0

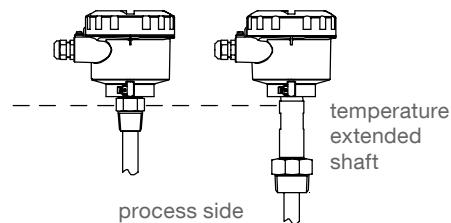
EPL Category Zone	Da	Ga	Ga
	1D	1G	1G
	20	0	0



Notes for use in Hazardous Locations

! Specific condition of use

Electrostatic charge	The user shall ensure that the equipment is not installed in a location where it may be subjected to external conditions which might cause a build-up of electrostatic charge on non-conducting surfaces.
Impact / Friction	Because the enclosure and optionally the process connection of the equipment is made of aluminium alloy, the apparatus must be installed so, that even in the event of rare incidents, an ignition source due to impact or friction between enclosure and iron / steel is excluded, when used in potentially explosive atmosphere requiring apparatus of equipment 1G.
Flameproof joints	The flameproof joints are not intended to be repaired.
Ambient and process temperature range	The relation between the ambient and process temperature ranges and the surface temperature or temperature class is shown in the thermal data tables page 35.
Max. permitted temperature close to the enclosure	If the process temperature exceeds the max. permissible ambient temperature, the max. resulting temperature at the connection of the sensor head (see dotted line) shall not exceed the related max. permissible ambient temperature (see page 35), taking the worst case conditions into account. This shall be verified by measurement when installed.



Notes for use in Hazardous Locations

! Warnings for installation

Intrinsically safe supply For intrinsically safe models, power must be supplied from an Intrinsically Safe power source, otherwise protection is no longer guaranteed.

Process pressure The device construction allows process over-pressure up to 10 or 35 bar (146 or 511 psi). This pressure is allowed for test purposes. The definition of the Ex approvals are only valid for a container-over-pressure between -0.2 .. +0.1 bar (-2.9 .. +1.45 psi). For higher or lower pressures the approvals are not valid.

Process and ambient temperature Please check the ambient and process temperatures page 35 for the specific configuration you are about to use or install.

Chemical resistance against the medium If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised. Aggressive substances: e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials. Suitable precautions: e.g. establishing from the material's data sheet that it is resistant to specific chemicals.

Cable entry devices / blanking elements general Dust Ignition Proof:
 For use in potentially explosive dust atmospheres:
 The cable entry devices and the blanking elements of unused apertures shall be of a certified type, suitable for the conditions of use and correctly installed.
 The minimum ingress protection requirement of IP6X according to EN 60529 must be satisfied.

Flameproof:
 For use in potentially explosive gas atmospheres:
 The cable entry devices and the blanking elements of unused apertures shall be of a certified flameproof type, suitable for the conditions of use and correctly installed.

Intrinsically Safe:
 The cable entry devices and the blanking elements of unused apertures shall be of a certified type, suitable for the conditions of use and correctly installed.
 The minimum ingress protection requirement of IP64 according to EN 60529 must be satisfied.

Versions with cable gland mounted by default:
 The used cable gland is only suitable for fixed installations.
 The installer is responsible for providing appropriate strain-relief to prevent pulling or twisting.

Versions with blanking element mounted by default:
 Blanking elements are not to be used with any form of adaptors or reducers.

Versions with cable gland / blanking element mounted by default Below-mentioned cable diameters and tightening torques of the nut resp. blanking element shall be observed for the installation.

Cable gland M20x1.5 (Dust Ignition Proof, Intrinsically Safe)

Cable diameter: 6 mm to 12 mm

Tightening torque: Depending on the used cable and therefore to be determined by the user

Cable gland M20x1.5 (Flameproof)

Cable diameter: Bedding 3.1 mm to 8.6 mm / Overall 6.1 mm to 13.1 mm

Tightening torque: Number of turns depending on the overall cable diameter of the used cable (e. g. 1 turn / cable diameter 12.5 mm to 5.5 turns / cable diameter 6.5 mm)

Blanking element M20x1.5 (all versions)

Tightening torque: 32.5 Nm

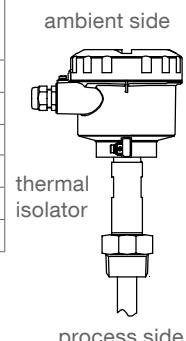
Notes for use in Hazardous Locations

- ! Ambient and Process temperature range,
- max. Surface Temperature and Temperature Class

ATEX:

Flameproof and Dust Ignition Proof with intrinsically safe output to probe (Typecode Pos.2 W,T)
 Electronic module: Standard and Digital

Ambient temperature range	Process temperature range	Max. Surface temperature (EPL Da)	Max. Surface temperature (EPL Db)	Temperature class (EPL Ga or Gb)
-40 to +70°C (-40 to +158°F)	-40 to +75°C (-40 to +167°F) (1)	T ₂₀₀ 80°C	T80°C	T6
-40 to +80°C (-40 to +176°F)	-40 to +90°C (-40 to +194°F) (1) (2)	T ₂₀₀ 95°C	T90°C	T5
-40 to +80°C (-40 to +176°F)	-40 to +125°C (-40 to +257°F) (1) (2)	T ₂₀₀ 130°C	T90°C	T4
-40 to +80°C (-40 to +176°F)	-40 to +190°C (-40 to +374°F) (1) (2)	T ₂₀₀ 195°C	T90°C	T3
-40 to +80°C (-40 to +176°F)	-40 to +285°C (-40 to +545°F) (3)	T ₂₀₀ 290°C	T90°C	T2
-40 to +80°C (-40 to +176°F)	-40 to +400°C (-40 to +752°F) (3)	T ₂₀₀ 405°C	T90°C	T1



Intrinsically safe (Typecode Pos.2 Y)

Electronic module: Digital

Ambient temperature range	Process temperature range	Max. Surface temperature (EPL Da)	Max. Surface temperature (EPL Db)	Temperature class (EPL Ga)
-40 to +60°C (-40 to +140°F)	-40 to +75°C (-40 to +167°F) (1)	T ₂₀₀ 80°C	T70°C	T6
-40 to +60°C (-40 to +140°F)	-40 to +90°C (-40 to +194°F) (1) (2)	T ₂₀₀ 95°C	T70°C	T5
-40 to +60°C (-40 to +140°F)	-40 to +125°C (-40 to +257°F) (1) (2)	T ₂₀₀ 130°C	T70°C	T4
-40 to +60°C (-40 to +140°F)	-40 to +190°C (-40 to +374°F) (1) (2)	T ₂₀₀ 195°C	T70°C	T3
-40 to +60°C (-40 to +140°F)	-40 to +290°C (-40 to +554°F) (3)	T ₂₀₀ 295°C	T70°C	T2
-40 to +60°C (-40 to +140°F)	-40 to +400°C (-40 to +752°F) (3)	T ₂₀₀ 405°C	T70°C	T1

(1) With option FFKM O-ring seal: Lower process temperature limited to -20 °C (-4°F)

(2) For process temperature > 85 °C: Only applicable for versions with thermal isolator or for High temperature version

(3) Only applicable for High temperature version

INMETRO:

Flameproof with intrinsically safe output to probe

Application in Zone 0 (cat 1G)

Ambient temperature range	Process temperature range
-20 to +60°C (-4 to +140°F)	-20 to +60°C (-4 to +140°F)

Application in Zone 1 (cat 2G):

Ambient temperature range	Process temperature range	Temperature class
-40 to +70°C (-40 to +158°F)	-40 to +80°C (-40 to +176°F)	T6
-40 to +85°C (-40 to +185°F)	-40 to +100°C (-40 to +212°F) (1)	T5
-40 to +85°C (-40 to +185°F)	-40 to +135°C (-40 to +275°F) (1)	T4
-40 to +85°C (-40 to +185°F)	-40 to +200°C (-40 to +392°F) (1) (3)	T3
-40 to +85°C (-40 to +185°F)	-40 to +300°C (-40 to +572°F) (2) (3)	T2
-40 to +85°C (-40 to +185°F)	-40 to +400°C (-40 to +752°F) (2) (3)	T1

(1) For process temperature > 85 °C: Only applicable for versions with thermal isolator or for High temperature version

(2) Only applicable for High temperature version

(3) Not applicable with Electronic module Digital (Profibus)

Dust ignition proof

The maximum surface temperature of T 100 °C is based on a maximum ambient temperature of +85 °C.

Notes for use in Hazardous Locations

FM / CSA:

Explosion proof / Dust ignition proof

Ambient temperature range	Temperature class
-40 to +85°C (-40 to +185°F)	T4

Intrinsically safe

Installation shall be done according to "FM/CSA Approval - Connection drawing" on page 23

Ambient temperature range	Temperature class
-40 to +40°C (-40 to +40°F)	T6
-40 to +85°C (-40 to +185°F)	T4

Process temperature is not considered for definition of Temperature class.

Probe modifications

Shortening the rope (rope version)

CAUTION:

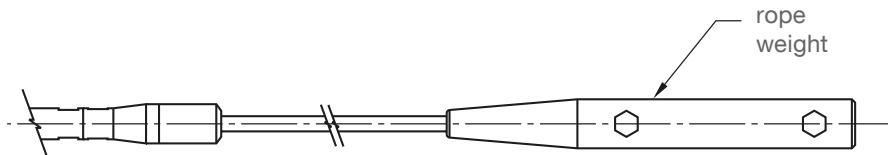
When shortening a PFA rope, be sure to take extra care not to damage the PFA coating.

Methods

An angle grinder (preferably with a disc suitable for stainless steel) or
Wire cutters (suitable for piano rope Ø 6 to 9 mm).

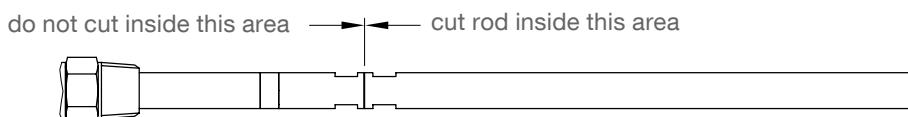
Procedure

1. Loosen the three set screws and pull weight from the rope.
2. Grind/cut the rope to the required length, and then remove rough edges from the rope.
3. Ensure that rope strands are properly seated in the lay of the rope (i.e. no wire strands sticking outside the normal rope profile). Make sure ALL strands are properly seated before continuing the assembly.
4. Push the weight onto the rope while simultaneously rotating it counter-clockwise around the rope. Make sure that no rope strands are pushed out of their position in the rope and that the rope is fully inserted.
5. Re-fasten the weight by tightening the three set screws.



Shortening the rod (rod version)

Cut the rod with an angle grinder (preferably with a disc suitable for stainless steel)



Change rod to rope or rope to rod

Unscrew the probe at the dotted line and replace by a different probe.

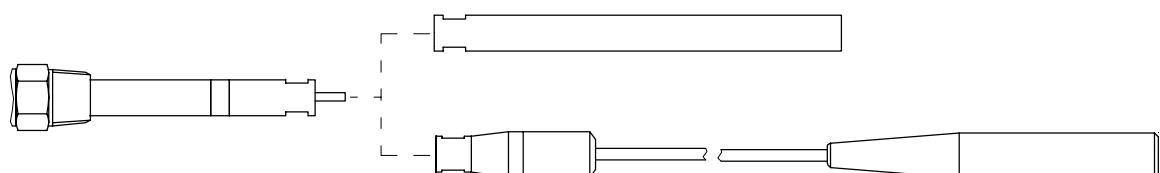


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Disposal	21

Subject to technical change.
All dimensions in mm (inch).

We assume no liability for typing errors.
Different variations than specified are possible.
Please contact our technical consultants.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning may be accomplished only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.

Special attention must be paid to warnings and notes as follows:

WARNING



Relates to a caution symbol on the product: A failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.

WARNING



Relates to a caution symbol on the product: Risk of electric shock

WARNING



A failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product	Description
	CAUTION: refer to accompanying documents (manual) for details.
	Earth (ground) Terminal
	Protective Conductor Terminal

Technical support

Please contact your local supplier (for address see www.uwt.de). Otherwise you can contact:

UWT GmbH
Westendstr. 5
D-87488 Betzigau
Germany

Tel.: 0049 (0)831 57123-0
Fax: 0049 (0)831 76879
info@uwt.de
www.uwt.de

Introduction

Applications

Capacitive level limit switch for level monitoring in all types of containers and silos.

It can be used with powdery and granulated bulk materials with a dielectric constant of min. 1.6

A selection of fields of application:

- **Building materials industry**
lime, moulding sand, cement, etc.
- **Food industry**
milk powder, flour, salt, etc.
- **Plastics industry**
plastics granules etc.
- **Animal feed industry**
- **Chemical industry**
- **Mechanical engineering**

Function

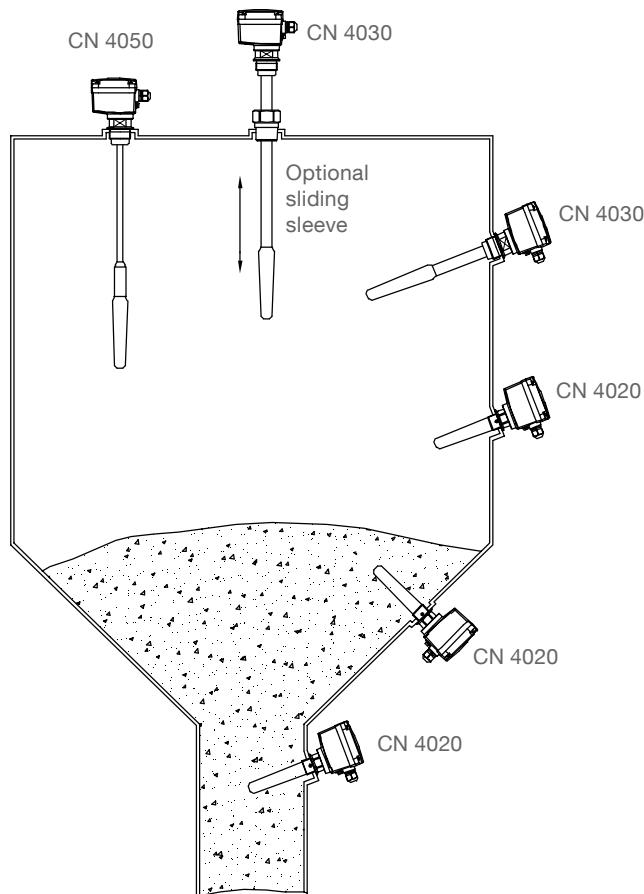
The Capanivo detects the capacitance around its probe. Due to the active shield technology it has an increased insensitivity to material buildup on the probe.

The measurement is nearly independent from the influence of the silo wall. Therefore factory provided precalibration allows measurement of most applications without calibration on site.

The unit is normally screwed into the lateral container wall so that it is level with the filling height to be registered and monitored.

The length of the probe can be up to 3 m (118") with an extension tube (CN 4030) or up to 6 m (236") with an extension rope (CN 4050).

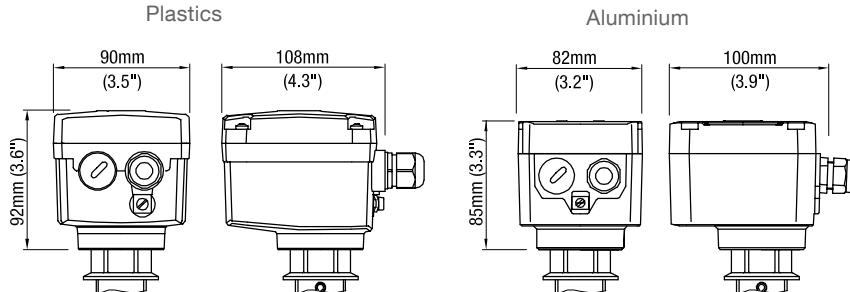
The use of a sliding sleeve is recommended so that the switch point can be changed easily during operation of the device.



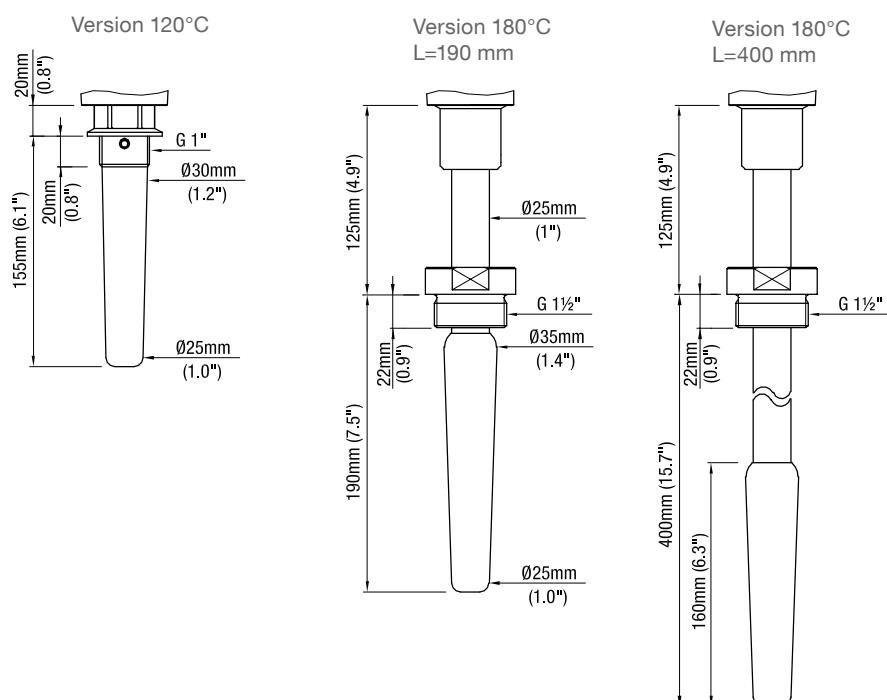
Technical data

Dimensions

Housing versions

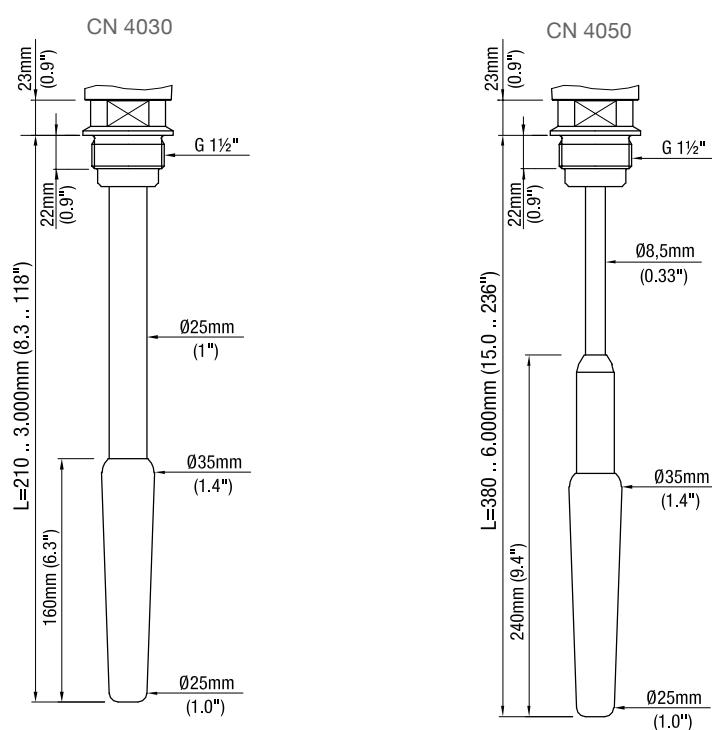


CN 4020



CN 4030

CN 4050



Technical data

Electrical data

Connection terminals	0.14 - 2.5 mm ² (AWG 26-14)		
Cable entry	M20 x 1.5 screwed cable gland NPT 1/2" or NPT 3/4" conduit connection		
Clamping range (diameter) of the factory provided cable glands: M20 x 1.5: 6 .. 12 mm (0.24 .. 0.47")			
Signal delay	Sensor free -> covered Sensor covered -> free	adjustable adjustable	ca. 0.5 to 20 sec ca. 0.5 to 20 sec
Safety operation (FSL,FSH)	Switchable for minimum or maximum safety		
Sensitivity	Adjustable in 4 ranges		
Ovvoltage category	II		
Pollution degree	2 (inside housing)		

Electronics	Relay SPDT	Relay DPDT Universal voltage	PNP 3-wire
Power supply	21 .. 27 V DC ±10% (incl. 10% of EN 61010)	21 .. 230 V AC 50 - 60 Hz 21 .. 45 V DC ±10% (incl. 10% of EN 61010)	20 .. 40 V DC ±10% (incl. 10% of EN 61010)
Max. ripple of power supply	7 V _{ss}	7 V _{ss} at DC	7 V _{ss}
Installed load	max. 1.5 W	max. 18 VA/ 2 W	max. 0.5 A
Signal output	Floating relay SPDT AC max. 250 V, 3 A non inductive DC max. 30 V, 5 A non inductive	Floating relay DPDT AC max. 250 V, 8 A non inductive DC max. 30 V, 5 A non inductive	Open Collector: permanent load max. 0.4 A short-circuit and overload protected turn-on voltage: max. 44 V (reverse protection)
Indicating light	Status of signal output by built-in LED	Status of signal output by built-in LED	Status of signal output by built-in LED
Isolation	Power supply to signal output: 2,225 Vrms	Power supply to signal output: 2,225 Vrms Signal output to signal output (DPDT): 2,225 Vrms	-
Protection class	I	I	III

Technical data

Mechanical data

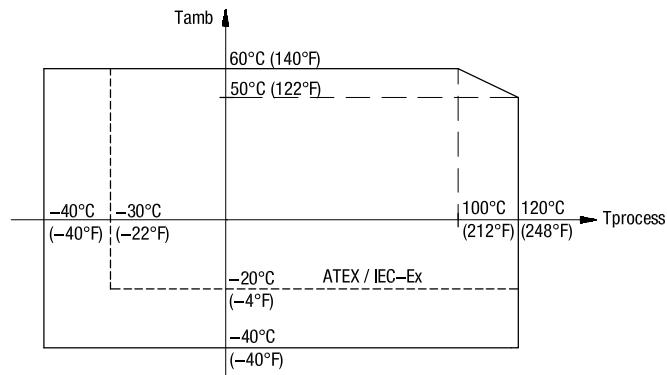
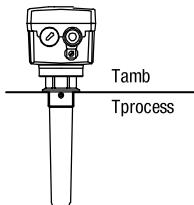
Housing	Plastics PA6 GF, RAL 5010 gentian blue or aluminium, powder coated, RAL 5010 gentian blue
	Seal between housing and lid: NBR Seal between housing and process connection: NBR Nameplate: polyester film
Degree of protection	IP66 (EN 60529)
Process connection and extension	CN 4020 version 120°C: Material process connection/ probe: Plastics PPS (glass fibre reinforced) ⁽¹⁾ , FDA listed ⁽²⁾ Thread: G 1" Adapter (optional): G 1" to G 1½" in aluminium or 1.4305 (SS305) ⁽²⁾ CN 4020 version 180°C: Material process connection/ extension: 1.4305 (SS303) ⁽²⁾ Material probe: Plastics PPS (glass fibre reinforced) ⁽¹⁾ , FDA listed ⁽²⁾ Thread: G 1½"
	CN 4030: Material process connection/ extension: Aluminium or 1.4305 (SS303) ⁽²⁾ Material probe: Plastics PBT (glass fibre reinforced) ⁽¹⁾ , FDA listed ⁽²⁾ Thread: G 1½"
	CN 4050: Material process connection: Aluminium or 1.4305 (SS303) Material extension cable: PE with black carbon Material probe: Plastics PPS/PBT (glass fibre reinforced) ⁽¹⁾ Thread: G 1½"
	Flat gasket (included): Material AFM30
	<small>⁽¹⁾ Discolouration is possible due to influence of UV and temperature. This has no negative effect to the material properties.</small>
	<small>⁽²⁾ Food grade</small>
Sound level	max. 40 dBA
Overall weight (ca.)	CN 4020 version 120°C: 0.5 kg (1.1 lbs) CN 4020 version 180°C: 1.8 kg (4.0 lbs) CN 4030 (aluminium extension): 0.8 kg (1.8 lbs) + 0.8 kg/m (1.8 lbs per 39.3") CN 4030 (stainless steel extension): 1.5 kg (3.3 lbs) + 1.6 kg/m (3.5 lbs per 39.3") CN 4050 (aluminium extension): 0.9 kg (2.0 lbs) + 0.25 kg/m (0.55 lbs per 39.3") CN 4050 (stainless steel extension): 1.4 kg (3.1 lbs) + 0.25 kg/m (0.55 lbs per 39.3")
Tolerance length "L"	CN 4020 version 120°C: ±5 mm (±0.2") CN 4020 version 180°C : ±10 mm (±0.4") CN 4030: ±10 mm (±0.4") CN 4050: ±15 mm (±0.6")

Technical data

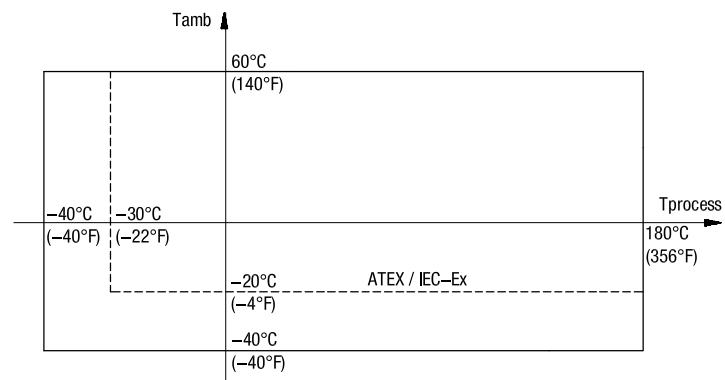
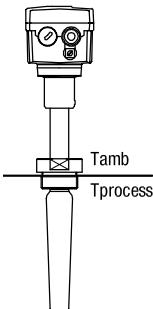
Operating conditions

Ambient and process temperature

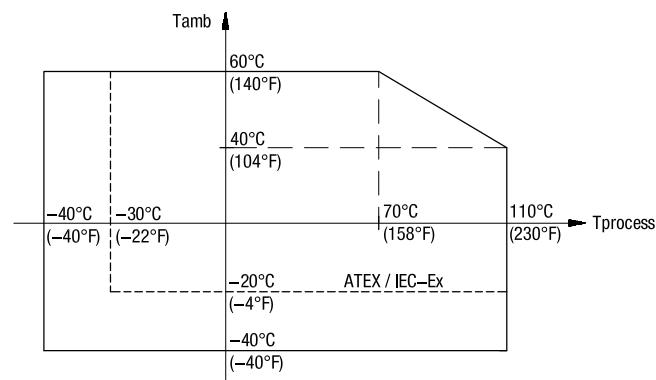
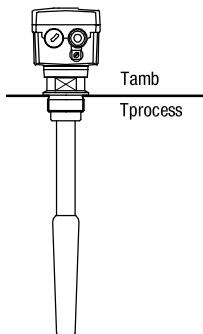
CN 4020
 version 120°C



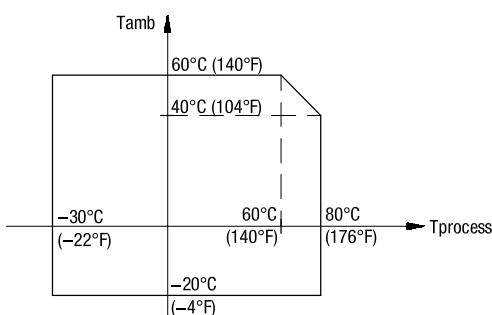
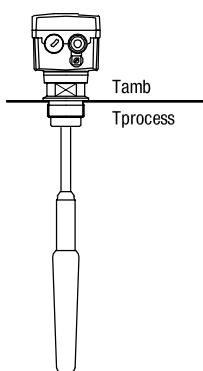
CN 4020
 version 180°C



CN 4030



CN 4050



Technical data

Ventilation	Ventilation is not required	
Max. permitted mechanical torque	CN 4020 version 120°C	CN 4020 version 180°C CN 4030
	Recommended protection in case of high material load: mounting of a protective angle above the probe	
Max. tractive force	CN 4050	4 kN
Max. process pressure	CN 4020 (Ausführung 120°C) CN 4020 (Ausführung 180°C)/ CN 4030 CN 4050	25 bar (363 psi) 16 bar (232 psi) 6 bar (87 psi)
Vibration	1.5 (m/s ²) ² /Hz according to EN 60068-2-64	
Features of bulk material	Min. DK: 1.6 (dielectric constant, see external DK tables) Max. grain size: ca. 30 mm	
Switching point	Material with high DK value -> the signal output switches when the probe is covered a few mm Material with low DK value -> the signal output switches, when the probe is covered a few cm	
Relative Humidity	0 - 100%, suitable for outdoor use	
Altitude	max. 2,000 m (6,562 ft)	
Expected product lifetime	Following parameters have a negative influence on the expected product lifetime: High ambient- and process temperature, corrosive environment, high vibration, high flow rate of abrasive bulk material passing the sensor element.	

Transport and Storage

Transport	Observe the instructions as stated on the transport packaging, otherwise the products may get damaged. Transport temperature: -40 .. +80°C (-40 .. +176°F) Transport humidity: 20 .. 85% Transport incoming inspections must be carried out to check for possible transport damage.
Storage	Products must be stored at a dry and clean place. They must be protected from influence of corrosive environment, vibration and exposure to direct sunlight. Storage temperature: -40 .. +80°C (-40 .. +176°F) Storage humidity: 20 .. 85%

Approvals

General Purpose (Ordinary Locations)	CE TR-CU	EN 61010-1	
Hazardous Locations *	CN 4020/ CN 4030:	ATEX: IEC-Ex: TR-CU:	II 1/2D Ex ta/tb IIIC T! Da/Db Ex ta/tb IIIC T! Da/Db Ex ta/tb IIIC T! Da/Db X
	CN 4050:	ATEX: IEC-Ex: TR-CU:	II 1/2D Ex ia/tb IIIC T! Da/Db Ex ia/tb IIIC T! Da/Db Ex ia/tb IIIC T135°C Da/Db X
EMC	EN 61326 - A1		
RoHS conform	According to directive 2011/65/EU		
Food grade material	According to directive 1935/2004/EC		
Pressure Equipment Directive (2014/68/EU)	<p>The units are not subject to this directive, because they are classified as „pressure-keeping equipment“ and do not have a pressurized housing (see Art.1, Abs. 2.1.4). The units are designed and manufactured in accordance to the Pressure Equipment Directive. The unit is NOT intended for use as an “equipment part with safety function (Art.1, Abs. 2.1.3). If the units should be used as „equipment part with safety function“ please contact the manufacturer.</p>		

* Depending on selected version

Options / Accessories

Weather-protection-cover	When the measuring device is used outdoor, the use of the weather-protection-cover is recommended. It protects the device from all atmospheric influences such as:	
	<ul style="list-style-type: none"> • rain water • condensation of water • excessively high temperatures due to insulation • excessively low temperatures in winter 	
	Material: PE, weathering and temperature stable	
	! For use in Hazardous Locations: only permitted for Zone 22.	
Hexagon nut	For mounting on a wall without a socket. Material: Aluminium or 1.4305 (303)	
Sliding sleeve	CN 4030 G 1½" ISO 228 Material: 1.4305 (303) Sealing material to the extension tube: FKM	
Bulb	Bright indicating light seen from outside. Not available for use in Hazardous Locations.	
Plug	Used instead of cable gland. <ul style="list-style-type: none"> • Valve connector or • M12 or • Harting Han 4A Not available for use in Hazardous Locations.	
Adapter	G 1" to G 1½"/ NPT 1¼"/ NPT 1½" Material: Aluminium or 1.4305 (303)	
Shortening kit	For CN 4050 cable	

Mounting

! General Safety Instructions

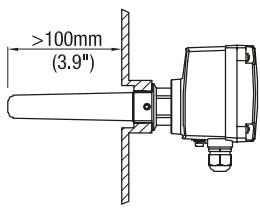
Process pressure	Improper installation may result in loss of process pressure.
Chemical resistance against the medium	Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.
Fastening of the threaded process connection	Mounting torque for the thread may not exceed 40 Nm (metal thread)/ 20 Nm (plastic thread). Use a open-end wrench. Do not fasten by turning the housing, for this will destroy the unit.
Food grade material	The materials are available for the use under normal and predictable applications (according to directive 1935/2004 Art.3). Other conditions can influence the safety.

Mounting instructions

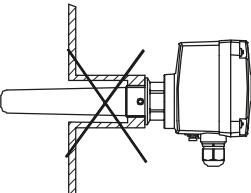
Direction of the cable glands	When the unit is mounted from the side, ensure, that the cable glands face downwards and are closed to avoid water penetration into the housing. The housing can be rotated after installation.
Sealing	Ensure proper seal of the process thread in case of process pressure.

Distances of the probe

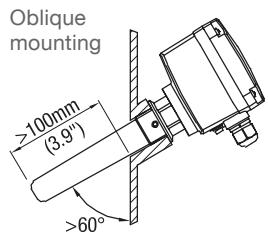
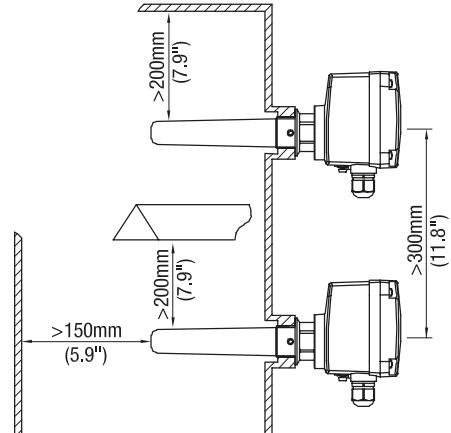
CORRECT
Probe leads into the product



WRONG
Socket too long



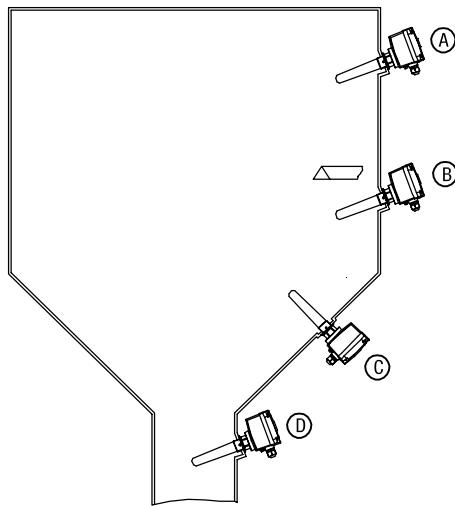
Observe min. distance between two sensors, to metal silo wall and to protective angle.



Observe mounting angle to ensure, that the active tip of the probe has enough distance to the metal silo wall

Mounting

CN 4020



CAUTION

Observe:

- General distances of the probe (see page 11).
- Distance to material flow (filling).
- Max. permitted mechanical load (see page 8).
- Wearing due to abrasive bulk material.

A Full detector horizontal or oblique.

Slight incline mounting helps remaining material to fall off more easily.

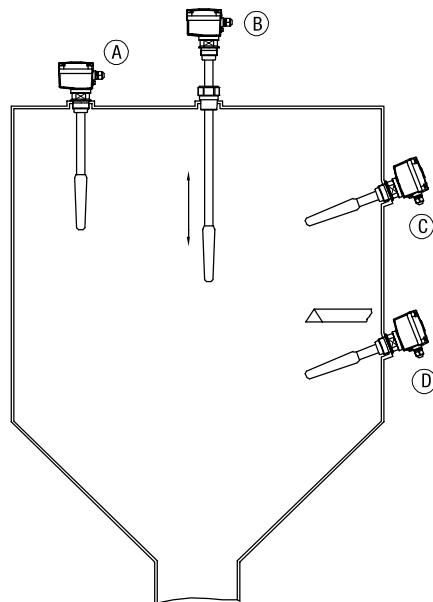
B Demand or empty detector horizontal or oblique.

Slight incline mounting helps remaining material to fall off more easily. Protective angle recommended depending on load and abrasion of the material.

C Empty detector oblique from the bottom.

D Empty detector in the silo outlet.

CN 4030



CAUTION

Observe:

- General distances of the probe (see page 11).
- Distance to material flow (filling).
- Max. permitted mechanical load (see page 8).
- Wearing due to abrasive bulk material.

A Full detector vertical.

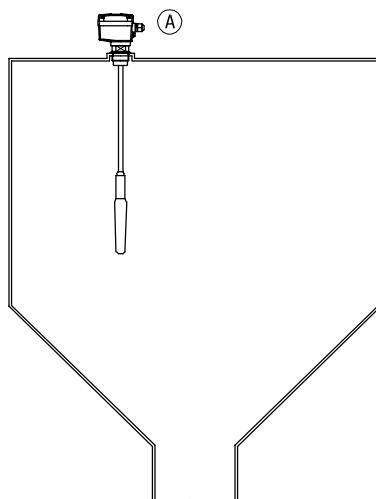
B Full detector with sliding sleeve.

C Full detector horizontal or oblique. Slight incline mounting helps remaining material to fall off more easily.

D Demand or empty detector horizontal or oblique.

Slight incline mounting helps remaining material to fall off more easily. Protective angle recommended depending on load and abrasion of the material.

CN 4050



CAUTION

Observe:

- Distance of the probe to the silo wall (see page 11). Consider that the hanging probe can move sideways with material.
- Distance to material flow (filling).
- Max. permitted mechanical traction (see page 8). Empty detector: Do not install in the center of the silo due to high traction with moving material.
- Wearing due to abrasive bulk material.

A Full, demand or empty detector vertical.

Electrical installation

! General Safety Instructions

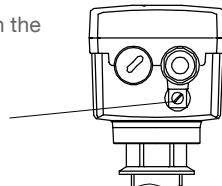
Handling	In the case of inexpert handling or handling malpractice the electric safety of the device cannot be guaranteed.
Protective earthing	Before any electrical installation, the device must be connected to the protective earthing terminal inside the housing.
Installation regulations	The local regulations or VDE 0100 (Regulations of German Electro technical Engineers) must be observed. With use of 24 V supply voltage, an apprroved power supply with renforced isolation to mains is required
Fuse	Use a fuse as stated in the connection diagram.
RCCB protection	In the case of a defect, the distribution voltage must automatically be cut off by a RCCB protection switch so as to protect the user of the device from indirect contact with dangerous electric tensions.
Power supply switch	A power-supply-disconnecting switch must be provided and marked near the device.
Wiring diagram	The electrical connections have to be made according to the wiring diagram.
Supply voltage	Compare the supply voltage applied with the specifications given on the electronic and name plate before switching the device on.
Cable gland/ closing element	The screwed cable gland and closing element must have following specifications: Ingress protection IP66, temperature range from -40°C to +70°C, UL or VDE certified (depending on the country where the unit is installed), pull relief. Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion). Cable glands that are not used have to be locked with a closing element.
Field wiring cables	<ul style="list-style-type: none"> • The diameter has to match to the clamping range of the used cable gland. • The cross section has to match with the clamping range of the connection terminals and consider the max. current. • All field wirings must have insulation suitable for at least 250 V AC. • The temperature rating must be at least 90°C (194°F). • If higher immunity interferences as specified in the stated EMC standards are present (see chapter approval), a shielded cable is required, otherwise an unshielded instrumentation cable is satisfactory.
Connecting the terminals	Make sure that max. 8 mm (0.31") of the pigtails are bared (danger of contact with live parts).
Guiding the cables in the terminal box	Cut the field wiring cables to appropriate length to fit properly into the terminal box.
Relay and transistor protection	Provide protection for relay contacts and output transistors to protect the device against spikes with inductive loads.
Protection against static charging	The unit must be grounded in any case to avoid static charging of the unit, especially on applications with pneumatic conveying.

Electrical installation

! Additional Safety Instructions for Hazardous Locations

External equipotential bonding terminal

Connect external terminal on the housing with equipotential bonding of the plant.



Cable glands and conduit system

- Installation according to the regulations of the country, where the product is installed.
- Not used entries have to be closed with blanking elements certified for this purpose.
- Where applicable the factory provided parts must be used.
- A strain relief must be provided for the field wiring cables, when the device is installed with the factory provided cable glands.
- The diameter of the field wiring cable must match to the clamping range of the cable clamp.
- If other than the factory provided parts are used, following must be ensured:
The parts must have an approval adequate to the approval of the level sensor (certificate and type of protection). The approved temperature range must be from the min. ambient temperature of the level sensor to the max. ambient temperature of the level sensor increased by 10 K.
The parts must be mounted according to the instructions of the supplier.

Commissioning

Commissioning only with closed lid.

Opening the lid

Before opening the lid take care, that no dust deposits or whirlings are present.
Do not remove the lid (cover) while circuits are alive.

Electrical installation

Relay SPDT

Power supply:

21 .. 27 V DC $\pm 10\%^*$ 1.5W

*incl. 10% of EN 61010

Fuse on power supply:

max. 10 A, fast or slow, HBC, 250 V

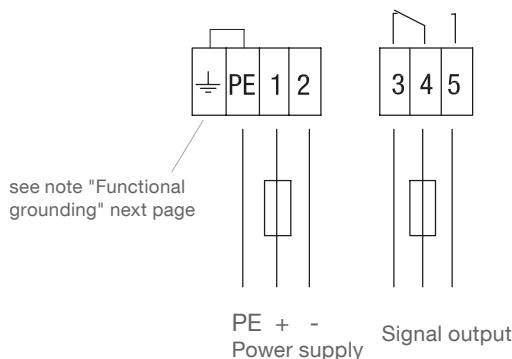
Signal output:

Floating relay SPDT

AC max. 250 V, 3 A, non inductive
 DC max. 30 V, 5 A, non inductive

Fuse on signal output:

max. 5 A, fast or slow, HBC, 250 V



Relay DPDT

Universal voltage

Power supply:

21 .. 230 V 50 - 60 Hz $\pm 10\%^*$ 18 VA

21 .. 45 V DC $\pm 10\%^*$ 2 W

*incl. 10% of EN 61010

Fuse on power supply:

max. 10 A, fast or slow, HBC, 250 V

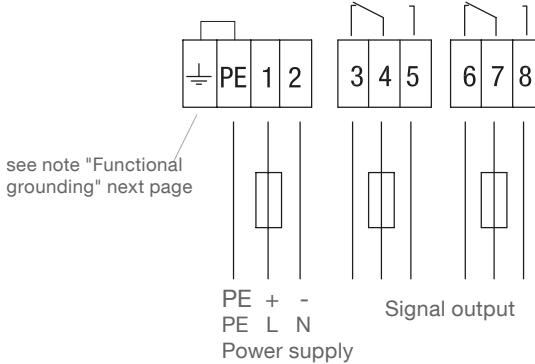
Signal output:

Floating relay DPDT

AC max. 250 V, 8 A, non inductive
 DC max. 30 V, 5 A, non inductive

Fuse on signal output:

max. 10 A, fast or slow, HBC, 250 V



PNP

3-wire

Power supply:

20 .. 40 V DC $\pm 10\%^*$ 0.5 A

*incl. 10% of EN 61010

Fuse:

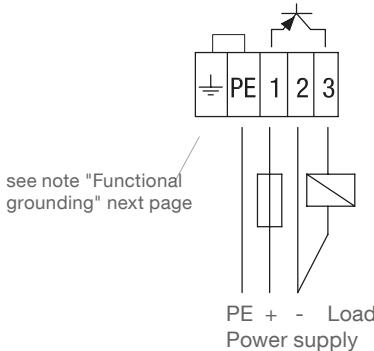
max. 4 A, fast or slow, 250V, HBC

Signal output:

max. 0.4 A

Load for example:

PLC, relay, contactor, bulb



Approved power supply with reinforced insulation to mains is required

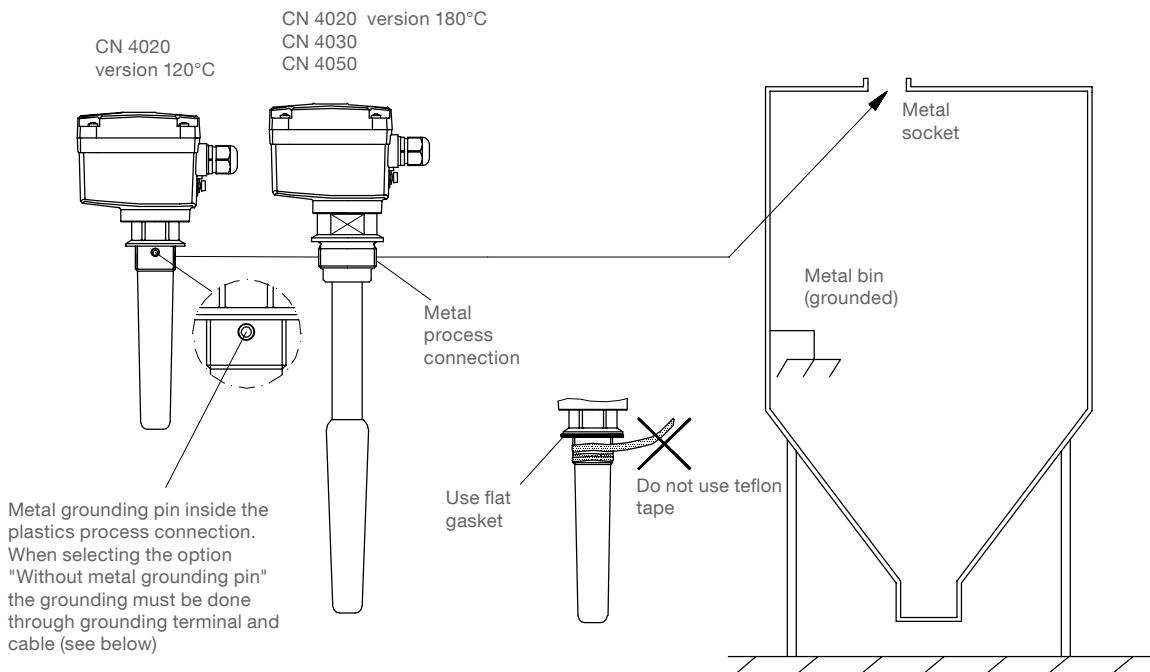
Electrical installation

Functional grounding

The unit must have connection to earth for proper functioning. This can be done by one of the following possibilities:

Grounding through process connection

CAUTION: This grounding alone is not enough for Ex applications.



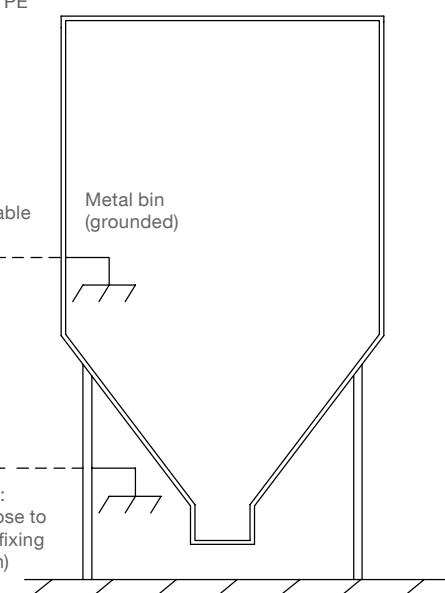
Grounding through grounding terminal and cable

Internal \pm terminal is connected with PE terminal

Standard cable max. 5 m

Connect external (standard for Ex units) or internal terminal

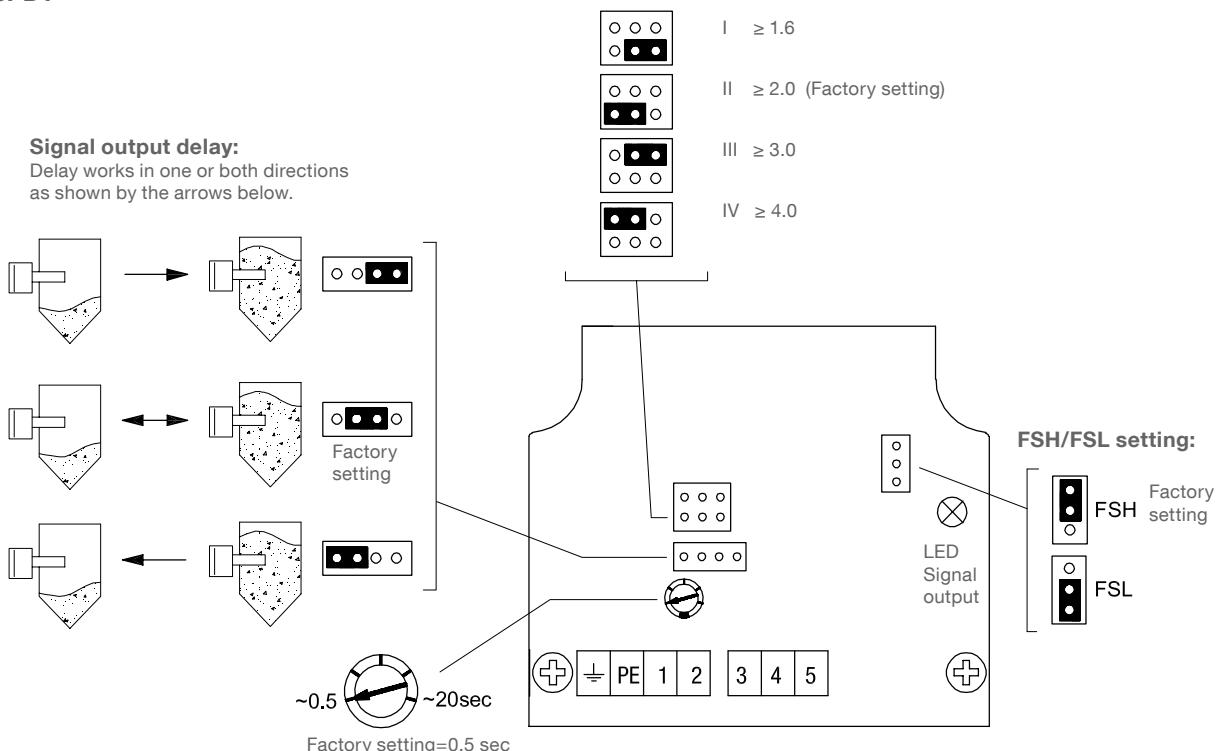
For non metal bins: grounded parts close to the bin (e.g. metal fixing elements of the bin)



Settings

Control elements

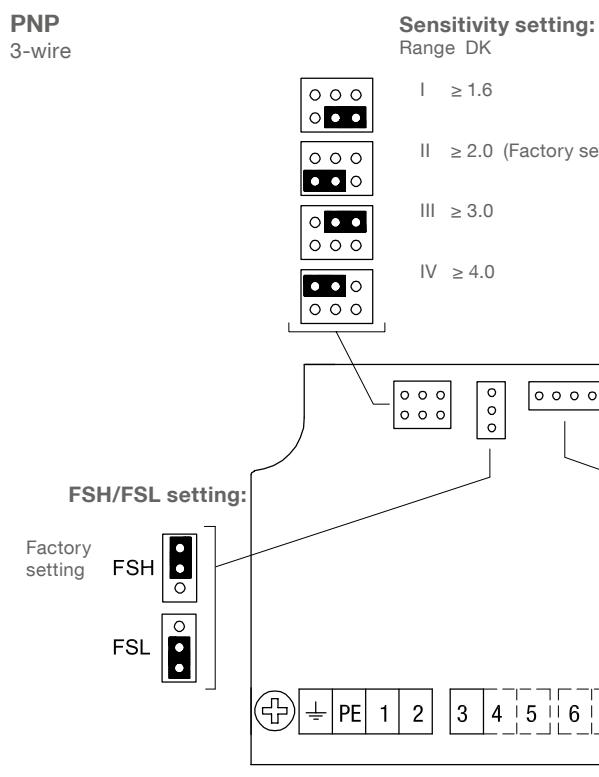
Relay SPDT



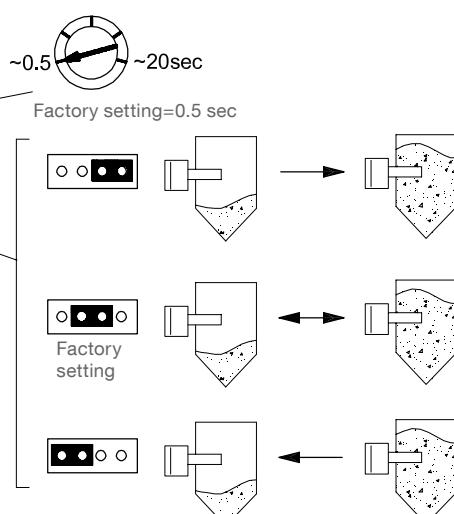
Relay DPDT

Universal voltage

PNP 3-wire



Signal output delay.
Delay works in one or both directions as shown by the arrows below.



Settings / Signal output logic

Sensitivity setting

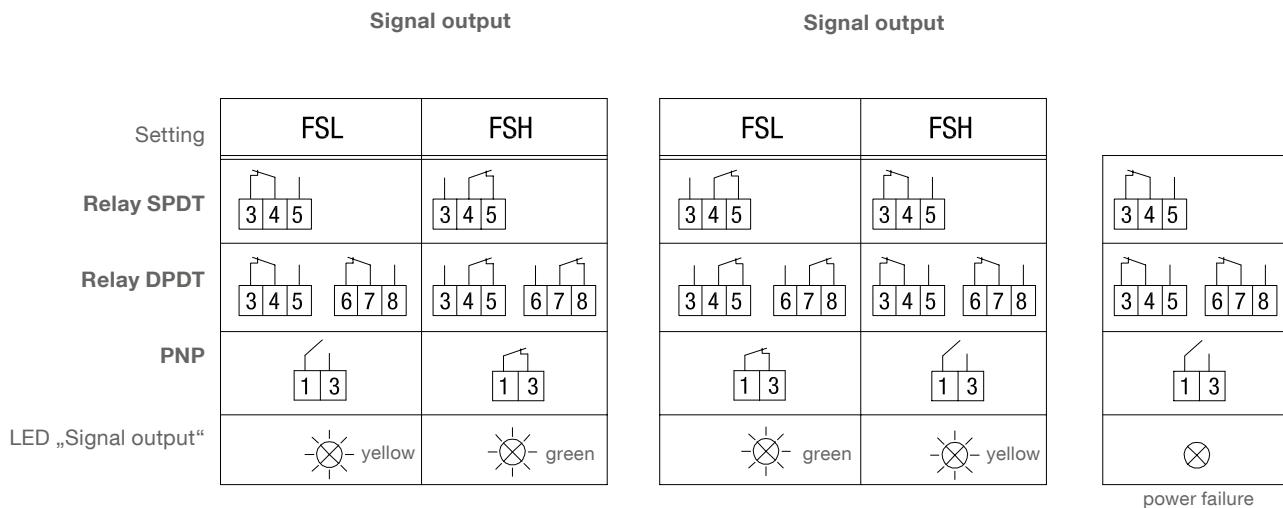
The units are factory set to Range II and do normally not need to be resetted on site.
 If required, the setting can be changed:

	Description	Required DK value	Possible material buildup
Range I	Max. sensitivity for low DK value	≥ 1.6	Low
Range II	Standard setting for most applications	≥ 2.0	Medium
Range III	Low sensitivity for high material buildup on the probe	≥ 3.0	High
Range IV	Min. sensitivity for very high material buildup on the probe	≥ 4.0	Very high

Signal output logic

FSL: Set in case of using the sensor as a full detector: Power failure or line break is regarded as "full" signal (protection against overcharging).

FSL: Set in case of using the sensor as an empty detector: Power failure or line break is regarded as "empty" signal (protection against running dry).



Maintenance

Opening the lid (cover)	<p>! Before opening the lid for maintenance reasons observe following items:</p> <ul style="list-style-type: none"> • Do not remove the lid while circuits are alive. • No dust deposits or whirlings are present. • No rain can enter into the housing.
Frequent check of the unit	<p>! To ensure durable safety in hazardous locations and with electrical safety, following items must be checked frequently depending on the application:</p> <ul style="list-style-type: none"> • Mechanical damage or corrosion of any components (housing side and sensor side) and of the field wiring cables. • Tight sealing of the process connection, cable glands and enclosure lid. • Properly connected external PE cable (if present).
Cleaning	<p>! If cleaning is required by the application, following must be observed:</p> <ul style="list-style-type: none"> • Cleaning agent must comply with the materials of the unit (chemical resistance). Mainly the lid sealing, cable gland and the surface of the unit must be considered. <p>! The cleaning process must be done in a way, that:</p> <ul style="list-style-type: none"> • The cleaning agent cannot enter into the unit through the lid sealing or cable gland. • No mechanical damage of the lid sealing, cable gland or other parts can happen. <p>A possible accumulation of dust on the unit does not increase the maximum surface temperature and must therefore not be removed for purposes of maintaining the surface temperature in hazardous locations.</p>
Function test	<p>! A frequent function test may be required depending on the application.</p> <p>! Observe all relevant safety precautions related with a safe work depending on the application (e.g. hazardous locations, hazardous bulk material, electric safety, process pressure).</p> <p>! This test does not proof if the sensor is sensitive enough to measure the material of the application.</p> <p>! Function test is done by touching the sensor part with appropriate means (e.g. grounded metal plate or hand) and monitor if a correct change of the signal output from uncovered to covered happens.</p>
Production date	The production date can be traced by the serial number on the typeplate. Please contact the manufacturer or your local distributor.
Spare parts	All available spare parts are stated in the selection list

Change of the electronic board:

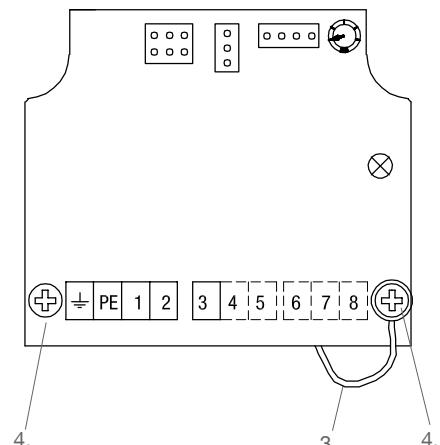
CN 4020 Deenergise device and secure against being switched on again.
 Before opening the lid take care, that the unit is clean an no water or dirt can enter into the housing.

1. Open the housing lid.
2. Remove the field wiring cables.
3. Remove the internal functional ground cable.
4. Unscrew the two fastening screws of the electronic board.
5. Take out the electronic board.
6. Remove the plug to the probe.
7. Connect the plug to a new electronic board.
8. Insert the new electronic board and tighten fastening screws.
9. Connect the functional ground cable and the field wire cables.

Calibration is not required.

CN 4030 For these types a non changeable electronic is located inside the probe. Please return defective units to the manufacturer.

CN 4050



Notes for use in Hazardous Locations

Zone classification

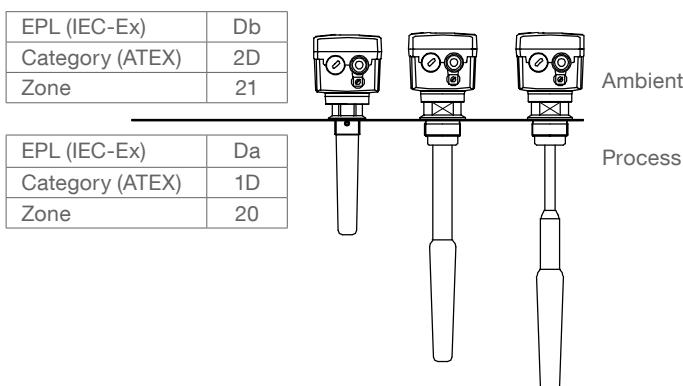
	Usable in zone	ATEX category	IEC-Ex Equipment Protection Level (EPL)
Dust applications	20, 21, 22	1 D	Da
	21, 22	2 D	Db
	22	3 D*	Dc

* in case of conductive dust additional demands for the installation are possible.

General Notes

Marking	Devices with Ex approval are marked on the name plate.
Process pressure	The device construction allows process over-pressure up to 6/ 16 bar (87/ 232 psi) (see name plate). These pressures are allowed for test purposes. The definition of the ATEX/ IEC-Ex is only valid for a container-over-pressure between -0.2 .. +0.1 bar (-2.9 .. +1.45 psi). For higher or lower pressures the approval is not valid.
Process and ambient temperature	The permitted temperature ranges are marked on the name plate. Observe derating curves.

Permitted zones (categories) for mounting in partition wall



Max. Surface Temperature

The temperature marking on the name plate refers to the instruction manual. On the following tables the relevant temperature ratings are shown. The maximum surface temperature is the hottest temperature of the unit which could occur during malfunction (according to Ex-definition).

Version CN 4020 120°C/ CN 4030/ CN 4050:

Max. ambient temperature*	Max. process temperature*	Max. surface temperature
60°C (140°F)	CN 4020: 120°C (248°F) CN 4030: 110°C (230°F)	120°C (248°F)
	CN 4050: 80°C (176°F)	135°C (275°F)

* Observe derating (see page 7)

Version CN 4020 180°C:

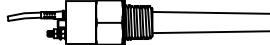
Max. ambient temperature	Max. process temperature	Max. surface temperature
60°C (140°F)	120°C (248°F) 130°C (266°F) 140°C (284°F) 150°C (302°F) 160°C (320°F) 170°C (338°F) 180°C (356°F)	120°C (248°F) 130°C (266°F) 140°C (284°F) 150°C (302°F) 160°C (320°F) 170°C (338°F) 180°C (356°F)

Disposal

The product consists of materials which can be recycled, details of the used materials see chapter "Technical data - mechanical data".

Recycling must be done by a specialised recycling company. Since the product is not subject to the WEEE directive 2002/96/EG, it is not permitted to bring it to a public recycling station.

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Subject to technical change.
All dimensions in mm (inch).

We assume no liability for typing errors.
Different variations than specified are possible.
Please contact our technical consultants.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning may be accomplished only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.
- This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications.

Special attention must be paid to warnings and notes as follows:

WARNING



Relates to a caution symbol on the product: A failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.

WARNING



Relates to a caution symbol on the product: Risk of electric shock

WARNING



A failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product	Description
	CAUTION: refer to accompanying documents (manual) for details.
	Earth (ground) Terminal
	Protective Conductor Terminal

Technical support

Please contact your local supplier (for address see www.uwt.de). Otherwise you can contact:

UWT GmbH
Westendstr. 5
D-87488 Betzigau

Tel.: 0049 (0)831 57123-0
Fax: 0049 (0)831 76879
info@uwt.de
www.uwt.de

Introduction

Applications

CN 7000 is a compact 2-wire capacitance switch for level detection in constricted spaces, applicable in:

- Interfaces, solids, liquids, slurries, and foam
- Foods and pharmaceuticals
- Chemical and petrochemical
- Hazardous areas

Versions

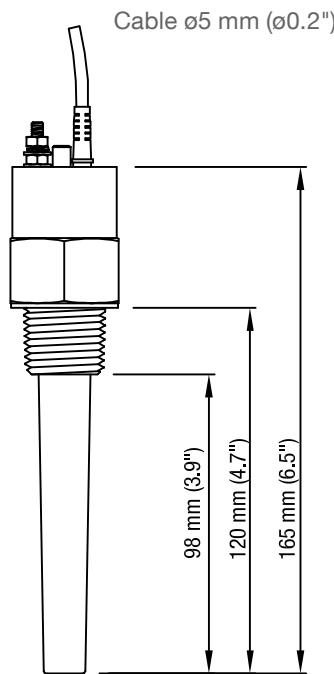
- Integral cable version with stainless steel process connection and probe options of PPS or PVDF
- Enclosure version (thermoplastic polyester enclosure) with stainless steel process connection in combination with a PPS or PVDF probe.
- Enclosure version (thermoplastic polyester enclosure) with fully synthetic process connection combined with a PPS probe.

Features

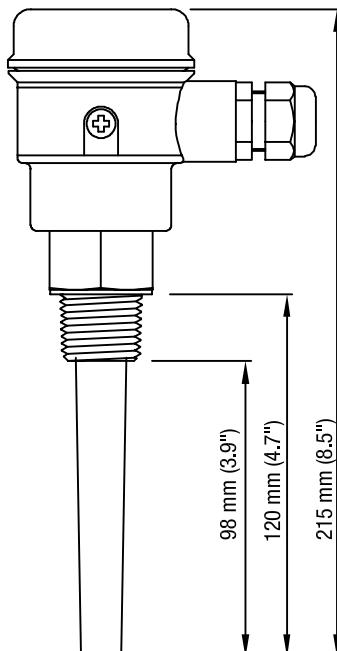
- NPT, R (BSPT), G (BSPP) process connections.
- Corrosion resistant construction, PPS, and 316L stainless steel (optional PVDF wetted parts).
- Non-polarized, solid-state switch or relay output (enclosure version with fully synthetic process connection only).

Technical data - Dimensions

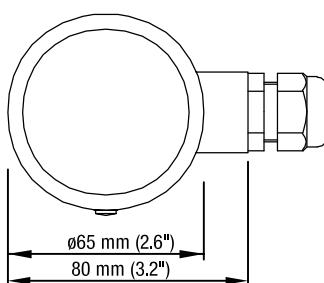
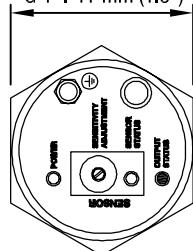
CN 7100
Integral Cable version



CN 7100
Enclosure version



**¾" NPT: 36 mm (1.4")
R 1": 36 mm (1.4")
G 1": 41 mm (1.6")**



Technical data - Electrical data

Electrical

	Integral cable version or Enclosure version with stainless steel process connection	Enclosure version with PPS process connection
Power supply		
Standard	12 - 33 V DC	12 - 33 V DC
Intrinsically safe	10 - 30 V DC Intrinsically safe barrier required	-
	For ATEX: $U_i=30\text{ V}$ $I_i=120\text{ mA}$ $P_i=0.8\text{ W}$ $C_i=2.1\text{ nF}^*$ $L_i=1.3\text{ mH}$	
	For INMETRO: $U_i=30\text{ V}$ $I_i=200\text{ mA}$ $P_i=1.5\text{ W}$ $C_i=2\text{ nF}^*$ $L_i=1\text{ mH}$	
	* For an integral cable with a length of more than 1.5m a capacitance of 0.3 nF/ m shall be added	
	For FM/ CSA: see page 12	
Alarm Outputs		
mA	4/ 20 mA or 20/ 4 mA 2-wire current loop detection	4/ 20 mA or 20/ 4 mA 2-wire current loop detection
Solid-state switch (Standard)	30 V DC/ 30 V AC 82 mA max. Limited to 30 V DC/ 16 V AC 82 mA max. in wet locations	-
Solid-state switch (Intrinsically safe)	30 V DC max. Intrinsically safe barrier required. The power supply circuit is infallibly galvanically isolated from the solid-state switch circuit.	-
	For ATEX: $U_i=30\text{ V}$ $I_i=200\text{ mA}$ $P_i=350\text{ mW}$ $C_i=0^*$ $L_i=0$	
	For INMETRO: $U_i=30\text{ V}$ $I_i=200\text{ mA}$ $P_i=1.5\text{ W}$ $C_i=2\text{ nF}^*$ $L_i=1\text{ mH}$	
	* For an integral cable with a length of more than 1.5m a capacitance of 0.3 nF/ m shall be added	
	For FM/ CSA: see page 12	
Relay output	-	
- max. switching voltage		60 V DC or 30 V AC; limited to 30 V DC/ 16 V AC in wet locations
- max. switching current		1 A
- max. switching power		60 W
Repeatability	2 mm (0.08")	2 mm (0.08")

Technical data - Mechanical data / Operating conditions

Mechanical

Common probe/ wetted parts	PPS process connection and PPS sensor or 316L process connection and PPS or PVDF sensor
	Metal process connection seal: Standard is FKM (e.g. Viton). FFKM (e.g. Kalrez) is optional.
<hr/>	
Integral cable version	
- Integral cable body	316L stainless steel
- Process connection	316L stainless steel, $\frac{3}{4}$ " NPT or R 1" (BSPT), or G 1" (BSPP)
- Connecting cable	1 m (3.3 ft) of 4 conductor, 22 AWG, shielded, polyester jacket
<hr/>	
Enclosure version	
- Housing	VALOX® (thermoplastic polyester)
- Lid	Transparent thermoplastic polycarbonate (PC)
- Process connection	316L stainless steel, $\frac{3}{4}$ " NPT or R 1" (BSPT), or G 1" (BSPP) or PPS process connection, $\frac{3}{4}$ " NPT or R 1" (BSPT)
- Wiring	Internal 5-point terminal block $\frac{1}{2}$ " NPT wiring entrance (optional M20 x 1.5" cable entry)

Environmental

Ambient temperature	Integral cable version and Enclosure version with stainless steel process connection: -30 to +85°C (-22 to +185°F) -20 to +85°C (-4 to +185°F) with option FFKM seal O-ring
	Enclosure version with PPS process connection: -10 to +85°C (+14 to +185°F)
	With ATEX approval: Depending on Surface Temperature and Temperature Class, details see page 22.

Ingress protection:

- Enclosure version	Type 4/ IP68
- Integral cable version	Type 4/ IP65

Installation category	I
-----------------------	---

Pollution degree	4
------------------	---

Process Conditions

Relative dielectric constant	1.5 minimum
Process Temperature	Integral cable version and Enclosure version with stainless steel process connection: -30 to +100°C (-22 to +212°F) -20 to +100°C (-4 to +212°F) with option FFKM seal O-ring
	Enclosure version with PPS process connection: -10 to +100°C (+14 to +212°F)
	With ATEX approval: Depending on Surface Temperature and Temperature Class, details see page 22.
Pressure (vessel)	-1 to 10 bar (146 psi) gauge, nominal

Approvals / Mounting

Approvals

	PPS process connection, enclosure version	Stainless steel process connection, enclosure version and internal cable version
General Purpose	CE, FM, CSA	CE, FM/ CSA, TR-CU
Intrinsically Safe (intrinsic safety barrier required)	-	ATEX II 1G 1/2G 1D 1/2D FM/ CSA Class I, II, III, Div. 1, Gr. A-G INMETRO TR-CU
Marine	-	Lloyds Register of Shipping, Categories ENV1, ENV2 and ENV5
Overfill protection	WHG	WHG

Note:

EMC testing was conducted on the CN 7000 metal version while mounted in a metallic vessel and wired using shielded cable. The sensitivity was set by turning sensitivity potentiometer 2 turns counter-clockwise from the set point.

Mounting

! General Safety Instructions

Installation shall only be performed by qualified personnel and in accordance with local governing regulations.

This product is susceptible to electrostatic shock. Follow proper grounding procedures.

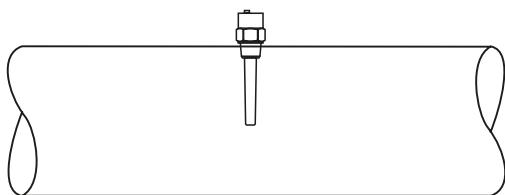
! Additional Safety Instructions for Hazardous Locations

see page 20ff

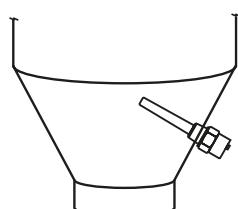
Location

The CN 7000 is normally mounted into the vessel top (high detection alarm) or through the tank wall at the detection level (high or low detection alarm).

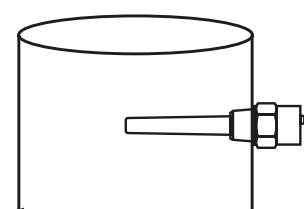
Vertical



Angle



Horizontal

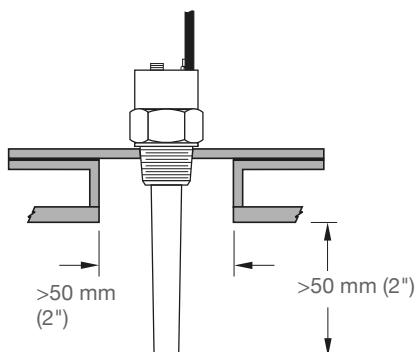


Mounting

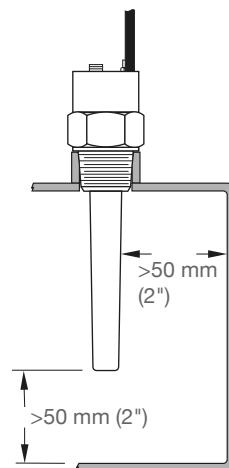
Installation Features and Restrictions

Note: Mounting diagrams apply to intergal cable version and enclosure version.

Standpipes



Wall Restriction

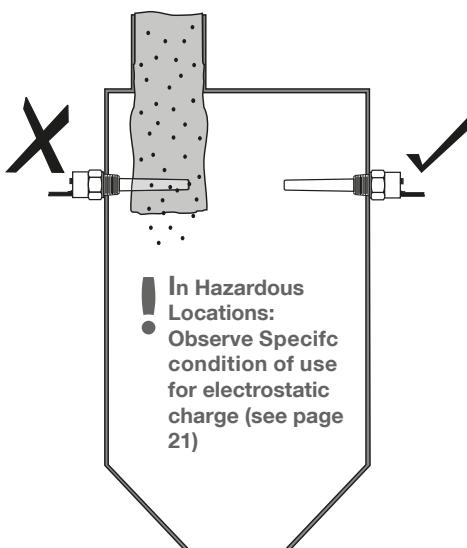


Multiple Units

When using multiple units, sensors must be 100 mm apart. Mount diagonally if vertical space is restricted.

Process cautions for solids

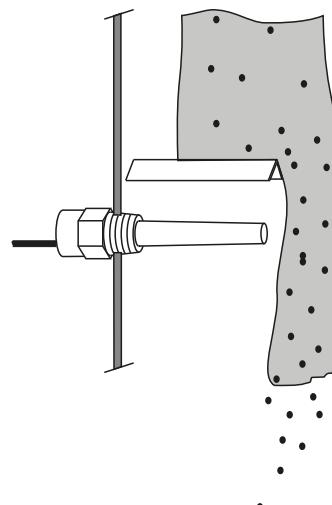
Keep out of path of falling material



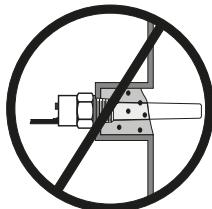
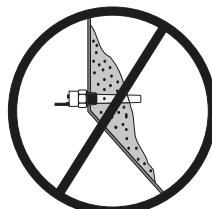
Consider material surface configuration when installing unit



Protect probe from falling material



Avoid areas where material build up occurs.



Electrical installation



General Safety Instructions

The DC input terminal shall be supplied from a source providing electrical isolation between the input and output, in order to meet the applicable safety requirements of IEC 61010-1.

A wet location is a location where water or other conductive liquid may be present and is likely to increase the risk of electric shock.

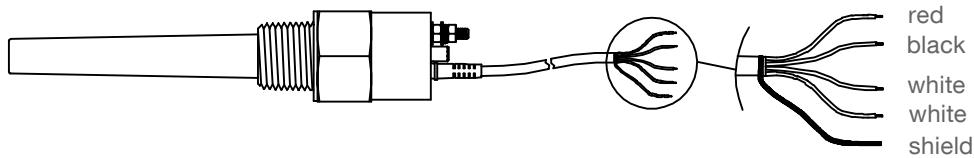


Additional Safety Instructions for Hazardous Locations

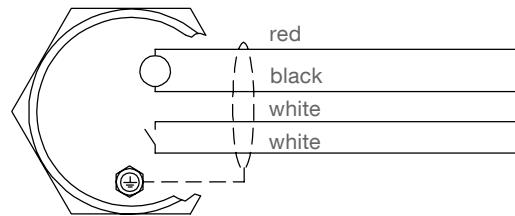
see page 20 and following pages

Electrical installation

Integral Cable Version



Operation with solid state switch/ relay

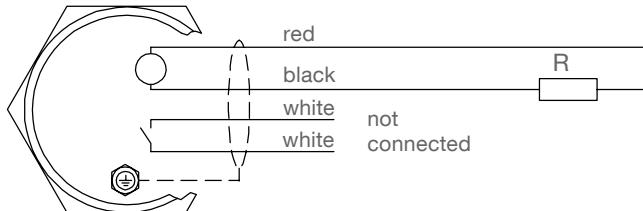


Shield is internal connected to ground.
 It is recommended to use a shielded cable for stable measurement.

red/ black	white/ white
Supply: 12 - 33V DC 10 - 30V DC intrinsic safe*	Output: Solid state switch* Observe protection (see below). Max. 30 V DC/ 30 V AC, 82 mA Limited to 30 V DC/ 16 V AC, 82 mA in wet locations

* For intrinsic safe operation an intrinsic safety barrier is required
 Ratings U_i , I_i , P_i , C_i , L_i of power supply and solid state switch: see page 5

Operation with 4/ 20 mA loop



Shield is internal connected to ground.
 It is recommended to use a shielded cable for stable measurement.

Supply: 12 - 33V DC 10 - 30V DC intrinsic safe*
Polarity determines output logic, see table below * For intrinsic safe operation an intrinsic safety barrier is required. Ratings U_i , I_i , P_i , C_i , L_i of power supply: see page 5

$R_{max} = (V_{supply} - 12 V) / 20 \text{ mA}$
 Example: 24 V supply allows R_{max} of 600 Ohms

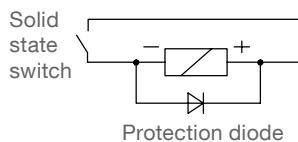
Output logic

Yellow LED	○	●		
Status	FSL	FSH	FSL	FSH
Supply polarity (cable colour)	red + black -	red - black +	red + black -	red - black +
Red LED	○	●	●	○
Solid state switch				
4/ 20 mA loop	4 mA	20 mA	20 mA	4 mA

FSL = Fail safe low FSH = Fail safe high

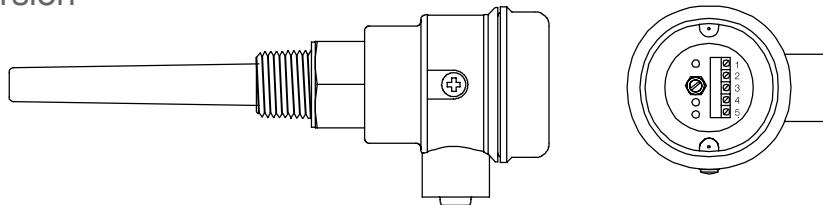
Protection of Solid State Switch

Observe a Protection diode in case of connecting an external relay to the Solid state switch

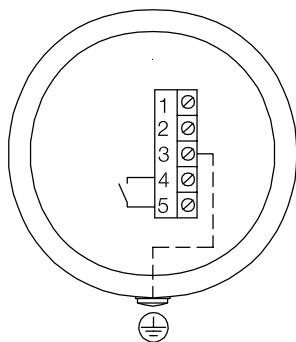


Electrical installation

Enclosure Version



Operation with solid state switch/ relay

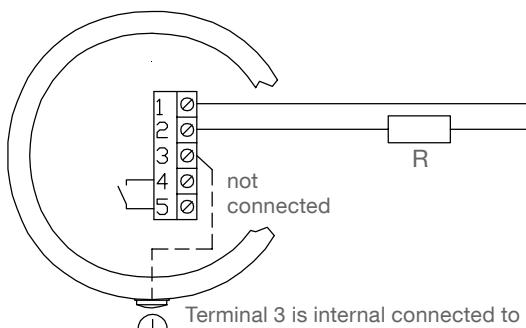


Terminal 3 is internal connected to ground. It is recommended to use a shielded cable for stable measurement.

Terminal 1, 2	Terminal 3	Terminal 4, 5
Supply: 12 - 33 V DC 10 - 30 V DC intrinsic safe* Polarity determines output logic, see table below	cable shield connection connect to ground	Output: Solid state switch * Present with stainless steel process connection. Observe protection (see below). Max. 30 V DC/ 30 V AC, 82 mA, limited to 30 V DC/ 16 V AC, 82 mA in wet locations

* For intrinsic safe operation an intrinsic safety barrier is required
 Ratings U_i , I_i , P_i , C_i , L_i of power supply and solid state switch: see page 5

Operation with 4/ 20 mA loop



Terminal 3 is internal connected to ground.
 It is recommended to use a shielded cable for stable measurement.

$R_{max} = (V_{supply} - 12) V / 20 \text{ mA}$
 Example: 24 V supply allows R_{max} of 600 Ohms

Supply: 12 - 33 V DC 10 - 30 V DC intrinsic safe* Polarity determines output logic, see table below
* For intrinsic safe operation an intrinsic safety barrier is required. Ratings U_i , I_i , P_i , C_i , L_i of power supply: see page 5

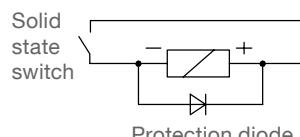
Output logic

Yellow LED	○	●		
Status	FSL	FSH	FSL	FSH
Supply polarity (Terminal)	1 + 2 -	1 - 2 +	1 + 2 -	1 - 2 +
Red LED	○	●	●	○
Solid state switch				
4/ 20 mA loop	4 mA	20 mA	20 mA	4 mA

FSL = Fail safe low FSH = Fail safe high

Protection of Solid State Switch

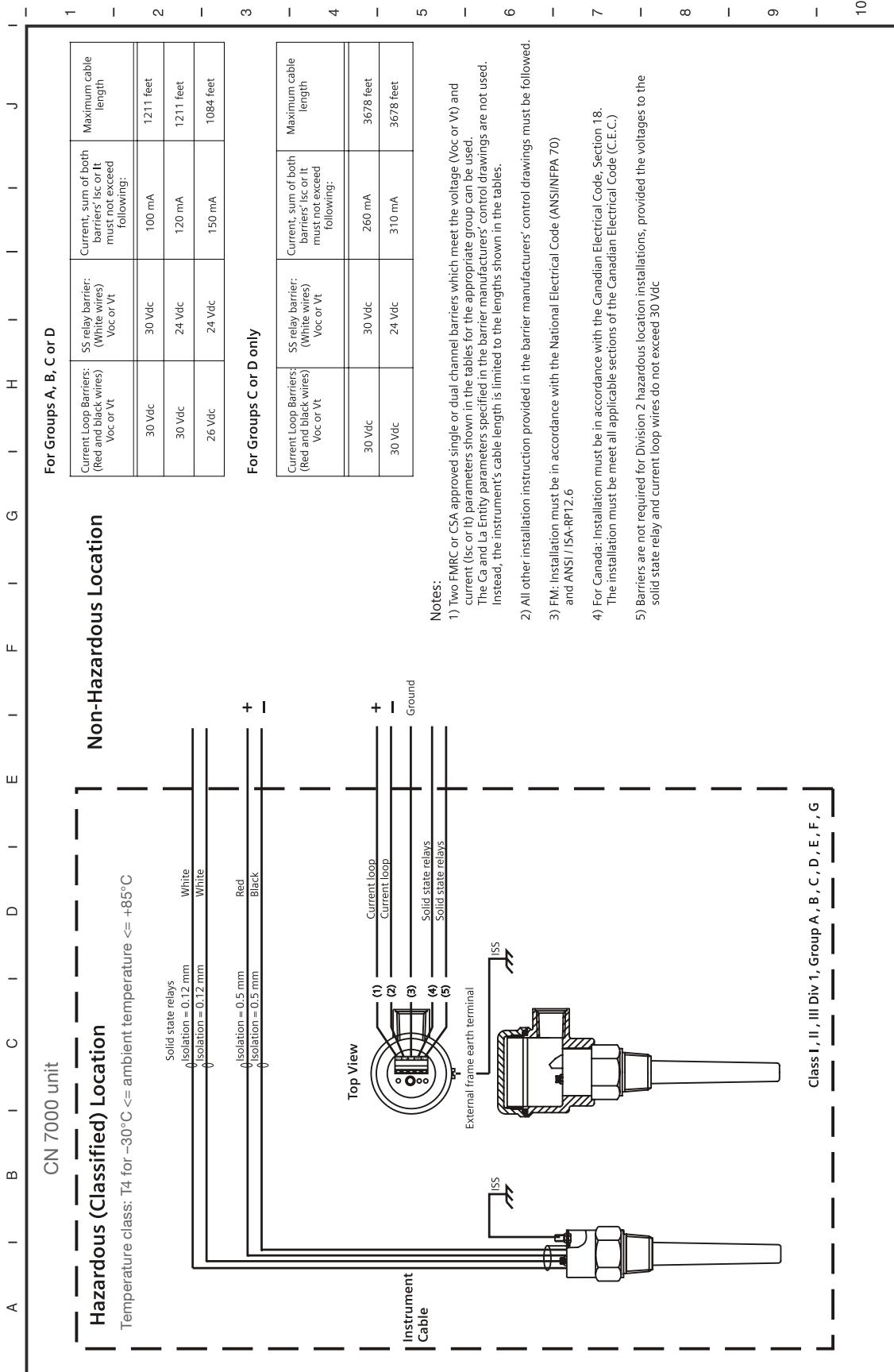
Observe a Protection diode in case of connecting an external relay to the Solid state switch



Protection diode

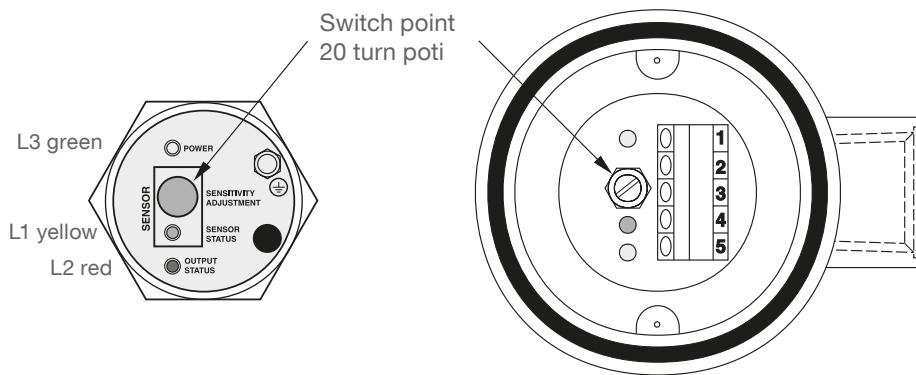
Electrical installation

FM/ CSA Approval Connection drawing



Operation

Settings



LEDs

L1: Sensor status

ON if sensor is detected as covered (capacitance on sensor is greater than setted switchpoint)

L2: Signal output

ON if current loop has 20 mA/ Solid state switch is closed.

L3: Power supply

ON if power is present

Output logic (Failsafe High/ Failsafe Low)

See table on page 10 and 11.

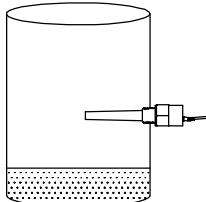
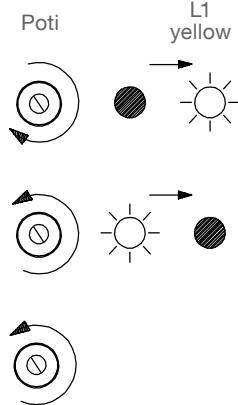
Operation

Switchpoint Adjustment

Select the switchpoint adjustment according to the application as follows:

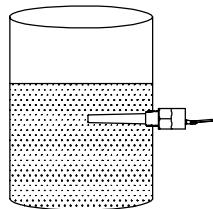
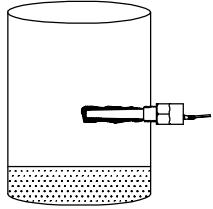
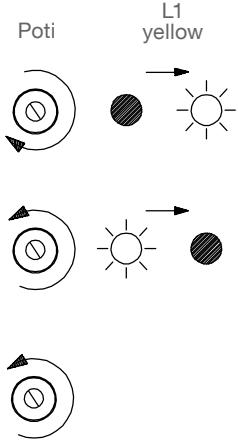
Application	Material	Adjustment conditions
General	<ul style="list-style-type: none"> Dry solids Low viscosity liquids 	Sensor uncovered
Demanding	<ul style="list-style-type: none"> Hygroscopic/ wet solids High viscosity and high conductivity liquids 	Sensor immersed and then uncovered, retaining max. possible material buildup
Interface detection	<ul style="list-style-type: none"> Ignoring liquid A/ detecting liquid B Ignoring foam/ detecting liquid 	Immerse sensor in liquid A or foam

General applications

1. Ensure material level is well below the probe	The unit will calibrate to an uncovered probe.									
2. Adjust switchpoint with poti	<p>If LED L1 (yellow) is OFF, turn poti clockwise until L1 is ON.</p> <p>Turn poti counter clockwise until L1 just stops glowing.</p> <p>Turn poti further counter clockwise:</p> <table border="1"> <tr> <th>Dielectric constant of material</th> <th>Number of turns</th> </tr> <tr> <td><2</td> <td>1/4</td> </tr> <tr> <td>2 ... 4</td> <td>1/2</td> </tr> <tr> <td>>4</td> <td>1</td> </tr> </table> <p>Depending on the application and the required switchpoint the number of turns can be varied.</p>	Dielectric constant of material	Number of turns	<2	1/4	2 ... 4	1/2	>4	1	
Dielectric constant of material	Number of turns									
<2	1/4									
2 ... 4	1/2									
>4	1									
Switchpoint adjustment is finished										

Operation

Demanding applications

1. Ensure material level is well above the probe									
2. Ensure material level is well below the probe	<p>It is important that as much material buildup as possible is retaining on the sensor.</p> 								
3. Adjust switchpoint with poti	<p>If LED L1 (yellow) is OFF, turn poti clockwise until L1 is ON.</p> <p>Turn poti counter clockwise until L1 just stops glowing.</p> <p>Turn poti further counter clockwise:</p> <table border="1"> <thead> <tr> <th>Dielectric constant of material</th> <th>Number of turns</th> </tr> </thead> <tbody> <tr> <td><2</td> <td>1/4</td> </tr> <tr> <td>2 ... 4</td> <td>1/2</td> </tr> <tr> <td>>4</td> <td>1</td> </tr> </tbody> </table> <p>Depending on the application and the required switchpoint the number of turns can be varied.</p> 	Dielectric constant of material	Number of turns	<2	1/4	2 ... 4	1/2	>4	1
Dielectric constant of material	Number of turns								
<2	1/4								
2 ... 4	1/2								
>4	1								
Switchpoint adjustment is finished									

Operation

Interface detection

1. Immerse probe in liquid A or in foam which should NOT be detected	<p>Ensure that liquid A or foam (which should NOT be detected) is covering the probe.</p> <p>Liquid A or foam must have a lower dielectric constant than liquid B, which should be detected.</p>									
2. Adjust switchpoint with poti	<p>If LED L1 (yellow) is OFF, turn poti clockwise until L1 is ON.</p> <p>Turn poti counter clockwise until L1 just stops glowing.</p> <p>Turn poti further counter clockwise:</p> <table border="1"> <thead> <tr> <th>Dielectric constant of material</th><th>Number of turns</th></tr> </thead> <tbody> <tr> <td><2</td><td>1/4</td></tr> <tr> <td>2 ... 4</td><td>1/2</td></tr> <tr> <td>>4</td><td>1</td></tr> </tbody> </table> <p>Depending on the application and the required switchpoint the number of turns can be varied.</p> <p>Note: The sensitivity is now setted thus that liquid A or foam is NOT detected.</p>	Dielectric constant of material	Number of turns	<2	1/4	2 ... 4	1/2	>4	1	
Dielectric constant of material	Number of turns									
<2	1/4									
2 ... 4	1/2									
>4	1									
3. Immerse probe in liquid B which should be detected	<p>Ensure that liquid B (which should be detected) is covering the probe.</p> <p>L1 should glow.</p>									
Switchpoint adjustment is finished										

Operation

Measurement through non metal vessel wall

1. Ensure material level is well below the probe	The unit will calibrate to an uncovered probe.	
2. Adjust switchpoint with poti	<p>If LED L1 (yellow) is OFF, turn poti clockwise until L1 is ON.</p> <p>Turn poti counter clockwise until L1 just stops glowing.</p> <p>Turn poti counter clockwise another ca. 1/4 turns. Depending on the application and the required switchpoint the number of turns can be varied.</p>	
3. Ensure material level is well above the probe	L1 should glow.	
Switchpoint adjustment is finished		

Troubleshooting

Symptom	Cause	Action
Green LED off	Proper power not applied to device Power range must equal 12 to 33 V DC at all times (10 to 30 V DC for IS versions)	Check power source Minimum 12 V DC on the terminals when the signal current is 20 mA (minimum 10 V DC for IS versions)
Green LED off, with proper supply	Defective component in device. Connector came loose.	Contact distributor Refasten connector
Green LED on and Yellow LED on while not responding to product and/ or adjustment	Proper power not applied to device. Power range must equal 12 to 33 V DC at all times (10 to 30 V DC for IS versions)	Check power source Minimum 12 V DC on the terminals when the signal current is 20 mA (minimum 10 V DC for IS versions)
Hysteresis region too great	Proper power not applied to device. Power range must equal 12 to 33 V DC at all times (10 to 30 V DC for IS versions)	Check power source Minimum 12 V DC on the terminals when the signal current is 20 mA (minimum 10 V DC for IS versions).
Unequal current in red and black wire	Loop circuitry is DC biased w.r.t. ground Black wire exceeds +36 V DC against ground	Correct loop circuitry. Remove cause of voltage on the red wire and/or bias
Yellow LED won't come on or off	Defective component in device	Contact distributor
Too much current in loop	Supply voltage too high	Ensure power range equals 12 to 33 V DC at all times (10 to 30 V DC for IS versions).
Red LED lights opposite to the Yellow LED when this is not meant to happen	Incorrect polarity on red and black loop terminals	Reverse polarity on loop terminals
Red and Yellow LEDs are blinking fast	Proper power not applied to device. Power range must equal 12 to 33 V DC at all times (10 to 30 V DC for IS versions)	Check power source Minimum 12 V DC on the terminals when the signal current is 20 mA (minimum 10 V DC for IS versions)
Red and Yellow LEDs are blinking while switching	Proper power not applied to device. Power range must equal 12 to 33 V DC at all times (10 to 30 V DC for IS versions)	Check power source Minimum 12 V DC on the terminals when the signal current is 20 mA (minimum 10 V DC for IS versions)
Solid state contact does not follow status Red LED	Defective component in device. Probable cause: wrong wiring in this circuit.	Contact distributor

Troubleshooting / Maintenance

Relay state contact does not follow status Red LED	Proper power not applied to device Power range must equal 12 to 33 V DC at all times Defective component in device.	Check power source Minimum 12 V DC on the terminals when the signal current is 20 mA Contact distributor
Yellow LED is lit while probe is not covered	May indicate significant product buildup.	Rotate sensitivity potentiometer further CCW (counter clockwise) Check sensor tip

Maintenance

The CN 7000 requires no maintenance or cleaning.

Notes for use in Hazardous Locations

Use of this Manual

For use and assembly, refer to the instructions in this Manual. It does contain all instruction as required by ATEX Directive 2014_34_EU, Annex II, 1/0/6 and Ordinance INMETRO n° 179/2010

General notes

Refer to appropriate certificate for application in specific hazardous environment.

The equipment has not been assessed as a safety related device (as referred to by Directive 2014_34_EU Annex II, clause 1.5).

The certificate numbers have an 'X' suffix, which indicates that specific condition of use apply. Those installing or inspecting this equipment must have access to the certificates.

! Qualification of personnel / Servicing / Repair

Installation and inspection of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (ABNT NBR IEC/EN 60079-14 and ABNT/NBR IEC/EN 60079-17 in Europe).

Repair of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (e.g. ABNT NBR IEC/EN 60079-19 within Europe).

Components to be incorporated into or used as replacements in the equipment shall be fitted by suitably trained personnel in accordance with the manufacturer's documentation.

Turn off power before servicing any device (the transmitter is in operation when the power supply is switched on). In case of removing the unit from vessel, take care of process pressure and material passing the opening.

ATEX: Certificates / List of Standards

See www.uwt.de for the latest certificates

See EU - Declaration of conformity for the list of standards valid for ATEX certificates

ATEX: Year of manufacturing

Marking on the name plate is done according to IEC 60062 as follows:

Year of manufacturing	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Marking code	K	L	M	N	P	R	S	T	U	V	W	X

ATEX: Ex-Marking

Devices with ATEX approval are marked on the name plate as follows:

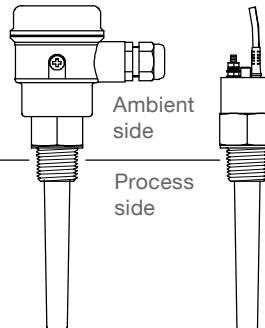
II 1 G Ex ia IIC TX Ga
II 1/2 G Ex ia IIC TX Ga/Gb
II 1 D Ex ia IIIC TX Da
II 1/2 D Ex ia IIIC TX Da/Db

Notes for use in Hazardous Locations

! ATEX: Permitted zones for installation

Devices can be installed as follows:

EPL Category Zone	Dust applications		Gas applications	
	marking Da/Db	marking Da	marking Ga/Gb	marking Ga
	Db	Da	Gb	Ga
	2D	1D	2G	1G
EPL Category Zone	21	20	1	0
	Da	Da	Ga	Ga
	1D	1D	1G	1G
	20	20	0	0



! Specific condition of use

Electrostatic charge	The user shall ensure that the equipment is not installed in a location where it may be subjected to external conditions which might cause a build-up of electrostatic charge on non-conducting surfaces.
Process and ambient temperature	The relation between ambient and process temperature ranges and the surface temperature or temperature class is shown in the thermal data tables page 22.

! Warnings for installation

Intrinsically safe supply	For intrinsically safe models, power must be supplied from an Intrinsically Safe power source, otherwise protection is no longer guaranteed.
Process pressure	The device construction allows process over-pressure up to 10 bar (146 psi). This pressure is allowed for test purposes. The definition of the Ex approvals are only valid for a container-over-pressure between -0.2 .. +0.1 bar (-2.9 .. +1.45 psi). For higher or lower pressures the approvals are not valid.
Chemical resistance against the medium	If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised. Aggressive substances: e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials. Suitable precautions: e.g. establishing from the material's data sheet that it is resistant to specific chemicals.

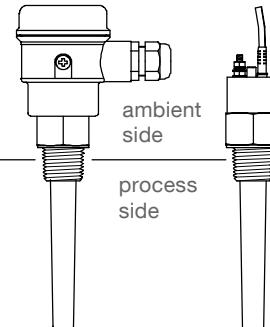
Notes for use in Hazardous Locations

- ! Ambient and process temperature range,
- max. Surface Temperature and Temperature Class

ATEX:

Ambient temperature range	Process temperature range	Max. Surface temperature (EPL Da or Db)	Temperature class (EPL Ga or Gb)
-30 to +45°C (-22 to +113°F) (1)	-30 to +45°C (-22 to +113°F) (1)	T ₂₀₀ 95°C	T6
-30 to +85°C (-22 to +185°F) (1)	-30 to +85°C (-22 to +185°F) (1)	T ₂₀₀ 135°C	T4

(1) With option FFKM O-ring seal: Lower ambient and process temperature limited to -20°C (-4°F)



INMETRO:

Ambient temperature range	Process temperature range	Max. Surface temperature	Temperature class
-40 to +40°C (-40 to +104°F)	-40 to +40°C (-40 to +104°F)	62 °C	T6
-40 to +85°C (-40 to +185°F)	-40 to +100°C (-40 to +212°F)	107 °C	T4

FM:

Ambient temperature range	Process temperature range	Temperature class
-30 to +85°C (-22 to +185°F)	-30 to +100°C (-22 to +212°F)	T4

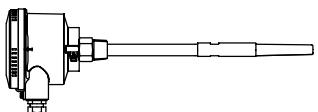
CSA:

Ambient temperature range	Process temperature range	Temperature class
-40 to +85°C (-40 to +185°F)	-40 to +100°C (-40 to +212°F)	T4

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Technical data CN 8100	
	
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Subject to technical change.
All dimensions in mm (inch).

We assume no liability for typing errors.
Different variations than specified are possible.
Please contact our technical consultants.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning may be accomplished only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.
- This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications.

Special attention must be paid to warnings and notes as follows:

WARNING



Relates to a caution symbol on the product: A failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.

WARNING



Relates to a caution symbol on the product: Risk of electric shock

WARNING



A failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product	Description
	CAUTION: refer to accompanying documents (manual) for details.
	Earth (ground) Terminal
	Protective Conductor Terminal

Technical support

Please contact your local supplier (for address see www.uwt.de). Otherwise you can contact:

UWT GmbH
Westendstr. 5
D-87488 Betzigau

Tel.: 0049 (0)831 57123-0
Fax: 0049 (0)831 76879
info@uwt.de
www.uwt.de

Introduction

Applications

CN 8000 is designed for level detection and simple pump control in a variety of applications:

- Liquids, solids (powder and granules), slurries, interface detection (for example, oil/ water), and foam detection
- Foods and pharmaceuticals
- Chemical and petrochemical
- High pressure and temperature

Function

CN 8000 is a versatile capacitance switch, ideal for level detection of interfaces, solids, liquids, slurries, and foam, and for simple pump control.

The switch responds to the presence of any material with a relative dielectric constant of 1.5 or more by detecting a change in capacitance, which is registered as a change in oscillating frequency.

The switch can be set to detect before contact or on contact with the probe. The design of the CN 8000 allows the instrument to operate independently of the tank wall or pipe, so it does not require an external reference electrode for level detection in a nonconductive vessel such as concrete or plastic.

The power supply is galvanically isolated.

The materials used in the probe construction provide a high level of chemical resistance, and an excellent temperature rating on the process wetted portion of the probe: up to 125 °C (257 °F).

CN 8000 is available in two models: the standard model, and the digital model with integral local display.

Features

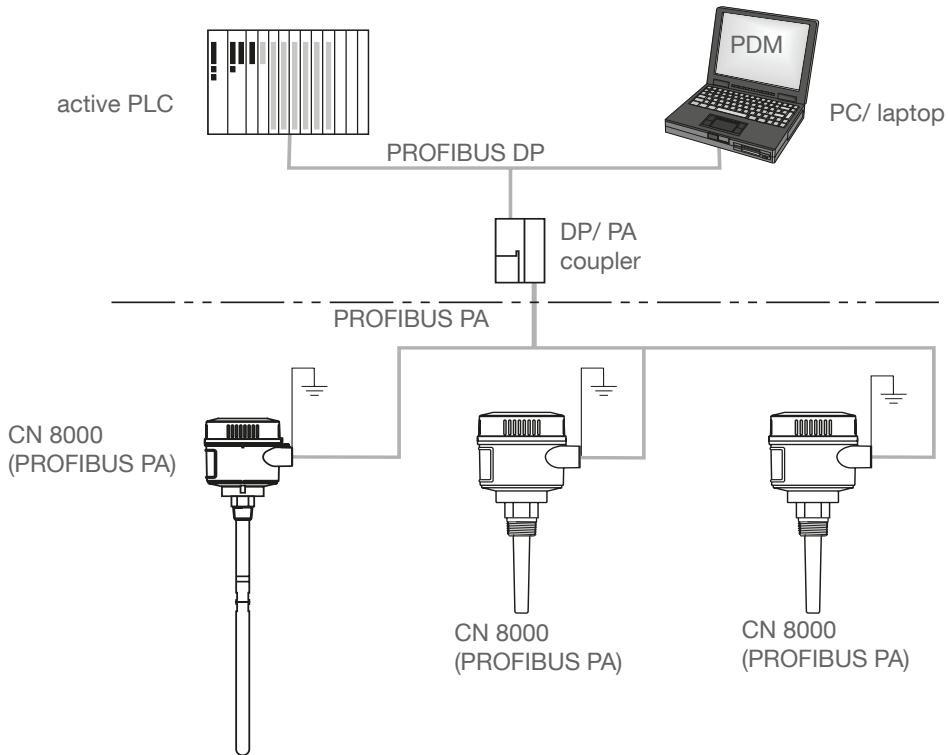
- Potted construction protects components from shock, vibration, humidity, and/or condensation
- High chemical resistance on probes
- Level detection independent of tank wall/pipe
- Freely programmable set up covers wide range of applications/materials
- Integrated Local User Interface (LUI) for ease of use
- Rigid and cable versions available
- Communication via PROFIBUS PA (profile version 3.0, Class B)
- Intrinsically Safe (IS) transmitter design for hazardous areas (requires external barrier or IS power supply)

Introduction

Profibus PA - System Implementation

CN 8000 supports PROFIBUS communication protocol, and SIMATIC PDM software.

Basic PLC configuration with PROFIBUS PA



Programming

CN 8000 carries out its level measurement function according to the set of built-in parameters. You can make parameter changes locally via the local user interface, or from a remote location via a PC using SIMATIC PDM software.

CN 8000 Digital can be used either:

- as a standalone unit, programmed locally using the Local User Interface, or
- installed as part of a network, programmed remotely using SIMATIC PDM on Profibus PA network (or locally using the Local User Interface).

Alarm signalling

The solid-state switch can be set to react either to a diagnosed fault in the instrument, or to a change in the process level.

Fault Signalling

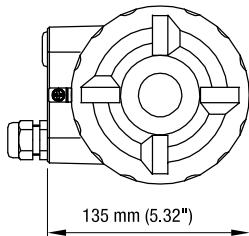
CN 8000 can actively report information on its own status via PROFIBUS PA when used as part of a network, or by means of a pre-defined output status at the solid state switch and on the Local User Interface (LUI).

Technical data - Dimensions

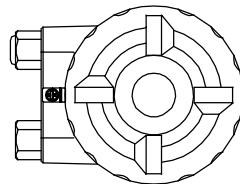
Enclosure

CN 8100
 Top view

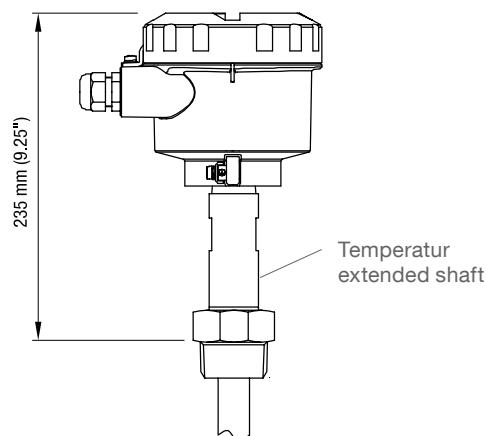
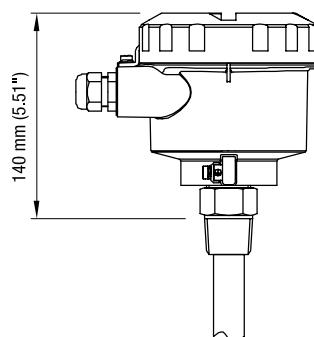
M20x1.5 cable gland



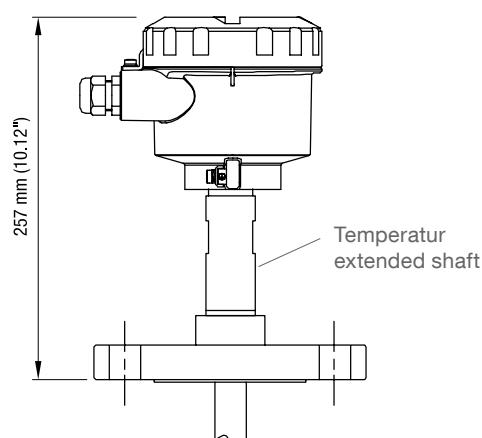
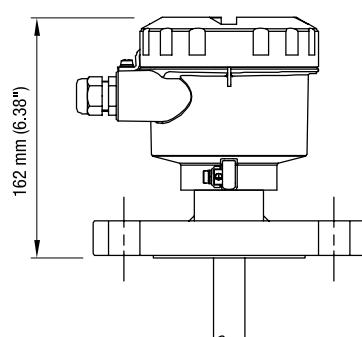
NPT 1/2" conduit



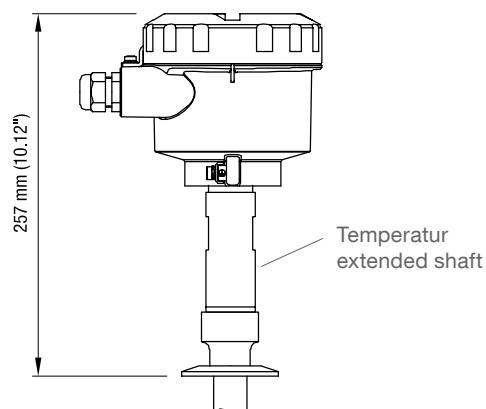
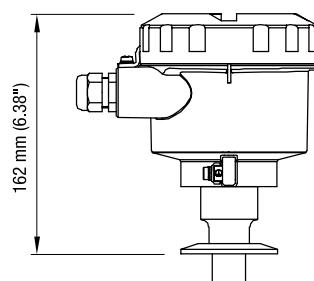
CN 8100
 Threaded
 process connection



CN 8100
 Flanged
 process connection



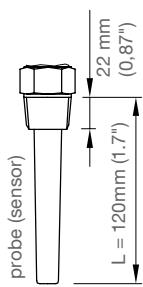
CN 8100
 Triclamp
 process connection



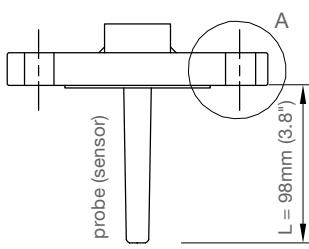
Technical data - Dimensions

CN 8100
Short extension lenght
 Shortest length

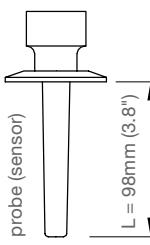
Threaded process connection



Flanged process connection

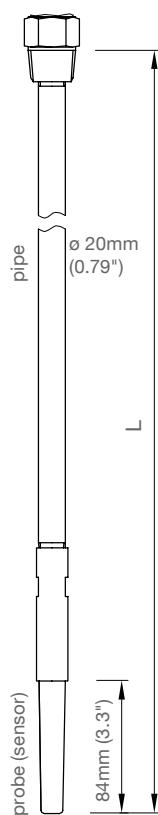


Triclamp process connection

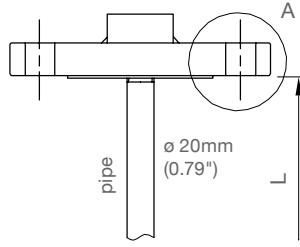


CN 8100
Pipe version
 Extended

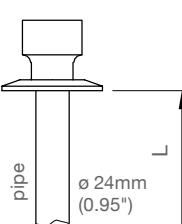
Threaded process connection



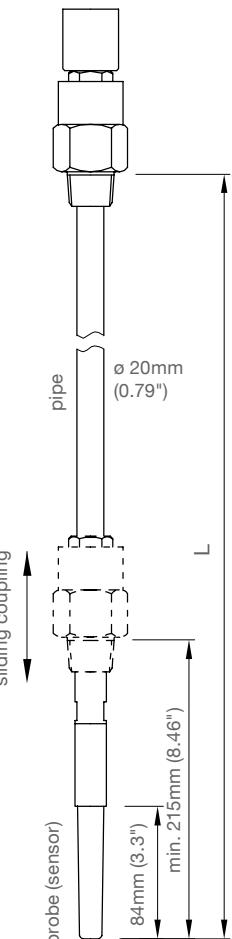
Flanged process connection



Triclamp process connection

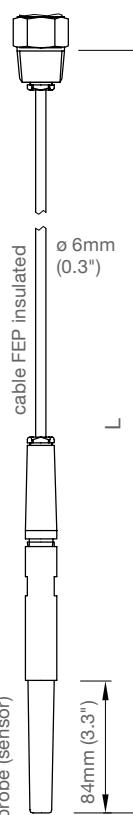


CN 8100
Pipe version
 Extended,
 with Sliding
 coupling (pos.19)

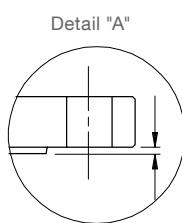
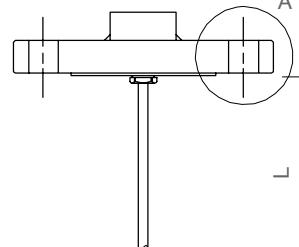


CN 8100
Cable version

Threaded process connection



Flanged process connection



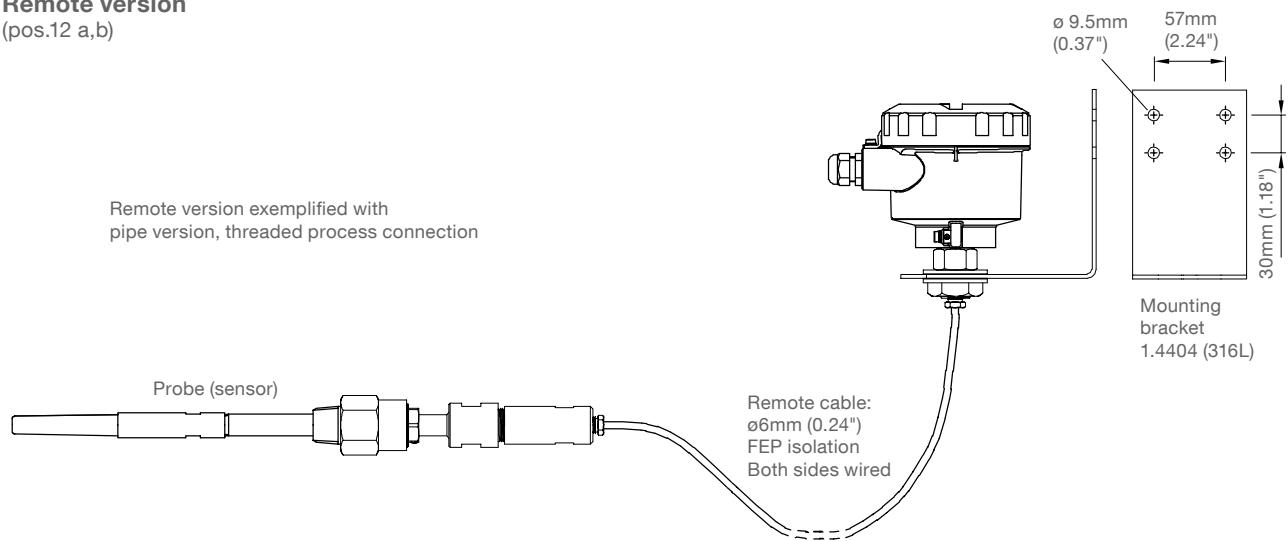
L does not include any raised face (see page 7)

Technical data - Dimensions

CN 8100

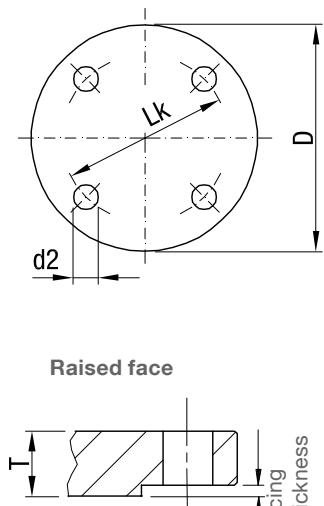
Remote version

(pos.12 a,b)



Flanges

Code	Type	Number of holes	d2 mm (inch)	Lk mm (inch)	D mm (inch)	T thickness mm (inch)
ASME B16.5, raised face	5A 1" 150 lbs	4	15.9 (0.63)	79.3 (3.12)	108.0 (4.25)	14.3 (0.56)
	5B 1" 300 lbs	4	19.1 (0.75)	88.9 (3.5)	123.8 (4.87)	17.5 (0.69)
	5C 1" 600 lbs	4	19.1 (0.75)	88.9 (3.5)	123.8 (4.87)	17.5 (0.69)
	5D 1½" 150 lbs	4	15.9 (0.63)	98.6 (3.88)	127.0 (5.0)	17.5 (0.69)
	5E 1½" 300 lbs	4	22.2 (0.87)	114.3 (4.5)	155.6 (6.13)	20.6 (0.81)
	5F 1½" 600 lbs	4	22.2 (0.87)	114.3 (4.5)	155.6 (6.13)	22.4 (0.88)
	5G 2" 150 lbs	4	19.1 (0.75)	120.7 (4.75)	152.4 (6.01)	19.1 (0.75)
	5H 2" 300 lbs	8	19.1 (0.75)	127.0 (5.0)	165.1 (6.5)	22.2 (0.87)
	5J 2" 600 lbs	8	19.1 (0.75)	127.0 (5.0)	165.1 (6.5)	25.4 (1.0)
	5K 3" 150 lbs	4	19.1 (0.75)	152.4 (6.01)	190.5 (7.5)	23.9 (0.94)
	5L 3" 300 lbs	8	22.2 (0.87)	168.2 (6.62)	209.6 (8.25)	28.6 (1.13)
	5M 3" 600 lbs	8	22.2 (0.87)	168.2 (6.62)	209.6 (8.25)	31.7 (1.25)
	5N 4" 150 lbs	8	19.1 (0.75)	190.5 (7.5)	228.6 (9.0)	23.9 (0.94)
	5P 4" 300 lbs	8	22.2 (0.87)	200.0 (7.87)	254.0 (10.0)	31.7 (1.25)
	5Q 4" 600 lbs	8	25.4 (1.0)	215.9 (8.5)	273.1 (10.75)	38.1 (1.5)
EN 1092-1 type A, flat faced	6A DN25 PN16	4	14.0 (0.55)	85.0 (3.35)	115.0 (4.53)	18.0 (0.71)
	6B DN25 PN40	4	14.0 (0.55)	85.0 (3.35)	115.0 (4.53)	18.0 (0.71)
	6C DN40 PN16	4	18.0 (0.71)	110.0 (4.33)	150.0 (5.91)	18.0 (0.71)
	6D DN40 PN40	4	18.0 (0.71)	110.0 (4.33)	150.0 (5.91)	18.0 (0.71)
	6E DN50 PN16	4	18.0 (0.71)	125.0 (4.92)	165.0 (6.5)	18.0 (0.71)
	6F DN50 PN40	4	18.0 (0.71)	125.0 (4.92)	165.0 (6.5)	20.0 (0.79)
	6G DN80 PN16	8	18.0 (0.71)	160.0 (6.3)	200.0 (7.87)	20.0 (0.79)
	6H DN80 PN40	8	18.0 (0.71)	160.0 (6.3)	200.0 (7.87)	24.0 (0.94)
	6J DN100 PN16	8	18.0 (0.71)	180.0 (7.09)	220.0 (8.66)	20.0 (0.79)
	6K DN100 PN40	8	22.0 (0.87)	190.0 (7.48)	235.0 (9.25)	24.0 (0.94)



Type	Facing thickness
ASME 150 lb	2 mm (0.08")
ASME 300 lb	7 mm (0.28")

Technical data - Electrical data

Electronic module: Standard (Relay SPDT / Solid State)

Power

Supply	12 to 250 V AC/DC (0 to 60 Hz)
Ex approvals	Max. voltage which does not invalidate the intrinsically safe protection of the sensor (probe): Um = 250V AC
Power consumption	2W max.

Performance

Repeatability	±1% of measurement
---------------	--------------------

User Interface

Configuration	Locally, using dip switches and potentiometers
Local display	3 LED indicators
Output	Relay contact and solid-state switch
Polarity-independent	Yes
Failsafe	Relay and solid-state switch can be de-energized in the absence of a sensor signal

Alarm Outputs

Relay	1 Form C (SPDT) contact (selectable NC or NO contact) max. switching voltage/current (DC): 30 V DC / 5 A max. switching voltage/current (AC): 250 V AC / 8 A (resistive load)
Solid-state switch	Rated 30 V DC or peak 30 V AC, 82 mA
Time delay	ON/OFF alarm, duration selectable 1 to 42 seconds / 1 to 100 seconds
Hysteresis	Dependent on DK: max. 2 mm (0.08") @ DK = 1.5
Failsafe operation	Failsafe High or Failsafe Low
Delay timers	2: Alarm ON to OFF and Alarm OFF to ON

Electronic module: Digital (Profibus PA / Solid State)

Power

Bus voltage	12 to 30 V DC, 12.5 mA
- General purpose	
- Intrinsically Safe	12 to 24 V DC, 12.5 mA, FISCO Field Device Intrinsically safe barrier required for ATEX: U _i = 24V I _i = 380mA P _i = 5.32W C _i = 5nF L _i = 10uH for FM/CSA: see page 23
Ex approvals (Flameproof, Dust ignition proof)	Max. voltage which does not invalidate the intrinsically safe protection of the sensor (probe): Um = 250V AC
Starting current < current of normal operation	Yes
Fault current	0 mA (max. uninterrupted current minus current of normal operation)
Fault disconnect equipment (FDE)	Yes
Auxiliary source	Bus powered
Separate supply necessary	No

Performance

Repeatability	Approx. ± 2 mm for a conductive fluid
---------------	---------------------------------------

Technical data - Electrical data

User Interface

Configuration

Locally, using local user interface (LUI), for standalone operation, or
 Remotely, using SIMATIC PDM on a Profibus PA network

Local Digital Display	LCD
Output (bus)	PROFIBUS PA (IEC 61158 CPF3 CP3/2) Bus physical layer: IEC 61158-2 MBP(-IS)
Polarity-independent	yes
Simultaneous communication with Master Class 2	4 (max.)
Cyclic User data (normal operation)	
Byte output	2 bytes representing one value
Byte input	0
Device profile	PROFIBUS PA Profile for Process Control Devices Version 3.0, Class B
Function blocks	1
Discrete input	1
Logical inversion	Parameterizable
Simulation functions	
Output	yes
Input	yes
Failsafe	Parameterizable (last usable value, substitute value, erroneous value)
Block Structure	
Physical block	1
Transducer block	1
Transducer block discrete input	Yes
Monitoring measuring limits	Yes

Signal Output

Solid-state switch	Galvanically isolated, non-polarity sensitive transistor Rated 30V DC or peak AC max., 82mA max Voltage drop below 1 V typical @ 50 mA With Intrinsically safe: barrier required for ATEX: $U_i = 30V$ $I_i = 200mA$ $P_i = 350mW$ $C_i = 0$ $L_i = 0$ for FM/CSA: see page 23
Time delay	Controlled by software 2 delay timers: alarm ON delay and alarm OFF delay)
Hysteresis	100% adjustable
Failsafe operation	Failsafe High or Failsafe Low
Terminal	Removable terminal block, 2.5 mm ² max.

Diagnostics

Input Reed contact: for test function

Technical data - Mechanical data

Probe

Model	Length (max)	Process Connections	Extension	Tensile (max)	Wetted Parts
Pipe	5,500 mm/216.5"	<ul style="list-style-type: none"> • Threaded: ¾" 1" 1 ½" BSPT (R), BSPP (G) ¾" 1" 1 ¼" 1 ½" NPT • Welded flange: ASME 1" 1 ½" 2" 3" 4" DN 25 40 50 80 100 • Triclamp: 1" 1 ½" 2" 2 ½" 3" ISO2852 	1.4404 (316L)	n/a	<ul style="list-style-type: none"> • 1.4404 (316L) optional PFA coating • FKM seals optional FFKM • PPS probe optional PVDF
Cable	30,000 mm/1,181.1"	<ul style="list-style-type: none"> • Threaded: ¾" 1" 1 ½" BSPT (R), BSPP (G) ¾" 1" 1 ¼" 1 ½" NPT • Welded flange: ASME: 1" 1 ½" 2" 3" 4" DN 25 40 50 80 100 	FEP (Fluorinated Ethylene Polymer)	180 kg/400 lbs	<ul style="list-style-type: none"> • 1.4404 (316L) • FEP jacketed cable • FKM seals optional FFKM • PPS probe optional PVDF

Enclosure

Termination

Removable terminal block

Tightening torque of terminal screws: 0.5 to 0.6 Nm

Conductor cross section:

- | | |
|--|--|
| 1 conductor | 2 conductors with same cross section |
| - solid: 0.2 to 2.5 mm ² | - solid: 0.2 to 1.0 mm ² |
| - flexible: 0.2 to 2.5 mm ² | - stranded: 0.2 to 1.5 mm ² |
| - flexible, with ferrule with or without plastic sleeve: 0.25 to 2.5 mm ² | - stranded, with ferrule without plastic sleeve: 0.25 to 1.0 mm ² |
| - AWG 24 to 12 | - stranded, TWIN ferrule with plastic sleeve: 0.5 to 1.0 mm ² |

Construction	Powder-coated aluminum with gasket
Optional thermal isolator	1.4404 (316L) stainless steel
Cable entry	2 x M20 thread, option: 2 x 1/2" NPT thread with adaptor
	With ATEX approval: - Default: 2x M20x1.5 - With selection of option Pos.33a: 2x NPT ½" tapered ANSI B1.20.1
Ingress protection	Type 4 / IP65 or IP68 (depending on Cable Entry option)

Note: The use of approved watertight conduit hubs/glands is required for Type 4 / IP65 or IP68 (outdoor applications).

Separation between Zone 0 and Zone 1 (ATEX II 1/2G)	Material of the separation element (partition wall) - Stainless steel, 1.4404 (316L) - Glass, Inconel 600 (Glass seal)
---	--

Weight

Weight varies based on configuration. For example:

- compact, 100 mm (4") insertion length,
¾" process connection 1 kg (2.20 lb.) approx.

Technical data - Operating conditions

Environmental

Location	Indoor/outdoor
Altitude	2.000 m (6.562 ft.) max.
Ambient temperature	-40 to 85 °C (-40 to 185 °F) With ATEX approval: Depending on Surface Temperature and Temperature Class, details see page 36 / 37.
LUI (local user interface)	-30 to 85 °C (-22 to 185 °F)
Storage temperature	-40 to 85 °C (-40 to 185 °F)
Relative humidity	Suitable for outdoor
Installation category	II (Electronic module : Standard) I (Electronic module : Digital)
Pollution degree	4

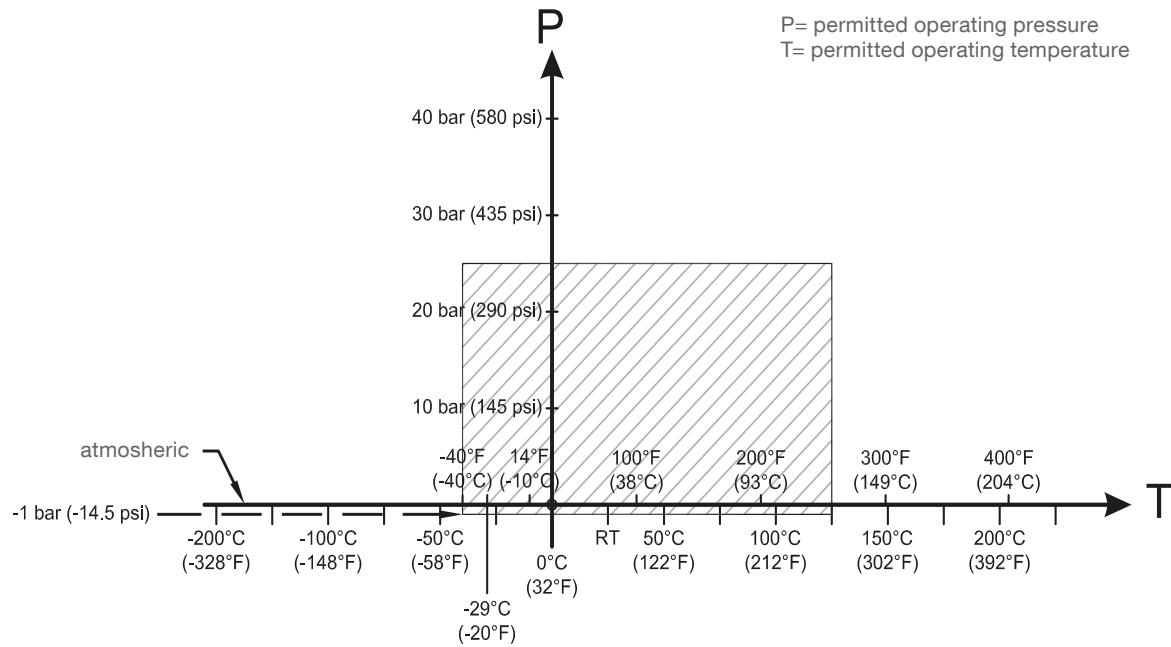
Process

Relative dielectric constant	1.5 minimum
Temperature at process connection	Without temperature extended shaft: -40 to 85 °C (-40 to 185 °F) - 20 to 85°C (-4 to +185°F) with option FFKM seal O-ring With temperature extended shaft: -40 to 125 °C (-40 to 257 °F) - 20 to 125°C (-4 to +257°F) with option FFKM seal O-ring With ATEX approval: Depending on Surface Temperature and Temperature Class, details see page 36 / 37.
Pressure (vessel): - pipe version - cable version / triclamp version - sliding coupling version	-1 to 25 bar g/-14.6 to 365 psi g (nominal) -1 to 10 bar g/-14.6 to 150 psi g (nominal) -1 to 10 bar g/-14.6 to 150 psi g (nominal)
Note: please see Pressure versus Temperature Curves on next pages.	

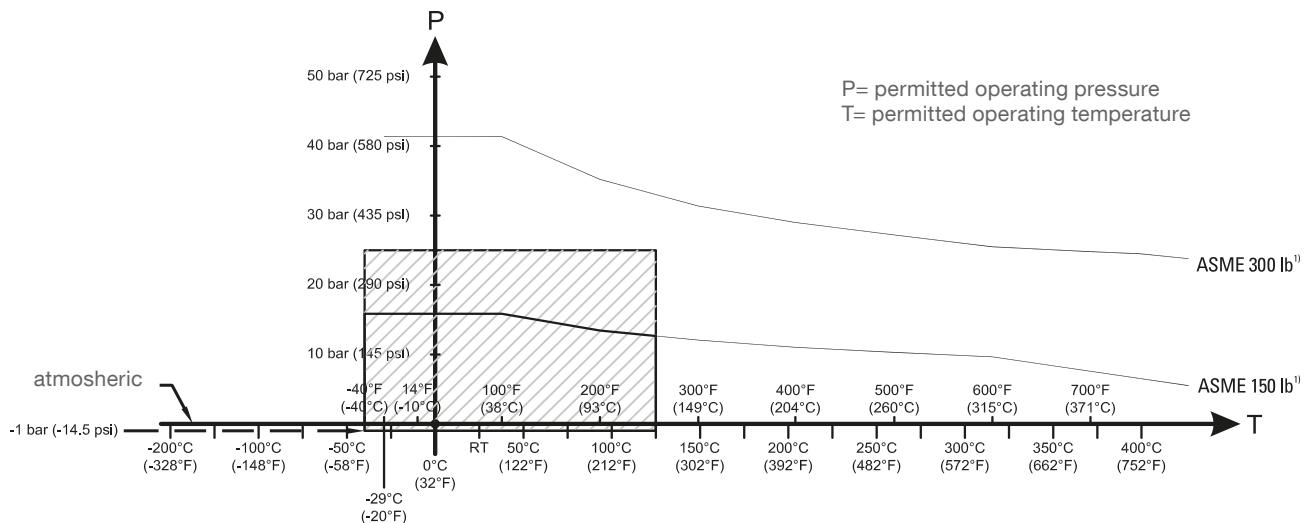
Technical data - Operating conditions

Pressure versus Temperature Curves

Shortest length and extended pipe, threaded



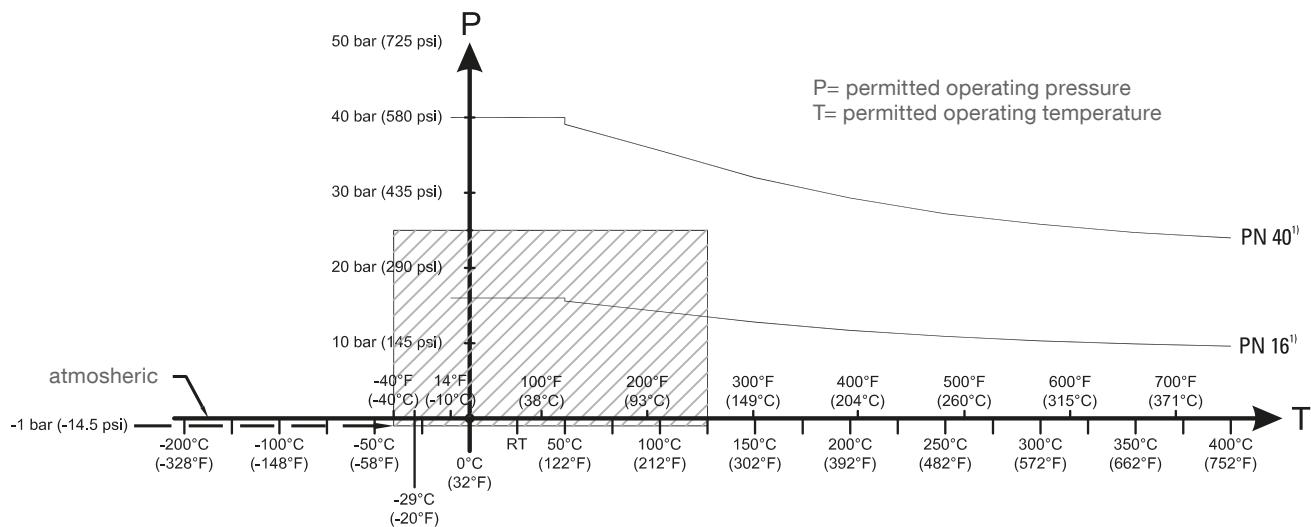
Shortest length and extended pipe, ASME welded flange



1) The curves denote the minimum allowable flange class for the shaded area below.

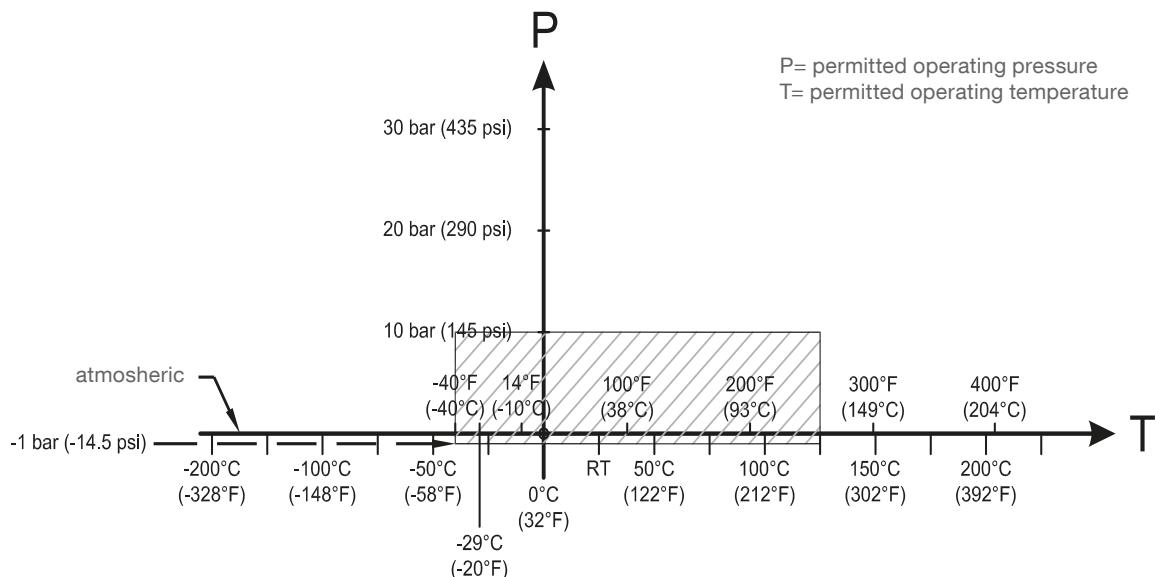
Technical data - Operating conditions

Shortest length and extended pipe, EN welded flange



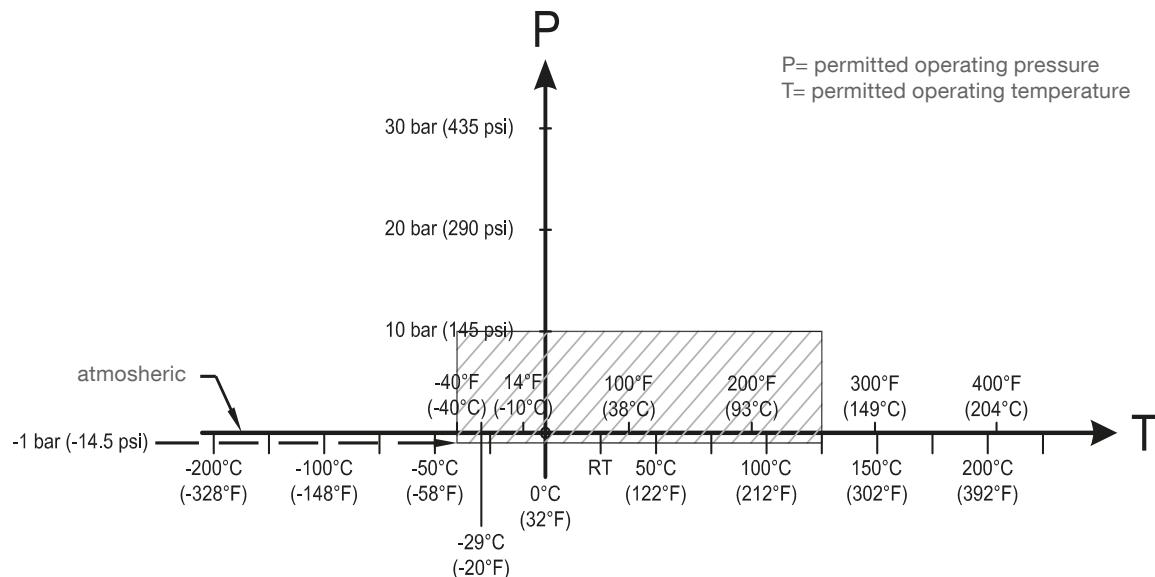
1) The curves denote the minimum allowable flange class for the shaded area below.

Tricclamp

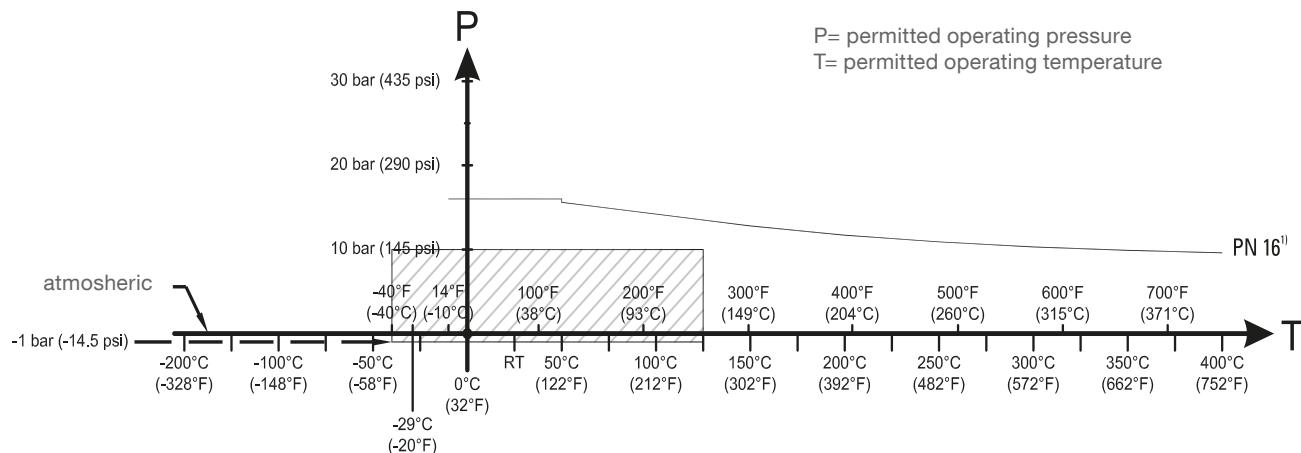


Technical data - Operating conditions

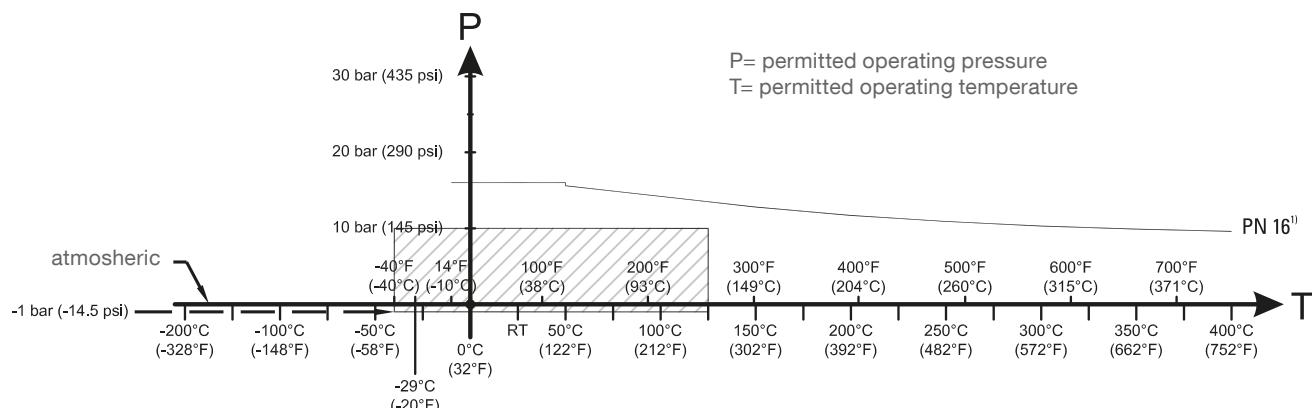
Cable, threaded



Cable, ASME welded flange



Cable, EN welded flange



1) The curves denote the minimum allowable flange class for the shaded area below.

Approvals

Electronic module: Standard (Relay SPDT / Solid State)

General Purpose	CE, CSA, FM, TR-CU
Dust Ignition Proof	ATEX II 1/2D, IIIC CSA/FM Class II, Div. 1, Gr. E, F, G Class III TR-CU INMETRO
Flame Proof / Explosion Proof	ATEX II 1/2G, IIC CSA/FM Class I, Div. 1, Gr. A, B, C, D TR-CU INMETRO KC
Marine	Lloyds Register of Shipping, Categories ENV1, ENV2 and ENV5
Overfill Protection	WHG

Electronic module: Digital (Profibus PA / Solid State)

General Purpose	CE, CSA, FM, TR-CU
Dust Ignition Proof	ATEX II 1/2D, IIIC CSA/FM Class II, Div. 1, Gr. E, F, G Class III TR-CU INMETRO
Flame Proof / Explosion Proof	ATEX II 1/2G, IIC CSA/FM Class I, Div. 1, Gr. A, B, C, D TR-CU INMETRO KC
Intrinsically Safe ¹	ATEX II 1G, IIC ATEX II 1/2D, IIIC CSA/FM Class I, Div. 1, Gr. A, B, C, D TR-CU
Type of protection n Non-incendive	ATEX II 3G, IIC CSA/FM Class I, Div. 2, Gr. A, B, C, D

¹ Barrier or Intrinsically Safe power supply required for Intrinsically Safe protection

Note: EN 61326 (CE EMC) testing was conducted while mounted in a metallic vessel and wired using shielded cable, where the cable was terminated in an EMC cable gland at the device entry point. In addition, units with a flange process connection were mounted using a metallic gasket.

Mounting

! General Safety Instructions

- Installation shall only be performed by qualified personnel and in accordance with local governing regulations.
- This product is susceptible to electrostatic shock. Follow proper grounding procedures.
- The housing may only be opened for maintenance, local operation, or electrical installation.
- Before installing the instrument, verify that the environment complies with any restrictions specified on the product nameplate.
- To comply with CE EMC regulations, where applicable, the CN 8000 should be installed in accordance with the testing details on page 15.

! Additional Safety Instructions for Hazardous Locations

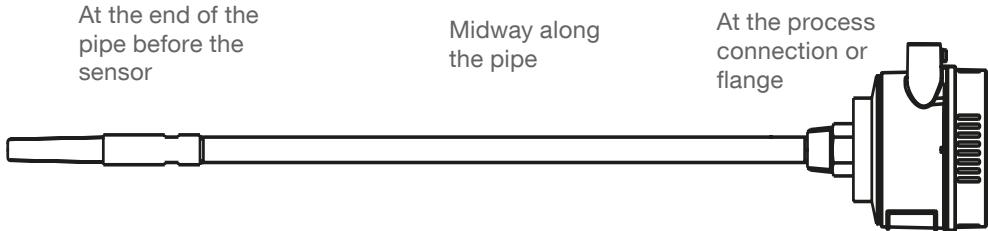
see page 31ff

Handling Precautions

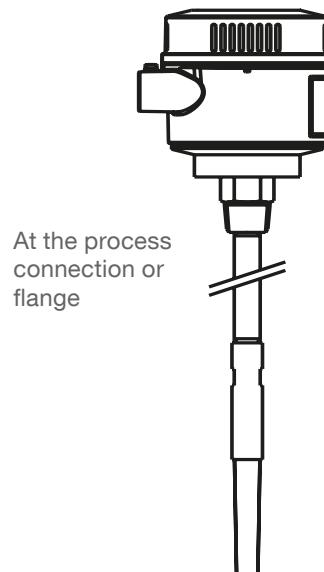
! WARNING:

- To prevent damage, all units with a pipe longer than 2 m (6.5 ft) must be handled as described below.

When lifting CN 8000 from a horizontal position, support it at these three points:



Once vertical, CN 8000 may be held by the process connection or flange:



Note:

Unit shown with extended pipe version.
Handling precautions apply to all units with pipes longer than 2 m (6.5 ft).

Mounting

Location

Recommended:

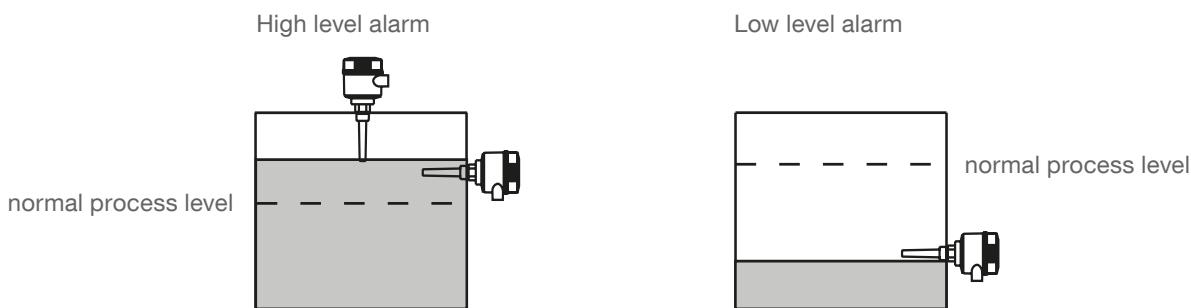
- Provide a sun shield to protect the transmitter from direct heat radiation.

Precautions:

- Avoid mounting CN 8000 in locations subject to strong vibrations in the vicinity, whenever possible.
- Do not exceed the permissible ambient temperature limits (see Environmental on page 11 for details).

Mounting

Compact probe



For high level alarm (level exceeds normal process level):

- normally mounted into the vessel top, or
- mounted through the tank wall at the detection level

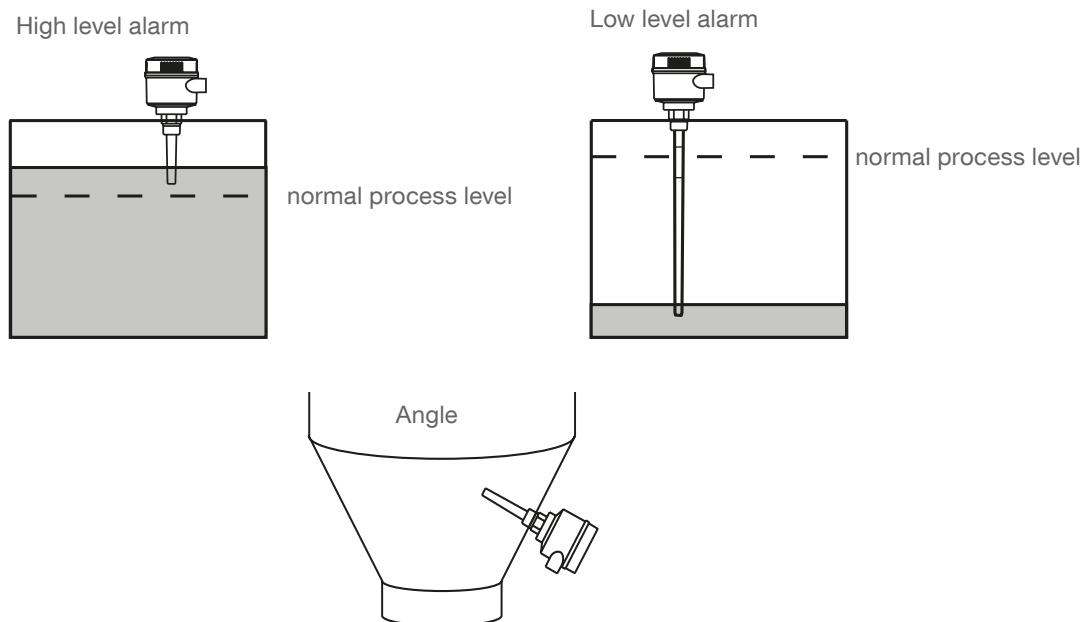
For low level alarm (level drops below normal process level):

- mounted through the tank wall at the detection level

Typical configuration with extensions

For high or low level alarm:

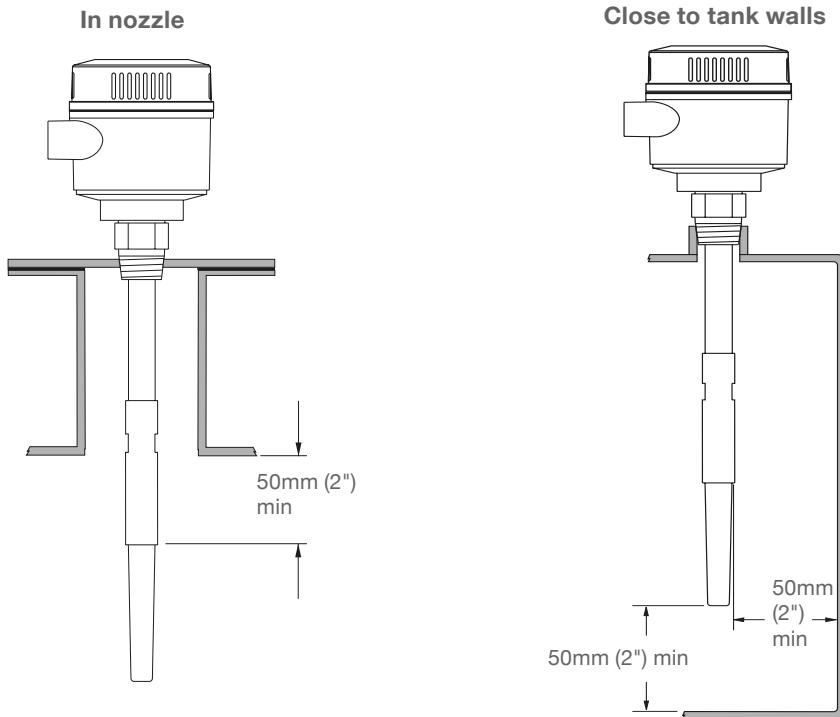
- designed for top mounting. The probe suspends vertically so that it reaches into the process at the desired detection level (high or low detection alarm).



Mounting

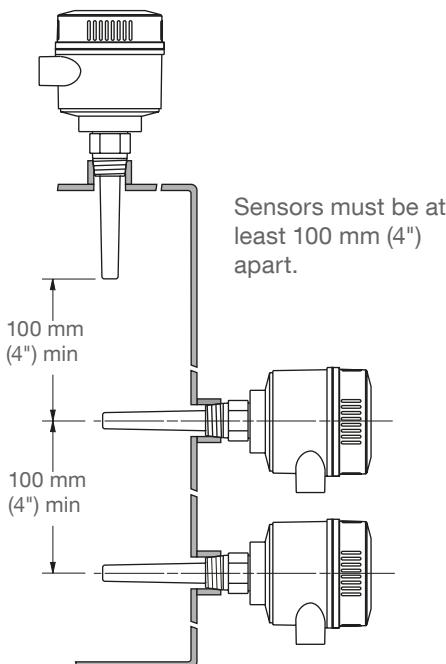
Mounting Restrictions

- ! • Keep the sensor at least 50 mm (2") away from any nozzle or tank wall.
- If multiple units are used, allow at least 100 mm (4") between them, to prevent interference.

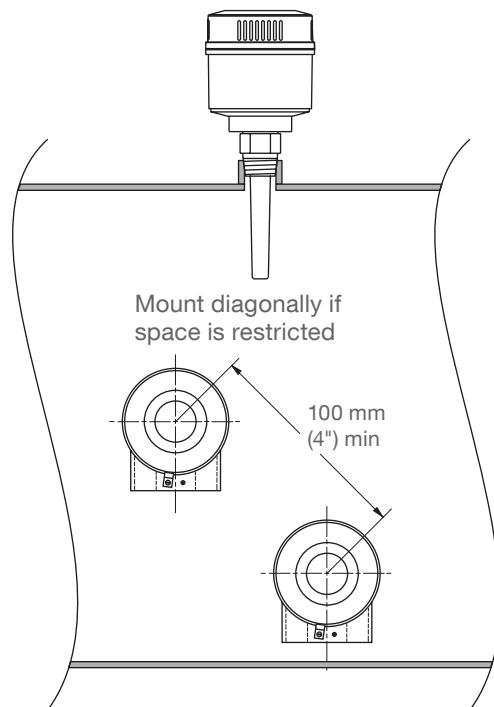


Multiple Units

Side View



End View

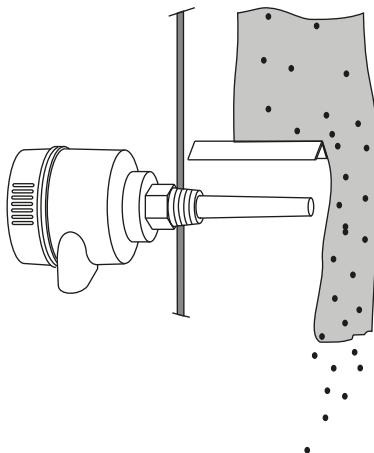
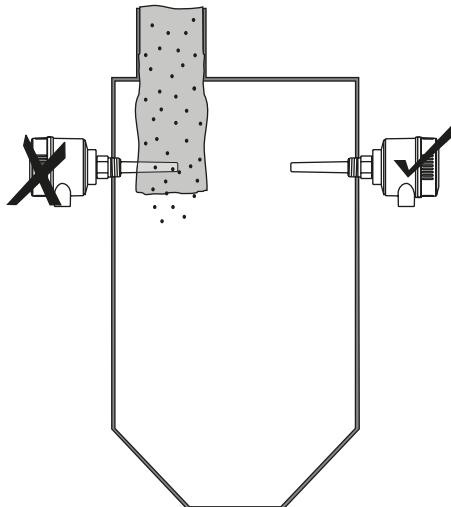


Mounting

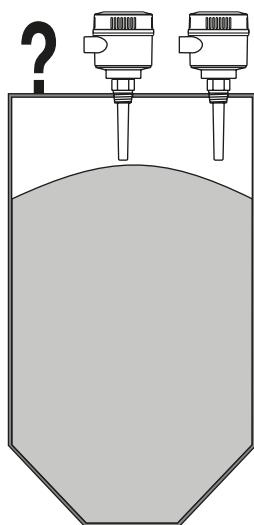
! Process Cautions for solids

In Hazardous Locations: Observe Specific condition of use for electrostatic charge (see page 34)

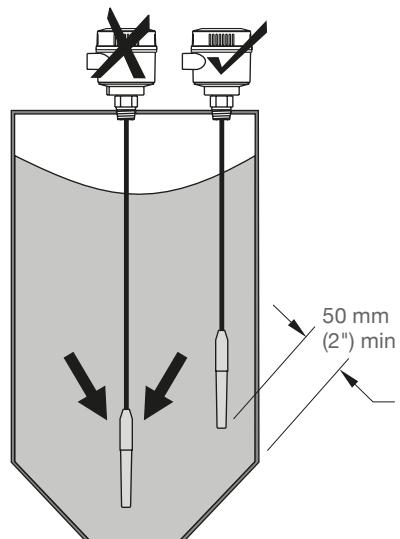
- The maximum allowable torque on a horizontally installed pipe is 15 Nm.
- Keep unit out of path of falling material, or protect probe from falling material.



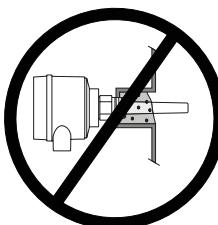
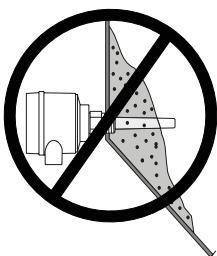
Consider material surface configuration when installing unit.



Tensile load must not exceed probe or vessel rating (see Tensile (max) on page 10).



Avoid areas where material build up occurs.



Electrical installation

! General Safety Instructions

Electronic module: Standard (Relay SPDT / Solid State)

WARNING:

- All field wiring must have insulation suitable for at least 250 V.
- Only qualified personnel are authorized to install and operate this equipment in accordance with established safety practices and standards.

- The Protective Earth Terminal indicated by  must be connected to reliable ground. Use crimp type cable socket for 4 mm screw diameter, ring form or U-form (e. g. DIN 46234). In case of non-metallic vessels, the external earth wire should be connected to an earthed component which is earthed near the vessel.
- All wiring must be done by qualified personnel in accordance with all governing regulations.
- The equipment must be protected by a 16A fuse or circuit breaker in the building installation.
- A circuit breaker or switch in the building installation, marked as a disconnect switch, shall be in close proximity to the equipment and within easy reach of the operator.
- Use shielded cable, wire gauge 20 AWG to 14 AWG (0.5 mm² to 2.0 mm²). For CE installations use a cable with a braided metallic shield (or armoured cable where applicable).
- Maximum working voltage between adjacent relay contacts is 250 V.
- Relay contact terminals are for use with equipment which has no accessible live parts and wiring which has insulation suitable for at least 250 V.
- Cable entry devices and closing elements of unused apertures must meet a temperature range from min. -40°C to 10 K above max. ambient temperature.

Electronic module: Digital (Profibus PA / Solid State)

WARNING:

- Observe the specifications of the examination certificate valid in your country.
- Observe the laws and regulations valid in your country for electrical installations in potentially explosive atmospheres.
- Refer to Hazardous Area Installation on page 31 if applicable.
- Ensure that the available power supply complies with the power supply specified on the product nameplate and specified in the examination certificate valid in your country.
- Shipping plugs in the cable inlets must be replaced by suitable screwtype glands or dummy plugs, which are appropriately certified for transmitters with explosion-proof protection.
- For CE installations, use a cable with a braided metallic shield (or armoured cable where applicable).
- The lid must not be opened in wet locations while the unit is powered. (A wet location is a location where water or another conductive fluid may be present and is likely to increase the risk of electric shock.)
- Cable entry devices and closing elements of unused apertures must meet a temperature range from min. -40°C to 10 K above max. ambient temperature.

Notes:

- Lay PROFIBUS PA cable separately from power cable with voltages greater than 60 V.
- Avoid locating the unit near large electrical equipment wherever possible.
- Connect the cable shield to earth (for example, to the housing by means of a metallic screwed gland).

Additional Safety Instructions for Hazardous Locations

! see page 31ff

Electrical installation

Electronic module: Standard (Relay SPDT / Solid State)

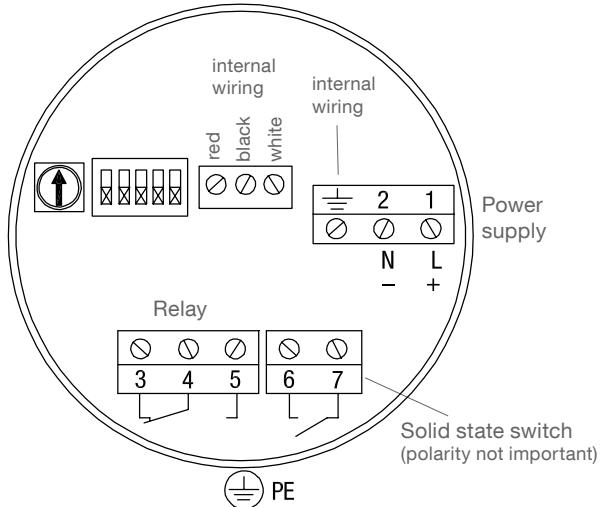
Power supply:

12 to 250 V AC/DC (0 to 60 Hz)
 2W max.

Signal output:

Relay:
 Floating relay SPDT
 AC max. 250V, 8A, 2000VA, non inductive
 DC max. 30V, 5A, 150W, non inductive

Solid state switch:
 30 V DC or 30 V AC (peak), 82 mA
 Observe protection (see below)



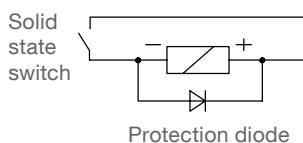
1. Loosen the lid clip and remove the lid to access the connectors and electronics.
2. Connect the wires to the terminals
3. Ground the instrument according to local regulations.
4. Tighten the gland to form a good seal.

Connect protective earth wire to terminal provided in housing and marked with

Use crimp type cable socket for 4 mm screw diameter, ring form or U-form (e. g. DIN 46234).

Protection of Solid State Switch

Observe a Protection diode in case of connecting an external relay to the Solid state switch



Note: Switch and potentiometer settings are for illustration purposes only.

Electrical installation

Electronic module: Digital (Profibus PA / Solid State)

Power supply:

12 .. 30 V DC, 12.5 mA

Intrinsically Safe:

12 .. 24 V DC, 12.5 mA

Intrinsically safe barrier required

For ATEX: $U_i=24$ V, $I_i=380$ mA, $P_i=5.32$ W, $C_i=5$ nF, $L_i=10$ uH

For FM/ CSA: See "Connection drawing on page 23"

Signal output:

Solid state switch:

30 V DC or 30 V AC (peak), 82 mA

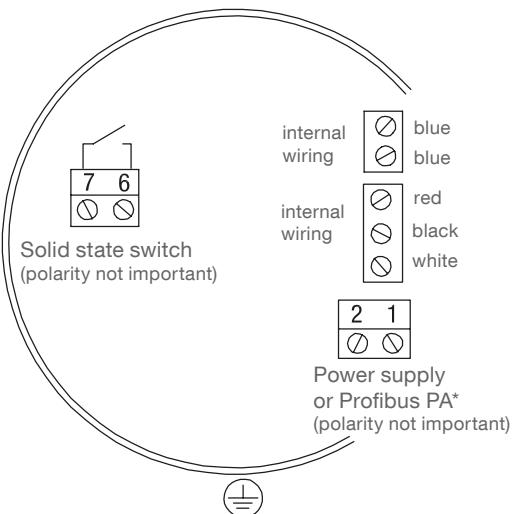
Observe protection (see below)

Intrinsically safe:

Intrinsically safe barrier required

For ATEX: $U_i=30$ V, $I_i=200$ mA, $P_i=350$ mW, $C_i=0$, $L_i=0$

For FM/ CSA: See "Connection drawing on page 23"



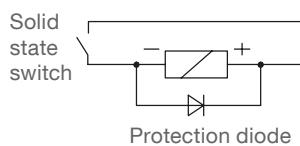
* With use of Profibus PA the wiring must be according to Profibus PA standards.
 If Profibus PA is not used, a shielded cable is recommended to ensure stable measurement.

Connect protective earth wire to terminal provided in housing and marked with

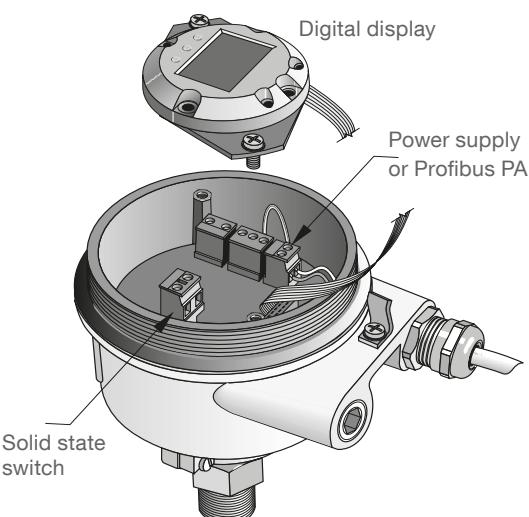
Use crimp type cable socket for 4 mm screw diameter, ring form or U-form (e.g. DIN 46234).

Protection of Solid State Switch:

Observe a Protection diode in case of connecting an external relay to the Solid state switch



Connecting the electronic module:



1. Loosen the lid clip and unscrew the lid of the enclosure.
2. Unscrew and lift up the digital display (loosen each screw two turns before completely loosening both, to keep the rubber retaining rings in place.)
3. Connect the wires to the terminals
4. Ground the instrument according to local regulations.
5. Tighten the cable gland to form a good seal.
6. Fix the digital display.
7. To adjust the transmitter locally, using the keypad, go to Programming via the Local User Interface (LUI). After adjustment, replace the enclosure lid and tighten the lid clip.

Electrical installation

FM/CSA approval Connection drawing

GROUPS A, B, C, D, E, F, G; II C		GROUPS C, D, E, F, G; II B	
Entity Parameter	Current Loop Output	Solid State Output	Current Loop Output
Ui (Vmax)	24 V	30 V	24 V
Ii (Imax)	380 mA	110 mA	380 mA
Pi	5.32 W	825 mW	5.32 W
Ci	5 nF	0	5 nF
Li	10 μ H	0	10 μ H

Unclassified Location

Temperature class:
 T4 for -40°C <= ambient temperature <= +85°C
 T6 for -40°C <= ambient temperature <= +40°C

RF 8000 / CN 8000 init

External frame earth terminal

Communication I/O

Note 3

Solid state output

Alarm Output

Point Level Sensors

NOTES.

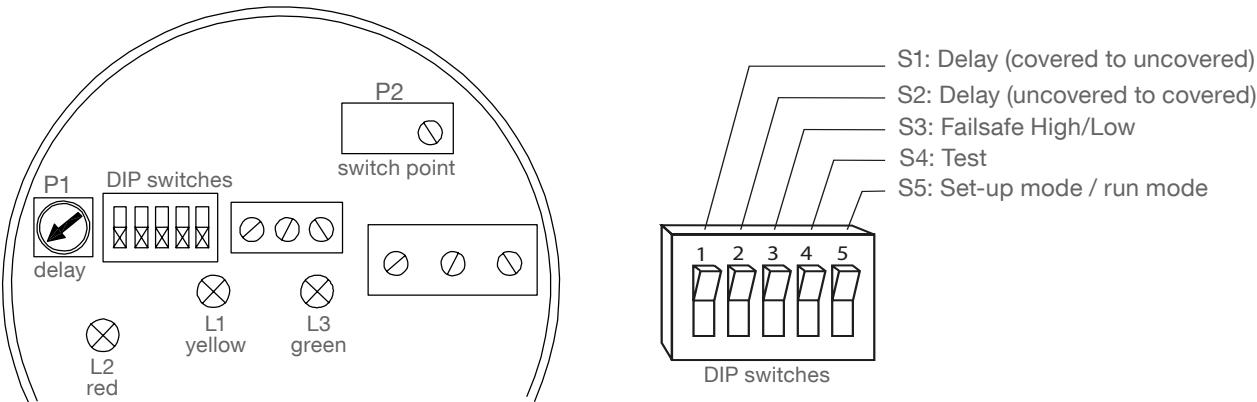
- 1) Fieldbus input: specified to the fisco model
 - 2) Manufacture's installation instructions must be followed for installation of Associated Intrinsically Safe Apparatus
 - 3) Either one or both wire pairs between Associated Intrinsically Safe Apparatus must be grounded screened or shielded wires.
 - 4) For FM: Installation must be in accordance with ANSI / ISA 12.06.01 and the National Electrical Code (ANSI / NFPA 70)
 - 5) For CSA: Installation must be in accordance with applicable section of Canadian Electrical Code (CEC)
 - 6) For Division 2 installation, associated apparatus is not required, installation must be in accordance with Division 2 wiring methods and supply voltage must not exceed 30 Volts
 - 7) Dust-tight seals must be used for Class II and III installations
 - 8) The RF 8000 / CN 8000 transmitter is approved for Class I, Zone 0 applications if connecting to ATEX/IECEx rated Associated Intrinsically Safe Apparatus. The transmitter is suitable only for Class I, Zone 1 or Zone 2, and not suitable for Class 1, Zone 0 or Class, Division 1 applications
 - 9) For FM the unit must be installed using FM Approved Apparatus

Installation must in accordance with the National Electrical Code (R) NFPA 70 Article 504 and ANSI/ISA-RP-12.06.01



Operation - Electronic module: Standard

Settings



LEDs

- L1: Sensor status (yellow)
 ON if sensor is detected as covered (capacitance on sensor is greater than setted switch point)
- L2: Signal output (red)
 ON if Relay is activated / Solid state switch is closed.
- L3: Power supply (green)
 ON if power is present

S1 / S2: Signal output delay

Use the delay function to slow the signal output response, and compensate for turbulence or false readings.

S1	Delay off Delay active*	Signal output delay: Sensor covered to uncovered 	P1 Delay time / seconds 14 21 28 7 35 42
S2	Delay off Delay active*	Signal output delay: Sensor uncovered to covered 	P1 Delay time / seconds 12 25 40 60 1* 80 100

*Factory setting

*Factory setting

S3: Failsafe High / Low

Failsafe Mode	S3		
Failsafe High			
Failsafe Low*			

*Factory setting

Operation - Electronic module: Standard

S4: Test

Allows to test the setted signal output delay time without the need to change the sensor from covered to uncovered or from uncovered to covered.

S4		Normal operation*	
S4		<p>Test mode</p> <p>If sensor is uncovered: Setting S4 to Test mode simulates a covered probe. After the setted delay time "Sensor uncovered to covered" (see DIP switch S2) has passed, the signal output and LED2 (red) are switching.</p> <p>If sensor is covered: Setting S4 to Test mode simulates a uncovered probe. After the setted delay time "Sensor covered to uncovered" (see DIP switch S1) has passed, the signal output and LED2 (red) are switching.</p>	

*Factory setting

S5: Set-up mode / run mode

S5		Run mode*	Normal operation after switchpoint adjustment is complete.
S5		Set-up mode	Use this setting only during switchpoint adjustment.

*Factory setting

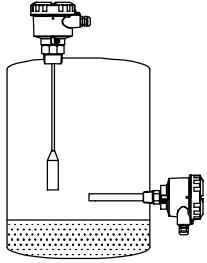
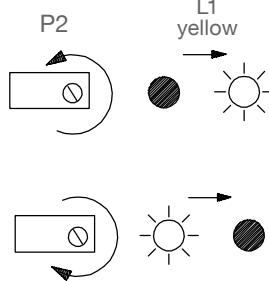
Operation - Electronic module: Standard

Switchpoint Adjustment

Select the switchpoint adjustment according to the application as follows:

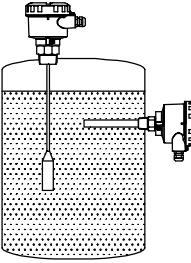
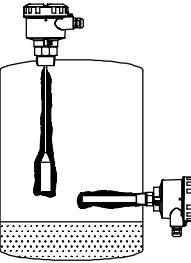
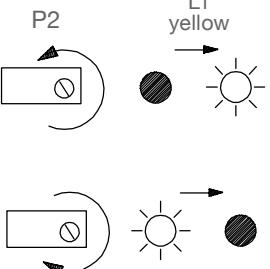
Application	Material	Adjustment conditions
General	<ul style="list-style-type: none"> Dry solids Low viscosity liquids 	Sensor uncovered
Demanding	<ul style="list-style-type: none"> Hygroscopic / wet solids High viscosity and high conductivity liquids 	Sensor immersed and then uncovered, retaining max. possible material buildup
Interface detection	<ul style="list-style-type: none"> Ignoring liquid A / detecting liquid B Ignoring foam / detecting liquid 	Immerse sensor in liquid A or foam

General applications

1. Ensure material level is well below the probe	The unit will calibrate to an uncovered probe.	
2. Set to Set-up mode	Set dip switch S5 to Set-up mode	
3. Adjust switchpoint with poti P2	<p>If LED L1 (yellow) is OFF, turn poti P2 counter clockwise until L1 is ON.</p> <p>Turn P2 clockwise until L1 just stops glowing.</p>	
4. Set to Run mode	Set dip switch S5 to Run mode	
Switchpoint adjustment is finished		

Operation - Electronic module: Standard

Demanding applications

1. Ensure material level is well above the probe.	In case of top mounting with cable extension the vessel should be filled up.	
2. Ensure material level is well below the probe	It is important that as much material buildup as possible is retaining on the sensor.	
3. Set to Set-up mode	Set dip switch S5 to Set-up mode	
4. Adjust switchpoint with poti P2	If LED L1 (yellow) is OFF, turn poti P2 counter clockwise until L1 is ON. Turn P2 clockwise until L1 just stops glowing.	
5. Set to Run mode	Set dip switch S5 to Run mode	
Switchpoint adjustment is finished		

Operation - Electronic module: Standard

Interface detection

1. Immerse probe in liquid A or in foam which should NOT be detected	<p>Ensure that liquid A or foam (which should NOT be detected) is covering the probe.</p> <p>Liquid A or foam must have a lower dielectric constant than liquid B, which should be detected.</p>	
2. Set to Set-up mode	Set dip switch S5 to Set-up mode	
3. Adjust switchpoint with poti P2	<p>If LED L1 (yellow) is OFF, turn poti P2 counter clockwise until L1 is ON.</p> <p>Turn P2 clockwise until L1 just stops glowing.</p> <p>Note: The sensitivity is now setted thus that liquid A or foam is NOT detected.</p>	
4. Set to Run mode	Set dip switch S5 to Run mode	
5. Immerse probe in liquid B which should be detected	<p>Ensure that liquid B (which should be detected) is covering the probe.</p> <p>L1 should glow.</p>	
Switchpoint adjustment is finished		

Operation - Electronic module: Standard

Troubleshooting

Symptom	Observation	Action
No Alarm Response	L3 (green) off.	Check power supply voltage.
Alarm doesn't switch when sensor is uncovered.	L1 (yellow) doesn't respond when sensor is uncovered.	Readjust trip point potentiometer P2.
	L1 (yellow) responds when sensor is uncovered.	Check that relay changes state when S3 is toggled ON and OFF.
Alarm doesn't switch on when sensor is covered.	L1 (yellow) doesn't respond when sensor is covered.	Readjust trip point potentiometer P2.
	L1 (yellow) responds when sensor is covered.	Check that relay changes state when S3 is toggled ON and OFF.
	L1 (yellow) flashes when material level approaches the alarm setpoint.	

Operation - Electronic module: Digital

See separate "Operating Manual (Digital Electronic)"

Notes for use in Hazardous Locations

Use of this Manual

For use and assembly, refer to the instructions in this Manual. It does contain all instruction as required by ATEX Directive 2014_34_EU, Annex II, 1/0/6 and Ordinance INMETRO n° 179/2010

General notes

Refer to appropriate certificate for application in specific hazardous environment.

The equipment has not been assessed as a safety related device (as referred to by Directive 2014_34_EU Annex II, clause 1.5).

The certificate numbers have an 'X' suffix, which indicates that specific condition of use apply. Those installing or inspecting this equipment must have access to the certificates.



Qualification of personnel / Servicing / Repair

Installation and inspection of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (ABNT NBR IEC/EN 60079-14 and ABNT/NBR IEC/EN 60079-17 in Europe).

Repair of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (e.g. ABNT NBR IEC/EN 60079-19 within Europe).

Repair of flameproof path is not intended.

Components to be incorporated into or used as replacements in the equipment shall be fitted by suitably trained personnel in accordance with the manufacturer's documentation.

In potentially explosive atmospheres open the enclosure only when CN 8000 is not energized.

Turn off power before servicing any device (the transmitter is in operation when the power supply is switched on). In case of removing the unit from vessel, take care of process pressure and material passing the opening.

ATEX: Certificates / List of Standards

Certificate numbers: DEKRA 18ATEX0042 X and DEKRA 18ATEX0044 X

See www.uwt.de for the latest certificates

See EU - Declaration of conformity for the list of standards valid for ATEX certificates

ATEX: Year of manufacturing

Marking on the name plate is done according to IEC 60062 as follows:

Year of manufacturing	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Marking code	K	L	M	N	P	R	S	T	U	V	W	X

Notes for use in Hazardous Locations

ATEX: Ex-Marking

- Devices with ATEX approval are marked on the name plate as follows.
- If both Flameproof and Dust ignition proof are present on the same nameplate, a tick box is present where the end user needs to select (mark) the protection method used at the time of installation.

Dust Ignition Proof with intrinsically safe output to probe (Typecode Pos.2 W)

Electronic module: Standard and Digital

Integral version: II 1/2 D Ex ia/tb [ia Da] IIIC TX Da/Db

Remote version: Electronics enclosure: II 2(1) D Ex ia tb [ia Da] IIIC TX Db

Level probe: II 1 D Ex ia IIIC TX Da

II 1/2 D Ex ia IIIC TX Da/Db

Flameproof / Dust Ignition proof with intrinsically safe output to probe (Typecode Pos.2 T)

Electronic module: Standard and Digital

Integral version: II 1/2 G Ex ia/db [ia Ga] IIC TX Ga/Gb

II 1/2 D Ex ia/tb [ia Da] IIIC TX Da/Db

II 2(1) G Ex db ia [ia Ga] IIC TX Gb

II 2(1) D Ex ia tb [ia Da] IIIC TX Db

Level probe: II 1 G Ex ia IIC TX Ga

II 1 D Ex ia IIIC TX Da

II 1/2 D Ex ia IIIC TX Da/Db

Intrinsically Safe (Typecode Pos.2 Y)

Elektronic module: Digital

Integral version: II 1 G Ex ia IIC TX Ga

II 1/2 D Ex ia IIIC TX Da/Db

Remote version: Electronics enclosure: II 1 G Ex ia IIC TX Ga

II 2 D Ex ia IIIC TX Db

Level probe: II 1 G Ex ia IIC TX Ga

II 1 D Ex ia IIIC TX Da

II 1/2 D Ex ia IIIC TX Da/Db

Type of protection n (Typecode Pos.2 G)

Elektronic module: Digital

Integral version: II 3 G Ex ic nA IIC TX Gc

Remote version: Electronics enclosure: II 3 G Ex ic nA IIC TX Gc

Level probe: II 3 G Ex ic IIC TX Gc

Notes for use in Hazardous Locations

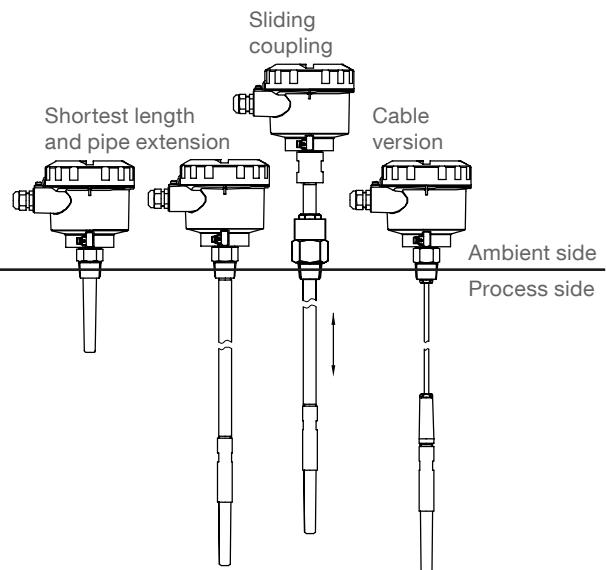
! ATEX: Permitted zones for installation

Integral version

Devices can be installed as follows:

Marking	Dust applications		Gas applications	
	Da/Db	Ga/Gb	Ga	Gc
EPL	Db	Gb	Ga	Gc
Category	2D	2G	1G	3G
Zone	21	1	0	2

EPL	Da	Ga	Ga	Gc
	1D	1G	1G	3G
	20	0	0	2



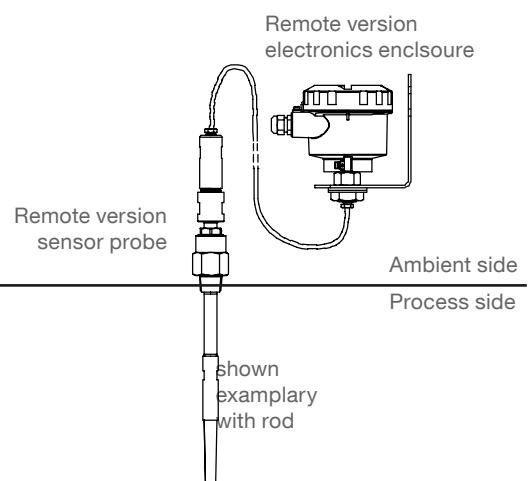
Remote version

Devices can be installed as follows:

Marking	Dust applications		Gas applications	
	Db	Db	Ga	Gb
electronics enclosure	Db	Db	Ga	Gb
EPL	Db	Db	Ga	Gb
Category	2D	2D	1G	2G
Zone	21	21	0	1

Marking	Da/Db	Da	Ga	Ga
	Db	Da	Ga	Ga
	2D	1D	1G	1G
sensor probe	21	20	0	0
	Da/Db	Da	Ga	Ga
	Db	Da	Ga	Ga

EPL	Da	Da	Ga	Ga
	1D	1D	1G	1G
	20	20	0	0



Notes for use in Hazardous Locations

! Specific condition of use

Electrostatic charge The user shall ensure that the equipment is not installed in a location where it may be subjected to external conditions which might cause a build-up of electrostatic charge on non-conducting surfaces.

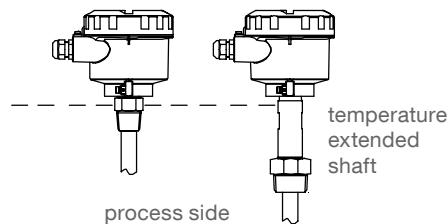
Impact / Friction Because the enclosure and optionally the process connection of the equipment is made of aluminium alloy, the apparatus must be installed so, that even in the event of rare incidents, an ignition source due to impact or friction between enclosure and iron / steel is excluded, when used in potentially explosive atmosphere requiring apparatus of equipment 1G.

Flameproof joints The flameproof joints are not intended to be repaired.

Transient limitation for Type of protection n A transient protection device shall be used, set at a level not exceeding 140 % of the peak rated voltage of 85 V.

Ambient and process temperature range The relation between the ambient and process temperature ranges and the surface temperature or temperature class is shown in the thermal data tables page 36 / 37.

Max. permitted temperature close to the enclosure If the process temperature exceeds the max. permissible ambient temperature, the max. resulting temperature at the connection of the sensor head (see dotted line) shall not exceed the related max. permissible ambient temperature (see page 36 / 37), taking the worst case conditions into account. This shall be verified by measurement when installed.



Notes for use in Hazardous Locations



Warnings for installation

Intrinsically safe supply	For intrinsically safe models, power must be supplied from an Intrinsically Safe power source, otherwise protection is no longer guaranteed.
Process pressure	The device construction allows process over-pressure up to 10 or 25 bar (146 or 365 psi). This pressure is allowed for test purposes. The definition of the Ex approvals are only valid for a container-over-pressure between -0.2 .. +0.1 bar (-2.9 .. +1.45 psi). For higher or lower pressures the approvals are not valid.
Process and ambient temperature	Please check the ambient and process temperatures page 36 /37 for the specific configuration you are about to use or install.
Chemical resistance against the medium	If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised. Aggressive substances: e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials. Suitable precautions: e.g. establishing from the material's data sheet that it is resistant to specific chemicals.
Cable entry devices / blanking elements general	<p>Dust Ignition Proof: For use in potentially explosive dust atmospheres: The cable entry devices and the blanking elements of unused apertures shall be of a certified type, suitable for the conditions of use and correctly installed. The minimum ingress protection requirement of IP6X according to EN 60529 must be satisfied.</p> <p>Flameproof: For use in potentially explosive gas atmospheres: The cable entry devices and the blanking elements of unused apertures shall be of a certified flameproof type, suitable for the conditions of use and correctly installed.</p> <p>Intrinsically Safe / Type of protection n: The cable entry devices and the blanking elements of unused apertures shall be of a certified type, suitable for the conditions of use and correctly installed. The minimum ingress protection requirement of IP64 according to EN 60529 must be satisfied.</p> <p>Versions with cable gland mounted by default: The used cable gland is only suitable for fixed installations. The installer is responsible for providing appropriate strain-relief to prevent pulling or twisting.</p> <p>Versions with blanking element mounted by default: Blanking elements are not to be used with any form of adaptors or reducers.</p>
Versions with cable gland / blanking element mounted by default	<p>Below-mentioned cable diameters and tightening torques of the nut resp. blanking element shall be observed for the installation.</p> <p>Cable gland M20x1.5 (Dust Ignition Proof, Intrinsically Safe, Type of protection n) Cable diameter: 6 mm to 12 mm Tightening torque: Depending on the used cable and therefore to be determined by the user</p> <p>Cable gland M20x1.5 (Flameproof) Cable diameter: Bedding 3.1 mm to 8.6 mm / Overall 6.1 mm to 13.1 mm Tightening torque: Number of turns depending on the overall cable diameter of the used cable (e. g. 1 turn / cable diameter 12.5 mm to 5.5 turns / cable diameter 6.5 mm)</p> <p>Blanking element M20x1.5 (all versions) Tightening torque: 32.5 Nm</p>

Notes for use in Hazardous Locations

- ! Ambient and process temperature range, max. Surface Temperature and
- Temperature Class

ATEX:

Flameproof and Dust Ignition Proof with intrinsically safe output to probe (Typecode Pos.2 W,T)

Electronic module: Standard and Digital

- Integral version
- Remote version: level probe

Ambient temperature range	Process temperature range	Max. Surface temperature (EPL Da)	Max. Surface temperature (EPL Db)	Temperature class (EPL Ga or Gb)
-40 to +45°C (-40 to +113°F)	-40 to +45°C (-40 to +113°F) (2)	T ₂₀₀ 95°C	T55°C	T6
-40 to +60°C (-40 to +140°F)	-40 to +60°C (-40 to +140°F) (2)	T ₂₀₀ 110°C	T70°C	T5
-40 to +80°C (-40 to +176°F)	-40 to +95°C (-40 to +203°F) (1) (2)	T ₂₀₀ 145°C	T90°C	T4
-40 to +80°C (-40 to +176°F)	-40 to +125°C (-40 to +257°F) (1) (2)	T ₂₀₀ 175°C	T90°C	T3

- Remote version: electronics enclosure

Ambient temperature range	Max. Surface temperature (EPL Db)	Temperature class (EPL Gb)
-40 to +45°C (-40 to +113°F)	T55°C	T6
-40 to +60°C (-40 to +140°F)	T70°C	T6
-40 to +80°C (-40 to +176°F)	T90°C	T5

Intrinsically safe (Typecode Pos.2 Y)

Electronic module: Digital

- Integral version
- Remote version: level probe

Ambient temperature range	Process temperature range	Max. Surface temperature (EPL Da)	Max. Surface temperature (EPL Db)	Temperature class (EPL Ga or Gb)
-40 to +45°C (-40 to +113°F)	-40 to +45°C (-40 to +113°F) (2)	T ₂₀₀ 95°C	T55°C	T6
-40 to +60°C (-40 to +140°F)	-40 to +60°C (-40 to +140°F) (2)	T ₂₀₀ 110°C	T70°C	T5
-40 to +60°C (-40 to +140°F)	-40 to +95°C (-40 to +203°F) (1) (2)	T ₂₀₀ 145°C	T70°C	T4
-40 to +60°C (-40 to +140°F)	-40 to +125°C (-40 to +257°F) (1) (2)	T ₂₀₀ 175°C	T70°C	T3

- Remote version: electronics enclosure

Ambient temperature range	Max. Surface temperature (EPL Db)	Temperature class (EPL Ga)
-40 to +45°C (-40 to +113°F)	T55°C	T6
-40 to +60°C (-40 to +140°F)	T70°C	T4

Type of protection n (Typecode Pos.2 G)

Electronic module: Digital

- Integral version
- Remote version: level probe

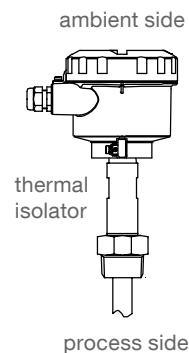
Ambient temperature range	Process temperature range	Temperature class (EPL Gc)
-40 to +45°C (-40 to +113°F)	-40 to +75°C (-40 to +167°F) (2)	T6
-40 to +60°C (-40 to +140°F)	-40 to +90°C (-40 to +194°F) (1) (2)	T5
-40 to +60°C (-40 to +140°F)	-40 to +125°C (-40 to +257°F) (1) (2)	T4

- Remote version: electronics enclosure

Ambient temperature range	Temperature class (EPL Gc)
-40 to +45°C (-40 to +113°F)	T6
-40 to +60°C (-40 to +140°F)	T4

(1) For process temperature > 85 °C: Only applicable for versions with thermal isolator

(2) With option FFKM O-ring seal: Lower process temperature limited to -20°C (-4°F)



Notes for use in Hazardous Locations

INMETRO:

Flameproof with intrinsically safe output to probe

Application in Zone 0 (cat 1G):

Ambient temperature range	Process temperature range
-20 to +60°C (-4 to +140°F)	-20 to +60°C (-4 to +140°F)

Application in Zone 1 (cat 2G):

Ambient temperature range	Process temperature range	Temperature class
-40 to +70°C (-40 to +158°F)	-40 to +85°C (-40 to +185°F)	T6
-40 to +85°C (-40 to +185°F)	-40 to +95°C (-40 to +203°F) (1)	T5
-40 to +85°C (-40 to +185°F)	-40 to +125°C (-40 to +257°F) (1)	T4

(1) For process temperature > 85 °C: Only applicable for versions with thermal isolator

Dust ignition proof

The maximum surface temperature of T 100 °C is based on a maximum ambient temperature of +85 °C.

FM / CSA:

Explosion proof / Dust ignition proof

Ambient temperature range	Process temperature range	Temperature class
-40 to +85°C (-40 to +185°F)	-40 to +125°C (-40 to +257°F)	T4

Intrinsically safe

Installation shall be done according to "FM/CSA Approval - Connection drawing" on page 23

Ambient temperature range	Process temperature range	Temperature class
-40 to +40°C (-40 to +40°F)	-40 to +40°C (-40 to +40°F)	T6
-40 to +85°C (-40 to +185°F)	-40 to +125°C (-40 to +257°F)	T4

Probe modifications

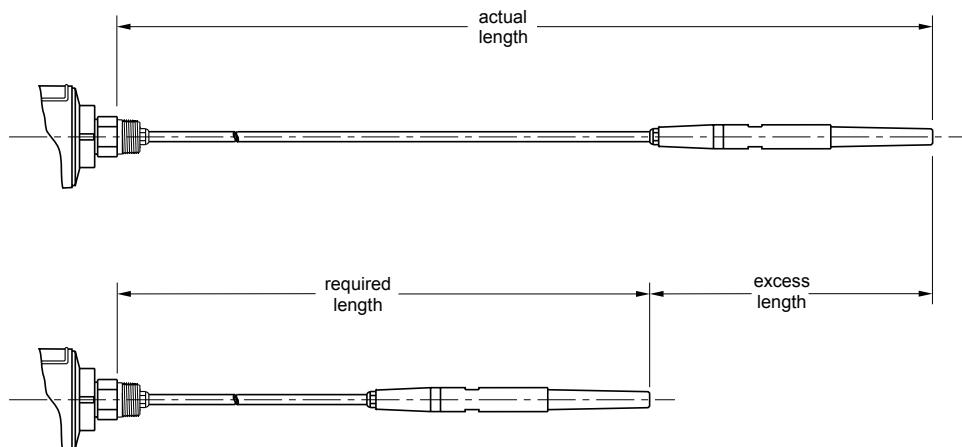
Shortening the cable (cable version)

CAUTION:

Possible only with the general purpose configuration; please verify against product nameplate.

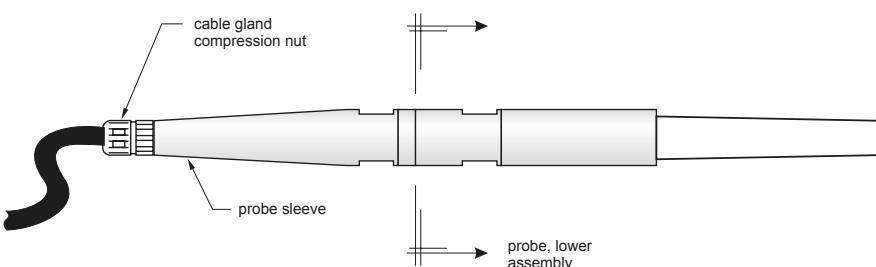
Preparation

Determine the required cable length, and subtract that amount from the actual length, to find the excess length to cut off. For example: 10 m (actual length) minus 9 m (required length) = 1 m (excess)

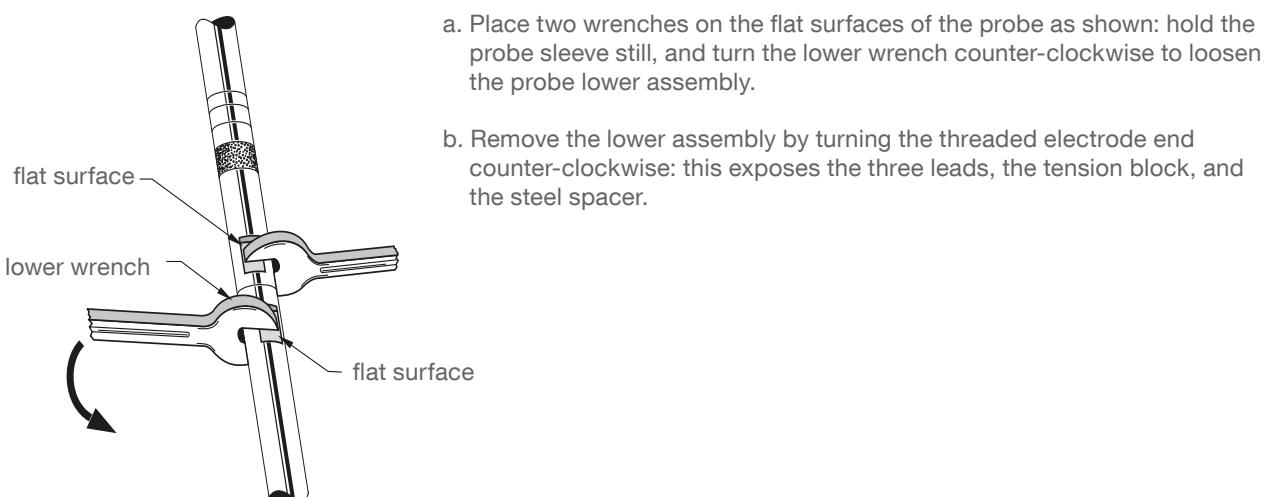


Steps

1. Unscrew the cable gland compression nut to relieve the sealing cone and release the cable.

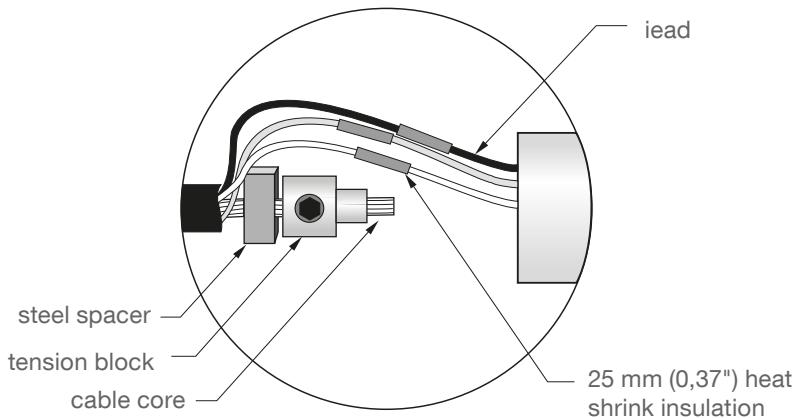


2. Unscrew the probe sleeve from the lower assembly using two 17 mm (0.67") wrenches across the flat surfaces, as shown below.



Probe modifications

3. Remove the heat shrink insulation covering the solder connections.



4. Unsolder the connections.

Note: Do not cut the connections to the probe leads, as this can render them too short to work with later.

5. Remove the tension block, and save it for re-use in step 7.

6. Calculate the excess cable, then add back an allowance of 75 mm (3") for making the connections:

For example, 1000 mm = excess
less 75 mm = allowance for connections
925 mm = excess cable to be removed

7. Cut off the excess cable.

Caution: To prevent wires from being pulled through the cable bundle, secure each wire close to where the outer black jacket stops prior to stripping cable insulation from it.

8. Remove approximately 75 mm (3") of cable jacket, shield, and filler strands.

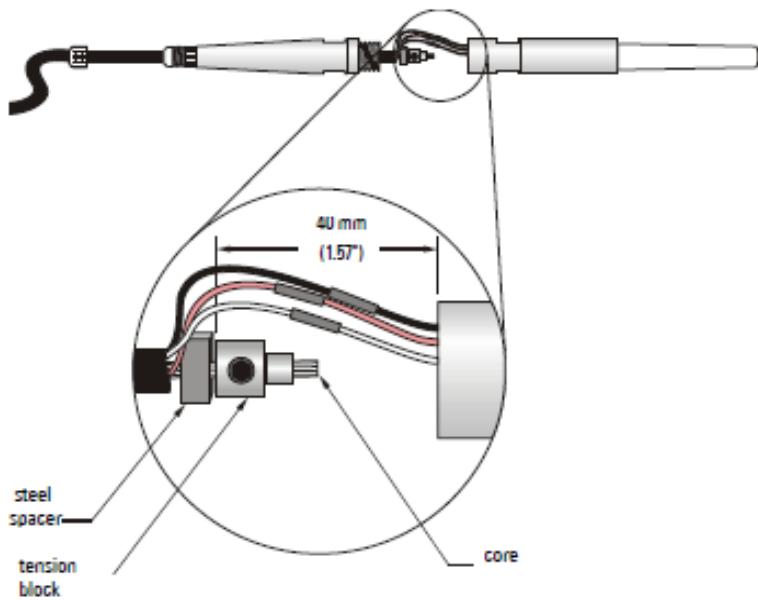
9. Cut off the excess cable core, making sure the cut is clean and square

10. Replace the steel spacer and tension block, then shorten the leads to approximately 40 mm (1.6").

11. Prepare the leads for soldering, and if heat shrink is used to insulate splices, remember to slip on the heat shrink before soldering the leads. (Note: white heat shrink has been applied to the orange wire to simplify correct connection.)

12. Make the solder connections and position the heat shrink to completely insulate each solder connection before shrinking it.

Probe modifications



13. Remove any excess cable core, if necessary.
14. Apply PTFE type tape/sealant to all threads.
15. Add a pre-twist to the wires before screwing the probe sleeve and lower probe assembly together: hold the probe sleeve still, and gently turn the lower probe assembly counter-clockwise about 5 full turns. This avoids the wires being broken when the probe and probe sleeve are assembled.
16. Screw the lower probe assembly clockwise into the probe sleeve, and tighten it with a 17 mm (0.67") wrench.
17. Check that the instrument is operating correctly, using the test procedure (see external Operating Manual).

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Subject to technical change.	We assume no liability for typing errors.
All dimensions in mm (inches).	Different variations to those specified are possible. Please contact our technical consultants.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning must be carried out only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.

Special attention must be paid to warnings and notes as follows:

WARNING



Relates to a caution symbol on the product and means, that a failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.

WARNING



Relates to a caution symbol on the product: Risk of electric shock

WARNING



Relates to a caution symbol on the product and means, that a failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product	Description
--------------------------	-------------



CAUTION: refer to related documents (manual) for details.



Earth (ground) Terminal



Protective Conductor Terminal

Technical support

Please contact your local supplier (see www.uwt.de for address). Otherwise you can contact:

UWT GmbH
Westendstr. 5
87488 Betzigau
Germany

Tel. 0049 (0)831 57123-0
Fax. 0049 (0)831 76879
info@uwt.de
www.uwt.de

Introduction

The Nivobob® NB 3000 is an electromechanic level measuring instrument for continuous measuring of level or volumes in silos, hoppers or tanks.

Applications

- Powder, granulate, small or coarse bulk goods
- Interface measurement (solids in water)

Available for industries such as

- Chemistry
- Food
- Cement
- Mining
- Plastics
- others

Features

Process

- Suitable for most types of bulk goods
- Independent of bulk material properties, such as:
 - Dielectricity and conductivity of the bulk good
 - Dusty atmosphere in the silo
 - Changing humidity inside the product
 - Products that tend to stick
- No mechanical load on the silo roof, the sensor weight just touches the surface of the material
- Very accurate measurement

Service

- Simple installation and commissioning
- Measurement principle easy to understand
- Rope, tape and (optional) motor with increased service life
- Low maintenance

Approvals

- Approval for use in Hazardous Locations

Mechanic

- Measurement range up to 50 m (164 ft)
- 1½" process connection possible
- Different sensor weights, suitable for every application
- Internal tape cleaner for difficult materials
- Window in lid and external start button (optional)
- Robust cast housing, ingress protection IP66

Electronic

- Micro processor controlled measurement
- Comprehensive diagnostics possibilities
- Output 0/4-20 mA/ Modbus/ Profibus DP/ counting pulses
- Programmable relais (can be used as level limit switch outputs)
- Measurement start with external signal or integrated timer

Function

The Nivobob® NB 3000 is mounted on the top of the silo. A sensor weight is driven down into the silo. It is mounted at the end of a rope or tape which is wound on a motor driven roller. Upon contact with bulk material, the motor changes the winding direction and the sensor weight is driven back to the upper stop position.

During downwards movement of the sensor weight the distance is electronically measured by the rotations of the internal rope / tape roller. The microcontroller converts the measured distance into an output signal, which is a volumetric signal based on the silo geometry. The output signal is updated, when the sensor weight touches the bulk material.

Diagnostics

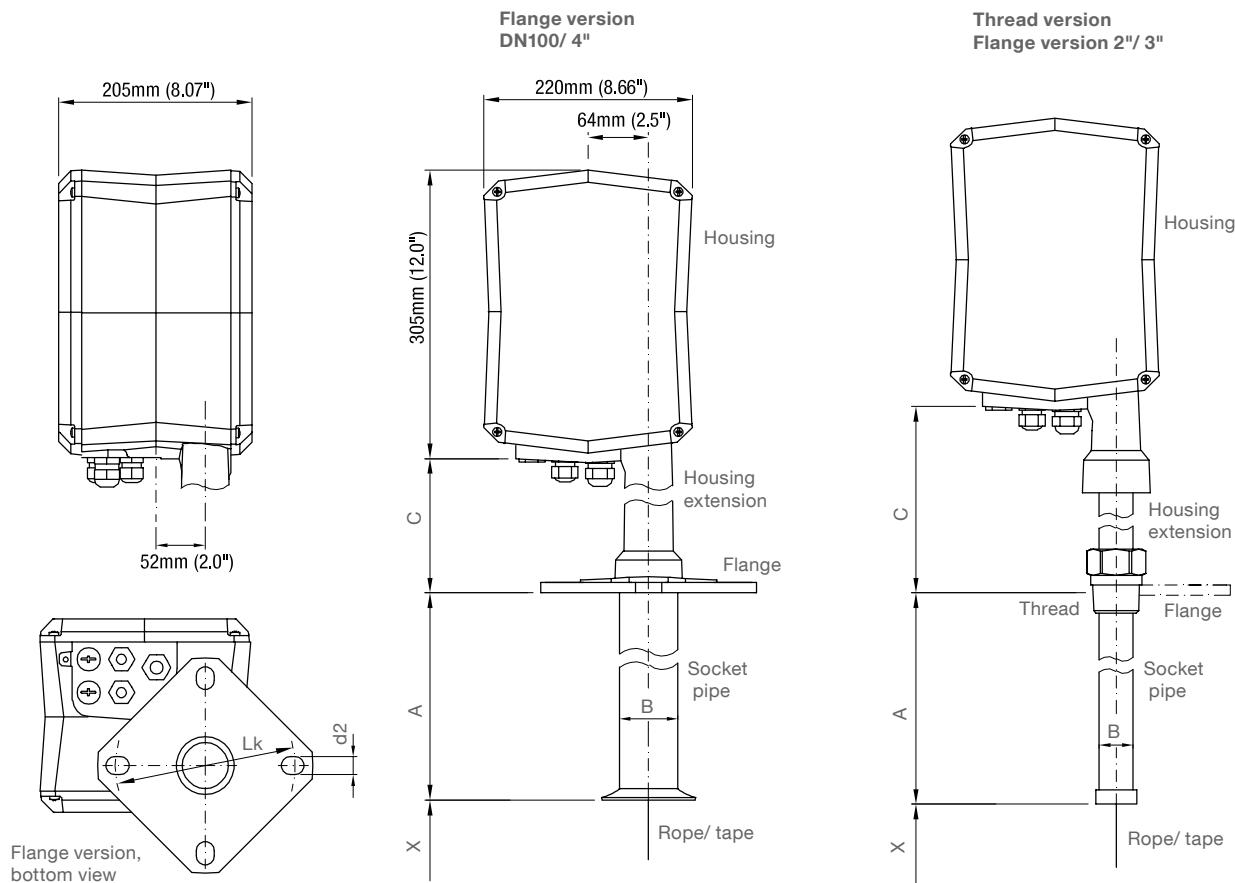
Comprehensive diagnostics possibilities are present:

- Measurement control is done by comparing the moved distance between up and downward movement and checking for discrepancy. In case of discrepancy, the sensor weight is pulled to the upper stop position to ensure, that the sensor weight is not inside the silo.
- Service interval after a certain amount of measurements and running time.
- Internal control of motor, motor driver electronic and smooth movement of rope/ tape rollers.

Diagnostics is in accordance with NAMUR recommendation NE107.

Dimensions

Basic type



Dimensions

X = Length to bottom of sensor weight
 (in upper stop position): see next page

A = Length of socket pipe

200 mm (7.9")
 Optional 500 mm (19.7")/ 1,000 mm (39.4")

B = Diameter of socket pipe

Rope version with Flange DN100/ 4"	ø60 mm (ø2.36")
------------------------------------	-----------------

All other versions	ø40 mm (ø1.57")
--------------------	-----------------

C = Housing extension

Flange version DN100/ 4"	80°C/ 150°C	95 mm (3.74")
	250°C	340 mm (13.4")
All other versions	80°C/ 150°C	160 mm (6.3")
	250°C	340 mm (13.4")

Rope ø1.0 mm (ø0.04")

Tape 12 x 0.2 mm (0.47 x 0.008")

Flanges

fitting to:
 DN100 PN16/ 4" 150lbs

Lk = ø180 - 190.5 mm (ø7.1 - 7.5") slot
 d2 = ø19 mm (ø0.75")

fitting to:
 2" / 3" 150 lbs

Lk = ø120.7 - 152.4 mm (ø4.75 - 6.0") slot
 d2 = ø19 mm (ø0.75")

Materials

Housing outside	Aluminium, powder coated
Housing inside	Aluminium
Housing extension	Aluminium, powder coated or 1.4305 (303)
Flange	80°C/ 150°C: Aluminium, powder coated 250°C: 1.4305 (303)
Thread	1.4301 (304)
Socket pipe	Flange version DN100/ 4", 80°C/ 150°C: Aluminium All other versions: 1.4301 (304)
Rope	1.4401 (316)
Tape	1.4310 (301)

With option "Increased corrosion resistance":

All metal parts in contact with the process are coated.

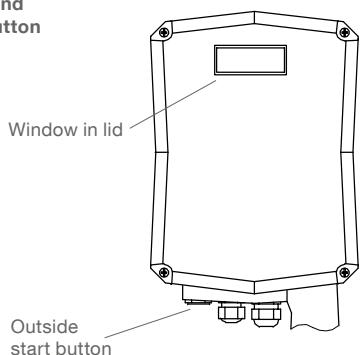
The rope is plastic coated with PA.

The internal bearings are made of stainless steel.

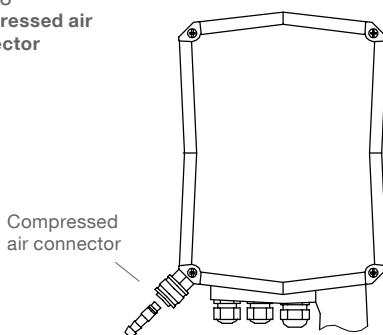
Dimensions

Options and Accessories

pos.25
 Window in lid and
 outside start button



pos.28
 Compressed air
 connector

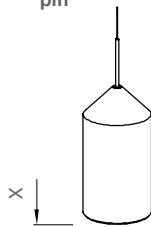


Sensor weights

Solids measurement: Rope version

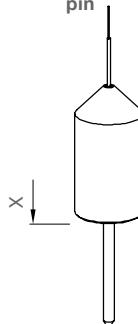
All weights ca. 1,0 kg (2.2 lbs)

PVC without
 pin



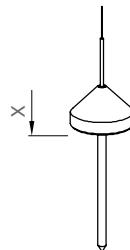
ø81 mm (ø3.2")
 X = 137 mm (5.4")
 Material: PVC

PVC with
 pin



ø81 mm (ø3.2")
 X = 137 mm (5.4")
 Pin: 130 mm (5.1")
 Material: PVC (pin POM)

Stainless steel

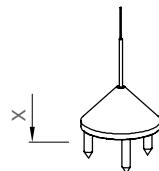


Material:
 1.4305 (303)

Version with
 Flange DN100/ 4"
 ø75 mm (ø3.0")
 X = 25 mm (1.0")
 Pin: 130 mm (5.1")

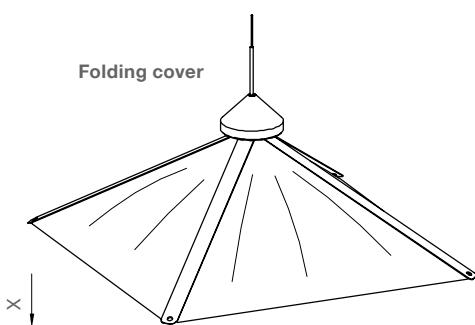
All other versions
 ø42 mm (ø1.65")
 X = 81 mm (3.19")
 Pin: 130 mm (5.1")

Claw



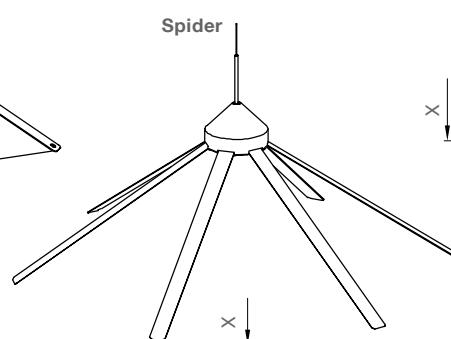
ø95 mm (ø3.7")
 X = 71 mm (2.80")
 Material: 1.4305 (303)

Folding cover



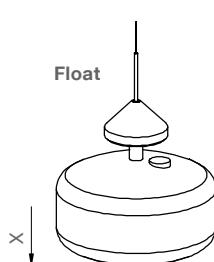
380 x 380 mm (15 x 15")
 X = 150 mm (5.9")
 Material: 1.4310 (301)/ 1.4305 (303)
 PA canvas

Spider



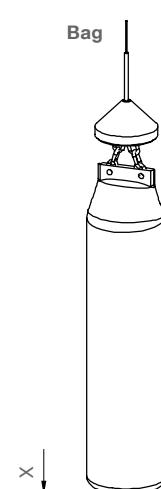
ø600 mm (ø23.6")
 X = 160 mm (6.3")
 Material: 1.4301 (304)/ 1.4305 (303)
 1.4310 (301)

Float



ø190 mm (ø7.5")
 X = 175 mm (6.9")
 Material: Float PP,
 Cone: aluminium

Bag

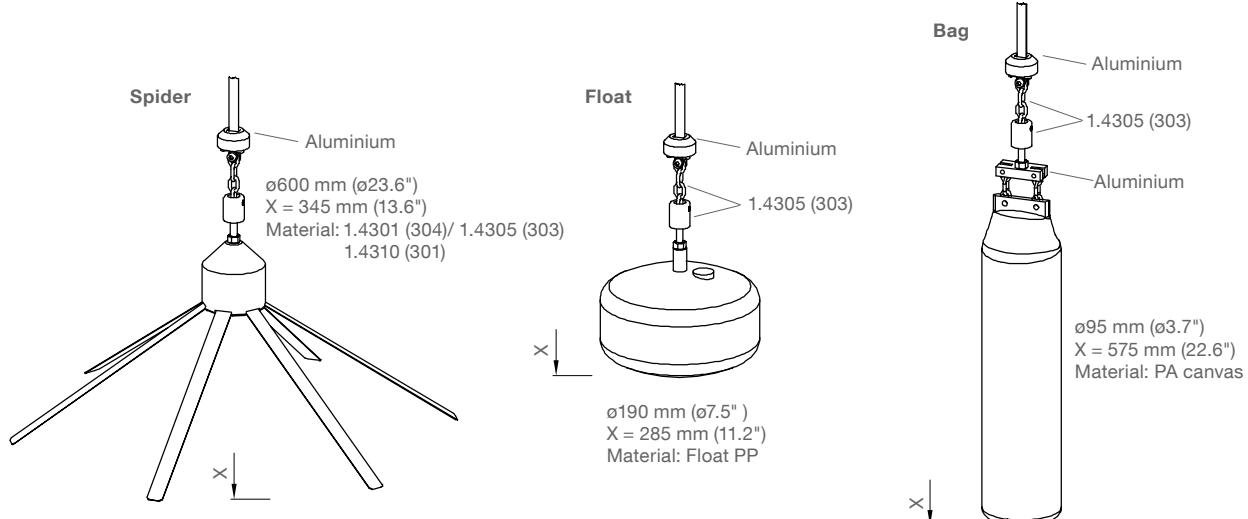
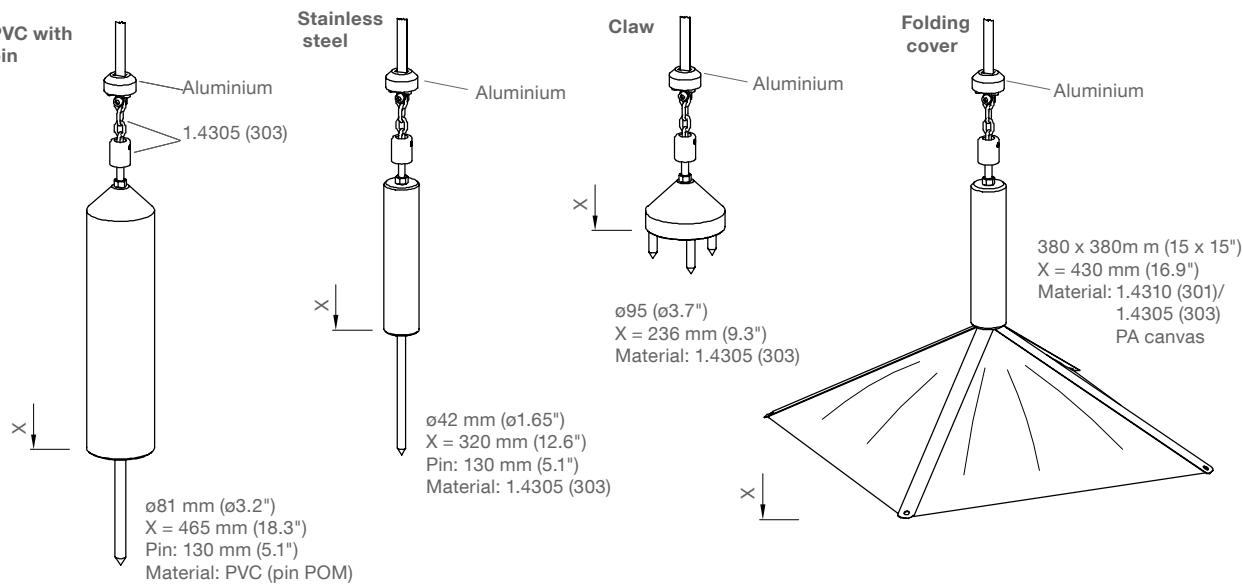


ø95 mm (ø3.7")
 X = 460 mm (18.1")
 Material: PA canvas,
 Chain: 1.4305 (303)
 Cone: aluminium

Dimensions

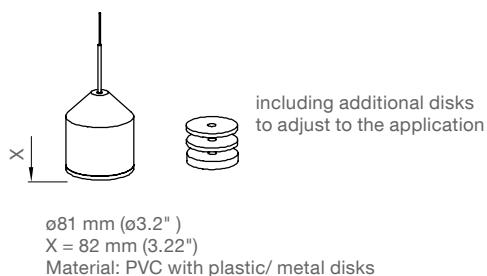
Solids measurement: Tape version

All weights ca. 2.1 kg (4.6 lbs)



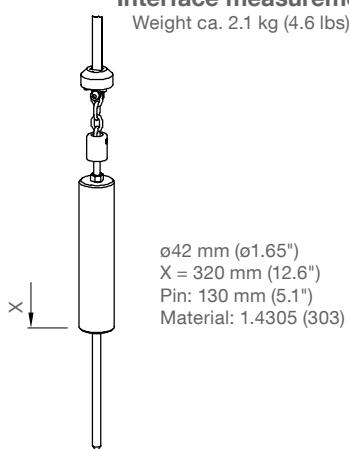
Interface measurement: Rope version

Weight ca. 1.0 kg (2.2 lbs)



Interface measurement: Tape version

Weight ca. 2.1 kg (4.6 lbs)



Technical data

Electrical data

Power supply	AC version 98 .. 253 V 50 - 60 Hz DC version 20 .. 28 V (voltages incl. 10% of EN 61010)												
Installed load	AC version: 150 VA (including internal heater (80 W)) DC version: One unit: 150 W (with or without internal heater) * Further units which are connected to the same power supply: 25 W per unit (without internal heater, motor off) ** 50 W per unit (without internal heater, motor running) 80 W per unit (with internal heater, supply voltage 20 V DC) 100 W per unit (with internal heater, supply voltage 24 V DC) 120W per unit (with internal heater, supply voltage 28 V DC)												
	* Considers the max. motor traction which is needed in a failure condition. A failure condition is assumed for max. one unit at the same time. ** This value can be considered, if the controlling PLC starts the measurement for max. one unit at the same time.												
Signal output: 0/4-20 mA	Max. 500 Ohms (active, isolated) Linearity ±0.1 mA												
Signal output: Relay	4x Relay SPST: max. 250 V AC, 2 A, 500 VA non inductive												
Signal output: Electronic counting pulse	Optocoupler max. 30 V DC, max. 25 mA												
Communication: Modbus RTU	Physical layer: RS 485 and Ground, isolated Mode: RTU, Type: Slave Device number range: 1 - 247 (selectable in menu), Baudrate: 1,200 to 57,600 Baud, Data bits: 8, Stop Bits: 1 Parity: None Multi-drop configuration possible. Factory setting of address is 31. Each unit which is connected to the network must be set to an individual address. Supported commands Reading: All diagnostics and parameters using command 03 _{HEX} : Read Holding Register Writing: All parameters using command 06 _{HEX} : Write Single Register (not supported is command 10 _{HEX} : Write Multiple Register).												
Communication: Profibus DP	Physical layer: RS 485, isolated Type: Slave Device number range: 0 - 126 (selectable in menu), Baudrate: 9.6 kbps to 12 Mbps Available communication by GSD file, Read only (Sensor weight bottom to material (in mm))												
Accuracy of measurement	<table border="1"> <thead> <tr> <th>Output</th> <th>Setting</th> <th>Accuracy</th> </tr> </thead> <tbody> <tr> <td>Counting pulse</td> <td>10 cm (1/3 ft)/ pulse 5 cm (1/6 ft)/ pulse 2,5 cm (1/10 ft)/ pulse 1 cm (1/20 ft)/ pulse</td> <td>1 pulse 1 pulse 2 pulses 4 pulses</td> </tr> <tr> <td>0/4-20 mA</td> <td></td> <td>1% of max. range</td> </tr> <tr> <td>Modbus RTU/ Profibus</td> <td></td> <td>0.5% of max. range</td> </tr> </tbody> </table>	Output	Setting	Accuracy	Counting pulse	10 cm (1/3 ft)/ pulse 5 cm (1/6 ft)/ pulse 2,5 cm (1/10 ft)/ pulse 1 cm (1/20 ft)/ pulse	1 pulse 1 pulse 2 pulses 4 pulses	0/4-20 mA		1% of max. range	Modbus RTU/ Profibus		0.5% of max. range
Output	Setting	Accuracy											
Counting pulse	10 cm (1/3 ft)/ pulse 5 cm (1/6 ft)/ pulse 2,5 cm (1/10 ft)/ pulse 1 cm (1/20 ft)/ pulse	1 pulse 1 pulse 2 pulses 4 pulses											
0/4-20 mA		1% of max. range											
Modbus RTU/ Profibus		0.5% of max. range											
Display	LCD display: 2 line x 16 digit												
Indication light	Status by built in LED: Power On, Relais, Maintenance and Failure												

Technical data

Memory	Non-volatile (no backup battery required) > 10 years data retention	
Connection terminals	0.14 .. 2.5 mm ² (AWG 26 .. 14)	
Cable entry	According to selection: Screwed cable gland: 2x M20 x 1.5 and 1x M25 x 1.5 Blindplug: 2x M20 x 1.5 or Conduit ANSI B1.20.1: 1x NPT ¾" and 2x NPT ½" Blindplug: 2x NPT ½" Clamping range (diameter) of the factory provided cable glands: M20 x 1.5: 6 .. 12 mm (0.24 .. 0.47") M25 x 1.5: 8 .. 17 mm (0.31 .. 0.67")	
Extension cables for Profibus DP/ Modbus	Use common recommended cables	
Isolation	Power supply to all other outputs/ inputs: Relay to relay: 2,210 Vrms	AC version 2,210 Vrms DC version: 1,000 VDC
Protection class	I	
Oversupply category	II	
Pollution degree	2 (inside housing)	

Mechanical data

Ingress protection	IP66, Type 4	
Process connection	Threads: Flanges:	R 1½" EN 10226 tapered, NPT 1½" or 3" ANSI B1.20.1 tapered DN100 PN16 EN 1092-1 (unit fits to this flange) 2" or 3" or 4" 150lbs ANSI B16.5 (unit fits to this flange)
Colour	Housing, Flange Lid	RAL 5010 (gentian blue) RAL 9006 (aluminium silver)
Material	See detail specifications on page 4 - 6	
Measuring range	Rope version max. 30 m (100 ft) Tape version max. 50 m (164 ft)	
Measuring speed	Sensor weight speed in average: Standard version: ca. 0.25 m/s (0.8 ft/sec) Version with brushless motor: ca. 0.33 m/s (1.0 ft/sec)	
Sound level	max. 50 dBA	
Weight	Rope version Tape version	with flange: ca. 11 kg (24.2 lbs) with thread: ca. 12 kg (26.4 lbs) with flange: ca. 12 kg (26.4 lbs) with thread: ca. 13 kg (28.6 lbs)
Deviation of vertical mounting	max. 2° max. 1° for tape version with extended socket pipe (see page 4)	
Compressed air connector (Option)	Quick coupling incl. opposite part, for hose diameter 9 mm (0.35"), female at housing Max. operating pressure 0.2 bar (2.9 psi)	

Technical data

Operating conditions

Process overpressure	-0.3 .. +0.3 bar (-4.4 .. +4.4 psi) -0.5 .. + 1.7 bar (-7.3 .. +25 psi) optional for CE + ATEX -0.5 .. + 1.1 bar (-7.3 .. +16 psi) optional for FM general purpose	
Process temperature	-40°C .. +80/ 150/ 250°C (-40 .. +176/ 302/ 482°F)	
Ambient temperature	-20°C .. +60°C (-4 .. +140°F) -40°C .. +60°C (-40 .. +140°F) -40°C .. +60°C (-40 .. +140°F) max. +40°C (104°F)	CE, FM General Purpose with internal heater ATEX, FM Class II on request possible Version with Process temp. 150°C (302°F)
Ventilation	Ventilation is not required	
Min. powder density	see "Sensor weight guide" on next page	
Minimum time between measuring starts	measuring height 5 m (16 ft) -> 3 min measuring height 10 m (33 ft) -> 6 min measuring height 20 m (66 ft) -> 12 min measuring height 30 m (98 ft) -> 18 min measuring height 40 m (131 ft) -> 24 min measuring height 50 m (164 ft) -> 30 min	
Rope/ tape operating time	see page 36	
Max. permitted tractive force	Tape version: with brushless motor: ca. 3,000 N standard motor: ca. 800 N Rope version: with brushless motor: ca. 1,000 N standard motor: ca. 800 N with increased corrosion resistance: ca. 700 N	
Relative humidity	0 - 100%, suitable for outdoor	
Altitude	max. 2,000 m (6,562 ft)	
Expected product lifetime	Following parameters have a negative influence on the expected product lifetime: High ambient- and process temperature, corrosive environment, high vibration, high flow rate of abrasive bulk material passing the sensor element, high amount of measurement cycles.	

Transport and Storage

Transport	Observe the instructions as stated on the transport packaging, otherwise the products may get damaged. Transport temperature: -40 .. +80°C (-40 .. +176°F) Transport humidity: 20 .. 85% Transport incoming inspections must be carried out to check for possible transport damage.
Storage	Products must be stored at a dry and clean place. They must be protected from influence of corrosive environment, vibration and exposure to direct sunlight. Storage temperature: -40 .. +80°C (-40 .. +176°F) Storage humidity: 20 .. 85%

Technical data

Approvals

Hazardous Locations*	ATEX II 1/2 D FM Class. II, III Div.1 Gr. E-G TR-CU Ex ta/tb IIIC T! Da/Db X
General purpose *	CE EN 61010-1 FM General purpose TR-CU
EMC	EN 61326 - A1 (industrial standard)
RoHS conform	According to directive 2011/65/EU

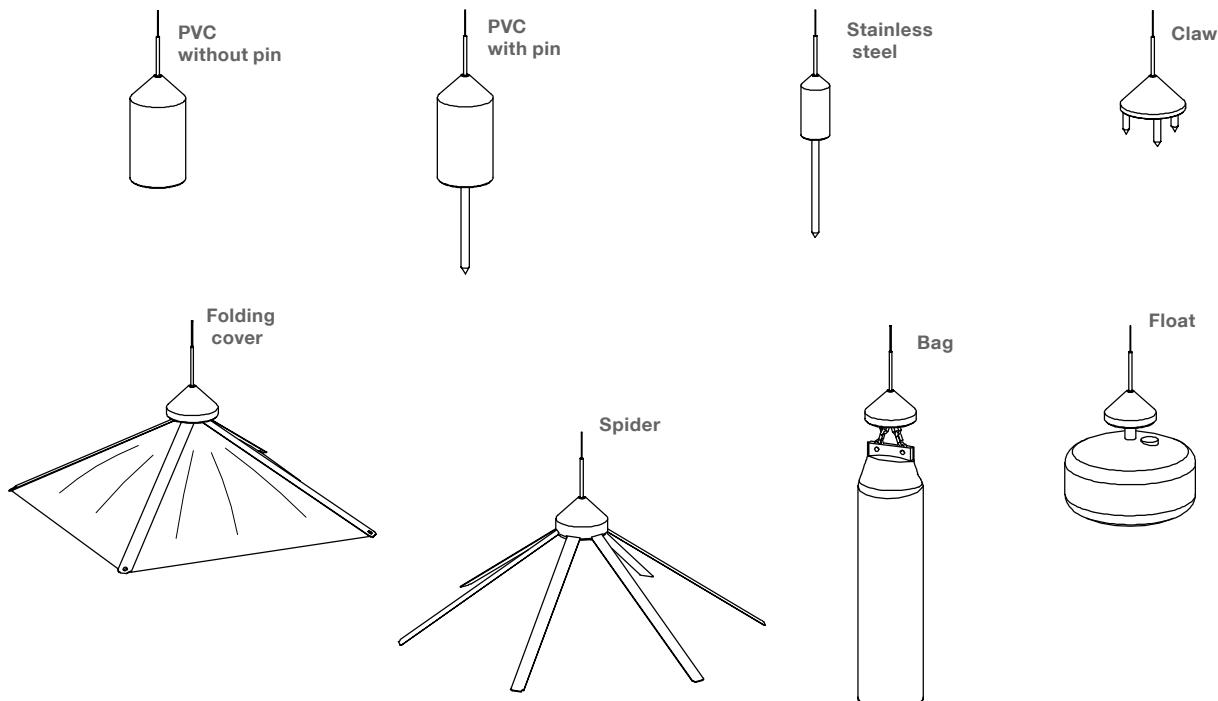
* Depending on selected version in selection list

Technical data

Sensor weight guide (solids measurement)

Sensor weight	Application				Note	Fits through mounting hole			
	* Material density g/l (lb/ft³)	Material consistence	Angle of repose	Max. process temp.		Thread	Flange	1½"	3" 2" 3" DN100 / 4"
PVC without pin	>300 (18)	granulate	flat	80°C (176°F)	Standard weight				•
PVC with pin	>300 (18)	granulate, powder	steep	80°C (176°F)	The pin penetrates into the material and avoids slipping or tilting of the sensor weight on the steep bulk surface.				•
Stainl. steel	>300 (18)	granulate, powder	flat, steep	250°C (482°F)	The pin penetrates into the material and avoids slipping or tilting of the sensor weight on the steep bulk surface.	•	•	•	•
Claw	>200 (12)	coarse (e.g. stones)	steep	250°C (482°F)	Avoids slipping or tilting on the steep bulk surface.				•
Folding cover	>20 (1.2)	light powder	flat, steep	80°C (176°F)	Big surface prevents the sensor weight from sinking into the material.	•	•	•	•
Spider	>40 (1.4)	light powder	flat, steep	250°C (482°F)	Big surface prevents the sensor weight from sinking into the material.				•
Bag	>300 (18)	granulate, powder	flat	80°C (176°F)	Prevents damage of the conveying screw. To be filled with bulk material.				•
Float	-	liquids only	-	80°C (176°F)	To be filled with material.				

* The above mentioned data is a guideline and is valid for material which has settled after filling.
 During the filling the bulk density can change (e. g. for fluidised material).



Options

Window in lid and external start button

Enables to see the display through the closed lid and to start a measurement without opening the lid.

Material of the window: break-proof glass.

Drawing see page 5

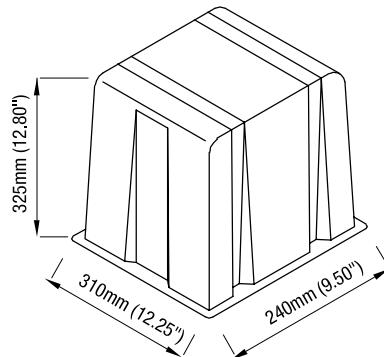
Weather protection cover

If the unit is used outdoors, the use of the weather protection cover is recommended. It protects the device from all atmospheric influences such as

- rain water
- condensation water
- excessively high temperatures
- excessively low temperatures in winter

Material: PE, weather and temperature stable

For use in Hazardous Locations only permitted for Zone 22 or Division 2.



Mounting

! General Safety Instructions

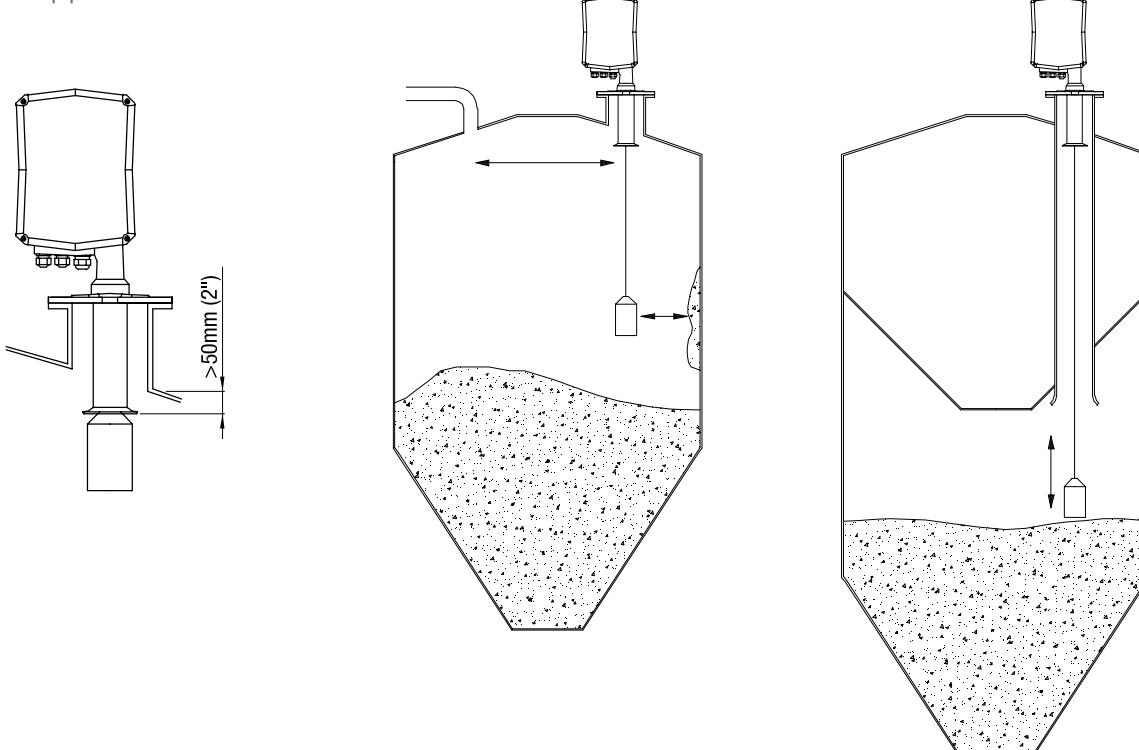
Process pressure	Improper installation may result in loss of process pressure.
Chemical resistance against the medium	Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.
Mounting location	The right mounting place is significant for a proper function. Observe mounting instructions.
Vibrations	Avoid mounting in applications with strong vibration. Use rubber mounts for absorption in case of light vibrations.

! Additional Safety Instructions for Hazardous Locations

Installation regulations	For devices to be used in Hazardous Locations the respective valid installation regulations must be observed.
Sparks	The installation has to be done in a way, that mechanical friction or impact does not cause sparks between the aluminium enclosure and steel.

Mounting instructions

Mounting position	<ul style="list-style-type: none"> The unit is mounted vertically on the silo. Max. deviation is 2°. There must be at least 200 mm (7.87") space for the sensor weight to move down in case of a full silo. Observe the bottom of the sensor weight at "upper stop position" (dimensions see page 4 - 6). With overfilling the rope/tube may break.
<ul style="list-style-type: none"> The socket pipe of the unit must protrude at least 50 mm (2") into the silo. A version with longer socket pipe is available. 	<ul style="list-style-type: none"> Proper movement of the sensor weight must be guaranteed, even if the sensor weight oscillates. Observe enough distance to the silo wall, stanchions and built-in fittings. For measurements through a long pipe in a double chamber silo we recommend the use of NB 3200 (tape version).



Mounting

Measurement during filling of the silo Filling of the silo while measuring might cover the sensor weight with bulk material. Measurements during filling are possible, if there is enough distance to the infeed, so that no material can fall on the sensor weight.

Sensor weight "Bag" and "Float"

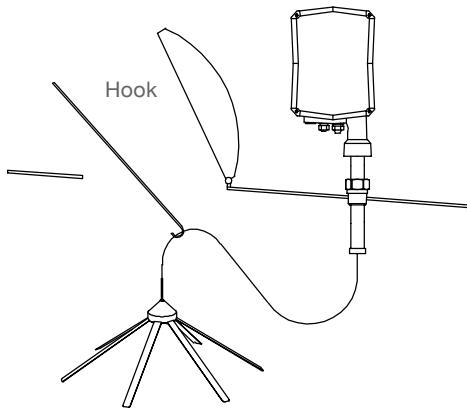
- The weights are filled with plastic granulate or sand. They shall be filled on site with bulk material or liquid, which is not critical if mixed with the material stored in the silo. Consider ageing of the material.
- When filling, observe the total weight of the sensor: rope version 1.0 kg (2.2 lbs), tape version 2.1 kg (4.6 lbs)

Sealing

- A rubber seal must be used to tighten the flange.
- Close both lids of the enclosure tightly.

Sensor weight which does not fit through the mounting hole The sensor weight must be removed before placing the unit on the silo. An inlet close to the fixing location and a hook is needed.

See installation manual for more details.



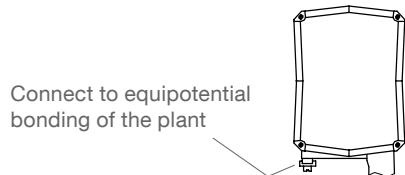
Electrical installation

! General Safety Instructions

Handling	In case of improper handling or handling malpractice, the electric safety of the device cannot be guaranteed.
Installation regulations	The local regulations or VDE 0100 (Regulations of German Electrotechnical Engineers) must be observed.
Fuse	Use a fuse as stated in the connection diagrams.
RCCB protection	In case of a fault, the supply voltage must be automatically switched off by a RCCB protection switch to protect against indirect contact with dangerous voltages.
Power supply switch	A voltage disconnection switch must be provided near the device.
Wiring diagram	The electrical connections are made in accordance with the wiring diagram.
Supply voltage	Compare the supply voltage applied with the specifications given on the name plate before switching the device on.
Cable gland	The screwed cable gland and closing element must have following specifications: Ingress protection IP66, temperature range from -40°C to +70°C, UL or VDE or INMETRO certified (depending on the country where the unit is installed), pull relief. Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion). Cable glands that are not used have to be sealed with a blanking element. The diameter of the field wiring cable has to match to the clamping range of the used cable gland.
Conduit system	In case of using a conduit system (with NPT thread) instead of a cable gland the regulations of the country, where the unit is installed, must be observed. The conduit must have a tapered thread either NPT ½" or NPT ¾" in accordance with the unit and ANSI B 1.20.1. Not used inlets must be closed tight with a metal blanking element.
Field wiring cables	<ul style="list-style-type: none">• The diameter has to match to the clamping range of the used cable gland.• The cross section has to match with the clamping range of the connection terminals and consider the max. current.• All field wirings must have insulation suitable for at least 250 V AC.• The temperature rating must be at least 90°C (194°F).• If higher immunity interferences as specified in the stated EMC standards are present (see chapter approval), a shielded cable is required, otherwise an unshielded instrumentation cable is satisfactory.
Guiding the cables in the terminal box	Cut the field wiring cables to appropriate length to fit properly into the terminal box.
Relay protection	Provide protection for relay contacts to protect the device against inductive load surges.
Protection against static charging	The housing of the unit must be grounded to avoid static charging of the unit. This is particularly important for applications with pneumatic conveying and non-metallic containers.

! Additional Safety Instructions for Hazardous Locations

External equipotential bonding terminal



Field wiring A strain relief must be provided for the field wiring cables, if the device is installed with the factory provided cable glands.

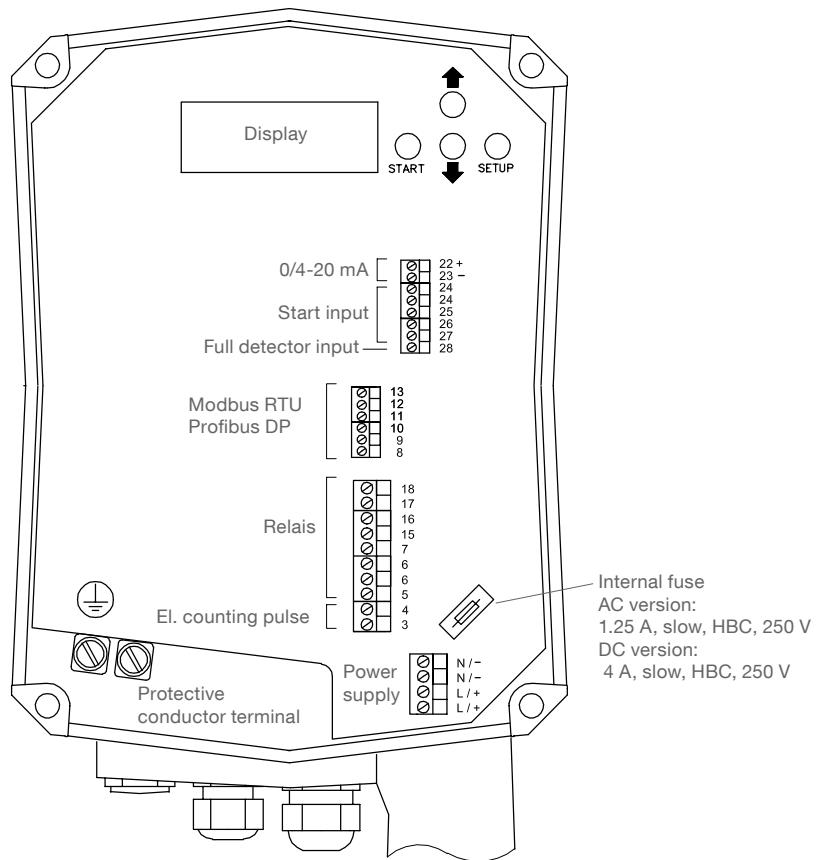
Cable glands for ATEX/ TR-CU Hazardous Locations The used entry devices and blanking elements must have an adequate type approval and a temperature range as defined in the technical data of the unit. In addition they shall be suitable for the conditions and correctly installed. Where available the provided original parts of the manufacturer must be used.

Conduit system for FM Hazardous Locations In addition the regulations of the country must be observed. The used flameproof seals and blanking elements must have an adequate type approval and a temperature range as defined in the technical data of the unit. In addition they shall be suitable for the conditions and correctly installed. Where available the provided original parts of the manufacturer must be used.

Commissioning/ opening the lid Commissioning only, when there are no dust deposits or swirls present.

Electrical installation

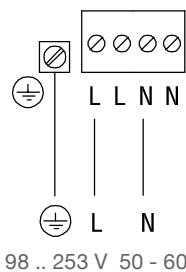
Terminal location



Power supply and Signal input/ output

Power supply

AC version

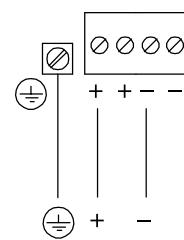


0.75 .. 2.5 mm²
 (AWG 18 .. 13)

AC or DC supply
 depending on
 ordered version

98 .. 253 V 50 - 60 Hz

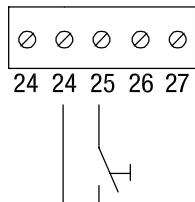
DC version



1.5 .. 2.5 mm²
 (AWG 15 .. 13)

20 .. 28 V DC

Signal input: Start of measurement

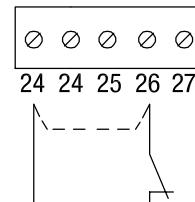


Start contact

alternative

Start +24 V

Start +24 V

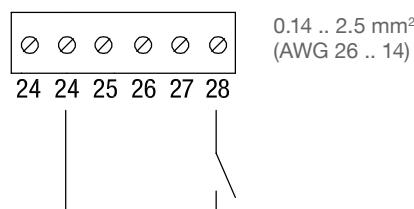


Measurement interruption in
 case of filling. If used, remove
 factory provided connection.

**Signal
 description:**
 See page 20

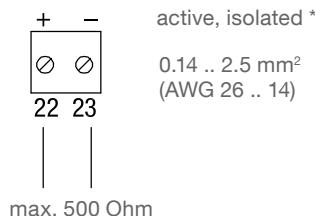
Electrical installation

Signal input:
Full detector



Signal description:
 See page 20

Signal output:
0/4-20 mA

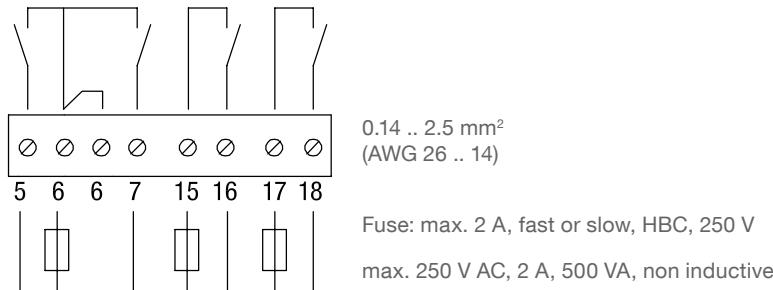


* CAUTION:
 If connecting to a PLC with isolated
 (floating) 4-20 mA input, the "-" line
 must be connected to ground of the PLC.
 See user manual of the PLC.

Signal description:
 See page 20

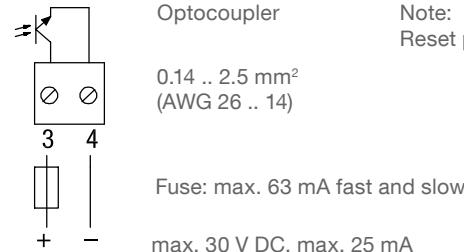
Signal output:
Relay

Relay1 Relay2 Relay3 Relay4



Signal description:
 See page 20

Signal output:
Electronic counting pulse

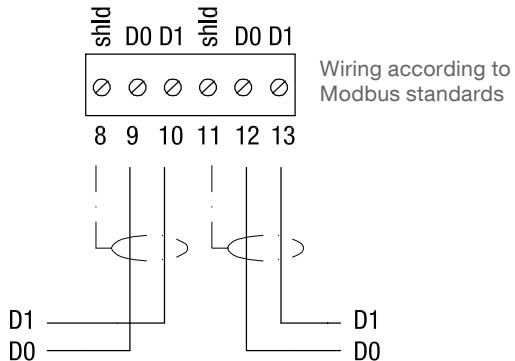


Note:
 Reset pulse is done with Relay 2

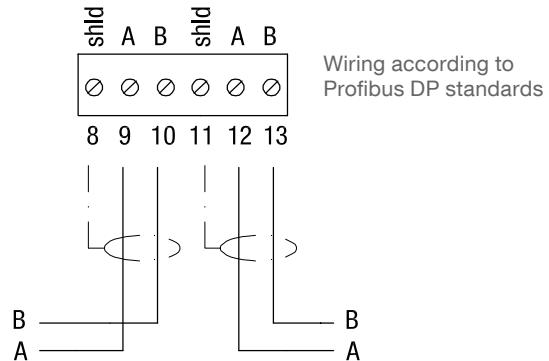
Signal description:
 See page 21

Electrical installation

Modbus network

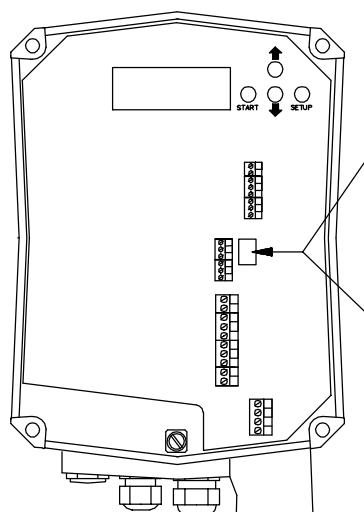


Profibus DP network



Setting Biasing and Termination Resistor

For use of NB 3000 units in a external Modbus or Profibus network, it is possible to set Biasing and Termination Resistor on each unit as required.



Version with Jumper

Biasing	OFF*	OFF	ON
Termination Resistor	OFF*	ON	ON

Version with DIP switch

Biasing	OFF*	OFF	ON	ON
Termination Resistor	OFF*	ON	OFF	ON

*factory provided

DIP Switch position:

Top view Side view

Signal overview

Signal input / output

- Signal input:** • Floating contact (terminal 24, 25) or
Start of measurement • 24 V DC voltage (terminal 25, 27), current consumption approx. 25 mA, observe the polarity.

Duration of starting signal: 0.7 to 5 s
 The contact must be closed or the 24 V signal must be present to start.

Measurement interruption

Used to avoid a measurement in case of filling and to interrupt a running measurement when filling starts. When the terminal 24 und 26 are opened, the sensor weight returns to the upper stop position. If required, remove factory provided wire between terminal 24 and 26 and connect to the filling coupling. The contact must be closed to enable a measurement.

Signal input: Full detector	Enables to implement a full detector signal in the Modbus or Profibus. When the signal is present (terminal 24 - 28 closed) the yellow LED next to the display is on.
Signal output: 0/4-20 mA	Programmable to indicate a level or a volume signal. The output is updated, when the sensor weight touches the surface of the bulk good. It stays until the next measurement is done.

Signal output: Relay	Relais can be setted as shown in the following table:
Factory settings	Relay 1 Relay 2 Relay 3 Relay 4
Programmable	Counting pulse Reset pulse Failure Upper stop position
	Limit switch 1 Limit switch 2 Maintenance Maintenance

Relais 1/2 set to Counting/ Reset pulse:

The counting pulse output is used to connect an external digital counter or a PLC with counting input.

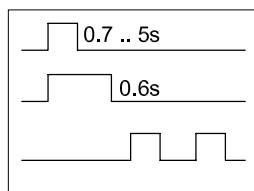
Reset pulse (terminal 6 and 7):

After start of measurement, a reset pulse is given. It is used to reset the connected evaluation device (counter/ PLC, ...).

Counting pulse (terminal 5 and 6):

The counting pulse communicates the measured value to the connected evaluation device. During the downward movement of the sensor weight, this pulse is generated according to the following table:

Timing



Start
Reset
Counting

Counting pulse programmed to:	ON	OFF
10cm (1/3ft) / pulse	0.13s	0.13..0.3s
5cm (1/6 ft) / pulse	0.07s	0.07..0.15s

Relais 1/2 set to Limit switch:

It is possible to indicate two independent level limit switches. The limit switch signal is derived from the analogue measurement signal (details see Programming page 26)

Relay 3 - set to "Failure"

The relay indicates a failure (see also programming on page 27 and diagnostics "Failure" on page 37)

Relay 3 - set to "Maintenance"

The relay indicates a necessary maintenance (see also programming on page 27 and diagnostics "Maintenance" on page 35)

Signal overview

Relay 4 - set to "Upper stop position"

The signal allows the user to determine whether the measurement has come to its end. In this case the sensor weight is in its upper stop position, relay contacts are closed.

Relay 4 - set to "Maintenance"

The relay indicates a necessary maintenance (see also programming on G27 and diagnostics "Maintenance" on G35)

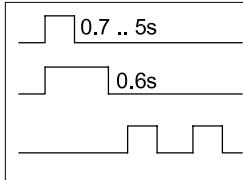
Signal output:

Electronic counting pulse

Counting pulse (terminal 3 and 4):

The electronic counting pulse enables a high amount of pulses to receive a high resolution of the measurement signal.

Timing



Start

Reset

Counting

Counting pulse programmed to:

	ON	OFF
2,5 cm (1/10 ft)/ pulse	25 ms	25 .. 70 ms
1 cm (1/20 ft)/ pulse	10 ms	10 .. 30 ms

Note:

The reset pulse is done with relay 2.

LED status

LED	Status	
LED's next to the Display	Green is on	Power On
	Red is on	Failure
	Red is blinking	Maintenance
	Yellow in on	Full detector input present
LEDs next to relais terminals	Yellow is on	Relay is energised

Diagnostics signals

Failure

Result is a non valid measurement.

Red LED is on. Relay 3 indicates Failure.

The signal indicates critical situations. Evaluation can help to avoid losing the sensor weight inside the silo.

If Failure is indicated, the unit must be checked on site.

Failure codes description see page 37.

Maintenance

Result is an indication for the user with still valid measurement.

Red LED is blinking. Relay 4 indicates Maintenance (programmable).

The signal enables a preventive maintenance. Evaluating can help to avoid loosing the sensor weight inside the silo.

If Maintenance is indicated, the measurement process can be continued.

Maintenance codes description see page 35.

Programming

Quickset menu

The Quickset menu is used for fast and easy start-up of the system.

If the unit is working in normal operation (measurement mode), the SETUP button brings up the Quickset menu.

<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Measurement mode 0.0m (0.0ft) </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Language </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Unit </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Max. move distance M </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Silo height H </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Air distance A </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Cone height C </div>	<div style="border: 1px solid black; padding: 2px;">SETUP</div>	<div style="border: 1px solid black; padding: 2px;">↑</div> <div style="border: 1px solid black; padding: 2px;">↓</div> <div style="border: 1px solid black; padding: 2px;">↑</div> <div style="border: 1px solid black; padding: 2px;">↓</div> <div style="border: 1px solid black; padding: 2px;">↑</div> <div style="border: 1px solid black; padding: 2px;">↓</div> <div style="border: 1px solid black; padding: 2px;">↑</div> <div style="border: 1px solid black; padding: 2px;">↓</div>	<small>*Deutsch English Francais Russian</small>
--	---	---	--

*Meter, Distance
 Meter, Empty Level
 Meter, Level
 Feet, Distance
 Feet, Empty Level
 Feet, Level

0 .. 30/ 40/ 50 m
 (0 .. 100/ 133/
 164 ft) *1 m (3 ft)

0 .. 30/ 40/ 50 m
 (0 .. 100/ 133/
 164 ft) *0 m (0 ft)

0 .. 30/ 40/ 50 m
 (0 .. 100/ 133/
 164 ft) *0 m (0 ft)

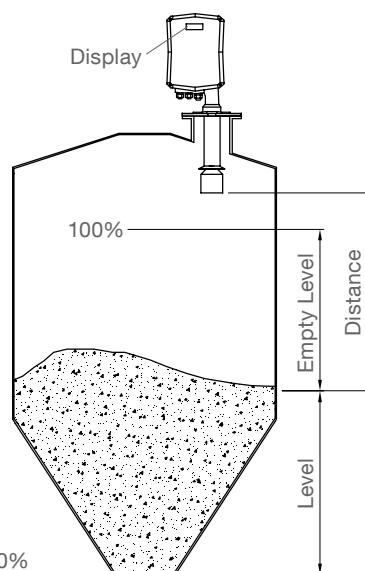
Press **START** to return to
 measurement mode

Max. adjustable length of 30/ 50 m depending on ordered version.

* Factory-provided

Unit

- Defines if units are meter or feet.
- Defines what shall be stated on the display of the unit.
 This is not related to the signal output.

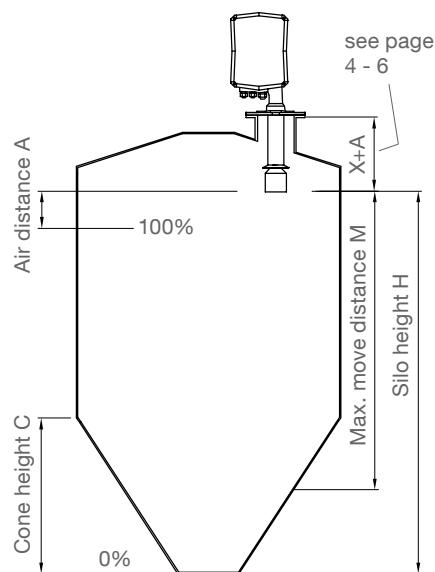


Programming

Max. move distance M	Ensures that the weight does not enter into the silo outlet.
Silo height H	Definition of 0% level output. Note: If the maximum move distance M is smaller than the silo height H, the measured value will always be more than 0%.
Air distance A	Definition of 100% level output.
Cone height C	Enables to set the current output as volume. $C = 0$ Current output indicates material level $C > 0$ Current output indicates material volume

Note:

Note: When using the digital pulse output (terminal 5/ 6/ 7, see page 18/ 21) the parameters silo height H, air distance A and cone height C have no influence on the measurement value.



Programming

Programming buttons

- | | |
|--|---|
| | Continues with next adjustment item |
| | Continues with measurement display after parameter adjustment |
| | Starts measurement |
| | Cancels a Failure or Maintenance message |
| | Increases the value to be adjusted |
| | Decreases the value to be adjusted |

Runtime messages

During measurement mode, following runtime indications are given:

- | | | |
|-----------------------------|--|---|
| | Upper Stop Position is reached | Note:
Pressing the ARROW DOWN button in measurement mode brings up more service information (not described in this manual) |
| | Motor is moving the sensor weight downwards resp. upwards (fast mode) | |
| | Motor is moving in slow mode (shortly after motor start and before Upper Stop Position is reached) | |
| Blocked 24 - 26 open | Measurement interruption is active (terminal 24-26 not connected, see page 20) | |
| Blocked Modbus | Measurement interruption is active (signal is set via Modbus) | |

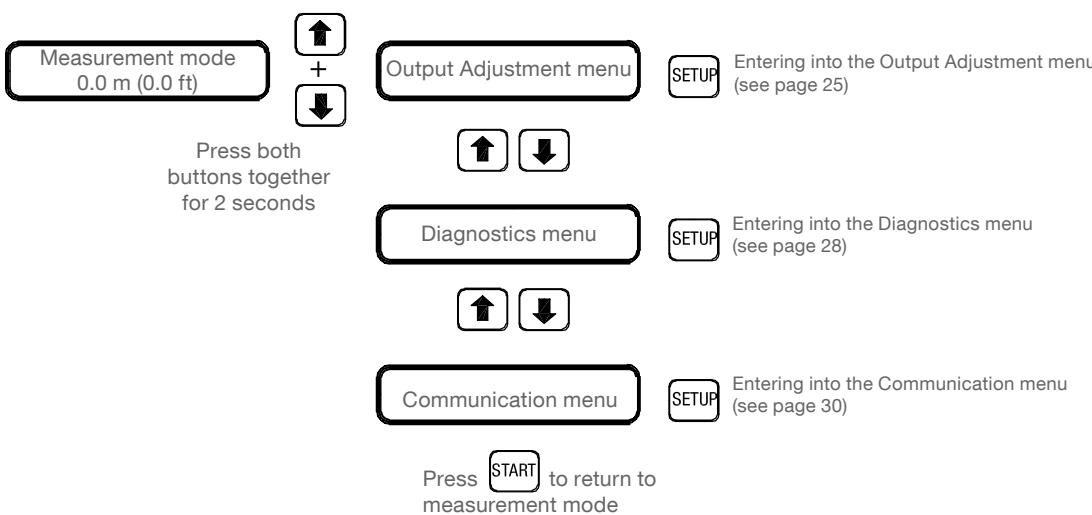
Advanced menus

(use only if necessary)

With the advanced menues it is possible to set the outputs and to display the actual state of the unit.

Entering the advanced menues:

If the unit is working in normal operation (measurement mode), press both "arrow" buttons together for approx. 2 seconds.



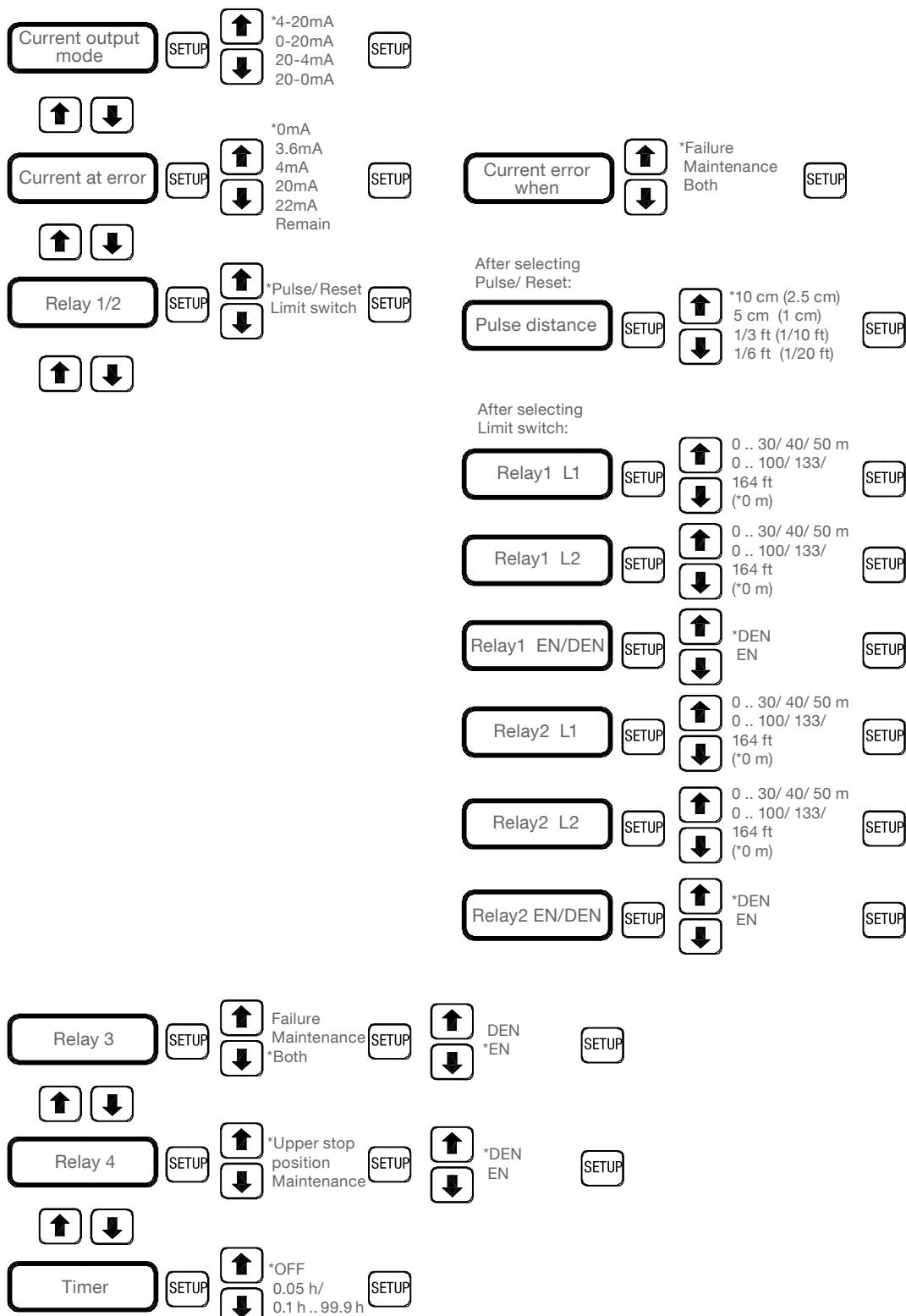
Factory settings

To reset all programmed parameters to factory setting (default values), press the buttons ARROW UP, ARROW DOWN and SETUP together for approx. 10 seconds.

Programming

Output Adjustment menu

The Output Adjustment menu is used for setting the 0/4-20mA, relais and internal timer

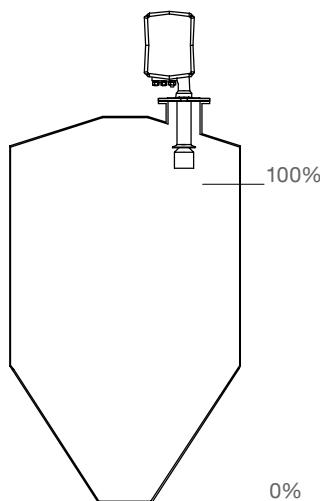


Press 2x **START** to return to measurement mode

* Factory provided

Programming

Current output mode



Setting	Current output at level	
	0%	100%
4-20 mA	4 mA	20 mA
0-20 mA	0 mA	20 mA
20-4 mA	20 mA	4 mA
20-0 mA	20 mA	0 mA

Current at error

In case of error (Failure, Maintenance) the current output shows the adjusted value. It can also be adjusted, whether the current output shall indicate Failure or Maintenance or both situations.

Relay 1/2

Selects, if Relay 1 and 2 shall work as Counting/ Reset pulse output or as two independently programmable limit switches.

Selecting Pulse/ Reset:

Relay 1 works as Counting pulse output with selected pulse rate (the values in brackets are valid for the version with Electronic counting pulse). Relay 2 works as Reset pulse. Details see Signal Overview on page 20.

Selecting Limit switch:

The relays are programmed with the distance from the sensor weight bottom to the required material surface switching point. The relays can be set to energise or de-energise. The relay logic is as follows:

DEN The relay is normally de-energised and is energised when the product rises above the L1 level. It remains energised until the product falls below the L2 level.

EN The relay is normally energised and is de-energised when the product rises above the L1 level. It remains de-energised until the product falls below the L2 level.

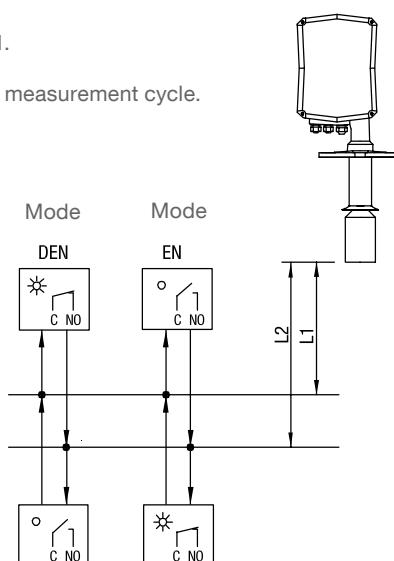
L1 L1 is the upper switching point.

L2 L2 is the lower switching point.

Note: L2 must always be greater than L1.

Note: The limit switch outputs are updated after a measurement cycle.

LED at relay	Relay
OFF	De-energised
ON	Energised



Programming

Relay 3

Selects, if relay 3 shall indicate Failure, Maintenance or both situations.

Failure/ Maintenance	Mode DEN	Mode EN *
Present	15 16	15 16
Not present	15 16	15 16

* factory provided

Relay 4

Selects, if relay 4 shall indicate "Upper stop position" or Maintenance.

Upper stop position/ Maintenance	Mode DEN *	Mode EN
Present	17 18	17 18
Not present	17 18	17 18

* factory provided

Timer

Automatic start of measurement with timer function.

The timing interval between two measurements can be adjusted between 0.05 h (3 minutes) for the version with brushless motor (otherwise 0.1h (6 minutes)) and 99.9 hours. Position „off“ causes no automatic measurement start.

The timer will be reset:

- after finishing a measurement
- after linking the terminals 24/ 26 (measurement interruption during filling)

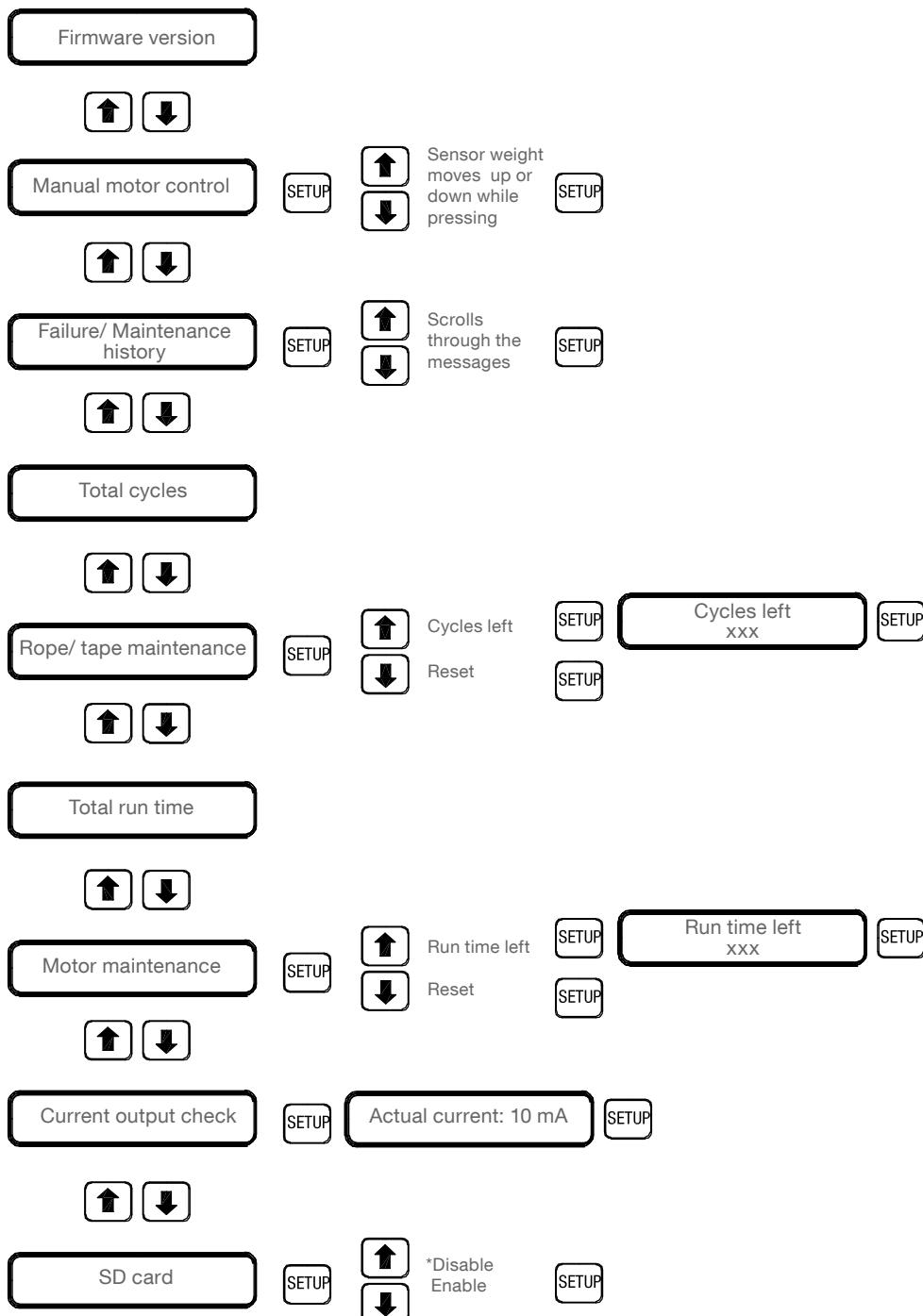
For automatic measurement at a predetermined time of day, an external start unit connected to terminals 24/ 25/ 27 is necessary.

To avoid needless wear and tear, the unit should not be started more often than necessary.

Programming

Diagnostics menu

The Diagnostics menu is used to diagnostics the unit status and for manual motor driving mode



Press 2x to return to measurement mode

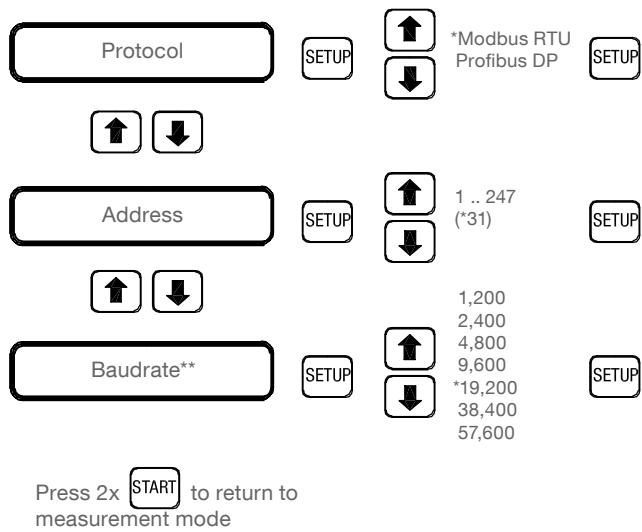
Programming

Firmware version	States the firmware version of the unit.
Manual motor control	<p>The motor moves the sensor weight upwards while the "ARROW UP" button is being pushed. The motor moves the sensor weight downwards while the "ARROW DOWN" button is being pushed.</p> <p>Note: If the sensor weight is in the upper stop position or touching the bulk material surface or after the max. move distance, the motor is automatically stopped.</p> <p>CAUTION: Avoid the sensor weight reaching the outlet position of the silo.</p>
Failure / Maintenance history	<p>Indicates the last 93 error messages related to the motor run time after switching on the power supply for the first time. Messages can be scrolled up and down with the "ARROW" buttons. If "None" is indicated, there is no message filed. The messages and the time information are permanently filed even when the power supply is switched off. Details of the messages see page 35 - 37</p> <p>Examples of indicating a Failure:</p> <p>Hist. 0512h 1350s 0348h 2400s +F11 Meaning: Actual motor run time is 512 hours and 1,350 seconds after first power on. At 348 hours and 2,400 seconds the Failure F11 came up</p> <p>Hist. 0512h 1350s 0356h 1920s -F11 Meaning: Actual motor run time is 512 hours and 1,350 seconds after first power on. At 356 hours and 1,920 seconds the Failure F11 was resetted</p>
Total cycles	Indicates how many measurement cycles have been performed up to now.
Rope/tape maintenance	<p>Cycles left: Indicates how many measurement cycles are left until the next rope/ tape failure message F16 will appear and the unit will stop working.</p> <p>Reset: Can be done after a rope/tape change, if the Maintenance message was not yet present. It sets the internal counter to zero to have the full amount of measurement cycles until the next maintenance message will appear.</p> <p>Note 1: After a Maintenance message is reset with the "START" button, the rope/tape maintenance counter is automatically set to zero.</p> <p>Note 2: The number of preset cycles to the next maintenance message depends on the use of rope or tape version.</p>
Total run time	Indicates, how long the motor has been running up to now (in hours).
Motor maintenance	<p>Run time left: Indicates, how much motor run time (in hours) is left, until the motor failure message F17 will appear and the unit will stop working.</p> <p>Reset: Can be done after a motor change, if the Maintenance message was not yet present. It sets the internal counter to zero to have the full amount of motor run time until the next maintenance message will appear.</p> <p>Note 1: After a Maintenance message is reset with the "START" button, the motor maintenance counter is automatically set to zero.</p>
Current output check	Enables to check, if the current output is working proper. The current output is forced to 10 mA. This can be evaluated by an external connected multimeter.
SD card	Optional use for service aspects (not explained in this manual). After connecting a SD card to the electronics, this parameter shall be set to "Enable". Before removing the SD card, it shall be set back to "Disable".

Programming

Communication menu

The Communication menu is used for setting parameters of Modbus RTU and Profibus DP



Press 2x **START** to return to measurement mode

* Factory provided

** Displayed only with Modbus. With Profibus Baudrate is set automatically.

Protocol Selects if Modbus RTU or Profibus DP protocol is used.

Address Selects the used communication address.

Baudrate Selects the used baudrate.

Programming

Modbus Register

The following registers describe the communication via Modbus.

CAUTION

Writing to the registers different from what is stated will cause a miss function of the unit

Register address	Register name	Register description	Register use	Default value
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Setup

40001	M_LANGUAGE	Language on the menu DEUTSCH 0 ENGLISH 1 FRANCAIS 2 RUSSIAN 3	R/W	0
40002	M_UNIT	Unit used for distance visualisation METER 0 FEET 1	R/W	0
40003	M_MAX_MOVE_DIST	Max. move distance mm	R/W	1000
40004	M_SILO_HEIGHT	Silo height mm	R/W	0
40005	M_AIR_DIST	Air distance mm	R/W	0
40006	M_CONE_HEIGHT	Cone height mm	R/W	0
40022	M_TIMER	Timer interval (for automatic start of measurements), in 1/100 hours (Off = 0) Notes: 1/100 hour = 36 sec Minimum time for standard motor: 0.10 hours (value =10) Minimum time for brushless motor: 0.05 hours (value = 5)	R/W	0

Measurement

40051	M_START	Start of a measurement Start 1	W	
40046	M_DISTANCE	Actual measured distance, in mm Note: After the unit has finished the measurement, the M_STATUS register states "Ready, measurement valid" (the Modbus master must read the M_STATUS register). Then the data on the register M_DISTANCE is valid.	R	
40055	M_VOLUME	Actual measured volume (considering the programmed cone height, air distance and silo height), in % See note on register M_DISTANCE	R	
40052	M_INHIBIT	Block command (allows to block the unit, so that no measurement can be started) No block 0 Block 1 The unit will remain blocked as long as the register has the value "Block". Note: Unit states the blocked status through the M_STATUS register.	W	0
40045	M_STATUS	States the functional status of the unit Blocked 1 Ready, measurement not valid 2 Ready, measurement valid 6 Busy 8 Failure present 16 Temporary not ready 32 -> Explanation see next page	R	

Programming

		<p>Explanation:</p> <p>Blocked: No measurement can be started.</p> <p>Ready: A new measurement can be started.</p> <p>Measurement valid: Indicates a valid measurement.</p> <p>Measurement not valid: Indicates a maintenance condition (details see M_MAINTENANCE)</p> <p>Busy: A measurement is actually running.</p> <p>Failure present: No new measurement can be started (details see M_FAILURE)</p> <p>Temporary not ready: No measurement can be started due to internal actions (usually during upwards movement of the sensor weight).</p>	R	
40057	M_FULL_DETECTOR	States the full detector input status Contact open (24-28) 0 Contact close (24-28) 1	R	

Diagnostics

		Total measured cycles up to now = "M_TOTAL_CYCLES" + 65536 * "M_TOTAL_CYCLES_H"		
40026	M_TOTAL_CYCLES	Total measured cycles up to now, in cycles	R	
40044	M_TOTAL_CYCLES_H	Total measured cycles up to now, in 65536 cycles	R	
		Measurement cycles left until failure message F16 will appear = "M_CYCLES_LEFT" + 65536 * "M_CYCLES_LEFT_H"		
40028	M_CYCLES_LEFT	Measurement cycles left until F16 will appear, in cycles	R	
40050	M_CYCLES_LEFT_H	Measurement cycles left until F16 will appear, in 65536 cycles	R	
		Total motor run time up to now = "M_TOTAL_RUN_TIME" hours + "M_TOTAL_RUN_TIME_S" seconds		
40029	M_TOTAL_RUN_TIME	Total motor run time up to now, in hours	R	
40048	M_TOTAL_RUN_TIME_S	Total motor run time up to now, in seconds	R	
40031	M_RUN_TIME_LEFT	Motor run time left until F17 will appear, in hours	R	
40053	M_FAILURE	Failure status of the unit (stated on a bit basis) F10 – Motor or motor-driver-electronic defect b0 = 1 F11 – Sensor weight is buried b1 = 1 F12 – Rope/tape broken b2 = 1 F13 – Rope/tape too short or jammed in the rope roller b3 = 1 F15 – Not enough current from power supply b4 = 1 F16 – Service interval rope/tape b5 = 1 F17 – Service interval motor b6 = 1	R	
40054	M_MAINTENANCE	Maintenance status of the unit (stated on a bit basis) M10 – Deflection pulley moves not smooth b0 = 1 M11 – Sensor weight blocked inupper position b1 = 1 M16 – Service interval rope/tape b3 = 1 M17 – Service interval motor b4 = 1	R	

Communication

40034	M_PROTOCOL	Bus protocol used for communication Modbus 0	R/W	0
40035	M_ADDRESS	Device address 1 to 247	R/W	31
40036	M_BAUDRATE	Communication speed 1,200 baud 0 2,400 baud 1 4,800 baud 2 9,600 baud 3 19,200 baud 4 38,400 baud 5 57,600 baud 6	R/W	4

R/W: read/write

R: read only

W: write only

Commissioning: Interface measurement

General items

Applications	Measurement of solids in water like mud, sand, bed ash, sediment, stones etc. Rope version: The material surface can be soft/ muddy or compact. Sensitivity adjustment possible. Tape version: The material surface must be compact (the sensor weight cannot sink in). No sensitivity adjustment possible.
Principle	The sensor weight penetrates into the water and stops when touching the solid surface.

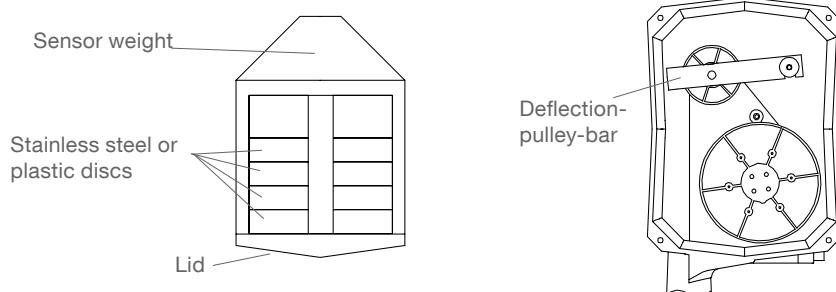
Sensitivity adjustment (rope version)

General	The sensitivity (needed release force for the sensor weight when touching the solid surface) can be set to the requirements of the application. Sensitivity adjustment is done by lowering the sensor weight into the water by using the "Manual motor control" (see page 28).
----------------	---

1. Coarse adjustment	Coarse adjustment is done to avoid the detection of the water surface.
-----------------------------	--

When penetrating into the water, the weight must not float. This can be checked by watching the deflection-pulley-bar. If the deflection-pulley-bar will move briefly upwards while penetrating into the water, the sensor weight floats and needs to be heavier. This is achieved by unscrewing the lid of the sensor weight and replacing one or more plastic discs by stainless steel discs. For soft/ muddy surfaces the sensor weight shall be as light as possible to keep it from sinking into the bulk material surface (see step 2).

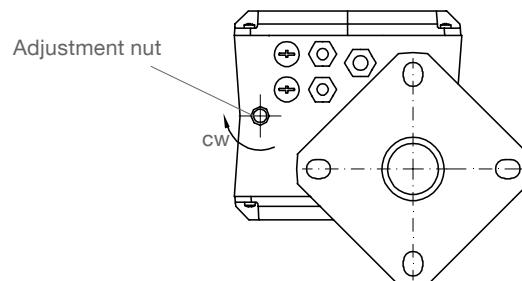
Note: It is important that the sensor weight is completely filled with discs to avoid intrusion of air.



2. Fine adjustment	Fine adjustment is done to keep the sensor weight from sinking into a soft/ muddy material surface.
---------------------------	---

- Turn adjustment nut anti clockwise: measurement becomes more sensitive (for soft/ muddy surface)
- Turn adjustment nut clockwise: measurement becomes less sensitive (for more compact surface)
- Fix the adjustment nut with the counter nut

The adjustment was successful if the sensor weight penetrates the water surface easily and detects the material surface without sinking in.



Maintenance

General items

Opening the lid (cover)



Before opening the lid for maintenance reasons observe following items:

- Do not remove the lid while circuits are alive.
- No dust deposits or whirlings are present.
- No rain can enter into the housing

Frequent check of the unit



To ensure durable safety in hazardous locations and with electrical safety, following items must be checked frequently depending on the application:

- Mechanical damage or corrosion of any components (housing side and sensor side) and of the field wiring cables.
- Tight sealing of the process connection, cable glands and enclosure lid.
- Properly connected external PE cable (if present).

Cleaning



If cleaning is required by the application, following must be observed:

- Cleaning agent must comply with the materials of the unit (chemical resistance). Mainly the lid sealing, cable gland and the surface of the unit must be considered.



The cleaning process must be done in a way, that:

- The cleaning agent cannot enter into the unit through the lid sealing or cable gland.
- No mechanical damage of the lid sealing, cable gland or other parts can happen.

A possible accumulation of dust on the unit does not increase the maximum surface temperature and must therefore not be removed for purposes of maintaining the surface temperature in hazardous locations.

Production date

The production date can be traced by the serial number on the typeplate. Please contact the manufacturer or your local distributor.

Spare parts

All available spare parts are stated in the selection list

Maintenance

Diagnostics: Maintenance

Result is an indication for the user with still valid measurement.

Red LED is blinking. Relay 4 indicates Maintenance (programmable).

The signal enables a preventive maintenance. Evaluating the signal can help to avoid losing the sensor weight inside the silo.

If Maintenance was indicated, the measurement process can be continued.

Mainte-nance code	Description	Performance of the device	Solution
M10	Deflection pulley moves not smooth/ regular	Message is shown, measurement can be continued. If the following 5 measurement cycles after indication are okay, the message will automatically disappear.	Check for proper movement of the pulley. Check for possible slipping of the rope/ tape on the pulley.
M11	Sensor weight blocked in "upper stop position" or block distance of sensor weight to short	The unit tries to start 5 times. If the sensor weight is not released during this time, the message is shown. If after a new measurement start the sensor weight is released, the message will automatically disappear.	Release sensor weight. Ensure, that the min. moving distance (block distance) is > 200 mm (7.87")
M12	SD card not working properly	In the diagnostics menu the setting "SD card Enable" is done but SD card is not present or not working properly	Set the menu to "SD card Disable" or change SD card
M16	Service interval: rope/ tape	The amount of measurement cycles has reached 70% of the rope/ tape lifetime. To further guarantee faultless performance, it is strongly recommended to change the rope/tape. After resetting the message, the internal counter for the rope/ tape cycles is reset to zero. If the message is not reset, the unit will continue measuring, until 90% of the rope/tape lifetime is reached. Then Failure F16 will come up.	Change rope/ tape.
M17	Service interval: motor	The actual run time has reached 70% of the motor lifetime. To further guarantee faultless performance, it is strongly recommended to change the motor. After resetting the message, the internal counter for the motor run time is reset to zero. If the message is not reset, the unit will continue measuring, until 90% of the motor lifetime is reached. Then Failure F17 will come up.	Change motor

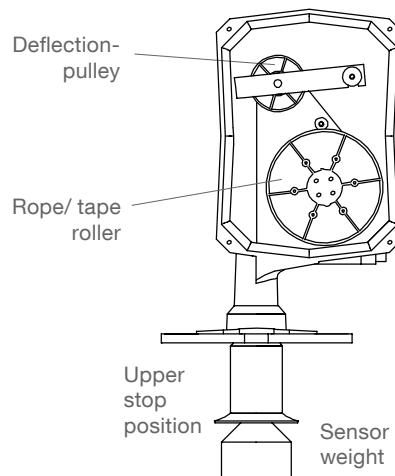
By pushing the START button the actual stated messages shown on the display can be reset.

If more than one message is present, the one with a lower code is shown on the display. After reset with the START button, the next one will be stated.

Possibilities to see a maintenance history: see page G28.

CAUTION

Before removing the rope/ tape roller, remount the unit from the silo to avoid, that the sensor weight can fall into the silo.



Maintenance

Rope/ Tape lifetime

The expected life time (measurement cycles) for the rope/ tape is:

Rope version: approx. 200,000

Tape version: approx. 500,000

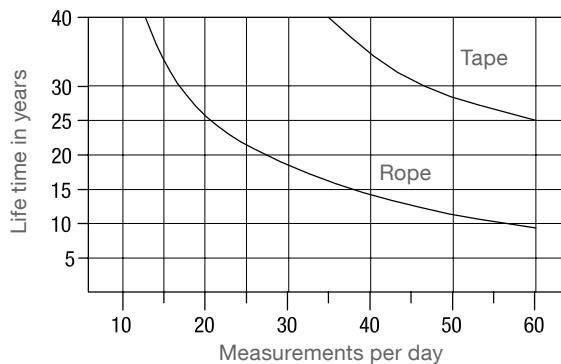
Note: These values refer to lifetime tests under the following conditions:

No excessive material influence. The sensor weight meets an inclined surface, so that an oscillating movement of the sensor weight during upwards movement is caused.

The maintenance message is displayed at 70%, the failure message at 90% of the expected lifetime to provide some safety. For further information see message M16 and F16.

See figure on right hand for the operating time depending on the measurement cycles per day.

For applications with adverse conditions it is recommended to change the rope/tape more frequently.



Motor lifetime

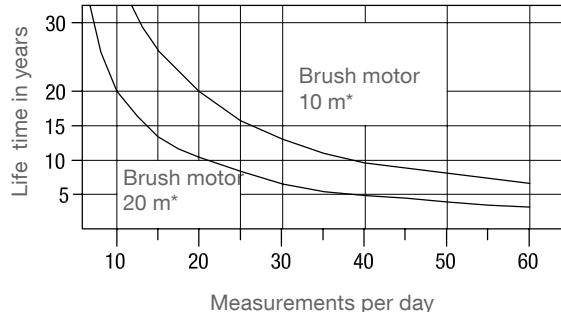
The expected life time (run time) for the motor is:

Version for high measurement frequency (brushless motor):
 approx. 60,000 hours

Version with standard motor (brush motor):
 approx. 3,500 hours

The maintenance message is displayed at 70%, the failure message at 90% of the expected lifetime to consider some safety. For further informations see message M17 and F17.

See figure on right hand for the operating time depending on the measurement cycles per day.



*average measurement distance

Maintenance

Diagnostics: Failure

Result is an invalid measurement.

Red LED is on. Relay 3 indicates Failure.

The signal indicates critical situations. Evaluating the signal can help to avoid losing the sensor weight inside the silo.

If Failure is indicated, the unit must be checked on site.

Failure code	Description	Indication	Performance of the device	Solution
F10	Motor or motor-driver-electronic defect	Motor does not rotate when it is actuated. Evaluation by the hallsensor on the rope/tape roller.	If possible, the sensor weight will be moved up to the "Upper stop position".	Check motor connection. Motor or electronic change.
F11	Sensor weight is buried or jammed	Difference of distance between down and up movement too big. Evaluation by the hallsensor on the rope/ tape roller.	Motor moves 4 seconds upwards, then waits 10 seconds. After that motor moves shortly downwards and then upwards again. If the sensor weight is still jammed, this cycle is repeated 5 times. After that the cycle goes on with a delaytime of one hour.	Release the sensor weight. Make sure, that the sensor weight can move freely.
F12	Rope/ tape broken	Motor is running but the upper stop position is not reached. Evaluation by the hallsensor on the rope/tape roller on the deflection pulley bar.	Motor moves upwards. If after a certain time the upper stop position is not reached, the motor stops.	Repair of rope/ tape break. Check, if rope/tape maintenance was properly done. Check possibility of buried sensor weight.
F13	Rope/ tape too short or rope jammed in the rope roller	The deflection pulley and the rope/tape roller move in different directions. Evaluation by the Hall sensors on the pulley and the rope/tape roller.	Motor direction is selected so the sensor weight moves upwards until upper stop position is reached.	Check if the rope/ tape is too short compared to the adjusted minimum safety setting. Check if the rope is jammed in the rope roller and wound in the wrong direction.
F15	Not enough current available from DC power supply (DC version only)	Supply voltage drops during function.	Sensor weight is moved to the upper stop position.	Enable enough supply current according to the technical data specification.
F16	Service interval: rope/ tape	The amount of measurement cycles is 90% of the rope/tape lifetime. See also maintenance message M16.	The measurement cannot be restarted.	Change rope or tape.
F17	Service interval: motor	The actual run time is 90% of the motor lifetime. See also maintenance message M17.	The measurement cannot be restarted.	Change motor.

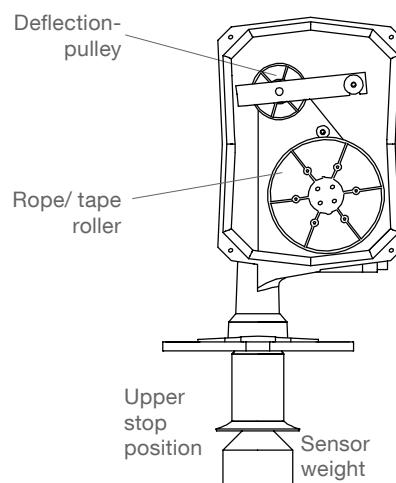
By pushing the START and SETUP button together for 2 seconds, the message shown on the display can be reset.

Possibilities to see a failure history: see page G28.

CAUTION

Resetting F16 or F17 without changing the rope/ tape respective the motor will cause material damage by a broken rope/ tape.

Before removing the rope/ tape roller, remount the unit from the silo to avoid, that the sensor weight can fall into the silo.

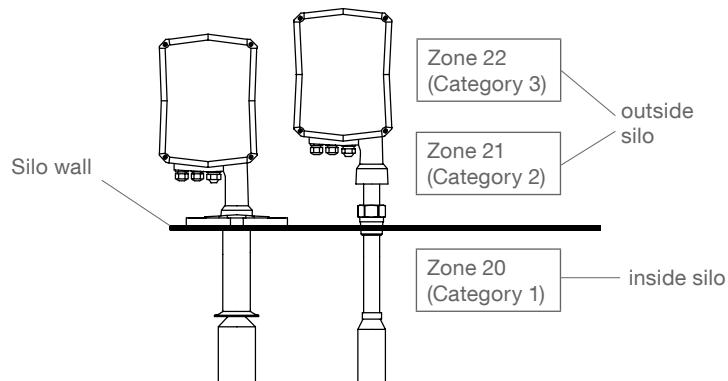


Notes for use in Hazardous Locations

Zone classification

Category	useable in zone	
1 D	20, 21, 22	
2 D	21, 22	
3 D*	22	* in case of conductive dust, additional requirements for installation are necessary.

! Permitted zones (categories) for mounting in partition wall



! General notes

Marking

Devices with Ex-approval are marked on the type plate.

Process pressure

The device construction allows process over-pressure up to 0.3 bar (4.4 psi) (option 1.7 bar (25 psi)). These pressures are allowed for test purposes. The definition of the Ex approvals are only valid for a silo-over-pressure between -0.2 .. +0.1 bar (-2.9 .. +1.45 psi). Out of these pressures the approvals are not valid.

Process and ambient temperature

The permitted temperature ranges are marked on the type plate.

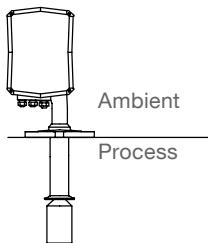
Notes for use in Hazardous Locations

! Maximum Surface Temperature

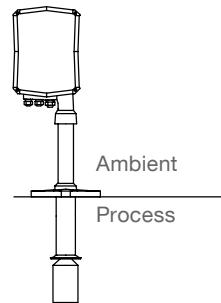
The temperature marking on the name plate refers to the instruction manual.
 On the following table the relevant temperature ratings are shown.

The maximum surface temperature and the temperature class refer to the warmest area outside on the unit which can occur in failure case (according to EX definition).

Version for process temperature
 max. 80°C (176°F)/
 max. 150°C (302°F)



Version for process temperature
 max. 250°C (482°F)



Max. ambient temperature	Max. process temperature	Max. surface temperature	Temp. class
60°C (140°F)	80°C (176°F)	130°C (266°F)	T4
40°C (104°F)	90°C (194°F)	130°C (266°F)	T4
	100°C (212°F)	130°C (266°F)	T4
	110°C (230°F)	130°C (266°F)	T4
	120°C (248°F)	130°C (266°F)	T4
	130°C (266°F)	130°C (266°F)	T4
	135°C (275°F)	135°C (275°F)	T4
	140°C (284°F)	140°C (284°F)	T3C
	150°C (302°F)	150°C (302°F)	T3C

Max. ambient temperature	Max. process temperature	Max. surface temperature	Temp. class
60°C (140°F)	80°C (176°F)	130°C (266°F)	T4
	130°C (266°F)	130°C (266°F)	T4
	135°C (275°F)	135°C (275°F)	T4
	140°C (284°F)	140°C (284°F)	T3C
	150°C (302°F)	150°C (302°F)	T3C
	160°C (320°F)	160°C (320°F)	T3C
	165°C (329°F)	165°C (329°F)	T3B
	170°C (338°F)	170°C (338°F)	T3A
	180°C (356°F)	180°C (356°F)	T3A
	190°C (374°F)	190°C (374°F)	T3
	200°C (392°F)	200°C (392°F)	T3
	210°C (410°F)	210°C (410°F)	T2D
	215°C (419°F)	215°C (419°F)	T2D
	220°C (428°F)	220°C (428°F)	T2C
	230°C (446°F)	230°C (446°F)	T2C
	240°C (464°F)	240°C (464°F)	T2B
	250°C (482°F)	250°C (482°F)	T2B

! Static discharge of the material surface

It must be ensured that no static discharge can occur when the grounded metal sensor weight or rope/ tape touches the surface of the bulk material. If this can not be ensured, the safe use of the unit is NOT guaranteed. The responsibility for this rests with the user. In case of in clarity an assessment from a notified body is necessary.

From the manufacturer side a version with a plastic sensor weight and additional plastic rope insulation part is available on request. This keeps a 500 mm (19.7") distance from the material surface to the grounded rope/ tape.

Disposal

The product consists of materials which can be recycled, details of the used materials see chapter "Technical data - mechanical data". Recycling must be done by a specialised recycling company. Since the product is not subject to the WEEE directive 2002/96/EG, it is not permitted to bring it to a public recycling station.

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Subject to technical change.
All dimensions in mm (inches).

We assume no liability for typing errors.
Different variations to those specified are possible.
Please contact our technical consultants.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning must be carried out only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.

Special attention must be paid to warnings and notes as follows:

WARNING



Relates to a caution symbol on the product and means, that a failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.

WARNING



Relates to a caution symbol on the product: Risk of electric shock

WARNING



Relates to a caution symbol on the product and means, that a failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product

Description



CAUTION: refer to related documents (manual) for details.



Earth (ground) Terminal



Protective Conductor Terminal

Technical support

Please contact your local supplier (see www.uwt.de for address). Otherwise you can contact:

UWT GmbH
Westendstr. 5
87488 Betzigau
Germany

Tel. 0049 (0)831 57123-0
Fax. 0049 (0)831 76879
info@uwt.de
www.uwt.de

Introduction

The Nivobob® NB 4000 is an electromechanic level measuring instrument for continuous measuring of level or volumes in silos, hoppers or tanks.

Applications

- Powder, granulate, small or coarse bulk goods

Available for industries such as

- Food
- Grain
- Cement
- Plastics
- others

Features

Process

- Suitable for most types of bulk goods
- Independent of bulk material properties, such as:
 - Dielectricity and conductivity of the bulk good
 - Dusty atmosphere in the silo
 - Changing humidity inside the product
 - Products that tend to stick
- No mechanical load on the silo roof, the sensor weight just touches the surface of the material
- Accurate measurement

Service

- Simple installation and commissioning
- Measurement principle easy to understand
- Rope, tape with increased service life
- Low maintenance

Approvals

- Approval for use in Hazardous Locations

Mechanic

- Measurement range up to 30 m (100 ft)
- 1½" process connection possible
- Aiming flange to be mounted directly on a flat silo roof
- Internal tape cleaner for difficult materials
- Robust cast housing, ingress protection IP66

Electronics

- Micro processor controlled measurement
- Diagnostics possibilities
- Output 4-20 mA
- Two programmable Relais (can be used as Counting/ Reset pulse output or as Failure/ Upper stop position)
- Measurement start with external signal or integrated timer

Function

The Nivobob® NB 4000 is mounted on the top of the silo. A sensor weight is driven down into the silo. It is mounted at the end of a rope or tape which is wound on a motor driven roller. Upon contact with bulk material, the motor changes the winding direction and the sensor weight is driven back to the upper stop position.

During downwards movement of the sensor weight the distance is electronically measured by the rotations of the internal rope/ tape roller. The microcontroller converts the measured distance into an output signal, which is a volumetric signal based on the silo geometry. The output signal is updated, when the sensor weight touches the bulk material.

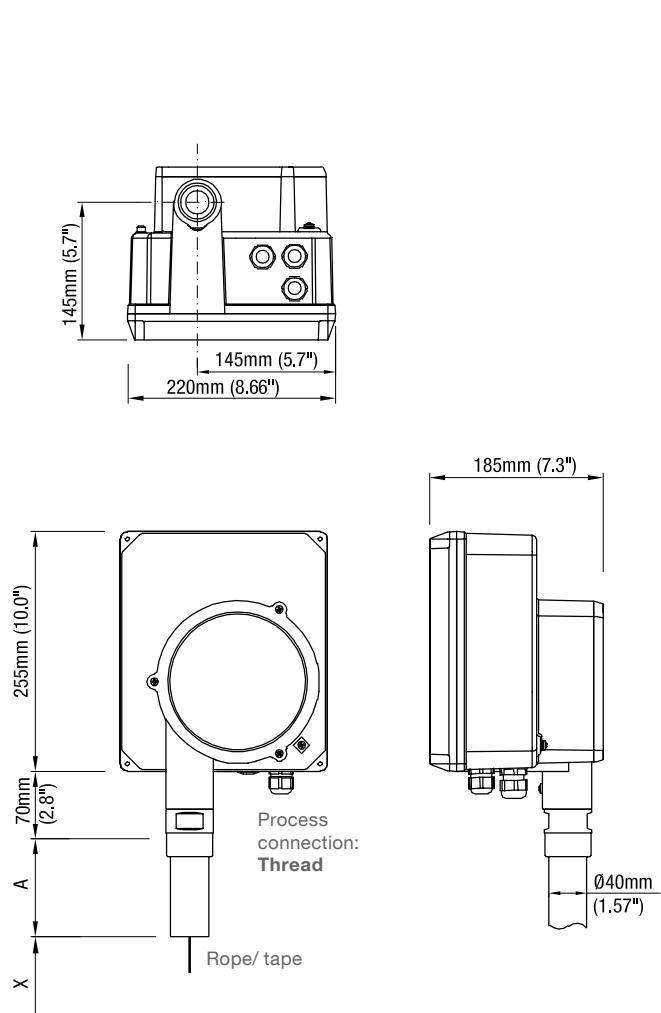
Diagnostics

Comprehensive diagnostics possibilities are present:

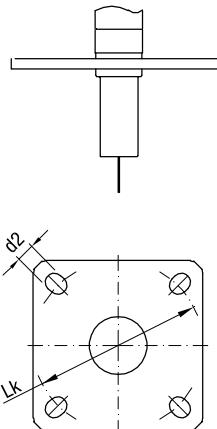
- Measurement control is done by comparing the moved distance between up and downward movement and checking for discrepancy. In case of discrepancy, the sensor weight is pulled to the upper stop position to ensure, that the sensor weight is not inside the silo.
- Service interval after a certain amount of measurements and run time.
- Internal control of motor and motor driver electronic.

Diagnostics is in accordance with NAMUR recommendation NE107.

Dimensions and materials

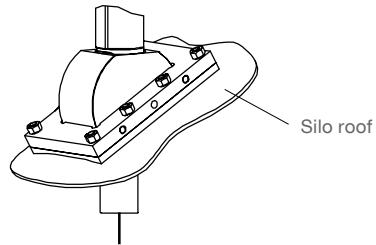


Process connection: Flange



Process connection: Aiming flange

To be screwed directly to the silo roof
 0° - 50° adjustable
 Including screws, nuts and sealing



Flange plate outside dimensions:
 Width x Height: 120 mm x 180 mm (4.7" x 7.1")

Dimensions

X = Length to bottom of sensor weight (in upper stop position, see next page)	
A = Length of socket pipe 100 mm (3.9") Optional 200 mm (7.9")/ 500 mm (19.7")/ 1,000 mm (39.4")	
Flanges	
fitting to: DN100 PN16/ 4" 150lbs	
fitting to: 2" / 3" 150lbs	Lk = ø180 - 190.5 mm (ø7.1 - 7.5") slot d2 = ø19 mm (ø0.75")
Rope	ø1.0 mm (ø0.04")
Tape	12 x 0.2 mm (0.47 x 0.008")

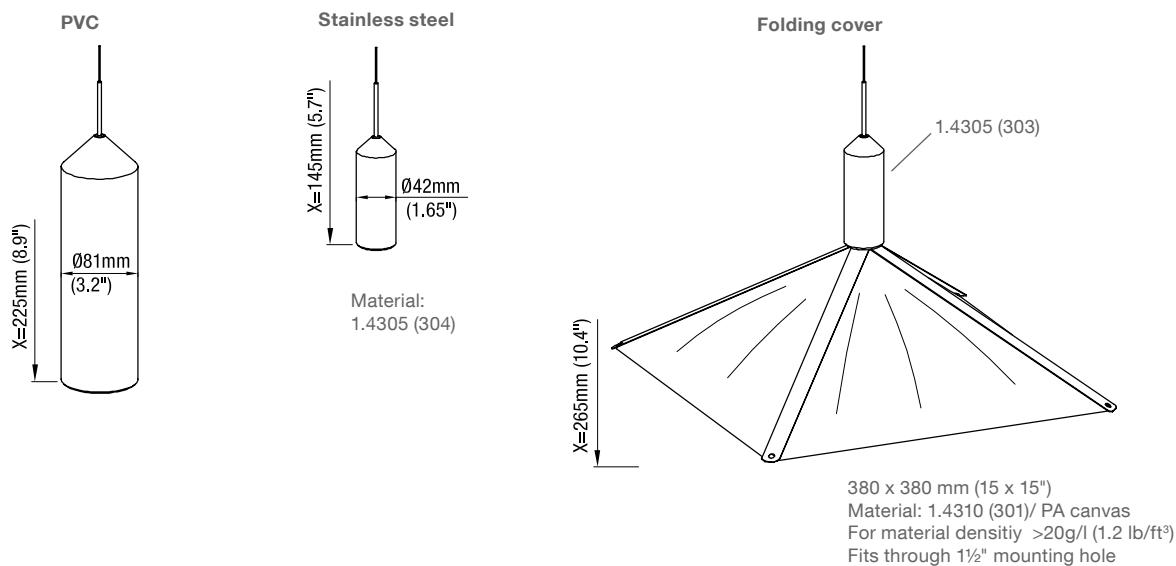
Materials

Housing outside	Aluminium, outside powder coated
Thread/ flange	Aluminium
Aiming flange	Aluminium/ 1.4301 (304)
Rope	1.4301 (304)
Tape	1.4310 (301)

Dimensions and materials

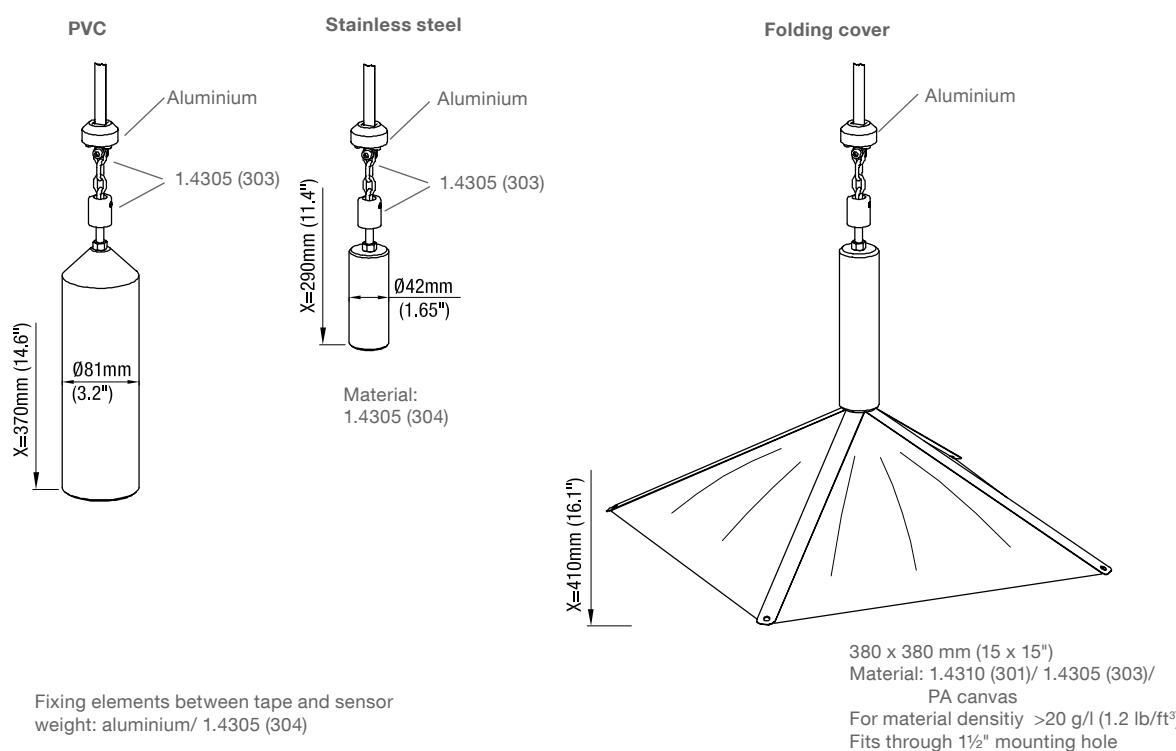
Sensor weights

Rope version



All sensor weights:
 1.6 kg (3.5 lbs)

Tape version



Fixing elements between tape and sensor weight: aluminium/ 1.4305 (304)

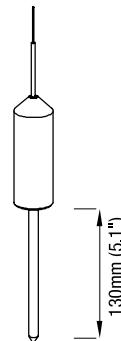
All sensor weights:
 1.6 kg (3.5 lbs)

Options and Accessories

Options

Pin for sensor weight

Recommended for powder
The pin penetrates into the material and avoids slipping or tilting of the sensor weight on the steep bulk surface.



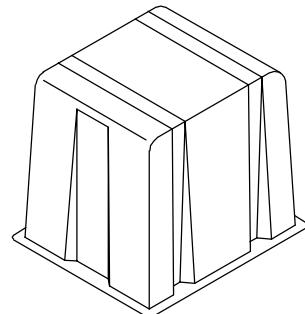
Weather protection cover

If the unit is used outdoors, the use of the weather protection cover is recommended. It protects the device from all atmospheric influences such as

- rain water
- condensation water
- excessively high temperatures
- excessively low temperatures in winter

Material: PE, weather and temperature stable

For use in Hazardous Locations only permitted for Zone 22 or Division 2



Accessories

Mounting kits

Material for mounting the unit on a flange
Sealings, screws and washers

Adapter NPT 1½" to NPT 3"

Aluminium
For mounting the unit on a 3" ferrule
Thread tapered ANSI B1.20.1



Technical data

Electrical data

Power supply	AC version 230 V or 115 V 50 - 60 Hz +10%/-15% (incl. 10% of EN 61010) DC version 20 .. 28 V (incl. 10% of EN 61010)		
Installed load	AC version: 150 VA (including internal heater (80 W)) DC version: One unit: 150 W (with or without internal heater) * Further units which are connected to the same power supply: 25 W per unit (without internal heater, motor off) ** 50 W per unit (without internal heater, motor running) 80 W per unit (with internal heater, supply voltage 20 V DC) 100 W per unit (with internal heater, supply voltage 24 V DC) 120 W per unit (with internal heater, supply voltage 28 V DC)		
	<small>*Considers the max. motor traction which is needed in a failure condition. A failure condition is assumed for max. one unit at the same time. ** This value can be considered, if the controlling PLC starts the measurement for max. one unit at the same time.</small>		
Signal output: 4-20mA	Max. 500 Ohms (active, isolated) Linearity ±0.1 mA		
Signal output: Relais	Optional: 1x Relais SPST and 1x Relais DPDT max. 250 V AC, 2 A, 500 VA non inductive		
Communication: Modbus RTU	Physical layer: RS 485 and Ground, isolated Mode: RTU, Type: Slave Device number range: 1 - 247 (selectable in menu), Baudrate: 1,200 to 57,600 Baud, Data bits: 8, Stop Bits: 1 Parity: None Multi-drop configuration possible. Factory setting of address is 31. Each unit which is connected to the network must be set to an individual address. Supported commands Reading: All diagnostics and parameters using command 03 _{HEX} : Read Holding Register Writing: All parameters using command 06 _{HEX} : Write Single Register (not supported is command 10 _{HEX} : Write Multiple Register).		
Accuracy of measurement	Output	Measuring range	Accuracy Rope version
	Counting pulse	< 10 m (33 ft) < 20 m (66 ft) < 30 m (100 ft)	2 pulses 3 pulses 5 pulses
	4-20 mA/ Modbus RTU	< 30 m (100 ft)	1.5% of measured length
Display	LCD		
Indication light	Status by built in LED: Power On, Relay, Failure		
Memory	Non-volatile (no backup battery required) > 10 years data retention		
Connection terminals	0.14 .. 2.5 mm ² (AWG 26 .. 14) 0.14 .. 1.5 mm ² (AWG 26 .. 16) Modbus terminals		
Cable entry	According to selection: Screwed cable gland 1x M25 x 1.5 + 1x M20 x 1.5 Blind plug 1x M25 x 1.5 + 1x M20 x 1.5 or Conduit ANSI B1.20.1 1x NPT ¾" + 1x NPT ½" Blind plug 1x NPT ¾" + 1x NPT ½"		
	Clamping range (diameter) of the factory provided cable glands: M20 x 1.5: 6 .. 12 mm (0.24 .. 0.47") M25 x 1.5: 8 .. 17 mm (0.31 .. 0.67")		

Technical data

Extension cables for Modbus	Use common recommended cables	
Isolation	Power supply to all other outputs/ inputs: Relay to relay: 2,210 Vrms	AC version 2,210 Vrms DC version: 1,000 VDC
Protection class	I	
Overvoltage category	II	
Pollution degree	2 (inside housing)	

Mechanical data

Ingress protection	IP66, Type 4	
Process connection	Threads: Flanges: Aiming flange:	R 1½" EN 10226 tapered, NPT 1½" ANSI B1.20.1 tapered (Adapter for NPT 3" available) DN100 PN16 EN 1092-1 (unit fits to this flange) 2" or 3" or 4" 150lbs ANSI B16.5 (unit fits to this flange) To be mounted directly on a flat silo roof
Colour	Housing Lid	RAL 5010 (gentian blue) RAL 9006 (aluminium silver)
Material	See detail specifications on page 4/ 5	
Measuring range	Max. 15 m (50 ft) or max. 30 m (100 ft)	
Measuring speed	Sensor weight speed in average: ca. 0.2 m/s (0.6 ft/sec)	
Sound level	max. 50 dBA	
Weight	With thread: ca. 9 kg (20 lbs) With flange: ca. 11 kg (24 lbs)	
Deviation of vertical mounting	max. 2°	

Operating conditions

Process overpressure	-0.2 .. +0.2 bar (-3.0 .. +3.0 psi)	
Process temperature	-40°C .. +80°C (-40 .. +176°F)	
Ambient temperature	-20°C .. +60°C (-4 .. +140°F) -40°C .. +60°C (-40 .. +140°F) -40°C .. +60°C (-40 .. +140°F)	CE, FM General Purpose with internal heater ATEX, FM Class II on request possible
Ventilation	Ventilation is not required	
Min. powder density	>300 g/l (18 lb/ft³) >20 g/l (1.2 lb/ft³) with folding cover The data is a guideline and is valid for material which has settled after filling. During the filling the bulk density can change (e. g. for fluidised material).	

Technical data

Minimum time between measuring starts	measuring height 5 m (16 ft) -> 3 min measuring height 10 m (33 ft) -> 6 min measuring height 20 m (66 ft) -> 12 min measuring height 30 m (98 ft) -> 18 min
Rope/tape operating time	see page 27
Max. permitted tractive force	ca. 800 N
Relative humidity	0 - 100%, suitable for outdoor
Altitude	max. 2,000 m (6,562 ft)
Expected product lifetime	Following parameters have a negative influence on the expected product lifetime: High ambient- and process temperature, corrosive environment, high vibration, high flow rate of abrasive bulk material passing the sensor element, high amount of measurement cycles.

Transport and Storage

Transport	Observe the instructions as stated on the transport packaging, otherwise the products may get damaged. Transport temperature: -40 .. +80°C (-40 .. +176°F) Transport humidity: 20 .. 85% Transport incoming inspections must be carried out to check for possible transport damage.
Storage	Products must be stored at a dry and clean place. They must be protected from influence of corrosive environment, vibration and exposure to direct sunlight. Storage temperature: -40 .. +80°C (-40 .. +176°F) Storage humidity: 20 .. 85%

Approvals

Hazardous Locations*	ATEX II 1/2 D (zone 20/21) FM Class. II, III Div.1 Gr. E-G TR-CU Ex ta/tb IIIC T! Da/Db X
Ordinary Locations *	CE EN 61010-1 FM General purpose TR-CU
EMC	EN 61326 - A1 (industrial standard)
RoHS conform	According to directive 2011/65/EU

* Depending on selected version in selection list

Mounting

! General Safety Instructions

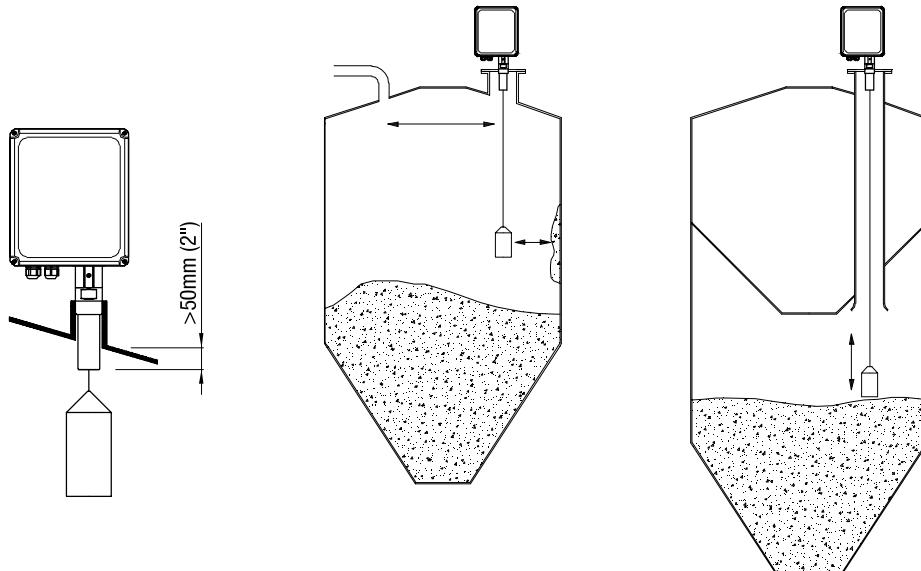
Process pressure	Improper installation may result in loss of process pressure.
Chemical resistance against the medium	Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.
Mounting location	The right mounting place is significant for a proper function. Observe mounting instructions.
Vibrations	Avoid mounting in applications with strong vibration. Use rubber mounts for absorption in case of light vibrations.

! Additional Safety Instructions for Hazardous Locations

Installation regulations	For devices to be used in Hazardous Locations the respective valid installation regulations must be observed.
Sparks	The installation has to be done in a way, that mechanical friction or impact does not cause sparks between the aluminium enclosure and steel.

Mounting instructions

Mounting position	<ul style="list-style-type: none"> The unit is mounted vertically on the silo. Max. deviation is 2°. There must be at least 200 mm (7.87") space for the sensor weight to move down in case of a full silo. Observe the bottom of the sensor weight at "upper stop position" (dimensions see page 4). With overfilling the rope/tape may break. The socket pipe of the unit must protrude at least 50 mm (2") into the silo. A version with longer socket pipe is available. Proper movement of the sensor weight must be guaranteed, even if the sensor weight oscillates. Observe enough distance to the silo wall, stanchions and built-in fittings. For measurements through a long pipe in a double chamber silo we recommend the use of NB 4200 (tape version).
--------------------------	--



Measurement during filling of the silo	Filling of the silo while measuring might cover the sensor weight with bulk material. Measurements during filling are possible, if there is enough distance to the infeed, so that no material can fall on the sensor weight.
---	---

Sealing	<ul style="list-style-type: none"> A rubber seal must be used to tighten the thread or flange. Close both lids of the enclosure tightly.
----------------	--

Mounting with aiming flange

Mounting with aiming flange

The aiming flange allows to mount the unit directly on the roof of a silo without the need of a socket.



When working on a silo roof, take precautions according to the valid safety regulations to avoid that persons can fall down.

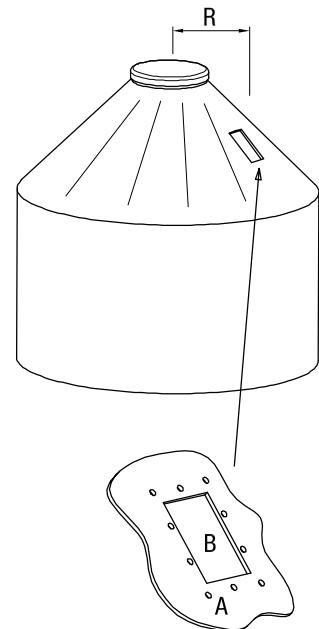
- Find the right mounting position (see page before). To ensure a proper sealing of the rubber on a shaped silo roof, the distance "R" from the center of the silo to the mounting position must be >500 mm (19.7").

- Mark ten drilling holes "A" and the cutaway "B" with a marker on the silo roof. Use the attached template.



While doing the next steps 3. and 4., ensure that swarfs or any parts can not fall into the silo.

- Drill ten holes "A" with a 9.5 mm driller. Use a cut-off grinder to grind out the shape "B". Before doing this, drill a bigger hole in the middle of "B", where you can hold the cutted plate to avoid that it falls into the silo when it gets loose.

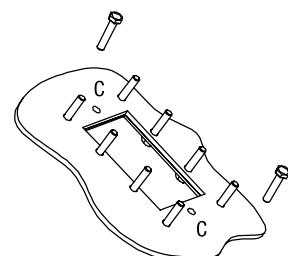


- Insert the clamping plate from inside the silo and fix with two screws "C"

- Apply the rubber sealing from outside over the shafts. Take care that the shaped side faces to the (shaped) silo roof and the knobs faces upwards..

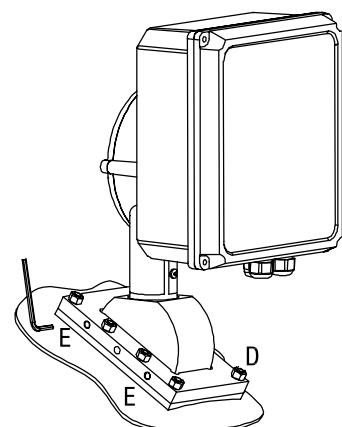


If the sealing is fixed in the wrong direction, the sealing may not be water and dust tight.



- Mount the NB 4000 unit. Fix equally and crosswise all the eight nuts "D", first with a low torque, increase up to a torque of 2 Nm

- Adjust the unit to a vertical position (deviation of max. 2°) by using a water level. Fix two screws "E" with a torque of 15 Nm.



Electrical installation

! General Safety Instructions

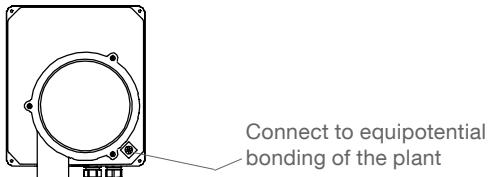
Handling	In case of improper handling or handling malpractice, the electric safety of the device cannot be guaranteed.
Installation regulations	The local regulations or VDE 0100 (Regulations of German Electrotechnical Engineers) must be observed.
Fuse	Use a fuse as stated in the connection diagrams.
RCCB protection	In case of a fault, the supply voltage must be automatically switched off by a RCCB protection switch to protect against indirect contact with dangerous voltages.
Power supply switch	A voltage disconnection switch must be provided near the device.
Wiring diagram	The electrical connections are made in accordance with the wiring diagram.
Supply voltage	Compare the supply voltage applied with the specifications given on the name plate before switching the device on.
Cable gland	<p>The screwed cable gland and closing element must have following specifications: Ingress protection IP66, temperature range from -40°C to +70°C, UL or VDE certified (depending on the country where the unit is installed), pull relief. Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion). Cable glands that are not used have to be sealed with a blanking element. The diameter of the field wiring cable has to match to the clamping range of the used cable gland.</p>
Conduit system	In case of using a conduit system (with NPT thread) instead of a cable gland the regulations of the country, where the unit is installed, must be observed. The conduit must have a tapered thread either NPT ½" or NPT ¾" in accordance with the unit and ANSI B 1.20.1. Not used inlets must be closed tight with a metal blanking element.
Field wiring cables	<ul style="list-style-type: none">• The diameter has to match to the clamping range of the used cable gland.• The cross section has to match with the clamping range of the connection terminals and consider the max. current.• All field wirings must have insulation suitable for at least 250V AC.• The temperature rating must be at least 90°C (194°F).• If higher immunity interferences as specified in the stated EMC standards are present (see chapter approval), a shielded cable is required, otherwise an unshielded instrumentation cable is satisfactory.
Guiding the cables in the terminal box	Cut the field wiring cables to appropriate length to fit properly into the terminal box.
Relay protection	Provide protection for relay contacts to protect the device against inductive load surges.
Protection against static charging	The housing of the unit must be grounded to avoid static charging of the unit. This is particularly important for applications with pneumatic conveying and non-metallic containers.

Electrical installation



Additional Safety Instructions for Hazardous Locations

External equipotential bonding terminal



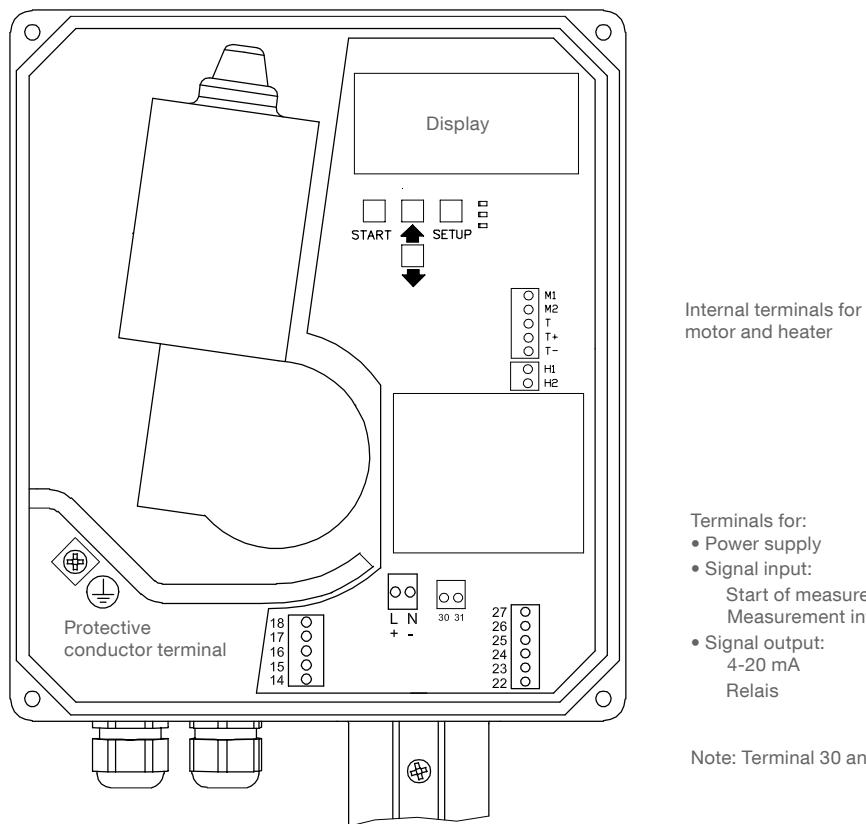
Connect to equipotential bonding of the plant

Field wiring	A strain relief must be provided for the field wiring cables, if the device is installed with the factory provided cable glands.
Cable glands for ATEX/ TR-CU Hazardous Locations	The used entry devices and blanking elements must have an adequate type approval and a temperature range as defined in the technical data of the unit. In addition they shall be suitable for the conditions and correctly installed. Where available the provided original parts of the manufacturer must be used.
Conduit system for FM Hazardous Locations	In addition the regulations of the country must be observed. The used flameproof seals and blanking elements must have an adequate type approval and a temperature range as defined in the technical data of the unit. In addition they shall be suitable for the conditions and correctly installed. Where available the provided original parts of the manufacturer must be used.
Commissioning/ opening the lid	Commissioning only, when there are no dust deposits or swirls present.

Electrical installation

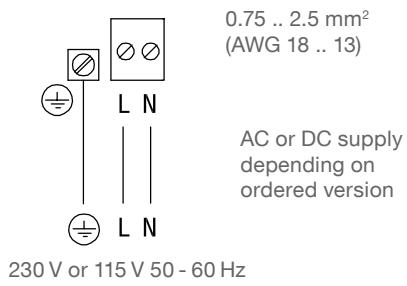
Version 4-20 mA

Terminal location

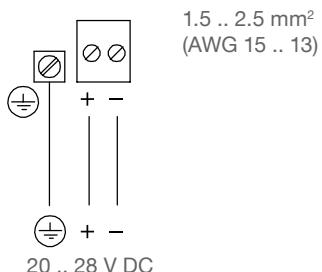


Power supply

AC version

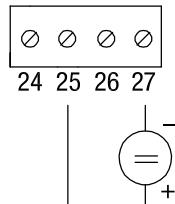
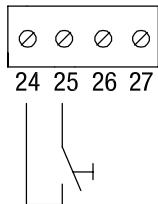


DC version

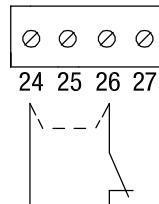


Signal input:

Start of measurement



Measurement interruption

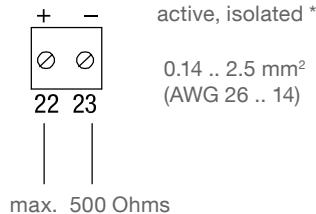


0.14 .. 2.5 mm²
(AWG 26 .. 14)

**Signal
description:**
See page 17

Electrical installation

Signal output:
 4-20 mA



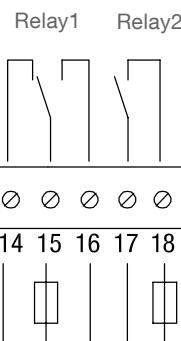
active, isolated *

0.14 .. 2.5 mm²
 (AWG 26 .. 14)

Signal description:
 See page 17

* CAUTION:
 If connecting to a PLC with isolated (floating)
 4-20 mA input, the "-" line must be connected to
 ground of the PLC. See user manual of the PLC.

Signal output:
 Relais
 (optional)



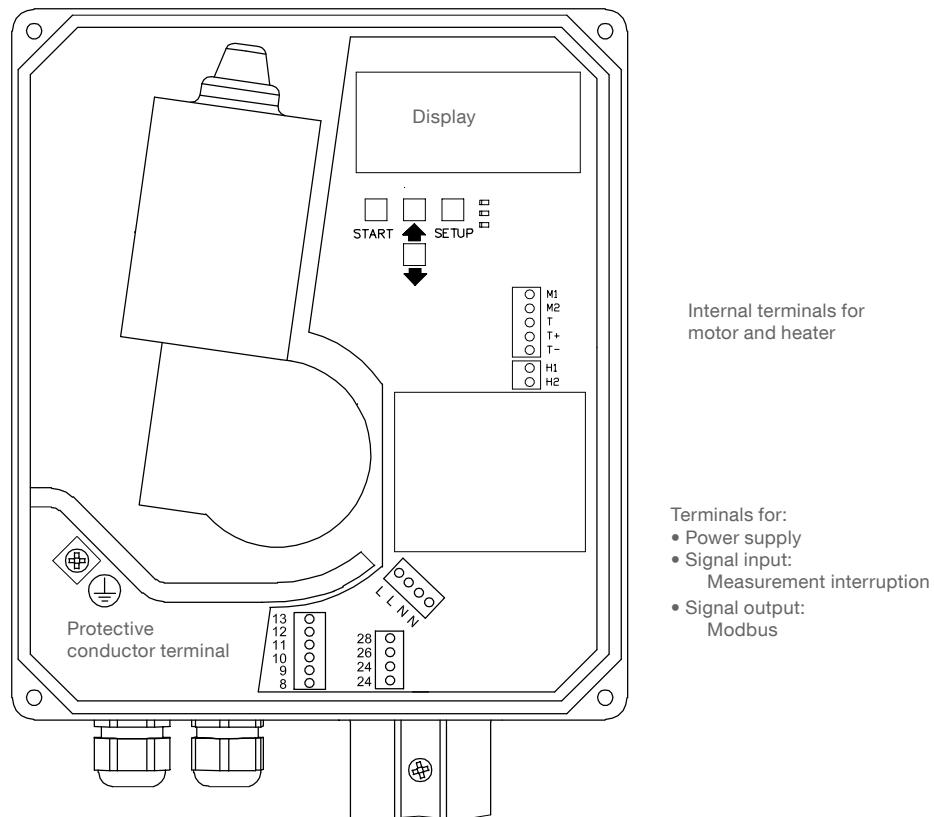
0.14 .. 2.5 mm²
 (AWG 26 .. 14)

Signal description:
 See page 17

Fuse: max. 2 A, 250 V, HBC, fast or slow
 max. 250 V AC, 2 A, 500 VA, non inductive

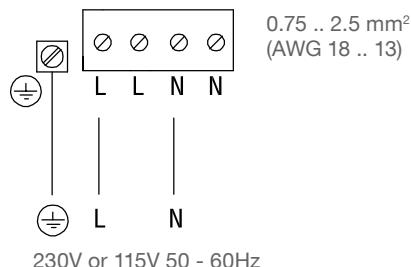
Version Modbus

Terminal location

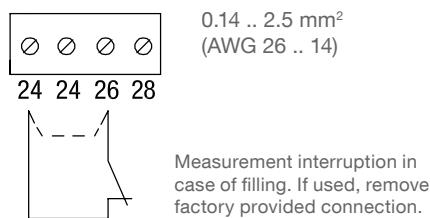


Electrical installation

Power supply

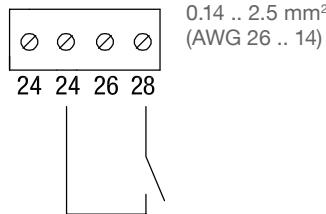


Signal input:
Measurement interruption



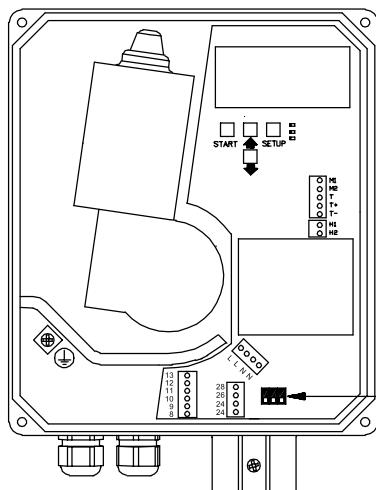
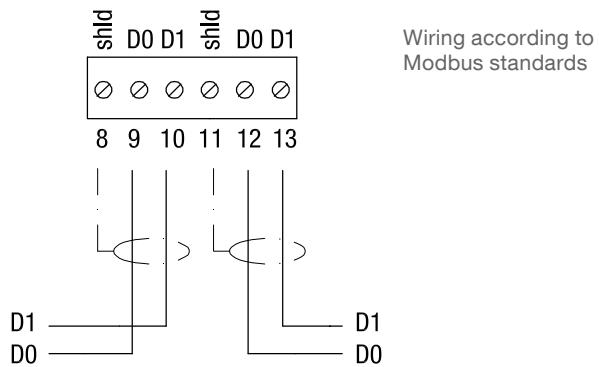
Signal description:
 See page 17

Signal input:
Full detector



Signal description:
 See page 17

Modbus network



Setting Biasing and Termination Resistor

For use of NB 4000 units in a external Modbus network, it is possible to set Biasing and Termination Resistor on each unit as required.

Biasing	OFF*	OFF	ON	ON
Termination Resistor	OFF*	ON	OFF	ON

*factory provided

DIP Switch position:

Top view Side view

Signal overview

Signal input/ output

Signal input:

Start of measurement

Measurement interruption

Start of measurement

- Floating contact (terminal 24, 25) or

• 24 V DC voltage (terminal 25, 27), current consumption approx. 25 mA, observe the polarity.

Duration of starting signal: 0.7 to 5 sec.

The contact must be closed or the 24 V signal must be present to start.

Measurement interruption

Used to avoid a measurement in case of filling and to interrupt a running measurement when filling starts.

When the terminal 24 und 26 are opened, the sensor weight returns to the upper stop position.
 If required, remove factory provided wire between terminal 24 and 26 and connect to the filling coupling.

The contact must be closed to enable a measurement.

Signal input:

Full detector

Enables to implement a full detector signal in the Modbus.

When the signal is present (terminal 24 - 28 closed) the yellow LED next to the display is on.

Signal output:

4-20 mA

Programmable to indicate a level or a volume signal. The output is updated, when the sensor weight touches the surface of the bulk good. It stays until the next measurement is done.

Signal output:

**Relais
(optional)**

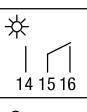
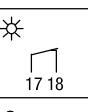
Relais can be setted as shown in the following table:

	Relay 1	Relay 2
Factory settings	Failure	Upper stop position
Programmable	Reset pulse	Counting pulse

Relais set to "Upper stop position/ Failure"

Relay 1: indicates a Failure (see also diagnostics "Failure" on page 28)

Relay 2: indicates "Upper stop position". The signal allows the user to determine whether the measurement has come to its end. In this case the sensor weight is in its upper stop position, relay contacts are closed.

	Relay 1	Relay 2
	Failure	Upper stop position
Present	 14 15 16	 17 18
Not present	 14 15 16	 17 18

Signal overview

Relais set to Counting/ Reset pulse:

The counting pulse output is used to connect an external digital counter or a PLC with counting input.

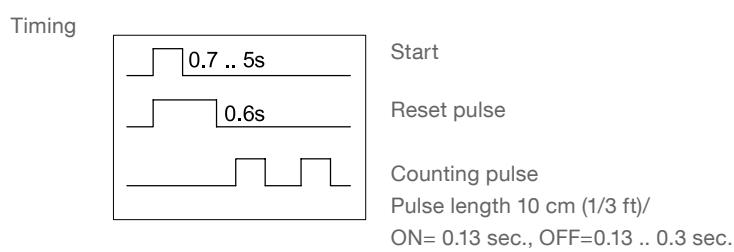
Reset pulse (terminal 15 and 16, Relay 1):

After start of measurement, a reset pulse is given. It is used to reset the connected evaluation device (counter/ PLC, ...).

Counting pulse (terminal 17 and 18, Relay 2):

The counting pulse communicates the measured value to the connected evaluation device. During the downward movement of the sensor weight, this pulse is generated according to the following table:

Note: If the used digital counter or PLC requires a common ground for reset and counting pulse, the terminals 15 and 17 can be connected together.



LED status

LED		Status
LEDs next to display	Green is on	Power On
	Red is on	Failure
	Red is blinking	Maintenance
	Yellow is on	Full detector is present (only Modbus version)
LEDs next to relais terminals	Yellow is on	Relay is energised

Diagnostics signals

Failure

Result is a non valid measurement.

Red LED is on. Relay indicates Failure (if selected).

The signal indicates critical situations. Evaluation can help to avoid losing the sensor weight inside the silo.

If Failure is indicated, the unit must be checked on site.

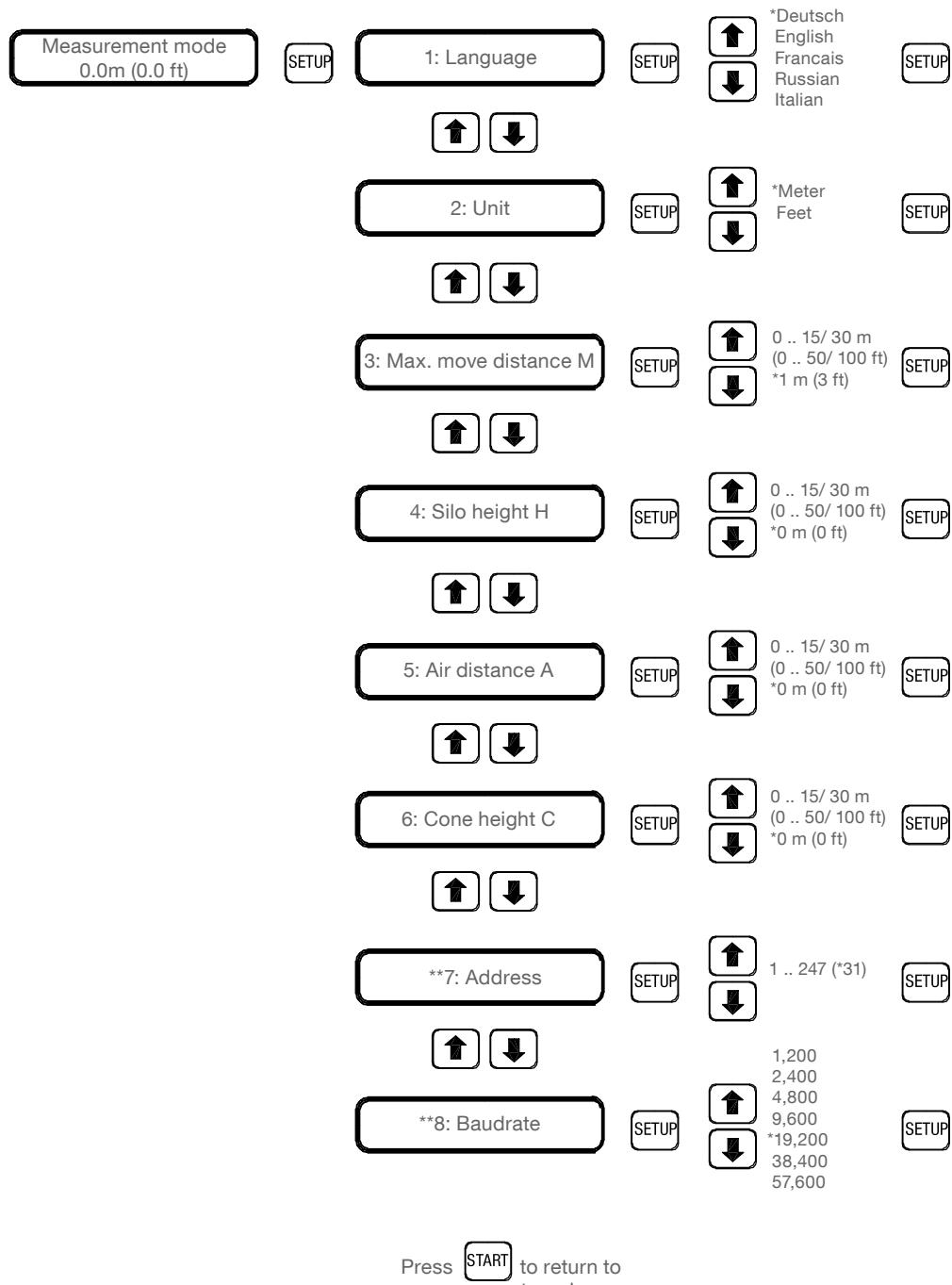
Failure codes description see page 28.

Programming

Quickset menu

The Quickset menu is used for fast and easy start-up of the system.

If the unit is working in normal operation (measurement mode), the SETUP button brings up the Quickset menu.



Press **START** to return to measurement mode

* Factory-provided

** Present only with Modbus version

Programming

Max. move distance M Ensures that the weight does not enter into the silo outlet.

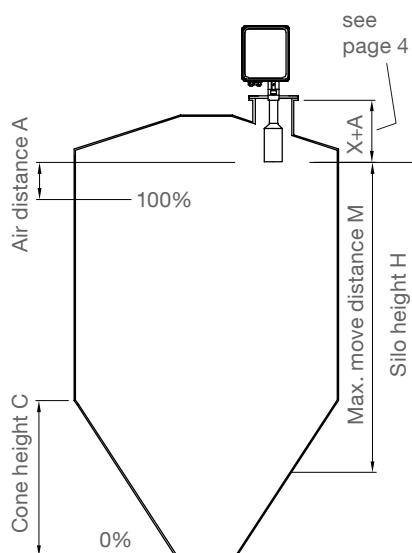
(1) Silo height H Definition of 0% level output.
 Note: If the maximum move distance M is smaller than the silo height H, the measured value will always be more than 0%.

(1) (2) Air distance A Definition of 100% level output.

(1) Cone height C Enables to set the current output as volume.
 $C = 0$ Current output indicates material level
 $C > 0$ Current output indicates material volume

Address Selects the used communication address for Modbus.

Baudrate Selects the used baudrate for Modbus.



(1) These values are not relevant, if the "Counting pulse output" is used.

(2) If needed the 100% level can be set higher than the level of the sensor weight.
 See advanced menu, item "Inverted air distance".

Programming buttons

- | | |
|--|--|
| | Continues with next adjustment item |
| | Continues with measurement display after parameter adjustment
Starts measurement
Cancels a Failure message (when pressed 2 sec together with SETUP button) |
| | Increases the value to be adjusted |
| | Decreases the value to be adjusted |

Runtime messages

During measurement mode, following runtime indications are given:

- * Upper stop position is reached
- Motor is moving the sensor weight downwards resp. upwards (fast mode)
- Motor is moving in slow mode (shortly after motor start and before upper stop position is reached)
- Blocked 24 - 26 open** Measurement interruption is active (terminal 24 - 26 not connected, see page 14)

Note:
 Pressing the ARROW DOWN button in measurement mode brings up more service information (not described in this manual)

Factory settings

To reset all programmed parameters to factory setting (default values), press the buttons ARROW UP, ARROW DOWN and SETUP together for approx. 10 seconds.

Programming

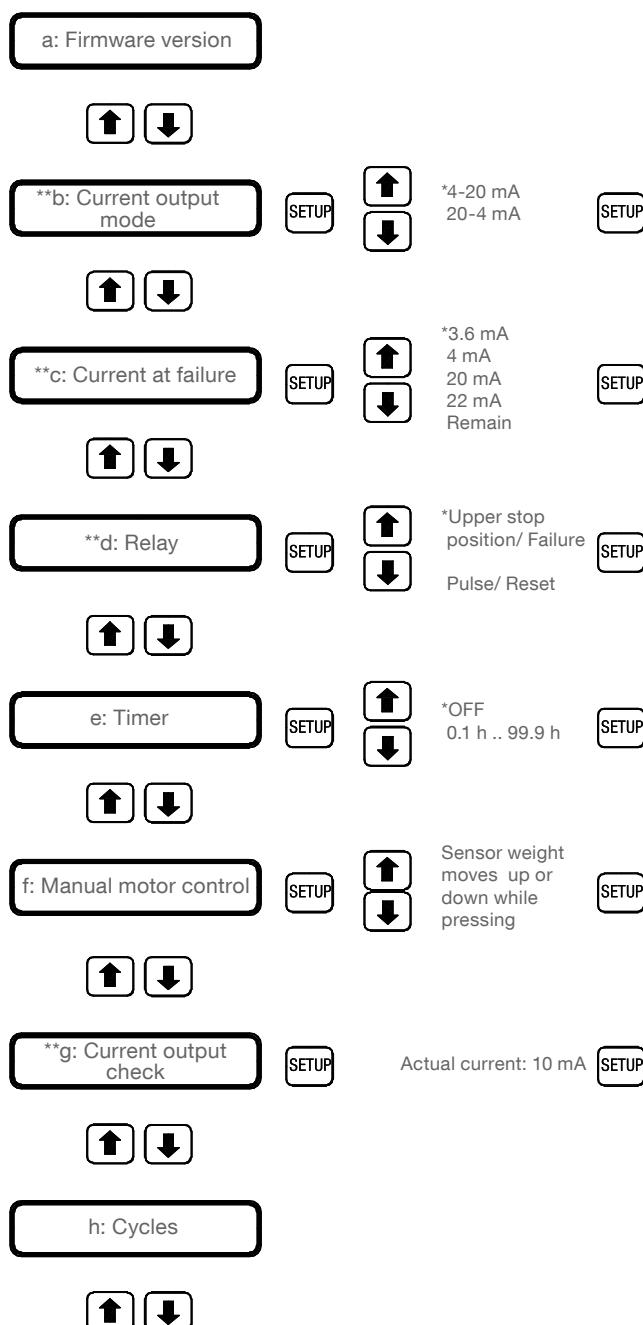
Advanced menu

(use only if necessary)

With the advanced menue it is possible to set the outputs and to display the actual state of the unit.

Entering the advanced menue:

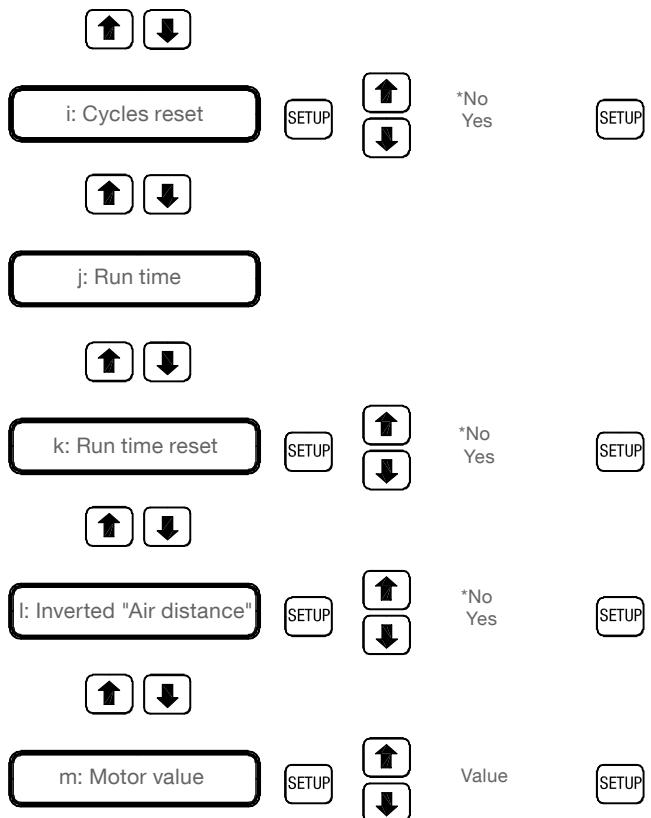
If the unit is working in normal operation (measurement mode), press both "arrow" buttons together for approx. 2 seconds.



continuation next page

Programming

continuation



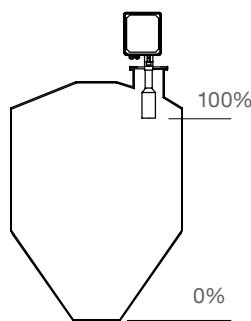
Press **START** to return to measurement mode

* Factory-provided
** Present only with 4-20 mA version

Firmware version

States the firmware version of the unit.

Current output mode



Setting	Current output at level	
	0%	100%
4-20 mA	4 mA	20 mA
20-4 mA	20 mA	4 mA

Current at failure

In case of failure the current output shows the adjusted value.

Relay

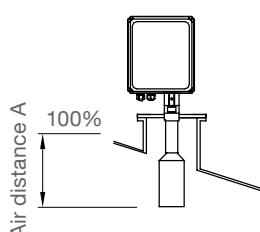
Selects, if Relais shall indicate "Upper stop position" and "Failure" or work as Counting/ Reset pulse output
Details see Signal Overview on page 17/ 18



Programming

Timer	<p>Automatic start of measurement with timer function.</p> <p>The timing interval between two measurements can be adjusted between 0.1 hour (6 minutes) and 99.9 hours. Position „off“ causes no automatic measurement start.</p> <p>The timer will be reset after finishing a measurement or after connecting the terminals 24 and 26 (measurement interruption).</p> <p>If the timer is set, a measurement will start immediately after power on.</p> <p>For automatic measurement at a predetermined time of day, an external start unit connected to terminals 24/ 25/ 27 is necessary.</p> <p>To avoid needless wear and tear, the unit should not be started more often than necessary.</p>
Manual motor control	<p>The motor moves the sensor weight upwards while the "ARROW UP" button is being pushed. The motor moves the sensor weight downwards while the "ARROW DOWN" button is being pushed.</p> <p>Note: If the sensor weight is in the upper stop position or touching the bulk material surface or after the max. move distance, the motor is automatically stopped.</p> <p>CAUTION: Avoid the sensor weight reaching the outlet position of the silo.</p>
Current output check	<p>Enables to check, if the current output is working proper. The current output is forced to 10 mA. This can be evaluated by an external connected multimeter.</p>
Cycles	<p>Indicates how many measurement cycles have been performed up to now.</p>
Cycles reset	<p>Can be done after a rope/tape change, if the service interval message F16 was not yet present. It sets the internal counter to zero to have the full amount of measurement cycles until the next service interval message will appear.</p> <p>Note: After a F16 message is reset with the "START" + "RESET" button, the rope/tape counter is automatically set to zero.</p>
Run time	<p>Indicates, how long the motor has been running up to now (in hours).</p>
Run time reset	<p>Can be done after a motor change, if the service interval message F17 was not yet present. It sets the internal counter to zero to have the full amount of motor run time until the next service interval message will appear.</p> <p>Note: After a F17 message is reset with the "START" + "RESET" button, the motor counter is automatically set to zero.</p>

Inverted "Air Distance"



Enables to set the 100% reference of the 4-20 mA output to a level which is over the level of the sensor weight.

To do this the value must be set to "Yes".
 The "Air distance A", which is adjusted in the Quickset Menue (see page 19/ 20), is now over the level of the sensor weight.
 The display in the Quickset menue indicates this with a minus as follows: Air distance: -1.5 m

Note: In this case the output will never reach 100%.

Motor value	Internal value only to be used in case of replacement of the motor (see instruction manual of motor replacement).
--------------------	---

Programming

Modbus Register

The following registers describe the communication via Modbus.

CAUTION

Writing to the registers different from what is stated will cause a miss function of the unit

Register address	Register name	Register description	Register use	Default value
------------------	---------------	----------------------	--------------	---------------

Setup

40001	M_LANGUAGE	Language on the menu DEUTSCH 0 ENGLISH 1 FRANCAIS 2 RUSSIAN 3 ITALIAN 4	R/W	0
40002	M_UNIT	Unit used for distance visualisation METER 0 FEET 1	R/W	0
40003	M_MAX_MOVE_DIST	Max. move distance mm	R/W	1000
40004	M_SILO_HEIGHT	Silo height mm	R/W	0
40005	M_AIR_DIST	Air distance mm	R/W	0
40006	M_CONE_HEIGHT	Cone height mm	R/W	0
40022	M_TIMER	Timer interval (for automatic start of measurements) , in 1/100 hours (Off = 0) Notes: 1/100 hour = 36 sec. Minimum time: 0.10 hours (value =10)	R/W	0

Measurement

40051	M_START	Start of a measurement Start 1	W	
40046	M_DISTANCE	Actual measured distance, in mm Note: After the unit has finished the measurement, the M_STATUS register states "Ready, measurement valid" (the Modbus master must read the M_STATUS register). Then the data on the register M_DISTANCE is valid.	R	
40055	M_VOLUME	Actual measured volume (considering the programmed cone height, air distance and silo height), in %. See note on register M_DISTANCE	R	
40052	M_INHIBIT	Block command (allows to block the unit, so that no measurement can be started) No block 0 Block 1 The unit will remain blocked as long as the register has the value "Block". Note: Unit states the blocked status through the M_STATUS register.	W	0
40045	M_STATUS	States the functional status of the unit Blocked 1 Ready, measurement not valid 2 Ready, measurement valid 6 Busy 8 Failure present 16 Temporary not ready 32 Explanation: Blocked: No measurement can be started. Ready: A new measurement can be started. Measurement valid: Indicates a valid measurement. Measurement not valid: Indicates a maintenance condition (details see M_MAINTENANCE)	R	
40057	M_FULL_DETECTOR	States the full detector input status Contact open (24 - 28) 0 Contact close (24 - 28) 1	R	

Programming

Diagnostics

		Total measured cycles up to now = "M_TOTAL_CYCLES" + 65536 * "M_TOTAL_CYCLES_H"		
40026	M_TOTAL_CYCLES	Total measured cycles up to now, in cycles	R	
40044	M_TOTAL_CYCLES_H	Total measured cycles up to now, in 65536 cycles	R	
		Measurement cycles left until failure message F16 will appear = "M_CYCLES_LEFT" + 65536 * "M_CYCLES_LEFT_H"		
40028	M_CYCLES_LEFT	Measurement cycles left until F16 will appear, in cycles	R	
40050	M_CYCLES_LEFT_H	Measurement cycles left until F16 will appear, in 65536 cycles	R	
		Total motor run time up to now = "M_TOTAL_RUN_TIME" hours + "M_TOTAL_RUN_TIME_S" seconds		
40029	M_TOTAL_RUN_TIME	Total motor run time up to now, in hours	R	
40048	M_TOTAL_RUN_TIME_S	Total motor run time up to now, in seconds	R	
40031	M_RUN_TIME_LEFT	Motor run time left until F17 will appear, in hours	R	
40053	M_FAILURE	Failure status of the unit (stated on a bit basis) F10 – Motor or motor-driver-electronic defect F11 – Sensor weight is buried F12 – Rope/tape broken F13 – Spring broken F16 – Service interval rope/tape F17 – Service interval motor	b0 = 1 b1 = 1 b2 = 1 b3 = 1 b5 = 1 b6 = 1	R
40054	M_MAINTENANCE	Maintenance status of the unit (stated on a bit basis) M11 – Sensor weight blocked in upper position	b1 = 1	R

Communication

40035	M_ADDRESS	Device address 1 to 247	R/W	31
40036	M_BAUDRATE	Communication speed 1,200 baud 0 2,400 baud 1 4,800 baud 2 9,600 baud 3 19,200 baud 4 38,400 baud 5 57,600 baud 6	R/W	4

R/W: read/ write R: read only W: write only

Maintenance

General items

Opening the lid (cover)



Before opening the lid for maintenance reasons observe following items:

- Do not remove the lid while circuits are alive.
- No dust deposits or whirlings are present.
- No rain can enter into the housing

Frequent check of the unit



To ensure durable safety in hazardous locations and with electrical safety, following items must be checked frequently depending on the application:

- Mechanical damage or corrosion of any components (housing side and sensor side) and of the field wiring cables.
- Tight sealing of the process connection, cable glands and enclosure lid.
- Properly connected external PE cable (if present).

Cleaning



If cleaning is required by the application, following must be observed:



The cleaning process must be done in a way, that:

- The cleaning agent cannot enter into the unit through the lid sealing or cable gland.
- No mechanical damage of the lid sealing, cable gland or other parts can happen.

A possible accumulation of dust on the unit does not increase the maximum surface temperature and must therefore not be removed for purposes of maintaining the surface temperature in hazardous locations.

Production date

The production date can be traced by the serial number on the typeplate. Please contact the manufacturer or your local distributor.

Spare parts

All available spare parts are stated in the selection list

Maintenance

Rope/ Tape lifetime

The expected life time (measurement cycles) for the rope/ tape is:

Rope version: approx. 200,000

Tape version: approx. 500,000

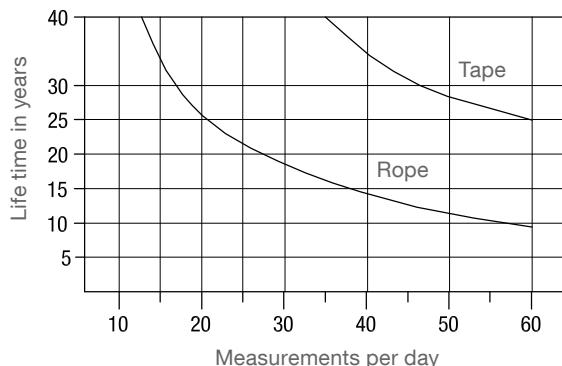
Note: These values refer to lifetime tests under the following conditions:

No excessive material influence. The sensor weight meets an inclined surface, so that an oscillating movement of the sensor weight during upwards movement is caused.

The failure message is displayed at 90% of the expected lifetime to provide some safety. For further information see message F16.

See figure on right hand for the operating time depending on the measurement cycles per day.

For applications with adverse conditions it is recommended to change the rope/tape more frequently.

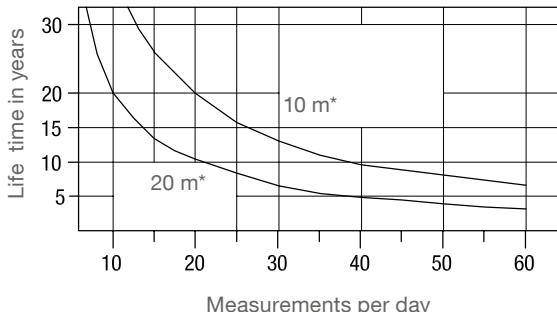


Motor lifetime

The expected life time (run time) for the motor is approx. 3,500 hours.

The failure message is displayed at 90% of the expected lifetime to consider some safety. For further informations see message F17.

See figure on right hand for the operating time depending on the measurement cycles per day.



*average measurement distance

Maintenance

Diagnostics Failure:

Result is an invalid measurement.

Red LED is on. Relay 1 indicates Failure (if selected).

The signal indicates critical situations. Evaluating the signal can help to avoid loosing the sensor weight inside the silo.

If Failure is indicated, the unit must be checked on site.

Failure code	Description	Indication	Performance of the device	Solution
F10	a) Rope/ tape too short or rope jammed in the rope roller. b) Motor or motor-driver-electronic defect.	Motor does not rotate when it is actuated.	If possible, the sensor weight will be moved up to the "Upper stop position".	a) Check rope/ tape. b) Check motor connection. Motor or electronic change.
F11	Sensor weight is buried or jammed.	Difference of distance between down and up movement too big.	Motor moves 4 seconds upwards, then waits 10 seconds. After that motor moves shortly downwards and then upwards again. If the sensor weight is still jammed, this cycle is repeated 5 times. After that the cycle goes on with a delaytime of one hour.	Release the sensor weight. Make sure, that the sensor weight can move freely.
F12	Rope/ tape broken.	Motor is running but the upper stop position is not reached.	Motor moves upwards. If after a certain time the upper stop position is not reached, the motor stops.	Repair of rope/ tape break. Check, if rope/ tape maintenance was properly done. Check possibility of buried sensor weight.
F13	Spring broken.	Motor moves downwards and upper stop position is sensed	Motor stop.	Check internal spring.
F15	Not enough current available from DC power supply (DC version only).	Supply voltage drops during function.	Sensor weight is moved to the upper stop position.	Enable enough supply current according to the technical data specification.
F16	Service interval: rope/ tape.	The amount of measurement cycles is 90% of the rope/ tape lifetime.	The measurement cannot be restarted.	Change rope- or tape roller (do not just cut the rope or tape*).
F17	Service interval: motor.	The actual run time is 90% of the motor lifetime.	The measurement cannot be restarted.	Change motor.

By pushing the **START** and **SETUP** button together for 2 seconds, the failure message shown on the display can be reset.

* Cutting of the rope or tape shall not be done. This leads to an inaccurate measurement result, because it changes the diameter of the rope- or tape roller and therefore leads to a different tape length related to the number of turns of the tape roller.

CAUTION

Resetting F16 or F17 without changing the rope/tape respective the motor will cause material damage by a broken rope/tape.

Before removing the rope/ tape roller, remove the unit from the silo to avoid, that the sensor weight can fall into the silo.

Diagnostics - Maintenance:

Red LED is blinking.

The following message is indicated on the display, but will NOT lead to a failure state and is not indicated by the failure relais or the 4-20 mA output:

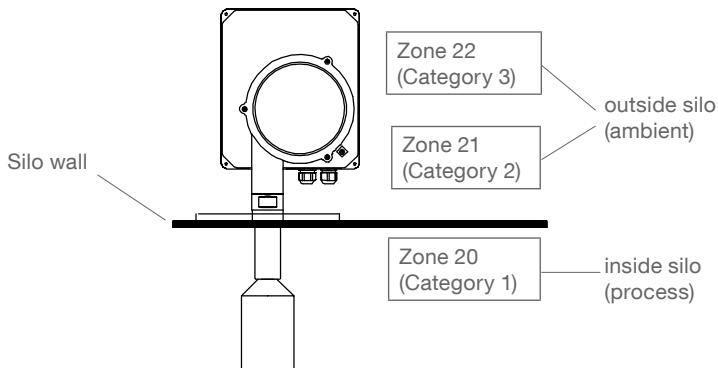
Code	Description	Performance of the device	Solution
M11	Sensor weight blocked in "upper stop position" or block distance of sensor weight to short	The unit tries to start 5 times. If the sensor weight is not released during this time, the message is shown. If after a new measurement start the sensor weight is released, the message will automatically disappear.	Release sensor weight. Ensure, that the min. moving distance (block distance) is >200 mm (7.87")

Notes for use in Hazardous Locations

ATEX Zone classification

Category	useable in zone	
1 D	20, 21, 22	
2 D	21, 22	
3 D*	22	* in case of conductive dust, additional requirements for installation are necessary.

! Permitted zones (categories) for mounting in partition wall



! General notes

Marking

Devices with Ex-approval are marked on the type plate.

Process pressure

The device construction allows process over-pressure up to +0.2 bar (2.9 psi). This pressure is allowed for test purposes. The definition of the Ex approvals are only valid for a silo-over-pressure between -0.2 .. +0.1 bar (-2.9 .. +1.45 psi). Outside of these pressure the approvals are not valid.

Process and ambient temperature

The permitted temperature range is marked on the type plate.

! Maximum Surface Temperature

The maximum surface temperature refer to the warmest area outside on the unit which can occur in failure case (according to Ex definition).

Max. Ambient temperature	Max. Process temperature	Max. Surface temperature	Temperature Code
60°C (140°F)	80°C (176°F)	117°C (243°F)	T4A
50°C (122°F)	90°C (194°F)	117°C (243°F)	T4A
40°C (104°F)	100°C (212°F)	117°C (243°F)	T4A
	110°C (230°F)	117°C (243°F)	T4A
	120°C (248°F)	120°C (248°F)	T4A
	130°C (266°F)	130°C (266°F)	T4
	135°C (275°F)	135°C (275°F)	T4
	140°C (284°F)	140°C (284°F)	T3C
	150°C (302°F)	150°C (302°F)	T3C

! Static discharge of the material surface

It must be ensured that no static discharge can occur when the grounded metal sensor weight or rope/ tape touches the surface of the bulk material. If this can not be ensured, the safe use of the unit is NOT guaranteed. The responsibility for this rests with the user. In case of in clarity an assessment from a notified body is necessary.

From the manufacturer side a version with a plastic sensor weight and additional plastic rope insulation part is available on request. This keeps a 500 mm (19.7") distance from the material surface to the grounded rope/ tape.

Disposal

The product consists of materials which can be recycled, details of the used materials see chapter "Technical data - mechanical data".

Recycling must be done by a specialised recycling company. Since the product is not subject to the WEEE directive 2002/96/EG, it is not permitted to bring it to a public recycling station.

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Subject to technical change.

All dimensions in mm (inches).

We assume no liability for typing errors.

Different variations to those specified are possible.

Please contact our technical consultants.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning must be carried out only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.

Special attention must be paid to warnings and notes as follows:

WARNING



Relates to a caution symbol on the product and means, that a failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.

WARNING



Relates to a caution symbol on the product: Risk of electric shock

WARNING



Used when there is no corresponding caution symbol on the product, means that failure to observe the necessary precautions can result in death, serious injury, and/ or considerable material damage.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product

Description



CAUTION: refer to related documents (manual) for details.



Earth (ground) Terminal



Protective Conductor Terminal

Technical support

Please contact your local supplier (see www.uwt.de for address). Otherwise you can contact:

UWT GmbH
Westendstr. 5
87488 Betzigau
Germany

Tel. 0049 (0)831 57123-0
Fax. 0049 (0)831 76879
info@uwt.de
www.uwt.de

Introduction

NivoRadar® is a 2-wire, 78 GHz FMCW radar level transmitter for continuous monitoring of solids and liquids in silos and vessels.

Applications

Ideal system for all solids applications, including those with extreme dust and high temperatures to +200°C (+392°F).

- Powder, granulate, small or coarse bulk goods

Available for industries such as

- Food
- Grain
- Cement
- Plastics
- others

Function

The main benefits of using 78 GHz over devices using lower frequency are:

- Very narrow beam, so device is insensitive to mounting nozzle interference and vessel obstructions.
- Short wavelength yields very good reflection properties on sloped solids, thus a safe measurement is ensured.

The technology is very tolerant to buildup on the lens antenna, however an air purge inlet is provided for periodic cleaning if required. Signals are processed using Process Intelligence which has been field-proven in over 1,000,000 applications worldwide (ultrasonic and radar).

Features

Measurement range

- Up to 100 m (329 ft)

Approvals

- Approval for use in both General and Hazardous Locations.

Mechanic

- Lens antenna and flange for quick and easy positioning.
- Stainless steel housing.
- Plane flanges and Aiming flanges.

Service

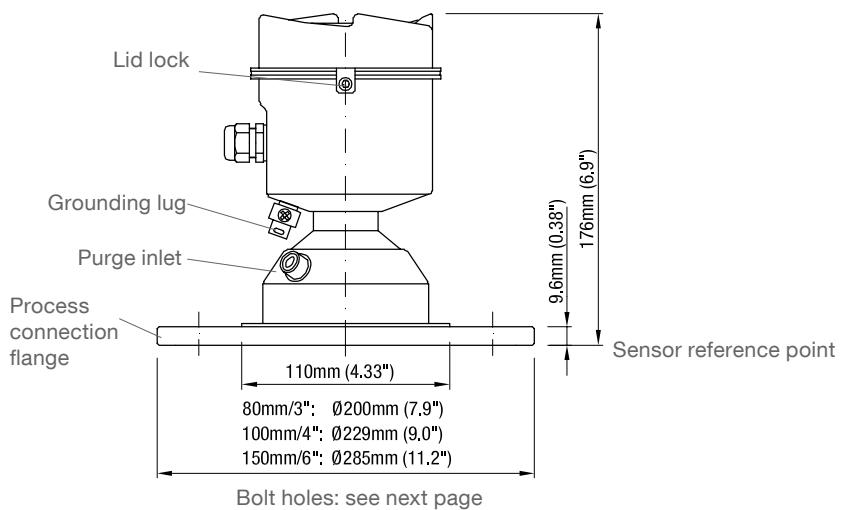
- Plug and play system, simple installation and commissioning.

Programming

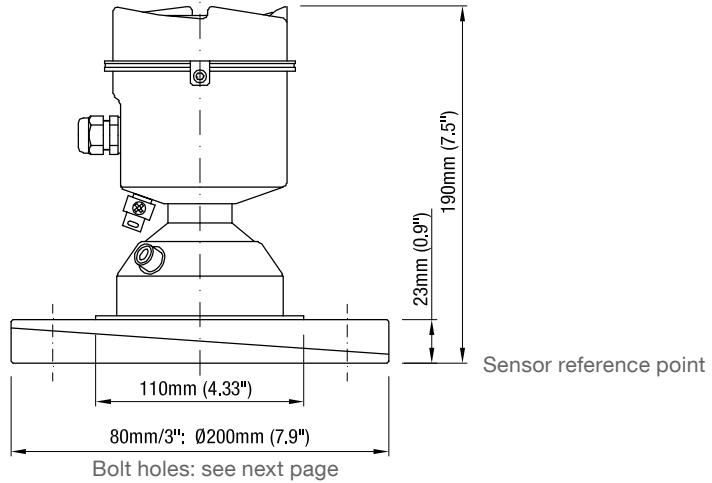
- Configure via optional Plug on Display with push buttons.
Configuration with only 6 parameters.
Once programmed, the Plug on Display can be removed if desired and used to copy parameters to multiple units.
- Alternative configuration via HART possible.

Dimensions

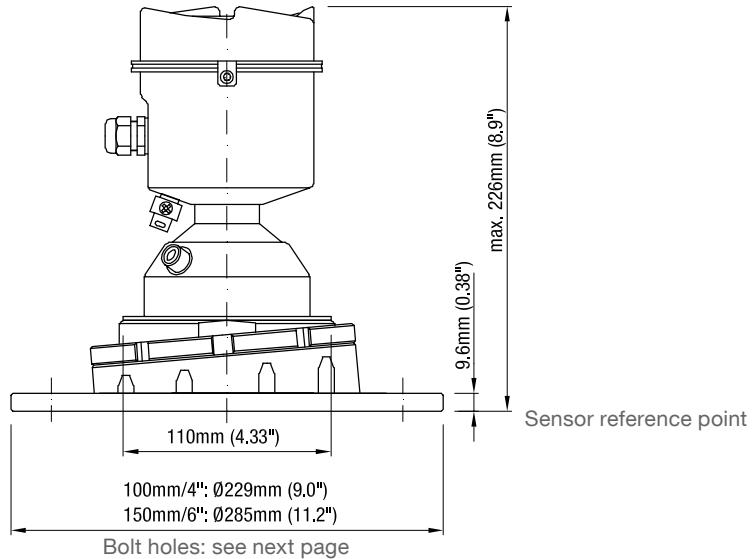
Plane flange version



Easy Aimer flange version
 80 mm/ 3"

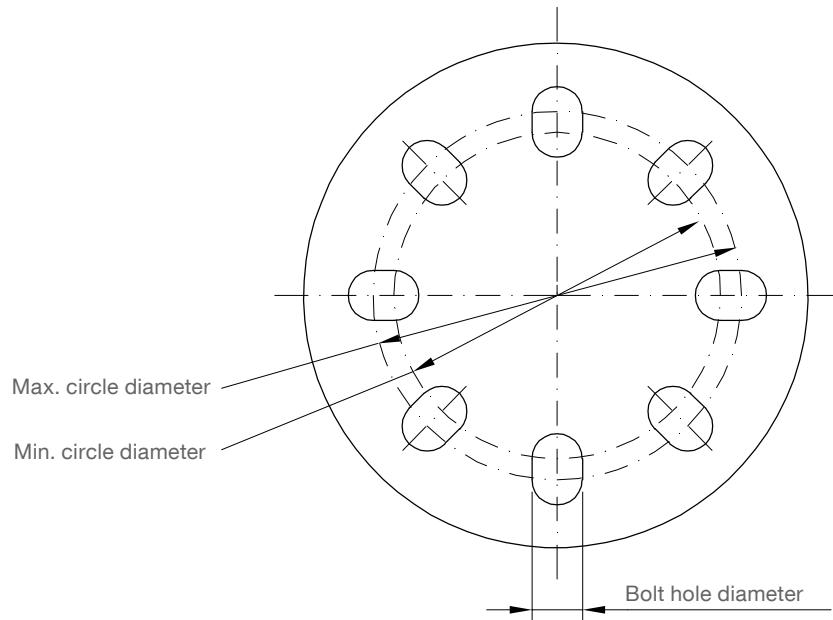


Easy Aimer flange version
 100 mm/ 4"
 150 mm/ 6"



Dimensions / Options

Flanges



Universal flange (plane flange and Easy Aimer flange) mates with bolt hole pattern of:
 EN 1092-1 (PN16)
 ASME B16.5 (150 lb)
 JIS 2220 (10K)

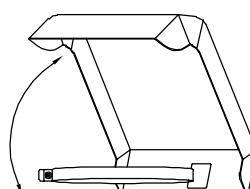
Pipe size	Max. circle diameter	Min. circle diameter	Bolt hole diameter	Number of bolt holes
80 mm/ 3"	160 mm (6.30")	150 mm (5.91")	19.3 mm (0.76")	8
100 mm/ 4"	191 mm (7.52")	175 mm (6.89")	19.3 mm (0.76")	8
150 mm/ 6"	242 mm (9.53")	240 mm (9.45")	23 mm (0.90")	8

Options

Sun protection cover

If the unit is used outdoors, the use of the sun protection cover is recommended. It protects the device from excessively high temperatures.

Material: Stainless steel 1.4301 (304)



Mounting kits

Sealings, screws and washers for mounting the unit on a flange

Technical data

Electrical data

Power supply	4-20 mA loop power Nominal 24 V DC (16.5 .. 30 V DC)								
4-20 mA output	Accuracy ±0.02 mA Upper limit 20 to 22.6 mA adjustable Lower limit 3.56 to 4 mA adjustable Fail signal 3.56 mA to 22.6 mA; or last value								
Max. loop resistance	<table border="1"> <tr> <th>Loop voltage</th> <th>Max. loop resistance</th> </tr> <tr> <td>16.5 V</td> <td>250 Ohm</td> </tr> <tr> <td>24 V</td> <td>550 Ohm</td> </tr> <tr> <td>30 V</td> <td>800 Ohm</td> </tr> </table>	Loop voltage	Max. loop resistance	16.5 V	250 Ohm	24 V	550 Ohm	30 V	800 Ohm
Loop voltage	Max. loop resistance								
16.5 V	250 Ohm								
24 V	550 Ohm								
30 V	800 Ohm								
Communication HART	Max. line length: multi-wire: ≤1,500 m (4,921 ft) (depending on wire type. See www.hartcomm.org for more details) Protocol HART, Version 6.0								
Memory	Non-volatile EEPROM (no battery required)								
Connection terminals	0.34 .. 2.5 mm² (AWG 22 .. 14)								
Cable entry	1 piece M20 x 1.5 or ½" NPT								
Plug on display (inside housing)	Removeable graphic LCD, with bar graph representing level. Display quality will be degraded in temperatures below -20°C (-4°F) and above +65°C (+149°F).								

Mechanical data

Ingress protection	Type 4X/NEMA 4X, Type 6/NEMA 6, IP68
Process connection	Plane flanges: EN 1092-1 (PN16)/ ASME B16.5 (150 lb)/ JIS 2220 (10K) bolt hole pattern 3" / 80 mm, 4" / 100 mm, 6" / 150 mm Stainless steel 316L (1.4404 or 1.4435), or 304
	Easy Aimer flanges: EN 1092-1 (PN16)/ ASME B16.5 (150 lb)/ JIS 2220 (10K) bolt hole pattern 3" / 80 mm, 4" / 100 mm, 6" / 150 mm Polyurethane powder-coated cast aluminum
Enclosure	316L/ 1.4404 stainless steel Lid with window (window material polycarbonate)
Lens antenna	Material: 40 m version: PEI 100 m version: PEEK
Air Purge Connection	Female 1/8" NPT fitting Non return valve (option, stainless steel, connection of 6mm tube diameter, opens at ca. 0.5 bar (7.25 psi))
Weight	3" stainless steel flange model: 3.15 kg (6.94 lb)

Technical data

Operating conditions

Ambient temperature	-40 .. +80°C (-40 .. +176°F)
Process temperature	40 m version: -40°C .. +100°C (-40 .. +121°F) 100 m version: -40°C .. +200°C (-40 .. +392°F) Observe derating curve
Process overpressure	Depending on ordered version: -1 .. +0.5 bar (-14.5 .. +7.2 psi) -1 .. +3.0 bar (-14.5 .. +43 psi)
Ventilation	Ventilation is not required
Pollution degree	4
Installation category	I
Relative humidity	0 - 100%, suitable for outdoor
Altitude	max. 5,000 m (16,404 ft)

Performance

Accuracy of measurement	Maximum measured error: 5 mm (0.2") including hysteresis and non-repeability. Under severe EMC environments per IEC 61326-1 or NAMUR NE21 the device error may increase to max. 25 mm (1"). Reference conditions: Position Detect (2.7.3.3.) set to Center and Algorithm (2.7.3.1.) set to True First Echo. Measured in accordance with IEC 60770-1: <ul style="list-style-type: none"> • ambient temperature +15 to +25°C (+59 to +77°F) • humidity 45% to 75% relative humidity • ambient pressure 860 to 1,060 mbar g (86,000 to 106,000 N/m² g)
Frequency/ Beam angle	78 .. 79 GHz FMCW/ Beam angle 4°
Max. measurement range	40 m version: 40 m (131 ft) 100 m version: 100 m (328 ft) From sensor reference point
Min. detectable distance	400 mm (15.7") from sensor reference point
Dielectric constant of material measured	For ranges up to 20 m (65.6 ft): min. DK = 1.6 For ranges up to 100 m (328 ft): min. DK = 2.5
Update time	Maximum 10 seconds (Response Rate (2.4.1.) set to FAST)
Influence of ambient temperature	< 0.003% / K (average over full temperature range, referenced to maximum range)

Technical data

Transport and Storage

Transport	Observe the instructions as stated on the transport packaging, otherwise the products may get damaged. Transport temperature: -40 .. +80°C (-40 .. +176°F) Transport humidity: 20 .. 85% Transport incoming inspections must be carried out to check for possible transport damage.
Storage	Products must be stored at a dry and clean place. They must be protected from influence of corrosive environment, vibration and exposure to direct sunlight. Storage temperature: -40 .. +80°C (-40 .. +176°F) Storage humidity: 20 .. 85%

Approvals

Hazardous Locations*

Dust Ignition Proof:
ATEX II 1D, 1/2D, 2D Ex ta IIIC
IEC-Ex Ex ta IIIC T139°C Da
FM/CSA DIP Class II, Div.1, Gr. E, F, G Class III

Non-sparking/ Energy Limited:
ATEX II 3G Ex nA II T4 Gc, Ex nL IIC T4 Gc
IEC-Ex nA II T4 Gc, nL IIC T4 Gc, ta IIIC

Non-incendive:
FM/CSA NI Class I, Div.2, Gr. A,B,C,D

Ordinary Locations*

CE
FM/ CSA General purpose

EMC

EN 61326 - 1 (industrial standard)

RoHS conformity

According to directive 2011/65/EU

Radio

Radio Equipment Directive (RED) Compliance (Europe)
FCC Conformity (US)
Industry Canada

Radio Equipment Directive (RED) Compliance (Europe)

Hereby, UWT GmbH, declares that the NR 3000 is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.

The NR 3000 complies with EN 302 372 for use in closed storage vessels, when installed according to the installation requirements of EN 302 372, and may be used in all EU countries.

For the receiver test that covers the influence of an interferer signal to the device, the performance criterion has at least the following level of performance according to ETSI TS 103 361 [6]:

- Performance criterion: measurement value variation Δd over time during a distance measurement
- Level of performance: $\Delta d \leq \pm 50$ mm

The NR 3000 complies with EN 302 729 for use outside of closed tanks in EU countries. For open air installations, the following conditions must be observed:

- Installation and maintenance is performed by suitably qualified and trained personnel.
- The NR 3000 shall be installed only in a permanent fixed position pointing downwards. Its location shall comply with the following two restrictions:

1) It shall be installed with a minimum separation distance of 4 km from Radio Astronomy sites listed at www.craf.eu/radio-observatories-in-europe unless special authorization has been provided by the responsible national regulatory authority.

2) If it is installed at a location between 4 and 40 km from any Radio Astronomy site listed at www.craf.eu/radio-observatories-in-europe the NR 3000 shall be installed at a height not exceeding 15 m from the ground.

FCC Conformity (US)

US Installations only: Federal Communications Commission (FCC) rules:

WARNING: Changes or modifications not expressly approved by UWT GmbH could void the user's authority to operate the equipment.

Notes:

- This device has been tested and found to comply with the limits Class B digital device part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

* Depending on selected version in selection list

Technical data / Mounting

- This device has also been tested and found to comply with the limits §15.256, Subpart C-Intentional radiators, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
- This device generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications, in which case the user will be required to correct the interference at his/her own expense.
- This device may be used to measure levels in fixed or mobile enclosed tanks.
- This device may be used to measure levels in open air environments or outside enclosed tanks, subject to the following conditions:
 - o Devices shall be installed and maintained to ensure a vertically downward orientation of the transmit antenna's main beam.
 - o Devices shall be installed only at fixed locations. Devices shall not operate while being moved or while inside a moving container.
 - o Hand-held applications and residential use are prohibited.

Industry Canada

The NR 3000 complies with Industry Canada standard RSS211 (March 2015).

- a) The installation of the NR 3000 shall be done by trained installers, in strict compliance with the manufacturer's instructions.
- b) The use of this device is on a "no-interference, no-protection" basis. That is, the user shall accept operations of high-powered radar in the same frequency band which may interfere with or damage this device. However, devices found to interfere with primary licensing operations will be required to be removed at the user's expense.
- c) The installer/ user of this device shall ensure that it is at least 10 km from the Dominion Astrophysical Radio Observatory (DRAO) near Penticton, British Columbia. The coordinates of the DRAO are latitude 49°19'15" N and longitude 119°37'12" W. For devices not meeting this 10 km separation (e.g., those in the Okanagan Valley, British Columbia,) the installer/ user must coordinate with, and obtain the written concurrence of, the Director of the DRAO before the equipment can be installed or operated. The Director of the DRAO may be contacted at 250-497-2300 (tel.) or 250-497-2355 (fax). (Alternatively, the Manager, Regulatory Standards, Industry Canada, may be contacted.)

Mounting

! General Safety Instructions

Process pressure	Improper installation may result in loss of process pressure.
	Never attempt to loosen, remove, or disassemble process connection or instrument housing while vessel contents are under pressure.
Chemical resistance against the medium	Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.
Mounting location	The right mounting place is significant for a proper function. Observe mounting instructions.
Sealings	The user is responsible for the selection of bolting and gasket materials which will fall within the limits of the flange and its intended use and which are suitable for the service conditions.

! Additional Safety Instructions for Hazardous Locations

Installation regulations	For devices to be used in Hazardous Locations the respective valid installation regulations must be observed.
Electrostatic charge	Parts of the enclosure may be non-conducting and may generate an ignitioncapable level of electrostatic charge under certain extreme conditions. The user should ensure that the equipment is not installed in a location where it may be subjected to external conditions (such as high-pressure steam), which might cause a build-up of electrostatic charge on non-conducting surfaces.

Mounting

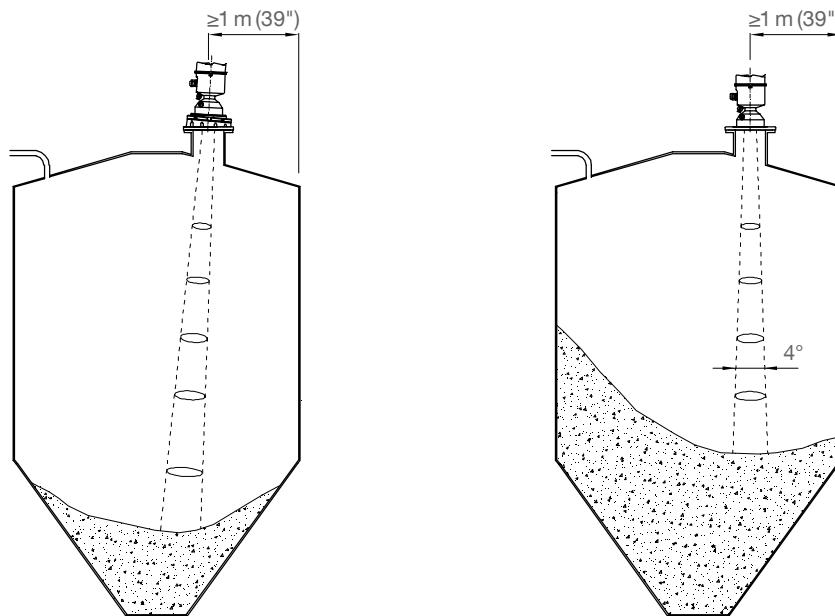
Mounting instructions

Mounting position and aiming

- The unit is mounted vertically on top of the silo.
- Observe enough distance to the wall.
- Avoid central locations on tall, narrow vessels.
- A clear line of sight from the sensor to the product being monitored is required.
- Keep the sensor away from fill pipes, ladders, beams etc.

Aiming is strongly suggested for solid measurement.
 It helps to optimize the echo signal (mainly for low material level in the cone) and helps to solve not perfect mounting positions.

For proper mounting positions vertical installation without aiming is possible.

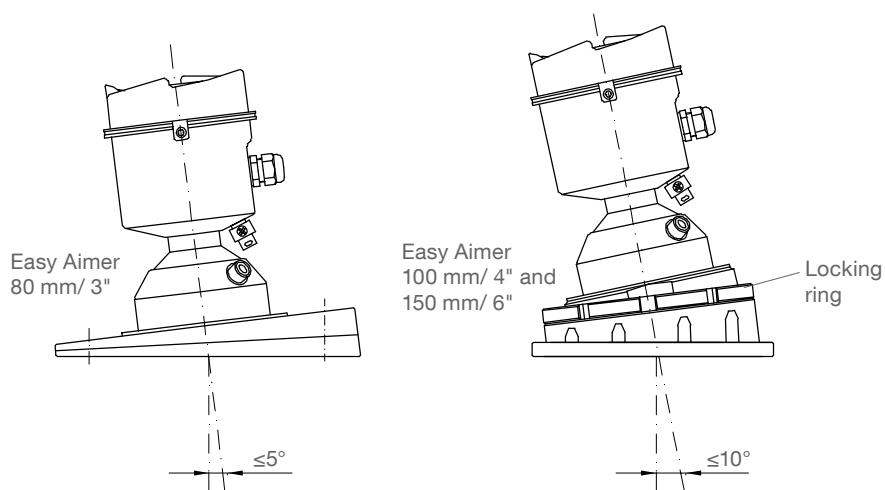


Easy Aimer adjustment

- For the 80 mm/ 3" Easy Aimer flange, tapered split washers with pressure rated versions are provided to keep nuts and bolts perpendicular to the flange surface.

For 100 mm/ 4" and 150 mm/ 6" Easy Aimer flange: Loosen the set screws in the locking ring. Holding the electronics enclosure firmly, loosen the Aimer locking ring using the supplied C spanner, until the unit drops down slightly. The enclosure can then be turned freely.

- Direct the unit in the desired position and re-tighten the screws.



Mounting

Air Purging System

Use of air purging system

- The purge airflow is designed to create a strong vortex of air that rapidly cleans the face of the lens.
- The air purge system can clean both dust and moisture off the lens.
- It can be used for periodic cleaning.

Purge airflow

- The customer will supply the purging air by a manual or automatic valve system.
- Clean, dry air must be provided.
- Recommended 6.2 .. 7.6 bar (90 .. 110 psi) for effective cleaning.
- Air pressure in vessel can affect purge operation.

Notes:

- Purge duration, pressure, and interval, will vary with each application. It is the user's responsibility to determine the requirements depending on the application and cleaning required.
- Short duration bursts of high pressure provide more effective cleaning than continuous low pressure air.
- It is the customer's responsibility to ensure that any vacuum or pressure in the measured vessel is maintained, considering the hole that passes through the process connection and the antenna system.

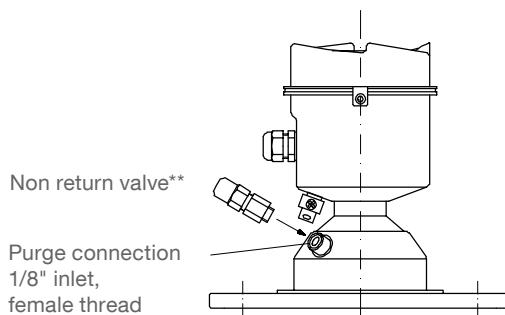
Flow rate versus applied pressure:

Air Pressure	Approx. inlet volume flow rate
1.4 bar (20 psi)	54 Nm ³ /h (5 SCFM*)
2.8 bar (40 psi)	107 Nm ³ /h (10 SCFM*)
3.4 bar (50 psi)	161 Nm ³ /h (15 SCFM*)
5.5 bar (80 psi)	214 Nm ³ /h (20 SCFM*)
6.9 bar (100 psi)	268 Nm ³ /h (25 SCFM*)
7.6 bar (110 psi)	322 Nm ³ /h (30 SCFM*)

*standard cubic feet per minute

Purge Connection

- The purge connection is closed by the manufacturer.
- When the plug is removed to connect a purging system, the operator is responsible for ensuring that the purging circuit conforms to "Ex" requirements, for example, by fitting an NRV valve (non return valve). If applicable use the Non return valve offered by the manufacturer.



** Non return valve offered by the manufacturer:

- Stainless steel
- Connection of 6 mm tube diameter
- Opens at ca. 0.5 bar (7.25 psi)

Electrical installation

! General Safety Instructions

Handling	In case of improper handling or handling malpractice, the electric safety of the device cannot be guaranteed.
Installation regulations	The local regulations or VDE 0100 (Regulations of German Electrotechnical Engineers) must be observed.
Type plate	Check the type plate on your instrument to verify the approval rating.
Wiring diagram	The electrical connections are made in accordance with the wiring diagram.
Supply voltage	Compare the supply voltage applied with the specifications given on the name plate before switching the device on. The DC input terminals shall be supplied from a source providing electrical isolation between the input and output, in order to meet the applicable safety requirements of IEC 61010-1.
Cable gland	The screwed cable gland and closing element must have following specifications: Ingress protection IP68, temperature range from -40°C to +80°C, UL or VDE certified (depending on the country where the unit is installed), pull relief. Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion). The diameter of the field wiring cable has to match to the clamping range of the used cable gland.
Conduit system	In case of using a conduit system (with NPT thread) instead of a cable gland the regulations of the country, where the unit is installed, must be observed. The conduit must have a tapered thread NPT ½" in accordance with the unit and ANSI B 1.20.1.
Field wiring cables	Use twisted pair cable. The cross section has to match with the clamping range of the connection terminals. The temperature rating must be in accordance to the ambient temperature.
Guiding and connecting the cable in the terminal box	Cut the field wiring cables to appropriate length to fit properly into the terminal box. Strip the cable jacket for approximately 70 mm (2.75") from the end of the cable, and thread the wires through the gland.

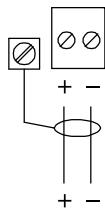
! Additional Safety Instructions for Hazardous Locations

External equipotential bonding terminal	Connect to equipotential bonding of the plant
Field wiring	The equipment shall be installed such that the supply cable is protected from mechanical damage. The cable shall not be subjected to tension or torque. The equipment manufacturer is not responsible for providing the supply cable.
Cable glands for ATEX Hazardous Locations	The used entry devices and blanking elements must have an adequate type approval (protection concepts type 'n' or increased safety 'e' or flameproof 'd') and a temperature range as defined in the technical data of the unit. In addition they shall be suitable for the conditions and correctly installed. Where available the provided original parts of the manufacturer must be used.
Conduit system for FM Hazardous Locations	In addition the regulations of the country must be observed. The used flameproof seals and blanking elements must have an adequate type approval and a temperature range as defined in the technical data of the unit. In addition they shall be suitable for the conditions and correctly installed. Where available the provided original parts of the manufacturer must be used.
Supply rating	The supply to the equipment shall be rated for a prospective short-circuit current of not more than 10 kA and shall be protected by a suitably-rated fuse.
Further safety notes	See page 23.

Electrical installation

4-20 mA

The terminals are located below the display. To connect the unit, remove the display by gently turning the display a quarter turn counter-clockwise until it is free.



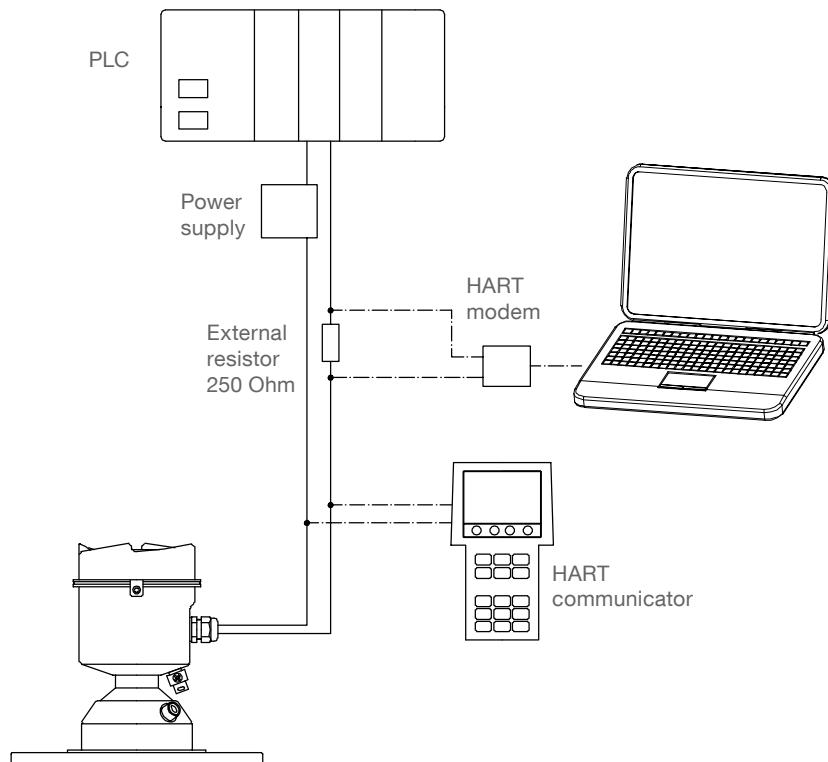
Use twisted pair cable: 0.34 mm² to 2.5 mm² (AWG 22 to 14)
Connect cable shield to ground terminal

24 V DC/ 4-20 mA loop

4-20 mA HART

Typical PLC/ mA configuration with HART:

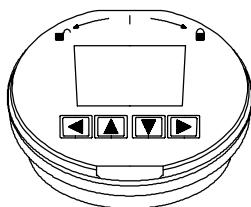
- Depending on the system design, the power supply may be separate from the PLC, or integral to it.
- HART resistance (total loop resistance, that is, cable resistance plus 250 Ohm (external resistor) must be less than 550 Ohm @24 V supply for the device to function properly.
- The external resistor is not required, if the PLC has an integral 250 Ohm resistor.



Programming

Overview

Plug on display

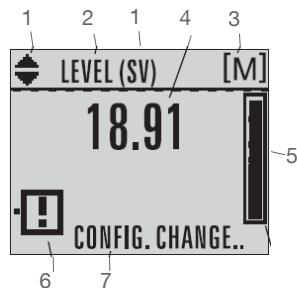


Programming is done with the "Plug on display".

The first time the device is configured, you will be prompted to select a language (English, German, French, Spanish or Chinese). Select language with ▼ and confirm by pressing ►.

Measurement mode

After power up the unit goes to Measurement mode.
 The required time to first measurement is less than 50 seconds.



Normal operation:

- 1 Not relevant*
- 2 Selected operation: level, space, or distance.
- 3 Selected units: m, cm, mm, ft, in.
- 4 Actual measured value (according to selected items 2 and 3).
- 5 Bar graph indicates level.
- 6 Device status indicator.
- 7 Device status text messages.

* Relevant with advanced programming. Toggle indicator for PV or SV (primary or secondary values). PV values represent the 4-20 mA output (considering a programmed linearisation), SV values represent the pure measured values (without linearisation). Press ▲ ▼ to switch.

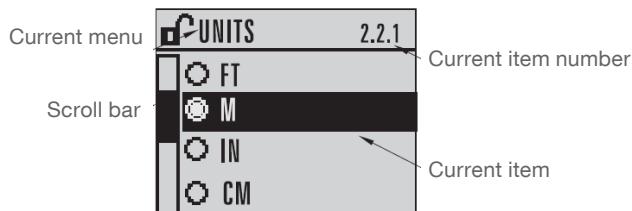


In case of fault:

- 6 Service required icon appears.
- 7 Text area displays a fault code and an error message.

Program mode

Display view



General procedure modify digits

Note: When the Enter ← icon is highlighted, press ▲ to insert a digit on the right, ▼ to delete the right-most digit, ► to accept the value, or ◀ to cancel.

1. Navigate to the parameter you wish to modify and press ► to edit it. The value will be highlighted.
2. Press ▲ or ▼ to delete the highlighted value, or ◀ to modify the value from the left-most digit, starting with the plus/ minus sign.
3. With the plus or minus sign highlighted, press ▲ or ▼ to change it. Press ► to highlight the next digit to the right.
4. Use ▲ or ▼ to modify the highlighted digit. Scroll past 9 to reach the decimal point.
5. When the value is complete, press ► until the Enter ← icon is highlighted , then press ► to accept the value.

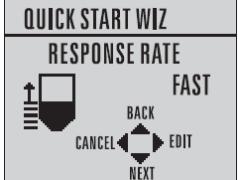
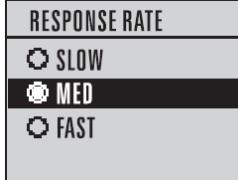
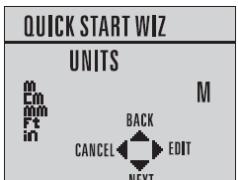
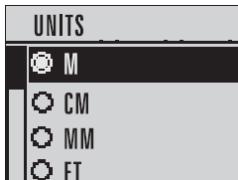
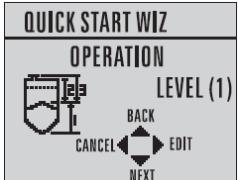
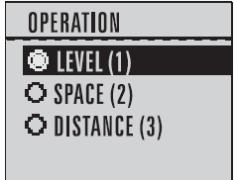
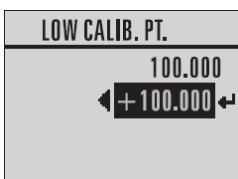
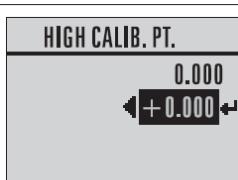
To modify a text string

1. Navigate to the parameter you wish to modify and press ► to edit it. The string will be highlighted.
2. Follow the same steps as above, to add, delete, or modify characters.

Programming

Quick Start

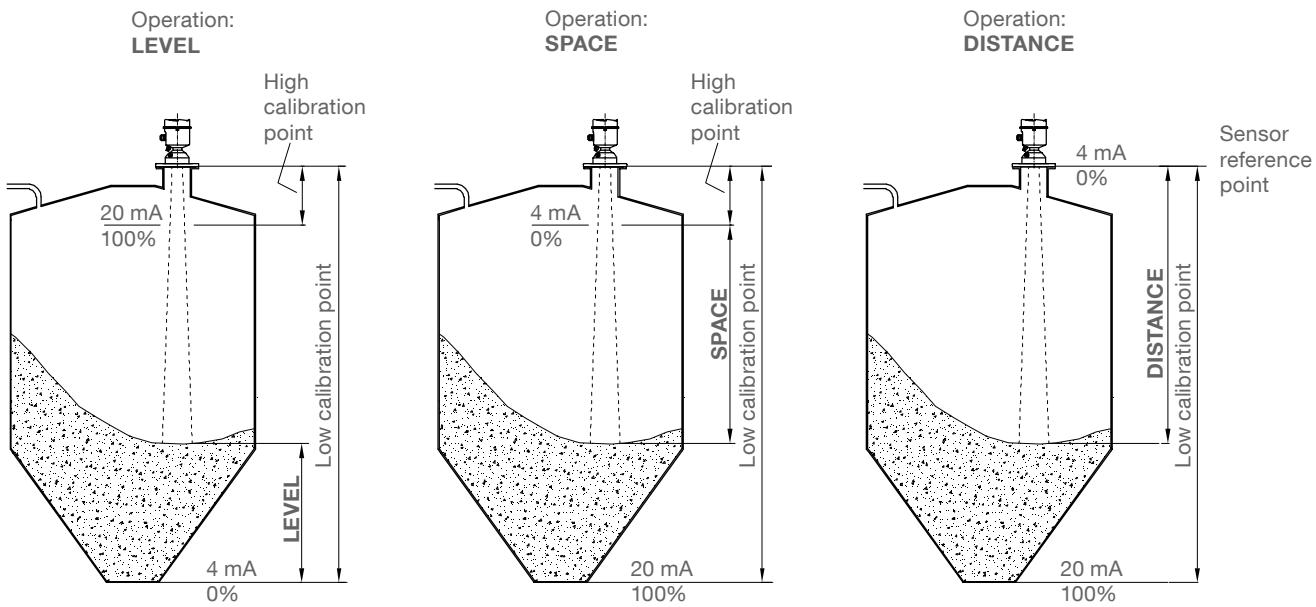
In Measurement mode press ► to enter Program mode.
 Choose Quick Start (1.), and then press ► to enter Quick Start Wizard (1.1.).
 Press ▼ to jump to first Quick Start item "Vessel".

Vessel	 	Select vessel construction material.								
Response Rate	 	Sets the reaction speed of the device to measurement changes in the target range.								
Units	 	Sensor measurement units shown on the display.								
Operation	 	<table border="1"> <thead> <tr> <th>Operation</th><th>Description</th></tr> </thead> <tbody> <tr> <td>LEVEL (1) *</td><td>Distance from Low Calibration Point to material surface</td></tr> <tr> <td>SPACE (2)</td><td>Distance from High Calibration Point to material surface</td></tr> <tr> <td>DISTANCE(3)</td><td>Distance from Sensor Reference Point to material surface</td></tr> </tbody> </table>	Operation	Description	LEVEL (1) *	Distance from Low Calibration Point to material surface	SPACE (2)	Distance from High Calibration Point to material surface	DISTANCE(3)	Distance from Sensor Reference Point to material surface
Operation	Description									
LEVEL (1) *	Distance from Low Calibration Point to material surface									
SPACE (2)	Distance from High Calibration Point to material surface									
DISTANCE(3)	Distance from Sensor Reference Point to material surface									
Low calibration point	 	<p>The 4-20 mA output will be set accordingly, see drawing on next page.</p>								
High calibration point	 	<p>Distance from Sensor Reference Point to Low Calibration Point: usually process empty level.</p> <p>Values Range: 0 to 40 m/100 m.</p> <p>See drawing on next page.</p>								
		<p>Distance from Sensor Reference Point to High Calibration Point: usually process full level.</p> <p>Values Range: 0 to 40 m/100 m.</p> <p>See drawing on next page.</p>								

To transfer Quick Start values to the device and return to Program menu, press ▼ (Finish).
 To ensure a safe measurement, go to page 17, "Check for safe measurement using echo profile"

* Factory setted values

Programming



Programming

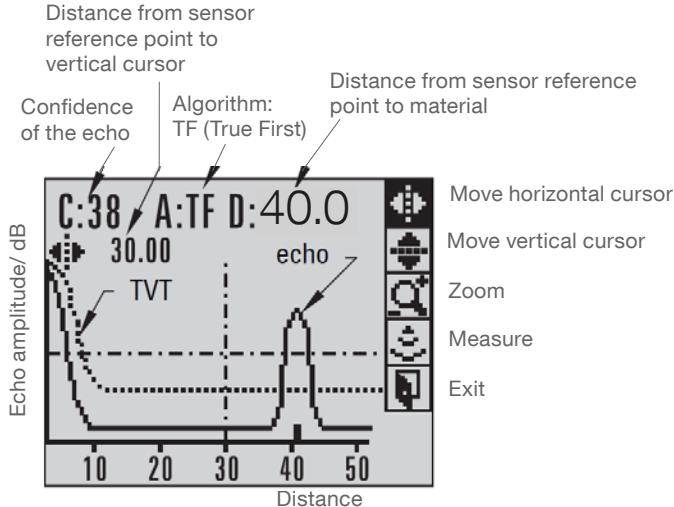
Check for safe measurement using echo profile

In Measurement mode press ► to enter Program mode.

Choose Diagnostics (3.), and then Echo Profile (3.2.)

Press ► to request a profile.

Displayed echo profile



- Distance from sensor reference point to vertical cursor:
Allows to measure the exact distance of an echo.
- Algorithm TF (True First):
Standard setting. The first echo which is bigger than the TTV curve is considered as material level.
- Distance from sensor reference point to material:
Distance of the echo considered as material level.

To navigate in the echo profile

Use ▲ or ▼ to scroll to an icon. When an icon is highlighted, that feature becomes active.

To move a cursor, press ► to increase the value, ◀ to decrease.

To Zoom into an area, position the intersection of the cursor at the center of that area, select Zoom, and press ► . Press ◀ to Zoom out.

To update the profile, select Measure and press ► .

Checking the echo profile

Following items can easily be checked:

- Confidence of the echo needs to be ≥ 5 . If the value is smaller, the echo is too weak.
- Echoes in front of the material level echo need to be significant below the TTV curve. If an echo is present which is bigger than the TTV curve, it is considered as material level and causes a wrong measurement.

Possible improvements:

Check for proper mounting position (see chapter Mounting).

Check if sensor aiming helps to decrease such an echo (see chapter Mounting).

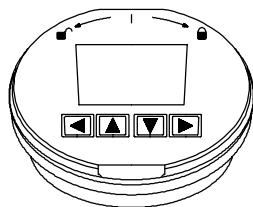
If no improvement is possible, contact manufacturer.

Return to Measurement mode

To return to the previous menu, select Exit, then press ► , then press ◀ to return to Measurement mode.

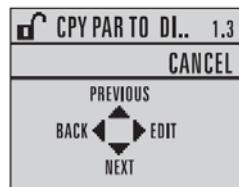
Programming / Trouble shooting

Copy of programmed parameters to other devices



After a device is programmed, the parameters can be copied to others devices by loading the parameters into the "Plug on display", then remove the display from the device, insert it on another device and load the parameters into this device.

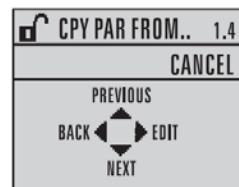
Copy parameters to "Plug on display"



In Measurement mode press ► to enter Program mode.

Choose Quick Start (1.), then CPY PAR TO DI (1.3.) Press ►, then select START and press ►. PARAM UPLOAD is displayed, then the device returns to Measurement mode.

Copy parameters from "Plug on display" to a unit



In Measurement mode press ► to enter Program mode.

Choose Quick Start (1.), then CPY PAR FROM (1.4.) Press ►, then select START and press ►. PARAM DOWNLOAD is displayed, then the device returns to Measurement mode.

Advanced programming and FDT (Pactware)

This is not part of this manual. Please refer to manufacturer for more information.

Trouble shooting

Failure description	Possible reason	Solution
Value jumps during measurement to 100% (indicating full vessel).	Reflections from mounting (e.g. socket)	<p>Ensure that at least 1.5 m distance from sensor reference point to material level is present.</p> <p>In Measurement mode press ► to enter Program mode.</p> <p>Select SETUP (2.), TTV SETUP (2.8), AUTO ECHO SUPP (2.8.1). Go to LEARN and press ►.</p> <p>The units states LEARN for some seconds. During this time echoes up to 1.0 m distance are measured and as wrong echoes ignored.</p> <p>When the unit states ON, you can go back to measurement mode by pressing several times ◀.</p>

Fault codes

Code	Meaning	Corrective action
S: 0	The device was unable to get a measurement within the Fail-safe LOE Timer period. Possible causes: faulty installation, antenna material buildup, foaming/ other adverse process conditions, invalid configuration range.	<ul style="list-style-type: none"> • Ensure installation details are correct. • Ensure no antenna material buildup. Clean if necessary. • Adjust process conditions to minimize foam or other adverse conditions. • Correct configuration range. • If fault persists, contact your local representative.
S: 3	Device is nearing its lifetime limit according to the value set in Maintenance Required Limit.	Replacement is recommended.
S: 4	Device is nearing its lifetime limit according to the value set in Maintenance Demanded Limit.	Replacement is recommended.
S: 6	Sensor is nearing its lifetime limit according to the value set in Maintenance Required Limit.	Replacement is recommended.
S: 7	Sensor is nearing its lifetime limit according to the value set in Maintenance Demanded Limit.	Replacement is recommended.
S: 8	Service interval as defined in Maintenance Required Limit has expired.	Perform service.
S: 9	Service interval as defined in Maintenance Demanded Limit has expired.	Perform service.
S: 12	Internal temperature of device has exceeded specifications: it is operating outside its temperature range.	<ul style="list-style-type: none"> • Relocate device and/ or lower process temperature enough to cool device. • Inspect for heat-related damage and contact your local representative if repair is required. • Fault code will persist until a manual reset is performed.
S: 17	Calibration interval as defined in Maintenance Required Limit has expired.	Perform calibration.
S: 18	Calibration interval as defined in Maintenance Demanded Limit has expired.	Perform calibration.
S: 25	Internal error.	Reset power. If fault persists, contact your local representative.
S: 48	User configuration is invalid. One or more of parameters: Low Calibration Point, High Calibration Point, Volume breakpoints, and/ or Auto False-Echo Suppression, are set to invalid values.	<ul style="list-style-type: none"> • Reconfigure the unit. • Ensure the difference between High Calibration Point and Low Calibration Point is not less than or equal to zero; do a Master Reset.
S: 52	Fail-safe is activated. Possible causes: 1. hardware failure 2. memory failure 3. Fail-safe LOE timer expired– possible causes: faulty installation, antenna material buildup, foaming/ other adverse process conditions, invalid calibration range.	For 3: <ul style="list-style-type: none"> • Correct configuration; ensure installation is correct; • no antenna buildup; • adjust process conditions to minimize foaming/ other adverse conditions; • correct calibration range. If fault persists, or for 1 and 2, contact your local representative.
S: 54	Fault occurs when the PV exceeds the user configured min./ max. range for mA output.	Adjust process to fall within limits of min./ max. mA values or adjust limits of mA if possible.
S: 94	Device error. Possible causes: 1. Voltage low at the NR 3000 2. Hardware defect	For 1: Confirm voltage is within specifications and modify wiring or increase source voltage accordingly. For 2: Repair required: contact your local representative.
other codes		Contact your local representative.

Menu structure

Menu structure

1. WIZARDS

- 1.1 QUICK START WIZ
 - VESSEL
 - RESPONSE RATE
 - UNITS
 - OPERATION
 - LOW CALIB. PT.
 - HIGH CALIB. PT.
- 1.2 AFES WIZ
- 1.3 COPY PARAMETERS TO DISPLAY
- 1.4 COPY PARAMETERS FROM DISPLAY
- 1.5 COPY FIRMWARE TO DISPLAY
- 1.6 COPY FIRMWARE FROM DISPLAY

2. SETUP

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 - 2.1.2 TAG
 - 2.1.3 DESCRIPTOR
 - 2.1.4 MESSAGE
 - 2.1.5 INSTAL DATE
 - 2.1.6 HARDWARE REV
 - 2.1.7 FIRMWARE REV
 - 2.1.8 LOADER REV
 - 2.1.9 MENU TIMEOUT
 - 2.1.10 MANUF. DATE
- 2.2 SENSOR
 - 2.2.1 UNITS
 - 2.2.2 SENSOR MODE
 - 2.2.3 DAMPING FILTER
 - 2.2.4 TEMP. UNITS
 - 2.2.5 UNIT
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 - 2.3.3 SENSOR OFFSET
- 2.4 RATE
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 - 2.5.2 TIMER
 - 2.5.3 LEVEL
- 2.6 ANALOG OUTPUT SCALE
 - 2.6.1 CURRENT OUTPUT FUNCTION
 - 2.6.2 4 MA SETPOINT
 - 2.6.3 20 MA SETPOINT
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 - 2.7.2 FAR RANGE

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 - 2.7.3.1 ALGORITHM
 - 2.7.3.2 ECHO THRESHOLD
 - 2.7.3.3 POSITION DETECT
 - 2.7.3.4 CLEF RANGE
 - 2.7.3.5 ECHO MARKER
- 2.7.4 SAMPLING
 - 2.7.4.1 ECHO LOCK
 - 2.7.4.2 UP SAMP.
 - 2.7.4.3 DOWN SAMP.
 - 2.7.4.4 ECHO LOCK WINDOW
- 2.7.5 FILTERING
 - 2.7.5.1 NARROW ECHO FILTER
 - 2.7.5.2 REFORM ECHO
 - 2.7.5.3 AVG AMOUNT
- 2.7.6 ECHO QUALITY
 - 2.7.6.1 CONFIDENCE
 - 2.7.6.2 ECHO STRENGTH

- 2.8 TVT SETUP
 - 2.8.1 AUTO ECHO SUPP
 - 2.8.2 AUTO SUPP RANGE
 - 2.8.3 HOVER LEVEL
 - 2.8.4 SHAPER MODE
- 2.9 TVT SHAPER
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 - 2.9.2 BREAKPOINT 10-18
 - 2.9.3 BREAKPOINT 19-27
 - 2.9.4 BREAKPOINT 28-36
 - 2.9.5 BREAKPOINT 37-45
 - 2.9.6 BREAKPOINT 46-54
 - 2.9.7 BREAKPOINT 55-63
 - 2.9.8 BREAKPOINT 64-72
 - 2.9.9 BREAKPOINT 73-81
 - 2.9.10 BREAKPOINT 82-90
 - 2.9.11 BREAKPOINT 91-99
 - 2.9.12 BREAKPOINT 100-108
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 - 2.9.14 BREAKPOINT 118-120
- 2.10 MEASURED VALUES
 - 2.10.1 MAIN OUTPUT
 - 2.10.2 O/P NO LINEAR
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- 3.2 ECHO PROFILE
- 3.3 TREND
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 - 3.4.2 MAX. MEAS. VALUE
 - 3.4.3 MINIMUM PV
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- 3.5 ELECT TEMP
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Menu structure

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3.6.2 REMAIN LIFETIME
3.6.3 REMIND. 1 (REQ.)
3.6.4 REMIND. 2 (DEM.)
3.6.5 REMINDER ACTIVATION
3.6.6 LIFETIME EXPECTED
3.6.7 MAINT STAT
3.6.8 ACK STATUS
3.6.9 ACK

3.7 REMAIN. SENS LIFE
3.7.1 TIME IN OPER
3.7.2 REMAIN LIFETIME
3.7.3 REMIND. 1 (REQ.)
3.7.4 REMIND. 2 (DEM.)
3.7.5 REMINDER ACTIVATION
3.7.6 LIFETIME EXPECTED
3.7.7 MAINT STAT
3.7.8 ACK STATUS
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4. SERVICE

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5. COMMUNICATION

5.1 DEVICE ADDRESS

5.2 REMOTE LOCKOUT

6. SECURITY

6.1 WRITE PROTECTION

7. LANGUAGE



Maintenance

General items

Opening the lid (cover)



Before opening the lid for maintenance reasons observe following items:

- No dust deposits or whirlings are present.
- No rain can enter into the housing

Frequent check of the unit



To ensure durable safety in hazardous locations and with electrical safety, following items must be checked frequently depending on the application:

- Mechanical damage or corrosion of any components (housing side and sensor side) and of the field wiring cables.
- Tight sealing of the process connection, cable glands and enclosure lid.
- Properly connected external PE cable (if present).

Cleaning

The unit requires no cleaning under normal operating conditions.

Under severe operating conditions, the antenna may require periodic cleaning.

If cleaning is required by the application, following must be observed:



- Cleaning agent must comply with the materials of the unit (chemical resistance). Mainly the lid, antenna material, sealing, cable gland and the surface of the unit must be considered.



The cleaning process must be done in a way, that:

- The cleaning agent cannot enter into the unit through the lid sealing or cable gland.
- No mechanical damage of the lid sealing, cable gland or other parts can happen.
- Remove the instrument from service and wipe the antenna clean using a cloth and suitable cleaning solution.

A possible accumulation of dust on the unit does not increase the maximum surface temperature and must therefore not be removed for purposes of maintaining the surface temperature in hazardous locations.

Production date

The production date can be traced by the serial number on the typeplate. Please contact the manufacturer or your local distributor.

Spare parts

All available spare parts are stated in the selection list

Notes for use in Hazardous Locations

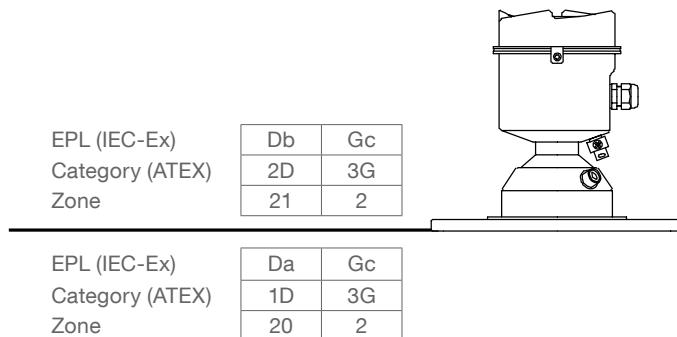
ATEX Zone classification

Category	Useable in zone	
1 D	20, 21, 22	
2 D	21, 22	
3 D*	22	
3 G	2	

* In case of conductive dust, additional requirements for installation are necessary.



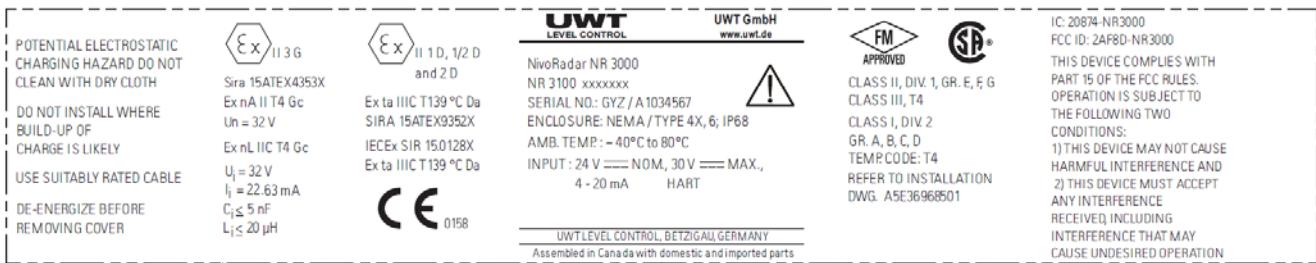
Permitted zones (categories) for mounting in partition wall



General notes

Marking/ assembly

Devices with Ex-approval are marked on the type plate. For use and assembly and details of marking/ coding, refer to the main part of this Instruction manual.



Process pressure

The device construction allows process over-pressure up to +0.5 bar or 3 bar (7.5 or 40 psi). This pressure is allowed for test purposes. The definition of the Ex approvals are only valid for a silo-over-pressure between -0.2 .. +0.1 bar (-2.9 .. +1.45 psi). Outside of these pressure the approvals are not valid.

Process and ambient temperature

The equipment is certified for use in an ambient temperature range of -40°C to 80°C. The permitted temperature range is as well marked on the type plate.

Safety related device

The equipment has not been assessed as a safety related device (as referred to by Directive 94/9/EC Annex II, clause 1.5).

Repair

Repair of this equipment shall be carried out by suitably trained and authorized personnel in accordance with the applicable code of practice.

Notes for use in Hazardous Locations

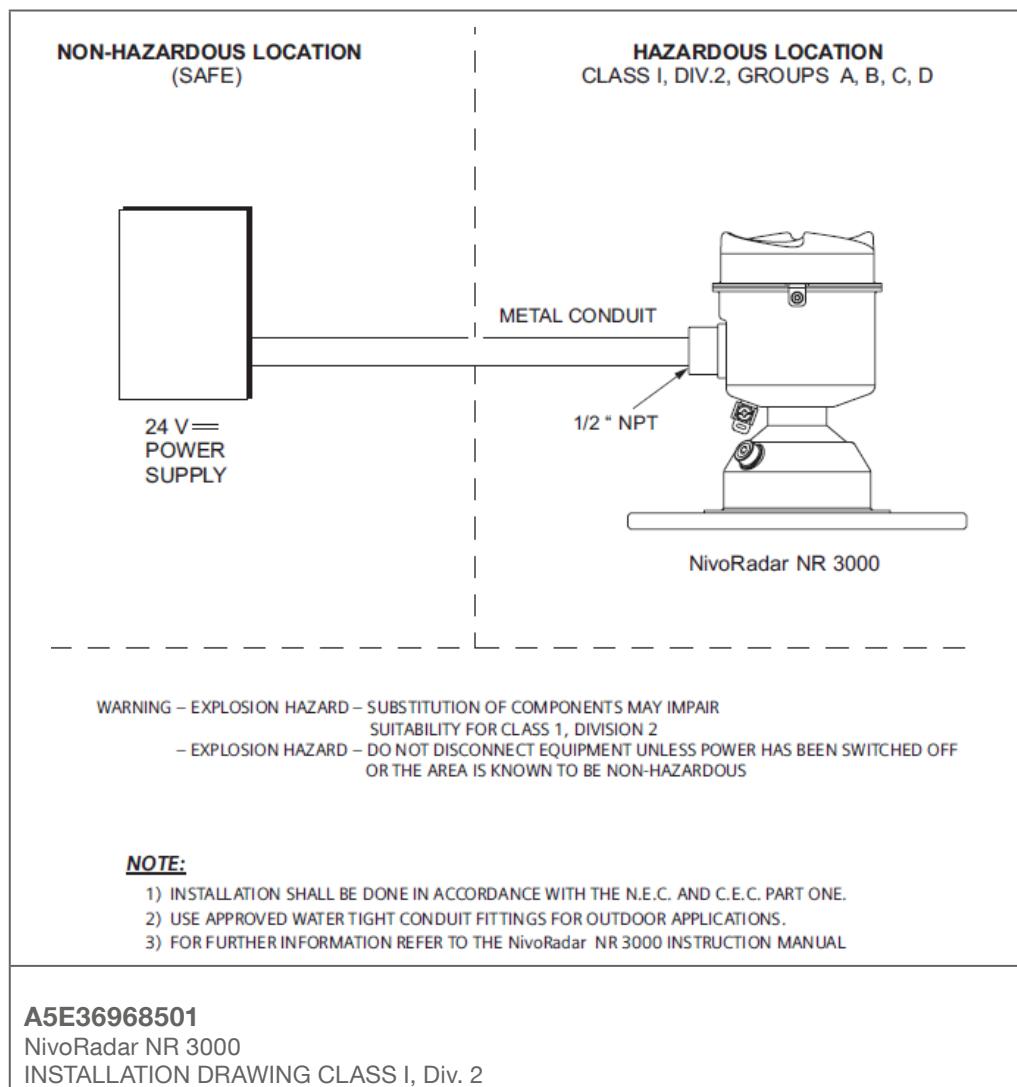
! Maximum Surface Temperature

The maximum surface temperature refer to the warmest area outside on the unit which can occur in failure case (according to Ex definition).

Refer to the applicable code of practice for selection of this equipment with respect to specific dust ignition temperatures.

Max. Ambient temperature	Max. Surface temperature
80°C (176°F)	139°C (282°F)

! Installation Drawing Class I Div.2



Disposal

The product consists of materials which can be recycled, details of the used materials see chapter "Technical data - mechanical data".

Recycling must be done by a specialised recycling company. Since the product is not subject to the WEEE directive 2002/96/EG, it is not permitted to bring it to a public recycling station.

NivoGuide® 3100

Two-wire 4 ... 20 mA/HART

Rod and cable probe

TDR sensor for continuous level measurement of bulk
solids



Quick setup guide



Document ID: 61268



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Information:

This quick setup guide enables quick setup and commissioning of your instrument.

You can find further information in the corresponding, comprehensive operating instructions as well as in the Safety Manual for instruments with SIL qualification.

**Operating instructions NivoGuide 3100 - 4 ... 20 mA/HART -
Two-wire - Rod and cable probe: Document-ID 58879
Editing status of the quick setup guide: 2019-02-12**

1 For your safety

1.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified personnel authorised by the plant operator.

During work on and with the device, the required personal protective equipment must always be worn.

1.2 Appropriate use

NivoGuide 3100 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

1.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

1.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

1.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

1.6 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

2 Product description

2.1 Configuration

Type label

The type label contains the most important data for identification and use of the instrument:

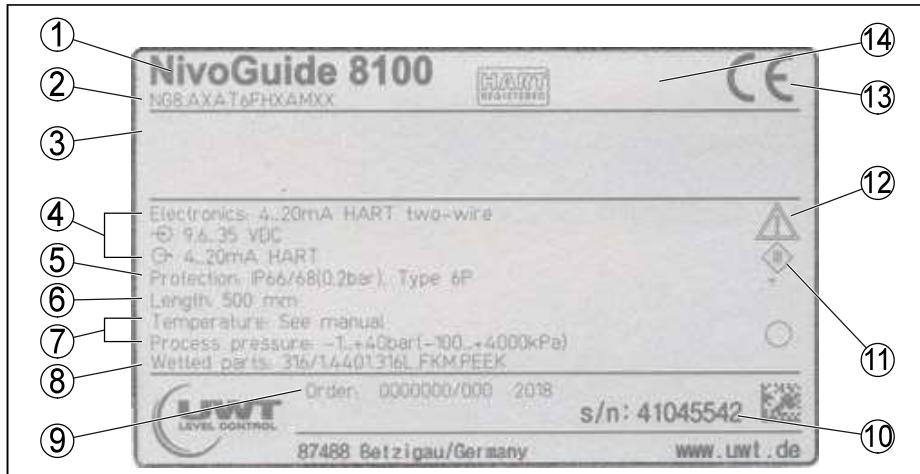


Fig. 1: Layout of the type label (example)

- 1 Instrument type
- 2 Product code
- 3 Approvals (option)
- 4 Power supply and signal output, electronics
- 5 Protection rating
- 6 Probe length (measurement accuracy optional)
- 7 Process and ambient temperature, process pressure
- 8 Material wetted parts
- 9 Order number
- 10 Serial number of the instrument
- 11 Symbol of the device protection class
- 12 ID numbers, instrument documentation
- 13 CE identification
- 14 Approval directives (optional)

3 Mounting

3.1 General instructions for use of the instrument

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "Connecting to power supply")
- Tighten the cable gland or plug connector
- When mounting horizontally, turn the housing so that the cable gland or plug connector point downward
- Lead the connection cable downward in front of the cable entry or plug connector.

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

Make sure that the degree of contamination specified in chapter "Technical data" meets the existing ambient conditions.

3.2 Mounting instructions

Installation position

Mount NivoGuide 3100 in such a way that the distance to vessel installations or to the vessel wall is at least 300 mm (12 in). In non-metallic vessels, the distance to the vessel wall should be at least 500 mm (19.7 in).

During operation, the probe must not touch any installations or the vessel wall. If necessary, fasten the probe end.

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom. Keep in mind that measurement all the way down to the tip of the probe may not be possible. The exact value of the min. distance (lower dead band) is stated in chapter "Technical data" of the operating instructions.

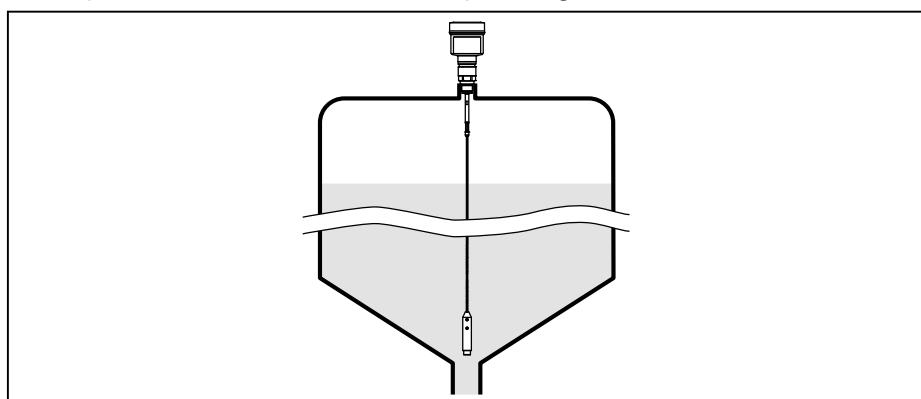


Fig. 2: Vessel with conical bottom

Type of vessel

Plastic vessel/Glass vessel

The guided microwave principle requires a metallic surface on the process fitting. Therefore, in plastic vessels, etc., use an instru-

ment version with flange (from DN 50) or place a metal sheet ($\varnothing > 200$ mm/8 in) beneath the process fitting when screwing it in.

Make sure that the plate has direct contact with the process fitting.

When using the probes without metal vessel wall, e.g. in plastic vessels, the measured value can be influenced by strong electromagnetic fields (emitted interference according to EN 61326: class A).

Use a probe in coax version for applications in liquids.

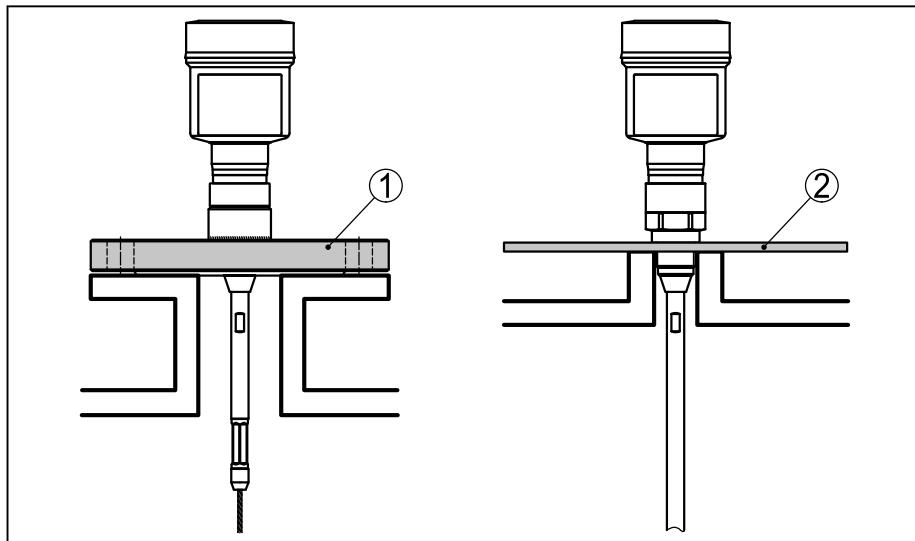


Fig. 3: Mounting in non-metallic vessel

- 1 Flange
- 2 Metal sheet

Concrete vessel

When mounting in thick concrete ceilings, NivoGuide 3100 should be mounted front flush to the lower edge. In concrete silos, the distance to the wall should be at least 500 mm (20 in).

3 Mounting

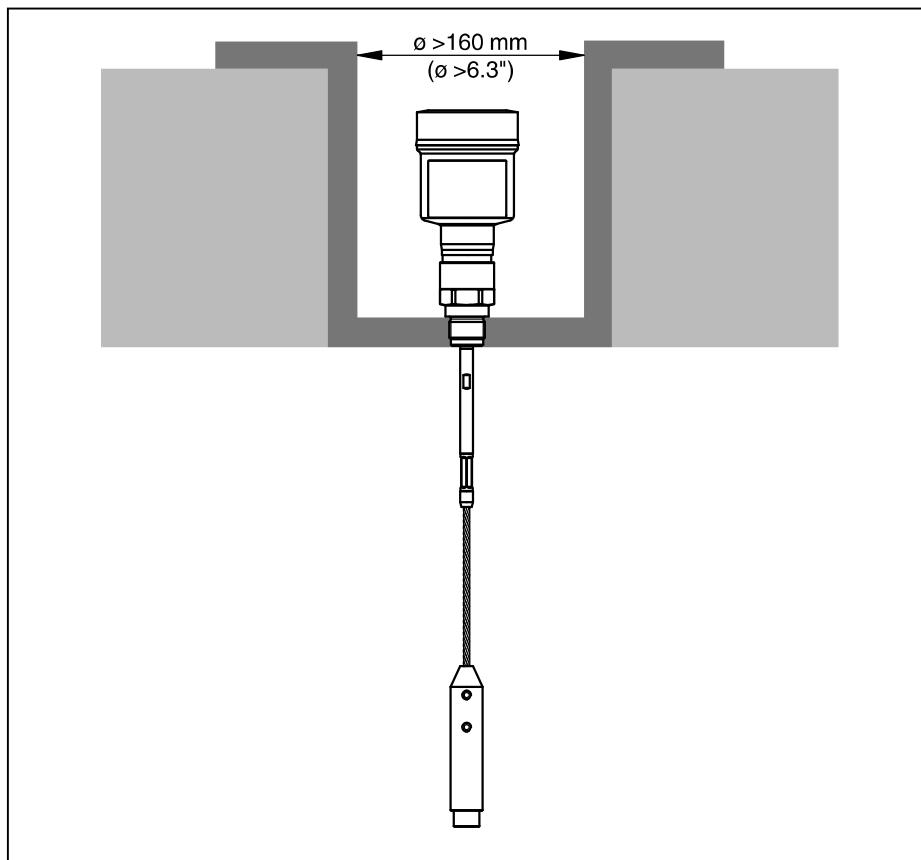


Fig. 4: Mounting in concrete silo

Mounting socket

If possible, avoid sockets. Mount the sensor flush with the vessel top. If this is not possible, use short sockets with small diameter.

Higher sockets or sockets with a bigger diameter can generally be used. They can, however, increase the upper blocking distance (dead band). Check if this is relevant for your measurement.

In such cases, always carry out a false signal suppression after mounting. You can find further information under "*Setup procedure*".

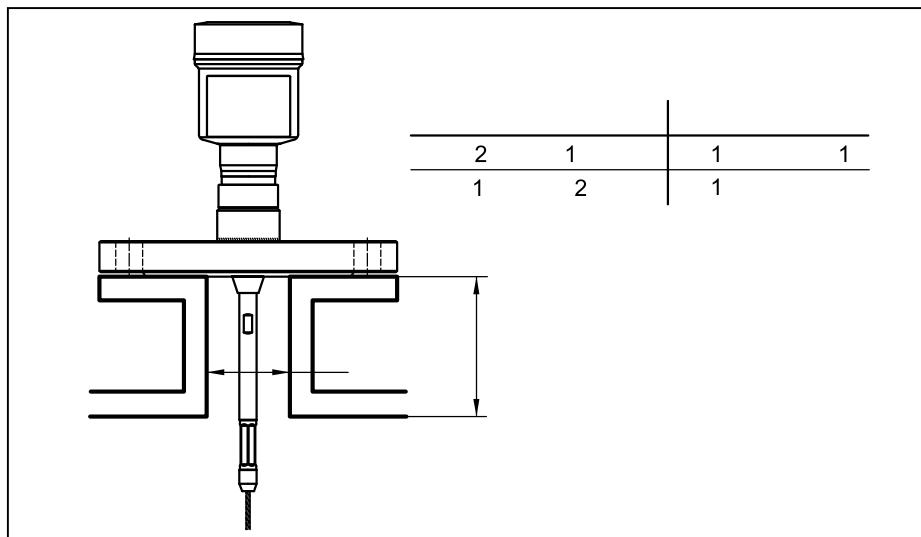


Fig. 5: Mounting socket

When welding the socket, make sure that the socket is flush with the vessel top.

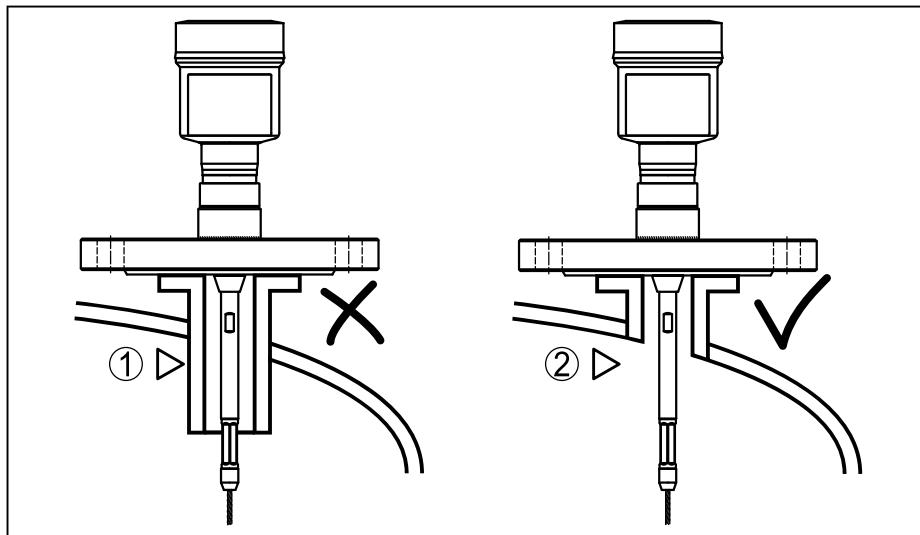


Fig. 6: Socket must be installed flush

- 1 Unfavourable mounting
- 2 Socket flush - optimum mounting

4 Connecting to power supply

4.1 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.



Information:

The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry



Fig. 7: Connection steps 5 and 6

- 1 Single chamber housing
- 2 Double chamber housing

6. Insert the wire ends into the terminals according to the wiring plan



Information:

Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

You can find further information on the max. wire cross-section under "Technical data - Electromechanical data".

7. Check the hold of the wires in the terminals by lightly pulling on them

8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
 9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
 10. Reinsert the display and adjustment module, if one was installed
 11. Screw the housing lid back on
- The electrical connection is finished.

4.2 Wiring plan, single chamber housing



The following illustration applies to the non-Ex, Ex-ia and Ex-d-ia version.

Electronics and connection compartment

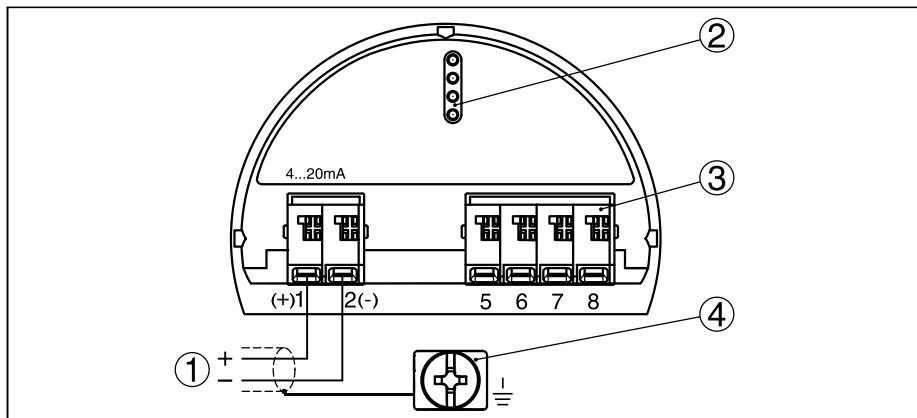


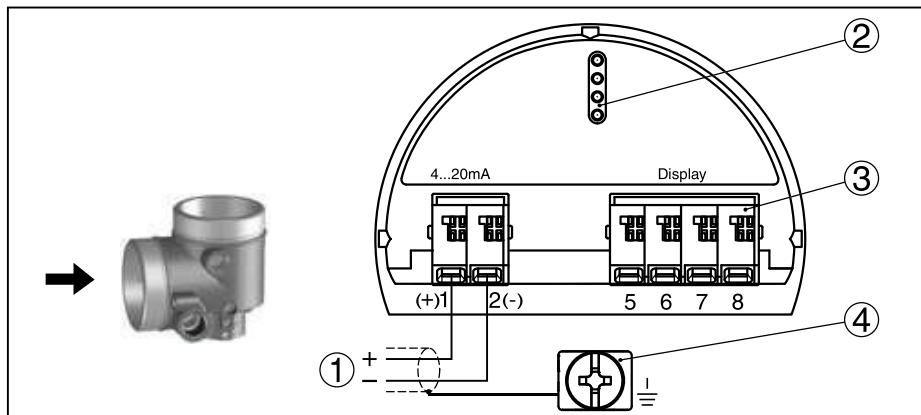
Fig. 8: Electronics and connection compartment - single chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

4.3 Wiring plan, double chamber housing



The following illustrations apply to the non-Ex as well as to the Ex-ia version.

Connection compartment*Fig. 9: Connection compartment - double chamber housing*

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

5 Set up with the display and adjustment module

5.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 10: Installing the display and adjustment module in the electronics compartment of the single chamber housing

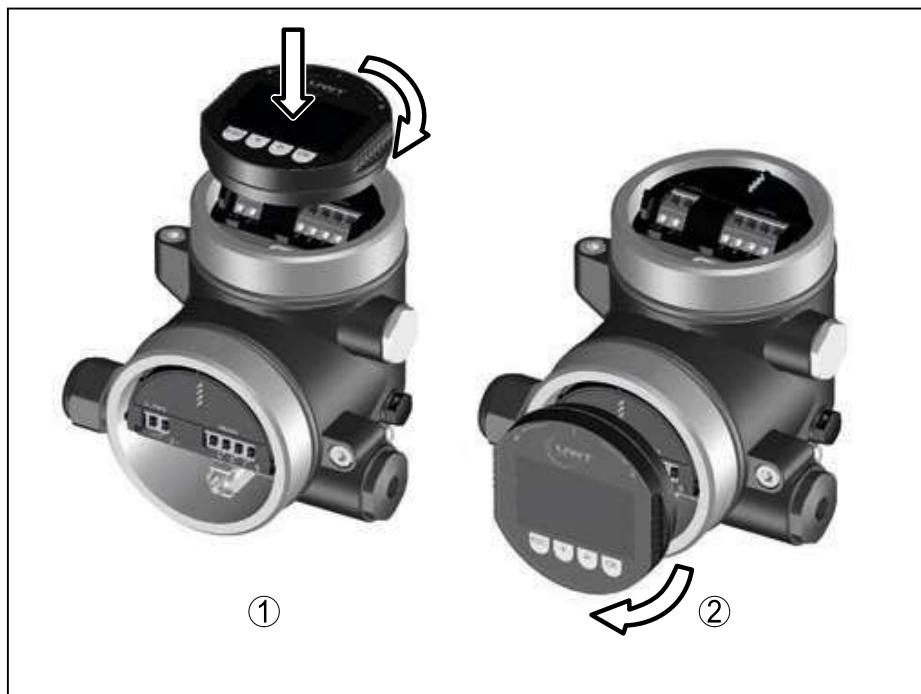


Fig. 11: Installing the display and adjustment module in the double chamber housing

- 1 In the electronics compartment
- 2 In the connection compartment



Note:

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

5.2 Parameter adjustment - Quick setup

Quick setup

To quickly and easily adapt the sensor to the application, select the menu item "Quick setup" in the start graphic on the display and adjustment module.



You can find "*Extended adjustment*" in the detailed operating instructions.

General information

Measurement loop name

In the first menu item you can assign a suitable measurement loop name. You can enter a name with max. 19 characters.

Type of medium

In the next menu item you can see which type of medium the instrument is suitable for. If your instrument is only suitable for a certain medium, this menu item is not visible.

Application

In this menu item, you can select the application. You can choose between level measurement and interface measurement. You can also choose between measurement in a vessel or in a bypass or standpipe.

Measurement loop name TANK 04	Application Level vessel	Type of medium Liquid
----------------------------------	-----------------------------	--------------------------

Level measurement

Medium - dielectric constant

In this menu item, you can define the type of medium (product).

Max. adjustment

In this menu item, you can enter the max. adjustment for the level.

Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. The distance refers to the sensor reference plane (seal surface of the process fitting). Keep in mind that the max. level must lie below the dead band.

Min. adjustment

In this menu item, you can enter the min. adjustment for the level.

Enter the suitable distance value in m for the empty vessel (e.g. distance from the flange to the probe end) corresponding to the percentage value. The distance refers to the sensor reference plane (seal surface of the process fitting).

Medium/Dielectric constant Water-based/>10	Max. adjustment level 100.00% 80 mm F013	Min. adjustment level 0.00% 850 mm 726 mm
---	---	--

Linearisation

Linearisation

A linearisation is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. a horizontal cylindrical or spherical tank, when the indication or output of the volume is required. Corresponding linearisation curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume.

The linearization applies for the measured value indication and the current output. By activating the suitable curve, the percentage vessel volume is displayed correctly.

Linearization Linear	False signal suppression Change?
-------------------------	-------------------------------------

6 Supplement

6.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein - for example regarding the process conditions or the voltage supply.

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; 0.2 bar

Cable entry

- M20 x 1.5 1 x cable gland M20 x 1.5 (cable: ø 6 ... 12 mm), 1 x blind plug M20 x 1.5
- ½ NPT 1 x blind plug NPT, 1 x closing cap (red) ½ NPT

Wire cross-section (spring-loaded terminals)

- Massive wire, stranded wire 0.2 ... 2.5 mm² (AWG 24 ... 14)
- Stranded wire with end sleeve 0.2 ... 1.5 mm² (AWG 24 ... 16)

Voltage supply

Operating voltage U_B

- Non-Ex instrument 9.6 ... 35 V DC
- Ex-ia instrument 9.6 ... 30 V DC

Operating voltage U_B with lighting switched on

- Non-Ex instrument 16 ... 35 V DC
- Ex-ia instrument 16 ... 30 V DC

Reverse voltage protection

Integrated

Permissible residual ripple - Non-Ex, Ex-ia instrument

- for 9.6 V < U_B < 14 V ≤ 0.7 V_{eff} (16 ... 400 Hz)
- for 18 V < U_B < 36 V ≤ 1.0 V_{eff} (16 ... 400 Hz)

Load resistor

- Calculation (U_B - U_{min}) / 0.022 A
- Example - Non-Ex instrument with
U_B = 24 V DC (24 V - 9.6 V) / 0.022 A = 655 Ω

NivoGuide® 3100

Two-wire 4 ... 20 mA/HART

Rod and cable probe

With SIL qualification

TDR sensor for continuous level measurement of bulk
solids



Quick setup guide



Document ID: 61905



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Information:

This quick setup guide enables quick setup and commissioning of your instrument.

You can find supplementary information in the corresponding, more detailed Operating Instructions Manual as well as the Safety Manual that comes with instruments with SIL qualification. These manuals are available on our homepage.

**Operating instructions NivoGuide 3100 - Two-wire 4 ... 20 mA/
HART - Rod and cable probe - With SIL qualification: Document-
ID 61894**

Editing status of the quick setup guide: 2019-07-30

1 For your safety

1.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified personnel authorised by the plant operator.

During work on and with the device, the required personal protective equipment must always be worn.

1.2 Appropriate use

NivoGuide 3100 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

1.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

1.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

1.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

The EU conformity declaration can be found on our homepage.

Electromagnetic compatibility

Instruments in four-wire or Ex-d-ia version are designed for use in an industrial environment. Nevertheless, electromagnetic interference from electrical conductors and radiated emissions must be taken into account, as is usual with class A instruments according to EN 61326-1. If the instrument is used in a different environment, the electromagnetic compatibility to other instruments must be ensured by suitable measures.

1.6 SIL qualification according to IEC 61508

The Safety Integrity Level (SIL) of an electronic system is used to assess the reliability of integrated safety functions.

For detailed specification of the safety requirements, multiple SIL levels are specified according to safety standard IEC 61508. You can find detailed information in chapter "*Functional safety (SIL)*" of the operating instructions.

The instrument meets the specifications of IEC 61508: 2010 (Edition 2). It is qualified for single-channel operation up to SIL2. The instrument can be used homogeneously redundant up to SIL3 in multi-channel architecture with HFT 1.

1.7 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

2 Product description

2.1 Configuration

Type label

The type label contains the most important data for identification and use of the instrument:

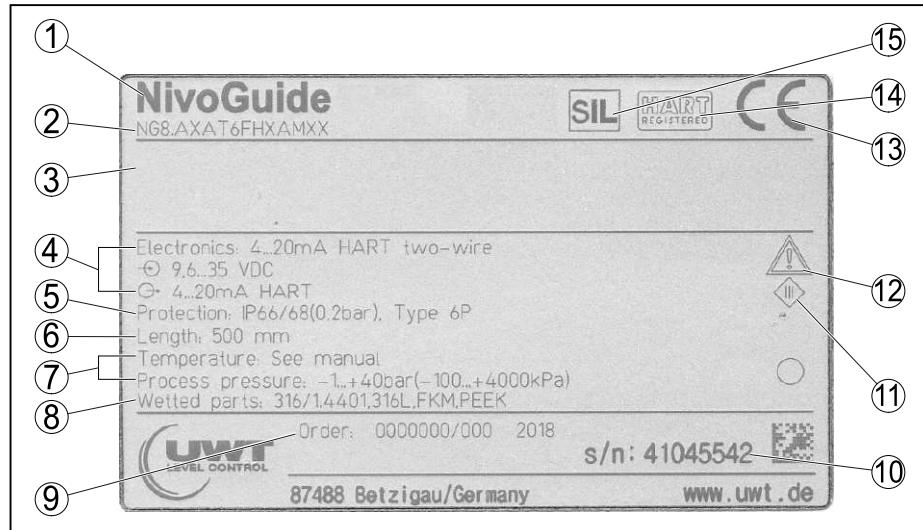


Fig. 1: Layout of the type label (example)

- 1 Instrument type
- 2 Product code
- 3 Approvals
- 4 Power supply and signal output, electronics
- 5 Protection rating
- 6 Probe length (measurement accuracy optional)
- 7 Process and ambient temperature, process pressure
- 8 Material wetted parts
- 9 Order number
- 10 Serial number of the instrument
- 11 Symbol of the device protection class
- 12 Reminder to observe the instrument documentation
- 13 Notified authority for CE marking
- 14 Approval directives
- 15 Marking of the safety function in SIS

3 Mounting

3.1 General instructions for use of the instrument

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "Connecting to power supply")
- Tighten the cable gland or plug connector
- Lead the connection cable downward in front of the cable entry or plug connector

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.



Note:

Make sure that the degree of contamination specified in chapter "Technical data" meets the existing ambient conditions.



Note:

Make sure that during installation or maintenance no moisture or dirt can get inside the instrument.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

3.2 Mounting instructions

Installation position

Mount NivoGuide 3100 in such a way that the distance to vessel installations or to the vessel wall is at least 300 mm (12 in). In non-metallic vessels, the distance to the vessel wall should be at least 500 mm (19.7 in).

During operation, the probe must not touch any installations or the vessel wall. If necessary, fasten the probe end.

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom. Keep in mind that measurement all the way down to the tip of the probe may not be possible. The exact value of the min. distance (lower dead zone) is stated in chapter "Technical data" of the operating instructions.

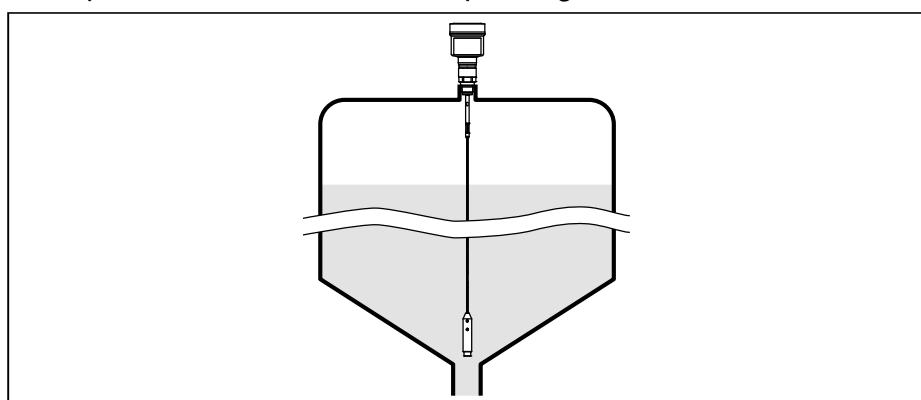


Fig. 2: Vessel with conical bottom

Type of vessel

Plastic vessel/Glass vessel

The guided microwave principle requires a metallic surface on the process fitting. Therefore, in plastic vessels, etc., use an instrument version with flange (from DN 50) or place a metal sheet ($\varnothing > 200$ mm/8 in) beneath the process fitting when screwing it in.

Make sure that the plate has direct contact with the process fitting.

When using the probes without metal vessel wall, e.g. in plastic vessels, the measured value can be influenced by strong electromagnetic fields (emitted interference according to EN 61326: class A).

Use a probe in coax version for applications in liquids.

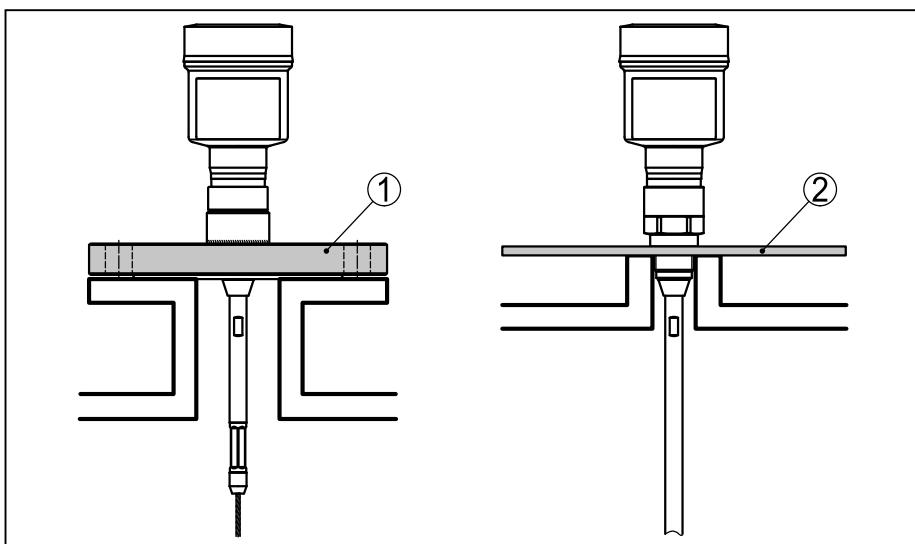


Fig. 3: Mounting in non-metallic vessel

- 1 Flange
- 2 Metal sheet

Concrete vessel

When mounting in thick concrete ceilings, NivoGuide 3100 should be mounted front flush to the lower edge. In concrete silos, the distance to the wall should be at least 500 mm (20 in).

3 Mounting

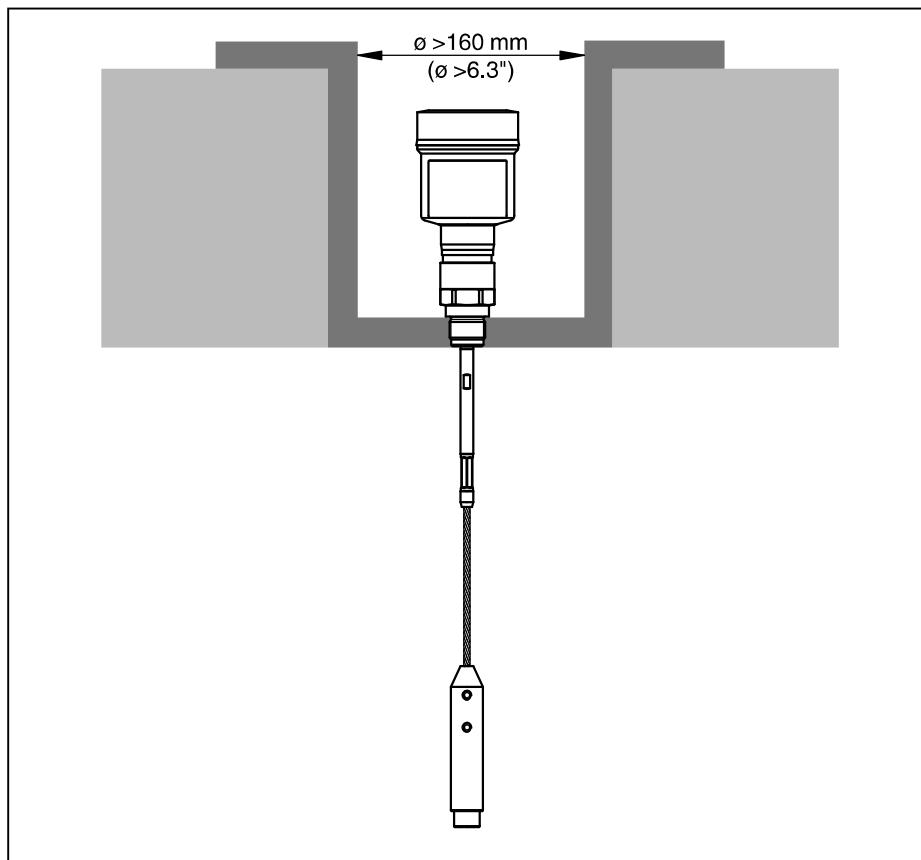


Fig. 4: Mounting in concrete silo

Mounting socket

If possible, avoid sockets. Mount the sensor flush with the vessel top. If this is not possible, use short sockets with small diameter.

Higher sockets or sockets with a bigger diameter can generally be used. They can, however, increase the upper dead zone. Check if this is relevant for your measurement.

In such cases, always carry out a false signal suppression after mounting. You can find further information under "*Setup procedure*".

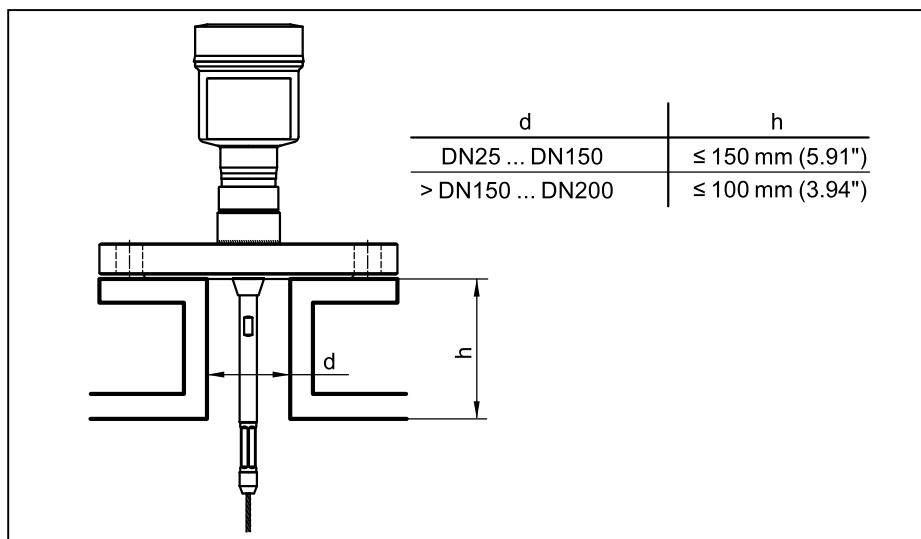


Fig. 5: Mounting socket

When welding the socket, make sure that the socket is flush with the vessel top.

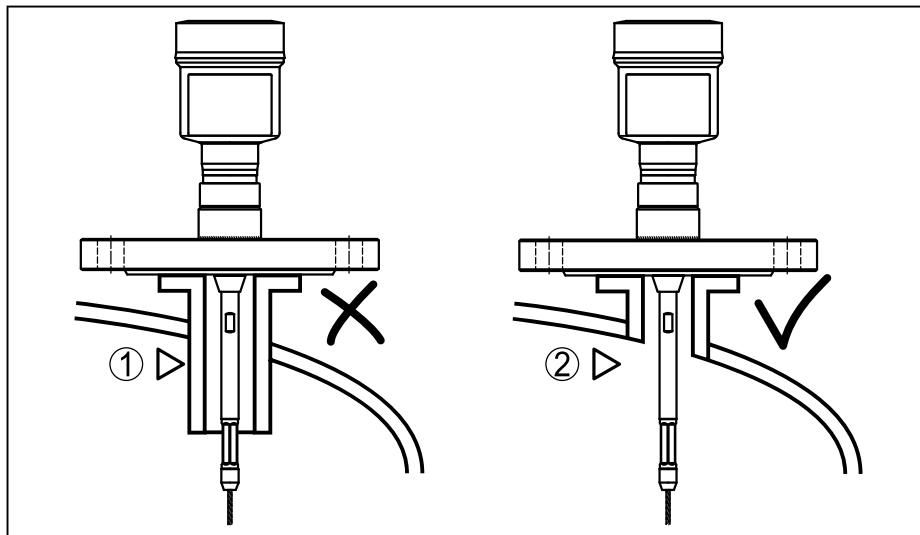


Fig. 6: Socket must be installed flush

- 1 Unfavourable mounting
- 2 Socket flush - optimum mounting

4 Connecting to power supply

4.1 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.



Information:

The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry

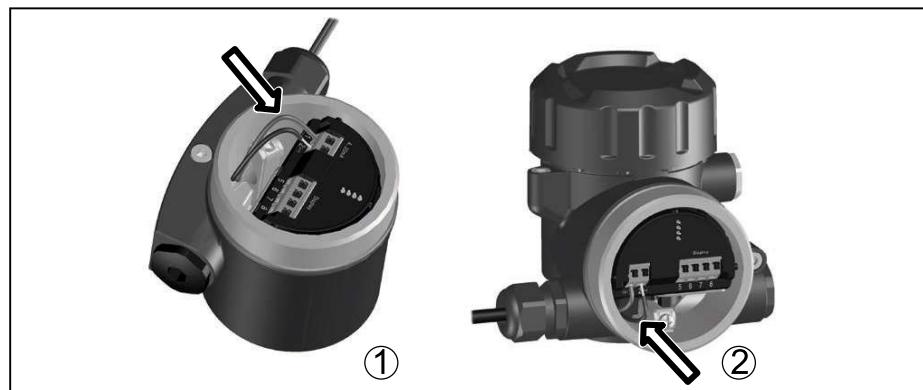


Fig. 7: Connection steps 5 and 6

- 1 Single chamber housing
- 2 Double chamber housing

6. Insert the wire ends into the terminals according to the wiring plan



Information:

Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

You can find further information on the max. wire cross-section under "Technical data - Electromechanical data".

7. Check the hold of the wires in the terminals by lightly pulling on them

8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
 9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
 10. Reinsert the display and adjustment module, if one was installed
 11. Screw the housing lid back on
- The electrical connection is finished.

4.2 Wiring plan, single chamber housing



The following illustration applies to the non-Ex, Ex-ia and Ex-d-ia version.

Electronics and connection compartment

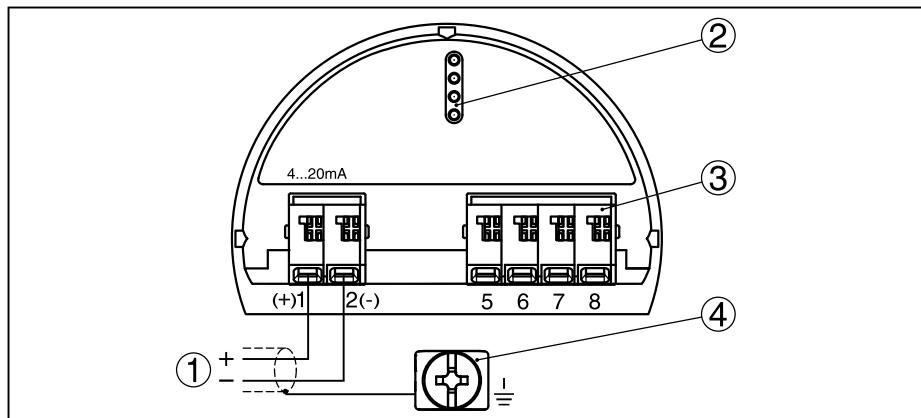


Fig. 8: Electronics and connection compartment - single chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

4.3 Wiring plan, double chamber housing



The following illustrations apply to the non-Ex as well as to the Ex-ia version.

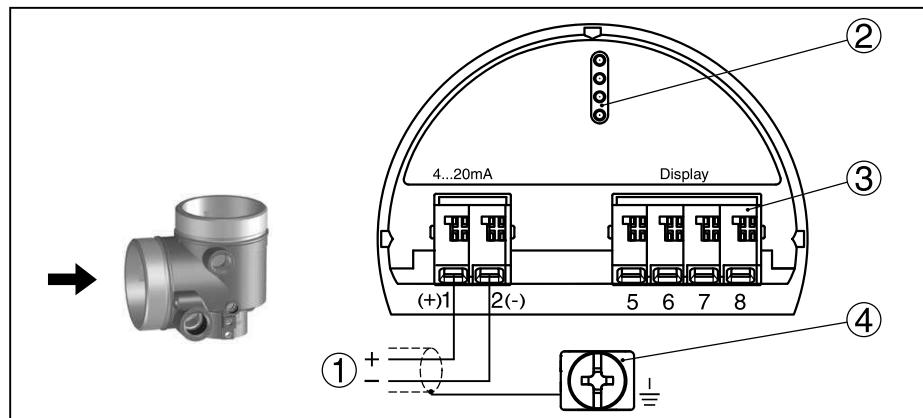
Connection compartment

Fig. 9: Connection compartment - double chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

5 Set up with the display and adjustment module

5.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 10: Installing the display and adjustment module in the electronics compartment of the single chamber housing

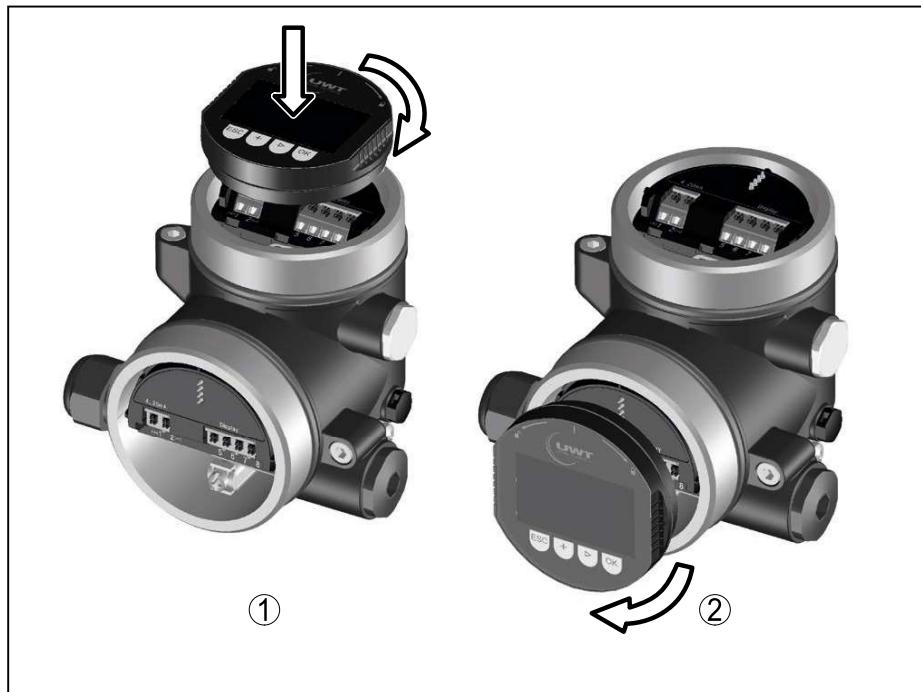


Fig. 11: Installing the display and adjustment module in the double chamber housing

- 1 In the electronics compartment
- 2 In the connection compartment



Note:

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

5.2 Parameter adjustment

Set parameters

1. In this menu item you can select the application.

Measurement loop name	Type of medium	Application
TANK 04	Liquid	Level vessel

2. In the menu item "Medium - Dielectric constant" you can define the type of medium (medium).
3. Carry out the adjustment in the menu items "Min. adjustment" and "Max. adjustment".

Max. adjustment level 100.00 % ≈ 80 mm F013	Min. adjustment level 0.00 % ≈ 850 mm 726 mm
--	---

4. A "Linearization" is recommended for all vessels in which the vessel volume does not increase linearly with the level - e.g. in a horizontal cylindrical or spherical tank. Activate the appropriate curve.

Parameterization example The sensor measures the distance from the sensor (reference plane) to the product surface.

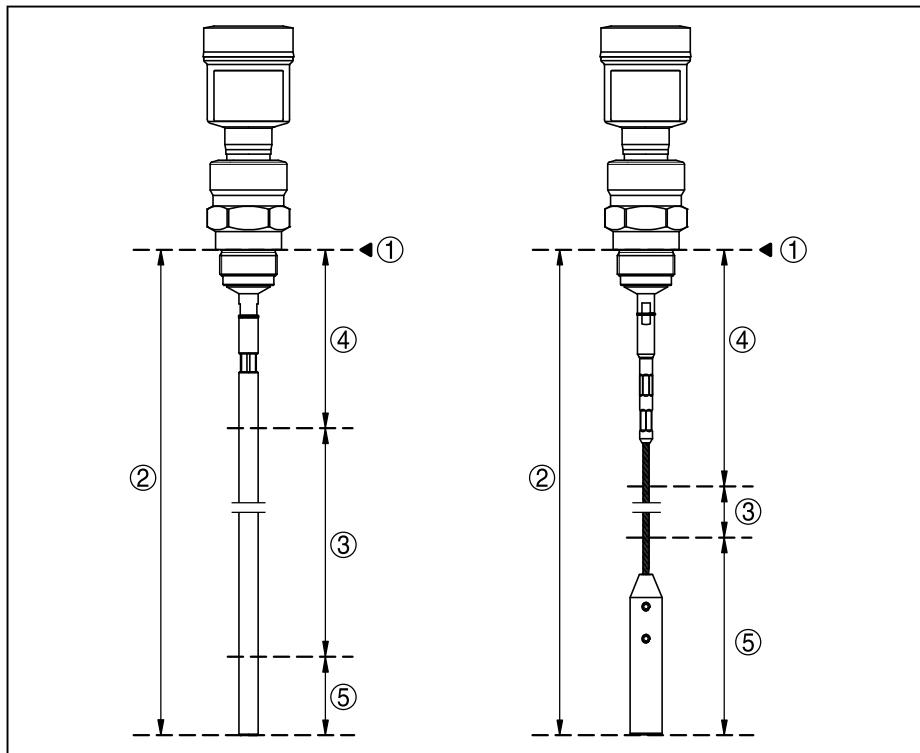


Fig. 12: Measuring ranges - NivoGuide 3100

- 1 Reference plane
- 2 Probe length L
- 3 Measuring range
- 4 Upper dead zone (in this area no measurement is possible)
- 5 Lower dead zone (in this area no measurement is possible)

For this adjustment, the distance is entered when the vessel is full and nearly empty. If these values are not known, an adjustment with other distances, for example, 10 % and 90 % is also possible. Starting point for these distance specifications is always the seal surface of the thread or flange.

Further steps

1. In the menu "Additional settings", menu item "Damping" you can adjust the requested damping of the output signal.
2. Select the parameter of the current output and the output characteristics in the menu item "Current output".

6 Supplement

6.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions which are included in delivery are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein, for example regarding the process conditions or the voltage supply.

All approval documents can be downloaded from our homepage.

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; (0.2 bar)

Cable entry

- M20 x 1.5 1 x cable gland M20 x 1.5 (cable: ø 6 ... 12 mm), 1 x blind plug M20 x 1.5
- ½ NPT 1 x blind plug NPT, 1 x closing cap (red) ½ NPT

Wire cross-section (spring-loaded terminals)

- Massive wire, stranded wire 0.2 ... 2.5 mm² (AWG 24 ... 14)
- Stranded wire with end sleeve 0.2 ... 1.5 mm² (AWG 24 ... 16)

Voltage supply

Operating voltage U_B

- Non-Ex instrument, Ex-d instrument 9.6 ... 35 V DC
- Ex-ia instrument 9.6 ... 30 V DC
- Ex-d-ia instrument 15 ... 35 V DC
- Ex-d-ia instrument with ship approval 15 ... 35 V DC

Operating voltage U_B with lighting switched on

- Non-Ex instrument, Ex-d instrument 16 ... 35 V DC
- Ex-ia instrument 16 ... 30 V DC
- Ex-d-ia instrument No lighting (integrated ia barrier)

Reverse voltage protection Integrated

Permissible residual ripple - Non-Ex, Ex-ia instrument

- for 9.6 V < U_B < 14 V $\leq 0.7 V_{eff}$ (16 ... 400 Hz)
- for 18 V < U_B < 36 V $\leq 1 V_{eff}$ (16 ... 400 Hz)

Permissible residual ripple - Ex-d-ia instrument

- for 18 V < U_B < 36 V $\leq 1 V_{eff}$ (16 ... 400 Hz)

Load resistor

- Calculation $(U_B - U_{min})/0.022 A$
- Example - Non-Ex instrument with $(24 V - 9.6 V)/0.022 A = 655 \Omega$
U_B= 24 V DC

NivoGuide® 8100

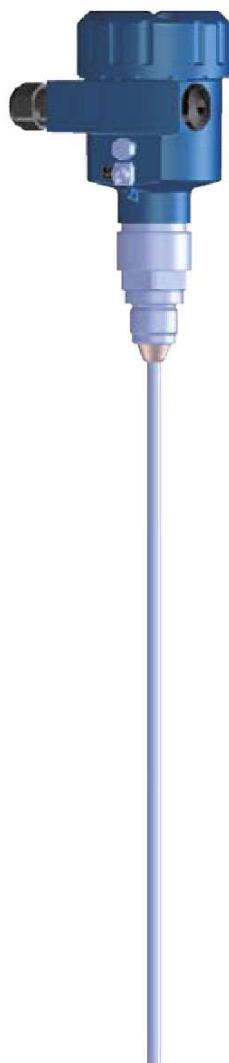
Two-wire 4 ... 20 mA/HART

Rod and cable probe

TDR sensor for continuous level and interface
measurement of liquids



Quick setup guide



Document ID: 61266



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Information:

This quick setup guide enables quick setup and commissioning of your instrument.

You can find further information in the corresponding, comprehensive operating instructions as well as in the Safety Manual for instruments with SIL qualification.

**Operating instructions NivoGuide 8100 - 4 ... 20 mA/HART -
Two-wire - Rod and cable probe: Document-ID 58878
Editing status of the quick setup guide: 2019-02-12**

1 For your safety

1.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified personnel authorised by the plant operator.

During work on and with the device, the required personal protective equipment must always be worn.

1.2 Appropriate use

NivoGuide 8100 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

1.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

1.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

1.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

1.6 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

2 Product description

2.1 Configuration

Type label

The type label contains the most important data for identification and use of the instrument:

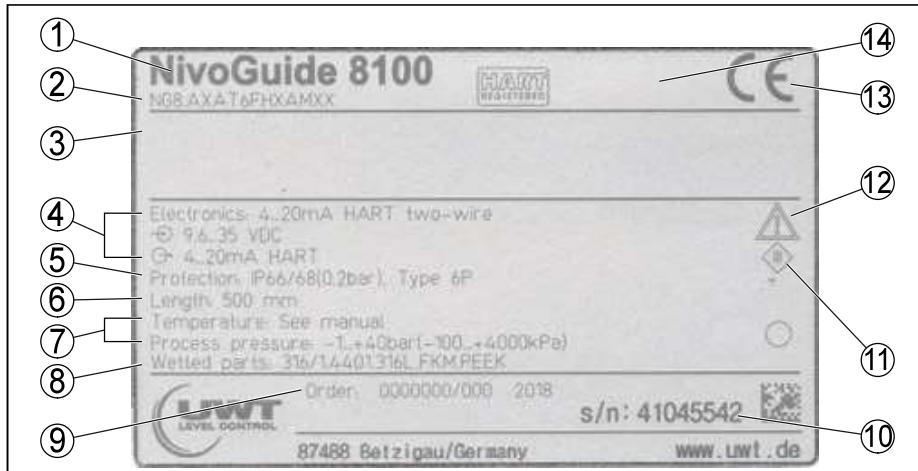


Fig. 1: Layout of the type label (example)

- 1 Instrument type
- 2 Product code
- 3 Approvals (option)
- 4 Power supply and signal output, electronics
- 5 Protection rating
- 6 Probe length (measurement accuracy optional)
- 7 Process and ambient temperature, process pressure
- 8 Material wetted parts
- 9 Order number
- 10 Serial number of the instrument
- 11 Symbol of the device protection class
- 12 ID numbers, instrument documentation
- 13 CE identification
- 14 Approval directives (optional)

3 Mounting

3.1 General instructions for use of the instrument

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "Connecting to power supply")
- Tighten the cable gland or plug connector
- When mounting horizontally, turn the housing so that the cable gland or plug connector point downward
- Lead the connection cable downward in front of the cable entry or plug connector.

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

Make sure that the degree of contamination specified in chapter "Technical data" meets the existing ambient conditions.

3.2 Mounting instructions

Installation position

Mount NivoGuide 8100 in such a way that the distance to vessel installations or to the vessel wall is at least 300 mm (12 in). In non-metallic vessels, the distance to the vessel wall should be at least 500 mm (19.7 in).

During operation, the probe must not touch any installations or the vessel wall. If necessary, fasten the probe end.

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom. Keep in mind that measurement all the way down to the tip of the probe may not be possible. The exact value of the min. distance (lower dead band) is stated in chapter "Technical data" of the operating instructions.

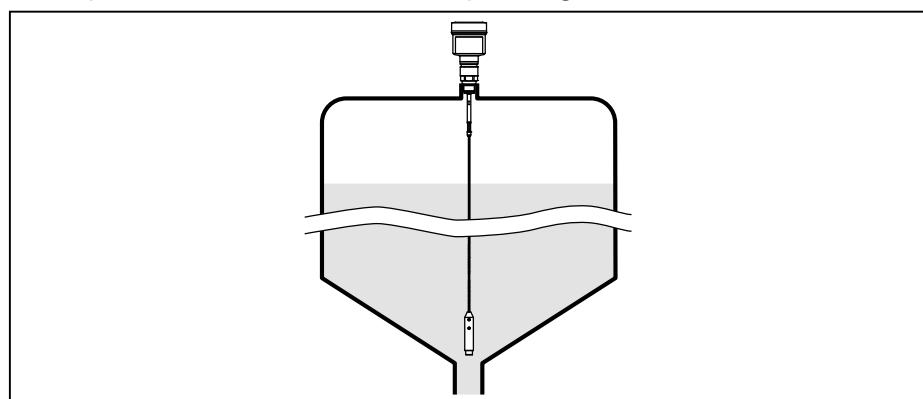


Fig. 2: Vessel with conical bottom

Type of vessel

Plastic vessel/Glass vessel

The guided microwave principle requires a metallic surface on the process fitting. Therefore, in plastic vessels, etc., use an instru-

ment version with flange (from DN 50) or place a metal sheet ($\varnothing > 200$ mm/8 in) beneath the process fitting when screwing it in. Make sure that the plate has direct contact with the process fitting. When mounting rod or cable probes in vessels without metal walls, e.g. in plastic vessels, the measured value can be influenced by strong electromagnetic fields (emitted interference according to EN 61326: class A). In this case, use a probe with coaxial version.

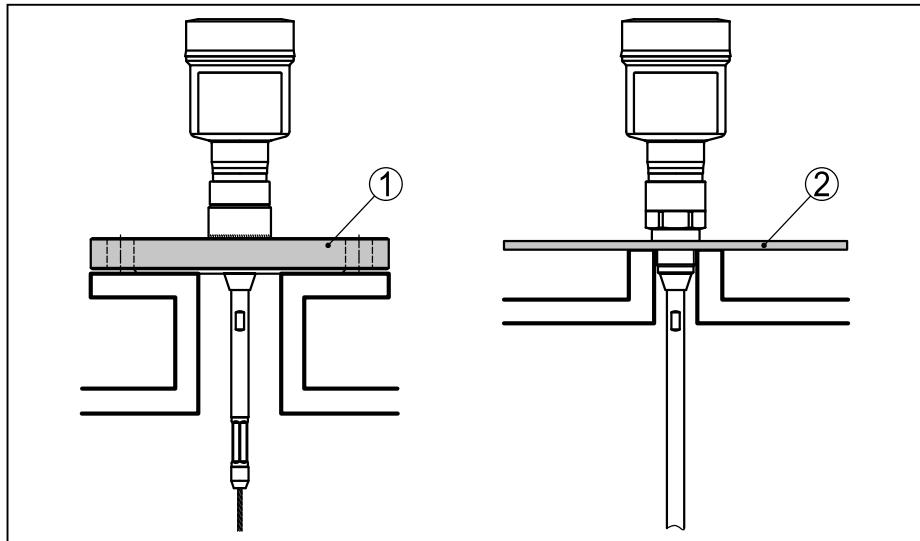


Fig. 3: Mounting in non-metallic vessel

- 1 Flange
- 2 Metal sheet

Mounting socket

If possible, avoid sockets. Mount the sensor flush with the vessel top. If this is not possible, use short sockets with small diameter.

Higher sockets or sockets with a bigger diameter can generally be used. They can, however, increase the upper blocking distance (dead band). Check if this is relevant for your measurement.

In such cases, always carry out a false signal suppression after mounting. You can find further information under "Setup procedure".

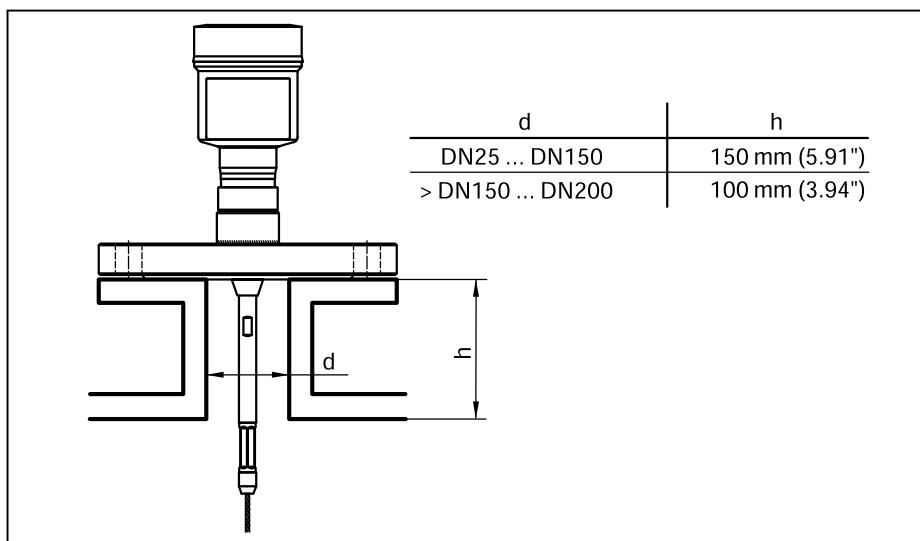


Fig. 4: Mounting socket

3 Mounting

When welding the socket, make sure that the socket is flush with the vessel top.

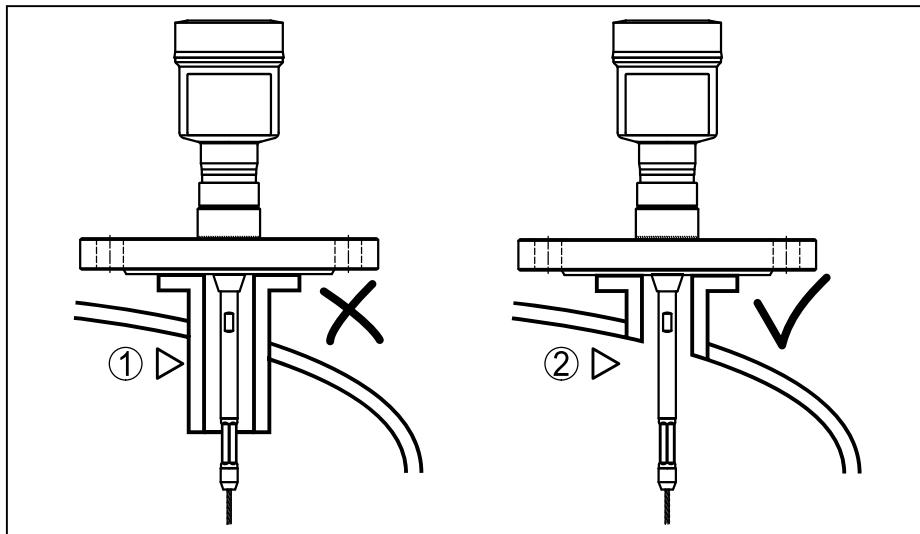


Fig. 5: Socket must be installed flush

- 1 *Unfavourable mounting*
- 2 *Socket flush - optimum mounting*

4 Connecting to power supply

4.1 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.



Information:

The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry



Fig. 6: Connection steps 5 and 6

- 1 Single chamber housing
- 2 Double chamber housing

6. Insert the wire ends into the terminals according to the wiring plan



Information:

Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

You can find further information on the max. wire cross-section under "Technical data - Electromechanical data".

7. Check the hold of the wires in the terminals by lightly pulling on them

4 Connecting to power supply

8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
 9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
 10. Reinsert the display and adjustment module, if one was installed
 11. Screw the housing lid back on
- The electrical connection is finished.

4.2 Wiring plan, single chamber housing



The following illustration applies to the non-Ex, Ex-ia and Ex-d-ia version.

Electronics and connection compartment

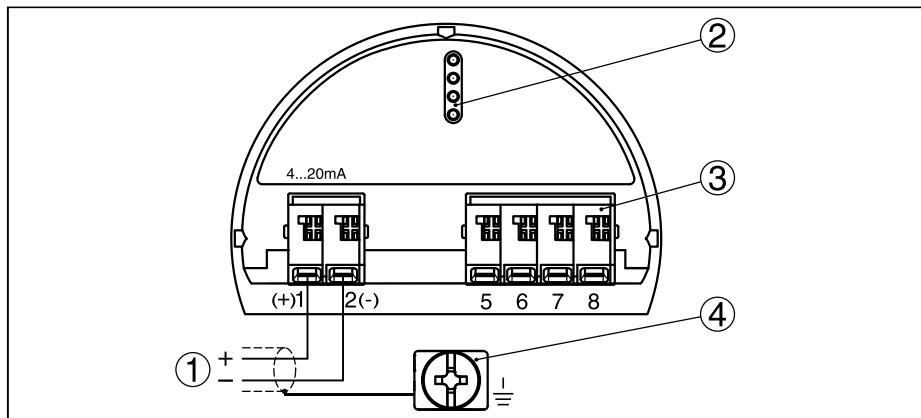


Fig. 7: Electronics and connection compartment - single chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

4.3 Wiring plan, double chamber housing



The following illustrations apply to the non-Ex as well as to the Ex-ia version.

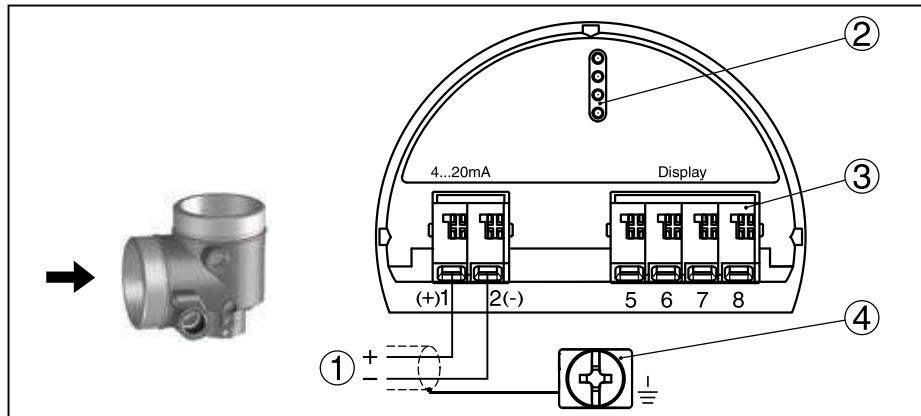
Connection compartment

Fig. 8: Connection compartment - double chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

5 Set up with the display and adjustment module

5.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 9: Installing the display and adjustment module in the electronics compartment of the single chamber housing

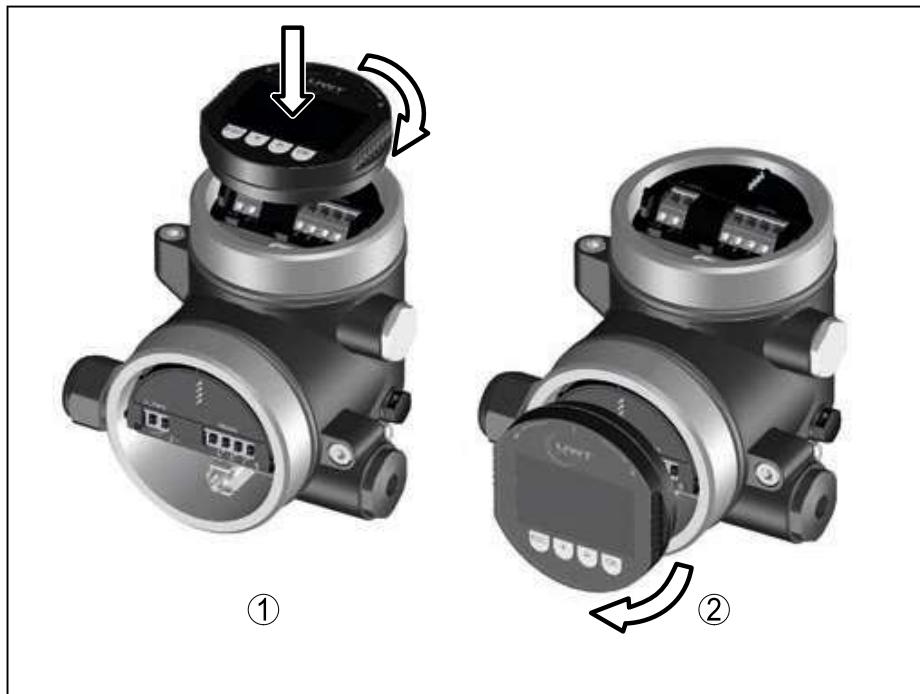


Fig. 10: Installing the display and adjustment module in the double chamber housing

- 1 In the electronics compartment
- 2 In the connection compartment



Note:

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

5.2 Parameter adjustment - Quick setup

Quick setup

To quickly and easily adapt the sensor to the application, select the menu item "Quick setup" in the start graphic on the display and adjustment module.



You can find "*Extended adjustment*" in the detailed operating instructions.

General information

Measurement loop name

In the first menu item you can assign a suitable measurement loop name. You can enter a name with max. 19 characters.

Type of medium

In the next menu item you can see which type of medium the instrument is suitable for. If your instrument is only suitable for a certain medium, this menu item is not visible.

5 Set up with the display and adjustment module

Application

In this menu item, you can select the application. You can choose between level measurement and interface measurement. You can also choose between measurement in a vessel or in a bypass or standpipe.

Measurement loop name TANK 04	Application Level vessel	Type of medium Liquid
----------------------------------	-----------------------------	--------------------------

Level measurement

Medium - dielectric constant

In this menu item, you can define the type of medium (product).

Max. adjustment

In this menu item, you can enter the max. adjustment for the level.

Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. The distance refers to the sensor reference plane (seal surface of the process fitting). Keep in mind that the max. level must lie below the dead band.

Min. adjustment

In this menu item, you can enter the min. adjustment for the level.

Enter the suitable distance value in m for the empty vessel (e.g. distance from the flange to the probe end) corresponding to the percentage value. The distance refers to the sensor reference plane (seal surface of the process fitting).

Medium/Dielectric constant Water-based/>10	Max. adjustment level 100.00% 80 mm F013	Min. adjustment level 0.00% 850 mm 726 mm
---	---	--

Interface measurement

Dielectric constant - upper medium

In this menu item, you can define the type of medium (product).

Max. adjustment

In this menu item, you can enter the max. adjustment for the level.

Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. The distance refers to the sensor reference plane (seal surface of the process fitting). Keep in mind that the max. level must lie below the dead band.

Min. adjustment

In this menu item, you can enter the min. adjustment for the level.

Enter the suitable distance value in m for the empty vessel (e.g. distance from the flange to the probe end) corresponding to the percentage value. The distance refers to the sensor reference plane (seal surface of the process fitting).

Dielectric constant Enter Calculate	Max. adjustment level 100.00% 80 mm F013	Min. adjustment level 0.00% 850 mm 726 mm
---	---	--

Max. adjustment - Interface

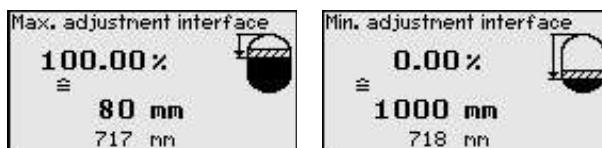
Carry out the max. adjustment for the interface.

To do this, enter the percentage value and the corresponding distance value in m for the full vessel.

Min. adjustment - Interface

Carry out the min. adjustment for the interface.

To do this, enter the percentage value and the corresponding distance value in m for the empty vessel.



Linearisation

Linearisation

A linearisation is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. a horizontal cylindrical or spherical tank, when the indication or output of the volume is required. Corresponding linearisation curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume.

The linearization applies for the measured value indication and the current output. By activating the suitable curve, the percentage vessel volume is displayed correctly.

False signal suppression

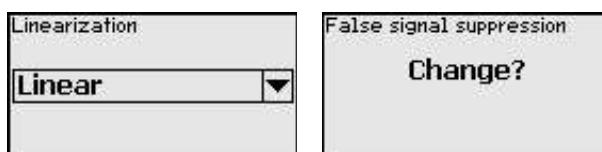
High sockets and internal vessel installations cause interfering reflections and can influence the measurement.

A false signal suppression detects, marks and saves these false signals so that they are no longer taken into account for the level and interface measurement. We generally recommend carrying out a false signal suppression to achieve the best possible accuracy. This should be done with the lowest possible level so that all potential interfering reflections can be detected.

Enter the actual distance from the sensor to the product surface.

All interfering signals in this section are detected by the sensor and stored.

The instrument carries out an automatic false signal suppression as soon as the probe is uncovered. The false signal suppression is always updated.



6 Supplement

6.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein - for example regarding the process conditions or the voltage supply.

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; 0.2 bar

Cable entry

- M20 x 1.5 1 x cable gland M20 x 1.5 (cable: ø 6 ... 12 mm), 1 x blind plug M20 x 1.5
- ½ NPT 1 x blind plug NPT, 1 x closing cap (red) ½ NPT

Wire cross-section (spring-loaded terminals)

- Massive wire, stranded wire 0.2 ... 2.5 mm² (AWG 24 ... 14)
- Stranded wire with end sleeve 0.2 ... 1.5 mm² (AWG 24 ... 16)

Voltage supply

Operating voltage U_B

- Non-Ex instrument 9.6 ... 35 V DC
- Ex-ia instrument 9.6 ... 30 V DC

Operating voltage U_B with lighting switched on

- Non-Ex instrument 16 ... 35 V DC
- Ex-ia instrument 16 ... 30 V DC

Reverse voltage protection

Integrated

Permissible residual ripple - Non-Ex, Ex-ia instrument

- for 9.6 V < U_B < 14 V $\leq 0.7 \text{ V}_{\text{eff}} (16 \dots 400 \text{ Hz})$
- for 18 V < U_B < 36 V $\leq 1.0 \text{ V}_{\text{eff}} (16 \dots 400 \text{ Hz})$

Load resistor

- Calculation $(U_B - U_{\text{min}})/0.022 \text{ A}$
- Example - Non-Ex instrument with
 $U_B = 24 \text{ V DC}$ $(24 \text{ V} - 9.6 \text{ V})/0.022 \text{ A} = 655 \Omega$

NivoGuide® 8100

Two-wire 4 ... 20 mA/HART

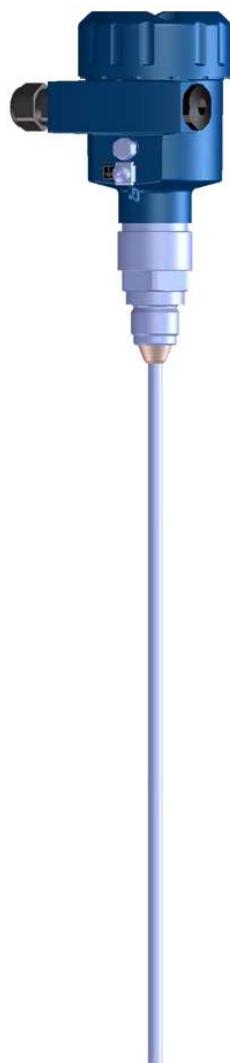
Rod and cable probe

With SIL qualification

TDR sensor for continuous level and interface
measurement of liquids



Quick setup guide



Document ID: 61903



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Information:

This quick setup guide enables quick setup and commissioning of your instrument.

You can find supplementary information in the corresponding, more detailed Operating Instructions Manual as well as the Safety Manual that comes with instruments with SIL qualification. These manuals are available on our homepage.

**Operating instructions NivoGuide 8100 - Two-wire 4 ... 20 mA/
HART - Rod and cable probe - With SIL qualification: Document-
ID 61892**

Editing status of the quick setup guide: 2019-07-30

1 For your safety

1.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified personnel authorised by the plant operator.

During work on and with the device, the required personal protective equipment must always be worn.

1.2 Appropriate use

NivoGuide 8100 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

1.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

1.4 General safety instructions

This is a state-of-the-art instrument complying with IEC 61508 and all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

The safety instructions in this operating instructions manual, the corresponding Safety Manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

1.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

The EU conformity declaration can be found on our homepage.

Electromagnetic compatibility

Instruments in four-wire or Ex-d-ia version are designed for use in an industrial environment. Nevertheless, electromagnetic interference from electrical conductors and radiated emissions must be taken into account, as is usual with class A instruments according to EN 61326-1. If the instrument is used in a different environment, the electromagnetic compatibility to other instruments must be ensured by suitable measures.

1.6 SIL qualification according to IEC 61508

The Safety Integrity Level (SIL) of an electronic system is used to assess the reliability of integrated safety functions.

For detailed specification of the safety requirements, multiple SIL levels are specified according to safety standard IEC 61508. You can find detailed information in chapter "*Functional safety (SIL)*" of the operating instructions.

The instrument meets the specifications of IEC 61508: 2010 (Edition 2). It is qualified for single-channel operation up to SIL2. The instrument can be used homogeneously redundant up to SIL3 in multi-channel architecture with HFT 1.

1.7 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

2 Product description

2.1 Configuration

Type label

The type label contains the most important data for identification and use of the instrument:

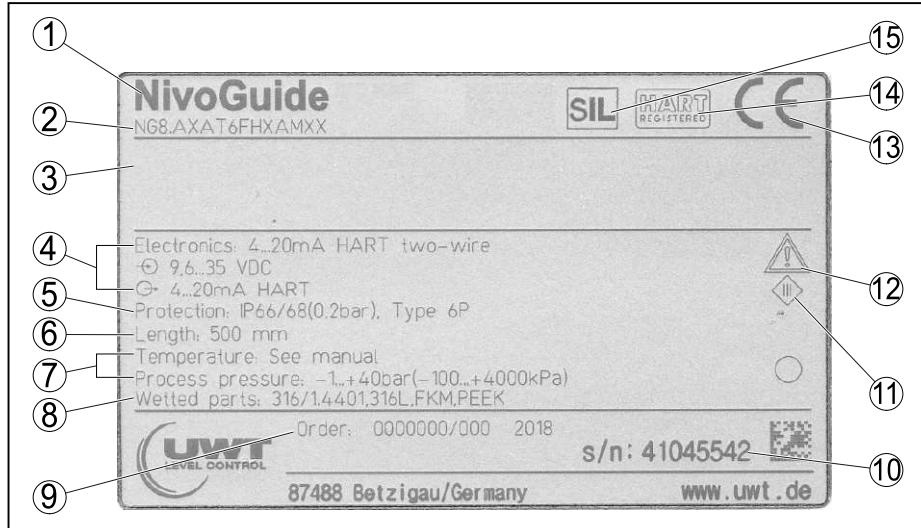


Fig. 1: Layout of the type label (example)

- 1 Instrument type
- 2 Product code
- 3 Approvals
- 4 Power supply and signal output, electronics
- 5 Protection rating
- 6 Probe length (measurement accuracy optional)
- 7 Process and ambient temperature, process pressure
- 8 Material wetted parts
- 9 Order number
- 10 Serial number of the instrument
- 11 Symbol of the device protection class
- 12 Reminder to observe the instrument documentation
- 13 Notified authority for CE marking
- 14 Approval directives
- 15 Marking of the safety function in SIS

Serial number - Instrument search

The type label contains the serial number of the instrument. With it you can find the following instrument data on our homepage:

- Product code (HTML)
- Delivery date (HTML)
- Order-specific instrument features (HTML)
- Operating instructions and quick setup guide at the time of shipment (PDF)
- Order-specific sensor data for an electronics exchange (XML)
- Test certificate (PDF) - optional

Move to "www.vega.com" and enter in the search field the serial number of your instrument.

Alternatively, you can access the data via your smartphone:

- Download the VEGA Tools app from the "Apple App Store" or the "Google Play Store"

2 Product description

- Scan the Data Matrix code on the type label of the instrument or
- Enter the serial number manually in the app

3 Mounting

3.1 General instructions for use of the instrument

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "Connecting to power supply")
- Tighten the cable gland or plug connector
- Lead the connection cable downward in front of the cable entry or plug connector

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.



Note:

Make sure that the degree of contamination specified in chapter "Technical data" meets the existing ambient conditions.



Note:

Make sure that during installation or maintenance no moisture or dirt can get inside the instrument.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

3.2 Mounting instructions

Installation position

Mount NivoGuide 8100 in such a way that the distance to vessel installations or to the vessel wall is at least 300 mm (12 in). In non-metallic vessels, the distance to the vessel wall should be at least 500 mm (19.7 in).

During operation, the probe must not touch any installations or the vessel wall. If necessary, fasten the probe end.

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom. Keep in mind that measurement all the way down to the tip of the probe may not be possible. The exact value of the min. distance (lower dead zone) is stated in chapter "Technical data" of the operating instructions.

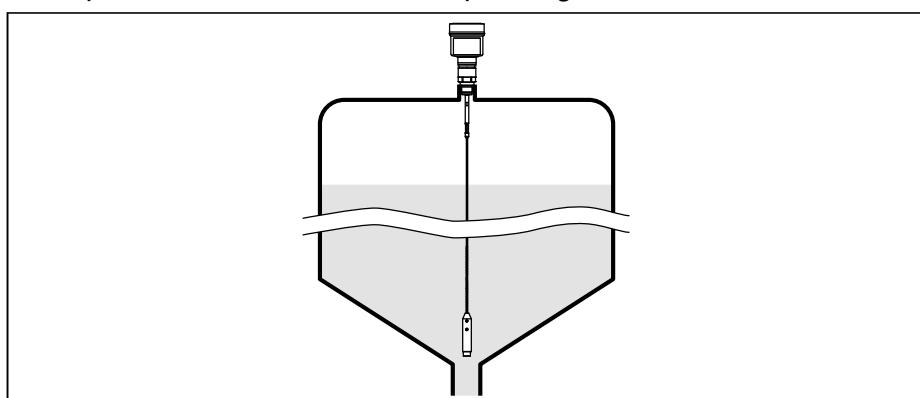


Fig. 2: Vessel with conical bottom

3 Mounting

Type of vessel

Plastic vessel/Glass vessel

The guided microwave principle requires a metallic surface on the process fitting. Therefore, in plastic vessels, etc., use an instrument version with flange (from DN 50) or place a metal sheet ($\varnothing > 200$ mm/8 in) beneath the process fitting when screwing it in.

Make sure that the plate has direct contact with the process fitting.

When mounting rod or cable probes in vessels without metal walls, e.g. in plastic vessels, the measured value can be influenced by strong electromagnetic fields (emitted interference according to EN 61326: class A). In this case, use a probe with coaxial version.

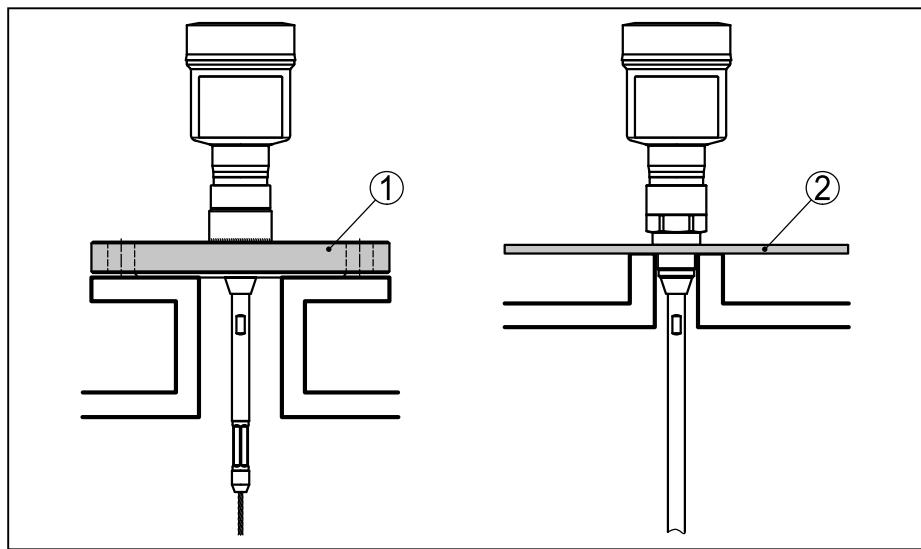


Fig. 3: Mounting in non-metallic vessel

- 1 Flange
- 2 Metal sheet

Mounting socket

If possible, avoid sockets. Mount the sensor flush with the vessel top. If this is not possible, use short sockets with small diameter.

Higher sockets or sockets with a bigger diameter can generally be used. They can, however, increase the upper dead zone. Check if this is relevant for your measurement.

In such cases, always carry out a false signal suppression after mounting. You can find further information under "*Setup procedure*".

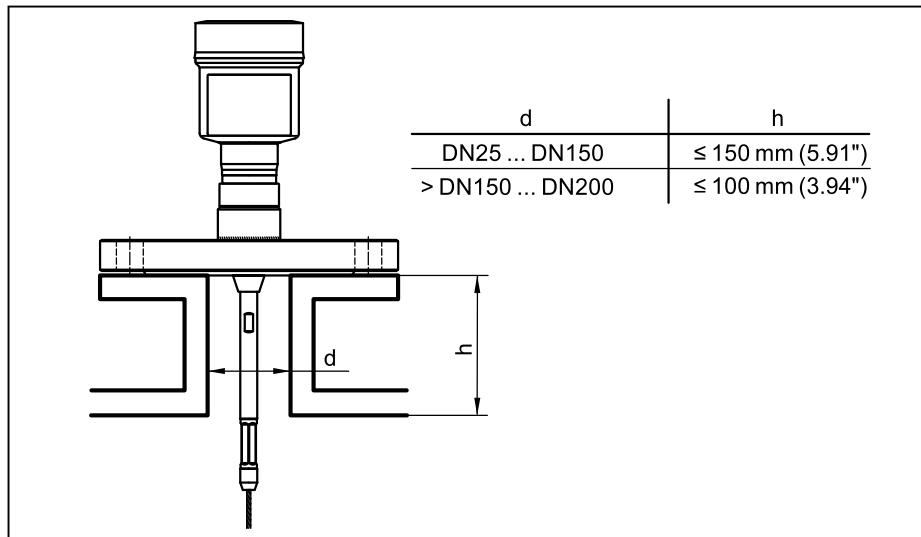


Fig. 4: Mounting socket

When welding the socket, make sure that the socket is flush with the vessel top.

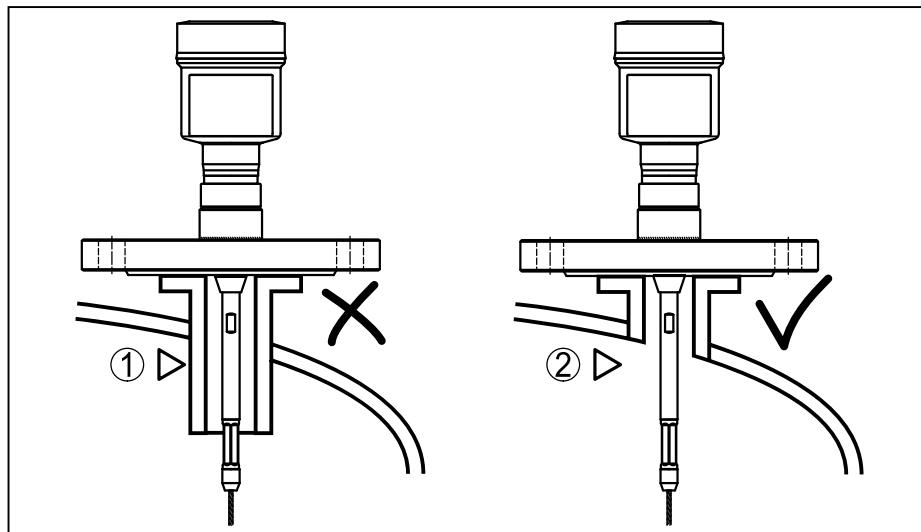


Fig. 5: Socket must be installed flush

- 1 Unfavourable mounting
- 2 Socket flush - optimum mounting

4 Connecting to power supply

4.1 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.



Information:

The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry

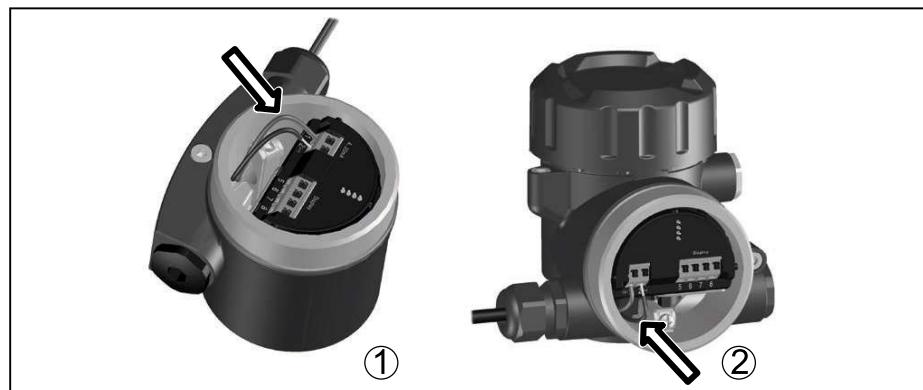


Fig. 6: Connection steps 5 and 6

- 1 Single chamber housing
- 2 Double chamber housing

6. Insert the wire ends into the terminals according to the wiring plan



Information:

Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

You can find further information on the max. wire cross-section under "Technical data - Electromechanical data".

7. Check the hold of the wires in the terminals by lightly pulling on them

8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
 9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
 10. Reinsert the display and adjustment module, if one was installed
 11. Screw the housing lid back on
- The electrical connection is finished.

4.2 Wiring plan, single chamber housing



The following illustration applies to the non-Ex, Ex-ia and Ex-d-ia version.

Electronics and connection compartment

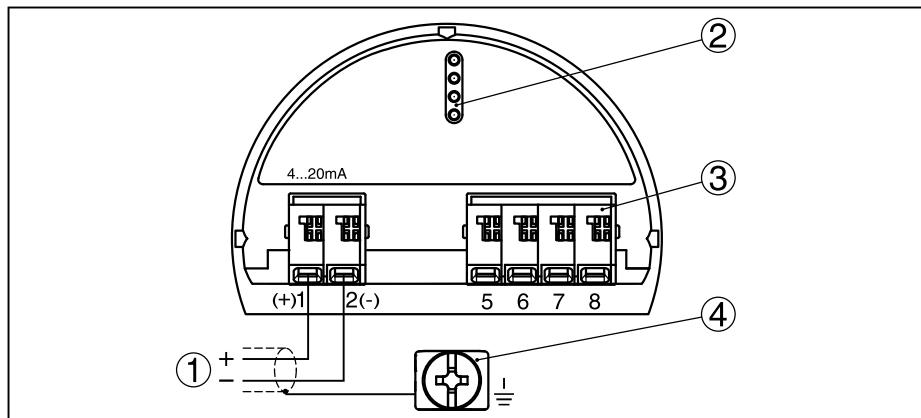


Fig. 7: Electronics and connection compartment - single chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

4.3 Wiring plan, double chamber housing



The following illustrations apply to the non-Ex as well as to the Ex-ia version.

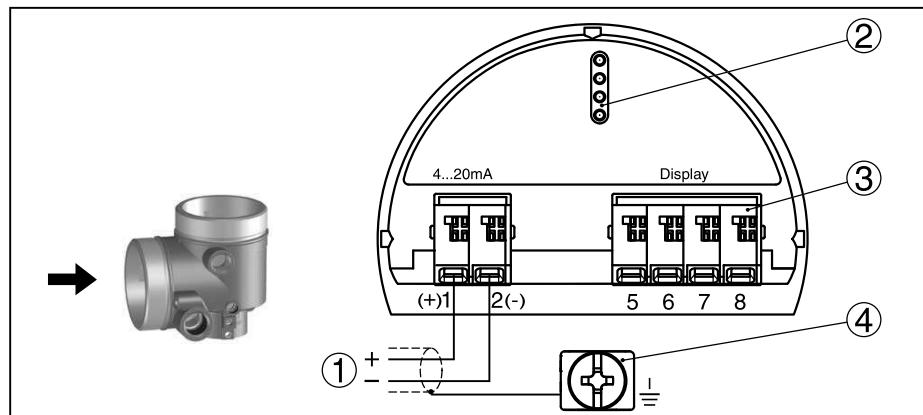
Connection compartment

Fig. 8: Connection compartment - double chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

5 Set up with the display and adjustment module

5.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 9: Installing the display and adjustment module in the electronics compartment of the single chamber housing

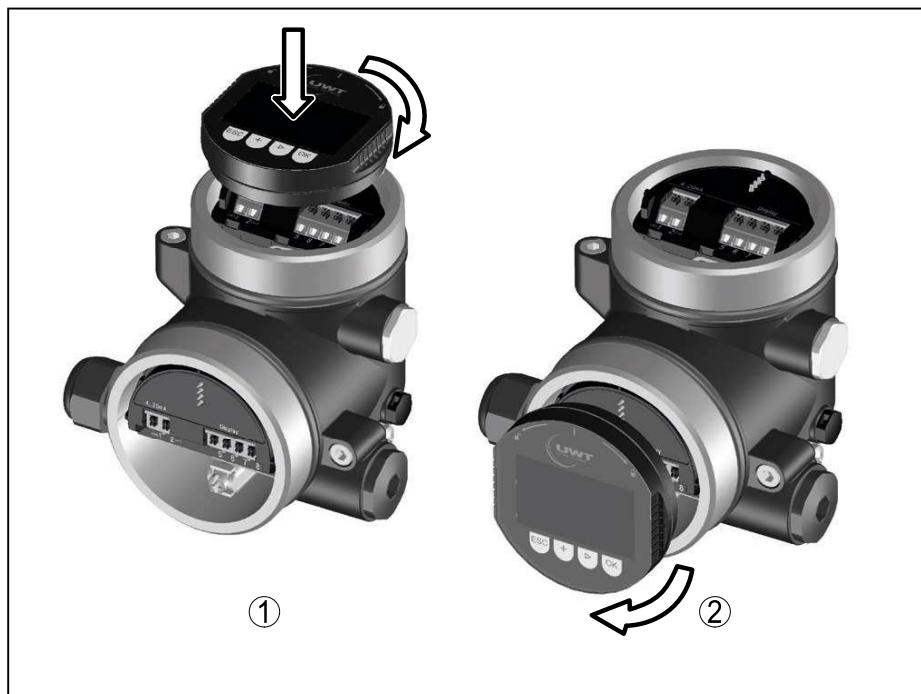


Fig. 10: Installing the display and adjustment module in the double chamber housing

- 1 In the electronics compartment
- 2 In the connection compartment



Note:

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

5.2 Parameter adjustment

Set parameters

1. In this menu item you can select the application. You can choose between level and interface measurement.

Measurement loop name TANK_04	Type of medium Liquid	Application Level vessel
--------------------------------------	------------------------------	---------------------------------

2. In the menu item "Medium - Dielectric constant" you can define the type of medium (medium).
3. Carry out the adjustment in the menu items "Min. adjustment" and "Max. adjustment".

Setup Probe length Application Adjustment level Adjustment interface Damping	Max. adjustment level 100.00 % 80 mm F013	Min. adjustment level 0.00 % 850 mm 726 mm
---	--	---

4. A "Linearization" is recommended for all vessels in which the vessel volume does not increase linearly with the level - e.g. in a horizontal cylindrical or spherical tank. Activate the appropriate curve.

5. A "False signal suppression" detects, marks and saves the false signals so that they are no longer taken into account for level measurement. We generally recommend a false signal suppression.

Parameterization example The sensor measures the distance from the sensor (reference plane) to the product surface. See also chapter "*Parameter adjustment*".

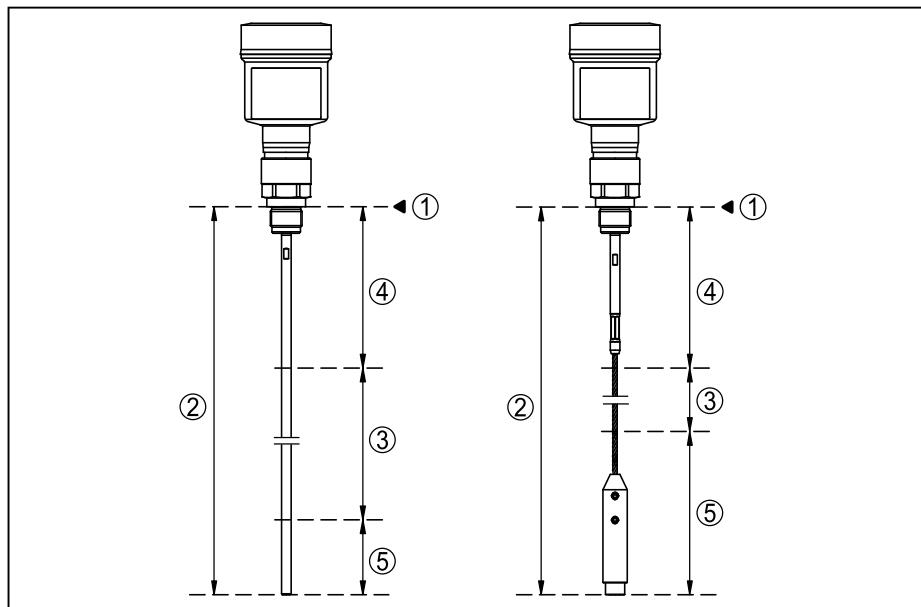


Fig. 11: Measuring ranges - NivoGuide 8100

- 1 Reference plane
- 2 Probe length L
- 3 Measuring range (default setting refers to the measuring range in water)
- 4 Upper dead zone (in this area no measurement is possible)
- 5 Lower dead zone (in this area no measurement is possible)

For this adjustment, the distance is entered when the vessel is full and nearly empty. If these values are not known, an adjustment with other distances, for example, 10 % and 90 % is also possible. Starting point for these distance specifications is always the seal surface of the thread or flange.

Further steps

1. In the menu "Additional settings", menu item "Damping" you can adjust the requested damping of the output signal.
2. Select the parameter of the current output and the output characteristics in the menu item "Current output".

6 Supplement

6.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions which are included in delivery are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein, for example regarding the process conditions or the voltage supply.

All approval documents can be downloaded from our homepage.

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; (0.2 bar)

Cable entry

- M20 x 1.5 1 x cable gland M20 x 1.5 (cable: ø 6 ... 12 mm), 1 x blind plug M20 x 1.5
- ½ NPT 1 x blind plug NPT, 1 x closing cap (red) ½ NPT

Wire cross-section (spring-loaded terminals)

- Massive wire, stranded wire 0.2 ... 2.5 mm² (AWG 24 ... 14)
- Stranded wire with end sleeve 0.2 ... 1.5 mm² (AWG 24 ... 16)

Voltage supply

Operating voltage U_B

- Non-Ex instrument, Ex-d instrument 9.6 ... 35 V DC
- Ex-ia instrument 9.6 ... 30 V DC
- Ex-d-ia instrument 15 ... 35 V DC
- Ex-d-ia instrument with ship approval 15 ... 35 V DC

Operating voltage U_B with lighting switched on

- Non-Ex instrument, Ex-d instrument 16 ... 35 V DC
- Ex-ia instrument 16 ... 30 V DC
- Ex-d-ia instrument No lighting (integrated ia barrier)

Reverse voltage protection Integrated

Permissible residual ripple - Non-Ex, Ex-ia instrument

- for 9.6 V < U_B < 14 V $\leq 0.7 V_{eff}$ (16 ... 400 Hz)
- for 18 V < U_B < 36 V $\leq 1 V_{eff}$ (16 ... 400 Hz)

Permissible residual ripple - Ex-d-ia instrument

- for 18 V < U_B < 36 V $\leq 1 V_{eff}$ (16 ... 400 Hz)

Load resistor

- Calculation $(U_B - U_{min})/0.022 A$
- Example - Non-Ex instrument with $(24 V - 9.6 V)/0.022 A = 655 \Omega$
U_B=24 V DC

NivoGuide® 8100

Two-wire 4 ... 20 mA/HART

Coax probe

TDR sensor for continuous level and interface
measurement of liquids



Quick setup guide



Document ID: 61267



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Information:

This quick setup guide enables quick setup and commissioning of your instrument.

You can find further information in the corresponding, comprehensive operating instructions as well as in the Safety Manual for instruments with SIL qualification.

**Operating instructions NivoGuide 8100 - 4 ... 20 mA/HART -
Two-wire - Rod and coax probe: Document-ID 61019
Editing status of the quick setup guide: 2019-02-12**

1 For your safety

1.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified personnel authorised by the plant operator.

During work on and with the device, the required personal protective equipment must always be worn.

1.2 Appropriate use

NivoGuide 8100 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

1.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

1.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

1.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

1.6 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

2 Product description

2.1 Configuration

Type label

The type label contains the most important data for identification and use of the instrument:

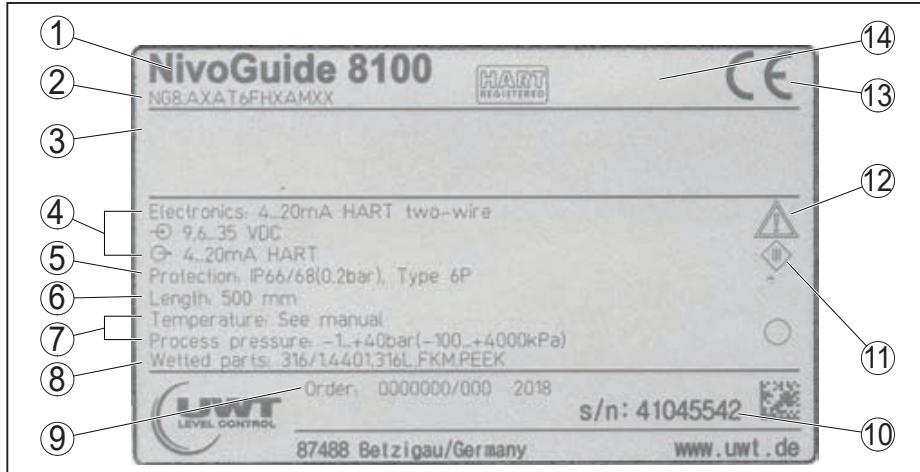


Fig. 1: Layout of the type label (example)

- 1 Instrument type
- 2 Product code
- 3 Approvals (option)
- 4 Power supply and signal output, electronics
- 5 Protection rating
- 6 Probe length (measurement accuracy optional)
- 7 Process and ambient temperature, process pressure
- 8 Material wetted parts
- 9 Order number
- 10 Serial number of the instrument
- 11 Symbol of the device protection class
- 12 ID numbers, instrument documentation
- 13 CE identification
- 14 Approval directives (optional)

3 Mounting

3.1 General instructions for use of the instrument

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "*Connecting to power supply*")
- Tighten the cable gland or plug connector
- When mounting horizontally, turn the housing so that the cable gland or plug connector point downward
- Lead the connection cable downward in front of the cable entry or plug connector.

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

Make sure that the degree of contamination specified in chapter "*Technical data*" meets the existing ambient conditions.

3.2 Mounting instructions

Installation position

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom. Keep in mind that measurement all the way down to the tip of the probe may not be possible. The exact value of the min. distance (lower dead band) is stated in chapter "*Technical data*".

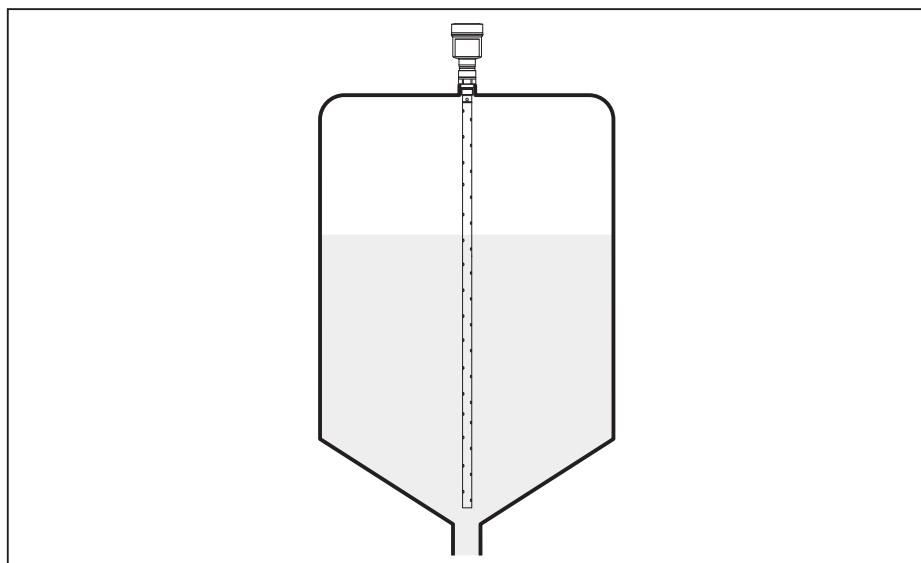


Fig. 2: Vessel with conical bottom

4 Connecting to power supply

4.1 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.



Information:

The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry



Fig. 3: Connection steps 5 and 6

- 1 Single chamber housing
- 2 Double chamber housing

6. Insert the wire ends into the terminals according to the wiring plan



Information:

Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

You can find further information on the max. wire cross-section under "Technical data - Electromechanical data".

7. Check the hold of the wires in the terminals by lightly pulling on them

4 Connecting to power supply

8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
 9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
 10. Reinsert the display and adjustment module, if one was installed
 11. Screw the housing lid back on
- The electrical connection is finished.

4.2 Wiring plan, single chamber housing



The following illustration applies to the non-Ex, Ex-ia and Ex-d-ia version.

Electronics and connection compartment

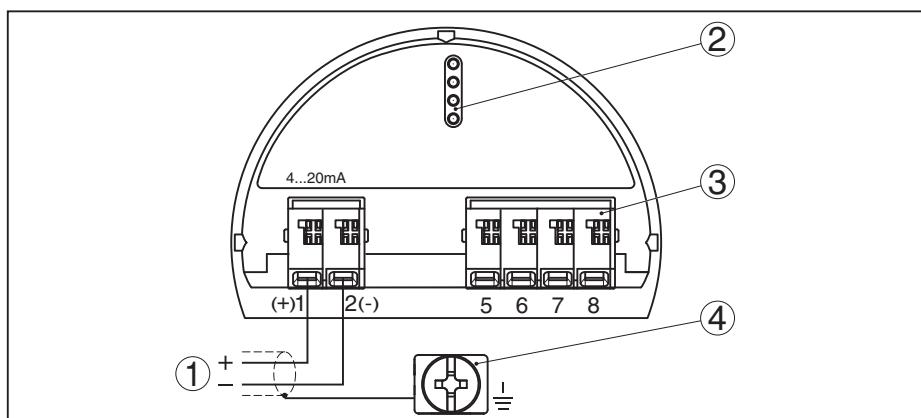


Fig. 4: Electronics and connection compartment - single chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

4.3 Wiring plan, double chamber housing



The following illustrations apply to the non-Ex as well as to the Ex-ia version.

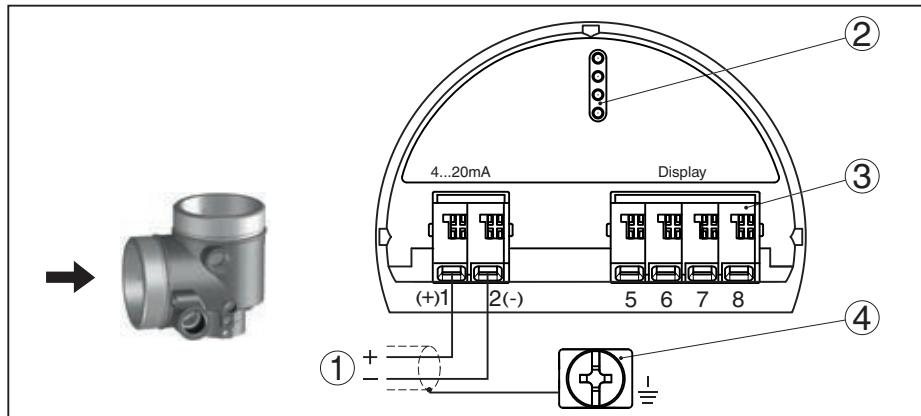
Connection compartment

Fig. 5: Connection compartment - double chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

5 Set up with the display and adjustment module

5.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 6: Installing the display and adjustment module in the electronics compartment of the single chamber housing



Fig. 7: Installing the display and adjustment module in the double chamber housing

- 1 In the electronics compartment
- 2 In the connection compartment



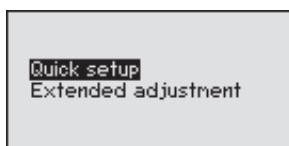
Note:

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

5.2 Parameter adjustment - Quick setup

Quick setup

To quickly and easily adapt the sensor to the application, select the menu item "Quick setup" in the start graphic on the display and adjustment module.



You can find "*Extended adjustment*" in the detailed operating instructions.

General information

Measurement loop name

In the first menu item you can assign a suitable measurement loop name. You can enter a name with max. 19 characters.

Type of medium

In the next menu item you can see which type of medium the instrument is suitable for. If your instrument is only suitable for a certain medium, this menu item is not visible.

Application

In this menu item, you can select the application. You can choose between level measurement and interface measurement. You can also choose between measurement in a vessel or in a bypass or standpipe.

Measurement loop name TANK 04	Application Level vessel	Type of medium Liquid
----------------------------------	-----------------------------	--------------------------

Level measurement

Medium - dielectric constant

In this menu item, you can define the type of medium (product).

Max. adjustment

In this menu item, you can enter the max. adjustment for the level.

Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. The distance refers to the sensor reference plane (seal surface of the process fitting). Keep in mind that the max. level must lie below the dead band.

Min. adjustment

In this menu item, you can enter the min. adjustment for the level.

Enter the suitable distance value in m for the empty vessel (e.g. distance from the flange to the probe end) corresponding to the percentage value. The distance refers to the sensor reference plane (seal surface of the process fitting).

Medium/Dielectric constant Water-based/>10	Max. adjustment level 100.00% 80 mm F013	Min. adjustment level 0.00% 850 mm 726 mm
---	---	--

Interface measurement

Dielectric constant - upper medium

In this menu item, you can define the type of medium (product).

Max. adjustment

In this menu item, you can enter the max. adjustment for the level.

Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. The distance refers to the sensor reference plane (seal surface of the process fitting). Keep in mind that the max. level must lie below the dead band.

Min. adjustment

In this menu item, you can enter the min. adjustment for the level.

Enter the suitable distance value in m for the empty vessel (e.g. distance from the flange to the probe end) corresponding to the percentage value. The distance refers to the sensor reference plane (seal surface of the process fitting).

Dielectric constant Enter Calculate	Max. adjustment level 100.00% 80 mm F013	Min. adjustment level 0.00% 850 mm 726 mm
---	---	--

Max. adjustment - Interface

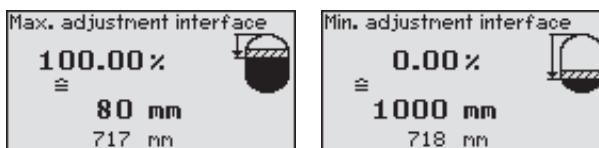
Carry out the max. adjustment for the interface.

To do this, enter the percentage value and the corresponding distance value in m for the full vessel.

Min. adjustment - Interface

Carry out the min. adjustment for the interface.

To do this, enter the percentage value and the corresponding distance value in m for the empty vessel.



Linearisation

Linearisation

A linearisation is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. a horizontal cylindrical or spherical tank, when the indication or output of the volume is required. Corresponding linearisation curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume.

The linearization applies for the measured value indication and the current output. By activating the suitable curve, the percentage vessel volume is displayed correctly.

False signal suppression

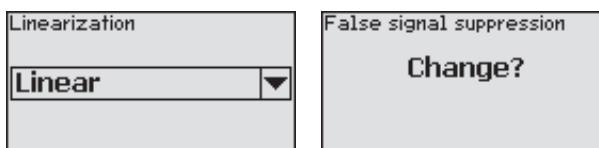
High sockets and internal vessel installations cause interfering reflections and can influence the measurement.

A false signal suppression detects, marks and saves these false signals so that they are no longer taken into account for the level and interface measurement. We generally recommend carrying out a false signal suppression to achieve the best possible accuracy. This should be done with the lowest possible level so that all potential interfering reflections can be detected.

Enter the actual distance from the sensor to the product surface.

All interfering signals in this section are detected by the sensor and stored.

The instrument carries out an automatic false signal suppression as soon as the probe is uncovered. The false signal suppression is always updated.



6 Supplement

6.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein - for example regarding the process conditions or the voltage supply.

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; 0.2 bar

Cable entry

- M20 x 1.5 1 x cable gland M20 x 1.5 (cable: ø 6 ... 12 mm), 1 x blind plug M20 x 1.5
- ½ NPT 1 x blind plug NPT, 1 x closing cap (red) ½ NPT

Wire cross-section (spring-loaded terminals)

- Massive wire, stranded wire 0.2 ... 2.5 mm² (AWG 24 ... 14)
- Stranded wire with end sleeve 0.2 ... 1.5 mm² (AWG 24 ... 16)

Voltage supply

Operating voltage U_B

- Non-Ex instrument 9.6 ... 35 V DC
- Ex-ia instrument 9.6 ... 30 V DC

Operating voltage U_B with lighting switched on

- Non-Ex instrument 16 ... 35 V DC
- Ex-ia instrument 16 ... 30 V DC

Reverse voltage protection

Integrated

Permissible residual ripple - Non-Ex, Ex-ia instrument

- for 9.6 V < U_B < 14 V $\leq 0.7 \text{ V}_{\text{eff}} (16 \dots 400 \text{ Hz})$
- for 18 V < U_B < 36 V $\leq 1.0 \text{ V}_{\text{eff}} (16 \dots 400 \text{ Hz})$

Load resistor

- Calculation $(U_B - U_{\text{min}})/0.022 \text{ A}$
- Example - Non-Ex instrument with
U_B = 24 V DC $(24 \text{ V} - 9.6 \text{ V})/0.022 \text{ A} = 655 \Omega$

NivoGuide® 8100

Two-wire 4 ... 20 mA/HART

Coax probe

With SIL qualification

TDR sensor for continuous level and interface
measurement of liquids



Quick setup guide



Document ID: 61904



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Information:

This quick setup guide enables quick setup and commissioning of your instrument.

You can find supplementary information in the corresponding, more detailed Operating Instructions Manual as well as the Safety Manual that comes with instruments with SIL qualification. These manuals are available on our homepage.

**Operating instructions NivoGuide 8100 - Two-wire 4 ... 20 mA/
HART - Coaxial probe - With SIL qualification: Document-ID
61893**

Editing status of the quick setup guide: 2019-07-30

1 For your safety

1.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified personnel authorised by the plant operator.

During work on and with the device, the required personal protective equipment must always be worn.

1.2 Appropriate use

NivoGuide 8100 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

1.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

1.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

1.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

The EU conformity declaration can be found on our homepage.

Electromagnetic compatibility

Instruments in four-wire or Ex-d-ia version are designed for use in an industrial environment. Nevertheless, electromagnetic interference from electrical conductors and radiated emissions must be taken into account, as is usual with class A instruments according to EN 61326-1. If the instrument is used in a different environment, the electromagnetic compatibility to other instruments must be ensured by suitable measures.

1.6 SIL qualification according to IEC 61508

The Safety Integrity Level (SIL) of an electronic system is used to assess the reliability of integrated safety functions.

For detailed specification of the safety requirements, multiple SIL levels are specified according to safety standard IEC 61508. You can find detailed information in chapter "*Functional safety (SIL)*" of the operating instructions.

The instrument meets the specifications of IEC 61508: 2010 (Edition 2). It is qualified for single-channel operation up to SIL2. The instrument can be used homogeneously redundant up to SIL3 in multi-channel architecture with HFT 1.

1.7 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

2 Product description

2.1 Configuration

Type label

The type label contains the most important data for identification and use of the instrument:

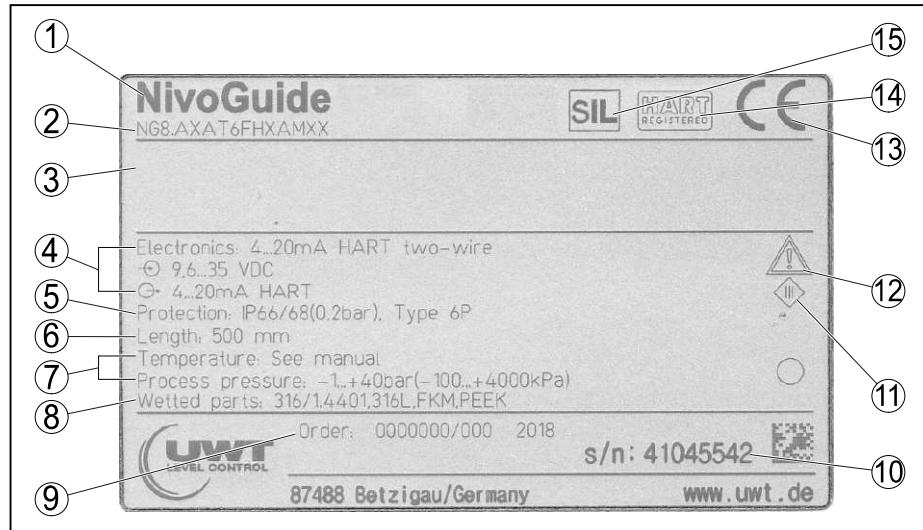


Fig. 1: Layout of the type label (example)

- 1 Instrument type
- 2 Product code
- 3 Approvals
- 4 Power supply and signal output, electronics
- 5 Protection rating
- 6 Probe length (measurement accuracy optional)
- 7 Process and ambient temperature, process pressure
- 8 Material wetted parts
- 9 Order number
- 10 Serial number of the instrument
- 11 Symbol of the device protection class
- 12 Reminder to observe the instrument documentation
- 13 Notified authority for CE marking
- 14 Approval directives
- 15 Marking of the safety function in SIS

3 Mounting

3.1 General instructions for use of the instrument

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "Connecting to power supply")
- Tighten the cable gland or plug connector
- Lead the connection cable downward in front of the cable entry or plug connector

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.



Note:

Make sure that the degree of contamination specified in chapter "Technical data" meets the existing ambient conditions.



Note:

Make sure that during installation or maintenance no moisture or dirt can get inside the instrument.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

3.2 Mounting instructions

Installation position

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom. Keep in mind that measurement all the way down to the tip of the probe may not be possible. The exact value of the min. distance (lower dead zone) is stated in chapter "Technical data".

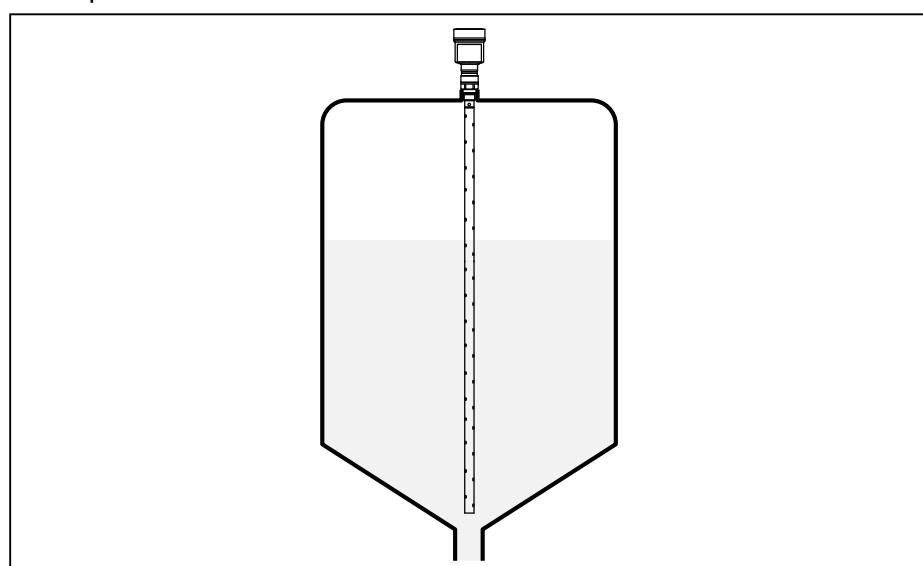


Fig. 2: Vessel with conical bottom

4 Connecting to power supply

4.1 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.



Information:

The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry

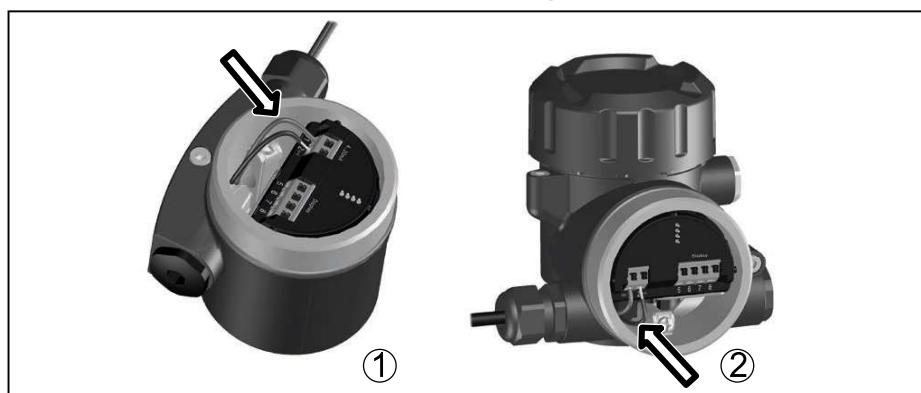


Fig. 3: Connection steps 5 and 6

- 1 Single chamber housing
- 2 Double chamber housing

6. Insert the wire ends into the terminals according to the wiring plan



Information:

Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

You can find further information on the max. wire cross-section under "Technical data - Electromechanical data".

7. Check the hold of the wires in the terminals by lightly pulling on them

4 Connecting to power supply

8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
 9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
 10. Reinsert the display and adjustment module, if one was installed
 11. Screw the housing lid back on
- The electrical connection is finished.

4.2 Wiring plan, single chamber housing



The following illustration applies to the non-Ex, Ex-ia and Ex-d-ia version.

Electronics and connection compartment

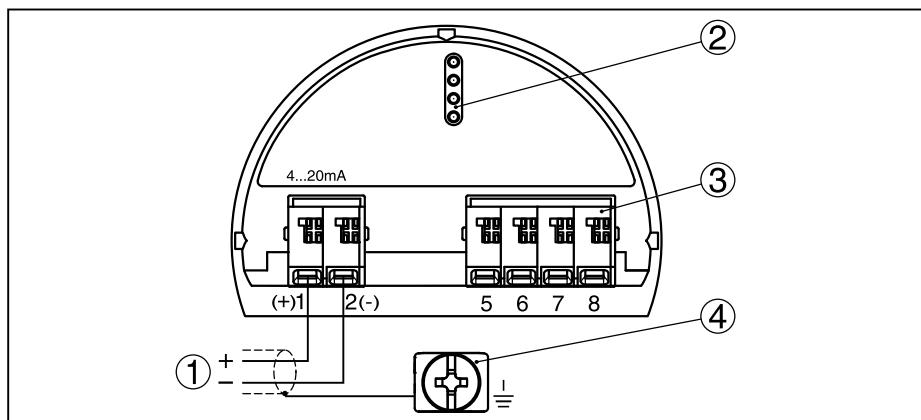


Fig. 4: Electronics and connection compartment - single chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

4.3 Wiring plan, double chamber housing



The following illustrations apply to the non-Ex as well as to the Ex-ia version.

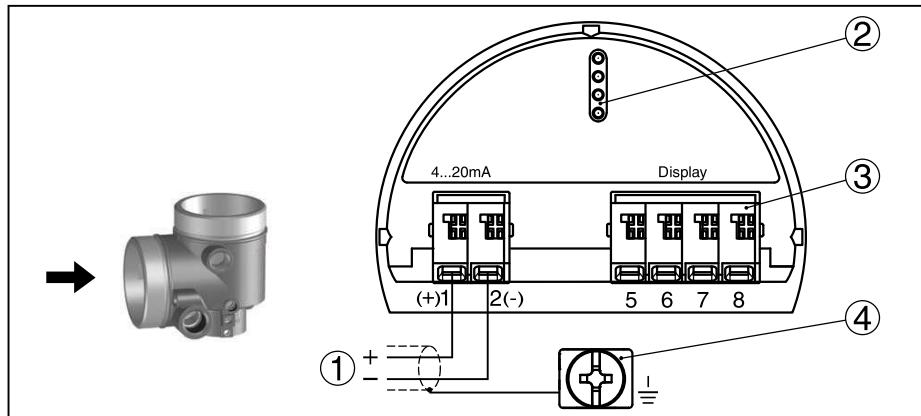
Connection compartment

Fig. 5: Connection compartment - double chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

5 Set up with the display and adjustment module

5.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 6: Installing the display and adjustment module in the electronics compartment of the single chamber housing

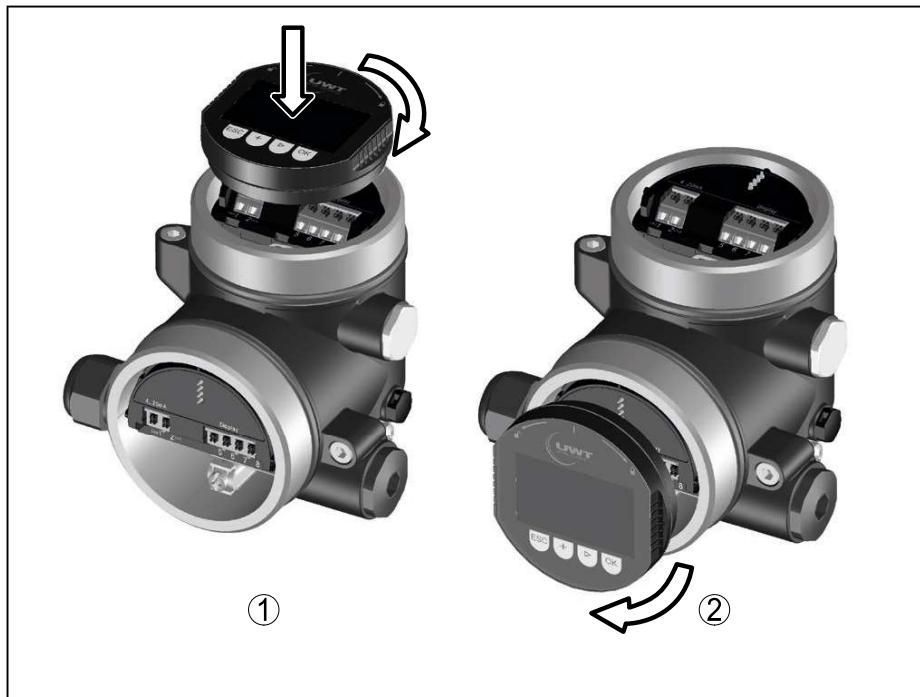


Fig. 7: Installing the display and adjustment module in the double chamber housing

- 1 In the electronics compartment
- 2 In the connection compartment



Note:

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

5.2 Parameter adjustment

Set parameters

1. In this menu item you can select the application. You can choose between level and interface measurement.

Measurement loop name TANK 04	Type of medium Liquid	Application Level vessel
--------------------------------------	------------------------------	---------------------------------

2. In the menu item "Medium - Dielectric constant" you can define the type of medium (medium).
3. Carry out the adjustment in the menu items "Min. adjustment" and "Max. adjustment".

Setup Probe length Application Adjustment level Adjustment interface Damping	Max. adjustment level 100.00 % 80 mm F013	Min. adjustment level 0.00 % 850 mm 726 mm
---	--	---

4. A "Linearization" is recommended for all vessels in which the vessel volume does not increase linearly with the level - e.g. in a horizontal cylindrical or spherical tank. Activate the appropriate curve.

5 Set up with the display and adjustment module

5. A "False signal suppression" detects, marks and saves the false signals so that they are no longer taken into account for level measurement. We generally recommend a false signal suppression.

Parameterization example The sensor measures the distance from the sensor (reference plane) to the product surface.

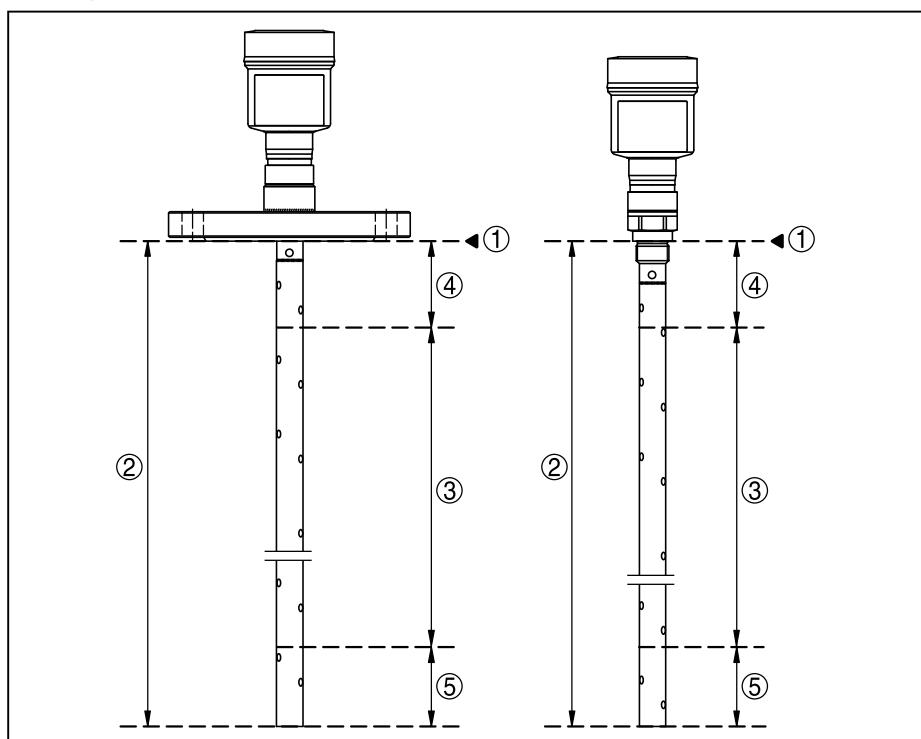


Fig. 8: Measuring ranges - NivoGuide 8100

- 1 Reference plane
- 2 Probe length L
- 3 Measuring range (default setting refers to the measuring range in water)
- 4 Upper dead zone (in this area no measurement is possible)
- 5 Lower dead zone (in this area no measurement is possible)

For this adjustment, the distance is entered when the vessel is full and nearly empty. If these values are not known, an adjustment with other distances, for example, 10 % and 90 % is also possible. Starting point for these distance specifications is always the seal surface of the thread or flange.

Further steps

1. In the menu "Additional settings", menu item "Damping" you can adjust the requested damping of the output signal.
2. Select the parameter of the current output and the output characteristics in the menu item "Current output".

6 Supplement

6.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions which are included in delivery are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein, for example regarding the process conditions or the voltage supply.

All approval documents can be downloaded from our homepage.

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; (0.2 bar)

Cable entry

- M20 x 1.5 1 x cable gland M20 x 1.5 (cable: ø 6 ... 12 mm), 1 x blind plug M20 x 1.5
- ½ NPT 1 x blind plug NPT, 1 x closing cap (red) ½ NPT

Wire cross-section (spring-loaded terminals)

- Massive wire, stranded wire 0.2 ... 2.5 mm² (AWG 24 ... 14)
- Stranded wire with end sleeve 0.2 ... 1.5 mm² (AWG 24 ... 16)

Voltage supply

Operating voltage U_B

- Non-Ex instrument, Ex-d instrument 9.6 ... 35 V DC
- Ex-ia instrument 9.6 ... 30 V DC
- Ex-d-ia instrument 15 ... 35 V DC
- Ex-d-ia instrument with ship approval 15 ... 35 V DC

Operating voltage U_B with lighting switched on

- Non-Ex instrument, Ex-d instrument 16 ... 35 V DC
- Ex-ia instrument 16 ... 30 V DC
- Ex-d-ia instrument No lighting (integrated ia barrier)

Reverse voltage protection Integrated

Permissible residual ripple - Non-Ex, Ex-ia instrument

- for 9.6 V < U_B < 14 V $\leq 0.7 V_{eff}$ (16 ... 400 Hz)
- for 18 V < U_B < 36 V $\leq 1 V_{eff}$ (16 ... 400 Hz)

Permissible residual ripple - Ex-d-ia instrument

- for 18 V < U_B < 36 V $\leq 1 V_{eff}$ (16 ... 400 Hz)

Load resistor

- Calculation $(U_B - U_{min})/0.022 A$
- Example - Non-Ex instrument with
U_B=24 V DC $(24 V - 9.6 V)/0.022 A = 655 \Omega$

NivoGuide® 8200

Two-wire 4 ... 20 mA/HART

Rod and cable probe

-20 ... +250 °C

TDR sensor for continuous level and interface
measurement of liquids



Quick setup guide



Document ID: 61906



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Information:

This quick setup guide enables quick setup and commissioning of your instrument.

You can find supplementary information in the corresponding, more detailed Operating Instructions Manual as well as the Safety Manual that comes with instruments with SIL qualification. These manuals are available on our homepage.

**Operating instructions NivoGuide 8200 - Two-wire 4 ... 20 mA/
HART - Rod and cable probe, -20 ... +250 °C: Document-ID
61895**

Editing status of the quick setup guide: 2019-07-30

1 For your safety

1.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified personnel authorised by the plant operator.

During work on and with the device, the required personal protective equipment must always be worn.

1.2 Appropriate use

NivoGuide 8200 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

1.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

1.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

1.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

The EU conformity declaration can be found on our homepage.

Electromagnetic compatibility

Instruments in four-wire or Ex-d-ia version are designed for use in an industrial environment. Nevertheless, electromagnetic interference from electrical conductors and radiated emissions must be taken into account, as is usual with class A instruments according to EN 61326-1. If the instrument is used in a different environment, the electromagnetic compatibility to other instruments must be ensured by suitable measures.

1.6 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

2 Product description

2.1 Configuration

Type label

The type label contains the most important data for identification and use of the instrument:

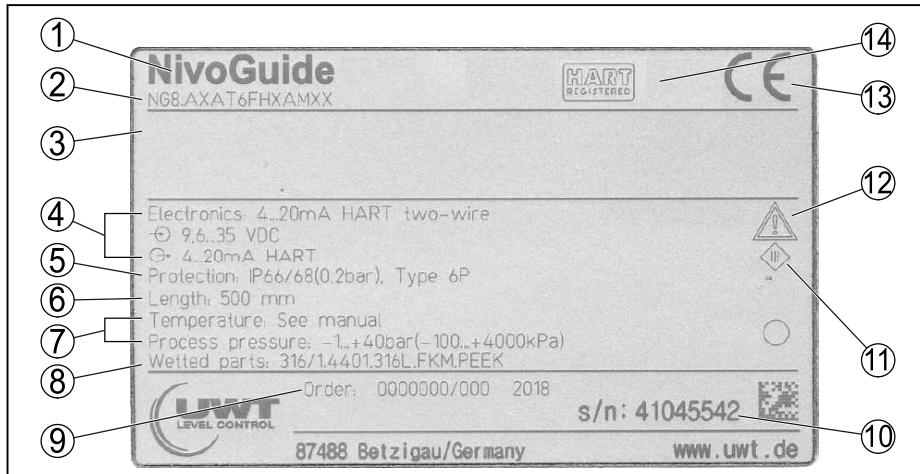


Fig. 1: Layout of the type label (example)

- 1 Instrument type
- 2 Product code
- 3 Approvals (option)
- 4 Power supply and signal output, electronics
- 5 Protection rating
- 6 Probe length (measurement accuracy optional)
- 7 Process and ambient temperature, process pressure
- 8 Material wetted parts
- 9 Order number
- 10 Serial number of the instrument
- 11 Symbol of the device protection class
- 12 ID numbers, instrument documentation
- 13 CE identification
- 14 Approval directives (optional)

3 Mounting

3.1 General instructions for use of the instrument

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "Connecting to power supply")
- Tighten the cable gland or plug connector
- Lead the connection cable downward in front of the cable entry or plug connector

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.



Note:

Make sure that the degree of contamination specified in chapter "Technical data" meets the existing ambient conditions.



Note:

Make sure that during installation or maintenance no moisture or dirt can get inside the instrument.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

3.2 Mounting instructions

Installation position

Mount NivoGuide 8200 in such a way that the distance to vessel installations or to the vessel wall is at least 300 mm (12 in). In non-metallic vessels, the distance to the vessel wall should be at least 500 mm (19.7 in).

During operation, the probe must not touch any installations or the vessel wall. If necessary, fasten the probe end.

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom. Keep in mind that measurement all the way down to the tip of the probe may not be possible. The exact value of the min. distance (lower dead zone) is stated in chapter "Technical data".

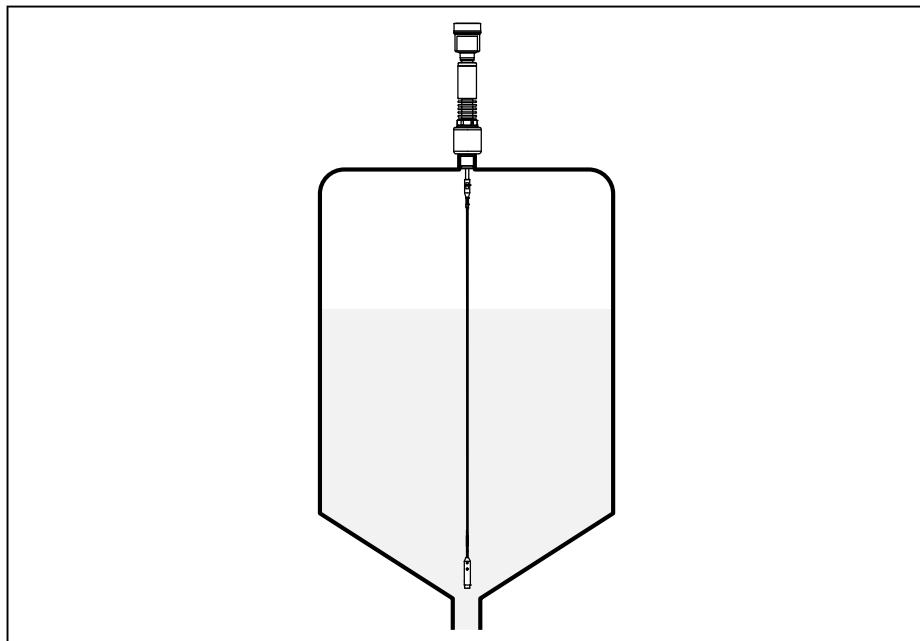


Fig. 2: Vessel with conical bottom

Type of vessel

Plastic vessel/Glass vessel

The guided microwave principle requires a metallic surface on the process fitting. Therefore, in plastic vessels, etc., use an instrument version with flange (from DN 50) or place a metal sheet ($\varnothing > 200$ mm/8 in) beneath the process fitting when screwing it in.

Make sure that the plate has direct contact with the process fitting.

When mounting rod or cable probes in vessels without metal walls, e.g. in plastic vessels, the measured value can be influenced by strong electromagnetic fields (emitted interference according to EN 61326: class A). In this case, use a probe with coaxial version.

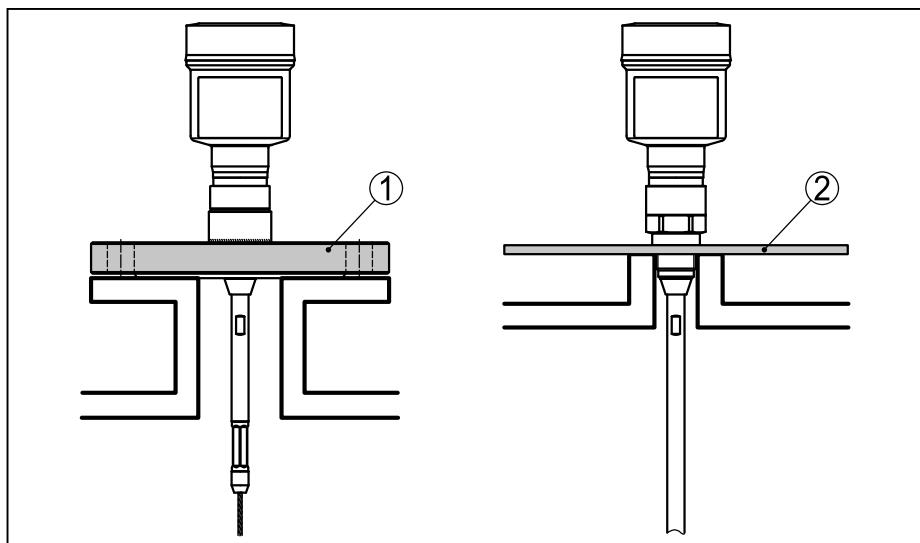


Fig. 3: Mounting in non-metallic vessel

- 1 Flange
- 2 Metal sheet

Mounting socket

If possible, avoid sockets. Mount the sensor flush with the vessel top. If this is not possible, use short sockets with small diameter.

3 Mounting

Higher sockets or sockets with a bigger diameter can generally be used. They can, however, increase the upper dead zone. Check if this is relevant for your measurement.

In such cases, always carry out a false signal suppression after mounting. You can find further information under "*Setup procedure*".

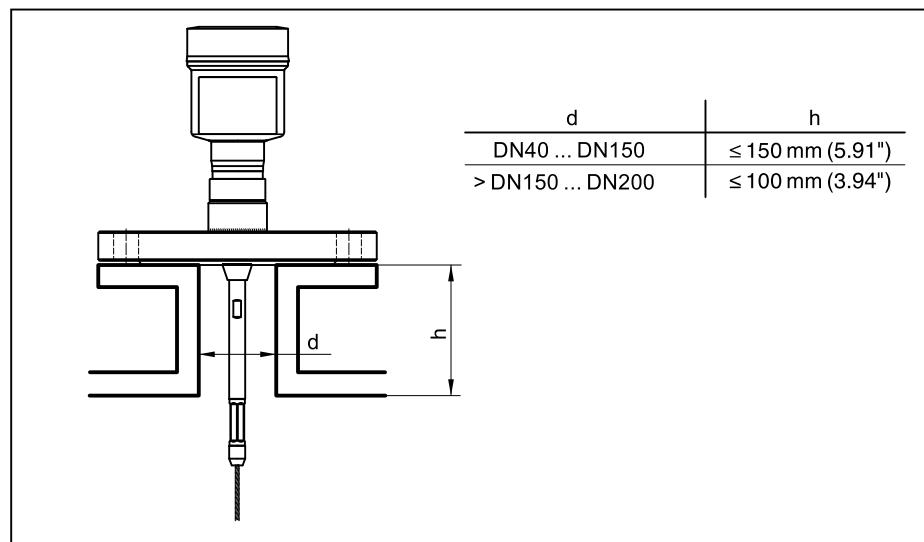


Fig. 4: Mounting socket

When welding the socket, make sure that the socket is flush with the vessel top.

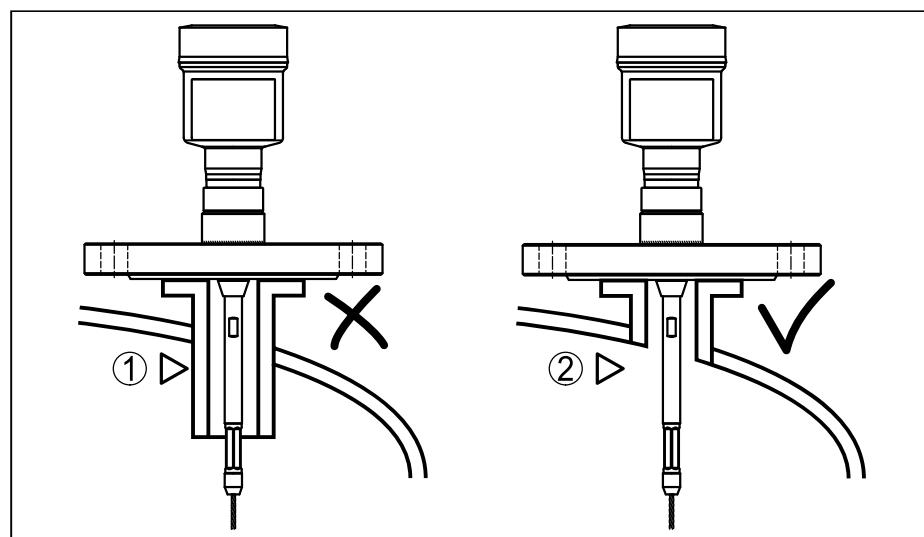


Fig. 5: Socket must be installed flush

- 1 Unfavourable mounting
- 2 Socket flush - optimum mounting

4 Connecting to power supply

4.1 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.



Information:

The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry

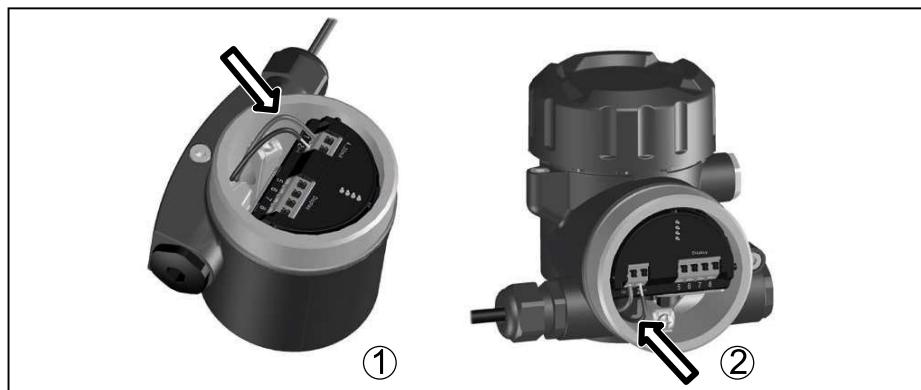


Fig. 6: Connection steps 5 and 6

- 1 Single chamber housing
- 2 Double chamber housing

6. Insert the wire ends into the terminals according to the wiring plan



Information:

Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

You can find further information on the max. wire cross-section under "Technical data - Electromechanical data".

7. Check the hold of the wires in the terminals by lightly pulling on them

4 Connecting to power supply

8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
 9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
 10. Reinsert the display and adjustment module, if one was installed
 11. Screw the housing lid back on
- The electrical connection is finished.

4.2 Wiring plan, single chamber housing



The following illustration applies to the non-Ex, Ex-ia and Ex-d-ia version.

Electronics and connection compartment

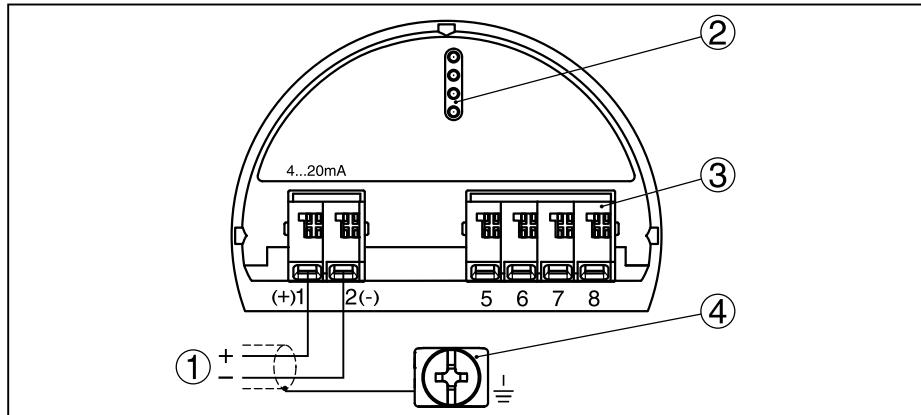


Fig. 7: Electronics and connection compartment - single chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

4.3 Wiring plan, double chamber housing



The following illustrations apply to the non-Ex as well as to the Ex-ia version.

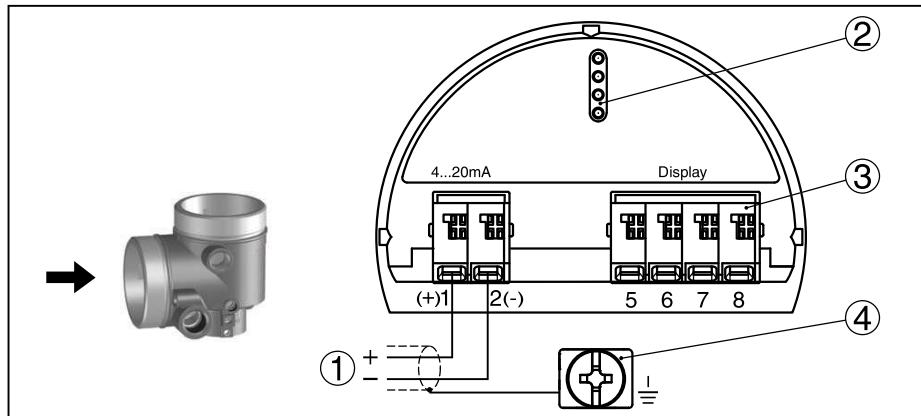
Connection compartment

Fig. 8: Connection compartment - double chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

5 Set up with the display and adjustment module

5.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 9: Installing the display and adjustment module in the electronics compartment of the single chamber housing

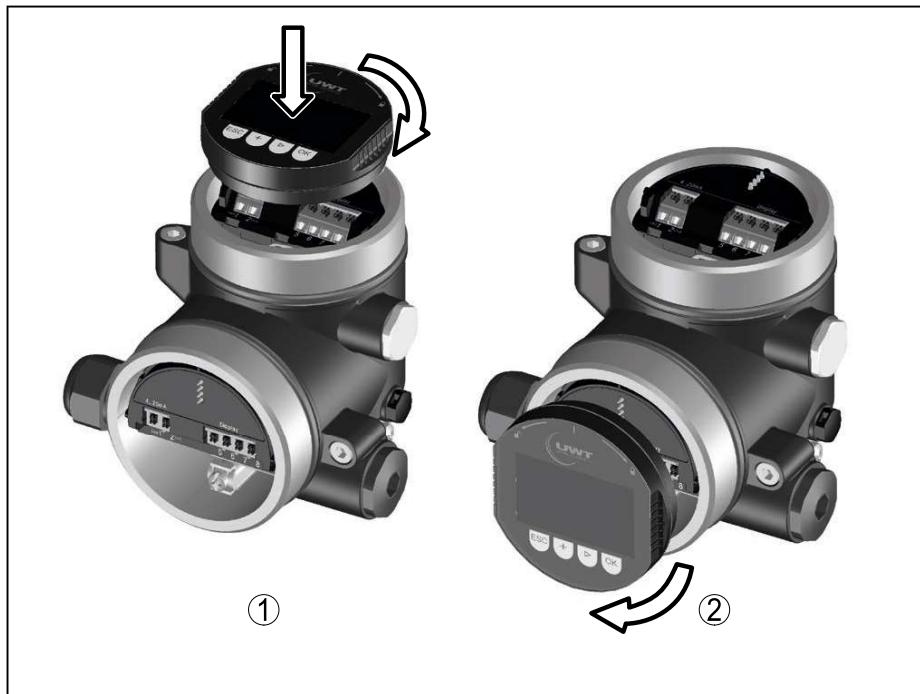


Fig. 10: Installing the display and adjustment module in the double chamber housing

- 1 In the electronics compartment
- 2 In the connection compartment



Note:

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

5.2 Parameter adjustment - Quick setup

Quick setup

To quickly and easily adapt the sensor to the application, select the menu item "Quick setup" in the start graphic on the display and adjustment module.



You can find "*Extended adjustment*" in the detailed operating instructions.

General information

Measurement loop name

In the first menu item you can assign a suitable measurement loop name. You can enter a name with max. 19 characters.

Type of medium

In the next menu item you can see which type of medium the instrument is suitable for. If your instrument is only suitable for a certain medium, this menu item is not visible.

5 Set up with the display and adjustment module

Application

In this menu item, you can select the application. You can choose between level measurement and interface measurement. You can also choose between measurement in a vessel or in a bypass or standpipe.

Measurement loop name TANK_04	Application Level vessel	Type of medium Liquid
----------------------------------	-----------------------------	--------------------------

Level measurement

Medium - dielectric constant

In this menu item, you can define the type of medium (product).

Max. adjustment

In this menu item, you can enter the max. adjustment for the level.

Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. The distance refers to the sensor reference plane (seal surface of the process fitting). Keep in mind that the max. level must lie below the dead zone.

Min. adjustment

In this menu item, you can enter the min. adjustment for the level.

Enter the suitable distance value in m for the empty vessel (e.g. distance from the flange to the probe end) corresponding to the percentage value. The distance refers tot he sensor reference plane (seal surface of the process fitting).

Medium/Dielectric constant Water-based/>10	Max. adjustment level 100.00% 80 mm F013	Min. adjustment level 0.00% 850 mm 726 mm
---	---	--

Interface measurement

Dielectric constant - upper medium

In this menu item, you can define the type of medium (product).

Max. adjustment

In this menu item, you can enter the max. adjustment for the level.

Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. The distance refers to the sensor reference plane (seal surface of the process fitting). Keep in mind that the max. level must lie below the dead zone.

Min. adjustment

In this menu item, you can enter the min. adjustment for the level.

Enter the suitable distance value in m for the empty vessel (e.g. distance from the flange to the probe end) corresponding to the percentage value. The distance refers tot he sensor reference plane (seal surface of the process fitting).

Dielectric constant Enter Calculate	Max. adjustment level 100.00% 80 mm F013	Min. adjustment level 0.00% 850 mm 726 mm
---	---	--

Max. adjustment - Interface

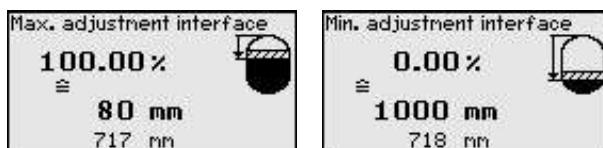
Carry out the max. adjustment for the interface.

To do this, enter the percentage value and the corresponding distance value in m for the full vessel.

Min. adjustment - Interface

Carry out the min. adjustment for the interface.

To do this, enter the percentage value and the corresponding distance value in m for the empty vessel.



Linearisation

Linearisation

A linearisation is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. a horizontal cylindrical or spherical tank, when the indication or output of the volume is required. Corresponding linearisation curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume.

The linearization applies for the measured value indication and the current output. By activating the suitable curve, the percentage vessel volume is displayed correctly.

False signal suppression

High sockets and internal vessel installations cause interfering reflections and can influence the measurement.

A false signal suppression detects, marks and saves these false signals so that they are no longer taken into account for the level and interface measurement. We generally recommend carrying out a false signal suppression to achieve the best possible accuracy. This should be done with the lowest possible level so that all potential interfering reflections can be detected.

Enter the actual distance from the sensor to the product surface.

All interfering signals in this section are detected by the sensor and stored.

The instrument carries out an automatic false signal suppression as soon as the probe is uncovered. The false signal suppression is always updated.



6 Supplement

6.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions which are included in delivery are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein, for example regarding the process conditions or the voltage supply.

All approval documents can be downloaded from our homepage.

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; (0.2 bar)

Cable entry

- M20 x 1.5 1 x cable gland M20 x 1.5 (cable: ø 6 ... 12 mm), 1 x blind plug M20 x 1.5
- ½ NPT 1 x blind plug NPT, 1 x closing cap (red) ½ NPT

Wire cross-section (spring-loaded terminals)

- Massive wire, stranded wire 0.2 ... 2.5 mm² (AWG 24 ... 14)
- Stranded wire with end sleeve 0.2 ... 1.5 mm² (AWG 24 ... 16)

Voltage supply

Operating voltage U_B

- Non-Ex instrument, Ex-d instrument 9.6 ... 35 V DC
- Ex-ia instrument 9.6 ... 30 V DC
- Ex-d-ia instrument 15 ... 35 V DC
- Ex-d-ia instrument with ship approval 15 ... 35 V DC

Operating voltage U_B with lighting switched on

- Non-Ex instrument, Ex-d instrument 16 ... 35 V DC
- Ex-ia instrument 16 ... 30 V DC
- Ex-d-ia instrument No lighting (integrated ia barrier)

Reverse voltage protection Integrated

Permissible residual ripple - Non-Ex, Ex-ia instrument

- for 9.6 V < U_B < 14 V $\leq 0.7 V_{eff}$ (16 ... 400 Hz)
- for 18 V < U_B < 36 V $\leq 1 V_{eff}$ (16 ... 400 Hz)

Permissible residual ripple - Ex-d-ia instrument

- for 18 V < U_B < 36 V $\leq 1 V_{eff}$ (16 ... 400 Hz)

Load resistor

- Calculation $(U_B - U_{min})/0.022 A$
- Example - Non-Ex instrument with $(24 V - 9.6 V)/0.022 A = 655 \Omega$
U_B= 24 V DC

NivoGuide® 8200

Two-wire 4 ... 20 mA/HART, with SIL qualification

Rod and cable probe

-20 ... +250 °C

TDR sensor for continuous level and interface measurement of liquids



Quick setup guide



Document ID: 61907



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Information:

This quick setup guide enables quick setup and commissioning of your instrument.

You can find supplementary information in the corresponding, more detailed Operating Instructions Manual as well as the Safety Manual that comes with instruments with SIL qualification. These manuals are available on our homepage.

**Operating instructions NivoGuide 8200 - Two-wire 4 ... 20 mA/
HART - Rod and cable probe - With SIL qualification,
-20 ... +250 °C: Document-ID 61896**
Editing status of the quick setup guide: 2019-07-30

1 For your safety

1.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified personnel authorised by the plant operator.

During work on and with the device, the required personal protective equipment must always be worn.

1.2 Appropriate use

NivoGuide 8200 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

1.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

1.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

1.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

The EU conformity declaration can be found on our homepage.

Electromagnetic compatibility

Instruments in four-wire or Ex-d-ia version are designed for use in an industrial environment. Nevertheless, electromagnetic interference from electrical conductors and radiated emissions must be taken into account, as is usual with class A instruments according to EN 61326-1. If the instrument is used in a different environment, the electromagnetic compatibility to other instruments must be ensured by suitable measures.

1.6 SIL qualification according to IEC 61508

The Safety Integrity Level (SIL) of an electronic system is used to assess the reliability of integrated safety functions.

For detailed specification of the safety requirements, multiple SIL levels are specified according to safety standard IEC 61508. You can find detailed information in chapter "*Functional safety (SIL)*" of the operating instructions.

The instrument meets the specifications of IEC 61508: 2010 (Edition 2). It is qualified for single-channel operation up to SIL2. The instrument can be used homogeneously redundant up to SIL3 in multi-channel architecture with HFT 1.

1.7 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

2 Product description

2.1 Configuration

Type label

The type label contains the most important data for identification and use of the instrument:

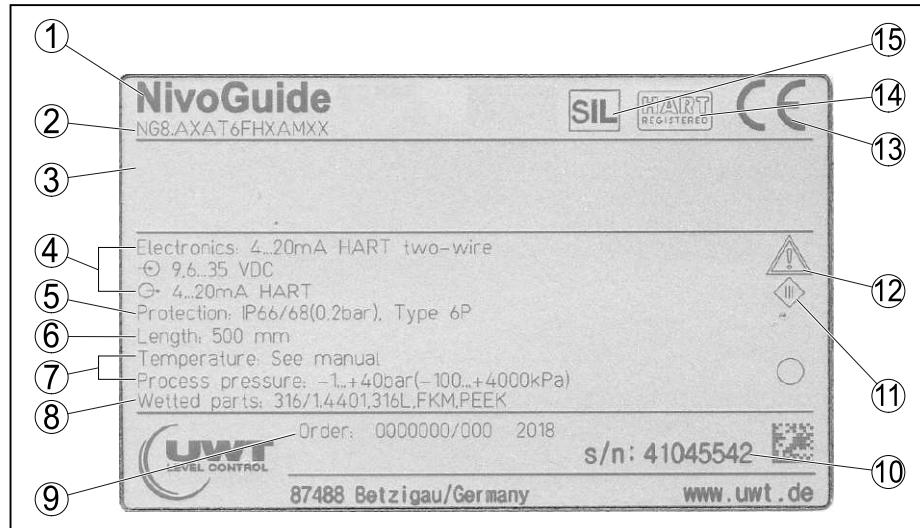


Fig. 1: Layout of the type label (example)

- 1 Instrument type
- 2 Product code
- 3 Approvals
- 4 Power supply and signal output, electronics
- 5 Protection rating
- 6 Probe length (measurement accuracy optional)
- 7 Process and ambient temperature, process pressure
- 8 Material wetted parts
- 9 Order number
- 10 Serial number of the instrument
- 11 Symbol of the device protection class
- 12 Reminder to observe the instrument documentation
- 13 Notified authority for CE marking
- 14 Approval directives
- 15 Marking of the safety function in SIS

3 Mounting

3.1 General instructions for use of the instrument

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "Connecting to power supply")
- Tighten the cable gland or plug connector
- Lead the connection cable downward in front of the cable entry or plug connector

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.



Note:

Make sure that the degree of contamination specified in chapter "Technical data" meets the existing ambient conditions.



Note:

Make sure that during installation or maintenance no moisture or dirt can get inside the instrument.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

3.2 Mounting instructions

Installation position

Mount NivoGuide 8200 in such a way that the distance to vessel installations or to the vessel wall is at least 300 mm (12 in). In non-metallic vessels, the distance to the vessel wall should be at least 500 mm (19.7 in).

During operation, the probe must not touch any installations or the vessel wall. If necessary, fasten the probe end.

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom. Keep in mind that measurement all the way down to the tip of the probe may not be possible. The exact value of the min. distance (lower dead zone) is stated in chapter "Technical data".

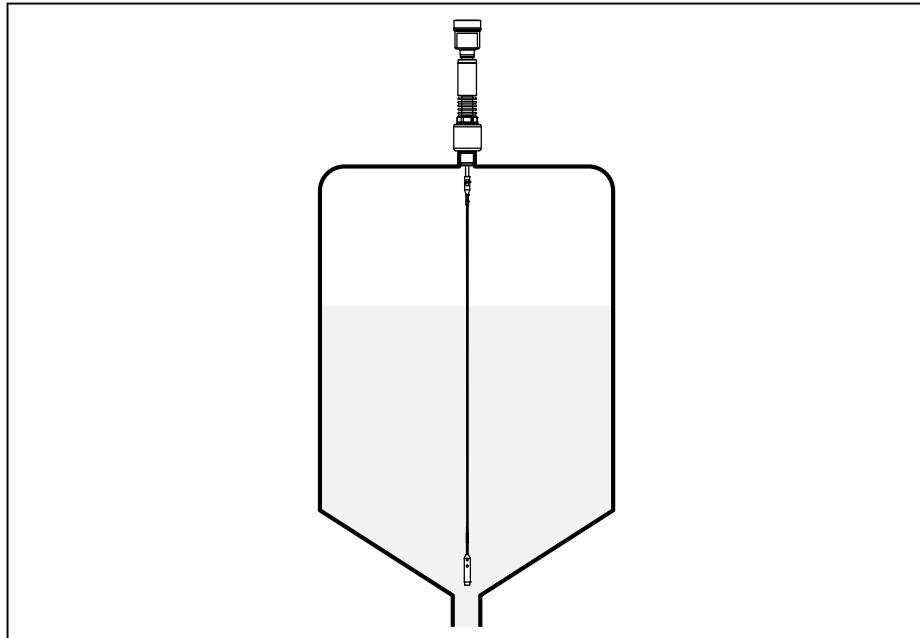


Fig. 2: Vessel with conical bottom

Type of vessel

Plastic vessel/Glass vessel

The guided microwave principle requires a metallic surface on the process fitting. Therefore, in plastic vessels, etc., use an instrument version with flange (from DN 50) or place a metal sheet ($\varnothing > 200$ mm/8 in) beneath the process fitting when screwing it in.

Make sure that the plate has direct contact with the process fitting.

When mounting rod or cable probes in vessels without metal walls, e.g. in plastic vessels, the measured value can be influenced by strong electromagnetic fields (emitted interference according to EN 61326: class A). In this case, use a probe with coaxial version.

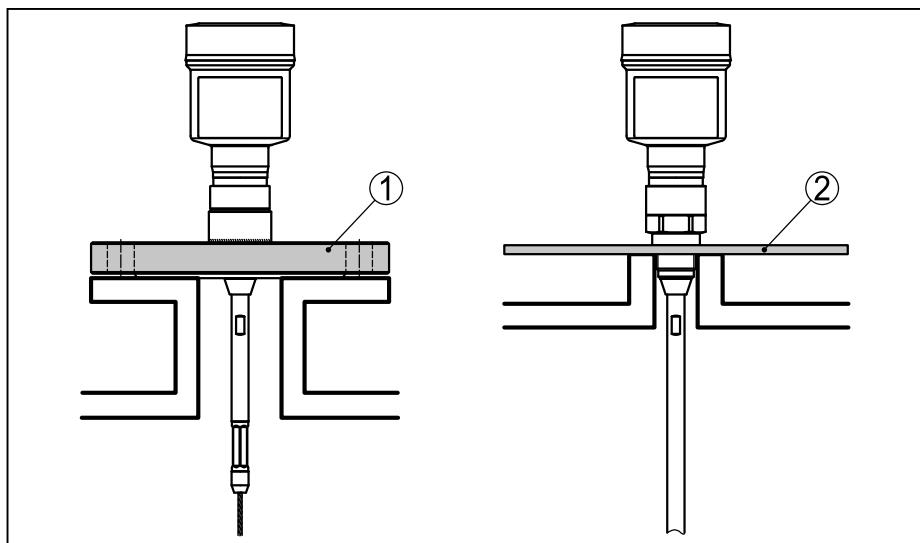


Fig. 3: Mounting in non-metallic vessel

- 1 Flange
- 2 Metal sheet

Mounting socket

If possible, avoid sockets. Mount the sensor flush with the vessel top. If this is not possible, use short sockets with small diameter.

3 Mounting

Higher sockets or sockets with a bigger diameter can generally be used. They can, however, increase the upper dead zone. Check if this is relevant for your measurement.

In such cases, always carry out a false signal suppression after mounting. You can find further information under "*Setup procedure*".

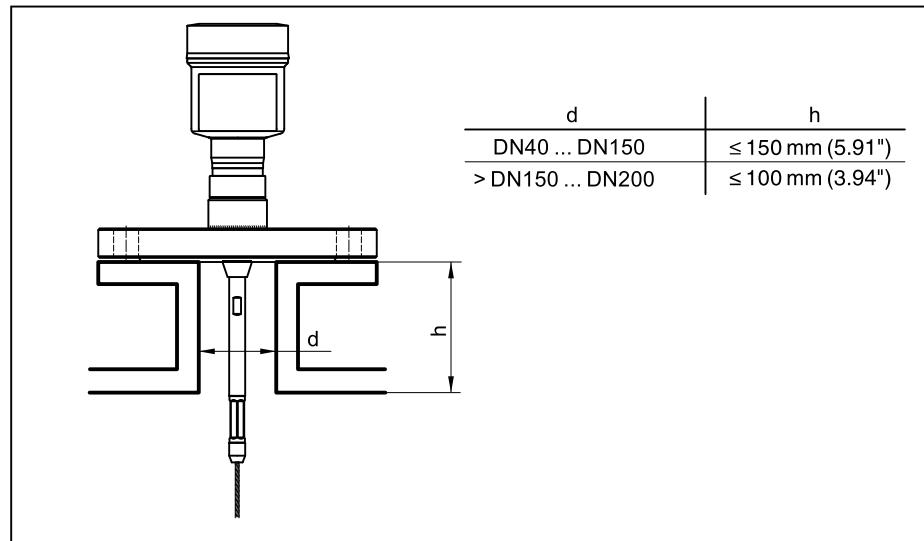


Fig. 4: Mounting socket

When welding the socket, make sure that the socket is flush with the vessel top.

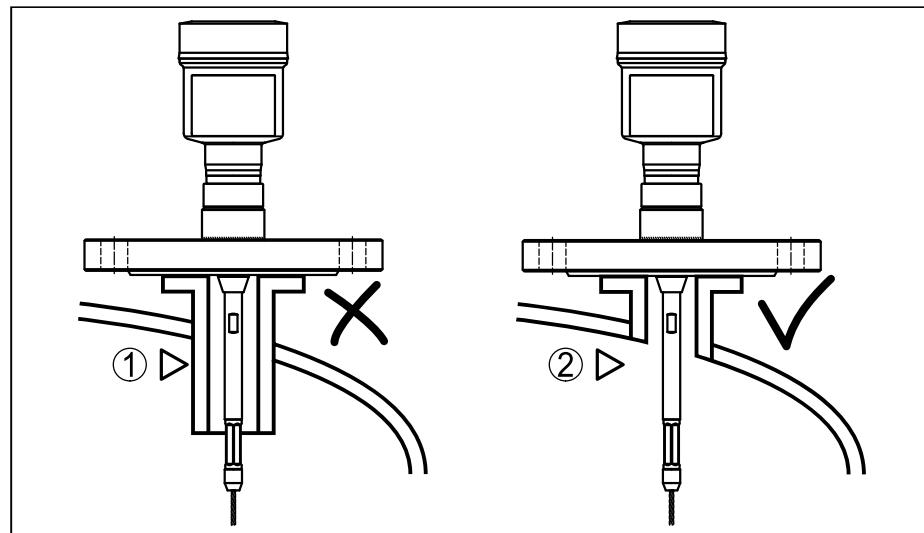


Fig. 5: Socket must be installed flush

- 1 Unfavourable mounting
- 2 Socket flush - optimum mounting

4 Connecting to power supply

4.1 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.



Information:

The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry

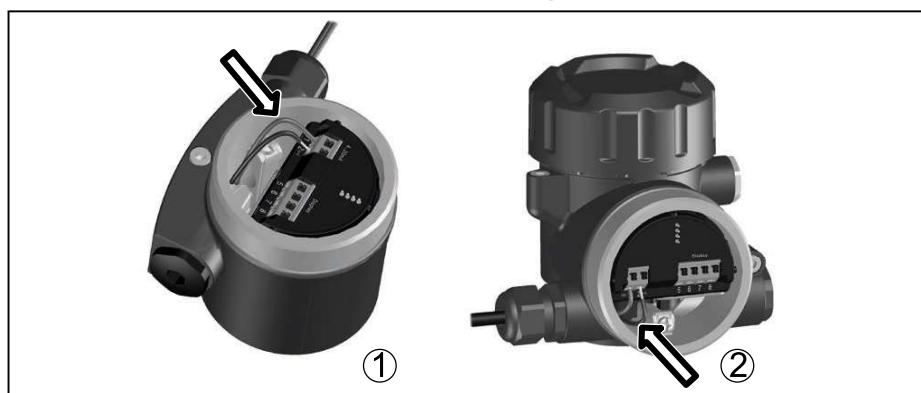


Fig. 6: Connection steps 5 and 6

- 1 Single chamber housing
- 2 Double chamber housing

6. Insert the wire ends into the terminals according to the wiring plan



Information:

Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

You can find further information on the max. wire cross-section under "Technical data - Electromechanical data".

7. Check the hold of the wires in the terminals by lightly pulling on them

4 Connecting to power supply

8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
 9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
 10. Reinsert the display and adjustment module, if one was installed
 11. Screw the housing lid back on
- The electrical connection is finished.

4.2 Wiring plan, single chamber housing



The following illustration applies to the non-Ex, Ex-ia and Ex-d-ia version.

Electronics and connection compartment

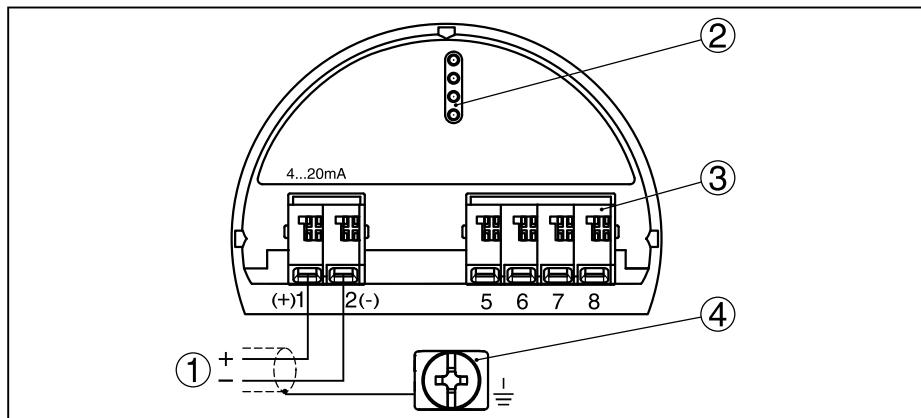


Fig. 7: Electronics and connection compartment - single chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

4.3 Wiring plan, double chamber housing



The following illustrations apply to the non-Ex as well as to the Ex-ia version.

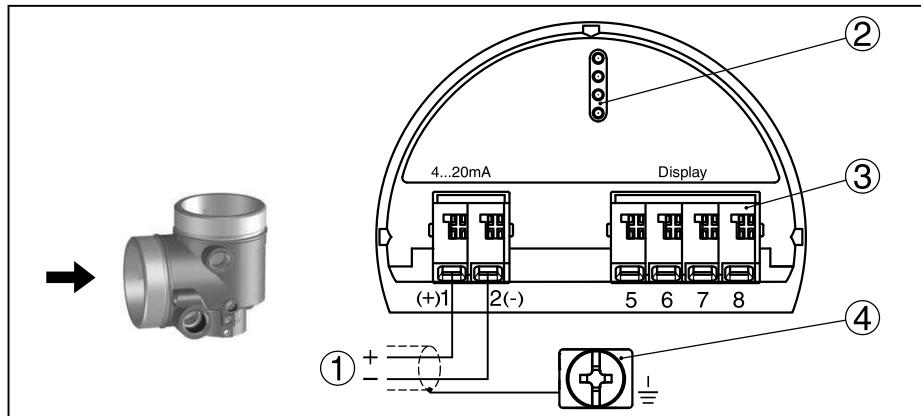
Connection compartment

Fig. 8: Connection compartment - double chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

5 Set up with the display and adjustment module

5.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 9: Installing the display and adjustment module in the electronics compartment of the single chamber housing

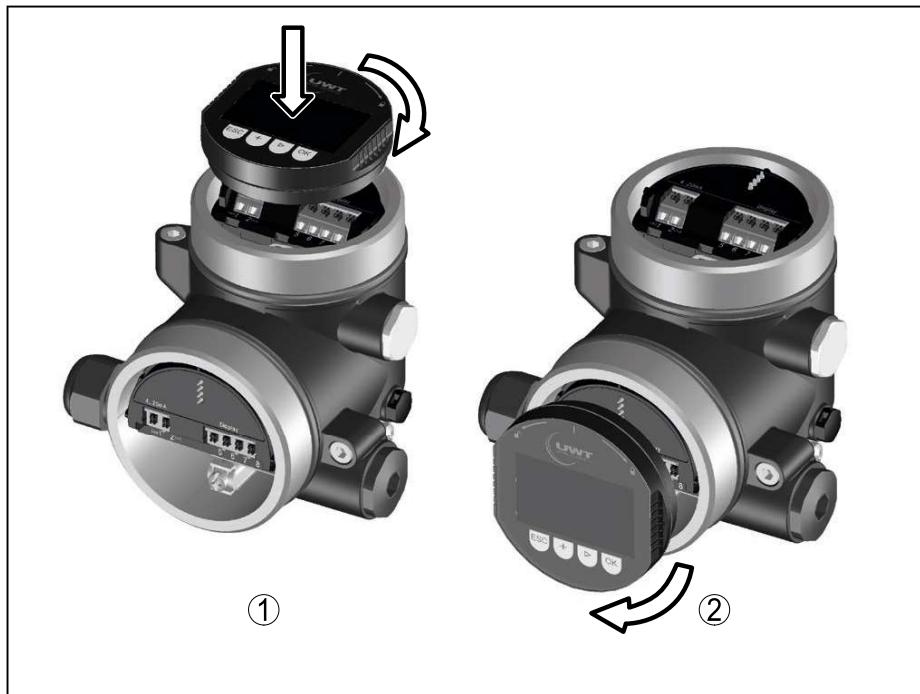


Fig. 10: Installing the display and adjustment module in the double chamber housing

- 1 In the electronics compartment
- 2 In the connection compartment



Note:

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

5.2 Parameter adjustment

Set parameters

1. In this menu item you can select the application. You can choose between level and interface measurement.

Measurement loop name TANK 04	Type of medium Liquid	Application Level vessel
--------------------------------------	------------------------------	---------------------------------

2. In the menu item "Medium - Dielectric constant" you can define the type of medium (medium).
3. Carry out the adjustment in the menu items "Min. adjustment" and "Max. adjustment".

Setup Probe length Application Adjustment level Adjustment interface Damping	Max. adjustment level 100.00 % 80 mm F013	Min. adjustment level 0.00 % 850 mm 726 mm
---	--	---

4. A "Linearization" is recommended for all vessels in which the vessel volume does not increase linearly with the level - e.g. in a horizontal cylindrical or spherical tank. Activate the appropriate curve.

5 Set up with the display and adjustment module

5. A "False signal suppression" detects, marks and saves the false signals so that they are no longer taken into account for level measurement. We generally recommend a false signal suppression.

Parameterization example The sensor measures the distance from the sensor (reference plane) to the product surface.

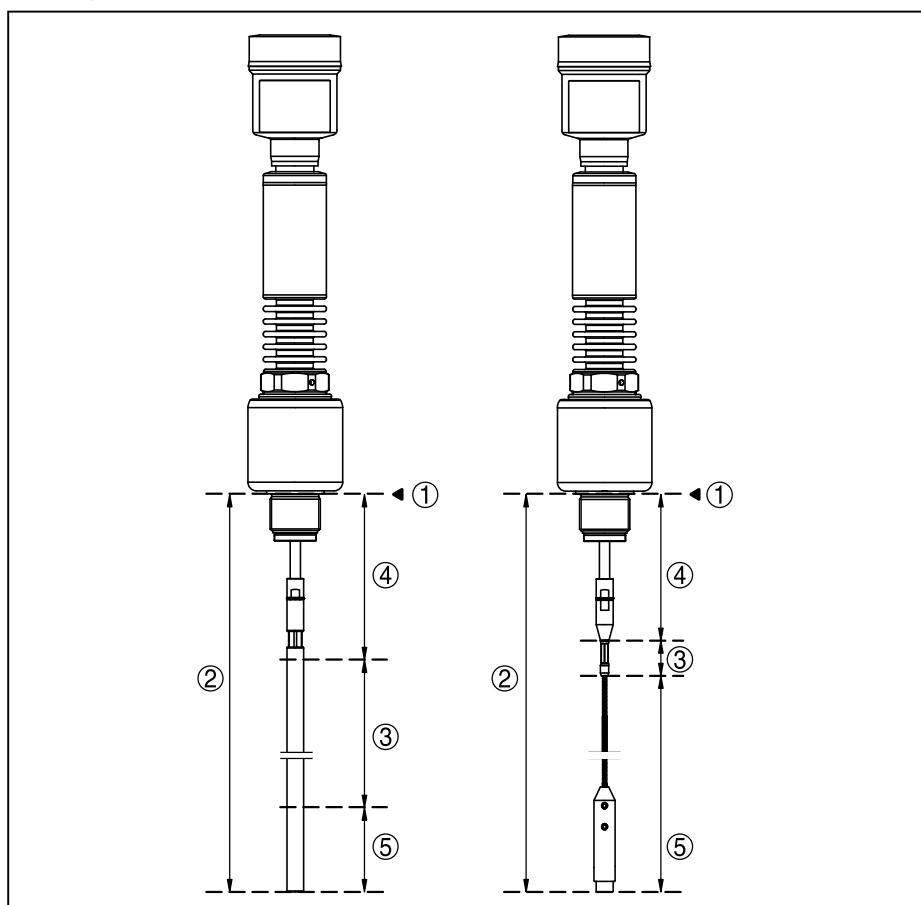


Fig. 11: Measuring ranges - NivoGuide 8200

- 1 Reference plane
- 2 Probe length L
- 3 Measuring range (default setting refers to the measuring range in water)
- 4 Upper dead zone (in this area no measurement is possible)
- 5 Lower dead zone (in this area no measurement is possible)

For this adjustment, the distance is entered when the vessel is full and nearly empty. If these values are not known, an adjustment with other distances, for example, 10 % and 90 % is also possible. Starting point for these distance specifications is always the seal surface of the thread or flange.

Further steps

1. In the menu "Additional settings", menu item "Damping" you can adjust the requested damping of the output signal.
2. Select the parameter of the current output and the output characteristics in the menu item "Current output".

6 Supplement

6.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions which are included in delivery are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein, for example regarding the process conditions or the voltage supply.

All approval documents can be downloaded from our homepage.

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; (0.2 bar)

Cable entry

- M20 x 1.5 1 x cable gland M20 x 1.5 (cable: ø 6 ... 12 mm), 1 x blind plug M20 x 1.5
- ½ NPT 1 x blind plug NPT, 1 x closing cap (red) ½ NPT

Wire cross-section (spring-loaded terminals)

- Massive wire, stranded wire 0.2 ... 2.5 mm² (AWG 24 ... 14)
- Stranded wire with end sleeve 0.2 ... 1.5 mm² (AWG 24 ... 16)

Voltage supply

Operating voltage U_B

- Non-Ex instrument, Ex-d instrument 9.6 ... 35 V DC
- Ex-ia instrument 9.6 ... 30 V DC
- Ex-d-ia instrument 15 ... 35 V DC
- Ex-d-ia instrument with ship approval 15 ... 35 V DC

Operating voltage U_B with lighting switched on

- Non-Ex instrument, Ex-d instrument 16 ... 35 V DC
- Ex-ia instrument 16 ... 30 V DC
- Ex-d-ia instrument No lighting (integrated ia barrier)

Reverse voltage protection Integrated

Permissible residual ripple - Non-Ex, Ex-ia instrument

- for 9.6 V < U_B < 14 V ≤ 0.7 V_{eff} (16 ... 400 Hz)
- for 18 V < U_B < 36 V ≤ 1 V_{eff} (16 ... 400 Hz)

Permissible residual ripple - Ex-d-ia instrument

- for 18 V < U_B < 36 V ≤ 1 V_{eff} (16 ... 400 Hz)

Load resistor

- Calculation (U_B - U_{min})/0.022 A
- Example - Non-Ex instrument with U_B=24 V DC (24 V - 9.6 V)/0.022 A = 655 Ω

NivoGuide® 8200

Two-wire 4 ... 20 mA/HART

Coax probe

-20 ... +250 °C

TDR sensor for continuous level and interface
measurement of liquids



Quick setup guide



Document ID: 61908



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Information:

This quick setup guide enables quick setup and commissioning of your instrument.

You can find supplementary information in the corresponding, more detailed Operating Instructions Manual as well as the Safety Manual that comes with instruments with SIL qualification. These manuals are available on our homepage.

**Operating instructions NivoGuide 8200 - Two-wire 4 ... 20 mA/
HART - Coaxial probe, -20 ... +250 °C: Document-ID 61897**
Editing status of the quick setup guide: 2019-07-30

1 For your safety

1.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified personnel authorised by the plant operator.

During work on and with the device, the required personal protective equipment must always be worn.

1.2 Appropriate use

NivoGuide 8200 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

1.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

1.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

1.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

The EU conformity declaration can be found on our homepage.

Electromagnetic compatibility

Instruments in four-wire or Ex-d-ia version are designed for use in an industrial environment. Nevertheless, electromagnetic interference from electrical conductors and radiated emissions must be taken into account, as is usual with class A instruments according to EN 61326-1. If the instrument is used in a different environment, the electromagnetic compatibility to other instruments must be ensured by suitable measures.

1.6 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

2 Product description

2.1 Configuration

Type label

The type label contains the most important data for identification and use of the instrument:

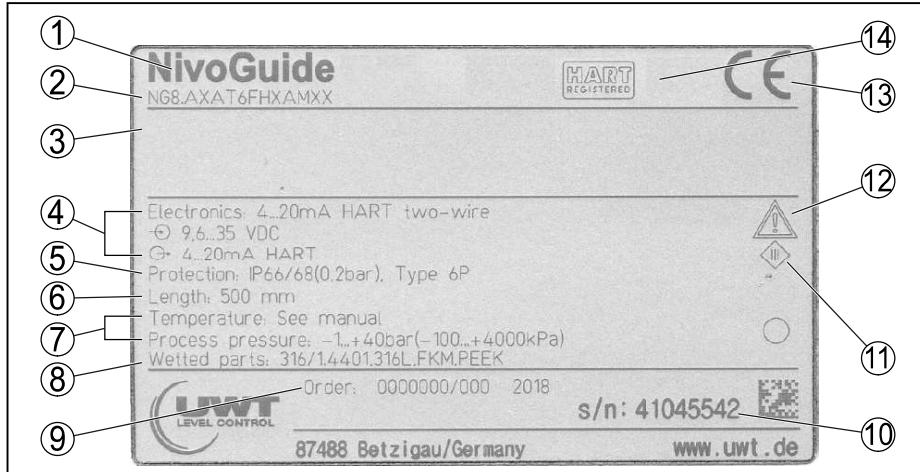


Fig. 1: Layout of the type label (example)

- 1 Instrument type
- 2 Product code
- 3 Approvals (option)
- 4 Power supply and signal output, electronics
- 5 Protection rating
- 6 Probe length (measurement accuracy optional)
- 7 Process and ambient temperature, process pressure
- 8 Material wetted parts
- 9 Order number
- 10 Serial number of the instrument
- 11 Symbol of the device protection class
- 12 ID numbers, instrument documentation
- 13 CE identification
- 14 Approval directives (optional)

3 Mounting

3.1 General instructions for use of the instrument

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "Connecting to power supply")
- Tighten the cable gland or plug connector
- Lead the connection cable downward in front of the cable entry or plug connector

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.



Note:

Make sure that the degree of contamination specified in chapter "Technical data" meets the existing ambient conditions.



Note:

Make sure that during installation or maintenance no moisture or dirt can get inside the instrument.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

3.2 Mounting instructions

Installation position

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom. Keep in mind that measurement all the way down to the tip of the probe may not be possible. The exact value of the min. distance (lower dead zone) is stated in chapter "Technical data".

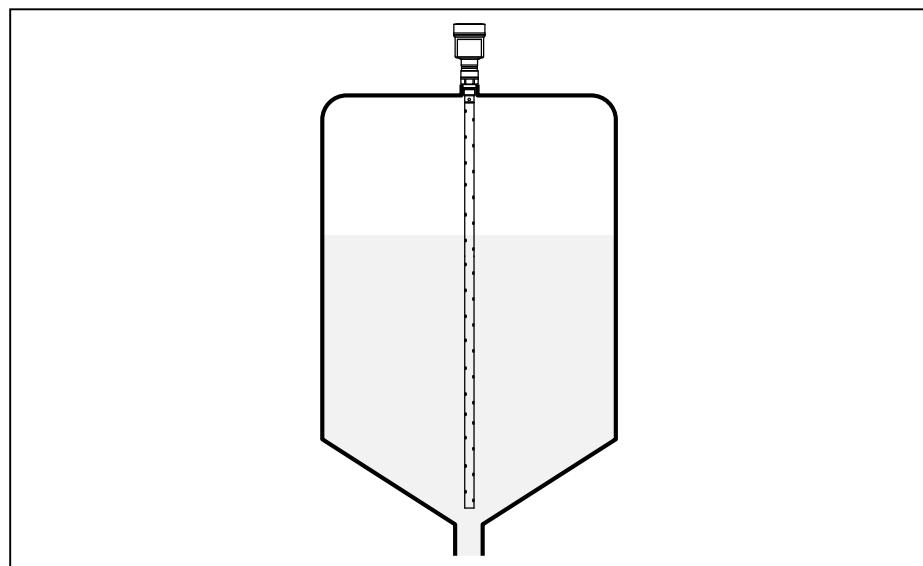


Fig. 2: Vessel with conical bottom

4 Connecting to power supply

4.1 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.



Information:

The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry

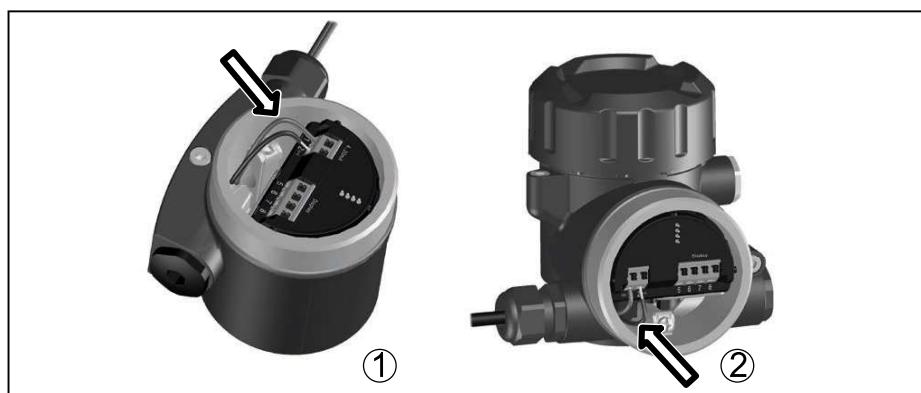


Fig. 3: Connection steps 5 and 6

- 1 Single chamber housing
- 2 Double chamber housing

6. Insert the wire ends into the terminals according to the wiring plan



Information:

Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

You can find further information on the max. wire cross-section under "Technical data - Electromechanical data".

7. Check the hold of the wires in the terminals by lightly pulling on them

4 Connecting to power supply

8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
 9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
 10. Reinsert the display and adjustment module, if one was installed
 11. Screw the housing lid back on
- The electrical connection is finished.

4.2 Wiring plan, single chamber housing



The following illustration applies to the non-Ex, Ex-ia and Ex-d-ia version.

Electronics and connection compartment

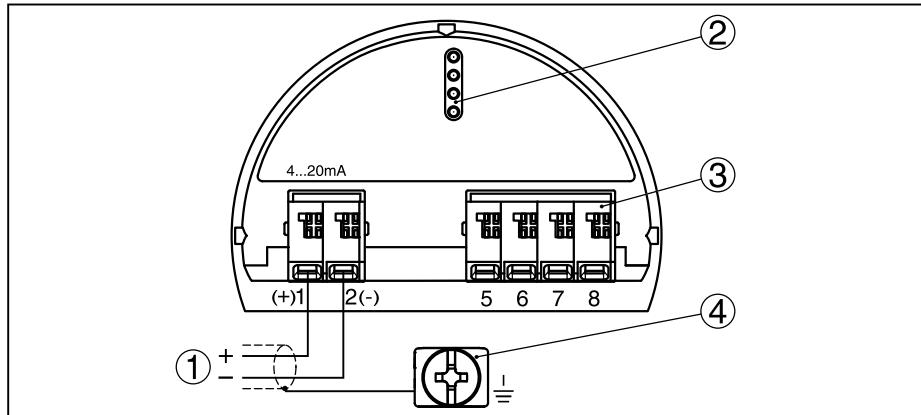


Fig. 4: Electronics and connection compartment - single chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

4.3 Wiring plan, double chamber housing



The following illustrations apply to the non-Ex as well as to the Ex-ia version.

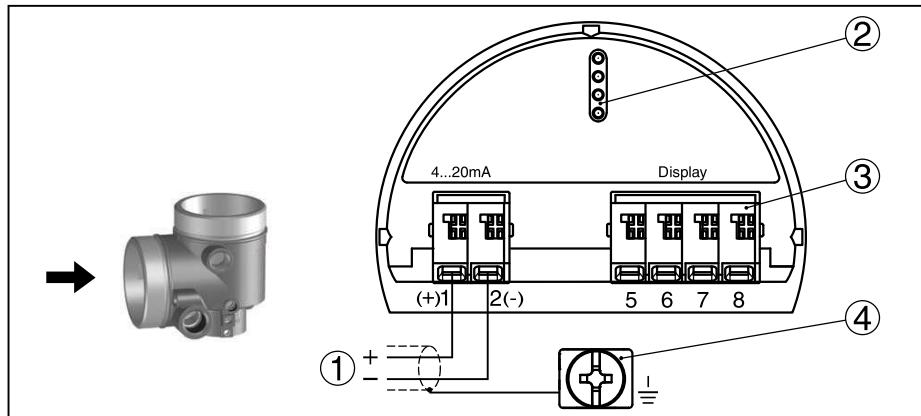
Connection compartment

Fig. 5: Connection compartment - double chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

5 Set up with the display and adjustment module

5.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 6: Installing the display and adjustment module in the electronics compartment of the single chamber housing

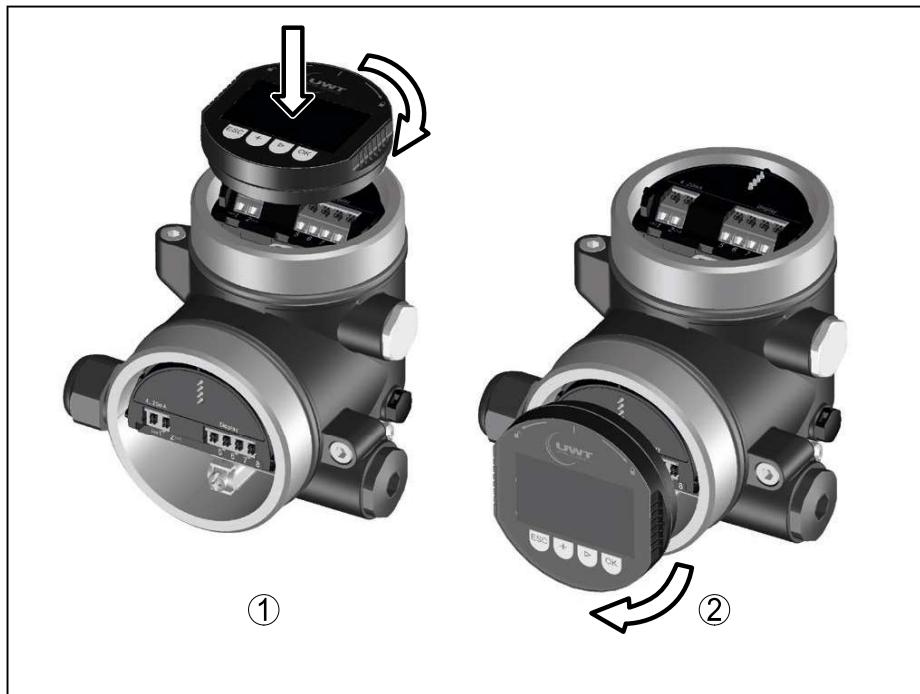


Fig. 7: Installing the display and adjustment module in the double chamber housing

- 1 In the electronics compartment
- 2 In the connection compartment



Note:

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

5.2 Parameter adjustment - Quick setup

Quick setup

To quickly and easily adapt the sensor to the application, select the menu item "Quick setup" in the start graphic on the display and adjustment module.



You can find "*Extended adjustment*" in the detailed operating instructions.

General information

Measurement loop name

In the first menu item you can assign a suitable measurement loop name. You can enter a name with max. 19 characters.

Type of medium

In the next menu item you can see which type of medium the instrument is suitable for. If your instrument is only suitable for a certain medium, this menu item is not visible.

5 Set up with the display and adjustment module

Application

In this menu item, you can select the application. You can choose between level measurement and interface measurement. You can also choose between measurement in a vessel or in a bypass or standpipe.

Measurement loop name TANK_04	Application Level vessel	Type of medium Liquid
----------------------------------	-----------------------------	--------------------------

Level measurement

Medium - dielectric constant

In this menu item, you can define the type of medium (product).

Max. adjustment

In this menu item, you can enter the max. adjustment for the level.

Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. The distance refers to the sensor reference plane (seal surface of the process fitting). Keep in mind that the max. level must lie below the dead zone.

Min. adjustment

In this menu item, you can enter the min. adjustment for the level.

Enter the suitable distance value in m for the empty vessel (e.g. distance from the flange to the probe end) corresponding to the percentage value. The distance refers tot he sensor reference plane (seal surface of the process fitting).

Medium/Dielectric constant Water-based/>10	Max. adjustment level 100.00% 80 mm F013	Min. adjustment level 0.00% 850 mm 726 mm
---	---	--

Interface measurement

Dielectric constant - upper medium

In this menu item, you can define the type of medium (product).

Max. adjustment

In this menu item, you can enter the max. adjustment for the level.

Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. The distance refers to the sensor reference plane (seal surface of the process fitting). Keep in mind that the max. level must lie below the dead zone.

Min. adjustment

In this menu item, you can enter the min. adjustment for the level.

Enter the suitable distance value in m for the empty vessel (e.g. distance from the flange to the probe end) corresponding to the percentage value. The distance refers tot he sensor reference plane (seal surface of the process fitting).

Dielectric constant Enter Calculate	Max. adjustment level 100.00% 80 mm F013	Min. adjustment level 0.00% 850 mm 726 mm
---	---	--

Max. adjustment - Interface

Carry out the max. adjustment for the interface.

To do this, enter the percentage value and the corresponding distance value in m for the full vessel.

Min. adjustment - Interface

Carry out the min. adjustment for the interface.

To do this, enter the percentage value and the corresponding distance value in m for the empty vessel.



Linearisation

Linearisation

A linearisation is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. a horizontal cylindrical or spherical tank, when the indication or output of the volume is required. Corresponding linearisation curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume.

The linearization applies for the measured value indication and the current output. By activating the suitable curve, the percentage vessel volume is displayed correctly.

False signal suppression

High sockets and internal vessel installations cause interfering reflections and can influence the measurement.

A false signal suppression detects, marks and saves these false signals so that they are no longer taken into account for the level and interface measurement. We generally recommend carrying out a false signal suppression to achieve the best possible accuracy. This should be done with the lowest possible level so that all potential interfering reflections can be detected.

Enter the actual distance from the sensor to the product surface.

All interfering signals in this section are detected by the sensor and stored.

The instrument carries out an automatic false signal suppression as soon as the probe is uncovered. The false signal suppression is always updated.



6 Supplement

6.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions which are included in delivery are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein, for example regarding the process conditions or the voltage supply.

All approval documents can be downloaded from our homepage.

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; (0.2 bar)

Cable entry

- M20 x 1.5 1 x cable gland M20 x 1.5 (cable: ø 6 ... 12 mm), 1 x blind plug M20 x 1.5
- ½ NPT 1 x blind plug NPT, 1 x closing cap (red) ½ NPT

Wire cross-section (spring-loaded terminals)

- Massive wire, stranded wire 0.2 ... 2.5 mm² (AWG 24 ... 14)
- Stranded wire with end sleeve 0.2 ... 1.5 mm² (AWG 24 ... 16)

Voltage supply

Operating voltage U_B

- Non-Ex instrument, Ex-d instrument 9.6 ... 35 V DC
- Ex-ia instrument 9.6 ... 30 V DC
- Ex-d-ia instrument 15 ... 35 V DC
- Ex-d-ia instrument with ship approval 15 ... 35 V DC

Operating voltage U_B with lighting switched on

- Non-Ex instrument, Ex-d instrument 16 ... 35 V DC
- Ex-ia instrument 16 ... 30 V DC
- Ex-d-ia instrument No lighting (integrated ia barrier)

Reverse voltage protection Integrated

Permissible residual ripple - Non-Ex, Ex-ia instrument

- for 9.6 V < U_B < 14 V $\leq 0.7 V_{eff}$ (16 ... 400 Hz)
- for 18 V < U_B < 36 V $\leq 1 V_{eff}$ (16 ... 400 Hz)

Permissible residual ripple - Ex-d-ia instrument

- for 18 V < U_B < 36 V $\leq 1 V_{eff}$ (16 ... 400 Hz)

Load resistor

- Calculation $(U_B - U_{min})/0.022 A$
- Example - Non-Ex instrument with $(24 V - 9.6 V)/0.022 A = 655 \Omega$
U_B = 24 V DC

NivoGuide® 8200

Two-wire 4 ... 20 mA/HART, with SIL qualification

Coax probe

-20 ... +250 °C

TDR sensor for continuous level and interface measurement of liquids



Quick setup guide



Document ID: 61909



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Information:

This quick setup guide enables quick setup and commissioning of your instrument.

You can find supplementary information in the corresponding, more detailed Operating Instructions Manual as well as the Safety Manual that comes with instruments with SIL qualification. These manuals are available on our homepage.

**Operating instructions NivoGuide 8200 - Two-wire 4 ... 20 mA/
HART - Coaxial probe - With SIL qualification, -20 ... +250 °C:
Document-ID 61898**

Editing status of the quick setup guide: 2019-07-30

1 For your safety

1.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified personnel authorised by the plant operator.

During work on and with the device, the required personal protective equipment must always be worn.

1.2 Appropriate use

NivoGuide 8200 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

1.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

1.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

1.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

The EU conformity declaration can be found on our homepage.

Electromagnetic compatibility

Instruments in four-wire or Ex-d-ia version are designed for use in an industrial environment. Nevertheless, electromagnetic interference from electrical conductors and radiated emissions must be taken into account, as is usual with class A instruments according to EN 61326-1. If the instrument is used in a different environment, the electromagnetic compatibility to other instruments must be ensured by suitable measures.

1.6 SIL qualification according to IEC 61508

The Safety Integrity Level (SIL) of an electronic system is used to assess the reliability of integrated safety functions.

For detailed specification of the safety requirements, multiple SIL levels are specified according to safety standard IEC 61508. You can find detailed information in chapter "*Functional safety (SIL)*" of the operating instructions.

The instrument meets the specifications of IEC 61508: 2010 (Edition 2). It is qualified for single-channel operation up to SIL2. The instrument can be used homogeneously redundant up to SIL3 in multi-channel architecture with HFT 1.

1.7 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

2 Product description

2.1 Configuration

Type label

The type label contains the most important data for identification and use of the instrument:

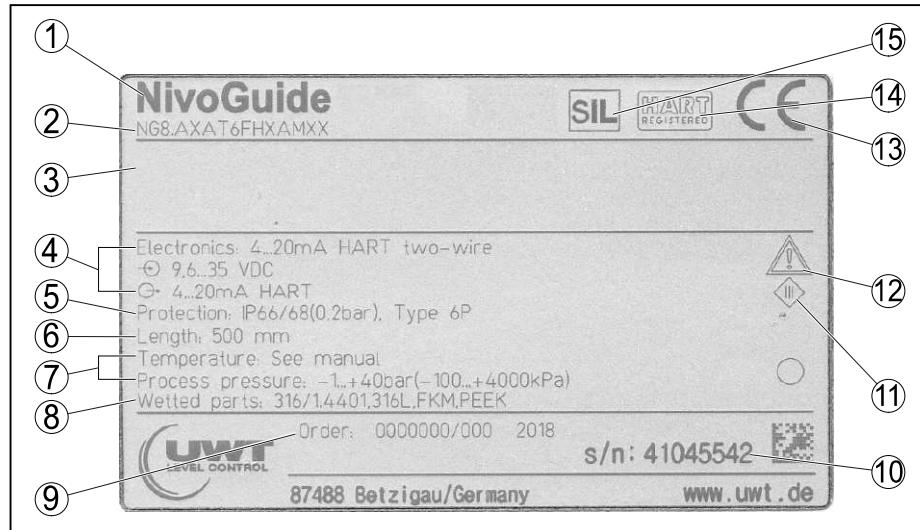


Fig. 1: Layout of the type label (example)

- 1 Instrument type
- 2 Product code
- 3 Approvals
- 4 Power supply and signal output, electronics
- 5 Protection rating
- 6 Probe length (measurement accuracy optional)
- 7 Process and ambient temperature, process pressure
- 8 Material wetted parts
- 9 Order number
- 10 Serial number of the instrument
- 11 Symbol of the device protection class
- 12 Reminder to observe the instrument documentation
- 13 Notified authority for CE marking
- 14 Approval directives
- 15 Marking of the safety function in SIS

3 Mounting

3.1 General instructions for use of the instrument

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "Connecting to power supply")
- Tighten the cable gland or plug connector
- Lead the connection cable downward in front of the cable entry or plug connector

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.



Note:

Make sure that the degree of contamination specified in chapter "Technical data" meets the existing ambient conditions.



Note:

Make sure that during installation or maintenance no moisture or dirt can get inside the instrument.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

3.2 Mounting instructions

Installation position

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom. Keep in mind that measurement all the way down to the tip of the probe may not be possible. The exact value of the min. distance (lower dead zone) is stated in chapter "Technical data".

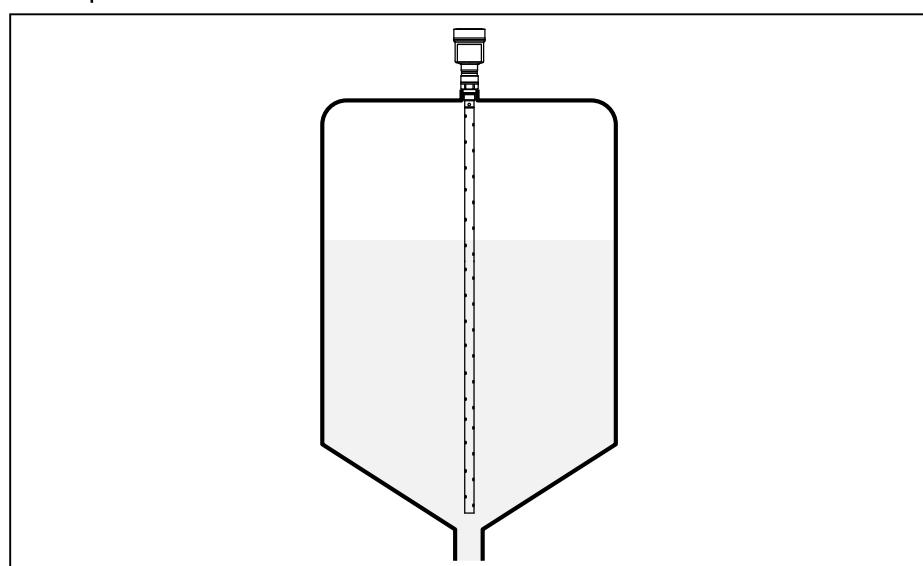


Fig. 2: Vessel with conical bottom

4 Connecting to power supply

4.1 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.



Information:

The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry

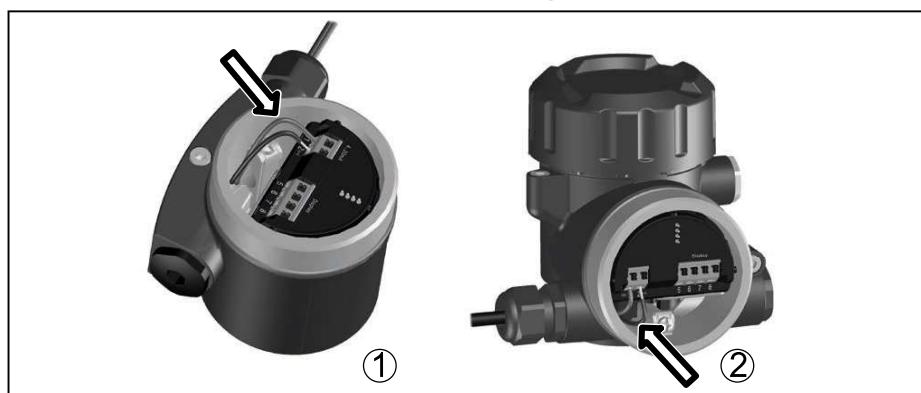


Fig. 3: Connection steps 5 and 6

- 1 Single chamber housing
- 2 Double chamber housing

6. Insert the wire ends into the terminals according to the wiring plan



Information:

Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

You can find further information on the max. wire cross-section under "Technical data - Electromechanical data".

7. Check the hold of the wires in the terminals by lightly pulling on them

4 Connecting to power supply

8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
 9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
 10. Reinsert the display and adjustment module, if one was installed
 11. Screw the housing lid back on
- The electrical connection is finished.

4.2 Wiring plan, single chamber housing



The following illustration applies to the non-Ex, Ex-ia and Ex-d-ia version.

Electronics and connection compartment

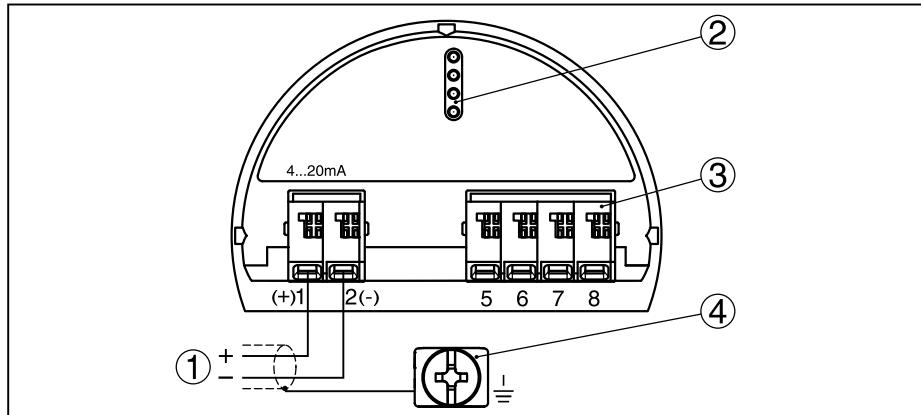


Fig. 4: Electronics and connection compartment - single chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

4.3 Wiring plan, double chamber housing



The following illustrations apply to the non-Ex as well as to the Ex-ia version.

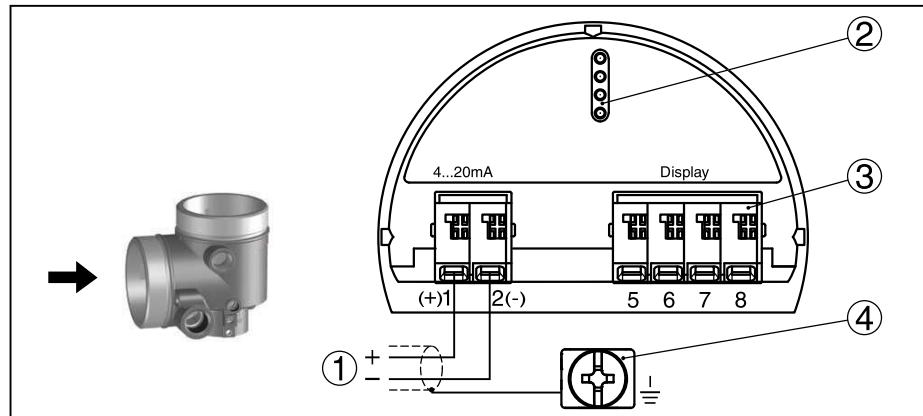
Connection compartment

Fig. 5: Connection compartment - double chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

5 Set up with the display and adjustment module

5.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 6: Installing the display and adjustment module in the electronics compartment of the single chamber housing

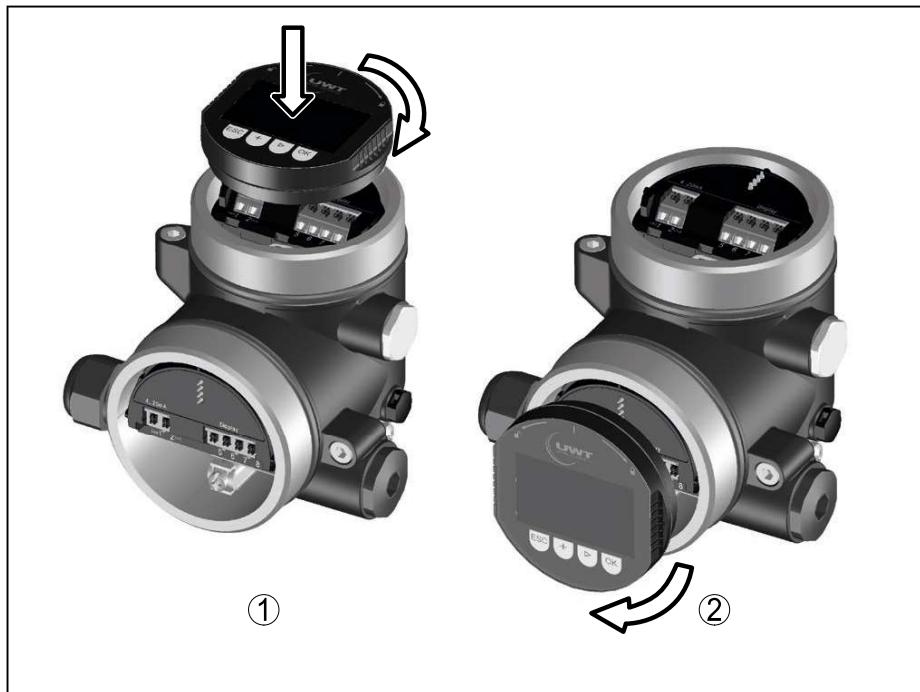


Fig. 7: Installing the display and adjustment module in the double chamber housing

- 1 In the electronics compartment
- 2 In the connection compartment



Note:

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

5.2 Parameter adjustment

Set parameters

1. In this menu item you can select the application. You can choose between level and interface measurement.

Measurement loop name TANK_04	Type of medium Liquid	Application Level vessel
--------------------------------------	------------------------------	---------------------------------

2. In the menu item "Medium - Dielectric constant" you can define the type of medium (medium).
3. Carry out the adjustment in the menu items "Min. adjustment" and "Max. adjustment".

Setup Probe length Application Adjustment level Adjustment interface Damping	Max. adjustment level 100.00 % 80 mm F013	Min. adjustment level 0.00 % 850 mm 726 mm
---	--	---

4. A "Linearization" is recommended for all vessels in which the vessel volume does not increase linearly with the level - e.g. in a horizontal cylindrical or spherical tank. Activate the appropriate curve.

5 Set up with the display and adjustment module

5. A "False signal suppression" detects, marks and saves the false signals so that they are no longer taken into account for level measurement. We generally recommend a false signal suppression.

Parameterization example The sensor measures the distance from the sensor (reference plane) to the product surface.

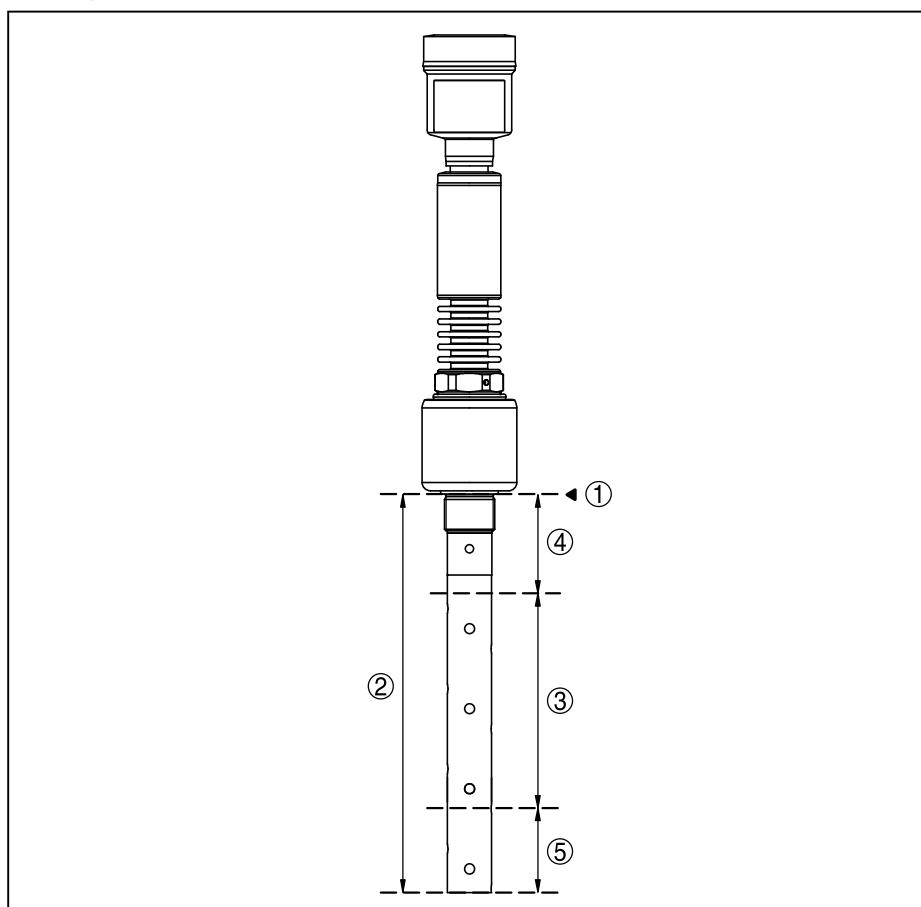


Fig. 8: Measuring ranges - NivoGuide 8200

- 1 Reference plane
- 2 Probe length L
- 3 Measuring range (default setting refers to the measuring range in water)
- 4 Upper dead zone (in this area no measurement is possible)
- 5 Lower dead zone (in this area no measurement is possible)

For this adjustment, the distance is entered when the vessel is full and nearly empty. If these values are not known, an adjustment with other distances, for example, 10 % and 90 % is also possible. Starting point for these distance specifications is always the seal surface of the thread or flange.

Further steps

1. In the menu "Additional settings", menu item "Damping" you can adjust the requested damping of the output signal.
2. Select the parameter of the current output and the output characteristics in the menu item "Current output".

6 Supplement

6.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions which are included in delivery are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein, for example regarding the process conditions or the voltage supply.

All approval documents can be downloaded from our homepage.

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; (0.2 bar)

Cable entry

- M20 x 1.5 1 x cable gland M20 x 1.5 (cable: ø 6 ... 12 mm), 1 x blind plug M20 x 1.5
- ½ NPT 1 x blind plug NPT, 1 x closing cap (red) ½ NPT

Wire cross-section (spring-loaded terminals)

- Massive wire, stranded wire 0.2 ... 2.5 mm² (AWG 24 ... 14)
- Stranded wire with end sleeve 0.2 ... 1.5 mm² (AWG 24 ... 16)

Voltage supply

Operating voltage U_B

- Non-Ex instrument, Ex-d instrument 9.6 ... 35 V DC
- Ex-ia instrument 9.6 ... 30 V DC
- Ex-d-ia instrument 15 ... 35 V DC
- Ex-d-ia instrument with ship approval 15 ... 35 V DC

Operating voltage U_B with lighting switched on

- Non-Ex instrument, Ex-d instrument 16 ... 35 V DC
- Ex-ia instrument 16 ... 30 V DC
- Ex-d-ia instrument No lighting (integrated ia barrier)

Reverse voltage protection Integrated

Permissible residual ripple - Non-Ex, Ex-ia instrument

- for 9.6 V < U_B < 14 V ≤ 0.7 V_{eff} (16 ... 400 Hz)
- for 18 V < U_B < 36 V ≤ 1 V_{eff} (16 ... 400 Hz)

Permissible residual ripple - Ex-d-ia instrument

- for 18 V < U_B < 36 V ≤ 1 V_{eff} (16 ... 400 Hz)

Load resistor

- Calculation (U_B - U_{min})/0.022 A
- Example - Non-Ex instrument with U_B=24 V DC (24 V - 9.6 V)/0.022 A = 655 Ω

NivoGuide® 8200

Two-wire 4 ... 20 mA/HART

Rod and cable probe

-196 ... +280 °C, -196 ... +450 °C

TDR sensor for continuous level and interface
measurement of liquids



Quick setup guide



Document ID: 61910



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Information:

This quick setup guide enables quick setup and commissioning of your instrument.

You can find supplementary information in the corresponding, more detailed Operating Instructions Manual as well as the Safety Manual that comes with instruments with SIL qualification. These manuals are available on our homepage.

**Operating instructions NivoGuide 8200 - Two-wire 4 ... 20 mA/
HART - Rod and cable probe, -196 ... +280 °C / -196 ... +450 °C:
Document-ID 61899**

Editing status of the quick setup guide: 2019-07-30

1 For your safety

1.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified personnel authorised by the plant operator.

During work on and with the device, the required personal protective equipment must always be worn.

1.2 Appropriate use

NivoGuide 8200 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

1.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

1.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

1.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

The EU conformity declaration can be found on our homepage.

Electromagnetic compatibility

Instruments in four-wire or Ex-d-ia version are designed for use in an industrial environment. Nevertheless, electromagnetic interference from electrical conductors and radiated emissions must be taken into account, as is usual with class A instruments according to EN 61326-1. If the instrument is used in a different environment, the electromagnetic compatibility to other instruments must be ensured by suitable measures.

1.6 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

2 Product description

2.1 Configuration

Type label

The type label contains the most important data for identification and use of the instrument:

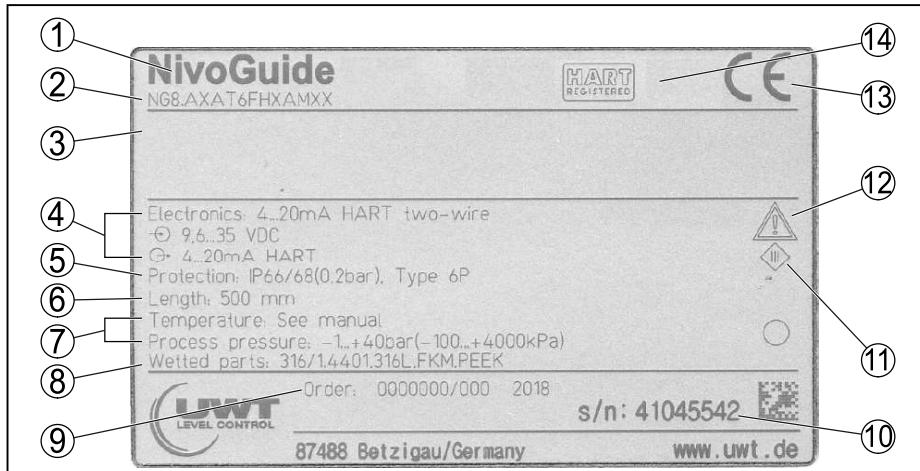


Fig. 1: Layout of the type label (example)

- 1 Instrument type
- 2 Product code
- 3 Approvals (option)
- 4 Power supply and signal output, electronics
- 5 Protection rating
- 6 Probe length (measurement accuracy optional)
- 7 Process and ambient temperature, process pressure
- 8 Material wetted parts
- 9 Order number
- 10 Serial number of the instrument
- 11 Symbol of the device protection class
- 12 ID numbers, instrument documentation
- 13 CE identification
- 14 Approval directives (optional)

3 Mounting

3.1 General instructions for use of the instrument

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "Connecting to power supply")
- Tighten the cable gland or plug connector
- Lead the connection cable downward in front of the cable entry or plug connector

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.



Note:

Make sure that the degree of contamination specified in chapter "Technical data" meets the existing ambient conditions.



Note:

Make sure that during installation or maintenance no moisture or dirt can get inside the instrument.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

3.2 Mounting instructions

Installation position

Mount NivoGuide 8200 in such a way that the distance to vessel installations or to the vessel wall is at least 300 mm (12 in). In non-metallic vessels, the distance to the vessel wall should be at least 500 mm (19.7 in).

During operation, the probe must not touch any installations or the vessel wall. If necessary, fasten the probe end.

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom. Keep in mind that measurement all the way down to the tip of the probe may not be possible. The exact value of the min. distance (lower dead zone) is stated in chapter "Technical data".

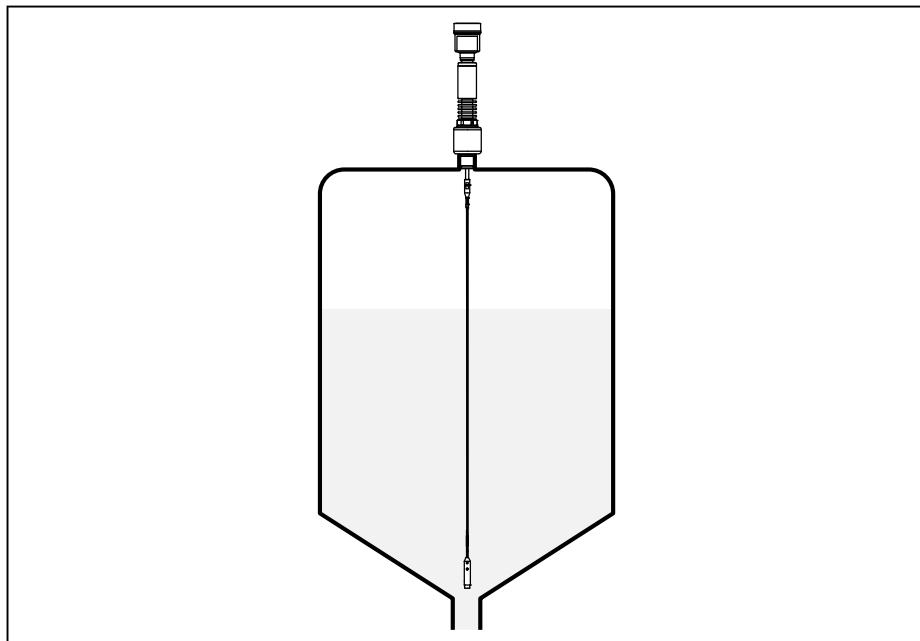


Fig. 2: Vessel with conical bottom

Type of vessel

Plastic vessel/Glass vessel

The guided microwave principle requires a metallic surface on the process fitting. Therefore, in plastic vessels, etc., use an instrument version with flange (from DN 50) or place a metal sheet ($\varnothing > 200$ mm/8 in) beneath the process fitting when screwing it in.

Make sure that the plate has direct contact with the process fitting.

When mounting rod or cable probes in vessels without metal walls, e.g. in plastic vessels, the measured value can be influenced by strong electromagnetic fields (emitted interference according to EN 61326: class A). In this case, use a probe with coaxial version.

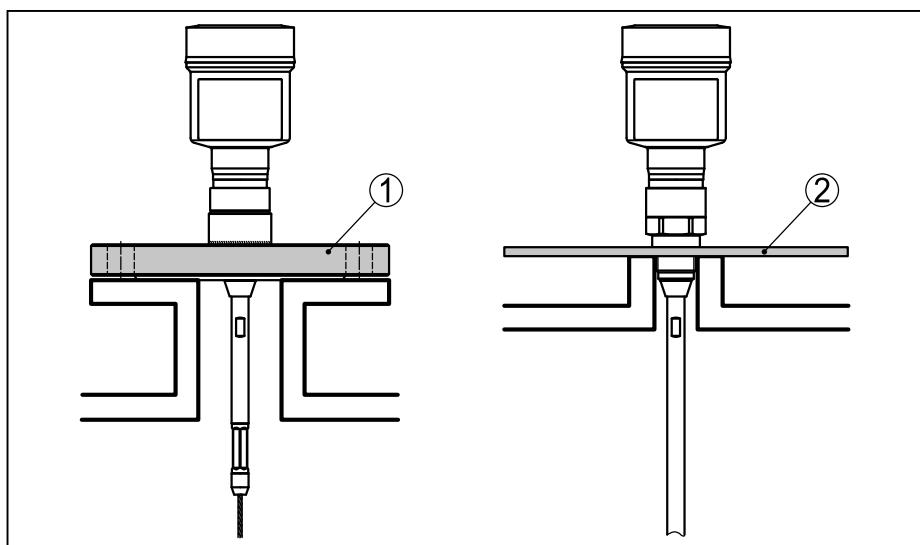


Fig. 3: Mounting in non-metallic vessel

- 1 Flange
- 2 Metal sheet

Mounting socket

If possible, avoid sockets. Mount the sensor flush with the vessel top. If this is not possible, use short sockets with small diameter.

3 Mounting

Higher sockets or sockets with a bigger diameter can generally be used. They can, however, increase the upper dead zone. Check if this is relevant for your measurement.

In such cases, always carry out a false signal suppression after mounting. You can find further information under "*Setup procedure*".

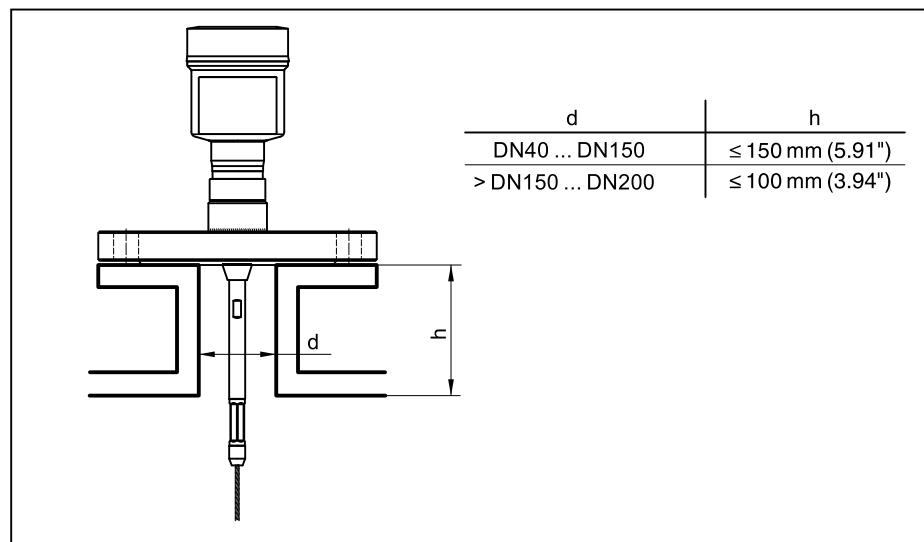


Fig. 4: Mounting socket

When welding the socket, make sure that the socket is flush with the vessel top.

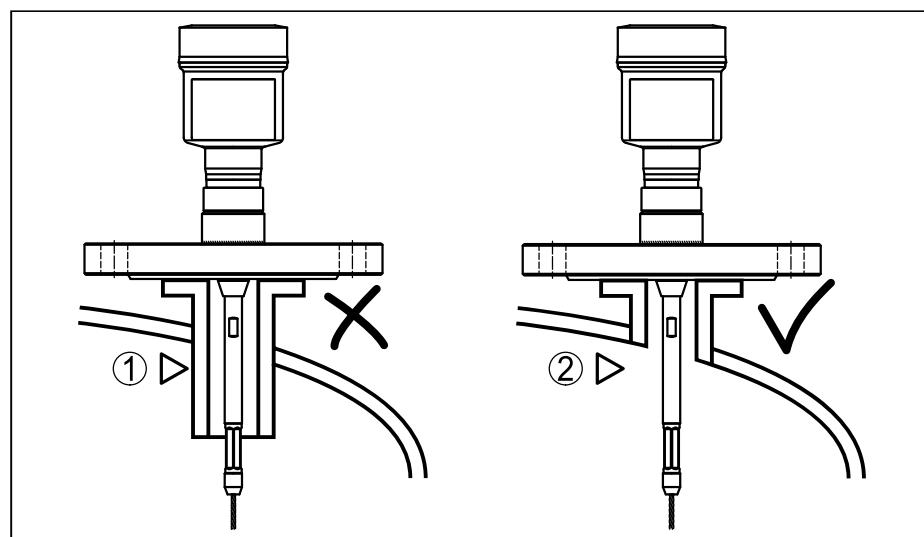


Fig. 5: Socket must be installed flush

- 1 Unfavourable mounting
- 2 Socket flush - optimum mounting

4 Connecting to power supply

4.1 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.



Information:

The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry

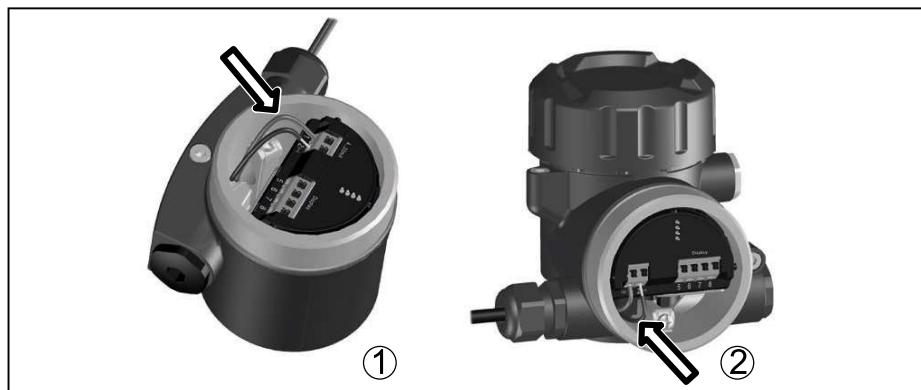


Fig. 6: Connection steps 5 and 6

- 1 Single chamber housing
- 2 Double chamber housing

6. Insert the wire ends into the terminals according to the wiring plan



Information:

Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

You can find further information on the max. wire cross-section under "Technical data - Electromechanical data".

7. Check the hold of the wires in the terminals by lightly pulling on them

4 Connecting to power supply

8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
 9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
 10. Reinsert the display and adjustment module, if one was installed
 11. Screw the housing lid back on
- The electrical connection is finished.

4.2 Wiring plan, single chamber housing



The following illustration applies to the non-Ex, Ex-ia and Ex-d-ia version.

Electronics and connection compartment

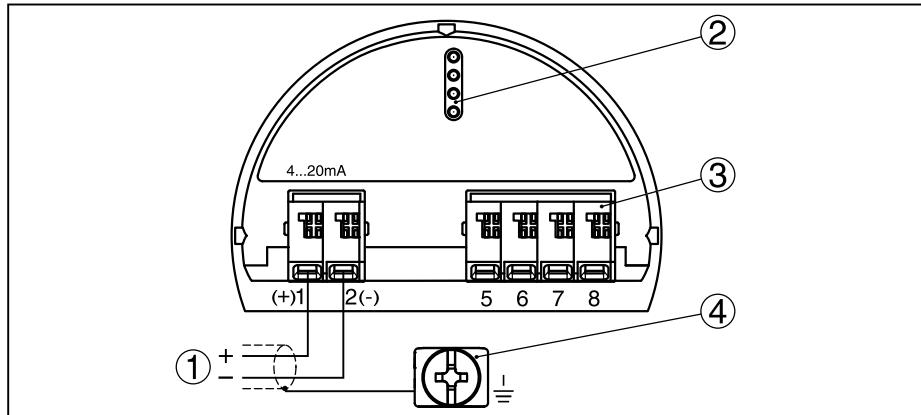


Fig. 7: Electronics and connection compartment - single chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

4.3 Wiring plan, double chamber housing



The following illustrations apply to the non-Ex as well as to the Ex-ia version.

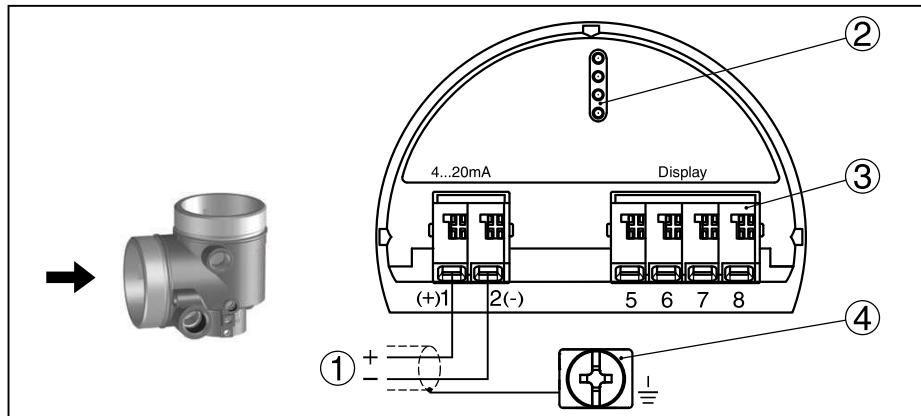
Connection compartment

Fig. 8: Connection compartment - double chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

5 Set up with the display and adjustment module

5.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 9: Installing the display and adjustment module in the electronics compartment of the single chamber housing

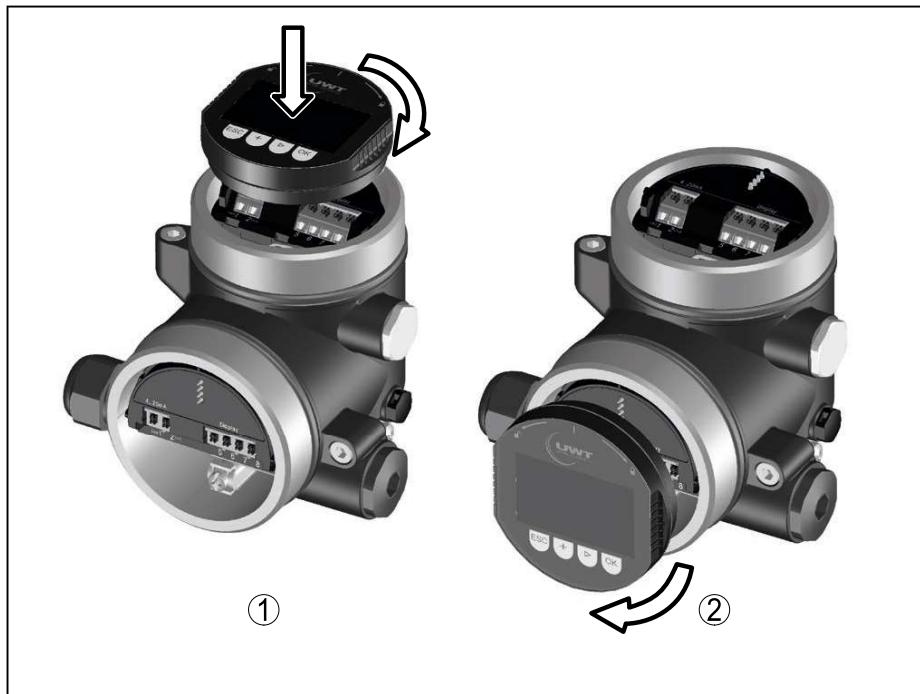


Fig. 10: Installing the display and adjustment module in the double chamber housing

- 1 In the electronics compartment
- 2 In the connection compartment



Note:

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

5.2 Parameter adjustment - Quick setup

Quick setup

To quickly and easily adapt the sensor to the application, select the menu item "Quick setup" in the start graphic on the display and adjustment module.



You can find "*Extended adjustment*" in the detailed operating instructions.

General information

Measurement loop name

In the first menu item you can assign a suitable measurement loop name. You can enter a name with max. 19 characters.

Type of medium

In the next menu item you can see which type of medium the instrument is suitable for. If your instrument is only suitable for a certain medium, this menu item is not visible.

5 Set up with the display and adjustment module

Application

In this menu item, you can select the application. You can choose between level measurement and interface measurement. You can also choose between measurement in a vessel or in a bypass or standpipe.

Measurement loop name TANK_04	Application Level vessel	Type of medium Liquid
----------------------------------	-----------------------------	--------------------------

Level measurement

Medium - dielectric constant

In this menu item, you can define the type of medium (product).

Max. adjustment

In this menu item, you can enter the max. adjustment for the level.

Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. The distance refers to the sensor reference plane (seal surface of the process fitting). Keep in mind that the max. level must lie below the dead zone.

Min. adjustment

In this menu item, you can enter the min. adjustment for the level.

Enter the suitable distance value in m for the empty vessel (e.g. distance from the flange to the probe end) corresponding to the percentage value. The distance refers tot he sensor reference plane (seal surface of the process fitting).

Medium/Dielectric constant Water-based/>10	Max. adjustment level 100.00% 80 mm F013	Min. adjustment level 0.00% 850 mm 726 mm
---	---	--

Interface measurement

Dielectric constant - upper medium

In this menu item, you can define the type of medium (product).

Max. adjustment

In this menu item, you can enter the max. adjustment for the level.

Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. The distance refers to the sensor reference plane (seal surface of the process fitting). Keep in mind that the max. level must lie below the dead zone.

Min. adjustment

In this menu item, you can enter the min. adjustment for the level.

Enter the suitable distance value in m for the empty vessel (e.g. distance from the flange to the probe end) corresponding to the percentage value. The distance refers tot he sensor reference plane (seal surface of the process fitting).

Dielectric constant Enter Calculate	Max. adjustment level 100.00% 80 mm F013	Min. adjustment level 0.00% 850 mm 726 mm
---	---	--

Max. adjustment - Interface

Carry out the max. adjustment for the interface.

To do this, enter the percentage value and the corresponding distance value in m for the full vessel.

Min. adjustment - Interface

Carry out the min. adjustment for the interface.

To do this, enter the percentage value and the corresponding distance value in m for the empty vessel.



Linearisation

Linearisation

A linearisation is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. a horizontal cylindrical or spherical tank, when the indication or output of the volume is required. Corresponding linearisation curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume.

The linearization applies for the measured value indication and the current output. By activating the suitable curve, the percentage vessel volume is displayed correctly.

False signal suppression

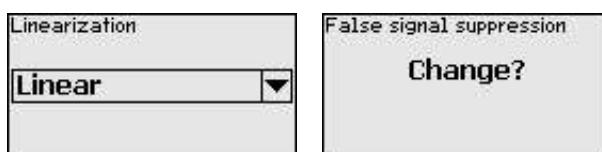
High sockets and internal vessel installations cause interfering reflections and can influence the measurement.

A false signal suppression detects, marks and saves these false signals so that they are no longer taken into account for the level and interface measurement. We generally recommend carrying out a false signal suppression to achieve the best possible accuracy. This should be done with the lowest possible level so that all potential interfering reflections can be detected.

Enter the actual distance from the sensor to the product surface.

All interfering signals in this section are detected by the sensor and stored.

The instrument carries out an automatic false signal suppression as soon as the probe is uncovered. The false signal suppression is always updated.



6 Supplement

6.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions which are included in delivery are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein, for example regarding the process conditions or the voltage supply.

All approval documents can be downloaded from our homepage.

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; (0.2 bar)

Cable entry

- M20 x 1.5 1 x cable gland M20 x 1.5 (cable: ø 6 ... 12 mm), 1 x blind plug M20 x 1.5
- ½ NPT 1 x blind plug NPT, 1 x closing cap (red) ½ NPT

Wire cross-section (spring-loaded terminals)

- Massive wire, stranded wire 0.2 ... 2.5 mm² (AWG 24 ... 14)
- Stranded wire with end sleeve 0.2 ... 1.5 mm² (AWG 24 ... 16)

Voltage supply

Operating voltage U_B

- Non-Ex instrument, Ex-d instrument 9.6 ... 35 V DC
- Ex-ia instrument 9.6 ... 30 V DC
- Ex-d-ia instrument 15 ... 35 V DC
- Ex-d-ia instrument with ship approval 15 ... 35 V DC

Operating voltage U_B with lighting switched on

- Non-Ex instrument, Ex-d instrument 16 ... 35 V DC
- Ex-ia instrument 16 ... 30 V DC
- Ex-d-ia instrument No lighting (integrated ia barrier)

Reverse voltage protection Integrated

Permissible residual ripple - Non-Ex, Ex-ia instrument

- for 9.6 V < U_B < 14 V $\leq 0.7 V_{eff}$ (16 ... 400 Hz)
- for 18 V < U_B < 36 V $\leq 1 V_{eff}$ (16 ... 400 Hz)

Permissible residual ripple - Ex-d-ia instrument

- for 18 V < U_B < 36 V $\leq 1 V_{eff}$ (16 ... 400 Hz)

Load resistor

- Calculation $(U_B - U_{min})/0.022 A$
- Example - Non-Ex instrument with $(24 V - 9.6 V)/0.022 A = 655 \Omega$
U_B= 24 V DC

NivoGuide® 8200

Two-wire 4 ... 20 mA/HART, with SIL qualification

Rod and cable probe

-196 ... +280 °C, -196 ... +450 °C

TDR sensor for continuous level and interface measurement of liquids



Quick setup guide



Document ID: 61911



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Information:

This quick setup guide enables quick setup and commissioning of your instrument.

You can find supplementary information in the corresponding, more detailed Operating Instructions Manual as well as the Safety Manual that comes with instruments with SIL qualification. These manuals are available on our homepage.

**Operating instructions NivoGuide 8200 - Two-wire 4 ... 20 mA/
HART - Rod and cable probe - With SIL qualification,
-196 ... +280 °C / -196 ... +450 °C: Document-ID 61900**
Editing status of the quick setup guide: 2019-07-30

1 For your safety

1.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified personnel authorised by the plant operator.

During work on and with the device, the required personal protective equipment must always be worn.

1.2 Appropriate use

NivoGuide 8200 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

1.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

1.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

1.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

The EU conformity declaration can be found on our homepage.

Electromagnetic compatibility

Instruments in four-wire or Ex-d-ia version are designed for use in an industrial environment. Nevertheless, electromagnetic interference from electrical conductors and radiated emissions must be taken into account, as is usual with class A instruments according to EN 61326-1. If the instrument is used in a different environment, the electromagnetic compatibility to other instruments must be ensured by suitable measures.

1.6 SIL qualification according to IEC 61508

The Safety Integrity Level (SIL) of an electronic system is used to assess the reliability of integrated safety functions.

For detailed specification of the safety requirements, multiple SIL levels are specified according to safety standard IEC 61508. You can find detailed information in chapter "*Functional safety (SIL)*" of the operating instructions.

The instrument meets the specifications of IEC 61508: 2010 (Edition 2). It is qualified for single-channel operation up to SIL2. The instrument can be used homogeneously redundant up to SIL3 in multi-channel architecture with HFT 1.

1.7 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

2 Product description

2.1 Configuration

Type label

The type label contains the most important data for identification and use of the instrument:

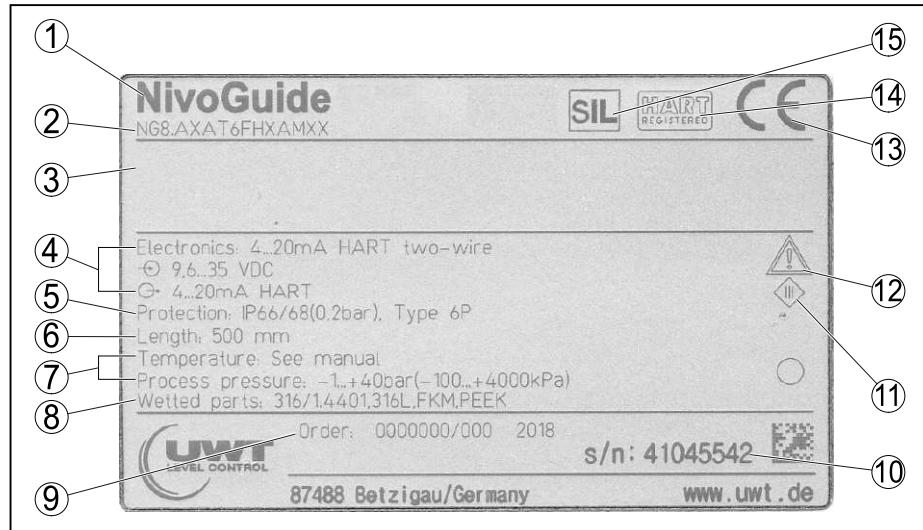


Fig. 1: Layout of the type label (example)

- 1 Instrument type
- 2 Product code
- 3 Approvals
- 4 Power supply and signal output, electronics
- 5 Protection rating
- 6 Probe length (measurement accuracy optional)
- 7 Process and ambient temperature, process pressure
- 8 Material wetted parts
- 9 Order number
- 10 Serial number of the instrument
- 11 Symbol of the device protection class
- 12 Reminder to observe the instrument documentation
- 13 Notified authority for CE marking
- 14 Approval directives
- 15 Marking of the safety function in SIS

3 Mounting

3.1 General instructions for use of the instrument

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "Connecting to power supply")
- Tighten the cable gland or plug connector
- Lead the connection cable downward in front of the cable entry or plug connector

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.



Note:

Make sure that the degree of contamination specified in chapter "Technical data" meets the existing ambient conditions.



Note:

Make sure that during installation or maintenance no moisture or dirt can get inside the instrument.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

3.2 Mounting instructions

Installation position

Mount NivoGuide 8200 in such a way that the distance to vessel installations or to the vessel wall is at least 300 mm (12 in). In non-metallic vessels, the distance to the vessel wall should be at least 500 mm (19.7 in).

During operation, the probe must not touch any installations or the vessel wall. If necessary, fasten the probe end.

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom. Keep in mind that measurement all the way down to the tip of the probe may not be possible. The exact value of the min. distance (lower dead zone) is stated in chapter "Technical data".

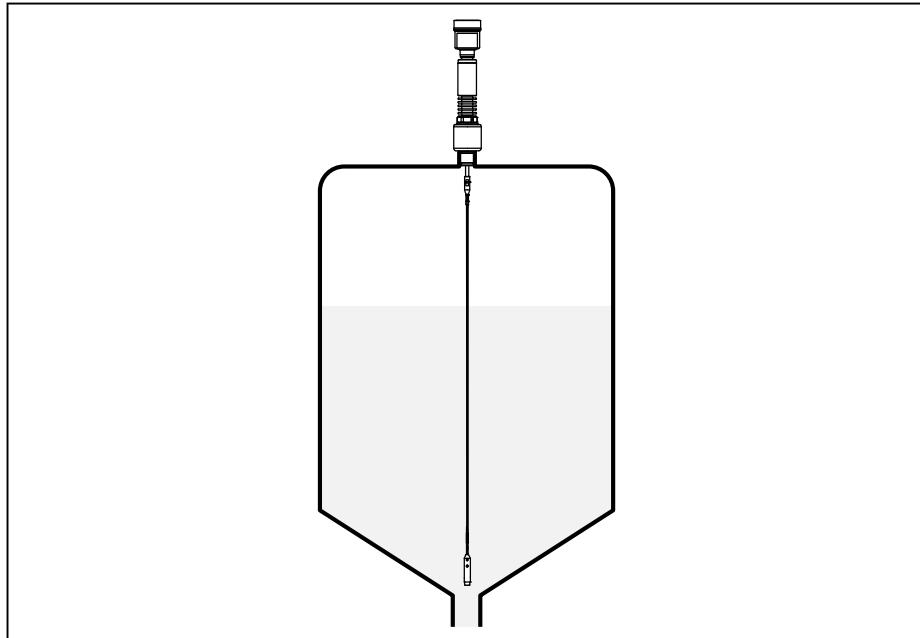


Fig. 2: Vessel with conical bottom

Type of vessel

Plastic vessel/Glass vessel

The guided microwave principle requires a metallic surface on the process fitting. Therefore, in plastic vessels, etc., use an instrument version with flange (from DN 50) or place a metal sheet ($\varnothing > 200$ mm/8 in) beneath the process fitting when screwing it in.

Make sure that the plate has direct contact with the process fitting.

When mounting rod or cable probes in vessels without metal walls, e.g. in plastic vessels, the measured value can be influenced by strong electromagnetic fields (emitted interference according to EN 61326: class A). In this case, use a probe with coaxial version.

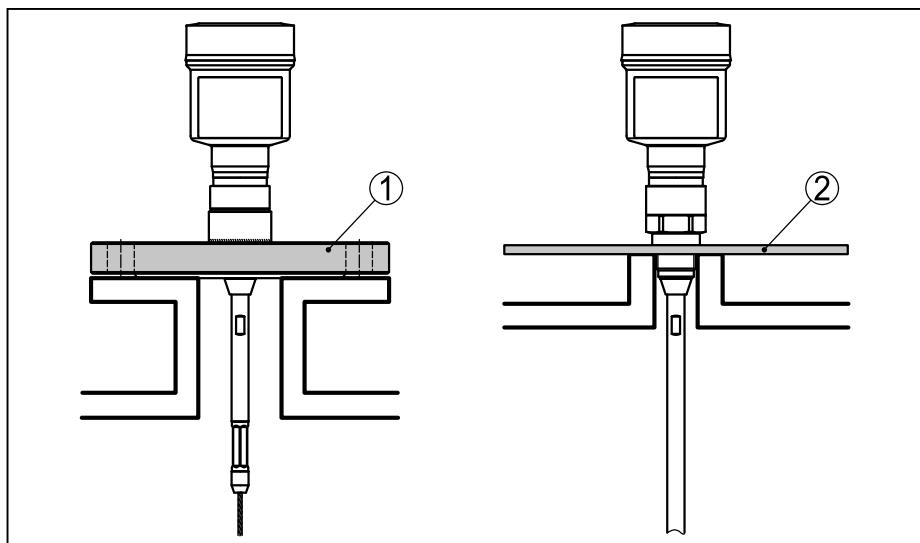


Fig. 3: Mounting in non-metallic vessel

- 1 Flange
- 2 Metal sheet

Mounting socket

If possible, avoid sockets. Mount the sensor flush with the vessel top. If this is not possible, use short sockets with small diameter.

3 Mounting

Higher sockets or sockets with a bigger diameter can generally be used. They can, however, increase the upper dead zone. Check if this is relevant for your measurement.

In such cases, always carry out a false signal suppression after mounting. You can find further information under "*Setup procedure*".

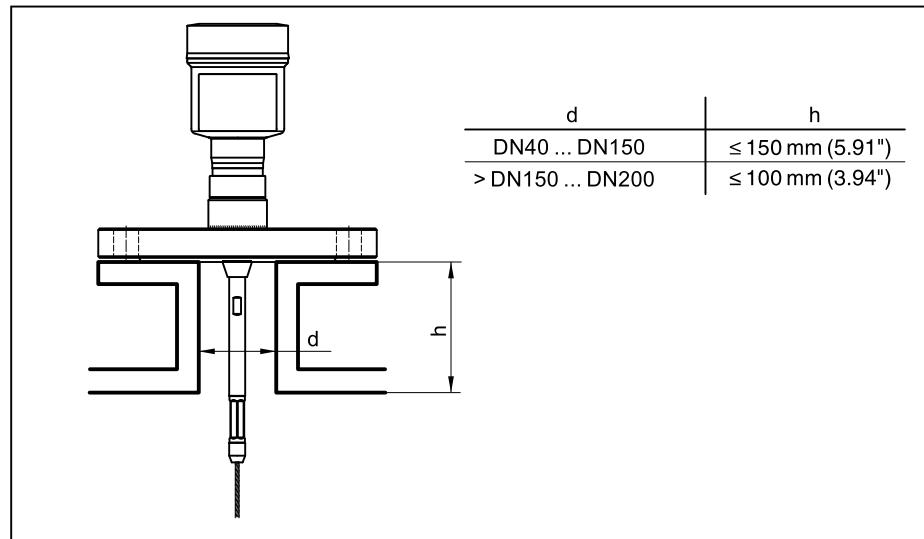


Fig. 4: Mounting socket

When welding the socket, make sure that the socket is flush with the vessel top.

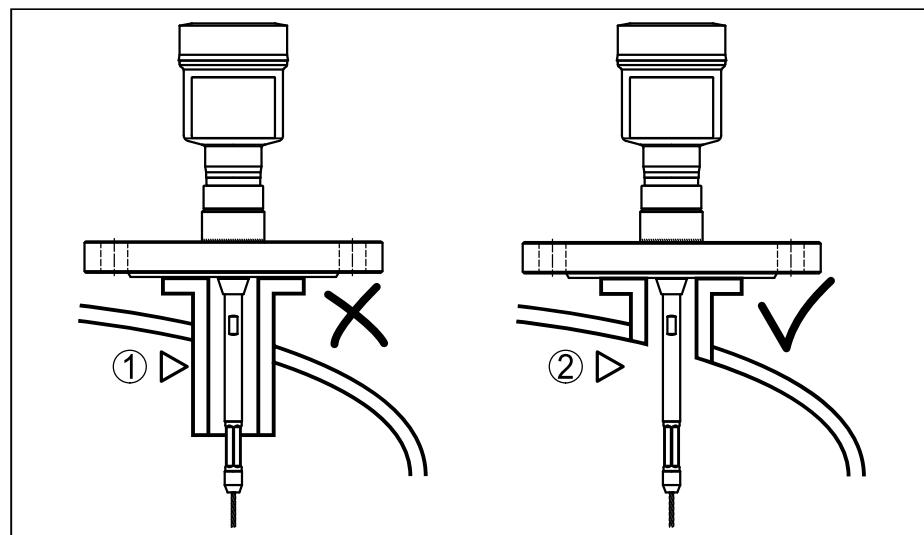


Fig. 5: Socket must be installed flush

- 1 Unfavourable mounting
- 2 Socket flush - optimum mounting

4 Connecting to power supply

4.1 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.



Information:

The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry

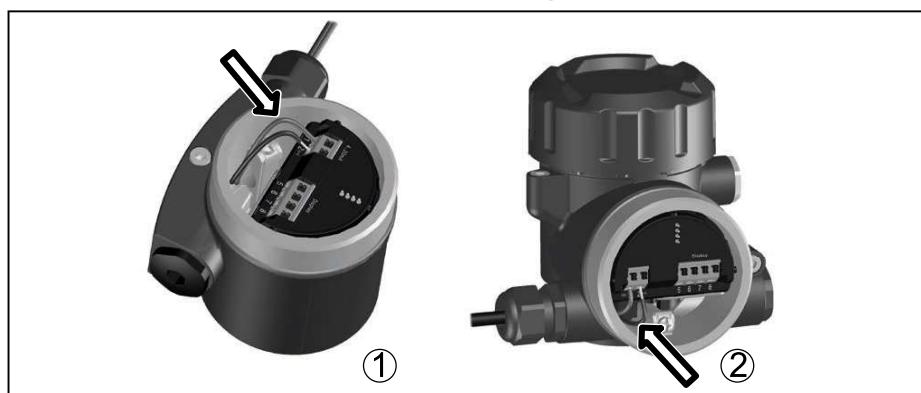


Fig. 6: Connection steps 5 and 6

- 1 Single chamber housing
- 2 Double chamber housing

6. Insert the wire ends into the terminals according to the wiring plan



Information:

Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

You can find further information on the max. wire cross-section under "Technical data - Electromechanical data".

7. Check the hold of the wires in the terminals by lightly pulling on them

4 Connecting to power supply

8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
 9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
 10. Reinsert the display and adjustment module, if one was installed
 11. Screw the housing lid back on
- The electrical connection is finished.

4.2 Wiring plan, single chamber housing



The following illustration applies to the non-Ex, Ex-ia and Ex-d-ia version.

Electronics and connection compartment

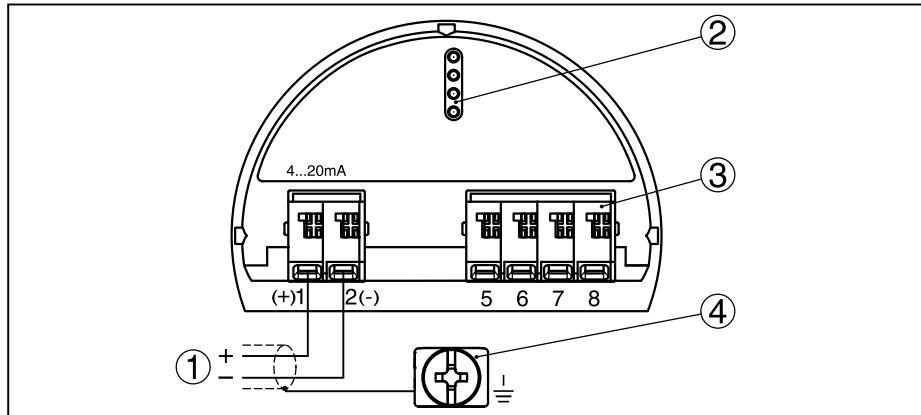


Fig. 7: Electronics and connection compartment - single chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

4.3 Wiring plan, double chamber housing



The following illustrations apply to the non-Ex as well as to the Ex-ia version.

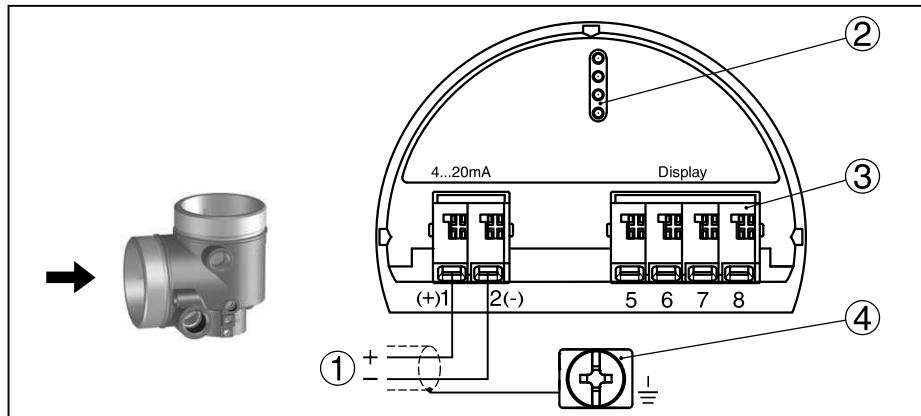
Connection compartment

Fig. 8: Connection compartment - double chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

5 Set up with the display and adjustment module

5.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 9: Installing the display and adjustment module in the electronics compartment of the single chamber housing

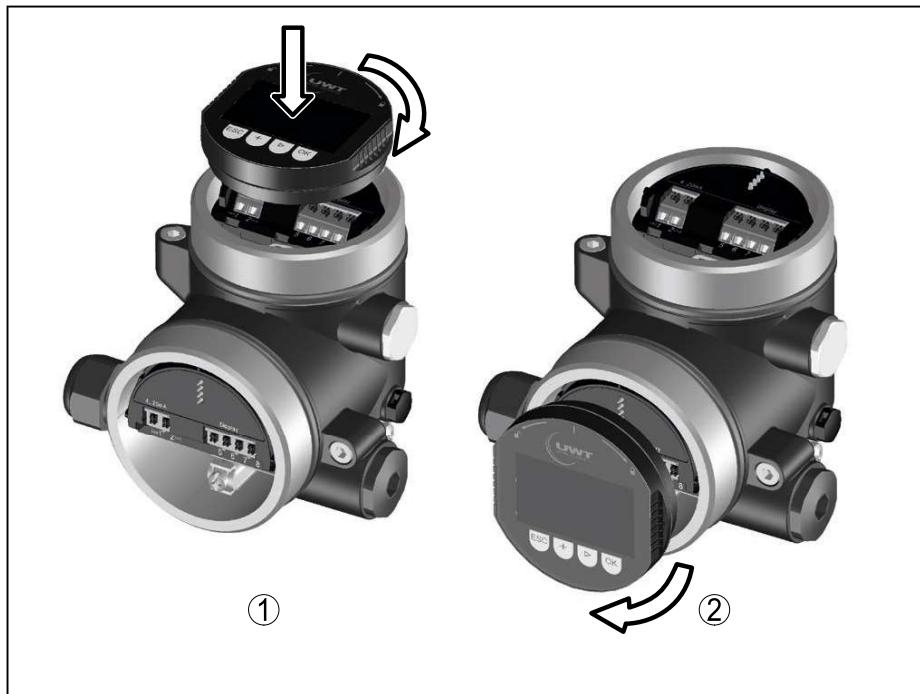


Fig. 10: Installing the display and adjustment module in the double chamber housing

- 1 In the electronics compartment
- 2 In the connection compartment



Note:

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

5.2 Parameter adjustment

Set parameters

1. In this menu item you can select the application. You can choose between level and interface measurement.

Measurement loop name TANK 04	Type of medium Liquid	Application Level vessel
--------------------------------------	------------------------------	---------------------------------

2. In the menu item "Medium - Dielectric constant" you can define the type of medium (medium).
3. Carry out the adjustment in the menu items "Min. adjustment" and "Max. adjustment".

Setup Probe length Application Adjustment level Adjustment interface Damping	Max. adjustment level 100.00 % 80 mm F013	Min. adjustment level 0.00 % 850 mm 726 mm
---	--	---

4. A "Linearization" is recommended for all vessels in which the vessel volume does not increase linearly with the level - e.g. in a horizontal cylindrical or spherical tank. Activate the appropriate curve.

5 Set up with the display and adjustment module

5. A "False signal suppression" detects, marks and saves the false signals so that they are no longer taken into account for level measurement. We generally recommend a false signal suppression.

Parameterization example The sensor measures the distance from the sensor (reference plane) to the product surface.

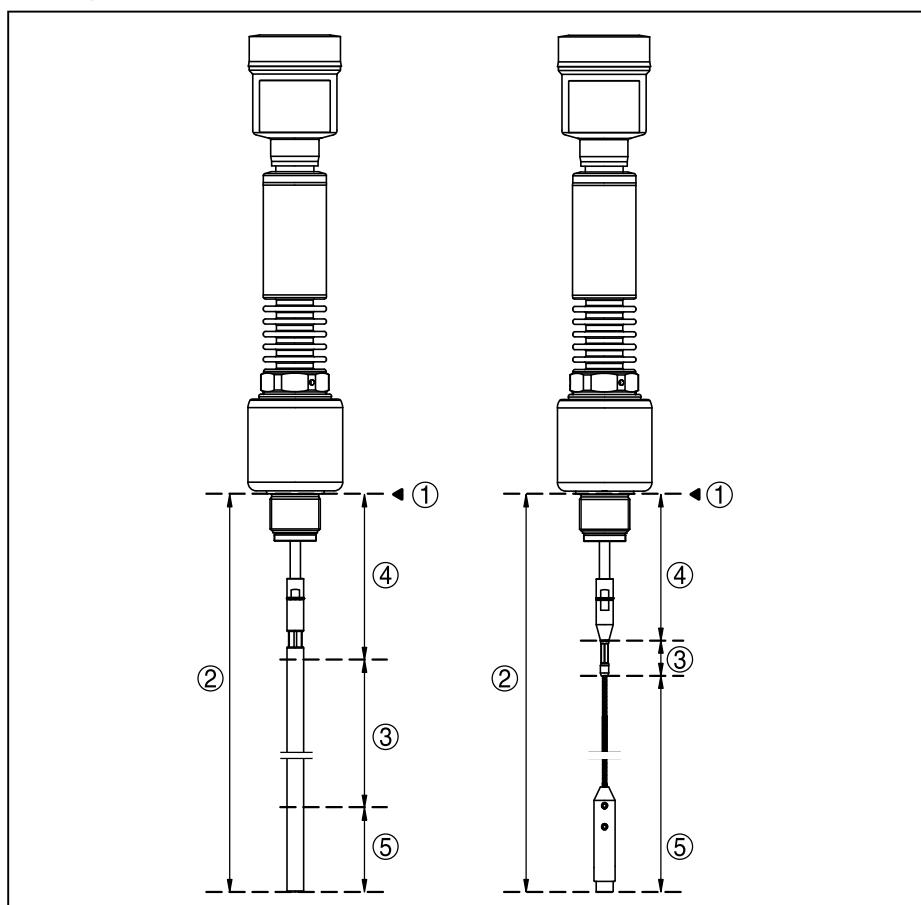


Fig. 11: Measuring ranges - NivoGuide 8200

- 1 Reference plane
- 2 Probe length L
- 3 Measuring range (default setting refers to the measuring range in water)
- 4 Upper dead zone (in this area no measurement is possible)
- 5 Lower dead zone (in this area no measurement is possible)

For this adjustment, the distance is entered when the vessel is full and nearly empty. If these values are not known, an adjustment with other distances, for example, 10 % and 90 % is also possible. Starting point for these distance specifications is always the seal surface of the thread or flange.

Further steps

1. In the menu "Additional settings", menu item "Damping" you can adjust the requested damping of the output signal.
2. Select the parameter of the current output and the output characteristics in the menu item "Current output".

6 Supplement

6.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions which are included in delivery are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein, for example regarding the process conditions or the voltage supply.

All approval documents can be downloaded from our homepage.

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; (0.2 bar)

Cable entry

- M20 x 1.5 1 x cable gland M20 x 1.5 (cable: ø 6 ... 12 mm), 1 x blind plug M20 x 1.5
- ½ NPT 1 x blind plug NPT, 1 x closing cap (red) ½ NPT

Wire cross-section (spring-loaded terminals)

- Massive wire, stranded wire 0.2 ... 2.5 mm² (AWG 24 ... 14)
- Stranded wire with end sleeve 0.2 ... 1.5 mm² (AWG 24 ... 16)

Voltage supply

Operating voltage U_B

- Non-Ex instrument, Ex-d instrument 9.6 ... 35 V DC
- Ex-ia instrument 9.6 ... 30 V DC
- Ex-d-ia instrument 15 ... 35 V DC
- Ex-d-ia instrument with ship approval 15 ... 35 V DC

Operating voltage U_B with lighting switched on

- Non-Ex instrument, Ex-d instrument 16 ... 35 V DC
- Ex-ia instrument 16 ... 30 V DC
- Ex-d-ia instrument No lighting (integrated ia barrier)

Reverse voltage protection Integrated

Permissible residual ripple - Non-Ex, Ex-ia instrument

- for 9.6 V < U_B < 14 V ≤ 0.7 V_{eff} (16 ... 400 Hz)
- for 18 V < U_B < 36 V ≤ 1 V_{eff} (16 ... 400 Hz)

Permissible residual ripple - Ex-d-ia instrument

- for 18 V < U_B < 36 V ≤ 1 V_{eff} (16 ... 400 Hz)

Load resistor

- Calculation (U_B - U_{min})/0.022 A
- Example - Non-Ex instrument with U_B=24 V DC (24 V - 9.6 V)/0.022 A = 655 Ω

NivoGuide® 8200

Two-wire 4 ... 20 mA/HART

Coax probe

-196 ... +280 °C, -196 ... +450 °C

TDR sensor for continuous level and interface measurement of liquids



Quick setup guide



Document ID: 61912



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Information:

This quick setup guide enables quick setup and commissioning of your instrument.

You can find supplementary information in the corresponding, more detailed Operating Instructions Manual as well as the Safety Manual that comes with instruments with SIL qualification. These manuals are available on our homepage.

**Operating instructions NivoGuide 8200 - Two-wire 4 ... 20 mA/
HART - Coaxial probe, -196 ... +280 °C / -196 ... +450 °C:
Document-ID 61901**
Editing status of the quick setup guide: 2019-07-30

1 For your safety

1.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified personnel authorised by the plant operator.

During work on and with the device, the required personal protective equipment must always be worn.

1.2 Appropriate use

NivoGuide 8200 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

1.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

1.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

1.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

The EU conformity declaration can be found on our homepage.

Electromagnetic compatibility

Instruments in four-wire or Ex-d-ia version are designed for use in an industrial environment. Nevertheless, electromagnetic interference from electrical conductors and radiated emissions must be taken into account, as is usual with class A instruments according to EN 61326-1. If the instrument is used in a different environment, the electromagnetic compatibility to other instruments must be ensured by suitable measures.

1.6 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

2 Product description

2.1 Configuration

Type label

The type label contains the most important data for identification and use of the instrument:

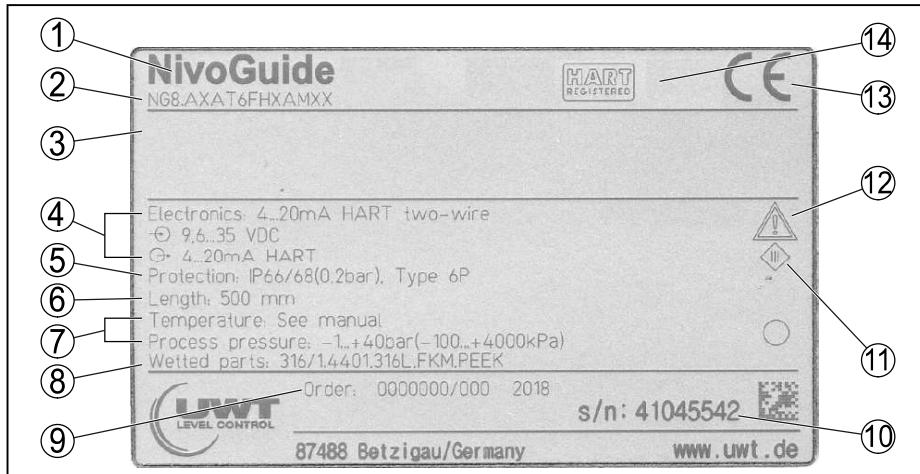


Fig. 1: Layout of the type label (example)

- 1 Instrument type
- 2 Product code
- 3 Approvals (option)
- 4 Power supply and signal output, electronics
- 5 Protection rating
- 6 Probe length (measurement accuracy optional)
- 7 Process and ambient temperature, process pressure
- 8 Material wetted parts
- 9 Order number
- 10 Serial number of the instrument
- 11 Symbol of the device protection class
- 12 ID numbers, instrument documentation
- 13 CE identification
- 14 Approval directives (optional)

3 Mounting

3.1 General instructions for use of the instrument

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "Connecting to power supply")
- Tighten the cable gland or plug connector
- Lead the connection cable downward in front of the cable entry or plug connector

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.



Note:

Make sure that the degree of contamination specified in chapter "Technical data" meets the existing ambient conditions.



Note:

Make sure that during installation or maintenance no moisture or dirt can get inside the instrument.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

3.2 Mounting instructions

Installation position

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom. Keep in mind that measurement all the way down to the tip of the probe may not be possible. The exact value of the min. distance (lower dead zone) is stated in chapter "Technical data".

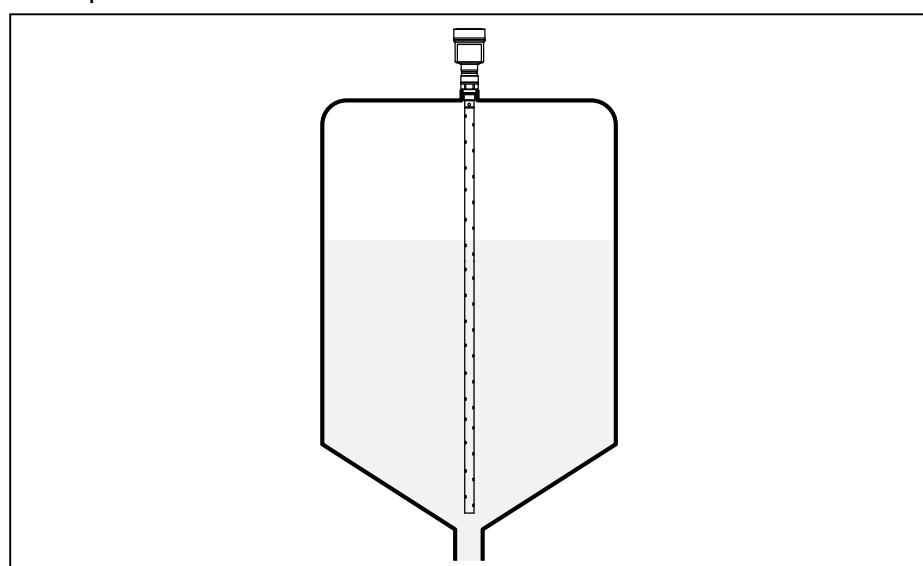


Fig. 2: Vessel with conical bottom

4 Connecting to power supply

4.1 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.



Information:

The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry

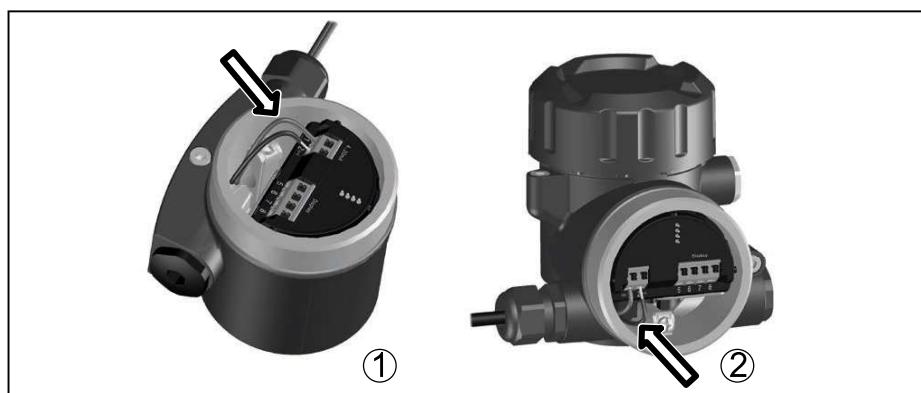


Fig. 3: Connection steps 5 and 6

- 1 Single chamber housing
- 2 Double chamber housing

6. Insert the wire ends into the terminals according to the wiring plan



Information:

Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

You can find further information on the max. wire cross-section under "Technical data - Electromechanical data".

7. Check the hold of the wires in the terminals by lightly pulling on them

4 Connecting to power supply

8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
 9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
 10. Reinsert the display and adjustment module, if one was installed
 11. Screw the housing lid back on
- The electrical connection is finished.

4.2 Wiring plan, single chamber housing



The following illustration applies to the non-Ex, Ex-ia and Ex-d-ia version.

Electronics and connection compartment

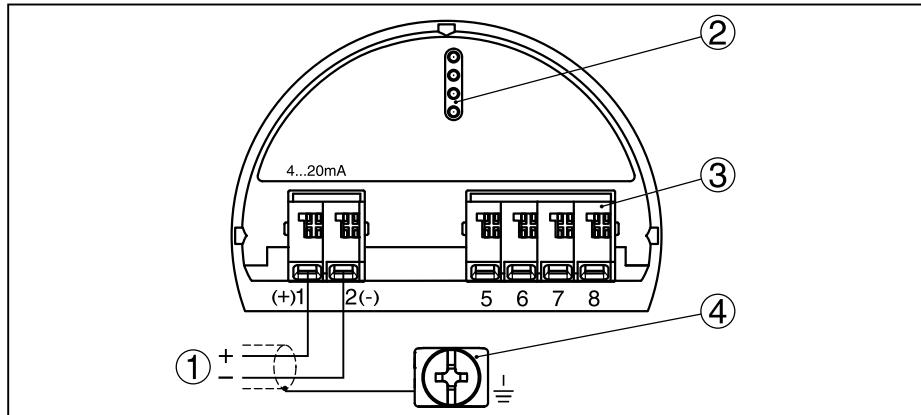


Fig. 4: Electronics and connection compartment - single chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

4.3 Wiring plan, double chamber housing



The following illustrations apply to the non-Ex as well as to the Ex-ia version.

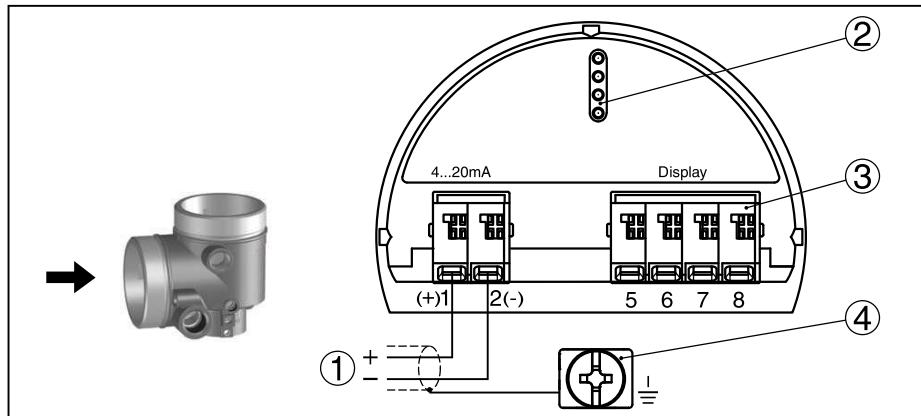
Connection compartment

Fig. 5: Connection compartment - double chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

5 Set up with the display and adjustment module

5.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 6: Installing the display and adjustment module in the electronics compartment of the single chamber housing

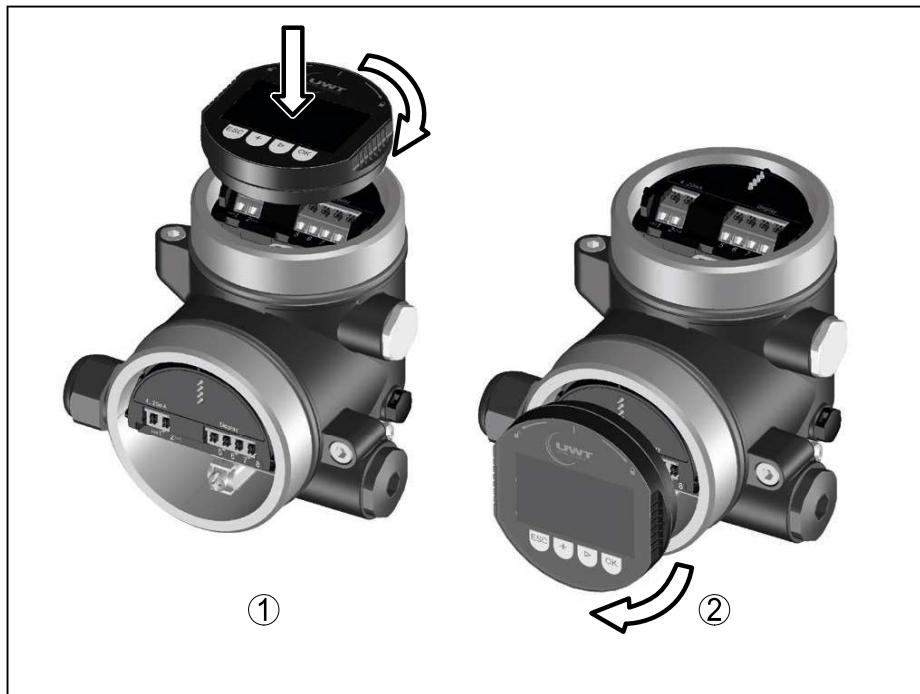


Fig. 7: Installing the display and adjustment module in the double chamber housing

- 1 In the electronics compartment
- 2 In the connection compartment



Note:

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

5.2 Parameter adjustment - Quick setup

Quick setup

To quickly and easily adapt the sensor to the application, select the menu item "Quick setup" in the start graphic on the display and adjustment module.



You can find "*Extended adjustment*" in the detailed operating instructions.

General information

Measurement loop name

In the first menu item you can assign a suitable measurement loop name. You can enter a name with max. 19 characters.

Type of medium

In the next menu item you can see which type of medium the instrument is suitable for. If your instrument is only suitable for a certain medium, this menu item is not visible.

5 Set up with the display and adjustment module

Application

In this menu item, you can select the application. You can choose between level measurement and interface measurement. You can also choose between measurement in a vessel or in a bypass or standpipe.

Measurement loop name TANK_04	Application Level vessel	Type of medium Liquid
----------------------------------	-----------------------------	--------------------------

Level measurement

Medium - dielectric constant

In this menu item, you can define the type of medium (product).

Max. adjustment

In this menu item, you can enter the max. adjustment for the level.

Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. The distance refers to the sensor reference plane (seal surface of the process fitting). Keep in mind that the max. level must lie below the dead zone.

Min. adjustment

In this menu item, you can enter the min. adjustment for the level.

Enter the suitable distance value in m for the empty vessel (e.g. distance from the flange to the probe end) corresponding to the percentage value. The distance refers tot he sensor reference plane (seal surface of the process fitting).

Medium/Dielectric constant Water-based/>10	Max. adjustment level 100.00% 80 mm F013	Min. adjustment level 0.00% 850 mm 726 mm
---	---	--

Interface measurement

Dielectric constant - upper medium

In this menu item, you can define the type of medium (product).

Max. adjustment

In this menu item, you can enter the max. adjustment for the level.

Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. The distance refers to the sensor reference plane (seal surface of the process fitting). Keep in mind that the max. level must lie below the dead zone.

Min. adjustment

In this menu item, you can enter the min. adjustment for the level.

Enter the suitable distance value in m for the empty vessel (e.g. distance from the flange to the probe end) corresponding to the percentage value. The distance refers tot he sensor reference plane (seal surface of the process fitting).

Dielectric constant Enter Calculate	Max. adjustment level 100.00% 80 mm F013	Min. adjustment level 0.00% 850 mm 726 mm
---	---	--

Max. adjustment - Interface

Carry out the max. adjustment for the interface.

To do this, enter the percentage value and the corresponding distance value in m for the full vessel.

Min. adjustment - Interface

Carry out the min. adjustment for the interface.

To do this, enter the percentage value and the corresponding distance value in m for the empty vessel.



Linearisation

Linearisation

A linearisation is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. a horizontal cylindrical or spherical tank, when the indication or output of the volume is required. Corresponding linearisation curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume.

The linearization applies for the measured value indication and the current output. By activating the suitable curve, the percentage vessel volume is displayed correctly.

False signal suppression

High sockets and internal vessel installations cause interfering reflections and can influence the measurement.

A false signal suppression detects, marks and saves these false signals so that they are no longer taken into account for the level and interface measurement. We generally recommend carrying out a false signal suppression to achieve the best possible accuracy. This should be done with the lowest possible level so that all potential interfering reflections can be detected.

Enter the actual distance from the sensor to the product surface.

All interfering signals in this section are detected by the sensor and stored.

The instrument carries out an automatic false signal suppression as soon as the probe is uncovered. The false signal suppression is always updated.



6 Supplement

6.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions which are included in delivery are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein, for example regarding the process conditions or the voltage supply.

All approval documents can be downloaded from our homepage.

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; (0.2 bar)

Cable entry

- M20 x 1.5 1 x cable gland M20 x 1.5 (cable: ø 6 ... 12 mm), 1 x blind plug M20 x 1.5
- ½ NPT 1 x blind plug NPT, 1 x closing cap (red) ½ NPT

Wire cross-section (spring-loaded terminals)

- Massive wire, stranded wire 0.2 ... 2.5 mm² (AWG 24 ... 14)
- Stranded wire with end sleeve 0.2 ... 1.5 mm² (AWG 24 ... 16)

Voltage supply

Operating voltage U_B

- Non-Ex instrument, Ex-d instrument 9.6 ... 35 V DC
- Ex-ia instrument 9.6 ... 30 V DC
- Ex-d-ia instrument 15 ... 35 V DC
- Ex-d-ia instrument with ship approval 15 ... 35 V DC

Operating voltage U_B with lighting switched on

- Non-Ex instrument, Ex-d instrument 16 ... 35 V DC
- Ex-ia instrument 16 ... 30 V DC
- Ex-d-ia instrument No lighting (integrated ia barrier)

Reverse voltage protection Integrated

Permissible residual ripple - Non-Ex, Ex-ia instrument

- for 9.6 V < U_B < 14 V $\leq 0.7 V_{eff}$ (16 ... 400 Hz)
- for 18 V < U_B < 36 V $\leq 1 V_{eff}$ (16 ... 400 Hz)

Permissible residual ripple - Ex-d-ia instrument

- for 18 V < U_B < 36 V $\leq 1 V_{eff}$ (16 ... 400 Hz)

Load resistor

- Calculation $(U_B - U_{min})/0.022 A$
- Example - Non-Ex instrument with
U_B=24 V DC $(24 V - 9.6 V)/0.022 A = 655 \Omega$

NivoGuide® 8200

Two-wire 4 ... 20 mA/HART, with SIL qualification

Coax probe

-196 ... +280 °C, -196 ... +450 °C

TDR sensor for continuous level and interface measurement of liquids



Quick setup guide



Document ID: 61913



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Information:

This quick setup guide enables quick setup and commissioning of your instrument.

You can find supplementary information in the corresponding, more detailed Operating Instructions Manual as well as the Safety Manual that comes with instruments with SIL qualification. These manuals are available on our homepage.

**Operating instructions NivoGuide 8200 - Two-wire 4 ... 20 mA/
HART - Coaxial probe - With SIL qualification, -196 ... +280 °C /
-196 ... +450 °C: Document-ID 61902**
Editing status of the quick setup guide: 2019-07-30

1 For your safety

1.1 Authorised personnel

All operations described in this documentation must be carried out only by trained, qualified personnel authorised by the plant operator.

During work on and with the device, the required personal protective equipment must always be worn.

1.2 Appropriate use

NivoGuide 8200 is a sensor for continuous level measurement.

You can find detailed information about the area of application in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

1.3 Warning about incorrect use

Inappropriate or incorrect use of this product can give rise to application-specific hazards, e.g. vessel overfill through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the protective characteristics of the instrument can be impaired.

1.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

The safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules must be observed by the user.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

To avoid any danger, the safety approval markings and safety tips on the device must also be observed and their meaning read in this operating instructions manual.

1.5 EU conformity

The device fulfils the legal requirements of the applicable EU directives. By affixing the CE marking, we confirm the conformity of the instrument with these directives.

The EU conformity declaration can be found on our homepage.

Electromagnetic compatibility

Instruments in four-wire or Ex-d-ia version are designed for use in an industrial environment. Nevertheless, electromagnetic interference from electrical conductors and radiated emissions must be taken into account, as is usual with class A instruments according to EN 61326-1. If the instrument is used in a different environment, the electromagnetic compatibility to other instruments must be ensured by suitable measures.

1.6 SIL qualification according to IEC 61508

The Safety Integrity Level (SIL) of an electronic system is used to assess the reliability of integrated safety functions.

For detailed specification of the safety requirements, multiple SIL levels are specified according to safety standard IEC 61508. You can find detailed information in chapter "*Functional safety (SIL)*" of the operating instructions.

The instrument meets the specifications of IEC 61508: 2010 (Edition 2). It is qualified for single-channel operation up to SIL2. The instrument can be used homogeneously redundant up to SIL3 in multi-channel architecture with HFT 1.

1.7 NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for fault information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components
- NE 107 – Self-monitoring and diagnosis of field devices

For further information see www.namur.de.

2 Product description

2.1 Configuration

Type label

The type label contains the most important data for identification and use of the instrument:

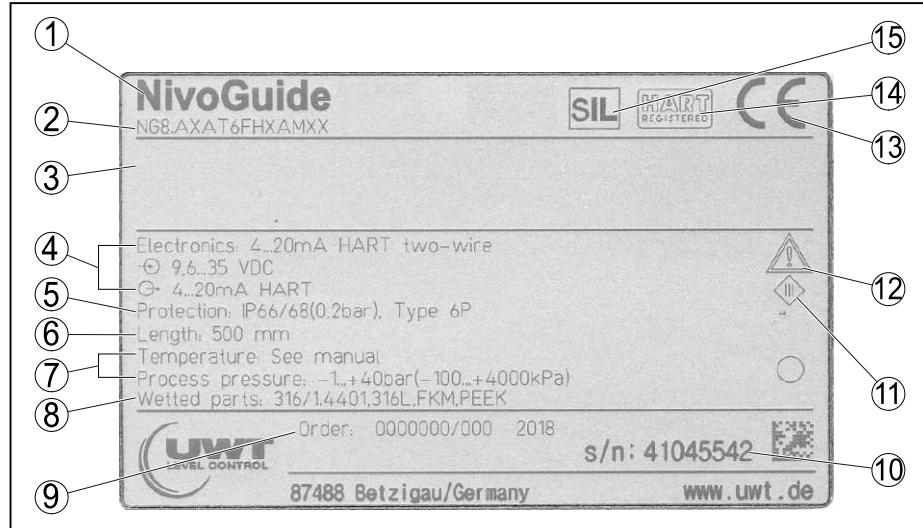


Fig. 1: Layout of the type label (example)

- 1 Instrument type
- 2 Product code
- 3 Approvals
- 4 Power supply and signal output, electronics
- 5 Protection rating
- 6 Probe length (measurement accuracy optional)
- 7 Process and ambient temperature, process pressure
- 8 Material wetted parts
- 9 Order number
- 10 Serial number of the instrument
- 11 Symbol of the device protection class
- 12 Reminder to observe the instrument documentation
- 13 Notified authority for CE marking
- 14 Approval directives
- 15 Marking of the safety function in SIS

3 Mounting

3.1 General instructions for use of the instrument

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "Connecting to power supply")
- Tighten the cable gland or plug connector
- Lead the connection cable downward in front of the cable entry or plug connector

This applies mainly to outdoor installations, in areas where high humidity is expected (e.g. through cleaning processes) and on cooled or heated vessels.



Note:

Make sure that the degree of contamination specified in chapter "Technical data" meets the existing ambient conditions.



Note:

Make sure that during installation or maintenance no moisture or dirt can get inside the instrument.

To maintain the housing protection, make sure that the housing lid is closed during operation and locked, if necessary.

3.2 Mounting instructions

Installation position

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible nearly down to the lowest point of the bottom. Keep in mind that measurement all the way down to the tip of the probe may not be possible. The exact value of the min. distance (lower dead zone) is stated in chapter "Technical data".

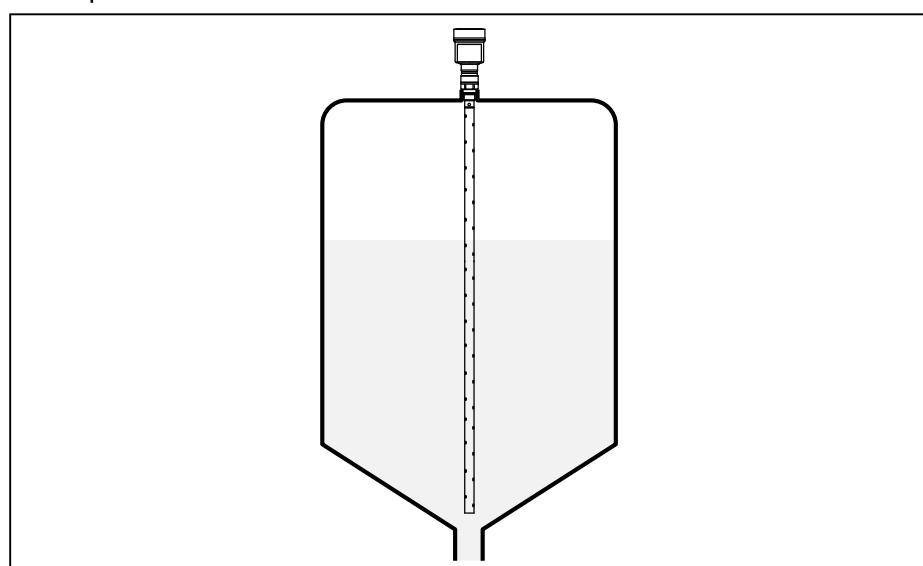


Fig. 2: Vessel with conical bottom

4 Connecting to power supply

4.1 Connecting

Connection technology

The voltage supply and signal output are connected via the spring-loaded terminals in the housing.

Connection to the display and adjustment module or to the interface adapter is carried out via contact pins in the housing.



Information:

The terminal block is pluggable and can be removed from the electronics. To do this, lift the terminal block with a small screwdriver and pull it out. When reinserting the terminal block, you should hear it snap in.

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug
4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry

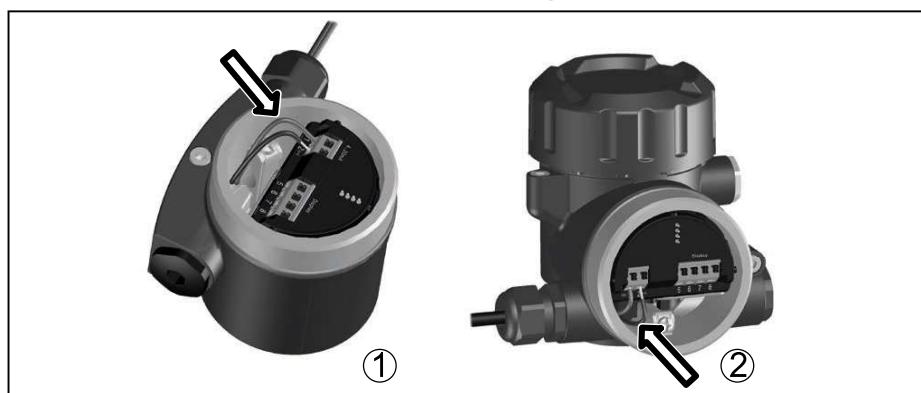


Fig. 3: Connection steps 5 and 6

- 1 Single chamber housing
- 2 Double chamber housing

6. Insert the wire ends into the terminals according to the wiring plan



Information:

Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

You can find further information on the max. wire cross-section under "Technical data - Electromechanical data".

7. Check the hold of the wires in the terminals by lightly pulling on them

4 Connecting to power supply

8. Connect the screen to the internal ground terminal, connect the external ground terminal to potential equalisation
 9. Tighten the compression nut of the cable entry gland. The seal ring must completely encircle the cable
 10. Reinsert the display and adjustment module, if one was installed
 11. Screw the housing lid back on
- The electrical connection is finished.

4.2 Wiring plan, single chamber housing



The following illustration applies to the non-Ex, Ex-ia and Ex-d-ia version.

Electronics and connection compartment

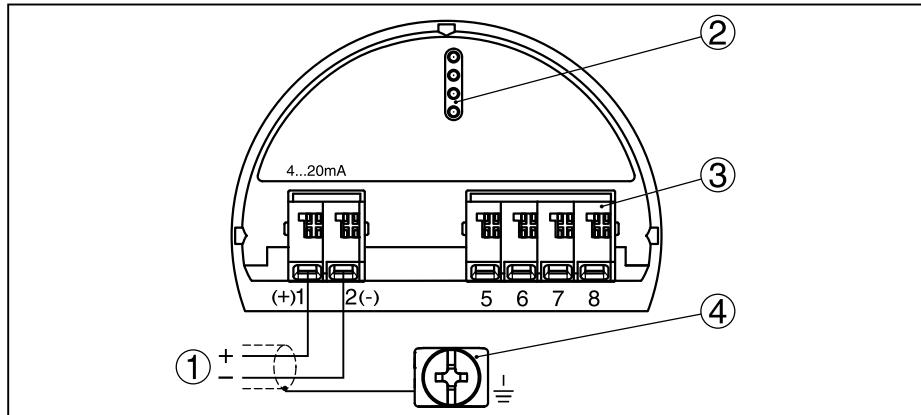


Fig. 4: Electronics and connection compartment - single chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

4.3 Wiring plan, double chamber housing



The following illustrations apply to the non-Ex as well as to the Ex-ia version.

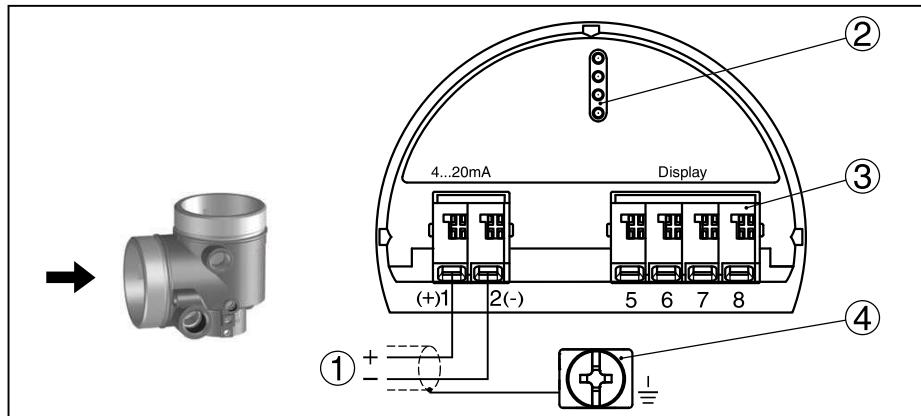
Connection compartment

Fig. 5: Connection compartment - double chamber housing

- 1 Voltage supply, signal output
- 2 For display and adjustment module or interface adapter
- 3 For external display and adjustment unit
- 4 Ground terminal for connection of the cable screening

5 Set up with the display and adjustment module

5.1 Insert display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. You can choose any one of four different positions - each displaced by 90°. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing lid
2. Place the display and adjustment module on the electronics in the desired position and turn it to the right until it snaps in.
3. Screw housing lid with inspection window tightly back on

Disassembly is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 6: Installing the display and adjustment module in the electronics compartment of the single chamber housing

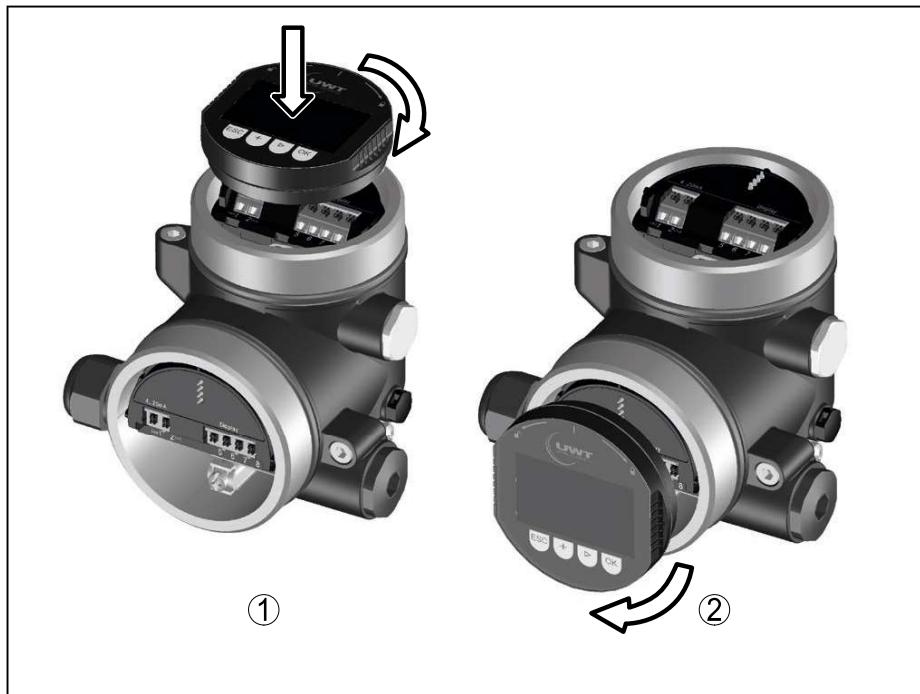


Fig. 7: Installing the display and adjustment module in the double chamber housing

- 1 In the electronics compartment
- 2 In the connection compartment



Note:

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher lid with an inspection glass is required.

5.2 Parameter adjustment

Set parameters

1. In this menu item you can select the application. You can choose between level and interface measurement.

Measurement loop name TANK_04	Type of medium Liquid	Application Level vessel
--------------------------------------	------------------------------	---------------------------------

2. In the menu item "Medium - Dielectric constant" you can define the type of medium (medium).
3. Carry out the adjustment in the menu items "Min. adjustment" and "Max. adjustment".

Setup Probe length Application Adjustment level Adjustment interface Damping	Max. adjustment level 100.00 % 80 mm F013	Min. adjustment level 0.00 % 850 mm 726 mm
---	--	---

4. A "Linearization" is recommended for all vessels in which the vessel volume does not increase linearly with the level - e.g. in a horizontal cylindrical or spherical tank. Activate the appropriate curve.

5 Set up with the display and adjustment module

5. A "False signal suppression" detects, marks and saves the false signals so that they are no longer taken into account for level measurement. We generally recommend a false signal suppression.

Parameterization example The sensor measures the distance from the sensor (reference plane) to the product surface.

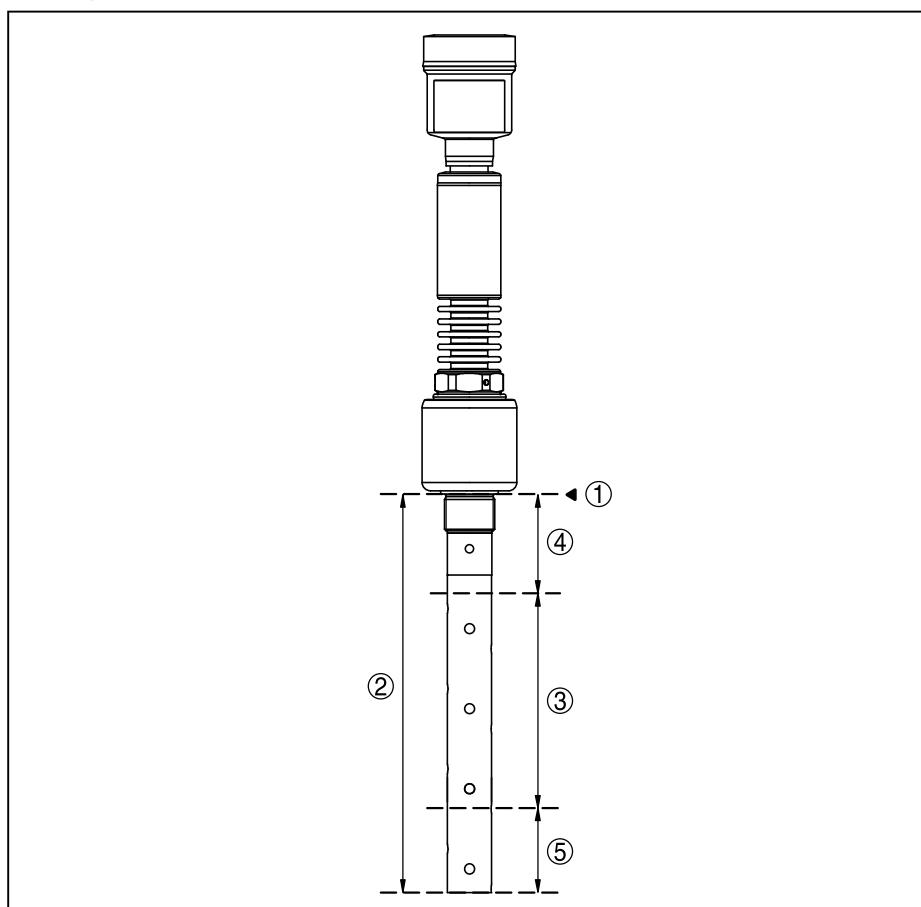


Fig. 8: Measuring ranges - NivoGuide 8200

- 1 Reference plane
- 2 Probe length L
- 3 Measuring range (default setting refers to the measuring range in water)
- 4 Upper dead zone (in this area no measurement is possible)
- 5 Lower dead zone (in this area no measurement is possible)

For this adjustment, the distance is entered when the vessel is full and nearly empty. If these values are not known, an adjustment with other distances, for example, 10 % and 90 % is also possible. Starting point for these distance specifications is always the seal surface of the thread or flange.

Further steps

1. In the menu "Additional settings", menu item "Damping" you can adjust the requested damping of the output signal.
2. Select the parameter of the current output and the output characteristics in the menu item "Current output".

6 Supplement

6.1 Technical data

Note for approved instruments

The technical data in the respective safety instructions which are included in delivery are valid for approved instruments (e.g. with Ex approval). These data can differ from the data listed herein, for example regarding the process conditions or the voltage supply.

All approval documents can be downloaded from our homepage.

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; (0.2 bar)

Cable entry

- M20 x 1.5 1 x cable gland M20 x 1.5 (cable: ø 6 ... 12 mm), 1 x blind plug M20 x 1.5
- ½ NPT 1 x blind plug NPT, 1 x closing cap (red) ½ NPT

Wire cross-section (spring-loaded terminals)

- Massive wire, stranded wire 0.2 ... 2.5 mm² (AWG 24 ... 14)
- Stranded wire with end sleeve 0.2 ... 1.5 mm² (AWG 24 ... 16)

Voltage supply

Operating voltage U_B

- Non-Ex instrument, Ex-d instrument 9.6 ... 35 V DC
- Ex-ia instrument 9.6 ... 30 V DC
- Ex-d-ia instrument 15 ... 35 V DC
- Ex-d-ia instrument with ship approval 15 ... 35 V DC

Operating voltage U_B with lighting switched on

- Non-Ex instrument, Ex-d instrument 16 ... 35 V DC
- Ex-ia instrument 16 ... 30 V DC
- Ex-d-ia instrument No lighting (integrated ia barrier)

Reverse voltage protection Integrated

Permissible residual ripple - Non-Ex, Ex-ia instrument

- for 9.6 V < U_B < 14 V ≤ 0.7 V_{eff} (16 ... 400 Hz)
- for 18 V < U_B < 36 V ≤ 1 V_{eff} (16 ... 400 Hz)

Permissible residual ripple - Ex-d-ia instrument

- for 18 V < U_B < 36 V ≤ 1 V_{eff} (16 ... 400 Hz)

Load resistor

- Calculation (U_B - U_{min})/0.022 A
- Example - Non-Ex instrument with U_B=24 V DC (24 V - 9.6 V)/0.022 A = 655 Ω

NivoGuide 8100, 3100, 8200

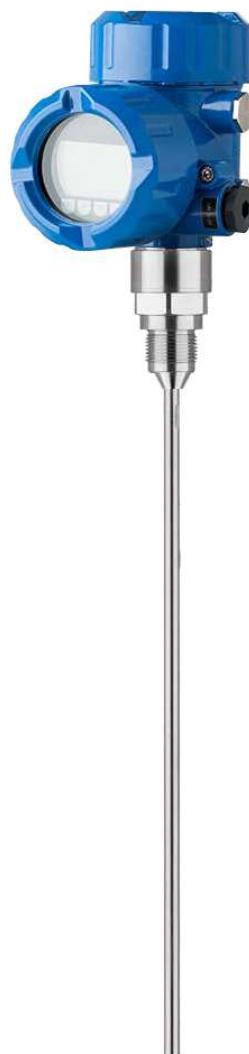
Flameproof enclosure "d"

Two-wire 4 ... 20 mA/HART

Two-wire 4 ... 20 mA/HART with SIL qualification



Safety instructions



CE 0158



Document ID: 62099



SOLUTIONS

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Supplementary documentation:

- Operating Instructions NivoGuide 8100, 3100, 8200
- Quick setup guide NivoGuide 8100, 3100, 8200
- EU-type approval certificate TÜV 19 ATEX 248591 X, Issue 00 (Document ID: 62100)

Editing status: 2019-07-11

DE	Sicherheitshinweise für den Einsatz in explosionsgefährdeten Bereichen
EN	Safety instructions for the use in hazardous areas
FR	Consignes de sécurité pour une application en atmosphères explosives
IT	Normative di sicurezza per l'impiego in luoghi con pericolo di esplosione
ES	Instrucciones de seguridad para el empleo en áreas con riesgo de explosión
PT	Normas de segurança para utilização em zonas sujeitas a explosão
NL	Veiligheidsaanwijzingen voor gebruik op plaatsen waar ontstekingsgevaar kan heersen
SV	Säkerhetsanvisningar för användning i explosionsfarliga områden
DA	Sikkerhedsforskrifter til anvendelse i explosionsfarlig atmosfare
FI	Turvallisuusohjeet räjähdyssaarallisissa tiloissa käytöä varten
EL	Υποδείξεις ασφαλείας για τη χρησιμοποίηση σε περιοχές που υπάρχει κίνδυνος έκρηξης

DE	Die vorliegenden Sicherheitshinweise sind in den Sprachen deutsch, englisch, französisch und spanisch verfügbar. Weitere EU-Landessprachen stellt der Hersteller nach Anforderungen zur Verfügung.
EN	The present safety instructions are available in German, English, French and Spanish. Further EU languages will be provided by the manufacturer upon request.
FR	Les présentes consignes de sécurité sont disponibles dans les langues allemand, anglais, français et espagnol. Le fabricant met d'autres langues de l'Union Européenne à disposition en fonction des demandes.
ES	Las presentes instrucciones de seguridad están disponibles en los idiomas alemán, inglés, francés y español. El fabricante pone a disposición según demanda otros idiomas nacionales de la UE.

1 Area of applicability

These safety instructions apply to the NivoGuide 8100, 3100, 8200 of type series:

- NivoGuide 8100 NG8100.AV*A/B**1*** *****A/D
- NivoGuide 3100 NG3100.AV/T*A/B**1*** *****A/D
- NivoGuide 8200 NG8200.BV*A/B**1**0 *****A/D

With the electronics versions:

- A - Two-wire 4 ... 20 mA/HART
- B - Two-wire 4 ... 20 mA/HART with SIL qualification

According to EU type approval certificate TÜV 19 ATEX 248591 X, Issue 00 (certificate number on the type label) and for all instruments with safety instruction 62099.

The classification as well as the respective standards are stated in the EU type approval certificate:

- EN IEC 60079-0: 2018
- EN 60079-1: 2014
- EN 60079-26: 2015

Type of protection marking:

- II 1/2G, 2G Ex db IIC T6 ... T1 Ga/Gb, Gb

2 Important specification in the type code

NivoGuide 8100 NG8100.A**A/B**1*** *****A/D

Position	Feature	Description
2	Certificate	V ATEX II 1/2G, 2G Ex db IIC T6 ... T1 Ga/Gb, Gb
3	Seal / Second line of defense / Process temperature	A FKM (SHS EPM 70C3 GLT) / without / -40 ... +80 °C
		B EPDM (A+P 70.10-02) / without / -40 ... +80 °C
		D FFKM (Kalrez 6375) / without / -20 ... +150 °C
		F FKM (SHS FPM 70C3 GLT) / without / -40 ... +150 °C
		G FKM (SHS FPM 70C3 GLT) / with / -40 ... +150 °C
		H EPDM (A+P 70.10-02) / without / -40 ... +150 °C
		E Silicone FEP coated (A+P FEP-O-SEAL) / without / -40 ... +150 °C
		K FFKM (Kalrez 6375) / without / -20 ... +200 °C
		L FFKM (Kalrez 6375) / with / -20 ... +200 °C
		M EPDM (A+P 70.10-02) / with / -40 ... +150 °C
		N Silicone FEP coated (A+P FEP-O-SEAL) / with / -40 ... +150 °C
		C Silicone FEP coated (A+P FEP-O-SEAL) / without / -40 ... +80 °C
		P FFKM (Kalrez 6375) / with / -20 ... +150 °C
		Q FKM (SHS EPM 70C3 GLT) / with / -40 ... +80 °C
		R EPDM (A+P 70.10-02) / with / -40 ... +80 °C
		S Silicone FEP coated (A+P FEP-O-SEAL) / with / -40 ... +80 °C
4	Electronics module	A Two-wire 4 ... 20 mA/HART
		B Two-wire 4 ... 20 mA/HART with SIL qualification

Position	Feature	Description
5,6	Process fitting	** Gas-tight threaded connections, pipe connections and industrial flanges acc. to ASME, BS, DIN, EN, GOST, HG/T, JIS, other international, national or industrial standards, regulations or standards, with pressure specifications
8	Version and length of bracket "L" / Material	E exchangeable rod (ø 8 mm) / 316L
		F exchangeable rod (ø 12 mm) / 316L
		B exchangeable cable (ø 2 mm) with gravity weight / 316
		U exchangeable cable (ø 4 mm) without weight / 316
		A exchangeable cable (ø 4 mm) with gravity weight / 316
		K Coax (ø 21.3 mm) with single hole / 316L
		L Coax (ø 21.3 mm) with multiple hole / 316L
		P Coax (ø 42.2 mm) with multiple hole / 316L
9	Indicating/adjustment module	O without
		A mounted; lid with inspection window
		F without; lid with inspection window
		B laterally mounted; double chamber housing, lid with inspection window
10	Length rigid part "L1"	O without (version with rod)
		Z L1 = customer-specific (version with cable)
16	Housing	A Aluminium - single chamber
		D Aluminium - double chamber

NivoGuide 3100 NG3100.AA/B**1*** *****A/D**

Position	Feature	Description
2	Certificate	V ATEX II 1/2G, 2G Ex db IIC T6 ... T1 Ga/Gb, Gb
		T ATEX II 1/2G, 2G Ex db IIC T6 ... T1 Ga/Gb, Gb, II 1D, 1/2D, 1/3D, 2D Ex ta, ta/tb, ta/tc, tb IIIC T*
3	Seal / Process temperature	A FKM (SHS EPM 70C3 GLT) / -40 ... +80 °C
		F FKM (SHS FPM 70C3 GLT) / -40 ... +150 °C
		K FFKM (Kalrez 6375) / -20 ... +200 °C
		B EPDM (A+P 70.10-02) / -40 ... +80 °C
		H EPDM (A+P 70.10-02) / -40 ... +150 °C
4	Electronics module	A Two-wire 4 ... 20 mA/HART
		B Two-wire 4 ... 20 mA/HART with SIL qualification
5, 6	Process fitting	** Gas-tight threaded connections, pipe connections and industrial flanges acc. to ASME, BS, DIN, EN, GOST, HG/T, JIS, other international, national or industrial standards, regulations or standards, with pressure specifications

Position		Feature	Description
8	Version and length of bracket "L" / Material	A	exchangeable cable (ø 4 mm) / 316
		F	exchangeable rod (ø 6 mm) / 316
		E	exchangeable steel cable (ø 6 mm with gravity weight / PA coated
		G	exchangeable steel cable (ø 11 mm with gravity weight / PA coated
		H	exchangeable rod (ø 16 mm) / 316L
9	Indicating/adjustment module	O	without
		A	mounted; lid with inspection window
		F	without; lid with inspection window
		B	laterally mounted; double chamber housing, lid with inspection window
16	Housing	A	Aluminium - single chamber
		D	Aluminium - double chamber

NivoGuide 8200 NG8200.BA/B**1**0 *****A/D**

Position		Feature	Description
2	Certificate	V	ATEX II 1/2G, 2G Ex db IIC T6 ... T1 Ga/Gb, Gb
3	Seal / Second line of defense / Process temperature	1	Ceramic-graphite / with / -196 ... +280 °C
		2	Ceramic-graphite / with / -196 ... +450 °C
		3	PEEK-FFKM (Kalrez 6375) / with / -20 ... +250 °C
4	Electronics module	A	Two-wire 4 ... 20 mA/HART
		B	Two-wire 4 ... 20 mA/HART with SIL qualification
5,6	Process fitting	**	Gas-tight threaded connections, pipe connections and industrial flanges acc. to ASME, BS, DIN, EN, GOST, HG/T, JIS, other international, national or industrial standards, regulations or standards, with pressure specifications
8	Version and length of bracket "L" / Material	E	exchangeable rod (ø 8 mm) / 316L
		H	exchangeable rod (ø 16 mm) / 316L
		B	exchangeable cable (ø 2 mm) with gravity weight / 316
		A	exchangeable cable (ø 4 mm) with gravity weight / 316
		L	Coax (ø 21.3 mm) with multiple hole / 316L
		P	Coax (ø 42.2 mm) with multiple hole / 316L
9	Indicating/adjustment module	O	without
		A	mounted; lid with inspection window
		F	without; lid with inspection window
		B	laterally mounted; double chamber housing, lid with inspection window
16	Housing	A	Aluminium - single chamber
		D	Aluminium - double chamber

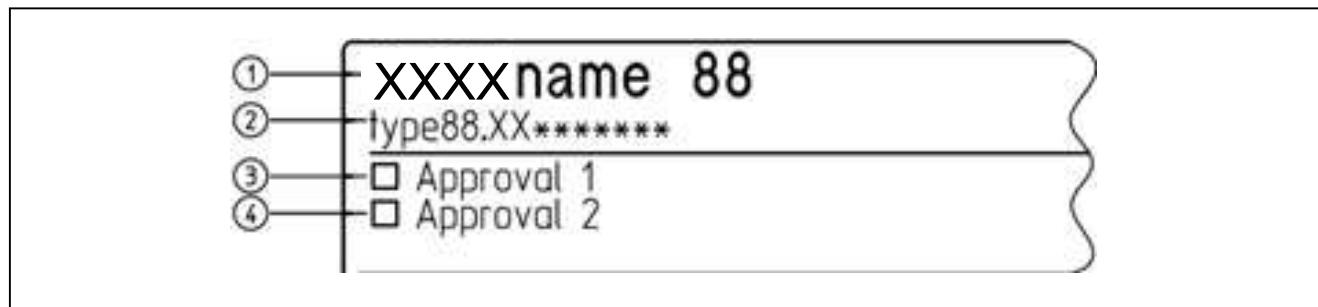
Multiple listed characteristics according to the dependencies of the device configuration.

In the following, all above mentioned versions are called NivoGuide 8100, 3100, 8200. If parts of these safety instructions refer only to certain versions, then these will be mentioned explicitly with their type code.

3 Different ignition protection types

The NivoGuide 8100, 3100, 8200 can be either used in explosive dust atmospheres or in explosive gas atmospheres.

The operator must specify the selected ignition protection type before installation. The selected ignition protection must be determined by marking it firmly on the identification label of the type plate.



- 1 NivoGuide 8100, 3100, 8200
- 2 Instrument version
- 3 Identificatiion label: Approval in dust ignition protection type e. g. „Ex t“
- 4 Identificatiion label: Approval in Gas ignition protection type e. g. „Ex i“, „Ex d“

If NivoGuide 8100, 3100, 8200 is installed in a dust atmosphere, then the safety instructions and the instructions in the respective certificates must be noted:

Installation	Approval	Certificate	Safety instruction
Dust	"W"	TÜV 18 ATEX xxxx X	xxxx

4 General information

The level measuring instruments NivoGuide 8100, 3100, 8200 as guided radar sensors are used to detect the distance between product surface and sensor by means of high frequency electromagnetic waves in the GHz range. The electronics uses the running time of the signals reflected by the product surface to calculate the distance to the product surface.

The NivoGuide 8100, 3100, 8200 consist of an electronics housing, a process connection element and a sensor, i.e. a measuring cable or a measuring rod. As an option, the display and adjustment module can also be installed in the instrument.

The NivoGuide 8100, 3100, 8200 are suitable for applications in hazardous atmospheres of all combustible materials of explosion groups IIA, IIB and IIC.

The NivoGuide 8100, 3100, 8200 are suitable for applications requiring category 1/2G (EPL Ga/Gb) or 2G (EPL Gb) instruments.

5 Application area

Category 1/2G or 1/3G (EPL Ga/Gb or EPL Ga/Gc instruments)

The NivoGuide 8100, 3100, 8200 with mechanical fixing element are installed in hazardous areas of zone 1 or zone 2 requiring instruments of category 2G (EPL Gb) or 3G (EPL Gc). The mechanical fixing element, process connection element is installed in the separating wall, which separates areas requiring instruments of category 2G (EPL Gb) or 3G (EPL Gc). The sensor measuring system is installed in hazardous areas of zone 0 requiring instruments of category 1G (EPL Ga)

Category 2G (EPL Gb instruments)

The NivoGuide 8100, 3100, 8200 with the mechanical fixing element are installed in hazardous areas of zone 1 requiring category 2G (EPL Gb) instruments.

Instrument	3G (EPL Gc)	2G (EPL Gb)	1/2G (EPL Ga/Gb)
Ex Zone 2 			
Ex Zone 1 			
Ex Zone 0 			

6 Specific conditions of use ("X" identification)

The following overview is listing all special properties of NivoGuide 8100, 3100, 8200, which make a labelling with the symbol "X" behind the certificate number necessary.

Electrostatic charging (ESD)

You can find the details in chapter "*Electrostatic charging (ESD)*" of these safety instructions.

Ambient temperature

You can find the details in chapter "*Thermal data*" of these safety instructions.

Impact and friction sparks

The NivoGuide 8100, 3100, 8200 in light metal versions (e.g. aluminium, titanium, zircon) must be mounted in such a way that sparks from impact and friction between light metals and steel (except stainless steel, if the presence of rust particles can be excluded) cannot occur.

Non-grounded, metallic parts

Resistance between aluminium housing to metal measuring point identification plate is $> 10^9$ Ohm.

The capacitance of the metal measuring point identification plate was measured with 15 pF.

7 Important information for mounting and maintenance

General instructions

The following requirements must be fulfilled for mounting, electrical installation, setup and maintenance of the instrument:

- The staff must be qualified according the respective tasks
- The staff must be trained in explosion protection
- The staff must be familiar with the respectively valid regulations, e.g. planning and installation acc. to IEC/EN 60079-14
- Make sure when working on the instrument (mounting, installation, maintenance) that there is no explosive atmosphere present, the supply circuits should be voltage-free, if possible.

- The instrument has to be mounted according to the manufacturer specifications, the EU type approval certificate and the valid regulations and standards
- Modifications on the instrument can influence the explosion protection and hence the safety
- Modifications must only be carried out by authorized employees
- Use only approved spare parts
- Components for installation and connection not included in the approval documents are only permitted if these correspond technically to the latest standard mentioned on the cover sheet. They must be suitable for the application conditions and have a separate certificate. The special conditions of the components must be noted and if necessary, the components must be integrated in the type test. This applies also to the components already mentioned in the technical description.
- Vessel installations and probable flow must be taken into account

Cable and wire entries

- The NivoGuide 8100, 3100, 8200 must be connected via suitable cable gland or conduit systems that are in conformity with the requirements of the flame proofing and the IP protection and provided with a separate type approval certificate. When connecting NivoGuide 8100, 3100, 8200 to conduit systems, the corresponding sealing facility must be connected directly to the housing.
- The red thread or/dust covers screwed in when the instruments are shipped (depending on the version) must be removed before setup and replaced by cable entries or closing screws suitable for the respective ignition protection type and IP protection.
- Note type and size of the thread: A label with the respective thread name is in the area of the respective thread
- Threads must have no damages
- Cable entries and closing screws should be mounted correctly and according to the safety instructions of the manufacturer to ensure the specified ignition protection type and IP protection rating. When using certified or suitable cable glands, closing screws or plug connections, it is absolutely necessary to note the corresponding certificates/documents. Supplied cable entries or closing screws meet these requirements.
- Unused openings must be closed with plugs suitable for the ignition protection type and IP protection. Supplied plugs meet these requirements.
- Cable or wire entries resp. the closing screws must be tightly screwed into the housing
- The connection cables resp. pipeline sealing facilities must be suitable for the application conditions (e.g. temperature range) of the application
- With surface temperatures > 70 °C, the cables must be suitable for the higher application conditions
- The connection cable of NivoGuide 8100, 3100, 8200 has to be wired fix and in such a way that damages can be excluded.

Single chamber housing

- 1 Lid, optionally with inspection window
- 2 Electronics compartment
- 3 Label: Thread type
- 4 Screw plug
- 5 External ground terminal
- 6 Red threaded or dust protection cap
Transport protection, replace with installation
- 7 Locking screws of the lid for lid locking

Double chamber housing



- 1 Lid, optionally with inspection window
- 2 Electronics compartment
- 3 Screw plug
- 4 Connection compartment
- 5 Transport protection, replace with installation
Red threaded or dust protection cap
- 6 Label: Thread type
- 7 Locking screws of the lid for lid locking
- 8 Lid, optionally with inspection window
- 9 Locking screws of the lid for lid locking

Mounting

Keep in mind for instrument mounting

- Mechanical damage on the instrument must be avoided
- Mechanical friction must be avoided
- Vessel installations and probable flow must be taken into account
- Process connections separating two areas of different Ex-zones must comply to valid regulations and standards and the protection rating must be in conformity to IEC/EN 60529.
- Close the housing lid (s) up to the stop before starting operating, to ensure the IP protection rating specified on the type label
- Protect the lid against unauthorized opening by unscrewing the locking screw up to the stop. With double chamber housing, you have to protect both lids.

Maintenance

To ensure the functionality of the device, periodic visual inspection is recommended for:

- Secure mounting
- No mechanical damages or corrosion
- Worn or otherwise damaged cables
- The potential equalization terminal must be secured against loosening
- Correct and clearly marked cable connections

The parts of the NivoGuide 8100, 3100, 8200 being in contact with flammable media during operation must be included in the periodic overpressure test of the plant.

Flameproof enclosure "d"

- The terminals for connecting the operating voltage or signal circuits are integrated in the connection compartment with type of protection flameproof enclosure "d"
- The thread gaps between housing and cover as well as between threaded fitting and container are flameproof joints
- It is not allowed to repair the flameproof joints.
- Cable, wire entries and closing screws must be certified acc. to ignition protection type Flame-proof enclosures "d". Cable, wire entries and closing screws of simple design must not be used.
- Separately certified cable and wire entries can determine the permissible ambient temperature range or the temperature classes
- Only one threaded adapter is allowed per thread, when using a closing screw, threaded adapters are not allowed

Version with exchangeable cable or rod probe

Only original cable or rod probes must be mounted to NivoGuide 8100, 3100, 8200. When mounting cable or rod probes, the torques specified in the respective operating instruction manuals must be maintained. The mechanical connection must be ensured.

8 Safe operating mode

General operating conditions

- Do not operate the instrument outside the electrical, thermal and mechanical specifications of the manufacturer
- Use the instrument only in media against which the wetted parts are sufficiently resistant
- Note the relation between process temperature on the sensor/antenna and the permissible ambient temperature on the electronics housing. For permissible temperatures, see the respective temperature tables. See chapter "*Thermal data*".
- If necessary, a suitable overvoltage arrester can be connected in front of the NivoGuide 8100, 3100, 8200
- For assessment and reduction of the explosion risk, valid standards such as for example ISO/EN 1127-1 must be taken into account
- Lids must not be opened if there is a hazardous atmosphere. The housing lids are marked with the warning label:

**WARNING - DO NOT OPEN WHEN AN
EXPLOSIVE ATMOSPHERE IS PRESENT**

9 Potential equalization/Grounding

- Integrate the instruments into the local potential equalisation, e.g. via the internal or external earth terminal
- The potential equalization terminal must be secured against loosening and twisting
- If grounding of the cable screening is necessary, this must be carried out acc. to the valid standards and regulations, e.g. acc. to IEC/EN 60079-14

10 Electrostatic charging (ESD)

In case of instrument versions with electrostatically chargeable plastic parts, the danger of electrostatic charging and discharging must be taken into account!

The following parts can charge and discharge:

- Lacquered housing version or alternative special lacquering

- Plastic housing, plastic housing parts
- Metal housing with inspection window
- Plastic process fittings
- Plastic-coated process fittings and/or plastic-coated sensors
- Connection cable for separate versions
- Type label
- Isolated metallic labels (measuring point identification plate)

Take note in case of danger of electrostatic charges:

- Avoid friction on the surfaces
- Do not dry clean the surfaces

The instruments must be mounted/installed in such a way that the following can be ruled out:

- electrostatic charges during operation, maintenance and cleaning.
- process-related electrostatic charges, e.g. by measuring media flowing past

The warning label indicates danger:

WARNING - POTENTIAL ELECTROSTATIC CHARGING HAZARD - SEE INSTRUCTIONS

11 Electrical data

NivoGuide 8100, 3100, 8200

Supply and signal circuit in the electronics and connection compartment, single chamber housing:	
Terminals 1[+], 2[-]	$U = 9.6 \dots 35 \text{ V DC}$ $U_m = 253 \text{ V AC/DC}$ $I \leq 3.5 \dots 22.5 \text{ mA}$ (with superimposed HART signal)

NivoGuide 8100, 3100, 8200

Supply and signal circuit in the connection compartment, double chamber housing:	
Terminals 1[+], 2[-]	$U = 9.6 \dots 35 \text{ V DC}$ $U_m = 253 \text{ V AC/DC}$ $I \leq 3.5 \dots 22.5 \text{ mA}$ (with superimposed HART signal)
Display and adjustment circuit:	
Spring contacts in the connection compartment	Only for connection to the NivoGuide display and adjustment module.

The circuits of NivoGuide 8100, 3100, 8200 are galvanically separated from ground.

The circuits of NivoGuide 8100, 3100, 8200 are galvanically connected to ground potential via the earth terminals.

The metallic parts of NivoGuide 8100, 3100, 8200 are electrically connected with the earth terminals.

12 Mechanical data

The following mechanical data are valid for all housing and electronics versions.

Mechanical data	
Ground terminal (connection cross-section)	≥ 4 mm ²
Overvoltage category	See operating instructions NivoGuide 8100, 3100, 8200, chapter " <i>Technical data</i> "
Pollution degree	2
● Materials ● Max. tensile load on the cable or rod probe ● Potential connections and electrical separating measures in the instrument ● Electromechanical data ● Electrical protective measures	Are described in the operating instructions NivoGuide 8100, 3100, 8200 in chapter " <i>Technical data</i> ".

13 Thermal data

The following temperature tables are valid for all housing and electronics versions.

The relationship between the permissible ambient temperature for the electronics housing depending on the area of application and the maximum surface temperatures, temperature classes, can be seen in the following tables.

Temperature class	Temperature on the sensor (measuring cable, rod)	Ambient temperature on the electronics	
		Housing lid without inspection window	Housing lid with inspection window
T6	-40 ... +80 °C	-40 ... +60 °C	-40 ... +60 °C
T5	-40 ... +95 °C	-40 ... +61 °C	-40 ... +61 °C
T4	-40 ... +130 °C	-40 ... +70 °C	-40 ... +70 °C
T3	-40 ... +195 °C	-40 ... +70 °C	-40 ... +70 °C
T2	-40 ... +290 °C	-40 ... +70 °C	-40 ... +70 °C
T1	-40 ... +440 °C	-40 ... +70 °C	-40 ... +70 °C

Low temperature version up to -196 °C

Temperature class	Temperature on the sensor (measuring cable, rod)	Ambient temperature on the electronics	
		Housing lid without inspection window	Housing lid with inspection window
T6	-196 ... +80 °C	-40 ... +60 °C	-40 ... +60 °C
T5	-196 ... +95 °C	-40 ... +61 °C	-40 ... +61 °C
T4	-196 ... +130 °C	-40 ... +70 °C	-40 ... +70 °C
T3	-196 ... +195 °C	-40 ... +70 °C	-40 ... +70 °C
T2	-196 ... +290 °C	-40 ... +70 °C	-40 ... +70 °C
T1	-196 ... +440 °C	-40 ... +70 °C	-40 ... +70 °C

The sensors (measuring cable, rod) may only be operated in areas for EPL Ga, EPL Ga/Gb and EPL Gb applications if atmospheric conditions are present (pressure of 0.8 ... 1.1 bar).

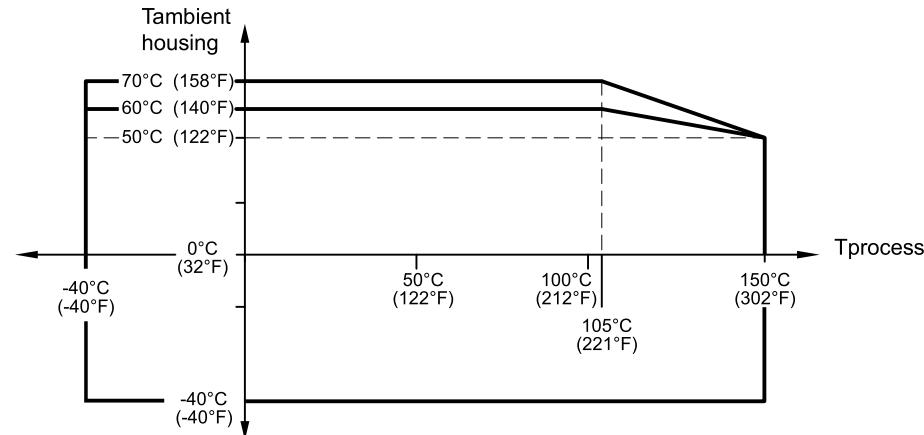
If there is no explosive atmosphere, the permissible operating temperatures and pressures must be taken from the manufacturer specifications (operating instructions).

If the sensors (measuring cable, measuring rod) are operated at temperatures higher than those listed in the table above, measures must be taken to prevent the risk of ignition from hot surfaces.

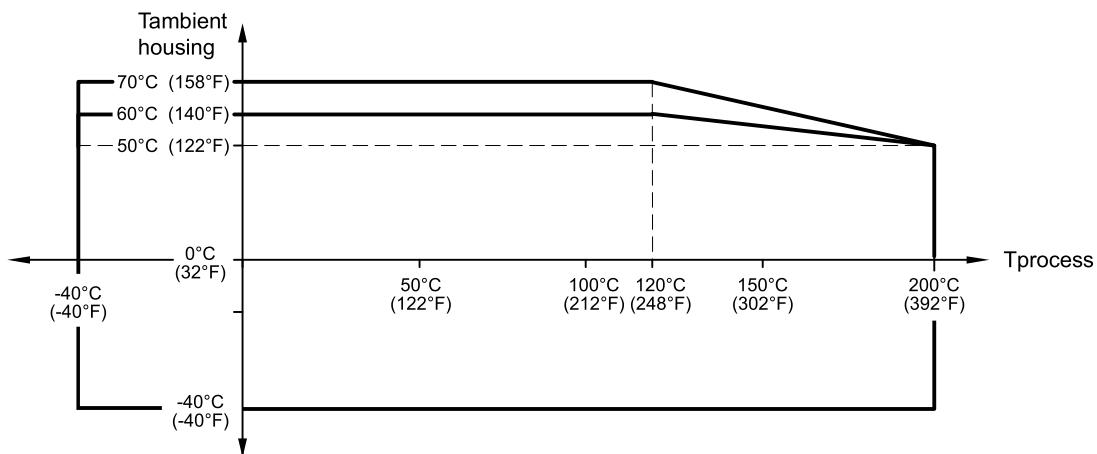
The maximum permissible temperature at the electronics/housing must not exceed the values in the above table.

Temperature derating for process temperatures up to +150 °C, +200 °C, +250 °C, +280 °C and +450 °C

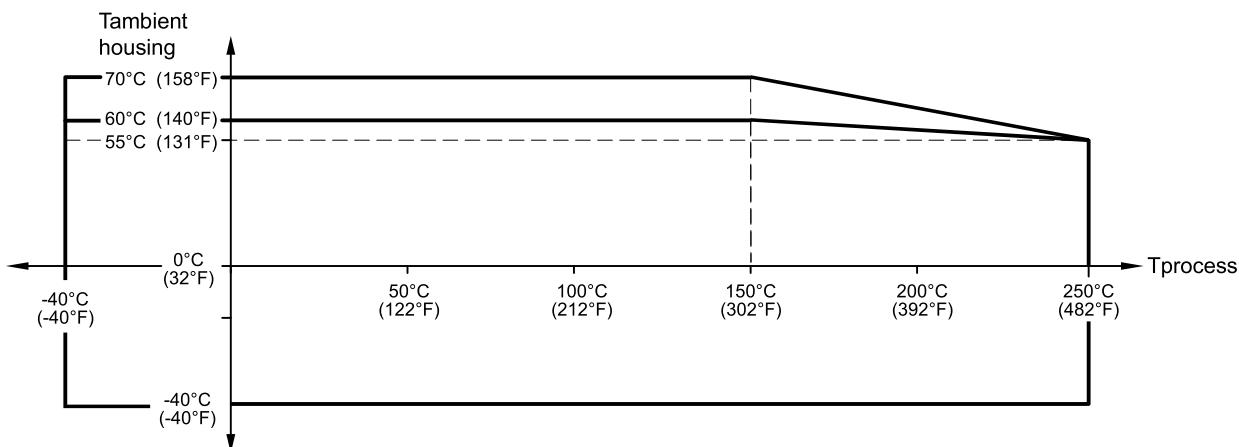
Versions for process temperatures up to +150 °C



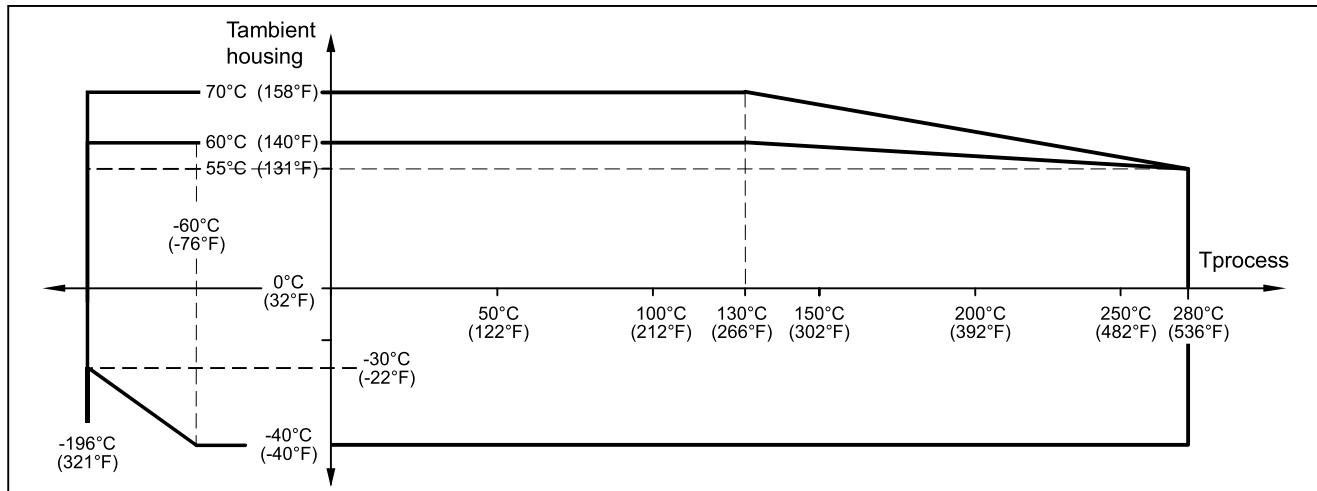
Versions for process temperatures up to +200 °C



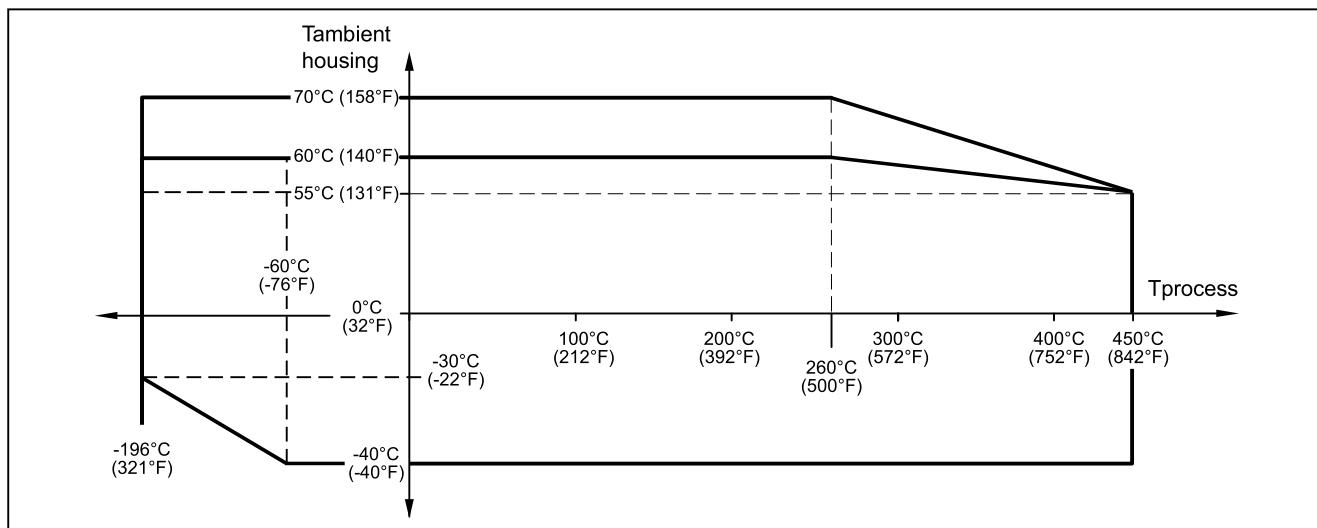
Versions for process temperatures up to +250 °C



Versions for process temperatures up to +280 °C



Versions for process temperatures up to +450 °C



NivoGuide 8100, 3100, 8200

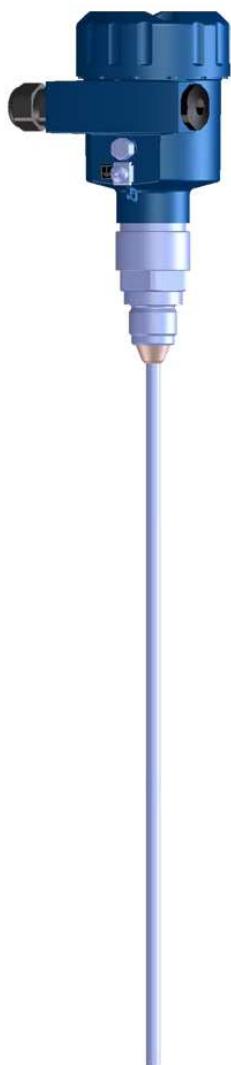
Intrinsic safety "i"

Two-wire 4 ... 20 mA/HART

Two-wire 4 ... 20 mA/HART with SIL qualification



Safety instructions



CE 0158



Document ID: 61519



SOLUTIONS

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Supplementary documentation:

- Operating Instructions NivoGuide 8100, 3100, 8200
- Quick setup guide NivoGuide 8100, 3100, 8200
- EU type approval certificate TÜV 19 ATEX 248529 X (Document ID: 61520)

Editing status: 2019-07-11

DE	Sicherheitshinweise für den Einsatz in explosionsgefährdeten Bereichen
EN	Safety instructions for the use in hazardous areas
FR	Consignes de sécurité pour une application en atmosphères explosives
IT	Normative di sicurezza per l'impiego in luoghi con pericolo di esplosione
ES	Instrucciones de seguridad para el empleo en áreas con riesgo de explosión
PT	Normas de segurança para utilização em zonas sujeitas a explosão
NL	Veiligheidsaanwijzingen voor gebruik op plaatsen waar ontstekingsgevaar kan heersen
SV	Säkerhetsanvisningar för användning i explosionsfarliga områden
DA	Sikkerhedsforskrifter til anvendelse i explosionsfarlig atmosfare
FI	Turvallisuusohjeet räjähdyssaarallisissa tiloissa käytöä varten
EL	Υποδείξεις ασφαλείας για τη χρησιμοποίηση σε περιοχές που υπάρχει κίνδυνος έκρηξης

DE	Die vorliegenden Sicherheitshinweise sind in den Sprachen deutsch, englisch, französisch und spanisch verfügbar. Weitere EU-Landessprachen stellt der Hersteller nach Anforderungen zur Verfügung.
EN	The present safety instructions are available in German, English, French and Spanish. Further EU languages will be provided by the manufacturer upon request.
FR	Les présentes consignes de sécurité sont disponibles dans les langues allemand, anglais, français et espagnol. Le fabricant met d'autres langues de l'Union Européenne à disposition en fonction des demandes.
ES	Las presentes instrucciones de seguridad están disponibles en los idiomas alemán, inglés, francés y español. El fabricante pone a disposición según demanda otros idiomas nacionales de la UE.

1 Area of applicability

These safety instructions apply to the NivoGuide 8100, 3100, 8200 of type series:

- NivoGuide 8100.AQ/Y*A/B**1**** *****A/D/N
- NivoGuide 3100.AS*A/B**1**** *****A/D/N
- NivoGuide 8200.BQ/Y*A/B**1**0 *****A/D/N

With the electronics versions:

- A - Two-wire 4 ... 20 mA/HART
- B - Two-wire 4 ... 20 mA/HART with SIL qualification

According to EU type approval certificate TÜV 19 ATEX 248529 X (certificate number on the type label) and for all instruments with safety instruction 61519.

The classification as well as the respective standards are stated in the EU type approval certificate:

- EN IEC 60079-0: 2018
- EN 60079-11: 2012
- EN 60079-26: 2015

Type of protection marking:

- II 1G, 1/2G, 2G Ex ia IIC T6 ... T1 Ga, Ga/Gb, Gb

2 Important specification in the type code

NivoGuide 8100.NG8100.A*****1*** *****A/D/N

Position	Feature	Description
2	Certificate	Q ATEX II 1G, 1/2G, 2G Ex ia IIC T6 ... T1 Ga, Ga/Gb, Gb
		Y ATEX II 1G, 1/2G, 2G Ex ia IIC T6 ... T1 Ga, Ga/Gb, Gb, II 1D, 1/2D, 1/3D, 2D Ex ta, ta/tb, ta/tc, tb IIIC T*
3	Seal / Second line of defense / Process temperature	A FKM (SHS EPM 70C3 GLT) / without / -40 ... +80 °C
		B EPDM (A+P 70.10-02) / without / -40 ... +80 °C
		D FFKM (Kalrez 6375) / without / -20 ... +150 °C
		F FKM (SHS FPM 70C3 GLT) / without / -40 ... +150 °C
		G FKM (SHS FPM 70C3 GLT) / with / -40 ... +150 °C
		H EPDM (A+P 70.10-02) / without / -40 ... +150 °C
		E Silicone FEP coated (A+P FEP-O-SEAL) / without / -40 ... +150 °C
		K FFKM (Kalrez 6375) / without / -20 ... +200 °C
		L FFKM (Kalrez 6375) / with / -20 ... +200 °C
		M EPDM (A+P 70.10-02) / with / -40 ... +150 °C
		N Silicone FEP coated (A+P FEP-O-SEAL) / with / -40 ... +150 °C
		C Silicone FEP coated (A+P FEP-O-SEAL) / without / -40 ... +80 °C
		P FFKM (Kalrez 6375) / with / -20 ... +150 °C
		Q FKM (SHS EPM 70C3 GLT) / with / -40 ... +80 °C
		R EPDM (A+P 70.10-02) / with / -40 ... +80 °C
		S Silicone FEP coated (A+P FEP-O-SEAL) / with / -40 ... +80 °C

Position		Feature	Description
4	Electronics module	A	Two-wire 4 ... 20 mA/HART
		B	Two-wire 4 ... 20 mA/HART with SIL qualification
5,6	Process fitting	**	Gas-tight threaded connections, pipe connections and industrial flanges acc. to ASME, BS, DIN, EN, GOST, HG/T, JIS, other international, national or industrial standards, regulations or standards, with pressure specifications
8	Version and length of bracket "L" / Material	E	exchangeable rod (ø 8 mm) / 316L
		F	exchangeable rod (ø 12 mm) / 316L
		B	exchangeable cable (ø 2 mm) with gravity weight / 316
		U	exchangeable cable (ø 4 mm) without weight / 316
		A	exchangeable cable (ø 4 mm) with gravity weight / 316
		K	Coax (ø 21.3 mm) with single hole / 316L
		L	Coax (ø 21.3 mm) with multiple hole / 316L
		P	Coax (ø 42.2 mm) with multiple hole / 316L
9	Indicating/adjustment module	O	without
		A	mounted; lid with inspection window
		F	without; lid with inspection window
		B	laterally mounted; double chamber housing, lid with inspection window
10	Length rigid part "L1"	O	without (version with rod)
		Z	L1 = customer-specific (version with cable)
16	Housing	A	Aluminium - single chamber
		D	Aluminium - double chamber
		N	Stainless steel single chamber

NivoGuide 3100 NG3100.A***1** *****A/D/N**

Position		Feature	Description
2	Certificate	S	ATEX II 1G, 1/2G, 2G Ex ia IIC T6 ... T1 Ga, Ga/Gb, Gb
3	Seal / Process temperature	A	FKM (SHS EPM 70C3 GLT) / -40 ... +80 °C
		F	FKM (SHS FPM 70C3 GLT) / -40 ... +150 °C
		K	FFKM (Kalrez 6375) / -20 ... +200 °C
		B	EPDM (A+P 70.10-02) / -40 ... +80 °C
		H	EPDM (A+P 70.10-02) / -40 ... +150 °C
4	Electronics module	A	Two-wire 4 ... 20 mA/HART
		B	Two-wire 4 ... 20 mA/HART with SIL qualification
5, 6	Process fitting	**	Gas-tight threaded connections, pipe connections and industrial flanges acc. to ASME, BS, DIN, EN, GOST, HG/T, JIS, other international, national or industrial standards, regulations or standards, with pressure specifications

Position		Feature	Description
8	Version and length of bracket "L" / Material	A	exchangeable cable (ø 4 mm) / 316
		F	exchangeable rod (ø 6 mm) / 316
		E	exchangeable steel cable (ø 6 mm with gravity weight / PA coated
		G	exchangeable steel cable (ø 11 mm with gravity weight / PA coated
		H	exchangeable rod (ø 16 mm) / 316L
9	Indicating/adjustment module	O	without
		A	mounted; lid with inspection window
		F	without; lid with inspection window
		B	laterally mounted; double chamber housing, lid with inspection window
16	Housing	A	Aluminium - single chamber
		D	Aluminium - double chamber
		N	Stainless steel single chamber

NivoGuide 8200 NG8200.B***1**0 *****A/D/N**

Position		Feature	Description
2	Certificate	Q	ATEX II 1G, 1/2G, 2G Ex ia IIC T6 ... T1 Ga, Ga/Gb, Gb
		Y	ATEX II 1G, 1/2G, 2G Ex ia IIC T6 ... T1 Ga, Ga/Gb, Gb, II 1D, 1/2D, 1/3D, 2D Ex ta, ta/tb, ta/tc, tb IIIC T*
3	Seal / Second line of defense / Process temperature	1	Ceramic-graphite / with / -196 ... +280 °C
		2	Ceramic-graphite / with / -196 ... +450 °C
		3	PEEK-FFKM (Kalrez 6375) / with / -20 ... +250 °C
4	Electronics module	A	Two-wire 4 ... 20 mA/HART
		B	Two-wire 4 ... 20 mA/HART with SIL qualification
5,6	Process fitting	**	Gas-tight threaded connections, pipe connections and industrial flanges acc. to ASME, BS, DIN, EN, GOST, HG/T, JIS, other international, national or industrial standards, regulations or standards, with pressure specifications
8	Version and length of bracket "L" / Material	E	exchangeable rod (ø 8 mm) / 316L
		H	exchangeable rod (ø 16 mm) / 316L
		B	exchangeable cable (ø 2 mm) with gravity weight / 316
		A	exchangeable cable (ø 4 mm) with gravity weight / 316
		L	Coax (ø 21.3 mm) with multiple hole / 316L
		P	Coax (ø 42.2 mm) with multiple hole / 316L
9	Indicating/adjustment module	O	without
		A	mounted; lid with inspection window
		F	without; lid with inspection window
		B	laterally mounted; double chamber housing, lid with inspection window

Position		Feature	Description
16	Housing	A	Aluminium - single chamber
		D	Aluminium - double chamber
		N	Stainless steel single chamber

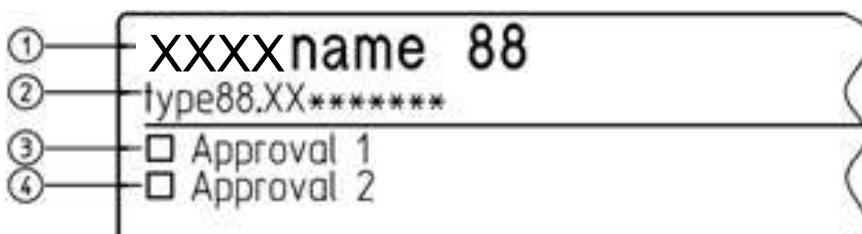
Multiple listed characteristics according to the dependencies of the device configuration.

In the following, all above mentioned versions are called NivoGuide 8100, 3100, 8200. If parts of these safety instructions refer only to certain versions, then these will be mentioned explicitly with their type code.

3 Different ignition protection types

The NivoGuide 8100, 3100, 8200 can be either used in explosive dust atmospheres or in explosive gas atmospheres.

The operator must specify the selected ignition protection type before installation. The selected ignition protection must be marked by scratching off on the identification mark of the type label.



- 1 NivoGuide 8100, 3100, 8200
- 2 Instrument version
- 3 Identification label: Approval in dust ignition protection type e. g. „Ex t“
- 4 Identification label: Approval in Gas ignition protection type e. g. „Ex i“, „Ex d“

If NivoGuide 8100, 3100, 8200 is installed in a dust atmosphere, then the safety instructions and the instructions in the respective certificates must be noted:

Installation	Approval	Certificate	Safety instruction
Dust (Protection by enclosure "t")	"W"	TÜV 19 ATEX xxxx X	xxxxx

4 General information

The level measuring instruments NivoGuide 8100, 3100, 8200 as guided radar sensors are used to detect the distance between product surface and sensor by means of high frequency electromagnetic waves in the GHz range. The electronics uses the running time of the signals reflected by the product surface to calculate the distance to the product surface.

The NivoGuide 8100, 3100, 8200 consist of an electronics housing, a process connection element and a sensor, i.e. a measuring cable or a measuring rod. As an option, the display and adjustment module can also be installed in the instrument.

The NivoGuide 8100, 3100, 8200 are suitable for applications in hazardous atmospheres of all combustible materials of explosion groups IIA, IIB and IIC.

The NivoGuide 8100, 3100, 8200 are suitable for applications requiring category 1G (EPL Ga), 1/2G (EPL Ga/Gb) or 2G (EPL Gb) instruments.

5 Application area

Category 1G (EPL Ga instruments)

The NivoGuide 8100, 3100, 8200 with the mechanical fixing element are installed in hazardous areas of zone 0 requiring category 1G (EPL Ga) instruments.

Category 1/2G or 1/3G (EPL Ga/Gb or EPL Ga/Gc instruments)

The NivoGuide 8100, 3100, 8200 with mechanical fixing element are installed in hazardous areas of zone 1 or zone 2 requiring instruments of category 2G (EPL Gb) or 3G (EPL Gc). The mechanical fixing element, process connection element is installed in the separating wall, which separates areas requiring instruments of category 2G (EPL Gb) or 3G (EPL Gc). The sensor measuring system is installed in hazardous areas of zone 0 requiring instruments of category 1G (EPL Ga)

Category 2G (EPL Gb instruments)

The NivoGuide 8100, 3100, 8200 with the mechanical fixing element are installed in hazardous areas of zone 1 requiring category 2G (EPL Gb) instruments.

Instrument	3G (EPL Gc)	2G (EPL Gb)	1/2G (EPL Ga/Gb)	1G (EPL Ga)
Ex Zone 2 				
Ex Zone 1 				
Ex Zone 0 				

6 Specific conditions of use ("X" identification)

The following overview is listing all special properties of NivoGuide 8100, 3100, 8200, which make a labelling with the symbol "X" behind the certificate number necessary.

Electrostatic charging (ESD)

You can find the details in chapter "*Electrostatic charging (ESD)*" of these safety instructions.

Ambient temperature

You can find the details in chapter "*Thermal data*" of these safety instructions.

Impact and friction sparks

The NivoGuide 8100, 3100, 8200 in light metal versions (e.g. aluminium, titanium, zircon) must be mounted in such a way that sparks from impact and friction between light metals and steel (except stainless steel, if the presence of rust particles can be excluded) cannot occur.

Non-grounded, metallic parts

Resistance between aluminium housing to metal measuring point identification plate is $> 10^9$ Ohm.

The capacitance of the metal measuring point identification plate was measured with 15 pF.

7 Important information for mounting and maintenance

General instructions

The following requirements must be fulfilled for mounting, electrical installation, setup and maintenance of the instrument:

- The staff must be qualified according the respective tasks
- The staff must be trained in explosion protection
- The staff must be familiar with the respectively valid regulations, e.g. planning and installation acc. to IEC/EN 60079-14
- Make sure when working on the instrument (mounting, installation, maintenance) that there is no explosive atmosphere present, the supply circuits should be voltage-free, if possible.
- The instrument has to be mounted according to the manufacturer specifications, the EU type approval certificate and the valid regulations and standards
- Modifications on the instrument can influence the explosion protection and hence the safety
- Modifications must only be carried out by authorized employees
- Use only approved spare parts
- Components for installation and connection not included in the approval documents are only permitted if these correspond technically to the latest standard mentioned on the cover sheet. They must be suitable for the application conditions and have a separate certificate. The special conditions of the components must be noted and if necessary, the components must be integrated in the type test. This applies also to the components already mentioned in the technical description.
- Vessel installations and probable flow must be taken into account

Cable and wire entries

- The NivoGuide 8100, 3100, 8200 must be connected via suitable cable gland or conduit systems that are in conformity with the requirements of the flame proofing and the IP protection and provided with a separate type approval certificate. When connecting NivoGuide 8100, 3100, 8200 to conduit systems, the corresponding sealing facility must be connected directly to the housing.
- The red thread or/dust covers screwed in when the instruments are shipped (depending on the version) must be removed before setup and replaced by cable entries or closing screws suitable for the respective ignition protection type and IP protection.
- Note type and size of the thread: A label with the respective thread name is in the area of the respective thread
- Threads must have no damages
- Cable entries and closing screws should be mounted correctly and according to the safety instructions of the manufacturer to ensure the specified ignition protection type and IP protection rating. When using certified or suitable cable glands, closing screws or plug connections, it is absolutely necessary to note the corresponding certificates/documents. Supplied cable entries or closing screws meet these requirements.
- Unused openings must be closed with plugs suitable for the ignition protection type and IP protection. Supplied plugs meet these requirements.
- Cable or wire entries resp. the closing screws must be tightly screwed into the housing
- The connection cables resp. pipeline sealing facilities must be suitable for the application conditions (e.g. temperature range) of the application
- With surface temperatures > 70 °C, the cables must be suitable for the higher application conditions
- The connection cable of NivoGuide 8100, 3100, 8200 has to be wired fix and in such a way that damages can be excluded.

Mounting

Keep in mind for instrument mounting

- Mechanical damage on the instrument must be avoided
- Mechanical friction must be avoided
- Process connections separating two areas of different Ex-zones must comply to valid regulations and standards and the protection rating must be in conformity to IEC/EN 60529.
- Close the housing lid (s) up to the stop before starting operating, to ensure the IP protection rating specified on the type label

Maintenance

To ensure the functionality of the device, periodic visual inspection is recommended for:

- Secure mounting
- No mechanical damages or corrosion
- Worn or otherwise damaged cables
- The potential equalization terminal must be secured against loosening
- Correct and clearly marked cable connections

The parts of the NivoGuide 8100, 3100, 8200 being in contact with flammable media during operation must be included in the periodic overpressure test of the plant.

Intrinsic safety "i"

- Valid regulations for connection of intrinsically safe circuits, e.g. proof of intrinsic safety according to IEC/EN 60079-14 must be observed
- The instrument is only suitable for connection to certified, intrinsically safe instruments
- When connecting a circuit with protection level Ex ib, the device, the sensor meas. system of the device must no more be used in hazardous areas of zone 0.
- When connecting an intrinsically safe instruments with classification mark Ex ia to a circuit with protection level Ex ib, then the classification mark of the instrument changes to Ex ib. After the use as instrument with Ex ib power supply, the instrument must no more be used in circuits with protection level Ex ia
- When connecting an intrinsically safe instrument to an non-intrinsically safe circuit, the instrument must be no longer used in intrinsically safe circuits
- With surface temperatures > 70 °C, the cables must be suitable for the higher application conditions

Version with exchangeable cable or rod probe

Only original cable or rod probes must be mounted to NivoGuide 8100, 3100, 8200. When mounting cable or rod probes, the torques specified in the respective operating instruction manuals must be maintained. The mechanical connection must be ensured.

8 Safe operating mode

General operating conditions

- Do not operate the instrument outside the electrical, thermal and mechanical specifications of the manufacturer
- Use the instrument only in media against which the wetted parts are sufficiently resistant
- Note the relation between process temperature on the sensor/antenna and the permissible ambient temperature on the electronics housing. For permissible temperatures, see the respective temperature tables. See chapter "*Thermal data*".
- If necessary, a suitable overvoltage arrester can be connected in front of the NivoGuide 8100, 3100, 8200
- For assessment and reduction of the explosion risk, valid standards such as for example ISO/EN 1127-1 must be taken into account

9 Potential equalization/Grounding

- Integrate the instruments into the local potential equalisation, e.g. via the internal or external earth terminal
- The potential equalization terminal must be secured against loosening and twisting
- If grounding of the cable screening is necessary, this must be carried out acc. to the valid standards and regulations, e.g. acc. to IEC/EN 60079-14
- The intrinsically safe input and the intrinsically safe output circuits are ground-free. The voltage resistance against ground is min. 500 Veff.

10 Electrostatic charging (ESD)

In case of instrument versions with electrostatically chargeable plastic parts, the danger of electrostatic charging and discharging must be taken into account!

The following parts can charge and discharge:

- Lacquered housing version or alternative special lacquering
- Plastic housing, plastic housing parts
- Metal housing with inspection window
- Plastic process fittings
- Plastic-coated process fittings and/or plastic-coated sensors
- Connection cable for separate versions
- Type label
- Isolated metallic labels (measuring point identification plate)

Take note in case of danger of electrostatic charges:

- Avoid friction on the surfaces
- Do not dry clean the surfaces

The instruments must be mounted/installed in such a way that the following can be ruled out:

- electrostatic charges during operation, maintenance and cleaning.
- process-related electrostatic charges, e.g. by measuring media flowing past

The warning label indicates danger:

WARNING - POTENTIAL ELECTROSTATIC CHARGING HAZARD - SEE INSTRUCTIONS

11 Instructions for zone 0, zone 0/1 applications

In hazardous areas, the instrument, sensor measuring system in zone 0 should only be operated under atmospheric conditions:

- Temperature: -20 ... +60 °C.
- Pressure: 80 ... 110 kPa (0.8 ... 1.1 bar)
- Air with normal oxygen content, normally 21 %

The operator must ensure that the medium temperature in zone 0 is not higher than 80 % of the self-ignition temperature of the concerned medium (in °C) and does not exceed the max. permissible flange temperature depending on the temperature class. The parts of the sensor which during operation are in contact with flammable products, must be integrated in the periodic overpressure test of the plant.

If no explosive mixtures or additional application conditions are certified resp. supplementary measures such as e.g. according to ISO/EN 1127-1 taken, then the instruments can be also operated according to the manufacturer specification outside atmospheric conditions.

If there is a risk of dangerous potential differences inside zone 0, then suitable measures for circuits in zone 0 must be taken, e.g. according to the requirements of IEC/EN 60079-14.

Process fittings between two explosion protection areas require category 1G (EPL Ga) and less endangered areas must show a tightness in accordance with protection rating IP 67 acc. to IEC/EN 60529.

12 Electrical data

NivoGuide 8100, 3100, 8200, single chamber housing, Ex i electronics and connection compartment

Intrinsically safe voltage supply, signal circuit:	
Terminals 1[+], 2[-]	<p>In type of protection intrinsic safety Ex ia IIC</p> <p>For connection to a certified, intrinsically safe circuit.</p> <p>$U_i = 30 \text{ V}$</p> <p>$I_i = 131 \text{ mA}$</p> <p>$P_i = 983 \text{ mW}$</p> <p>The effective internal capacitance C_i is negligibly small.</p> <p>The effective internal inductance is $L_i \leq 5 \mu\text{H}$.</p>

NivoGuide 8100, 3100, 8200, double chamber housing, Ex i connection compartment

Intrinsically safe voltage supply, signal circuit:	
Terminals 1[+], 2[-]	<p>In type of protection intrinsic safety Ex ia IIC</p> <p>For connection to a certified, intrinsically safe circuit.</p> <p>$U_i = 30 \text{ V}$</p> <p>$I_i = 131 \text{ mA}$</p> <p>$P_i = 983 \text{ mW}$</p> <p>The effective internal capacitance C_i is negligibly small.</p> <p>The effective internal inductance is $L_i \leq 10 \mu\text{H}$.</p>

NivoGuide 8100, 3100, 8200, single and double chamber housing, Ex i electronics and connection compartment

Intrinsically safe circuit for the display and adjustment module or the interface adapter	
Spring contacts	<p>In type of protection intrinsic safety Ex ia IIC</p> <p>Only for connection to the NivoGuide display and adjustment module.</p>

13 Mechanical data

The following mechanical data are valid for all housing and electronics versions.

Mechanical data	
Ground terminal (connection cross-section)	$\geq 4 \text{ mm}^2$
Oversupply category	See operating instructions NivoGuide 8100, 3100, 8200, chapter "Technical data"

Mechanical data	
Pollution degree	2
● Materials ● Max. tensile load on the cable or rod probe ● Potential connections and electrical separating measures in the instrument ● Electromechanical data ● Electrical protective measures	Are described in the operating instructions NivoGuide 8100, 3100, 8200 in chapter " <i>Technical data</i> ".

14 Thermal data

The following temperature tables are valid for all housing and electronics versions.

If the NivoGuide 8100, 3100, 8200 level transmitters are operated in hazardous areas for EPL Ga, EPL Ga/Gb and EPL Gb applications, the permissible temperature range on the electronics/housings as well as on the sensor (measuring cable, rod) depending on the temperature class can be found in the following table:

Temperature class	Ambient temperature range (Electronics/housing)	Product temperature range on the sensor (measuring cable, rod)
T6	-40 ... +46 °C	-40 ... +80 °C
T5	-40 ... +61 °C	-40 ... +95 °C
T4	-40 ... +70 °C	-40 ... +130 °C
T3	-40 ... +70 °C	-40 ... +195 °C
T2	-40 ... +70 °C	-40 ... +290 °C
T1	-40 ... +70 °C	-40 ... +440 °C

Low temperature version up to -196 °C

Temperature class	Ambient temperature range (Electronics/housing)	Product temperature range on the sensor (measuring cable, rod)
T6	-40 ... +46 °C	-196 ... +80 °C
T5	-40 ... +61 °C	-196 ... +95 °C
T4	-40 ... +70 °C	-196 ... +130 °C
T3	-40 ... +70 °C	-196 ... +195 °C
T2	-40 ... +70 °C	-196 ... +290 °C
T1	-40 ... +70 °C	-196 ... +440 °C

The sensors (measuring cable, rod) may only be operated in areas for EPL Ga, EPL Ga/Gb and EPL Gb applications if atmospheric conditions are present (pressure of 0.8 ... 1.1 bar).

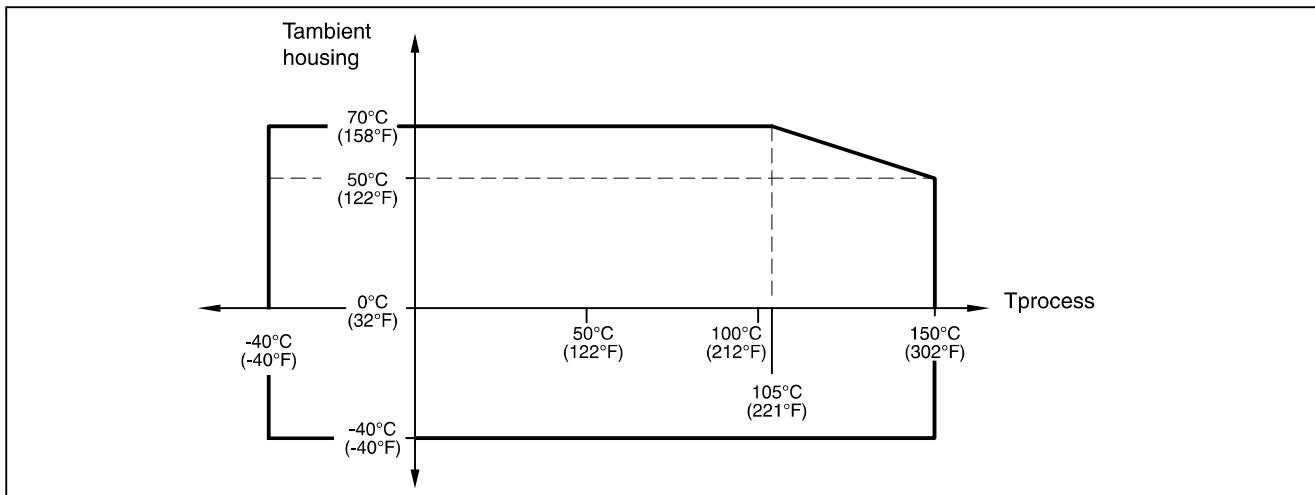
If there is no explosive atmosphere, the permissible operating temperatures and pressures must be taken from the manufacturer specifications (operating instructions).

If the sensors (measuring cable, measuring rod) are operated at temperatures higher than those listed in the table above, measures must be taken to prevent the risk of ignition from hot surfaces.

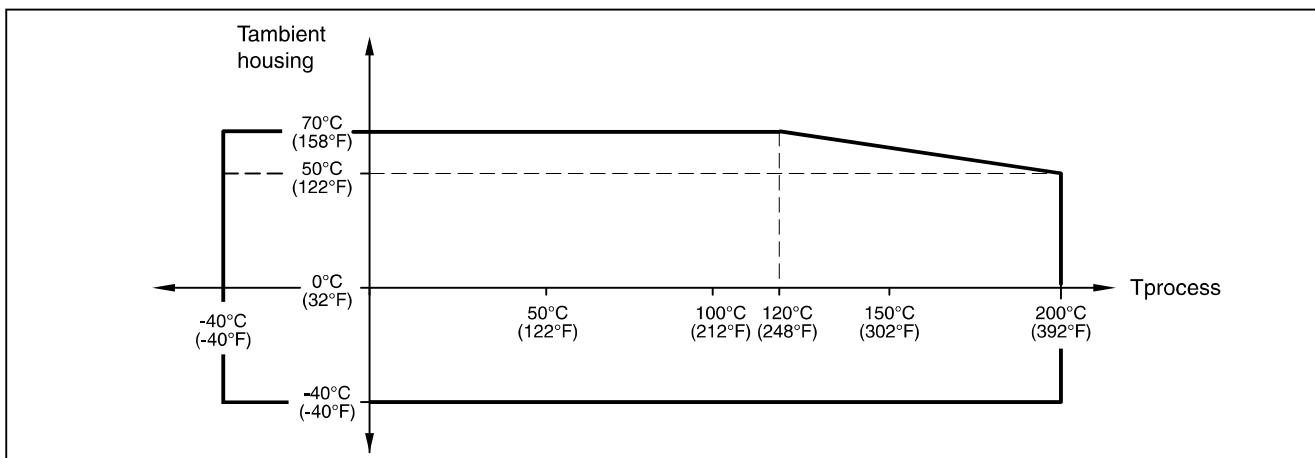
The maximum permissible temperature at the electronics/housing must not exceed the values in the above table.

Temperature derating for process temperatures up to +150 °C, +200 °C, +250 °C, +280 °C and +450 °C

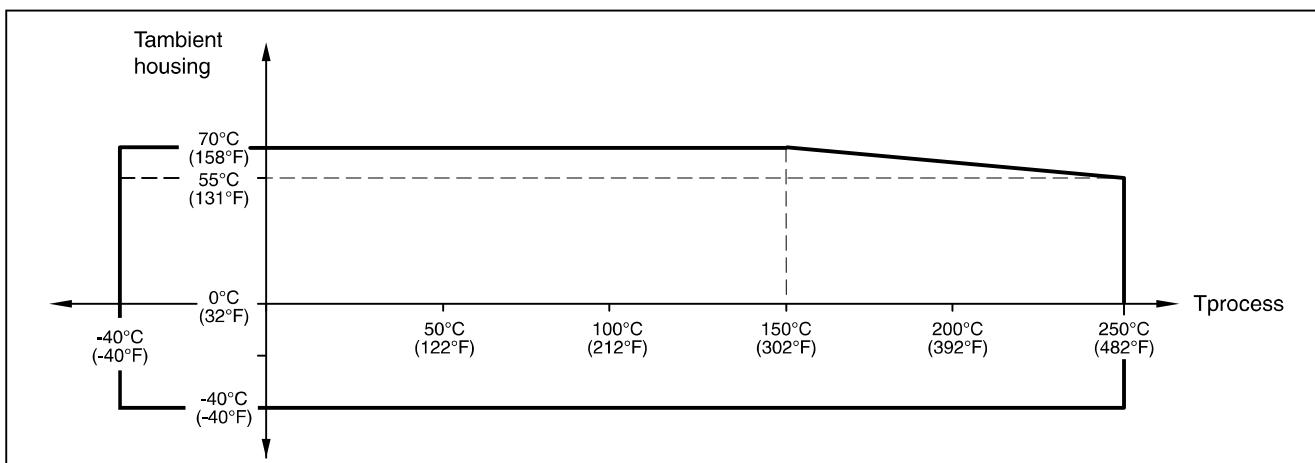
Versions for process temperatures up to +150 °C with metal housing



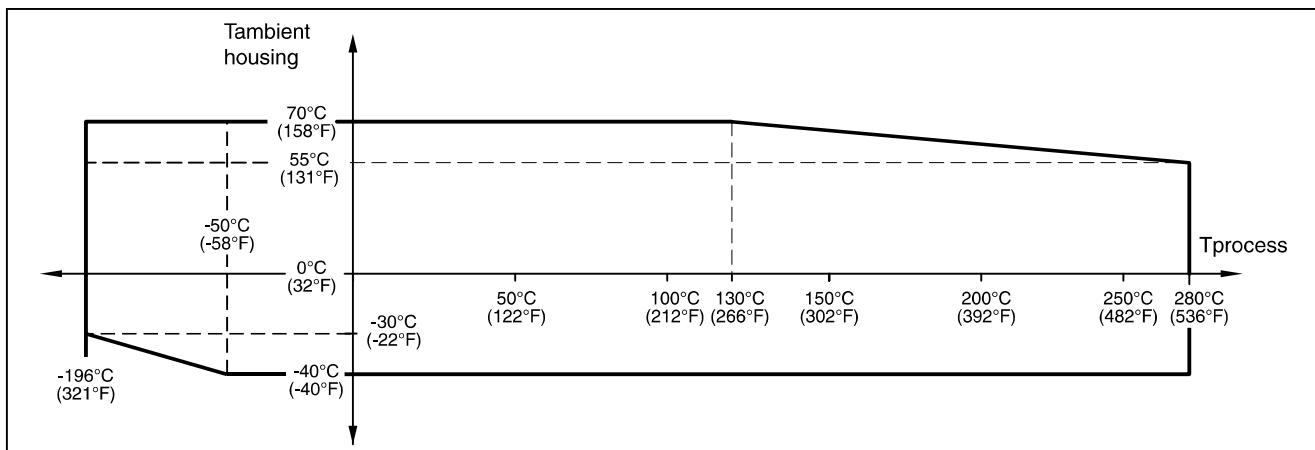
Versions for process temperatures up to +200 °C with metal housing



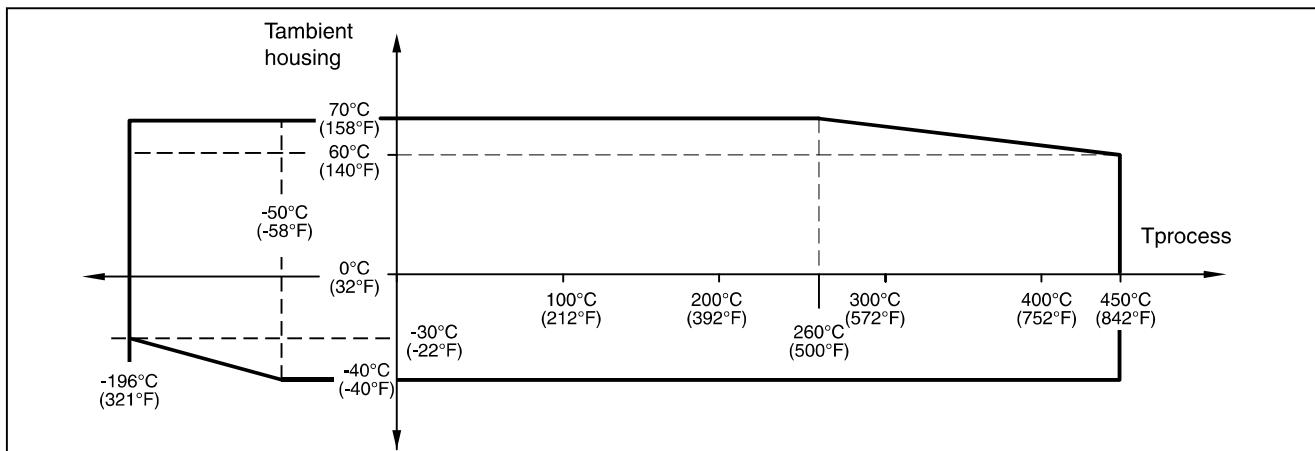
Versions for process temperatures up to +250 °C with metal housing



Versions for process temperatures up to +280 °C with metal housing



Versions for process temperatures up to +450 °C with metal housing



NivoGuide 8100, 3100, 8200

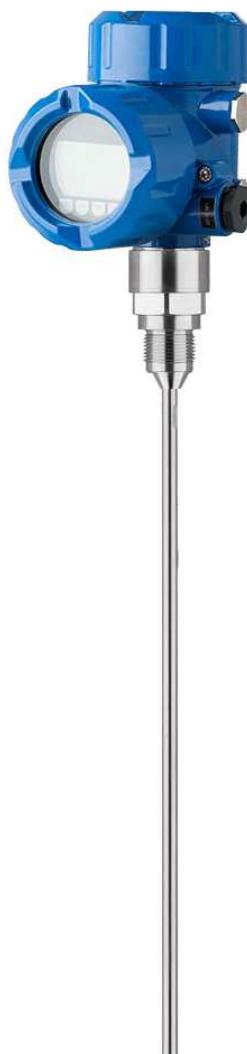
Flameproof enclosure "d"

Two-wire 4 ... 20 mA/HART

Two-wire 4 ... 20 mA/HART with SIL qualification



Safety instructions



Document ID: 62101



SOLUTIONS

A horizontal color bar consisting of four colored squares (grey, blue, grey, white) followed by the word "SOLUTIONS" in a bold, sans-serif font.

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Supplementary documentation:

- Operating Instructions NivoGuide 8100, 3100, 8200
- Quick setup guide NivoGuide 8100, 3100, 8200
- Certificate of Conformity IECEx TUN 19.0007 X, Issue No. 00 (Document ID: 62102)

Editing status: 2019-07-11

1 Area of applicability

These safety instructions apply to the NivoGuide 8100, 3100, 8200 of type series:

- NivoGuide NG8100.AC*A/B**1*** ****A/D
- NivoGuide NG3100.AC/D*A/B**1*** ****A/D
- NivoGuide NG8200.BC*A/B**1**0 ****A/D

With the electronics versions:

- A - Two-wire 4 ... 20 mA/HART
- B - Two-wire 4 ... 20 mA/HART with SIL qualification

According to Certificate of Conformity IECEx TUN 19.0007 X, Issue No. 00 (certificate number on the type label) and for all instruments with safety instruction 62101.

The classification as well as the respective standards are stated in the Certificate of Conformity:

- IEC 60079-0: 2017 (Edition 7.0)
- IEC 60079-1: 2014 (Edition 7.0)
- IEC 60079-26: 2014 (Edition 3.0)

Type of protection marking:

- Ex db IIC T6 ... T1 Ga/Gb, Gb

2 Important specification in the type code

NivoGuide 8100 NG8100.A**A/B**1*** ****A/D

Position	Feature	Description
2	Certificate	C Ex db IIC T6 ... T1 Ga/Gb, Gb
3	Seal / Second line of defense / Process temperature	A FKM (SHS EPM 70C3 GLT) / without / -40 ... +80 °C
		B EPDM (A+P 70.10-02) / without / -40 ... +80 °C
		D FFKM (Kalrez 6375) / without / -20 ... +150 °C
		F FKM (SHS FPM 70C3 GLT) / without / -40 ... +150 °C
		G FKM (SHS FPM 70C3 GLT) / with / -40 ... +150 °C
		H EPDM (A+P 70.10-02) / without / -40 ... +150 °C
		E Silicone FEP coated (A+P FEP-O-SEAL) / without / -40 ... +150 °C
		K FFKM (Kalrez 6375) / without / -20 ... +200 °C
		L FFKM (Kalrez 6375) / with / -20 ... +200 °C
		M EPDM (A+P 70.10-02) / with / -40 ... +150 °C
		N Silicone FEP coated (A+P FEP-O-SEAL) / with / -40 ... +150 °C
		C Silicone FEP coated (A+P FEP-O-SEAL) / without / -40 ... +80 °C
		P FFKM (Kalrez 6375) / with / -20 ... +150 °C
		Q FKM (SHS EPM 70C3 GLT) / with / -40 ... +80 °C
		R EPDM (A+P 70.10-02) / with / -40 ... +80 °C
		S Silicone FEP coated (A+P FEP-O-SEAL) / with / -40 ... +80 °C
4	Electronics module	A Two-wire 4 ... 20 mA/HART
		B Two-wire 4 ... 20 mA/HART with SIL qualification

Position	Feature	Description
5,6	Process fitting	** Gas-tight threaded connections, pipe connections and industrial flanges acc. to ASME, BS, DIN, EN, GOST, HG/T, JIS, other international, national or industrial standards, regulations or standards, with pressure specifications
8	Version and length of bracket "L" / Material	E exchangeable rod (ø 8 mm) / 316L
		F exchangeable rod (ø 12 mm) / 316L
		B exchangeable cable (ø 2 mm) with gravity weight / 316
		U exchangeable cable (ø 4 mm) without weight / 316
		A exchangeable cable (ø 4 mm) with gravity weight / 316
		K Coax (ø 21.3 mm) with single hole / 316L
		L Coax (ø 21.3 mm) with multiple hole / 316L
		P Coax (ø 42.2 mm) with multiple hole / 316L
9	Indicating/adjustment module	O without
		A mounted; lid with inspection window
		F without; lid with inspection window
		B laterally mounted; double chamber housing, lid with inspection window
10	Length rigid part "L1"	O without (version with rod)
		Z L1 = customer-specific (version with cable)
16	Housing	A Aluminium - single chamber
		D Aluminium - double chamber

NivoGuide 3100 NG3100.AA/B**1*** *****A/D**

Position	Feature	Description
2	Certificate	C Ex db IIC T6 ... T1 Ga/Gb, Gb
		D Ex db IIC T6 ... T1 Ga/Gb, Gb, II 1D, 1/2D, 1/3D, 2D Ex ta, ta/tb, ta/tc, tb IIIC T*
3	Seal / Process temperature	A FKM (SHS EPM 70C3 GLT) / -40 ... +80 °C
		F FKM (SHS FPM 70C3 GLT) / -40 ... +150 °C
		K FFKM (Kalrez 6375) / -20 ... +200 °C
		B EPDM (A+P 70.10-02) / -40 ... +80 °C
		H EPDM (A+P 70.10-02) / -40 ... +150 °C
4	Electronics module	A Two-wire 4 ... 20 mA/HART
		B Two-wire 4 ... 20 mA/HART with SIL qualification
5, 6	Process fitting	** Gas-tight threaded connections, pipe connections and industrial flanges acc. to ASME, BS, DIN, EN, GOST, HG/T, JIS, other international, national or industrial standards, regulations or standards, with pressure specifications

Position		Feature	Description
8	Version and length of bracket "L" / Material	A	exchangeable cable (ø 4 mm) / 316
		F	exchangeable rod (ø 6 mm) / 316
		E	exchangeable steel cable (ø 6 mm with gravity weight / PA coated
		G	exchangeable steel cable (ø 11 mm with gravity weight / PA coated
		H	exchangeable rod (ø 16 mm) / 316L
9	Indicating/adjustment module	O	without
		A	mounted; lid with inspection window
		F	without; lid with inspection window
		B	laterally mounted; double chamber housing, lid with inspection window
16	Housing	A	Aluminium - single chamber
		D	Aluminium - double chamber

NivoGuide 8200 NG8200.BA/B**1**0 *****A/D**

Position		Feature	Description
2	Certificate	C	Ex db IIC T6 ... T1 Ga/Gb, Gb
3	Seal / Second line of defense / Process temperature	1	Ceramic-graphite / with / -196 ... +280 °C
		2	Ceramic-graphite / with / -196 ... +450 °C
		3	PEEK-FFKM (Kalrez 6375) / with / -20 ... +250 °C
4	Electronics module	A	Two-wire 4 ... 20 mA/HART
		B	Two-wire 4 ... 20 mA/HART with SIL qualification
5,6	Process fitting	**	Gas-tight threaded connections, pipe connections and industrial flanges acc. to ASME, BS, DIN, EN, GOST, HG/T, JIS, other international, national or industrial standards, regulations or standards, with pressure specifications
8	Version and length of bracket "L" / Material	E	exchangeable rod (ø 8 mm) / 316L
		H	exchangeable rod (ø 16 mm) / 316L
		B	exchangeable cable (ø 2 mm) with gravity weight / 316
		A	exchangeable cable (ø 4 mm) with gravity weight / 316
		L	Coax (ø 21.3 mm) with multiple hole / 316L
		P	Coax (ø 42.2 mm) with multiple hole / 316L
9	Indicating/adjustment module	O	without
		A	mounted; lid with inspection window
		F	without; lid with inspection window
		B	laterally mounted; double chamber housing, lid with inspection window
16	Housing	A	Aluminium - single chamber
		D	Aluminium - double chamber

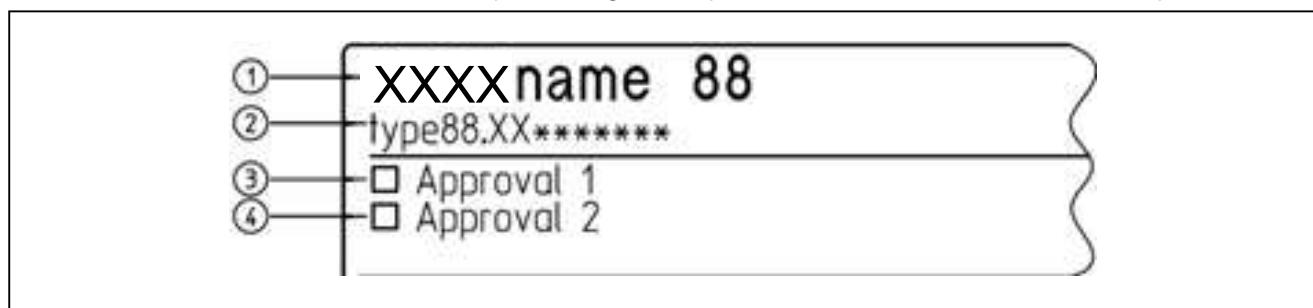
Multiple listed characteristics according to the dependencies of the device configuration.

In the following, all above mentioned versions are called NivoGuide 8100, 3100, 8200. If parts of these safety instructions refer only to certain versions, then these will be mentioned explicitly with their type code.

3 Different ignition protection types

The NivoGuide 8100, 3100, 8200 can be either used in explosive dust atmospheres or in explosive gas atmospheres.

The operator must specify the selected ignition protection type before installation. The selected ignition protection must be determined by marking it firmly on the identification label of the type plate.



- 1 NivoGuide 8100, 3100, 8200
- 2 Instrument version
- 3 Identification label: Approval in dust ignition protection type e.g. „Ex t“
- 4 Identification label: Approval in Gas ignition protection type e.g. „Ex i“, „Ex d“

If NivoGuide 8100, 3100, 8200 is installed in a dust atmosphere, then the safety instructions and the instructions in the respective certificates must be noted:

Installation	Approval	Certificate	Safety instruction
Dust	"A"	IECEx TUN 18.xxxxx X	xxxx

4 General information

The level measuring instruments NivoGuide 8100, 3100, 8200 as guided radar sensors are used to detect the distance between product surface and sensor by means of high frequency electromagnetic waves in the GHz range. The electronics uses the running time of the signals reflected by the product surface to calculate the distance to the product surface.

The NivoGuide 8100, 3100, 8200 consist of an electronics housing, a process connection element and a sensor, i.e. a measuring cable or a measuring rod. As an option, the display and adjustment module can also be installed in the instrument.

The NivoGuide 8100, 3100, 8200 are suitable for applications in hazardous atmospheres of all combustible materials of explosion groups IIA, IIB and IIC.

The NivoGuide 8100, 3100, 8200 are suitable for applications requiring EPL Ga/Gb or EPL Gb instruments.

5 Application area

EPL Ga/Gb or EPL Ga/Gc instrument

The NivoGuide 8100, 3100, 8200 with mechanical fixing element are installed in hazardous areas of zone 1 or zone 2 requiring EPL Gb or EPL Gc instruments. The mechanical fixing element, process connection element is installed in the separating wall, which separates areas requiring EPL Gb or EPL Gc instruments. The sensor measuring system is installed in hazardous areas of zone 0 requiring EPL Ga instruments.

EPL Gb instrument

The NivoGuide 8100, 3100, 8200 with the mechanical fixing element are installed in hazardous areas of zone 1 requiring EPL Gb instruments.

Instrument	EPL Gc	EPL Gb	EPL Ga/Gb
Ex Zone 2 			
Ex Zone 1 			
Ex Zone 0 			

6 Specific conditions of use ("X" identification)

The following overview is listing all special properties of NivoGuide 8100, 3100, 8200, which make a labelling with the symbol "X" behind the certificate number necessary.

Electrostatic charging (ESD)

You can find the details in chapter "*Electrostatic charging (ESD)*" of these safety instructions.

Ambient temperature

You can find the details in chapter "*Thermal data*" of these safety instructions.

Impact and friction sparks

The NivoGuide 8100, 3100, 8200 in light metal versions (e.g. aluminium, titanium, zircon) must be mounted in such a way that sparks from impact and friction between light metals and steel (except stainless steel, if the presence of rust particles can be excluded) cannot occur.

Non-grounded, metallic parts

Resistance between aluminium housing to metal measuring point identification plate is $> 10^9$ Ohm.

The capacitance of the metal measuring point identification plate was measured with 15 pF.

7 Important information for mounting and maintenance

General instructions

The following requirements must be fulfilled for mounting, electrical installation, setup and maintenance of the instrument:

- The staff must be qualified according the respective tasks
- The staff must be trained in explosion protection
- The staff must be familiar with the respectively valid regulations, e.g. planning and installation acc. to IEC/EN 60079-14
- Make sure when working on the instrument (mounting, installation, maintenance) that there is no explosive atmosphere present, the supply circuits should be voltage-free, if possible.

- The instrument has to be mounted according to the manufacturer specifications, the Certificate of Conformity and the valid regulations and standards
- Modifications on the instrument can influence the explosion protection and hence the safety
- Modifications must only be carried out by authorized employees
- Use only approved spare parts
- Components for installation and connection not included in the approval documents are only permitted if these correspond technically to the latest standard mentioned on the cover sheet. They must be suitable for the application conditions and have a separate certificate. The special conditions of the components must be noted and if necessary, the components must be integrated in the type test. This applies also to the components already mentioned in the technical description.
- Vessel installations and probable flow must be taken into account

Cable and wire entries

- The NivoGuide 8100, 3100, 8200 must be connected via suitable cable gland or conduit systems that are in conformity with the requirements of the flame proofing and the IP protection and provided with a separate type approval certificate. When connecting NivoGuide 8100, 3100, 8200 to conduit systems, the corresponding sealing facility must be connected directly to the housing.
- The red thread or/dust covers screwed in when the instruments are shipped (depending on the version) must be removed before setup and replaced by cable entries or closing screws suitable for the respective ignition protection type and IP protection.
- Note type and size of the thread: A label with the respective thread name is in the area of the respective thread
- Threads must have no damages
- Cable entries and closing screws should be mounted correctly and according to the safety instructions of the manufacturer to ensure the specified ignition protection type and IP protection rating. When using certified or suitable cable glands, closing screws or plug connections, it is absolutely necessary to note the corresponding certificates/documents. Supplied cable entries or closing screws meet these requirements.
- Unused openings must be closed with plugs suitable for the ignition protection type and IP protection. Supplied plugs meet these requirements.
- Cable or wire entries resp. the closing screws must be tightly screwed into the housing
- The connection cables resp. pipeline sealing facilities must be suitable for the application conditions (e.g. temperature range) of the application
- With surface temperatures > 70 °C, the cables must be suitable for the higher application conditions
- The connection cable of NivoGuide 8100, 3100, 8200 has to be wired fix and in such a way that damages can be excluded.

Single chamber housing



- 1 Lid, optionally with inspection window
- 2 Electronics compartment
- 3 Label: Thread type
- 4 Screw plug
- 5 External ground terminal
- 6 Red threaded or dust protection cap
Transport protection, replace with installation
- 7 Locking screws of the lid for lid locking

Double chamber housing



- 1 Lid, optionally with inspection window
- 2 Electronics compartment
- 3 Screw plug
- 4 Connection compartment
- 5 Transport protection, replace with installation
Red threaded or dust protection cap
- 6 Label: Thread type
- 7 Locking screws of the lid for lid locking
- 8 Lid, optionally with inspection window
- 9 Locking screws of the lid for lid locking

Mounting

Keep in mind for instrument mounting

- Mechanical damage on the instrument must be avoided
- Mechanical friction must be avoided
- Vessel installations and probable flow must be taken into account
- Process connections separating two areas of different Ex-zones must comply to valid regulations and standards and the protection rating must be in conformity to IEC/EN 60529.
- Close the housing lid (s) up to the stop before starting operating, to ensure the IP protection rating specified on the type label
- Protect the lid against unauthorized opening by unscrewing the locking screw up to the stop. With double chamber housing, you have to protect both lids.

Maintenance

To ensure the functionality of the device, periodic visual inspection is recommended for:

- Secure mounting
- No mechanical damages or corrosion
- Worn or otherwise damaged cables
- The potential equalization terminal must be secured against loosening
- Correct and clearly marked cable connections

The parts of the NivoGuide 8100, 3100, 8200 being in contact with flammable media during operation must be included in the periodic overpressure test of the plant.

Flameproof enclosure "d"

- The terminals for connecting the operating voltage or signal circuits are integrated in the connection compartment with type of protection flameproof enclosure "d"
- The thread gaps between housing and cover as well as between threaded fitting and container are flameproof joints
- It is not allowed to repair the flameproof joints.
- Cable, wire entries and closing screws must be certified acc. to ignition protection type Flameproof enclosures "d". Cable, wire entries and closing screws of simple design must not be used.
- Separately certified cable and wire entries can determine the permissible ambient temperature range or the temperature classes
- Only one threaded adapter is allowed per thread, when using a closing screw, threaded adapters are not allowed

Version with exchangeable cable or rod probe

Only original cable or rod probes must be mounted to NivoGuide 8100, 3100, 8200. When mounting cable or rod probes, the torques specified in the respective operating instruction manuals must be maintained. The mechanical connection must be ensured.

8 Safe operating mode

General operating conditions

- Do not operate the instrument outside the electrical, thermal and mechanical specifications of the manufacturer
- Use the instrument only in media against which the wetted parts are sufficiently resistant
- Note the relation between process temperature on the sensor/antenna and the permissible ambient temperature on the electronics housing. For permissible temperatures, see the respective temperature tables. See chapter "*Thermal data*".
- If necessary, a suitable overvoltage arrester can be connected in front of the NivoGuide 8100, 3100, 8200
- For assessment and reduction of the explosion risk, valid standards such as for example ISO/EN 1127-1 must be taken into account
- Lids must not be opened if there is a hazardous atmosphere. The housing lids are marked with the warning label:

WARNING - DO NOT OPEN WHEN AN
EXPLOSIVE ATMOSPHERE IS PRESENT

9 Potential equalization/Grounding

- Integrate the instruments into the local potential equalisation, e.g. via the internal or external earth terminal
- The potential equalization terminal must be secured against loosening and twisting
- If grounding of the cable screening is necessary, this must be carried out acc. to the valid standards and regulations, e.g. acc. to IEC/EN 60079-14

10 Electrostatic charging (ESD)

In case of instrument versions with electrostatically chargeable plastic parts, the danger of electrostatic charging and discharging must be taken into account!

The following parts can charge and discharge:

- Lacquered housing version or alternative special lacquering

- Plastic housing, plastic housing parts
- Metal housing with inspection window
- Plastic process fittings
- Plastic-coated process fittings and/or plastic-coated sensors
- Connection cable for separate versions
- Type label
- Isolated metallic labels (measuring point identification plate)

Take note in case of danger of electrostatic charges:

- Avoid friction on the surfaces
- Do not dry clean the surfaces

The instruments must be mounted/installed in such a way that the following can be ruled out:

- electrostatic charges during operation, maintenance and cleaning.
- process-related electrostatic charges, e.g. by measuring media flowing past

The warning label indicates danger:

WARNING - POTENTIAL ELECTROSTATIC CHARGING HAZARD - SEE INSTRUCTIONS

11 Electrical data

NivoGuide 8100, 3100, 8200

Supply and signal circuit in the electronics and connection compartment, single chamber housing:	
Terminals 1[+], 2[-]	$U = 9.6 \dots 35 \text{ V DC}$ $U_m = 253 \text{ V AC/DC}$ $I \leq 3.5 \dots 22.5 \text{ mA}$ (with superimposed HART signal)

NivoGuide 8100, 3100, 8200

Supply and signal circuit in the connection compartment, double chamber housing:	
Terminals 1[+], 2[-]	$U = 9.6 \dots 35 \text{ V DC}$ $U_m = 253 \text{ V AC/DC}$ $I \leq 3.5 \dots 22.5 \text{ mA}$ (with superimposed HART signal)
Display and adjustment circuit:	
Spring contacts in the connection compartment	Only for connection to the NivoGuide display and adjustment module.

The circuits of NivoGuide 8100, 3100, 8200 are galvanically separated from ground.

The circuits of NivoGuide 8100, 3100, 8200 are galvanically connected to ground potential via the earth terminals.

The metallic parts of NivoGuide 8100, 3100, 8200 are electrically connected with the earth terminals.

12 Mechanical data

The following mechanical data are valid for all housing and electronics versions.

Mechanical data	
Ground terminal (connection cross-section)	≥ 4 mm ²
Overvoltage category	See operating instructions NivoGuide 8100, 3100, 8200, chapter " <i>Technical data</i> "
Pollution degree	2
● Materials ● Max. tensile load on the cable or rod probe ● Potential connections and electrical separating measures in the instrument ● Electromechanical data ● Electrical protective measures	Are described in the operating instructions NivoGuide 8100, 3100, 8200 in chapter " <i>Technical data</i> ".

13 Thermal data

The following temperature tables are valid for all housing and electronics versions.

The relationship between the permissible ambient temperature for the electronics housing depending on the area of application and the maximum surface temperatures, temperature classes, can be seen in the following tables.

Temperature class	Temperature on the sensor (measuring cable, rod)	Ambient temperature on the electronics	
		Housing lid without inspection window	Housing lid with inspection window
T6	-40 ... +80 °C	-40 ... +60 °C	-40 ... +60 °C
T5	-40 ... +95 °C	-40 ... +61 °C	-40 ... +61 °C
T4	-40 ... +130 °C	-40 ... +70 °C	-40 ... +70 °C
T3	-40 ... +195 °C	-40 ... +70 °C	-40 ... +70 °C
T2	-40 ... +290 °C	-40 ... +70 °C	-40 ... +70 °C
T1	-40 ... +440 °C	-40 ... +70 °C	-40 ... +70 °C

Low temperature version up to -196 °C

Temperature class	Temperature on the sensor (measuring cable, rod)	Ambient temperature on the electronics	
		Housing lid without inspection window	Housing lid with inspection window
T6	-196 ... +80 °C	-40 ... +60 °C	-40 ... +60 °C
T5	-196 ... +95 °C	-40 ... +61 °C	-40 ... +61 °C
T4	-196 ... +130 °C	-40 ... +70 °C	-40 ... +70 °C
T3	-196 ... +195 °C	-40 ... +70 °C	-40 ... +70 °C
T2	-196 ... +290 °C	-40 ... +70 °C	-40 ... +70 °C
T1	-196 ... +440 °C	-40 ... +70 °C	-40 ... +70 °C

The sensors (measuring cable, rod) may only be operated in areas for EPL Ga, EPL Ga/Gb and EPL Gb applications if atmospheric conditions are present (pressure of 0.8 ... 1.1 bar).

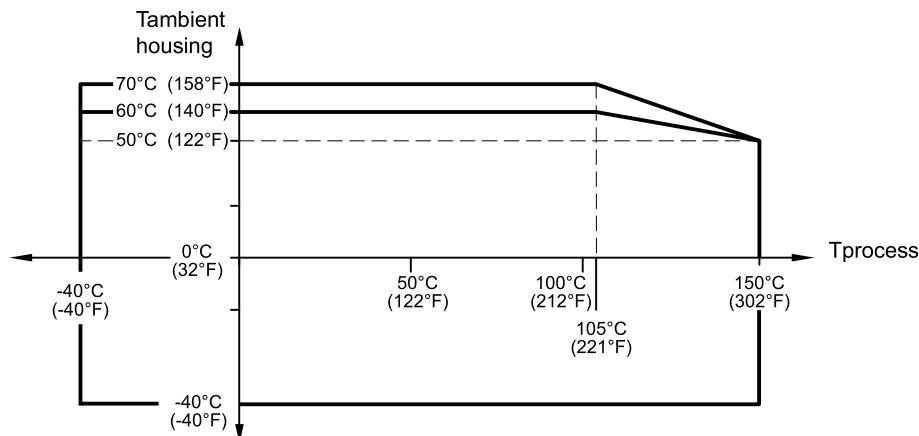
If there is no explosive atmosphere, the permissible operating temperatures and pressures must be taken from the manufacturer specifications (operating instructions).

If the sensors (measuring cable, measuring rod) are operated at temperatures higher than those listed in the table above, measures must be taken to prevent the risk of ignition from hot surfaces.

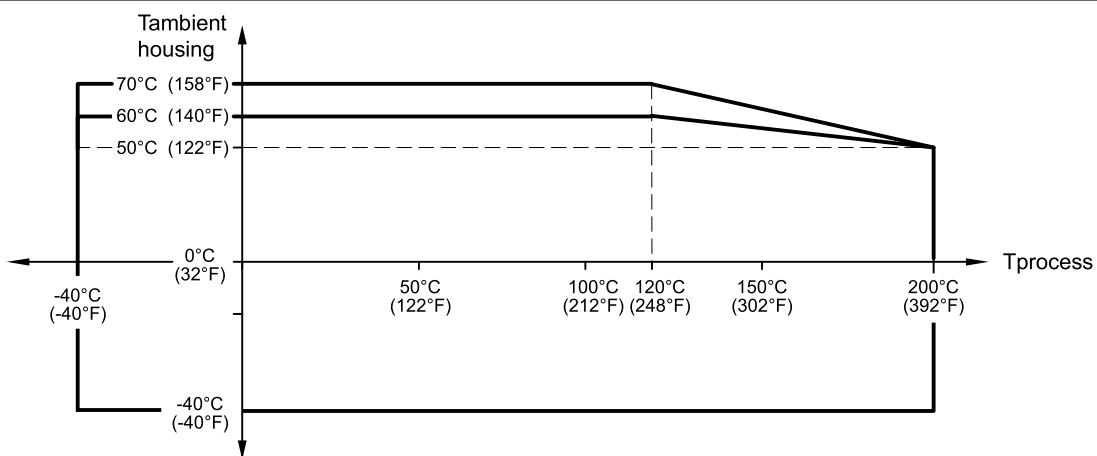
The maximum permissible temperature at the electronics/housing must not exceed the values in the above table.

Temperature derating for process temperatures up to +150 °C, +200 °C, +250 °C, +280 °C and +450 °C

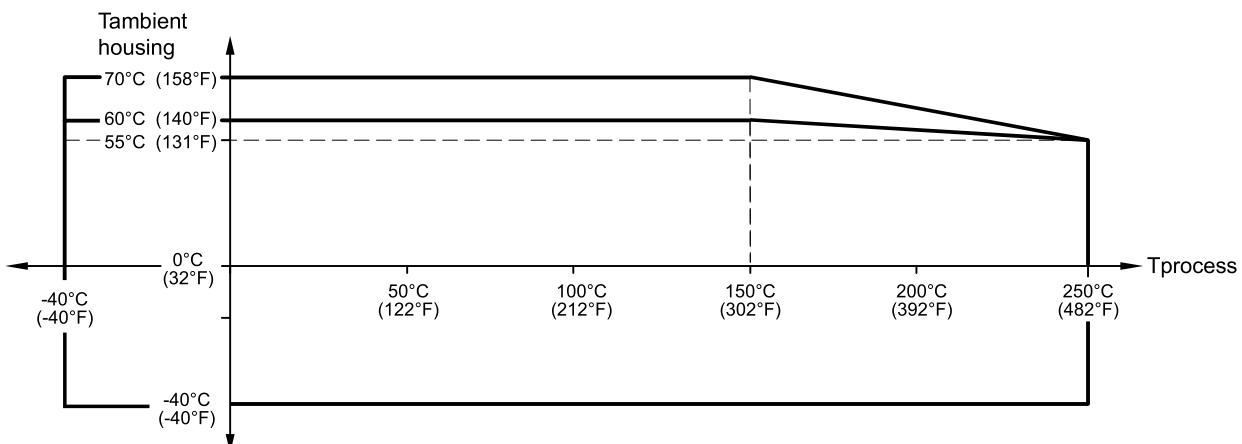
Versions for process temperatures up to +150 °C

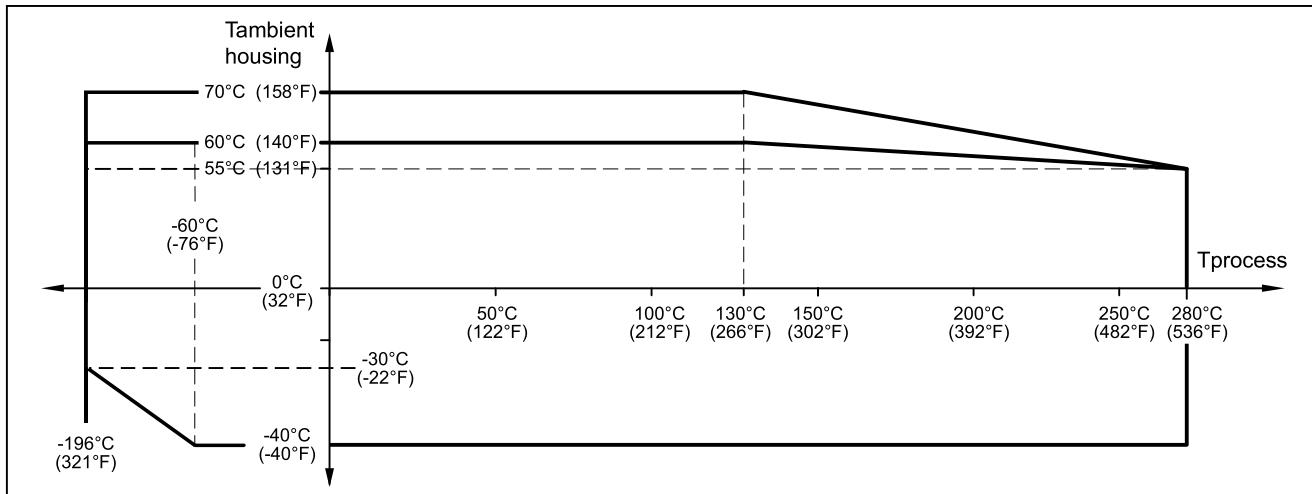
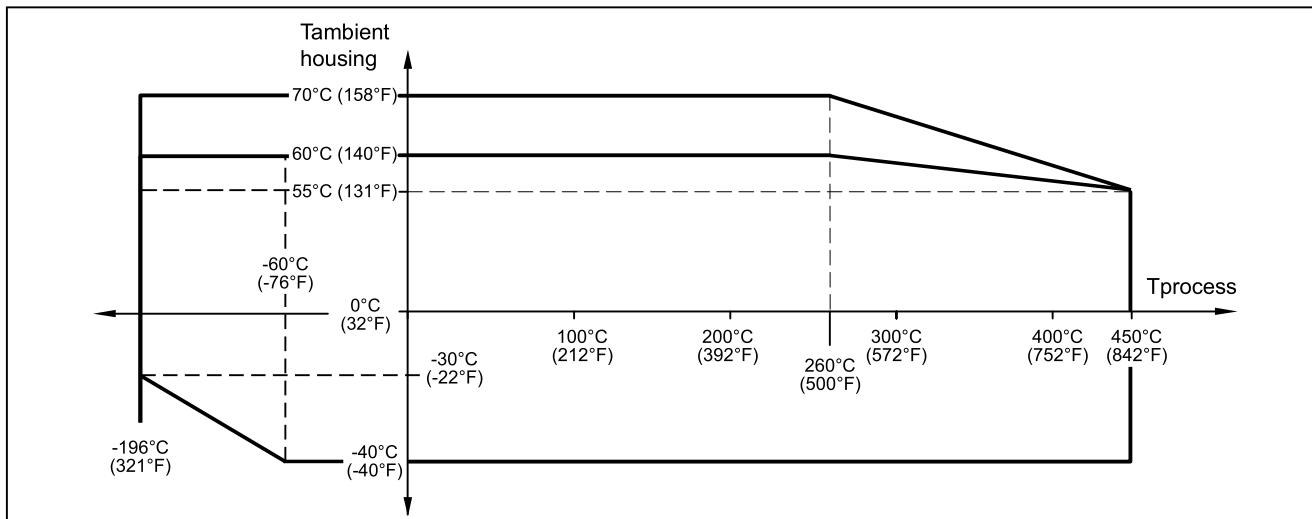


Versions for process temperatures up to +200 °C



Versions for process temperatures up to +250 °C



Versions for process temperatures up to +280 °C

Versions for process temperatures up to +450 °C


NivoGuide 8100, 3100, 8200

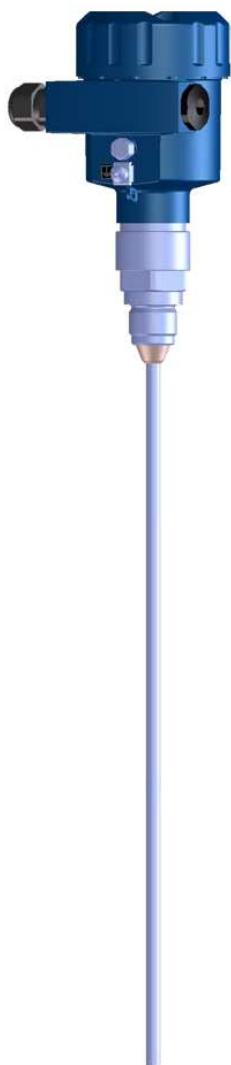
Intrinsic safety "i"

Two-wire 4 ... 20 mA/HART

Two-wire 4 ... 20 mA/HART with SIL qualification



Safety instructions



Document ID: 61521



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Supplementary documentation:

- Operating Instructions NivoGuide 8100, 3100, 8200
- Quick setup guide NivoGuide 8100, 3100, 8200
- Certificate of Conformity IECEx TUN 19.0006 X (Document ID: 61522)

Editing status: 2019-07-11

1 Area of applicability

These safety instructions apply to the NivoGuide 8100, 3100, 8200 of type series:

- NivoGuide 8100 NG8100.AB/D*A/B**1*** *****A/D/N
- NivoGuide 3100 NG3100.AB*A/B**1*** *****A/D/N
- NivoGuide 8200 NG8200.B/D*A/B**1**0 *****A/D/N

With the electronics versions:

- A - Two-wire 4 ... 20 mA/HART
- B - Two-wire 4 ... 20 mA/HART with SIL qualification

According to Certificate of Conformity IECEx TUN 19.0006 X (certificate number on the type label) and for all instruments with safety instruction 61521.

The classification as well as the respective standards are stated in the Certificate of Conformity:

- IEC 60079-0: 2017 (Edition 7.0)
- IEC 60079-11: 2011 (Edition 6.0)
- IEC 60079-26: 2014 (Edition 3.0)

Type of protection marking:

- Ex ia IIC T6 ... T1 Ga, Ga/Gb, Gb

2 Important specification in the type code

NivoGuide 8100 NG8100.AB/D*A/B**1*** *****A/D/N

Position	Feature	Description
2	B	Ex ia IIC T6 ... T1 Ga, Ga/Gb, Gb
	D	Ex ia IIC T6 ... T1 Ga, Ga/Gb, Gb, II 1D, 1/2D, 1/3D, 2D Ex ta, ta/tb, ta/tc, tb IIIC T*
3	A	FKM (SHS EPM 70C3 GLT) / without / -40 ... +80 °C
	B	EPDM (A+P 70.10-02) / without / -40 ... +80 °C
	D	FFKM (Kalrez 6375) / without / -20 ... +150 °C
	F	FKM (SHS FPM 70C3 GLT) / without / -40 ... +150 °C
	G	FKM (SHS FPM 70C3 GLT) / with / -40 ... +150 °C
	H	EPDM (A+P 70.10-02) / without / -40 ... +150 °C
	E	Silicone FEP coated (A+P FEP-O-SEAL) / without / -40 ... +150 °C
	K	FFKM (Kalrez 6375) / without / -20 ... +200 °C
	L	FFKM (Kalrez 6375) / with / -20 ... +200 °C
	M	EPDM (A+P 70.10-02) / with / -40 ... +150 °C
	N	Silicone FEP coated (A+P FEP-O-SEAL) / with / -40 ... +150 °C
	O	Silicone FEP coated (A+P FEP-O-SEAL) / without / -40 ... +80 °C
	P	FFKM (Kalrez 6375) / with / -20 ... +150 °C
	Q	FKM (SHS EPM 70C3 GLT) / with / -40 ... +80 °C
	R	EPDM (A+P 70.10-02) / with / -40 ... +80 °C
	S	Silicone FEP coated (A+P FEP-O-SEAL) / with / -40 ... +80 °C

Position		Feature	Description
4	Electronics module	A	Two-wire 4 ... 20 mA/HART
		B	Two-wire 4 ... 20 mA/HART with SIL qualification
5,6	Process fitting	**	Gas-tight threaded connections, pipe connections and industrial flanges acc. to ASME, BS, DIN, EN, GOST, HG/T, JIS, other international, national or industrial standards, regulations or standards, with pressure specifications
8	Version and length of bracket "L" / Material	E	exchangeable rod (ø 8 mm) / 316L
		F	exchangeable rod (ø 12 mm) / 316L
		B	exchangeable cable (ø 2 mm) with gravity weight / 316
		U	exchangeable cable (ø 4 mm) without weight / 316
		A	exchangeable cable (ø 4 mm) with gravity weight / 316
		K	Coax (ø 21.3 mm) with single hole / 316L
		L	Coax (ø 21.3 mm) with multiple hole / 316L
		P	Coax (ø 42.2 mm) with multiple hole / 316L
9	Indicating/adjustment module	O	without
		A	mounted; lid with inspection window
		F	without; lid with inspection window
		B	laterally mounted; double chamber housing, lid with inspection window
10	Length rigid part "L1"	O	without (version with rod)
		Z	L1 = customer-specific (version with cable)
16	Housing	A	Aluminium - single chamber
		D	Aluminium - double chamber
		N	Stainless steel single chamber

NivoGuide 3100 NG3100AB*A/B1*** *****A/D/N**

Position		Feature	Description
2	Certificate	B	Ex ia IIC T6 ... T1 Ga, Ga/Gb, Gb
3	Seal / Process temperature	A	FKM (SHS EPM 70C3 GLT) / -40 ... +80 °C
		F	FKM (SHS FPM 70C3 GLT) / -40 ... +150 °C
		K	FFKM (Kalrez 6375) / -20 ... +200 °C
		B	EPDM (A+P 70.10-02) / -40 ... +80 °C
		H	EPDM (A+P 70.10-02) / -40 ... +150 °C
4	Electronics module	A	Two-wire 4 ... 20 mA/HART
		B	Two-wire 4 ... 20 mA/HART with SIL qualification
5, 6	Process fitting	**	Gas-tight threaded connections, pipe connections and industrial flanges acc. to ASME, BS, DIN, EN, GOST, HG/T, JIS, other international, national or industrial standards, regulations or standards, with pressure specifications

Position		Feature	Description
8	Version and length of bracket "L" / Material	A	exchangeable cable (ø 4 mm) / 316
		F	exchangeable rod (ø 6 mm) / 316
		E	exchangeable steel cable (ø 6 mm with gravity weight / PA coated
		G	exchangeable steel cable (ø 11 mm with gravity weight / PA coated
		H	exchangeable rod (ø 16 mm) / 316L
9	Indicating/adjustment module	O	without
		A	mounted; lid with inspection window
		F	without; lid with inspection window
		B	laterally mounted; double chamber housing, lid with inspection window
16	Housing	A	Aluminium - single chamber
		D	Aluminium - double chamber
		N	Stainless steel single chamber

NivoGuide 8200 NG8200.B***1**0 *****A/D/N**

Position		Feature	Description
2	Certificate	B	Ex ia IIC T6 ... T1 Ga, Ga/Gb, Gb
		D	Ex ia IIC T6 ... T1 Ga, Ga/Gb, Gb, II 1D, 1/2D, 1/3D, 2D Ex ta, ta/tb, ta/tc, tb IIIC T*
3	Seal / Second line of defense / Process temperature	1	Ceramic-graphite / with / -196 ... +280 °C
		2	Ceramic-graphite / with / -196 ... +450 °C
		3	PEEK-FFKM (Kalrez 6375) / with / -20 ... +250 °C
4	Electronics module	A	Two-wire 4 ... 20 mA/HART
		B	Two-wire 4 ... 20 mA/HART with SIL qualification
5,6	Process fitting	**	Gas-tight threaded connections, pipe connections and industrial flanges acc. to ASME, BS, DIN, EN, GOST, HG/T, JIS, other international, national or industrial standards, regulations or standards, with pressure specifications
8	Version and length of bracket "L" / Material	E	exchangeable rod (ø 8 mm) / 316L
		H	exchangeable rod (ø 16 mm) / 316L
		B	exchangeable cable (ø 2 mm) with gravity weight / 316
		A	exchangeable cable (ø 4 mm) with gravity weight / 316
		L	Coax (ø 21.3 mm) with multiple hole / 316L
		P	Coax (ø 42.2 mm) with multiple hole / 316L
9	Indicating/adjustment module	O	without
		A	mounted; lid with inspection window
		F	without; lid with inspection window
		B	laterally mounted; double chamber housing, lid with inspection window

Position		Feature	Description
16	Housing	A	Aluminium - single chamber
		D	Aluminium - double chamber
		N	Stainless steel single chamber

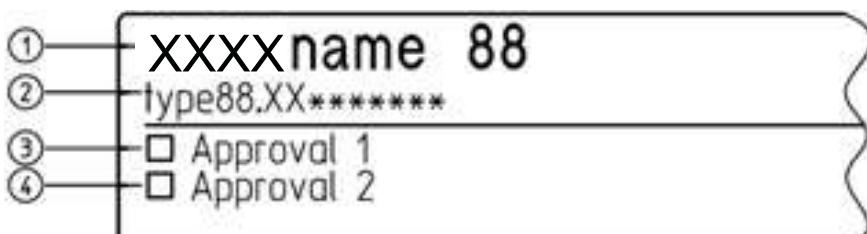
Multiple listed characteristics according to the dependencies of the device configuration.

In the following, all above mentioned versions are called NivoGuide 8100, 3100, 8200. If parts of these safety instructions refer only to certain versions, then these will be mentioned explicitly with their type code.

3 Different ignition protection types

The NivoGuide 8100, 3100, 8200 can be either used in explosive dust atmospheres or in explosive gas atmospheres.

The operator must specify the selected ignition protection type before installation. The selected ignition protection must be determined by marking it firmly on the identification label of the type plate.



- 1 NivoGuide 8100, 3100, 8200
- 2 Instrument version
- 3 Identification label: Approval in dust ignition protection type e. g. „Ex t“
- 4 Identification label: Approval in Gas ignition protection type e. g. „Ex i“, „Ex d“

If NivoGuide 8100, 3100, 8200 is installed in a dust atmosphere, then the safety instructions and the instructions in the respective certificates must be noted:

Installation	Approval	Certificate	Safety instruction
Dust (Protection by enclosure "t")	"A"	IECEx TÜV 18 xxxx X	xxxxx

4 General information

The level measuring instruments NivoGuide 8100, 3100, 8200 as guided radar sensors are used to detect the distance between product surface and sensor by means of high frequency electromagnetic waves in the GHz range. The electronics uses the running time of the signals reflected by the product surface to calculate the distance to the product surface.

The NivoGuide 8100, 3100, 8200 consist of an electronics housing, a process connection element and a sensor, i.e. a measuring cable or a measuring rod. As an option, the display and adjustment module can also be installed in the instrument.

The NivoGuide 8100, 3100, 8200 are suitable for applications in hazardous atmospheres of all combustible materials of explosion groups IIA, IIB and IIC.

The NivoGuide 8100, 3100, 8200 are suitable for applications requiring EPL Ga, EPL Ga/Gb or EPL Gb instruments.

5 Application area

EPL Ga instrument

The NivoGuide 8100, 3100, 8200 with the mechanical fixing element are installed in hazardous areas of zone 0 requiring EPL Ga instruments.

EPL Ga/Gb or EPL Ga/Gc instrument

The NivoGuide 8100, 3100, 8200 with mechanical fixing element are installed in hazardous areas of zone 1 or zone 2 requiring EPL Gb or EPL Gc instruments. The mechanical fixing element, process connection element is installed in the separating wall, which separates areas requiring EPL Gb or EPL Gc instruments. The sensor measuring system is installed in hazardous areas of zone 0 requiring EPL Ga instruments.

EPL Gb instrument

The NivoGuide 8100, 3100, 8200 with the mechanical fixing element are installed in hazardous areas of zone 1 requiring EPL Gb instruments.

Instrument	EPL Gc	EPL Gb	EPL Ga/Gb	EPL Ga
Ex Zone 2 				
Ex Zone 1 				
Ex Zone 0 				

6 Specific conditions of use ("X" identification)

The following overview is listing all special properties of NivoGuide 8100, 3100, 8200, which make a labelling with the symbol "X" behind the certificate number necessary.

Electrostatic charging (ESD)

You can find the details in chapter "*Electrostatic charging (ESD)*" of these safety instructions.

Ambient temperature

You can find the details in chapter "*Thermal data*" of these safety instructions.

Impact and friction sparks

The NivoGuide 8100, 3100, 8200 in light metal versions (e.g. aluminium, titanium, zircon) must be mounted in such a way that sparks from impact and friction between light metals and steel (except stainless steel, if the presence of rust particles can be excluded) cannot occur.

Non-grounded, metallic parts

Resistance between aluminium housing to metal measuring point identification plate is $> 10^9$ Ohm.

The capacitance of the metal measuring point identification plate was measured with 15 pF.

7 Important information for mounting and maintenance

General instructions

The following requirements must be fulfilled for mounting, electrical installation, setup and maintenance of the instrument:

- The staff must be qualified according the respective tasks
- The staff must be trained in explosion protection
- The staff must be familiar with the respectively valid regulations, e.g. planning and installation acc. to IEC/EN 60079-14
- Make sure when working on the instrument (mounting, installation, maintenance) that there is no explosive atmosphere present, the supply circuits should be voltage-free, if possible.
- The instrument has to be mounted according to the manufacturer specifications, the Certificate of Conformity and the valid regulations and standards
- Modifications on the instrument can influence the explosion protection and hence the safety
- Modifications must only be carried out by authorized employees
- Use only approved spare parts
- Components for installation and connection not included in the approval documents are only permitted if these correspond technically to the latest standard mentioned on the cover sheet. They must be suitable for the application conditions and have a separate certificate. The special conditions of the components must be noted and if necessary, the components must be integrated in the type test. This applies also to the components already mentioned in the technical description.
- Vessel installations and probable flow must be taken into account

Cable and wire entries

- The NivoGuide 8100, 3100, 8200 must be connected via suitable cable gland or conduit systems that are in conformity with the requirements of the flame proofing and the IP protection and provided with a separate type approval certificate. When connecting NivoGuide 8100, 3100, 8200 to conduit systems, the corresponding sealing facility must be connected directly to the housing.
- The red thread or/dust covers screwed in when the instruments are shipped (depending on the version) must be removed before setup and replaced by cable entries or closing screws suitable for the respective ignition protection type and IP protection.
- Note type and size of the thread: A label with the respective thread name is in the area of the respective thread
- Threads must have no damages
- Cable entries and closing screws should be mounted correctly and according to the safety instructions of the manufacturer to ensure the specified ignition protection type and IP protection rating. When using certified or suitable cable glands, closing screws or plug connections, it is absolutely necessary to note the corresponding certificates/documents. Supplied cable entries or closing screws meet these requirements.
- Unused openings must be closed with plugs suitable for the ignition protection type and IP protection. Supplied plugs meet these requirements.
- Cable or wire entries resp. the closing screws must be tightly screwed into the housing
- The connection cables resp. pipeline sealing facilities must be suitable for the application conditions (e.g. temperature range) of the application
- With surface temperatures > 70 °C, the cables must be suitable for the higher application conditions
- The connection cable of NivoGuide 8100, 3100, 8200 has to be wired fix and in such a way that damages can be excluded.

Mounting

Keep in mind for instrument mounting

- Mechanical damage on the instrument must be avoided
- Mechanical friction must be avoided
- Process connections separating two areas of different Ex-zones must comply to valid regulations and standards and the protection rating must be in conformity to IEC/EN 60529.
- Close the housing lid (s) up to the stop before starting operating, to ensure the IP protection rating specified on the type label

Maintenance

To ensure the functionality of the device, periodic visual inspection is recommended for:

- Secure mounting
- No mechanical damages or corrosion
- Worn or otherwise damaged cables
- The potential equalization terminal must be secured against loosening
- Correct and clearly marked cable connections

The parts of the NivoGuide 8100, 3100, 8200 being in contact with flammable media during operation must be included in the periodic overpressure test of the plant.

Intrinsic safety "i"

- Valid regulations for connection of intrinsically safe circuits, e.g. proof of intrinsic safety according to IEC/EN 60079-14 must be observed
- The instrument is only suitable for connection to certified, intrinsically safe instruments
- When connecting a circuit with protection level Ex ib, the device, the sensor meas. system of the device must no more be used in hazardous areas of zone 0.
- When connecting an intrinsically safe instruments with classification mark Ex ia to a circuit with protection level Ex ib, then the classification mark of the instrument changes to Ex ib. After the use as instrument with Ex ib power supply, the instrument must no more be used in circuits with protection level Ex ia
- When connecting an intrinsically safe instrument to a non-intrinsically safe circuit, the instrument must be no longer used in intrinsically safe circuits
- With surface temperatures > 70 °C, the cables must be suitable for the higher application conditions

Version with exchangeable cable or rod probe

Only original cable or rod probes must be mounted to NivoGuide 8100, 3100, 8200. When mounting cable or rod probes, the torques specified in the respective operating instruction manuals must be maintained. The mechanical connection must be ensured.

8 Safe operating mode

General operating conditions

- Do not operate the instrument outside the electrical, thermal and mechanical specifications of the manufacturer
- Use the instrument only in media against which the wetted parts are sufficiently resistant
- Note the relation between process temperature on the sensor/antenna and the permissible ambient temperature on the electronics housing. For permissible temperatures, see the respective temperature tables. See chapter "*Thermal data*".
- If necessary, a suitable overvoltage arrester can be connected in front of the NivoGuide 8100, 3100, 8200
- For assessment and reduction of the explosion risk, valid standards such as for example ISO/EN 1127-1 must be taken into account

9 Potential equalization/Grounding

- Integrate the instruments into the local potential equalisation, e.g. via the internal or external earth terminal
- The potential equalization terminal must be secured against loosening and twisting
- If grounding of the cable screening is necessary, this must be carried out acc. to the valid standards and regulations, e.g. acc. to IEC/EN 60079-14
- The intrinsically safe input and the intrinsically safe output circuits are ground-free. The voltage resistance against ground is min. 500 Veff.

10 Electrostatic charging (ESD)

In case of instrument versions with electrostatically chargeable plastic parts, the danger of electrostatic charging and discharging must be taken into account!

The following parts can charge and discharge:

- Lacquered housing version or alternative special lacquering
- Plastic housing, plastic housing parts
- Metal housing with inspection window
- Plastic process fittings
- Plastic-coated process fittings and/or plastic-coated sensors
- Connection cable for separate versions
- Type label
- Isolated metallic labels (measuring point identification plate)

Take note in case of danger of electrostatic charges:

- Avoid friction on the surfaces
- Do not dry clean the surfaces

The instruments must be mounted/installed in such a way that the following can be ruled out:

- electrostatic charges during operation, maintenance and cleaning.
- process-related electrostatic charges, e.g. by measuring media flowing past

The warning label indicates danger:

WARNING - POTENTIAL ELECTROSTATIC CHARGING HAZARD - SEE INSTRUCTIONS

11 Instructions for zone 0, zone 0/1 applications

In hazardous areas, the instrument, sensor measuring system in zone 0 should only be operated under atmospheric conditions:

- Temperature: -20 ... +60 °C.
- Pressure: 80 ... 110 kPa (0.8 ... 1.1 bar)
- Air with normal oxygen content, normally 21 %

The operator must ensure that the medium temperature in zone 0 is not higher than 80 % of the self-ignition temperature of the concerned medium (in °C) and does not exceed the max. permissible flange temperature depending on the temperature class. The parts of the sensor which during operation are in contact with flammable products, must be integrated in the periodic overpressure test of the plant.

If no explosive mixtures or additional application conditions are certified resp. supplementary measures such as e.g. according to ISO/EN 1127-1 taken, then the instruments can be also operated according to the manufacturer specification outside atmospheric conditions.

If there is a risk of dangerous potential differences inside zone 0, then suitable measures for circuits in zone 0 must be taken, e.g. according to the requirements of IEC/EN 60079-14.

Process fittings between two explosion protection areas require category 1G (EPL Ga) and less endangered areas must show a tightness in accordance with protection rating IP 67 acc. to IEC/EN 60529.

12 Electrical data

NivoGuide 8100, 3100, 8200, single chamber housing, Ex i electronics and connection compartment

Intrinsically safe voltage supply, signal circuit:	
Terminals 1[+], 2[-]	<p>In type of protection intrinsic safety Ex ia IIC</p> <p>For connection to a certified, intrinsically safe circuit.</p> <p>$U_i = 30 \text{ V}$</p> <p>$I_i = 131 \text{ mA}$</p> <p>$P_i = 983 \text{ mW}$</p> <p>The effective internal capacitance C_i is negligibly small.</p> <p>The effective internal inductance is $L_i \leq 5 \mu\text{H}$.</p>

NivoGuide 8100, 3100, 8200, double chamber housing, Ex i connection compartment

Intrinsically safe voltage supply, signal circuit:	
Terminals 1[+], 2[-]	<p>In type of protection intrinsic safety Ex ia IIC</p> <p>For connection to a certified, intrinsically safe circuit.</p> <p>$U_i = 30 \text{ V}$</p> <p>$I_i = 131 \text{ mA}$</p> <p>$P_i = 983 \text{ mW}$</p> <p>The effective internal capacitance C_i is negligibly small.</p> <p>The effective internal inductance is $L_i \leq 10 \mu\text{H}$.</p>

NivoGuide 8100, 3100, 8200, single and double chamber housing, Ex i electronics and connection compartment

Intrinsically safe circuit for the display and adjustment module or the interface adapter	
Spring contacts	<p>In type of protection intrinsic safety Ex ia IIC.</p> <p>Only for connection to the NivoGuide display and adjustment module.</p>

13 Mechanical data

The following mechanical data are valid for all housing and electronics versions.

Mechanical data	
Ground terminal (connection cross-section)	$\geq 4 \text{ mm}^2$
Oversupply category	See operating instructions NivoGuide 8100, 3100, 8200, chapter "Technical data"

Mechanical data	
Pollution degree	2
● Materials ● Max. tensile load on the cable or rod probe ● Potential connections and electrical separating measures in the instrument ● Electromechanical data ● Electrical protective measures	Are described in the operating instructions NivoGuide 8100, 3100, 8200 in chapter " <i>Technical data</i> ".

14 Thermal data

The following temperature tables are valid for all housing and electronics versions.

If the NivoGuide 8100, 3100, 8200 level transmitters are operated in hazardous areas for EPL Ga, EPL Ga/Gb and EPL Gb applications, the permissible temperature range on the electronics/housings as well as on the sensor (measuring cable, rod) depending on the temperature class can be found in the following table:

Temperature class	Ambient temperature range (Electronics/housing)	Product temperature range on the sensor (measuring cable, rod)
T6	-40 ... +46 °C	-40 ... +80 °C
T5	-40 ... +61 °C	-40 ... +95 °C
T4	-40 ... +70 °C	-40 ... +130 °C
T3	-40 ... +70 °C	-40 ... +195 °C
T2	-40 ... +70 °C	-40 ... +290 °C
T1	-40 ... +70 °C	-40 ... +440 °C

Low temperature version up to -196 °C

Temperature class	Ambient temperature range (Electronics/housing)	Product temperature range on the sensor (measuring cable, rod)
T6	-40 ... +46 °C	-196 ... +80 °C
T5	-40 ... +61 °C	-196 ... +95 °C
T4	-40 ... +70 °C	-196 ... +130 °C
T3	-40 ... +70 °C	-196 ... +195 °C
T2	-40 ... +70 °C	-196 ... +290 °C
T1	-40 ... +70 °C	-196 ... +440 °C

The sensors (measuring cable, rod) may only be operated in areas for EPL Ga, EPL Ga/Gb and EPL Gb applications if atmospheric conditions are present (pressure of 0.8 ... 1.1 bar).

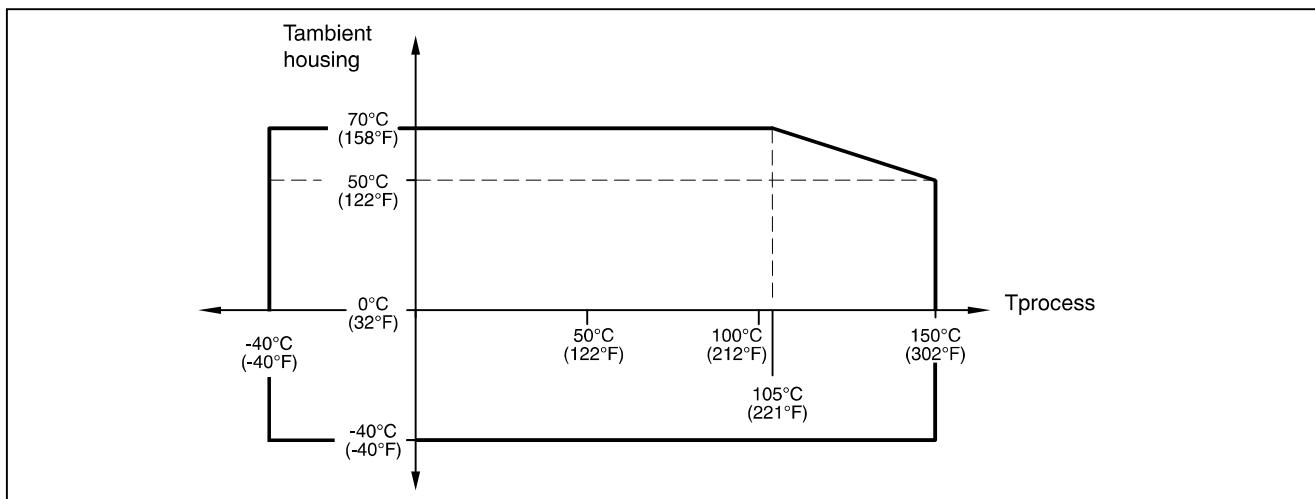
If there is no explosive atmosphere, the permissible operating temperatures and pressures must be taken from the manufacturer specifications (operating instructions).

If the sensors (measuring cable, measuring rod) are operated at temperatures higher than those listed in the table above, measures must be taken to prevent the risk of ignition from hot surfaces.

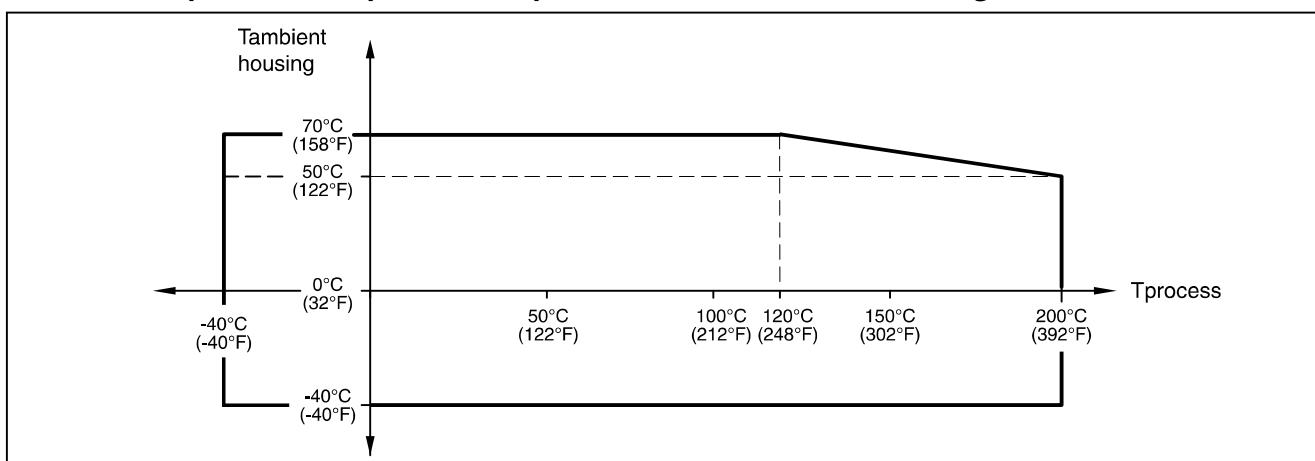
The maximum permissible temperature at the electronics/housing must not exceed the values in the above table.

Temperature derating for process temperatures up to +150 °C, +200 °C, +250 °C, +280 °C and +450 °C

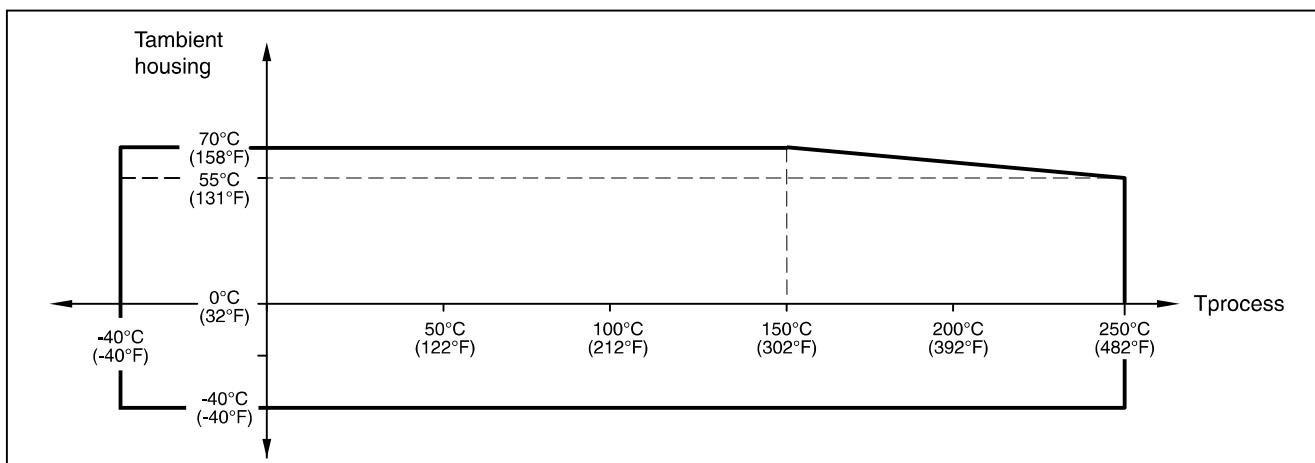
Versions for process temperatures up to +150 °C with metal housing



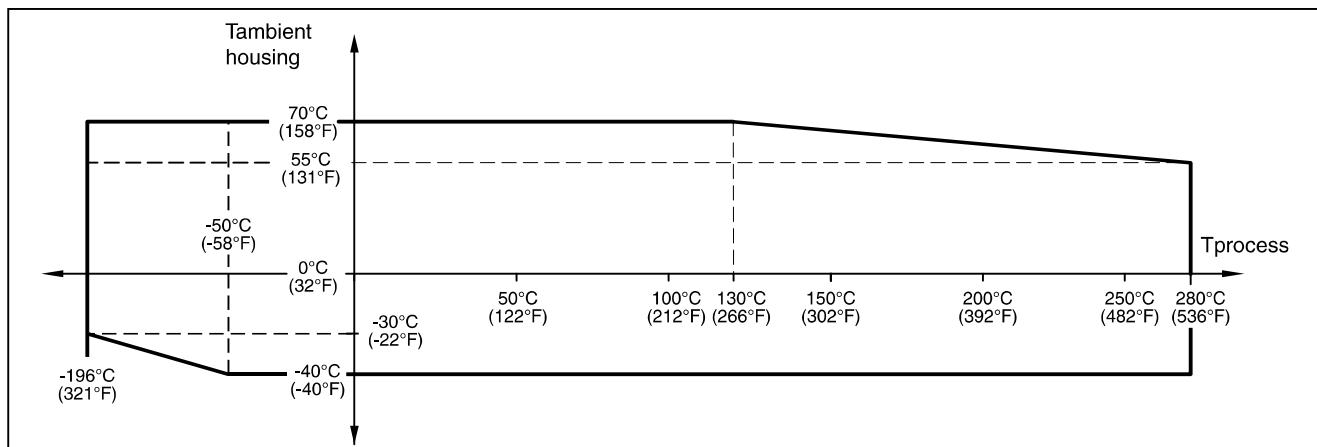
Versions for process temperatures up to +200 °C with metal housing



Versions for process temperatures up to +250 °C with metal housing



Versions for process temperatures up to +280 °C with metal housing



Versions for process temperatures up to +450 °C with metal housing

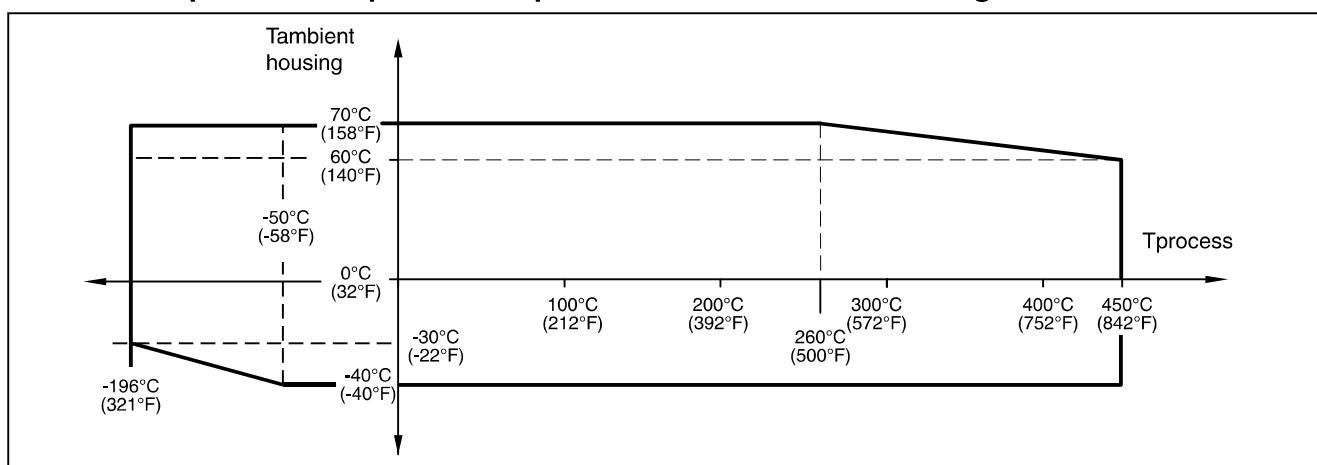
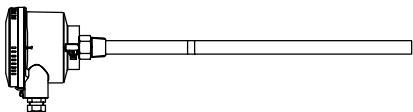


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Subject to technical change.
All dimensions in mm (inch).

We assume no liability for typing errors.
Different variations than specified are possible.
Please contact our technical consultants.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning may be accomplished only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.
- This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications.

Special attention must be paid to warnings and notes as follows:

WARNING



Relates to a caution symbol on the product: A failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.

WARNING



Relates to a caution symbol on the product: Risk of electric shock

WARNING



A failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product	Description
	CAUTION: refer to accompanying documents (manual) for details.
	Earth (ground) Terminal
	Protective Conductor Terminal

Technical support

Please contact your local supplier (for address see www.uwt.de). Otherwise you can contact:

UWT GmbH
Westendstr. 5
D-87488 Betzigau

Tel.: 0049 (0)831 57123-0
Fax: 0049 (0)831 76879
info@uwt.de
www.uwt.de

Introduction

Applications

NC 8000 is a cost-effective instrument for level measurement in applications such as the processing of food and beverages, pharmaceuticals, detergents and pet food. It performs in liquids, bulk solids and slurries, including viscous (conductive or nonconductive) materials, even in challenging environments involving vapour and dust.

- Mining and cement
- Power
- Food and beverage
- Water
- Chemical
- Oil and gas

Function

NC 8000 is a 2-wire instrument combining a sophisticated, yet easy-to-adjust, microprocessor transmitter with field-proven probes.

The electronic component contains the measurement module (driver) and the microprocessor module. This set of parts forms a calibrated pair that measures process capacitance in pico Farads (pF) which is proportional to the level of material in the tank. An optional safety barrier can be included in the electronic compartment for Hazardous Area applications.

The probe comprises a measurement section and an active shield section that is a fixed length. The probe is the primary system sensor, and it indicates the electrical capacitance value of the measurement section relative to the environment (tank wall, stilling well, or conductive material). This part of the probe connects to the electronic transmitter.

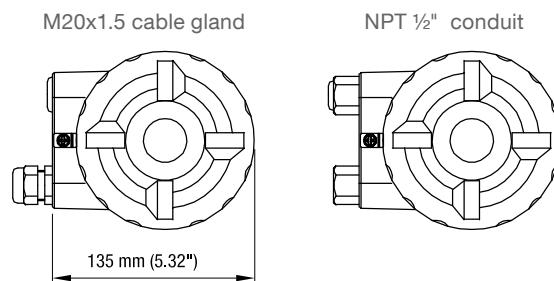
Features

- Threaded and flanged process connections
- Corrosion resistant construction, PFA, PEEK, and 316L stainless steel wetted parts
- 5 m (16.4 ft) maximum insertion length for rod versions
- 25 m (82 ft) maximum insertion length for rope versions
- Rugged shear and abrasion resistant probe
- Fully adjustable range: level, damping, diagnostics, etc.
- Field adjustable insertion length for rope probes without PFA insulation
- Probe input ESD protected
- Field proven and Active-Shield technology and variable frequency oscillator

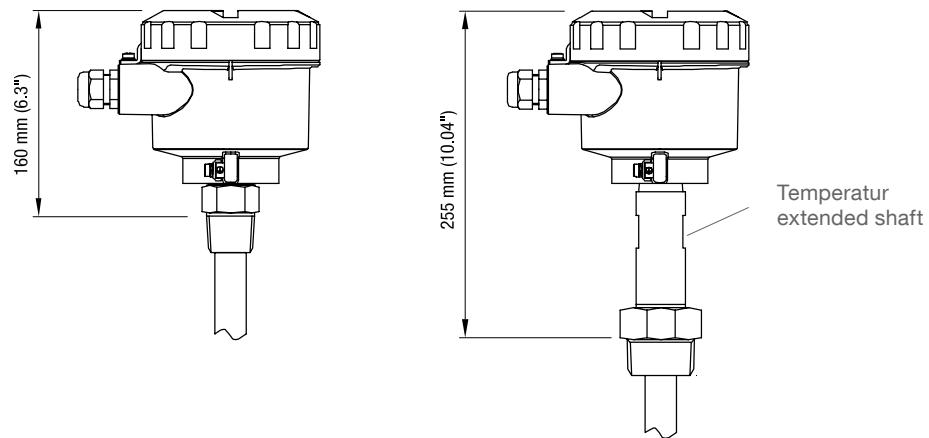
Technical data - Dimensions

Enclosure

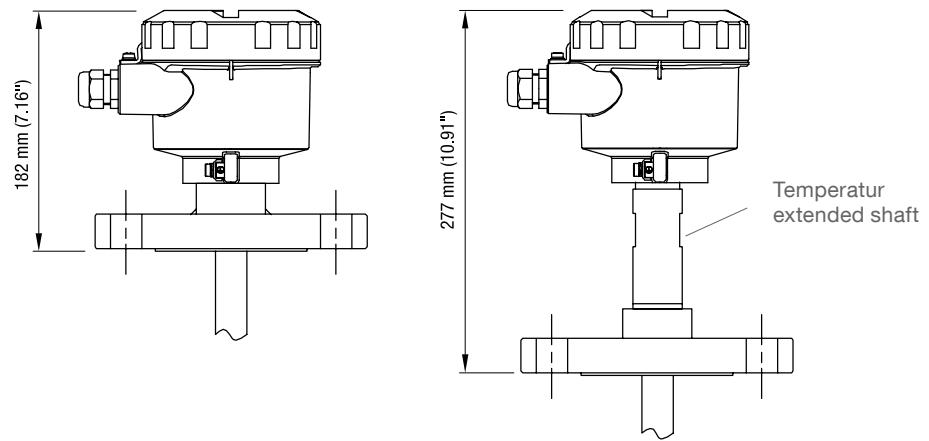
NC 8100
 Top view



NC 8100
 Threaded
 process connection



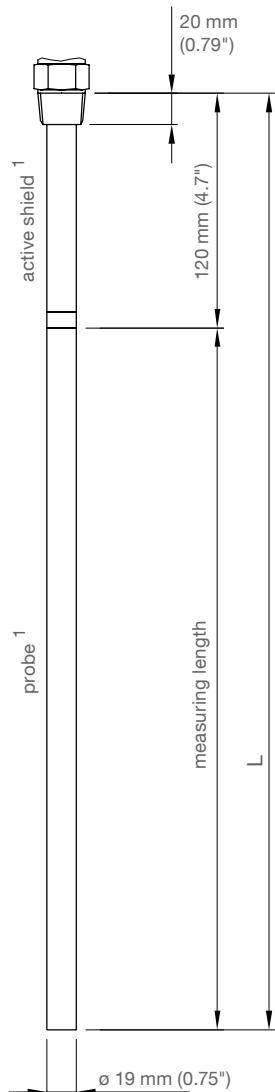
NC 8100
 Flanged
 process connection



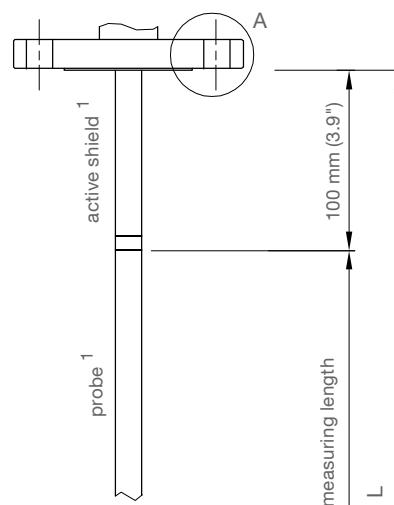
Dimensions

NC 8100 Rod version

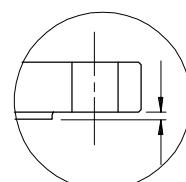
Threaded process connection



Flanged process connection



Detail "A"



L does not include any raised face (see page 7)

¹ Active shield and probe is PFA coated

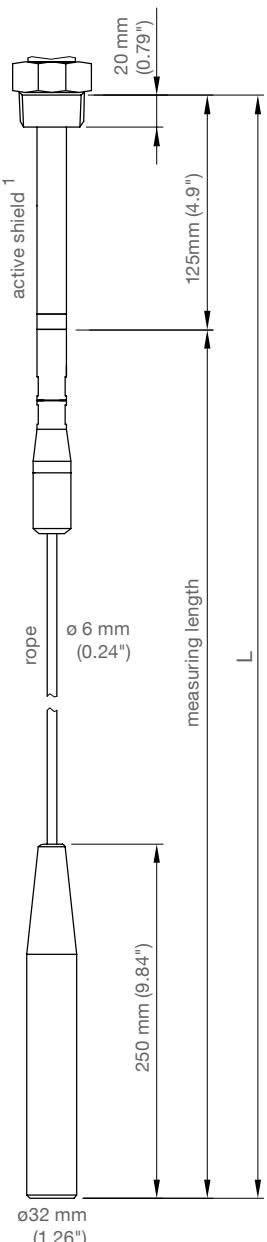
Dimensions

NC 8100 Rope version

Rope not PFA coated

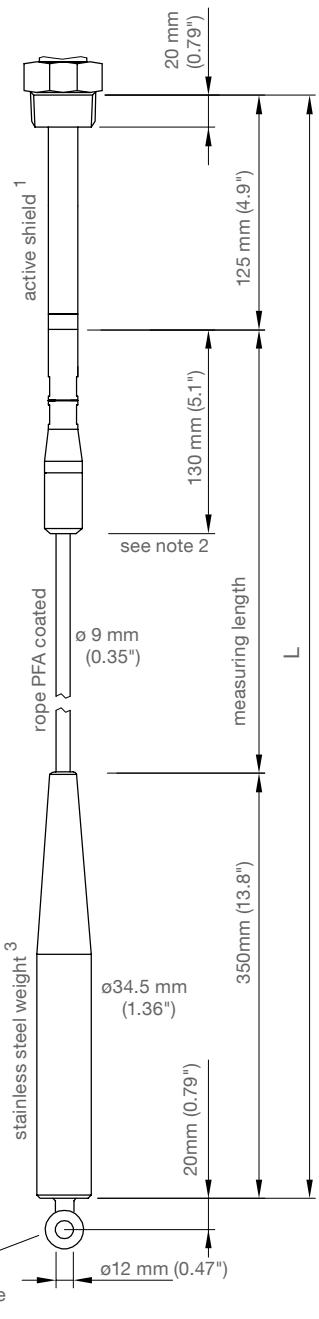
Applicable for isolating (non conductive) media only

Threaded process connection

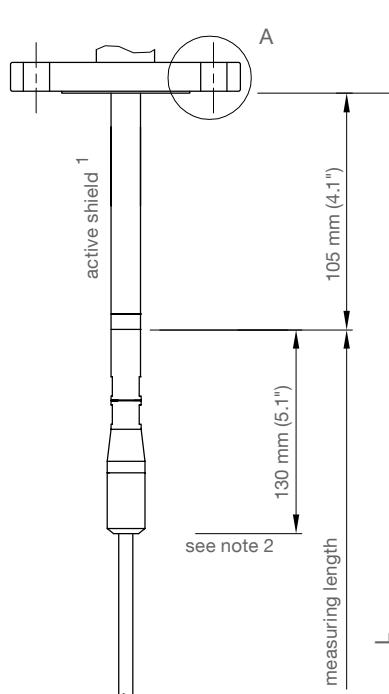


Rope PFA coated

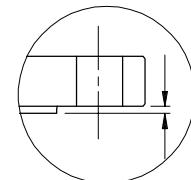
Threaded process connection



Flanged process connection



Detail "A"



L does not include any raised face (see page 7)

¹ Active shield is PFA coated

² For version with PFA coated rope:

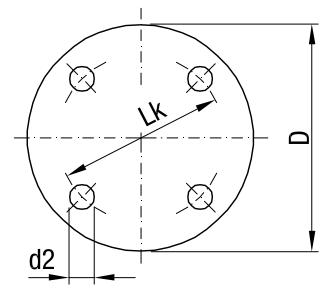
For conductive materials, the measuring length includes the exposed PFA coated rope only. Any fluid contact with the upper rod assembly (level above PFA rope) will result in a short circuit and incorrect readings.

³ Weight is electrically isolated from rope, but not PFA coated

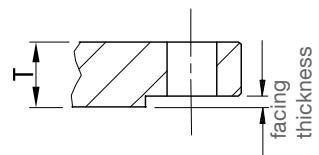
Dimensions

Flanges

Code	Type	Number of holes	d2 mm (inch)	Lk mm (inch)	D mm (inch)	T thickness mm (inch)
ASME B16.5, raised face	5A 1" 150 lbs	4	15.9 (0.63)	79.3 (3.12)	108.0 (4.25)	14.3 (0.56)
	5B 1" 300 lbs	4	19.1 (0.75)	88.9 (3.5)	123.8 (4.87)	17.5 (0.69)
	5C 1" 600 lbs	4	19.1 (0.75)	88.9 (3.5)	123.8 (4.87)	17.5 (0.69)
	5D 1½" 150 lbs	4	15.9 (0.63)	98.6 (3.88)	127.0 (5.0)	17.5 (0.69)
	5E 1½" 300 lbs	4	22.2 (0.87)	114.3 (4.5)	155.6 (6.13)	20.6 (0.81)
	5F 1½" 600 lbs	4	22.2 (0.87)	114.3 (4.5)	155.6 (6.13)	22.4 (0.88)
	5G 2" 150 lbs	4	19.1 (0.75)	120.7 (4.75)	152.4 (6.01)	19.1 (0.75)
	5H 2" 300 lbs	8	19.1 (0.75)	127.0 (5.0)	165.1 (6.5)	22.2 (0.87)
	5J 2" 600 lbs	8	19.1 (0.75)	127.0 (5.0)	165.1 (6.5)	25.4 (1.0)
	5K 3" 150 lbs	4	19.1 (0.75)	152.4 (6.01)	190.5 (7.5)	23.9 (0.94)
	5L 3" 300 lbs	8	22.2 (0.87)	168.2 (6.62)	209.6 (8.25)	28.6 (1.13)
	5M 3" 600 lbs	8	22.2 (0.87)	168.2 (6.62)	209.6 (8.25)	31.7 (1.25)
	5N 4" 150 lbs	8	19.1 (0.75)	190.5 (7.5)	228.6 (9.0)	23.9 (0.94)
	5P 4" 300 lbs	8	22.2 (0.87)	200.0 (7.87)	254.0 (10.0)	31.7 (1.25)
	5Q 4" 600 lbs	8	25.4 (1.0)	215.9 (8.5)	273.1 (10.75)	38.1 (1.5)
EN 1092-1 type A, flat faced	6A DN25 PN16	4	14.0 (0.55)	85.0 (3.35)	115.0 (4.53)	18.0 (0.71)
	6B DN25 PN40	4	14.0 (0.55)	85.0 (3.35)	115.0 (4.53)	18.0 (0.71)
	6C DN40 PN16	4	18.0 (0.71)	110.0 (4.33)	150.0 (5.91)	18.0 (0.71)
	6D DN40 PN40	4	18.0 (0.71)	110.0 (4.33)	150.0 (5.91)	18.0 (0.71)
	6E DN50 PN16	4	18.0 (0.71)	125.0 (4.92)	165.0 (6.5)	18.0 (0.71)
	6F DN50 PN40	4	18.0 (0.71)	125.0 (4.92)	165.0 (6.5)	20.0 (0.79)
	6G DN80 PN16	8	18.0 (0.71)	160.0 (6.3)	200.0 (7.87)	20.0 (0.79)
	6H DN80 PN40	8	18.0 (0.71)	160.0 (6.3)	200.0 (7.87)	24.0 (0.94)
	6J DN100 PN16	8	18.0 (0.71)	180.0 (7.09)	220.0 (8.66)	20.0 (0.79)
	6K DN100 PN40	8	22.0 (0.87)	190.0 (7.48)	235.0 (9.25)	24.0 (0.94)



Raised face



Type	Facing thickness
ASME 150 lb	2 mm (0.08")
ASME 300 lb	7 mm (0.28")

Technical data - Electrical data

Power / Output

Supply voltage	12-30 V DC any polarity, 2-wire current loop circuit, max. resistance value 550 Ω @ 24 V DC
Ex approvals	Max. voltage which does not invalidate the intrinsically safe protection of the sensor (probe): Um = 250V AC
Measurement signal	Current loop 4 – 20 mA or 20 – 4 mA according to NAMUR NE 43

Performance

Measurement range	1.66 pF to 3300 pF
Minimum span	3.3 pF
Accuracy	< 0.5% of actual measurement value
Non-linearity and reproducibility	< 0.4% full scale and actual measurement value
Temperature stability	max. temperature drift of 0.25% of actual capacitance value
Safety	- current signaling according to NAMUR NE 43, signal 3.8 to 20.5, fault <=3.6 or >=21 mA (22 mA) - probe input ESD protected - inputs/outputs fully galvanically isolated - polarity-insensitive current loop
Diagnostics	- measurement limits - failure in measurement circuit - memory check sum - system watch dog

See Fault Values on page 20 for detailed descriptions of Diagnostic messages

User interface

Local LCD	Display 4-digit (each digit can be 0 to 9 or limited alpha characters)
Rotary switch and Push buttons	Menu setting and calibration

Technical data - Mechanical data

Process connections

Threaded rod mounting	$\frac{3}{4}$ ", 1", 1 $\frac{1}{4}$ ", 1 $\frac{1}{2}$ "NPT (Taper) R $\frac{3}{4}$ ", 1", 1 $\frac{1}{2}$ " (BSPT) G $\frac{3}{4}$ ", 1", 1 $\frac{1}{2}$ " (BSPP)	ANSI/ASME B1.20.1 EN 10226; PT (JIS-T), JIS B 0203 EN ISO 228-1; PF (JIS-P), JIS B 0202
Threaded rope mounting	1 $\frac{1}{2}$ " NPT (Taper) R 1 $\frac{1}{2}$ " (BSPT) G 1 $\frac{1}{2}$ " (BSPP)	ANSI/ASME B1.20.1 EN 10226; PT (JIS-T), JIS B 0203 EN ISO 228-1; PF (JIS-P), JIS B 0202
Flange mounting	1 to 4" NPS DN 25 to 100	ASME B16.5 EN 1092-1

Probe

Material wettet parts	1.4404 (316L)/PEEK/PFA Rope probe without PFA coating applicable for isolating (non conductive) media only. FKM or FFKM O-ring
Tensile (max)	Rod probe: horizontal tensile load 30 Nm Rope probe: 1.900kg (4,188 lbs)

Enclosure

Termination	Removable terminal block, 2.5 mm ² max.
Construction	Powder-coated aluminum with gasket
Optional thermal isolator	1.4404 (316L) stainless steel
Cable entry	2 x M20 thread (option: 1 x 1 $\frac{1}{2}$ " NPT thread with adaptor)
	With ATEX approval: - Default: 2x M20x1.5 - With selection of option Pos.33a: 2x NPT 1 $\frac{1}{2}$ " tapered ANSI B1.20.1
Ingress protection	Type 4 / IP65 or IP68 (depending on Cable Entry option)
	Note: The use of approved watertight conduit hubs/glands is required for Type 4 / IP65 or IP68 (outdoor applications).
Separation between Zone 0 and Zone 1 (ATEX II 1/2G)	Material of the separation element (partition wall) - Stainless steel, 1.4404 (316L) - Glass, Inconel 600 (Glass seal)

Weight

Depends on configuration

Technical data - Operating conditions

Environmental

Location	Indoor/outdoor
Altitude	2,000 m max.
Ambient temperature	-40 to +85°C (-40 to +185°F) With ATEX approval: Depending on Surface Temperature and Temperature Class, details see page 26.
Relative humidity	Suitable for outdoors
Installation category	I
Pollution degree	4

Process

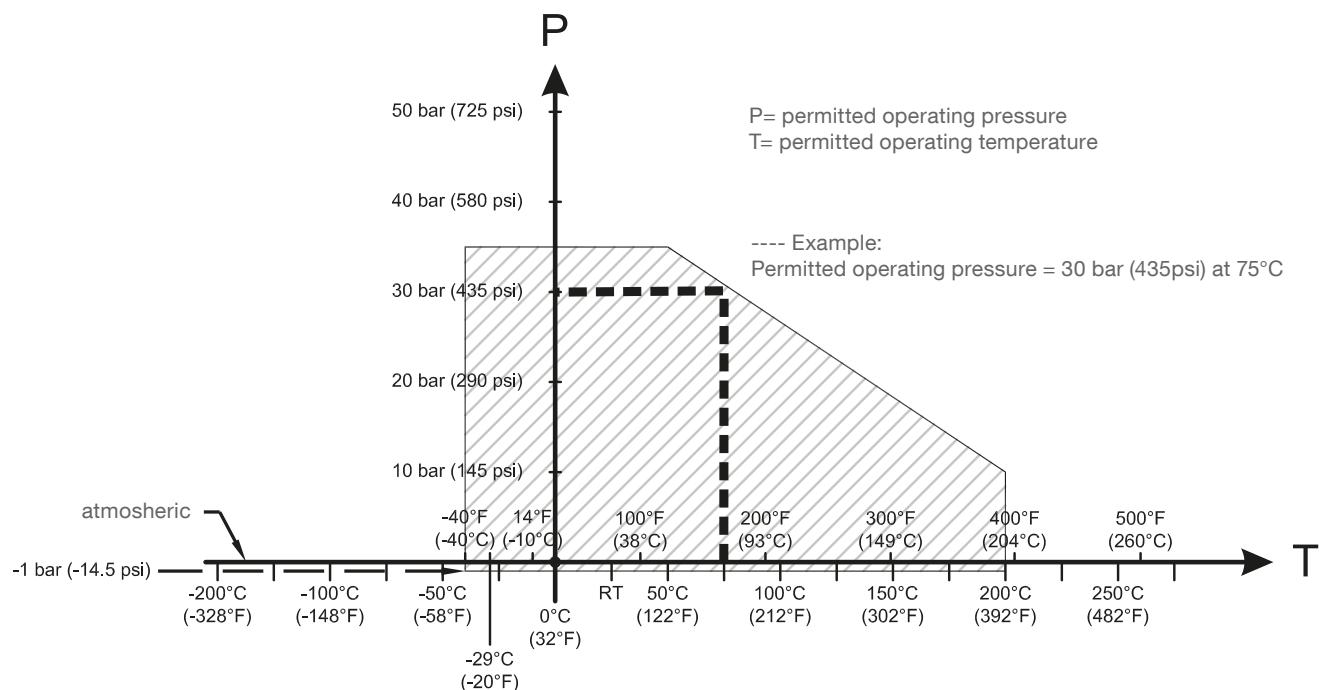
Note: Not recommended for direct steam contact

Pressure range	-1 to 35 bar g (-14.6 to 511 psi g) See Pressure versus temperature curves below
Temperature range	Without temperature extended shaft: -40 to 85°C (-40 to 185°F) -20 to 85°C (-4 to +185°F) with option FFKM seal O-ring With temperature extended shaft: -40 to 200°C (-40 to 392°F) -20 to 200°C (-4 to +392°F) with option FFKM seal O-ring With ATEX approval: Depending on Surface Temperature and Temperature Class, details see page 26.
Min. relative dielectric constant	1.5

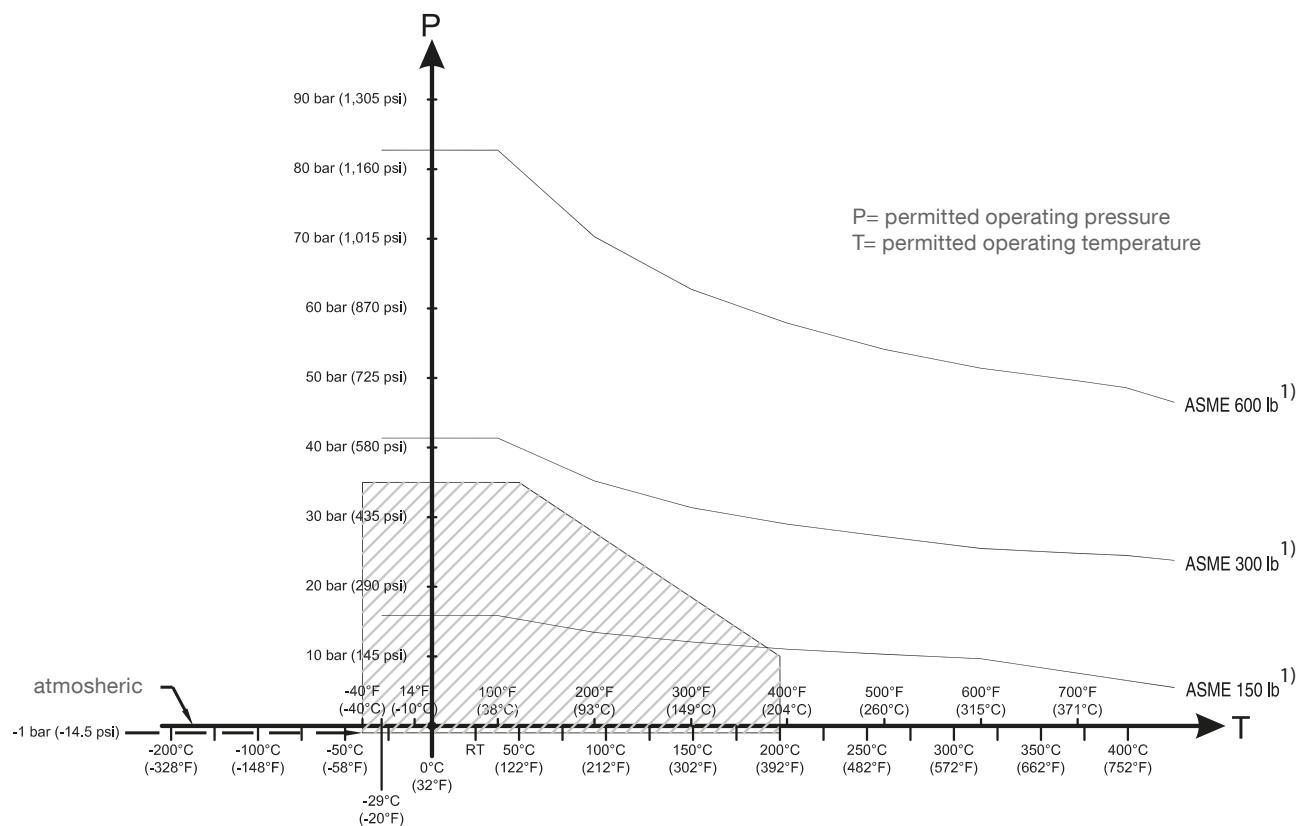
Technical data - Operating conditions

Pressure versus temperature curves

All versions, threaded



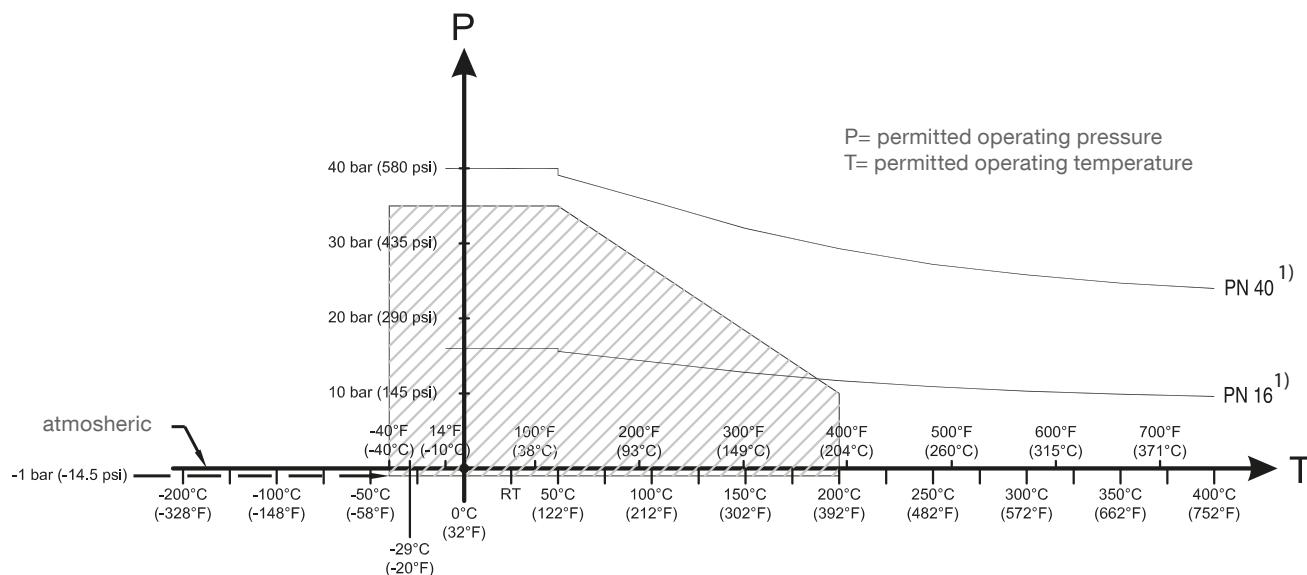
All versions, ASME flanged



1) The curve denotes the minimum allowable flange class for the shaded area below.

Technical data - Operating conditions

All versions, EN flanged



1) The curve denotes the minimum allowable flange class for the shaded area below.

Approvals

General Purpose	CE, CSA, FM, TR-CU
Dust Ignition Proof	ATEX II 1/2D, IIIC CSA/FM Class II, Div. 1, Gr. E, F, G Class III TR-CU INMETRO
Flame Proof / Explosion Proof	ATEX II 1/2G, IIC CSA/FM Class I, Div. 1, Gr. A, B, C, D TR-CU INMETRO
Marine	Lloyds Register of Shipping, Categories ENV1, ENV2 and ENV5

Pressure Equipment
Directive 2014/68/EU

NC 8000 units have no pressure-bearing housing of their own, and therefore do not come under the Pressure Equipment Directive as pressure nor safety accessories (see EU Commission Guideline 1/8 and 1/20).

Mounting

! General Safety Instructions

- Installation shall be performed only by qualified personnel and in accordance with local governing regulations.
- This device is to be used only in the manner outlined in this manual. Otherwise, protection provided by the device may be impaired.
- Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.
- The user is responsible for the selection of bolting and gasket materials which will fall within the limits of the flange and its intended use, and which are suitable for the service conditions
- Refer to the device nameplate for approval information.
- This product is susceptible to electrostatic shock. Follow proper grounding procedures.
- Before inserting the instrument into its mounting connection, check to ensure the threads are matching to avoid damaging them.
- Cable entry devices and closing elements of unused apertures must meet a temperature range from min. -40°C to 10 K above max. ambient temperature.

Pressure applications

- Never attempt to loosen, remove or disassemble process connection or instrument housing while vessel contents under pressure.
- Improper installation may result in loss of process pressure.
- For pressure applications, use PTFE tape or other appropriate thread sealing compound and tighten the process connection beyond hand-tight.
- NC 8000 units are pressure tested, meeting or exceeding the requirements of the ASME Boiler and Pressure Vessel Code and the European Pressure Equipment Directive.

Rope tensile strength

- Do not exceed the tensile strength of the rope at 1900 kg/ 4188 lbs.
- Always confirm that the load carrying capability of the silo/tank roof is sufficient to withstand the actual force on the rope conditions, especially where the force will be, or could be, as great as 1900 kg/4188 lbs. A rope probe with a PFA jacket reduces the amount of possible product build-up on the probe as well as the tensile force on the rope.

! Additional Safety Instructions for Hazardous Locations

see page 22ff

Handling Precautions

! To prevent damage, all units with a rod longer than 2 m (6.5 ft) must be handled as described below.

When lifting NC 8000 from a horizontal position, support it at these three points:

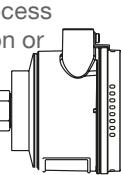
At the end of the rod before the sensor



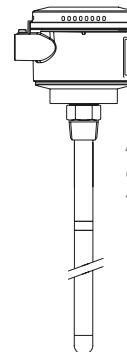
Midway along the rod



At the process connection or flange



Once vertical, NC 8000 may be held by the process connection or flange:



At the process connection or flange

Mounting

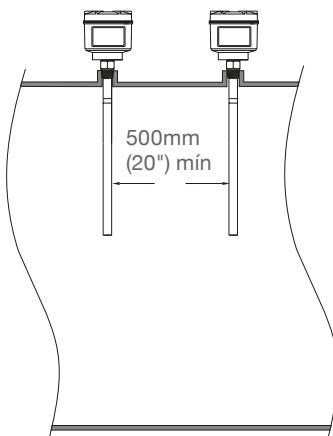
Mounting

- NC 8000 is normally mounted on the vessel top
- Before inserting the instrument into its mounting connection, check to ensure the threads are matching to avoid damaging them. Simply screw the instrument into the process connection and tighten.

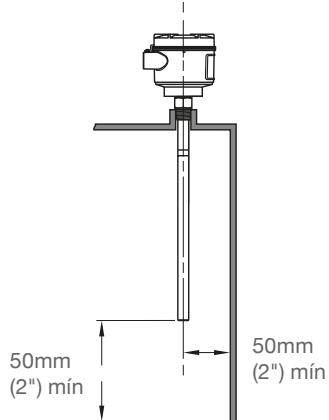
Rope version:

- The rope version is designed for top mounting. The rope suspends vertically so that it reaches into the process with the end of the rope being the start of the measurement (dependent on probe option).
- Non-insulated rope version:
For non-conductive applications only. Weight is included in measuring length.
- PFA insulated rope version:
For conductive materials, the measuring length includes the exposed PFA insulated rope only. Any fluid contact with the upper rod assembly (level above PFA rope, see page 6) will result in a short circuit and incorrect readings.

Multiple Units



Wall Restriction



Process cautions for solids



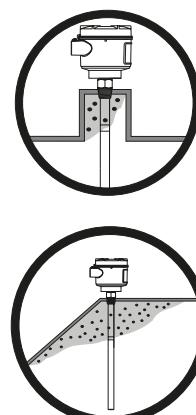
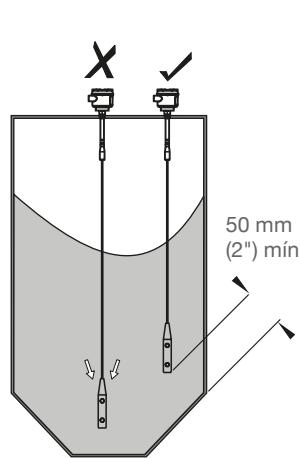
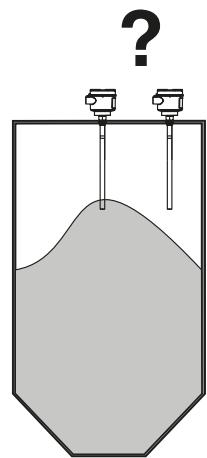
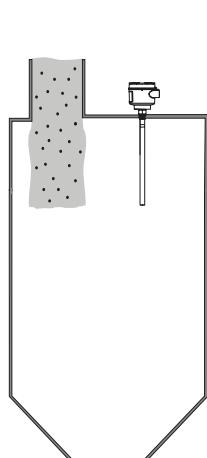
In Hazardous Locations: Observe Specific condition of use for electrostatic charge (see page 24)

Keep unit out of path of falling material.

Consider material surface configuration when installing unit.

Tensile load must not exceed probe or vessel rating.

Note: Buildup of material or condensation in active shield area does not affect operation.



Electrical installation

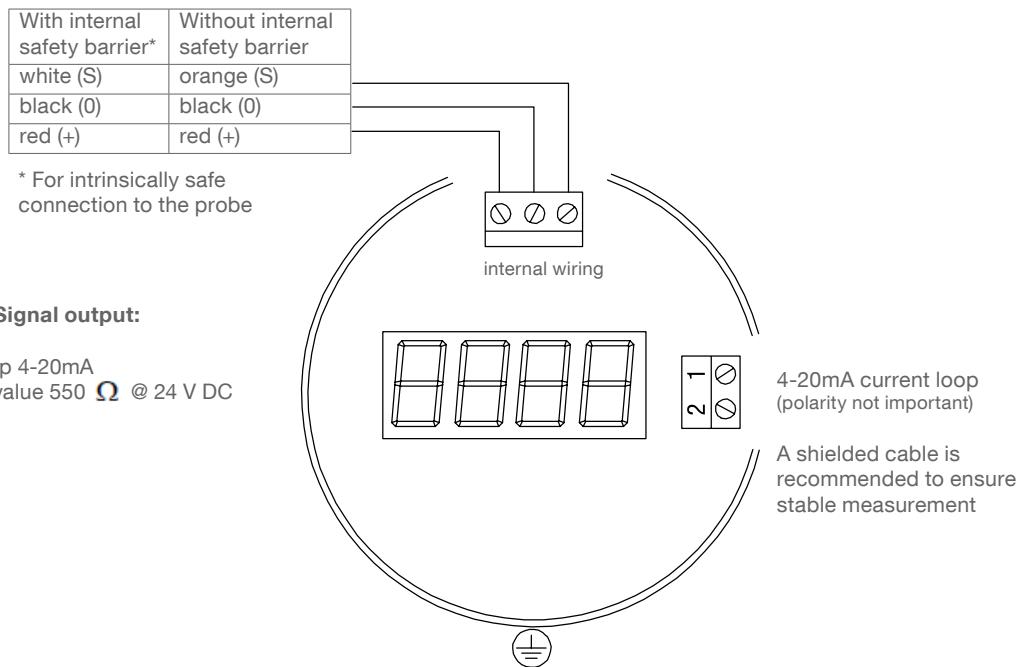
! General Safety Instructions

- Check the device nameplate and process device tag to verify the approval rating.
- Use appropriate conduit seals to maintain IP or NEMA rating.
- The sensor terminal block connects the electronics to the measurement module, providing the supply voltage and receiving the frequency signal from the measurement. The user should not alter these connections.

! Additional Safety Instructions for Hazardous Locations

see page 22ff

Wiring



1. Loosen the retaining lid clip and remove the enclosure cover.
2. Loosen the cable gland and thread the cable through it.
3. Connect the power/signal conductor wires to the current-loop terminal blocks (any polarity). The loop voltage must be between 12 and 30 V DC.
4. Ground the enclosure by connecting the housing and the process connection with either the stilling well and/or the tank wall, using the ground lug near the bottom of the housing.
5. Check that all connections are secure.
6. Replace enclosure cover and tighten retaining lid clip.

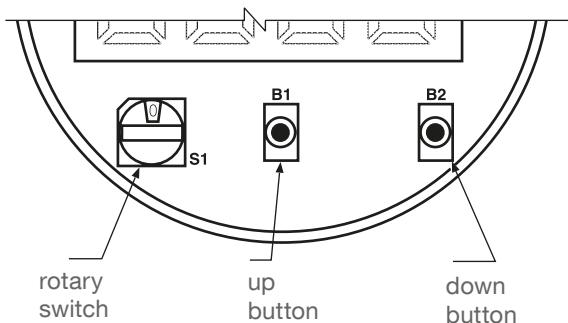
Connect protective earth wire to terminal provided in housing and marked with

Use crimp type cable socket for 4 mm screw diameter, ring form or U-form (e. g. DIN 46234).

Operation

User interface

The user interface comprises the liquid crystal display (LCD), the 6-position rotary switch, and two push-buttons. Select a menu using the rotary switch; select and/or alter a readout or value using the push-buttons.



The rotary switch can be set from 0 to 5. Each position represents a menu. The position wraps from 5 to 0. The LCD (liquid crystal) displays settings altered by the rotary switch and the pushbuttons.

Menu functions

Menu (Rotary switch position)	0	1	2	3	4	5
Display	Actual measured value (pF)	Lower Range Value LRV (pF) Related to: 0% level/ 4mA	Upper Range Value URV (pF) Related to: 100% level/ 20mA	Actual loop-current (mA)	Diagnostics	Damping
Up button		Increase LRV	Increase URV	Set fault protection to 22 mA	Product version	Increase damping
Down button		Decrease LRV	Decrease URV	Set fault protection to 3.6 mA		Decrease damping
Both buttons		The actual measured value is set as LRV	The actual measured value is set as URV	Disable fault protection	Reset/ Acknowledge Fault	Set damping to 1.00

When you turn the rotary switch, the LCD shows the new menu selection for about 1 second followed by the data for that selection. When you alter a read-out or value, a colon (:) is displayed when the debounce delay timer has expired and the new value has been accepted.

Menu positions 0 and 3 are the recommended positions during normal operation.

Operation

Menu position 0

Actual measurement (pF)

Display	<ul style="list-style-type: none"> LCD displays the actual measurement in pF. In case of a system fault, the display alternates between actual measurement and "Flt". View the fault details in menu 4. Pressing either or both push-buttons in menu 0 has no effect.
----------------	--

Menu position 1

Lower Range Value (pF), related to 0% level / 4mA

Display	<ul style="list-style-type: none"> LCD displays the Lower Range Value (LRV) in pF, occurring when the range is at 0% and the loop-current is set to 4 mA.
Up button	Increases the Lower Range Value (LRV) Each time you press the button increases the value by the setted step size (initial is 0.01pF) To change the step size: see note below
Down button	Decreases the Lower Range Value (LRV) Each time you press the button decreases the value by the setted step size (initial is 0.01pF) To change the step size: see note below
Both buttons	<ul style="list-style-type: none"> Pressing both buttons for more than 1 second sets the Lower Range Value (LRV) to the actual measured value.

Menu position 2

Upper Range Value (pF), related to 100% level /20mA

Display	<ul style="list-style-type: none"> LCD displays the Upper Range Value (URV) in pF, occurring when the range is at 100% and the loop-current is set to 20 mA.
Up button	Increases the Upper Range Value (URV) Each time you press the button increases the value by the setted step size (initial is 0.01pF) To change the step size: see note below
Down button	Decreases the Upper Range Value (URV) Each time you press the button decreases the value by the setted step size (initial is 0.01pF) To change the step size: see note below
Both buttons	<ul style="list-style-type: none"> Pressing both buttons for more than 1 second sets the Upper Range Value (URV) to the actual measured value.

Change the step size

The step size can be set to: To change the step size:

pF	display
0.1	U0:1
1	U:1
10	U:10
100	U1:00
1000	U1:E3

- Hold the Up or Down buttons for more than 1 second and continue to hold the button until the required step size is displayed
- When no button is pressed for 4 seconds, the step size decreases to the next smallest value.

Operation

Menu position 3

Actual loop current (mA)

Position 3 displays the loop current that is actually present.

The Up and Down buttons set the system fault protection settings (according to NAMUR NE 43). System fault protection is used by control equipment to determine whether or not the NC 8000 is presenting a reliable signal.

When a system fault occurs:

Position 3 fault protection setting	Menu 3 LCD display	Current signal	Menu 0 reading
C:Hi	22 mA	22 mA	pF reading
C:Lo	3.6 mA	3.6 mA	alternating with FLT
C:An	mA value at time of fault	none	pF reading

Display	LCD shows the loop current that is actually present. <ul style="list-style-type: none"> The mA values varies between 3.8 mA (lower saturation point) and 20.5 mA (upper saturation point). When the reading goes above the URV or below the LRV but still within the measurement range of the unit, it will remain at 20.5 or 3.8 respectively until the level returns between URV and LRV.
Up button	<ul style="list-style-type: none"> Pressing the Up button for less than 1 second shows the system fault protection setting. Holding the Up button for longer than 1 second will change the fault protection setting to C:Hi. ^a
Down button	<ul style="list-style-type: none"> Pressing the Down button for less than 1 second shows the system fault protection setting. Holding the Down button for longer than 1 second will change the fault protection setting to C:Lo.
Both buttons	<ul style="list-style-type: none"> Pressing both buttons for more than 1 second disables the system fault protection and the LCD will read C:An.

^a. System errors that would trigger a fault are a checksum error, an absence of measurement signal, or a measurement beyond 1.66 pF (low) or 3300 pF (high).

Menu position 4

Diagnostics

Display	<ul style="list-style-type: none"> LCD shows diagnostic information. A correctly operating device shows 0.00 on the LCD. See chart below for explanation of system fault values.
Up button	<ul style="list-style-type: none"> LCD shows revision information. Please note this information when calling manufacturer for assistance.
Both buttons	<ul style="list-style-type: none"> Holding both buttons for more than 1 second will try to reset the error status. The LCD reads 0.00 when the status has been successfully reset. Monitor the NC 8000 more closely after a diagnostic error has occurred.

Operation

Fault values

128	The device is in calibration mode. The measurement values and the loop-current setting may no longer be trusted.
64	A checksum error has occurred in the program and/or data memory. The measurement values and the loop-current setting may no longer be trusted.
32	NC 8000 system watchdog has been activated. This fault can be combined with fault 64, resulting in fault 96. The measurement values and the loop-current setting may no longer be trusted.
8	An arithmetic error has occurred, perhaps caused by an incorrect value setting. This event type error will rarely affect the operation of the NC 8000.
4	An error occurred while trying to store settings in the local nonvolatile memory. The NC 8000 may not operate correctly.
2	The measurement has exceeded the device limits (1.66 pF and 3300 pF). Check that the probe is correctly connected to the measurement module.
1	The measurement circuit no longer emits signal. Check the wiring to/from the measurement module or barrier circuit.

Note: It is possible for more than one fault to occur at the same time. The display will read the combined result of both fault values. For example: If fault value 1 and fault value 2 occur together, the display will read fault value 3. If the display reads fault value 10, it means fault value 8 and fault value 2 have occurred together.

Menu position 5

Damping

Display	<ul style="list-style-type: none"> LCD shows the damping value. The damping value alters the delay at which the display and the loop current will follow the measured capacitance from the probe. <p>Rough indication: Assuming that an immediate capacitance change on the probe rises the loop current from 4mA to 13mA. Depending on the damping value the loop current takes a delay as stated below to rise to 8,5mA (50% of the total rise to 13mA):</p> <table> <thead> <tr> <th>Setted damping value</th><th>Delay to reach 8,5mA</th></tr> </thead> <tbody> <tr> <td>10</td><td>< 1sec</td></tr> <tr> <td>50</td><td>2 sec</td></tr> <tr> <td>100</td><td>3 sec</td></tr> <tr> <td>500</td><td>10 sec</td></tr> <tr> <td>1000</td><td>17 sec</td></tr> <tr> <td>5000</td><td>90 sec</td></tr> </tbody> </table>	Setted damping value	Delay to reach 8,5mA	10	< 1sec	50	2 sec	100	3 sec	500	10 sec	1000	17 sec	5000	90 sec
Setted damping value	Delay to reach 8,5mA														
10	< 1sec														
50	2 sec														
100	3 sec														
500	10 sec														
1000	17 sec														
5000	90 sec														
Up button	<ul style="list-style-type: none"> Pressing Up button for less than 1 second increases the damping value in 0.01 steps. Damping can be set to any value from 1.0 to 9999. Holding the Up or Down buttons for more than 1 second increases the step size to 0.1. If you continue to hold the button, the step size increases to 10, 100, and 1000 (displayed as 1E3). When no button is pressed for 4 seconds, the step size decreases to the next smallest value. At each step size, press the buttons for less than 1 second to adjust the value. 														
Down buttons	<ul style="list-style-type: none"> Pressing Down button for less than 1 second decreases the damping value in 0.01 steps. Damping can be set to any value from 1.0 to 9999. When held for more than 1 second, the Down Button will increase the step size by 0.1, 10, 100, and 1000. When no button is pressed for 4 seconds, the step size decreases to the next smallest value. At each step size, press the buttons for less than 1 second to adjust the value. 														
Both buttons	<ul style="list-style-type: none"> Holding both buttons for more than 1 second sets the damping value back to 1.0 (default). 														

Operation

Start up

Setting Lower Range Value (LRV)

- If probe is fully uncovered in application (0% level is present):

Set rotary switch to Menu Position 1
Set LRV by pressing both buttons for more than 1 second.
The actual measured value is now related to 4mA

Setting Upper Range Value (URV)

- If probe is fully covered in application (100% level is present):

Set rotary switch to Menu Position 2
Set URV by pressing both buttons for more than 1 second.
The actual measured value is now related to 20mA

- If probe is not fully covered:

This procedure is possible with cylindric vessels only (linear relation between level and capacitance)
Set to your application based on the following example:

LRV (0% level) was set to 12.5 pF

Actual measurement is at 45% of the measurement length of probe:
Menu Position 0 reads 37 pF

Calculate URV (100% level) as follows:

$$\begin{aligned} \text{URV} &= [(\text{Actual measurement}-\text{LRV}) * 100 / \text{actual measurement in \%}] + \text{LRV} \\ &= [(37-12.5) * 100 / 45] + 12.5 \\ &= 66.94 \text{ pF} \end{aligned}$$

Set rotary switch to Menu Position 2 and adjust to 66.94

When calculating the URV, best results are achieved when using the highest possible actual level.

Recommissioning

The NC 8000 should be recommissioned whenever the transmitter or probes are replaced.
The procedure is similar to procedure "Start up", see above.

Maintenance

NC 8000 requires no regular maintenance or cleaning.

Note: Build-up of material on the active shield area has little or no effect on the performance of the NC 8000.

Unit repair and excluded liability

All changes and repairs must be done by qualified personnel, and applicable safety regulations must be followed.
Please note the following:

- The user is responsible for all changes and repairs made to the device.
- All new components must be provided by the manufacturer.
- Restrict repair to faulty components only.
- Do not re-use faulty components.

Notes for use in Hazardous Locations

Use of this Manual

For use and assembly, refer to the instructions in this Manual. It does contain all instruction as required by ATEX Directive 2014_34_EU, Annex II, 1/0/6 and Ordinance INMETRO n° 179/2010

General notes

Refer to appropriate certificate for application in specific hazardous environment.

The equipment has not been assessed as a safety related device (as referred to by Directive 2014_34_EU Annex II, clause 1.5).

The certificate numbers have an 'X' suffix, which indicates that specific condition of use apply. Those installing or inspecting this equipment must have access to the certificates.

! Qualification of personnel / Servicing / Repair

Installation and inspection of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (ABNT NBR IEC/EN 60079-14 and ABNT/NBR IEC/EN 60079-17 in Europe).

Repair of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (e.g. ABNT NBR IEC/EN 60079-19 within Europe).

Repair of flameproof path is not intended.

Components to be incorporated into or used as replacements in the equipment shall be fitted by suitably trained personnel in accordance with the manufacturer's documentation.

In potentially explosive atmospheres open the enclosure only when NC 8000 is not energized.

Turn off power before servicing any device (the transmitter is in operation when the power supply is switched on). In case of removing the unit from vessel, take care of process pressure and material passing the opening.

ATEX: Certificates / List of Standards

Certificate number: DEKRA 18ATEX0046 X

See www.uwt.de for the latest certificates

See EU - Declaration of conformity for the list of standards valid for ATEX certificates

ATEX: Year of manufacturing

Marking on the name plate is done according to IEC 60062 as follows:

Year of manufacturing	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Marking code	K	L	M	N	P	R	S	T	U	V	W	X

Notes for use in Hazardous Locations

ATEX: Ex-Marking

- Devices with ATEX approval are marked on the name plate as follows.
- If both Flameproof and Dust ignition proof are present on the same nameplate, a tick box is present where the end user needs to select (mark) the protection method used at the time of installation.

Dust Ignition Proof with intrinsically safe output to probe (Typecode Pos.2 W)

II 1/2 D Ex ia/tb [ia Da] IIIC TX Da/Db

Flameproof / Dust Ignition Proof with intrinsically safe output to probe (Typecode Pos.2 T)

II 1/2 G Ex ia/db [ia Ga] IIC TX Ga/Gb

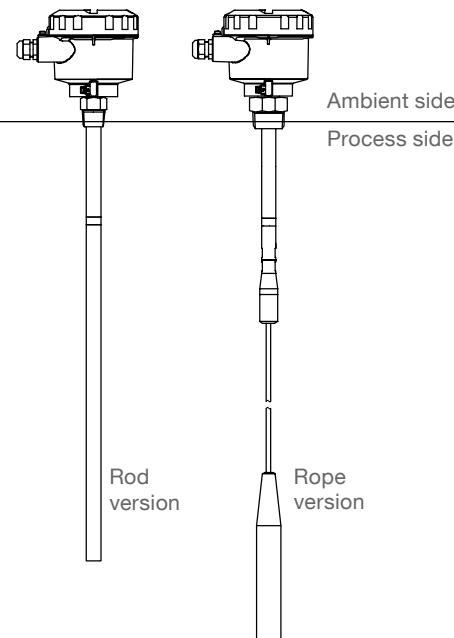
II 1/2 D Ex ia/tb [ia Da] IIIC TX Da/Db

! ATEX: Permitted zones for installation

Devices can be installed as follows:

	Dust applications	Gas applications
EPL	marking Da/Db	marking Ga/Gb
Category	Db	Gb
Zone	2D	2G
	21	1

	Dust applications	Gas applications
EPL	Da	Ga
Category	1D	1G
Zone	20	0



Notes for use in Hazardous Locations

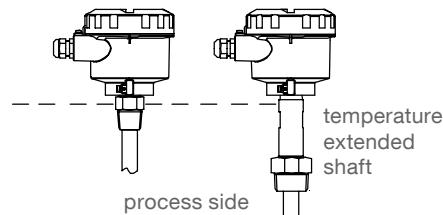
! Specific condition of use

Electrostatic charge The user shall ensure that the equipment is not installed in a location where it may be subjected to external conditions which might cause a build-up of electrostatic charge on non-conducting surfaces.

Flameproof joints The flameproof joints are not intended to be repaired.

Ambient and process temperature range The relation between ambient and process temperature ranges and the surface temperature or temperature class is shown in the thermal data tables page 26.

Max. permitted temperature close to the enclosure If the process temperature exceeds the max. permissible ambient temperature, the max. resulting temperature at the connection of the sensor head (see dotted line) shall not exceed the related max. permissible ambient temperature (see page 26), taking the worst case conditions into account. This shall be verified by measurement when installed.



Notes for use in Hazardous Locations

! Warnings for installation

Process pressure The device construction allows process over-pressure up to 10 or 35 bar (146 or 511 psi). This pressure is allowed for test purposes. The definition of the Ex approvals are only valid for a container-over-pressure between -0.2 .. +0.1 bar (-2.9 .. +1.45 psi). For higher or lower pressures the approvals are not valid.

Process and ambient temperature	Please check the ambient and process temperatures page 26 for the specific configuration you are about to use or install.
--	---

Chemical resistance against the medium	If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised. Aggressive substances: e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials. Suitable precautions: e.g. establishing from the material's data sheet that it is resistant to specific chemicals.
---	---

Cable entry devices / blanking elements general	Dust Ignition Proof: For use in potentially explosive dust atmospheres: The cable entry devices and the blanking elements of unused apertures shall be of a certified type, suitable for the conditions of use and correctly installed. The minimum ingress protection requirement of IP6X according to EN 60529 must be satisfied.
--	--

	Flameproof: For use in potentially explosive gas atmospheres: The cable entry devices and the blanking elements of unused apertures shall be of a certified flameproof type, suitable for the conditions of use and correctly installed.
--	--

	Versions with cable gland mounted by default: The used cable gland is only suitable for fixed installations. The installer is responsible for providing appropriate strain-relief to prevent pulling or twisting.
--	---

	Versions with blanking element mounted by default: Blanking elements are not to be used with any form of adaptors or reducers.
--	---

Versions with cable gland / blanking element mounted by default	Below-mentioned cable diameters and tightening torques of the nut resp. blanking element shall be observed for the installation.
--	--

	Cable gland M20x1.5 (Dust Ignition Proof)
--	---

	Cable diameter: 6 mm to 12 mm
--	-------------------------------

	Tightening torque: Depending on the used cable and therefore to be determined by the user
--	---

	Cable gland M20x1.5 (Flameproof)
--	----------------------------------

	Cable diameter: Bedding 3.1 mm to 8.6 mm / Overall 6.1 mm to 13.1 mm
--	--

	Tightening torque: Number of turns depending on the overall cable diameter of the used cable (e. g. 1 turn / cable diameter 12.5 mm to 5.5 turns / cable diameter 6.5 mm)
--	---

	Blanking element M20x1.5 (all versions)
--	---

	Tightening torque: 32.5 Nm
--	----------------------------

Notes for use in Hazardous Locations

- ! Ambient and Process temperature range,
- max. Surface Temperature and Temperature Class

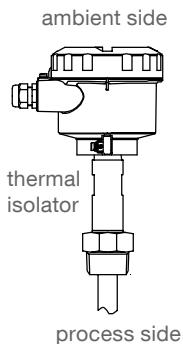
ATEX:

Flameproof and Dust Ignition Proof with intrinsically safe output to probe (Typecode Pos.2 W,T)

Ambient temperature range	Process temperature range	Max. Surface temperature (EPL Da)	Max. Surface temperature (EPL Db)	Temperature class (EPL Ga or Gb)
-40 to +70°C (-40 to +158°F)	-40 to +75°C (-40 to +167°F) (1)	T ₂₀₀ 80°C	T80°C	T6
-40 to +80°C (-40 to +176°F)	-40 to +90°C (-40 to +194°F) (1) (2)	T ₂₀₀ 95°C	T90°C	T5
-40 to +80°C (-40 to +176°F)	-40 to +125°C (-40 to +257°F) (1) (2)	T ₂₀₀ 130°C	T90°C	T4
-40 to +80°C (-40 to +176°F)	-40 to +190°C (-40 to +374°F) (1) (2)	T ₂₀₀ 195°C	T90°C	T3
-40 to +80°C (-40 to +176°F)	-40 to +200°C (-40 to +392°F) (1) (2)	T ₂₀₀ 205°C	T90°C	T2

(1) With option FFKM O-ring seal: Lower process temperature limited to -20 °C (-4°F)

(2) For process temperature > 85 °C: Only applicable for versions with thermal isolator



INMETRO:

Flameproof with intrinsically safe output to probe

Application in Zone 0 (cat 1G)

Ambient temperature range	Process temperature range
-20 to +60°C (-4 to +140°F)	-20 to +60°C (-4 to +140°F)

Application in Zone 1 (cat 2G):

Ambient temperature range	Process temperature range	Temperature class
-40 to +70°C (-40 to +158°F)	-40 to +80°C (-40 to +176°F)	T6
-40 to +85°C (-40 to +185°F)	-40 to +100°C (-40 to +212°F) (1)	T5
-40 to +85°C (-40 to +185°F)	-40 to +135°C (-40 to +275°F) (1)	T4
-40 to +85°C (-40 to +185°F)	-40 to +200°C (-40 to +392°F) (1)	T3

(1) For process temperature > 85 °C: Only applicable for versions with thermal isolator

Dust ignition proof

The maximum surface temperature of T 100 °C is based on a maximum ambient temperature of +85 °C.

FM / CSA:

Explosion proof / Dust ignition proof

Ambient temperature range	Temperature class
-40 to +85°C (-40 to +185°F)	T4

Process temperature is not considered for definition of Temperature class.

Probe modifications

Shortening the rope (rope version)

CAUTION:

PFA insulated rope cannot be shortened.

Methods

1. An angle grinder (preferably with a disc suitable for stainless steel)
or
2. Wire cutters (suitable for piano rope Ø 6 to 9 mm).

Procedure

1. Loosen the three set screws and pull weight from the rope.
2. Grind/cut the rope to the required length, and then remove rough edges from the rope.
3. Ensure that rope strands are properly seated in the lay of the rope (i.e. no wire strands sticking outside the normal rope profile). Make sure ALL strands are properly seated before continuing the assembly.
4. Push the weight onto the rope while simultaneously rotating it counter-clockwise around the rope. Make sure that no rope strands are pushed out of their position in the rope and that the rope is fully inserted.
5. Re-fasten the weight by tightening the three set screws.

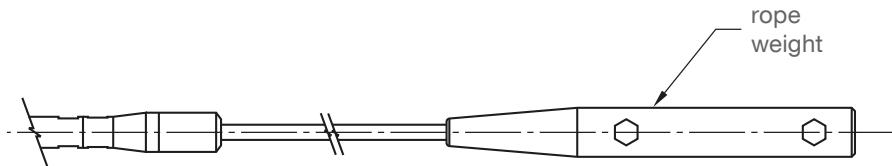


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Visualisation - Operation	8

Subject to technical change.

We assume no liability for typing errors.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning must be carried out only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.

Special attention must be paid to warnings and notes as follows:



WARNING

Relates to a caution symbol on the product and means, that a failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.



WARNING

Relates to a caution symbol on the product and means, that a failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product	Description
	CAUTION: refer to related documents (manual) for details.
	Earth (ground) Terminal
	Protective Conductor Terminal

Technical support

Please contact your local supplier (see www.uwt.de for address). Otherwise you can contact:

UWT GmbH
Westendstr. 5
87488 Betzigau
Germany

Tel. 0049 (0)831 57123-0
Fax. 0049 (0)831 76879
info@uwt.de
www.uwt.de

Overview

Features

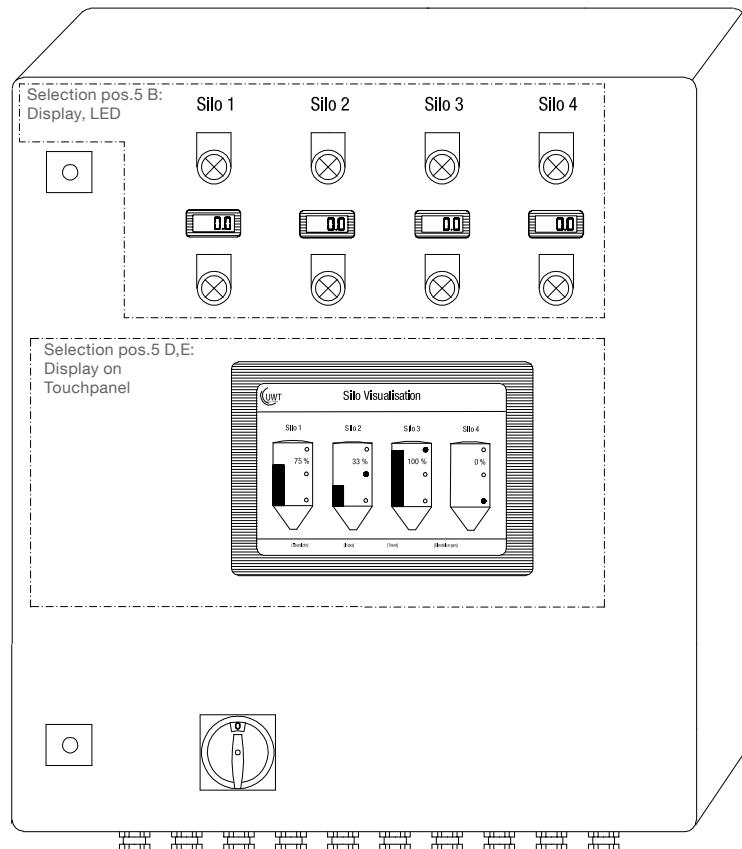
- Fill level visualisation via HTTP-web server
- Visualisation via standard Internet browser software on all Ethernet PCs
- Password protected
- Worldwide remote enquiry of the level password protected - on request
- Software operation additional via a touch panel in the control cabinet or via fill level LEDs
- Data in percentage, height, volume or weight
- Trend display, data storage, export via .csv
- Evaluation of the analogue 4-20 mA signals of any sensors, as well as Modbus RTU of the UWT-systems
- Different input signals within the same system is possible
- Fill control via full alarm signals and shut off valves
- Separate truck module for safe and comfortable monitoring during silo filling

NT 3500 control cabinet

The heart of the NT 3500 is a web server module, which the visualisation software uses. All fill level control and display functions can be operated via the visualisation on a PC or a Touch panel with backlight. An Ethernet interface ensures that the visualisation can be simultaneously operated from all PCs which are connected to the interface. Access is password protected. Additionally the control cabinet can be equipped with operating and display elements. Either the 10.4" or 15" touch panel or the digital level display with full and empty LEDs can be chosen. The electromechanical lead system can be started by the visualisation or by a push button. A buzzer for alarm "silo full" can be mounted directly on the silo. Control for pinch valves to stop the filling is available. The NT 3500 is a complete system which also provides the supply voltage for the sensors. The system is delivered with project specific electrical plans.

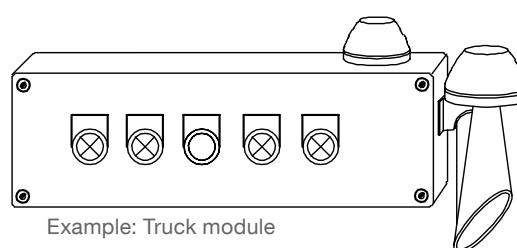
Functionality of alarm "silo full" and control of the pinch valves:

1. The filling (opening of the pinch valve) is enabled either via the hose coupling when connecting the filling hose, via a key switch on the cabinet or on the truck module or via PC/ Touch panel.
2. In case of an alarm "silo full" the pinch valve closes, the LED "silo full" and the buzzer is switched on, the reset button is blinking. After reset of the alarm the pinch valve opens for ca. 5 min to enable the expulsion of the filling pipe, then it is closed again. Independend from this control the pinch valve can be opened or closed by an authorized user at any time.



Truck module

- One module for a defined number of silos (depending on the project)
- Mounting directly at the silo frame
- Display silo full/ empty and pinch valve status with LEDs
- Reset of alarm "silo full"
- Key switch for pinch valve control



Example: Truck module

Technical Data / Electrical installation

Technical data

Dimensions	Depending on project
Mounting	Control cabinet Wall mounting Truck module Mounting on silo filler pipe
Material	Steel plate
Ingress protection	Control cabinet IP54 Truck module IP65
Ambient temperature	Control cabinet 0 .. +55°C Truck module -20 .. +55°C
Power supply	115 V or 230 V 50/ 60 Hz
Power consumption	Depending on project

Technical data of the used Wago Controllers:see www.wago.com, search for 750-8202

Electrical installation

! Safety Instructions

Handling	In case of improper handling or handling malpractice, the electric safety of the device cannot be guaranteed.
Installation regulations	The local regulations or VDE 0100 (Regulations of German Electrotechnical Engineers) must be observed.
RCCB protection	In case of a fault, the supply voltage must be automatically switched off by a RCCB protection switch to protect against indirect contact with dangerous voltages.
Wiring diagram	The electrical connections are made in accordance with the wiring diagram.
Supply voltage	Compare the supply voltage applied with the specifications given on the name plate before switching the device on.
Cable gland	Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion). Cable glands that are not used have to be sealed with a blanking element.
Field wiring cables	All field wirings must have insulation suitable for at least 250 V AC. The temperature rating must be at least 80°C (176°F).
Installation in Hazardous Locations	The NT 3500 is not permitted for installation in Hazardous Areas. Observe the valid regulations for wiring in Hazardous Areas, if the NB 3000/ NB 4000 is installed in Hazardous Areas.

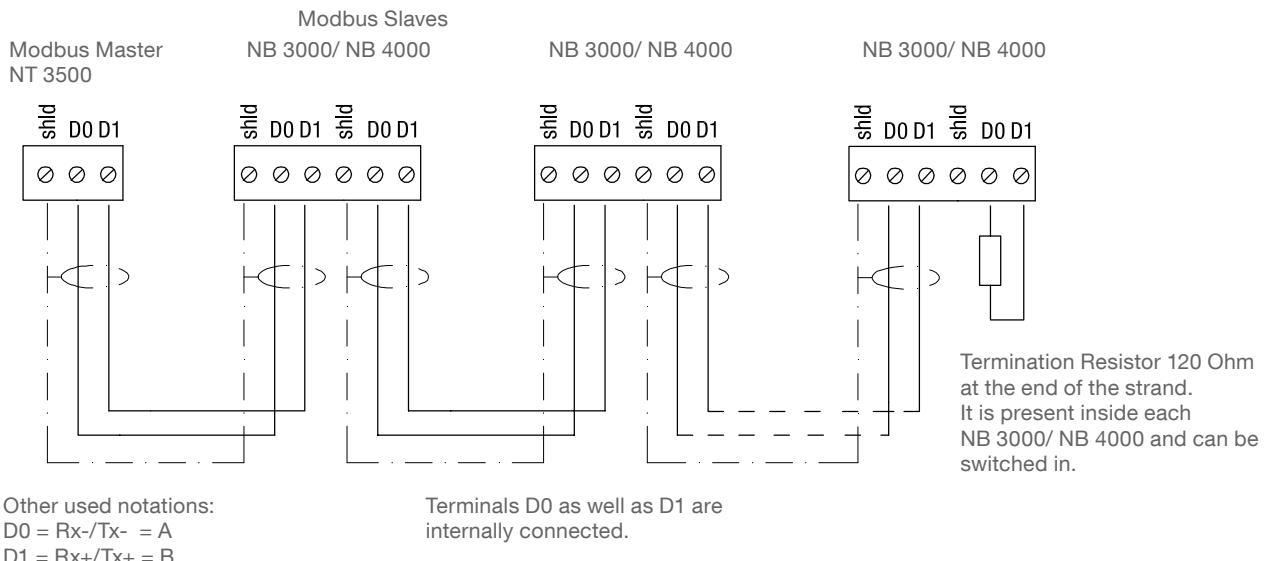
Wiring diagram

The NT 3500 will be delivered with detail wiring diagram depending on the project.

Electrical installation

Modbus network

General wiring of a Modbus network



Cable recommendations for Modbus network

Shielded cable

Functionality up to 50 m

Manufacturer: Lapp, Type UNITRONIC LiYCY 2 x 0.34, Art.no: 0034502

Twisted pair cable

Functionality up to 1,000 m

Manufacturer: Lapp, Type UNITRONIC BUS CAN 1x 2 x 0.34, Art.no: 2170263

UV-protection hose with threaded hose coupling M20 x 1.5

UV protection for Modbus cable

Manufacturer: Flexa, Type Rohrflex PA6, Art.no: 0233.202.012 and Type RQG1-M, Art.no: 5020.055.018

ATEX-protection hose with threaded hose coupling M20 x 1.5

For installation of Modbus cable in ATEX Zone 21

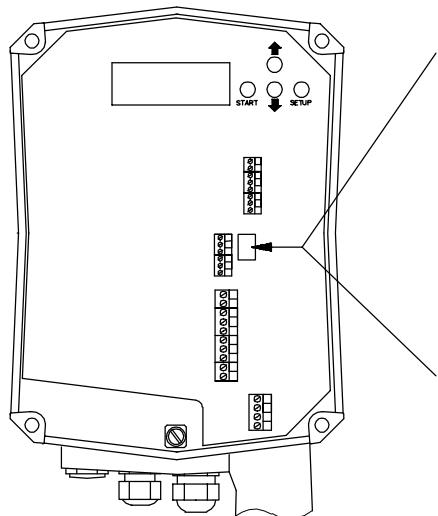
Manufacturer: PMA, Type ESX, Art.no: ESXT-12B.50 and Type END, Art.no: BEND-M202GT

Electrical installation

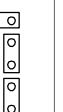
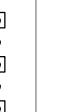
Setting: Biasing and Termination Resistor

For use of NB 3000/ NB 4000 units in a external Modbus network, it is possible to set Biasing and Termination Resistor on each unit as required.

NB 3000



Version with Jumper

Biasing	OFF*	OFF	ON
Termination Resistor	OFF*	ON	ON
	  	  	 

Version with DIP switch

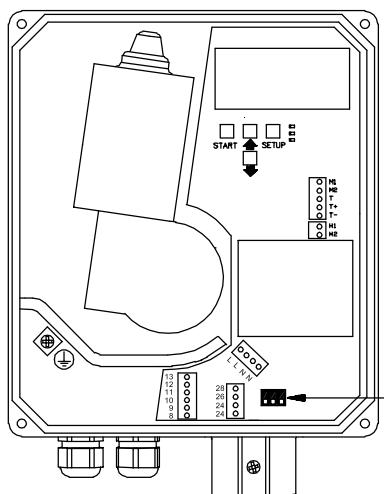
Biasing	OFF*	OFF	ON	ON
Termination Resistor	OFF*	ON	OFF	ON
	   	   	 	 

*factory provided

DIP Switch position:

Top view  Side view

NB 4000



Biasing	OFF*	OFF	ON	ON
Termination Resistor	OFF*	ON	OFF	ON
	   	   	 	 

*factory provided

DIP Switch position:

Top view  Side view

Commissioning

1. Web server configuration

CAUTION: The configuration should be done by the network administrator only.

The web server is preset to the IP address 192.168.10.70. It must be changed to a company's own IP address as follows:

- Use a PC, which is connected via Ethernet to the Web server. Set in the system control the TCP/ IP to address 192.168.10.xxx, whereas xxx can be any number between 0 and 255 (the access to the Web server requires the number 192.168.10., the last numberblock is not relevant).
- An up to date version of Internet browser must be installed.
- Open the Internet browser and type the IP address 192.168.10.70 of the web server in the command bar. The overview page "Home" of the visualisation opens (see page 8).
- Click the "Login" button and set the user name to "Admin" with the password "admin". The "System Config" button will appear in the menu bar.
- Click on this button. The configuration page of the web server will open (see page 10ff.).
- Enter the number of silos, language, date and time, your IP address, sub net mask and gateway.
- Then reset to your TCP/ IP address in the system control of your PC.

2. Perform the basic settings of the connected sensors

With the following settings, the connected sensors are addressed via the visualisation and give a real measurement result. For this settings the above mentioned synoptical table is helpful. On the overview page "Home", click into the desired silo. There you have to edit the following settings:

- On page "Setup" (see page 14f.) the data under "Silo Data", "Signal Source", "Level Limit Sensor" and if applicable/ "Modbus RTU".
- On page "Volume Calculation" (see page 16) the data under "Silo Shape" and "Silo Data".

3. Perform further user settings

Enter the required user specific settings according to the "Visualisation - Operation" from page 8 onwards.

Visualisation - Operation

Start of the Visualisation

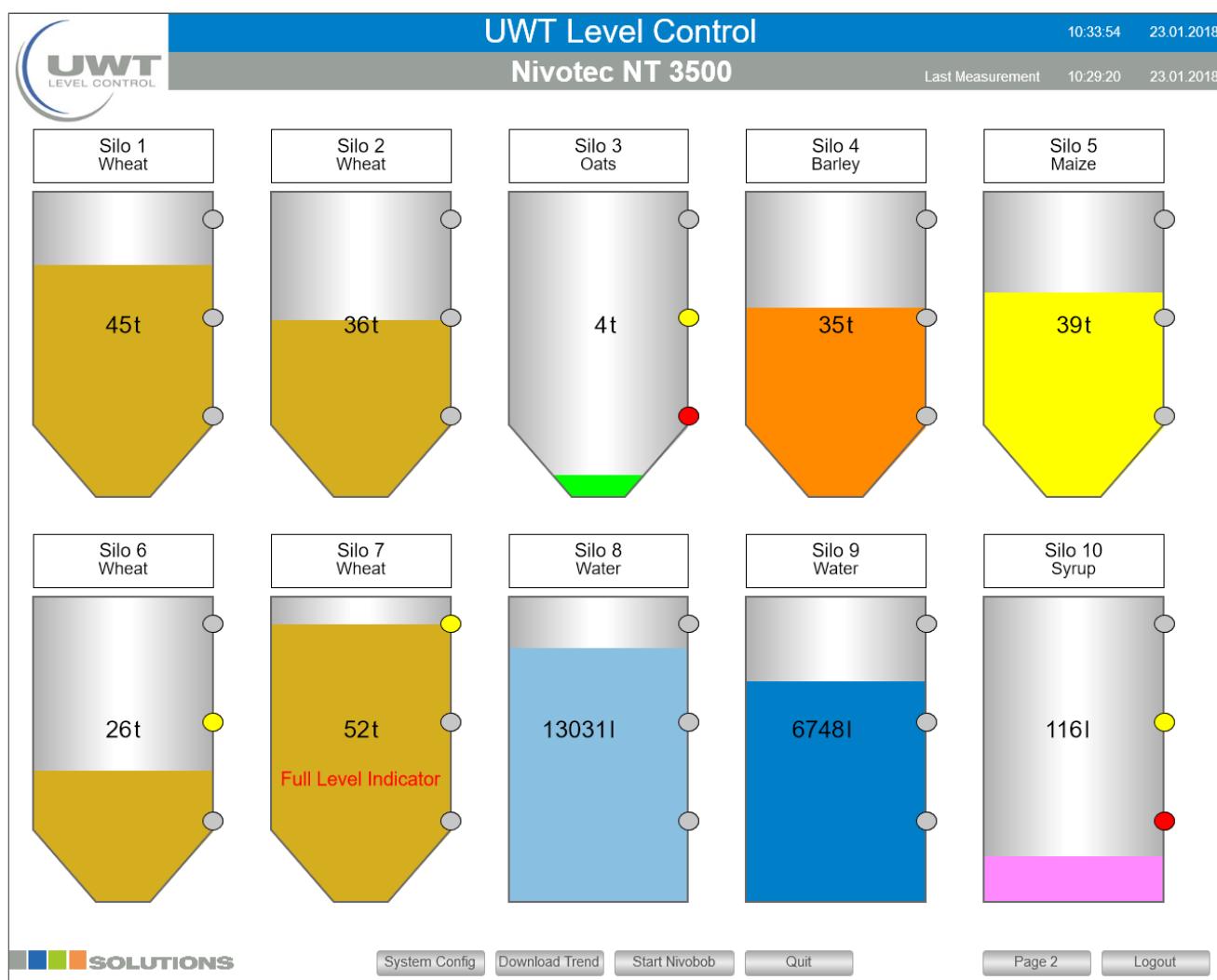
By entering the IP address in the browser (according to the web server configuration) the visualisation starts.
 After successful start the overview page "Home" appears.

Overview page (Home)

Display of level, level limit sensors, information regarding silo and error messages

All user names

The selected number of silos (see page 10 "System Config" -> Number of silos) is presented. If more than 10 silos are defined, a button appears for progression to the next page.



Note: If a distorted image on the PC is present, it should not be viewed in full screen mode, thus the window can be drawn in an undistorted view.

Visualisation - Operation

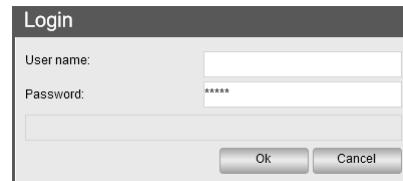
The following selections appear depending on the setted user name:

Login Logout

Using the Login button, you can change to other user names with additional privileges:

User (password: user)

- Page "Silo Single View"
- View of Event List
- Page "System Config"
- Download of trend data
- Start Nivobob
- Reset of the full signal (buzzer) and of error messages
- Logout



Purchase (password: purchase)

Similar to User, additional:

- On page "Silo Single View": page "Logistics Department"

Admin (password: admin)

Similar to Purchase, additional:

- On page "Silo Single View":
 - Page "Setup"
 - Page "Volume Calculation"
- On page "System Config":
 - Page "Number of silo - Date - Time - Language - Trend"
 - Page "Network"
 - Page "E-Mail"
 - Release User Settings

The button Logout is used to logout.

Silo Single View (click on a silo)

The single view for the respective silo will open (see page 16).

System Config

See page 13 ff.

Download Trend

Issue of trend data for all silos as csv-file. The level values are stated in the unit as defined under "Volume Calculation" (see page 16).

Start Nivobob

Starts the measurement of all connected Nivobobs. If more than 10 silos are defined, the measurements of the silos not displayed on the screen are started as well. As long as the measurement is running, a green arrow appears in each silo.

Quit

Reset of the full signal (buzzer) and of error messages.

Visualisation - Operation

Page "System Configuration"

Display of Softwareinformations, navigation to extended user settings

All user names

System Info		
1	Project	NT4500
2	SW Nivotec	8.1.0
3	FW Wago	02.06.20(09)
4	PN Wago	WAGO 750-8202 PFC200
5	Type Wago	750-8202
6	FW Webserver	1.1.9.10
7	Licence	Codesys-Runtime-Licens
8	Host	PFC200-40E80A
9	Domain	localdomain.lan
10	Silo Analog	
11	Silo Modbus	
12	Silo Impulse	
13	Generation	17.01.2018
14	RS485	
15	Gateway 1	
16	Gateway 2	
17	Gateway 3	
18	Modbus Converter	
19	Tank Truck	
20	Pinch Valve	
21	Access Number of Silo	
22	Current Number of Silo	11
23	Maximal Silo Number	25

SOLUTIONS

Home

The following selections appears depending on the setted user name:

Number of Silo - Date - Time - Language - Trend

See page 11.

Network

See page 12.

E-Mail

See page 12.

Reset User Settings

The button "Change Password" will be shown for 5 minutes (independent from logged in user name).

Change Password

A popup to change the password of the actually logged in user name will be shown.

Change password

User name:	<input type="text" value="User"/>
Old password:	<input type="password" value="*****"/>
New password:	<input type="password" value="*****"/>
Acknowledge password:	<input type="password" value="*****"/>
<input type="button" value="Ok"/> <input type="button" value="Cancel"/>	

Visualisation - Operation

Page "System Config" Button "Number os Silo - Date - Time - Language - Trend"

Setting of date, time, menu language of software, number of silos, writing interval for trend and reset of trend .csv file

User name Admin

System Configuration Nivotec NT 3500		10:45:34 23.01.2018
Date & Time		Language
Current Time	10:45:34	German
Current Date	23.01.2018	English
New Time	00:00:00	Dutch
New Date	01.01.2017	
Save		
Number of Silo		Trend
Number of Silo	11	Interval Writing
		00:01:00
		If changed, CSV file is lost Save data from it
Trend CSV File		Event CSV File
Delete		Current Quarter
		Download
Last Quarter		Last Quarter
		Download
SOLUTIONS		Config Home

Number of Silo

The number of silos to be displayed on Overview page (Home) is set here. Per page a maximum of 10 silos will be shown, additional silos will be shown on a following page. The maximum amount of shown silos is limited to 25 or rather 50 silos, depending on device configuration.

Tend

The trend on the pages "Silo Single View" and "Logistics Department" consist in total of 200 measurement points per silo. The oldest measurement point will be deleted, if an actual value is added. By editing the "Interval Writing", the total time of the trend can be determined. The trend saving takes place in this interval (hours : minutes : seconds). By changing the linterval writing, the existing trend will be deleted, to ensure a linear display of the trend.

Trend CSV File

The trend data is written continuous to a csv-file on SD-card. By using the button "Download Trend", the csv-file can be downloaded (see page 8f.). To avoid large data-files, the csv-file can be reseted manually by using the button "Delete". Hint: When changing the number of silos, the csv-file will be deleted also.

Event CSV File

The event data are stored continuously to the SD-card for diagnostics. Per quarter and silo, one file is created. There are files for the prior and for the actual quater up to the actual date available for download. Older files are deleted automatically.

Visualisation - Operation

Page "Ethernet Configuration"

Setting of parameters for the network interface

User name Admin

Hint: If you make a mistake at configuration or loose the settings, the controller can be addressed on connector X2 (see page 6) with IP address 192.168.30.70.

Setup Network Nivotec	
Current IP Adress	192.168.10.70
Current Sub Net Mask	255.255.255.0
Current Gateway	192.168.10.20
New IP Adress	
New Sub Net Mask	
New Gateway	
Save	

Page "Send an E-Mail"

Setting of receiver for notes per email when full detector, demand detector, empty detector and failure

User name Admin

E - Mail Receiver

Receiver 1	
Name	Admin
E-Mail Adress	admin@uwt.de
Receiver 2	
Name	Logistics Department
E-Mail Adress	logistics@uwt.de
Receiver 3	
Name	
E-Mail Adress	
Receiver 4	
Name	
E-Mail Adress	
Receiver 5	
Name	
E-Mail Adress	

Send an E-Mail
Nivotec NT 3500

10:53:57 23.01.2018

Send an E-Mail at					
Receiver	Full Detector	Demand Detect	Empty Detector	Failure	Test Mail
Admin					Transmit
Logistics Department					Transmit
					Transmit
					Transmit
					Transmit

State

Client 1	OK
Client 2	OK
Client 3	OK
Client 4	OK
Client 5	OK

SOLUTIONS

Config Home

Visualisation - Operation

Page "Silo Single View"

View of details and settings of the sensors for a silo

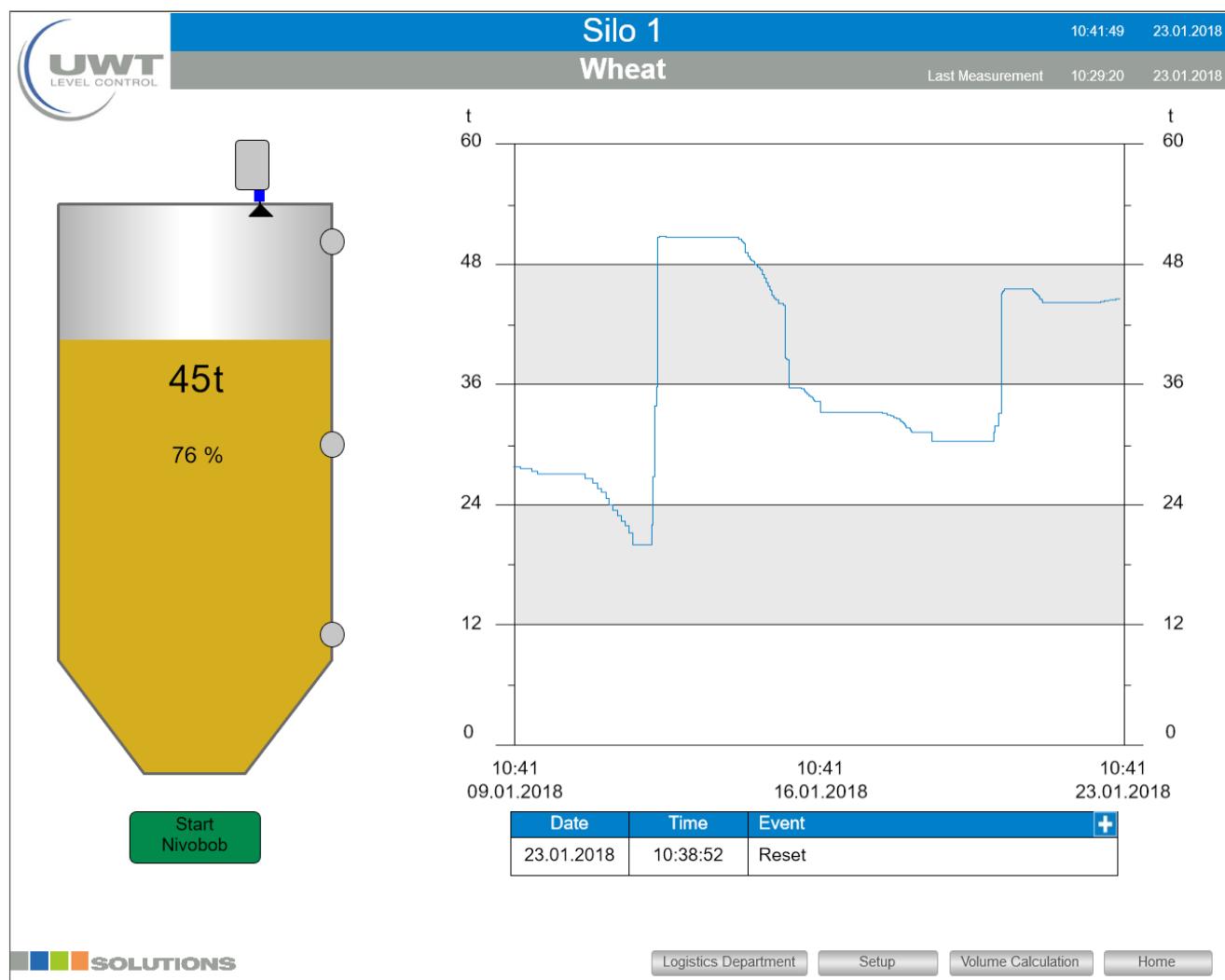
User name User, Purchase and Admin

Clicking on a silo in the Overview page (Home) opens the Silo Single View.

The level is displayed in the unit as defined under "Volume Calculation" (see page 16), in addition as a percentage. The colored points display the full, demand and empty detection. The color of the filling can be set on page "Setup" (see page 14f.) to the demand of the filling.

The trend stores a total of 200 data points per silo. The oldest point is deleted when a new value is stored.

Events are displayed in a table. The selection "+" opens the list of the last 11 events. In case of a alarm, above the table up to 3 notifications will be shown additional.



Nivobob Start

Starts the measurement of the Nivobob for this silo. During the measurement, the button appears gray. When the measurement is completed, the color changes back to green.

The button appears only if the attached sensor is a Nivobob.

Disposition

Leads to the page "Logistics Department" of this silo (see page 17).

Setup

Leads to the page "Setup" of this silo (see page 14ff.).

Volume Calculation

Leads to the page "Volume Calculation of this silo (see page 16).

Visualisation - Operation

Page "Setup"

Detail settings for the respective measurement point

User name Admin

View if via Modbus connected sensor is a Novobob:

Silo Data		Modbus RTU		Level Limit Sensor	
Silo Name	Silo 1	Adress	1	Full Detector	
Silo Content	Wheat	Active		Value	55 t
Article Number				Modbus	
				Digital	

Nivobob	
Enable	
Automatic Power Measure	
Interval Start	
Interval Time	01:00:00
Starttime Interval	00:00:00
Start Time 1	00:00:00
Start Time 2	00:00:00
Start Time 3	00:00:00
Start Time 4	00:00:00
Start Full Detector	

Signal Source	
Modbus RTU	
Analog 4-20mA	
Impulse Counter	
Modem	

Silo color	
Current color	Switch

[Back](#) [Home](#)

The following selections appears under topic Nivobob, if according sensor is connected:

Enable

The measurement start can be blocked by deactivation of this field, e.g. when a silo si filled up.

Automatic Power Measurement Start

After rebooting the webserver or blackout, the Nivobob will start automatically, if this field is activated. The filling level is then immediately actual (Nivobob loses measurement values after blackout, until measurement is started).

Interval Start, Interval Time, Starttime Interval

If the field "Interval Start" is activated, measurement starts of the Nivobob take place automatically. The starts take place daily, first-time at "Starttime Interval" (hours - minutes - seconds), then with periodic repeated interval time" (hours - minutes - seconds).

Start Time 1 to 4

Additional/ alternative to the Interval Start up to 4 individual Start Times can be set per day (hours - minutes - seconds).

Start Full Detector

If the field "Start Full Detector" is activated, measurement start of the Nivobob takes place automatically, if the full detector of the corresponding silo is actuated. From actuation to measurement start is a delay of 10 minutes.

Visualisation - Operation

View if via analog input connected sensor is NivoRadar®

Silo Data	
Silo Name	Silo 1
Silo Content	Wheat
Article Number	

Select Sensor	
Nivobob 3000	
Nivobob 4000	
Nivoradar	
Sensor of Another Supp	

Signal Source	
Modbus RTU	
Analog 4-20mA	
Impulse Counter	
Modem	

Level Limit Sensor	
Full Detector	
Value	55 t
Digital	
Demand Detector	
Value	20 t
Digital	
Empty Detector	
Value	10 t
Digital	

Silo color	
Current color	
Switch	

Silo Daten

The silo shown can be labeled with any text for silo name, content and article number.

Modbus RTU

Setting of the Modbus address of the connected hardware.

If a Modbus converter is connected to the selected address, the Nivotec detects this automatically. A field to select the channel number for the 4-20 mA sensor and the full detector appears:

- Channel 0 is allocated to the terminal Vin0+ and DI0 (see electrical installation on page 9)
- Channel 1 is allocated to the terminal Vin1+ and DI1
- Channel 2 is allocated to the terminal Vin2+ and DI2
- Channel 3 is allocated to the terminal Vin3+ and DI3

Hint for defining the Modbus addresses:

The Modbus address of the Nivobob is set in the Nivobob communication menu (see manual Nivobob). It is reasonable to use the address 1 for the first device, then ascending to 2, 3, etc. With mixed use of Modbus converters the first addresses of the Modbus converters are already preset (see below), the Nivobob addresses must then be allocated above these. Optional (with selection code 33) the Nivobob devices are delivered with already preset address.

The Modbus converters are factory preset to address 1 for the first Modbus converter, then ascending to 2, 3, etc. The settings can not be changed. A label with the Modbus address is present inside the Modbus converters on the implemented module M-7002.

Grenzstansmelder

If a full detector is connected, it is read with setting to "Modbus".

If "value" is selected, the message for full is activated, when the entered value (in accordance to the unit set on page "Volume Calculation", see page 16) is exceeded by the material level. The message for demand and empty is activated, when the material level is below the entered values. The demand and empty message can only be activated via the input "value".

Hint: When changing the unit on page "Volume Calculation", the values for full, demand and empty detector have to be adapted accordingly.

Silo color

The chromatic illustration of the filling can be adapted to the filling.

Visualisation - Operation

Page "Volume Calculation"

Settings for volume related measurement display and setting of the silo dimensions

User name Admin

Volume Calculation Silo 1

Wheat

10:39:01 23.01.2018

Silo Shape

Cylinder	
Rectangle	

Silo Data

Unit	Metre	Feet
Silo Height (H)	30.00	
Air Distance (A)	1.00	
Cone (C)	2.00	
Move Distance Nivobob	0.00	
Diameter 1 (D1)	2.00	
Diameter 2 (D2)	0.00	

Density

Density	680	g/l
---------	-----	-----

Calculated Values

Maximal Content	59 t
Current Content	45 t

100%

SOLUTIONS

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Silo Profile and Silo Data

With the setted data the software calculates the actual content:

Programming of the sensors

For the correct measurement display the connected sensors must be set as follows:

- **Nivobob NB 3000/ NB 4000:**

The value "Move Distance Nivobob" must equal the silo hight to use the full measurement range down to 0%. Values can be exchanged with the Nivobob via the buttons "Read from Nivobob" and "Transmmit to Nivobob".

- **4-20 mA sensors** (connected via Modbus converter):

4 mA must correspond to the value 0% given above
 20 mA must correspond to the value 100% given above

Note: All sensors needs to have a linear level signal (relation between the signal output and level in the silo).

The volume-based calculation is performed in the visualisation only.

Unit/ Density

The selected unit is used in the visualisation. When selecting a mass unit (kilograms, tons, US tons), the entered bulk density is used for calculation of the mass.

Calculated values

Display of the calculated maximum content (according to the entered Silo Profile and Data) and the actual content. Both values are shown in the above selected unit.

Visualisation - Operation

Page "Logistics Department"

View and setting of silo content, article number and density, as well as view of maximal content, current content and current free space

User name Purchase and Admin

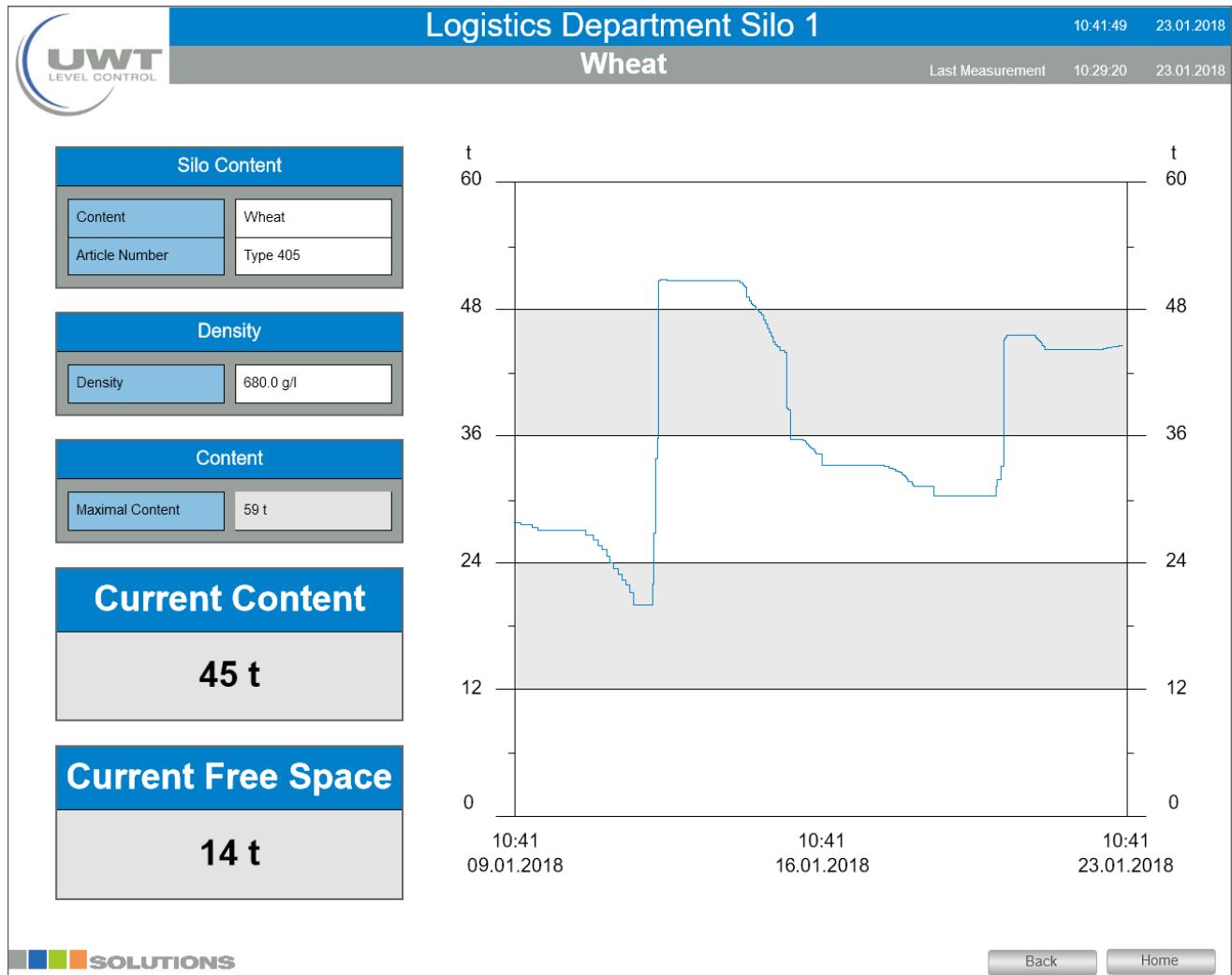


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Technical Data	4

Accessories	4

Electrical installation	5

Commissioning	10

Visualisation - Operation	11

Subject to technical change.

We assume no liability for typing errors.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning must be carried out only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.

Special attention must be paid to warnings and notes as follows:



WARNING

Relates to a caution symbol on the product and means, that a failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.



WARNING

Relates to a caution symbol on the product and means, that a failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product	Description
	CAUTION: refer to related documents (manual) for details.
	Earth (ground) Terminal
	Protective Conductor Terminal

Technical support

Please contact your local supplier (see www.uwt.de for address). Otherwise you can contact:

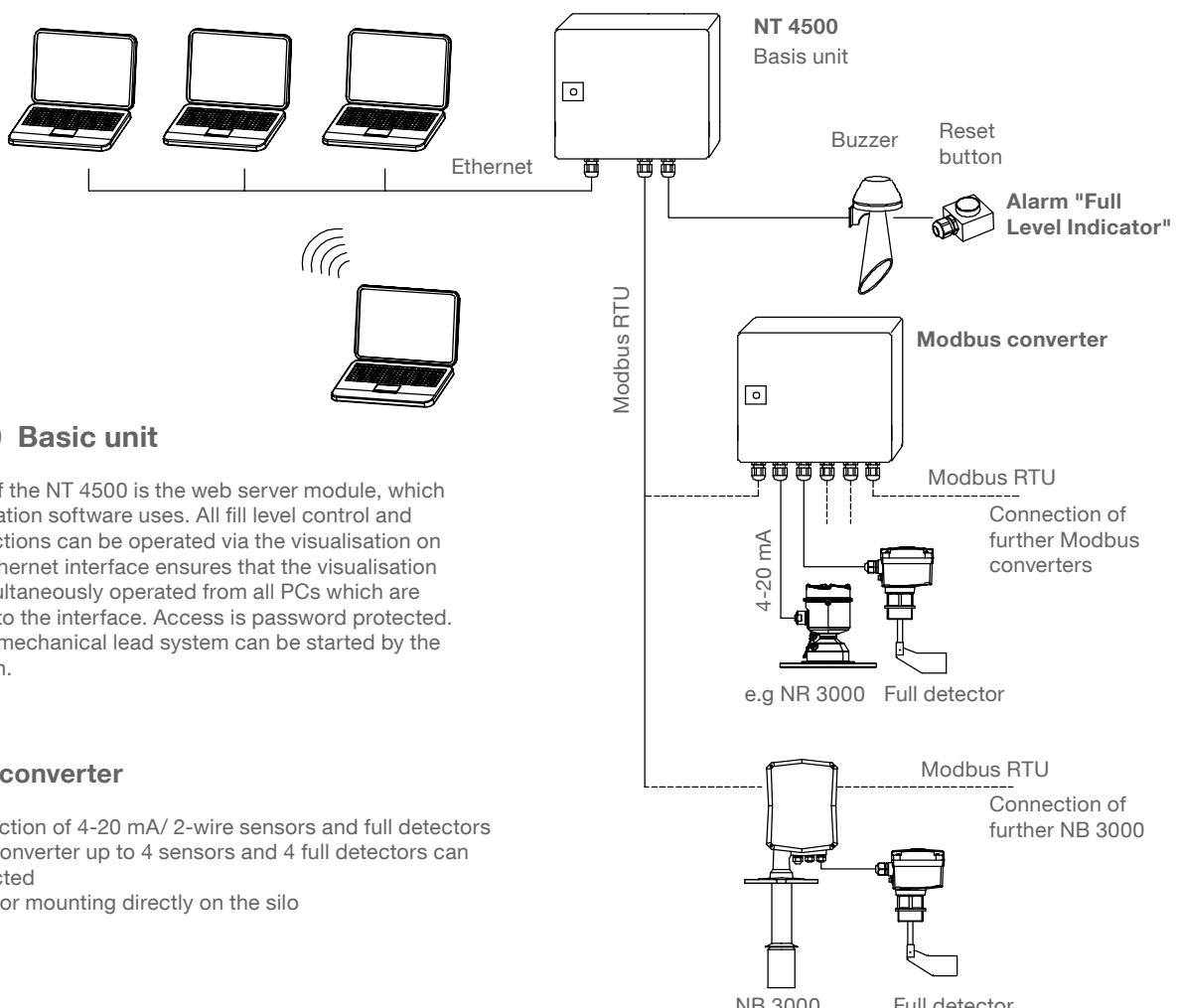
UWT GmbH
Westendstr. 5
87488 Betzigau
Germany

Tel. 0049 (0)831 57123-0
Fax. 0049 (0)831 76879
info@uwt.de
www.uwt.de

Overview

Level monitoring and visualisation via web server

- Standardized system up to 50 silos
- Visualisation and operation via standard internet browser software
- Software language german, english or dutch
- Password protected
- Worldwide remote enquiry of the level
- Data in percentage, height, volume or weight
- Trend display, data storage, export via csv-file
- Evaluation of the analogue 4-20 mA signals of any sensors, as well as Modbus RTU of the UWT-systems
- Different input signals within the same system is possible
- Implementation of full detectors
- Fill control via full alarm signal (buzzer)
- Indication of warnings/ reports



Technical Data / Accessories

Technical data

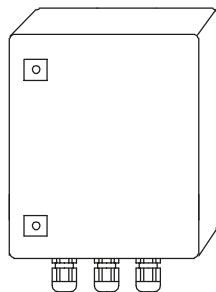
Dimensions	NT 4500, Modbus converter:	300 x 300 x 210 mm (W x H x D)
Mounting	NT 4500, Modbus converter:	wall mounting
Material	NT 4500, Modbus converter:	steel plate
Ingress protection	NT 4500, Modbus converter:	IP65
Ambient temperature	NT 4500:	0 .. +55°C
	Modbusumsetzer:	-25 .. +70°C
Power supply	NT 4500, Modbus converter:	115 V or 230 V 50/60 Hz (integrated power converter 24 VDC)
	NR 3000:	supplied by Modbus converter
	NB 3000/ NB 4000:	115 V or 230 V AC, connection is made on site
	Full detector:	Connection either on NB 3000/ NB 4000 resp. Modbus converter. In this case the supply voltage must be equal to NB 3000/ NB 4000 resp. Modbus converter. Alternative it is possible to connect on site.
Power consumption	NT 4500, Modbus converter:	20 VA
	Connected level sensors:	see documentation of the respective sensors
Signal output full detector	Floating contact is required	

Technical data of the used Wago Controllers:

see www.wago.com, search for 750-8202

Terminal box

Intermediate terminals for the wires leading to the silo (mounting e.g. on the silo frame). Applicable for cables of level (Modbus or 4-20 mA), limit switch, buzzer, reset button



Technical data

Dimensions	200 x 300 x 120 mm (W x H x D), for wall mounting
Material	steel plate
Ingress protection	IP65
Ambient temperature	-25 .. +60°C
Terminal blocks	15 pieces grey, 5 pieces blue, 5 pieces green/ yellow; each terminal implements 3 cable inlets 2.5 mm ² , mounted on top hat rail
Cable glands	6 pieces M20 x 1.5 2 pieces M25 x 1.5

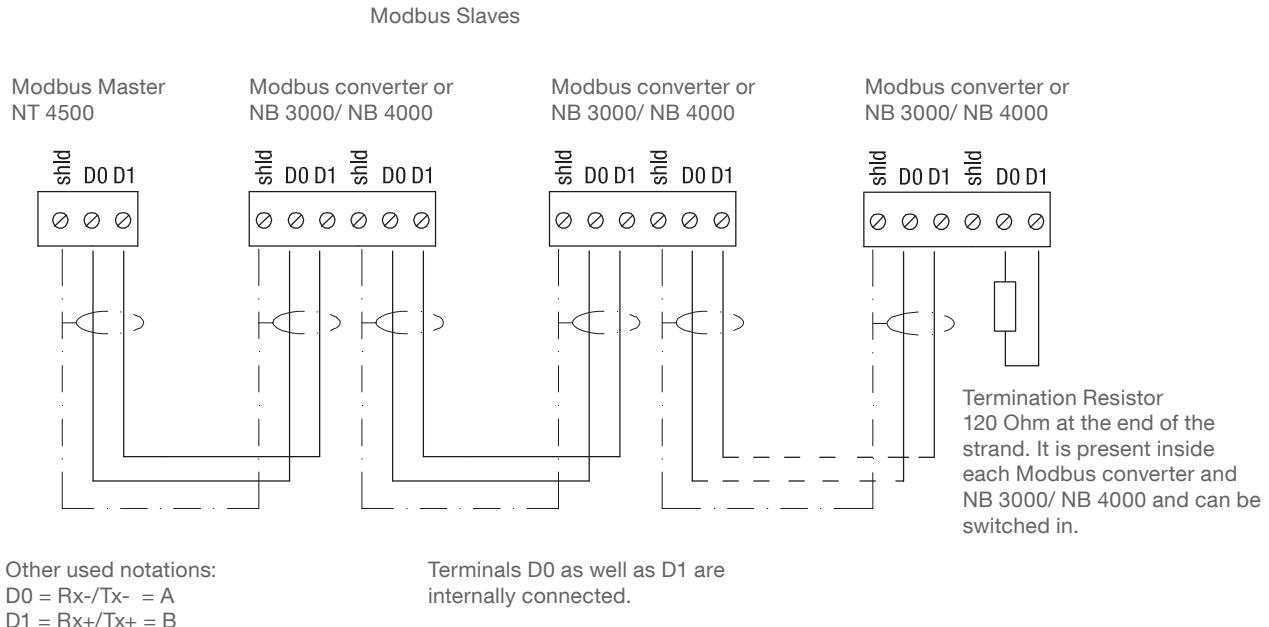
Electrical installation

! Safety Instructions

Handling	In case of improper handling or handling malpractice, the electric safety of the device cannot be guaranteed.
Installation regulations	The local regulations or VDE 0100 (Regulations of German Electrotechnical Engineers) must be observed.
Fuse	Use a fuse as stated in the connection diagrams.
RCCB protection	In case of a fault, the supply voltage must be automatically switched off by a RCCB protection switch to protect against indirect contact with dangerous voltages.
Power supply switch	A voltage disconnection switch must be provided near the device.
Wiring diagram	The electrical connections are made in accordance with the wiring diagram.
Supply voltage	Compare the supply voltage applied with the specifications given on the name plate before switching the device on.
Cable gland	Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion). Cable glands that are not used have to be sealed with a blanking element.
Field wiring cables	All field wirings must have insulation suitable for at least 250 V AC. The temperature rating must be at least 80°C (176°F).
Installation in Hazardous Locations	The NT 4500 and the Mobus converter are not permitted for installation in Hazardous Areas. Observe the valid regulations for wiring in Hazardous Areas, if the NB 3000/ NB 4000 is installed in Hazardous Areas.

Modbus network

General wiring of a Modbus network



Note:

If required it is possible to split the Modbus network into two strands. Both strands are wired in parallel at the Modbus Master. A termination resistor must be present at the end of each strand.

Electrical installation

Cable recommendations for Modbus network

Shielded cable

Functionality up to 50 m

Manufacturer: Lapp, Type UNITRONIC LiYCY 2x0.34, Art.no: 0034502

Twisted pair cable

Functionality up to 1,000 m

Manufacturer: Lapp, Type UNITRONIC BUS CAN 1x2x0.34, Art.no: 2170263

UV-protection hose with threaded hose coupling M20 x 1.5

UV protection for Modbus cable

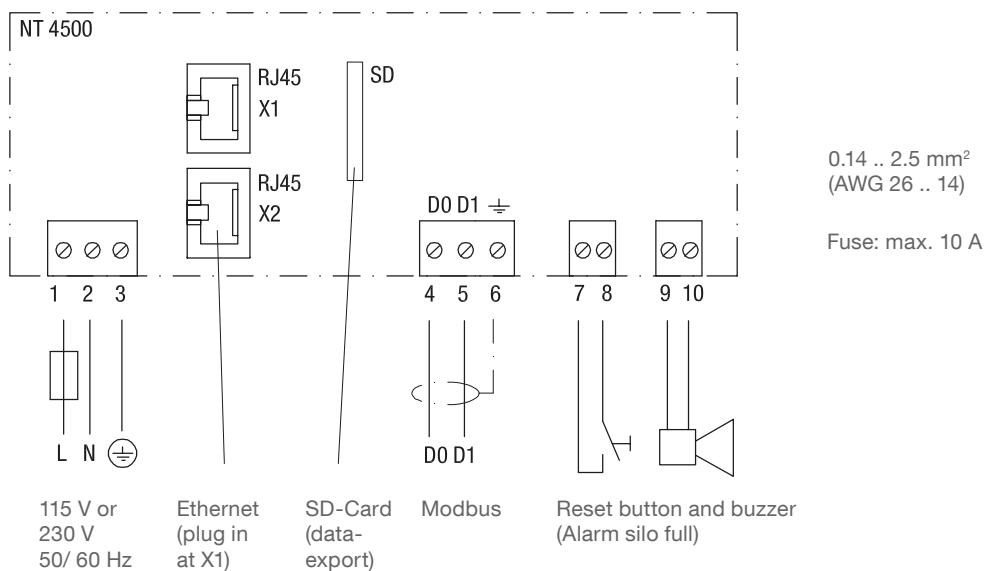
Manufacturer: Flexa, Type Rohrflex PA6, Art.no: 0233.202.012 and Type RQG1-M, Art.no: 5020.055.018

ATEX-protection hose with threaded hose coupling M20 x 1.5

For installation of Modbus cable in ATEX Zone 21

Manufacturer: PMA, Type ESX, Art.no: ESXT-12B.50 and Type END, Art.no: BEND-M202GT

NT 4500

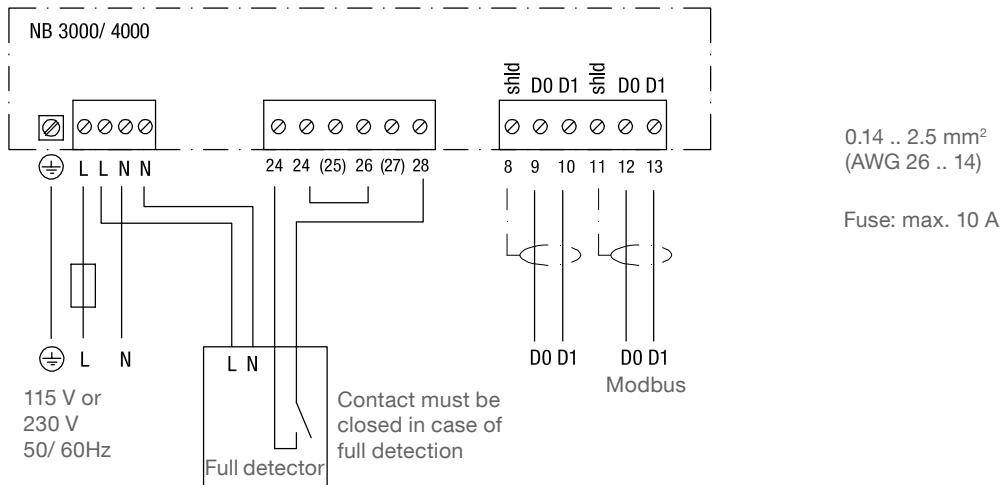


Note:

- The sliding switch on the controller is set to RUN and must not be changed.
 - The csv-file for data-export is written on a SD-card.
- The SD-card has to rest in the controller for continuous recording.

Electrical installation

NB 3000/ NB 4000

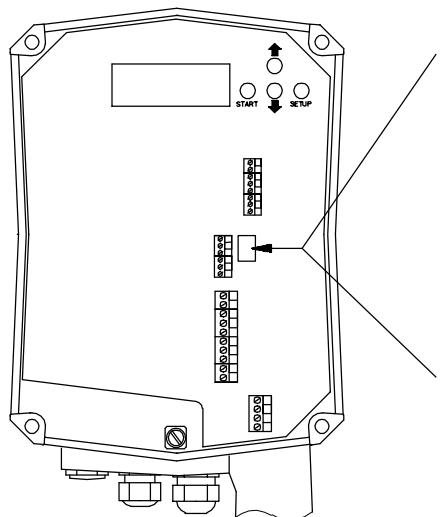


Electrical installation

Setting: Biasing and Termination Resistor

For use of NB 4000 units in a external Modbus network, it is possible to set Biasing and Termination Resistor on each unit as required.

NB 3000



Version with Jumper

Biasing	OFF*	OFF	ON
Termination Resistor	OFF*	ON	ON

Version with DIP switch

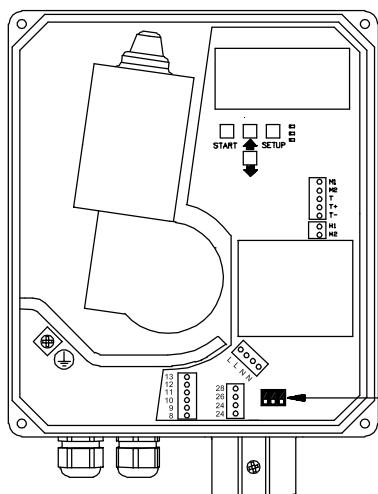
Biasing	OFF*	OFF	ON	ON
Termination Resistor	OFF*	ON	OFF	ON

*factory provided

DIP Switch position:

Top view Side view

NB 4000



Biasing	OFF*	OFF	ON	ON
Termination Resistor	OFF*	ON	OFF	ON

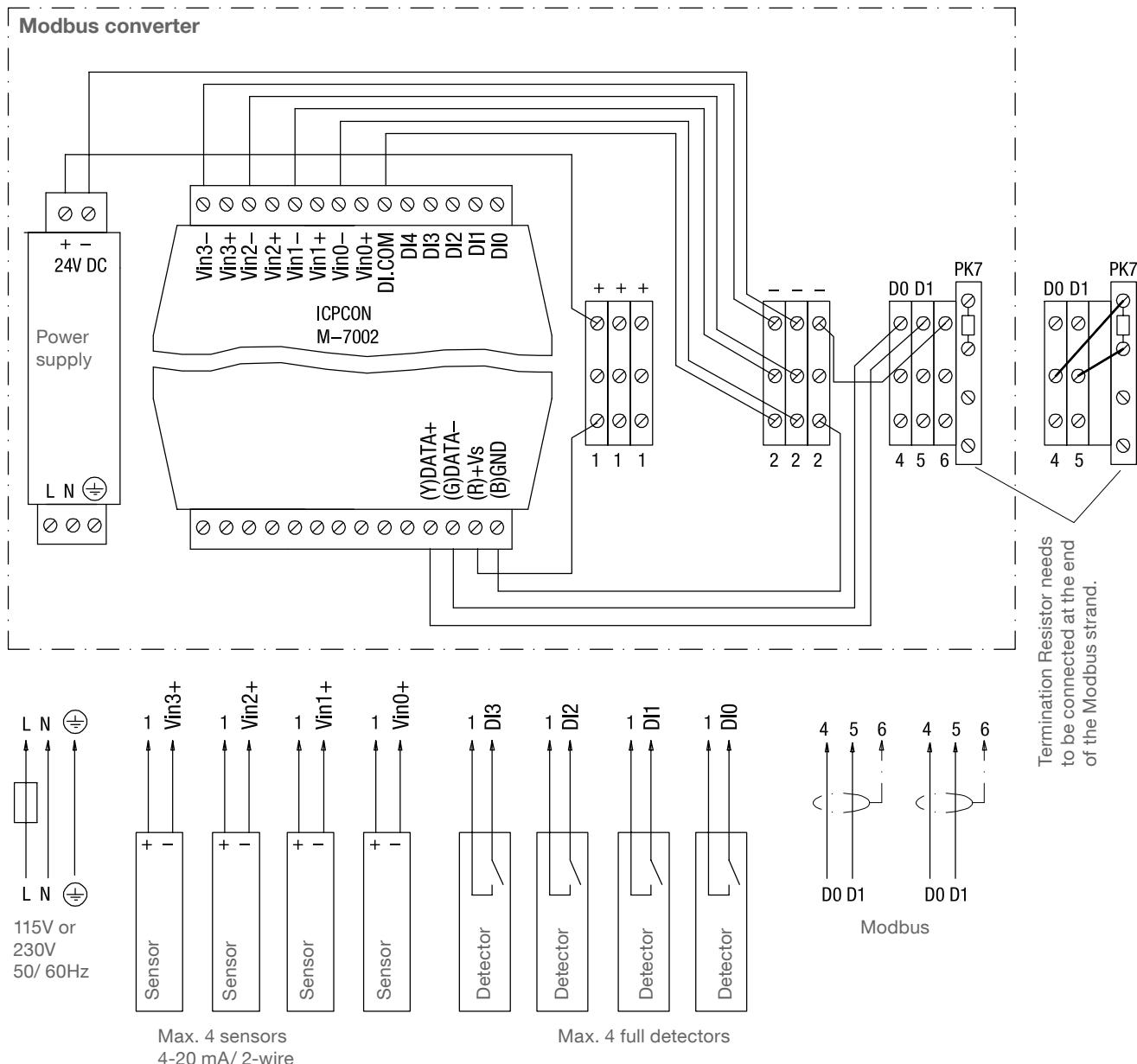
*factory provided

DIP Switch position:

Top view Side view

Electrical installation

Modbus converter



Fuse: max. 10 A

Terminals M-7002: 0.14 .. 1.5 mm² (AWG 26 .. 16)
 Other terminals: 0.14 .. 2.5 mm² (AWG 26 .. 14)

The stated wiring inside the Modbus converter is factory provided.

Commissioning

1. Generation of a synoptical table

Commissioning is facilitated if an overview of the connected sensors is made in advance.

The table shows an example of a project with 11 silos and mixed configuration of Nivobob® NB 3000 and NR 3000 radar as well as implementation of full detectors:

Silo	Sensor	Modbus ID	Modbus converter Channel*	Modbus converter Terminal of sensor	Modbus converter Terminal of full detector
1	NB 3000	3	n/ a	n/ a	n/ a
2	NB 3000	4	n/ a	n/ a	n/ a
3	NB 3000	5	n/ a	n/ a	n/ a
4	NB 3000	6	n/ a	n/ a	n/ a
5	NR 3000	1	0	Vin0+	DI0
6	NR 3000	1	1	Vin1+	DI1
7	NR 3000	1	2	Vin2+	DI2
8	NR 3000	1	3	Vin3+	DI3
9	NR 3000	2	0	Vin0+	DI0
10	NR 3000	2	1	Vin1+	DI1
11	NR 3000	2	2	Vin2+	DI2

* see page 17f. under "Modbus RTU"/ "Full Detector"

2. Check the wiring

Make sure that the Modbus network is wired, set the Modbus Termination Resistor (and for NB 3000/ NB 4000 the Biasing), check that the Ethernet connection is available (see "Electrical installation" from page 5 onwards).

Note: All units are preset to 19200 Baud. Thus no setting is required.

3. Web server configuration

CAUTION: The configuration should be done by the network administrator only.

The web server is preset to the IP address 192.168.10.70. It must be changed to a company's own IP address as follows:

- Use a PC, which is connected via Ethernet to the Web server. Set in the system control the TCP/ IP to address 192.168.10.xxx, whereas xxx can be any number between 0 and 255 (the access to the Web server requires the number 192.168.10., the last numberblock is not relevant).
- An up to date version of Internet browser must be installed.
- Open the Internet browser and type the IP address 192.168.10.70 of the web server in the command bar. The overview page "Home" of the visualisation opens (see page 11).
- Click the "Login" button and set the user name to "Admin" with the password "admin". The "System Config" button will appear in the menu bar.
- Click on this button. The configuration page of the web server will open (see page 13ff.).
- Enter the number of silos, language, date and time, your IP address, sub net mask and gateway.
- Then reset to your TCP/ IP address in the system control of your PC.

4. Perform the basic settings of the connected sensors

With the following settings, the connected sensors are addressed via the visualisation and give a real measurement result. For this settings the above mentioned synoptical table is helpful. On the overview page "Home", click into the desired silo. There you have to edit the following settings:

- On page "Setup" (see page 17f.) the data under "Silo Data", "Modbus RTU" and "Level Limit Sensor".
- On page "Volume Calculation" (see page 19) the data under "Silo Shape" and "Silo Data".

5. Perform further user settings

Enter the required user specific settings according to the "Visualisation - Operation" from page 11 onwards.

Visualisation - Operation

Start of the Visualisation

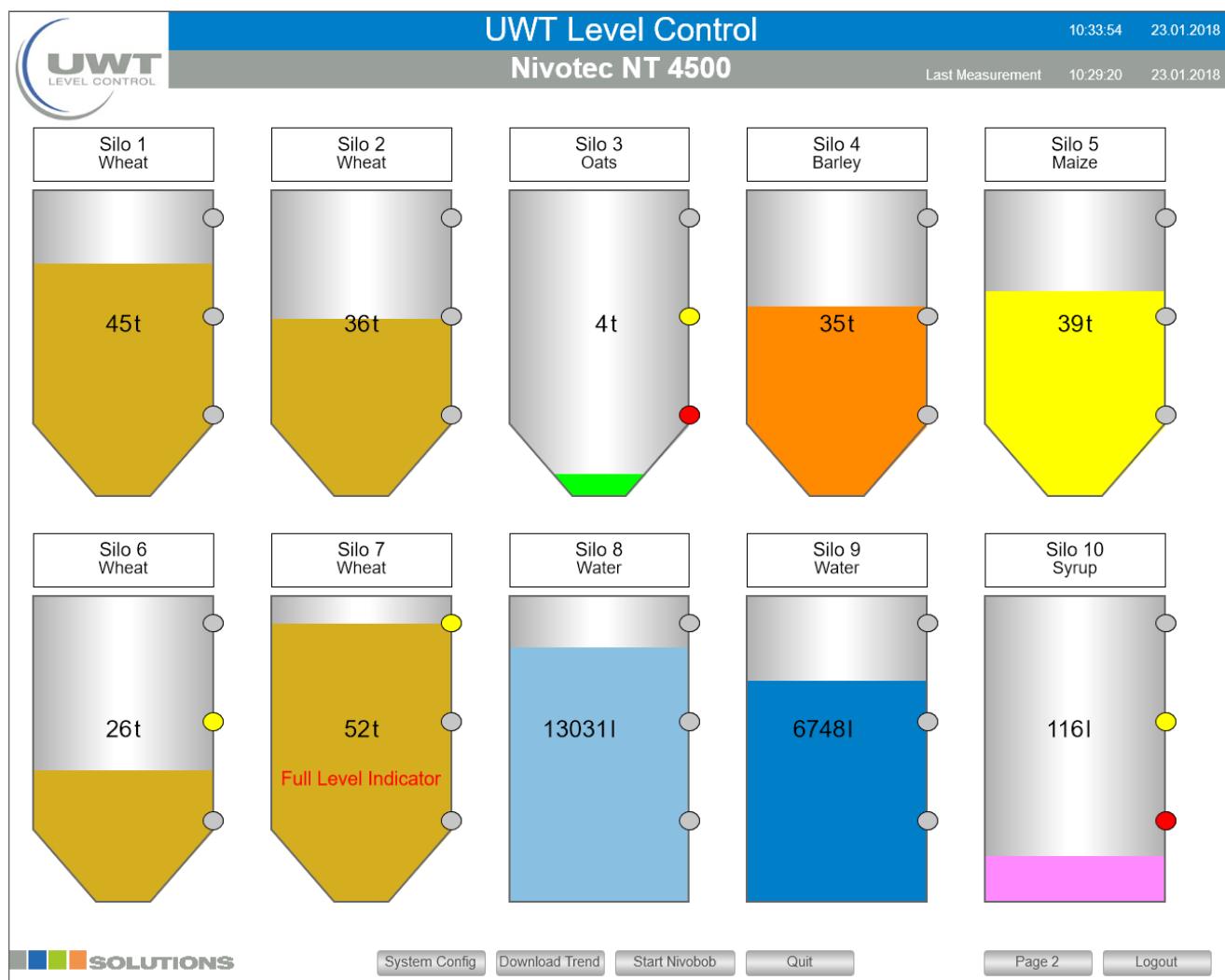
By entering the IP address in the browser (according to the web server configuration) the visualisation starts.
 After successful start the overview page "Home" appears.

Overview page (Home)

Display of level, level limit sensors, information regarding silo and error messages

All user names

The selected number of silos (see page "System Config" -> Number of silos) is presented. If more than 10 silos are defined, a button appears for progression to the next page.



Note: If a distorted image on the PC is present, it should not be viewed in full screen mode, thus the window can be drawn in an undistorted view.

Visualisation - Operation

The following selections appear depending on the setted user name:

Login Logout

Using the Login button, you can change to other user names with additional privileges:

User (password: user)

- Page "Silo Single View"
- View of Event List
- Page "System Config"
- Download of trend data
- Start Nivobob®
- Reset of the full signal (buzzer) and of error messages
- Logout



Purchase (password: purchase)

Similar to User, additional:

- On page "Silo Single View": page "Logistics Department"

Admin (password: admin)

Similar to Purchase, additional:

- On page "Silo Single View":
 - Page "Setup"
 - Page "Volume Calculation"
- On page "System Config":
 - Page "Number of silo - Date - Time - Language - Trend"
 - Page "Network"
 - Page "E-Mail"
 - Release User Settings

The button Logout is used to logout.

Silo Single View (click on a silo)

The single view for the respective silo will open (see page 16).

System Config

See page 13 ff.

Download Trend

Issue of trend data for all silos as csv-file. The level values are stated in the unit as defined under "Volume Calculation" (see page 19).

Start Nivobob®

Starts the measurement of all connected Nivobobs. If more than 10 silos are defined, the measurements of the silos not displayed on the screen are started as well. As long as the measurement is running, a green arrow appears in each silo.

Quit

Reset of the full signal (buzzer) and of error messages.

Visualisation - Operation

Page "System Configuration"

Display of Softwareinformations, navigation to extended user settings

All user names

System Info		
1	Project	NT4500
2	SW Nivotec	8.1.0
3	FW Wago	02.06.20(09)
4	PN Wago	WAGO 750-8202 PFC200
5	Type Wago	750-8202
6	FW Webserver	1.1.9.10
7	Licence	Codesys-Runtime-Licens
8	Host	PFC200-40E80A
9	Domain	localdomain.lan
10	Silo Analog	
11	Silo Modbus	
12	Silo Impulse	
13	Generation	17.01.2018
14	RS485	
15	Gateway 1	
16	Gateway 2	
17	Gateway 3	
18	Modbus Converter	
19	Tank Truck	
20	Pinch Valve	
21	Access Number of Silo	
22	Current Number of Silo	11
23	Maximal Silo Number	25

The following selections appears depending on the setted user name:

Number of Silo - Date - Time - Language - Trend

See page 14.

Network

See page 15.

E-Mail

See page 15.

Reset User Settings

The button "Change Password" will be shown for 5 minutes (independent from logged in user name).

Change Password

A popup to change the password of the actually logged in user name will be shown.

Change password	
User name:	<input type="text" value="User"/>
Old password:	<input type="password" value="*****"/>
New password:	<input type="password" value="*****"/>
Acknowledge password:	<input type="password" value="*****"/>
<input type="button" value="Ok"/> <input type="button" value="Cancel"/>	

Visualisation - Operation

Page "System Config" Button "Number os Silo - Date - Time - Language - Trend"

Setting of date, time, menu language of software, number of silos, writing interval for trend and reset of trend .csv file

User name Admin

Date & Time		Language		Number of Silo	
Current Time	10:45:34	German		Number of Silo	11
Current Date	23.01.2018	English		If changed, CSV file is lost Save data from it	
New Time	00:00:00	Dutch			
New Date	01.01.2017				
		Save			

Trend	
Interval Writing	00:01:00

Trend CSV File	
Delete	

Event CSV File	
Current Quarter	Download
Last Quarter	Download

SOLUTIONS Config Home

Number of Silo

The number of silos to be displayed on Overview page (Home) is set here. Per page a maximum of 10 silos will be shown, additional silos will be shown on a following page. The maximum amount of shown silos is limited to 25 or rather 50 silos, depending on device configuration.

Trend

The trend on the pages "Silo Single View" and "Logistics Department" consist in total of 200 measurement points per silo. The oldest measurement point will be deleted, if an actual value is added. By editing the "Interval Writing", the total time of the trend can be determined. The trend saving takes place in this interval (hours : minutes : seconds). By changing the linterval writing, the existing trend will be deleted, to ensure a linear display of the trend.

Trend CSV File

The trend data is written continuous to a csv-file on SD-card. By using the button "Download Trend", the csv-file can be downloaded (see page 11f.). To avoid large data-files, the csv-file can be reseted manually by using the button "Delete". Hint: When changing the number of silos, the csv-file will be deleted also.

Event CSV File

The event data are stored continuously to the SD-card for diagnostics. Per quarter and silo, one file is created. There are files for the prior and for the actual quater up to the actual date available for download. Older files are deleted automatically.

Visualisation - Operation

Page "Ethernet Configuration"

Setting of parameters for the network interface

User name Admin

Hint: If you make a mistake at configuration or loose the settings, the controller can be addressed on connector X2 (see page 6) with IP address 192.168.30.70.

Setup Network Nivotec	
Current IP Adress	192.168.10.70
Current Sub Net Mask	255.255.255.0
Current Gateway	192.168.10.20
New IP Adress	
New Sub Net Mask	
New Gateway	
Save	

Page "Send an E-Mail"

Setting of receiver for notes per email when full detector, demand detector, empty detector and failure

User name Admin



E - Mail Receiver

Receiver 1	
Name	Admin
E-Mail Adress	admin@uwt.de
Receiver 2	
Name	Logistics Department
E-Mail Adress	logistics@uwt.de
Receiver 3	
Name	
E-Mail Adress	
Receiver 4	
Name	
E-Mail Adress	
Receiver 5	
Name	
E-Mail Adress	

Send an E-Mail

Nivotec NT 4500

10:53:57 23.01.2018

Receiver	Full Detector	Demand Detect	Empty Detector	Failure	Test Mail
Admin					Transmit
Logistics Department					Transmit
					Transmit
					Transmit
					Transmit

State

Client 1	OK
Client 2	OK
Client 3	OK
Client 4	OK
Client 5	OK

SOLUTIONS
Config
Home

Visualisation - Operation

Page "Silo Single View"

View of details and settings of the sensors for a silo

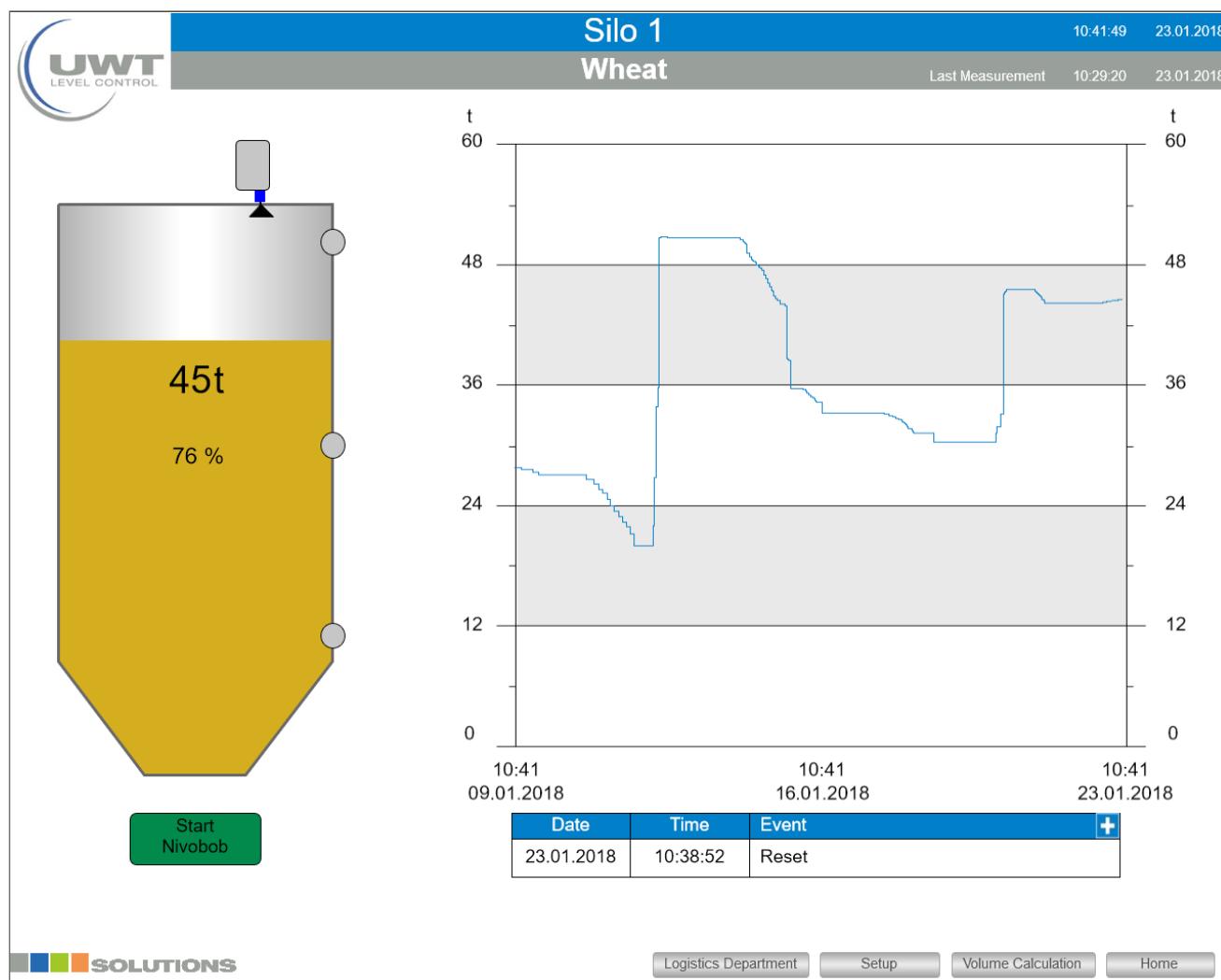
User name User, Purchase and Admin

Clicking on a silo in the Overview page (Home) opens the Silo Single View.

The level is displayed in the unit as defined under "Volume Calculation" (see page 19), in addition as a percentage. The colored points display the full, demand and empty detection. The color of the filling can be set on page "Setup" (see page 17ff.) to the demand of the filling.

The trend stores a total of 200 data points per silo. The oldest point is deleted when a new value is stored.

Events are displayed in a table. The selection "+" opens the list of the last 11 events. In case of a alarm, above the table up to 3 notifications will be shown additional.



Nivobob® Start

Starts the measurement of the Nivobob® for this silo. During the measurement, the button appears gray. When the measurement is completed, the color changes back to green.

The button appears only if the detected sensor is a Nivobob®.

Disposition

Leads to the page "Logistics Department" of this silo (see page 20).

Setup

Leads to the page "Setup" of this silo (see page 17ff.).

Volume Calculation

Leads to the page "Volume Calculation" of this silo (see page 19).

Visualisation - Operation

Page "Setup"

Detail settings for the respective measurement point

User name Admin

View if connected sensor is a Novobob®:

Silo Data		Modbus RTU		Level Limit Sensor	
Silo Name	Silo 1	Adress	1	Full Detector	
Silo Content	Wheat	Active		Value	55 t
Article Number	Type 405			Modbus	

Nivobob	
Enable	
Automatic Power Meas.	
Interval Start	
Interval Time	01:00:00
Starttime Interval	00:00:00
Start Time 1	00:00:00
Start Time 2	00:00:00
Start Time 3	00:00:00
Start Time 4	00:00:00
Start Full Detector	

Silo color	
Current color	Switch

SOLUTIONS Back Home

The following selections appears under topic Nivobob®, if according sensor is connected:

Enable

The measurement start can be blocked by deactivation of this field, e.g. when a silo si filled up.

Automatic Power Measurement Start

After rebooting the webserver or blackout, the Nivobob® will start automatically, if this field is activated. The filling level is then immediately actual (Nivobob® looses measurement values after blackout, until measurement is started).

Interval Start, Interval Time, Starttime Interval

If the field "Interval Start" is activated, measurement starts of the Nivobob® take place automatically. The starts take place daily, first-time at "Starttime Interval" (hours - minutes - seconds), then with periodic repeated interval time" (hours - minutes - seconds).

Start Time 1 to 4

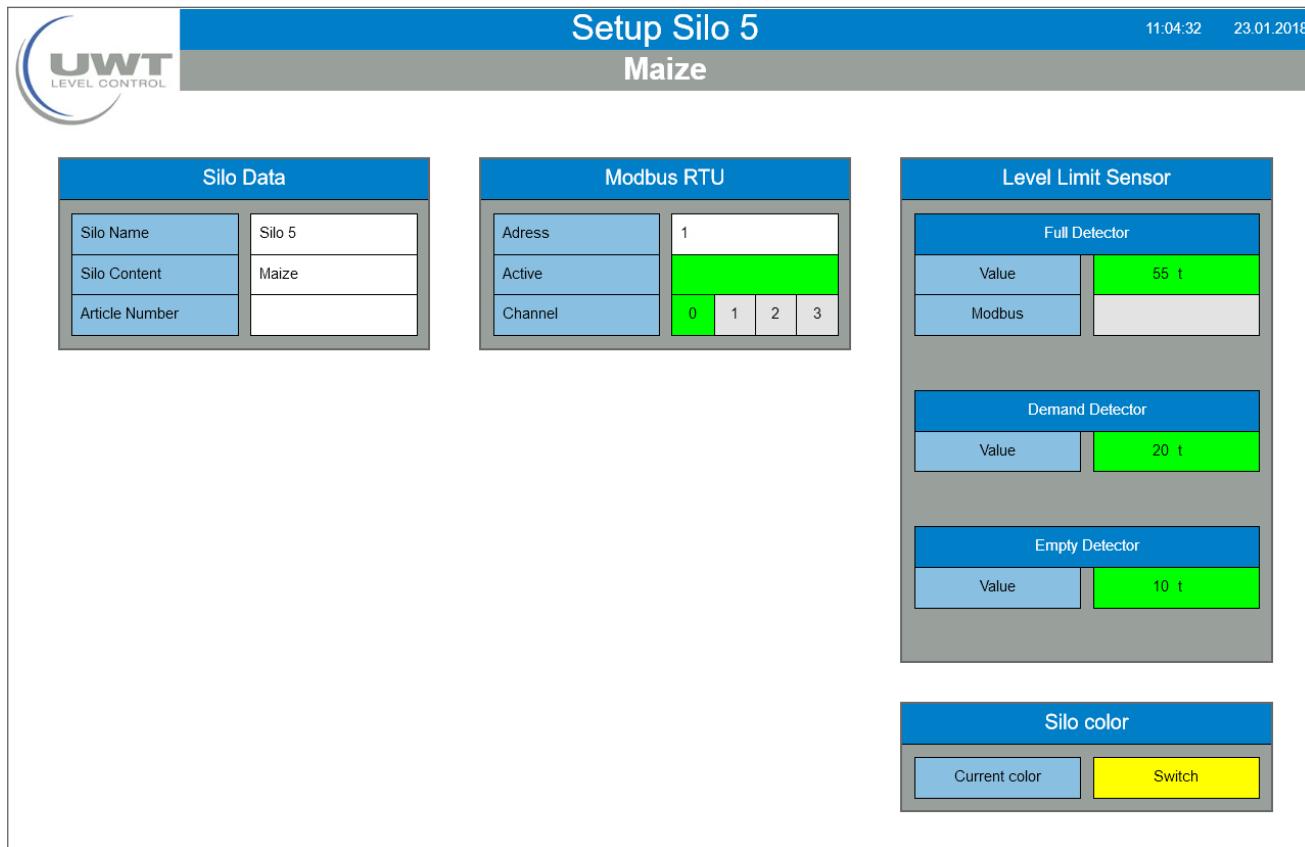
Additional/ alternative to the Interval Start up to 4 individual Start Times can be set per day (hours - minutes - seconds).

Start Full Detector

If the field "Start Full Detector" is activated, measurement start of the Nivobob® takes place automatically, if the full detector of the corresponding silo is actuated. From actuation to measurement start is a delay of 10 minutes.

Visualisation - Operation

View if connected sensor is connected via Modbus converter:



Silo Daten

The silo shown can be labeled with any text for silo name, content and article number.

Modbus RTU

Setting of the Modbus address of the connected hardware.

If a Modbus converter is connected to the selected address, the Nivotec detects this automatically. A field to select the channel number for the 4-20 mA sensor and the full detector appears:

Channel 0 is allocated to the terminal Vin0+ and DI0 (see electrical installation on page 9)

Channel 1 is allocated to the terminal Vin1+ and DI1

Channel 2 is allocated to the terminal Vin2+ and DI2

Channel 3 is allocated to the terminal Vin3+ and DI3

Hint for defining the Modbus addresses:

The Modbus address of the Nivobob® is set in the Nivibob communication menu (see manual Nivobob®). It is reasonable to use the address 1 for the first device, then ascending to 2, 3, etc. With mixed use of Modbus converters the first addresses of the Modbus converters are already preset (see below), the Nivobob® addresses must then be allocated above these. Optional (with selection code 33) the Nivobob® devices are delivered with already preset address.

The Modbus converters are factory preset to address 1 for the first Modbus converter, then ascending to 2, 3, etc. The settings can not be changed. A label with the Modbus address is present inside the Modbus converters on the implemented module M-7002.

Grenzstansmelder

If a full detector is connected, it is read with setting to "Modbus".

If "value" is selected, the message for full is activated, when the entered value (in accordance to the unit set on page "Volume Calculation", see page 19) is exceeded by the material level. The message for demand and empty is activated, when the material level is below the entered values. The demand and empty message can only be activated via the input "value".

Hint: When changing the unit on page "Volume Calculation", the values for full, demand and empty detector have to be adapted accordingly.

Silo color

The chromatic illustration of the filling can be adapted to the filling.

Visualisation - Operation

Page "Volume Calculation"

Settings for volume related measurement display and setting of the silo dimensions

User name Admin

Silo Shape

Cylinder	
Rectangle	

Silo Data

Unit	Metre	Feet
Silo Height (H)	30.00	
Air Distance (A)	1.00	
Cone (C)	2.00	
Move Distance Nivobob	0.00	
Diameter 1 (D1)	2.00	
Diameter 2 (D2)	0.00	

Unit

Centimeter	
Inch	
Cubicmeter	
Kilogram	
Tons	
US Tons	
Litre	
US Gallon	
Imp Gallon	
Percent	

Density

Density	680	g/l
---------	-----	-----

Calculated Values

Maximal Content	59 t
Current Content	45 t

Read from Nivobob
Transmit to Nivobob

Volume Calculation Silo 1

Wheat

10:39:01 23.01.2018

Silo Profile and Silo Data

With the setted data the software calculates the actual content:

Programming of the sensors

For the correct measurement display the connected sensors must be set as follows:

- **Nivobob® NB 3000/ NB 4000:**

The value "Move Distance Nivobob®" must equal the silo hight to use the full measurement range down to 0%.
 Values can be exchanged with the Nivobob® via the buttons "Read from Nivobob®" and "Transmint to Nivobob®".

- **4-20 mA sensors** (connected via Modbus converter):

4 mA must correspond to the value 0% given above
 20 mA must correspond to the value 100% given above
 Note: All sensors needs to have a linear level signal (relation between the signal output and level in the silo).

The volume-based calculation is performed in the visualisation only.

Unit/ Density

The selected unit is used in the visualisation. When selecting a mass unit (kilograms, tons, US tons), the entered bulk density is used for calculation of the mass.

Calculated values

Display of the calculated maximum content (according to the entered Silo Profile and Data) and the actual content.
 Both values are shown in the above selected unit.

NT 4500

gi010218

page 19

Visualisation - Operation

Page "Logistics Department"

View and setting of silo content, article number and density, as well as view of maximal content, current content and current free space

User name Purchase and Admin

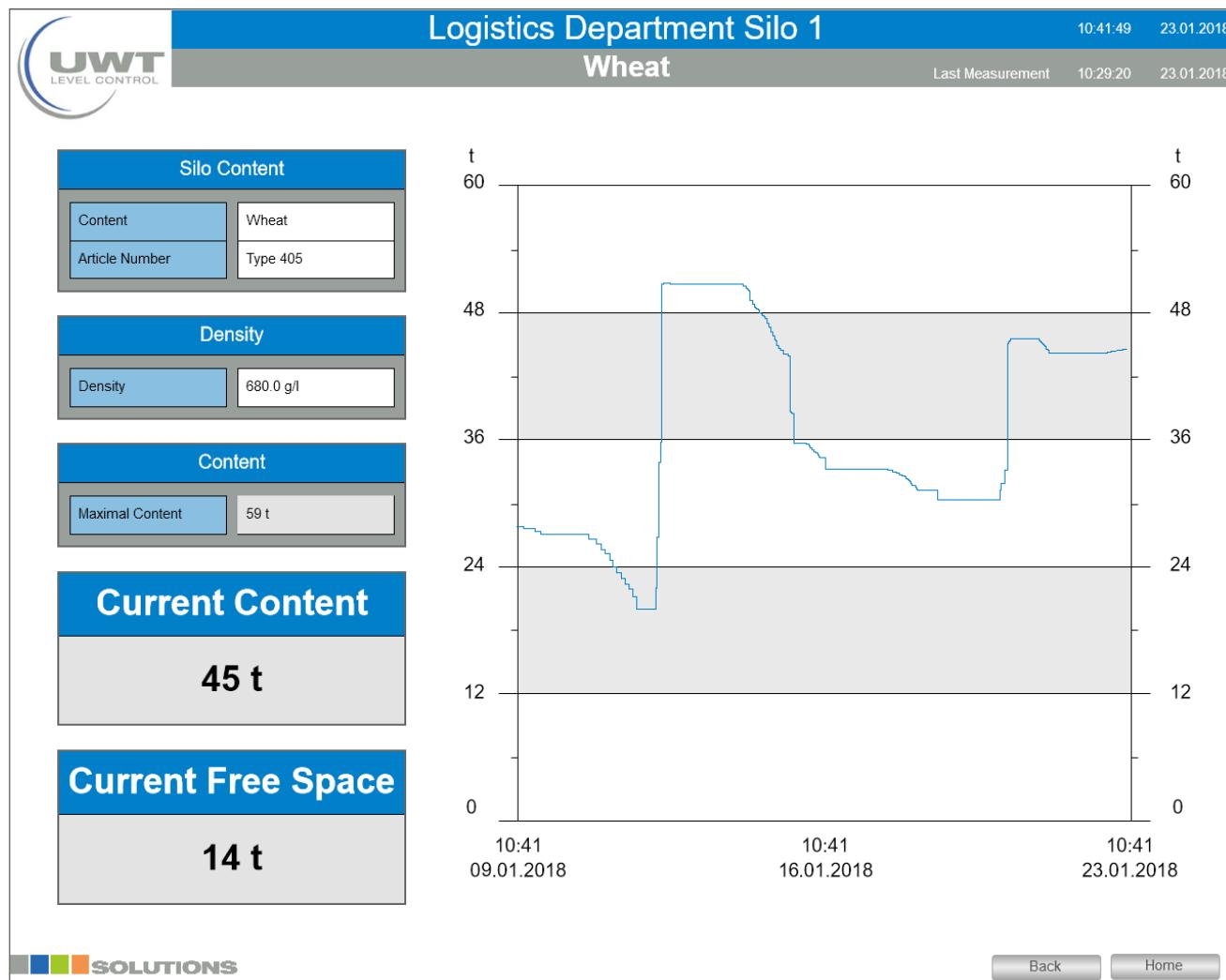


Table of contents

	Page
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Overview	3

Technical Data	4

Accessories	4

Electrical installation	5

Commissioning	10

Visualisation - Operation	11

Subject to technical change.

We assume no liability for typing errors.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning must be carried out only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.

Special attention must be paid to warnings and notes as follows:



WARNING

Relates to a caution symbol on the product and means, that a failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.



WARNING

Relates to a caution symbol on the product and means, that a failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product	Description
	CAUTION: refer to related documents (manual) for details.
	Earth (ground) Terminal
	Protective Conductor Terminal

Technical support

Please contact your local supplier (see www.uwt.de for address). Otherwise you can contact:

UWT GmbH
Westendstr. 5
87488 Betzigau
Germany

Tel. 0049 (0)831 57123-0
Fax. 0049 (0)831 76879
info@uwt.de
www.uwt.de

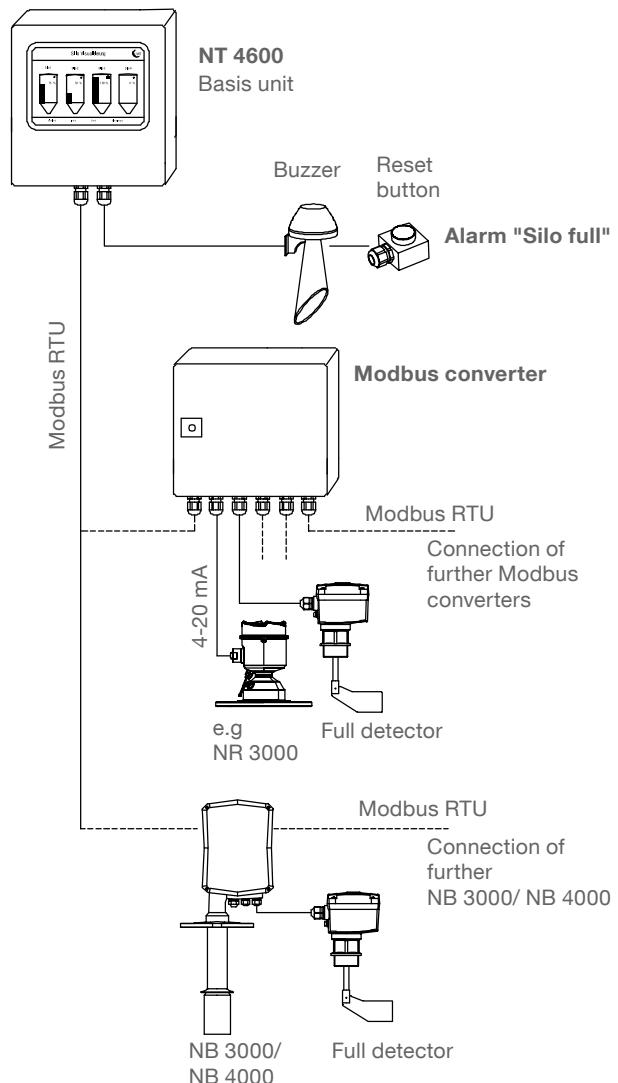
Overview

Level monitoring and visualisation via touch panel

- Standardized system up to 15 silos
- Visualisation and operation via 7" touch panel (coloured, 800 x 480 pixel)
- Software language german or english
- Password protected
- Data in percentage, height, volume or weight
- Trend display, data storage
- Evaluation of the analogue 4-20 mA signals of any sensors, as well as Modbus RTU of the UWT-systems
- Different input signals within the same system is possible
- Implementation of full detectors
- Fill control via full alarm signal (Buzzer)

NT 4600 Basis unit

The heart of the NT 4600 is a touch panel, which runs the visualisation software. All fill level control and display functions can be operated via the touch panel. Access is password protected. The electromechanical lead system can be started by the visualisation software.



Modbus converter

- For connection of 4-20 mA/ 2-wire sensors and full detectors
- On each converter up to 4 sensors and 4 full detectors can be connected
- Provided for mounting directly on the silo

Integration of full detector incl. alarm "silo full"

- Buzzer with reset button (supplied loose, for outdoor mounting)
- One unit for all connected silos
- Alarm happens, if one of the silos gets full
- Reset of the alarm
- Provided for mounting directly on the silo

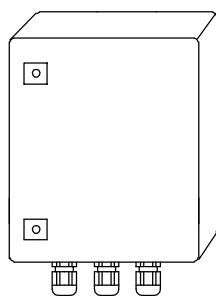
Technical Data / Accessories

Technical data

Dimensions	NT 4600, Modbus converter:	300 x 300 x 155 mm (W x H x D)
Dimensions (Touch panel without cabinet)	Touch panel Panel cutout	200 x 146 x 34 mm 192 x 138 mm
Mounting	NT 4600, Modbus converter:	wall mounting
Material	NT 4600, Modbus converter:	steel plate
Ingress protection	NT 4600, Modbus converter:	IP65
Ambient temperature	NT 4600: Modbusumsetzer:	0 .. +50°C -25 .. +70°C
Power supply	NT 4600, Modbus converter: NR 3000: NB 3000/ 4000: Full detector:	115 V or 230 V 50/ 60 Hz (integrated power converter 24 V DC) supplied by Modbus converter 115 V or 230 V AC, connection is made on site Connection either on NB 3000/ NB 4000 resp. Modbus converter. In this case the supply voltage must be equal to NB 3000/ NB 4000 resp. Modbus converter. Alternative it is possible to connect on site.
Power consumption	NT 4600, Modbus converter: Connected level sensors:	20 VA see documentation of the respective sensors
Signal output full detector	Floating contact is required	

Terminal box

Intermediate terminals for the wires leading to the silo (mounting e.g. on the silo frame).
 Applicable for cables of level (Modbus or 4-20 mA), limit switch, buzzer, reset button



Technical data

Dimensions	200 x 300 x 120 mm (W x H x D), for wall mounting
Material	steel plate
Ingress protection	IP65
Ambient temperature	-25 .. +60°C
Terminal blocks	15 pieces grey, 5 pieces blue, 5 pieces green/yellow; each terminal implements 3 cable inlets 2.5 mm ² , mounted on top hat rail
Cable glands	6 pieces M20 x 1.5 2 pieces M25 x 1.5

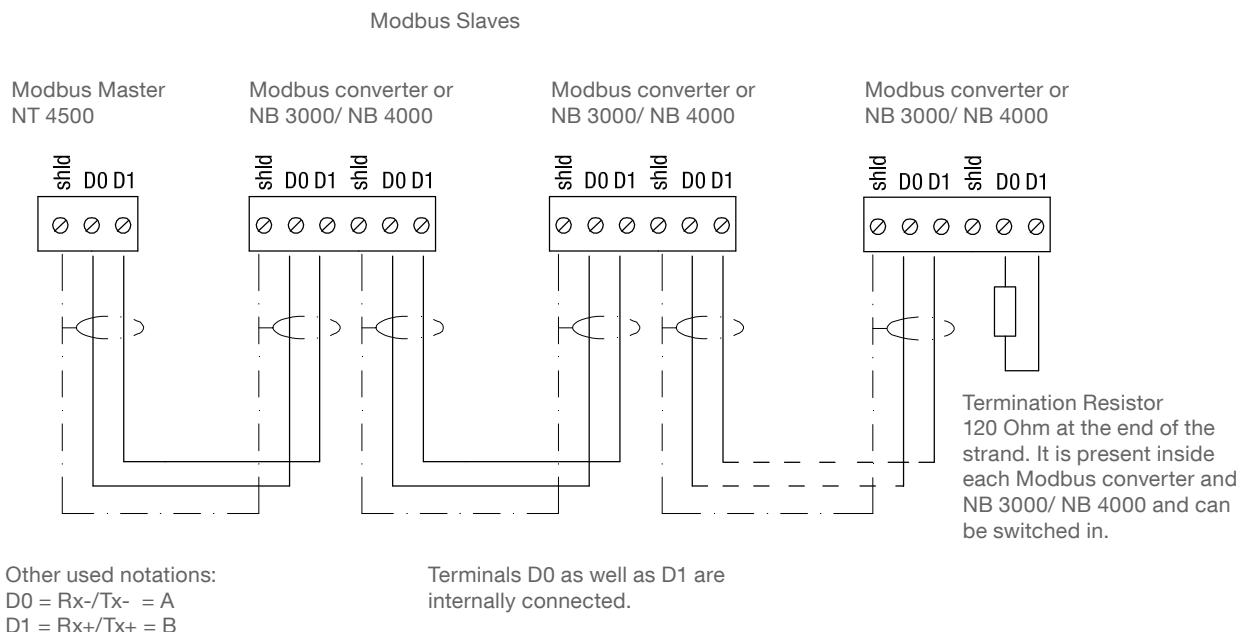
Electrical installation

! Safety Instructions

Handling	In case of improper handling or handling malpractice, the electric safety of the device cannot be guaranteed.
Installation regulations	The local regulations or VDE 0100 (Regulations of German Electrotechnical Engineers) must be observed.
Fuse	Use a fuse as stated in the connection diagrams.
RCCB protection	In case of a fault, the supply voltage must be automatically switched off by a RCCB protection switch to protect against indirect contact with dangerous voltages.
Power supply switch	A voltage disconnection switch must be provided near the device.
Wiring diagram	The electrical connections are made in accordance with the wiring diagram.
Supply voltage	Compare the supply voltage applied with the specifications given on the name plate before switching the device on.
Cable gland	Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion). Cable glands that are not used have to be sealed with a blanking element.
Field wiring cables	All field wirings must have insulation suitable for at least 250 V AC. The temperature rating must be at least 80°C (176°F).
Installation in Hazardous Locations	The NT 4500 and the Mobus converter are not permitted for installation in Hazardous Areas. Observe the valid regulations for wiring in Hazardous Areas, if the NB 3000/ NB 4000 is installed in Hazardous Areas.

Modbus network

General wiring of a Modbus network



Note:

If required it is possible to split the Modbus network into two strands. Both strands are wired in parallel at the Modbus Master. A termination resistor must be present at the end of each strand.

Electrical installation

Cable recommendations for Modbus network

Shielded cable

Functionality up to 50 m

Manufacturer: Lapp, Type UNITRONIC LiYCY 2x 0.34, Art.no: 0034502

Twisted pair cable

Functionality up to 1,000 m

Manufacturer: Lapp, Type UNITRONIC BUS CAN 1x 2x 0.34, Art.no: 2170263

UV-protection hose with threaded hose coupling M20 x 1.5

UV protection for Modbus cable

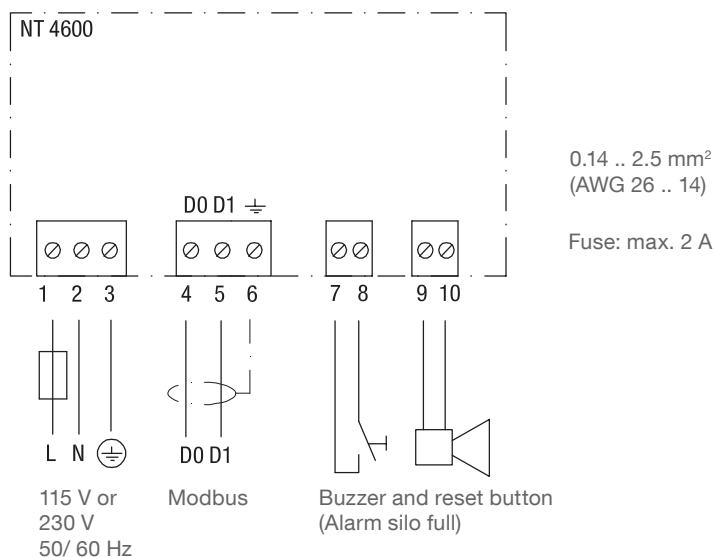
Manufacturer: Flexa, Type Rohrflex PA6, Art.no: 0233.202.012 and Type RQG1-M, Art.no: 5020.055.018

ATEX-protection hose with threaded hose coupling M20 x 1.5

For installation of Modbus cable in ATEX Zone 21

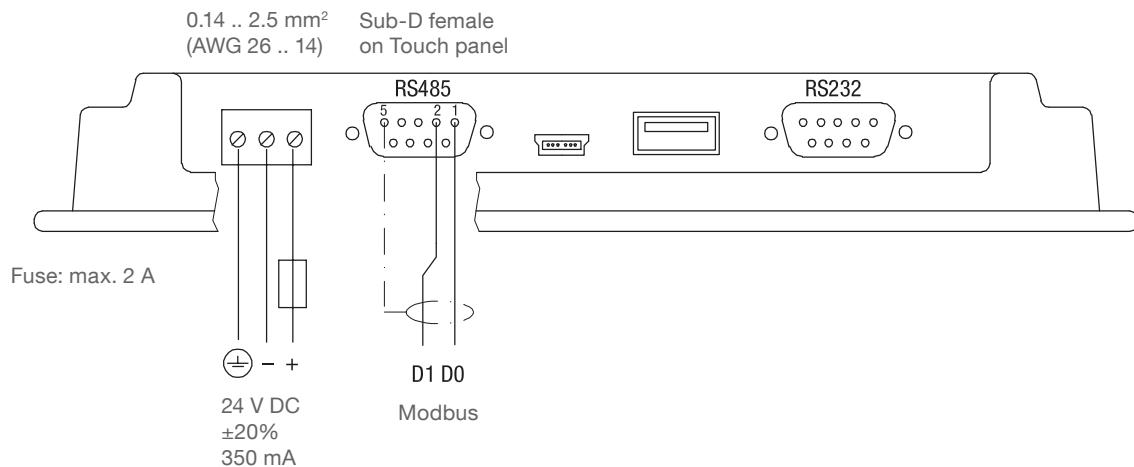
Manufacturer: PMA, Type ESX, Art.no: ESXT-12B.50 and Type END, Art.no: BEND-M202GT

NT 4600



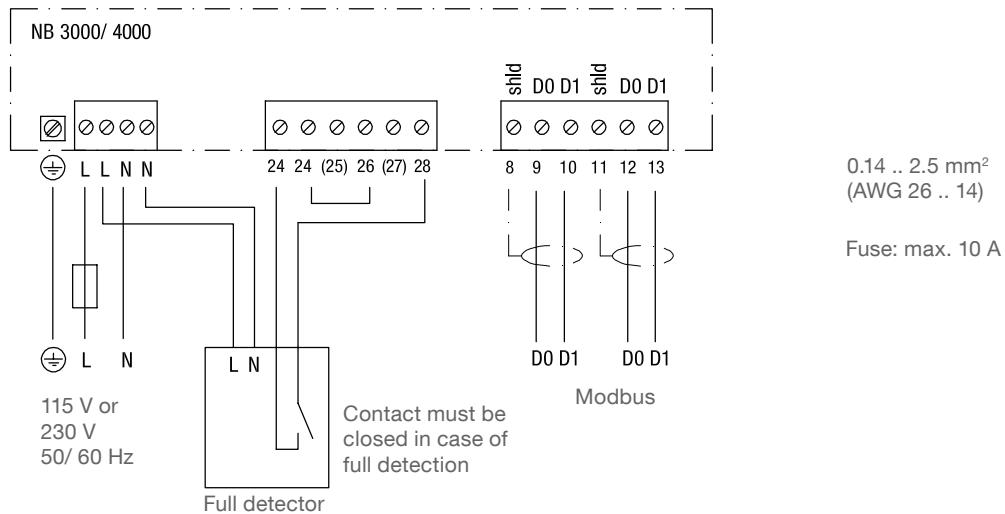
Wiring of Touch panel

Only relevant if pos.1 A "Touch panel without control cabinet" was ordered



Electrical installation

NB 3000/ NB 4000

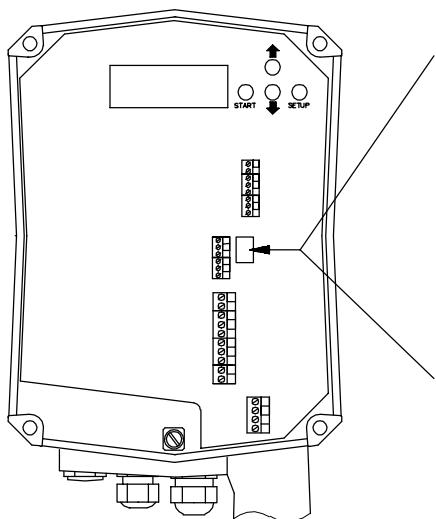


Electrical installation

Setting: Biasing and Termination Resistor

For use of NB 3000/ NB 4000 units in a external Modbus network, it is possible to set Biasing and Termination Resistor on each unit as required.

NB 3000



Version with Jumper

Biasing	OFF*	OFF	ON
Termination Resistor	OFF*	ON	ON
	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>

Version with DIP switch

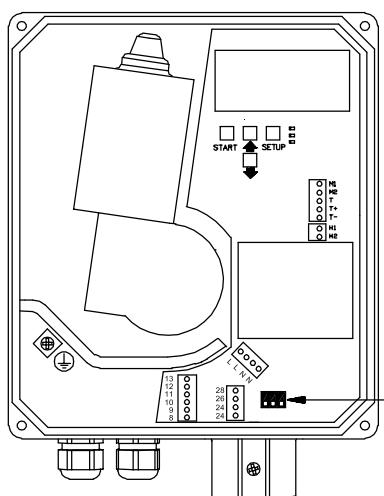
Biasing	OFF*	OFF	ON	ON
Termination Resistor	OFF*	ON	OFF	ON
	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>

*factory provided

DIP Switch position:

Top view Side view

NB 4000



Biasing	OFF*	OFF	ON	ON
Termination Resistor	OFF*	ON	OFF	ON
	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>

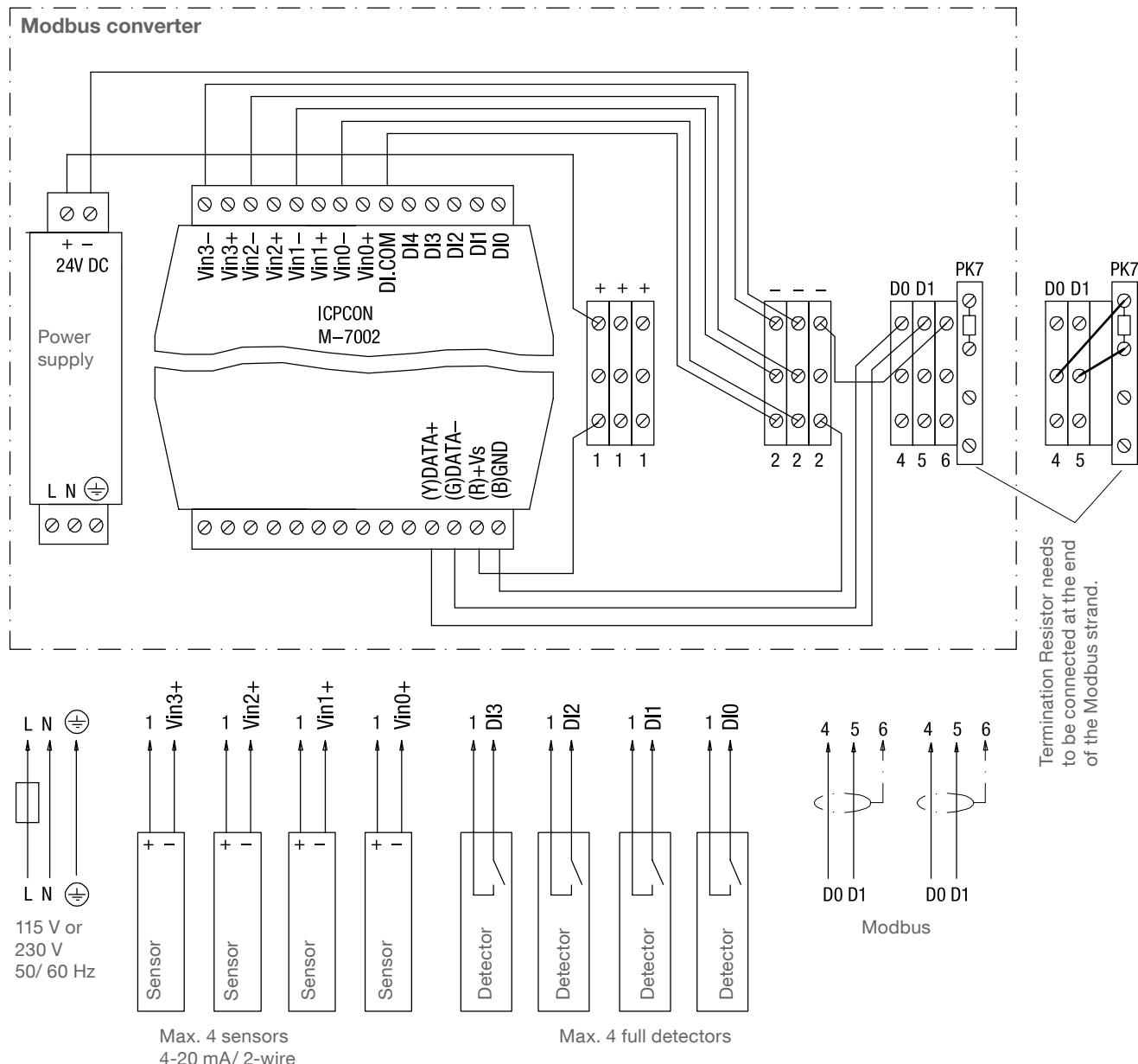
*factory provided

DIP Switch position:

Top view Side view

Electrical installation

Modbus converter



Fuse: max. 10 A

Terminals M-7002: 0.14 .. 1.5 mm² (AWG 26 .. 16)
 Other terminals: 0.14 .. 2.5 mm² (AWG 26 .. 14)

The stated wiring inside the Modbus converter is factory provided.

Commissioning

1. Generation of a synoptical table

Commissioning is facilitated if an overview of the connected sensors is made in advance.
 The table shows an example of a project with 10 silos and mixed configuration of Nivobob NB 3000 and NR 3000 radar as well as implementation of full detectors:

Silo	Sensor	Modbus ID	Modbus converter*		
			Channel	Terminal of 4-20 mA sensor	Terminal of full detector
1	NB 3000	3	n/ a	n/ a	n/ a
2	NB 3000	4	n/ a	n/ a	n/ a
3	NB 3000	5	n/ a	n/ a	n/ a
4	NB 3000	6	n/ a	n/ a	n/ a
5	NR 3000 4-20 mA sensor	1	0	Vin0+	DI0
6	NR 3000 4-20 mA sensor	1	1	Vin1+	DI1
7	NR 3000 4-20 mA sensor	1	2	Vin2+	DI2
8	NR 3000 4-20 mA sensor	1	3	Vin3+	DI3
9	NR 3000 4-20 mA sensor	2	0	Vin0+	DI0
10	NR 3000 4-20 mA sensor	2	1	Vin1+	DI1

* see page 9 as well as 17 - 18 under "Input Signal"

2. Check the wiring

Make sure that the Modbus network is wired, set the Modbus Termination Resistor (and for NB 3000 the Biasing), check that the Ethernet connection is available (see "Electrical installation" from page 5 onwards).

3. Perform the basic settings for the visualisation

- Basic Settings - User (see page 13).
 To do further settings, the userlevel must be set to Level 2.
- Basic Settings - System (see page 14).

4. Perform the settings of the silo data and of the connected sensors

With the following settings, the connected sensors are addressed via the visualisation and give a real measurement result. For this settings the above mentioned synoptical table is helpful:

- Silo Settings (see page 16).
- Sensor Settings (see page 17 - 18).
 Note: All units are preset to 19200 Baud. Thus no setting is required.

Visualisation - Operation

Overview page (Silo overview)

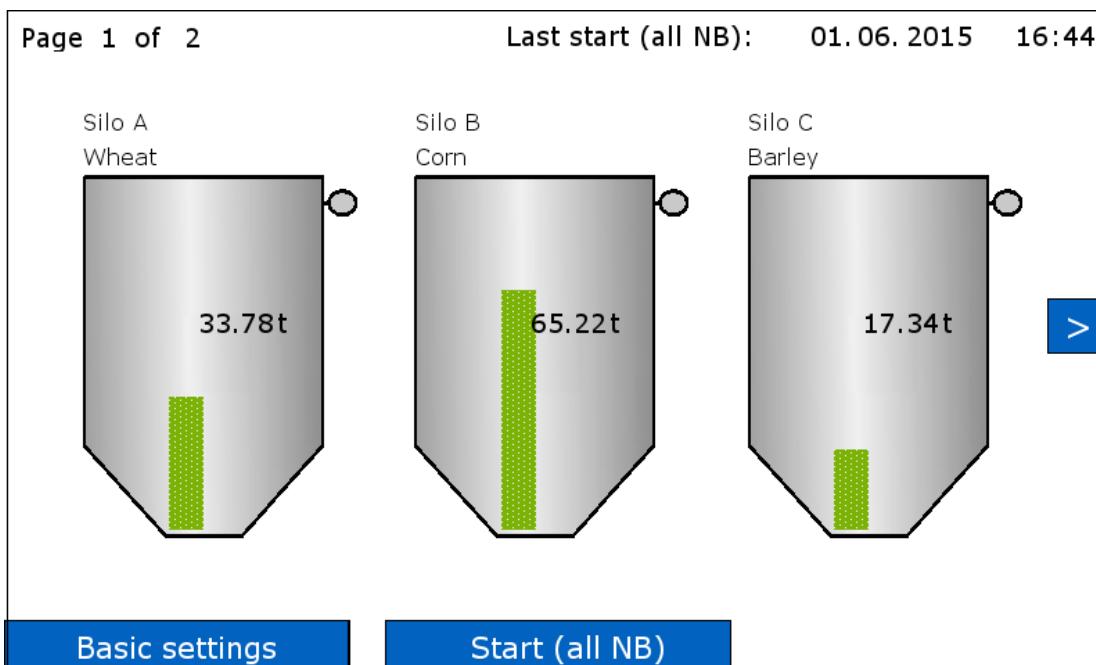
Display of level, full detector, information regarding silo and error messages

User Level 0 or higher

The selected number of silos (as defined on page 14) is presented. If more than 3 silos are defined, a button appears for progression to the next or previous page.

The level is stated according to the unit as selected under "unit level" (see page 16)

The colored points display the full detection as defined under "Full detector" (see page 17 - 18).



Silo Single View (pressing on a silo)

The single view for the respective silo will open (see page 12).

Basic settings

see page 13 to 15

START (all NB)

User Level 1 or 2.

Starts the measurement of all connected Nivobobs. If more than 3 silos are defined, the measurements of the silos not displayed on the screen are started as well.

While the measurement is running, a green arrow appears in each silo.

In the top line the date and time of the last measurement is displayed.

Measurement start is not possible due to one of the following reasons:

Under "Sensor-settings" the selection "Sensor Nivobob" is not present (see page 17).

The "Modbus for silo" is set to "inactiv" (see page 17).

Display "Blocked Start": The Nivobob Measurement Start is set to "no" (see page 17).

Display "Blocked 24 - 26": The bridge between terminal 24 - 26 at the Nivobob ist open. See Nivobob user manual.

Horn reset

Reset of the full signal (horn). The button appears only, if the horn is activated.

Possible other messages:

"Offline": The "Modbus for silo" is set to "inactiv", thus the respective silo has no valid measurement (see page 17).

"Modbus": The Modbus network is not working. See items under commissioning (page 10).

Further diagnostic messages may appear. If so, the messages implement comments for reason and possible measures.

Visualisation - Operation

Page "Silo Single View"

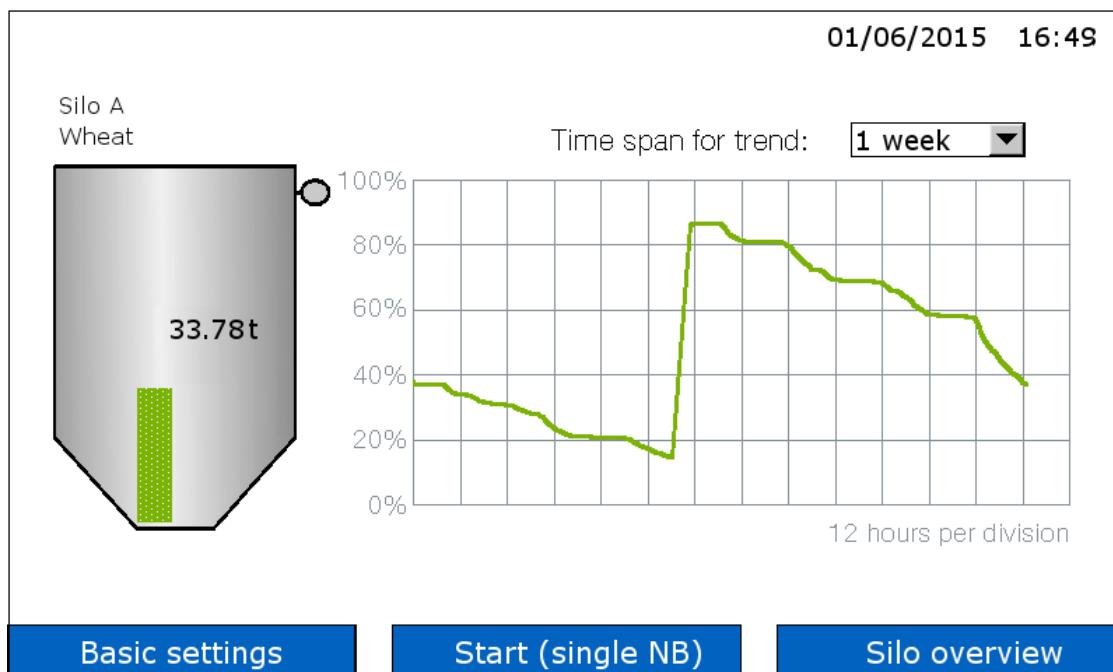
Display of trend and forward to the settings of silo and sensor

User Level 0 or higher

The page opens by pressing on a silo in the Overview page (Silo overview).

The level is displayed similar to the Overview page (Silo overview).

The selected "Time span for trend" defines the time which is displayed in the diagram. Previous data are not stored.
 After a power failure the trend starts from the beginning. With use of a USB stick the data can be readout from the stick.



START (single NB)

Starts the measurement of the Nivobob only for this silo.
 While the measurement is running, a green arrow appears in the silo.

If no START button appears, the measurement start is not possible due to one of the following reasons:

Under "Sensor-settings" the selection "Sensor Nivobob" is not present (see page 17).

The "Modbus for silo" is set to "inactiv" (see page 17).

Display "Blocked Start": The Nivobob Measurement Start is set to "no" (see page 17).

Display "Blocked 24 - 26": The bridge between terminal 24 - 26 at the Nivobob ist open. See Nivobob user manual.

Pressing on the silo

Leads to the page "Silo Settings" (see page 16) and "Sensor Settings" (see page 17 - 18) for this silo.

Possible other messages:

"Offline": The "Modbus Enable" is set to "inactiv", thus the respective silo has no valid measurement (see page 17).

"Modbus": The Modbus network is not working. See items under commissioning (page 10).

Further diagnostic messages may appear. The messages implement comments for reason and possible measures.

Visualisation - Operation

Page "Basic settings - User"

Selection of user rights and password

User rights overview

Depending on the selected userlevel the following features are available:

Feature	Level 0	Level 1	Level 2
Overview page (Silo overview)	x	x	x
Silo single view	x	x	x
Horn reset (full detection)	x	x	x
Measurement start Nivobob		x	x
Page "Basic settings"			x
Page "Silo settings"			x
Page "Sensor settings"			x
Password change for Level 1 and 2			x

Change of user rights

Select the userlevel to be changed to, enter the password and press "Change".

Factory provided the password for all levels is set to "0".

If the change was successful, the box changes its colour to green, otherwise to red.

If the password is forgotten, please contact the supplier.

Note: Level 3 und 4 are used for service reasons (not available).

Actual userlevel: Level 2

Change to:

Password:

Password change

Factory provided the password for all levels is set to "0".

To change a password requires to be logged in Level 2, where the button "Edit password" appears. Press this button and select the level for which the password shall be changed.

For Level 0 the password can not be changed, it remains "0".

For Level 1 and 2 the new password may be one-digit to six-digit.

If the password change was successful, the box changes its colour to green, otherwise to red.

Editing for:

Old password:

New password:

Password confirmation:

Visualisation - Operation

Page "Basic settings - System"

Setting of date, time, country-specific units, number of displayed silos , measuring interval of Nivobob, horn, USB data storage

User Level 2

System Settings		Firmware v1.0	01/06/2015 16:27	
Date - time Day: 1 Month: 6 Year: 2015 Hour: 16 Minute: 27 Second: 56		Amount of silos 5 Measuring interval Starttime [hh:mm] 5:00 Interval [hh:mm] 14:00 Horn connected no <input type="checkbox"/> yes	USB Data storage no <input type="checkbox"/> yes Interval [hh:mm] 0:30 Storage [MB/year] 2.05	
Language english				
Units feet				
Basic settings		Silo overview		

Date - time

Setting of the actual date and time.

Language

Setting of the software language.

Units

Setting of the unit for the silo dimensions in page "Silo settings" (see page 16).

Amount of silos

Definition of the total number of silos for the visualisation.

Measuring interval

Activation of automatic measurement starts of the Nivobobs. The measurement starts happens daily, the first time at the setted Starttime (time of day), then regularly repeated with the setted Interval (hours : minutes).

If the Interval is set to 0, no measurement starts will happen.

Horn connected

Setting, if a horn (which is activated with a full detection) is connected. This setting is required to adjust the internal data processing to the horn functionality.

USB data storage

A USB stick can be plugged in at the bottom side of the panel. The data storage starts automatically after the switch is set to "yes".

Trend data for all silos are stored to the USB stick in .csv format.

The stored level values are volume related (considering the silo cone), in per mil (0 - 1,000 per mil). Storage in absolute values like tons, cubic meter or meter is not possible.

A new file is created for every month.

The transfer of data to the USB stick is done automatically every 10 minutes.

Interval:

The Interval defines the time until the next measurement value is stored (hours : minutes). Minimum Interval is one minute. With setting 00:00 no storage will happen.

Storage:

States the required storage space of the USB stick (depending on the selected Interval).

Visualisation - Operation

Page "Basic settings - Diagnostics Nivobob"

Readout of diagnostics data from Nivobob

User Level 2

The data are used for diagnostic reasons.

Modbus ID		31	Read	01/06/2015 16:11	
Setup					Diagnostics
40001 - M_LANGUAGE	00000		40026 - M_TOTAL_CYCLES	00000	
40002 - M_UNIT	00000		40044 - M_TOTAL_CYCLES_H	00000	
40003 - M_MAX_MOVE_DIST	00000		40028 - M_CYCLES_LEFT	00000	
40004 - M_SILO_HIGHT	00000		40050 - M_CYCLES_LEFT_H	00000	
40005 - M_AIR_DIST	00000		40029 - M_TOTAL_RUN_TIME	00000	
40006 - M_CONE_HIGHT	00000		40048 - M_TOTAL_RUN_TIME_S	00000	
40022 - M_TIMER	00000		40031 - M_RUN_TIME_LEFT	00000	
Measurement					Communication
40051 - M_START	00000		40034 - M_PROTOCOL	00000	
40046 - M_DISTANCE	00000		40035 - M_ADDRESS	00000	
40055 - M_VOLUME	00000		40036 - M_BAUDRATE	00000	
40052 - M_INHIBIT	00000				
40045 - M_STATUS	00000				
40057 - M_FULL_DETECTOR	00000				
Basic settings			Silo overview		

Modbus ID

Enter the ID number (Modbus address) of the Nivobob which shall be readout.

After pressing "READ" all Modbus registers of the related Nivobob are readout and displayed.

Please see user manual of Nivobob for further explanation of the registers.

To write data into the Nivobob registers is not possible.

Visualisation - Operation

Page "Silo settings"

Settings for silo related data

User Level 2

The page opens by pressing on the silo in the page "Silo single view".

Silo settings
Sensor settings
01/06/2015 16:26

Silo description

Name	Silo A
Content	Wheat
Article no.	

Silo data

H	46.20 ft
K	9.60 ft
L	3.60 ft
D1	10.50 ft
D2	1.50 ft

Silo shape
 round angular

Unit level
 tn. Sh. ▾

Bulk density
 46.800 lb/ft³

Max. value: 74.41 tnsh

Basic settings
Back
Silo overview

Silo description

The silo can be labeled with any text for silo name, content and article number.

Silo data and Silo shape

With the setted data the software calculates the volume related measurement.

Unit level

The selected unit is stated inside the silos, see page 11 and 12.

Bulk density

If a weight is selected in "Unit level", it is required to enter the densitity of the bulk material to enable the weight calculation.

Max. value

Display of the max. calculated content according to above setted data.

Visualisation - Operation

Page "Sensor settings"

Settings for sensor related data

User Level 2

The page opens by pressing on the silo in the page "Silo single view".

a) With use of Nivobob

Sensor		Nivobob	
Nivobob	4-20mA	Enable start	no <input checked="" type="checkbox"/> yes
Input Signal		Max. move dist. <input type="text" value="15.00"/> m <input type="button" value="read"/>	
Modbus for silo	inactive <input type="checkbox"/> active	Modbus ID	<input type="text" value="1"/>
Full detector		Modbus <input type="checkbox"/> value	

Sensor

Setting to "Nivobob".

Input Signal

Modbus for silo:

It is possible to switch off single silos from the Modbus network (e.g. for revision) by setting the related Modbus ID inactive. If so, the other silos stay active. Inside the related silo it will be stated "Offline".

Modbus ID:

Input of the Modbus ID (Modbus address) of the Nivobob.

The Modbus address of the Nivobob is setted in the Nivobob communication menu (see user manual of Nivobob). It is reasonable to use the address 1 for the first device, then ascending to 2, 3, etc. With mixed use of Modbus converters the first addresses of the Modbus converters are already preset (see next page), the Nivobob addresses must then be allocated above these. Optional (with selection code 33) the Nivobob devices are delivered with already preset address.

Full detector

If a full detector is connected, it is read with setting to "Modbus" (see electrical installation page 7 for connection to NB 3000/ NB 4000). If "value" is selected, the message for full detection is activated, if the entered value (in percent) is exceeded by the material level.

Nivobob

Enable start:

Measurement start can be blocked by setting to "no", for example while a silo is being filled. Inside the related silo it will be stated "Blocked Start".

Max. move distance:

Setting of the max. move distance of the sensor weight.

By pressing "read" the value is readout from the Nivobob and displayed.

By setting a value and pressing "write" the setted value is written into the Nivobob.

Note: The setting of the max. move distance can also be done directly at the Nivobob.

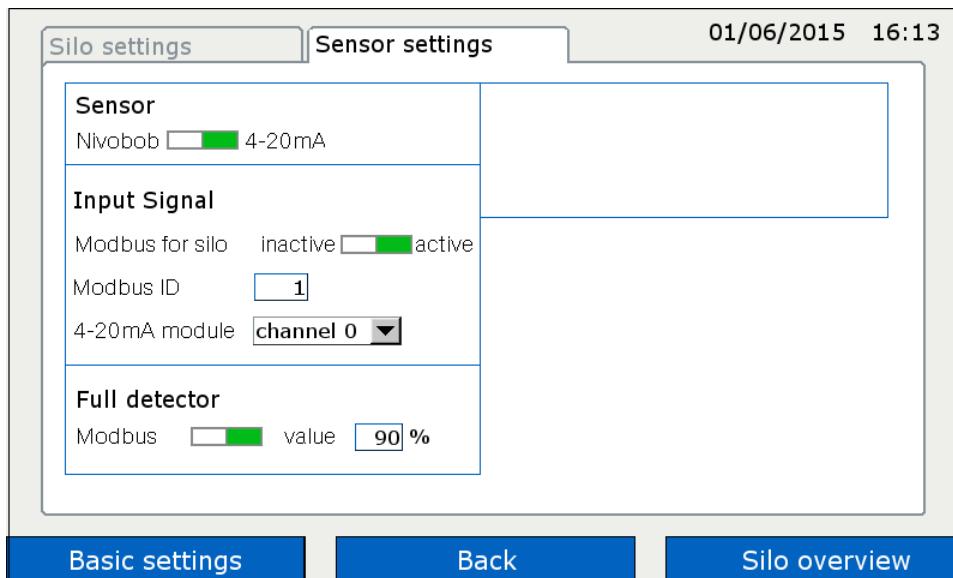
Note: Further settings inside the Nivobob menu are not relevant, since the visualisation requires only the measured distance from the Nivobob and calculates to a volume based display.

b) With use of 4-20 mA sensor (connected via Modbus converter)

Programming of the 4-20 mA sensor:

The connected sensor must be set as follows:

- 4 mA must correspond to the level value 0% (see "Silo settings", page 16).
- 20 mA must correspond to the level value 100%.
- Note to NR 3000: H and L are related to the fixing flange.
- The sensors needs to have a linear level signal (relation between the signal output and level in the silo). The volume-based calculation is performed in the visualisation only.



Sensor

Setting to "4-20 mA".

Input Signal

Modbus for this silo:

It is possible to switch off single silos from the Modbus network (e.g. for revision) by setting the related Modbus ID inactive. If so, the other silos stay active. Inside the related silo it will be stated "Offline".

Modbus ID:

Input of the Modbus ID (Modbus address) of the Modbus converter.

The Modbus converters are factory preset to address 1 for the first Modbus converter, then ascending to 2, 3, etc. The settings can not be changed. A label with the Modbus address is present inside the Modbus converters on the implemented module M-7002.

4-20 mA Modul:

Setting of the Channel for 4-20 mA sensors and full detectors:

Channel 0 is allocated to the terminal Vin0+ and DI0 (see electrical installation on page 9)

Channel 1 is allocated to the terminal Vin1+ and DI1

Channel 2 is allocated to the terminal Vin2+ and DI2

Channel 3 is allocated to the terminal Vin3+ and DI3

Full detector

If a full detector is connected, it is read with setting to "Modbus" (see electrical installation page 9 for connection to Modbus converter). If "value" is selected, the message for full detection is activated, if the entered value (in percent) is exceeded by the material level.

Table of contents

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Subject to technical change.

We assume no liability for typing errors.

Safety notes / Technical support

Notes

- Installation, maintenance and commissioning must be carried out only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.

Special attention must be paid to warnings and notes as follows:



WARNING

Relates to a caution symbol on the product and means, that a failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.



WARNING

Relates to a caution symbol on the product and means, that a failure to observe the necessary precautions can result in death, serious injury and/ or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

Safety symbols

In manual and on product	Description
	CAUTION: refer to related documents (manual) for details.
	Earth (ground) Terminal
	Protective Conductor Terminal

Technical support

Please contact your local supplier (see www.uwt.de for address). Otherwise you can contact:

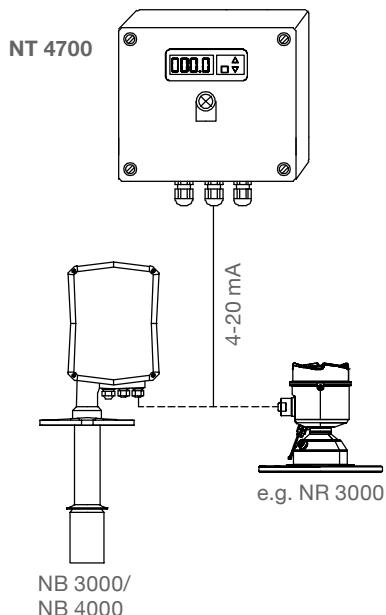
UWT GmbH
Westendstr. 5
87488 Betzigau
Germany

Tel. 0049 (0)831 57123-0
Fax. 0049 (0)831 76879
info@uwt.de
www.uwt.de

Overview / Technical Data

Level display for one silo

- Evaluation of the analogue 4-20 mA signal of any sensor
- LED-Display in percentage, height, volume or weight (implements NT 4900)
- Version for Nivobob NB 3000/ NB 4000 implements start button and indicator lamp when sensor weight is in the upper position
- Simple operation



Technical data

Dimensions	182 x 180 x 90 mm (W x H x D)	
Mountng	Wall mounting	
Material	Polycarbonat	
Ingress protection	IP65	
Ambient temperature	0 .. +50°C	
Power supply	NT 4700-1/ NT 4700-2: NT 4700-5/ NT 4700-6: NT 4700-3/ NT 4700-4:	230 V 50/ 60 Hz 115 V 50/ 60 Hz 24 V DC
	NB 3000/ NB 4000:	230 V 50/ 60 Hz or 115 V 50/ 60 Hz or 24 V DC, connection is made on site
	2-wire 4-20 mA :	supplied by NT 4700-2 (integrated power converter 24 V DC) or by NT 4700-4 or by NT 4700-6
Power consumption	NT 4700: Connected level sensor:	10 VA see documentation of the respective sensor

Electrical installation

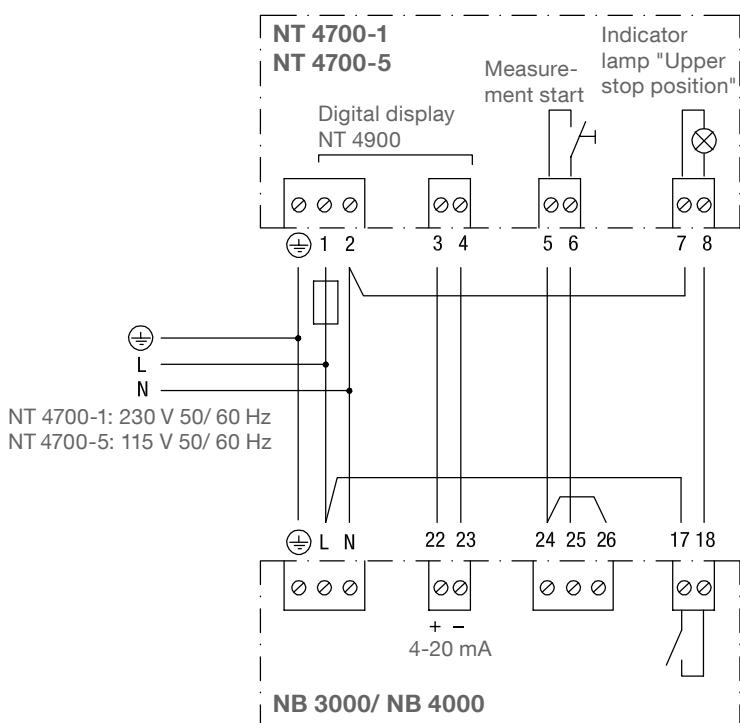
! Safety Instructions

Handling	In case of improper handling or handling malpractice, the electric safety of the device cannot be guaranteed.
Installation regulations	The local regulations or VDE 0100 (Regulations of German Electrotechnical Engineers) must be observed.
Fuse	Use a fuse as stated in the connection diagrams.
RCCB protection	In case of a fault, the supply voltage must be automatically switched off by a RCCB protection switch to protect against indirect contact with dangerous voltages.
Power supply switch	A voltage disconnection switch must be provided near the device.
Wiring diagram	The electrical connections are made in accordance with the wiring diagram.
Supply voltage	Compare the supply voltage applied with the specifications given on the name plate before switching the device on.
Cable gland	Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion). Cable glands that are not used have to be sealed with a blanking element.
Field wiring cables	All field wirings must have insulation suitable for at least 250 V AC. The temperature rating must be at least 80°C (176°F).
Installation in Hazardous Locations	The NT 4700 is not permitted for installation in Hazardous Areas. Observe the valid regulations for wiring in Hazardous Areas, if the NB 3000/400 is installed in Hazardous Areas.

Electrical installation

NT 4700-1/ NT 4700-5

230 V/ 115 V version for connecting a Nivobob NB 3000/ NB 4000



0.14 .. 2.5 mm²
(AWG 26 .. 14)

Fuse: max. 2 A

Indicator lamp "Upper stop position": for NB 4000 only possible if the option pos.25 "Relais output" was selected with NB 4000.

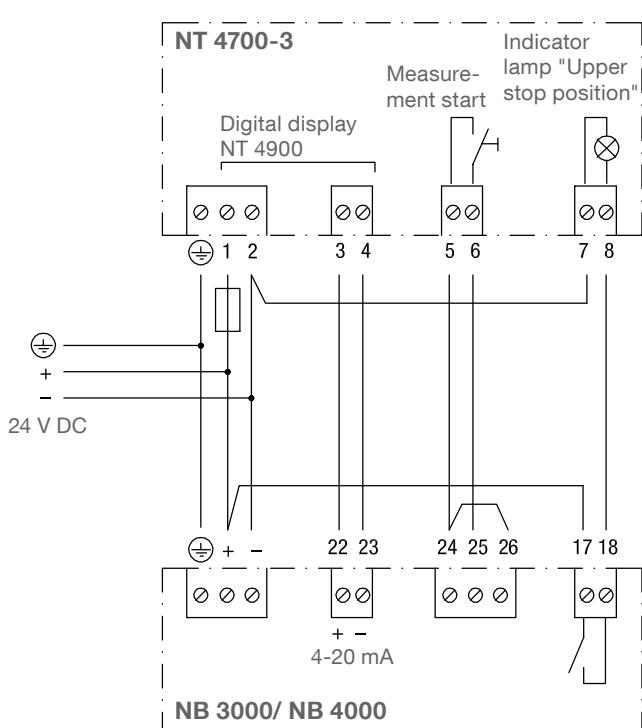
If measurement interruption during filling is required:

Remove the wire from terminal 24 - 26 and connect to filling nozzle (see manual NB 3000/ NB 4000).

Relais on terminal 17 - 18
is factory provided to state
"Upper stop position". Thus
no change is required to be
done.

NT 4700-3

24 V DC version for connecting a Nivobob NB 3000/ NB 4000



0.14 .. 2.5 mm²
(AWG 26 .. 14)

Fuse: max. 2 A

Indicator lamp "Upper stop position": for NB 4000 only possible if the option pos.25 "Relais output" was selected with NB 4000.

If measurement interruption during filling is required:
Remove the wire from terminal 24 - 26 and connect to filling nozzle (see manual NB 3000/NB 4000).

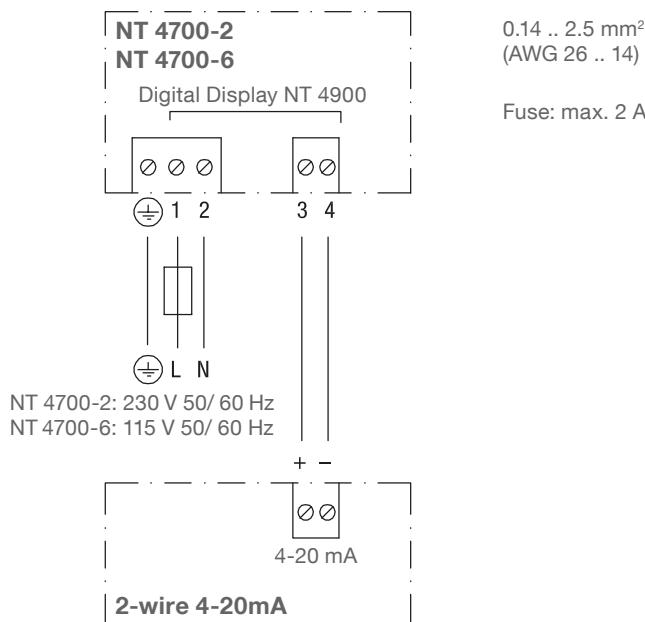
Relais on terminal 17 - 18
is factory provided to state
"Upper stop position". Thus
no change is required to be
done.



Electrical installation

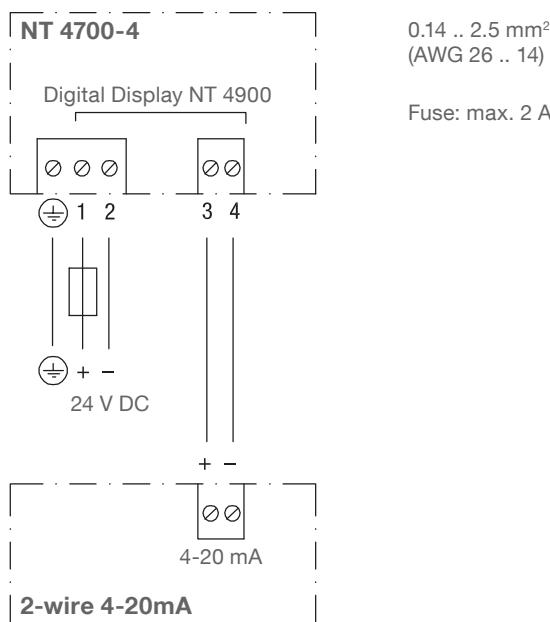
NT 4700-2/ NT 4700-6

230 V/ 115 V version for connecting a 2-wire 4-20 mA (e.g. NR 3000)



NT 4700-4

24 V DC version for connecting a 2-wire 4-20mA (e.g. NR 3000)



Commissioning

Commissioning

Programming:

- NB 3000/ NB 4000: see respective Instruction Manual. Only the parameters of the Quickstart Menue need to be programmed
- 2-wire 4-20 mA: see respective Instruction Manual
- Digital Display NT 4900: see respective Instruction Manual

Note:

An error or a required maintenance can be seen on the Digital Display NT 4900 by a untypical negative measurement value. This requires that the NT 4900 is programmed to 4-20 mA and the connected sensor provides less than 4 mA in case of error/maintenance (NB 3000/ NB 4000 are factory preset to give 0 mA).

Overview / Technical Data

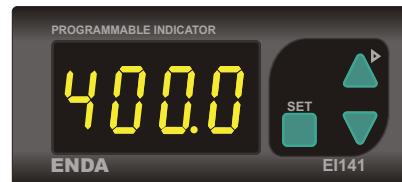


Read this document carefully before using this device. The guarantee will be expired by damaging of the device if you don't attend to the directions in the user manual. Also we don't accept any compensations for personal injury, material damage or capital disadvantages.

ENDA EI141 PROGRAMMABLE INDICATOR

Thank you for choosing ENDA EI141 INDICATOR.

- * 35x77mm sized.
- * 4 digits display.
- * Easy to use by front panel keypad.
- * Display scale can be adjusted between -1999 and 4000.
- * Decimal point can be adjusted between 1. ile 3. digits.
- * Measurement unit can be displayed.
- * Selectable four different standard input types (0-20mA, 4-20mA, 0-1V, 0-10V)
- * User can calibrate the device according to his/her own specified input type.
- * Sampling time can be adjusted in four steps.
- * Maximum and minimum measurement values are registered.
- * The maximum or the minimum values can be hold on the display.
- * Current and voltage calibration can be made..
- * Parameter access protection on 3 levels.
- * Easy connection by removable screw terminal.



Compliant

Order Code : EI141-

1 - Supply Voltage

230VAC...230V AC
 24VAC.....24V AC
 SM.....9-30V DC / 7-24V AC

TECHNICAL SPECIFICATIONS

ENVIRONMENTAL CONDITIONS

Ambient/storage temperature	0 ... +50°C/-25 ... +70°C (with no icing)
Max. relative humidity	80% up to 31°C decreasing linearly 50% at 40°C.
Rated pollution degree	According to EN 60529
	Front panel : IP65 Rear panel : IP20
Height	Max. 2000m



Do not use the device in locations subject to corrosive and flammable gases.

ELECTRICAL CHARACTERISTICS

Supply	230VAC +10%/-20%, 50/60Hz, 24VAC±10%,50/60Hz or 24Vac/dc (9-30Vdc or 7-24Vac)		
Power consumption	Max. 7VA		
Wiring	2.5mm ² screw-terminal connections		
Date retention	EEPROM (Min. 10 years)		
EMC	EN 61326-1: 1997, A1: 1998, A2: 2001 (Performance criterion B for the EMC standard)		
Safety requirements	EN 61010-1: 2001 (pollution degree 2, overvoltage category II, measurement category I)		



EI141 must not be used in location where measurement category is II, III or IV.

Input type	Measurement range		Measurement accuracy	Input impedance
	Min.	Max.		
0-1V DC voltage	0V	1.1V	±0,5% (of full scale)	Approx. 11kΩ (terminal voltage limits: min. = -2V, max. = 30V)
0-10V DC voltage	0V	14V	±0,5% (of full scale)	Approx. 11kΩ (terminal voltage limits: min. = -2V, max. = 30V)
0-20mA DC current	0mA	25mA	±0,5% (of full scale)	Approx. 5Ω (applicable terminal voltage is max. 50mA.)
4-20mA DC current	0mA	25mA	±0,5% (of full scale)	Approx. 5Ω (applicable terminal voltage is max. 50mA.)



In the current measurement mode input impedance is 5Ω. Therefore, in the current measurement mode, any voltage input should not be connected to the input terminals. Otherwise, the device will be broken down. To change the input type from voltage to a current measurement mode while the device is operating, first, leave out the voltage inputs. Then, change input type to one of the current measurement modes.

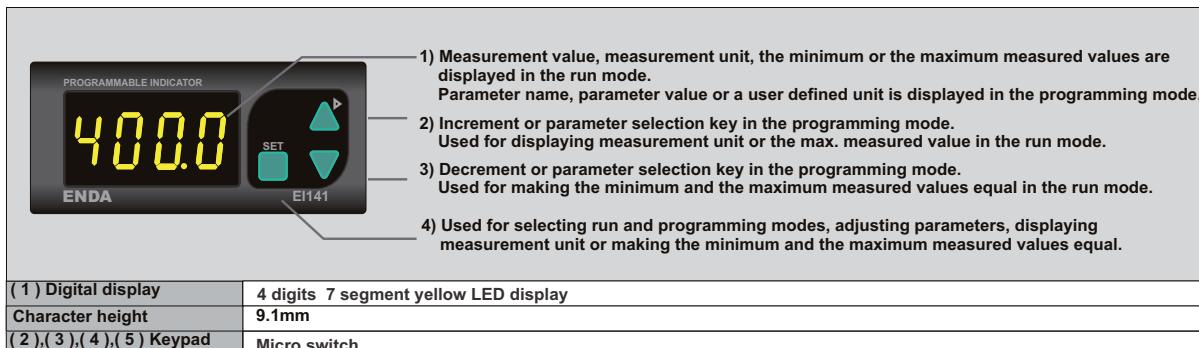
HOUSING

Housing type	Suitable for flush-panel mounting according to DIN 43 700.		
Dimensions	W77xH35xD71mm		
Weight	Approx. 250g (after packing)		
Enclosure material	Self extinguishing plastics		



While cleaning the device, solvents (thinner, benzine, acid etc.) or corrosive materials must not be used.

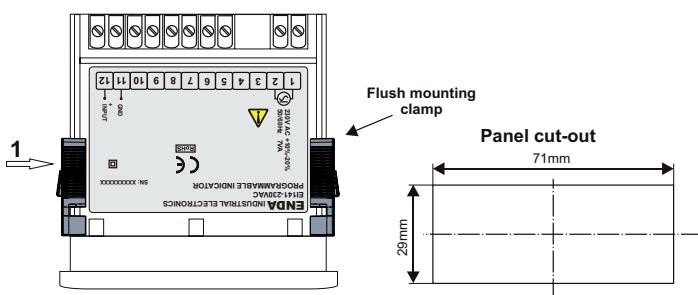
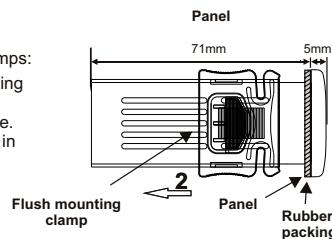
Technical Data



DIMENSIONS



For removing mounting clamps:
 - Push up the flush-mounting clamp in direction 1 as shown in the figure above.
 - Then, pull out the clamp in direction 2.

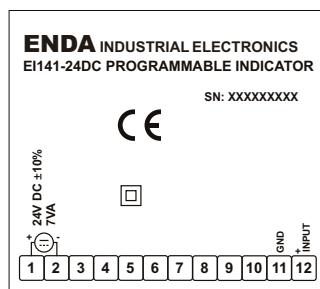
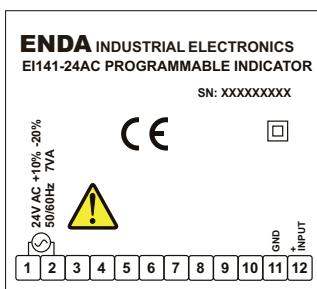
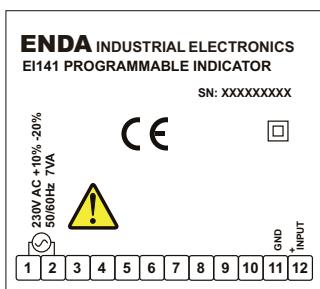


Note : 1) Panel thickness should be maximum 7 mm.
 2) If there is no 60mm free space at the back side of the device, it would be difficult to remove it from the panel.

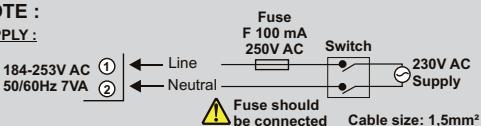
CONNECTION DIAGRAM



ENDA EI141 is intended for installation in control panels. Make sure that the device is used only for intended purpose. The shielding must be grounded on the instrument side. During an installation, all of the cables that are connected to the device must be free of energy. The device must be protected against inadmissible humidity, vibrations, severe soiling and make sure that the operation temperature is not exceeded. All input and output lines that are not connected to the supply network must be laid out as shielded and twisted cables. These cables should not be close to the power cables or components. The installation and electrical connections must be carried on by a qualified staff and must be according to the relevant locally applicable regulations.



NOTE : SUPPLY :



Holding screw
 0.4-0.5Nm

Equipment is protected throughout
 by DOUBLE INSULATION.

Note : 1) Mains supply cords shall meet the requirements of IEC 60227 or IEC 60245.
 2) In accordance with the safety regulations, the power supply switch shall bring the identification of the relevant instrument and it should be easily accessible by the operator.

Programming example

Setting the display

The following example sets the display to indicate 4 mA = 0 tons and 20 mA = 60.0 tons.

After connecting the supply voltage, the display indicates a test value [1999].

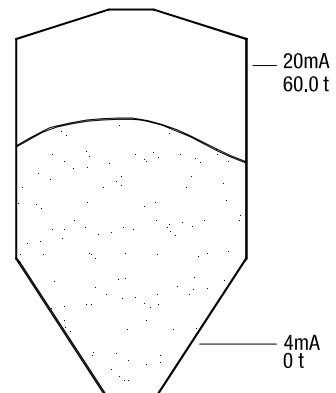
To configure the display, press the **[SET]-button** ca. 5 sec.

The display changes to the main menu with the first main menu item **[d.CnF]**.

Attend:

If the keys are not activated for ca. 20 sec, the device automatically switches back to the standard display "measure value".

Main menu	Submenu	Description	Setting
d.CnF	i.Typ	<ul style="list-style-type: none"> - Press arrow key ↓ - The first sub menu item [i.Typ] is indicated - Press and hold the [SET]-key, then select "4-20 mA" with the arrow key ↓ - After release of the [SET]-key, the setting is stored 	4-20 mA
U.oPt	d.Pnt	<ul style="list-style-type: none"> - Change to main menu with arrow key ↑, the main menu item [U.oPt] is indicated - Press arrow key ↓, the sub menu item [CAL.E.] is indicated - Search menu item [d.Pnt] with arrow key ↓ - Press and hold the [SET]-key, then set the decimal dot position with the arrow key ↑ to the first digit from right side - Indication is [000.0] - After release of the [SET]-key, the setting is stored 	Decimal dot on first digit from right side 000.0
U.oPt	L.SCL	<ul style="list-style-type: none"> - Change from sub menu item [d.Pnt] to sub menu item [L.SCL] with arrow key ↓ - Press and hold the [SET]-key, then set the lower scale value to 0 with arrow key ↓* - After release of the [SET]-key, the setting is stored 	Lower scale value 0 tons at 4 mA
U.oPt	H.SCL	<ul style="list-style-type: none"> - Change from sub menu item [L.SCL] to sub menu item [H.SCL] with arrow key ↓ - Press and hold the [SET]-key, then set the upper scale value to 60.0 with arrow key ↓* - After release of the [SET]-key, the setting is stored - Wait 20 sec. until the indication changes to the measure value (indication is now depending on the actual current; if no current is present, the device indicates -15.0) - The programming is finished 	Upper scale value 60.0 tons at 20 mA

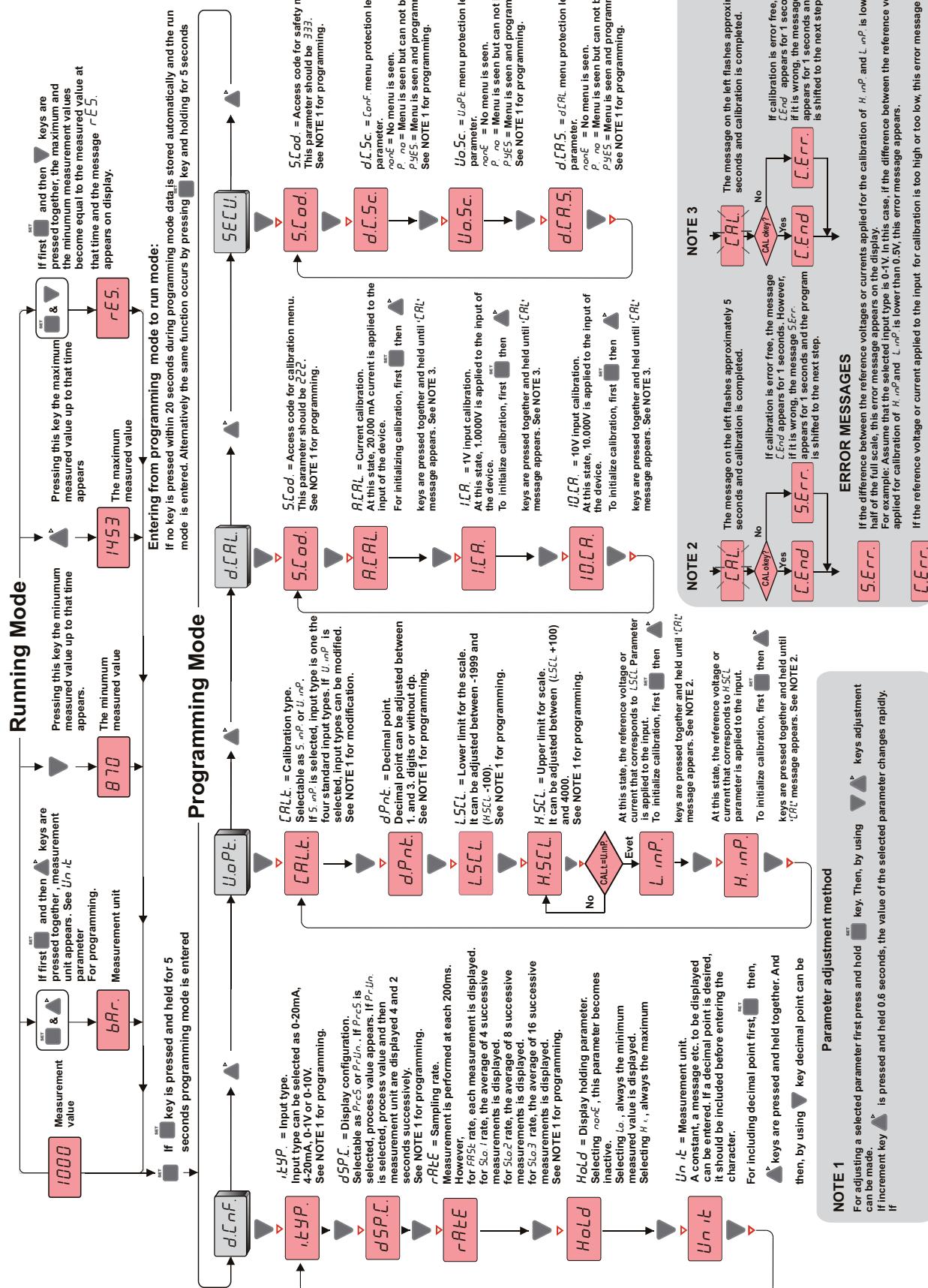


*Note: By pressing the arrow keys for a longer time, the speed of the value change increases.

The arrow key ↑ increases the value, the arrow key ↓ decreases the value.



Overview programming menu



NOTE 1

For adjusting a selected parameter first press and hold **key**. Then, by using **keys adjustment** is pressed and held 0.6 seconds, the value of the selected parameter changes rapidly.

Parameter adjustment method

ER

steps you will go through

If the difference between the reference voltages or currents applied for the calibration of $H_{in,P}$ and $L_{in,P}$ is lower than one half of the full scale, this error message appears on the DVI display.

For example: Assume that the selected input type is 0-1V. In this case, if the difference between the reference voltages applied for calibration of $H_{in,P}$ and $L_{in,P}$ is lower than 0.5V, this error message appears.

difference between the reference



Service Offers

Installation / Set-up / Operator training

High-class service for high-tech products

Service Offers



High-class service for high-tech products

The competent UWT sales and service team helps our clients in consulting and engineering, with professional installation, precise parameterization and an universal service support. Our products are designed individually according to the needs of our customers. It can be taken advantage of single features as well as a suitable service package at a fixed price can be put in order. However, a service of UWT have in common: Our specialists are not satisfied before our customers are.



Project

- Our experts offer individual advice for tailored measurement technology for your system
- We support you throughout the whole project and are always there for you, to support you within technical questions
- At UWT you get complete packages from a single source - easy, professional and efficient
- The UWT team supports you reliable, flexible and of the highest quality



Installation and Set-up

- Our experienced specialists will install all matched components professionally and give you a frictionless start
- To our professional wiring it goes without saying to use just high-quality materials, e.g. outdoor cables are installed UV protected
- Concerning the logged commissioning UWT service technicians nothing left to chance and thus prevent subsequent error from the beginning



Operator training

- Operator instructions and user training ensure effective implementation and a high trouble-free operating
- After commissioning we furthermore support your plant

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Initial setup service package Initial setup, user training	3

Pro rata service charges/ cancellation charges	4

Subject to technical and price change.

Prices are valid from 01.04.2020 until 31.03.2021 unless otherwise agreed.

By publishing this selection list all other lists become invalid.

We assume no liability for typing errors.

All prices in Euro excl. VAT

Complete service package

This service package includes the installation, cabling & wiring and initial set up of the level measurement instrumentation on the vessel/ silo and the Nivotec system in the plant. The flat rate ensures a set price which can be calculated for each project and also includes the training of personnel on how to use the level measurement instrumentation and the Nivotec system. The material required for mounting will be invoiced separately. The travel costs can either be charged according to a flat rate system or according to the travel method and time, whichever the customer wishes.

Installation, wiring, initial setup, user training

Measurement instrumentation on the vessel/ silo sp300100 per vessel/ silo •

- complete installation of the continuous measurement instrumentation, including full and empty detectors
- Cabling & wiring of instrumentation up to the terminal box on the silo
- Parameter setting, tuning and setting of the measurement instrumentation
- Issue of the initial setup documentation
- User training

Nivotec-system sp300110 per vessel/ silo •

- Complete installation of the Nivotec Systems
- Cabling & wiring of instrumentation up to the terminal box on the silo
- Parameter setting, tuning and setting of the measurement instrumentation
- Issue of the initial setup documentation
- User training

Travel costs - flat distance rates for the complete service package (two people)

The rates include the travel time and all other costs, such as accommodation, food, train, flights etc.

Start from Betzigau (Location of UWT GmbH).

- up to 100 km	sp300120	•
- from 100 to 200 km	sp300121	•
- from 200 to 500 km	sp300122	•
- from 500 to 750 km	sp300123	•
- from 750 to 1,000 km	sp300124	•
- from 1,000 to 1,500 km	sp300125	•
- over 1,500 km	sp300126	on request

Conditions for installation and wiring

The required power, ethernet, internet or telephone connections for the Nivotec systems and the measurement instrumentation must be provided on site close to the installation of the control cabinet UWT will not carry out any digging or ground work for cable laying. Cable laying will be carried out over a maximum of 500 m in cable ducts or tubes. All cables and wires provided for outdoor use by UWT are UV resistant or are protected from UV rays by protective tubing. The installation of the cable ducts and tubes will be carried out to a maximum height of 4 meters. A hoist or lifting ramp must be provided on site.

Initial setup service package

This service package includes the initial set up of the level measurement instrumentation on the vessel/ silo and the Nivotec system in the plant, as well as the training of personnel on how to use the level measurement instrumentation and the Nivotec system. The installation, cabling & wiring of the level measurement instrumentation and the Nivotec system is the responsibility of the customer. The preparation and cabling of the ethernet and telephone connections, as well as the IP addresses for the NT 3000 are also the responsibility of the customer. The travel costs can either be charged according to a flat rate distance system or according to the travel method and time, whichever the customer wishes.

Initial setup, user training

Measurement instrumentation on the vessel/ silo sp300200 per vessel/ silo •

- Parameter setting, tuning and setting of the measurement instrumentation
- Issue of the initial setup documentation
- User training

Nivotec-system sp300210 per vessel/ silo •

- Parameter setting, tuning and setting of the visualisation and the measurement level displays
- Issue of the initial setup documentation
- User training

Travel costs - flat distance rates for the initial setup service package (one person)

The rates include the travel time and all other costs, such as accommodation, food, train, flights etc.

Start from Betzigau (Location of UWT GmbH).

- up to 100 km	sp300220	•
- from 100 to 200 km	sp300221	•
- from 200 to 500 km	sp300222	•
- from 500 to 750 km	sp300223	•
- from 750 to 1,000 km	sp300224	•
- from 1,000 to 1,500 km	sp300225	•
- over 1,500 km	sp300226	on request

Pro rata service charges

The charge rates apply for the initial set up, servicing, repair work and other similar work, which will be charged pro rata.

pos.1	Engineer		
	Working time, cost per hour	sp300010.....	•
	Travel, waiting and preparation time per hour	sp300011	•
	Service technician		
	Working time, cost per hour	sp300015.....	•
	Travel, waiting and preparation time per hour	sp300016.....	•
pos.2	Additional charges (on top of the hourly charges in position 1)		
	For the first 2 additional hours (after 8 hours of work)	sp300020	•
	From the 3rd additional hour (after 8 hours of work)	sp300021	•
	For work on Sundays and German public holidays	sp300022	•
pos.3	Allowances		
	The allowance will be charged in full, when travel begins before 12 noon.		
	When travel begins after 12 noon or the journey is completed before 12 noon, then half of the allowance will be charged.		
	Allowance per day	sp300030	•
	Overnight costs	sp300031	•
pos.4	Travel costs		
	Travel by car per kilometre	sp300040	•

For all other travel costs such as flights or train, the actual costs are to be paid.

Cancellation and modification charges

pos.1	Modification costs		
	Flat rate charges		•
	Additional costs for the already completed work		according to the work
pos.2	Cancellation costs		
	For standard instrumentation up to one week before the confirmed delivery date		•
	For standard instrumentation with customer requested modifications		•
	For custom made instrumentation up to one week before the confirmed delivery date		•

¹⁾ of the order value

Please note that our general terms and conditions apply.
For details see our website

www.uwt.de



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