



6 YEARS
GUARANTEE
APPROVED
QUALITY

NivoBob® 3000

ELECTROMECHANICAL PLUMB BOB

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® 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: 0/4-20 mA or communication via Modbus or Profibus DP.



NivoBob® 3000

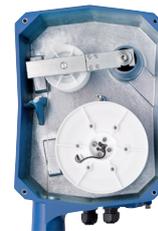


- Microprocessor controlled measurement, intelligent monitoring
- Easy installation; variety of process connections (flange and thread)
- Unaffected by material properties such as conductivity, dust, dielectricity



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 max. 30 m; Tape max. 50 m	
Signal output/ Communication	0/4-20mA; relay counting pulse; Modbus; Profibus DP	
Certificates	ATEX, FM, TR-CU, UKEX (Dust explosion-proof)	CE; FM general purpose
Process temperature	-40 °C .. +250 °C (-40 °F .. +482 °F)	-40 °C .. +80 °C (-40 °F .. +176 °F)
Sensitivity	From 20 g/l (1.2 lb/ft ³) depending on sensor weight	-
Process connection	Flange DN100 PN16 Flange 4" 150 lbs Flange 2" und 3" 150 lbs Thread R 1½" Thread NPT 1½" Thread NPT 3"	Flange DN100 PN16 Flange 4" 150 lbs



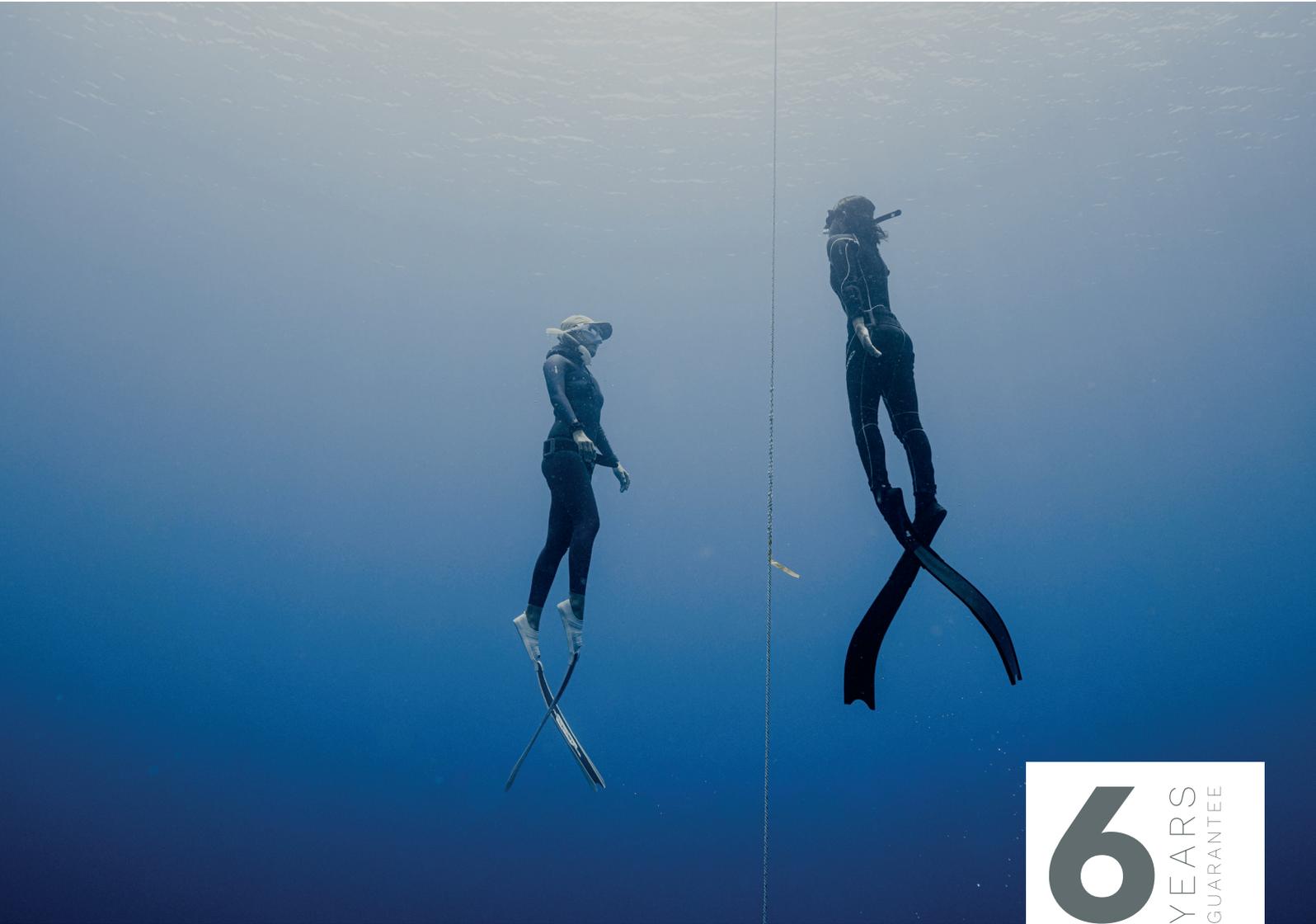
View rope/tape chamber



View electronic chamber

Different sensor weights





6 YEARS
 GUARANTEE
 APPROVED
 QUALITY

Interface Solutions

LEVEL AND POINT LEVEL SENSORS

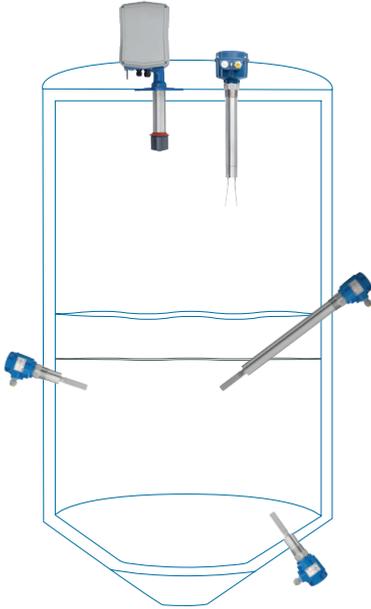
Configuration options for interface detection of solids in liquids as well as liquid layers for continuous measurement and for point level detection in different industries.



Interface Solutions

INTERFACE MEASUREMENT OF SOLIDS IN LIQUIDS

The detection of bulk solids in liquids as well as sludge levels usually takes place in sediment containers, filters or inclined clarifiers. Typical areas of application are in the metal industry, in chemical plants, lime or gravel works and the sewage industry.



OUR SOLUTIONS FOR:

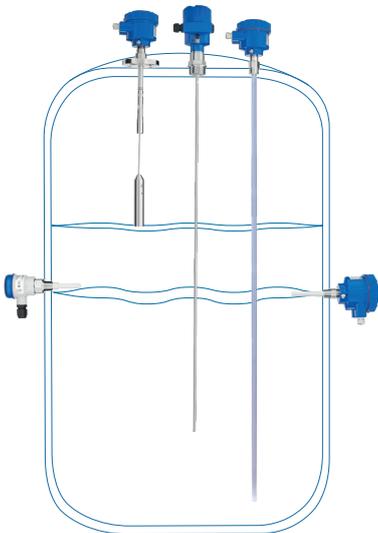
- Continuous level measurement:
Lot system NivoBob® series NB 3300/3400
- Point level detection:
Vibration fork Vibranivo® series VN 1000/5000

SPECIAL FEATURES:

- Adjustable sensitivity
- Robust design
- Unaffected by dirt and moisture
- Reliable and precise detection of solids

INTERFACE MEASUREMENT OF LIQUID LAYERS

In industry applications where a separating layer between two different liquids or a liquid and foam layer is measured, both the capacitance measuring principle and the guided wave radar technology are used.



OUR SOLUTIONS FOR:

- Continuous level measurement:
Capacitance level transmitter NivoCapa® series NC 8000
TDR sensor NivoGuide® series NG 8000
- Point level detection:
Capacitance level switch Capanivo® series CN 7000/8000
Capacitance level switch RFnivo® series RF 8000

SPECIAL FEATURES:

- Adjustable sensitivity
- High measurement accuracy
- Chemical resistant materials
- Detection of total level, separation layer and thickness of upper layer



6
YEARS
GUARANTEE
APPROVED
QUALITY

NivoBob® 3300 / 3400

INTERFACE MEASUREMENT OF SEDIMENTS IN LIQUIDS

The electromechanical level measuring instrument NivoBob® 3300/3400 detects the level of sludge and solids in liquids e.g. stones, sand, salt, bed ash, etc. - very precise, even suitable for corrosive liquids. The applications range from sludge level measurements in settling tanks of lime and gravel plants to interface measurements of salt in water.

NivoBob® 3300 / 3400

- Measures almost all interfaces of sludge and solids
- High corrosion resistance through high-quality coatings
- Extra long lifetime due to brushless motor
- Simple installation and commissioning

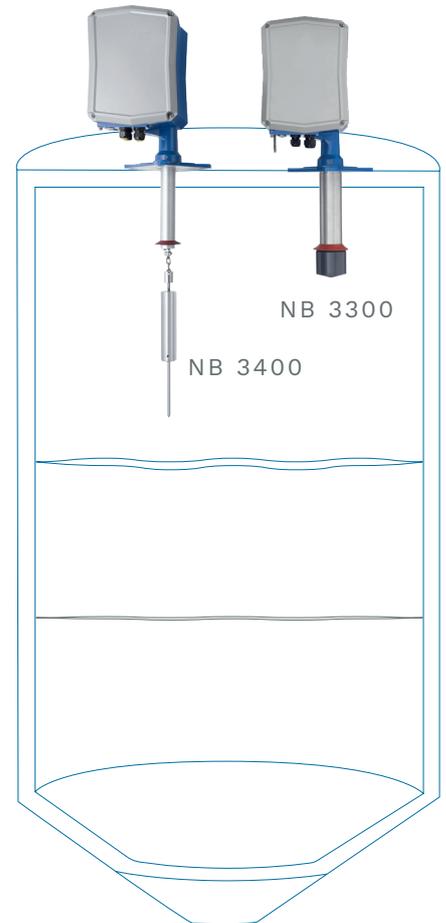
NB 3300

Interface measurement of sludge. The sensitivity can be adjusted exactly to the consistency of the sludge by coarse and fine adjustment. Parts in contact with the process are plastic coated.



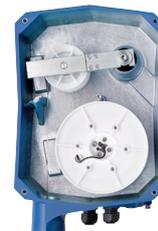
NB 3400

Interface measurement of solids. The resistant tape version fits perfect for applications under extreme conditions and guarantees an extraordinary long lifetime.



TECHNICAL DATA

Model	NB 3300 / 3400
Electronics	Processor-controlled; menu-driven parameter input via display, buttons
Housing	Aluminium IP 66 (Type 4)
Pressure	Max. +1.7 bar (+25 psi)
Supply voltage	AC version 98...253V 50-60Hz DC version 20...28V
Measuring range	NB 3300 max. 30m NB 3400 max. 40m
Signal output/ Communication	0/4-20mA; Relais counting pulse; Modbus RTU; Profibus DP
Approvals	CE; FM general purpose
Process temperature	-40°C .. +80°C (-40°F .. +176°F)
Process connection	Flansch DN 100 PN16 Flansch 4 inch 150lbs



View mechanical chamber



View electronic chamber with cover

Different sensor weights

NB 3300

The sensitivity is adjusted inside the sensor weight with PVC plastic and stainless steel discs for the precise interface.



NB 3400

The robust sensor weight with a pin of stainless steel measures accurately the surface of solid interfaces.



Table of contents

	Page
Safety notes/ Technical support	2

Introduction	3

Dimensions	4

Technical data	
Electrical Data	7
Mechanical Data	8
Operating conditions	9
Transport and Storage	9
Approvals	10
Sensor weight guide	11

Options	12

Mounting	13

Electrical installation	15

Signal overview	20

Programming	
Quickset menu	22
Output adjustment menu	25
Diagnostics menu	28
Communication menu	30
Modbus register	31

Commissioning	
Interface measurement	33

Maintenance	
General items	34
Diagnostics Maintenance	35
Diagnostics Failure	37

Notes for use in Hazardous Locations	38

Disposal	41

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.uwtgroup.com 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@uwtgroup.com
www.uwtgroup.com



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 relays (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

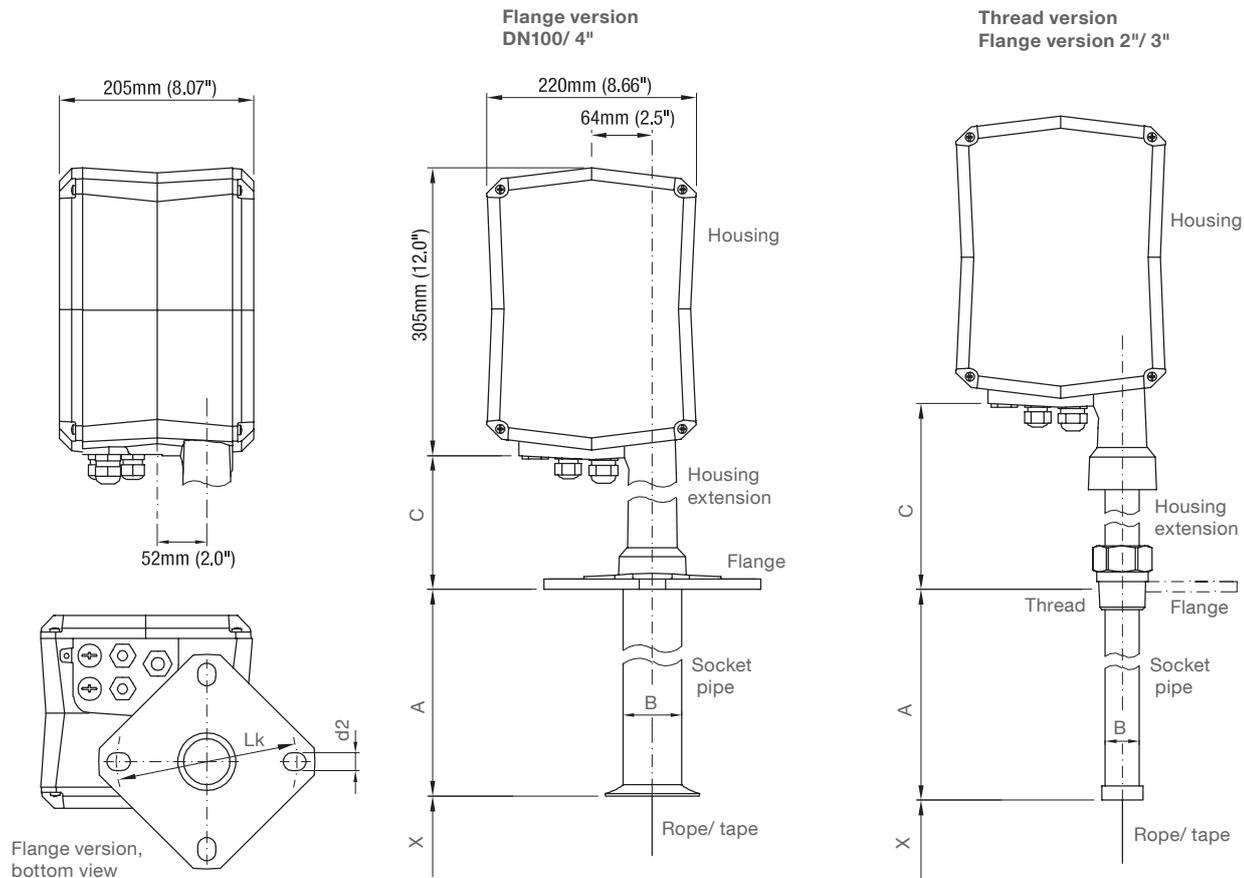
Comprehensive diagnostics possibilities are present:

- 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

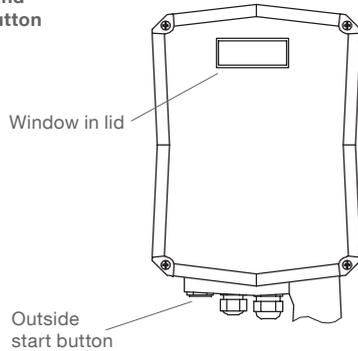
Housing outside	Aluminium, powder coated
Housing inside	Aluminium
Housing extension	Aluminium, powder coated or 1.4305 (303)
Flange	80°C/ 150°C: Aluminium, powder coated 250°C: 1.4305 (303)
Thread	1.4301 (304)
Socket pipe	Flange version DN100/ 4", 80°C/ 150°C: Aluminium All other versions: 1.4301 (304)
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.

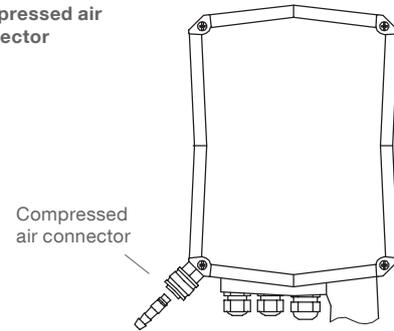
Dimensions

Options and Accessories

pos.25
**Window in lid and
 outside start button**



pos.28
**Compressed air
 connector**

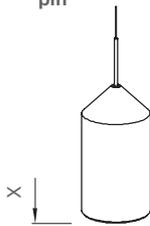


Sensor weights

Solids measurement: Rope version

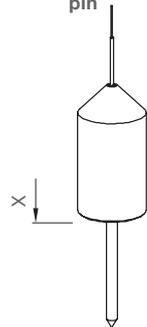
All weights ca. 1,0 kg (2.2 lbs)

**PVC without
 pin**



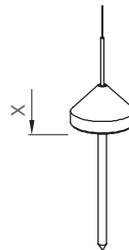
ø81 mm (ø3.2")
 X = 137 mm (5.4")
 Material: PVC

**PVC with
 pin**

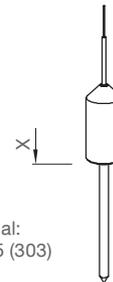


ø81 mm (ø3.2")
 X = 137 mm (5.4")
 Pin: 130 mm (5.1")
 Material: PVC (pin POM)

Stainless steel



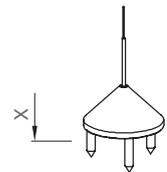
Version with
 Flange DN100/ 4"
 ø75 mm (ø3.0")
 X = 25 mm (1.0")
 Pin: 130 mm (5.1")



Material:
 1.4305 (303)

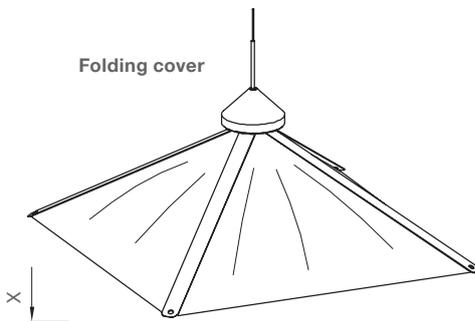
All other versions
 ø42 mm (ø1.65")
 X = 81 mm (3.19")
 Pin: 130 mm (5.1")

Claw



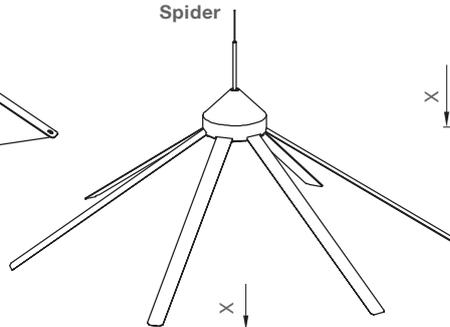
ø95 mm (ø3.7")
 X = 71 mm (2.80")
 Material: 1.4305 (303)

Folding cover



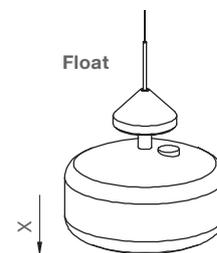
380 x 380 mm (15 x 15")
 X = 150 mm (5.9")
 Material: 1.4310 (301)/ 1.4305 (303)
 PA canvas

Spider



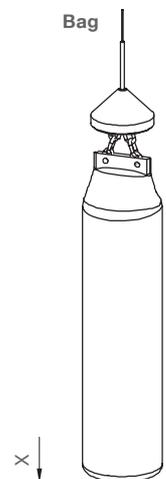
ø600 mm (ø23.6")
 X = 160 mm (6.3")
 Material: 1.4301 (304)/ 1.4305 (303)
 1.4310 (301)

Float



ø190 mm (ø7.5")
 X = 175 mm (6.9")
 Material: Float PP,
 Cone: aluminium

Bag

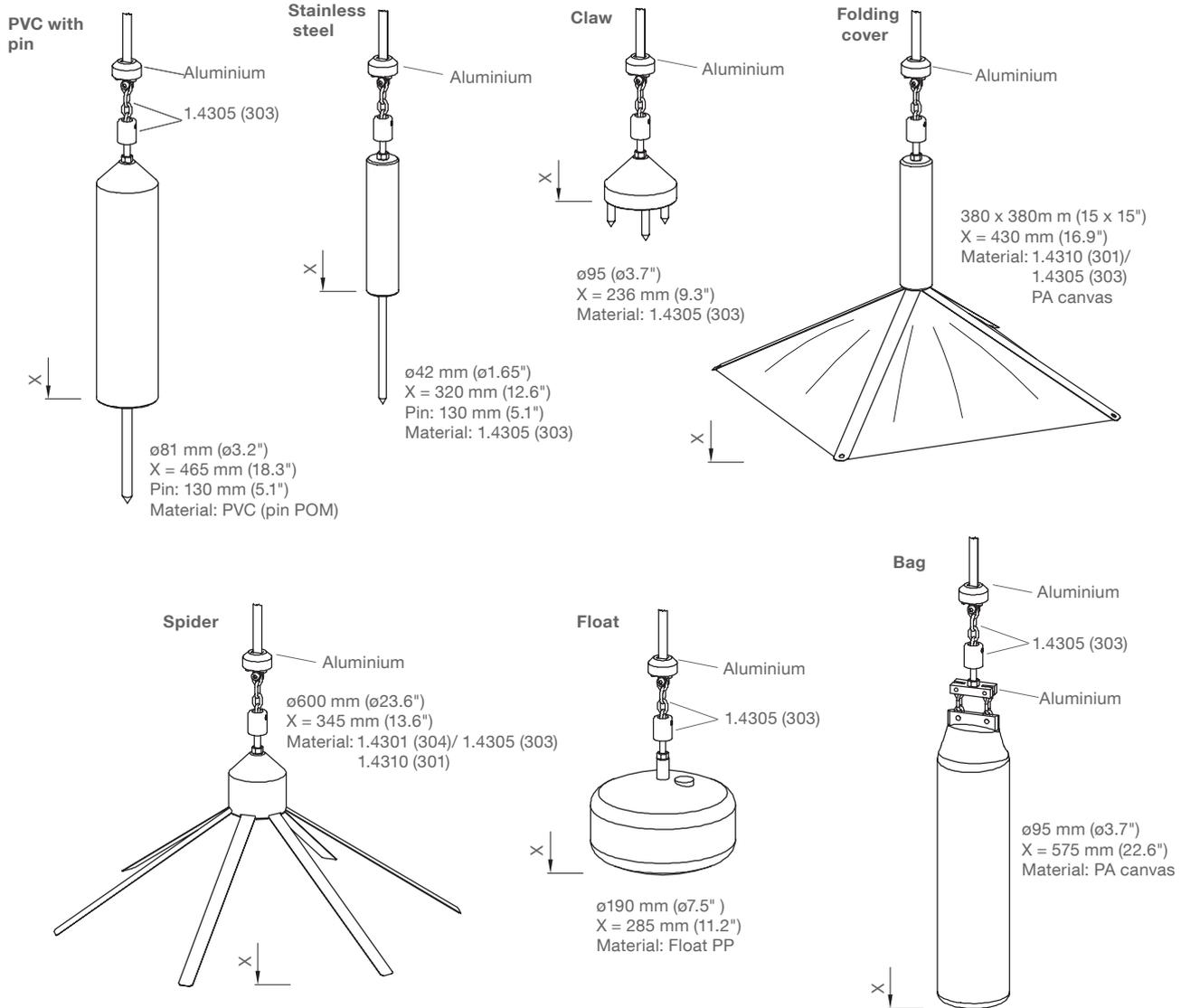


ø95 mm (ø3.7")
 X = 460 mm (18.1")
 Material: PA canvas,
 Chain: 1.4305 (303)
 Cone: aluminium

Dimensions

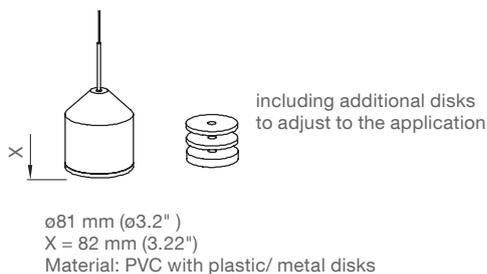
Solids measurement: Tape version

All weights ca. 2.1 kg (4.6 lbs)



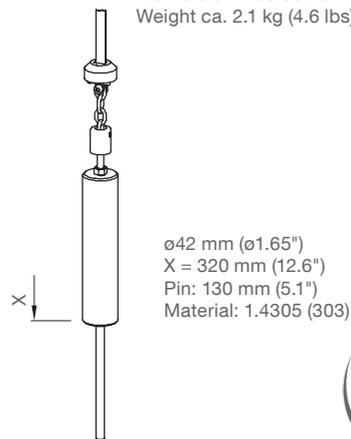
Interface measurement: Rope version

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 adress is 31. Each unit which is connected to the network must be set to an individual adress. 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	Output	Setting	Accuracy
	Counting pulse	10 cm (1/3 ft)/ pulse	1 pulse
		5 cm (1/6 ft)/ pulse	1 pulse
		2,5 cm (1/10 ft)/ pulse	2 pulses
		1 cm (1/20 ft)/ pulse	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 build 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:	AC version 2,210 Vrms DC version: 1,000 VDC
	Relay to relay: 2,210 Vrms	
Protection class	I	
Overvoltage category	II	
Pollution degree	2 (inside housing)	
Mechanical data		
Ingress protection	IP66, Type 4	
Process connection	Threads:	R 1½" EN 10226 tapered, NPT 1½" or 3" ANSI B1.20.1 tapered
	Flanges:	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	RAL 5010 (gentian blue)
	Lid	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	with flange: ca. 11 kg (24.2 lbs) with thread: ca. 12 kg (26.4 lbs)
	Tape version	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 + UKCA + ATEX + UKEX + TR-CU -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, UKCA, FM General Purpose with internal heater ATEX, UKEX, FM Class II, TR-CU 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: standard motor:	ca. 3,000 N ca. 800 N
	Rope version:	with brushless motor: standard motor: with increased corrosion resistance:	ca. 1,000 N ca. 800 N 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 1/2D Ex ta/tb IIIC T! Da/Db
 UKEX II 1/2D Ex ta/tb IIIC T! Da/Db
 FM Class II, III Div.1 Group E-G
 TR-CU Ex ta/tb IIIC T130°C...T250°C Da/Db X

General purpose * CE/ UKCA EN 61010-1
 FM General purpose
 TR-CU

EMC EN 61326 - A1 (industrial standard)

RoHS conform According to directive 2011/65/EU

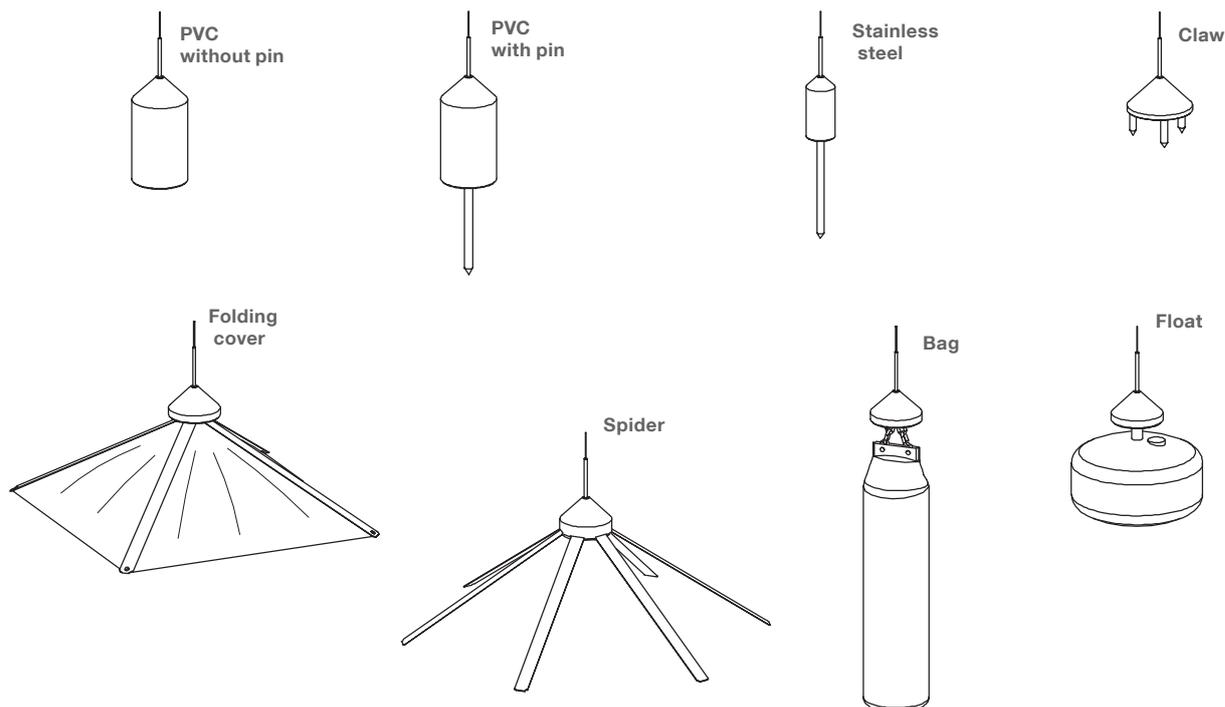
* Depending on selected version in selection list

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.

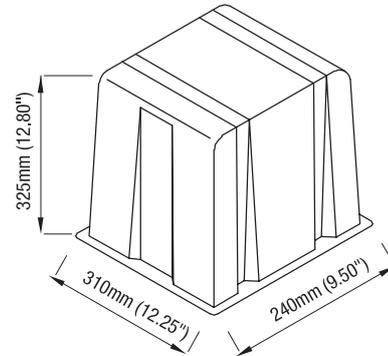
Drawing see page 5

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.

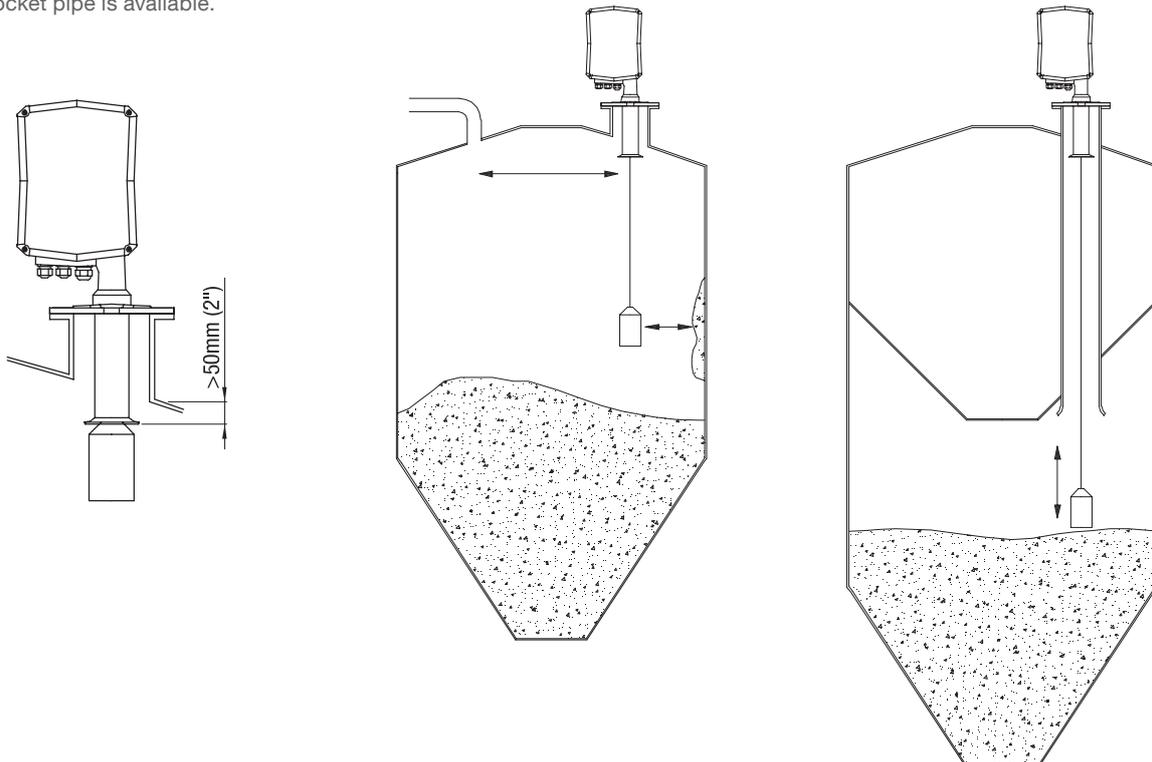
! Additional Safety Instructions for Hazardous Locations

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

- 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.
- 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 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)

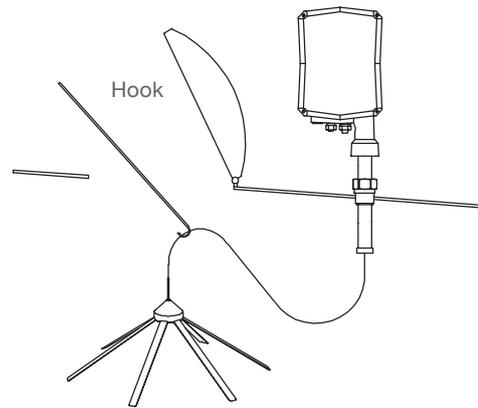
Sealing

- 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

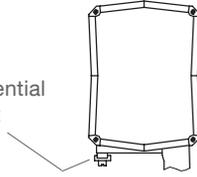
! General Safety Instructions

Handling	In case of improper handling or handling malpractice, the electric safety of the device cannot be guaranteed.
Installation regulations	The local regulations 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, 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 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 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

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 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 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.

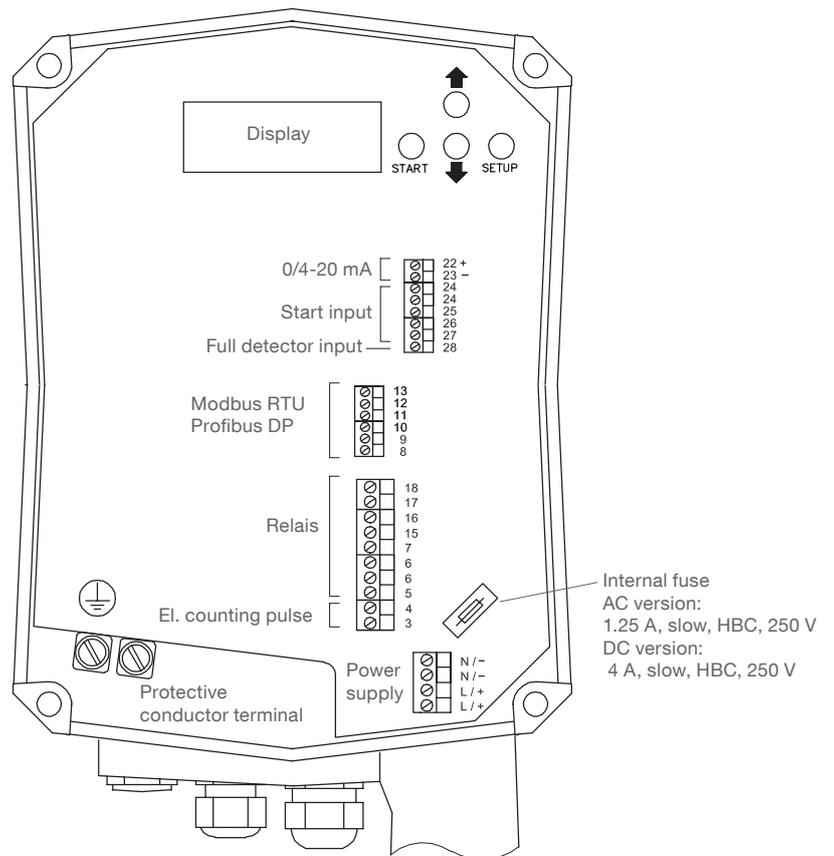
Comissioning/ opening the lid Comissioning only, when there are no dust deposits or swirls present.

! Specific condition of use

Electrostatic charge The apparatus shall be installed in way that danger caused by electrostatic charges is avoided.

Electrical installation

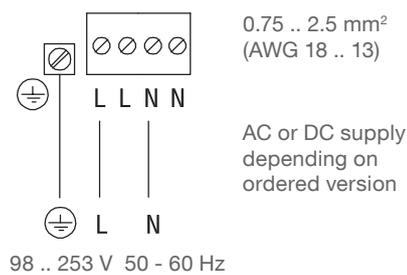
Terminal location



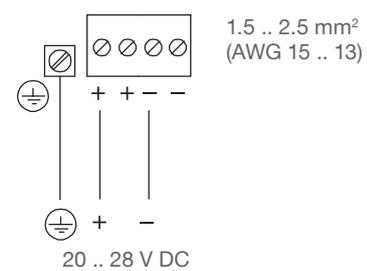
Power supply and Signal input/ output

Power supply

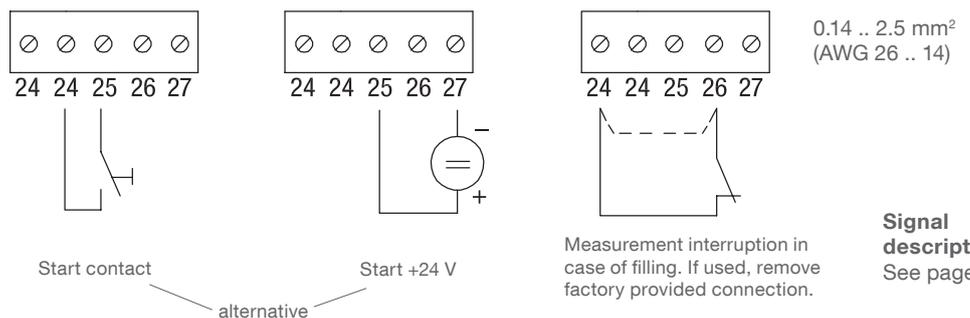
AC version



DC version

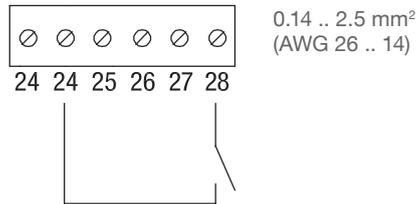


Signal input: Start of measurement



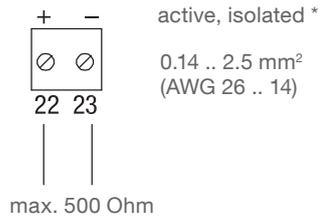
Electrical installation

Signal input:
Full detector



Signal description:
 See page 20

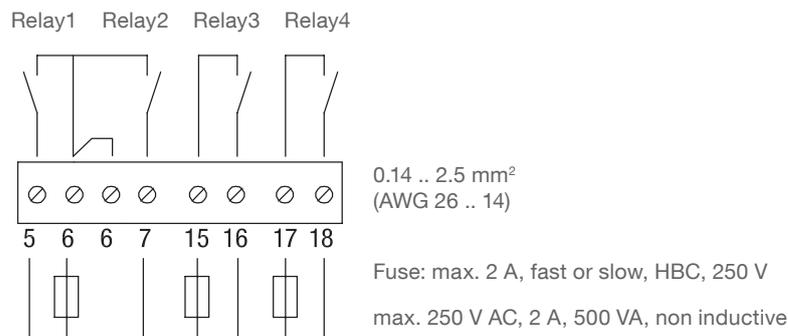
Signal output:
0/4-20 mA



*** 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.

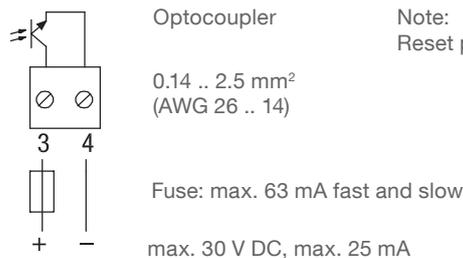
Signal description:
 See page 20

Signal output:
Relay



Signal description:
 See page 20

Signal output:
Electronic counting pulse

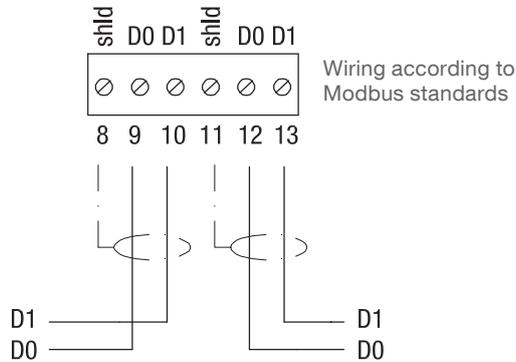


Note:
 Reset pulse is done with Relay 2

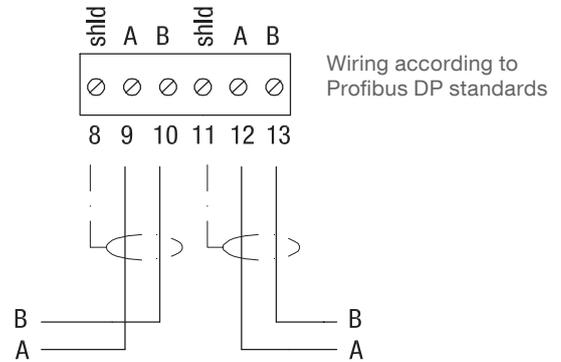
Signal description:
 See page 21

Electrical installation

Modbus network

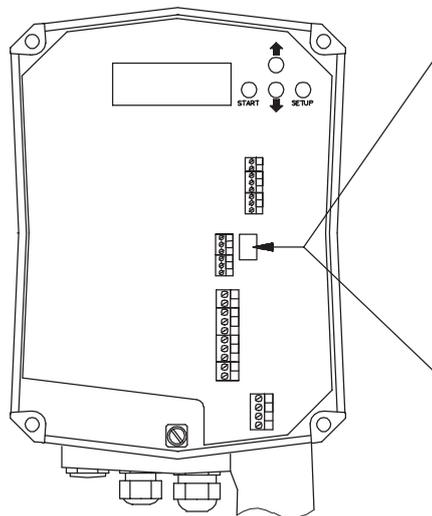


Profibus DP network

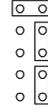


Setting Biasing and Termination Resistor

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: Enables to implement a full detector signal in the Modbus or Profibus.
Full detector When the signal is present (terminal 24 - 28 closed) the yellow LED next to the display in on.

Signal output: 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.
0/4-20 mA

Signal output: Relais can be setted as shown in the following table:
Relay

	Relay 1	Relay 2	Relay 3	Relay 4
Factory settings	Counting pulse	Reset pulse	Failure	Upper stop position
Programmable	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.

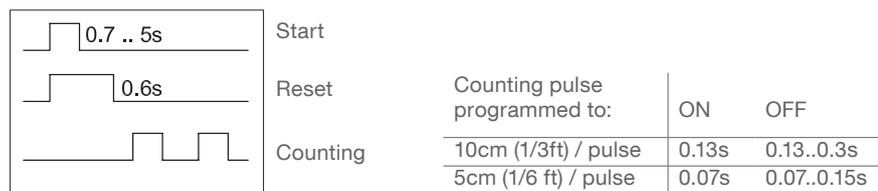
Reset pulse (terminal 6 and 7):

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



Relais 1/2 set to Limit switch:

It is possible to indicate two independent level limit switches. The limit switch signal is derivated 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"

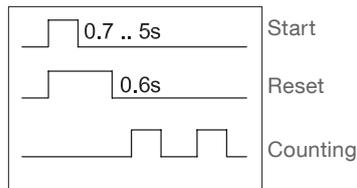
The relay indicates a necessary maintenance (see also programming on G27 and diagnostics "Maintenance" on G35)

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



Note:

The reset pulse is done with relay 2.

Counting pulse programmed to:	ON	OFF
	2,5 cm (1/10 ft)/ pulse	25 ms
1 cm (1/20 ft)/ pulse	10 ms	10 .. 30 ms

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 losing the sensor weight inside the silo.

If Maintenance is indicated, the measurement process can be continued.

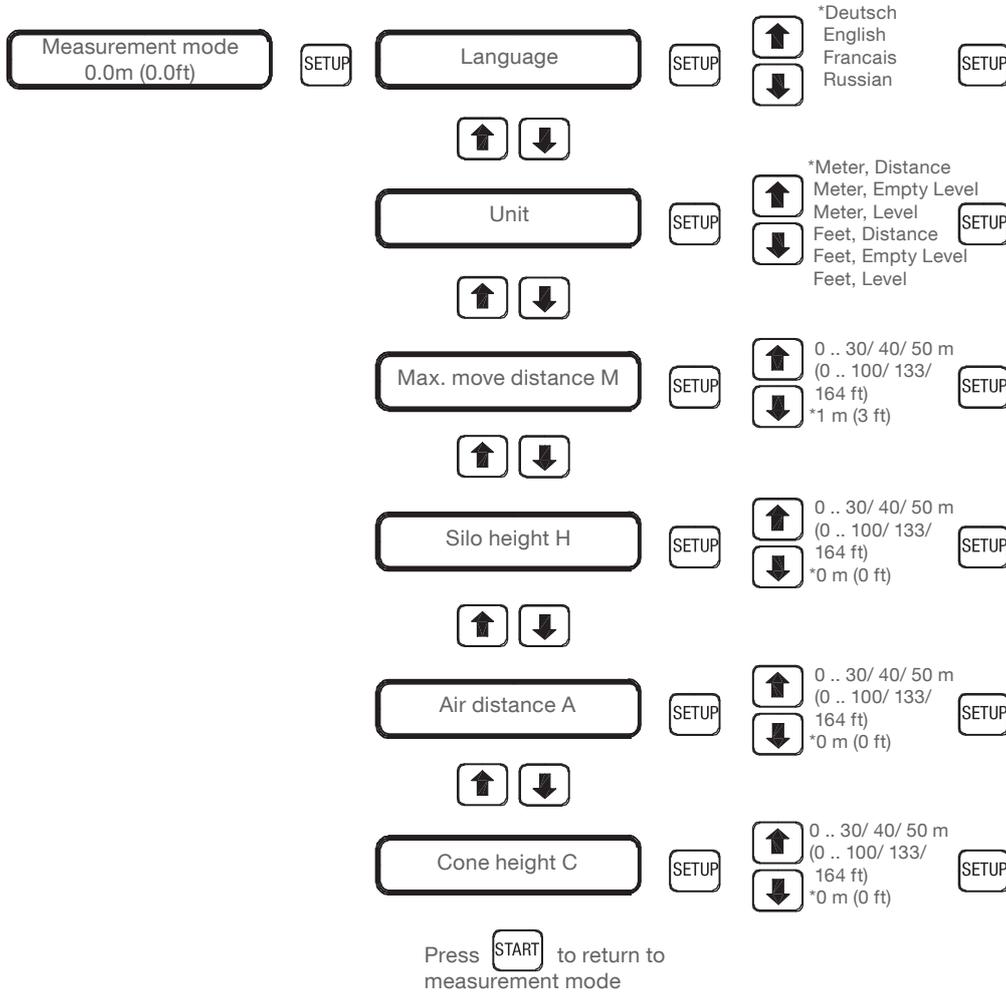
Maintenance codes description see page 35.

Programming

Quickset menu

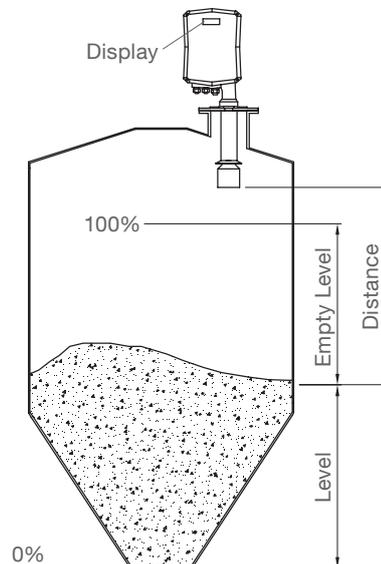
The Quickset menu is used for fast and easy start-up of the system.

If the unit is working in normal operation (measurement mode), the SETUP button brings up the Quickset menu.



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.

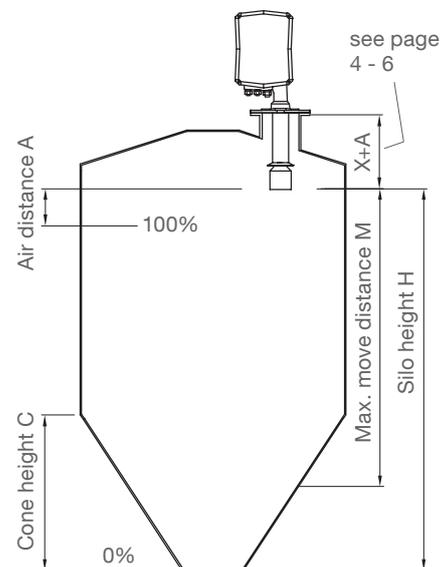


Programming

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:

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
-  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)

Note:
 Pressing the ARROW DOWN button in measurement mode brings up more service information (not described in this manual)

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)

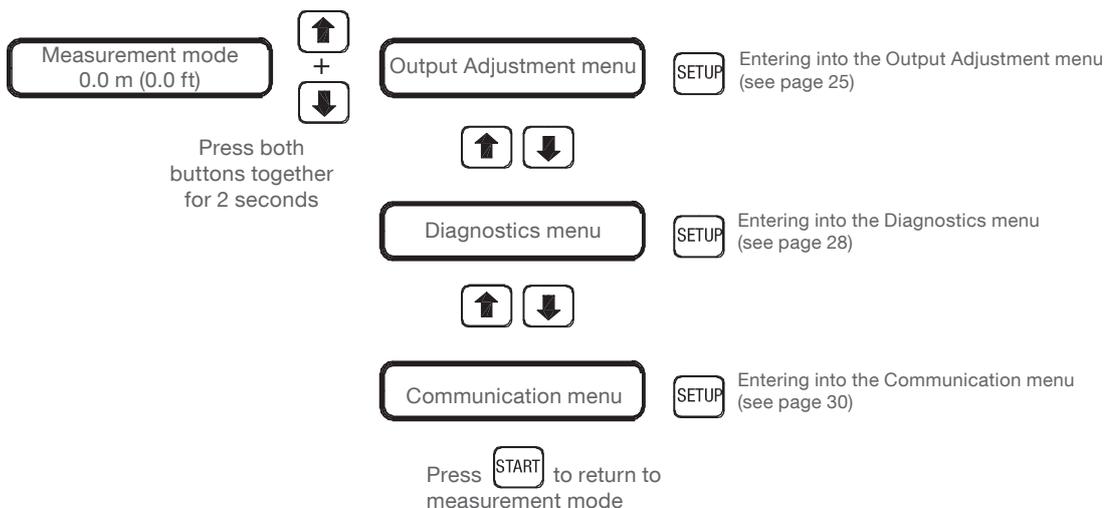
Advanced menus

(use only if necessary)

With the advanced menus it is possible to set the outputs and to display the actual state of the unit.

Entering the advanced menus:

If the unit is working in normal operation (measurement mode), press both "arrow" buttons together for approx. 2 seconds.



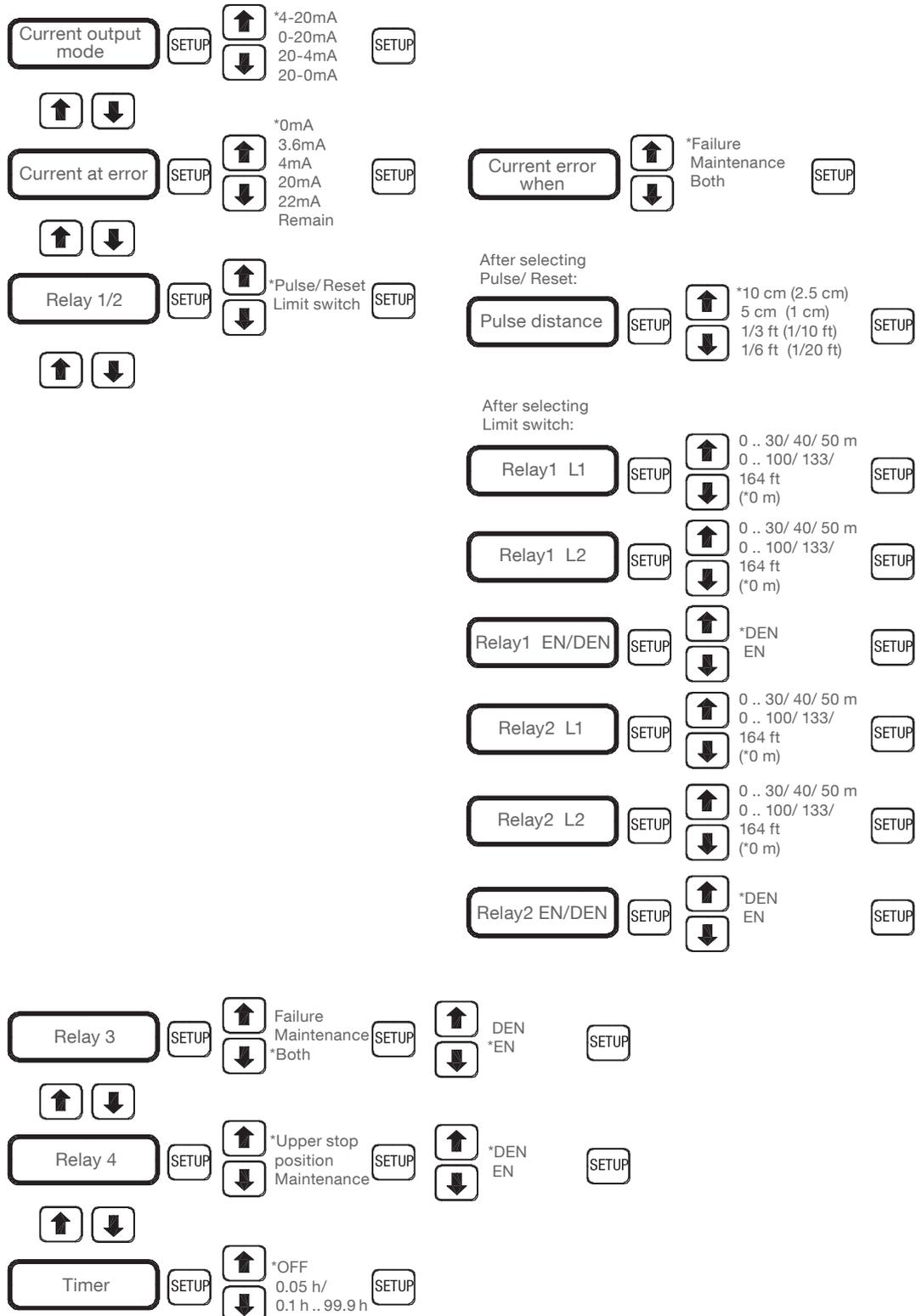
Factory settings

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, relays and internal timer

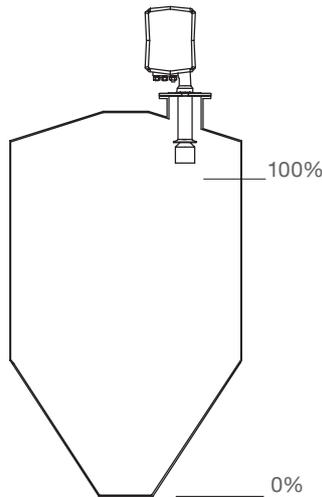


Press 2x **START** to return to measurement mode

* 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.

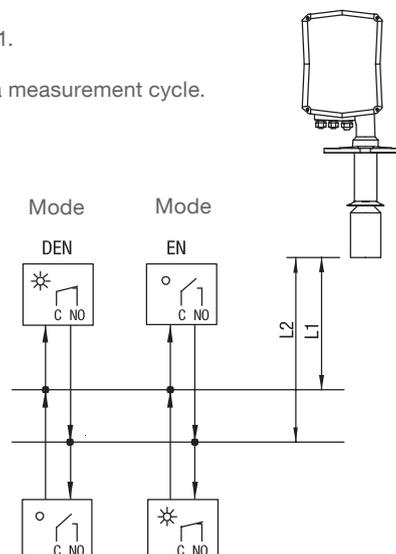
Selecting Limit switch:

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 deenergised when the product rises above the L1 level. It remains deenergised 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		
Not present		

* factory provided

Relay 4

Selects, if relay 4 shall indicate "Upper stop position" or Maintenance.

Upper stop position/ Maintenance	Mode DEN *	Mode EN
Present		
Not present		

* 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)

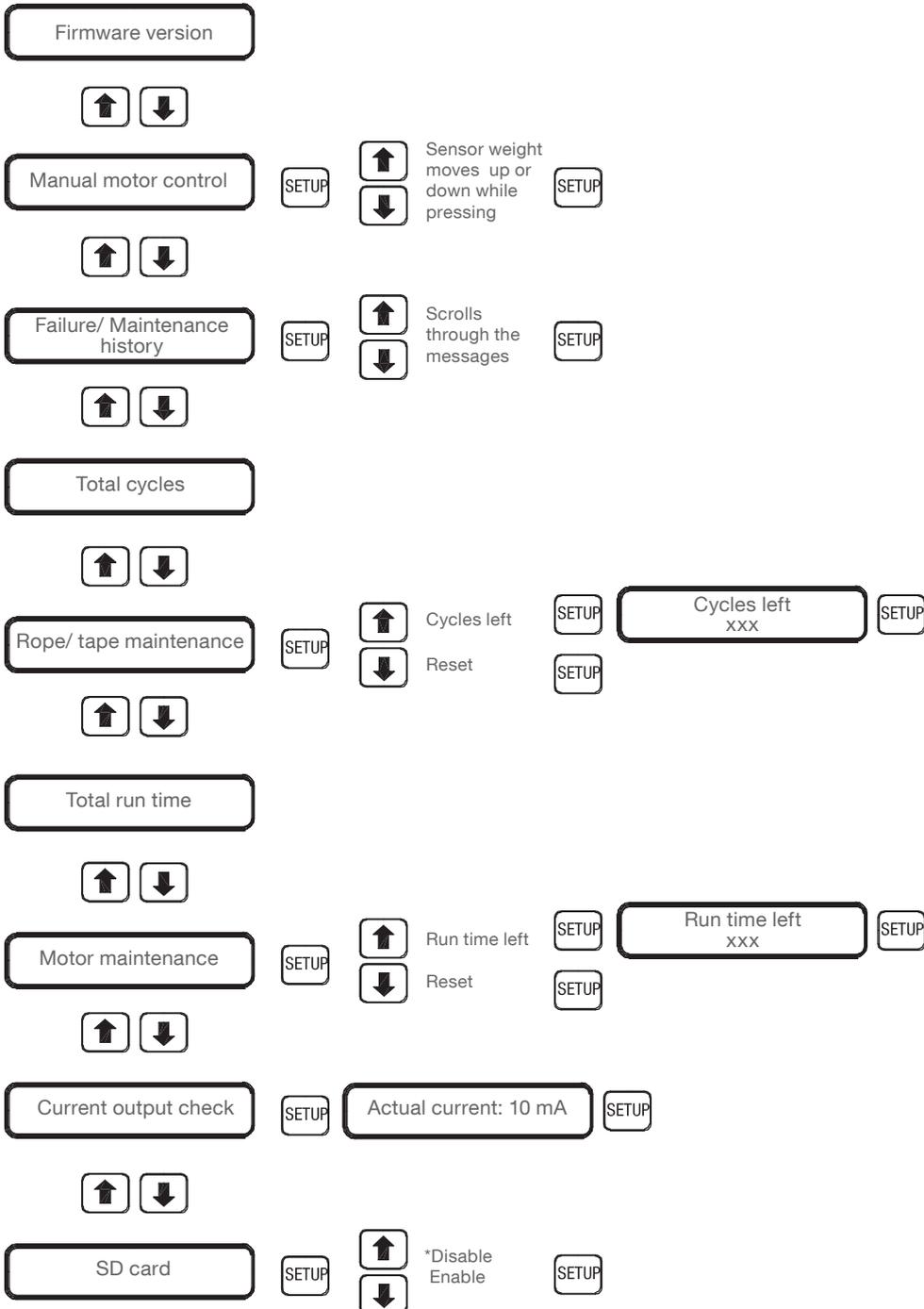
For automatic measurement at a predetermined time of day, an external start unit connected to terminals 24/ 25/ 27 is necessary.

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 **START** to return to measurement mode

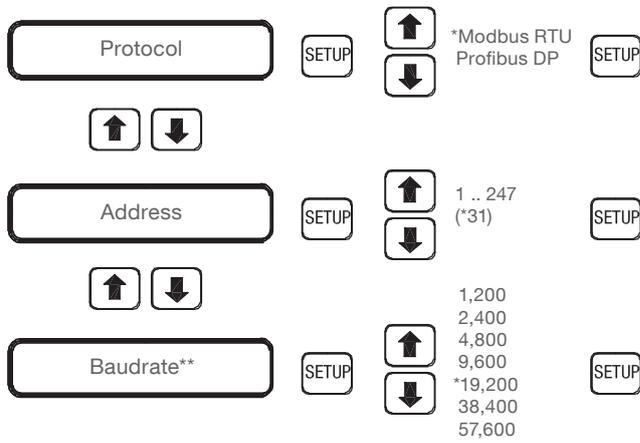
Programming

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. 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	<p>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".</p>

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.
Adress	Selects the used communication adress.
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
------------------	---------------	----------------------	--------------	---------------

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

		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) Busy: A measurement is actually running. Failure present: No new measurement can be started (details see M_FAILURE) Temporary not ready: No measurement can be started due to internal actions (usually during upwards movement of the sensor weight).	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 in upper 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.

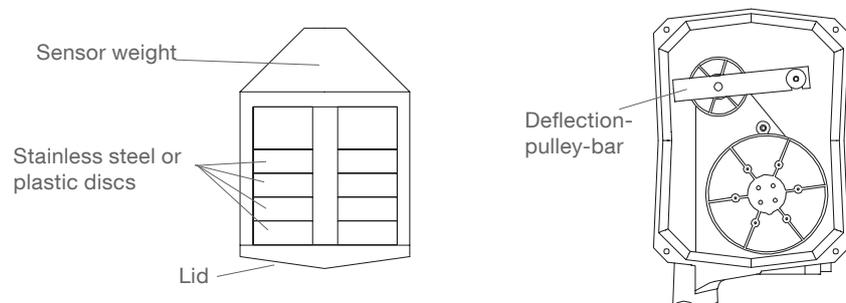
Sensitivity adjustment is done by lowering the sensor weight into the water by using the "Manual motor control" (see page 28).

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.

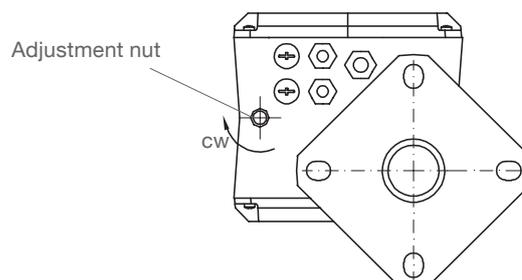


2. Fine adjustment

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.

Maintenance 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

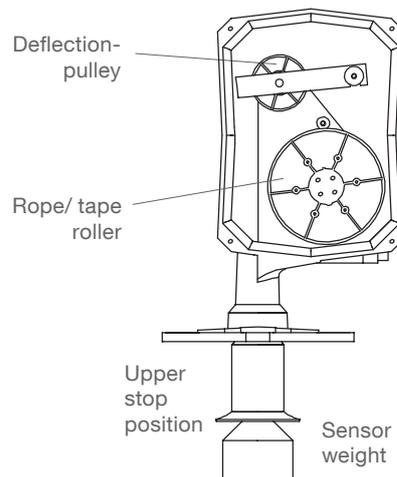
By pushing the START button the actual stated messages shown on the display can be reset.

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

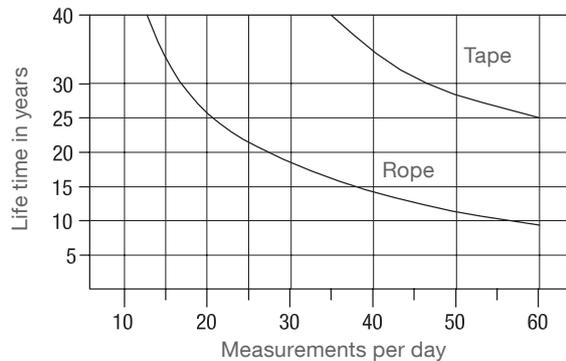
Note: These values refer to lifetime tests under the following conditions:

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

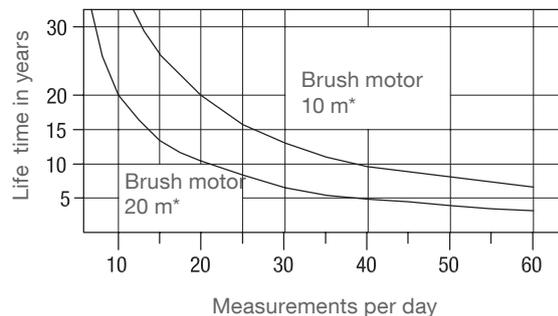
The expected life time (run time) for the motor is:

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.

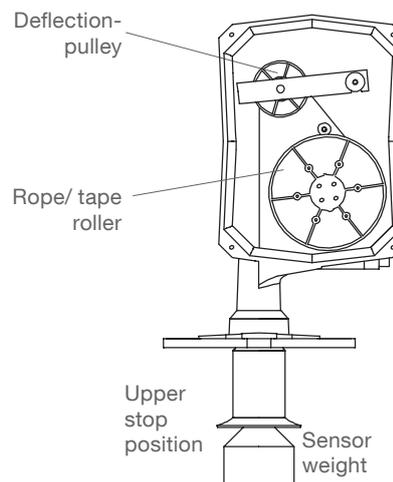
By pushing the START and SETUP button together for 2 seconds, the message shown on the display can be reset.

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.



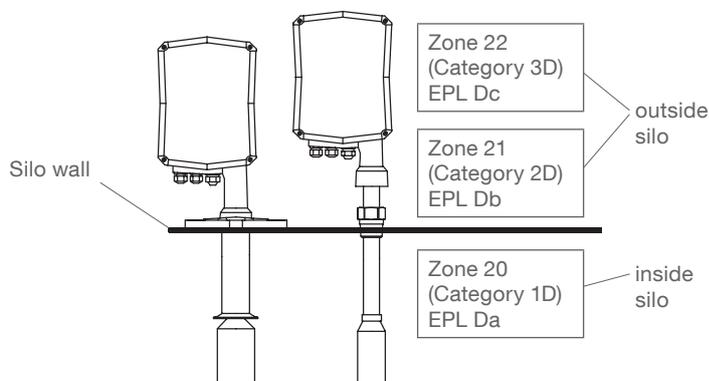
Notes for use in Hazardous Locations

Zone classification

Category	useable in zone	Equipement Protection Level (EPL)
1 D	20, 21, 22	Da
2 D	21, 22	Db
3 D*	22	Dc

* 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



Devices with Ex Approval are approved for atmospheric pressure. A detailed explanation is given below for ATEX and applies analogously for other Ex approvals: The scope of the ATEX directive is generally limited to atmospheric pressure, see ATEX directive 2014_34_EU Chapter 1 Art.2 (4). Atmospheric pressure is defined as absolute pressure 0.8bar to 1.1bar, see ATEX guideline §50 and IEC 60079-0 chapter 1 Scope. The technical background is that an explosive atmosphere which is compressed (overpressure) or released (underpressure) can exhibit different explosion behaviour than under atmospheric conditions. The standards for the types of protection against explosion (IEC 60079 series), on which a type approval according to the ATEX directive is based, are designed for atmospheric conditions and do not automatically cover deviating pressure conditions. Thus, an ATEX type approval issued in accordance with this directive only covers atmospheric pressure. This applies to all manufacturers. A deviating operating pressure can be assessed and approved by an expert for the respective application. Regardless of this, the design of the level indicators is suitable for a vessel overpressure / underpressure in accordance with the specified technical data.

Process and ambient temperature

The permitted temperature ranges are marked on the type plate.

Notes for use in Hazardous Locations

ATEX/ UKEX: 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

! Specific conditions of use

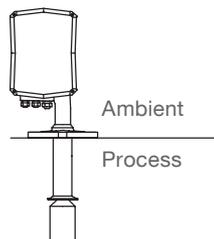
Electrostatic charge The apparatus shall be installed in a way that danger caused by electrostatic charges is avoided.

! Maximum Surface Temperature

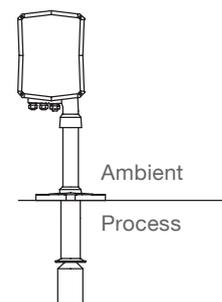
The temperature marking on the name plate  refers to the instruction manual. On the following table the relevant temperature ratings are shown.

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 T ₂₀₀ (EPL Da)	Max. surface temperature (EPL Db)	Temp. class
60°C (140°F)	80°C (176°F)	130°C (266°F)	130°C (266°F)	T4
40°C (104°F)	90°C (194°F)	130°C (266°F)	130°C (266°F)	T4
	100°C (212°F)	130°C (266°F)	130°C (266°F)	T4
	110°C (230°F)	130°C (266°F)	130°C (266°F)	T4
	120°C (248°F)	130°C (266°F)	130°C (266°F)	T4
	130°C (266°F)	130°C (266°F)	130°C (266°F)	T4
	135°C (275°F)	135°C (275°F)	130°C (266°F)	T4
	140°C (284°F)	140°C (284°F)	130°C (266°F)	T3C
	150°C (302°F)	150°C (302°F)	130°C (266°F)	T3C

Max. ambient temperature	Max. process temperature	Max. surface temperature T ₂₀₀ (EPL Da)	Max. surface temperature (EPL Db)	Temp. class
60°C (140°F)	80°C (176°F)	130°C (266°F)	130°C (266°F)	T4
	130°C (266°F)	130°C (266°F)	130°C (266°F)	T4
	135°C (275°F)	135°C (275°F)	130°C (266°F)	T4
	140°C (284°F)	140°C (284°F)	130°C (266°F)	T3C
	150°C (302°F)	150°C (302°F)	130°C (266°F)	T3C
	160°C (320°F)	160°C (320°F)	130°C (266°F)	T3C
	165°C (329°F)	165°C (329°F)	130°C (266°F)	T3B
	170°C (338°F)	170°C (338°F)	130°C (266°F)	T3A
	180°C (356°F)	180°C (356°F)	130°C (266°F)	T3A
	190°C (374°F)	190°C (374°F)	130°C (266°F)	T3
	200°C (392°F)	200°C (392°F)	130°C (266°F)	T3
	210°C (410°F)	210°C (410°F)	130°C (266°F)	T2D
	215°C (419°F)	215°C (419°F)	130°C (266°F)	T2D
	220°C (428°F)	220°C (428°F)	130°C (266°F)	T2C
	230°C (446°F)	230°C (446°F)	130°C (266°F)	T2C
	240°C (464°F)	240°C (464°F)	130°C (266°F)	T2B
	250°C (482°F)	250°C (482°F)	130°C (266°F)	T2B

Notes for use in Hazardous Locations

! 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 inclarity 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.

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

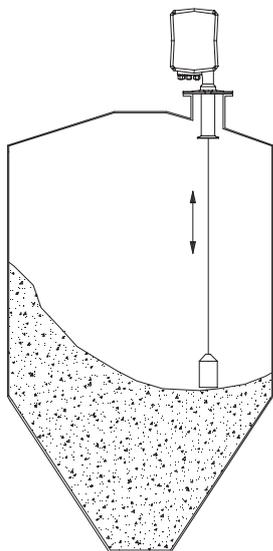
- Micro processor controlled measurement
- Comprehensive diagnostic possibilities
- Output 0/ 4-20 mA/ Modbus/ Profibus DP/ counting pulses
- Programmable Relais (can be used as level limit switch outputs)

Specification

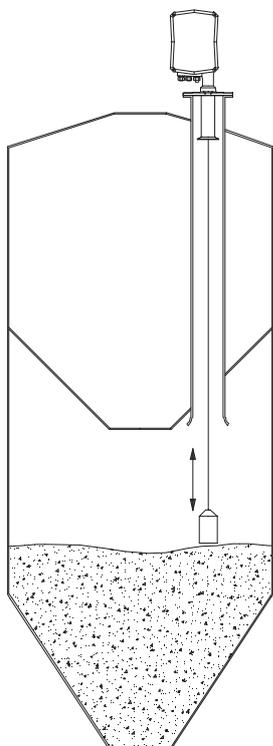
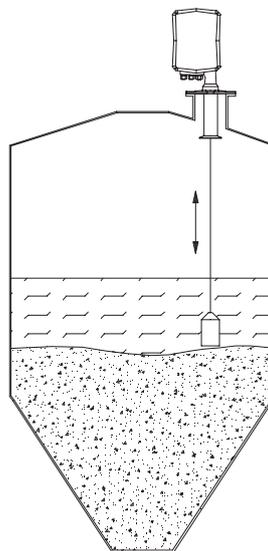
				NB 3100/ 3200 Solids measurement	NB 3300/ 3400 Interface measurement
Process	Measurement range	Rope version	30 m (98.4 ft)	•	•
		Tape version	40 m (131 ft)/ 50 m (164 ft)	•	•
	Process temperature		80°C (176°F)	•	•
			150°C (302°F)	•	
			250°C (482°F)	•	
	Process overpressure		-0.3 .. +0.3 bar (-4.35 .. + 4.35 psi)	•	•
			-0.5 .. +1.1 bar (-7.3 .. +16 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	•	•
			UKEX 1/2D	•	•
			FM Cl. II, III Div. 1	•	•
			TR-CU	•	•
	Ordinary Locations		CE, UKCA, FM, TR-CU	•	•

Applications

Solids measurement



**Interface measurement
(solids in water)**



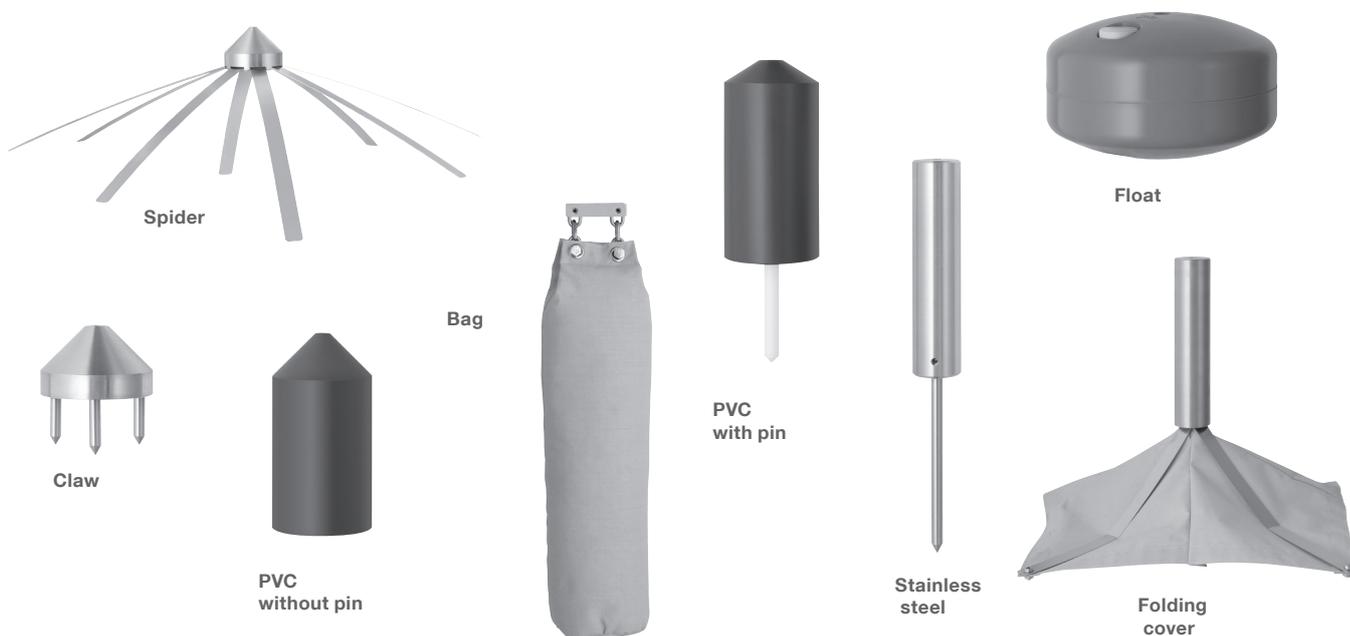
For measurements through a long pipe in a double chamber silo we recommend the use of NB 3200 (tape version).

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.					

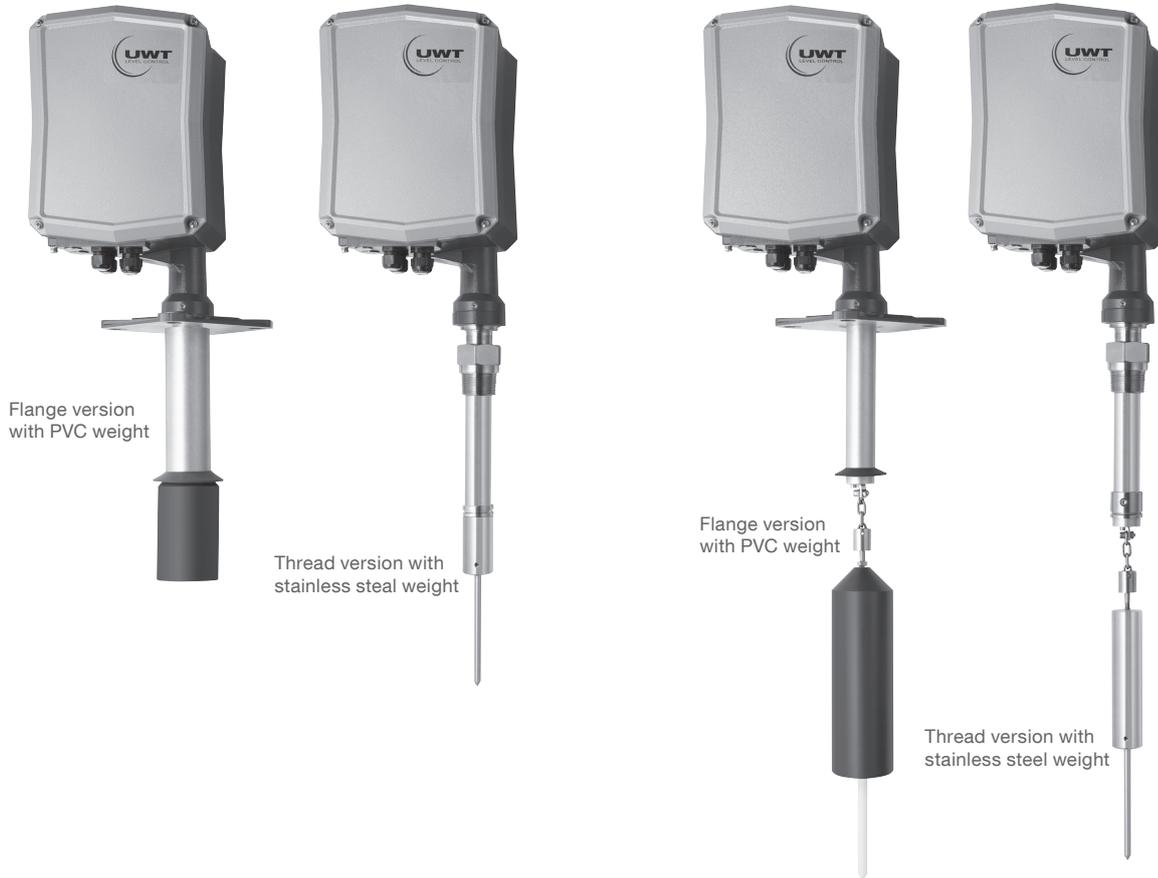
* The above mentioned data is a guideline and is valid for material which has settled after filling. During the filling the bulk density can change (e. g. for fluidised material).



Solids measurement

NB 3100
 Rope version

NB 3200
 Tape version



Cable entries (by default)

Depending on selected version (options see pos.31):

CE, UKCA, ATEX, UKEX, TR-CU	Screwed cable gland: 2x M20 x 1.5 and 1x M25 x 1.5 Blindplug: 2x M20 x 1.5
FM	Open conduit ANSI B1.20.1: 1x NPT ¾" and 2x NPT ½" Blindplug: 2x NPT ½"

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)

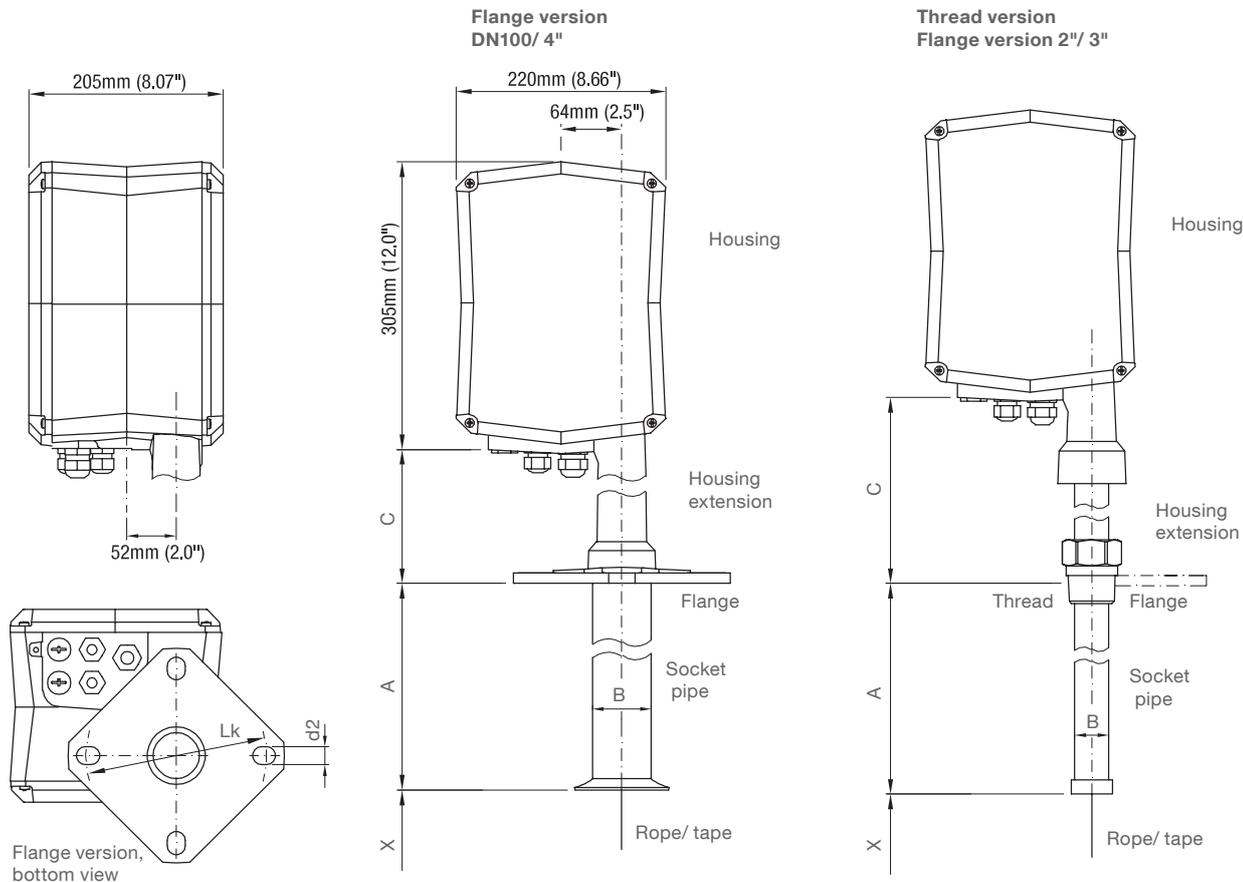
Cable entries (by default)

Depending on selected version (options see pos. 31):

CE, UKCA, ATEX, UKEX, TR-CU	Screwed cable gland: 2x M20 x 1.5 and 1x M25 x 1.5 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

Basic type



Dimensions

X = Length to bottom of sensor weight

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

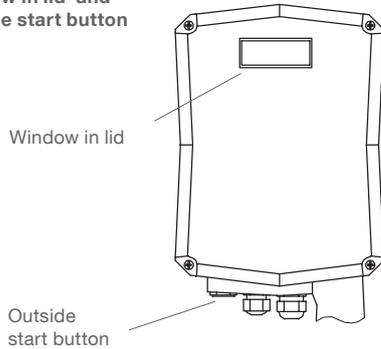
Housing outside	Aluminium, powder coated
Housing inside	Aluminium
Housing extension	Aluminium, powder coated or 1.4305 (303)
Flange	80°C/ 150°C: Aluminium, powder coated 250°C: 1.4305 (303)
Thread	1.4301 (304)
Socket pipe	Flange version DN100/ 4", 80°C/ 150°C: Aluminium All other versions: 1.4301 (304)
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.

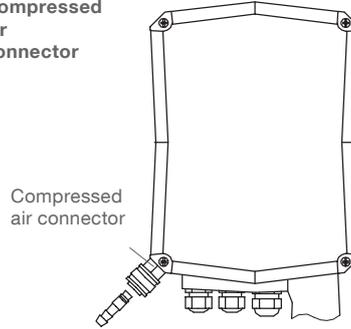
Dimensions

Options

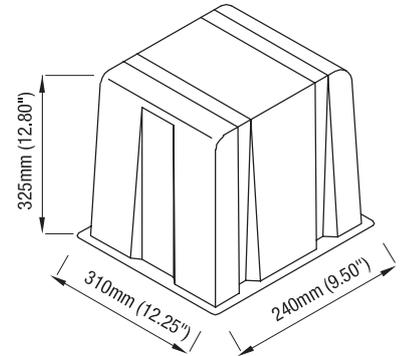
pos.25
Window in lid and outside start button



pos.28
Compressed air connector



pos.21
Weather protection cover

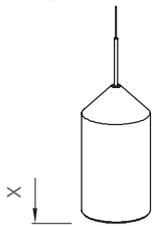


Sensor weights

Solids measurement: Rope version

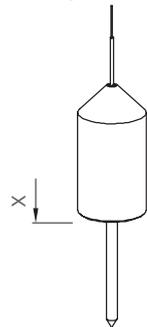
All weights ca. 1,0 kg (2.2 lbs)

PVC without pin



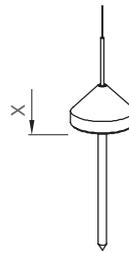
ø81 mm (ø3.2")
 X = 137 mm (5.4")
 Material: PVC

PVC with pin

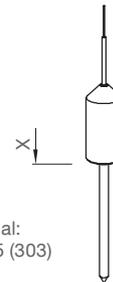


ø81 mm (ø3.2")
 X = 137 mm (5.4")
 Pin: 130 mm (5.1")
 Material: PVC (pin POM)

Stainless steel



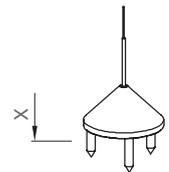
Version with
 Flange DN100/ 4"
 ø75 mm (ø3.0")
 X = 25 mm (1.0")
 Pin: 130 mm (5.1")



Material:
 1.4305 (303)

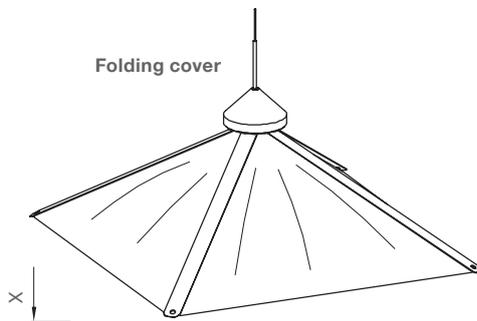
All other versions
 ø42 mm (ø1.65")
 X = 81 mm (3.19")
 Pin: 130 mm (5.1")

Claw



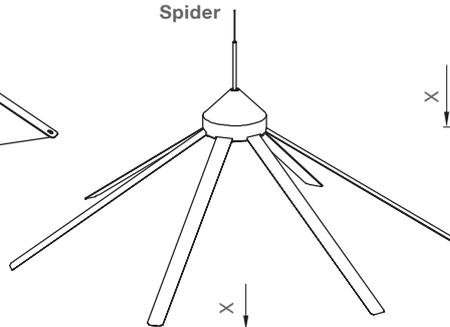
ø95 mm (ø3.7")
 X = 71 mm (2.8")
 Material: 1.4305 (303)

Folding cover



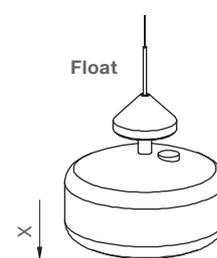
380 x 380 mm (15 x 15")
 X = 150 mm (5.9")
 Material: 1.4310 (301)/ 1.4305 (303)
 PA canvas

Spider



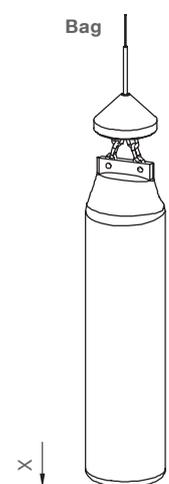
ø600 mm (ø23.6")
 X = 160 mm (6.3")
 Material: 1.4301 (304)/ 1.4305 (303)
 1.4310 (301)

Float



ø190 mm (ø7.5")
 X = 175 mm (6.9")
 Material: Float PP,
 Cone: aluminium

Bag

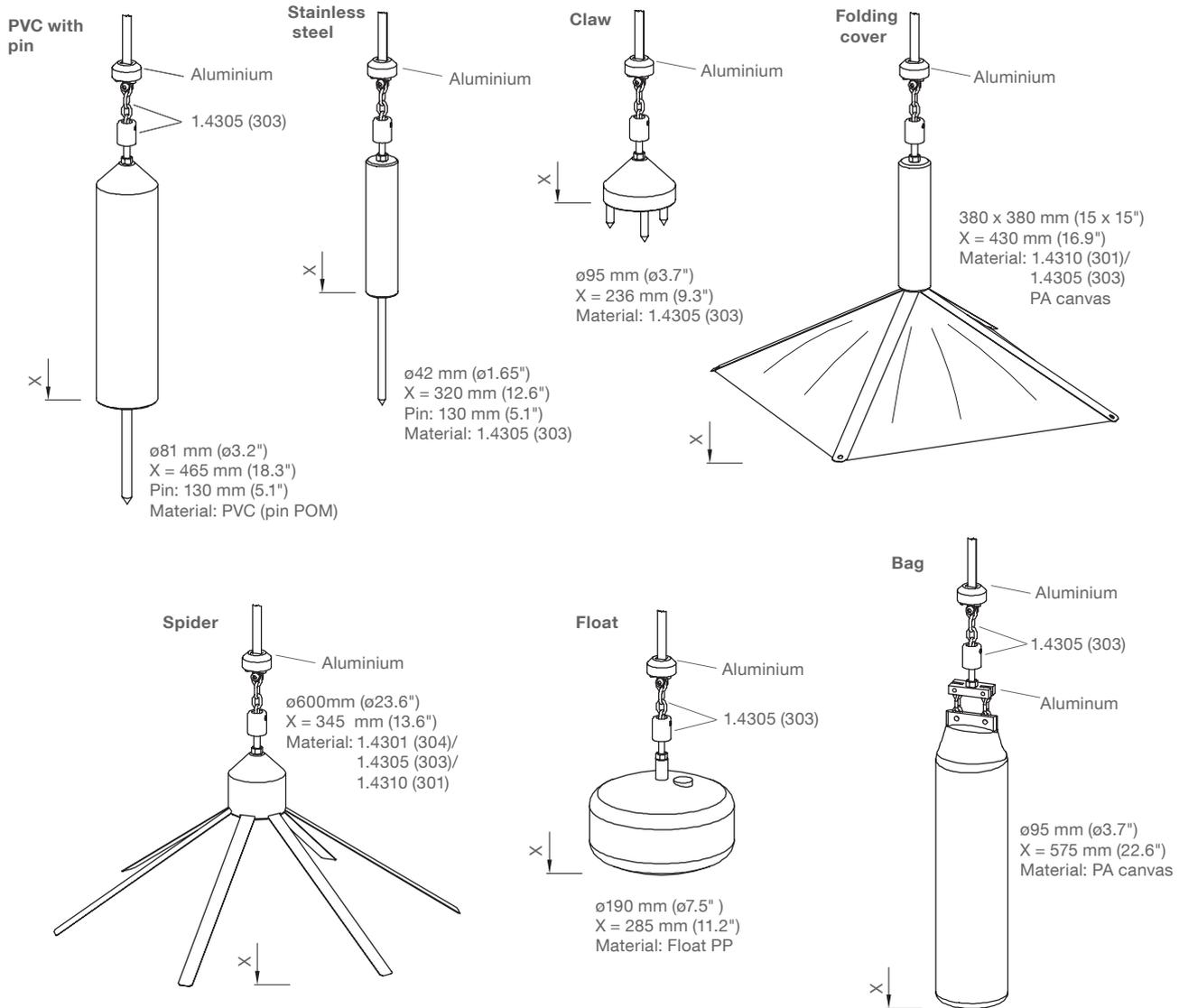


ø95 mm (ø3.7")
 X = 460 mm (18.1")
 Material: PA canvas,
 Chain: 1.4305 (303)
 Cone: aluminium

Dimensions

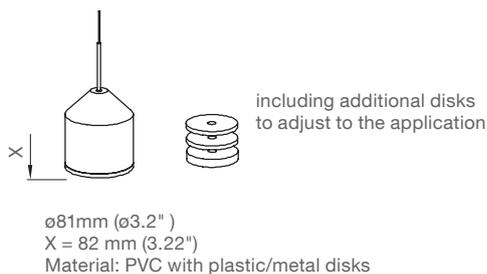
Solids measurement: Tape version

All weights ca. 2.1 kg (4.6 lbs)



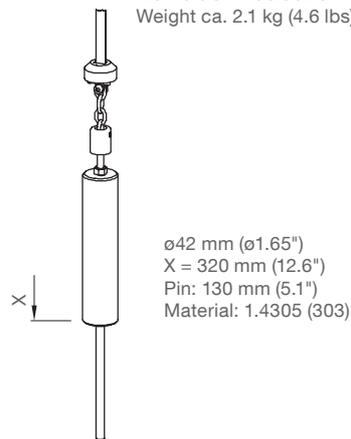
Interface measurement: Rope version

Weight ca. 1.0 kg (2.2 lbs)



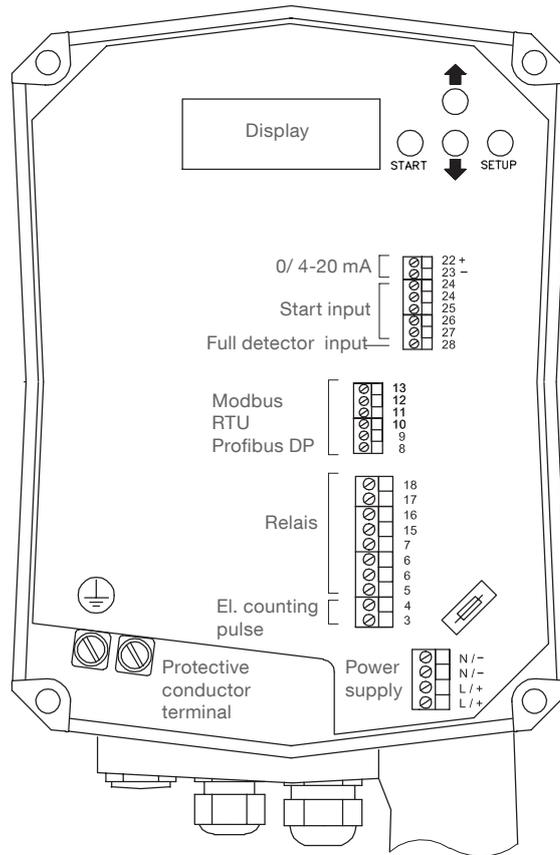
Interface measurement: Tape version

Weight ca. 2.1 kg (4.6 lbs)



Electrical installation

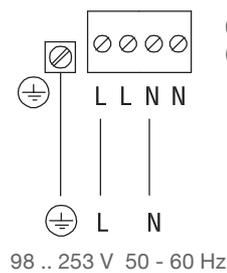
Terminal location



Power supply and Signal input/ output

Power supply

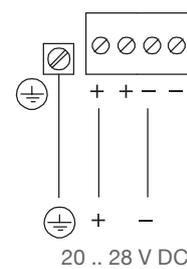
AC version



0.75 .. 2.5 mm²
(AWG 18 .. 13)

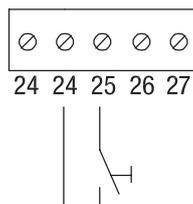
AC or DC supply
 depending on
 ordered version

DC version

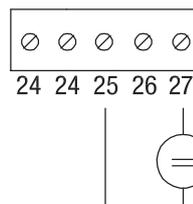


1.5 .. 2.5 mm²
(AWG 15 .. 13)

Signal input: Start of measurement

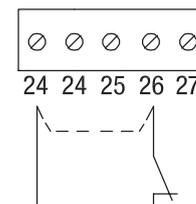


Start contact



Start +24 V

alternative

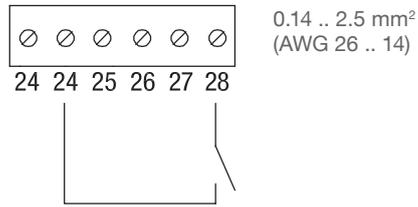


Measurement interruption in
 case of filling. If used, remove
 factory provided connection.

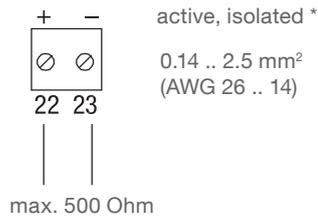
0.14 .. 2.5 mm²
(AWG 26 .. 14)

Electrical installation

Signal input:
Full detector

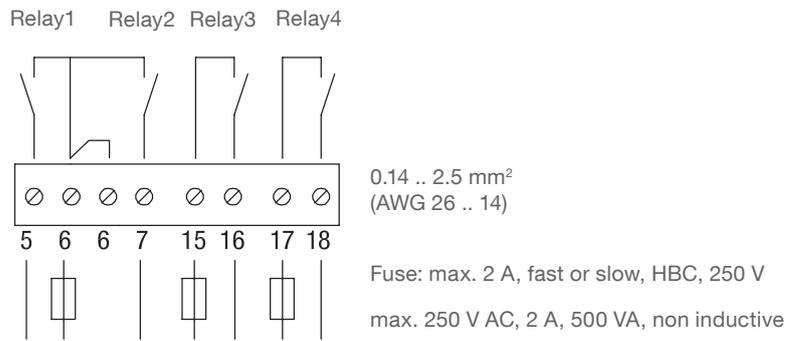


Signal output:
0/4-20 mA

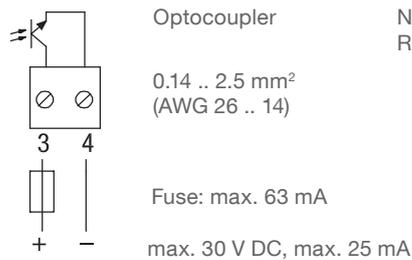


*** CAUTION:**
 If connecting to a PLC with isolated (floating) 4-20 mA input, the "-" line must be connected to ground of the PLC. See user manual of the PLC.

Signal output:
Relay



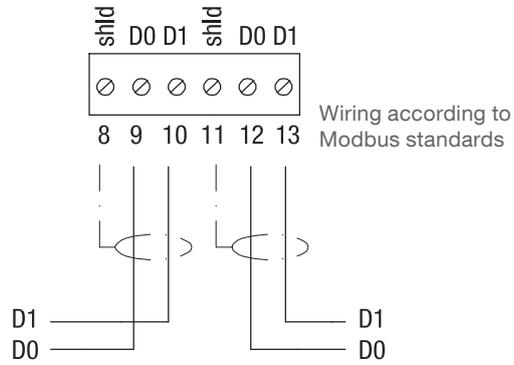
Signal output:
Electronic counting pulse



Note:
 Reset pulse is done with Relay 2

Electrical installation

Modbus network



Profibus DP network

