

# Microwave level measurement

continuous level measuring for bulk goods

# MWF 1

## Appliance information

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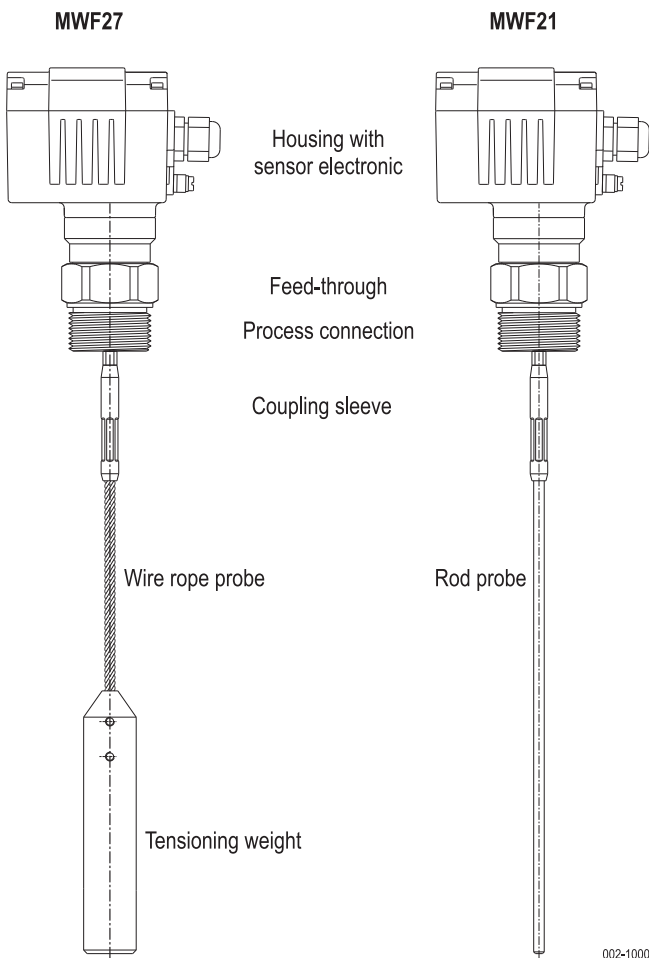
## 1 Application (Intended use)

Continuous level measurement with integrated limit level detection for almost all bulk goods.  
Independent from changing process characteristics as e.g. bulk density, conductivity, temperature, pressure, moisture and dusty milieu.  
Usable in small vessels just as in big silos, also with difficult vessel geometry or nearby disturbing appliances.

## Mode of operation

High-frequency electromagnetic impulses with low energy were generated by the sensor electronic and propagated along the probe. When these impulses hit the surface of the bulk goods, a part of the impulse energy will be reflected back up the probe to the electronic. The level will be calculated by the time difference between the impulses send and the impulses reflected and will be provided as a continuous measurement reading through its analogue output. A freely positionable switching output signal can be set.

## Construction



The **MWF** consists of three components:

- the housing with the sensor electronic,
- the process connection with the feed through,
- the probe mounted on the feed through

Three probe types are deliverable:

- **27** wire rope probe with tensioning weight for all silos and vessels
- **26** pendulum rod probe for small vessels with bulk goods which exert lateral forces at the probe
- **21** rod probe, rigid for small vessels and bulk goods which exert low lateral forces at the probe

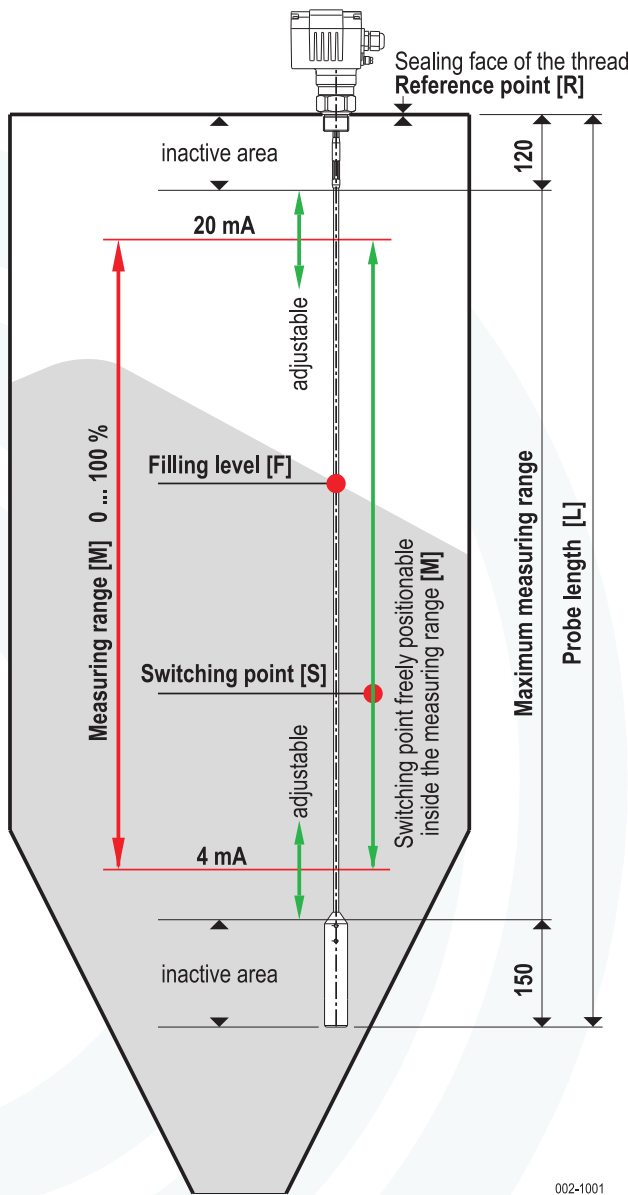
The high-frequency measuring signal will be transmitted by the sensor electronic through the feed-through to the probe in the bulk goods vessel and returned.

## Technical data

<b>Material</b>	Housing <b>A1</b>	Aluminium, coated RAL 7001
	Housing <b>A2</b>	Stainless steel 1.4408 / 316
<b>Material</b>	Feed-through	PEEK
<b>Material</b>	Process connection	Stainless steel 1.4571 / 316 Ti
<b>Material</b>	Coupling sleeve	Stainless steel 1.4571 / 316 Ti
	Rope	Stainless steel 1.4401 / 316
	Rod	Stainless steel 1.4571 / 316 Ti
	Tensioning weight	Stainless steel 1.4571 / 316 Ti
<b>Wire rope probe</b>		Ø 6 mm with tensioning weight Ø 30 mm
	Probe length [LS]	1.0 m ... 20.0 m
<b>Rod probe</b>		Ø 6 mm
	Probe length [LW]	0.5 m ... 3.0 m
<b>Tolerance of the lengthen [L]</b>		± 10 mm

## Electrical data

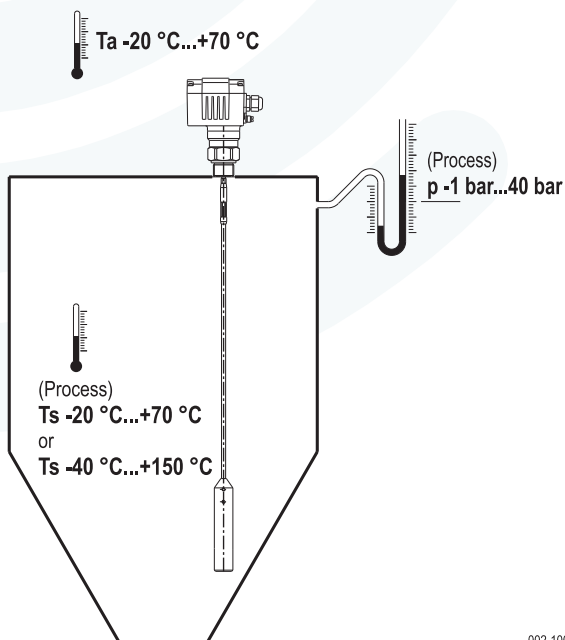
<b>Supply voltage</b>	<b>U<sub>N</sub></b>	12 ... 30 V DC (reverse-polarity protected)	<b>Supply</b>
<b>Analog output signal</b>	<b>I<sub>N</sub></b>	4 ... 20 mA (0 ... 100 %) active current output	<b>Output</b>
<b>Switching output</b>	<b>U<sub>s</sub></b>	0 ... U <sub>N</sub> DC PNP (active) NC or NO (selectable) Factory setting NC	<b>Contact</b>
	Load current	≤200 mA HIGH = U <sub>N</sub> - 2 V, LOW = 0 V ... 1 V	
<b>Power consumption</b>		<70 mA with 24 V DC (no burden)	
<b>Start-up time</b>		<6 sec	
<b>Response time</b>		<100 ms	
<b>Connection clamps</b>		0.5 - 2 mm <sup>2</sup> , screwless	
<b>Cable entry</b>		Cable gland M20x1.5	
<b>Protection class</b>		I ⊕	
<b>Type of protection</b>	<b>IP</b>	<b>IP66</b> and in the vessel intrinsically safe „ia“	



### Measuring data

		wire rope	rod
Inactive area	down	150 mm	80 mm
Inactive area	up	120 mm	120 mm
Measuring range (analog) [M]		4 mA lower current value 20 mA upper current value	
Factory setting 4 mA		above the bottom inactive area	
Factory setting 20 mA		depending on probe length: up to 3.0 m at <b>0.3 m</b> up to 5.0 m at <b>0.4 m</b> up to 10.0 m at <b>0.6 m</b> up to 15.0 m at <b>0.8 m</b> up to 20.0 m at <b>1.0 m</b> <b>beneath the reference point [R]</b> or depending on customers specification	
Switching point (digital) [S]		selectable within measuring range [M] of probe length [L] below [R]	
Factory setting	20%		
Measuring accuracy		±3 mm or max. 0.03 % of the measuring data	
Repeatability		<2 mm	
Resolution		<1 mm (at reference conditions)	
Temperature drift		<0.2 mm/K	
Measurable level changes		<1 m/s	

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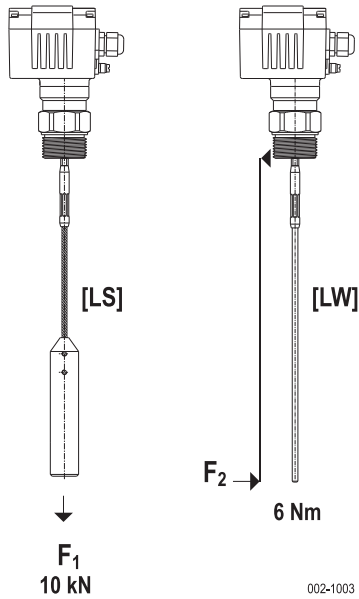


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### Application data

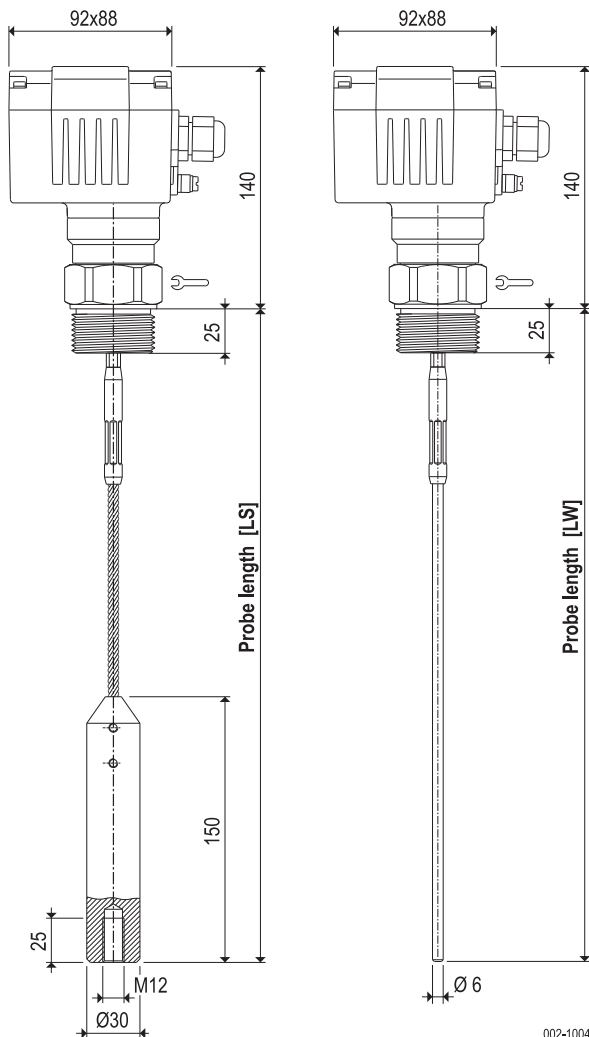
Dielectric constant	[εr]	>1.8	
Ambient temperature	Ta	-20 °C ... +70 °C	Tamb
Bulk goods temperature			
with order code E0	Ts	-20 °C ... +70 °C	T(Process)
with order code E1	Ts	-40 °C ... +150 °C	
Pressure in container	p	-1 bar ... 40 bar	p(Process)

**1 Maximum forces**



Wire rope probe [LS] maximum tractive force  $F_1 = 10 \text{ kN}$   
 Rod probe [LW] maximum side load  $F_2 \times LW = 6 \text{ Nm}$

**Dimensions**



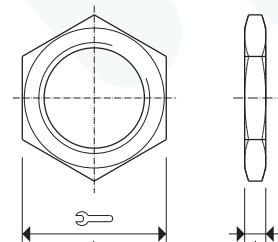
**Probe length**

Wire rope probe [LS] 1.0 m ... 20.0 m  
 Rod probe [LW] 0.5 m ... 3.0 m

**Process connection - thread**

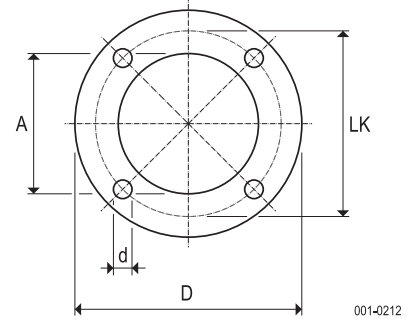
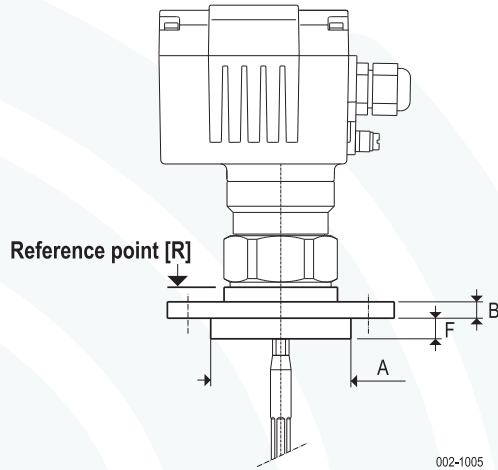
Thread code	Thread		
G1I	G1	46	} Delivery incl. Seals
G2I	G1¼	50	
G3I	G1½	55	

**Hexagonal nuts**



Art.-Nr.	Thread			for thread code
SM1E	G1	41	6	G1I
SM2E	G1¼	50	8	G2I
SM3E	G1½	55	8	G3I

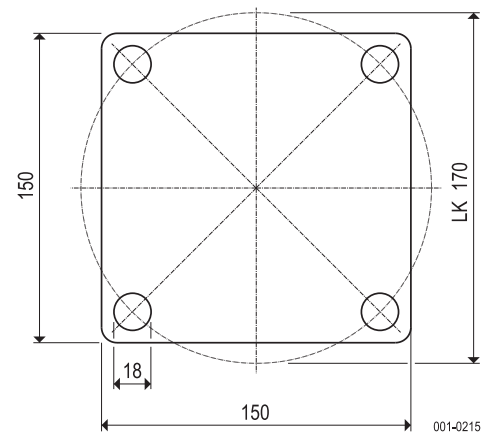
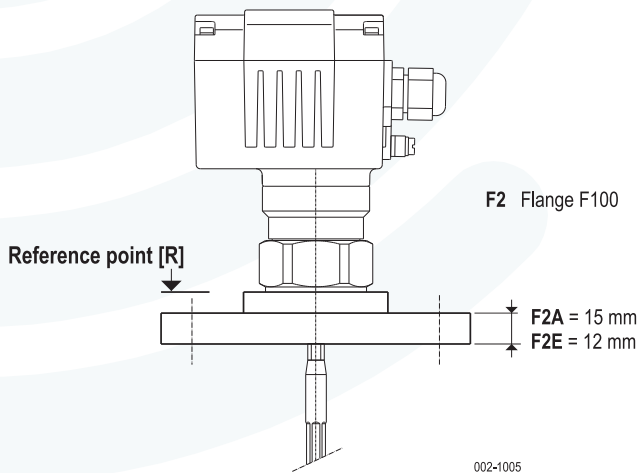
**Process connection - Flanges**



Flange	D	B	A	F	LK	d	Quantity
F1A F70	110	8	69	10	90	9	4
F1E F70	110	8	69	10	90	9	4
F5E DN32 PN10	140	16	78	2	100	18	4
F6E DN100 PN6	210	16		0	170	18	4
F7E DN100 PN16	220	20		0	180	18	8

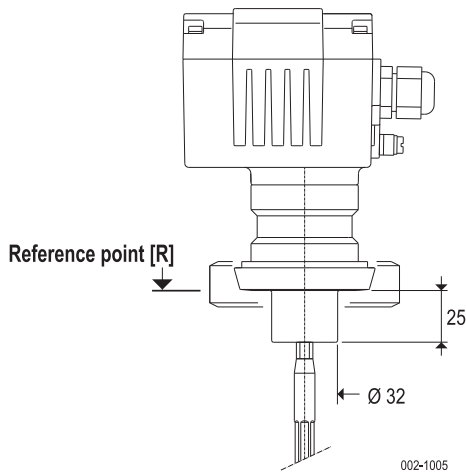
Delivery incl. Gaskets

**Process connection - Flange F2**



Delivery incl. Gaskets

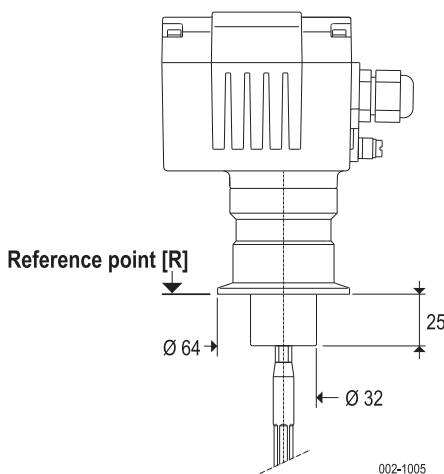
**1 Dairy coupling F42**



Level indicator with conical adapter and corresponding groove nut for dairy coupling.  
For installation of the level indicator into containers which must be cleaned for hygienic reasons, or for quick removal of the indicators when the vessels are changed.

<b>Coupling size</b>	Dairy coupling DN 50 / 2
<b>Material</b>	Conical adapter 1.4571 / 316 Ti Groove nut 1.4404 / 316 L
<b>Container pressure</b>	-0.9 bar ... 10 bar $p^{(Process)}$

**Clamp connection F46**

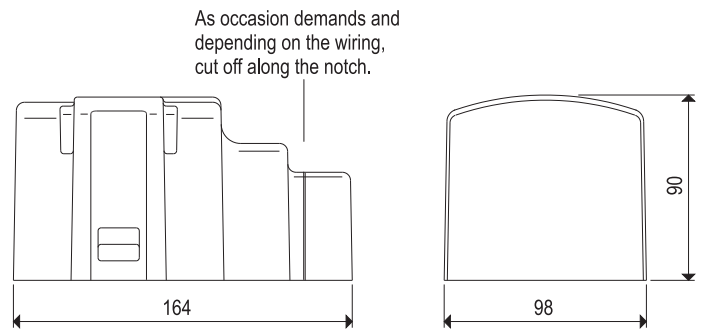
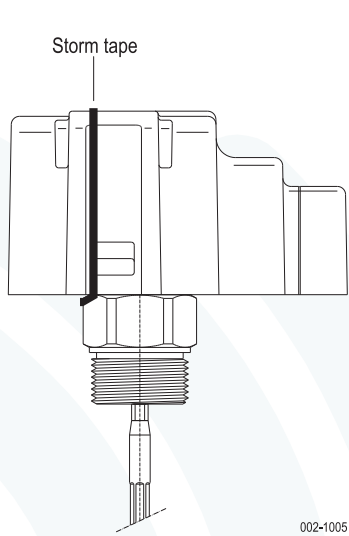


Level indicator with clamp connection.  
For installation of the level indicator into containers which must be cleaned for hygienic reasons, or for quick removal of the indicators when the vessels are changed.

<b>Clamp size</b>	DN 50 / 2
<b>Material</b>	1.4571 / 316 Ti
<b>Container pressure</b>	-0.9 bar ... 10 bar $p^{(Process)}$
<b>Clamp seal</b>	not in the delivery extent

The Technical Data presented here are to be considered as maximum values, relating only to the equipment described herein.  
Depending on the selection of options and instruments used, these data must be considered or reduced correspondingly.

## Weather protection hood DF-SH



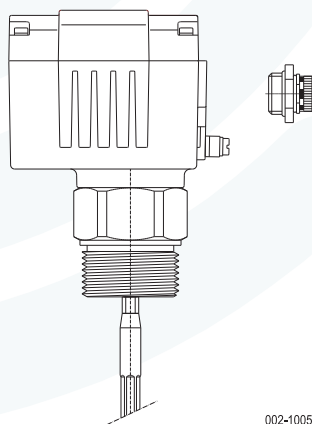
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Weather protection hood for outdoor use. Protection against control head overheating and prevents the inside of the housing from development of condensation.

**Materials**

Hood	PVC, RAL 7001
Storm tape	EDPM, weather-resisting

## Protection from condensation DF-SDK



Condensate protection valve for insertion into a threaded hole. A watertight but vapour-permeable membrane prevents condensate formation in the interior of the housing.

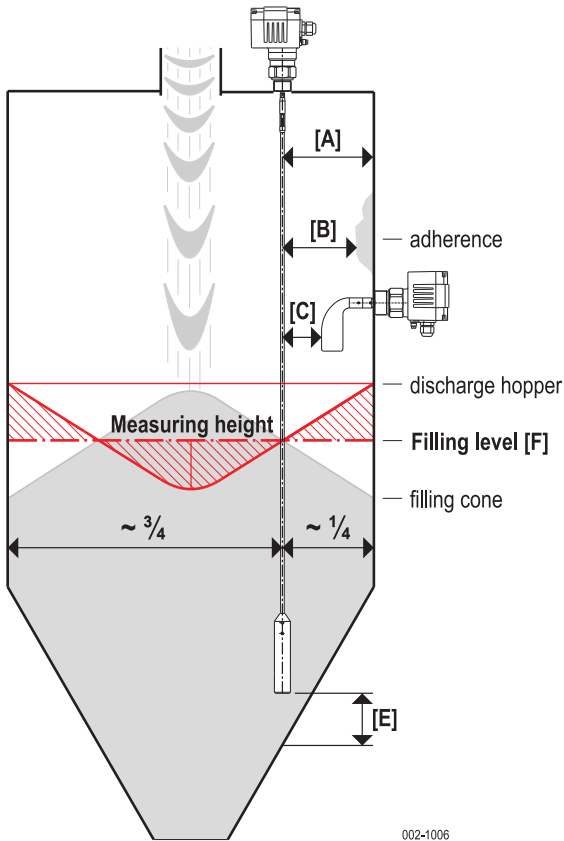
**Material**

	Polyamide
Sealings	VITON

**Connection thread** M20 and M12

**Type of protection** IP66

**1 Choice of mounting position**



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If possible place the probe so that a space remains:

- to plane metallic walls [A] >100 mm
- to concrete walls [A] >500 mm
- to adhesions on the wall [B] >100 mm
- to metallic installations [C] >300 mm
- to metallic parts outside of plastic containers [D] >300 mm
- to metallic hoppers and bottoms [E] >150 mm

The probe must not touch metallic walls and bottoms.

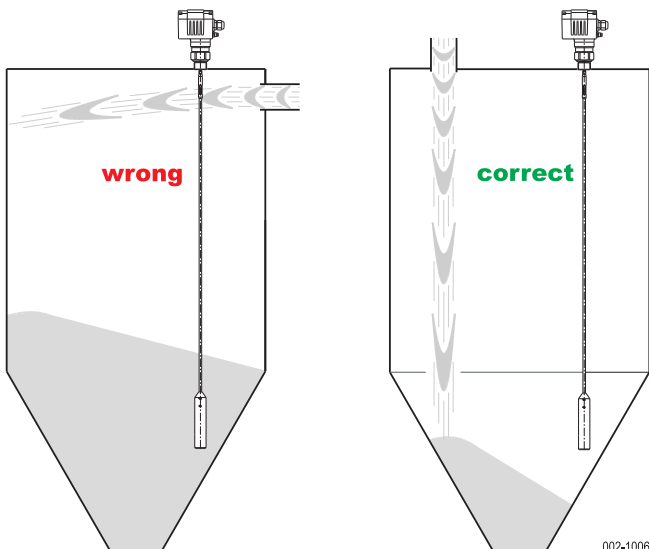
**Exception:** Probe will be fixed.

By spaces [C] [D] <300 mm  
a disturbance signal suppression has to be done.

**Filling level [F]**

If possible choose measuring height (mounting position) so ( $\sim 3/4$  to  $\sim 1/4$ ), that the proportion of volumes of the filling cone and the discharge hopper will be vaguely equalized.

**Protection from impacting bulk goods**

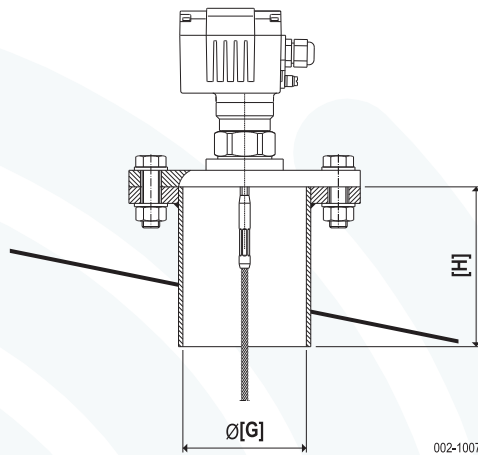


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Choose the mounting position in that way the probe will not be hit by the filling flow rate.



## Protruding nozzle



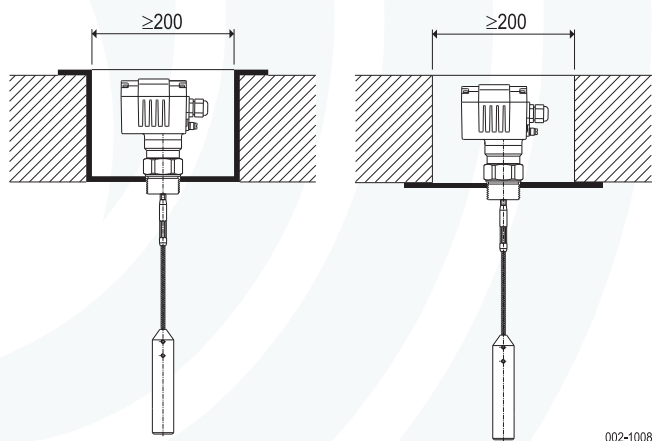
Protruding nozzle diameter [G] <150 mm

Protruding nozzle height [H] <150 mm

Larger heights and diameters will restrict the measuring capability in the local area.

By thermally insulated vessels the nozzle should be also insulated to avoid condensation.

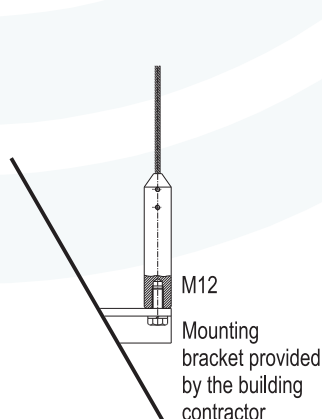
## Installation in silos made of concrete



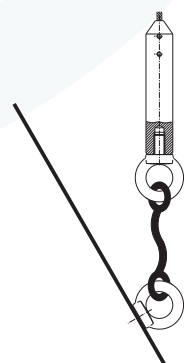
By mounting in a concrete floor the process connection should aligned with the bottom edge of the floor.

In concrete silos if possible a distance [A] of minimum 500 mm between concrete walls and the probe should be kept. Optimal is 1000 mm.

## Wire rope probe locate



reliable earthed fixation



reliable insulated fixation

Fixing of the probe can be necessary if:

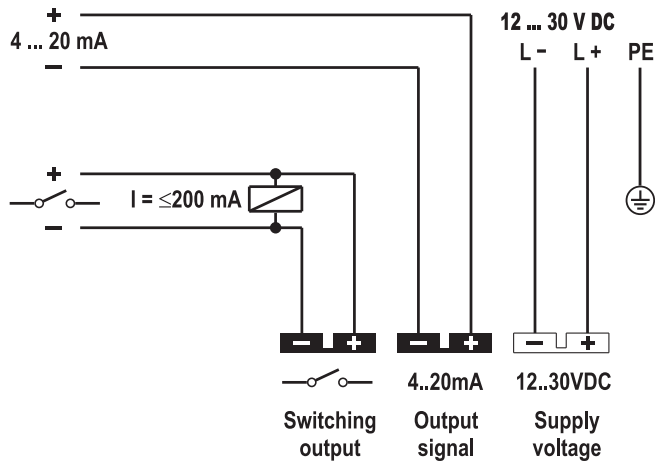
- vibrations can bring the probe to swing
- the probe touch at times the silo walls, the cone, installations or other metallic parts
- the probe is closer than 500 mm to a concrete wall

For fixation a thread M12 is provided in the lower end of the tensioning weight.

The probe should hang loose to avoid to high tension loading and the danger of rope break and

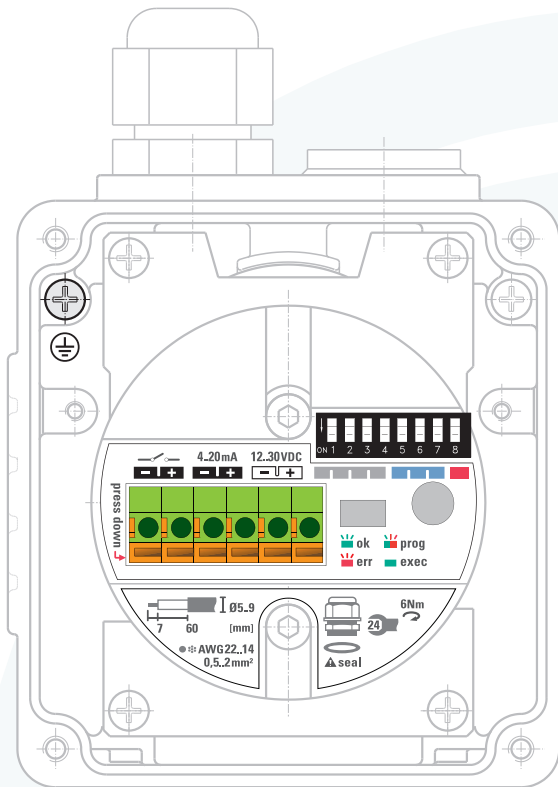
either reliable earthed or reliable insulated.

**1 Electrical connection**



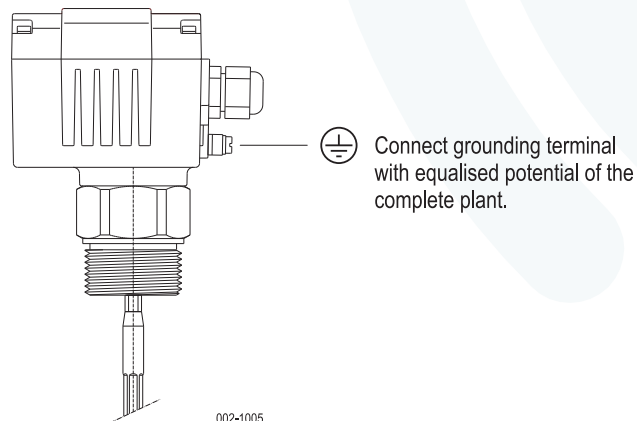
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**Connection picture**



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**Potential compensation**



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