

Microwave level measurement

continuous level measuring for bulk goods

MWF

Appliance information

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MOLLET measures filling level

ATEX option

B1 **Dust**  II 1/2D Ex ta[ia]/tb IIIC T86 °C

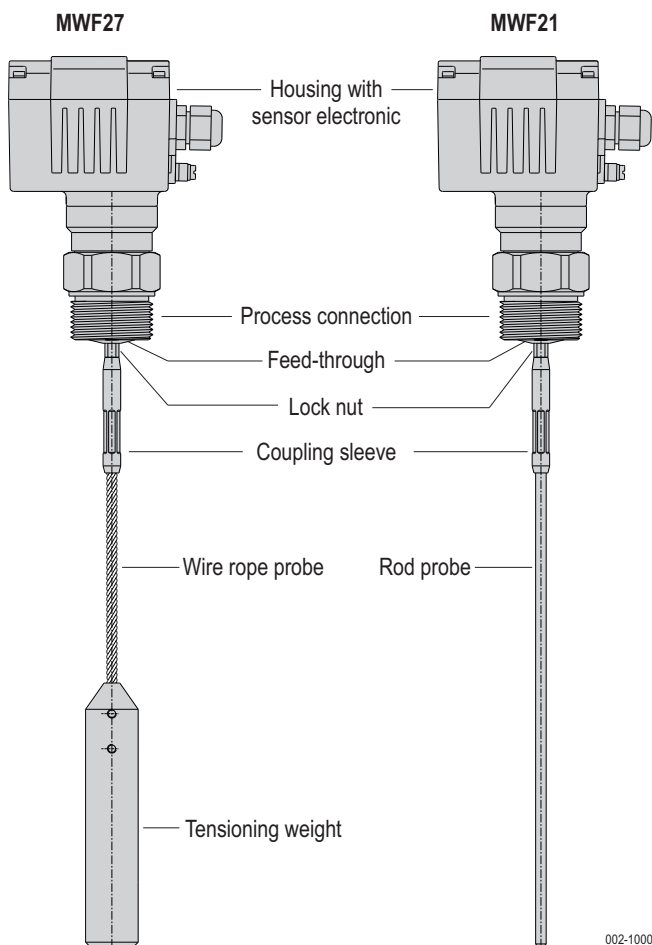
Application (Intended use)

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
- **21** rod probe, rigid for small vessels and bulk goods which exert low lateral forces at the probe

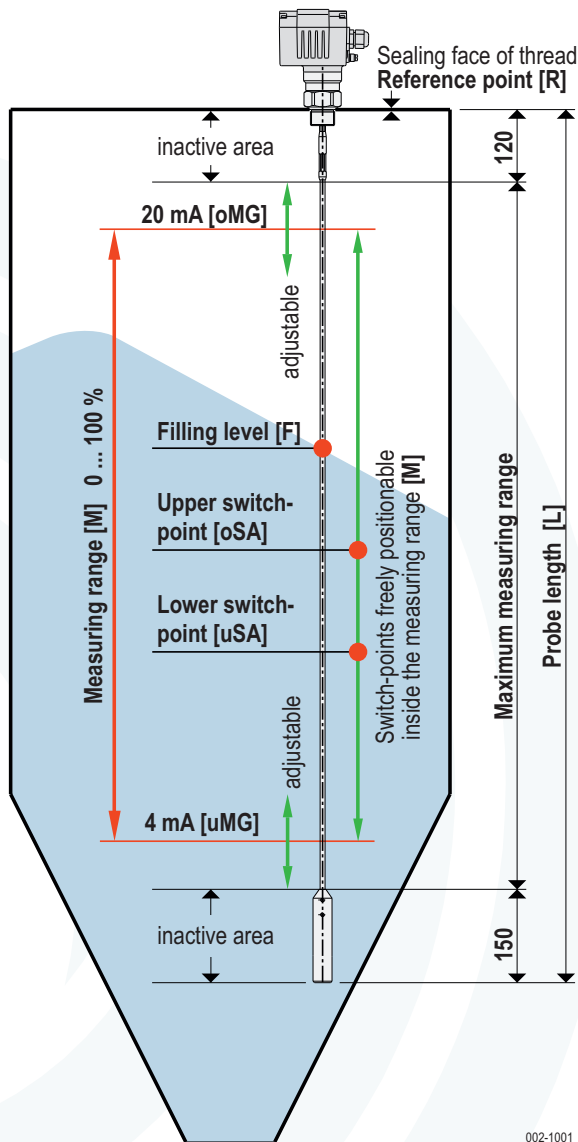
The high-frequency measuring signal will be transmitted by the sensor electronic through the feed-through to the probe in the bulk goods vessel and returned.

Technical data

Material	Housing A1	Aluminium, coated RAL 7001
	Housing A2	Stainless steel 1.4408 / 316
	Feed-through	PEEK
	Process connection	Stainless steel 1.4571 / 316 Ti
	Flange F1 F70	1.4571 / 316 Ti or aluminium
	Flange F2 F100	1.4301 / 304 or aluminium
	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
	Hexagonal nut	G3 1.4571 / 316 Ti or 1.4301 / 304
Wire rope probe		Ø 6 mm with tensioning weight Ø 30 mm
	Probe length [LS]	1.0 m ... 20.0 m
Rod probe		Ø 6 mm
	Probe length [LW]	0.5 m ... 3.0 m
Tolerance of the lengthen [L]		± 10 mm

Electrical data

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

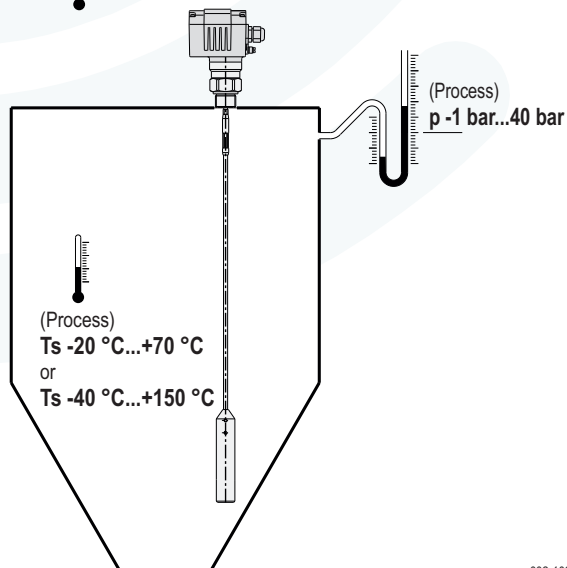


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Technical measuring data

Probe length	[L]	Reference point [R] to end of probe max. measuring range < probe length
Inactive area		wire rope rod
	below	150 mm 10 mm
	top	120 mm 120 mm
Measuring range (analog) [M]		4 mA lower current value [uMG] 20 mA upper current value [oMG]
Factory setting [uMG]	4 mA	Top edge tensioning weight
Factory setting [oMG]	20 mA	depending on probe length for bulk goods: up to 3.0 m at 0.3 m up to 5.0 m at 0.4 m up to 10.0 m at 0.6 m up to 15.0 m at 0.8 m up to 20.0 m at 1.0 m beneath reference point [R] or depending on customers request
Switch-points (digital)	[oSA] [uSA]	freely positionable inside measuring range [M] with switch-hysteresis - upper and lower switch-point freely selectable - minimum distance 3 mm Factory setting at 20% of probe length [L] below [R]
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 changes of filling level		<1 m/s

Ta -20 °C...+70 °C

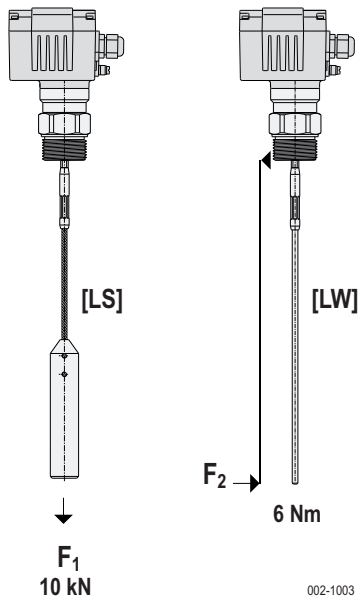


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Application data

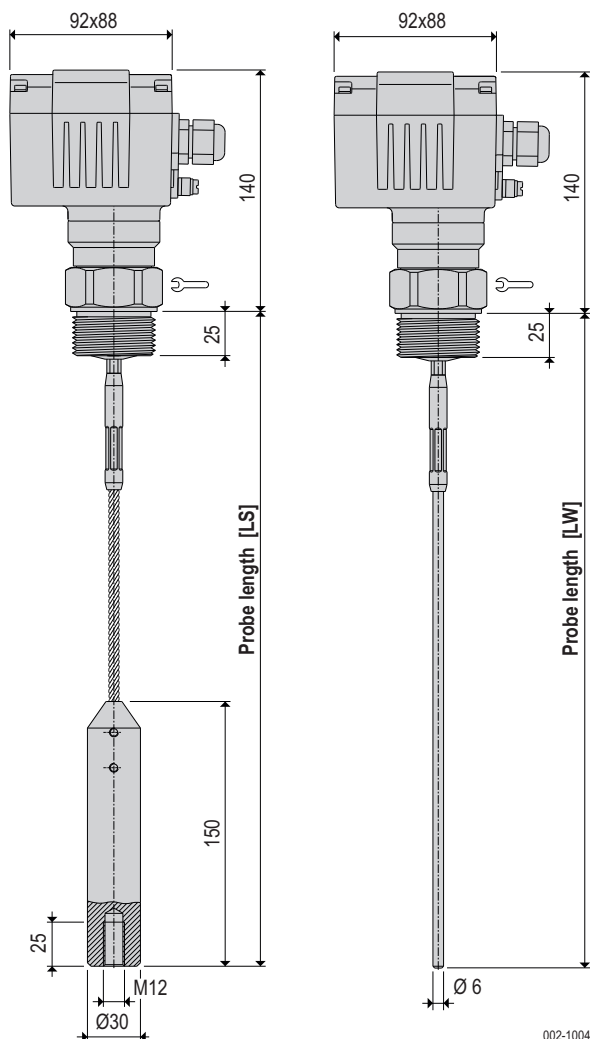
Dielectric constant	[εr]	>1.8 (below 1.8 on request)
Ambient temperature	Ta	-20 °C ... +70 °C Ta
Bulk goods temperature		
with order code E0	Ts	-20 °C ... +70 °C T(Process)
with order code E1	Ts	-40 °C ... +150 °C
Pressure in container	p	-1 bar ... 40 bar p(Process)

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



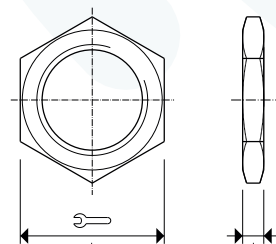
Probe length

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

Process connection - thread

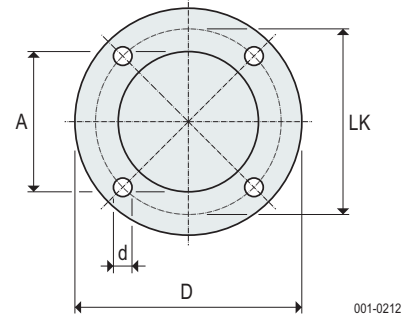
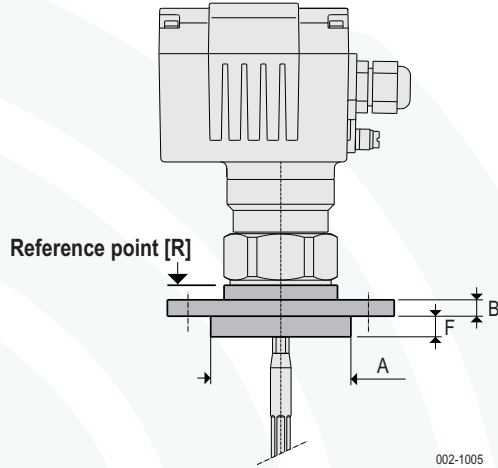
Thread code	Thread		} Delivery incl. Seals
G1I	G1	46	
G2I	G1¼	50	
G3I	G1½	55	

Hexagonal nuts



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

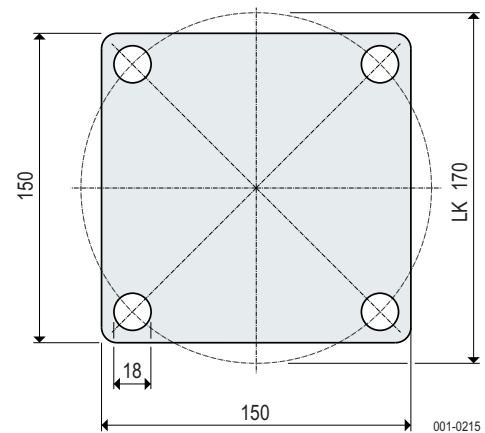
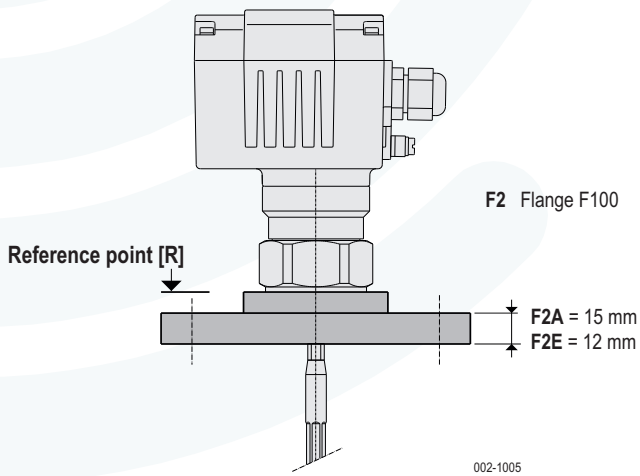
Process connection - Flanges



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

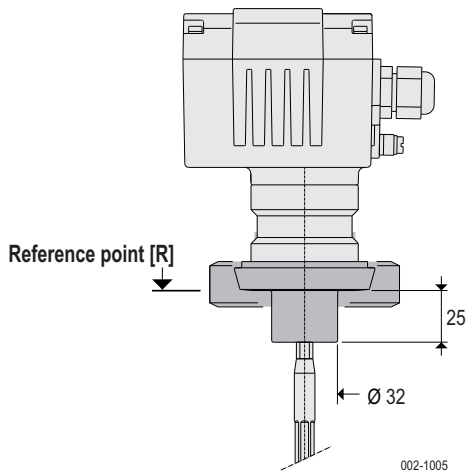
Delivery incl. Gaskets

Process connection - Flange F2



Delivery incl. Gaskets

Dairy coupling F42



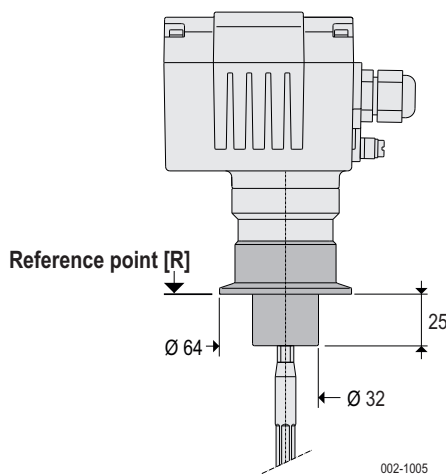
Level indicator with conical adapter and corresponding groove nut for dairy coupling.
For installation of the level indicator into containers which must be cleaned for hygienic reasons, or for quick removal of the indicators when the vessels are changed.

Coupling size Dairy coupling DN 50 / 2

Material Conical adapter 1.4571 / 316 Ti
Groove nut 1.4404 / 316 L

Container pressure -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.

Clamp size DN 50 / 2

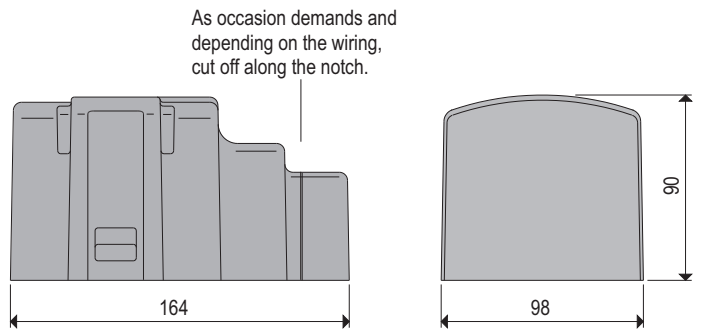
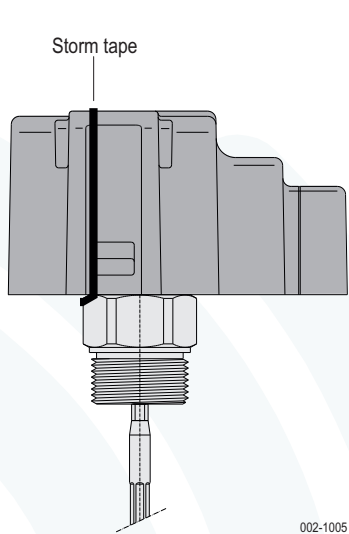
Material 1.4571 / 316 Ti

Container pressure -0.9 bar ... 10 bar $p^{(Process)}$

Clamp seal 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 SH



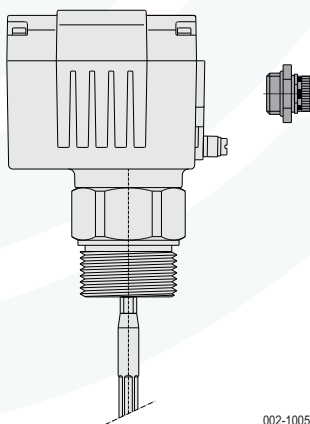
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Weather protection hood for outdoor use. Protection against control head overheating and prevents the inside of the housing from development of condensation.

Materials

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

Protection from condensation 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.

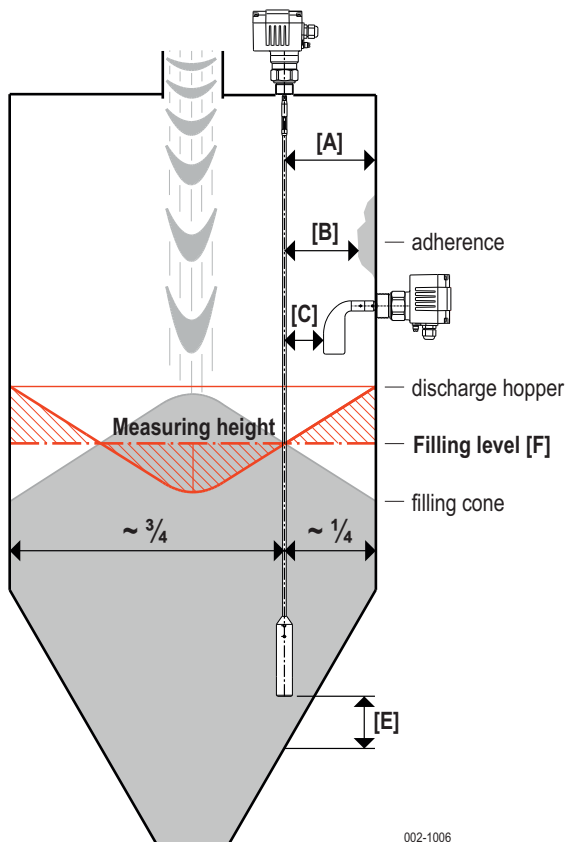
Material

	Polyamide
Sealings	VITON

Connection thread M20

Type of protection IP66

Choice of mounting position



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.

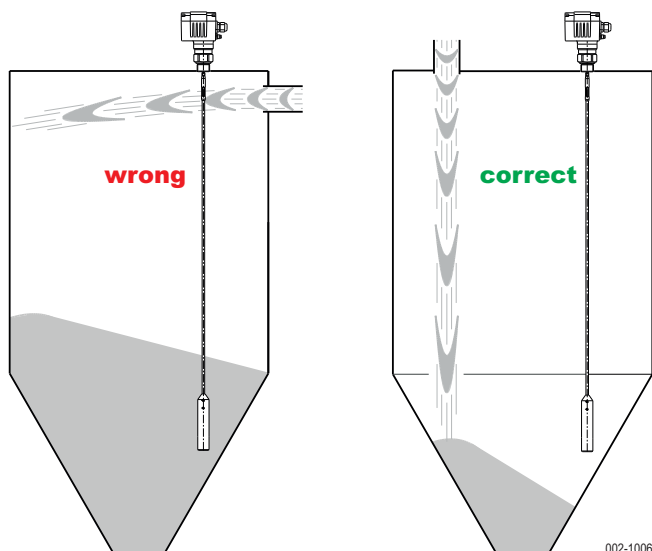
Exception: Probe will be fixed.

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

Filling level [F]

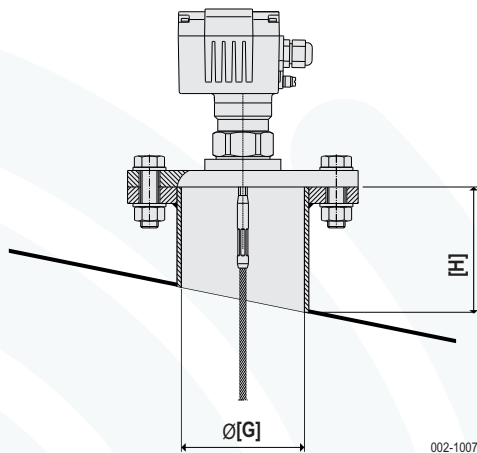
If possible choose measuring height (mounting position) so ($\sim 3/4$ to $\sim 1/4$), that the proportion of volumes of the filling cone and the discharge hopper will be vaguely equalized.

Protection from impacting bulk goods



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

Protruding nozzle



Protruding nozzle diameter [G] ≥ 100 mm

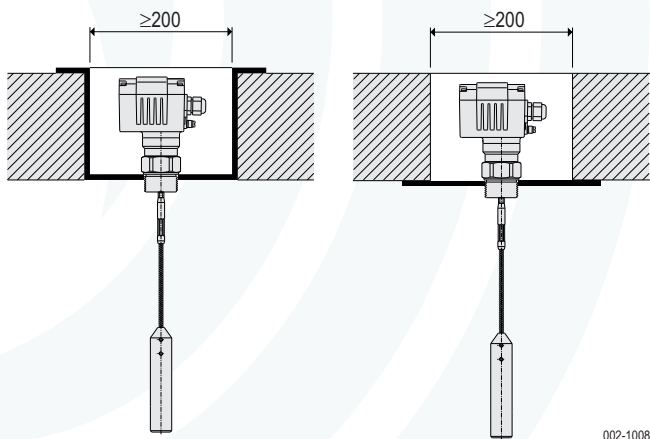
Protruding nozzle height [H] ≤ 200 mm

Smaller diameters and heights > 200 mm could restrict the measuring capability.

By use of thermally insulated vessels the nozzle should be also insulated in order to avoid condensation.

The protruding nozzle should be short and inside flush with the silo roof.

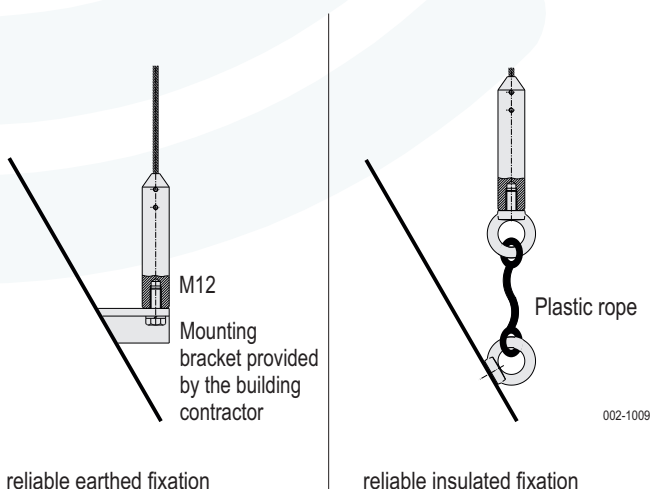
Installation in silos made of concrete



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:

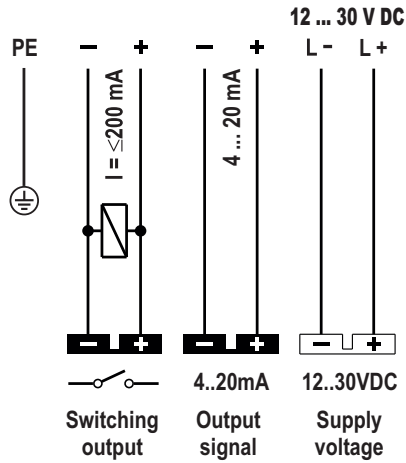
- vibrations can bring the probe to swing
- the probe touch at times the silo walls, the cone, installations or other metallic parts
- the probe is closer than 500 mm to a concrete wall

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

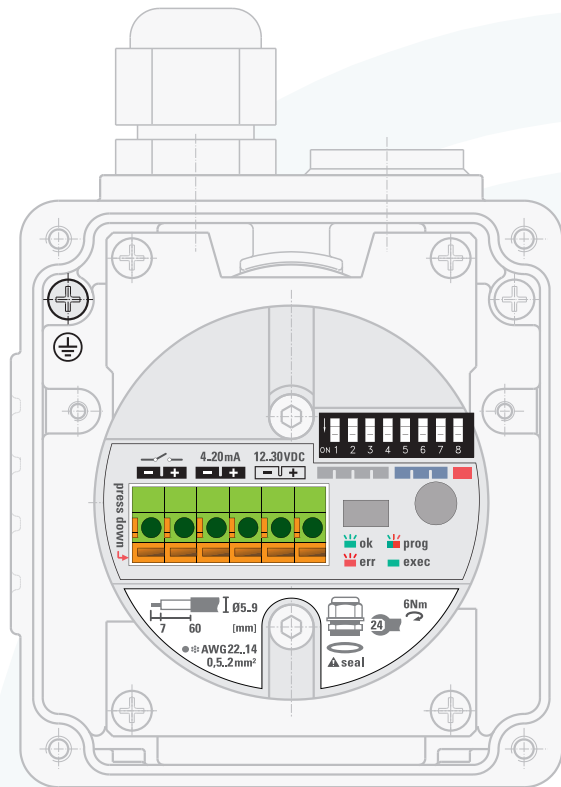
The probe should hang loose to avoid to high tension loading and the danger of rope break and

either reliable earthed or reliable insulated.

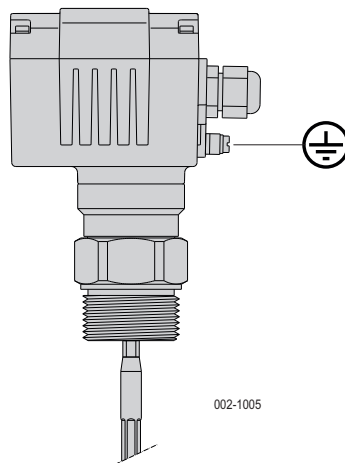
Electrical connection



Connection picture



Potential compensation



- Connect grounding terminal with equalised potential of the complete plant.
- Wire as short as possible
- Cable cross-section $\geq 2,5\text{ mm}^2$