

Microwave level measurement
continuous level measuring for bulk goods

MWF

Operating instruction

Index	Page
Safety instructions Special conditions for ATEX-devices Use	02
Data of manufacturer Receiving department Application Function Design	03
Technical data Electrical data Technical measuring data	04
Application data Dimensions Process connection Hexagonal nuts	05
Maximum forces Mounting position	06
Installation advices	07
Installation advices Preparation of mounting Mounting	08
Connection plan Switching sequence Electrical connection Potential compensation	09
Commissioning Maintenance Disposal	09
Troubleshooting Returns	10

- Please, read and obey these safety instructions and the complete operating manual.

1. Safety instructions

- 1.1 The installation, initial operation and maintenance must be done by a qualified expert with electrical know-how.
- 1.2 Check before installation whether the measuring device is in compliance with the specification of the point of measurement as process and ambient temperature as well as the measuring range.
- 1.3 Use in potentially explosive atmospheres only devices with  - identification marking.
- 1.4 For the electrical connection take notice of the local and statutory rules and regulations and/or the VDE 0100.
- 1.5 Consider the data of the name plate on the device.
- 1.6 A fuse (max. 4 A) has to be connected in series to the voltage supply.
- 1.7 Check the cable entry, cable gland and clamping nut, to see if they are sitting correctly and are sealed.
- 1.8 Put the device into operation only when the unit is closed and the cover sealing is intact.
- 1.9 The probe must not touch the wall, the bottom or other installations and may not come to the striking distance of them.
- 1.10 Changes and repairs of the device are allowed only in so far as it is permitted in the operating instructions.

-  Prior to the use of the device in potentially explosive atmospheres please, read and obey the

Special conditions and guidance for safe use

in the attached

Explosions protection information

and observe the operating instruction.

2. Use of the device

2.1 Intended use

- The device is used for continuous level measurement of bulk solids and liquids in silos and bins and tanks.

2.2 Normal operation

- Please operate the measuring device only according the intended use.
- Use the measuring device only within the specified temperature ranges for process and ambience.
- Protect the electronics compartment against pollution.
- In case the measuring device becomes damaged, please stop operation immediately.

2.3 Improper use

- Ignoring safety regulations and operating instruction.
- Operation of the measuring device in inappropriate use.
- Installation of spare parts that are no original parts.
- Removal, addition or modification of components as far as it is not described in the documentation of the manufacturer.
- Violation of applicable standards and laws.

3. Data of manufacturer

Manufacturer	MOLLET Füllstandtechnik GmbH
Address	Industriepark RIO 103 74706 Osterburken Germany
Name of part	MOLOS wave Microwave level measurement
Type	MWF2 ...

4. Receiving department

4.1 Receipt of goods

- Please check whether packaging or content are damaged.
- Please check whether the supplied goods are incomplete or do not comply the requirements as set out in your order.

4.2 Storage

- For storage and transportation the measuring device has to be packed shock-resistant.
- Store the device at a place protected against moisture and dust.
- Take care that the probe will not be bended.
- **Temperature range for storage** -40 °C ... +85 °C

5. Application

Continuous level measurement with integrated limit level detection for all bulk goods and liquids with a dielectric permittivity (DK value) of minimum 1.8.

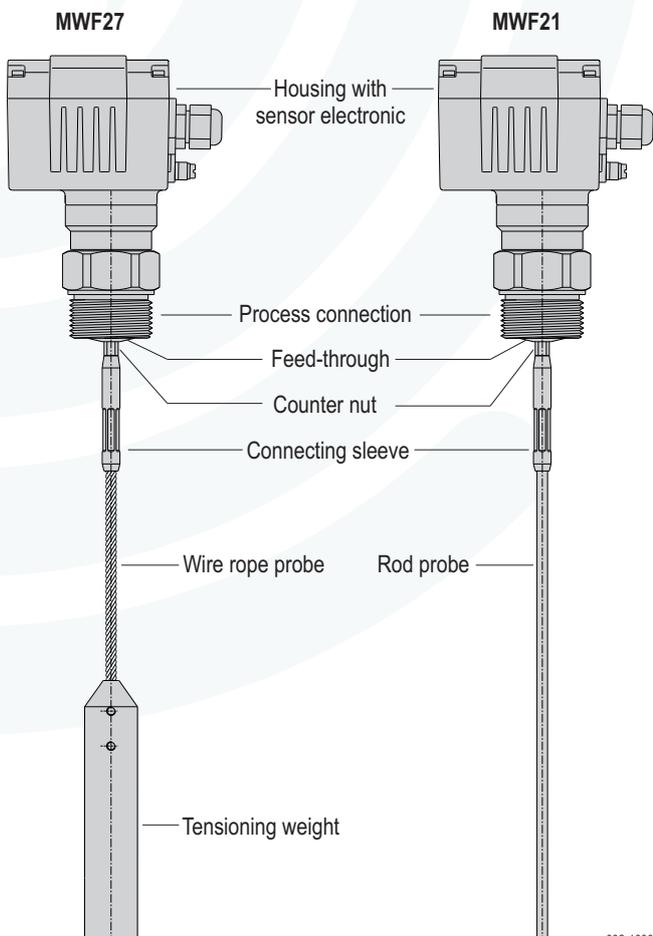
Independent from changing process characteristics as e.g. bulk density, conductivity, temperature, pressure, moisture and dusty milieu.

Usable in small vessels just as in big silos and tanks, also with difficult vessel geometry or nearby disturbing appliances.

6. Function

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 filling 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 sent and the impulses reflected and will be provided as a continuous measurement signal through its analogue output. A freely positionable switching output signal can be set.

7. Design



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.

Two probe types are deliverable:

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

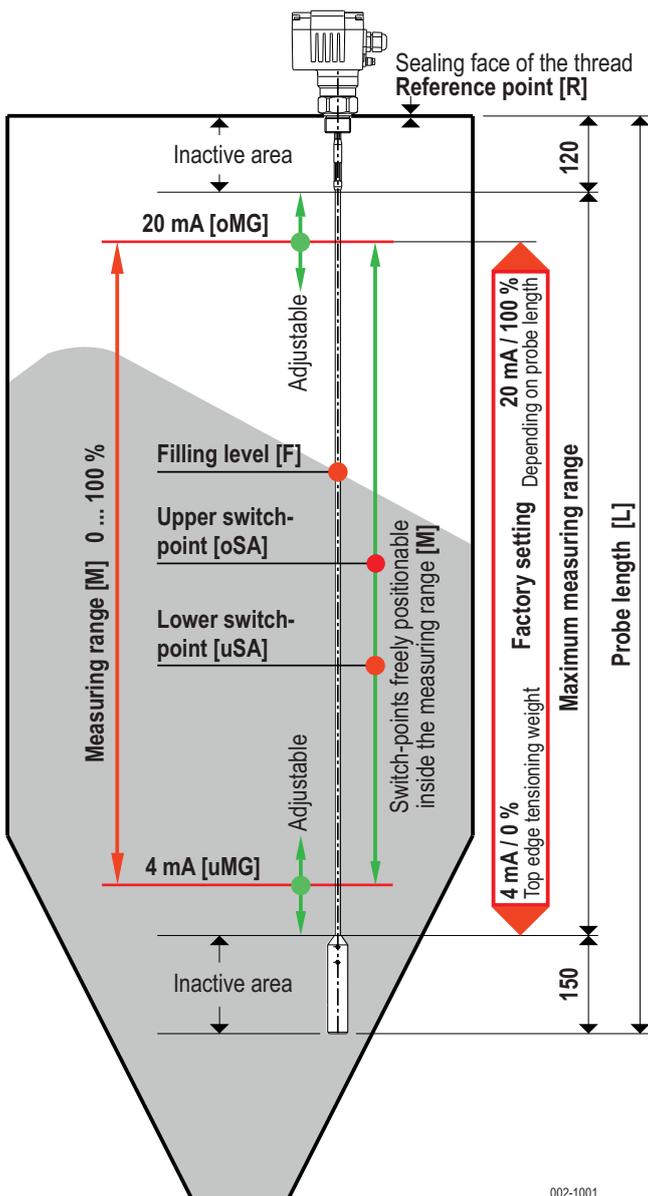
The high-frequency measuring signal will be transmitted by the sensor electronic through the feed-through to the probe in the vessel with the filling good and returned.

8. 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
Connecting sleeve	Stainless steel	1.4571 / 316 Ti
	Wire rope	Stainless steel 1.4401 / 316
	Rod	Stainless steel 1.4571 / 316 Ti
Tensioning weight	Stainless steel	1.4571 / 316 Ti
Hexagon nut	G3 stainless steel	1.4571 / 316 Ti else stainless steel 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 length	[L]	± 10 mm

9. Electrical data

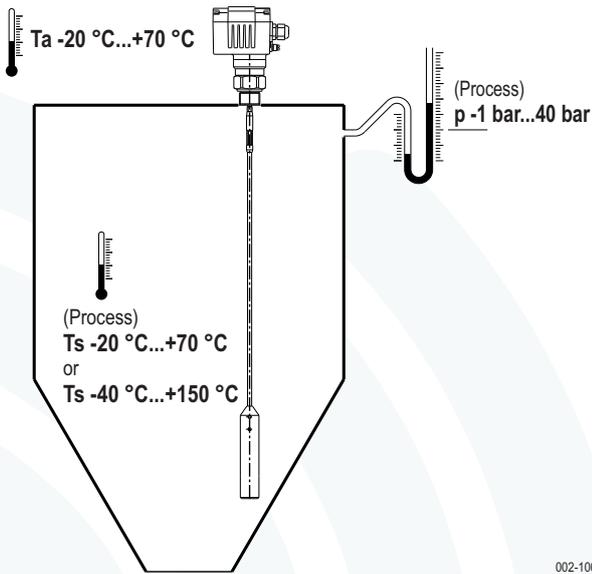
Supply voltage	U_N	12 ... 30 V DC (reverse-polarity protected)	Supply
Analog output signal (active)	I_N	4 ... 20 mA (0 ... 100 %)	Output
Switching output	U_S	0 ... U _N DC PNP (active) NC or NO (selectable) Factory setting NC	Contact
	Load current	<200 mA HIGH = U _N -2 V, LOW = 0 V ... 1 V	
Power consumption		<70 mA bei 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 vessel intrinsically safe „ia“	



10. Technical measuring data

Probe length	[L]	Reference point [R] to end of probe max. measuring range < probe length
Inactive area		wire rope rod
	down	150 mm 10 mm
	up	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 measured value
Repeatability		<2 mm
Resolution		<1 mm (at reference conditions)
Temperature drift		<0.2 mm/K
Measurable changes of filling level		<1 m/s

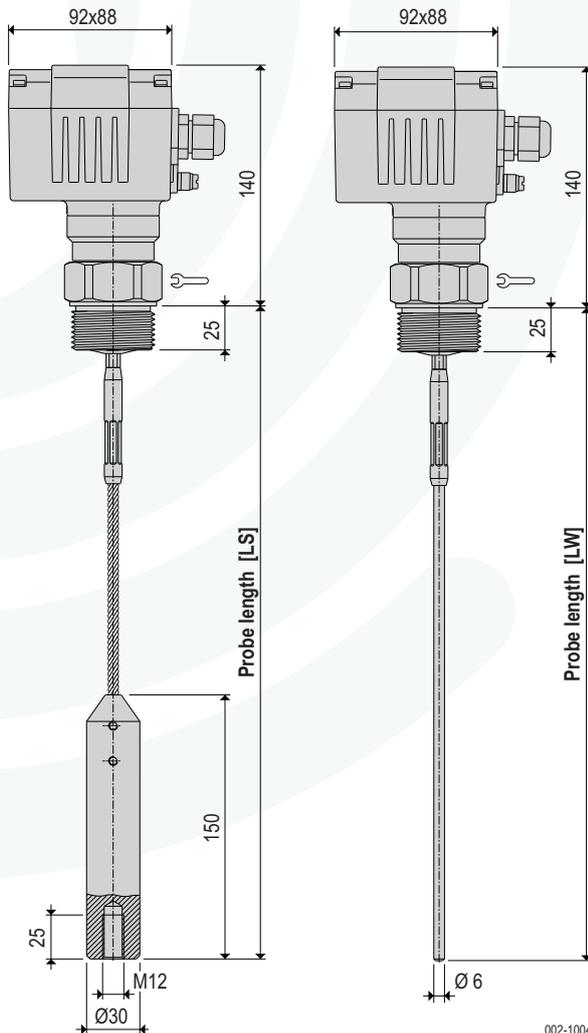
11. Application data



002-1002

Dielectric constant	[ϵ_r]	>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)

12. Dimensions



002-1004

Probe length

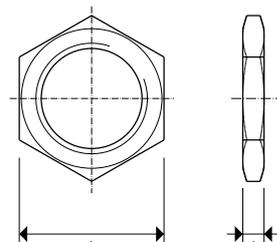
Wire rope probe [LS] 1.0 m ... 20.0 m

Rod probe [LW] 0.5 m ... 3.0 m

13. Process connection - thread

Thread code	Thread	Key	} Delivery including seals
G1I	G1	46	
G2I	G1¼	50	
G3I	G1½	55	

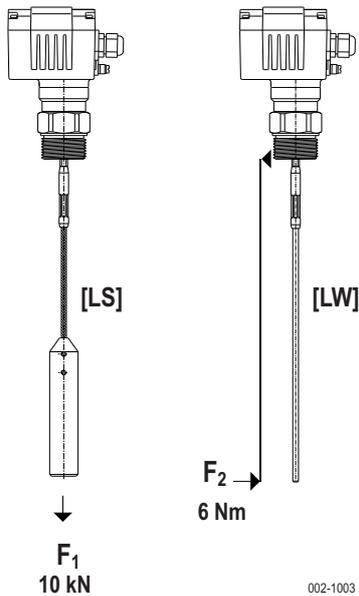
14. Hexagonal nuts



001-0150

Art.-No.	Thread	Width	Height	For thread code
SM1E	G1	41	6	G1I 1.4301
SM2E	G1¼	50	8	G2I 1.4301
SM3E	G1½	55	8	G3I 1.4301

15. Maximum forces



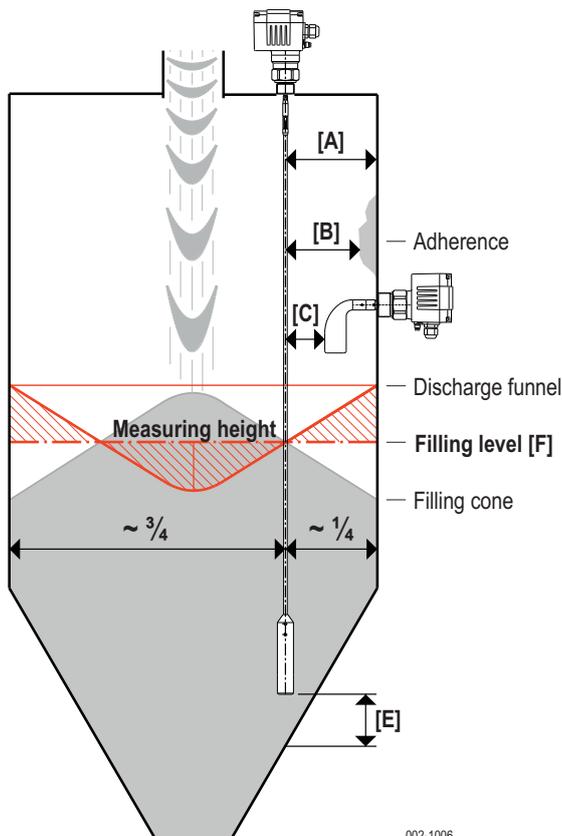
Wire rope probe [LS] maximum tractive force $F_1 = 10 \text{ kN}$

► **ATTENTION:**

In large silos a significant tractive force at the probe can be generated by the bulk goods. The roof of the silo has to withstand this force.

Rod probe [LW] maximum side load $F_2 \times LW = 6 \text{ Nm}$

16. Mounting position



Probe should be placed in such a way that distance 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.

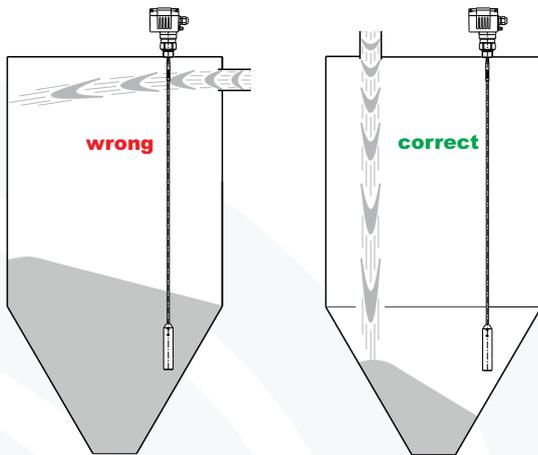
Exception: Probe will be fixed.

By distances [C] [D] <300 mm a disturbance signal suppression has to be done (see parameterisation manual: Disturbance signal scan).

Filling level [F]

Mounting position should be selected in such a way that the proportion of volumes of the filling cone and the discharge funnel will be vaguely equalized (~ 3/4 to ~ 1/4 of silo diameter).

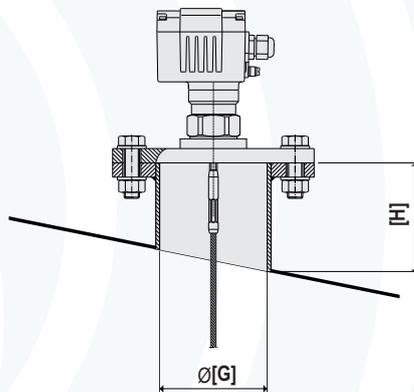
17. Installation advices



002-1006

Installation in consideration of filling

Choose the mounting position in such a way that the probe will not be touched by the filling stream.



002-1007

Installation with protruding nozzle

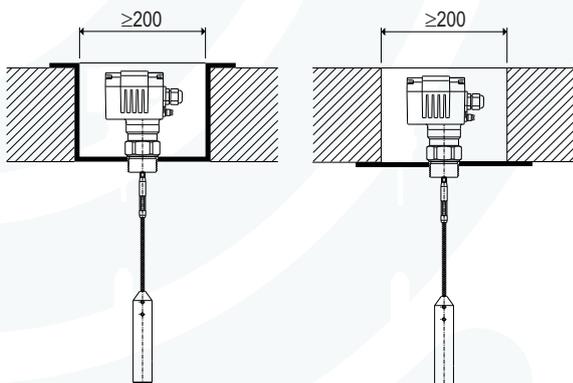
Protruding nozzle diameter $[G] \geq 100 \text{ mm}$

Protruding nozzle height $[H] \leq 200 \text{ mm}$

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.

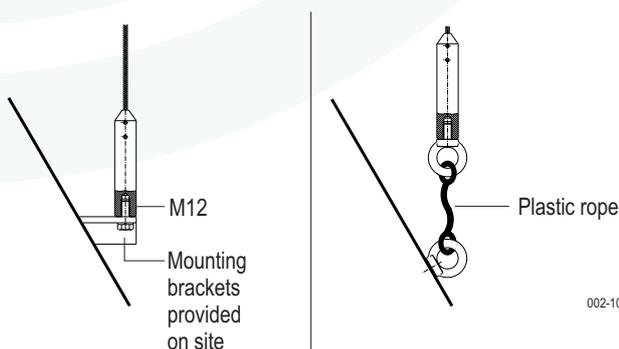


002-1008

Installation in silos made of concrete

In case of installation in a concrete floor the process connection should be flush with the bottom edge of the floor.

In silos made of concrete a minimum distance $[A]$ of 500 mm between the concrete wall and the probe should be kept. A distance of at least 1000 mm is recommended.



002-1009

Installation with fastened wire rope probe

Fixing of the wire rope probe could be necessary, when:

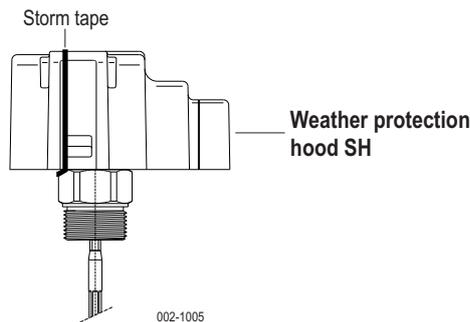
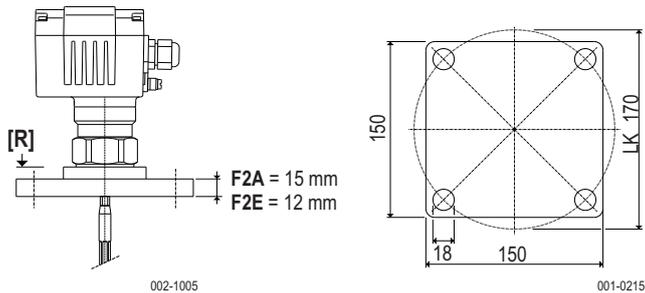
- rope starts swinging due to vibrations,
- wire rope probe touches sometimes the silo wall, the cone, internal installations or other metallic parts,
- wire rope probe gets closer than 500 mm to a concrete wall.

For fixing a thread M12 is provided at the bottom of the tensioning weight.

The rope must be loose in order to avoid a heavy tensile load and with it the danger of a rope breakage and

either reliably grounded or reliably isolated.

17. Installation advices



Mounting in open or non-metallic silos or bins

MWF requires for correct functioning a metallic plate at the process connection (near Reference point [R]).

Use for mounting in open or non-metallic silos or bins the flange F2 (F100) made of Aluminium or stainless steel.

Instead of the flange a metal sheet with $\varnothing > 150$ mm could be used as well.

The reference point [R] is located above the flange.

Protection against influence of weather

For protection against influence of weather the use of the weather protection hood SH is recommended. It protects the sensor electronic against overheating caused by direct solar radiation and avoids condensation inside of the housing.

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

18. Preparation of mounting

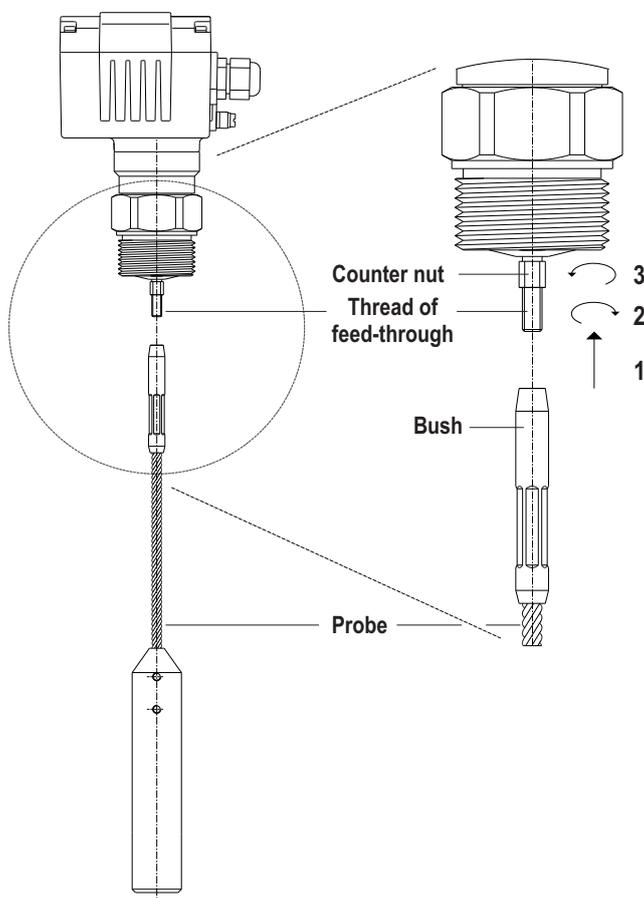
In most cases the MWF is delivered completely preassembled.

If the device should be delivered with a detached probe, it has to be attached at the thread of feed-through before mounting the device:

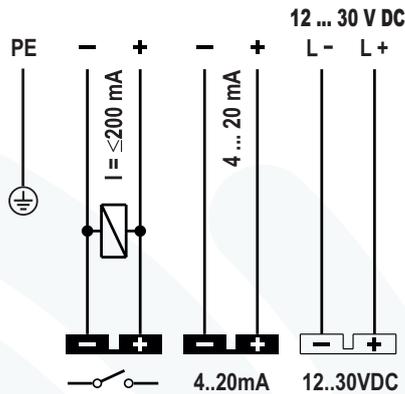
- 1 + 2 Screw the bush of the probe on the thread of the feed-through.
- 3 After the bush of the probe has been completely screwed, it has to be secured with the counter nut.
- Do not turn the counter nut against the plastic of the feed-through. This would result in permanently damaging of the sensor.
- Use for handling and wearing of the MWF the hexagon or the lower section of the housing.
- Do not lift or handle MWF by its probe.

19. Mounting

- Select the mounting position according to the guidelines in chapter 16 and consider the installation advices in chapter 17.
- MWF has to be mounted vertically into the silo or vessel.
- MWF has to be mounted into empty silos or vessels in order to make sure that wire rope probe hang vertically and don't knot.
- Seal the process connection professional. Consider the process conditions like e.g.: temperature, pressure and the characteristics of the process. For most applications a sealing ring is part of the shipment.
- Screw the MWF into a screw socket or a flange with internal thread.
- Do not screw in MWF by its housing. Use the hexagon at the process connection.

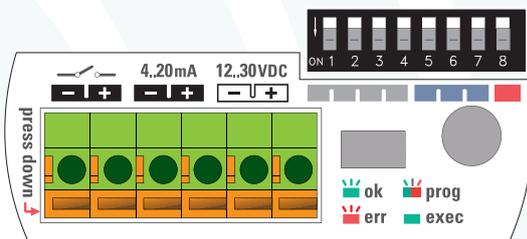


20. Connection plan

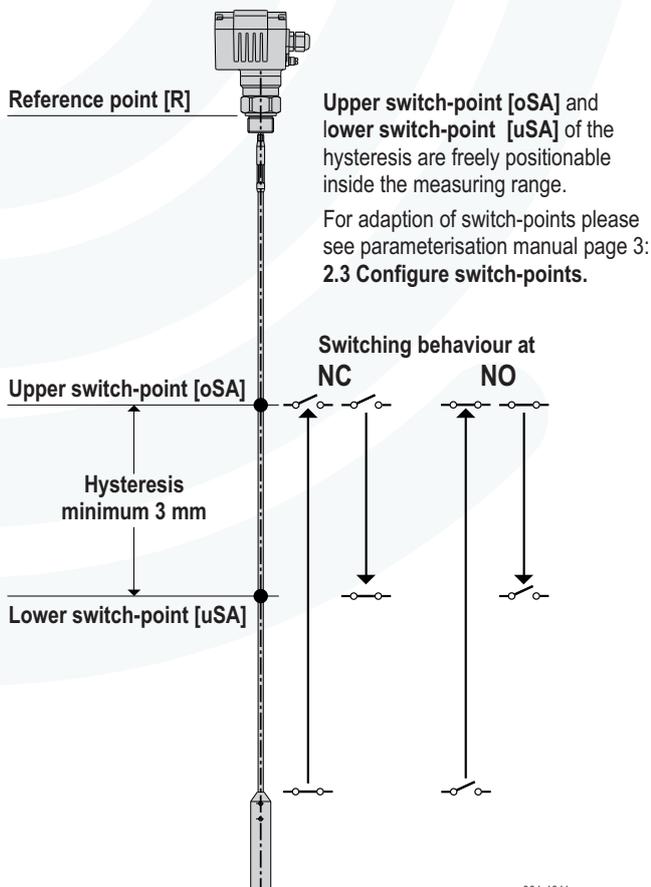


002-AP05

20.1 Connection drawing



21. Switching sequence



001-1011

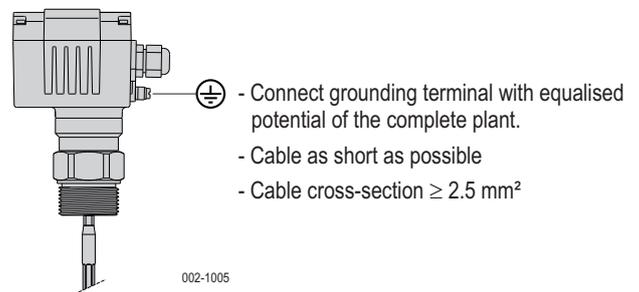
22. Electrical connection

- Connect the MWF appropriate the connection plan.
- Basic installation cable with solid or stranded wire is sufficient.
- Recommended are wire-end ferrules without plastic collar.

▶ ATTENTION:

- Separate supply and signal wire (4-wire-technology)
- Operation via display device with 2-wire-technology **not possible**

23. Potential compensation



002-1005

24. Commissioning

- Check the terminal assignments for correctness and the cable glands for tightness.
- Be aware of the duly fit of the housing cover.
- Switch on the power supply.
- **MWF is supplied ready for operation.** All required parameters are programmed with factory settings. (Adaption of parameters only by changed process conditions and after consulting MOLLET recommended)
- LED shines green and blinks after approx. 6 seconds.
- MWF is in measuring mode.

25. Maintenance

- Level measurement device **MWF** is maintenance-free in operation according the intended use.
- Check the condition of the probe at least once a year. It must not be cracked, twisted or disintegrated.

26. Disposal

- Level measurement device **MWF** can be recycled.
- Disposal of the MWF is subject to the environmental legislation of the respective country in effect for the operator's premises.

27. Troubleshooting

Diagnosis with LED	Potential cause of error	What must be done?
LED doesn't blink green	Wrong power supply	Check the power supply 12...30V DC , the correct polarity and the cable connection
	Reset of MWF necessary	Interrupt the power supply in order to restart the device If the LED is not blinking after the restart, please proceed with step 27.1
LED blinks green	DIP switch not in position 0	Put all DIP switch levers in the upper position off/0
	Analysis device or display shows no or wrong values	Measure current of the analogue output signal 4..20mA with a multimeter 1. If no current is measurable, interrupt the power supply in order to restart the device 2. If no current is measurable after the restart, please proceed with step 27.1 3. If the measured current correlates to the filling level (e.g. 12 mA at a filling height of 50 %), please check the analysis device, display or the connection
LED blinks green and the measured current doesn't correlate to the filling level	Probe touches silo wall, installed equipment or nozzle	Remove probe from silo wall, installed equipment or nozzle and make sure that the distance to them is sufficient
	Cornice near the probe	Remove cornice near the probe
	Bridges in the silo	Remove bridges in the silo and avoid bridge building
	Larger caking to the probe	Remove larger caking and clean the probe
	Probe buckled	Straighten the probe or renew it
	Probe released from the device	Install probe or renew it
	Tensioning weight released from the rope	Install tensioning weight or renew it
	Parameterisation not correct	Adapt parameterisation after consultation of MOLLET

27.1 If the malfunction persists, the MWF has to be returned to MOLLET for review of the device function.

28. Returns

28.1 Remove all adherent material residues of filling material from the MWF. Be aware of seal grooves and cracks where material residues could stick.

**In particular if the bulk goods or liquids has been dangerous to health,
e. g. flammable, toxic, caustic or cancer-producing.**

28.2 Furthermore please state:

- Chemical and physical characteristics of the the bulk goods or liquid
- Description of the application
- Description of the failure occurred
- Operating time of the MWF

EU-Konformitätserklärung EU-Declaration of Conformity

Wir/We

MOLLET Füllstandtechnik GmbH

Industriepark RIO 103
D-74706 Osterburken
Tel. 06291 64400 Fax 06291 9846

erklären in alleiniger Verantwortung, dass das Produkt:
declares under our sole responsibility, that the product:

Mikrowellen-Füllstandanzeiger / Microwave level indicator

TDR-Sensor zur kontinuierlichen Füllstandmessung / TDR sensor for continuous level measurement

Typ/Type **MWF ...**

den folgenden Europäischen Richtlinien entspricht:
conforms with the following European directives:

EMV-Richtlinie	EMC directive	2014/30/EU
Niederspannungsrichtlinie	Low voltage directive	2014/35/EU

Angewandte harmonisierte Normen oder normative Dokumente:
Applied harmonized standards or normative documents:

DIN EN 61326-1:2013	DIN EN 60529:2014
DIN EN 61010-1:2020	

Und die Geräte mit  - Kennzeichnung entsprechen zusätzlich der folgenden Europäischen Richtlinie:
And the devices with  - marking conform additional with the following European directive:

ATEX-Richtlinie	ATEX directive	2014/34/EU
------------------------	-----------------------	-------------------

Angewandte harmonisierte Normen oder normative Dokumente:
Applied harmonized standards or normative documents:

DIN EN IEC 60079-0:2019	DIN EN 60079-11:2012	DIN EN 60079-31:2014
--------------------------------	-----------------------------	-----------------------------

EU-Baumusterprüfbescheinigungsnummer:
EU-Type Examination Certificate: **IBExU11ATEX1108X**

Ausgestellt von: / Issued by: **IBExU Institut für Sicherheitstechnik GmbH, 09599 Freiberg (0637)**

Qualitätssicherung: / Quality assurance: **TÜV NORD CERT GmbH, 30159 Hannover (0044)**

Osterburken, den 03.03.2020



Wolfgang Hageleit
Geschäftsführer / Managing director

Diese Erklärung darf nur unverändert weiterverbreitet werden.
This declaration is only allowed to hand out in unchanged form.