



Microwave level measurement continuous level measuring for bulk goods

MWF

Operating instruction

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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 seat	
Name of part	MOLOSwave Microwave level measurement

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.





Technical data 8.

Material	Housing A1 Housing A2	Aluminium, coated RAL 7001 Stainless steel 1.4408 / 316	Supply voltage U _N	12 30 V DC (reverse-polar
	Feed-through	PEEK	Analog output signal (active) I_N	4 20 mA (0
	Process connection Flange F1 F70 Flange F2 F100	Stainless steel 1.4571 / 316 Ti 1.4571 / 316 Ti or Aluminium 1.4301 / 304 or Aluminium	Switching output U _S	0 U _N DC PNP (activ NC or NO (sel
	Connecting sleeve Wire rope Rod	Stainless steel 1.4571 / 316 Ti Stainless steel 1.4401 / 316 Stainless steel 1.4571 / 316 Ti	Load current	Factory setting <200 mA HIGH = U _N -2
	Tensioning weight Hexagon put	Stainless steel 1.4571 / 316 Ti G3 stainless steel 1.4571 / 316 Ti else	Power consumption	<70 mA bei 2
	noxugon nut	stainless steel 1.4301 / 304	Start-up time	<6 sec
Wire rope probe		Ø 6 mm with tensioning weight Ø 30 mm	Response time	<100 ms
	Probe length [LS]	1.0 m 20.0 m	Connection clamps	0.5 - 2 mm², s
Rod probe	Probe length [LW]	Ø 6 mm 0.5 m 3.0 m	Cable entry	Cable gland N
Tolerance of the lenghth [L]		± 10 mm	Protection class	I 🕀
		± 10 mm	Type of protection	IP66 and in ve

Electrical data 9.

Supply voltage U _N	12 30 V DC supply (reverse-polarity protected)
Analog output signal (active) I_N	4 20 mA (0 100 %) Outp^{ut}
Switching output U _S	0 U _N DC PNP (active) NC or NO (selectable) Factory satting NC
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"

Sealing face of the thread **Reference point [R]** Inactive area 120 ╈ 20 mA [oMG] Factory setting Depending on probe length Adjustable Filling level [F] 0 ... 100 % Maximum measuring range Upper switch-Probe length [L] Switch-points freely positionable inside the measuring range [M] point [oSA] Measuring range [M] Lower switchpoint [uSA] 4 mA / 0 % Top edge tensioning weight Adjustable 4 mA [uMG] X t 150 Inactive area 002-1001

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 [oSA] [uSA] (digital)	freely positionable inside measuring range [M] with switch-hysteresis - upper and lower switch-point freely selectable		
Factory setting	- minimum distance 3 mm 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		
Measureable changes of filling level	<1 m/s		



MWF



11. Application data



Dielectric constant	[Er] >1.8 (below 1.8 on request)		
Ambient temperature	Та	-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	((F 1 ²
Pressure in container	р	-1 bar 40 bar	P (Process)

12. Dimensions



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	হ	Λ
G1I	G1	46 \\	
G2I	G1¼	50	> Delivery including seals
G3I	G1½	55 /	

14. Hexagonal nuts







15. Maximum forces



Wire rope probe [LS] maximum tractive force $F_1 = 10$ 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 x LW = 6 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 adherences 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 bottom	s [E]	>150 mm.	
The probe must not touch meta E	allic walls an Exception:	d bottoms. 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 ($\sim \frac{3}{4}$ to $\sim \frac{1}{4}$ of silo diameter).





17. Installation advices







Installation in consideration of filling

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

Installation with protruding nozzle

Protruding nozzle diameter [G]	≥100 mm
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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

002-1007

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.

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 threat 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



Storm tape



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.



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 advises 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.



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20. Connection plan



20.1 Connection drawing



21. Switching sequence



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



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 disentangled.

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?	
	Wrong power supply	Check the power supply 1230V DC , the correct polarity and the cable connection	
LED doesn't blink green		Interrupt the power supply in order to restart the device	
	Reset of MWF necessary	If the LED is not blinking after the restart, please proceed with step 27.1	
	DIP switch not in position 0	Put all DIP switch levers in the upper position off/0	
		Measure current of the analogue output signal 420mA with a multimeter	
		1. If no current is measurable, interrupt the power supply in order to restart the device	
LED blinks green	Analysis device or display shows no or wrong values	 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	
	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	
LED blinks green and the measured current doesn't	Larger caking to the probe	Remove larger caking and clean the probe	
correlate to the filling level	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 G	imbH	
	Industriepark RIO 103 D-74706 Osterburken Tel. 06291 64400 Fax 06291 9846	6	
erklären in alleiniger Verantwortung, das declares under our sole responsibility, th	as das Produkt: at the product:		
Mikrowellen-Füllstandanzeige TDR-Sensor zur kontinuierlichen Füllsta	r / Microwave level indicator indmessung /TDR sensor for continuou	us level measurement	
Тур/Туре МWF			
den folgenden Europäischen Richtlinien conforms with the following European di	entspricht: rectives:		
EMV-Richtlinie Niederspannungsrichtlinie	EMC directive Low voltage directive	2014/30/EU 2014/35/EU	
Angewandte harmonisierte Normen ode Applied harmonized standards or norma	er normative Dokumente: tive documents:		
DIN EN 61326-1:2013 DIN EN 61010-1:2020	DIN EN 60529:2014		
Und die Geräte mit 🐵 - Kennzeichnung And the devices with 🐵 - marking confo	gentsprechen zusätzlich der folgenden orm additional with the following Europe	Europäischen Richtlinie:	
ATEX-Richtlinie	ATEX directive	2014/34/EU	
Angewandte harmonisierte Normen ode Applied harmonized standards or norma	er normative Dokumente: tive documents:		
DIN EN IEC 60079-0:2019	DIN EN 60079-11:2012	DIN EN 60079-31:2014	
EG-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 Har	nnover (0044)	
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