



Level



Pressure



Flow



Temperature

Liquid
Analysis

Registration

Systems
Components

Services



Solutions

Technical Information

Micropilot M FMR230/231/240/244/245

Level-Radar

Continuous and non-contact level measurement.

Cost-effective 4 to 20 mA 2-wire technology.

Suitable for hazardous locations.



Application

The Micropilot M is used for continuous, non-contact level measurement of liquids, pastes, slurries, and solids. The measurement is not affected by changing media, temperature changes, gas blankets or vapors.

- The FMR230 is especially suited for measurement in buffer and process tanks.
- The FMR231 has its strengths wherever high chemical compatibility is required.
- The FMR240 with the small 40 mm (1½") horn antenna is ideally suited for small vessels. Additionally, it provides an accuracy of ± 3 mm (0.12 in).
- The FMR244 combines the advantages of the horn antenna with high chemical resistance. The 80 mm (3") horn antenna is used additionally in solids.
- The FMR245 - highly resistant up to 200 °C (392 °F) and easy to clean.

Your benefits

- 2-wire technology, low price:
A real alternative to differential pressure, floats and displacers. 2-wire technology reduces wiring costs and allows easy implementation into existing systems.
- Non-contact measurement:
Measurement is almost independent from product properties.

- Easy on-site operation via menu-driven alphanumeric display.
- Easy commissioning, documentation and diagnostics via Endress+Hauser operating software.
- 2 frequency ranges - FMR230/FMR231 in the C-band and FMR240/244/245 in the K-band: No compromises, the right frequency for every application.
- HART or PROFIBUS PA respectively FOUNDATION Fieldbus protocol.
- High temperatures: Suitable for process temperatures up to 200 °C (392 °F), up to 400 °C (752 °F) with high-temperature antenna.
- Rod antenna with inactive length:
Reliable measurement in narrow nozzles, with condensation and build-up in the nozzle.
- Used for level monitoring (MIN, MAX) up to SIL 2 as per IEC 61508 / IEC 61511.
- Gas-tight feedthrough to improve the process safety for FMR230 standard, for FMR231/240/245 optionally.

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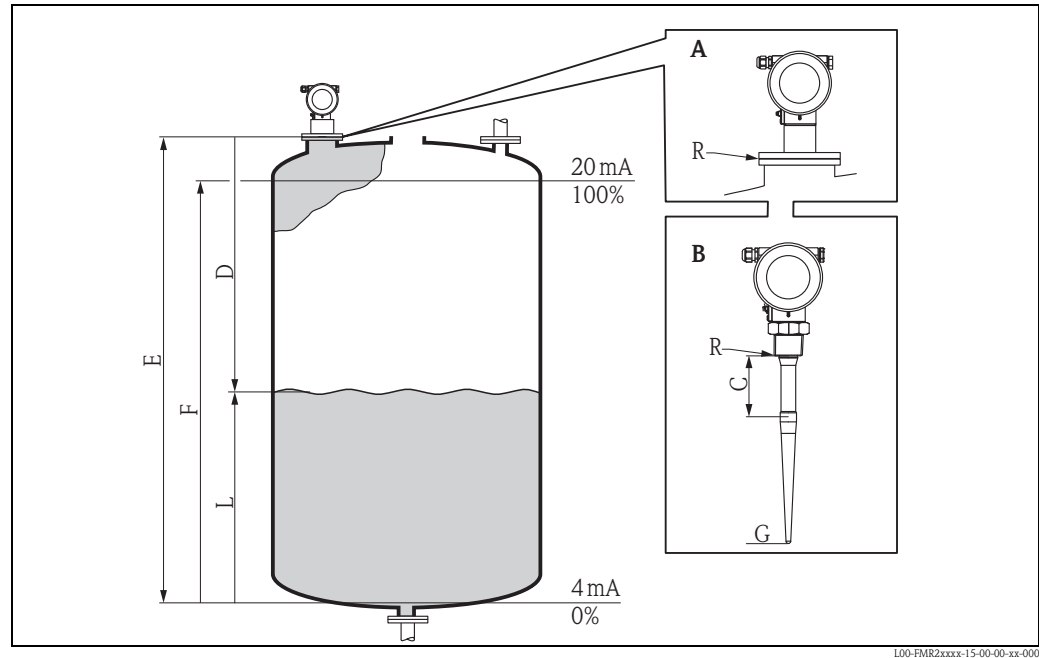
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Function and system design

Measuring principle

The Micropilot is a "downward-looking" measuring system, operating based on the time-of-flight method. It measures the distance from the reference point (process connection) to the product surface. Radar impulses are emitted by an antenna, reflected off the product surface and received again by the radar system.



A Flange version
C Inactive length
R Reference point

B Threaded connection $R1\frac{1}{2}$ ", $1\frac{1}{2}$ " NPT
G Max. level

100-FMR2xxxx-15-00-00-xx-000

Input

The reflected radar impulses are received by the antenna and transmitted into the electronics. A microprocessor evaluates the signal and identifies the level echo caused by the reflection of the radar impulse at the product surface. The unambiguous signal identification is accomplished by the PulseMaster® eXact software, based on many years of experience with time-of-flight technology.

The distance "D" to the product surface is proportional to the time of flight "t" of the impulse:

$$D = c \cdot t / 2,$$

with "c" being the speed of light.

Based on the known empty distance "E", the level "L" is calculated:

$$L = E - D$$

Refer to the above figure for the reference point for "E".

The Micropilot is equipped with functions to suppress interference echoes. The user can activate these functions. They ensure that interference echoes (i.e. from edges and weld seams) are not interpreted as level echo.

Output

The Micropilot is commissioned by entering an empty distance "E" (=zero), a full distance "F" (=span) and an application parameter. The application parameter automatically adapts the device to the process conditions. For models with a current output, the factory adjustment for zero point "E" and span "F" is 4 mA and 20 mA. For digital outputs and the display module, the factory adjustment for zero point "E" and span "F" is 0% and 100%. A linearization with max. 32 points, based on a table entered either manually or semi-automatically, can be activated locally or remotely. This function provides a measurement in engineering units and a linear output signal for spheres, horizontal cylindrical tanks and vessels with conical outlet.

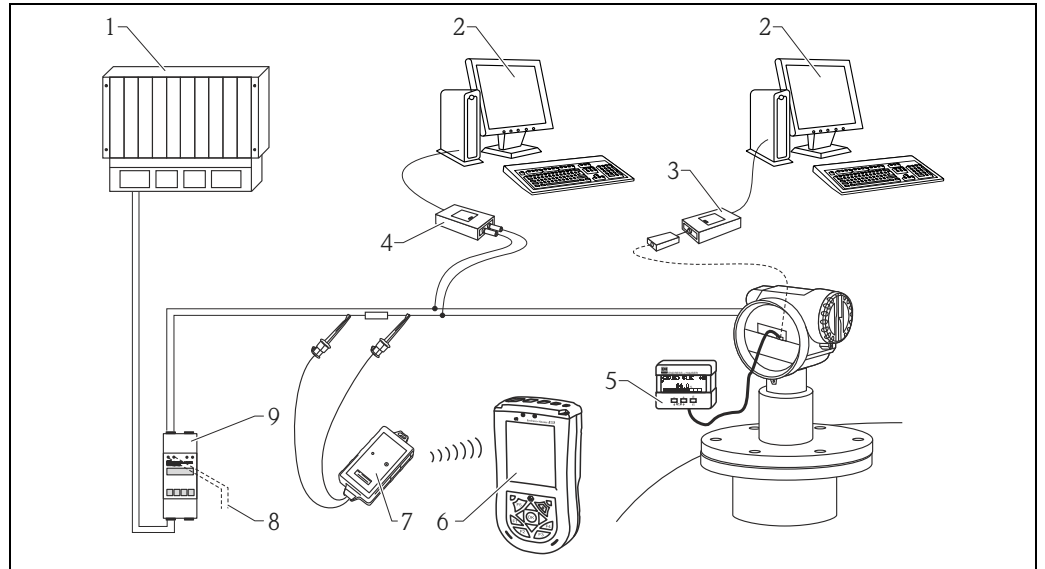
Equipment architecture

Stand-alone

The Micropilot M can be used for measurement in a stilling well / bypass as well as in free space. The device provides a 4 to 20 mA output with HART protocol, or PROFIBUS PA respectively FOUNDATION Fieldbus communication.

4 to 20 mA output with HART protocol.

The complete measuring system consists of:



- | | | | |
|---|---|---|--|
| 1 | PLC | 6 | Field Xpert SFX100 |
| 2 | FieldCare | 7 | VIATOR Bluetooth modem with connecting cable |
| 3 | Commubox FXA195 with ToF Adapter FXA291 | 8 | Connection for Commubox FXA195 |
| 4 | Commubox FXA195 | 9 | Transmitter power supply unit RMA422 or RN221N (communication resistor included) |
| 5 | Operating and display module | | |

On-site operation

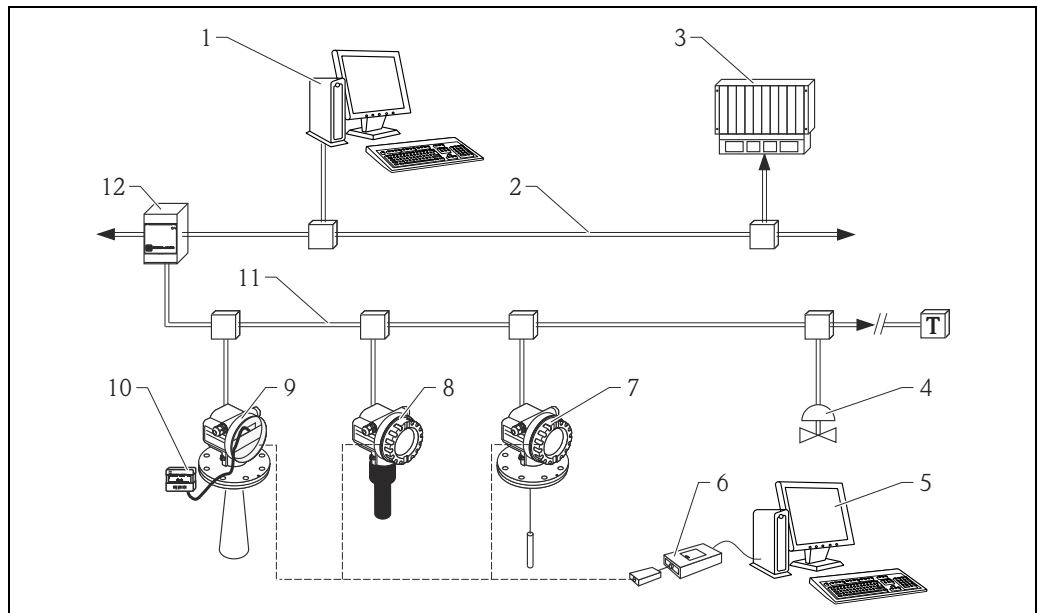
- With display and operating module,
- With a Personal Computer, FXA291 with ToF Adapter FXA291 (USB) and the operating software "FieldCare". FieldCare is a graphical operating software for devices from Endress+Hauser (radar, ultrasonic, guided microimpulse). It assists with commissioning, securing data, signal analysis and documentation of the measuring point.

Remote operation

- With Field Xpert SFX100
- With a Personal Computer, Commubox FXA195 and the operating software "FieldCare"

System integration via PROFIBUS PA

A maximum of 32 transmitters (8 if mounted in an explosion hazardous location Ex ia IIC according to FISCO-model) can be connected to the bus. The segment coupler provides the operating voltage to the bus. Both on-site as well as remote operation are possible. The complete measuring system consists of:

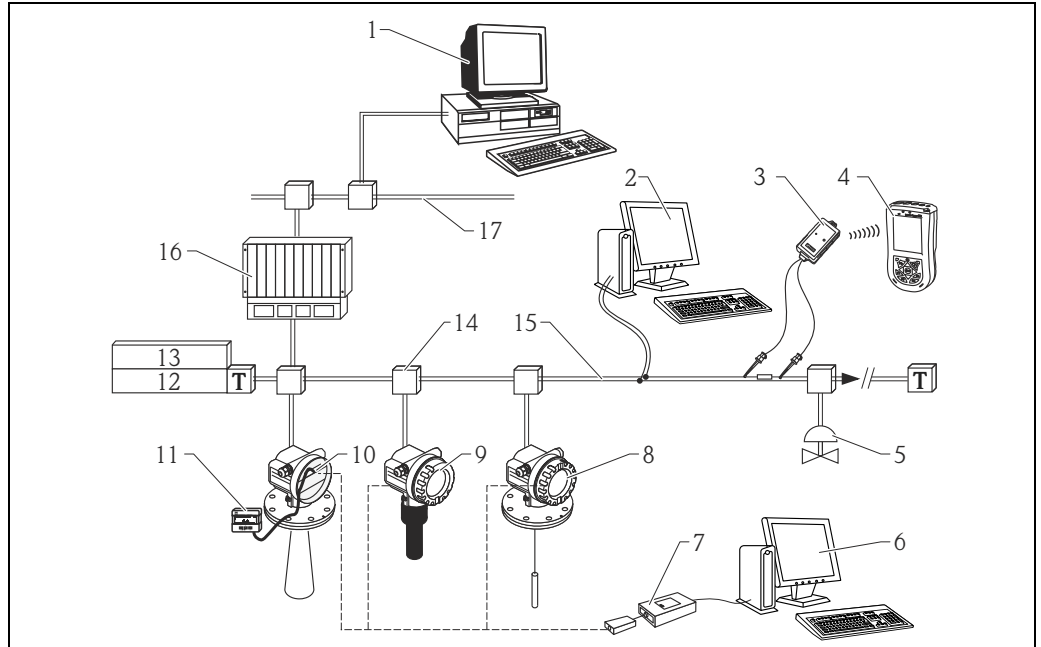


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- | | | | |
|---|--|----|------------------------------|
| 1 | PC with FieldCare and Profiboard resp. Proficard | 7 | Levelflex M |
| 2 | PROFIBUS DP | 8 | Prosonic M |
| 3 | PLC | 9 | Micropilot M |
| 4 | More Functions (valves etc.) | 10 | Operating and display module |
| 5 | FieldCare | 11 | PROFIBUS PA |
| 6 | Commubox FXA291 with ToF Adapter FXA291 | 12 | Segment coupler |

System integration via FOUNDATION Fieldbus

A maximum of 32 transmitters (standard, Ex em or Ex d) can be connected to the bus.
 For protection class Ex ia IIC: the max. number of transmitters depends on the established rules and standards for intrinsically safe circuits (EN 60079-14, proof of intrinsically safety). Both on-site as well as remote operation are possible. The complete measuring system consists of:

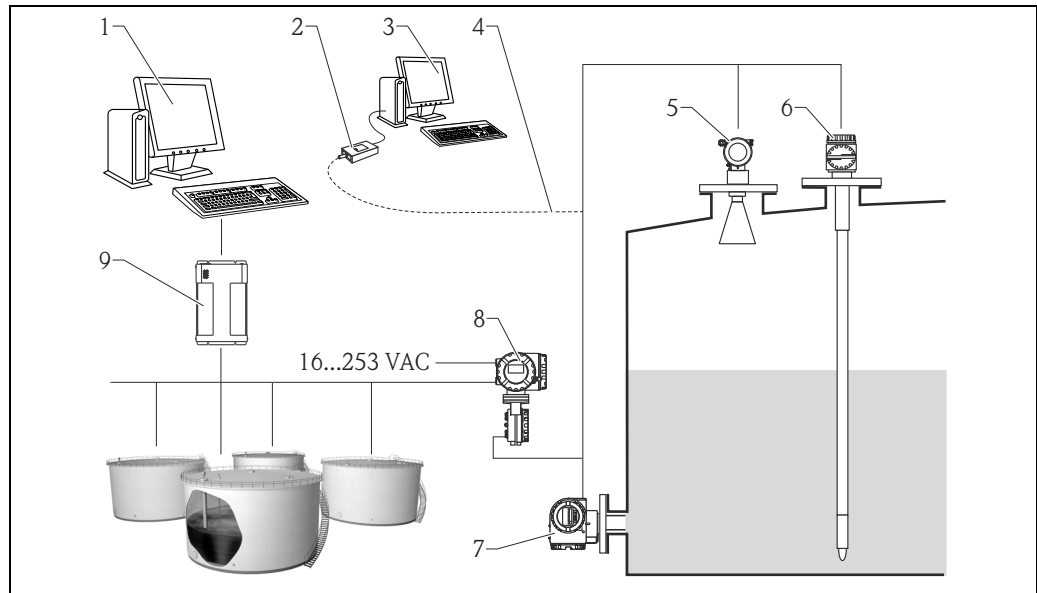


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- | | | | |
|---|--|----|------------------------------|
| 1 | ControlCare Delta V... | 10 | Micropilot M |
| 2 | E.g. NI-FBUS configurator | 11 | Operating and display module |
| 3 | VIATOR Bluetooth modem with connecting cable | 12 | Power conditioner |
| 4 | Field Xpert SFX100 | 13 | Power supply |
| 5 | More Functions (valves etc.) | 14 | FF Link |
| 6 | FieldCare | 15 | FOUNDATION Fieldbus |
| 7 | Commubox FXA291 with ToF Adapter FXA291 | 16 | PLC |
| 8 | Levelflex M | 17 | Ethernet |
| 9 | Prosonic M | | |

Integrated in tank gauging system

The Endress+Hauser Tank Side Monitor NRF590 provides integrated communications for sites with multiple tanks, each with one or more sensors on the tank, such as radar, spot or average temperature, capacitive probe for water detection and/or pressure sensors. Multiple protocols out of the Tank Side Monitor guarantee connectivity to nearly any of the existing industry standard tank gauging protocols. Optional connectivity of analog 4 to 20 mA sensors, digital I/O and analog output simplify full tank sensor integration. Use of the proven concept of the intrinsically safe HART bus for all on-tank sensors yields extremely low wiring costs, while at the same time providing maximum safety, reliability and data availability.



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- | | | | |
|---|-------------------------------|---|---------------------------------------|
| 1 | <i>Fuels Manager Software</i> | 6 | <i>Prothermo</i> |
| 2 | <i>Commubox FXA195</i> | 7 | <i>Pressure</i> |
| 3 | <i>FieldCare</i> | 8 | <i>Tank Side Monitor</i> |
| 4 | <i>HART 2 wire</i> | 9 | <i>RTU8130 (remote terminal unit)</i> |
| 5 | <i>Micropilot M</i> | | |

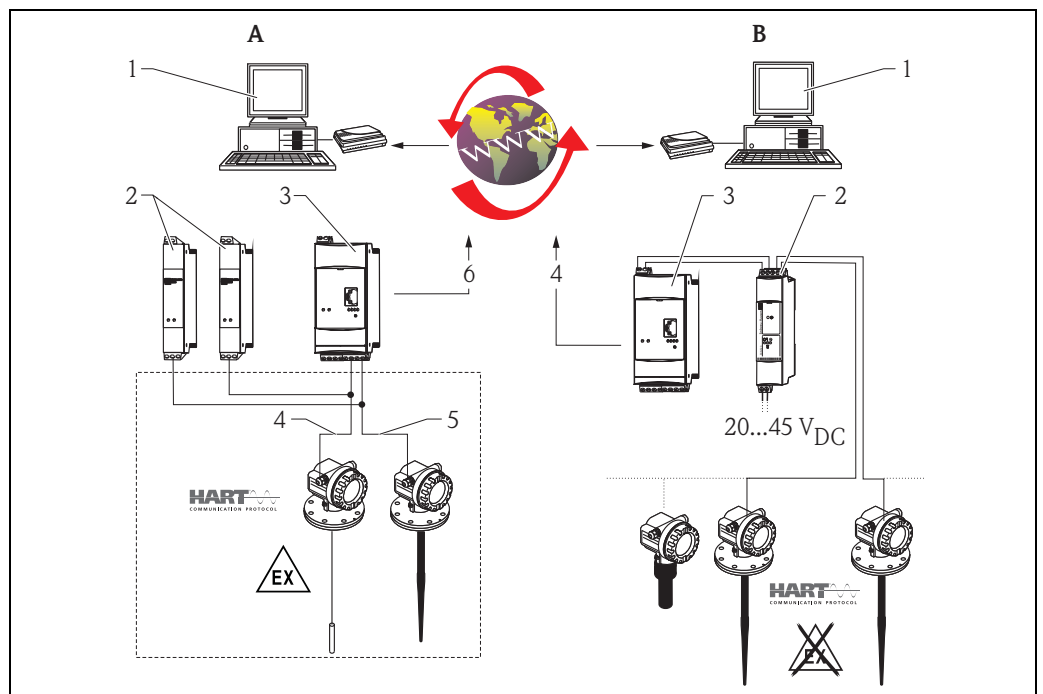
System integration via Fieldgate

Vendor Managed Inventory

By using Fieldgates to interrogate tank or silo levels remotely, suppliers of raw materials can provide their regular customers with information about the current supplies at any time and, for example, account for them in their own production planning. For their part, the Fieldgates monitor the configured level limits and, if required, automatically activate the next supply. The spectrum of options here ranges from a simple purchasing requisition via e-mail through to fully automatic order administration by coupling XML data into the planning systems on both sides.

Remote maintenance of measuring equipment

Fieldgates not only transfer the current measured values, they also alert the responsible standby personnel, if required, via e-mail or SMS. In the event of an alarm or also when performing routine checks, service technicians can diagnose and configure connected HART devices remotely. All that is required for this is the corresponding HART operating software (e.g. FieldCare) for the connected device. Fieldgate passes on the information transparently, so that all options for the respective operating software are available remotely. Some on-site service operations can be avoided by using remote diagnosis and remote configuration and all others can at least be better planned and prepared.



A Remote configuration/diagnostics

- 1 Via HART Client: FieldCare
- 2 E.g. 2x RN221N-B...
- 3 Fieldgate FXA520
- 4 Channel 1
- 5 Channel 2
- 6 Analog; Ethernet; GSM

B Remote monitoring

- 1 HTTP script; Web browser
- 2 Multidrop-Connector FXN520
- 3 Fieldgate FXA520
- 4 Analog / Ethernet / GSM

Note!

The number of devices which can be connected in multidrop mode can be calculated by the "FieldNetCalc" program. A description of this program can be found in Technical Information T100400F/00/EN (Multidrop Connector FXN520). The program is available from your Endress+Hauser sales organisation or in the internet at: www.endress.com → Select your country → Download → Search: Fieldnetcalc.

Input

Measured variable

The measured variable is the distance between a reference point (→ 4) and a reflective surface (i.e. medium surface). The level is calculated based on the tank height entered. The level can be converted into other units (volume, mass) by means of a linearization (32 points).

Measuring range in liquids

The usable measuring range depends on the size of the antenna, the reflectivity of the medium, the mounting location and eventual interference reflections.

The maximum configurable range is:

- 20 m (66 ft) for Micropilot M FMR23x,
- 40 m (131 ft) for Micropilot M FMR24x (basic version),
- 70 m (230 ft) for Micropilot M FMR24x (with additional option F (G), see "Ordering information")

The following tables describe the groups of media as well as the achievable measuring range as a function of application and media group. If the dielectric constant of a medium is unknown, it is recommended to assume media group B to ensure a reliable measurement.

| Media group | DC (ϵ_r) | Examples |
|-------------|---------------------|---|
| A | 1.4 to 1.9 | non-conducting liquids, e.g. liquefied gas ¹⁾ |
| B | 1.9 to 4 | non-conducting liquids, e.g. benzene, oil, toluene, ... |
| C | 4 to 10 | e.g. concentrated acids, organic solvents, esters, aniline, alcohol, acetone, ... |
| D | > 10 | conducting liquids, e.g. aqueous solutions, dilute acids and alkalis |

1) Treat Ammonia NH_3 as a medium of group A, i.e. use FMR230 in a stilling well.

Measuring range in solids

The FMR244 with 80 mm (3") antenna or FMR240 with 100 mm (4") horn antenna and additional option "F" (= advanced dynamics) is also suited for solid applications. The usable measuring range depends on the reflection properties of the medium, the mounting position and interference reflections which may be present. The maximum configurable measuring range for the FMR240 with 100 mm (4") horn antenna and additional option "F" (= advanced dynamics) is 30 m (98 ft) in solid applications. It is recommended to use the variable flange seal for alignment (→ 84).

Reduction of the max. possible measuring range through:

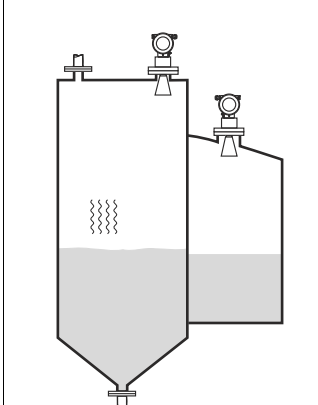
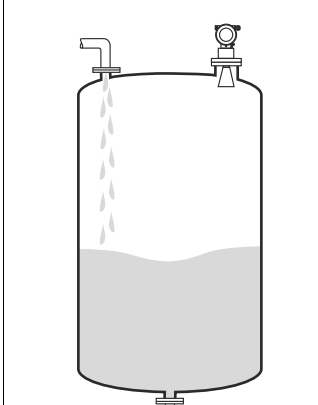
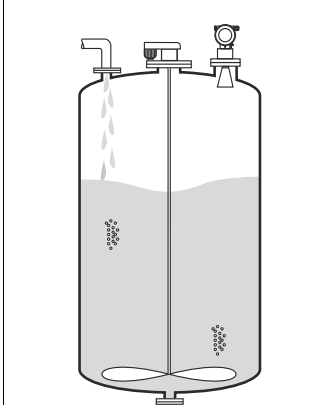
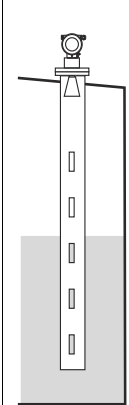
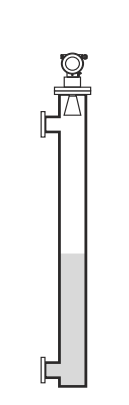
- Media with poor reflection properties (= small DC). For examples refer to table below.
- Angle of repose.
- Extremely loose surfaces of bulk solids, e.g. bulk solids with low bulk weight for pneumatic filling.
- Build-up, above all of moist products.

The following table describes the media groups and the dielectric constant ϵ_r .

| Media group | DC (ϵ_r) | Examples | Signal attenuation |
|-------------|---------------------|--|--------------------|
| A | 1.6 to 1.9 | – Plastic granulate – White lime, special cement – Sugar | 19 to 16 dB |
| B | 1.9 to 2.5 | – Portland cement, plaster | 16 to 13 dB |
| C | 2.5 to 4 | – Grain, seeds – Ground stones – Sand | 13 to 10 dB |
| D | 4 to 7 | – Naturally moist (ground) stones, ores – Salt | 10 to 7 dB |
| E | > 7 | – Metallic powder – Carbon black – Coal | < 7 dB |

The respective lower group applies for very loose or loosened bulk solids.



Measuring range depending on vessel type, conditions and product for FMR230, FMR231

| | Storage tank ¹⁾ | | Buffer tank ¹⁾ | | Process tank with agitator ¹⁾ | | Stilling well | Bypass | | | |
|---------------------------------|--|------------------------------|---|------------------------------|--|------------------------------|---|---|------------|-------------------|-------------|
| |  | |  | |  | |  |  | | | |
| | Calm product surface (e.g. intermittent filling, filling from bottom, immersion tubes). | | Moving surfaces (e.g. continuous filling, from above, mixing jets). | | Turbulent surface. Single stage agitator < 60 U/min. | | | | | | |
| FMR230: | 150 mm (6") | 200 mm (8"), 250 mm (10") | 150 mm (6") | 200 mm (8"), 250 mm (10") | 150 mm (6") | 200 mm (8"), 250 mm (10") | 80 to 250 mm (3 to 10") | 80 to 250 mm (3 to 10") ²⁾ | | | |
| FMR231: | Rod antenna | — | Rod antenna | — | Rod antenna | — | — | — | | | |
| | B | C | D | B | C | D | B | C | D | A, B, C, D | C, D |
| | 10 (32) | 15 (49) | 20 (65) | 15 (49) | 20 (65) | 20 (65) | 6 (20) | 8 (26) | 10 (32) | 20 (65) | 20 (65) |
| | | | | 5 (16) | 7.5 (25) | 10 (32) | 4 (13) | 6 (20) | 8 (26) | | |
| | | | | 7.5 (25) | 10 (32) | 12.5 (41) | | | | | |
| Measuring range [m (ft)] | | | | | | | | | | | |

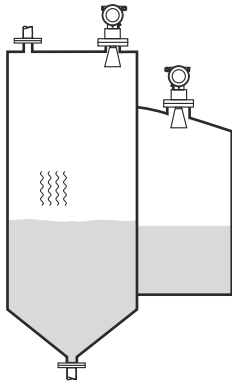
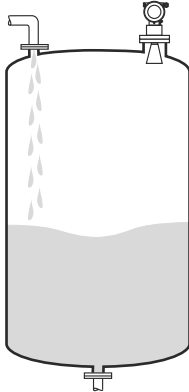







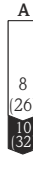






















1) For media group A to use a stilling well (20 m (66 ft)).

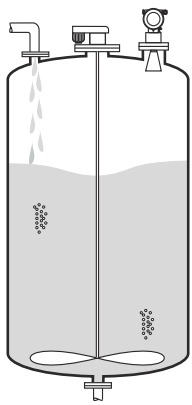
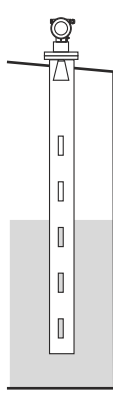



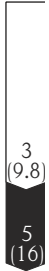
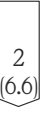
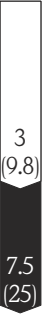

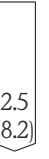




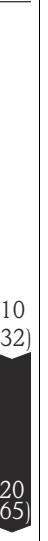


2) For media group A and B possible, i.e. with stilling well in bypass.

Measuring range depending on vessel type, conditions and product for FMR240, FMR244, FMR245

| | | | |
|---|---|--|---|
|  | Standard: max. measuring range = 40 m (131 ft) |  | With additional option "F" ("G"): max. measuring range = 70 m (230 ft) |
| <p>* Max. recommended measuring range = 20 m (66 ft) for FMR244 with 80 mm (3") antenna, in solids 15 m (49 ft).^{1) 2)} The recommended measuring range for FMR240 with 100 mm (4") horn antenna in solids is 30 m (98 ft).</p> | | | |

- 1) Larger measuring range in solids available on request.
- 2) In solids with additional option "F" (= advanced dynamic), and variable flange seal (→ 84).

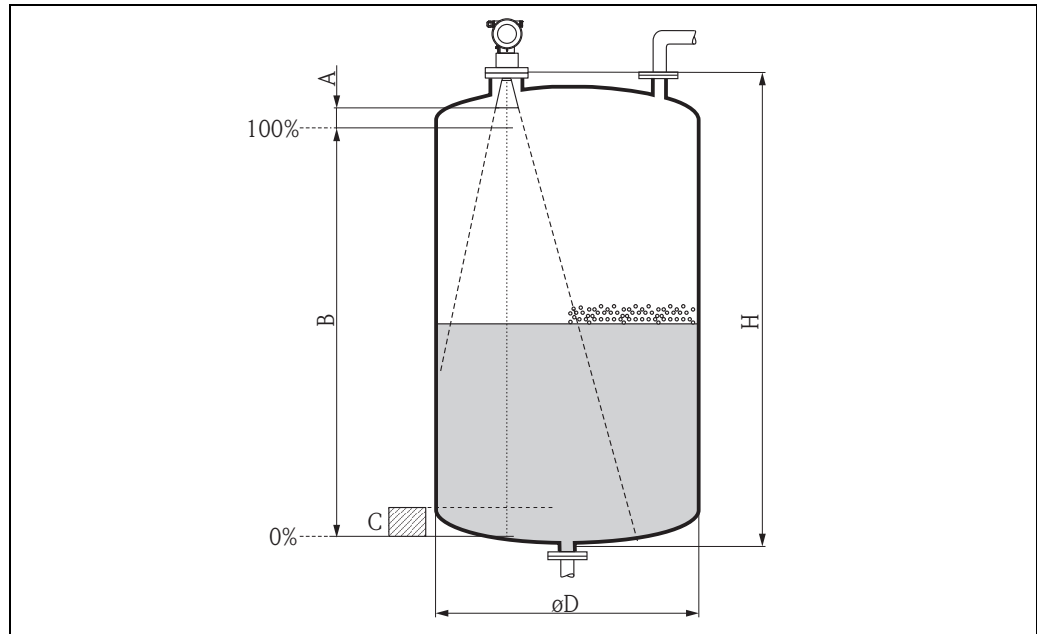
| | Storage tank | | | | Buffer tank | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|---|---|---|---|---|---|---|---|---|---|---|---|
| |  | | | |  | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Calm product surface (e.g. intermittent filling, filling from bottom, immersion tubes). | | | | Moving surfaces (e.g. continuous filling, from above, mixing jets). | | | | | | | | | | | | | | | | | | | | | | | | | |
| FMR240 | 40 mm (1½") | 50 mm (2") | 80 mm (3") | 100 mm (4") | 40 mm (1½") | 50 mm (2") | 80 mm (3") | 100 mm (4") | | | | | | | | | | | | | | | | | | | | | | |
| FMR244 | 40 mm (1½") | - | * 80 mm (3") | - | 40 mm (1½") | - | * 80 mm (3") | - | | | | | | | | | | | | | | | | | | | | | | |
| FMR245 | - | 50 mm (2") | 80 mm (3") | - | - | 50 mm (2") | 80 mm (3") | - | | | | | | | | | | | | | | | | | | | | | | |
| | A  | B  | C  | D  | A  | B  | C  | D  | A  | B  | C  | D  | A  | B  | C  | D  | B  | C  | D  | B  | C  | D  | A  | B  | C  | D  | A  | B  | C  | D  |
| | Measuring range [m (ft)] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | Process tank with agitator | | | | Stilling well ¹⁾ | Bypass ²⁾ | | | | | | | | |
|---|--|--|--|--|--|--|--|---|--|--|--|--|---|---|
| |  | | | |  |  | | | | | | | | |
| | Turbulent surface. Single stage agitator < 60 RPM. | | | | | | | | | | | | | |
| FMR240 | 40 mm (1½") | 50 mm (2") | 80 mm (3") | 100 mm (4") | 40 to 100 mm (1½" to 4") | 40 to 100 mm (1½" to 4") | | | | | | | | |
| FMR244 | 40 mm (1½") | - | 80 mm (3") | - | 40 to 100 mm (1½" to 4") | - | | | | | | | | |
| FMR245 | - | 50 mm (2") | 80 mm (3") | - | 50 to 80 mm (2" to 3") | 50 to 80 mm (2" to 3") | | | | | | | | |
| | B  | C  | D  | B  | C  | D  | B  | C  | D  | B  | C  | D  | A, B, C, D  | C, D  |
| Measuring range [m (ft)] | | | | | | | | | | | | | | |
| 1) Larger measuring range on request. 2) For media group A and B to use a Levelflex M with coax probe. | | | | | | | | | | | | | | |

Measuring conditions in liquids

Note!

- In case of **boiling surfaces, bubbling** or tendency for **foaming**, use FMR230 or FMR231. Depending on its consistence, foam can either absorb microwaves or reflect them off the foam surface. Measurement is possible under certain conditions. For FMR240/244/245, the additional option "F" ("G") recommended (→ 67).
- In case of heavy **steam development** or **condensate** the max. measuring range of FMR240 may decrease depending on density, temperature and composition of the steam → use FMR230 or FMR231.
- For the measurement of absorbing gases such as **ammonia NH₃** or some **fluorocarbons**¹⁾, please use FMR230 in a stilling well.



100-FMR2xxx-17-00-00-xx-000

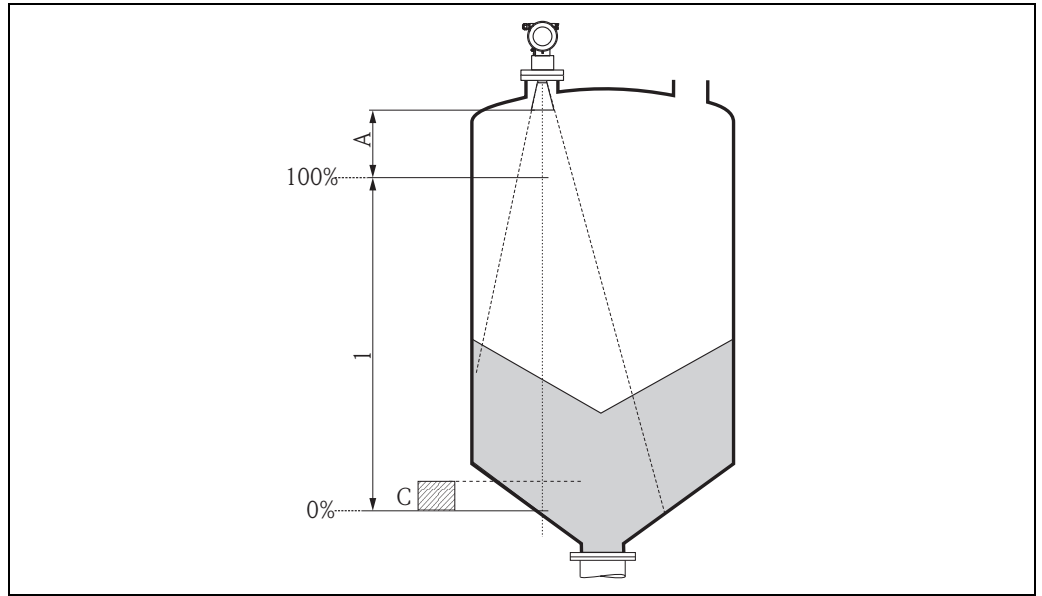
- The measuring range begins, where the beam hits the tank bottom. Particularly with dish bottoms or conical outlets the level cannot be detected below this point.
- In case of media with a low dielectric constant (groups A and B), the tank bottom can be visible through the medium at low levels (low height C). Reduced accuracy has to be expected in this range. If this is not acceptable, we recommend positioning the zero point at a distance C (see Fig.) above the tank bottom in these applications.
- In principle it is possible to measure up to the tip of the antenna with FMR230/231/240. However, due to considerations regarding corrosion and build-up, the end of the measuring range should not be chosen any closer than A (see Fig.) to the tip of the antenna.
For FMR244/245, the end of measuring range should not be chosen closer than A (see Fig.) to the tip of the antenna, especially if there is development of condensate.
- The smallest possible measuring range B depends on the antenna version (see Fig.).
- The tank diameter should be greater than D (see Fig.), the tank height at least H (see Fig.).

| | A [mm (in)] | B [m (ft)] | C [mm (in)] | D [m (ft)] | H [m (ft)] |
|-------------------|-------------|-------------|---------------------------|-------------|-------------|
| FMR230/231 | 50 (1.97) | > 0,5 (1.6) | 150 to 300 (5.91 to 11.8) | > 1 (3.3) | > 1,5 (4.9) |
| FMR240 | 50 (1.97) | > 0,2 (0.7) | 50 to 250 (1.97 to 9.84) | > 0,2 (0.7) | > 0,3 (1) |
| FMR244 | 150 (5.91) | > 0,2 (0.7) | 50 to 250 (1.97 to 9.84) | > 0,2 (0.7) | > 0,3 (1) |
| FMR245 | 200 (7.87) | > 0,2 (0.7) | 50 to 250 (1.97 to 9.84) | > 0,2 (0.7) | > 0,3 (1) |

1) Affected compounds are e.g. R134a, R227, Dymel 152a.

Measuring conditions in solids

- The measuring range begins, where the beam hits the bottom. Particularly with conical outlets the level cannot be detected below this point. The maximum measuring range can be increased in such applications by using a top target positioner (→ 82).
- In case of media with a low dielectric constant (groups A and B), the bottom can be visible through the medium at low levels. In order to guarantee the required accuracy in these cases, it is recommended to position the zero-point at a distance **C** above the bottom (see Fig.).
- In principle it is possible to measure up to the tip of the antenna with the Micropilot M. However, due to considerations regarding abrasion and build-up and depending on the orientation of the product surface (angel of repose), the end of the measuring range should be at a distance of **A** (see Fig.). If required, and if some conditions (high DC value, flat angle of repose) are met, shorter distances can be achieved.



L00-FMR250xx-17-00-00-xx-001

1 Measuring range

| A [mm (in)] | C [mm (in)] |
|--------------------|--------------------------|
| approx. 400 (15.7) | 50 to 150 (1.97 to 5.91) |

Operating frequency

- FMR230/231: C-band
- FMR240/244/245: K-band

Up to 8 Micropilot M transmitters can be installed in the same tank because the transmitter pulses are statistically coded.

Transmitting power

| Distance | Average energy density in beam direction | |
|--------------|---|---------------------------------|
| | max. measuring range = 20 m (66 ft) / 40 m (131 ft) | measuring range = 70 m (230 ft) |
| 1 m (3.3 ft) | < 12 nW/cm ² | < 64 nW/cm ² |
| 5 m (16 ft) | < 0.4 nW/cm ² | < 2.5 nW/cm ² |

Output

Output signal

HART

| | |
|------------------------|---------------------------------------|
| Signal coding | FSK ± 0.5 mA over currency signal |
| Data transmission rate | 1200 Baud |
| Galvanic isolation | Yes (IO-Module) |

PROFIBUS PA

| | |
|------------------------|------------------------------|
| Signal coding | Manchester Bus Powered (MBP) |
| Data transmission rate | 31.25 KBit/s, voltage mode |
| Galvanic isolation | Yes (IO-Module) |

FOUNDATION Fieldbus

| | |
|------------------------|------------------------------|
| Signal coding | Manchester Bus Powered (MBP) |
| Data transmission rate | 31.25 KBit/s, voltage mode |
| Galvanic isolation | Yes (IO-Module) |

Signal on alarm

Error information can be accessed via the following interfaces:

- Local display:
 - Error symbol
 - Plain text display
- Current output, signal on error can be selected (e.g. according to NAMUR recommendation NE43).
- Digital interface

Linearization

The linearization function of the Micropilot M allows the conversion of the measured value into any unit of length or volume. Linearization tables for calculating the volume in cylindrical tanks are pre-programmed. Other tables of up to 32 value pairs can be entered manually or semi-automatically.

Protocol specific data

HART

| | | |
|-------------------------------|--|-------------------------------|
| Manufacturer ID | 000011 hex | |
| Device Type Code | 000F hex (for FMR230/231) | 001E hex (for FMR240/244/245) |
| Transmitter specific revision | 04 hex (for FMR230/231) | 05 hex (for FMR240/244/245) |
| HART specification | 5.0 | |
| DD-Files | Information and files can be found: <ul style="list-style-type: none"> ■ www.endress.com ■ www.hartcomm.org | |
| Load HART | Min. 250 Ω | |
| Device variables | Primary value: level or volume ¹⁾ | |
| Features supported | <ul style="list-style-type: none"> ■ Burst mode ■ Additional Transmitter Status | |

1) according to configuration

PROFIBUS PA

| | |
|--------------------|---|
| Manufacturer ID | 000011 hex |
| Ident number | 1522 hex |
| Profile Version | 3.0 |
| GSD file | Information and files can be found: <ul style="list-style-type: none"> ■ www.endress.com ■ www.hartcom.com |
| GSD file version | |
| Output values | Primary value: measured value Secondary value: distance |
| Input values | Display value of PLC |
| Features supported | <ul style="list-style-type: none"> ■ I&M ■ Identification & Maintenance (for FMR240/244/245 of software version 01.05.00) |

FOUNDATION Fieldbus

| | FMR230/231 | FMR240/244/245 |
|---------------------------------------|---|----------------|
| Manufacturer ID | 452B48 | |
| Device Type | 100F hex | 100F hex |
| Device Revision | 04 hex | 05 hex |
| DD Revision | Information and files can be found: <ul style="list-style-type: none"> ■ www.endress.com ■ www.feldbus.org | |
| CFF Revision | | |
| Devise Tester Version (ITK Version) | 4.61 | 5.00 |
| ITK Test Campaign Number | IT035500 | IT042000 |
| Link Master (LAS) Capable | yes | |
| Link Master / Basic Device Selectable | yes, default: Basic Device | |
| Node Address | Default: 247 | |
| Features supported | Following methods are supported: <ul style="list-style-type: none"> ■ Basic setup ■ Safety settings ■ Acknowledge alarm ■ Linearisation ■ Extended calibration ■ Output ■ System parameters ■ Lock TB Manufacturer parameters | |

| Virtual Communication Relationship (VCRs) | |
|--|----|
| Number of VCRs | 24 |
| Number of Link Objects in VFD | 24 |
| Permanent entries | 1 |
| Client VCRs | 0 |
| Server VCRs | 24 |
| Source VCRs | 23 |
| Sink VCRs | 0 |
| Subscriber VCRs | 23 |
| Publisher VCRs | 23 |

| Devise Link Capabilities | |
|---------------------------------|----|
| Slot time | 4 |
| Min. inter PDU delay | 4 |
| Max. response delay | 10 |

| Transducer Blocks | | |
|-------------------|--|--|
| Block | Content | Output values |
| Sensor Block | Contains all parameters related to the measurement | <ul style="list-style-type: none"> ■ Level or volume¹⁾ (channel 1) ■ Distance (channel 2) |
| Diagnotic Block | Contains diagnostic information | No output values |
| Display Block | Contains parameters to configure the local display | No output values |

1) depending on the configuration of the sensor-block

| Function Blocks | | | | |
|----------------------------|--|------------------|----------------|---------------|
| Block | Content | Number of blocks | Execution time | Functionality |
| Resource Block | The Resource Block contains all the data that uniquely identifies the field device. It is an electronic version of a nameplate of the device. | 1 | — | Enhanced |
| Analog Input 1 | The AI block takes the manufacturer's input data, selected by channel number, and makes it available to other function blocks at its output. | 2 | 30 ms | Standard |
| Analog Input 2 | | | 30 ms | |
| PID Block | The PID block serves as proportional-integral-derivative controller and is used almost universally to do closed-loop-control in the field including cascade and feedforward. | 1 | 80 ms | Standard |
| Arithmetic Function Block | This block is designed to permit simple use of popular measurement math functions. The user does not have to know how to write equations. The math algorithm is selected by name, chosen by the user for the function to be done. | 1 | 50 ms | Standard |
| Input Selector Block | The input selector block provides selection of up to four inputs and generates an output based on the configured action. This block normally receives its inputs from AI blocks. The block performs maximum, minimum, middle, average and 'first good' signal selection. | 1 | 30 ms | Standard |
| Signal Characterizer Block | The signal characterizer block has two sections, each with an output that is a non-linear function of the respective input. The non-linear function is determined by a single look-up table with 21 arbitrary x-y pairs. | 1 | 40 ms | Standard |
| Integrator Block | The Integrator Function Block integrates a variable as a function of the time or accumulates the counts from a Pulse Input block. The block may be used as a totalizer that counts up until reset or as a batch totalizer that has a setpoint, where the integrated or accumulated value is compared to pre-trip and trip settings, generating discrete signals when these settings are reached. | 1 | 60 ms | Standard |

| Additional Function Block Information | |
|---------------------------------------|----|
| Instantiable Function Blocks | No |
| Number of instanciable blocks | — |

Auxiliary energy

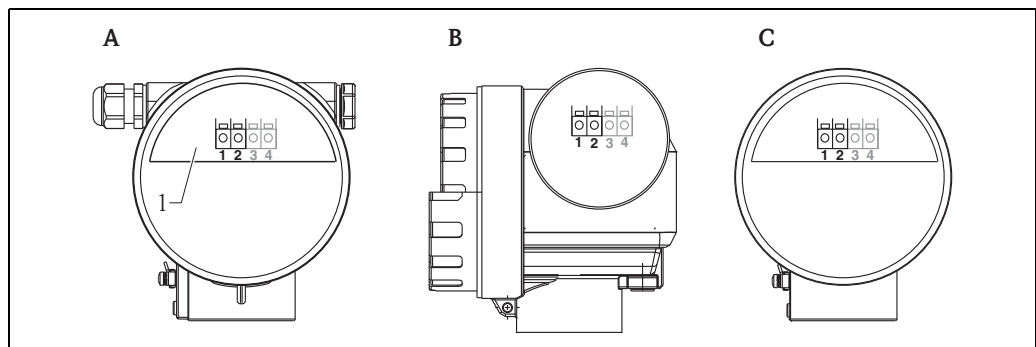
Electrical connection

Terminal compartment

Three housings are available:

- Aluminium housing F12 with additionally sealed terminal compartment for:
 - Standard,
 - Ex ia.
- Aluminium housing T12 with separate terminal compartment for:
 - Standard,
 - Ex e,
 - Ex d,
 - Ex ia (with overvoltage protection, → 24)
- 316L housing F23 for:
 - Standard,
 - Ex ia.

The electronics and current output are galvanically isolated from the antenna circuit.



- A** F12 housing
B T12 housing
C F23 housing
1 Sealed terminal compartment

Cable gland

| | Type | Clamping area |
|---------------------|-----------------|--------------------------------|
| Standard, Ex ia, IS | Plastic M20x1.5 | 5 to 10 mm (0.2 to 0.39 in) |
| Ex em, Ex nA | Metal M20x1.5 | 7 to 10.5 mm (0.28 to 0.41 in) |

Terminals

For wire cross-sections of 0.5 to 2.5 mm² (20 to 14 AWG)

Terminal assignment

2-wire, 4 to 20 mA with HART

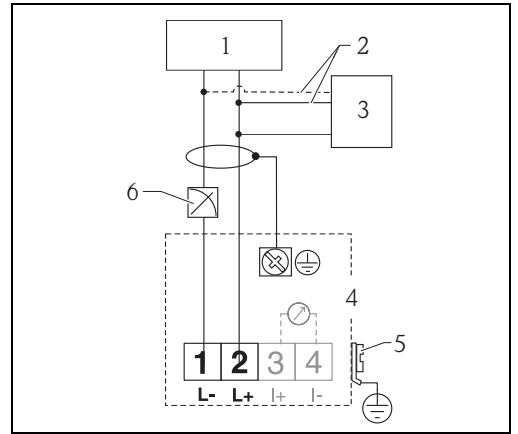
The 2-wire cable is connected to the screw terminals in the terminal compartment.

Cable specification:

A standard installation cable is sufficient if only the analogue signal is used. Use a screened cable when working with a superimposed communications signal (HART).

Note!

- Protective circuitry against reverse polarity, RFI, and over-voltage peaks is built into the device (refer to TI00241F/00/EN "basics for EMC-tests").
- See TI00402F/00/EN for connection to Tank Side Monitor NRF590.



- 1 Power
- 2 Alternatively
- 3 Commubox FXA195, Field Xpert SFX100
- 4 Test socket for testing of the signal current
- 5 Plant ground
- 6 4 to 20 mA

PROFIBUS PA

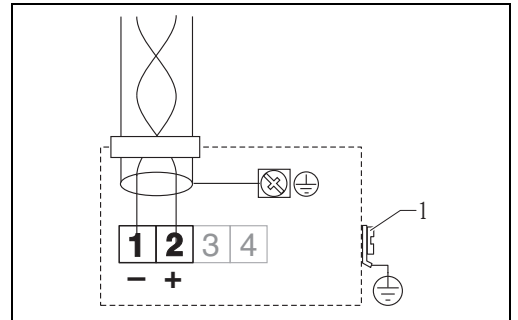
The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the auxiliary energy. For further information on the network structure and earthing and for further bus system components such as bus cables, see the relevant documentation, e.g. BA00034S/04/EN "Guidelines for planning and commissioning PROFIBUS DP/PA" and the PNO Guideline.

Cable specification:

Use a twisted, screened two-wire cable, preferably cable type A.

Note!

For further information on the cable specifications, see Operating Instructions BA00034S/04/EN "Guidelines for planning and commissioning PROFIBUS DP/PA", PNO Guideline 2.092 "PROFIBUS PA User and Installation Guideline" and IEC 61158-2 (MBP).



- 1 Plant ground

FOUNDATION Fieldbus

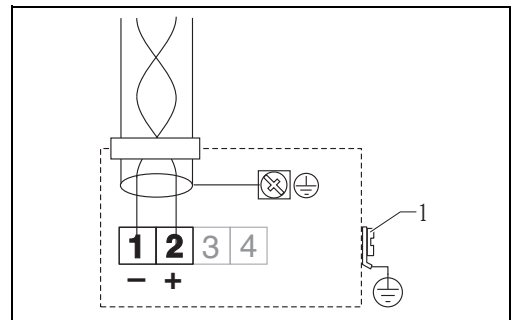
The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the auxiliary energy. For further information on the network structure and earthing and for further bus system components such as bus cables, see the relevant documentation, e.g. BA00013S/04/EN "FOUNDATION Fieldbus Overview" and the FOUNDATION Fieldbus Guideline.

Cable specification:

Use a twisted, screened two-wire cable, preferably cable type A.

Note!

For further information on the cable specifications, see Operating Instructions BA00013S/04/EN "FOUNDATION Fieldbus Overview", FOUNDATION Fieldbus Guideline and IEC 61158-2 (MBP).



- 1 Plant ground

Fieldbus plug connectors

For the versions with a connector M12 or 7/8", the housing does not have to be opened for connecting the signal line.

Pin assignment of the M12 plug connector

| | Pin | Meaning |
|--|-----|--------------|
| | 1 | Signal + |
| | 2 | Not assigned |
| | 3 | Signal - |
| | 4 | Earth |

Pin assignment of the 7/8" plug connector

| | Pin | Meaning |
|--|-----|--------------|
| | 1 | Signal - |
| | 2 | Signal + |
| | 3 | Shield |
| | 4 | Not assigned |

Load HART

Minimum load for HART communication: 250 Ω

Supply voltage**HART**

The following values are the voltages across the terminals directly at the device:

| Communication | | Current consumption | Terminal voltage |
|---|----------|---------------------|--------------------------|
| HART | standard | 4 mA | 16 to 36 V |
| | | 20 mA | 7.5 to 36 V |
| | Ex ia | 4 mA | 16 to 30 V |
| | | 20 mA | 7.5 to 30 V |
| | Ex d | 4 mA | 16 to 30 V |
| | | 20 mA | 11 to 30 V |
| | dust Ex | 4 mA | 16 to 30 V |
| | | 20 mA | 11 to 30 V |
| Fixed current, adjustable e.g. for solar power operation (measured value transferred at HART) | standard | 11 mA | 10 ¹⁾ to 36 V |
| | Ex ia | 11 mA | 10 ¹⁾ to 30 V |
| Fixed current for HART Multidrop mode | standard | 4 mA ²⁾ | 16 to 36 V |
| | Ex ia | 4 mA ²⁾ | 16 to 30 V |

1) Short-term min. start-up voltage: 11.4 V

2) Start up current 11 mA.

PROFIBUS PA and FOUNDATION Fieldbus

The following values are the voltages across the terminals directly at the device:

| Type | Terminal voltage |
|---|---|
| Supply voltage | 9 to 30 V (Ex) ¹⁾ 9 to 32 V (non-Ex) max. voltage 35 V |
| Device (Lift off) minimum voltage | 9 V |
| Polarity sensitive | No |
| FISCO/FNICO compliant in accordance to IEC 60079-27 | Yes |

1) There may be additional restrictions for devices with an explosion protection certificate. Refer to the notes in the appropriate safety instructions (XA).

| | |
|--------------------|--|
| Cable entry | <ul style="list-style-type: none"> ■ Cable gland: M20x1,5 (for Ex d: cable entry) ■ Cable entry: G½ or ½NPT ■ PROFIBUS PA M12 plug ■ FOUNDATION Fieldbus 7/8" plug |
|--------------------|--|

| | |
|--------------------------|-------------------------|
| Power consumption | min. 60 mW, max. 900 mW |
|--------------------------|-------------------------|

Current consumption

HART

| | |
|-------------------------------|---|
| Device basic current | 3.6 to 22 mA, for HART Multidrop: start up current is 11 mA |
| Breakdown signal (NAMUR NE43) | Adjustable |

PROFIBUS PA

| | |
|--|------------|
| Device basic current | max. 13 mA |
| Error current FDE (Fault Disconnection Electronic) | 0 mA |

FOUNDATION Fieldbus

| | |
|--|--------|
| Device basic current | 15 mA |
| Device In-rush current | ≤15 mA |
| Error current FDE (Fault Disconnection Electronic) | 0 mA |

FISCO

| | |
|----------------|------------------------------------|
| U _i | 17.5 V |
| I _i | 500 mA; with surge arrester 273 mA |
| P _i | 5.5 W; with surge arrester 1.2 W |
| C _i | 5 nF |
| L _i | 0,01 mH |

| | |
|------------------------------|--|
| Ripple HART | 47 to 125 Hz: $U_{ss} = 200 \text{ mV}$ (at 500Ω) |
| Max. noise HART | 500 Hz to 10 kHz: $U_{eff} = 2.2 \text{ mV}$ (at 500Ω) |
| Overvoltage protector | The level transmitter Micropilot M with T12-housing (housing version "D", see Ordering information, → 67) is equipped with an internal overvoltage protector (600 V surge arrester) according to EN/IEC 60079-14 or EN/IEC 60060-1 (impulse current test $8/20 \mu\text{s}$, $I = 10 \text{ kA}$, 10 pulses). Connect the metallic housing of the Micropilot M to the tank wall or screen directly with an electrically conductive lead to ensure reliable potential matching. |

Performance characteristics

| | |
|---|--|
| Reference operating conditions | <ul style="list-style-type: none"> ■ Temperatur = $+20 \text{ °C} \pm 5 \text{ °C}$ ($+68 \text{ °F} \pm 41 \text{ °F}$) ■ Pressure = $1013 \text{ mbar abs.} \pm 20 \text{ mbar}$ ($15.19 \text{ psi} \pm 0.3 \text{ psi}$) ■ Relative humidity (air) = $65\% \pm 20\%$ ■ Ideal reflector ■ No major interference reflections inside the signal beam |
| Maximum measured error | <p>Typical statements for reference conditions, include linearity, repeatability, and hysteresis:</p> <p>FMR230, FMR231:</p> <ul style="list-style-type: none"> ■ to 10 m (33 ft): $\pm 10 \text{ mm}$ (0.39 in) ■ ex 10 m (33 ft): $\pm 0.1\%$ of measuring range <p>FMR240, FMR244, FMR245:</p> <ul style="list-style-type: none"> ■ Not for max. measuring range = 70 m (230 ft) <ul style="list-style-type: none"> – to 1 m (3.3 ft): $\pm 10 \text{ mm}$ (0.39 in) ■ For max. measuring range = 40 m (131 ft) <ul style="list-style-type: none"> – to 10 m (33 ft): $\pm 3 \text{ mm}$ (0.12 in) – ex 10 m (33 ft): $\pm 0.03\%$ of measuring range ■ For max. measuring range = 70 m (230 ft) <ul style="list-style-type: none"> – to 1 m (3.3 ft): $\pm 30 \text{ mm}$ (1.18 in) – ex 1 m (3.3 ft): $\pm 15 \text{ mm}$ (0.59 in) or 0.04% of measuring range, whatever is larger |
| Resolution | Digital/analog in % 4 to 20 mA: 1 mm (0.04 in)/ 0.03% of measuring range |
| Reaction time | The reaction time depends on the parameter settings (min. 1 s). In case of fast level changes, the device needs the reaction time to indicate the new value. |
| Influence of ambient temperature | <p>The measurements are carried out in accordance with EN61298-3:</p> <ul style="list-style-type: none"> ■ Digital output (HART, PROFIBUS PA, FOUNDATION Fieldbus): <ul style="list-style-type: none"> – FMR24x Average T_K: 2 mm (0.08 in) /10 K, max. 5 mm (0.2 in) over the entire temperature range -40 to +80 °C (-40 to +176°F). – FMR230 Average T_K: 3 mm (0.12 in) /10 K, max. 10 mm (0.39 in) over the entire temperature range -40 to +80 °C (-40 to +176°F). – FMR231 Average T_K: 5 mm (0.2 in) /10 K, max. 15 mm (0.59 in) over the entire temperature range -40 to +80 °C (-40 to +176°F). ■ Current output (additional error, in reference to the span of 16 mA): <ul style="list-style-type: none"> – Zero point (4 mA) Average T_K: 0,03%/10 K, max. 0,45% over the entire temperature range -40 to +80 °C (-40 to +176°F). – Span (20 mA) Average T_K: 0,09%/10 K, max. 0,95% over the entire temperature range -40 to +80 °C (-40 to +176°F). |

Effect of gas phase

High pressures reduce the propagation velocity of the measuring signals in the gas/vapor above the fluid. This effect depends on the kind of gas/vapor and of its temperature. This results in a measuring error that gets bigger as the distance increases between the device zero point (flange) and product surface. The following table illustrates this measured error for a few typical gases/vapors (with regard to the distance; a positive value means that too large a distance is being measured):

| Gas phase | Temperature °C (°F) | Pressure in bar (psi) | | | | |
|----------------------------|------------------------|-----------------------|----------|----------|------------|------------|
| | | 1 (14.5) | 10 (145) | 50 (725) | 100 (1450) | 160 (2320) |
| Air Nitrogen | 20 (68) | 0.00% | 0.22% | 1.2% | 2.4% | 3.89% |
| | 200 (392) | -0.01% | 0.13% | 0.74% | 1.5% | 2.42% |
| | 400 (752) | -0.02% | 0.08% | 0.52% | 1.1% | 1.70% |
| Hydrogen | 20 (68) | -0.01% | 0.10% | 0.61% | 1.2% | 2.00% |
| | 200 (392) | -0.02% | 0.05% | 0.37% | 0.76% | 1.23% |
| | 400 (752) | -0.02% | 0.03% | 0.25% | 0.53% | 0.86% |
| Water (saturated steam) | 100 (212) | 0.20% | - | - | - | - |
| | 180 (356) | - | 2.1% | - | - | - |
| | 263 (505.4) | - | - | 8.6% | - | - |
| | 310 (590) | - | - | - | 22% | - |
| | 364 (687.2) | - | - | - | - | 41.8% |

Note!

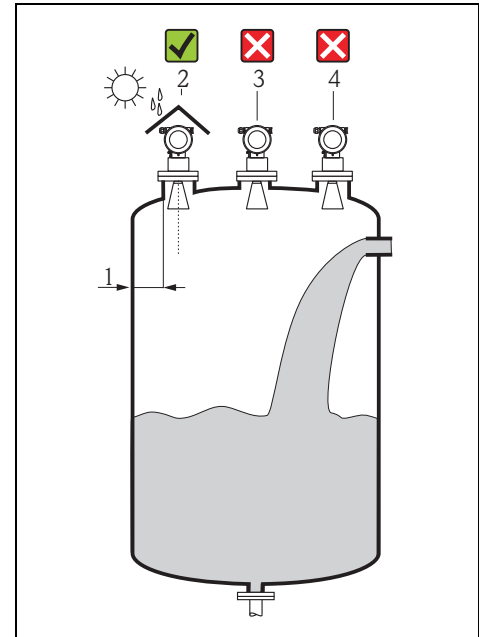
When the pressure is known and constant, this measured error can, for example, be compensated by means of linearization.

Operating conditions: Installation

Installation instructions

Orientation

- Recommended distance (1) wall – **outer edge** of nozzle: ~1/6 of tank diameter. Nevertheless the device should not be installed closer than
 - 30 cm (11.8 in) (FMR230/231)
 - 15 cm (5.91 in) (FMR240/244/245)
 to the tank wall.
- Not in the centre (3), interference can cause signal loss.
- Not above the fill stream (4).
- It is recommended to use a weather protection cover (2) in order to protect the transmitter from direct sun or rain. Assembly and disassembly is simply done by means of a tension clamp (→ 82, "Accessories").



L00-FMR2xxxx-17-00-00-xx-003

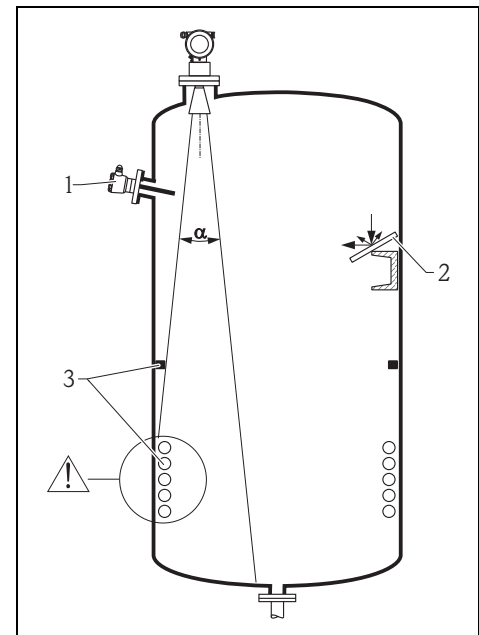
Tank installations

- Avoid any installations (1), like limit switches, temperature sensors, etc., inside the signal beam (→ 28, "Beam angle").
- Symmetrical installations (2), i.e. vacuum rings, heating coils, baffles, etc., can also interfere with the measurement.

Optimization options

- Antenna size: the bigger the antenna, the smaller the beam angle, the less interference echoes.
- Mapping: the measurement can be optimized by means of electronic suppression of interference echoes.
- Antenna alignment: refer to "optimum mounting position", → 29.
- Stilling well: a stilling well can always be used to avoid interference.
- Metallic screens (3) mounted at a slope spread the radar signals and can, therefore, reduce interference echoes.

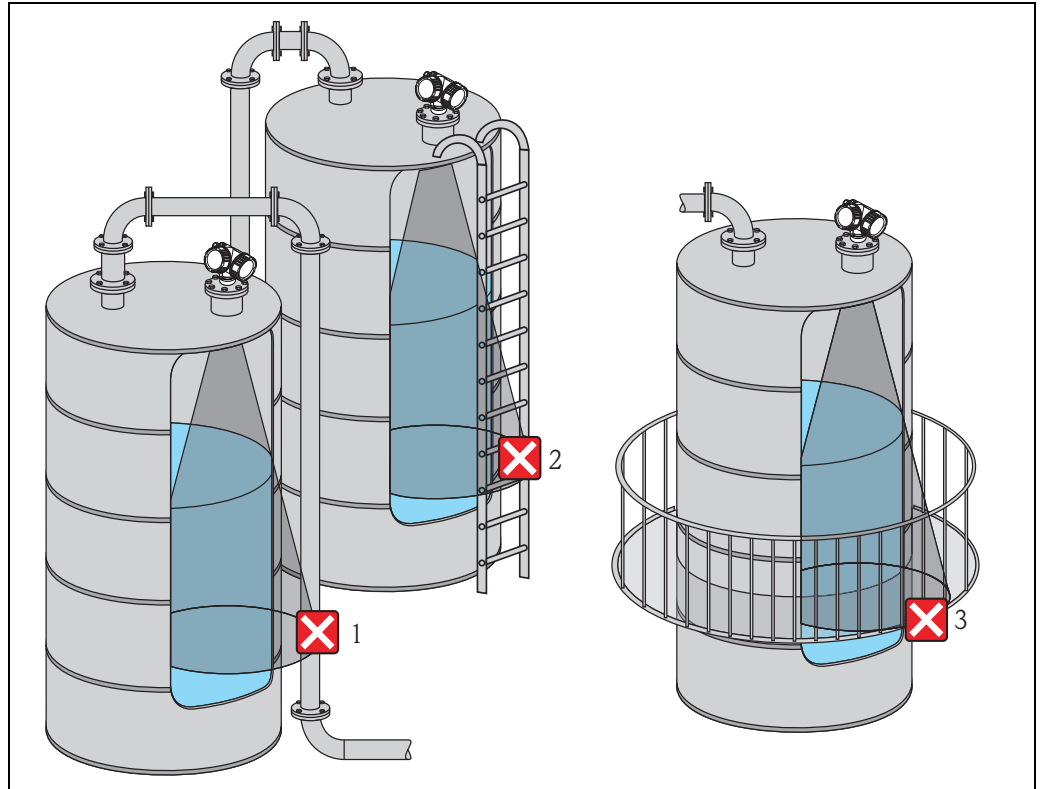
Please contact Endress+Hauser for further information.



L00-FMR2xxxx-17-00-00-xx-004

Measurement in a plastic tank

If the outer wall of the tank is made of a non-conductive material (e.g. GRP), microwaves can also be reflected off interfering installations outside the signal beam (e.g. metallic pipes (1), ladders (2), grates (3), ...). Therefore, there should be no such interfering installations in the signal beam. Please contact Endress+Hauser for further information.



100-FMR2xxxx-17-00-00-xx-013

Beam angle

The beam angle is defined as the angle α where the energy density of the radar waves reaches half the value of the maximum energy density (3dB-width). Microwaves are also emitted outside the signal beam and can be reflected off interfering installations. Beam diameter **W** as function of antenna type (beam angle α) and measuring distance **D**:

| Antenna size (horn diameter) | FMR230 | | | FMR231 |
|------------------------------|-------------|-------------|--------------|--------|
| | 150 mm (6") | 200 mm (8") | 250 mm (10") | Rod |
| Beam angle α | 23° | 19° | 15° | 30° |

| Measuring distance (D) | Beamwidth diameter (W) | | | |
|------------------------|------------------------|-----------------|-----------------|-----------------|
| | 150 mm (6") | 200 mm (8") | 250 mm (10") | Rod |
| 3 m (9.8 ft) | 1,22 m (4 ft) | 1,00 m (3.3 ft) | 0,79 m (2.6 ft) | 1,61 m (5.3 ft) |
| 6 m (20 ft) | 2,44 m (8 ft) | 2,01 m (6.6 ft) | 1,58 m (5.2 ft) | 3,22m (11 ft) |
| 9 m (30 ft) | 3,66 m (12 ft) | 3,01 m (9.9 ft) | 2,37 m (7.8 ft) | 4,82 m (16 ft) |
| 12 m (39 ft) | 4,88 m (16 ft) | 4,02 m (13 ft) | 3,16 m (10 ft) | 6,43 m (21 ft) |
| 15 m (49 ft) | 6,10 m (20 ft) | 5,02 m (16 ft) | 3,95 m (13 ft) | 8,04 m (26 ft) |
| 20 m (66 ft) | 8,14 m (27 ft) | 6,69 m (22 ft) | 5,27 m (17 ft) | 10,72 m (35 ft) |

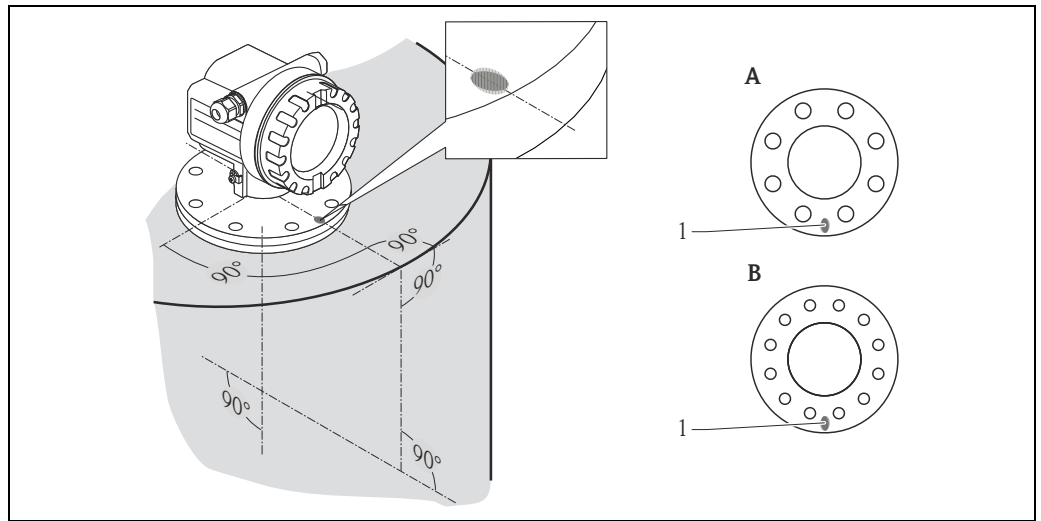
100-FMR2xxxx-14-00-06-xx-001

| Antenna size (horn diameter) | FMR240 | 40 mm (1½") | 50 mm (2") | 80 mm (3") | 100 mm (4") |
|------------------------------|--------|-------------|------------|------------|-------------|
| | FMR244 | 40 mm (1½") | — | 80 mm (3") | — |
| | FMR245 | — | 50 mm (2") | 80 mm (3") | — |
| Beam angle α | | 23° | 18° | 10° | 8° |

| Measuring distance (D) | Beamwidth diameter (W) | | | |
|------------------------|------------------------|-----------------|-----------------|-----------------|
| | 40 mm (1½") | 50 mm (2") | 80 mm (3") | 100 mm (4") |
| 3 m (9.8 ft) | 1,22 m (4 ft) | 0,95 m (3.1 ft) | 0,53 m (1.7 ft) | 0,42 m (1.4 ft) |
| 6 m (20 ft) | 2,44 m (8 ft) | 1,90 m (6.2 ft) | 1,05 m (3.4 ft) | 0,84 m (2.8 ft) |
| 9 m (30 ft) | 3,66 m (12 ft) | 2,85 m (9.4 ft) | 1,58 m (5.2 ft) | 1,26 m (4.1 ft) |
| 12 m (39 ft) | 4,88 m (16 ft) | 3,80 m (12 ft) | 2,10 m (6.9 ft) | 1,68 m (5.5 ft) |
| 15 m (49 ft) | 6,10 m (20 ft) | 4,75 m (16 ft) | 2,63 m (8.6 ft) | 2,10 m (6.9 ft) |
| 20 m (66 ft) | 8,14 m (27 ft) | 6,34 m (21 ft) | 3,50 m (11 ft) | 2,80 m (9.2 ft) |
| 25 m (82 ft) | 10,17 m (33 ft) | 7,92 m (26 ft) | 4,37 m (14 ft) | 3,50 m (11 ft) |
| 30 m (98 ft) | — | 9,50 m (31 ft) | 5,25 m (17 ft) | 4,20 m (14 ft) |
| 35 m (115 ft) | — | 11,09 m (36 ft) | 6,12 m (20 ft) | 4,89 m (16 ft) |
| 40 m (131 ft) | — | 12,67 m (42 ft) | 7,00 m (23 ft) | 5,59 m (18 ft) |
| 45 m (148 ft) | — | — | 7,87 m (26 ft) | 6,29 m (21 ft) |
| 60 m (197 ft) | — | — | 10,50 m (34 ft) | 8,39 m (28 ft) |
| 70 m (230 ft) | — | — | — | 9,79 m (32 ft) |

**Installation in tank
(free space) FMR230**

Optimum mounting position

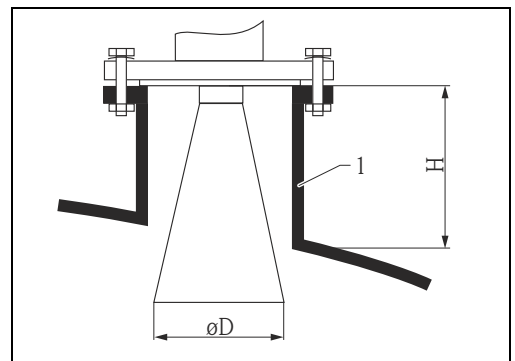


- A DN 150, ANSI 6"
- B DN 200 to 250, ANSI 8 to 10"
- 1 Marker at device flange

L00-FMR230xx-17-00-00-xx-003

Standard installation

- Observe installation instructions, → 26.
- Marker is aligned towards tank wall.
- The marker is good visibly situated between the sensor neck and the bolt-holes of the flange.
- After mounting, the housing can be turned 350° in order to simplify access to the display and the terminal compartment.
- The horn antenna must extend below the nozzle, otherwise use antenna extension FAR10.
- Align horn antenna vertically.



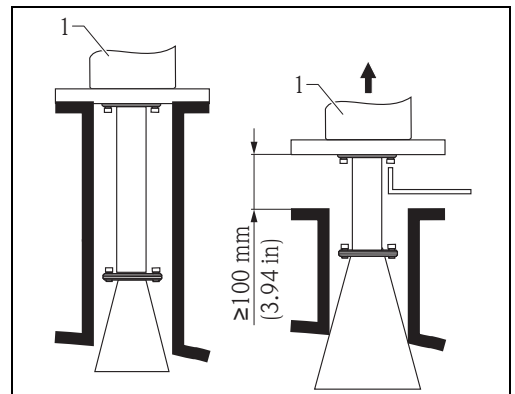
A0016822

1 Nozzle

| Antenna size | 150 mm (6") | 200 mm (8") | 250 mm (10") |
|--------------|--------------|--------------|--------------|
| D [mm (in)] | 146 (5.75) | 191 (7.52) | 241 (9.49) |
| H [mm (in)] | < 205 (8.07) | < 290 (11.4) | < 380 (15) |

Antenna extension FAR10

- The antenna extension has to be selected such that the horn extends below the nozzle.
- If the horn diameter is greater than the nominal width of the nozzle, the antenna including the extension is mounted from inside the vessel. The bolts are tightened from outside, with the device lifted up. The extension has to be selected such that the device can be lifted by at least 100 mm (3.94 in).
- Recommended torque: 10 Nm (7.37 lbf ft).



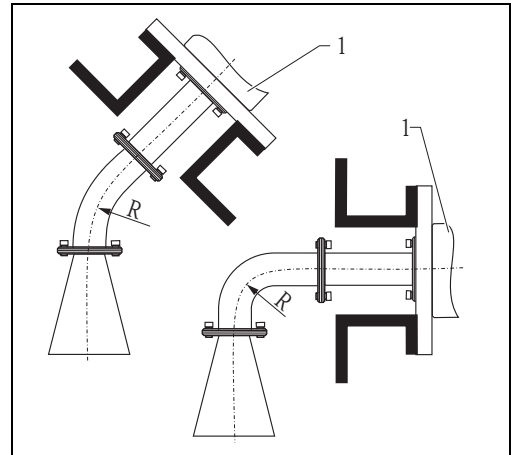
L00-FMR230xx-17-00-00-xx-001

1 FMR230

Special extensions

- If the antenna has to be mounted on a sloping or vertical vessel wall, an extension with a 45° respectively 90° bend is available.
- The smallest possible radius R for the bend is 300 mm (11.8 in).

Please contact Endress+Hauser for further information.

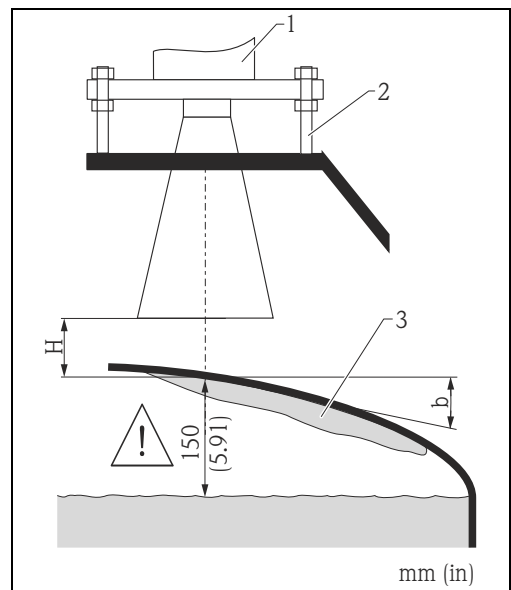


L00-FMR230xx-17-00-00-yy-004

1 FMR230

Measurement from the outside through plastic walls

- Medium with dielectric constant $\epsilon_r > 10$.
- Maximum level 15 cm (5.91 in) below tank ceiling.
- Distance H greater than 100 mm (3.94 in).
- Preferred mounting by means of stand-offs for adjustment of the ideal distance H.
- If possible, **avoid mounting location where condensation or build-up might occur**. In case of outdoor mounting, the space between antenna and vessel has to be protected from the elements.
- Optimum angle β between 15° to 20°
- Select vessel construction material with low dielectric constant and corresponding thickness. No conductive (black) plastics (refer to table).
- If possible, use an antenna DN 250 (10").
- Do not mount any potential reflectors (i.e. pipes) outside the tank in the signal beam.



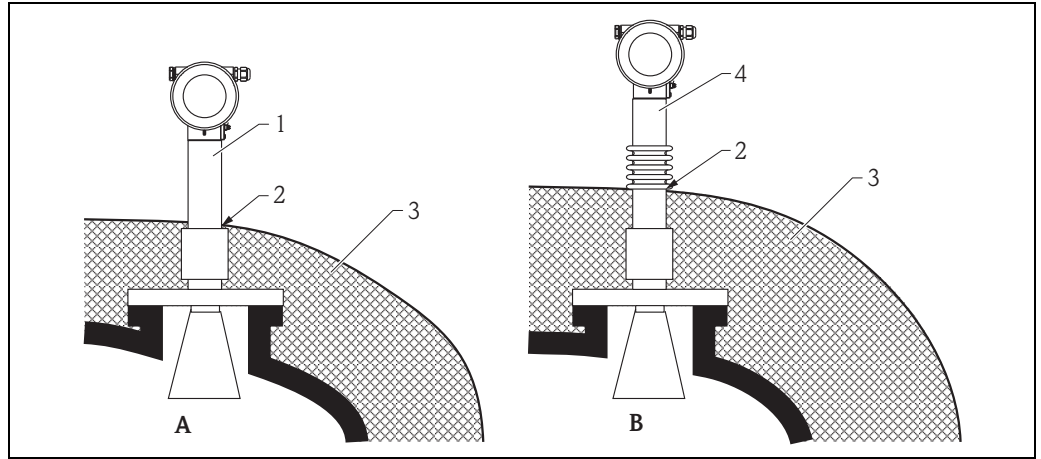
L00-FMR230xx-17-00-00-de-005

1 FMR230
 2 Bolt
 3 Condensation and build-up attenuate the measuring signal

| Penetrated material | PE | PTFE | PP | Perspex |
|---|-------------|-------------|-------------|-------------|
| DK / ϵ_r | 2.3 | 2.1 | 2.3 | 3.1 |
| Optimum thickness [mm (in)] ¹⁾ | 15,7 (0.62) | 16,4 (0.65) | 15,7 (0.62) | 13,5 (0.53) |

1) Other possible values for the thickness are multiples of the values listed (i.e. E: 31,4 mm (1.24 in), 47,1 mm (1.85 in), ...)

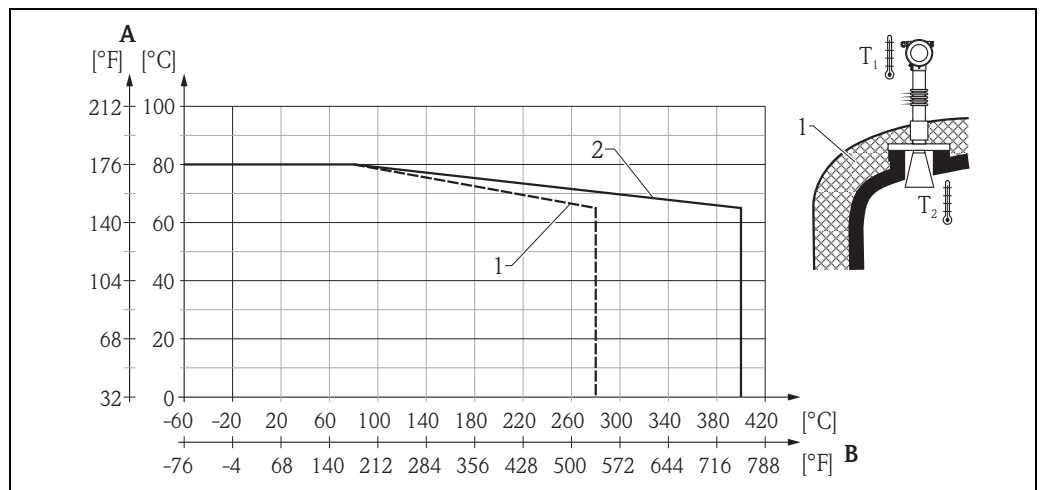
**Installation FMR230
with heat insulation**



A Max. 280 °C (536 °F)
B Max. 400 °C (752 °F)

1 Extended temperature version (type of antenna L)
 2 MAX
 3 Tank insulation
 4 High temperature version (type of antenna M)

- To avoid the electronics heating up as a result of heat radiation or convection, the FMR230 must be incorporated into the tank insulation at high process temperature (≥ 200 °C (392 °F)).
- The isolation should not exceed the points marked with "MAX" within the sketch.

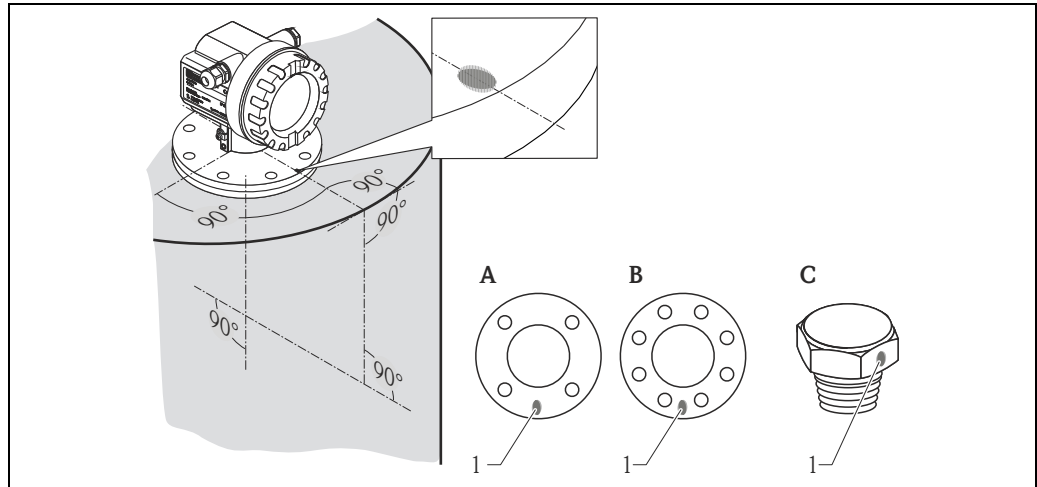


A Max. ambient temperature T_1
B Max. process connection temperature T_2
 1 FMR230 with type of antenna L (extended temperature)
 2 FMR230 with type of antenna M (high temperature)

For process connection temperatures (T_2) above 80 °C (176 °F), the allowed ambient temperature (T_1) at the housing is reduced according to the above diagram.

**Installation in tank
(free space) FMR231**

Optimum mounting position



- A DN 50, ANSI 2"
- B DN 80 to 150, ANSI 3 to 6"
- C R1 1/2 oder 1 1/2 NPT

1 Marker at device flange or threaded boss

L00-FMR231xx-17-00-00-xx-000

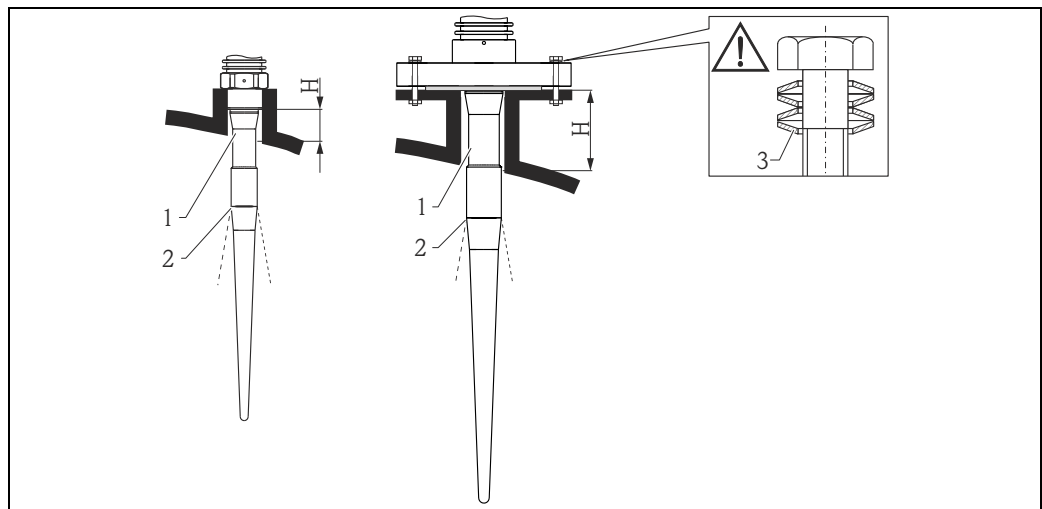
Standard installation

- Observe installation instructions, → 26.
- Marker is aligned towards tank wall.
- The marker is good visibly situated between the sensor neck and the bolt-holes of the flange.
- Use spring washers (1) (see Fig.).

Note!

It is recommended to retighten the flange bolts periodically, depending on process temperature and pressure. Recommended torque: 60 to 100 Nm (44.24 to 73.75 lbf ft).

- After mounting, the housing can be turned 350° in order to simplify access to the display and the terminal compartment.
- The inactive part of the rod antenna must extend below the nozzle.
- The rod antenna must be aligned vertically.



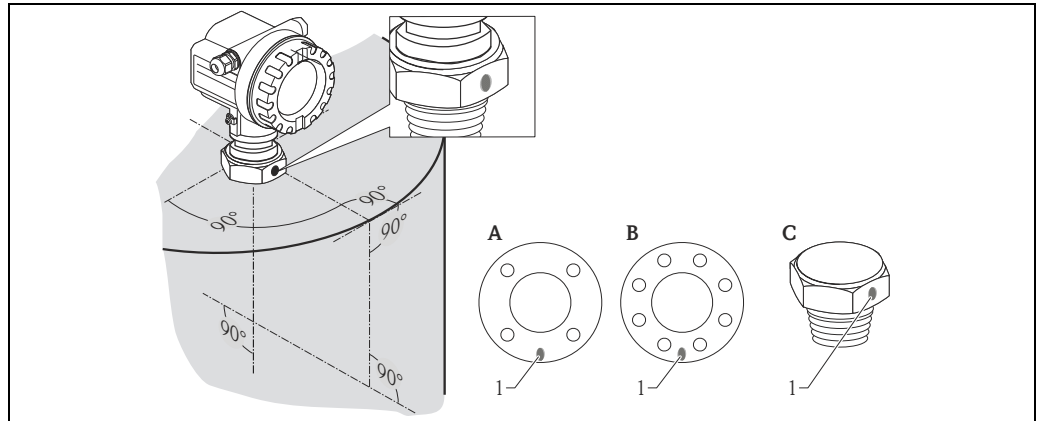
- 1 Inactive length
- 2 Beam launched here
- 3 Spring washers

A0016821

| Material | PPS | | PTFE | |
|--------------------------|--------------|--------------|--------------|--------------|
| Antenna length [mm (in)] | 360 (14.2) | 510 (20.1) | 390 (15.4) | 540 (21.3) |
| H [mm (in)] | < 100 (3.94) | < 250 (9.84) | < 100 (3.94) | < 250 (9.84) |

**Installation in tank
(free space) FMR240,
FMR244, FMR245**

Optimum mounting position



- A DN50, ANSI 2"
- B DN80 to 150, ANSI 3 to 6"
- C R1 1/2, G1 1/2 (FMR244) oder 1 1/2 NPT

1 Marker at device flange or threaded boss

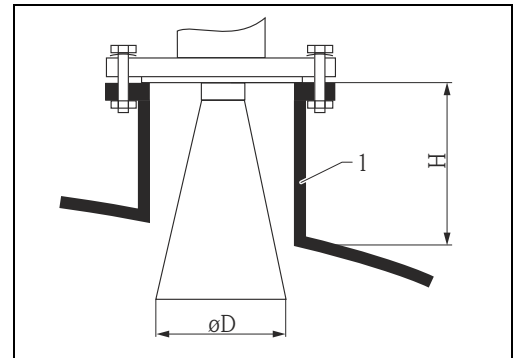
L00-FMR240xx-17-00-00-xx-001

Standard installation FMR240

- Observe installation instructions, → 26.
- Marker is aligned towards tank wall.
- The marker is good visibly situated between the sensor neck and the bolt-holes of the flange.
- After mounting, the housing can be turned 350° in order to simplify access to the display and the terminal compartment.
- For optimum measurement, the horn antenna should extend below the nozzle. Select version with 100 mm (3.94 in) antenna extension if necessary. Nozzle heights up to 500 mm (19.7 in) can be accepted if this should not be possible due to mechanical reasons.

Note!

Please contact Endress+Hauser for application with higher nozzle.



1 Nozzle

A0016822

- **The horn antenna must be aligned vertically.**

Caution!

The maximum range may be reduced, if the horn antenna is not vertically aligned.

- For mounting in solid applications use the variable flange seal to align the device towards the product surface (→ 82, "Accessories").

| Antenna size | 40 mm (1 1/2") | 50 mm (2") | 80 mm (3") | 100 mm (4") |
|--------------|----------------|--------------|--------------|-------------|
| D [mm (in)] | 40 (1.57) | 48 (1.85) | 75 (2.95) | 95 (3.74) |
| H [mm (in)] | < 85 (3.35) | < 115 (4.53) | < 210 (8.27) | < 280 (11) |

Measurement from the outside through plastic walls

- Observe instructions, → 26.
- If possible, use an antenna 100 mm (4").

| Penetrated material | PE | PTFE | PP | Perspex |
|---|------------|------------|------------|------------|
| DK / εr | 2,3 | 2,1 | 2,3 | 3,1 |
| Optimum thickness [mm (in)] ¹⁾ | 3,8 (0.15) | 4,0 (0.16) | 3,8 (0.15) | 3,3 (0.13) |

1) Other possible values for the thickness are multiples of the values listed (i.e. E: 7,6 mm (0.3 in), 11,4 mm (0.45 in), ...)

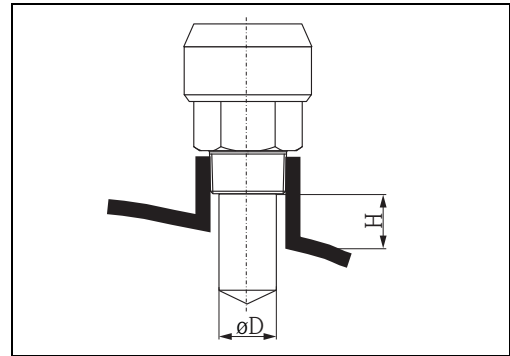
Standard installation FMR244 - 40 mm (1½") antenna

- Observe installation instructions, → 26.
- Marker is aligned towards tank wall.
- Install the device using the threaded boss (AF60) only. Observe the max. torque of 20 Nm (14.75 lbf ft).
- After mounting, the housing can be turned 350° in order to simplify access to the display and the terminal compartment.
- For optimum measurement, the tip of the antenna should extend below the nozzle. Nozzle heights up to 500 mm (19.7 in) can be accepted if this should not be possible due to mechanical reasons.

Note!

Please contact Endress+Hauser for application with higher nozzle.

- The antenna must be aligned vertically.

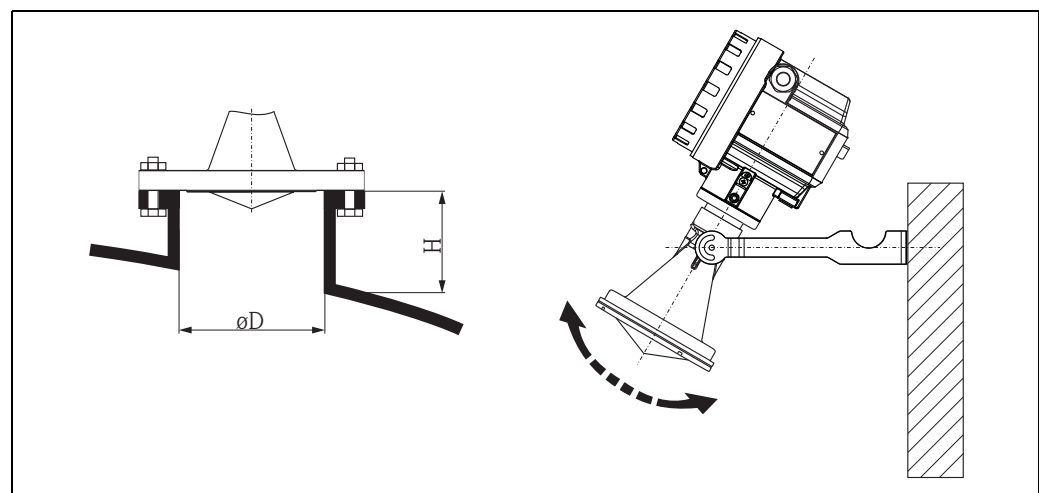


L100-FMR244xx-17-00-00-xx-000

| Antenna size | 40 mm (1½") |
|--------------|-------------|
| D [mm (in)] | 39 (1.54) |
| H [mm (in)] | < 85 (3.35) |

Standard installation FMR244 - 80 mm (3") antenna

- Observe installation instructions, → 26.
- Marker is aligned towards tank wall.
- The marker is located directly below the housing neck on the stainless steel feedthrough.
- As an option for flange mounting, a variable flange seal (→ 82, "Accessories") can be used to align the device (solid applications).
- If using a mounting bracket (→ 82, "Accessories"), the device can be aligned at the bracket (solid applications).
- After mounting (flange), the housing can be turned 350° in order to simplify access to the display and the terminal compartment.



L100-FMR244xx-17-00-00-xx-001

| Antenna size | 80 mm (3") | | |
|--------------|--------------|--------------|--------------|
| D [mm (in)] | 80 (3.15) | 100 (3.94) | 150 (5.91) |
| H [mm (in)] | < 500 (19.7) | < 500 (19.7) | < 500 (19.7) |

Standard installation FMR245

- Observe installation instructions, → 26.
- Marker is aligned towards tank wall.
- The marker is good visibly situated between the sensor neck and the bolt-holes of the flange.
- Use spring washers (1) (see Fig.).

Note!

It is recommended to retighten the flange bolts periodically, depending on process temperature and pressure.
Recommended torque: 60 to 100 Nm (44.25 to 73.75 lbf ft).

- After mounting, the housing can be turned 350° in order to simplify access to the display and the terminal compartment.
- **The antenna must be aligned vertically.**

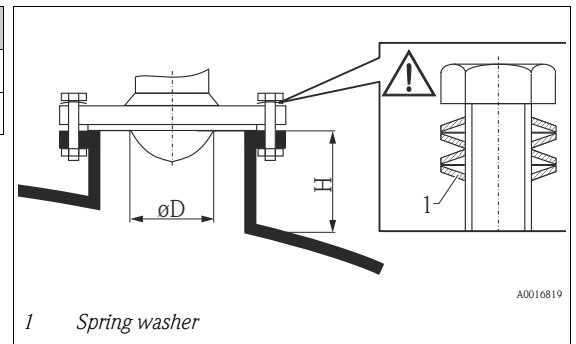
Caution!

The maximum range may be reduced, if the antenna is not vertically aligned.

Note!

Please contact Endress+Hauser for application with higher nozzle.

| Antenna size | 50 mm (2") | 80 mm (3") |
|--------------|--------------|--------------|
| D [mm (in)] | 48 (1.89) | 75 (2.95) |
| H [mm (in)] | < 500 (19.7) | < 500 (19.7) |

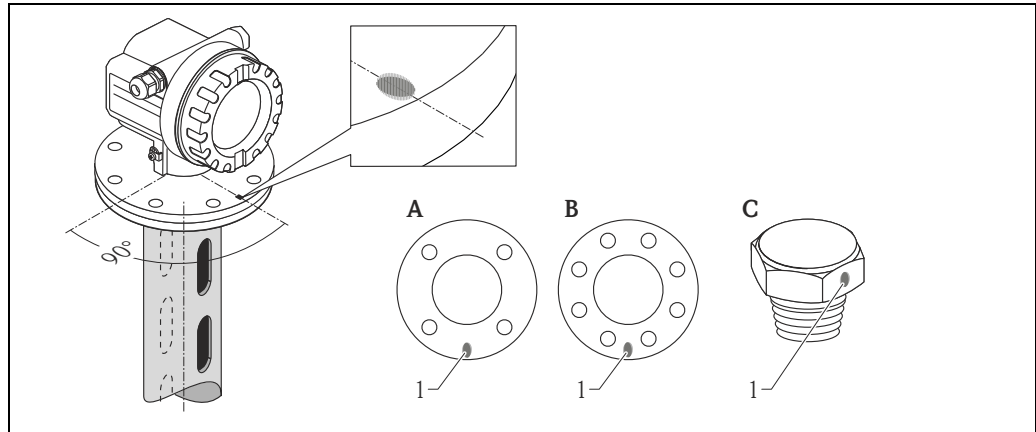


Note!

The PTFE plating of the FMR245 is used for sealing to the process. Usually no other sealing is necessary.

Installation in stilling well
FMR230, FMR240,
FMR244, FMR245

Optimum mounting position



A DN 50, ANSI 2"

B DN 80 to 150, ANSI 3 to 6"

C R1½, G1½ (FMR244) oder 1½ NPT

1 Marker at device flange or threaded boss

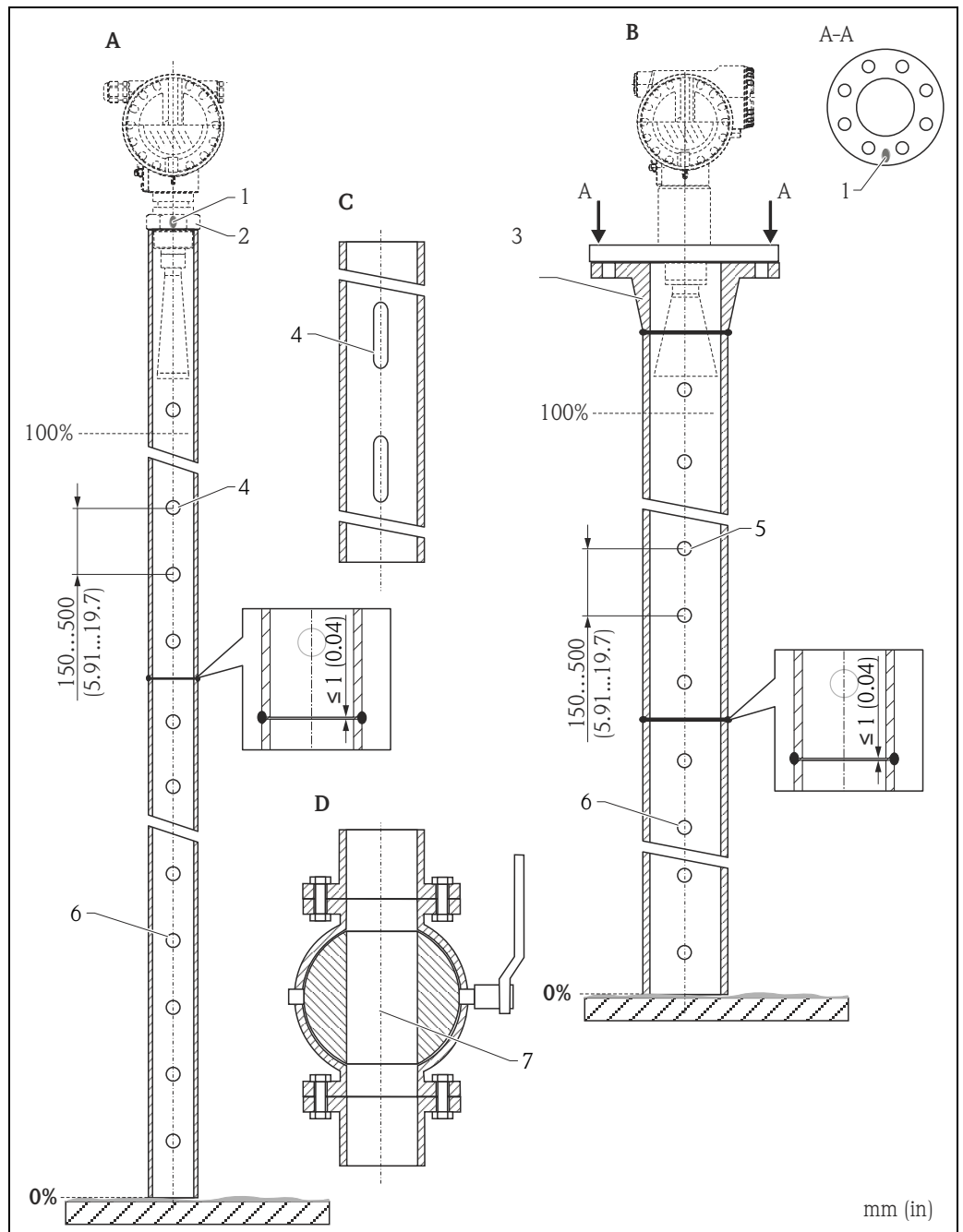
Standard installation

- Marker is aligned toward slots.
- The marker is good visibly situated between the sensor neck and the bolt-holes of the flange.
- After mounting, the housing can be turned 350° in order to simplify access to the display and the terminal compartment.
- Measurements can be performed through an open full bore ball valve without any problems.
- Additional installation instructions, → 26.

Recommendations for the stilling well

- Metal (no enamel coating, plastic on request).
- Constant diameter.
- Diameter of stilling well not larger than antenna diameter.
- Weld seam as smooth as possible and on the same axis as the slots.
- Slots offset 180° (not 90°).
- Slot width respectively diameter of holes max. 1/10 of pipe diameter, de-burred. Length and number do not have any influence on the measurement.
- Select horn antenna as big as possible. For intermediate sizes (i.e. 180 mm (7")) select next larger antenna and adapt it mechanically (FMR230/FMR240 only).
- At any transition (i.e. when using a ball valve or mending pipe segments), no gap may be created exceeding 1 mm (0.04 in).
- The stilling well must be smooth on the inside (average roughness $R_z \leq 6.3 \mu\text{m}$ (248 μin)). Use extruded or parallel welded stainless steel pipe. An extension of the pipe is possible with welded flanges or pipe sleeves. Flange and pipe have to be properly aligned at the inside.
- Do not weld through the pipe wall. The inside of the stilling well must remain smooth. In case of unintentional welding through the pipe, the weld seam and any unevenness on the inside need to be carefully removed and smoothened. Otherwise, strong interference echoes will be generated and material build-up will be promoted.
- Particularly on smaller nominal widths it needs to be observed that flanges are welded to the pipe such that they allow for a correct orientation (marker aligned toward slots).

Examples for the construction of stilling wells

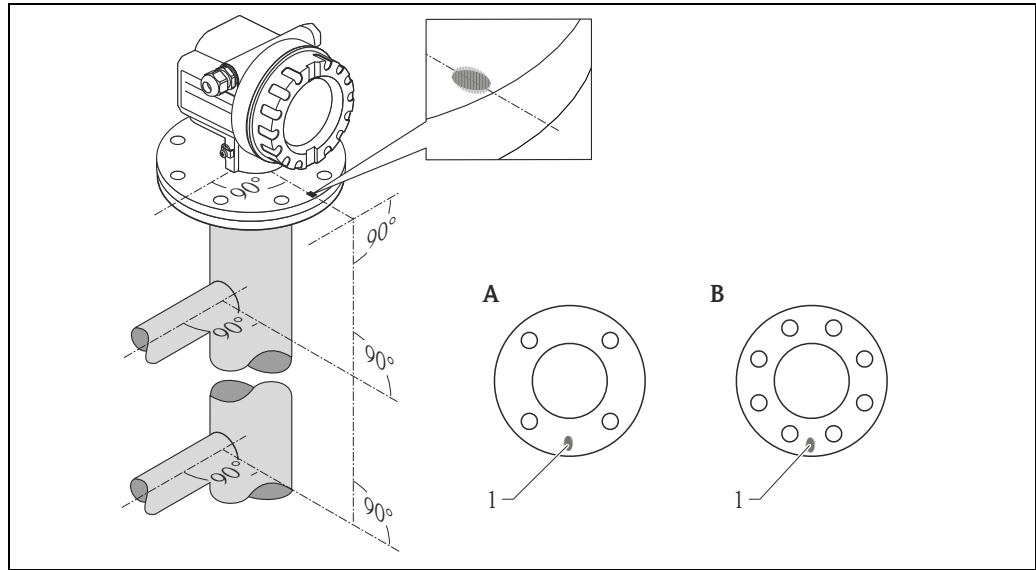


L00-FMR2xxxx-17-00-00-xx-014

- A** FMR240, FMR244 (40 mm (1½"))
- B** FMR230, FMR240, FMR244 (80 mm (3")), FMR245
- C** Stilling well with slots
- D** Full bore ball valve
- 1 Marker
- 2 Threaded connection 1½" BSPT (R1½"), G1½" (FMR244) or 1½"NPT
- 3 E.g. welding neck flange DIN2633
- 4 <math>< 1/10</math> pipe diameter
- 5 Hole <math>< 1/10</math> pipe diameter, single sided or drilled through
- 6 Inside of holes deburred
- 7 Diameter of opening of ball valve must always be equivalent to pipe diameter. Avoid edges and constrictions.

Installation in bypass
FMR230, FMR240, FMR245

Optimum mounting position



A DN 50, ANSI 2"

B DN 80 to 150, ANSI 3 to 6"

1 Marker at device flange

L00-FMR230xx-17-00-00-xx-008

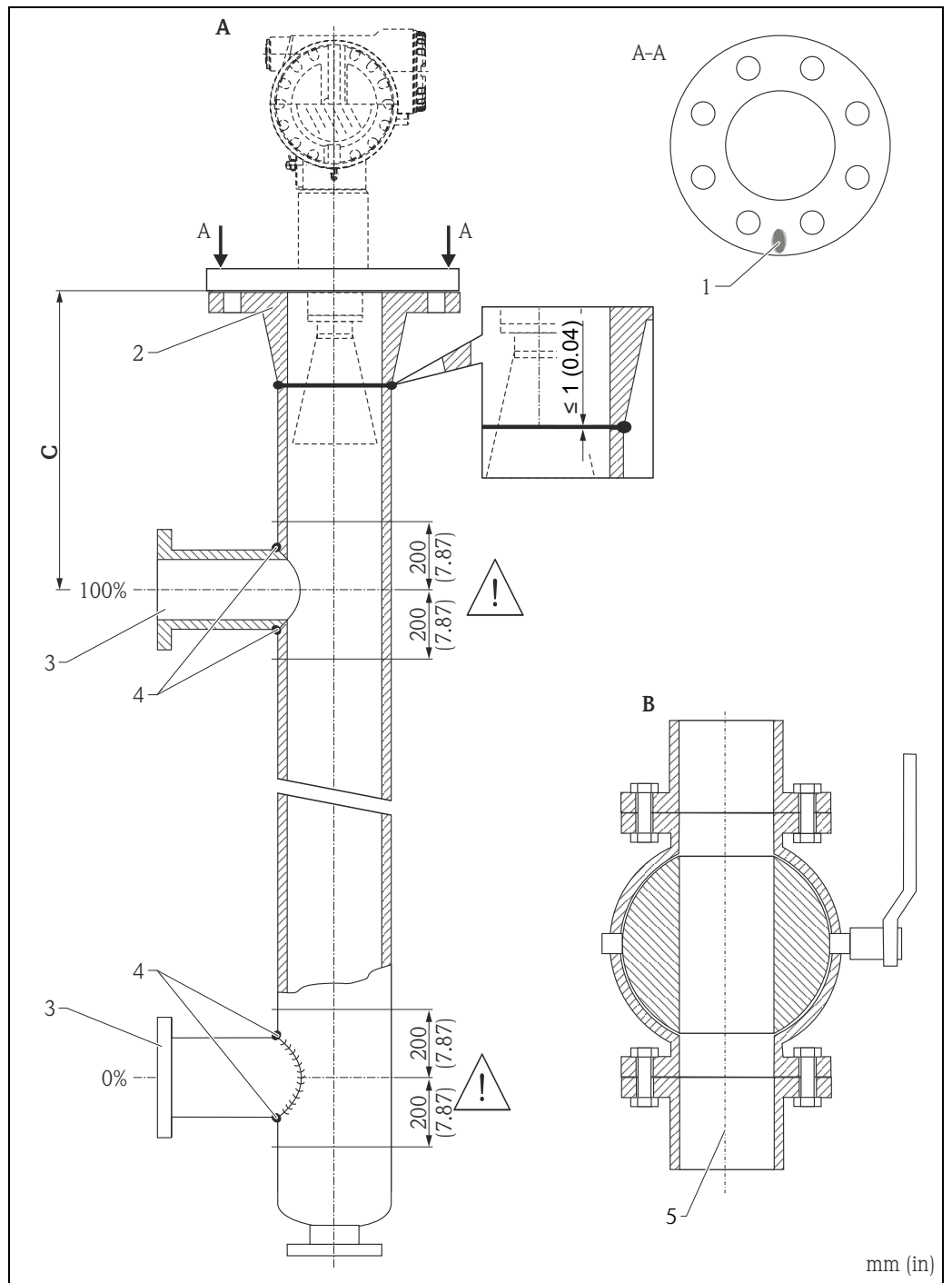
Standard installation

- Marker is aligned perpendicular (90°) to tank connectors.
- The marker is good visibly situated between the sensor neck and the bolt-holes of the flange.
- After mounting, the housing can be turned 350° in order to simplify access to the display and the terminal compartment.
- The horn must be aligned vertically.
- Measurements can be performed through an open full bore ball valve without any problems.
- Additional installation instructions, → 26.

Recommendations for the bypass pipe

- Metal (no plastic or enamel coating).
- Constant diameter.
- Select horn antenna as big as possible. For intermediate sizes (i.e. 95 mm (3.5")) select next larger antenna and adapt it mechanically (FMR230/FMR240 only).
- At any transition (i.e. when using a ball valve or mending pipe segments), no gap may be created exceeding 1 mm (0.04 in).
- In the area of the tank connections (~ ±20 cm (7.87 in)) a reduced accuracy of the measurement has to be expected.

Example for the construction of a bypass.



100-FMR2xxxx-17-00-00-xx-015

- A** FMR230, FMR240, FMR244 (80 mm (3")), FMR245
- B** Full bore ball valve
- C** Recommendation: min. 400 mm (15.7 in)
- 1** Marker
- 2** E.g. welding neck flange DIN2633
- 3** Diameter of the connection pipes as small as possible
- 4** Do not weld through the pipe wall. The inside of the bypass must remain smooth.
- 5** Diameter of opening of ball valve must always be equivalent to pipe diameter. Avoid edges and constrictions.

Operating conditions: Environment

| | |
|--|---|
| Ambient temperature range | Ambient temperature for the transmitter: -40 to +80 °C (-40 to +176 °F), -50 °C (-58 °F) with manufacturer declaration on request. The functionality of the LCD display may be limited for temperatures $T_a < -20$ °C (-4 °F) and $T_a > +60$ °C (+140 °F). A weather protection cover should be used for outdoor operation if the device is exposed to direct sunlight. |
| Storage temperature | -40 to +80 °C (-40 to +176 °F), -50 °C (-58 °F) with manufacturer declaration on request. |
| Climate class | DIN EN 60068-2-38 (test Z/AD) |
| Geometric height according to IEC61010-1 Ed.3 | Up to 2 000 m (6 600 ft) above MSL. Can be expanded to 3 000 m (9 800 ft) above MSL by application of an overvoltage protection, e.g. HAW562 or HAW569. |
| Degree of protection | <ul style="list-style-type: none"> ■ With closed housing: IP65, NEMA4X (higher degree of protection e.g. IP68 on request) ■ With open housing: IP20, NEMA1 (also ingress protection of the display) ■ Antenna: IP68 (NEMA6P) |
| Vibration resistance | DIN EN 60068-2-64 / IEC 68-2-64: <ul style="list-style-type: none"> ■ 20 to 2000 Hz, 1 (m/s²)²/Hz (FMR230/231; FMR240; FMR245; FMR244 with 40 mm (1½") antenna) ■ 20 to 2000 Hz, 0.5 (m/s²)²/Hz (FMR244 with 80 mm (3") antenna) |
| Cleaning of the antenna | The antenna can get contaminated, depending on the application. The emission and reception of microwaves can thus eventually be hindered. The degree of contamination leading to an error depends on the medium and the reflectivity, mainly determined by the dielectric constant ϵ_r . If the medium tends to cause contamination and deposits, cleaning on a regular basis is recommended. Care has to be taken not to damage the antenna in the process of a mechanical or hose-down cleaning (eventually connection for cleaning liquid). The material compatibility has to be considered if cleaning agents are used! The maximum permitted temperature at the flange should not be exceeded. |
| Electromagnetic compatibility (EMC) | <ul style="list-style-type: none"> ■ Electromagnetic compatibility in accordance with all the relevant requirements of the EN 61326 series and NAMUR recommendation (NE21). For details refer to the Declaration of Conformity. Maximum deviation < 0.5% of the span. ■ A standard installation cable is sufficient if only the analogue signal is used. Use a screened cable when working with a superimposed communications signal (HART). |

Operating conditions: Process

Process temperature range/ Process pressure limits

Note!

The specified range may be reduced by the selected process connection. The pressure rating (PN) specified on the flanges refers to a reference temperature of 20 °C (68 °F), for ASME flanges to 100 °F. Observe pressure-temperature dependency.

The pressure values permitted at higher temperatures can be found in the following standards:

- EN 1092-1: 2001 Tab. 18

With regard to their temperature stability properties, the materials 1.4404 and 1.4435 are grouped under 13E0 in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.

- ASME B 16.5a - 1998 Tab. 2-2.2 F316
- ASME B 16.5a - 1998 Tab. 2.3.8 N10276
- JIS B 2220

| FMR230 | | | | | |
|-----------------|----------------------|---------------------------|--|--|--|
| Type of antenna | Seal | Temperature | Pressure | Wetted parts | |
| V | Standard | FKM Viton GLT | -40 to +200 °C ¹⁾ (-40 to +392 °F) | -1 to +64 bar (-14.5 to +928 psi) | PTFE, seal, 316L resp. Alloy C4 |
| E | Standard | EPDM | -40 to +150 °C (-40 to +302 °F) | | |
| K | Standard | Kalrez (Spectrum 6375) | -20 to +200 °C ¹⁾ (-4 to +392 °F) | | |
| L | Extended temperature | Graphit | -60 to +280 °C (-76 to +536 °F) | -1 to +100 bar (-14.5 to +1450 psi) | Ceramic (Al ₂ O ₃ : 99,7%), Graphit, 316L |
| M | High temperature | Graphit | -60 to +400 °C (-76 to +752 °F) | -1 to +160 bar (-14.5 to +2320 psi) | |

↑ Ordering information, → 67

- 1) Max. +150 °C (+302 °F) for conductive media.

| FMR231 | | | | | | |
|-----------------|---|---------------------------|-----------------------------------|--------------------------------------|---|---|
| Type of antenna | Process connection | Temperature | Pressure | Wetted parts | | |
| A, B | PPS | — | -20 to +120 °C (-4 to +248 °F) | -1 to +16 bar (-14.5 to +232 psi) | 316L, Viton, PPS | |
| E, F | PTFE (conform to FDA 21 CFR 177.1550 and USP <88> Class VI) | PVDF threaded connection | -40 to +80 °C (-40 to +176 °F) | -1 to +3 bar (-14.5 to +43.5 psi) | PVDF, PTFE | |
| | | Metal threaded connection | | -1 to +40 bar (-14.5 to +302 °F) | 316L, PTFE (conform to FDA 21 CFR 177.1550 and USP <88> Class VI) | |
| | | Flange unclad | | -1 to +16 bar (-14.5 to +232 psi) | PTFE (conform to FDA 21 CFR 177.1550 and USP <88> Class VI) | |
| | | Flange clad ¹⁾ | | | | |
| | | Tri-Clamp 2" | | -40 to +150 °C (-40 to +302 °F) | -1 to +16 bar (-14.5 to +232 psi) | 316L, PTFE (conform to FDA 21 CFR 177.1550 and USP <88> Class VI) |
| | | Tri-Clamp 3" | | | -1 to +10 bar (-14.5 to +145 psi) | |
| | | Aseptic, Dairy | | | -1 to +25 bar (-14.5 to +362.5 psi) | |

| FMR231 | | | | | |
|-----------------|--|---------------------------|--------------------------------------|-------------------------------------|----------------------|
| Type of antenna | Process connection | Temperature | Pressure | Wetted parts | |
| H, J | PTFE antistatic (TFM4220, 2% conductive additives) | Metal threaded connection | -40 to +150 °C (-40 to +302 °F) | -1 to +40 bar (-14.5 to +302 °F) | 316L, PTFE (TFM4220) |
| | | Flange unclad | | | |
| | | Flange clad ¹⁾ | -1 to +16 bar (-14.5 to +232 psi) | PTFE (TFM4220) | |

↑ Ordering information, → 70

1) On DN 150, 6" ANSI, JIS 150A the disc is made of antistatic PTFE (=black).

| FMR240 | | | | |
|-----------------|----------|---------------------------|------------------------------------|--|
| Type of antenna | Seal | Temperature | Pressure | Wetted parts |
| V | Standard | FKM Viton | -20 to +150 °C (-4 to +302 °F) | -1 to +40 bar (-14.5 to +580 psi) PTFE, seal, 316L resp. Alloy C22 |
| E | Standard | FKM Viton GLT | -40 to +150 °C (-40 to +302 °F) | |
| K | Standard | Kalrez (Spectrum 6375) | -20 to +150 °C (-4 to +302 °F) | |

↑ Ordering information, → 73

| FMR244 | | | | |
|-----------------|--|------------------|------------------------------------|---|
| Type of antenna | Seal | Temperature | Pressure | Wetted parts |
| V | Standard, completely PTFE encapsulated | FKM Viton GLT | -40 to +130 °C (-40 to +266 °F) | -1 to +3 bar (-14.5 to +43.5 psi) PTFE (conform to FDA 21 CFR 177.1550 and USP <88> Class VI), Viton, PVDF |
| S | Standard, PP clad | Silicone | -40 to +80 °C (-40 to +176 °F) | |

↑ Ordering information, → 76

| FMR245 | | | | |
|-----------------|------------------------|-------------|------------------------------------|---|
| Type of antenna | Seal | Temperature | Pressure | Wetted parts |
| B, C, F, G | Standard, PTFE clad | none | -40 to +200 °C (-40 to +392 °F) | -1 to +16 bar (-14.5 to +232 psi) PTFE (conform to FDA 21 CFR 177.1550 and USP <88> Class VI) ¹⁾ |

↑ Ordering information, → 79

1) 3A-, EHEDG approval for Tri-Clamp process connection.

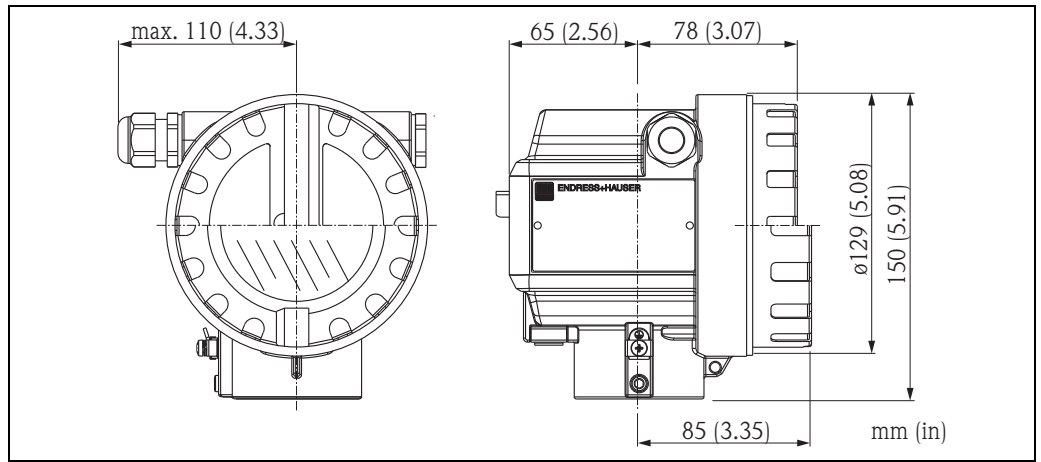
Dielectric constant

- In a stilling well: $\epsilon_r \geq 1,4$
- In free space: $\epsilon_r \geq 1,9$

Mechanical construction

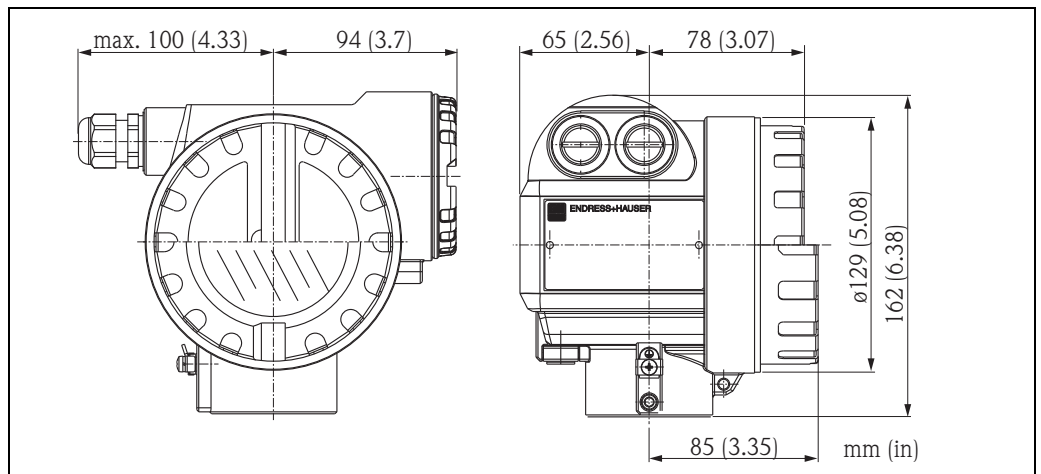
Design, dimensions

Housing dimensions



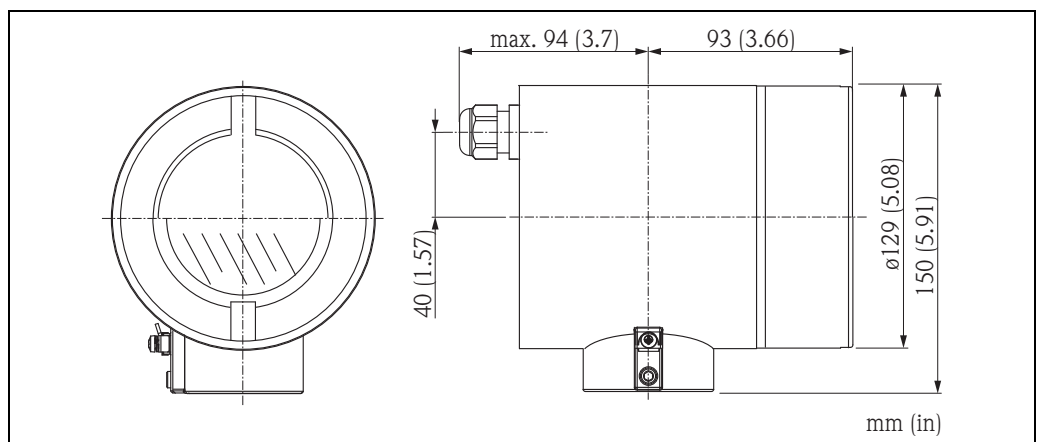
L00-F12xxxx-06-00-00-xx-000

F12 housing (Aluminium)



L00-T12xxxx-06-00-00-xx-000

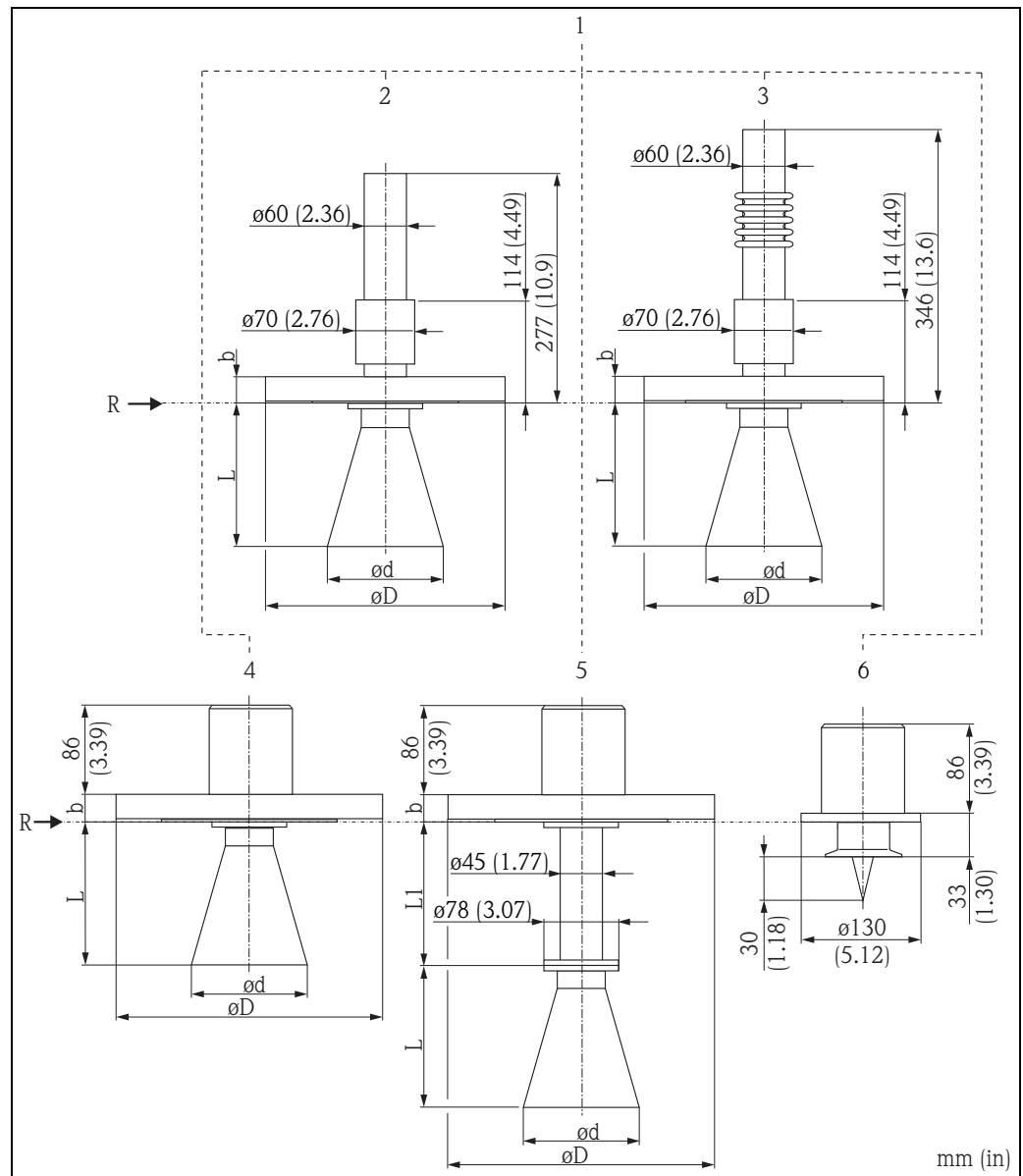
T12 housing (Aluminium)



L00-F23xxxx-06-00-00-de-001

F23 housing (316L)

Micropilot M FMR230 - Process connection and antenna



- 1 F12/T12/F23 housing
- 2 Ext. temperature version; feature 30, version L
- 3 High temperature version ; feature 30, version M
- 4 Standard antenna
- 5 Antenna extension
- 6 3" Tri-Clamp ISO 2852
- R Reference point of measurement
- L1 Antenna extension:
standard length 100 mm (3.94 in), 200 mm (7.87 in), 300 mm (11.8 in), 400 mm (15.7 in)

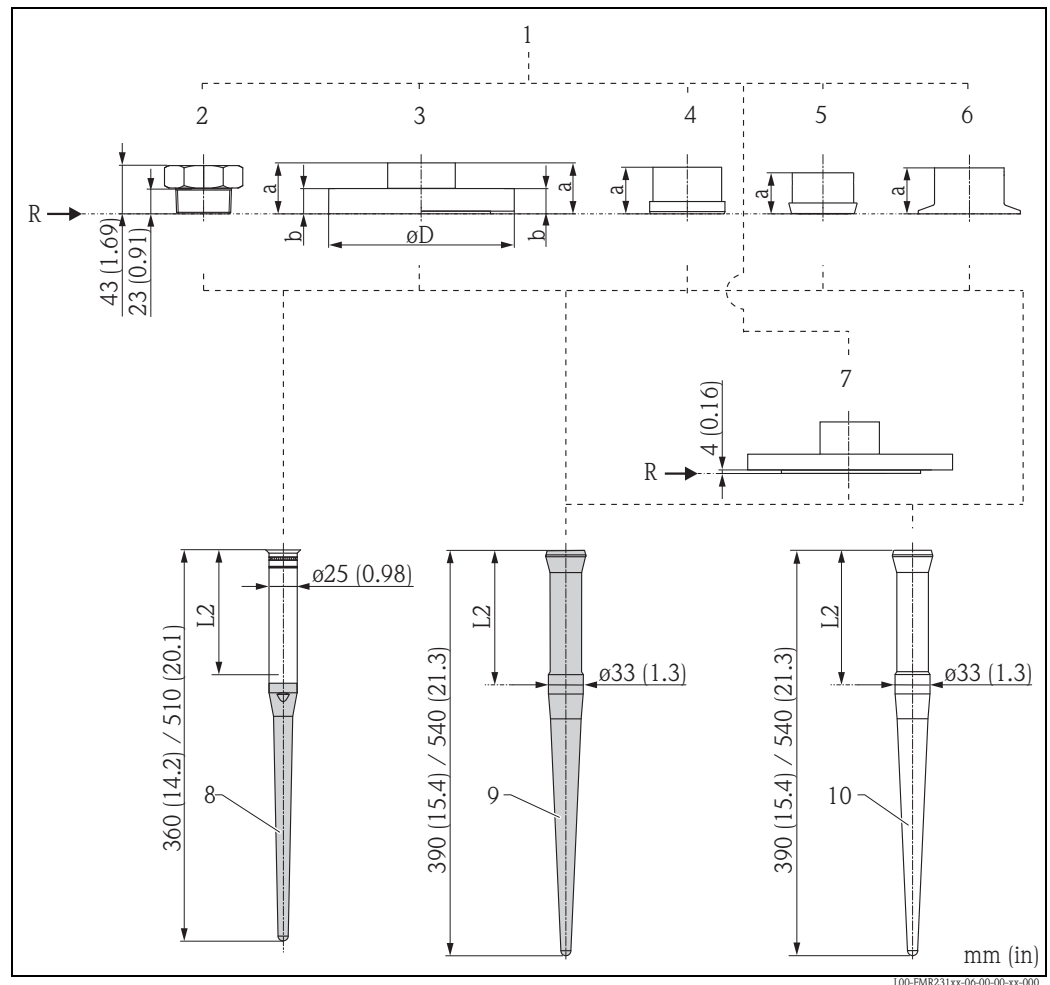
| Horn antenna; mm (in) | | | | | | |
|------------------------------|---------|----------------|-----------------|-----------------|-----------------|------------------|
| Antenna size | | 80 (3") | 100 (4") | 150 (6") | 200 (8") | 250 (10") |
| L | 316L | 68 (2.68) | 105 (4.13) | 185 (7.28) | 268 (10.6) | 360 (14.2) |
| | Alloy4C | 74 (2.91) | 119 (4.69) | 204 (8.03) | 289 (11.4) | 379 (14.9) |
| d | | 75 (2.95) | 95 (3.74) | 145 (5.71) | 190 (7.48) | 240 (9.45) |

| Flange to ANSI B16.5; mm (in) | | | | | | |
|--------------------------------------|---------|--------------|-------------|------------|--------------|-------------|
| Flange | | 3" | 4" | 6" | 8" | 10" |
| b | 150 lbs | 23,9 (0.94) | 23,9 (0.94) | 25,4 (1) | 28,4 (1.12) | 30,2 (1.19) |
| | 300 lbs | 28,4 (1.12) | 31,8 (1.25) | - | - | - |
| D | 150 lbs | 190,5 (7.5) | 228,6 (9) | 279,4 (11) | 342,9 (13.5) | 406,4 (16) |
| | 300 lbs | 209,5 (8.25) | 254 (10) | - | - | - |

| Flange to EN 1092-1 (agreeable to DIN 2527); mm (in) | | | | | | |
|---|------|--------------|---------------|---------------|---------------|---------------|
| Flange | | DN 80 | DN 100 | DN 150 | DN 200 | DN 250 |
| b | PN16 | 20 (0.79) | 20 (0.79) | 22 (0.87) | 24 (0.94) | 26 (1.02) |
| | PN40 | 24 (0.94) | 24 (0.94) | - | - | - |
| D | PN16 | 200 (7.87) | 220 (8.66) | 285 (11.2) | 340 (13.4) | 405 (15.9) |
| | PN40 | 200 (7.87) | 235 (9.25) | - | - | - |

| Flange to JIS B2220; mm (in) | | | | | | |
|-------------------------------------|--|--------------|---------------|---------------|---------------|---------------|
| Flansch | | DN 80 | DN 100 | DN 150 | DN 200 | DN 250 |
| b | | 18 (0.79) | 18 (0.79) | 22 (0.87) | 22 (0.87) | 24 (0.94) |
| D | | 185 (7.28) | 210 (8.27) | 280 (11) | 330 (13) | 400 (15.7) |

Micropilot M FMR231 - Process connection and antenna



100-FMR231xx-00-00-00-xx-000

- 1 F12/T12/F23 housing
- 2 Threaded connection 1½" BSPT (R1½") or 1½" NPT
- 3 Flange DN 50 to 150 or equivalent
- 4 DN 50 aseptic DIN 11864-1 form A with O-ring for tubes according to DIN 11850
- 5 DN 50 dairy coupling DIN 11851
- 6 2"/3" Tri-Clamp ISO 2852
- 7 Flange cladded version
- 8 PPS, antistatic
- 9 PTFE, antistatic
- 10 PTFE, conform to FDA21 CFR177.1550 and USP<88> Class VI
(in conjunction with DN 50 aseptic/dairy coupling respectively Tri-Clamp)
- R Reference point of measurement
- L2 Inactive length, equivalent to max. nozzle height 100 mm (3.94 in), 250 mm (9.84 in)

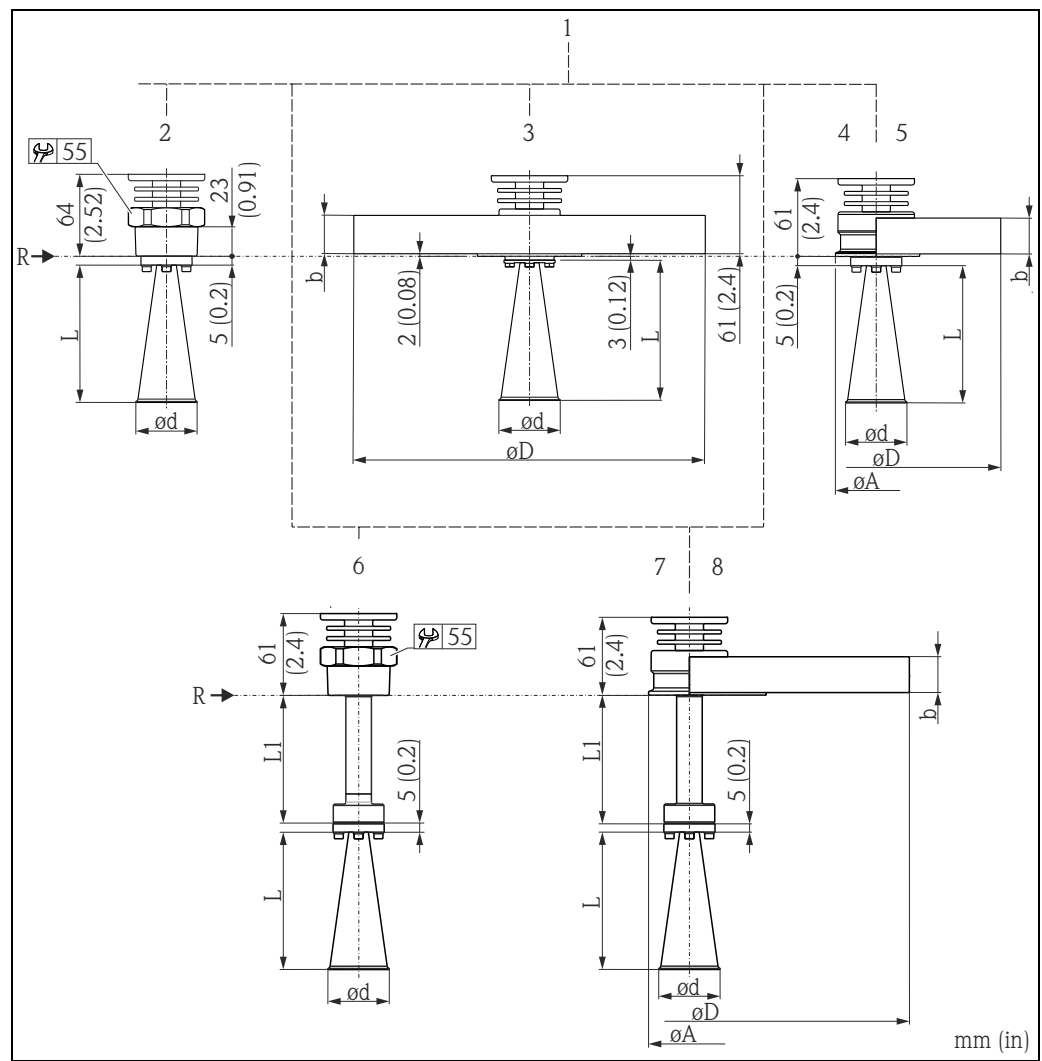
| Flange to EN 1092-1 (agreeable to DIN 2527); mm (in) | | | | | |
|--|------|-----------|------------|------------|------------|
| Flange | | DN 50 | DN 80 | DN 100 | DN 150 |
| b | PN16 | 20 (0.79) | 20 (0.79) | 20 (0.79) | 22 (0.87) |
| | PN40 | - | 24 (0.94) | - | - |
| D | PN16 | 165 (6.5) | 200 (7.87) | 220 (8.66) | 285 (11.2) |
| | PN40 | - | 200 (7.87) | - | - |

| Flange to ANSI B16.5; mm (in) | | | | | |
|-------------------------------|---------|-------------|--------------|-------------|------------|
| Flange | | 2" | 3" | 4" | 6" |
| b | 150 lbs | 19,1 (0.75) | 23,9 (0.94) | 23,9 (0.94) | 25,4 (1) |
| | 300 lbs | - | 28,4 (1.12) | 31,8 (1.25) | - |
| D | 150 lbs | 152,4 (6) | 190,5 (7.5) | 228,6 (9) | 279,4 (11) |
| | 300 lbs | - | 209,5 (8.25) | 254 (10) | - |

| Flange to JIS B2220 (für 10K); mm (in) | | | | | |
|--|--|-----------|------------|------------|-----------|
| Flange | | DN 50 | DN 80 | DN 100 | DN 150 |
| b | | 16 (0.63) | 18 (0.71) | 18 (0.71) | 22 (0.87) |
| D | | 155 (6.1) | 185 (7.28) | 210 (8.27) | 280 (11) |

| Process connection; mm (in) | | | | | |
|-----------------------------|------------------------------|------------------------|---------------------------|-------------------------|----------------------|
| Process connection | | Flange DN 50 to 150 | DN 50 aseptic coupling | DN 50 diary coupling | 2" / 3" Tri-Clamp |
| a | without gastight feedthrough | 41 (1.61) | 44,5 (1.75) | 41 (1.61) | 41 (1.61) |
| | with gastight feedthrough | 77 (3.03) | 80,5 (3.17) | 77 (3.03) | 77 (3.03) |

Micropilot M FMR240 - Process connection and antenna



- 1 F12/T12/F23 housing
- 2 Screw-in adapter, compact R1½" or 1½ NPT
- 3 Flange plated DN 50 to 150 or equivalent
- 4 2"/3" Tri-Clamp ISO 2852
- 5 Flange DN 50 to 150 or equivalent
- 6 Screw-in adapter, compact R1½" or 1½ NPT
- 7 2"/3" Tri-Clamp ISO 2852
- 8 Flange DN 50 to 150 or equivalent
- R Reference point of measurement
- L1 With tube extension 100 mm (3.94 in)

| Horn antenna; mm (in) | | | | |
|-----------------------|-----------|------------|------------|------------|
| Antenna size | 40 (1") | 50 (2") | 80 (3") | 100 (4") |
| L | 86 (3.39) | 115 (4.53) | 211 (8.31) | 282 (11.1) |
| d | 40 (1.57) | 48 (1.89) | 75 (2.95) | 95 (3.74) |

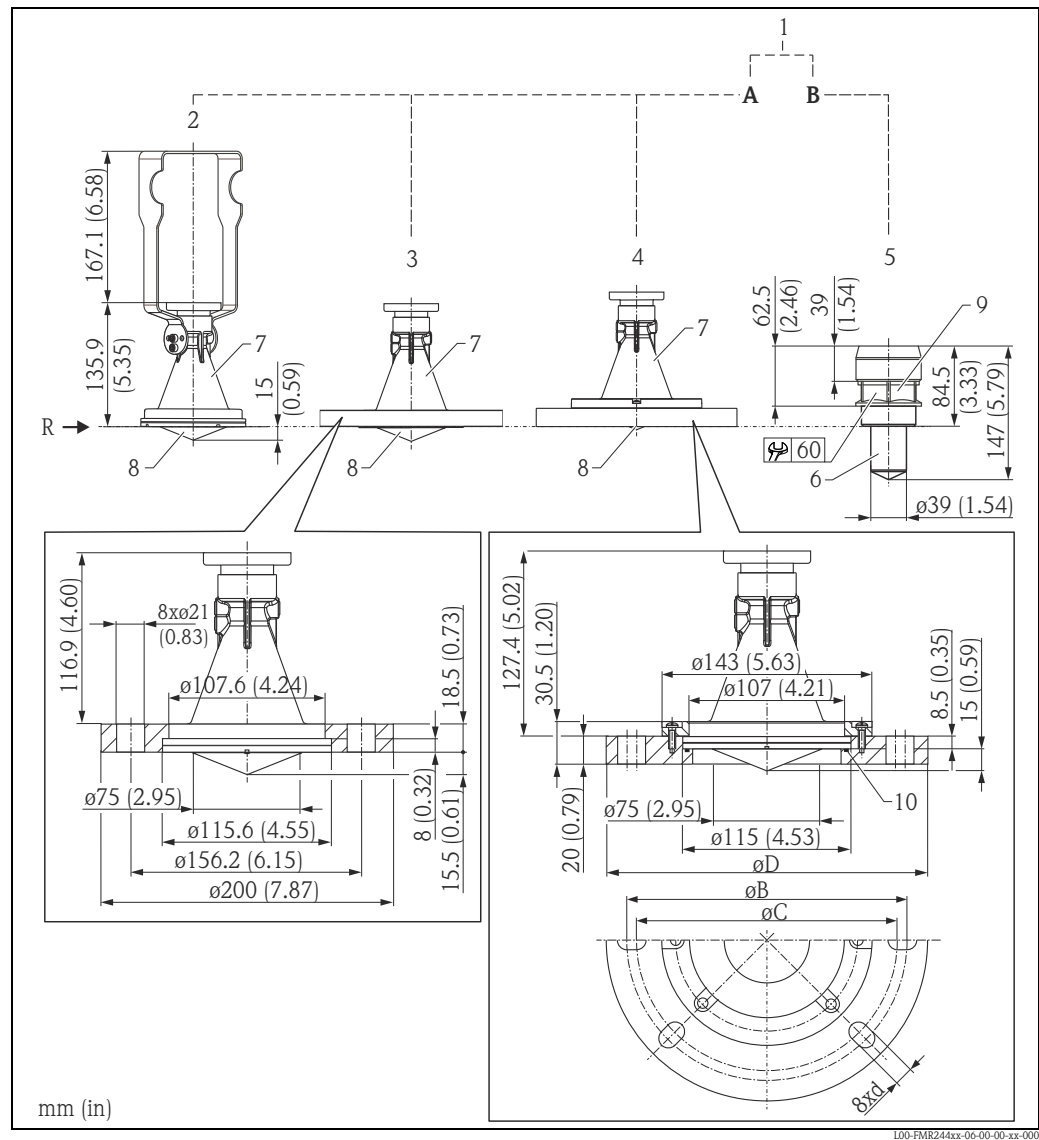
| Flange to JIS B2220 (für 10K); mm (in) | | | | |
|--|-----------|------------|------------|-----------|
| Flange | DN 50 | DN 80 | DN 100 | DN 150 |
| b | 16 (0.63) | 18 (0.71) | 18 (0.71) | 22 (0.87) |
| D | 155 (6.1) | 185 (7.28) | 210 (8.27) | 280 (11) |

| Flange to EN 1092-1 (passend zu DIN 2527); mm (in) | | | | | |
|--|------|-----------|------------|------------|------------|
| Flange | | DN 50 | DN 80 | DN 100 | DN 150 |
| b | PN16 | 18 (0.71) | 20 (0.79) | 20 (0.79) | 22 (0.87) |
| | PN40 | 20 (0.79) | 24 (0.94) | 24 (0.94) | - |
| D | PN16 | 165 (6.5) | 200 (7.87) | 220 (8.66) | 285 (11.2) |
| | PN40 | 165 (6.5) | 200 (7.87) | 235 (9.25) | - |

| Flange to ANSI B16.5; mm (in) | | | | | |
|-------------------------------|---------|-------------|--------------|-------------|------------|
| Flange | | 2" | 3" | 4" | 6" |
| b | 150 lbs | 19,1 (0.75) | 23,9 (0.94) | 23,9 (0.94) | 25,4 (1) |
| | 300 lbs | 22,4 (0.88) | 28,4 (1.12) | 31,8 (1.25) | - |
| D | 150 lbs | 152,4 (6) | 190,5 (7.5) | 228,6 (9) | 279,4 (11) |
| | 300 lbs | 165,1 (6.5) | 209,5 (8.25) | 254 (10) | - |

| Tri-Clamp to ISO 2852; mm (in) | | |
|--------------------------------|-----------|-----------|
| Clamp | 2" | 3" |
| A | 64 (2.52) | 91 (3.58) |

Micropilot M FMR244 - Process connection and antenna



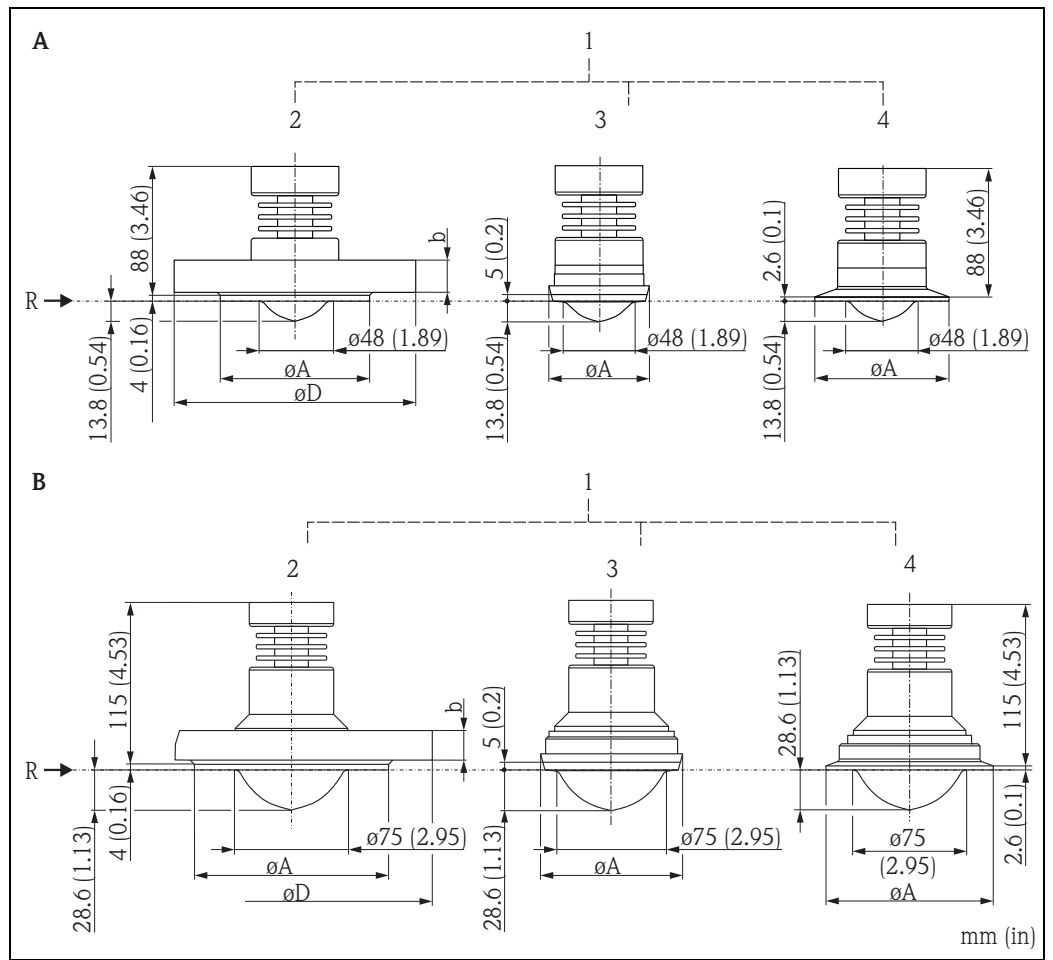
- A Feature 20, version 4
- B Feature 20, version 2
- 1 F12/T12 housing
- 2 Standard, mounting bracket optional²⁾
- 3 Endress+Hauser UNI flange DN80³⁾; suitable for DN80 PN16 / ASME 3" 150 lbs / 10K 80
- 4 Endress+Hauser flange DN100/DN150 suitable for DN 100 PN16 / ASME 4" 150 lbs / 10K 100 and for DN 150 PN16 / ASME 6" 150lbs / 10K 150³⁾
- 5 Screw-in adapter G1½", 1½ NPT
- 6 PTFE, conform to FDA21 CFR 177.1550 and USP <88> Class VI
- 7 PBT
- 8 PP
- 9 PVDF
- 10 Seal Viton
- R Reference point of measurement

| Flange | øD | øB | øC | d |
|--------|------------------|-------------------|------------------|-----------------|
| DN100 | 228,6 mm (9 in) | 190,5 mm (7.5 in) | 175 mm (6.89 in) | 19 mm (0.75 in) |
| DN150 | 285 mm (11.2 in) | 241,3 mm (9.5 in) | 240 mm (9.45 in) | 23 mm (0.91 in) |

2) Housing T12: mounting limited only.

3) Installation hints: The bolt-holes have been enlarged for adaption of dimensions, therefore, the flange needs to be properly aligned to the counterflange before the bolts are tightened.

Micropilot M FMR245 - Process connection and antenna



L00-FMR245xx-06-00-00-4e-006

- A** Feature 20, version B, F
 1 F12/T12/F23 housing
 2 Flange DN 50 or equivalent
 3 DN 50 dairy coupling DIN 11851
 4 2" / 3" Tri-Clamp ISO 2852
 R Reference point of measurement

- B** Feature 20, version C, G
 1 F12/T12/F23 housing
 2 Flange DN 80 or equivalent
 3 DN 80 dairy coupling DIN 11851
 4 4" Tri-Clamp ISO 2852

Note!

Plating from PTFE (conform to FDA21 CFR 177.1550 and USP <88> Class VI):
 3A / EHEDG approval with Tri-Clamp process connection.

| Flange to EN 1092-1 (agreeable to DIN 2527); mm (in) | | | | | |
|--|------|------------|------------|------------|------------|
| Flange | | DN 50 | DN 80 | DN 100 | DN 150 |
| b | PN16 | 20 (0.79) | 20 (0.79) | 20 (0.79) | 22 (0.87) |
| D | PN16 | 165 (6.5) | 200 (7.87) | 220 (8.66) | 285 (11.2) |
| A | PN16 | 102 (4.02) | 138 (5.43) | 158 (6.22) | 212 (8.35) |

| Flange to ANSI B16.5; mm (in) | | | | | |
|-------------------------------|---------|-------------|-------------|-------------|------------|
| Flange | | 2" | 3" | 4" | 6" |
| b | 150 lbs | 19,1 (0.75) | 23,9 (0.94) | 23,9 (0.94) | 25,4 (1) |
| D | 150 lbs | 152,4 (6) | 190,5 (7.5) | 228,6 (9) | 279,4 (11) |
| A | 150 lbs | 92 (3.62) | 127 (5) | 158 (6.22) | 212 (8.35) |

| Flange to JIS B2220 (für 10K); mm (in) | | | | | |
|--|--|-----------|------------|------------|------------|
| Flange | | DN 50 | DN 80 | DN 100 | DN 150 |
| b | | 16 (0.63) | 18 (0.71) | 18 (0.71) | 22 (0.87) |
| D | | 155 (6.1) | 185 (7.28) | 210 (8.27) | 280 (11) |
| A | | 96 (3.78) | 127 (5) | 151 (5.94) | 212 (8.35) |

| Tri-Clamp; mm (in) | | | |
|--------------------|-----------|-----------|------------|
| Tri-Clamp | 2" | 3" | 4" |
| A | 64 (2.52) | 91 (3.58) | 119 (4.69) |

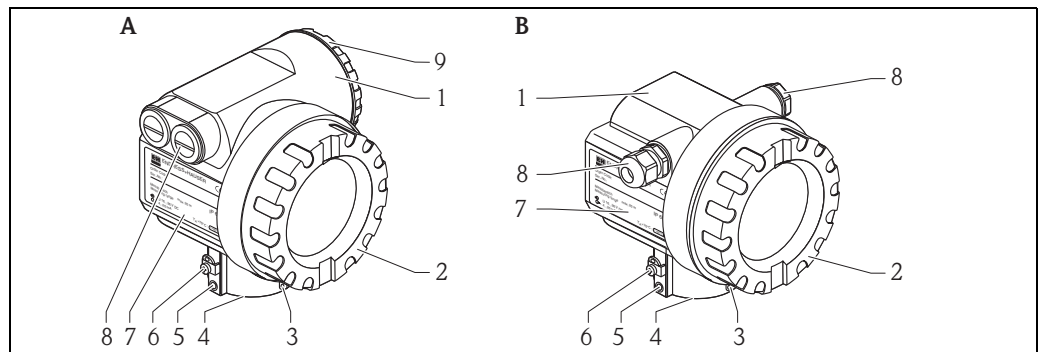
| Diary coupling; mm (in) | | |
|-------------------------|------------|------------|
| Diary coupling | DN 50 | DN 80 |
| A | 68,5 (2.7) | 100 (3.94) |

Weight

| Micropilot M | FMR230 | FMR231 | FMR240 | FMR244 | FMR245 |
|--------------------|--|--|--|------------------------------|--|
| F12 or T12 housing | Approx. 6 kg (13.23 lbs) + weight of flange | Approx. 4 kg (8.82 lbs) + weight of flange | Approx. 4 kg(8.82 lbs) + weight of flange | Approx. 2,5 kg (5.51 lbs) | Approx. 4 kg (8.82 lbs) + weight of flange |
| F23 housing | Approx. 9,4 kg (20.73 lbs) + weight of flange | Approx. 7,4 kg (16.32 lbs) + weight of flange | Approx. 7,4 kg (16.32 lbs) + weight of flange | - | Approx. 7,4 kg (16.32 lbs) + weight of flange |

**Material
(not in contact with process)**

T12 and F12 housing (seawater-resistant¹⁾, powder-coated)

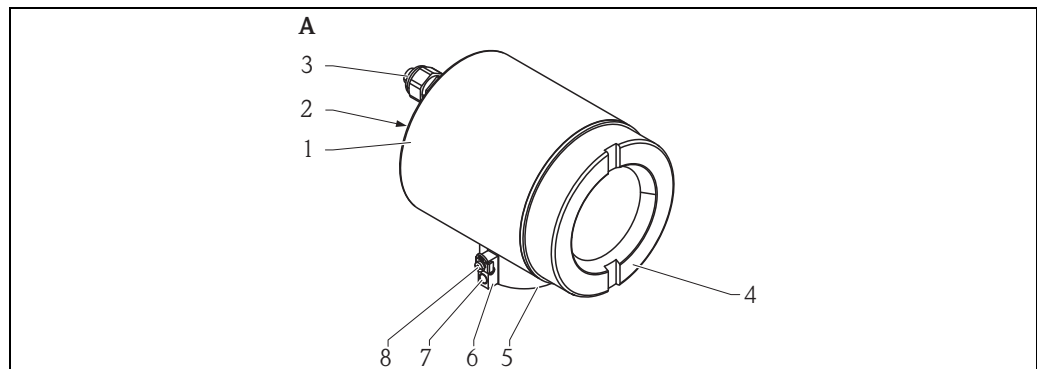


A T12 housing

B F12 housing

| Pos. | Part | Material | |
|---------|--------------------------------|---|-------------------|
| 1 | T12 and F12 housing | AlSi10Mg | |
| 2 | Cover (Display) | AlSi10Mg | |
| | Sealing | Fa. SHS: EPDM 70pW FKN | |
| | Window | ESG-K-Glass (Toughened safety glass) | |
| | Sealing of the glass | Silicone sealing compound Gomastit 402 | |
| 3 | Tag | 304 (1.4301) | |
| | Rope | VA | |
| | Crimp sleeve | Aluminium | |
| 4 | Sealing ring | Fa. SHS: EPDM 70pW FKN Trelleborg: EPDM E7502/E7515 | |
| 5 | Screws ¹⁾ | A2-70 | |
| 6 | Ground terminal ¹⁾ | Screws: A2; Spring washer: A4; Clamp: 304 (1.4301) Holder: 301 (1.4310) | |
| 7 | Nameplate ¹⁾ | 304 (1.4301) | |
| | Groove pin ¹⁾ | A2 | |
| 8 | Sealing | Fa. SHS: EPDM 70 pW FKN Trelleborg: EPDM E7502 | |
| | Cable gland | Polyamid (PA), CuZn nickel-plated | |
| | Plug | PBT-GF30 | 1.0718 galvanized |
| | | PE | 3.1655 |
| Adapter | 316L (1.4435) | AlMgSiPb (anodized) | |
| 9 | Cover (Connection compartment) | AlSi10Mg | |
| | Sealing | Fa. SHS: EPDM 70pW FKN Trelleborg: EPDM E7502/E7515 | |
| | Clamp | Screws: A4; Clamp: Ms nickel-plated; Spring washer: A4 | |

1) Seawater-resistant on request (complete in 316L (1.4404)).

F23 housing (seawater-resistant¹⁾, corrosion-resistant)

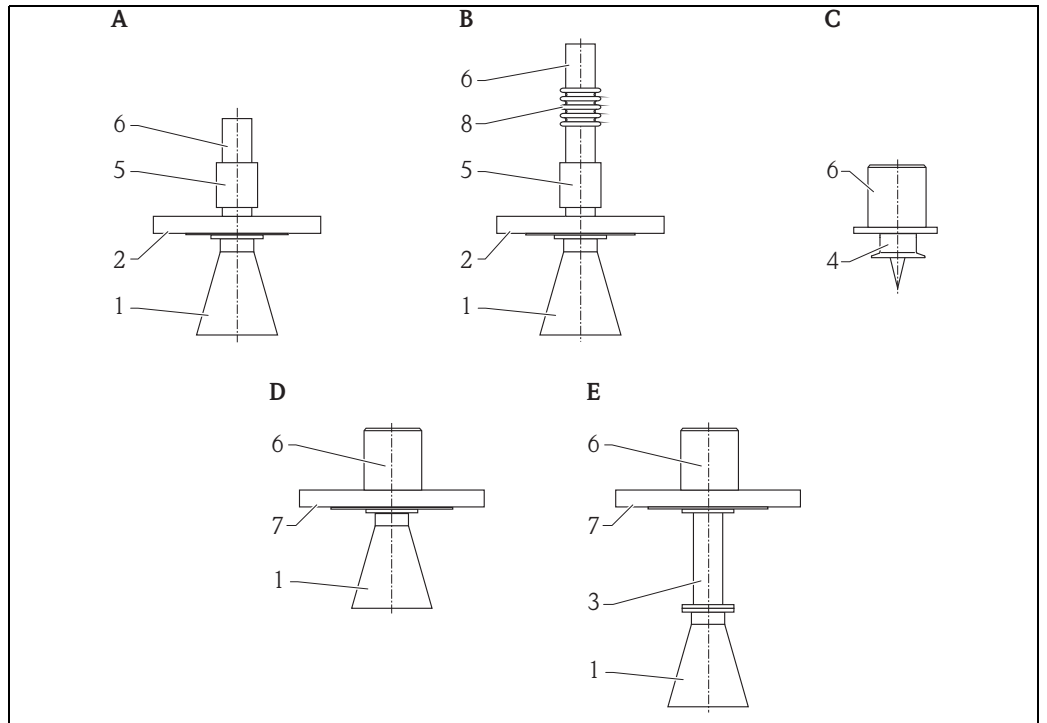
A T23 housing

| Pos. | Part | Material | | |
|---------|----------------------------------|--|------------------------|--|
| 1 | F23 housing | Housing body: 316L (1.4404); Sensor neck: 316 L(1.4435); earth connection block: 316L (1.4435) | | |
| 2 | Nameplate ¹⁾ | 304 (1.4301) | | |
| | Groove pin ¹⁾ | A2 | | |
| 3 | Sealing | Fa. SHS: EPDM 70pW FKN | Trelleborg: EPDM E7502 | |
| | Cable gland | Polyamid (PA), CuZn nickel-plated | | |
| | Plug | PBT-GF30 | 1.0718 galvanized | |
| | | PE | 3.1655 | |
| Adapter | 316L (1.4435) | | | |
| 4 | Cover | 316L (1.4404) | | |
| | Sealing | Fa. SHS: EPDM 70pW FKN | | |
| | Window | ESG-K-Glass (Toughened safety glass) | | |
| | Sealing of the glass | Silicone sealing compound Gomastit 402 | | |
| 5 | Sealing ring | Fa. SHS: EPDM 70pW FKN | Trelleborg: EPDM E7502 | |
| 6 | Tag | 304 (1.4301) | | |
| | Rope | 316 (1.4401) | | |
| | Crimp sleeve | Aluminium | | |
| 7 | Screw ¹⁾ | A2-70 | | |
| 8 | Grounding terminal ¹⁾ | Screws: A2; Spring washer: A4; Clamp: 304 (1.4301); Holder: 301 (1.4310) | | |

1) Seawater-resistant on request (complete in 316L (1.4404)).

Material
(in contact with process)

FMR230

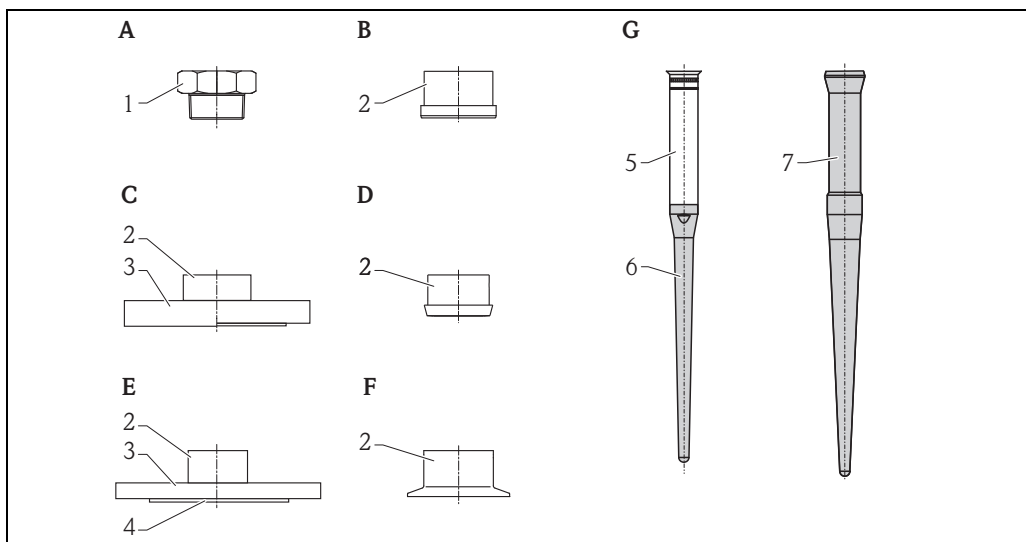


L00-FMR230xx-16-00-00-xx-000

- A Extended temperature version
- B High temperature version
- C 3" Tri-Clamp ISO 2852
- D Standard antenna
- E Antenna extension

| Pos. | Part | Material | |
|------|-------------------------------------|---|-----------|
| 1 | Horn antenna | 316L (1.4404) | Hastelloy |
| | Screw | A4 | Hastelloy |
| | Spring washer | A4 | |
| 2 | Flange | 316L (1.4404/1.4435) | |
| 3 | Antenna extension | 316L (1.4435) | Hastelloy |
| | Screws | A4 | Hastelloy |
| | Spring washer | A4 | |
| 4 | Process connection (e.g. Tri-Clamp) | 316L (1.4435) | |
| | Coupling | | |
| 5 | Process separation | 316L (1.4404) | |
| 6 | Housing adapter | 304 (1.4301) | |
| 7 | Flange | 316L (1.4404) optional Hastelloy plated | |
| | Coupling | 316L (1.4435) | Hastelloy |
| 8 | Temperature reduction | 304 (1.4301) | |

FMR231

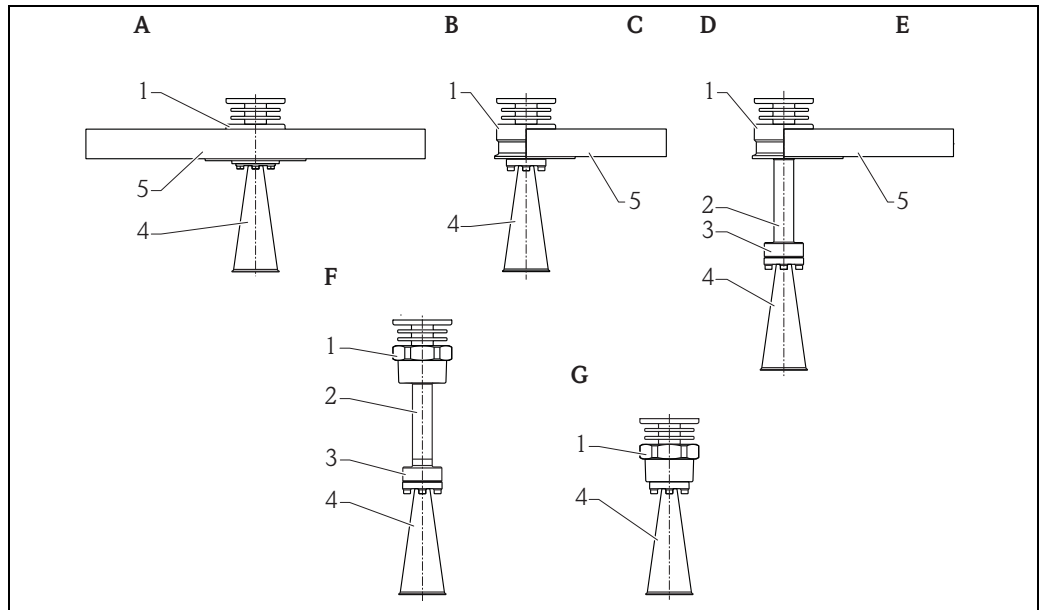


L00-FMR230cc-16-00-00-xz-000

- A Threaded connection 1½" BSPT (R1½") or 1½"NPT
- B DN 50 aseptic; DIN 11864-1 form A with o-ring for tubes according to DIN 11850
- C Flange DN 50 to DN 150
- D DN 50 dairy coupling; DIN 11851
- E Flange, cladded version
- F 2"/3" Tri-Clamp; ISO 2852
- G Antennas

| Pos. | Bauteil | Werkstoff |
|------|-------------|--|
| 1 | Adapter | 316L (1.4435) |
| | | PVDF |
| 2 | Adapter | 316L (1.4435) |
| 3 | Flange | 316L (1.4404/1.4435) |
| 4 | Plating | PTFE |
| 5 | Pipe | 316L (1.4435) |
| 6 | Rod antenna | PPS, antistatic |
| 7 | Rod antenna | PTFE, antistatic |
| | | PTFE, conform to FDA 21 CFR 177.1550 and USP <88> Class VI (in conjunction with flange, DN 50 aseptic/dairy coupling respectively Tri-clamp) |

FMR240

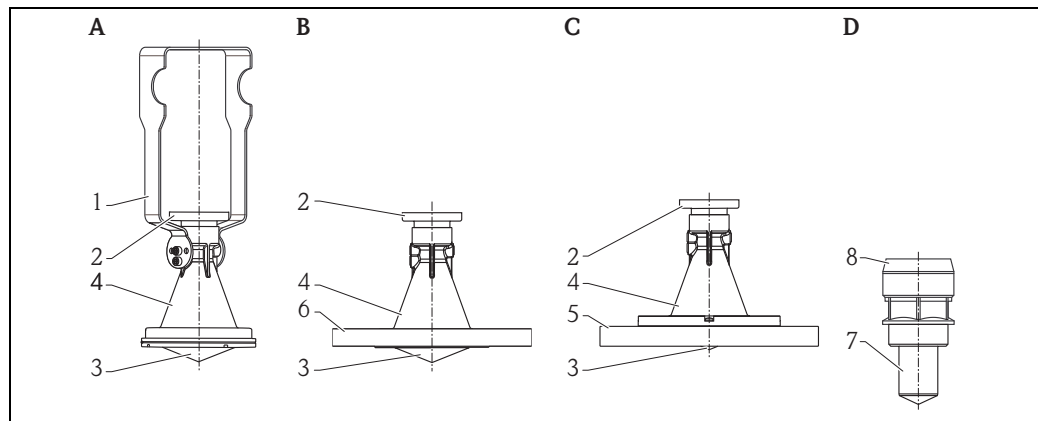


L00-FMR240xx-16-00-00-xx-000

- A Flange plated, DN 50 to DN 150 or equivalent
- B 2"/3" Tri-Clamp; ISO 2852
- C Flange DN 50 to DN 150 or equivalent
- D 2"/3" Tri-Clamp; ISO 2852
- E Flange DN 50 to DN 150 or equivalent
- F Screw-in adapter R1 1/2" oder 1 1/2"NPT
- G Screw-in adapter, compact R1 1/2" oder 1 1/2"NPT

| Pos. | Part | Material | |
|------|---------------------------|---|---------------|
| 1 | Adapter | 316L (1.4404) | |
| | Mounting plate | | |
| 2 | Pipe extension | 316L (1.4404) | |
| 3 | Process adapter extension | 316L (1.4404) | |
| | Mounting plate | | |
| 4 | Horn | 316L (1.4404) | Hastelloy C22 |
| | Screws | A4 | Hastelloy C22 |
| | Spring washer | A4 | |
| 5 | Flange | 316L (1.4404) optional Hastelloy C22 plated | |

FMR244

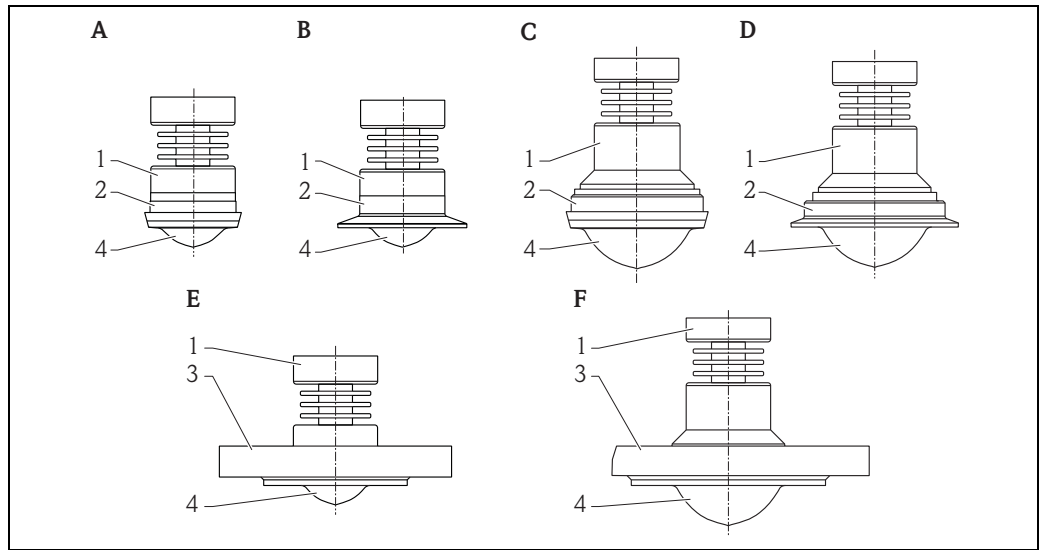


100-FMR244xx-16-00-00-xx-000

- A Standard
- B Endress+Hauser UNI flange DN 80
- C Endress+Hauser UNI flange DN 100/DN 150
- D Screw-in adapter G1 1/2", NPT 1 1/2"

| Pos. | Part | Material |
|------|-----------------------|---|
| 1 | Mounting bracket | 304 (1.4301) |
| | Screws | A2 |
| | Nordlock disk | A4 |
| 2 | Adapter | 304 (1.4301) |
| 3 | Focusing refractor | PP |
| | Sealing | Silicone |
| 4 | Horn | PBT |
| 5 | Flange + adapter ring | PP |
| | Screws | A2 |
| | Sealing | Viton |
| 6 | Collar flange | PP |
| 7 | Sleeve | PTFE (conform to FDA 21 CFR 177.1550 and USP <88> Class VI) |
| | Sealing | Viton |
| 8 | Adapter | PVDF |

FMR245



L00-FMR245xx-16-00-00-xx-000

- A DN 50 dairy coupling; DIN 11851
- B 2"/3" Tri-Clamp; ISO 2852
- C DN 80 dairy coupling; DIN 11851
- D 4" Tri-Clamp; ISO 2852
- E Flange DN 50 or equivalent
- F Flange DN 80 to DN 150 or equivalent

| Pos. | Part | Material |
|------|--------------------|---|
| 1 | Adapter | 304 (1.4301) |
| 2 | Process connection | 316L (1.4435) |
| 3 | Flange | 316L (1.4404 / 1.4435) |
| 4 | Plating | PTFE (conform to FDA 21 CFR 177.1550 and USP <88> Class VI) |

Flange

Endress+Hauser supplies DIN/EN flanges made of stainless steel AISI 316L with the material number 1.4404 or 1.4435. With regard to their temperature stability properties, the materials 1.4404 and 1.4435 are grouped under 13E0 in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.

Process connection

See "Ordering information", → 67.

Note!

Material process connection = material horn antenna, resp. wetted parts of the process connection.

Seal

See "Ordering information", → 67.

Antenna

See "Ordering information", → 67.

Note!

Material process connection = material horn antenna, resp. wetted parts of the process connection.

Human interface

Operation concept

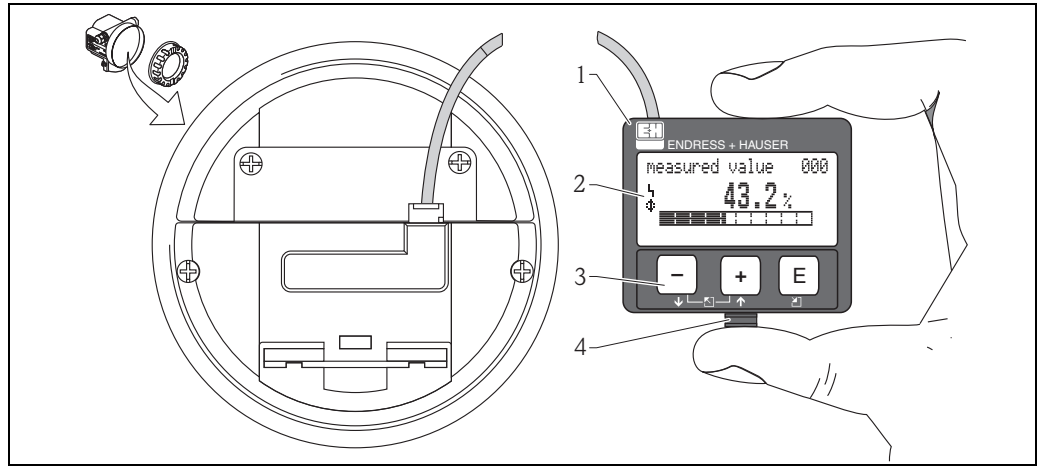
The display of the process value and the configuration of the Micropilot occur locally by means of a large 4-line alphanumeric display with plain text information. The guided menu system with integrated help texts ensures a quick and safe commissioning. To access the display the cover of the electronic compartment may be removed even in hazardous area (IS and XP).

Remote commissioning, including documentation of the measuring point and in-depth analysis functions, is supported via the FieldCare, the graphical operating software for Endress+Hauser time-of-flight systems.

Display elements

Liquid crystal display (LCD):

Four lines with 20 characters each. Display contrast adjustable through key combination.



- 1 LCD (liquid crystal display)
- 2 Symbols
- 3 3 keys
- 4 snap-fit

100-FMxxxxx-07-00-00-en-000

The LCD display can be removed to ease operation by simply pressing the snap-fit (see graphic above). It is connected to the device by means of a 500 mm (19.7 in) cable.















The following table describes the symbols that appear on the liquid crystal display:

| Sybmol | Meaning |
|--------|---|
| | ALARM_SYMBOL This alarm symbol appears when the device is in an alarm state. If the symbol flashes, this indicates a warning. |
| | LOCK_SYMBOL This lock symbol appears when the device is locked, i.e. if no input is possible. |
| | COM_SYMBOL This communication symbol appears when a data transmission via e.g. HART, PROFIBUS PA or FOUNDATION Fieldbus is in progress. |
| | SIMULATION_SWITCH_ENABLE This communication symbol appears when simulation in FOUNDATION Fieldbus is enabled via the DIP switch. |

Operating elements

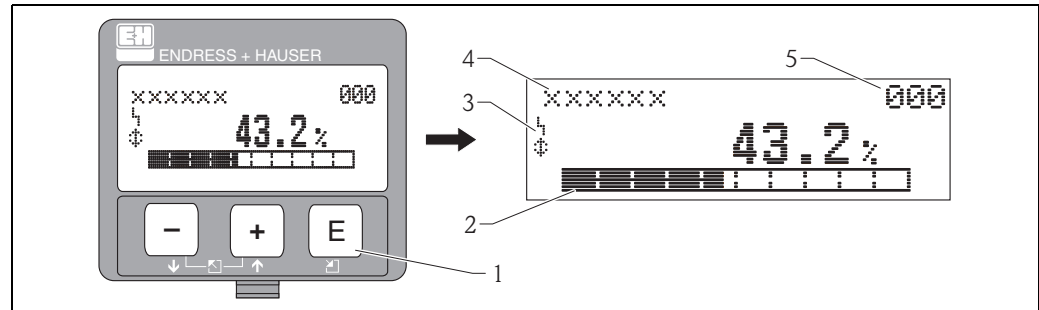
The operating elements are located inside the housing and are accessible for operation by opening the lid of the housing.

Function of the keys

| Key(s) | Meaning |
|--|--|
|  or  | Navigate upwards in the selection list. Edit numeric value within a function. |
|  or  | Navigate downwards in the selection list. Edit numeric value within a function. |
|  or  | Navigate to the left within a function group. |
|  | Navigate to the right within a function group, confirmation. |
|  and  or  and  | Contrast settings of the LCD. |
|  and  and  | Hardware lock / unlock After a hardware lock, an operation of the device via display or communication is not possible! The hardware can only be unlocked via the display. An unlock parameter must be entered to do so. |

On-site operation**Operation with device display**

The LC-Display allows configuration via 3 keys directly at the device. All device functions can be set through a menu system. The menu consists of function groups and functions. Within a function, application parameters can be read or adjusted. The user is guided through a complete configuration procedure.



- 1 Operating keys
- 2 Bargraph
- 3 Symbols
- 4 Function name
- 5 Parameter Identification number

100-FMRxxxxx-07-00-00-xx-000

Remote operation

The Micropilot M can be remotely operated via HART, PROFIBUS PA and FOUNDATION Fieldbus. On-site adjustments are also possible.

Field Xpert SFX100

Field Xpert is an industrial PDA with integrated 3.5" touchscreen from Endress+Hauser based on WindowsMobile. It offers wireless communication via the optional VIATOR Bluetooth modem as a point-to-point connection to a HART device, or via WiFi and Endress+Hauser's Fieldgate FXA520 to offer communication to one or more HART devices. Field Xpert also works as a stand-alone device for asset management applications. For details, refer to BA00060S/04/EN.

FieldCare

FieldCare is an Endress+Hauser asset management tool based on FDT technology. With FieldCare, you can configure all Endress+Hauser devices as well as devices from other manufacturers that support the FDT standard. Hardware and software requirements you can find on the internet:
www.endress.com → select your country → search: FieldCare → FieldCare → Technical Data.

FieldCare supports the following functions:

- Configuration of transmitters in online operation
- Singal analysis via envelope curve
- Tank linearisation
- Loading and saving device data (upload/download)
- Documentation of the measuring point

Connection options:

- HART via Commubox FXA195 and the USB port on a computer
- PROFIBUS PA via segment coupler and PROFIBUS interface card
- Commubox FXA291 with ToF Adapter FXA291 (USB) via service interface

Menu-guided commissioning

measured value: 0 %

Device type: Microplot M measured dist.: 0.000 m Write protect: No
 Model: FMR2xx Tag: MICROPIL Software rev: 0

Label

- Communication
- Matrix group sel.
- basic setup
 - measured value
 - tank shape
 - medium property
 - process cond.
 - empty calibr.
 - full calibr.
 - check distance
- safety settings
- linearisation
- extended calibr.
- output
- display
- diagnostics
- system parameters
- Device data

Function "measured value" (000)
 This function displays the current measured value in the selected unit (see "customer unit" (042) function). The number of digits after decimal point can be selected in the "no. of decimals" (095) function.

Caution!
 When using an FAR 10 antenna extension, carry out a correction before the basic setup. The length of the FAR 10 is to be entered in the function "antenna extens" (0C9).

Function "tank shape" (002)
 This function is used to select the tank shape.

Selection:

Basic Setup Step 1/4

MicroplotM-en-305

Signal analysis via envelope curve

Language File Envelope

[dB]

[-10.00
-20.00
-30.00
-40.00
-50.00
-60.00
-70.00
-80.00
-90.00
-100.00
-110.00
-120.00]

[0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00] [m]

(2.80 m, -46.00 dB)

Parameters:

| Name | Value |
|------------------|--------------|
| measured value | 20.047 % |
| measured dist. | 2.799 m |
| tank shape | dome ceiling |
| medium property | unknown |
| process cond. | fast change |
| echo quality | 28 dB |
| present FEF | 19.422 dB |
| blocking dist. | 0.130 m |
| application par. | not modified |
| present error | |

Curves:

- Envelope Curve
- Map
- FAC
- First Echo
- min. Echo Quality
- Ideal Echo

Data at Cursor Position:

Cursor1:
 Cursor2:
 Diff.:
 Ideal echo dist.: 0.00 dB

Curve Data:

Number: 1/4
 24.05.2002 10:26:59
 Time remaining: --

Remarks

Envelope Curve

MicroplotM-en-305

Tank linearisation

| Index | input level (m) | input volume (%) |
|-------|-----------------|------------------|
| 1 | 0.000 | 0.000 |
| 2 | 0.065 | 1.772 |
| 3 | 0.129 | 3.765 |
| 4 | 0.194 | 5.980 |
| 5 | 0.258 | 8.417 |
| 6 | 0.323 | 11.080 |
| 7 | 0.387 | 13.966 |
| 8 | 0.452 | 17.078 |
| 9 | 0.516 | 20.411 |
| 10 | 0.581 | 23.965 |
| 11 | 0.645 | 27.736 |
| 12 | 0.710 | 31.702 |
| 13 | 0.774 | 35.804 |
| 14 | 0.839 | 39.999 |
| 15 | 0.903 | 44.256 |
| 16 | 0.968 | 48.546 |
| 17 | 1.032 | 52.843 |
| 18 | 1.097 | 57.120 |
| 19 | 1.161 | 61.349 |
| 20 | 1.226 | 65.500 |
| 21 | 1.290 | 69.538 |
| 22 | 1.355 | 73.409 |
| 23 | 1.419 | 77.068 |
| 24 | 1.484 | 80.508 |
| 25 | 1.548 | 83.727 |
| 26 | 1.613 | 86.722 |
| 27 | 1.677 | 89.492 |
| 28 | 1.742 | 92.038 |
| 29 | 1.806 | 94.360 |
| 30 | 1.871 | 96.459 |
| 31 | 1.935 | 98.339 |
| 32 | 2.000 | 100.000 |

Dish bottoms according DIN 28011

H: 2.2 [m] Angle: 15 °

Empty (E): 2.2 [m] End Typ (right): Flat

Full (F): 2 [m] End Typ (left): Flat

Diameter (D): 2 [m]

Length (L): 5 [m] Change Position (P): 2.5 [m]

Type: Horizontal cylindrical tank Levels: Automatic Start Volume: Zero

Steps: 32 Calculate Table User Defined Calculated

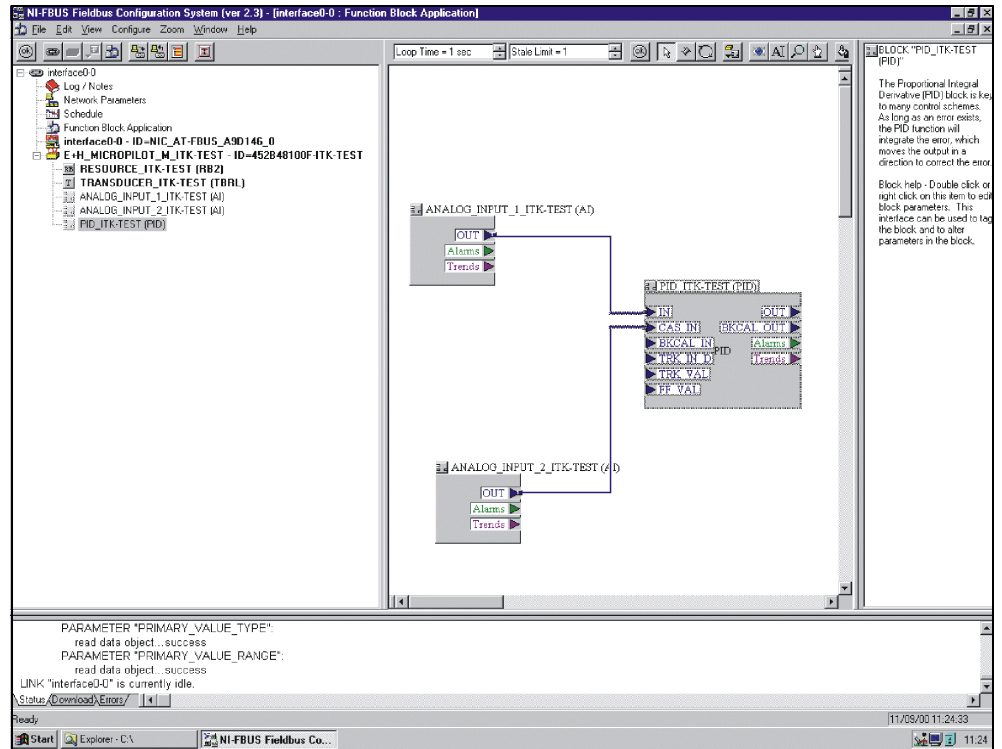
MicropilotM-es-307

Operation with NI-FBUS configurator (only FOUNDATION Fieldbus)





The NI-FBUS Configurator is an easy-to-use graphical environment for creating linkages, loops, and a schedule based on the fieldbus concepts.

You can use the NI-FBUS Configurator to configure a fieldbus network as follows:

- Set block and device tags
- Set device addresses
- Create and edit function block control strategies (function block applications)
- Configure vendor-defined function and transducer blocks
- Create and edit schedules
- Read and write to function block control strategies (function block applications)
- Invoke Device Description (DD) methods
- Display DD menus
- Download a configuration
- Verify a configuration and compare it to a saved configuration
- Monitor a downloaded configuration
- Replace devices
- Log project download changes
- Save and print a configuration



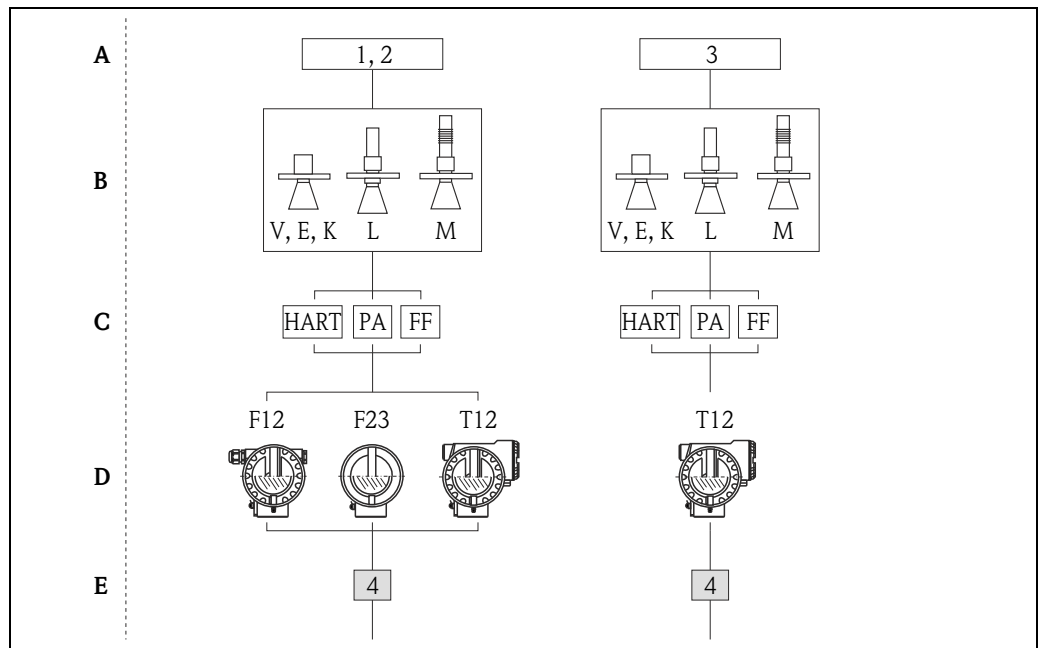
Certificates and approvals

| | |
|--|--|
| CE approval | The measuring system meets the legal requirements of the EC-guidelines. Endress+Hauser confirms the device passing the required tests by attaching the CE-mark. |
| Ex approval | See "Ordering information", →  67. |
| Sanitary compatibility | <p>FMR231 with antenna made of PTFE (conform to FDA 21 CFR 177.1550 and USP <88> Class VI).</p> <p>FMR245 with flange cladding made of PTFE (conform to FDA 21 CFR 177.1550 and USP <88> Class VI)</p> <p>– 3A/EHEDG approval with Tri-clamp process connection.</p> <div style="text-align: right;">   </div> <p>Note! The leak-tight connections can be cleaned with the cleaning methods usually used in this industry without leaving residues.</p> |
| Overspill protection | German WHG. See "Ordering information", →  67. (see ZE00244F/00/DE). SIL 2, for 4 to 20 mA output signal (see SD00327F/00/EN "Functional Safety Manual"). |
| Marine certificate | GL (Germanisch Lloyd), ABS, NK – HART, PROFIBUS PA – Not HT antenna |
| External standards and guidelines | <ul style="list-style-type: none"> ■ EN 60529 Protection class of housing (IP-code). ■ EN 61010 Safety regulations for electrical devices for measurement, control, regulation and laboratory use. ■ EN 61326-X EMC product family standard for electrical equipment for measurement, control and laboratory use. ■ NAMUR User association for automation technology in process industries. |
| RF approvals | R&TTE, FCC |
| Pressure measuring device guideline | The devices of the Micropilot M product family are not subject to the scope of the EC Directive 97/23/EC (Pressure Measuring Device Guideline). |

Ordering information

Micropilot M FMR230

Device selection



L00-FMR230xx-16-00-00-xx-001

A Certificate
 B Type of antenne / Seal
 C Communication
 D Housing
 E Gas-tight feed through

1 Non-hazardous area
 2 Ex ia IS
 3 Ex em / d XP
 4 Gas-tight - standard ⁴⁾

4) The gas-tight feed through of the device improves the process safety between the seal coupling the antenna to the process and the electronics compartment (connection compartment of the device).

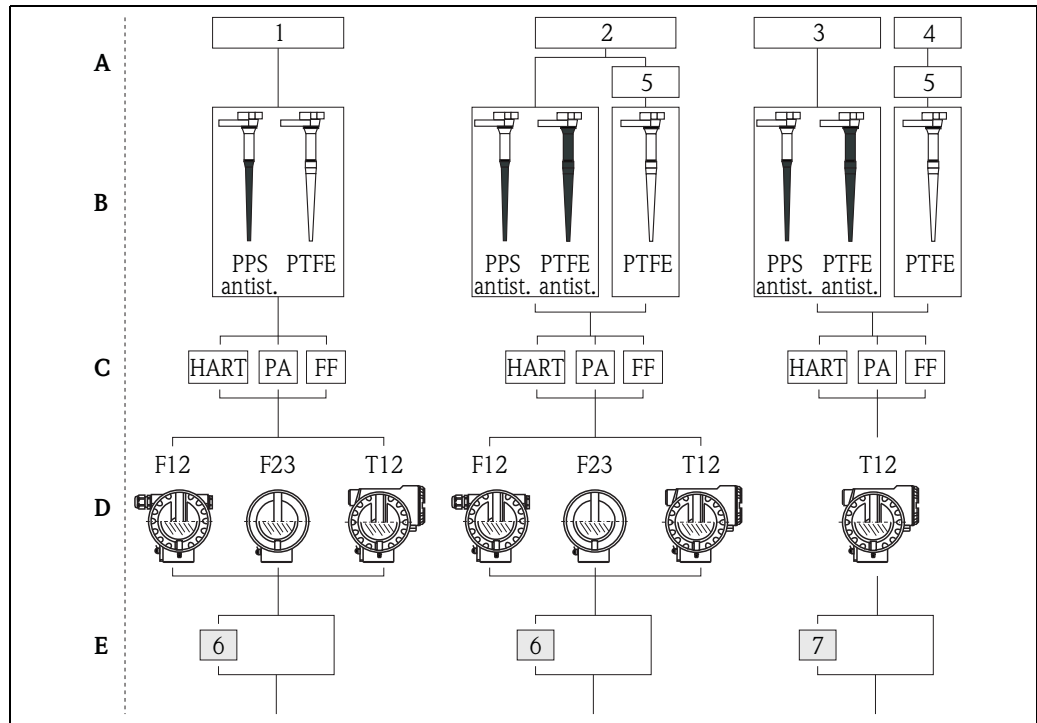
Ordering structure Micropilot M FMR230

| 10 | Approval | |
|----|---------------------------|---|
| | A | Non-hazardous area |
| | F | Non-hazardous area, WHG |
| | 1 | ATEX II 1/2G EEx ia IIC T6, IECEx Zone 0/1 |
| | 2 | ATEX II 1/2G EEx ia IIC T6, XA, IECEx Zone 0/1, Note safety instruction (XA) (electrostatic charging)! |
| | 3 | ATEX II 1/2G EEx em (ia) IIC T6 |
| | 4 | ATEX II 1/2G EEx d (ia) IIC T6, IECEx Zone 0/1 |
| | 6 | ATEX II 1/2G EEx ia IIC T6, WHG, IECEx Zone 0/1 |
| | 7 | ATEX II 1/2G EEx ia IIC T6, WHG, XA, IECEx Zone 0/1, Note safety instruction (XA) (electrostatic charging)! |
| | 8 | ATEX II 1/2G EEx em (ia) IIC T6, WHG |
| | G | ATEX II 3G EEx nA II T6 |
| | H | ATEX II 1/2G EEx ia IIC T6, ATEX II 3D |
| | S | FM IS - Cl.I Div.1 Gr. A-D, zone 0, 1, 2 |
| | T | FM XP - Cl.I Div.1 Group A-D, zone 1, 2 |
| | N | CSA General Purpose |
| | U | CSA IS - Cl.I Div.1 Group A-D, zone 0, 1, 2 |
| | V | CSA XP - Cl.I Div.1 Group A-D, zone 1, 2 |
| | L | TIIS EEx d (ia) IIC T4 |
| | M | TIIS EEx d (ia) IIC T1 |
| | I | NEPSI Ex ia IIC T6 |
| | J | NEPSI Ex d (ia) ia IIC T6 |
| | R | NEPSI Ex nAL IIC T6 |
| | Y | Special version, TSP-no. to be spec. |
| 20 | Antenna | |
| | 1 | w/o horn, for pipe installation |
| | 2 | 80mm/3" |
| | 3 | 100mm/4" |
| | 4 | 150mm/6" |
| | 5 | 200mm/8" |
| | 6 | 250mm/10" |
| | Y | Special version, TSP-no. to be spec. |
| 30 | Antenna Seal; Temperature | |
| | V | FKM Viton; -40°C...200°C/-40°F...392°F, conductive media max 150°C/302°F |
| | E | EPDM; -40°C...150°C/-40°F...302°F |
| | K | Kalrez; -20°C...200°C/-4°F...392°F, conductive media max 150°C/302°F |
| | L | Graphit; -60°C...280°C/-76°F...536°F |
| | M | Graphit; -60°C...400°C/-76°F...752°F |
| | Y | Special version, TSP-no. to be spec. |
| 40 | Process Connection | |
| | CMJ | DN80 PN16 B1, 316L flange EN1092-1 (DIN2527 C) |
| | CNJ | DN80 PN40 B1, 316L flange EN1092-1 (DIN2527 C) |
| | CQJ | DN100 PN16 B1, 316L flange EN1092-1 (DIN2527 C) |
| | CO5 | DN100 PN10/16, AlloyC4 > 316Ti flange EN1092-1 (DIN2527 C) |
| | CRJ | DN100 PN40 B1, 316L flange EN1092-1 (DIN2527 C) |
| | CWJ | DN150 PN16 B1, 316L flange EN1092-1 (DIN2527 C) |
| | CW5 | DN150 PN10/16, AlloyC4 > 316Ti flange EN1092-1 (DIN2527 C) |
| | CXJ | DN200 PN16 B1, 316L flange EN1092-1 (DIN2527 C) |
| | C6J | DN250 PN16 B1, 316L flange EN1092-1 (DIN2527 C) |
| | C65 | DN200 PN16, AlloyC4 > 316Ti flange EN1092-1 (DIN2527 C) |
| | UKJ | 2" 300lbs RF, 316/316L flange ANSI B16.5 |
| | ALJ | 3" 150lbs RF, 316/316L flange ANSI B16.5 |
| | AMJ | 3" 300lbs RF, 316/316L flange ANSI B16.5 |
| | APJ | 4" 150lbs RF, 316/316L flange ANSI B16.5 |
| | AQJ | 4" 300lbs RF, 316/316L flange ANSI B16.5 |
| | AVJ | 6" 150lbs RF, 316/316L flange ANSI B16.5 |
| | AV5 | 6" 150lbs, AlloyC4 > 316Ti flange ANSI B16.5 |
| | A3J | 8" 150lbs RF, 316/316L flange ANSI B16.5 |
| | A35 | 8" 150lbs, AlloyC4 > 316Ti flange ANSI B16.5 |
| | A5J | 10" 150lbs RF, 316/316L flange ANSI B16.5 |
| | A55 | 10" 150lbs, AlloyC4 > 316Ti flange ANSI B16.5 |
| | KA2 | 10K 80A RF, 316Ti flange JIS B2220 |
| | KH2 | 10K 100A RF, 316Ti flange JIS B2220 |
| | KV2 | 10K 150A RF, 316Ti flange JIS B2220 |
| | KD2 | 10K 200A RF, 316Ti flange JIS B2220 |
| | K52 | 10K 250A RF, 316Ti flange JIS B2220 |

| | | | | | | | | | | | | | |
|----------------|--|--|--|--|--|--|--|--|--|--|--|--|---|
| 40 | | | | | | | | | | | | | Process Connection |
| | | | | | | | | | | | | | TL2 Tri-Clamp ISO2852 DN70-76.1 (3"), 316Ti UV6 6" 150lbs FF, AlloyC4, purge flange ANSI B16.5 NUS YY9 Special version, TSP-no. to be spec. |
| 50 | | | | | | | | | | | | | Output; Operation |
| | | | | | | | | | | | | | A 4-20mA SIL HART; 4-line display VU331, envelope curve display on site B 4-20mA SIL HART; w/o display, via communication K 4-20mA SIL HART; Prepared for FHX40, remote display (Accessory) C PROFIBUS PA; 4-line display VU331, envelope curve display on site D PROFIBUS PA; w/o display, via communication E FOUNDATION Fieldbus; 4-line display, envelope curve display on site F FOUNDATION Fieldbus; w/o display, via communication Y Special version, TSP-no. to be spec. |
| 60 | | | | | | | | | | | | | Housing |
| | | | | | | | | | | | | | A F12 Alu, coated IP65 NEMA4X B F23 316L IP65 NEMA4X C T12 Alu, coated IP65 NEMA4X, separate conn. compartment D T12 Alu, coated IP65 NEMA4X+OVP, separate conn. compartment, OVP=overvoltage protection Y Special version, TSP-no. to be spec. |
| 70 | | | | | | | | | | | | | Cable Entry |
| | | | | | | | | | | | | | 2 Gland M20 (EEx d > thread M20) 3 Thread G1/2 4 Thread NPT1/2 5 Plug M12 6 Plug 7/8" 9 Special version, TSP-no. to be spec. |
| 80 | | | | | | | | | | | | | Additional Option |
| | | | | | | | | | | | | | A Basic version B EN10204-3.1 material, wetted parts (316L wetted parts) inspection certificate H 5-point linearity protocol, see additional spec. J 5-point, 3.1, NACE, 5-point linearity protocol, see additional spec., EN10204-3.1 material, NACE MR0175, (316L wetted parts) inspection certificate N EN10204-3.1, material, NACE MR0175 (316L wetted parts) inspection certificate S GL/ABS/NK marine certificate Y Special version, TSP-no. to be spec. |
| 995 | | | | | | | | | | | | | Marking |
| | | | | | | | | | | | | | 1 Tagging (TAG), see additional spec. 2 Bus adress, see additional spec. |
| FMR230- | | | | | | | | | | | | | Complete product designation |

Micropilot M FMR231

Device selection



L00-FMR231ex-16-00-00-xx-001

- | | |
|--|--|
| <p>A Certificate</p> <p>B Type of antenna / seal</p> <p>C Communication</p> <p>D Housing</p> <p>E Gas-tight feed through</p> | <p>1 Non-hazardous area</p> <p>2 Ex ia IS</p> <p>3 Ex em / d XP</p> <p>4 Ex d XP</p> <p>5 Note electrostatic charging!</p> <p>6 Gas-tight - standard ⁵⁾</p> <p>7 Gas-tight - standard - Essential to Ex em! ⁵⁾</p> |
|--|--|

5) The gas-tight feed through of the device improves the process safety between the seal coupling the antenna to the process and the electronics compartment (connection compartment of the device).

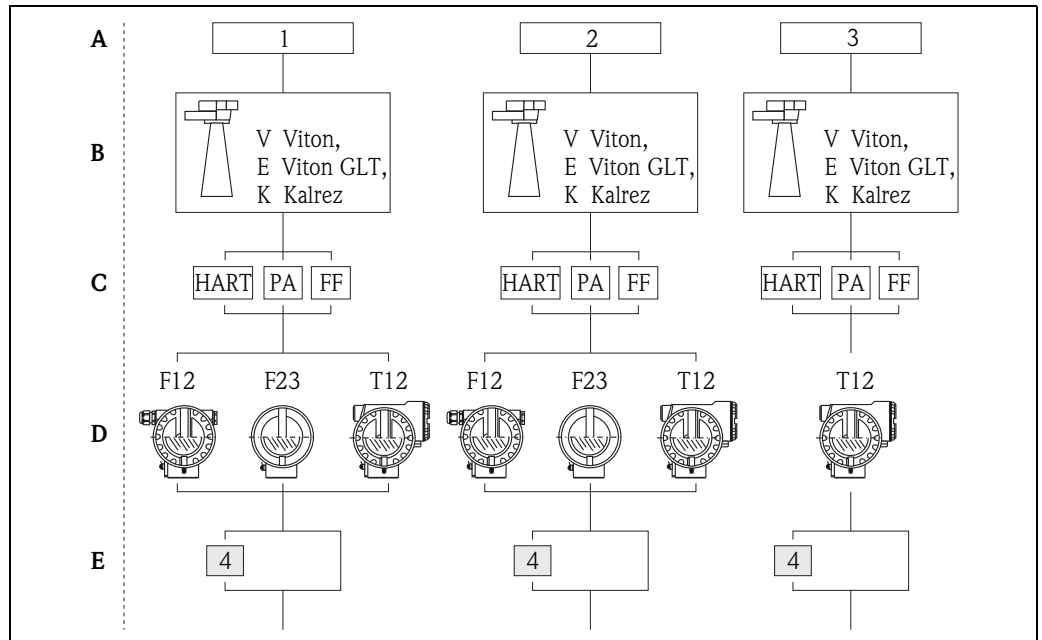
Ordering structure Micropilot M FMR231

| 10 | | Approval |
|----|-----|---|
| | A | Non-hazardous area |
| | F | Non-hazardous area, WHG |
| | 1 | ATEX II 1/2 G EEx ia IIC T6, IECEx Zone 0/1 |
| | 2 | ATEX II 1/2 G EEx ia IIC T6, XA, IECEx Zone 0/1 Note safety instruction (XA) (electrostatic charging)! |
| | 5 | ATEX II 1/2 G EEx d (ia) IIC T6, XA, IECEx Zone 0/1 Note safety instruction (XA) (electrostatic charging)! |
| | 6 | ATEX II 1/2 G EEx ia IIC T6, WHG, IECEx Zone 0/1 |
| | 7 | ATEX II 1/2 G EEx ia IIC T6, WHG, XA, IECEx Zone 0/1 Note safety instruction (XA) (electrostatic charging)! |
| | 3 | ATEX II 1/2 G EEx em (ia) IIC T6 |
| | 8 | ATEX II 1/2 G EEx em (ia) IIC T6, WHG |
| | 4 | ATEX II 1/2 G EEx d (ia) IIC T, IECEx Zone 0/16 |
| | G | ATEX II 3 G EEx nA II T6, XA, fully insulalted antenna: Note safety instruction (XA) (electrostatic charging)! |
| | H | ATEX II 1/2G EEx ia IIC T6, ATEX II 3D, XA, fully insulalted antenna: Note safety instruction (XA) (electrostatic charging)! |
| | S | FM IS - Cl.I Div.1 Gr. A-D, zone 0, 1, 2 |
| | T | FM XP - Cl.I Div.1 Group A-D, zone 1, 2 |
| | N | CSA General Purpose |
| | U | CSA IS - Cl.I Div.1 Group A-D, zone 0, 1, 2 |
| | V | CSA XP - Cl.I Div.1 Group A-D, zonw 1, 2 |
| | L | TIIS EEx d [ia] IIC T4 |
| | I | NEPSI Ex ia IIC T6 |
| | J | NEPSI Ex d (ia) ia IIC T6 |
| | R | NEPSI Ex nAL IIC T6 |
| | Y | Special version, TSP-no. to be spec. |
| 20 | | Antenna; Inactive Length |
| | A | PPS antistatic 360mm/14", Viton, 316L; nozzle height max 100mm/4" |
| | B | PPS antistatic 510mm/20", Viton, 316L; nozzle height max 250mm/10" |
| | E | PTFE 390mm/15", fully insulated; nozzle height max 100mm/4" |
| | F | PTFE 540mm/21", fully insulated; nozzle height max 250mm/10" |
| | H | PTFE antistatic 390mm/15", fully insul.; nozzle height max 100mm/4" |
| | J | PTFE antistatic 540mm/21", fully insul.; nozzle height max 250mm/10" |
| | Y | Special version, TSP-no. to be spec. |
| 30 | | Process Connection |
| | GGJ | Thread EN10226 R1-1/2, 316L |
| | GGS | Thread EN10226 R1-1/2, PVDF |
| | GNJ | Thread ANSI NPT1-1/2, 316L |
| | GNS | Thread ANSI NPT1-1/2; PVDF |
| | TEJ | Tri-Clamp ISO2852 DN40-51 (2"), 316L |
| | TLJ | Tri-Clamp ISO2852 DN70-76.1 (3"), 316L |
| | MFJ | DIN11851 DN50 PN40, slotted-nut, 316L |
| | HFJ | DIN11864-1 A DN50 Tube DIN11850, slotted-nut, 316L |
| | BFJ | DN50 PN10/16 A, 316L flange EN1092-1 (DIN2527 B) |
| | CFJ | DN50 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C) |
| | CFK | DN50 PN10/16, PTFE > 316L flange EN1092-1 (DIN2527) |
| | BMJ | DN80 PN10/16 A, 316L flange EN1092-1 (DIN2527 B) |
| | CMJ | DN80 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C) |
| | BNJ | DN80 PN25/40 A, 316L flange EN1092-1 (DIN2527 B) |
| | CNJ | DN80 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C) |
| | CMK | DN80 PN10/16, PTFE > 316L flange EN1092-1 (DIN2527) |
| | BQJ | DN100 PN10/16 A, 316L flange EN1092-1 (DIN2527 B) |
| | CQJ | DN100 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C) |
| | CQK | DN100 PN10/16, PTFE > 316L flange EN1092-1 (DIN2527) |
| | BWJ | DN150 PN10/16 A, 316L flange EN1092-1 (DIN2527 B) |
| | CWJ | DN150 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C) |
| | CWK | DN150 PN10/16, PTFE (black) > 316L flange EN1092-1 (DIN2527) PTFE (black) = conductive cladding |
| | AEJ | 2" 150lbs RF, 316/316L flange ANSI B16.5 |
| | AEK | 2" 150lbs, PTFE > 316/316L flange ANSI B16.5 |
| | ALJ | 3" 150lbs RF, 316/316L flange ANSI B16.5 |
| | AMJ | 3" 300lbs RF, 316/316L flange ANSI B16.5 |

| | | | | | | | | |
|----------------|--|--|--|--|--|--|--|--|
| 30 | | | | | | | | Process Connection |
| | | | | | | | | ALK 3" 150lbs, PTFE > 316/316L flange ANSI B16.5 APJ 4" 150lbs RF, 316/316L flange ANSI B16.5 AQJ 4" 300lbs RF, 316/316L flange ANSI B16.5 APK 4" 150lbs, PTFE > 316/316L flange ANSI B16.5 AVJ 6" 150lbs RF, 316/316L flange ANSI B16.5 AVK 6" 150lbs, PTFE (black) > 316/316L flange ANSI B16.5 PTFE (black) = conductive cladding KEJ 10K 50A RF, 316L flange JIS B2220 KEK 10K 50A, PTFE > 316L flange JIS B2220 KLJ 10K 80A RF, 316L flange JIS B2220 KLK 10K 80A, PTFE > 316L flange JIS B2220 KPJ 10K 100A RF, 316L flange JIS B2220 KPK 10K 100A, PTFE > 316L flange JIS B2220 KVJ 10K 150A RF, 316L flange JIS B2220 KVK 10K 150A, PTFE (black) > 316L flange JIS B2220 PTFE (black) = conductive cladding YY9 Special version, TSP-no. to be spec. |
| 40 | | | | | | | | Output; Operation |
| | | | | | | | | A 4-20mA SIL HART; 4-line display VU331, envelope curve display on site B 4-20mA SIL HART; w/o display, via communication K 4-20mA SIL HART; Prepared for FHX40, remote display (Accessory) C PROFIBUS PA; 4-line display VU331, envelope curve display on site D PROFIBUS PA; w/o display, via communication E FOUNDATION Fieldbus; 4-line display, envelope curve display on site F FOUNDATION Fieldbus; w/o display, via communication Y Special version, TSP-no. to be spec. |
| 50 | | | | | | | | Housing |
| | | | | | | | | A F12 Alu, coated IP65 NEMA4X B F23 316L IP65 NEMA4X C T12 Alu, coated IP65 NEMA4X, separate conn. compartment D T12 Alu, coated IP65 NEMA4X+OVP, separate conn. compartment, OVP=overvoltage protection Y Special version, TSP-no. to be spec. |
| 60 | | | | | | | | Cable Entry |
| | | | | | | | | 2 Gland M20 (EEx d > thread M20) 3 Thread G1/2 4 Thread NPT1/2 5 Plug M12 6 Plug 7/8" 9 Special version, TSP-no. to be spec. |
| 70 | | | | | | | | Gas-Tight Feed Through |
| | | | | | | | | A Not selected C Selected, TSP-no. to be spec. |
| 80 | | | | | | | | Additional Option |
| | | | | | | | | A Basic version B EN10204-3.1 material, watted parts, (316L wetted parts) inspection certificate C EN10204-3.1 material, pressurized, (316/316L pressurized) inspection certificate H 5-point linearity protocol, see additional spec. J 5-point, 3.1, wetted parts 5-point linearity protocol, see additional spec., EN10204-3.1 material, wetted parts, (316L wetted parts) inspection certificate K 5-point, 3.1, pressurized, 5-point linearity protocol, see additional spec., EN10204-3.1 material, pressurized, (316/316L pressurized) inspection certificate S GL/ABS/NK marine certificate Y Special version, TSP-no. to be spec. |
| 995 | | | | | | | | Marking |
| | | | | | | | | 1 Tagging (TAG), see additional spec. 2 Bus adress, see additional spec. |
| FMR231- | | | | | | | | Complete product designation |

Micropilot M FMR240

Device selection



L00-FMR240xx-16-00-00-xx-001

- A Certificate
- B Type of antenne / Seal
- C Communication
- D Housing
- E Gas-tight feed through

- 1 Non-hazardous area
- 2 Ex ia IS
- 3 Ex em / d XP
- 4 Gas-tight - standard ⁶⁾

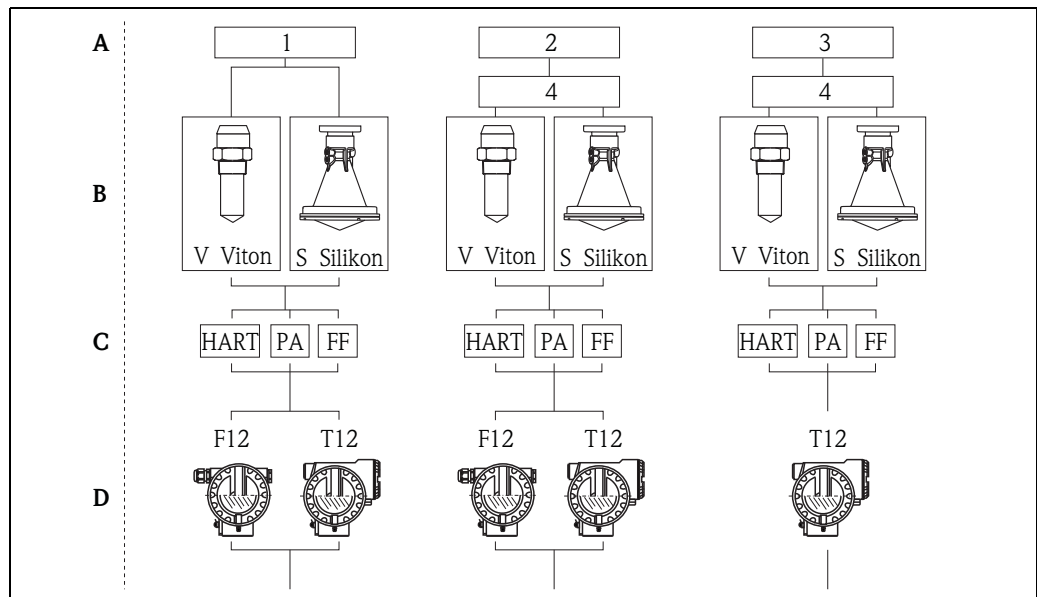
6) The gas-tight feed through of the device improves the process safety between the seal coupling the antenna to the process and the electronics compartment (connection compartment of the device).

Ordering structure Micropilot M FMR240

| | | | | | |
|-----------|----------------------------------|--|--|--|--|
| 10 | Approval | | | | |
| | A | Non-hazardous area | | | |
| | F | Non-hazardous area, WHG | | | |
| | 1 | ATEX II 1/2G EEx ia IIC T6 | | | |
| | 6 | ATEX II 1/2G EEx ia IIC T6, WHG | | | |
| | 3 | ATEX II 1/2G EEx em (ia) IIC T6 | | | |
| | 8 | ATEX II 1/2G EEx em (ia) IIC T6, WHG | | | |
| | 4 | ATEX II 1/2G EEx d (ia) IIC T6 | | | |
| | B | ATEX II 1/2G, II 1/2D, Alu blind cover, ATEX II 1/2G EEx ia IIC T6, ATEX II 1/2D | | | |
| | H | ATEX II 1/2G EEx ia IIC T6, ATEX II 3D | | | |
| | G | ATEX II 3G EEx nA II T6 | | | |
| | S | FM IS - Cl.I Div.1 Gr. A-D, zone 0, 1, 2 | | | |
| | T | FM XP - Cl.I Div.1 Group A-D, zone 1, 2 | | | |
| | N | CSA General Purpose | | | |
| | U | CSA IS - Cl.I Div.1 Group A-D, zone 0, 1, 2 | | | |
| | V | CSA XP - Cl.I Div.1 Group A-D, zone 1, 2 | | | |
| | L | TIIS EEx d (ia) IIC T4 | | | |
| | D | IECEX Zone 0/1, Ex ia IIC T6 | | | |
| | E | IECEX Zone 0/1, Ex d (ia) IIC T6 | | | |
| | I | NEPSI Ex ia IIC T6 | | | |
| | J | NEPSI Ex d (ia) ia IIC T6 | | | |
| | R | NEPSI Ex nAL IIC T6 | | | |
| | Y | Special version, TSP-no. to be spec. | | | |
| 20 | Antenna | | | | |
| | E | 40mm/1-1/2", gas-tight feed through | | | |
| | F | 50mm/2", gas-tight feed through | | | |
| | G | 80mm/3", gas-tight feed through | | | |
| | H | 100mm/4", gas-tight feed through | | | |
| | 2 | 40mm/1-1/2" | | | |
| | 3 | 50mm/2" | | | |
| | 4 | 80mm/3" | | | |
| | 5 | 100mm/4" | | | |
| | 9 | Special version, TSP-no. to be spec. | | | |
| 30 | Antenna Seal; Temperature | | | | |
| | V | FKM Viton; -20...150°C/-4...302°F | | | |
| | E | FKM Viton GLT; -40...150°C/-40...302°F | | | |
| | K | Kalrez; -20...150°C/-4...302°F | | | |
| | Y | Special version, TSP-no. to be spec. | | | |
| 40 | Antenna Extension | | | | |
| | 1 | Not selected | | | |
| | 2 | 100 mm/4" | | | |
| | 9 | Special version, TSP-no. to be spec. | | | |
| 50 | Process Connection | | | | |
| | GGJ | Thread EN10226 R1-1/2, 316L | | | |
| | GNJ | Thread ANSI NPT1-1/2, 316L | | | |
| | TDJ | Tri-Clamp ISO2852 DN40-51 (2"), 316L | | | |
| | TLJ | Tri-Clamp ISO2852 DN70-76.1 (3"), 316L | | | |
| | CFJ | DN50 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C) | | | |
| | CGJ | DN50 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C) | | | |
| | CFM | DN50 PN10/16, AlloyC22 > 316L flange EN1092-1 (DIN2527) | | | |
| | CGM | DN50 PN25/40, AlloyC22 > 316L flange EN1092-1 (DIN2527) | | | |
| | CMJ | DN80 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C) | | | |
| | CNJ | DN80 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C) | | | |
| | CMM | DN80 PN10/16, AlloyC22 > 316L flange EN1092-1 (DIN2527) | | | |
| | CNM | DN80 PN25/40, AlloyC22 > 316L flange EN1092-1 (DIN2527) | | | |
| | CQJ | DN100 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C) | | | |
| | CRJ | DN100 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C) | | | |
| | CQM | DN100 PN10/16, AlloyC22 > 316L flange EN1092-1 (DIN2527) | | | |
| | CRM | DN100 PN25/40, AlloyC22 > 316L flange EN1092-1 (DIN2527) | | | |
| | CWJ | DN150 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C) | | | |
| | CWM | DN150 PN10/16, AlloyC22 > 316L flange EN1092-1 (DIN2527) | | | |
| | AEJ | 2" 150lbs RF, 316/316L flange ANSI B16.5 | | | |
| | AFJ | 2" 300lbs RF, 316/316L flange ANSI B16.5 | | | |
| | AEM | 2" 150lbs, AlloyC22 > 316/316L flange ANSI B16.5 | | | |
| | AFM | 2" 300lbs, AlloyC22 > 316/316L flange ANSI B16.5 | | | |
| | ALJ | 3" 150lbs RF, 316/316L flange ANSI B16.5 | | | |

Micropilot M FMR244

Device selection



100-FMR244xx-16-00-00-xx-001

- A Certificate
- B Type of antenne / Seal
- C Communication
- D Housing

- 1 Non-hazardous area
- 2 Ex ia IS
- 3 Ex em / d XP
- 4 Note electrostatic charging!

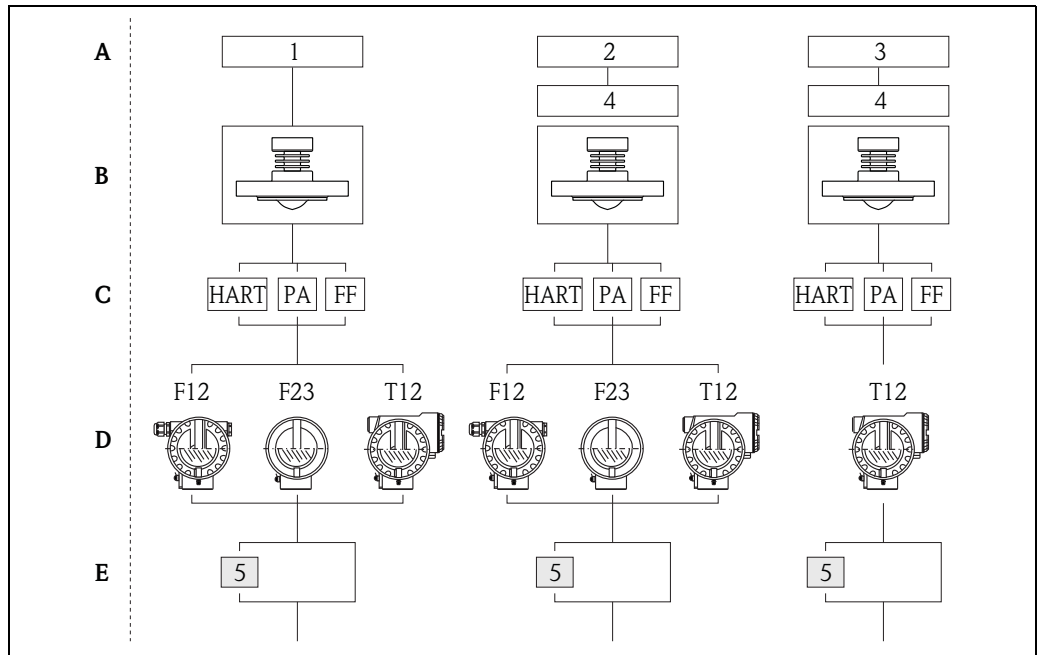
Ordering structure Micropilot M FMR244

| | | | | | | | | | |
|-----------|----------------------------------|--|--|--|--|--|--|--|--|
| 10 | Approval | | | | | | | | |
| | A | Non-hazardous area | | | | | | | |
| | F | Non-hazardous area, WHG | | | | | | | |
| | 2 | ATEX II 1/2G EEx ia IIC T6, XA note safety instruction (XA) (electrostatic charging)! | | | | | | | |
| | 7 | ATEX II 1/2G EEx ia IIC T6, WHG, XA note safety instruction (XA) (electrostatic charging)! | | | | | | | |
| | 5 | ATEX II 1/2G EEx d [ia] IIC T6, XA note safety instruction (XA) (electrostatic charging)! | | | | | | | |
| | H | ATEX II 1/2G EEx ia IIC T6, ATEX 3D, XA note safety instruction (XA) (electrostatic charging)! | | | | | | | |
| | B | ATEX II 1/2D, Alu blind cover, XA | | | | | | | |
| | C | ATEX II 1/3D, XA | | | | | | | |
| | G | ATEX II 3G EEx nA II T6 | | | | | | | |
| | S | FM IS - Cl.I Div.1 Gr. A-D, zone 0, 1, 2 | | | | | | | |
| | T | FM XP - Cl.I Div.1 Group A-D, zone 1, 2 | | | | | | | |
| | N | CSA General Purpose | | | | | | | |
| | U | CSA IS - Cl.I Div.1 Group A-D, zone 0, 1, 2 | | | | | | | |
| | V | CSA XP - Cl.I Div.1 Group A-D, zone 1, 2 | | | | | | | |
| | K | TIIS EEx ia IIC T4 | | | | | | | |
| | L | TIIS EEx d [ia] IIC T4 | | | | | | | |
| | D | IECEX Zone 0/1, Ex ia IIC T6, XA note safety instruction (XA) (electrostatic charging)! | | | | | | | |
| | E | IECEX Zone 0/1, Ex d (ia) IIC T6, XA note safety instruction (XA) (electrostatic charging)! | | | | | | | |
| | I | NEPSI Ex ia IIC T6 | | | | | | | |
| | J | NEPSI Ex d (ia) ia IIC T6 | | | | | | | |
| | R | NEPSI Ex nAL IIC T6 | | | | | | | |
| | Y | Special version, TSP-no. to be spec. | | | | | | | |
| 20 | Antenna | | | | | | | | |
| | 2 | 40mm/1-1/2", PTFE encapsulated | | | | | | | |
| | 4 | 80mm/3", PP cladde | | | | | | | |
| | 9 | Special version, TSP-no. to be spec. | | | | | | | |
| 30 | Antenna Seal; Temperature | | | | | | | | |
| | S | Silicone; -40...80°C/-40...176°F | | | | | | | |
| | V | FKM Viton GLT; -40...130°C/-40...266°F | | | | | | | |
| | Y | Special version, TSP-no. to be spec. | | | | | | | |
| 40 | Process Connection | | | | | | | | |
| | GGS | Thread ISO228 G1-1/2, PVDF | | | | | | | |
| | GNS | Thread ANSI NPT1-1/2, PVDF | | | | | | | |
| | XME | Mounting bracket, 304 | | | | | | | |
| | XXR | W/o slip on flange/mounting bracket, customer side connection | | | | | | | |
| | XVG | UNI slip on flange 3"/DN80/80, PP max 4bar abs/58psia, suitable for 3" 150lbs/DN80 PN16/10K 80 | | | | | | | |
| | XXG | UNI slip on flange 4"/DN100/100, PP max 4bar abs/58psia, suitable for 4" 150lbs / DN100 PN16 / 10K 100 | | | | | | | |
| | X1G | UNI slip on flange 6"/DN150/150, PP max 4bar abs/58psia, suitable for 6" 150lbs / DN150 PN16 / 10K 150 | | | | | | | |
| | YY9 | Special version, TSP-no. to be spec. | | | | | | | |
| 50 | Output; Operation | | | | | | | | |
| | A | 4-20mA SIL HART; 4-line display VU331, envelope curve display on site | | | | | | | |
| | B | 4-20mA SIL HART; w/o display, via communication | | | | | | | |
| | K | 4-20mA SIL HART; Prepared for FHX40, remote display (Accessory) | | | | | | | |
| | C | PROFIBUS PA; 4-line display VU331, envelope curve display on site | | | | | | | |
| | D | PROFIBUS PA; w/o display, via communication | | | | | | | |
| | E | FOUNDATION Fieldbus; 4-line display, envelope curve display on site | | | | | | | |
| | F | FOUNDATION Fieldbus; w/o display, via communication | | | | | | | |
| | Y | Special version, TSP-no. to be spec. | | | | | | | |
| 60 | Housing | | | | | | | | |
| | A | F12 Alu, coated IP65 NEMA4X | | | | | | | |
| | C | T12 Alu, coated IP65 NEMA4X, separate conn. compartment | | | | | | | |
| | D | T12 Alu, coated IP65 NEMA4X, separate conn. compartment, OVP=overvoltage protection | | | | | | | |
| | Y | Special version, TSP-no. to be spec. | | | | | | | |
| 70 | Cable entry | | | | | | | | |
| | 2 | Gland M20 (EEx d > thread M20) | | | | | | | |
| | 3 | Thread G1/2 | | | | | | | |
| | 4 | Thread NPT1/2 | | | | | | | |
| | 5 | Plug M12 | | | | | | | |
| | 6 | Plug 7/8" | | | | | | | |
| | 9 | Special version, TSP-no. to be spec. | | | | | | | |

| | | | | | | | | | | |
|----------------|--|--|--|--|--|--|--|--|--|--|
| 80 | | | | | | | | | | Additional option |
| | | | | | | | | | | A Basic version |
| | | | | | | | | | | F Advanced dynamics, max. MB=70m liquids, max. MB=15m solids, MB=measuring range |
| | | | | | | | | | | H 5-point linearity protocol, see additional spec. |
| | | | | | | | | | | L 5-point, advanced dynamics, 5-point linearity protocol, see additional spec., Advanced dynamics, max MB=70m liquids, max MB=15m solids, MB=measuring range |
| | | | | | | | | | | S GL/ABS/NK marine certificate |
| | | | | | | | | | | Y Special version, TSP-no. to be spec. |
| 995 | | | | | | | | | | Marking |
| | | | | | | | | | | 1 Tagging (TAG), see additional spec. |
| | | | | | | | | | | 2 Bus address, see additional spec. |
| FMR244- | | | | | | | | | | Complete product designation |

Micropilot M FMR245

Device selection



L00-FMR245xx-16-00-00-xx-001

- A Certificate
- B Type of antenne
- C Communication
- D Housing
- E Gas-tight feed through

- 1 Non-hazardous area
- 2 Ex ia IS
- 3 Ex em / d XP
- 4 Note electrostatic charging
- 5 Gas-tight - standard⁷⁾

7) The gas-tight feed through of the device improves the process safety between the seal coupling the antenna to the process and the electronics compartment (connection compartment of the device).

Ordering structure Micropilot M FMR245

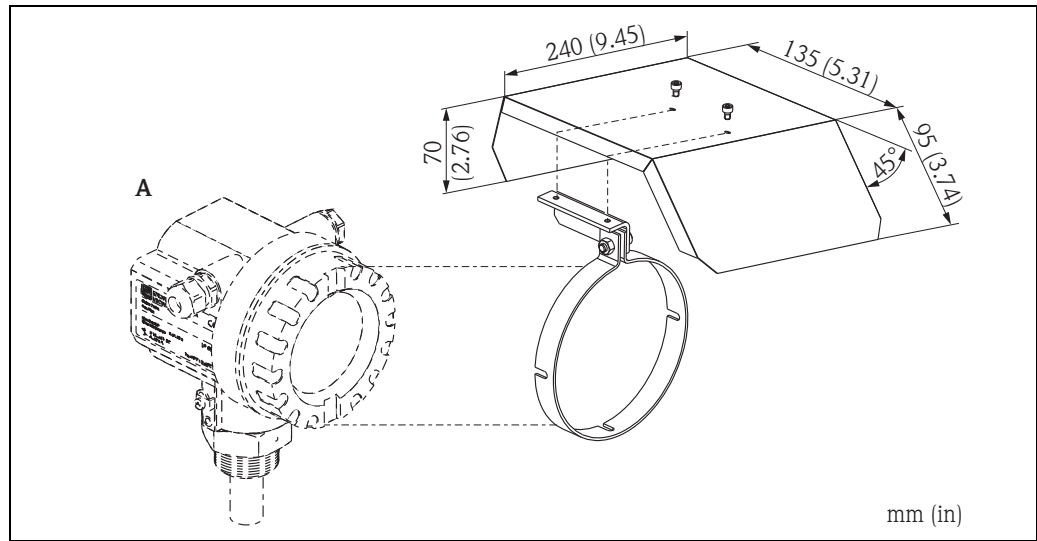
| 10 | Approval |
|-----|---|
| A | Non-hazardous area |
| F | Non-hazardous area, WHG |
| 2 | ATEX II 1/2G EEx ia IIC T6, XA, Note safety instruction (XA) (electrostatic charging)! |
| 7 | ATEX II 1/2G EEx ia IIC T6, WHG, XA, Note safety instruction (XA) (electrostatic charging)! |
| 5 | ATEX II 1/2G EEx d [ia] IIC T6, XA, Note safety instruction (XA) (electrostatic charging)! |
| H | ATEX II 1/2G EEx ia IIC T6, ATEX 3D, XA, Note safety instruction (XA) (electrostatic charging)! |
| B | ATEX II 1/2G, ATEX II 1/2D, XA, Alu blind cover ATEX II 1/2G EEx ia IIC T6, ATEX II 1/2D, Note safety instruction (XA) (electrostatic charging)! |
| G | ATEX II 3G EEx nA II T6, Note safety instruction (XA) (electrostatic charging)! |
| S | FM IS - Cl.I Div.1 Gr. A-D, zone 0, 1, 2 |
| T | FM XP - Cl.I Div.1 Group A-D, zone 1, 2 |
| N | CSA General Purpose |
| U | CSA IS - Cl.I Div.1 Group A-D, zone 0, 1, 2 |
| V | CSA XP - Cl.I Div.1 Group A-D, zone 1, 2 |
| K | TIIS EEx ia IIC T4 |
| L | TIIS EEx d [ia] IIC T4 |
| D | IECEX Zone 0/1, Ex ia IIC T6, XA, Note safety instruction (XA) (electrostatic charging)! |
| E | IECEX Zone 0/1, Ex d (ia) IIC T6, XA, Note safety instruction (XA) (electrostatic charging)! |
| I | NEPSI Ex ia IIC T6 |
| J | NEPSI Ex d (ia) ia IIC T6 |
| R | NEPSI Ex nAL IIC T6 |
| Y | Special version, TSP-no. to be spec. |
| 20 | Antenna |
| B | 50mm/2", -40...200°C/-40...392°F |
| C | 80mm/3", -40...200°C/-40...392°F |
| F | 50mm/2", -40...200°C/-40...392°F, gas-tight feed through |
| G | 80mm/3", -40...200°C/-40...392°F, gas-tight feed through |
| 9 | Special version, TSP-no. to be spec. |
| 30 | Process Connection |
| CFK | DN50 PN10/16, PTFE > 316L flange EN1092-1 (DIN2527) |
| CMK | DN80 PN10/16, PTFE > 316L flange EN1092-1 (DIN2527) |
| COK | DN100 PN10/16, PTFE > 316L flange EN1092-1 (DIN2527) |
| CWK | DN150 PN10/16, PTFE > 316L flange EN1092-1 (DIN2527) |
| AEK | 2" 150lbs, PTFE > 316L flange ANSI B16.5 |
| ALK | 3" 150lbs, PTFE > 316L flange ANSI B16.5 |
| APK | 4" 150lbs, PTFE > 316L flange ANSI B16.5 |
| AVK | 6" 150lbs, PTFE > 316L flange ANSI B16.5 |
| KEK | 10K 50A, PTFE > 316L flange JIS B2220 |
| KLK | 10K 80A, PTFE > 316L flange JIS B2220 |
| KPK | 10K 100A, PTFE > 316L flange JIS B2220 |
| KVK | 10K 150A, PTFE > 316L flange JIS B2220 |
| MRK | DIN11851 DN50 PN25, slotted-nut, PTFE > 316L |
| MTK | DIN11851 DN80 PN25, slotted-nut, PTFE > 316L |
| TDK | Tri-Clamp ISO2852 DN51 (2"), PTFE > 316L, 3A |
| TFK | Tri-Clamp ISO2852 DN76.1 (3"), PTFE > 316L, 3A |
| THK | Tri-Clamp ISO2852 DN101.6 (4"), PTFE > 316L, 3A |
| YY9 | Special version, TSP-no. to be spec. |
| 40 | Output; Operation |
| A | 4-20mA SIL HART; 4-line display VU331, envelope curve display on site |
| B | 4-20mA SIL HART; w/o display, via communication |
| K | 4-20mA SIL HART; Prepared for FHX40, remote display (Accessory) |
| C | PROFIBUS PA; 4-line display VU331, envelope curve display on site |
| D | PROFIBUS PA; w/o display, via communication |
| E | FOUNDATION Fieldbus; 4-line display, envelope curve display on site |
| F | FOUNDATION Fieldbus; w/o display, via communication |
| Y | Special version, TSP-no. to be spec. |

| | | | | | | | | | |
|----------------|--|--|--|--|--|--|--|--|---|
| 50 | | | | | | | | | Housing |
| | | | | | | | | | A F12 Alu, coated IP65 NEMA4X B F23 316L IP65 NEMA4X C T12 Alu, coated IP65 NEMA4X, separate conn. compartment D T12 Alu, coated IP65 NEMA4X+OVP, separate conn. compartment, OVP=overvoltage protection Y Special version, TSP-no. to be spec. |
| 60 | | | | | | | | | Cable Entry |
| | | | | | | | | | 2 Gland M20 (EEx d > thread M20) 3 Thread G1/2 4 Thread NPT1/2 5 Plug M12 6 Plug 7/8" 9 Special version, TSP-no. to be spec. |
| 70 | | | | | | | | | Additional Option |
| | | | | | | | | | A Basic version C EN10204-3.1 material, pressurized, (316/316L pressurized) inspection certificate F Advanced dynamics, max. MB=70m liquids, MB=measuring range G Advanced dynamics, 3.1, max. MB=70m liquids, MB=measuring range, EN10204-3.1 material (316L pressurized) inspection certificate H 5-point linearity protocol, see additional spec. K 5-point, 3.1, pressurized, 5-point linearity protocol, see additional spec., EN10204-3.1 material, pressurized, (316/316L pressurized) inspection certificate L 5-point, advanced dynamics, 3.1, 5-point linearity protocol, see additional spec., Advanced dynamics, 3.1 material, max MB=70m liquids, MB=measuring range EN10204-3.1 material, (316L pressurized) inspection certificate S GL/ABS/NK marine certificate Y Special version, TSP-no. to be spec. |
| 995 | | | | | | | | | Marking |
| | | | | | | | | | 1 Tagging (TAG), see additional spec. 2 Bus address, see additional spec. |
| FMR245- | | | | | | | | | Complete product designation |

Accessories

Weather protection cover

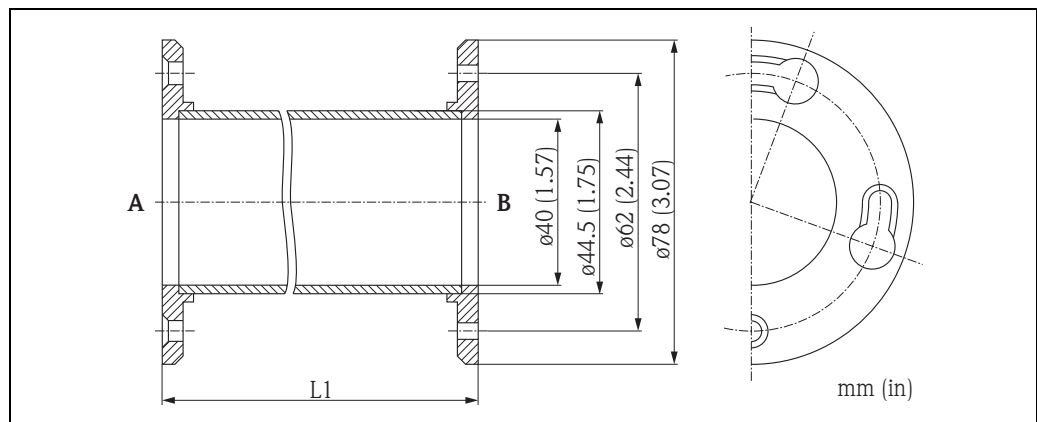
A Weather protection cover made of stainless steel is recommended for outdoor mounting (order code: 543199-0001). The shipment includes the protective cover and tension clamp.



A F12/T12 housing

Antenna extension FAR10 (for FMR230)

Dimensions



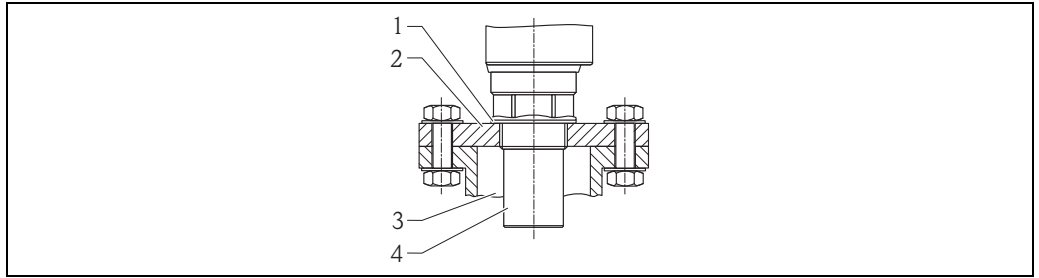
A Device

B Horn

Ordering information:

| 010 | Material |
|---------------|--|
| 6 | 316L |
| 7 | 316L + EN10204-3.1, NACE MR1075 (316L wetted parts) inspection certificate |
| 4 | AlloyB2 |
| 5 | AlloyC4 |
| 9 | Special version, TSP-no. to be spec. |
| 020 | Extension |
| A | 100 mm / 4" |
| B | 200 mm / 8" |
| C | 300 mm / 12" |
| D | 400 mm / 16" |
| Y | Special version, TSP-no to be spec. |
| FAR10- | Complete product designation |

Screw in flange for FMR244 - 40 mm (1½") antenna



100-FM150xxx-00-00-xx-002

- A Sealing ring EPDM (supplied)
- B Screw in flange
- C Sensor
- D Nozzle

Ordering information:

| 015 | Material |
|--------|--|
| | BR1 DN50 PN10/16 A, steel flange EN1092-1 |
| | BS1 DN80 PN10/16 A, steel flange EN1092-1 |
| | BT1 DN100 PN10/16 A, steel flange EN1092-1 |
| | JF1 2" 150lbs FF, steel flange ANSI B16.5 |
| | JG1 3" 150lbs FF, steel flange ANSI B16.5 |
| | JH1 4" 150lbs FF, steel flange ANSI B16.5 |
| | JK2 8" 150lbs FF, PP max 3bar abs/44psia flange ANSI B16.5 |
| | XIF UNI flange 2"/DN50/50, PVDF max 4bar abs/58psia, suitable for 2" 150lbs/DN50 PN16/10K 50 |
| | XIG UNI flange 2"/DN50/50, PP max 4bar abs/58psia, suitable for 2" 150lbs/DN50 PN16/10K 50 |
| | XIJ UNI flange 2"/DN50/50, 316L max 4bar abs/58psia, suitable for 2" 150lbs/DN50 PN16/10K 50 |
| | XJF UNI flange 3"/DN80/80, PVDF max 4bar abs/58psia, suitable for 3" 150lbs/DN80 PN16/10K 80 |
| | XJG UNI flange 3"/DN80/80, PP max 4bar abs/58psia, suitable for 3" 150lbs/DN80 PN16/10K 80 |
| | XJJ UNI flange 3"/DN80/80, 316L max 4bar abs/58psia, suitable for 3" 150lbs/DN80 PN16/10K 80 |
| | KKF UNI flange 4"/DN100/100, PVDF max 4bar abs/58psia, suitable for 4" 150lbs/DN100 PN16/10K 100 |
| | XKG UNI flange 4"/DN100/100, PP max 4bar abs/58psia, suitable for 4" 150lbs/DN100 PN16/10K 100 |
| | XKJ UNI flange 4"/DN100/100, 316L max 4bar abs/58psia, suitable for 4" 150lbs/DN100 PN16/10K 100 |
| | XLF UNI flange 6"/DN150/150, PVDF max 4bar abs/58psia, suitable for 6" 150lbs/DN150 PN16/10K 150 |
| | XLG UNI flange 6"/DN150/150, PP max 4bar abs/58psia, suitable for 6" 150lbs/DN150 PN16/10K 150 |
| | XLJ UNI flange 6"/DN150/150, 316L max 4bar abs/58psia, suitable for 6" 150lbs/DN150 PN16/10K 150 |
| | XMG UNI flange DN200/200, PP max 4bar abs/58psia, suitable for DN200 PN16/10K 200 |
| | XNG UNI flange DN250/250, PP max 4bar abs/58psia, suitable for DN250 PN16/10K 250 |
| | YYY Special version, TSP-no to be spec. |
| 020 | Sensor Connection |
| | A Thread ISO228 G3/4 |
| | B Thread ISO228 G1 |
| | C Thread ISO228 G1-1/2 |
| | D Thread ISO228 G2 |
| | E Thread ANSI NPT3/4 |
| | F Thread ANSI NPT1 |
| | G Thread ANSI NPT1-1/2 |
| | H Thread ANSI NPT2 |
| | Y Special version, TSP-no to be spec. |
| FAX50- | Vollständige Produktbezeichnung |

**Variable flange seal for
FMR244 - 80 mm (3") antenna
and FMR240 -100 mm (4")
horn antenna**

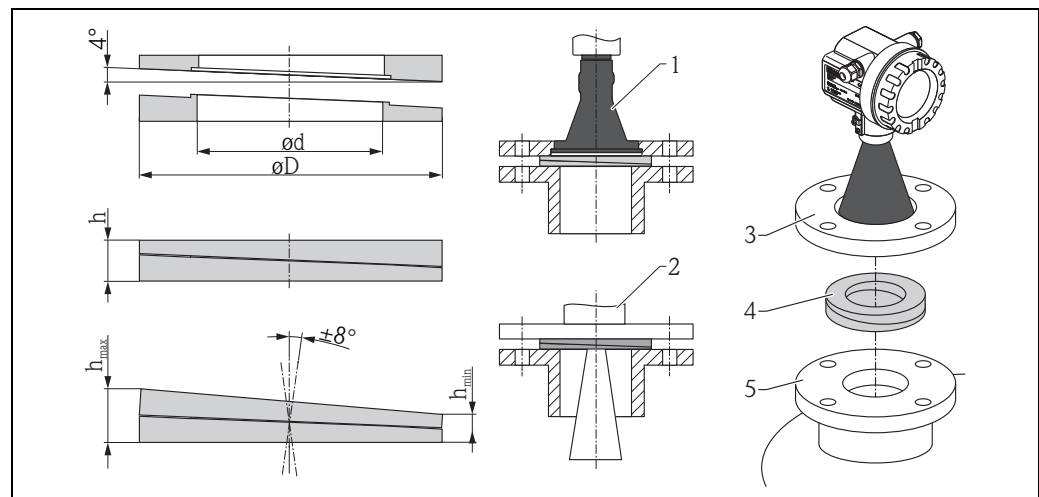
Technical data and ordering information

| Variable flange seal | DN 80 | DN 100 | DN 150 |
|----------------------|--|--|--|
| compatible with | DN 80 PN10-40 ANSI 3" 150lbs JIS 10K 80A | DN 100 PN10-40 ANSI 4" 150lbs JIS 10K 100A | DN 150 PN10-40 ANSI 6" 150lbs JIS 10K 150A |
| Material | EPDM | | |
| Process pressure | -0.1 to 0.1bar (-1.45 to 1.45 psi) | | |
| Process temperature | -40 to +80 °C (-40 to +176 °F) | | |
| Order code | 71074263 | 71074264 | 71074265 |

Note for Ex-applications:

The material and process conditions of the adjustable flange seal must fit the process properties (temperature, pressure, resistance).

Dimensions



- 1 E.g. FMR244 - DN 80
- 2 E.g. FMR240 - 100 mm (4") horn
- 3 UNI slip on flange
- 4 Variable flange seal
- 5 Nozzle

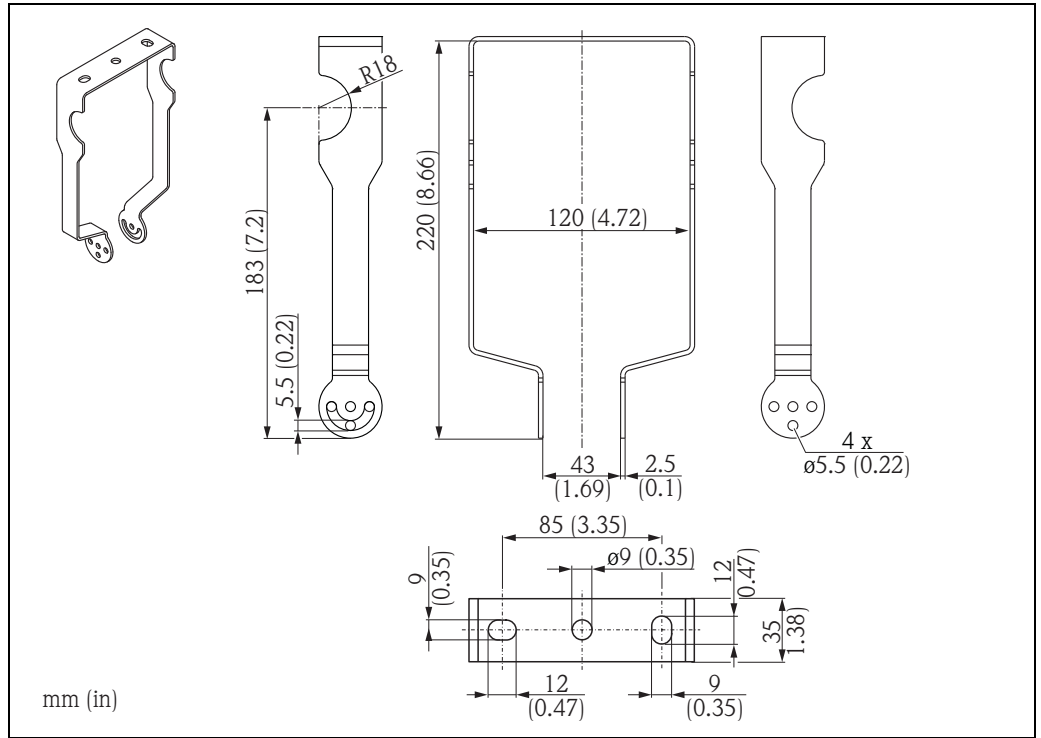
| Variable flange seal | DN 80 ¹⁾ | DN 100 ^{1) 2)} | DN 150 ^{1) 2)} |
|----------------------------|---------------------|-------------------------|-------------------------|
| D [mm (in)] | 142 (5.59) | 162 (6.38) | 218 (8.58) |
| d [mm (in)] | 89 (3.5) | 115 (4.53) | 169 (6.65) |
| h [mm (in)] | 22 (0.87) | 23.5 (0.93) | 26.5 (1.04) |
| h _{min} [mm (in)] | 14 (0.55) | 14 (0.55) | 14 (0.55) |
| h _{max} [mm (in)] | 30 (1.18) | 33 (1.3) | 39 (1.54) |

1) For FMR244 with process connection XVG, XXG or X1G (UNI slip on flange).

2) For FMR240 with 100 mm (4") horn antenna and flange mounting process connection.

Mounting bracket for FMR244 Dimensions

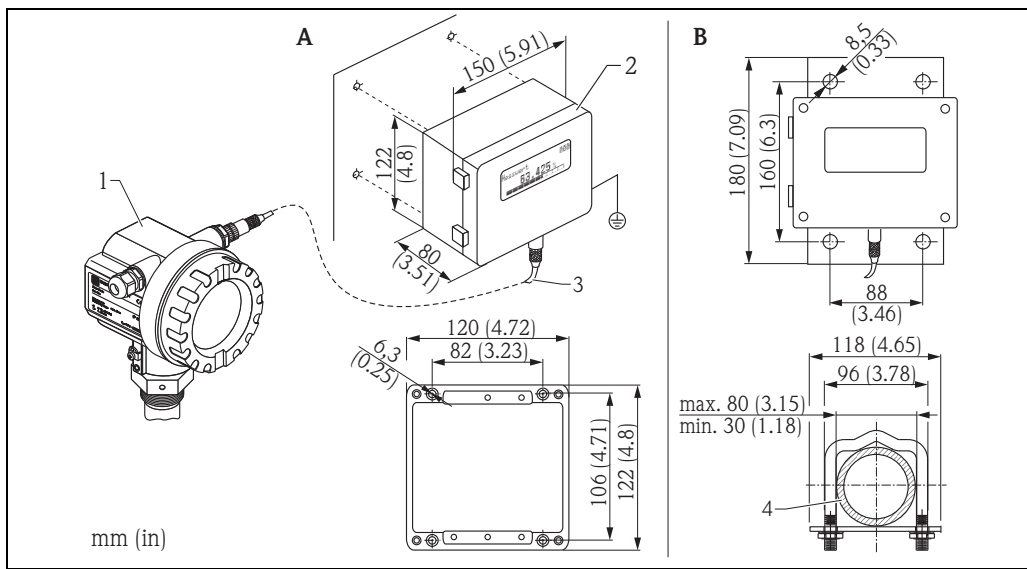
Mounting bracket to the alignment of FMR244 in solid applications uses (order code: 71091643).



Note!

With T12 housing it's not possible to mount the device direct at the ceiling.

Remote display FHX40



- 1 Micropilot M, Levelflex M, Prosonic M
 - 2 Separate housing FHX40 (IP65)
 - 3 Cable
 - 4 Pipe
- A Wall mounting (without mounting bracket)
 - B Pipe mounting (mounting bracket and plate supplied optionally, see product structure)

Note!

For the device families Micropilot FMR2xx, Levelflex FMP4x and Prosonic FMU4x, the remote display FHX40 must be only used for the HART communication version.

Ordering information:

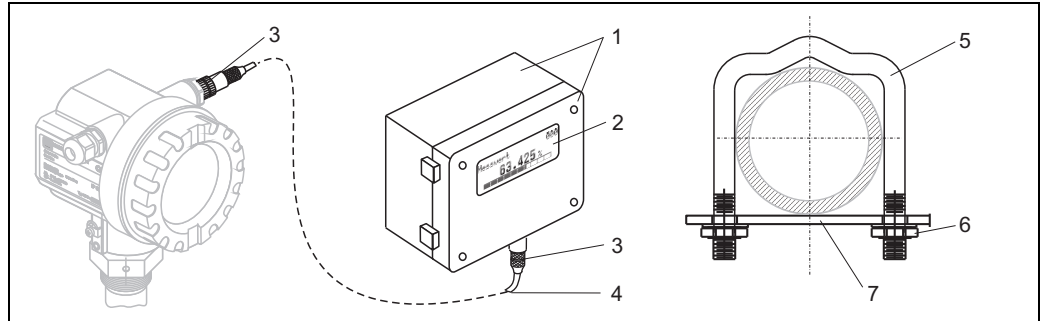
| | | |
|----------------|--------------------------|--|
| 010 | Approval | |
| | A | Non-hazardous area |
| | 2 | ATEX II 2G Ex ia IIC T6 |
| | 3 | ATEX II 2D Ex ia IIIC T80°C |
| | G | IECEX zone1 Ex ia IIC T6/T5 |
| | S | FM IS Cl.I Div.1 Gr.A-D, zone 0 |
| | U | CSA IS Cl.I Div.1 Gr.A-D, zone 0 |
| | N | CSA General Purpose |
| | K | TIIS Ex ia IIC T6 |
| | C | NEPSI Ex ia IIC T6/T5 |
| | Y | Special version, TSP-no. to be spec. |
| 020 | Cable | |
| | 1 | 20m/65ft; for HART |
| | 5 | 20 m/65 ft (> PROFIBUS PA / FOUNDATION Fieldbus) |
| | 9 | Special version, TSP-no. to be spec. |
| 030 | Additional option | |
| | A | Basic version |
| | B | Mounting bracket, pipe 1"/ 2" |
| | Y | Special version, TSP-no. to be spec. |
| 995 | Marking | |
| | 1 | Messstelle (TAG), see additional spec. |
| FHX40 - | | Complete product designation |

For connection of the remote display FHX40 use the cable which fits the communication version of the respective instrument.

Technical data (cable and housing)

| | |
|----------------------|---|
| Max. cable length | 20 m (66 ft) (fixed length including the cast-on plugs) |
| Temperature range | -40 to +60 °C (-40 to +140 °F) |
| Degree of protection | IP65/67 (housing); IP68 (cable) acc. to IEC 60529 |
| Materials | Housing: AISi12; cable glands: nickle plated brass |
| Dimensions [mm (in)] | 122x150x80 (4.8x5.91x3.15) / HxWxD |

Materials



L00-FMxxxx-00-00-06-de-003

| Position | Part | Material |
|----------|------------------|---|
| 1 | Housing/Cover | AISI12, Screw: V2A |
| | Ground terminal | CuZn nickel-plated, Screw: V2A |
| 2 | Display | Glass |
| 3 | Cable gland | CuZn nickel-plated |
| 4 | Cable | PVC |
| 5 | Mounting bracket | 316 Ti (1.4571) or 316 L (1.4435) or 316 (1.4401) |
| 6 | Nut | V4A |
| 7 | Plate) | 316 Ti (1.4571) |
| | Screw set (M5) | Spring washer: 301 (1.4310) or V2A Screw: V4A, Nut: V4A |

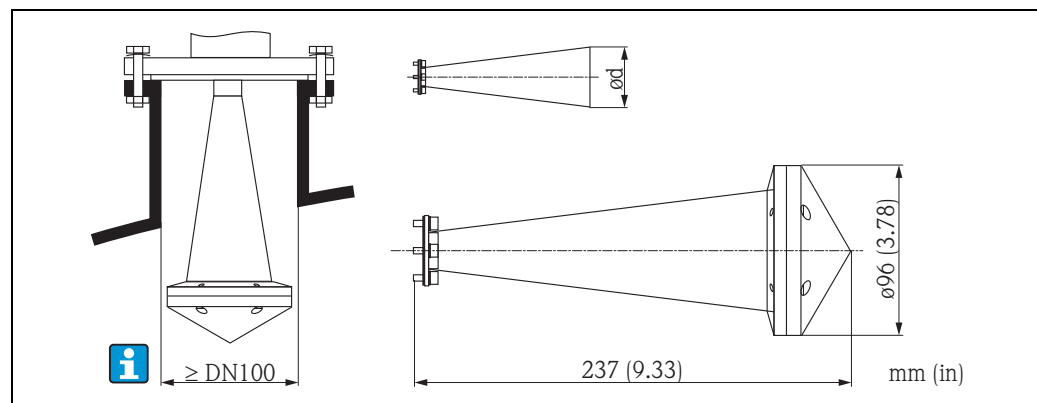
Horn cover for 80 mm (3") and 100 mm (4") horn antenna

Technical data

| Materials | |
|--------------|----------|
| Horn cover | PTFE |
| Screws | 316L |
| Holding ring | 316L |
| Contact ring | 316L |
| O-ring seal | Silicone |
| Flat seal | PTFE |

| Process conditions | |
|--------------------------|---------------------|
| Vessel pressure max. | 0.5 bar (7.252 psi) |
| Process temperature max. | 130 °C (266 °F) |

Dimensions

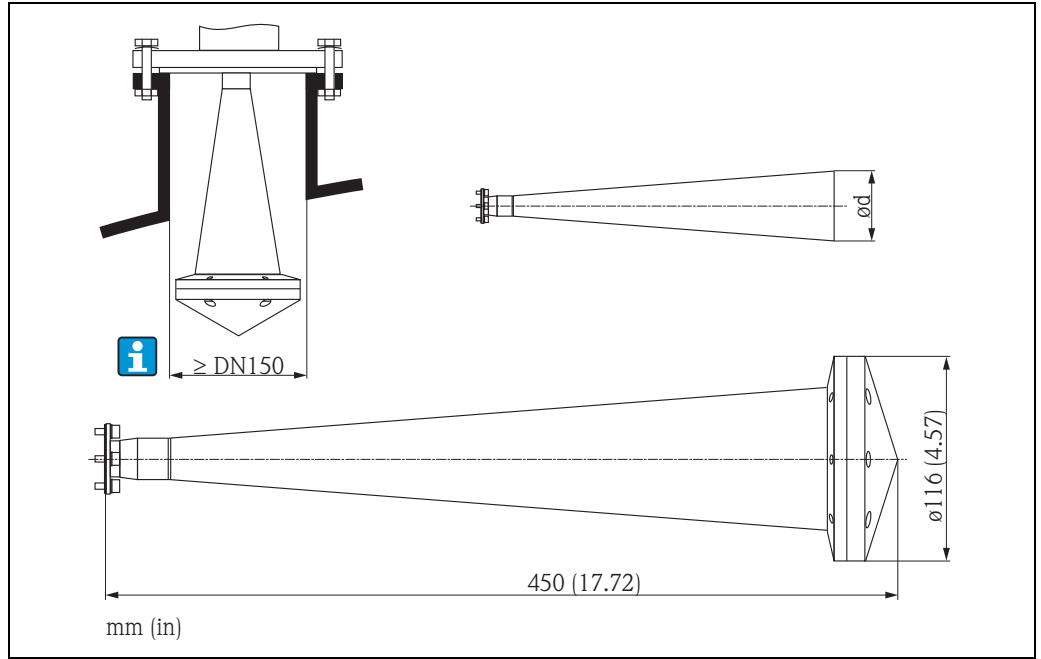


Horn cover for horn antenna 80 mm (3")

- For antenna diameter $d = 75$ mm (2.95 in)
- For FMR240: antenna variant G, 4
- For FMR250: antenna variant D

Note!

The horn cover is not allowed to use in areas, where explosion proofed equipment is necessary.



L00-FMR2xxxx-06-00-00-xx-001

Horn cover for horn antenna 100 mm (4")
 – For antenna diameter $d = 95$ mm (3.74 in)
 – For FMR240: antenna variant H, S
 – For FMR250: antenna variant E

Note!

The horn cover is not allowed to use in areas, where explosion proofed equipment is necessary.

Ordering information

| Horn antenna | 80 mm (3") | 100 mm (4") |
|--------------|------------|-------------|
| Order code | 71105890 | 71105889 |

-
- Commubox FXA195 HART** For intrinsically safe communication with FieldCare via the USB interface.
 For details refer to TI00404F/00/EN.
-
- Commubox FXA291** The Commubox FXA291 connects Endress+Hauser field devices with CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a personal computer or a notebook.
 For details refer to TI00405C/07/EN.
- Note!**
 For the device you need the "ToF Adapter FXA291" as an additional accessory.
-
- ToF Adapter FXA291** The ToF Adapter FXA291 connects the Commubox FXA291 via the USB interface of a personal computer or a notebook to the device. For details refer to KA00271F/00/A2.
-
- Field Xpert SFX100** Compact, flexible and robust industry handheld terminal for remote parametrization and measured value inspection via the HART current output or FOUNDATION Fieldbus.
 For details refer to Operating Instructions BA00060S/04/EN

Documentation

Special Documentation

Continuous level measurement in liquids

Selection and engineering guide for the process industry, CP00023F/00/EN.

Radar Tank Gauging brochure

For inventory control and custody transfer applications in tank farms and terminals, SO00001G/00/EN.

Technical Information

Tank Side Monitor NRF590

Technical Information for Tank Side Monitor NRF590, TI00402F/00/EN.

Fieldgate FXA520

Technical Information for Fieldgate FXA520, TI00369F/00/EN.

Operating Instructions

Micropilot M

Correlation of operating instructions to the device:

| Device | Output | Communication | Operating Instructions | Description of Device Functions | Brief Operating Instructions (in the device) |
|--------|---------|---------------------|------------------------|---------------------------------|--|
| FMR230 | A, B, K | HART | BA00218F/00/EN | BA00221F/00/EN | KA00159F/00/A2 |
| | C, D, L | PROFIBUS PA | BA00225F/00/EN | BA00221F/00/EN | KA00159F/00/A2 |
| | E, F, M | FOUNDATION Fieldbus | BA00228F/00/EN | BA00221F/00/EN | KA00159F/00/A2 |

| | | | | | |
|--------|---------|---------------------|----------------|----------------|----------------|
| FMR231 | A, B, K | HART | BA00219F/00/EN | BA00221F/00/EN | KA00159F/00/A2 |
| | C, D, L | PROFIBUS PA | BA00226F/00/EN | BA00221F/00/EN | KA00159F/00/A2 |
| | E, F, M | FOUNDATION Fieldbus | BA00229F/00/EN | BA00221F/00/EN | KA00159F/00/A2 |

| | | | | | |
|--------|---------|---------------------|----------------|----------------|----------------|
| FMR240 | A, B, K | HART | BA00220F/00/EN | BA00291F/00/EN | KA00235F/00/A2 |
| | C, D, L | PROFIBUS PA | BA00227F/00/EN | BA00291F/00/EN | KA00235F/00/A2 |
| | E, F, M | FOUNDATION Fieldbus | BA00230F/00/EN | BA00291F/00/EN | KA00235F/00/A2 |

| | | | | | |
|--------|---------|---------------------|----------------|----------------|----------------|
| FMR244 | A, B, K | HART | BA00248F/00/EN | BA00291F/00/EN | KA00235F/00/A2 |
| | C, D, L | PROFIBUS PA | BA00249F/00/EN | BA00291F/00/EN | KA00235F/00/A2 |
| | E, F, M | FOUNDATION Fieldbus | BA00250F/00/EN | BA00291F/00/EN | KA00235F/00/A2 |

| | | | | | |
|--------|---------|---------------------|----------------|----------------|----------------|
| FMR245 | A, B, K | HART | BA00251F/00/EN | BA00291F/00/EN | KA00235F/00/A2 |
| | C, D, L | PROFIBUS PA | BA00252F/00/EN | BA00291F/00/EN | KA00235F/00/A2 |
| | E, F, M | FOUNDATION Fieldbus | BA00253F/00/EN | BA00291F/00/EN | KA00235F/00/A2 |

Tank Side Monitor NRF590

Operating Instructions for Tank Side Monitor NRF590, BA00256F/00/EN.

Description of Device Functions for Tank Side Monitor NRF590, BA00257F/00/EN.

Certificates

Correlation of safety instructions (XA, XC) and certificates (ZD, ZE) to the device:

| Authority | Version | Designation | Housing | | | Output | Document | Type |
|---------------|--|--|----------|-----------------|-----|---------------------------------|----------------------|--------------------------------|
| | | | F12 | T12 | F23 | | | |
| ATEX | FMR240/245: B | II 1/2 G Ex ia IIC T6 II 1/2 D | X | X ¹⁾ | X | HART, HART für FHX40, PA, FF | XA00406F XA00407F | 240 245 |
| | FMR244: B, C | II 1/2 G Ex ia IIC T6 II 1/2 D II 1/3D | | | | | XA00408F | 244 |
| ATEX IECEX | H, 1, 6, | II 1/2 G Ex ia IIC T6 Zone 0/1 | X | | | HART | XA00099F | 230, 231, 240 |
| | | | | X ¹⁾ | | | XA00207F | 230, 231, 240 |
| | | | | | X | | XA00203F | 230, 231, 240 |
| | | | X | | | HART für FHX40 | XA00099F | 230, 231, 240 |
| | | | | | X | | XA00203F | 230, 231, 240 |
| | | | X | | | PA, FF | XA00102F | 230, 231, 240 |
| | | | | | X | | XA00204F | 230, 231, 240 |
| | X ¹⁾ | | XA00208F | 230, 231, 240 | | | | |
| ATEX IECEX | FMR230/231: 1, 6, FMR240/244/ 245: D | II 1/2 G Ex ia IIC T6 Zone 0/1 | | | X | HART | XA00366F XA00367F | 230, 231, 240 245, |
| | | | | X ¹⁾ | | | XA00368F XA00369F | 230, 231, 240 244, 245, |
| | | | X | | | HART für FHX40 | XA00354F XA00358F | 230, 231, 240 244, 245 |
| | | | | | X | | XA00366F XA00367F | 230, 231, 240 245, |
| | | | X | | | PA, FF | XA00354F XA00358F | 230, 231 244, 245 |
| | | | X | | | | XA00357F XA00361F | 230, 231, 240 244, 245 |
| | | | | | X | | XA00362F XA00363F | 230, 231, 240 245, |
| | | | | X ¹⁾ | | | XA00364F XA00365F | 230, 231, 240 244, 245 |
| ATEX | H | II 3 D | X | X ¹⁾ | X | HART, HART für FHX40, PA, FF | XA00277F | 230, 231, 240, 245 |
| | | | X | X ¹⁾ | | | XA00277F | 244, |
| ATEX | 3, 8 | II 1/2 G Ex em (ia) IIC T6 | | X | | HART, PA, FF | XA00100F | 230, 231, 240 |
| ATEX IECEX | FMR230/231: 4 FMR240: E | II 1/2 G Ex d (ia) IIC T6 Zone 0/1 | | X | | HART, PA, FF | XA00101F XA00356F | 230, 231, 240 230, 231, 240 |
| | | | | | | HART für FHX40 | XA00356F | 230, 231, 240 |
| ATEX | FMR230/231/ 240: 5 FMR244/245: E | II 1/2 G Ex d (ia) IIC T6 Zone 0/1 | | X | | HART, PA, FF | XA00105F XA00360F | 230, 231, 244 245 |
| | | | | | | HART für FHX40 | XA00360F | 230, 231, 244, 245 |

| Authority | Version | Designation | Housing | | | Output | Document | Type |
|---------------|--------------------------------------|-----------------------------------|---------|-----------------|-----|---------------------------------|----------|--------------------|
| | | | F12 | T12 | F23 | | | |
| ATEX IECEX | H, 2 ²⁾ , 7 ²⁾ | II 1/2 G Ex ia IIC T6 Zone 0/1 | X | | | HART | XA00103F | 230, 231, 244 |
| | | | | X ¹⁾ | | | XA00209F | 230, 231, 244, 245 |
| | | | | | X | | XA00205F | 230, 231, 245 |
| | | | X | | | HART für FHX40 | XA00103F | 230, 231, 244 |
| | | | | | X | | XA00205F | 230, 231, 245 |
| | | | X | | | PA, FF | XA00106F | 230, 231, 244 |
| | | | | X ¹⁾ | | | XA00210F | 230, 231, 244, 245 |
| | | | | | X | | XA00206F | 230, 231, 245 |
| ATEX IECEX | 2 ²⁾ , 7 ²⁾ | II 1/2 G Ex ia IIC T6 Zone 0/1 | X | | | HART | XA00358F | 230, 231 |
| | | | | X ¹⁾ | | | XA00369F | 230, 231 |
| | | | | | X | | XA00367F | 230, 231 |
| | | | X | | | HART für FHX40 | XA00358F | 230, 231 |
| | | | | | X | | XA00367F | 230, 231 |
| | | | X | | | PA, FF | XA00361F | 230, 231 |
| | | | | | X | | XA00363F | 230, 231 |
| | | | | X ¹⁾ | | | XA00365F | 230, 231 |
| ATEX | G | II 3 G Ex nA II T6 | X | X ¹⁾ | X | HART, HART für FHX40, PA, FF | XA00233F | 230, 231, 240, 245 |
| | | | X | X ¹⁾ | | | XA00233F | 244, |

- 1) Housing with overvoltage protection (OVP)
- 2) Note safety instructions (XA) (electrostatic charging)!

| Authority | Version | Designation | Housing | | | Output | Document | Type |
|-----------|---------|---------------------|---------|-----------------|-----|---------------------------------|----------------------|-------------------------------------|
| | | | F12 | T12 | F23 | | | |
| NEPSI | I | Ex ia IIC T6 | X | X ¹⁾ | X | HART, HART für FHX40 | XA00370F | 230, 231, 240 230, 231, 245 |
| | | | X | X ¹⁾ | | | XA00372F | |
| | | | X | X ¹⁾ | X | PA, FF | XA00373F | 230, 231, 240 230, 231, 245 |
| | | | X | X ¹⁾ | | | XA00375F | |
| | J | Ex d (ia) ia IIC T6 | | X | | HART, HART für FHX40, PA, FF | XA00371F XA00374F | 230, 231, 240 230, 231, 244, 245 |
| | R | Ex nAL IIC T6 | X | X ¹⁾ | X | HART, HART für FHX40, PA, FF | XC00007F | 230, 231, 240, 245 244 |
| | | | X | X ¹⁾ | | | XC00007F | |

1) Housing with overvoltage protection (OVP)

| Authority | Version | Designation | Housing | | | Output | Document | Type | | |
|-----------|---------|---|---------|-----------------|-----------------|--------------|----------------|-------------------------|-------------------------|--------------------|
| | | | F12 | T12 | F23 | | | | | |
| FM | S | IS Cl. I Div. 1 Gr. A-D Zone 0, 1, 2 | X | | | HART | ZD00055F | 230, 231, 240, 244, 245 | | |
| | | | | X ¹⁾ | | | ZD00127F | | 230, 231, 240, 244, 245 | |
| | | | | | X | | ZD00126F | | | |
| | | | | X | | | HART für FHX40 | ZD00055F | 230, 231, 240, 244, 245 | |
| | | | | | X | ZD00126F | | | | |
| | | | | X | | | PA, FF | ZD00056F | 230, 231, 240, 244, 245 | |
| | | | | X | X ¹⁾ | X | | ZD00021F | | 230, 231, 240, 245 |
| | | | | X | X ¹⁾ | | | ZD00021F | | |
| | | | | | X ¹⁾ | | | ZD00129F | | |
| | | | | | | X | | ZD00128F | | |
| | T | XP Cl. I Div. 1 Gr. A-D Zone 1, 2 | | X | | HART, PA, FF | ZD00058F | 230, 231, 240, 244, 245 | | |
| CSA | U | IS Cl. I Div. 1 Gr. A-D Zone 0, 1, 2 | X | | | HART | ZD00059F | 230, 231, 240, 244, 245 | | |
| | | | | X ¹⁾ | | | ZD00133F | | 230, 231, 240, 244, 245 | |
| | | | | | X | | ZD00132F | | | |
| | | | | X | | | HART für FHX40 | ZD00059F | 230, 231, 240, 244, 245 | |
| | | | | | X | ZD00132F | | | | |
| | | | | X | | | PA, FF | ZD00060F | 230, 231, 240, 244, 245 | |
| | | | | | X ¹⁾ | | | ZD00135F | | |
| | | | | | | X | | ZD00134F | | |
| | V | XP Cl. I Div. 1 Gr. A-D Zone 1, 2 | | X | | HART, PA, FF | ZD00062F | 230, 231, 240, 244, 245 | | |

1) Housing with overvoltage protection (OVP)

| Authority | Version | Designation | Housing | | | Output | Document | Type |
|-----------|--|------------------------|---------|-----------------------|-----|----------------|----------|--------------------|
| | | | F12 | T12 | F23 | | | |
| WHG | FMR2xx: F FMR230/231/240: 6 FMR230/231/244/ 245: 7 ¹⁾ FMR230/231/240: 8 | Ex-freier Bereich, WHG | X | X, X ¹⁾ | X | HART, PA | ZE00244F | 230, 231, 240, 245 |
| | | | | | | HART für FHX40 | | 230, 231, 240, 244 |

1) Only for FMR230, FMR231, FMR244

This product may be protected by at least one of the following patents.
Further patents are pending.

- US 5,387,918 \cong EP 0 535 196
- US 5,689,265 \cong EP 0 626 063
- US 5,659,321
- US 5,614,911 \cong EP 0 670 048
- US 5,594,449 \cong EP 0 676 037
- US 6,047,598
- US 5,880,698
- US 5,926,152
- US 5,969,666
- US 5,948,979
- US 6,054,946
- US 6,087,978
- US 6,014,100

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