



Level



Pressure



Flow



Temperature

Liquid
Analysis

Registration

Systems
Components

Services



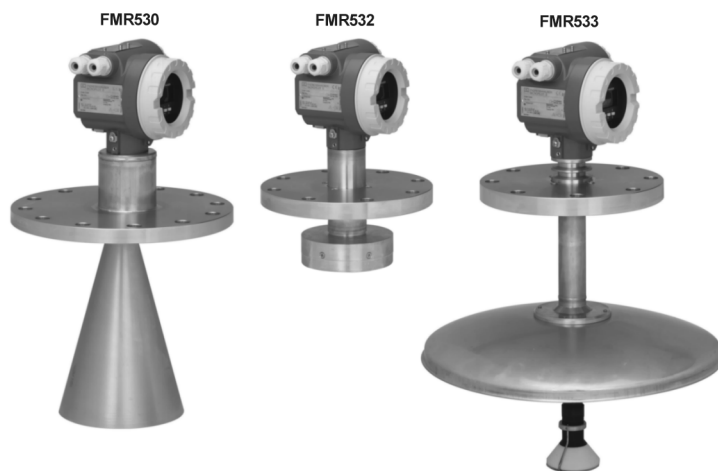
Solutions

Technical Information

Micropilot S FMR530, FMR532, FMR533

Level-Radar

Continuous level transmitter for continuous and non-contact precision level measurement. For custody transfer and inventory control applications with NMI- and PTB-approvals.



Application

The Micropilot S is used for highly accurate level measurement in storage tanks and can be applied in custody transfer applications. It meets the relevant requirements according to OIML R85 and API 3.1B.

- The FMR530 with horn antenna is suitable for free space applications (up to 25 m) that disallow the use of a parabolic antenna due to tank/nozzle geometry.
- The FMR532 with planar antenna is specifically suited for stilling well applications with ranges up to 38 m (124 ft).
- The FMR533 with parabolic antenna is excellently suited for free space applications up to 40 m (131 ft).

Your benefits

- 0.5 mm accuracy (2σ value)
- National approvals (NMI, PTB) for custody transfer.
- Applicable as stand-alone system or tied into tank gauging systems via the Tank Side Monitor NRF590.
- Easy on-site operation via menu-driven alphanumeric display.
- Easy commissioning, documentation and diagnostics via FDT/DTM technology (FieldCare).
- Application-specific antenna selection. Planar antenna versions allow direct installation on tapered stilling wells.
- Cost-effective and simple installation via 4-wire cable with HART and 24 V DC intrinsically safe power supply.
- Gas-tight process connection (second line of defense) standard for any antenna version.
- Inventory Control Version with reduced accuracy (3 mm) available for all device types.

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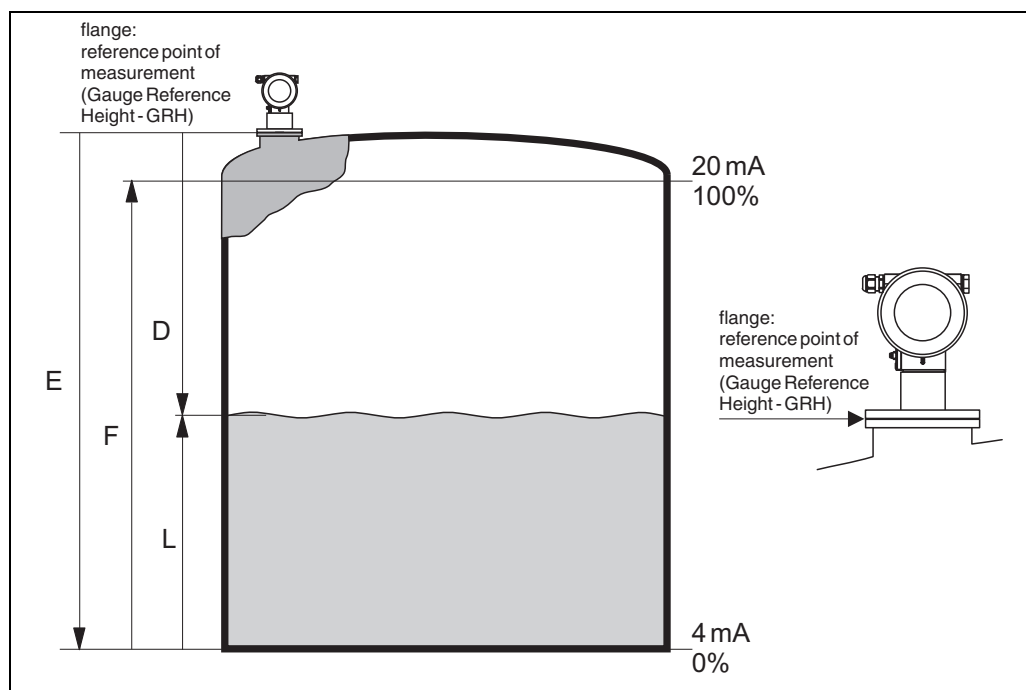
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Function and system design

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.



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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® software, based on many years of experience with time-of-flight technology. The mm-accuracy of the Micropilot S could be achieved with the patented algorithms of the PhaseMaster® software.

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 stability of the reference point of measurement (GRH) has a decisive influence on the accuracy of the measurement!

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. The data points "E" and "F" correspond with 4 mA and 20 mA for devices with current output. They correspond with 0 % and 100 % for digital outputs and the display module.

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

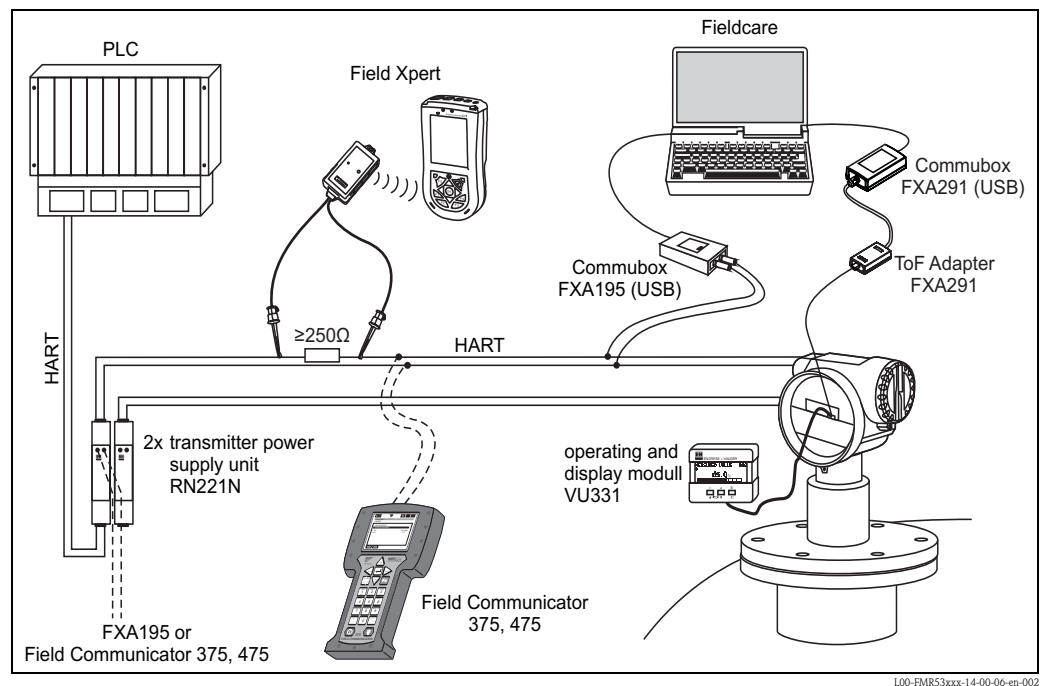
Stand-alone

The Micropilot S can be used for measurement in a stilling well as well as in free space. The different device versions are applied as follows:

- The Micropilot S FMR532 with planar antenna is the preferred device in stilling wells ≥ 150 mm.
- In stilling wells with a diameter < 150 mm, the Micropilot S FMR532 can be applied in connection with a suitable reducing adapter. For more information please contact your Endress+Hauser representative.
- The Micropilot S FMR533 with parabolic antenna is preferred for free-space measurements. The Micropilot S FMR530 with horn antenna can be used as an alternative for small nozzle. It is essential to keep the minimum distance from the tank wall.
- The devices are equipped with a passive 4 to 20 mA output with HART protocol.
- Reliable transmission of a measurement with mm accuracy is only ensured by the HART protocol

4 to 20 mA output with HART protocol

The complete measuring system consists of:



On-site operation:

- with display and operating module VU331,
- with a Personal Computer, Commubox 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 micro-impulse). It assists with commissioning, securing data, signal analysis and documentation of the measuring point.

Remote operation

- with Field Communicator 375, 475,
- with Field Xpert SFX100,
- with a Personal Computer, Commubox FXA195 and the operating software "FieldCare",
- with a Personal Computer, TSM (Tank Side Monitor) and the operating software FuelsManager.

Integration into the Asset Management System

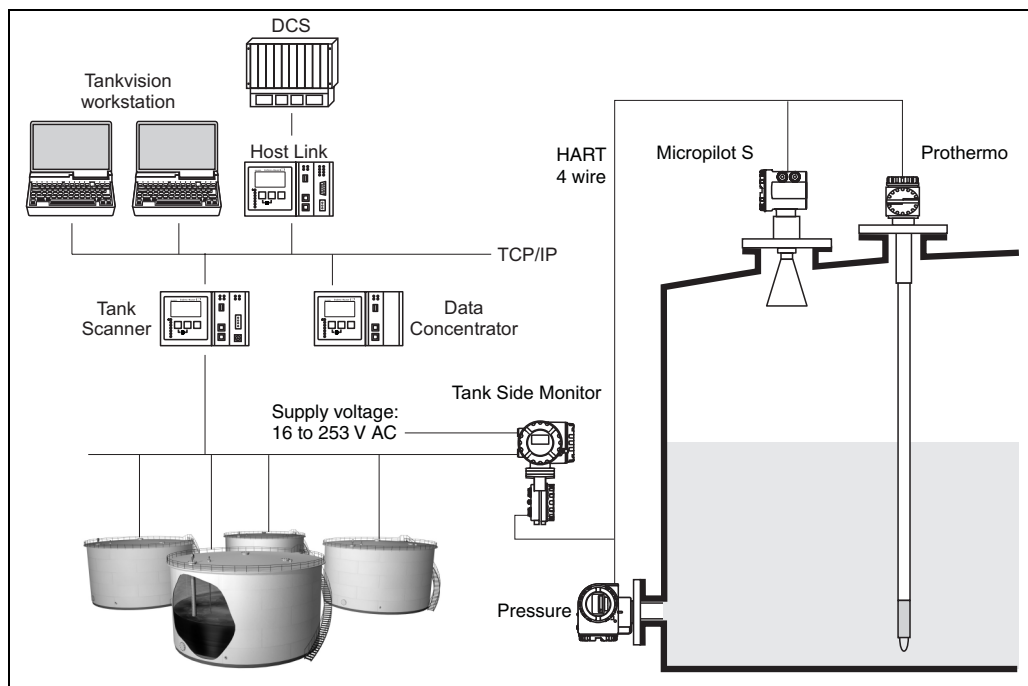
The HART interface allows the integration into the AMS® (Asset Management System) from Fisher-Rosemount.

Custody transfer applications

The Micropilot S is suitable for custody transfer and inventory control applications. The on-site testing has to be done in compliance with the applicable regulatory standards. The Micropilot S can be sealed after successful on-site calibration to be protected against any access to the electronics compartment and any changes of software settings. If the Micropilot S is used for custody transfer or inventory control, any temperature influence on the tank shell height can be compensated for using the Tank Side Monitor (TSM). In addition, the vertical movement of the gauge reference point due to the hydrostatic tank deformation can be compensated in the Tank Side Monitor. A Tank Side Monitor can provide 24 V DC for a Micropilot S. The Tank Side Monitor can communicate with up to 6 devices via HART Multidrop.

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 (HART multidrop) for all on-tank sensors yields extremely low wiring costs, while at the same time providing maximum safety, reliability and data availability.



Input

Measured variable

The measured variable is the distance between a reference point GRH (mounting flange) and a reflective surface (e.g. product surface). The measured value and all parameters are displayed using either metrical SI-units or US/UK-units (inch, ft, ...).

The level is calculated based on the tank height entered. In order to compensate for non-linear effects like movement of the tank roof, an additional correction table (diptable) can be entered.

Antenna selection for Micropilot S-series

It is essential for each and every application and installation to evaluate the right antenna type.

The antenna selection depends on the following criteria:

- Type of application (i.e. free space vs. stilling well)
- Installation possibilities (size, location and height of nozzle)
- Properties of the product stored in the tank (radar reflectivity, vapor pressure, temperature, etc.)
- Accuracy requirements

The Micropilot S series radar comes with 3 basic radar antenna forms.

For stilling well applications:

- Planar stilling well antenna (FMR532)

For free space applications:

- Horn antenna (FMR530 > 4" (DN100))
- Parabolic antenna (FMR533)

Each of these antennas fits specific applications:

Planar antenna (for stilling well)

The planar stilling well antenna is specially designed for stilling well applications only. The emitted circular mode radar pattern is a must for high accuracy applications on stilling wells. This special mode allows the software to compensate for variations of the inside diameter of the stilling well and layering of adhering product. The diameter of the antenna itself fits in DN150 (6") stilling wells directly. Cone adapters allow installation on larger diameter stilling wells. A good match between well and adapter is essential. The Micropilot S with planar antenna can even be installed directly onto conical stilling wells and thereby often makes modifications of the stilling well unnecessary.



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Parabolic antenna

The parabolic antenna is the largest free space antenna with the smallest beam angle. It is ideal for applications close to tank walls, where a manway cover is available. The parabolic antenna is also an excellent choice on products with a low reflectivity (e.g. asphalts and bitumens).

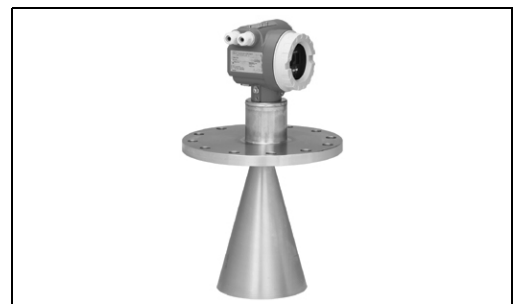


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Horn antenna

For free space applications, it is essential that the horn extends below the nozzle (→ 17).

The general rule for diameter selection is "the larger, the better," as a larger aperture of the antenna generates a narrower beam and has a better gain – signal to noise (S/N) ratio.



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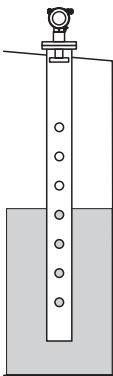
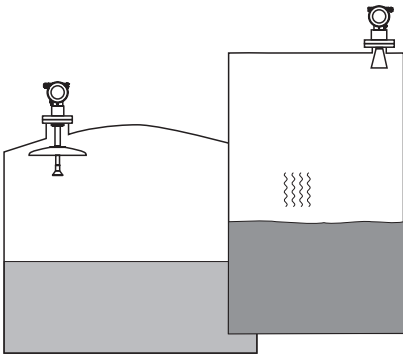
Measuring range

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

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.

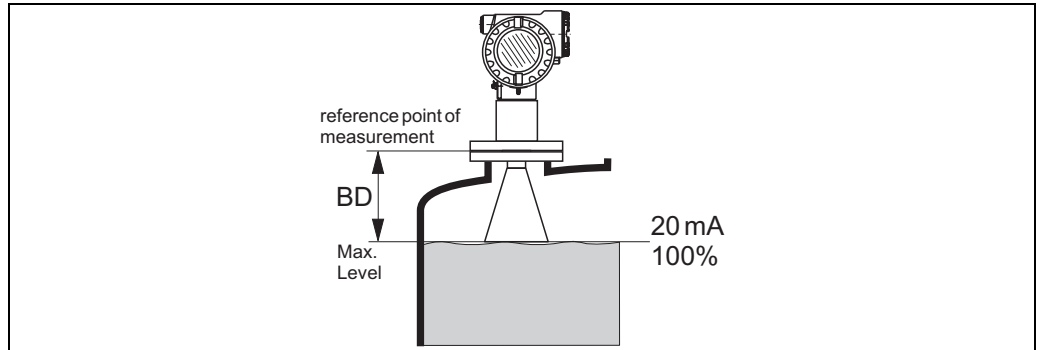
| Media group | DC (ϵ_r) | Examples |
|-------------|---------------------|---|
| A | 1.4 to 1.9 | non-conducting liquids, e.g. liquefied gas (LPG). For more information please contact your Endress+Hauser representative. |
| B | 1.9 to 4 | non-conducting liquids, e.g. benzene, oil, toluene, white products, black products, crudes, bitumen/asphalts, ... |
| 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 |

Measuring range depending on vessel type, conditions, and product for Micropilot S

| Media group | | Stilling well/ Bypass | Free space (Storage tank) | |
|---|----------------------------------|--|---|--|
| | |  |  | |
| | | Measuring range | Measuring range | |
| | | FMR532 ≥ DN150 | FMR533 | FMR530 DN150/200/250 |
| A | DC (ϵ_r) = 1.4 to 1.9 | 38 m (124 ft) | — | — |
| B | DC (ϵ_r) = 1.9 to 4 | 38 m (124 ft) | 40 m (131 ft) | DN150: 10 m (33 ft) DN200/250: 15 m (49 ft) |
| C | DC (ϵ_r) = 4 to 10 | 38 m (124 ft) | 40 m (131 ft) | DN150: 15 m (49 ft) DN200/250: 20 m (65 ft) |
| D | DC (ϵ_r) > 10 | 38 m (124 ft) | 40 m (131 ft) | DN150: 20 m (65 ft) DN200/250: 25 m (82 ft) |
| max. measuring range with custody transfer approvals | | NMi: 25m (82 ft) PTB: 30 m (98 ft) | NMi: 25 m (82 ft) PTB: 30 m (98 ft) | NMi and PTB: DN150: 20 m (65 ft) DN200/250: 25 m (82 ft) |

Blocking distance

The blocking distance (= BD) is the minimum distance from the reference point of the measurement (mounting flange) to the medium surface at maximum level.



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| Blocking distance (BD) ¹⁾ | Stilling well / Bypass | Free space (Storage tank) | |
|--------------------------------------|------------------------|---------------------------|--------------------------|
| | FMR532 | FMR533 | FMR530 |
| from flange | 1 m (40") | 1 m (40") | Length of horn (→ 24) |

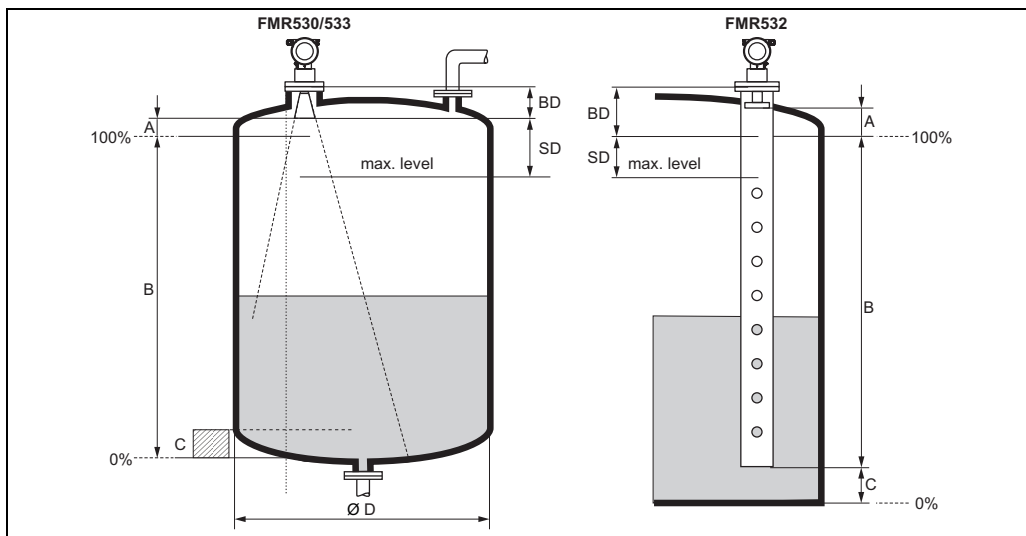
1) 1 mm accuracy under reference conditions

Note!

- If an antenna extension (FMR530 only) is used, its length has to be added.
- Inside the blocking distance of FMR532/533, a reliable measurement can not be guaranteed.

Measuring conditions

- 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.
- For **overspill protection**, it is possible to define a safety distance (**SD**) additionally to the blocking distance (**BD**).
- Depending on its consistence, foam can either absorb microwaves or reflect them off the foam surface. Measurement is possible under certain conditions.
- The smallest possible measuring range **B** depends on the antenna version (see Fig.).
- Tank diameter and height should be at least dimensioned such that a reflection of the radar signal on both sides of the tank can be ruled out ("Beam angle", → 16).
- **FMR530, FMR533:** 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.
FMR532: The zero should be positioned at the end of the tube, as the electromagnetic waves do not propagate completely outside the tube. It must be taken into account that the accuracy may be reduced in the area C. In order to guarantee the required accuracy in these cases, it is recommended to position the zero-point at a distance **C** above the tank bottom (see Fig.).
- In principle it is possible to measure up to the tip of the **horn** antenna. However, due to considerations regarding accuracy corrosion and build-up, the end of the measuring range should not be chosen any closer than 50 mm (2") to the tip of the **horn** antenna (see **A** in Fig.).
- In applications with **planar** or **parabolic** antennas, especially for media with low dielectric constants (media group A and B, → 8), the end of the measuring range should not be closer than 1 m (40") to the flange (cf. **BD** in Fig.).
- This safety distance (**SD**) is set to 0.1 m (4") by default for FMR530 (horna antenna) and generating an alarm in case the product level rises inside the safety distance.
- For FMR533 (parabolic antenna) and FMR532 (planar antenna) the safety distance (**SD**) is set to 0.5 m (20") by default, generating an alarm in case the product level rises inside the safety distance.



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| | reference: flange / BD (cf. picture) | | reference: antenna tip (cf. picture) | | |
|---------------------------|--------------------------------------|-----------------|--------------------------------------|------------|----------------------|
| | Blocking distance | Safety distance | recommended additional settings | | |
| | BD [m (ft)] | SD [m (ft)] | A [mm (in)] | B [m (ft)] | C [mm (in)] |
| FMR530 (horn) | horn length | 0.1 (0.3) | 50 (2) | 0.5 (1.6) | 150 to 300 (6 to 12) |
| FMR532 (planar) | 1 (3.28") | 0.5 (1.6) | 1000 (40) | 0.5 (1.6) | 150 to 300 (6 to 12) |
| FMR533 (parabolic) | 1 (3.28") | 0.5 (1.6) | 1000 (40) | 0.5 (1.6) | 150 to 300 (6 to 12) |

Behaviour if measuring range is exceeded

The behaviour in case of the measuring range being exceeded can be freely set:
 The default setting is a current of 22 mA and the generation of a digital warning (E681).

Output

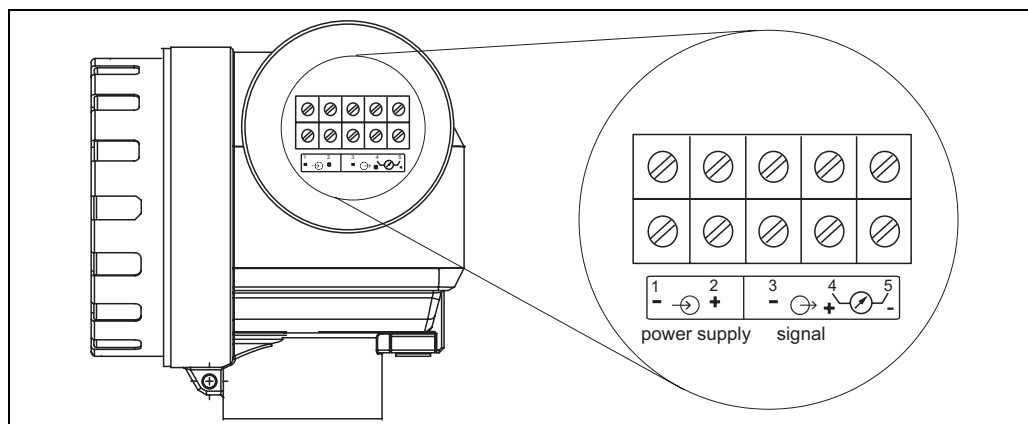
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| Output signal | 4 to 20 mA (invertible) with HART protocol (e.g. for multidrop connection to the Tank Side Monitor NRF590); This version can be operated via the PC operating software FieldCare. The device supports both point-to-point and multidrop operation. |
| Signal on alarm | Error information can be accessed via the following interfaces: <ul style="list-style-type: none">■ Local display:<ul style="list-style-type: none">– Error symbol– Plain text display– LED's: red LED continuously on = alarm, red LED flashes = warning■ Current output■ Digital interface |
| Linearization | The linearization function of the Micropilot S 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. |
| Galvanic isolation | 500 V towards: <ul style="list-style-type: none">■ power supply and ground■ power supply and signal |

Auxiliary energy

Electrical connection

Terminal compartment

The housing features a separate terminal compartment.

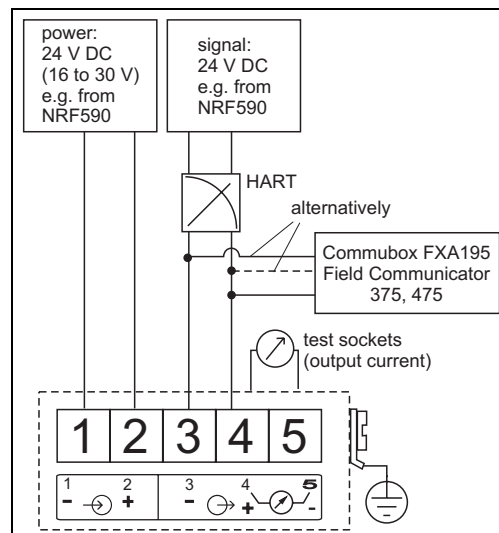


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Terminal assignment

4 to 20 mA with HART

The 4-wire cable is connected to the screw terminals (wire diameter 0.5 to 2.5 mm) in the terminal compartment. Use 4-wire twisted pair cable with screen for the connection. Protective circuitry against reverse polarity, RFI, and over-voltage peaks is built into the device (refer to TI00241F/00/EN "basics for EMC-tests"). Refer to TI00402F/00/EN for connection to the Tank Side Monitor NRF590.



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Load HART

Minimum load for HART communication: 250 Ω

Supply voltage

DC voltage: 16 to 36 V DC

| Communication | | Terminal voltage | minimum | maximum |
|---------------|----------|------------------|---------|---------|
| Power supply | Standard | U (20 mA) = | 16 V | 36 V |
| | Ex | U (20 mA) = | 16 V | 30 V |
| Signal | Ex | U (4 mA) = | 11.5 V | 30 V |
| | | U (20 mA) = | 11.5 V | 30 V |

Cable entry

- Cable gland: 2 x M20x1.5
- Cable entry: 2 x G½ or 2 x ½NPT

| | |
|------------------------------------|--|
| Power consumption | <ul style="list-style-type: none"> ■ max. 330 mW at 16 V ■ max. 500 mW at 24 V ■ max. 600 mW at 30 V ■ max. 700 mW at 36 V |
| Current consumption | Max. 21 mA (50 mA inrush current) |
| Ripple HART | 47 to 125 Hz: $U_{ss} = 200 \text{ mV}$ (at 500 Ω) |
| Power supply | <ul style="list-style-type: none"> ■ For stand alone operation recommended via two Endress+Hauser RN221N. ■ Integrated in tank gauging systems via Endress+Hauser Tank Side Monitor NRF590 (recommended). |
| Highly accurate measurement | For highly accurate measurements the measured variable must be transmitted using HART protocol to ensure the necessary resolution. |
| Overvoltage protector | <ul style="list-style-type: none"> ■ The level transmitter Micropilot S is equipped with an internal overvoltage protector (600 Vrms surge arrester) according to EN/IEC 60079-14 or EN/IEC 60060-1 (impulse current test 8/20 μs, $\hat{I} = 10 \text{ kA}$, 10 pulses). Additionally, the device is protected by a galvanic insulation of 500 Vrms between the power supply and the (HART) current output. Connect the metallic housing of the Micropilot S to the tank wall or screen directly with an electrically conductive lead to ensure reliable potential matching. ■ Installation with additional overvoltage protector HAW560Z/HAW562Z (see XA00081F-B "Safety instructions for electrical apparatus certified for use in explosion-hazardous areas"). <ul style="list-style-type: none"> – Connect the external overvoltage protector and the Micropilot S transmitter to the local potential matching system. – Potentials shall be equalised both inside and outside the explosion hazardous area. – The cable connecting the overvoltage protector and the Micropilot S transmitter shall not exceed 1 m in length; the cable shall be protected e.g. routed in an armoured hose. |

Performance characteristics

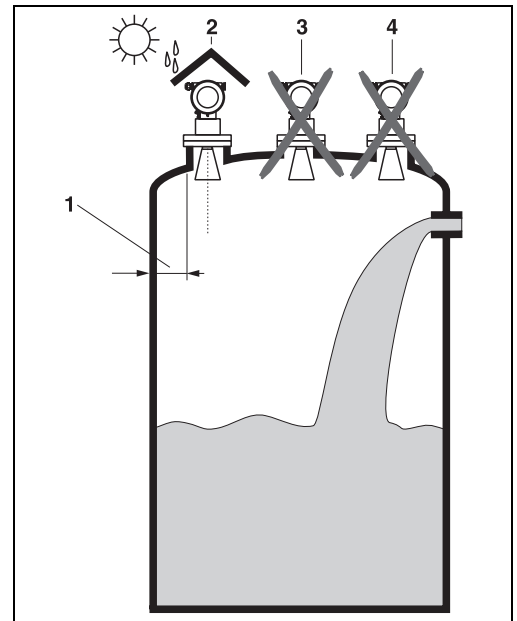
| | |
|---|--|
| Note! | Performance characteristics for devices that can be calibrated for inventory control and custody transfer applications according to regulatory standards in compliance with OIML R85. General operating / environmental conditions, → 22 . |
| Reference operating conditions | <p>According to OIML R85:</p> <ul style="list-style-type: none"> ■ Temperature = -25 °C to +55 °C (-13 °F to +131 °F) ■ Atmospheric pressure ■ Relative humidity (air) = 65 % ±15 % ■ Medium properties: e.g. medium with good reflectivity and calm surface ■ Tank diameter: signal beam hits the tank wall only at one side ■ No major interference reflections inside the signal beam |
| Maximum measured error | <p>Absolute accuracy: better than ±1 mm</p> <p>Note! Free space Micropilot S radar gauges typically provide accuracy of ±0.5 mm (2 sigma value). The Micropilot S FMR532 stilling well radar gauges typically provide accuracy of ± 0.8 mm (2 sigma value). Depending on the respective national gauging regulations, the admissible errors after installation of the device on the tank are ±4 mm (OIML, API)...</p> |
| Non-repeatability | 0.3 mm (1/64") |
| Hysteresis | 0.3 mm (1/64") |
| Long-term drift | The long-term drift is within the specified accuracy. |
| Influence of ambiente temperature | Within the specified accuracy according to OIML R85. |
| Proof of accuracy of custody transfer versions | The accuracy of each Micropilot S is established through a calibration certificate that records the absolute and relative error at 10 points during the final test. A Laser Interferometer (Jenaer Messtechnik ZLM 500) with an absolute accuracy of 0.1 mm is used as a reference for the free space measurements with FMR530/533. For stilling well measurements with FMR532, a NMI / PTB calibrated tape with an absolute accuracy of 0.25 mm is used. Each Micropilot S is delivered with the PTB and NMi type approval. Additional initial factory verifications for custody applications are available on demand for Micropilot S. |
| Maximum fill speed | By the first pass trough of measuring range: 100 mm/min., thereafter unlimited. |
| 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. |
| Resolution | <ul style="list-style-type: none"> ■ digital: 0.1 mm ■ analog: 0.03 % of measuring range |
| Settling time | Typical 15 sec. |
| Software reliability | <p>The software used in the radar device Micropilot S fulfills the requirements of OIML R85. This particularly includes:</p> <ul style="list-style-type: none"> ■ cyclical test of data consistency ■ non-volatile memory ■ segmented data storage <p>The radar device Micropilot S continuously monitor the compliance with accuracy requirements for custody transfer measurements according to OIML R85. If the accuracy cannot be maintained, a specific alarm is generated on the local display and via the digital communication (→ 33).</p> |
| Inventory control versions | All device types can be delivered as "Inventory Control Versions" with a reduced accuracy of ±3 mm (under reference conditions). To these versions, the calibration certificate or custody transfer type approval is not attached. The "Inventory Control Versions" can be selected by choosing the option "R" in feature "70 - Custody transfer approvals", → 38 . |

Operating conditions: Installation

Installation instructions

Orientation

- Recommended distance (1) wall - **outer edge** of nozzle: $\sim 1/6$ of tank diameter ("Beam angle", \rightarrow 16).
- 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 ("Accessories", \rightarrow 43).



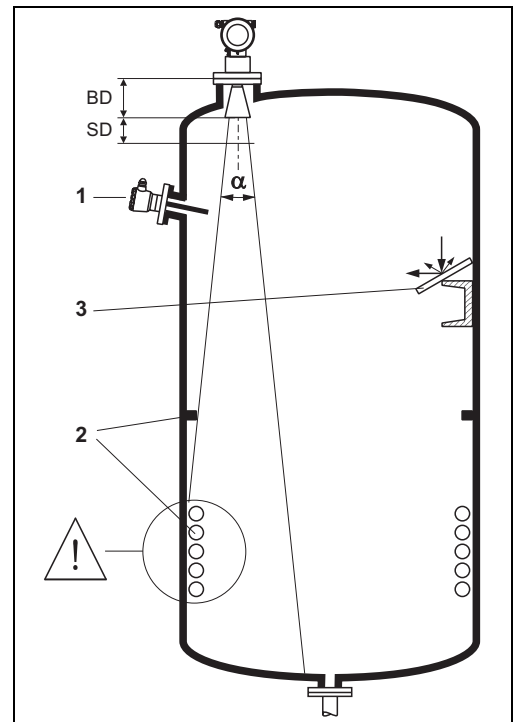
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Tank installations

- Avoid any installations (1), like limit switches, temperature sensors, etc., inside the signal beam ("Beam angle", \rightarrow 16).
- It is essential that HiHi alarm is below the blocking distance (BD) and the safety distance (SD).
- Symmetrical installations (2), e.g. vacuum rings, heating coils, baffles, etc., can also interfere with the measurement.

Optimisation 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: "Optimum mounting position", \rightarrow 17.
- Stilling well: a stilling well can always be used to avoid interference. The FMR532 with planar antenna is recommended for stilling wells with a diameter DN150 (6") and larger.
- Metallic screens (3) mounted at a slope spread the radar signals and can, therefore, reduce interference echoes.



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Please contact Endress+Hauser for further information.

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.

Beamwidth diameter **W** as function of antenna type (beam angle α) and measuring distance **D**:

| Antenna size (\varnothing horn) | FMR530 | | | FMR533 |
|---------------------------------------|--------|--------|--------|-----------|
| | 150 mm | 200 mm | 250 mm | parabolic |
| Beam angle α | 23° | 19° | 15° | 7° |

| Gauge Reference Height (GRH) | recommended distance from the tank wall (W/2) | | | |
|------------------------------|---|--------|--------|-----------|
| | 150 mm | 200 mm | 250 mm | parabolic |
| 3 m | 0.6 m | 0.5 m | 0.5 m | 0.2 m |
| 6 m | 1.2 m | 1 m | 0.8 m | 0.4 m |
| 9 m | 1.8 m | 1.5 m | 1.2 m | 0.6 m |
| 12 m | 2.5 m | 2 m | 1.5 m | 0.7 m |
| 15 m | 3 m | 2.5 m | 2 m | 0.9 m |
| 20 m | 4 m | 3 m | 2.5 m | 1.2 m |
| 25 m | 5 m | 4 m | 3.3 m | 1.5 m |
| 38 m | — | — | — | 2.3 m |
| 40 m | — | — | — | 2.4 m |

The diagram illustrates a radar beam originating from a sensor at the top. The beam spreads downwards at an angle α from the vertical axis. At a distance D from the sensor, the beam has a diameter of $W/2$. The beam is shaded to represent the signal area.

100-FMR53xxx-14-00-00-xx-003

Note!

The Micropilot S FMR532 is designed for level measurement in **stilling wells** only!

Caution!

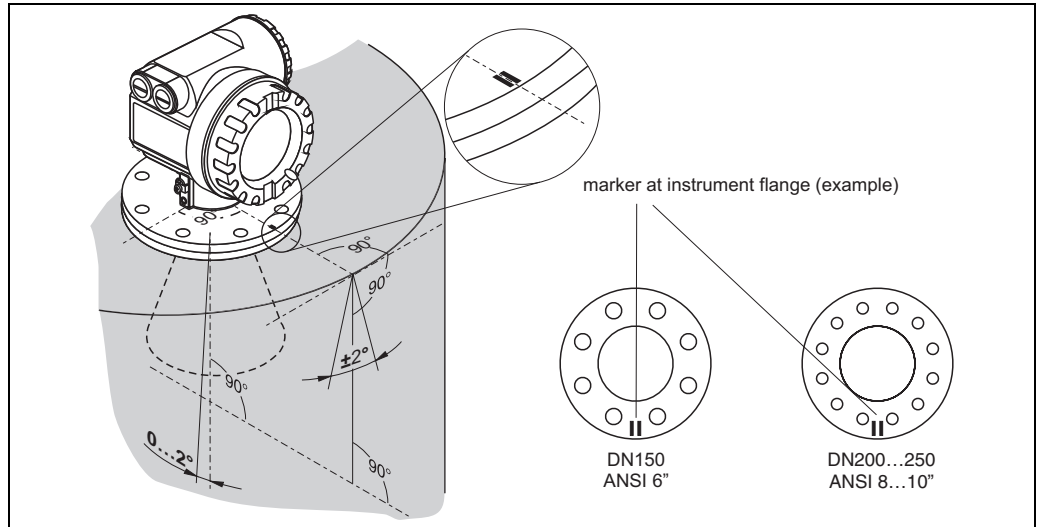
Make sure that **only one** tank wall (**not two** tank walls) is directly hit by the radar beam!

Nozzle for manual gauging

"Installation hints", → 44.

**Installation in tank
(free space) FMR530**

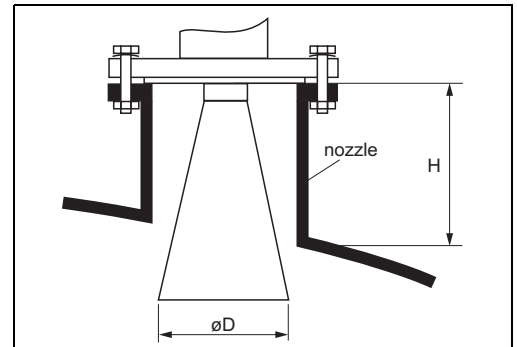
Optimum mounting position



100-FMR530xx-17-00-00-en-001

Standard installation

- Observe installation instructions, → 15.
- Marker is aligned towards tank wall.
The marker is located clearly visible on the sensor neck or the flange.
- The device shall not be mounted in a slant towards the tank wall.
- 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, please contact Endress+Hauser.
- The horn antenna must be aligned vertically.

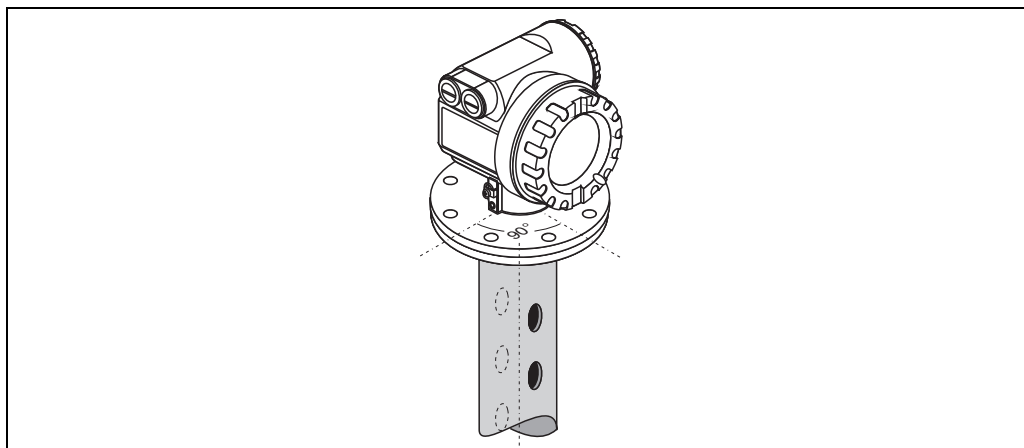


100-FMR230xx-17-00-00-en-002

| Antenna size | 150 mm (6") | 200 mm (8") | 250 mm (10") |
|--------------|---------------|----------------|--------------|
| D [mm (in)] | 146 (5.8) | 191 (7.5) | 241 (9.5) |
| H [mm (in)] | < 180 (< 7.2) | < 260 (< 10.4) | < 350 (< 14) |

Installation in stilling well FMR532

Optimum mounting position



100-FMR532ex-17-00-00-zz-008

Standard installation

- No alignment is required.
- After mounting, the housing can be turned 350° in order to simplify access to the display and the terminal compartment.
- Planar axis vertical to flange.
- Measurements can be performed through an open ball valve without any problems.

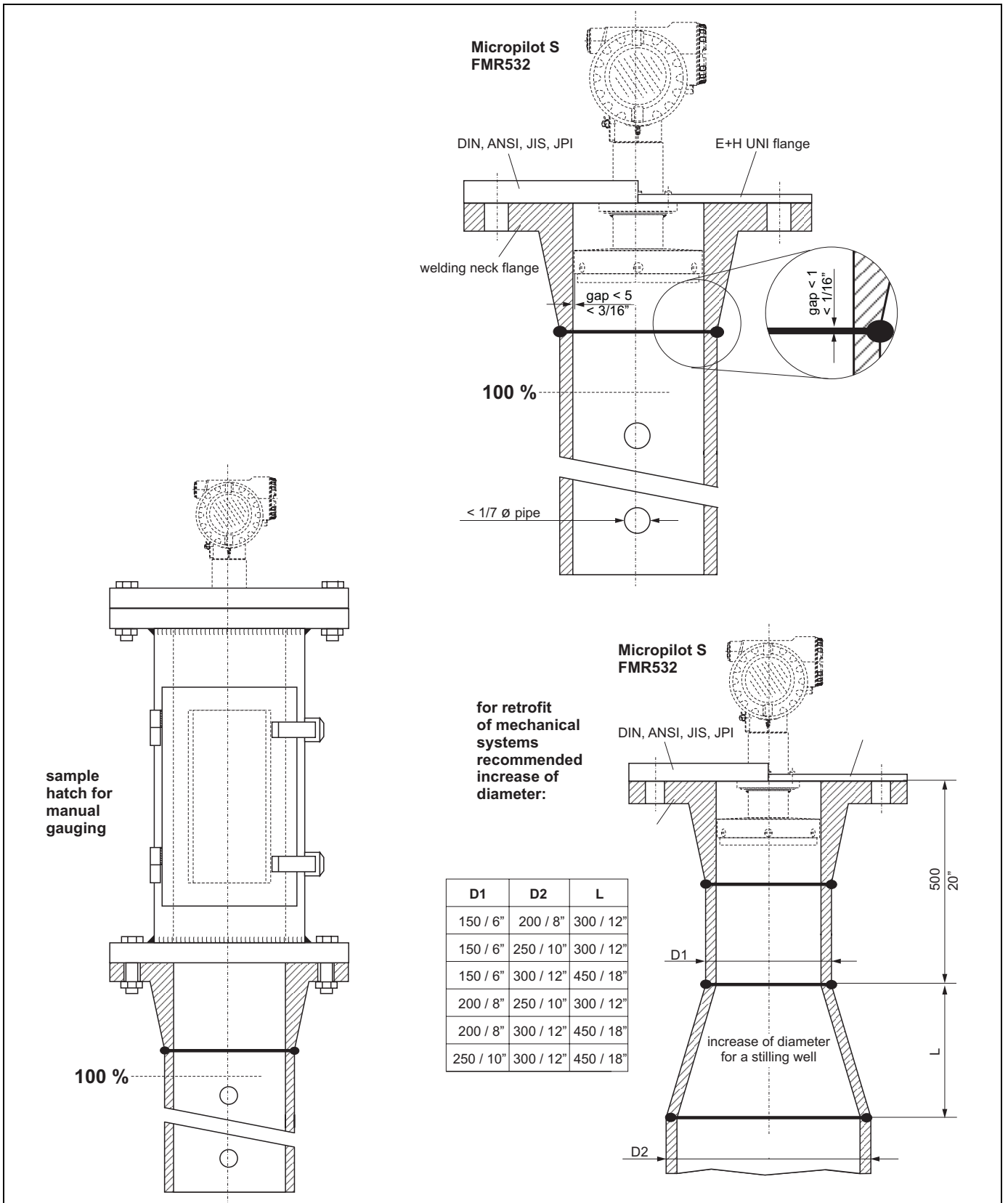
Recommendations for the stilling well

- Metal (no enamel coating, plastic on request).
- Constant diameter.
- When using a FMR532, an increase of the pipe diameter from DN150 to DN200 / DN200 to DN250 / DN250 to DN300 is acceptable. A larger step-width for the increase of the pipe diameter (e.g. DN150 to DN300) is possible if the upper part of the pipe has a suitable length.
The length of the stilling well enlargement must be kept. In this case, the upper end of the pipe must have a minimum length of 0.5 m (20") before the diameter increases (refer to table, → 19). If the length is less than "L", please contact Endress+Hauser in order to determine a suitable antenna adapter (separable antenna horn). Ideally, a sample hatch is used.
- Any rectangular increase of the pipe diameter has to be avoided.
- Weld seam as smooth as possible and on the same axis as the slots.
- For best radar propagation behavior holes it is recommended to have holes instead of slots. If slots can not be avoided, they should be as thin and short as possible.
- The diameter of the holes (deburred) can be up to 1/7 of the pipe diameter but should not exceed 30 mm.
- Length and number of the holes do not affect the measurement.
- Maximum gap allowed between the antenna/horn and the inside of the stilling well is 5 mm (3/16").
- At any transition (e.g. when using a ball valve or mending pipe segments), no gap may be created exceeding 1 mm.
- The stilling well must be smooth on the inside (average roughness $R_z \leq 6.3 \mu\text{m}$). 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 smoothed. Otherwise, strong interference echoes will be generated and material build-up will be promoted.

Note!

- Select antenna extension as big as possible. For intermediate sizes (e.g. 180 mm) select next larger antenna extensions and adapt it mechanically. Maximum gap allowed between the antenna/horn and the inside of the stilling well is 5 mm (3/16").
- The antenna extensions of the FMR532 is mounted with defined pressure.
- Dimensions of a nozzle for manual gauging must be adapt to the dimensions of the horn antenna used, compare with → 44.

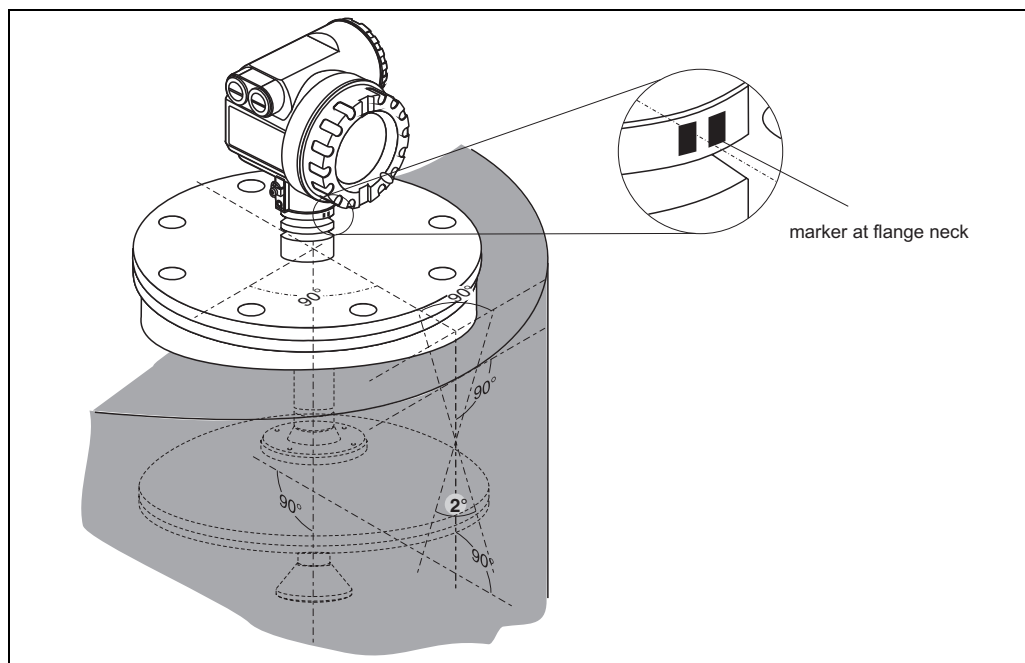
Examples for the construction of stilling wells for FMR532



L00-FMR532xx-17-00-00-en-006

Installation in tank (free space) FMR533

Optimum mounting position



L00-FMR533xx-17-00-00-en-001

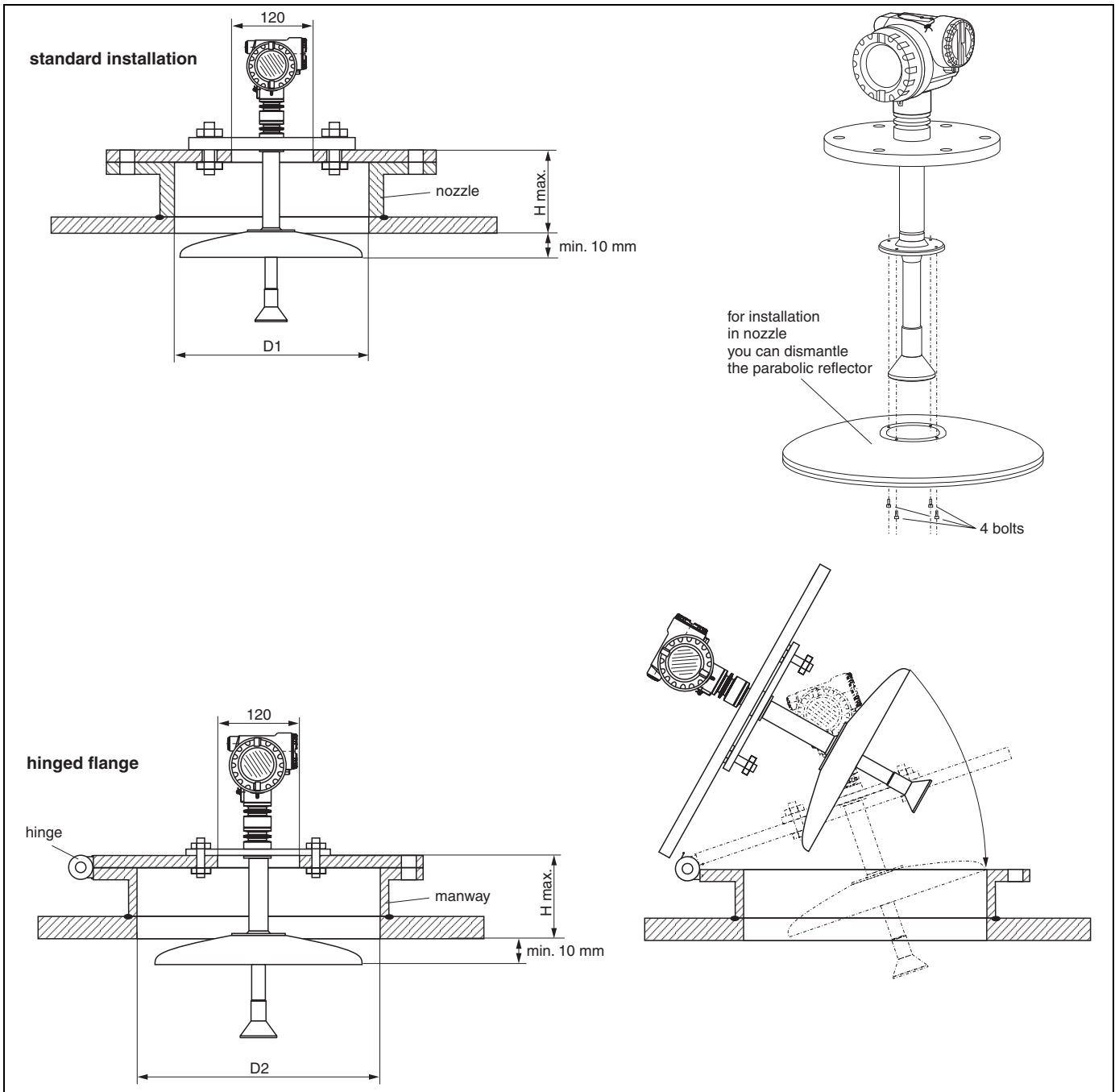
Standard installation

- Observe installation instructions, → 15.
- Marker is aligned towards tank wall.
The marker is located clearly visible on the sensor neck or the flange.
- After mounting, the housing can be turned 350° in order to simplify access to the display and the terminal compartment.
- The parabolic mirror must extend below the nozzle.
- Align parabolic antenna vertically.

Mounting in manway

The parabolic antenna can be mounted on a manway cover. The manway cover must have an opening with a diameter D1 or D2 for mounting of the antenna (refer following fig.). It has to be possible to remove the cover in order to mount the antenna. The device can be mounted on the manway cover with a weld-on flange with a neck. Please consider the maximum height of the nozzle (H max. = 200 mm (8")) for the diameter of the basis.

Examples for installation in a manway



L00-FMRS33xx-17-00-00-en-003

| | D (=inside diameter of manway) | H max. (=maximum height of nozzle) |
|---------------------------------|--------------------------------|------------------------------------|
| Standard installation D1 | ≥ 500 mm (≥ 20") | 200 mm (8") |
| Hinged flange D2 | ≥ 600 mm (≥ 24") | 200 mm (8") |

Operating conditions: Environment

| | |
|--|---|
| Ambient temperature range | <p>Ambient temperature for the transmitter:</p> <ul style="list-style-type: none"> ■ Standard: -40 °C to +80 °C (-40 °F to +176 °F) ■ For calibration to regulatory standards: -25 °C to +55 °C (-30 °F to +140 °F) <p>With $T_u < -20$ °C and $T_u > +60$ °C the operability of the LCD-display is reduced. A weather protection cover should be used for outdoor operation if the device is exposed to direct sunlight.</p> |
| Storage temperature | -40 °C to +80 °C (-40 °F to +176 °F) |
| Climate class | DIN EN 60068-2-38 (test Z/AD) |
| Degree of protection | <ul style="list-style-type: none"> ■ Housing: IP68, NEMA 6P (open housing and removed liquid crystal display: IP20, NEMA 1) ■ Antenna: IP68 (NEMA 6P) |
| Vibration resistance | DIN EN 60068-2-64 / IEC 68-2-64: 20 to 2000 Hz, 1 (m/s ²) ² /Hz |
| 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. 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 EMC (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). |
| Approvals for custody transfer applications | All aspects of OIML R85 are fulfilled. |

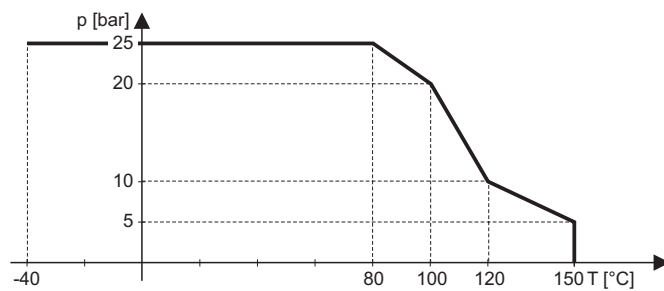
Operating conditions: Process

Process temperature range

| Antenna | Horn antenna | Planar antenna | Parabolic antenna |
|-------------------|---|--|---|
| Temperature range | -40 °C to +200 °C (-40 °F to + 392 °F) | -40 °C to +150 °C (-40 °F to +302 °F) For FKM-seal: -20 °C to +150 °C (-4 °F to +302 °F) | -40 °C to +200 °C (-40 °F to + 392 °F) |

Process pressure limits

- FMR530: 0 to 40 bar (14.5 to 580 psi); option 64 bar (928 psi)
- FMR532: 0 to 25 bar (14.5 to 362 psi)
- FMR533: 0 to 16 bar (14.5 to 232 psi)



L00-FMR53xxx-05-00-00-yy-002

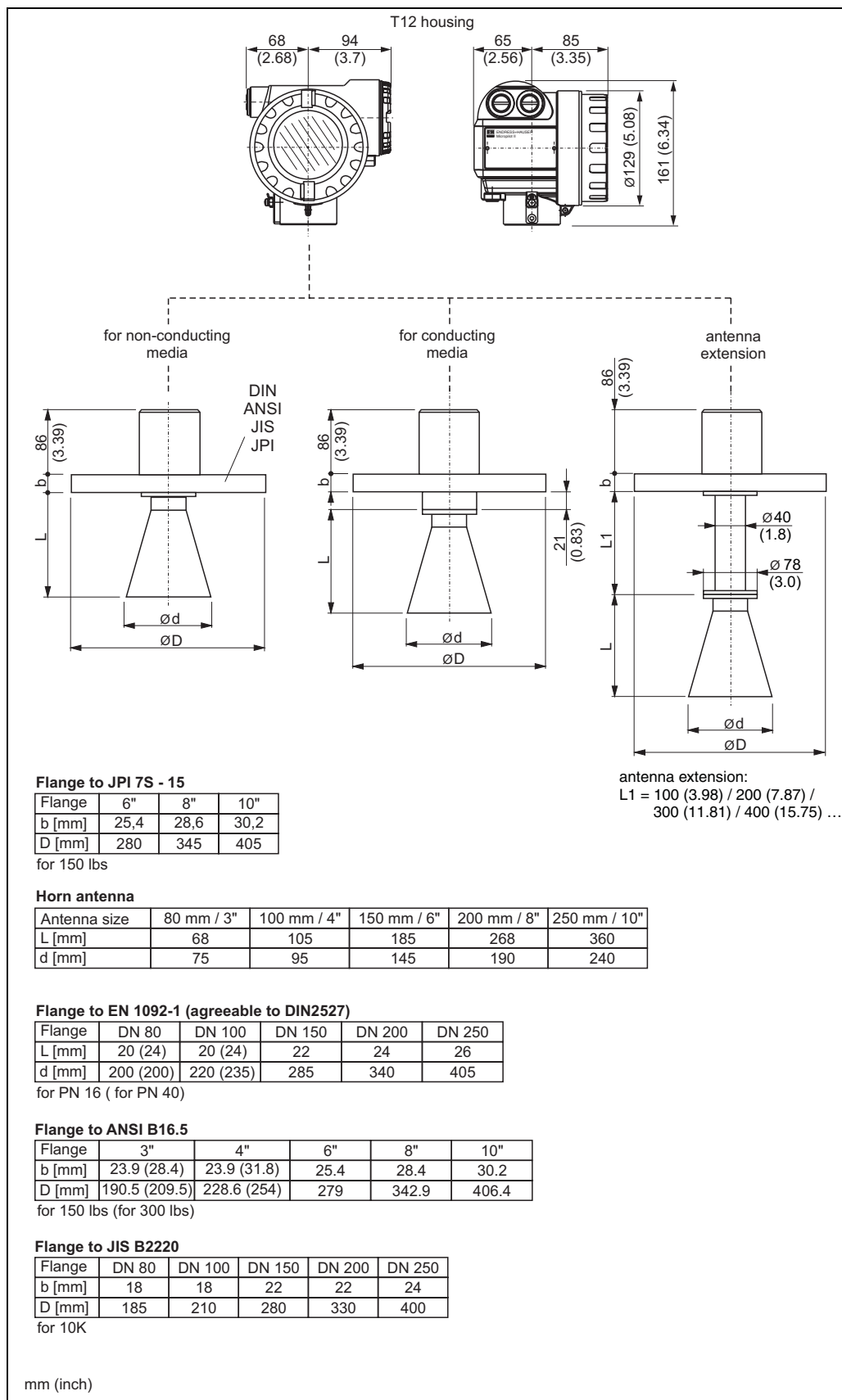
Dielectric constant

- In a stilling well: $\epsilon_r \geq 1.4$
- In free space: $\epsilon_r \geq 1.9$

Mechanical construction

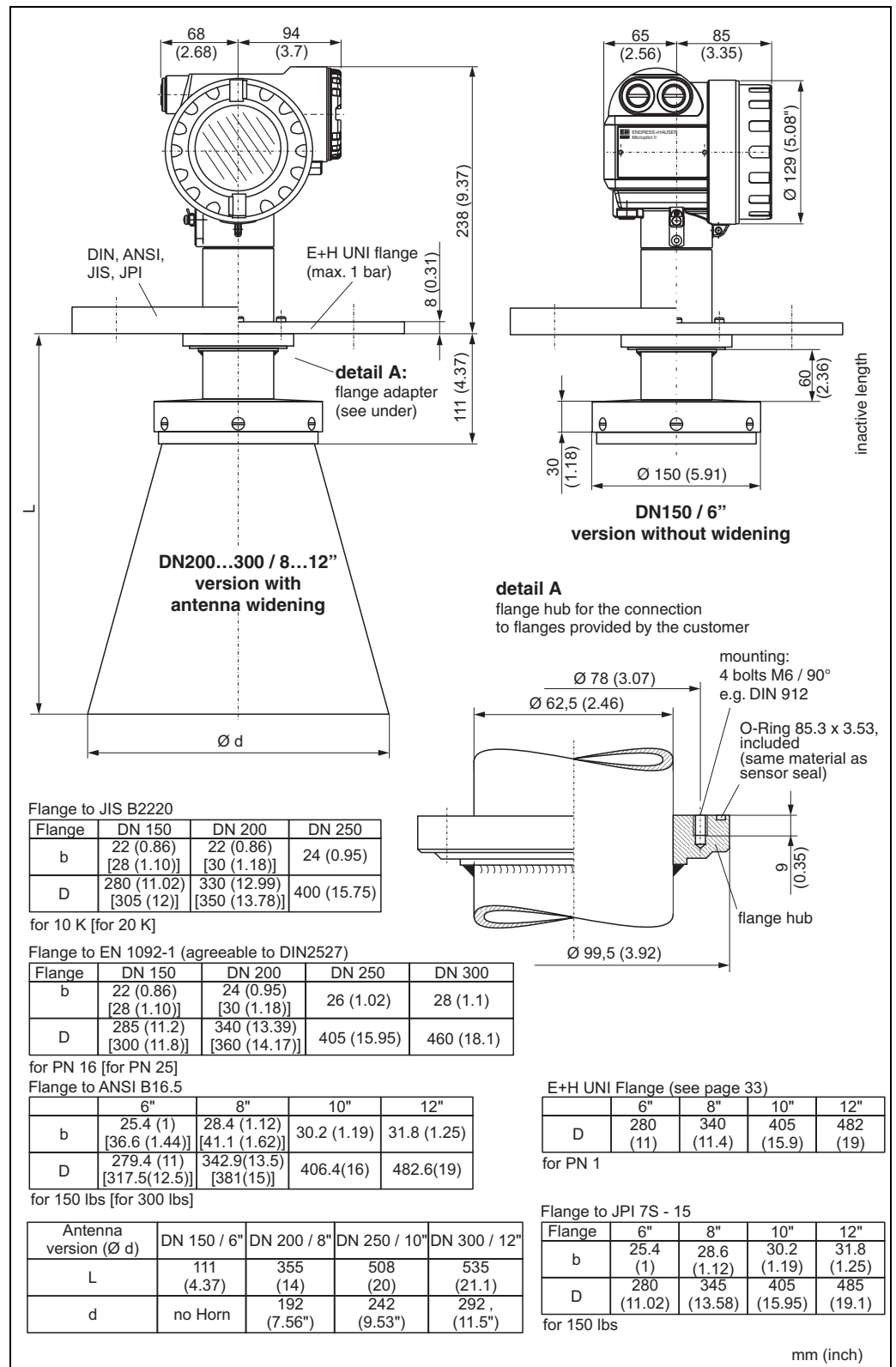
Design, dimensions

Micropilot S FMR530 with horn antenna



L00-FMR530xx-06-00-00-es-006

Micropilot S FMR532 with planar antenna

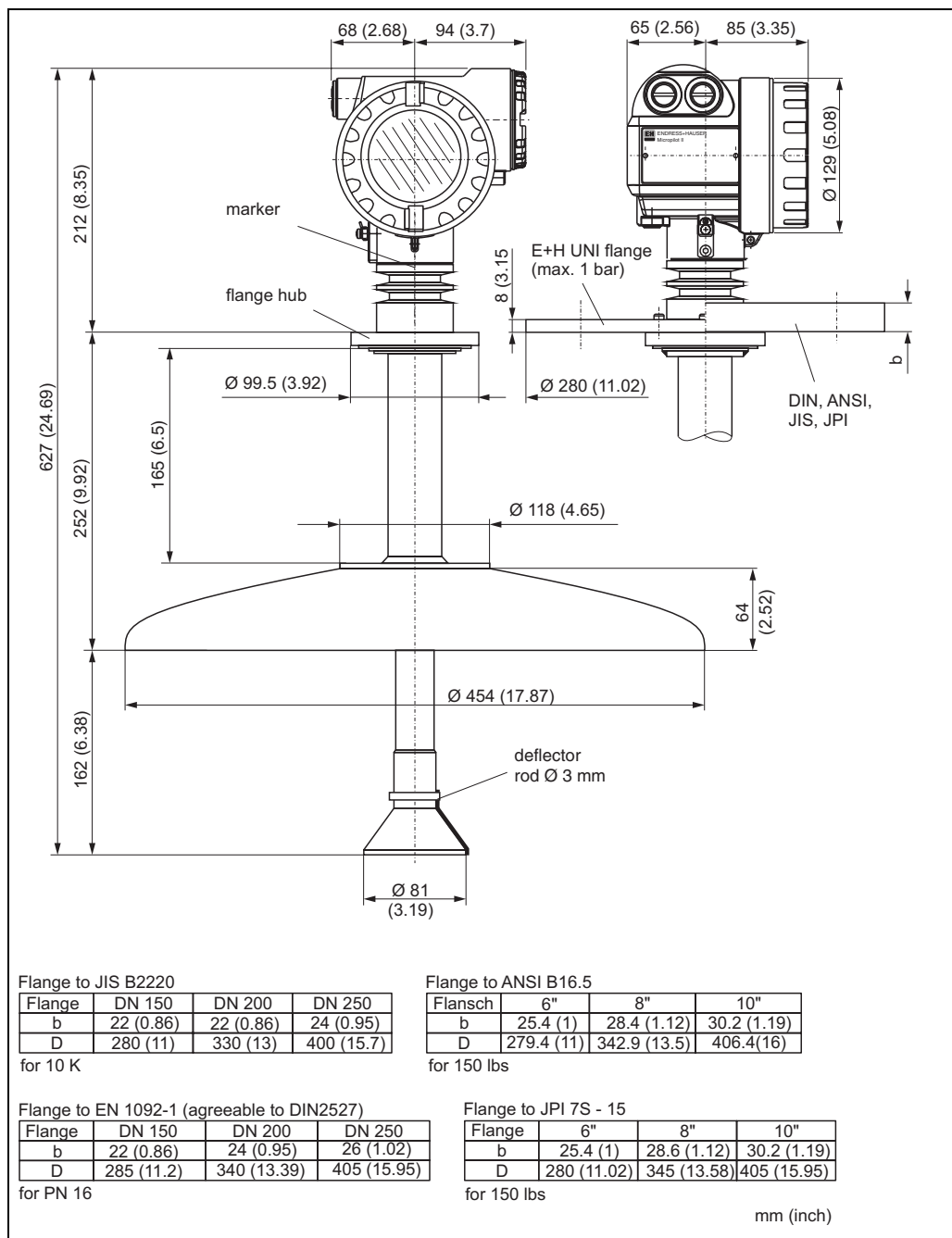


L00-FMR532xx-06-00-en-002

Note!

The inactive length of 60 mm prevents condensation effects to the antenna performance. Special versions with longer construction are available.

Micropilot S FMR533 with parabolic antenna



L00-FMR533xx-06-00-00-en-002

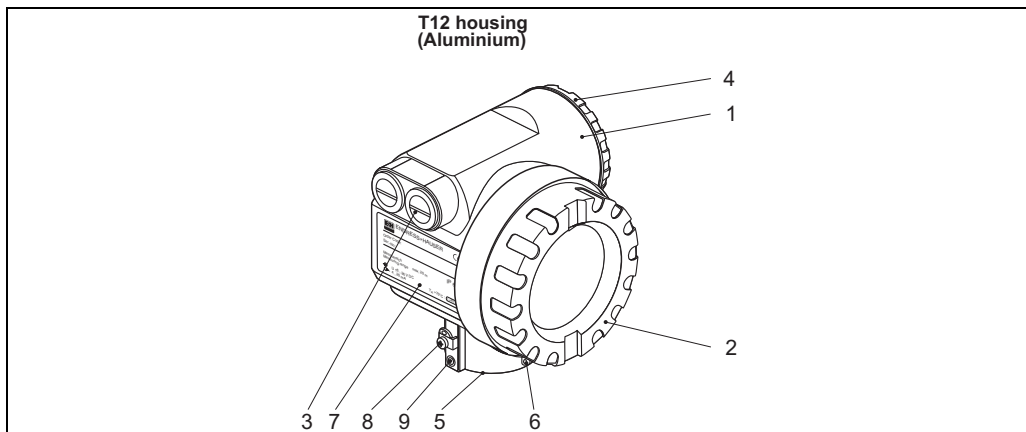
Weight

| FMR530 | FMR532 | FMR533 |
|---|---|--|
| 7.1 kg + weight of flange ¹⁾ | 6.5 kg + weight of flange ¹⁾ | 13 kg + weight of flange ¹⁾ |

1) Flange weights according to form sheet

Material
(not in contact with process)

T12 housing (seawater-resistant*, powder-coated)



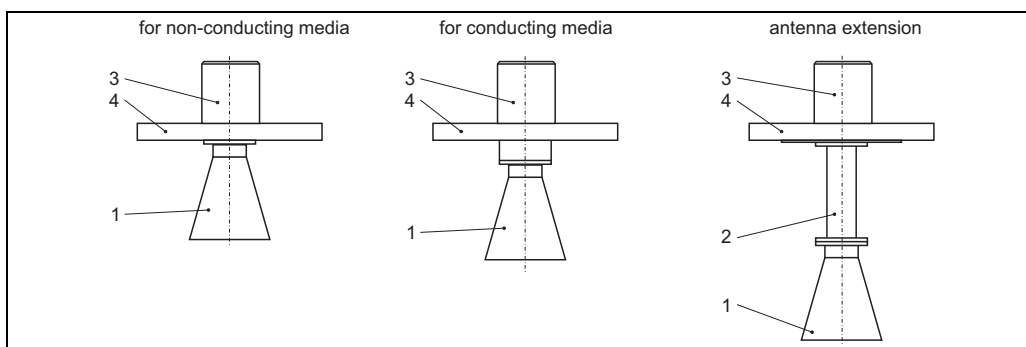
L00-x12xxxx-16-00-00-en-001

| 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 | 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) | |
| 4 | Cover (Connection compartment) | AlSi10Mg | |
| | Sealing | Fa. SHS: EPDM 70pW FKN | Trelleborg: EPDM E7502/E7515 |
| | Clamp | Screws: A4; Clamp: Ms nickel-plated; Spring washer: A4 | |
| 5 | Sealing ring | Fa. SHS: EPDM 70pW FKN | Trelleborg: EPDM E7502/E7515 |
| 6 | Tag* | 304 (1.4301) | |
| | Rope | 316 (1.4401) | |
| | Crimp sleeve | Aluminium | |
| 7 | Nameplate* | 304 (1.4301) | |
| | Groove pin* | A2 | |
| 8 | Ground terminal* | Screws: A2; Spring washer: A4; Clamp: 304 (1.4301) Holder: 1.4310 | |
| 9 | Screws* | A2-70 | |

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

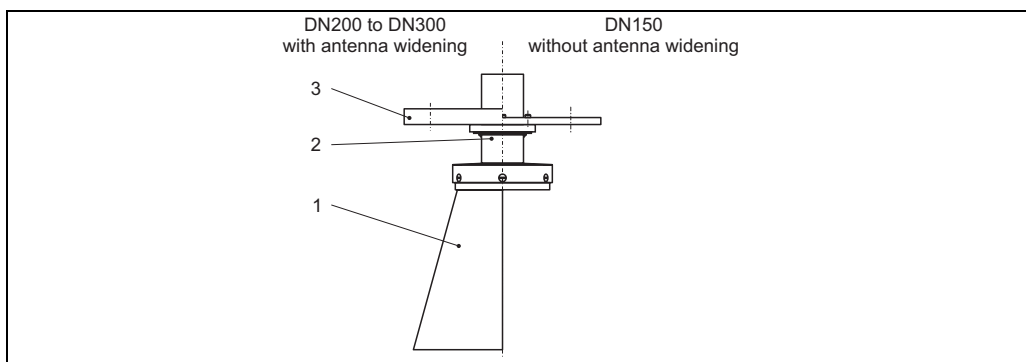
**Material
(in contact with process)**

Materials FMR530



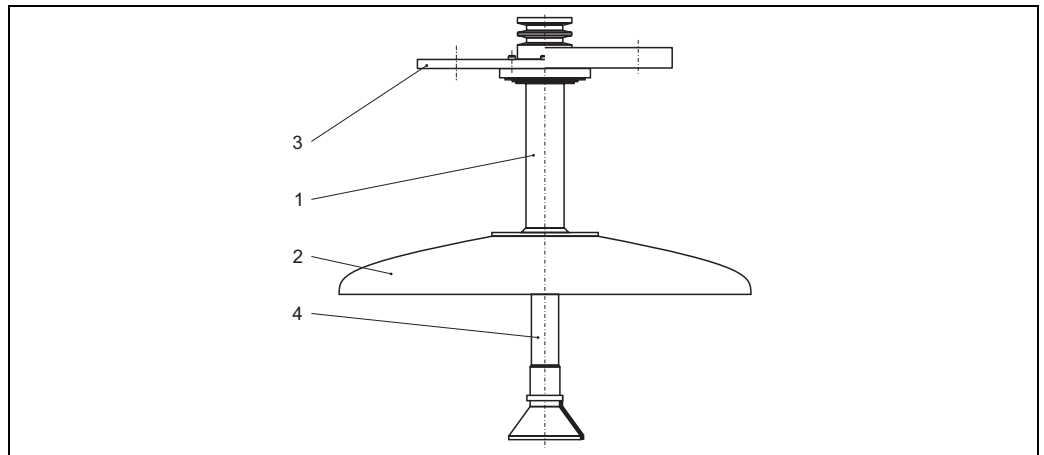
| Pos. | Part | Material |
|------|-----------------------|---------------|
| 1 | Horn antenna | 316L (1.4404) |
| | Screws, Spring washer | A4 |
| 2 | Antenna extension | 316L (1.4435) |
| | Screws, Spring washer | A4 |
| 3 | Housing adapter | 304 (1.4301) |
| 4 | Flange | 316L (1.4404) |
| | Coupling | 316L (1.4435) |

Materials FMR532



| Pos. | Part | Material |
|------|----------------------------|-------------------------------------|
| 1 | Horn antenna | 316L (1.4404) |
| 2 | Housing pipe | 316L (1.4435) |
| | Housing and retaining ring | 316L (1.4404) |
| | Screw | A2 |
| | Planar antenna | PTFE |
| | Sealing | Viton |
| 3 | Flange | 316L (1.4404/1.4435) 304 (1.4301) |
| | Adapter | 316L (1.4404) |
| | Sealing | Viton |
| | Screws, Spring washer | A2 |

Materials FMR533



L00-FMR533xx-16-00-00-en-001

| Pos. | Part | Material | |
|------|-----------------------|------------------------|--------------|
| 1 | Adapter | 316L (1.4435) | |
| | Pipe | 316L (1.4435) | |
| | Reflector adapter | 316L (1.4435) | |
| 2 | Parabolic reflector | 316L (1.4404) | |
| | Screw | A4 | |
| | Spring washer | A2 | |
| 3 | Flange | 316L (1.4404/1.4435) | 304 (1.4301) |
| | Adapter | 316L (1.4404) | |
| | Sealing | Viton | |
| | Screws, Spring washer | A2 | |
| 4 | Tube | PTFE conductive | |
| | Antenna taper + foil | PTFE + PTFE conductive | |
| | Subreflector | 316L (1.4435) | |
| | Clamp | 1.4430 | |
| | Ring | 316L (1.4404) | |

Flange

Endress+Hauser supplies DIN/EN flanges made of stainless steel according to AISI 316L (DIN/EN 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

"Ordering information", → 38.
 All process connections dispose of a gas-tight glass feed-through to prevent any gas leakage to the inside of the housing.

Seal

"Ordering information", → 38.

Antenna

"Ordering information" on → 38.

Type plate / type plate for custody transfer applications

In addition to the standard type plate, the device features a type plate for custody transfer applications with the following statements:

- manufacturer
- device type
- label for custody transfer approval
 - PTB: "Z" with approval number and issuing agency, the 4-digit approval number is shown in the upper part of the "Z", the lower part shows year and month of type approval.
 - NMi: field for 5-digit approval number
- year of manufacturing
- space for imprinted tank identification number
- statement of measuring range suitable for custody transfer approval including unit
- statement of ambient temperature range suitable for calibration to regulatory standards.

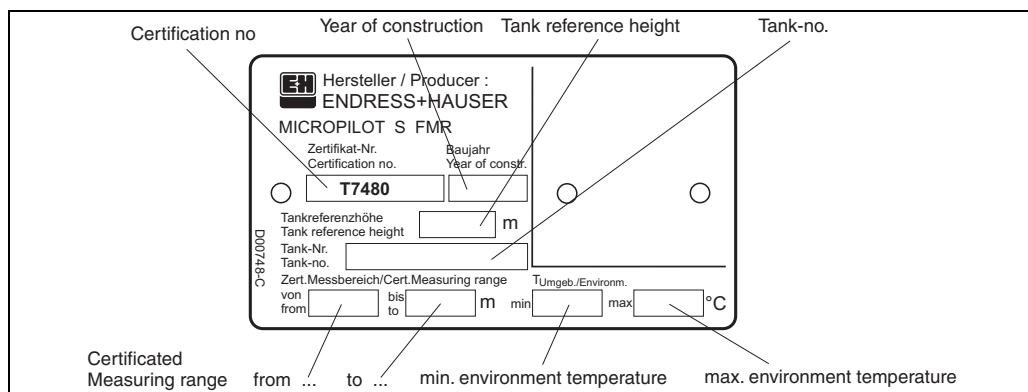
The following statements are also required for calibration to regulatory standards. They are listed on the standard type plate and are not repeated here:

- date of manufacturing
- tester

Note!

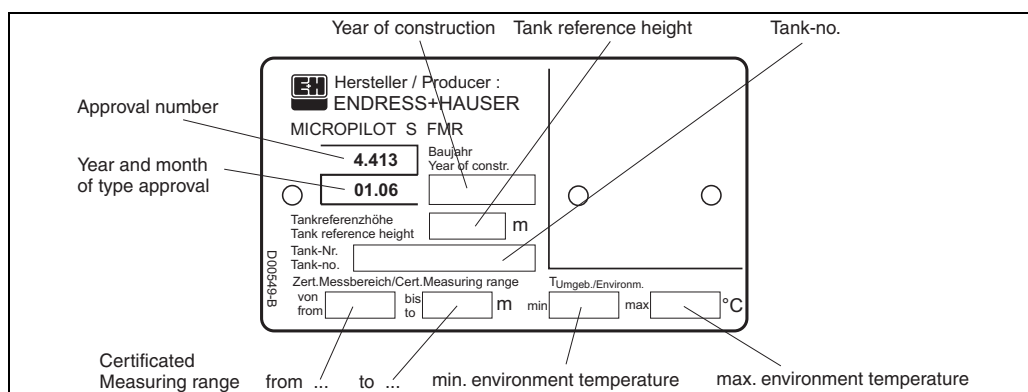
The fields are only filled if in feature "70 - Weight + measure approval" the variant "F" or "G" is selected.

NMi type plate (example)



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PTB type plate (example)

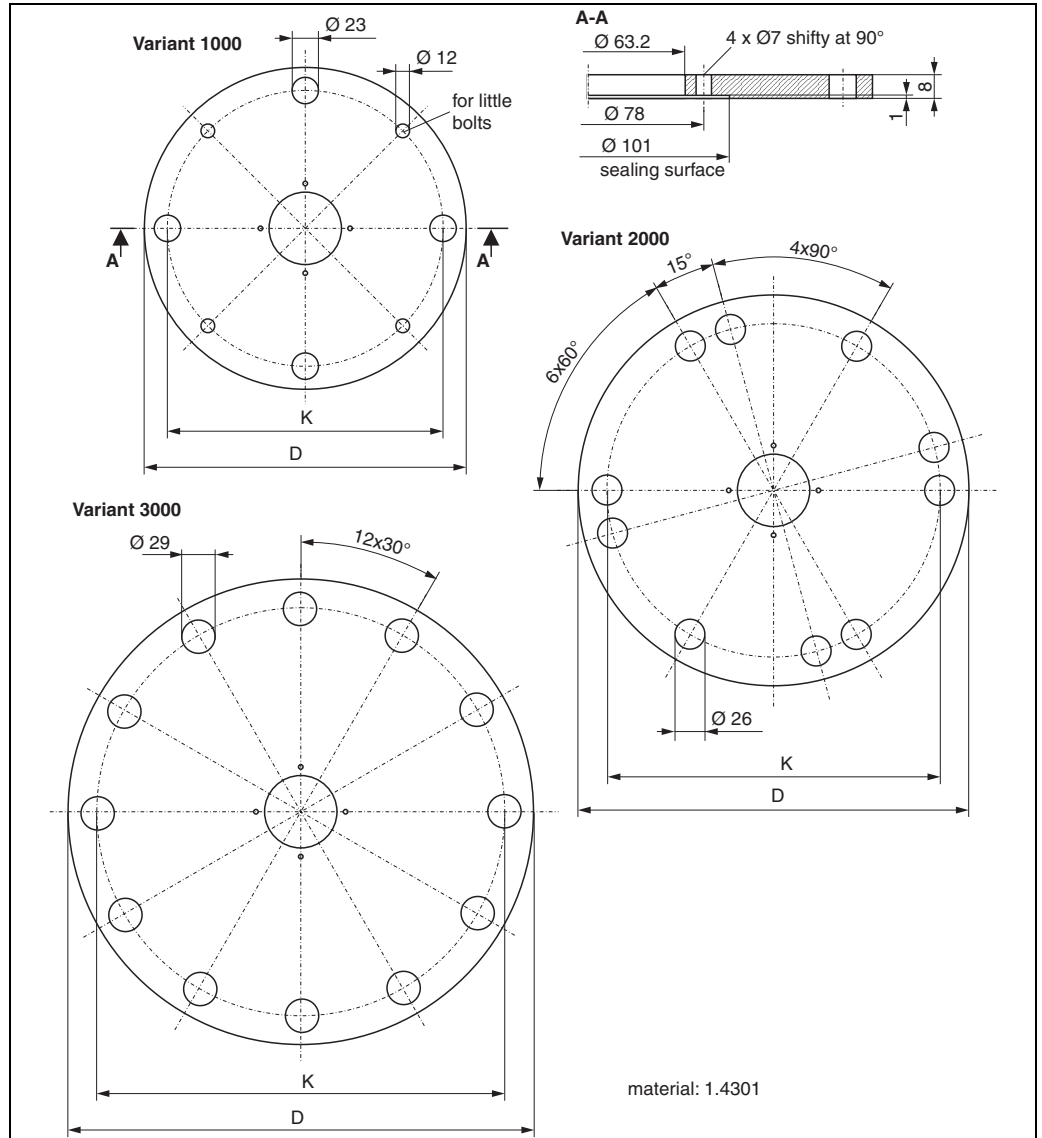


L00-FMRS3xxx-18-00-00-en-005

**Endress+Hauser
UNI flange**

Installation hints

Endress+Hauser UNI flanges are designed for non-pressurized operation. Typical pressure fluctuations of breather valves can be tolerated. The number of bolts has sometimes been reduced. 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.



L00-FMR53xxx-06-00-00-en-001

| Version | Compatible with | D [mm] | K [mm] | Type plate no. |
|---------|--|--------|---|----------------|
| 1000 | DN150 PN16 ANSI 6" 150lbs JIS 10K 150 | 280 | 240 | 942455-3001 |
| 2000 | DN200 PN16 ANSI 8" 150lbs JIS 10K 200 | 340 | 294.5 | 942455-3002 |
| 3000 | DN250 PN16 ANSI 10" 150lbs JIS 10K 250 | 405 | 358 | 942455-3003 |
| 4000 | DN300 PN16 ANSI 12" 150lbs JIS 10K 300 | 482 | 410 (for DIN) 431.8 (for ANSI) 400 (for JIS) 404.5 (for DIN + JIS) | 942455-3004 |

Human interface

Operation concept

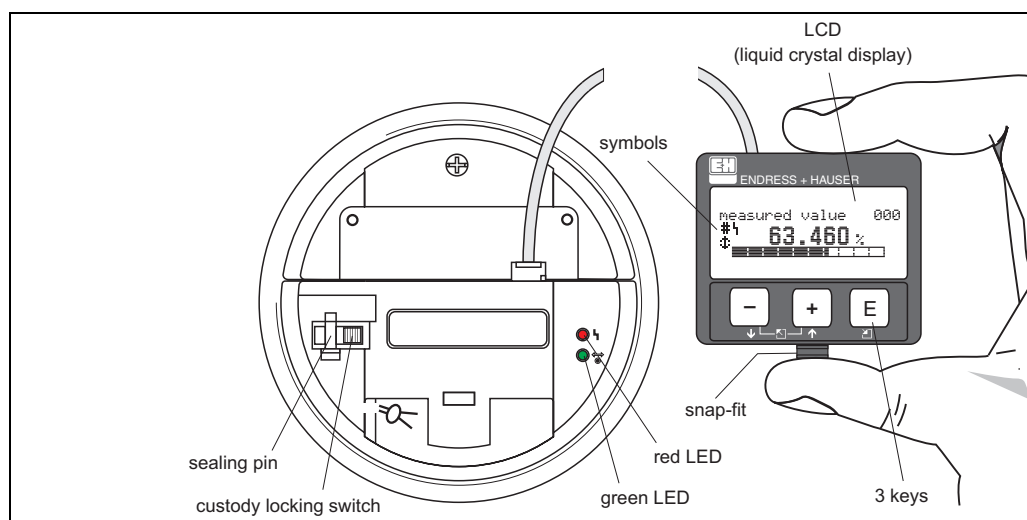
The display of the process value and the configuration of the Micropilot occur locally by means of a large 4-line alphanumeric display with plain text information. The guided menu system with integrated help texts ensures a quick and safe commissioning. Display and operation can occur in one out of six languages (English, German, French, Italian, Dutch or Spanish). During the first start-up, the device explicitly asks for the desired unit / language. Remote commissioning, including documentation of the measuring point and in-depth analysis functions, is supported via FieldCare, the FDT-based Plant Asset Management Tool by Endress+Hauser.

Access to the electronics can be prevented by means of a custody locking switch that locks the device settings. The custody locking switch can be sealed for custody transfer applications.

Display elements

Liquid crystal display (LCD):

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







L00-FMRS3xxxx-07-00-00-en-001

Note!

To access the display, it is possible to open the cover of the electronics compartment even in an explosion hazardous area. 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 cable.

Display symbols

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

| Symbols | 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 is in progress. |
|  | Calibration to regulatory standards disturbed If the device is not locked or it cannot guarantee the calibration to regulatory standards, the situation will be indicated on the display via the symbol. |

Light emitting diodes (LEDs):
















There is a green and a red LED besides the Liquid Crystal Display.

| LED (LED) | Meaning |
|---------------------------|------------------------------------|
| red LED continuously on | Alarm |
| red LED flashes | Warning |
| red LED off | No alarm |
| green LED continuously on | Operation |
| Green LED flashes | Communication with external device |

Operating elements

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

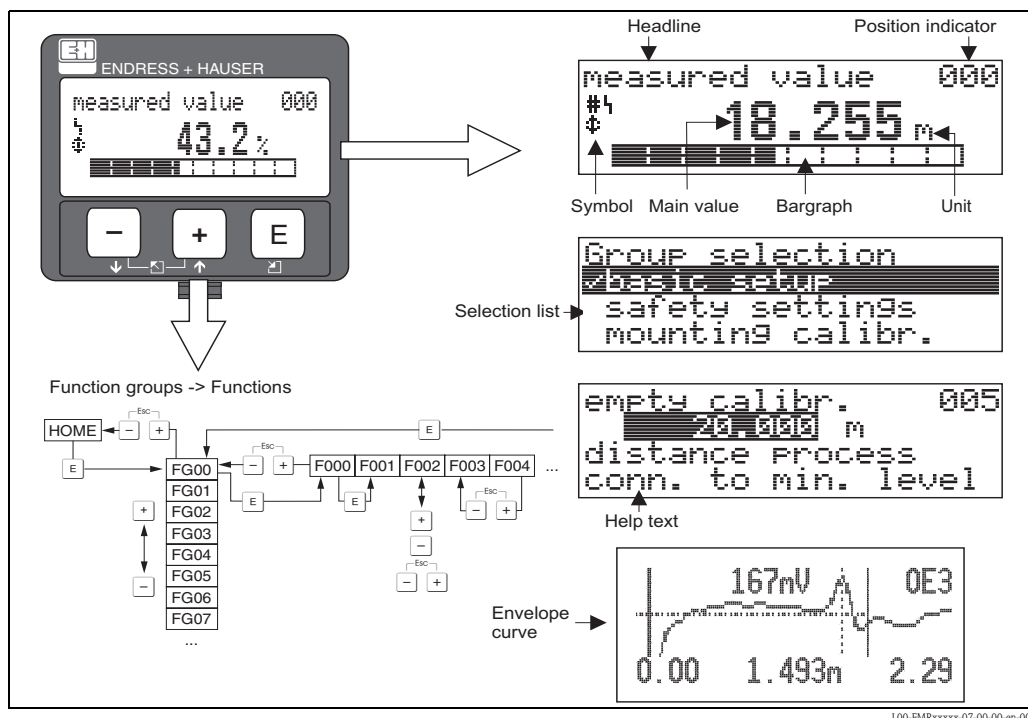
Function of the keys

| 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. |
|  or  | Navigate to the right within a function group. |
|  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 VU331

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.



100-FMRxxxxx-07-00-00-es-002

Operation with Field Communicator 375, 475

All device functions can be adjusted via a menu operation with the Field Communicator 375, 475.

Note!

Further information on the handheld unit is given in the respective operating manual included in the transport bag of the Field Communicator 375, 475.

Remote operation

The Micropilot S can be remotely operated via HART. On-site adjustments are also possible.

Operation with 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.

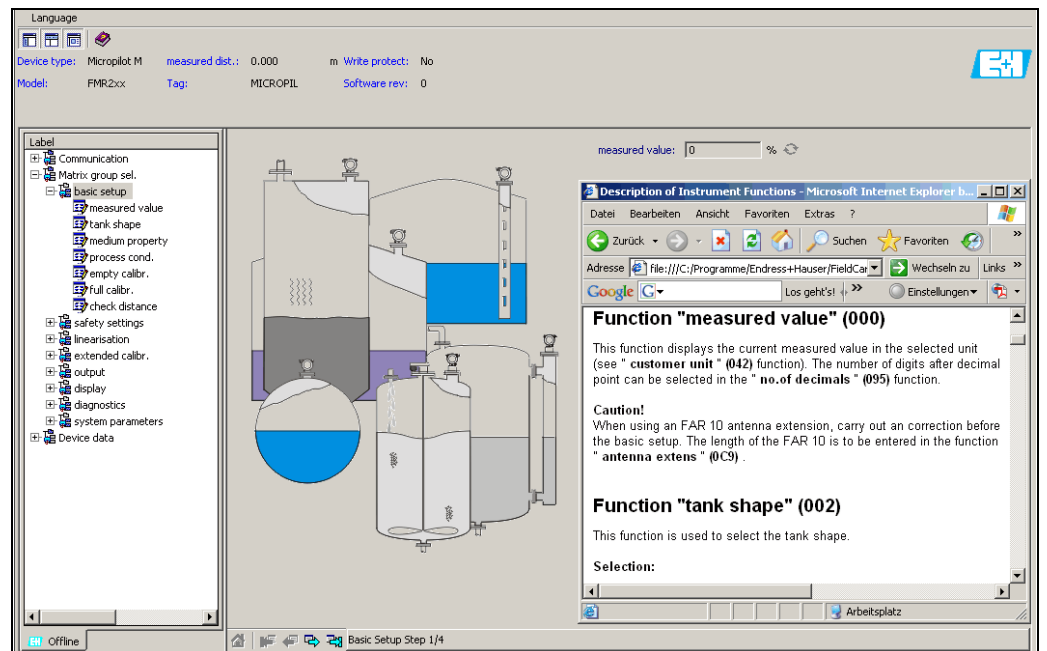
FieldCare supports the following functions:

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

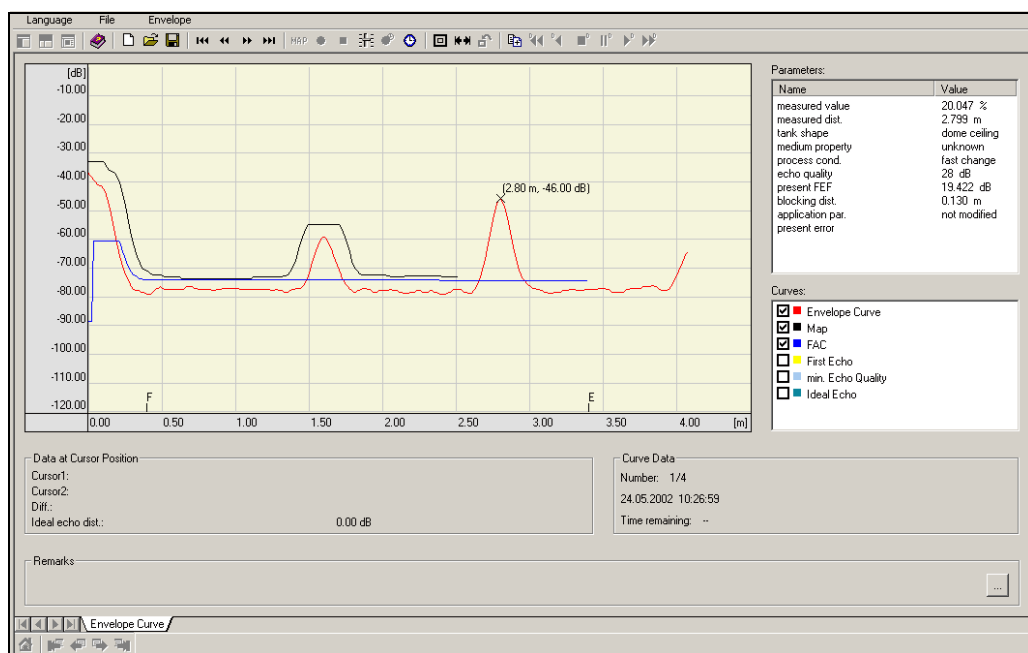
Connection options:

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

Menu-guided commissioning

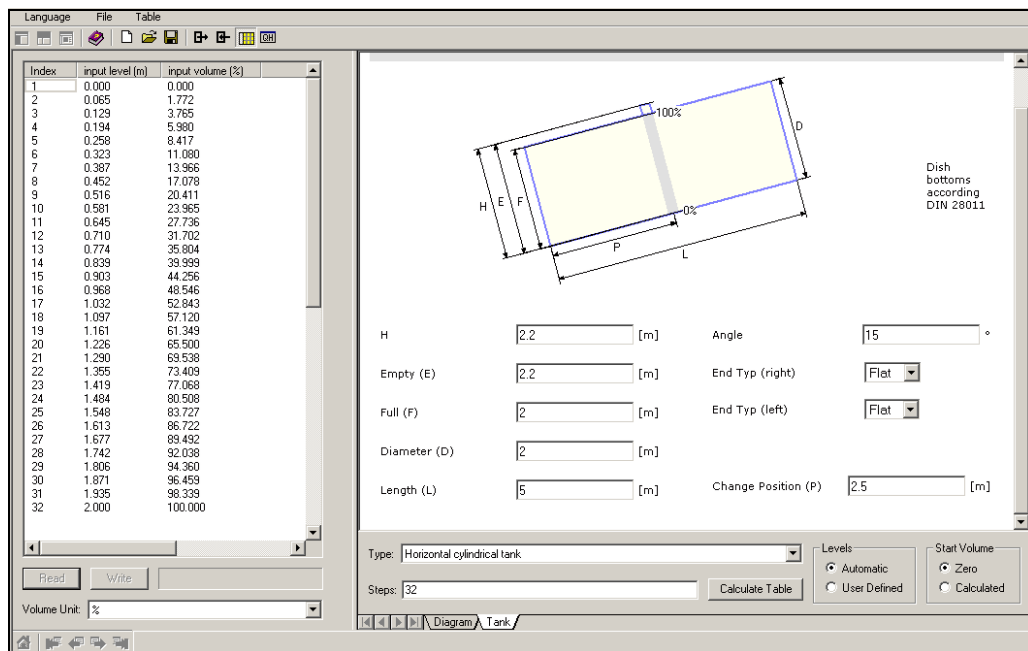


Signal analysis via envelope curve



MicropilotM-en-300

Tank linearisation



MicropilotM-en-307

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 | "Ordering information", → 38ff. |
| External standards and guidelines | To conception and development for Micropilot S have been followed the external standards and guidelines: EN 60529 Protection class of housing (IP-code) EN 61010 Safety regulations for electrical devices for measurement, control, regulation, and laboratory use EN 61326 Emissions (equipment class B), compatibility (appendix A – industrial area) NAMUR Standards committee for measurement and control in the chemical industry API (American Petroleum Institute) Particularly "Manual of Petroleum Measurement Standards" OIML R85 (Organisation Internationale de Métrologie Légale) |
| Overspill protection | WHG, see ZE00243F/00/DE. |
| Custody type approval | All aspects of OIML R85 are fulfilled. |
| RF approvals | R&TTE 1999/5/EG, FCC CRF 47, part 15 |
| Marine certificate | GL (Germanischer Lloyd) |

Ordering information

Micropilot S FMR530

This overview does not mark options which are mutually exclusive.

| 10 | Approval: | |
|----|----------------------------|---|
| | A | Non-hazardous area |
| | I | ATEX II 1/2G EEx ia IIC T6 |
| | 6 | ATEX II 1/2G EEx ia IIC T6, WHG |
| | D | IEC Ex ia IIC T6 (in preparation) |
| | G | ATEX II 3G EEx nA II T6 |
| | I | NEPSI Ex ia IIC T6 (in preparation) |
| | K | TIIS Ex ia IIC T3 |
| | L | TIIS Ex ia IIC T6 |
| | S | FM IS Cl.I Div.1 Gr. A-D, zone 0,1,2 |
| | U | CSA IS Cl.I Div.1 Gr. A-D, zone 0,1,2 |
| | Y | Special version, TSP-No. to be spec. |
| 20 | Antenna; Seal: | |
| | M | 80mm/3"; FKM, non-conductive media |
| | P | 80mm/3"; Kalrez, non-conductive media |
| | R | 80mm/3"; PTFE, conductive media |
| | I | 100mm/4", FKM, non-conductive media |
| | K | 100mm/4", Kalrez, non-conductive media |
| | L | 100mm/4", PTFE, conductive media |
| | A | 150mm/6", FKM, non-conductive media |
| | C | 150mm/6", Kalrez, non-conductive media |
| | D | 150mm/6", PTFE, conductive media |
| | U | 200mm/8", FKM, non-conductive media |
| | W | 200mm/8", Kalrez, non-conductive media |
| | X | 200mm/8", PTFE, conductive media |
| | E | 250mm/10", FKM, non-conductive media |
| | G | 250mm/10", Kalrez, non-conductive media |
| | H | 250mm/10", PTFE, conductive media |
| | Y | Special version, TSP-No. to be spec. |
| 30 | Process connection: | |
| | – EN-Flanges – | |
| | CMJ | DN80 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C) |
| | CNJ | DN80 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C) |
| | CQJ | DN100 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C) |
| | CRJ | DN100 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C) |
| | CWJ | DN150 PN10/16 B1, 316L 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) |
| | – ANSI-Flanges – | |
| | 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 |
| | A3J | 8" 150lbs RF, 316/316L flange ANSI B16.5 |
| | A5J | 10" 150lbs RF, 316/316L flange ANSI B16.5 |
| | – JIS-Flanges – | |
| | KA2 | 10K 80 RF, 316Ti flange JIS B2220 |
| | KD2 | 10K 200 RF, 316Ti flange JIS B2220 |
| | KH2 | 10K 100 RF, 316Ti flange JIS B2220 |
| | KV2 | 10K 150 RF, 316Ti flange JIS B2220 |
| | K52 | 10K 250 RF, 316Ti flange JIS B2220 |
| | JPI-Flanges | |
| | LJJ | 150A 150lbs RF, 316/316L flange JPI 7S-15 |
| | LKJ | 200A 150lbs RF, 316/316L flange JPI 7S-15 |
| | LLJ | 250A 150lbs RF, 316/316L flange JPI 7S-15 |
| | YY9 | Special version, TSP-No. to be spec. |
| 40 | Output; Operation: | |
| | A | 4-20mA HART; 4-line display, envelope curve display on site |
| | Y | Special version, TSP-No. to be spec. |

Micropilot S FMR532

This overview does not mark options which are mutually exclusive.

| 10 | | Approval: | |
|----|-----|----------------------------|---|
| A | | | Non-hazardous area |
| I | | | ATEX II 1/2G EEx ia IIC T6 - XA Note safety instruction (electrostatic charging)! |
| 6 | | | ATEX II 1/2G EEx ia IIC T6, WHG - XA Note safety instruction (electrostatic charging)! |
| D | | | IEC Ex ia IIC T6 (in preparation) |
| G | | | ATEX II 3G EEx nA II T6 |
| I | | | NEPSI Ex ia IIC T6 (in preparation) |
| S | | | FM IS Cl.I Div.1 Gr. A-D, zone 0,1,2 |
| U | | | CSA IS Cl.I Div.1 Gr. A-D, zone 0,1,2 |
| K | | | TIIS Ex ia IIC T3 |
| L | | | TIIS Ex ia IIC T6 |
| Y | | | Special version, TSP-No. to be spec. |
| 20 | | Antenna: | |
| 1 | | | 150mm/6", PTFE surface, FKM, Planar |
| 2 | | | 200mm/8", PTFE surface, FKM, Planar |
| 3 | | | 250mm/10", PTFE surface, FKM, Planar |
| 4 | | | 300mm/12", PTFE surface, FKM, Planar |
| Y | | | Special version, TSP-No. to be spec. |
| 30 | | Process connection: | |
| | | | – EN-Flanges – |
| | CWJ | | DN150 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C) |
| | C1J | | DN150 PN25 B1, 316L flange EN1092-1 (DIN2527 C) |
| | CXJ | | DN200 PN16 B1, 316L flange EN1092-1 (DIN2527 C) |
| | CZJ | | DN200 PN25 B1, 316L flange EN1092-1 (DIN2527 C) |
| | C6J | | DN250 PN16 B1, 316L flange EN1092-1 (DIN2527 C) |
| | C8J | | DN300 PN16 B1, 316L flange EN1092-1 (DIN2527 C) |
| | | | – ANSI-Flanges – |
| | AVJ | | 6" 150lbs RF sch.40, 316/316L flange ANSI B16.5 |
| | AWJ | | 6" 300lbs RF sch.40, 316/316L flange ANSI B16.5 |
| | A3J | | 8" 150lbs RF sch.40, 316/316L flange ANSI B16.5 |
| | AXJ | | 8" 300lbs RF sch.40, 316/316L flange ANSI B16.5 |
| | A5J | | 10" 150lbs RF sch.40, 316/316L flange ANSI B16.5 |
| | A7J | | 12" 150lbs RF, 316/316L flange ANSI B16.5 |
| | | | – JIS-Flanges – |
| | KVJ | | 10K 150A RF, 316L flange JIS B2220 |
| | KWJ | | 20K 150A RF, 316L flange JIS B2220 |
| | KDJ | | 10K 200A RF, 316L flange JIS B2220 |
| | KXJ | | 20K 200A RF, 316L flange JIS B2220 |
| | K5J | | 10K 250A RF, 316L flange JIS B2220 |
| | | | – JPI-Flanges – |
| | LJJ | | 150A 150lbs RF, 316/316L flange JPI 7S-15 |
| | LKJ | | 200A 150lbs RF, 316/316L flange JPI 7S-15 |
| | LLJ | | 250A 150lbs RF, JPI, 316/316L flange JPI 7S-15 |
| | LMJ | | 250A 150lbs RF, JPI, 316/316L flange JPI 7S-15 |
| | | | – Miscellaneous – |
| | XXJ | | With flange hub, 316L |
| | XVU | | UNI-Flange 6"/DN150/150, 304 max 14.5lbs/PN1/1K, compatible with 6" 150lbs / DN150 PN16 / 10K 150 |
| | X3U | | UNI-Flange 8"/DN200/200, 304 max 14.5lbs/PN1/1K, compatible with 8" 150lbs / DN200 PN16 / 10K 200 |
| | X5U | | UNI-Flange 10"/DN250/250, 304 max 14.5lbs/PN1/1K, compatible with 10" 150lbs / DN250 PN16 / 10K 250 |
| | X7U | | UNI-Flange 12"/DN300/300, 304 max 14.5lbs/PN1/1K, compatible with 12" 150lbs / DN300 PN16 / 10K 300 |
| | YY9 | | Special version, TSP-No. to be spec. |
| 40 | | Output; Operation: | |
| A | | | 4-20mA HART; 4-line display VU331, envelope curve display on site |
| Y | | | Special version, TSP-No. to be spec. |

Micropilot S FMR533

This overview does not mark options which are mutually exclusive.

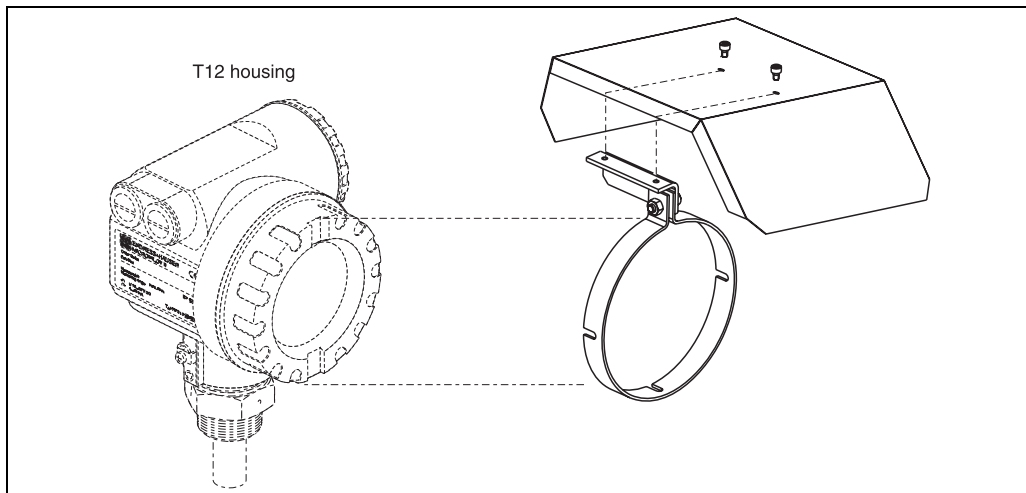
| | | | | |
|----------------|-----------------------------------|---|--|------------------------------|
| 10 | Approval: | | | |
| | A | Non-hazardous area | | |
| | 1 | ATEX II 1/2G EEx ia IIC T6 - XA Note safety instruction (electrostatic charging)! | | |
| | 6 | ATEX II 1/2G EEx ia IIC T6, WHG - XA Note safety instruction (electrostatic charging)! | | |
| | D | IEC Ex ia IIC T6 (in preparation) | | |
| | G | ATEX II 3G EEx nA II T6 | | |
| | I | NEPSI Ex ia IIC T6 (in preparation) | | |
| | S | FM IS Cl.I Div.1 Gr. A-D, zone 0,1,2 | | |
| | U | CSA IS Cl.I Div.1 Gr. A-D, zone 0,1,2 | | |
| | K | TIIS Ex ia IIC T3 | | |
| | L | TIIS Ex ia IIC T6 | | |
| | Y | Special version, TSP-No. to be spec. | | |
| 20 | Antenna: | | | |
| | A | 450mm/20", Parabolic, no wetted O-ring | | |
| | Y | Special version, TSP-No. to be spec. | | |
| 30 | Process connection: | | | |
| | | - EN-Flanges - | | |
| | CWJ | DN150 PN10/16 B1, 316L 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) | | |
| | | - ANSI-Flanges - | | |
| | AVJ | 6" 150lbs RF, 316/316L flange ANSI B16.5 | | |
| | A3J | 8" 150lbs RF, 316/316L flange ANSI B16.5 | | |
| | A5J | 10" 150lbs RF, 316/316L flange ANSI B16.5 | | |
| | | - JIS-Flanges - | | |
| | KVJ | 10K 150A RF, 316L flange JIS B2220 | | |
| | KDJ | 10K 200A RF, 316L flange JIS B2220 | | |
| | K5J | 10K 250A RF, 316L flange JIS B2220 | | |
| | | - JPI-Flanges - | | |
| | LJJ | 150A 150lbs RF, 316/316L flange JPI 7S-15 | | |
| | LKJ | 200A 150lbs RF, 316/316L flange JPI 7S-15 | | |
| | LLJ | 250A 150lbs RF, 316/316L flange JPI 7S-15 | | |
| | | - Miscellaneous - | | |
| | XXJ | With flange hub, 316L | | |
| | XVU | UNI-Flange 6"/DN150/150, 304 max 14.5lbs/PN1/1K, compatible with 6" 150lbs / DN150 PN16 / 10K 150 | | |
| | YY9 | Special version, TSP-No. to be spec. | | |
| 40 | Output; Operation: | | | |
| | A | 4-20mA HART; 4-line display VU331, envelope curve display on site | | |
| | Y | Special version, TSP-No. to be spec. | | |
| 50 | Housing: | | | |
| | C | T12 Alu, coated IP65 NEMA4X, separate conn. compartment | | |
| | Y | Special version, TSP-No. to be spec. | | |
| 60 | Cable entry: | | | |
| | 2 | Gland M20 | | |
| | 3 | Thread G1/2 | | |
| | 4 | Thread NPT1/2 | | |
| | 9 | Special version, TSP-No. to be spec. | | |
| 70 | Weight + measure approval: | | | |
| | A | NMI + PTB (<1 mm) type approval | | |
| | F | NMI witnessed initial verificat. (<1 mm) type approval | | |
| | G | PTB witnessed initial verificat. (<1 mm) type approval | | |
| | R | Not selected; Inventory control version (3 mm) | | |
| | Y | Special version, TSP-No. to be spec. | | |
| 80 | Additional option: | | | |
| | A | Basic version | | |
| | Y | Special version, TSP-No. to be spec. | | |
| 995 | Marking: | | | |
| | 1 | Tagging (TAG), see additional spec. | | |
| FMR533- | | | | Complete product designation |

Accessories

A variety of accessories is available for the Micropilot S. They can be ordered separately from Endress+Hauser.

Weather protection cover

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



L00-FMRS3xxx-00-00-06-en-001

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.

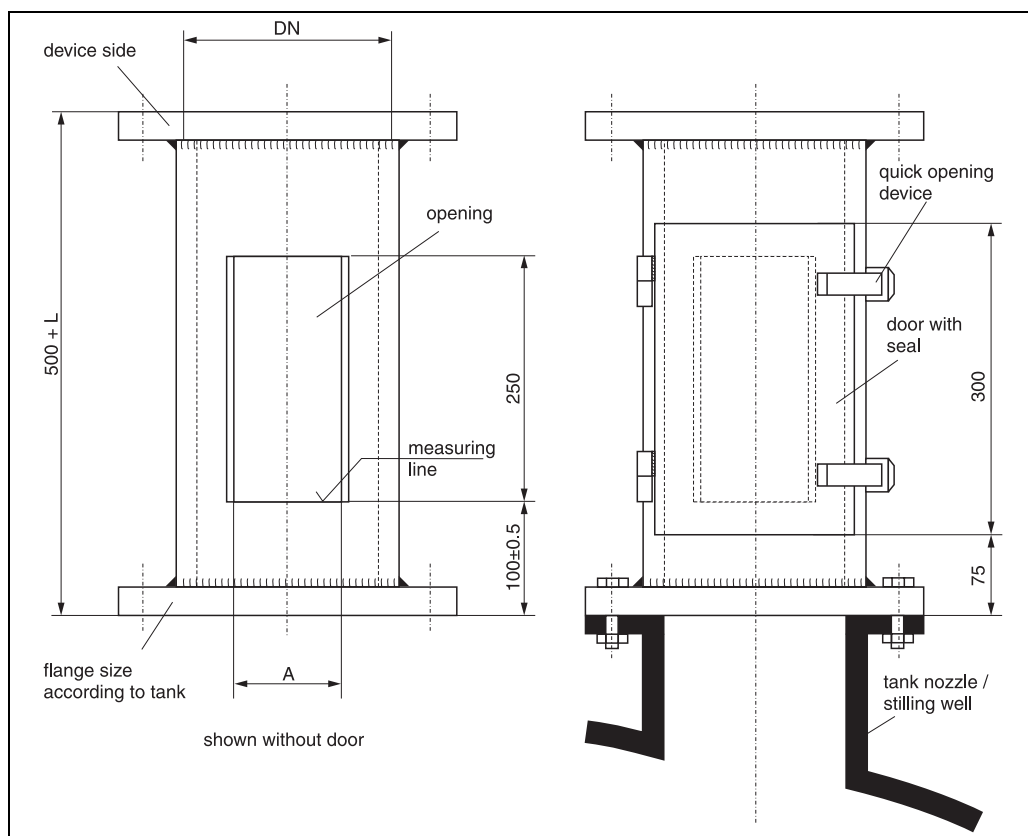
**Sample hatch for
Micropilot S FMR532**

Installation hints

For control and cleaning purposes for sample taking as well as for hand dipping (tape), a sample hatch is recommended. The sensor head of FMR532 (planar antenna!) can be easily checked in the area of the opening. Manual gauging with gauge rod or tape is possible without removal of the transmitter. The lower edge of the opening is the reference for the gauging. The construction is only suitable for non-pressurized operation and should be used for the planar antenna version FMR532 only.

Note!

The sample hatch is not part of the standard offering from Endress+Hauser. Please contact Endress+Hauser for further information.



L00-FMR53xxx-00-00-00-en-004

| Flange | DN150 | DN200 | DN250/300 | Flange | ANSI 6" | ANSI 8" | ANSI 10" |
|------------------------|-------|-------|-----------|------------------------|---------|---------|----------|
| PN [bar] ¹⁾ | 16 | 16 | 16 | PN [lbs] ¹⁾ | 150 | 150 | 150 |
| A [mm] | 110 | 140 | 170 | A [mm] | 110 | 140 | 170 |
| L [mm] | — | 300 | 450 | L [mm] | — | 300 | 450 |

1) Only dimensions adapted to standard. Designed for non-pressurized operation only, therefore thickness of flange can be reduced (e.g. 8 mm).

Supplementary Documentation

System Information System Information for Micropilot, SI00019F/00/EN.

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

Operating Instructions **Correlation of operating instructions to the device:**

| Device | Output | Communication | Operating Instructions | Description of Instrument Functions | Brief Operating Instructions (in the device) |
|--------|--------|---------------|------------------------|-------------------------------------|--|
| FMR530 | A | HART | BA00206F/00/EN | BA00217F/00/EN | KA00161F/00/A2 |
| FMR532 | | | BA00208F/00/EN | | |
| FMR533 | | | BA00209F/00/EN | | |

Tank Side Monitor NRF590

Operating Instructions for Tank Side Monitor NRF590, BA00256F/00/EN.
 Description of Instrument Functions for Tank Side Monitor NRF590, BA00257F/00/EN.

Certificates **Correlation of safety instructions (XA) and certificates (ZE) to the device:**

| Device | Certificate | Explosion protection | Output | Communication | ATEX-Nr. | XA | WHG |
|---------------------------|-------------|-----------------------------------|--------|---------------|--------------------|----------|----------------|
| FMR530, FMR532, FMR533 | 1 | ATEX II 1/2 G EEx ia IIC T6 | A | HART | PTB 00 ATEX 2067 X | XA00081F | — |
| | 6 | ATEX II 1/2 G EEx ia IIC T6 + WHG | A | HART | PTB 00 ATEX 2067 X | XA00081F | ZE00243F/00/DE |
| NRF590 | 6 | ATEX II 2 (1) G EEx d[ia] IIC T4 | — | — | PTB 02 ATEX 2216 X | XA00160F | — |
| NRF590 IS Module | 6 | ATEX II 2 (1) G EEx d[ia] IIC T4 | — | — | PTB 02 ATEX 2216 X | XA00169F | — |

Correlation of Control Drawings (ZD) to the device:

| Device | Certificate | Explosion protection | Output | Communication | ZD |
|---------------------------|-------------|----------------------|--------|---------------|----------------|
| FMR530, FMR532, FMR533 | S | FM IS | A | HART | ZD00065F/00/EN |
| | U | CSA IS | A | HART | ZD00073F/00/EN |
| NRF590 | S | FM IS | — | — | ZD00084F/00/EN |
| | U | CSA IS | — | — | ZD00103F/00/EN |
| NRF590 IS Module | S | FM IS | — | — | ZD00085F/00/EN |
| | U | CSA IS | — | — | ZD00104F/00/EN |

Patents

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

- US 5,387,918 ≅ EP 0 535 196
- US 5,689,265 ≅ EP 0 626 063
- US 5,659,321
- US 5,614,911 ≅ EP 0 670 048
- US 5,594,449 ≅ 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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