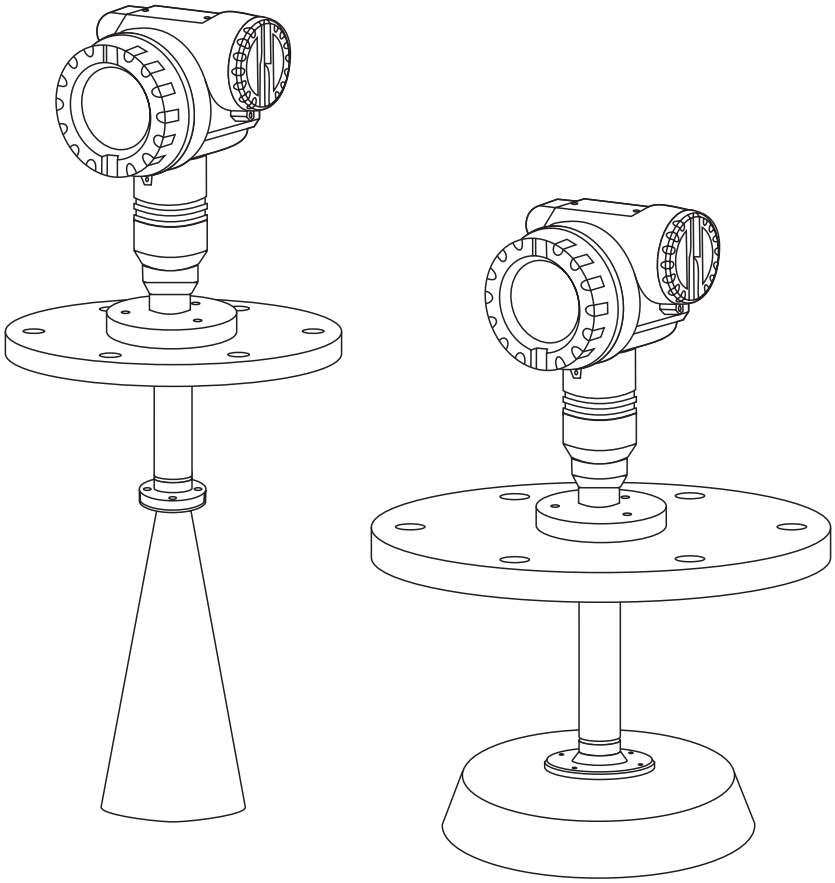
Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Operating Instructions

# Micropilot M FMR250

## Level-Radar

HART COMMUNICATION PROTOCOL

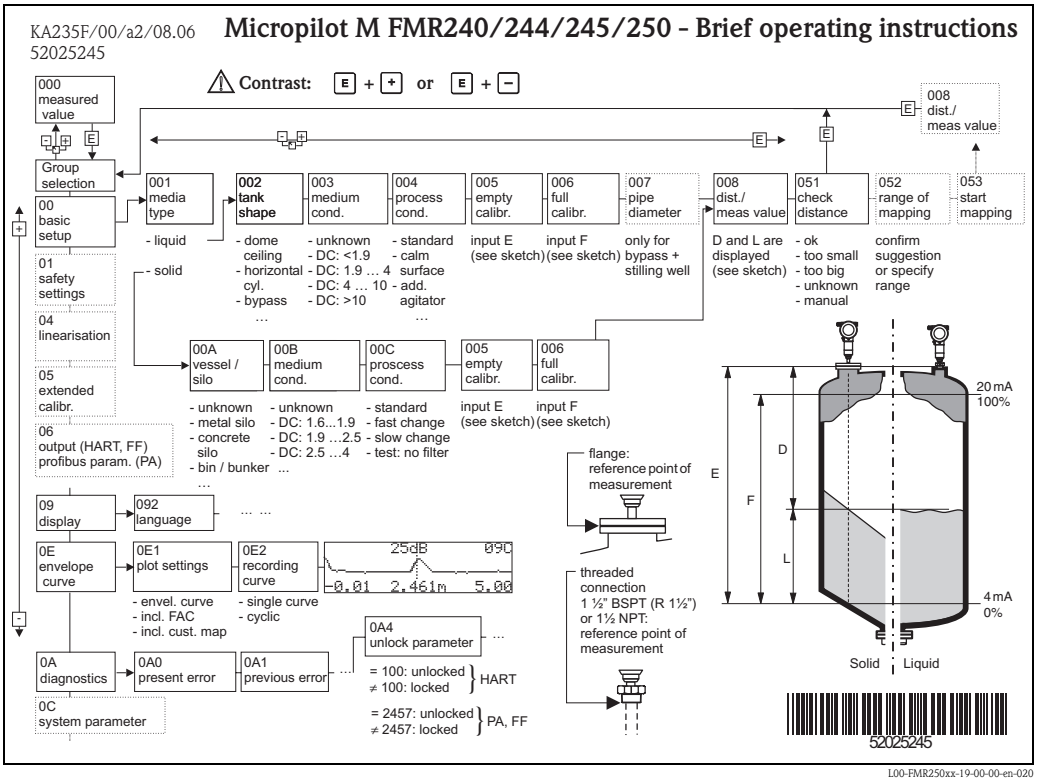


BA284F/00/EN/03.10
71112111

Valid as of software version:
01.05.00

Endress+Hauser
People for Process Automation

# Brief operating instructions




L00-FMR250xx-19-00-00-en-020

Note!
This operating manual explains the installation and initial start-up for the level transmitter. All functions that are required for a typical measuring task are taken into account here. In addition, the Micropilot M provides many other functions that are not included in this operating manual, such as optimising the measuring point and converting the measured values.

An **overview of all device functions** can be found on → 86.

The operating manual BA291F/00/EN "Description of Instrument Functions" provides an **extensive description of all device functions**, which can be found on the enclosed CD-ROM.

# Table of contents

# 1 Safety instructions

## 1.1 Designated use

The Micropilot M is a compact level radar for the continuous, contactless measurement of predominantly solids. The device can also be freely mounted outside closed metal vessels because of its operating frequency of about 26 GHz and a maximum radiated pulsed energy of 1 mW (average power output 1 μW). Operation is completely harmless to humans and animals.

## 1.2 Installation, commissioning and operation

The Micropilot M has been designed to operate safely in accordance with current technical, safety and EU standards. If installed incorrectly or used for applications for which it is not intended, however, it is possible that application-related dangers may arise, e.g. product overflow due to incorrect installation or calibration. For this reason, the instrument must be installed, connected, operated and maintained according to the instructions in this manual: personnel must be authorised and suitably qualified. The manual must have been read and understood, and the instructions followed. Modifications and repairs to the device are permissible only when they are expressly approved in the manual.

## 1.3 Operational safety and process safety

Alternative monitoring measures must be taken to ensure operational safety and process safety during configuration, testing and maintenance work on the device.

### 1.3.1 Hazardous areas

Measuring systems for use in hazardous environments are accompanied by separate "Ex documentation", which is an integral part of this Operating Manual. Strict compliance with the installation instructions and ratings as stated in this supplementary documentation is mandatory.

- Ensure that all personnel are suitably qualified.
- Observe the specifications in the certificate as well as national and local standards and regulations.

### 1.3.2 FCC approval

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

Caution!
Changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

## 1.4 Notes on safety conventions and symbols

In order to highlight safety-relevant or alternative operating procedures in the manual, the following conventions have been used, each indicated by a corresponding symbol in the margin.

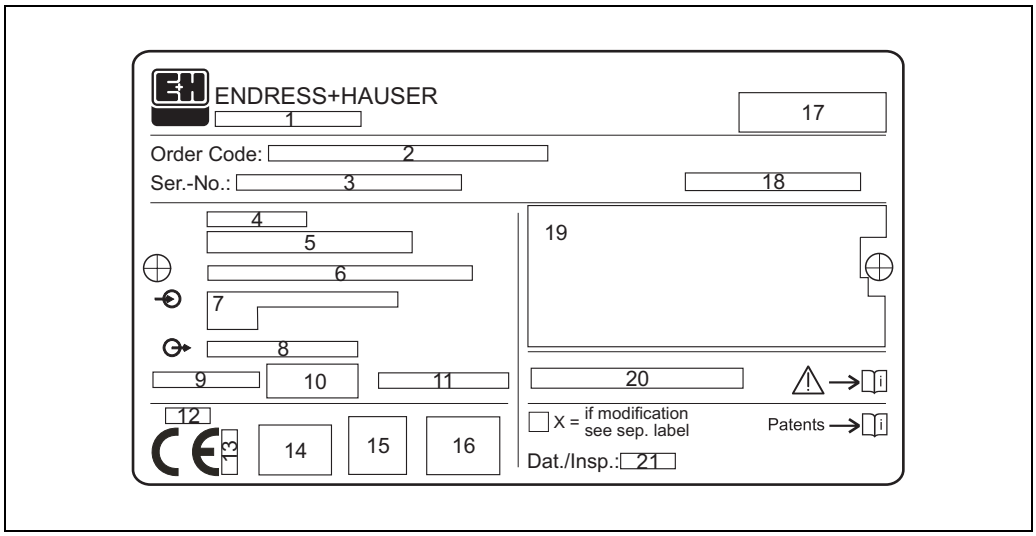
| Safety conventions | |
|---|---|
|  | **Warning!**<br>A warning highlights actions or procedures which, if not performed correctly, will lead to personal injury, a safety hazard or destruction of the instrument. |
|  | **Caution!**<br>Caution highlights actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the instrument. |
|  | **Note!**<br>A note highlights actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned. |
| **Explosion protection** | |
|  | **Device certified for use in explosion hazardous area**<br>If the device has this symbol embossed on its name plate it can be installed in an explosion hazardous area. |
|  | **Explosion hazardous area**<br>Symbol used in drawings to indicate explosion hazardous areas. Devices located in and wiring entering areas with the designation “explosion hazardous areas” must conform with the stated type of protection. |
|  | **Safe area (non-explosion hazardous area)**<br>Symbol used in drawings to indicate, if necessary, non-explosion hazardous areas. Devices located in safe areas still require a certificate if their outputs run into explosion hazardous areas. |
| **Electrical symbols** | |
|  | **Direct voltage**<br>A terminal to which or from which a direct current or voltage may be applied or supplied. |
|  | **Alternating voltage**<br>A terminal to which or from which an alternating (sine-wave) current or voltage may be applied or supplied. |
|  | **Grounded terminal**<br>A grounded terminal, which as far as the operator is concerned, is already grounded by means of an earth grounding system. |
|  | **Protective grounding (earth) terminal**<br>A terminal which must be connected to earth ground prior to making any other connection to the equipment. |
|  | **Equipotential connection (earth bonding)**<br>A connection made to the plant grounding system which may be of type e.g. neutral star or equipotential line according to national or company practice. |
|  | **Temperature resistance of the connection cables**<br>States, that the connection cables must be resistant to a temperature of at least 85 °C (185 °F). |

# 2 Identification

## 2.1 Device designation

### 2.1.1 Nameplate

The following technical data are given on the instrument nameplate:




*Information on the nameplate of the Micropilot M*

*1 Instrument designation*
*2 Order code*
*3 Serial number*
*4 Process pressure*
*5 Process temperature*
*6 Length (optional)*
*7 Power supply*
*8 Current supply*
*9 Ambient temperature*
*10 Cable specification*
*11 Factory sealed*
*12 Radio equipment number*
*13 TÜV identification mark*
*14 Certificate symbol (optional) e.g. Ex, NEPSI*
*15 ertificate symbol (optional) e.g. 3A*
*16 Certificate symbol (optional) e.g. SIL, FF*
*17 Place of production*
*18 Degree of protection e.g. IP65, IP67*
*19 Certificates and approvals*
*20 Document number of safety instructions e.g. XA, ZD, ZE*
*21 Dat./Insp. xx / yy (xx = week of production, yy = year of production)*

## 2.1.2 Ordering structure

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 |
| | 4 ATEX II 1/2G EEx d [ia] IIC T6 |
| | G ATEX II 3G EEx nA II T6 |
| | B ATEX II 1/2GD EEx ia IIC T6, Alu blind cover |
| | C ATEX II 1/2G EEx ia IIC T6, ATEX II 1/3D |
| | D ATEX II 1/2D, Alu blind cover |
| | E ATEX II 1/3D |
| | I NEPSI Ex ia IIC T6 |
| | J NEPSI Ex d (ia) ia IIC T6 |
| | Q NEPSI DIP |
| | L TISS EEx d (ia) IIC T3 |
| | S FM IS-Cl.I/II/III Div.1 Gr.A-G, zone 0, 1, 2 |
| | T FM XP-Cl.I/II/III Div.1 Gr.A-G, zone 1, 2 |
| | N CSA General Purpose |
| | U CSA IS Cl.I/II/III Div.1 Gr.A-G, zone 0, 1, 2 |
| | V CSA XP Cl.I/II/III Div.1 Gr.A-G, zone 1, 2 |
| | Y Special version |

| 20 | | Antenna: |
|---|---|---|
| | D | Horn 80mm/3", increased near distance dynamics |
| | E | Horn 100mm/4", increased near distance dynamics |
| | G | Parabolic 200mm/8", increased near distance dynamics |
| | H | Parabolic 250mm/10", increased near distance dynamics |
| | 4 | Horn 80mm/3" |
| | 5 | Horn 100mm/4" |
| | 6 | Parabolic 200mm/8" |
| | 9 | Special version |

| 30 | | Antenna seal; Temperature: |
|---|---|---|
| | E | FKM Viton GLT; -40...200°C/-40...392 °F |
| | Y | Special version |

| 40 | | Antenna extension: |
|---|---|---|
| | 1 | Not selected |
| | 2 | 250mm/10" |
| | 3 | 450mm/18" |
| | 9 | Special version |

| 50 | | Process connection: |
|---|---|---|
| | GGJ | Thread EN10226 R1-1/2, 316L |
| | GNJ | Thread ANSI NPT1-1/2, 316L |
| | X3J | UNI flange DN200/8"/200, 316L<br>max PN1/14.5lbs/1K, compatible DN200 PN10/16, 8" 150lbs, 10K 200 |
| | X5J | UNI flange DN250/10"/250, 316L<br>max PN1/14.5lbs/1K, compatible DN250 PN10/16, 10" 150lbs, 10K 250 |
| | XCJ | Top target pos., UNI DN100/4"/100, 316L<br>max PN1/14.5lbs/1K, compatible DN100 PN10/16, 4" 150lbs, 10K 100 |
| | XEJ | Top target pos., UNI DN200/8"/200, 316L<br>max PN1/14.5lbs/1K, compatible DN200 PN10/16, 8" 150lbs, 10K 200 |
| | XFJ | Top target pos., UNI DN250/10"/250, 316L<br>max PN1/14.5lbs/1K, compatible DN250 PN10/16, 10" 150lbs, 10K 250 |
| | CMJ | DN80 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C) |
| | CQJ | DN100 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C) |
| | ALJ | 3" 150lbs RF, 316/316L flange ANSI B16.5 |
| | APJ | 4" 150lbs RF, 316/316L flange ANSI B16.5 |
| | KLJ | 10K 80A RF, 316L flange JIS B2220 |
| | KPJ | 10K 100A RF, 316L flange JIS B2220 |
| | YY9 | Special version |

| 60 | | Output; Operation: |
|---|---|---|
| | A | 4-20mA SIL HART; 4-line display VU331, envelope curve display on site |

| | | |
|---|---|---|
| **60** | | **Output; Operation:** |
| | 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 |
| | L | PROFIBUS PA; prepared for FHX40, remote display (Accessory) |
| | E | FOUNDATION Fieldbus; 4-line display, envelope curve display on site |
| | F | FOUNDATION Fieldbus; w/o display, via communication |
| | M | FOUNDATION Fieldbus; prepared for FHX40, remote display (Accessory) |
| | Y | Special version |

| | | |
|---|---|---|
| **70** | | **Housing:** |
| | A | F12 Alu, coated IP65 NEMA4X |
| | B | F23 316L IP65 NEMA4X |
| | C | T12 Alu, coated IP65 NEMA4X, separate connection compartment |
| | D | T12 Alu, coated IP65 NEMA4X + OVP, separate connection compartment, OVP = overvoltage protection |
| | Y | Special version |

| | | |
|---|---|---|
| **80** | | **Cable entry:** |
| | 2 | Gland M20 (EEx d > thread M20) |
| | 3 | Thread G1/2 |
| | 4 | Thread NPT1/2 |
| | 9 | Special version |

| | | |
|---|---|---|
| **90** | | **Additional option:** |
| | K | Air purge connection G1/4 |
| | M | Air purge connection NPT1/4 |
| | P | 5-point, Air purge connection G1/4<br>5-point linearity protocol, see additional spec. |
| | Q | 5-point, Air purge connection NPT1/4<br>5-point linearity protocol, see additional spec. |
| | Y | Special version |

| | | |
|---|---|---|
| **995** | | **Marking:** |
| | 1 | Tagging (TAG) |
| | 2 | Bus address |

| | |
|---|---|
| **FMR250-** | Complete product designation |

## 2.2 Scope of delivery

Caution!
It is essential to follow the instructions concerning the unpacking, transport and storage of measuring instruments given in the chapter "Incoming acceptance, transport, storage", → 10!

The scope of delivery consists of:
- Assembled instrument
- Accessories (→ 63)
- Endress+Hauser operating program on the enclosed CD-ROM
- Brief operating instructions KA1015F/00/EN for quick commissioning
- Brief operating instructions KA235F/00/A2 (basic setup/trouble shooting), housed in the instrument
- Approval documentation: if this is not included in the operating manual
- CD-ROM with further documentation, e. g.
  – Technical Information
  – Operating Instruction
  – Description of Instrument Functions

## 2.3 Certificates and approvals

**CE mark, declaration of conformity**
The device is designed to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate. The device complies with the applicable standards and regulations as listed in the EC declaration of conformity and thus complies with the statutory requirements of the EG directives. Endress+Hauser confirms the successful testing of the device by affixing to it the CE mark.

## 2.4 Registered trademarks

KALREZ®, VITON®, TEFLON®
Registered trademark of the company, E.I. Du Pont de Nemours & Co., Wilmington, USA

TRI-CLAMP®
Registered trademark of the company, Ladish & Co., Inc., Kenosha, USA

HART®
Registered trademark of HART Communication Foundation, Austin, USA

ToF®
Registered trademark of the company Endress+Hauser GmbH+Co. KG, Maulburg, Germany

PulseMaster®
Registered trademark of the company Endress+Hauser GmbH+Co. KG, Maulburg, Germany

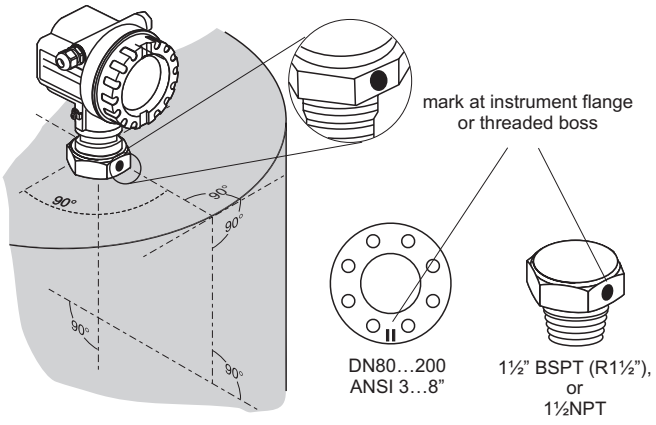
PhaseMaster®
Registered trademark of the company Endress+Hauser GmbH+Co. KG, Maulburg, Germany

# 3 Installation

## 3.1 Quick installation guide

**At mounting adjust the marking at the instrument flange!**

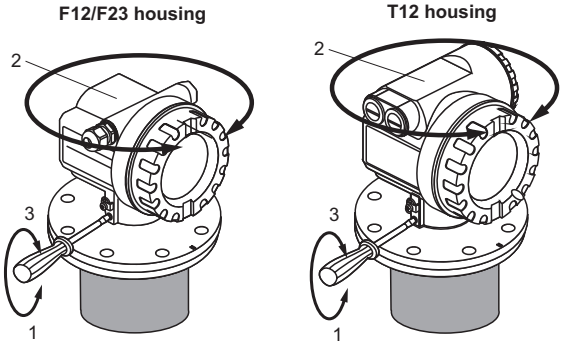
**Installation in vessel (free space):**
**Mark on process connector facing the nearest vessel wall!**




Note!
At version with top target positioner, the marker is at the housing adapter (opposite the air purge connection).

**Turn housing**

The housing can be turned 350° in order to simplify access to the display and the terminal compartment




Allen key 4 mm (0.16 in)

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## 3.2 Incoming acceptance, transport, storage

### 3.2.1 Incoming acceptance

Check the packing and contents for any signs of damage.
Check the shipment, make sure nothing is missing and that the scope of supply matches your order.

### 3.2.2 Transport

Caution!
Follow the safety instructions and transport conditions for instruments of more than 18 kg (39.69 lbs). Do not lift the measuring instrument by its housing in order to transport it.

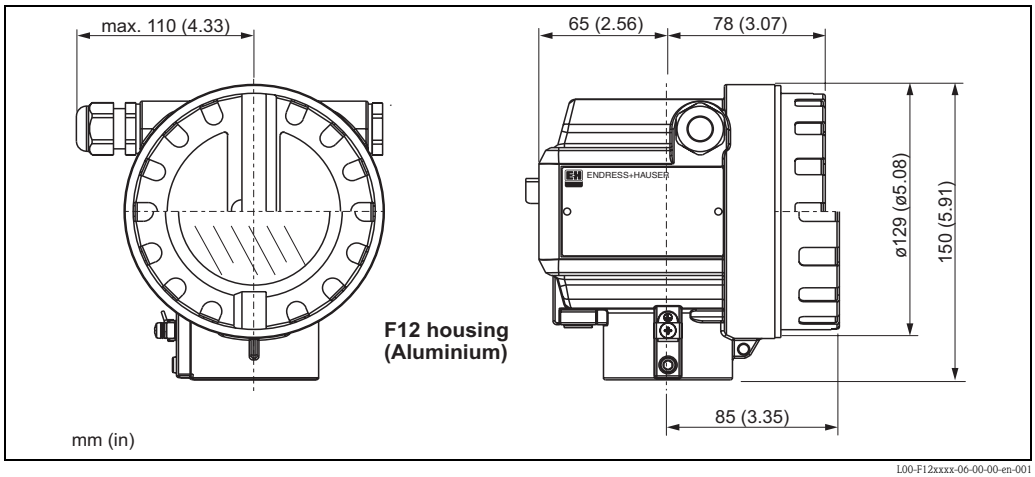
### 3.2.3 Storage

Pack the measuring instrument so that is protected against impacts for storage and transport. The original packing material provides the optimum protection for this.
The permissible storage temperature is -40 °C to +80 °C (-40 °F to +176 °F) or -50 °C to +80 °C (+58 °F to +176 °F).

# 3.3 Installation conditions

## 3.3.1 Dimensions

### Housing dimensions

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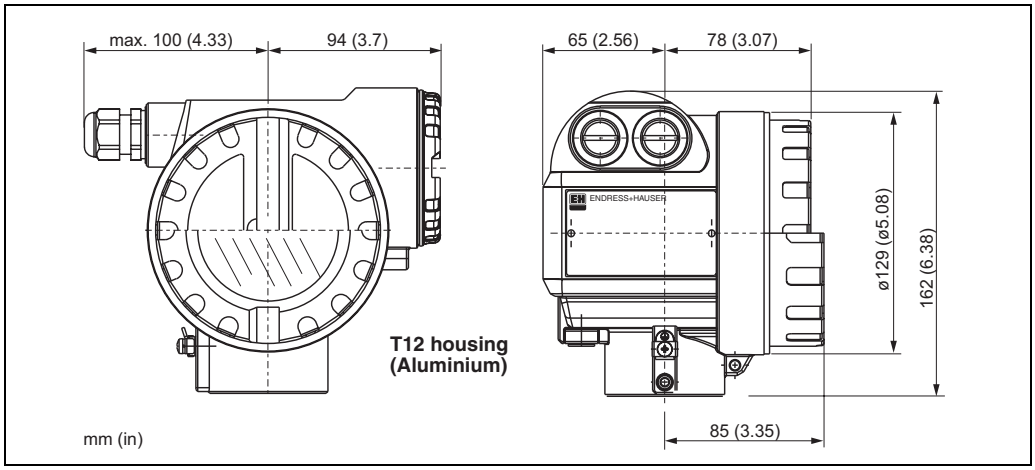


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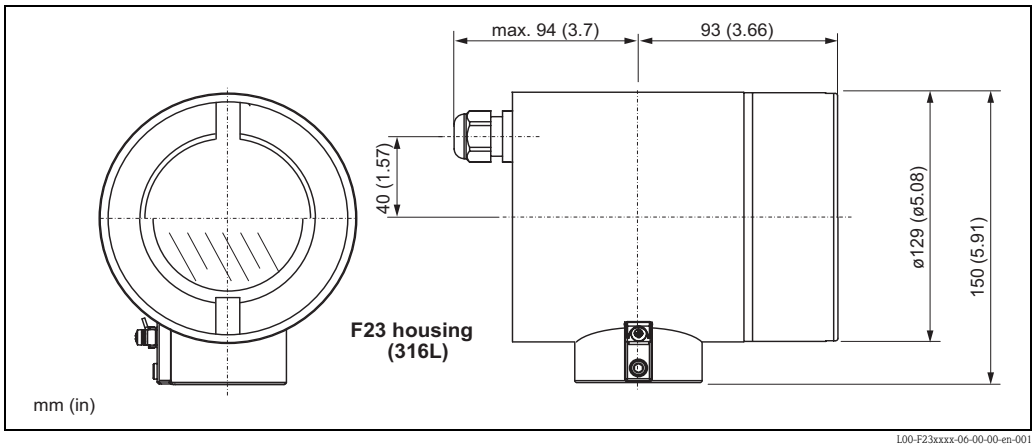


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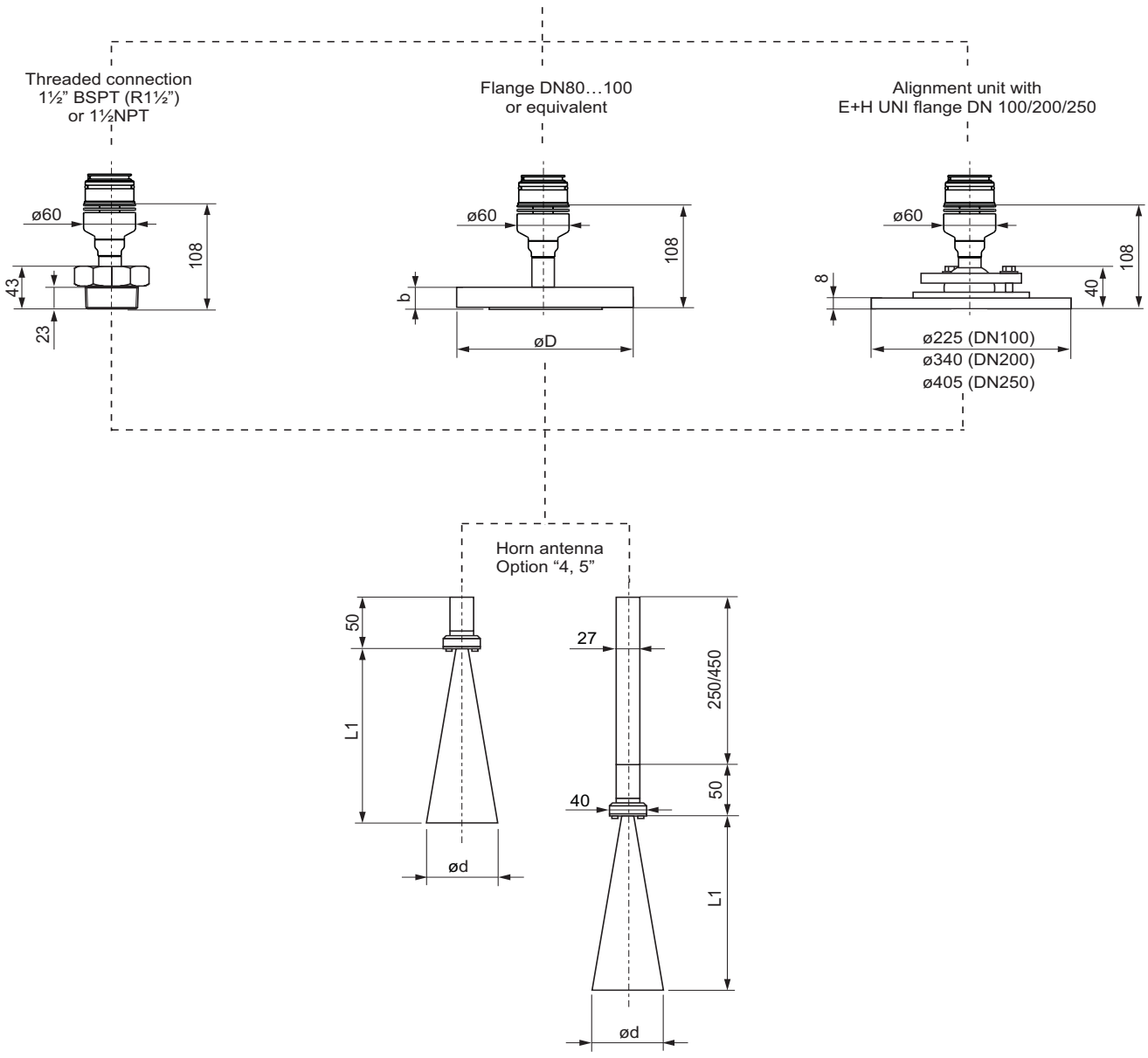
## Process connection and antenna (option "4, 5")

**F12 / T12 / F23 housing**




**Horn antenna**

| **Antenna size** | 80 mm (3") | 100 mm (4") |
|---|---|---|
| L1 [mm] | 211 | 430 |
| d [mm] | 75 | 95 |

**Flange to ANSI B16.5**

| **Flange** | 3" | 4" |
|---|---|---|
| b [mm] | 23.9 | 23.9 |
| D [mm] | 190.5 | 228.6 |

for 150 lbs

**Flange to EN 1092-1 (agreeable to DIN 2527)**

| **Flange** | DN 80 | DN 100 |
|---|---|---|
| b [mm] | 20 | 20 |
| D [mm] | 200 | 220 |

for PN10/16

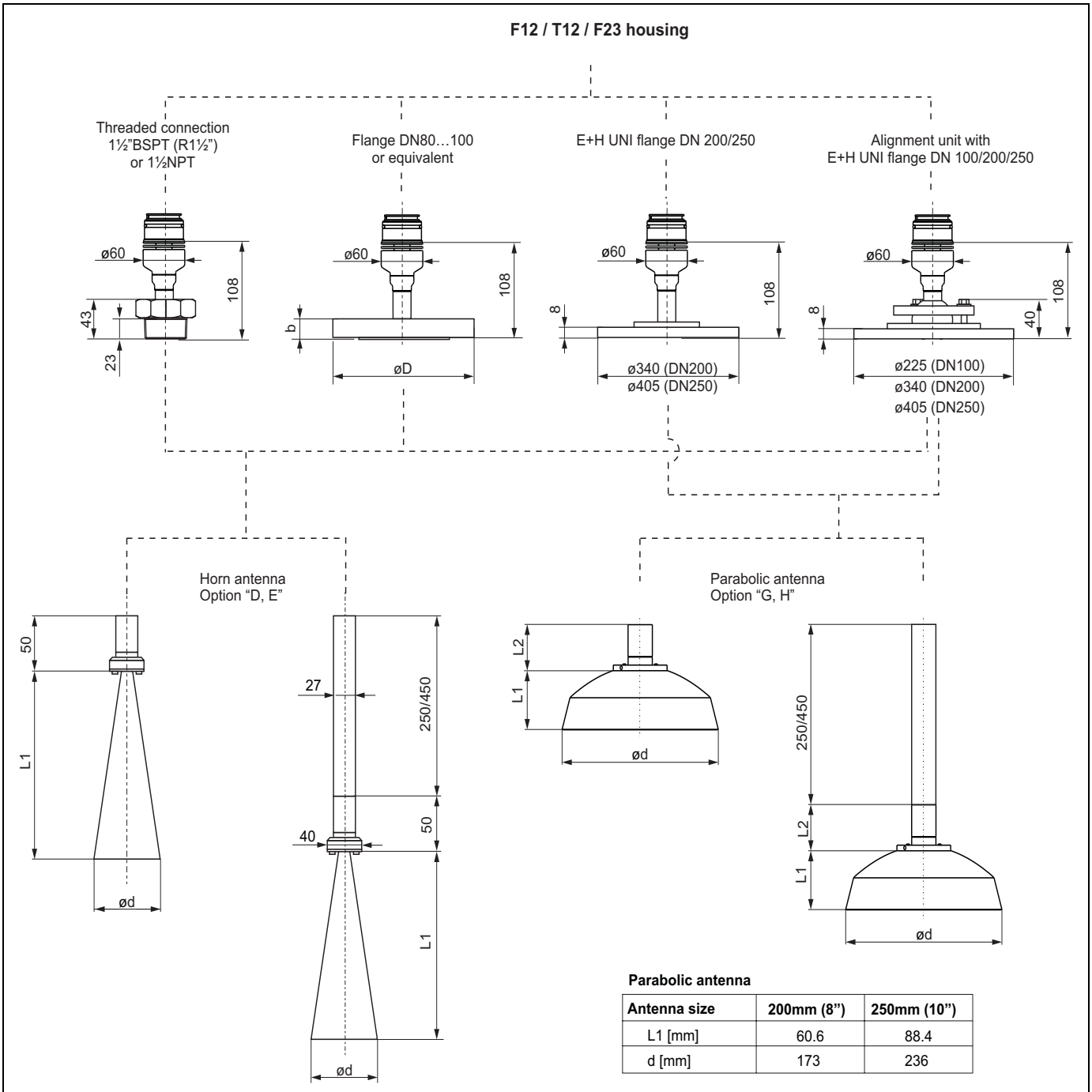
**Flange to JIS B2220**

| **Flange** | DN 80 | DN 100 |
|---|---|---|
| b [mm] | 18 | 18 |
| D [mm] | 185 | 210 |

for 10K

a0011475-en

## Process connection and antenna (option "D, E, G, H")




**Horn antenna**

| Antenna size | 80 mm (3") | 100 mm (4") |
|---|---|---|
| L1 [mm] | 211 | 430 |
| d [mm] | 75 | 95 |

**Parabolic antenna**

| Antenna size | 200mm (8") | 250mm (10") |
|---|---|---|
| L1 [mm] | 60.6 | 88.4 |
| d [mm] | 173 | 236 |

**Parabolic antenna**

| Antenna size / flange | 200 mm (8") UNI | 250 mm (10") UNI |
|---|---|---|
| L2 [mm] | 50 | 37 |

**Flange to EN 1092-1 (agreeable to DIN 2527)**

| Flange | DN 80 | DN 100 |
|---|---|---|
| b [mm] | 20 | 20 |
| D [mm] | 200 | 220 |

for PN10/16

**Flange to ANSI B16.5**

| Flange | 3" | 4" |
|---|---|---|
| b [mm] | 23.9 | 23.9 |
| D [mm] | 190.5 | 228.6 |

for 150 lbs

**Flange to JIS B2220**

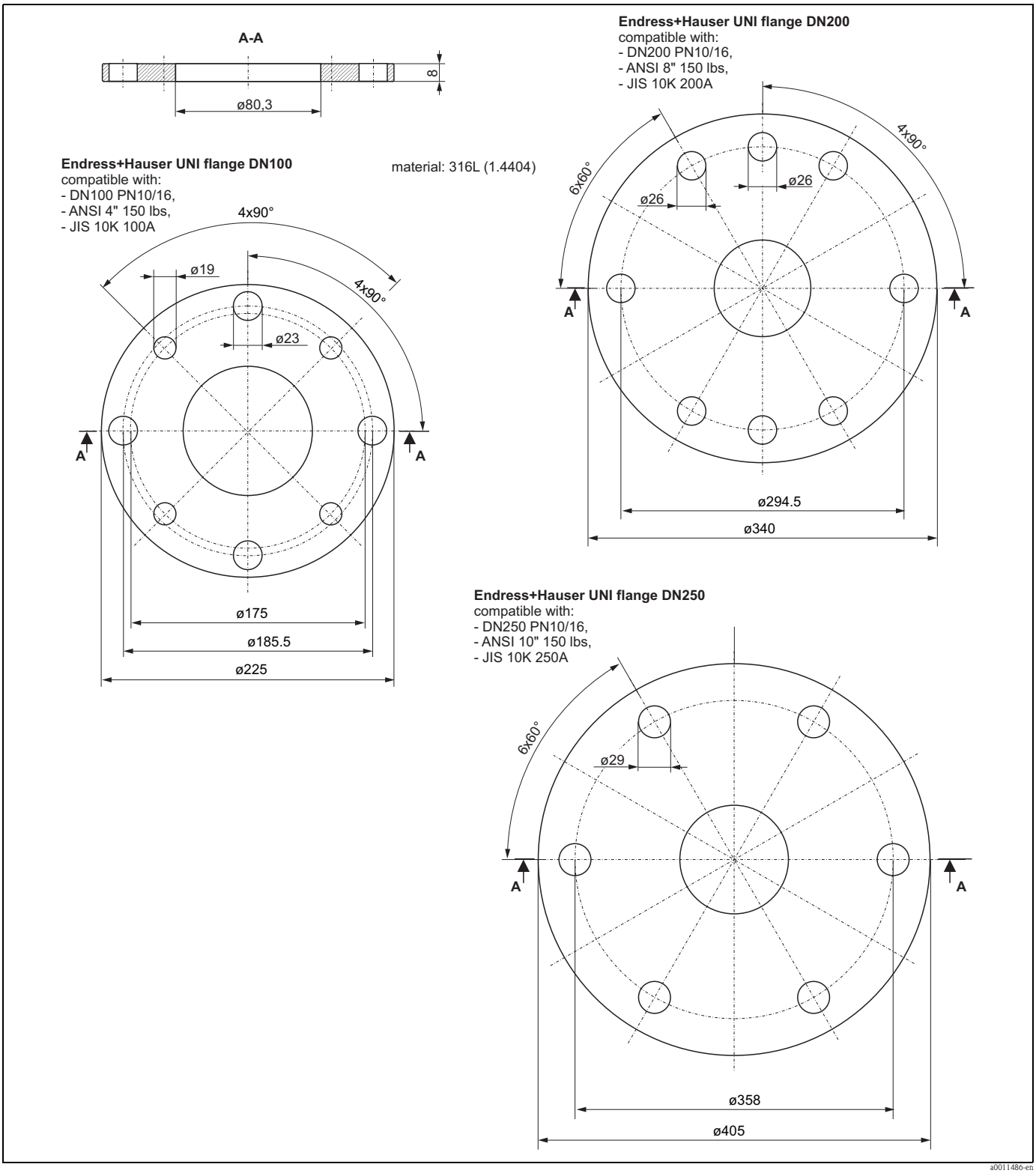
| Flange | DN 80 | DN 100 |
|---|---|---|
| b [mm] | 18 | 18 |
| D [mm] | 185 | 210 |

for 10K

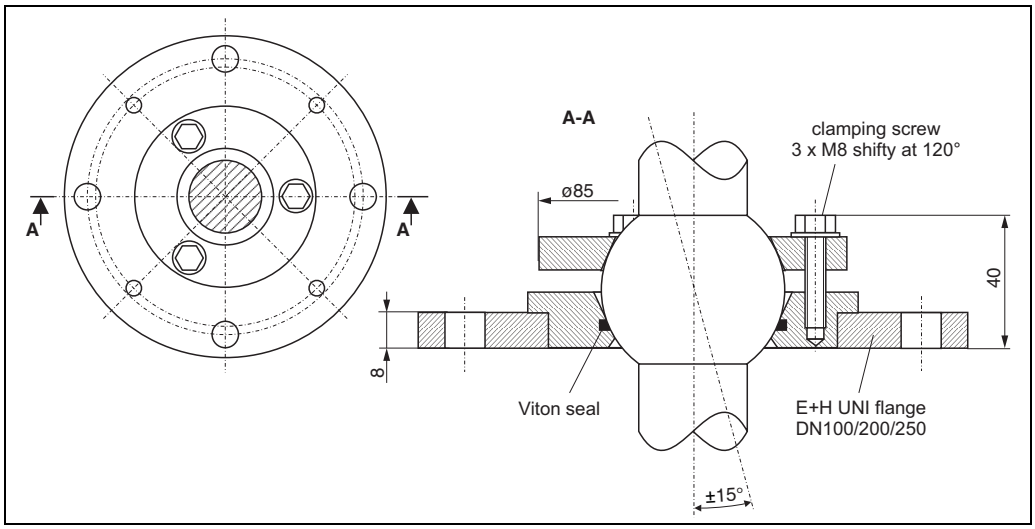
a0011476-en

### Endress+Hauser UNI flange

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.



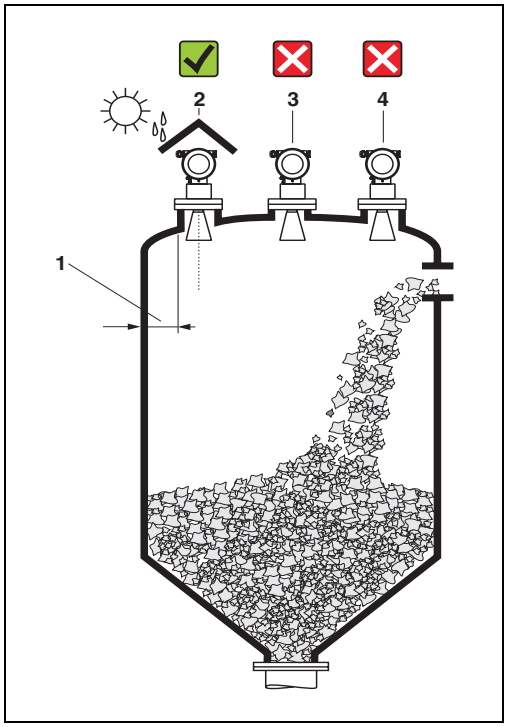
**Top target positioner with Endress+Hauser UNI flange**



### 3.3.2 Engineering hints

**Orientation**

- Recommended distance (1) wall – **outer edge** of nozzle: ~1/6 of vessel diameter. However, the device should not, under any circumstances, be mounted less than 20 cm (7.87 in) from the vessel wall.
  Note!
  If the tank wall is not smooth (corrugated metal, welding seams, irregularities etc.) the distance from the wall should be kept as large as possible. If necessary, use an alignment unit to prevent interference reflections from 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 (→ 63, "Accessories").
- In extremely dusty applications, the integrated air purge connection can prevent clogging of the antenna.



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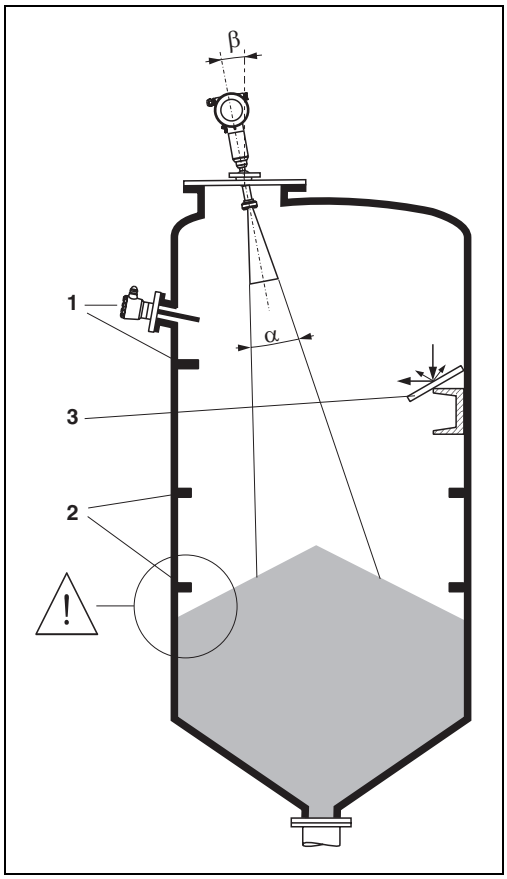
**Vessel installations**

- Avoid any installations (1), like limit switches, struts, etc., inside the signal beam (→ 17, "Beam angle").
- Symmetrical installations (2), i.e. reinforcing rings, heating coils, 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", → 20.
- In devices with top target positioner, the sensor can be optimally aimed within the vessel and/or interference reflections can be avoided. The max. angle β is ±15°.
- In particular, sensor alignment serves to:
  – prevent interference reflections
  – extend the maximum possible measuring range in conical outlets.
- Metallic screens (3) mounted at a slope spread the radar signals and can, therefore, reduce interference echoes.

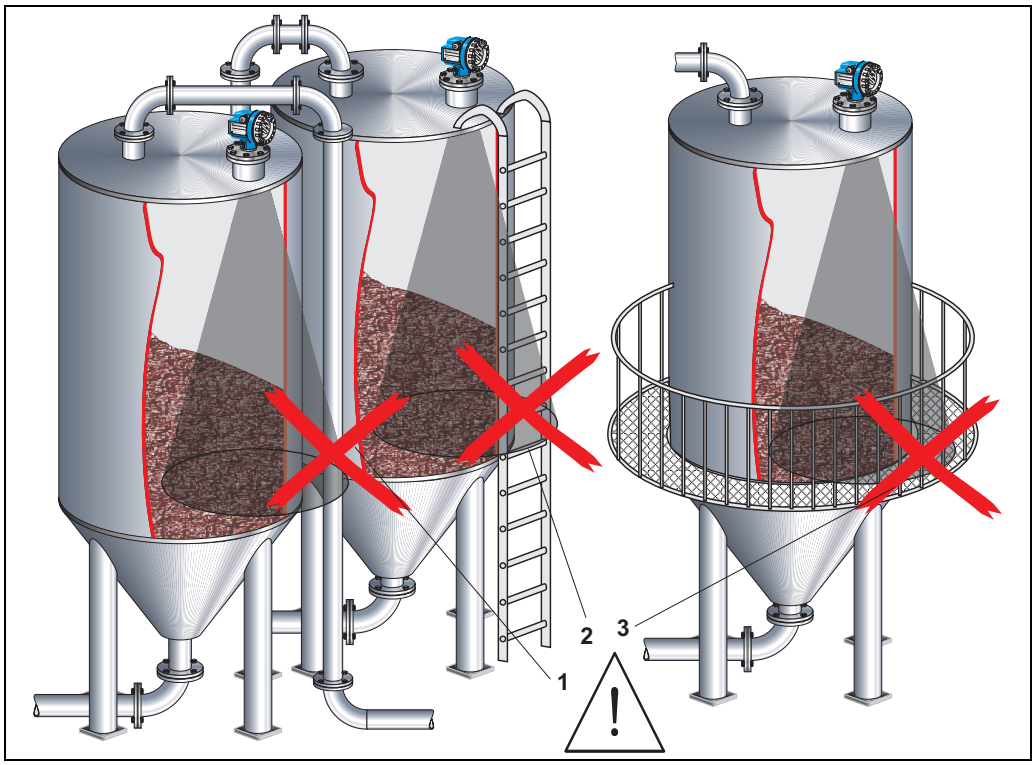
Please contact Endress+Hauser for further information.



L00-FMR250xx-17-00-00-xx-002

### 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.

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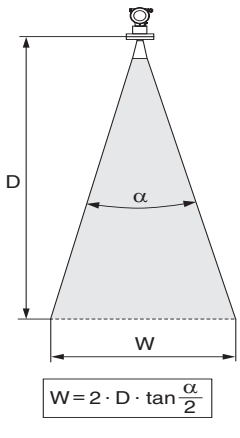
### Beam angle

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 antenna | | Parabolic antenna | |
|---|---|---|---|---|
| | 80 mm (3") | 100 mm (4") | 200 mm (8") | 250 mm (10") |
| **Beam angle α** | 10° | 8° | 4° | 3.5° |

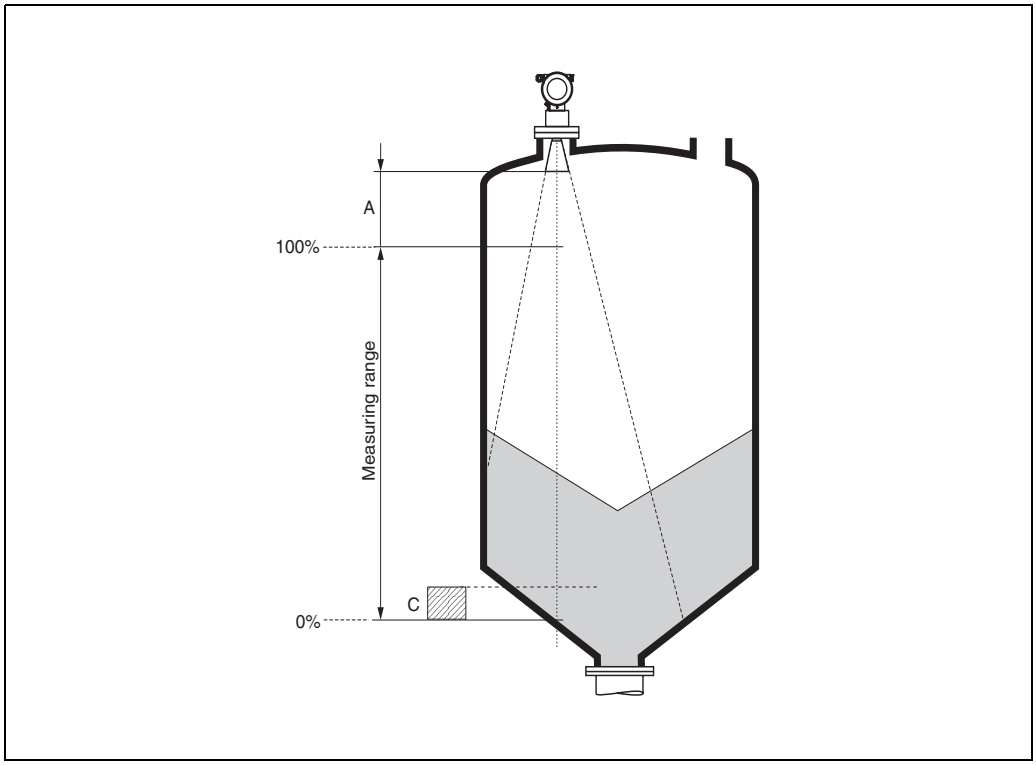
| Measuring distance (D) | Beamwidth diameter (W) | | | |
|---|---|---|---|---|
| | 80 mm (3") | 100 mm (4") | 200 mm (8") | 250 mm (10") |
| 5 m (16 ft) | 0,87 m (2.9 ft) | 0,70 m (2.3 ft) | 0,35 m (1.1 ft) | 0,3 m (1 ft) |
| 10 m (33 ft) | 1,75 m (5.7 ft) | 1,40 m (4.6 ft) | 0,70 m (2.3 ft) | 0,61 m (2 ft) |
| 15 m (49 ft) | 2,62 m (8.6 ft) | 2,10 m (6.9 ft) | 1,05 m (3.4 ft) | 0,92 m (3 ft) |
| 20 m (66 ft) | 3,50 m (11 ft) | 2,80 m (9.2 ft) | 1,40 m (4.6 ft) | 1,22 m (4 ft) |
| 30 m (98 ft) | 5,25 m (17 ft) | 4,20 m (14 ft) | 2,10 m (6.9 ft) | 1,83 m (6 ft) |
| 40 m (131 ft) | 7,00 m (23 ft) | 5,59 m (18 ft) | 2,79 m (9.2 ft) | 2,44 m (8 ft) |
| 50 m (164 ft) | 8,75 m (29 ft) | 6,99 m (23 ft) | 3,50 m (11 ft) | 3,06 m (10 ft) |




L00-FMR2xxxx-14-00-06-de-027

### Measuring conditions

- 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 top target positioner (→ 16).
- 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 FMR250. 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-en-001

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

### 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 maximum configurable range is 70 m (230 ft).

To achieve an optimised Signal strength it is recommended to use an antenna with as large as possible diameter (DN200 (8") parabolic antenna, DN100 (4") horn).

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 εr.

| Media group | DC (εr) | Examples | Signal attenuation |
|---|---|---|---|
| **A** | 1.6 to 1.9 | – Plastic granulate<br>– White lime, special cement<br>– 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<br>– Ground stones<br>– Sand | 13 to 10 dB |
| **D** | 4 to 7 | – Naturally moist (ground) stones, ores<br>– Salt | 10 to 7 dB |
| **E** | > 7 | – Metallic powder<br>– Carbon black<br>– Coal | < 7 dB |

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

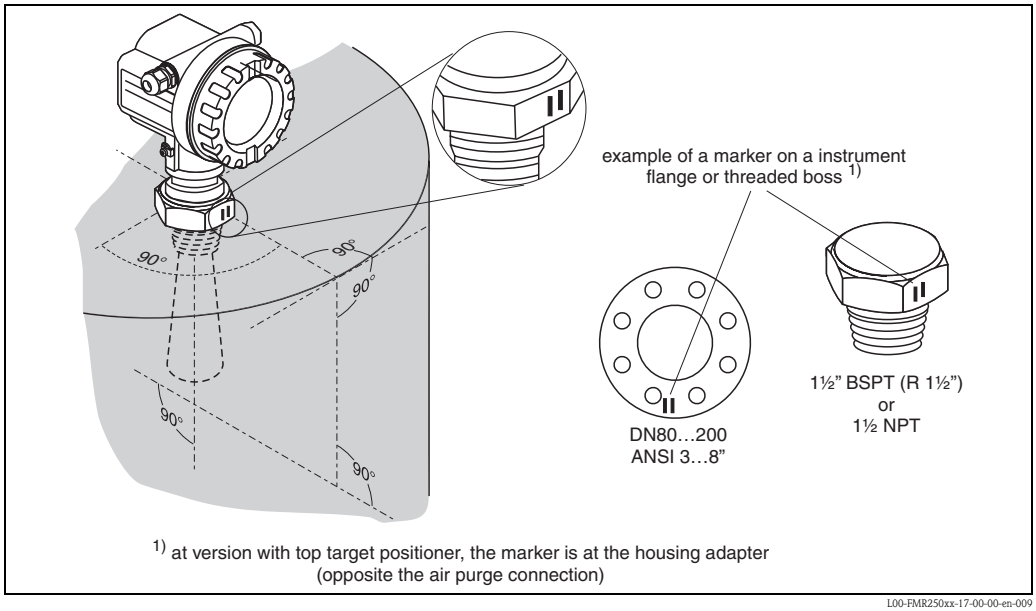
# 3.4 Installation instructions

## 3.4.1 Mounting kit

In addition to the tool needed for flange mounting, you will require the following tool:
- A key AF60 for threaded boss
- 4 mm (0.16 in) Allen wrench for turning the housing.

## 3.4.2 Installation in vessel (free space)

**Optimum mounting position**

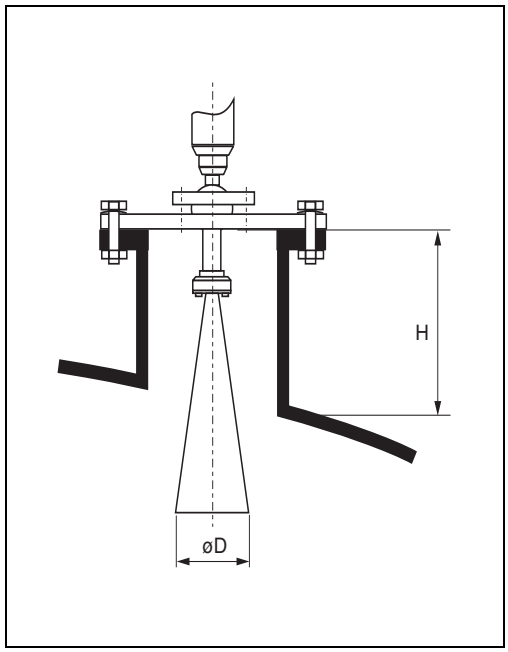



1) at version with top target positioner, the marker is at the housing adapter (opposite the air purge connection)

L00-FMR250xx-17-00-00-en-009

**Standard installation FMR250 with horn antenna**

- Observe installation instructions, → 16.
- Marker is aligned towards vessel wall.
- The marker is always exactly in the middle between two bolt-holes in 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 should protrude from the nozzle. If this is not possible for mechanical reasons, larger nozzle heights can be accepted.
  Note!
  Please contact Endress+Hauser for application with higher nozzle.
- **Vertical horn antenna.**
  Ideally, the horn antenna should be installed vertically. To avoid interference reflections or for optimum alignment within the vessel, the FMR250 with optional top target positioner can be swiveled by 15° in all directions.



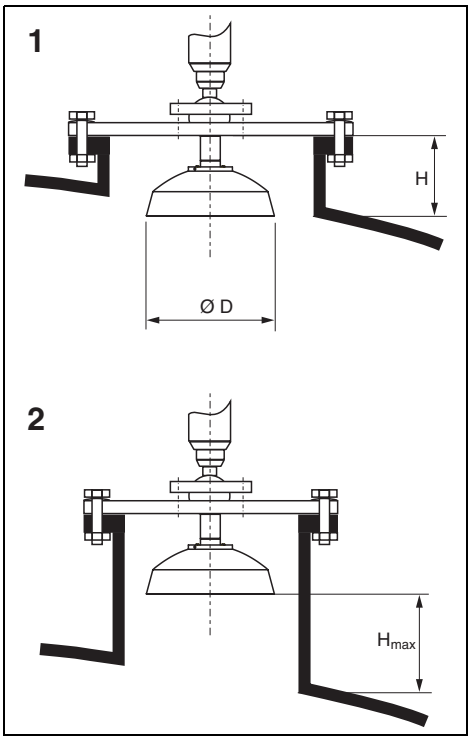
L00-FMR250xx-17-00-00-en-004

| **Antenna size** | 80 mm (3") | 100 mm (4") |
|---|---|---|
| **D [mm (in)]** | 75 (2.95) | 95 (3.74) |
| **H [mm (in)]**<br>(without antenna extension) | < 260 (< 10.2) | < 480 (< 18.9) |

**Standard installation FMR250 with parabolic antenna**

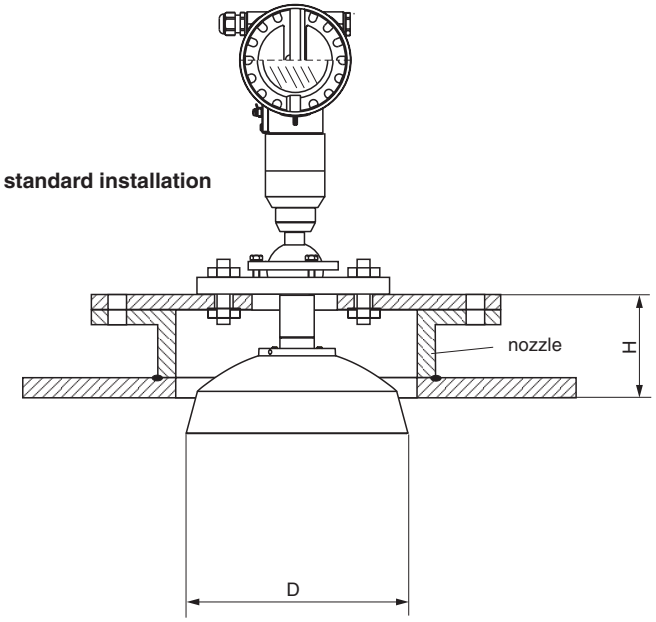
- Observe installation instructions, → 16.
- Marker is aligned towards vessel wall.
- The marker is always exactly in the middle between two bolt-holes in the flange.
- After mounting, the housing can be turned 350° in order to simplify access to the display and the terminal compartment.
- Ideally the parabolic antenna should protrude from the nozzle (1).
  Particularly when using the top target positioner, please ensure that the parabolic reflector is protruding from the nozzle/roof so as not to inhibit alignment.
  Note!
  For applications with higher nozzle it may be necessary to install the parabolic antenna completely in the nozzle (2). The maximum height of the nozzle ($H_{max}$) to the parabolic mirror (option "G, H") should not exceed 500 mm (19.7 in).
  Interfering edges within the nozzle should be avoided.
- **Vertical parabolic antenna.**
  Ideally, the parabolic antenna should be installed vertically.
  To avoid interference reflections or for optimum alignment within the vessel, the FMR250 with optional top target positioner can be swiveled by 15° in all directions.

| Parabolic antenna | Option "G" | Option "H" |
|---|---|---|
| **Antenna size** | 200 mm (8") | 250 mm (10") |
| **D [mm (in)]** | 173 (6.81) | 236 (9.29) |
| **H [mm (in)]** (without antenna extension) | < 50 (< 1.96) | < 50 (< 1.96) |



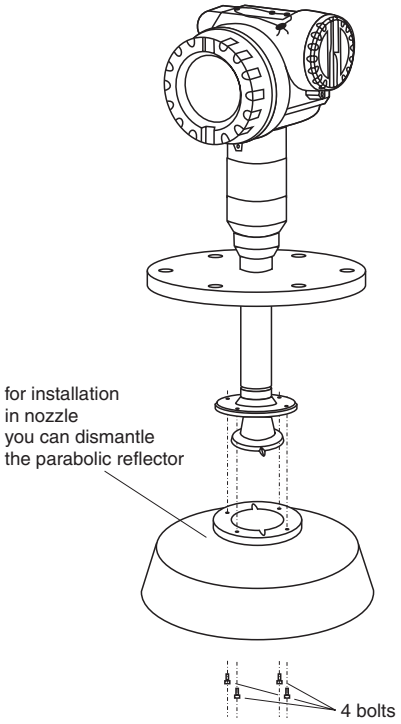

L00-FMR250xx-17-00-00-en-004

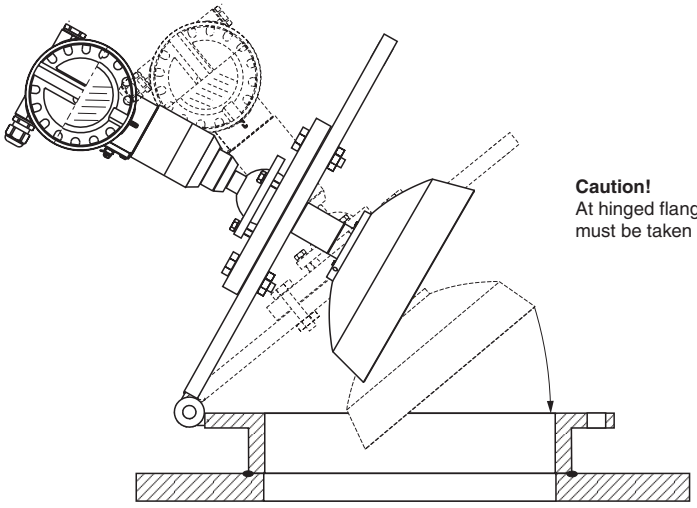
**Examples for installation with small flange (< parabolic reflector) for parabolic antenna (option "G, H")**




| Antenna size | 200 mm (8") | 250 mm (10") |
|---|---|---|
| D [mm (inch)] | 173 (6.81) | 236 (9.29) |
| H [mm (inch)] 1) | < 50 (< 1.96) | < 50 (< 1.96) |

1) without antenna extension



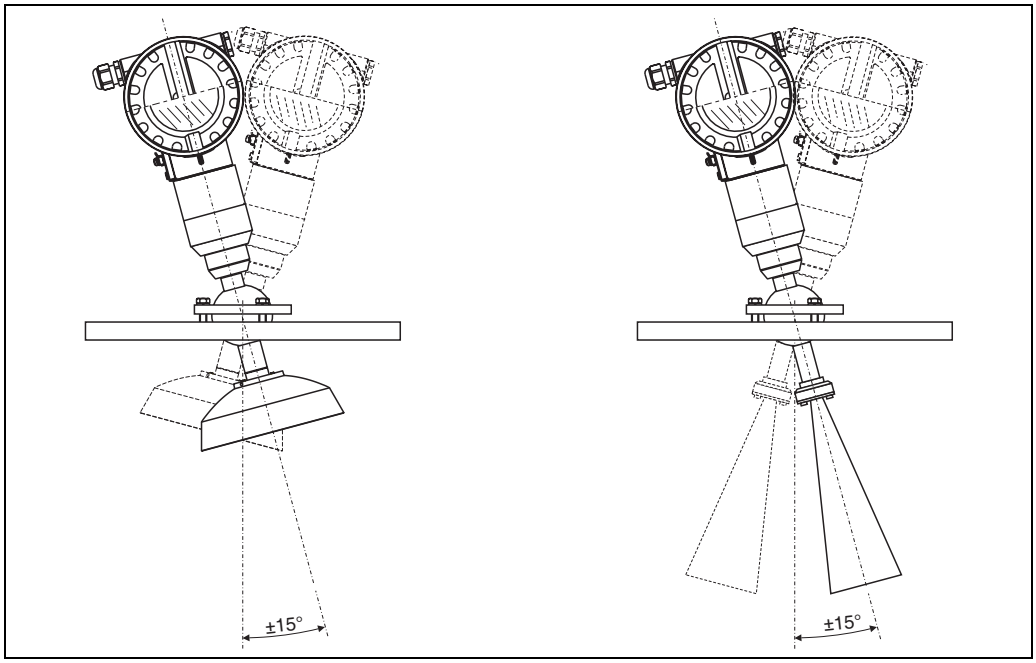



**Caution!**
At hinged flanges, the length of the antenna must be taken into account!

a0011471-en

### FMR250 with top target positioner

Using top target positioner it is possible to tilt the antenna axis by up to 15° in all directions. The top target positioner is used for the optimum alignment of the radar beam with the bulk solids surface.




a0011472

Align antenna axis:

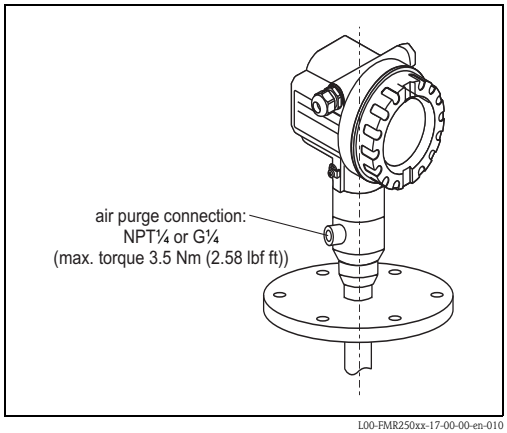
1. Loosen screws.
2. Align antenna axis (here this is possible up to max. ±15° in all directions).
3. Tighten screws.

### Integrated air purge connection

In extremely dusty applications, the integrated air purge connection can prevent clogging of the antenna. Pulsed operation is recommended.

- Pulsed operation:
  max. pressure of purge air: 6 bar abs (87 psi).
- Permanent operation:
  recommended pressure range of the purge air:
  200 mbar to 500 mbar (3 psi to 7.25 psi).

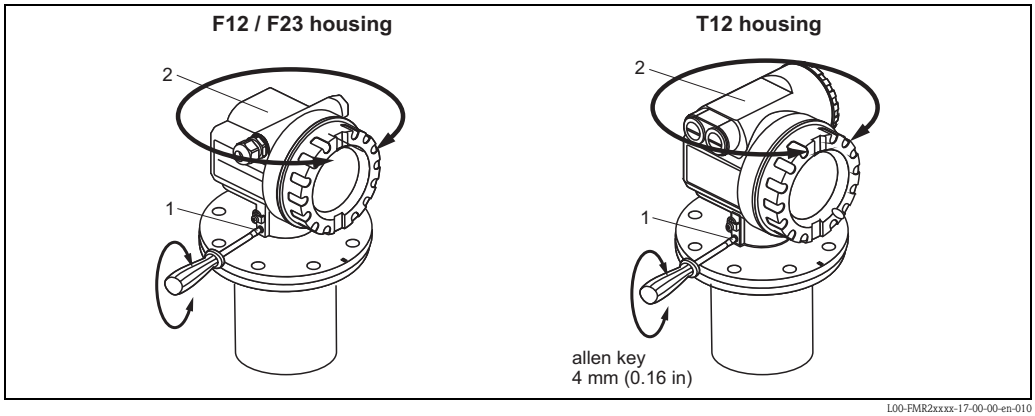
**Caution!**
Make sure to use dry purge air.




L00-FMR250xx-17-00-00-en-010

### 3.4.3 Turn housing

After mounting, the housing can be turned 350° in order to simplify access to the display and the terminal compartment. Proceed as follows to turn the housing to the required position:
- Undo the fixing screws (1)
- Turn the housing (2) in the required direction
- Tighten up the fixing screws (1)




L00-FMR2xxxx-17-00-00-en-010

## 3.5 Post-installation check

After the measuring instrument has been installed, perform the following checks:
- Is the measuring instrument damaged (visual check)?
- Does the measuring instrument correspond to the measuring point specifications such as process temperature/pressure, ambient temperature, measuring range, etc.?
- Is the flange marking correctly aligned (→ 10)?
- Have the flange screws been tightened up with the respective tightening torque?
- Are the measuring point number and labeling correct (visual check)?
- Is the measuring instrument adequately protected against rain and direct sunlight (→ 63)?

# 4 Wiring

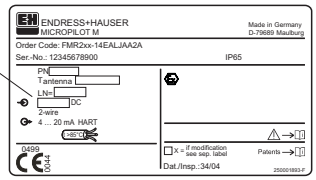
## 4.1 Quick wiring guide

### Wiring in F12/F23 housing

**Caution!**

Before connection please note the following:

- The power supply must be identical to the data on the nameplate (1).
- Switch off power supply before connecting up the device.
- Connect Equipotential bonding to transmitter ground terminal before connecting up the device.
- Tighten the locking screw:
  It forms the connection between the antenna and the housing ground potential.

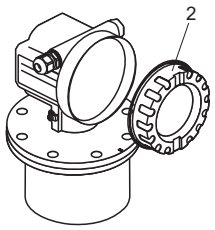



When you use the measuring system in hazardous areas, make sure you comply with national standards and the specifications in the safety instructions (XA's). Make sure you use the specific cable gland.

EX

On devices supplied with a certificate, the explosion protection is designed as follows:

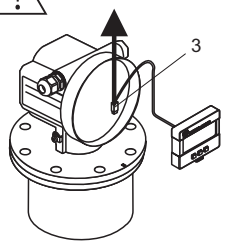
- Housing F12/F23 - Ex ia:
  Power supply must be intrinsically safe.
- The electronics and the current output are galvanically separated from the antenna circuit.




Connect up the Micropilot M as follows:

- Unscrew housing cover (2).
- Remove any display (3) if fitted.
- Remove cover plate from terminal compartment (4).
- Pull out terminal module slightly using pulling loop.
- Insert cable (5) through gland (6).
  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).

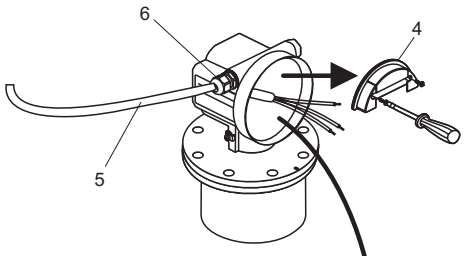
**Unplug display connector!**

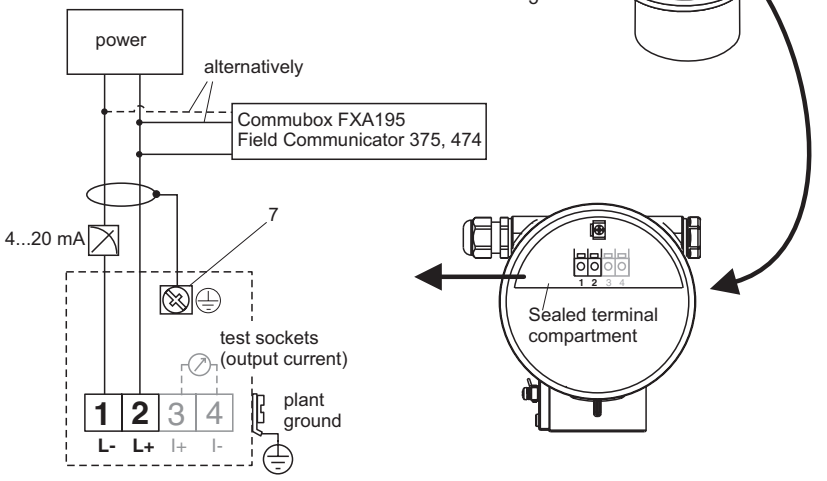



EX

Only ground screening of the line (7) on sensor side.

- Make connection (see pin assignment).
- Re-insert terminal module.
- Tighten cable gland (6).
- Tighten screws on cover plate (4).
- Insert display if fitted.
- Screw on housing cover (2).
- Switch on power supply.



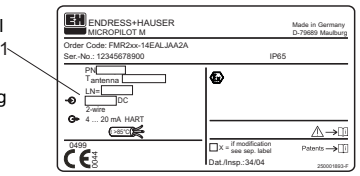

L00-FMR2xxxx-04-00-00-en-013

## Wiring in T12 housing

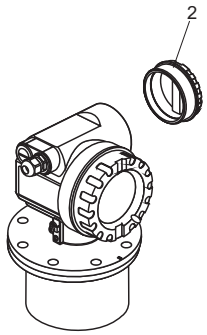
Before connection please note the following:

**Caution!**

- The power supply must be identical to the data on the nameplate (1).
- Switch off power supply before connecting up the device.
- Connect Equipotential bonding to transmitter ground terminal before connecting up the device.
- Tighten the locking screw:
  It forms the connection between the antenna and the housing ground potential.




When you use the measuring system in hazardous areas, make sure you comply with national standards and the specifications in the safety instructions (XA's).
Make sure you use the specific cable gland.

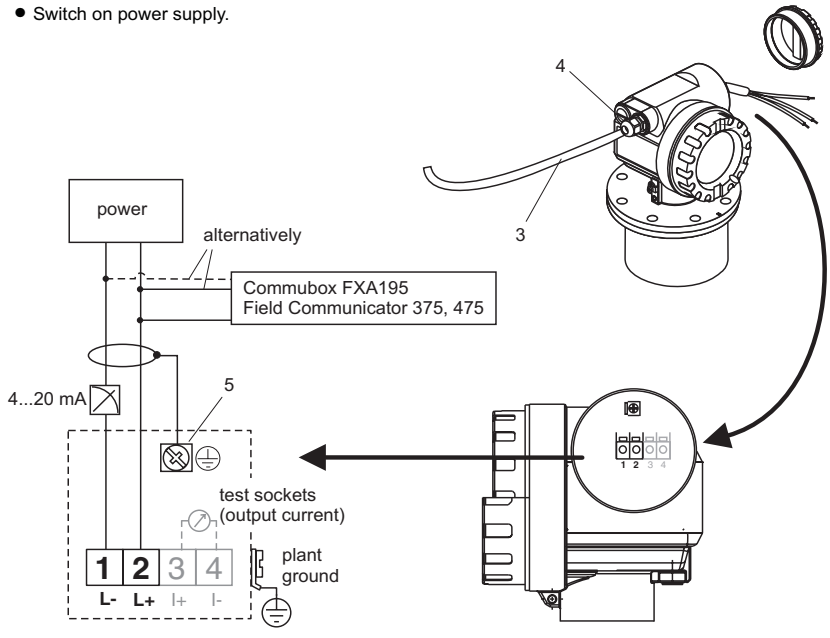



Connect up the Micropilot M as follows:
Before unscrew housing cover (2) at sperate connection room turn off the power supply!

- Insert cable (3) through gland (4).
  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).

Only ground screening of the line (5) on sensor side.

- Make connection (see pin assignment).
- Tighten cable gland (4).
- Screw on housing cover (2).
- Switch on power supply.



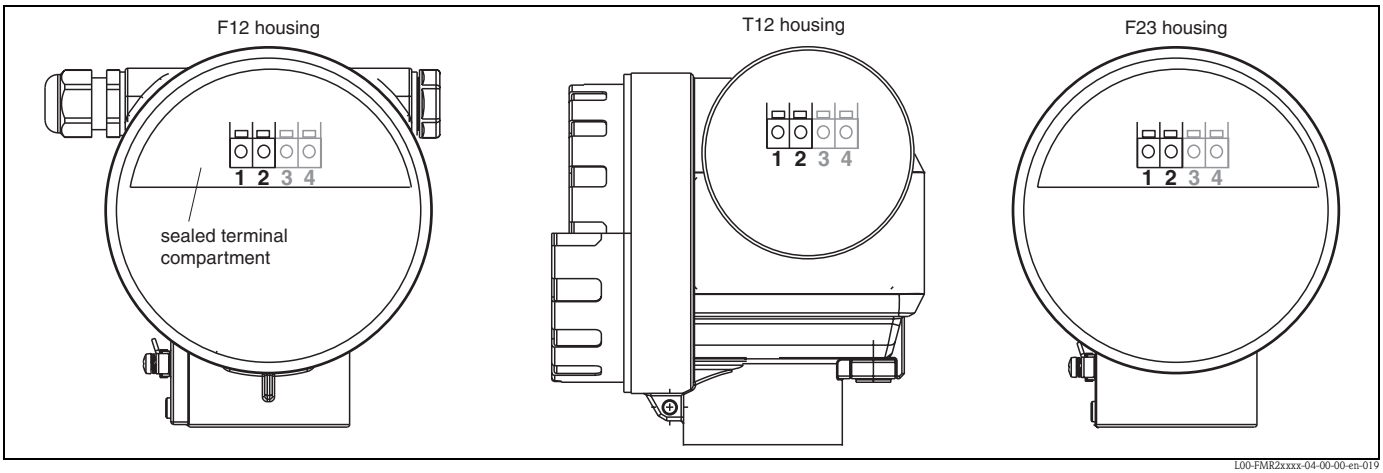

L00-FMR2xxxx-04-00-00-en-014

## 4.2 Connecting the measuring unit

### Terminal compartment

Three housings are available:
- Aluminium housing F12 with additionally sealed terminal compartment for:
  - standard,
  - Ex ia,
  - Ex ia with dust Ex.
- Aluminium housing T12 with separate terminal compartment for:
  - standard,
  - Ex d,
  - Ex ia (with overvoltage protection),
  - dust Ex.
- 316L housing F23 for:
  - standard,
  - Ex ia,
  - Ex ia with dust Ex.

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




The instrument data are given on the nameplate together with important information regarding the analog output and voltage supply. Housing orientation regarding the wiring, → 📄 25.

### Load HART

Minimum load for Hart communication: 250 Ω

### Cable entry

Cable gland: M20x1.5
Cable entry: G½ or ½NPT

### Supply voltage

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

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

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

2) Start up current 11 mA.

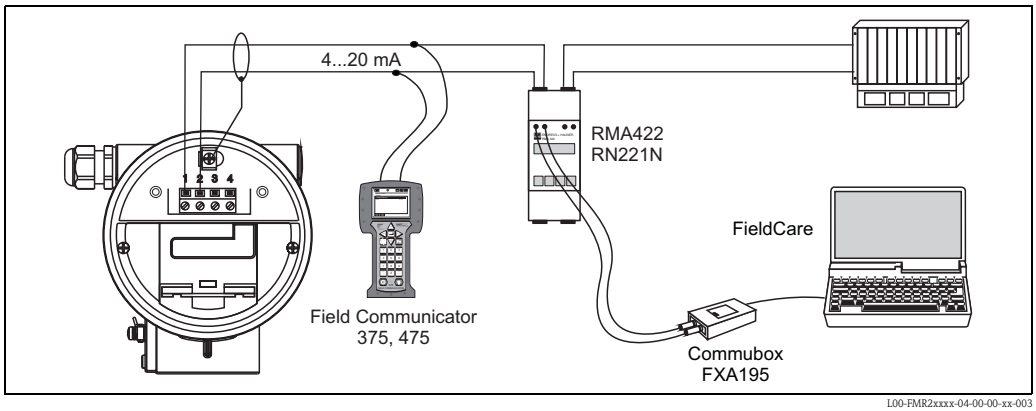
### Power consumption

min. 60 mW, max. 900 mW

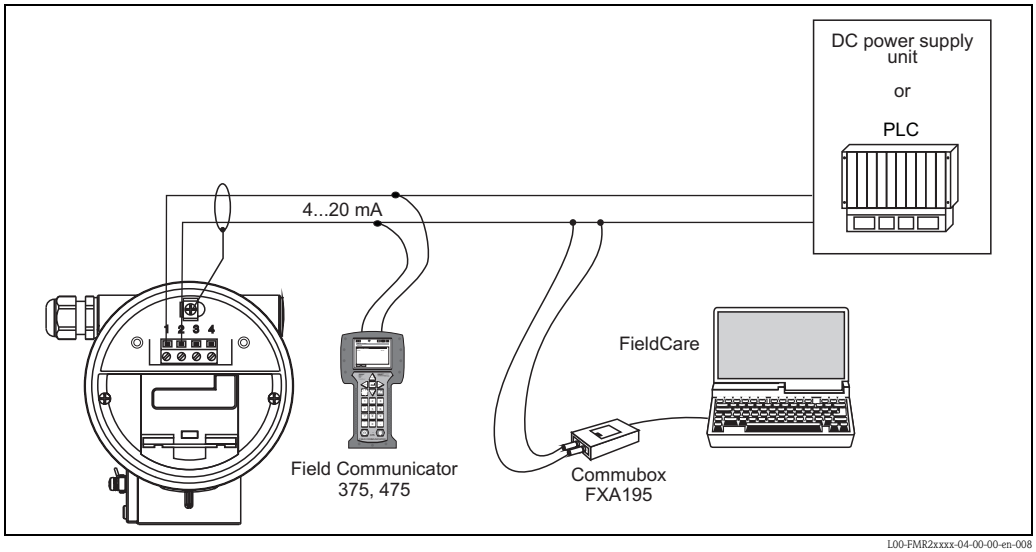
### Current consumption

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

### 4.2.1 HART connection with Endress+Hauser RMA422 / RN221N




### 4.2.2 HART connection with other supplies




Caution!
If the HART communication resistor is not built into the supply unit, it is necessary to insert a communication resistor of 250 Ω into the 2-wire line.

## 4.3 Recommended connection

### 4.3.1 Equipotential bonding

Connect the equipotential bonding to the external ground terminal of the transmitter.

### 4.3.2 Wiring screened cable

Caution!
In Ex applications, the screen must only be grounded on the sensor side. Further safety instructions are given in the separate documentation for applications in explosion hazardous areas.

## 4.4 Degree of protection

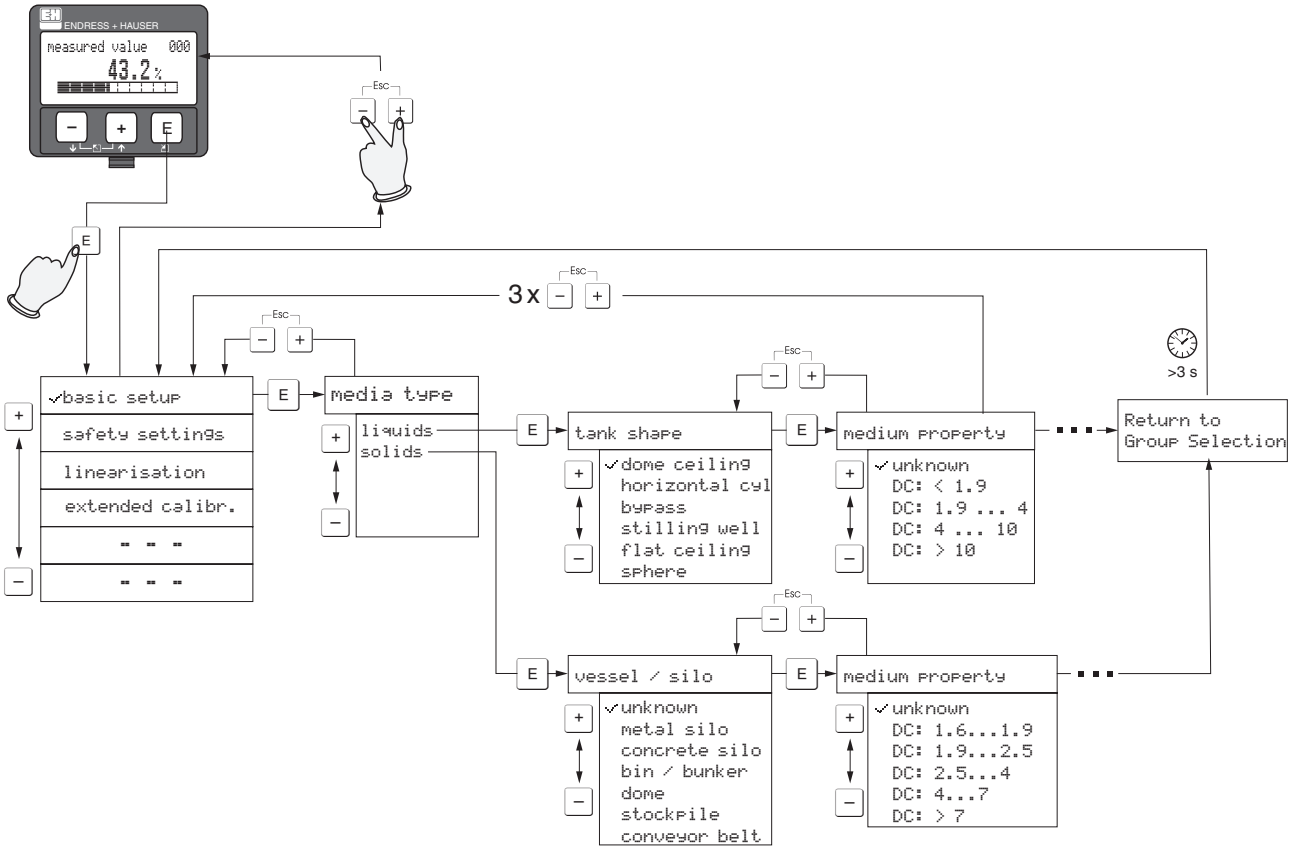
- with closed housing: IP65, NEMA4X (higher degree of protection e.g. IP68 on request)
- with open housing: IP20, NEMA1 (also ingress protection of the display)
- antenna: IP68 (NEMA6P)

## 4.5 Post-connection check

After wiring the measuring instrument, perform the following checks:
- Is the terminal allocation correct (→ 26 and → 27)?
- Is the cable gland tight?
- Is the housing cover screwed tight?
- If auxiliary power is available:
  Is the instrument ready for operation and does the liquid crystal display show any value?

# 5 Operation

## 5.1 Quick operation guide




**Example - Selection and configuration in Operation menu:**

1.) Change from Measured Value Display to **Group Selection** by pressing E

2.) Press − or + to select the required **Function Group** (e.g.. "basic setup (00)") and confirm by pressing E ➜ First f**unction** (e.g. "tank shape (002)") is selected.

**Note!**
The active selection is marked by a ⋰ in front of the menu text.

3.) Activate Edit mode with + or −.

**Selection menus:**

a) Select the required **Parameter** in selected **function** (e.g. "tank shape (002)") with − or +.
b) E confirms selection ➜ ⋰ appears in front of the selected parameter
c) E confirms the edited value ➜ system quits Edit mode
d) + + − (= Esc) interrupts selection ➜ system quits Edit mode

**Typing in numerals and text:**

a) Press + or − to edit the first character of the **numeral / text** (e.g. "empty calibr. (005)")
b) E positions the cursor at the next character ➜ continue with (a) until you have completed your input
c) if a ⇂ symbol appears at the cursor, press E to accept the value entered ➜ system quits Edit mode
d) + + − (= Esc) interrupts the input, system quits Edit mode

4) Press E to select the next **function** (e.g. "medium property (003)")

5) Press + + − (= Esc) once ➜ return to previous **function** (e.g. "tank shape (002)")
Press + + − (= Esc) twice ➜ return to **Group selection**

6) Press + + − (= Esc) to return to **Measured value display**

L00-FMR250xx-19-00-00-en-002

### 5.1.1 General structure of the operating menu

The operating menu is made up of two levels:

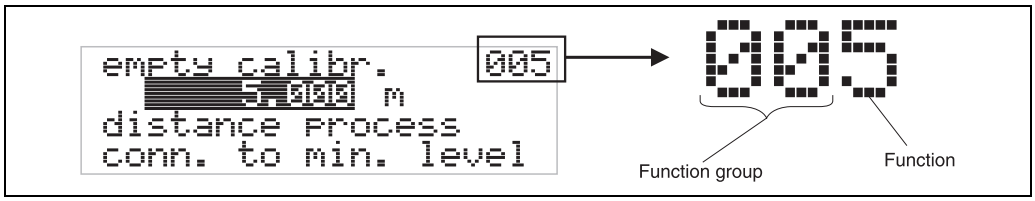
- **Function groups (00, 01, 03, …, 0C, 0D):** The individual operating options of the instrument are split up roughly into different function groups. The function groups that are available include, e.g.: "**basic setup**", "**safety settings**", "**output**", "**display**", etc.
- **Functions (001, 002, 003, …, 0D8, 0D9):** Each function group consists of one or more functions. The functions perform the actual operation or parameterisation of the instrument. Numerical values can be entered here and parameters can be selected and saved. The available functions of the "**basic setup**" **(00)** function group include, e.g.: "**tank shape**" **(002)**, "**medium property**" **(003)**, "**process cond.**" **(004)**, "**empty calibr.**" **(005)**, etc.

If, for example, the application of the instrument is to be changed, carry out the following procedure:

1. Select the "**basic setup**" **(00)** function group.
2. Select the "**tank shape**" **(002)** function (where the existing tank shape is selected).

### 5.1.2 Identifying the functions

For simple orientation within the function menus (→ 86), for each function a position is shown on the display.




The first two digits identify the function group:

- **basic setup** **00**
- **safety settings** **01**
- **linearisation** **04**

. . .

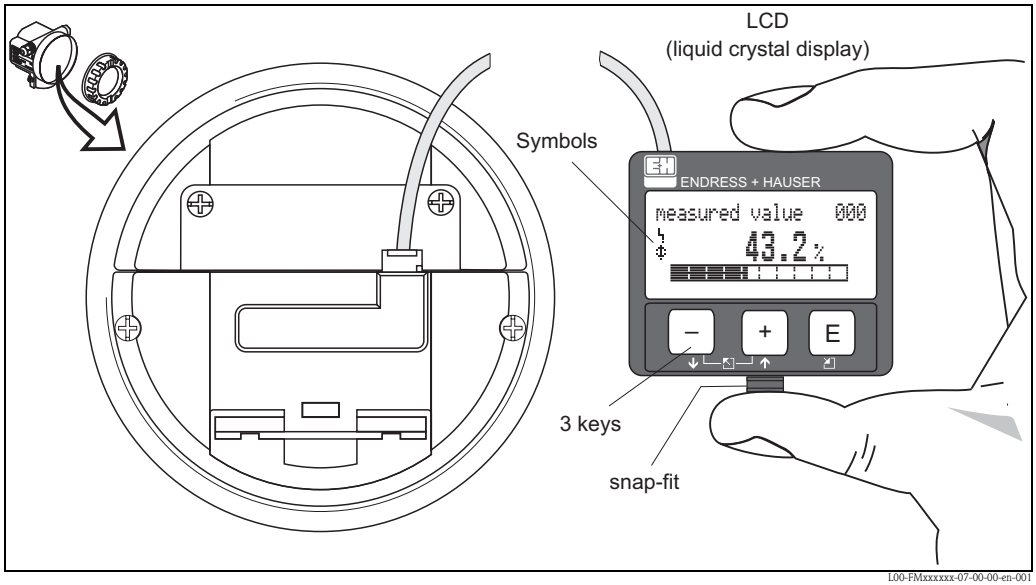
The third digit numbers the individual functions within the function group:

- **basic setup** **00** → 
  - **tank shape** **002**
  - **medium property** **003**
  - **process cond.** **004**

  . . .

Hereafter the position is always given in brackets (e.g. "**tank shape**" **(002)**) after the described function.

## 5.2 Display and operating elements




*Layout of the display and operating elements*

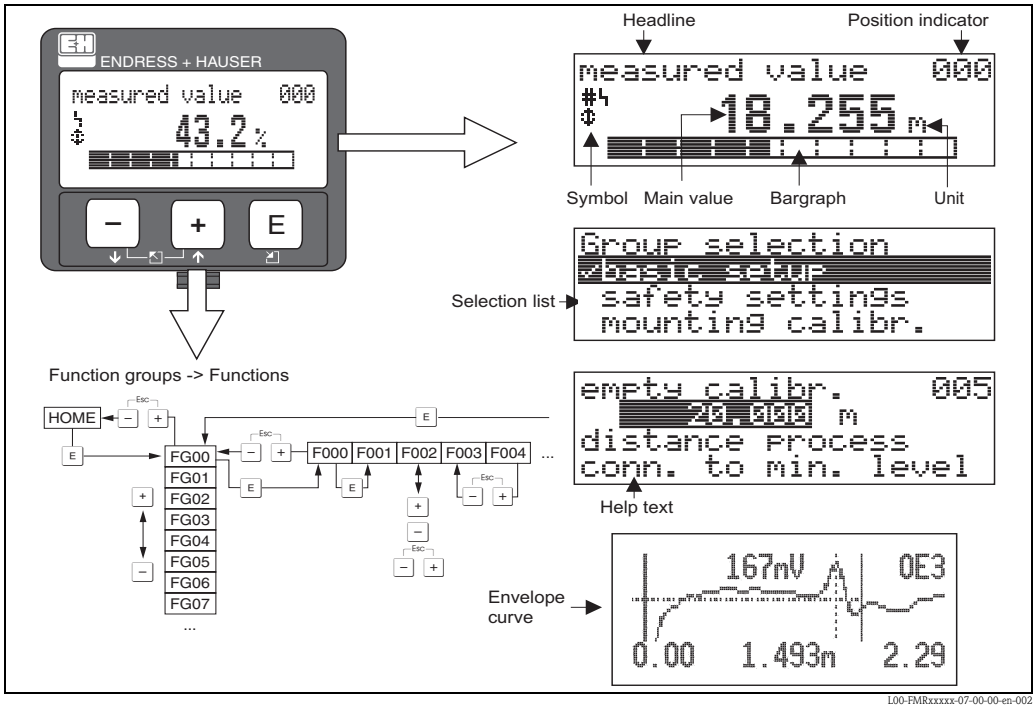
The LCD display can be removed to ease operation by simply pressing the snap-fit (see graphic above). It is connected to the device by means of a 500 mm (19.7 in) cable.

Note!
To access the display the cover of the electronic compartment may be removed even in hazardous area (IS and XP).

### 5.2.1 Display

**Liquid crystal display (LCD):**

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




*Display*

### 5.2.2 Display symbols

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

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

### 5.2.3 Key assignment

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.<br>Edit numeric value within a function. |
| − or ↓ | Navigate downwards in the selection list.<br>Edit numeric value within a function. |
| Esc − + or ← | Navigate to the left within a function group. |
| E | Navigate to the right within a function group, confirmation. |
| + and E<br>or<br>− and E | Contrast settings of the LCD. |
| + and − and E | Hardware lock / unlock<br>After a hardware lock, an operation of the instrument via display or communication is not possible!<br>The hardware can only be unlocked via the display. An unlock parameter must be entered to do so. |

# 5.3 Local operation

## 5.3.1 Locking of the configuration mode

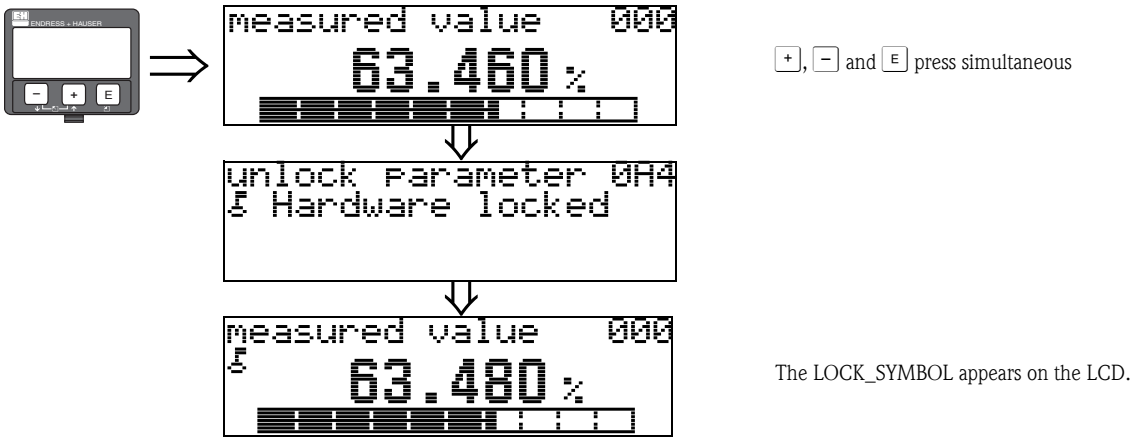
The Micropilot can be protected in two ways against unauthorised changing of instrument data, numerical values or factory settings:

**Function "unlock parameter" (0A4):**

A value **<> 100** (e.g. 99) must be entered in "**unlock parameter**" **(0A4)** in the "**diagnostics**" **(0A)** function group. The lock is shown on the display by the symbol and can be released again either via the display or by communication.

**Hardware lock:**

The instrument is locked by pressing the [+], [−] and [E] keys at the same time.
The lock is shown on the display by the symbol and can **only** be unlocked again via the display by pressing the [+], [−] and [E] keys at the same time again. It is **not** possible to unlock the hardware by communication. All parameters can de displayed even if the instrument is locked.




[+], [−] and [E] press simultaneous

The LOCK_SYMBOL appears on the LCD.

### 5.3.2 Unlocking of configuration mode

If an attempt is made to change parameters on display when the instrument is locked, the user is automatically requested to unlock the instrument:

**Function "unlock parameter" (0A4):**

By entering the unlock parameter (on the display or via communication)

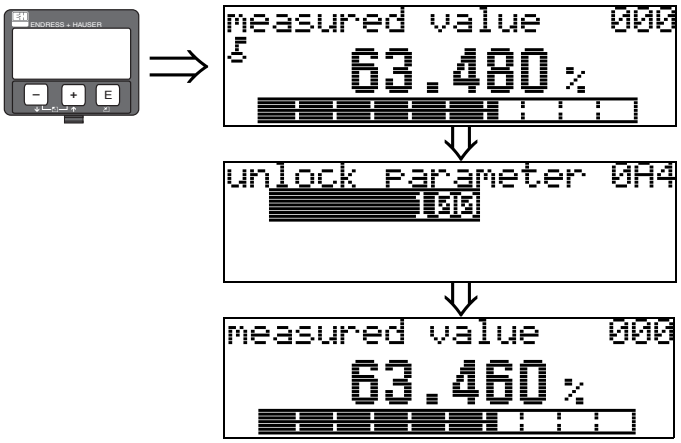
**100** = for HART devices

the Micropilot is released for operation.

**Hardware unlock:**

After pressing the [+], [−] and [E] keys at the same time, the user is asked to enter the unlock parameter

**100** = for HART devices.




[+], [−] and [E] press simultaneous

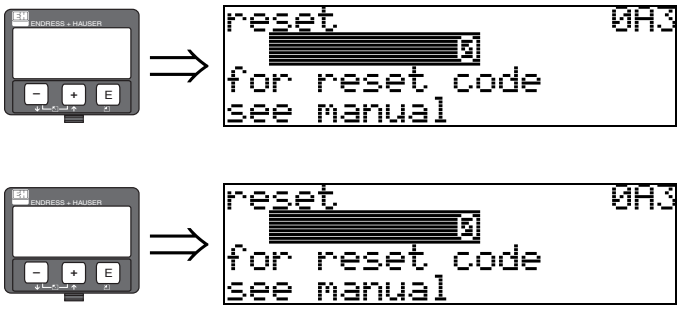
Please enter unlock code and confirm with [E].

Caution!
Changing certain parameters such as all sensor characteristics, for example, influences numerous functions of the entire measuring system, particularly measuring accuracy. There is no need to change these parameters under normal circumstances and consequently, they are protected by a special code known only to the Endress+Hauser service organization.
Please contact Endress+Hauser if you have any questions.

### 5.3.3 Factory settings (Reset)

Caution!
A reset sets the instrument back to the factory settings. This can lead to an impairment of the measurement. Generally, you should perform a basic setup again following a reset.

A reset is only necessary if the instrument...
- ... no longer functions
- ... must be moved from one measuring point to another
- ... is being de-installed /put into storage/installed




**User input ("reset" (0A3)):**
- 333 = customer parameters

**333 = reset customer parameters**
This reset is recommended whenever an instrument with an unknown "history" is to be used in an application:
- The Micropilot is reset to the default values.
- The customer specific tank map is not deleted.
- A linearisation is switched to "**linear**" although the table values are retained. The table can be reactivated in the "**linearisation**" **(04)** function group.

List of functions that are affected by a reset:
- tank shape (002) – liquids only
- vessel / silo (00A) – solids only
- empty calibr. (005)
- full calibr. (006)
- pipe diameter (007) – liquids only
- output on alarm (010)
- output on alarm (011)
- outp. echo loss (012)
- ramp %span/min (013)
- delay time (014)
- safety distance (015)
- in safety dist. (016)
- level/ullage (040)
- linearisation (041)
- customer unit (042)
- diameter vessel (047)
- range of mapping (052)
- pres. Map dist (054)
- offset (057)
- low output limit (062)
- fixed current (063)
- fixed cur. value (064)
- simulation (065)
- simulation value (066)
- 4mA value (068)
- 20mA value (069)
- format display (094)
- distance unit (0C5)
- download mode (0C8)

The tank map can also be reset in the "**mapping**" **(055)** function of the "**extended calibr.**" **(05)** function group.

This reset is recommended whenever an instrument with an unknown "history" is to be used in an application or if a faulty mapping was started:
- The tank map is deleted. The mapping must be recommenced.

## 5.4 Display and acknowledging error messages

**Type of error**

Errors that occur during commissioning or measuring are displayed immediately on the local display. If two or more system or process errors occur, the error with the highest priority is the one shown on the display.

**The measuring system distinguishes between two types of error:**

- **A (Alarm):**
  Instrument goes into a defined state (e.g. max 22 mA)
  Indicated by a constant symbol.
  (For a description of the codes, → 68)
- **W (Warning):**
  Instrument continue measuring, error message is displayed.
  Indicated by a flashing symbol.
  (For a description of the codes, → 68)
- **E (Alarm / Warning):**
  Configurable (e.g. loss of echo, level within the safety distance)
  Indicated by a constant/flashing symbol.
  (For a description of the codes, → 68)


### 5.4.1 Error messages

Error messages appear as four lines of plain text on the display. In addition, a unique error code is also output. A description of the error codes, → 68.

- The "**diagnostics**" **(0A)** function group can display current errors as well as the last errors that occurred.
- If several current errors occur, use + or − to page through the error messages.
- The last occurring error can be deleted in the "**diagnostics**" **(0A)** function group with the funktion"**clear last error**" **(0A2)**.

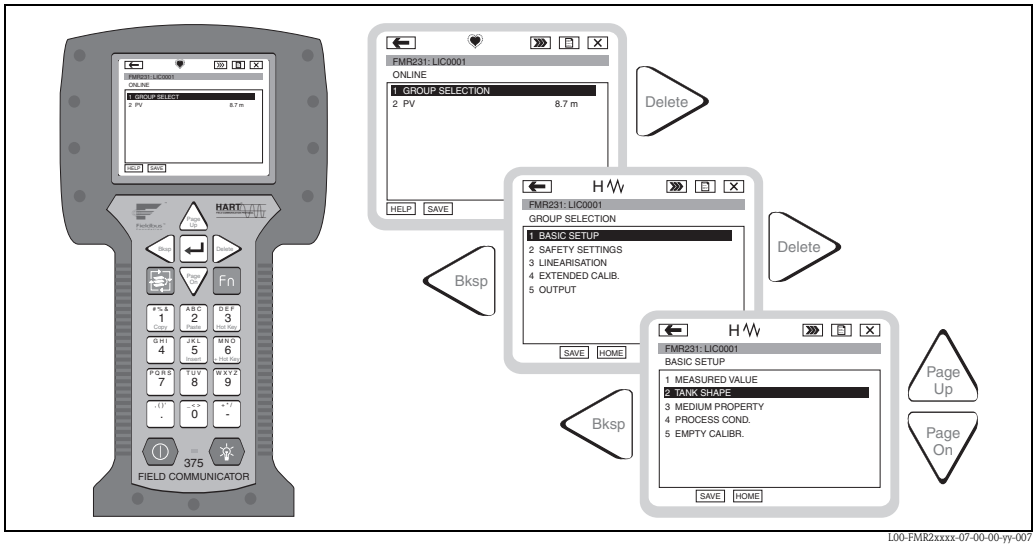
## 5.5 HART communication

Apart from local operation, you can also parameterise the measuring instrument and view measured values by means of a HART protocol. There are two options available for operation:
- Operation via the universal Field Communicator 375, 475.
- Operation via the Personal Computer (PC) using the operating program (e.g. FieldCare, → 30).

Note!
The Micropilot M can also be operated locally using the keys. If operation is prevented by the keys being locked locally, parameter entry via communication is not possible either.

### 5.5.1 Field Communicator 375, 475

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




*Menu operation with the Field Communicator 375*

Note!
- Further information on the Field Communicator 375, 475 is given in the respective operating manual included in the transport bag of the instrument.

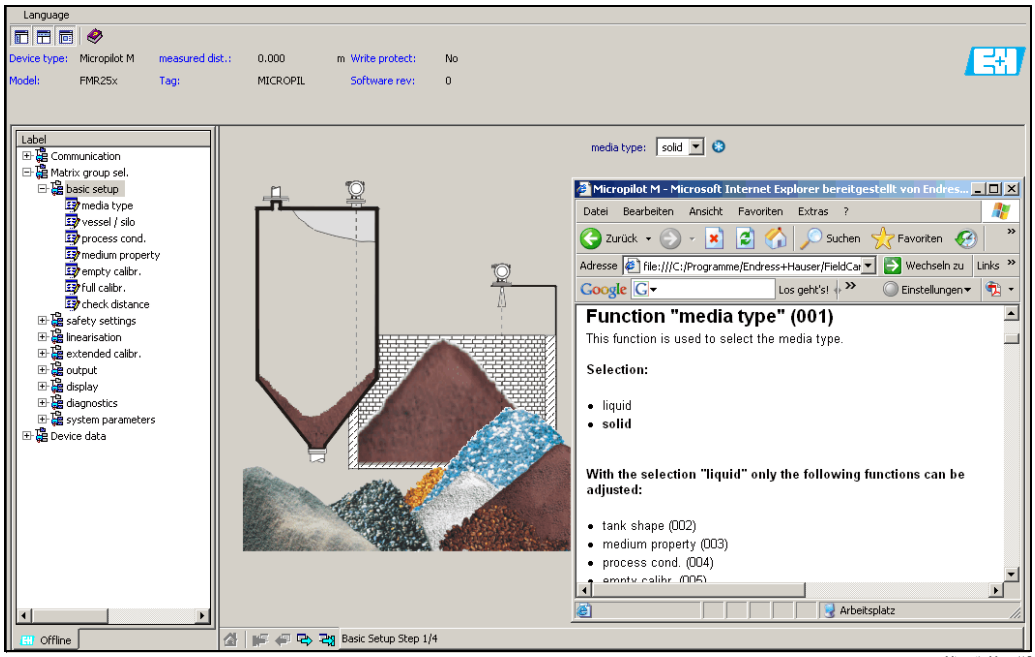
### 5.5.2 Endress+Hauser operating program

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

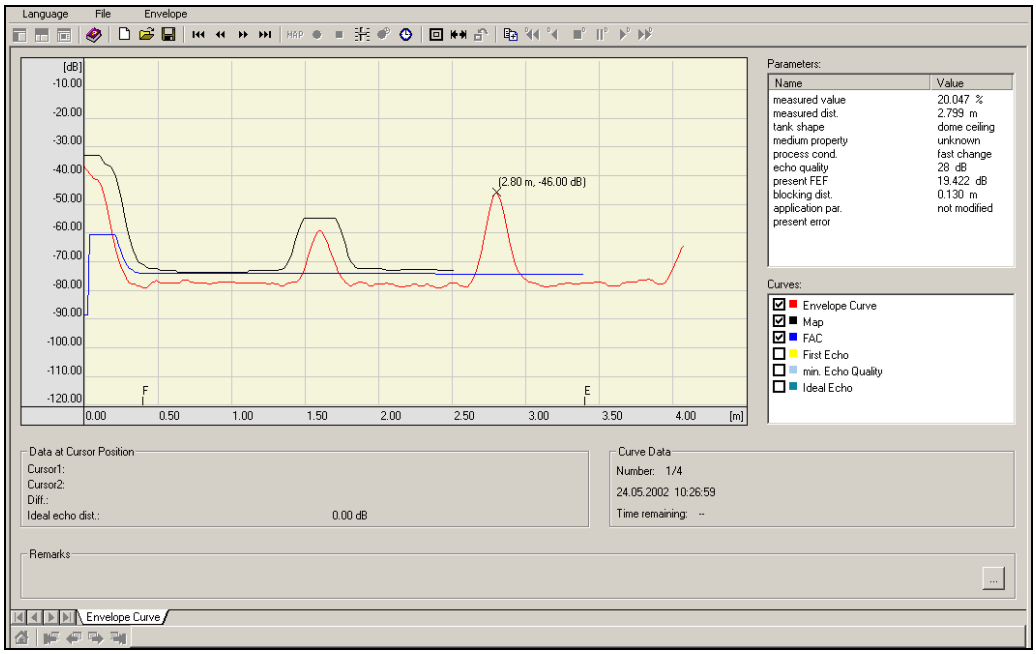
Connection options:
- HART via Commubox FXA195 and the USB port on a computer
- Commubox FXA291 with ToF Adapter FXA291 (USB) via service interface

#### Menu-guided commissioning



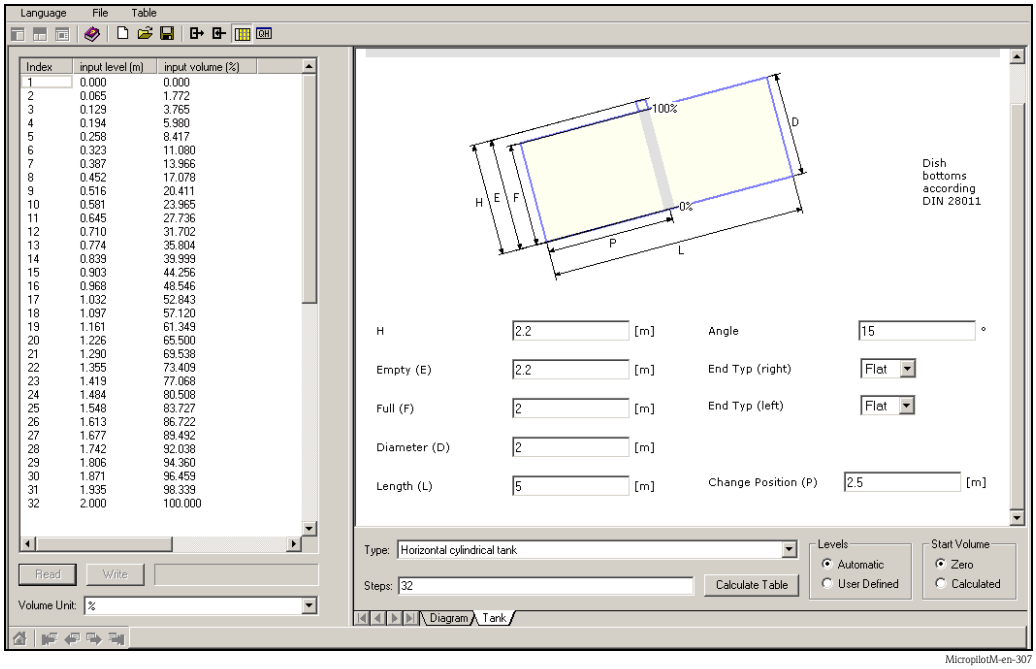
MicropilotM-en-415

## Signal analysis via envelope curve




MicropilotM-en-306

## Tank linearisation




MicropilotM-en-307

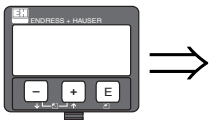
# 6 Commissioning

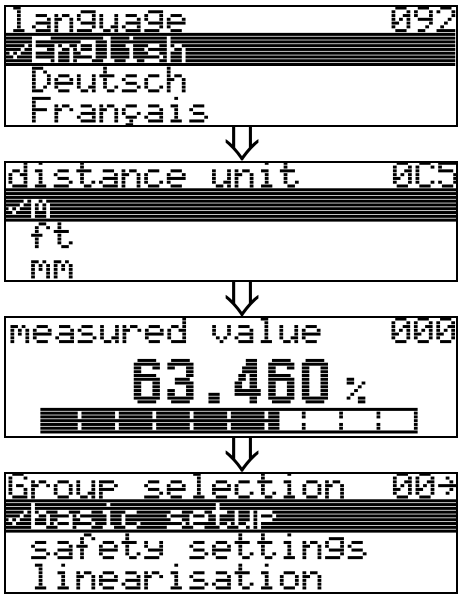
## 6.1 Function check

Make sure that all final checks have been completed before you start up your measuring point:
- Checklist "Post installation check", → 25.
- Checklist "Post connection check", → 31.

## 6.2 Switching on the measuring device

When the instrument is switched on for the first time, the following messages appear in a sequence of 5 s on the display: software version, communication protocol and language selection.




Select the language (this message appears the first time the instrument is switched on)

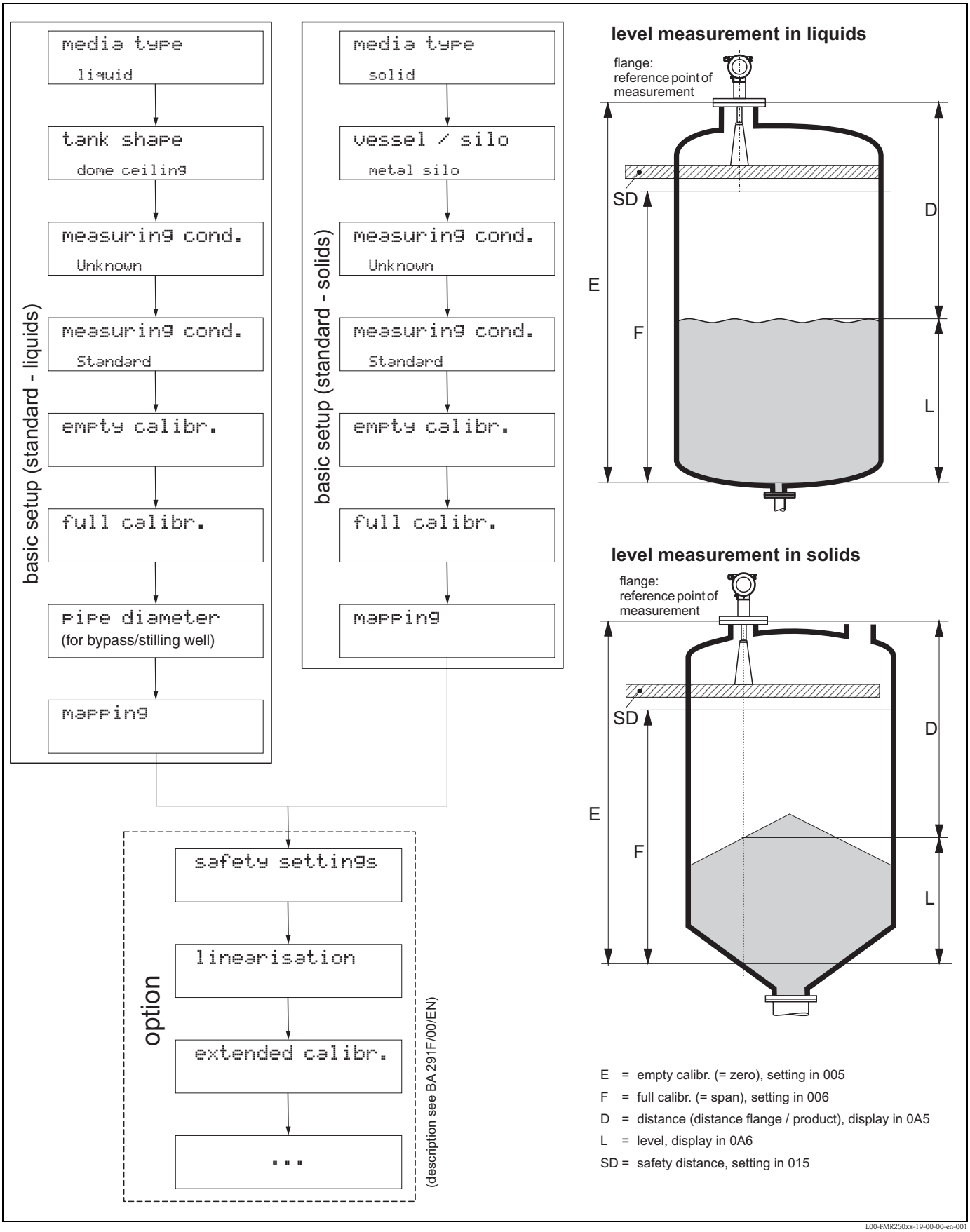
Select the basic unit (this message appears the first time the instrument is switched on)

The current measured value is displayed

After E is pressed, you reach the group selection

This selection enables you to perform the basic setup

## 6.3 Basic Setup



Caution!
The basic setup is sufficient for successful commissioning in most applications. Complex measuring operations necessitate additional functions that the user can use to customise the Micropilot as necessary to suit his specific requirements. The functions available to do this are described in detail in the BA291F/00/EN.

Comply with the following instructions when configuring the functions in the "**basic setup**" **(00)**:
- Select the functions as described → 32.
- Some functions can only be used depending on the parameterisation of the instrument. For example, the pipe diameter of a stilling well can only be entered if "**stilling well**" was selected beforehand in the "**tank shape**" **(002)** function.
- Certain functions (e.g. starting an interference echo mapping (053)) prompt you to confirm your data entries. Press [+] or [−] to select "**YES**" and press [E] to confirm. The function is now started.
- If you do not press a key during a configurable time period (→ function group "**display**" **(09)**), an automatic return is made to the home position (measured value display).

Note!
- The instrument continues to measure while data entry is in progress, i.e. the current measured values are output via the signal outputs in the normal way.
- If the envelope curve mode is active on the display, the measured values are updated in a slower cycle time. Thus, it is advisable to leave the envelope curve mode after the measuring point has been optimised.
- If the power supply fails, all preset and parameterised values remain safely stored in the EEPROM.
- All functions are described in detail, as is the overview of the operating menu itself, in the manual **"BA291F - Description of Instrument Functions"**, which is found on the enclosed CD-ROM.
- The default values of the parameters are typed in **boldface**.

## 6.4 Basic Setup with the device display

**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.

### 6.4.1 Function group "basic setup" (00)


**Function "media type" (001)**


This function is used to select the media type.

**Selection:**
- liquid
- **solid**

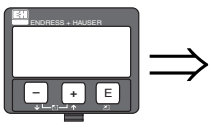
**With the selection "liquid" only the following functions can be adjusted:**

| | |
|---|---|
| ■ tank shape | 002 |
| ■ medium property | 003 |
| ■ process cond. | 004 |
| ■ empty calibr. | 005 |
| ■ full calibr. | 006 |
| ■ pipe diameter | 007 |
| ■ check distance | 051 |
| ■ range of mapping | 052 |
| ■ start mapping | 053 |
| ■ . . . | |

**With the selection "solids" only the following functions can be adjusted:**

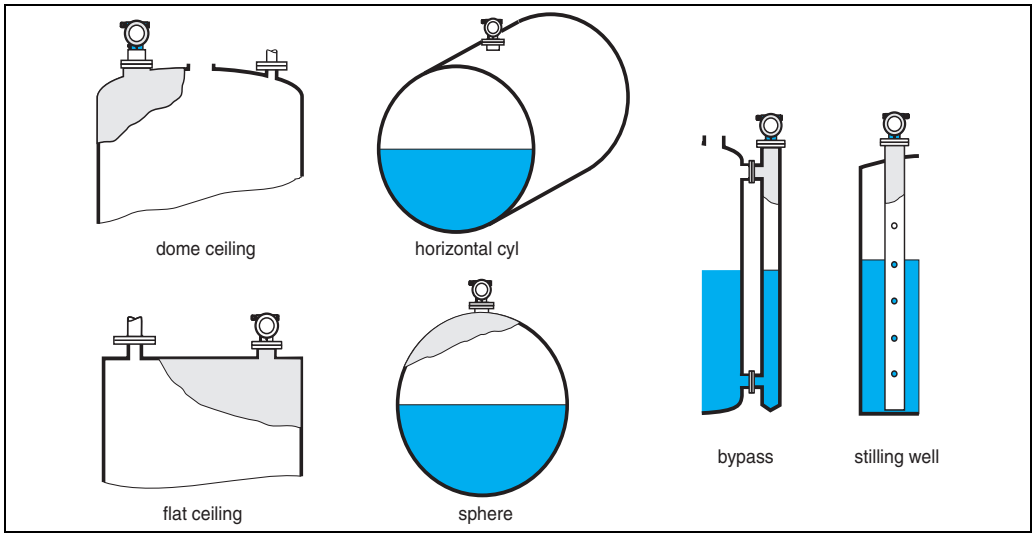
| | |
|---|---|
| ■ vessel / silo | 00A |
| ■ medium property | 00B |
| ■ process cond. | 00C |
| ■ empty calibr. | 005 |
| ■ full calibr. | 006 |
| ■ check distance | 051 |
| ■ range of mapping | 052 |
| ■ start mapping | 053 |
| ■ . . . | |

### Function "tank shape" (002), liquids only



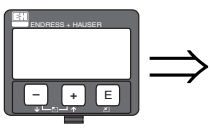

This function is used to select the tank shape.

**Selection:**
- **dome ceiling**
- horizontal cyl
- bypass
- stilling well
- flat ceiling
- sphere




L00-FMR2xxxx-14-00-06-en-007

### Function "medium property" (003), liquids only



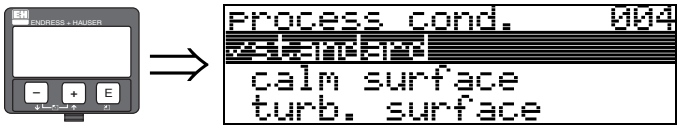

This function is used to select the dielectric constant.

**Selection:**
- **unknown**
- DC: < 1.9
- DC: 1.9 ... 4
- DC: 4 ... 10
- DC: > 10

| Product class | DC (εr) | 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 |

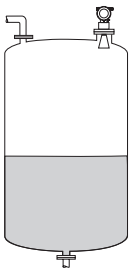
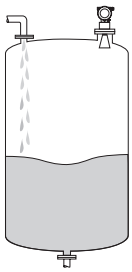
1) Treat Ammonia NH3 as a medium of group A, i.e. use FMR230 in a stilling well.

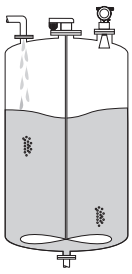
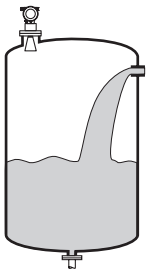
**Function "process cond." (004) , liquids only**



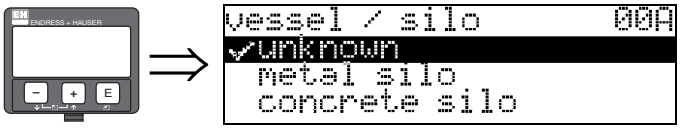

This function is used to select the process conditions.

**Selection:**
- **standard**
- calm surface
- turb. surface
- agitator
- fast change
- test:no filter

| standard | calm surface | turb. surface |
|---|---|---|
| For all applications that do not fit into any of the following groups. | Storage tanks with immersion tube or bottom filling. | Storage / buffer tanks with rough surface due to free filling or mixer nozzles. |
| |  |  |
| The filter and output damping are set to average values. | The averaging filters and output damping are set to high values.<br>→ steady meas. value<br>→ precise measurement<br>→ slower reaction time | Special filters to smooth the input signals are emphasised.<br>→ smoothed meas. value<br>→ medium fast reaction time |

| agitator | fast change | test:no filter |
|---|---|---|
| Agitated surfaces (with possible vortex) due to agitators. | Rapid change of level, particularly in small tanks. | All filters can be switched off for service / diagnostic purposes. |
|  |  | |
| Special filters to smooth the input signals are set to high values.<br>→ smoothed meas. value<br>→ medium fast reaction time<br>→ minimization of effects by agitator blades. | The averaging filters are set to low values. The output damping is set to 0.<br>→ rapid reaction time<br>→ possibly unsteady meas. value | All filters off. |

### Function "vessel / silo" (00A), solids only




This function is used to select the vessel / silo.

**Selection:**
- **unknown**
- metal silo
- concrete silo
- bin / bunker
- dome
- stockpile
- conveyor belt

### Function "medium property" (00B), solids only


This function is used to select the dielectric constant.

**Selection:**
- **unknown**
- DC: 1.6 ... 1.9
- DC: 1.9 ... 2.5
- DC: 2.5 ... 4
- DC: 4 ... 7
- DC: > 7

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

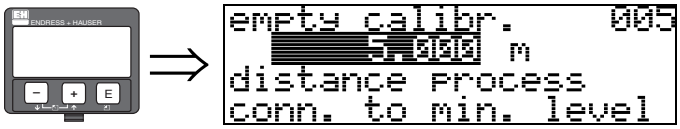
The respective lower group applies for very loose or loosened bulk solids.

**Function "process cond." (00C), solids only**

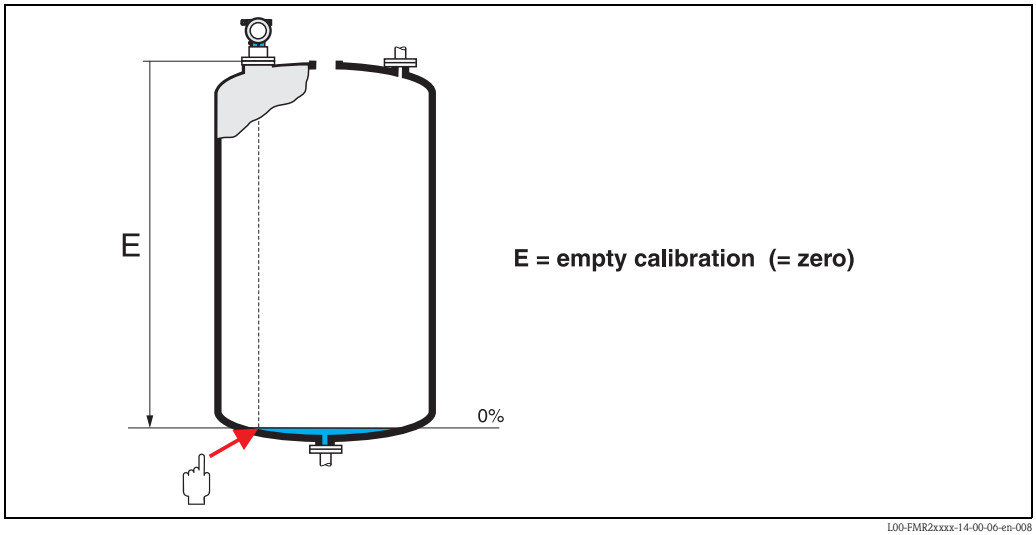

This function is used to select the process conditions.

**Selection:**
- **standard**
- fast change
- slow change
- test:no filter

**Function "empty calibr." (005)**



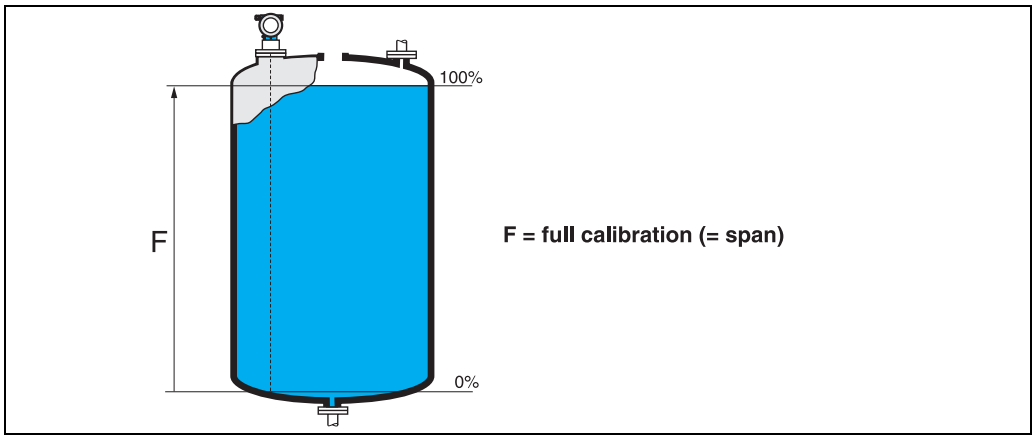

This function is used to enter the distance from the flange (reference point of the measurement) to the minimum level (=zero).




Caution!
For dish bottoms or conical outlets, the zero point should be no lower than the point at which the radar beam hits the bottom of the vessel.

### Function "full calibr." (006)


This function is used to enter the distance from the minimum level to the maximum level (=span). In principle, it is possible to measure up to the tip of the antenna. However, due to considerations regarding corrosion and build-up, the end of the measuring range should not be chosen any closer than 50 mm (1.97 in) to the tip of the antenna.

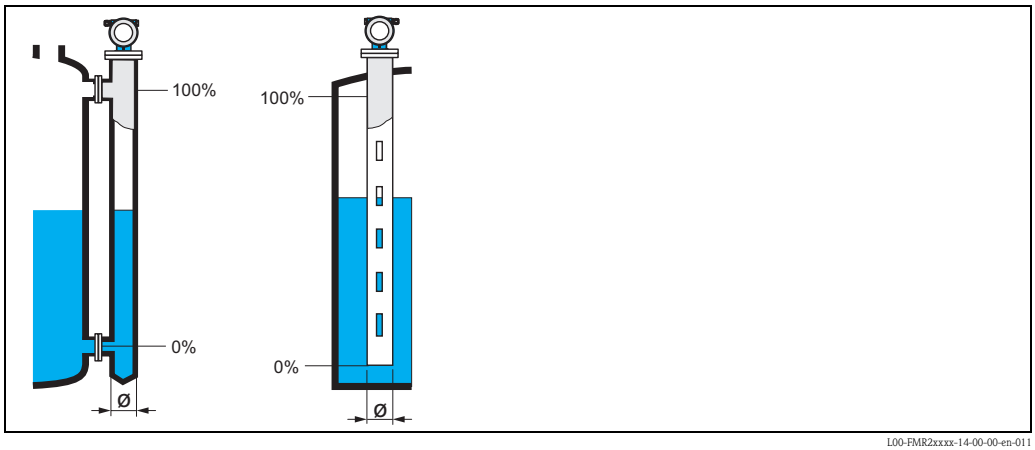



L00-FMR2xxxx-14-00-06-en-009

Note!
If **bypass** or **stilling well** was selected in the "**tank shape**" **(002)** function, the pipe diameter is requested in the following step.

### Function "pipe diameter" (007)

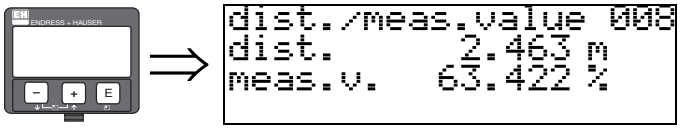

This function is used to enter the pipe diameter of the stilling well or bypass pipe.




L00-FMR2xxxx-14-00-00-en-011

Microwaves propagate more slowly in pipes than in free space. This effect depends on the inside diameter of the pipe and is automatically taken into account by the Micropilot. It is only necessary to enter the pipe diameter for applications in a bypass or stilling well.

### Function "dist./meas.value" (008)

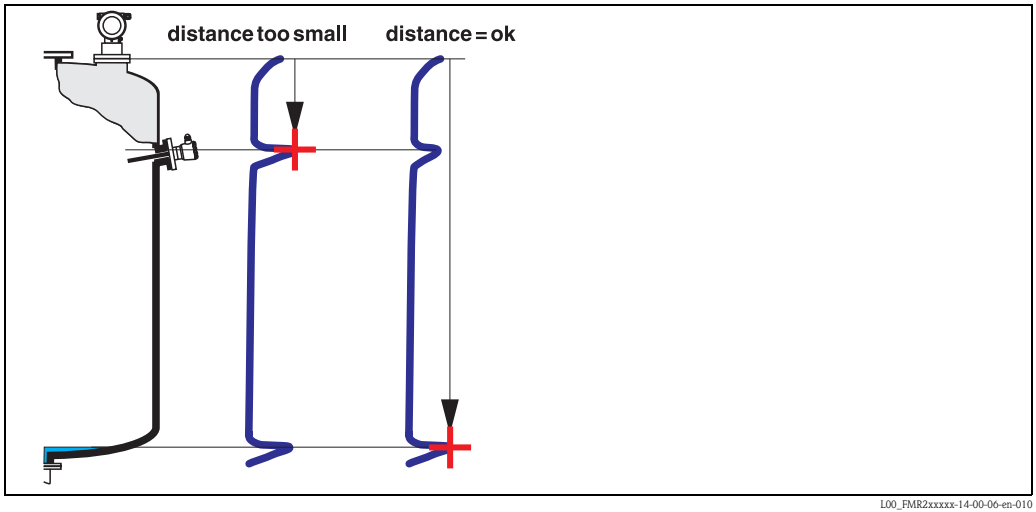



The **distance** measured from the reference point to the product surface and the **level** calculated with the aid of the empty adjustment are displayed. Check whether the values correspond to the actual level or the actual distance. The following cases can occur:
- Distance correct – level correct → continue with the next function, "**check distance**" **(051)**
- Distance correct – level incorrect → Check "**empty calibr.**" **(005)**
- Distance incorrect – level incorrect → continue with the next function, "**check distance**" **(051)**

### Function "check distance" (051)


This function triggers the mapping of interference echoes. To do so, the measured distance must be compared with the actual distance to the product surface. The following options are available for selection:

**Selection:**
- distance = ok
- dist. too small
- dist. too big
- **dist. unknown**
- manual




**distance = ok**
- mapping is carried out up to the currently measured echo
- The range to be suppressed is suggested in the "**range of mapping**" **(052)** function

Anyway, it is wise to carry out a mapping even in this case.

**dist. too small**
- At the moment, an interference is being evaluated
- Therefore, a mapping is carried out including the presently measured echoes
- The range to be suppressed is suggested in the "**range of mapping**" **(052)** function

**dist. too big**
- This error cannot be remedied by interference echo mapping
- Check the application parameters **(002), (003), (004)** and "**empty calibr.**" **(005)**

**dist. unknown**
If the actual distance is not known, no mapping can be carried out.

**manual**
A mapping is also possible by manual entry of the range to be suppressed. This entry is made in the "**range of mapping**" **(052)** function.

Caution!
The range of mapping must end 0,5 m (1.6 ft) before the echo of the actual level. For an empty vessel, do not enter E, but E – 0,5 m (1.6 ft)). If a mapping already exists, it is overwriten up to the distance specified in "**range of mapping**" **(052)**. Beyond this value the existing mapping remains unchanged.

**Function "range of mapping" (052)**


This function displays the suggested range of mapping. The reference point is always the reference point of the measurement (→ 44). This value can be edited by the operator.
For manual mapping, the default value is 0 m.

**Function "start mapping" (053)**

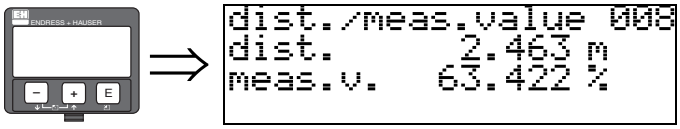

This function is used to start the interference echo mapping up to the distance given in "**range of mapping**" **(052)**.

**Selection:**
- off → no mapping is carried out
- on → mapping is started

During the mapping process the message "**record mapping**" is displayed.

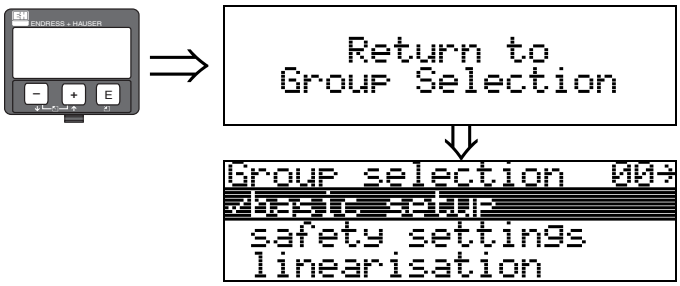
Caution!
A mapping will be recorded only, if the device is not in alarm-state.

**Function "dist./meas.value" (008)**




The **distance** measured from the reference point to the product surface and the **level** calculated with the aid of the empty adjustment are displayed. Check whether the values correspond to the actual level or the actual distance. The following cases can occur:

- Distance correct – level correct → continue with the next function, "**check distance**" **(051)**
- Distance correct – level incorrect → Check "**empty calibr.**" **(005)**
- Distance incorrect – level incorrect → continue with the next function, "**check distance**" **(051)**

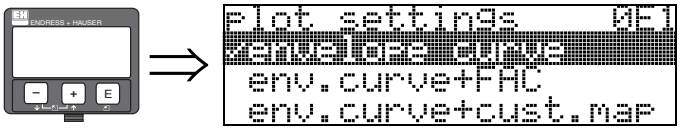



After 3 s, the following message appears

### 6.4.2 Envelope curve with device display

After the basic setup, an evaluation of the measurement with the aid of the envelope curve ("**envelope curve**" **(0E)** function group) is recommended.

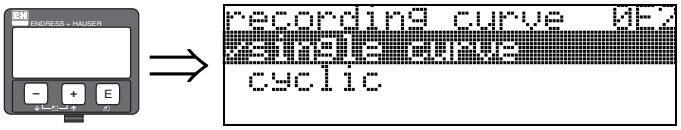
**Function "plot settings" (0E1)**




Select which information will be displayed in the LCD:
- **envelope curve**
- env.curve+FAC (on FAC see BA291F/00/EN)
- env.curve+cust.map (i.e. customer tank map is also displayed)

**Function "recording curve" (0E2)**

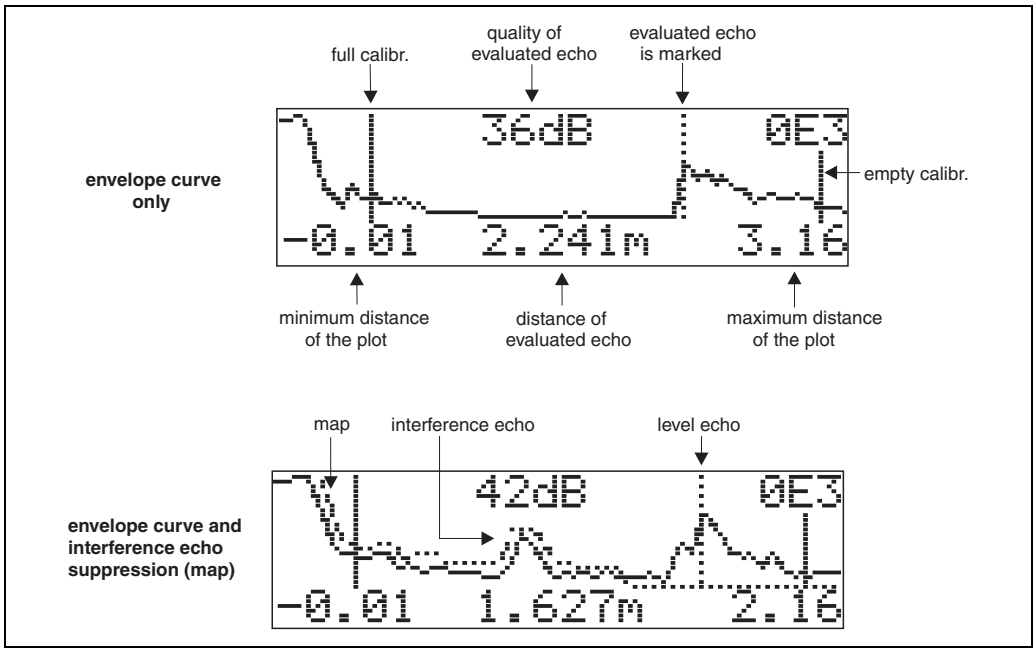
This function defines whether the envelope curve is read as a
- **single curve**
  or
- cyclic.




Note!
- If the cyclical envelope curve is active in the display, the measured value is refreshed in a slower cycle time. It is therefore recommended to exit the envelope curve display after optimising the measuring point.
- An **orientation** of the Micropilot can help to optimise measurement in applications with very weak level echos or strong interference echos by increasing the useful echo/reducing the interference echo (see "Orientation of the Micropilot", → 74).
  When using the Wave Guide antenna: **No** orientation is required!

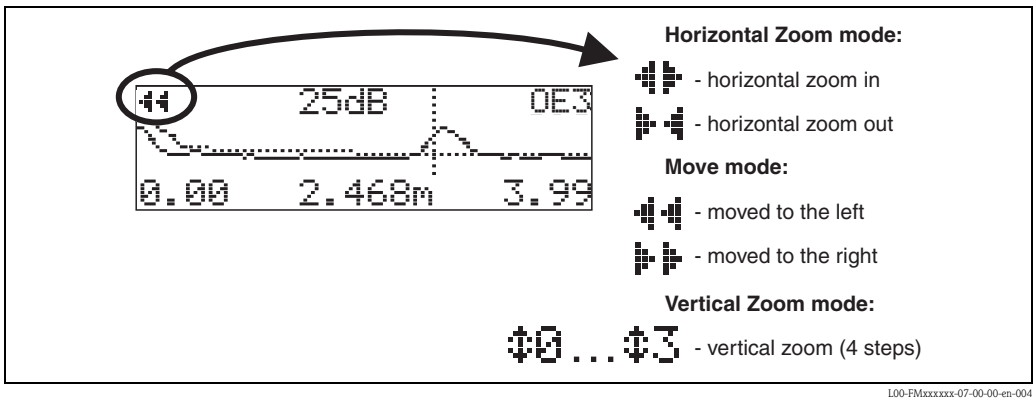
### Function "envelope curve display" (0E3)

The envelope curve is displayed in this function. You can use it to obtain the following information:




### Navigating in the envelope curve display

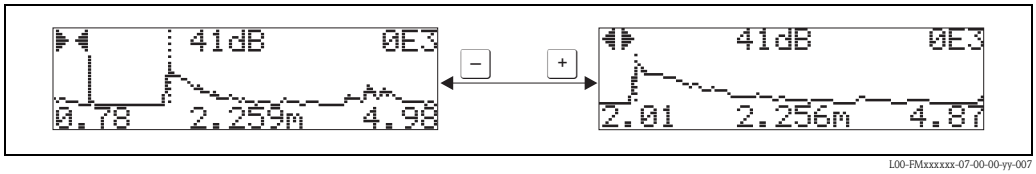
Using navigation, the envelope curve can be scaled horizontally and vertically and shifted to the left or the right. The active navigation mode is indicated by a symbol in the top left hand corner of the display.




### Horizontal Zoom mode

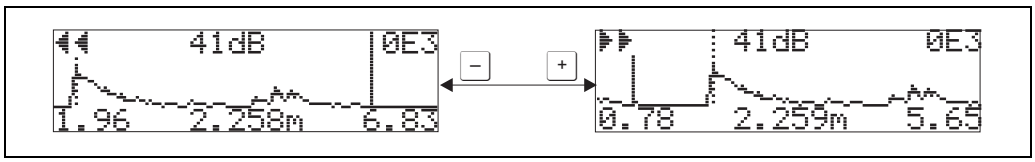
Firstly, go into the envelope curve display. Then press [+] or [−] to switch to the envelope curve navigation. You are then in Horizontal Zoom mode. Either ↔ or → ← is displayed.

- [+] increases the horizontal scale.
- [−] reduces the horizontal scale.



### Move mode

Then press [E] to switch to Move mode. Either ⇤ or ⇥ is displayed.
- [+] shifts the curve to the right.
- [–] shifts the curve to the left.

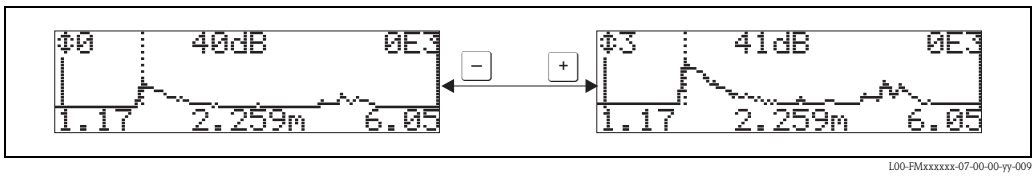



L00-FMxxxxxx-07-00-00-yy-008

### Vertical Zoom mode

Press [E] once more to switch to Vertical Zoom mode. ⇳1 is displayed. You now have the following options.
- [+] increases the vertical scale.
- [–] reduces the vertical scale.

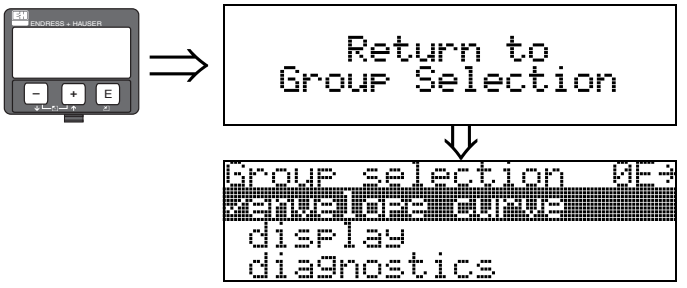
The display icon shows the current zoom factor (⇳0 to ⇳3).




L00-FMxxxxxx-07-00-00-yy-009

### Exiting the navigation

- Press [E] again to run through the different modes of the envelope curve navigation.
- Press [+] and [–] to exit the navigation. The set increases and shifts are retained. Only when you reactivate the "**recording curve**" **(0E2)** function does the Micropilot use the standard display again.




After 3 s, the following message appears

## 6.5 Basic Setup with the Endress+Hauser operating program

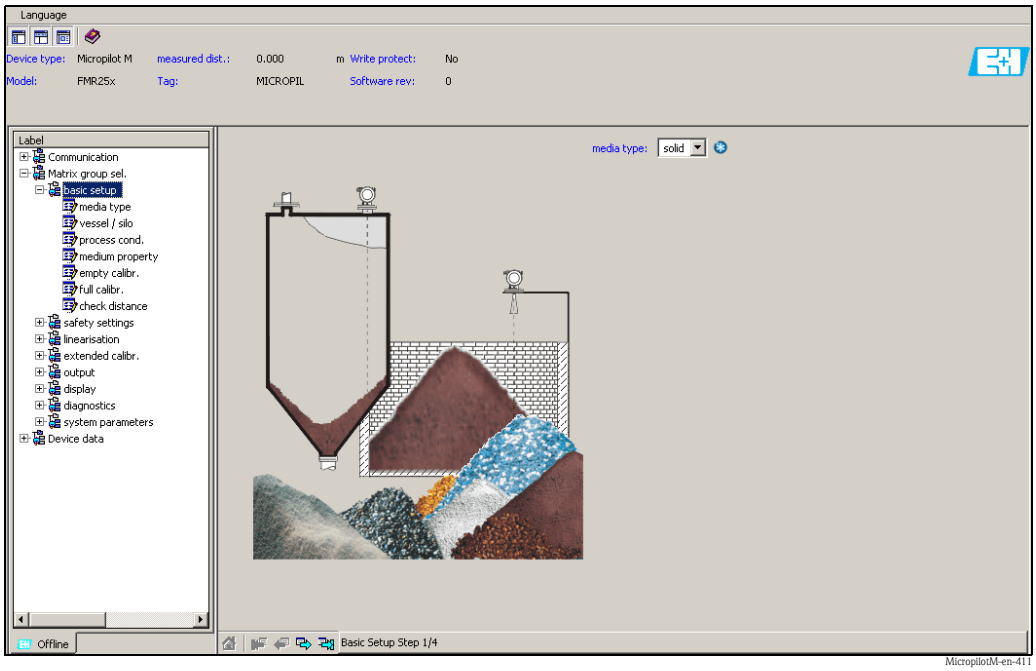
To carry out the basic setup with the operating program, proceed as follows:
- Start the operating program and establish a connection.
- Select the "**basic setup**" function group in the navigation window.

The following display appears on the screen:

**Basic Setup step 1/4:**

- media type
  - if "**liquid**" is selected in the "**media type**" function for level measurement in liquids
  - if "**solid**" is selected in the "**media type**" function for level measurement in solids

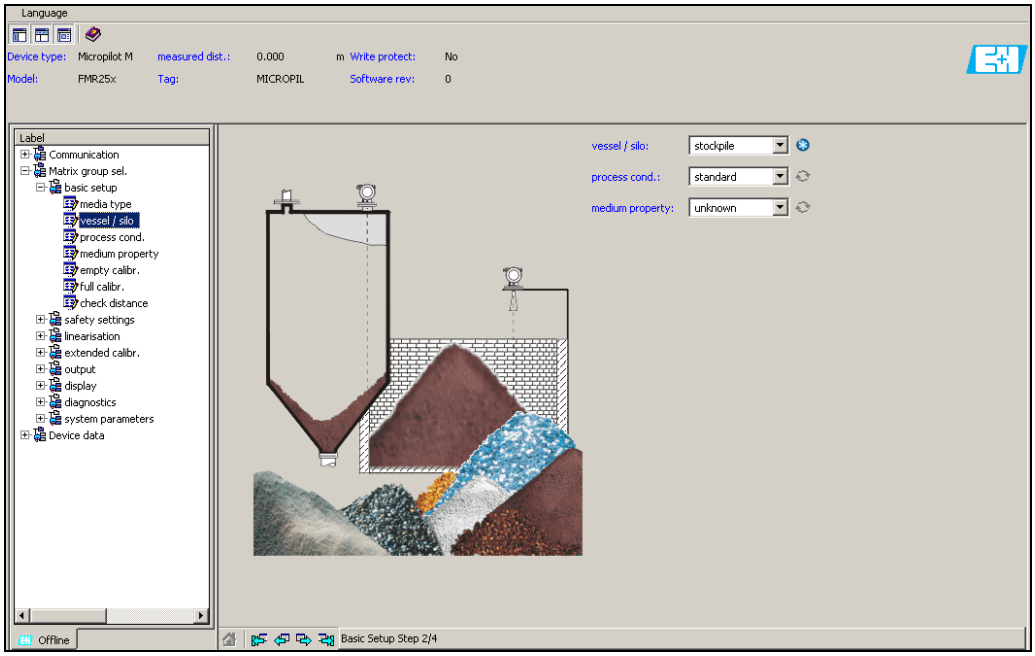
Note!
Each parameter that is changed must be confirmed with the **RETURN** key!




- The "**Next**" button moves you to the next screen display:

**Basic Setup step 2/4:**

- Enter the application parameters:
  - Vessel / silo
  - Medium property
  - Process cond.

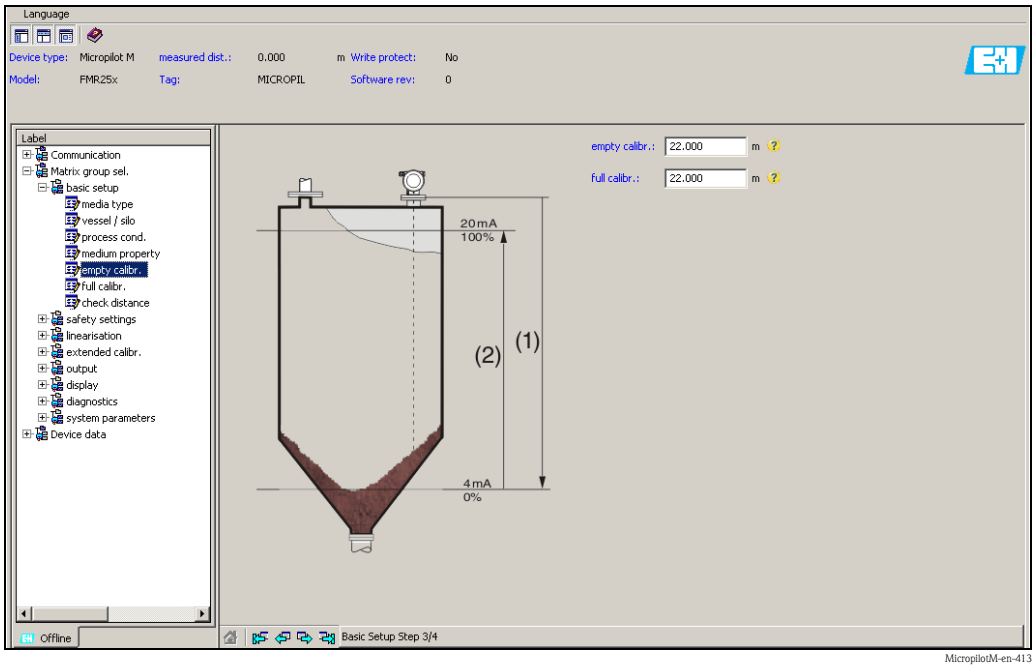



MicropilotM-en-412

**Basic Setup step 3/4:**

If "**metal silo**", "**concrete silo**", "**...**" is selected in the "**vessel / silo**" function, the following display appears on the screen:

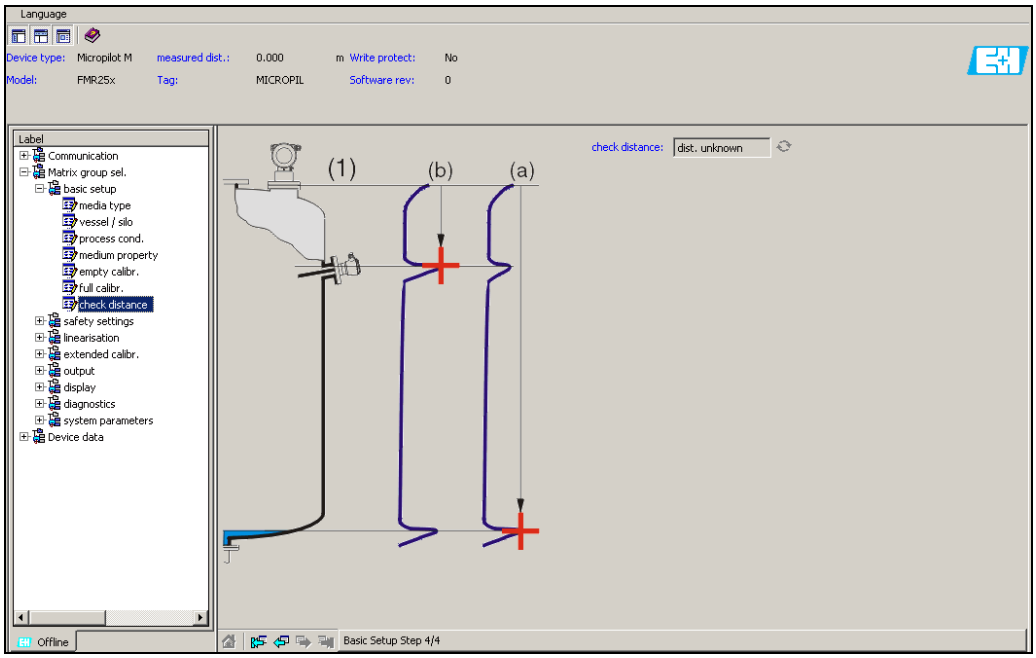
- Empty calibr.
- Full calibr.




MicropilotM-en-413

**Basic Setup step 4/4:**

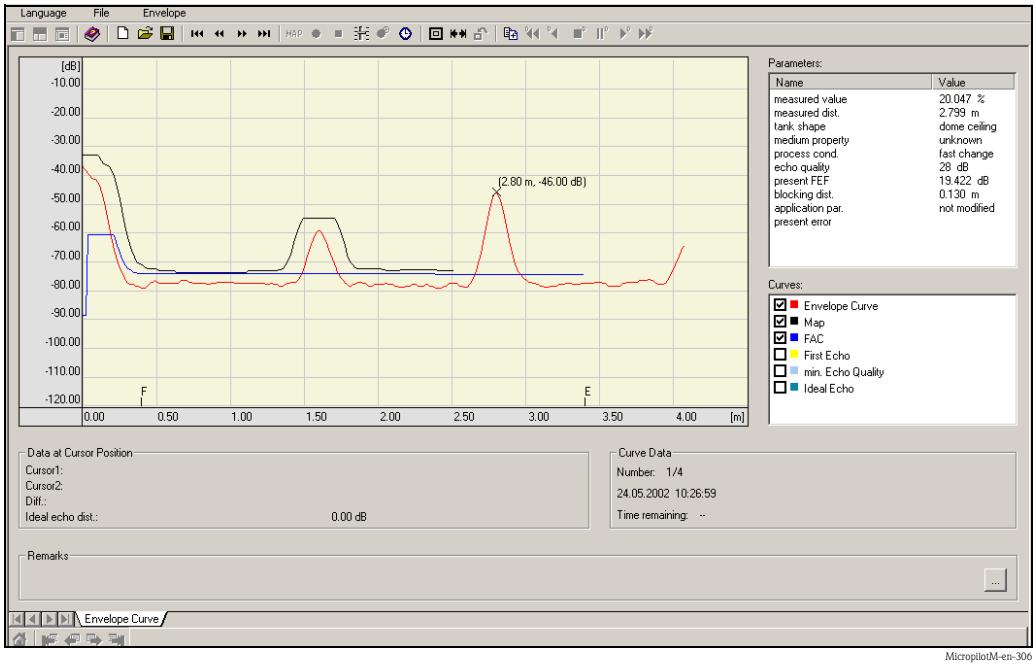
- This step starts the tank mapping
- The measured distance and the current measured value are always displayed in the header




MicropilotM-en-404

## 6.5.1 Signal analysis via envelope curve

After the basic setup, an evaluation of the measurement using the envelope curve is recommended.




MicropilotM-en-306

Note!
If the level of echo is very weak or there is a heavy interference echo, an orientation of the Micropilot can help optimise the measurement (increase of the useful echo/reduction of the interference echo).

### 6.5.2 User-specific applications (operation)

For details of setting the parameters of user-specific applications, see separate documentation BA291F/00/EN "Description of Instrument Functions" on the enclosed CD-ROM.

# 7 Maintenance

The Micropilot M measuring instrument requires no special maintenance.

### Exterior cleaning

When cleaning the exterior of measuring devices, always use cleaning agents that do not attack the surface of the housing and the seals.

### Replacing seals

The process seals of the sensors must be replaced periodically, particularly if molded seals (aseptic construction) are used. The period between changes depends on the frequency of cleaning cycles and on the temperature of the measured substance and the cleaning temperature.

### Repairs

The Endress+Hauser repair concept assumes that the measuring devices have a modular design and that customers are able to undertake repairs themselves (→ 📄 76, "Spare Parts"). Please contact Endress+Hauser Service for further information on service and spare parts.

### Repairs to Ex-approved devices

When carrying out repairs to Ex-approved devices, please note the following:
- Repairs to Ex-approved devices may only be carried out by trained personnel or by the Endress+Hauser Service.
- Comply with the prevailing standards, national Ex-area regulations, safety instructions (XA) and certificates.
- Only use original spare parts from Endress+Hauser.
- When ordering a spare part, please note the device designation on the nameplate. Only replace parts with identical parts.
- Carry out repairs according to the instructions. On completion of repairs, carry our the specified routine test on the device.
- Only Endress+Hauser Service may convert a certified device into a different certified variant.
- Document all repair work and conversions.

### Replacement

After a complete Micropilot or electronic module has been replaced, the parameters can be downloaded into the instrument again via the communication interface. Prerequisite to this is that the data were uploaded to the PC beforehand using the FieldCare.
Measurement can continue without having to carry out a new setup.

- You may have to activate linearisation (see BA291F/00/EN on the enclosed CD-ROM)
- You may need to record the tank map again (see Basic Setup)

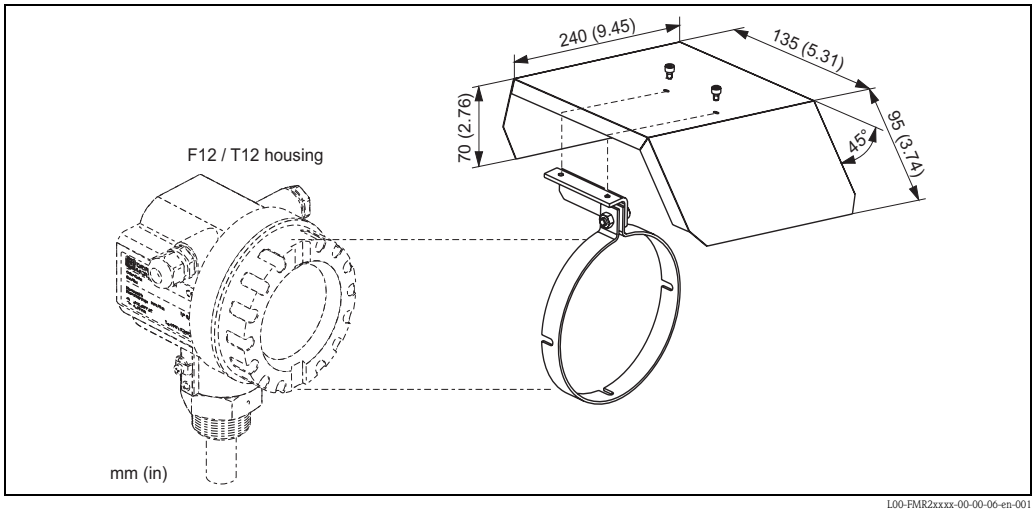
After an antenna component or electronic has been replaced, a new calibration must be carried out. This is described in the repair instructions.

# 8 Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the Micropilot M.

## 8.1 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.




## 8.2 Commubox FXA195 HART

For intrinsically safe communication with FieldCare via the USB interface.
For details refer to TI404F/00/EN.

## 8.3 Commubox FXA291

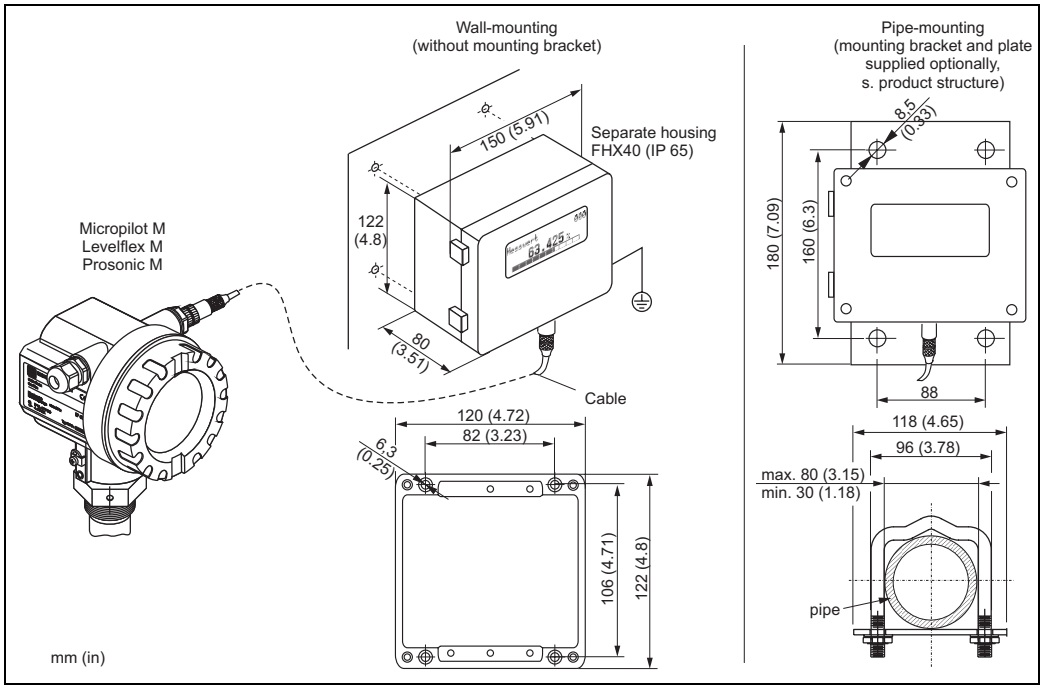
The Commubox FXA291 connects Endress+Hauser field instruments with CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a personal computer or a notebook. For details refer to TI405C/07/EN.

Note!
For the instrument you need the "ToF Adapter FXA291" as an additional accessory.

## 8.4 ToF Adapter FXA291

The ToF Adapter FXA291 connects the Commubox FXA291 via the USB interface of a personal computer or a notebook to the instrument. For details refer to KA271F/00/A2.

## 8.5 Remote display FHX40




Technical data (cable and housing) and product structure:

| | |
|---|---|
| Max. cable length | 20 m (66 ft) |
| Temperature range | –30 °C to +70 °C (-22 °F to +158 °F) |
| Degree of protection | IP65/67 (housing); IP68 (cable) acc. to EN60529 |
| Materials | Housing: AlSi12; cable glands: nickle plated brass |
| Dimensions [mm (in)] | 122x150x80 (4.8x5.91x3.15) / HxWxD |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Approval:** | | | | | |
| | A | Non-hazardous area | | | | |
| | 1 | ATEX II 2 G EEx ia IIC T6, ATEX II 3D | | | | |
| | S | FM IS Cl.I Div.1 Gr.A-D, zone0 | | | | |
| | U | CSA IS Cl.I Div.1 Gr.A-D, zone0 | | | | |
| | N | CSA General Purpose | | | | |
| | K | TIIS Ex ia IIC T6/T5 | | | | |
| | C | NEPSI Ex ia IIC T6/T5 | | | | |
| | G | IECEx zone1 Ex ia IIC T6/T5 | | | | |
| | Y | Special version | | | | |
| | | **Cable:** | | | | |
| | | 1 | 20m/65ft; for HART | | | |
| | | 5 | 20m/65ft; for PROFIBUS PA/FOUNDATION Fieldbus | | | |
| | | 9 | Special version | | | |
| | | | **Additional option:** | | | |
| | | | A | Basic version | | |
| | | | B | Mounting bracket, pipe 1"/ 2" | | |
| | | | Y | Special version | | |
| | | | | **Marking:** | | |
| | | | | 1 | Tagging (TAG) | |
| **FHX40 -** | | | | | | Complete product designation |

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

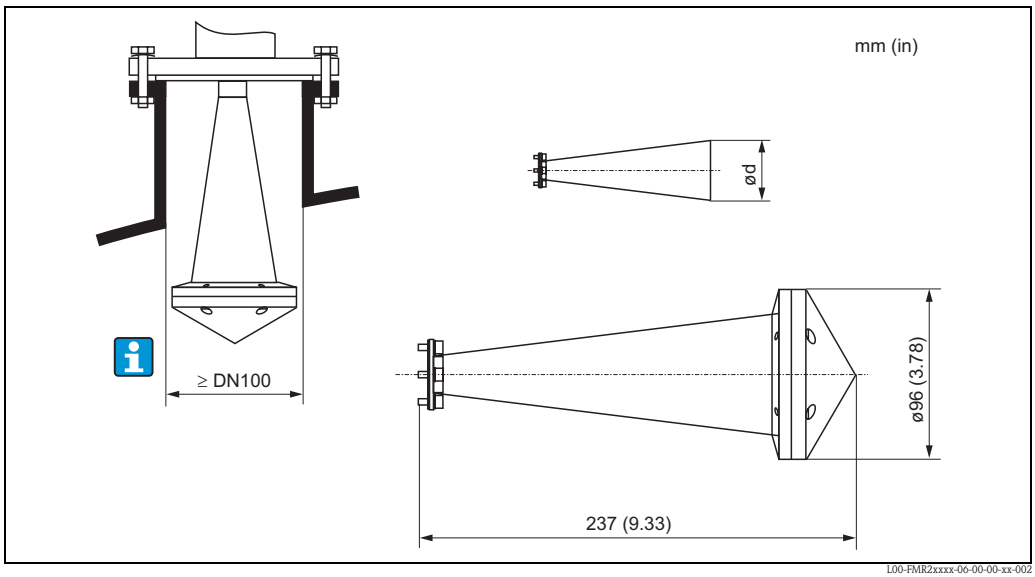
# 8.6 Horn cover for 80 mm (3") and 100 mm (4") horn antenna

### Technical data

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

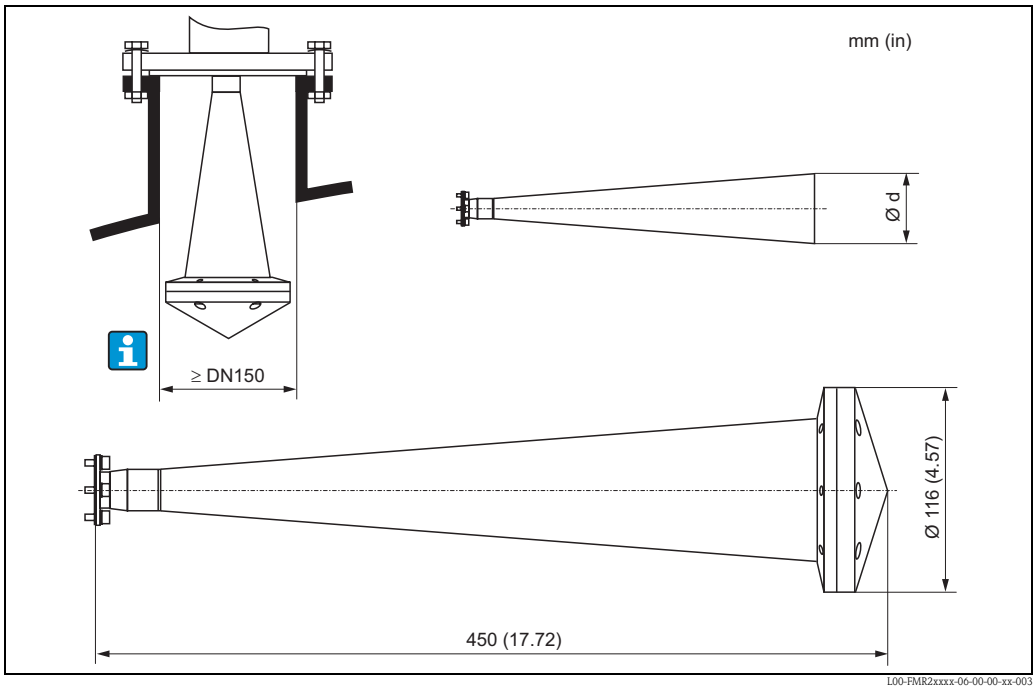
| Process conditions | |
|---|---|
| Vessel pressure max. | 0,5 bar (7.252 psi) |
| Process temperature max. | 130 °C (266 °F) |

### 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.




*Horn cover for horn antenna 100 mm (4")*
- *for antenna diameter d = 95 mm (3.74 in)*
- *for FMR240: antenna variant H, 5*
- *for FMR250: antenna variant E*

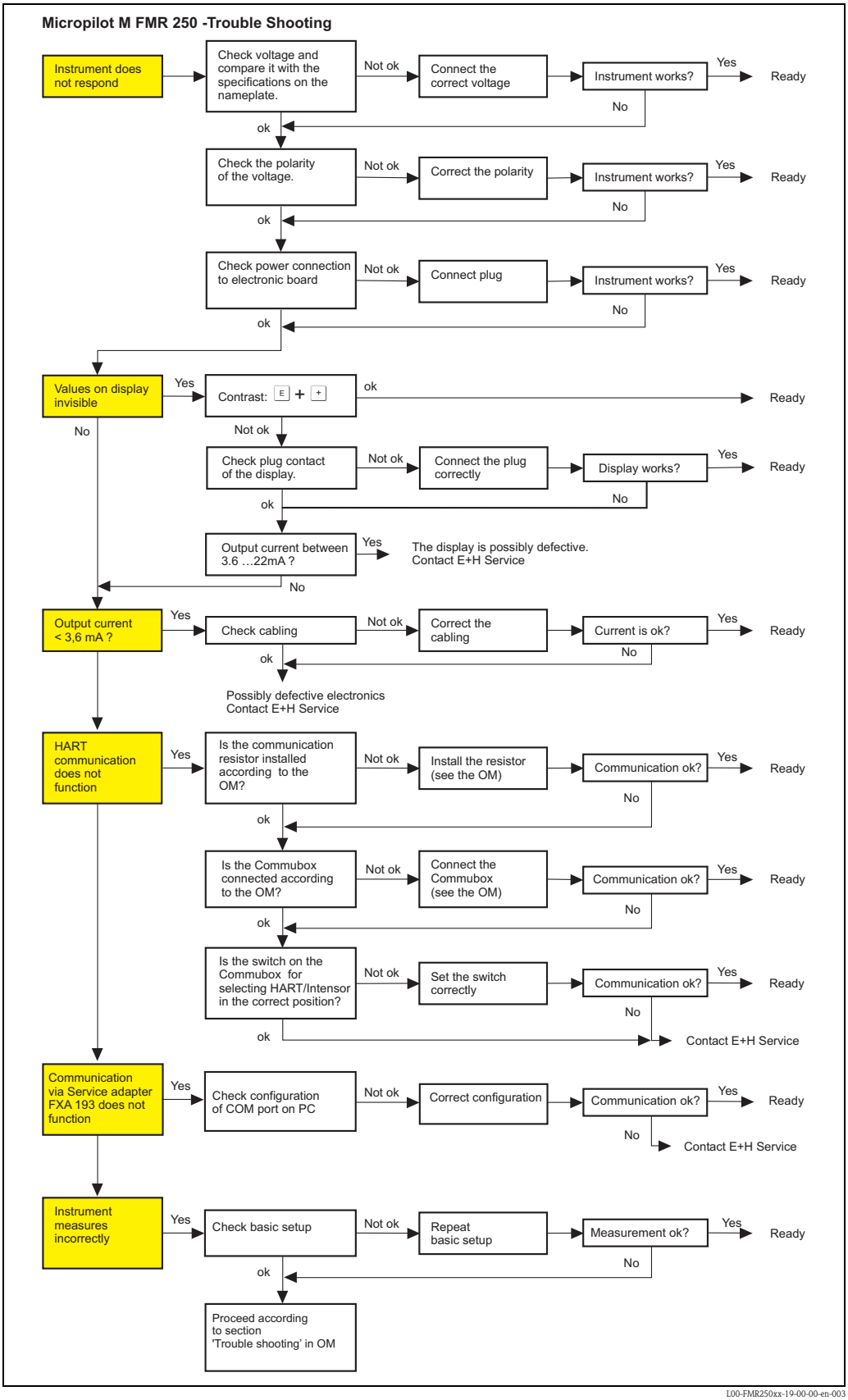
Note!
The horn cover is not allowed to use in areas, where explosion proofed equipment is necessary.

### Ordering information

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

# 9 Trouble-shooting

## 9.1 Trouble-shooting instructions



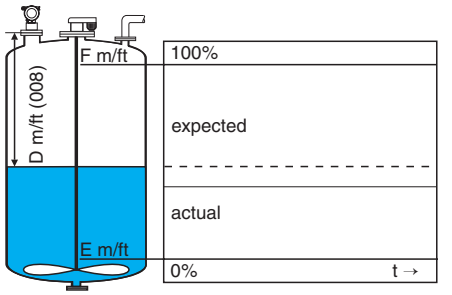
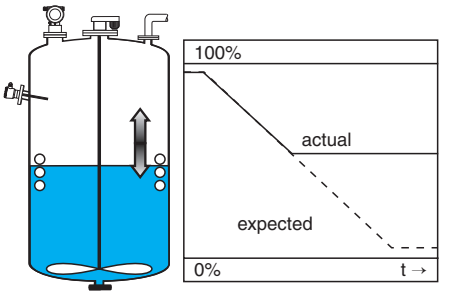

L00-FMR250xx-19-00-00-en-003

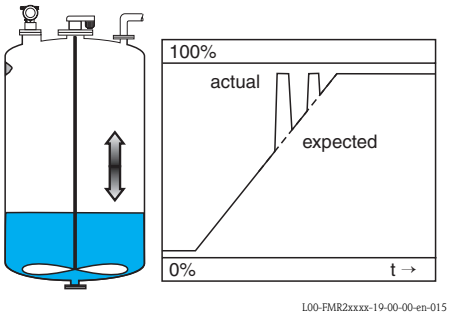
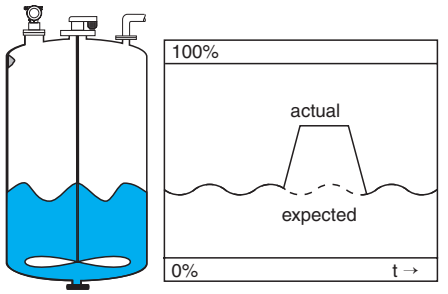
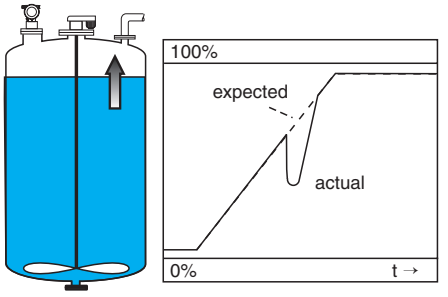
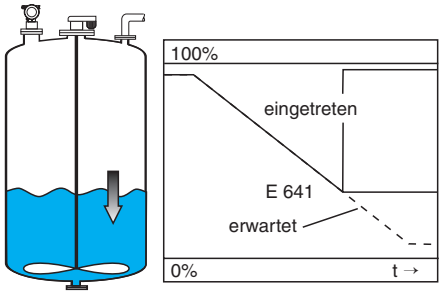
## 9.2 System error messages

| Code | Description | Possible cause | Remedy |
|---|---|---|---|
| A102 | checksum error<br>general reset & new calibr.required | device has been powered off before data could be stored;<br>emc problem;<br>EEPROM defect | reset;<br>avoid emc problem;<br>if alarm prevails after reset, exchange electronics |
| W103 | initialising - please wait | EEPROM storage not yet finished | wait some seconds; if warning prevails, exchange electronics |
| A106 | downloading please wait | processing data download | wait until warning disappears |
| A110 | checksum error<br>general reset & new calibr.required | device has been powered off before data could be stored;<br>emc problem;<br>EEPROM defect | reset;<br>avoid emc problem;<br>if alarm prevails after reset, exchange electronics |
| A111 | electronics defect | RAM defective | reset;<br>if alarm prevails after reset, exchange electronics |
| A113 | electronics defect | RAM defective | reset;<br>if alarm prevails after reset, exchange electronics |
| A114 | electronics defect | EEPROM defect | reset;<br>if alarm prevails after reset, exchange electronics |
| A115 | electronics defect | general hardware problem | reset;<br>if alarm prevails after reset, exchange electronics |
| A116 | download error<br>repeat download | checksum of stored data not correct | restart download of data |
| A121 | electronics defect | no factory calibration existant;<br>EEPROM defective | contact service |
| W153 | initialising - please wait | initialisation of electronics | wait some seconds; if warning prevails, power off device and power on again |
| A155 | electronics defect | hardware problem | reset;<br>if alarm prevails after reset, exchange electronics |
| A160 | checksum error<br>general reset & new calibr.required | device has been powered off before data could be stored;<br>emc problem;<br>EEPROM defect | reset;<br>avoid emc problem;<br>if alarm prevails after reset, exchange electronics |
| A164 | electronics defect | hardware problem | reset;<br>if alarm prevails after reset, exchange electronics |
| A171 | electronics defect | hardware problem | reset;<br>if alarm prevails after reset, exchange electronics |
| A231 | sensor 1 defect<br>check connection | HF module or electronics defective | exchange HF module or electronics |
| W511 | no factory calibration ch1 | factory calibration has been deleted | record new factory calibration |
| A512 | recording of mapping please wait | mapping active | wait some seconds until alarm disappears |
| A601 | linearisation ch1 curve not monotone | linearisation not monotonously increasing | correct linearisation table |

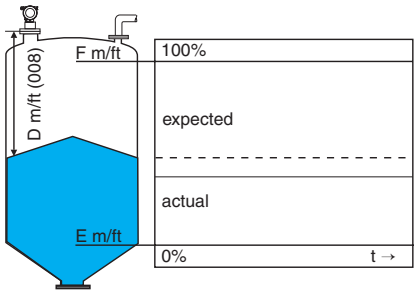
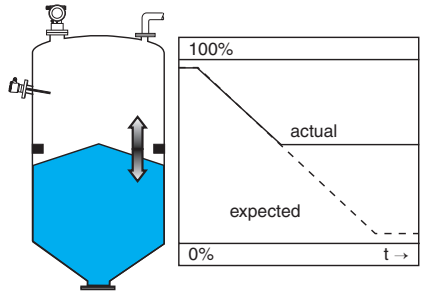
| Code | Description | Possible cause | Remedy |
|---|---|---|---|
| W611 | less than 2 linearisation points for channel 1 | number of entered linearisation points < 2 | correct linearisation table |
| W621 | simulation ch. 1 on | simulation mode is active | switch off simulation mode |
| E641 | no usable echo channel 1 check calibr. | echo lost due to application conditions or built up on antenna | check installation; optimize orientation of antenna; clean antenna (cf. OM) |
| E651 | level in safety distance - risk of overspill | level in safety distance | alarm will disappear as soon as level leaves safety distance; |
| E671 | linearisation ch1 not complete, not usable | linearisation table is in edit mode | activate linearisation table |
| W681 | current ch1 out of range | current out of range (3.8 mA to 20.5 mA) | check calibration and linearisation |

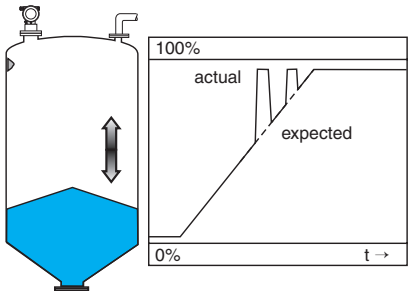
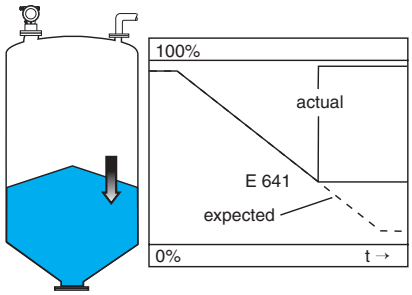
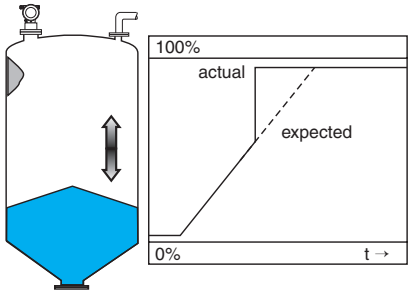
# 9.3 Application errors in liquids

| Error | Output | Possible cause | | Remedy |
|---|---|---|---|---|
| **A warning or alarm has occurred** | Depending on the configuration | See table of error messages (→ 68) | | 1. See table of error messages (→ 68) |
| **Measured value (000) is incorrect** |  L00-FMR2xxxx-19-00-00-en-019 | Measured distance (008) OK? | yes → | 1. Check empty calibr. (005) and full calibr. (006).<br>2. Check linearisation:<br>→ level/ullage (040)<br>→ max. scale (046)<br>→ diameter vessel (047)<br>→ Check table |
| | | no ↓ | | |
| | | Measurement in bypass or stilling well? | yes → | 1. Is bypass or stilling well selected in tank shape (002)?<br>2. Is the pipe diameter (007) correct? |
| | | no ↓ | | |
| | | An interference echo may have been evaluated. | yes → | 1. Carry out tank mapping<br>→ basic setup |
| **No change off measured value on filling/emptying** |  L00-FMR2xxxx-19-00-00-en-014 | Interference echo from installations, nozzle or extension on the antenna | | 1. Carry out tank mapping<br>→ basic setup<br>2. If necessary, clean antenna<br>3. If necessary, select better mounting position (→ 16)<br>4. If necessary due to wide interference echos set function detection window (0A7) to "off" |

| Error | Output | Possible cause | | Remedy |
|---|---|---|---|---|
| **If the surface is not calm (e.g. filling, emptying, agitator running), the measured value jumps sporadically to a higher level** |  L00-FMR2xxxx-19-00-00-en-015<br>  L00-FMR2xxxx-19-00-00-en-016 | Signal is weakened by the rough surface – the interference echoes are sometimes stronger | | 1. Carry out tank mapping → basic setup<br>2. Set the process cond. (004) to "turb. surface" or "agitator"<br>3. Increase the output damping (058)<br>4. Optimise the orientation (→ 74)<br>5. If necessary, select a better mounting position and/or larger antenna (→ 16) |
| **During filling/ emptying the measured value jumps ownwards** |  L00-FMR2xxxx-19-00-00-en-017 | Multiple echoes | yes → | 1. Check the tank shape (002), e.g. "dome ceiling" or "horizontal cyl"<br>2. In the range of the blocking dist. (059) there is no echo evaluation → Adapt the value<br>3. If possible, do not select central installation position (→ 16)<br>4. Perhaps use a stilling well |
| **E641 (loss of echo)** |  L00-FMR2xxxx-19-00-00-en-018 | Level echo is too weak.<br>Possible causes:<br>■ Rough surface due to filling/ emptying<br>■ Agitator running<br>■ Foam | yes → | 1. Check application arameters (002), (003) and (004)<br>2. Optimise alignment (→ 74)<br>3. If necessary, select a better installation position and/or larger antenna (→ 16) |

# 9.4 Application errors in solids

| Error | Output | Possible cause | | Remedy |
|---|---|---|---|---|
| **A warning or alarm has occurred.** | Depending on the configuration | See table of error messages (→ 68) | | 1. See table of error messages (→ 68) |
| **Measured value (000) is incorrect** |  | Measured distance (008) OK? | yes → | 1. Check empty calibr. (005) and full calibr. (006).<br>2. Check linearisation:<br>→ level/ullage (040)<br>→ max. scale (046)<br>→ Check table |
| | | no ↓ | | |
| | | An interference echo may have been evaluated. | yes → | 1. Carry out tank mapping<br>→ basic setup |
| **No change off measured value on filling/emptying** |  | Interference echo from installations, nozzle or build up on the antenna | | 1. Carry out tank mapping<br>→ basic setup<br>2. If necessary, use top target positioner to aim antenna better to product surface (avoidance of interference echo) (→ 74)<br>3. If necessary, clean antenna (air purge)<br>4. If necessary, select better mounting position<br>5. If necessary due to wide interference echos set function detection window (0A7) to "off" |

| Error | Output | Possible cause | | Remedy |
|---|---|---|---|---|
| **During filling/ emptying or measumement the measured value jumps sporadically to a higher level** |  | Signal is weakened (e.g. by fluidisation of the surface, extreme dust formation) – the interference echoes are sometimes stronger. Strong build-up, filling stream in path of beam. | | 1. Carry out tank mapping → basic setup<br>2. Increase the output damping (058)<br>3. Optimise the orientation (→ 74)<br>4. If necessary, select a better mounting position and/or larger antenna<br>5. If necessary, clear antenna |
| **E641 (loss of echo)** |  | Level echo is too weak.<br>Possible causes:<br>■ fluidisation of the surface<br>■ extreme dust formation<br>■ angle of repose | yes → | 1. Check application arameters (00A), (00B) and (00C)<br>2. Optimise alignment (→ 74)<br>3. If necessary, select a better installation position and/or larger antenna |
| **Measured value jumps to higher levels and remains there** |  | Possible causes:<br>■ build-up at container<br>■ build-up at antenna<br>■ strong condensate formation at antenna | | 1. Periodic cleaning<br>2. Carry out tank mapping → basic setup<br>3. Increase the output damping (058)<br>4. Optimise the orientation (→ 74)<br>5. If necessary, select a better mounting position and/or larger antenna |

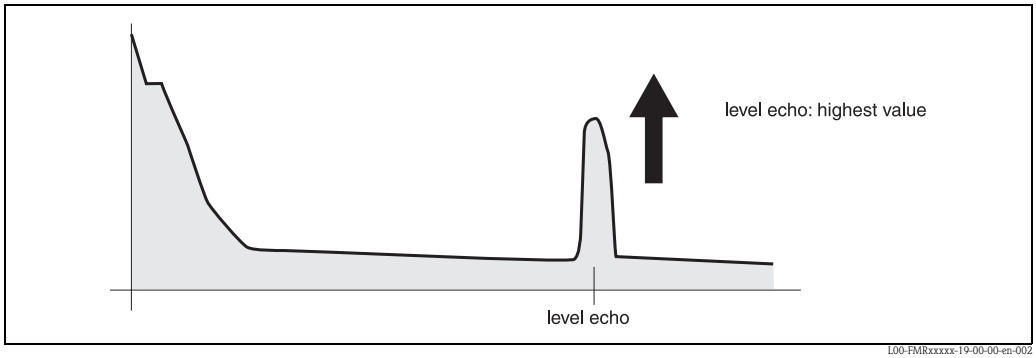
## 9.5 Orientation of the Micropilot

For orientation a marker is found on the flange or threaded boss of the Micropilot. During installation this must be oriented as follows (→ 10):
- In tanks: to the vessel wall
- In stilling wells: to the slots
- In bypass pipes: vertical to the tank connectors
- When using the Wave Guide antenna **no** orientation is required!

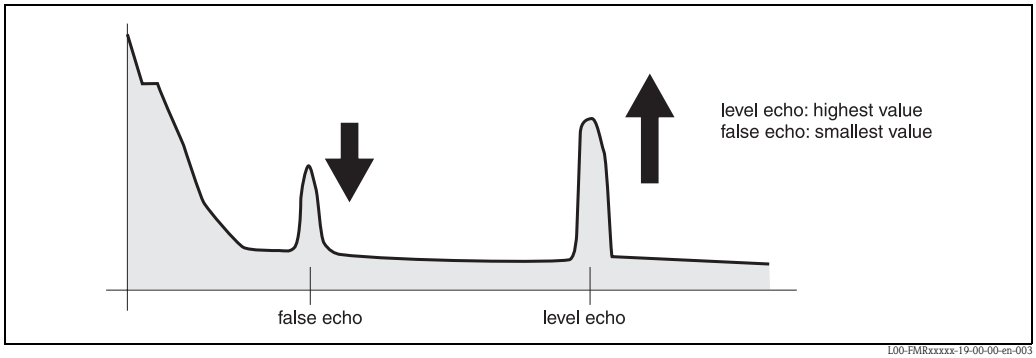
After commissioning the Micropilot, the echo quality indicates whether a sufficiently large measuring signal is obtained. If necessary, the quality can be optimised later. Vice versa, the presence of an interference echo can be used to minimise this by optimum orientation. The advantage of this is that the subsequent tank mapping uses a somewhat lower level that causes an increase in the strength of the measuring signal. Proceed as follows:

Warning!
Subsequent alignment can lead to personal injury. Before you unscrew or loosen the process connection, make sure that the vessel is not under pressure and does not contain any injurious substances.

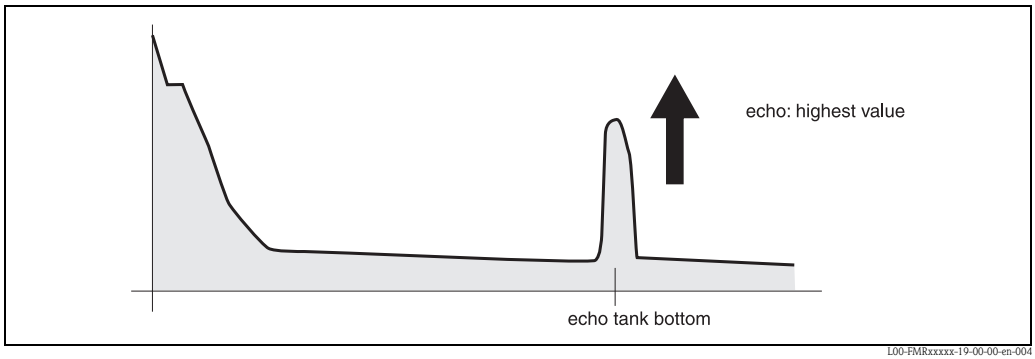
1. It is best to empty the container so that the bottom is just covered. However, alignment can be carried out even if the vessel is empty.
2. Optimisation is best carried out with the aid of the envelope graph in the display or the FieldCare.
3. Unscrew the flange or loosen the threaded boss by a half a turn.
4. Turn the flange by one hole or screw the threaded boss by one eighth of a turn. Note the echo quality.
5. Continue to turn until 360° is reached.
6. Optimum alignment:



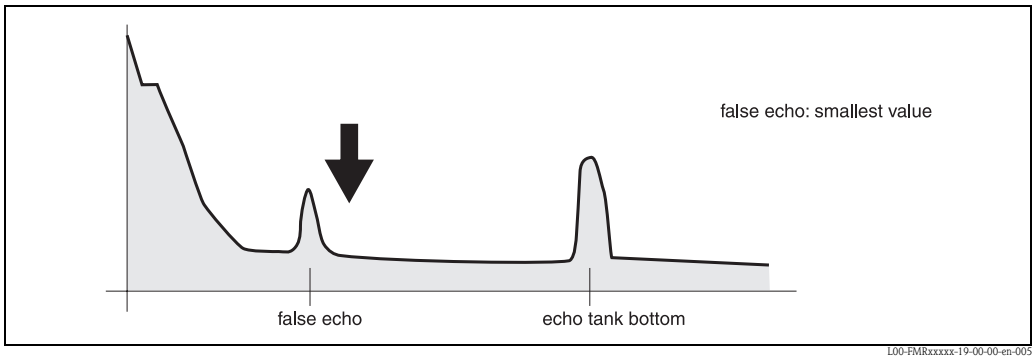

*Vessel partly full, no interference echo obtained*




*Vessel partly full, interference echo obtained:*




*Vessel empty, no interference echo*




*Vessel empty, interference echo obtained*

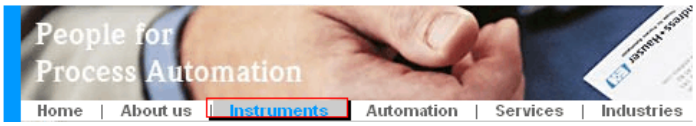
7. Fix the flange or threaded boss in this position. If necessary, replace the seal.
8. Carry out tank mapping, → 52.

**Top target positioner - optional**
Using top target positioner it is possible to tilt the antenna axis by up to 15° in all directions. The top target positioner is used for the optimum alignment of the radar beam with the bulk solids surface.

## 9.6 Spare Parts

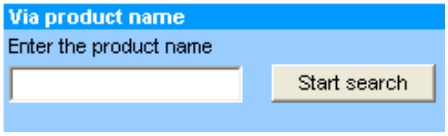
An overview of the spare parts for your device is available in the internet at www.endress.com. To obtain information on the spare parts, proceed as follows:

1. Go to "www.endress.com" and select your country.
2. Click "Instruments".

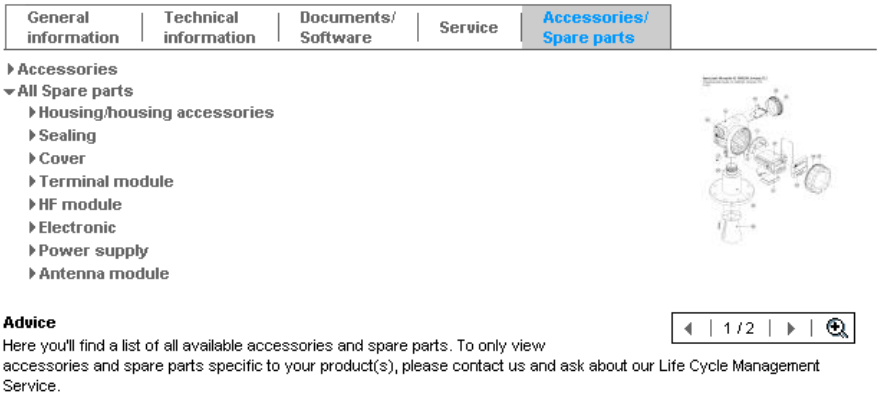



3. Enter the product name into the "product name" field.

**Endress+Hauser product search**




4. Select the device.
5. Click the "Accessories/Spare parts" tab.




6. Select the required spare parts (You may also use the overview drawing on the right side of the screen.)

When ordering spare parts, always quote the serial number indicated on the nameplate. As far as necessary, the spare parts also include replacement instructions.

## 9.7 Return

The following procedures must be carried out before a transmitter is sent to Endress+Hauser e.g. for repair or calibration:

- Remove all residue which may be present. Pay special attention to the gasket grooves and crevices where fluid may be present. This is especially important if the fluid is dangerous to health, e.g. corrosive, poisonous, carcinogenic, radioactive, etc.
- Always enclose a duly completed "Declaration of contamination" form (a copy of the “Declaration of contamination” is included at the end of this operating manual).
  Only then can Endress +Hauser transport, examine and repair a returned device.
- Enclose special handling instructions if necessary, for example a safety data sheet as per EN91/155/EEC.

Additionally specify:

- An exact description of the application.
- The chemical and physical characteristics of the product.
- A short description of the error that occurred (specify error code if possible)
- Operating time of the device.

## 9.8 Disposal

In case of disposal please seperate the different components according to their material consistence.

## 9.9 Software history

| Date | Software version | Changes to software | Documentation |
|---|---|---|---|
| 09.2004 | 01.01.00 | Original software.<br>Operated via:<br>– ToF Tool from version 2.0<br>– HART communicator DXR375 with Rev. 1, DD 1. | BA291F/00/EN/08.04 |
| 11.2005 | 01.04.00 | ■ Function: detection window<br>■ Communication: PROFIBUS PA<br>Operated via:<br>– ToF Tool from version 4.2<br>– HART communicator DXR375 with Rev. 1, DD 1. | BA291F/00/EN/01.06 |
| 09.2006 | 01.05.00 | Support of additional HF modules integrated.<br>■ Communication: FOUNDATION Fieldbus | BA291F/00/EN/08.06<br>71030727 |

## 9.10 Contact addresses of Endress+Hauser

The addresses of Endress+Hauser are given on the back cover of this operating manual. If you have any questions, please do not hesitate to contact your E+H representative.

# 10 Technical data

## 10.1 Additional technical data

### 10.1.1 Input

**Measured variable**

The measured variable is the distance between a reference point 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).

**Operating frequency**

- K-band

**Transmitting power**

| Distance | Average energy density in beam direction measuring range = 70 m (230 ft) |
|---|---|
| 1 m (3.3 ft) | < 64 nW/cm$^2$ |
| 5 m (16 ft) | < 2.5 nW/cm$^2$ |

### 10.1.2 Output

**Output signal**

4 to 20 mA (invertible) with HART protocol

**Signal coding**

FSK ±0.5 mA over currency signal

**Data transmission rate**

1200 Baud

**Galvanic isolation**

Yes (IO-Module)

**Signal on alarm**

Error information can be accessed via the following interfaces:
- Local display:
  - Error symbol (→ 35)
  - 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.

### 10.1.3 Auxiliary energy

**Ripple HART**

47...125 Hz: Uss = 200 mV (at 500 Ω)

**Max. noise HART**

500 Hz...10 kHz: Ueff = 2.2 mV (at 500 Ω)

### 10.1.4 Performance characteristics

| | |
|---|---|
| Reference operating conditions | ■ temperature = +20 °C ±5 °C (+68 °F ±41 °F)<br>■ pressure = 1013 mbar abs. ±20 mbar (15.19 psi ±0.3 psi)<br>■ relative humidity (air) = 65 % ±20 %<br>■ ideal reflector<br>■ no major interference reflections inside the signal beam |
| Maximum measured error | Typical statements for reference conditions, include linearity, repeatability, and hysteresis:<br>■ up to 1 m (3.3 ft): ±30 mm (1.18 in)<br>■ ex 1 m (3.3 ft): ±15 mm (0.59 in) (or 0.04% of measuring range, whatever is larger) |
| Resolution | Digital / analog in % 4 to 20 mA: 1mm (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 instrument needs the reaction time to indicate the new value. |
| Influence of ambiente temperature | The measurements are carried out in accordance with EN61298-3:<br>■ digital output HART:<br>– average $T_K$: 5 mm (0.2 in) /10 K, max. 15 mm (0.59 in) over the entire temperature range -40 °C to +80 °C (-40 °F to +176 °F).<br>■ Current output (additional error, in reference to the span of 16 mA):<br>– **Zero point (4 mA)**<br>average $T_K$: 0,03 %/10 K, max. 0,45 % over the entire temperature range -40 °C to +80 °C (-40 °F to +176 °F).<br>– **Span (20 mA)**<br>average $T_K$: 0,09 %/10 K, max. 0,95 % over the entire temperature range -40 °C to +80 °C (-40 ° to +176 °F). |

### 10.1.5 Operating conditions: Environment

| | |
|---|---|
| Ambient temperature range | Ambient temperature for the transmitter: -40 °C to +80 °C (-40 ° to +176 °F) or -50 °C to +80 °C (-58 °F to +176 °F). 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 instrument is exposed to direct sunlight. |
| Storage temperature | -40 °C to +80 °C (-40 ° to +176 °F) or -50 °C to +80 °C (-58 °F to +176 °F). |
| Climate class | DIN EN 60068-2-38 (test Z/AD) |
| Vibration resistance | DIN EN 60068-2-64 / IEC 68-2-64: 20…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 εr. 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 air purge connection). The material compatibility has to be considered if cleaning agents are used!<br>The maximum permitted temperature at the flange should not be exceeded. |

Electromagnetic compatibility

- Electromagnetic compatibility in accordance with all the relevant requirements of the EN61326 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).

## 10.1.6 Operating conditions: Process

Process temperature range / Process pressure limits

Note!
The specific range may be reduces by the selected process condition. The pressure rating (PN) specified on 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:

- EN1092-1: 2001 Tab.18
  With regard to their temperature stability properties, the materials 1.4404 and 1.4435 are grouped unter 13E0 in EN1092-1 Tab. 18. The chemical composition of the two materials can be identical.
- ASME B16.5a - 1998 Tab. 2-2.2 F316
- ASME B16.5a - 1998 Tab. 2.3.8 N10276
- JIS B2220

| **Feature "20 Antenna:"** | | | **Seal** | **Temperature** | **Pressure** [1] | **Wetted parts** |
|---|---|---|---|---|---|---|
| **Type** | **Option** | **Size** | | | | |
| Horn | **4**<br>**5**<br>**D**<br>**E** | 80 mm (3")<br>100 mm (4")<br>80 mm (3")<br>100 mm (4") | FKM Viton GLT | -40 °C to +200 °C<br>(-40 °F to +392 °F) | -1 bar to 16 bar<br>(-14.5 psi to 232 psi) | PEEK, seal,<br>316L/1.4404/<br>1.4435 |
| Parabolic | **G**<br>**H** | 200 mm (8")<br>250 mm (10") | FKM Viton GLT | -40 °C to +200 °C<br>(-40 °F to +392 °F) | -1 bar to 16 bar<br>(-14.5 psi to 232 psi) | PTFE, seal,<br>316L/1.4404/<br>1.4435 |

↑ Ordering information, → 🖹 6

1) E+H UNI flange: -1 bar to 1 bar (-14.5 psi to 14.5 psi)

Optional top target positioner: ±15°, seal: FMK Viton GLT

Dielectric constant

- in free space: $\varepsilon r \geq 1.6$ (for horizontal, even product surfaces: $\varepsilon r \geq 1.4$)

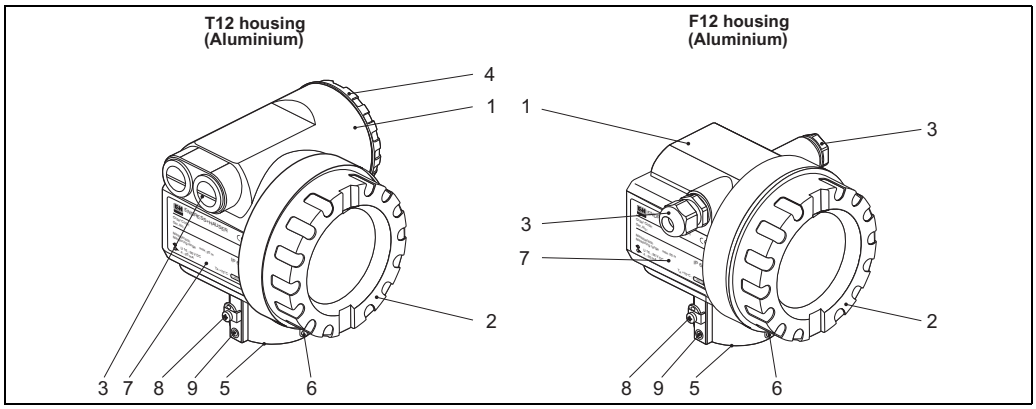
## 10.1.7 Mechanical construction

Weight

- F12/T12 housing: approx 6 kg (13.32 lbs) + weight of flange
- F23 housing: approx 9.4 kg (20.73 lbs) + weight of flange

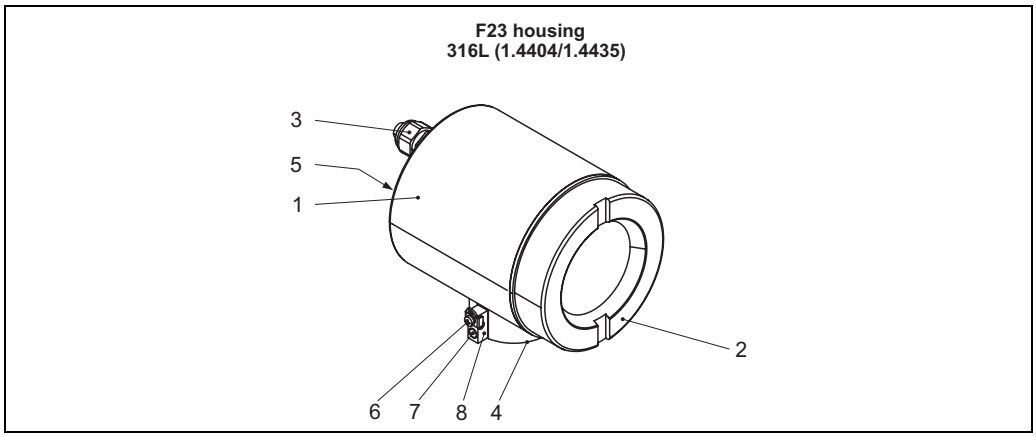
Material
(not in contact with process)

*Materials of T12 and F12 housing (seawater-resistant, powder-coated)*



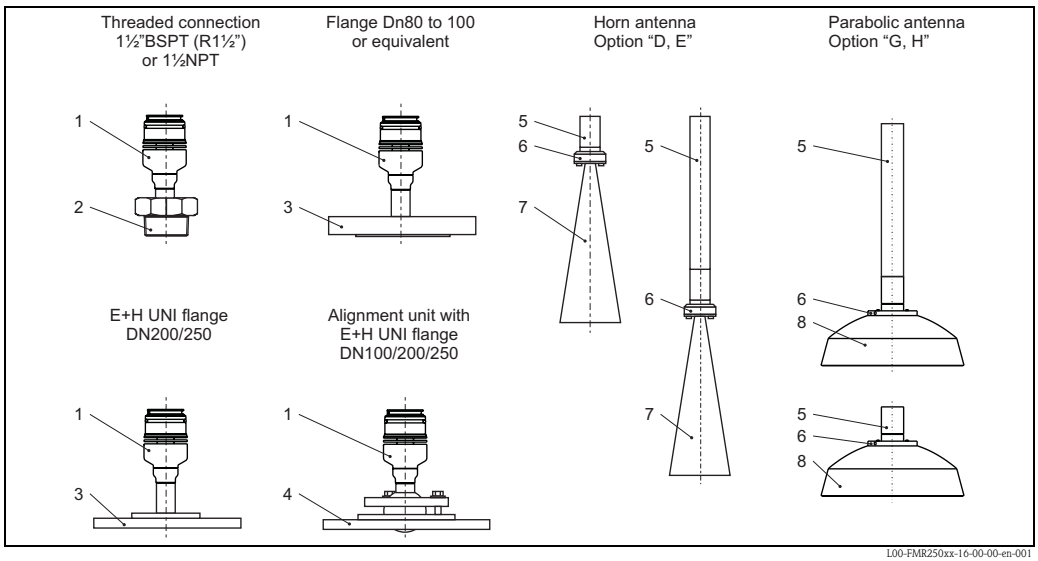

| Pos. | Part | Material | |
|---|---|---|---|
| 1 | T12 and F12 housing | AlSi10Mg | |
| 2 | Cover (Display) | AlSi10Mg | |
| | Sealing | Fa. SHS: EPDM 70pW FKN | |
| | Window | ESG-K-Glass (Toughened safety glass) | |
| | Sealing of the glass | Silicone sealing compound Gomastit 402 | |
| 3 | Sealing | 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 | Retaining ring for tag | VA | |
| | Rope | VA | |
| | Crimp sleeve | Aluminium | |
| 7 | Nameplate | 1.4301 | |
| | Groove pin | A2 | |
| 8 | Ground terminal: | Screws: A2; Spring washer: A4; Clamp: 1.4301 Holder: 1.4310 | |
| 9 | Screws | A2-70 | |

*Materials of F23 housing (corrosion-resistant)*




| Pos. | Part | Material | |
|---|---|---|---|
| 1 | F23 housing | Housing body: 1.4404; Sensor neck: 1.4435; earth connection block: 1.4435 | |
| 2 | Cover | 1.4404 | |
| | 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 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 | Sealing ring | Fa. SHS: EPDM 70pW FKN | Trelleborg: EPDM E7502 |
| 5 | Nameplate | 1.4301 | |
| 6 | Grounding terminal: | Screws: A2; Spring washer: A4; Clamp: 1.4301; Holder: 1.4310 | |
| 7 | Screw | A2-70 | |
| 8 | Retaining ring for tag | VA | |
| | Rope | VA | |
| | Crimp sleeve | Aluminium | |

Material
(in contact with process)




| Pos. | Part | Material | |
|---|---|---|---|
| 1 | Adapter | 316L (1.4404) | |
| | Plug | A4 | 316L (1.4404) |
| | Adapter (G ➞ NPT) | 316L (1.4404) | |
| | Sealing | Viton | |
| 2 | Process connection | R1½": 316L (1.4404) | 1½" NPT: 316L (1.4404/1.4435) |
| 3 | Flange | 316L (1.4404 / 1.4435) | |
| | Adapter | 316L (1.4404) | |
| 4 | Flange | 316L (1.4404) | |
| | Ball | 316L (1.4404) | |
| | Screws | A2 | |
| | Spring washer | 1.4310 | |
| | Jammes flange | 316L (1.4404) | |
| | Adapter | 316L (1.4404) | |
| | Sealing | Viton | |
| 5 | Pipe | 316L (1.4404) | |
| 6 | Parts for process separation | 316L (1.4404) | |
| | Adapter Horn/Parabolic | 316L (1.4404) | |
| 7 | Horn | 316L (1.4404) | |
| | Screws | A4 | |
| 8 | Parabolic reflector | 316L (1.4404) | |
| | Screws | A4 | |

*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 EN1092-1 Tab. 18. The chemical composition of the two materials can be identical.

### 10.1.8 Certificates and approvals

| | |
|---|---|
| CE approval | The measuring system meets the legal requirements of the EC-guidelines. Endress+Hauser confirms the instrument passing the required tests by attaching the CE-mark. |
| RF approvals | R&TTE, FCC |
| External standards and guidelines | **EN 60529**<br>Protection class of housing (IP-code).<br>**EN 61010**<br>Safety regulations for electrical devices for measurement, control, regulation and laboratory use.<br>**EN 61326-X**<br>EMC product family standard for electrical equipment for measurement, control and laboratory use.<br>**NAMUR**<br>User Association for Automation in Process Industries. |

Ex approval

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

| Feature | | Variant | ZD021F | ZD209F | ZD208F | ZD171F | ZD170F | ZD169F | ZD168F | XA448F | XA447F | XA446F | XA445F | XA345F | XA344F | XA343F | XA342F | XA315F | XA314F | XA313F | XA312F | XA233F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 Approval: | Non-hazardous area | A | | | | | | | | | | | | | | | | | | | | |
| | ATEX II 1/2GD Ex ia IIC T6, Alu blind cover | B | | | | | | | | | | | | | | | X | | | | X | |
| | ATEX II 1/2G Ex ia IIC T6,ATEX II 1/3D | C | | | | | | | | | | | | | | | X | | | | X | |
| | ATEX II 1/2D, Alu blind cover | D | | | | | | | | | | | | X | | | | X | | | | |
| | ATEX II 1/3D | E | | | | | | | | | | | | X | | | | X | | | | |
| | ATEX II 3G Ex nA II T6 | G | | | | | | | | | | | | | | | | | | | | X |
| | NEPSI Ex ia IIC T6 | I | | | | | | | | | X | | X | | | | | | | | | |
| | NEPSI Ex d(ia)ia IIC T6 | J | | | | | | | | X | | | | | | | | | | | | |
| | TIIS Ex d (ia) IIC T3 | L | | | | | | | | | | | | | | | | | | | | |
| | CSA General Purpose | N | | | | | | | | | | | | | | | | | | | | |
| | NEPSI DIP | Q | | | | | | | | | | X | | | | | | | | | | |
| | FM IS Cl.I,II,III Div.1 Gr.A-G, zone 0, 1, 2 | S | X | | X | | | | X | | | | | | | | | | | | | |
| | FM XP Cl.I,II,III Div.1 Gr.A-G, zone 1, 2 | T | | | | | | X | | | | | | | | | | | | | | |
| | CSA IS Cl.I,II,III Div.1 Gr.A-G, zone 0, 1, 2 | U | | X | | | X | | | | | | | | | | | | | | | |
| | CSA XP Cl.I,II,III Div.1 Gr.A-G, zone 1, 2 | V | | | | X | | | | | | | | | | | | | | | | |
| | Special version | Y | | | | | | | | | | | | | | | | | | | | |
| | ATEX II 1/2G Ex ia IIC T6 | 1 | | | | | | | | | | | | | X | | | | | X | | |
| | ATEX II 1/2G Ex d (ia) IIC T6 | 4 | | | | | | | | | | | | | X | | | | X | | | |
| 60 Output; Operation: | 4-20mA SIL HART, 4-line display VU331[1] | A | | | | | X | X | X | X | X | | X | X | | | | | X | X | X | X | X |
| | 4-20mA SIL HART. w/o display[2] | B | | | | | X | X | X | X | X | | X | X | | | | | X | X | X | X | X |
| | PROFIBUS PA, 4-line display VU331[1] | C | X | X | X | X | | X | | X | X | X | | X | X | X | X | | | | | | X |
| | PROFIBUS PA, w/o display[2] | D | X | X | X | X | | X | | X | X | X | | X | X | X | X | | | | | | X |
| | FOUNDATION Fieldbus, 4-line display[1] | E | X | X | X | X | | X | | X | X | X | | X | X | X | X | | | | | | X |
| | FOUNDATION Fieldbus, w/o display[2] | F | X | X | X | X | | X | | X | X | X | | X | X | X | X | | | | | | X |
| | 4-20mA SIL HART, prepared for FHX40 | K | | | | | X | | X | | | X | X | | | | | X | | X | X | X |
| | PROFIBUS PA, prepared for FHX40 | L | X | X | X | | | | | | X | X | | X | | X | X | | | | | X |
| | FOUNDATION Fieldbus, prepared for FHX40 | M | X | X | X | | | | | | X | X | | X | | X | X | | | | | |
| | Special version | Y | | | | | | | | | | | | | | | | | | | | |
| 70 Housing: | F12 Alu, coated IP65 NEMA4X | A | X | X | X | | X | | X | | X | X | X | X | | X | X | X | | X | X | X |
| | F23 316L IP65 NEMA4X | B | X | X | X | | X | | X | | X | X | X | X | | X | X | X | | X | X | X |
| | T12 Alu, coated IP65 NEMA4X[3] | C | | | | X | | X | | X | | X | | X | X | | | X | X | | | |
| | T12 Alu, coated IP65 NEMA4X + OVP[3,4] | D | X | X | X | | X | | X | | X | X | X | X | | X | X | X | | X | X | X |
| | Special version | Y | | | | | | | | | | | | | | | | | | | | |

1) Envelope curve display on site.
2) Via communication.
3) Separate conn. compartment.
4) OVP = overvoltage protection.

## 10.1.9 Supplementary Documentation

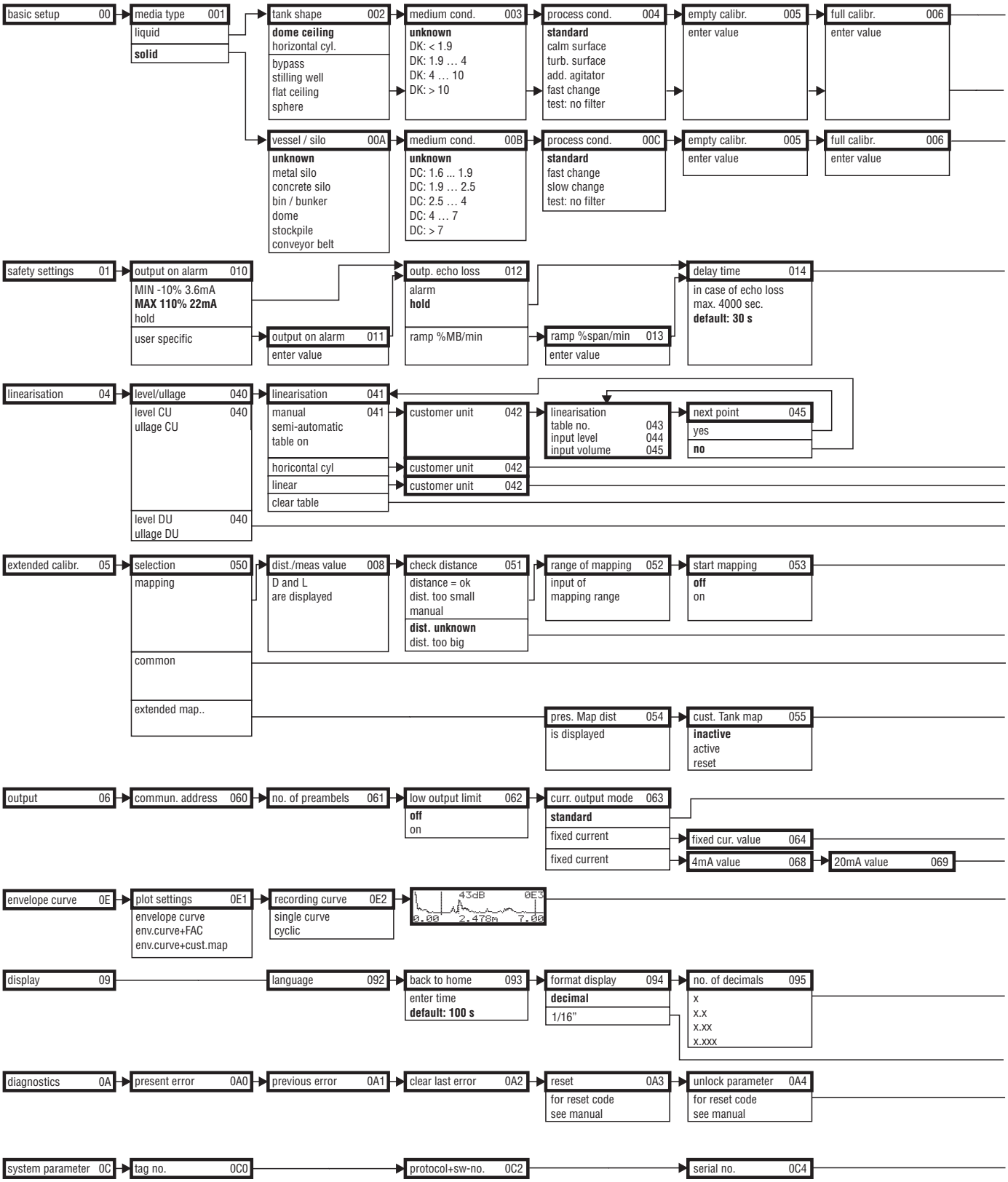
Supplementary Documentation

This supplementary documentation can be found on our product pages on www.endress.com.

- Technical Information (TI390F/00/EN)
- Operating Instructions "Description of Instrument Functions" (BA291F/00/EN)
- Brief Operating Instructions (KA1015F/00/EN)

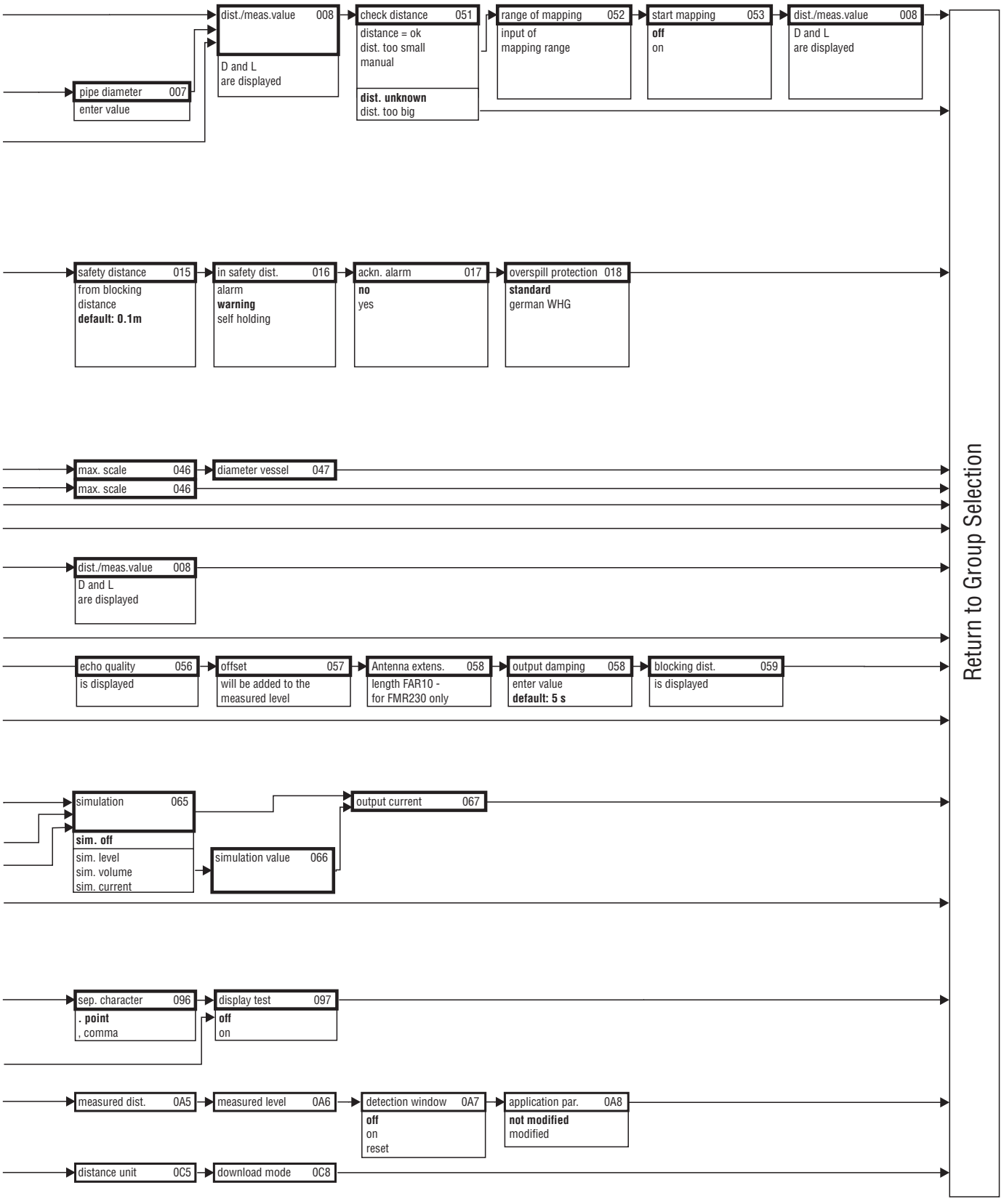
# 11 Appendix

## 11.1 Operating menu HART




**Note!** The default values of the parameters are typed in boldface.

L00-FMR250xx-19-00-01-en-036




L00-FMR250xx-19-00-02-en-036

## 11.2 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

# Index

## U



## V



## W

Endress+Hauser

People for Process Automation

# Declaration of Hazardous Material and De-Contamination

## *Erklärung zur Kontamination und Reinigung*

**RA No.** ☐☐☐☐☐☐☐☐

Please reference the Return Authorization Number (RA#), obtained from Endress+Hauser, on all paperwork and mark the RA# clearly on the outside of the box. If this procedure is not followed, it may result in the refusal of the package at our facility.

*Bitte geben Sie die von E+H mitgeteilte Rücklieferungsnummer (RA#) auf allen Lieferpapieren an und vermerken Sie diese auch außen auf der Verpackung. Nichtbeachtung dieser Anweisung führt zur Ablehnung ihrer Lieferung.*

Because of legal regulations and for the safety of our employees and operating equipment, we need the "Declaration of Hazardous Material and De-Contamination", with your signature, before your order can be handled. Please make absolutely sure to attach it to the outside of the packaging.

*Aufgrund der gesetzlichen Vorschriften und zum Schutz unserer Mitarbeiter und Betriebseinrichtungen, benötigen wir die unterschriebene "Erklärung zur Kontamination und Reinigung", bevor Ihr Auftrag bearbeitet werden kann. Bringen Sie diese unbedingt außen an der Verpackung an.*

**Type of instrument / sensor**
*Geräte-/Sensortyp* _____

**Serial number**
*Seriennummer* _____

☐ **Used as SIL device in a Safety Instrumented System /** *Einsatz als SIL Gerät in Schutzeinrichtungen*

**Process data/** *Prozessdaten*

Temperature / *Temperatur* _____ [°F] _____ [°C]
Pressure / *Druck* _____ [psi] _____ [ Pa ]
Conductivity / *Leitfähigkeit* _____ [µS/cm]
Viscosity / *Viskosität* _____ [cp] _____ [$mm^2/s$]

**Medium and warnings**
*Warnhinweise zum Medium*

| | Medium /concentration *Medium /Konzentration* | Identification CAS No. |  flammable *entzündlich* |  toxic *giftig* |  corrosive *ätzend* |  harmful/ irritant *gesundheits-schädlich/ reizend* |  other * *sonstiges** |  harmless *unbedenklich* |
|---|---|---|---|---|---|---|---|---|
| Process medium / *Medium im Prozess* | | | | | | | | |
| Medium for process cleaning / *Medium zur Prozessreinigung* | | | | | | | | |
| Returned part cleaned with / *Medium zur Endreinigung* | | | | | | | | |

* explosive; oxidising; dangerous for the environment; biological risk; radioactive
* *explosiv; brandfördernd; umweltgefährlich; biogefährlich; radioaktiv*

Please tick should one of the above be applicable, include safety data sheet and, if necessary, special handling instructions.
*Zutreffendes ankreuzen; trifft einer der Warnhinweise zu, Sicherheitsdatenblatt und ggf. spezielle Handhabungsvorschriften beilegen.*

**Description of failure /** *Fehlerbeschreibung* _____

_____

_____

**Company data /** *Angaben zum Absender*

Company / *Firma* _____

_____

Address / *Adresse*

_____

_____

Phone number of contact person / *Telefon-Nr. Ansprechpartner:*

_____

Fax / E-Mail _____

Your order No. / *Ihre Auftragsnr.* _____

"We hereby certify that this declaration is filled out truthfully and completely to the best of our knowledge.We further certify that the returned parts have been carefully cleaned. To the best of our knowledge they are free of any residues in dangerous quantities."

*"Wir bestätigen, die vorliegende Erklärung nach unserem besten Wissen wahrheitsgetreu und vollständig ausgefüllt zu haben. Wir bestätigen weiter, dass die zurückgesandten Teile sorgfältig gereinigt wurden und nach unserem besten Wissen frei von Rückständen in gefahrbringender Menge sind."*

_____ (place, date / *Ort, Datum*)

_____ Name, dept./ *Abt.* (please print / *bitte Druckschrift*)

_____ Signature / *Unterschrift*

www.endress.com/worldwide

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