Technical Information

Micropilot FMR56, FMR57

Level radar
Level measurement in bulk solids

Application

Continuous, non-contact level measurement in powdery to granular bulk solids

Features FMR56:

- Attractively-priced basic device for standard process conditions, as for example in bulk cargo silos and storage tanks
- PP-cladded horn antenna
- Maximum measuring range: 30 m (98 ft)
- Process connection: Mounting bracket or slip-on flange with variable flange seal for alignment
- Temperature range: −40 to +80 °C (−40 to 176 °F)
- Pressure range: −1 to +3 bar (−14.5 to +43.5 psi)
- Accuracy: ± 3 mm

Features FMR57:

- Premium device for highly demanding solid applications; ideally suited for measurements in high silos, bunkers and stockpiles
- Horn or parabolic antenna
- Air purge connection integrated
- Maximum measuring range: 70 m (230 ft)
- Process connection: 1½" thread or flange
- Temperature range: −40 to +400 °C (−40 to 752 °F)
- Pressure range: −1 to +16 bar (−14.5 to +232 psi)
- Accuracy: ± 3 mm

Your benefits

- Reliable measurement even for changing product and process conditions
- Integrated data memory (HistoROM) for high availability
- Intuitive operating menu in national languages for easy commissioning
- Simple integration into control or asset management systems
- Exact diagnostic and process information to assist fast decisions
- International approvals for use in hazardous areas
- 5-point linearity protocol
- SIL2 according to IEC 61508, SIL3 in case of homogeneous or heterogeneous redundancy
- System integration via HART/PROFIBUS PA (Profile 3.02)/FOUNDATION Fieldbus

Endress+Hauser

People for Process Automation

Table of contents

Important document information

Document conventions

Safety symbols

Symbol	Meaning
⚠ DANGER A0011189-EN	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
⚠ WARNING A0011190-EN	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
⚠ CAUTION A0011191-EN	**CAUTION!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
NOTICE A0011192-EN	**NOTICE!** This symbol contains information on procedures and other facts which do not result in personal injury.

Electrical symbols

Symbol	Meaning
⎓ A0011197	**Direct current** A terminal to which DC voltage is applied or through which direct current flows.
∼ A0011198	**Alternating current** A terminal to which alternating voltage is applied or through which alternating current flows.
≂ A0017381	**Direct current and alternating current** ■ A terminal to which alternating voltage or DC voltage is applied. ■ A terminal through which alternating current or direct current flows.
⏚ A0011200	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
⏚ A0011199	**Protective ground connection** A terminal which must be connected to ground prior to establishing any other connections.
▽ A0011201	**Equipotential connection** A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.

Symbols for certain types of information

Symbol	Meaning
✓ A0011182	**Allowed** Indicates procedures, processes or actions that are allowed.
✓✓ A0011183	**Preferred** Indicates procedures, processes or actions that are preferred.
✗ A0011184	**Forbidden** Indicates procedures, processes or actions that are forbidden.
ℹ A0011193	**Tip** Indicates additional information.
📖 A0011194	**Reference to documentation** Refers to the corresponding device documentation.

Symbol	Meaning
A0011195	**Reference to page** Refers to the corresponding page number.
A0011196	**Reference to graphic** Refers to the corresponding graphic number and page number.

Symbols in graphics

Symbol	Meaning
1, 2, 3 ...	Item numbers
1. , 2. , 3. ...	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections
A0011187	**Hazardous area** Indicates a hazardous area.
A0011188	**Safe area (non-hazardous area)** Indicates a non-hazardous location.

Symbols at the device

Symbol	Meaning
△ → 🗎	**Safety instructions** Observe the safety instructions contained in the associated Operating Instructions.
⊐≋	**Temperature resistance of the connection cables** Specifies the minimum value of the temperature resistance of the connection cables.

Function and system design

Measuring principle

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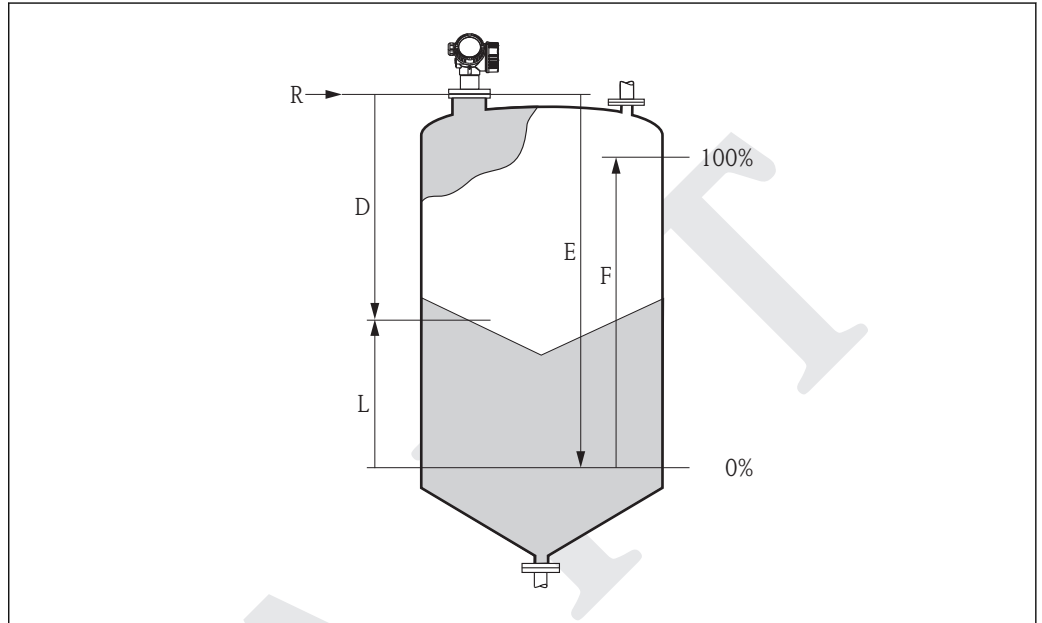
1 Setup parameters of the Micropilot

R   *Reference point of the measurement (lower edge of the flange or threaded connection)*
E   *Empty calibration (= zero)*
F   *Full calibration (= span)*
D   *Measured distance*
L   *Level (L = E – D)*

Input

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

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

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

with c being the speed of light.

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

$$L = E - D$$

The reference point R of the measurement is located at the process connection. For details see the dimensional drawing:

- FMR56: ($\rightarrow$ 📄 55)
- FMR57: ($\rightarrow$ 📄 58)

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

Output

The Micropilot is commissioned by entering an empty distance "E" (=zero), a full distance "F" (=span) and application parameters. The application parameters are automatically adapt into the instrument to the process conditions. For models with a current output, the factory adjustment for zero point "E" and span "F" is 4 mA and 20 mA. For digital outputs and the display module, the factory adjustment for zero point "E" and span "F" is 0 % and 100 %.

A linearization with max. 32 points, based on a table entered either manually or semi-automatically, can be activated locally or remotely. This function provides a measurement in engineering units and a linear output signal for spheres, horizontal cylindrical tanks and vessels with conical outlet.

Life cycle of the product
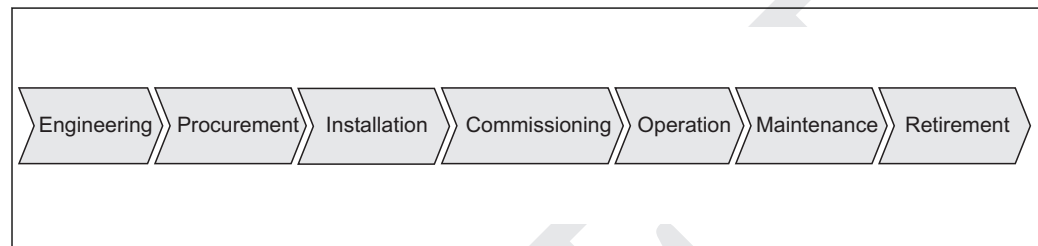
A0013773-EN

2 Life cycle

Engineering
- Universal measuring principle
- Measurement unaffected by medium properties
- Hardware and software developed according to SIL IEC 61508

Procurement
- Endress+Hauser being the world market leader in level measurement guarantees asset protection
- Worldwide support and service

Installation
- Special tools are not required
- Reverse polarity protection
- Modern, detachable terminals
- Main electronics protected by a separate connection compartment

Commissioning
- Fast, menu-guided commissioning in only a few steps on site or from the control room
- Plain text display in national languages reduces the risk of error or confusion
- Direct local access of all parameters
- Short instruction manual at the device

Operation
- Multi-echo tracking: Reliable measurement through self-learning echo-search algorithms taking into account the short-term and long-term history in order to check the found echoes for plausibility and to suppress interference echoes.
- Diagnostics in accordance with NAMUR NE107

Maintenance
- HistoROM: Data backup for instrument settings and measured values
- Exact instrument and process diagnosis to assist fast decisions with clear details concerning remedies
- Intuitive, menu-guided operating concept in national languages saves costs for training, maintenance and operation
- Cover of the electronics compartment can be opened in hazardous areas

Retirement
- Order code translation for subsequent models
- RoHS-conforming (Restriction of certain Hazardous Substances), unleaded soldering of electronic components
- Environmentally sound recycling concept

Input

Measured variable	The measured variable is the distance between the reference point and the product surface.
	Subject to the empty distance entered "E" the level is calculated.
	Alternatively, the level can be converted into other variables (volume, mass) by means of linearization (32 points).

Measuring range

Maximum measuring range

Device	Maximum measuring range
FMR56	30 m (98 ft)
FMR57	70 m (230 ft)

Usable measuring range

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.

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

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

Operating frequency

K–band (~ 26 GHz)

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

Transmitting power

Distance	Average energy density in beam direction
1 m (3.3 ft)	< 64 nW/cm^2
5 m (16 ft)	< 2.5 nW/cm^2

Output

Output signal	**HART**

Signal coding	FSK ±0.5 mA over current signal
Data transmission rate	1 200 Bit/s
Galvanic isolation	Yes

PROFIBUS PA (in preparation)

Signal coding	Manchester Bus Powered (MBP)
Data transmission rate	31.25 kBit/s, voltage mode
Galvanic isolation	Yes

FOUNDATION Fieldbus (in preparation)

Signal coding	Manchester Bus Powered (MBP)
Data transmission rate	31.25 kBit/s, voltage mode
Galvanic isolation	Yes

Switch output

For HART devices, the switch output is available as an option. See product structure, feature 20: "Power Supply, Output", option B: "2-wire; 4-20mA HART, switch output"

Devices with PROFIBUS PA and FOUNDATION Fieldbus always have a switch output.

Switch output	
Function	Open collector switching output
Switching behavior	Binary (conductive or non-conductive), switches when the programmable switch point is reached
Failure mode	non-conductive
Eectrical connection values	U = 10.4 to 35 V_{DC}, I = 0 to 40 mA
Internal resistance	$R_I < 880\ \Omega$ The voltage drop at this internal resistance has to be taken into account on planning the configuration. For example, the resulting voltage at a connected relay must be sufficient to switch the relay.
Insulation voltage	floating, Insulation voltage 1 350 V_{DC} to power supply aund 500 V_{AC} to ground
Switch point	freely programmable, separately for switch-on and switch-off point
Switching delay	freely programmable from 0 to 100 sec. , separately for switch-on and switch-off point
Number of switching cycles	corresponds to the measuring cycle
Signal source device variables	▪ Level linearized ▪ Distance ▪ Terminal voltage ▪ Electronic temperature ▪ Relative echo amplitude ▪ Diagnostic values, Advanced diagnostics
Number of switching cycles	unlimited

Signal on alarm	Depending on the interface, failure information is displayed as follows:
	■ Current output (for HART devices)
	  – Failsafe mode selectable (in accordance with NAMUR Recommendation NE 43):
	    Minimum alarm: 3.6 mA
	    Maximum alarm (= factory setting): 22 mA
	  – Failsafe mode with user-selectable value: 3.59 to 22.5 mA
	■ Local display
	  – Status signal (in accordance with NAMUR Recommendation NE 107)
	  – Plain text display
	■ Operating tool via digital communication (HART, PROFIBUS PA, FOUNDATION Fieldbus) or service interface (CDI)
	  – Status signal (in accordance with NAMUR Recommendation NE 107)
	  – Plain text display

Linearization	The linearization function of the device allows the conversion of the measured value into any unit of length or volume. Linearization tables for calculating the volume in cylindrical tanks are pre-programmed. Other tables of up to 32 value pairs can be entered manually or semi-automatically.
Galvanic isolation	All circuits for the outputs are galvanically isolated from each other.
Protocol-specific data	**HART**

Manufacturer ID	17 (0x11)
Device type ID	41 (0x28)
HART specification	6.0
Device description files (DTM, DD)	Information and files under: ■ www.endress.com ■ www.hartcomm.org
HART load	Min. 250 Ω
HART device variables	The measured values can be freely assigned to the device variables. **Measured values for PV (primary variable)** ■ Level linearized ■ Distance ■ Electronic temperature ■ Relative echo amplitude ■ Analog output adv. diagnostics **Measured values for SV, TV, FV (second, third and fourth variable)** ■ Level linearized ■ Distance ■ Terminal voltage ■ Electronic temperature ■ Absolute echo amplitude ■ Relative echo amplitude ■ Area of incoupling
Supported functions	■ Burst mode ■ Additional transmitter status

PROFIBUS PA (in preparation)

Manufacturer ID	17 (0x11)
Ident number	0x1559
Profile version	3.02
GSD file	Information and files under:
GSD file version	■ www.endress.com ■ www.profibus.org

Output values	**Analog Input:** ■ Level linearized ■ Distance ■ Terminal voltage ■ Electronic temperature ■ Absolute echo amplitude ■ Relative echo amplitude
	Digital Input: ■ Extended diagnostic blocks ■ Status output PFS Block
Input values	**Analog Output:** ■ Analog value from PLC (for sensor block external pressure and temperature) ■ Analog value from PLC to be indicated on the display
	Digital Output: ■ Extended diagnostic block ■ Level limiter ■ Sensor block measurement on ■ Sensor block save history on ■ Status output
Supported functions	■ Identification & Maintenance Einfachste Geräteidentifizierung seitens des Leitsystems und des Typenschildes ■ Automatic Ident Number Adoption GSD compatibility mode with respect to the preceding product Micropilot M FMR2xx ■ Physical Layer Diagnostics Installation check of the PRFIBUS segment and the Micropilot FMR5x via the terminal voltage and telegram surveillance. ■ PROFIBUS Up-/Download Up to 10 times faster writing and reading of parameters via PROFIBUS up-/download ■ Condensed Status Simple and self-explanatory diagnostic information by categorization of occurring diagnostic messages.

FOUNDATION Fieldbus (in preparation)

Manufacturer ID	0x452B48
Device type	0x1028
Device Revision	0x01
DD Revision	Information and files can be found: ■ www.endress.com ■ www.fieldbus.org
CFF Revision	
Device Tester Version (ITK Version)	6.0.1
ITK Test Campaign Number	IT085300
Link Master (LAS) capable	yes
Link Master / Basic Device selectable	yes; default: Basic Device
Node address	Default: 247 (0xF7)
Features supported	Following methods are supported: ■ Restart ■ ENP Restart ■ Setup ■ Linearization ■ Self Check
Virtual Communication Relationships (VCRs)	
Number of VCRs	44
Number of Link Objects in VFD	50

Permanent entries	1
Client VCRs	0
Server VCRs	10
Source VCRs	43
Sink VCRs	0
Subscriber VCRs	43
Publisher VCRs	43
Device Link Capabilities	
Slot time	4
Min. inter PDU delay	8
Max. response delay	20

Transducer Blocks

Block	Content	Output values
Setup Transducer Block	Contains all parameters for a standard commissioning procedure	■ Level or volume [1] (Channel 1) ■ Distance (Channel 2)
Advanced Setup Transducer Block	Contains all parameters for a more detailed configuration of the device	no output values
Display Transducer Block	Contains all parameters for the configuration of the display module	no output values
Diagnostic Transducer Block	Contains diagnostic information	no output values
Expert Configuration Transducer Block	Contains parameters which require detailed knowledge of the functionalities of the device	no output values
Expert Information Transducer Block	Contains information about the state of the device	no output values
Service Sensor Transducer Block	Contains parameters which can only be operated by Endress+Hauser service personnel	no output values
Service Information Transducer Block	Contains information on the state of device which is relevant for service operations	no output values
Data Transfer Transducer Block	Contains parameters which allow to backup the device configuration in the display module and to restore it into the device.	no output values

1)   depending on the configuration of the block

Function Blocks

Block	Content	Number of permanent blocks	Number of instantiable blocks	Execution time	Functionality
Resource Block	The Resource Block contains all the data that uniquely identifies the field device. It is an electronic version of a nameplate of the device.	1	0	–	enhanced
Multiple Analog Input Block	The AI block takes the manufacturer's input data, selected by channel number, and makes it available to other function blocks at its output.	2	3	25 ms	enhanced
Discrete Input Block	The DI block takes a discrete input value (e.g. indication of an level limit), and makes it available to other function blocks at its output.	1	2	20 ms	standard

Block	Content	Number of permanent blocks	Number of instantiable blocks	Execution time	Functionality
PID Block	The PID block serves as proportional-integralderivative controller and is used almost universally to do closed-loop-control in the field including cascade and feedforward.	1	1	25 ms	standard
Arithmetic Block	This block is designed to permit simple use of popular measurement math functions. The user does not have to know how to write equations. The math algorithm is selected by name, chosen by the user for the function to be done.	1	1	25 ms	standard
Signal Characterizer Block	The signal characterizer block has two sections, each with an output that is a non-linear function of the respective input. The non-linear function is determined by a single look-up table with 21 arbitrary x–y pairs.	1	1	25 ms	standard
Input Selector Block	The input selector block provides selection of up to four inputs and generates an output based on the configured action. This block normally receives its inputs from AI blocks. The block performs maximum, minimum, middle, average and 'first good' signal selection.	1	1	25 ms	standard
Integrator Block	The Integrator Function Block integrates a variable as a function of the time or accumulates the counts from a Pulse Input block. The block may be used as a totalizer that counts up until reset or as a batch totalizer that has a setpoint, where the integrated or accumulated value is compared to pre-trip and trip settings, generating discrete signals when these settings are reached.	1	1	25 ms	standard
Analog Alarm Block		1	1	25 ms	standard

Up to 20 blocks can be instantiated in the device altogether, including the blocks already instantiated on delivery.

Power supply

Terminal assignment   **2-wire: 4-20mA HART**
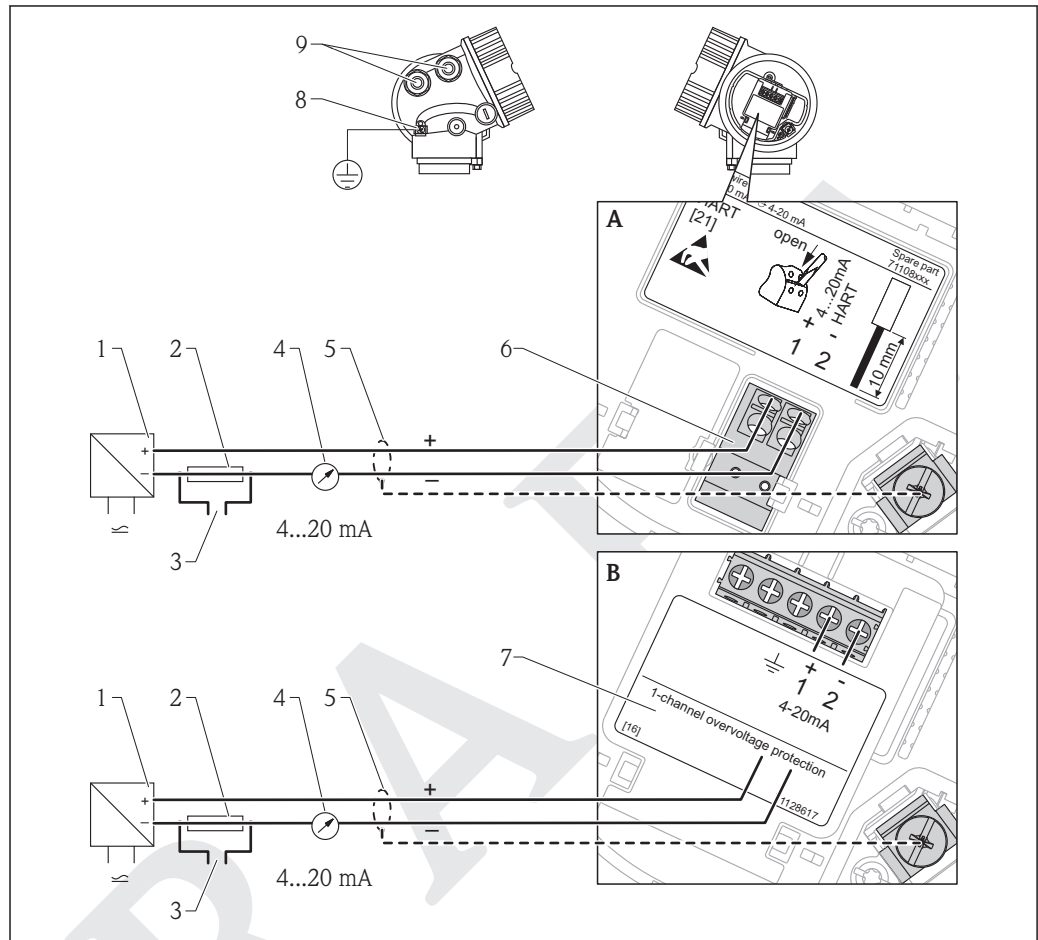
A0011294

3   *Terminal assignment 2-wire; 4-20mA HART*

A   *Without integrated overvoltage protection*
B   *With integrated overvoltage protection*
1   *Active barrier with power supply (e.g. RN221N): Observe terminal voltage (→ 🖹 22)*
2   *HART communication resistor (≥250 Ω): Observe maximum load (→ 🖹 22)*
3   *Connection for Commubox FXA195 or FieldXpert SFX100 (via VIATOR Bluetooth modem)*
4   *Analog display device: Observe maximum load (→ 🖹 22)*
5   *Cable screen; observe cable specification (→ 🖹 25)*
6   *Terminals for 4-20mA HART (passive)*
7   *Overvoltage protection module*
8   *Terminal for potential equalization line*
9   *Cable entry*

2-wire: 4–20mA HART, switch output

🖎 4   Terminal assignment 2-wire; 4-20mA HART, switch output

A   Without integrated overvoltage protection
B   With integrated overvoltage protection
1   Active barrier with power supply (e.g. RN221N): Observe terminal voltage (→ 🖹 22)
2   HART communication resistor (≥250 Ω): Observe maximum load (→ 🖹 22)
3   Connection for Commubox FXA195 or FieldXpert SFX100 (via VIATOR Bluetooth modem)
4   Analog display device: Observe maximum load (→ 🖹 22)
5   Cable screen; observe cable specification (→ 🖹 25)
6   Terminals for 4-20mA HART (passive)
7   Terminals for switch output (open collector)
8   Terminal for potential equalization line
9   Cable entry for 4–20mA HART line
10   Cable entry for switch output line
11   Overvoltage protection module
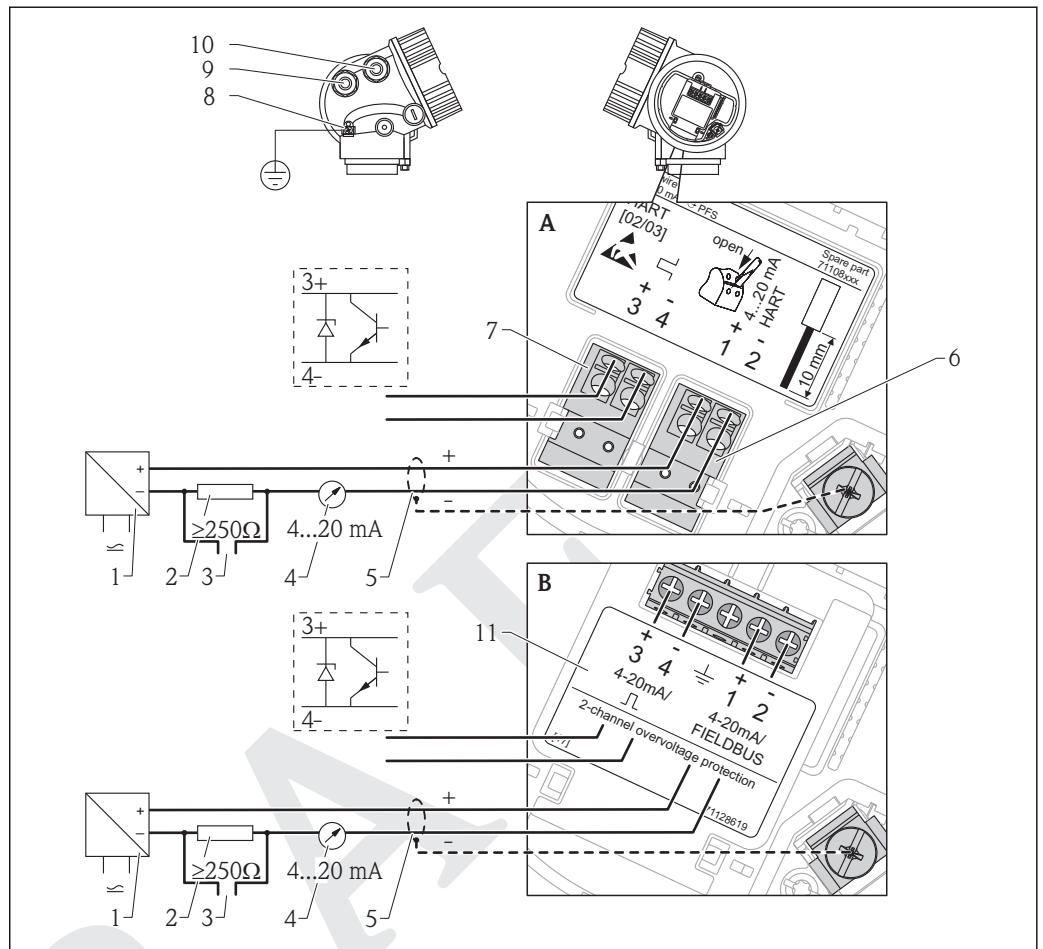
2-wire: 4-20mA HART, 4-20mA
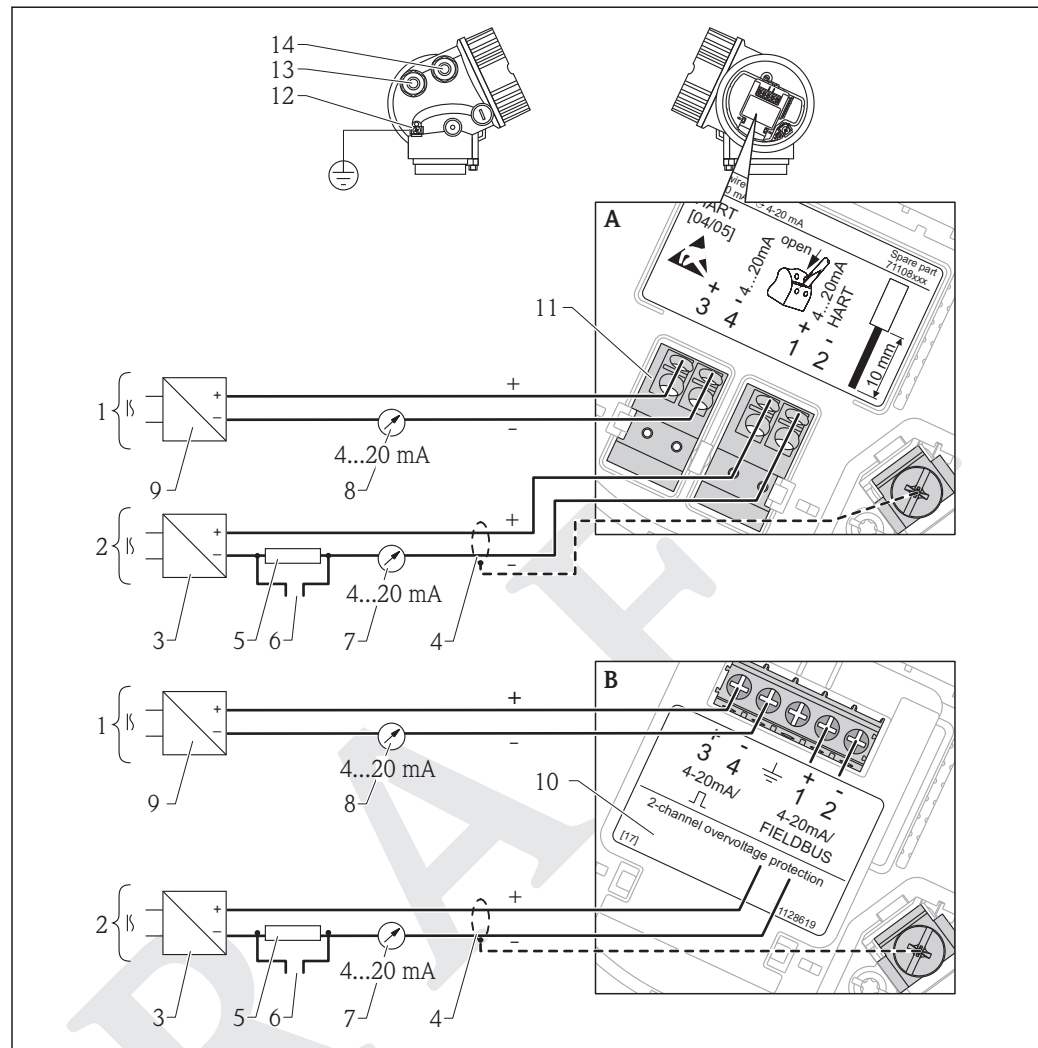
▣ 5   Terminal assignment 2-wire, 4-20 mA HART, 4...20mA

A   *Without integrated overvoltage protection*
B   *With integrated overvoltage protection*
1   *Connection current output 2*
2   *Connection current output 1*
3   *Supply voltage for current output 1 (e.g. RN221N); Observe terminal voltage (→ ▤ 23)*
4   *Cable screen; observe cable specification (→ ▤ 25)*
5   *HART communication resistor (≥ 250 Ω): Observe maximum load (→ ▤ 23)*
6   *Connection for Commubox FXA195 or FieldXpert SFX100 (via VIATOR Bluetooth modem)*
7   *Analog display device ; observe maximum load (→ ▤ 23)*
8   *Analog display device ; observe maximum load (→ ▤ 23)*
9   *Supply voltage for current output 2 (e.g. RN221N); Obesrve terminal voltage (→ ▤ 23)*
10 *Overvoltage protection module*
11 *Terminals for current output 2*
12 *Terminal for the potential equalization line*
13 *Cable entry for current output 1*
14 *Cable entry for current output 2*

ℹ️   This version is also suited for single–channel operation. In this case, current output 1 (terminals 1 and 2) must be used.

4-wire: 4–20mA HART (10.4 to 48 V$_{DC}$)
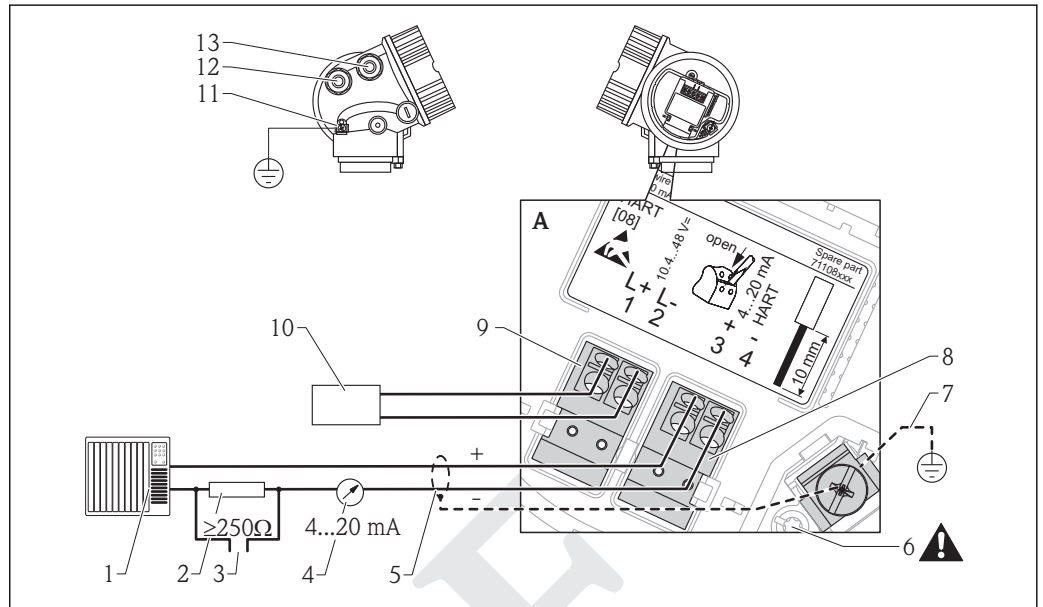
🖼 *6   Terminal assignment 4-wire; 4-20mA HART (10.4 to 48 VDC)*

1   Evaluation unit, e.g. PLC
2   HART communication resistor (≥250 Ω): Observe maximum load (→ 🖹 24)
3   Connection for Commubox FXA195 or FieldXpert SFX100 (via VIATOR Bluetooth modem)
4   Analog display device: Observe maximum load (→ 🖹 24)
5   Signal cable including screening (if required), observe cable specification (→ 🖹 25)
6   Protective connection; do not disconnect!
7   Protective earth, observe cable specification (→ 🖹 25)
8   Terminals for 4...20mA HART (active)
9   Terminals for supply voltage
10   Supply voltage: Observe terminal voltage (→ 🖹 24), observe cable specification (→ 🖹 25)
11   Terminal for potential equalization
12   Cable entry for signal line
13   Cable entry for power supply

⚠ CAUTION

To ensure electrical safety:
▶   Do not disconnect the protective connection (7).
▶   Disconnect the supply voltage before disconnecting the protective earth (8).

ℹ   Connect protective earth to the internal ground terminal (8) before connecting the supply voltage. If necessary, connect the potential matching line to the external ground terminal (12).

ℹ   In order to ensure electromagnetic compatibility (EMC): Do not only ground the device via the protective earth conductor of the supply cable. Instead, the functional grounding must also be connected to the process connection (flange or threaded connection) or to the external ground terminal.

ℹ   An easily accessible power switch must be installed in the proximity of the device. The power switch must be marked as a disconnector for the device (IEC/EN61010).

4-wire: 4–20mA HART (90 to 253 V$_{AC}$)

A0018965
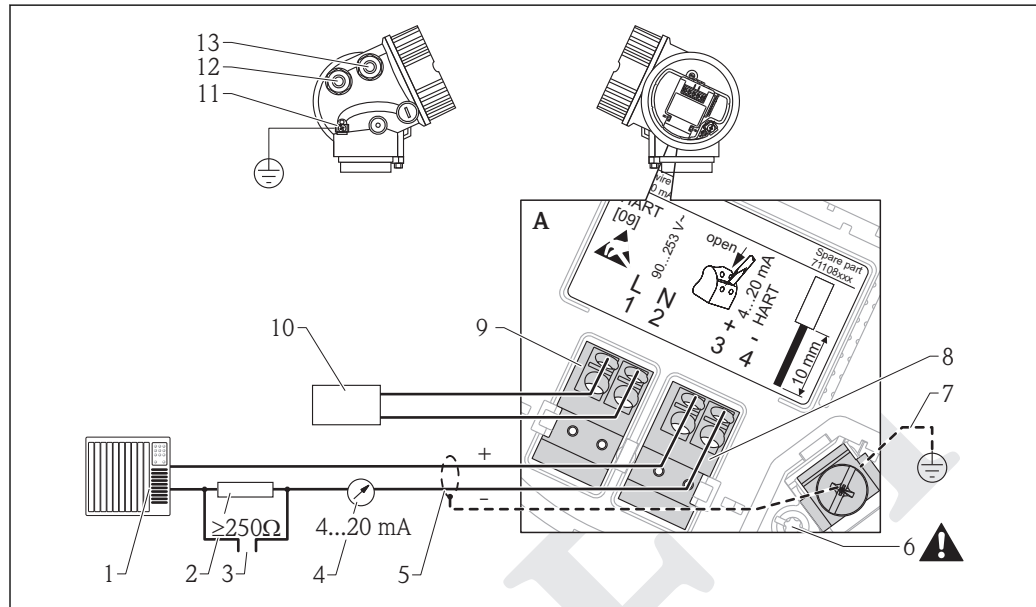
 7   *Terminal assignment 4-wire; 4-20mA HART (90 to 253 VAC)*

1   Evaluation unit, e.g. PLC
2   HART communication resistor (≥250 Ω): Observe maximum load (→ 24)
3   Connection for Commubox FXA195 or FieldXpert SFX100 (via VIATOR Bluetooth modem)
4   Analog display device: Observe maximum load (→ 24)
5   Signal cable including screening (if required), observe cable specification (→ 25)
6   Protective connection; do not disconnect!
7   Protective earth, observe cable specification (→ 25)
8   Terminals for 4...20mA HART (active)
9   Terminals for supply voltage
10 Supply voltage: Observe terminal voltage (→ 24), observe cable specification (→ 25)
11 Terminal for potential equalization
12 Cable entry for signal line
*13 Cable entry for power supply*

> ⚠ **CAUTION**
>
> **To ensure electrical safety:**
> ▶ Do not disconnect the protective connection (7).
> ▶ Disconnect the supply voltage before disconnecting the protective earth (8).

> ℹ Connect protective earth to the internal ground terminal (8) before connecting the supply voltage. If necessary, connect the potential matching line to the external ground terminal (12).

> ℹ In order to ensure electromagnetic compatibility (EMC): Do not only ground the device via the protective earth conductor of the supply cable. Instead, the functional grounding must also be connected to the process connection (flange or threaded connection) or to the external ground terminal.

> ℹ An easily accessible power switch must be installed in the proximity of the device. The power switch must be marked as a disconnector for the device (IEC/EN61010).

PROFIBUS PA / FOUNDATION Fieldbus (in preparation)
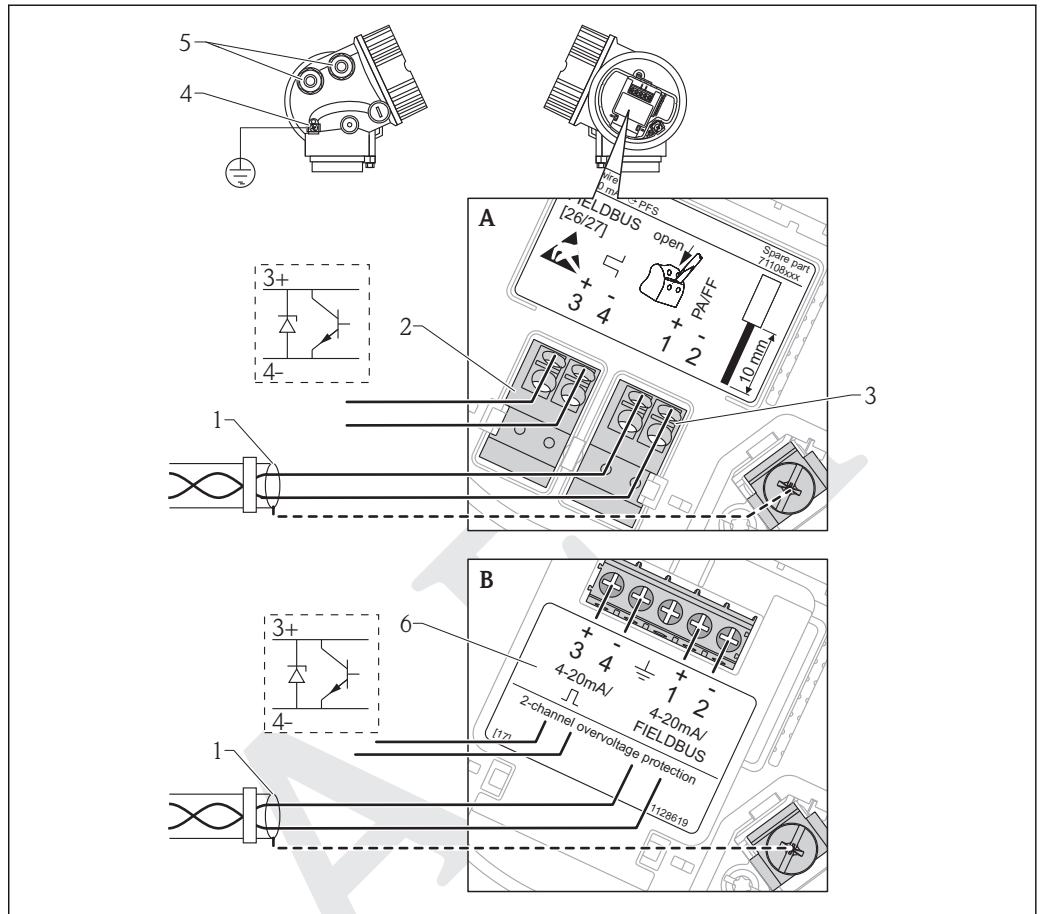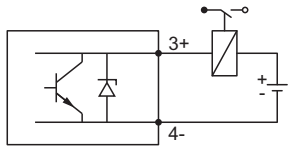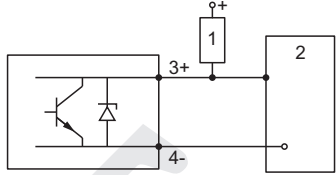
⊠ 8   Terminal assignment PROFIBUS PA / FOUNDATION Fieldbus

A   Without integrated overvoltage protection
B   With integrated overvoltage protection
1   Cable screen: Observe cable specifications (→ ▤ 25)
2   Terminals for switch output (open collector)
3   Terminals PROFIBUS PA / FOUNDATION Fieldbus
4   Terminal for potential equalization line
5   Cable entries
6   Overvoltage protection module

Connection examples for the switch output

ℹ️ For HART devices, the switch output is available as an option. See product structure, feature 20: "Power Supply, Output", option B: "2-wire; 4-20mA HART, switch output"

Devices with PROFIBUS PA and FOUNDATION Fieldbus always have a switch output.

9   Connection of a relay

Suitable relays (examples):
- Solid-state relay: Phoenix Contact OV-24DC/480AC/5 with mounting rail connector UMK-1 OM-R/AMS
- Electromechanical relay: Phoenix Contact PLC-RSC-12DC/21

10   Connection of a digital input

1   Pull-up resistor
2   Digital input

Device plug connectors   ℹ️ For the versions with fieldbus plug connector (M12 or 7/8"), the signal line can be connected without opening the housing.

Pin assignment of the M12 plug connector

	Pin	Meaning
4● ⏚ 3● − 1● + 2● nc A0011175	1	Signal +
	2	not connected
	3	Signal −
	4	Ground

Pin assignment of the 7/8" plug connector

	Pin	Meaning
1● 3● 2● 4● A0011176	1	Signal −
	2	Signal +
	3	Screen
	4	Not connected
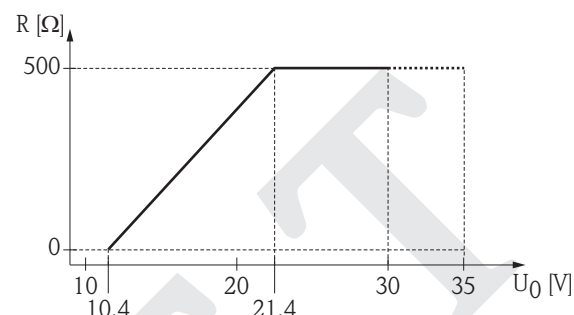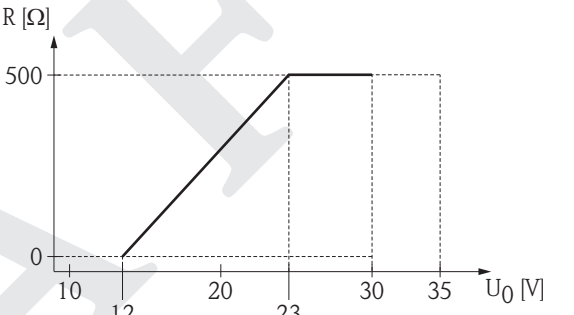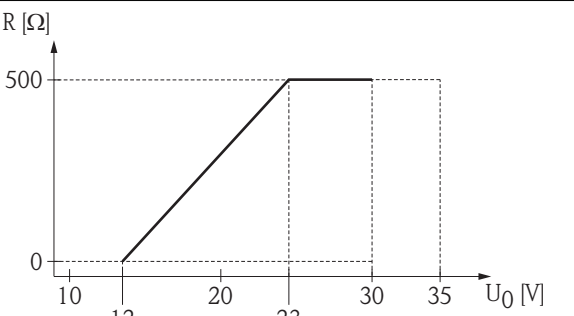
Supply voltage An external power supply is required.

ℹ️ Various supply units can be ordered from Endress+Hauser: see "Accessories" section (→ 📄 83)
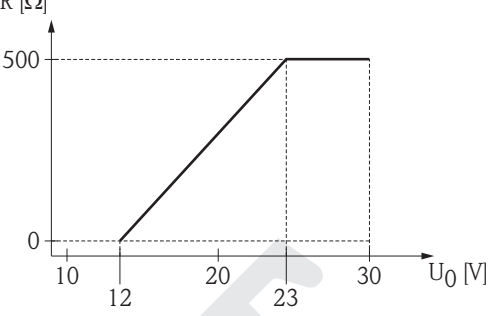
2-wire, 4–20mA HART, passive

"Power Supply, Output" [1]	"Approval" [2]	Terminal voltage U at the device	Maximum load R, depending on the supply voltage U_0 at the supply unit
A: 2-wire; 4-20mA HART	▪ Non-Ex ▪ Ex nA ▪ Ex ic ▪ CSA GP	10.4 to 35 V [3]	
	Ex ia / IS	10.4 to 30 V [3]	
	▪ Ex d(ia) / XP ▪ Ex ic(ia) ▪ Ex nA(ia) ▪ Ex ta / DIP	12 to 35 V [4]	
	Ex ia + Ex d(ia) / IS + XP	12 to 30 V [4]	

1) Feature 020 of the product structure
2) Feature 010 of the product structure
3) For ambient temperatures $T_a \leq$ –20 °C (–4 °F) a minimum voltage of 15 V is required for the sartup of the device at the MIN error current (3,6 mA). The startup current can be parametrized. If the device is operated with a fixed current I ≥ 5,5 mA (HART multidrop mode), a voltage of U ≥ 10,4 V is sufficient throughout the entire range of ambient temperatures.
4) For ambient temperatures $T_a \leq$ –20 °C (–4 °F) a minimum voltage of 16 V is required for the satrtup of the device at the MIN error current (3.6 mA).

"Power Supply, Output" [1]	"Approval" [2]	Terminal voltage U at the device	Maximum load R, depending on the supply voltage U_0 at the supply unit
B: 2-wire; 4-20 mA HART, switch output	▪ Non-Ex ▪ Ex nA ▪ Ex nA(ia) ▪ Ex ic ▪ Ex ic(ia) ▪ Ex d(ia) / XP ▪ Ex ta / DIP ▪ CSA GP	12 to 35 V [3]	
	▪ Ex ia / IS ▪ Ex ia + Ex d(ia) / IS + XP	12 to 30 V [3]	

1) Feature 020 of the product structure
2) Feature 010 of the product structure
3) For ambient temperatures $T_a \leq$ –30 °C (–22 °F) a minimum voltage of 16 V is required for the satrtup of the device at the MIN error current (3.6 mA).

"Power Supply, Output" [1]	"Approval" [2]	Terminal voltage U at the device	Maximum load R, depending on the supply voltage U_0 at the supply unit
C: 2-wire; 4–20mA HART, 4–20mA	any	12 to 30 V [3]	

1) Feature 020 of the product structure
2) Feature 010 of the product structure
3) For ambient temperatures $T_a \leq -30\,°C$ (–22 °F) a minimum voltage of 16 V is required for the satrtup of the device at the MIN error current (3.6 mA).

Polarity reversal protection	Yes
Admissible residual ripple at f = 0 to 100 Hz	$U_{SS} < 1$ V
Admissible residual ripple at f = 100 to 10000 Hz	$U_{SS} < 10$ mV

4-wire, 4-20mA HART, active

"Power supply; Output" [1]	Terminal voltage	Maximum load R_{max}
K: 4-wire 90-253VAC; 4-20mA HART	90 to 253 V_{AC} (50 to 60 Hz), overvoltage category II	500 Ω
L: 4-wire 10,4-48VDC; 4-20mA HART	10.4 to 48 V_{DC}	

1)   Feature 020 of the product structure

PROFIBUS PA, FOUNDATION Fieldbus (in preparation)

"Power supply; Output" [1]	"Approval" [2]	Terminal voltage
E: 2-wire; FOUNDATION Fieldbus, switch output **G:** 2-wire; PROFIBUS PA, switch output	■ Non-Ex ■ Ex nA ■ Ex nA(ia) ■ Ex ic ■ Ex ic(ia) ■ Ex d(ia) / XP ■ Ex ta / DIP ■ CSA GP	9 to 32 V [3]
	■ Ex ia / IS ■ Ex ia + Ex d(ia) / IS + XP	9 to 30 V [3]

1)   Feature 020 of the product structure
2)   Feature 010 of the product structure
3)   Input voltages up to 35 V will not spoil the device.

Polarity sensitive	No
FISCO/FNICO compliant according to IEC 60079-27	Yes

Power consumption

"Power supply; Output" [1]	Power consumption
A: 2-wire; 4-20mA HART	< 0.9 W
B: 2-wire; 4-20mA HART, switch output	< 0.9 W
C: 2-wire; 4-20mA HART, 4-20mA	< 2 x 0.7 W
K: 4-wire 90-253VAC; 4-20mA HART	6 VA
L: 4-wire 10,4-48VDC; 4-20mA HART	1.3 W

1)   Feature 020 of the product structure

Current consumption

HART

Nominal current	3.6 to 22 mA, the start-up current for multidrop mode can be parametrized (is set to 3.6 mA on delivery)
Breakdown signal (NAMUR NE43)	adjustable: 3.59 to 22.5 mA

PROFIBUS PA (in preparation)

Nominal current	14 mA
Error current FDE (Fault Disconnection Electronic)	0 mA

FOUNDATION Fieldbus (in preparation)

Device basic current	14 mA
Error current FDE (Fault Disconnection Electronic)	0 mA

FISCO (in preparation)

U_i	17.5 V
I_i	550 mA
P_i	5.5 W
C_i	5 nF
L_i	10 μH

Power supply failure	▪ Configuration is retained in the HistoROM (EEPROM). ▪ Error messages (incl. value of operated hours counter) are stored.
Potential equalization	No special measures for potential equalization are required. 📖 If the device is designed for hazardous areas, observe the information in the documentation "Safety Instructions" (XA, ZD).
Terminals	▪ **Without integrated overvoltage protection** Plug–in spring terminals for wire cross–sections 0.5 to 2.5 mm^2 (20 to 14 AWG) ▪ **With integrated overvoltage protection** Screw terminals for wire cross–sections 0.2 to 2.5 mm^2 (24 to 14 AWG)

Cable entries	▪ Cable gland (not for Ex d):
	  – Plastics M20x1.5 for cable ⌀ 5 to 10 mm (0.2 to 0.39 in): non-Ex, ATEX/IECEx/NEPSI Ex ia/ic
	  – Metal M20x1.5 for cable ⌀ 7 to 10 mm (0.28 to 0.39 in): dust-Ex, FM IS, CSA IS, CSA GP, Ex nA
	▪ Thread for cable entry:
	  – ½" NPT
	  – G ½"
	  – M20 × 1.5
	▪ Connector (only for non–Ex, Ex ic, Ex ia): M12 or 7/8"

Cable specification	▪ Standard device cable is sufficient for the power supply of the device.
	▪ Minimum cross-section: (→ 🗎 25)
	▪ For ambient temperature $T_U \geq 60$ °C (140 °F): use cable for temperature T_U +20 K.
	
	HART
	▪ A normal device cable suffices if only the analog signal is used.
	▪ A shielded cable is recommended if using the HART protocol. Observe grounding concept of the plant.
	
	PROFIBUS (in preparation)
	Use a twisted, screened two–wire cable, preferably cable type A.
	
	  ℹ️ For further information on the cable specifications, see Operating Instructions BA00034S "Guidelines for planning and commissioning PROFIBUS DP/PA", PNO Guideline 2.092 "PROFIBUS PA User and Installation Guideline" and IEC61158–2 (MBP).
	
	FOUNDATION Fieldbus (in preparation)
	Endress+Hauser recommends using twisted, shielded two–wire cables.
	
	  ℹ️ For further information on the cable specifications, see Operating Instructions BA00013S "FOUNDATION Fieldbus Overview", FOUNDATION Fieldbus Guideline and IEC 61158-2 (MBP).

Overvoltage protection

If the measuring device is used for level measurement in flammable liquids which requires the use of overvoltage protection according to DIN EN 60079-14, standard for test procedures 60060-1 (10 kA, pulse 8/20 µs), overvoltage protection has to be ensured by an integrated or external overvoltage protection module.

Integrated overvoltage protection

An integrated overvoltage protection module is available for 2-wire HART as well as PROFIBUS PA and FOUNDATION Fieldbus devices.

Product structure: Feature 610 "Accessory mounted", option NA "Overvoltage protection".

Technical data	
Resistance per channel	2 * 0.5 Ω max
Threshold DC voltage	400 to 700 V
Threshold impulse voltage	< 800 V
Capacitance at 1 MHz	< 1.5 pF
Nominal arrest impulse voltage (8/20 µs)	10 kA

External overvoltage protection

HAW562 or HAW569 from Endress+Hauser are suited as external overvoltage protection.

For detailed information please refer to the following documents:
- HAW562: TI01012K
- HAW569: TI01013K

Performance characteristics

Reference operating conditions	• Temperature = +24 °C (+75 °F) ±5 °C (±9 °F) • Pressure = 960 mbar abs. (14 psia) ±100 mbar (±1.45 psi) • Humidity = 60 % ±15 % • Reflector: metal plate with a minimum diameter of 1 m (40 in) • No major interference reflections inside the signal beam

Maximum measured error

Typical data under reference operating conditions: DIN EN 61298-2, percentage values in relation to the span.

Device	Value	Output	
		digital	**analog** [1]
FMR56/FMR57	Sum of non-linearity, nonrepeatability and hysteresis	± 3 mm (0.12 in)	± 0.02 %
	Offset/Zero	± 4 mm (0.2 in)	± 0.03 %

1)   Add error of the analogous value to the digital value.

Differing values in near-range applications
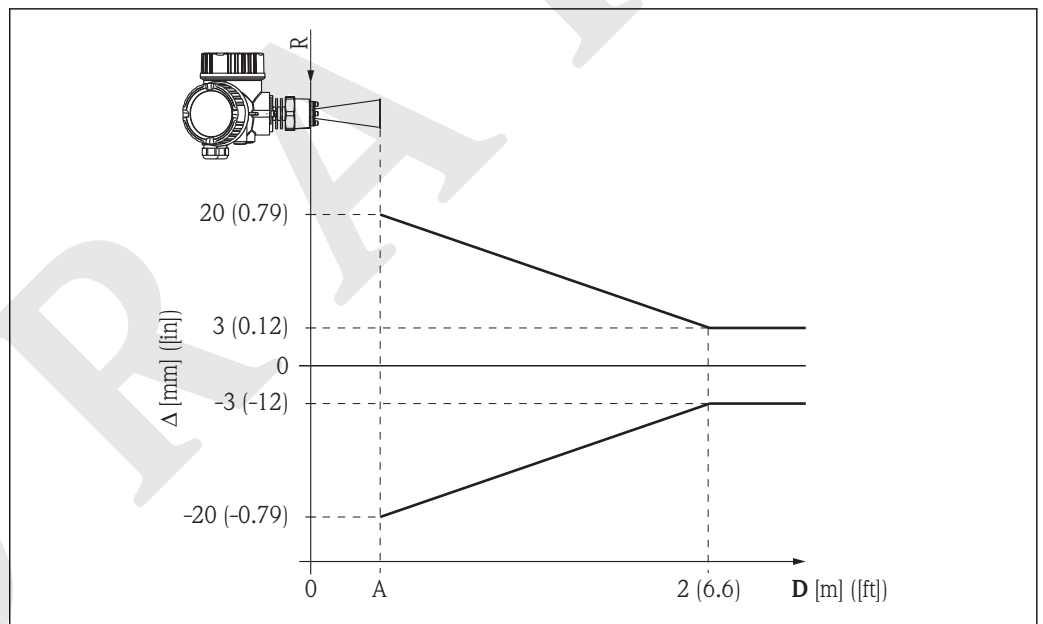
🖂 *11   Maximum measured error in near-range applications*

Δ   *Maximum measured error*
D   *Distance from the reference point R*
A   *Lower edge of the antenna*

Measured value resolution

Dead band according to EN61298-2:

• digital: 1 mm
• analog: 1 μA

	Tank height	Sampling rate	Step response time
Reaction time	< 10 m (33 ft)	$\geq 3.6\ \text{s}^{-1}$	< 0.8 s
	< 70 m (230 ft)	$\geq 2.2\ \text{s}^{-1}$	< 1 s

The reaction time can be parametrized. The following step response times (as per DIN EN 61298-2) [1]are valid if the damping is switched off:

Influence of ambient temperature

The measurements are carried out in accordance with EN 61298-3
- Digital (HART, PROFIBUS PA): average T_K = 5 mm/10 K; maximum 15 mm
- Analog (current output):
  - zero point (4 mA): average T_K = 0.02 %/10 K
  - span (20 mA): average T_K = 0.05 %/10 K

---

[1]   According to DIN EN 61298-2 the response time is the time which passes after a sudden change of the input signal until the output signal for the first time assumes 90% of the steady-state value.

Installation

Installation conditions   Mounting position

A0016883
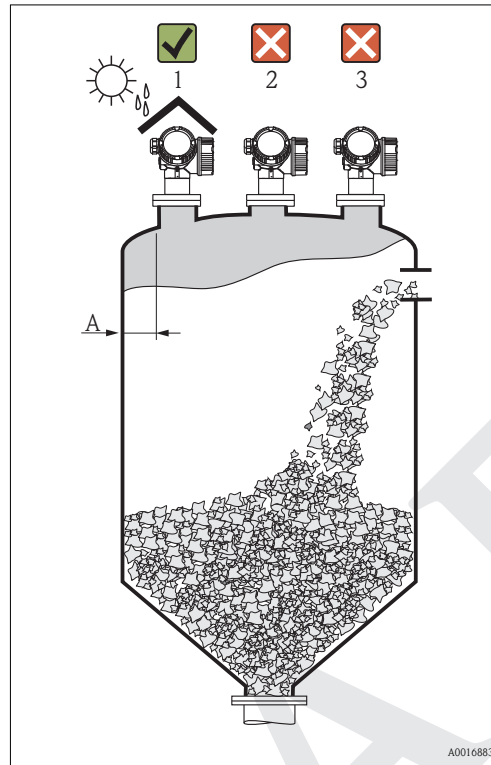
- Recommended distance **A** from wall to outer edge of nozzle: ~ 1/6 of vessel diameter. Nevertheless the device should not be installed closer than 20 cm (7.87 in) to the vessel wall. If the wall of the vessel is not smooth (corrugated metal, welding seams, irregularities etc.) the distance from the wall should be kept as large as possible. If necessary, use an alignment device to prevent interference reflections from the wall(→ 🗎 44).
- Not in the center (2), as interference can cause signal loss.
- Not above the fill stream (3).
- It is recommended to us a weather protection cover (1) in order to protect the device from direct sun or rain.
- In extremely dusty applications, the integrated air purge connection can prevent clogging of the antenna (→ 🗎 45).

Vessel installations

A0018946
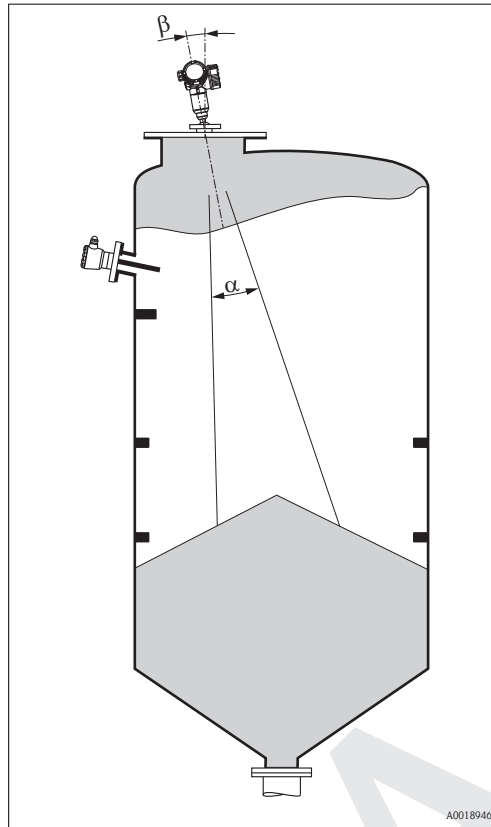
Avoid any installations (limit switches, temperature sensors, braces etc.) inside the signal beam. Take into account the beam angle (→ 🗎 34):

Reduction of interference echoes
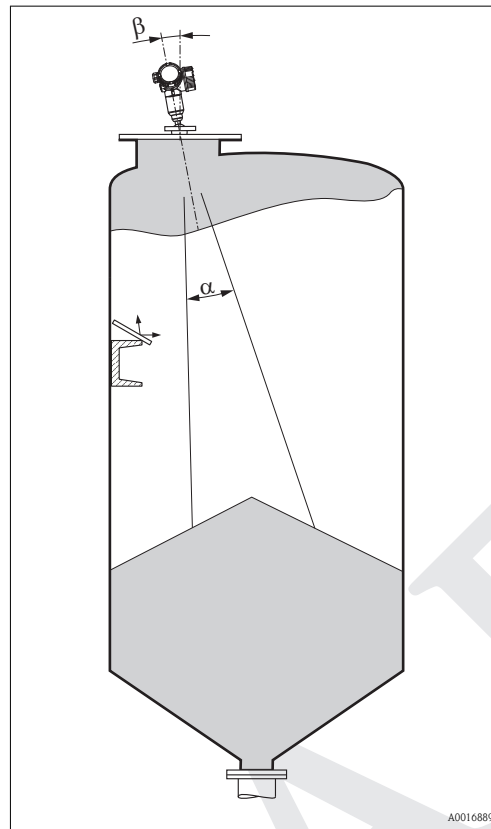
Metallic screens mounted at a slope spread the radar signal and can, therefore, reduce interference echoes.

Measurement in a plastic vessel

If the outer wall of the vessel 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.
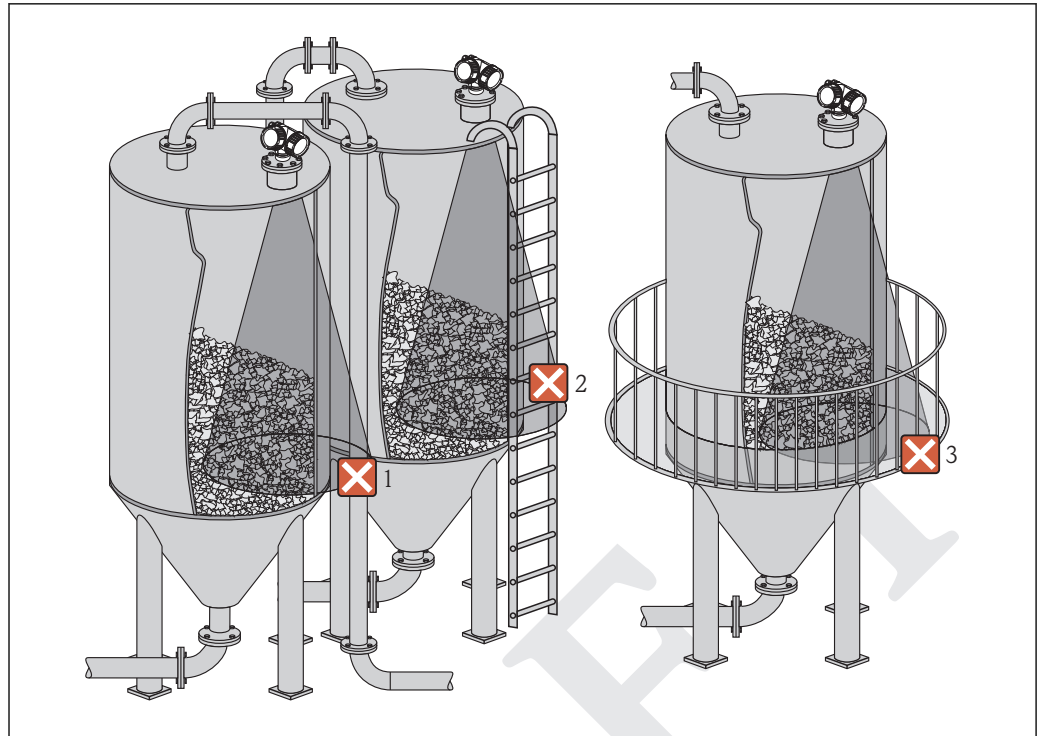
A0017125

Optimization options

- Antenna size
  The bigger the antenna, the smaller the beam angle α and the fewer interference echoes ($\rightarrow$ 🖹 34).
- Mapping
  The measurement can be optimized by means of electronic suppression of interference echoes.
- Antenna alignment
  Take into account the marker on the flange or threaded connection ($\rightarrow$ 🖹 39).
- Metallic screens mounted at a slope (3)
  They spread the radar signals and can, therefore, reduce interference echoes.
- Variable flange seal (FMR56)
  Using the variable flange seal, the device can be aligned in the direction of the product surface. For details refer to Operating Instructions BA01048F, chapter "Accessories".
- Alignment device for FMR57
  In FMR57 with alignment device, the sensor can be optimally aimed within the vessel and thus interference echoes can be avoided. The maximum angle β is ±15°.
  In particular, sensor alignment serves to:
  – prevent interference reflections
  – extend the maximum possible measuring range in conical outlets.

Beam angle

$$W = 2 \cdot D \cdot \tan\frac{\alpha}{2}$$
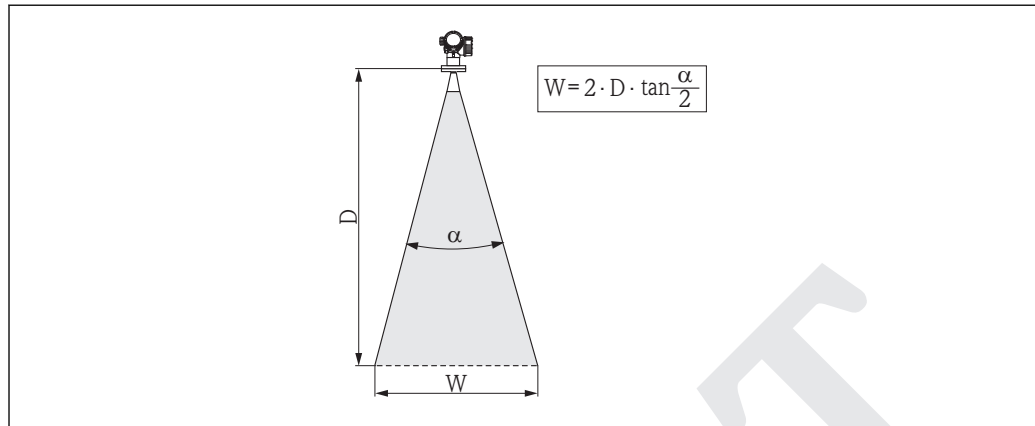
⊠ 12 Relationship between beam angle α, distance D and beamwidth diameter W

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 (3–dB–width). Microwaves are also emitted outside the signal beam and can be reflected off interfering installations.

Beam diameter **W** as a function of beam angle **α** and measuring distance **D**:

FMR56		
Antenna size	80 mm (3 in)	100 mm (4 in)
Beam angle α	10°	8°
Measuring distance (D)	**Beamwidth diameter (W)**	
3 m (9.8 ft)	0.53 m (1.7 ft)	0.42 m (1.4 ft)
6 m (20 ft)	1.05 m (3.4 ft)	0.84 m (2.8 ft)
9 m (30 ft)	1.58 m (5.2 ft)	1.26 m (4.1 ft)
12 m (39 ft)	2.1 m (6.9 ft)	1.68 m (5.5 ft)
15 m (49 ft)	2.63 m (8.6 ft)	2.10 m (6.9 ft)
20 m (66 ft)	3.50 m (11 ft)	2.80 m (9.2 ft)
25 m (82 ft)	4.37 m (14 ft)	3.50 m (11 ft)
30 m (98 ft)	5.25 m (17 ft)	4.20 m (14 ft)

FMR57 – Horn antenna		
Antenna size	80 mm (3 in)	100 mm (4 in)
Beam angle α	10°	8°
Measuring distance (D)	**Beamwidth diameter W**	
5 m (16 ft)	0.87 m (2.9 ft)	0.7 m (2.3 ft)
10 m (33 ft)	1.75 m (5.7 ft)	1.4 m (4.6 ft)
15 m (49 ft)	2.62 m (8.6 ft)	2.1 m (6.9 ft)
20 m (66 ft)	3.50 m (11 ft)	2.80 m (9.2 ft)
30 m (98 ft)	5.25 m (17 ft)	4.20 m (14 ft)
40 m (131 ft)	7.00 m (23 ft)	5.59 m (18 ft)
50 m (164 ft)	8.75 m (29 ft)	6.99 m (23 ft)

FMR57 – Parabolic antenna		
Antenna size	200 mm (8 in)	250 mm (10 in)
Beam angle α	4°	3,5°
Measuring distance (D)	Beamwidth diameter W	
5 m (16 ft)	0.35 m (1.1 ft)	0.30 m (1 ft)
10 m (33 ft)	0.70 m (2.3 ft)	0.61 m (2 ft)
15 m (49 ft)	1.05 m (3.4 ft)	0.92 m (3 ft)
20 m (66 ft)	1.40 m (4.6 ft)	1.22 m (4 ft)
30 m (98 ft)	2.10 m (6.9 ft)	1.83 m (6 ft)
40 m (131 ft)	2.79 m (9.2 ft)	2.44 m (8 ft)
50 m (164 ft)	3.50 m (11 ft)	3.06 m (10 ft)
60 m (197 ft)	4.19 m (14 ft)	3.70 m (12 ft)
70 m (230 ft)	4.90 m (16 ft)	4.28 m (14 ft)

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 an alignment device (→ 📄 44).
- In case of media with a low dielectric constant (ε_r = 1.5 to 2.5) [2], 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 figure).
- In principle it is possible to measure up to the tip of the antenna with Micropilot. However, due to considerations regarding abrasion and build-up and depending on the orientation of the product surface (angle of repose), the end of the measuring range should be at a distance of **A** (see figure) from the tip of the antenna. If required, and if some conditions (high DC value, flat angle of repose) are met, shorter distances can be achieved.
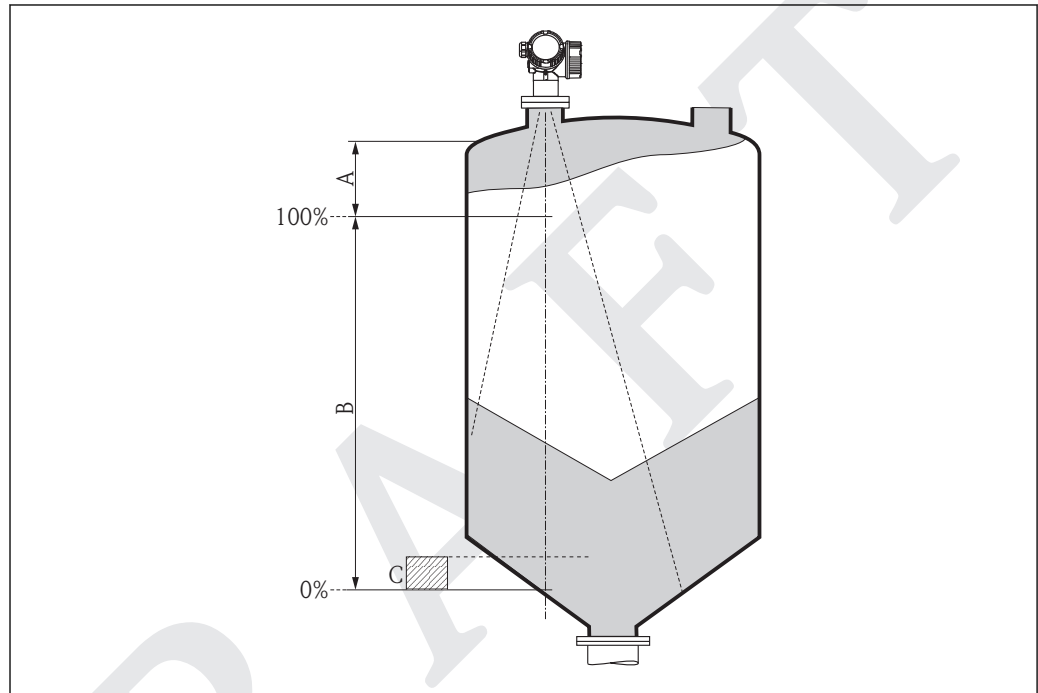
A0016916

Device	A [mm (in)]	C [mm (in)]
FMR56	400(15.7)	50 to 150(1.97 to 5.91)
FMR57		

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2) Dielectric constants of important media commonly used in the industry are summarized in the document SD106F, which can be downloaded from the Endress+Hauser web page (www.endress.com).

| Installation in vessel (free space) | **Horn antenna with slip-on flange (FMR56)** |

Alignment

ℹ️ When using the Micropilot with a slip-on flange in explosion-hazardous areas, strictly observe all specifications in the relevant Safety Instructions (XA).

- Align the antenna vertically to the product surface.
  Optionally, a variable flange seal, which is available as an accessory, can be used for alignment (see Technical Information BA01048F, chapter "Accessories").
- A marking at the boss enables axial alignment of the antenna. This marking must be aligned towards the tank wall.

Nozzle mounting

🖼 *13   Nozzle height and diameter for horn antenna with slip-on flange (FMR50/FMR56)*

Antenna size	80 mm (3 in)			100 mm (3.94 in)	
D	80 mm (3.15 in)	100 mm (3.94 in)	150 mm (5.91 in)	100 mm (3.94 in)	150 mm (5.91 in)
H	< 500 mm (19.7 in)	< 500 mm (19.7 in)	< 500 mm (19.7 in)	< 500 mm (19.7 in)	< 500 mm (19.7 in)

Horn antenna with mounting bracket (FMR56)
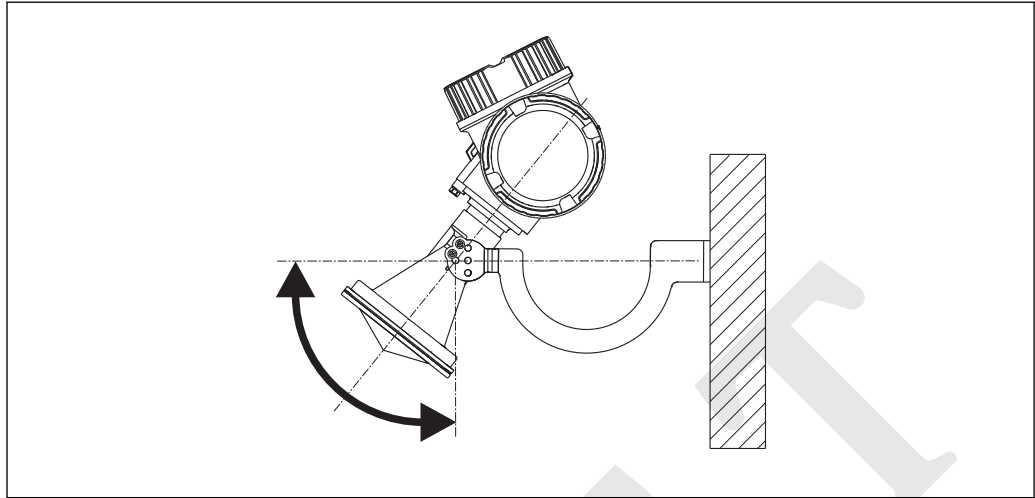
▣ 14   Installation of the horn antenna with mounting bracket (FMR50/FMR56)

Align the antenna vertically to the product surface using the mounting bracket.

NOTICE

The mounting bracket has no conductive connection to the transmitter housing.
Danger of electrostatic charge
▶ Connect the mounting bracket to the local potential equalization system.

Horn antenna (FMR57)

Alignment

- Ideally, the horn antenna should be installed vertically. To avoid interference reflections or for optimum alignment within the vessel, the Micropilot with optional alignment device can be inclined by 15° in all directions (→ 🖹 45).
- A marking at the boss enables axial alignment of the antenna. This marking must be aligned towards the tank wall.
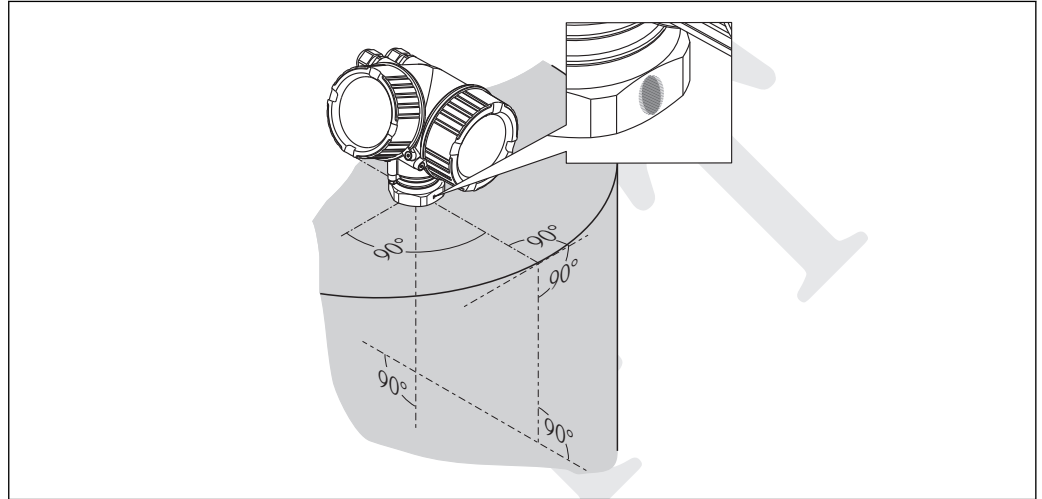
A0019434

Nozzle mounting

The horn antenna should protrude from the nozzle. If this is not possible for mechanical reasons, larger nozzle heights can be accepted.
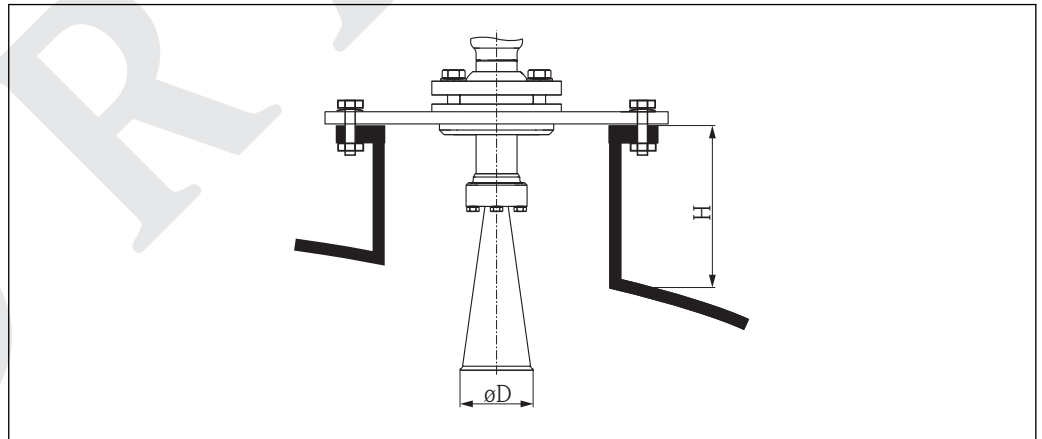
A0016825

🖼 *15   Nozzle height and diameter for the horn antenna (FMR57)*

Antenna size	80 mm (3 in)	100 mm (4 in)
D	75 mm (2.95 in)	95 mm (3.74 in)
H without antenna extension	< 260 mm (10.2 in)	< 480 mm (18.9 in)

ℹ Please contact Endress+Hauser for applications with higher nozzle.

Threaded connection

- Tighten with the hexagonal nut only.
- Tool : Hexagonal wrench 60 mm
- Maximum permissible torque: 60 Nm (44 lbf ft)

Parabolic antenna (FMR57)

Alignment

Ideally, the parabolic antenna should be installed vertically. To avoid interference reflections or for optimum alignment within the vessel, the Micropilot with optional alignment device can be swiveled by 15° in all directions (→ 🖹 44).

Nozzle mounting

▪ Ideally, the parabolic antenna should protrude from the nozzle (1). Particularly when using the alignment device, please ensure that the parabolic reflector is protruding from the nozzle/roof so as not to inhibit alignment.
▪ 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 should not exceed 500 mm (19.7 in). Interfering edges within the nozzle should be avoided.
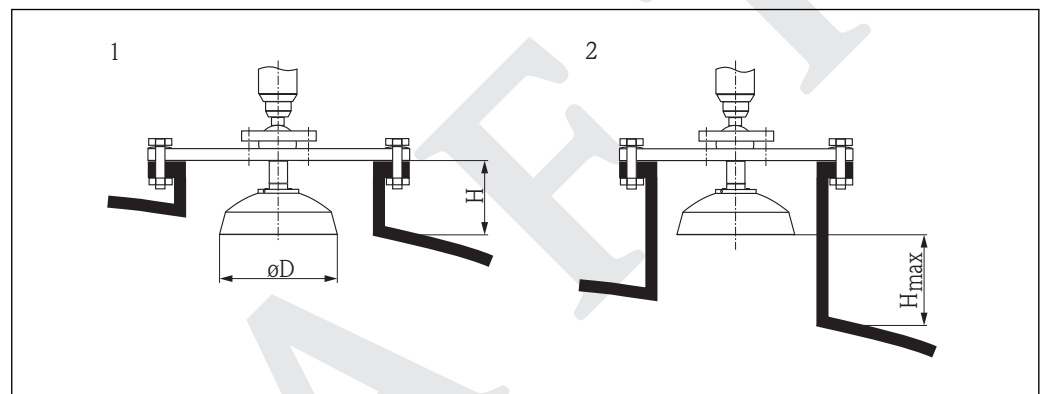
🖾 *16   Nozzle mounting of Micropilot FMR57 with parabolic antenna*

1   Antenna protrudes from the nozzle
2   Antenna completely within the nozzle

Antenna size	200 mm (8 in)	250 mm (10 in)
D	173 mm (6.81 in)	236 mm (9.29 in)
H without antenna extension	< 50 mm (1.97 in)	< 50 mm (1.97 in)

Examples for installation with small flange

If the flange is smaller than the parabolic reflector, the device can be mounted in one of the following ways:

- Standard installation (→ 🖹 42)
- Dismantling the parabolic reflector (→ 🖹 42)
- Installation with hinged flange (→ 🖹 43)

Standard installation
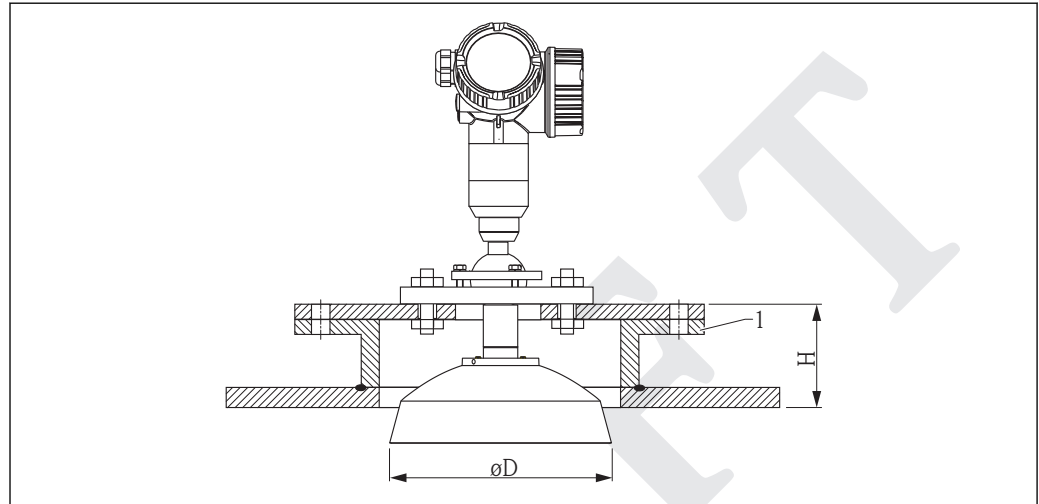
A0018874

1   Nozzle

Antenna size	ØD	H [1]
200 mm (8 in)	173 mm (6.81 in)	< 50 mm (1.96 in)
250 mm (10 in)	236 mm (9.29 in)	< 50 mm (1.96 in)

1)   without antenna extension

Dismantling the parabolic reflector

For installation in a nozzle, the parabolic reflector can be dismantled:
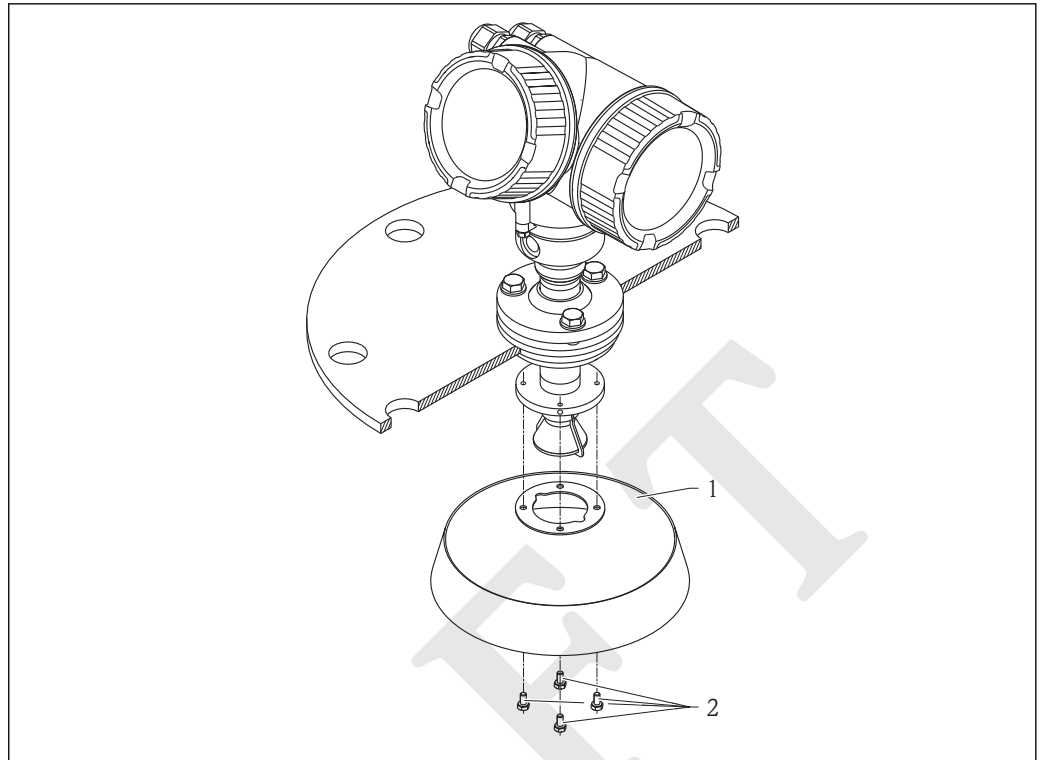
A0018877

1   Parabolic reflector
2   4 bolts

Installation with hinged flange

ℹ️   At hinged flanges, the length of the antenna must be taken into account.
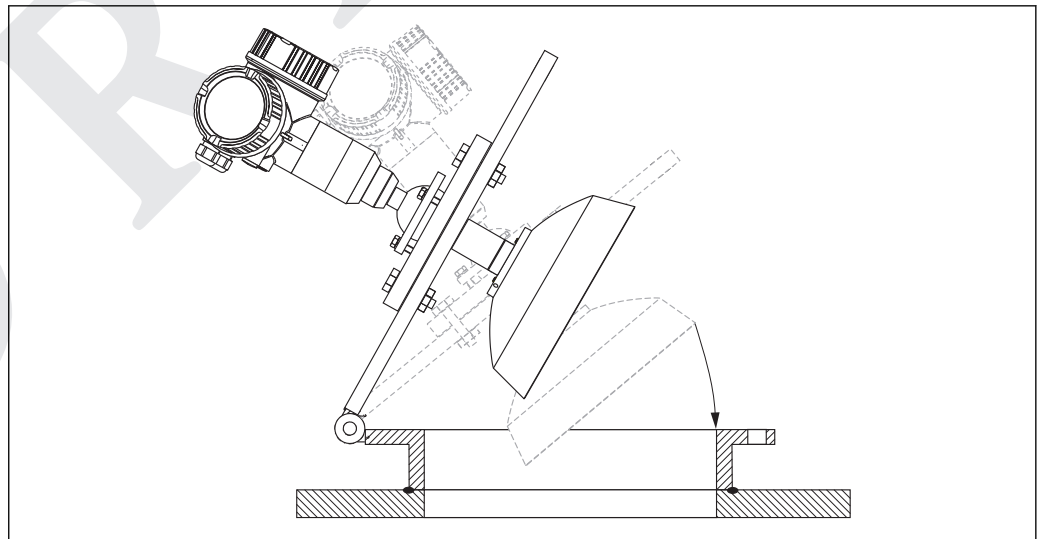
A0018878

Alignment device for FMR57

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

Product structure: Feature 100 "Process connection", options XCJ, XEJ, XFJ
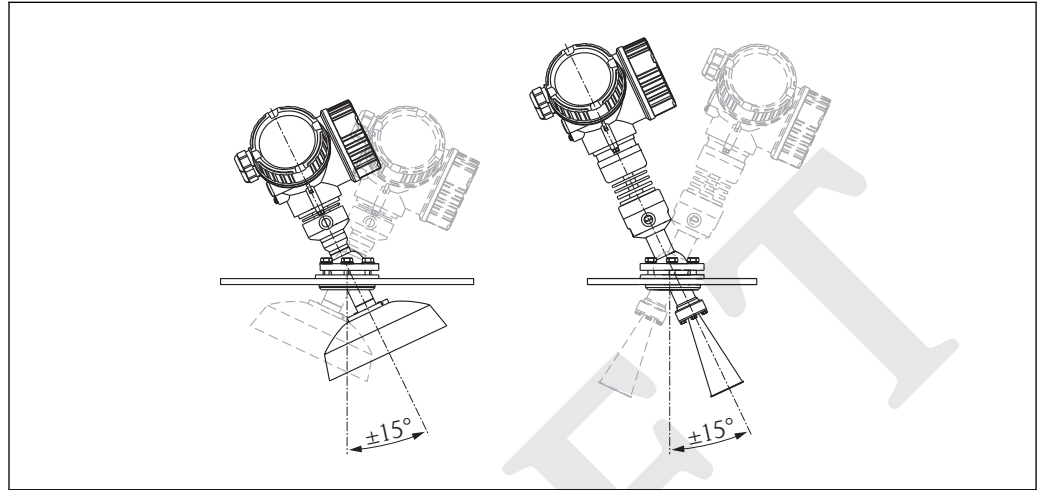
A0016931

17   Micropilot FMR57 with alignment device

Integrated air purge connection for FMR57

In extremely dusty applications, the integrated air purge connection can prevent clogging of the antenna. Pulsed operation is recommended.
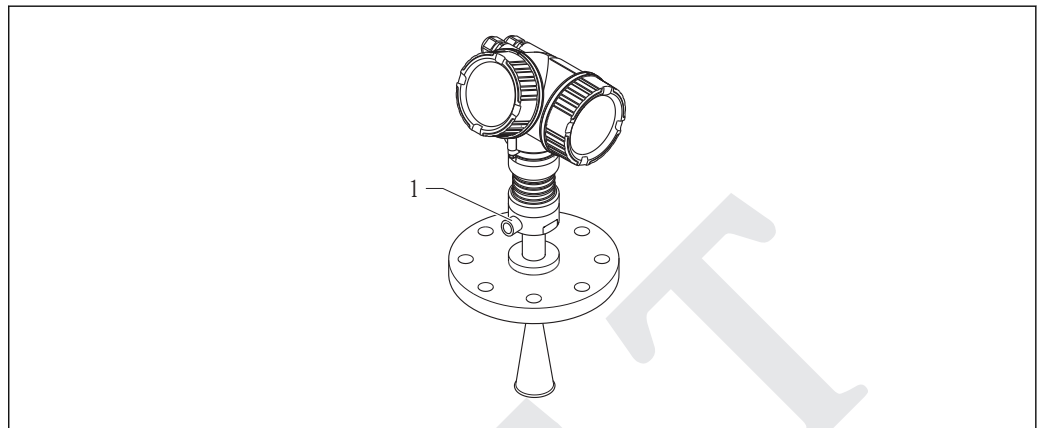
18   Micropilot FMR57 with air purge connection

1   Air purge connection NPT¼ or G¼

Torque for air purge connection: 6 Nm (4.4 lbf ft)

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

Make sure to use dry purge air.

In general, air purging should only be used as much as necessary, since too much air purging may cause mechanical damage.

Vessels with heat insulation
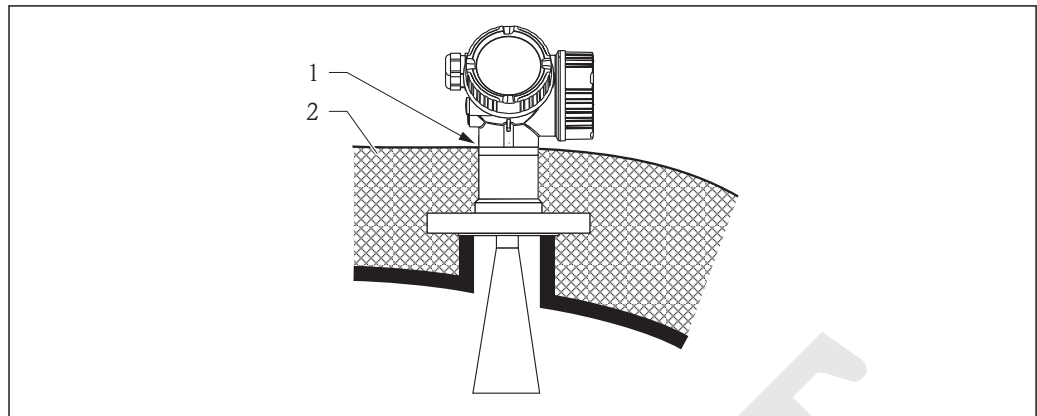
A0019142

If process temperatures are high, the device must be included in normal tank insulation to prevent the electronics heating up as a result of heat radiation or convection. The insulation may not exceed beyond the neck of the housing.

Environment

Ambient temperature range	Measuring device	–40 to +80 °C (–40 to +176 °F); –50 °C (–58 °F) with manufacturer declaration on request
	Local display	–20 to +70 °C (–4 to +158 °F), the readability of the display may be impaired at temperatures outside the temperature range.

When operating the device in the open with strong sunlight:
- Mount the device in a shady position.
- Avoid direct sunlight, especially in warmer regions.
- Use a weather protection cover (see accessories).

Ambient temperature limits

The following diagrams take into account only function requirements. There may be further restrictions for certified device versions. Please refere to the separate Safety Instructions (→ 📄 84).

With a temperature (T_p) at the process connection the admissible ambient temperature (T_a) is reduced according to the following diagram (temperature derating):
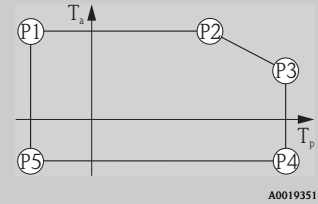
Information concerning the derating tables

Option	Meaning
A	2-wire; 4-20 mA HART
B	2-wire; 4-20 mA HART, switch output
C	2-wire; 4-20 mA HART, 4-20 mA
E	2-wire; FF, switch output
G	2-wire; PA, switch output
K	4-wire 90-253VAC; 4-20 mA HART
L	4-wire 10, 4-48VDC; 4-20 mA HART

FMR56
Housing: GT19 (Plastics PBT)
Temperature unit: °C (°F)

A0019351

Power Supply; Output (Pos. 2 of the product structure)	P1		P2		P3		P4		P5		P6	
	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
A	–40 (–40)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
B Switch output not used	–40 (–40)	76 (169)	76 (169)	76 (1698)	80 (176)	75 (167)	80 (176)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
B Switch output used	–40 (–40)	60 (140)	60 (140)	60 (140)	80 (176)	58 (136)	80 (176)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
C Channel 2 not used	–40 (–40)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
C Channel 2 used	–40 (–40)	74 (165)	74 (165)	74 (165)	80 (176)	73 (163)	80 (176)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
E, G Switch output not used	–40 (–40)	79 (174)	79 (174)	79 (174)	80 (176)	79 (174)	80 (176)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
E, G Switch output used	–40 (–40)	63 (145)	63 (145)	63 (145)	80 (176)	60 (140)	80 (176)	–40 (–40)	–40 (–40)	–40 (–40)	–	–

FMR56
Housing: GT20 (Alu, coated)
Temperature unit: °C (°F)

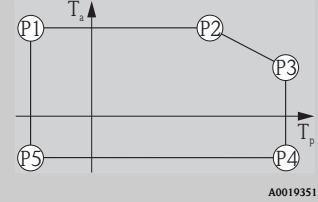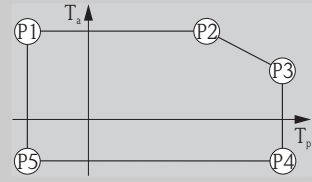| Power Supply; Output (Pos. 2 of the product structure)	P1		P2		P3		P4		P5		P6	
	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
A	–40 (–40)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
B Switch output not used	–40 (–40)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
B Switch output used	–40 (–40)	77 (171)	77 (171)	77 (171)	80 (176)	76 (169)	80 (176)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
C Channel 2 not used	–40 (–40)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
C Channel 2 used	–40 (–40)	79 (174)	79 (174)	79 (174)	80 (176)	79 (174)	80 (176)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
E, G Switch output not used	–40 (–40)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
E, G Switch output used	–40 (–40)	78 (172)	78 (172)	78 (172)	80 (176)	78 (172)	80 (176)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
K, L	–40 (–40)	77 (171)	77 (171)	77 (171)	80 (176)	77 (171)	80 (176)	–40 (–40)	–40 (–40)	–40 (–40)	–	–

FMR57
Seal: Viton GLT
Housing: GT18 (316 L)
Temperature unit: °C (°F)
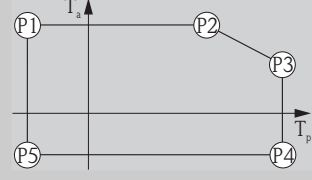
Power Supply; Output (Pos. 2 of the product structure)	P1		P2		P3		P4		P5		P6	
	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
A	–40 (–40)	81 (178)	81 (178)	81 (178)	200 (392)	67 (153)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
B Switch output not used	–40 (–40)	82 (180)	82 (180)	82 (180)	200 (392)	67 (153)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
B Switch output used	–40 (–40)	77 (171)	77 (171)	77 (171)	200 (392)	62 (144)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
C Channel 2 not used	–40 (–40)	82 (180)	82 (180)	82 (180)	200 (392)	68 (154)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
C Channel 2 used	–40 (–40)	79 (174)	79 (174)	79 (174)	200 (392)	64 (147)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
E, G Switch output not used	–40 (–40)	83 (181)	83 (181)	83 (181)	200 (392)	68 (154)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
E, G Switch output used	–40 (–40)	78 (172)	78 (172)	78 (172)	200 (392)	63 (145)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
K, L	–40 (–40)	77 (171)	77 (171)	77 (171)	200 (392)	62 (144)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–

FMR57
Seal: Viton GLT
Housing: GT19 (Plastics PBT)
Temperature unit: °C (°F)
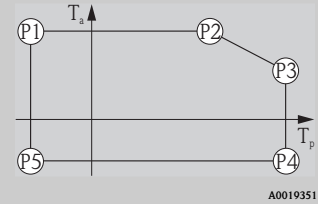
A0019351

Power Supply; Output (Pos. 2 of the product structure)	P1		P2		P3		P4		P5		P6	
	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
A	–40 (–40)	80 (176)	80 (176)	80 (176)	200 (392)	53 (127)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
B Switch output not used	–40 (–40)	76 (169)	76 (169)	76 (169)	200 (392)	53 (127)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
B Switch output used	–40 (–40)	60 (140)	60 (140)	60 (140)	200 (392)	37 (99)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
C Channel 2 not used	–40 (–40)	82 (180)	82 (180)	82 (180)	200 (392)	53 (127)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
C Channel 2 used	–40 (–40)	74 (165)	74 (165)	74 (165)	200 (392)	53 (127)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
E, G Switch output not used)	–40 (–40)	79 (174)	79 (174)	79 (174)	200 (392)	53 (127)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
E, G Switch output used	–40 (–40)	63 (145)	63 (145)	63 (145)	200 (392)	40 (104)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–

FMR57
Seal: Viton GLT
Housing: GT20 (Alu, coated)
Temperature unit: °C (°F)
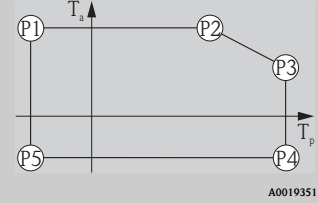
A0019351

Power Supply; Output (Pos. 2 of the product structure)	P1		P2		P3		P4		P5		P6	
	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
A	–40 (–40)	81 (178)	81 (178)	81 (178)	200 (392)	70 (158)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
B Switch output not used	–40 (–40)	82 (180)	82 (180)	82 (180)	200 (392)	70 (158)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
B Switch output used	–40 (–40)	77 (171)	77 (171)	77 (171)	200 (392)	65 (149)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
C Channel 2 not used	–40 (–40)	82 (180)	82 (180)	82 (180)	200 (392)	71 (160)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
C Channel 2 used	–40 (–40)	79 (174)	79 (174)	79 (174)	200 (392)	67 (153)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
E, G Switch output not used	–40 (–40)	83 (181)	83 (181)	83 (181)	200 (392)	71 (160)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
E, G Schaltausgang verwende)	–40 (–40)	78 (172)	78 (172)	78 (172)	200 (392)	66 (151)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
K, L	–40 (–40)	77 (171)	77 (171)	77 (171)	200 (392)	66 (151)	200 (392)	–40 (–40)	–40 (–40)	–40 (–40)	–	–

FMR57
Seal: Graphite
Housing: GT18 (316 L)
Temperature unit: °C (°F)

A0019351

Power Supply; Output (Pos. 2 of the product structure)	P1		P2		P3		P4		P5		P6	
	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
A	−40 (−40)	81 (178)	81 (178)	81 (178)	400 (752)	51 (124)	400 (752)	−40 (−40)	−40 (−40)	−40 (−40)	−	−
B Switch output not used	−40 (−40)	82 (180)	82 (180)	82 (180)	400 (752)	51 (124)	400 (752)	−40 (−40)	−40 (−40)	−40 (−40)	−	−
B Switch output used	−40 (−40)	77 (171)	77 (171)	77 (171)	400 (752)	47 (117)	400 (752)	−40 (−40)	−40 (−40)	−40 (−40)	−	−
C Channel 2 not used	−40 (−40)	82 (180)	82 (180)	82 (180)	400 (752)	51 (124)	400 (752)	−40 (−40)	−40 (−40)	−40 (−40)	−	−
C Channel 2 used	−40 (−40)	79 (174)	79 (174)	79 (174)	400 (752)	49 (120)	400 (752)	−40 (−40)	−40 (−40)	−40 (−40)	−	−
E, G Switch output not used	−40 (−40)	83 (181)	83 (181)	83 (181)	400 (752)	51 (124)	400 (752)	−40 (−40)	−40 (−40)	−40 (−40)	−	−
E, G Switch output used	−40 (−40)	78 (172)	78 (172)	78 (172)	400 (752)	49 (120)	400 (752)	−40 (−40)	−40 (−40)	−40 (−40)	−	−
K, L	−40 (−40)	77 (171)	77 (171)	77 (171)	400 (752)	48 (118)	400 (752)	−40 (−40)	−40 (−40)	−40 (−40)	−	−

FMR57
Seal: Graphite
Housing: GT19 (Plastics PBT)
Temperature unit: °C (°F)

A0019351

Power Supply; Output (Pos. 2 of the product structure)	P1		P2		P3		P4		P5		P6	
	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
A	−40 (−40)	80 (176)	80 (176)	80 (176)	400 (752)	15 (59)	400 (752)	−40 (−40)	−40 (−40)	−40 (−40)	−	−
B Switch output not used	−40 (−40)	76 (169)	76 (169)	76 (169)	400 (752)	15 (59)	400 (752)	−40 (−40)	−40 (−40)	−40 (−40)	−	−
B Switch output used	−40 (−40)	60 (140)	60 (140)	60 (140)	400 (752)	15 (59)	400 (752)	−40 (−40)	−40 (−40)	−40 (−40)	−	−
C Channel 2 not used	−40 (−40)	82 (180)	82 (180)	82 (180)	400 (752)	15 (59)	400 (752)	−40 (−40)	−40 (−40)	−40 (−40)	−	−
C Channel 2 used	−40 (−40)	74 (165)	74 (165)	74 (165)	400 (752)	15 (59)	400 (752)	−40 (−40)	−40 (−40)	−40 (−40)	−	−
E, G Switch output not used	−40 (−40)	79 (174)	79 (174)	79 (174)	400 (752)	15 (59)	400 (752)	−40 (−40)	−40 (−40)	−40 (−40)	−	−
E, G Switch output used	−40 (−40)	63 (145)	63 (145)	63 (145)	400 (752)	15 (59)	400 (752)	−40 (−40)	−40 (−40)	−40 (−40)	−	−

FMR57
Seal: Graphite
Housing: GT20 (Alu, coated)
Temperature unit: °C (°F)

Power Supply; Output (Pos. 2 of the product structure)	P1		P2		P3		P4		P5		P6	
	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a
A	–40 (–40)	81 (178)	81 (178)	81 (178)	400 (752)	58 (136)	400 (752)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
B Switch output not used	–40 (–40)	82 (180)	82 (180)	82 (180)	400 (752)	59 (138)	400 (752)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
B Switch output used	–40 (–40)	77 (171)	77 (171)	77 (171)	400 (752)	53 (127)	400 (752)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
C Channel 2 not used	–40 (–40)	82 (180)	82 (180)	82 (180)	400 (752)	59 (138)	400 (752)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
C Channel 2 used	–40 (–40)	79 (174)	79 (174)	79 (174)	400 (752)	56 (133)	400 (752)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
E, G Switch output not used	–40 (–40)	83 (181)	83 (181)	83 (181)	400 (752)	59 (138)	400 (752)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
E, G Switch output used	–40 (–40)	78 (172)	78 (172)	78 (172)	400 (752)	55 (131)	400 (752)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
K, L	–40 (–40)	77 (171)	77 (171)	77 (171)	400 (752)	54 (129)	400 (752)	–40 (–40)	–40 (–40)	–40 (–40)	–	–
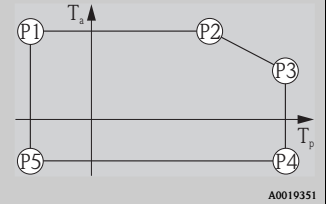
Storage temperature	–40 to +80 °C (–40 to +176 °F)
Climate class	DIN EN 60068-2-38 (test Z/AD)
Geometric height according to IEC61010-1 Ed.3	Up to 2 000 m (6 600 ft) above MSL. Can be expanded to 3 000 m (9 800 ft) above MSL by application of an overvoltage protection, e.g. HAW562 or HAW569.
Degree of protection	■ With closed housing tested according to: – IP68, NEMA6P (24 h at 1.83 m under water surface) – For plastic housing with transparent cover (display module): IP68 (24 h at 1.00 m under water surface) [3] – IP66, NEMA4X ■ With open housing: IP20, NEMA1 (also ingress protection of the display) ℹ Degree of protection IP68 NEMA6P applies for M12 PROFIBUS PA plugs only when the PROFIBUS cable is plugged in and is also rated IP68 NEMA6P.
Vibration resistance	DIN EN 60068-2-64 / IEC 68-2-64: 20 to 2 000 Hz, 1 $(m/s^2)^2/Hz$
Cleaning the antenna	The antenna can get contaminated, depending on the application. The emission and reception of microwaves can thus eventually be hindered. The degree of contamination leading to an error depends on the medium and the reflectivity, mainly determined by the dielectric constant ε_r. If the medium tends to cause contamination and deposits, cleaning on a regular basis is recommended. In the case of FRM57, the integrated air purge connection can be used for this (→ 📄 45). Care has to be taken not to damage the antenna in the process of a mechanical or hose-down cleaning. The material compatibility has to be considered if cleaning agents are used! The maximum permitted temperature at the flange should not be exceeded.

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[3] This restriction is valid if the following options of the product structure have been selected at the same time: 030("Display, Operation") = C("SD02") or E("SD03"); 040("Housing") = A("GT19").

Air purge connection

in preparation

Electromagnetic compatibility (EMC)	Electromagnetic compatibility to all relevant requirements of the EN 61326- series and NAMUR recommendation EMC (NE21). For details see declaration of conformity. [4].

If only the analogue signal is used, unshielded interconnection lines are sufficient for the installation. In case of using the digital signal (HART/ PA/ FF) use shielded interconnection lines. Use a shielded cable when working with a digital communications signal.

Max. fluctuations during EMC- tests: < 0.5 % of the span. As an exception to this, the maximum fluctuations may amount to 2 % of the span for devices with plastic housing and see-through lid (integrated display and operating module SD02 or SD03) if strong electromagnetic interferences in the frequenency range of 1 to 2 GHz are present.

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4)   Can be downloaded from www.endress.com.

Process

Process temperature range

Sensor	Seal	Process temperature range
FMR56	–	–40 to +80 °C (–40 to +176 °F)
FMR57	Viton GLT	–40 to +200 °C (–40 to +392 °F)
	Graphite	–40 to +400 °C (–40 to +752 °F)

Process pressure range

Sensor	Process pressure range
FMR56	p_{rel} = –1 to 3 bar (–14.5 to 43.5 psi) p_{abs} < 4 bar (58 psi)
FMR57	p_{rel} = –1 to 16 bar (–14.5 to 232 psi)

This range may be reduced by the selected process connection. The pressure rating (PN) specified on the flanges refers to a reference temperature of 20 °C, for ASME flanges 100 °F. Pay attention to pressure–temperature dependencies.

Please refer to the following standards for the pressure values permitted for higher temperatures:
- EN 1092–1: 2001 Tab. 18
  With regard to their temperature stability properties, the materials 1.4435 and 1.4404 are grouped under 13E0 in EN 1092–1 Tab. 18. The chemical composition of the two materials can be identical.
- ASME B 16.5a – 1998 Tab. 2–2.2 F316
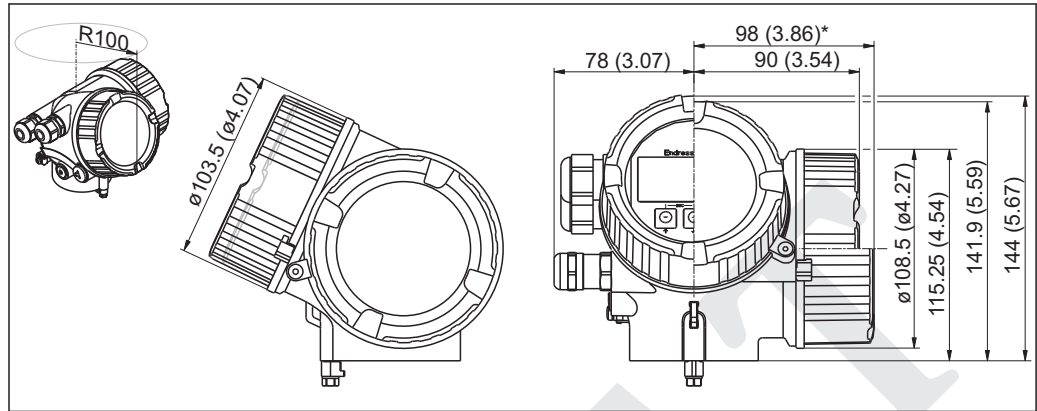- ASME B 16.5a – 1998 Tab. 2.3.8 N10276
- JIS B 2220

Dielectric constant

- **For liquids**
  - $\varepsilon_r \geq 1.9$ in free–field applications
  - $\varepsilon_r \geq 1.4$ in stilling well
- **For bulk solids**
  $\varepsilon_r \geq 1.6$
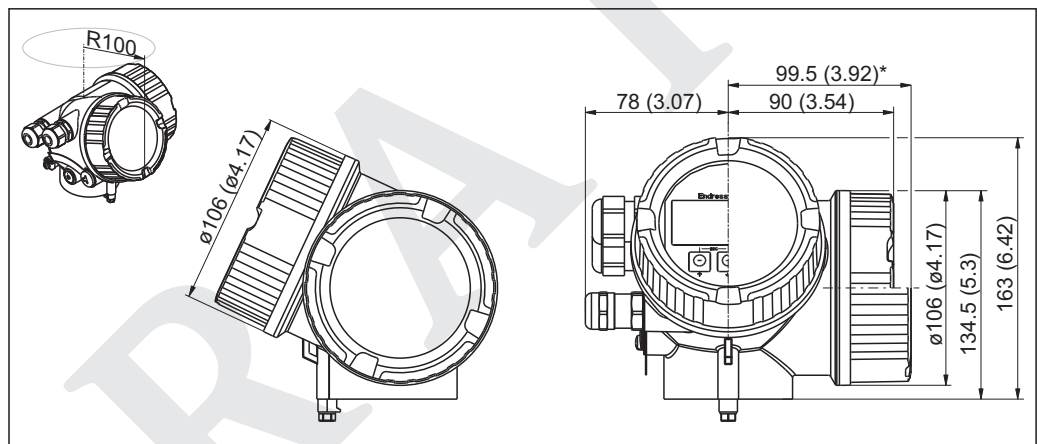
Mechanical construction

Dimensions

Dimensions of the electronics housing

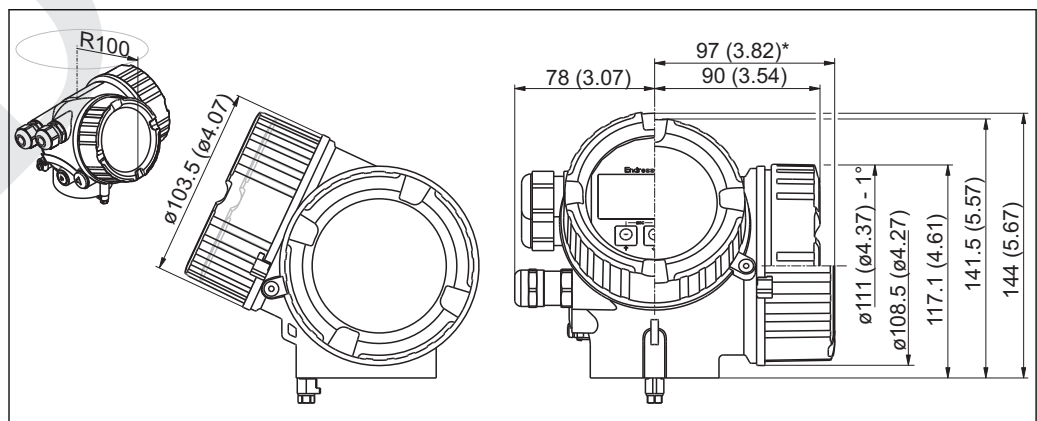

▣ 19   *Housing GT18 (316L); Dimensions in mm (in)*

This measure is valid for devices with integrated overvoltage protection.

▣ 20   *Housing GT19 (Plastics PBT); Dimensions in mm (in)*

This measure is valid for devices with integrated overvoltage protection.
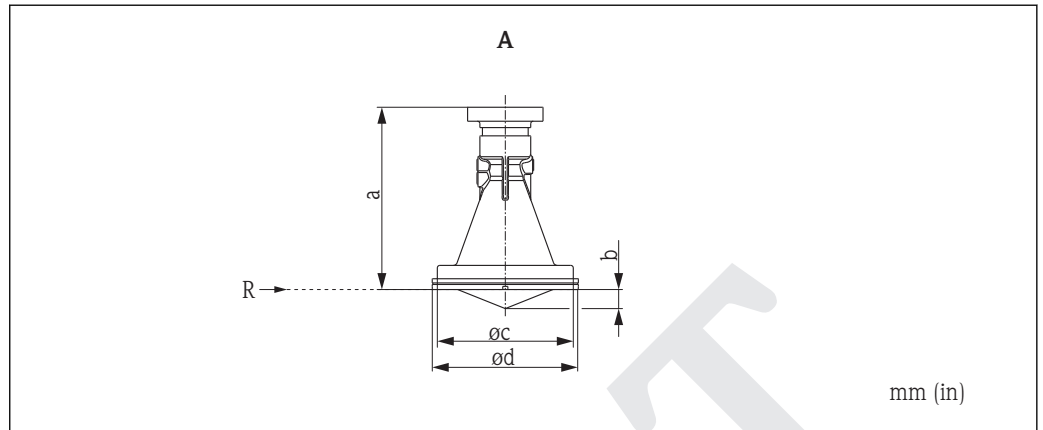

▣ 21   *Housing GT20 (Alu coated); Dimensions in mm (in)*

This measure is valid for devices with integrated overvoltage protection.

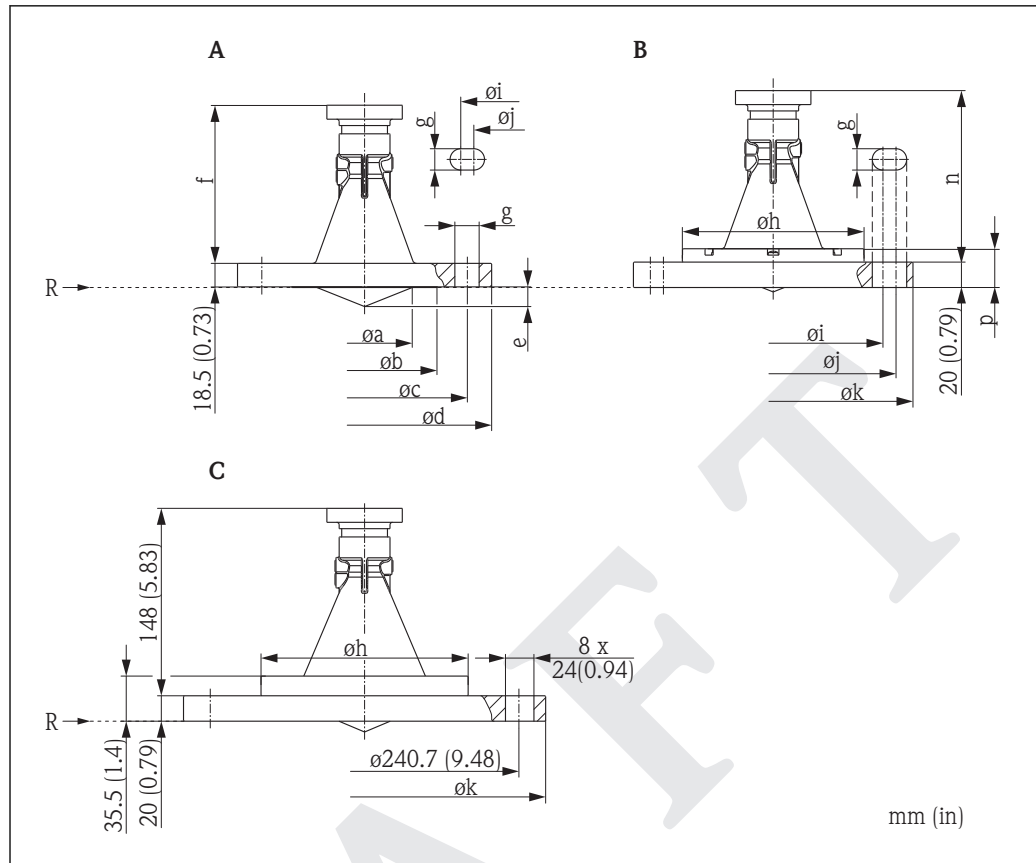Dimensions FMR56 (process connection/antenna)

A   *Horn DN80 (3")/DN100 (4") standard version*
*R*   *Reference point of the measurement*

Dimension	DN80	DN100
a	137.9 mm (5.43 in)	150.5 mm (5.93 in)
b	15 mm (0.59 in)	20 mm (0.79 in)
øc	107 mm (4.21 in)	127 mm (5 in)
ød	115 mm (4.53 in)	135 mm (5.31 in)

A0017742

A   *Horn DN80 (3")/DN100 (4"); flange DN80/DN100 (with slotted hole) with slip-on flange*
      suitable for DN80 PN16 / ANSI 3" 150 lbs / 10K 80
      suitable for DN100 PN16 / ANSI 4" 150 lbs / 10K 100
B   *Horn DN80; flange DN100/DN150 with adapter ring*
      suitable for DN100 PN16 / ANSI 4" 150 lbs / 10K 100
      suitable for DN150 PN16 / ANSI 6" 150 lbs / 10K 150
C   *Horn DN100 (4"); flange DN150 with adapter ring*
      suitable for DN150 PN16 / ANSI 6" 150 lbs / 10K 150
R   *Reference point of the measurement*

| Dimension	DN80	DN100	DN150
a	⌀75 mm (2.95 in)	⌀95 mm (3.74 in)	–
b	⌀115.6 mm (4.55 in)	⌀135.6 mm (5.34 in)	–
c	⌀156.2 mm (6.15 in)	–	–
d	⌀200 mm (7.87 in)	⌀228.6 mm (9 in)	–
e	15.5 mm (0.61 in)	20.5 mm (0.81 in)	–
f	119 mm (4.69 in)	131.5 mm (5.18 in)	–
g	8 x ⌀21 mm (0.83 in)	8 x 19 mm (0.75 in)	8 x 23 mm (0.91 in)
h	⌀143 mm (5.63 in)	⌀163 mm (6.42 in)	–
i	–	⌀175 mm (6.89 in)	⌀240 mm (9.45 in)
j	–	⌀190.5 mm (7.5 in)	⌀241.3 mm (9.5 in)
k	–	⌀228.6 mm (9 in)	⌀285 mm (11.2 in)
n	129.5 mm (5.1 in)	142 mm (5.59 in)	–
p	30.5 mm (1.2 in)	35.5 mm (1.4 in)	–
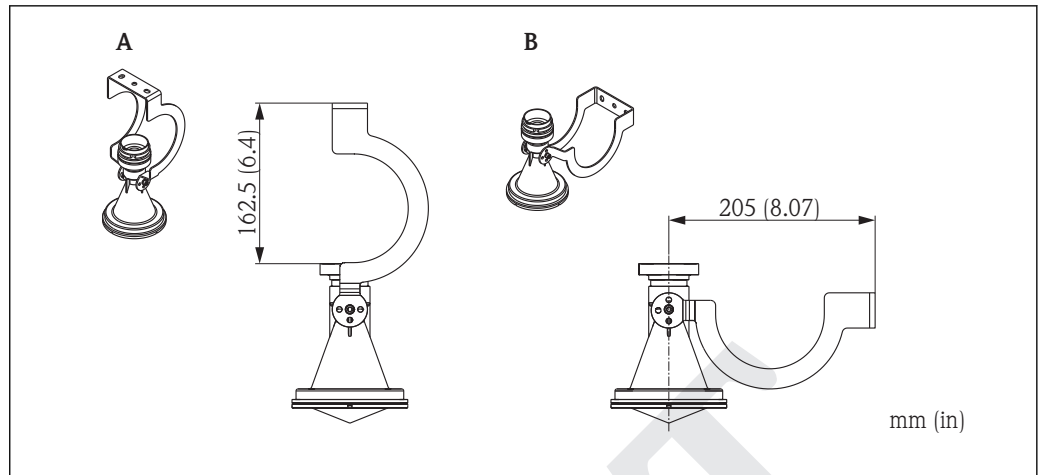
A0017746

A   Mounting bracket with alignment for roof mounting
B   Mounting bracket with alignment for wall mounting

Dimensions FMR57 (process connection/antenna)
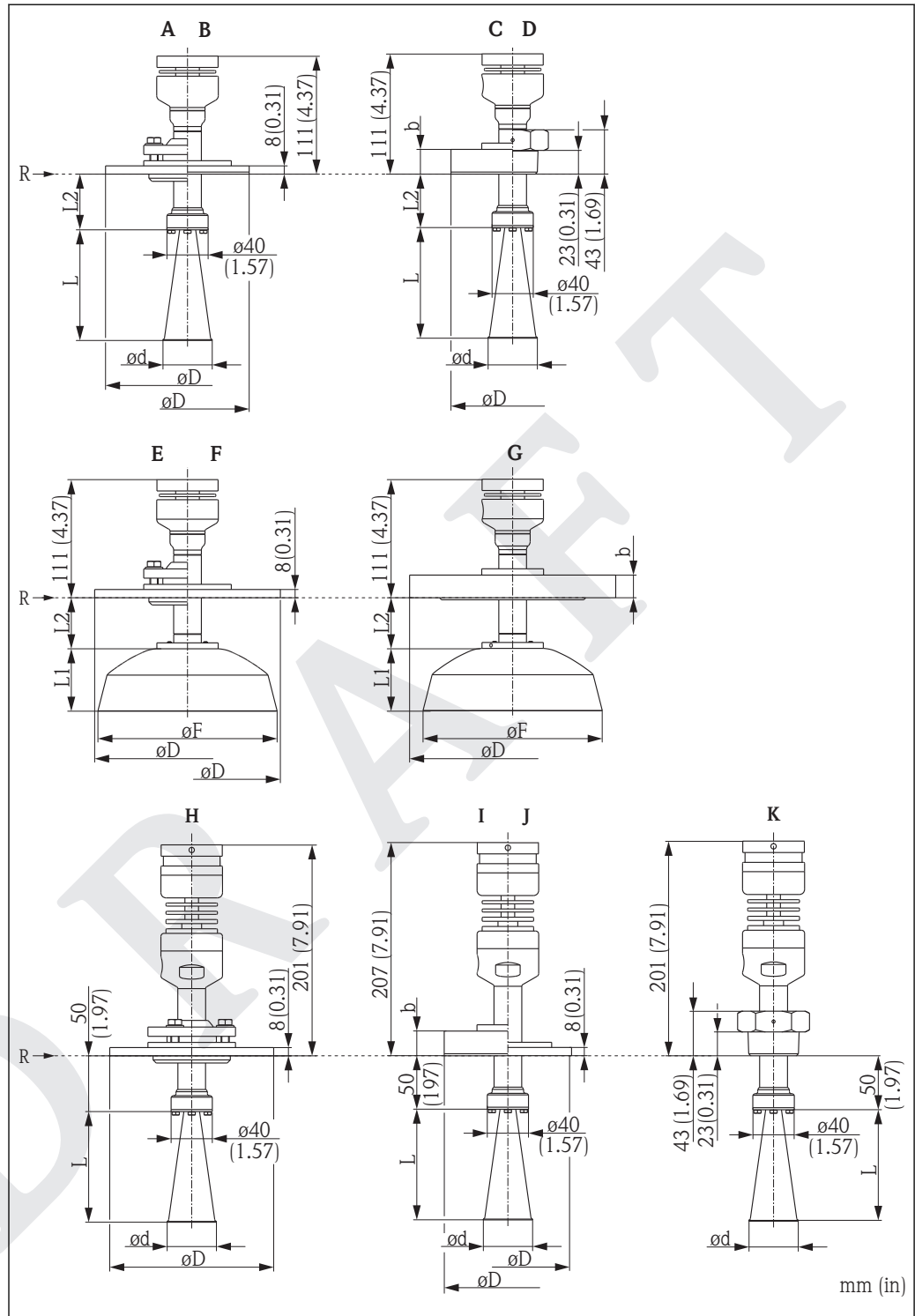
A0017814

A   Horn antenna, standard version with alignment device and UNI flange
B   Horn antenna, standard version with UNI flange
C   Horn antenna, standard version with standard flange
D   Horn antenna, standard version with threaded connection
E   Parabolic antenna with alignment device and UNI flange
F   Parabolic antenna with UNI flange
G   Parabolic antenna, standard version with standard flange
H   Horn antenna, high temperature version with alignment device and UNI flange
I   Horn antenna, high temperature version with standard flange

J *Horn antenna, high temperature version with UNI flange*
K *Horn antenna, high temperature version with threaded connection*
R *Reference point of the measurement*

Horn antenna

Dimension	80 mm (3")	100 mm (4")
L	211 mm (8.37 in)	430 mm (16.9 in)
⌀d	⌀75 mm (2.95 in)	⌀95 mm (3.74 in)

Parabolic antenna

Dimension	200 mm (8")	250 mm (10")
L1	60.6 mm (2.39 in)	88.4 mm (3.48 in)
⌀F	⌀173 mm (6.81 in)	⌀236 mm (9.29 in)
L2	50 mm (1.97 in)	37 mm (1.46 in)
	für version with 250 mm (10 in) antenna extension:	
	300 mm (11.8 in)	287 mm (11.3 in)
	for version with 450 mm (18 in) antenna extension:	
	500 mm (19.7 in)	487 mm (19.2 in)

Flanges according to EN1092-1 (suitable for DIN2527)

Dimension	Version	DN80	DN100
b	16 bar	20 mm (0.79 in)	20 mm (0.79 in)
⌀D		⌀200 mm (7.87 in)	⌀220 mm (8.66 in)

Flanges according to ANSI B16.5

Dimension	Version	3"	4"
b	150 lbs	23.9 mm (0.94 in)	23.9 mm (0.94 in)
⌀D		⌀190.5 mm (7.5 in)	⌀228.6 mm (9 in)

Flanges according to JIS B2220

Dimension	Version	DN80	DN100
b	10 K	18 mm (0.71 in)	18 mm (0.71 in)
⌀D		⌀185 mm (7.28 in)	⌀210 mm (8.27 in)

Endress+Hauser UNI flange
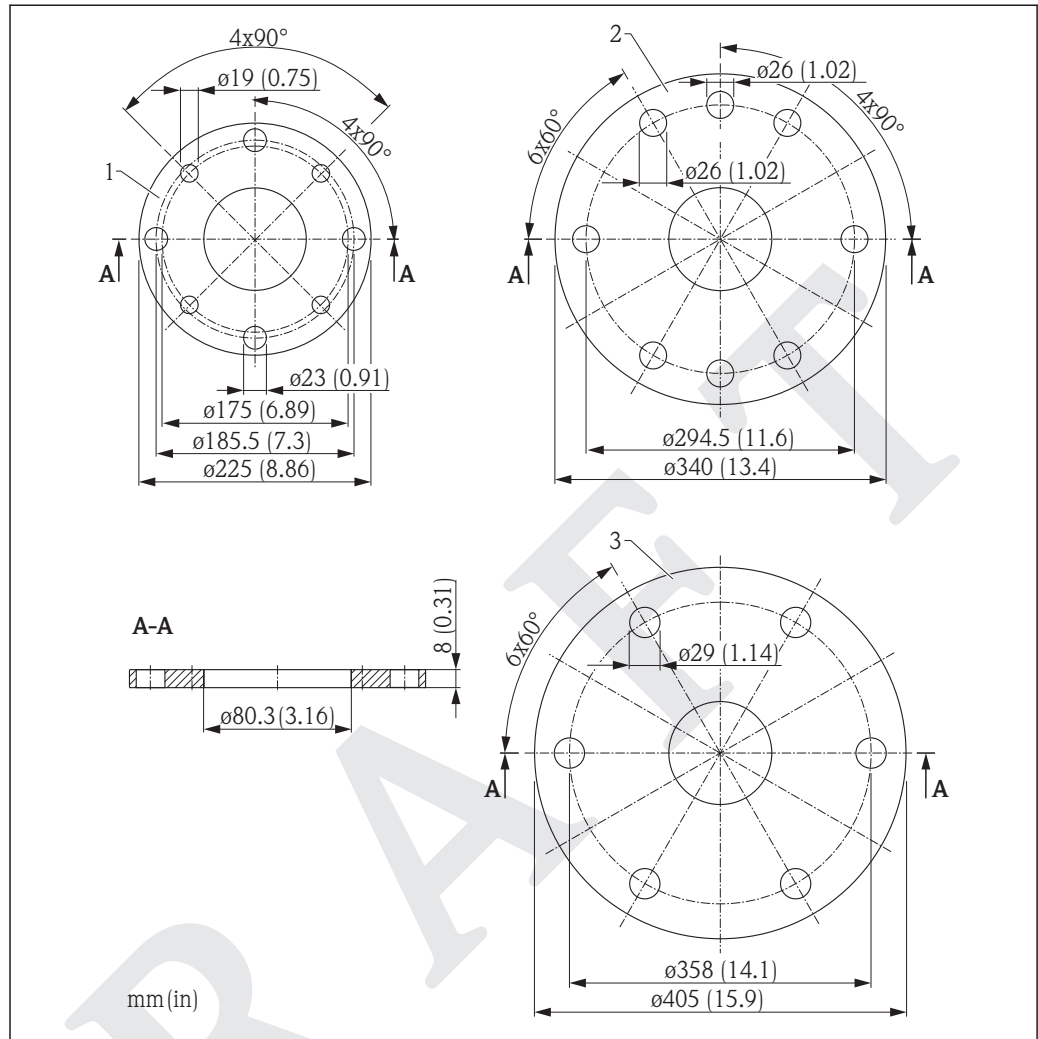
A0018947

Pos.	Flange	Suitable for	Material
1:	UNI flange DN100	■ 4" 150lbs ■ DN100 PN16 ■ 10K 100	316L (1.4404)
2:	UNI- flange DN200	■ 8" 150lbs ■ DN200 PN16 ■ 10K 200	316L (1.4404)
3:	UNI flange DN250	■ 10" 150lbs ■ DN250 PN16 ■ 10K 250	316L (1.4404)

ℹ 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.

Alignment device with Endress+Hauser UNI flange

A0018948
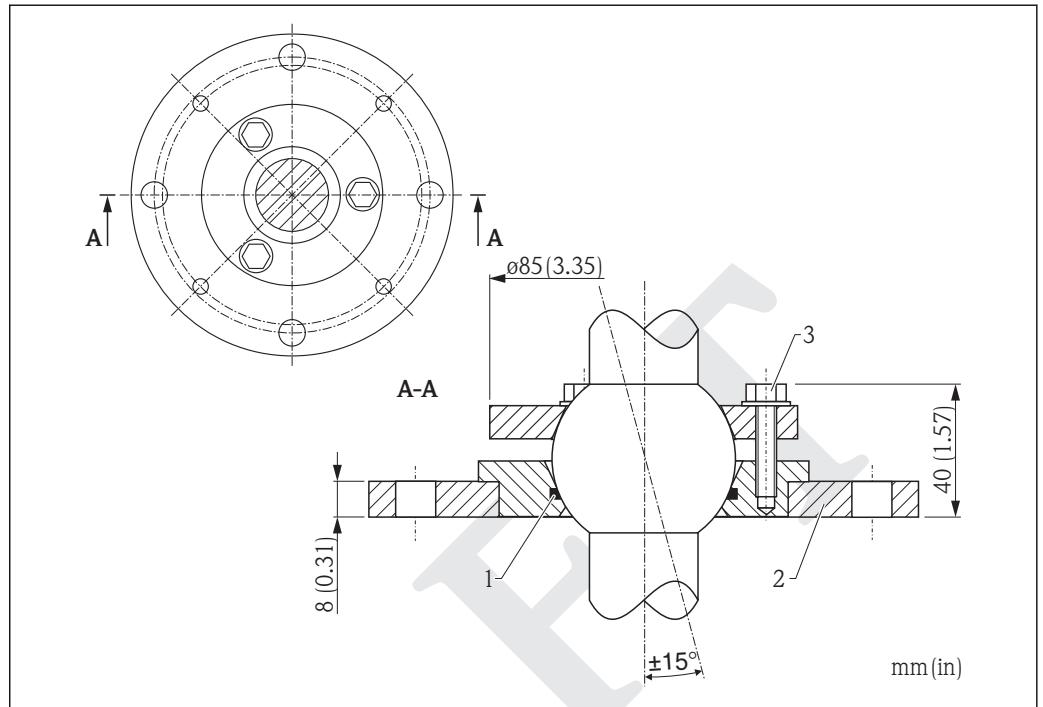
1   *Viton seal*
2   *Endress+Hauser UNI flange DN100/200/250*
3   *Clamping screw 3 x M8, shifty at 120°*

ℹ️ For the high temperature version of the FMR57 (sales option 090: "Seal", option D4 "Graphite, –40...400°C /–40...752°F"), there is no Viton seal (1) at the alignment device.

Weight

Housing

Part	Weight
Housing GT18 – stainless steel	approx. 4.5 kg (9.9 lbs)
Housing GT19 – plastic	approx. 1.2 kg (2.7 lbs)
Housing GT20 – aluminium	approx. 1.9 kg (4.2 lbs)

Antenna and process connection

Device	Weight of antenna and process connection
FMR56	max. 1.5 kg (3.3 lbs) + weight of flange [1]
FMR57	max. 5.5 kg (12.1 lbs) + weight of flange [1]

1)   For the weight of the flange refer to Technical Information TI00426F.
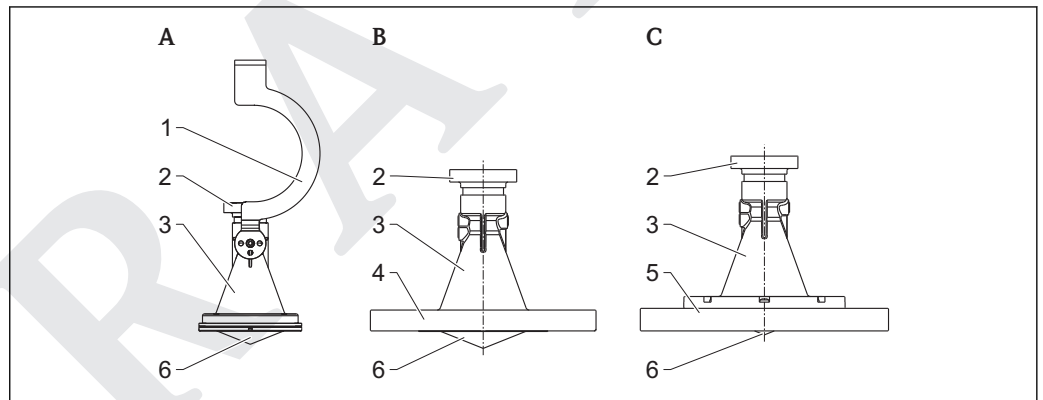
Materials

Housing
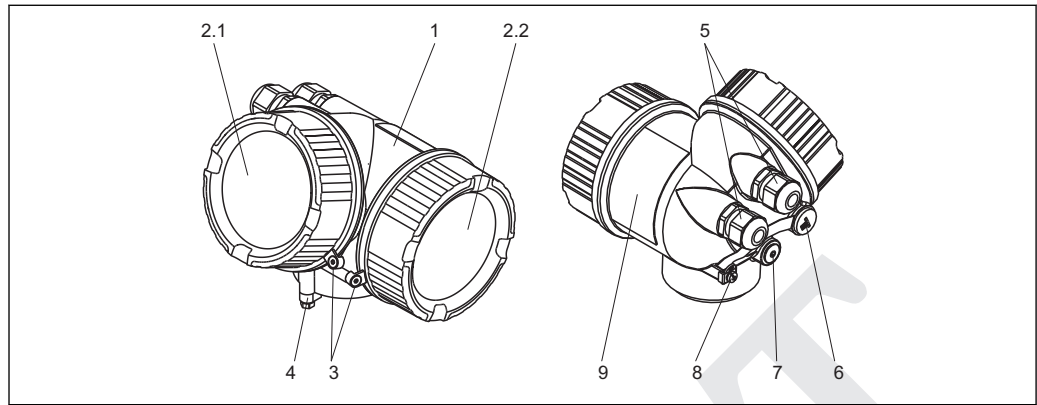
A0013788

Housing GT18 - stainless steel, corrosion-resistant			
No.	Part: material	No.	Part: material
1	Housing: 316L (CF–3M, 1.4404)	5	Cable entry ■ Sealing: EMPB ■ Cable gland: 316L (1.4404) ■ Adapter: 316L (1.4435)
2.1	Cover of the electronics compartment ■ Cover: 316L (CF–3M, 1.4404) ■ Window: glass ■ Cover seal: EPDM		
2.2	Cover of the terminal compartment ■ Cover: 316L (CF–3M, 1.4404) ■ Cover seal: EPDM	6	Dummy plug: 316L (1.4404)
		7	Pressure relief stopper: 316L (1.4404)
3	Cover lock ■ Screw: A4 ■ Clamp: 316L (1.4404)	8	Ground terminal ■ Screw: A4 ■ Spring washer: A4 ■ Clamp: 316L (1.4404) ■ Holder: 316L (1.4404)
4	Turn housing ■ Screw: A4-70 ■ Clamp: 316L (1.4404)	9	Identification ■ Nameplate: 304 (1.4301) ■ Groove pin: A2

Housing GT19 - plastic			
No.	Part: material	No.	Part: material
1	Housing: PBT	5	Cable entry ■ Sealing: EMPB ■ Cable gland: polyamide (PA), nickel-plated brass (CuZn) ■ Adapter: 316L (1.4435)
2.1	Cover of the electronics compartment ■ Cover: – PA (see-through cover) – PBT (non-transparent cover) ■ Cover seal: EPDM		
2.2	Cover of the terminal compartment ■ Cover: PBT ■ Cover seal: EPDM	6	Dummy plug: nickel-plated brass (CuZn)
		7	Pressure relief stopper: nickel-plated brass (CuZn)
4	Turn housing ■ Screw: A4-70 ■ Clamp: 316L (1.4404)	8	Ground terminal ■ Screw: A2 ■ Spring washer: A4 ■ Clamp: 304 (1.4301) ■ Holder: 304 (1.4301)
		9	Identification Nameplate: sticker

Housing GT20 – die-cast aluminum, powder-coated, seawater-resistant			
No.	Part: material	No.	Part: material
1	Housing: AlSi10Mg(<0.1% Cu) Coating: polyester	5	Cable entry ■ Sealing: EMPB ■ Cable gland: polyamide (PA), nickel-plated brass (CuZn) ■ Adapter: 316L (1.4435)
2.1	Cover of the electronics compartment ■ Cover: AlSi10Mg(<0.1% Cu) ■ Window: glass ■ Cover seal: EPDM		
2.2	Cover of the terminal compartment ■ Cover: AlSi10Mg(<0.1% Cu) ■ Cover seal: EPDM	6	Dummy plug: nickel-plated brass (CuZn)
		7	Pressure relief stopper: nickel-plated brass (CuZn)
3	Cover lock ■ Screw: A4 ■ Clamp: 316L (1.4404)	8	Ground terminal ■ Screw: A2 ■ Spring washer: A2 ■ Clamp: 304 (1.4301) ■ Holder: 304 (1.4301)
4	Turn housing ■ Screw: A4-70 ■ Clamp: 316L (1.4404)	9	Identification Nameplate: sticker

**Antenna and process connection**

FMR56

A0018950

A   Standard version with mounting bracket
B   Horn antenna with slip-on flange
C   Horn antenna with flange and adapter ring

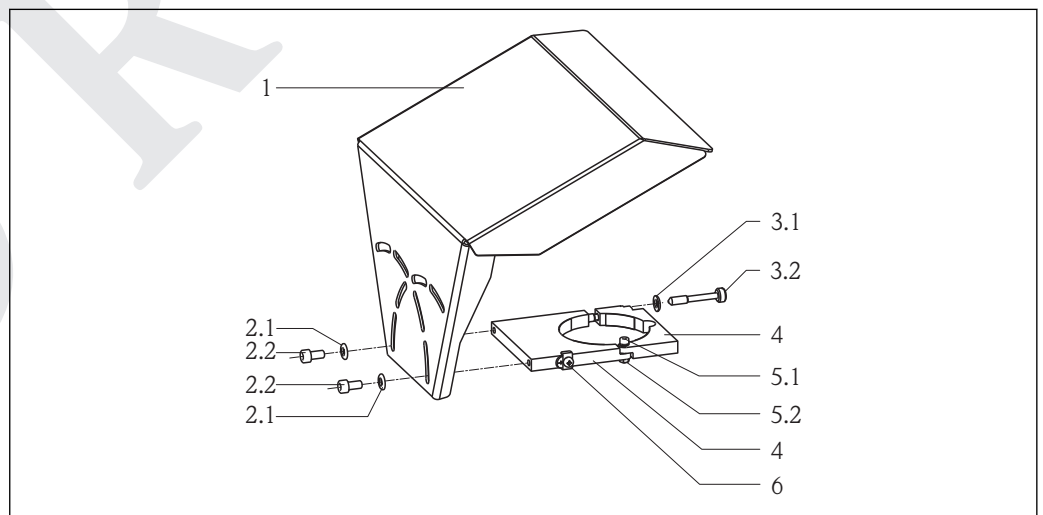| Pos.	Part	Material
1	Mounting bracket	304 (1.4301)
	Screw	A2
	Nordlock washer	A4
2	Housing adapter	304 (1.4301)
3	Horn	PBT
4	Slip-on flange	PP
5	Flange and adapter ring	PP
	Screw	A2
	Seal	FKM
6	Focusing lense	PP
	Seal	VMQ

FMR57
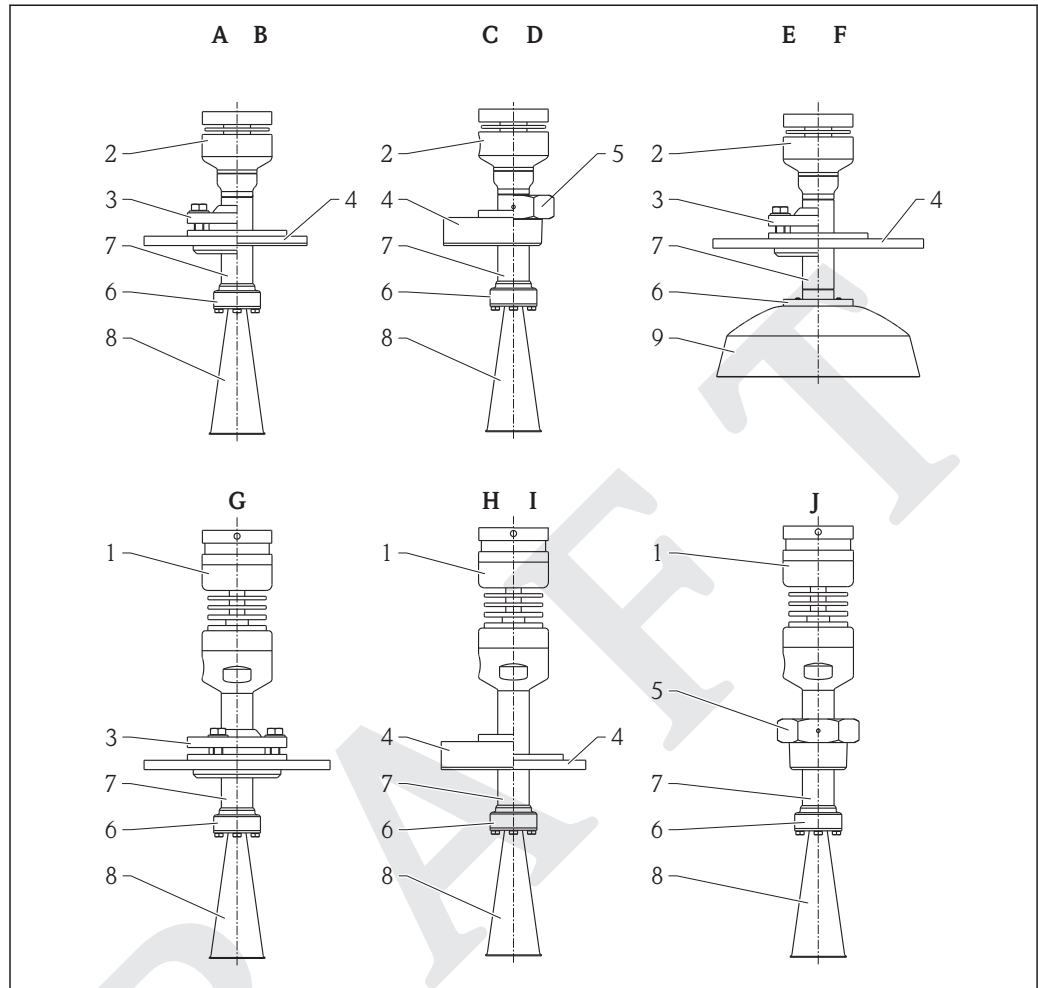
A0018958

A   Horn standard version with alignment device and UNI flange
B   Horn standard version with UNI flange
C   Horn standard version with standard flange
D   Horn standard version with screw–in adapter
E   Parabolid version with alignment device and UNI flange
F   Parabolid version with UNI flange
G   Horn high temperature version with alignment device and UNI flange
H   Horn high temperature version with standard flange
I   Horn high temperature version with UNI flange
J   Horn high temperature version with threaded connection

Pos.	Part	Material	
1	Housing adapter	316L (1.4404)	
	Temperature reduction	316L (1.4404)	
	Intermediate adapter	316L (1.4404)	
	Purge-air connection	316L (1.4404)	
	Plug	A4	316L (1.4404)
	Adapter (G→NPT)	316L (1.4404)	
2	Housing adapter	316L (1.4404)	
	Plug	A4	316L (1.4404)
	Adapter (G→NPT)	316L (1.4404)	
	Dichtung	FKM	PTFE (tape)

Pos.	Part	Material	
3	Flange	316L (1.4404)	
	Ball	316L (1.4404)	
	Screws	A2	
	Spring-lock washer	1.4310	
	Clamping flange	316L (1.4404)	
	Adapter	316L (1.4404)	
	Seal (except for version "G")	FKM	
4	Flange	316L (1.4404/1.4435)	
	Adapter	316L (1.4404)	
5	Process connection	316L (1.4404)	
6	Process separating parts	316L (1.4404)	
	Adapter Horn/Parabolic	316L (1.4404)	
7	Tube	316L (1.4404)	
8	Horn	316L (1.4404)	
	Screws	A4	
	Process separating cone	Standard: PEEK	High temperature: PI
	Seal	Standard: FKM	High temperature: Graphite
9	Parabolic reflector	316L (1.4404)	
	Screws	A4	
	Feed	PTFE	
	Seal	FKM	

Weather protection cover

A0015473

Weather protection cover				
Nr.	Part: material		Nr.	Part: material
1	Protection cover: 304 (1.4301)		4	Bracket: 304 (1.4301)
2.1	Washer: A2		5.1	Cheese head screw: A2-70
2.2	Cheese head screw: A4-70		5.2	Nut: A2

Weather protection cover				
Nr.	Part: material		Nr.	Part: material
3.1	Washer: A2		6	Ground terminal ■ Screw: A4 ■ Spring washer: A4 ■ Clamp: 316L (1.4404) ■ Holder: 316L (1.4404)
3.2	Tightening screw: 304 (1.4301)			

Operability

| Operating concept | **Operator-oriented menu structure for user-specific tasks** |

Operator-oriented menu structure for user-specific tasks
- Commissioning
- Operation
- Diagnostics
- Expert level

Quick and safe commissioning
- Guided menus ("Make-it-run" wizards) for applications
- Menu guidance with brief explanations of the individual parameter functions
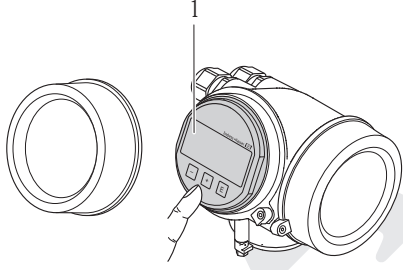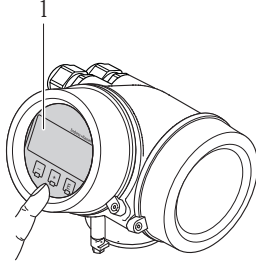
Reliable operation
- Local operation in different languages (see product structure, feature "Additional Operation Language")
- Standardized operation at the device and in the operating tools
- Data storage device (HistoROM) for process and measuring device data with event logbook available at all times – even if electronics modules are replaced

Efficient diagnostics increase measurement reliability
- Remedy information is integrated in plain text
- Diverse simulation options and line recorder functions

Local operation

Order code for "Display; Operation", option **C** "SD02"	Order code for "Display; Operation", option **E** "SD03" (in preparation)
A0015544	A0015546
1 Operation with pushbuttons	*1 Operation with touch control*

Display elements
- 4-line display
- In the case of order code for "Display; Operation", option **E**: white background lighting; switches to red in event of device errors (in preparation)
- Format for displaying measured variables and status variables can be individually configured
- Permitted ambient temperature for the display: –20 to +60 °C (–4 to +140 °F)
 The readability of the display may be impaired at temperatures outside the temperature range.

Operating elements
- In the case of order code "Display; Operation", Option **C**: local operation with 3 push buttons (⊕, ⊖, ⓔ)
- In the case of order code for "Display; Operation", option **E**: external operation via touch control; 3 optical keys: ⊕, ⊖, ⓔ (in preparation)
- Operating elements also accessible in various hazardous areas

Additional functionality
- Data backup function
  The device configuration can be saved in the display module.
- Data comparison function
  The device configuration saved in the display module can be compared to the current device configuration.
- Data transfer function
  The transmitter configuration can be transmitted to another device using the display module.

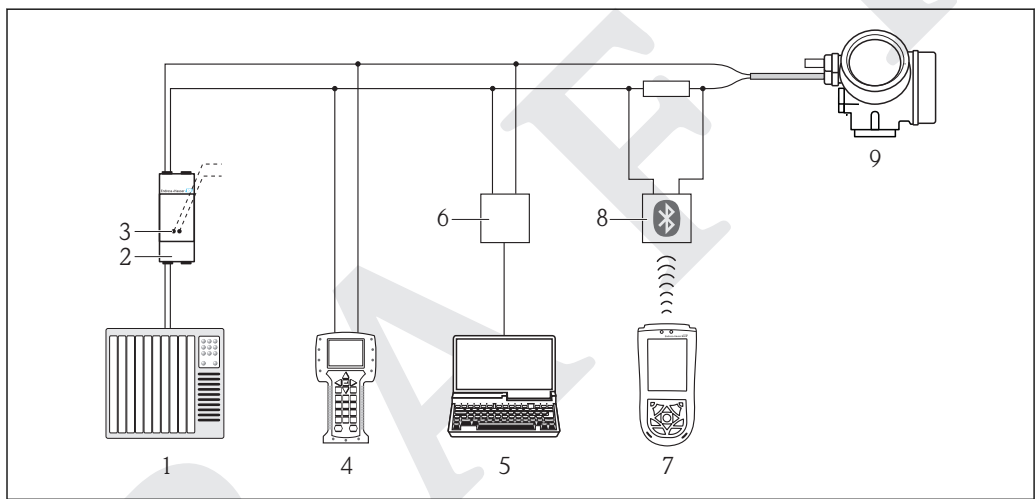**Operation with remote display and operating module FHX50**
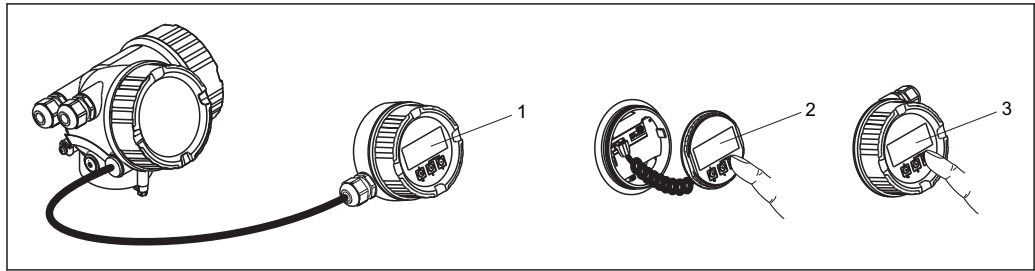
⊠ 22   FHX50 operating options

1   Housing of the remote display and operating module FHX50
2   Display and operating module SD02, push buttons; cover must be removed
3   Display and operating module SD03, optical keys; can be operated through the glass of the cover (in preparation)

Remote operation

Via HART protocol

⊠ 23   Options for remote operation via HART protocol

1   PLC (programmable logic controller)
2   Transmitter power supply unit, e.g. RN221N (with communication resistor)
3   Connection for Commubox FXA191, FXA195 and Field Communicator 375, 475
4   Field Communicator 375, 475
5   Computer with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)
6   Commubox FXA191 (RS232) or FXA195 (USB)
7   Field Xpert SFX100
8   VIATOR Bluetooth modem with connecting cable
9   Transmitter

Via PROFIBUS PA protocol (in preparation)
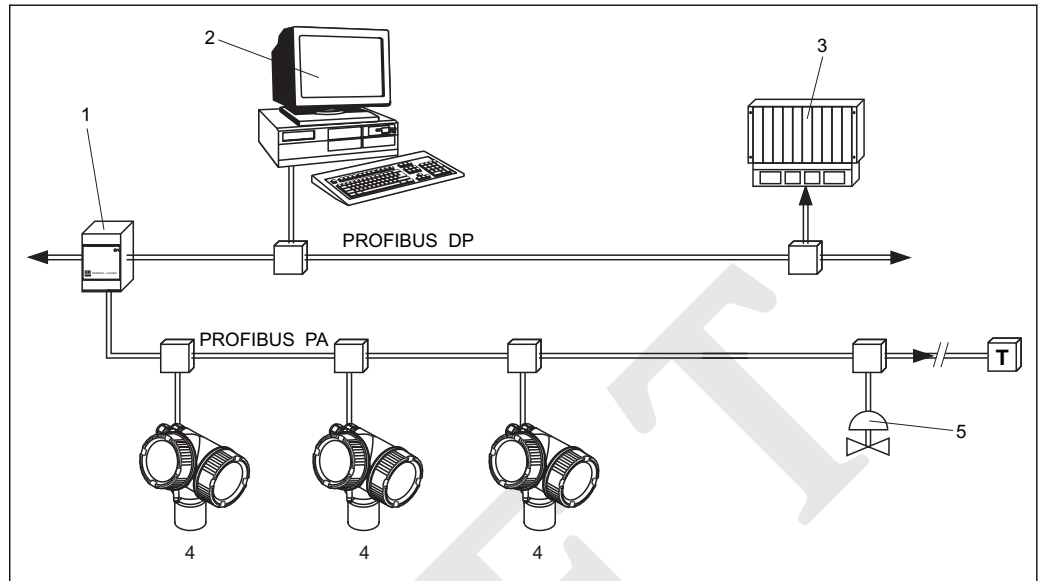
A0015775

1   Segment coupler
2   Computer with Profiboard/Proficard and operating tool (e.g. FieldCare)
3   PLC (Progrommable Logic Controller)
4   Transmitter
5   Additional functions (valves etc.)

Via FOUNDATION Fieldbus (in preparation)
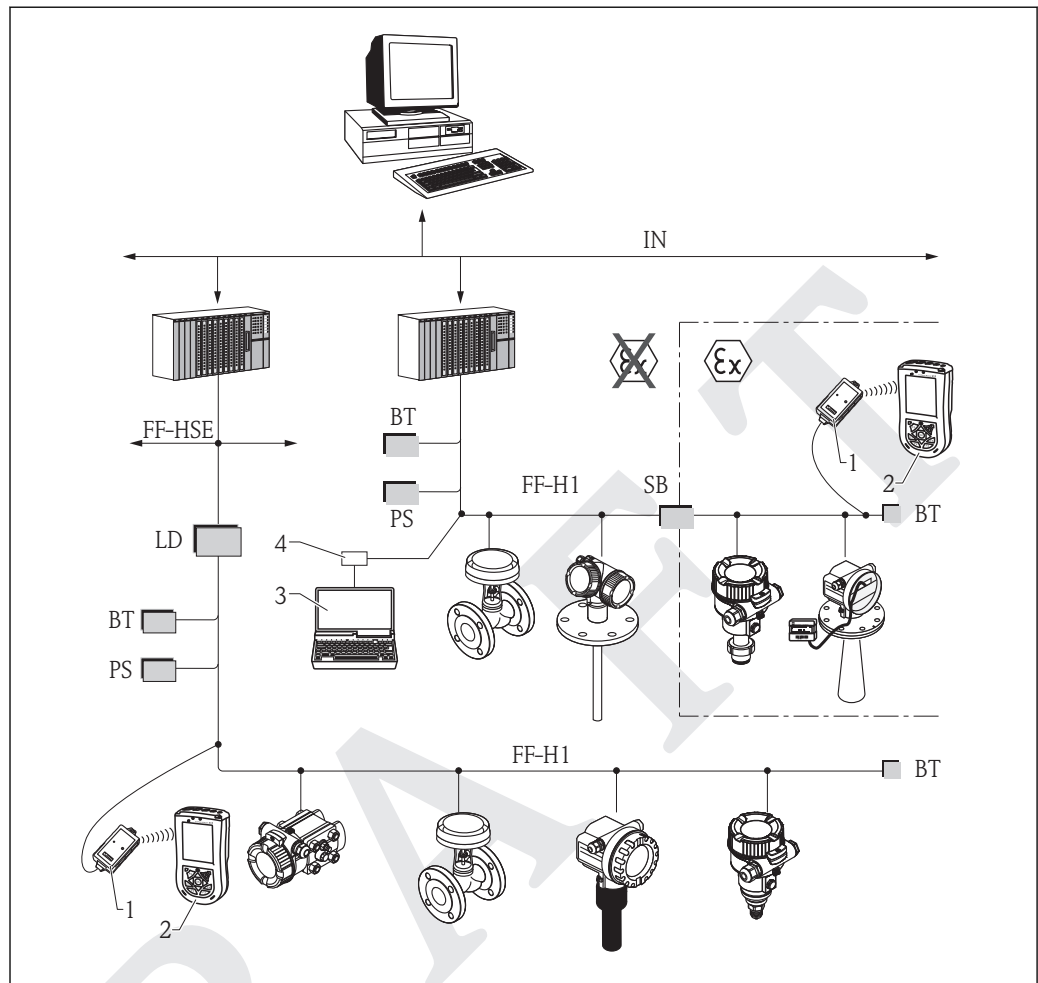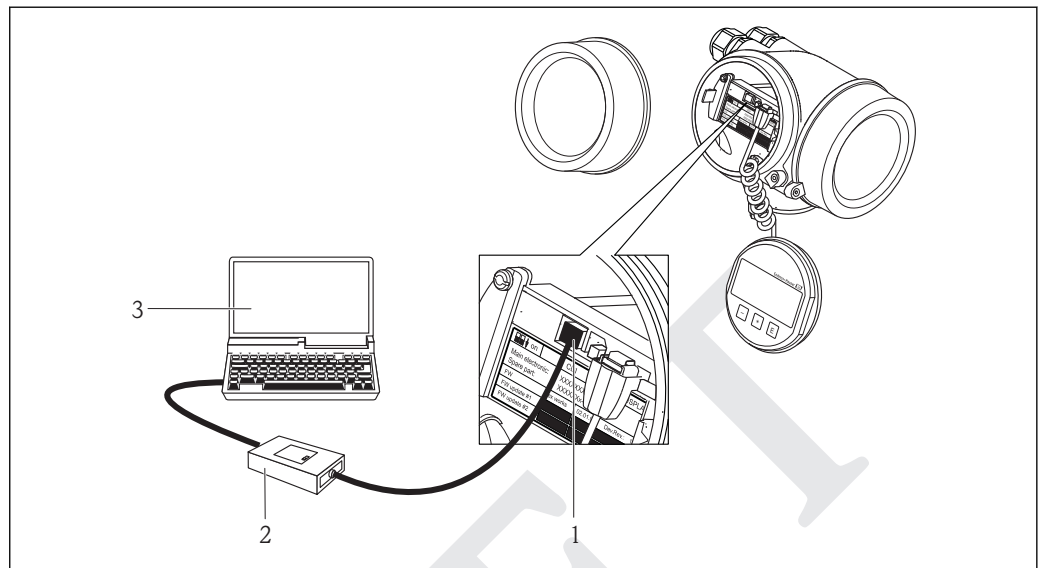

A0017188

24   FOUNDATION Fieldbus system architecture with associated components

IN   Industrial network
FF–   High Speed Ethernet
HSE
FF–   FOUNDATION Fieldbus–H1
H1
LD   Linking Device FF–HSE/FF–H1
PS   Bus Power Supply
SB   Safety Barrier
BT   Bus Terminator
1   FFblue Bluetooth modem
2   Field Xpert SFX100
3   FieldCare
4   NI-FF interface card

Via service interface (CDI)

A0014019

1   Service interface (CDI) of the measuring device (= Endress+Hauser Common Data Interface)
2   Commubox FXA291
3   Computer with "FieldCare" operating tool

System integration via Fieldgate	**Vendor Managed Inventory**

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

Remote maintenance of measuring equipment

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

A0011278
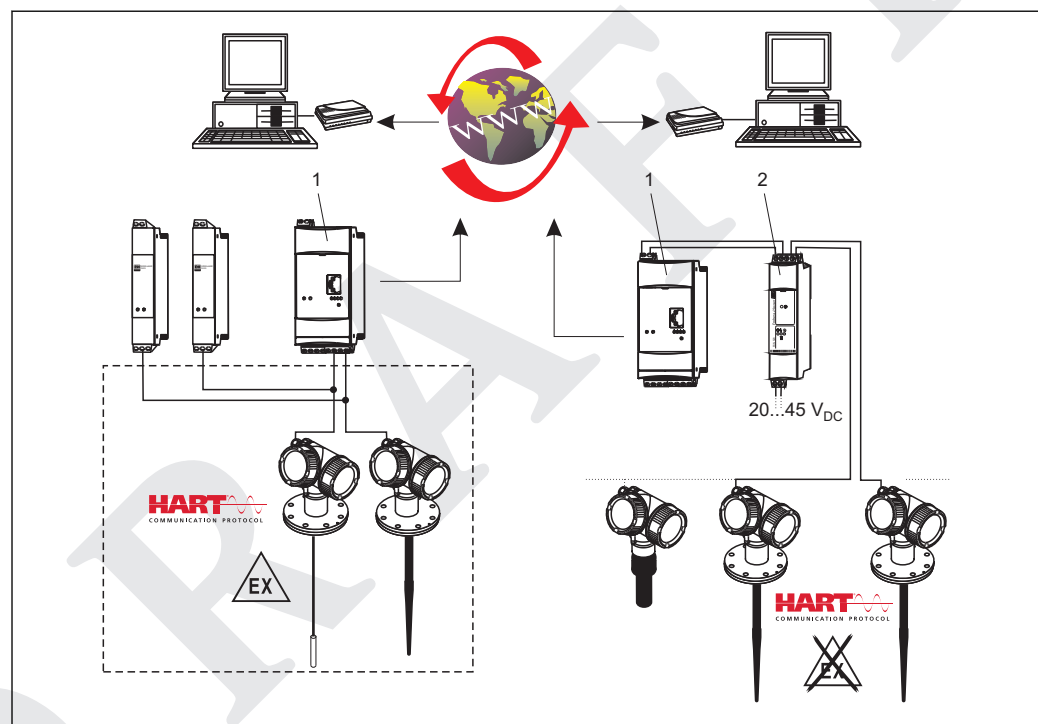
25   The complete measuring system consists of devices and:

1   Fieldgate FXA520
2   Multidrop Connector FXN520

The number of instruments which can be connected in mutidrop mode can be calculated by the "FieldNetCalc" program. A description of this program can be found in Technical Information TI 400F (Multidrop Conncector FXN520). The program is available form your Endress+Hauser sales organisation or in the internet at: www.de.endress.com/Download (text search = "Fieldnetcalc").

Certificates and approvals

CE mark	The measuring system meets the legal requirements of the applicable EC guidelines. These are listed in the corresponding EC Declaration of Conformity together with the standards applied. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
C-Tick symbol	The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".
Ex approval	• ATEX • IEC Ex • CSA (in Vorbereitung) • FM (in Vorbereitung) • NEPSI (in Vorbereitung) • TIIS (in Vorbereitung) Additional safety instructions must be observed for applications in hazardous areas. They are contained in the separate "Safety Instructions" (XA) document, which is included in the scope of delivery. Reference is made to the XA on the nameplate of the device. ⓘ Details on the available certificats as well as the associated XAs can be found in the **Associated documentation** chapter in the **Safety instructions** section: (→ 🖹 84).
Dual seal according to ANSI/ISA 12.27.01	The devices Micropilot FMR5x have been designed according to ANSI/ISA 12.27.01 as dual seal devices, allowing the user to waive the use and save the cost of installing external secondary process seals in the conduit as required by the process sealing sections of ANSI/NFPA 70 (NEC) and CSA 22.1 (CEC). These instruments comply with the North-American installation practice and provide a very safe and cost-saving installation for pressurized applications with hazardous fluids. Further information can be found in the control drawings of the relevant devices.
Functional Safety	Used for level monitoring (MIN, MAX, range) up to SIL 3 (homogeneous or inhomogeneous redundancy), independently assessed by TÜV Rhineland as per IEC 61508. Other information see documentation SD01087F: "Functional Safety Manual".
AD2000	The pressure retaining material 316L (1.4435/1.4404) corresponds to AD2000 – W2/W10.
Pressure Equipment Directive	The Micropilot is not subject to the scope of the Pressure Equipment Directive 97/23/EC, as it does not have a pressure-bearing housing according to article 1, section 2.1.4 of the directive.
Marine certificate (in preparation)	in preparation
Radio standard EN302729-1/2	The devices Micropilot FMR50, FMR51, FMR52, FMR56 and FMR57 are conform with the LPR (Level Probing Radar) standard EN302729-1/2. The devices are allowed to be used inside or outside of closed bins or tanks in countries of th EU and the EFTA. Precondition is that the country itself already has implemented the directive. At present, the following countries have already implemented the directive: Belgium, Bulgaria, Germany, Denmark, Estonia, France, Greece, Great Britain, Ireland, Iceland, Italy, Liechtenstein, Lithuania, Latvia, Malta, Netherland, Norway, Austria, Poland, Romania, Sweden, Switzerland, Slovakia, Spain, Czech Republic and Cyprus. All countries not mentioned above are at present in the implementation phase. For the use of the devices outside of closed bins or tanks, the following has to be observed: 1. The installation has to be done by trained personnel. 2. The antenna of the device has to be mounted on a fixed place and vertically to the bottom. 3. The mounting place has to be in a distance of at least 4 km to the mentioned astronomical stations or an appropriate permission has to be issued by the national authority. If the device is mounted at a

distance of 4 to 40 km from the stations mentioned, the maximum mounting height is restricted to 15 m (49 ft).

Astronomical stations

Country	Name of the station	Geographical latitude	Geographical longitude
Germany	Effelsberg	50°31'32" N	06°53'00" E
Finland	Metsähovi	60°13'04" N	24°23'37" E
	Tuorla	60°24'56" N	24°26'31" E
France	Plateau de Bure	44°38'01" N	05°54'26" E
	Floirac	44°50'10" N	00°31'37" W
United Kingdom	Cambridge	52°09'59" N	00°02'20" E
	Damhall	53°09'22" N	02°32'03" W
	Jodrell Bank	53°14'10" N	02°18'26" W
	Knockin	52°47'24" N	02°59'45" W
	Pickmere	53°17'18" N	02°26'38" W
Italy	Medicina	44°31'14" N	11°38'49" E
	Noto	36°52'34" N	14°59'21" E
	Sardinia	39°29'50" N	09°14'40" E
Poland	Krakow Fort Skala	50°03'18" N	19°49'36" E
Russia	Dmitrov	56°26'00" N	37°27'00" E
	Kalyazin	57°13'22" N	37°54'01" E
	Pushchino	54°49'00" N	37°40'00" E
	Zelenchukskaya	43°49'53" N	41°35'32" E
Sweden	Onsala	57°23'45" N	11°55'35" E
Switzerland	Bleien	47°20'26" N	08°06'44" E
Spain	Yebes	40°31'27" N	03°05'22" W
	Robledo	40°25'38" N	04°14'57" W
Hungary	Penc	47°47'22" N	19°16'53" E

ℹ️ In general the requirements of EN 302729-1/2 has to be taken in consideration.

Radio standard EN302372-1/2

The devices Micropilot FMR50, FMR51, FMR52, FMR53, FMR54, FMR56 and FMR57 are conform with the TLPR (Tanks Level Probing Radar) standard EN302372-1/2 and can always be used in closed tanks or bins. For installation, points a to f in Annex B of EN302372-1 have to be taken into account.

FCC / Industry Canada

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.

Canada CNR-Gen Section 7.1.3

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) This device may not interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

[Any] changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

CRN approval	in preparation
Track record	FMR5x is the upgrade model of the corresponding FMR2xx series.
Other standards and guidelines	■ EN 60529 Degrees of protection by housing (IP code) ■ EN 61010-1 Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures. ■ IEC/EN 61326 "Emission in accordance with Class A requirements". Electromagnetic compatibility (EMC requirements) ■ NAMUR NE 21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment. ■ NAMUR NE 43 Standardization of the signal level for the breakdown information of digital transmitters with analog output signal. ■ NAMUR NE 53 Software of field devices and signal-processing devices with digital electronics ■ NAMUR NE 107 Status classification as per NE107 ■ NAMUR NE 131 Requirements for field devices for standard applications ■ IEC61508 Functional safety of electrical/electronic/programmable electronic safety-related systems

Ordering information

Ordering information	Detailed ordering information is available from the following sources: • In the Product Configurator on the Endress+Hauser website: www.endress.com → Select country → Instruments → Select device → Product page function: Configure this product • From your Endress+Hauser Sales Center: www.endress.com/worldwide

> **Product Configurator – the tool for individual product configuration**
> • Up-to-the-minute configuration data
> • Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
> • Automatic verification of exclusion criteria
> • Automatic creation of the order code and its breakdown in PDF or Excel output format
> • Ability to order directly in the Endress+Hauser Online Shop

5-point linearity protocol (in preparation)	The following notes must be taken into account if option F4 ("5 point linearity protocol") has been selected in feature 550 ("Calibration"). The five points of the linearity protocol are evenly distributetd across the measuring range (0% to 100%). In order to define the measuring range, **Empty calibration** (E) and **Full calibration** (F) have to be specified [5]. The following restrictions have to be taken into account when defining E and F:
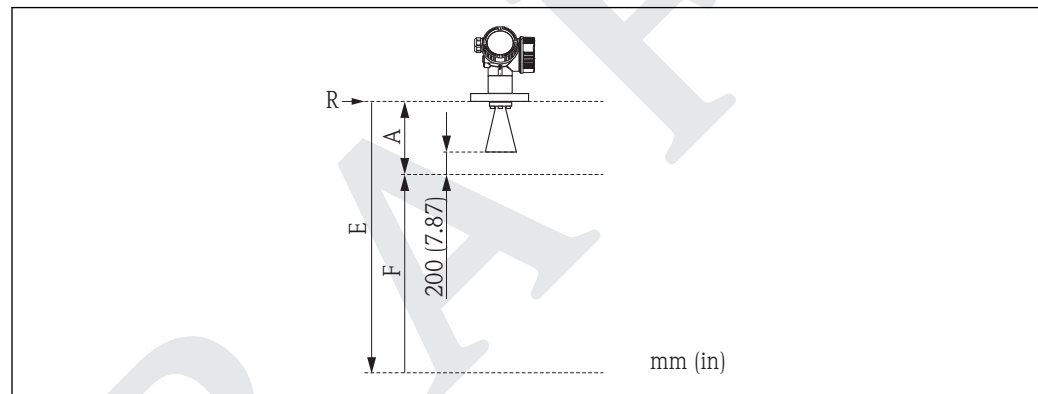
A0017983

Minimum distance between reference point (R) and 100% level	Minimum span	Maximum value for "empty calibration"
A ≥ Length of antenna + 200 mm (8 in) Minimum value: 400 mm (16 in)	F ≥ 400 mm (16 in)	E ≤ 24 m (79 ft)

> The linearity is checked under reference conditions.

> The selected values of **Empty calibration** and **Full calibration** are only used to record the linearity protocol and are reset to their antenna specific default values thereafter. If values different from the default are required, they must be ordered as a customized parametrization (→ 🖹 77).

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5) If E and F are not specified, antenna dependent default values will be used instead.
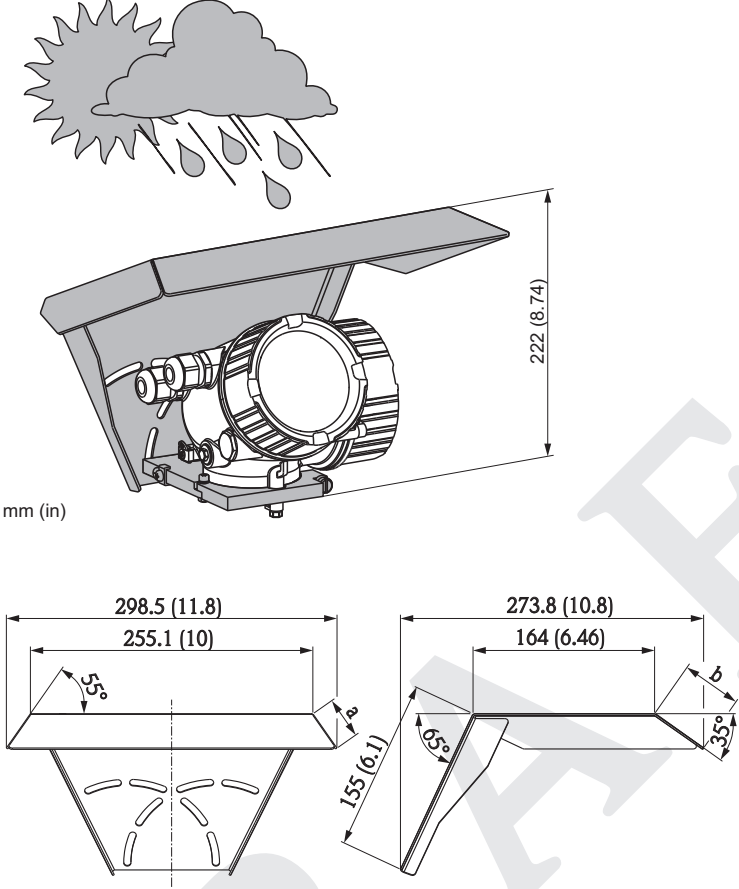
Customized parametrization
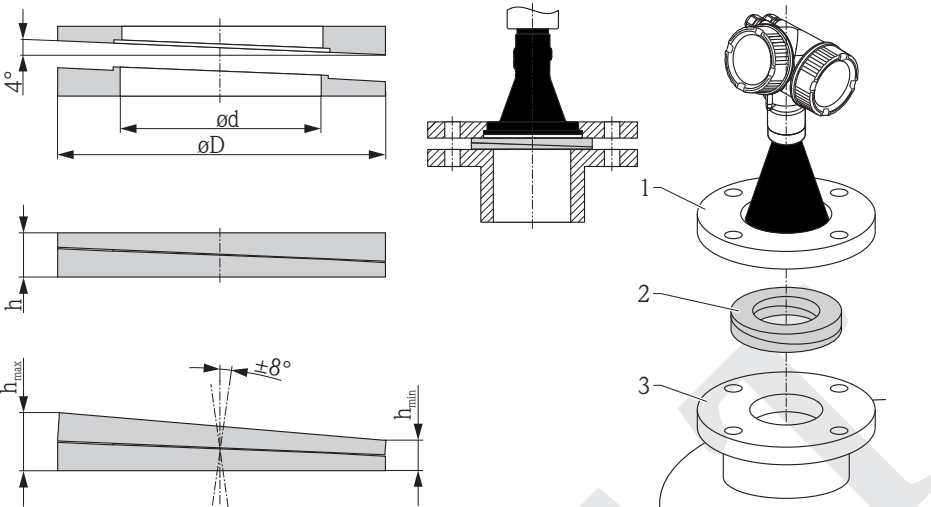
If the option IJ "Customized parametrization HART", IK "Customized parametrization PA" or IL "Customized parametrization FF" has been selected in feature 570 "Service", customer specific presettings can be selected for the following parameters:

Parameter	Communication	Selection list / range of values
Setup → Distance unit	■ HART ■ PA ■ FF	■ in ■ mm
Setup → Empty calibration	■ HART ■ PA ■ FF	0 to 70 m (0 to 230 ft)
Setup → Full calibration	■ HART ■ PA ■ FF	0 to 70 m (0 to 230 ft)
Setup → Adv. Setup → Current output 1/2 → Damping	HART	0 to 999,9 s
Setup → Adv. Setup → Current output 1/2 → Failure mode	HART	■ Min ■ Max ■ Last valid value
Expert → Comm. → HART config. → Burst mode	HART	■ Off ■ On
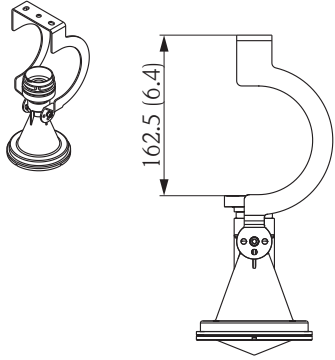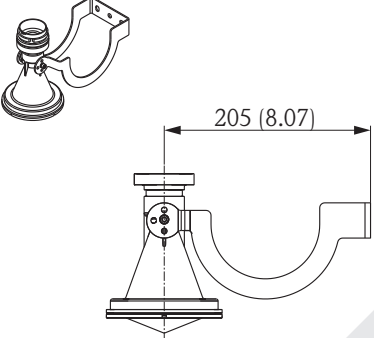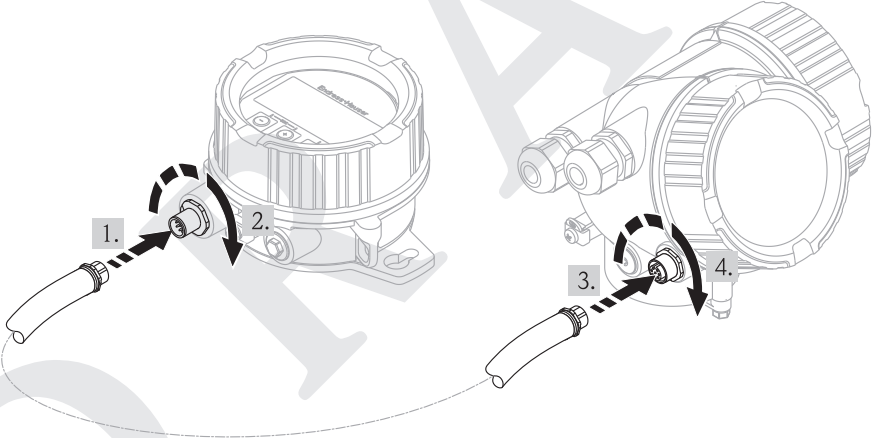
Accessories

Accessory	Description
Weather protection cover	mm (in) A0015466 298.5 (11.8) 255.1 (10) 55° 273.8 (10.8) 164 (6.46) 65° 35° 155 (6.1) *a* *b* mm (in) A0015472 *a* 37.8 mm (1.49 in) *b* 54 mm (2.13 in) ℹ The weather protection cover can be ordered together with the device (product structure, feature 620 "Accessory Enclosed", option PB "Weather Protection Cover"). Alternatively, it can be separately ordered as an accessory; order code 71132889.

Accessory	Description
Variable flange seal for FMR50/FMR56	 *1 UNI slip-on flange* *2 Variable flange seal* *3 Nozzle* ℹ The material and process conditions of the adjustable flange seal must fit the process properties (temperature, pressure, resistance).

Variable flange seal	DN80	DN100	DN150
Order code	71074263	71074264	71074265
compatible with	▪ DN80 PN10-40 ▪ ANSI3" 150lbs ▪ JIS 10K 80A	▪ DN100 PN10-40 ▪ ANSI 4" 150lbs ▪ JIS 10K 100A	▪ DN150 PN10-40 ▪ ANSI 6"150lbs ▪ JIS 10K 150A
Material	EPDM		
Process pressure	−0.1 to 0.1 bar (−1.45 to 1.45 psi)		
Process temperature	−40 to +80 °C (−40 to +176 °F)		
D	142 mm (5.59 in)	162 mm (6.38 in)	218 mm (8.58 in)
d	89 mm (3.5 in)	115 mm (4.53 in)	169 mm (6.65 in)
h	22 mm (0.87 in)	23.5 mm (0.93 in)	26.5 mm (1.04 in)
h_{min}	14 mm (0.55 in)	14 mm (0.55 in)	14 mm (0.55 in)
h_{max}	30 mm (1.18 in)	33 mm (1.3 in)	39 mm (1.45 in)
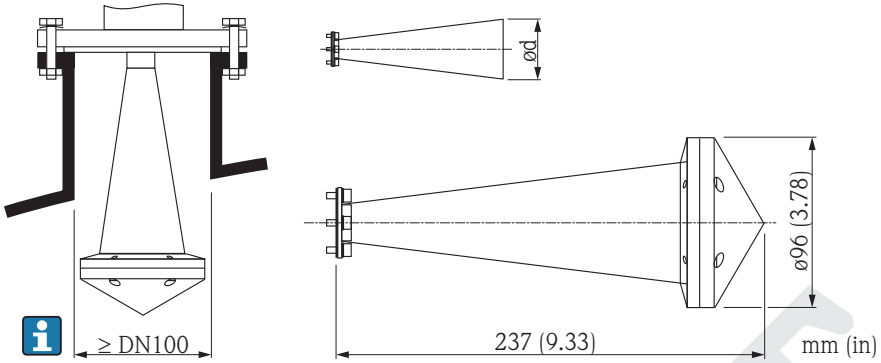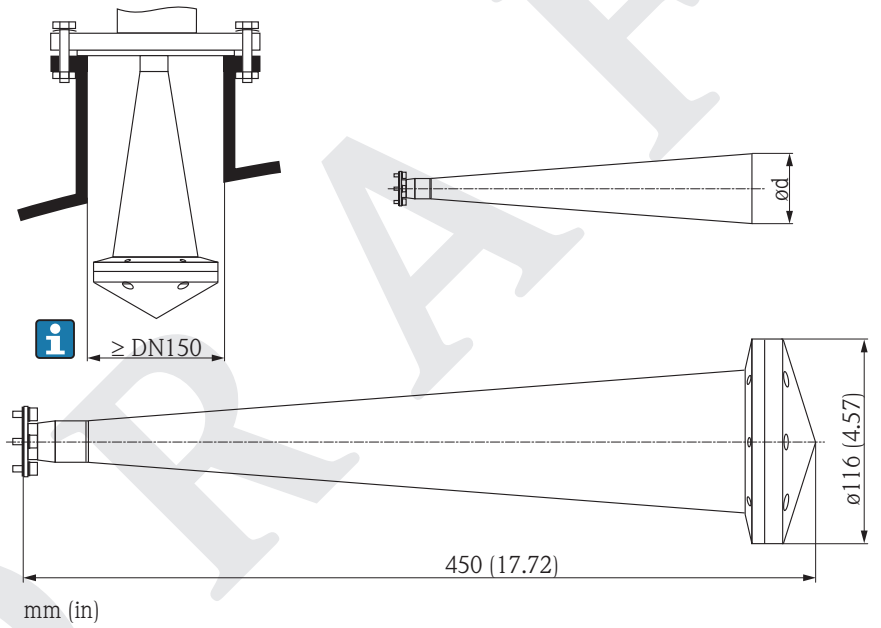
Accessory	Description
Mounting bracket for wall or ceiling mounting of FMR50/FMR56	A B 162.5 (6.4) 205 (8.07) mm (in) A0017746 ⊡ 26 *Mounting bracket for FMR50/FMR56 with horn antenna* *A* *Mounting at ceiling* *B* *Mounting at wall* Material – Mounting bracket: 304 (1.4301) – Screws: A2 – Nordlock washer: A4

Accessory	Description

Remote display FHX50	1. 2. 3. 4.
	
	A0019128
	
	■ Material:
	  – Plastics PBT
	  – 316L (in preparation)
	■ Suitable for the display modules:
	  – SD02 (push buttons)
	  – SD03 (touch control) (in preparation)
	■ Connection cable:
	  – Cable with M12 plug; supplied with the FHX50; up to 30 m (98 ft)
	  – Customer supplied standard cable; up to 60 m (196 ft)
	
	ℹ ■ If the remote display is to be used, the Micropilot must be ordered in the version "Prepared for display FHX50" (feature 030, option L or M). For the FHX50, on the other hand, the option A: "Prepared for display FHX50" has to be selected in feature 050: "Option Measurement Device".
	  ■ If a Micropilot has not been ordered in the version "Prepared for display FHX50", but is nevertheless to be equipped with an FHX50, it is essential to select the option B: "Not prepared for display FHX50" in feature 050: "Option Measurement Device" of the FHX50. In this case, a retrofit kit, needed to prepare the Micropilot for the remote display, is supplied together with the FHX50.
	
	ℹ For details refer to the document SD01007F.

Accessory	Description
Horn protection for 80 mm (3 in) horn antenna	 ≥ DN100 ⌀d ⌀96 (3.78) 237 (9.33) mm (in) A0019143 For details please refer to the Mounting Instructions SD01084F. Danger of explosion Avoid electrostatic charging of the horn protection.

Accessory	Description
Horn protection for 100 mm (4 in) horn antenna	 ≥ DN150 ⌀d ⌀116 (4.57) 450 (17.72) mm (in) A0019144 For details please refer to the Mounting Instructions SD01084F. Danger of explosion Avoid electrostatic charging of the horn protection.

Communication-specific accessories

Accessory	Description
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface. For details refer to Technical Information TI00404F

Accessory	Description
Commubox FXA291	Connects Endress+Hauser field devices with CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a computer. For details refer to Technical Information TI00405C

Accessory	Description
HART Loop Converter HMX50	Evaluates the dynamic HART variables and converts them to analog current signals or limit values.
	For details refer to Technical Information TI00429F and Operating Instructions BA00371F

Accessory	Description
WirelessHART Adapter SWA70	Connects field devices to a WirelessHART network. The WirelessHART adapter can be mounted directly at a HART device and is easily integrated into an existing HART network. It ensures safe data transmission and can be operated in parallel with other wireless networks.
	For details refer to Operating Instructions BA00061S

Accessory	Description
Fieldgate FXA320	Gateway for remote monitoring of connected 4-20mA measuring devices via web browser.
	For details refer to Technical Information TI00025S and Operating Instructions BA00053S

Accessory	Description
Fieldgate FXA520	Gateway for remote diagnosis and parametrization of connected HART measuring devices via web browser.
	For details refer to Technical Information TI00025S and Operating Instructions BA00051S

Accessory	Description
Field Xpert SFX100	Compact, flexible and robust industry handheld terminal for remote parametrization and measured value inspection via the HART output or via FOUNDATION Fieldbus .
	For details refer to Operating Instructions BA00060S

Service-specific accessories

Accessory	Description
FieldCare	Endress+Hauser's FDT–based Plant Asset Management tool. Helps to configure and maintain all field devices of your plant. By supplying status information it also supports the diagnosis of the devices.
	For details refer to Operating Instructions BA00027S and BA00059S.

System components

Accessory	Description
Graphic Data Manager Memograph M	The graphic data manager Memograph M provides information on all the relevant process variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on an SD card or USB stick.
	🕮 For details refer to Technical Information TI00133R and Operating Instructions BA00247R
RN221N	Active barrier with power supply for safe separation of 4 to 20 mA current circuits. Provides bi-directional HART transmission.
	🕮 For details refer to Technical Information TI00073R and Operating Instructions BA00202R
RNS221	Transmitter supply for 2-wire sensors or transmitters exclusively for non-Ex areas. Provides bi-directional communication using the HART communication sockets.
	🕮 For details refer to Technical Information TI00081R and Operating Instructions KA00110R

Documentation

ℹ️ The following document types are available:
- On the CD supplied with the device
- In the Download Area of the Endress+Hauser Internet site: www.endress.com → Download

Standard documentation

Micropilot FMR56, FMR57

Correlation of documentations to the device:

Device	Power supply, output	Communikation	Document type	Document code
FMP56, FMP57	A, B, C, K, L	HART	Operating Instructions	BA01048F/00/EN
			Brief Operating Instructions	KA01102F/00/EN
			Description of Device Parameters	GP01014F/00/EN
	G	PROFIBUS PA (in preparation)	Operating Instructions	BA01127F/00/EN
			Brief Operating Instructions	KA01131F/00/EN
			Description of Device Parameters	GP01018F/00/EN
	E	FOUNDATION Fieldbus (in preparation)	Operating Instructions	BA01123F/00/EN
			Brief Operating Instructions	KA01127F/00/EN
			Description of Device Parameters	GP01017F/00/EN

Supplementary documentation

Device	Document type	Document code
Fieldgate FXA520	Technical Information	TI369F/00/EN
Tank Side Monitor NRF590	Technical Information	TI402F/00/EN
	Operating Instructions	BA256F/00/EN
	Description of Device Parameters	BA257F/00/EN

Safety Instructions (XA)

Depending on the approval, the following Safety Instructions (XA) are supplied with the device. They are an integral part of the Operating Instructions.

Feature 010	Approval	Available for	Safety Instructions HART	Safety Instructions PROFIBUS FOUNDATION Fieldbus
BA	ATEX: II 1 G Ex ia IIC T6 Ga	■ FMR56 ■ FMR57	XA00677F	XA00685F
BB	ATEX: II 1/2 G Ex ia IIC T6-T1 Ga/Gb	■ FMR56 ■ FMR57	XA00677F	XA00685F
BC	ATEX: II 1/2 G Ex d [ia] IIC T6-T1 Ga/Gb	■ FMR56 ■ FMR57	XA00680F	XA00688F
BD	ATEX: II 1/2/3 G Ex ic [ia Ga] IIC T6-T1 Ga/Gb/Gc	FMR57	XA00678F	XA00686F
BE	ATEX: II 1 D Ex ta IIIC T500 xx°C Da	■ FMR56 ■ FMR57	XA00682F	XA00690F
BF	ATEX: II 1/2 D Ex ta IIIC Txx°C Da/Db	■ FMR56 ■ FMR57	XA00682F	XA00690F
BG	ATEX: II 3 G Ex nA IIC T6-T1 Gc	■ FMR56 ■ FMR57	XA00679F	XA00687F
BH	ATEX: II 3 G Ex ic IIC T6-T1 Gc	■ FMR56 ■ FMR57	XA00679F	XA00687F
BL	ATEX: II 1/2/3 G Ex nA [ia Ga] IIC T6-T1 Ga/Gb/Gc	FMR57	XA00678F	XA00686F
B2	ATEX: II 1/2 G Ex ia IIC T6-T1 Ga/Gb ATEX: II 1/2 D Ex ia IIIC Txx°C Da/Db	■ FMR56 ■ FMR57	XA00683F	XA00691F

Feature 010	Approval	Available for	Safety Instructions HART	Safety Instructions PROFIBUS FOUNDATION Fieldbus
B3	ATEX: II 1/2 G Ex d [ia] IIC T6-T1 Ga/Gb ATEX: II 1/2 D Ex ta IIIC Txx°C Da/Db	▪ FMR56 ▪ FMR57	XA00684F	XA00692F
IA	IECEx: Ex ia IIC T6-T1 Ga	▪ FMR56 ▪ FMR57	XA00677F	XA00685F
IB	IECEx: Ex ia IIC T6-T1 Ga/Gb	▪ FMR56 ▪ FMR57	XA00677F	XA00685F
IC	IECEx: Ex d [ia] IIC T6-T1 Ga/Gb	▪ FMR56 ▪ FMR57	XA00680F	XA00688F
ID	IECEx: Ex ic [ia Ga] IIC T6-T1 Ga/Gb/Gc	FMR57	XA00678F	XA00686F
IE	IECEx: Ex ta IIIC T_{500} xx°C Da	▪ FMR56 ▪ FMR57	XA00682F	XA00690F
IF	IECEx: Ex ta IIIC Txx°C Da/Db	▪ FMR56 ▪ FMR57	XA00682F	XA00690F
IG	IECEx: Ex nA IIC T6-T1 Gc	▪ FMR56 ▪ FMR57	XA00679F	XA00687F
IH	IECEx: Ex ic IIC T6-T1 Gc	▪ FMR56 ▪ FMR57	XA00679F	XA00687F
IL	IECEx: Ex nA [ia Ga] IIC T6-T1 Ga/Gb/Gc	FMR57	XA00678F	XA00686F
I2	IECEx: Ex ia IIC T6-T1 Ga/Gb IECEx: Ex ia IIIC Txx°C Da/Db	▪ FMR56 ▪ FMR57	XA00683F	XA00691F
I3	IECEx: Ex d [ia] IIC T6-T1 Ga/Gb IEXEx: Ex ta IIIC Txx°C Da/Db	▪ FMR56 ▪ FMR57	XA00684F	XA00692F

ℹ For certified devices the relevant Safety Instructions (XA) are indicated on the nameplate.

If the device is prepared for the remote display FHX50 (product structure: feature 030: Display, Operation", option L or M), the Ex marking of some certificates changes according to the following table [6]:

Feature 010 ("Approval")	Feature 030 ("Display, Operation")	Ex marking
BE	L oder M	ATEX II 1D Ex ta [ia] IIIC T_{500} xx°C Da
BF	L oder M	ATEX II 1/2 D Ex ta [ia Db] IIIC Txx°C Da/Db
BG	L oder M	ATEX II 3G Ex nA [ia Ga] IIC T6 Gc
BH	L oder M	ATEX II 3G Ex ic [ia Ga] IIC T6 Gc
B3	L oder M	ATEX II 1/2G Ex d [ia] IIC T6 Ga/Gb, ATEX II 1/2D Ex ta [ia Db] IIIC Txx°C Da/Db
IE	L oder M	IECEx Ex ta [ia] IIIC T500 xx°C Da
IF	L oder M	IECEx ta [ia Db] IIIC Txx°C Da/Db
IG	L oder M	IECEx Ex nA [ia Ga] IIC T6 Gc
IH	L oder M	IECEx Ex ic [ia Ga] IIC T6 Gc
I3	L oder M	IECEx Ex d [ia] IIC T6 Ga/Gb, IECEx Ex ta [ia Db] IIIC Txx°C Da/Db

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6)   The marking of certificates not mentioned in this table are not affected by the FHX50.

Registered trademarks

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

PROFIBUS®
Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

FOUNDATION™ Fieldbus
Registered trademark of the Fieldbus Foundation, Austin, Texas, USA

KALREZ®, VITON®
Registered trademark of DuPont Performance Elastomers L.L.C., Wilmington, USA

TEFLON®
Registered trademark of E.I. DuPont de Nemours & Co., Wilmington, USA

TRI CLAMP®
Registered trademark of Alfa Laval Inc., Kenosha, USA

Patents

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

Further patents are pending.

US Patents	EP Patents
5.948.979	882 957
6.087.978	955 527
6.140.940	–
6.155.112	834 722
–	882 955
6.266.022	1 083 413
6.295.874	210 567
6.512.358	1 301 914
6.606.904	–
6.640.628	–
6.679.115	1 360 523
–	1 389 337
6.779.397	–
7.201.050	–
7.412.337	–
7.552.634	–
7.730.760	–
7.819.002	–
–	1 774 616
7.966.141	–
8.040.274	–
8.049.371	–

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People for Process Automation