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Endress+Hauser

Wichtige Hinweise zum Dokument

Symbols

Safety symbols

Symbol	Meaning
	DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
	CAUTION! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
	NOTE! This symbol contains information on procedures and other facts which do not result in personal injury.

Electrical symbols

Symbol	Meaning
	Direct current
	Alternating current
	Direct current and alternating current
	Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	Protective Earth (PE) A terminal which must be connected to ground prior to establishing any other connections. The ground terminals are situated inside and outside the device: ▪ Inner ground terminal: Connects the protective earth to the mains supply. ▪ Outer ground terminal: Connects the device to the plant grounding system.

Symbols for certain types of information

Symbol	Meaning
	Permitted Procedures, processes or actions that are permitted.
	Preferred Procedures, processes or actions that are preferred.
	Forbidden Procedures, processes or actions that are forbidden.
	Tip Indicates additional information.
	Reference to documentation.
	Reference to page.
	Reference to graphic.
	Visual inspection.

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

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.

Terms and abbreviations

Term/abbreviation	Explanation
BA	Document type "Operating Instructions"
KA	Document type "Brief Operating Instructions"
TI	Document type "Technical Information"
SD	Document type "Special Documentation"
XA	Document type "Safety Instructions"
PN	Nominal pressure
MWP	Maximum Working Pressure The MWP can also be found on the nameplate.
ToF	Time of Flight
FieldCare	Scalable software tool for device configuration and integrated plant asset management solutions
DeviceCare	Universal configuration software for Endress+Hauser HART, PROFIBUS, FOUNDATION Fieldbus and Ethernet field devices
DTM	Device Type Manager
DD	Device Description for HART communication protocol
ϵ_r (DC value)	Relative dielectric constant
Operating tool	The term "operating tool" is used in place of the following operating software: - FieldCare / DeviceCare, for operation via HART communication and PC - SmartBlue (app), for operation using an Android or iOS smartphone or tablet.
BD	Blocking Distance; no signals are analyzed within the BD.
PLC	Programmable Logic Controller
CDI	Common Data Interface
PFS	Pulse Frequency Status (Switching output)
MBP	Manchester Bus Powered
PDU	Protocol Data Unit

HART®

PROFIBUS®

FOUNDATION™ Fieldbus

Bluetooth®

Apple®

Android®

KALREZ[®], VITON[®]

TEFLON®

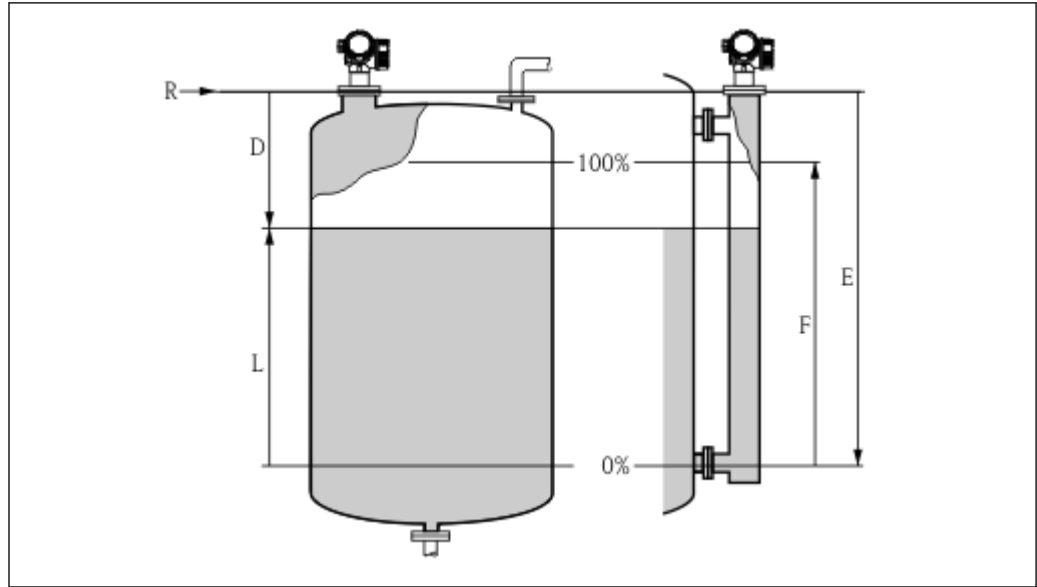
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Function and system design

Measuring principle

The Micropilot is a "downward-looking" measuring system, operating based on the time-of-flight method (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.



A0017871

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:

FMR50: → 54

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.

Input

Measured variable

The measured variable is the distance between the reference point and the product surface.

The level is calculated from this distance, taking into account the empty distance "E" entered by the user.

If required, the level can be converted into other variables (volume, mass) by means of a linearization (up to 32 points).

Measuring range

Maximum measuring range

Device	Maximum measuring range
FMR50 - standard version	30 m (98 ft)
FMR50 - with "Advanced dynamics" application package	40 m (131 ft)

Usable measuring range

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

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

Media groups

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

1) Treat Ammonia NH_3 as a medium of group A.



For dielectric constants (DC values) of many media commonly used in various industries refer to:

- the Endress+Hauser DC manual (CP01076F)
- the Endress+Hauser "DC Values App" (available for Android and iOS)

Legend

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Measuring range [m (ft)]

Legend

	Measuring range of the standard version
	Measuring range for the "Advanced dynamics" application package (product structure: feature 540: "Application Package", Option EM: "Advanced dynamics")

Output signal

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

Device version	Ordering feature 610 "Accessory mounted", option NF "Bluetooth"
Operation / configuration	By the <i>SmartBlue</i> app.
Range under reference conditions	> 10 m (33 ft)
Encryption	Encrypted communication and password encryption prevent incorrect operation by unauthorized persons.

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

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

 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"

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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 linearization 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 <table border="1"> <tr> <td>Manufacturer ID</td><td>17 (0x11)</td></tr> <tr> <td>Device type ID</td><td>0x1128</td></tr> <tr> <td>HART specification</td><td>7.0</td></tr> <tr> <td>Device description files (DTM, DD)</td><td>Information and files under: ■ www.endress.com ■ www.fieldcommgroup.org </td></tr> <tr> <td>HART load</td><td>min. 250 Ω</td></tr> </table>	Manufacturer ID	17 (0x11)	Device type ID	0x1128	HART specification	7.0	Device description files (DTM, DD)	Information and files under: ■ www.endress.com ■ www.fieldcommgroup.org	HART load	min. 250 Ω
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Device description files (DTM, DD)	Information and files under: ■ www.endress.com ■ www.fieldcommgroup.org										
HART load	min. 250 Ω										

Wireless HART data

PROFIBUS PAEndress+Hauser

FOUNDATION Fieldbus

Endress+Hauser

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
Advanced Diagnostic Transducer Block	Contains parameters for the Advanced Diagnostic	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. Access to these parameters is restricted to the Endress+Hauser service.	no output values

- 1) depending on the configuration of the block

Function Blocks

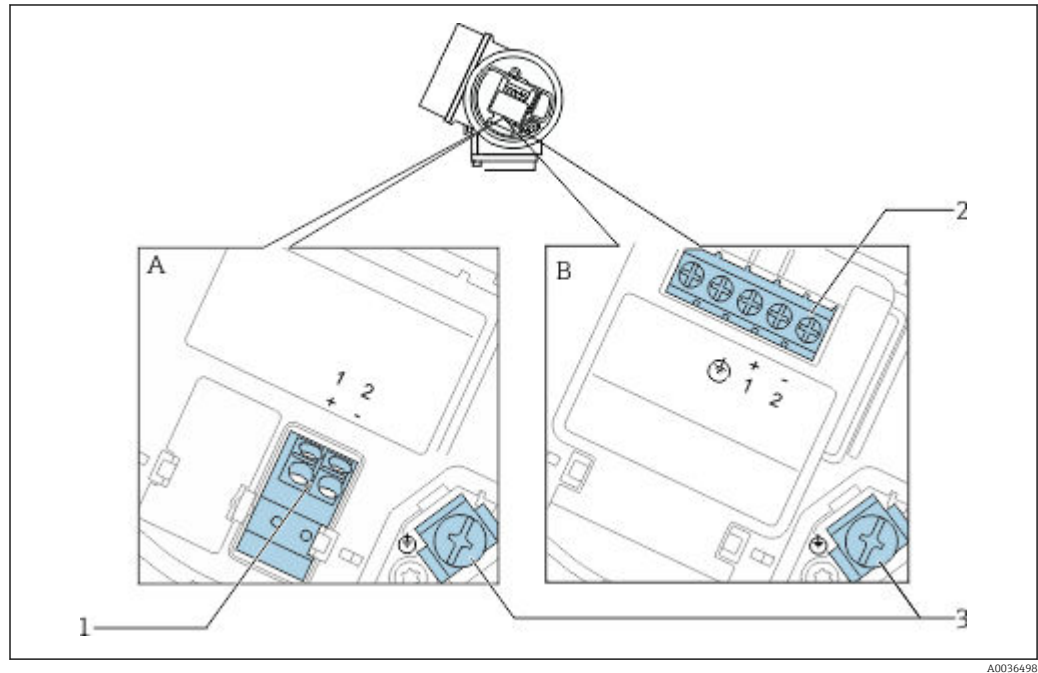
Block	Content	Number of permanent blocks	Number of instantiable blocks	Execution time	Functionality
Resource Block	The Resource Block contains all the data that uniquely identifies the field device. It is an electronic version of a nameplate of the device.	1	0	-	enhanced
Analog Input Block	The AI block 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
Mutiple Analog Output Block	This block is used to transfer analog data from the bus into the device	1	0	20 ms	standard
Mutiple Discrete Output Block	This block is used to transfer discrete data from the bus to the device.	1	0	20 ms	standard

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

Power supply

Terminal assignment

Terminal assignment 2-wire: 4-20 mA HART



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

A Without integrated overvoltage protection

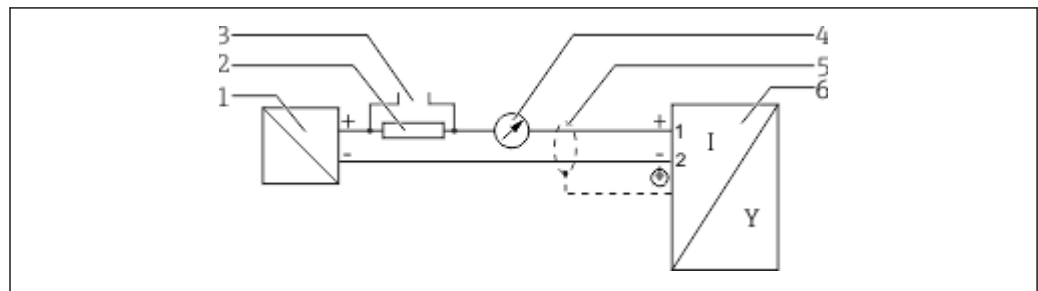
B With integrated overvoltage protection

1 Connection 4-20 mA HART passive: terminals 1 and 2, without integrated overvoltage protection

2 Connection 4-20 mA HART passive: terminals 1 and 2, with integrated overvoltage protection

3 Terminal for cable screen

Block diagram 2-wire: 4-20 mA HART



3 Block diagram 2-wire: 4-20 mA HART

1 Active barrier with power supply (e.g. RN221N); observe terminal voltage

2 HART communication resistor ($\geq 250 \Omega$); observe maximum load

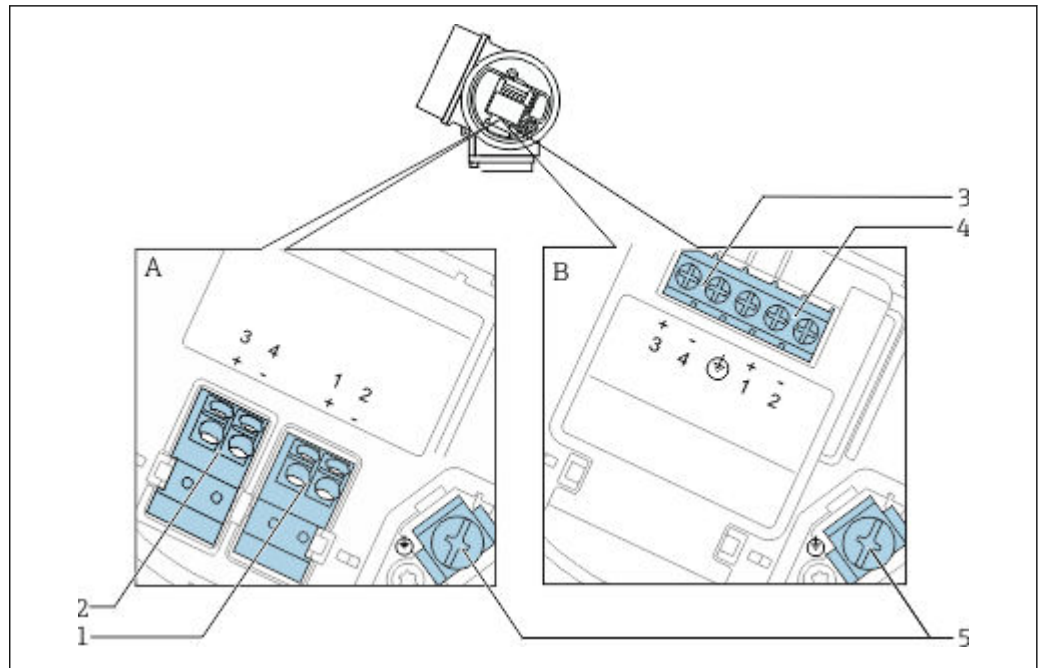
3 Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)

4 Analog display device; observe maximum load

5 Cable screen; observe cable specification

6 Measuring device

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



A0036500

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

A Without integrated overvoltage protection

B With integrated overvoltage protection

1 Connection 4-20 mA HART passive: terminals 1 and 2, without integrated overvoltage protection

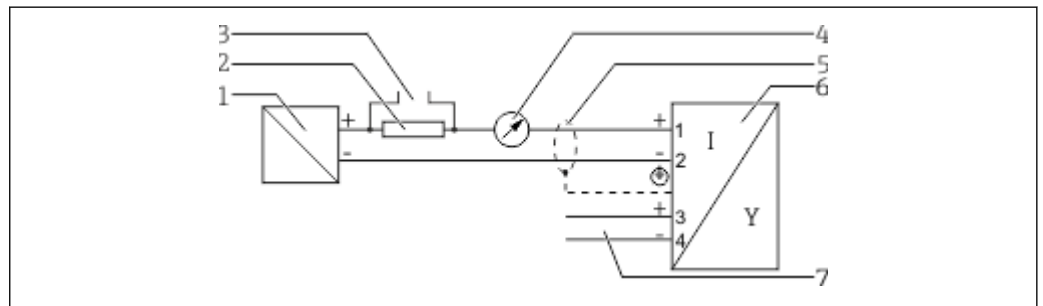
2 Connection switch output (Open Collector): terminals 3 and 4, without integrated overvoltage protection

3 Connection switch output (Open Collector): terminals 3 and 4, with integrated overvoltage protection

4 Connection 4-20 mA HART passive: terminals 1 and 2, with integrated overvoltage protection

5 Terminal for cable screen

Block diagram 2-wire: 4-20 mA HART, switch output



A0036501

5 Block diagram 2-wire: 4-20 mA HART, switch output

1 Active barrier with power supply (e.g. RN221N); observe terminal voltage

2 HART communication resistor ($\geq 250 \Omega$); observe maximum load

3 Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)

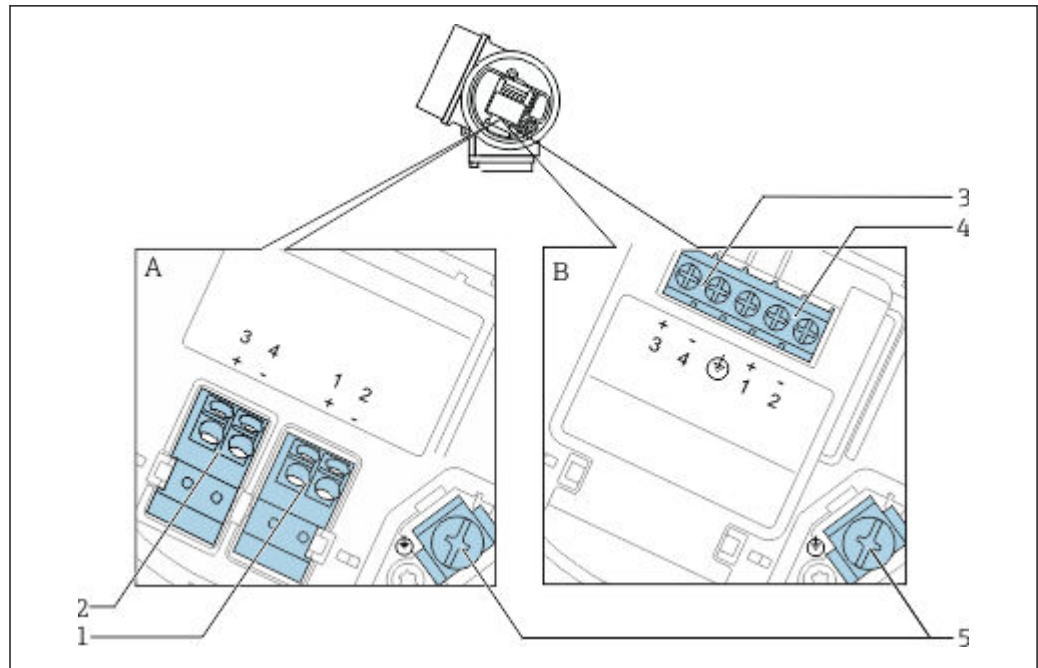
4 Analog display device; observe maximum load

5 Cable screen; observe cable specification

6 Measuring device

7 Switch output (Open Collector)

Terminal assignment 2-wire: 4-20 mA HART, 4-20 mA



A0036500

6 Terminal assignment 2-wire: 4-20 mA HART, 4-20 mA

A Without integrated overvoltage protection

B With integrated overvoltage protection

1 Connection current output 1, 4-20 mA HART passive: terminals 1 and 2, without integrated overvoltage protection

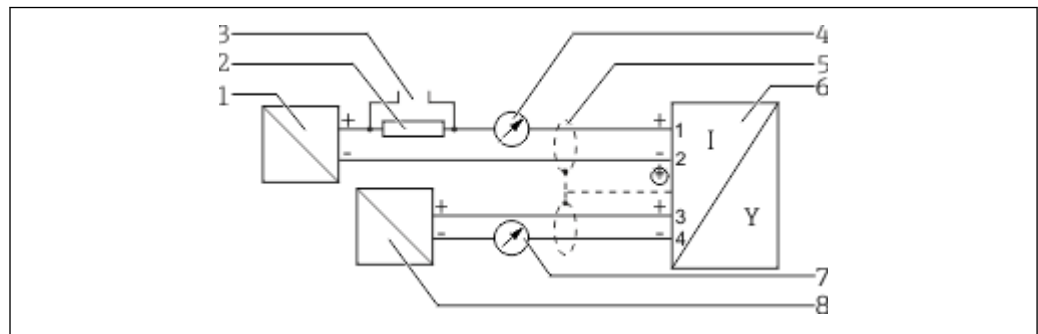
2 Connection current output 2, 4-20 mA: terminals 3 and 4, without integrated overvoltage protection

3 Connection current output 2, 4-20 mA: terminals 3 and 4, with integrated overvoltage protection

4 Connection current output 1, 4-20 mA HART passive: terminals 1 and 2, with integrated overvoltage protection

5 Terminal for cable screen

Block diagram 2-wire: 4-20 mA HART, 4-20 mA



A0036502

7 Block diagram 2-wire: 4-20 mA HART, 4-20 mA

1 Active barrier with power supply (e.g. RN221N); observe terminal voltage

2 HART communication resistor ($\geq 250 \Omega$); observe maximum load

3 Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)

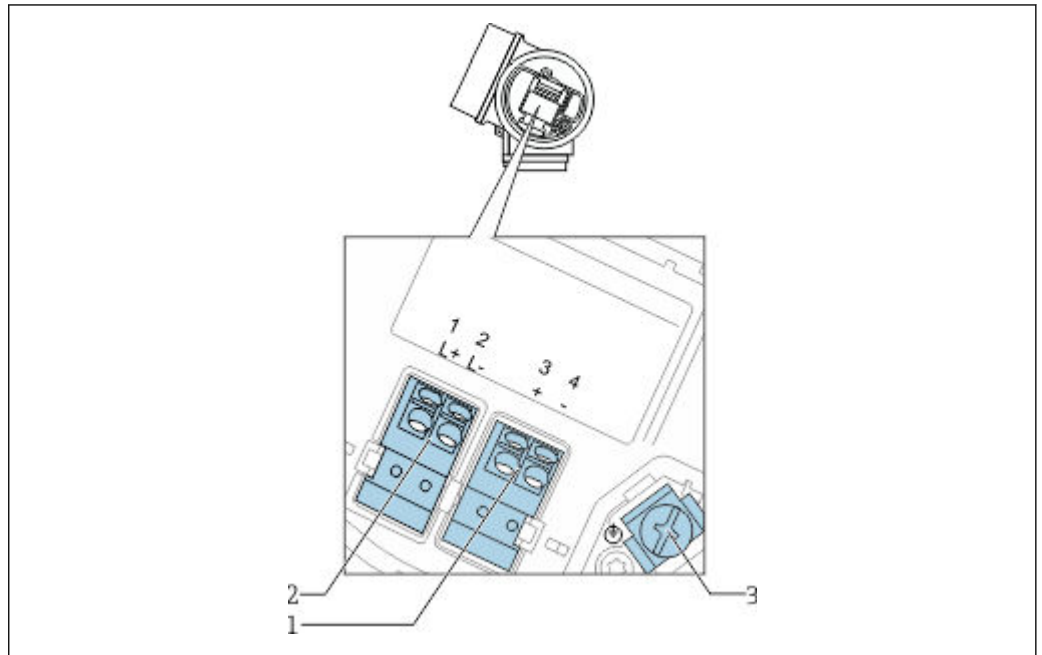
4 Analog display device; observe maximum load

5 Cable screen; observe cable specification

6 Measuring device

7 Analog display device; observe maximum load

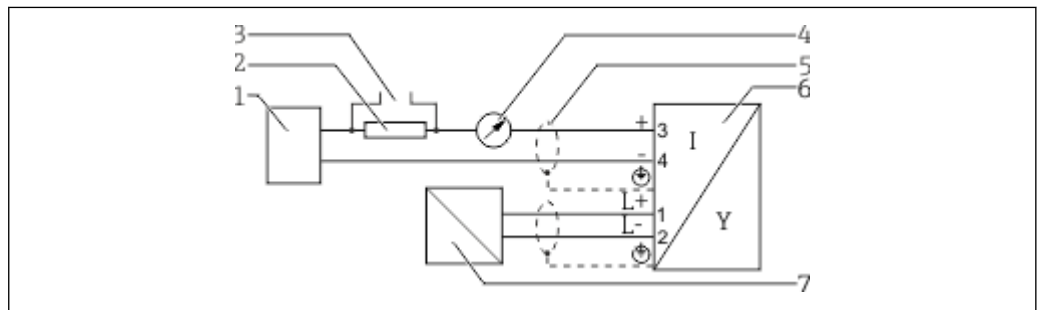
8 Active barrier with power supply (e.g. RN221N), current output 2; observe terminal voltage

Terminal assignment 4-wire: 4-20 mA HART (10.4 to 48 V_{DC})

A0036516

8 Terminal assignment 4-wire: 4-20 mA HART (10.4 to 48 V_{DC})

- 1 Connection 4-20 mA HART (active): terminals 3 and 4
- 2 Connection supply voltage: terminals 1 and 2
- 3 Terminal for cable screen

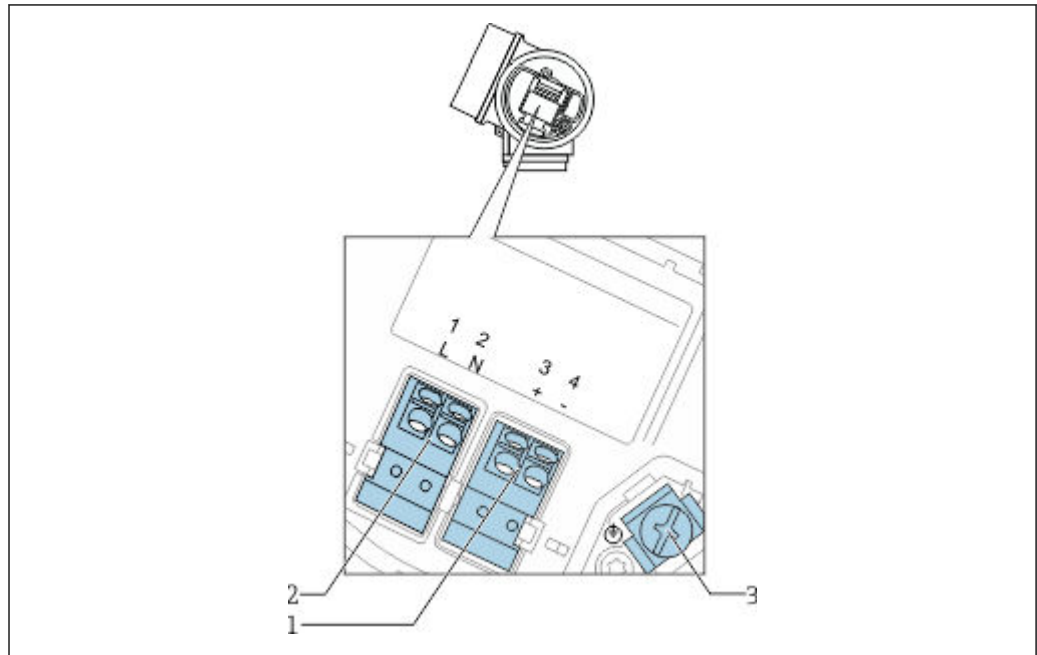
Block diagram 4-wire: 4-20 mA HART (10.4 to 48 V_{DC})

A0036526

9 Block diagram 4-wire: 4-20 mA HART (10.4 to 48 V_{DC})

- 1 Evaluation unit, e.g. PLC
- 2 HART communication resistor ($\geq 250 \Omega$); observe maximum load
- 3 Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)
- 4 Analog display device; observe maximum load
- 5 Cable screen; observe cable specification
- 6 Measuring device
- 7 Supply voltage; observe terminal voltage, observe cable specification

Terminal assignment 4-wire: 4-20 mA HART (90 to 253 V_{AC})



A0036519

10 Terminal assignment 4-wire: 4-20 mA HART (90 to 253 V_{AC})

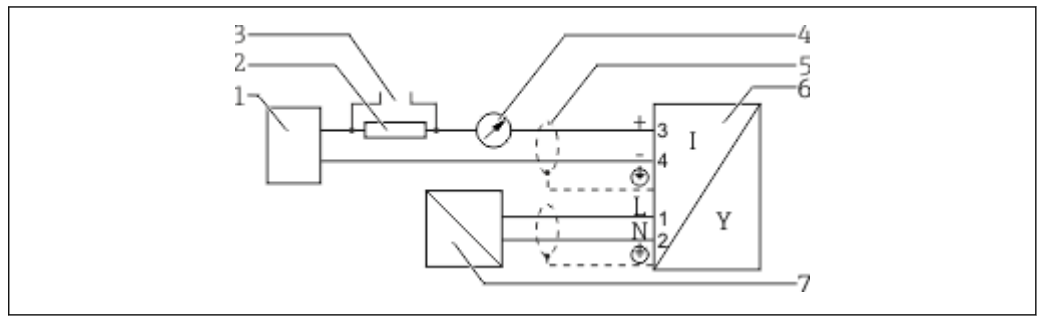
- 1 Connection 4-20 mA HART (active): terminals 3 and 4
- 2 Connection supply voltage: terminals 1 and 2
- 3 Terminal for cable screen

⚠ CAUTION

To ensure electrical safety:

- ▶ Do not disconnect the protective connection.
- ▶ Disconnect the supply voltage before disconnecting the protective earth.

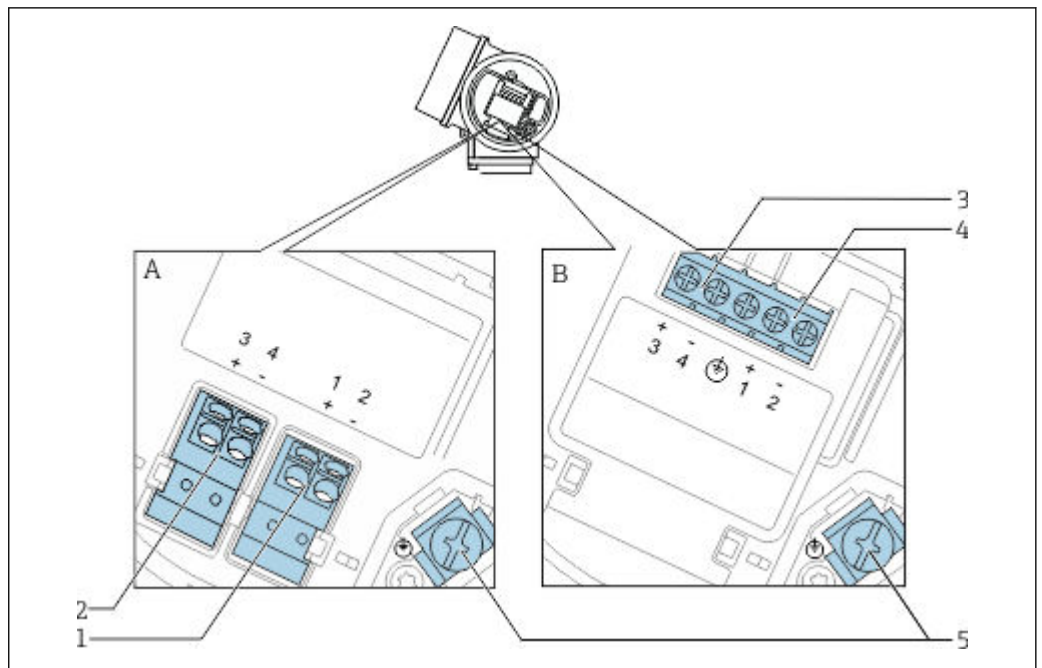
- i** Connect protective earth to the internal ground terminal (3) before connecting the supply voltage. If necessary, connect the potential matching line to the external ground terminal.
- i** In order to ensure electromagnetic compatibility (EMC): Do **not** only ground the device via the protective 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 disconnect for the device (IEC/EN61010).

Block diagram 4-wire: 4-20 mA HART (90 to 253 V_{AC})

A0036527

11 Block diagram 4-wire: 4-20 mA HART (90 to 253 V_{AC})

- 1 Evaluation unit, e.g. PLC
- 2 HART communication resistor ($\geq 250 \Omega$); observe maximum load
- 3 Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)
- 4 Analog display device; observe maximum load
- 5 Cable scree; observe cable specification
- 6 Measuring device
- 7 Supply voltage; observe terminal voltage, observe cable specification

Terminal assignment PROFIBUS PA / FOUNDATION Fieldbus

A0036500

12 Terminal assignment PROFIBUS PA / FOUNDATION Fieldbus

- A Without integrated overvoltage protection
- B With integrated overvoltage protection
- 1 Connection PROFIBUS PA / FOUNDATION Fieldbus: terminals 1 and 2, without integrated overvoltage protection
- 2 Connection switch output (Open Collector): terminals 3 and 4, without integrated overvoltage protection
- 3 Connection switch output (Open Collector): terminals 3 and 4, with integrated overvoltage protection
- 4 Connection PROFIBUS PA / FOUNDATION Fieldbus: terminals 1 and 2, with integrated overvoltage protection
- 5 Terminal for cable screen

The diagram shows a vacuum tube rectifier circuit. A vacuum tube is depicted with a cathode (1) and anode (2). The cathode is connected to the center tap (4) of a transformer (3). The anode is connected to one of the secondary terminals (1 or 2). The transformer has a primary winding connected to an AC source. The circuit is labeled I and Y.

A0036530

- 1 Cable screen; observe cable specifications
- 2 Connection PROFIBUS PA / FOUNDATION Fieldbus
- 3 Measuring device
- 4 Switch output (open collector)

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



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

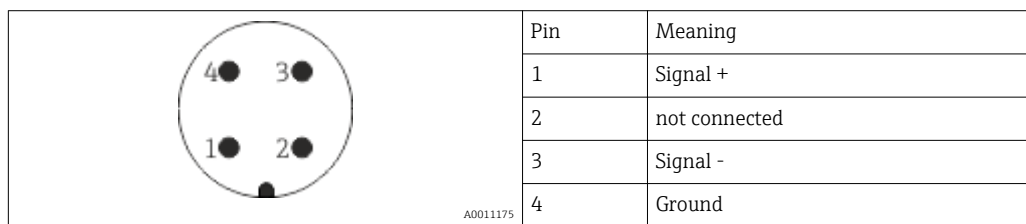


1	Pull-up resistor
2	Digital input



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Pin assignment of the M12 plug connector



5

Pin	Meaning
1	Signal -
2	Signal +
3	Not connected
4	Screen

"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	13 to 28 V ³⁾ ⁴⁾	A line graph with the y-axis labeled 'R [Ω]' and the x-axis labeled 'U₀ [V]'. The y-axis has a tick mark at 500. The x-axis has tick marks at 10, 13, 20, 24, and 28. A solid line starts at (13, 0) and rises linearly to (24, 500). From (24, 500) to (28, 500), the line is horizontal. Dashed lines connect the points (13, 0), (24, 500), and (28, 500) to their respective values on the axes. A0034841

- 1) Feature 020 of the product structure
- 2) Feature 010 of the product structure
- 3) For ambient temperatures $T_a \leq -30\text{ }^{\circ}\text{C}$ (-22 °F) a minimum voltage of 16 V is required for the startup of the device at the minimum error current (3.6 mA).
- 4) If the Bluetooth modem is used, the minimum supply voltage increases by 3 V.

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

Device basic current	15 mA
Failure current FDE (Fault Disconnection Electronic)	0 mA

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

Terminals	■ Without integrated overvoltage protection Plug-in spring terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG) ■ With integrated overvoltage protection Screw terminals for wire cross-sections 0.2 to 2.5 mm² (24 to 14 AWG)
------------------	--

Connection of power supply and signal line

To be selected in feature 050 "Electrical connection"

- Gland M20; Material dependent on the approval:
 - For Non-Ex, ATEX, IECEx, NEPSI Ex ia/ic:
Plastics M20x1.5 for cable Ø5 to 10 mm (0.2 to 0.39 in)
 - For Dust-Ex, FM IS, CSA IS, CSA GP, Ex nA:
 - For Ex d:
No gland available
- Thread
 - ½" NPT
 - G ½"
 - M20 × 1.5
- Plug M12 / Plug 7/8"
Only available for Non-Ex, Ex ic, Ex ia

Connection of remote display FHX50

Feature 030 "Display, Operation"	Cable entry for FHX50 connection
L: "Prepared for display FHX50 + M12 connection"	M12 socket
M: "Prepared for display FHX50 + M16 gland, custom connection"	M12 cable gland
N: "Prepared for display FHX50 + NPT1/2 thread, custom connection"	NPT1/2 thread

- **Devices without integrated overvoltage protection**
Pluggable spring-force terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)
- **Devices with integrated overvoltage protection**
Screw terminals for wire cross-sections 0.2 to 2.5 mm² (24 to 14 AWG)
- For ambient temperature T_{II} ≥ 60 °C (140 °F): use cable for temperature T_{II} + 20 K.

- 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.
- For 4-wire devices: Standard device cable is sufficient for the power line.

PROFIBUS

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



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

FOUNDATION Fieldbus

Endress+Hauser recommends using twisted, shielded two-wire cables.



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), an overvoltage protection module has to be installed.

Integrated overvoltage protection module

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 module

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

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

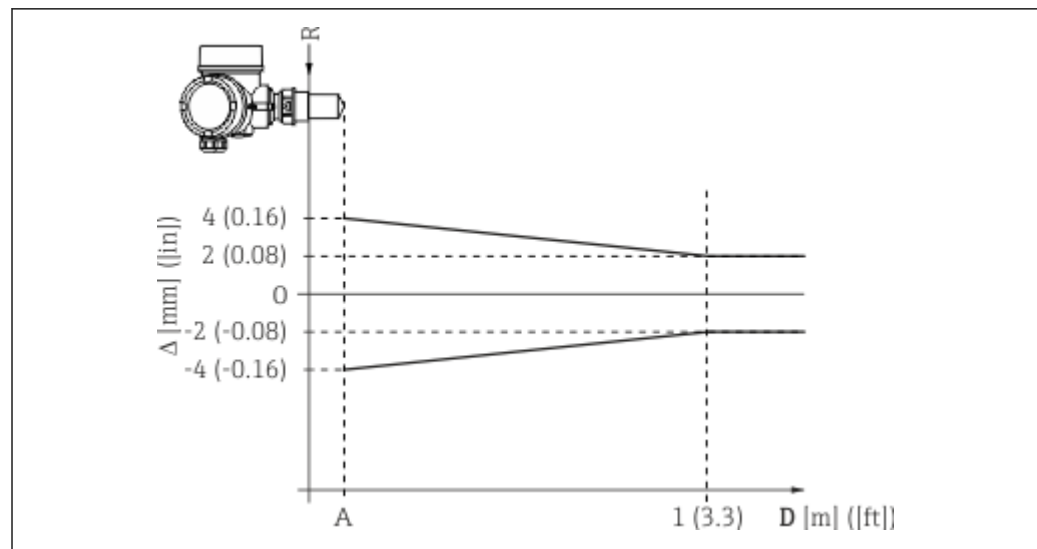
Maximum measured error

Typical data under reference operating conditions: DIN EN IEC 61298-2 / DIN EN IEC 60770-1; percentage values in relation to the span.

Device	Value	Output	
		digital	analog ¹⁾
FMR50 Standard version	Sum of non-linearity, nonrepeatability and hysteresis	± 2 mm (0.08 in)	± 0.02 %
	Offset/Zero	± 4 mm (0.2 in)	± 0.03 %
FMR50 Version with application package "Advanced dynamics" ²⁾	Sum of non-linearity, nonrepeatability and hysteresis	± 3 mm (0.12 in)	± 0.02 %
	Offset/Zero	± 4 mm (0.2 in)	± 0.03 %

- 1) Only relevant for 4-20mA current output; add error of the analog value to the digital value.
- 2) Product structure: Feature 540 "Application Package", Option EM "Advanced dynamics"

Differing values in near-range applications



16 Maximum measured error in near-range applications; values for standard version

- Δ Maximum measured error
A Lower edge of the antenna
D Distance from the lower edge A of the antenna
R Reference point of the distance measurement



Δ	Maximum measured error
A	Lower edge of the antenna
D	Distance from the lower edge A of the antenna
R	Reference point of the distance measurement

- 1) According to DIN EN IEC 61298-2 / DIN EN IEC 60770-1 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.
- 2) Feature 540 "Application Package", option EM

Installation conditions

Diagram illustrating the correct and incorrect placement of level sensors in a tank. The tank contains a liquid (blue) and a foam layer (grey). Three sensors are shown:

- Sensor 1: Correct placement (indicated by a green checkmark) at the top of the tank, measuring the total height of the liquid and foam.
- Sensor 2: Incorrect placement (indicated by a red X) in the middle of the tank, measuring only the liquid level.
- Sensor 3: Incorrect placement (indicated by a red X) at the bottom of the tank, measuring only the liquid level.

The dimension line 'A' indicates the height of the liquid level.

- Recommended distance **A** from wall to outer edge of nozzle: $\sim 1/6$ of tank diameter. Nevertheless the device should not be installed closer than 15 cm (5.91 in) to the tank wall.
- Not in the center (2), as interference can cause signal loss.
- Not above the fill stream (3).
- It is recommended to use a weather protection cover (1) in order to protect the device from direct sun or rain.

Avoid any installations (point level switches, temperature sensors, braces, vacuum rings, heating coils, baffles etc.) inside the signal beam.
→  38.

A diagram of a vertical cylindrical tank. At the top center, there is a sensor or camera unit. A cone representing its field of view extends downwards from the sensor, with the angle between the central axis and the side edge labeled as α . On the left side of the tank, there is a probe or sensor arm extending horizontally into the tank. A smaller cone representing its field of view is shown originating from the probe tip. The tank is partially filled with a liquid, indicated by a shaded area at the top.

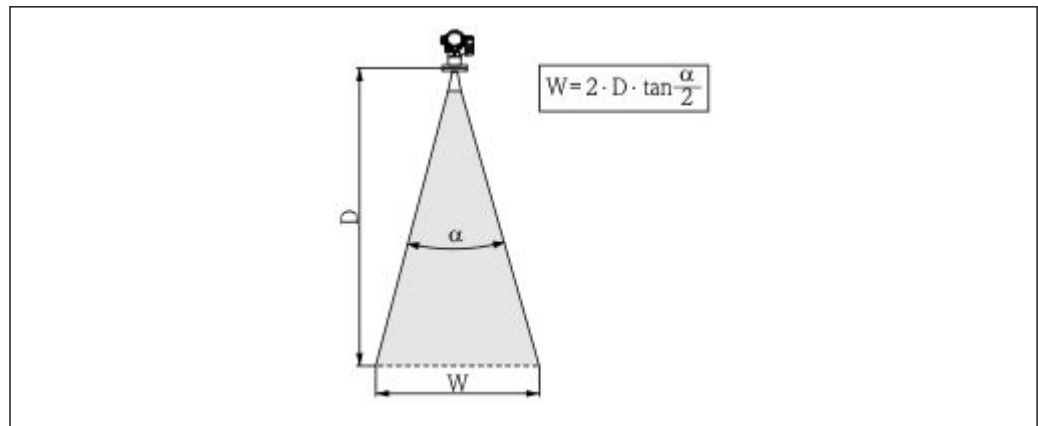
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Optimization options

- **Antenna size**
The bigger the antenna, the smaller the beam angle α and the fewer interference echoes
→ 38.
- **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 → 40 → 41.
- **Stilling well**
A stilling well can be applied to avoid interferences → 44.
- **Metallic screens mounted at a slope**
They spread the radar signals and can, therefore, reduce interference echoes.

Beam angle



A0016891

18 Relationship between beam angle α , distance D and beamwidth diameter W

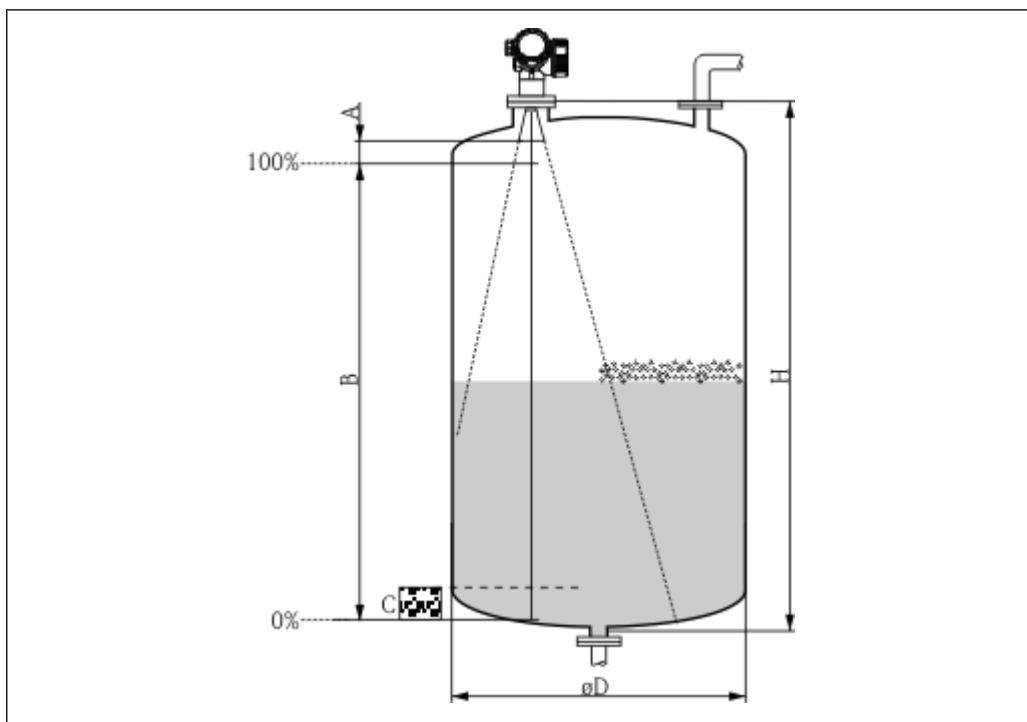
The beam angle is defined as the angle α where the energy density of the radar waves reaches half the value of the maximum energy density (3-dB-width). Microwaves are also emitted outside the signal beam and can be reflected off interfering installations.

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

FMR50			
Antenna size	40 mm (1½ in)	80 mm (3 in)	100 mm (4 in)
Beam angle α	23°	10°	8°
Measuring distance (D)	Beamwidth diameter W		
3 m (9.8 ft)	1.22 m (4 ft)	0.53 m (1.7 ft)	0.42 m (1.4 ft)
6 m (20 ft)	2.44 m (8 ft)	1.05 m (3.4 ft)	0.84 m (2.8 ft)
9 m (30 ft)	3.66 m (12 ft)	1.58 m (5.2 ft)	1.26 m (4.1 ft)
12 m (39 ft)	4.88 m (16 ft)	2.1 m (6.9 ft)	1.68 m (5.5 ft)
15 m (49 ft)	6.1 m (20 ft)	2.63 m (8.6 ft)	2.10 m (6.9 ft)
20 m (66 ft)	8.14 m (27 ft)	3.50 m (11 ft)	2.80 m (9.2 ft)
25 m (82 ft)	10.17 m (33 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)
35 m (115 ft)	-	6.12 m (20 ft)	4.89 m (16 ft)
40 m (131 ft)	-	7.00 m (23 ft)	5.59 m (18 ft)

Measuring conditions

- In case of **boiling surfaces, bubbling** or tendency for **foaming** use FMR53 or FMR54. Depending on its consistence, foam can either absorb microwaves or reflect them off the foam surface. Measurement is possible under certain conditions. For FMR50, FMR51 and FMR52, the additional option "Advanced dynamics" is recommended in these cases (feature 540: "Application Package", option EM).
- In case of heavy **steam development** or **condensate**, the maximum measuring range of FMR50, FMR51 and FMR52 may decrease depending on density, temperature and composition of the steam → use FMR53 or FMR54.
- For the measurement of absorbing gases such as **ammonia NH₃** or some **fluorocarbons**³⁾, please use Levelflex or Micropilot FMR54 in a stilling well.
- The measuring range begins, where the beam hits the tank bottom. Particularly with dish bottoms or conical outlets the level cannot be detected below this point.
- In stilling well applications, the electromagnetic waves do not propagate completely outside the tube. It must be taken into account that the accuracy may be reduced in the area **C**. In order to guarantee the required accuracy in these cases, it is recommended to position the zero-point at a distance **C** above the end of the tube (see figure).
- In case of media with a low dielectric constant ($\epsilon_r = 1.5$ to 4)⁴⁾ the tank bottom can be visible through the medium at low levels (low height **C**). Reduced accuracy has to be expected in this range. If this is not acceptable, we recommend positioning the zero point at a distance **C** (see figure) above the tank bottom in these applications.
- In principle it is possible to measure up to the tip of the antenna with FMR51, FMR53 and FMR54. However, due to considerations regarding corrosion and build-up, the end of the measuring range should not be chosen any closer than **A** (see figure) to the tip of the antenna.
- When using FMR54 with planar antenna, especially for media with low dielectric constants, the end of the measuring range should not be closer than **A: 1 m (3.28 ft)** to the flange.
- The smallest possible measuring range **B** depends on the antenna version (see figure).
- The tank height should be at least **H** (see table).



Device	A [mm (in)]	B [m (ft)]	C [mm (in)]	H [m (ft)]
FMR50	150 (5.91)	> 0.2 (0.7)	50 to 250 (1.97 to 9.84)	> 0.3 (1.0)

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

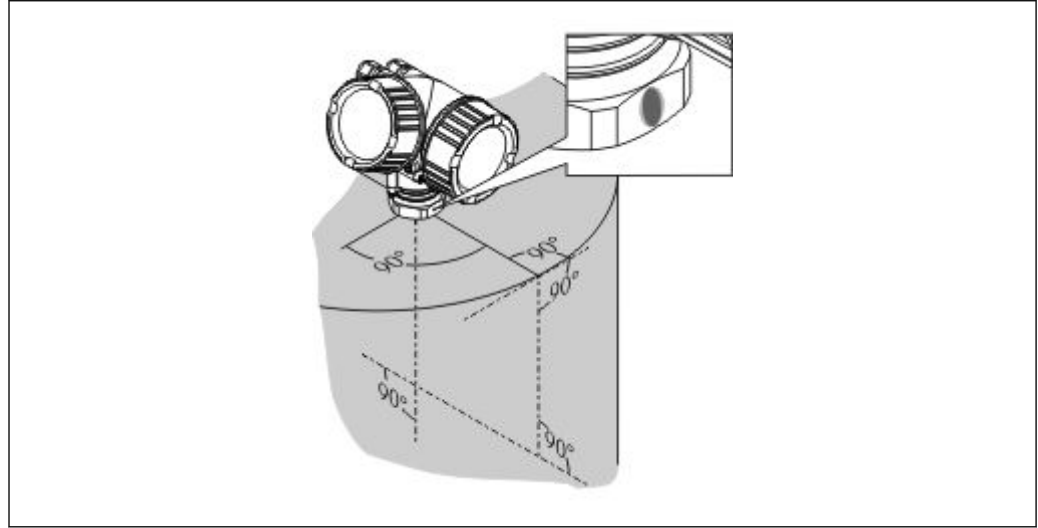
4) Dielectric constants of important media commonly used in various industries are summarized in the DC manual (CP01076F) and in the Endress +Hauser "DC Values App" (available for Android and iOS).

Installation in vessel (free space)

Horn antenna encapsulated (FMR50)

Alignment

- Align the antenna vertically to the product surface.
- A marking at the threaded connection enables alignment of the antenna. This marking must be aligned towards the tank wall as well as possible.



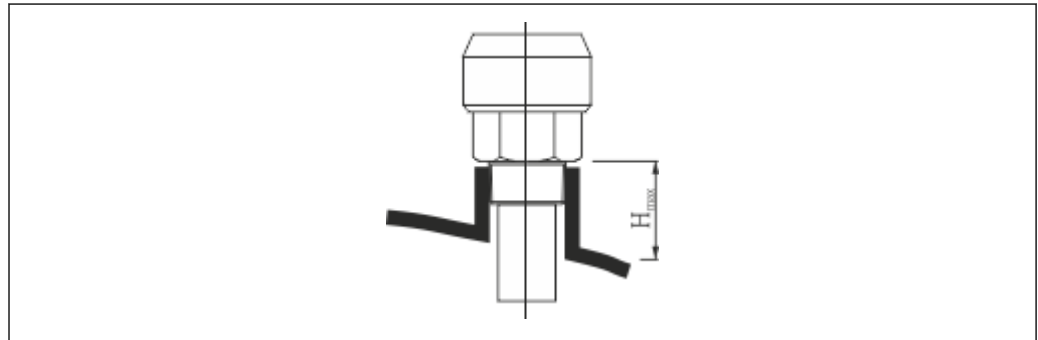
A0019434



Depending on the device version the marking may be a circle or two short parallel lines.

Nozzle mounting

For optimum measurement, the tip of the antenna should extend below the nozzle. This is achieved by a nozzle height up to $H_{max} = 60 \text{ mm}$ (2.36 in).



A0016806

19 Nozzle height for horn antenna, encapsulated (FMR50); $H_{max} = 60 \text{ mm}$ (2.36 in)

Conditions for longer nozzles

If the medium has good reflective properties, higher nozzles can be accepted. In this case the maximum nozzle height, H_{max} , is dependent on the nozzle diameter, D :



 If the antenna doesn't extend below the nozzle, observe the following:

- The nozzle end must be smooth and free of burrs. If possible its edge should be rounded.
- An interference echo suppression must be performed.
- Please contact Endress+Hauser for applications with higher nozzles than those indicated in the table.

- Tighten with the hexagonal nut only.
- Tool : 50 mm hexagonal wrench
- Maximum permissible torque: 35 Nm (26 lbf ft)

Alignment

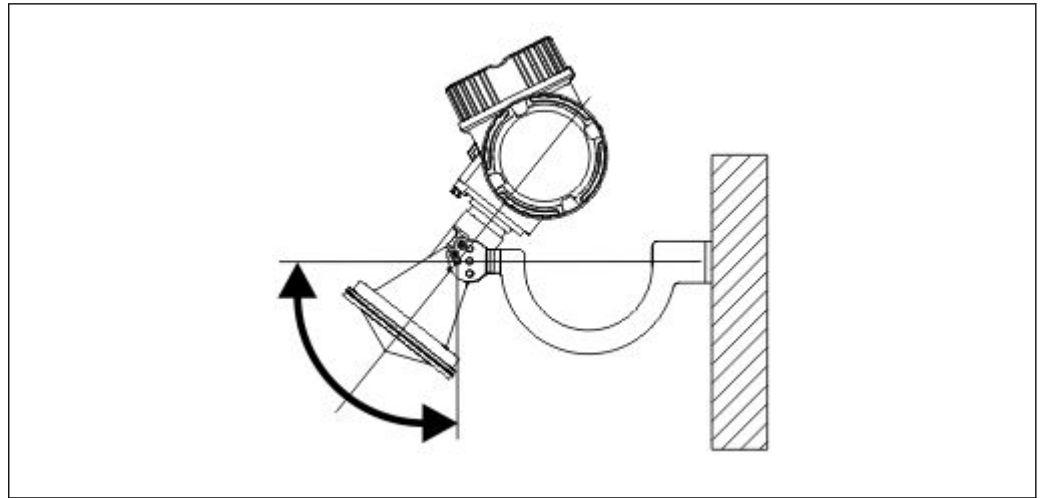


Nozzle mounting



Nozzle diameter D	Maximum nozzle height H_{max}
80 mm (3 in)	300 mm (11.8 in)
100 mm (4 in)	400 mm (15.8 in)
150 mm (6 in)	500 mm (19.7 in)

Horn antenna with mounting bracket (FMR50)



A0016865

21 Installation of the horn antenna with mounting bracket

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.

Measurement from the outside through plastic walls (FMR50/FMR51)

- Dielectric constant of the medium: $\epsilon_r > 10$
- If possible, use an antenna 100 mm (4 in).
- The distance from the lower edge of the antenna to the tank ceiling should be about 100 mm (4 in).
- If possible, avoid mounting locations where condensation or build-up might occur.
- In case of outdoor mounting, the space between antenna and vessel has to be protected from the elements.
- Do not mount any potential reflectors (e.g. pipes) outside the tank in the signal beam.

Suitable thickness of the tank ceiling:

Penetrated material	PE	PTFE	PP	Perspex
DK / ϵ_r	2.3	2.1	2.3	3.1
Optimum thickness ¹⁾	3.8 mm (0.15 in)	4.0 mm (0.16 in)	3.8 mm (0.15 in)	3.3 mm (0.13 in)

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

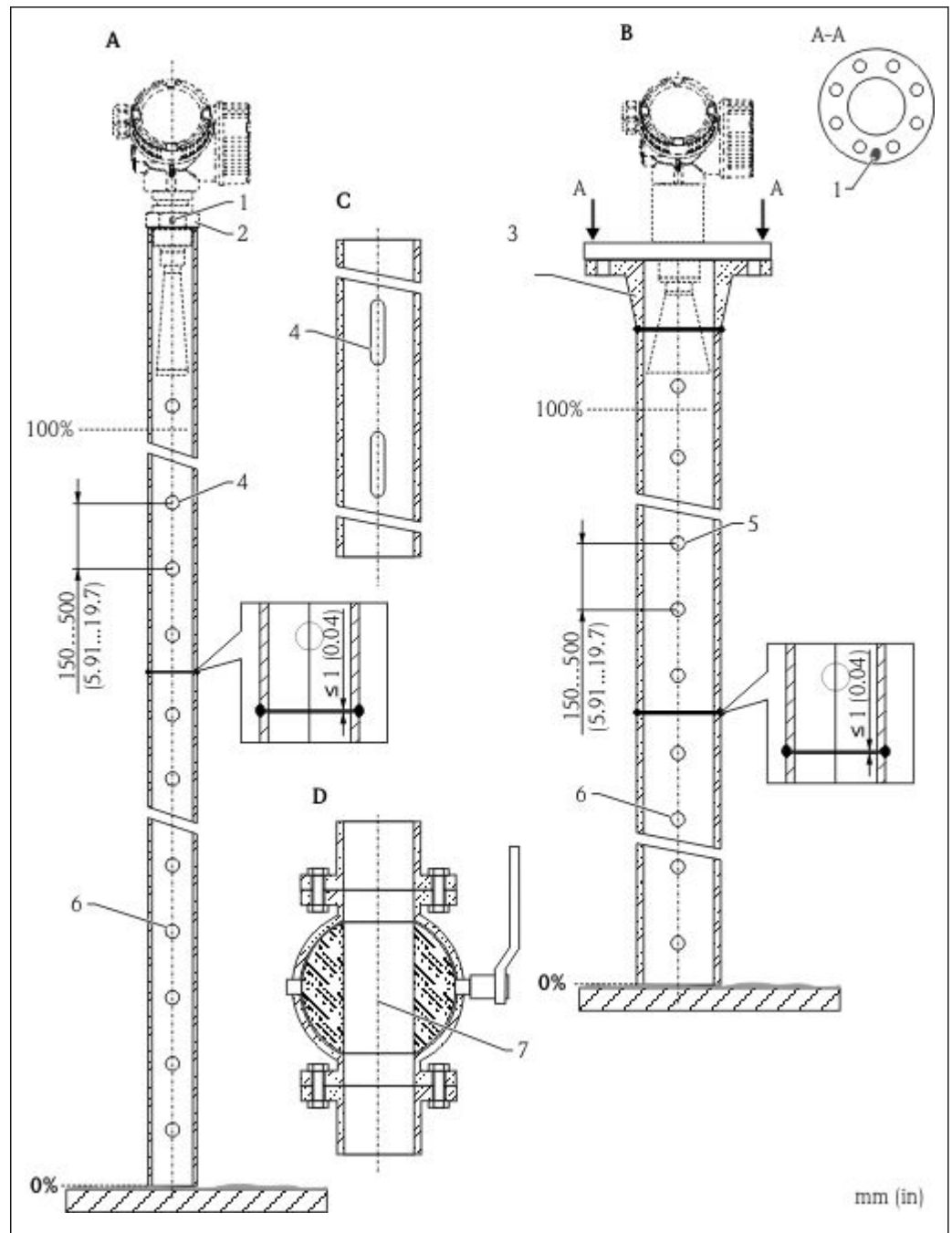
A001684

1 Marking for antenna alignment

- For horn antenna: Align the marking towards the slots of the stilling well.
- Measurements can be performed through an open full bore ball valve without any problems.
- After mounting, the housing can be turned 350° in order to facilitate access to the display and the terminal compartment.

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

Examples for the construction of stilling wells



A0019009

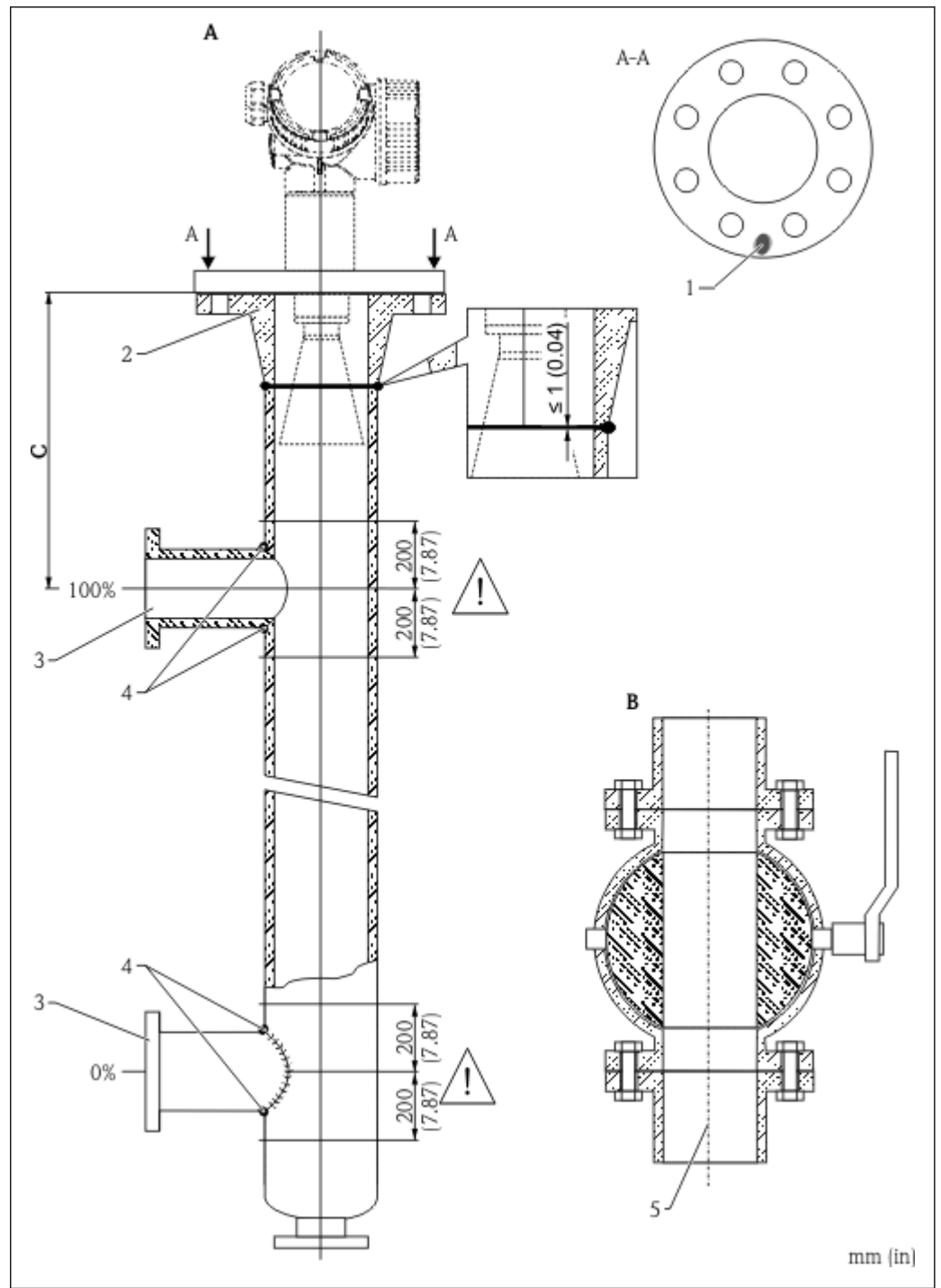
- A Micropilot FMR50/FMR51: Horn 40mm(1½")
- B Micropilot FMR50/FMR51/FMR52/FMR54: Horn 80mm(3")
- C Stilling well with slots
- D Full bore ball valve
- 1 Marking for axial alignment
- 2 Threaded connection
- 3 e.g. welding neck flange DIN2633
- 4 ϕ hole max. 1/10 ϕ stilling well
- 5 ϕ hole max. 1/10 ϕ stilling well; single sided or drilled through
- 6 Inside of holes deburred
- 7 Diameter of opening of ball valve must always be equivalent to pipe diameter; avoid edges and constrictions.

23 Installation in bypass

- Align the marker perpendicular (90°) to the tank connectors.
- Measurements can be performed through an open full bore ball valve without any problems.
- After mounting, the housing can be turned 350° in order to simplify access to the display and the terminal compartment.

- Metal (no plastic or enamel coating).
- Constant diameter.
- Select horn antenna as big as possible. For intermediate sizes (e.g. 95 mm (3.5 in)) select next larger antenna and adapt it mechanically (for horn antennas).
- Diameter difference between horn antenna and inner diameter of the bypass as small as possible.
- At any transition (i.e. when using a ball valve or mending pipe segments), no gap may be created exceeding 1 mm (0.04 in).
- In the area of the tank connections ($\sim \pm 20$ cm (7.87 in)) a reduced accuracy of the measurement has to be expected.

Example for the construction of a bypass



- A Micropilot FMR50/FMR51/FMR52/FMR54: Horn 80mm(3")
- B Full bore ball valve
- C Minimum distance to upper connection pipe: 400 mm (15,7 in)
- 1 Marking for axial alignment
- 2 e.g. welding neck flange DIN2633
- 3 Diameter of the connection pipes as small as possible
- 4 Do not weld through the pipe wall; the inside of the bypass must remain smooth.
- 5 Diameter of opening of ball valve must always be equivalent to pipe diameter. Avoid edges and constrictions.

48



V. 10, Rev. 2, 1-10-2019

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.
Remote display FHX50	–40 to 80 °C (–40 to 176 °F)
Remote display FHX50 (option)	–50 to 80 °C (–58 to 176 °F) ¹⁾

- 1) This range is valid if option JN "Ambient temperature transmitter -50 °C (-58 °F)" has been selected in ordering feature 580 "Test, Certificate". If the temperature is permanently below -40 °C (-40 °F), increased failure rates have to be expected.

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 functional aspects. There may be further restrictions for certified device versions. Please refer to the separate Safety Instructions → 95.

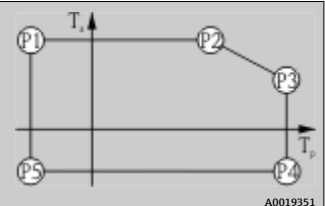
With a temperature (T_p) at the process connection the admissible ambient temperature (T_a) is reduced according to the following diagram (temperature derating):

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

FMR50

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



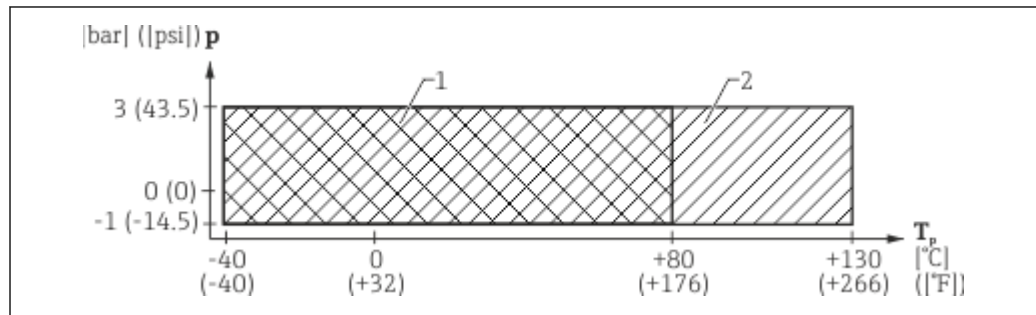
Power Supply; Output (Pos. 2 of the product structure)	P1		P2		P3		P4		P5		P6	
	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a	T _p	T _a
A	-40 (-40)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	-	-
B Switch output not used	-40 (-40)	76 (169)	76 (169)	76 (169)	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)	-	-

- 5) 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").
- 6) Can be downloaded from www.endress.com.

Process

Process temperature, Process pressure

FMR50



A0032615

24 FMR50: Admissible range of process temperature and process pressure

- 1 Process connection: Flange
2 Process connection: Thread

Feature 100 "Process Connection"	Admissible process temperature	Admissible process pressure
- GGF: Thread ISO228 G1-1/2 - RGF: Thread ANSI MNPT1-1/2	-40 to +130 °C (-40 to +266 °F)	$p_{rel} = -1 \text{ to } 3 \text{ bar } (-14.5 \text{ to } 43.5 \text{ psi})$ $p_{abs} < 4 \text{ bar } (58 \text{ psi})$ ¹⁾
- XWG: UNI slip-on flange 3"/DN80/80 - XZG: UNI slip-on flange 4"/DN100/100 - XOG: UNI slip-on flange 6"/DN150/150	-40 to +80 °C (-40 to +176 °F)	

1) For devices with CRN approval the pressure range may be reduced → 75

Dielectric constant

- For liquids
 - $\epsilon_r \geq 1.9$ in free-field applications
 - $\epsilon_r \geq 1.4$ in stilling well
- For bulk solids
 - $\epsilon_r \geq 1.6$

i For dielectric constants (DC values) of many media commonly used in various industries refer to:

- the Endress+Hauser DC manual (CP01076F)
- the Endress+Hauser "DC Values App" (available for Android and iOS)

Dimensions



**for devices with integrated overvoltage protection.*



**for devices with integrated overvoltage protection.*

[illegible]

A0023372

R Reference point of the measurement

- Feature 100 "Process connection"

- GGF: Thread ISO228 G1-1/2, PVDF
- GGF: Thread ANSI MNPT1-1/2, PVDF
- **Feature 070 "Antenna"**
BM: Horn 40mm/1-1/2", PVDF encapsulated

Technical drawing of a mechanical part, likely a valve or actuator, showing dimensions a , b , $\varnothing c$, and $\varnothing d$. A force R is indicated acting on the side.

A001774

R Reference point of the measurement

	Feature 100 "Process connection" ▪ UAE Mounting bracket ▪ XRO: Customer side connection	
	Feature 070 "Antenna" BN: Horn 80mm/3"	Feature 070 "Antenna" BR: Horn 100mm/4"
a	138 mm (5.43 in)	151 mm (5.94 in)
b	15 mm (0.59 in)	20 mm (0.79 in)
ϕc	107 mm (4.21 in)	127 mm (5 in)
ϕd	115 mm (4.53 in)	135 mm (5.31 in)



 29 Mounting bracket for FMR50/FMR56; dimensions: mm (in)

A Mounting bracket aligned for roof mounting
B Mounting bracket aligned for wall mounting

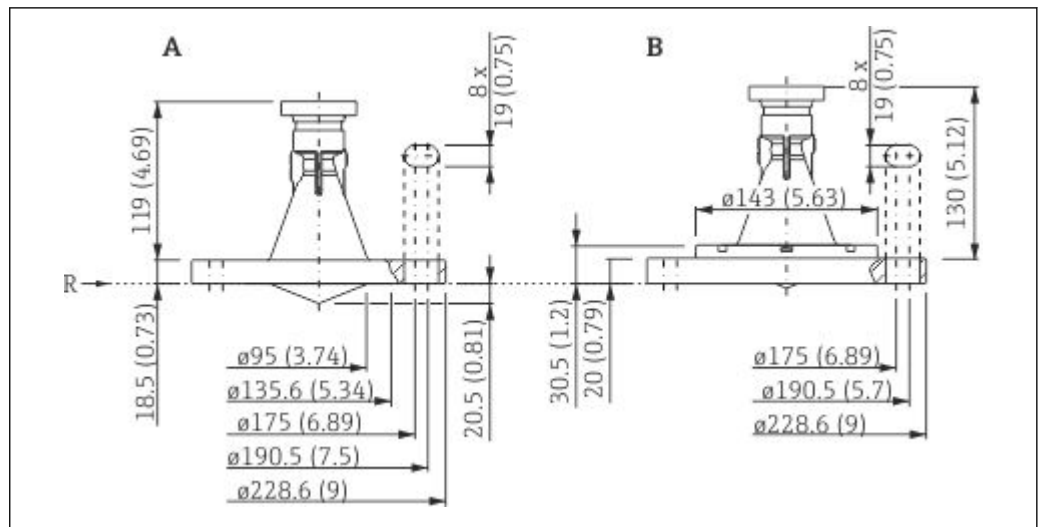
A0023377

R Reference point of the measurement

- **Feature 100 "Process connection"**
XWG: UNI slip-on flange 3"/DN80, PP
- **Feature 070 "Antenna"**
BN: Horn 80mm/3", PP clad



FMR50 with slip-on flange 4"/DN100



A0023379

31 FMR50 with slip-on flange 4"/DN100; dimensions: mm (in)

- A Horn antenna 100mm/4" (without adapter ring)
 B Horn antenna 80mm/3" (with adapter ring)
 R Reference point of the measurement

Valid for the following device versions

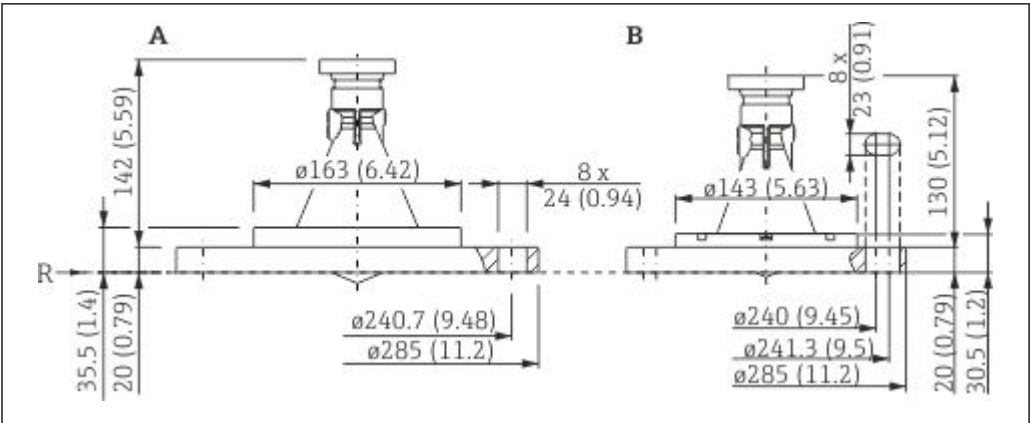
- **Feature 100 "Process connection":**
 XZG: UNI slip-on flange 4"/DN100
- **Feature 070 "Antenna":**
 - BR: Horn 100mm/4", PP clad (diagram A)
 - BN: Horn 80mm/3", PP clad (diagram B)



The UNI slip-on flange is suitable for:

- ASME: NPS 4" Cl.150
- EN: DN100 PN16
- JIS: 10K 100

FMR50 with slip-on flange 6"/DN150



32 FMR50 with slip-on flange 6"/DN150; dimensions: mm (in)

- A Horn antenna 100mm/4"
B Horn antenna 80mm/3"
R Reference point of the measurement

Valid for the following device versions

- **Feature 100 "Process connection":**
XOG: UNI slip-on flange 6"/DN150, PP
- **Feature 070 "Antenna":**
 - BR: Horn 100mm/4", PP cladded (Diagramm A)
 - BN: Horn 80mm/3", PP cladded (Diagramm B)

- i** The UNI slip-on flange is suitable for:
- ASME: NPS 6" Cl.150
 - EN: DN150 PN16
 - JIS: 10K 150

Weight

Housing

Part	Weight
Housing GT19 - plastic	approx. 1.2 kg (2.7 lb)
Housing GT20 - aluminium	approx. 1.9 kg (4.2 lb)

Antenna and process connection

Device	Weight of antenna and process connection
FMR50	max. 1.5 kg (3.3 lb) + weight of flange ¹⁾

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

Materials: GT19 housing (plastic)



- 1) For the version with M12 plug the sealing material is Viton.
- 2) For the version with 7/8" plug, the sealing material is NBR.

Materials: GT20 housing
(die-cast aluminum, powder-coated)



Nr.	Part	Material
1	Housing, RAL 5012 (blue)	■ Housing: AlSi10Mg(<0,1% Cu) ■ Coating: Polyester
2.1	Cover of the electronics compartment; RAL 7035 (gray)	■ Cover: AlSi10Mg(<0,1% Cu) ■ Window: Glass ■ Cover seal: NBR ■ Seal of the window: NBR ■ Thread-coating: Graphite-based lubricant varnish
2.2	Cover of the terminal compartment; RAL 7035 (gray)	■ Cover: AlSi10Mg(<0,1% Cu) ■ Cover seal: NBR ■ Thread-coating: Graphite-based lubricant varnish
3	Cover lock	■ Screw: A4 ■ Clamp: 316L (1.4404)
4	Lock at the housing neck	■ Screw: A4-70 ■ Clamp: 316L (1.4404)
5.1	Dummy plug, cable gland, adapter or plug (depending on the device version)	■ Dummy plug, depending on the device version: ■ PE ■ PBT-GF ■ Cable gland, depending on the device version: ■ Nickel-plated brass (CuZn) ■ PA ■ Adapter: 316L (1.4404/1.4435) ■ Seal: EPDM ■ M12 plug: Nickel-plated brass ¹⁾ ■ 7/8" plug: 316 (1.4401) ²⁾
5.2	Dummy plug, cable gland or adapter (depending on the device version)	■ Dummy plug, depending on the device version: ■ PE ■ PBT-GF ■ Nickel-plated steel ■ Cable gland, depending on the device version: ■ Nickel-plated brass (CuZn) ■ PA ■ Adapter: 316L (1.4404/1.4435) ■ Seal: EPDM
6	Dummy plug or M12 socket (depending on the device version)	■ Dummy plug : Nickel-plated brass (CuZn) ■ M12 socket: Nickel-plated GD-Zn
7	Pressure relief stopper	Nickel-plated brass (CuZn)

- 1) For the version with M12 plug the sealing material is Viton.
- 2) For the version with 7/8" plug, the sealing material is NBR.

FMR50



- | Pos. | Part | Material |
|------|-----------------------|--------------|
| 1 | Focusing lense | PP |
| | Seal | VMQ |
| 2 | Horn | PBT |
| 3 | Housing adapter | 304 (1.4301) |
| 4 | Mounting bracket | 304 (1.4301) |
| | Screw | A2 |
| | Nordlock washer | A4 |
| 5 | Slip-on flange | PP |
| 6 | Flange + adapter ring | PP |
| | Screw | A2 |
| | Seal | FKM |
| 7 | Housing adapter | PBT |
| 8 | Schrew-in adapter | PVDF |

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V. 10, Rev. 2, 1-10-2019

Operability

Operating concept

Operator-oriented menu structure for user-specific tasks

- Commissioning
- Operation
- Diagnostics
- Expert level

Operating languages

- English
- Deutsch
- Français
- Español
- Italiano
- Nederlands
- Portuguesa
- Polski
- русский язык (Russian)
- Svenska
- Türkçe
- 中文 (Chinese)
- 日本語 (Japanese)
- 한국어 (Korean)
- Bahasa Indonesia
- tiếng Việt (Vietnamese)
- čeština (Czech)

 Feature 500 of the product structure determines which of these languages is preset on delivery.

Quick and save commissioning

- Interactive wizard with graphical interface for easy commissioning via FieldCare/DeviceCare
- Menu guidance with brief explanations of the individual parameter functions
- Standardized operation at the device and in the operating tools

Integrated data storage device (HistoROM)

- Enables transfer of configuration when changing electronic modules
- Records up to 100 event messages in the device
- Records up to 1000 measured values in the device
- Saves the signal curve on commissioning which can later be used as a reference.

Efficient diagnostics increase measurement reliability

- Remedy information is integrated in plain text
- Diverse simulation options and line recorder functions

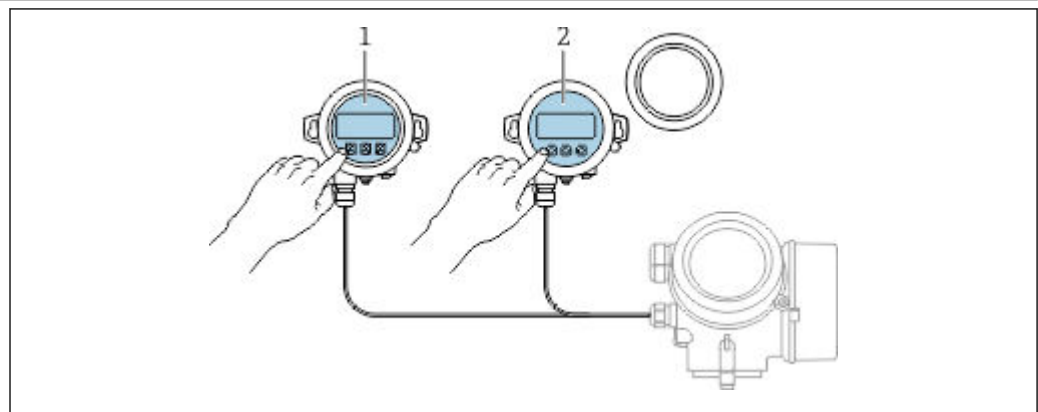
Integrated Bluetooth module (option for HART devices)

- Easy and fast setup via SmartBlue (app)
- No additional tools or adapters required
- Signal curve via SmartBlue (app)
- Encrypted single point-to-point data transmission (Fraunhofer-Institut, third party, tested) and password-protected communication via Bluetooth® wireless technology

Local operation

Operation with	Pushbuttons	Touch Control
Order code for "Display; Operation"	Option C "SD02"	Option E "SD03"
	 A0036312	 A0036313
Display elements	4-line display	4-line display white background lighting; switches to red in event of device error
	Format for displaying measured variables and status variables can be individually configured	
	Permitted ambient temperature for the display: -20 to +70 °C (-4 to +158 °F) The readability of the display may be impaired at temperatures outside the temperature range.	
Operating elements	local operation with 3 push buttons (⏏, □, ⏏)	external operation via touch control; 3 optical keys: ⏏, □, ⏏
	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



A0036314

33 FHX50 operating options

- 1 Display and operating module SD03, optical keys; can be operated through the glass of the cover
- 2 Display and operating module SD02, push buttons; cover must be removed

Requirements



1 Electronics housing of the device
2 Bluetooth module

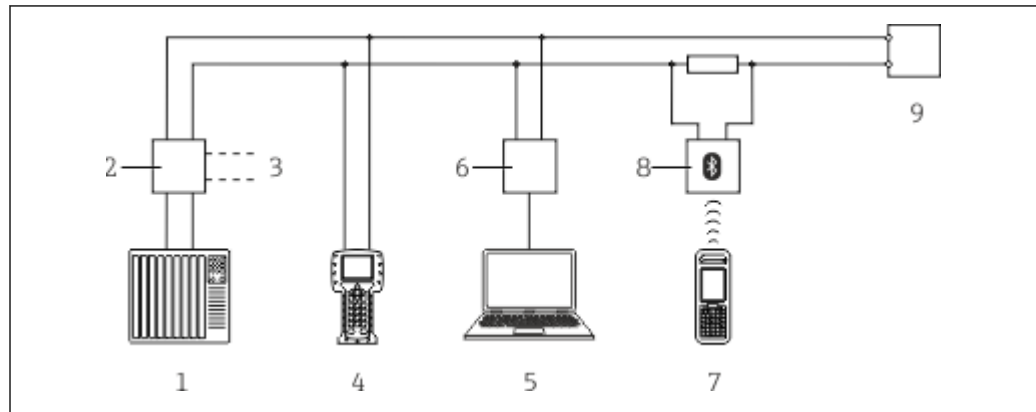
- The device has been ordered with a Bluetooth module:
Feature 610 "Accessory Mounted", option NF "Bluetooth"
- The Bluetooth module has been ordered as an accessory (ordering number: 71377355) and has been mounted. See Special Documentation SD02252F.

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- 1 Transmitter power supply unit
- 2 Smartphone / tablet with SmartBlue (app)
- 3 Transmitter with Bluetooth module

Remote operation

Via HART protocol

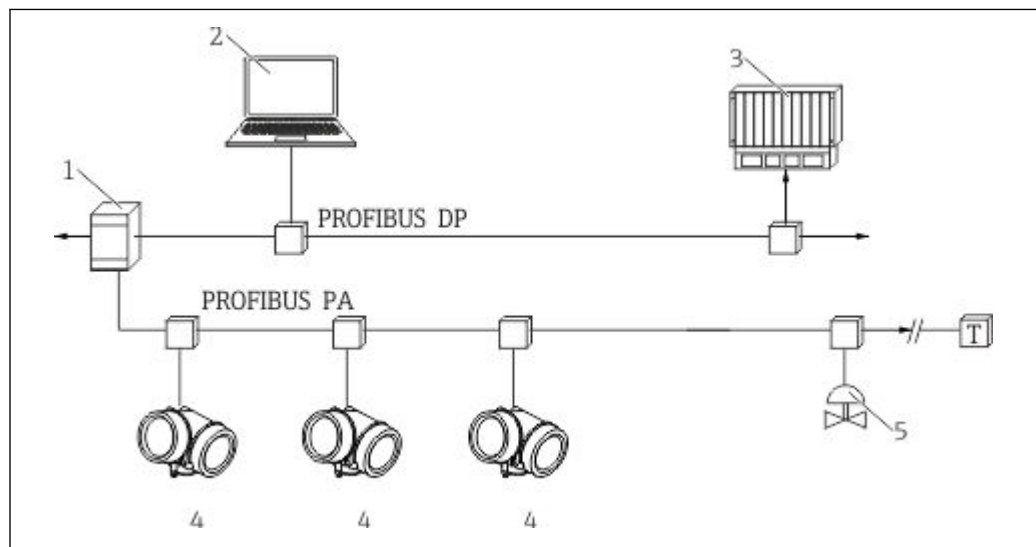


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36 Options for remote operation via HART protocol

- 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 475
- 5 Computer with operating tool (e.g. DeviceCare/FieldCare, AMS Device Manager, SIMATIC PDM)
- 6 Commubox FXA191 (RS232) or FXA195 (USB)
- 7 Field Xpert SFX350/SFX370
- 8 VIATOR Bluetooth modem with connecting cable
- 9 Transmitter

Via PROFIBUS PA protocol



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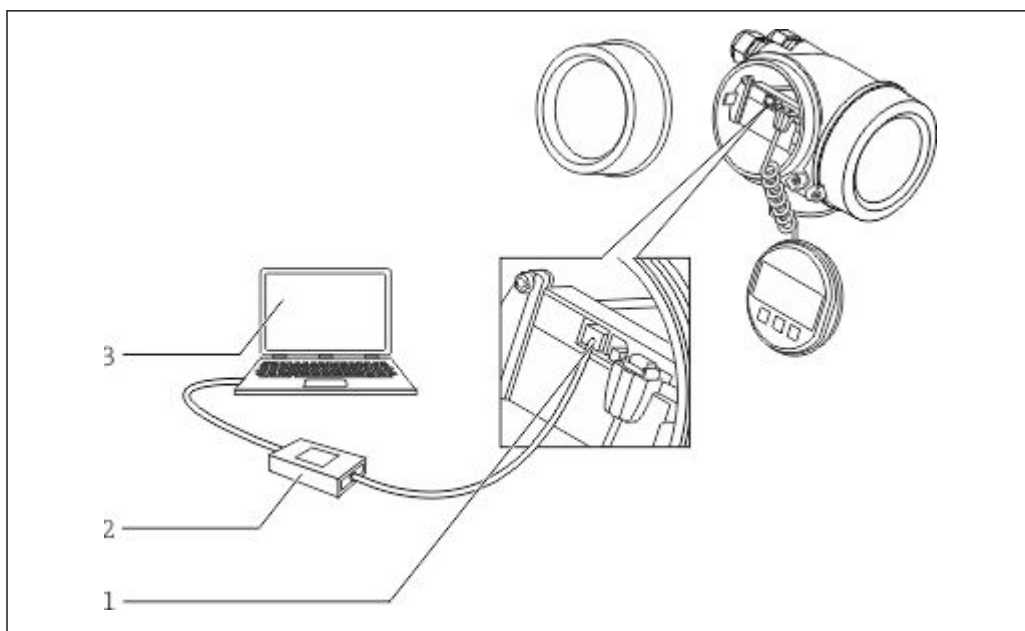
37 Options for remote operation via PROFIBUS PA protocol

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

A001718E

- | | |
|--------|-----------------------------|
| IN | Industrial network |
| FF-HSE | High Speed Ethernet |
| FF-H1 | FOUNDATION Fieldbus-H1 |
| LD | Linking Device FF-HSE/FF-H1 |
| PS | Bus Power Supply |
| SB | Safety Barrier |
| BT | Bus Terminator |

DeviceCare/FieldCare via service interface (CDI)



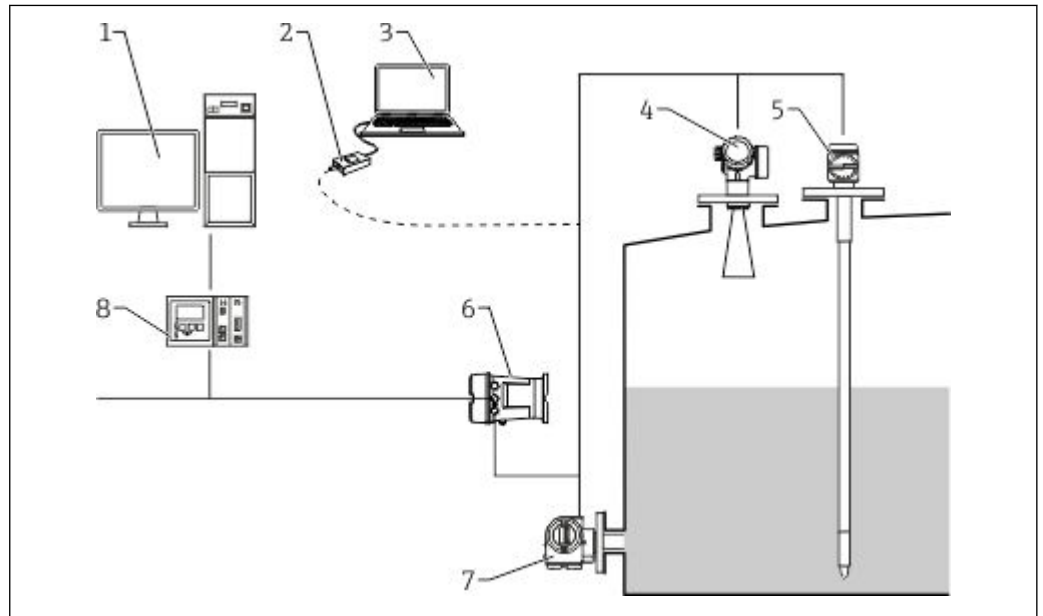
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39 DeviceCare/FieldCare via service interface (CDI)

- 1 Service interface (CDI) of the instrument (= Endress+Hauser Common Data Interface)
- 2 Commubox FXA291
- 3 Computer with DeviceCare/FieldCare operating tool

Integration in tank gauging system

The Endress+Hauser Tank Side Monitor NRF81 provides integrated communications for sites with multiple tanks, each with one or more sensors on the tank, such as radar, spot or average temperature, capacitive probe for water detection and/or pressure sensors. Multiple protocols out of the Tank Side Monitor guarantee connectivity to nearly any of the existing industry standard tank gauging protocols. Optional connectivity of analog 4...20 mA sensors, digital I/O and analog output simplify full tank sensor integration. Use of the proven concept of the intrinsically safe HART bus for all on-tank sensors yields extremely low wiring costs, while at the same time providing maximum safety, reliability and data availability.



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40 The complete measuring system consists of:

- 1 Tankvision workstation
- 2 Commubox FXA195 (USB) - optional
- 3 Computer with operating tool (ControlCare) - optional
- 4 Level measuring device
- 5 Temperature measuring device
- 6 Tank Side Monitor NRF81
- 7 Pressure measuring device
- 8 Tankvision Tank Scanner NXA820

SupplyCare inventory management software

SupplyCare is a web-based operating program for coordinating the flow of material and information along the supply chain. SupplyCare provides a comprehensive overview of the levels of geographically distributed tanks and silos, for instance, providing complete transparency over the current inventory situation, regardless of time and location.

Based on the measuring and transmission technology installed onsite, the current inventory data are collected and sent to SupplyCare. Critical levels are clearly indicated and calculated forecasts provide additional security for material requirements planning.

The main functions of SupplyCare:

Inventory visualization

SupplyCare determines the inventory levels in tanks and silos at regular intervals. It displays current and historical inventory data and calculated forecasts of future demand. The overview page can be configured to suit the user's preferences.

Master data management

With SupplyCare you can create and manage the master data for locations, companies, tanks, products and users, as well as user authorization.

Report Configurator

The Report Configurator can be used to create personalized reports quickly and easily. The reports can be saved in a variety of formats, such as Excel, PDF, CSV and XML. The reports can be transmitted in many ways, such as by http, ftp or e-mail.

Event management

Events, such as when levels drop below the safety stock level or plan points, are indicated by the software. In addition, SupplyCare can also notify pre-defined users by e-mail.

Alarms

If technical problems occur, e.g. connection issues, alarms are triggered and alarm e-mails are sent to the System Administrator and the Local System Administrator.

Delivery planning

The integrated delivery planning function automatically generates an order proposal if a pre-set minimum inventory level is undershot. Scheduled deliveries and disposals are monitored continuously by SupplyCare. SupplyCare notifies the user if scheduled deliveries and disposals are not going to be met as planned.

Analysis

In the Analysis module, the most important indicators for the inflow and outflow of the individual tanks are calculated and displayed as data and charts. Key indicators of material management are automatically calculated and form the basis for optimizing the delivery and storage process.

Geographical visualization

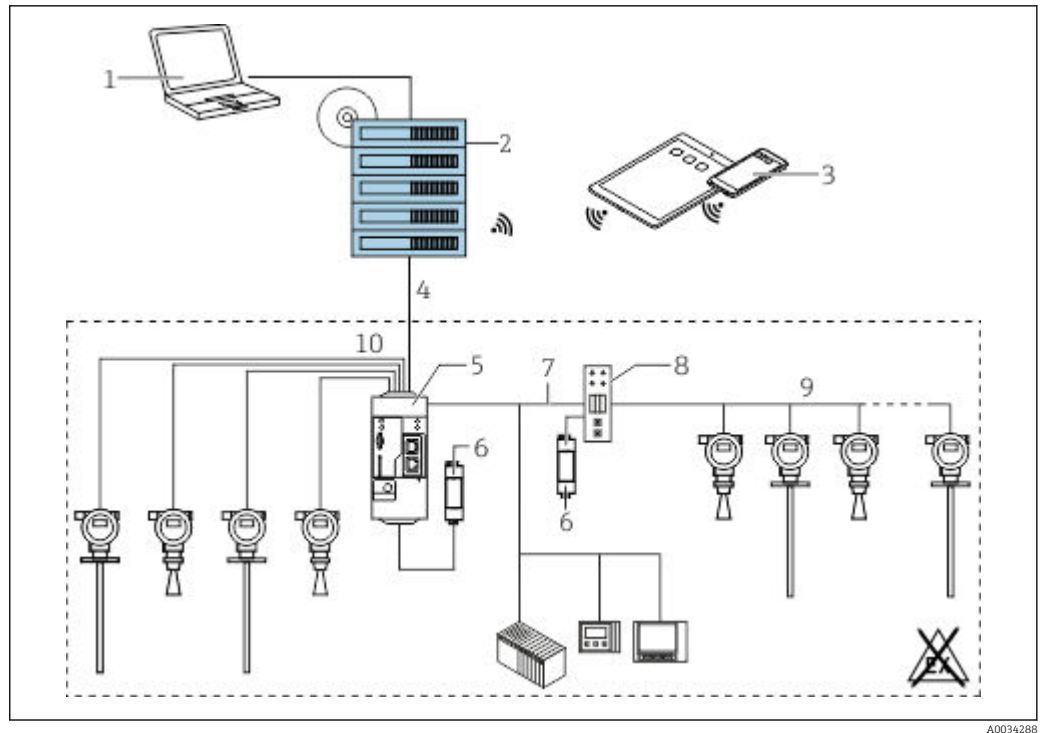
All the tanks and the tank inventories are represented graphically on a map (based on Google Maps). The tanks and inventory situations can be filtered by tank group, product, supplier or location.

Multi-language support

The multi-language user interface supports 9 languages, thereby enabling global collaboration on a single platform. The language and settings are recognized automatically using the browser settings.

SupplyCare Enterprise

SupplyCare Enterprise runs by default as a service under Microsoft Windows on an application server in an Apache Tomcat environment. The operators and administrators operate the application via a Web browser from their workstations.

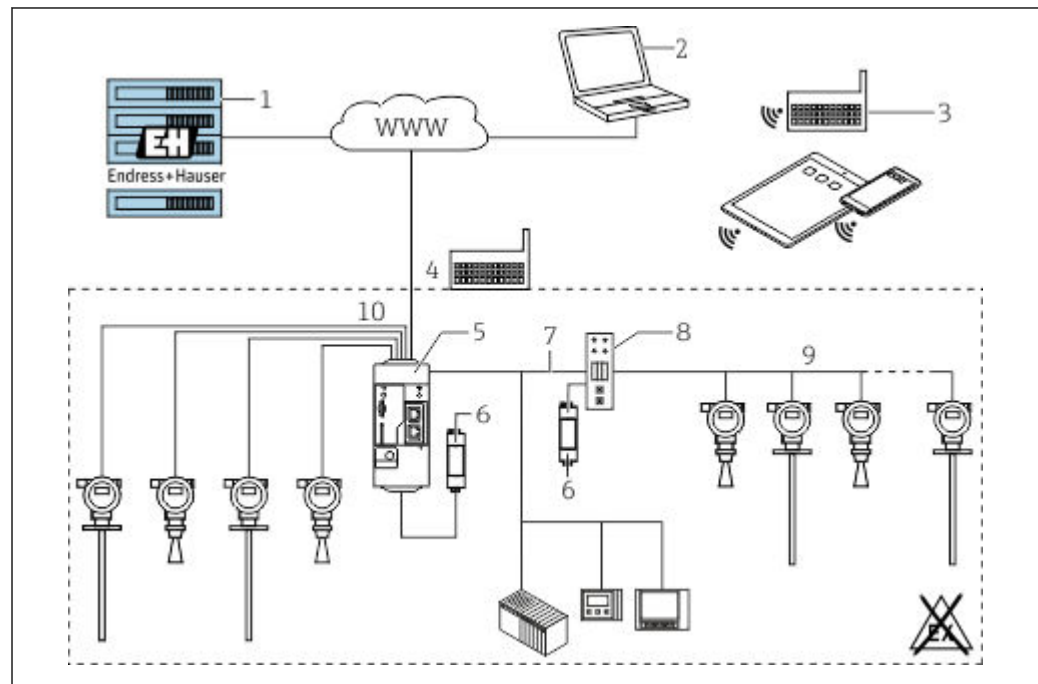


41 Example of inventory management platform with SupplyCare Enterprise SCE30B

- 1 SupplyCare Enterprise (via Web browser)
- 2 SupplyCare Enterprise installation
- 3 SupplyCare Enterprise on mobile devices (via Web browser)
- 4 Ethernet/WLAN/UMTS
- 5 Fieldgate FXA42
- 6 Power supply 24 V DC
- 7 Modbus TCP via Ethernet as server/client
- 8 Converter from Modbus to HART Multidrop
- 9 HART Multidrop
- 10 4 x 4 to 20 mA analog input (2-wire/4-wire)

Cloud-based application: SupplyCare Hosting

SupplyCare Hosting is offered as a hosting service (software as a service). Here, the software is installed within the Endress+Hauser IT infrastructure and made available to the user in the Endress+Hauser portal.



42 Example of inventory management platform with SupplyCare Hosting SCH30

- 1 SupplyCare Hosting installation in Endress+Hauser data center
- 2 PC workstation with Internet connection
- 3 Warehouse locations with Internet connection via 2G/3G with FXA42 or FXA30
- 4 Warehouse locations with Internet connection with FXA42
- 5 Fieldgate FXA42
- 6 Power supply 24 V DC
- 7 Modbus TCP via Ethernet as server/client
- 8 Converter from Modbus to HART Multidrop
- 9 HART Multidrop
- 10 4 x 4 to 20 mA analog input (2-wire/4-wire)

With SupplyCare Hosting, users do not need to make the initial software purchase or install and run the IT infrastructure needed. Endress+Hauser constantly update SupplyCare Hosting and enhance the capability of the software in conjunction with the customer. The hosted version of SupplyCare is thus always up-to-date and can be customized to meet different customer requirements. Other services are also offered in addition to the IT infrastructure and the software that is installed in a secure, redundant Endress+Hauser data center. These services include defined availability of the global Endress+Hauser Service and Support Organization and defined response times in a service event.

CE mark

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

RoHS

RCM-Tick marking



A0029561

Ex approval

- 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.

Dual seal according to
ANSI/ISA 12.27.01

The devices 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 Safety Instructions (XA) of the relevant devices.

Functional safety

Use for level monitoring (MIN, MAX, range) up to SIL 3 (homogeneous or diverse redundancy), independently evaluated by TÜV Rheinland in accordance with IEC 61508, refer to the "Functional Safety Manual" for information.

WHG

WHG approval: Z-65.16-524

Pressure equipment with allowable pressure ≤ 200 bar (2 900 psi)

Pressure instruments with a flange and threaded boss that do not have a pressurized housing do not fall within the scope of the Pressure Equipment Directive, irrespective of the maximum allowable pressure.

Reasons:

According to Article 2, point 5 of EU Directive 2014/68/EU, pressure accessories are defined as "devices with an operational function and having pressure-bearing housings".

If a pressure instrument does not have a pressure-bearing housing (no identifiable pressure chamber of its own), there is no pressure accessory present within the meaning of the Directive.

Radio standard EN302729

The devices Micropilot FMR50, with Antenna Horn 100 mm /4" cladded are conform with the LPR (Level Probing Radar) standard EN302729. The devices Micropilot FMR50, with Antenna Horn 100 mm /4" cladded are allowed to be used inside or outside of closed bins or tanks in countries of the 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, Netherlands, Norway, Austria, Poland, Romania, Sweden, Switzerland, Slovakia, Spain, Czech Republic and Cyprus.

Alle nicht aufgeführten Länder sind derzeit noch mit der Umsetzung beschäftigt.

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
	Zelenchujskaya	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



In general the requirements of EN 302729 have to be taken in consideration.

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- Process connections without CRN approval are not included in this table.
- Refer to the product structure to see which process connections are available for a specific device type.
- For some process connections not listed in the product structure a CRN approval is available on request.
- CRN approved devices are marked with the registration number OF15872.5C on the nameplate.

 For device versions listed in the table below, the maximum allowed pressure is reduced if they have a CRN approval. For device versions not listed in the table below the pressure range as indicated in the "Process" chapter →  52 is not affected by the CRN approval.

Product	Antenna ¹⁾	Process connection ²⁾	Seal ³⁾	max. pressure
FMR50/FMR56	BN: Horn 80mm/3"	XWG: UNI slip-on flange 3"		1.6 bar (23.2 psi)
		XZG: UNI slip-on flange 4"		1.5 bar (21.75 psi)
		XOG: UNI slip-on flange 6"		1.5 bar (21.75 psi)
	BR: Horn 100mm/4"	XZG: UNI slip-on flange 4"		12 bar (17.4 psi)
		XOG: UNI slip-on flange 6"		1.8 bar (26.1 psi)

- 1) Feature 070 of the product structure
- 2) Feature 100 of the product structure
- 3) Feature 090 of the product structure

FMR5x is the upgrade model of the corresponding FMR2xx series.

Enter the serial number from the nameplate (www.endress.com/deviceviewer)

- 550 "Calibration"
- 580 "Test, Certificate"

Hard-copy versions of the test reports, declarations and inspection certificates can also be order via order code 570 "Service", option I7 "Hard-copy product documentation". The documents are then supplied with the product.

Other standards and guidelines

- EN 60529
Degrees of protection provided by enclosures (IP code)
- EN 61010-1
Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use
- 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 safety-related electric/electronic/programmable electronic systems

Ordering information

- In the Product Configurator on the Endress+Hauser website: www.endress.com -> Click "Corporate" -> Select your country -> Click "Products" -> Select the product using the filters and search field -> Open product page -> The "Configure" button to the right of the product image opens the Product Configurator.

- **Product Configurator** - the tool for individual product configuration

- 79

The five points of the linearity protocol are evenly distributed 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 ⁷⁾.

The diagram shows a vertical beam of total height L . A camera is mounted at the top. A horizontal force R is applied at the top. A section of height A is indicated near the top. The beam is supported at the bottom by a fixed support.

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Tagging (TAG)

The following services can be selected via the product structure in the Product Configurator⁸⁾:

Ordering feature	895: Marking
Option	Z1: Tagging (TAG), see additional spec.
Position of the measuring point marking	To be selected in the additional specifications: ■ Tag plate Stainless Steel ■ Self-adhesive paper label ■ Supplied label/plate ■ RFID TAG ■ RFID TAG + Tag plate Stainless Steel ■ RFID TAG + Self-adhesive paper label ■ RFID TAG + Supplied label/plate
Definition of the measuring point designation	To be defined in the additional specifications: 3 lines containing up to 18 characters each The measuring point designation appears on the selected label and/or the RFID TAG.
Designation in the Electronic Name Plate (ENP)	The first 32 characters of the measuring point designation
Designation on the display module	The first 12 characters of the measuring point designation

8) Feature 570 of the product structure

- 82

Heartbeat Diagnostics

Availability

Available in all device versions.

Function

- Continuous self-monitoring of the device.
- Diagnostic messages output to
 - the local display.
 - an asset management system (e.g. FieldCare/DeviceCare).
 - an automation system (e.g. PLC).

Advantages

- Device condition information is available immediately and processed in time.
- The status signals are classified in accordance with VDI/VDE 2650 and NAMUR recommendation NE 107 and contain information about the cause of the error and remedial action.

Detailed description

See Operating Instructions of the device (→  95); chapter "Diagnostics and trouble shooting"

Availability

- EH: Heartbeat Verification + Monitoring
- EJ: Heartbeat Verification

- Verification of the correct functioning of the measuring device within specifications.
- The verification result provides information about the condition of the device: **Passed** or **Failed**.
- The results are documented in a verification report.
- The automatically generated report supports the obligation to demonstrate compliance with internal and external regulations, laws and standards.
- Verification is possible without interrupting the process.

- No onsite presence is required to use the function.
- The DTM⁹⁾ triggers verification in the device and interprets the results. No specific knowledge is required on the part of the user.
- The verification report can be used to prove quality measures to a third party.
- **Heartbeat Verification** can replace other maintenance tasks (e.g. periodic check) or extend the test intervals.

- The **Heartbeat Verification** module contains a wizard for the proof test which must be performed at appropriate intervals for the following applications:
 - SIL (IEC61508/IEC61511)
 - WHG (German Water Resources Act)
- To perform a proof test, the device must be locked (SIL/WHG locking).
- The wizard can be used via FieldCare, DeviceCare or a DTM-based process control system.

10) Only relevant for devices with SIL or WHG approval: order code 590 ("Additional approval"), option LA ("SIL") or LC ("WHG").

Availability

Available for the following options of feature 540 "Application Package":
EH: Heartbeat Verification + Monitoring

Function

- In addition to the verification parameters, the corresponding parameter values are also logged.
- Existing measured variables, such as the echo amplitude, are used in the **Foam detection** and **Build-up detection** wizards.

 For Micropilot FMR5x, the **Foam detection** and **Build-up detection** wizards cannot be used together.

"Foam detection" wizard

- The Heartbeat Monitoring module contains the **Foam detection** wizard.
- This wizard is used to configure automatic foam detection, which detects foam on the product surface on the basis of the reduced signal amplitude. Foam detection can be linked to a switch output in order to control a sprinkler system, for example, which dissolves the foam.
- This wizard can be used via FieldCare, DeviceCare or a DTM-based process control system.

"Build-up detection" wizard

- The Heartbeat Monitoring module contains the **Build-up detection** wizard.
- The wizard is used to configure automatic buildup detection, which detects the buildup of deposits on the antenna on the basis of the increased area of the coupling signal. Buildup detection can be linked to a switch output in order to control a compressed air system, for example, to clean the antenna.
- This wizard can be used via FieldCare, DeviceCare or a DTM-based process control system.

Advantages

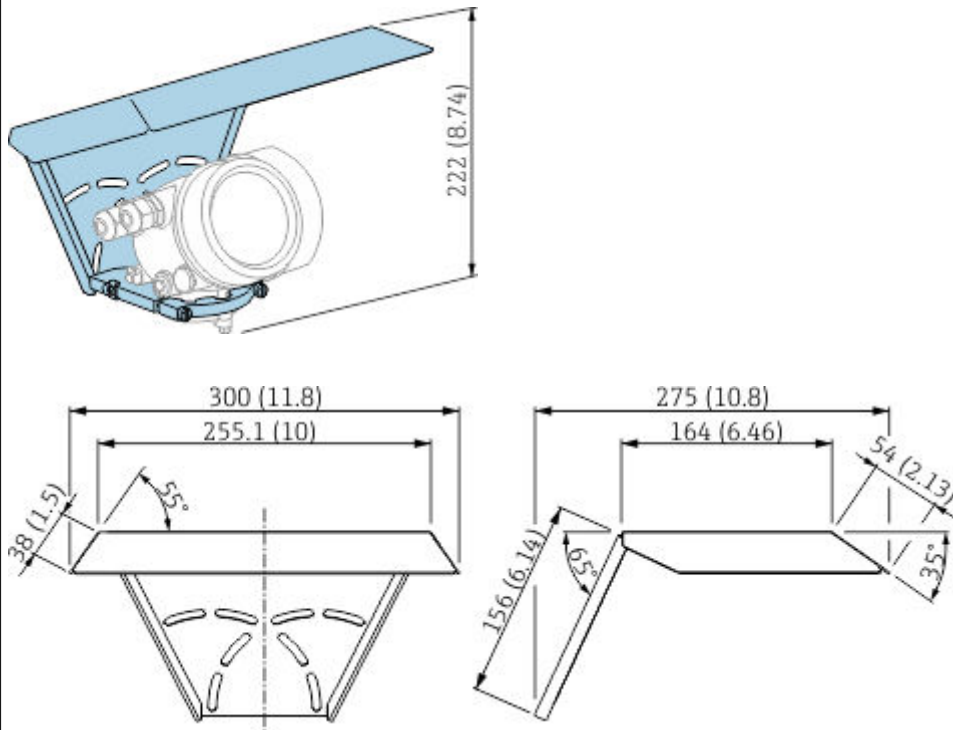
- Early detection of changes (trends) to ensure plant availability and product quality.
- Use of information for the proactive planning of measures (e.g. cleaning/maintenance).
- Identification of undesirable process conditions as the basis to optimizing the facility and the processes.
- Automated control of measures to remove foam or buildup.

Detailed description

 SD01871F

Accessories

Device-specific accessories Weather protection cover

Accessory	Description
Weather protection cover	  44 Weather protection cover; Dimensions: mm (in)  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 71162242.

Mounting nut G1-1/2

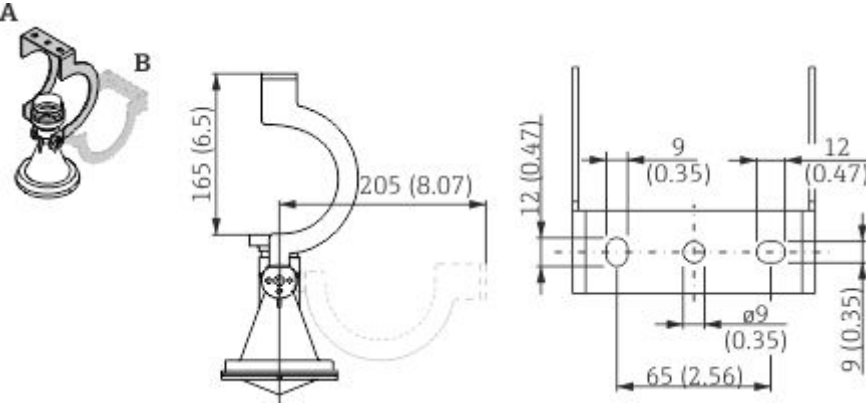
Accessory	Description
Mounting nut G1-1/2	Drawing in preparation For FMR50 with with 40mm/1-1/2" horn antenna and G1-1/2" thread Material: PC Order code: 52014146

Variable flange seal for FMR50/FMR56

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Accessory	Description			
	Technical data: ASME/JIS version			
	Order code	71249070	71249072	71249073
	Compatible with	▪ ASME 3" 150lbs ▪ JIS 80A 10K	ASME 4" 150lbs	ASME 6" 150lbs
	Length of screws	100 mm (3.9 in)	100 mm (3.9 in)	110 mm (4.3 in)
	Recommended screw size	M14	M14	M18
	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	133 mm (5.2 in)	171 mm (6.7 in)	219 mm (8.6 in)
	d	89 mm (3.5 in)	115 mm (4.53 in)	168 mm (6.6 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)

Mounting bracket for wall or ceiling mounting of FMR50/FMR56

Accessory	Description
Mounting bracket for wall or ceiling mounting of FMR50/FMR56	A  B 165 (6.5) 205 (8.07) 12 (0.47) 9 (0.35) 12 (0.47) 65 (2.56) 9 (0.35) 9 (0.35) 45 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 Order code: 71162776 A0017746

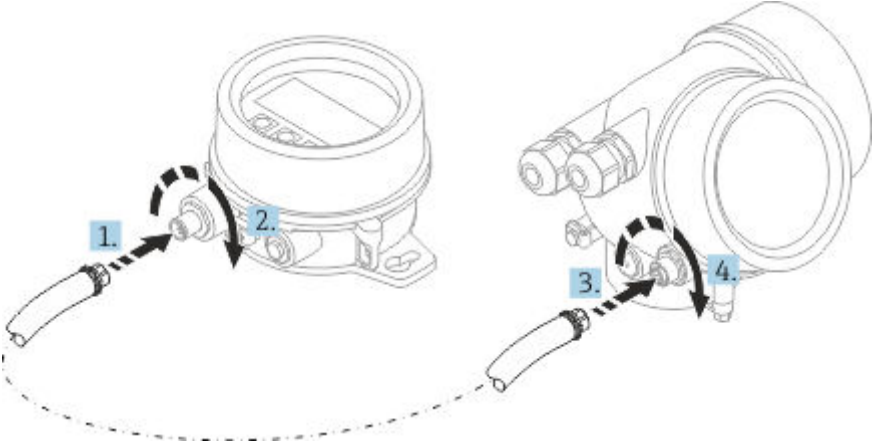
Installation bracket for FMR50

- **Material:** 316Ti (1.4571)
- **Suited for antenna version** ¹⁾:
BM: Horn 40mm (1½"), PVDF encapsulated, -40...130°C (-40...266°F)
- **Suited for process connection** ²⁾:
 - GGF: Thread ISO228 G1½, PVDF
 - RGF: Thread ANSI MNPT1½, PVDF
- **Order code:** 942669-0000

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

- 1) Feature 070 of the product structure
- 2) Feature 100 of the product structure

Remote display FHX50

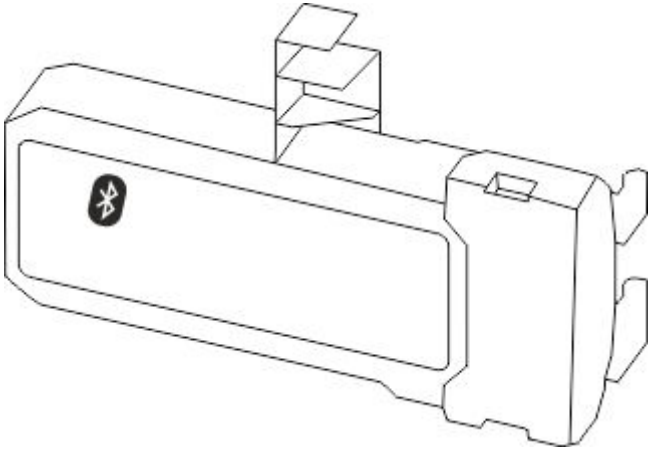
Accessories	Description
Remote display FHX50	 A0019128 - Material: - Plastic PBT 316L/1.4404 - Aluminum - Degree of protection: IP68 / NEMA 6P and IP66 / NEMA 4x - Suitable for display modules: - SD02 (push buttons) - SD03 (touch control) - Connecting cable: - Cable supplied with device up to 30 m (98 ft) - Standard cable supplied by customer up to 60 m (196 ft) - Ambient temperature range: -40 to 80 °C (-40 to 176 °F) - Ambient temperature range (option): -50 to 80 °C (-58 to 176 °F) ¹⁾ i If the remote display should be used, order the device version "Prepared for display FHX50" (feature 030, version L, M or N). For the FHX50, you must select option A: "Prepared for display FHX50" under feature 050 "Measuring device version". ■ If the device version "Prepared for display FHX50" was not originally ordered and a FHX50 display is to be retrofitted, you must select version B "Not prepared for display FHX50" under feature 050: "Measuring device version" when ordering the FHX50. In this case, a retrofit kit for the device is supplied with the FHX50. The kit can be used to prepare the device so that the FHX50 can be used. i Use of the FHX50 may be restricted for transmitters with an approval. A device can only be retrofitted with the FHX50 if the option L, M or N ("Prepared for FHX50") is listed under <i>Basic specifications</i>, item 4 "Display, operation" in the Safety Instructions (XA) for the device. Also pay attention to the Safety Instructions (XA) of the FHX50. i Retrofitting is not possible on transmitters with: - An approval for use in areas with flammable dust (dust ignition-proof approval) - Ex nA type of protection i For details, see document SD01007F.

1) This range is valid if option JN "Ambient temperature transmitter -50 °C (-58 °F)" has been selected in ordering feature 580 "Test, Certificate". If the temperature is permanently below -40 °C (-40 °F), failure rates may be increased.

Overvoltage protection

A0021734

Bluetooth module for HART devices

Accessory	Description
Bluetooth module	 ▪ Quick and easy commissioning via SmartBlue (app) ▪ No additional tools or adapters required ▪ Signal curve via SmartBlue (app) ▪ Encrypted single point-to-point data transmission (tested by Fraunhofer institute) and password protected communication via Bluetooth® wireless technology ▪ Range under reference conditions: > 10 m (33 ft)  When using the Bluetooth module the minimum supply voltage increases by up to 3 V.  Ordering with device The Bluetooth module is preferably ordered with the device. See product structure, feature 610 "Accessory Mounted", option NF "Bluetooth". A separate order is only necessary in case of retrofitting.  Order code for retrofitting Bluetooth module (BT10): 71377355  Restrictions in case of retrofitting Depending on the approval of the transmitter, application of the Bluetooth module may be restricted. A device may only be retrofitted with a Bluetooth module if the option <i>NF</i> (Bluetooth) is listed in the associated Safety Instructions (XA) under <i>Optional specifications</i>.  For details refer to SD02252F.

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. Order code: 51516983  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. Order code: 71063562  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

Accessories	Description
Connect Sensor FXA30/FXA30B	Fully integrated, battery-powered gateway for simple applications with SupplyCare Hosting. Up to 4 field devices with 4 to 20 mA communication (FXA30/FXA30B), serial Modbus (FXA30B) or HART (FXA30B) can be connected. With its robust design and ability to run for years on the battery, it is ideal for remote monitoring in isolated locations. Version with LTE (USA, Canada and Mexico only) or 3G mobile transmission for worldwide communication.  For details, see "Technical Information" TI01356S and Operating Instructions BA01710S.

Accessories	Description
Fieldgate FXA42	Fieldgates enable communication between connected 4 to 20 mA, Modbus RS485 and Modbus TCP devices and SupplyCare Hosting or SupplyCare Enterprise. The signals are transmitted either via Ethernet TCP/IP, WLAN or mobile communications (UMTS). Advanced automation capabilities are available, such as an integrated Web-PLC, OpenVPN and other functions.  For details, see "Technical Information" TI01297S and Operating Instructions BA01778S.

Accessories	Description
SupplyCare Enterprise SCE30B	Inventory management software that visualizes levels, volumes, masses, temperatures, pressures, densities or other tank parameters. The parameters are recorded and transmitted by means of gateways of the type Fieldgate FXA42. This Web-based software is installed on a local server and can also be visualized and operated with mobile terminals such as a smartphone or tablet.  For details, see "Technical Information" TI01228S and Operating Instructions BA00055S

Accessory	Description
Field Xpert SFX350	Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION fieldbus devices in the non-Ex area.  For details, see Operating Instructions BA01202S

Accessory	Description
Field Xpert SFX370	Field Xpert SFX370 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION fieldbus devices in the non-Ex area and the Ex area.  For details, see Operating Instructions BA01202S

Accessory	Description
DeviceCare SFE100	Configuration tool for HART, PROFIBUS and FOUNDATION Fieldbus devices Technical Information TI01134S - DeviceCare is available for download at www.software-products.endress.com. The download requires a registration in the Endress+Hauser software portal. - Alternatively, a DeviceCare DVD can be ordered with the device. Product structure: Feature 570 "Service", Option IV "Tooling DVD (DeviceCare Setup)".
FieldCare SFE500	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. Technical Information TI00028S

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

In the Download Area of the Endress+Hauser Internet site: www.endress.com → Download

Micropilot FMR50

Device	Power supply, output	Communication	Document type	Document code
FMR50	A, B, C, K, L	HART	Operating Instructions	BA01045F/00/EN
			Brief Operating Instructions	KA01099F/00/EN
			Description of Device Parameters	GP01014F/00/EN
	G	PROFIBUS PA	Operating Instructions	BA01124F/00/EN
			Brief Operating Instructions	KA01128F/00/EN
			Description of Device Parameters	GP01018F/00/EN
	E	FOUNDATION Fieldbus	Operating Instructions	BA01120F/00/EN
			Brief Operating Instructions	KA01124F/00/EN
			Description of Device Parameters	GP01017F/00/EN

Application Package ¹⁾	Document type	Document code
▪ EH: Heartbeat Verification + Monitoring ▪ EJ: Heartbeat Verification	Special documentation	SD01871F

Device	Document type	Document code
Fieldgate FXA520	Technical Information	TI00369F
Tank Side Monitor NRF81	Technical Information	TI01251G
	Operating Instructions	BA01465G
	Description of Device Parameters	GP01083G

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

Endress+Hauser

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- 1) 2-wire; 4-20mA HART
- 2) 2-wire; 4-20mA HART, switch output
- 3) 2-wire; 4-20mA HART, 4-20mA
- 4) 2-wire; FOUNDATION Fieldbus, switch output
- 5) 2-wire; PROFIBUS PA, switch output
- 6) 4-wire 90-253VAC; 4-20mA HART
- 7) 4-wire 10.4-48VDC; 4-20mA HART

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

Feature 010 ("Approval")	Feature 030 ("Display, Operation")	Ex marking
BG	L, M or N	ATEX II 3G Ex nA [ia Ga] IIC T6-T1 Gc
BH	L, M or N	ATEX II 3G Ex ic [ia Ga] IIC T6-T1 Gc
B3	L, M or N	ATEX II 1/2G Ex d [ia] IIC T6-T1 Ga/Gb, ATEX II 1/2D Ex ta [ia Db] IIIC Txx°C Da/Db
IG	L, M or N	IECEx Ex nA [ia Ga] IIC T6-T1 Gc
IH	L, M or N	IECEx Ex ic [ia Ga] IIC T6-T1 Gc
I3	L, M or N	IECEx Ex d [ia] IIC T6-T1 Ga/Gb, IECEx Ex ta [ia Db] IIIC Txx°C Da/Db
MH	L, M or N	Ex ic [ia Ga] IIC T6 Gc
NG	L, M or N	NEPSI Ex nA [ia Ga] IIC T6-T1 Gc
NH	L, M or N	NEPSI Ex ic [ia Ga] IIC T6-T1 Gc
N3	L, M or N	NEPSI Ex d [ia] IIC T6-T1 Ga/Gb, DIP A20/21 [ia D] TA, Txx°C IP6X

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