

Free space radar

Level measurement in liquids

- Continuous, non-contact level measurement of liquids, pastes and sludges
- PTFE drip-off antenna
- Maximum measuring range: 50 m (164 ft)
- Temperature: -40 to +130 °C (-40 to +266 °F)
- Pressure: -1 to +16 bar (-14.5 to +232 psi)
- Accuracy: ± 1 mm (0.04 in)
- Linearity protocol (3-point, 5-point)

Your benefits

- Innovative drip-off antenna made of PTFE
- Reliable measurement thanks to improved focusing and small beam angle, particularly in vessels with many internal fittings
- Safety by design - ensures highest safety
- Easy, guided commissioning with intuitive user interface
- **Bluetooth®** wireless technology for commissioning, operation and maintenance via free iOS / Android app SmartBlue
- Maximum reliability thanks to multi-echo tracking
- HistoROM configuration memory makes for easier commissioning, maintenance and diagnostics
- SIL2 as per IEC 61508, SIL3 for homogeneous or diverse redundancy
- Easy proof testing for SIL and WHG
- RFID TAG - easy identification of measuring points for improved data access
- Heartbeat Technology

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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.

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.

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

Symbols at the device

Endress+Hauser

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
DC	Relative dielectric constant ϵ_r
Operating tool	The term "operating tool" is used in place of the following operating software: FieldCare / DeviceCare, for operation via HART communication and PC
BD	Blocking Distance; no signals are analyzed within the BD.

HART®

Bluetooth®

Apple®

Android®

KALREZ[®], VITON[®]

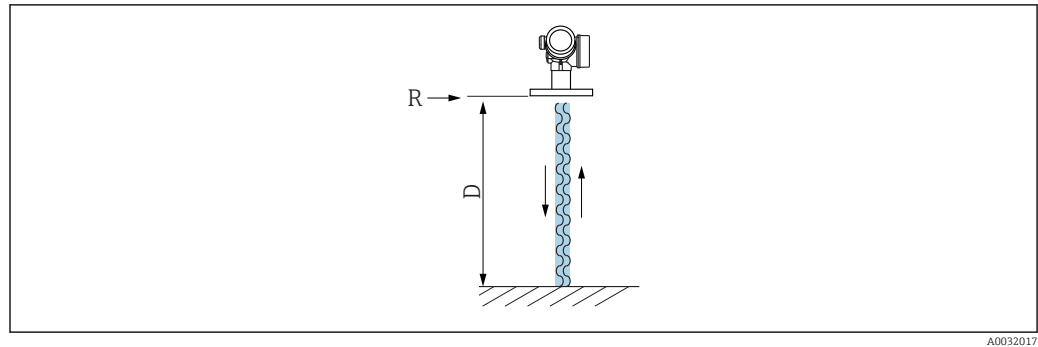
TEFLON®

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Function and system design

Measuring principle

The Micropilot is a "downward-looking" measuring system, operating based on the frequency modulated continuous wave method (FMCW). The antenna emits an electromagnetic wave at a continuously varying frequency. This wave is reflected by the product and received again by the antenna.



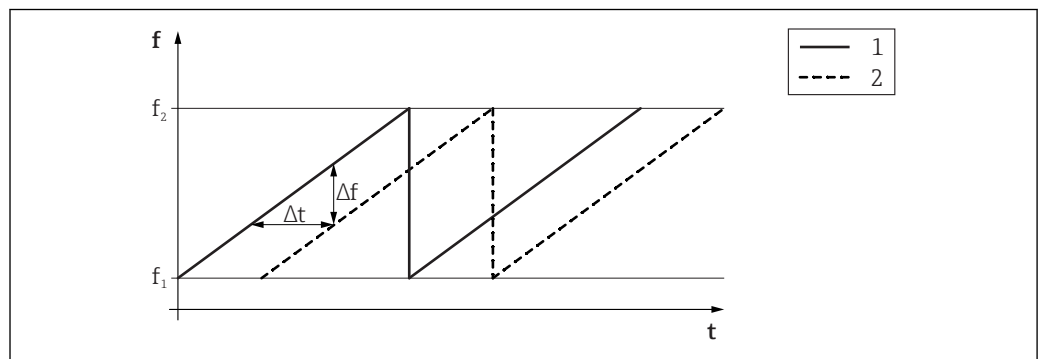
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1 FMCW principle: transmission and reflection of the continuous wave

R Reference point of measurement

D Distance between reference point and product surface

The frequency of this wave is modulated in the form of a sawtooth signal between two limit frequencies f_1 and f_2 :



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2 FMCW principle: result of frequency modulation

1 Transmitted signal

2 Received signal

This results in the following difference frequency at any time between the transmitted signal and the received signal:

$$\Delta f = k \Delta t$$

where Δt is the run time and k is the specified increase in frequency modulation.

Δt is given by the distance D between the reference point R and the product surface:

$$D = (c \Delta t) / 2$$

where c is the speed of propagation of the wave.

In summary, D can be calculated from the measured difference frequency Δf . D is then used to determine the content of the tank or silo.

Input

Measured variable	The measured variable is the distance between the reference point and the product surface. The level is calculated based on "E", the empty distance entered. Optionally, the level can be converted to other variables (volume, mass) by linearization (32 value pairs).
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Measuring range	Maximum measuring range		
	Device	Antenna ¹⁾	Maximum measuring range
	FMR60	GA: Drip-off, PTFE 50 mm / 2"	50 m (164 ft)

1) Feature 070 in the product structure

Usable measuring range

The usable measuring range depends on the antenna size, the medium's reflective properties, the installation position and any possible 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.

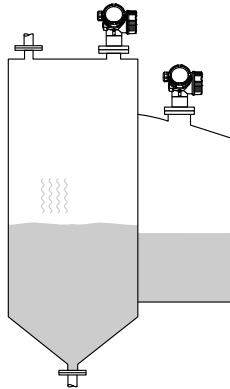
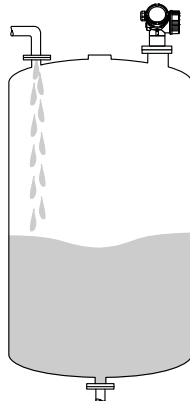
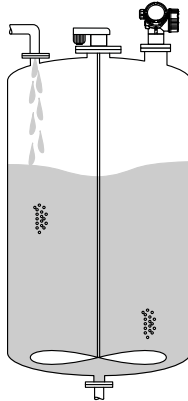
Media groups

Media group	DC (ϵ_r)	Example
A0	1.2 to 1.4	Butane, liquid nitrogen, liquefied hydrogen
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) NH_3 falls into medium 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)

FMR60		
Storage tank	Buffer tank	Process tank with agitator
 A0034565 Calm product surface (e.g. intermittent filling, filling from bottom, immersion tubes)	 A0034566 Moving surfaces (e.g. continuous filling, from above, mixing jets)	 A0034567 Turbulent surface (e.g. filling from above, agitators, baffles)
A0 A B C D 7 (23) 12 (39) 23 (75) 40 (131) 50 (164) A0034574	A0 A B C D 4 (13) 7 (23) 13 (43) 28 (92) 44 (144) A0034579	A0 A B C D 2 (7) 4 (13) 7 (23) 15 (49) 25 (82) A0034584
Measuring range [m (ft)]		

Operating frequency	Approx. 80 GHz Up to 8 devices can be installed in the same tank without interfering with each other.
Transmission power	■ Peak power: 6.3 mW ■ Average output power: 63 µW

HART

HART

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

Bluetooth® wireless technology

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.

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"

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
Electrical connection values	$U = 16$ 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 $1\ 350 \text{ V}_{DC}$ to power supply and 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 s , 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

Wireless HART data

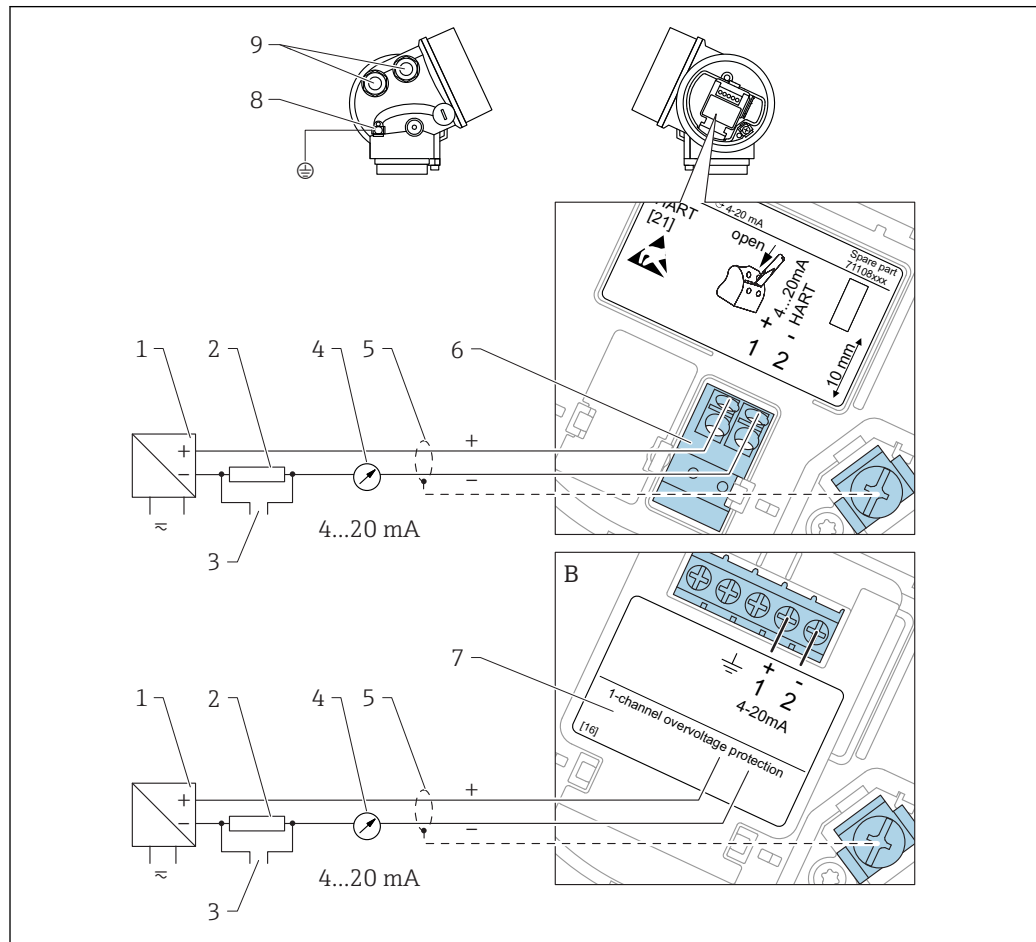
Minimum start-up voltage	16 V
Start-up current	3.6 mA
Start-up time	65 s
Minimum operating voltage	14.0 V

Multidrop current	4.0 mA
Set-up time	15 s

Power supply

Terminal assignment

2-wire: 4-20mA HART



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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

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

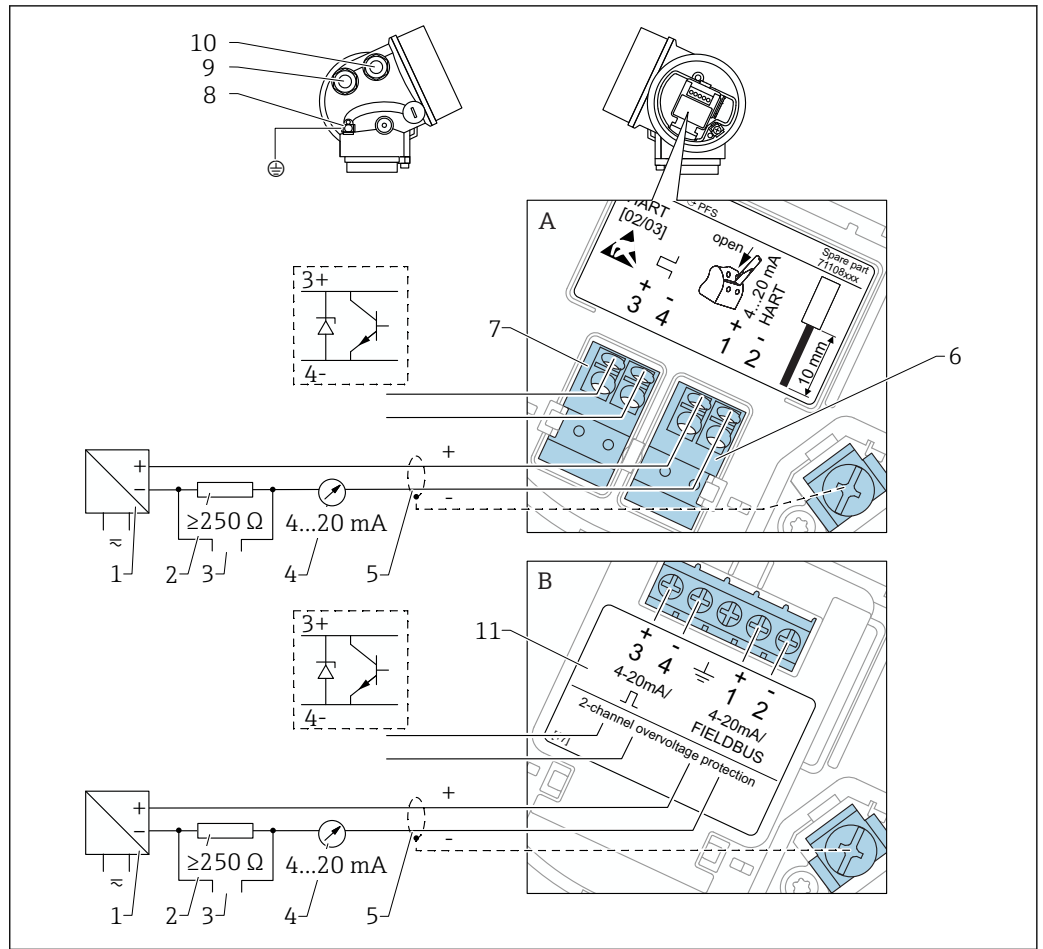
6 4-20mA HART (passive): Terminals 1 and 2

7 Overvoltage protection module

8 Terminal for potential equalization line

9 Cable entry

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

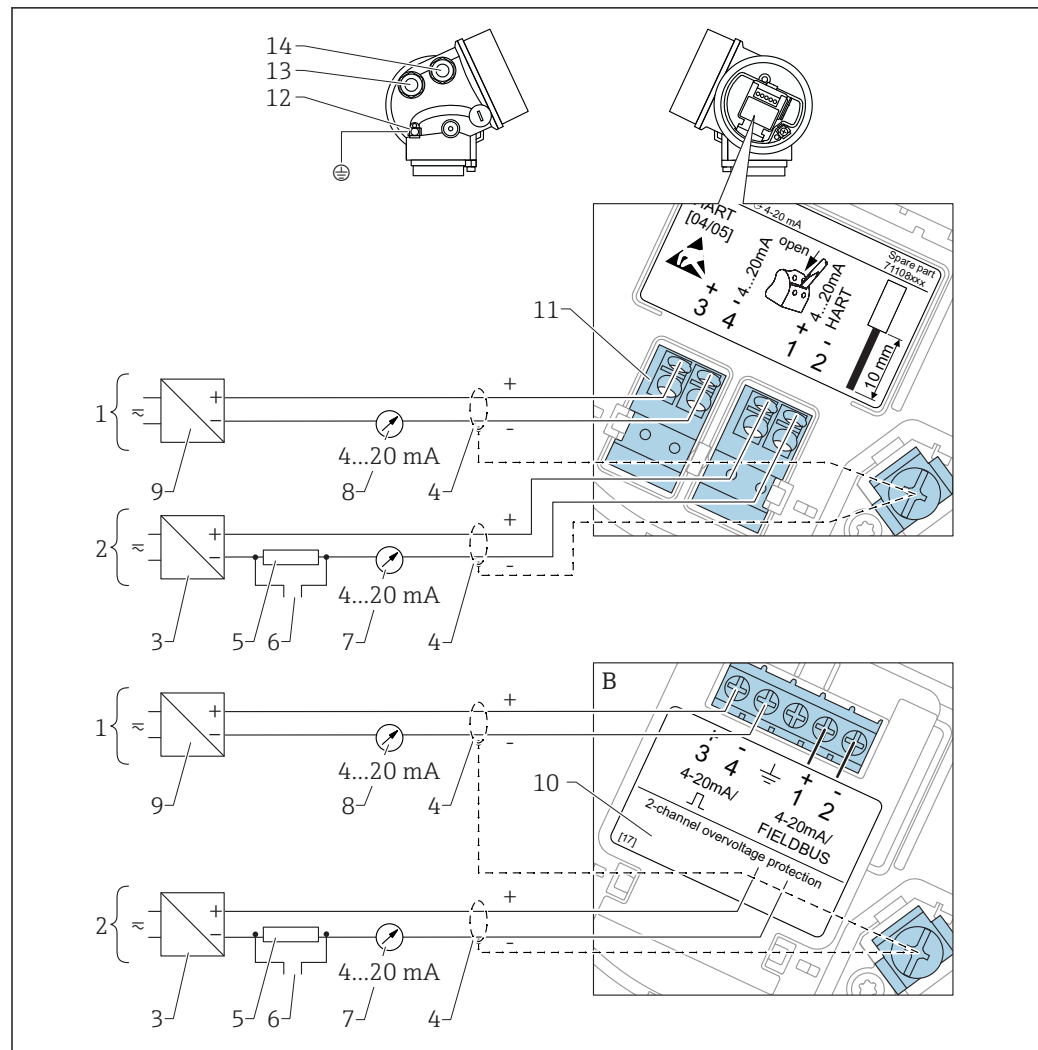


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4 Terminal assignment 2-wire; 4-20mA HART, switch output

- A Without integrated overvoltage protection
 B With integrated overvoltage protection
 1 Active barrier with power supply (e.g. RN221N): Observe terminal voltage
 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 4-20mA HART (passive): Terminals 1 and 2
 7 Switch output (open collector): Terminals 3 and 4
 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



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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

4 Cable screen; observe cable specification

5 HART communication resistor ($\geq 250 \Omega$); Observe maximum load

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

7 Analog display device ; observe maximum load

8 Analog display device ; observe maximum load

9 Supply voltage for current output 2 (e.g. RN221N); Observe terminal voltage

10 Overvoltage protection module

11 Current output 2: Terminals 3 and 4

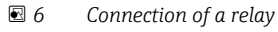
12 Terminal for the potential equalization line

13 Cable entry for current output 1

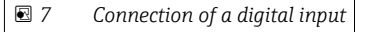
14 Cable entry for current output 2

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

 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"



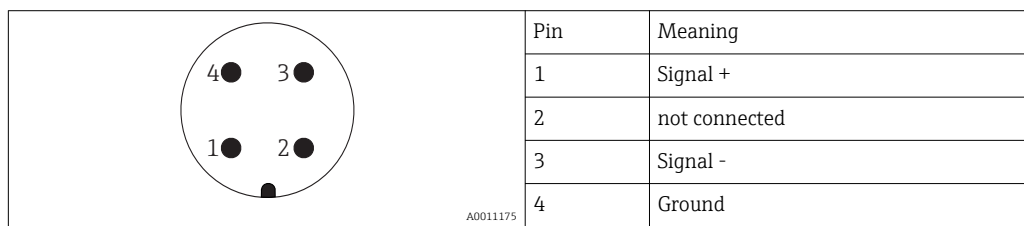
- Solid-state relay: Phoenix Contact OV-24DC/480AC/5 with mounting rail connector UMK-1 OM-R/AMS
- Electromechanical relay: Phoenix Contact PLC-RSC-12DC/21



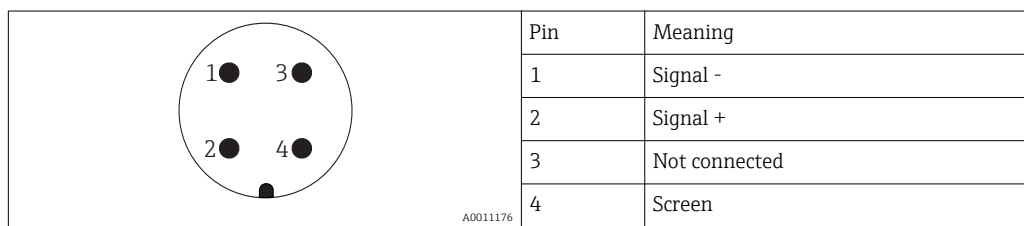
- | | |
|---|------------------|
| 1 | Pull-up resistor |
| 2 | Digital input |

 For optimum interference immunity we recommend to connect an external resistor (internal resistance of the relay or Pull-up resistor) of $< 1\,000\,\Omega$.

Pin assignment of the M12 plug connector



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"Power supply, output" ¹⁾	"Approval" ²⁾	Terminal voltage U at device	Maximum load R, depending on the supply voltage U ₀ of the power supply unit
A: 2-wire; 4-20mA HART	■ Non-hazardous ■ Ex nA ■ Ex ic ■ CSA GP	14 to 35 V ³⁾	Graph showing Maximum load R [Ω] versus supply voltage U₀ [V]. The load increases linearly from 0 Ω at 14 V to 500 Ω at 25 V, and then remains constant at 500 Ω up to 30 V.
	Ex ia / IS	14 to 30 V ³⁾	
	■ Ex d(ia) / XP ■ Ex ic(ia) ■ Ex nA(ia) ■ Ex ta / DIP	14 to 35 V ^{3) 4)}	
	Ex ia + Ex d(ia) / IS + XP	14 to 30 V ³⁾	

- | "Power supply, output" ¹⁾ | "Approval" ²⁾ | Terminal voltage U at device | Maximum load R, depending on the supply voltage U ₀ of the power supply unit |
|---|---|------------------------------|--|
| B:
2-wire;
4-20 mA HART,
switch
output | <ul style="list-style-type: none"> ■ Non-hazardous ■ Ex nA ■ Ex nA(ia) ■ Ex ic ■ Ex ic(ia) ■ Ex d(ia) / XP ■ Ex ta / DIP ■ CSA GP | 16 to 35 V ³⁾ | <p>Graph showing the maximum load resistance R [Ω] versus the supply voltage U_0 [V]. The load resistance increases linearly from 0 Ω at 16 V to 500 Ω at 27 V, and then remains constant at 500 Ω up to 30 V.</p> |
| | <ul style="list-style-type: none"> ■ Ex ia / IS ■ Ex ia + Ex d(ia) / IS + XP | 16 to 30 V ³⁾ | |

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- 1) Feature 020 in the product structure
- 2) Feature 010 in the product structure
- 3) If the Bluetooth modem is used, the minimum supply voltage increases by 2 V.

Power consumption

1) Feature 020 of the product structure

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

- Configuration is retained in the HistoROM (EEPROM).
- Error messages (incl. value of operated hours counter) are stored.

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).

To be selected in feature 050 "Electrical connection"

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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 diameter ≥ 1 m (40 in)
- No major interference reflections inside the signal beam

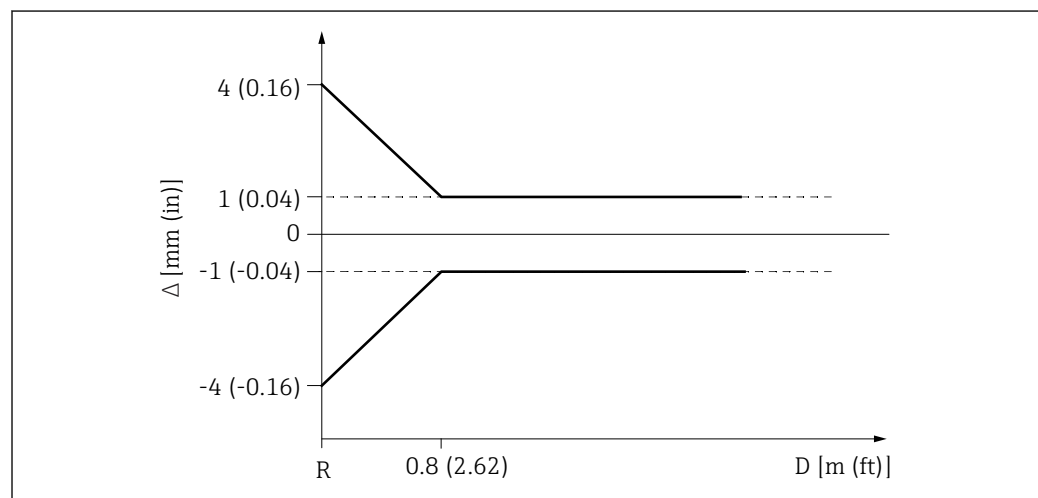
Reference accuracy

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

Output:	digital	analog ¹⁾
Accuracy (Sum of non-linearity, nonrepeatability and hysteresis) ²⁾	Measuring distance up to 0.8 m (2.62 ft): max. ±4 mm (±0.16 in)	±0.03 %
	Measuring distance > 0.8 m (2.62 ft): ±1 mm (±0.04 in)	±0.02 %
Non-repeatability ³⁾	≤ 1 mm (0.04 in)	

- 1) Add error of the analogous value to the digital value.
- 2) If the reference conditions are not met, the offset/zero point arising from the mounting conditions may be up to ±4 mm (0.16 in). This additional offset/zero point can be compensated for by entering a correction (parameter "level correction") during commissioning.
- 3) The non-repeatability is already considered in the accuracy.

Differing values in near-range applications



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8 Maximum measured error in near-range applications

- Δ Maximum measured error
 R Reference point of the distance measurement
 D Distance from reference point of antenna

Measured value resolution

Dead band according to DIN EN IEC 61298-2 / DIN EN IEC 60770-1:

- Digital: 1 mm
- Analog: 1 μA

Response time

The response time can be configured. The following step response times (in accordance with DIN EN IEC 61298-2 / DIN EN IEC 60770-1)²⁾ are when damping is switched off:

- 2) According to DIN EN IEC 61298-2 / DIN EN IEC 60770-1, the step response time is the time that elapses after an abrupt change in the input signal until the change in the output signal has adopted 90% of the steady-state value for the first time.

Influence of ambient temperature	The measurements are performed according to DIN EN IEC 61298-3 / DIN EN IEC 60770-1 ■ Digital (HART): average $T_K = 2 \text{ mm}/10 \text{ K}$ ■ Analog (current output): – Zero point (4 mA): average $T_K = 0.02 \text{ } \%/10 \text{ K}$ – Span (20 mA): average $T_K = 0.05 \text{ } \%/10 \text{ K}$
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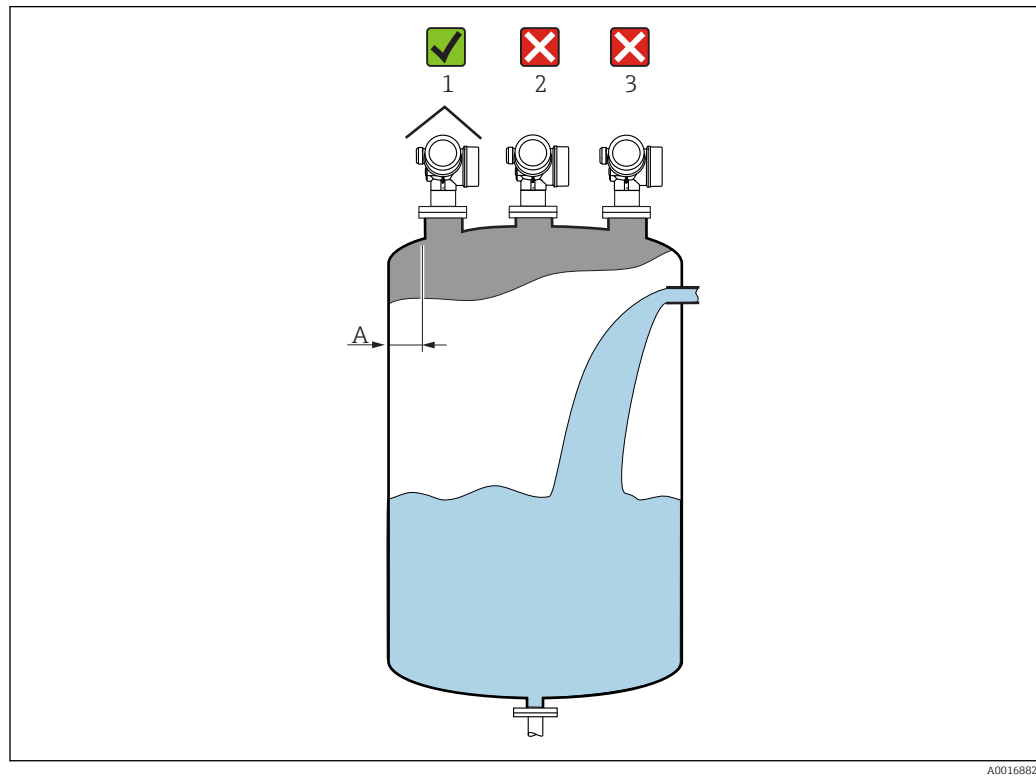
High pressure reduces the speed of propagation of the measuring signals in the gas/vapor above the medium. This effect depends on the type of gas phase and its temperature. This results in a systematic measured error that increases with increasing distance between the reference point of the measurement (flange) and the surface of the product. The following table shows this measured error for a few typical gases/vapors (with regard to the distance, a positive value means that a too large distance is measured):

 With a known, constant pressure, it is possible to compensate for this measured error with a linearization, for example.

Installation

Installation conditions

Mounting position

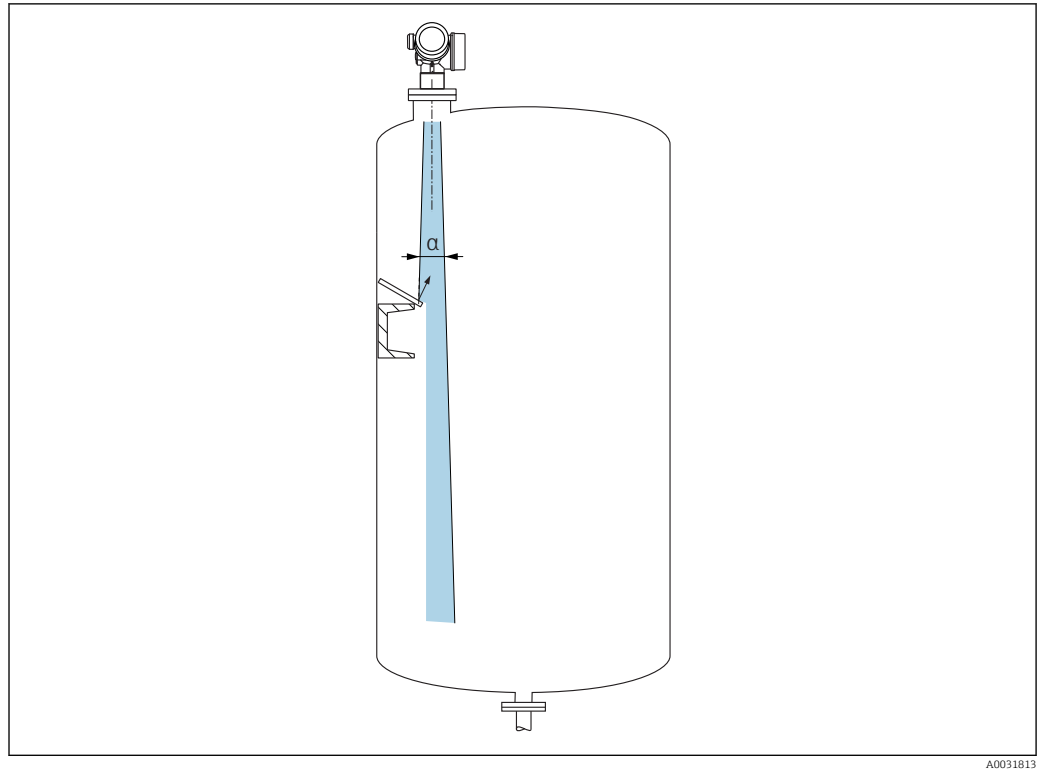


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- Recommended distance **A** wall - nozzle outer edge: $\sim 1/6$ of the container diameter. However, the device must not under any circumstances be mounted closer than 15 cm (5.91 in) to the tank wall.
- Not in the center (2) as interference can cause signal loss.
- Not above the filling curtain (3).
- The use of a weather protection cover (1) is recommended to protect the transmitter from direct sunlight or rain.

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Avoiding interference echoes



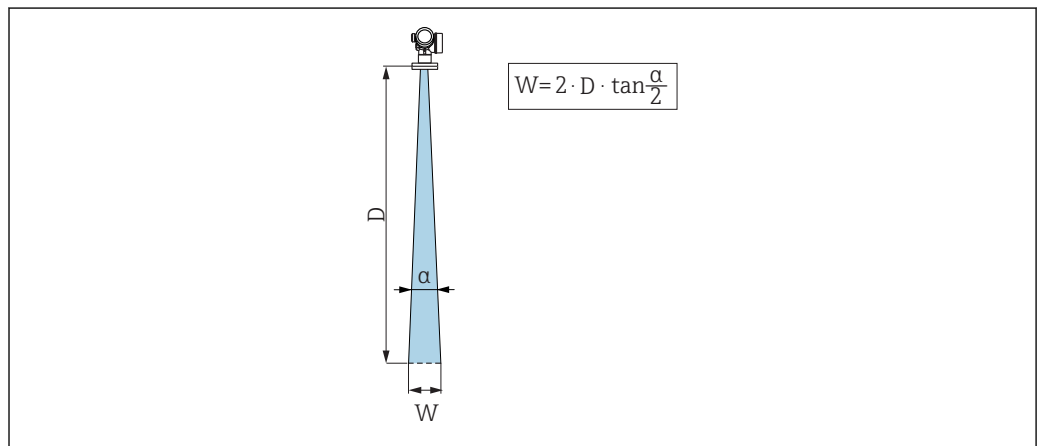
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Metal deflection plates installed at an angle to scatter the radar signals help prevent interference echoes.

Optimization options

- Antenna size
The larger the antenna the smaller the beam angle α , resulting in fewer interference echoes
→ 26.
- Mapping
Measurement can be optimized by electronically suppressing interference echoes.

Beam angle



A0031824

9 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 (3dB width). Microwaves are also emitted outside the signal beam and can be reflected off interfering installations.

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Measurement through a ball valve



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Measuring through plastic tank ceilings or dielectric windows

- Dielectric constant of the medium: $\epsilon_r \geq 10$
- The distance from the lower edge of the antenna to the tank ceiling or window 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 or dielectric window

Material	PE	PTFE	PP	Perspex
DK (= ϵ_r)	2.3	2.1	2.3	3.1
Optimum thickness	1.25 mm (0.049 in) ¹⁾	1.3 mm (0.051) ¹⁾	1.25 mm (0.049 in) ¹⁾	1.07 mm (0.042 in) ¹⁾

- 1) or an integer multiple of this value; however, take into account that the microwave transparency is significantly reduced when increasing the thickness of the window.

Installation: Drip-off antenna PTFE 50 mm / 2"**Aligning the antenna axis**

Align the antenna vertically to the product surface.

**Attention:**

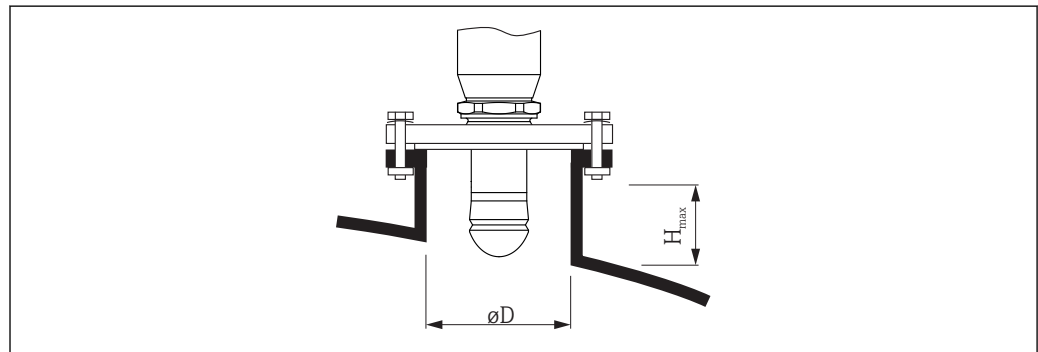
The maximum reach of the antenna can be reduced if it is not installed perpendicular to the product.

Radial alignment of the antenna

Based on the directional characteristic, radial alignment of the antenna is not necessary.

Information concerning nozzles

The maximum nozzle length H_{max} depends on the nozzle diameter D :



A0032209

Inner nozzle diameter D	Maximum nozzle height H_{max} ¹⁾
50 to 80 mm (2 to 3.2 in)	750 mm (30 in)
80 to 100 mm (3.2 to 4 in)	1 150 mm (46 in)

1) In case of longer nozzles, a reduction of the measuring performance is to be expected.

Note the following if the antenna does not project out of the nozzle:

- The end of the nozzle must be smooth and free from burrs. The edge of the nozzle should be rounded if possible.
- Mapping must be performed.
- Please contact Endress+Hauser for applications with nozzles that are higher than indicated in the table.

- When screwing in, turn by the hex bolt only.
- Tool: open-ended wrench 55 mm
- Maximum permissible torque: 50 Nm (36 lbf ft)

A technical line drawing of a mechanical assembly. The assembly consists of a cylindrical component with a flange at the top, mounted on a central shaft. The shaft passes through a horizontal plate. Below the plate, the shaft continues down to a base. Two callout lines are present: line 1 points to the central shaft, and line 2 points to the horizontal plate.

If process temperatures are high, the device should be included in the usual container insulation system (2) to prevent the electronics from heating as a result of thermal radiation or convection. The insulation should not be higher than the neck of the device (1).

Environment

Ambient temperature range

Measuring device	-40 to +80 °C (-40 to +176 °F)
Local display	-20 to +70 °C (-4 to +158 °F), the readability of the display may be impaired at temperatures outside the temperature range.

Outdoor operation in strong sunlight:

- Mount the device in the shade.
- Avoid direct sunlight, particularly in warm climatic regions.
- Use a weather protection cover (see accessories).

Ambient temperature limits

i The following diagrams only consider functional aspects. Additional restrictions may apply for certified device versions. See the separate Safety Instructions for more information → 68.

In the event of temperature (T_p) at the process connection, the permitted ambient temperature (T_a) is reduced as indicated in the following diagram (temperature derating) in the table header.

FMR60 Seal ¹⁾ A3: FKM Viton GLT, -40 to 80 °C (-40 to 176 °F)											
Temperature specifications: °C (°F) A0032024											
Housing type ²⁾	P1		P2		P3		P4		P5		
	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	T_p	T_a	
A: GT19 two-chamber Plastic PBT	-40 (-40)	60 (140)	60 (140)	60 (140)	80 (176)	54 (129.2)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	
C: GT20 two-chamber Aluminum, coated	-40 (-40)	76 (168.8)	76 (168.8)	76 (168.8)	80 (176)	76 (168.8)	80 (176)	-40 (-40)	-40 (-40)	-40 (-40)	

1) Feature 090 in the product structure

2) Feature 040 in the product structure

FMR60 Seal ¹⁾ A4: FKM Viton GLT, -40 to 130 °C (-40 to 266 °F)													
Temperature specifications: °C (°F) A0032025													
Housing type ²⁾	P1		P2		P2+		P3		P4		P5		
	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: GT19 two-chamber Plastic PBT	-40 (-40)	60 (140)	60 (140)	60 (140)	113 (235.4)	45 (113)	130 (266)	22 (71.6)	130 (266)	-40 (-40)	-40 (-40)	-40 (-40)	
C: GT20 two-chamber Aluminum, coated	-40 (-40)	76 (168.8)	76 (168.8)	76 (168.8)	110 (230)	71 (159.8)	130 (266)	60 (140)	130 (266)	-40 (-40)	-40 (-40)	-40 (-40)	

1) Feature 090 in the product structure

2) Feature 040 in the product structure

Process

Process temperature, process pressure



The pressure ranges indicated can be reduced by the choice of process connection. The nominal pressure (PN) indicated on the nameplate refers to a reference temperature of 20 °C, and of 100 °F for ASME flanges. Observe pressure-temperature dependency.

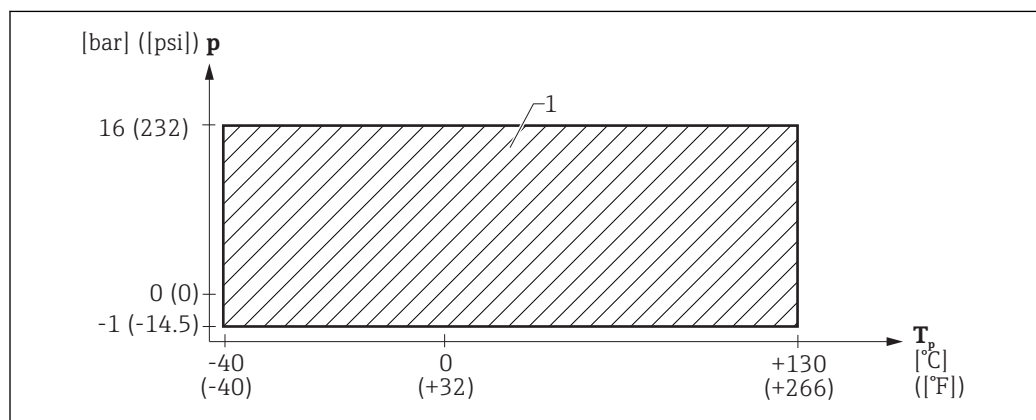
Please refer to the following standards for the pressure values permitted at higher temperatures:

- EN 1092-1: 2001 Tab. 18

In terms of their stability-temperature property, the materials 1.4435 and 1.4404 are grouped in EN 1092-1 table 18 under 13E0. 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

FMR60 threaded process connection



A0032614

10 FMR60: Permitted range for process temperature and process pressure

1 Feature 90, seal: A4, FKM Viton GLT

FMR60 threaded process connection

Feature 100 "Process connection"	Feature 90 "Seal"	Process temperature range	Process pressure range
■ GGJ: Thread ISO228 G1-1/2 ■ RGJ: Thread ANSI MNPT1-1/2	A4: FKM Viton GLT	-40 to +130 °C (-40 to +266 °F)	$p_{rel} =$ -1 to 16 bar (-14.5 to 232 psi) ¹⁾

1) The pressure range may be further restricted in the event of a CRN approval

A0032615

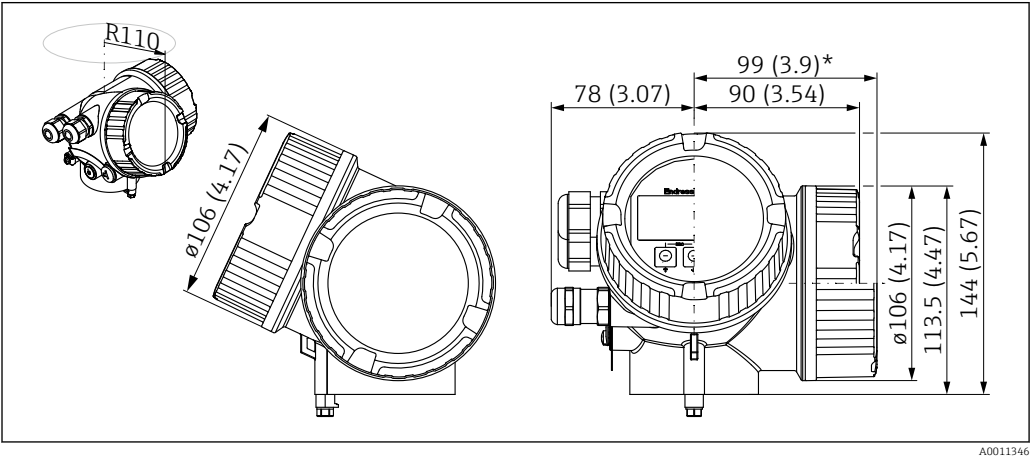
- | Feature 100 "Process connection" | Process temperature range | Process pressure range |
|---|---------------------------------|---|
| <ul style="list-style-type: none"> ■ XJG:
UNI flange 3"/DN80/80A, PP ■ KKG:
UNI flange 4"/DN100/100A, PP ■ XLG:
UNI flange 6"/DN150/150A, PP | -40 to +80 °C (-40 to +176 °F) | <p>p_{rel} = -1 to 3 bar (-14.5 to 43.5 psi)
 p_{abs} < 4 bar (58 psi) ¹⁾</p> |
| <ul style="list-style-type: none"> ■ XJJ:
UNI flange 3"/DN80/80A, 316L ■ XKJ:
UNI flange 4"/DN100/100A, 316L ■ XLJ:
UNI flange 6"/DN150/150A, 316L | -40 to +130 °C (-40 to +266 °F) | |

33

Mechanical construction

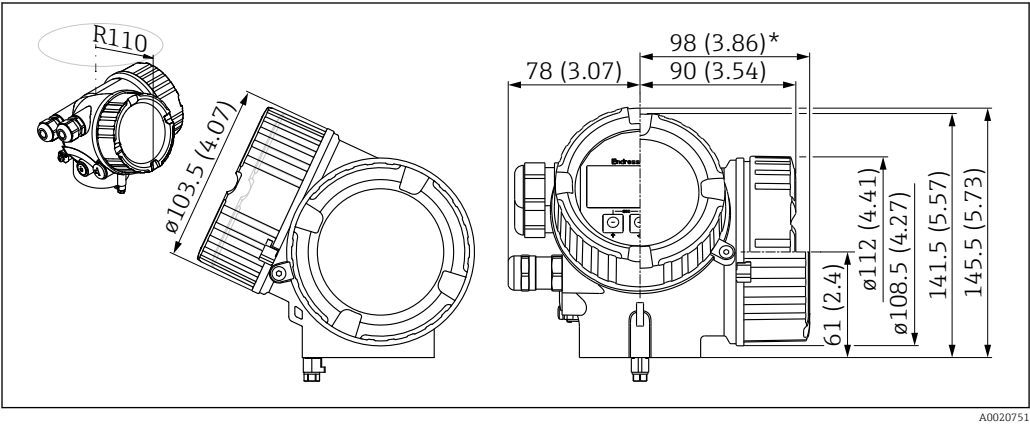
Dimensions

Dimensions of the electronics housing



12 Housing GT19 (Plastics PBT); Dimensions in mm (in)

*for devices with integrated overvoltage protection.



13 Housing GT20 (Alu coated); Dimensions in mm (in)

*for devices with integrated overvoltage protection.

Technical drawings of the test specimen showing front and side views with dimensions.

Front View (Left):

- Overall height: 205 (8.07)
- Top section height: 127 (5.00)
- Section below top: 22 (0.87)
- Section below that: 78 (3.07)
- Bottom section height: 107 (4.21)
- Bottom diameter: $\phi 42.5$ (1.67)
- Reference line R is indicated.

Side View (Right):

- Overall height: 205 (8.07)
- Top section height: 127 (5.00)
- Section below top: 22 (0.87)
- Section below that: 78 (3.07)
- Bottom section height: 107 (4.21)
- Bottom diameter: $\phi 42.5$ (1.67)

 14 Dimensions: mm (in)

B Process connection: UNI flange 3"/DN80/80A to 6"/DN150/150A

1 Bottom edge of housing

Technical drawing of a circular part, showing a top view and a cross-section A-A.

Top View: A circular part with a central hole. Six smaller holes are arranged in a circle around the center. A 45° angle is indicated between the centerline and one of the outer holes. The outer diameter is labeled $\varnothing$. The inner diameter of the central hole is labeled $\varnothing$. The diameter of the outer holes is labeled $\varnothing$. The diameter of the central hole is labeled $\varnothing$.

Cross-section A-A: A cylindrical part with a central hole. The thickness of the part is labeled 20 (0.79). The diameter of the central hole is labeled G 1 1/2. The outer diameter is labeled $\varnothing$. The cross-section is labeled A-A.

A0034611

36 V. 4, Rev. 2, 19-03-2018 Endress+Hauser

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.

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- 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.

FMR60

Endress+Hauser

Materials: Weather protection cover



No	Part: Material
1	Protection cover: 316L (1.4404)
2	Molded rubber part (4x): EPDM
3	Clamping screw: 316L (1.4404) + carbon fibre
4	Bracket: 316L (1.4404)
5	Ground terminal ▪ Screw: A4 ▪ Spring washer: A4 ▪ Clamp: 316L (1.4404) ▪ Holder: 316L (1.4404)
6	▪ Washer: A4 ▪ Cheese head screw: A4-70

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

Operator-oriented menu structure for user-specific tasks

- ## Operating languages

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

- 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

- 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.

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

- 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

A0036314

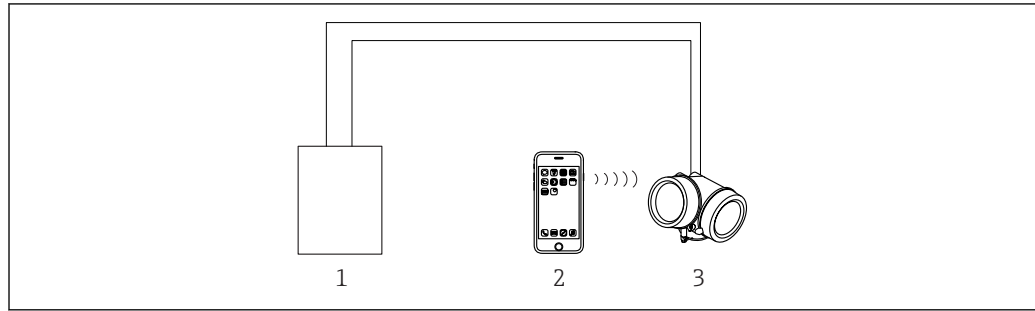
Operation with remote display and operating module FHX50



 16 *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

Operation via Bluetooth® wireless technology



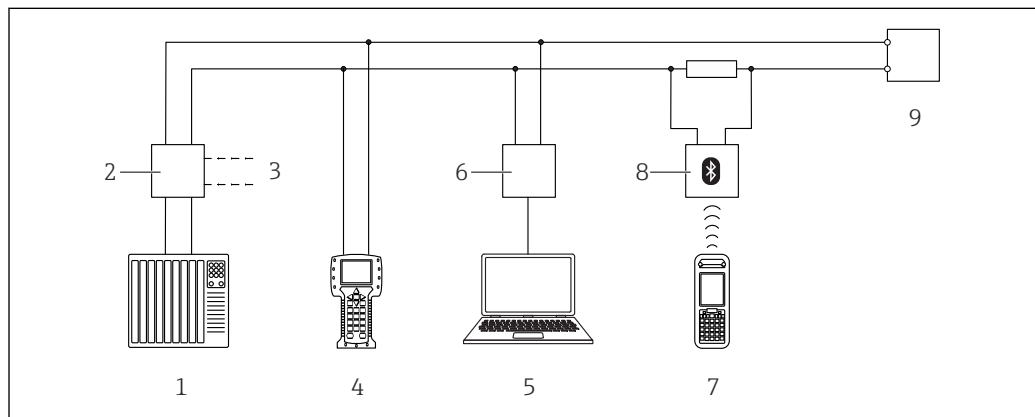
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17 Possibilities for remote operation via Bluetooth® wireless technology

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

Remote operation

Via HART protocol

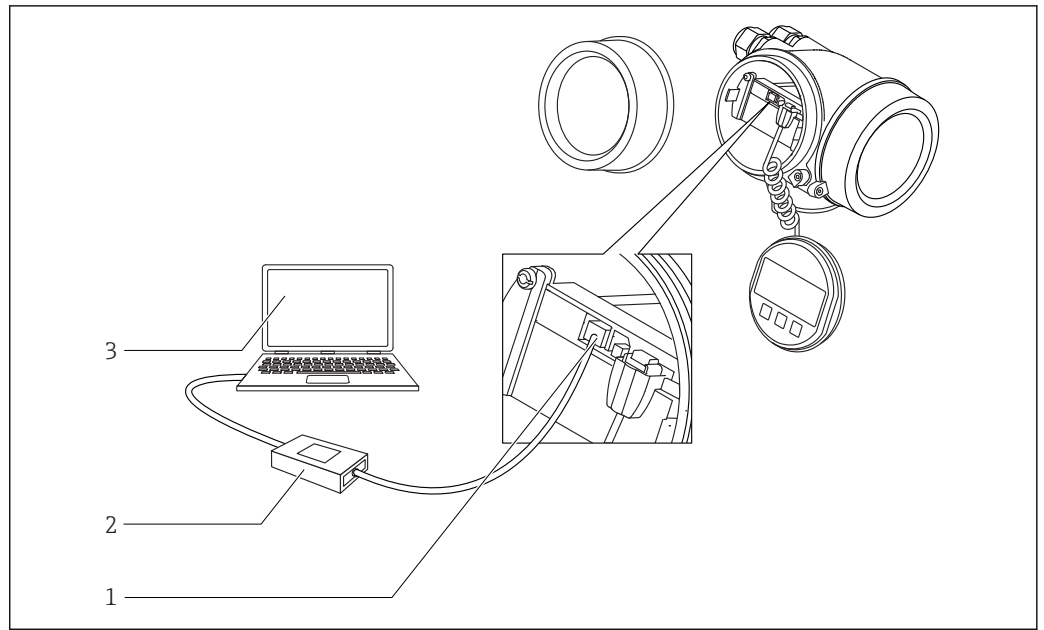


A0036169

18 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

DeviceCare/FieldCare via service interface (CDI)



A0032466

19 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

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

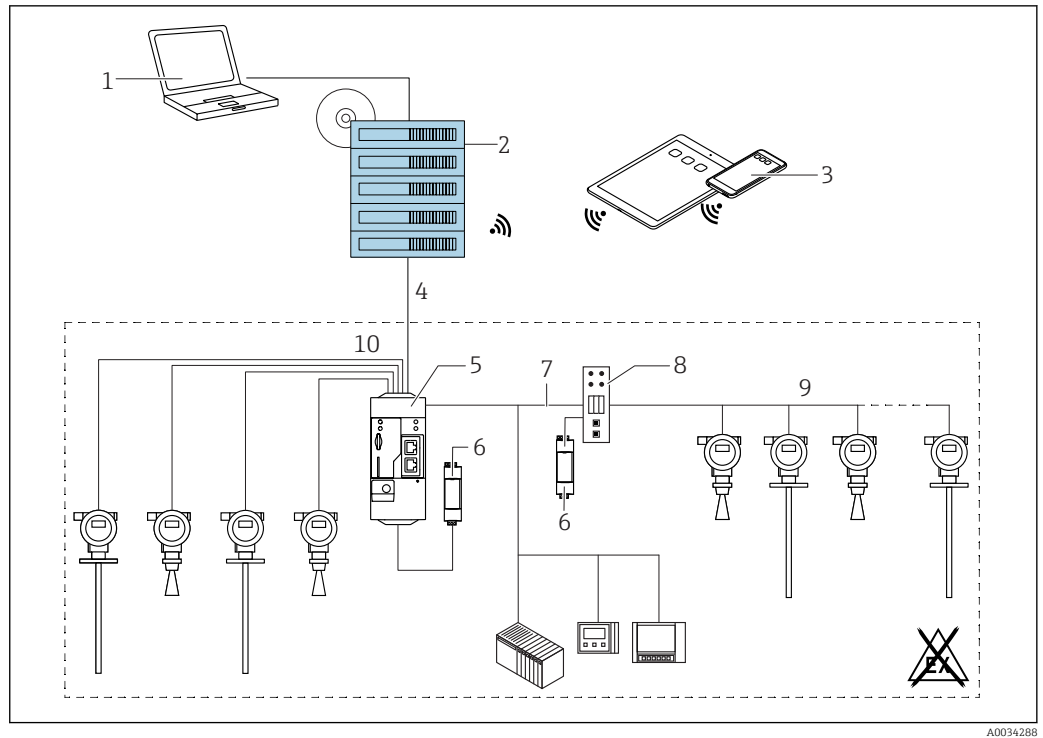
All the tanks and the tank inventories are represented graphically on a map (based on Google Maps). The tanks and inventory situations can be filtered by tank group, product, supplier or location.

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.



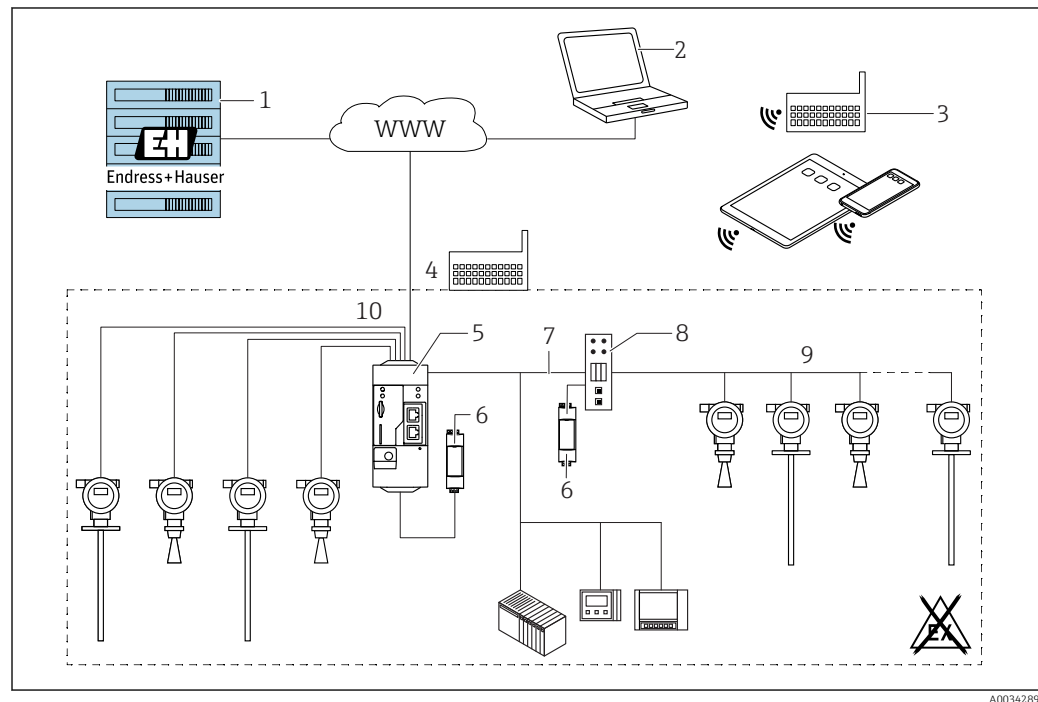
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20 Example of inventory management platform with SupplyCare Enterprise SCE30B

- 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.



21 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

- ATEX
- IECEx
- CSA
- FM
- NEPSI
- KC
- INMETRO
- TIIS ⁵⁾
- EAC

Additional safety instructions must be followed for use in hazardous areas. Please refer to the separate "Safety Instructions" (XA) document included in the delivery. Reference to the applicable XA can be found on the nameplate.



For details on the available certificates and associated XAs: → 68

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: No. requested

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".

5) in preparation

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 EN 302729-1/2

The devices comply with the Level Probing Radar (LPR) radio standard EN 302729-1/2. The devices are approved for unrestricted use inside and outside closed containers in countries of the EU and the EFTA that have already implemented this standard.

The following countries are those that have currently implemented the directive:

Belgium, Bulgaria, Germany, Denmark, Estonia, France, Greece, UK, Ireland, Iceland, Italy, Liechtenstein, Lithuania, Latvia, Malta, The Netherlands, Norway, Austria, Poland, Portugal, Romania, Sweden, Switzerland, Slovakia, Spain, Czech Republic and Cyprus.

Implementation is still underway in all of the countries not listed.

Please note the following for operation of the devices outside of closed vessels:

1. Installation must be carried out by properly trained, expert staff.
2. The device antenna must be installed in a fixed location pointing vertically downwards.
3. The installation site must be located at a distance of 4 km from the astronomy stations listed below or otherwise approval must be provided by the relevant authority. If the device is installed at a distance of 4 to 40 km from one of the listed stations, it must not be installed at a height of more than 15 m (49 ft) above the ground.

Astronomy stations

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



As a general rule, the requirements outlined in EN 302729-1/2 must be observed.

51

Feature 100 in the product structure	Process connection
RGJ	Thread ANSI MNPT1-1/2, 316L

- Process connections that do not have CRN approval are not listed in this table.
 - Please refer to the product structure to discover which process connections are available for a specific device type.
 - CRN-approved devices bear the registration number (tbd.) on the nameplate.
- An additional pressure restriction applies for the device versions listed in the table below if they are CRN-approved. The pressure range indicated in the "Process" section → 32 continues to apply for device versions not listed in the table below (in preparation).

Feature 580 "Test, certificate"	Description
JA	3.1 Material certificate, wetted metal parts, EN10204-3.1 inspection certificate

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

- 550 "Calibration"
- 580 "Test, certificate"

Hard-copy product documentation	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



- Up-to-the-minute configuration data

- 55

 The following points must be considered if option F3 (3-point linearity protocol) was selected in feature 550 ("Calibration").

A0032642

- | Measuring point | Position |
|---------------------|--|
| 1st measuring point | <ul style="list-style-type: none"> ■ At a distance A from the reference point ■ A = length of antenna + 500 mm (19.7 in) ■ Minimum distance: A_{min} = 1 000 mm (39.4 in) |
| 2nd measuring point | In the middle between the 1st and 3rd measuring point |
| 3rd measuring point | 6 000 mm (236 in) below the reference point R |

-  The position of the measuring points can vary by ± 1 cm (± 0.04 in).
-  The linearity check is performed under reference operating conditions.

The 5 points of the linearity protocol are evenly distributed over the measuring range (0% - 100%). **Empty calibration** (E) and **Full calibration** (F) must be specified in order to define the measuring range⁶⁾.

A diagram illustrating a vertical stack of three plates. The top plate is labeled 'R', the middle plate is labeled 'A', and the bottom plate is labeled 'F'. A camera is positioned above the top plate. Arrows indicate the vertical distance between the plates: 'A' for the distance between the top and middle plates, and 'F' for the distance between the middle and bottom plates. A dashed line extends from the top plate to the right, and another dashed line extends from the bottom plate to the right.



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Services

The following services can be selected via the product structure in the Product Configurator⁷⁾:

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

- PWIS-free (PWIS = paint-wetting impairment substances)
- Customized parameterization HART →  58
- Customized parameterization PA →  58
- Customized parameterization FF →  58
- W/o tooling DVD (FieldCare)
- Hard-copy product documentation

Application Packages

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 (→  68); 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 DTM⁸⁾ 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.

 SD01870F

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

Availability

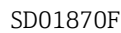
Function

- ## "Foam detection" wizard

- ## "Build-up detection" wizard

- ### Advantages

- ### Detailed description



Accessories

Device-specific accessories

Weather protection cover

Accessory	Description
Weather protection cover	222 (8.74) 300 (11.8) 255.1 (10) 38 (1.5) 55° 275 (10.8) 164 (6.46) 54 (2.13) 35° 65° 156 (6.14) 23 Weather protection cover; Dimensions: mm (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 71162242.

Mounting bracket adjustable

A0032295

- 1) Feature 040 in the product structure
- 2) Feature 070 in the product structure
- 3) Feature 100 in 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 or M). 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 or M ("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.

Gas-tight feedthrough

Accessories	Description
Gas-tight feedthrough	Chemically inert glass feedthrough; prevents gases from entering the electronics housing To order with the device: product structure, feature 610 "Accessory mounted", option NC "Gas-tight feedthrough"

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

Service-specific accessories

System components

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Supplementary documentation

-  For an overview of the scope of the associated Technical Documentation, refer to the following:
- The *W@M Device Viewer*: enter the serial number from the nameplate (www.endress.com/deviceviewer)
 - The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

 The following document types are available:
In the Download Area of the Endress+Hauser Internet site: www.endress.com → Downloads

Standard documentation

Micropilot FMR60

Correlation of documentations to the device:

Device	Power supply, output ¹⁾	Communication	Document type	Document code
FMR60	A, B, C, K, L	HART	Operating Instructions	BA01618F
			Brief Operating Instructions	KA01251F
			Description of Device Parameters	GP01101F

1) Feature 020 in the product structure

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.

 The nameplate indicates the Safety Instructions (XA) that are relevant to the device.

Feature 010	Approval	Feature 020 "Power Supply; Output"		
		A ¹⁾	B ²⁾	C ³⁾
BA	ATEX II 1G Ex ia IIC T6 Ga	XA01549F	XA01549F	XA01549F
BB	ATEX II 1/2G Ex ia IIC T6 Ga/Gb	XA01549F	XA01549F	XA01549F
BC	ATEX II 1/2G Ex ia/db [ia Ga] IIC T6 Ga/Gb	XA01552F	XA01552F	XA01552F
BG	ATEX II 3G Ex ec IIC T6 Gc	XA01551F	XA01551F	XA01551F
BH	ATEX II 3G Ex ic IIC T6 Gc	XA01551F	XA01551F	XA01551F
B2	ATEX II 1/2G Ex ia IIC T6 Ga/Gb, 1/2D Ex ia IIIC T85°C Da/Db	XA01555F	XA01555F	XA01555F
B3	ATEX II 1/2G Ex ia/db [ia Ga] IIC T6, Ga/Gb 1/2D Ex ta/tb IIIC T85°C Da/Db	XA01556F	XA01556F	XA01556F
B4	ATEX II 1/2G Ex ia IIC T6 Ga/Gb, Ex ia/db [ia Ga] IIC T6 Ga/Gb	XA01553F	XA01553F	XA01553F
CB	CSA IS Cl.I Div.1 Gr.A-D	XA01612F	XA01612F	XA01612F
CC	CSA XP Cl.I Div.1 Gr.A-D [Ex ia]	XA01613F	XA01613F	XA01613F
C2	CSA IS Cl.I,II,III Div.1 Gr.A-G, Ex ia, NI Cl.1 Div.2 [Ex ia]	XA01612F	XA01612F	XA01612F
C3	CSA XP Cl.I,II,III Div.1 Gr.A-G, Zn0/1, NI Cl.I Div.2 [Ex ia]	XA01613F	XA01613F	XA01613F
FA	FM IS Cl.I Div.1 Gr.A-D	XA01615F	XA01615F	XA01615F
FB	FM IS Cl.I,II,III Div.1 Gr.A-G, AEx ia, NI Cl.1 Div.2	XA01615F	XA01615F	XA01615F
FC	FM XP-IS Cl.I Div.1 Gr.A-D, AIS Cl.I Div.1 Gr.A-D	XA01616F	XA01616F	XA01616F
FD	FM XP-IS Cl.I Div.1 Gr.A-D, Zn0/1, DIP-IS Cl.I,III Div.1 Gr.E-G, NI Cl.I Div.2	XA01616F	XA01616F	XA01616F
GA	EAC 0Ex ia IIC T6...T3 Ga X	XA01617F	XA01617F	XA01617F
GB	EAC Ga/Gb Ex ia IIC T6...T3 X	XA01617F	XA01617F	XA01617F
GC	EAC Ga/Gb Ex ia/db [ia Ga] IIC T6...T3 X	XA01618F	XA01618F	XA01618F
IA	IEC Ex ia IIC T6 Ga	XA01549F	XA01549F	XA01549F
IB	IEC Ex ia IIC T6 Ga/Gb	XA01549F	XA01549F	XA01549F

- 1) 2-wire; 4-20mA HART
- 2) 2-wire; 4-20mA HART, switch output
- 3) 2-wire; 4-20mA HART, 4-20mA
- 4) in preparation

