



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Technical Information

Levelflex FMP55

Guided Level-Radar

Interface and level measurement in liquids



Application

- FMP55 – premium device with coated multiparameter probe for interface measurement in the oil & gas, chemical and power industry.
- Safe measured values both for the interface layer and the overall level by a redundant measuring system.
- Measuring range up to 10 m (33 ft)
- Process connection flange
- Temperature range:
 - 50 to +200 °C (–58 to +392 °F)
- Pressure range: –1 to 40 bar (–14.5 to 580 psi)
- The following interfaces are available for system integration:
 - HART with 4...20 mA analog
 - PROFIBUS PA
- Used for level monitoring (MIN, MAX, range) up to SIL 2, independently assessed by TÜV as per IEC 61508

Your benefits

- Reliable measuring:
 - for interface with emulsion
 - in case of moved surface and foam
 - for changing medias
- High availability
- Integrated data memory
- Factory precalibrated
- Intuitive, menu-guided operating concept in national languages
- Simple integration into control or asset management systems
- Exact instrument and process diagnosis to assist fast decisions
- Approvals: ATEX, IEC Ex, FM, CSA

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Important document information

Document conventions



Electrical symbols

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

Symbols and notation for certain types of information

Symbol	Meaning
 A0011182	Allowed Indicates procedures, processes or actions that are allowed.
 A0011183	Preferred Indicates procedures, processes or actions that are preferred.
 A0011184	Forbidden Indicates procedures, processes or actions that are forbidden.
 A0011193	Tip Indicates additional information.
 A0011194	Reference to documentation Refers to the corresponding device documentation.
 A0011195	Reference to page Refers to the corresponding page number.
 A0011196	Reference to graphic Refers to the corresponding graphic number and page number.

Symbols and notation in graphics

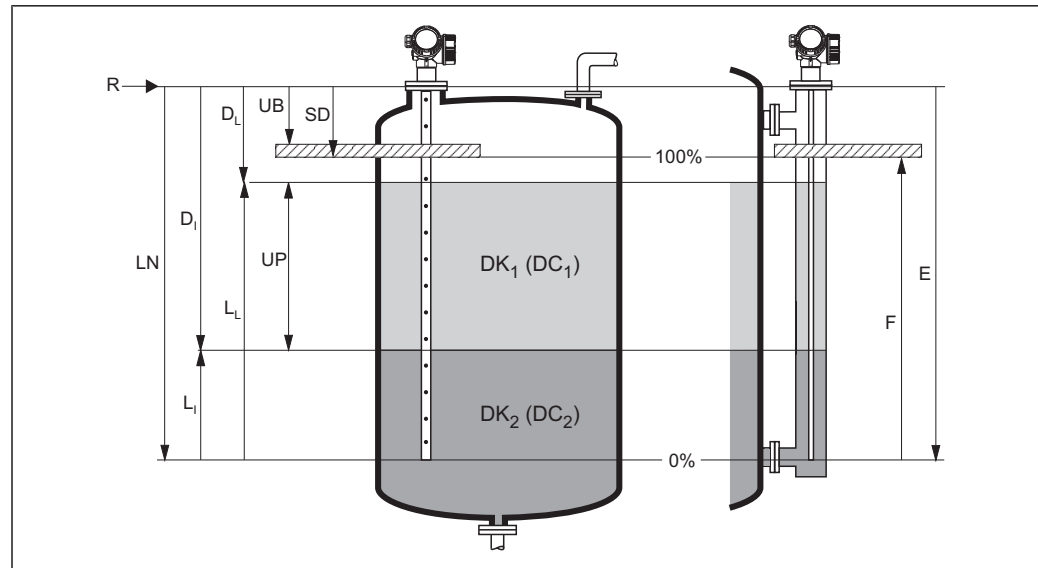
Symbol	Meaning
1,2,3 ...	Item numbers
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections
 A0011187	Hazardous area Indicates a hazardous area.
 A0011188	Safe area (non-hazardous area) Indicates a non-hazardous location.

Function and system design

Measuring principle

The Levelflex is a "downward-looking" measuring system that functions according to the ToF method (ToF = Time of Flight). The distance from the reference point to the product surface is measured. High-frequency pulses are injected to a probe and led along the probe. The pulses are reflected by the product surface, received by the electronic evaluation unit and converted into level information. This method is also known as TDR (Time Domain Reflectometry).

Bei der Trennschichtmessung wird diese Methode mit einer kapazitiven Messung kombiniert.



A001177

R = reference point of measurement *SD* = safety distance
E = empty calibration (= zero) *D_L* = distance level complete
F = full calibration (= span) *L_L* = level complete
LN = probe length *D_I* = distance interface (distance flange / *DC₂*)
UB = upper blocking distance *L_I* = level interface (distance probe end / *DC₁*)
UP = thickness upper medium

Dielectric constant

The dielectric constant (DC) of the medium has a direct impact on the degree of reflection of the high-frequency pulses. In the case of large DC values, such as for water or ammonia, there is strong pulse reflection while, with low DC values, such as for hydrocarbons, weak pulse reflection is experienced.

Input

The reflected pulses are transmitted from the probe to the electronics. There, a microprocessor analyzes the signals and identifies the level echo which was generated by the reflection of the high-frequency pulses at the product surface. This clear signal detection system benefits from over 30 years' experience with pulse time-of-flight procedures that have been integrated into the development of the PulseMaster® software.

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

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

where *c* is the speed of light.

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

$$L = E - D$$

Reference point for "E" see diagram above.

The Levelflex possesses functions for interference echo suppression that can be activated by the user. They guarantee that interference echoes from e.g. internals and struts are not interpreted as level echoes.

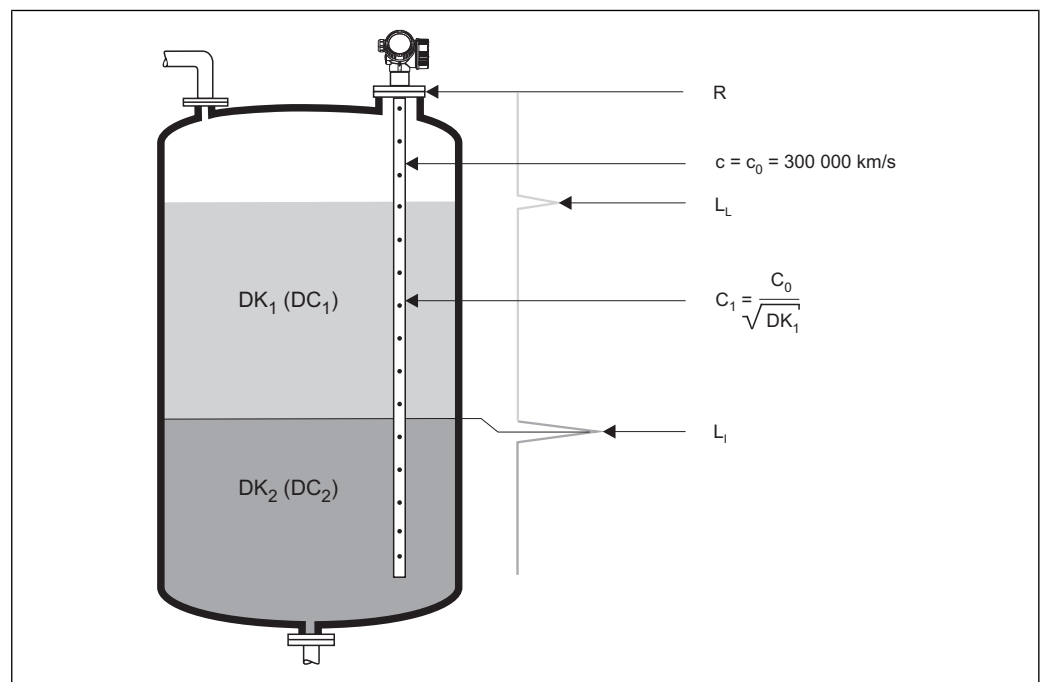
Output

The Levellflex is preset at the factory to the probe length ordered so that in most cases only the application parameters that automatically adapt the device to the measuring conditions need to be entered. For models with a current output, the factory adjustment for zero point E and span F is 4 mA and 20 mA, for digital outputs and the display module 0 % and 100 %. A linearization function with max. 32 points, which is based on a table entered manually or semi-automatically, can be activated on site or via remote operation. This function allows the level to be converted into units of volume or mass, for example.

Interface measurement

When the high-frequency pulses hit the surface of the medium, only a percentage of the transmission pulse is reflected. In the case of media with a low DK_1 , in particular, the other part penetrates the medium. The pulse is reflected once more at the interface point to a second medium with a higher DK_2 . The distance to the interface layer now can also be determined taking into account the delayed time-of-flight of the pulse through the upper medium.

In addition to this, FMP55 measures the capacitance of the probe. This enables interface measurements even if the second echo is missing due to an emulsion layer between the two phases.



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L_L = level complete

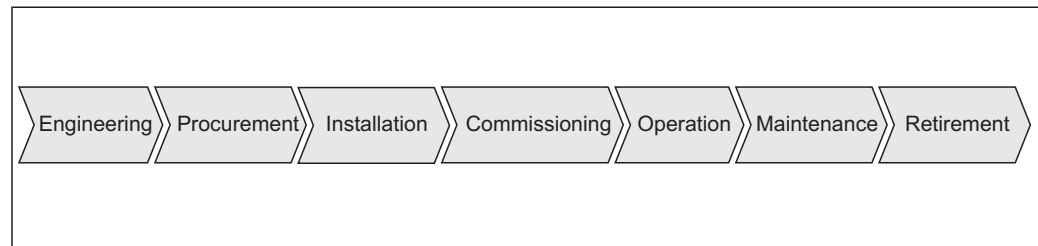
L_I = level interface

R = reference point of measurement


In addition, the following general conditions must be observed for interface measurement:

- The DK of the upper medium must be known and constant. The DK can be determined with the aid of the DK manual SD106F. In addition, whenever the interface thickness is existing and known, the DK can be calculated automatically via FieldCare.
- The DK of the upper medium may not be greater than 10.
- The DK difference between the upper medium and lower medium must be >10 .
- The interface must have a minimum thickness of 60 mm (interface electronics version) or 100 mm (special version).

Life cycle of the product



A0013773-EN

 1 Life cycle process

Engineering

- Universal measuring principle
- Measurement unaffected by medium properties
- Hardware and software developed according to SIL IEC 61508
- Genuine, direct interface measurement

Procurement

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

Installation

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

Commissioning

- Fast, menu-guided commissioning in only 6 steps
- Plain text display in national languages reduces the risk of error or confusion
- Direct local access of all parameters
- Short instruction manual at the device

Operation

- SensorFusion provides redundant measurement for highest safety
- Multi-echo tracking: Increased echo rate and analysis as well as automatic suppression of interfering echoes
- Diagnostics in accordance with NAMUR NE107

Maintenance

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

Retirement

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

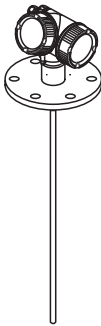

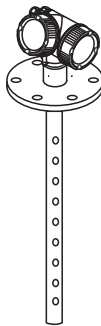
Measuring system

General notes on probe selection

- For interface measurement, ideally coax probes or rod probes are used in the bypass/stilling well.
- Coax probes are suited to liquids with viscosities of up to approx. 500 cst. Coax probes can measure most liquefied gases, as of a dielectric constant of 1.4. Moreover, installation conditions, such as nozzles, tank internal fittings etc., have no effect on the measurement when a coax probe is used. A coax probe offers maximum EMC safety when used in plastic tanks.
- Rod or rope probes for free installation in the tank available on request. Rope probes may not be used in the bypass/stilling well since the end weight always causes interference reflection which can be misinterpreted during interface measurement.

Probe selection

The various types of probe in combination with the process connections are suitable for the following applications:

Levellflex FMP55					
Type of probe	Rod probe		Rope probe		Coax probe
	 A0011357		 A0011358		 A0011359
Feature 060 - Probe:	Option:		Option:		Option:
	CA	16 mm (PFA>316L)	NA	4 mm (PFA>316)	UA ... mm (316L)
	CB	16 mm (PFA>316L)	ND	1/6" (PFA>316)	UB ... inch (316L)
Max. probe length	4 m (13 ft)		10 m (33 ft)		6 m (20 ft)
For application	level and interface measurement in liquids				

Input

Measured variable	<p>The measured variable is the distance between the reference point and the product surface.</p> <p>Subject to the empty distance entered "E" the level is calculated.</p> <p>Alternatively, the level can be converted into other variables (volume, mass) by means of linearization (32 points).</p>
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Measuring range	<p>The following table describes the media groups and the possible measuring range as a function of the media group.</p> <p>The maximum measuring range is:</p> <ul style="list-style-type: none"> ■ for rope probe in bypass or stilling well up to 10 m (33 ft) ■ for rod probe in bypass or stilling well up to 4 m (13 ft) ■ for coax probe up to 6 m (20 ft)
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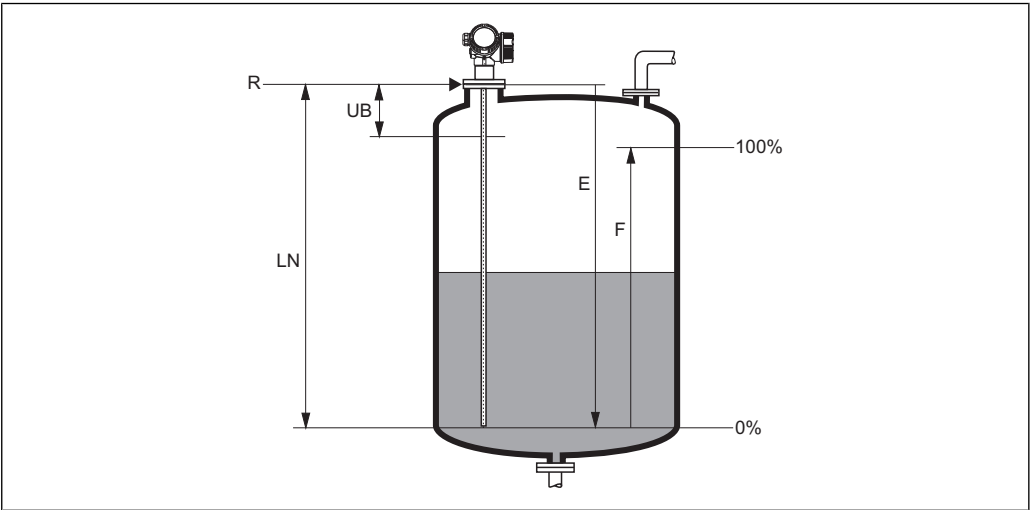
Levelflex FMP55					
Media group	DC (ϵ_r)	Typical liquids	Measuring range ¹⁾		coax probes
			PFA-coated rod probes	PFA-coated rope probes	
1	1.4...1.6	condensed gases, e.g. N ₂ , CO ₂	—	—	6 m (20 ft)
2	1.6...1.9	<ul style="list-style-type: none"> ■ liquefied gas, e.g. propane ■ solvent ■ Freon ■ palm oil 	4 m (13 ft)	12 to 15 m (39 to 49 ft)	6 m (20 ft)
3	1.9...2.5	mineral oils, fuels	4 m (13 ft)	15 to 25 m (49 to 82 ft)	6 m (20 ft)
4	2.5...4	<ul style="list-style-type: none"> ■ benzene, styrene, toluene ■ furan ■ naphthalene 	4 m (13 ft)	25 to 35 m (82 to 115 ft)	6 m (20 ft)
5	4...7	<ul style="list-style-type: none"> ■ chlorobenzene, chloroform ■ cellulose spray ■ isocyanate, aniline 	4 m (13 ft)	35 to 45 m (115 to 148 ft)	6 m (20 ft)
6	> 7	<ul style="list-style-type: none"> ■ aqueous solutions ■ alcohols ■ acids, alkalis 	4 m (13 ft)	45 m (148 ft)	6 m (20 ft)

1) The measuring range for interface measurement is limited to 10 m (33 ft). Larger measuring range available on request.

- Reduction of the max. possible measuring range through buildup, above all of moist products.
- Due to the high diffusion rate of ammonia it is recommended with gas-tight bushing ¹⁾ for measurements in this medium.


Blocking distance	<p>The upper blocking distance (= UB) is the minimum distance from the reference point of the measurement (mounting flange) to the maximum level.</p>
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1) for FMP55 optionally available



R = reference point of measurement *E* = empty calibration (= zero)
LN = probe length *F* = full calibration (= span)
UB = upper blocking distance

- Blocking distance (factory setting):
- with coax probes: 0 mm (0 in)
 - with rod and rope probes up to 8 m (26 ft): 200 mm (8 in)
 - with rod and rope probes exceeding a length of 8 m (26 ft): 0.025 * (length of probe)

 The specified blocking distances are preset on delivery. Depending on the application these settings can be changed.

Within the blocking distance, a reliable measurement can not be guaranteed.

Measuring frequency spectrum 100 MHz to 1,5 GHz

Output

Output signal

HART

Signal coding	FSK ±0.5 mA over currency signal
Data transmission rate	1200 Baud
Galvanic isolation	Ja

PROFIBUS PA

Signal coding	Manchester Bus Powered (MBP)
Data transmission rate	31,25 KBit/s, voltage mode
Galvanic isolation	Ja

Signal on alarm

- Maintenance information can be viewed via the following interfaces:
- Local display:
 - Error symbol (in accordance with NAMUR Recommendation NE 107)
 - Plain text display
 - Current output: failsafe mode selectable (in accordance with NAMUR Recommendation NE 43):
 - Minimum alarm: 3.6 mA
 - Maximum alarm (= factory setting): 22 mA
 - Digital interface such as HART communication or CDI service interface (in accordance with NAMUR Recommendation NE 107)

Linearization The linearization function of the Micropilot M allows the conversion of the measured value into any unit of length or volume. Linearization tables for calculating the volume in cylindrical tanks are pre-programmed. Other tables of up to 32 value pairs can be entered manually or semi-automatically.

Galvanic isolation All circuits for the outputs are galvanically isolated from each other.

Protocol-specific data

HART

Manufacturer ID	17 (0x11)
Device type ID	0x34
HART specification	6.0
Device description files (DTM, DD)	Information and files under: <ul style="list-style-type: none"> ■ www.endress.com ■ www.hartcom.org
HART load	Min. 250 Ω
HART device variables	The measured values can be freely assigned to the device variables. Measured values for PV (primary variable) <ul style="list-style-type: none"> ■ Level linearized ■ Distance ■ Interface ■ Interface distance ■ Upper interface thickness ■ Electronic temperature ■ Measured capacity ■ Relative echo amplitude ■ Relative interface amplitude ■ Relative interface amplitude Measured values for SV, TV, FV (second, third and fourth variable) <ul style="list-style-type: none"> ■ Level linearized ■ Distance ■ Interface linearized ■ Interface distance ■ Upper interface thickness ■ Terminal voltage ■ Electronic temperature ■ Measured capacity ■ Absolute echo amplitude ■ Relative echo amplitude ■ Absolute interface amplitude ■ Relative interface amplitude ■ Calculated DC
Supported functions	<ul style="list-style-type: none"> ■ Burst mode ■ Additional transmitter status

PROFIBUS PA

Manufacturer ID	17 (0x11)
Ident number	0x1558
Profile version	3.02
GSD file	Information and files under: <ul style="list-style-type: none"> ■ www.endress.com ■ www.profibus.org
GSD file version	

Output values	Analog Input: <ul style="list-style-type: none"> ■ Level linearized ■ Distance ■ Interface ■ Interface distance ■ Upper interface thickness ■ Terminal voltage ■ Electronic temperature ■ Measured capacity ■ Absolute echo amplitude ■ Relative echo amplitude ■ Absolute interface amplitude ■ Relative interface amplitude ■ Calculated DC Digital Input: <ul style="list-style-type: none"> ■ Extended diagnostic blocks ¹⁾ ■ Status output PFS Block
Input values	Analog Output: <ul style="list-style-type: none"> ■ Analog value from PLC (for sensor block external pressure and temperature) ■ Analog value from PLC to be indicated on the display Digital Output: <ul style="list-style-type: none"> ■ Extended diagnostic block ¹⁾ ■ Level limiter ■ Sensor block measurement on ■ Sensor block save history on ■ Status output
Supported functions	<ul style="list-style-type: none"> ■ Identification & Maintenance <ul style="list-style-type: none"> Simple device identification via control system and nameplate ■ Automatic Ident Number Adoption <ul style="list-style-type: none"> GSD compatibility mode with respect to the previous device Levelflex M FMP4x ■ Physical Layer Diagnostics <ul style="list-style-type: none"> Installation check of the PROFIBUS segment and the Levelflex FMP4x via terminal voltage and telegram monitoring ■ PROFIBUS Up-/Download <ul style="list-style-type: none"> Up to 10 times faster reading and writing of parameters via PROFIBUS Up-/Download ■ Condensed Status <ul style="list-style-type: none"> Simple and self-explanatory diagnostic information due to categorization of diagnostic messages

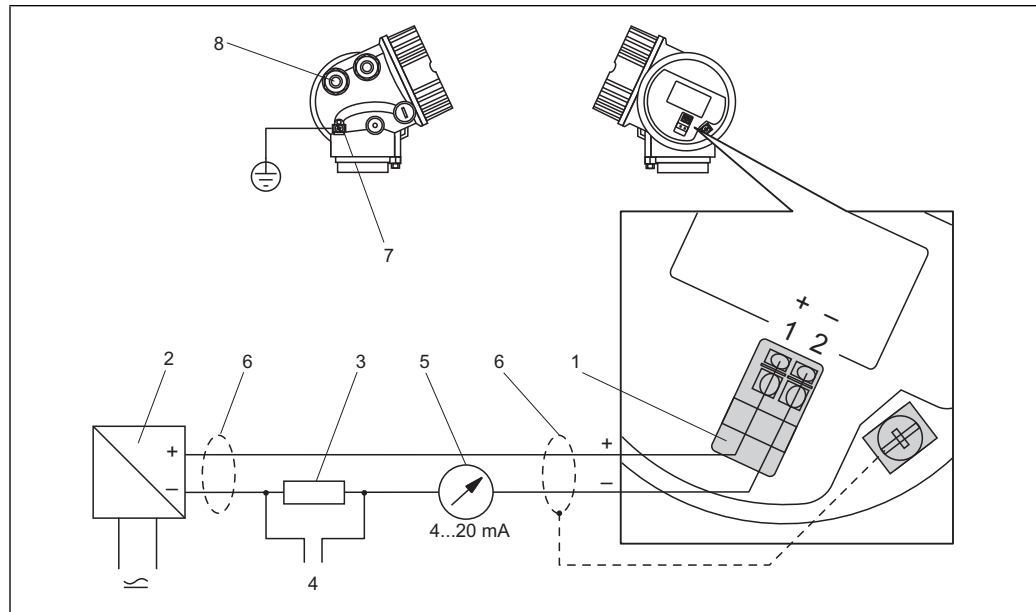
1) in preparation

Auxiliary energy

Electrical connection

2-wire, 4-20mA HART (FMP5x - **A...)

Without integrated overvoltage protection

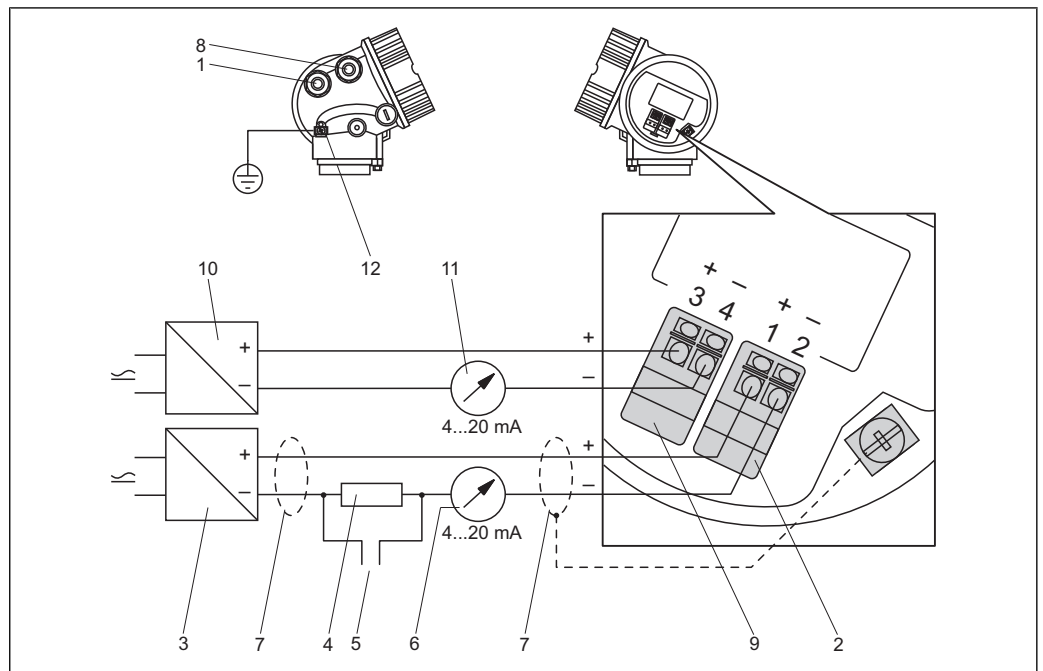


A0011294

- 1 Terminal 4...20mA HART passive
- 2 Active barrier with power supply (e.g. RN221N): Observe terminal voltage (→ 16)
- 3 HART communication resistor ($\geq 250 \Omega$): Observe maximum load (→ 18)
- 4 Connection for Field Communicator 375/475 or Commubox FXA195
- 5 Analog display device: Observe maximum load (→ 18)
- 6 Observe cable specification (→ 17)
- 7 Potential equalization
- 8 Cable entry

2-wire, 4-20 mA HART, 4...20mA

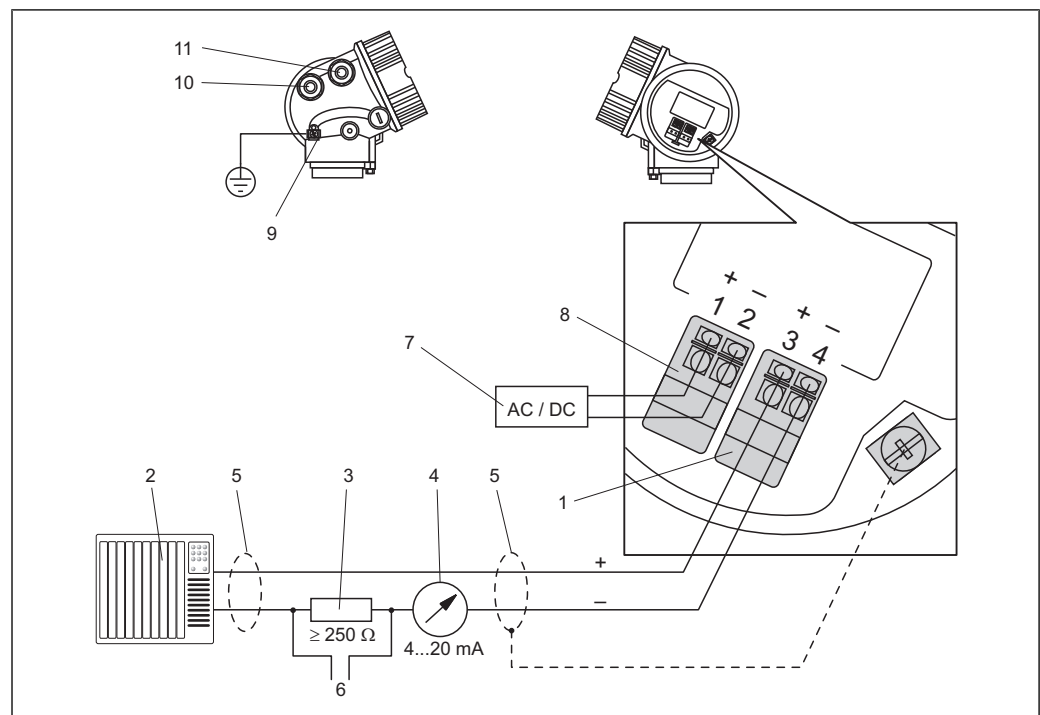
Without integrated overvoltage protection




- 1 Cable entry for current output 1
- 2 Terminal for current output 1
- 3 Supply voltage for current output 1 (e.g. RN221N); Observe terminal voltage (→ 17)
- 4 HART communication resistor ($\geq 250 \Omega$); Observe maximum load (→ 18)
- 5 Connection for Field Communicator 375/475 or Commubox FXA195
- 6 Analog display device ; observe maximum load (→ 18)
- 7 Observe cable specification (→ 17)
- 8 Cable entry for current output 2
- 9 Terminal for current output 2
- 10 Supply voltage for current output 2 (e.g. RN221N); Observe terminal voltage (→ 17)
- 11 Analog display device ; observe maximum load
- 12 Terminal for the potential equalization line

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

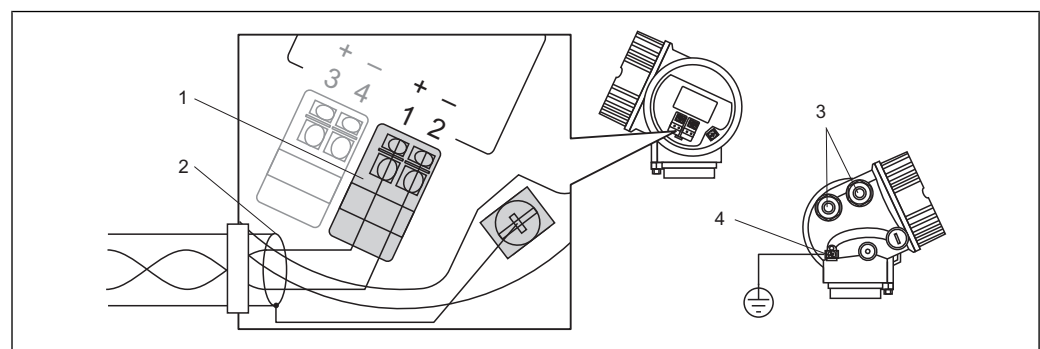
Without integrated overvoltage protection



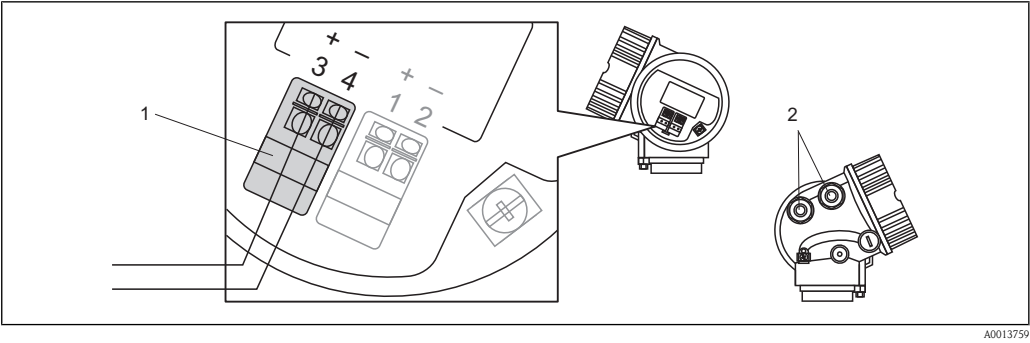
- 1 Terminal 4...20mA HART
- 2 Evaluation unit, e.g. PLC
- 3 HART communication resistor ($\geq 250 \Omega$): Observe maximum load (\rightarrow [Figure 18](#))
- 4 Analog display device: Observe maximum load (\rightarrow [Figure 18](#))
- 5 Observe cable specification (\rightarrow [Figure 17](#))
- 6 Connection Field Communicator 375/475 or Commubox FXA195
- 7 Supply voltage: Observe terminal voltage (\rightarrow [Figure 17](#))
- 8 Terminal supply voltage
- 9 Potential equalization
- 10 Cable entry for power supply
- 11 Cable entry for signal line

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

PROFIBUS PA



- 1 Terminals PROFIBUS PA
- 2 Cable screen
- 3 Cable entry
- 4 Potential equalization

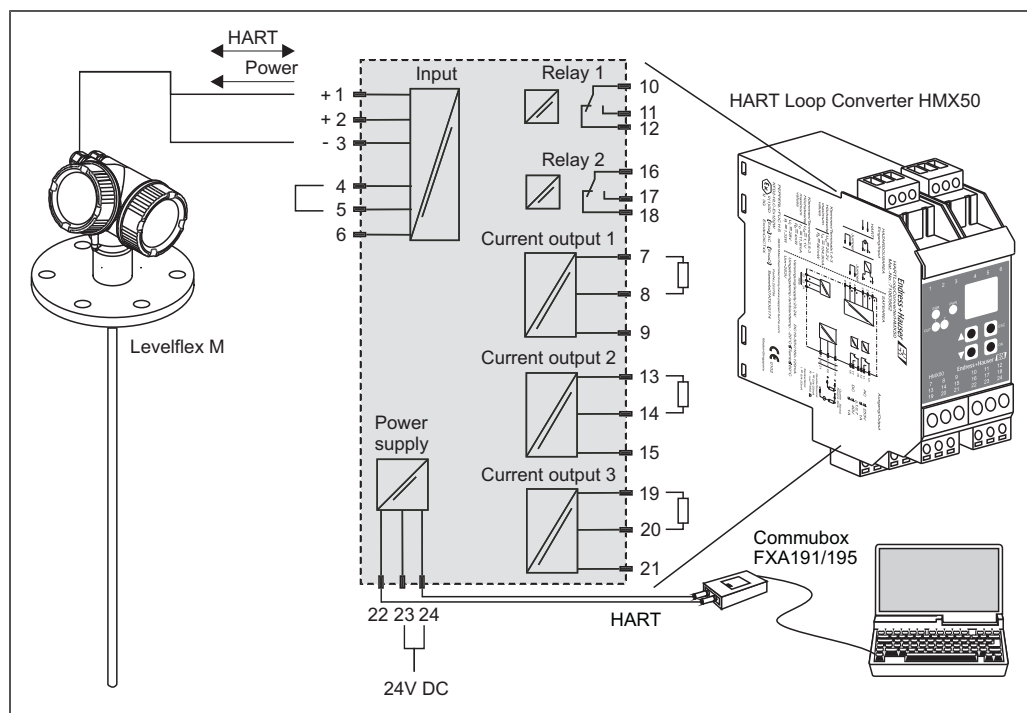


1 Terminals switching output
2 Cable entry

Switching 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	$U = 10.4 \text{ to } 35 \text{ V}_{\text{DC}}$, $I = 0 \text{ to } 70 \text{ mA}$
Insulation voltage	floating, Insulation voltage $1 \text{ } 350 \text{ V}_{\text{DC}}$ to power supply and $500 \text{ V}_{\text{AC}}$ to ground
Switch point	freely programmable, separately for switch-on and switch-off point
Switching delay	freely programmable from 0 to 100 sec. , separately for switch-on and switch-off point
Number of switching cycles	corresponds to the measuring cycle
Signal source device variables	<ul style="list-style-type: none">■ Level linearized■ Distance■ Terminal voltage■ Electronic temperature■ Relative echo amplitude■ Interface linearized■ Interface distance■ Upper interface thickness■ Relative interface amplitude■ Measured capacity
Number of switching cycles	unlimited

Connection HART loop converter HMX50

The dynamic variables of the HART protocol can be converted into individual 4 to 20 mA sections using the HART loop converter HMX50. The variables are assigned to the current output and the measuring ranges of the individual parameters are defined in the HMX50.



A0011356-DE-EN

2 Connection diagram for HART loop converter HMX50 (example: passive 2-wire device and current outputs connected as power source)

The HART loop converter HMX50 can be acquired using the order number 71063562.

Additional documentation: TI429F and BA371F.

Supply voltage

An external power supply is required.

i Various supply units can be ordered from Endress+Hauser: see "Accessories" section (→ 43)

2-wire, 4-20mA HART, passive

"Power Supply, Output" ¹⁾	Outputs	Terminal voltage	"Approval" ²⁾
A: 2-wire; 4-20mA HART	1	17.5 to 35 V	Non-Ex, Ex nA, CSA GP
		17.5 to 32 V	Ex ic
		17.5 to 30 V	Ex ia / IS, Ex d / XP, Ex ic(ia), Ex tD / DIP
C: 2-wire; 4-20mA HART, 4-20mA	1	18.5 to 30 V	all
	2	12 to 30 V	all

1) Feature 020 of the product structure

2) Feature 010 of the product structure

i Load (→ 18)

4-wire, 4-20mA HART, active

"Power supply; Output" ¹⁾	Terminal voltage
K: 4-wire 90-253VAC; 4-20mA HART	90 to 253 V _{AC} (50 to 60 Hz)
L: 4-wire 10,4-48VDC; 4-20mA HART	10.4 to 48 V _{DC}

1) Feature 020 of the product structure

PROFIBUS PA

"Power supply; Output" ¹⁾	Terminal voltage
G: 2-wire; PROFIBUS PA, switch output	9 to 32 V _{DC}

1) Feature 020 der Produktstruktur

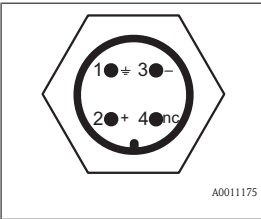
Terminals	Plug-in spring terminals for wire cross-sections 0.5 to 2.5 mm ² (20 to 14 AWG)
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Cable entries	<ul style="list-style-type: none">■ Cable gland (not for Ex d):<ul style="list-style-type: none">– Plastics M20x1,5 with cable Ø 5 to 10 mm (0.2 to 0.39 in): non-Ex, ATEX/IECEX/NEPSI Ex ia/ic/nA– Metal M20x1,5 with cable Ø 7 to 10 mm (0.28 to 0.39 in): dust-Ex, FM IS, CSA IS, CSA GP■ Thread for cable entry:<ul style="list-style-type: none">– ½" NPT– G ½"– M20 × 1.5■ Connector (only for non-Ex, Ex ic, Ex ia): M12 or 7/8"
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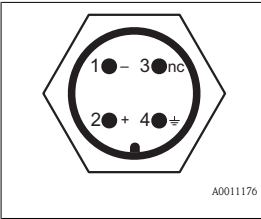
Cable specification	<ul style="list-style-type: none">■ For ambiente temperature T_U≥60 °C (140 °F): use cable for temperature T_U +20 K.■ A normal device cable suffices if only the analog signal is used.■ A shielded cable is recommended if using the HART protocol. Observe grounding concept of the plant.
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Device plug connectors	 For the versions with fieldbus plug connector (M12 or 7/8"), the signal line can be connected without opening the housing.
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Pin assignment of the M12 plug connector

	Pin	Meaning
	1	Ground
	2	Signal +
	3	Signal -
	4	not connected

Pin assignment of the 7/8" plug connector

	Pin	Meaning
	1	Signal -
	2	Signal +
	3	not connected
	4	Ground

Power consumption	min. 60 mW, max. 900 mW
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Current consumption

HART

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

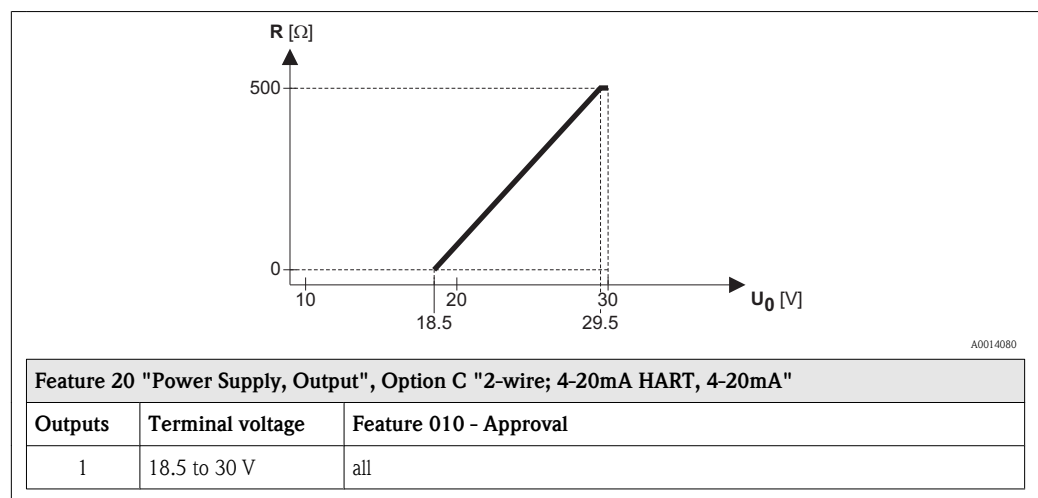
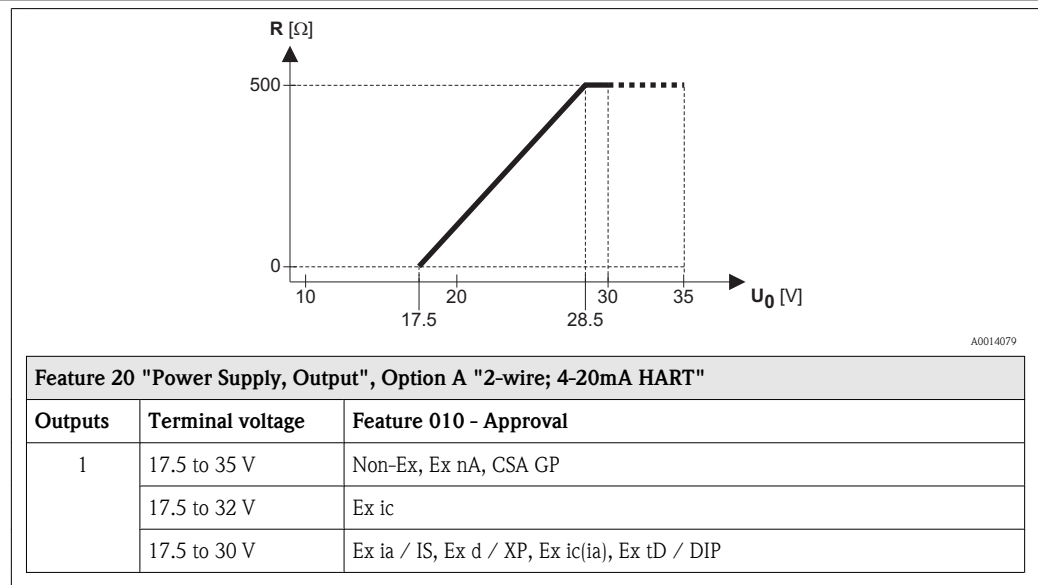
PROFIBUS PA

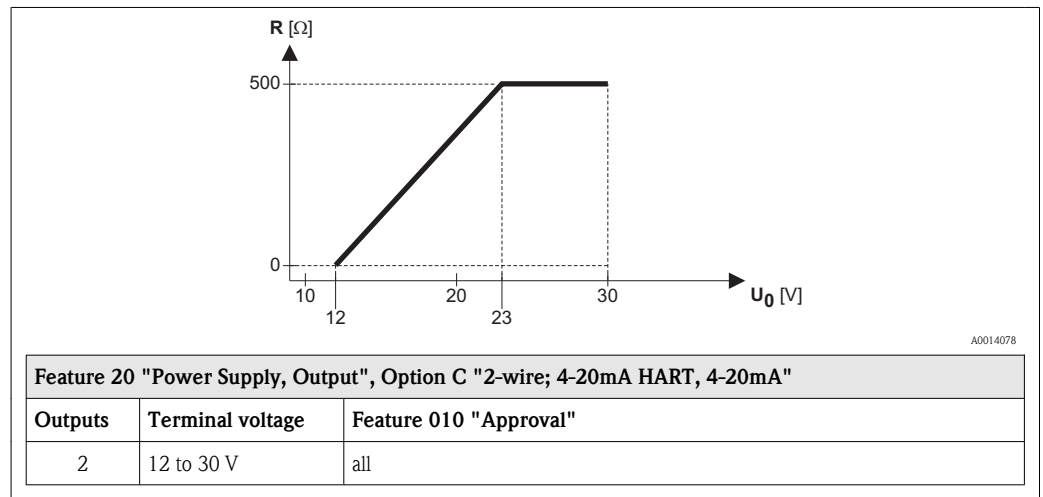
Nominal current	max. 15 mA
Error current FDE (Fault Disconnection Electronic)	0 mA

Power supply failure

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

Load





A0014078

Potential equalization

No special measures for potential equalization are required.



If the device is designed for hazardous areas, observe the information in the documentation "Safety Instructions" (XA, ZD).

Overvoltage protection

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

- Integrated overvoltage protection (in preparation);
Product structure: Feature 610 "Accessory mounted", option NA "Overvoltage protection".
- External overvoltage protection, e.g. Endress+Hauser's HAW262Z.

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 %
- Reflection factor ≥ 0,8 (surface of the water for coax probe, metal plate for rod and rope probe with min. 1 mm (0.04 in) diameter)
- Flange for rod or rope probe ≥ 300 mm (12 in) diameter
- Abstand zu Hindernissen ≥ 1 m (40 in)
- For interface measurement:
 - Coax probe
 - DC of the lower medium = 80 (water)
 - DC of the upper medium = 2 (oil)

Maximum measured error

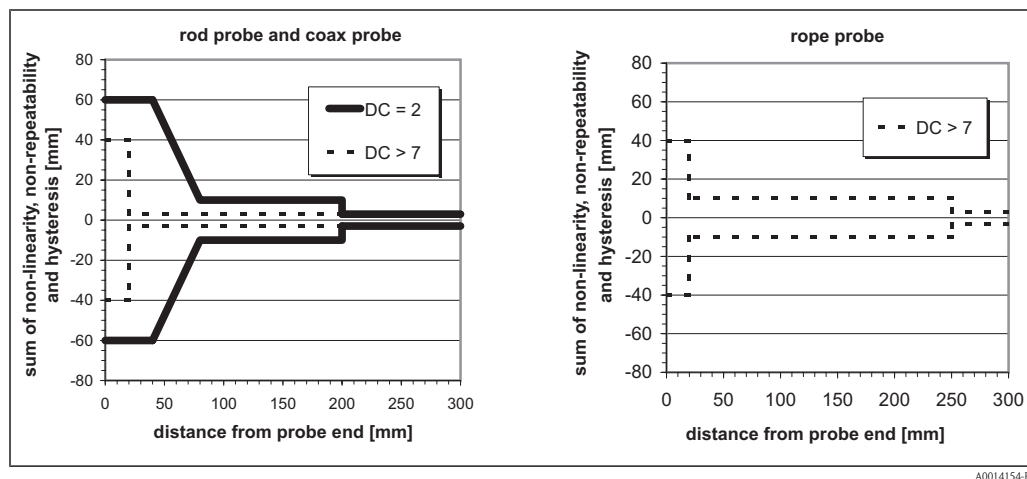
Typical data under reference operating conditions: DIN EN 61298-2, percentage values in relation to the span.

Output:	digital	analog ¹⁾
Sum of non-linearity, nonrepeatability and hysteresis	Level measurement: Measuring range up to 10 m (33 ft): ±2 mm (0.08 in)	±0.02 %
	Interface measurement: <ul style="list-style-type: none"> ■ Measuring range up to 500 mm (19.7 in): ±20 mm (0.79 in) ■ Measuring range >500 mm (19.7 in): ±10 mm (0.39 in) ■ If the thickness of the interface is <100 mm (3.94 in): ±40 mm (1.57 in) 	
Offset / Zero	±4 mm (0.16 in)	±0.03 %

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

If the reference conditions are not met, the offset/zero point arising from the mounting situation may be up to ± 12 mm (0.47 in) for rope and rod probes. This additional offset/zero point can be compensated for by entering a correction (parameter "level correction") during commissioning.

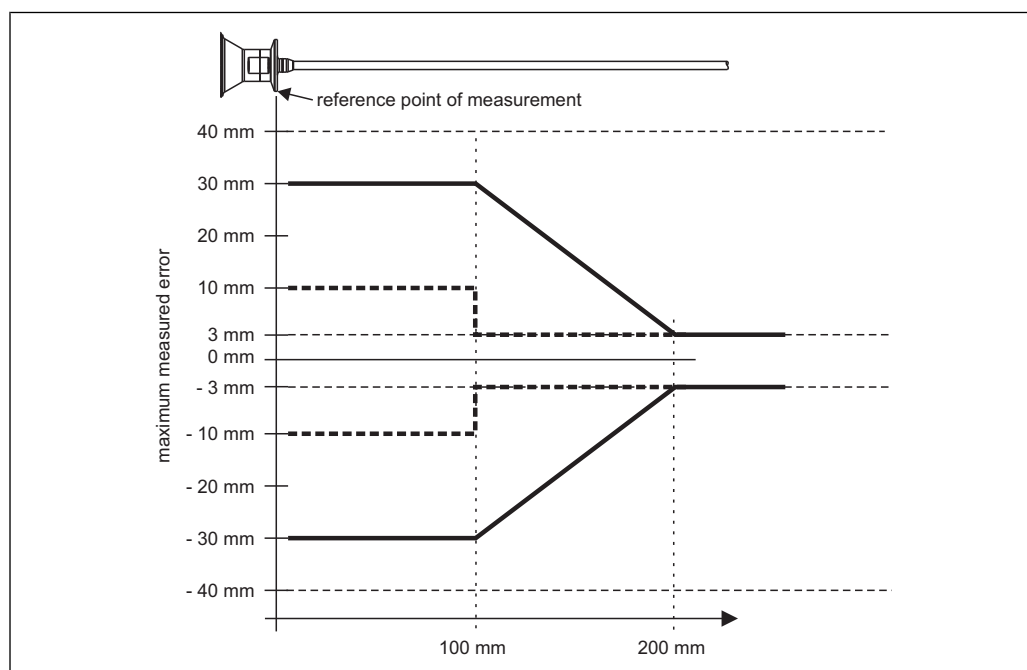
Differing from this, the following measuring error is present in the vicinity of the lower probe end:



A0014154-EN

If for rope probes the DC value is less than 7, then measurement is not possible in the area of the straining weight (0 to 250 mm from end of probe; lower blocking distance).

Differing from this, the following measuring error is present in the vicinity of the upper probe end (rod/rope only):



A0014155-EN

Resolution

- digital: 1 mm
- analog: 1 μ A

Reaction time

The reaction time can be parametrized. The fastest possible reaction time is given by the measuring rate:

Probe length	Level measurement
<10 m (33 ft)	3.6 measurements/second

Probe length	Interface measurement
up to 10 m (33 ft)	≥1.1 measurements/second

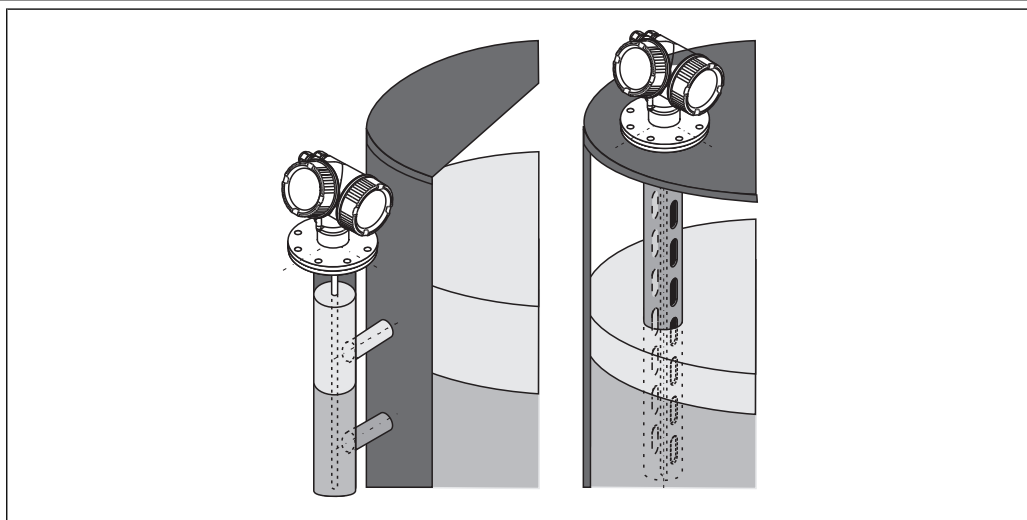
Influence of ambient temperature

The measurements are carried out in accordance with EN 61298-3

- digital (HART, PROFIBUS PA, FOUNDATION Fieldbus): average $T_K = 0.6 \text{ mm}/10 \text{ K}$
- analog (current output):
 - zero point (4 mA): average $T_K = 0.02 \text{ } \%/10 \text{ K}$
 - span (20 mA): average $T_K = 0.05 \text{ } \%/10 \text{ K}$

Operating conditions: Installation

Suitable mounting position



A0011281

- Rod probes: must be mounted in a stilling well or bypass (→ 23)
- Coax probes: can be mounted at an arbitrary distance from the wall of the vessel

Wall and pipe mounting

Endress+Hauser offers a mounting bracket for installing the device on pipes or on walls.

Ordering information: Feature 600 "Probe Design", Option MB "Sensor remote, 3m/9ft cable" (→ 42) or as a separate accessory (part number: 71102216).

Dimensions (→ 30).

Additional mounting hints

Bending strength of rod probes

Sensor	Feature 060	Probe	Bending strength [Nm]
FMP55	CA, CB	Rod 16mm (0.63") PFA>316L	30

Tensile load limit of rope probes

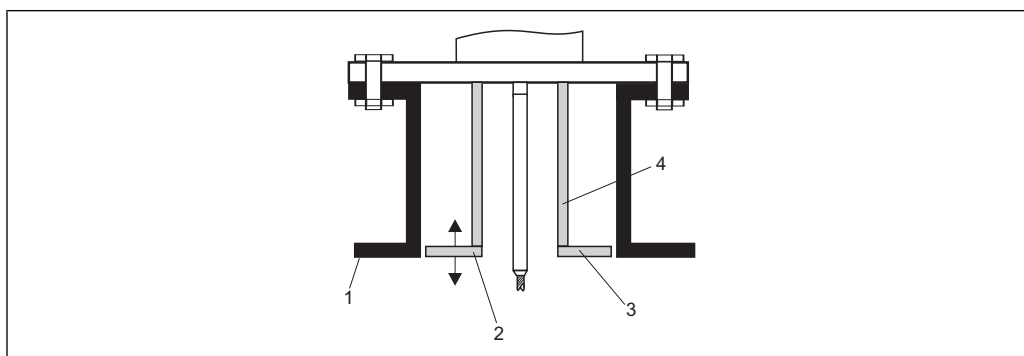
Sensor	Feature 060	Probe	Tensile load limit [kN]
FMP55	NA, ND	Rope 4mm (1/6") PFA>316	2

Bending strength of coax probes

Sensor	Feature 060	Process connection	Probe	Bending strength [Nm]
FMP55	UA, UB	Flange	Coax 316L, Ø 42,4 mm	300

Installation in nozzles \geq DN300

If installation in $\geq 300\text{mm}/12''$ nozzles is unavoidable, installation must be carried out in accordance with the sketch on the right.

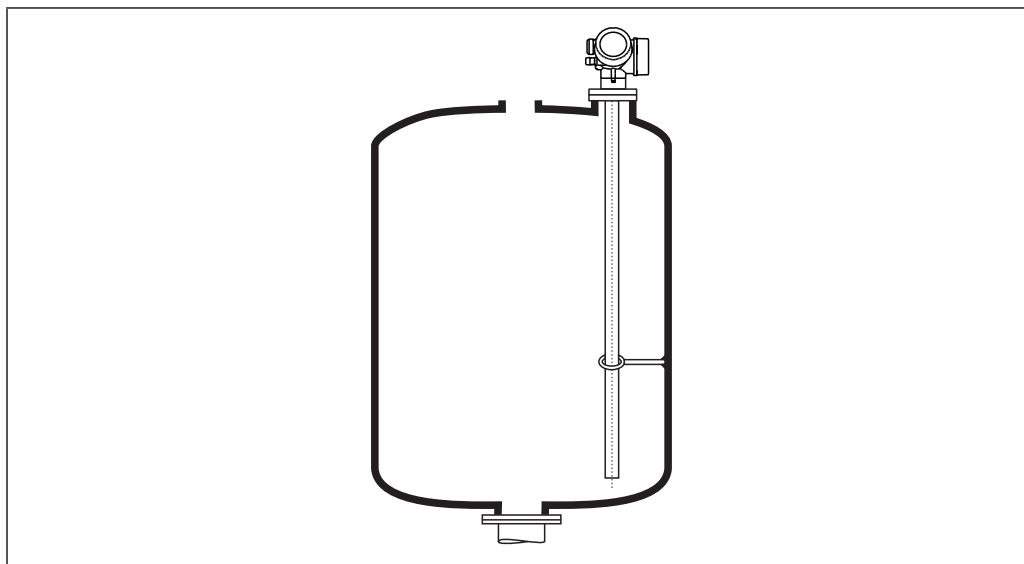


A0014199

- 1 Lower edge of the nozzle
- 2 Approx. flush with the lower edge of the nozzle ($\pm 50\text{ mm}/2''$)
- 3 Plate
- 4 Pipe $\varnothing 150$ to 180 mm (6 to 7 inch)

Nozzle diameter	Plate diameter
300 mm (12'')	280 mm (11'')
$\geq 400\text{ mm}$ (16'')	$\geq 350\text{ mm}$ (14'')

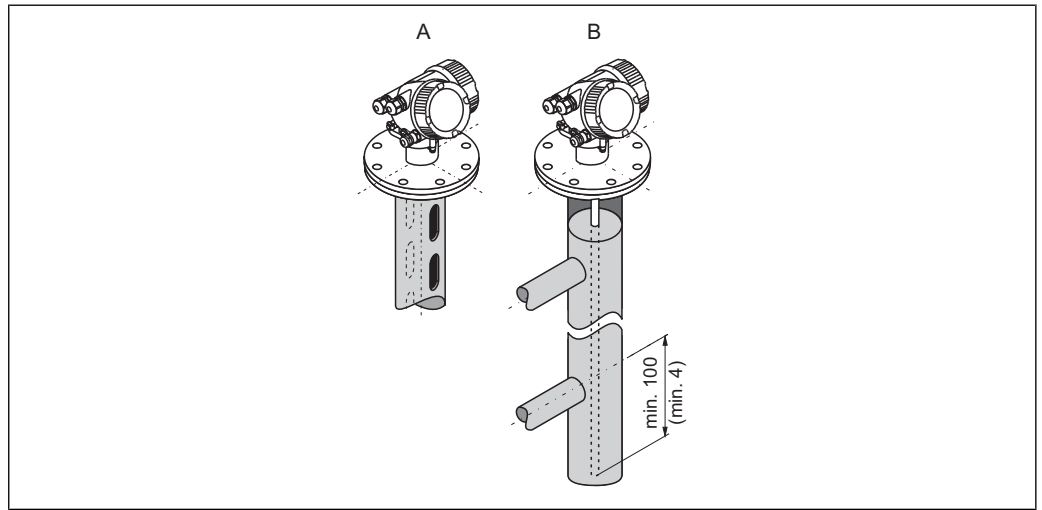
Securing coax probes



A0012608

Coax probes can be supported at any point of the outer tube.

Mounting in bypasses and stilling wells



A0014129

A Mounting in a stilling well
B Mounting in a bypass

- Pipe diameter: > 40 mm (1.6") for rod probes
- Rod probe installation can take place up to a diameter size of 100 mm. In the event of larger diameters, a coax probe is recommended.
- Side disposals, holes or slits and welded joints that protrude up to approx. 5 mm (0.2") inwards do not influence the measurement.
- The pipe may not exhibit any steps in diameter.
- The probe must be 100 mm longer than the lower disposal.
- Within the measuring range, the probe must not get into contact with the pipe wall. If necessary, use a center washer (see feature 610 of the product structure).
- Within the measuring range, the probe must not get into contact with the pipe wall. If necessary, use a PFA center washer (see feature 610 of the product structure).
- Coax probes can always be applied if there is enough mounting space.

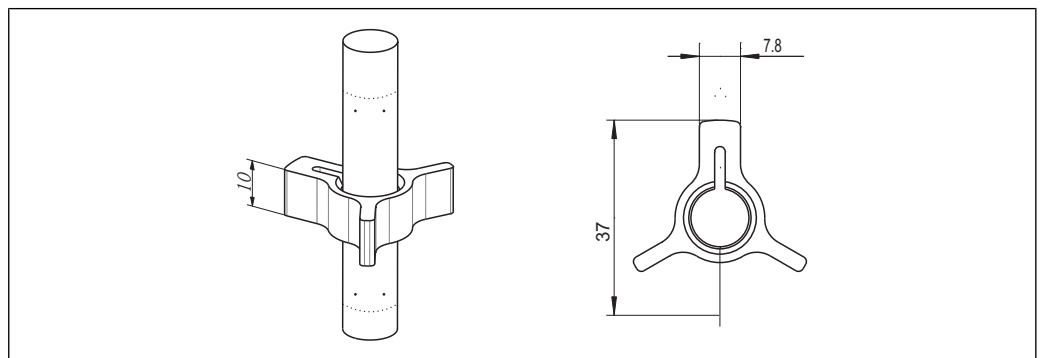
Centering disk PFA

The centering disk is suitable for probes with a rod diameter of 0.63 inch (also coated rod probes) and can be used in pipes from DN40 (1½") upto DN50 (2").

Temperature range: -200 ... +150°C

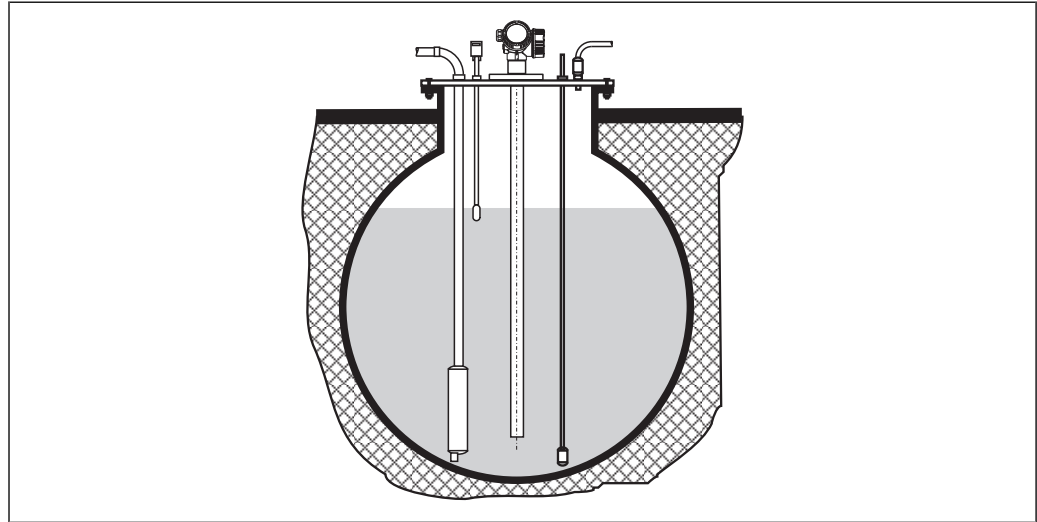
Can be ordered together with FMP53 via feature 610 of the product structure.

Can be ordered separately via order code: 71069065



A0014132

Installation in underground tanks



A0014142

Use coax probe for nozzles with large diameters in order to avoid reflections at the nozzle wall.

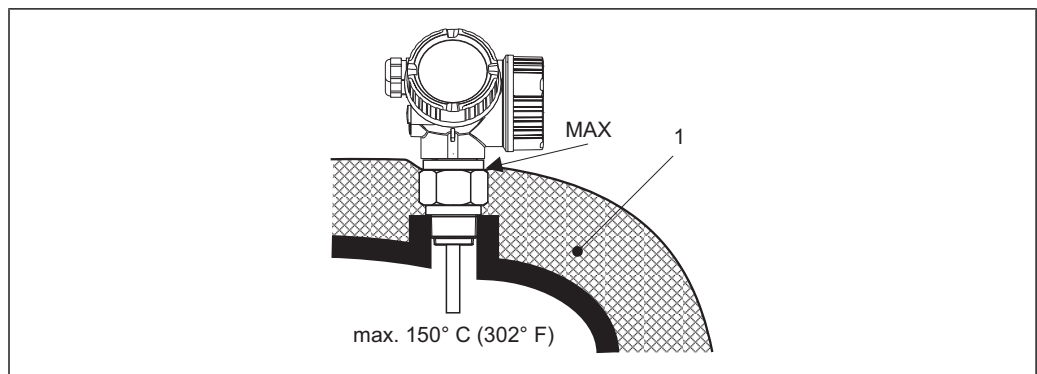
Mounting in non-metallic vessels

When mounting Levelflex in a non-metallic vessel, use a coax probe.

Installation with heat insulation

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

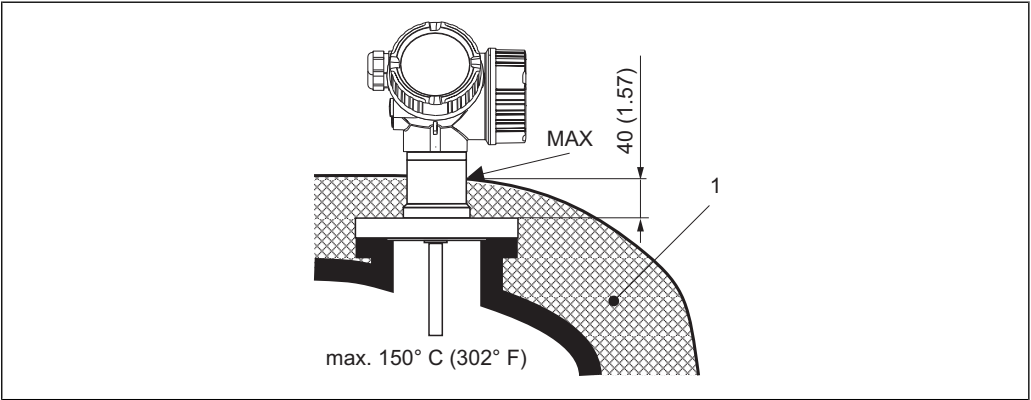
Process connection with thread



A0014143

1 Tank insulation

Process connection with flange



A0014144

1 Tank insulation

Operating conditions: 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.

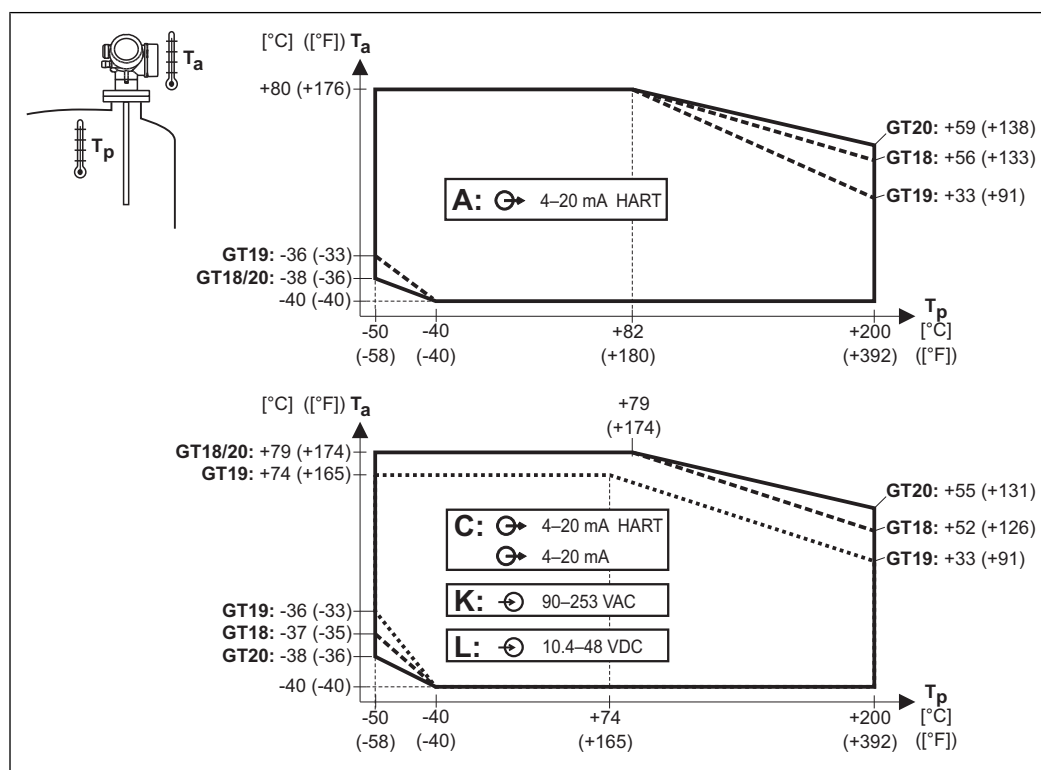
When operating the device in the open with strong sunlight:

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

Ambient temperature limits

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

Temperature derating for FMP55



GT18 = stainless steel housing
GT19 = plastic housing
GT20 = aluminum housing

A = 1 current output
C = 2 current outputs
K, L = 4-wire

T_a = ambient temperature
 T_p = temperature at the process connection

Storage temperature

–40 to +80 °C (–40 to +176 °F)

Climate class

DIN EN 60068-2-38 (test Z/AD)

Degree of protection

- With closed housing tested according to:
 - IP68, NEMA6P (24 h at 1.83 m under water surface)
 - IP66, NEMA4X
 - With open housing: IP20, NEMA1 (also ingress protection of the display)
- i** Degree of protection IP68 NEMA6P applies for M12 PROFIBUS PA plugs only when the PROFIBUS cable is plugged in and is also rated IP68 NEMA6P.

Vibration resistance

DIN EN 60068-2-64 / IEC 68-2-64: 20 to 2000 Hz, 1 (m/s²)/Hz

Cleaning the probe

Depending on the application, contamination or buildup can accumulate on the probe. A thin, even layer only influences measurement slightly. Thick layers can dampen the signal and then reduce the measuring range. Severe, uneven buildup, adhesion e.g. through crystallization, can lead to incorrect measurement. In this case, we recommend that you use a non-contact measuring principle, or check the probe regularly for soiling.

Electromagnetic compatibility (EMC)

Electromagnetic compatibility to EN 61326 and NAMUR Recommendation EMC (NE21). Details are provided in the Declaration of Conformity. A standard installation cable is sufficient if only the analog signal is used.

Use a shielded cable when working with a superimposed communications signal (HART).

Maximum measured error: < 0.5 % of the span.

When installing the probes in metal and concrete tanks and when using a coax probe:

- Interference emission to EN 61326 - x series, electrical equipment Class B.
- Interference immunity to EN 61326 - x series, requirements for industrial areas and NAMUR Recommendation NE 21 (EMC)

The measured value can be affected by strong electromagnetic fields when installing rod and rope probes without a shielding/metallic wall, e.g. in plastic and wooden silos.

- Interference emission to EN 61326 - x series, electrical equipment Class A.
- Interference Immunity: the measured value can be affected by strong electromagnetic fields.

Operating conditions: Process

Process temperature range

The maximum permitted temperature at the process connection is determined by the O-ring version ordered:

Device	O-ring material	Process temperature
FMP55	—	–50 to +20 °C (–58 to +392 °F); vollbeschichtet

Process pressure limits

Device	Process pressure
FMP55	–1 to 40 bar (–14.5 to 580 psi)



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

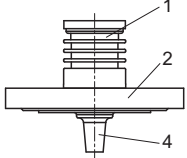
Please refer to the following standards for the pressure values permitted for higher temperatures:

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

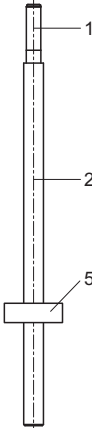
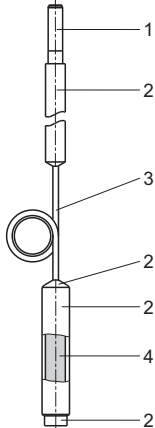
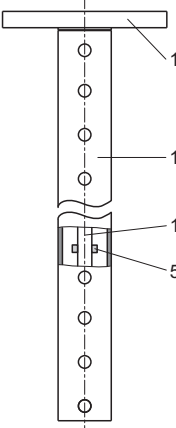
Materials in contact with process



- Endress+Hauser supplies DIN/EN flanges made of stainless steel according to AISI 316L (DIN/EN material number 1.4404 or 1.4435). With regard to their temperature stability properties, the materials 1.4404 and 1.4435 are grouped under 13E0 in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.
- Further material specifications (→ 31)

Levellflex FMP55		
Flange <i>EN/ASME/JIS</i>	No.	Material
	1	304 (1.4301)
	2	316L (1.4435/1.4404)
	4	PTFE (Dyneon TFM1600)

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Levellflex FMP55				
Rod probe Ø 16 mm (2/3") coated	Rope probe Ø 4 mm (1/6") coated	Coax probe	No.	Material
			1	316L (1.4404)
			2	PFA (Daikin PFA AP230)
			3	Rope: 316L (1.4404)
				Coating: PFA
			4	Core: 316L (1.4435)
			5	PFA (Daikin PFA AP230), centering disk

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Dielectric constant

- Coax probes: DC (ϵ_r) ≥ 1.4
- Rod and rope probe (when installing in pipes DN ≤ 150 mm (6 in): DC (ϵ_r) ≥ 1.4)

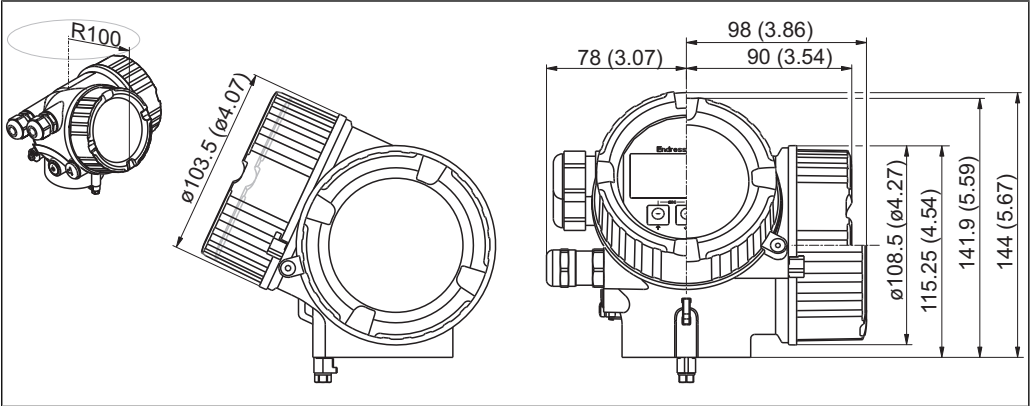
Extension of the rope probes through temperature

4 mm rope:
Elongation through temperature increase from 30 °C (86 °F) to 150 °C (302 °F): 2 mm / m rope length

Mechanical construction

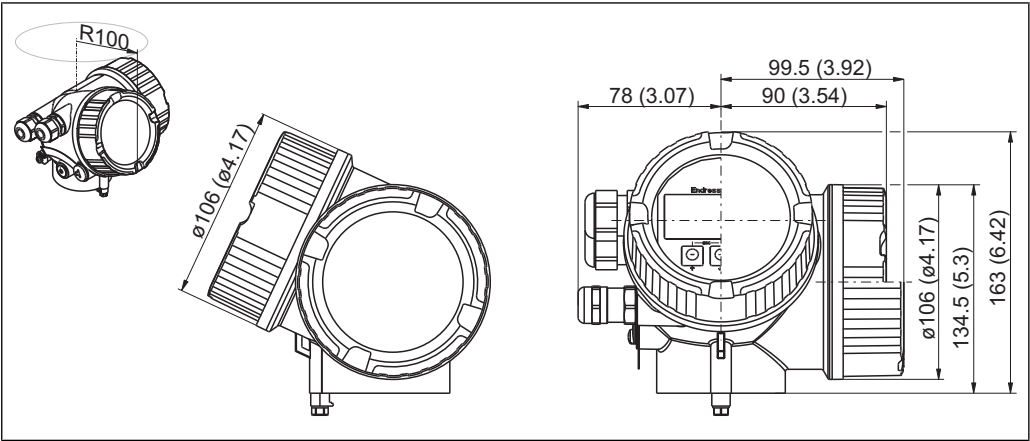
Design, dimensions

Dimensions of the electronics housing



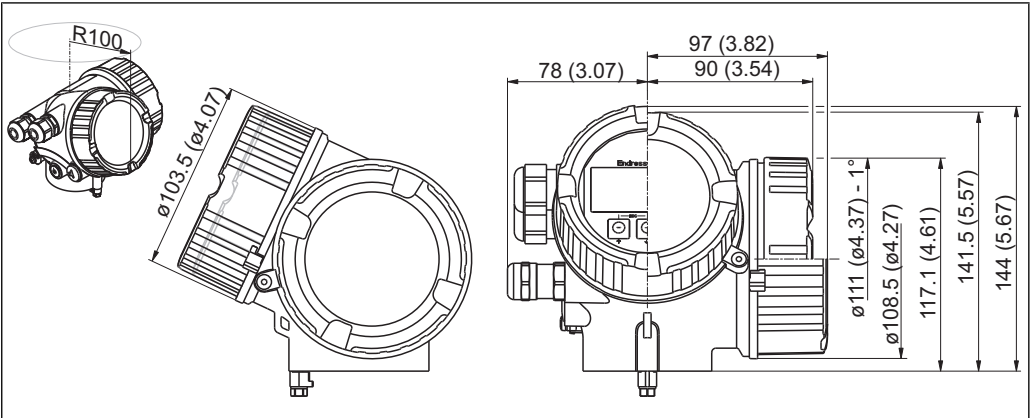
A0011666

3 Housing GT18 (316L); Dimensions in mm (in)



A0011346

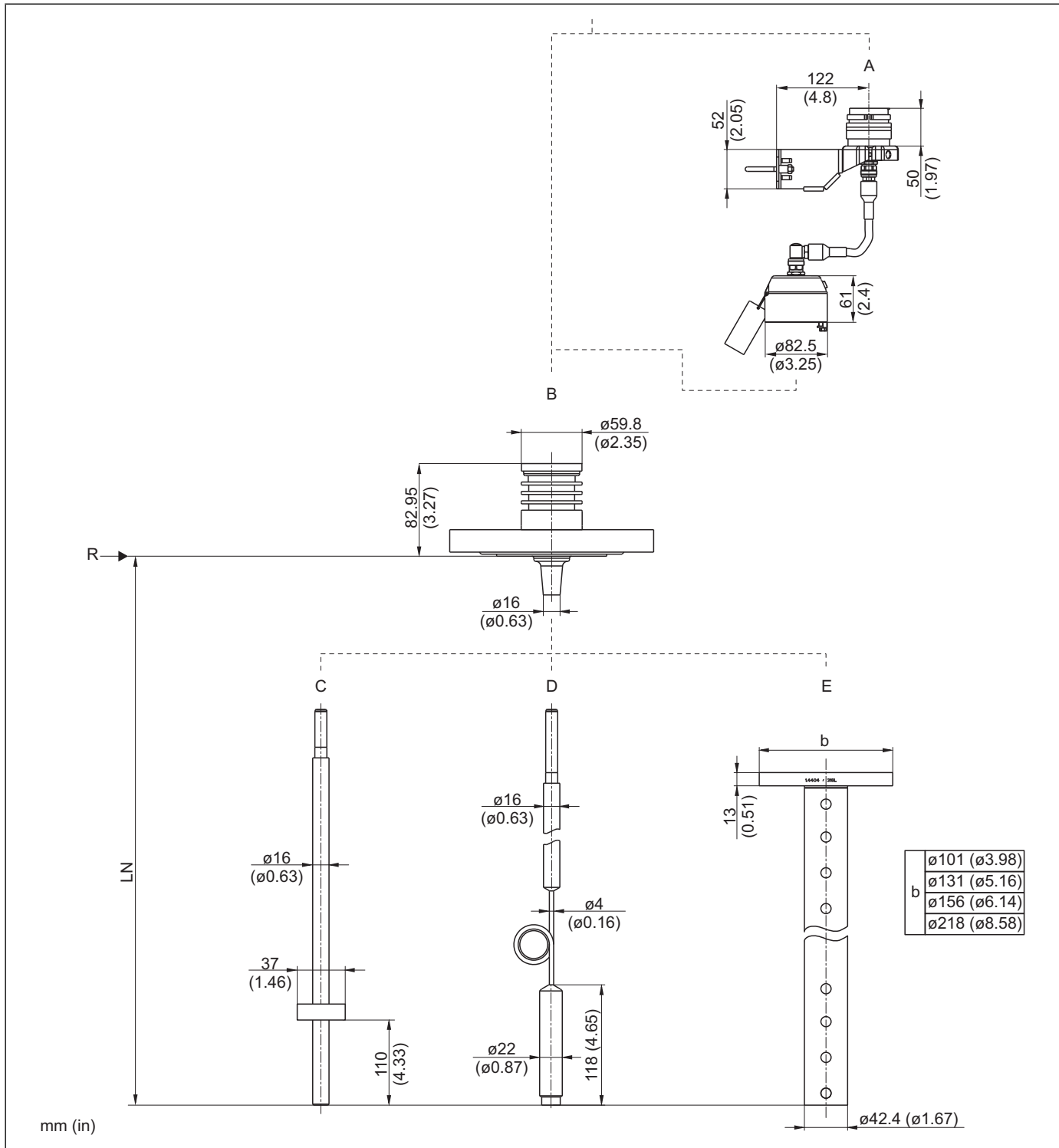
4 Housing GT19 (Plastics PBT); Dimensions in mm (in)



A0011665

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

FMP55: Dimensions of process connection and probe



A0012779

- A Mounting bracket for probe design "Sensor remote" (Feature 600)
- B Process adapter M48x1.5 and flange ANSI B16.5, EN1092-1, JIS B2220 (Feature 100)
- C Rod probe 16mm or 0.63in, PFA>316L (Feature 060)
- D Rope probe 4mm or 1/6", PFA>316 (Feature 060)
- E Coax probe (Feature 060)
- LN Length of probe
- R Reference point of the measurement

Tolerance of probe length

Rod probes				
Over [m (ft)]	—	1 (3,3)	3 (9,8)	6 (20)
Up to [m (ft)]	1 (3,3)	3 (9,8)	6 (20)	—
Admissible tolerance [mm (in)]	-5 (-0,2)	-10 (-0,39)	-20 (-0,79)	-30 (-1,18)

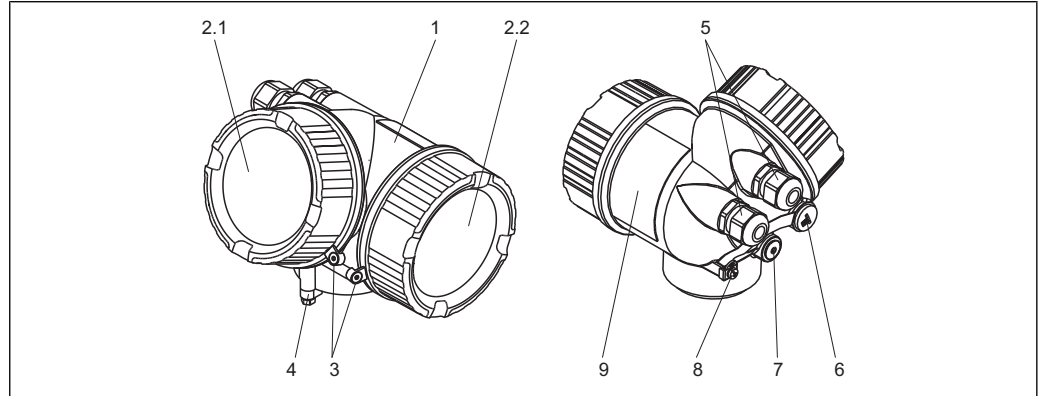
Rope probes				
Over [m (ft)]	—	1 (3,3)	3 (9,8)	6 (20)
Up to [m (ft)]	1 (3,3)	3 (9,8)	6 (20)	—
Admissible tolerance [mm (in)]	-10 (-0,39)	-20 (-0,79)	-30 (-1,18)	-40 (-1,57)

Weight
Housing

Part	Weight
Housing GT18 - stainless steel	approx. 4.5 kg
Housing GT19 - plastic	approx. 1.2 kg
Housing GT20 - aluminium	approx. 1.9 kg

FMP55

Part	Weight	Part	Weight
Sensor	approx. 1.2 kg + weight of flange	Rod probe 16 mm	approx. 1.1 kg/m probe length
Rope probe 4 mm	approx. 0.5 kg/m probe length	Coax probe	approx. 3.5 kg/m probe length

Material


A0013788

Housing GT18 - stainless steel, corrosion-resistant			
No.	Part: material	No.	Part: material
1	Housing: 316L (CF-3M)	5	Cable entry ■ Sealing: EMPB ■ Cable gland: polyamide (PA), nickel-plated brass (CuZn) ■ Adapter: 316L (1.4435)
2.1	Compartment for the display module ■ Cover: 316L (CF-3M) ■ Window: glass ■ Cover seal: EPDM	6	Dummy plug: 316L (1.4404)
2.2	Terminal compartment ■ Cover: 316L (CF-3M) ■ Cover seal: EPDM	7	Pressure relief stopper: 316L (1.4404)

Housing GT18 - stainless steel, corrosion-resistant			
No.	Part: material	No.	Part: material
3	Cover lock ■ Screw: A4 ■ Clamp: 316L (1.4404)	8	Ground terminal ■ Screw: A4 ■ Spring washer: A4 ■ Clamp: 316L (1.4404) ■ Holder: 316L (1.4404)
4	Turn housing ■ Screw: A4-70 ■ Clamp: 316L (1.4404)	9	Identification ■ Nameplate: 304 (1.4301) ■ Groove pin: A2

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

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



Further material specifications

- Materials in contact with process (→ 27)
- Ordering information (→ 39)
- Accessories materials (→ 42)

Human interface

Operating concept

Operator-oriented menu structure for user-specific tasks

- Commissioning
- Operation
- Diagnostics
- Expert level

Quick and safe commissioning

- Guided menus ("Make-it-run" wizards) for applications
- Menu guidance with brief explanations of the individual parameter functions

Reliable operation

- Local operation in several languages possible (→ Product structure → Feature 500 → Additional Operation Language)
- Standardized operation at the device and in the operating tools

Efficient diagnostics increase measurement reliability

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

Display elements

- 4-line display
- Format for displaying measured values 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

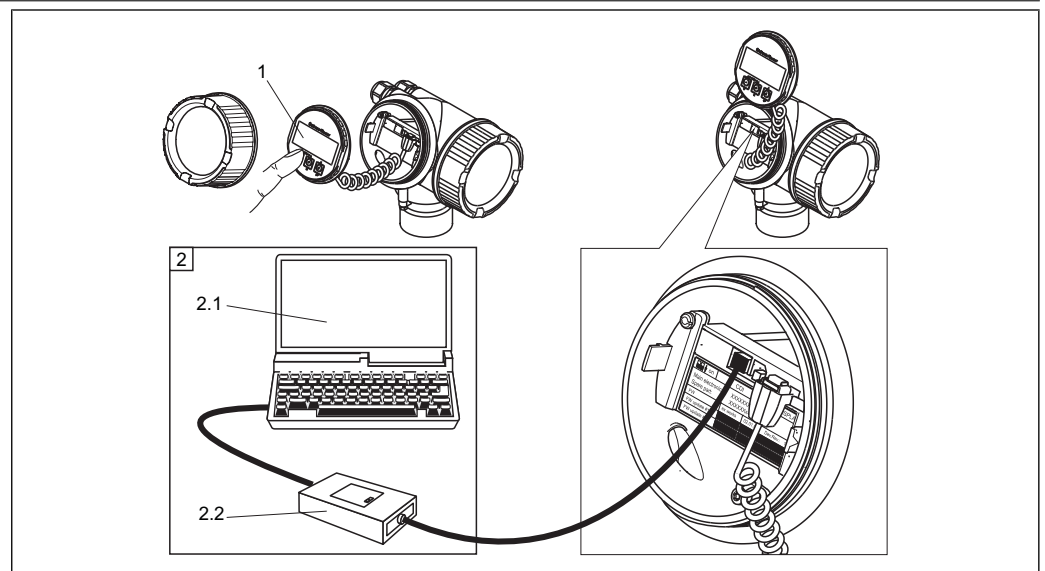
- Local operation with 3 push buttons (⊖, ⊕, Ⓢ)
- Operating elements also accessible in various hazardous areas

Additional functionality

The display module offers:

- 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.

On-site operation



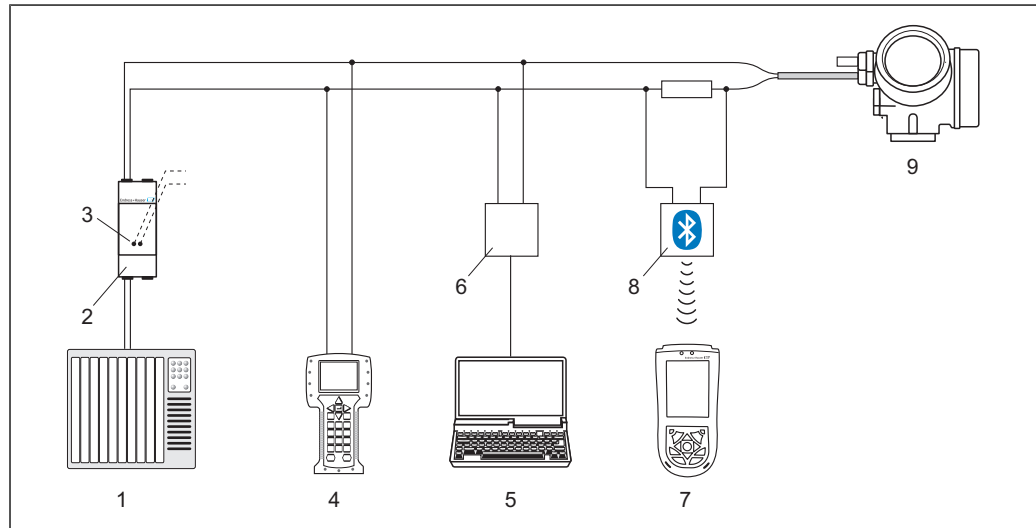
6 On-site operation options

- 1 Display module SD02, push buttons; cover must be open for operation
- 2 Operating options via CDI interface (= Endress+Hauser Common Data Interface)
 - 2.1 Computer with operating tool (FieldCare)
 - 2.2 Commubox FXA291, connected to the CDI interface of the device

Remote operation

Operation via:

- HART protocol
- Operating tools
 - FieldCare (→ 43)
 - AMS Device Manager
 - SIMATIC PDM



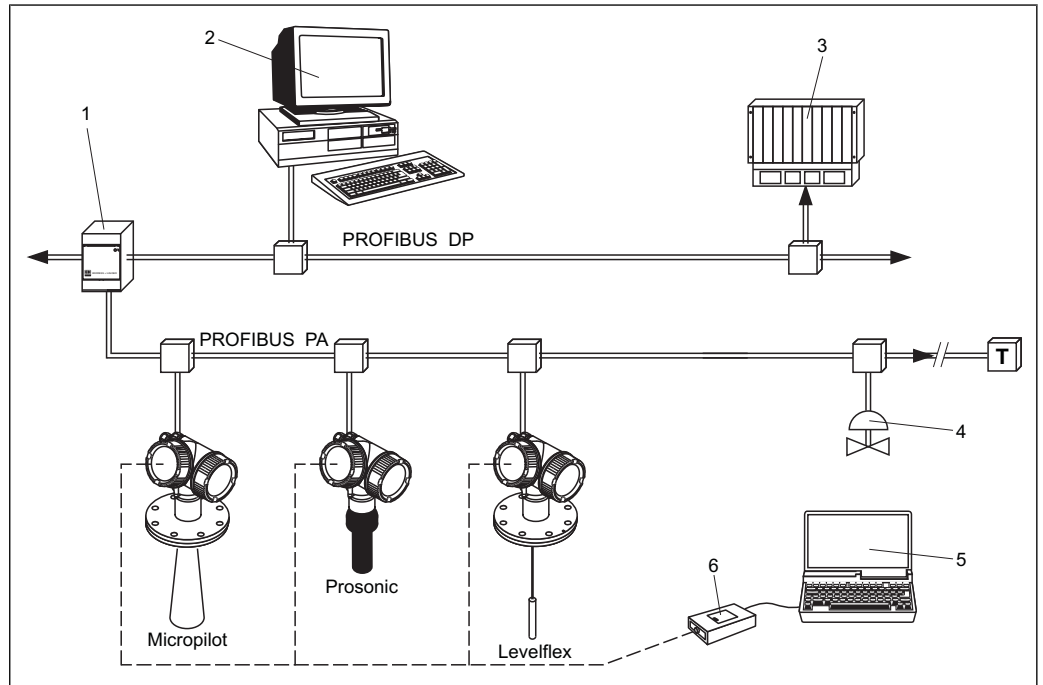
7 Options for remote operation via HART protocol

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

System integration

System integration via PROFIBUS PA

A maximum of 32 devices (8 if mounted in an explosion hazardous location EEx ia IIC according to FISCO-model) can be connected to the bus. The segment coupler provides the operating voltage to the bus. Both on-site as well as remote operation are possible.



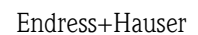
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8 The complete measuring system consists of devices and:

- 1 Segment coupler
- 2 Computer with Profiboard/Proficard and operating tool (FieldCare)
- 3 PLC (programmable logic controller)
- 4 More functions (valves etc.)
- 5 Computer with operating tool (FieldCare)
- 6 Commubox FXA291 (CDI interface)

Levelflex FMP55

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A0011277

- 1 Computer with Fuels Manager Software
- 2 Commubox FXA195 (USB) - optional
- 3 Computer with operating tool (ControlCare) - optional
- 4 Level measuring device
- 5 Temperature measuring device
- 6 Tank Side Monitor NRF590
- 7 Pressure measuring device
- 8 Remote Terminal Unit RTU8130

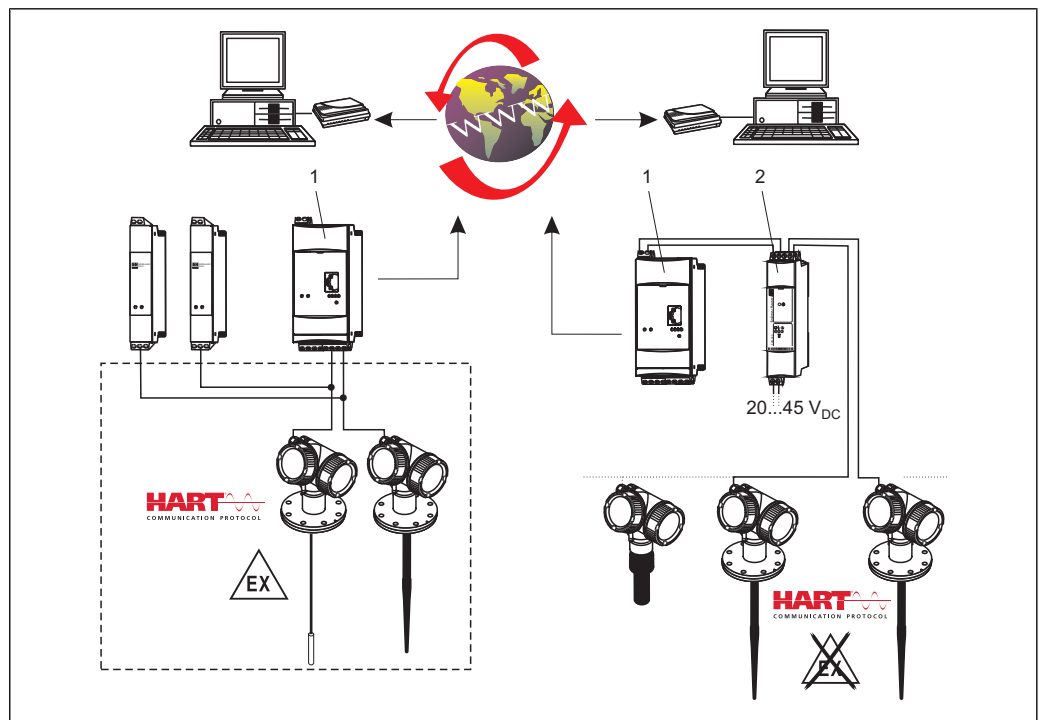
System integration via Fieldgate

Vendor Managed Inventory

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

Remote maintenance of measuring equipment

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



A0011278




10 The complete measuring system consists of devices and:

- 1 Fieldgate FXA520
- 2 Multidrop Connector FXN520



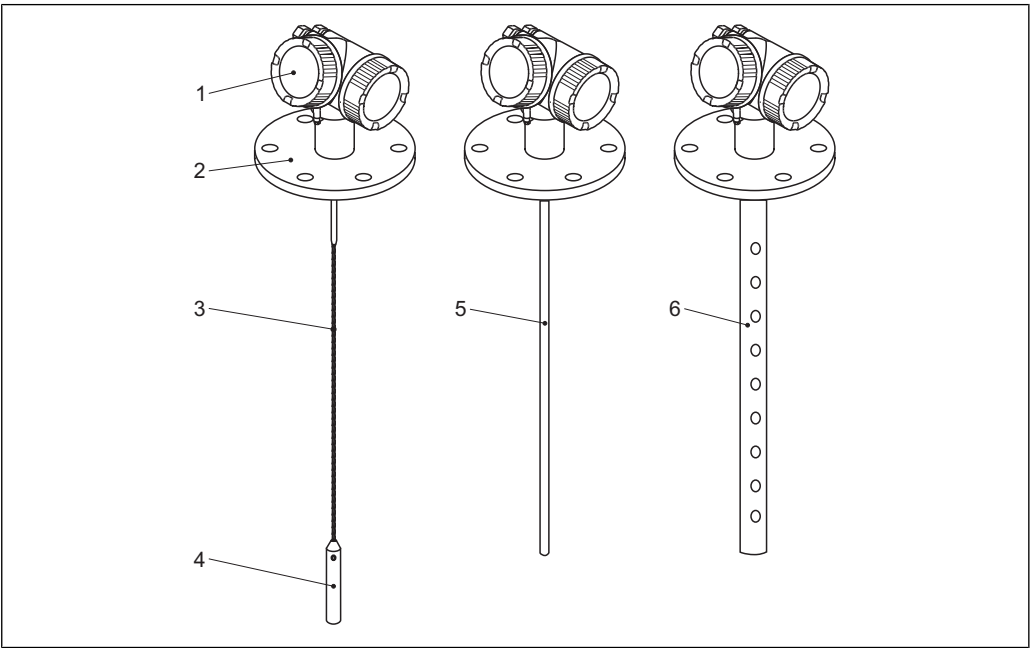
The number of instruments which can be connected in multidrop mode can be calculated by the "FieldNetCalc" program. A description of this program can be found in Technical Information TI 400F (Multidrop Connector FXN520). The program is available from your Endress+Hauser sales organisation or in the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

Certificates and approvals

CE mark	<p>The measuring system meets the legal requirements of the applicable EC guidelines. These are listed in the corresponding EC Declaration of Conformity together with the standards applied.</p> <p>Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.</p>
Ex approval	<p>The devices are certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Safety Instructions" (XA) document. Reference is made to this document on the nameplate.</p> <p> The separate documentation "Safety Instructions" (XA) containing all the relevant explosion protection data is available from your Endress+Hauser Sales Center. Correlation of documentations to the device (→  44).</p>
Functional Safety (in preparation)	<p>Used for level monitoring (MIN, MAX, range) up to SIL 2, independently assessed by TÜV Rheinland as per IEC 61508. Other information see documentation "Functional Safety Manual".</p>
Marine certificate (in preparation)	<ul style="list-style-type: none"> ■ GL (Germanischer Lloyd) ■ ABS (American Bureau of Shipping) ■ NK (Nippon Kaiji Kyokai) ■ DNV (Det Norske Veritas) <p> Only in connection with HART or PROFIBUS PA.</p>
Telecommunications	<p>Complies with part 15 of the FCC rules for an unintentional radiator. All probes meet the requirements for a Class A digital device.</p> <p>In addition, all probes in metallic tanks as well as the coax probe meet the requirements for a Class B digital device.</p>
CRN approval (in preparation)	<p>Some device versions have CRN approval. For a CRN-approved device, a CRN-approved process connection has to be ordered with a CSA approval.</p>
Other standards and guidelines	<ul style="list-style-type: none"> ■ EN 60529 Degrees of protection by housing (IP code) ■ EN 61010-1 Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures. ■ IEC/EN 61326 "Emission in accordance with Class A requirements". Electromagnetic compatibility (EMC requirements) ■ NAMUR NE 21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment. ■ NAMUR NE 43 Standardization of the signal level for the breakdown information of digital transmitters with analog output signal. ■ NAMUR NE 53 Software of field devices and signal-processing devices with digital electronics ■ NAMUR NE 107 Status classification as per NE107 ■ NAMUR NE 131 Requirements for field devices for standard applications

Ordering information

Compact device Levelflex



A0012399

11 Design of the Levelflex

- 1 Electronics housing
- 2 Process connection (here as an example: flange)
- 3 Rope probe
- 4 End of probe weight
- 5 Rod probe
- 6 Coax probe

Product structure FMP55



This overview does not mark options which are mutually exclusive.

Option with * = in preparation

010	Approval:
AA	Non-hazardous area
BA	ATEX II 1G Ex ia IIC T6
BB	ATEX II 1/2G Ex ia IIC T6
BC	ATEX II 1/2G Ex d(ia) IIC T6
BD	ATEX II 1/3G Ex ic(ia) IIC T6
BG	ATEX II 3G Ex nA IIC T6
BH	ATEX II 3G Ex ic IIC T6
B2	ATEX II 1/2G Ex ia IIC T6, 1/2D Ex tD IIIC IP6x
B3	ATEX II 1/2G Ex d(ia) IIC T6, 1/2D Ex tD IIIC IP6x
B4	ATEX II 1/2G Ex ia IIC T6, Ex d(ia) IIC T6
CA	CSA General Purpose
C2	CSA C/US IS Cl.I,II,III Div.1 Gr.A-G, NI Cl.1 Div.2, Ex ia
C3	CSA C/US XP Cl.I,II,III Div.1 Gr.A-G, NI Cl.1 Div.2, Ex d
*FB	FM IS Cl.I,II,III Div.1 Gr.A-G, AEx ia, NI Cl.1 Div.2
*FD	FM XP Cl.I,II,III Div.1 Gr.A-G, AEx d, NI Cl.1 Div.2
IA	IEC Ex Zone 0 Ex ia IIC T6 Ga
IB	IEC Ex Zone 0/1 Ex ia IIC T6 Ga/Gb
IC	IEC Ex Zone 0/1 Ex d(ia) IIC T6 Ga/Gb


010	Approval:
ID	IEC Ex Zone 0/2 Ex ic(ia) IIC T6 Ga/Gc
IG	IEC Ex Zone 2 Ex nA IIC T6 Gc
IH	IEC Ex Zone 2 Ex ic IIC T6 Gc
I2	IEC Ex Zone 0/1 Ex ia IIC T6 Ga/Gb, Zone 20/21 Ex tD IIIC A20/21 IP6x Da/Db
I3	IEC Ex Zone 0/1 Ex d(ia) IIC T6 Ga/Gb, Zone 20/21 Ex tD IIIC A20/21 IP6x Da/Db
*8A	FM/CSA IS+XP Cl.I,II,III Div.1 Gr.A-G
99	Special version, TSP-no. to be sepc.
020	Power Supply, Output
A	2-wire; 4-20mA HART
C	2-wire; 4-20mA HART, 4-20mA
*G	2-wire; PROFIBUS PA, switch output
K	4-wire 90-253VAC; 4-20mA HART
L	4-wire 10,4-48VDC; 4-20mA HART
Y	Special version, TSP-no. to be sepc.
030	Display, Operation:
A	W/o, via communication
C	SD02 4-line, push buttons + data backup function
Y	Special version, TSP-no. to be sepc.
040	Housing:
A	GT19 dual compartment, Plastics PBT
B	GT18 dual compartment, 316L
C	GT20 dual compartment, Alu coated
Y	Special version, TSP-no. to be sepc.
050	Electrical connection:
A	Gland M20, IP66/68 NEMA4X/6P
B	Thread M20, IP66/68 NEMA4X/6P
C	Thread G1/2, IP66/68 NEMA4X/6P
D	Thread NPT1/2, IP66/68 NEMA4X/6P
I	Plug M12, IP66/68 NEMA4X/6P
M	Plug 7/8", IP66/68 NEMA4X/6P
Y	Special version, TSP-no. to be sepc.
060	Probe:
CA mm, rod 16mm PFA>316L
CB inch, rod 0.63in PFA>316L
NA mm, rope 4mm PFA>316
ND inch, rope 1/6" PFA>316
UA mm, coax 316L
UB inch, coax 316L
YY	Special version, TSP-no. to be sepc.
100	Process connection:
AEK	1-1/2" 150lbs, PTFE>316/316L flange ANSI B16.5
AFK	2" 150lbs, PTFE>316/316L flange ANSI B16.5
AGK	3" 150lbs, PTFE>316/316L flange ANSI B16.5


100	Process connection:
AHK	4" 150lbs, PTFE>316/316L flange ANSI B16.5
AJK	6" 150lbs, PTFE>316/316L flange ANSI B16.5
AQK	1-1/2" 300lbs, PTFE>316/316L flange ANSI B16.5
ARK	2" 300lbs, PTFE>316/316L flange ANSI B16.5
ASK	3" 300lbs, PTFE>316/316L flange ANSI B16.5
ATK	4" 300lbs, PTFE>316/316L flange ANSI B16.5
CFK	DN50 PN10/16, PTFE>316L flange EN1092-1
CGK	DN80 PN10/16, PTFE>316L flange EN1092-1
CHK	DN100 PN10/16, PTFE>316L flange EN1092-1
CJK	DN150 PN10/16, PTFE>316L flange EN1092-1
CQK	DN40 PN10-40, PTFE>316L flange EN1092-1
CRK	DN50 PN25/40, PTFE>316L flange EN1092-1
CSK	DN80 PN25/40, PTFE>316L flange EN1092-1
CTK	DN100 PN25/40, PTFE>316L flange EN1092-1
KEK	10K 40, PTFE>316L flange JIS B2220
KFK	10K 50, PTFE>316L flange JIS B2220
KGK	10K 80, PTFE>316L flange JIS B2220
KHK	10K 100, PTFE>316L flange JIS B2220
YYY	Special version, TSP-no. to be sepc.
500	Additional Operation Language:
AA	English
AB	German
AC	French
AD	Spanish
AE	Italian
AF	Dutch
AL	Japanese
550	Calibration:
*F4	5-point linearity protocol
F9	Special version, TSP-no. to be sepc.
570	Service: <i>(Multiple options can be selected)</i>
HC	PWIS free, PWIS = paint-wetting impairment substances
IJ	Customized parametrization HART
IK	Customized parametrization PA
IW	W/o Tooling DVD (FieldCare setup)
I9	Special version, TSP-no. to be sepc.
580	Test, Certificate: <i>(Multiple options can be selected)</i>
JA	EN10204-3.1 material wetted parts 316/ 316L, inspection certificate
JD	EN10204-3.1 material pressurized 316/ 316L, inspection certificate
JE	NACE MR0103/MR0175 wetted parts
KE	EN10204-3.1 pressure test, inspection certificate
*KG	EN10204-3.1 PMI test, x-ray fluorescence spectroscopy, inspection certificate
K9	Special version, TSP-no. to be sepc.


590	Additional Approval: <i>(Multiple options can be selected)</i>
*LA	SIL
L9	Special version, TSP-no. to be sepc.
600	Probe Design: <i>(Multiple options can be selected)</i>
MB	Sensor remote, 3m/9ft cable, detachable+mounting bracket
M9	Special version, TSP-no. to be sepc.
610	Accessory mounted: <i>(Multiple options can be selected)</i>
NC	Gas-tight feed through
OE	Rod center washer d=37mm/1.45", PFA, interface measurement, pipe diameter DN40/1-1/2" + DN50/2"
O9	Special version, TSP-no. to be sepc.
620	Accessory Enclosed: <i>(Multiple options can be selected)</i>
PB	Weather protection cover
R9	Special version, TSP-no. to be sepc.
850	Firmware Version:
77	01.00.zz, PROFIBUS PA, DevRev01
78	01.00.zz, HART, DevRev01
895	Tagging: <i>(Multiple options can be selected)</i>
Z1	Tagging (TAG), see additional spec.
Z2	Bus address, see additional spec.


Accessories


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 TI404F/00


Accessory	Description
Commubox FXA291	Connects Endress+Hauser field devices with CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a computer.  For details refer to Technical Information TI405C/07

Accessory	Description
HART Loop Converter HMX50	Evaluates the dynamic HART variables and converts them to analog current signals or limit values.  For details refer to Technical Information " TI429F/00 and Operating Instructions BA371F/00


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 BA061S/04

Accessory	Description
Fieldgate FXA320	Gateway for remote monitoring of connected 4-20mA measuring devices via web browser.  For details refer to Technical Information TI025S/04 and Operating Instructions BA053S/04




Accessory	Description
Fieldgate FXA520	Gateway for remote diagnosis and parametrization of connected HART measuring devices via web browser.  For details refer to Technical Information TI025S/04/xx and Operating Instructions BA051S/04

Accessory	Description
Field Xpert SFX100	Compact, flexible and robust industry handheld terminal for remote parametrization and measured value inspection via the HART current output (4-20mA).  For details refer to Operating Instructions BA060S/04

Service-specific accessories


Accessory	Description
FieldCare	Endress+Hauser's FDT-based Plant Asset Management tool. Helps to configure and maintain all field devices of your plant. By supplying status information it also supports the diagnosis of the devices.  For details refer to Operating Instructions BA027S/04 and BA059AS/04

System components

Accessory	Description
Graphic Data Manager Memograph M	The graphic data manager Memograph M provides information on all the relevant process variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on an SD card or USB stick.  For details refer to Technical Information TI133R/09 and Operating Instructions BA247R/09
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 TI073R/09 and Operating Instructions BA202R/09
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 TI081R/09 and Operating Instructions KA110R/09

Documentation

Standard documentation

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

Levellflex FMP55

Correlation of documentations to the device:

Device	Power supply, output	Communication	Document type	Document code
FMP55	A, B, C, K, L	HART	Operating Instructions	BA01003F/00/DE
			Brief Operating Instructions	KA01060F/00/DE
			Description of Device Parameters	GP01000F/00/DE
	G	PROFIBUS PA	Operating Instructions	BA01008F/00/DE
			Brief Operating Instructions	KA01072F/00/DE
			Description of Device Parameters	GP01001F/00/DE

Supplementary documentation

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

Description	Document type	Document code
Time of Flight Liquid Level Measurement Selection and engineering for the process industry	Special Documentation	SD157F/00/EN
Radar Tank Gauging brochure For inventory control and custody transfer applications in tank farms and terminals	Special Documentation	SD001V/00/EN
Engineering hints PROFIBUS PA Guidelines for planning and commissioning	Operating Instructions	BA198F/00/EN

Certificates

Safety Instructions (XA) for Levellflex FMP55

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

Feature 010	Approval	Safety Instructions
BA	ATEX II 1 G Ex ia IIC T6 Ga	XA496F-A
BB	ATEX II 1/2 G Ex ia IIC T6 Ga/Gb	XA496F-A
BC	ATEX II 1/2 G Ex d[ia] IIC T6 Ga/Gb	XA499F-A
BD	ATEX II 1/3 G Ex ic[a] IIC T6 Ga/Gc	XA497F-A
BG	ATEX II 3 G Ex nA IIC T6 Gc	XA498F-A
BH	ATEX II 3 G Ex ic IIC T6 Gc	XA498F-A
B2	ATEX II 1/2 G Ex ia IIC T6 Ga/Gb, II 1/2 D Ex t[ia] IIIC Txx°C Da/Db IP6x	XA502F-A
B3	ATEX II 1/2 G Ex d[ia] IIC T6 Ga/Gb, II 1/2 D Ex t[ia] IIIC Txx°C Da/Db IP6x	XA503F-A
B4	ATEX II 1/2 G Ex ia IIC T6 Ga/Gb, Ex d[ia] IIC T6 Ga/Gb	XA500F-A
IA	IECEx Zone 0 Ex ia IIC T6 Ga	XA496F-A
IB	IECEx Zone 0/1 Ex ia IIC T6 Ga/Gb	XA496F-A
IC	IECEx Zone 0/1 Ex d[ia] IIC T6 Ga/Gb	XA499F-A
ID	IECEx Zone 0/2 Ex ic[ia] IIC T6 Ga/Gc	XA497F-A
IG	IECEx Zone 2 Ex nA IIC T6 Gc	XA498F-A
IH	IECEx Zone 2 Ex ic IIC T6 Gc	XA498F-A

Feature 010	Approval	Safety Instructions
I2	IECEEx Zone 0/1 Ex ia IIC T6 Ga/Gb, Zone 20/21 Ex t[ia] IIIC Txx°C Da/Db IP6x	XA502F-A
I3	IECEEx Zone 0/1 Ex d[ia] IIC T6 Ga/Gb, Zone 20/21 Ex t[ia] IIIC Txx°C Da/Db IP6x	XA503F-A



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

Registered trademarks

HART®

Registered trademark of the HART Communication Foundation, Austin, USA

PROFIBUS®

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

FOUNDATION™ Fieldbus

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

KALREZ®, VITON ®

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

TEFLON ®

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

TRI CLAMP ®

Registered trademark of Alfa Laval Inc., Kenosha, USA

Patents

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

Further patents are pending.

US Patents	EP Patents
5.827.985	—
5.884.231	—
5.973.637	—
6.087.978	955 527
6.140.940	—
6.481.276	—
6.512.358	1 301 914
6.559.657	1 020 735
6.640.628	—
6.691.570	—
6.847.214	—
7.441.454	—
7.477.059	—
—	1 389 337

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