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Technical Information
Levelflex FMP51
Modbus

Guided wave radar

Level and interface measurement in liquids

Application

- Rod, rope or coax probe
- Process connection: Starting 3/4" thread or flange
- Process temperature: −50 to +200 °C (−58 to +392 °F)
- Process pressure: −1 to +40 bar (−14.5 to +580 psi)
- Maximum measuring range: Rod 10 m (33 ft); rope 45 m (148 ft); coax 6 m (20 ft)
- Accuracy: ±2 mm (±0.08 in)
- International explosion protection certificates; EN10204-3.1
- Linearity protocol (3-point)

Your benefits

- Reliable measurement even for changing product and process conditions
- HistoROM data management for easy commissioning, maintenance and diagnostics
- Highest reliability due to Multi-Echo Tracking
- Seamless integration into control or asset management systems
- Intuitive user interface in national languages

Endress+Hauser
People for Process Automation

Table of contents

Important document information

Symbols

Safety symbols

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.

NOTICE
This symbol contains information on procedures and other facts which do not result in personal injury.

Electrical symbols

Alternating current

Direct current and alternating current

Direct current

Ground connection

A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.

Protective earth (PE)

Ground terminals that must be connected to ground prior to establishing any other connections.

The ground terminals are located on the interior and exterior of the device:
- Interior ground terminal: protective earth is connected to the mains supply.
- Exterior ground terminal: device is connected to the plant grounding system.

Tool symbols

Phillips head screwdriver

Flat-blade screwdriver

Torx screwdriver

Allen key

Open-ended wrench

Symbols for certain types of information and graphics

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 graphic

▶
Notice or individual step to be observed

1. , 2. , 3.
Series of steps


Result of a step


Visual inspection


Operation via operating tool


Write-protected parameter

1, 2, 3, ...
Item numbers

A, B, C, ...
Views


Safety instructions
Observe the safety instructions contained in the associated Operating Instructions


Temperature resistance of the connection cables
Specifies the minimum value of the temperature resistance of the connection cables

Terms and abbreviations

Term/abbreviation	Explanation
BA	Document type "Operating Instructions"
KA	Document type "Brief Operating Instructions"
TI	Document type "Technical Information"
SD	Document type "Special Documentation"
XA	Document type "Safety Instructions"
PN	Nominal pressure
MWP	Maximum Working Pressure The MWP can also be found on the nameplate.
ToF	Time of Flight
ε_r (DC value)	Relative dielectric constant
BD	Blocking Distance; no signals are analyzed within the BD.
PLC	Programmable Logic Controller
CDI	Common Data Interface

Registered trademarks

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

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FISHER®
Registered trademark of Fisher Controls International LLC, Marshalltown, USA

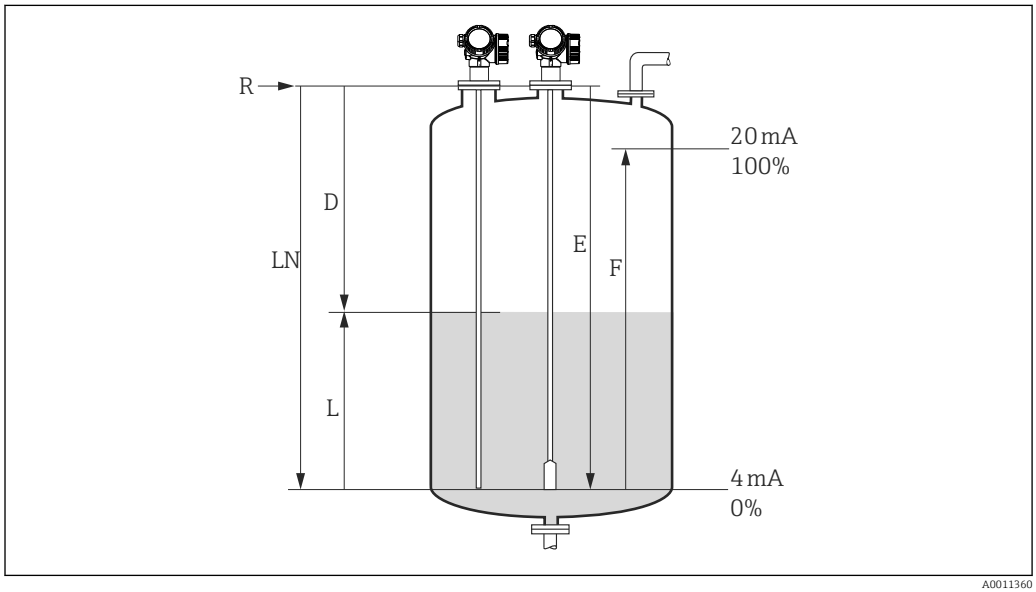
MASONEILAN®
Registered trademark of Dresser, Inc., Addison, USA

Function and system design

Measuring principle

General principles

The Levelflex is a "downward-looking" measuring system that functions according to the time-of-flight method (ToF). 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).



1 *Parameters for level measurement with guided wave radar*

LN Probe length
D Distance
L Level
R Reference point of measurement
E Empty calibration (= zero)
F Full calibration (= span)

If the ε_r value is less than 7 in the case of rope probes, measurement is not possible in the area of the tensioning weight (0 to 250 mm (0 to 9.84 in) from the probe end), (lower blocking distance).

The reference point **R** of the measurement is located at the process connection.

Dielectric constant

The dielectric constant (DC) of the medium directly affects the degree of reflection of the high-frequency pulses. In the case of large DC values, such as with water or ammonia, there is strong pulse reflection while, in the case of low DC values, such as with hydrocarbons, pulse reflection is weak.

Input

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

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

$D = c \cdot t/2$,

where c is the speed of light.

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

$L = E - D$

The reference point R of the measurement is located at the process connection. For details, see: FMP51: → 🖹 53

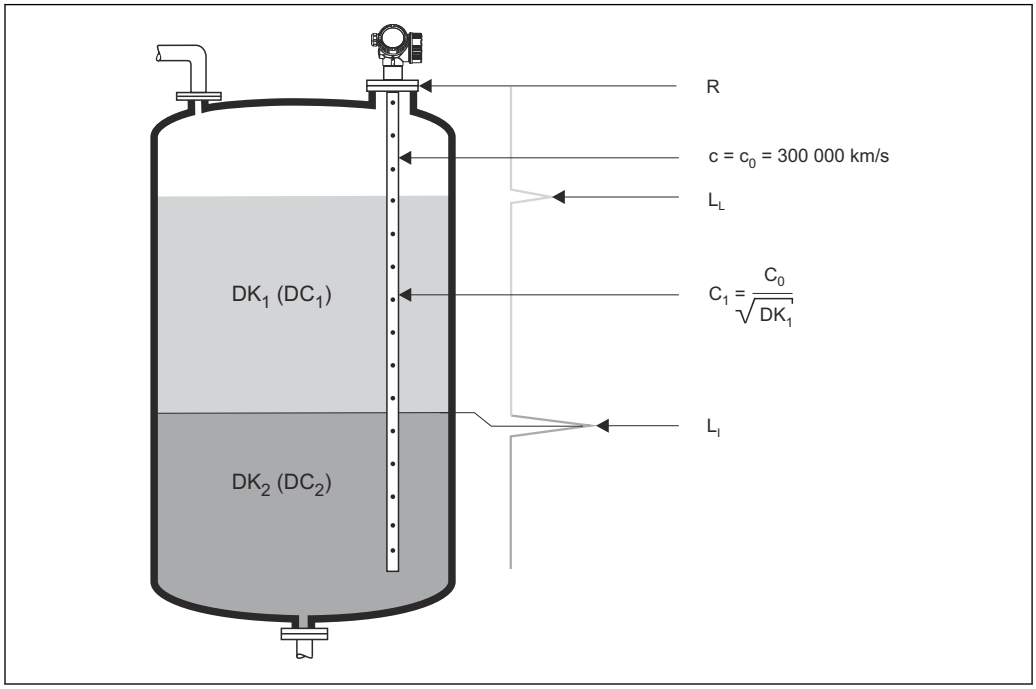
The Levelflex has functions to suppress interference echoes that can be activated by the user. They guarantee that interference echoes from internal fixtures and struts are not interpreted as level echoes.

Output

The Levelflex is preadjusted 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 medium with a low DC_1, in particular, the other part enters the medium. The pulse is reflected once more at the interface point to a second medium with a higher DC_2. The distance to the interface layer can now also be determined, taking into account the delayed time-of-flight of the pulse through the upper medium.



2 Interface measurement with the guided radar

LL Total level
LI Interface level
R Reference point of measurement

In addition, the following general conditions must be observed for interface measurement:
- The DC of the upper medium must be known and constant. If the interface thickness is known, the DC can be calculated automatically in FieldCare.
- The DC of the upper medium may not exceed 10.
- The DC difference between the upper and lower medium must be >10.
- The minimum thickness of the upper medium is 60 mm (2.4 in).
- Emulsion layers in the area of the interface can greatly attenuate the signal. However, emulsion layers up to 50 mm (2 in) are permitted.

For the dielectric constants (DC values) of many media commonly used in industry, please refer to:
- Dielectric constant (DC value) Compendium CP01076F
- The Endress+Hauser "DC Values app" (available for Android and iOS)

Product life cycle

Planning
- Universal measuring principle
- Measurement unaffected by medium properties
- Genuine, direct interface measurement

Procurement
Worldwide support and service

Installation
- No special tools are required
- Protection against reverse polarity
- Modern, detachable terminals
- Main electronics protected by a separate connection compartment

Commissioning
- Fast, menu-guided commissioning in just 6 steps
- Plain text display in local language reduces the risk of error or confusion
- Direct local access to all parameters
- Printed Brief Operating Instructions in the device onsite

Operation
- Multi-echo tracking: Reliable measurement thanks to self-learning echo search algorithms taking into account the short-term and long-term history and plausibility of the detected signals to suppress interference echoes.
- In accordance with NAMUR NE107

Maintenance
- HistoROM: Data backup for device settings and measured values
- Exact device and process diagnostics to assist fast decisions with clear information regarding remedial action
- Intuitive, menu-guided operating concept in local language saves costs for training, maintenance and operation
- Cover of the electronics compartment can also be opened in the hazardous area

Retirement
- Order code translation for subsequent models
- RoHS-compliant (Restriction of certain Hazardous Substances), unleaded soldering of electronic components
- Environmentally friendly recycling approach

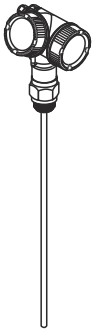
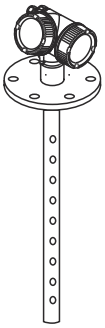
Measuring system

General notes on probe selection

- Normally use rod or coax probes for liquids. Rope probes are used in liquids for measuring ranges > 10 m (33 ft) (for FMP52: > 4 m (13 ft)) or if the ceiling clearance does not allow the installation of rigid probes.
- For interface measurement, ideally coax probes or rod probes are used in the bypass/stilling well.
- Coax probes are suitable for liquids with a viscosity of up to approx. 500 cst. The vast majority of liquefied gases can be measured with coax probes, from a dielectric constant of 1.4. Furthermore, installation conditions, such as nozzles, internal fixtures in the tank 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.

Probe selection

The various types of probe in combination with the process connections are suitable for the following applications [1]:

Levelflex FMP51						
Type of probe	**Rod probe**		**Rope probe**		**Coax probe** [1]	
	 A0011387		 A0011388		 A0011359	
Feature 060 - probe:	**Version:**		**Version:**		**Version:**	
	AA	8 mm (316L)	LA	4 mm (316)	UA	... mm (316L)
	AB	1/3" (316L)	LB	1/6" (316)	UB	... inch (316L)
	AC	12 mm (316L)	MB	4 mm (316) with centering rod	UC	... mm (AlloyC)
	AD	1/2" (316L)	MD	1/6" (316) with centering rod	UD	... inch (AlloyC)
	AL	12 mm (AlloyC)				
	AM	1/2" (AlloyC)				
	BA BC	16 mm (316L) Separable				
	BB BD	0.63 in (316L) Separable				
Max. probe length	10 m (33 ft) [2]		45 m (148 ft)		6 m (20 ft)	
Application for	Level and interface measurement in liquids		Level and interface measurement in liquids		Level and interface measurement in liquids	

1) Punched for 1-1/2" thread or flange process connections; multiple holes for 316L; one hole for AlloyC
2) Maximum probe length for inseparable rod probes: 4 m (13 ft)

1) Rod and rope probes can be replaced if necessary. They are secured with Nord-Lock washers or a thread coating.

Input

Measured variable

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

Subject to the empty distance entered "E" the level is calculated.

Alternatively, the level can be converted into other variables (volume, mass) by means of linearization (32 points).

Measuring range

The following table describes the media groups and the possible measuring range as a function of the media group.

Levelflex FMP51					
Media group	DC (ε_r)	Typical liquids	Measuring range [1]		
			bare metallic rod probes	bare metallic rope probes	coax probes
1	1.4...1.6	condensed gases, e.g. N_2, CO_2	on request		6 m (20 ft)
2	1.6...1.9	▪ liquefied gas, e.g. propane ▪ solvent ▪ Freon ▪ palm oil	▪ one-piece: 4 m (13 ft) ▪ divisible: 10 m (33 ft)	15 to 22 m (49 to 72 ft)	6 m (20 ft)
3	1.9...2.5	mineral oils, fuels	▪ one-piece: 4 m (13 ft) ▪ divisible: 10 m (33 ft)	22 to 32 m (72 to 105 ft)	6 m (20 ft)
4	2.5...4	▪ benzene, styrene, toluene ▪ furan ▪ naphthalene	▪ one-piece: 4 m (13 ft) ▪ divisible: 10 m (33 ft)	32 to 42 m (105 to 138 ft)	6 m (20 ft)
5	4...7	▪ chlorobenzene, chloroform ▪ cellulose spray ▪ isocyanate, aniline	▪ one-piece: 4 m (13 ft) ▪ divisible: 10 m (33 ft)	42 to 45 m (138 to 148 ft)	6 m (20 ft)
6	> 7	▪ aqueous solutions ▪ alcohols ▪ ammonia	▪ one-piece: 4 m (13 ft) ▪ divisible: 10 m (33 ft)	45 m (148 ft)	6 m (20 ft)

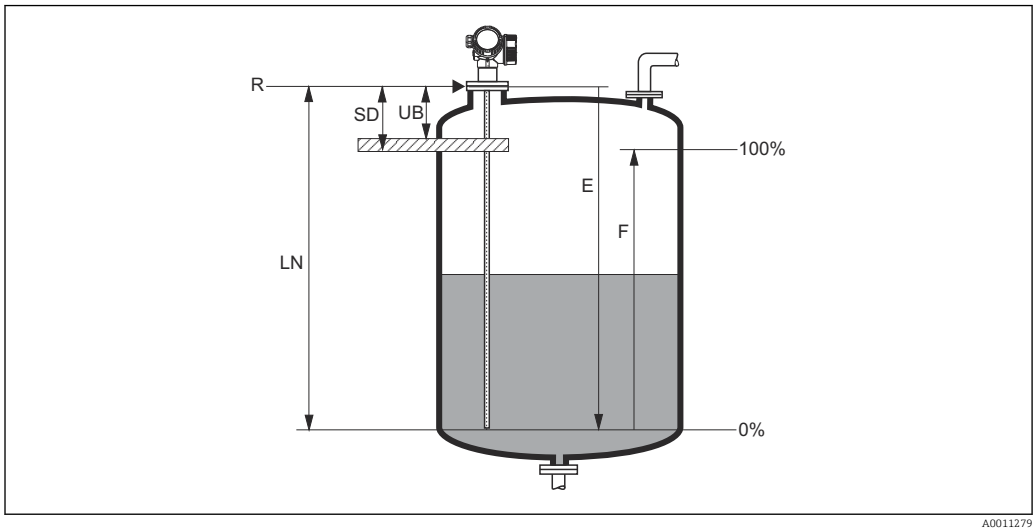
1) The measuring range for interface measurement is limited to 10 m (33 ft).

- 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 [2] for measurements in this medium.

2) optionally available for FMP51

Blocking distance

The upper blocking distance (= UB) is the minimum distance from the reference point of the measurement (mounting flange) to the maximum level.



3 Definition of blocking distance and safety distance

R Reference point of measurement
LN Probe length
UB Upper blocking distance
E Empty calibration (= zero)
F Full calibration (= span)
SD Safety 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.

For rod and rope probes and for media with DC > 7 (or generally for stilling well/bypass applications) the blocking distance may be reduced to 100 mm (4").

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

A safety distance SD can be defined in addition to the blocking distance. A warning is generated if the level rises into this safety distance.

Measuring frequency spectrum

100 MHz to 1.5 GHz

Output

Output signal

Modbus

Physical interface	RS485 in accordance with EIA/TIA-485 standard
Terminating resistor	Not integrated

Signal on alarm

Depending on the interface, failure information is displayed as follows:
- Local display
  - Status signal (in accordance with NAMUR Recommendation NE 107)
  - Plain text display
- Operating tool via digital communication or service interface (CDI)
  - Status signal (in accordance with NAMUR Recommendation NE 107)
  - Plain text display

Linearization

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

Galvanic isolation

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

Protocol-specific data

Modbus

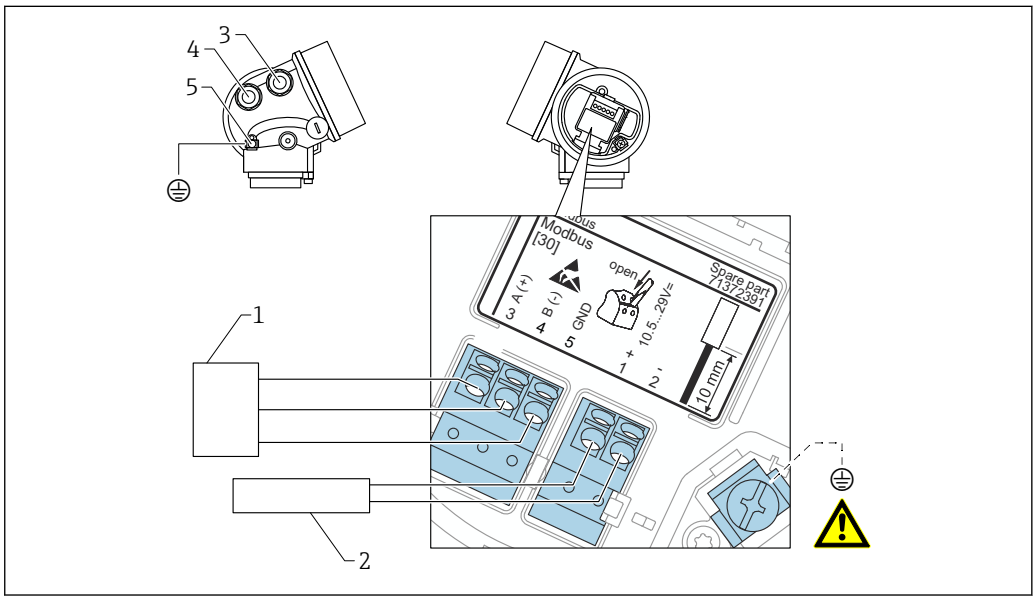
Protocol	▪ Modbus RTU ▪ Level Master
Response times	▪ Direct data access: typically 25 to 50 ms ▪ Auto-scan buffer (data range): typically 3 to 5 ms
Device type	Slave
Slave address range	1 to 63
Function codes	▪ 03: Read holding register ▪ 04: Read input register
Baud rate	Automatic baud rate detection
Parity	Automatic parity detection
Data transfer mode	RTU

Power supply

Terminal assignment

Modbus

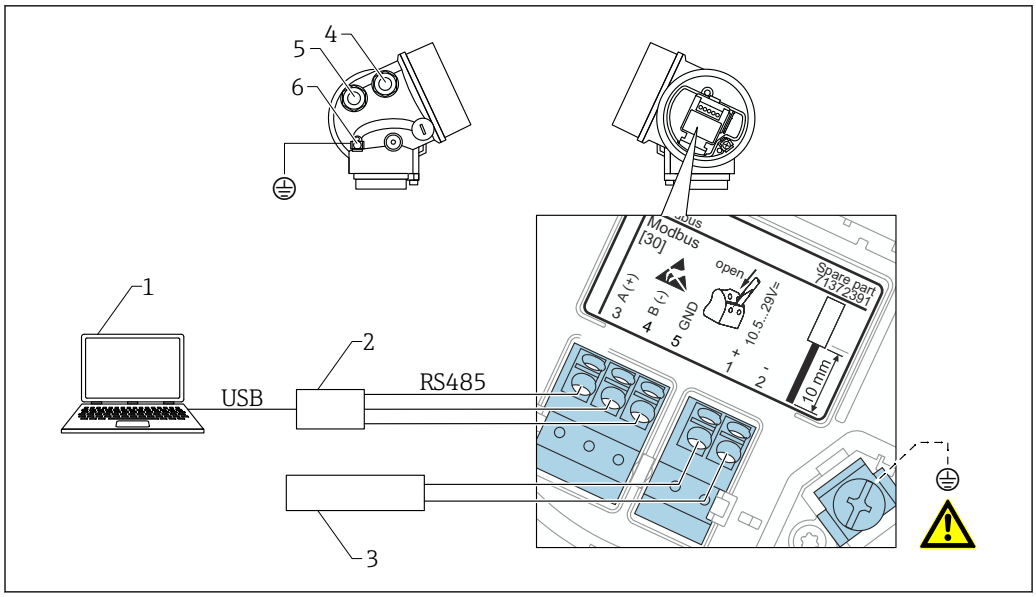
Connection to a Modbus master



1 *Modbus master*
2 *Supply voltage*
3 *Cable entry for the Modbus connection*
4 *Cable entry for the supply voltage*
5 *Connection for protective ground*

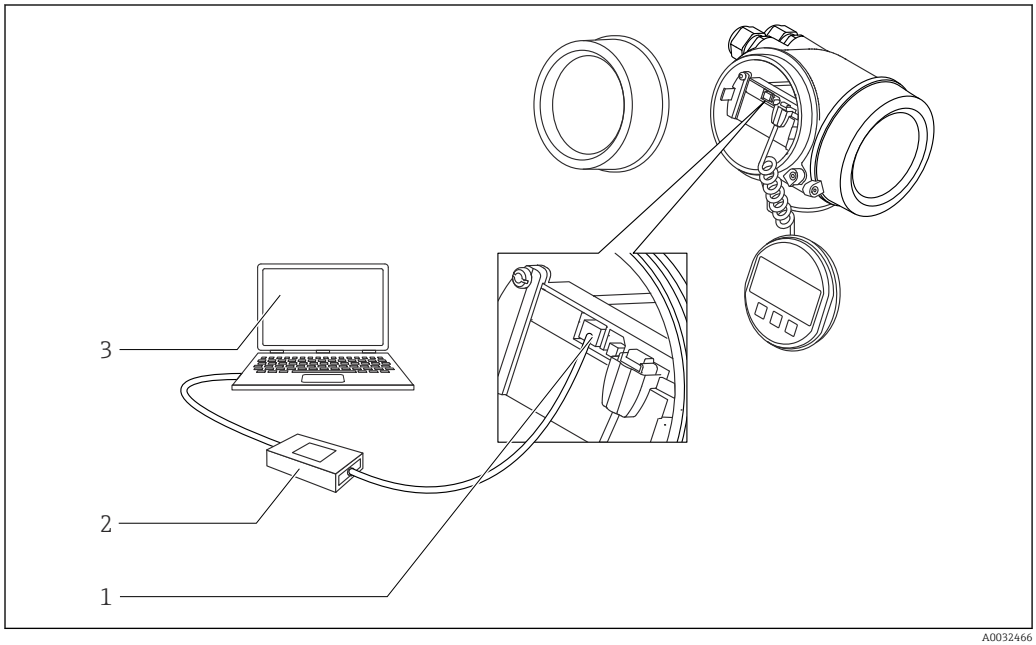
Connection to FieldCare/DeviceCare via RS485

For configuration via FieldCare or DeviceCare, it is advisable to disconnect the device from the bus and to connect it to the computer via a USB-to-RS485 interface.



1 *Computer with FieldCare/DeviceCare*
2 *USB-RS485 interface*
3 *Supply voltage*
4 *Cable entry for RS485*
5 *Cable entry for the supply voltage*
6 *Connection for protective ground*

Connection to DeviceCare/FieldCare via service interface



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

Supply voltage

Supply voltage	10.5 to 29 V_{DC}
Ripple	1 V_{SS} (< 100 Hz); 10 mV_{SS} (> 100 Hz)

Power consumption

Maximum	1 000 mW
Typical	400 mW

Power supply failure

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

Potential equalization

No special measures for potential equalization are required.

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

Terminals

- **Supply voltage**
  Plug-in spring terminals for wire cross-sections 0.2 to 2.5 mm² (24 to 14 AWG)
- **Modbus**
  Plug-in spring terminals for wire cross-sections 0.2 to 1.5 mm² (24 to 16 AWG)

Cable entries

Connection of the power supply and signal cables

To be selected in feature 050 "Electrical connection":

- Coupling M20, material depends on approval:
  - For non-Ex, ATEX, IECEx, NEPSI Ex ia/ic:
    Plastic M20x1.5 for cable Ø5 to 10 mm (0.2 to 0.39 in)
  - For Dust-Ex, FM IS, CSA IS, CSA GP, Ex ec:
  - For Ex db:
    No cable gland available
- Thread
  - ½" NPT
  - G ½"
  - M20 × 1.5
- M12 plug / 7/8" plug
  Only available for non-Ex, Ex ic, Ex ia

Connection of remote display FHX50

Feature 030 "Display, operation"	Cable entry for connection of FHX50
L: "Prepared for display FHX50 + M12 connection"	M12 socket
M: "Prepared for display FHX50 + custom connection"	M12 cable gland

Cable specification

- Power line: Standard device cable
- Modbus connection : A shielded cable is recommended. Observe grounding concept of the plant.

Overvoltage protection

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

External overvoltage protection module

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

Performance characteristics

Reference operating conditions

- Temperature = +24 °C (+75 °F) ±5 °C (±9 °F)
- Pressure = 960 mbar abs. (14 psia) ±100 mbar (±1.45 psi)
- Humidity = 60 % ±15 %
- Reflection factor ≥ 0,8 (water surface for coax probe, metal plate for rod and rope probe with min. 1 m (40 in) diameter)
- Flange for rod or rope probe ≥ 300 mm (12 in) diameter
- Distance to obstacles ≥ 1 m (40 in)
- For interface measurement:
  - Coax probe
  - DC of the lower medium = 80 (water)
  - DC of the upper medium = 2 (oil)

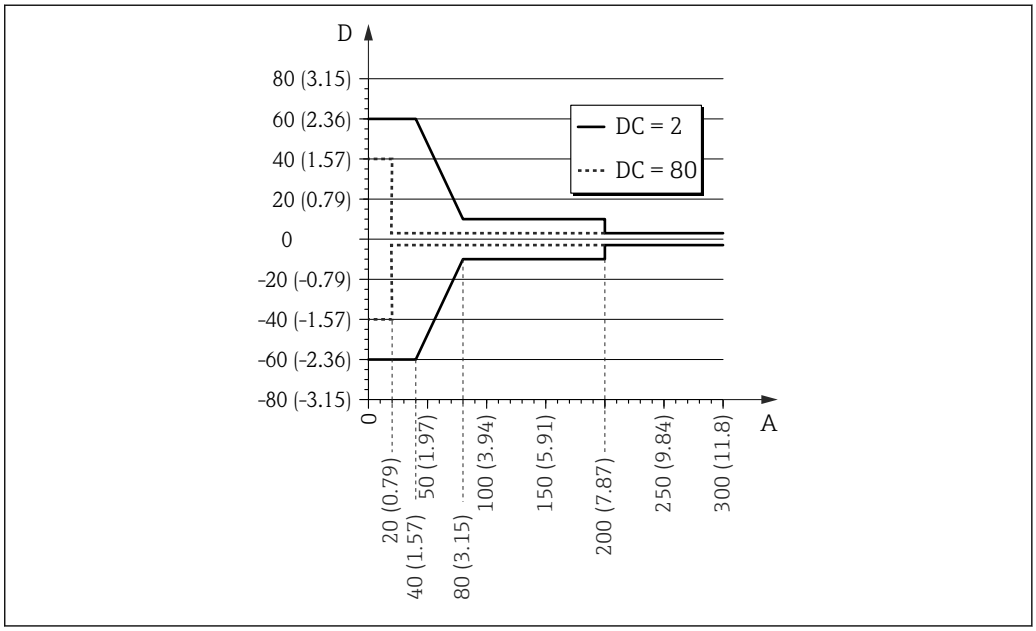
Reference accuracy

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]	**Level measurement:** ▪ Measuring distance up to 15 m (49 ft): ±2 mm (±0.08 in) [3] ▪ Measuring distance > 15 m (49 ft): ±10 mm (±0.39 in)	±0.02 %
	Interface measurement: ▪ Measuring distance up to 500 mm (19.7 in): ±20 mm (±0.79 in) ▪ Measuring distance > 500 mm (19.7 in): ±10 mm (±0.39 in) ▪ If the thickness of the upper medium is < 100 mm (3.94 in): ±40 mm (±1.57 in)	
Non-repeatability [4]	≤ 1 mm (0.04 in)	

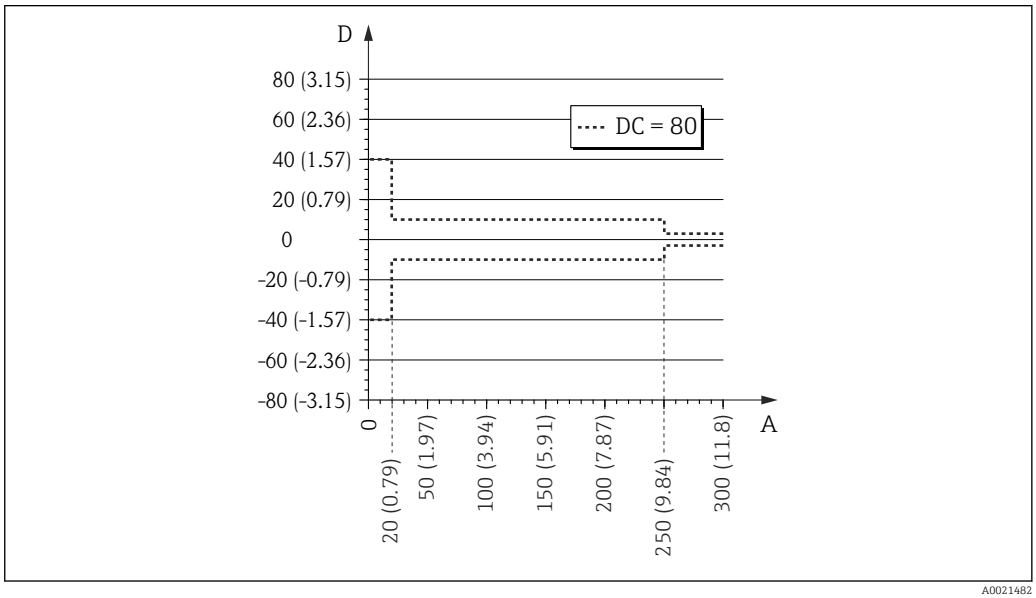
1) Add error of the analogous value to the digital value.
2) If the reference conditions are not met, the offset/zero point arising from the mounting conditions may be up to ±16 mm (±0.63 in). This additional offset/zero point can be compensated for by entering a correction (parameter "level correction") during commissioning.
3) For probes with centering stars, the accuracy may deviate close to the centering stars.
4) The non-repeatability is already considered in the accuracy.

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



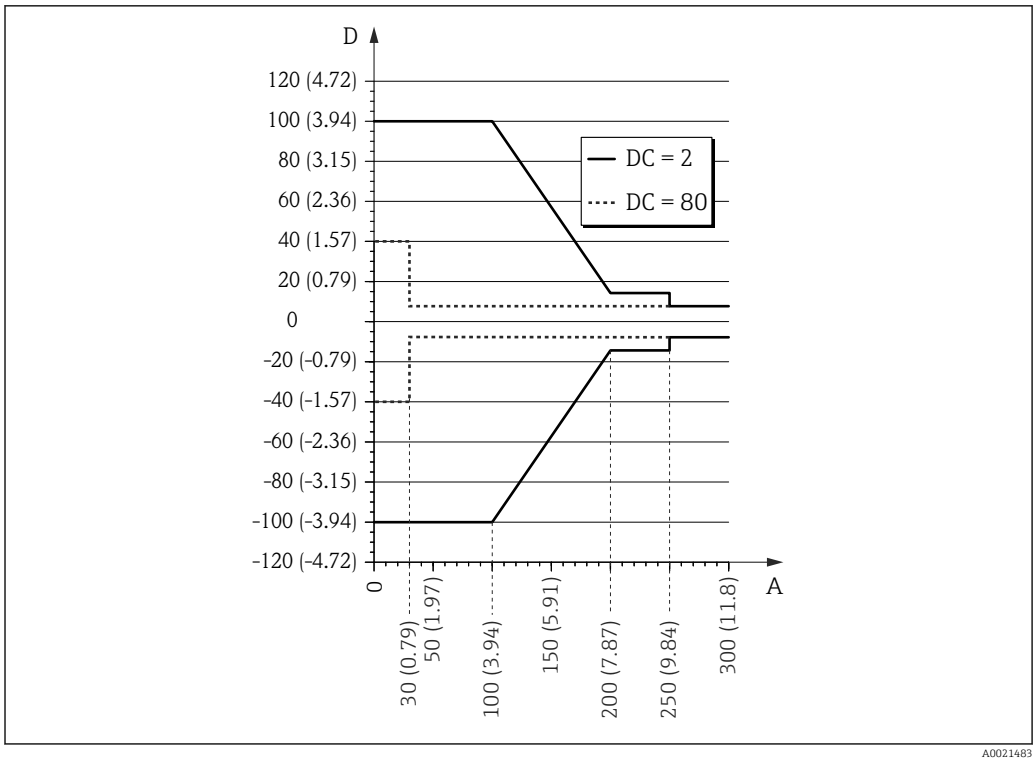
4 Measuring error at the end-of-probe for rod and coax probes

A Distance from probe end [mm(in)]
D Measuring error: Sum of non-linearity, non-repeatability and hysteresis



5 Measuring error at the end-of-probe for rope probes

A Distance from probe end
D Measuring error: Sum of non-linearity, non-repeatability and hysteresis

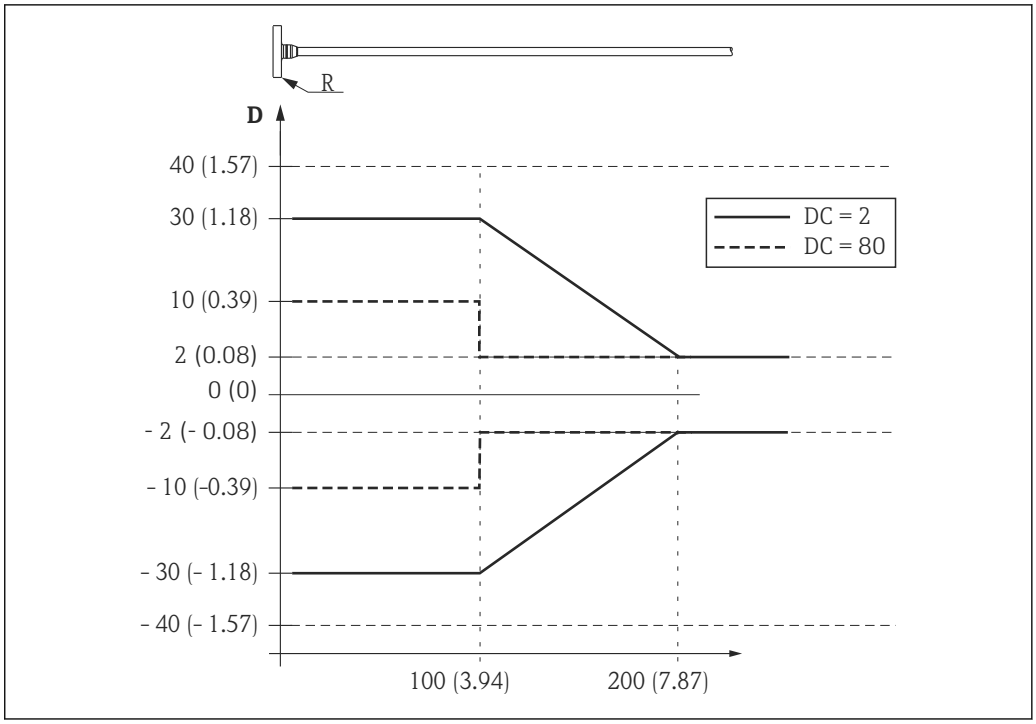


6 *Measuring error at the end-of-probe for probes with metallic centering disk (product structure: feature 610 "Accessory mounted", option OA, OB or OC)*

A Distance from probe end [mm(in)]
D Measuring error: Sum of non-linearity, non-repeatability and hysteresis

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).

In the area of the upper probe end, the measuring error is as follows (rod/rope only):



7 Measuring error at the upper end of the probe; dimensions: mm (in)

D Sum of non-linearity, non-repeatability and hysteresis
R Reference point of measurement
DC Dielectric constant

Resolution

- digital: 1 mm
- analog: 1 µA

Reaction time

The reaction time can be parametrized. The following step response times (as per DIN EN IEC 61298-2 / DIN EN IEC 60770-1) [3] are valid if the damping is switched off:

Level measurement		
Probe length	**Sampling rate**	**Step response time**
< 10 m (33 ft)	3.6 measurements/second	< 0.8 s
< 40 m (131 ft)	≥ 2.7 measurements/second	< 1 s

Interface measurement		
Probe length	**Sampling rate**	**Step response time**
< 10 m (33 ft)	≥ 1.1 measurements/second	< 2.2 s

Influence of ambient temperature

The measurements are carried out in accordance with DIN EN IEC 61298-3 / DIN EN IEC 60770-1

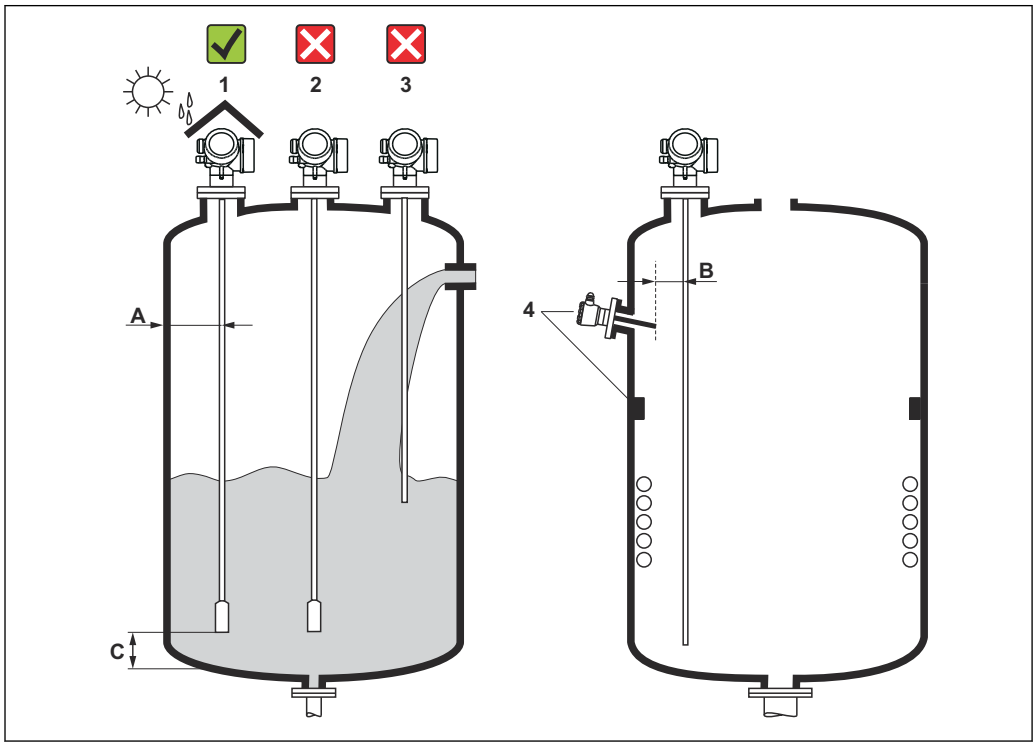
- digital (HART, PROFIBUS PA, FOUNDATION Fieldbus): average T_K = 0.6 mm/10 K
  For devices with remote sensor [4] there is an additional offset of ±0.3 mm/10K (±0.01 in/10K) per 1 m (3.3 ft) of the remote cable.
- analog (current output):
  - zero point (4 mA): average T_K = 0.02 %/10 K
  - span (20 mA): average T_K = 0.05 %/10 K

3) According to DIN EN IEC 61298-2 / DIN EN IEC 60770-1 the response time is the time which passes after a sudden change of the input signal until the output signal for the first time assumes 90% of the steady-state value.
4) Product structure: Feature 600, options MB, MC or MD)

Installation

Mounting requirements

Suitable mounting position



8 *Installation conditions for Levelflex*

Spacing requirements when mounting

- Distance (A) between the vessel wall and rod and rope probes:
  - For smooth metallic walls: > 50 mm (2 in)
  - For plastic walls: > 300 mm (12 in) to metallic parts outside the vessel
  - For concrete walls: > 500 mm (20 in), otherwise the permitted measuring range may be reduced.
- Distance (B) between rod probes and internal fittings (3): > 300 mm (12 in)
- When using more than one Levelflex:
  Minimum distance between the sensor axes: 100 mm (3.94 in)
- Distance (C) from the end of the probe to the bottom of the vessel:
  - Rope probe: > 150 mm (6 in)
  - Rod probe: > 10 mm (0.4 in)
  - Coax probe: > 10 mm (0.4 in)

Coax probes can be mounted at any distance to the wall and internal fixtures.

Additional conditions

- When mounting outdoors, a weather protection cover (1) can be used to protect the device against extreme weather conditions.
- In metallic vessels, preferably do not mount the probe in the center of the vessel (2), as this would lead to increased interference echoes.
  If a central mounting position cannot be avoided, it is essential to perform interference echo suppression (mapping) after commissioning the device.
- Do not mount the probe in the filling curtain (3).
- Avoid buckling the rope probe during installation or operation (e.g. as a result of product movement against silo wall) by selecting a suitable mounting location.

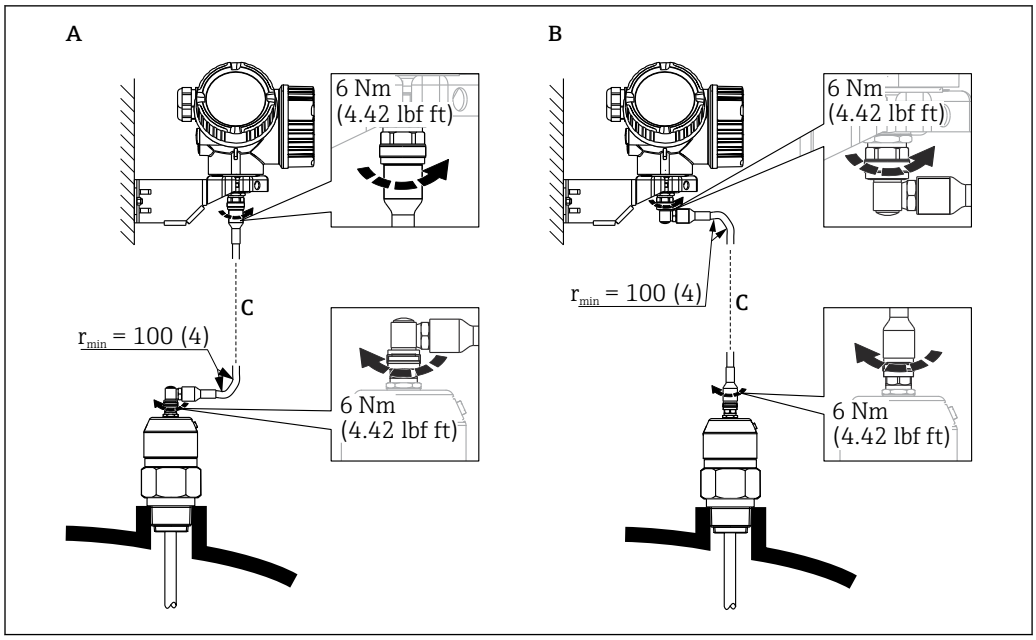
In the case of freely suspended rope probes (probe end not fixed at the bottom), the distance between the probe rope and internal fittings due to movement of the product must not fall below 300 mm (12 in). Occasional contact between the probe end weight and the cone of the vessel, however, does not influence the measurement provided that the dielectric constant is at least DC = 1.8.

When mounting the housing in a recess (e.g. in a concrete ceiling), observe a minimum distance of 100 mm (4 in) between the cover of the connection compartment/electronics compartment and the wall. Otherwise the connection compartment/electronics compartment will not be accessible after installation.

Mounting under confined conditions

Mounting with remote probe

The device version with a remote probe is suitable for applications with restricted mounting space. In this case, the electronics housing is mounted at a separate position from the probe.

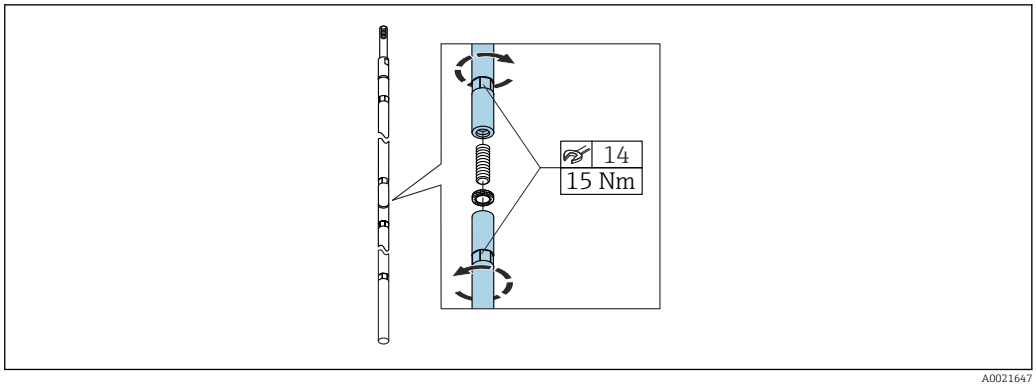


A Angled plug at the probe
B Angled plug at the electronics housing
C Length of the remote cable as ordered

- Product structure, feature 600 "Probe design":
  - Version MB "Sensor remote, 3m cable"
  - Version MC "Sensor remote, 6m cable"
  - Version MD "Sensor remote, 9m cable"
- The connecting cable is included in the delivery with these versions.
  Minimum bending radius: 100 mm (4 inch)
- The mounting bracket for the electronics housing is included in the delivery with these versions.
  Mounting options:
  - Wall mounting
  - Mounting on a post or pipe with a diameter of 42 to 60 mm (1-1/4 to 2 inch)
- The connection cable has one straight plug and one plug angled at 90°. Depending on the local conditions the angled plug can be connected at the probe or at the electronics housing.

The probe, electronics and connection cable are mutually compatible and bear a common serial number. Only components with the same serial number may be connected to one another.

Separable probes



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In confined mounting conditions (little distance to the ceiling), the use of separable rod probes is advisable (ϕ 16 mm).

- Max. probe length 10 m (394 in)
- Max. lateral loading capacity 30 Nm
- Probes can be separated several times, with the individual parts having the following lengths:
  - 500 mm (20 in)
  - 1 000 mm (40 in)
- Tightening torque: 15 Nm

Notes on the mechanical load of the probe

Tensile loading capacity of rope probes

Sensor	Feature 060	Probe	Tensile loading capacity [kN]
FMP51	LA, LB MB, MD	Rope 4mm (1/6") 316	5

Lateral loading capacity of rod probes

Sensor	Feature 060	Probe	Lateral loading capacity (bending strength) [Nm]
FMP51	AA, AB	Rod 8mm (1/3") 316L	10
	AC, AD	Rod 12mm (1/2") 316L	30
	AL, AM	Rod 12mm (1/2") AlloyC	30
	BA, BB, BC, BD	Rod 16mm (0.63") 316L separable	30

Lateral load (bending moment) from flow conditions

The formula for calculating the bending moment M acting on the probe:

$M = c_w \cdot \rho/2 \cdot v^2 \cdot d \cdot L \cdot (L_N - 0.5 \cdot L)$

With:

c_w: coefficient of friction

ρ [kg/m³]: density of medium

v [m/s]: flow velocity of the medium, perpendicular to the probe rod

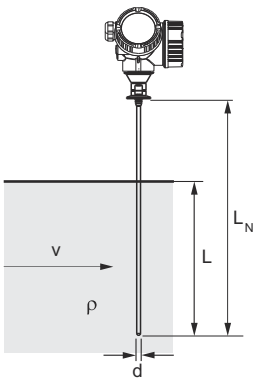
d [m]: diameter of the probe rod

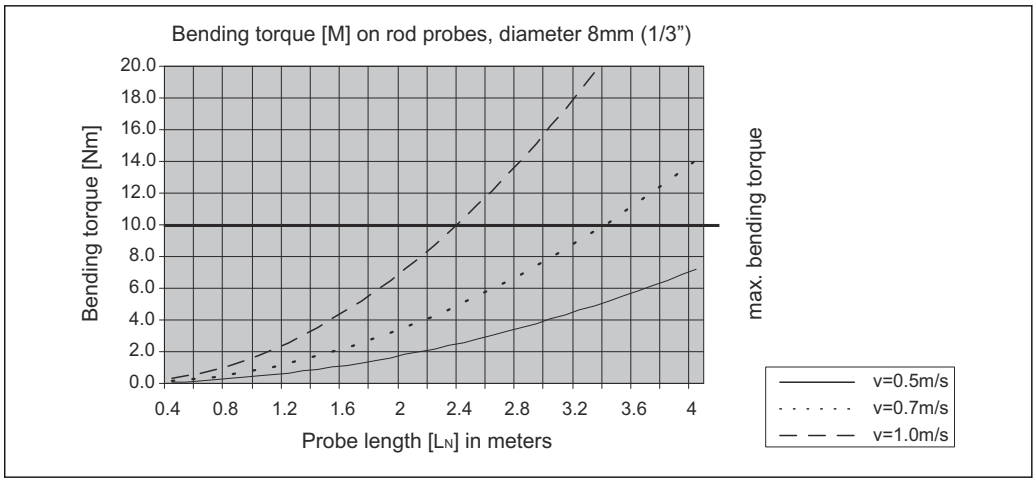
L [m]: level

LN [m]: probe length

Sample calculation

Coefficient of friction c_w	0.9 (assuming turbulent flow - high Reynolds number)
Density ρ [kg/m³]	1000 (e.g. water)
Probe diameter d [m]	0.008
$L = L_N$	(unfavorable conditions)





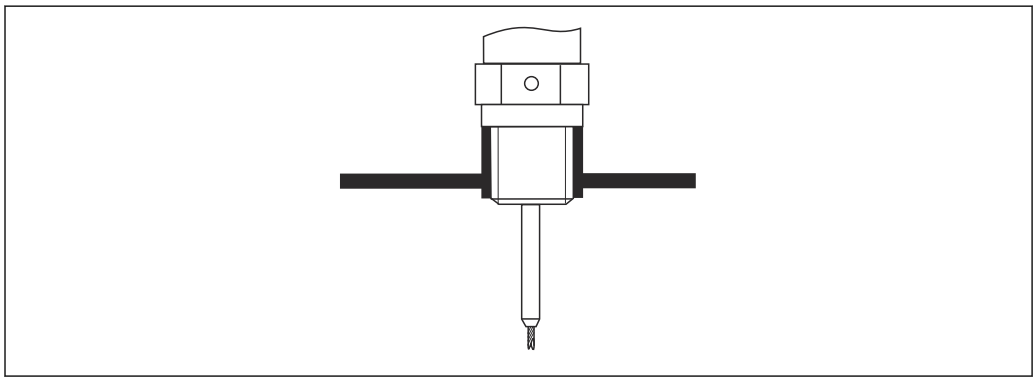
Lateral loading capacity of coax probes

Sensor	Feature 060	Process connection	Probe	Lateral loading capacity (bending strength) [Nm]
FMP51	UA, UB	G¾ or NPT¾ thread	Coax 316L, Ø 21.3 mm	60
		▪ G1½ or NPT1½ thread ▪ Flange	Coax 316L, Ø 42.4 mm	300
	UC, UD	Flange	Coax AlloyC, Ø 42.4 mm	300

Information concerning the process connection

Probes are mounted on the process connection with threaded connections or flanges. If, during this installation, there is the danger that the probe end moves so much that it occasionally touches the vessel floor or cone, the probe may need to be shortened at the bottom end and secured (fixed down) → 34.

Threaded connection



9 *Mounting with threaded connection; flush with the vessel ceiling*

Seal

The thread and the type of seal comply with DIN 3852 Part 1, screwed plug, form A.

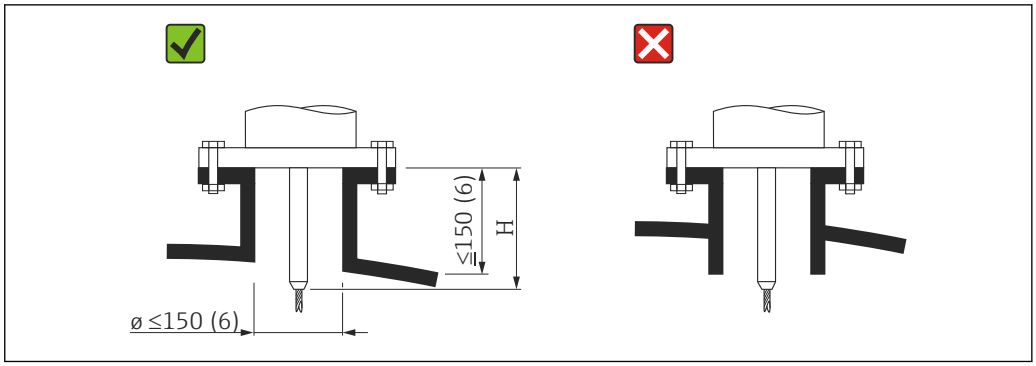
The following types of sealing ring can be used:

- For G3/4" thread: According to DIN 7603 with the dimensions 27 x 32 mm
- For G1-1/2" thread: According to DIN 7603 with the dimensions 48 x 55 mm

Use a sealing ring according to this standard in form A, C or D and of a material that offers appropriate resistance for the application.

Refer to the dimensional drawing for the length of the screwed plug:
FMP51: → 53

Nozzle installation



H Length of the centering rod or the rigid part of the rope probe

- Permissible nozzle diameter: ≤ 150 mm (6 in).
  For larger diameters, the near-range measuring capability may be reduced.
  For nozzles ≥ DN300: → 33.
- Permitted nozzle height [5]: ≤ 150 mm (6 in).
  For larger heights, the near-range measuring capability may be reduced.
  Larger nozzle heights may be possible in individual cases (see the "Centering rod" section).
- The end of the nozzle should be flush with the tank ceiling in order to avoid ringing effects.

In thermally insulated vessels, the nozzle should also be insulated in order to prevent condensate formation.

5) Larger nozzle heights available on request

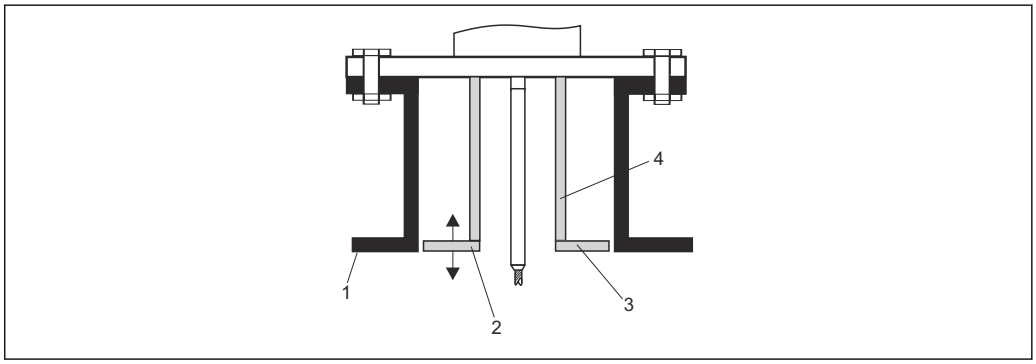
Centering rod

In the case of rope probes, it may be necessary to use a version with a centering rod so that the rope does not come in contact with the nozzle wall during the process.

Probe	Max. nozzle height (= length of centering rod)	Version of feature 060 ("probe")
FMP51	150 mm	LA
	6 inch	LB
	300 mm	MB
	12 inch	MD

Installation in nozzle ≥ DN300

If installation in nozzles ≥ 300 mm/12" is unavoidable, installation must be performed according to the following diagram in order to avoid interference signals in the near-range.

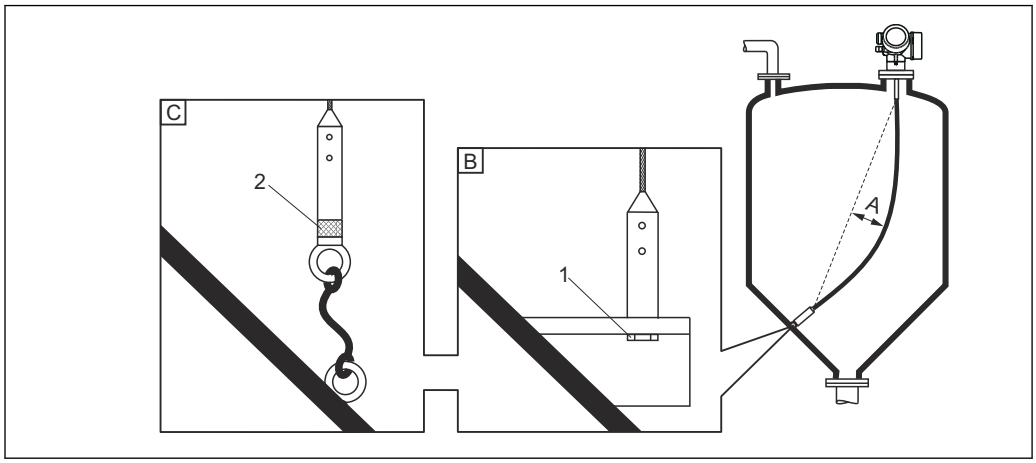


1 Lower edge of the nozzle
2 Approximately flush with the lower edge of the nozzle (± 50 mm)
3 Plate
4 Pipe Φ 150 to 180 mm

Nozzle diameter	Plate diameter
300 mm (12")	280 mm (11")
≥ 400 mm (16")	≥ 350 mm (14")

Securing the probe

Securing rope probes

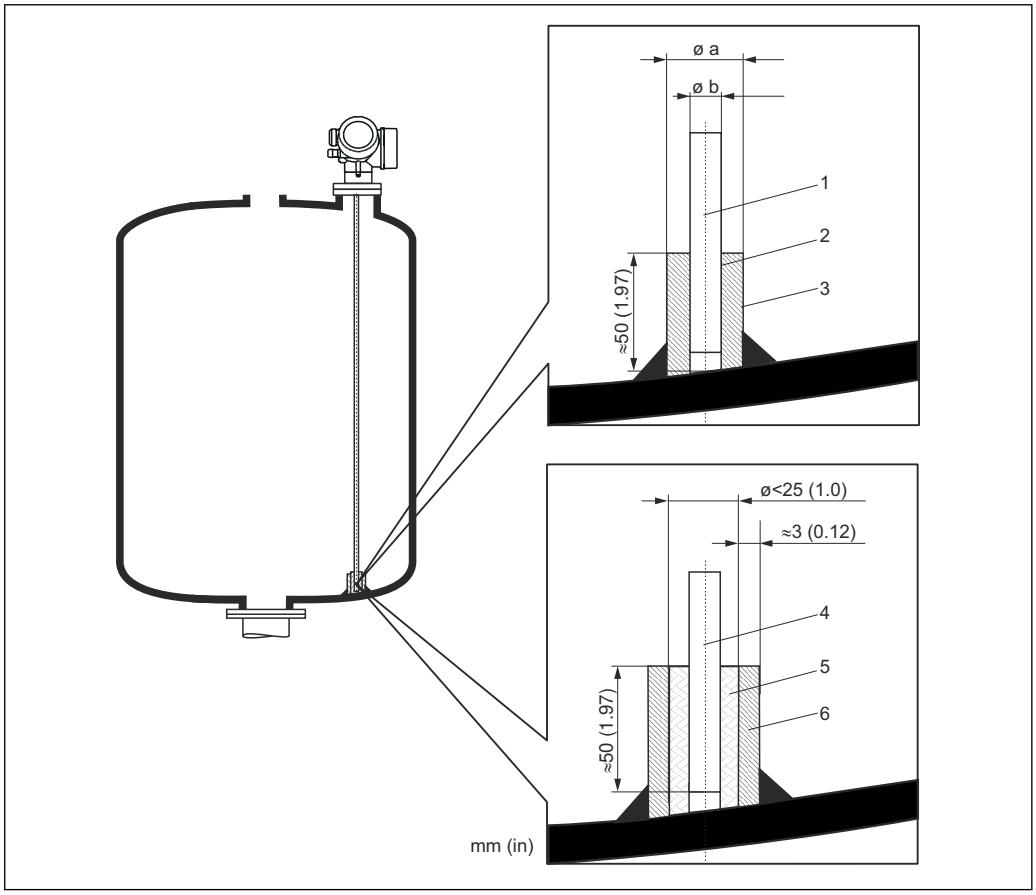


A Sag of the rope: ≥ 1 cm per 1m of the probe length (0.12 inch per 1 ft of the probe length)
B Reliably grounded end of probe
C Reliably isolated end of probe
1: Mounting and contact with a bolt
2 Mounting kit isolated

- The end of the probe needs to be secured under the following conditions:
  if otherwise the probe sporadically comes into contact with the wall of the vessel, the outlet cone, internal fittings or other parts of the installation.
- The end of probe can be secured at its internal thread
  rope 4 mm (1/6"), 316: M 14
- The fixing must be either reliably grounded or reliably insulated. If it is not possible to mount the probe weight with a reliably insulated connection, it can be secured using an isolated eyelet, which is available as an accessory.
- In order to prevent an extremely high tensile load (e.g. due to thermal expansion) and the risk of rope crack, the rope has to be slack. Make the rope longer than the required measuring range such that there is a sag in the middle of the rope that is ≥ 1cm/(1 m rope length) [0.12 inch/(1 ft rope length)].
  Tensile load limit of rope probes: → 🖹 24

Securing rod probes

- For WHG approvals: For probe lengths ≥ 3 m (10 ft) a support is required.
- In general, rod probes must be supported if there is a horizontal flow (e.g. from an agitator) or in the case of strong vibrations.
- Rod probes may only be supported at the end of the probe.



1 Probe rod, uncoated
2 Sleeve bored tight to ensure electrical contact between the rod and sleeve!
3 Short metal pipe, e.g. welded in place
4 Probe rod, coated
5 Plastic sleeve, e.g. PTFE, PEEK or PPS
6 Short metal pipe, e.g. welded in place

Φ probe	Φ a [mm (inch)]	Φ b [mm (inch)]
8 mm (1/3")	< 14 (0.55)	8.5 (0.34)
12 mm (1/2")	< 20 (0.78)	12.5 (0.52)
16 mm (0.63in)	< 26 (1.02)	16.5 (0.65)

NOTICE

Poor grounding of the end of probe may cause measuring errors.

► Apply a narrow sleeve which has good electrical contact to the probe.

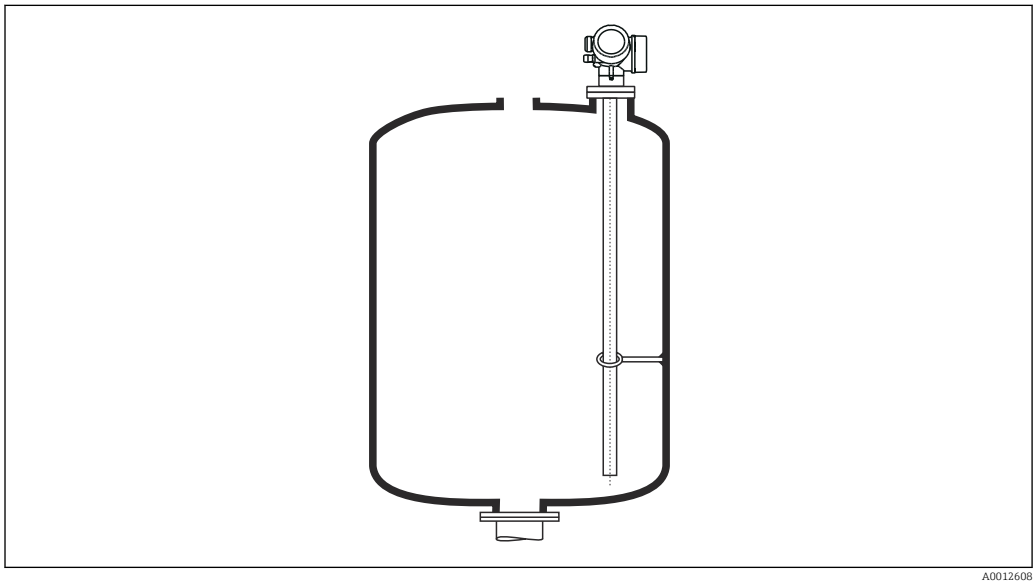
NOTICE

Welding may damage the main electronics module.

► Before welding: Ground the probe and dismount electronics.

Securing coax probes

For WHG approvals: For probe lengths ≥ 3 m (10 ft) a support is required.



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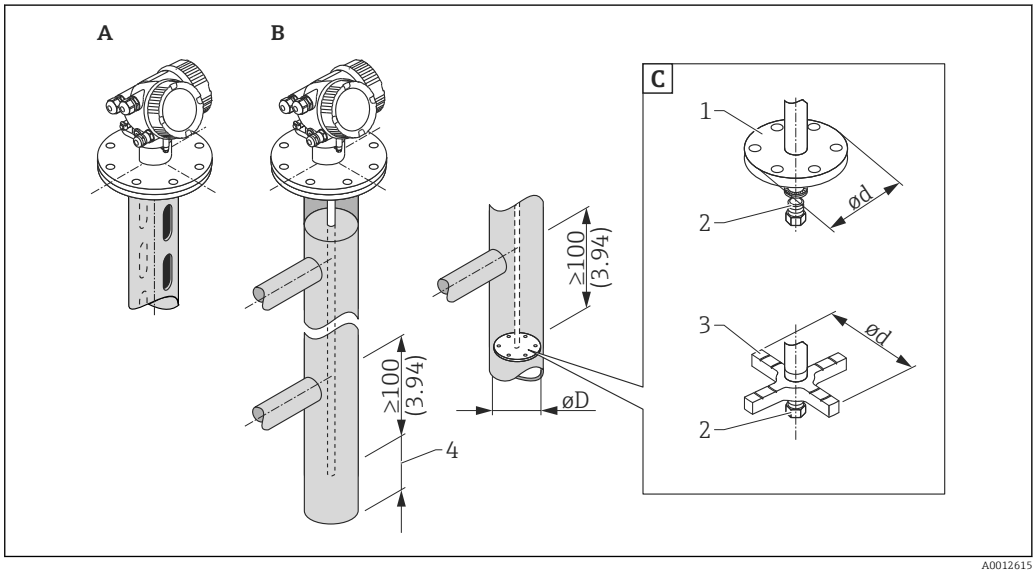
Coax probes can be supported at any point of the outer tube.

Special installation situations

Bypasses and stilling wells

In bypass and stilling well applications it is recommended to use a centering disks or stars.



10 *Dimensions: mm (in)*

A Mounting in a stilling well
B Mounting in a bypass
C Center washer or centering star
1 Metallic center washer (316L) for level measurement
2 Fixing screw; torque: 25 Nm ± 5 Nm
3 Non-metallic centering star (PEEK, PFA) for interface measurement
4 Minimum distance between end of probe and lower edge of the bypass; see table below

Allocation of probe type and center washer or centering star to pipe diameter

Feature 610 - Accessory mounted					
Application	**Option**	**Type of probe**	**Center washer Centering star**		**Pipe**
			Φ d [mm (in)]	**Material**	**Φ D [mm (in)]**
Level measurement	OA	Rod probe	75 (2,95)	316L	DN80/3" to DN100/4"
	OB	Rod probe	45 (1,77)	316L	DN50/2" to DN65/2½"
	OC	Rope probe	75 (2,95)	316L	DN80/3" to DN100/4"
Level or interface measurement	OD	Rod probe	48...95 (1,89...3,74)	PEEK [1]	≥ 50 mm (2")
	OE	Rod probe	37 (1,46)	PFA [2]	≥ 40 mm (1.57")

1) Operation temperature: −60 to +250 °C (−76 to 482 °F)
2) Operation temperature: −200 to +250 °C (−328 to +482 °F)

Minimum distance between end of probe and lower edge of the bypass

Type of probe	Minimum distance
Rope	10 mm (0.4 in)
Rod	10 mm (0.4 in)
Coax	10 mm (0.4 in)

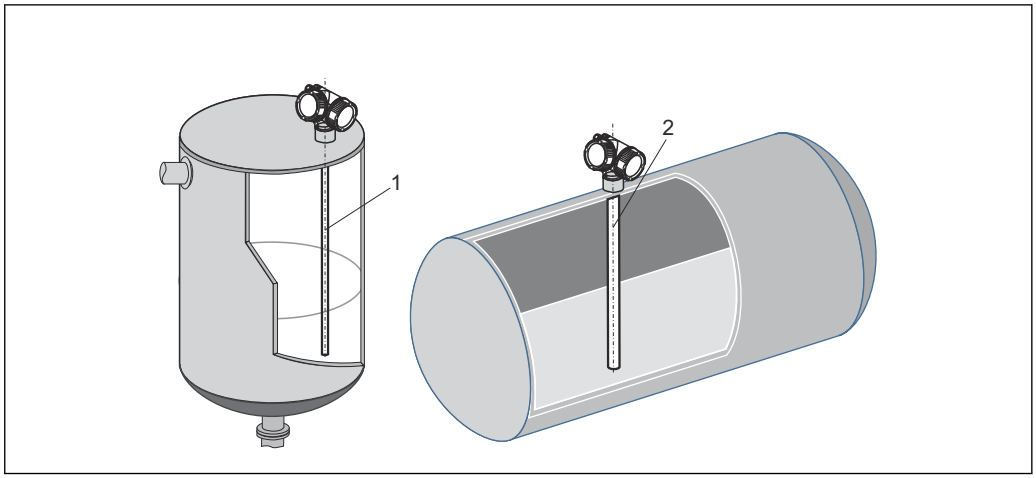
- Pipe diameter: > 40 mm (1.6") for rod probes
- Rod probe installation can take place up to a diameter size of 150 mm (6 in). In the event of larger diameters, a coax probe is recommended.
- Side disposals, holes or slits and welded joints that protrude up to approx. 5 mm (0.2") inwards do not influence 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, secure the probe by retaining or tensioning. All rope probes are prepared for tensioning in containers (tensioning weight with anchor hole).
- If a metallic center washer is mounted at the end of the probe, it enables a reliable recognition of the end-of-probe signal (see feature 610 of the product structure).
  Note: For interface measurements only use the nonmetallic centering star made of PEEK or PFA (feature 610, options OD or OE).
- Coax probes can always be applied if there is enough mounting space.

For bypasses with condensate formation (water) and a medium with low dielectric constant (e.g. hydrocarbons):

In the course of time the bypass is filled with condensate up to the lower disposal and for low levels the the level echo is superimposed by the condensate echo. Thus in this range the condensate level is measured instead of the correct level. Only higher levels are measured correctly. To prevent this, position the lower disposal 100 mm (4 in) below the lowest level to be measured and apply a metallic centering disk at the height of the lower edge of the lower disposal.

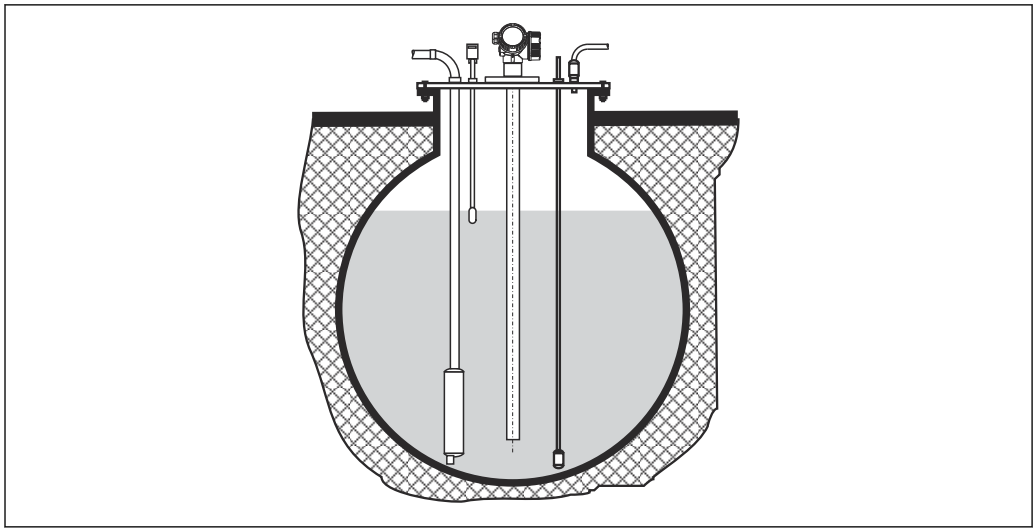
With heat insulated tanks the bypass should also be insulated in order to prevent condensate formation.

Horizontal cylindrical and vertical tanks



- Any distance from wall provided occasional contact is avoided.
- When installing in tanks with many internal fittings or internal fittings situated close to the probe: use a coax prob (1), (2).

Underground tanks



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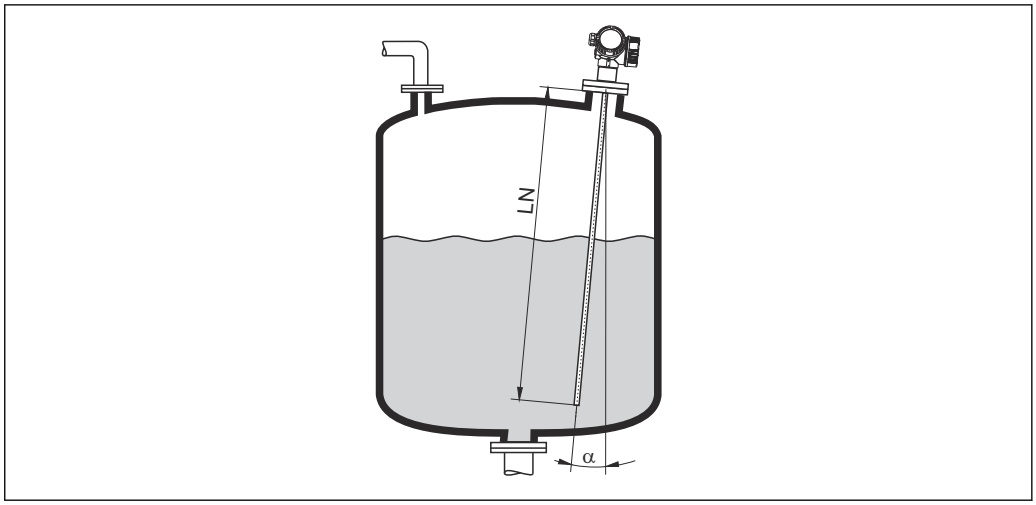
In the case of nozzles with large diameters, use a coax probe to avoid reflections at the nozzle wall.

Mounting at an angle



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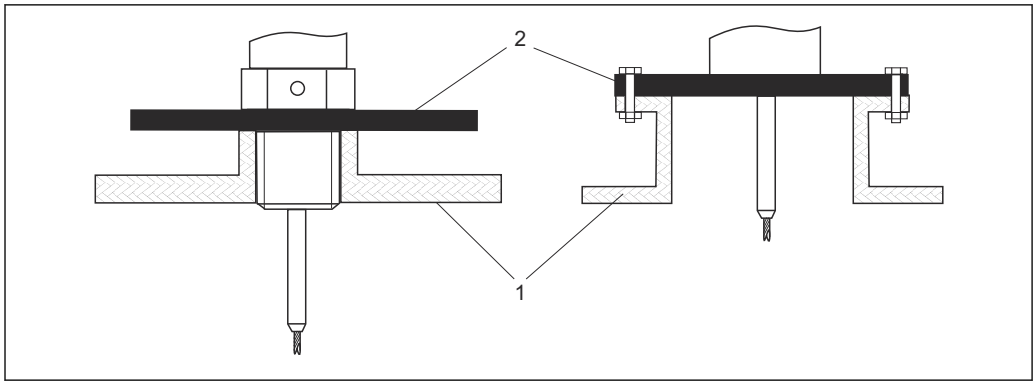
- For mechanical reasons, the probe should be installed as vertically as possible.
- If the probe is installed at an angle, the length of the probe must be reduced depending on the angle of installation.
  - Up to LN = 1 m (3.3 ft): α = 30°
  - Up to LN = 2 m (6.6 ft): α = 10°
  - Up to LN = 4 m (13.1 ft): α = 5°

Non-metal vessels



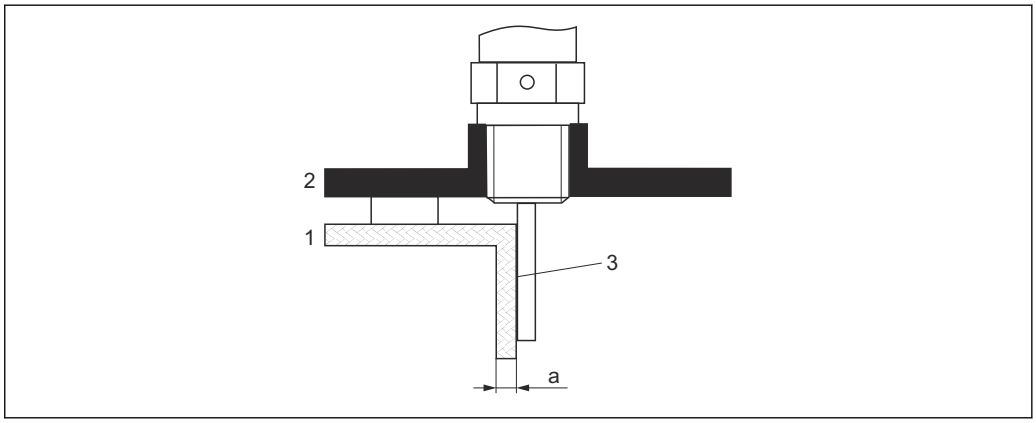
1 Non-metal vessel
2 Metal sheet or metal flange

To ensure good measurement results when mounting on non-metal vessels
- Use a device with a metal flange (minimum size DN50/2").
- Alternatively, mount a metal plate with a diameter of at least 200 mm (8 in) at a right angle to the probe at the process connection.

A metal surface is not required at the process connection in the case of coax probes.

Plastic and glass vessels: Mounting the probe on the outside wall

In the case of plastic and glass vessels, the probe can also be mounted on the outside wall under certain conditions.



A0014150

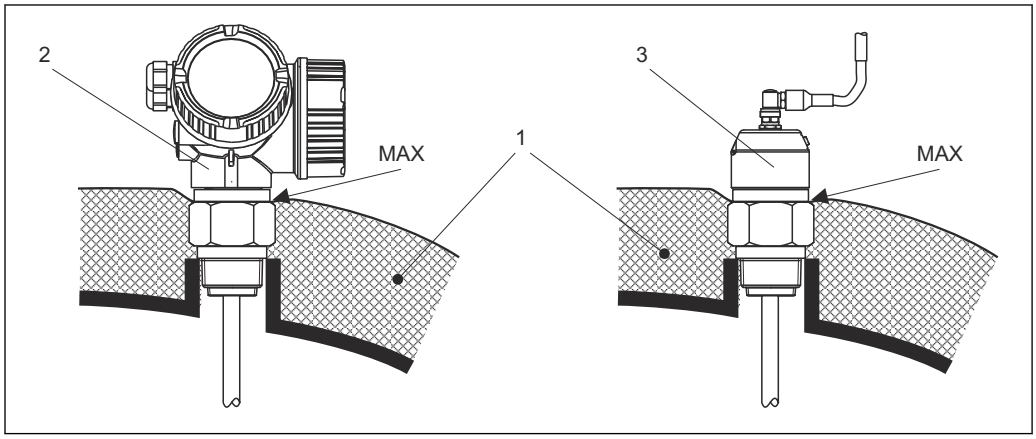
1 Plastic or glass vessel
2 Metal plate with screw-in sleeve
3 No space between vessel wall and probe!

Requirements
- Dielectric constant of the medium: DC > 7.
- Non-conductive vessel wall.
- Maximum wall thickness (a):
  - Plastic: < 15 mm (0.6 in)
  - Glass: < 10 mm (0.4 in)
- No metal reinforcements on the vessel.

Note the following when mounting the device:
- Mount the probe directly on the vessel wall without any space between the wall and probe.
- To prevent any influences on the measurement, affix a plastic half pipe with a minimum diameter of 200 mm (8 in) or a similar protective unit on the probe.
- If the vessel diameter is less than 300 mm (12 in):
  On the opposite side of the vessel, fit a grounding plate that is conductively connected to the process connection and covers around half of the vessel's circumference.
- If the vessel diameter is 300 mm (12 in) or higher:
  Mount a metal plate with a diameter of at least 200 mm (8 in) at a right angle to the probe at the process connection (see above).

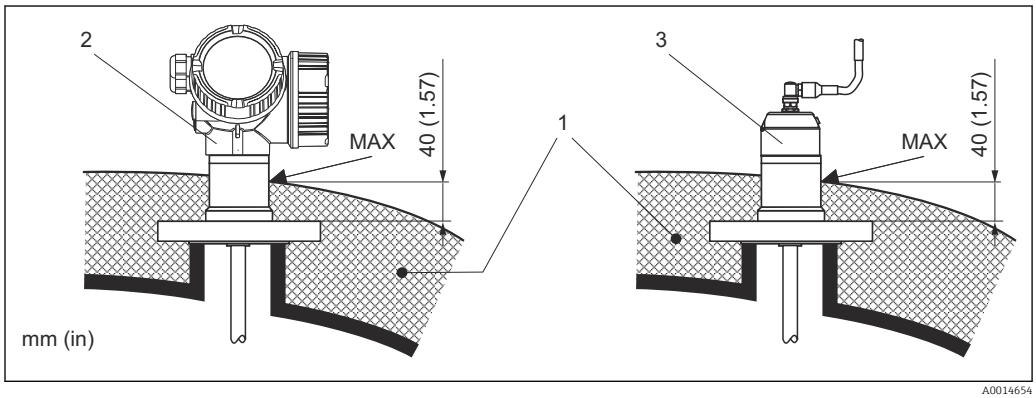
Vessel with thermal insulation

If process temperatures are high, the device must be included in normal vessel insulation (1) in order to prevent the electronics heating up as a result of thermal radiation or convection. The insulation may not go beyond the points labeled "MAX" in the drawings.



11 *Process connection with thread - FMP51*

1 *Vessel insulation*
2 *Compact device*
3 *Sensor remote (feature 600)*



12 *Process connection with flange - FMP51*

1 *Vessel insulation*
2 *Compact device*
3 *Sensor remote (feature 600)*

Operating conditions: Environment

Ambient temperature

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.
Connecting cable (for "Sensor, remote" probe design)	Max. 100 °C (212 °F)
Remote display FHX50	−40 to 80 °C (−40 to 176 °F)

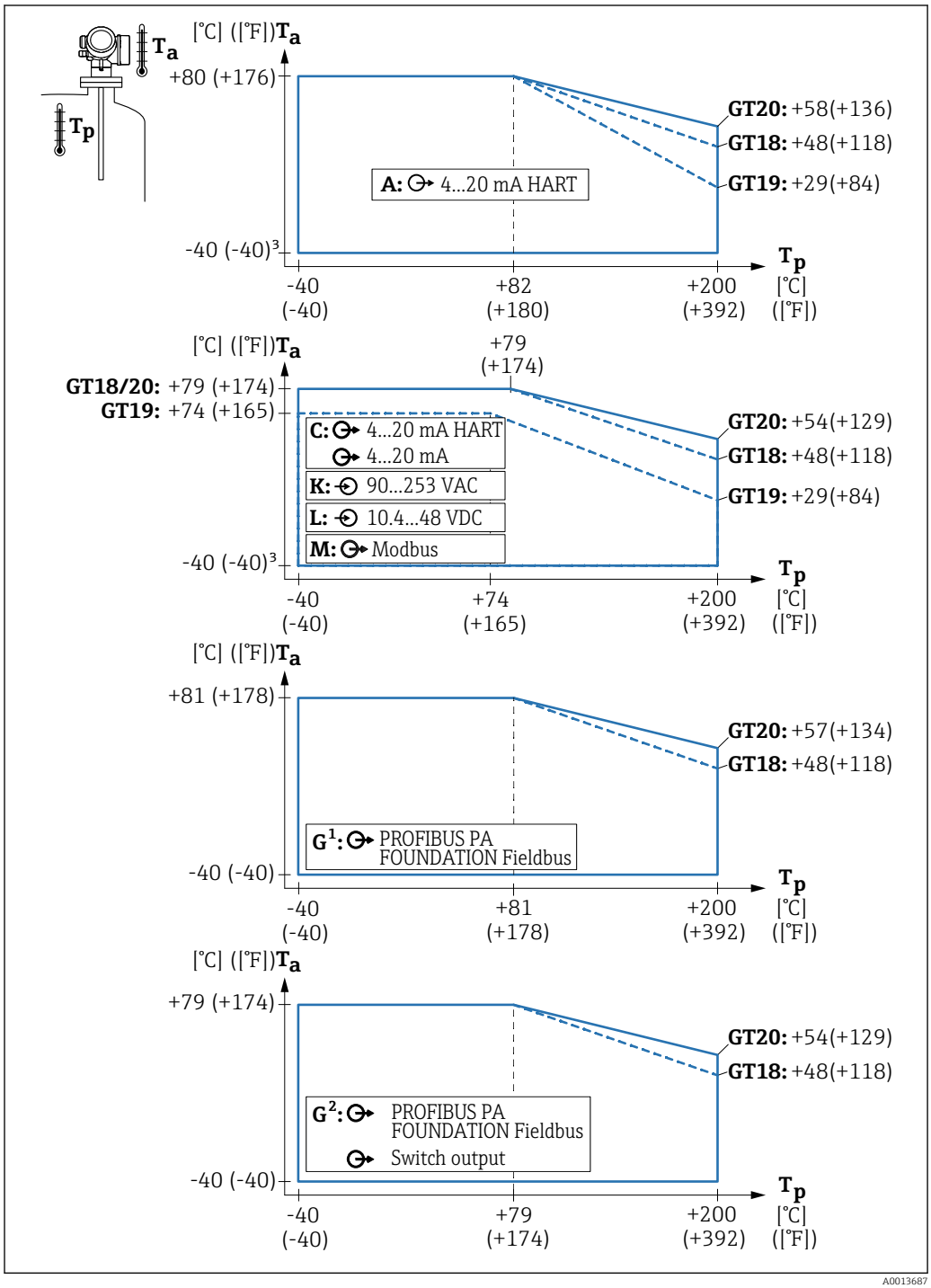
If operating outdoors in strong sunlight:
- Mount the device in the shade.
- Avoid direct sunlight, particularly in warm climatic regions.
- Use a weather protection cover (see accessories).

Ambient temperature limits

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

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):

Temperature derating for FMP51 with threaded connection G¾ or NPT¾



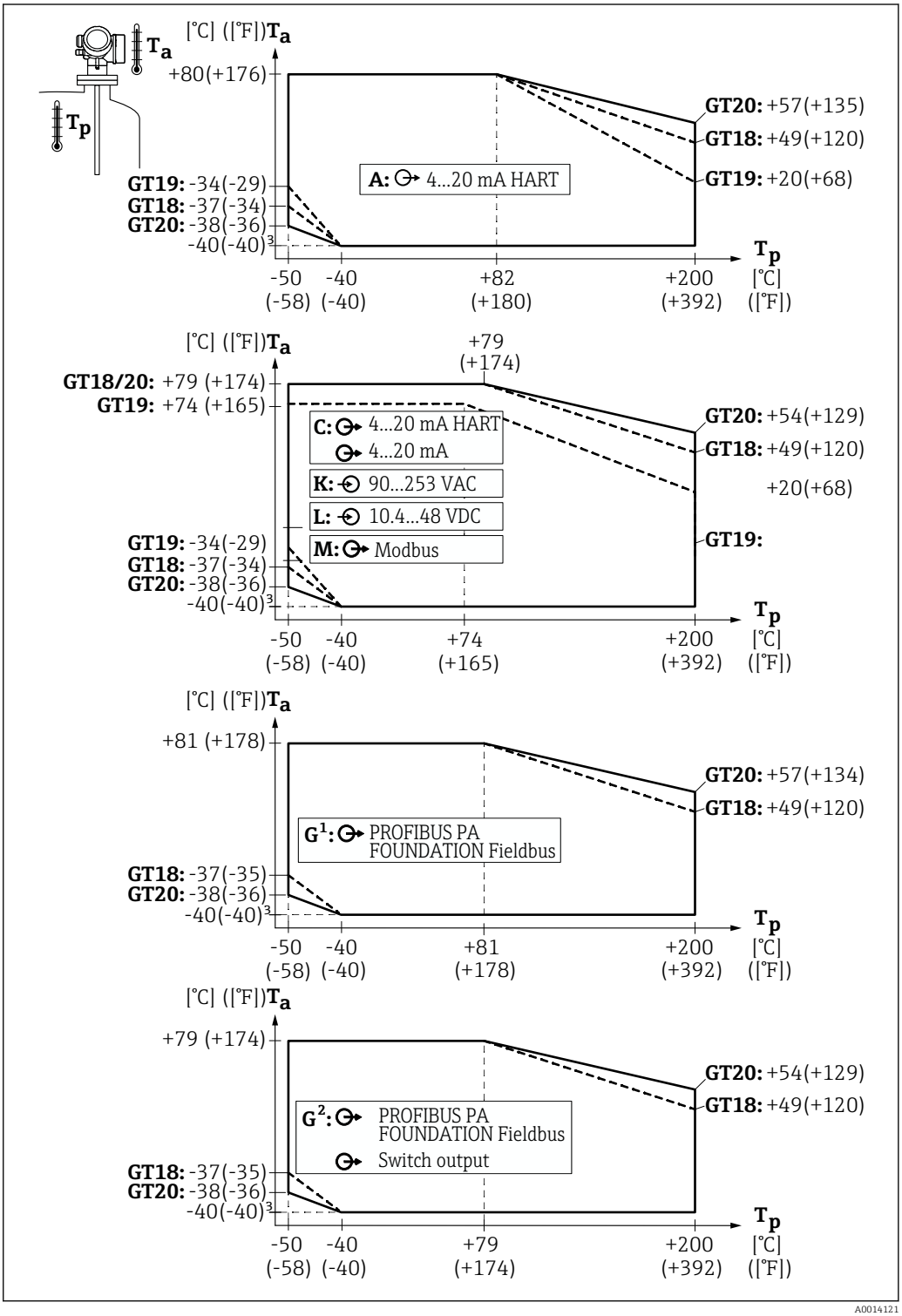
GT18 = Stainless steel housing
GT19 = Plastic housing
GT20 = Aluminum housing

A = 1 current output
C = 2 current outputs
G¹, G² = PROFIBUS PA [1) 2)]
K, L = 4-wire

T_a = Ambient temperature
T_p = Temperature at the process connection

1) G¹: Switch output not used
2) G²: Switch output used

Temperature derating for FMP51 with threaded connection G1½ or NPT1½



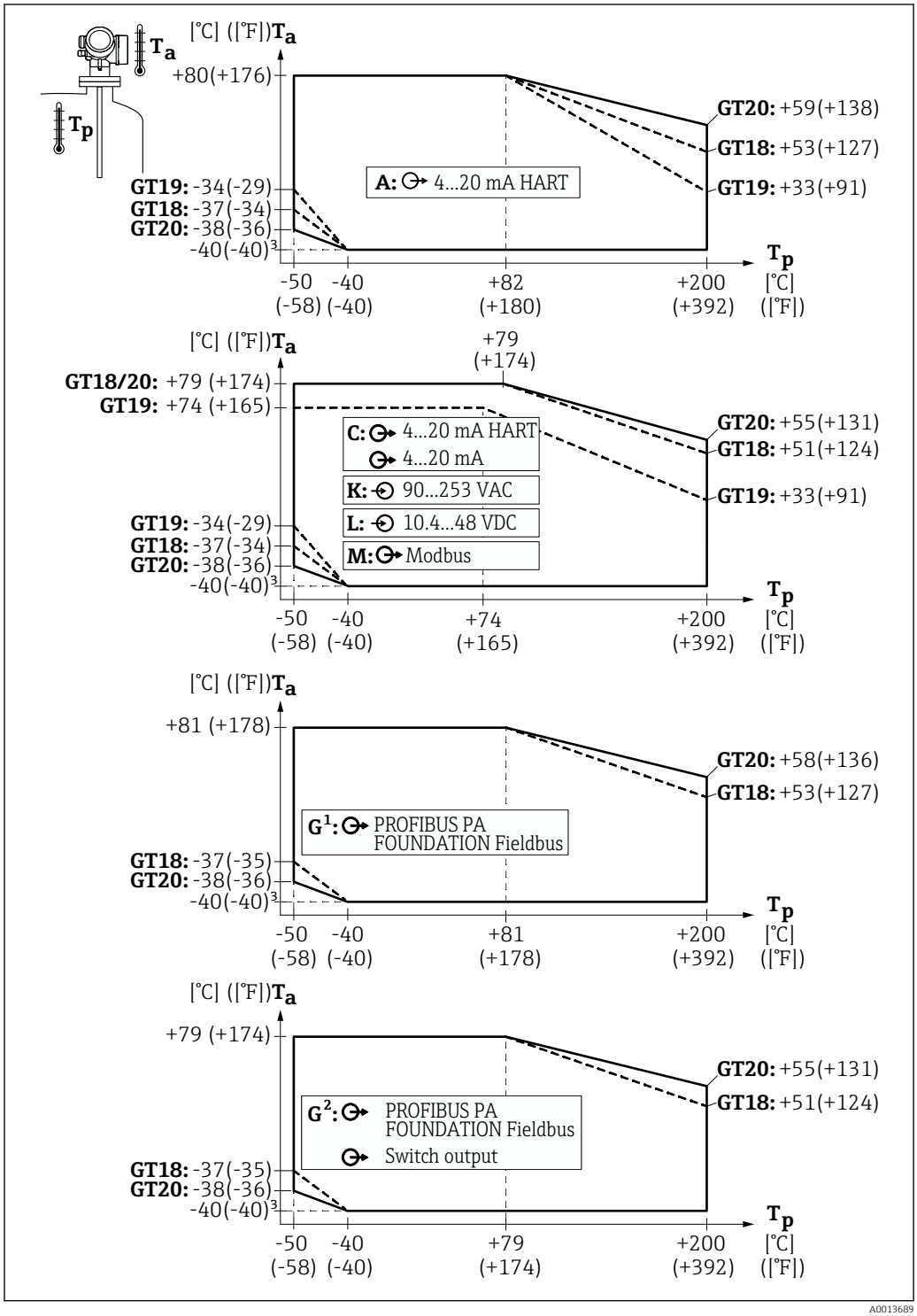
GT18 = Stainless steel housing
GT19 = Plastic housing
GT20 = Aluminum housing

A = 1 current output
C = 2 current outputs
G^1, G^2 = PROFIBUS PA [1) 2)]
K, L = 4-wire

T_a = Ambient temperature
T_p = Temperature at the process connection

1) G^1: Switch output not used
2) G^2: Switch output used

Temperature derating for FMP51 with flange



GT18 = Stainless steel housing
GT19 = Plastic housing
GT20 = Aluminum housing

A = 1 current output
C = 2 current outputs
G^1, G^2 = PROFIBUS PA [1) 2)]
K, L = 4-wire

T_a = Ambient temperature
T_p = Temperature at the process connection

1) G^1: Switch output not used
2) G^2: Switch output used

Storage temperature	−40 to +80 °C (−40 to +176 °F) Option for FMP51 and FMP54: −50 to +80 °C (−58 to +176 °F) [6]
Climate class	DIN EN 60068-2-38 (test Z/AD)

Altitude according to IEC61010-1 Ed.3	▪ Generally up to 2 000 m (6 600 ft) above MSL.
	▪ Above 2 000 m (6 600 ft) if the following conditions are met:
	  ▪ Ordering feature 020 "Power supply; Output" = A, B, C, E or G (2-wire versions)
	  ▪ Supply voltage U < 35 V
	  ▪ Supply voltage of overvoltage category 1

Degree of protection	▪ With closed housing tested according to:
	  ▪ IP68, NEMA6P (24 h at 1.83 m under water surface) [7]
	  ▪ For plastic housing with transparent cover (display module): IP68 (24 h at 1.00 m under water surface) [8]
	  ▪ IP66, NEMA4X
	▪ With open housing: IP20, NEMA1
	▪ Display module: IP22, NEMA2
	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 60068-2-64: 20 to 2 000 Hz, 1 $(m/s^2)^2/Hz$
Cleaning the probe	Dirt or buildup may form on the probe depending on the application. A thin, even layer has little impact on the measurement. Thick layers can dampen the signal and then reduce the measuring range. Very uneven deposit formation, e.g. caking due to crystallization, can result in incorrect measurements. In such cases, we recommend the use of a non-contact measuring principle, or a regular inspection of the probe for contamination.
Electromagnetic compatibility (EMC)	Electromagnetic compatibility in accordance with all the relevant requirements outlined in the EN 61326 series and NAMUR Recommendation EMC (NE 21). For details, refer to the Declaration of Conformity. A standard installation cable suffices if only the analog signal should be used. Use a shielded cable for digital communication (HART, PROFIBUS PA, FOUNDATION Fieldbus, Modbus). Maximum measured error during EMC testing: < 0.5 % of the span. When the probes are installed in metal and concrete vessels and when a coax probe is used: ▪ Interference emission according to EN 61326 - x series, Class B equipment. ▪ Interference immunity according to EN 61326 - x series, requirements for industry 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 according to EN 61326 - x series, Class A equipment. ▪ Interference immunity: the effect of strong electromagnetic fields can influence the measured value.

6) This range applies if the option JN "Transmitter ambient temperature" −50 °C (−58 °F) was selected in feature 580 "Test, Certificate". If the temperature is permanently below −40 °C (−40 °F), higher failure rates can be expected.
7) also valid for the "Sensor remote" version
8) This restriction is valid if the following options of the product structure have been selected at the same time: 030 ("Display, Operation") = C ("SD02") or E ("SD03"); 040 ("Housing") = A ("GT19").

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	Approval
FMP51	FKM (Viton GLT 37559)	−30 to +150 °C (−22 to +302 °F)	
		−40 to +150 °C (−40 to +302 °F) only in combination with feature 610 "Accessory Mounted" option model NC "Gas-tight feed through"	
	EPDM (70C4 pW FKN or E7515)	−40 to +120 °C (−40 to +248 °F)	
	FFKM (Kalrez 6375) [1]	−20 to +200 °C (−4 to +392 °F) [2]	
	FVMQ (FVMQ 70C79)	−50 to 130 °C (−58 to 260 °F)	

1) Recommended for steam applications
2) Not recommended for saturated steam above 150 °C (302 °F). Use FMP54 instead.

With uncoated probes, the medium temperature may be higher, under the condition that the maximum process temperature specified in the table above is not exceeded at the process connection.

However, when using rope probes, the stability of the probe rope is reduced by structural changes at temperatures above 350 °C (662 °F).

Process pressure range

Device	Process pressure
FMP51	−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. Pay attention to pressure-temperature dependencies.

Please refer to the following standards for the pressure values permitted for higher temperatures:
- EN 1092-1: 2007 Tab. G.4.1-x
  With regard to their temperature stability properties, the materials 1.4435 and 1.4404 are grouped under 13E0 in EN 1092-1:2007 Tab. G.3.1-1. The chemical composition of the two materials can be identical.
- ASME B 16.5a - 2013 Tab. 2-2.2 F316
- ASME B 16.5a - 2013 Tab. 2.3.8 N10276
- JIS B 2220

Dielectric constant (DC)

- Coax probes: DC (ε_r) ≥ 1.4
- Rod and rope probe: DC (ε_r) ≥ 1.6 (when installing in pipes DN ≤ 150 mm (6 in): DC (ε_r) ≥ 1.4)

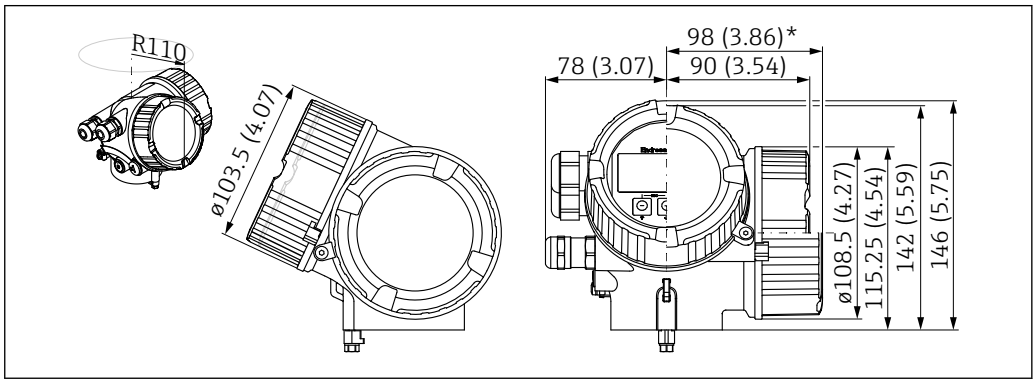
Expansion of the rope probes through temperature

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

Mechanical construction

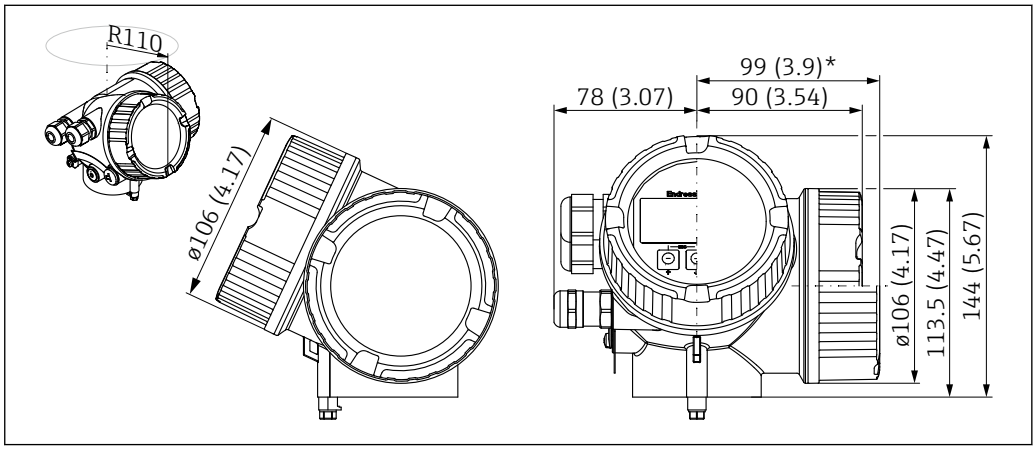
Dimensions

Dimensions of the electronics housing



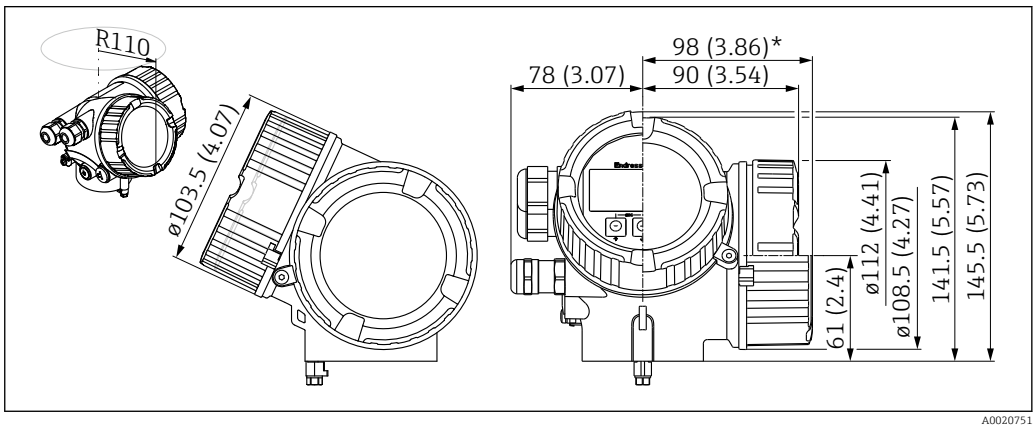
13 *Housing GT18 (316L). Unit of measurement mm (in)*

**For devices with integrated overvoltage protection.*



14 *GT19 housing (plastic PBT). Unit of measurement mm (in)*

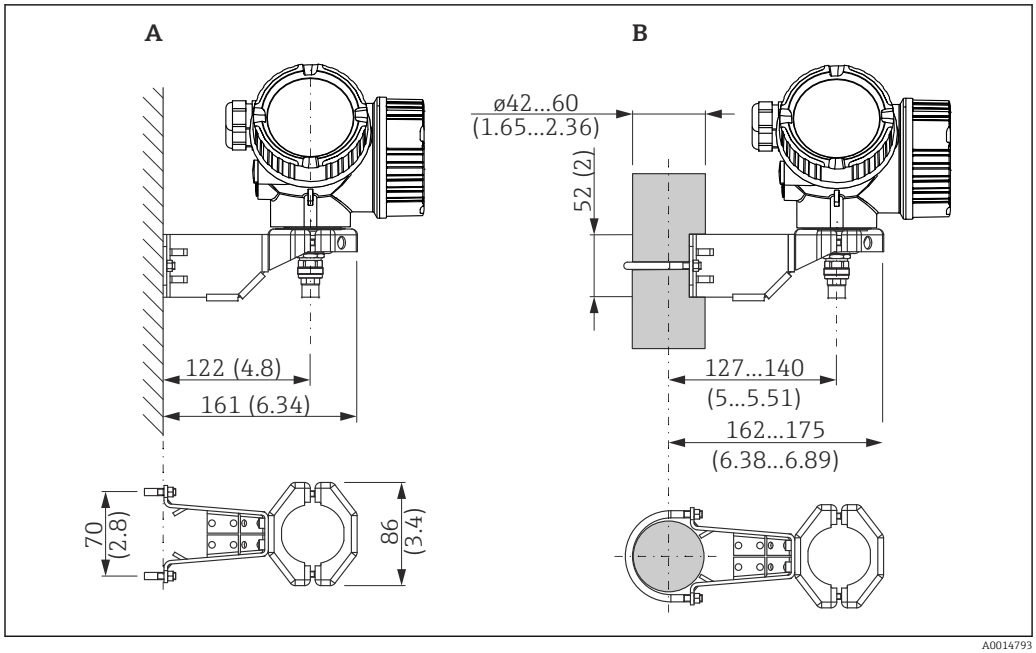
**For devices with integrated overvoltage protection.*



15 *Housing GT20 (aluminum coated). Unit of measurement mm (in)*

**For devices with integrated overvoltage protection.*

Mounting bracket dimensions

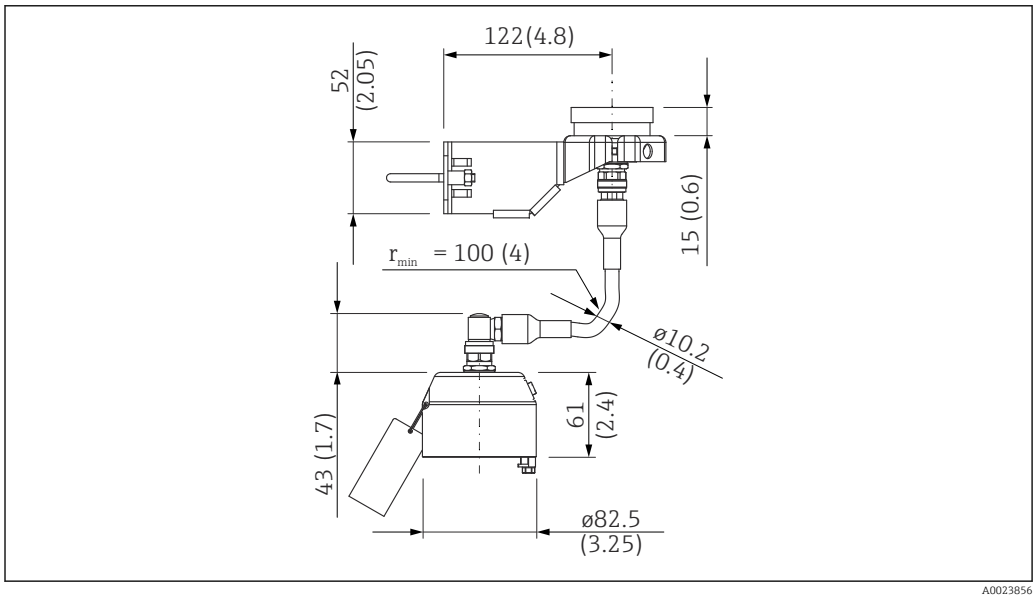


16 *Mounting bracket for electronics housing; engineering unit: mm (in)*

A Wall mounting
B Post mounting

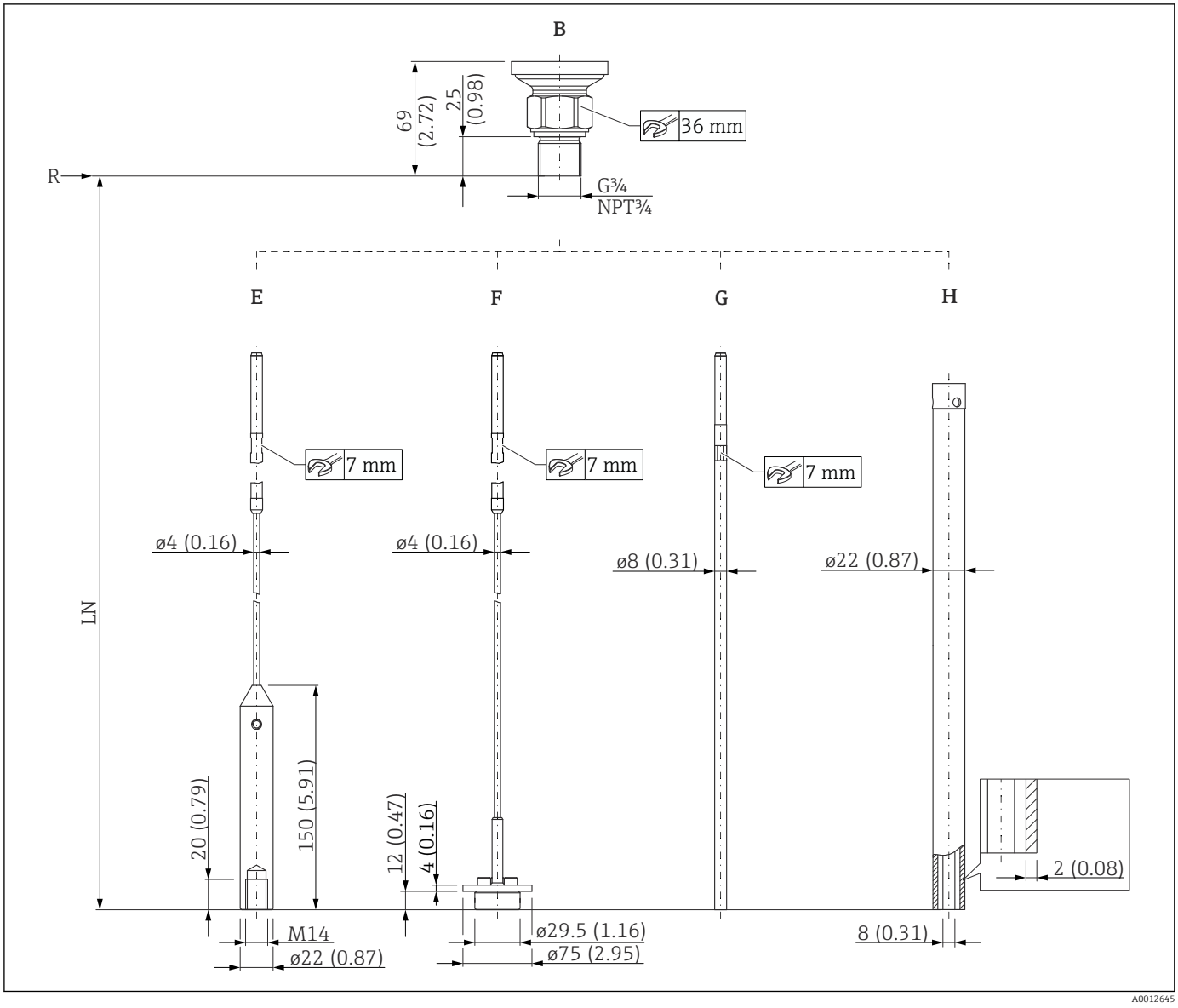
With "remote sensor" device versions (see feature 060 in the product structure), the mounting bracket is included in the scope of delivery. However, it can also be ordered separately as an accessory (order number: 71102216).

Dimensions of connection piece for remote probe



17 *Connection piece for the remote probe; engineering unit: mm (in); length of connecting cable: as ordered*

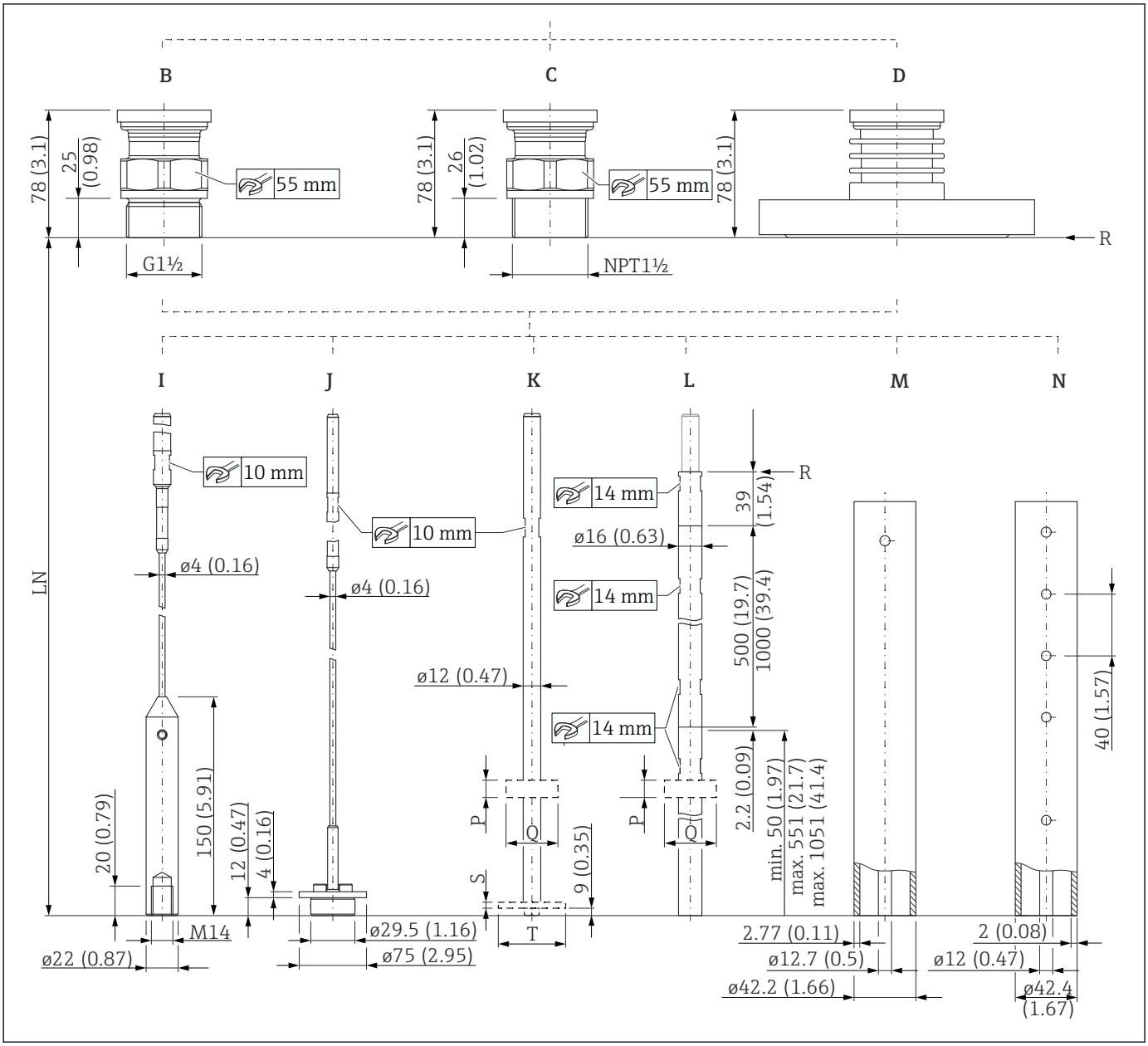
FMP51: Dimensions of process connection (G¾,NPT¾)/probe



18 FMP51: process connection / probe; engineering unit: mm (in). Unit of measurement mm (in)

B Thread ISO228 G3/4 or ANSI MNPT3/4 (feature 100)
E Rope probe 4mm or 1/6" (feature 060)
F Rope probe 4mm or 1/6"; centering disk optional (features 060 and 610)
G Rod probe 8mm or 1/3" (feature 060)
H Coax probe (feature 060); with venting hole Ø approx. 6 mm (0.24 in)
LN Probe length
R Reference point of measurement

FMP51: Dimensions of process connection (G1½,NPT1½, flange)/probe



19 FMP51: process connection / probe; engineering unit: mm (in)

B Thread ISO228 G1-1/2 (feature 100)
C Thread ANSI MNPT1-1/2 (feature 100)
D Flange ANSI B16.5, EN1092-1, JIS B2220 (feature 100)
I Rope probe 4mm or 1/6" (feature 060)
J Rope probe 4mm or 1/6"; centering disk optional (features 060 and 610)
K Rod probe 12mm or 1/2"; centering disk optional, see table below (features 060 and 610)
L Rod probe 16mm or 0.63in, 500mm or 1000mm, separable; centering disk optional, see table below (features 060 and 610)
M Coax probe; AlloyC (feature 060); with venting hole Ø approx. 8 mm (0.3 in)
N Coax probe; 316L (feature 060); with venting holes Ø approx. 10 mm (0.4 in)
LN Probe length
P Thickness of centering star; for table of values, see below
Q Diameter of centering star; for table of values, see below
R Reference point of measurement
S Thickness of centering disk or centering star; for table of values, see below
T Diameter of centering disk or centering star: for table of values, see below

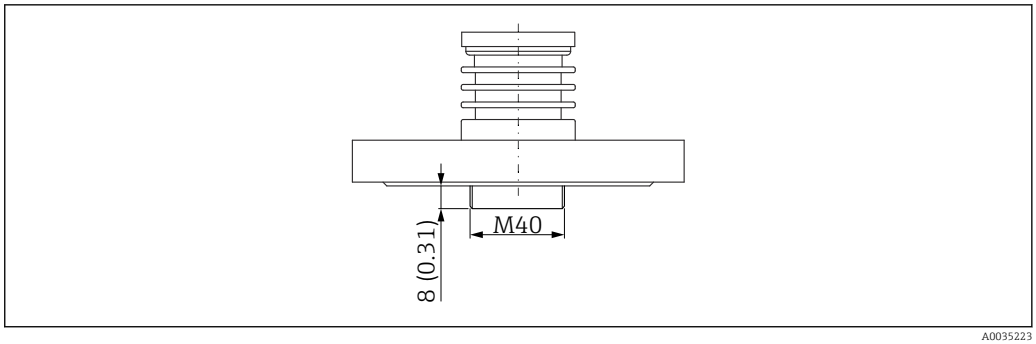
Centering disk / centering star / centering weight

Order code 610 "Accessory mounted"	Meaning	Thickness	Diameter
OA	Rod centering disk 316L; pipe diameter DN80/3" + DN100/4"	S = 4 mm (0.16 in)	T = 75 mm (2.95 in)
OB	Rod centering disk 316L; pipe diameter DN50/2" + DN65/2-1/2"	S = 4 mm (0.16 in)	T = 45 mm (1.77 in)
OC	Rope centering disk 316L; pipe diameter DN80/3" + DN100/4"	S = 4 mm (0.16 in)	T = 75 mm (2.95 in)
OD	Rod centering star PEEK; interface measurement; pipe diameter DN50/2" + DN100/4"	S =7 mm (0.28 in)	T = 48 to 95 mm (1.9 to 3.7 in)
OE	Rod centering star PFA; interface measurement; pipe diameter DN40/1-1/2" + DN50/2"	P = 10 mm (0.39 in)	Q = 37 mm (1.46 in)
OK	Rope centering weight 316L for DN50/2"	60 mm (2.4 in)	45 mm (1.77 in)
OL	Rope centering weight 316L for DN80/3"	30 mm (1.18 in)	75 mm (2.95 in)
OM	Rope centering weight 316L for DN100/4"	30 mm (1.18 in)	95 mm (3.7 in)

Note on AlloyC flanges

AlloyC flanges always have an additional thread, even if they are not used with a coax probe.

Options for order feature 100 for "Process connection" that are affected: AEM, AFM, AGM, AQM, ARM, ASM, ATM, CEM, CFM, CGM, CQM, CRM, CSM, CTM.



20 Dimensions of AlloyC flanges; engineering unit: mm (in)

Probe length tolerances

Rod and coax probes				
above [m (ft)]	–	1 (3.3)	3 (9.8)	6 (20)
up to [m (ft)]	1 (3.3)	3 (9.8)	6 (20)	–
permitted tolerance [mm (in)]	-5 (-0.2)	-10 (-0.39)	-20 (-0.79)	-30 (-1.18)

Rope probes				
above [m (ft)]	–	1 (3.3)	3 (9.8)	6 (20)
up to [m (ft)]	1 (3.3)	3 (9.8)	6 (20)	–
permitted tolerance [mm (in)]	-10 (-0.39)	-20 (-0.79)	-30 (-1.18)	-40 (-1.57)

Surface roughness of AlloyC coated flanges

Ra = 3.2 µm; lower surface roughness available on request.

This value applies to flanges with "AlloyC>316/316L"; see product structure, feature 100 "Process connection". For other flanges, the surface roughness corresponds to the relevant flange standard.

Shortening probes

If necessary, probes can be shortened by observing the following instructions:

Shortening rod probes

Rod probes must be shortened if the distance to the vessel floor or outlet cone is less than 10 mm (0.4 in). To shorten, saw off the bottom end of the rod probe.

It is **not** possible to shorten FMP52 rod probes due to their coating.

Shortening rope probes

Rope probes must be shortened if the distance to the vessel base or outlet cone is less than 150 mm (6 in).

Shortening coax probes

Coax probes must be shortened if the distance to the vessel floor or outlet cone is less than 10 mm (0.4 in).

Coax probes can be shortened by a maximum of 80 mm (3.2 in) from below. They have centering devices on the inside to secure the rod centrally in the pipe. A raised edge holds the centering devices in place on the rod. It is possible to shorten the probe up to approx. 10 mm (0.4 in) below the centering device.

Weight

Housing

Part	Weight
GT18 housing - stainless steel	Approx. 4.5 kg
GT19 housing - plastic	Approx. 1.2 kg
GT20 housing - aluminum	Approx. 1.9 kg

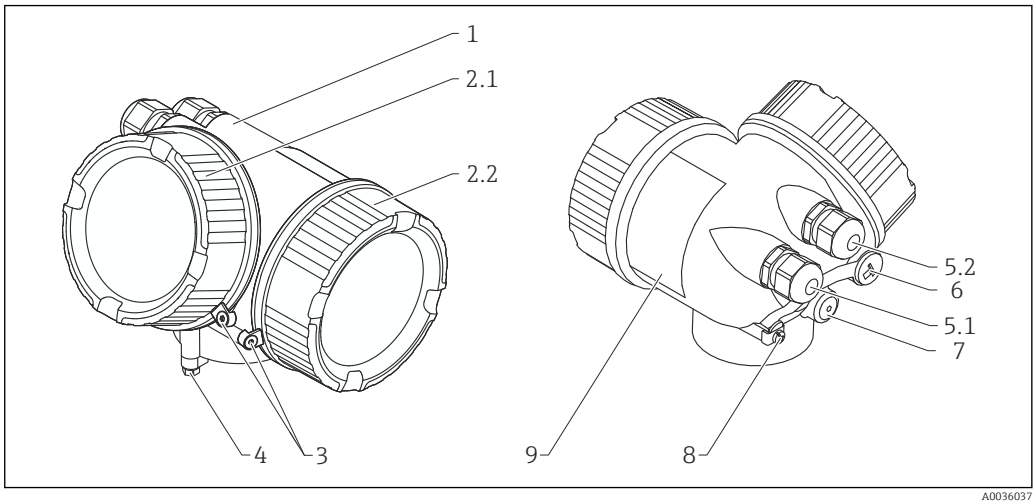
FMP51 with threaded connection G¾ or NPT¾

Part	Weight	Part	Weight
Sensor	Approx. 0.8 kg	Rod probe 8 mm	Approx. 0.4 kg/m probe length
Rope probe 4 mm	Approx. 0.1 kg/m probe length	Coax probe	Approx. 1.2 kg/m probe length

FMP51 with threaded connection G1½/NPT1½ or flange

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. 0.1 kg/m probe length	Coax probe	Approx. 3.0 kg/m probe length
Rod probe 12 mm	Approx. 0.9 kg/m probe length		

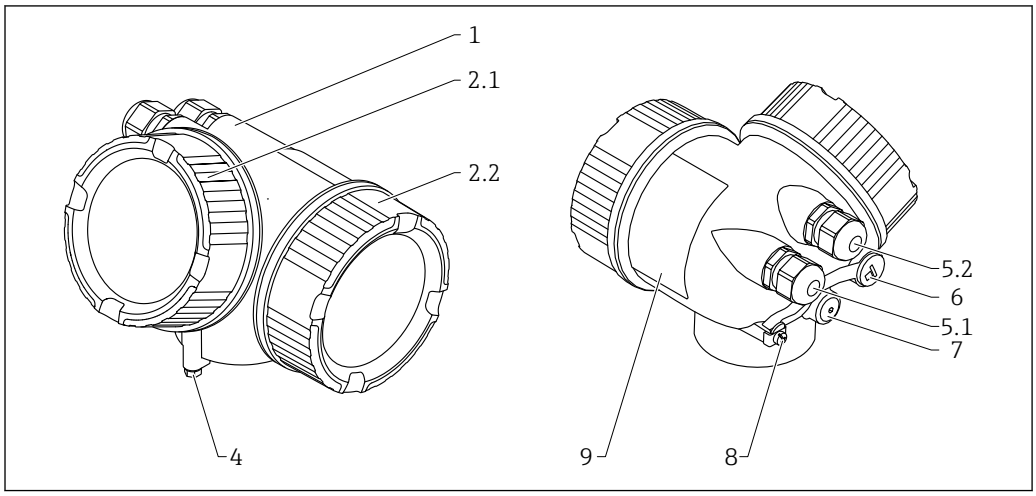
Materials: GT18 housing (stainless steel, corrosion-resistant)



21 Material; GT18 housing

1 Housing; CF3M (similar to 316L/ 1.4404)
2.1 Electronics compartment cover; CF3M (similar to 316L/ 1.4404), seals; NBR, window; glass, thread coating; graphite-based lubricant varnish
2.2 Connection compartment cover; CF3M (similar to 316L/ 1.4404), seal; NBR, thread coating; graphite-based lubricant varnish
3 Cover lock; 316L (1.4404), A4
4 Lock at the housing neck; 316L (1.4404), A4-70
5.1 Dummy plug, gland, adapter or plug (depending on the device version); 316L (1.4404), NBR, Viton, EPDM, PE, PBT-GF, nickel-plated brass (CuZn)
5.2 Dummy plug, gland, adapter or plug (depending on the device version); 316L (1.4404), NBR
6 Dummy plug or M12 socket (depending on the device version); 316L (1.4404)
7 Pressure relief plug; 316L (1.4404)
8 Ground terminal; 316L (1.4404), A4 (1.4571)
9 Nameplate; 316L (1.4404), A4 (1.4571)

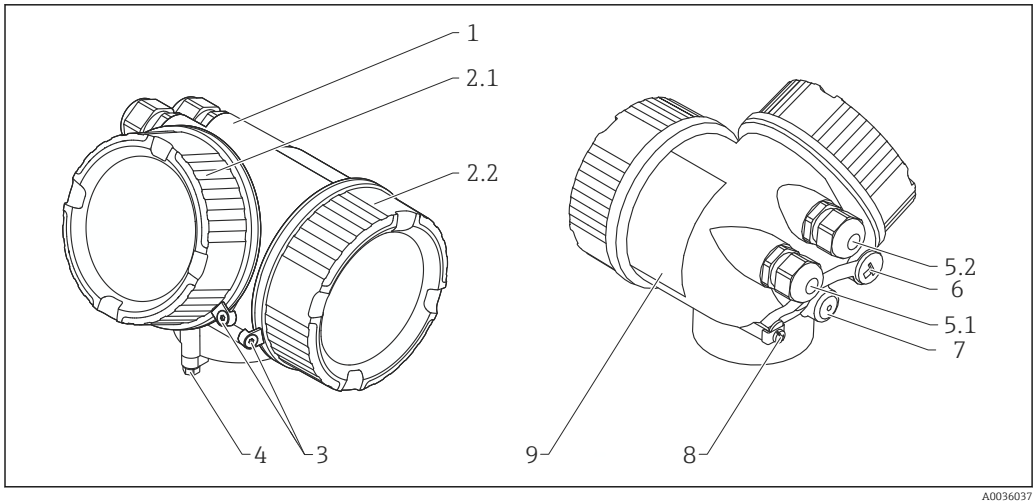
Materials: GT19 housing (plastic)



22 Material; GT19 housing

1 Housing; PBT
2.1 Electronics compartment cover; PBT-PC, seals; EPDM, window; PC, thread coating; graphite-based lubricant varnish
2.2 Connection compartment cover; PBT, seal; EPDM, thread coating; graphite-based lubricant varnish
4 Lock at the housing neck; 316L (1.4404), A4-70
5.1 Dummy plug, gland, adapter or plug (depending on the device version); 316L (1.4404), EPDM, PE, PBT-GF, nickel-plated brass (CuZn), PA
5.2 Dummy plug, gland, adapter or plug (depending on the device version); 316L (1.4404), EPDM, PE, PBT-GF, galvanized steel, nickel-plated brass (CuZn), PA
6 Dummy plug; nickel-plated brass (CuZn), M12 socket; GD-Zn nickel-plated
7 Pressure relief plug; nickel-plated brass (CuZn)
8 Ground terminal; 316L (1.4404), A4 (1.4571)
9 Adhesive nameplate; plastic

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

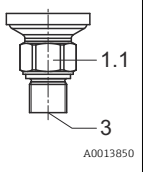
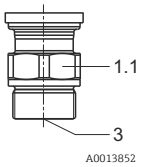
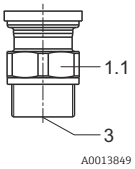
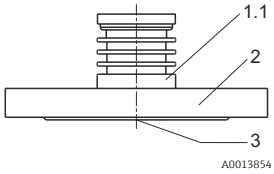
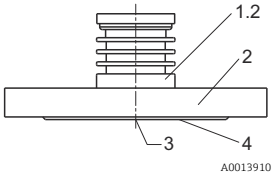


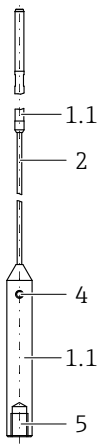
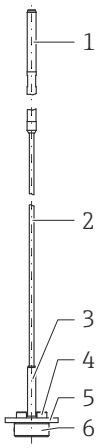
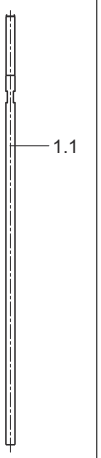
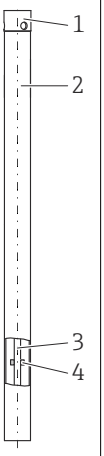
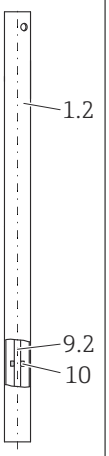
23 Material; GT20 housing

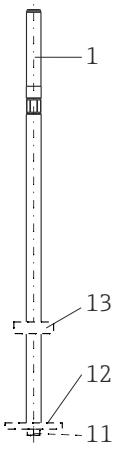
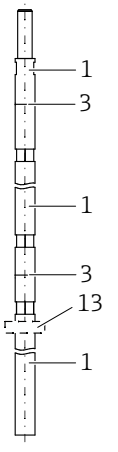
1 Housing RAL 5012 (blue); AlSi10Mg (<0.1% Cu), coating; polyester
2.1 Electronics compartment cover RAL 7035 (gray); AlSi10Mg (<0.1% Cu), seals; NBR, window; glass, thread coating; graphite-based lubricant varnish
2.2 Connection compartment cover RAL 7035 (gray); AlSi10Mg (<0.1% Cu), seals; NBR, thread coating; graphite-based lubricant varnish
3 Cover lock; 316L (1.4404), A4
4 Lock at the housing neck; 316L (1.4404), A4-70
5.1 Dummy plug, gland, adapter or plug (depending on the device version); 316L (1.4404), EPDM, PE, PBT-GF, nickel-plated brass (CuZn), PA
5.2 Dummy plug, gland, adapter or plug (depending on the device version); 316L (1.4404), EPDM, PE, PBT-GF, galvanized steel, nickel-plated brass (CuZn), PA
6 Dummy plug; nickel-plated brass (CuZn), M12 socket; GD-Zn nickel-plated
7 Pressure relief plug; nickel-plated brass (CuZn)
8 Ground terminal; 316L (1.4404), A4 (1.4571)
9 Adhesive nameplate; plastic

Materials: Process connection

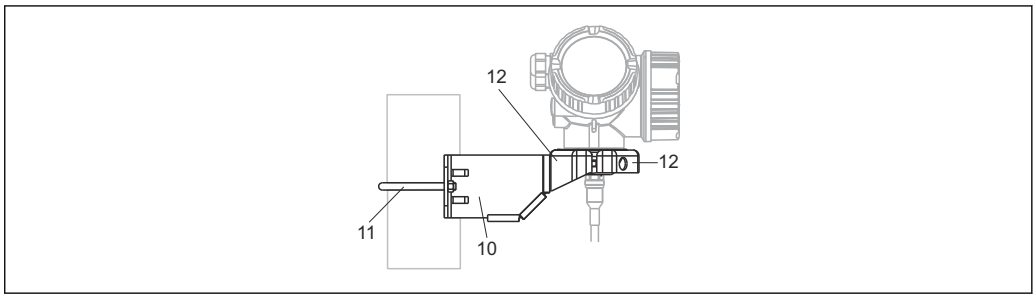
DIN/EN flanges and process connections with threaded connection in stainless steel comply with AISI 316L (DIN/ EN material number 1.4404 or 14435). With regard to their stability-temperature property, the materials 1.4404 and 1.4435 are grouped together under 13E0 in EN 1092-1: 2007 Tab. G.3.1-1. The chemical composition of the two materials can be identical.

Levelflex FMP51						
Threaded connection			Flange		No.	Material
G¾, NPT¾	*G1½*	*NPT1½*	*DN40 to DN200*	*DN40 to DN100*		
					1.1	316L (1.4404)
					1.2	Alloy C22 (2.4602)
					2	ASME: 316/316L EN: 316L (1.4404) JIS: 316L (1.4435)
					3	Ceramic Al_2O_3 99.7 %
					4	Cladding: Alloy C22 (2.4602)

Levelflex FMP51								
Rope probe		Rod probe		Coax probe			No.	Material
Φ 4 mm (1/6")	*Φ 4 mm (1/6") with centering disk*	*Φ 8 mm (1/3")*	*Φ 12.7 mm (1/2") AlloyC*	*With thread G3/4*	*With thread G1-1/2 AlloyC*	*With thread G1-1/2 316L*		
 A0031287	 A0013855	 A0013838	 A0013912	 A0013856	 A0013911	 A0017244	1.1	316L (1.4404)
							1.2	Alloy C22 (2.4602)
							2	316 (1.4401)
							3	316L (1.4404)
							4	Setscrew: A4-70
							5	Screw for tightening: A2-70
							6	Cylinder screw: A4-80
							7	Disk: 316L (1.4404)
							8	Setscrew: A4-70
							9.1	Rod: 316L (1.4404)
							9.2	Alloy C22 (2.4602)
							10	Spacer: PFA

Levelflex FMP51			
Rod probe		No.	Material
Φ 12 mm (1/2") 316L	*Φ 16 mm (2/3") separable*		
 A0013860	 A0013861	1	316L (1.4404)
		3	Connecting bolts: Alloy C22 (2.4602)
			Nord-Lock washer: 1.4547
		11	Hexagonal-headed bolt: A4-70
			Nord-Lock washer: 1.4547
		12	Centering disk, PEEK
			Centering disk, 316L (1.4404)
		13	Centering disk, PFA

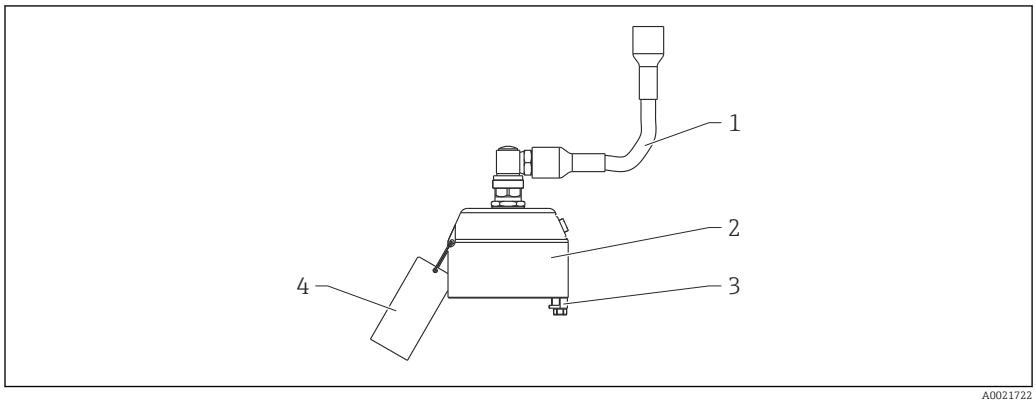
Materials: mounting bracket



A0015143

Mounting bracket for "remote sensor" version		
No.	**Component**	**Material**
10	Holder	316L (1.4404)
11	Round bracket	316Ti (1.4571)
	Screws/nuts	A4-70
	Distance sleeves	316Ti (1.4571) or 316L (1.4404)
12	Half-shells	316L (1.4404)

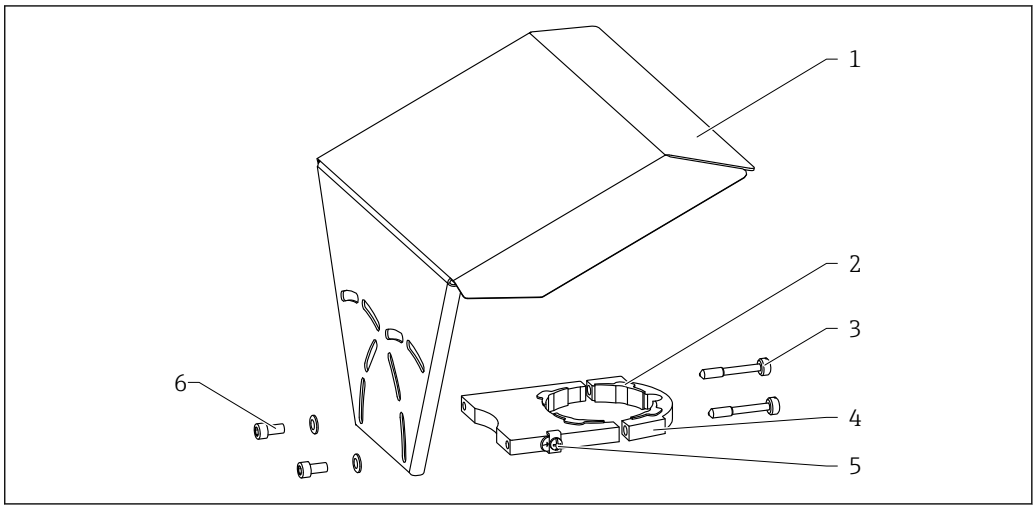
Materials: adapter and cable for remote sensor



A0021722

Adapter and cable for "remote sensor" version		
No.	**Component**	**Material**
1	Cable	FRNC
2	Sensor adapter	304 (1.4301)
3	Terminal	316L (1.4404)
	Screw	A4-70
4	Band	316 (1.4401)
	Crimp sleeve	Aluminum
	Nameplate	304 (1.4301)

Materials: weather protection cover



24 Material; weather protection cover

1 Protection cap; 316L (1.4404)
2 Molded rubber part (4x); EPDM
3 Clamping screw; 316L (1.4404) + carbon fiber
4 Bracket; 316L (1.4404)
5 Ground terminal; A4, 316L (1.4404)
6 Fillister-head screw; A4-70 + washer; A4

Operability

Operating concept

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

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

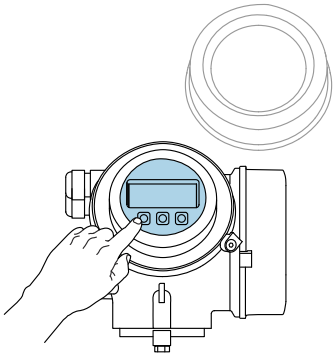
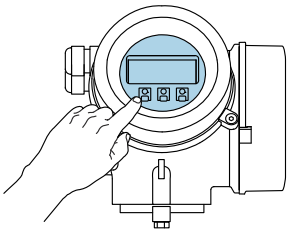
Feature 500 in the product structure determines which of these languages is preset on delivery.

Fast and safe commissioning
- Interactive wizard with graphical user interface for guided commissioning in FieldCare/DeviceCare
- Menu guidance with short explanations of the individual parameter functions
- Standardized operation at the device and in the operating tools

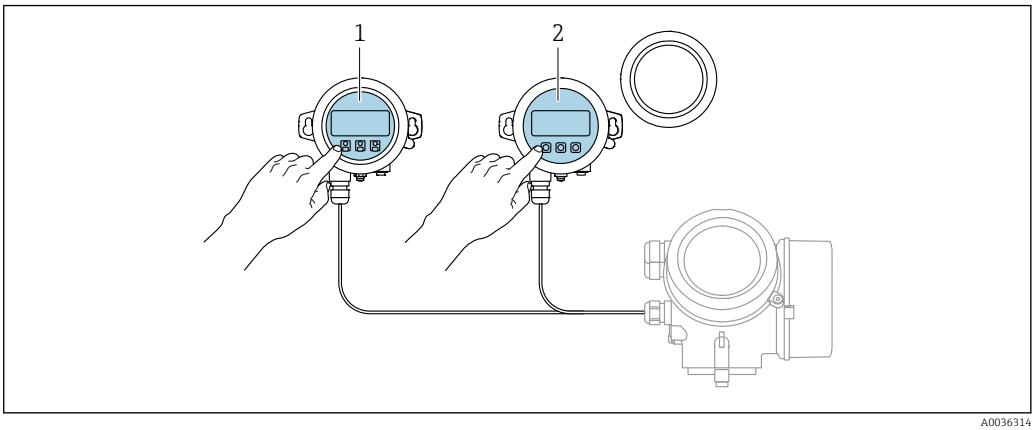
Integrated data memory (HistoROM)
- Adoption of data configuration when electronics modules are replaced
- Up to 100 event messages recorded in the device
- Data logging with up to 1000 logged values
- A reference signal curve is saved during commissioning for later use as a reference during operation

Efficient diagnostic behavior increases measurement availability
- Remedial measures are integrated in plain text
- Diverse simulation options and line recorder functions

Local operation

Operation with	*Pushbuttons*	*Touch Control*
Order code for "Display; Operation"	Option **C** "SD02"	Option **E** "SD03"
	 A0036312	 A0036313
Display elements	4-line display	4-line display white background lighting; switches to red in event of device error
	Format for displaying measured variables and status variables can be individually configured	
	Permitted ambient temperature for the display: –20 to +70 °C (–4 to +158 °F) The readability of the display may be impaired at temperatures outside the temperature range.	
Operating elements	local operation with 3 push buttons (⊞, ⊟, Ⓔ)	external operation via touch control; 3 optical keys: ⊞, ⊟, Ⓔ
	Operating elements also accessible in various hazardous areas	
Additional functionality	Data backup function The device configuration can be saved in the display module.	
	Data comparison function The device configuration saved in the display module can be compared to the current device configuration.	
	Data transfer function The transmitter configuration can be transmitted to another device using the display module.	

Operation with remote display and operating module FHX50



A0036314

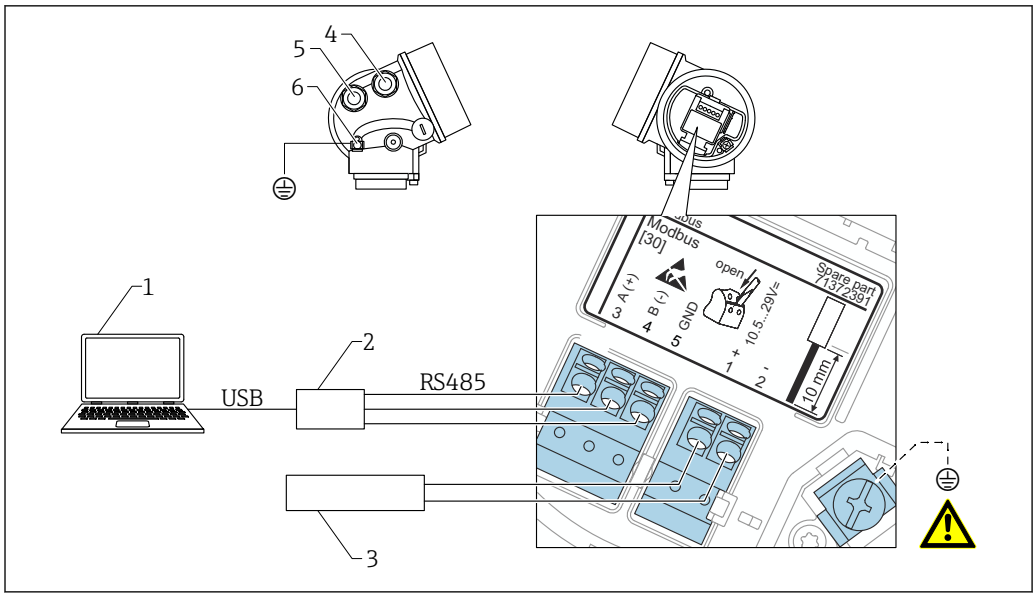
25 *FHX50 operating options*

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*

Remote operation

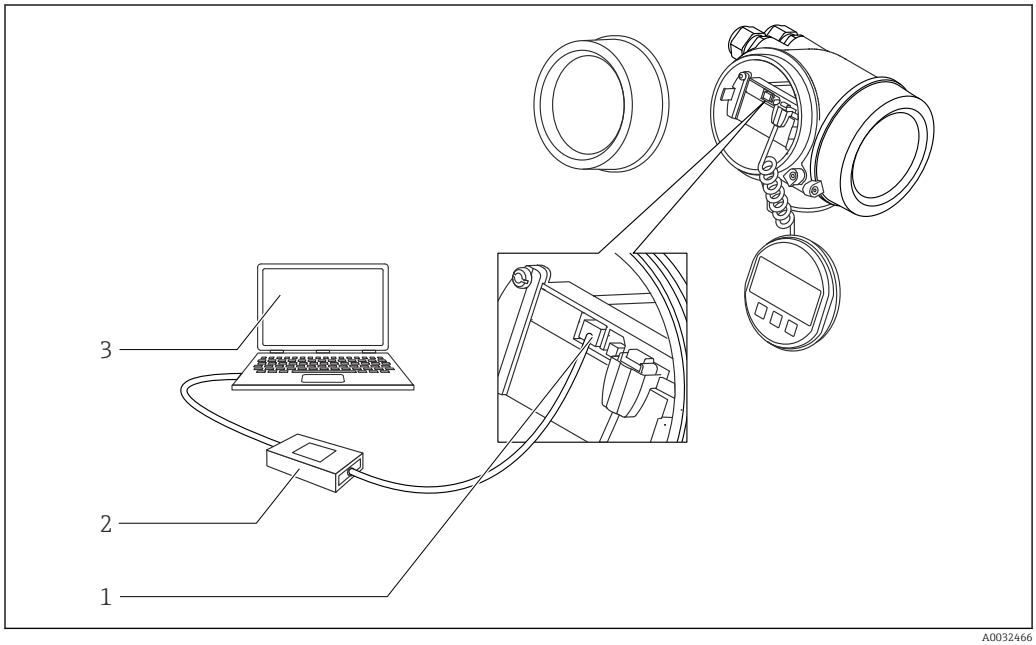
Via Modbus

For operation via FieldCare or DeviceCare, it is advisable to disconnect the device from the Modbus Master and to connect it to the computer via a USB-to-RS485 interface.



1 *Computer with FieldCare/DeviceCare*
2 *USB-RS485 interface*
3 *Supply voltage*
4 *Cable entry for RS485*
5 *Cable entry for the supply voltage*
6 *Connection for protective ground*

Via service interface (CDI)



1 *Service interface (CDI) of the measuring device*
2 *Commubox FXA291*
3 *Computer with DeviceCare/FieldCare operating tool*

Certificates and approvals

Current certificates and approvals that are available for the product can be selected via the Product Configurator at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Configuration**.

CE mark

The measuring system complies with the statutory requirements of the applicable EC directives. These are listed in the corresponding EC Declaration of Conformity along with the standards applied.

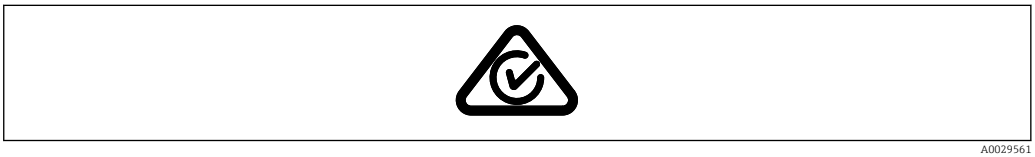
Successful testing of the device is confirmed by affixing the CE mark to the device.

RoHS

The measuring system meets the substance restrictions of the Directive on the Restriction of the Use of Certain Hazardous Substances 2011/65/EU (RoHS 2) and the Delegated Directive (EU) 2015/863 (RoHS 3).

RCM marking

The supplied product or measuring system meets the ACMA (Australian Communications and Media Authority) requirements for network integrity, interoperability, performance characteristics as well as health and safety regulations. Here, especially the regulatory arrangements for electromagnetic compatibility are met. The products bear the RCM marking on the nameplate.



A0029561

Ex approval

The devices are certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Safety Instructions" (XA, ZD) document. Reference is made to this document on the nameplate.

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.

Overfill protection

WHG

DIBt Z-65.16-501

AD2000

- The wetted material 316L (1.4435/1.4404) corresponds to AD2000 - W2/W10.
- Declaration of Conformity: see the product structure, feature 580, version JF.

NACE MR 0175 / ISO 15156

- The wetted, metal materials (excluding ropes) meet the requirements of NACE MR 0175 / ISO 15156.
- Declaration of Conformity: see the product structure, feature 580, version JB

NACE MR 0103

- The wetted, metal materials (excluding ropes) meet the requirements of NACE MR 0103 / ISO 17495.
- The Declaration of Conformity is based on NACE MR 0175.
  The hardness and intergranular corrosion have been tested, and heat treatment (solution annealed) has been performed. The materials used therefore meet the requirements of NACE MR 0103 / ISO 17495.
- Declaration of Conformity: see the product structure, feature 580, version JE.

ASME B31.1 and B31.3

- The design, the material used, the pressure and temperature ranges and the labeling of the devices meet the requirements of ASME B31.1 and B31.3
- Declaration of Conformity: see the product structure, feature 580, version KV.

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

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

Reasons:

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

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

Radio approval

Satisfies "Part 15" of the FCC rules for an unintentional radiator. All probes meet the requirements for a Class A digital device.

In addition, coax probes and all probes in metal vessels meet the requirements for a Class B digital device.

CRN approval

A CRN approval is available for some device versions. Devices are CRN approved if the following two conditions are met:

- The device has a CSA or FM approval (product structure: feature 010 "Approval")
- The device has a CRN-approved process connection according to the following table:

Feature 100 in the product structure	Approval
AEJ	NPS 1-1/2" Cl. 150 RF, 316/316L flange ASME B16.5
AEM	NPS 1-1/2" Cl. 150, AlloyC>316/316L flange ASME B16.5
AFJ	NPS 2" Cl. 150 RF, 316/316L flange ASME B16.5
AFM	NPS 2" Cl. 150, AlloyC>316/316L flange ASME B16.5
AGJ	NPS 3" Cl. 150 RF, 316/316L flange ASME B16.5
AGM	NPS 3" Cl. 150, AlloyC>316/316L flange ASME B16.5
AHJ	NPS 4" Cl. 150 RF, 316/316L flange ASME B16.5
AJJ	NPS 6" Cl. 150 RF, 316/316L flange ASME B16.5
AKJ	NPS 8" Cl. 150 RF, 316/316L flange ASME B16.5
AQJ	NPS 1-1/2" Cl. 300 RF, 316/316L flange ASME B16.5
AQM	NPS 1-1/2" Cl. 300, AlloyC>316/316L flange ASME B16.5
ARJ	NPS 2" Cl. 300 RF, 316/316L flange ASME B16.5
ARM	NPS 2" Cl. 300, AlloyC>316/316L flange ASME B16.5
ASJ	NPS 3" Cl. 300 RF, 316/316L flange ASME B16.5
ASM	NPS 3" Cl. 300, AlloyC>316/316L flange ASME B16.5
ATJ	NPS 4" Cl. 300 RF, 316/316L flange ASME B16.5
ATM	NPS 4" Cl.300, AlloyC>316/316L flange ASME B16.5
GGJ	Thread ISO228 G1-1/2, 316L
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 are labeled with registration number 0F14480.5C on the nameplate.

Test, certificate

Feature 580 "Test, certificate"	Designation	Approval
JA	3.1 Material documentation, wetted metal parts, EN10204-3.1 inspection certificate	FMP51
JB	Declaration of Conformity NACE MR0175, wetted metal parts	FMP51
JE	Declaration of Conformity NACE MR0103, wetted metal parts	FMP51
JF	Declaration of Conformity AD2000, wetted metal parts: Material conformity for all metal wetted/pressurized parts according to AD2000 (data sheets W2, W9, W10)	FMP51
JN	Ambient temperature of transmitter −50 °C (−58 °F) Devices with this option are routine tested (start-up test at −50 °C (−58 °F)).	FMP51
KD	Helium leak test, internal procedure, inspection certificate	FMP51
KE	Pressure test, internal procedure, inspection certificate	FMP51
KG	3.1 material certificate+PMI test (XRF), internal procedure, wetted metallic parts, EN10204-3.1 inspection certificate	FMP51
KP	Penetrant testing AD2000-HP5-3(PT), wetted/pressurized metal parts, inspection certificate	FMP51
KQ	Penetrant testing ISO23277-1 (PT), wetted/pressurized metal parts, inspection certificate	FMP51
KR	Penetrant testing ASME VIII-1 (PT), wetted/pressurized metal parts, inspection certificate	FMP51
KS	Welding documentation, wetted/pressurized seams Consists of: ▪ Welding drawing ▪ WPQR (Welding Procedure Qualification Report) ▪ WPS (Welding Process Specification) ▪ WQR (Manufacturer's Declaration)	FMP51
KV	Declaration of Conformity ASME B31.3: The design, the material used, the pressure and temperature ranges and the labeling of the devices meet the requirements of ASME B31.3	FMP51

Product documentation on paper

A printed (hard copy) version of test reports, declarations and inspection certificates can optionally be ordered via order code 570 "Service", option I7 "Product documentation on paper". The documents are then supplied with the product.

Other standards and guidelines

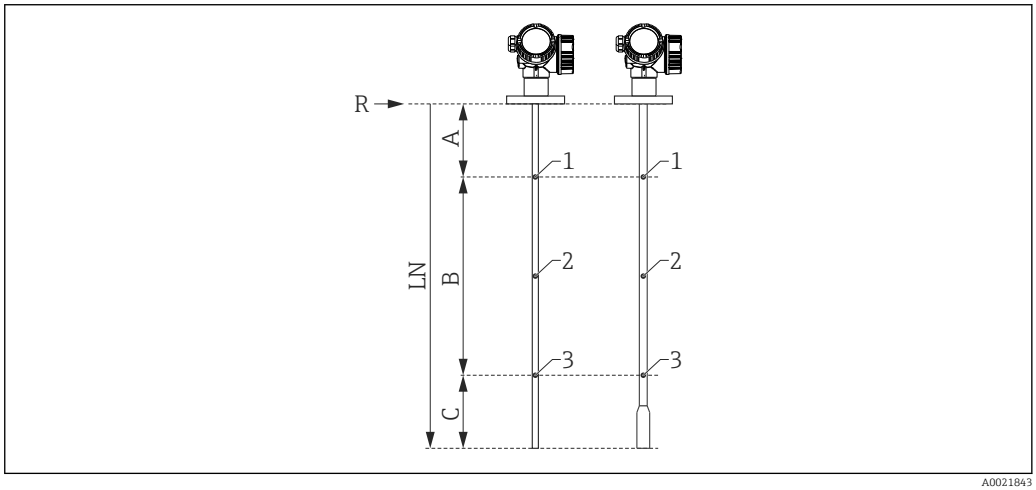
- EN 60529
  Degrees of protection provided by enclosures (IP code)
- EN 61010-1
  Safety requirements for electrical equipment for measurement, control and laboratory use
- IEC/EN 61326
  "Emission in accordance with Class A requirements". Electromagnetic compatibility (EMC requirements).
- NAMUR NE 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

3-point linearity protocol

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

The 3 points of the linearity protocol are defined as follows, depending on the selected probe:



A0021843

A Distance from the reference point R to the first measuring point
B Measuring range
C Distance from the probe end to the third measuring point
LN Probe length
R Reference point of measurement
1 First measuring point
2 Second measuring point (in the middle between the first and third measuring point)
3 Third measuring point

	Rod or coax probe [1] **LN ≤ 6 m (20 ft)**	**Separable rod probe LN > 6 m (20 ft)**	**Rope probe LN ≤ 6 m (20 ft)**	**Rope probe LN > 6 m (20 ft)**
Position of 1st measuring point	▪ FMP51/FMP52/FMP54 without gas phase compensation/ FMP55: A = 350 mm (13.8 in) ▪ FMP54 with gas phase compensation, L_{ref} = 300 mm (11 in): A = 600 mm (23.6 in) ▪ FMP54 with gas phase compensation, L_{ref} = 550 mm (21 in): A = 850 mm (33.5 in)		A = 350 mm (13.8 in)	A = 350 mm (13.8 in)
Position of 2nd measuring point	In the middle between the 1st and 3rd measuring point	In the middle between the 1st and 3rd measuring point	In the middle between the 1st and 3rd measuring point	In the middle between the 1st and 3rd measuring point
Position of 3rd measuring point	Measured from bottom: C = 250 mm (9.84 in)	Measured from top: A+B = 5 750 mm (226 in)	Measured from bottom: C = 500 mm (19.7 in)	Measured from top: A+B = 5 500 mm (217 in)
Minimum measuring range	B ≥ 400 mm (15.7 in)	B ≥ 400 mm (15.7 in)	B ≥ 400 mm (15.7 in)	B ≥ 400 mm (15.7 in)
Minimum probe length	LN ≥ 1 000 mm (39.4 in)	LN ≥ 1 000 mm (39.4 in)	LN ≥ 1 250 mm (49.2 in)	LN ≥ 1 250 mm (49.2 in)

1) Also applies for separable rods

The position of the measuring points can vary by ±1 cm (±0.04 in).

- In the case of rod and rope probes, the linearity check is performed with the entire device.
- For separable rod probes, a reference rod probe is used instead of the original probe.
- In the case of coax probes, the device electronics unit is mounted on a reference rod probe during the test and the linearity check is performed.
- The linearity check is performed under reference operating conditions.

Labeling (optional)

Various types of measuring point labeling can be selected in the Product Configurator.

This includes:
- Tag
- Adhesive label
- RFID TAG
- Labeling according to DIN91406, also with NFC.

Tag name
3 lines with a maximum of 18 characters per line

Labeling in the electronic nameplate (ENP)
The first 32 characters of the tag name

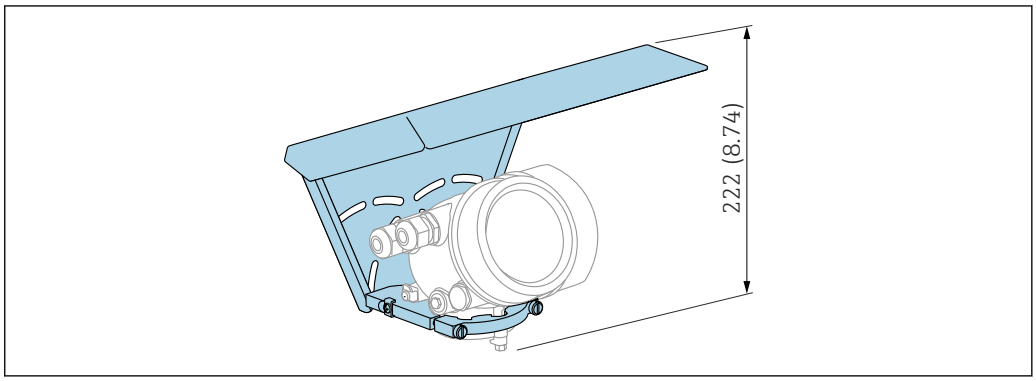
Labeling on the display module
The first 12 characters of the tag name

Accessories

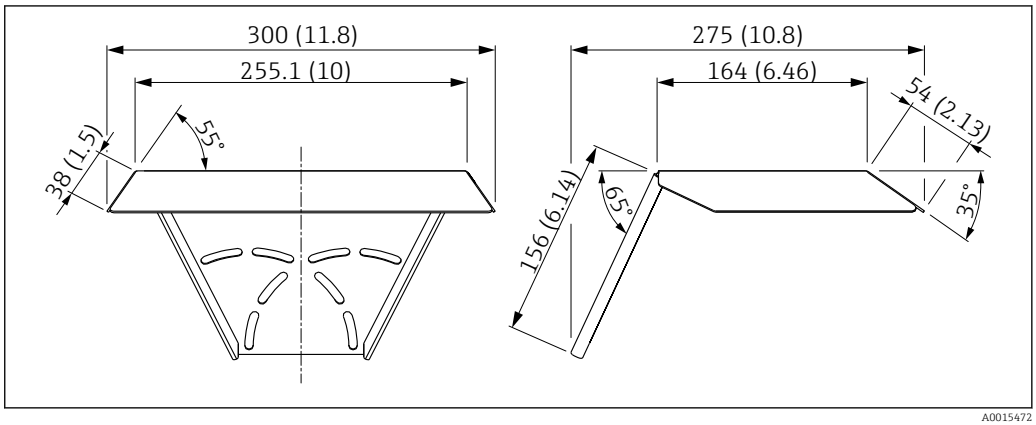
Device-specific accessories

Weather protection cover

The weather protection cover can be ordered together with the device via the "Accessory enclosed" product structure.



26 Height. Unit of measurement mm (in)

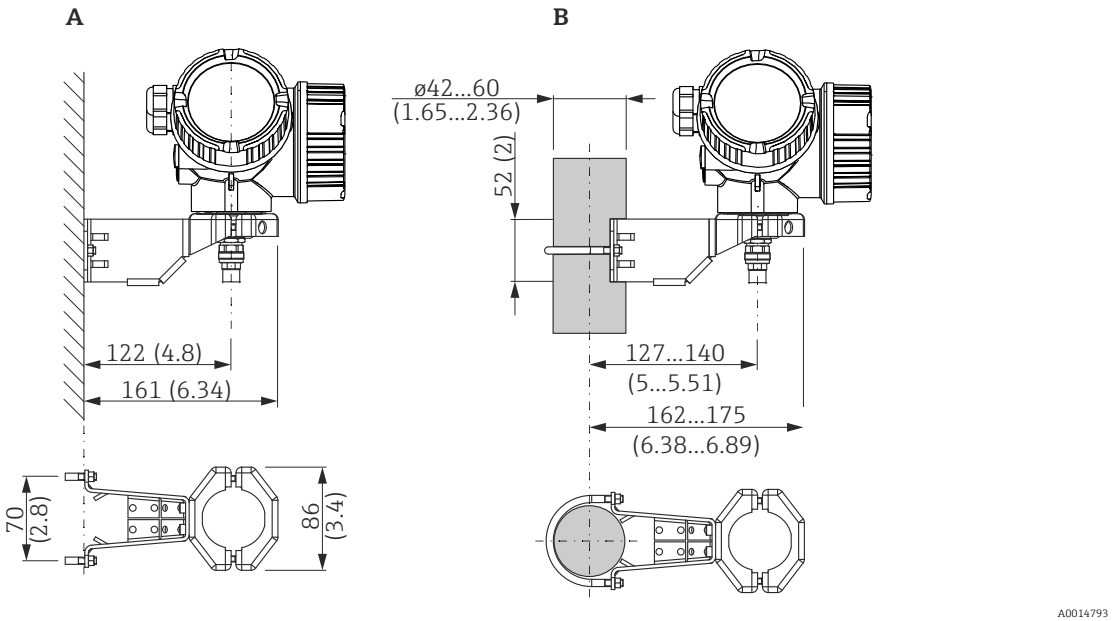


27 Dimensions. Unit of measurement mm (in)

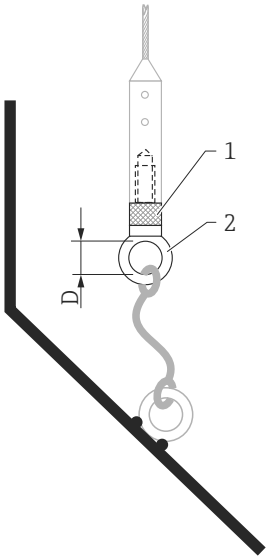
Material
316L

Order number for accessories:
71162242

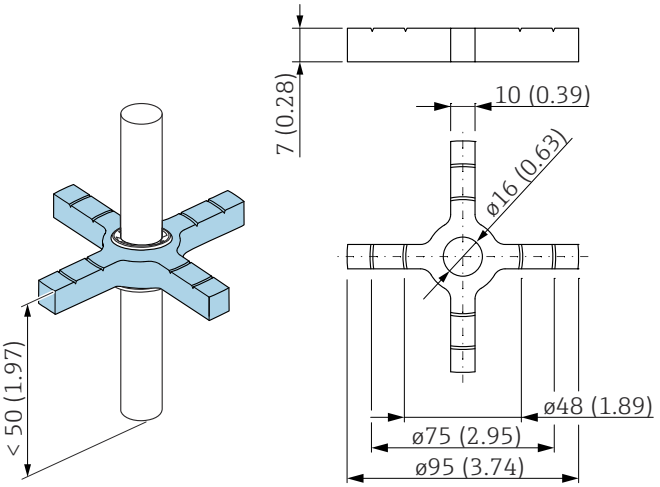
Mounting bracket for electronics housing

Accessories	Description
Mounting bracket for electronics housing	 *28 Mounting bracket for electronics housing; engineering unit: mm (in)* *A Wall mounting* *B Post mounting* With "remote sensor" device versions (see feature 060 in the product structure), the mounting bracket is included in the scope of delivery. However, it can also be ordered separately as an accessory (order number: 71102216).

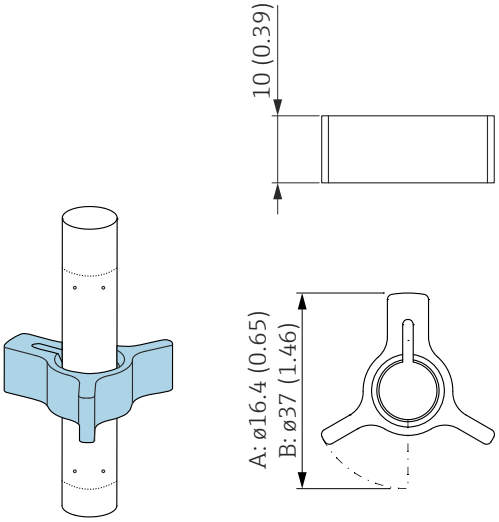
Mounting kit, insulated

Accessories	Description
Mounting kit, insulated suitable for FMP51	 A0013586 *29 Scope of delivery of mounting kit:* *1 Insulation sleeve* *2 Ring bolt* To secure rope probes so that they are reliably insulated. Maximum process temperature: 150 °C (300 °F) For rope probes 4 mm (⅙ in) or 6 mm (1/4 in) with PA>steel : ▪ Diameter D = 20 mm (0.8 in) ▪ Order number: 52014249 For rope probes 6 mm (¼ in) or 8 mm (1/3 in) with PA>steel: ▪ Diameter D = 25 mm (1 in) ▪ Order number: 52014250 Due to the risk of electrostatic charge, the insulation sleeve is not suitable for use in hazardous areas! In this case, the probe must be secured so that it is reliably grounded. The mounting kit can also be ordered directly with the device (Levelflex product structure, feature 620 "Accessory enclosed", version PG "mounting kit, insulated, rope").

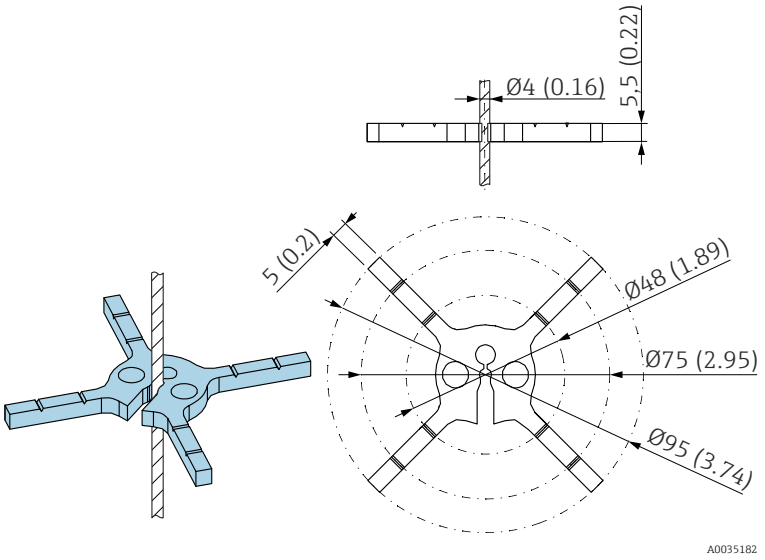
Centering star

Accessories	Description
Centering star PEEK ϕ 48-95 mm suitable for FMP51	 A0014576 The centering star is suitable for probes with a rod diameter of 16 mm (0.6 in) and can be used in pipes from DN50 to DN100. The markings make it easer to cut to size, ensuring that the centering star can be adjusted to the pipe diameter. See also Operating Instructions SD02316F. ▪ Material of centering star: PEEK ▪ Material of retaining rings: PH15-7Mo (UNS S15700) ▪ Permitted process temperature range: −60 to +250 °C (−76 to +482 °F) ▪ Order number: 71069064 If the centering star is used in a bypass, it must be positioned below the lower bypass outlet. This must be taken into account when choosing the probe length. In general, the centering star should not be mounted more than 50 mm (1.97") above the probe tip. It is advised not to use the PEEK centering star in the measuring range of the rod probe. The PEEK centering star can also be ordered directly with the device (Levelflex product structure, feature 610 "Accessory mounted", option OD). In this case, it is not secured to the rod using the retaining rings, but instead is secured using a hexagonal-headed bolt (A4-70) and a Nord Lock washer (1.4547) at the tip of the probe rod.

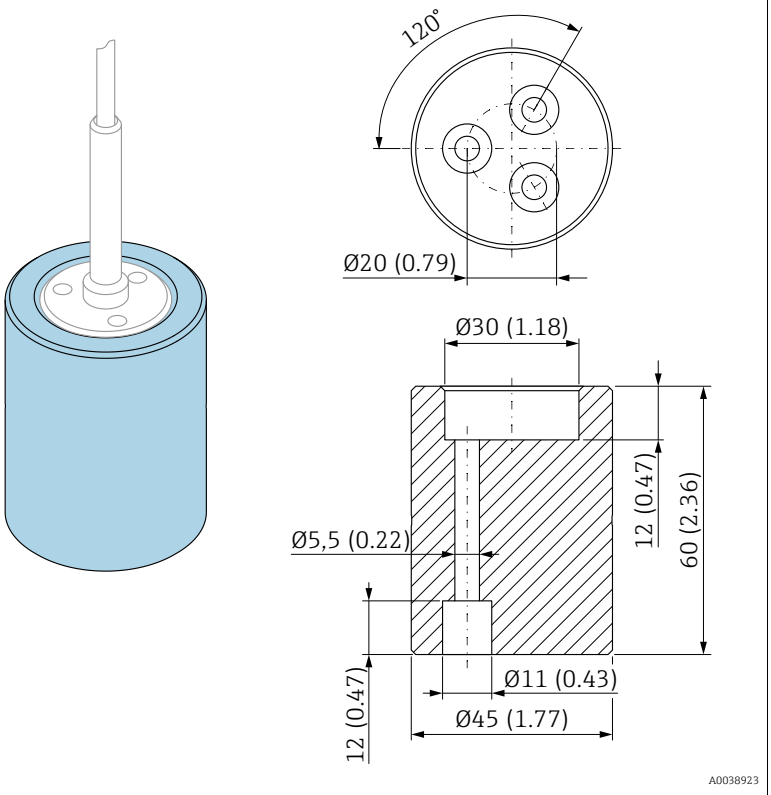
Accessories	Description

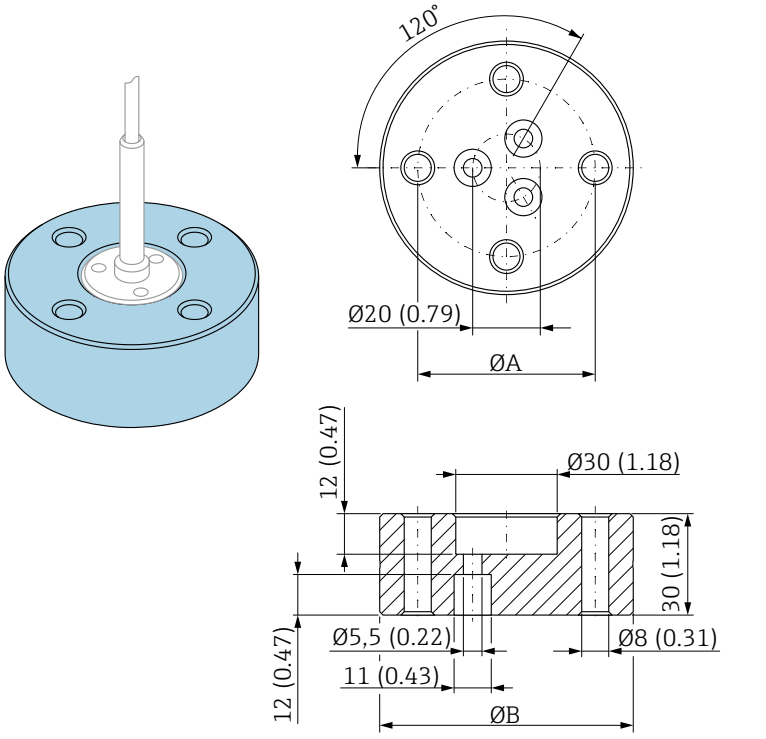
Centering star PFA
▪ ϕ 16.4 mm (0.65 in)
▪ ϕ 37 mm (1.46 in)
suitable for
FMP51
	
	A For probe 8 mm (0.3 in)
	B For probes 12 mm (0.47 in) and 16 mm (0.63 in)
	
	The centering star is suitable for probes with a rod diameter of 8 mm (0.3 in), 12 mm (0.47 in) and 16 mm (0.63 in) (including coated rod probes) and can be used in pipes from DN40 to DN50. See also Operating Instructions BA00378F/00/A2.
	
	▪ Material: PFA
	▪ Permitted process temperature range: −200 to +250 °C (−328 to +482 °F)
	▪ Order number
	  ▪ Probe 8 mm (0.3 in) : 71162453
	  ▪ Probe 12 mm (0.47 in): 71157270
	  ▪ Probe 16 mm (0.63 in): 71069065
	
	The PFA centering star can also be ordered directly with the device (Levelflex product structure, feature 610 "Accessory mounted", option OE).

Accessories	Description

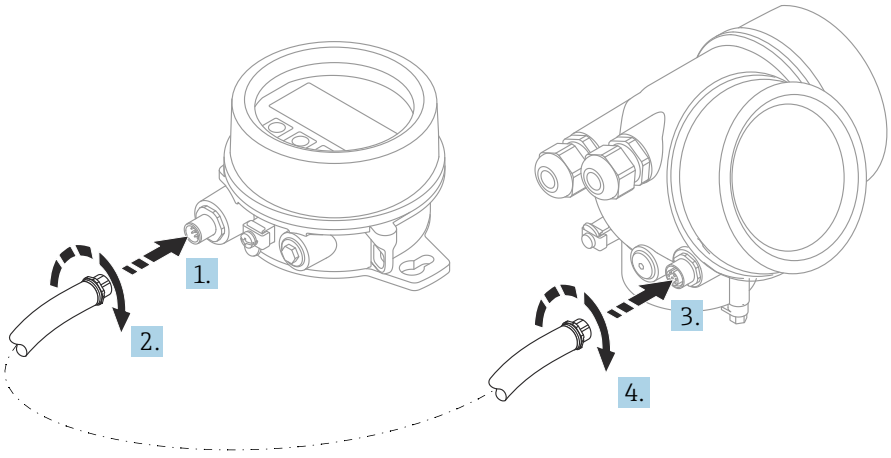
Centering star PEEK, Ø 48 to 95 mm (1.9 to 3.7 in) suitable for
FMP51
	
	The centering star is suitable for probes with a rope diameter of 4 mm (⅙ in) (including coated rope probes). See also Operating Instructions SD01961F.
	▪ Material: PEEK
	▪ Permitted process temperature range: −60 to +250 °C (−76 to +482 °F)
	▪ Order number
	  ▪ 71373490 (1x)
	  ▪ 71373492 (5x)

Centering weight

Accessories	Description
Centering weight 316L ϕ 45 mm (1.77 in) suitable for FMP51	 The centering weight is suitable for probes with a rope diameter of 4 mm (⅙ in) and can be used in DN50/2" pipes. Material: 316L The centering weight can be ordered directly with the device (product structure Levelflex) or as a probe without a process connection (product structure XPF0005-) using feature 610 "Accessory mounted", version **OK** (for pipe DN50/2").

Accessories	Description
Centering weight 316L ▪ ϕ 75 mm (2.95 in) ▪ ϕ 95 mm (3.7 in) suitable for FMP51	 *ϕA = 52.5 mm (2.07 in) for DN80/3" pipe* *= 62.5 mm (2.47 in) for DN100/4" pipe* *ϕB = 75 mm (2.95 in) for DN80/3" pipe* *= 95 mm (3.7 in) for DN100/4" pipe* The centering weight is suitable for probes with a rope diameter of 4 mm (⅙ in) and can be used in DN80/3" or DN100/4" pipes. Material: 316L The centering weight can be ordered directly with the device (product structure Levelflex) or as a probe without a process connection (product structure XPF0005-) using feature 610 "Accessory mounted", version **OL** (for pipe DN80/3") or **OM** (for pipe DN100/4").

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 provided by customer onsite up to 60 m (196 ft) ▪ Ambient temperature: −40 to 80 °C (−40 to 176 °F) ▪ 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. 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 *Basic specifications*, item 4 "Display, operation" in the Safety Instructions (XA) for the device. Also pay attention to the Safety Instructions (XA) of the FHX50. 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 For details, see document SD01007F.

Communication-specific accessories

Accessory	Description
Commubox FXA291	Connects field devices with CDI interface to the USB interface of a computer. Order code: 51516983

Service-specific accessories

Accessory	Description
DeviceCare SFE100	Configuration tool for HART, PROFIBUS and FOUNDATION Fieldbus devices Technical Information TI01134S
FieldCare SFE500	FDT-based Plant Asset Management tool. Helps to configure and maintain all field devices of your plant. By supplying status information it also supports the diagnosis of the devices. Technical Information TI00028S

System components

Accessory	Description
Graphic Data Manager Memograph M	The graphic data manager Memograph M provides information on all the relevant process variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on an SD card or USB stick. For details refer to Technical Information TI00133R and Operating Instructions BA00247R

Documentation

Standard documentation

Levelflex FMP51

Correlation of documentations to the device:

Device	Communication	Document type	Document code
FMP51	Modbus	Technical Information	TI01454F
		Operating Instructions	BA01957F
		Brief Operating Instructions	KA01421F
		Description of Device Parameters	GP01140F

Supplementary documentation

Application Package [1]	Document type	Document code
▪ EH: Heartbeat Verification + Monitoring ▪ EJ: Heartbeat Verification	Special documentation	in preparation

1) Feature 540 of 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.

Ordering feature 010 (Approval)		Ordering feature 020 (Power Supply; Output)		Safety Instructions
Option	Meaning	Option	Meaning	
CC	CSA C/US XP Cl. I, Div. 1, Groups A-D	M	4-wire, Modbus RS485	XA01700F
C3	CSA C/US XP Cl. I, II, III, Div. 1, Groups A-G; Class I, AEx d [ia] IIC/ Ex d [ia] IIC; Class I, Div. 2, Groups A-D	M	4-wire, Modbus RS485	XA01700F

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
7.965.087	---

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