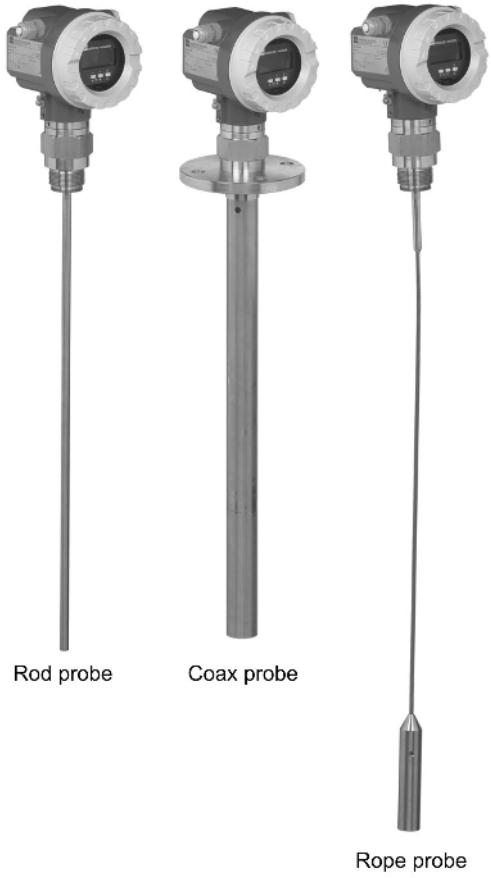
Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Levelflex M FMP40

Guided Level Radar
Continuous Level Transmitter for
- Level Measurement in Bulk Solids and Liquids
- Interface Measurement in Liquids



Application

Level measurement
Continuous level measurement of powdery to granular bulk solids e.g. plastic granulate and liquids.
- Measurement independent of density or bulk weight, conductivity, dielectric constant, temperature and dust e.g. during pneumatic filling.
- Measurement is also possible in the event of foam or if the surface is very turbulent.
- The HART with 4 to 20 mA analog, PROFIBUS PA and FOUNDATION Fieldbus protocols are available for system integration.
- Application in safety related systems (overspill protection) with requirements for functional safety up to SIL 2 in accordance with IEC 61508/IEC 61511-1.
- WHG approval

Interface measurement
Continuous measurement of interfaces between two liquids with very different dielectric constants, such as in the case of oil and water for example.
- Measurement independent of density, conductivity and temperature
- Electronics version for the simultaneous measurement of the level of interfaces and the total level in liquids. The HART with 4 to 20 mA analog protocol is available for system integration
- Special version for the measurement of the level of interfaces at a constant total level. The PROFIBUS PA and FOUNDATION Fieldbus protocols are available for system integration.

Your benefits

Probes are available with threaded process connections from ¾" and flanges from DN40 (1½").
- Rope probes, above all for measurement in bulk solids, measuring range up to 35 m.
- Rod probes, above all for liquids
- Coax probes, for liquids
- Simple, menu-guided onsite operation with four-line plain text display.
- Onsite envelope curve on the display for easy diagnosis.
- Easy remote operation, diagnosis and measuring point documentation with the free operating program supplied.
- Optional remote display and operation.
- With coax probes the measurement is independent of internals in the tank and of the installation in the nozzle.
- Probe rod and probe rope can be replaced/shortened.
- Approvals: ATEX, FM, CSA, TIIS, NEPSI, IECEx.

TI00358F/00/EN/15.12
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Endress+Hauser
People for Process Automation

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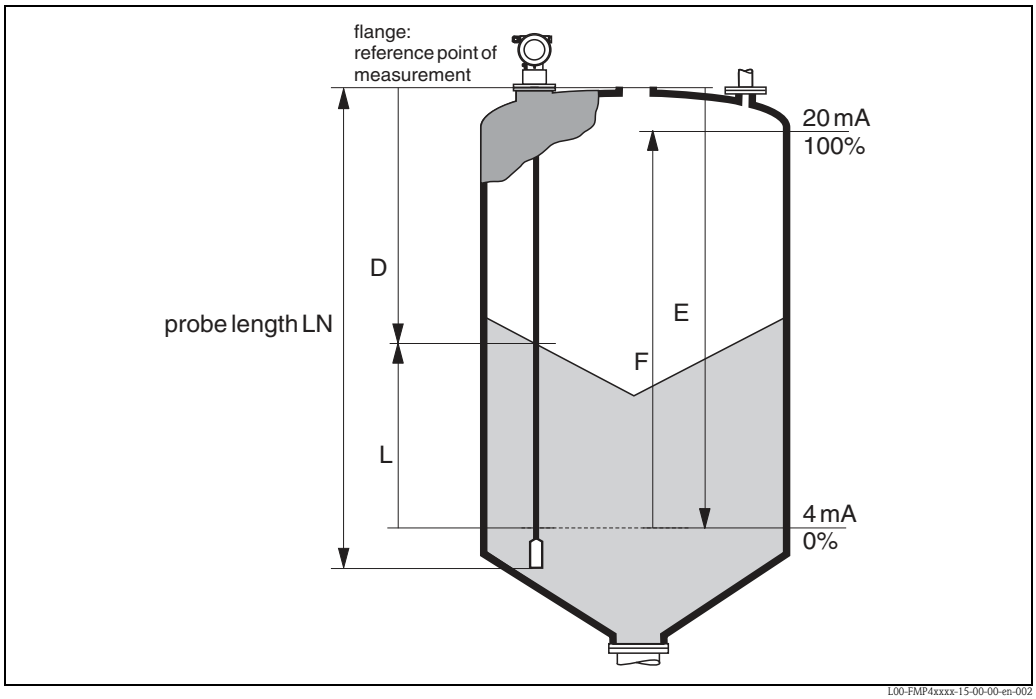
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Function and system design

Measuring principle

The Levelflex is a "downward-looking" measuring system that functions according to the ToF method (ToF = Time of Flight). The distance from the reference point (process connection of the measuring device, → 43) 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).



Reference point of the measurement, details → 43

Dielectric constant

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

Input

The reflected pulses are transmitted from the probe to the electronics. There, a microprocessor analyzes the signals and identifies the level echo which was generated by the reflection of the high-frequency pulses at the product surface. This clear signal detection system benefits from over 30 years' experience with pulse time-of-flight procedures that have been integrated into the development of the PulseMaster® software.
The distance "D" to the product surface is proportional to the time of flight t of the impulse:

$D = c \cdot t/2$,
where c is the speed of light.

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

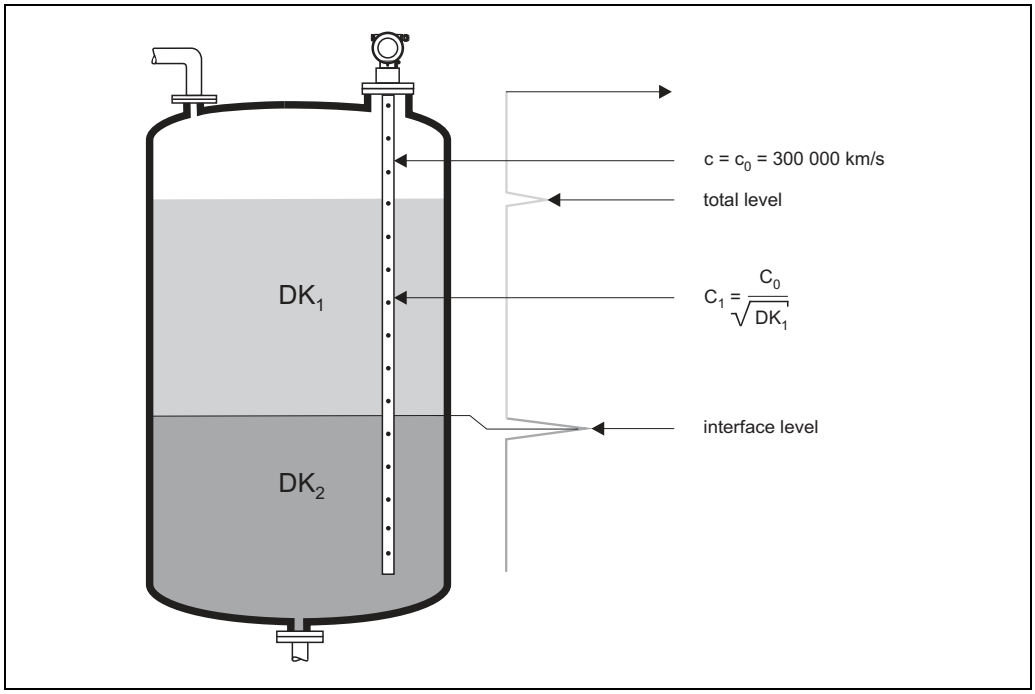
$L = E - D$

Reference point for "E" see diagram above.

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

Interface measurement

When the high-frequency pulses hit the surface of the medium, only a percentage of the transmission pulse is reflected. In the case of media with a low DC_1, in particular, the other part penetrates the medium. The pulse is reflected once more at the interface point to a second medium with a higher DC_2. The distance to the interface layer now can also be determined taking into account the delayed time-of-flight of the pulse through the upper medium.



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Output

The Levelflex is preset at the factory to the probe length ordered so that in most cases only the application parameters that automatically adapt the device to the measuring conditions need to be entered. For models with a current output, the factory adjustment for zero point "E" and span "F" is 4 mA and 20 mA. For digital outputs and the display module, the factory adjustment for zero point "E" and span "F" is 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.

Measuring system

Probe selection

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

Probes with 1½" threaded connection or flange

Type of probe:	6 mm rope probe	6 mm rope probe PA-coated [1]	4 mm rope probe	16 mm rod robe	16 mm rod probe, separable probe	Coax probe
						
Max. probe length:	35 m [2]	35 m [2]	Liquids: 35 m Bulk solids: 15 m	4 m	10 m	4 m
For application:	■ Bulk solids	■ Bulk solids especially cereal, flour	■ Liquids measuring range > 4 m	■ Liquids ■ bulk solids on short measuring ranges and sideway mounting ■ Interface measurement	■ Liquids ■ cramped mounting position (limited head clearance) ■ Interface measurement	■ Liquids ■ Interface measurement
Sideways capacity:	not relevant	not relevant	not relevant	30 Nm	20 Nm	300 Nm
Tensile loading capacity (min.): **rupture load (max.):** [3]	30 kN 35 kN	30 kN 35 kN	12 kN 16 kN	not relevant	not relevant	not relevant
Feature 30	**Option "B"**	**Option "H"**	**Option "A"**	**Option "K"**	**Option "S, T, U, V"**	**Option "L"**

1) ø6 mm + 2 mm PA coating.

2) Greater lengths available on request.

3) Max. load of silo ceiling. If overloaded, the rope tears; the bushing remains air-tight.

Probes with ¾" threaded connection

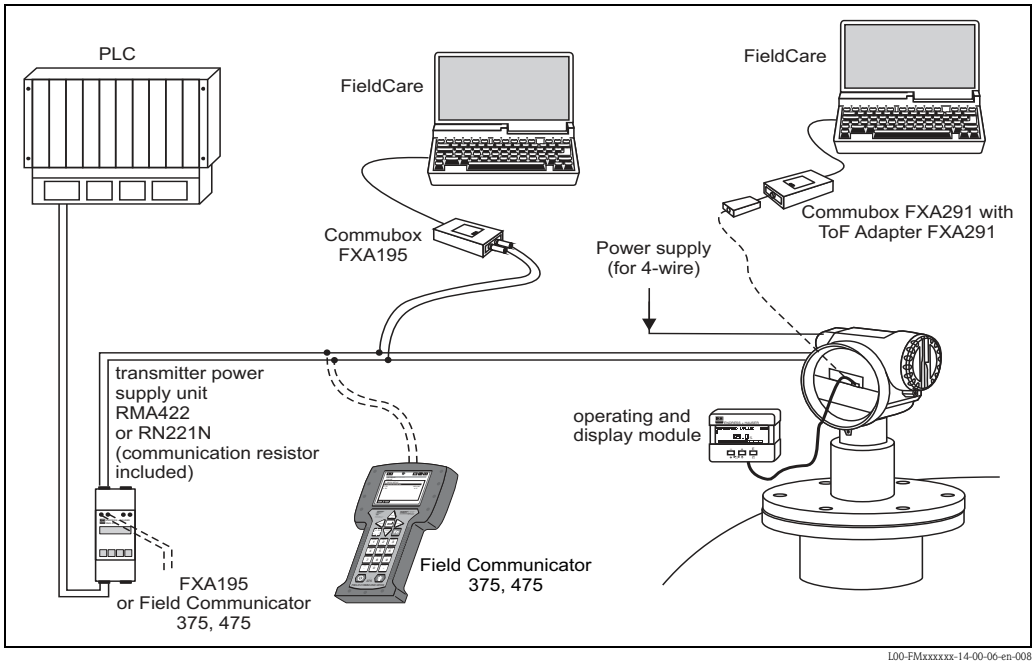
Type of probe:	4 mm rope probe	6 mm rod probe	Coax probe
			
Max. probe length:	35 m [1]	2 m	4 m
For application:	■ Liquids measuring range > 4 m	■ Liquids ■ Interface measurement	■ Liquids ■ Interface measurement
Sideways capacity:	not relevant	4 Nm	60 Nm
Tensile loading capacity (min.): **rupture load (max.):** [2]	5 kN 12 kN	not relevant	not relevant
Feature 30	**Option "A"**	**Option "P"**	**Option "L"**

1) Greater lengths available on request.

2) Max. load of silo ceiling. If overloaded, the rope tears; the bushing remains air-tight.

Stand-alone

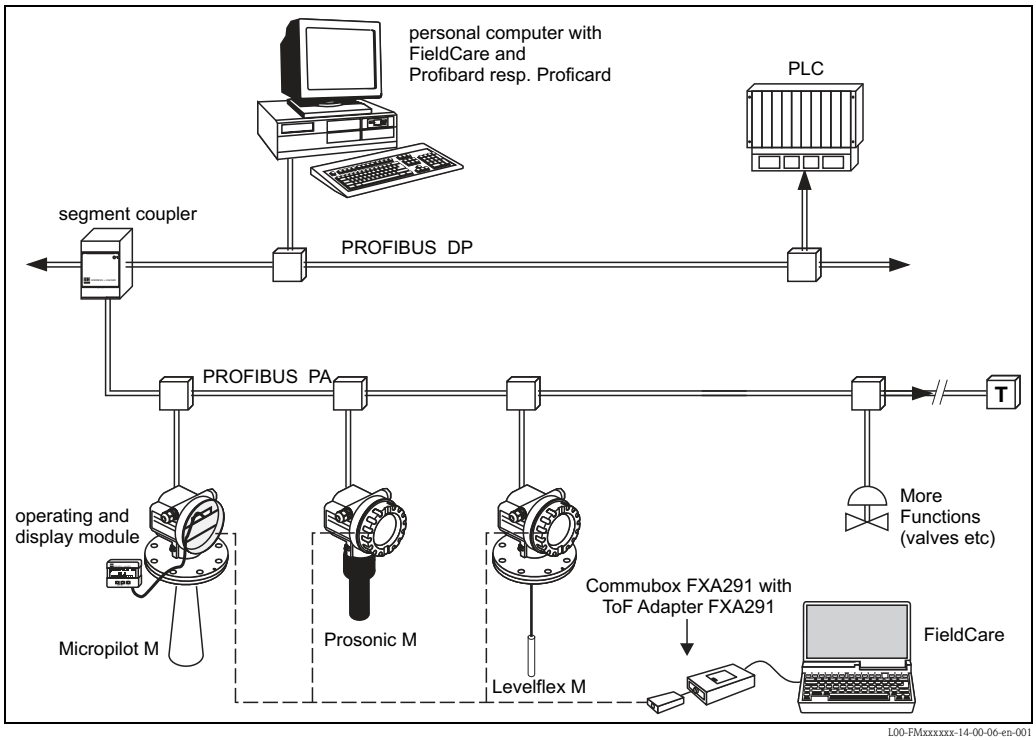
- Power supply directly from power line (4-wire) or from transmitter power supply unit (2-wire).
- Onsite operation with integrated display or remote operation with HART protocol.



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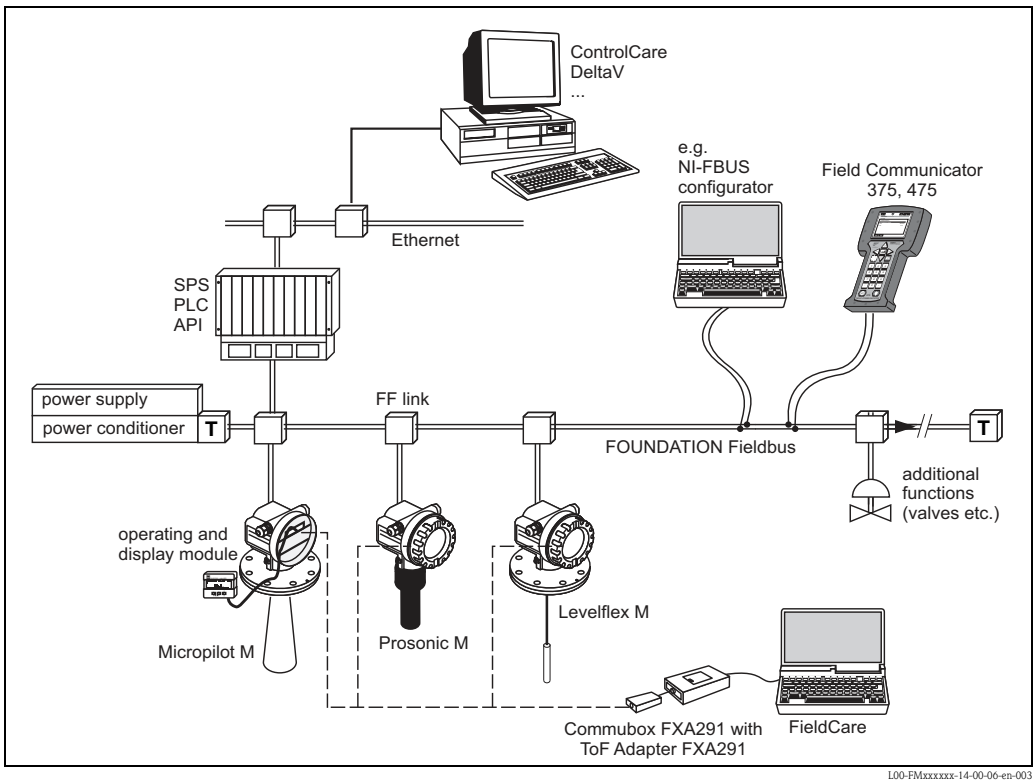
System integration via PROFIBUS PA

Maximum 32 transmitters (depending on the segment coupler, 10 in the Ex ia IIC hazardous area according to the FISCO Model) can be connected to the bus. The Bus voltage is supplied by the segment coupler. Both onsite as well as remote operation are possible.



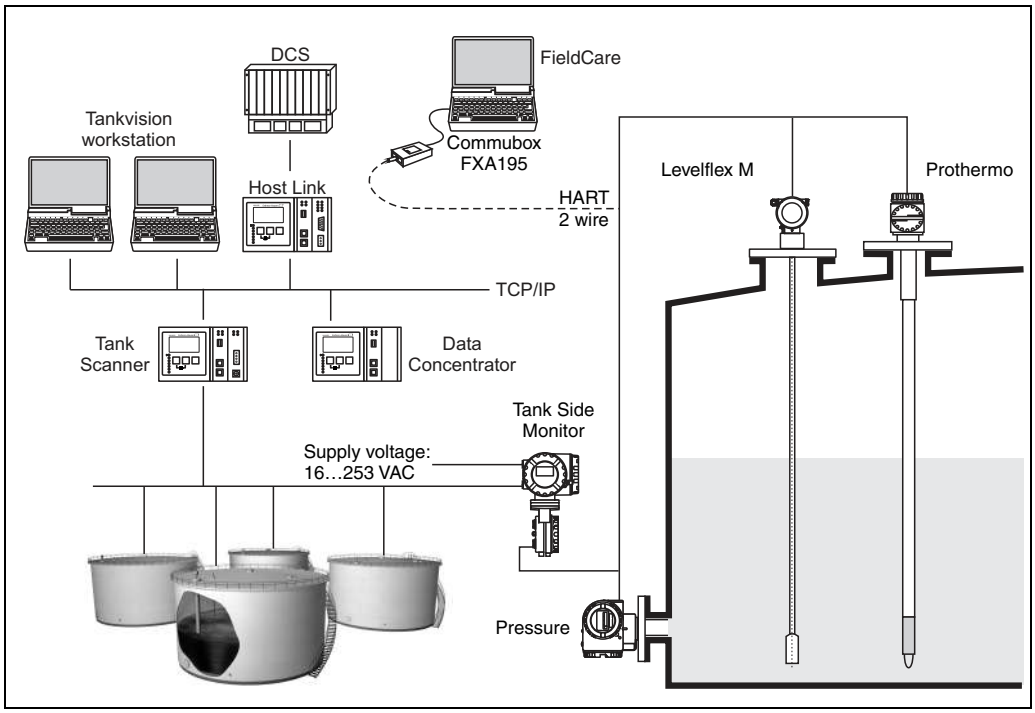
System integration via FOUNDATION Fieldbus

Max. 32 transmitters (standard, Ex em or Ex d) can be connected to the bus. In Ex ia IIC explosion protection: the max. number of transmitters is based on the applicable regulations and standards for interconnecting intrinsically safe circuits (EN 60079-14, proof of intrinsic safety). Both onsite as well as remote operation are possible. The complete measuring system consists of:



Integration into the tank gauging system

The Endress+Hauser Tank Side Monitor NRF590 provides integrated communications for sites with multiple tanks, each with one or more sensors on the tank, such as radar, spot or average temperature, capacitive probe for water detection and/or pressure sensors. Multiple protocols out of the Tank Side Monitor guarantee connectivity to nearly any of the existing industry standard tank gauging protocols.
Optional connectivity of analog 4 to 20 mA sensors, digital I/O and analog output simplify full tank sensor integration. Use of the proven concept of the intrinsically safe HART bus for all on-tank sensors yields extremely low wiring costs, while at the same time providing maximum safety, reliability and data availability.



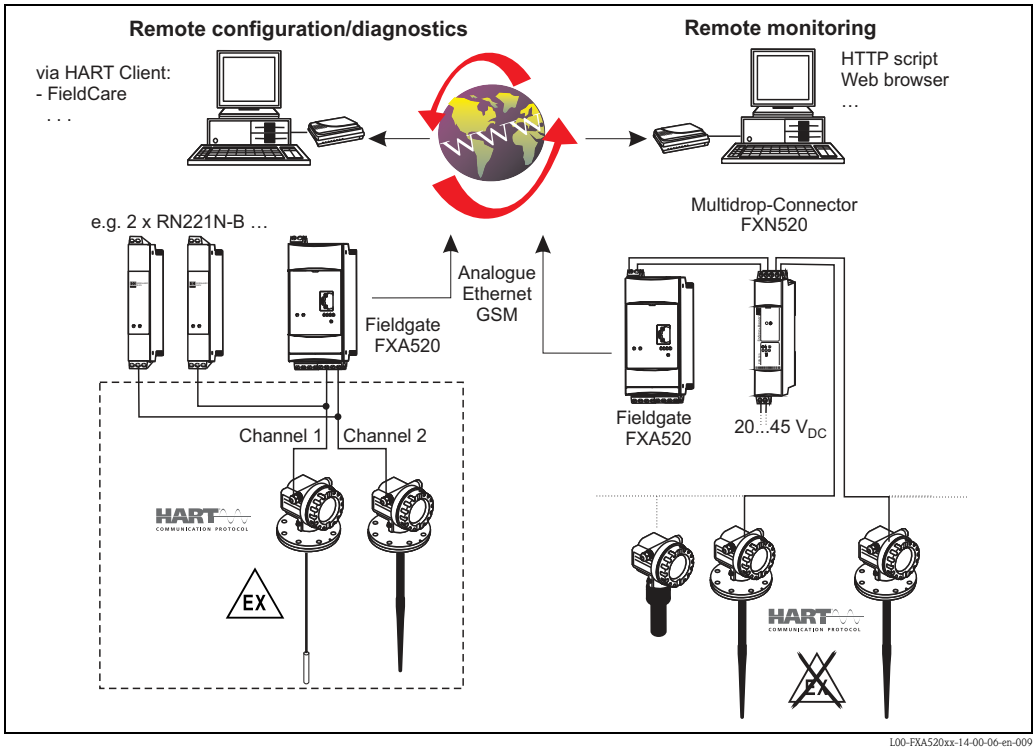
System integration via Fieldgate

Vendor Managed Inventory

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

Remote maintenance of measuring equipment

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



Note!
The number of devices which can be connected in multidrop mode can be calculated by the "FieldNetCalc" program. A description of this program can be found in Technical Information TI00400F/00/EN (Multidrop Connector FXN520).
The program is available from your Endress+Hauser sales organization or on the Internet at: www.endress.com. → select your country → download → search: Fieldnetcalc.

Input

Measured variable

The measured variable is the distance between the reference point (see Fig., → 📄 43) and the product surface. Subject to the empty distance entered "E" (see Fig., → 📄 4), the level is calculated. Alternatively, the level can be converted into other variables (volume, mass) by means of linearization (32 points).

Measuring range

Level measurement

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

Medium group	DC (Εr)	Typical bulk solids	Typical liquids	Measuring range	
				bare metallic probes	PA-coated Rope probes
1	1.4 to 1.6	-	– Condensed gases, e.g. N_2, CO_2	4 m, only coax probe	-
2	1.6 to 1.9	– Plastic granulate – White lime, special cement – Sugar	– Liquefied gas, e.g. propane – Solvent – Freon – Palm oil	25 m to 30 m	12.5 m to 15 m
3	1.9 to 2.5	– Portland cement, plaster	– Mineral oils, fuels	30 m to 35 m	-
		– Flour	-	-	15 m to 25 m
4	2.5 to 4	– Grain, seeds	–	–	25 m to 30 m
		– Ground stones – Sand	– Benzene, styrene, toluene – Furan – Naphthalene	35 m	25 m to 30 m
5	4 to 7	– Naturally moist (ground) stones, ores – Salt	– Chlorobenzene, chloroform – Cellulose spray – Isocyanate, aniline	35 m	35 m
6	> 7	– Metallic powder – Carbon black – Coal	– Aqueous solutions – Alcohols – Ammonia	35 m	35 m

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

Reduction of the max. possible measuring range through:
- Extremely loose surfaces of bulk solids, e.g. bulk solids with low bulk weight for pneumatic filling.
- Buildup, above all of moist products.

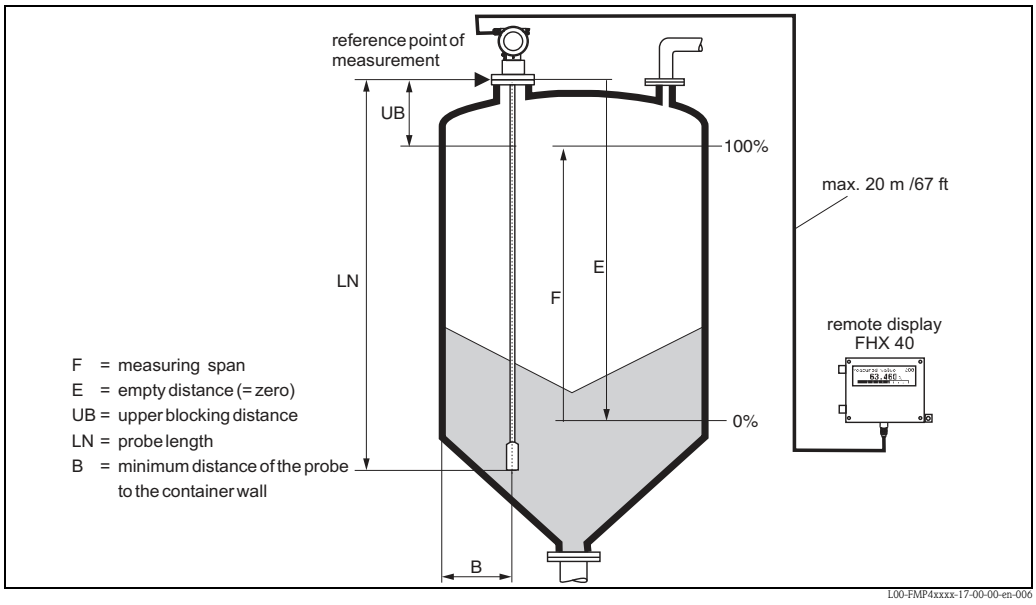
Note!
Due to the high diffusion rate of ammonia it is recommended to use the FMP45 with gas-tight bushing for measurements in this medium.

Interface measurement

The measuring range for interface measurement is limited to 10 m. Larger measuring range available on request.

Blocking distance

The upper blocking distance (= UB) is the minimum distance from the reference point of the measurement (mounting flange) to the maximum level. At the lowest part of the probe an exact measurement is not possible, see "Performance characteristics", → 20.



Reference point of the measurement, details → 43

Blocking distance and measuring range:

FMP40	LN [m] min	LN [m] max	UB [m] min
Rope probe	1	35 [1]	0.2 [2]
6 mm rod probe	0.3	2	0.2 [2]
16 mm rod robe	0.3	4	0.2 [2]
Coax probe	0.3	4	0

1) Larger measuring range available on request.

2) The indicated blocking distances are preset. At media with DC > 7, the upper blocking distance UB can be reduced for rod and rope probes on 0.1 m. The upper blocking distance UB can be entered manually.

FMP40 (interface)	LN [m] min	LN [m] max	UB [m] min
Coax probe	0.3	4	0
16 mm rod probe in the bypass	0.3	4	0.1 [1]
6 mm rod probe in the bypass	0.3	2	0.1 [1]
Rope probe in free field [2]	0.3	10[3]	0.1 [1]

1) The indicated blocking distances are preset. The upper blocking distance UB can be entered manually.

2) Measurements in free field available on request.

3) Larger measuring range available on request.

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

Used frequency spectrum

100 MHz to 1.5 GHz

Output

Output signal

- 4 to 20 mA (invertible) with HART protocol
- PROFIBUS PA:
  - signal coding: Manchester Bus Powered (MBP)
  - data transmission rate: 31.25 KBit/s, voltage mode
- FOUNDATION Fieldbus (H1):
  - signal coding: Manchester Bus Powered (MBP)
  - data transmission rate: 31.25 KBit/s, voltage mode

Signal on alarm

Error information can be accessed via the following interfaces:
- Local display:
  - Error symbol
  - Plain text display
- Current output, signal on error can be selected (e.g. according to NAMUR recommendation NE43)
- Digital interface

Linearization

The linearization function of the Levelflex M allows the conversion of the measured value into any unit of length or volume and mass or %. Linearization tables for calculating the volume in cylindrical tanks are preprogrammed. Other tables of up to 32 value pairs can be entered manually or semi-automatically. The creation of a linearization table with FieldCare is particularly convenient.

Data of the FOUNDATION Fieldbus interface

Basic Data

Device Type	1012 (hex)
Device Revision	04 (hex)
DD Revision	02 (hex)
CFF Revision	02 (hex)
ITK Version	4.61
ITK-Certification Driver-No.	www.endress.com / www.fieldbus.org
Link-Master (LAS) cabable	Yes
Link Master / Basic Device selectable	Yes; Default: Basic Devce
Number VCRs	24
Number of Link-Objects in VFD	24

Virtual communication references (VCRs)

Permanent Entries	1
Client VCRs	0
Server VCRs	24
Source VCRs	23
Sink VCRs	0
Subscriber VCRs	23
Publisher VCRs	23

Link Settings

Slot time	4
Min. Inter PDU delay	6
Max. response delay	10

Transducer Blocks

Block	Content	Output values
Sensor Block	Contains all parameters related to the measurement	■ Level or volume[1] (channel 1) ■ Distance (channel 2)
Diagnsotic Block	Contains diagnostiv information	No output values
Display Block	Contains parameters to configure the local display	No output values

1) Depending on the configuration of the sensor-block.

Function Blocks

Block	Content	Execution time	Functionality
Resource Block	The Resource Block contains all the data that uniquely identifies the field device. It is an electronic version of a nameplate of the device.		enhanced
Analog Input Block 1 Analog Input Block 2	The AI block takes the manufacturer's input data, selected by channel number, and makes it available to other function blocks at its output.	30 ms	standard
PID Block	The PID block serves as proportional-integral-derivative controller and is used almost universally to do closed-loop-control in the field including cascade and feedforward.	80 ms	standard
Arithmetic Block	This block is designed to permit simple use of popular measurement math functions. The user does not have to know how to write equations. The math algorithm is selected by name, chosen by the user for the function to be done.	50 ms	standard
Input Selector Block	The input selector block provides selection of up to four inputs and generates an output based on the configured action. This block normally receives its inputs from AI blocks. The block performs maximum, minimum, middle, average and "first good" signal selection.	30 ms	standard
Signal Characte-rizer Block	The signal characterizer block has two sections, each with an output that is a non-linear function of the respective input. The non-linear function is determined by a single look-up table with 21 arbitrary x-y pairs.	40 ms	standard
Integrator Block	The Integrator Function Block integrates a variable as a function of the time or accumulates the counts from a Pulse Input block. The block may be used as a totalizer that counts up until reset or as a batch totalizer that has a setpoint, where the integrated or accumulated value is compared to pre-trip and trip settings, generating discrete signals when these settings are reached.	60 ms	standard

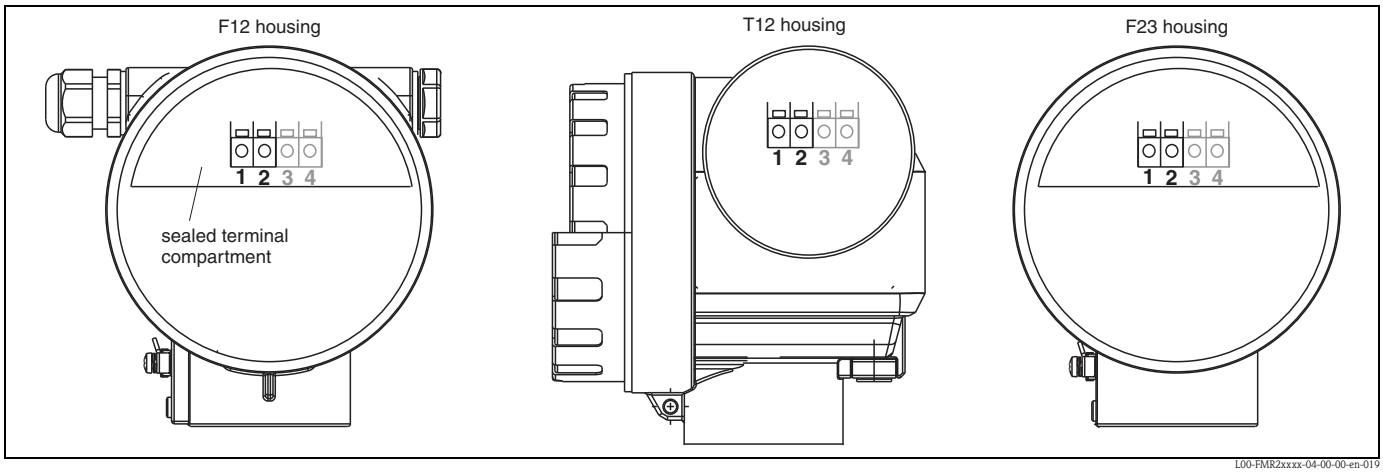
Auxiliary energy

Electrical connection

Connection compartment

Three housings are available:
- Aluminum housing F12 with additionally sealed connection compartment for:
  - standard
  - Ex ia
  - dust ignition-proof
- Aluminum housing T12 with separate connection compartment for:
  - standard
  - Ex e
  - Ex d
  - Ex ia (with overvoltage protection)
  - dust ignition-proof
- Stainless steel 316L (1.4435) housing F23 for:
  - standard
  - Ex ia
  - dust ignition-proof

After mounting, the housing can be turned 350° in order to make it easier to access the display and the connection compartment.



Ground connection

It is necessary to make a good ground connection to the ground terminal on the outside of the housing, in order to achieve EMC security.

Cable gland

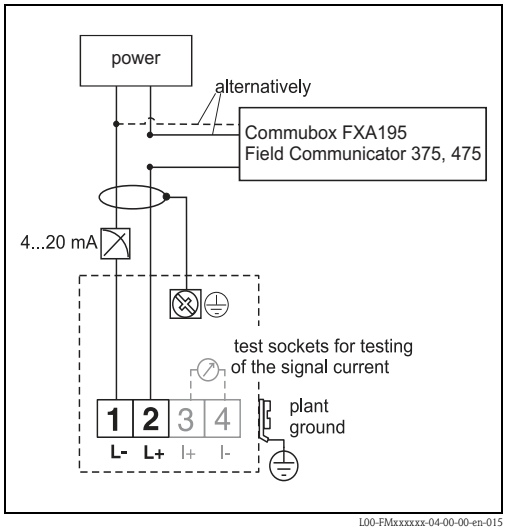
Type		Clamping area
Standard, Ex ia, IS	Plastic M20x1.5	5 to 10 mm
Ex em, Ex nA	Metal M20x1.5	7 to 10.5 mm

Terminals

For wire cross-sections of 0.5 to 2.5 mm^2

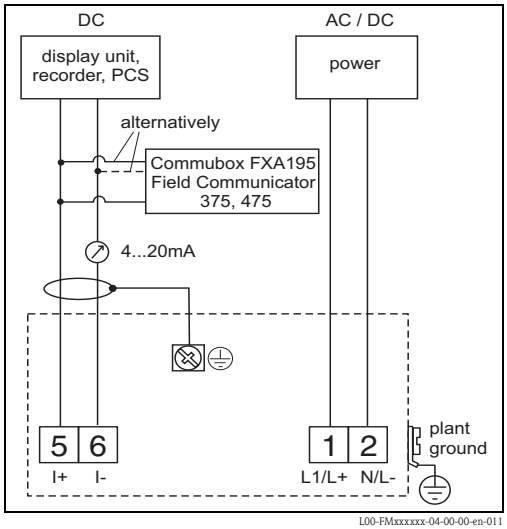
Terminal assignment

2-wire, 4 to 20 mA with HART



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4-wire, 4 to 20 mA active with HART



L00-FMxxxxxx-04-00-00-en-011

Note!
If 4-wire for dust-Ex-applications is used, the current output is intrinsically save.

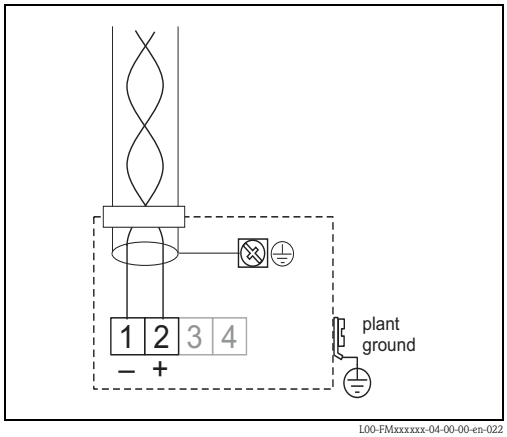
Connect the connecting line to the screw terminals in the terminal compartment.

Cable specification:
A standard installation cable is sufficient if only the analog signal is used. Use a shielded cable when working with a superimposed communications signal (HART).

Note!
- Protective circuitry against reverse polarity, RFI and over-voltage peaks is built into the device (see also TI00241F/00/EN "EMC Test Procedures").
- See TI00402F/00/EN for connection to Tank Side Monitor NRF590.

PROFIBUS PA
The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the auxiliary energy.
For further information on the network structure and grounding and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions BA034S/04/EN "Guidelines for planning and commissioning PROFIBUS DP/PA" and the PNO Guideline.

Cable specification:
Use a twisted, shielded two-wire cable, preferably cable type A.



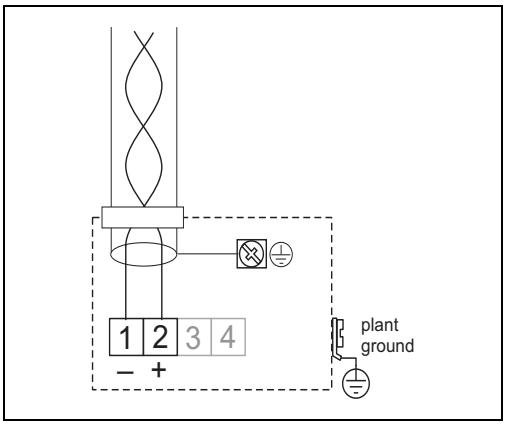
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Note!
For further information on the cable specifications, see Operating Instructions BA034S/04/EN Guidelines for planning and commissioning PROFIBUS DP/PA", PNO Guideline 2.092 " PROFIBUS PA User and Installation Guideline" and IEC 61158-2 (MBP).

FOUNDATION Fieldbus

The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the auxiliary energy. For further information on the network structure and grounding and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions BA013S/04/EN "FOUNDATION Fieldbus Overview" and the FONDATION Fieldbus Guideline.

Cable specification:
Use a twisted, shielded two-wire cable, preferably cable type A.



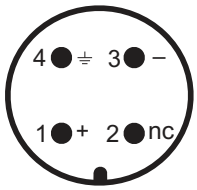
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Note!
For further information on the cable specifications, see Operating Instructions BA013S/04/EN "FOUNDATION Fieldbus Overview", FONDATION Fieldbus Guideline and IEC 61158-2 (MBP).

Connector

For the versions with a connector M12 or 7/8", the housing does not have to be opened for connecting the signal line.

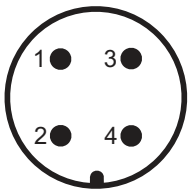
PIN assignment for M12 connector



A0011175

PIN	Meaning
1	Signal +
2	Not assigned
3	Signal –
4	Earth

PIN assignment for 7/8" connector



A0011176

PIN	Meaning
1	Signal –
2	Signal +
3	Shield
4	Not assigned

Load HART

Minimum load for HART communication: 250 Ω

Supply voltage

HART, 2-wire

All the following values are the terminal voltages directly at the device:

Communication		Current consumption	Terminal voltage
HART	Standard	4 mA	16 V to 36 V
		20 mA	7.5 V to 36 V
	Ex ia	4 mA	16 V to 30 V
		20 mA	7.5 V to 30 V
	Ex em Ex d	4 mA	16 V to 30 V
		20 mA	11 V to 30 V
Fixed current, adjustable e.g. for solar power operation (measured value transmitted via HART)	Standard	11 mA	10 V to 36 V
	Ex ia	11 mA	10 V to 30 V
Fixed current for HART Multidrop mode	Standard	4 mA[1)]	16 V to 36 V
	Ex ia	4 mA[1)]	16 V to 30 V

1) Start up current 11 mA.

HART residual ripple, 2-wire: $U_{ss} \leq 200$ mV

HART, 4-wire active

Version	Voltage	max. load
DC	10.5 to 32 V	600 Ω
AC, 50/60 Hz	90 to 253 V	600 Ω

Residual ripple HART, 4-wire, DC version: $U_{ss} \leq 2$ V, voltage incl. ripple within the permitted voltage (10.5 to 32 V)

PROFIBUS PA and FOUNDATION Fieldbus

The following values are the voltages across the terminals directly at the device:

Type	Terminal voltage
standard	9 V to 32 V
Ex ia (FISCO model)	9 V to 17.5 V
Ex ia (Entity concept)	9 V to 24 V

Supply voltage	9 V to 32 V [1)]
Lift-off voltage	9 V

1) There may be additional restrictions for devices with an explosion protection certificate. Refer to the notes in the appropriate safety instructions (XA).

Cable entry

- Cable gland: M20x1.5 (only cable entry for Ex d)
- Cable entry: G½ or ½NPT
- PROFIBUS PA M12 plug
- FOUNDATION Fieldbus 7/8" plug

Power consumption

Min. 60 mW, max. 900 mW

Current consumption

HART

Communication	Output current	Current consumption	Power consumption
HART, 2-wire	3.6 to 22 mA[1)]	—	min. 60 mW, max. 900 mW
HART, 4-wire (90 to 250 V_{AC})	2.4 to 22 mA	~ 3 to 6 mA	~ 3,5 VA
HART, 4-wire (10.5 to 32 V_{DC})	2.4 to 22 mA	~ 100 mA	~ 1 W

1) For HART-Multidrop: start up current is 11 mA.

PROFIBUS PA

Max. 11 mA.

FOUNDATION Fieldbus

Nominal current	15 mA
Starting current	≤ 15 mA
Error current	0 mA
FISCO/FNICO conformal	Compliant
Polarity sensitive	No

FISCO

U_i	17,5 V
I_i	500 mA; with overvoltage protection 273 mA
P_i	5,5 W; with overvoltage protection 1,2 W
C_i	5 nF
L_i	0,01 mH

Overvoltage protection

If the measuring device is used for level measurement in flammable liquids which requires the use of overvoltage protection according to EN/IEC 60079-14 or EN/IEC 60060-1 (10 kA, pulse 8/20 µs), it has to be ensured that:

- the measuring device with integrated overvoltage protection with 600 V gas discharge tubes within the T12-enclosure is used, refer to "Ordering information", → 58
  or
- This protection is achieved by the use of other appropriate measures (external protection devices e.g. HAW562Z).

Performance characteristics

Reference operating conditions

- Temperature = +20 °C ±5 °C
- Pressure = 1013 mbar abs. ±20 mbar
- Humidity = 65 % ±20 %
- Reflection factor ≥ 0.8 (surface of the water for coax probe, metal plate for rod and rope probe with min. 1 m ∅)
- Flange for rod or rope probe ≥ 30 cm ∅
- Distance to obstructions ≥ 1 m
- For interface measurement:
  - Coax probe
  - DC of the lower medium = 80 (water)
  - DC of the upper medium = 2 (oil)

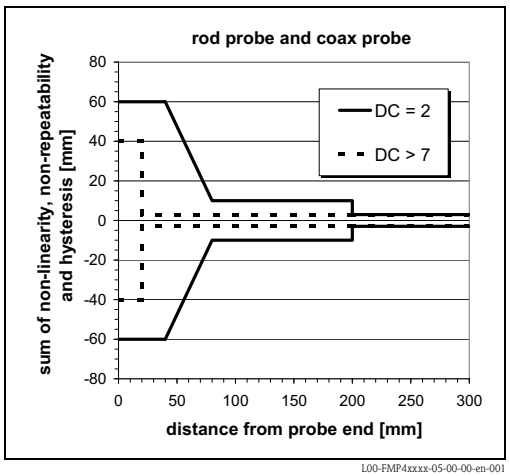
Maximum measured error

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

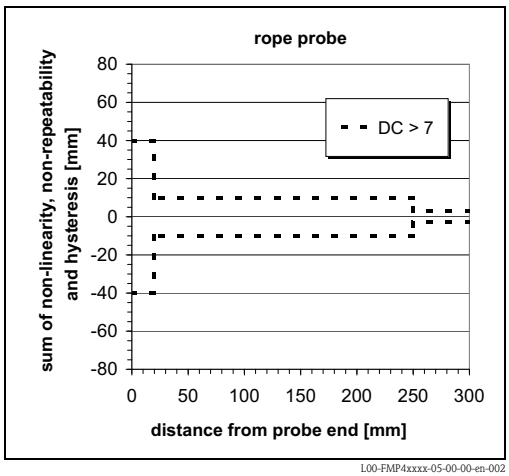
Output:	Digital	Analog
Sum of non-linearity, non-repeatability and hysteresis	**Level (electronic version level and interface measurement):** – Measuring range up to 10 m: ±3 mm – Measuring range >10 m: ±0.03 % **For PA-coated rope probes:** – Measuring range up to 5 m: ±5 mm – Measuring range > 5 m: ±0.1 %	±0.06 %
	Interface (only for electronic version "K" interface measurement): – Measuring range up to 10 m: ±10 mm If the thickness of the interface is < 60 mm, the interface can no longer be differentiated from the overall level such that both output signals are identical.	
Offset / Zero	±4 mm	±0.03 %

If the reference conditions are not met, the offset/zero point arising from the mounting situation may be up to ±12 mm for rope and rod probes. This additional offset/zero point can be compensated for by entering a correction (function "Offset" (057)) during commissioning.

Differing from this, the following measuring error is present in the vicinity of the level (electronic version level and interface measurement):



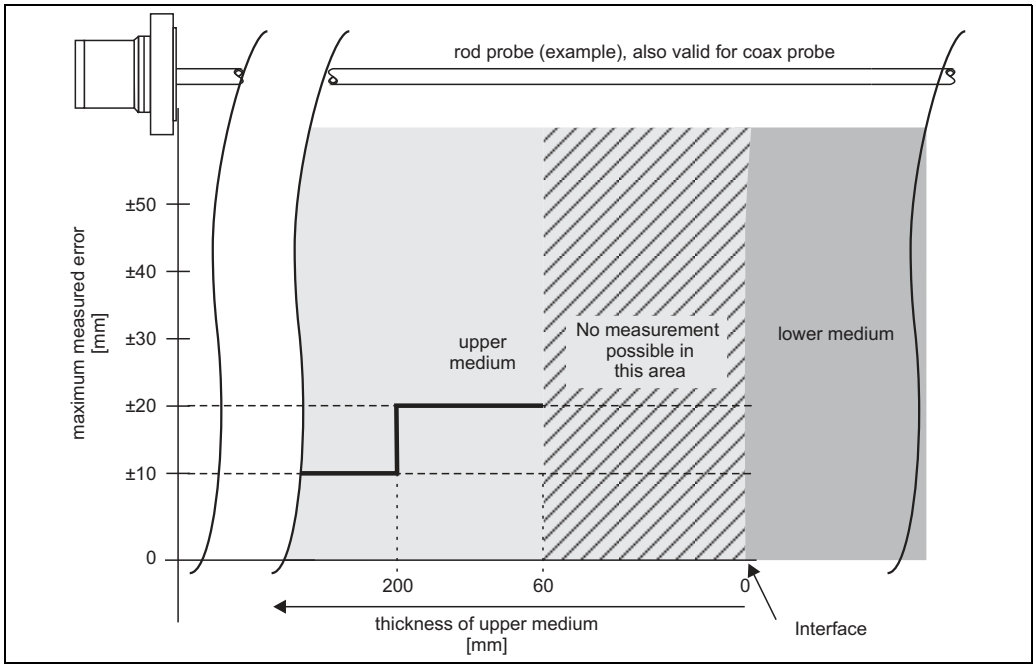
L00-FMP4xxxx-05-00-00-en-001



L00-FMP4xxxx-05-00-00-en-002

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

Differing from this, the following measuring error is present for thin interfaces (only for electronic version "K" interface measurement):



Resolution

- Digital: 1 mm
- Analog: 0.03 % of the measuring range

Reaction time

The reaction time depends on the configuration.

Shortest time:
- 2-wire electronics: 1 s
- 4-wire electronics: 0.7 s

Influence of ambient temperature

The measurements are carried out in accordance with EN 61298-3:
- Digital output (HART, PROFIBUS PA, FOUNDATION Fieldbus):
  - Average T_K: 0.6 mm/10 K, max. ±3.5 mm over the entire temperature range -40 °C to +80 °C.

2-wire:
- Current output (additional error, in reference to the span of 16 mA):
  - **Zero point (4 mA)**
    Average T_K: 0.032 %/10 K, max. 0.35 % over the entire temperature range -40 °C to +80 °C.
  - **Span (20 mA)**
    Average T_K: 0.05 %/10 K, max. 0.5 % over the entire temperature range -40 °C to +80 °C.

4-wire:
- Current output (additional error, in reference to the span of 16 mA):
  - **Zero point (4 mA)**
    Average T_K: 0.02 %/10 K, max. 0.29 % over the entire temperature range -40 °C to +80 °C.
  - **Span (20 mA)**
    Average T_K: 0.06 %/10 K, max. 0.89 % over the entire temperature range -40 °C to +80 °C.

Operating conditions: installation with level measurement

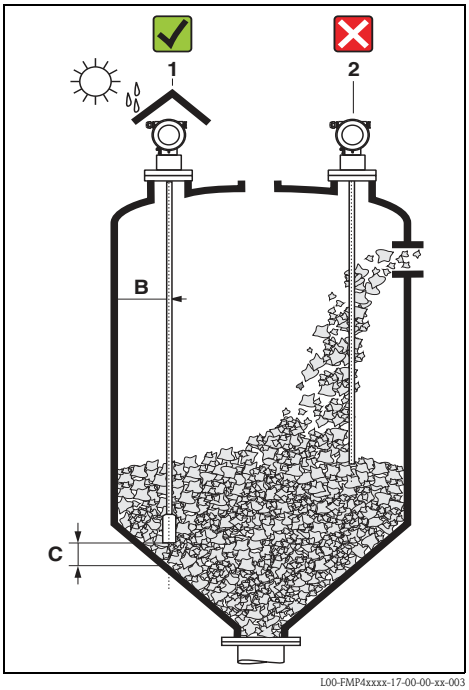
General information on level measurement

Probe selection (→ 🖹 6)

- Normally, rope probes should be used for bulk solids, rod probes are only suitable for short measuring ranges up to approx. 2 m in bulk solids. This applies above all to applications in which the probe is installed laterally at an angle and for light and pourable bulk solids.
- Normally use rod or coax probes for liquids. Rope probes are used in liquids for measuring ranges > 4 m and with restricted ceiling clearance which does not allow the installation of rigid probes.
- Coax probes are suited to liquids with viscosities of up to approx. 500 cst. Coax probes can measure most liquefied gases, as of a dielectric constant of 1.4. Moreover, installation conditions, such as nozzles, tank internal fittings etc., have no effect on the measurement when a coax probe is used. A coax probe offers maximum EMC safety when used in plastic tanks.
- In the case of large silos, the lateral pressure on the rope can be so high that a rope with plastic jacketing must be used. We recommend PA-coated ropes be used for cereal products wheat, flour etc.

Mounting location

- Do not mount rod or rope probes in the filling curtain (2).
- Mount rod and rope probes away from the wall (B) at such a distance that, in the event of buildup on the wall, there is still a minimum distance of 100 mm between the probe and the buildup.
- Mount rod and rope probes as far away as possible from installed fittings. "Mapping " must be carried out during commissioning in the event of distances < 300 mm.
- When installing rod and rope probes in plastic containers, the minimum distance of 300 mm also applies to metallic parts outside the container.
- Rod and rope probes may not, at times, contact metallic container walls or floors.
- Minimum distance of probe end to the container floor (C):
  - Rope probe: 150 mm
  - Rod probe: 50 mm
  - Coax probe: 10 mm
- When installing outdoors, it is recommended that you use a protective cover (1) (→ 🖹 62, "Accessories").
- Avoid buckling the rope probe during installation or operation (e.g. through product movement against silo wall) by selecting a suitable mounting location.



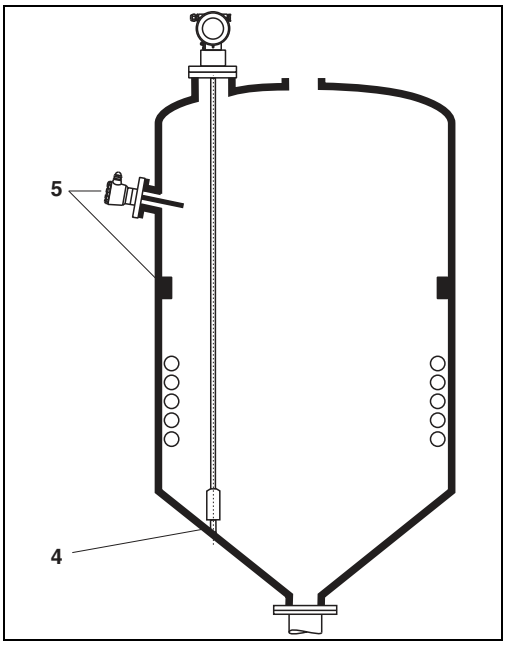
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Other installations

- Select the mounting location such that the distance to internals (5) (e.g. limit switch, struts) is > 300 mm over the entire length of the probe, also during operation.
- Probe must within the measuring span not touch any internals during operation. If necessary, when using rope probes the probe end (4) may be fixed to secure it (→ 📄 26)!.

Optimization options

- Interference echo suppression: measurement can be optimized by electronically tuning out interference echoes.

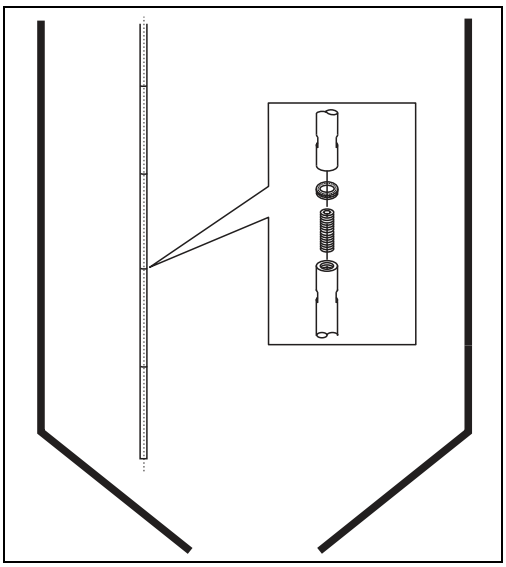


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Separable probes

If there is little mounting space (distance to the ceiling), it is advisable to use separable rod probes (∅16 mm).

- max. probe length 10 m (394 in)
- max. sideways capacity 20 Nm
- probes are separable several times with the lengths:
  - 500 mm (19.68 in)
  - 1000 mm (39.37 in)
- torque: 15 Nm

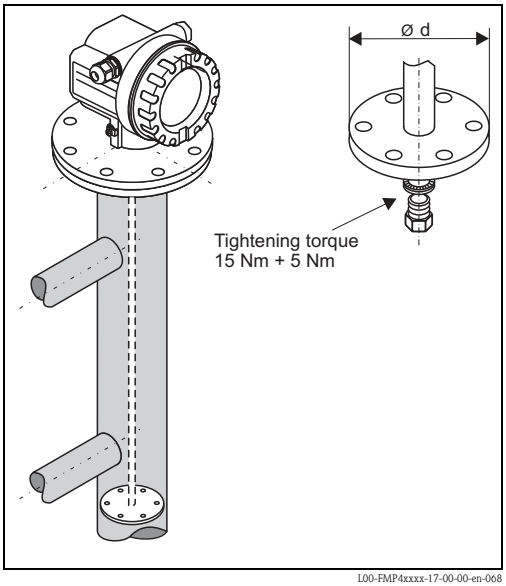


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Centering of probe end

If the centering disk is mounted at the end of the probe, it enables a reliable measuring.
See "Ordering information", → 📄 58.

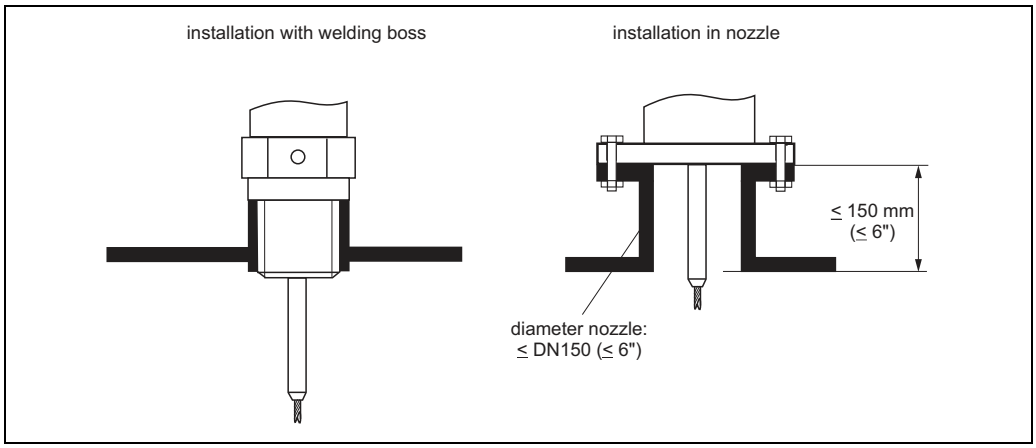
- Centering disk for rod probes:
  - d = 45 mm (DN50 (2"))
  - d = 75 mm (DN80 (3") + DN100 (4"))



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Type of probe installation

- Probes are mounted to the process connection with threaded connections or flanges and are usually also secured with these. If during this installation there is the danger that the probe end moves so much that it touches the tank floor or cone at times, the probe must, if necessary, be shortened and fixed down.
  The easiest way to fix the rope probes is to screw them to the internal thread on the lower end of the weight (Thread size, → 📄 26).
- The ideal installation is mounting in a screwed joint / screw-in sleeve which is internally flush with the container ceiling.
- If installation takes place in a nozzle, the nozzle should be 50 to 150 mm in diameter and should not be more than 150 mm high. Installation adapters are available for other dimensions, → 📄 35.



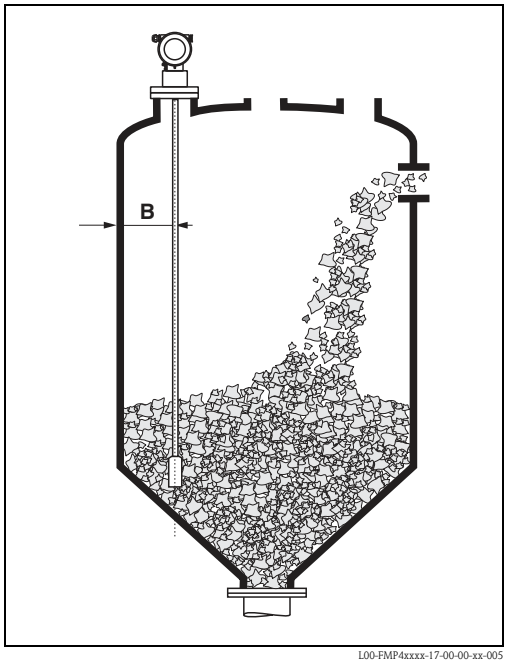
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Welding the probe into the vessel

Caution!
Before welding the probe into the vessel, it must be grounded by a low-resistive connection. If this is not possible, the electronics as well as the HF module must be disconnected. Otherwise the electronics may be damaged.

Special notes for bulk solids

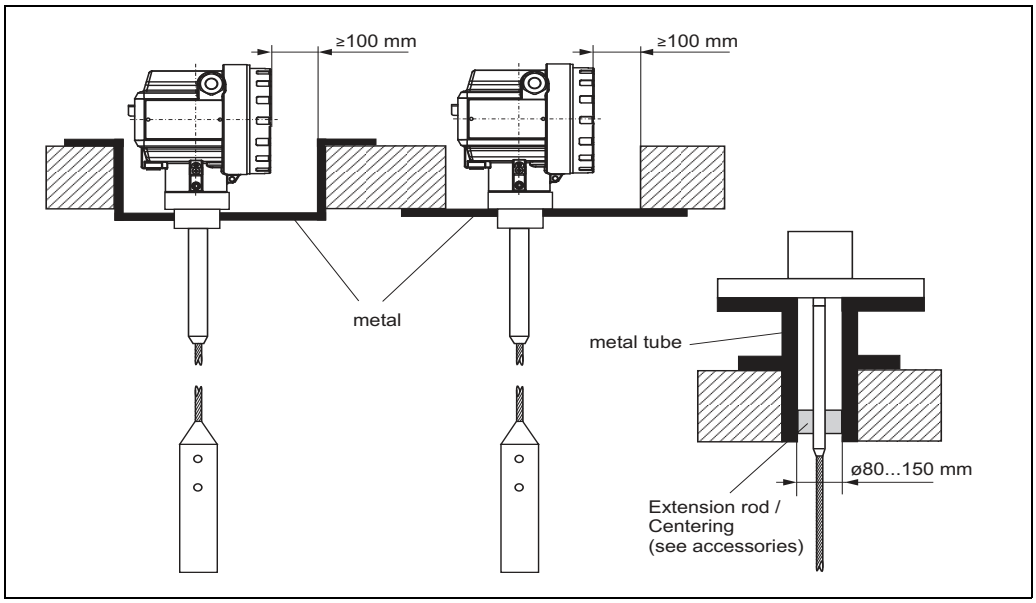
- In the case of bulk solids, as great a distance as possible from the filling curtain is especially important to avoid wear.
- In concrete silos, a **large distance** (B) should be observed between the probe and the concrete wall, if possible ≥ 1 m, but at least 0.5 m.
- The installation of rope probes must be carried out carefully. The rope should not be buckled.
  If possible, installation should be carried out when the silo is empty.
- Check the probe regularly for defect.



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Installation in concrete silos

Installation, for example, into a thick concrete ceiling should be made flush with the lower edge. Alternatively, the probe can also be installed into a pipe that must not protrude over the lower edge of the silo ceiling. The pipe should kept at a minimum length. Installation suggestions see diagram.



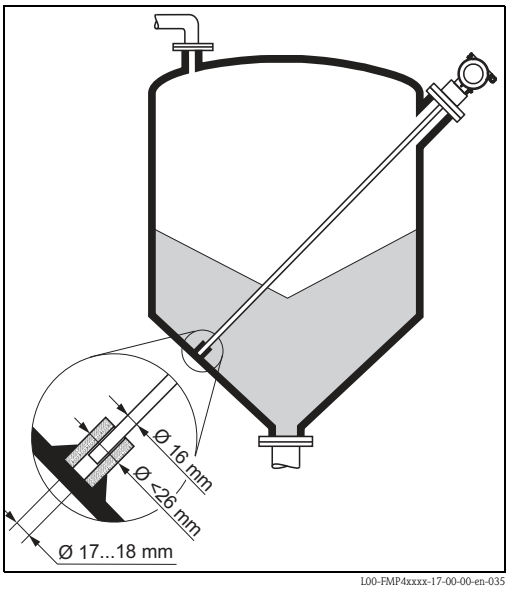
L00-FMP4xxxx-17-00-00-en-008

Note for installations with rod extension/center washer (accesories):
Strong dust generation can lead to build-up behind the center washer.
This can cause an interference signal. For other installation possibilities please contact Endress+Hauser.

Installation from the side

- If installation from above is not possible, the Levelflex can also be mounted from the side.
- In this case, always fix the rope probe ("Fixing rope probe", → 📄 26).
- Support rod and coax probe if the lateral load-bearing capacity is exceeded (→ 📄 6). Only fix rod probes at the probe end.

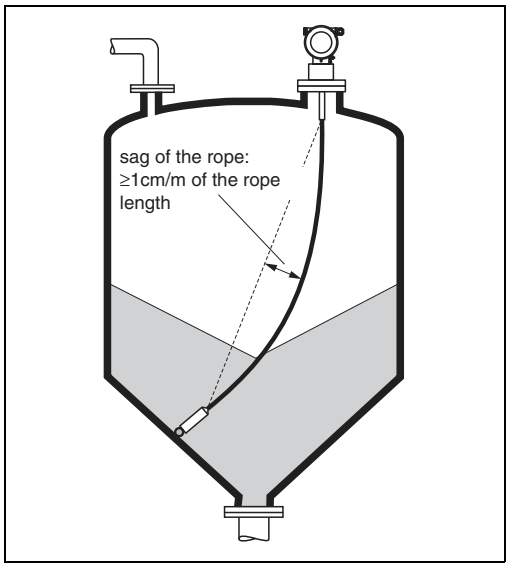
Caution!
Remove or ground the electronics when welding the sleeve as the device will otherwise be destroyed!



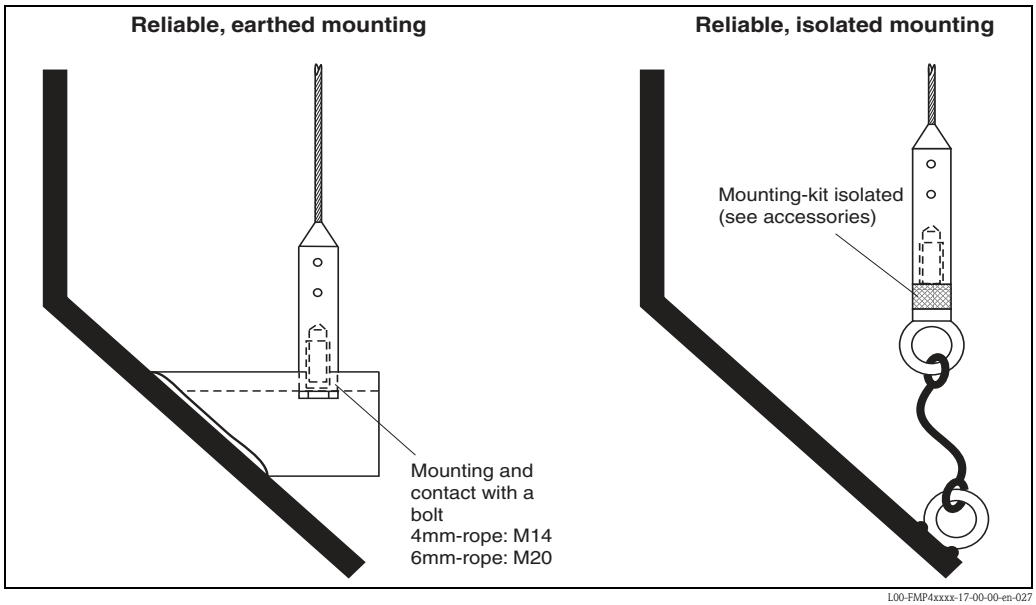
L00-FMP4xxxx-17-00-00-en-035

Fixing rope probe

- The end of the probe needs to be secured if the probe would otherwise touch the silo wall, the cone or another part, or the probe comes closer than 0.5 m to a concrete wall. This is what the internal thread in the probe weight is intended for:
  – 4 mm rope: M14
  – 6 mm rope: M20
- Preferably use the 6 mm rope probe due to the higher tensile strength when fixing a rope probe
- The fixing must be either reliably grounded or reliably insulated ("Accessories", → 62).
  If it is not possible to mount the probe weight with a safe earthed connection, it can be secured using an isolated eyelet, which is available as an accessory (→ 68).
- In order to prevent an extremely high tensile load 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 ≥ 1 cm/m of the rope length.



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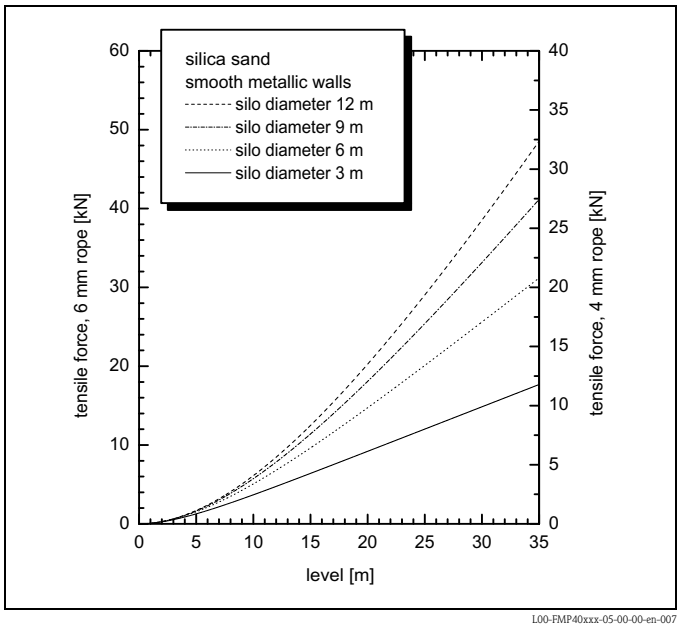


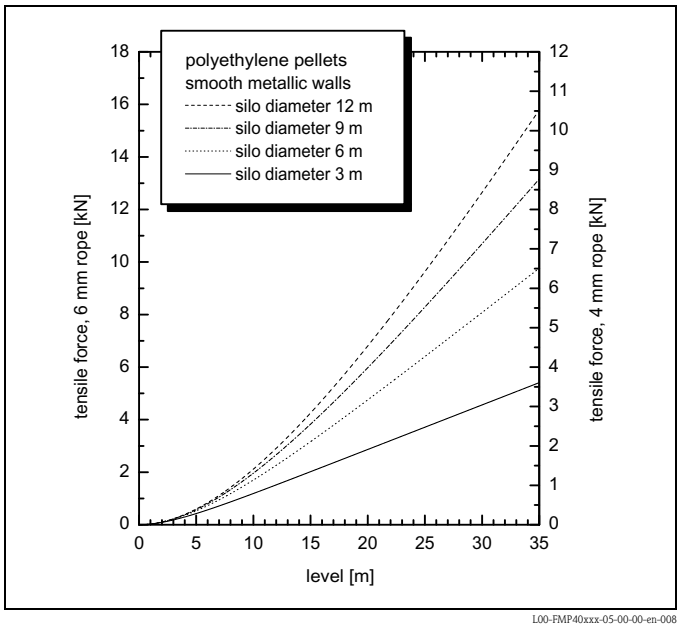
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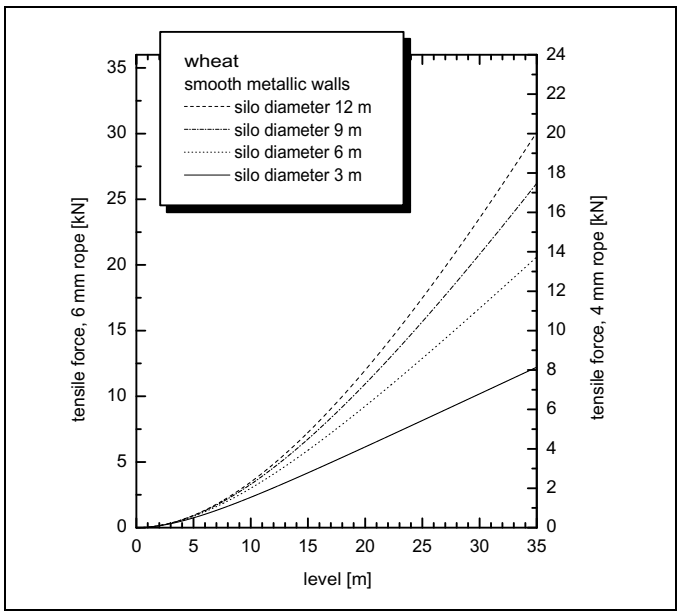
Tensile load

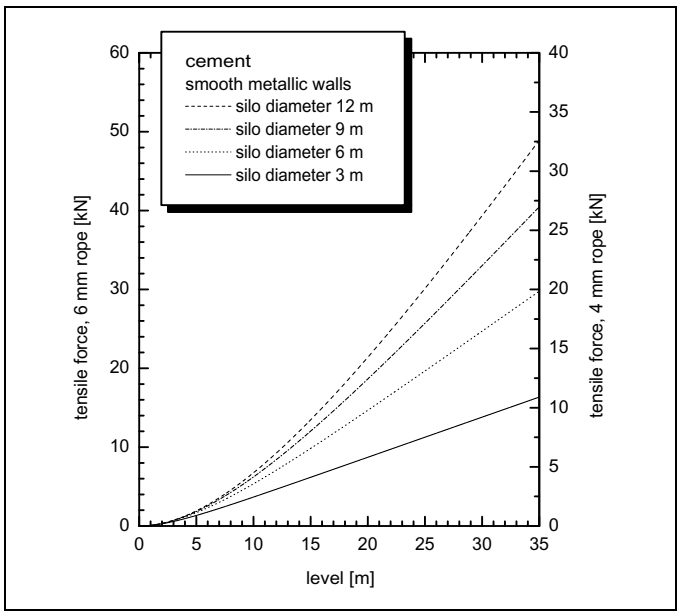
Bulk solids exert tensile forces (maximum admissible values, → 🖹 6) on rope probes whose height increases with:
- the length of the probe, i.e. max. cover,
- the bulk density of the product,
- the silo diameter and
- the diameter of the probe rope

The following diagrams show typical loads for frequently occurring bulk solids as reference values.
The calculation is performed for the following conditions:
- Suspended probe (probe end not fixed at the bottom)
- Free-flowing bulk solid, i.e. mass flow. A calculation for core flow is not possible. In the event of collapsing cornices, considerably higher loads can occur.
- The specification for tensile forces contains the safety factor 2, which compensates for the normal fluctuation range in pourable bulk solids.









Since the tensile forces are also heavily dependent on the viscosity of the product, a higher safety factor is necessary for highly viscous products and if there is a risk of cornice buildup.
In critical cases it is better to use a 6 mm rope instead of a 4 mm one.

The same forces also act on the silo cover. On a fixed rope, the tensile forces are definitely greater, but this can not be calculated. Observe the tensile strength of the probes or ensure that the tensile strength of the probes is not exceeded (see table, → 🖹 6).

Options for reducing the tensile forces:
- Shorten the probe,
- If the maximum tensile load is exceeded, check whether it would be possible to use a non-contact Ultrasonic or Level-Radar device.

Special notes for liquids

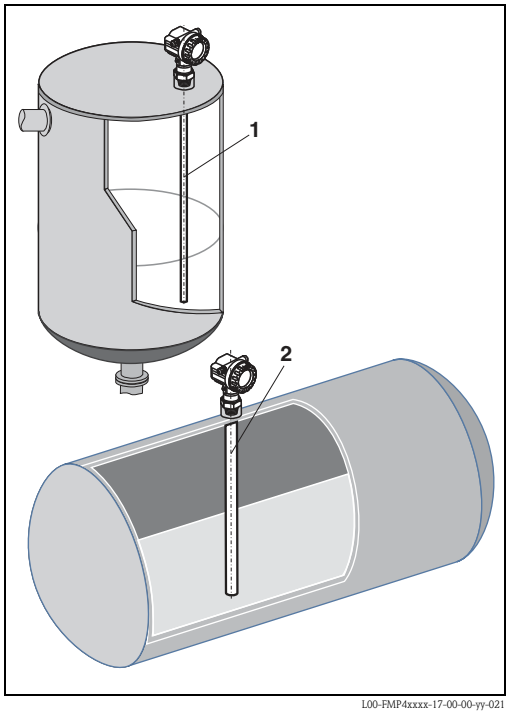
- When installing in agitation units, check whether a no-contact process (Ultrasonic or Level-Radar) would be better suited, especially if the agitator generates large mechanical loads on the probe.
- If Levelflex is, nevertheless, installed in tanks with agitators, it is better to use coax probes which have a greater lateral loading capacity, → 🖹 6.
  Additionally the coax probe can be protected against warping, → 🖹 31.

Standard installation

Using a coax probe offers great advantages when the viscosity of the product is < 500 cst and it is certain that the product does not accumulate buildup:
- Greater reliability:
  As of dielectric constant=1.4, measurement functions independently of all electrical properties in all liquids.
- Internals in the tank and nozzle dimensions do not have any influence on measurement.
- Higher lateral load-bearing capacity than rod probes.
- For higher viscosity a rod probe is recommended, or using a non-contact measuring principle with the Level-Radar Micropilot M.

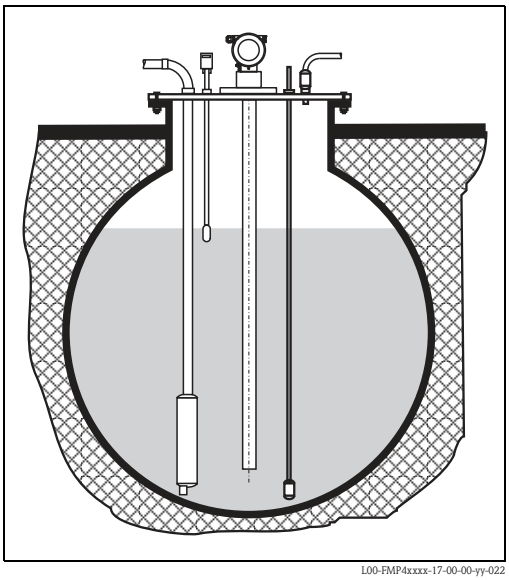
Installation in horizontal and upright cylindrical tanks

- Use the following types of probe for measuring ranges
  – up to 4 m: rod probe (1) or coax probe (2)
  – up to 10 m: separable probe
  – above 10 m: 4 mm rope probe
- Installation and possible fixing as with bulk solids.
- Any distance from wall, as long as occasional contact is prevented.
- When installing in tanks with a lot of internals or internals situated close to the probe:
  Use a coax probe!



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

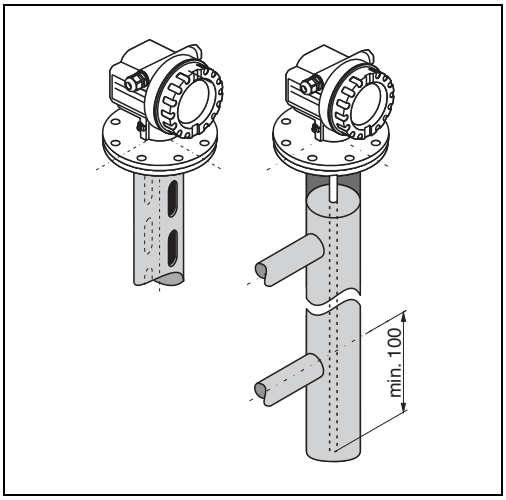


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Measurement in corrosive liquids

For measurement in corrosive liquids use Levelflex M FMP41C. When using plastic tanks it is also possible to mount the probe on the outside of the tank (see installation instructions, → 📄 30).
Levelflex measures the level of aqueous media through the plastic.

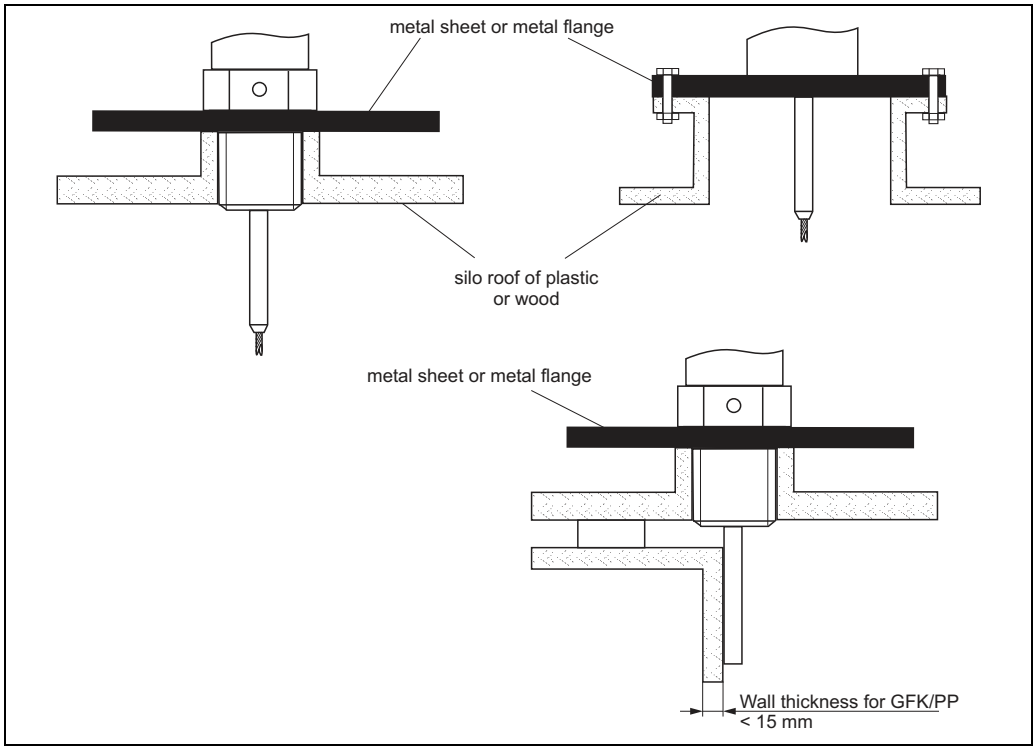
Installation in stilling well or bypass
- A rod probe can be used for pipe diameters bigger than 40 mm.
- When installing a rod probe into a metallic pipe with internal diameter of up to 150 mm, you have all the advantages of a coax probe.
- Welded joints that protrude up to approx. 5 mm inwards do not influence measurement.
- If a rod probe is used, the probe length must be 100 mm longer than the lower disposal.
- It must be ensured that the probe does not come into contact with the side wall. Where necessary, use a centering disk at the lower end of the probe (→ 📄 61, "Type of Probe:")



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Installation in plastic containers

Please note that the "guided level radar" measuring principle requires a metallic surface at the process connection! When installing the rod and rope probes in plastic silos, whose silo cover is also made of plastic or silos with wood cover, the probes must either be mounted in a ≥ DN50 (2") metallic flange, or a metal sheet with diameter of ≥ 200 mm must be mounted under the screw-in piece.



L00-FMP4xxxx-17-00-00-en-018

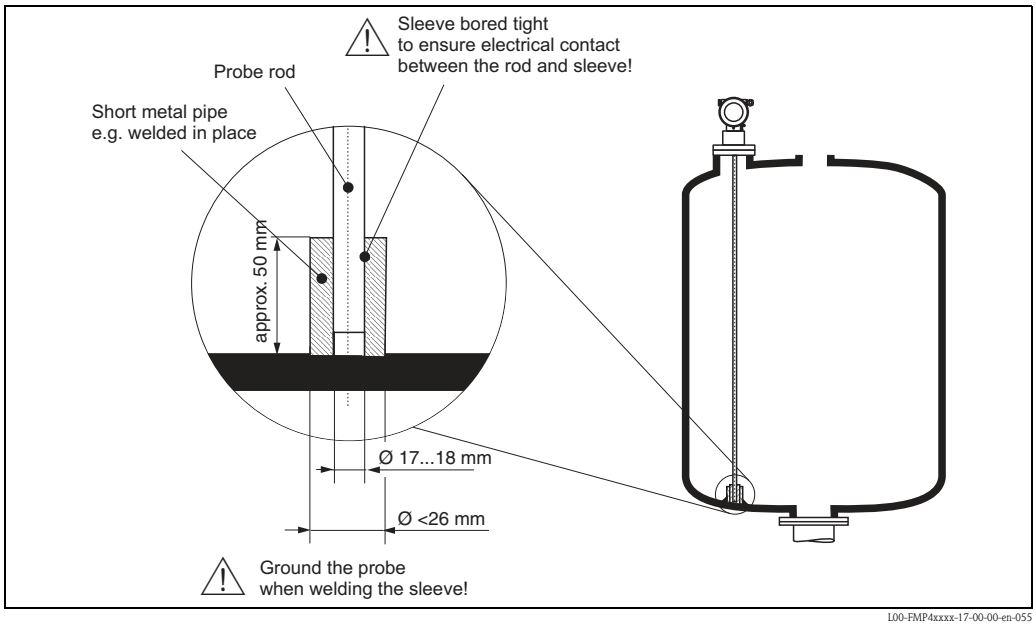
- It is also possible to mount the probe externally on the tank wall for measuring in Aqueous solutions. Measurement then takes place through the tank wall without contacting the medium. If people are in the vicinity of the probe mounting location, a plastic half pipe with a diameter of approx. 200 mm, or some other protective unit, must be affixed externally to the probe to prevent any influences on the measurement.
- There must not be any metallic reinforcement rings secured to the tank.
- The wall thickness should be < 15 mm for at GFR/PP.
- There must be no open space between the tank wall and the probe.

Supporting probes against warping

For WHG approval:
For probe lengths ≥ 3 m a support is required (see figure).

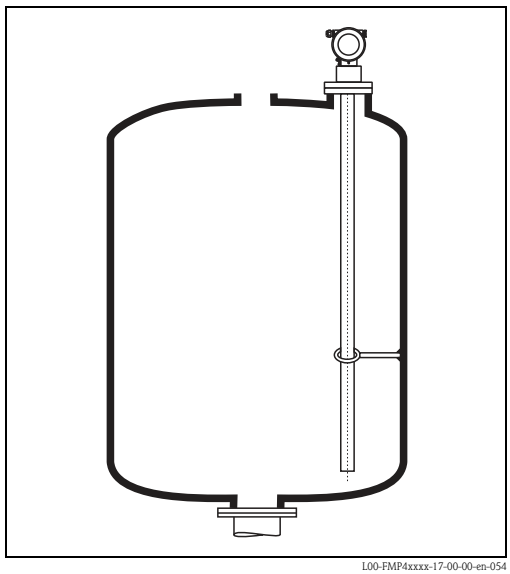
For GL/ABS approval:
Rod probes ∅16 mm ≤ 1 m permissible, rod probes ∅6 mm not permissible.
For coax probes ≥ 1 m a support is required (see figure).

a. Rod probes



L00-FMP4xxxx-17-00-00-en-055

b. Coax probes

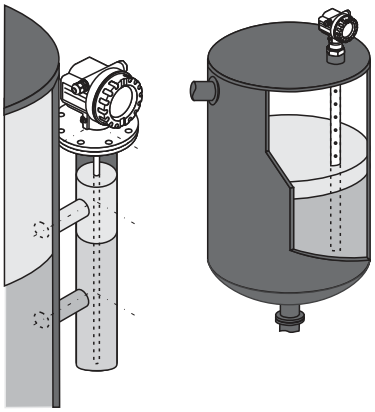
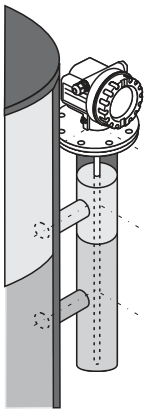


L00-FMP4xxxx-17-00-00-en-054

Operating conditions: installation with interface measurement

General information on interface measurement

The Levelflex M with the "Interface" electronics version ("power supply, output" feature) it the ideal choice for measuring interfaces. However, it is also possible to measure interfaces with a special version of the standard device but the total level has to remain constant here. This version is available on request.

	"Interface" electronics version	Special version
	 L00-FMP4xxxx-15-00-00-xx-001	 L00-FMP4xxxx-15-00-00-xx-002
Function	■ Measurement of variable interfaces and variable total levels. ■ Variable assignment of the output parameters. ■ Extended interface function	Measurement of variable interfaces with the prerequisite of a constant total level
Commissioning	Interface-specific menu guidance via onsite display or DTM	Special configuration, see modification information SV0107F/00/A2
Digital Communication	HART	PROFIBUS PA, FOUNDATION Fieldbus
Ordering information	FMP40 - #### ### K ####	FMP40 - #### ### D ###Y (PROFIBUS PA) FMP40 - #### ### F ###Y (FOUNDATION Fieldbus) Y = Special version available on request

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

- The DC of the upper medium must be known and constant. The DC can be determined with the aid of the DC manual CP00019F/00/EN. In addition, whenever the interface thickness is existing and known, the DC can be calculated automatically via FieldCare.
- The DC of the upper medium may not be greater than 10.
- The DC difference between the upper medium and lower medium must be >10.
- The interface must have a minimum thickness of 60 mm (interface electronics version) or 100 mm (special version).
- Emulsion layers in the vicinity of the interface can severely dampen the signal. However, emulsion layers up to 50 mm are permitted.

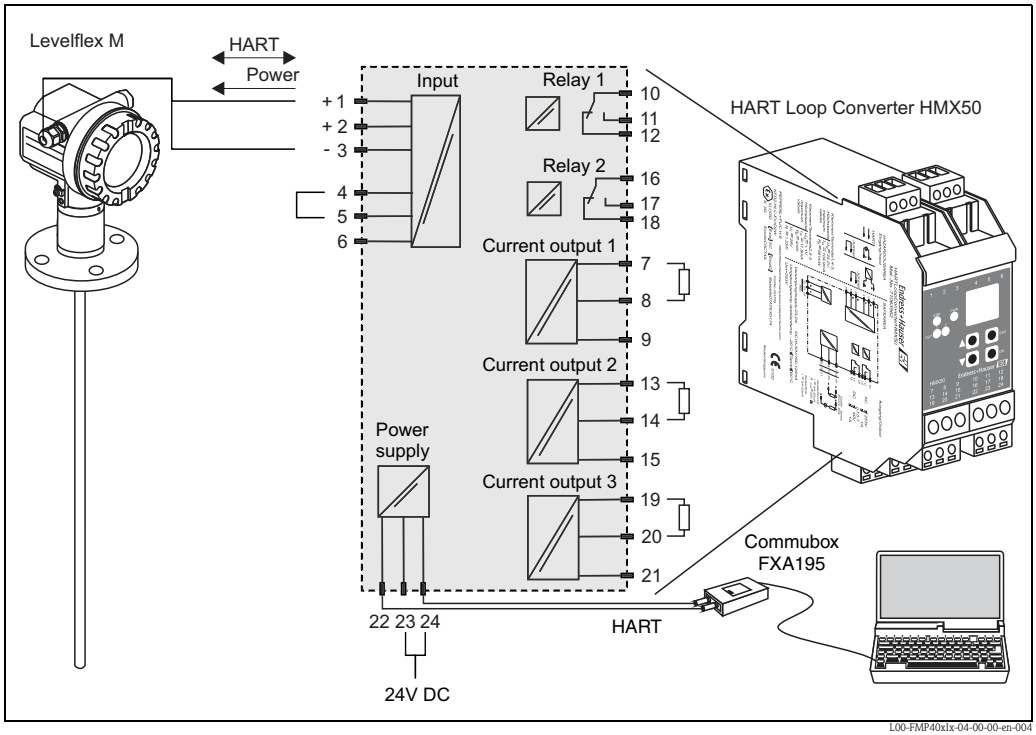
Interface electronics version

The device with the "Interface" electronics version makes it possible to measure the total level and the interface level simultaneously. The resulting process variables are output using the dynamic variables of the HART protocol. The process variables can be flexibly assigned to the dynamic variables (primary, secondary, tertiary, quaternary value).

Dynamic variables of the HART protocol	Possible process variable assignment	Comment
Primary Value	■ Interface ■ Total level ■ Thickness of the upper layer	The "primary value" is permanently assigned to the 4 to 20 mA current output
Secondary Value	■ Interface ■ Total level ■ Thickness of the upper layer	-
Tertiary Value	■ Interface ■ Total level ■ Thickness of the upper layer ■ Amplitude of the total level signal	-
Quaternary (4^{th}) Value	Amplitude of the interface level signal	No variable assignment

Using the HART loop converter HMX50

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



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

The HART loop converter HMX50 can be acquired using the order number 71063562.
Additional documentation: TI00429F/00/EN and BA00371F/00/EN.

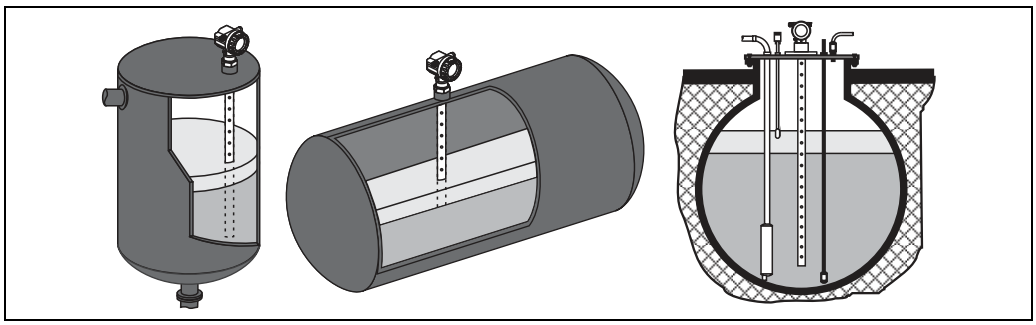
Probe selection (→ 🗎 6)

- For interface measurement, ideally coax probes or rod probes are used in the bypass/stilling well.
- Coax probes are suited to liquids with viscosities of up to approx. 500 cst. Coax probes can measure most liquefied gases, as of a dielectric constant of 1.4. Moreover, installation conditions, such as nozzles, tank internal fittings etc., have no effect on the measurement when a coax probe is used. A coax probe offers maximum EMC safety when used in plastic tanks.
- Rod or rope probes for free installation in the tank available on request. Rope probes for free installation in the tank must always be used with a rod weight in accordance with special products MVTFN0203 or MVT6N0186. Rope probes may not be used in the bypass/stilling well since the end weight always causes interference reflection which can be misinterpreted during interface measurement.

Special information on interface measurement

Installation in horizontal cylindrical, upright and underground tanks

- Use coax probes or rod probes in the bypass/stilling well. A separable probe is available as a special version for longer measuring ranges.
- Any distance from the wall is possible for coax probes or rod probes in the stilling well. In the case of rod probes, it must be ensured that the probe does not come into contact with the wall.

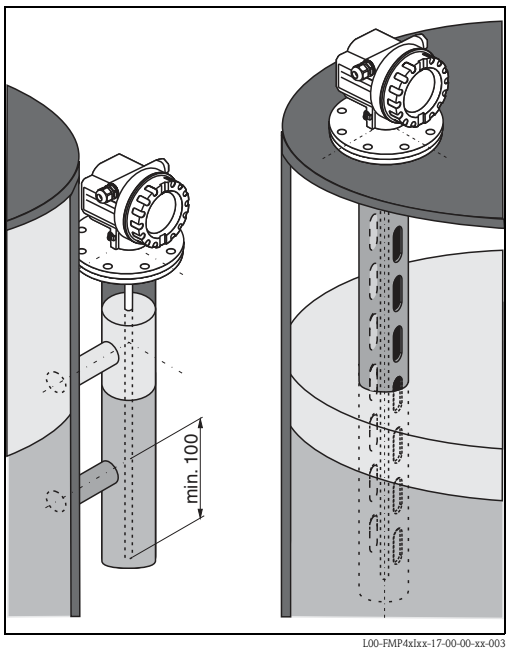


L00-FMP4xIxx-17-00-00-xx-002

Installation in stilling well or bypass

- A rod probe can be used for pipe diameters bigger than 40 mm.
- Rod probe installation can take place up to a diameter size of 100 mm. In the event of larger diameters, a coax probe is recommended.
- Welded joints that protrude up to approx. 5 mm inwards do not influence measurement.
- The pipe may not exhibit any steps in diameter.
- If a rod probe is used, the probe length must be 100 mm longer than the lower disposal.
- In the case of rod probes, it must be ensured that the probe does not come into contact with the wall. If necessary, use a centering disk at the end of the probe.

  Note!
  A plastic centering disk has to be used for interface measurement (→ 🗎 65, "Accessories").



L00-FMP4xIxx-17-00-00-xx-003

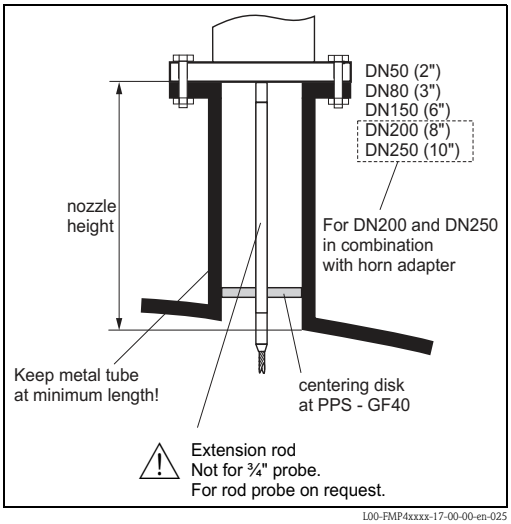
Operating conditions: general installation instructions for special installation situations

Probe length

The measuring range is directly dependent on the probe length.
It is better to order probes too long than too short since it is possible to shorten the probe if necessary.
In the case of the rope probe with a rod weight, shortening at the probe end weight is only possible with the special product in accordance with MVT6N0186. See also modification information MI0079/00/A2.

Installation in nozzles > 150 mm high

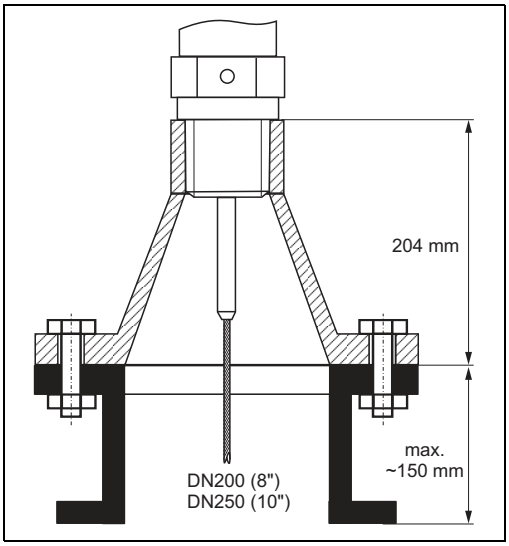
If, when installing probes in nozzles DN40 (1½") to 250 (10") with nozzle height (HS) of > 150 mm (6"), the probe could touch the lower edge of the nozzle due to moving materials in the container, we recommend using an extension rod with or without centering disk.
This accessory consists of the extension rod corresponding to the nozzle height, on which a centering disk is also mounted if the nozzles are narrow or when working in bulk solids.
This component is delivered separately from the device. Please order the probe length correspondingly shorter. For the exact length of the rod see "Extension rod (Centering)", → 67.
Order codes for specific nozzle nominal diameters and heights can be found on → 67.
Only use centering disks with small diameters (DN40 and DN50) if there is no significant buildup in the nozzle above the disk. The nozzle must not become clogged with product.



L00-FMP4xxxx-17-00-00-en-025

Installation in DN200 (8") and DN250 (10") nozzles

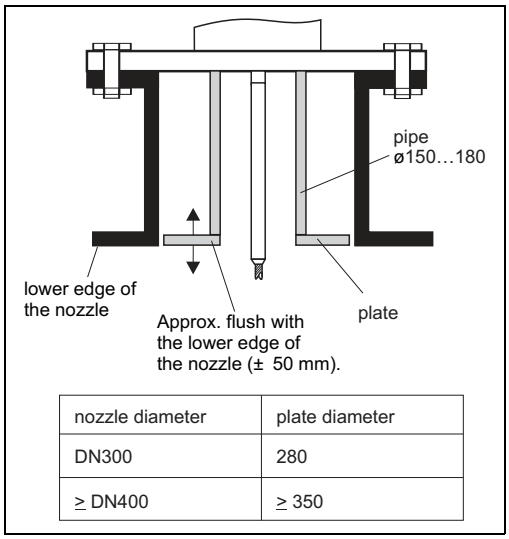
When installing the Levelflex in nozzles of > 200 mm (8"), signals are generated by reflections on the nozzle wall, which can sometimes lead to faulty measurements in the case of products with small dielectric constants. With nozzle diameters of 200 mm (8") or 250 mm (10"), therefore, a special flange with a “horn adapter” must be fitted.
Nozzles with nominal diameters greater than 250 mm (10") should be avoided.
If the rope probe is strongly deflected: use an extension rod/centering HMP40, additionally.



L00-FMP4xxxx-17-00-00-en-026

Installation in nozzle ≥ DN300

If installation in ≥ 300 mm (12") nozzles is unavoidable, installation must be carried out in accordance with the sketch on the right.



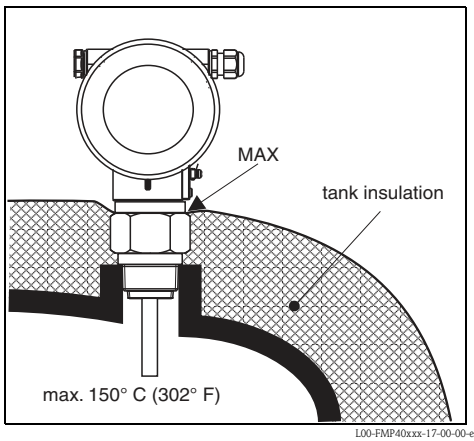
nozzle diameter	plate diameter
DN300	280
≥ DN400	≥ 350

L00-FMP4xxxx-17-00-00-en-034

Installation with heat insulation

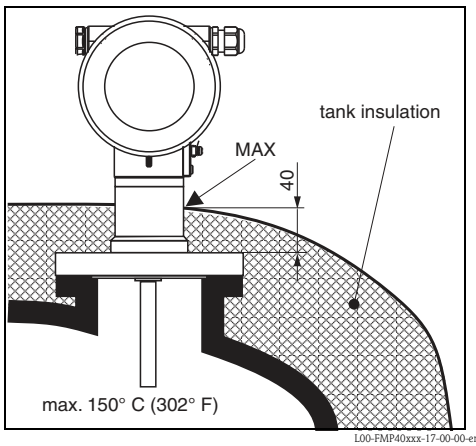
- If process temperatures are high, FMP40 must be included in normal tank insulation to prevent the electronics heating up as a result of heat radiation or convection.
- The insulation may not exceed beyond the points labeled "**MAX**" in the drawings.

Process connection with adapter G¾, G1½, ¾NPT or 1½NPT



L00-FMP40xxx-17-00-00-en-003

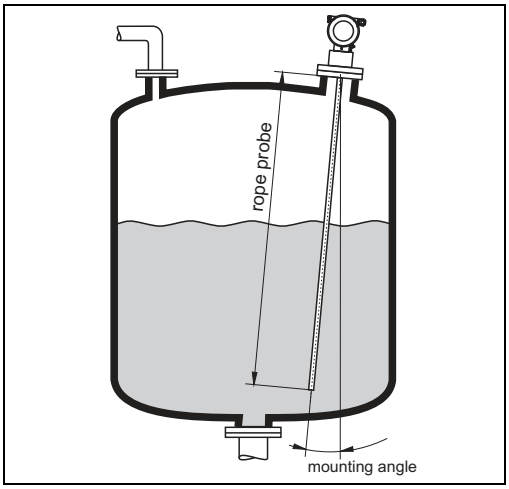
Process connection with flange DN40 to DN200



L00-FMP40xxx-17-00-00-en-002

Installation at an angle

- For mechanical reasons, the probe should be installed as vertically as possible.
- With inclined installations the probe length has to be adjusted in dependence to the installation angle.
  - up to 1 m = 30°
  - up to 2 m = 10°
  - up to 4 m = 5°.



L00-FMP4xxxx-17-00-00-en-048

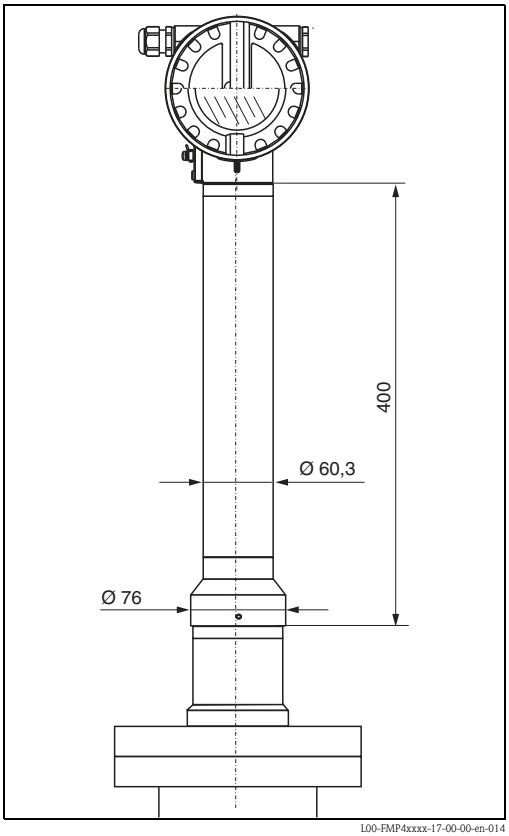
Installation for difficult-to-access process connections

For tight spaces or temperatures above that in the graphic (→ 40), the electronics housing can be ordered with distance pipe or connecting cable (separate housing).

Installation with spacer tube

When mounting please observe engineering hints (→ 22) the following points:

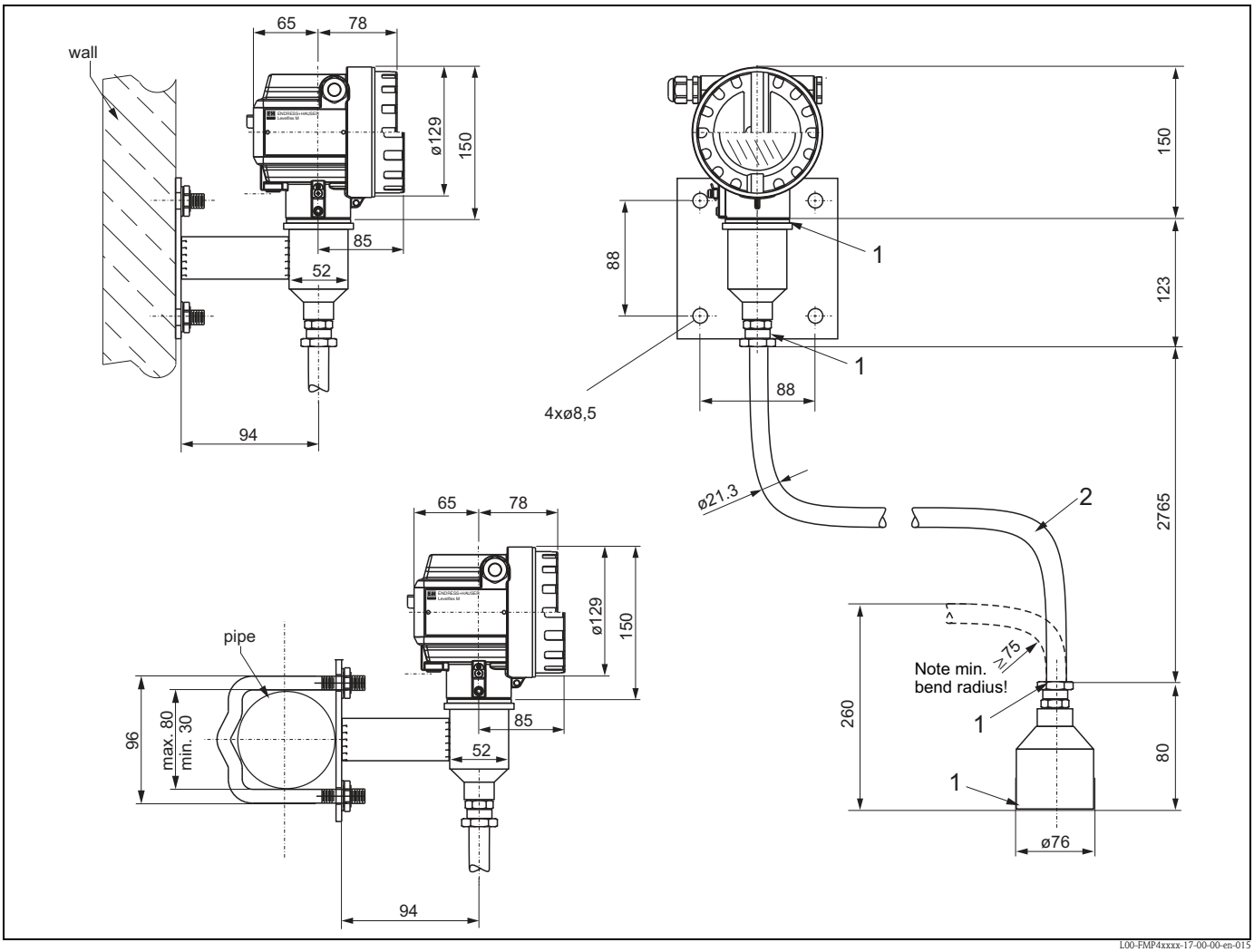
- After mounting, the housing can be turned 350° in order to make it easier to access the display and the connection compartment.
- The max. measuring range is reduced to 34 m.



L00-FMP4xxxx-17-00-00-en-014

Installation with remote electronics

- Wall and pipe bracket is contained in the scope of delivery and already mounted.
- When installing, follow the instructions, → 22.
- Mount housing on a wall or pipe (vertically or horizontally) as shown in the diagram.



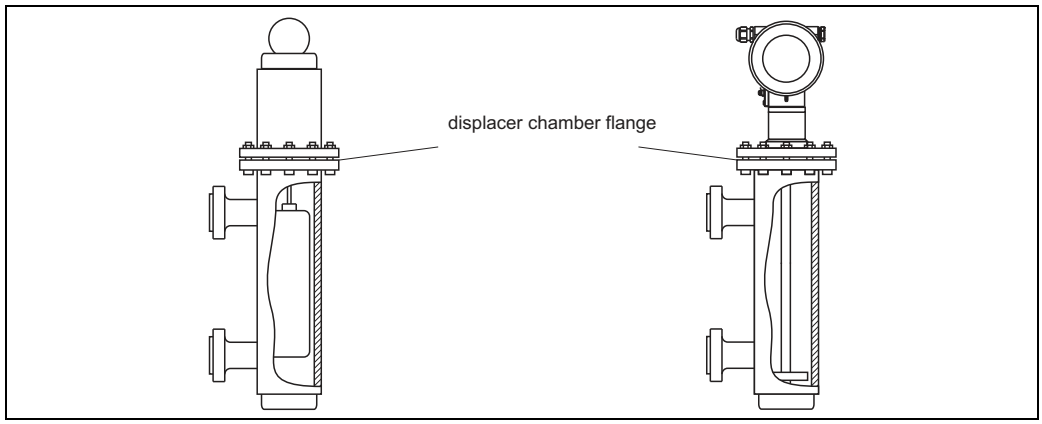
Note!
The protective hose cannot be disassembled at these points (1).

The ambient temperature for the connecting pipe (2) between the probe and the electronics must not be greater than 105 °C. The version with remote electronics consists of the probe, a connecting cable and the housing. If they are ordered as a complete unit they are assembled when delivered.

Replacing a displacer system in an existing displacer chamber

The Levelflex M is a perfect replacement for a conventional displacer system in an existing displacer chamber. In addition to the DIN and ANSI flanges, which are available as standard, Endress+Hauser also offers flanges that suit Fischer and Masoneilan displacer chamber (special product) for this purpose. Thanks to menu-guided local operation, commissioning the Levelflex M only takes a few minutes. Replacement is also possible when partially filled, and wet calibration is not required.

Your benefits:
- No moving parts, thus zero-maintenance operation.
- Not sensitive to process influences such as temperature, density, turbulence and vibrations.
- The rod probes can be shortened or replaced easily. In this way, the probe can be easily adjusted on site.



L00-FMP4xIxx-17-00-00-en-002

Planning instructions:
- In normal cases, use a rod probe. When installing into a metallic displacer chamber up to 150 mm, you have all the advantages of a coax probe ("Probe selection", → 🖹 6).
- It must be ensured that the probe does not come into contact with the side wall. Where necessary, use a centering disk at the lower end of the probe ("Type of Probe:", → 🖹 61).
- A centering disk must be adapted as accurately as possible to the internal diameter of the displacer chamber to also ensure perfect operation in the area of the probe end.

Additional information on interface measurement

- The pipe may not exhibit any steps in diameter. Use the coax probe where necessary.
- In the case of rod probes, it must be ensured that the probe does not come into contact with the wall. If necessary, use a centering disk at the end of the probe.

Note!
A plastic centering disk has to be used for interface measurement ("Accessories", → 🖹 65).

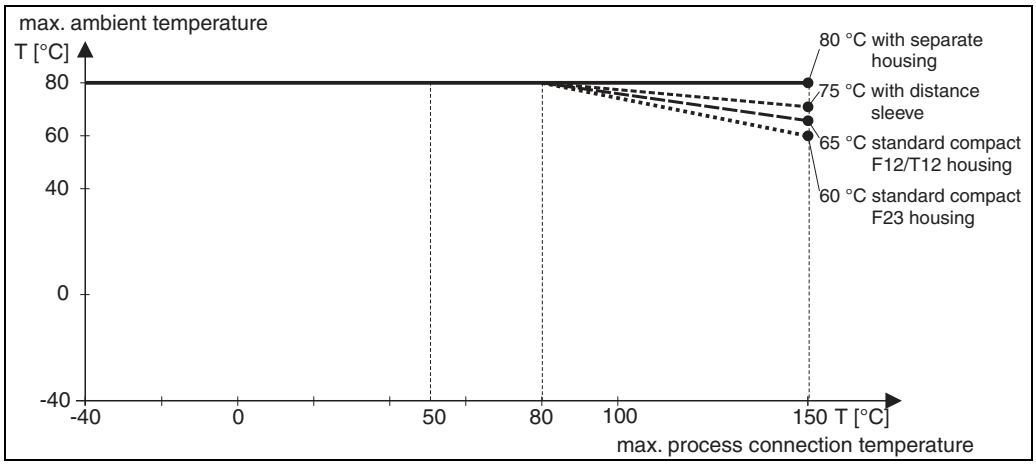
Operating conditions: Environment

Ambient temperature range

Ambient temperature at the electronics: -40 °C to +80 °C. The function of the LCD display is restricted at T_A < -20 °C and T_A > +60 °C. A weather protection cover should be used for outdoor operation if the device is exposed to direct sunlight.

Ambient temperature limits

If temperatures above 80 °C are present at the process connection, the permitted ambient temperature is reduced according to the following diagram (temperature derating):



Storage temperature

-40 °C to +80 °C

Climate class

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

Degree of protection

- With closed housing tested according to:
  - IP68, NEMA6P (24 h at 1.83 m under water surface)
  - IP66, NEMA4X
- With open housing: IP20, NEMA1 (also ingress protection of the display)

Caution!
Degree of protection IP68 NEMA6P applies for M12 PROFIBUS PA plugs only when the PROFIBUS cable is plugged in.

Vibration resistance

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

Cleaning the probe

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

Electromagnetic compatibility (EMC)

Electromagnetic compatibility to EN 61326 and NAMUR Recommendation EMC (NE21). Details are provided in the Declaration of Conformity. A standard installation cable is sufficient if only the analog signal is used. Use a shielded cable when working with a superimposed communications signal (HART).

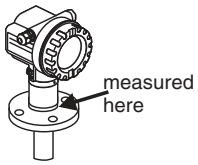
When installing the probes in metal and concrete tanks and when using a coax probe:
- Interference emission to EN 61326 - x series, electrical equipment Class B.
- Interference immunity to EN 61326 - x series, requirements for industrial areas and NAMUR Recommendation NE21 (EMC)

The measured value can be affected by strong electromagnetic fields when installing rod and rope probes without a shielding/metallic wall, e.g. plastic, and in wooden silos.
- Interference emission to EN 61326 - x series, electrical equipment Class A.
- Interference Immunity: the measured value can be affected by strong electromagnetic fields.

Operating conditions: Process

Process temperature range

The maximum permitted temperature at the process connection (see Figure for measuring point) is determined by the O-ring version ordered:

O-ring material	Min. temperature	Max. temperature [1]	
FKM (Viton)	-30 °C	+150 °C	
EPDM	-40 °C	+120 °C	
FFKM (Kalrez)	-5 °C[2]	+150 °C	

1) For PA coated probes, the maximal admissible temperature is 100 °C.

2) The min. temperature of FFKM may be -15 °C if the max. temperature of +80 °C is not exceeded.

Note!
The medium temperature can be higher. However, when using rope probes the stability of the probe rope is reduced by structural changes at temperatures over 350 °C.

Process pressure limits

All models: -1 to 40 bar.
The specified 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. Observe pressure-temperature dependency.

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

Note!
All Levelflex probes have two levels of sealing. There is an O-ring seal and a molded seal behind that.

Dielectric constant

- With coax probe: $\varepsilon r \geq 1.4$
- Rod and rope probe: $\varepsilon r \geq 1.6$

Extension of the rope probes through tension and temperature

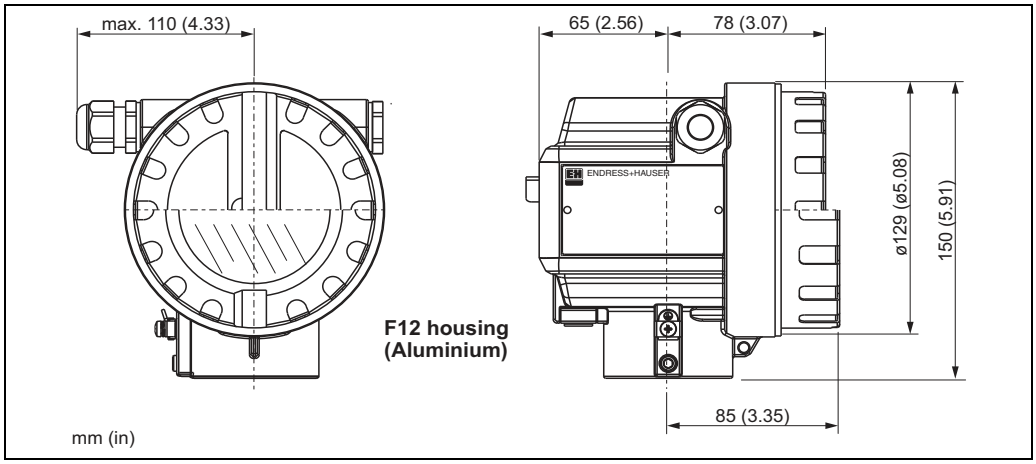
4 mm rope:
- Elongation through tension: at max. permitted tensile load (12 KN): 11 mm/m rope length
- Elongation through temperature increase from 30 °C to 150 °C: 2 mm/m rope length

6 mm rope:
- Elongation through tension: at max. permitted tensile load (30 KN): 13 mm/m rope length
- Elongation through temperature increase from 30 °C to 150 °C: 2 mm/m rope length

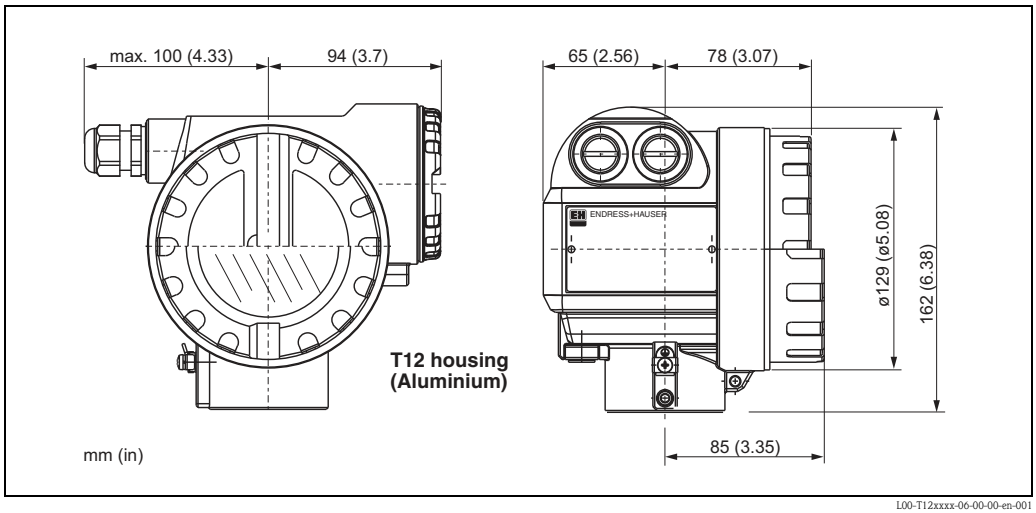
Mechanical construction

Design, dimensions

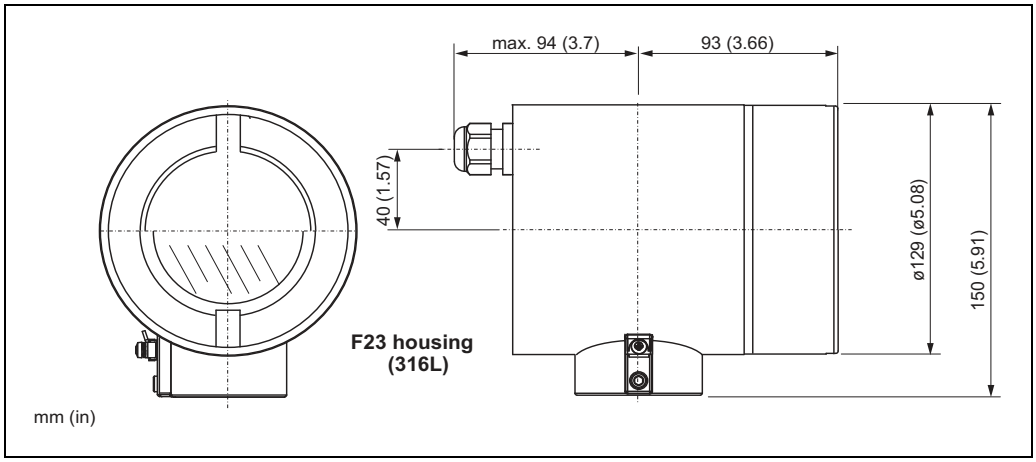
Housing dimensions



L00-F12xxxx-06-00-00-en-001

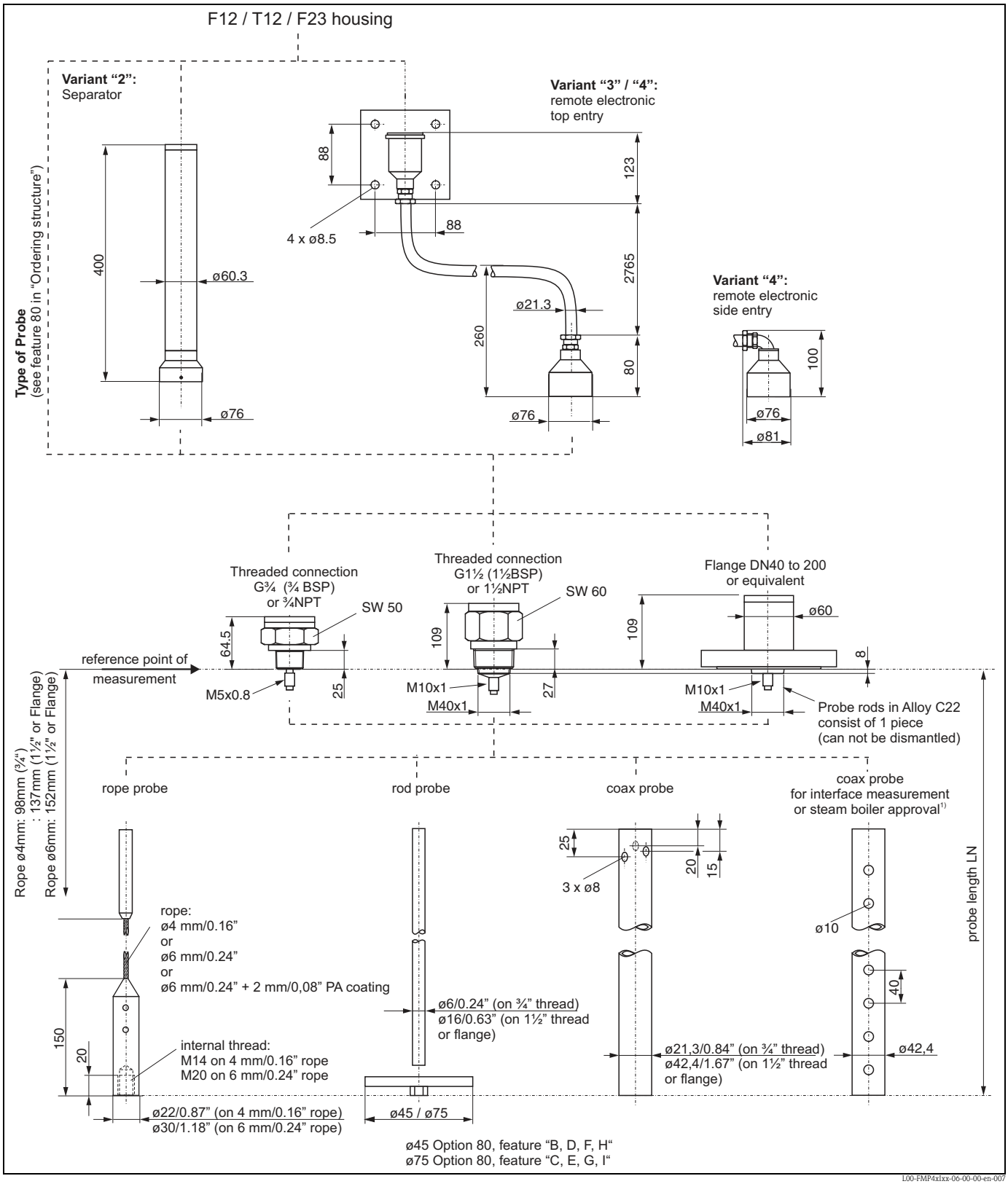


L00-T12xxxx-06-00-00-en-001



L00-F23xxxx-06-00-00-en-001

Process connection, probe type



1) see SD00288F/00/EN "Steam boiler approval".

General information on flanges

The surface roughness of the surface in contact with the medium, including the sealing surface of the flanges (all standards) made of Hastelloy C, Monel or Tantas, is Ra3.2. Lower surface roughness levels are available on request.

Tolerance of probe length

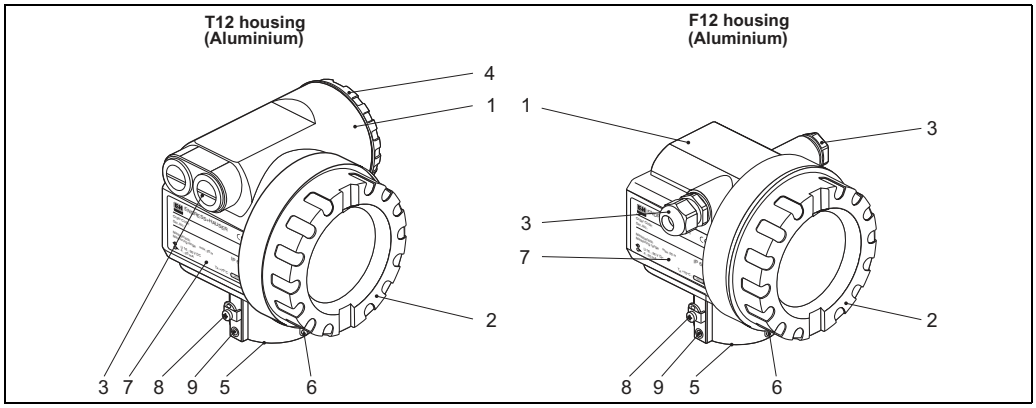
	Rod probes / Coax probes				Rope probes			
Over		1 m	3 m	6 m		1 m	3 m	6 m
Up to	1 m	3 m	6 m		1 m	3 m	6 m	
Admissible tolerance (mm)	- 5	- 10	- 20	- 30	- 10	- 20	- 30	- 40

Weight

Levelflex M	FMP40 + rope probe 4 mm	FMP40 + rod or rope probe 6 mm	FMP40 + rod probe 16 mm	FMP40 Coax probe
Weight for F12 or T12 housing	Approx. 4 kg + Approx. 0.1 kg/m Probe length + weight of flange	Approx. 4 kg + Approx. 0.2 kg/m Probe length + weight of flange	Approx. 4 kg + Approx. 1.6 kg/m Probe length + weight of flange	Approx. 4 kg + Approx. 3.5 kg/m Probe length + weight of flange
Weight for F23 housing	Approx. 7.4 kg + Approx. 0.1 kg/m Probe length + weight of flange	Approx. 7.4 kg + Approx. 0.2 kg/m Probe length + weight of flange	Approx. 7.4 kg + Approx. 1.6 kg/m Probe length + weight of flange	Approx. 7.4 kg + Approx. 3.5 kg/m Probe length + weight of flange

Material (not in contact with process)

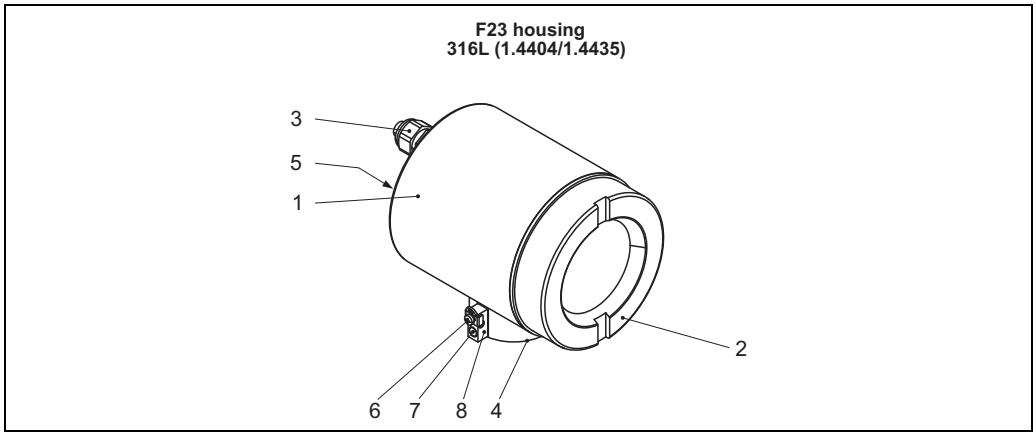
T12 and F12 housing (seawater-resistant*, powder-coated)



Pos.	Part	Material	
1	T12 and F12 housing	AlSi10Mg	
2	Cover (Display)	AlSi10Mg	
	Sealing	Fa. SHS: EPDM 70pW FKN	
	Window	ESG-K-Glass (Toughened safety glass)	
	Sealing of the glass	Silicone sealing compound Gomastit 402	
3	Sealing	Fa. SHS: EPDM 70 pW FKN	Trelleborg: EPDM E7502
	Cable gland	Polyamid (PA), CuZn nickel-plated	
	Plug	PBT-GF30	1.0718 galvanized
		PE	3.1655
	Adapter	316L (1.4435)	AlMgSiPb (anodized)
4	Cover (Connection compartment)	AlSi10Mg	
	Sealing	Fa. SHS: EPDM 70pW FKN	Trelleborg: EPDM E7502/E7515
	Clamp	Screws: A4; Clamp: Ms nickel-plated; Spring washer: A4	
5	Sealing ring	Fa. SHS: EPDM 70pW FKN	Trelleborg: EPDM E7502/E7515
6	Tag*	304 (1.4301)	
	Rope	316 (1.4401)	
	Crimp sleeve	Aluminium	
7	Nameplate*	304 (1.4301)	
	Groove pin*	A2	
8	Ground terminal*	Screws: A2; Spring washer: A4; Clamp: 304 (1.4301) Holder: 301 (1.4310)	
9	Screws*	A2-70	

* Seawater-resistant on request (complete in 316L (1.4404)).

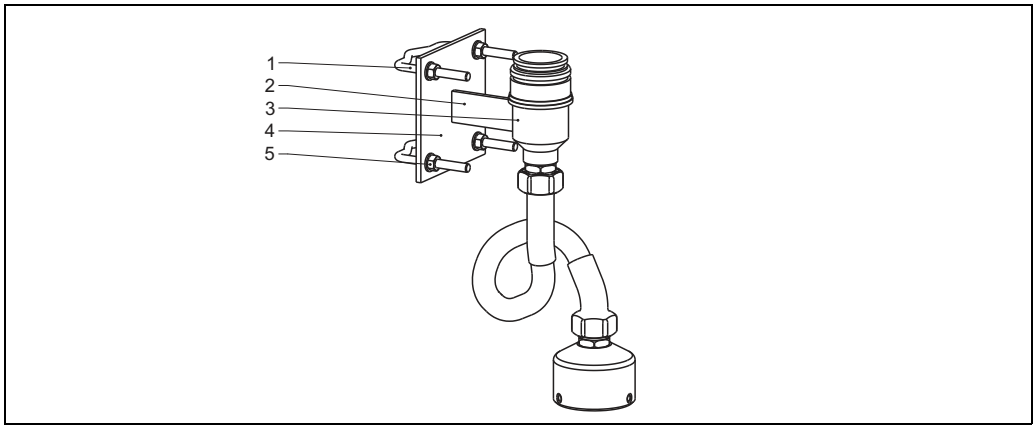
F23 housing (seawater-resistant*, corrosion-resistant)



Pos.	Part	Material	
1	F23 housing	Housing body: 316L (1.4404); Sensor neck: 316L (1.4435); earth connection block: 316L (1.4435)	
2	Cover	316L (1.4404)	
	Sealing	Fa. SHS: EPDM 70pW FKN	
	Window	ESG-K-Glass (Toughened safety glass)	
	Sealing of the glass	Silicone sealing compound Gomastit 402	
3	Sealing	Fa. SHS: EPDM 70pW FKN	Trelleborg: EPDM E7502
	Cable gland	Polyamid (PA), CuZn nickel-plated	
	Plug	PBT-GF30	1.0718 galvanized
		PE	3.1655
	Adapter	316L (1.4435)	
4	Sealing ring	Fa. SHS: EPDM 70pW FKN	Trelleborg: EPDM E7502
5	Nameplate*	304 (1.4301)	
	Groove pin*	A2	
6	Grounding terminal*	Screws: A2; Spring washer: A4; Clamp: 304 (1.4301); Holder: 301 (1.4310)	
7	Screw*	A2-70	
8	Tag*	304 (1.4301)	
	Rope	316 (1.4401)	
	Crimp sleeve	Aluminium	

* Seawater-resistant on request (complete in 316L (1.4404)).

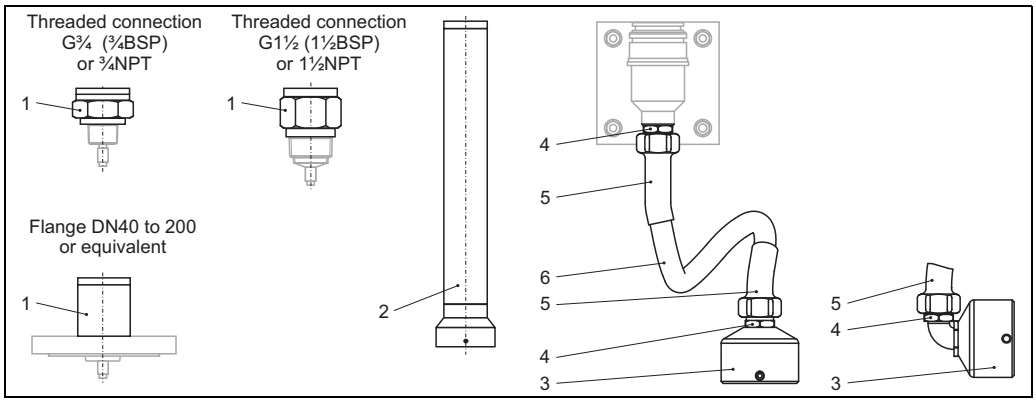
Wall and pipe bracket



L00-FMP4xxxx-16-00-00-xx-005

Pos.	Part	Material
1	Bracket	304 (1.4301)
2	Bar	304 (1.4301)
3	Housing adapter	316L (1.4435)
4	Disc	304 (1.4301)
5	Screw nut	A4
	Washer	A2

Connecting parts

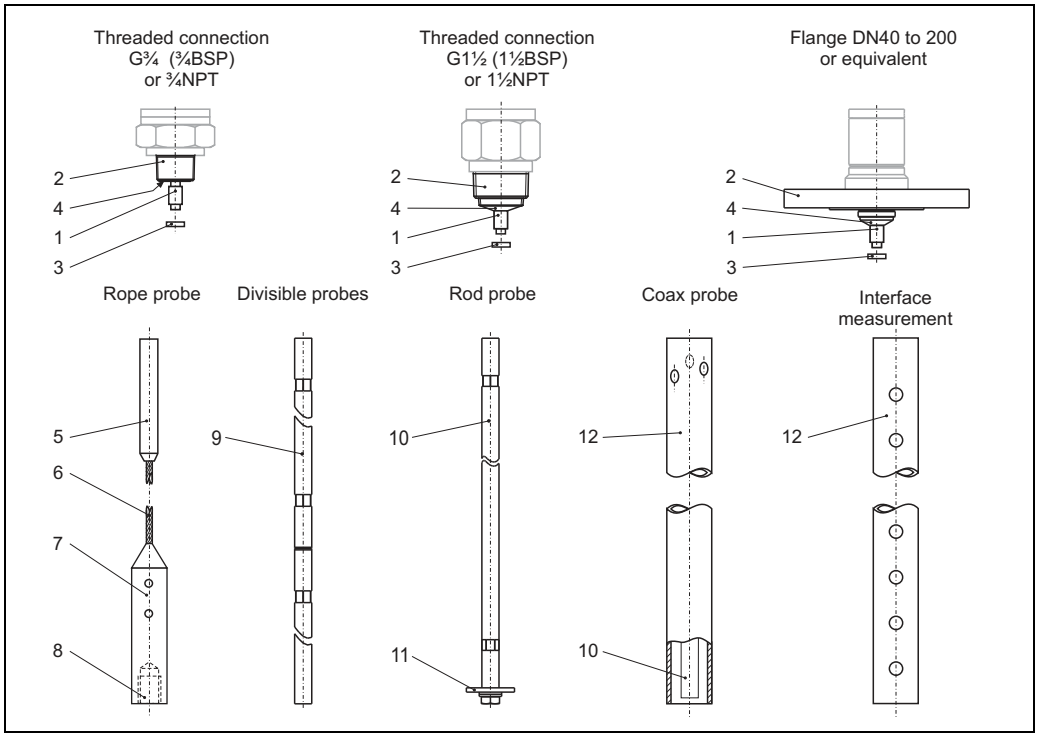


L00-FMP40xxx-16-00-00-xx-002

Pos.	Part	Material
1	Adapter	316L (1.4435)
2	Separator	316L (1.4435)
	Setscrew	A2
3	Adapter	316L (1.4404/1.4435)
	Setscrew	A2
4	Hose fitting	CuZn nickel-plated
5	Shrink hose	Polyolefin
6	Cable	PVC

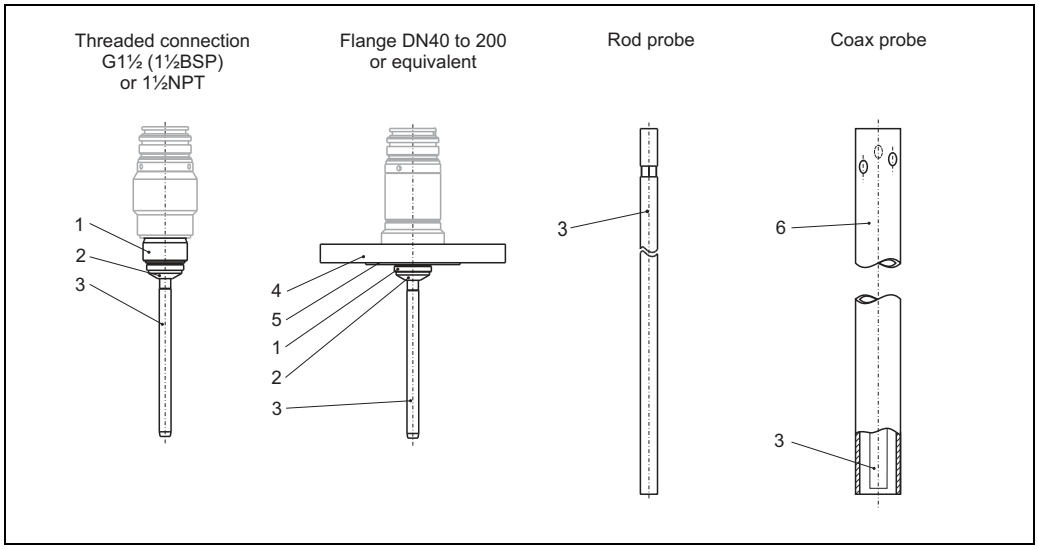
Material (in contact with process)

Standard variant



Pos.	Part	Material	
1	Counter nut	316L (1.4435)	
	Inner conductor	Rod/Rope: 318LN (1.4462)	Coax: 316L (1.4435)
2	Process connection	See Ordering information	
3	Nord-lock washer	1.4547	
4	Insulation sleeve	3/4": PPS-GF40	1-1/2": TFM1600
5	Press in sleeve	316L (1.4404/1.4435)	
6	Rope	316 (1.4401)	
7	Ballast weight	316L (1.4435)	
	Set screw	A4-70	
8	Screw	A2-70	
9	Rod	316L (1.4404/1.4435)	
	Connecting bolt	318LN (1.4462)	
	Nord-lock washer	1.4547	
10	Rod	3/4": 316L (1.4404)	1-1/2": 316L (1.4404/1.4435)
11	Centering of probe end	Disk: 316L (1.4404); Screw: A4; Nordlock: 1.4547	
12	Coax probe	316L (1.4435)	Interface measurement: 316L (1.4404)
	Spacer	PFA	

Alloy variant



Pos.	Part	Material
1	Adapter	2.4602
2	Insulation sleeve	TFM1600
3	Rod probe	2.4602
4	Flange	316L (1.4404 / 1.4435)
5	Flange plating	2.4602
6	Coax probe	2.4602
	Spacer	PFA

DIN/EN flanges

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

Process connection

See "Ordering information", → 📄 58.

Seal

See "Ordering information", → 📄 58.

Probe

See "Ordering information", → 📄 58.

Human interface

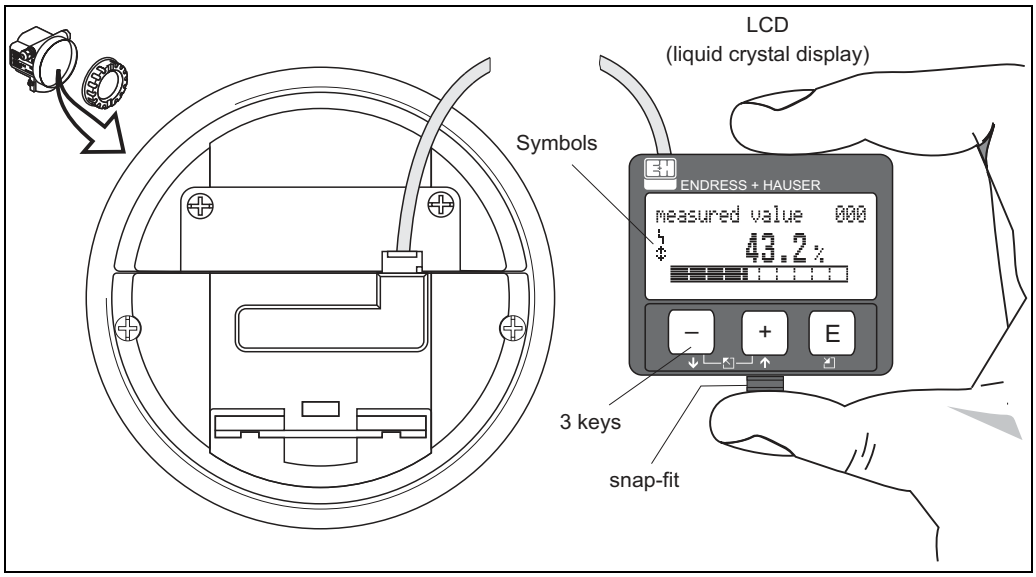
Operating concept

The display of the process value and the configuration of the Levelflex occur locally by means of a large 4-line alphanumeric display with plain text information. The guided menu system with integrated help texts ensures a quick and safe commissioning.To access the display the cover of the electronic compartment may be removed even in hazardous area (IS and XP).
Remote commissioning, including documentation of the measuring point and in-depth analysis functions, is supported by FieldCare, the graphical operating software for Endress+Hauser time-of-flight systems.

Display elements

Liquid crystal display (LCD):

Four lines with 20 characters each. Display contrast adjustable through key combination.



L00-FMxxxxxx-07-00-00-en-001

The VU331 LCD display can be removed to ease operation by simply pressing the snap-fit (see graphic above). It is connected to the device by means of a 500 mm cable.

The following table describes the symbols that appear on the liquid crystal display:

Symbol	Meaning
	ALARM_SYMBOL This alarm symbol appears when the device is in an alarm state. If the symbol flashes, this indicates a warning.
	LOCK_SYMBOL This lock symbol appears when the device is locked, i.e. if no input is possible.
	COM_SYMBOL This communication symbol appears when a data transmission via e.g. HART, PROFIBUS PA or FOUNDATION Fieldbus is in progress.
	SIMULATION_SWITCH_ENABLE This communication symbol appears when simulation in FOUNDATION Fieldbus is enabled via the DIP switch.

Operating elements

The operating elements are located inside the housing and are accessible for operation by opening the lid of the housing.

Function of the keys

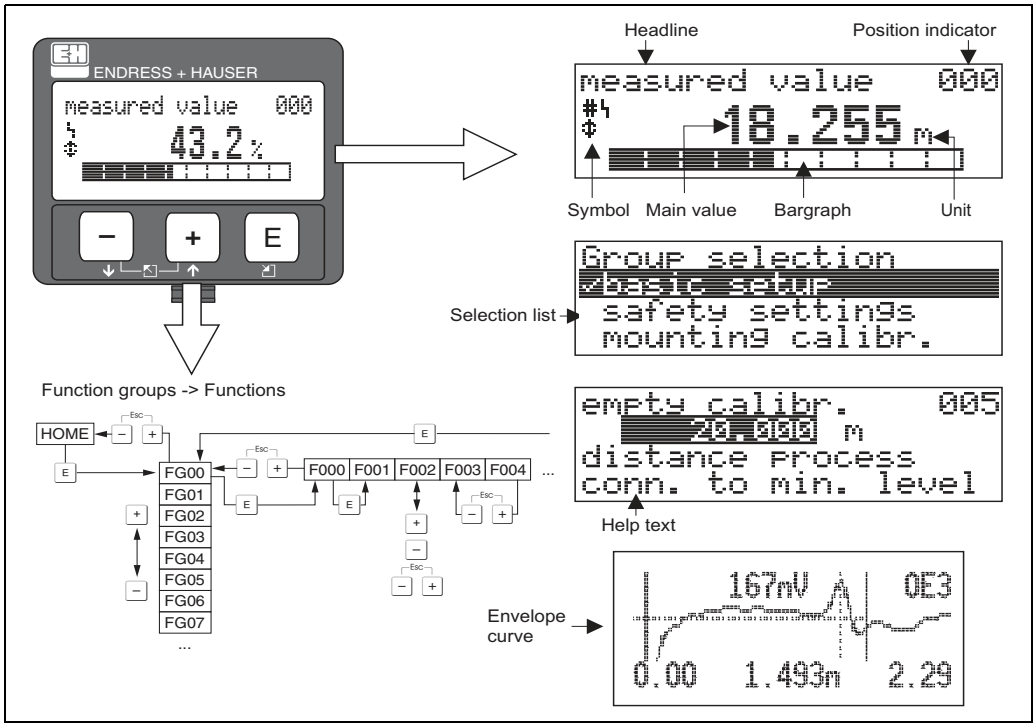
Key(s)	Meaning
+ or ↑	Navigate upwards in the selection list. Edit numeric value within a function.
− or ↓	Navigate downwards in the selection list. Edit numeric value within a function.
Esc − + or ←	Navigate to the left within a function group.
E	Navigate to the right within a function group, confirmation.
+ and E or − and E	Contrast settings of the LCD.
+ and − and E	Hardware lock / unlock After a hardware lock, operation of the device via display or communication is not possible! The hardware can only be unlocked via the display. A release code must be entered to do so.

Local operation

Operation with VU331

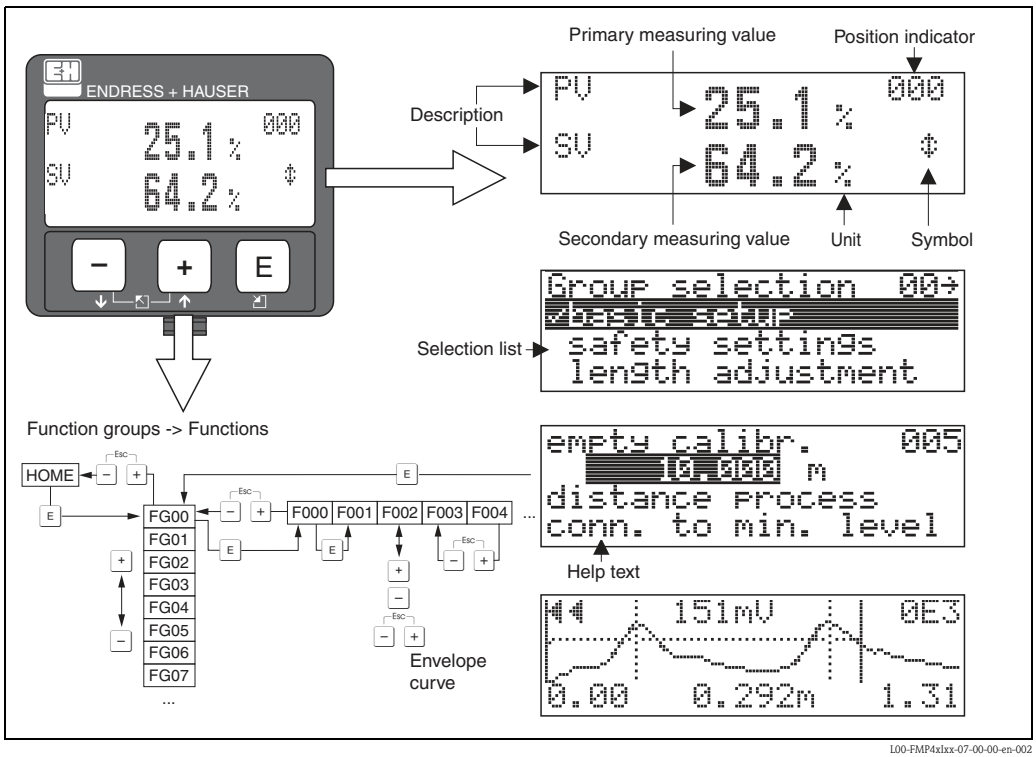
The LC-Display VU331 allows configuration via 3 keys directly at the device. All device functions can be set through a menu system. The menu consists of function groups and functions. Within a function, application parameters can be read or adjusted. The user is guided through a complete configuration procedure.

Display for level measurement



L00-FMRxxxxx-07-00-00-en-002

Display for interface measurement



L00-FMP4xlxx-07-00-00-en-002

Remote operation

The Levelflex M can be remotely operated via HART, PROFIBUS PA and FOUNDATION Fieldbus. Onsite adjustments are also possible.

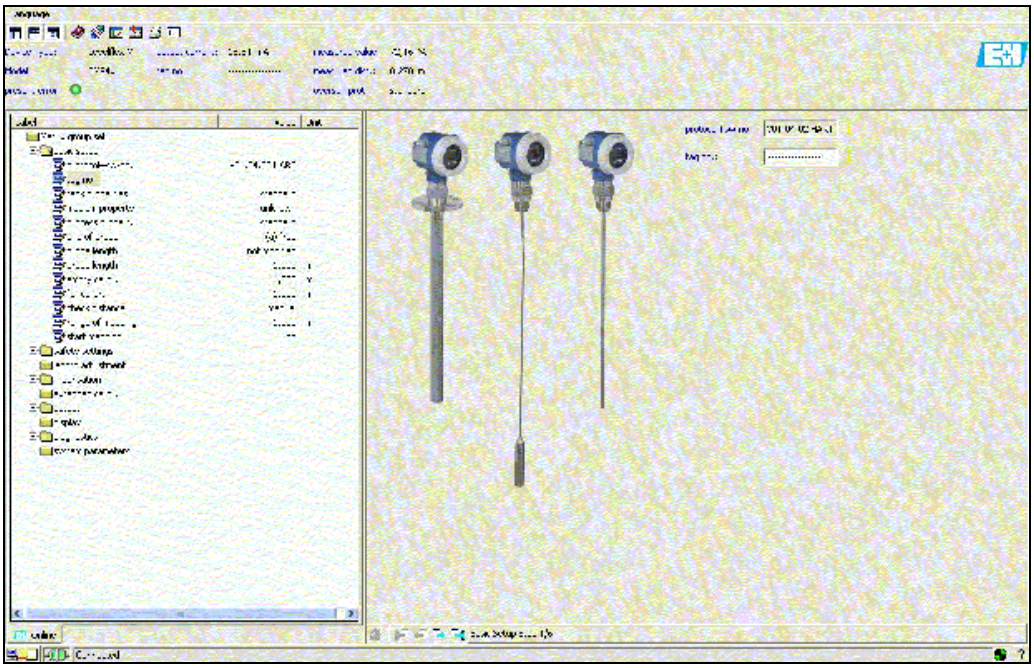
Operation with FieldCare

FieldCare is an Endress+Hauser Plant Asset Management Tool based on FDT technology. You can use FieldCare to configure all your Endress+Hauser devices, as well as devices from other manufacturers that support the FDT standard. Hardware and software requirements you can find on the internet:
www.endress.com → select your country → search: FieldCare → FieldCare → Technical Data.

FieldCare supports the following functions:
- Online configuration of transmitters
- Signal analysis via envelope curve
- Tank linearization
- Loading and saving of device data (upload/download)
- Documentation of the measuring point

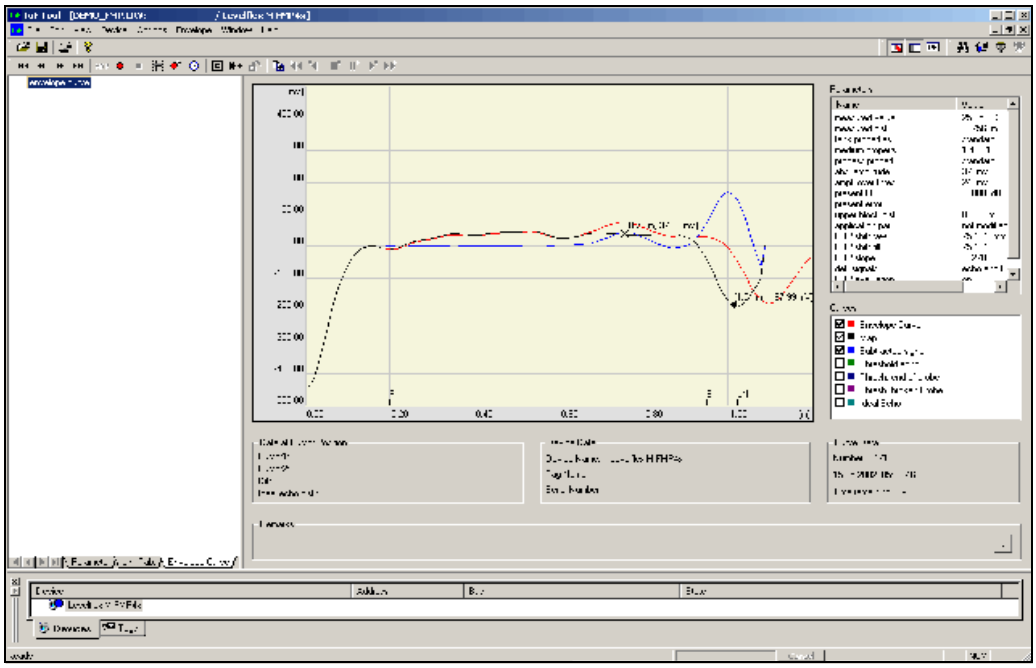
Connection options:
- HART via Commubox FXA195 and the USB port of a computer
- PROFIBUS PA via segment coupler and PROFIBUS interface card
- Commubox FXA291 with ToF Adapter FXA291 via service interface

Menu-guided commissioning



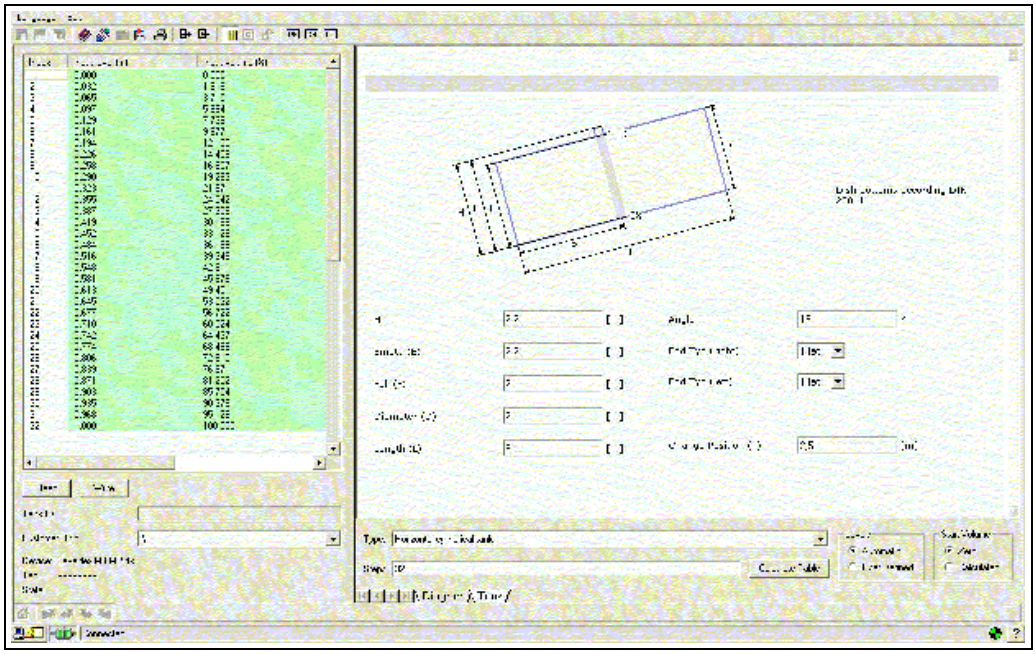
L00-FMP4xxxx-20-00-00-en-001

Signal analysis via envelope curve



L00-FMP4xxxx-20-00-00-en-007

Tank linearization

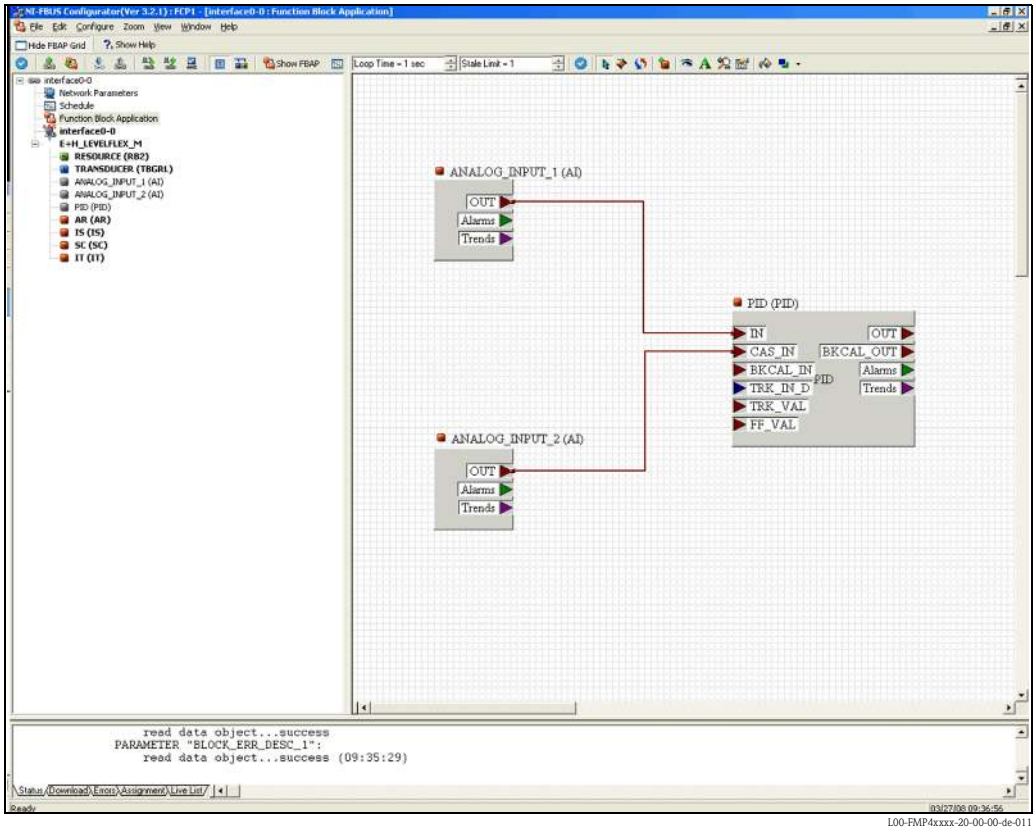


L00-fmp-lxxx-20-00-00-en-041

Operation with NI-FBUS Configurator (only FOUNDATION Fieldbus)

The NI-FBUS Configurator is an easy-to-use graphical environment for creating linkages, loops, and a schedule based on the fieldbus concepts.

You can use the NI-FBUS Configurator to configure a fieldbus network as follows:
- Set block and device tags
- Set device addresses
- Create and edit function block control strategies (function block applications)
- Configure vendor-defined function and transducer blocks
- Create and edit schedules
- Read and write to function block control strategies (function block applications)
- Invoke Device Description (DD) methods
- Display DD menus
- Download a configuration
- Verify a configuration and compare it to a saved configuration
- Monitor a downloaded configuration
- Replace devices
- Save and print a configuration



L00-FMP4xxxx-20-00-00-de-011

Operation with handheld terminal Field Communicator 375, 475

With the handheld terminal Field Communicator 375, 475, you can configure all the device functions via menu operation.

Note!
Further information on the HART handheld terminal is given in the appropriate Operating Instructions included in the carrying case of the Field Communicator 375, 475.

Certificates and approvals

CE mark

The measuring system meets the legal requirements of the applicable EC guidelines. These are listed in the corresponding EC Declaration of Conformity together with the standards applied. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

Ex approval

The devices are certified for use in hazardous areas. The safety instructions to be observed are enclosed and referenced on the nameplate:

- Europe: EC type-examination certificate, Safety Instructions XA
- USA: FM Approval, Control Drawing
- Canada: CSA Certificate of Compliance, Control Drawing
- China: NEPSI Explosion Protection Certificate of Conformity, Safety Instructions XA
- Japan: TIIS Certificate for Ex-apparatus

Correlation of the Certificates (XA, ZD, ZE) to the device:

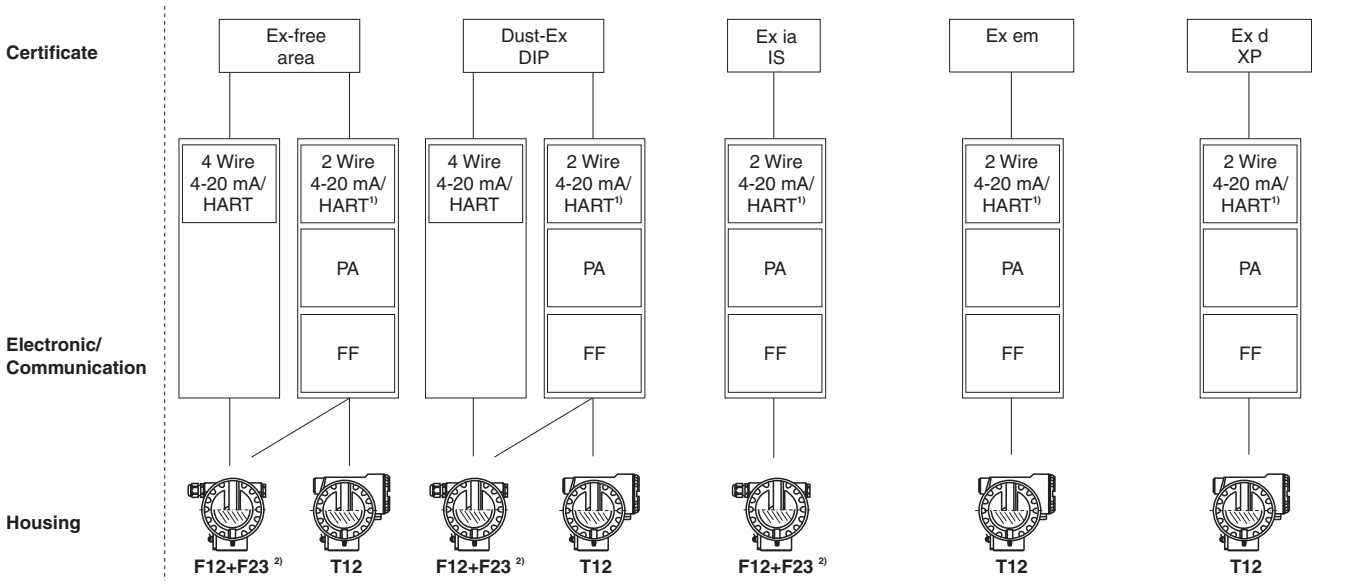
Feature		Variant	ZE256F	ZE258F	ZD117F	ZD116F	ZD114F	ZD113F	ZD110F	ZD109F	ZD107F	ZD106F	ZD021F	ZD083F	ZD082F	ZD081F	ZD080F	ZD078F	ZD077F	ZD076F	ZD075F	XA386F	XA381F	XA380F	XA379F	XA378F	XA376F	XA218F	XA330F	XA217F	XA216F	XA215F	XA213F	XA211F	XA212F	XA173F	XA172F	XA168F	XA167F	XA166F	XA165F	XA164F
10 Approval:	Non-hazardous area	A																																								
	NEPSI Ex emb (ia) IIC T6	C																								X																	
	Non-hazardous area, WHG	F	X																																							
	ATEX II 3G Ex nA II T6	G																										X														
	NEPSI Ex ia IIC T6	I																							X	X																
	NEPSI Ex d(ia) IIC T6	J																						X																		
	*TIIS Ex ia IIC T4	K																																								
	TIIS Ex d (ia) IIC T4	L																																								
	FM DIP Cl.II Div.1 Gr. E-G N.I.	M																X																								
	CSA General Purpose	N																																								
	CSA DIP Cl.II Div.1 Gr. G + coal dust, N.I.	P												X																												
	NEPSI DIP	Q																						X																		
	NEPSI Ex nA II T6	R																				X																				
	FM IS Cl.I,II,III Div.1 Gr. A-G N.I., zone 0, 1, 2	S							X	X	X	X	X								X	X																				
	FM XP Cl.I,II,III Div.1 Gr. A-G, zone 1, 2	T																	X																							
	CSA IS Cl.I,II,III Div.1 Gr. A-D, G + coal dust, N.I., zone 0, 1, 2	U			X	X	X	X								X	X																								
	CSA XP Cl.I,II,III Div.1 Gr. A-D, G + coal dust, N.I., zone 1, 2	V												X																												
	IEC Ex td A20/21, Alu blind cover	W																									X															
	IEC Ex tD A20/22	X																									X															
	ATEX II 1/2G Ex ia IIC T6 / IECEx zone 0/1	1																												X	X		X	X						X	X
	ATEX II 1/2D/IEC Ex td A20/21, Alu blind cover [1]	2																											X							X	X	X			
	ATEX II 2G Ex emb (ia) IIC T6 / IECEx zone 1	3																																				X				
	ATEX II 1/3D/ IEC Ex td A20/22 [1]	4																											X			X			X		X	X			
	ATEX II 1/2G Ex ia IIC T6, ATEX II 1/3D	5																											X			X					X				
	ATEX II 1/2G Ex ia IIC T6, WHG	6	X																											X	X		X	X						X	X
	ATEX II 1/2G Ex d (ia) IIC T6 / IEC Ex d (ia) IIC T6	7																																						X		
	ATEX II 1/2G Ex ia IIC T6, ATEX II 1/3D, WHG	8	X																											X			X					X				
60 Power supply Output:	2-wire 4-20mA SIL HART	B		X		X		X		X		X			X		X		X		X	X		X		X	X		X	X		X	X	X		X	X		X	X	
	2-wire PROFIBUS PA	D		X	X		X		X		X		X		X	X			X	X		X		X	X		X		X	X	X		X		X	X	X		X	X	
	2-wire FOUNDATION Fieldbus	F		X	X		X		X		X		X		X	X			X	X		X		X	X		X		X	X	X		X		X	X	X		X	X	
	4-wire 90-250VAC 4-20mA SIL HART	G		X										X				X					X				X										X				
	4-wire 10.5-32VDC 4-20mA SIL HART	H		X										X				X					X				X										X				
	2-wire 4-20mA HART, Interface	K				X		X		X		X			X		X		X		X	X		X		X	X		X	X		X	X	X		X	X		X	X	
70 Operation:	without display, via communication	1		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																				
	4-line display VU331	2		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																				
	applicable for FHX40	3					X	X		X	X	X	X	X	X	X	X	X	X	X	X																				
90 Housing, Cable entry:	F12 Alu, coated IP68 gland M20	A		X									X			X	X			X	X	X		X	X		X	X								X	X			X	X
	F12 Alu, coated IP68 thread G1/2	B											X	X		X	X			X	X	X		X	X		X									X	X			X	X
	F12 Alu, coated IP68 thread NPT1/2	C											X	X		X	X	X		X	X	X		X	X		X									X	X			X	X
	F12 Alu, coated IP68 Plug M12	D											X			X				X		X		X	X											X				X	X
	F12 Alu, coated IP68 Plug 7/8"	E											X			X				X		X		X	X											X				X	X
	T12 Alu, coated IP68 gland M20	G																					X			X										X	X		X	X	
	T12 Alu, coated IP68 thread G1/2	H													X			X					X			X										X	X		X	X	
	T12 Alu, coated IP68 thread NPT1/2	J													X			X					X			X										X	X		X	X	
	T12 Alu, coated IP68 Plug M12	K																																		X					
	T12 Alu, coated IP68 Plug 7/8"	L																																		X					
	T12 Alu, coated IP68 gland M20 + OV	M			X	X				X	X											X			X	X			X	X	X	X								
	T12 Alu, coated IP68 thread G1/2 + OV	N			X	X				X	X											X			X	X			X	X	X	X								
	T12 Alu, coated IP68 thread NPT1/2+OV	P			X	X				X	X											X			X	X			X	X	X	X								
	T12 Alu, coated IP68 Plug M12 + OVP	Q			X	X				X	X											X			X	X			X	X	X	X								
	T12 Alu, coated IP68 Plug 7/8" + OV	R			X	X				X	X											X			X	X			X	X	X	X								
	F23 316L IP68 gland M20	1					X	X			X	X	X									X			X	X		X				X	X	X							
	F23 316L IP68 thread G1/2	2					X	X			X	X	X									X			X	X						X	X	X							
	F23 316L IP68 thread NPT1/2	3					X	X			X	X	X									X			X	X						X	X	X							
	F23 316L IP68 Plug M12	4					X	X			X	X	X									X			X	X						X	X	X							
	F23 316L IP68 Plug 7/8"	5					X	X			X	X	X									X			X	X						X	X	X							

1) Housing F12/F23/T12-OVP: In combination with electronics B, D or F supply intrinsically safe.

Overfill prevention	WHG. See "Ordering information", → 🖹 58 (see ZE00256F/00/DE). SIL 2, for 4 to 20 mA output signal (see SD00174F/00/EN "Functional Safety Manual").
Telecommunications	Complies with "Part 15" of the FCC rules for an "Unintentional Radiator". All probes meet the requirements for a "Class A Digital Device". Coax probes and probes mounted in closed metallic vessels also meet the requirement for a "Class B Digital Device".
Standards and guidelines applied	The European directives and standards applied can be taken from the associated EC Declarations of Conformity. In addition, the following also applied for Levelflex M: EN 60529 Protection class of housing (IP-code) NAMUR – international user association of automation technology in process industries ■ NE21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment. ■ NE43 Standardization of the signal level for the failure information of digital transmitters.

Ordering information

Levelflex M FMP40 **Device selection**



L00-FMP4xxxx-16-00-00-en-003

Temperature (depending on O-ring)	**V** Viton, -30 °C to +150 °C	
	E EPDM, -40 °C to +120 °C	
	K Kalrez, -5 °C to +150 °C 1)	
Pressure (all types)	-1 to 40 bar	
Wetted parts	**Rope probes:** Flanges: 316L (1.4404) Process connection: 316L (1.4435), 1.4462 Rope: 316L (1.4401) Weight: 316L (1.4435)	**Rod probes:** Flanges: 316L (1.4404) Process connection: 316L (1.4435), 1.4462 Rod: 316L (1.4404 / 1.4435) Coax pipe: 316L (1.4435)

1) Recommended for steam applications.

The metallic uninsulated probes are only insulated in the area of the bushing. Thus there is no danger of electrostatic charging. The PA-coated rope has been tested and there is no dangerous electrostatic charging. As a result, there are no restrictions on use in Ex-areas for any of the probes.

Note!
For orders with a display, the housing cover is delivered with an inspection glass. For orders without a display, a dummy cover is delivered.

Exception: For orders with the ATEX II 1/2 D dust ignition-proof certificate, a dummy cover is always delivered, even for orders with a built-in display.

Product structure Levelflex M FMP40

10	Approval:
A	Non-hazardous area
F	Non-hazardous area, WHG
1	ATEX II 1/2G Ex ia IIC T6/IECEx Zone 0/1
2	ATEX II 1/2D/IEC Ex td A20/21, Alu blind cover
3	ATEX II 2G Ex emb (ia) IIC T6/IECEx Zone1
4	ATEX II 1/3D/IEC Ex td A20/22
5	ATEX II 1/2G Ex ia IIC T6, ATEX II 1/3D
6	ATEX II 1/2G Ex ia IIC T6, WHG
7	ATEX II 1/2G Ex d (ia) IIC T6/ IEC Ex d(ia) IIC T6
8	ATEX II 1/2G Ex ia IIC T6, ATEX II 1/3D, WHG
G	ATEX II 3G Ex nA II T6
C	NEPSI Ex emb (ia) IIC T6
I	NEPSI Ex ia IIC T6
J	NEPSI Ex d (ia) IIC T6
Q	NEPSI DIP
R	NEPSI Ex nA II T6
M	FM DIP Cl.II Div.1 Gr. E-G N.I.
S	FM IS Cl.I,II,III Div.1 Gr. A-G N.I., zone 0, 1, 2
T	FM XP Cl.I,II,III Div.1 Gr. A-G, zone 1, 2
N	CSA General Purpose
P	CSA DIP Cl.II Div.1 Gr. G + coal dust, N.I.
U	CSA IS Cl.I,II,III Div.1 Gr. A-D, G + coal dust, N.I., zone 0, 1, 2
V	CSA XP Cl.I,II,III Div.1 Gr. A-D, G + coal dust, N.I., zone 1, 2
W	IEC Ex td A20/21, Alu blind cover
X	IEC Ex td A20/22
K	TIIS Ex ia IIC T4 (in preparation)
L	TIIS Ex d (ia) IIC T4
Y	Special version, TSP-No. to be spec.

20	Probe:
A	Rope 4mm / 1/6", mainly liquid
B	Rope 6mm / 1/4", solid
H	Rope 6mm / 1/4", PA > steel, solid, T_{max} = 100°C / 212°F
P	Rod 6mm, liquid
1	Rod 12mm, liquid
K	Rod 16mm, mainly liquid
L	Coax, liquid
Y	Special version, TSP-No. to be spec.

30	Probe length:
A	..... mm, rope 4mm, 316
B	..... mm, rope 6mm, 316
C	..... inch rope 1/6", 316
D	..... inch, rope 1/4", 316
E	..... mm, rope 6mm, PA > steel
F	..... inch, rope 1/4", PA > steel
K	..... mm, rod 16mm, 316L
L	..... mm, coax, 316L
M	..... inch, rod 16mm, 316L
N	..... inch, coax, 316L
P	..... mm, rod 6mm, 316L
R	..... inch, rod 6mm, 316L
S	..... mm, rod 16mm, 316L, 500mm divisible
T	..... mm, rod 16mm, 316L, 1000mm divisible
U	..... inch, rod 16mm, 316L, 20in divisible
V	..... inch, rod 16mm, 316L, 40in divisible
1	..... mm rod 12mm, AlloyC22
2	..... mm coax, AlloyC22
3	..... inch, rod 12mm, AlloyC22
4	..... inch, coax, AlloyC22
Y	Special version, TSP-No. to be spec.

40	O-ring Material; Temperature:
2	Viton; -30...150°C/-22...302°F
3	EPDM; -40...120°C/-40...248°F
4	Kalrez; -5...150°C/23...302°F
9	Special version, TSP-No. to be spec.

50	Process Connection:
ACJ	1-1/2" 150lbs RF, 316/316L flange ANSI B16.5
ACM	1-1/2" 150lbs, AlloyC22 >316/316L flange ANSI B16.5
ADJ	1-1/2" 300lbs RF, 316/316L flange ANSI B16.5
ADM	1-1/2" 300lbs, AlloyC22 >316/316L flange ANSI B16.5
AEJ	2" 150lbs RF, 316/316L flange ANSI B16.5
AEM	2" 150lbs, AlloyC22 >316/316L flange ANSI B16.5
AFJ	2" 300lbs RF, 316/316L flange ANSI B16.5
AFM	2" 300lbs, AlloyC22 >316/316L flange ANSI B16.5
ALJ	3" 150lbs RF, 316/316L flange ANSI B16.5
ALM	3" 150lbs, AlloyC22 >316/316L flange ANSI B16.5
AMJ	3" 300lbs RF, 316/316L flange ANSI B16.5
AMM	3" 300lbs, AlloyC22 >316/316L flange ANSI B16.5
APJ	4" 150lbs RF, 316/316L flange ANSI B16.5
APM	4" 150lbs, AlloyC22 >316/316L flange ANSI B16.5
AQJ	4" 300lbs RF, 316/316L flange ANSI B16.5
AQM	4" 300lbs, AlloyC22 >316/316L flange ANSI B16.5
AWJ	6" 150lbs RF, 316/316L flange ANSI B16.5
AWM	6" 150lbs, AlloyC22 >316/316L flange ANSI B16.5
A3J	8" 150lbs RF, 316/316L flange ANSI B16.5
CFJ	DN40 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C)
CFM	DN40 PN25/40, AlloyC22 >316L flange EN1092-1 (DIN2527)
CGJ	DN50 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C)
CGM	DN50 PN25/40, AlloyC22 >316L flange EN1092-1 (DIN2527)
CMJ	DN80 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)
CMM	DN80 PN10/16, AlloyC22 >316L flange EN1092-1 (DIN2527)
CSJ	DN80 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C)
CSM	DN80 PN25/40, AlloyC22 >316L flange EN1092-1 (DIN2527)
CQJ	DN100 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)
CQM	DN100 PN10/16, AlloyC22 >316L flange EN1092-1 (DIN2527)
CTJ	DN100 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C)
CTM	DN100 PN25/40, AlloyC22 >316L flange EN1092-1 (DIN2527)
CWJ	DN150 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)
CWM	DN150 PN10/16, AlloyC22 >316L flange EN1092-1 (DIN2527)
CXJ	DN200 PN16 B1, 316L flange EN1092-1 (DIN2527 C)
CRJ	Thread ISO228 G3/4, 316L
GRJ	Thread ISO228 G1-1/2, 316L
GRM	Thread ISO228 G1-1/2, AlloyC22
CNJ	Thread ANSI NPT3/4, 316L
GNJ	Thread ANSI NPT1-1/2, 316L
GNM	Thread ANSI NPT1-1/2, AlloyC22
KDJ	10K 40A RF, 316L flange JIS B2220
KDM	10K 40A, AlloyC22 >316L flange JIS B2220
KEJ	10K 50A RF, 316L flange JIS B2220
KEM	10K 50A, AlloyC22 >316L flange JIS B2220
KLJ	10K 80A RF, 316L flange JIS B2220
KLM	10K 80A, AlloyC22 >316L flange JIS B2220
KPJ	10K 100A RF, 316L flange JIS B2220
KPM	10K 100A, AlloyC22 >316L flange JIS B2220
YY9	Special version, TSP-No. to be spec.

60	Power Supply; Output:
B	2-wire; 4-20mA SIL HART
D	2-wire; PROFIBUS PA
F	2-wire; FOUNDATION Fieldbus
K	2-wire; 4-20mA HART, Interface measurement
G	4-wire 90-250VAC; 4-20mA SIL HART
H	4-wire 10.5-32VDC; 4-20mA SIL HART
Y	Special version, TSP-No. to be spec.

70	Operation:
1	W/o display, via communication
2	4-line display VU331, Envelope curve display on site
3	Prepared for FHX40, Remote display (Accessory)
9	Special version, TSP-No. to be spec.

80		**Type of Probe:**
	B	Compact, centering disk d=45mm, 316L, pipe diameter DN50/2"
	C	Compact, centering disk d=75mm, 316L, pipe diameter DN80/3" + DN100/4"
	D	Spacer, center rod d=45mm, 316L, pipe diameter DN50/2", spacer, 400mm
	E	Spacer, center rod d=75mm, 316L,pipe diameter DN80/3" + DN100/4", spacer,400mm
	F	Remote, cable 3m, top, center d=45mm, centering disk d=45mm, 316L pipe diameter DN50/2", 316L
	G	Remote, cable 3m, top, center d=75mm, centering disk d=75mm, 316L, pipe diameter DN80/3" + DN100/4", 316L
	H	Remote, cable 3m, side, center d=45mm, centering disk d=45mm, 316L, pipe diameter DN50/2"
	I	Remote, cable 3m, side, center d=75mm, centering disk d=75mm, 316L, pipe diameter DN80/3" + DN100/4"
	1	Compact, basic version
	2	Spacer, 400mm
	3	Remote, cable 3m, top entry
	4	Remote, cable 3m, side entry
	9	Special version, TSP-No. to be spec.

90		**Housing; Cable Entry:**
	A	F12 Alu, coated IP68; gland M20
	B	F12 Alu, coated IP68; thread G1/2
	C	F12 Alu, coated IP68; thread NPT1/2
	D	F12 Alu, coated IP68; plug M12
	E	F12 Alu, coated IP68; plug 7/8"
	G	T12 Alu, coated IP68; gland M20 (Ex d > thread M20)
	H	T12 Alu, coated IP68; thread G1/2
	J	T12 Alu, coated IP68; thread NPT1/2
	K	T12 Alu, coated IP68; plug M12
	L	T12 Alu, coated IP68; plug 7/8"
	M	T12 Alu, coated IP68; gland M20 + OVP[1)]
	N	T12 Alu, coated IP68; thread G1/2 + OVP[1)]
	P	T12 Alu, coated IP68; thread NPT1/2+OVP[1)]
	Q	T12 Alu, coated IP68; plug M12 + OVP[1)]
	R	T12 Alu, coated IP68; plug 7/8" + OVP[1)]
	1	F23 316L IP68; gland M20
	2	F23 316L IP68; thread G1/2
	3	F23 316L IP68; thread NPT1/2
	4	F23 316L IP68; plug M12
	5	F23 316L IP68; plug 7/8"
	Y	Special version, TSP-No. to be spec.

100		**Additional Option:**
	A	Basic version
	B	EN10204-3.1 material, wetted parts, (316L wetted parts for rod/coax) inspection certificate
	C	EN10204-3.1 material, pressurized, (316L pressurized for rope version) inspection certificate
	H	5-point lienearity protocol, see additional spec.
	J	5-point, 3.1, NACE, 5-point linearity protocol, see additional spec. EN102043.1 material, NACE MR0175 (316L wetted parts), inspection certificate
	N	EN10204-3.1 material, NACE MR0175 (316L wetted parts) inspection certificate
	S	GL/ABS marine certificate
	Y	Special version, TSP-No. to be spec.

995		**Marking:**
	1	Tagging (TAG), see additional spec.
	2	Bus adress, see additional spec.

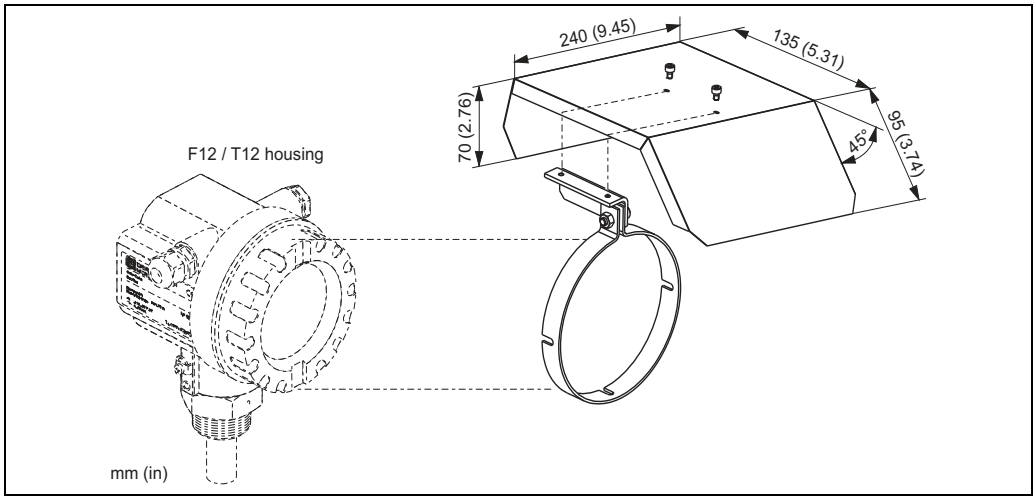
FMP40-	Complete product designation

[1)] OVP = overvoltage protection

Accessories

Weather protection cover

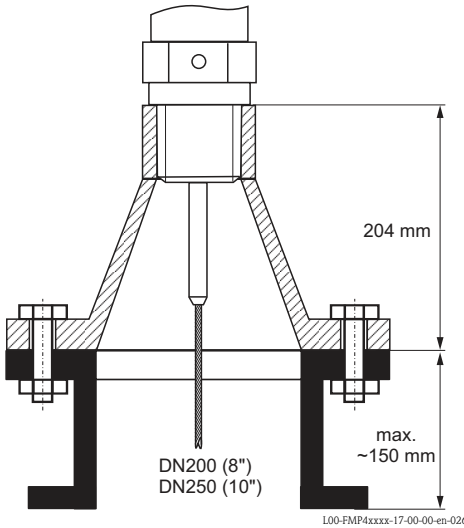
A weather protection cover made of stainless steel is available for outdoor installation dds (order code: 543199-0001). The shipment includes the protective cover and tension clamp.



L00-FMR2xxxx-00-00-06-en-001

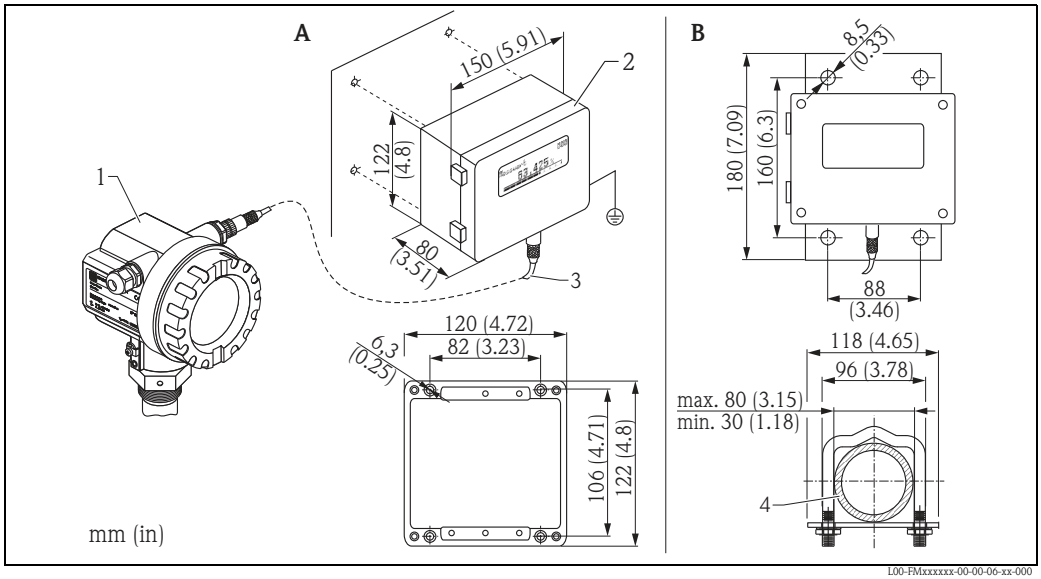
Flange with horn adapter to adapt on the following nozzles

Horn adapter	Order-No.
G1-1/2" at DN200 / PN16	52014251
G1-1/2" at DN250 / PN16	52014252
NPT1-1/2" at 8" / 150 psi	52014253
NPT1-1/2" at 10" / 150 psi	52014254
Material: 316L (1.4435)	



L00-FMP4xxxx-17-00-00-en-026

Remote display FHX40



1 Micropilot M, Levelflex M, Prosonic M
2 Separate housing FHX40 (IP65)
3 Cabel
4 Pipe

A Wall mounting (without mounting bracket)
B Pipe mounting (mounting bracket and plate supplied optionally, see product structure)

Note!
For the device families Micropilot FMR2xx, Levelflex FMP4x and Prosonic FMU4x, the remote display FHX40 must be only used for the HART communication version.

Ordering information:

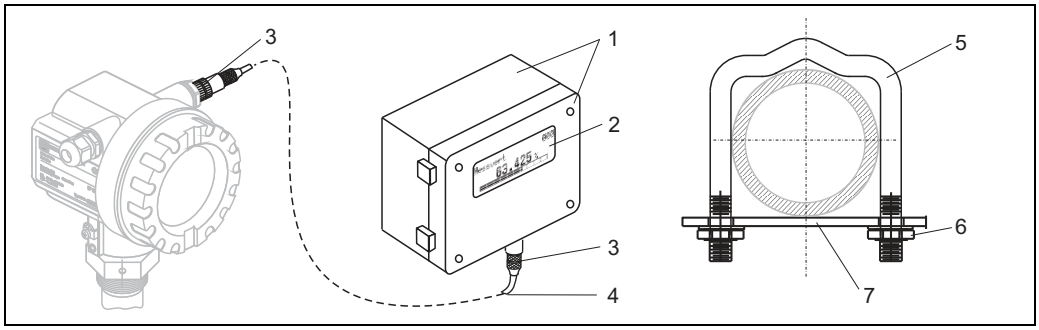
010	**Approval**					
	A	Non-hazardous area				
	2	ATEX II 2G Ex ia IIC T6				
	3	ATEX II 2D Ex ia IIIC T80°C				
	G	IECEx zone1 Ex ia IIC T6/T5				
	S	FM IS Cl.I Div.1 Gr.A-D, zone 0				
	U	CSA IS Cl.I Div.1 Gr.A-D, zone 0				
	N	CSA General Purpose				
	K	TIIS Ex ia IIC T6				
	C	NEPSI Ex ia IIC T6/T5				
	Y	Special version, TSP-no. to be spec.				
020		**Cable**				
		1	20m/65ft; for HART			
		5	20 m/65 ft (> PROFIBUS PA / FOUNDATION Fieldbus)			
		9	Special version, TSP-no. to be spec.			
030			**Additional option**			
			A	Basic version		
			B	Mounting bracket, pipe 1"/ 2"		
			Y	Special version, TSP-no. to be spec.		
995				**Marking**		
				1	Messstelle (TAG), see additional spec.	
FHX40 -					Complete product designation	

For connection of the remote display FHX40 use the cable which fits the communication version of the respective instrument.

Technical data (cable and housing)

Max. cable length	20 m (66 ft) (fixed length including the cast-on plugs)
Temperature range	–40 to +60 °C (–40 to +140 °F)
Degree of protection	IP65/67 (housing); IP68 (cable) acc. to IEC 60529
Materials	Housing: AlSi12; cable glands: nickle plated brass
Dimensions [mm (in)	122x150x80 (4.8x5.91x3.15) / HxWxD

Materials



L00-FMxxxxxx-00-00-06-de-003

Position	Part	Material
1	Housing/Cover	AlSi12, Screw: V2A
	Ground terminal	CuZn nickel-plated, Screw: V2A
2	Display	Glass
3	Cable gland	CuZn nickel-plated
4	Cable	PVC
5	Mounting bracket	316 Ti (1.4571) or 316 L (1.4435) or 316 (1.4401)
6	Nut	V4A
7	Plate) Screw set (M5	316 Ti (1.4571) Spring washer: 301 (1.4310) or V2A Screw: V4A, Nut: V4A

Centering disks

If the probes with rod version are used in stilling well or bypass, it must be ensured that the probe does not come into contact with the wall. The centering disk fixes the rod probe in the middle of the pipe.

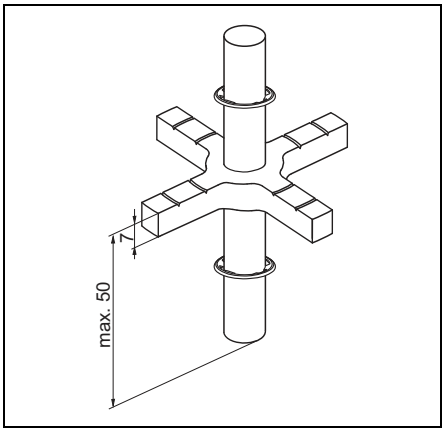
Centering disk PEEK Ø1.89 - 3.74 inch

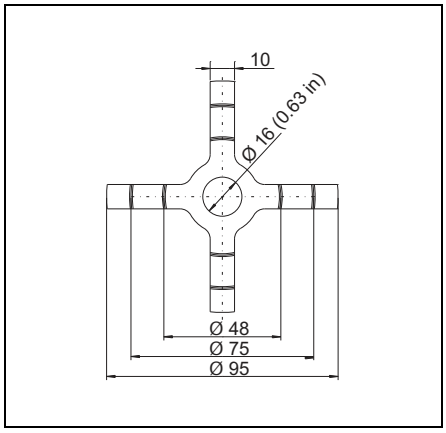
The centering disk is suitable for probes with a rod diameter of 16 mm and can be used in pipes from DN50 (2") up to DN100 (4"). Markings on the 4-leg centering disk ensure a simple tailoring. Hence the centering disk can be adapted to the pipe diameter. See also Operating Instruction BA00377F/00/EN.

- PEEK (statically dissipative)
- Measuring range: -60 °C to +200 °C

Order-no. 71069064

Note!
If the centering disk is inserted in an bypass, it must be positioned below the lower bypass outlet.
The has to be accounted for when choosing the probe length.
Generally, the centering disk should not be mounted higher than 50 mm from the probe end.
It is recommended not to insert the PEEK centering disk in the measuring range of the rod probe.



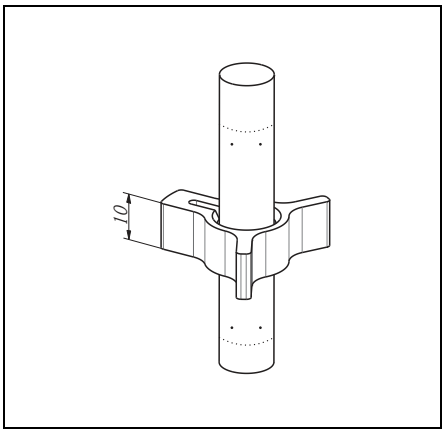


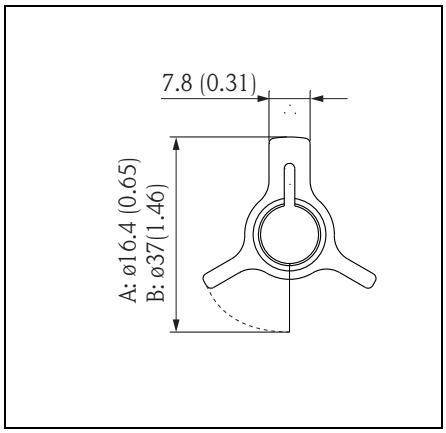
Centering disk PFA Ø 1.46 inch

The centering disk is suitable for probes with a rod diameter of 0.63 inch (also coated rod probes) and can be used in pipes from DN40 (1½") upto DN50 (2"). See also Operating Instruction BA00378F/00/EN.

- Measuring range: -200 °C to +150 °C

Order-no. 71069065





Commubox FXA195 HART

For intrinsically safe HART communication with FieldCare via the USB interface.
For details refer to TI00404F/00/EN.

Commubox FXA291

The Commubox FXA291 connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) to the USB port of a personal computer or laptop.
For details refer to TI00405C/07/EN.

Note!
For the device you need the "ToF adapter FXA291" as an additional accessory.

ToF adapter FXA291

The ToF adapter FXA291 connects the Commubox FXA291 via the USB port of a personal computer or laptop to the device. For details refer to KA00271F/00/A2.

Screw in flange FAX50

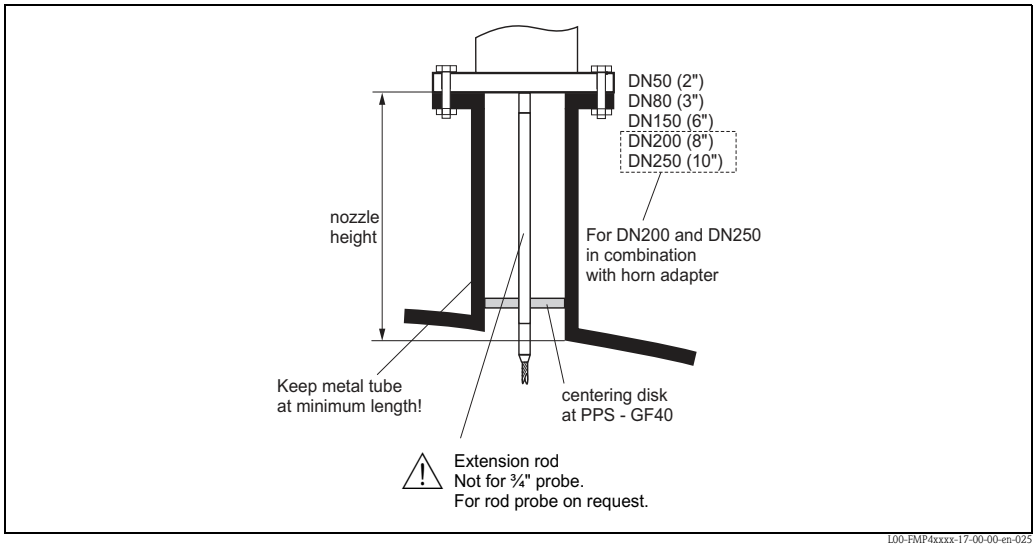
015	Diamter; Material	
	BR1	DN50 PN10/16 A, steel, flange EN1092-1
	BS1	DN80 PN10/16 A, steel, flange EN1092-1
	BT1	DN100 PN10/16 A, steel, flange EN1092-1
	JF1	2" 150lbs FF, steel, flange ANSI B16.5
	JG1	3" 150lbs FF, steel, flange ANSI B16.5
	JH1	4" 150lbs FF, steel, flange ANSI B16.5
	JK2	8" 150lbs FF, PP, max. 3bar abs / 44psia, flange ANSI B16.5
	XIF	UNI flange 2"/DN50/50, PVDF, max. 3bar abs/44psia, suitable for 2" 150lbs/DN50 PN16/10K 50
	XIG	UNI flange 2"/DN50/50, PP, max. 3bar abs/44psia, suitable for 2" 150lbs/DN50 PN16/10K 50
	XIJ	UNI flange 2"/DN50/50, 316L, max. 3bar abs/44psia, suitable for 2" 150lbs/DN50 PN16/10K 50
	XJF	UNI flange 3"/DN80/80, PVDF, max. 3bar abs/44psia, suitable for 3" 150lbs/DN80 PN16/10K 80
	XJG	UNI flange 3"/DN80/80, PP, max. 3bar abs/44psia, suitable for 3" 150lbs/DN80 PN16/10K 80
	XJJ	UNI flange 3"/DN80/80, 316L, max. 3bar abs/44psia, suitable for 3" 150lbs/DN80 PN16/10K 80
	XKF	UNI flange 4"/DN100/100, PVDF, max. 3bar abs/44psia, suitable for 4" 150lbs/DN100 PN16/10K 100
	XKG	UNI flange 4"/DN100/100, PP, max. 3bar abs/44psia, suitable for 4" 150lbs/DN100 PN16/10K 100
	XKJ	UNI flange 4"/DN100/100, 316L, max. 3bar abs/44psia, suitable for 4" 150lbs/DN100 PN16/10K 100
	XLF	UNI flange 6"/DN150/150, PVDF, max. 3bar abs/44psia, suitable for 6" 150lbs/DN150 PN16/10K 150
	XLG	UNI flange 6"/DN150/150, PP, max. 3bar abs/44psia, suitable for 6"/DN150 PN16/10K 150
	XLJ	UNI flange 6"/DN150/150, 316L, max. 3bar abs/44psia, suitable for 6" 150lbs/DN150 PN16/10K 150
	XMG	UNI flange DN200/200, PP, max. 3bar abs/44psia, suitable for DN200 PN16/10K 200
	XNG	UNI flange DN250/250, PP, max. 3bar abs/44psia, suitable for DN250 PN16/10K 250
	YYY	Special version, TSP-No. to be spec.

020		Sensor connection	
		A	Thread ISO228 G3/4
		B	Thread ISO228 G1
		C	Thread ISO228 G1-1/2
		D	Thread ISO228 G2
		E	Thread ANSI NPT3/4
		F	Thread ANSI NPT1
		G	Thread ANSI NPT1-1/2
		H	Thread ANSI NPT2
		Y	Special version, TSP-No. to be spec.

FAX50			Complete product designation

Sealing ring EPDM supplied.

Extension rod (Centering)



L00-FMP4xxxx-17-00-00-en-025

010	**Approval**			
	A			Non-hazardous area
	M			FM DIP Cl.II Div.1 Gr. E-G N.I., zone 21, 22
	P			CSA DIP Cl.II Div.1 Gr. G + Coal dust, N.I.
	S			FM Cl.I, II, III Div.1 Gr. A-G, N.I., zone 0, 1, 2, 20, 21, 22
	U			CSA Cl.I, II, III Div.1 Gr. A-G N.I., zone 0, 1, 2
	1			ATEX II 1G
	2			AREX II 1D
020		**Extension rod; Nozzle Height**		
		1		115mm; 150-250mm / 6-10"
		2		215mm; 250-350mm / 10-14"
		3		315mm; 350-450mm / 14-18"
		4		415mm; 450-550mm / 14-22"
		9		Special version, TSP-No. to be spec.
030			**Center washer**	
			A	not selected
			B	DN40 / 1-1/2", inside-d.= 40-45mm, PPS
			C	DN50 /2", inside-d.= 50-57mm, PPS
			D	DN80 / 3", inside-d.= 80-85mm, PPS
			E	DN80 / 3", inside-d.= 76-78mm, PPS
			G	DN100 / 4", inside-d.= 100-110mm, PPS
			H	DN150 / 6", inside-d.= 152-164mm, PPS
			J	DN200 / 8", inside-d.= 210-215mm, PPS
			K	DN250 / 10", inside-d.= 253-269mm, PPS
			Y	Special version, TSP-No. to be spec.
HMP40-				Complete product designation

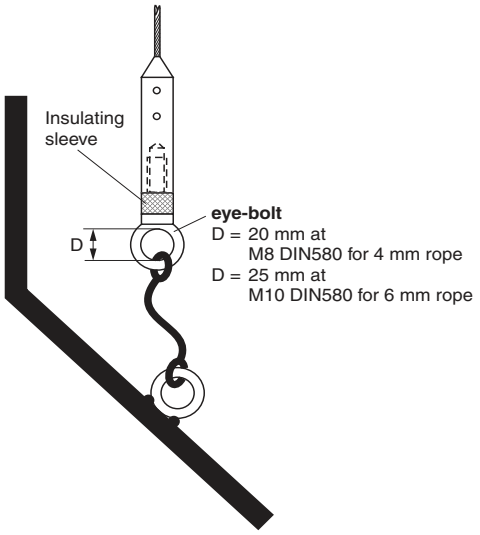
Mounting-kit isolated

Mounting-kit	Order-No.
For 4mm rope probe	52014249
For 6mm rope probe	52014250

If a rope probe has to be fixed and a secure grounded mounting is not possible, we recommend using the insulating sleeve made of PEEK GF-30 with accompanying DIN 580 eye-bolt made of stainless steel.
Max. process temp. 150 °C.

Due to the risk of electrostatic charge, the insulating sleeve is not suitable for use in hazardous areas. In these cases the fixing must be reliably grounded (→ 🖹 26).

Reliable, isolated mounting



Additional documentation

This Additional documentation can be found on our product pages on "www.endress.com".

Special Documentation

Time of Flight Liquid Level Measurement

Selection and engineering for the process industry, SD00157F/00/EN.

Radar Tank Gauging brochure

For inventory control and custody transfer applications in tank farms and terminals, SD00001V/00/EN.

Technical Information

Tank Side Monitor NFR590

Technical Information for Tank Side Monitor NRF590, TI00402F/00/EN.

Fieldgate FXA520

Technical Information for Fieldgate FXA520, TI00369F/00/EN.

Operating Instructions

Levelflex M FMP40

Correlation of Operating Instructions to the device:

Device	Output	Communication	Operating Instructions	Description of Device Functions	Brief Operating Instructions (in the device)
FMP40	B, G, H	HART	BA00242F/00/EN	BA00245F/00/EN	KA00189F/00/A2
	K	HART (interface)	BA00363F/00/EN	BA00366F/00/EN	KA00283F/00/A2
	D	PROFIBUS PA	BA00243F/00/EN	BA00245F/00/EN	KA00189F/00/A2
	F	FOUNDATION Fieldbus	BA00244F/00/EN	BA00245F/00/EN	KA00189F/00/A2

Tank Side Monitor NFR590

Operating Instructions for Tank Side Monitor NRF590, BA00256F/00/EN.
Description of Instrument Functions for Tank Side Monitor NRF590, BA00257F/00/EN.

Engineering hints PROFIBUS PA

Guidelines for planning and commissioning, BA034S/04/EN.

Certificates

See Section "Certificates and approvals", → 56.

Instruments International

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