



Level



Pressure



Flow



Temperature

Liquid
Analysis

Registration

Systems
Components

Services



Solutions

Technical Information

Levelflex M FMP41C, FMP45

Run Time Measurement

Guided Level-Radar; Smart Transmitter for

- Level Measurement in Liquids

- Interface Measurement in Liquids



- Rod and coax probes up to 4 m (157"), rope probes up to 35 m (1378") measuring range

The following interfaces are available for system integration:

- HART (standard) with 4...20 mA analog,
- PROFIBUS PA,
- FOUNDATION Fieldbus.

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

- **Measurement independent** of product properties as:
 - density,
 - dielectric constant,
 - conductivity.
- **Measurement is also possible in the event of foam or if the surface is very turbulent.**
- Simple, menu-guided onsite operation with four-line plain text display.
- Easy remote operation, diagnosis and measuring point documentation with the free operating program supplied.
- Optional remote display and operation.
- Onsite envelope curve on the display for easy diagnosis.
- Electronics can be replaced without opening the tank.
- Application in safety related systems (overspill protection) with requirements for functional safety up to SIL 2 in accordance with IEC 61508/IEC 61511-1.
- Approvals:
 - Europe: ATEX, EHEDG (FMP41C), PED (FMP45), WHG, steam boiler EN12952-11/EN12953-9
 - North America: FM, CSA, boiler act (FMP45).

Application

Level measurement

The Levelflex M is used for continuous level measurement of liquids.

FMP41C for corrosive liquids and hygienic requirements

- Highest chemical resistance
- Rod probes up to 4 m (157"), rope probes up to 30 m (1181") measuring range
- with rod probe also for food processing and pharmaceuticals
- All wetted components: PTFE, FDA-listed, **gap-free**

FMP45 for highest of pressures and/or temperatures

- Temperature range: -200 °C (-328 °F) ... +400 °C (+752 °F)
- Pressure range: -1 ... 400 bar (5802 psi)
- With second safety compartment: gas-tight glass feed though

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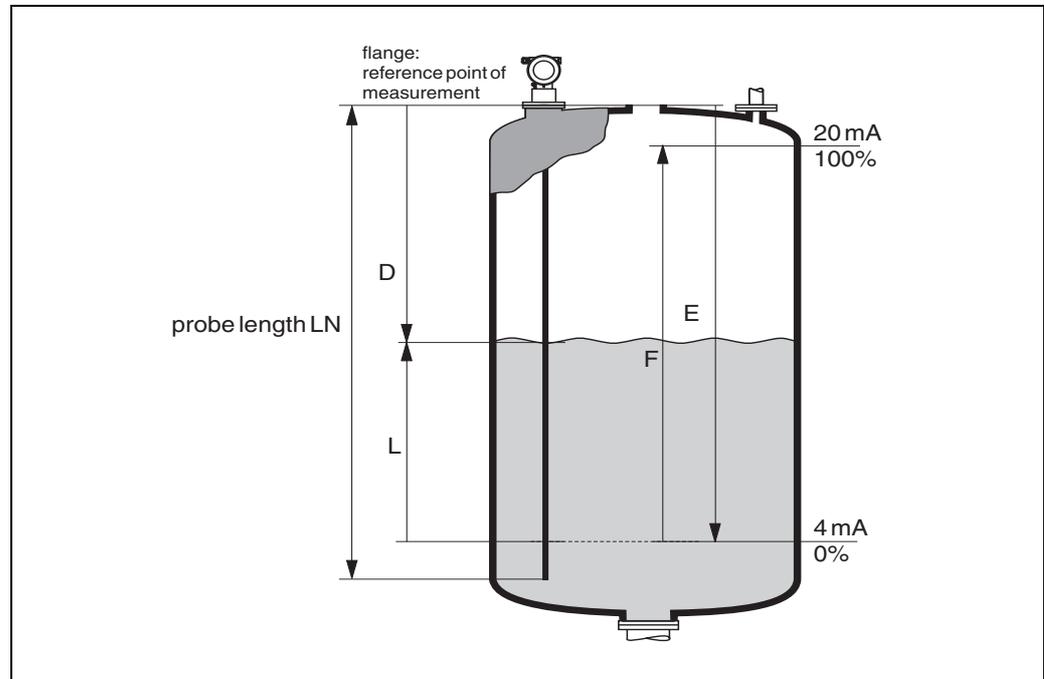
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Function and system design

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 → 41-42) 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).



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Reference point of measurement, details see Page 41-42

Dielectric constant

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

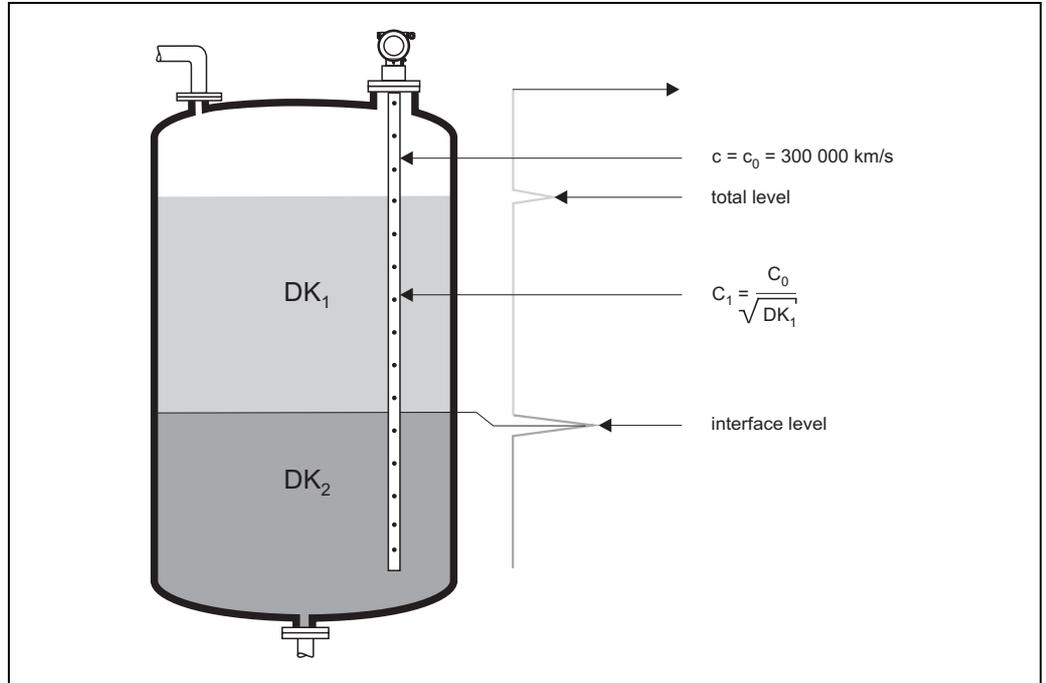
$$L = E - D$$

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 DK_1 , in particular, the other part penetrates the medium. The pulse is reflected once more at the interface point to a second medium with a higher DK_2 . The distance to the interface layer now can also be determined taking into account the delayed time-of-flight of the pulse through the upper medium.



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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 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:

FMP41C

Completely coated probes for measurement in corrosive/chemically aggressive liquids.

Type of probe:	Rod probe	Rope probe
		
Wetted materials:	Rod and rope: PFA Flange plating: PTFE (TFM 1600)	
Probe length:	0.3...4 m (12"...157")	1...30 m (40"...1181")
For application:	<ul style="list-style-type: none"> ■ corrosive liquids ■ liquids in the foods/ pharmaceutical sector ■ Interface measurement 	<ul style="list-style-type: none"> ■ corrosive liquids
Sideways capacity:	30 Nm	not relevant
Tensile loading capacity (min.):	not relevant	2000 N
Other materials:	Housing: see Ordering information Flange and housing adapter: SS316L/1.4435	
Feature 20:	Option "K, M"	Option "A, B, C, D, E, G"

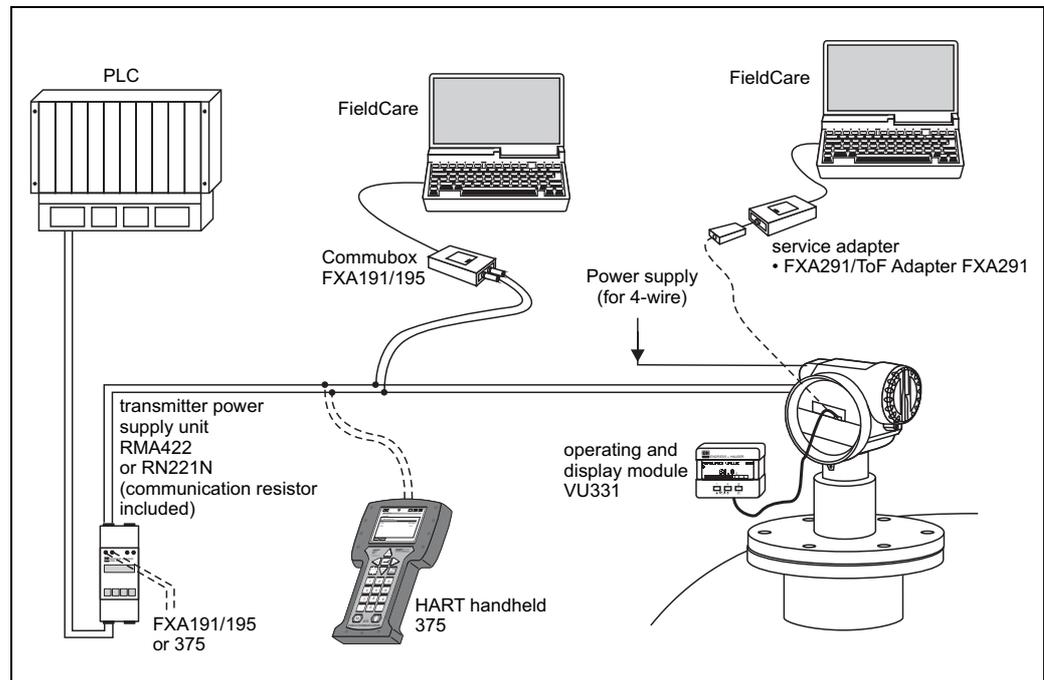
FMP45

For the highest of pressures and/or temperatures.

Type of probe:	Rod probe	Separable probe	Rope probe	Coax probe
				
Wetted materials:	Stainless steel 316L/1.4435, ceramic Al ₂ O ₃ 99.7%, pure graphite, Alloy C22		Stainless steel 316L/1.4435 and 316/1.4401, ceramic Al ₂ O ₃ 99.7%, pure graphite, Alloy C22	Stainless steel 316L/1.4435, ceramic Al ₂ O ₃ 99.7%, pure graphite, Alloy C22
Probe length:	0.3...4 m (12"...157")	max. 10 m (394")	1...35 m (40"...1378")	0.3...4 m (12"...157")
Other materials:	Housing: see Ordering information Flange and housing adapter: SS316L/1.4435			
Tensile loading capacity (min.):	not relevant	not relevant	10 kN	not relevant
Sideways capacity:	30 Nm	20 Nm	not relevant	300 Nm
For application:	<ul style="list-style-type: none"> ■ Liquids ■ Interface measurement 	<ul style="list-style-type: none"> ■ Liquids ■ cramped mountin position (limited head clearance) ■ Interface measurement 	<ul style="list-style-type: none"> ■ Liquids 	<ul style="list-style-type: none"> ■ Liquids ■ Interface measurement
Feature 30:	Option "K, M"	Option "S, T, U, V"	Option "A, C"	Option "L, N"

Stand-alone

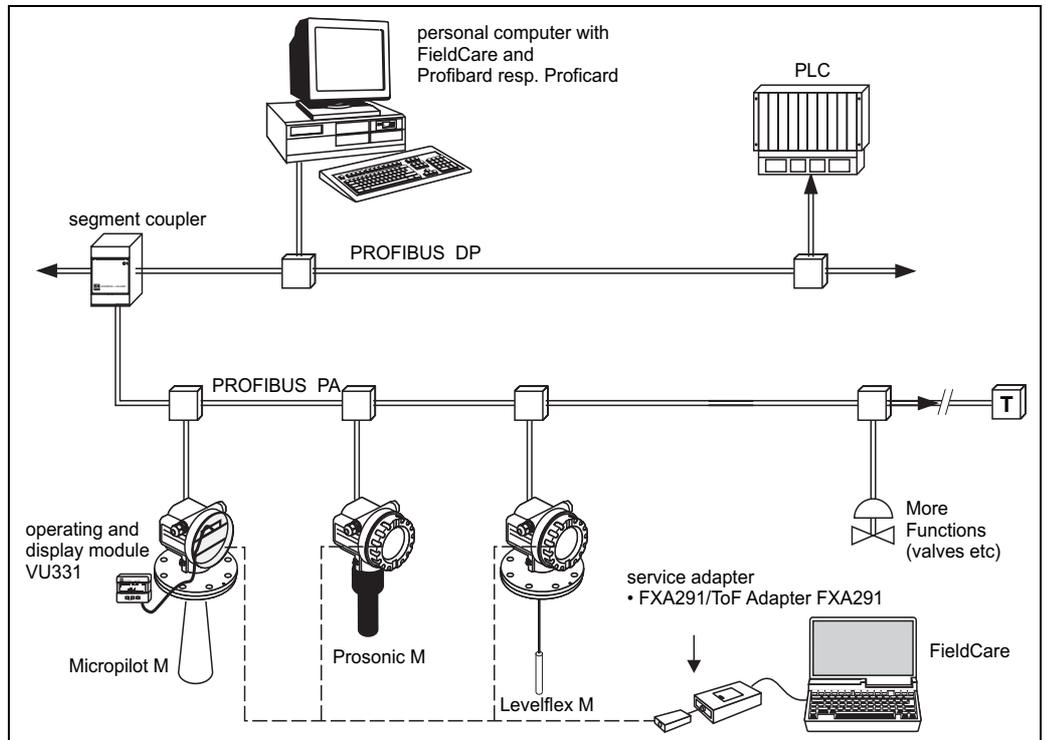
- Power supply directly from power line (4-wire) or from transmitter power supply unit (2-wire).
- Onsite operation with integrated display or remote operation with HART protocol.



If the HART communication resistor is not installed in the supply device and HART protocol communication is to be carried out, it is necessary to insert a communication resistor $\geq 250 \Omega$ into the 2-wire line.

System integration via PROFIBUS PA

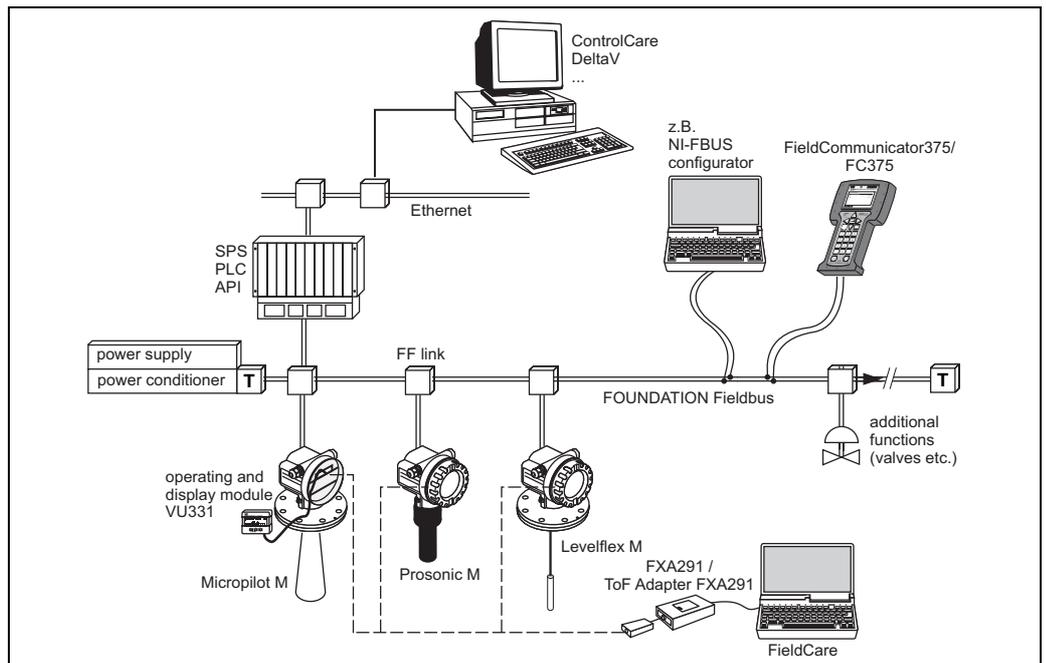
Maximum 32 transmitters (depending on the segment coupler, 10 in the Ex ia IIC hazardous area according to the FISCO Model) can be connected to the bus. The Bus voltage is supplied by the segment coupler. Both onsite as well as remote operation are possible.



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System integration via FOUNDATION Fieldbus

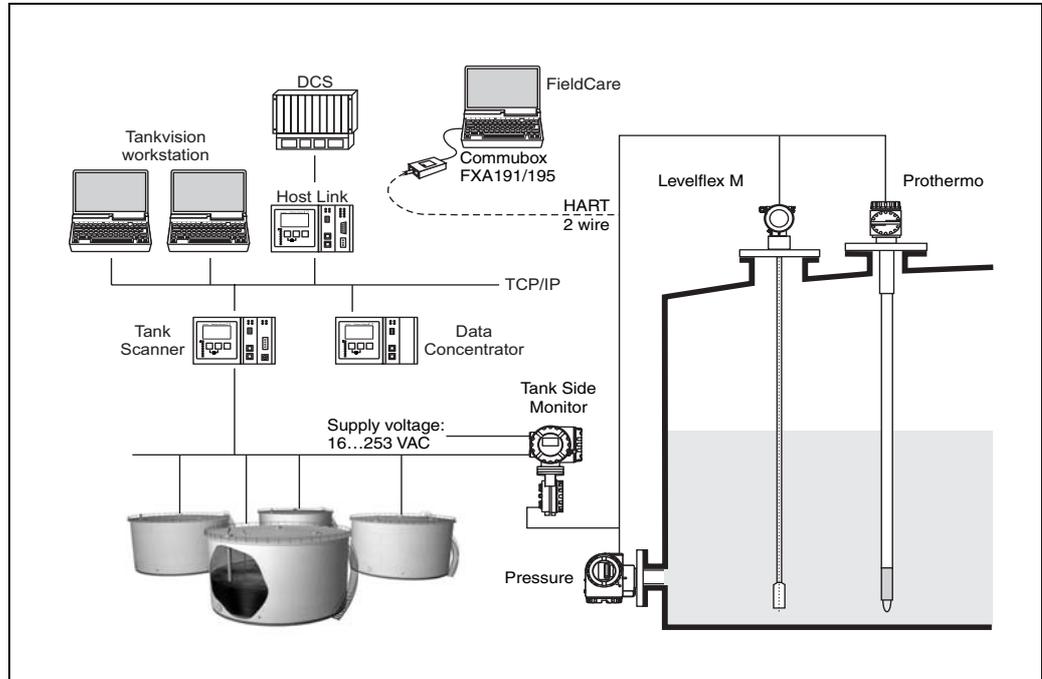
Max. 32 transmitters (standard, Ex em or Ex d) can be connected to the bus. In Ex ia IIC explosion protection: the max. number of transmitters is based on the applicable regulations and standards for interconnecting intrinsically safe circuits (EN 60079-14), proof of intrinsic safety. Both onsite as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



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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.



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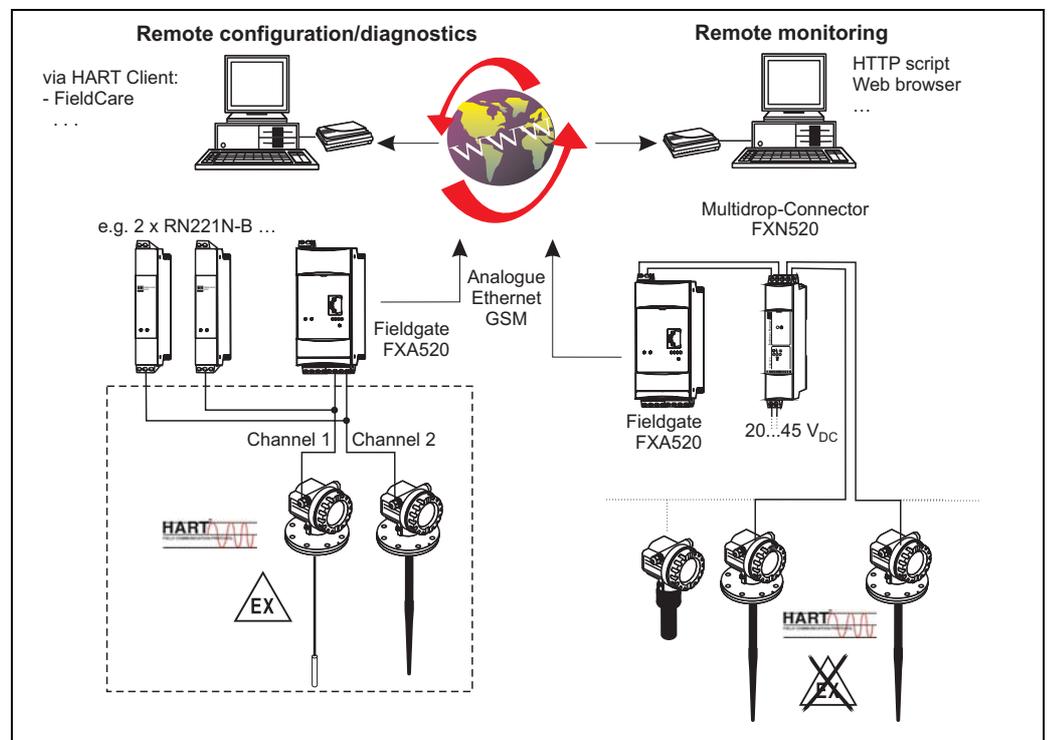
System integration via Fieldgate

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, etc.) 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.



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Note!

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

Input

Measured variable

The measured variable is the distance between the reference point (see Fig. on → ) and the product surface.

Subject to the empty distance entered (E, see Fig. on → ) , 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 liquids	Typ. measuring range FMP41C	Typ. measuring range FMP45
1	1.4 to 1.6	– Condensed gases, e.g. N ₂ , CO ₂	4 m (157"), when installed in metallic pipes	4 m (157"), coax probe, rod probe when installed in metallic pipes
2	1.6 to 1.9	– Liquefied gas, e.g. propane – Solvent – Freon – Palm oil	9 m (354")	25 m (984")
3	1.9 to 2.5	– Mineral oils, fuels	12 m (472")	30 m (1181")
4	2.5 to 4	– Benzene, styrene, toluene – Furan – Naphthalene	16 m (629")	35 m
5	4 to 7	– Chlorobenzene, chloroform – Cellulose spray – Isocyanate, aniline	25 m (984")	35 m
6	> 7	– Aqueous solutions – Alcohols – Acids, alkalis	30 m (1181")	35 m



Note!

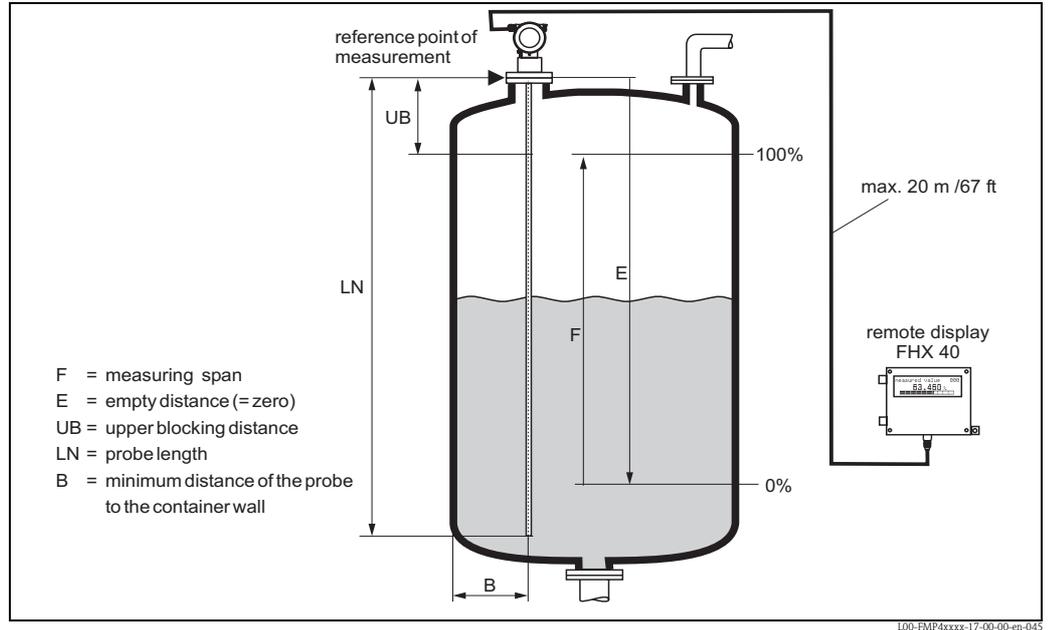
Due to the high diffusion rate of ammonia it is recommended to use the FMP45 with gas-tight bushing for measurements in this medium.

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" on → 21.



Reference point of the measurement, details → 41

Blocking distances and measuring range depending on probe type, for $DK \geq 1.6$ for FMP41C and FMP45:

Probe type	LN [m]		UB [m]
	min	max	min
Rod probe	0.3	4	0.2 ¹⁾
Rope probe	1	35 ²⁾ (FMP41C: 30)	0.2 ¹⁾
Coax probe (not FMP41C)	0.3	4	0

- 1) The indicated blocking distances are preset. At media with $DK > 7$, 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.
- 2) Larger measuring range available on request.



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

Blocking distances and measuring range depending on probe type (interface)

Probe type	LN [m]		UB [m]
	min	max	min
Rod probe in bypass	0.3	4	0.1 ¹⁾
Rope probe in free field (not FMP41C) ²⁾	1	35 ³⁾	0.1 ¹⁾
Coax probe (not FMP41C)	0.3	4	0

- 1) The indicated blocking distances are preset.
- 2) Measurements in free field available on request.
- 3) Larger measuring range available on request.

Used frequency spectrum 100 MHz to 1.5 GHz

Output

Output signal

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

Signal on alarm

Failure information can be accessed via the following interfaces:

- Local display:
 - Error symbol
 - Plain text display
- Current output, failsafe mode can be selected (e.g. according to NAMUR Recommendation NE 43).
- Digital interface

Linearization

The Levellflex M linearization function enables the measured value to be converted into any desired length or volume units and mass or %. Linearization tables for volume calculation in cylindrical tanks are preprogrammed. Any other tables with up to 32 value pairs can be input 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) capable	yes
Link Master / Basic Device selectable	yes; Default: Basic Device
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	<ul style="list-style-type: none"> ■ level or volume¹⁾ (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 Characterizer 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

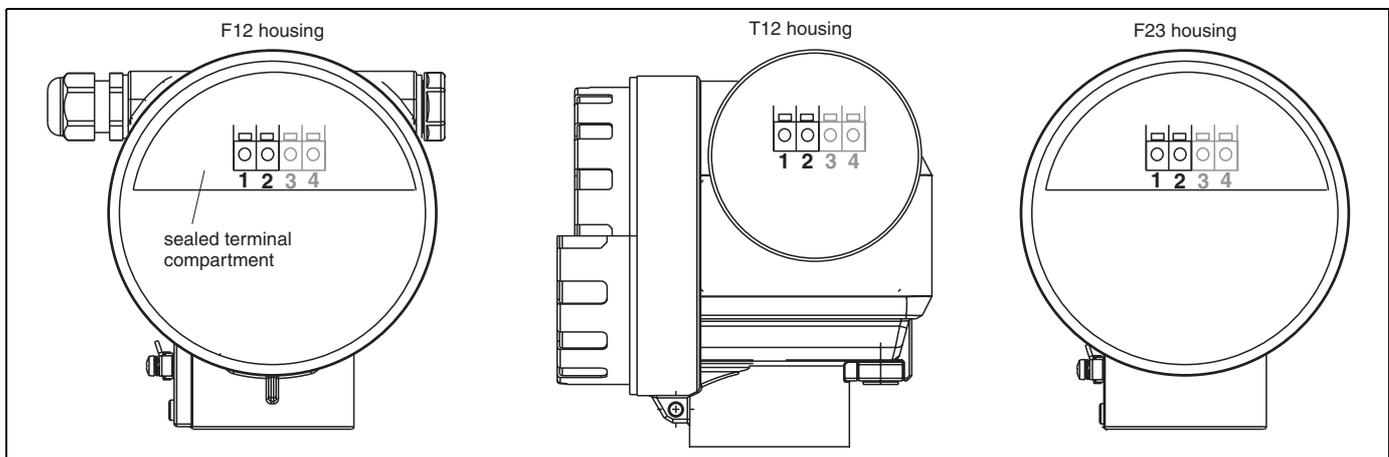
Electrical connection

Connection compartment

Three housings are available:

- Aluminum housing F12 with additionally sealed connection compartment for:
 - standard
 - Ex ia.
- Aluminum housing T12 with separate connection compartment for:
 - standard
 - Ex e
 - Ex d
 - Ex ia (with overvoltage protection).
- Stainless steel 1.4435/316L housing F23 for:
 - standard
 - Ex ia.

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

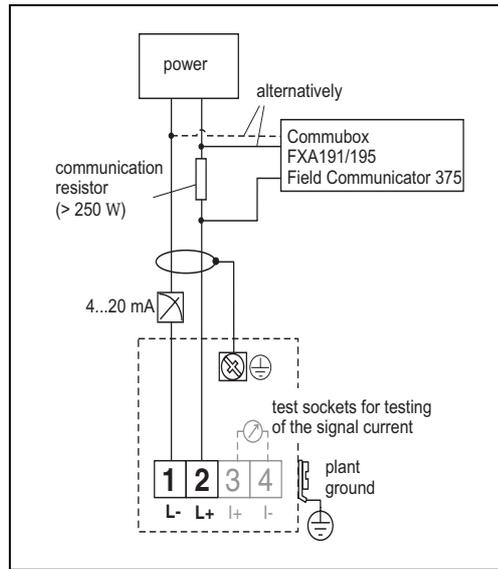
	Type	Clamping area
Standard, Ex ia, IS	Plastic M20x1.5	5 to 10 mm
Ex em, Ex nA	Metal M20x1.5	7 to 10.5 mm

Terminals

For wire cross-sections of 0.5 to 2.5 mm²

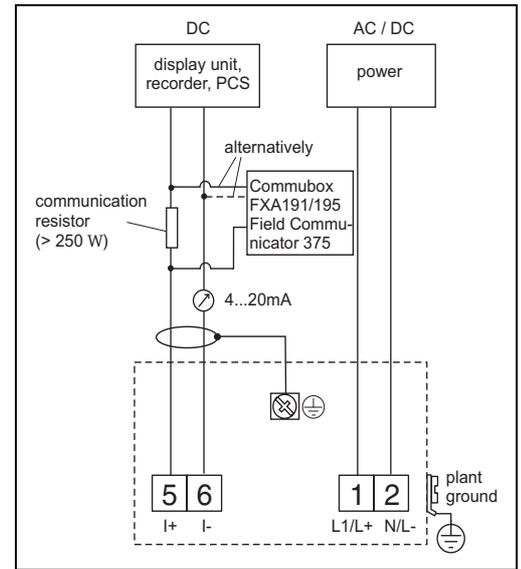
Terminal assignment

2-wire, 4 to 20 mA with HART



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4-wire, 4 to 20 mA active with HART



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Note!

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

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 Technical Information TI241F "EMC Test Procedures").
- See TI402F/00/en for connection to Tank Side Monitor NRF590.

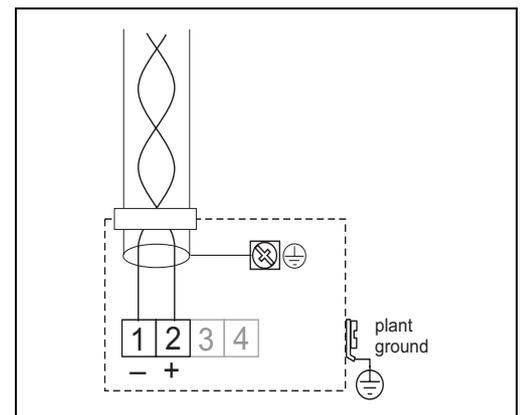
PROFIBUS PA

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 "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 "Guidelines for planning and commissioning PROFIBUS DP/PA", PNO Guideline 2.092 "PROFIBUS PA User and Installation Guideline" and IEC 61158-2 (MBP).

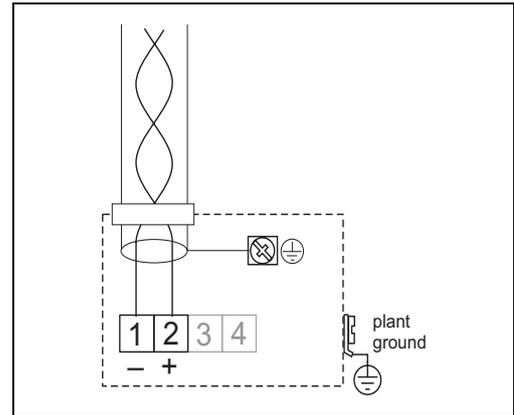
FOUNDATION Fieldbus

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 "FOUNDATION Fieldbus Overview" and the FONDATION Fieldbus Guideline.

Cable specification:

- Use a twisted, shielded two-wire cable, preferably cable type A



L00-FMxxxxxx-04-00-00-en-022



Note!

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

Fieldbus plug connectors

For the versions with fieldbus plug connector (M12 or 7/8"), the signal line can be connected without opening the housing.

Pin assignment of the M12 plug connector (PROFIBUS PA plug)

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

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Pin assignment of the 7/8" plug connector (FOUNDATION Fieldbus plug)

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

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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		
		minimum	maximum	
HART	Standard	4 mA	16 V	36 V
		20 mA	7.5 V	36 V
	Ex ia	4 mA	16 V	30 V
		20 mA	7.5 V	30 V
	Ex em Ex d	4 mA	16 V	30 V
		20 mA	11 V	30 V
Fixed current, adjustable e.g. for solar power operation (measured value transmitted via HART)	Standard	11 mA	10 V	36 V
	Ex ia	11 mA	10 V	30 V
Fixed current for HART Multidrop mode	Standard	4 mA ¹⁾	16 V	36 V
	Ex ia	4 mA ¹⁾	16 V	30 V

1) Startup 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

Supply voltage	9 V ... 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: G ½ or ½ NPT
 PROFIBUS PA M12 plug
 Fieldbus Foundation 7/8" plug

Power consumption

Min. 60 mW, max. 900 mW

Current consumption**HART**

3,6...22 mA 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 DIN EN 60079-14, standard for test procedures 60060-1 (10 kA, pulse 8/20 μ s), 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 product overview Ordering information on → 53
- or**
- This protection is achieved by the use of other appropriate measures (external protection devices e.g. HAW262Z).

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 Ø)
- Flange for rod or rope probe ≥ 30 cm Ø
- Distance to obstructions ≥ 1 m
- For interface measurement:
 - Coax probe
 - DK of the lower medium = 80 (water)
 - DK of the upper medium = 2 (oil)

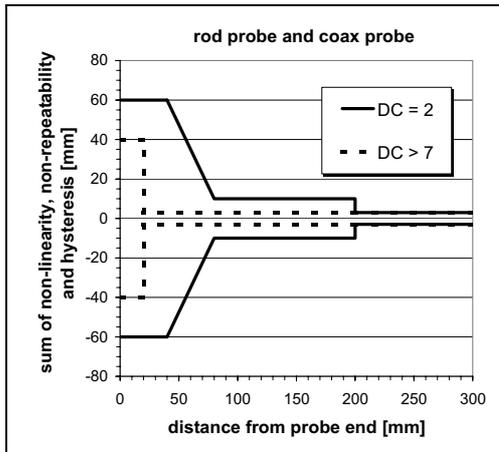
Maximum measured error

Typical statements for reference conditions:
DIN EN 61298-2, percentage of the span.

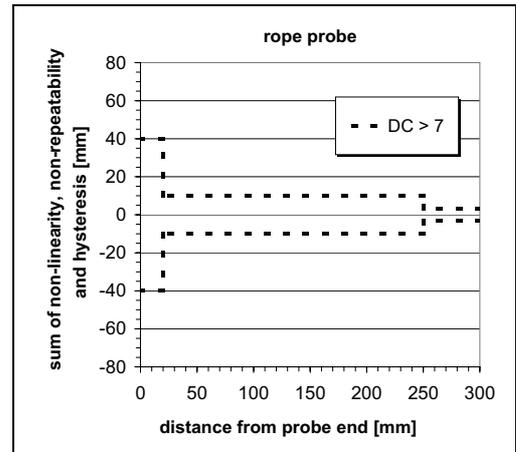
Output:	Digital	Analog
Sum of non-linearity, non-repeatability and hysteresis	<p>Level (electronic version level and interface measurement): measuring range FMP41C:</p> <ul style="list-style-type: none"> – up to 10 m: ±5 mm – > 10 m: ± 0.05 % <p>Measuring range FMP45:</p> <ul style="list-style-type: none"> – up to 10 m: ±3 mm – > 10 m: ± 0.03 % <p>FMP45 with coax probe:</p> <ul style="list-style-type: none"> – ±5 mm <hr/> <p>Interface (only for electronic version "K" interface measurement):</p> <ul style="list-style-type: none"> – 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. 	± 0.06 %
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):



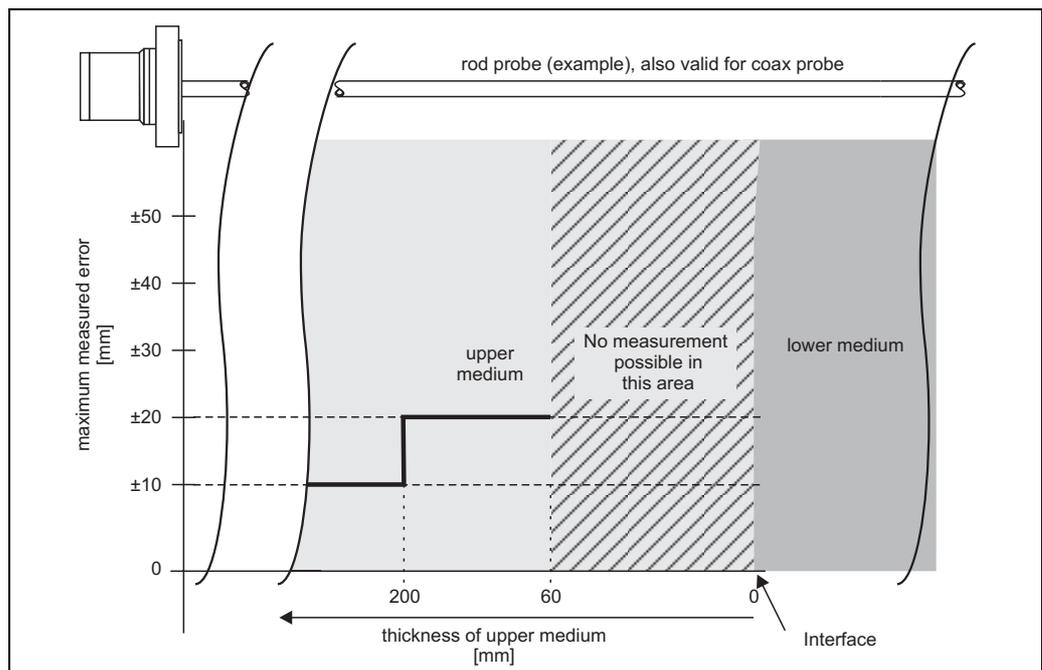
L00-FMP4xxxx-05-00-00-en-001



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):



L00-FMP4xlxx-05-00-00-en-001

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

Influence of gaslayer

High pressures reduce the propagation velocity of the measuring signals in the gas/vapor above the fluid. This effect depends on the vapor and is particularly large for high temperatures. This results in a measuring error that gets bigger as the distance increases between the device zero point (flange) and product surface. The following table illustrates this measured error for a few typical gases/vapors (with regard to the distance; a positive value means that too large a distance is being measured):

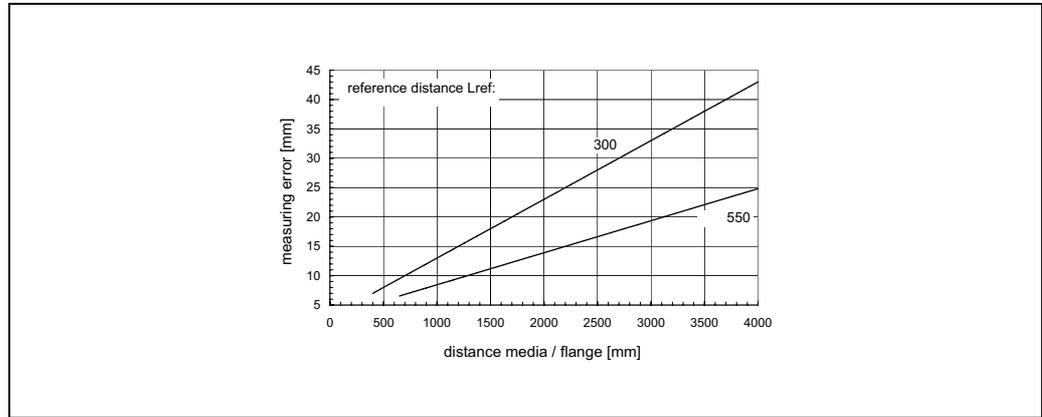
Gaslayer	Temperature		Pressure					
	°C	°F	1 bar/14.5 psi	10 bar/145 psi	50 bar/725 psi	100 bar/1450 psi	200 bar/2900 psi	400 bar/5801 psi
Air	20	68	0.00 %	0.22 %	1.2 %	2.4 %	4.9 %	9.5 %
	200	392	-0.01 %	0.13 %	0.74 %	1.5 %	3.0 %	6.0 %
	400	752	-0.02 %	0.08 %	0.52 %	1.1 %	2.1 %	4.2 %
Hydrogen	20	68	-0.01 %	0.10 %	0.61 %	1.2 %	2.5 %	4.9 %
	200	392	-0.02 %	0.05 %	0.37 %	0.76 %	1.6 %	3.1 %
	400	752	-0.02 %	0.03 %	0.25 %	0.53 %	1.1 %	2.2 %

Gaslayer	Temperature		Pressure							
	°C	°F	1 bar/14.5 psi	2 bar/29 psi	5 bar/72.5 psi	10 bar/145 psi	20 bar/290 psi	50 bar/725 psi	100 bar/1450 psi	200 bar/2900 psi
Water (saturated steam)	100	212	0.26 %	—	—	—	—	—	—	—
	120	248	0.23 %	0.50 %	—	—	—	—	—	—
	152	306	0.20 %	0.42 %	1.14 %	—	—	—	—	—
	180	356	0.17 %	0.37 %	0.99%	2.10 %	—	—	—	—
	212	414	0.15 %	0.32 %	0.86 %	1.79 %	3.9 %	—	—	—
	264	507	0.12 %	0.26 %	0.69 %	1.44 %	3.0 %	9.2 %	—	—
	311	592	0.09 %	0.22 %	0.58 %	1.21 %	2.5 %	7.1 %	19.3 %	—
	366	691	0.07 %	0.18 %	0.49 %	1.01 %	2.1 %	5.7 %	13.2 %	76 %

Installing FMP45 with Gasphase Compensation (Coax only)

Application

For level measurement in steam application at high pressures and temperatures. At high pressures and temperatures, the speed at which microwave signals are propagated in steam (polar media) is reduced above the liquid being measured. Automatic gas phase compensation allows this physical effect to be corrected from a measurement technology point of view. The accuracy of measurement is the higher the larger the reference Lref and the smaller the measuring range is:



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If there are fast changes in pressure, there may be an additional error, since the measured reference distance is filtered with twice the time constant of the level measurement.

In addition, condition of imbalance (e.g. due to heating) may cause density and pressure gradients within the medium and condensation of steam at the probe. As a result, the level readings at different locations inside the tank may vary slightly.

Caused by this application influences the measuring error may be increased by a factor up to 2 to 3.



Note!

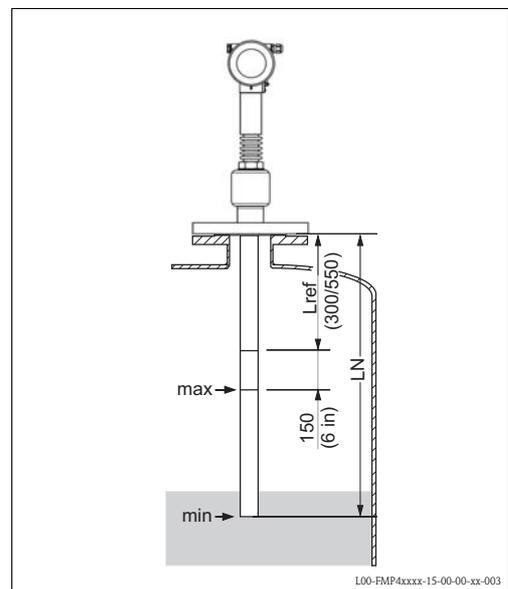
Coax probes with reference reflection can be installed in any tank (free in the tank or into a bypass). Coax probes are completely mounted and adjusted ex work. After mounting they are ready for use, additional settings are not necessary.

Installation

This version of Levelflex M generates a reference reflection in the distance Lref from the flange (see → 53, "Ordering information" option U: 300 mm/11"; option V: 550 mm/21"). The reference reflection must be at least 150 mm above the highest level. By means of the shift of the reference reflection the actual propagation speed is measured and the level value will be automatically corrected.

Limitations for coax probes

Maximum probe length LN	$LN \leq 4000 \text{ mm}$
Minimum probe length LN	$LN > Lref + 200 \text{ mm}$
Reference distance Lref	300 mm / 550 mm
Maximum level relative to sealing surface of flange:	$Lref + 150 \text{ mm}$
Minimum DC-value of medium:	$D_K > 7$



L00-FMP4xxxx-15-00-00-xx-003

Operating conditions: installation with level measurement

General information on level measurement

Probe selection (see overview on → 6-7)

In normal cases, use rod probes. Rope probes are used for measuring ranges > 4m and with restricted ceiling clearance which does not allow the installation of rigid probes.

Probe length



Note!

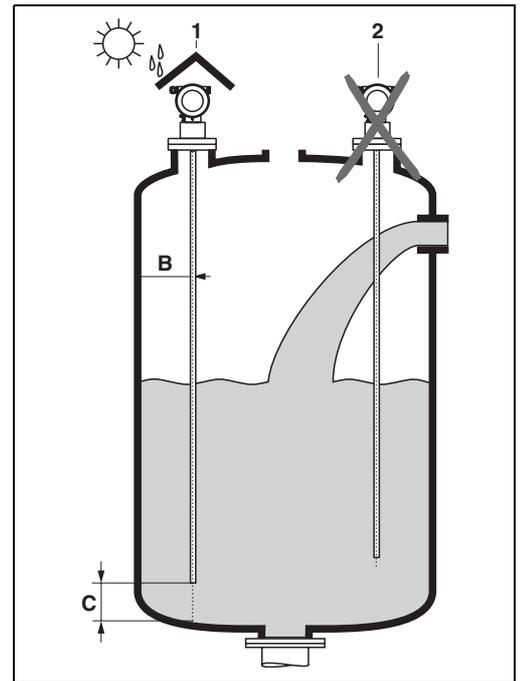
The measuring range is directly dependent on the probe length.

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 for interface measurement, shortening is possible at the probe end weight. The probe end weight can be shortened up to a minimum length of 500 mm.

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.
- Minimum distance of probe end to the container floor (C):
 - Rope probe: 150 mm
 - Rod probe: 50 mm
 - Coax probe (FMP45 only): 10 mm
- When installing outdoors, it is recommended that you use a protective cover (1) see "Accessories" on → 60.



L00-FMP4xxxx-17-00-00-xx-007



Note!

Seal for devices with G 1½" thread

The thread and type of seal on FMP45 corresponds to DIN 3852 Part 1, screwed plug form A. Sealing rings as per DIN 7603 with dimensions 48x55 mm can be used for this.

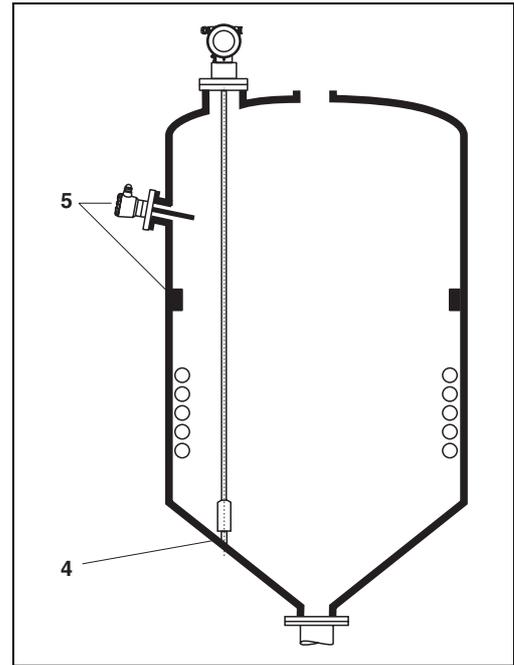
Please use a sealing ring according to this standard in the form A, C or D and of a material that is resistant to the application.

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.
- During operation, the probe must not touch any internals within the measuring range. If necessary, when using rope probes the probe end (4) may be fixed to secure it.

Optimization options

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



L00-FMP4xxx-17-00-00-xx-008

Type of probe installation

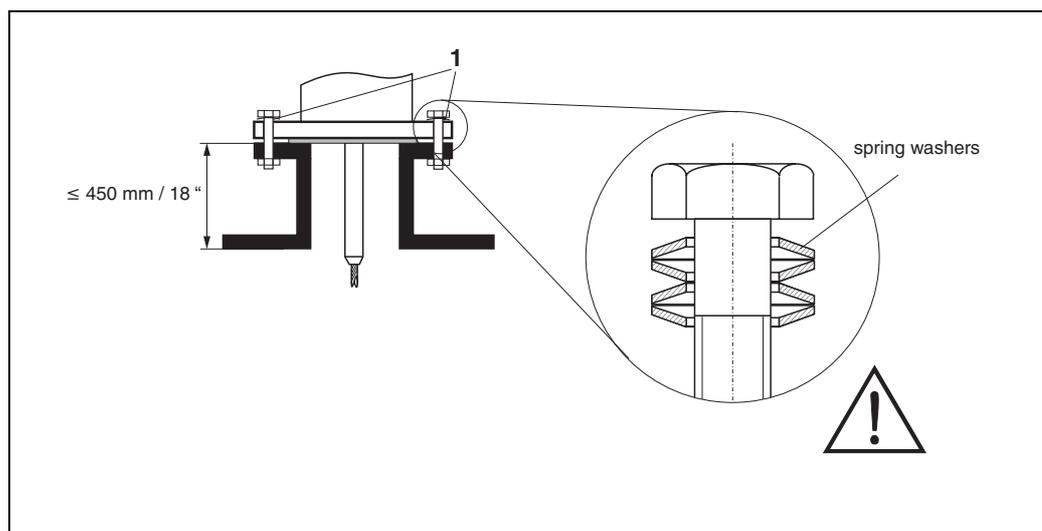
FMP41C

- When installing in plastic tanks, the nozzle must have at least DN50/2". The appropriate flange must be used as the process connection.
- For nozzles up to 450 mm high, select the length of the centering rod appropriate for the nozzle height when using rope probes.
- Observe installation instructions on → 25.
- Use spring washers (1) (see Figure below).

Note!

It is recommended to retighten the flange bolts periodically, depending on process temperature and pressure. Recommended torque: 60...100 Nm.

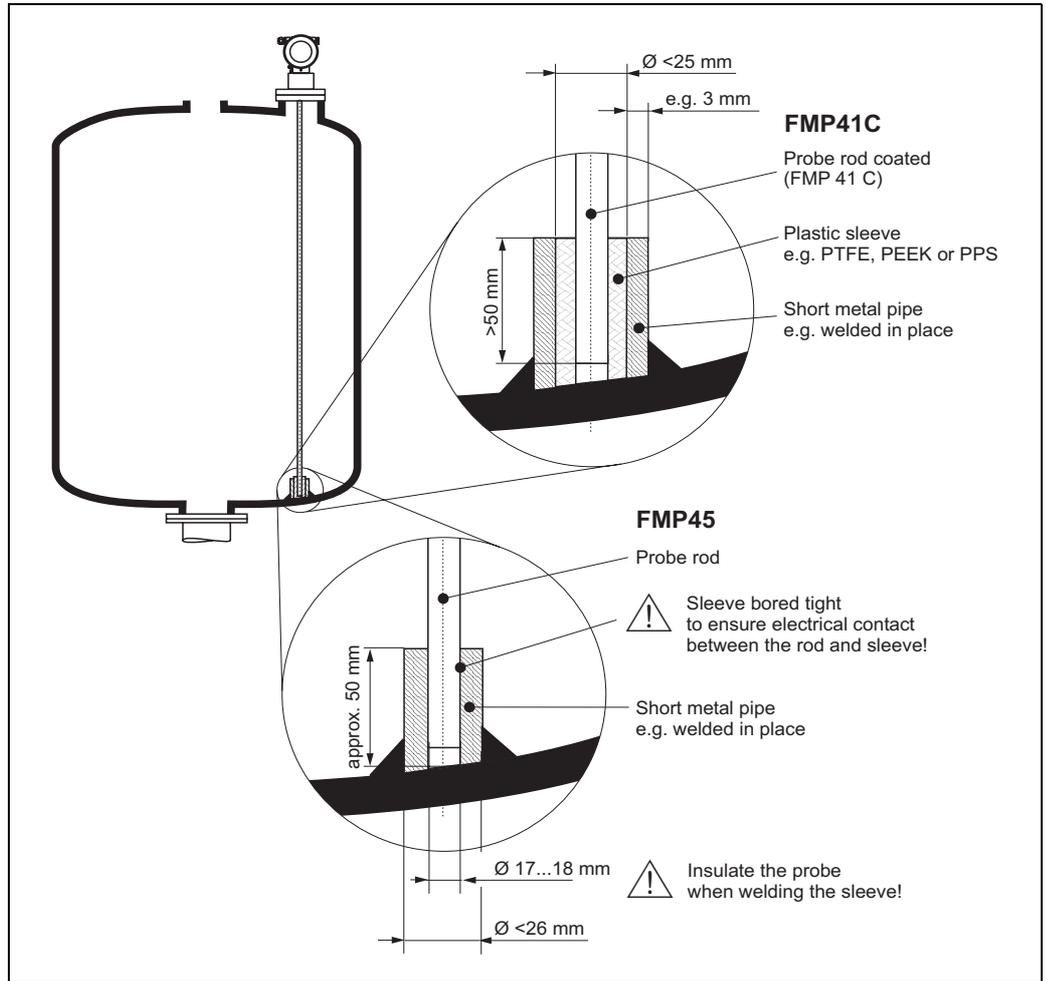
- After mounting, the housing can be turned 350° in order to make it easier to access the display and the connection compartment.



L00-FMP41Cxx-17-00-00-ess-005

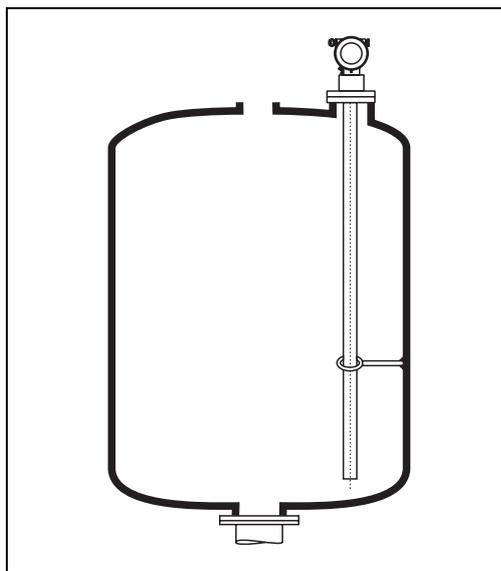
Supporting probes against warping

a. Rod probes: FMP41C and FMP45



L00-FMP4xxxx-17-00-00-en-053

b. Coax probes: FMP45

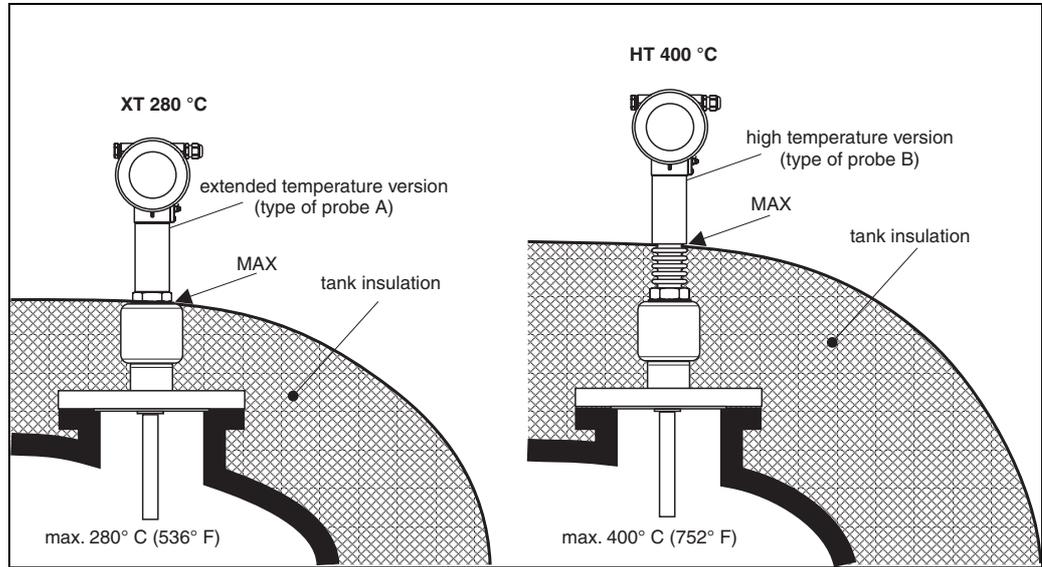


L00-FMP4xxxx-17-00-00-en-054

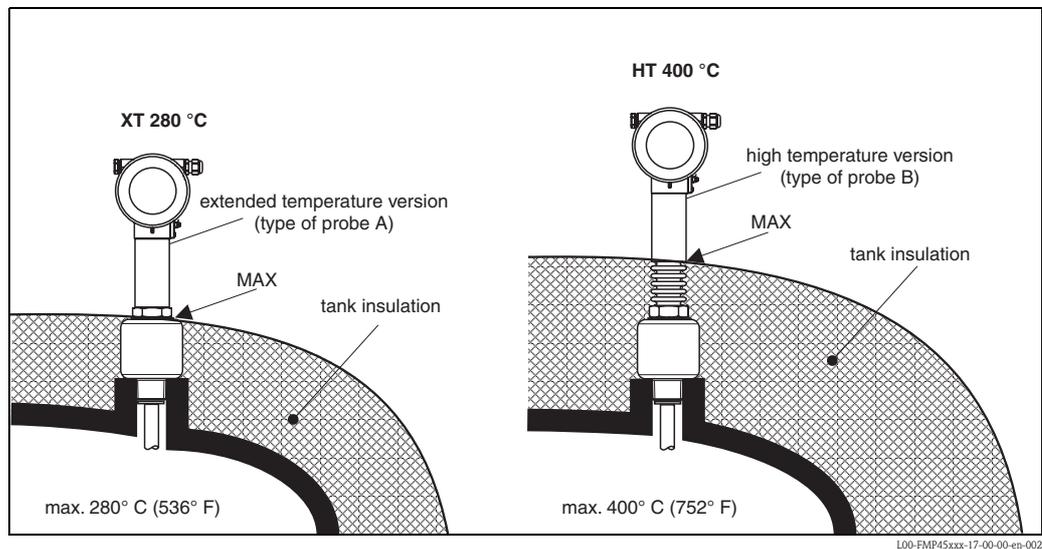
Installing FMP45 with heat insulation

- If process temperatures are high ($\geq 200\text{ }^{\circ}\text{C}$), FMP45 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 flange DN50...DN100



Process connection with adapter G 1½" and 1½" NPT

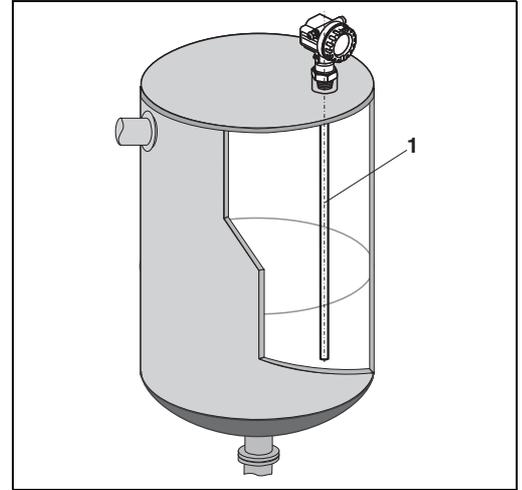


Special instructions

When installing in agitator tanks, observe lateral load-bearing capacity of rod probes (see → 6). Possibly check whether a non-contact process, Ultrasonic or Level-Radar would not be better suited, above all if the agitator generates large mechanical loads on the probe.

Installation in horizontal and upright cylindrical tanks

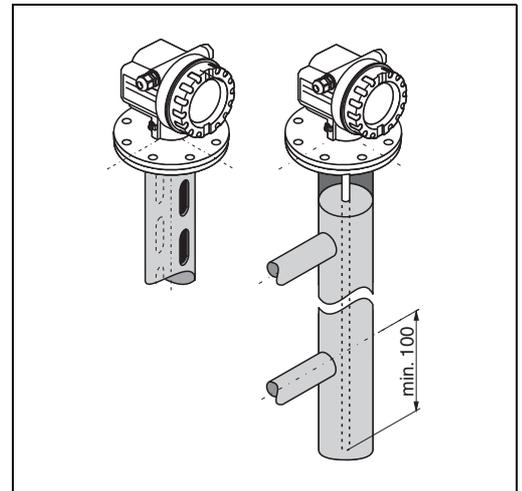
- Use a rod probe for measuring ranges up to 4 m. For anything over this, or if there is not enough overhead clearance, use a rope probe.
- Any distance from wall, as long as occasional contact is prevented.
- When using metal tanks, it is preferable to mount probes (1) eccentrically.



L00-FMP4xxxx-17-00-00-yy-049

Installation in stilling well or bypass

- Rod and rope probes can also be installed in pipes (stilling well, bypass).
- When installing in metal pipes up to DN150/6", the measuring sensitivity of the device increases such that liquids as of DK 1.4 can be measured.
- 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 (FMP45 only, → 56 ff "Type of probe:").

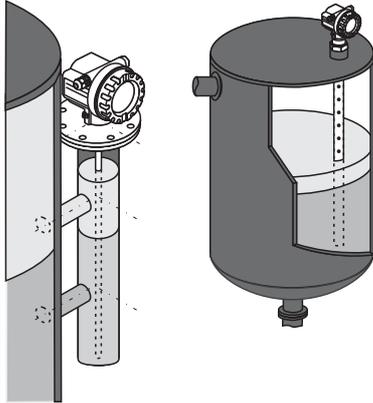
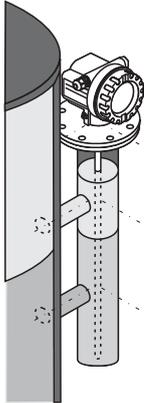


L00-FMP4xxxx-17-00-00-yy-023

Operating conditions: installation with interface measurement

General information on interface measurement

The Levellflex M with the "Interface" electronics version ("power supply, output" feature) is 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
	 <p style="text-align: center; font-size: small;">L00-FMP4xxxx-15-00-00-xx-001</p>	 <p style="text-align: center; font-size: small;">L00-FMP4xxxx-15-00-00-xx-002</p>
Function	<ul style="list-style-type: none"> ■ 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 SV0107
Digital Communication	HART	HART, PROFIBUS PA, FOUNDATION Fieldbus
Ordering information	FMP41C - ## ### K ##### FMP45 - ### ### K #####	FMP41C/45 - ... D ###Y (PROFIBUS PA) FMP41C/45 - ... F ###Y (FOUNDATION Fieldbus) Y = Special version available on request

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

- The DK of the upper medium must be known and constant. The DK can be determined with the aid of the DK manual SD106F. In addition, whenever the interface thickness is existing and known, the DK can be calculated automatically via FieldCare.
- The DK of the upper medium may not be greater than 10.
- The DK difference between the upper medium and lower medium must be >10.
- The interface must have a minimum thickness of 60 mm (interface electronics version) or 100 mm (special version).
- Emulsion layers in the vicinity of the interface can severely dampen the signal. However, emulsion layers up to 50 mm are permitted.

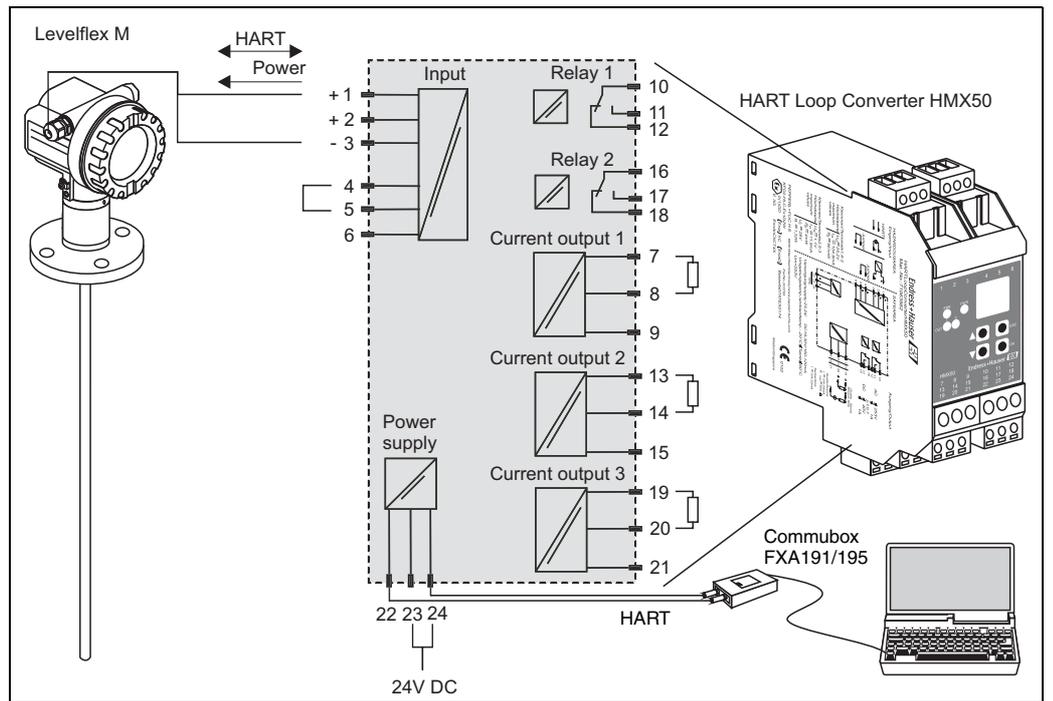
Interface electronics version:

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	<ul style="list-style-type: none"> ■ Interface ■ Total level ■ Thickness of the upper layer 	The "primary value" is permanently assigned to the 4 to 20mA current output
Secondary Value	<ul style="list-style-type: none"> ■ Interface ■ Total level ■ Thickness of the upper layer 	—
Tertiary Value	<ul style="list-style-type: none"> ■ 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)

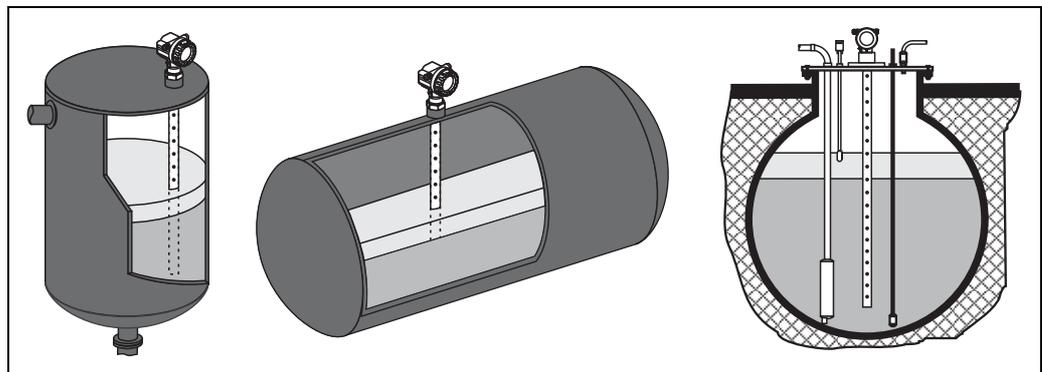
The HART loop converter HMX50 can be acquired using the order number 71063562. Additional documentation: TI429F and BA371F.

Probe selection (see overview on → 6-7)

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

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 (only FMP45).
- 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.



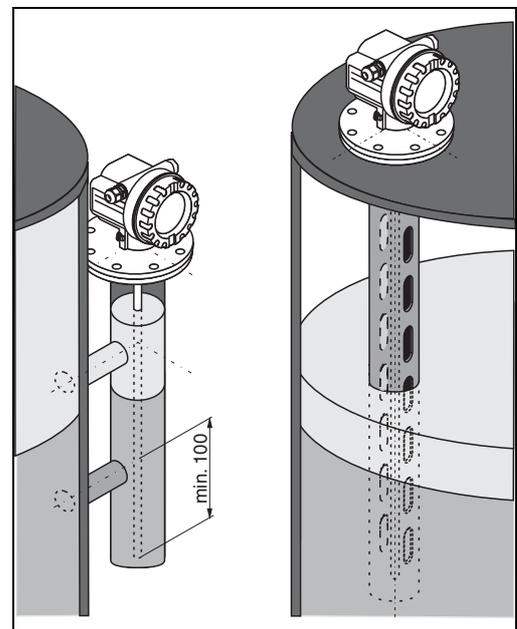
100-FMP41cx-17-00-00-xx-002

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 (see Accessories → 62).



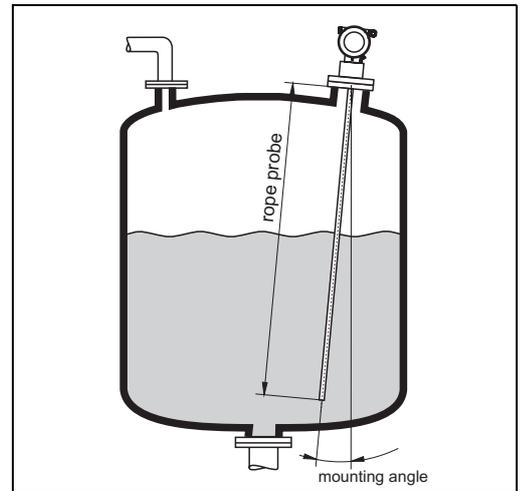
100-FMP41cx-17-00-00-xx-003

Operating conditions: general installation instructions for special installation situations

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°.

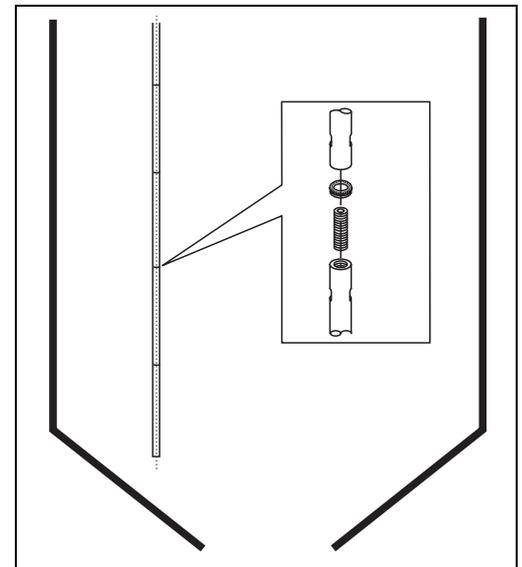


L00-FMP4xxxx-17-00-00-en-048

Separable probes

If there is little mounting space (distance to the ceiling), it is advisable to use separable rod probes (Ø16 mm).

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

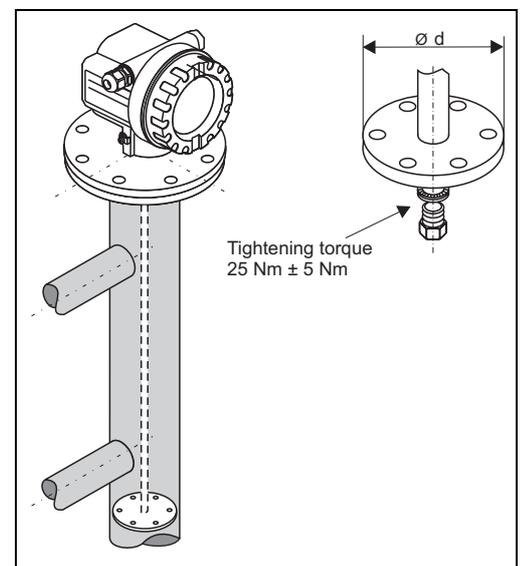


L00-FMP4xxxx-17-00-00-xx-015

Centering of probe end (FMP45 only)

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 (for DN50 / 2" + DN65 / 2 1/2")
 - d = 75 mm (for DN80 / 3" + DN100 / 4")

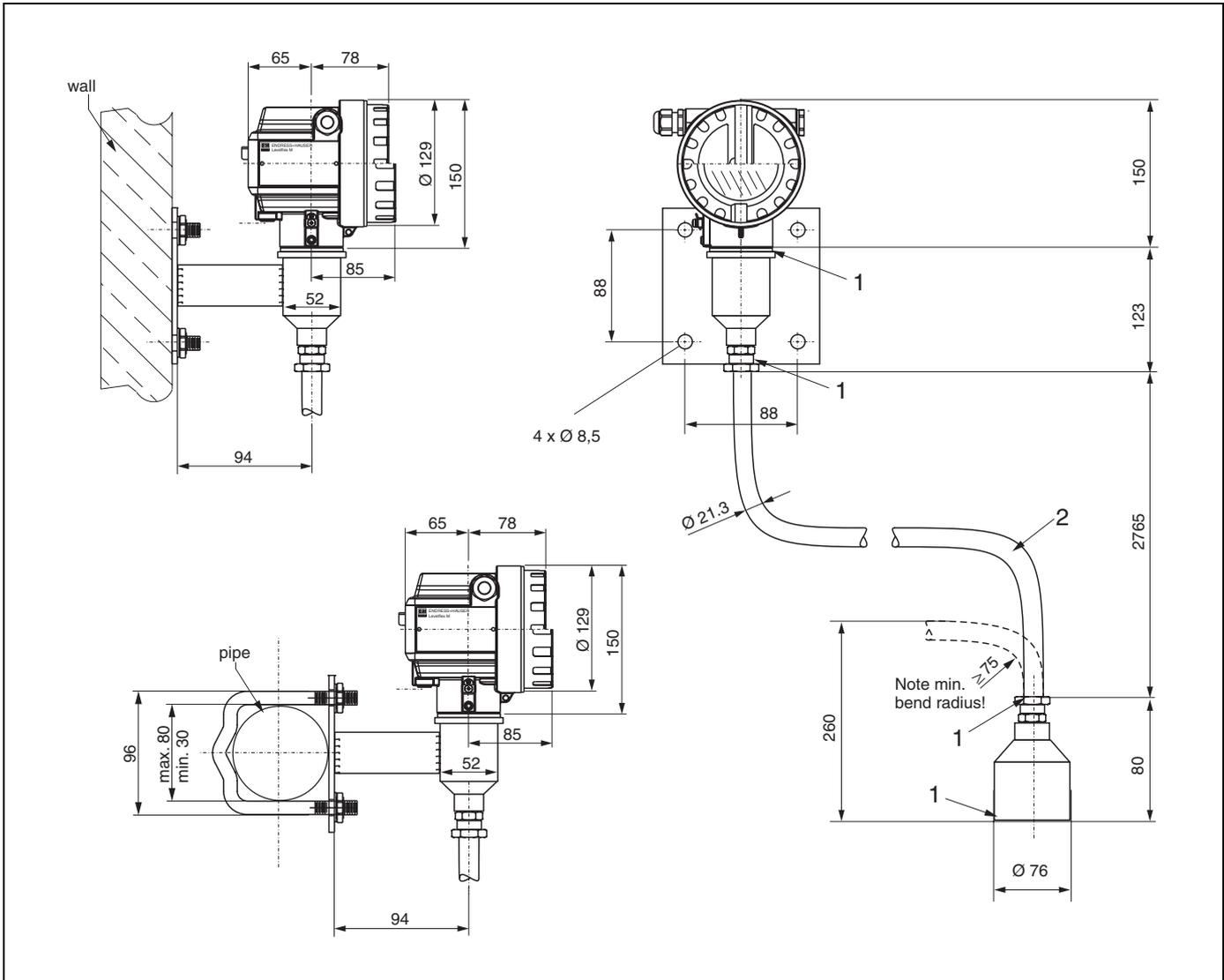


L00-FMP4xxxx-17-00-00-en-068

Installation for difficult-to-access process connections

Installation with remote electronics

- When installing, follow the instructions on → 25.
- Mount housing on a wall or pipe (vertically or horizontally) as shown in the diagram.



L00-FMP4xxxx-17-00-00-en-015



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.

FMP45: For the remote electronics, temperatures up to 280 °C or 400 °C (depending on the instrument version) are admissible at the process connection.

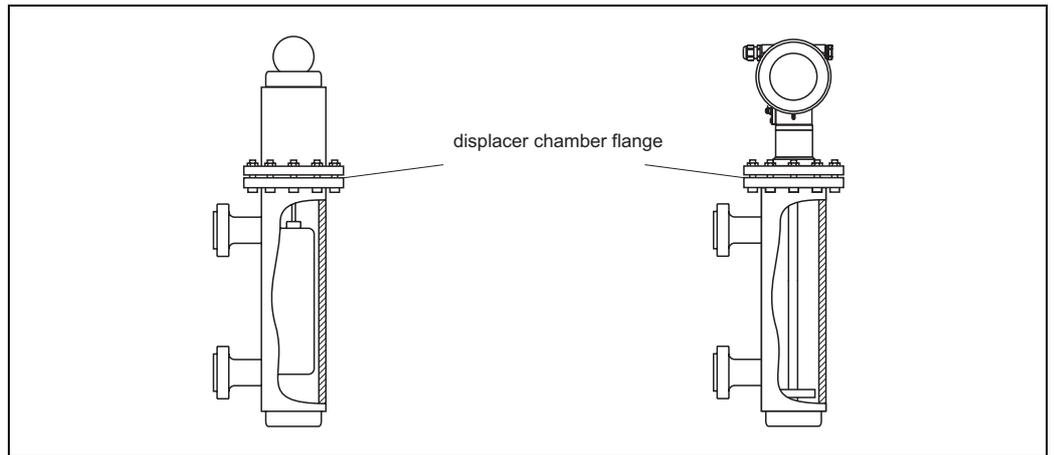
The version with remote electronics consists of the probe, a connecting cable and the housing. If they are ordered as a complete unit they are assembled when delivered.

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 Maseoilan 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-FMP41xx-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 (see probe selection → 6-7).
- 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 (→ 56 ff "Type of probe:").
- 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 (see Accessories → 62).

Operating conditions: Environment

Ambient temperature range

Ambient temperature at the electronics: -40 °C to +80 °C

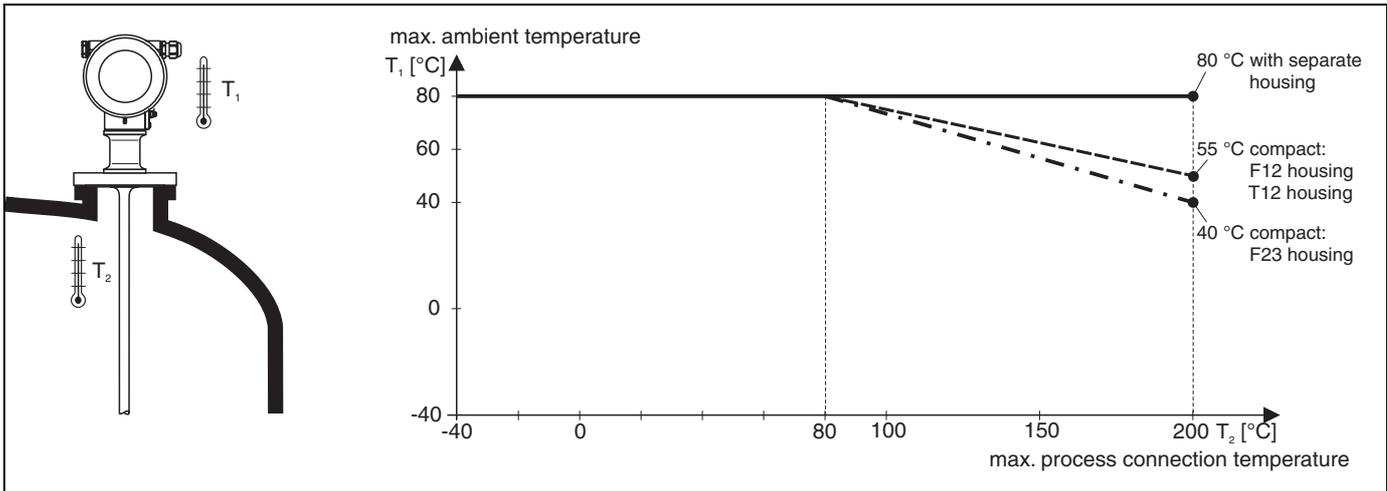
The function of the LCD display is restricted at $T_A < -20$ °C and $T_A > +60$ °C.

A weather protection cover should be used for outdoor operation if the device is exposed to direct sunlight.

Ambient temperature limits

FMP41C

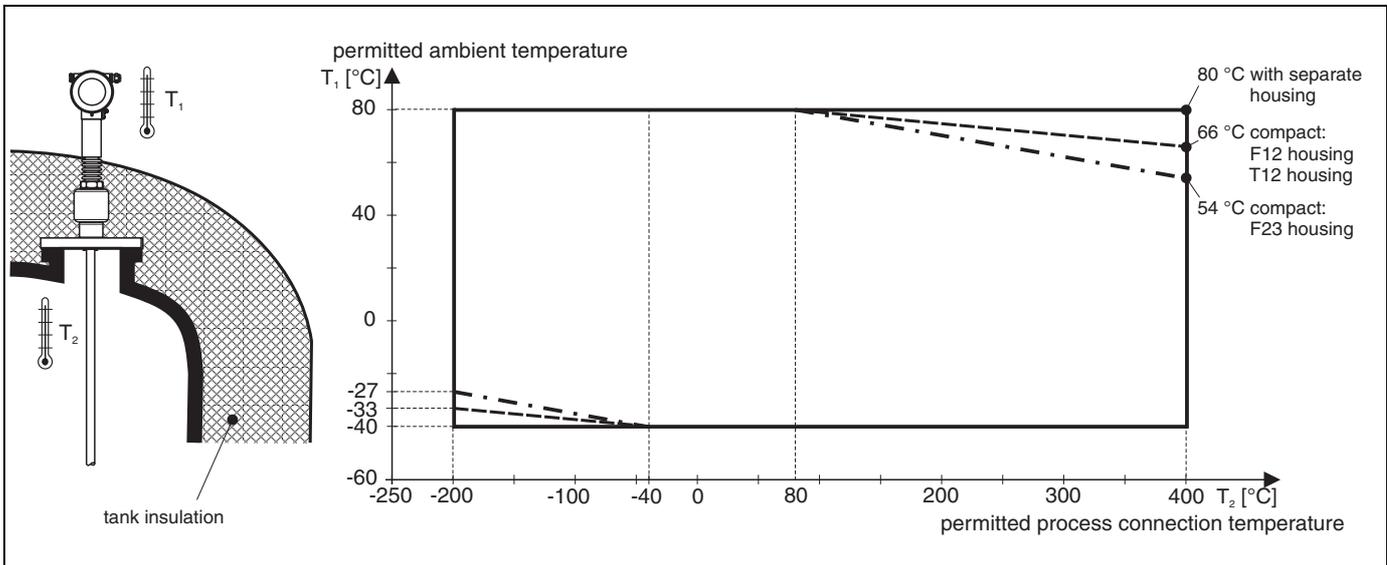
If the temperature (T_2) at the process connection is above 80 °C, the permitted ambient temperature (T_1) decreases as per the following diagram (temperature derating):



L00-FMP41xxxx-05-00-00-en-001

FMP45 (HT 400 °C)

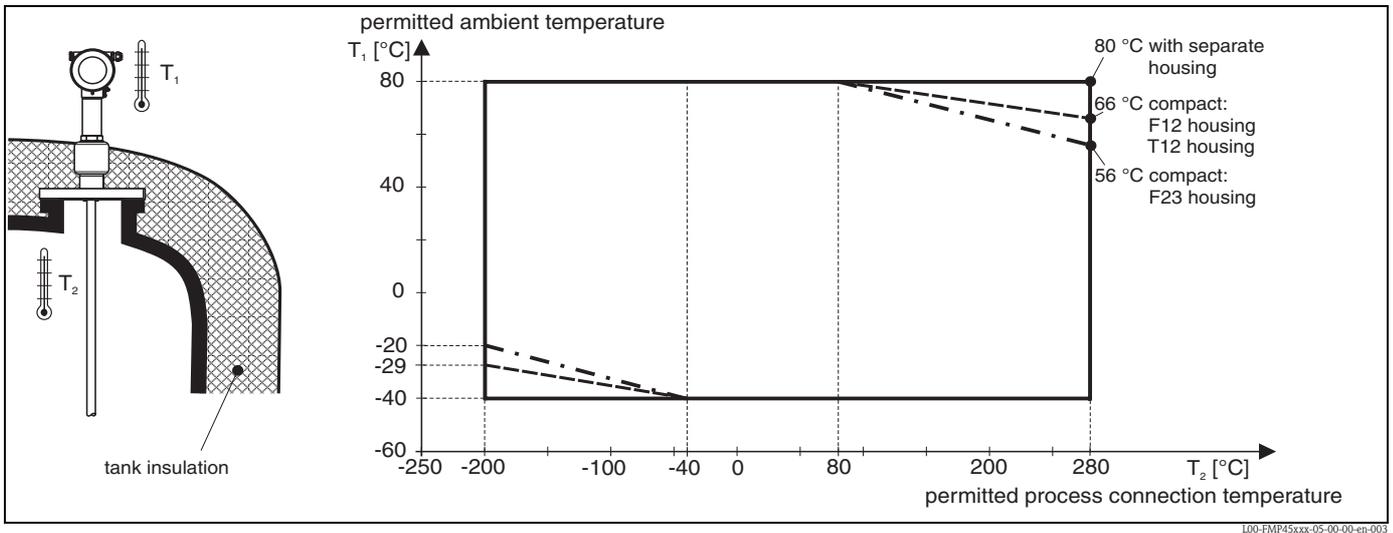
If the temperature (T_2) at the process connection is below > -40 °C or above > +80 °C, the permitted ambient temperature (T_1) is limited as shown in the following diagram (temperature derating):



L00-FMP45xxxx-05-00-00-en-002

FMP45 (XT 280 °C)

If the temperature (T_2) at the process connection is below > -40 °C or above $> +80$ °C, the permitted ambient temperature (T_1) is limited as shown in 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/s²)²/Hz

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

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

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

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

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

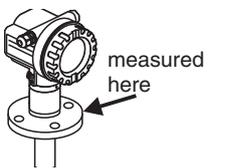
Operating conditions: Process

Process temperature range

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

FMP41C

Min. temperature	Max. temperature
-40 °C (-40 °F)	+200 °C (392 °F)

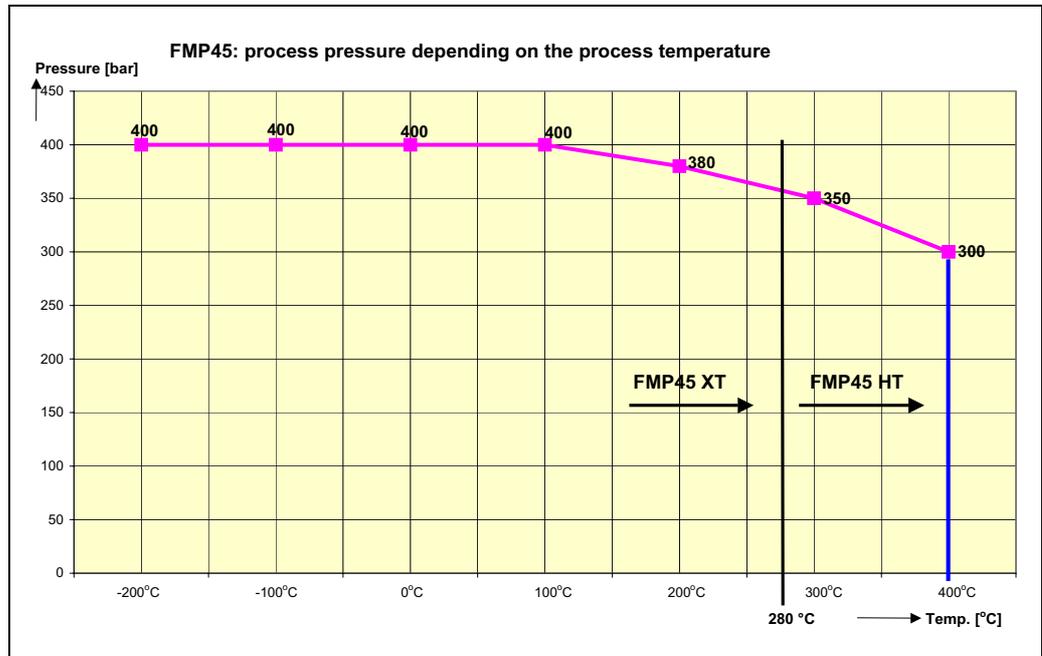


High process temperatures (> 150 °C/302 °F) may possibly accelerate diffusion of the process medium through the probe coating, which may reduce the operating time.

Recommendation: Use FMP45

For FMP41C with E+H universal adapter: 0 °C ... 150 °C (32 °F...302 °F).

FMP45



100-FMP45xxx-05-00-00-en-001

Process pressure limits

This range may be reduced by the process connection selected.

The pressure rating (PN) specified on the flanges refers to a reference temperature of 20°C, and to 100°F for ASME flanges. Pay attention to pressure-temperature dependencies.

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

- EN 1092-1: 2001 Tab. 18

With regard to their temperature stability properties, the materials 1.4435 and 1.4404 are grouped under 13E0 in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.

- ASME B 16.5a - 1998 Tab. 2-2.2 F316
- ASME B 16.5a - 1998 Tab. 2.3.8 N10276
- JIS B 2220

FMP41C

Depends on process connection, -1 ... 40 bar (over the entire temperature range)

For FMP41C with E+H universal adapter: max. 6 bar (87 psi).

For FMP41C with Clamp see ordering Information on → 53.

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. Pay attention to pressure-temperature dependencies.

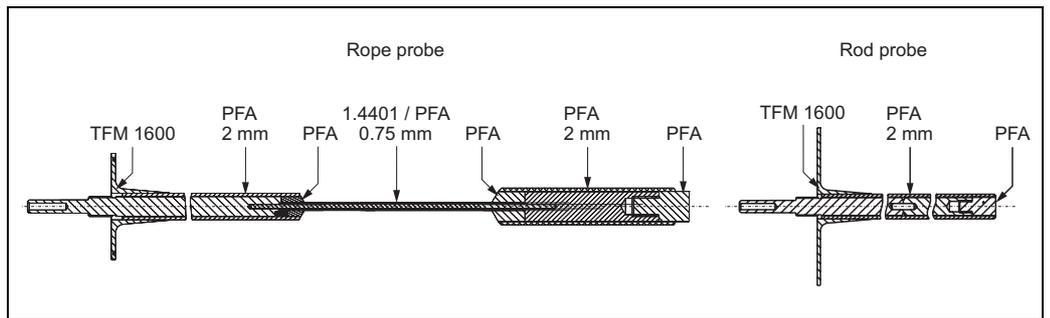
FMP45

See pressure/temperature diagram in chapter "Operating conditions: Process".

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. Pay attention to pressure-temperature dependencies.

Materials in contact with process



L00-FMP4xxxx-16-00-00-en-002

FMP41C

	Material	Approval
Rod probe, Rope probe	PFA (Daikin PFA AP230)	FDA
Cladding	PTFE (Dyneon TFM1600)	FDA, 3A

FMP45

	Rod and coax probe	Rope probe
Process connection	Stainless steel 1.4435/316L Alloy C22 ceramic Al ₂ O ₃ , 99.7% pure graphite	Stainless steel 1.4435/316L Alloy C22 ceramic Al ₂ O ₃ , 99.7% pure graphite
Probe	Stainless steel 1.4435/316L	Stainless steel 1.4401/316L

DIN/EN flanges

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

Dielectric constant

FMP41C

- Rod and rope probe: $\epsilon_r \geq 1.6$
- When installing in metallic pipes DN ≤ 150 mm: $\epsilon_r \geq 1.4$

FMP45

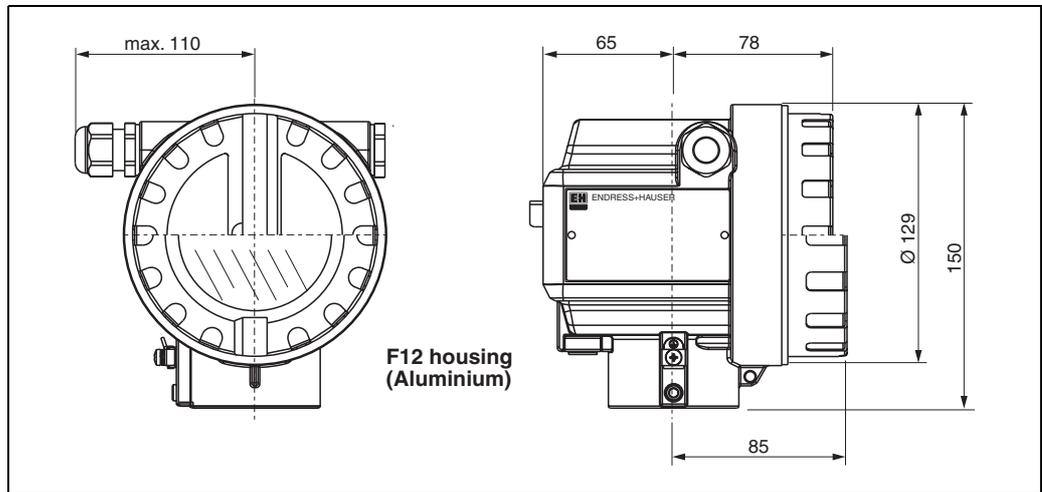
- Rod and rope probe: $\epsilon_r \geq 1.6$, when installing in pipes DN ≤ 150 mm: $\epsilon_r \geq 1.4$
- Coax probes: $\epsilon_r \geq 1.4$

Mechanical construction

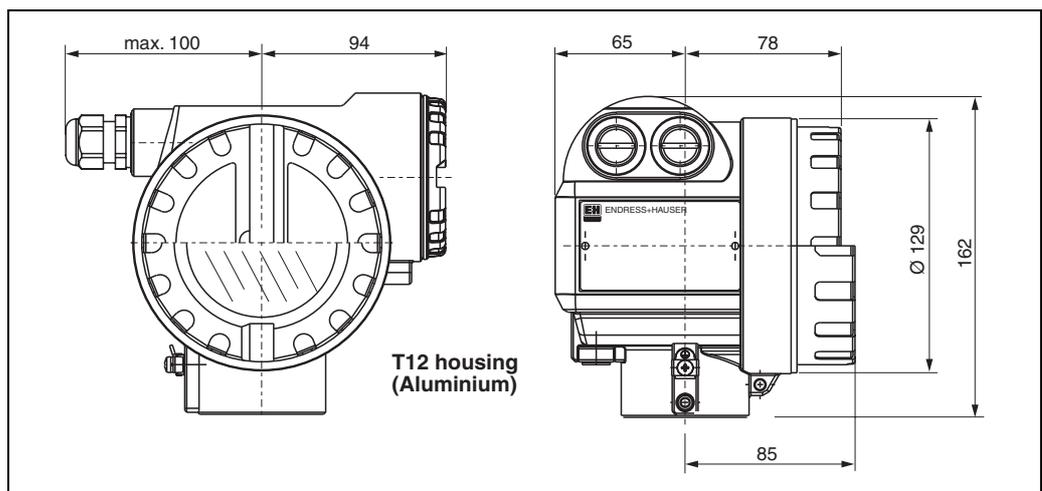
Design, dimensions

Housing dimensions

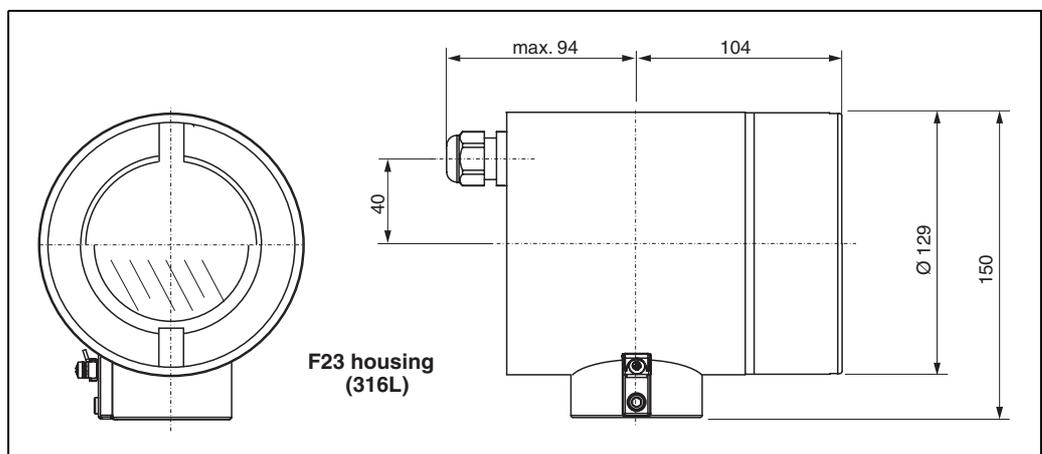
Dimensions for process connection and probe type → 41.



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



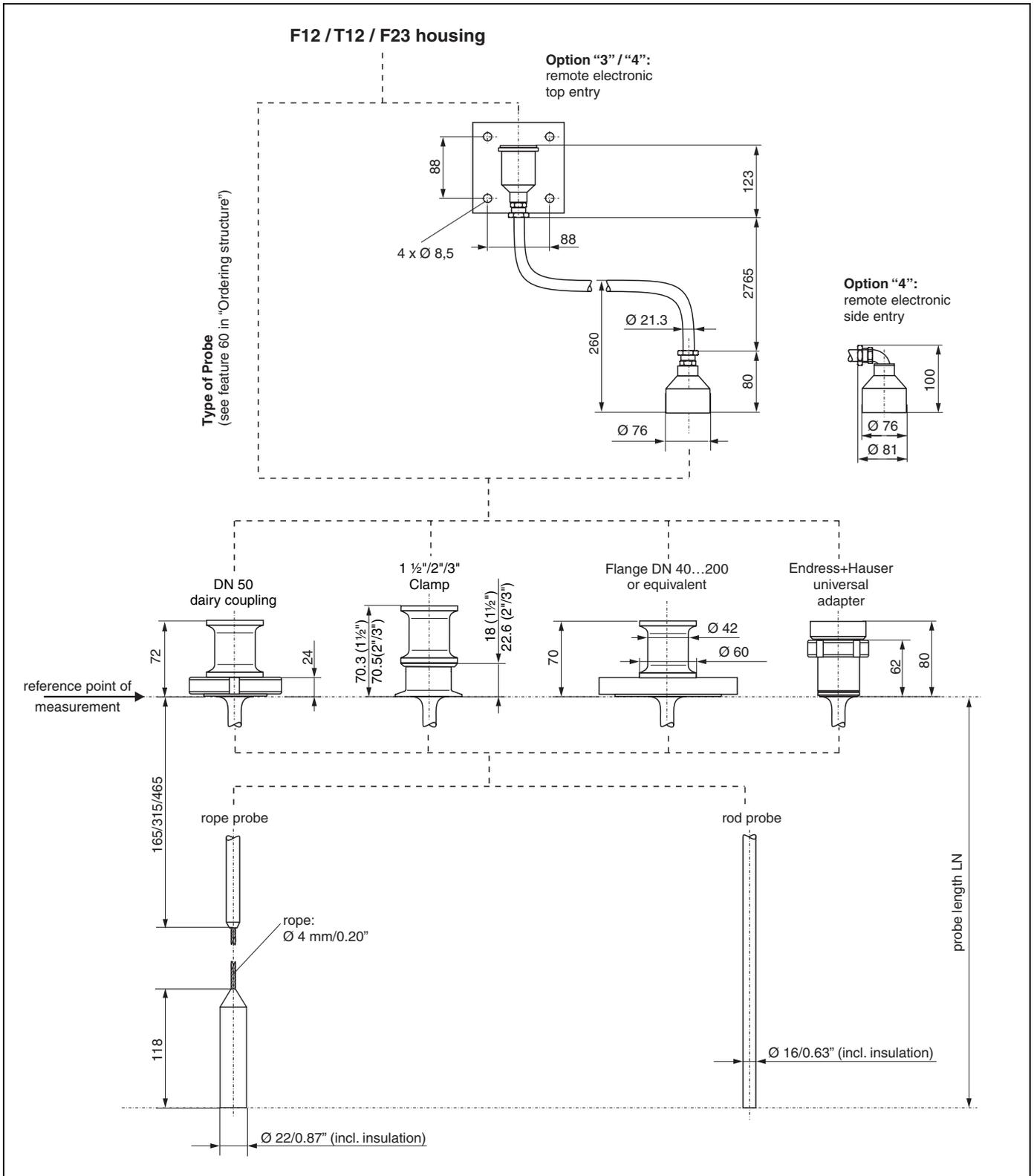
L00-T12xxxx-06-00-00-en-001



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

Levelflex M FMP41C - process connection, type of probe

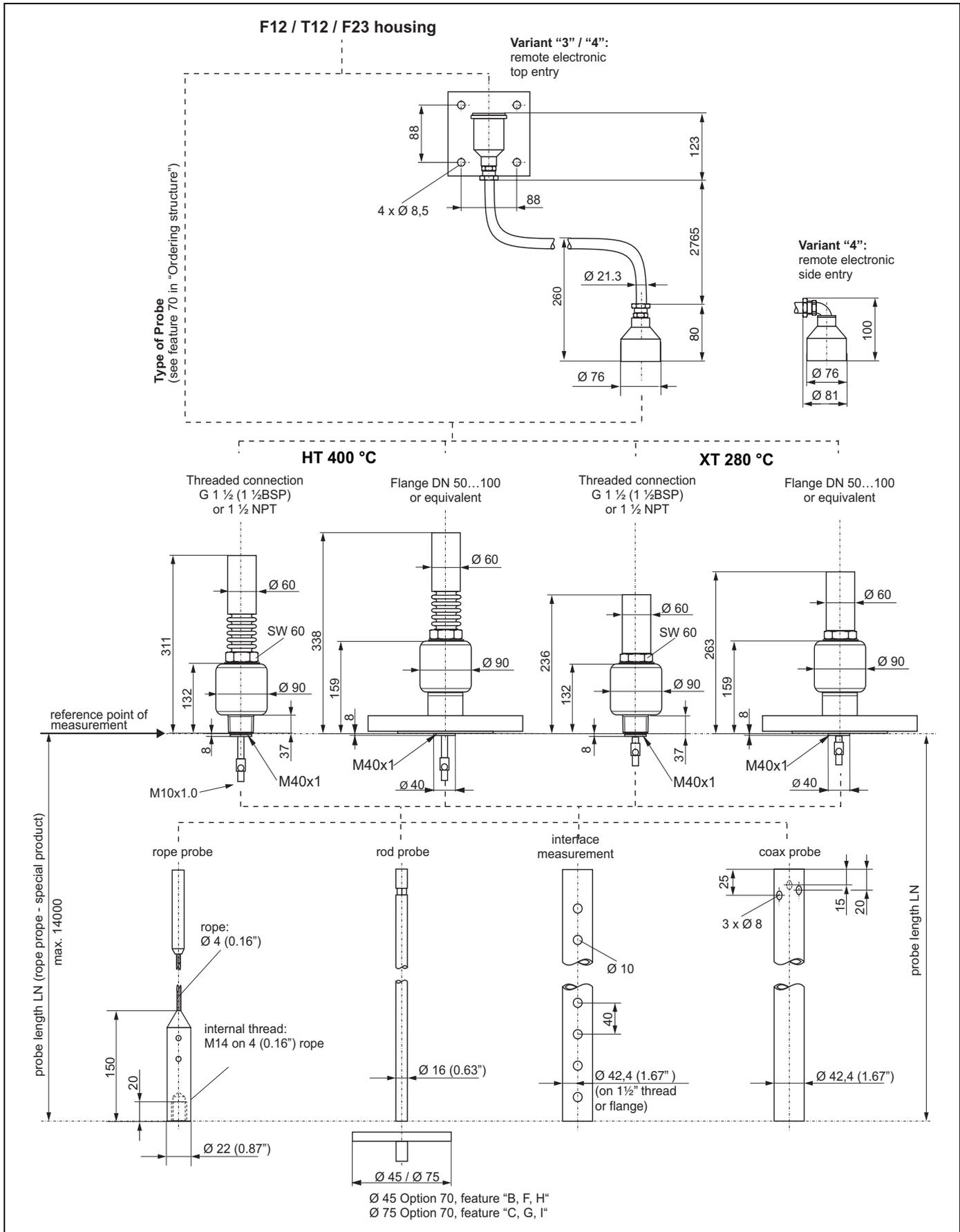
Housing dimensions → 40



L00-FMP41xxx-06-00-00-en-001

Levelflex M FMP45 - process connection, type of probe

Housing dimensions see Page 40



L00-FMP451xx-0c-00-00-es-001

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 Ra 3.2. Lower roughness levels are available on request.

Tolerance of probe length

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

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

Weight

Levelflex M	FMP41C	
	Rod probe	Rope probe
Weight with F12 or T12 housing	approx. 3.5 kg + approx. 1.1 kg/m Probe length + weight of flange	approx. 3.5 kg + approx. 0.5 kg/m Probe length + weight of flange
Weight with F23 housing	approx. 6.8 kg + approx. 1.1 kg/m Probe length + weight of flange	approx. 6.8 kg + approx. 0.5 kg/m Probe length + weight of flange

Levelflex M	FMP45					
	XT version (max. 280 °C)			HT version (max. 400 °C)		
	Rod probe	Rope probe	Coax probe	Rod probe	Rope probe	Coax probe
Weight with F12 or T12 housing	approx. 8.5 kg + Approx. 1.6 kg/m Probe length + weight of flange	approx. 8.5 kg + Approx. 0.1 kg/m Probe length + weight of flange	approx. 8.5 kg + Approx. 3.5 kg/m Probe length + weight of flange	approx. 9.5 kg + Approx. 1.6 kg/m Probe length + weight of flange	approx. 9.5 kg + Approx. 0.1 kg/m Probe length + weight of flange	approx. 9.5 kg + Approx. 3.5 kg/m Probe length + weight of flange
Weight with F23 housing	approx. 12 kg + Approx. 1.6 kg/m Probe length + weight of flange	approx. 12 kg + Approx. 0.1 kg/m Probe length + weight of flange	approx. 12 kg + Approx. 3.5 kg/m Probe length + weight of flange	approx. 13 kg + Approx. 1.6 kg/m Probe length + weight of flange	approx. 13 kg + Approx. 0.1 kg/m Probe length + weight of flange	approx. 13 kg + Approx. 3.5 kg/m Probe length + weight of flange

Material

- Housing:
 - housing F12/T12: aluminum (AlSi10Mg), seawater-resistant, powder-coated
 - Housing F23: 316L, corrosion-resistant steel
- Sight window: glass

Process connection

See "Ordering information" on → 53-57.

Probe

See "Ordering information" on → 53-57.

Human interface

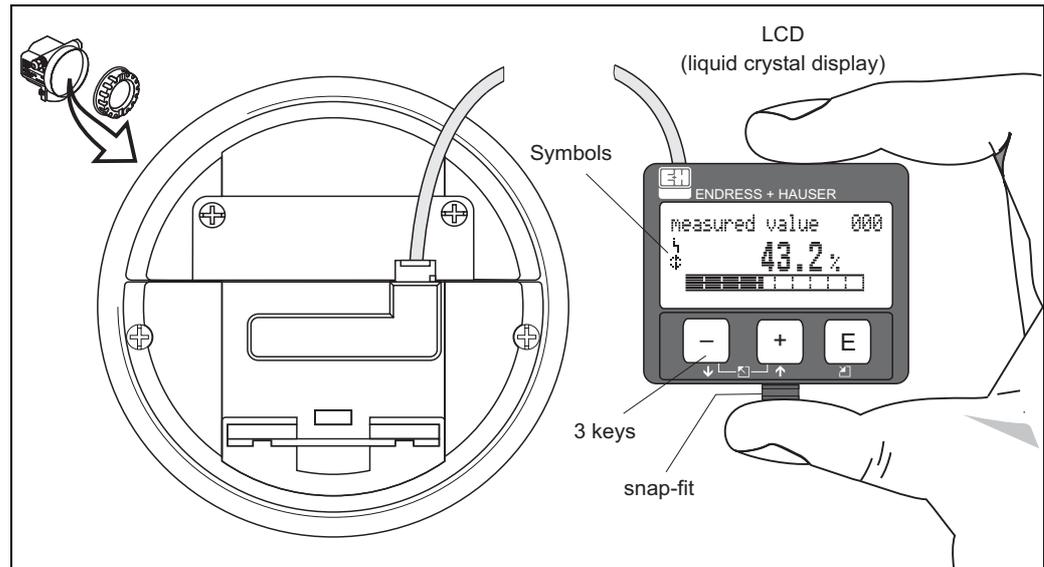
Operating concept

The display of the measured value and the configuration of the Levelflex occur locally by means of a large 4-line plain-text display. The guided menu system with integrated help texts ensures 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 instrument is in an alarm state. If the symbol flashes, this indicates a warning.
	LOCK_SYMBOL This lock symbol appears when the instrument 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

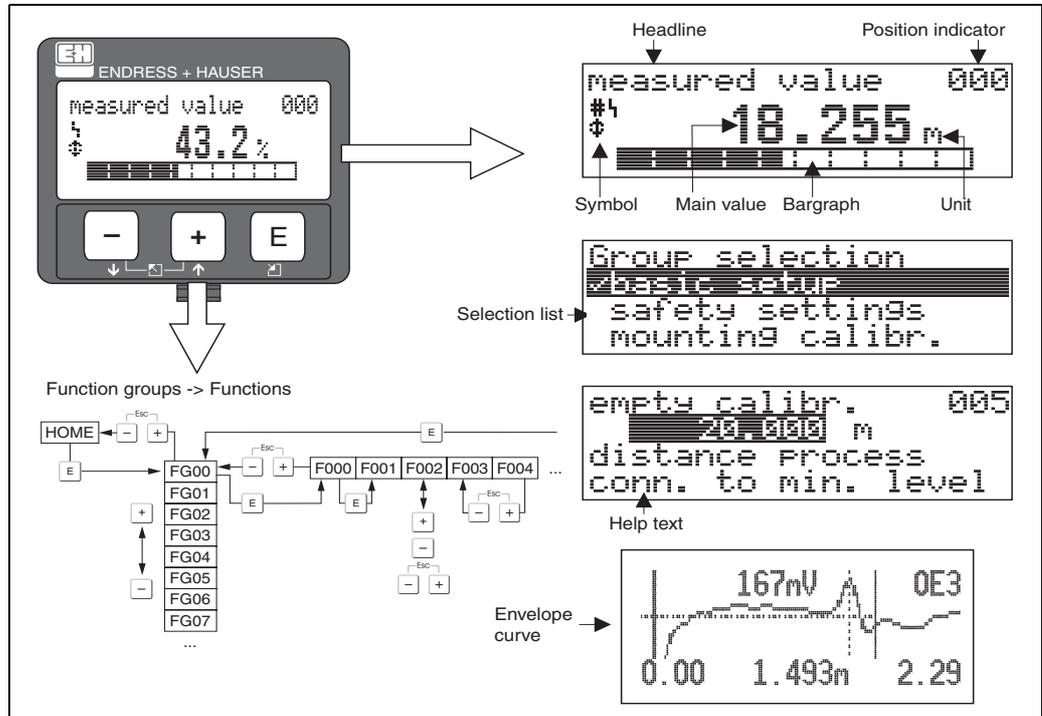
Key(s)	Meaning
 or 	Navigate upwards in the selection list Edit numeric value within a function
 or 	Navigate downwards in the selection list Edit numeric value within a function
  or 	Navigate to the left within a function group
	Navigate to the right within a function group, confirmation.
 and  or  and 	Contrast settings of the LCD
 and  and 	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

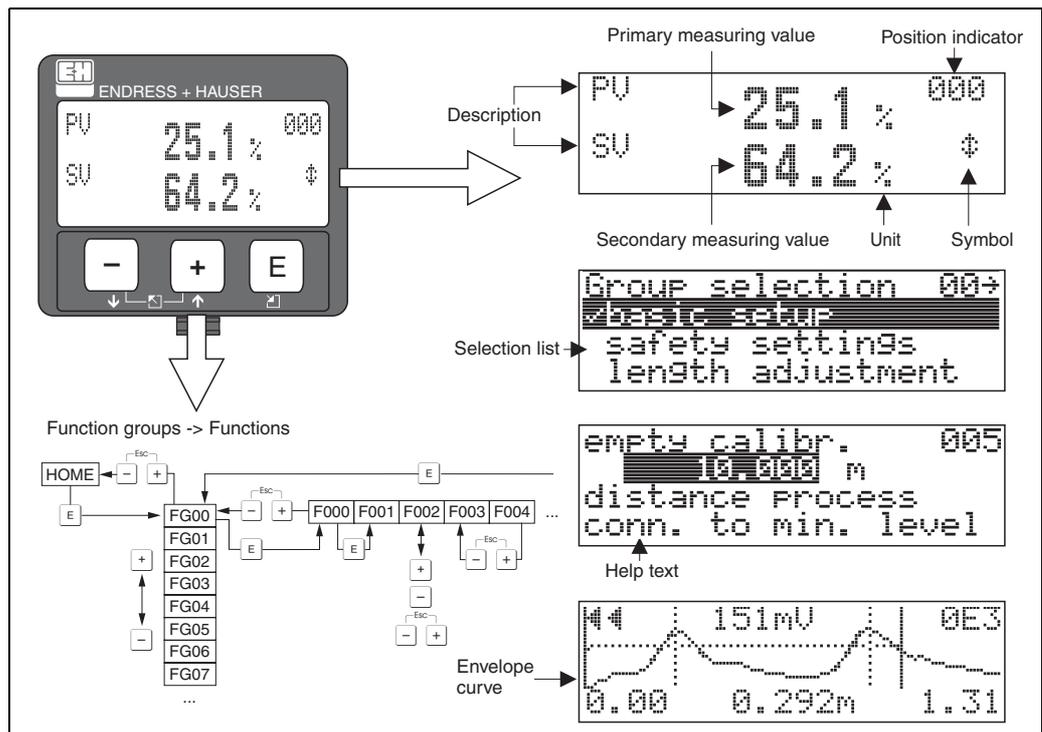
The LC-Display VU331 allows configuration via 3 keys directly at the instrument. All device functions can be set through a menu system. The menu consists of function groups and functions. Within a function, application parameters can be read or adjusted. The user is guided through a complete configuration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

Display for level measurement



L00-FMRxxxx-07-00-00-en-002

Display for interface measurement



L00-FMP41cx-07-00-00-en-002

Remote operation

The Levellflex 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. It is compatible with the following operating systems: Win2000, WinXP and Windows Vista.

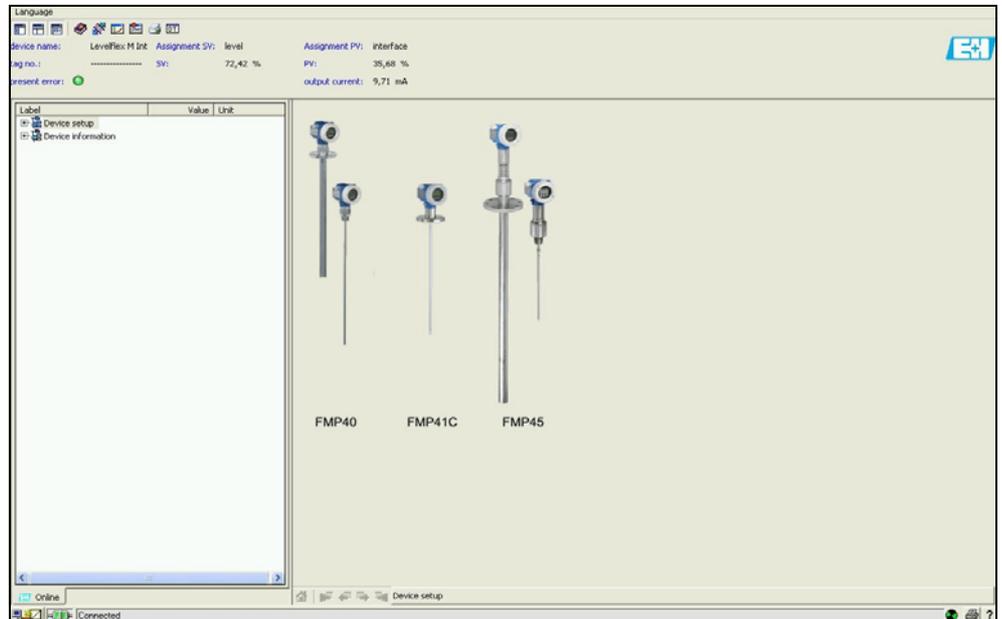
FieldCare supports the following functions:

- 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:

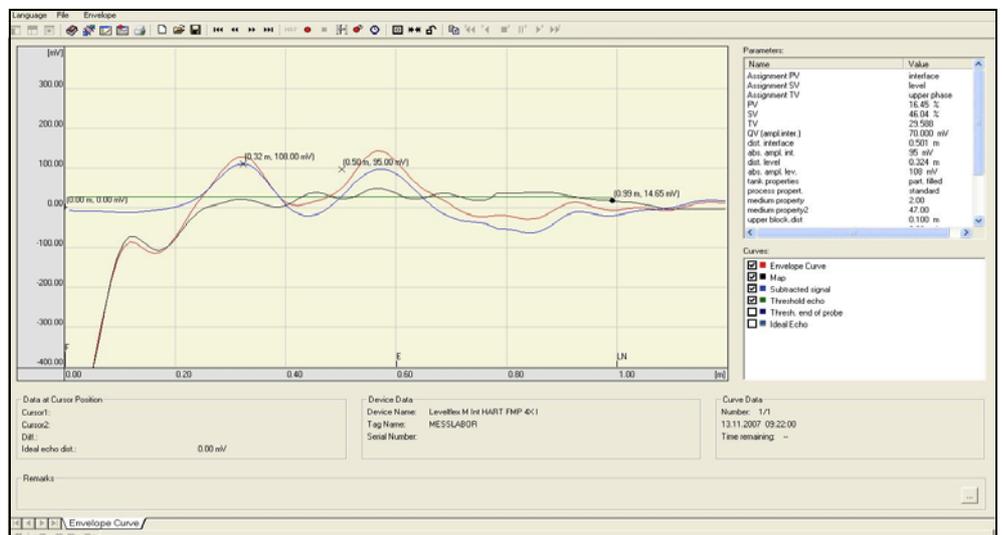
- HART via Commubox FXA191 and the RS 232 C serial port of a computer
- HART via Commubox FXA195 and the USB port of a computer
- PROFIBUS PA via segment coupler and PROFIBUS interface card

Menu-guided commissioning



L00-fmp-1xxx-20-00-00-en-033

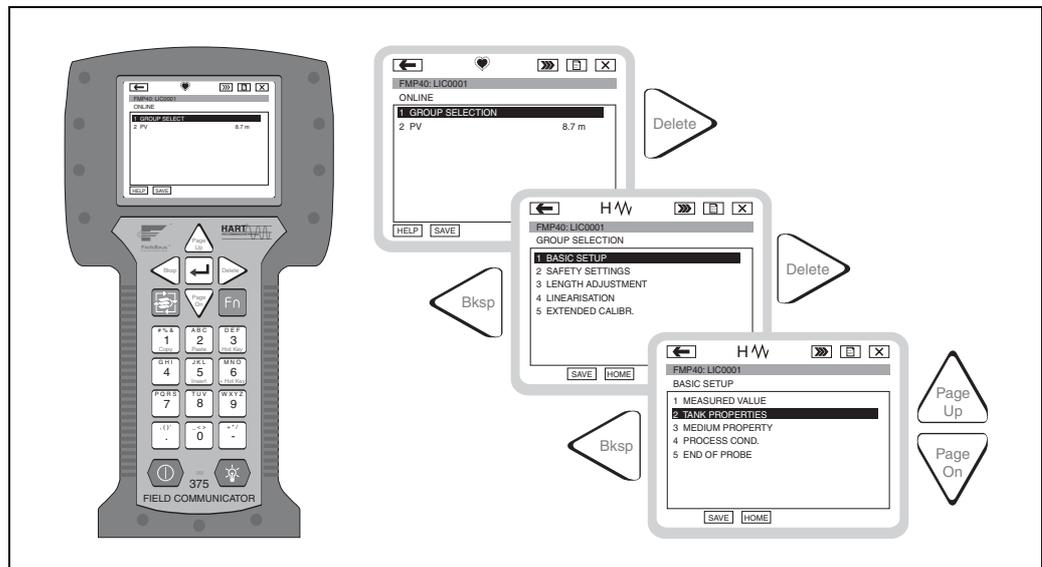
Signal analysis via envelope curve



L00-fmp-1xxx-20-00-00-en-034

Operation with handheld terminal Field Communicator 375

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



L00-FMPxxxxx-07-00-00-yy-005



Note!

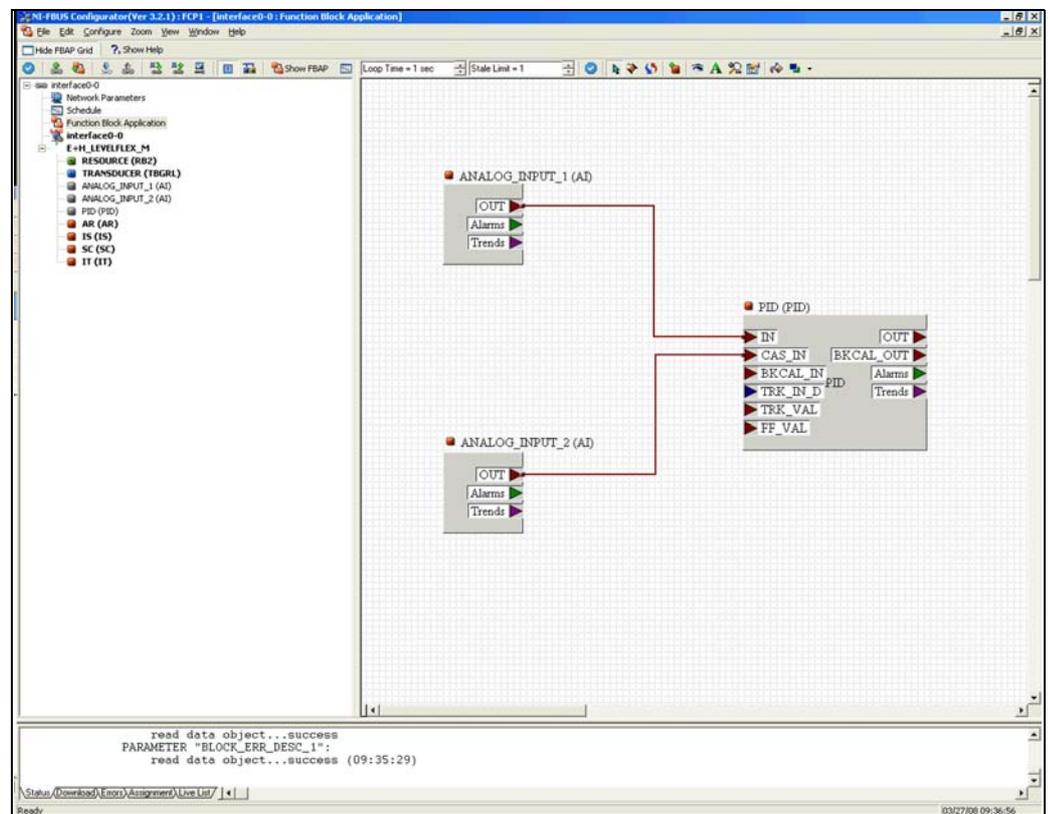
- Further information on the HART handheld terminal is given in the appropriate Operating Instructions included in the carrying case of the Field Communicator 375.

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



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 See "Ordering information" on → 53-57.

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

Assignment of the certificates (XA, ZD, ZE) to the device:

FMP41C:

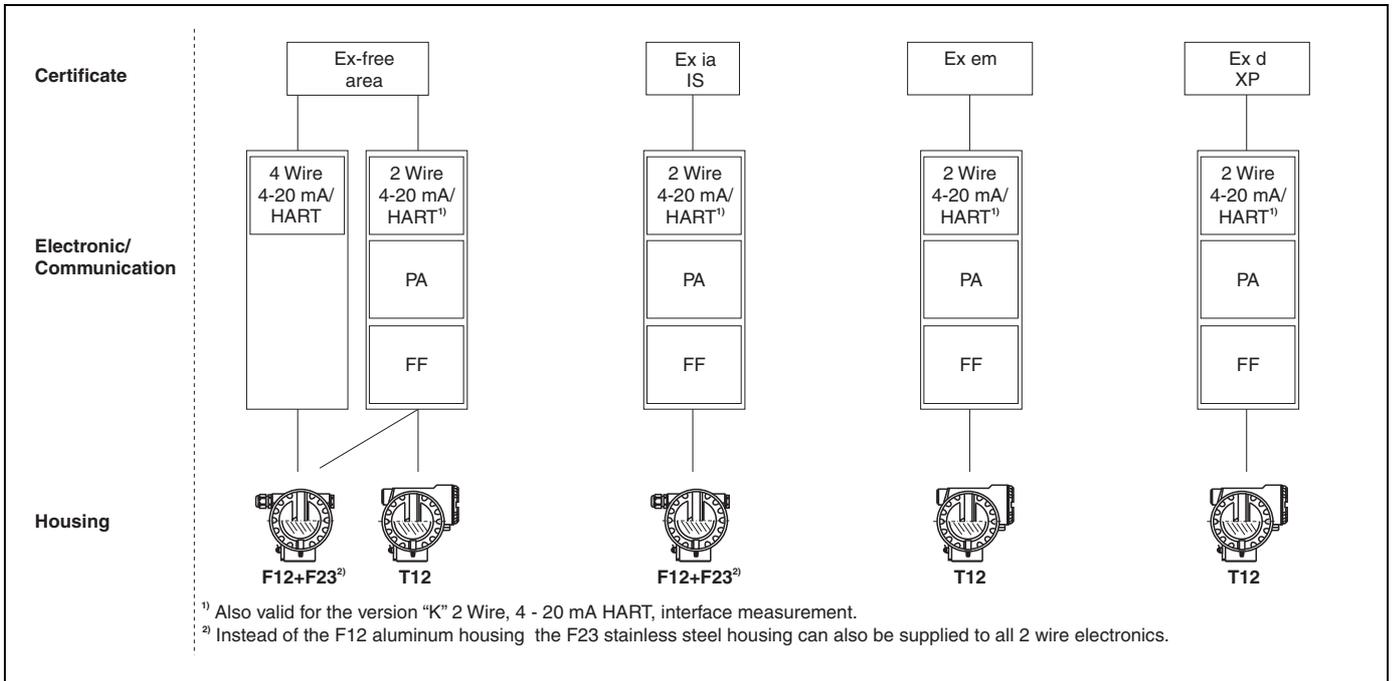
Feature	Variant	ZE256F	ZD199F	ZD176F	ZD177F	ZD188F	ZD174F	ZD173F	ZD172F	ZD021F	ZD166F	ZD165F	ZD163F	ZD162F	ZD159F	ZD158F	ZD157F	XA405F	XA404F	XA388F	XA387F	XA377F	XA329F	XA274F	XA273F	XA272F	XA270F	XA269F	XA268F	XA264F	XA263F	XA261F		
10 Approval:	Non-hazardous area	A																																
	NEPSI Ex em(ia) IIC T6	C																				X												
	Non-hazardous area, WHG	F	X																															
	ATEX II 3G EEx 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																																
	CSA General Purpose	N																																
	*NEPSI DIP	Q																																
	NEPSI Ex nA II T6	R																					X											
	FM IS Cl.I,II,III Div.1 Gr.A-G N.I.	S									X	X	X	X	X	X	X	X																
	FM XP Cl.I,II,III Div.1 Gr.A-G	T														X																		
	CSA IS Cl.I,II,III Div.1 Gr.A-D,G+	U	X	X	X	X				X	X																							
	CSA XP Cl.I,II,III Div.1 Gr.A-D,G+	V					X																											
	ATEX II 1/2G EEx ia IIC T6 Note safety instruction (XA) (electrostatic charging)!	1																								X	X						X	X
	ATEX II 2G EEx em (ia) IIC T6 Note safety instruction (XA) (electrostatic charging)!	3																															X	
	ATEX II 1/2G EEx ia IIC T6,ATEX II 1/3D Note safety instruction (XA) (electrostatic charging)!	5																							X			X						
	ATEX II 1/2G EEx ia IIC T6, WHG Note safety instruction (XA) (electrostatic charging)!	6	X																							X	X						X	X
	ATEX II 1/2G EEx d (ia) IIC T6 Note safety instruction (XA) (electrostatic charging)!	7																																X
ATEX II 1/2G EEx ia IIC T6 Note safety instruction (XA) (electrostatic charging)!	8	X																						X			X							
40 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	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	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	X	X	X	X	X	X	X	X	
	4-wire 90-250VAC 4-20mA SIL HART	G																																
	4-wire 10.5-32VDC 4-20mA SIL HART	H																																
70 Housing:	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	X	X	X	X	X		
	F12 Alu, coated IP68 NEMA6P	A															X	X	X	X	X	X	X									X	X	
	F23 316L IP68 NEMA6P	B		X	X													X	X	X	X	X	X											
	T12 Alu, coated IP68 NEMA6P	C			X														X	X	X	X	X									X	X	
80 Cable entry:	T12 Alu, coated IP68 NEMA6P + OVP	D	X	X							X	X	X					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
	thread M20 (EEx d > thread M20)	2																					X	X	X	X								
	thread G1/2	3																					X	X	X	X								
	thread NPT1/2	4																					X	X	X	X								
	Plug M12	5																					X	X	X									
Plug 7/8"	6																					X	X	X										

Overspill protection	WHG. See "Ordering information" on → 53-57 (see ZE256F/en). SIL 2, for 4...20 mA output signal (see SD174F/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. In addition, all probes in metallic tanks as well as the coax probe of the FMP45 meet the requirements for a Class B digital device.
External standards and guidelines	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. <ul style="list-style-type: none">■ NE 21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.■ NE 43 Standardization of the signal level for the failure information of digital transmitters.
Pressure Equipment Directive	The FMP45 corresponds to the 97/23/EC Directive (Pressure Equipment Directive). It is a pressure accessory with a volume < 0.1 l, corresponding to Category I. Conformity assessment was carried out as per Module A, the design as per EN 13445 and AD 2000 technical specifications. FMP45 is not suitable for use with unstable gases at nominal pressures above 200 bar.
Steam boiler approval	The FMP45 is approved as a limiting device for high water (HW) and low water (LW) for liquids in containers which are subject to the requirements of EN12952-11 and EN12953-9 (certified by TÜV Nord). See "Ordering information" → 58. Further information can be found in the safety instructions for steam boiler approval (SD288F/00/en).

Ordering information

Levelflex M FMP41C

Instrument selection



L00-FMP41xxx-16-00-00-en-002



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.

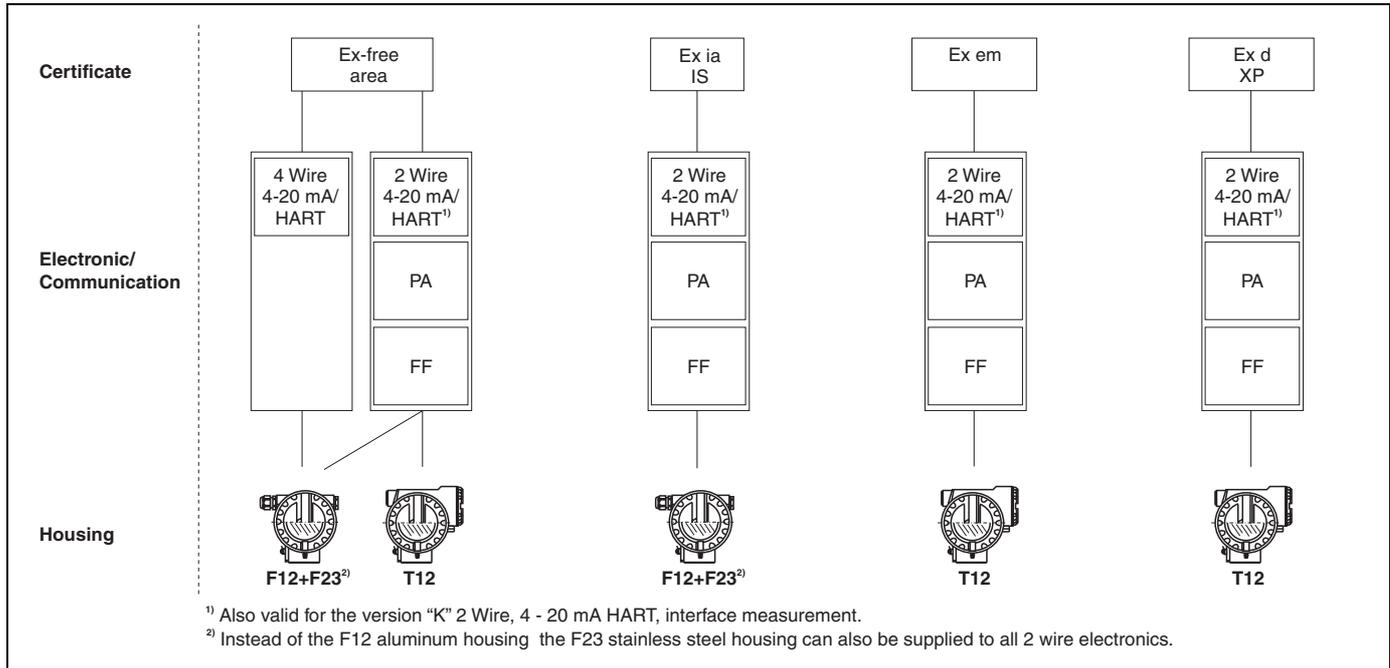
Versions that mutually exclude one another are not marked.

Ordering structure Levellflex M FMP41C

10	Approval:
	<p>A Non-hazardous area</p> <p>F Non-hazardous area, WHG</p> <p>1 ATEX II 1/2G Ex ia IIC T6 Note safety instruction (XA) (electrostatic charging)!</p> <p>3 ATEX II 2G Ex em (ia) IIC T6 Note safety instruction (XA) (electrostatic charging)!</p> <p>5 ATEX II 1/2G Ex ia IIC T6, ATEX II 1/3D Note safety instruction (XA) (electrostatic charging)!</p> <p>6 ATEX II 1/2G Ex ia IIC T6, WHG Note safety instruction (XA) (electrostatic charging)!</p> <p>7 ATEX II 1/2G Ex d (ia) IIC T6 Note safety instruction (XA) (electrostatic charging)!</p> <p>8 ATEX II 1/2G Ex ia IIC T6, ATEX II 1/3D, WHG Note safety instruction (XA) (electrostatic charging)!</p> <p>G ATEX II 3G Ex nA II T6</p> <p>C NEPSI Ex em(ia) IIC T6</p> <p>I NEPSI Ex ia IIC T6</p> <p>J NEPSI Ex d(ia) IIC T6</p> <p>Q *NEPSI DIP</p> <p>R NEPSI Ex nA II T6</p> <p>S FM IS Cl.I,II,III Div.1 Gr.A-G N.I.</p> <p>T FM XP Cl.I,II,III Div.1 Gr.A-G</p> <p>N CSA General Purpose</p> <p>U CSA IS Cl.I,II,III Div.1 Gr.A-D,G + coal dust, N.I.</p> <p>V CSA XP Cl.I,II,III Div.1 Gr.A-D,G + coal dust, N.I.</p> <p>K *TIIS Ex ia IIC T4</p> <p>L TIIS Ex d (ia) IIC T4</p> <p>Y Special version, to be specified</p>
20	Probe:
	<p>A mm, rope PFA>316, 150mm, Center rod, nozzle height max 150mm</p> <p>B mm, rope PFA>316, 300mm, Center rod, nozzle height max 300mm</p> <p>C mm, rope PFA>316, 450mm, Center rod, nozzle height max 450mm</p> <p>D inch, rope PFA>316, 6inch, Center rod, nozzle height max 6inch</p> <p>E inch, rope PFA>316, 12inch, Center rod, nozzle height max 12inch</p> <p>G inch, rope PFA>316, 18inch, Center rod, nozzle height max 18inch</p> <p>K mm, rod PFA>316L</p> <p>M inch, rod PFA>316L</p> <p>Y Special version, to be specified</p>
30	Process connection:
	<p>AEK 1-1/2" 150lbs RF, PTFE >316/316L flange ANSI B16.5</p> <p>AFK 2" 150lbs RF, PTFE >316/316L flange ANSI B16.5</p> <p>AGK 3" 150lbs RF, PTFE >316/316L flange ANSI B16.5</p> <p>AHK 4" 150lbs RF, PTFE >316/316L flange ANSI B16.5</p> <p>AJK 6" 150lbs RF, PTFE >316/316L flange ANSI B16.5</p> <p>AOK 1-1/2" 300lbs RF, PTFE >316/316L flange ANSI B16.5</p> <p>ARK 2" 300lbs RF, PTFE >316/316L flange ANSI B16.5</p> <p>ASK 3" 300lbs RF, PTFE >316/316L flange ANSI B16.5</p> <p>ATK 4" 300lbs RF, PTFE >316/316L flange ANSI B16.5</p> <p>CEK DN40 PN16-40, PTFE >316L flange EN1092-1 (DIN2527 C)</p> <p>CFK DN50 PN10-40, PTFE >316L flange EN1092-1 (DIN2527 C)</p> <p>CGK DN80 PN10/16, PTFE >316L flange EN1092-1 (DIN2527 C)</p> <p>CHK DN100 PN10/16, PTFE >316L flange EN1092-1 (DIN2527 C)</p> <p>CJK DN150 PN10/16, PTFE >316L flange EN1092-1 (DIN2527 C)</p> <p>CSK DN80 PN25/40, PTFE >316L flange EN1092-1 (DIN2527 C)</p> <p>CTK DN100 PN25/40, PTFE >316L flange EN1092-1 (DIN2527 C)</p> <p>KEK 10K 40, PTFE >316L flange JIS B2220</p> <p>KFK 10K 50, PTFE >316L flange JIS B2220</p> <p>KGK 10K 80, PTFE >316L flange JIS B2220</p> <p>KHK 10K 100, PTFE >316L flange JIS B2220</p> <p>MRK DIN11851 DN50 PN40, PTFE >316L</p> <p>TCK Tri-Clamp ISO2852 1-1/2", PTFE >316L</p> <p>TDK Tri-Clamp ISO2852 2", PTFE >316L</p> <p>TFK Tri-Clamp ISO2852 3", PTFE >316L</p> <p>TJK Tri-Clamp ISO2852 1-1/2", PTFE >316L, 3A EHEDG</p>

Levellflex M FMP45

Instrument selection



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.

Versions that mutually exclude one another are not marked.

Ordering information Levelflex M FMP45

10	Approval:	
	A	Non-hazardous area
	F	Non-hazardous area, WHG
	1	ATEX II 1/2G EEx ia IIC T6/IECEx Zone 0/1
	2	ATEX II 1/2D, Alu blind cover
	3	ATEX II 1/2G EEx em (ia) IIC T6/IECEx Zone 0/1
	4	ATEX II 1/3D
	5	ATEX II 1/2G EEx ia IIC T6, ATEX II 1/3D
	6	ATEX II 1/2G EEx ia IIC T6, WHG
	7	ATEX II 1/2G EEx d (ia) IIC T6
	8	ATEX II 1/2G EEx ia IIC T6, ATEX II 1/3D, WHG
	G	ATEX II 3G EEx nA II T6
	C	NEPSI Ex em(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.
	T	FM XP Cl.I,II,III Div.1 Gr.A-G
	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.
	V	CSA XP Cl.I,II,III Div.1 Gr.A-D,G + coal dust, N.I.
	K	TIIS Ex d (ia) IIC T1
	L	TIIS Ex d (ia) IIC T2
	Y	Special version, to be specified
20	Process temperature:	
	A	-200...+280 °C / -328...+5360 °F (XT)
	B	-200...+400 °C / -328...+7520 °F (HT)
	Y	Special version, to be specified
30	Probe:	
	A mm, rope 4mm, 316
	Cinch, rope 1/6", 316
	Kmm, rod 16 mm, 316L
	L mm, coax, 316L
	Minch, rod 16 mm, 316L
	N inch, coax, 316L
	S	*.....mm, rod 16 mm, 316L, 500 mm divisible
	T	*.....mm, rod 16 mm, 316L, 1000 divisible
	U	*.....inch, rod 16 mm, 316L, 20 in divisible
	V	*.....inch, rod 16 mm, 316L, 40 in divisible
	Y	Special version, to be specified
40	Process connection:	
	AFJ	2" 150lbs RF, 316/316L flange ANSI B16.5
	AGJ	3" 150lbs RF, 316/316L flange ANSI B16.5
	AHJ	4" 150lbs RF, 316/316L flange ANSI B16.5
	ARJ	2" 300/600lbs RF, 316/316L flange ANSI B16.5
	ASJ	3" 300/600lbs RF, 316/316L flange ANSI B16.5
	ATJ	4" 300lbs RF, 316/316L flange ANSI B16.5
	A1J	2" 1500lbs RF, 316/316L flange ANSI B16.5
	A2J	3" 1500lbs RF, 316/316L flange ANSI B16.5
	A3J	4" 600lbs RF, 316/316L flange ANSI B16.5
	A4J	4" 900lbs RF, 316/316L flange ANSI B16.5
	A5J	4" 1500lbs RF, 316/316L flange ANSI B16.5
	CHJ	DN100 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)
	CRJ	DN50 PN10-40 B1, 316L flange EN1092-1 (DIN2527 C)
	CSJ	DN80 PN10-40 B1, 316L flange EN1092-1 (DIN2527 C)
	CTJ	DN100 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C)
	C1J	DN50 PN63 B2, 316L flange EN1092-1 (DIN2527 E)
	C2J	DN50 PN100 B2, 316L flange EN1092-1 (DIN2527 E)
	C3J	DN80 PN63 B2, 316L flange EN1092-1 (DIN2527 E)
	C4J	DN80 PN100 B2, 316L flange EN1092-1 (DIN2527 E)
	C5J	DN100 PN63 B2, 316L flange EN1092-1 (DIN2527 E)
	C6J	DN100 PN100 B2, 316L flange EN1092-1 (DIN2527 E)

100										Additional options:	
										U	*Gas phase comp. 300mm/10" reference rod, EN10204-3.1 material, NACE MR0175 (316L wetted parts) inspection certificate
										V	*Gas phase comp. 550mm/18" reference rod, EN10204-3.1 material, NACE MR0175 (316L wetted parts) inspection certificate
										Y	Special version, to be specified

100										Marking:	
										1	Tagging (TAG)
										2	Bus address

You can fill in the options of the respective feature into the following table. The filled in options result in the complete order code.

FMP45-												Complete product designation
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Please enter probe length in mm or inch / 0.1 inch

mm

inch / 0.1 inch

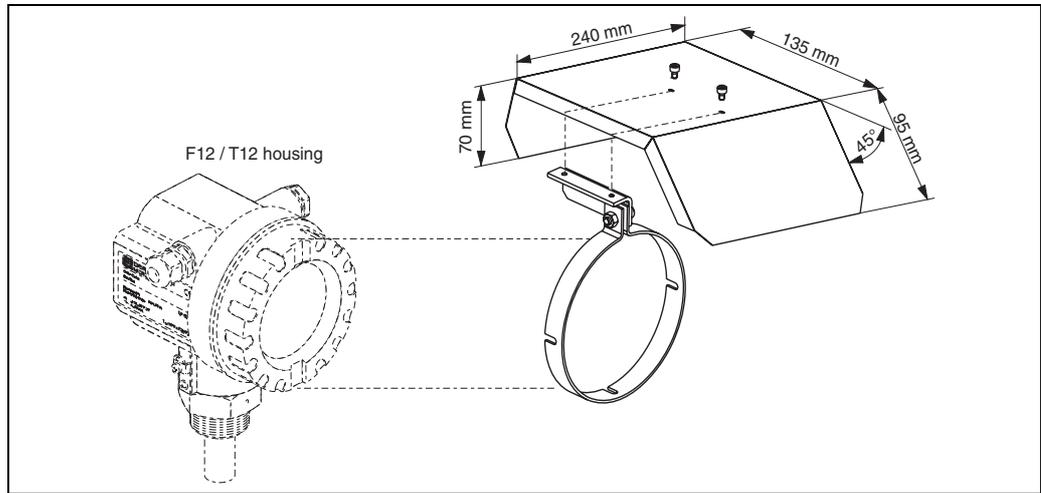
probe length LN see Page 42

¹⁾ OVP = overvoltage protection

Accessories

Weather protection cover

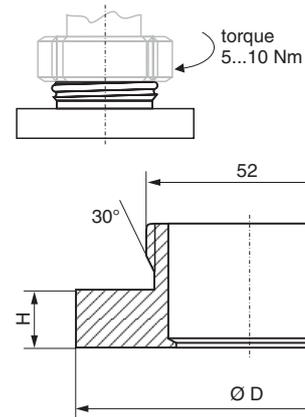
A weather protection cover made of stainless steel is available for outdoor installation (order code: 543199-0001). The shipment includes the protective cover and tension clamp.



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

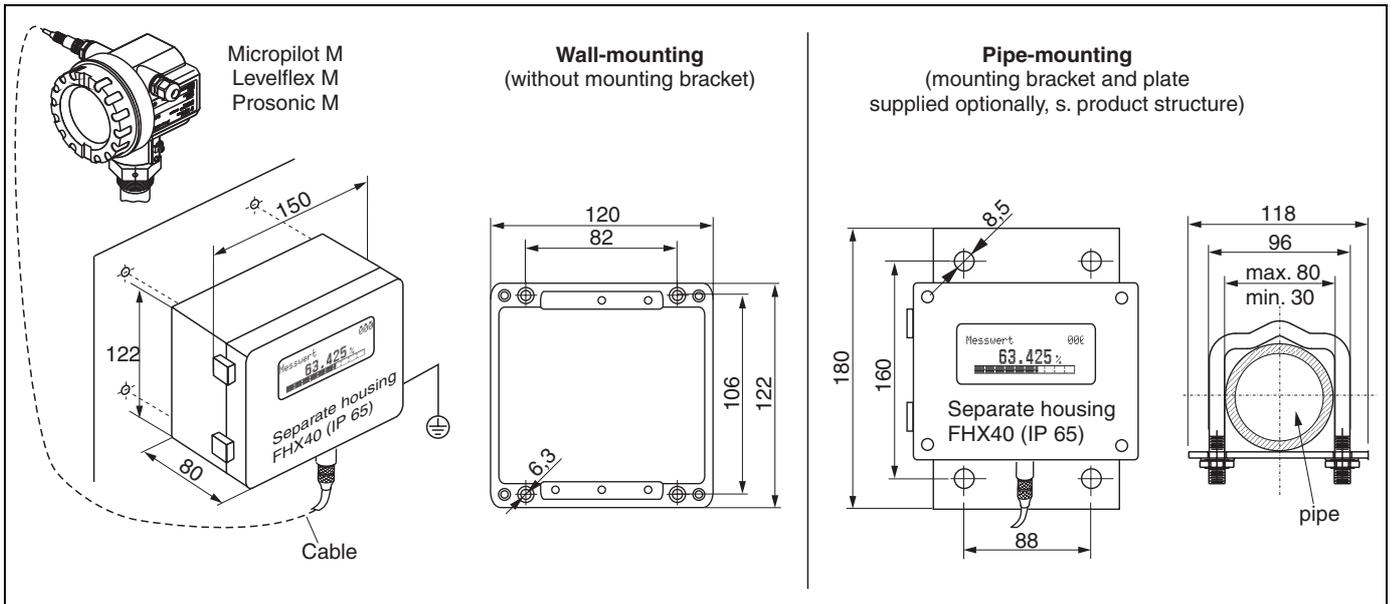
Welding boss for universal adapter (FMP41C only)

Dimensions of the welding ring		Order-No.
Diameter D [mm]	Height H [mm]	
85	12	52006262
65	8	214880-0002
Material: 1.4435/316L)		



L00-FMP4xxxx-00-00-06-en-006

Remote display and operation
FHX40



100-FMxxxxx-00-00-06-de-005

Technical data (cable and housing) and product structure:

Max. cable length	20 m (65 ft)
Temperature range	-30 °C...+70 °C (-22 °F...158 °F)
Degree of protection	IP65/67 (housing); IP68 (cable) acc. to IEC 60529
Materials	Housing: AISi12; cable glands: nickle plated brass
Dimensions [mm] / [inch]	122x150x80 (HxWxD) / 4.8x5.9x3.2

Approval:	
A	Non-hazardous area
C	NEPSI Ex ia IIC T6/T5
G	IECEX Zone1 Ex ia IIC T6/T5
K	TIIS Ex ia IIC T6
N	CSA General Purpose
S	FM IS Cl. I Div.1 Gr. A-D
U	CSA IS Cl. I Div.1 Gr. A-D
I	ATEX II 2G Ex ia IIC T6, ATEX II 3D
Y	Special version, to be specified
Cable:	
1	20m / 65ft (> for HART)
5	20m / 65ft (> for PROFIBUS PA/FOUNDATION Fieldbus)
9	Special version, to be specified
Additional option:	
A	Basic version
B	Mounting bracket, pipe 1" / 2"
Y	Special version, to be specified
Marking:	
1	Tagging (TAG)
FHX40 -	Complete product designation

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

Center 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.

Center disk PEEK Ø 1.89 - 3.74 inch (FMP45 only)

The centering disk is suitable for probes with a rod diameter of Ø 0.63in and can be used in pipes from DN40 (1½") 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 BA377F.

- PEEK (statically dissipative)
- Measuring range: -60 ... +250 °C

Order-no. 71069064

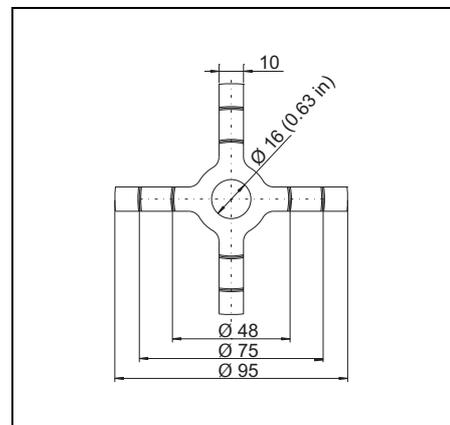
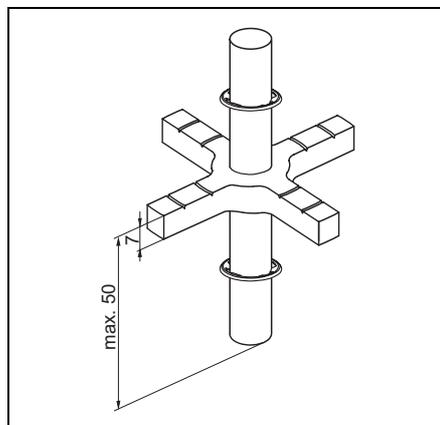


Note!

If the centering disk is inserted in an bypass, it must be positioned below the lower bypass outlet. This 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.

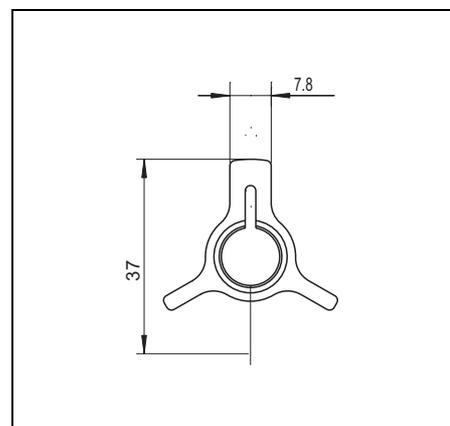
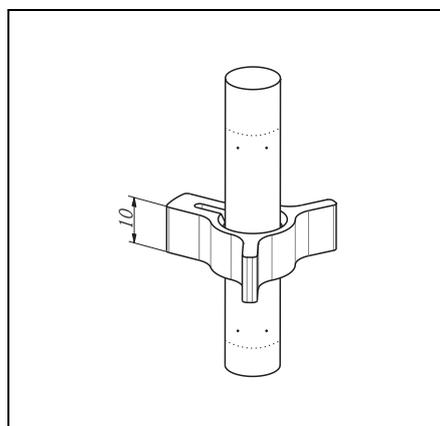


Centering disk PFA Ø 1.46 inch

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").

- Measuring range.: -200 ... +150°C

Order-no. 71069065



Commubox FXA191 HART	For intrinsically safe HART communication with FieldCare via the RS232C interface. For details refer to TI237F/00/en.
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface. For details refer to TI404F/00/en.
Commubox FXA291	<p>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 TI405C/07/en.</p> <p> Note! For the following Endress+Hauser devices you need the "ToF adapter FXA291" as an additional accessory:</p> <ul style="list-style-type: none">■ Cerabar S PMC71, PMP7x■ Deltabar S PMD7x, FMD7x■ Deltapilot S FMB70■ Gammapilot M FMG60■ Levellflex M FMP4x■ Micropilot FMR130/FMR131■ Micropilot M FMR2xx■ Micropilot S FMR53x, FMR540■ Prosonic FMU860/861/862■ Prosonic M FMU4x■ Tank Side Monitor NRF590 (with additional adapter cable)

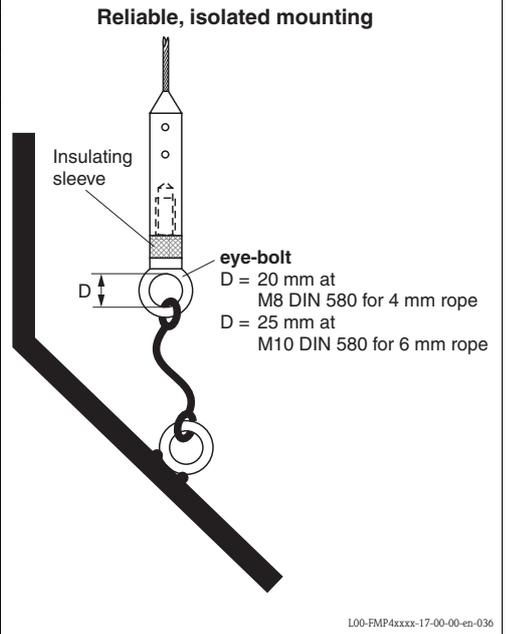
ToF adapter FXA291	<p>The ToF adapter FXA291 connects the Commubox FXA291 via the USB port of a personal computer or laptop to the following Endress+Hauser devices:</p> <ul style="list-style-type: none">■ Cerabar S PMC71, PMP7x■ Deltabar S PMD7x, FMD7x■ Deltapilot S FMB70■ Gammapilot M FMG60■ Levellflex M FMP4x■ Micropilot FMR130/FMR131■ Micropilot M FMR2xx■ Micropilot S FMR53x, FMR540■ Prosonic FMU860/861/862■ Prosonic M FMU4x■ Tank Side Monitor NRF590 (with additional adapter cable) <p>For details refer to KA271F/00/a2.</p>
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Mounting-kit isolated (FMP45)

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 (→ 33).



HART loop converter HMX50

The HART loop converter HMX50 can be acquired using the order number 71063562.
Additional documentation: TI429F and BA371F.

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, SD157F/00/en.

Radar Tank Gauging brochure

For inventory control and custody transfer applications in tank farms and terminals, SD001V/00/en.

Safety instructions for steam boiler approval

Guided level radar as limiting for high level water and low level water, SD288F/00/en.

Technical Information

Tank Side Monitor NRF590

Technical Information for Tank Side Monitor NRF590, TI402F/00/en.

Fieldgate FXA520

Technical Information for Fieldgate FXA520, TI369F/00/en.

Operating Instructions

Levelflex M

Correlation of operating instructions to the instrument:

Instrument	Output ¹⁾	Communication	Operating Instructions	Description of Device Functions	Brief Operating Instructions (in the device)
FMP41C	B, G, H	HART	BA276F/00/en	BA245F/00/en	KA189F/00/a2
	D	PROFIBUS PA	BA277F/00/en	BA245F/00/en	KA189F/00/a2
	F	FOUNDATION Fieldbus	BA278F/00/en	BA245F/00/en	KA189F/00/a2
	K	HART (interface)	BA364F/00/en	BA366F/00/en	KA283F/00/a2
FMP45	B, G, H	HART	BA279F/00/en	BA245F/00/en	KA189F/00/a2
	D	PROFIBUS PA	BA280F/00/en	BA245F/00/en	KA189F/00/a2
	F	FOUNDATION Fieldbus	BA281F/00/en	BA245F/00/en	KA189F/00/a2
	K	HART (interface)	BA365F/00/en	BA366F/00/en	KA283F/00/a2

1) assignment, see ordering information: 40 electronic insert/communication

Tank Side Monitor NRF590

Operating Instructions for Tank Side Monitor NRF590, BA256F/00/en.

Description of Instrument Functions for Tank Side Monitor NRF590, BA257F/00/en.

Engineering hints PROFIBUS PA

Guidelines for planning and commissioning, BA198F/00.

Manufacturer declaration

Permitted pressures, temperatures and load cycles as per EN 13445 and AD- data sheet S2 (for FMP45).

Patents

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

Further patents are pending.

- US 5,661,251 ≅ EP 0 780 664
- US 5,827,985 ≅ EP 0 780 664
- US 5,884,231 ≅ EP 0 780 665
- US 5,973,637 ≅ EP 0 928 974

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