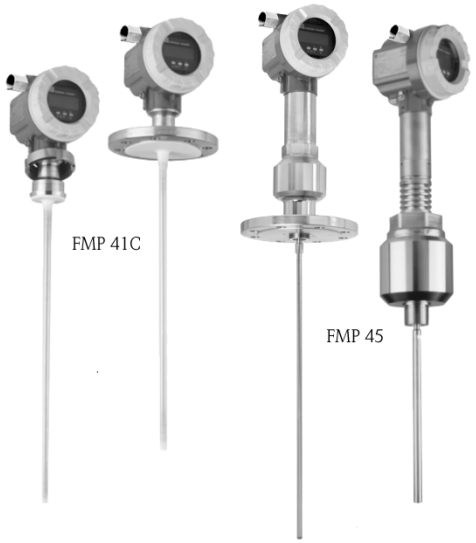
Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Levelflex M FMP41C, FMP45

Guided Level-Radar
Smart Transmitter for
- Level Measurement in Liquids
- Interface Measurement in Liquids



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 157" (4 m), cable probes up to 100 ft (30 m) measuring range
- With rod probe for food processing and pharmaceuticals
- All wetted components: PTFE, FDA-listed, **gap-free**

FMP 45 for high pressure and/or temperature

- Temperature range: -328°F to +752°F (-200°C to +400°C)
- Pressure range: -14 to 5800 psi (-1 to 400 bar)
- With second safety compartment: gas-tight glass feed through
- Rod and coax probes up to 157" (4 m), cable probes up to 115 ft (35 m) measuring range

The following interfaces are available for system integration:

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

Interface measurement

Continuous measurement of interfaces between two liquids with different dielectric constants, such as oil and water.

- 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 level measurement 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 turbulent**.
- Simple, menu-guided local 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.
- Local 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.
  - North America: FM, CSA, boiler act (FMP45).

TI386F/24/ae/02.09

Endress+Hauser

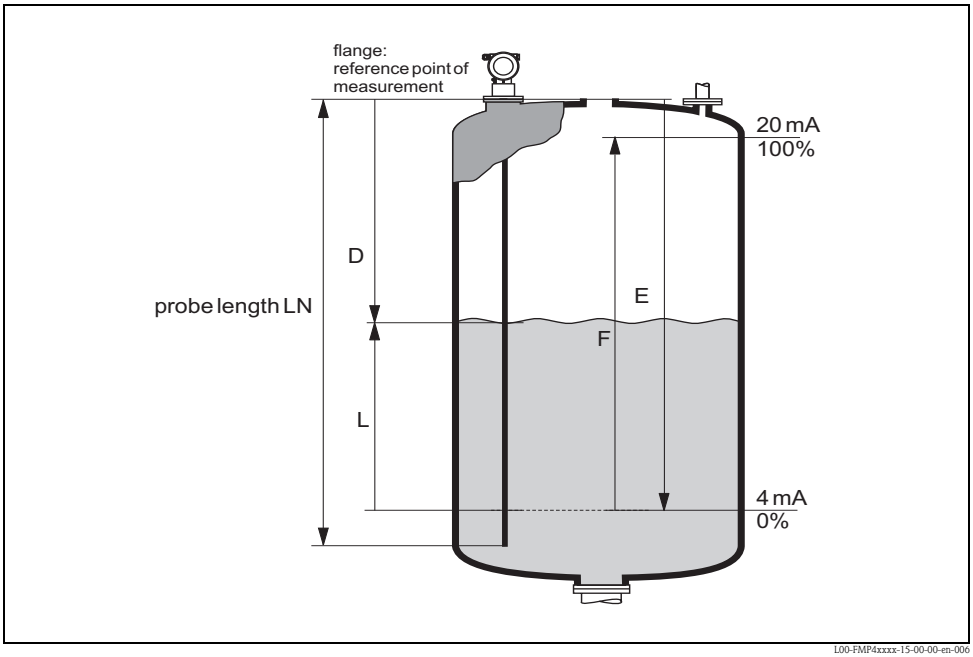
People for Process Automation

Table of contents

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, see page 32-33) 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 electronics and converted into level information. This method is also known as TDR (Time Domain Reflectometry).



Reference point of measurement, details see Page 32-33

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. 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:

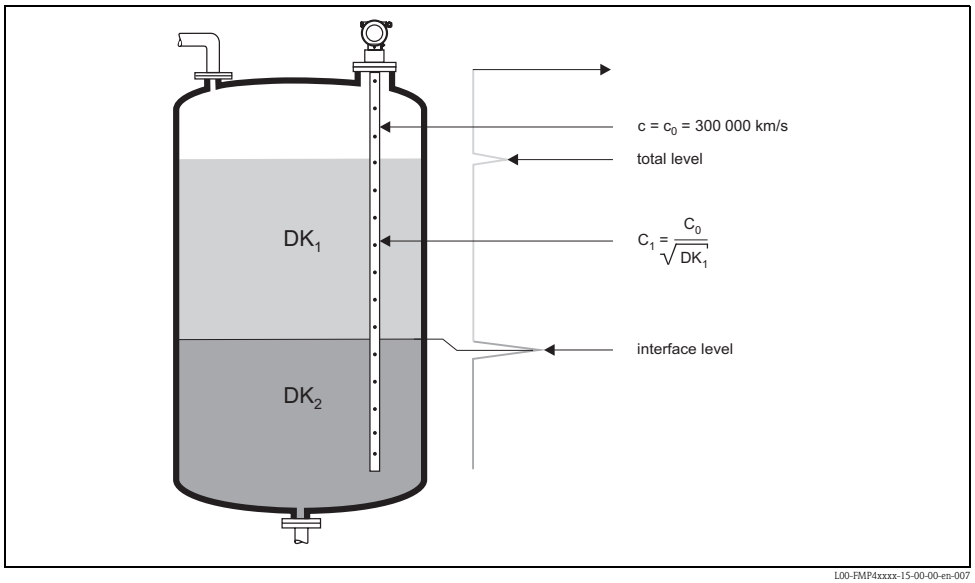
$L = E - D$

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 internal objects 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 a maximum of 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.

Measuring system

Probe selection

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

FMP41C

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

Version:	**FMP41C-#K########** **FMP41C-#L########**	**FMP41C-#A########** **FMP41C-#B########** **FMP41C-#C########** **FMP41C-#D########** **FMP41C-#E########** **FMP41C-#G######**
Type of probe:	**Rod probe**	**Cable probe**
		
Wetted materials:	Rod and cable: PFA Flange plating: PTFE (TFM 1600)	
Other materials:	Housing: see Ordering information Flange and housing adapter: SS316L/1.4435	
Tensile loading capacity (min.):	not relevant	450 lbf (2000 N)
Sideways capacity:	22 lbf ft (30 Nm)	not relevant
For application:	■ corrosive liquids ■ liquids in the foods/ pharmaceutical sector ■ Interface measurement	■ corrosive liquids
Probe length:	12" to 57" (0.3 to 4 m)	3 to 100 feet (1 to 30 m)

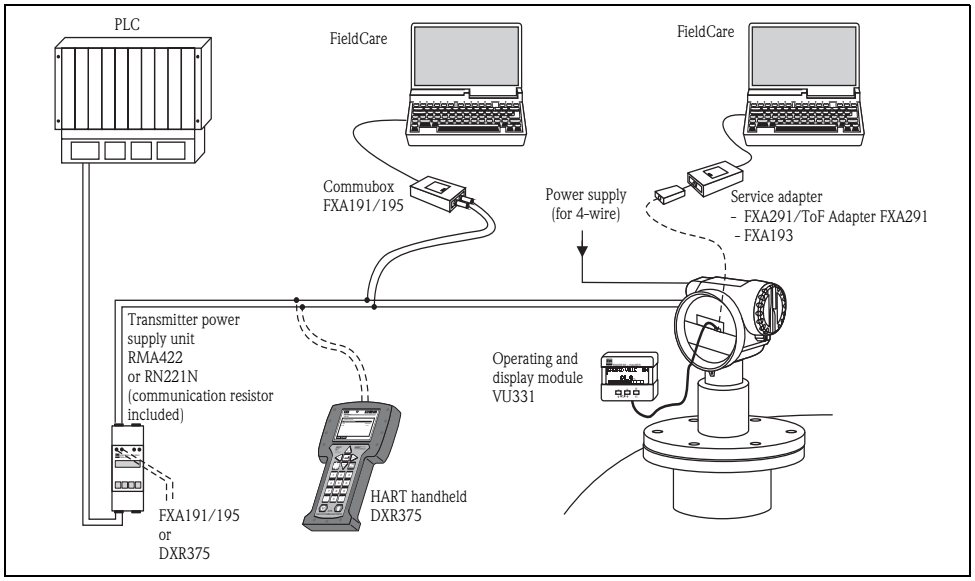
FMP45

For high pressure and/or temperature.

Version:	FMP45-##K####### FMP45-##M#######	FMP45-##A####### FMP45-##C#######	FMP45-##L####### FMP45-##N#######
Type of probe:	Rod probe	Cable probe	Coax probe
			
Wetted materials:	Stainless steel316L/1.4435, ceramic Al_2O_3 99.7%, pure graphite, Alloy C22	Stainless steel 316L/1.4435 and 316/1.4401, ceramic Al_2O_3 99.7%, pure graphite, Alloy C22	Stainless steel316L/1.4435, ceramic Al_2O_3 99.7%, pure graphite, Alloy C22
Other materials:	Housing: see Ordering information Flange and housing adapter: SS316L/1.4435		
Tensile loading capacity (min.):	not relevant	2248 lbf (10 kN)	not relevant
Sideways capacity:	22 lbf ft (30 Nm)	not relevant	221 lbf ft (300 Nm)
For application:	■ Liquids ■ Interface measurement	■ Liquids	■ Liquids ■ Interface measurement
Probe length:	12" to 157" (0.3 to 4 m)	3 to 115 ft (1 to 35 m)	12" to 157" (0.3 to 4 m)

Stand-alone

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



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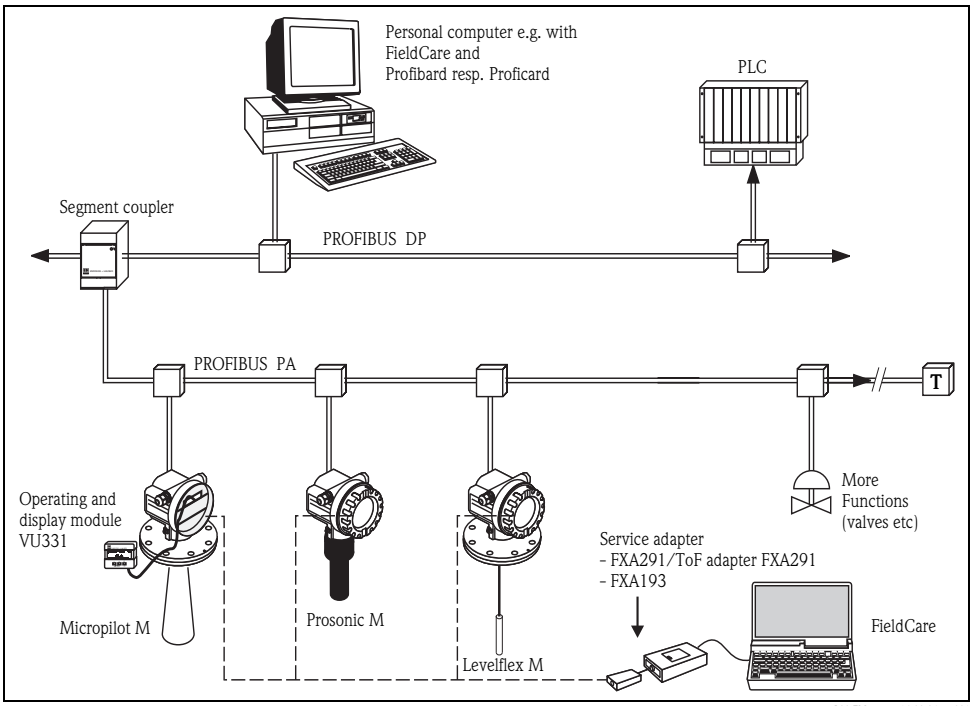
If the HART communication resistor is not installed in the supply device and HART protocol communication is to be carried out, it is necessary to insert a communication resistor $\geq 250\ \Omega$ into the 2-wire line.

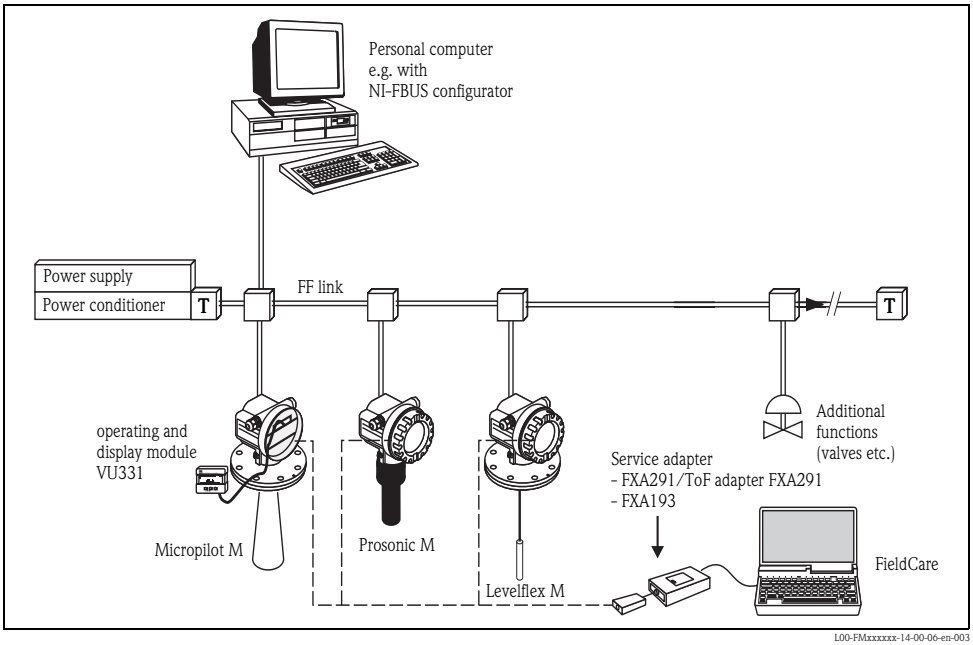
System integration via PROFIBUS PA

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 local and remote operation are possible.



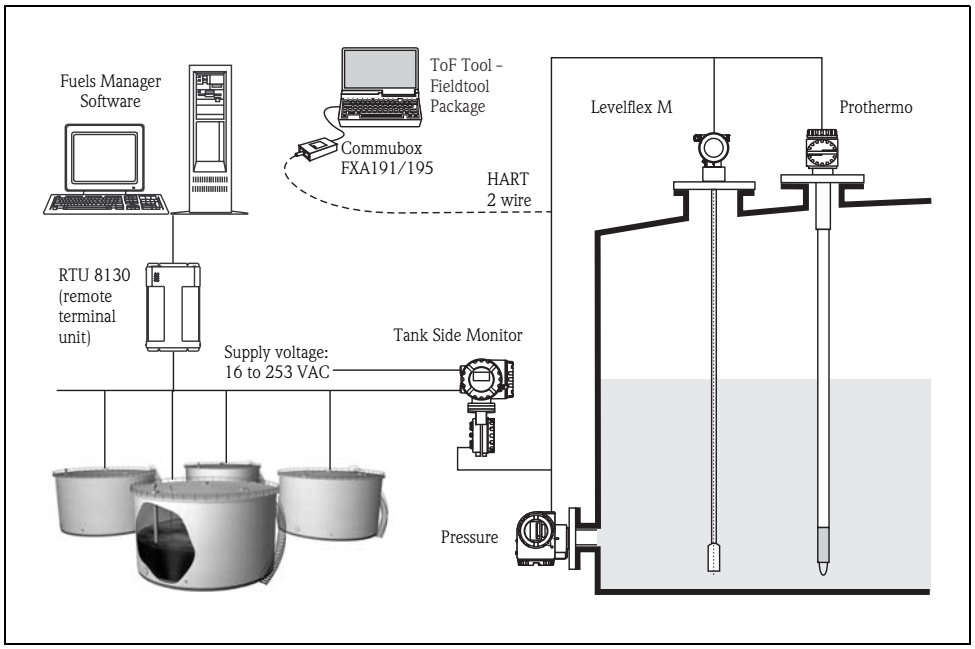
System integration via FOUNDATION Fieldbus

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



Integration into the tank gauging system

The Endress+Hauser Tank Side Monitor NRF590 provides integrated communications for sites with multiple tanks, each with one or more sensors on the tank, such as radar, spot or average temperature, capacitive probe for water detection and/or pressure sensors. Multiple protocols out of the Tank Side Monitor guarantee connectivity to nearly any of the existing industry standard tank gauging protocols. Optional connection 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 low wiring costs, while at the same time providing maximum safety, reliability and data availability.



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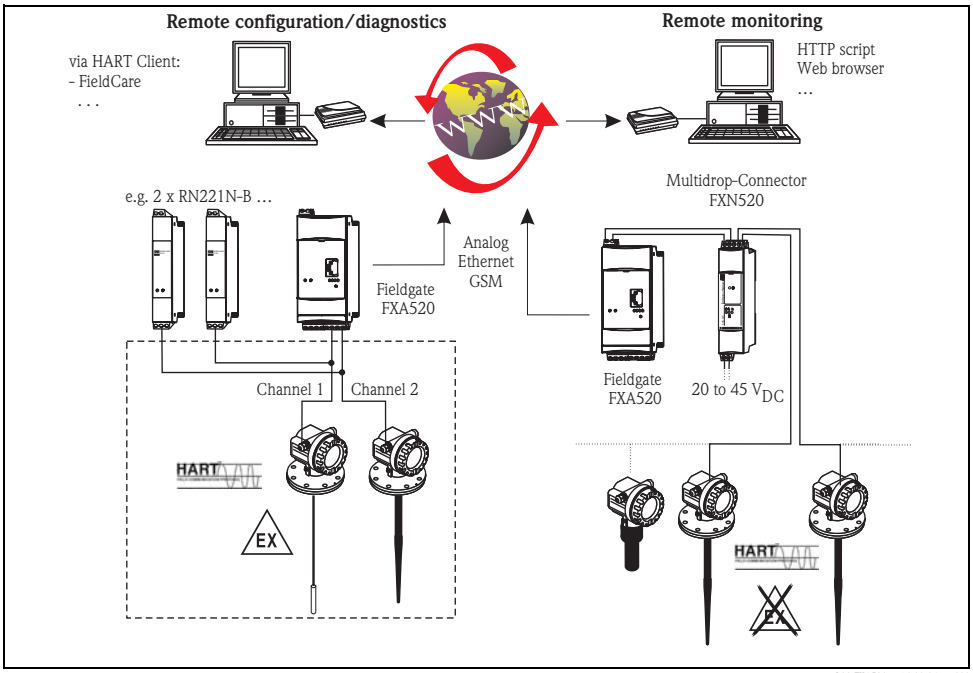
System integration via Fieldgate

Vendor Managed Inventory

By using Fieldgate 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 Fieldgate monitors the configured level limits and, if required, automatically activate the next supply. The spectrum of options ranges from a simple purchasing requisition via e-mail to fully automatic order administration by coupling XML data into the planning systems on both sides.

Remote maintenance of measuring equipment

Fieldgate not only transfers the current measured values, but also alerts the responsible personnel, if required, via e-mail or SMS. In the event of an alarm or when performing routine checks, service technicians can diagnose and configure connected HART devices remotely. All that is required 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 local service operations can be avoided by using remote diagnosis and remote configuration and all others can at least be better planned and prepared.



Note!
The number of 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 page 32) and the product surface.
Subject to the empty distance entered (E, see Fig. on page 4), the level is calculated.
Alternatively, the level can be converted into other variables (volume, mass) by means of linearization (32 points).

Measuring range

Level measurement

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

Medium group	DC (Εr)	Typical liquids	Typ. measuring range FMP41C	Typ. measuring range FMP45
1	1.4 to 1.6	– Condensed gases, e.g. N_2, CO_2	13 ft (4 m), when installed in metallic pipes	13 ft (4 m), coax probe, rod probe when installed in metallic pipes
2	1.6 to 1.9	– Liquefied gas, e.g. propane – Solvent – Freon – Palm oil	30 ft (9 m)	80 ft (25 m)
3	1.9 to 2.5	– Mineral oils, fuels	40 ft (12 m)	100 ft (30 m)
4	2.5 to 4	– Benzene, styrene, toluene – Furan – Naphthalene	50 ft (16 m)	115 ft (35 m)
5	4 to 7	– Chlorobenzene, chloroform – Cellulose spray – Isocyanate, aniline	80 ft (25 m)	115 ft (35 m)
6	> 7	– Aqueous solutions – Alcohols – Acids, alkalis	100 ft (30 m)	115 ft (35 m)

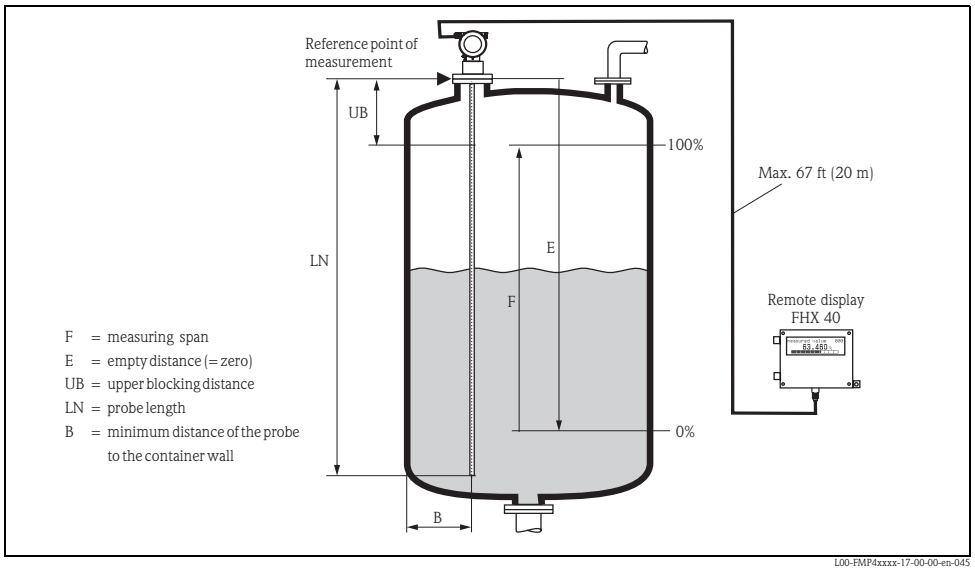
Note!
Due to the high diffusion rate of ammonia it is recommended to use the FMP45 with gas-tight bushing for measurements in this medium.

Interface measurement

The measuring range for interface measurement is limited to 32 ft (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 page 16.



Reference point of the measurement, details page 32

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

Probe type	LN, feet (m)		UB, feet (m)
	min	max	min
Rod probe	1 (0.3)	13 (4)	0.7 (0.2) [1]
Cable probe	3 (1)	115 (35) [2] FMP41C: 100 (30)	0.7 (0.2) [1]
Coax probe (not FMP41C)	1 (0.3)	13 (4)	0

1) The indicated blocking distances are preset. Media with DK > 7, the upper blocking distance UB can be reduced for rod and cable probes to 4 inches (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, feet (m)		UB, feet (m)
	min	max	min
Rod probe in bypass	1 (0.3)	13 (4)	0.7 (0.1) [1]
Cable probe [2] in free field (not FMP41C)	3 (1)	115 (35) [3]	0.7 (0.1) [1]
Coax probe (not FMP41C)	1 (0.3)	13 (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
- FOUNDATION Fieldbus (FF)

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 Levelflex 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.

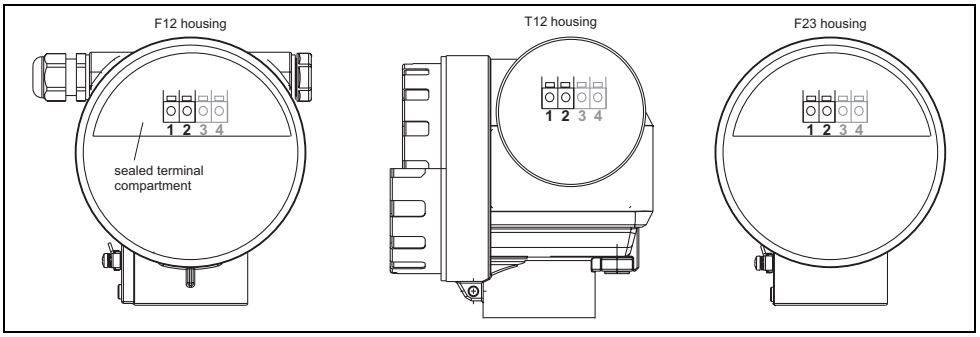
Auxiliary energy

Electrical connection

Connection compartment

Three housings are available:
- Aluminum housing F12 with additionally sealed connection compartment for:
  - standard
  - Intrinsically Safe (EEx ia)
- Aluminum housing T12 with separate connection compartment for:
  - standard
  - Encapsulated (EEx em)
  - Explosion Proof (EEx d)
  - Intrinsically safe (EEX ia), with overvoltage protection
- Stainless steel 1.4435/316L housing F23 for:
  - standard
  - Intrinsically Safe (EEx ia)

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



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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

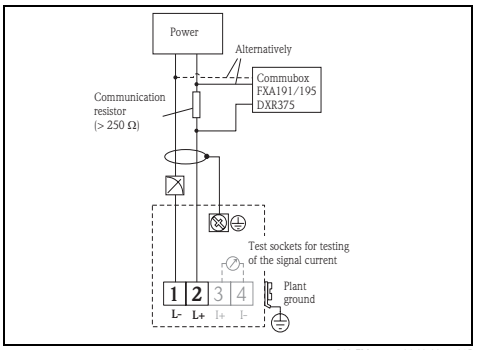
	Type	Clamping area
Standard, Intrinsically safe (EEx ia)	Plastic M20x1.5	5 to 10 mm
Encapsulated, (EEx em, EEx nA)	Metal M20x1.5	7 to 10.5 mm
All	Metal, threaded, 1/2" NPT	N/A

Terminals

For wire cross-sections 16 to 18 AWG (0.5 to 2.5 mm^2)

Terminal assignment

2-wire, 4 to 20 mA with HART



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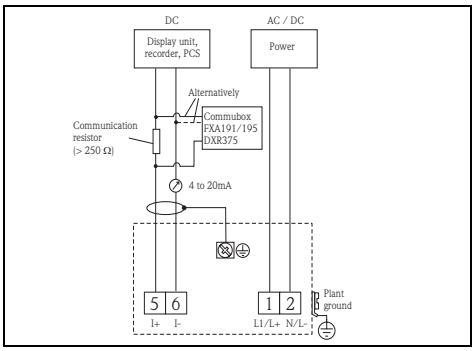
4-wire, 4 to 20 mA active with HART



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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).

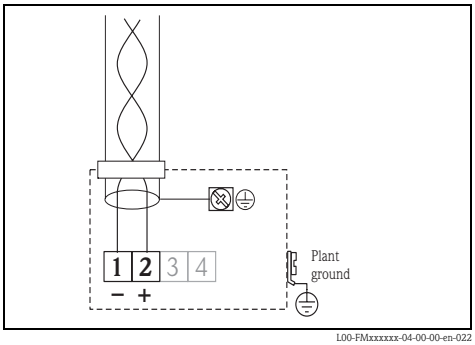
Note!
Protective circuitry against reverse polarity, RFI and over-voltage peaks is built into the device (see also Technical Information TI241F "EMC Test Procedures").

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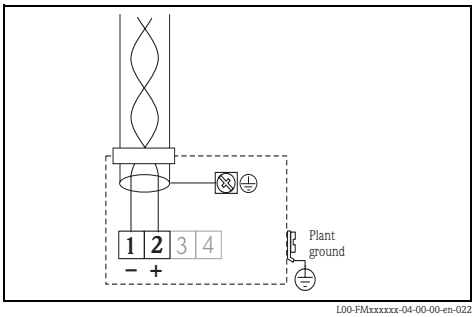
Note!
For further information on the cable specifications, see Operating Instructions BA034S Guidelines for planning and commissioning PROFIBUS DP/PA", PNO Guideline 2.092 " PROFIBUS PA User and Installation Guideline" and IEC 61158-2 (MBP).

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



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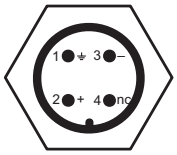
Note!
For further information on the cable specifications, see Operating Instructions BA013S "FOUNDATION Fieldbus Overview", FONDATION Fieldbus Guideline and IEC 61158-2 (MBP).

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)



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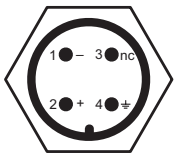
Pin	Meaning
1	Ground
2	Signal +
3	Signal –
4	not connected

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



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

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 min.	Terminal voltage max.
HART	Standard	4 mA	16 V	36 V
		20 mA	7.5 V	36 V
	Intrinsically safe (EEx ia)	4 mA	16 V	30 V
		20 mA	7.5 V	30 V
	Encapsulated (EEx em) Explosion proof (EEx 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
	Intrinsically safe (EEx ia)	11 mA	10 V	30 V
Fixed current for HART Multidrop mode	Standard	4 mA[1)]	16 V	36 V
	Intrinsically safe (EEx 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)

Cable entry

Cable gland: M20x1.5 (only cable entry for EEx 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

Communication	Output current	Current consumption Power consumption
HART, 2-wire	3.6 to 22 mA	—
HART, 4-wire (90 to 250 V_{AC})	2.4 to 22 mA	~ 3 to 6 mA / ~ 3.5 VA
HART, 4-wire (10.5 to 32 V_{DC})	2.4 to 22 mA	~ 100 mA / ~ 1 W
PROFIBUS PA	—	max. 11 mA
FOUNDATION Fieldbus	—	max. 15 mA

Overvoltage protection

If the measuring device is used for level measurement in flammable liquids which requires the use of overvoltage protection according to DIN EN 60079-14, standard for test procedures 60060-1 (10 kA, pulse 8/20 µs), 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 page 42
  or
- This protection is achieved by the use of other appropriate measures (external protection devices e.g. HAW262Z).

Performance characteristics

Reference operating conditions

- Temperature = +68°F (20°C) ± 9°F (5°C)
- Pressure = 14.7 psia (1013 mbar abs.) ± 0.3 psi (20 mbar)
- Humidity = 65 % ±20%
- Reflection factor ≥ 0.8 (surface of the water for coax probe, metal plate for rod and cable probe with min. 3 ft / 1 m ∅)
- Flange for rod or cable probe ≥ 12" (30 cm ∅)
- Distance to obstructions ≥ 3 ft (1 m)
- For interface measurement:
  – Coax probe
  – DK of the lower medium = 80 (water)
  – DK of the upper medium = 2 (oil)

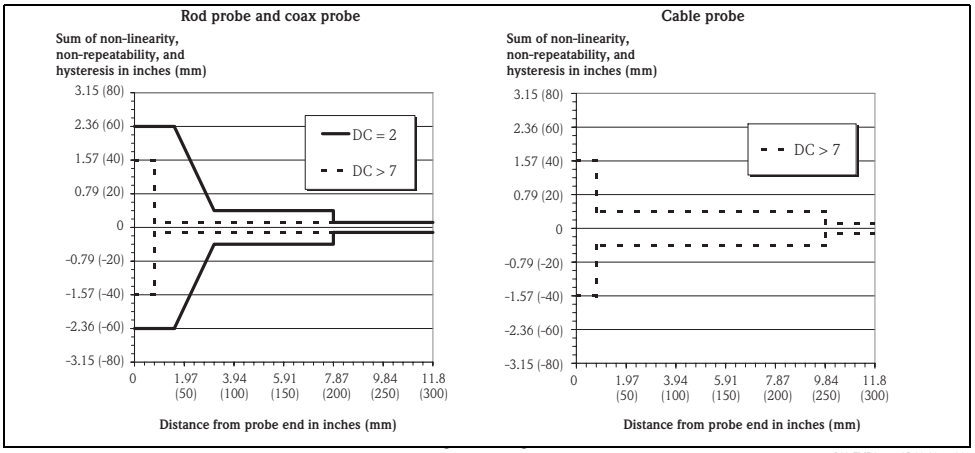
Maximum measured error

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

Output:	Digital	Analog
Sum of non-linearity, non-repeatability and hysteresis	**Level (electronic version level and interface measurement):** **measuring range FMP41C:** – up to 33 ft (10 m): ± 0.2" (5 mm) – > 33 ft (10 m): ± 0.05 % **Measuring range FMP45:** – up to 33 ft (10 m): ± 0.12" (3 mm) – > 33 ft (10 m): ± 0.03 % **FMP45 with coax probe:** – ± 0.2" (5 mm)	± 0.06 %
	Interface (only for electronic version "K" interface measurement): – Measuring range up to 33 ft (10 m): ± 0.4" (10 mm). If the thickness of the interface is <60 mm, the interface can no longer be differentiated from the overall level such that both output signals are identical.	
Offset / Zero	± 0.16" (4 mm)	± 0.03 %

If the reference conditions are not met, the offset/zero point arising from the mounting situation may be up to ± 0.47" (12 mm) for cable 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):



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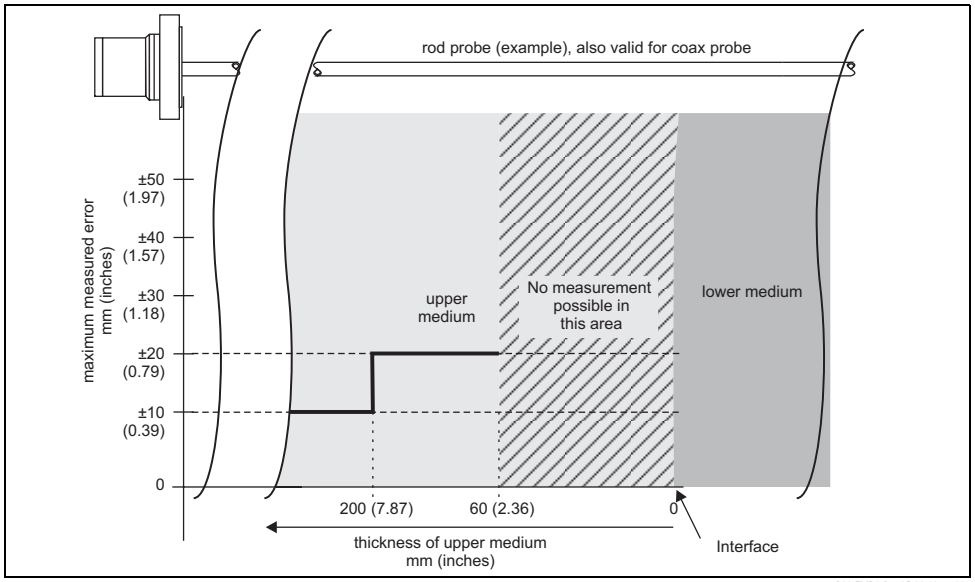
If for cable probes the DC value is less than 7, then measurement is not possible in the area of the straining weight 0 to 10" (0 to 250 mm) from end of probe; lower blocking distance.

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



L00-FMP4xIxx-05-00-00-en-001

Resolution

- Digital: 0.04" (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 to +176°F (-40 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 to +176°F (-40 to +80°C)
  - **Span (20 mA)**
    Average T_K: 0.05 %/10 K, max. 0.5 % over the entire temperature range -40 to +176°F (-40 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 to +176°F (-40 to +80°C)
  - **Span (20 mA)**
    Average T_K: 0.06 %/10 K, max. 0.89% over the entire temperature range -40 to +176°F (-40 to +80°C)

Influence of gas layer

High pressures reduce the propagation velocity of the measuring signals in the gas/vapor above the fluid. This effect depends on the gas/vapor and is particularly large for low temperatures. This results in a measuring error that gets larger 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):

Gas layer	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 %

Gas layer	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 %

Special versions of FMP45 are available which provide a compensation method for the gas phase influence. Please contact your local Endress+Hauser representative.

Operating conditions: installation with level measurement

General information on level measurement

Probe selection (see overview on page 6–7)

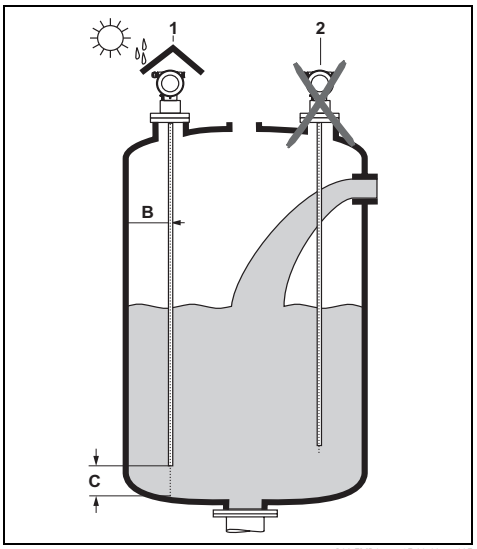
In normal cases, use rod probes. Rope probes are used for measuring ranges > 13 ft (4m) and with restricted ceiling clearance which does not allow the installation of rigid probes.

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 cable 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 20" (500 mm).

Mounting location

- Do not mount rod or cable probes in the filling curtain (2)
- Mount rod and cable 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 4" (100 mm) between the probe and the buildup.
- Mount rod and cable probes as far away as possible from installed fittings. "Mapping " must be carried out during commissioning in the event of distances < 12" (300 mm).
- Minimum distance of probe end to the container floor (C):
  – Cable probe: 6" (150 mm)
  – Rod probe: 2" (50 mm)
  – Coax probe (FMP45 only): 0.4" (10 mm)
- When installing outdoors, it is recommended that you use a protective cover (1) see "Accessories" on page 47.



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Note!
Seal for devices with G 1½" thread

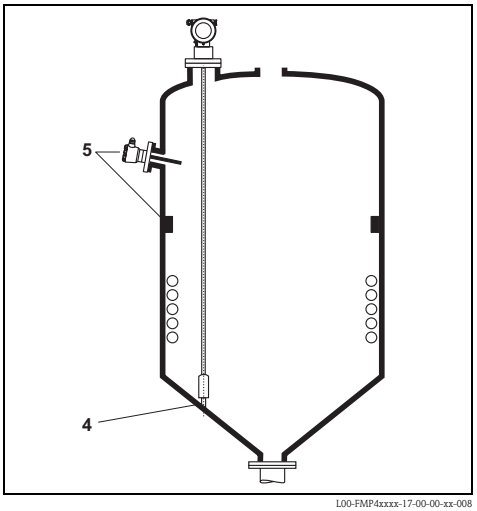
The thread and type of seal on FMP45 corresponds to DIN 3852 Part 1, screwed plug form A. Sealing rings as per DIN 7603 with dimensions 48x55 mm can be used for this.
Please use a sealing ring according to this standard in the form A, C or D and of a material that is resistant to the application.

Other installations

- Select the mounting location such that the distance to internals (5) (e.g. limit switch, struts) > is 12" (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.

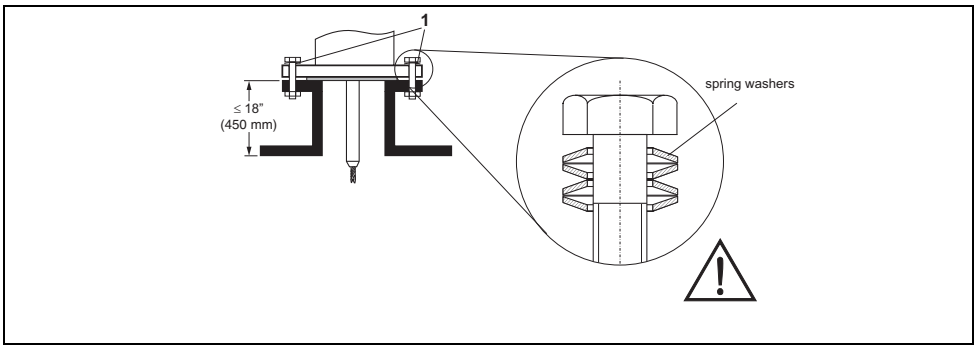


L00-FMP4xxxx-17-00-00-xx-008

Type of probe installation

FMP41C

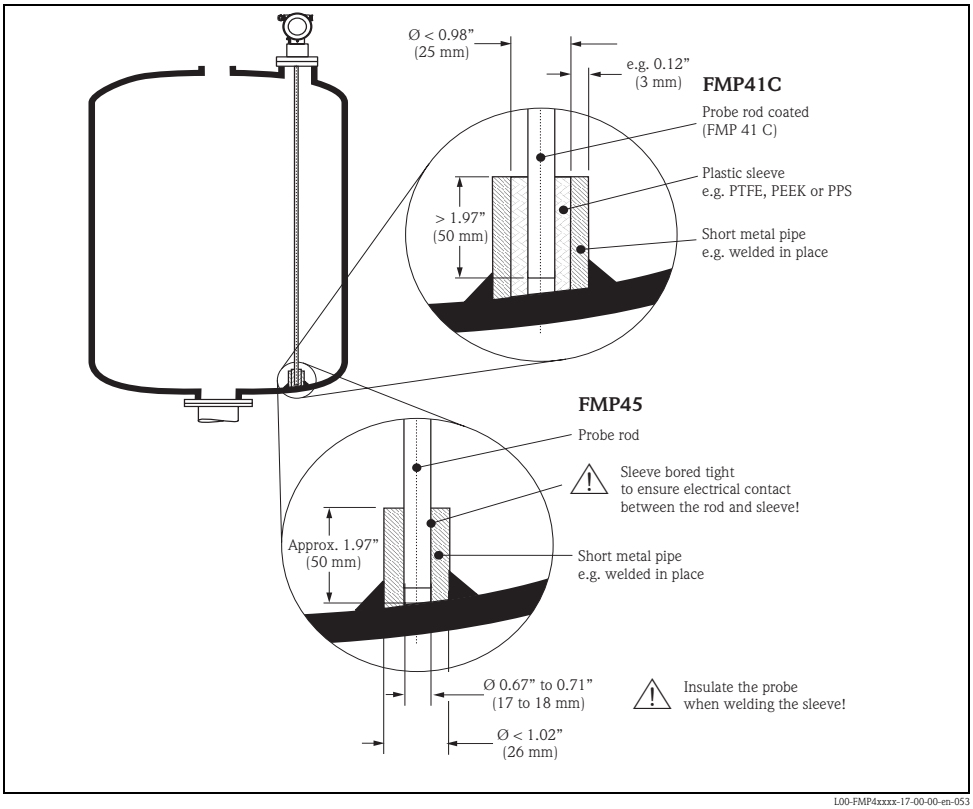
- When installing in plastic tanks, the nozzle must have at least 2" (DN50). The appropriate flange must be used as the process connection.
- For nozzles up to 18" (450 mm) high, select the length of the centering rod appropriate for the nozzle height when using rope probes.
- Observe installation instructions on page 19.
- 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: 44 to 74 lbf ft (60 to 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-en-005

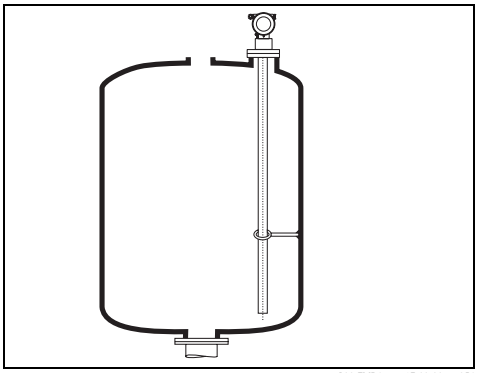
Supporting probes against warping

a. Rod probes: FMP41C and FMP45



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

b. Coax probes: FMP45

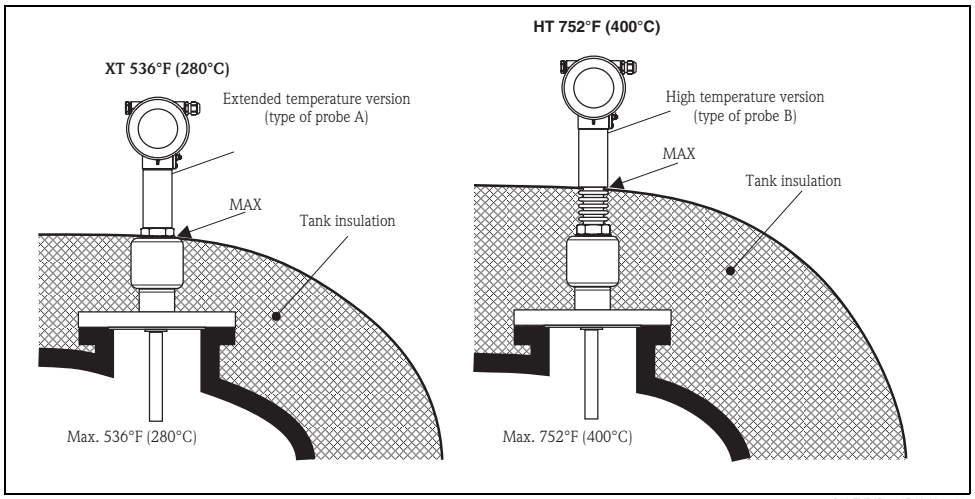


L00-FMP4xxxx-17-00-00-en-054

Installing FMP45 with heat insulation

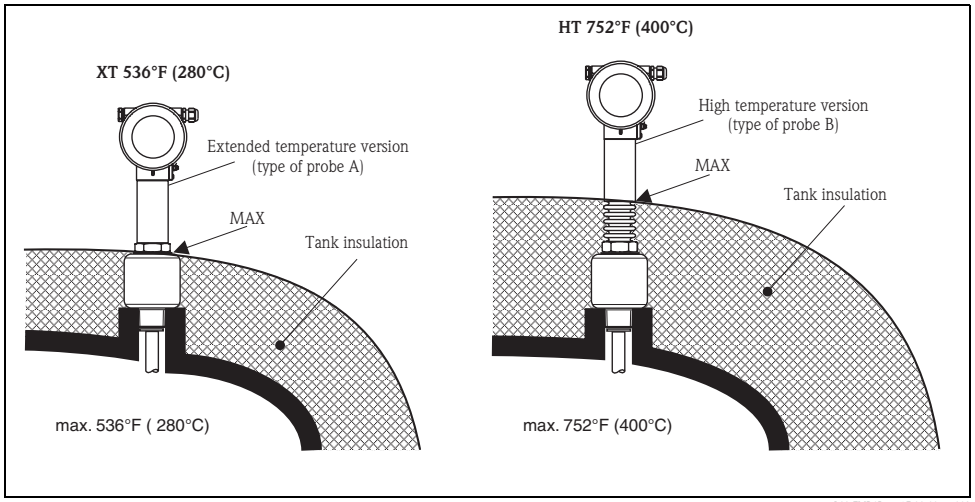
- If process temperatures are high (≥ 392°F / 200°C), FMP45 must be included in normal tank insulation to prevent the electronics heating up as a result of heat radiation or convection.
- The insulation may not exceed beyond the points labeled "**MAX**" in the drawings.

Process connection with flange 2" to 4" (DN50 to DN100)



L00-FMP45xxx-17-00-00-en-001

Process connection with adapter G 1½" and 1½" NPT



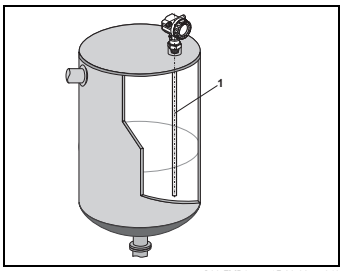
L00-FMP45xxx-17-00-00-en-002

Special instructions

When installing in agitator tanks, observe lateral load-bearing capacity of rod probes (see page 6). Possibly check whether a non-contact process, Ultrasonic or Level-Radar would be better suited, above all if the agitator generates large mechanical loads on the probe.

Installation in horizontal and upright cylindrical tanks

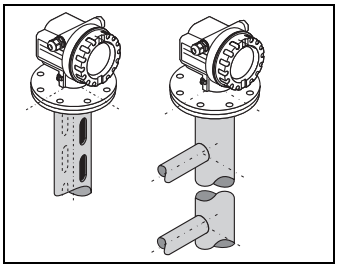
- Use a rod probe for measuring ranges up to 13 ft (4 m). For anything over this, or if there is not enough overhead clearance, use a cable probe.
- Any distance from wall, as long as occasional contact is prevented.
- When using metal tanks, it is preferable to mount probes (1) eccentrically.



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

Installation in stilling well or bypass

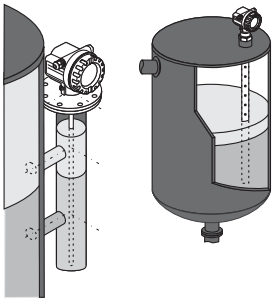
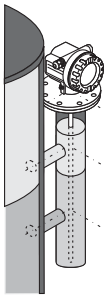
- Rod and cable probes can also be installed in pipes (stilling well, bypass).
- When installing in metal pipes up to 6" (DN150), the measuring sensitivity of the device increases such that liquids as of DK 1.4 can be measured.
- Welded joints that protrude up to approx. 0.2" (5 mm) inwards do not influence measurement.


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

Operating conditions: installation with interface measurement

General information on interface measurement

The Levelflex 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. This version is available on request.

	"Interface" electronics version	Special version
	 L00-FMP4xxxx-15-00-00-xx-001	 L00-FMP4xxxx-15-00-00-xx-002
Function	■ Measurement of variable interfaces and variable total levels. ■ Variable assignment of the output parameters. ■ Extended interface function	Measurement of variable interfaces with the prerequisite of a constant total level
Commissioning	Interface-specific menu guidance via onsite display or DTM	Special configuration, see modification information 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 2.4" / 60 mm (interface electronics version) or 4" / 100 mm (special version).
- Emulsion layers in the vicinity of the interface can severely dampen the signal. However, emulsion layers up to 2" (50 mm) are permitted.

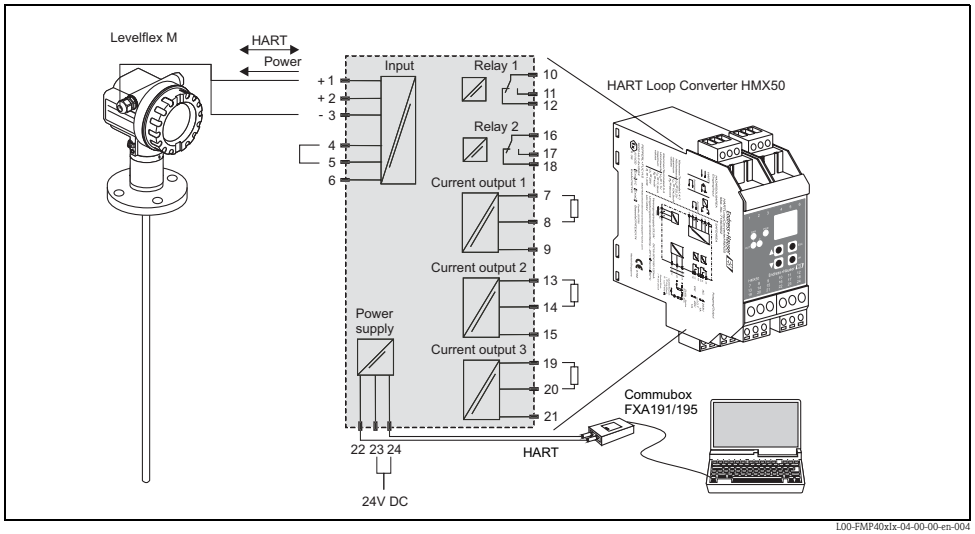
Interface electronics version:

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

Dynamic variables of the HART protocol	Possible process variable assignment	Comment
Primary Value	■ Interface ■ Total level ■ Thickness of the upper layer	The "primary value" is permanently assigned to the 4 to 20mA current output
Secondary Value	■ Interface ■ Total level ■ Thickness of the upper layer	—
Tertiary Value	■ Interface ■ Total level ■ Thickness of the upper layer ■ Amplitude of the total level signal	—
Quaternary (4th) 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.

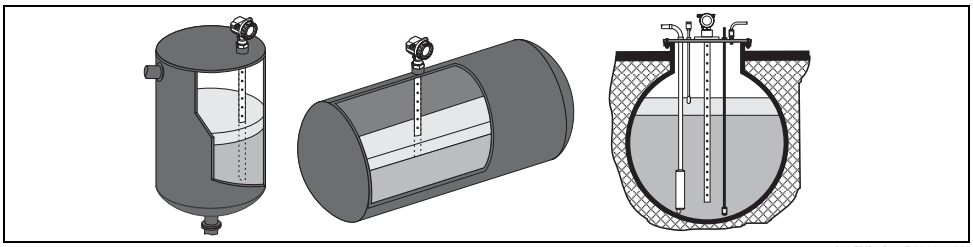
Probe selection (see overview on page 6-7)

- 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 cable probes for free installation in the tank available on request. Cable 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.

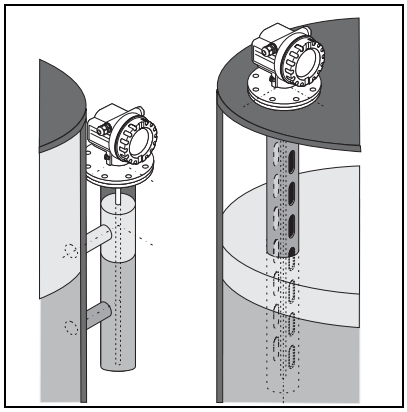


L00-FMP4xIxx-17-00-00-xx-002

Installation in stilling well or bypass

- A rod probe can be used for pipe diameters larger than 1-1/2" (40 mm).
- Rod probe installation can take place up to a diameter size of 4" (100 mm). In the event of larger diameters, a coax probe is recommended.
- Welded joints that protrude up to approx. 0.2" (5 mm) inwards do not influence measurement.
- The pipe may not exhibit any steps in diameter.
- 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 page 47).

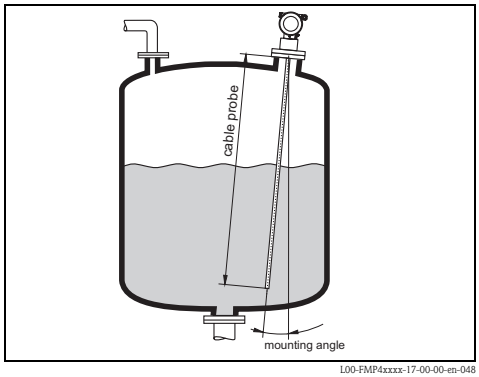


L00-FMP4xIxx-17-00-00-xx-003

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.
- Installation with a deviation up to approx. 5° from the vertical axis is permitted for probes up to approx. 3 ft (1 m) in length.
- With inclined installations the probe length has to be adjusted in dependence to the installation angle.
  - up to 3 ft (1 m) = 30°
  - up to 6 ft (2 m) = 10°
  - up to 13 ft (4 m) = 5°.

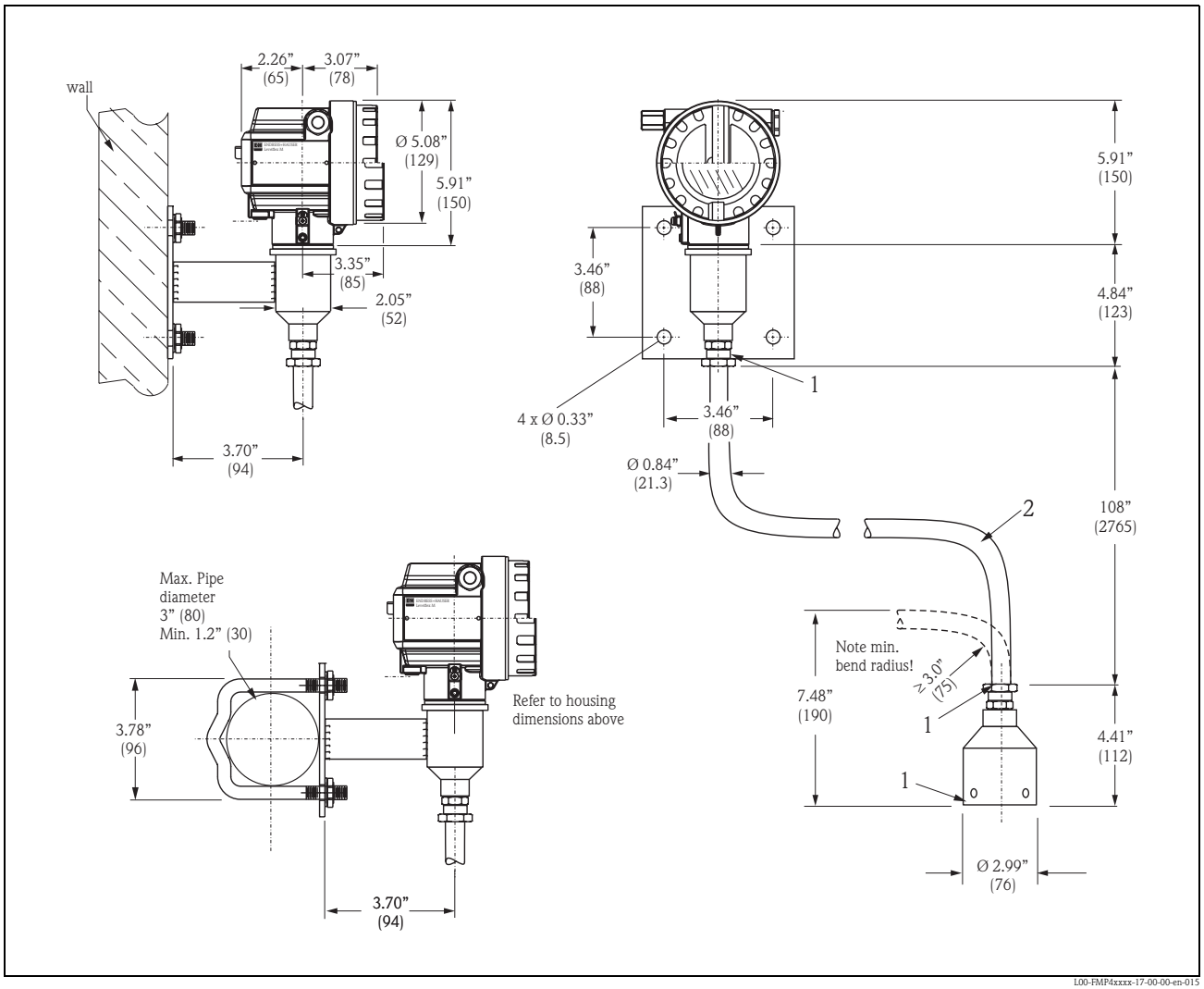


L00-FMP4xxxx-17-00-00-en-048

Installation for difficult-to-access process connections

Installation with remote electronics

- When installing, follow the instructions on page 19.
- Mount housing on a wall or pipe (vertically or horizontally) as shown in the diagram.



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

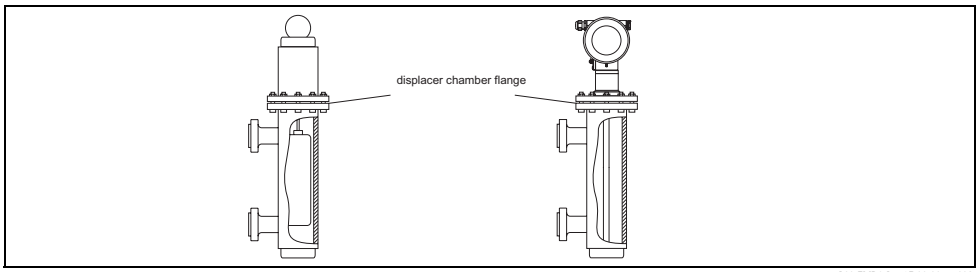
Note!
The protective hose cannot be disassembled at these points (1).

The ambient temperature for the connecting pipe (2) between the probe and the electronics must not be greater than 221°F (105°C).
FMP45: For the remote electronics, temperatures up to 536°F or 752°F (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 Masoneilan displacer chamber (special product) for this purpose. Thanks to menu-guided local operation, commissioning the Levelflex M only takes a few minutes. Replacement is also possible when partially filled, and wet calibration is not required.

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



L00-FMP4xlxx-17-00-00-en-002

Planning instructions:
- In normal cases, use a rod probe. When installing into a metallic displacer chamber up to 6" (150 mm), you have all the advantages of a coax probe (see probe selection page 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 (special product).
- 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 page 56).

Operating conditions: Environment

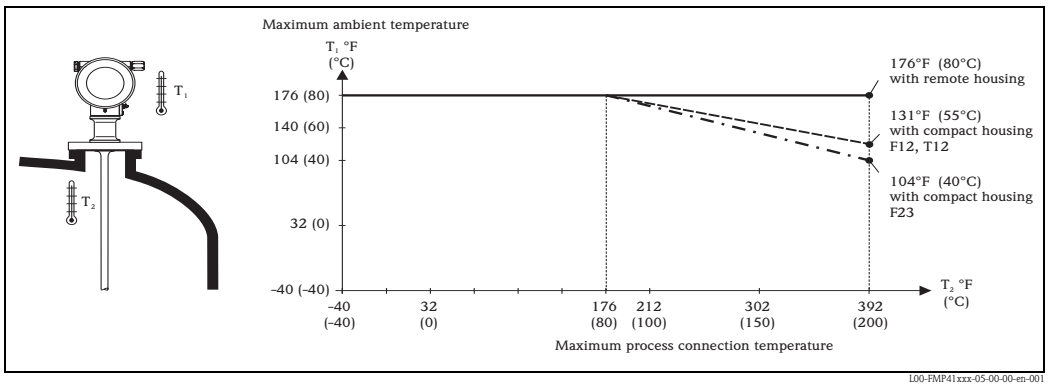
Ambient temperature range

Ambient temperature at the electronics: -40 to +176°F (-40 to +80°C)
The function of the LCD display is restricted at T_A< -4°F (-20°C) and T_A> +140°F (+60°C).
A weather protection cover should be used for outdoor operation if the device is exposed to direct sunlight.

Ambient temperature limits

FMP41C

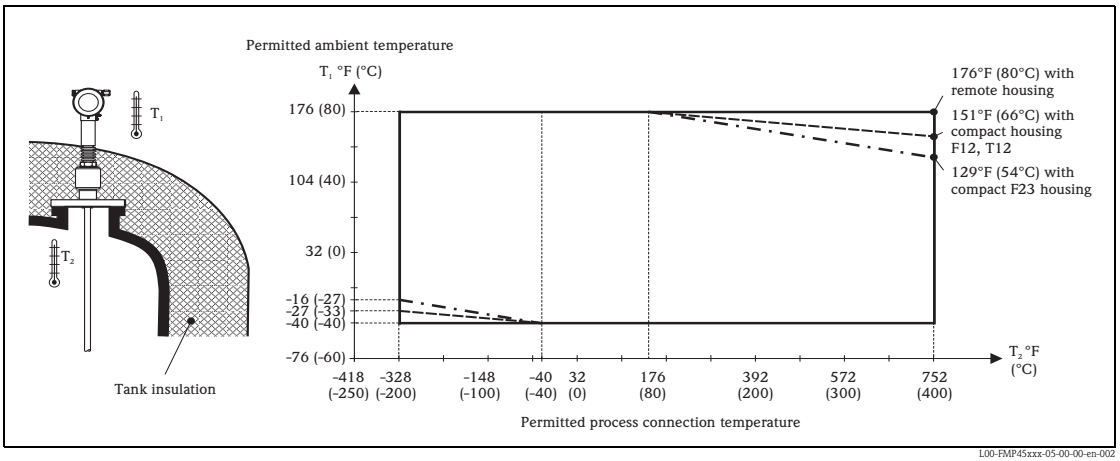
If the temperature (T_2) at the process connection is above 176°F (80°C), the permitted ambient temperature (T_1) decreases as per the following diagram (temperature derating):



L00-FMP41xxx-05-00-00-en-001

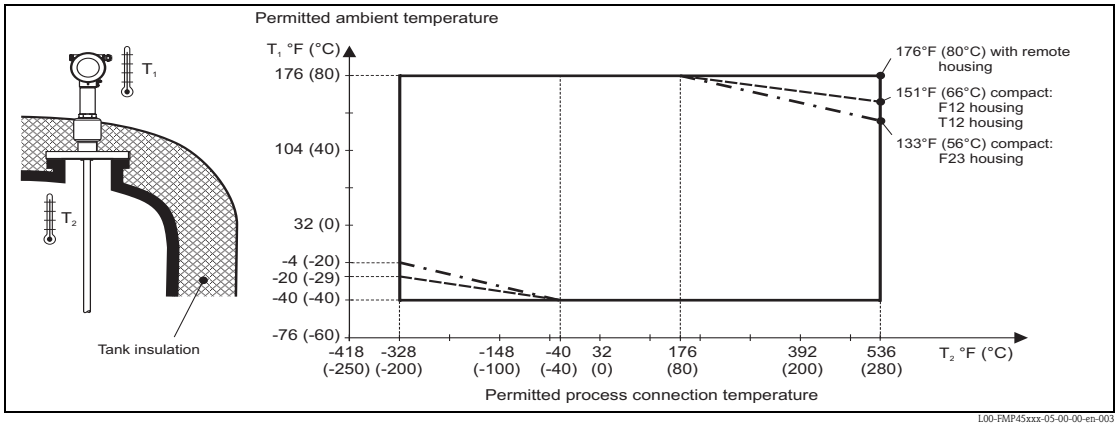
FMP45 (HT 752°F / 400°C)

If the temperature (T_2) at the process connection is below > -40°F (-40°C) or above > + 176°F (80°C), the permitted ambient temperature (T_1) is limited as shown in the following diagram (temperature derating):



FMP45 (XT 536°F / 280°C)

If the temperature (T_2) at the process connection is below > -40°F (-40°C) or above > +176°F (80°C), the permitted ambient temperature (T_1) is limited as shown in the following diagram (temperature derating):



Storage temperature	-40 to +176°F (-40 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 6 ft / 1.83 m under water surface) – IP66, NEMA4X ■ With open housing: IP20, NEMA1 (also ingress protection of the display) Caution! Degree of protection IP6/ NEMA6P applies for M12 PROFIBUS PA plugs only when the PROFIBUS cable is plugged in.
Vibration resistance	DIN EN 60068-2-64 / IEC 68-2-64: 20 to 2000 Hz, 1 $(m/s^2)^2/Hz$
Cleaning the probe	Depending on the application, contamination or 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)

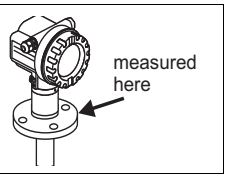
The measured value can be affected by strong electromagnetic fields when installing rod and cable probes without a shielding/metallic wall, e.g. plastic, and in wooden silos.
- Interference emission to EN 61326 – x series, electrical equipment Class A.
- Interference Immunity: the measured value can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

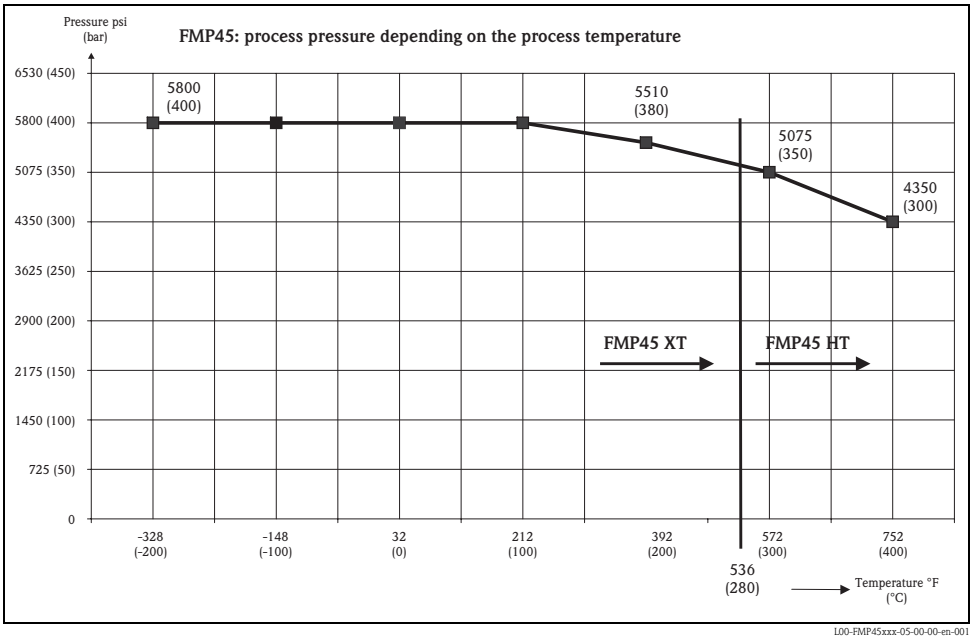
FMP41C

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

High process temperatures (> 302°F/150°C) 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: 32 to 302°F (0 to 150°C).

FMP45



Process pressure limits

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

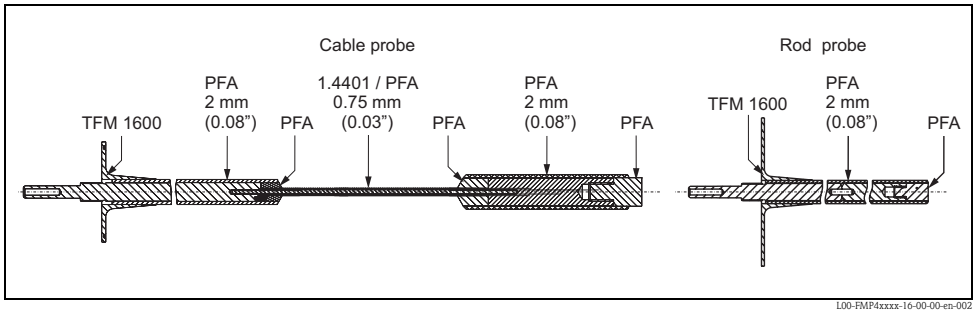
FMP41C

Depends on process connection, max. 580 psi (40 bar).
For FMP41C with E+H universal adapter: max. 87 psi (6 bar).
For FMP41C with Clamp see ordering Information on page 50.
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 68°F (20°C), for ASME flanges 100°F. Pay attention to pressure-temperature dependencies.

FMP45

See pressure/temperature diagram on this page.
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 68°F (20°C), for ASME flanges 100°F. Pay attention to pressure-temperature dependencies.

Materials in contact with process



FMP41C

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

FMP45

	Rod and coax probe	Cable probe
Process connection	Stainless steel 1.4435/316L Alloy C22 ceramic Al_2O_3, 99.7% pure graphite	Stainless steel 1.4435/316L Alloy C22 ceramic Al_2O_3, 99.7% pure graphite
Probe	Stainless steel 1.4435/316L	Stainless steel 1.4401/316L

Dielectric constant

FMP41C

- Rod and cable probe: $\varepsilon r \geq 1.6$
- When installing in metallic pipes DN ≤ 6" (150 mm): $\varepsilon r \geq 1.4$

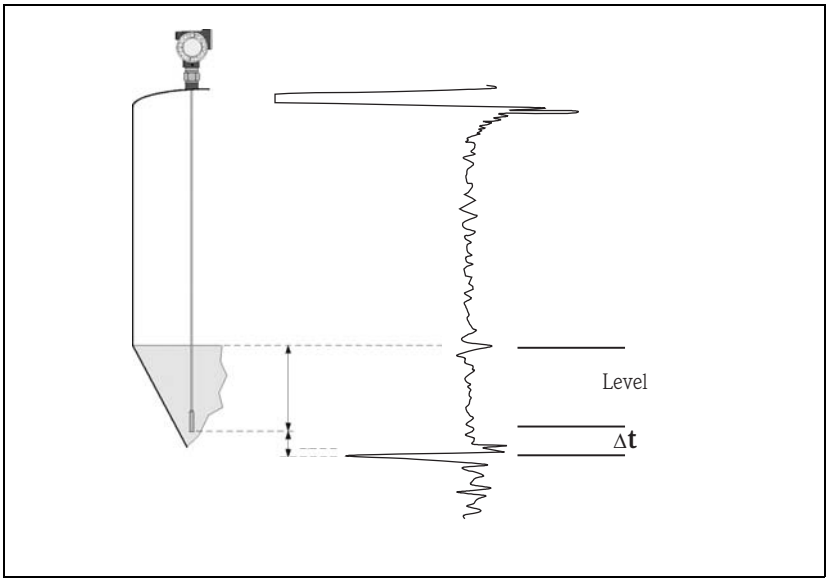
FMP45

- Rod and cable probe: $\varepsilon r \geq 1.6$, when installing in pipes DN ≤ 6" (150 mm): $\varepsilon r \geq 1.4$
- Coax probes: $\varepsilon r \geq 1.4$

End of Probe evaluation

The Levelflex can measure the level of a material with a very low dielectric constant by using two redundant methods: the surface reflection and the evaluation of the "End of Probe" shift.

An electromagnetic wave traveling through a material with a dielectric constant higher than 1 will slow down. Therefore, the reflection of the probe end is delayed compared to the probe end reflection of a material-free probe. This time shift is dependent on the material level and the dielectric constant of that specific material under process conditions. When a reflection of the surface is detected, the level is derived from this signal. In addition, the specific dielectric constant of a product under process conditions can be determined combining the level and the time shift of the End of Probe signal.
In case the surface reflection is too weak, the level is derived from the shift of the "End of Probe" signal, using the last calculated dielectric constant of the material. This mode will operate until a signal from the surface is detected again and the dielectric constant of the material can be updated.

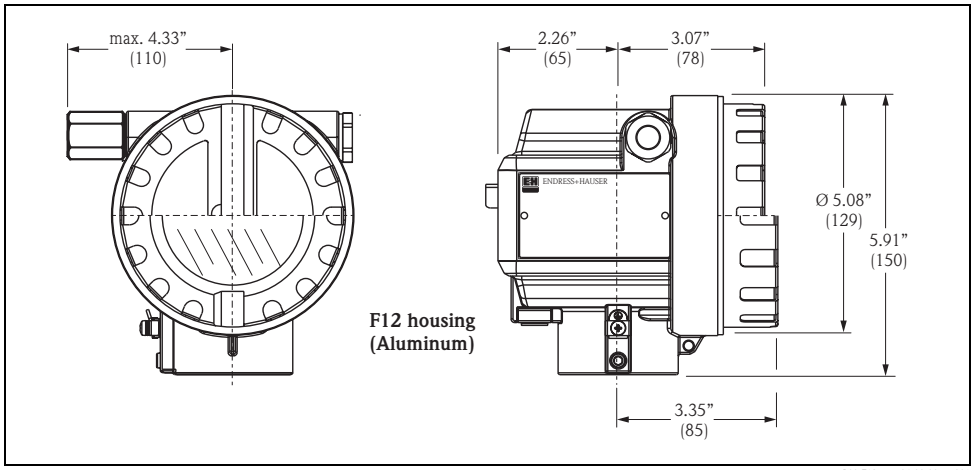


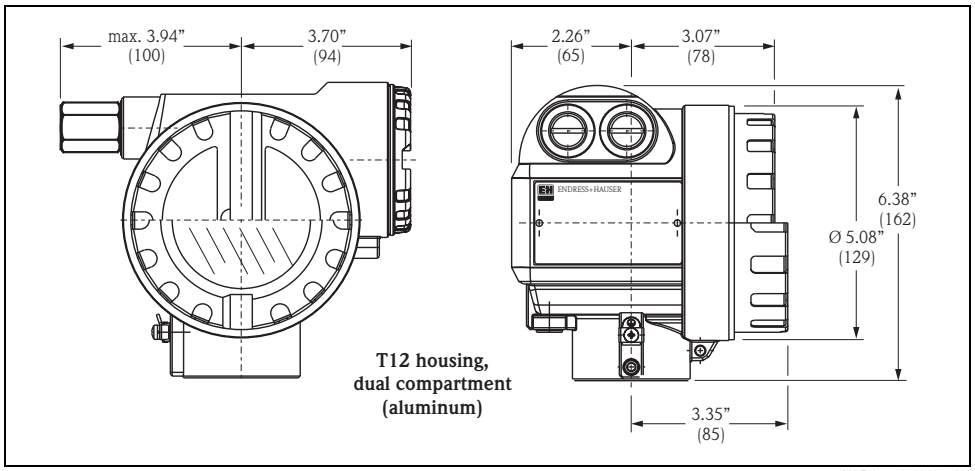
Mechanical construction

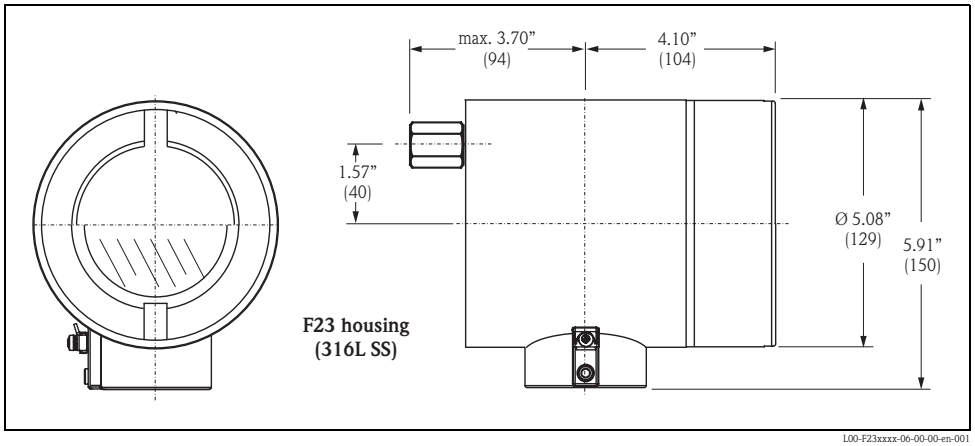
Design, dimensions

Housing dimensions

Dimensions for process connection and probe type page 32.

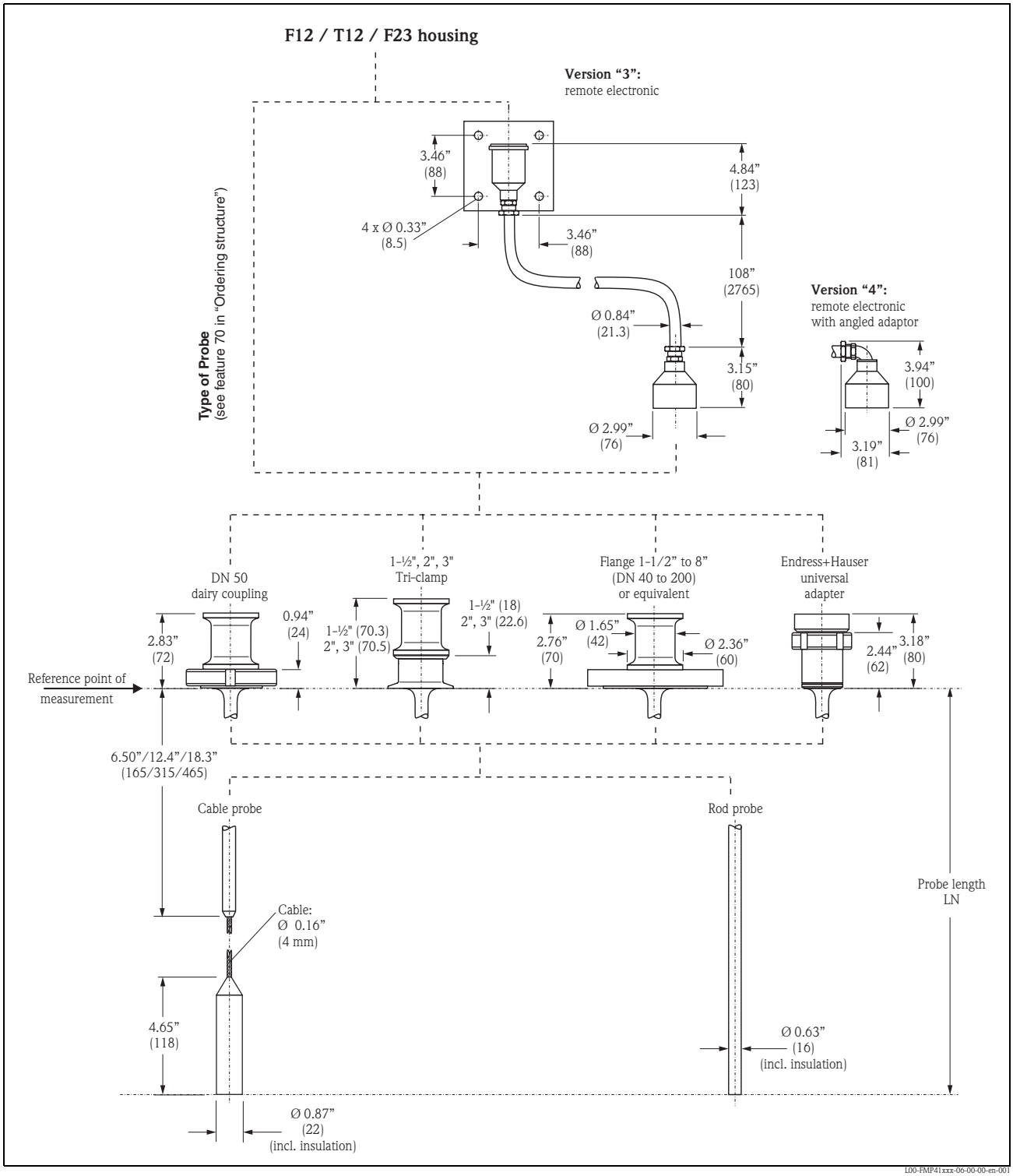






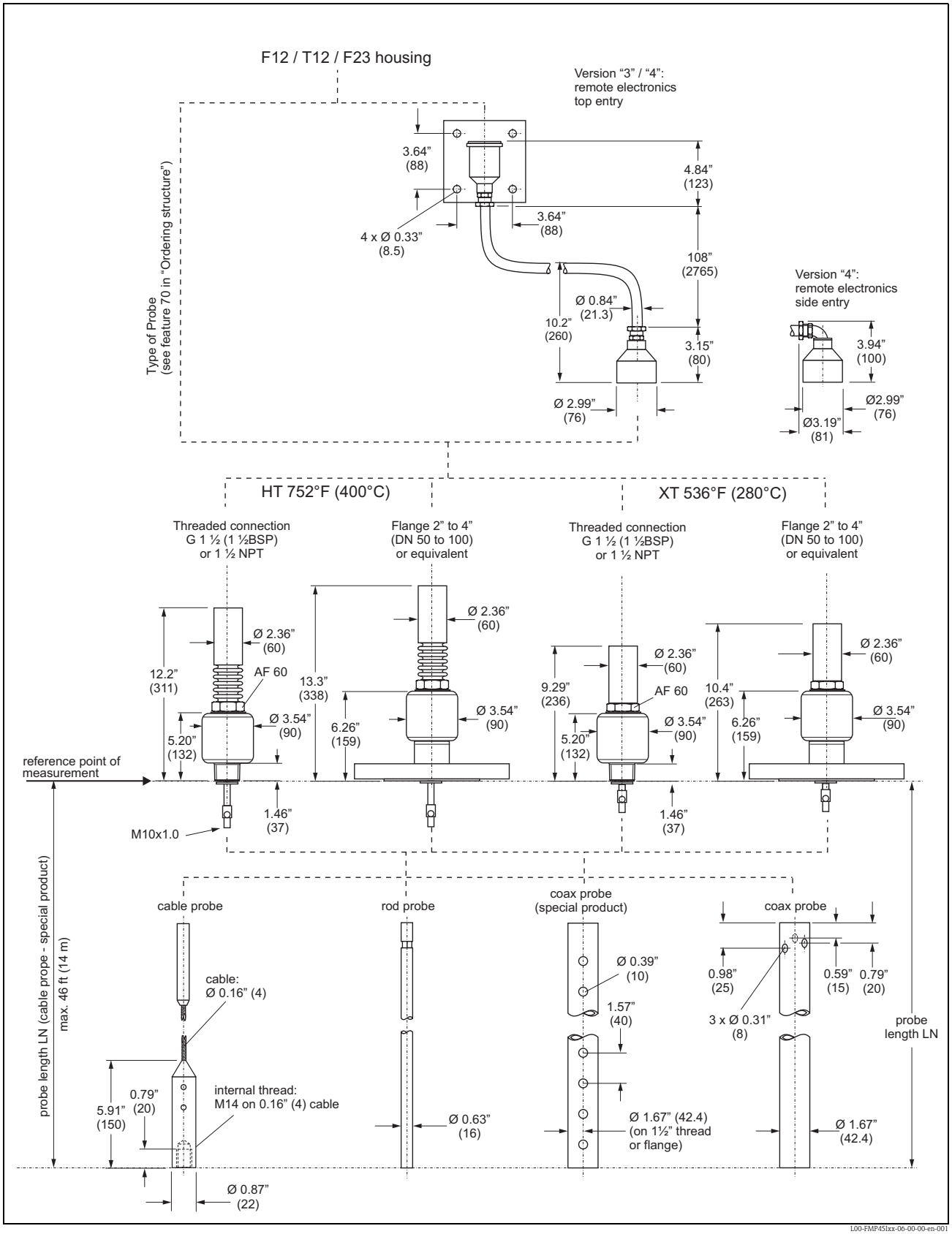
Levelflex M FMP41C - process connection, type of probe

Housing dimensions page 31



Levelflex M FMP45 - process connection, type of probe

Housing dimensions see Page 31



Tolerance of probe length

Rod probes/coax probes				
Over		3.2 ft (1 m)	9.8 ft (3 m)	20 ft (6 m)
Up to	3.2 ft (1 m)	9.8 ft (3 m)	20 ft (6 m)	
Admissible tolerance	-0.2" (-5 mm)	-0.4" (-10 mm)	-0.8" (-20 mm)	-1.21" (-30 mm)

Cable probes				
Over		3.2 ft (1 m)	9.8 ft (3 m)	20 ft (6 m)
Up to	3.2 ft (1 m)	9.8 ft (3 m)	20 ft (6 m)	
Admissible tolerance (mm)	-0.4" (-10 mm)	-0.8" (-20 mm)	-1.21" (-30 mm)	-1.6" (-40 mm)

Weight

Levelflex M	**FMP41C**	
	Rod probe	**Cable probe**
Weight with F12 or T12 housing	approx. 7.7 lb (3.5 kg) + approx. 2.4 lb/3 ft (1.1 kg/m) Probe length + Flange weight	approx. 7.7 lb (3.5 kg) + approx. 1 lb/3 ft (0.5 kg/m) Probe length + Flange weight
Weight with F23 housing	approx. 15 lb (6.8 kg) + approx. 2.4 lb/3 ft (1.1 kg/m) Probe length + Flange weight	approx. 15 lb (6.8 kg) + approx. 1 lb/3 ft (0.5 kg/m) Probe length + Flange weight

Levelflex M	**FMP45**					
	XT version (max. 356°F / 280°C)			**HT version (max. 752°F / 400°C)**		
	Rod probe	**Cable probe**	**Coax probe**	**Rod probe**	**Cable probe**	**Coax probe**
Weight with F12 or T12 housing	approx. 18 lb (8.5 kg) + approx. 3.5 lb/3 ft (1.6 kg/m) Probe length + Flange weight	approx. 18 lb (8.5 kg) + approx. 0.2 lb/3 ft (0.1 kg/m) Probe length + Flange weight	approx. 18 lb (8.5 kg) + approx. 7.7 lb/3 ft (3.5 kg/m) Probe length + Flange weight	approx. 21 lb (9.5 kg) + approx. 3.5 lb/3 ft (1.6 kg/m) + Flange weight	approx. 21 lb (9.5 kg) + approx. 0.2 lb/3 ft (0.1 kg/m) Probe length + Flange weight	approx. 21 lb (9.5 kg) + approx. 7.7 lb/3 ft (3.5 kg/m) Probe length + Flange weight
Weight with F23 housing	approx. 26 lb (12 kg) + approx. 3.5 lb/3 ft (1.6 kg/m) + Flange weight	approx. 26 lb (12 kg) + approx. 0.2 lb/3 ft (0.1 kg/m) Probe length + Flange weight	approx. 26 lb (12 kg) + approx. 7.7 lb/3 ft (3.5 kg/m) Probe length + Flange weight	approx. 29 lb (13 kg) + approx. 3.5 lb/3 ft (1.6 kg/m) + Flange weight	approx. 29 lb (13 kg) + approx. 0.2 lb/3 ft (0.1 kg/m) Probe length + Flange weight	approx. 29 lb (13 kg) + approx. 7.7 lb/3 ft (3.5 kg/m) Probe length + Flange weight

Material

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

Process connection

See "Ordering information" on page 42 - 47.

Probe

See "Ordering information" on page 42 - 47.

Human interface

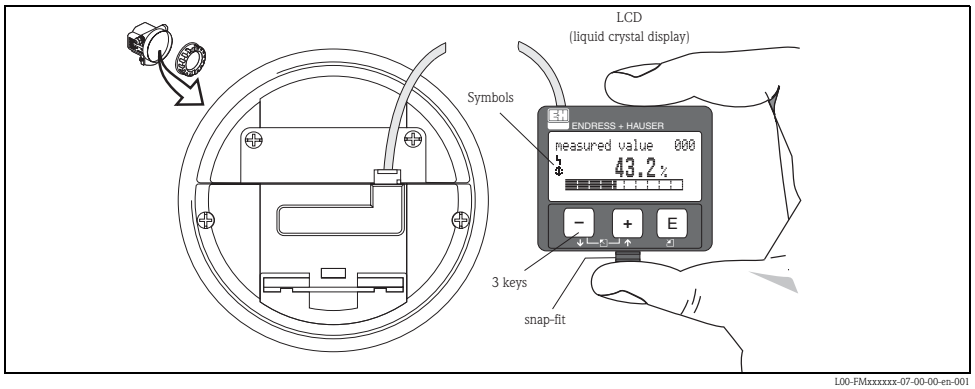
Operating concept

The measured value display 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 20" (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

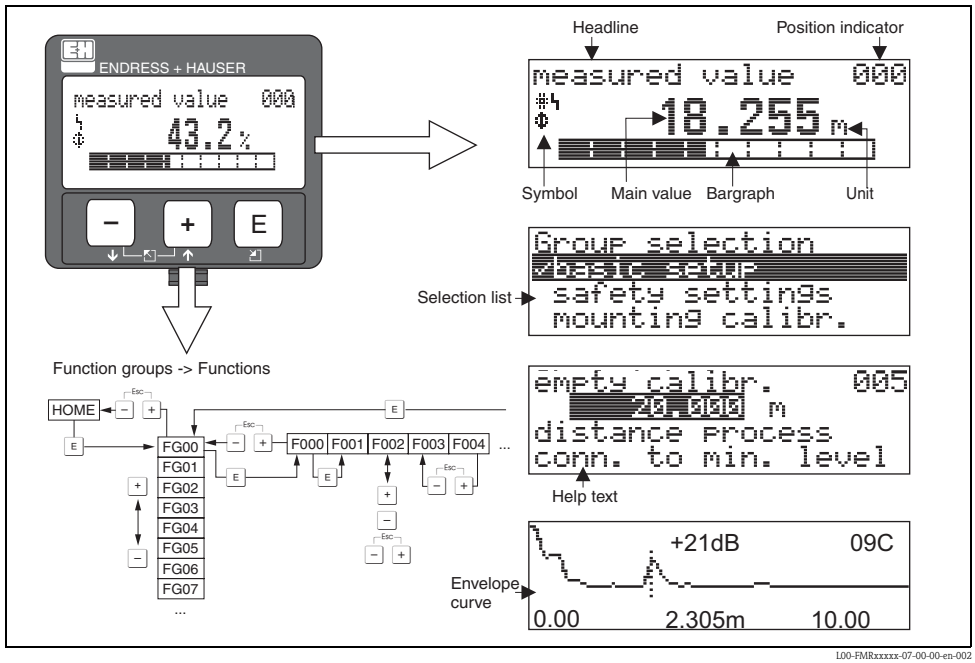
Key(s)	Meaning
[+] or [↑]	Navigate upwards in the selection list Edit numeric value within a function
[−] or [↓]	Navigate downwards in the selection list Edit numeric value within a function
[Esc] or [←]	Navigate to the left within a function group
[E]	Navigate to the right within a function group, confirmation.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

Local operation

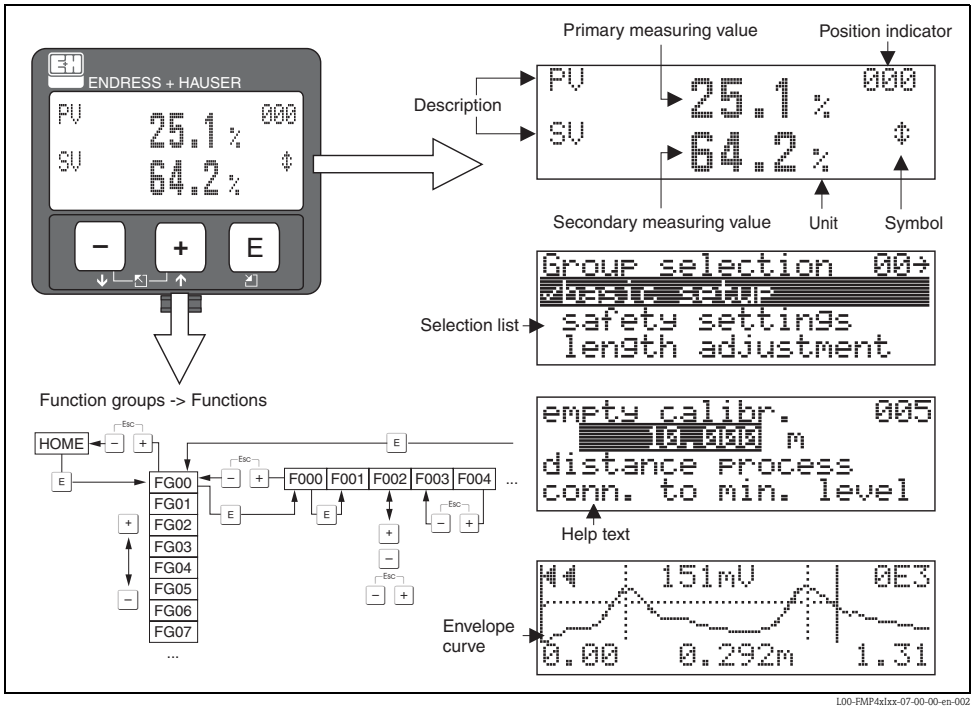
Operation with VU331

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



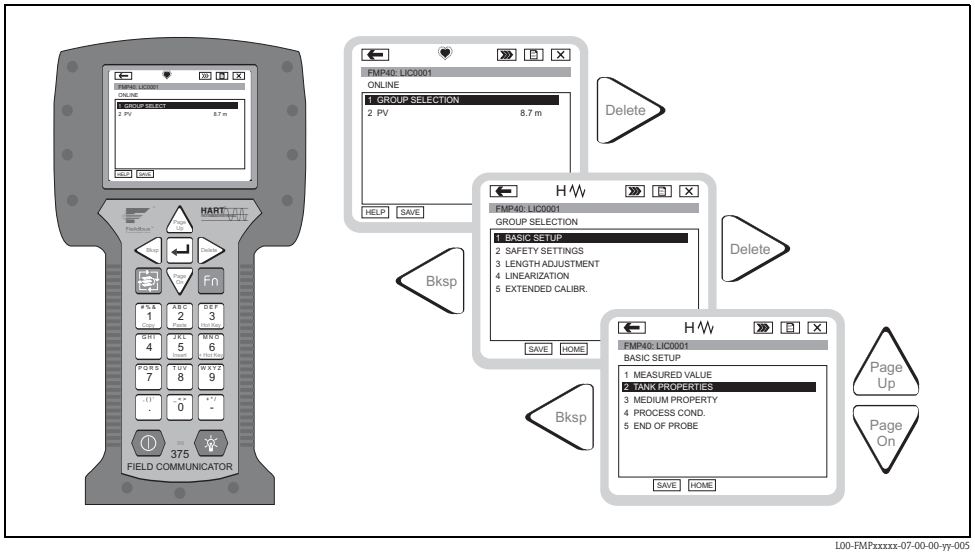
Display for interface measurement



L00-FMP4x1xx-07-00-00-en-002

Operation with handheld terminal Field Communicator 375

With the handheld terminal 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 375.

Remote operation

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

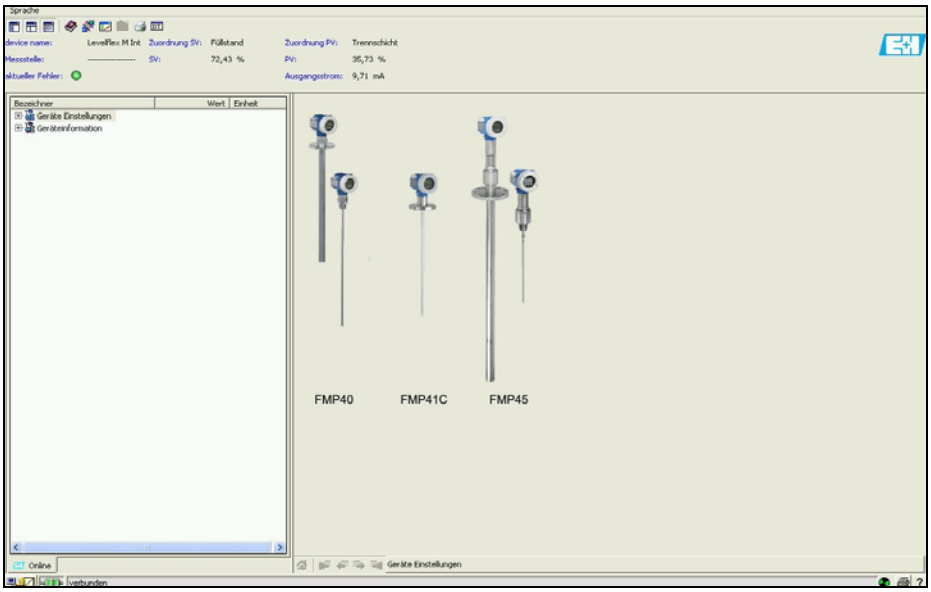
Operation with FieldCare

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: WinNT4.0, Win2000 and WinXP.

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

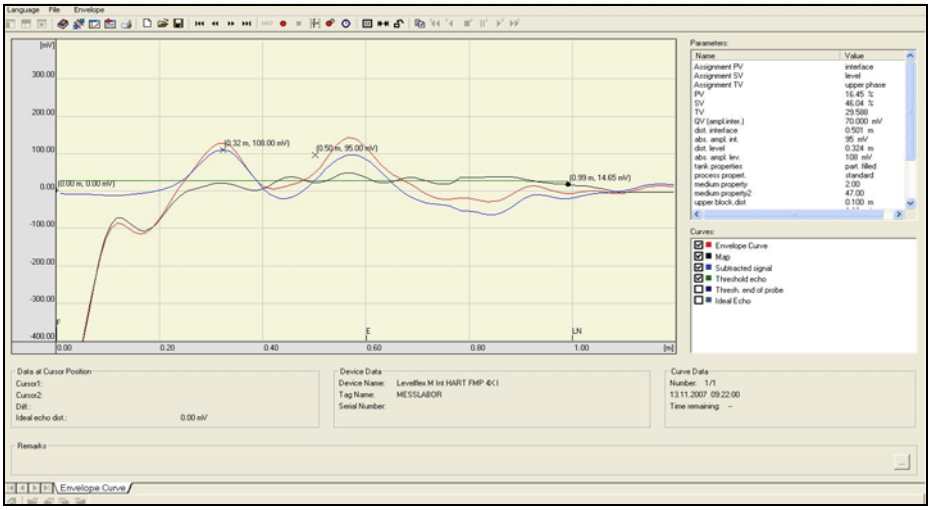
Connection options:
- HART via Commubox FXA191 and the RS 232 C serial port of a computer
- HART via Commubox FXA195 and the USB port of a computer
- PROFIBUS PA via segment coupler and PROFIBUS interface card

Menu-guided commissioning



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

Signal analysis via envelope curve

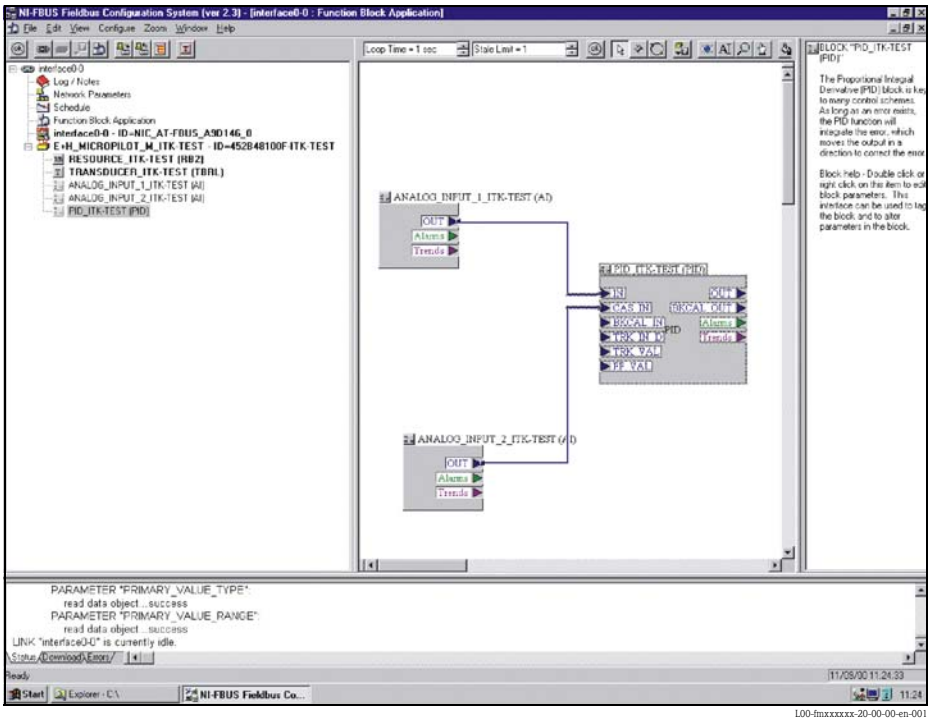


L00-fmp-1xxx-20-00-00-en-034

Operation with 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



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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 page 42 – 47.

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:

			Option:	XA405F	XA404F	XA388F	XA387F	XA377F	XA329F	XA274F	XA273F	XA272F	XA270F	XA269F	XA268F	XA266F	XA264F	XA263F	XA262F	XA261F	ZD199F	ZD198F	ZD177F	ZD176F	ZD174F	ZD173F	ZD172F	ZD021F	ZD166F	ZD165F	ZD163F	ZD162F	ZD159F	ZD158F	ZD157F	ZE256F
Approval:	10	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	
		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 + coal dust, N.I.	U																		X	X	X	X		X	X								
		CSA XP Cl.I,II,III Div.1 Gr.A-D,G + coal dust, N.I.	V																						X										
		Special version, to be specified	Y																																
		ATEX II 1/2G EEx ia IIC T6 Note safety instruction (XA) (electrostatic charging)!	1								X	X		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			X																			
		ATEX II 1/2G EEx ia IIC T6, WHG Note safety instruction (XA) (electrostatic charging)!	6								X	X		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, ATEX II 1/3D, WHG Note safety instruction (XA) (electrostatic charging)!	8							X			X			X																			X
Power supply Output	40	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		
		2-wire PROFIBUS PA	D	X		X	X	X	X	X	X		X	X		X	X	X	X		X		X		X	X	X		X	X		X	X	X	
		2-wire FOUNDATION Fieldbus	F	X		X	X	X	X	X	X		X	X		X	X	X	X		X		X		X	X	X		X	X		X	X	X	
		4-wire 90-250VAC 4-20mA SIL HART	G																																	
		4-wire 10.5-32VDC 4-20mA SIL HART	H																																	
		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		
		Special version, to be specified	Y																																

FMP45:

			Option:	XA386F	XA380F	XA379F	XA378F	XA376F	XA330F	XA217F	XA216F	XA215F	XA213F	XA212F	XA211F	XA173F	XA172F	XA168F	XA167F	XA166F	XA165F	XA164F	ZD117F	ZD116F	ZD114F	ZD113F	ZD083F	ZD082F	ZD081F	ZD080F	ZD021F	ZD110F	ZD109F	ZD107F	ZD106F	ZD078F	ZD077F	ZD076F	ZD075F	ZE256F
Approval:	10	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 d (ia) IIC T1	K																																				
		TIIS Ex d (ia) IIC T2	L																																				
		FM DIP Cl.II Div.1 Gr.E-G N.I.	M																																X				
		CSA General Purpose	N																																				
		CSA DIP Cl.II Div.1 Gr.G + coal dust, N.I.	P																								X												
		*NEPSI DIP	Q																																				
		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	
		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+coal dust, N.I.	U																					X	X	X	X			X	X									
		CSA XP Cl.I,II,III Div.1 Gr.A-D, G+coal dust, N.I.	V																									X												
		Special version, to be specified	Y																																					
		ATEX II 1/2G EEx ia IIC T6/IECEx Zone 0/1	1								X	X		X	X							X	X																	
		ATEX II 1/2D, Alu blind cover[1]	2							X			X			X	X	X																						
		ATEX II 1/2G EEx em (ia) IIC T6/IECEx Zone 0/1	3																X																					
		ATEX II 1/3D[1]	4							X			X			X	X	X																						
		ATEX II 1/2G EEx ia IIC T6,ATEX II 1/3D	5							X			X				X																						
		ATEX II 1/2G EEx ia IIC T6, WHG	6								X	X		X	X							X	X																	X
		ATEX II 1/2G EEx d (ia) IIC T6	7																		X																			
		ATEX II 1/2G EEx ia IIC T6, ATEX II 1/3D, WHG	8							X			X			X	X	X																						X
Power supply Output	50	2-wire 4-20mA SIL HART	B	X	X		X	X	X	X		X	X		X	X	X		X	X		X		X		X		X		X		X		X		X		X	
		2-wire PROFIBUS PA	D	X	X	X		X	X	X	X		X	X		X	X		X	X	X		X		X			X	X		X	X		X		X	X		
		2-wire FOUNDATION Fieldbus	F	X	X	X		X	X	X	X		X	X		X	X		X	X	X		X		X			X	X		X	X		X		X	X		
		4-wire 90-250VAC 4-20mA SIL HART	G															X										X								X				
		4-wire 10.5-32VDC 4-20mA SIL HART	H															X										X								X				
		2-wire 4-20mA HART, Interface	K	X	X		X	X	X	X		X	X		X	X	X		X	X		X		X		X		X		X		X		X		X		X	
		Special version, to be specified	Y																																					

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

Overspill protection

WHG. See "Ordering information" on page 42 – 47 (see ZE256F/en).
SIL 2, for 4 to 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.

Standards and guidelines applied

The European directives and standards applied can be taken from the associated EC Declarations of Conformity. In addition, the following also applied for Levelflex M:

EN 60529

Protection class of housing (IP-code)

NAMUR – international user association of automation technology in process industries.

- 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.

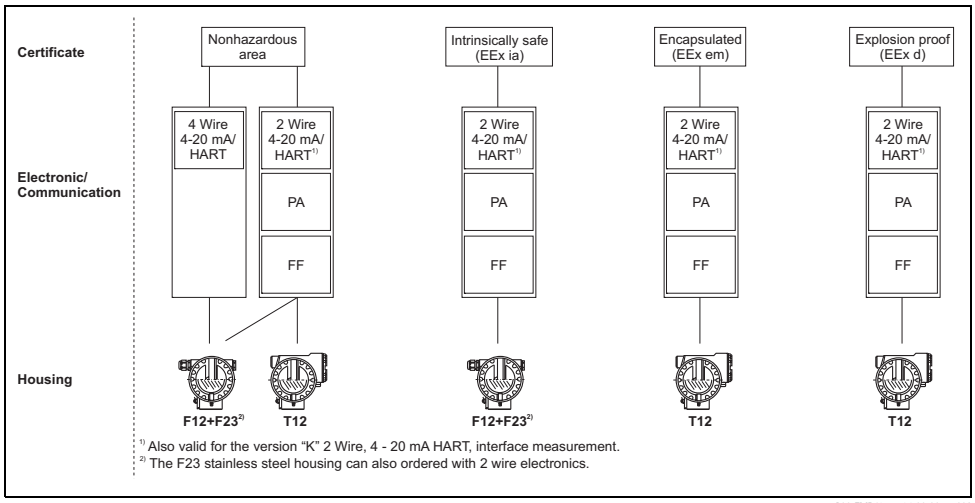
Pressure Equipment Directive

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 2900 psi (200 bar).

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.

Versions that mutually exclude one another are not marked.

Ordering structure Levelflex M FMP41C

10	Approval:	
	A	Non-hazardous area
	F	Non-hazardous area, WHG
	1	ATEX II 1/2G EEx ia IIC T6 Note safety instruction (XA) (electrostatic charging)!
	3	ATEX II 2G EEx em (ia) IIC T6 Note safety instruction (XA) (electrostatic charging)!
	5	ATEX II 1/2G EEx ia IIC T6, ATEX II 1/3D Note safety instruction (XA) (electrostatic charging)!
	6	ATEX II 1/2G EEx ia IIC T6, WHG Note safety instruction (XA) (electrostatic charging)!
	7	ATEX II 1/2G EEx d (ia) IIC T6 Note safety instruction (XA) (electrostatic charging)!
	8	ATEX II 1/2G EEx ia IIC T6, ATEX II 1/3D, WHG Note safety instruction (XA) (electrostatic charging)!
	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
	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
	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 ia IIC T4
	L	TIIS Ex d (ia) IIC T4
	Y	Special version, to be specified

20		Probe:	
		A	..... mm, cable PFA>316, 150 mm, Center rod, nozzle height max 150 mm
		B	..... mm, cable PFA>316, 300 mm, Center rod, nozzle height max 300 mm
		C	..... mm, cable PFA>316, 450 mm, Center rod, nozzle height max 450 mm
		D	..... inch, cable PFA>316, 6 inch, Center rod, nozzle height max 6 inch
		E	..... inch, cable PFA>316, 12 inch, Center rod, nozzle height max 12 inch
		G	..... inch, cable PFA>316, 18 inch, Center rod, nozzle height max 18 inch
		K	..... mm, rod PFA>316L
		M	..... inch, rod PFA>316L
		Y	Special version, to be specified

30	**Process connection:**	
	AEK	1-1/2" 150lbs, PTFE >316/316L flange ANSI B16.5
	AFK	2" 150lbs, PTFE >316/316L flange ANSI B16.5
	AGK	3" 150lbs, PTFE >316/316L flange ANSI B16.5
	AHK	4" 150lbs, PTFE >316/316L flange ANSI B16.5
	AJK	6" 150lbs, PTFE >316/316L flange ANSI B16.5
	AQK	1-1/2" 300lbs, PTFE >316/316L flange ANSI B16.5
	ARK	2" 300lbs, PTFE >316/316L flange ANSI B16.5
	ASK	3" 300lbs, PTFE >316/316L flange ANSI B16.5
	ATK	4" 300lbs, PTFE >316/316L flange ANSI B16.5
	CEK	DN40 PN16-40, PTFE >316L flange EN1092-1 (DIN2527 C)
	CFK	DN50 PN10-40, PTFE >316L flange EN1092-1 (DIN2527 C)
	CGK	DN80 PN10/16, PTFE >316L flange EN1092-1 (DIN2527 C)
	CHK	DN100 PN10/16, PTFE >316L flange EN1092-1 (DIN2527 C)
	CJK	DN150 PN10/16, PTFE >316L flange EN1092-1 (DIN2527 C)
	CSK	DN80 PN25/40, PTFE >316L flange EN1092-1 (DIN2527 C)
	CTK	DN100 PN25/40, PTFE >316L flange EN1092-1 (DIN2527 C)
	KEK	10K 40, PTFE >316L flange JIS B2220
	KFK	10K 50, PTFE >316L flange JIS B2220
	KGK	10K 80, PTFE >316L flange JIS B2220
	KHK	10K 100, PTFE >316L flange JIS B2220
	MRK	DIN11851 DN50 PN40, PTFE >316L
	TCK	Tri-Clamp ISO2852 1-1/2", PTFE >316L
	TDK	Tri-Clamp ISO2852 2", PTFE >316L
	TFK	Tri-Clamp ISO2852 3", PTFE >316L
	TJK	Tri-Clamp ISO2852 1-1/2", PTFE >316L, 3-A, EHEDG
	TLK	Tri-Clamp ISO2852 2", PTFE >316L, 3-A, EHEDG
	TNK	Tri-Clamp ISO2852 3", PTFE >316L, 3-A, EHEDG
	UPK	Universal adapter 44mm, PTFE >316L
	UQK	Universal adapter 44mm, PTFE >316L, EHEDG, 3-A
	YY9	Special version, to be specified

40	**Power Supply; Output:**	
	B	2-wire; 4-20mA SIL HART
	D	2-wire; PROFIBUS PA
	F	2-wire; FOUNDATION Fieldbus
	G	4-wire 90-250VAC; 4-20mA SIL HART
	H	4-wire 10.5-32VDC; 4-20mA SIL HART
	K	2-wire; 4-20mA HART, interface measurement
	Y	Special version, to be specified

50	**Operation:**	
	1	W/o display, via communication
	2	4-line display VU331, envelope curve display on site
	3	Prepared for FHX40, remote display (accessory)
	9	Special version, to be specified

60	**Type of probe:**	
	1	Compact, basic version
	3	Remote, cable 3m, top entry
	4	Remote, cable 3m, side entry
	9	Special version, to be specified

70	**Housing:**	
	A	F12 Alu, coated IP68 NEMA6P
	B	F23 316L IP68 NEMA6P
	C	T12 Alu, coated IP68 (NEMA 6P), separate conn. compartment
	D	T12 Alu, coated IP68 (NEMA 6P) + OVP, separate conn. compartment OVP = overvoltage protection
	Y	Special version, to be specified

80	**Cable Entry:**	
	2	Gland M20 (EEx d > thread M20)
	3	Thread G1/2
	4	Thread NPT 1/2"
	5	Plug M12
	6	Plug 7/8"
	9	Special version, to be specified

90		Additional options:
	A	Basic version
	C	EN10204-3.1 material, pressurized, (316/316L pressurized) inspection certificate
	Y	Special version, to be specified

FMP41C-	Complete product designation

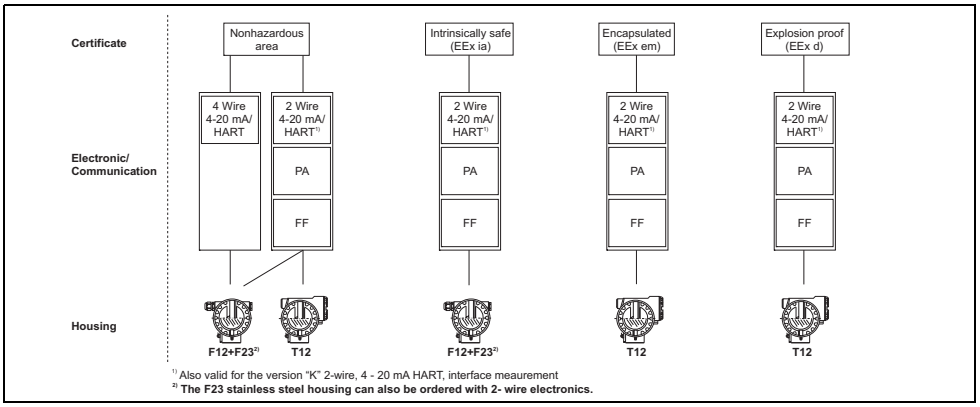
Please enter probe length in mm or inch / 0.1 inch

mm

inch / 0.1 inch

probe length LN see Page 38

Levelflex 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.

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, cable 4mm, 316
	C		.....inch, cable 0.16", 316
	K		.....mm, rod 16 mm, 316L
	L		..... mm, coax, 316L
	M		.....inch, rod 0.63" (16 mm), 316L
	N		..... inch, coax, 316L
	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)
	KFJ	10K 50 RF, 316L flange JIS B2220
	KGJ	10K 80 RF, 316L flange JIS B2220
	KHJ	10K 100 RF, 316L flange JIS B2220
	K3J	63K 50 RF, 316L flange JIS B2220
	K4J	63K 80 RF, 316L flange JIS B2220
	K5J	63K 100 RF, 316L flange JIS B2220
	GGJ	Thread ISO228 G1-1/2, 200bar, 316L
	GJJ	Thread ISO228 G1-1/2, 400bar, 316L, high pressure test
	RGJ	Thread ANSI NPT1-1/2, 200bar, 316L
	RJJ	Thread ANSI NPT1-1/2, 400bar, 316L, High pressure test
	YY9	Special version, to be specified

50		**Power supply; output:**
	B	2-wire; 4-20mA SIL HART
	D	2-wire; PROFIBUS PA
	F	2-wire; FOUNDATION Fieldbus
	G	4-wire 90-250VAC; 4-20mA, SIL, HART
	H	4-wire 10.5-32VDC; 4-20mA, SIL, HART
	K	2-wire; 4-20mA HART, interface measurement
	Y	Special version, to be specified

60		**Operation:**
	1	W/o display, via communication
	2	4-line display VU331, envelope curve display on site
	3	Prepared for FHX40, remote display (accessory)
	9	Special version, to be specified

70		**Type of probe:**
	1	Compact, basic version
	3	Remote, cable 3m, top entry
	4	Remote, cable 3m, side entry
	9	Special version, to be specified

80		**Housing:**
	A	F12 Alu, coated IP68 (NEMA 6P)
	B	F23 316L IP68 (NEMA 6P)
	C	T12 Alu, coated IP68 (NEMA 6P), separate conn. compartment
	D	T12 Alu, coated IP68 (NEMA 6P) + OVP, separate conn. compartment OVP = overvoltage protection
	Y	Special version, to be specified

90		**Cable Entry:**
	2	Gland M20 (EEx d > thread M20)
	3	Thread G1/2
	4	Thread NPT 1/2"
	5	Plug M12
	6	Plug 7/8"
	9	Special version, to be specified

100	Additional options:
	A Basic version
	B EN10204-3.1 material, wetted parts, (316L wetted parts for rod/coax) inspection certificate
	C EN10204-3.1 material, wetted parts, (316L pressurized for cable version) inspection certificate
	N EN10204-3.1 material, NACE MR0175, (316L wetted parts) inspection certificate
	U *Gas phase comp. 250mm/10" reference rod, EN10204-3.1 material, NACE MR0175 (316L wetted parts) inspection certificate
	V *Gas phase comp. 450mm/18" reference rod, EN10204-3.1 material, NACE MR0175 (316L wetted parts) inspection certificate
	Y Special version, to be specified

FMP45- ⇓ Complete product designation

Please enter probe length in mm or inch / 0.1 inch

mm

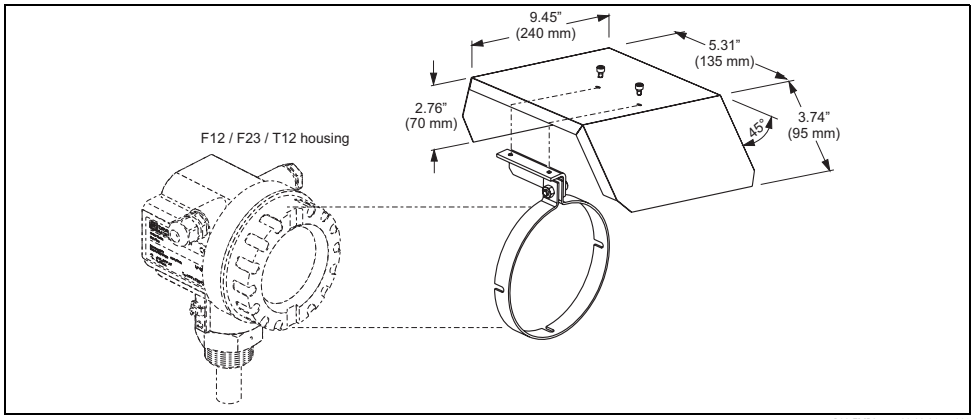
inch / 0.1 inch

probe length LN see Page 39

Accessories

Weather protection cover

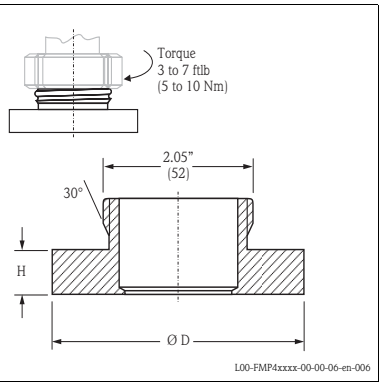
A weather protection cover made of stainless steel is available for outdoor installation (order code: 543199-0001). The shipment includes the protective cover and tension clamp.



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

Welding boss for universal adapter (FMP41C only)

Dimensions of the welding ring		Order-No.
Diameter D, inches (mm)	Height H, inches (mm)	
3.35 (85)	0.47 (12)	52006262
2.56 (65)	0.31 (8)	214880-0002
Material: 1.4435/316L SS)		



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

Center Washers

Center Washer PEEK 48-95 mm/1.89-3.74 in (only FMP45)

- Statically dissipative
- Tmax = 200° C / 392°F
- Diameter adaptable

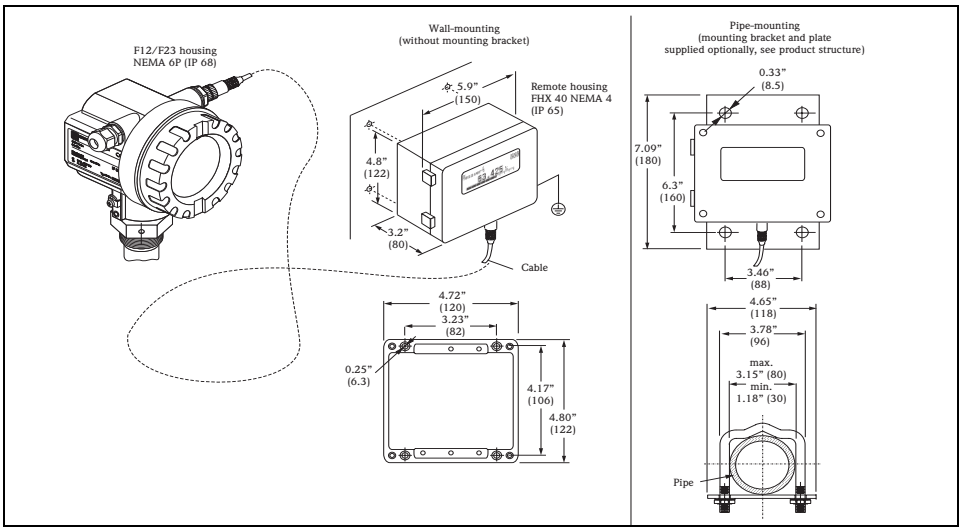
Material-No. 71069064

Center Washer PFA 37 mm/1.46 in

- Tmax=150°C / 302°F

Material-No. 71069065

FHX40 remote display and operation



L00-FMxxxxxx-00-00-06-en-003

Technical data (cable and housing) and product structure:

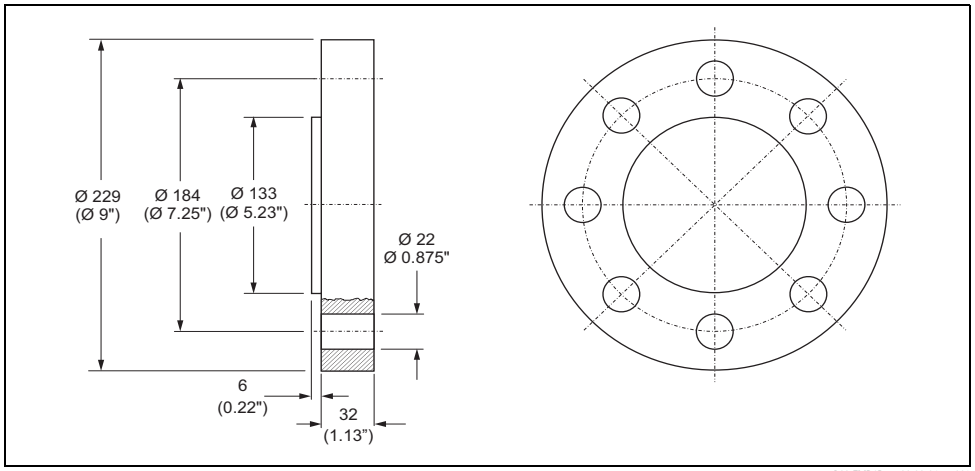
Cable length	65 ft (20 m), fixed length with cast-on connection plugs
Temperature range	-22 to +158°F (-30 to +70°C)
Degree of protection	NEMA 4 (IP65) to EN 60529
Materials	Housing: AlSi12; cable glands: nickel-plated brass
Dimensions: inch / mm	4.8 x 5.9 x 3.2 / 122x150x80 (HxWxD)

	Approval:				
	A				Non-hazardous area
	1				ATEX II 2 G EEx ia IIC T6, ATEX II 3D
	S				FM IS Cl.I Div.1 Gr.A-D
	U				CSA IS Cl.I Div.1 Gr.A-D
	N				CSA General Purpose
	K				TIIS ia IIC T6 (in preparation)
		Cable:			
		1			20m (65 ft); for HART
		5			20m (65 ft); for PROFIBUS PA/FOUNDATION Fieldbus
			Additional options:		
			A		Basic version
			B		Mounting bracket, pipe 1"/ 2"
FHX40 -					Complete product designation

To connect the remote display FHX40, use the appropriate cables provided for the communication version of the device.

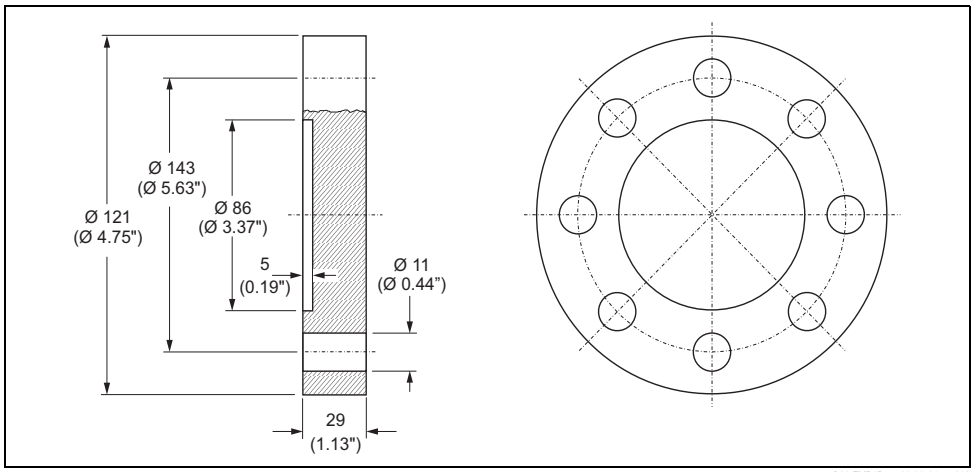
Special process connection (only FMP45)

Fisher flange 249B/259B (MVTF N0123)



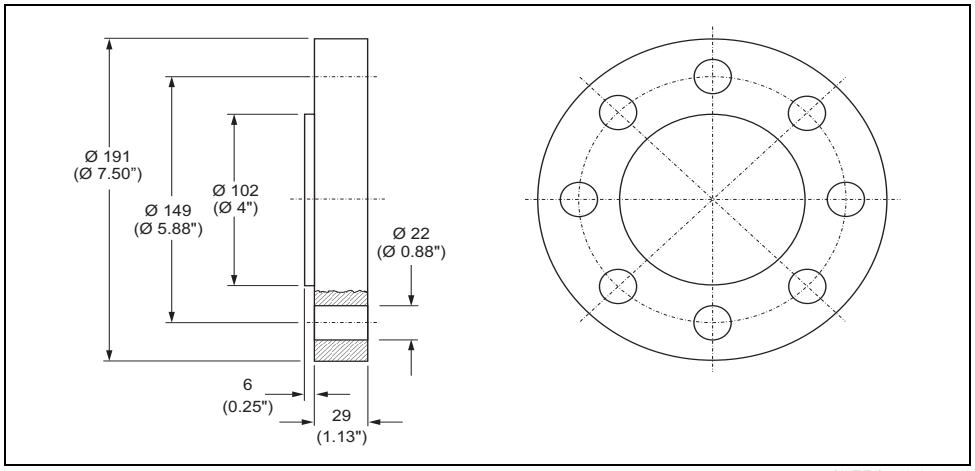
L00-FMP45xxx-00-00-06-en-001

Fisher flange 249C (MVTF N0124)



L00-FMP45xxx-00-00-06-en-002

Masoneillan flange (MVTF N0125)



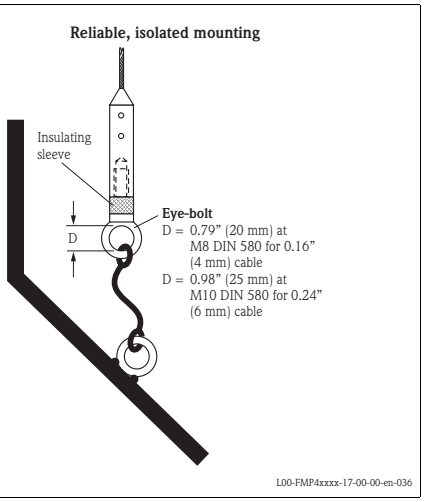
L00-FMP45xxx-00-00-06-en-003

Mounting-kit isolater for FMP45 cable probe only

Mounting-kit	Order-No.
for 0.16" (4mm) cable probe	52014249
for 0.24" (6mm) cable probe	52014250

If a cable probe has to be attached 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. 302°F (150°C).

Due to the risk of electrostatic charge, the insulating sleeve is not suitable for use in hazardous areas. In these cases, the attachment must be reliably grounded.



HART loop converter HMX50

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

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

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.

Note!
For the following Endress+Hauser devices you need the "ToF adapter FXA291" as an additional accessory:

- Cerabar S PMC71, PMP7x
- Deltabar S PMD7x, FMD7x
- Deltapilot S FMB70
- Gammapilot M FMG60
- Levelflex 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

The ToF adapter FXA291 connects the Commubox FXA291 via the USB port of a personal computer or laptop to the following Endress+Hauser devices:

- Cerabar S PMC71, PMP7x
- Deltabar S PMD7x, FMD7x
- Deltapilot S FMB70
- Gammapilot M FMG60
- Levelflex 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)

For details refer to KA271F/00/a2.

Documentation

This supplementary 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.

Technical Information

Tank Side Monitor NFR590

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 NFR590

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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TI386F/24/ae/02.09

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