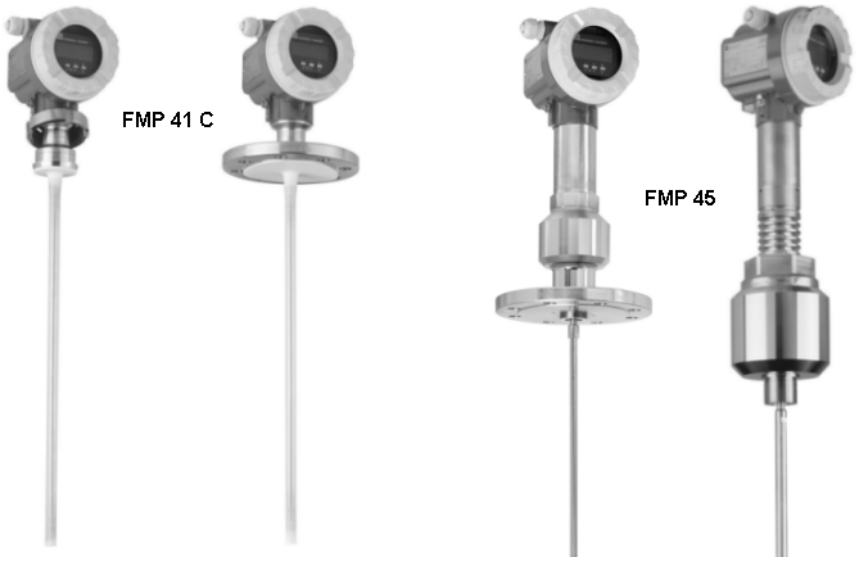
Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Levelflex M FMP41C, FMP45

Guided Level-Radar
Smart Transmitter for continuous level measurement in liquids.



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

FMP41C for corrosive liquids and hygienic requirements
- Highest chemical resistance
- Rod probes up to 4 m (157"), rope probes up to 30 m (1181") measuring range
- with rod probe also for food processing and pharmaceuticals
- All wetted components: PTFE, FDA-listed, **gap-free**

FMP 45 for highest of pressures and/or temperatures
- Temperature range: -200 °C (-328 °F) ... +400 °C (+752 °F)
- Pressure range: -1 ... 400 bar (5802 psi)
- With second safety compartment: gas-tight glass feed though
- Rod and coax probes up to 4 m (157"), rope probes up to 35 m (1378") measuring range

The following interfaces are available for system integration:
- HART (standard) with 4...20 mA analog,
- PROFIBUS PA,
- FOUNDATION Fieldbus.

Your benefits
- **Measurement independent** of product properties as:
  - density,
  - dielectric constant,
  - conductivity.
- **Measurement possible despite very turbulent surfaces or foam** .
- Easy menu-guided on-site operation via four-line plain text display.
- Convenient remote operation, diagnosis and documentation of the measuring point via the ToF Tool operating program supplied free of charge.
- Optional remote display and operation.
- Envelope curve presentation on-site 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 to IEC 61508/IEC 61511-1.
- Approvals:
  - Europe: ATEX, EHEDG (FMP41C), PED (FMP45), WHG.
  - North America: FM, CSA, boiler act (FMP45).

TI386F/00/en

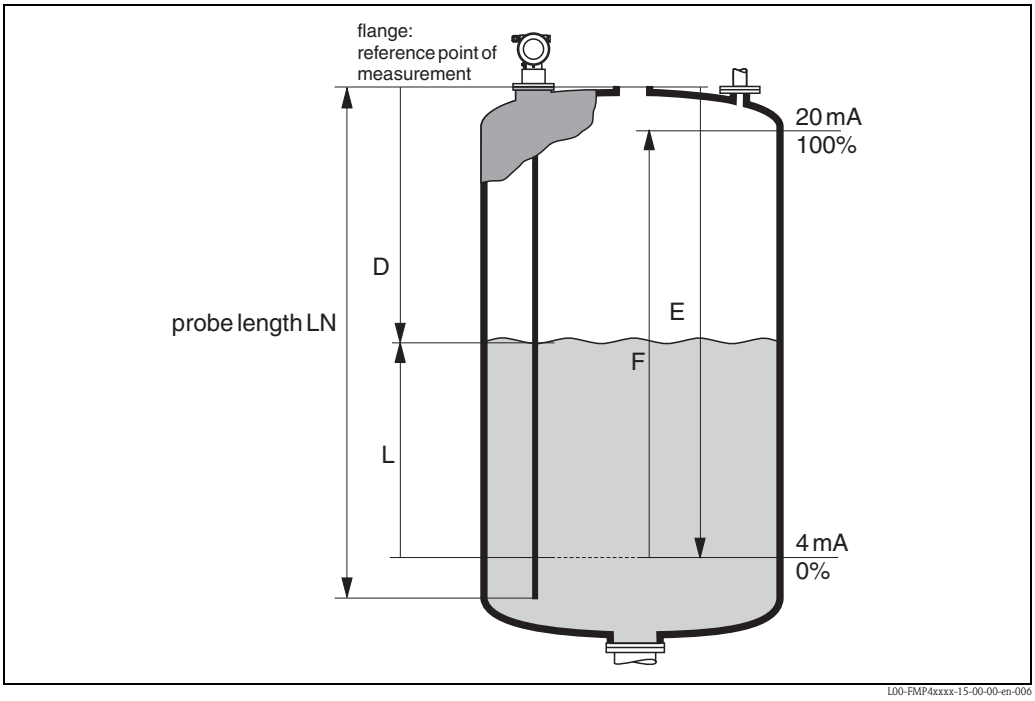
Endress+Hauser
People for Process Automation

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 31-32) to the product surface is measured. High-frequency pulses are injected to a probe and led along the probe. The pulses are reflected by the product surface, received by the electronic evaluation unit and converted into level information.
This method is also known as TDR (Time Domain Reflectometry).



Reference point of measurement, details see Page 31-32

Input

The reflected pulses are transmitted from the probe to the electronics. There, a microprocessor analyses 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 finding benefits from the more than 30 years of 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:

$D = c \cdot t/2$,
with c being the speed of light.

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

$L = E - D$

Reference point for "E" see above diagram.

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

Output

The Levelflex is initially adjusted 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 current output, the factory adjustment for zero point E and span is F 4 mA and 20 mA, for digital outputs and the display module 0 % and 100 %.
A linearisation function with max. 32 points, that is based on a manually or semi-automatically input table, can be activated on-site or via remote operation. This function enables, for example, the conversion of the level into units of volume or weight.

Equipment architecture

Probe selection

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

FMP41C

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

Version:	**FMP41C- *K...** **FMP41C- *L...**	**FMP41C- *A...** **FMP41C- *B...** **FMP41C- *C...** **FMP41C- *D...** **FMP41C- *E...** **FMP41C- *G...**
Type of probe:	**Rod probe**	**Rope probe**
		
Whetted materials:	Rod and rope: 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	2000 N
Lateral loading capacity:	30 Nm	Not relevant
Application for:	■ corrosive liquids ■ liquids in the foods/ pharmaceutical sector	■ corrosive liquids
Probe length:	0.3...4 m (12"...157")	1...30 m (40"...1181")

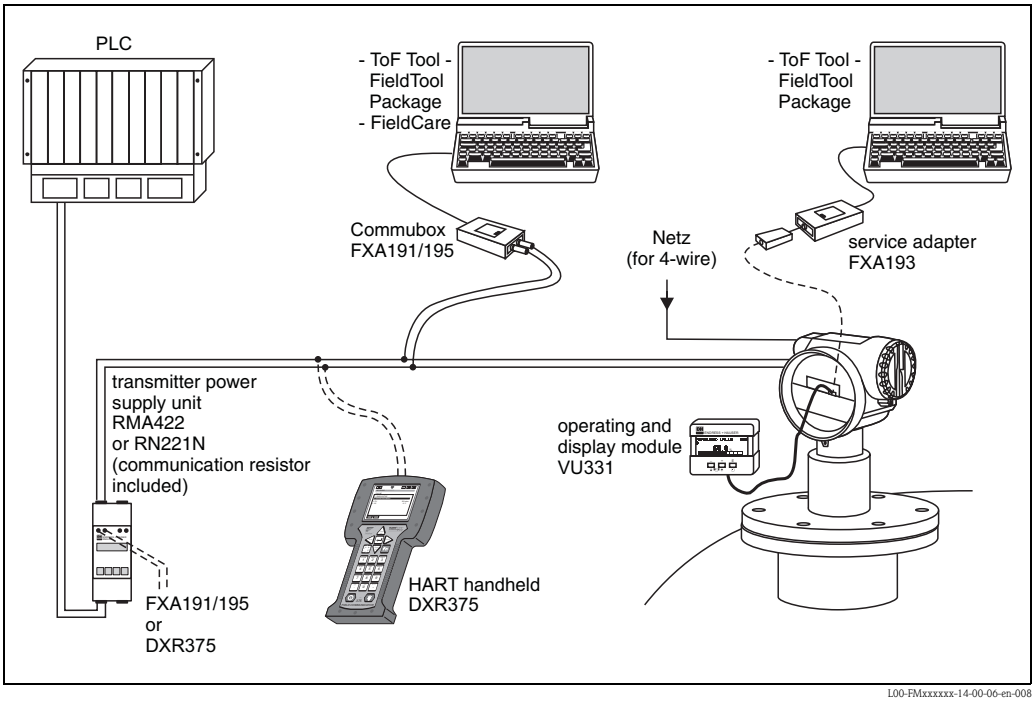
FMP45

For the highest of pressures and/or temperatures.

Version:	FMP45- *K... FMP45- *M...	FMP45- *A... FMP45- *C...	FMP45- *L... FMP45- *N...
Probe type:	Rod probe	Rope probe	Coax probe
			
Wetted materials:	Stainless steel 316L/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 steel 316L/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	10 kN	Not relevant
Lateral loading capacity:	30 Nm	Not relevant	300 Nm
Application for:	■ Liquids	■ Liquids	■ Liquids
Probe length:	0.3...4 m (12"...157")	1...35 m (40"...1378")	0.3...4 m (12"...157")

Stand-alone

- Power supply directly from power line (4-wire) or from transmitter power supply unit (2-wire).
- Operation by on-site display or remote operation via HART protocol.



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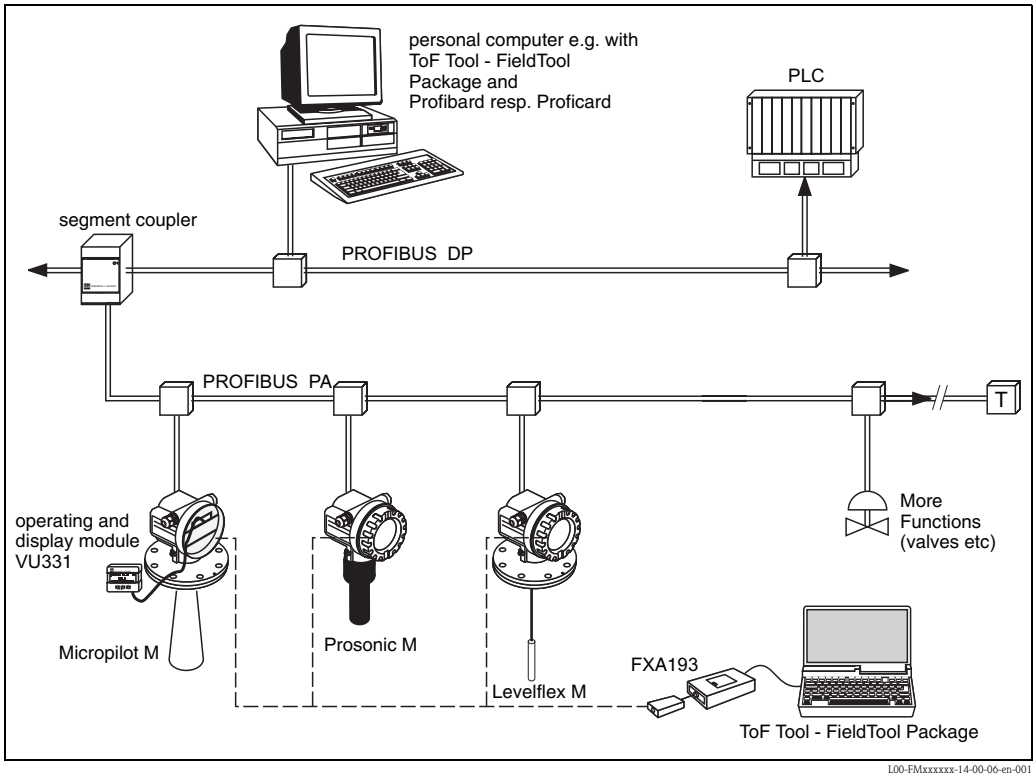
If the HART communication resistor is not installed in the supply device and HART protocol communication is to be carried out, it is necessary to insert a > 250 Ω communication resistor into the 2-wire line.

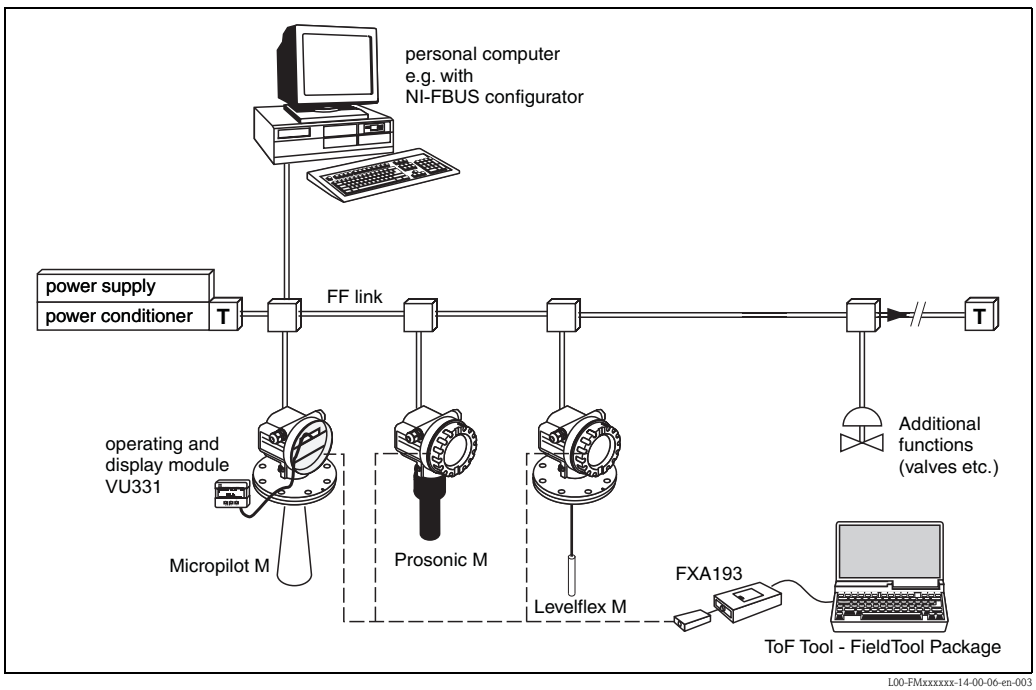
System integration via PROFIBUS PA

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 on-site as well as remote operation are possible.
The complete measuring system consists of:



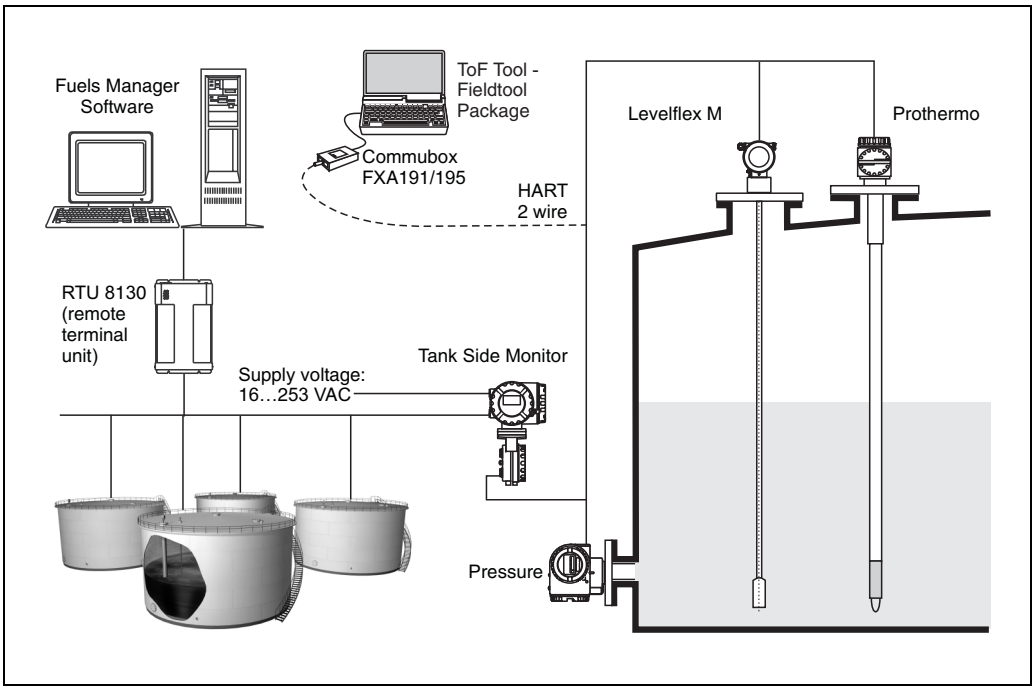
System integration via FOUNDATION Fieldbus

Max. 32 transmitters (standard, Ex em or Ex d) can be connected to the bus. Intrinsically-safe operation according to the FISCO model is also possible. Both on-site as well as remote operation are possible.



Integrated in tank gauging system

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



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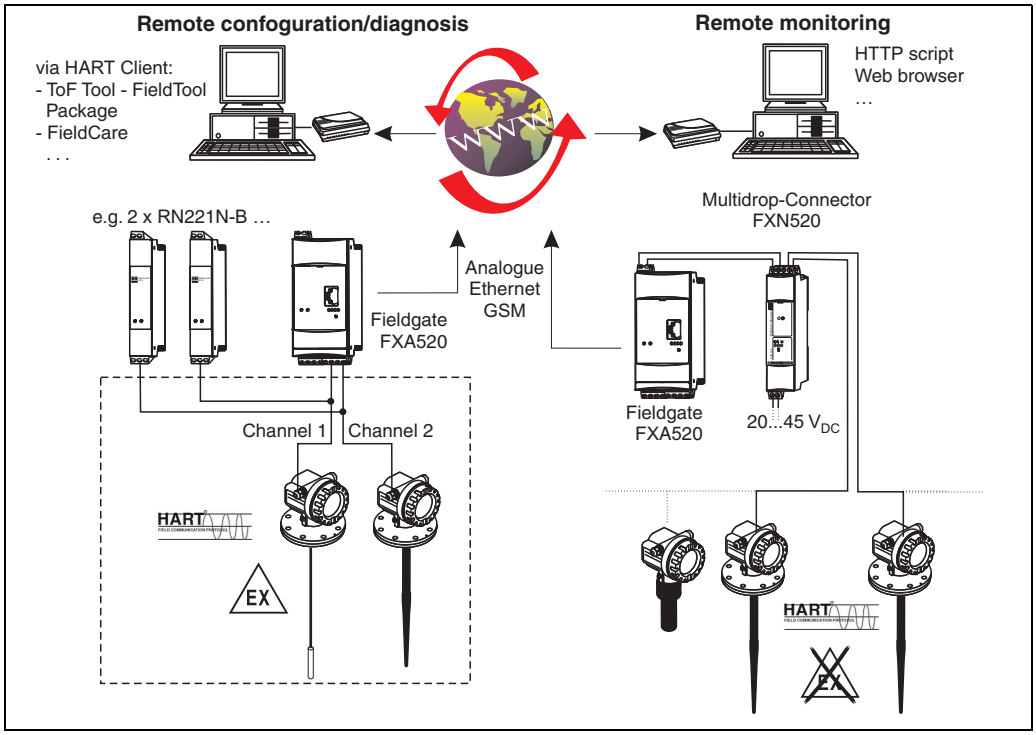
System integration via Fieldgate

Vendor Managed Inventory

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

Remote maintenance of measuring equipment

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



Note!
The number of instruments which can be connected in mutidrop mode can be calculated by the "FieldNetCalc" program. A description of this program can be found in Technical Information TI 400F (Multidrop Conncector FXN520). The program is available form your Endress+Hauser sales organisation or in the internet at: "**www.endress.com ➔ Download**" (Text Search = "Fieldnetcalc").

Input

Measured variable

The measured variable is the distance between the reference point (see Fig on Page 31) and the product surface.
Subject to the input zero point empty distance (E, see Fig. on Page 3) the level is calculated.
Alternatively, the level can be converted by means of linearisation (32 points) into other variables (volume, mass).

Measuring range

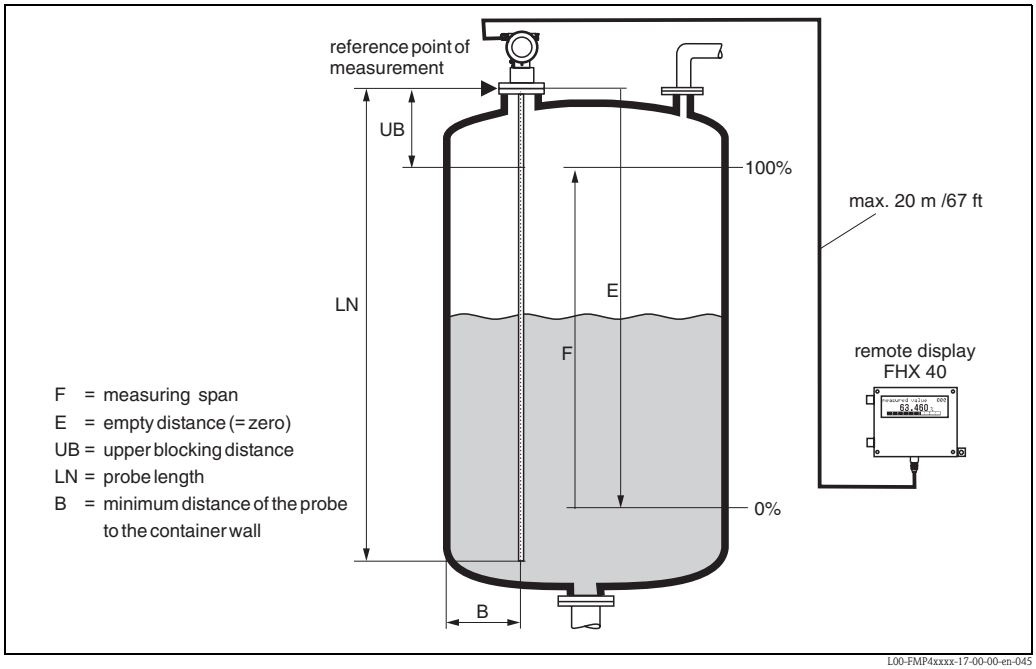
The following table describes the media groups and the possible measuring range as a function of the media group.

Media group	DC (Er)	Typical liquids	Typ. measuring range FMP41C	Typ. measuring range FMP45
1	1.4...1.6	– Condensed gases, e.g. N_2, CO_2	4 m (157"), when installed in metallic pipes	4 m (157"), coax probe, rod probe when installed in metallic pipes
2	1.6...1.9	– Liquefied gas, e.g. Propane – Solvent – Frigen / Freon – Palm oil	9 m (354")	25 m (984")
3	1.9...2.5	– Mineral oils, fuels	12 m (472")	30 m (1181")
4	2.5...4	– Benzene, styrene, toluene – Furan – Naphthalene	16 m (629")	35 m (1378")
5	4...7	– Chlorobenzene, chloroform – Cellulose spray – Isocyanate, aniline	25 m (984")	35 m (1378")
6	> 7	– Aqueous solutions – Alcohols – Acids, alkalis	30 m (1181")	35 m (1378")

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.

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 17.



Reference point of measurement, details see Page 31

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

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

1) The blocking distances given are preset. For media with DK >7, the upper blocking distance UB for rod and rope probes can be reduced to 0.1 m. The upper blocking distance UB can be entered manually.

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

Used frequency spectrum

100 MHz...1.5 GHz

Output

Output signal

- 4…20 mA with HART protocol
- PROFIBUS PA
- FOUNDATION Fieldbus (FF)

Signal on alarm

Error information can be accessed via the following interfaces:
- Local display:
  - Error symbol
  - Plain text display
- Current output
- Digital interface

Linearization

The Levelflex M linearisation function enables conversion of the measured value into any desired length or volume unit, mass or %. Linearisation tables for volume calculation in cylindrical tanks are pre-programmed. Any other table from up to 32 value pairs can be input manually or semi-automatically. The creation of a linearisation table with the ToF Tool or FieldCare is particularly convenient.

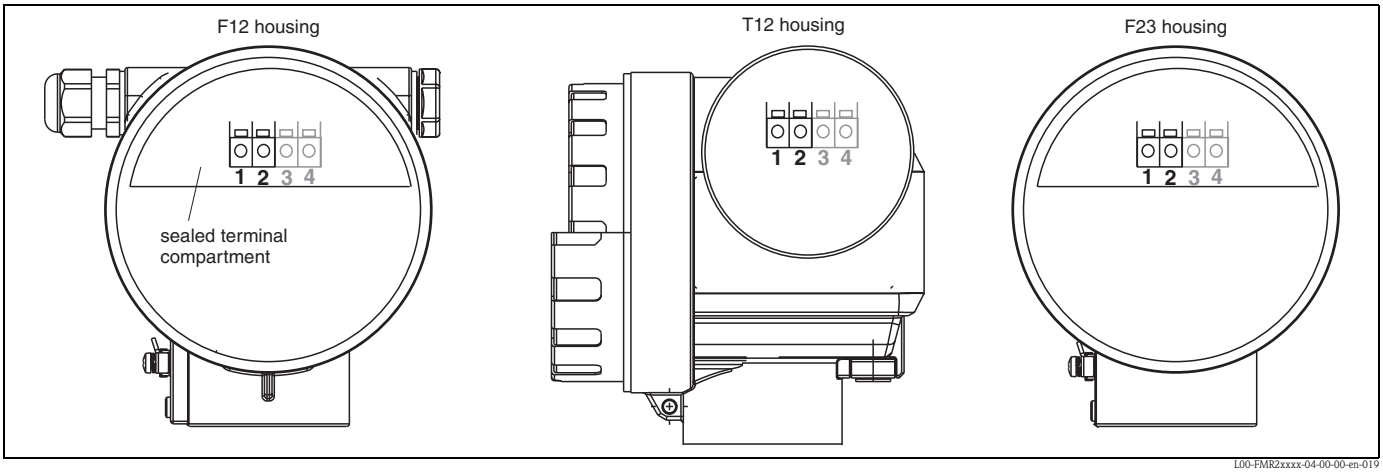
Auxiliary energy

Electrical connection

Terminal compartment

Three housings are available:
- Aluminium housing F12 with additionally sealed terminal compartment for:
  - standard,
  - EEx ia.
- Aluminium housing T12 with separate terminal compartment for:
  - standard,
  - EEx e,
  - EEx d
  - EEX ia (with overvoltage protection).
- Stainless steel 316L housing F23 for:
  - standard,
  - EEx ia.

After mounting, the housing can be turned 350° in order to simplify access to the display and the terminal compartment.



Ground connection

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

Cable gland

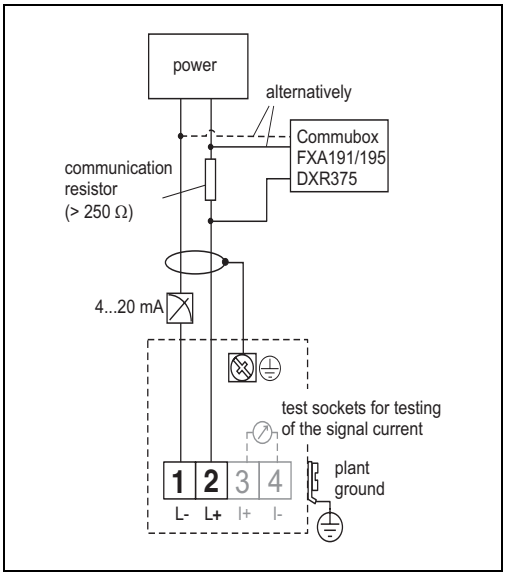
	Type	Clamping area
Standard, EEx ia, IS	Plastic M20x1.5	5...10 mm
EEx em, EEx nA	Metal M20x1.5	7...10.5 mm

Terminals

for wire cross-sections of 0.5...2.5 mm^2

Terminal assignment

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



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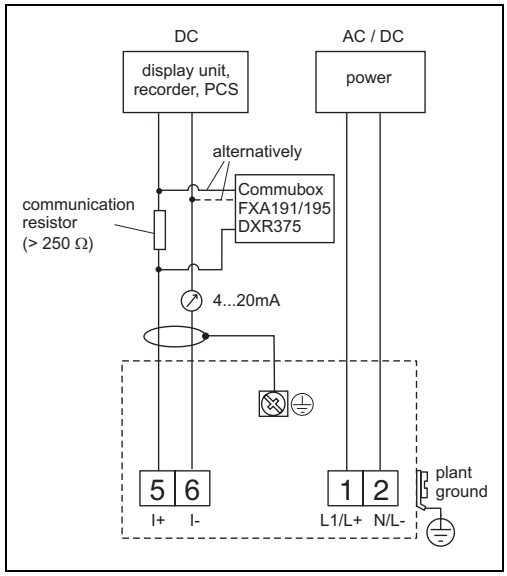
4-wire, 4...20 mA active with HART



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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 analogue signal is used. Use a screened cable when working with a superimposed communications signal (HART).

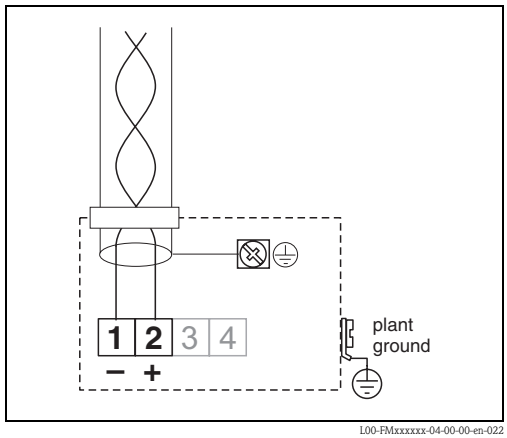
Note!
Protective circuitry against reverse polarity, RFI and over-voltage peaks is built into the device (see also Technical Information TI241F/00/en "EMC Test Procedures").

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 earthing 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, screened two-wire cable, preferably cable type A



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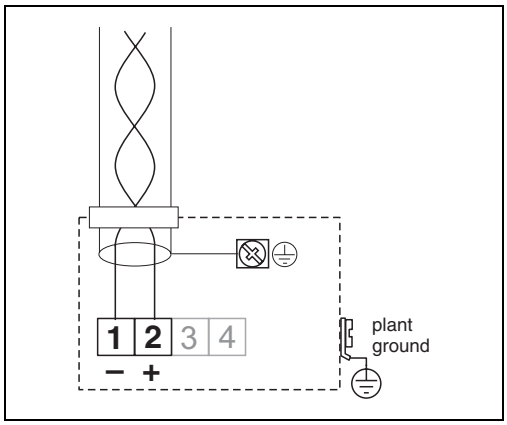
Note!
For further information on the cable specifications, see Operating Instructions BA034S "Guidelines for planning and commissioning PROFIBUS DP/PA", PNO Guideline 2.092 "PROFIBUS PA User and Installation Guideline" and IEC 61158-2 (MBP).

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 earthing 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, screened two-wire cable, preferably cable type A



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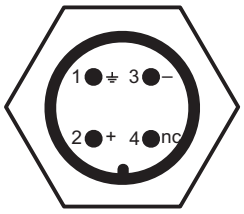
Note!
For further information on the cable specifications, see Operating Instructions BA013S "FOUNDATION Fieldbus Overview", FONDATION Fieldbus Guideline and IEC 61158-2 (MBP).

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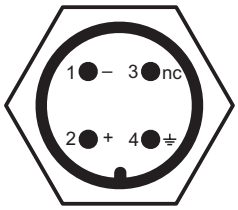
Pin	Meaning
1	Ground
2	Signal +
3	Signal –
4	not connected

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

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

Communication		Current consumption	Terminal voltage	
			minimal	maximal
HART	standard	4 mA	16 V	36 V
		20 mA	7.5 V	36 V
	EEx ia	4 mA	16 V	30 V
		20 mA	7.5 V	30 V
	EEx em 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 transferred at HART)	standard	11 mA	10 V	36 V
	EEx ia	11 mA	10 V	30 V
Fixed current for HART Multidrop mode	standard	4 mA[1)]	16 V	36 V
	EEx ia	4 mA[1)]	16 V	30 V

1) Start up current 11 mA.

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

HART, 4-wire active

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

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

Cable entry

Cable gland: M20x1,5 (for EEx d: cable entry)
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…22 mA	—
HART, 4-wire(90...250 V_{AC})	2.4...22 mA	~ 3...6 mA / ~ 3.5 VA
HART, 4-wire(10.5...32 V_{DC})	2.4...22 mA	~ 100 mA / ~ 1 W
PROFIBUS PA	—	max. 11 mA
FOUNDATION Fieldbus	—	max. 15 mA

Overvoltage protector

If there is the risk of differences in potential forming when installing the Levelflex M to measure the level of flammable liquids, the device can be fitted with a T12 housing and integrated overvoltage protection (600 V gas tube surge arrester), see ordering information on Page 41–42. This overvoltage protection meets the requirements of DIN EN 60079-14, test standard 60060-1, and also protects the device (10 kA, impulse 8/20 µs)

Performance characteristics

Reference operating conditions

- Temperature = +20 °C (68° F) ±5 °C (9° F)
- Pressure = 1013 mbar abs. (14.7 pisa) ±20 mbar (0.3 psi)
- Relative humidity (air) = 65 % ±20%
- Reflection factor 0.8 (surface of water for coax probe, metal plate for rod and rope probe with min. 1 m ∅)
- Flange for rod or rope probe ≥ 30 cm ∅
- Distance to obstructions ≥ 1 m

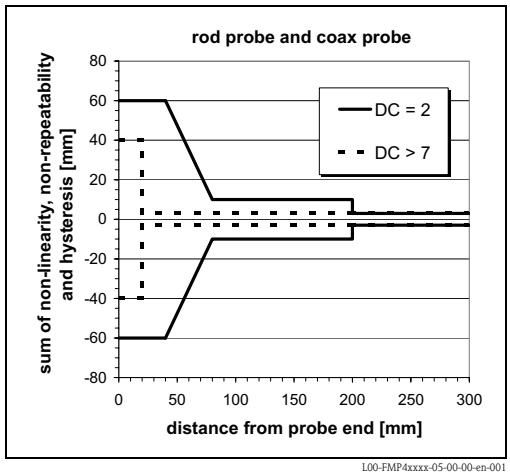
Maximum measured error

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

Output:	**digital**	**analogue**
sum of non-linearity, non-repeatability and hysteresis	**measurig range FMP41C:** – up to 10 m: ±5 mm – > 10 m: ± 0.05 % **measurig range FMP45:** – up to 10 m: ±3 mm – > 10 m: ± 0.03 % **FMP45 with coax probe:** – ±5 mm	± 0.06 %
Offset / Zero	±4 mm	± 0.03 %

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

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



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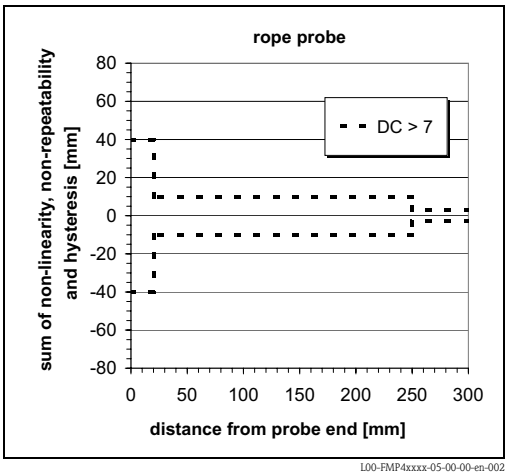

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If for rope probes the DC value is less than 7, then measurement is not possible in the area of the straining weight (0 ... 250 mm from end of probe; lower blocking distance).

Resolution

- digital: 1 mm
- analogue: 0.03 % of measuring range

Reaction time

The reaction time depends on the configuration (min. 1 s).

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

Repeatability

###

Influence of ambiente temperature

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

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

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

Influence of gaslayer

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

Gaslayer	Temperature		Pressure					
	°C	°F	1 bar/14.5 psi	10 bar/145 psi	50 bar/725 psi	100 bar/1450 psi	200 bar/2900 psi	400 bar/5801 psi
Air Nitrogen	20	68	0,00 %	0,22 %	1,2 %	2,4 %	4,9 %	9,5 %
	200	392	-0,01 %	0,13 %	0,74 %	1,5 %	3,0 %	6,0 %
	400	752	-0,02 %	0,08 %	0,52 %	1,1 %	2,1 %	4,2 %
Hydrogen	20	68	-0,01 %	0,10 %	0,61 %	1,2 %	2,5 %	4,9 %
	200	392	-0,02 %	0,05 %	0,37 %	0,76 %	1,6 %	3,1 %
	400	752	-0,02 %	0,03 %	0,25 %	0,53 %	1,1 %	2,2 %

Gaslayer	Temperatuer		Pressure				
	°C	°F	1 bar/14.5 psi	10 bar/145 psi	50 bar/725 psi	100 bar/1450 psi	200 bar/2900 psi
Water (saturated steam)	100	212	0,20 %	—	—	—	—
	180	356	—	2,1 %	—	—	—
	263	505,4	—	—	8,6 %	—	—
	310	590	—	—	—	22 %	—
	364	687,2	—	—	—	—	58 %

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

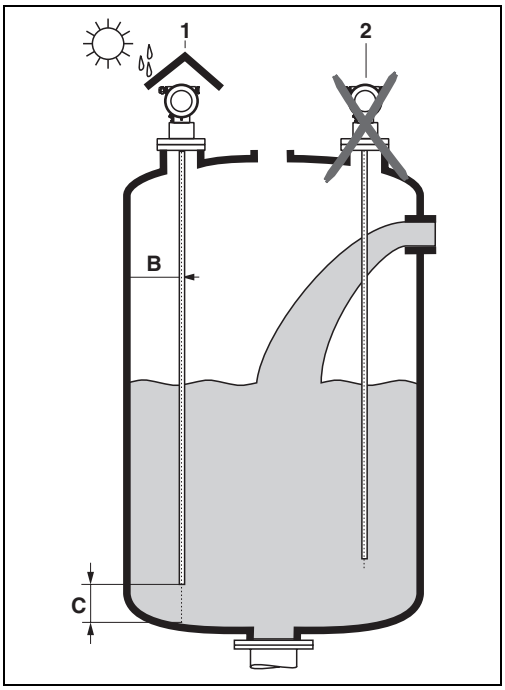
General instructions

Probe selection (see overview on Page 4)

- In normal cases, use rod probes. Rope probes are used for measuring ranges > 4 m or when the overhead clearance does not allow the installation of rigid probes.

Mounting location

- Do not mount rod or rope probes in the filling curtain (2)
- Mount rod and rope probes away from the wall (B) at such a distance that, in the event of build-up on the wall, there is still a minimum distance of 100 mm between the probe and the build-up.
- Mount rod and rope probes as far away as possible from installed fittings. "Mapping " must be carried out during commissioning in the event of distances < 300 mm.
- Minimum distance of probe end to the container floor (C):
  - Rope probe: 150 mm
  - Rod probe: 50 mm
  - Coax probe (FMP45 only): 10 mm
- When installing outdoors, it is recommended that you use a protective cover (1) see "Accessories" on Page 46.



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

Note!

Seal for devices with G 1½" thread

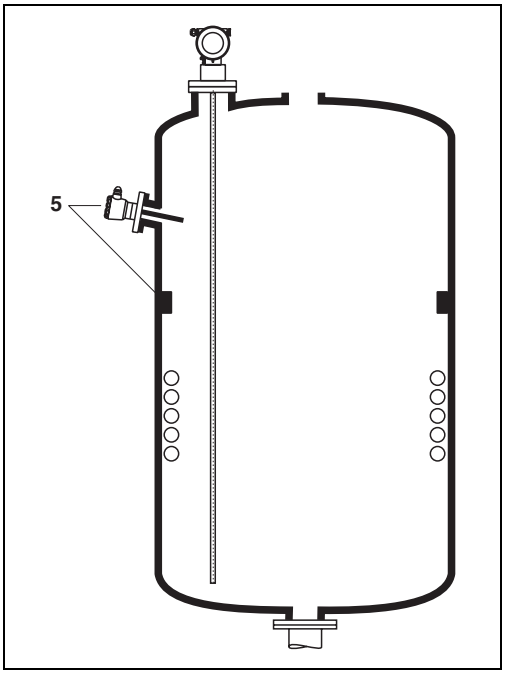
The thread and the type of seal comply to DIN 3852 part 1, screwed end type A. Gaskets accordingto DIN 7603 with a dimesnion of 48x55mm can be used for it.
Please use a gasket according to thisstandard in the form A, C or D and of a material that is resistant to your application.

Tank internals

- Select the mounting location such that the distance to internals (5) (e.g. limit switch, struts) > is 300 mm over the entire length of the probe, also during operation.
- The probe must not touch any internals within the measuring range during operation.

Optimization options

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

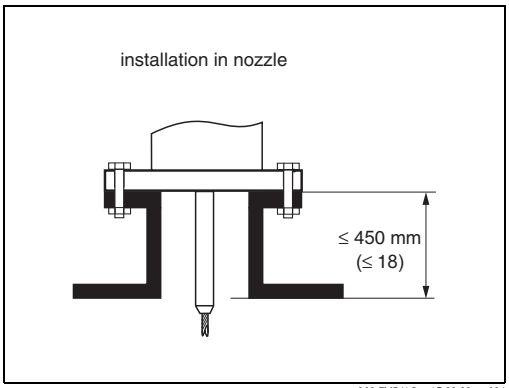


L00-FMP41Cxx-17-00-00-xx-001

Type of probe mounting

FMP41C

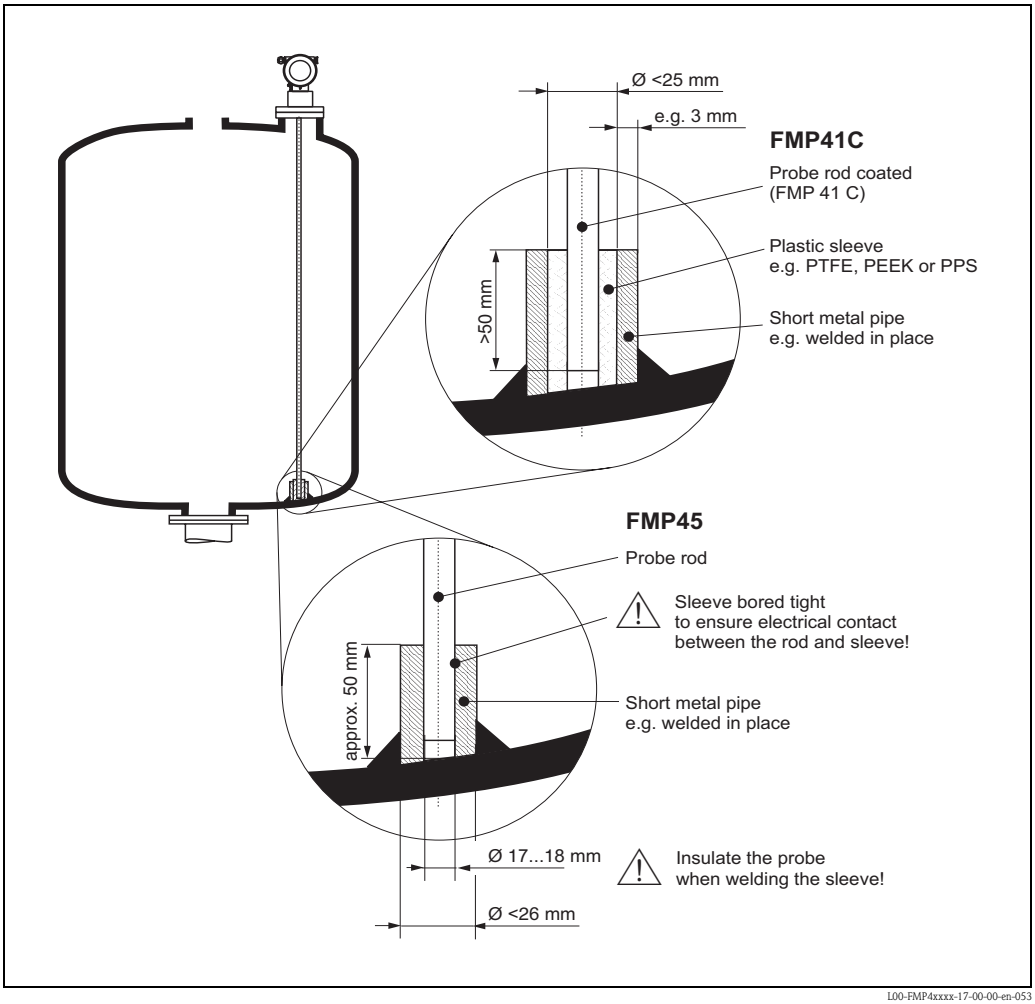
- When installing in plastic tanks, the nozzle must have at least DN50/2". The appropriate flange must be used as the process connection.
- For nozzles up to 450 mm high, select the length of the centering rod appropriate for the nozzle height when using rope probes.
- If the FMP41C is mounted using a flange, place spring elements (e.g. cup springs) under the flange screws to compensate any deformation of the PTFE or retighten the flange screws from time to time.



L00-FMP41Cxx-17-00-00-en-004

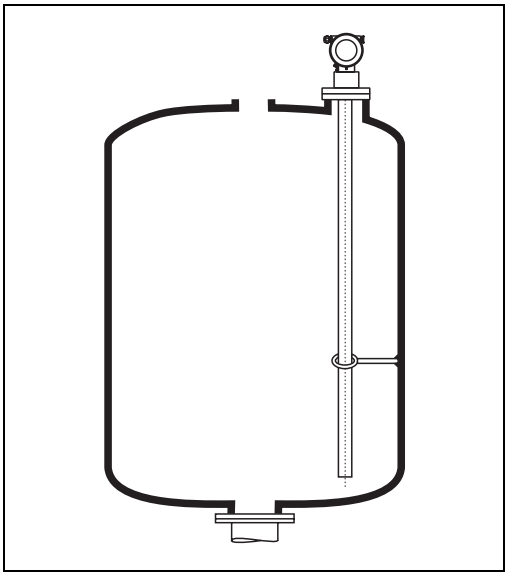
Supporting probes against warping

a. Rod probes: FMP41C and FMP45



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

b. Coax probes: FMP45

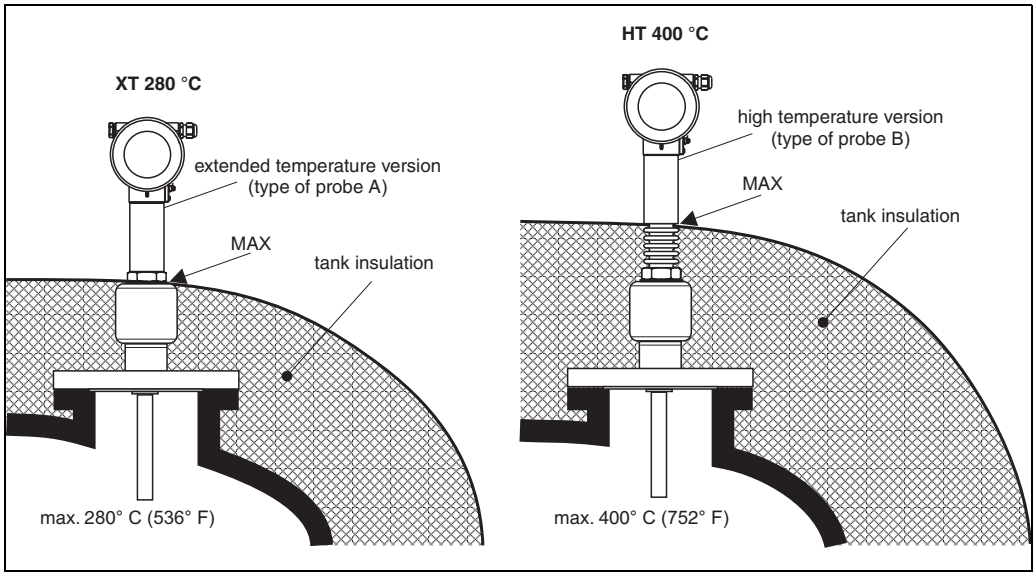


L00-FMP4xxxx-17-00-00-en-054

Installing FMP45 with heat insulation

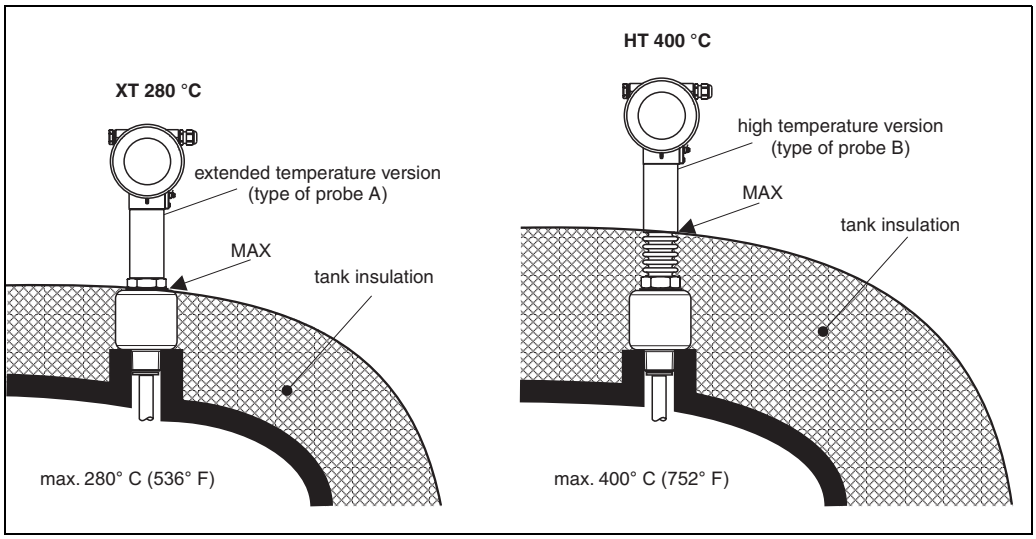
- If process temperatures are high (≥ 200 °C), FMP45 must be included in normal tank insulation to prevent the electronics heating up as a result of heat radiation or convection.
- The insulation may not exceed beyond the points labelled "**MAX**" in the drawing.

Process connection with flange DN50...DN100



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

Process connection with adapter G 1½" and 1½" NPT



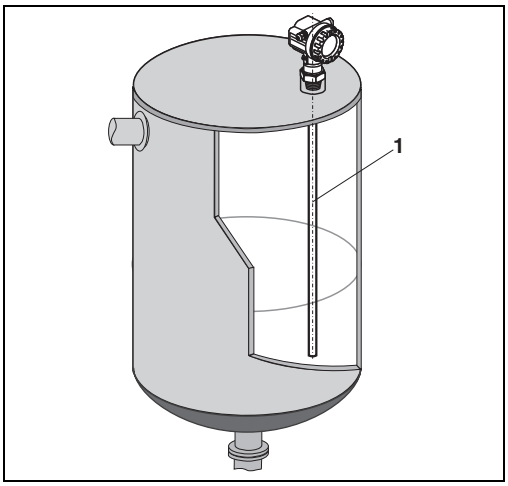
L00-FMP45xxx-17-00-00-en-002

Special instructions

When installing in stirring tanks, observe lateral load-bearing capacity of rod probes (see Page 4). Possibly check whether a non-contact process, Ultrasonic or Level-Radar would not be better suited, above all if the stirrer generates large mechanical loads on the probe.

Installation in horizontal cylindrical and standing tanks

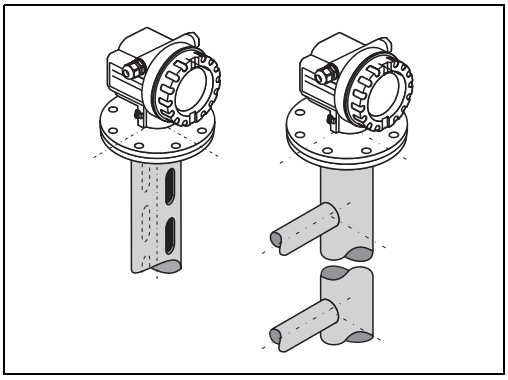
- Use a rod probe for measuring ranges up to 4 m. For anything over this or if there is too free cover space use a 4 mm rope probe.
- Any distance from wall, as long as occasional contact is prevented.
- When using metal tanks, it is preferable to mount probes (1) eccentrically.



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

Installation in stilling well or bypass

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



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

Minimum blocking distance

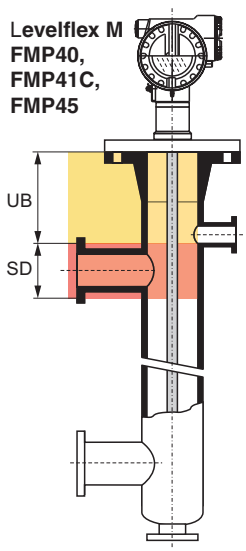
In the lower table, the recommended minimal settings for the upper blocking distance dependent upon the dielectric constant, lowest ambient temperature and nominal diameter of the tube are represented. Values validly for a 16mm rod in side gauge/bypass.

Dielectric constant		DC (εr) = 1,4...1,6		DC (εr) = 1,4...1,6		DC (εr) = 1,4...1,6	
Lowest ambient temperature		-40 °C	-20 °C	-40 °C	-20 °C	-40 °C	-20 °C
Nominal side gauge/ bypass diameter	DN50 / 2"	0 mm	0 mm	0 mm	0 mm	0 mm	0 mm
	DN60	0 mm	0 mm	0 mm	0 mm	0 mm	0 mm
	DN80 / 3"	200 mm 1)	0 mm	200 mm 1)	0 mm	0 mm	0 mm
	DN100 / 4"	200 mm 1)	0 mm	200 mm 1)	0 mm	0 mm	0 mm
	DN150 / 6"	200 mm 1)	200 mm 1)	200 mm 1)	0 mm	200 mm 1)	0 mm

1) UB = 0 mm possible using a coax probe

UB = Upper Blocking Distance (Default set at 200 mm)
Upper Blocking Distance can be reduced to 0 mm in the majority of applications. Upper Blocking Distance can be adjusted in the function group "extended calib." (05), see BA245F/00/en "Description of Instrument Functions".

SD = Safety Distance (Default set at 100 mm)
Safety Distance is recommended for blocking distance > 0 mm only. Safety Distance and instrument behaviour when level enters, can be set in the function group "safety settings" (01), see BA245F/00/en "Description of Instrument Functions".

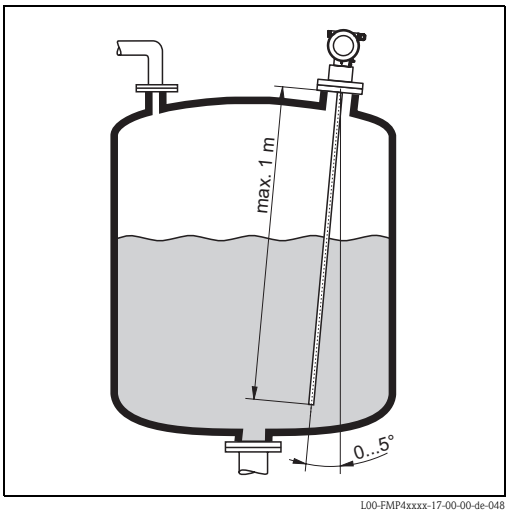


L00-FMP4xxxx-17-00-00-xx-065

Notes on 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. 1 m in length.

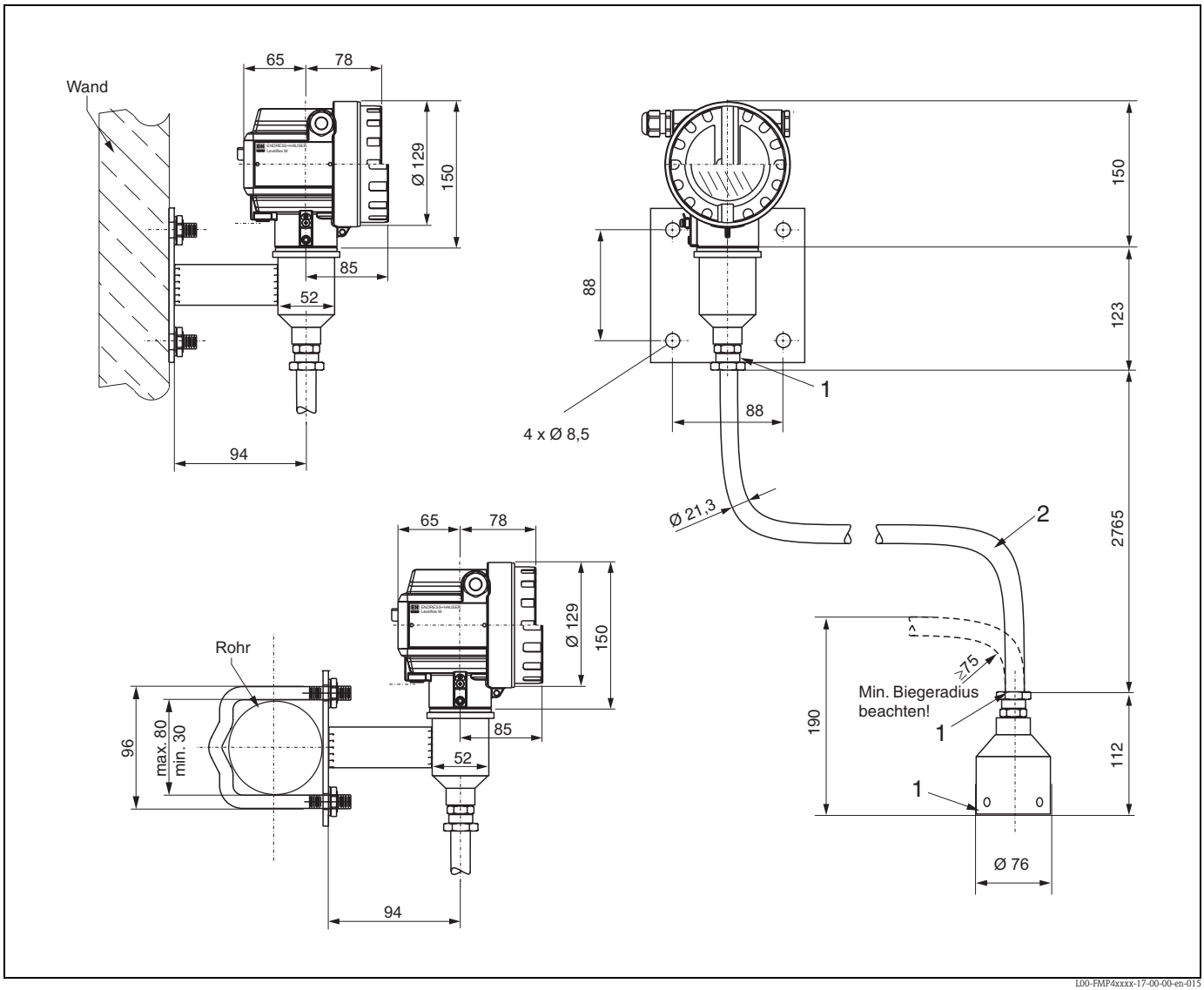


L00-FMP4xxxx-17-00-00-de-048

Installation for difficult to access process connections

Installation with separate housing

- Follow installation instructions on see Page 19.
- Mount the housing on the wall or pipe (in vertical or horizontal position as required) 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 line (2) between the probe and electronics can be max. 105 °C. The version with remote electronics consists of the probe, a connecting cable and the housing. If they are ordered as a set, they are assembled on delivery.

Operating conditions: Environment

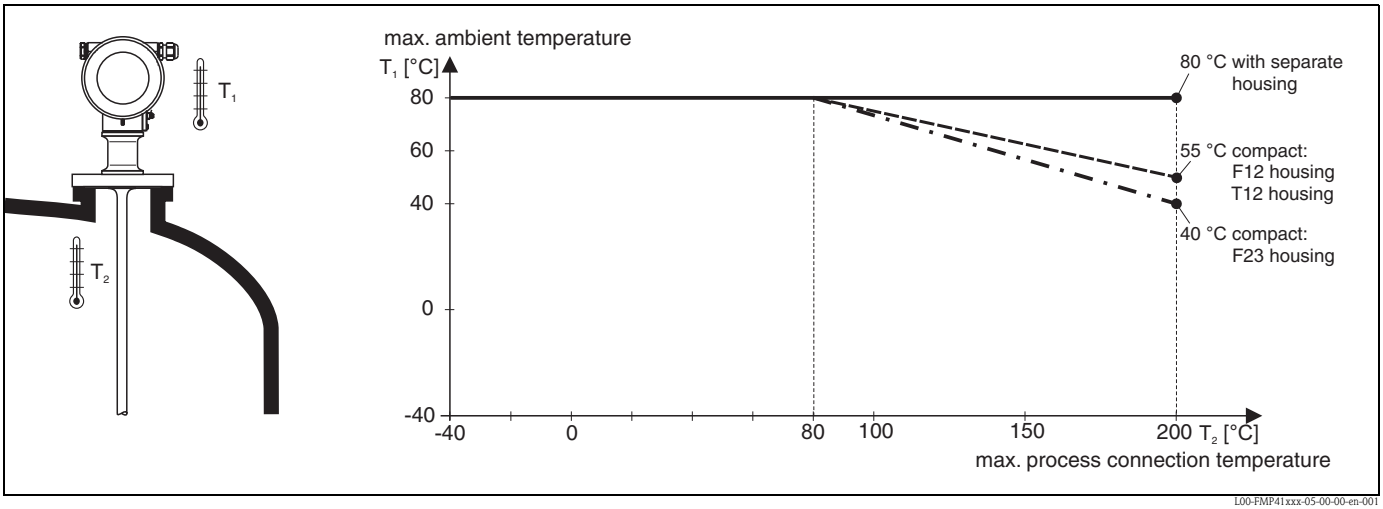
Ambient temperature range

Ambient temperature for the electronic: -40 °C ... +80 °C (-40 °F...+176 °F)
The functionality of the LCD display may be limited for temperatures T_a<-20 °C and T_a>+60 °C.
A weather protection cover should be used for outdoor operation if the instrument is exposed to direct sunlight.

Ambient temperature limits

FMP41C

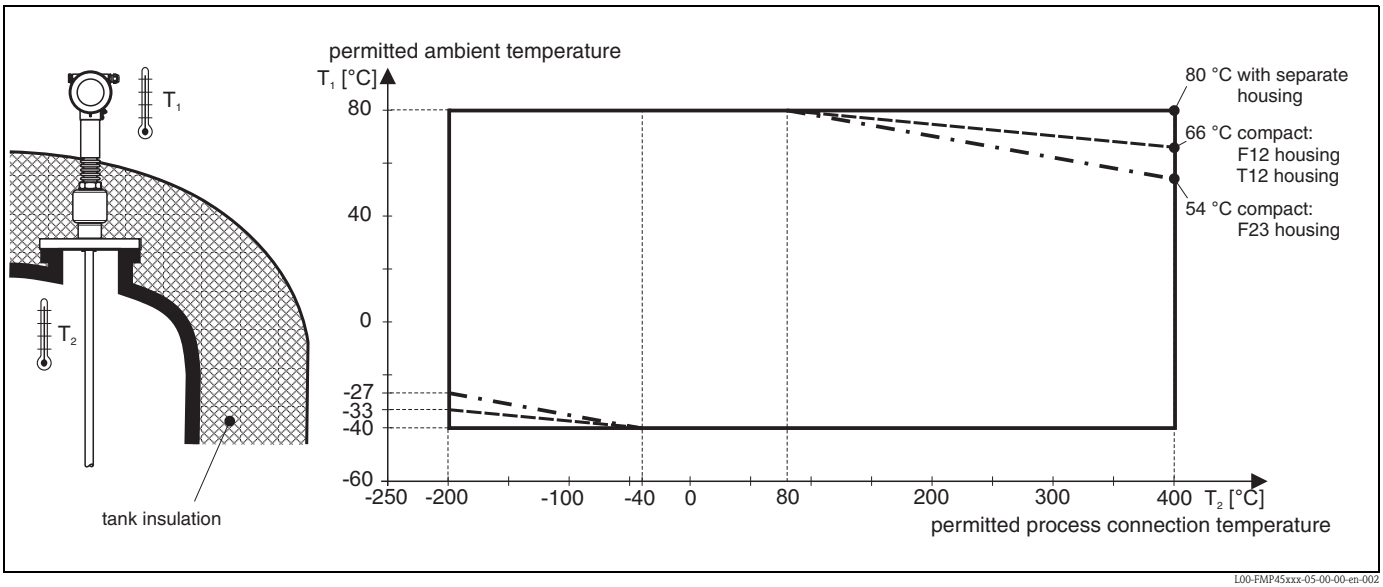
If the temperature (T_2) at the process connection is above 80 °C, the permitted ambient temperature (T_1) decreases as per the following diagram (temperature derating):



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

FMP45 (HT 400 °C)

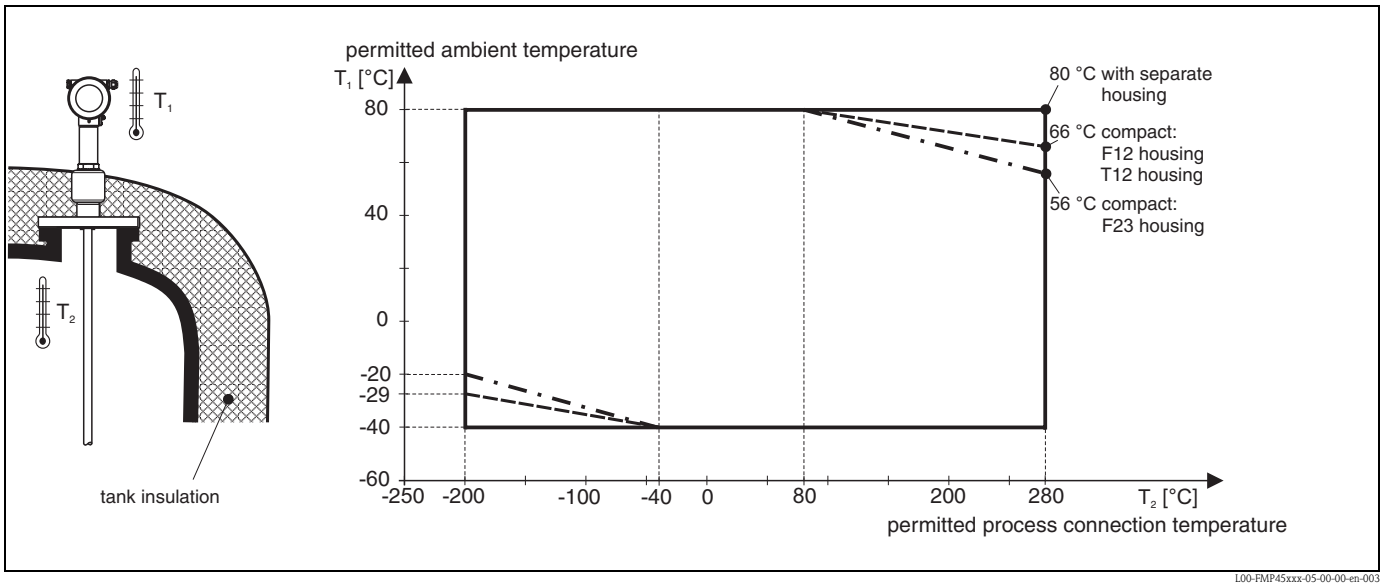
If the temperature (T_2) at the process connection is below > -40 °C or above > +80 °C, the permitted ambient temperature (T_1) is limited as shown in the following diagram (temperature derating):



L00-FMP45xxx-05-00-00-en-002

FMP45 (XT 280 °C)

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



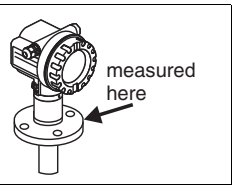
Storage temperature	-40 °C … +80 °C (-40 °F … +176 °F)
Climate class	DIN EN 60068-2-38 (test Z/AD)
Degree of protection	■ with closed housing tested according to – IP68, NEMA6P (24 h at 1.83 m under water surface) – IP66, NEMA4X ■ with open housing: IP20, NEMA1 (also ingress protection of the display) Caution! Degree of protection IP68 NEMA6P applies for M12 PROFIBUS PA plugs only when the PROFIBUS cable is plugged in.
Vibration resistance	DIN EN 60068-2-64 / IEC 68-2-64: 20…2000 Hz, 1 $(m/s^2)^2/Hz$
Cleaning of the probe	Depending on the application, soilings or sediments 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. Heavy, uneven build-up, above all adhesion e.g. through crystallisation, can lead to incorrect measurement. In this case, it is recommended that you use a non-contact measuring principle, or check the probe regularly for soiling.
Electromagnetic compatibility	When installing the probes in metal and concrete tanks and when using a coax probe: ■ Interference Emission to EN 61326, Electrical Equipment Class B ■ Interference Immunity to EN 61326, Annex A (Industrial area) and NAMUR Recommendation NE 21 (EMC) The measured value can be affected by strong electromagnetic fields when installing rod and rope probes without a metallic wall, e.g. plastic tanks. ■ Interference Emission to EN 61326, Class A equipment. ■ Interference Immunity: the measured value can be affected by strong electromagnetic fields.

Operating conditions: Process

Process temperature range

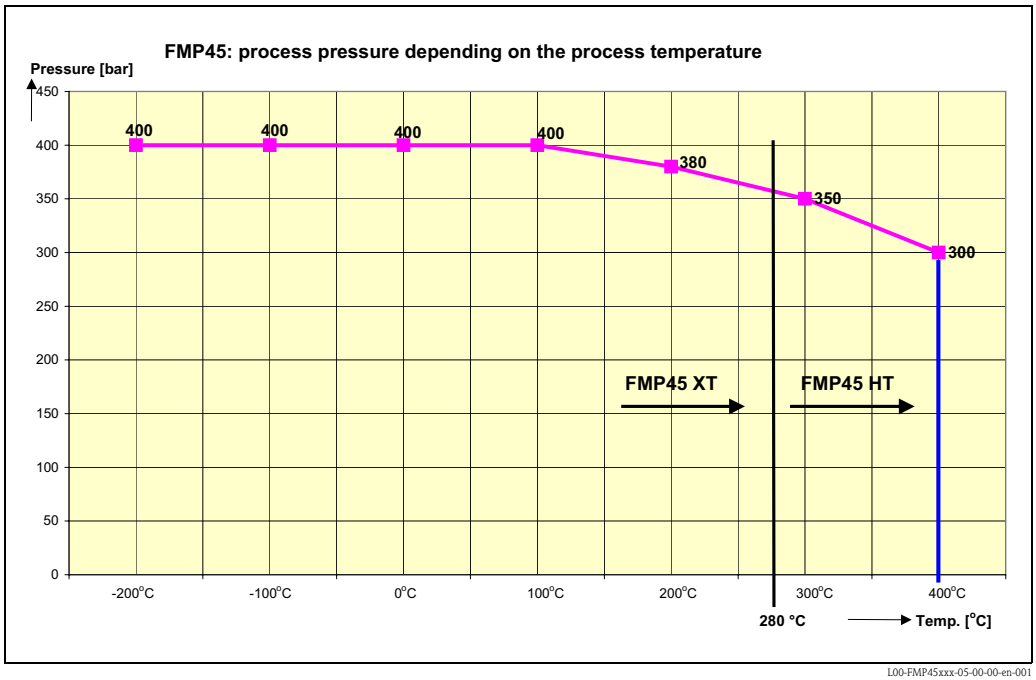
The maximum permitted temperature at the process connection (see figure measuring point) is determined by the process connection ordered:

FMP41C

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

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

FMP45



L00-FMP45xxx-05-00-00-en-001

Process pressure

FMP41C

All models: Vacuum up to max. 40 bar (585,9psi).
For FMP41C with E+H universal adapter: max. 6 bar (87 psi).
For FMP41C with Clamp see ordering Information on Page 41.

FMP45

See pressure/temperature diagram on this page.
The specified rage may be reduced by the selected process connection.
The pressure rating (PN) specified on the flanges refers to a reference temperature of 20 °C, for ASME flanges to 100 °F.

Materials used in the process

FMP41C

- Rod and rope : PFA
- Plating: PTFE (TFM 1600)

FMP45

	Rod and coax probe	Rope 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 1.4401/316

Dielectric constant

FMP41C

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

FMP 45

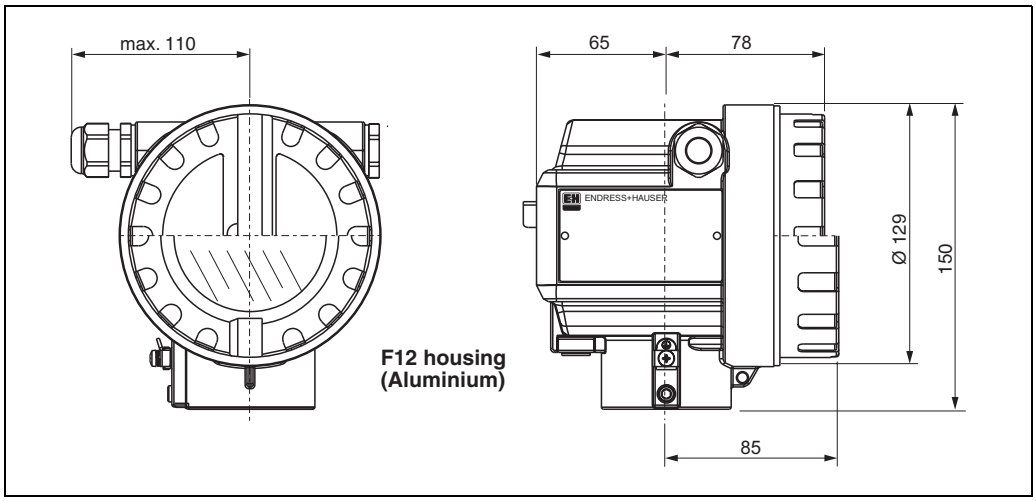
- Rod and rope probe: $\varepsilon r \geq 1.6$, when installing in pipes DN ≤ 150 mm: $\varepsilon r \geq 1.4$
- Coax probes: $\varepsilon r \geq 1.4$

Mechanical construction

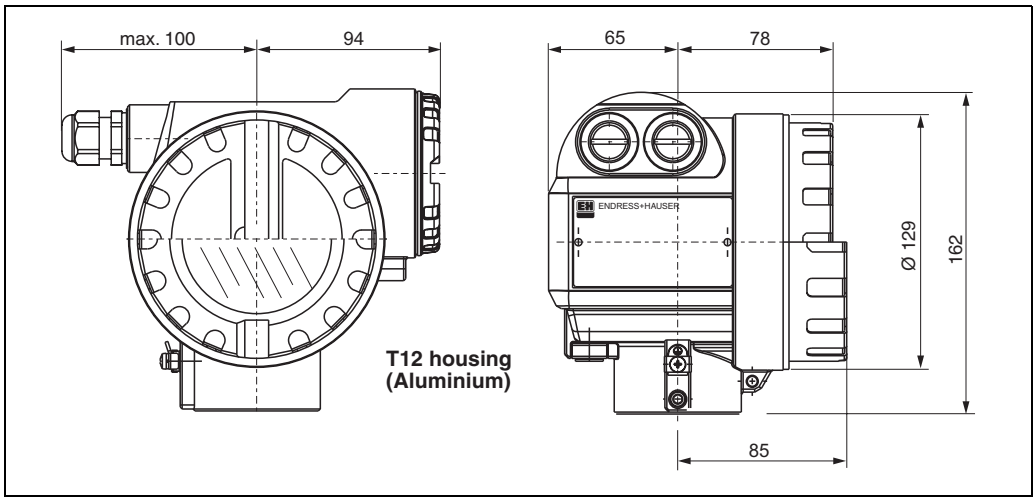
Design, dimensions

Housing dimensions

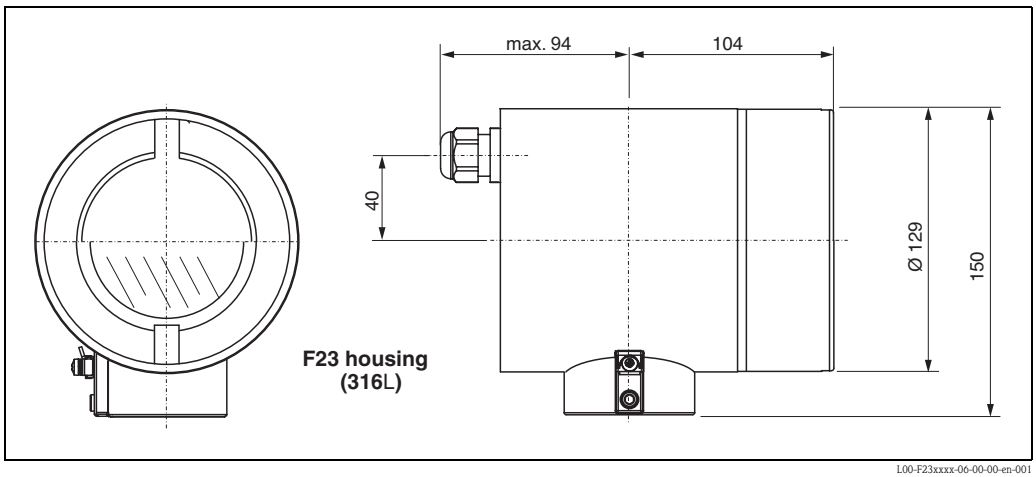
Dimensions for process connection and type of antenne see Page 31.



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



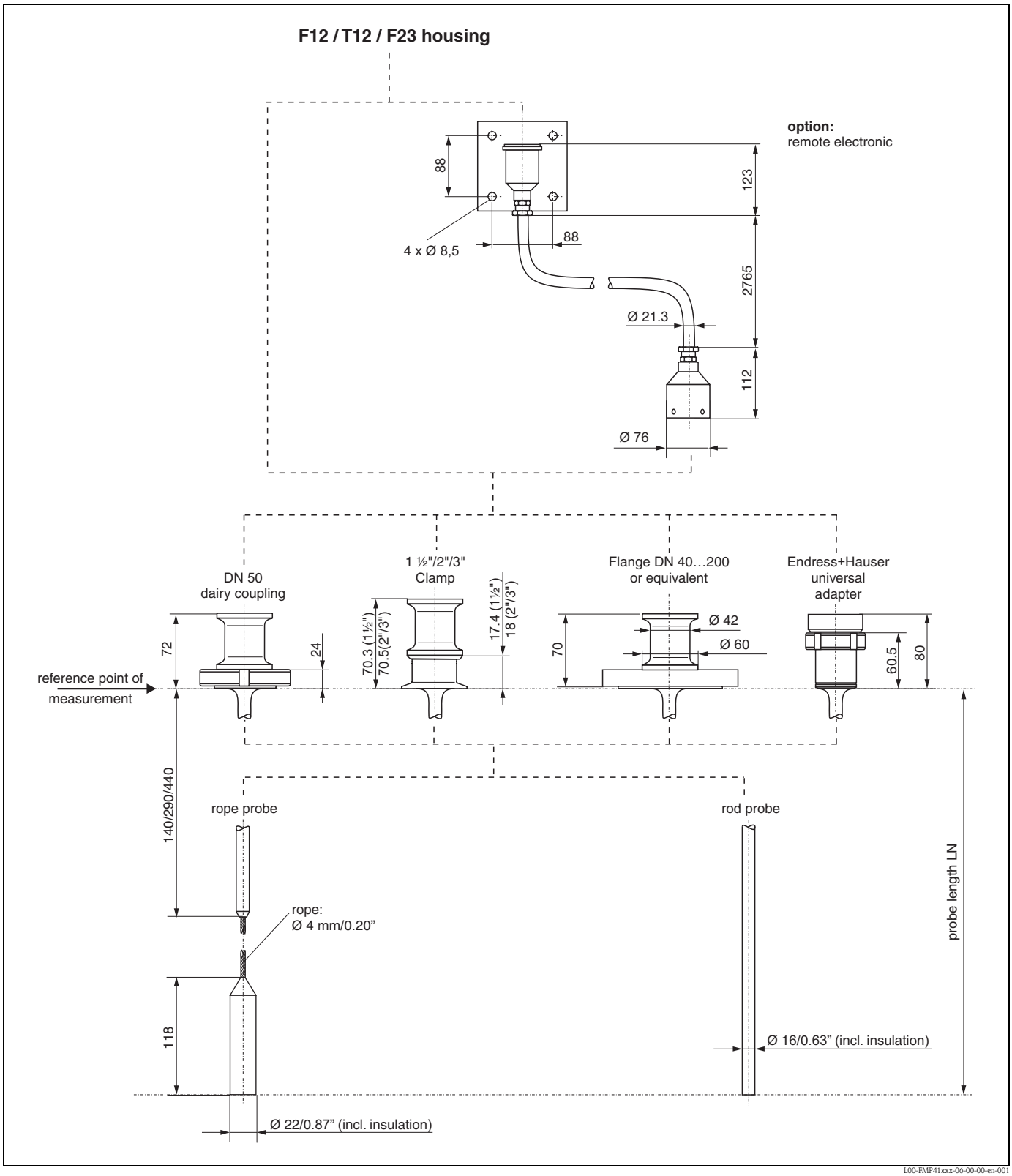
L00-T12xxxx-06-00-00-en-001



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

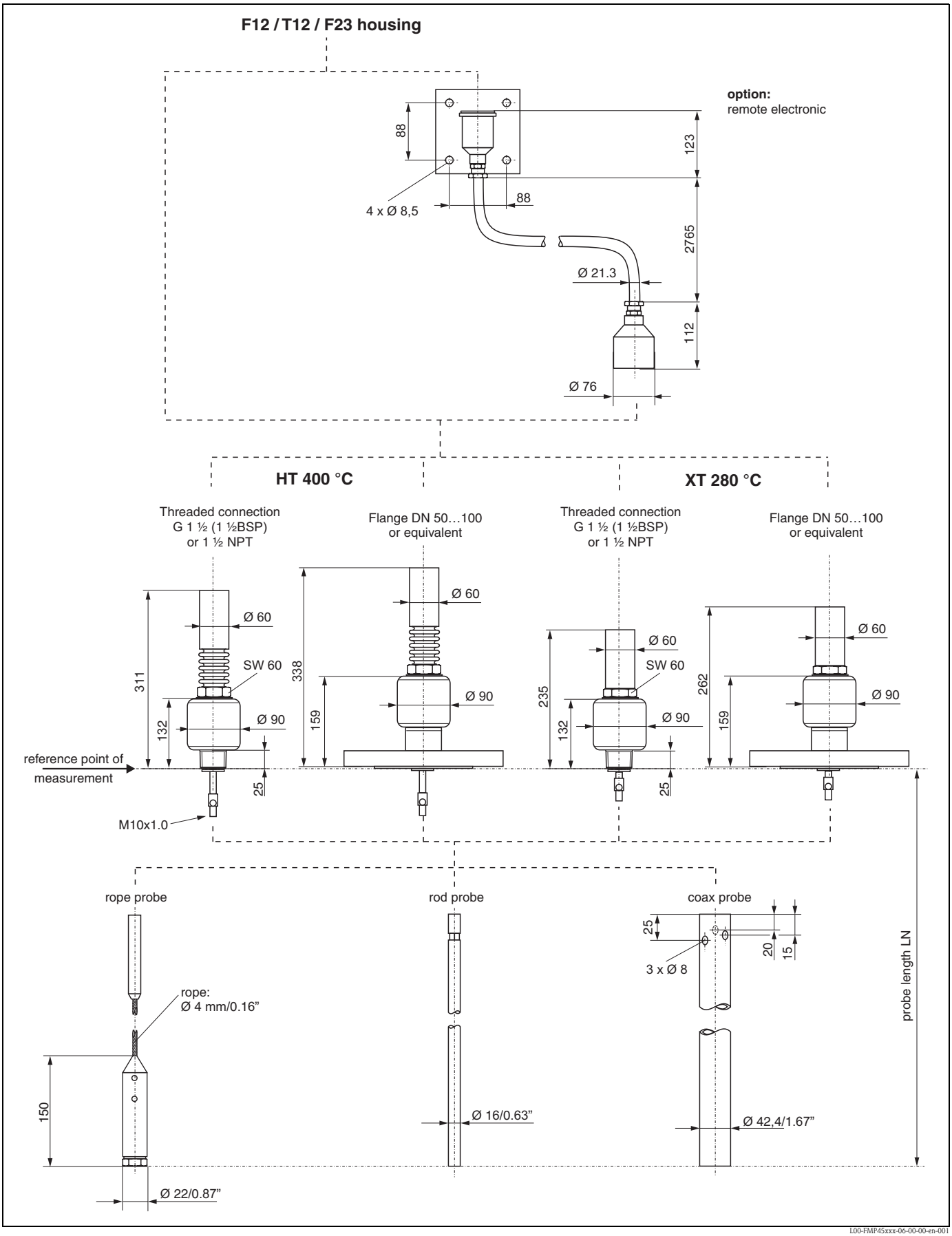
Levelflex M FMP41C - process connection, type of probe

Housing dimensions see Page 30.



Levelflex M FMP45 - process connection, type of probe

Housing dimensions see Page 30.



Weight

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

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

Material

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

Process connection

See "Ordering information" on Page 41-45.

Probe

See "Ordering information" on Page 41-45.

Human interface

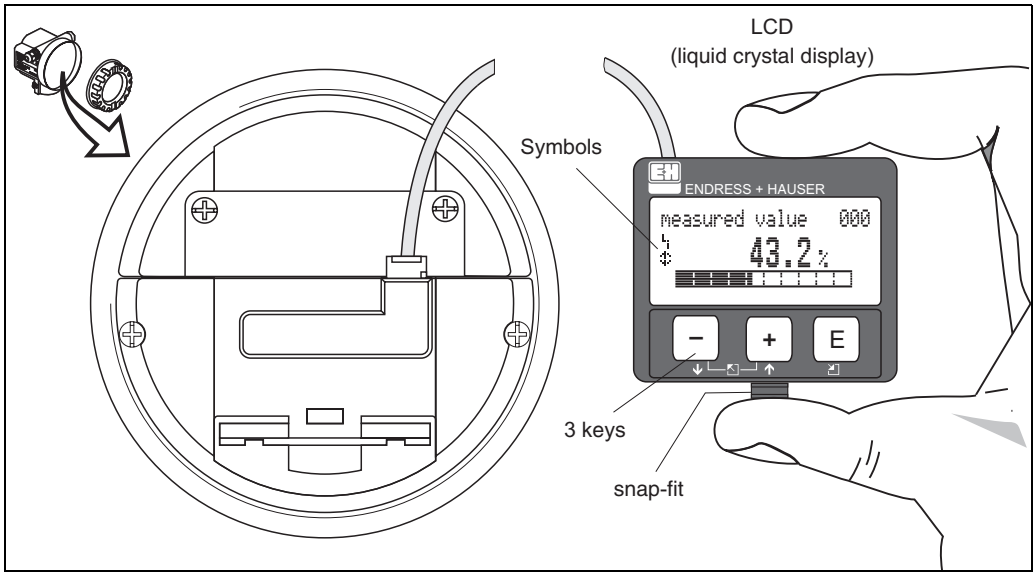
Operation concept

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

Display elements

Liquid crystal display (LCD):

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



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

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

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

Sybmol	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.

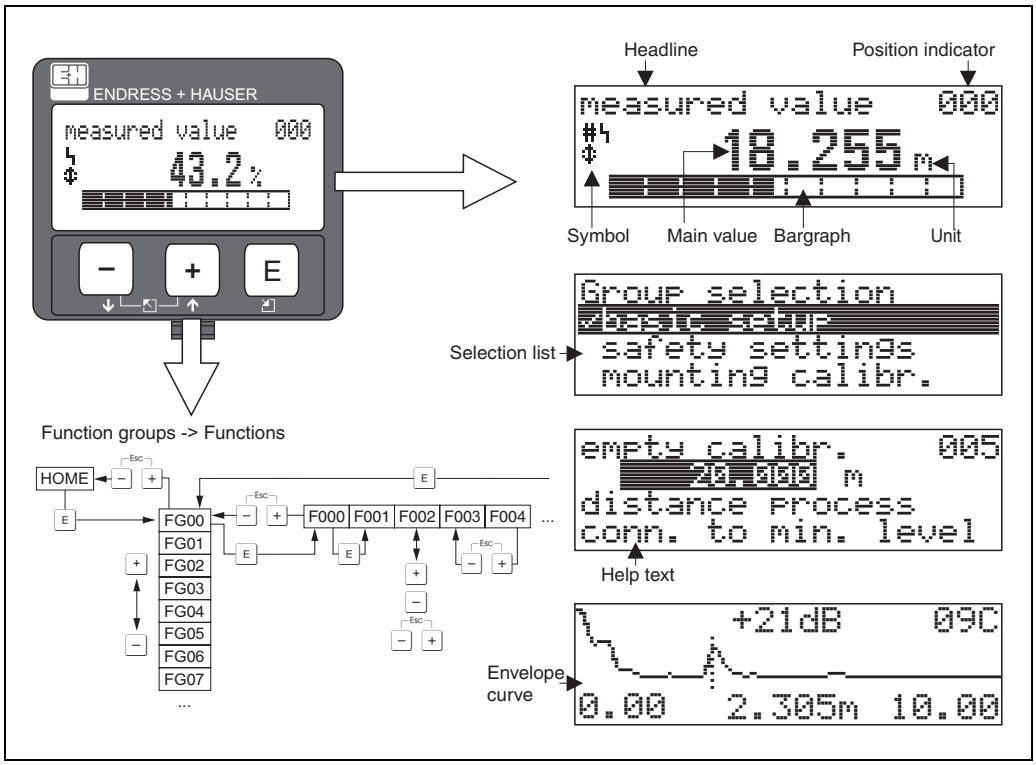
Function of the keys

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, an operation of the instrument via display or communication is not possible! The hardware can only be unlocked via the display. An unlock parameter must be entered to do so.

On-site operation

Operation with VU331

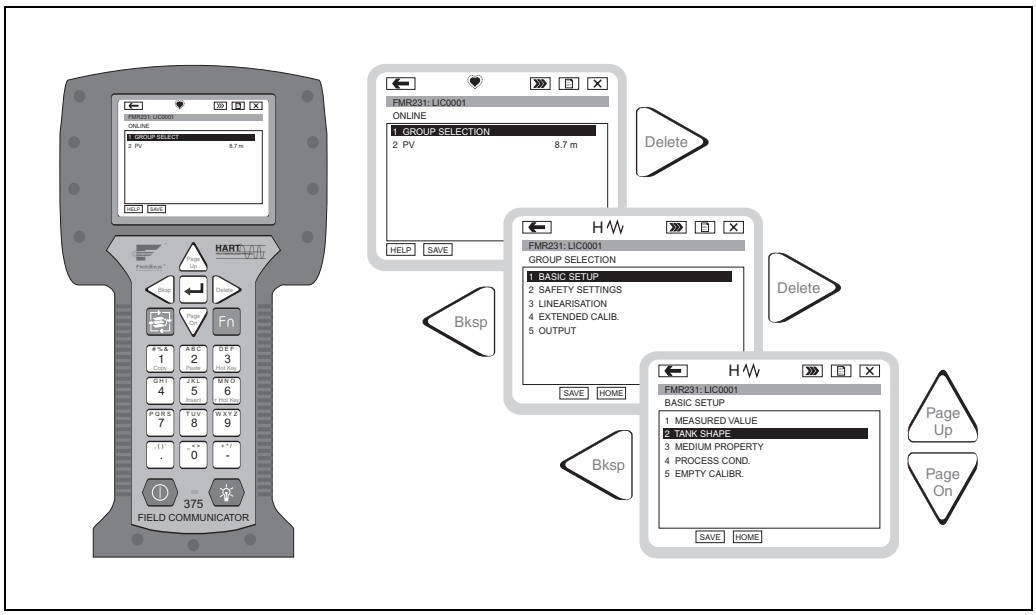
The LC-Display VU331 allows configuration via 3 keys directly at the instrument. All device functions can be set through a menu system. The menu consists of function groups and functions. Within a function, application parameters can be read or adjusted. The user is guided through a complete configuration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



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

Operation with handheld unit Field Communicator DXR375

All device functions can be adjusted via a menu operation with the handheld unit DXR375.



L00-FMR2xxxx-07-00-00-yy-007

Note!

- Further information on the HART handheld unit is given in the respective operating manual included in the transport bag of the DXR375.

Remote operation

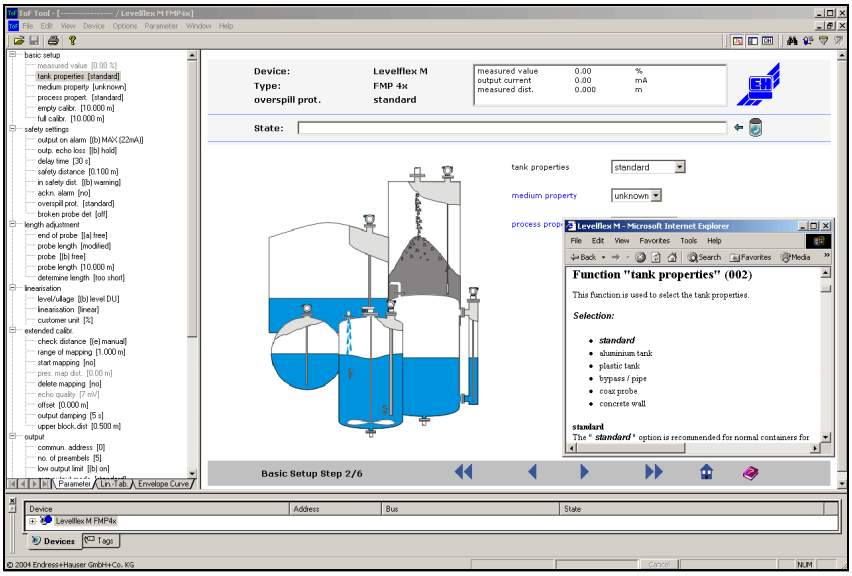
The Micropilot M can be remotely operated via HART, PROFIBUS PA and FOUNDATION Fieldbus. On-site adjustments are also possible.

Operation with ToF Tool

The ToF Tool is a graphical operation software for instruments from Endress+Hauser that operate based on the time-of-flight principle. It is used to support commissioning, securing of data, signal analysis and documentation of the instruments. It is compatible with the following operating systems: WinNT4.0, Win2000 and WINXP.

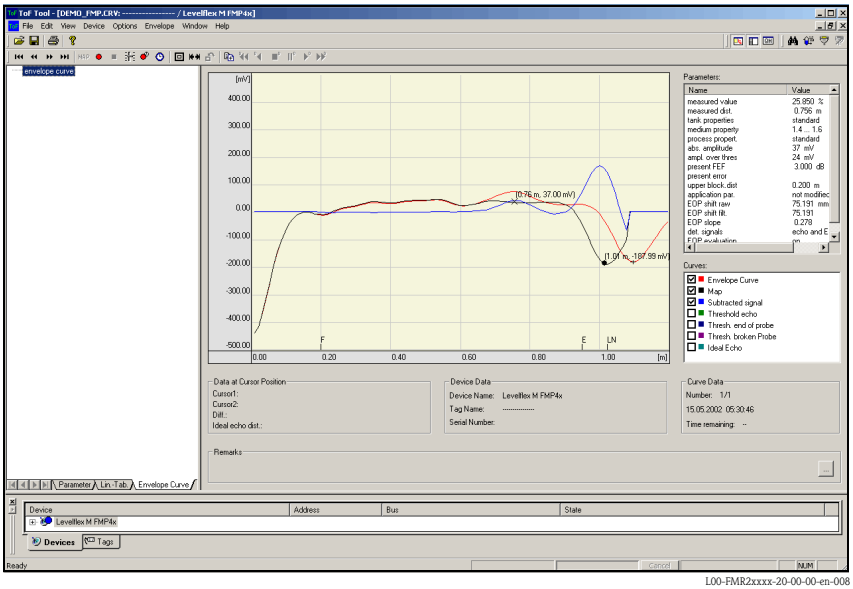
The ToF Tool supports the following functions:
- Online configuration of transmitters
- Signal analysis via envelope curve
- Loading and saving of instrument data (Upload/Download)
- Documentation of measuring point

Menu-guided commissioning:



L00-FMR2xxxx-20-00-00-en-002

Signal analysis via envelope curve:



L00-FMR2xxxx-20-00-00-en-008

Connection options:
- HART with Commubox FXA191/195
- PROFIBUS PA
- Service-interface with adapter FXA193

Operation with FieldCare

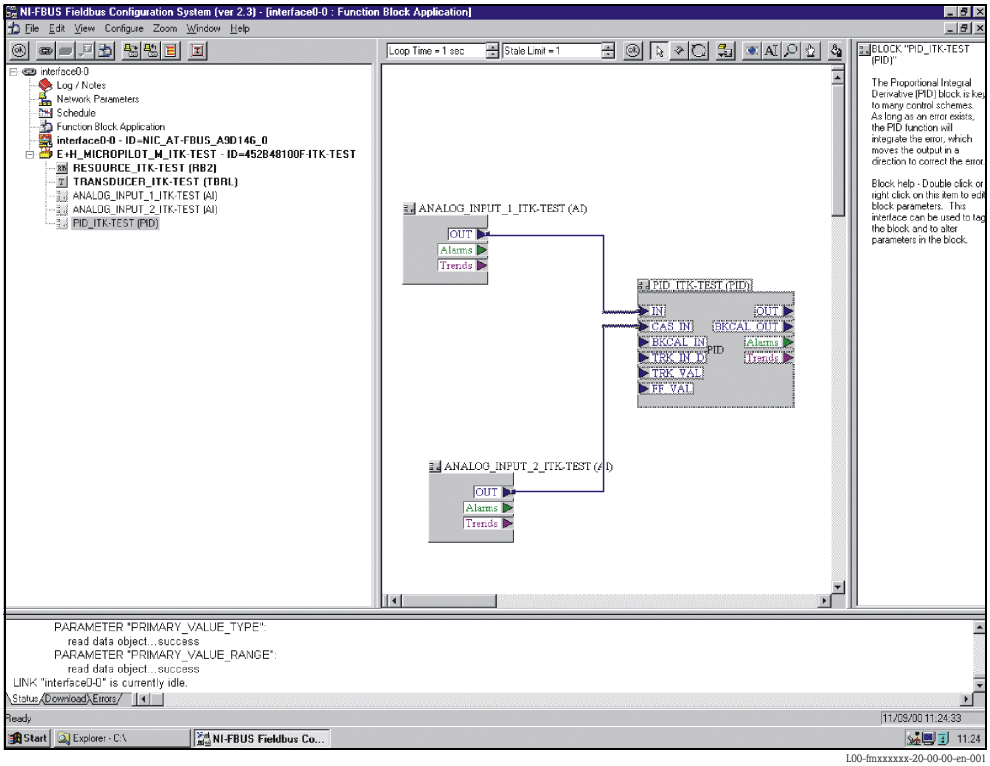
FieldCare is Endress+Hauser's FDT based Plant Asset Management Tool. It can configure all intelligent field devices in your plant and supports you in managing them. By using status information, it also provides a simple but effective means of checking their health.

- Supports Ethernet, HART, PROFIBUS, FOUNDATION Fieldbus etc.
- Operates all Endress+Hauser devices
- Operates all third-party actuators, I/O systems and sensors supporting the FDT standard
- Ensures full functionality for all devices with DTMs
- Offers generic profile operation for any third-party fieldbus device that does not have a vendor DTM

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
- Log project download changes
- Save and print a configuration



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Certificates and approvals

CE approval

The measuring system meets the legal requirements of the EC-guidelines. Endress+Hauser confirms the instrument passing the required tests by attaching the CE-mark.

Ex approval

See "Ordering information" on Page 41-45.

Overspill protection

German WHG. See "Ordering information" on Page 41-45 (see ZE256F/00/de).
SIL 2, for 4...20 mA output signal (see SD174F/00/en "Functional Safety Manual").

Telecommunications

Complies with part 15 of the FCC rules for an unintentional radiator. All probes meet the requirements for a class A digital device (commercial, industrial or business environment). In addition, all probes in metallic tanks as well as the coax probe of the FMP45 meet the requirements for a Class B digital device.

External standards and guidelines

EN 60529

Protection class of housing (IP-code)

EN 61010

Safety regulations for electrical devices for measurement, control, regulation and laboratory use.

EN 61326

Emissions (equipment class B), compatibility (appendix A – industrial area)

NAMUR

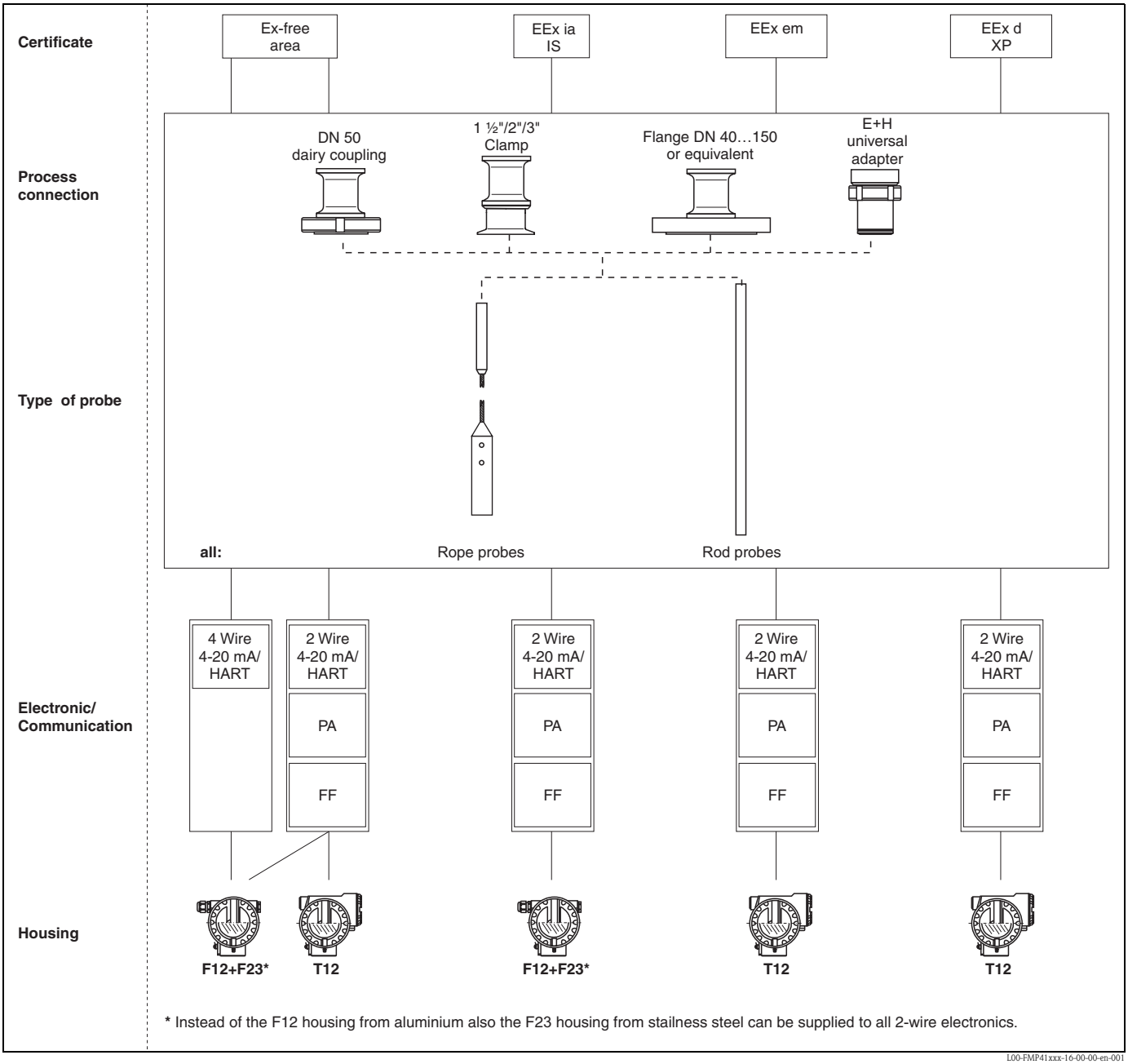
Standards committee for measurement and control in the chemical industry

Pressure Equipment Directive

The FMP45 corresponds to the 97/23/EC Directive (Pressure Equipment Directive). It is a pressure accessory with a volume < 0.1 l, corresponding to Category I.
Conformity assessment was carried out as per Module A, the design as per EN 13445 and AD 2000 technical specifications. FMP45 is not suitable for use with unstable gases at nominal pressures above 200 bar.

Ordering information

Levelflex M FMP41C **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.

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) (electristatic charging)!		
	3	ATEX II 2G EEx em (ia) IIC T6 Note safety instruction (XA) (electristatic charging)!		
	5	ATEX II 1/2G EEx ia IIC T6, ATEX II 1/3D Note safety instruction (XA) (electristatic charging)!		
	6	ATEX II 1/2G EEx ia IIC T6, WHG Note safety instruction (XA) (electristatic charging)!		
	7	ATEX II 1/2G EEx d (ia) IIC T6 Note safety instruction (XA) (electristatic charging)!		
	8	ATEX II 1/2G EEx ia IIC T6, ATEX II 1/3D, WHG Note safety instruction (XA) (electristatic charging)!		
	G	ATEX II 3G EEx 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 T5		
	Y	Special version		
20		**Probe:**		
		A	..... mm, rope PFA>316, 150mm, Center rod, nozzle height max 150mm	
		B	..... mm, rope PFA>316, 300mm, Center rod, nozzle height max 300mm	
		C	..... mm, rope PFA>316, 450mm, Center rod, nozzle height max 450mm	
		D	..... inch, rope PFA>316, 6inch, Center rod, nozzle height max 6inch	
		E	..... inch, rope PFA>316, 12inch, Center rod, nozzle height max 12inch	
		G	..... inch, rope PFA>316, 18inch, Center rod, nozzle height max 18inch	
		K	..... mm, rod PFA>316L	
		M	..... inch, rod PFA>316L	
		Y	Special version	
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

FMP41C-										Product designation (part 1)

Ordering structure Levelflex M FMP41C (continued)

30 Process Connection:

MRK	DIN11851 DN50 PN40, PTFE >316L
TCK	Clamp ISO2852 1-1/2", PTFE >316L
TDK	Clamp ISO2852 2", PTFE >316L
TFK	Clamp ISO2852 3", PTFE >316L
TJK	Clamp ISO2852 1-1/2", PTFE >316L
TKK	DRD 65mm PN40, PTFE >316L
TLK	Clamp ISO2852 2", PTFE >316L, 3A EHEDG
TNK	Clamp ISO2852 3", PTFE >316L, 3A EHEDG
UPK	Adapter 44mm, PTFE >316L
UQK	Adapter 44mm, PTFE >316L, EHEDG 3A
YY9	Special version

40 Power Supply; Output:

B	2-wire; 4…20mA HART
D	2-wire; PROFIBUS PA
F	2-wire; FOUNDATION Fieldbus
G	4-wire 90...250VAC; 4...20mA HART
H	4-wire 10.5...32VDC; 4...20mA HART
Y	Special version

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

60 Type of Probe:

1	Compact, basic version
3	Remote, cable 3m, top entry
9	Special version

70 Housing:

A	F12 Alu, coated IP68 NEMA6P
B	F23 316L IP68 NEMA6P
C	T12 Alu, coated IP68 NEMA6P, Separate conn. compartment
D	T12 Alu, coated IP68 NEMA6P + OVP, Separate conn. compartment, OVP = overvoltage protection
Y	Special version

80 Cable Entry:

2	Gland M20 (EEx d > thread M20)
3	Thread G1/2
4	Thread NPT1/2
5	Plug M12
6	Plug 7/8"
9	Special version

90 Additional Option:

A	Basic version
Y	Special version

FMP41C- ⇓ Complete product designation

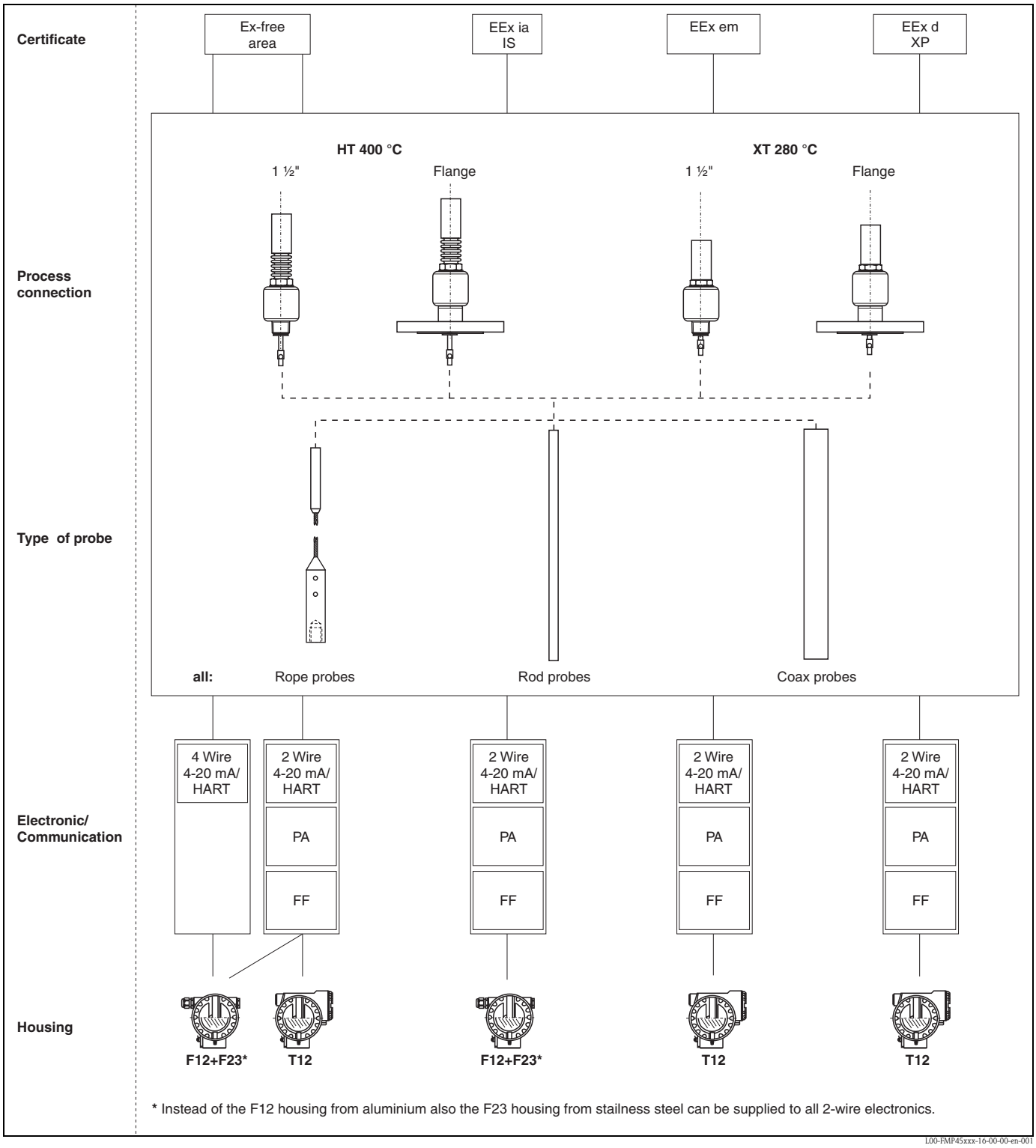
Please enter probe length in mm or inch / 0.1 inch

☐☐☐☐☐ mm

☐☐☐☐☐ inch / 0.1 inch

Probe length LN see Page 31

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.

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
	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 EEx ia IIC T4
	L	TIIS EEx d [ia] IIC T5
	Y	Special version
20	**Process temperature:**	
	A	-200...+280 °C / -328...+5360 °F (XT)
	B	-200...+400 °C / -328...+7520 °F (HT)
	Y	Special version
30	**Probe:**	
	A	.....mm, rope 4mm, 316
	C	.....inch, rope 1/16", 316
	K	.....mm, rod 16 mm, 316L
	L	.....mm, coax , 316L
	M	.....inch, rod 16 mm, 316L
	N	.....inch, coax, 316L
	Y	Special version
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

FMP45-											Product designation (part 1)

Ordering information Levelflex M FMP45 (continued)

40 Prozessanschluss:

GGJ	Thread ISO228 G1-1/2, 200bar, 316L
GJJ	Thread ISO228 G1-1/2, 400bar, 316L
RGJ	Thread ANSI NPT1-1/2, 200bar, 316L
RJJ	Thread ANSI NPT1-1/2, 400bar, 316L, High pressure test
YY9	Special version

50 Power Supply; Output:

B	2-wire; 4-20mA HART
D	2-wire; PROFIBUS -PA
F	2-wire; FOUNDATION Fieldbus
G	4-wire 90-250VAC; 4-20mA HART
H	4-wire 10.5-32VDC; 4-20mA HART
Y	Special version

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

70 Type of Probe:

1	Compact, basic version
3	Remote, cable 3m, top entry
9	Special version

80 Housing:

A	F12 Alu, coated IP68 NEMA6P
B	F23 316L IP68 NEMA6P
C	T12 Alu, coated IP68 NEMA6P, Separate conn. compartment,
D	T12 Alu, coated IP68 NEMA6P + OVP, Separate conn. compartment, OVP = overvoltage protection
Y	Special version

90 Cable Entry:

2	Gland M20 (EEx d > thread M20)
3	Thread G1/2
4	Thread NPT1/2
5	Plug M12
6	Plug 7/8"
9	Special version

100 Additional Option:

A	Basic version
B	EN10204-3.1 material, wetted parts, (316L wetted parts for rod/coax) inspection certificate
C	EN10204-3.1 material, wetted parts, (316L pressurized for rope version) inspection certificate
N	EN10204-3.1 material, NACE MR0175, (316L wetted parts) inspection certificate
Y	Special version

FMP45- ⇓ Complete product designation

Please enter probe length in mm or inch / 0.1 inch

mm

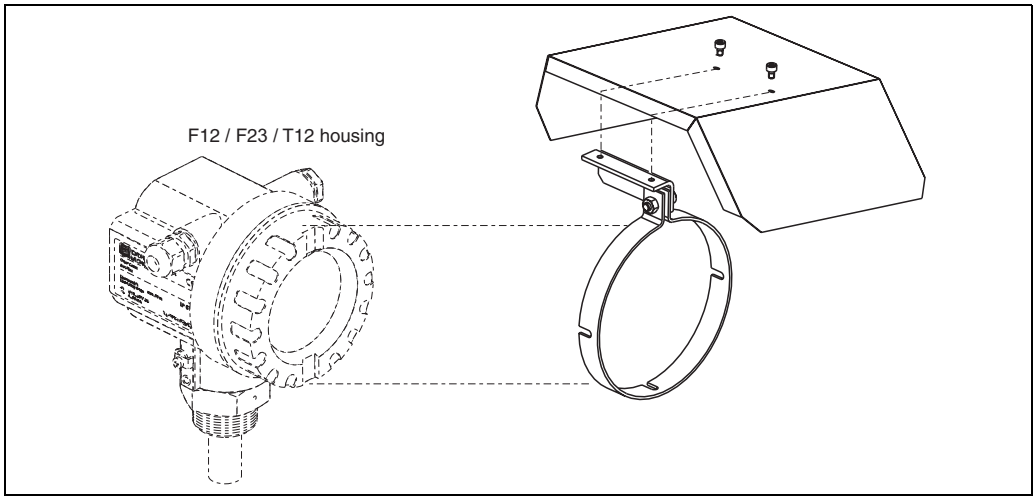
inch / 0.1 inch

Probe length LN see Page 32

Accessories

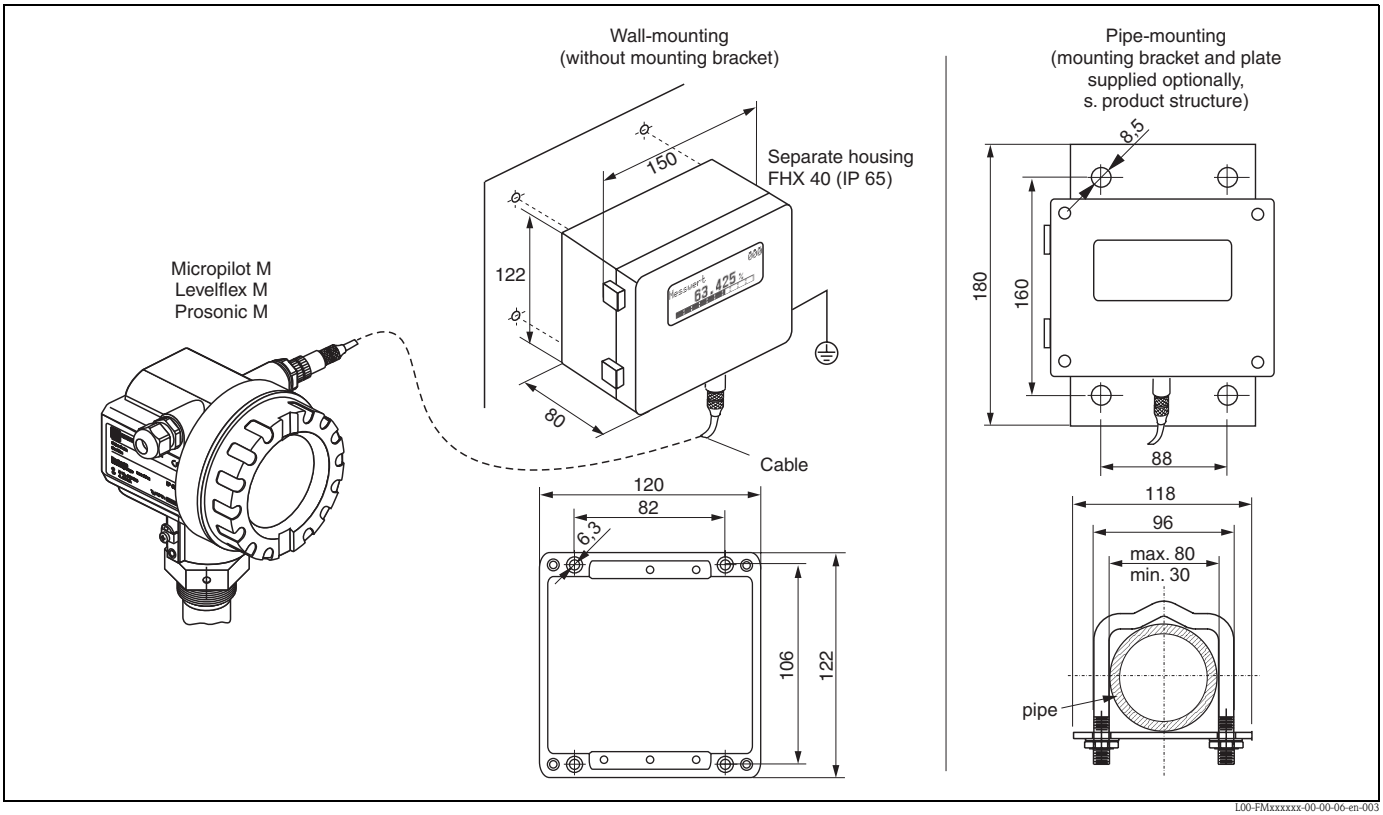
Weather protection cover

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



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

Remote display FHX40



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

Technical data (cable and housing) and product structure:

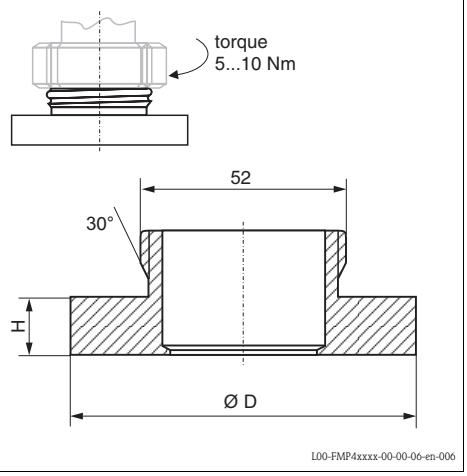
Max. cable length	20 m (65 ft)
Temperature range	-30 °C...+70 °C (-22 °F...158 °F)
Degree of protection	IP65 acc. to EN 60529 (NEMA 4)
Materials	Housing: AlSi12; cable glands: nickle plated brass
Dimensions [mm] / [inch]	122x150x80 (HxWxD) / 4.8x5.9x3.2

	Approval:				
	A				Nn-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/65ft; for HART
		5			20m/65ft; for PROFIBUS PA/FOUNDATION Fieldbus
			Additional option:		
			A		Basic version
			B		Mounting bracket, pipe 1"/ 2"
FHX40 -					Complete product designation

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

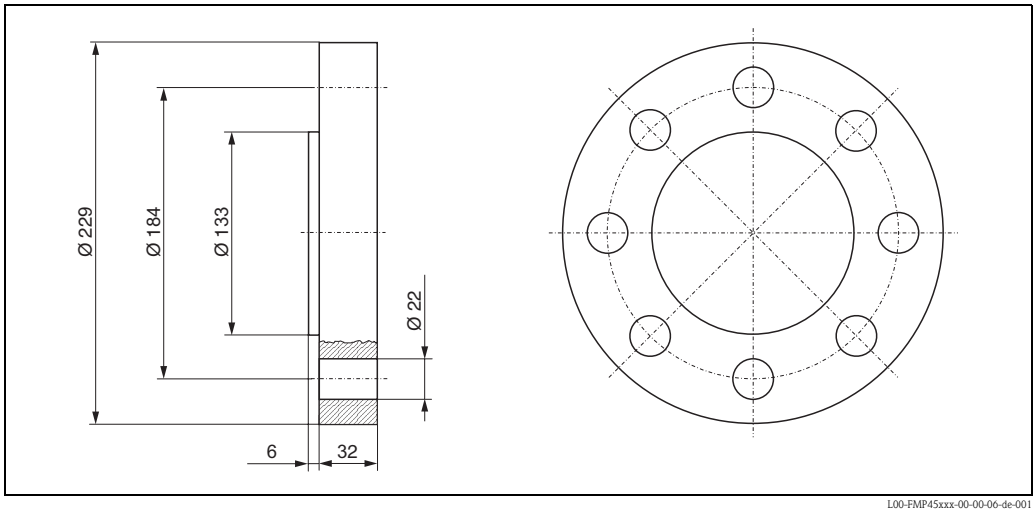
Welding boss for universal adapter (FMP41C only)

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



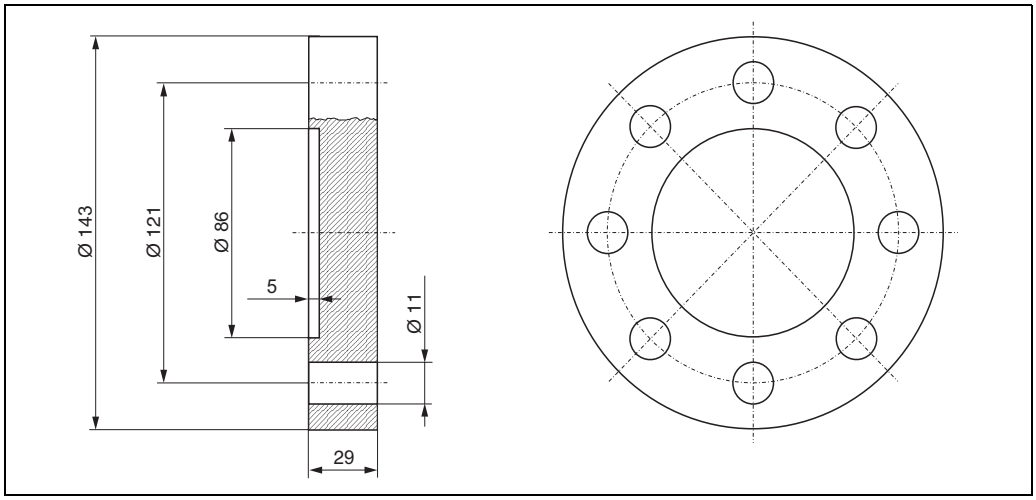
Special process connection (only FMP45)

Fisher flange 249B/259B (MVTF N0123)



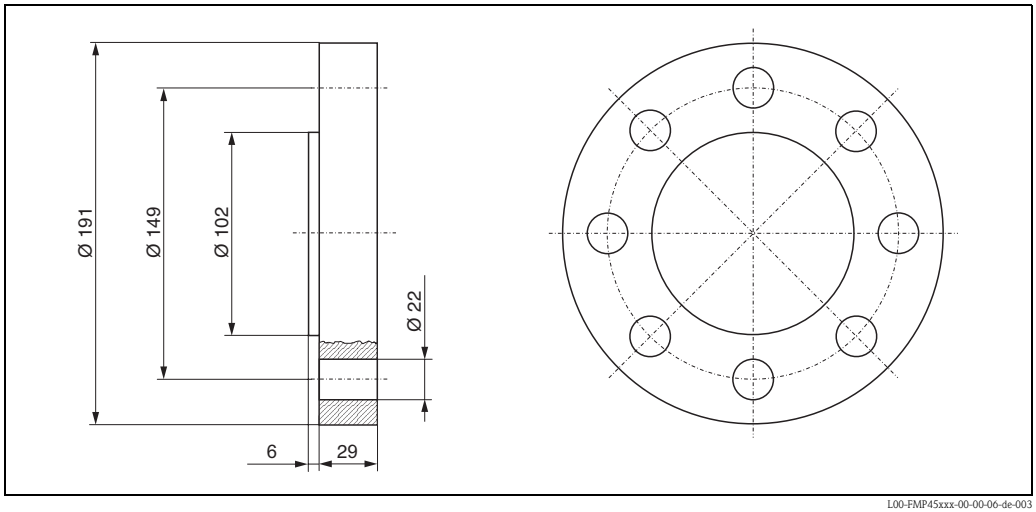
L00-FMP45xxx-00-00-06-de-001

Fisher flange 249C (MVTF N0124)



L00-FMP45xxx-00-00-06-de-002

Masoneillan flange (MVTF N0125)



L00-FMP45xxx-00-00-06-de-003

Commubox FXA191 HART

For intrinsically safe communication with ToF Tool/FieldCare via the RS232C interface. For details refer to TI237F/00/en.

Commubox FXA195 HART

For intrinsically safe communication with ToF Tool/FieldCare via the USB interface. For details refer to TI404F/00/en.

Service Interface FXA193

The Service-Interface connects the Service plug of Proline and ToF instruments with the 9 pin RS 232C interface of a PC. (USB connectors must be equipped with a usual commercial USB/Serial adapter.)

Product structure

	Approvals	
	A	For use in non-hazardous areas
	B	ATEX II (1) GD
	C	CSA/FM Class I Div. 1
	D	ATEX, CSA, FM
	9	other

		Connection cable	
		B	Connection cable for ToF devices
		E	Connection cable for Proline and ToF devices
		H	Connection cable for Proline and ToF devices and Connection cable for Ex two-wire devices
		X	without connection cable
		9	others

FXA193-			Complete product designation

Associated documentation

- Technical Information: TI063D
- Safety Instructions for ATEX II (1) GD: XA077D
- Supplementary information for the cable adapters: SD092D

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	Ausgang	Kommunikation	Betriebsanleitung	Beschreibung der Gerätefunktionen	Kurzanleitung (im Gerät)
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
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

Tank Side Monitor NRF590

Operating Instructions for Tank Side Monitor NRF590, BA256F/00/en.
Description of Instrument Functions for Tank Side Monitor NRF590, BA257F/00/en.

Engineering hints PROFIBUS PA

Guidelines for planning and commissioning, BA198F/00/en.

Manufacturer declaration

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

Certificates Correlation of safety instructions (XA) and certificates (ZE) to the instrument:

Gerätetyp	Certificate	Explosion protection	Output[1)]	Communication	Housing [2)]	KEMA 04 ATEX	XA	WHG
FMP41C	A	non-ex	B, G, H	HART, 4...20 mA	—	—	—	—
			D	PROFIBUS PA	—	—	—	—
			F	FOUNDATION Fieldbus	—	—	—	—
	F	non-ex + WHG	B, G, H	HART, 4...20 mA	—	—	—	ZE256F/00/de
			D	PROFIBUS PA	—	—	—	ZE256F/00/de
	1	ATEX II 1/2 G EEx ia IIC T6	B	HART, 4...20 mA	A	1129X	XA261F-A	—
			D	PROFIBUS PA	A	1129X	XA262F-A	—
			F	FOUNDATION Fieldbus	A	1129X	XA262F-A	—
			B	HART, 4...20 mA	B	1129X	XA268F-A	—
			D	PROFIBUS PA	B	1129X	XA269F-A	—
			F	FOUNDATION Fieldbus	B	1129X	XA269F-A	—
			B	HART, 4...20 mA	D	1129X	XA272F-A	—
			D	PROFIBUS PA	D	1129X	XA273F-A	—
			F	FOUNDATION Fieldbus	D	1129X	XA273F-A	—
	3	ATEX II 1/2 G EEx em [ia] IIC T6	B	HART, 4...20 mA	C	1129X	XA264F-A	—
			D	PROFIBUS PA	C	1129X	XA264F-A	—
			F	FOUNDATION Fieldbus	C	1129X	XA264F-A	—
	6	ATEX II 1/2 G EEx ia IIC T6 + WHG	B	HART, 4...20 mA	A	1129X	XA261F-A	ZE256F/00/de
			D	PROFIBUS PA	A	1129X	XA262F-A	ZE256F/00/de
			B	HART, 4...20 mA	B	1129X	XA268F-A	ZE256F/00/de
			D	PROFIBUS PA	B	1129X	XA269F-A	ZE256F/00/de
			B	HART, 4...20 mA	D	1129X	XA272F-A	ZE256F/00/de
			D	PROFIBUS PA	D	1129X	XA273F-A	ZE256F/00/de
	7	ATEX II 1/2 G EEx d [ia] IIC T6	B, D	HART, 4...20 mA PROFIBUS PA	C	1129X	XA263F-A	—

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

2) assignment, see ordering information: 70 housing

Instrument	Certificate	Explosion protection	Output[1)]	Communication	Housing [2)]	KEMA 02 ATEX	XA	WHG
FMP45	A	non-ex	B, G, H	HART, 4...20 mA	—	—	—	—
			D	PROFIBUS PA	—	—	—	—
			F	FOUNDATION Fieldbus	—	—	—	—
	F	non-ex + WHG	B, G, H	HART, 4...20 mA	—	—	—	ZE256F/00/de
			D	PROFIBUS PA	—	—	—	ZE256F/00/de
	1	ATEX II 1/2 G EEx ia IIC T6 IECEx Zone 0/1	B	HART, 4...20 mA	A	1109	XA164F-C	—
			D	PROFIBUS PA	A	1109	XA165F-C	—
			F	FOUNDATION Fieldbus	A	1109	XA165F-C	—
			B	HART, 4...20 mA	B	1109	XA211F-C	—
			D	PROFIBUS PA	B	1109	XA212F-C	—
			F	FOUNDATION Fieldbus	B	1109	XA212F-C	—
			B	HART, 4...20 mA	D	1109	XA215F-C	—
			D	PROFIBUS PA	D	1109	XA216F-C	—
			F	FOUNDATION Fieldbus	D	1109	XA216F-C	—
	3	ATEX II 1/2 G EEx em [ia] IIC T6 IECEx Zone 0/1	B, D, F	HART, 4...20 mA PROFIBUS PA FOUNDATION Fieldbus	C	1109	XA167F-C	—
	6	ATEX II 1/2 G EEx ia IIC T6 + WHG	B	HART, 4...20 mA	A	1109	XA164F-C	ZE256F/00/de
			D	PROFIBUS PA	A	1109	XA165F-C	ZE256F/00/de
			B	HART, 4...20 mA	B	1109	XA211F-C	ZE256F/00/de
			D	PROFIBUS PA	B	1109	XA212F-C	ZE256F/00/de
			B	HART, 4...20 mA	D	1109	XA211F-C	ZE256F/00/de
			D	PROFIBUS PA	D	1109	XA212F-C	ZE256F/00/de
	7	ATEX II 1/2 G EEx d [ia] IIC T6	B, D, F	HART, 4...20 mA PROFIBUS PA FOUNDATION Fieldbus	C	1109	XA166F-C	—

1) assignment, see ordering information: 50 electronic insert/communication

2) assignment, see ordering information: 80 housing

Correlation of Control Drawings (ZD) to the instrument:

Instrument	Certificate	Explosion protection	Output[1)]	Communication	Housing [2)]	ZD
FMP41C	S	FM IS	B	HART, 4...20 mA	—	in Vorbereitung
			D	PROFIBUS PA	—	in Vorbereitung
			F	FOUNDATION Fieldbus	—	in Vorbereitung
	T	FM XP	B	HART	—	in Vorbereitung
			D	PROFIBUS PA	—	in Vorbereitung
			F	FOUNDATION Fieldbus	—	in Vorbereitung
	U	CSA IS	B	HART, 4...20 mA	—	in Vorbereitung
			D	PROFIBUS PA	—	in Vorbereitung
			F	FOUNDATION Fieldbus	—	in Vorbereitung
	V	CSA XP	B	HART	—	in Vorbereitung
			D	PROFIBUS PA	—	in Vorbereitung
			F	FOUNDATION Fieldbus	—	in Vorbereitung
	N	General Purpose				in Vorbereitung

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

2) assignment, see ordering information: 70 housing

Instrument	Certificate	Explosion protection	Output[1)]	Kommunikation	Housing [2)]	ZD
FMP45	S	FM IS	B	HART, 4...20 mA	A	ZD075F/00/en
			D	PROFIBUS PA	A	ZD106F/00/en
			F	FOUNDATION Fieldbus	A	ZD109F/00/en
			B	HART, 4...20 mA	B, D	ZD076F/00/en
			D	PROFIBUS PA	B, D	ZD107F/00/en
			F	FOUNDATION Fieldbus	B, D	ZD110F/00/en
	T	FM XP	B	HART	C	ZD077F/00/en
			D	PROFIBUS PA	C	ZD077F/00/en
			F	FOUNDATION Fieldbus	C	ZD077F/00/en
	U	CSA IS	B	HART, 4...20 mA	A	ZD080F/00/en
			D	PROFIBUS PA	A	ZD113F/00/en
			F	FOUNDATION Fieldbus	A	ZD116F/00/en
			B	HART, 4...20 mA	B, D	ZD081F/00/en
			D	PROFIBUS PA	B, D	ZD114F/00/en
			F	FOUNDATION Fieldbus	B, D	ZD117F/00/en
	V	CSA XP	B	HART	C	ZD082F/00/en
			D	PROFIBUS PA	C	ZD082F/00/en
			F	FOUNDATION Fieldbus	C	ZD082F/00/en
	N	General Purpose				in Vorbereitung

1) assignment, see ordering information: 50 electronic insert/communication

2) assignment, see ordering information: 80 housing

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