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

Technical Information

Levelflex M FMP40

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

Application
The Levelflex M performs continuous level measurement of powdery to granular bulk solids e.g. plastic granulate and liquids.

Probes are available with threaded process connections from ¾" and flanges from DN40 / 1½":
- Rope probes, above all for measurement in bulk solids, measuring range up to 35 m/1378"
- Rod probes, above all for liquids
- Coax probes, for liquids

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

Your benefits
- **Measurement independent** of:
  - Density, resp. Bulk density,
  - Temperature,
  - Dust, e.g. **during pneumatic filling**.
- **Measurement also possible with foam** on the surface.
- Simple, menu-guided on-site operation with four-line plain text display.
- On-site envelope curve on the display for easy diagnosis.
- Easy operation, diagnosis and measuring point documentation with the supplied ToF Tool operating program.
- Optional remote display and operation.
- With coax probes the measurement is completely independent of internals in the tank and of the installation in the nozzle.
- Probe rod and probe rope can be replaced.
- Application in safety related systems (overspill protection) with requirements for functional safety up to SIL 2 in accordance to IEC 61508/IEC 61511-1.

Safety Integrity Level SIL Endress+Hauser

TI358F/00/en

Endress+Hauser
People for Process Automation

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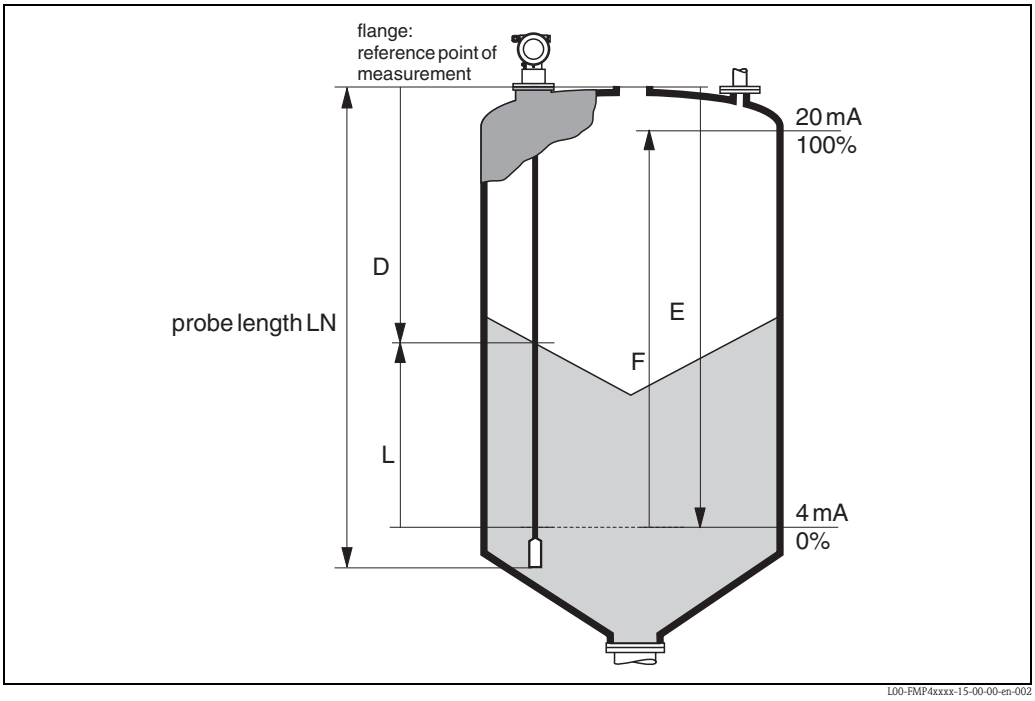
Function and system design

Measuring principle

The Levelflex is a "downward-looking" measuring system that functions according to the ToF method (ToF = Time of Flight). The distance from the reference point (process connection of the measuring device see Page 34) 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 34

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:

Probes with 1½" threaded connection or flange

Version:	FMP40- *B*...	FMP40- *H*...	FMP40- *A*...	FMP40- *K*...	FMP40- *L*...
Type of probe:	6 mm / 1/4" rope probe	6 mm / 1/4" rope probe PA-coated	4 mm / 1/6" rope probe	16 mm / 0.63" rod probe	coax probe
					
Tensile strength (min): Collapse load (max): [1]	30 kN 35 kN	30 kN 35 kN	12 kN 16 kN	not relevant	not relevant
Sideways capacity:	not relevant	not relevant	not relevant	30 Nm	300 Nm
For application:	■ bulk solids	■ Bulk solids especially cereal, flour	■ liquids measuring range > 4 m / 157"	■ liquids ■ bulk solids on short measuring ranges and sideway mounting	■ liquids
max. measuring range:	35 m / 1378" [2]	35 m / 1378" [2]	35 m / 1378"	4 m / 157"	4 m / 157"

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

2) Greater lengths available on request.

Probes with ¾" threaded connection

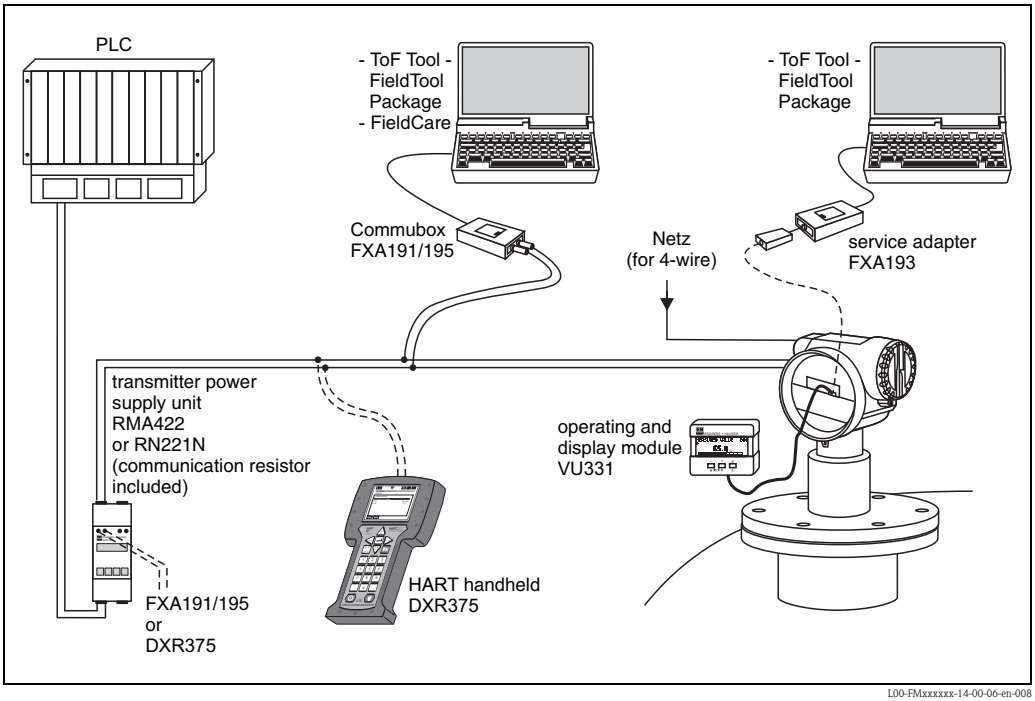
Version:	FMP40- *A*...	FMP40- *P*...	FMP40- *L*...
Type of probe:	**4 mm / 1/6" rope probe**	**6 mm / 1/4" rod probe**	**coax probe**
			
Tensile strength (min): **Collapse load (max):** [1]	5 kN 12 kN	not relevant	not relevant
Sideways capacity:	not relevant	4 Nm	60 Nm
For application:	■ liquids	■ liquids	■ liquids
max. measuring range:	35 m / 1378" [2]	2 m / 80"	4 m / 157"

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

2) Greater lengths available on request.

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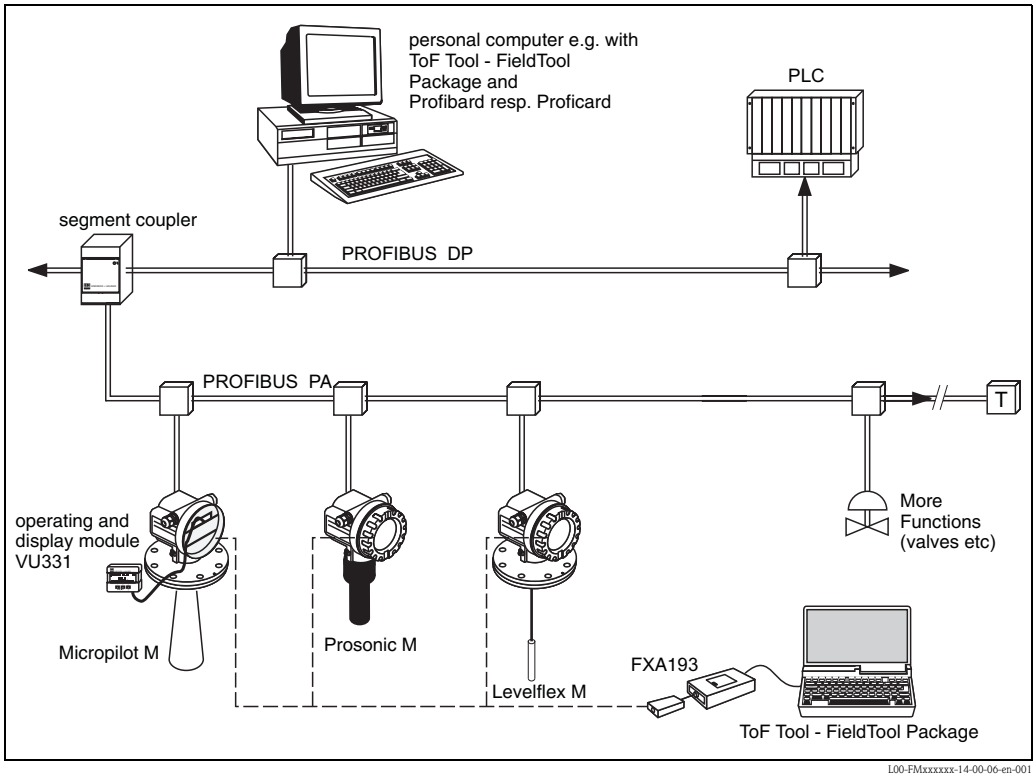
If the HART communication resistor is not installed in the supply device and HART protocol communication is to be carried out, it is necessary to insert a > 250 Ω communication resistor into the 2-wire line.

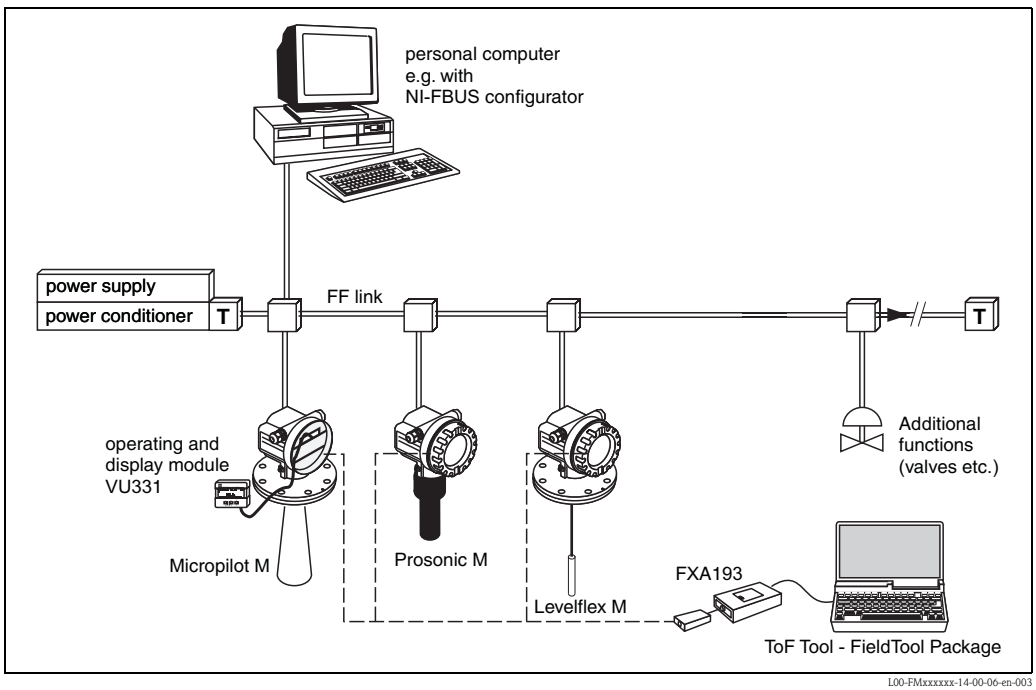
System integration via PROFIBUS PA

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:



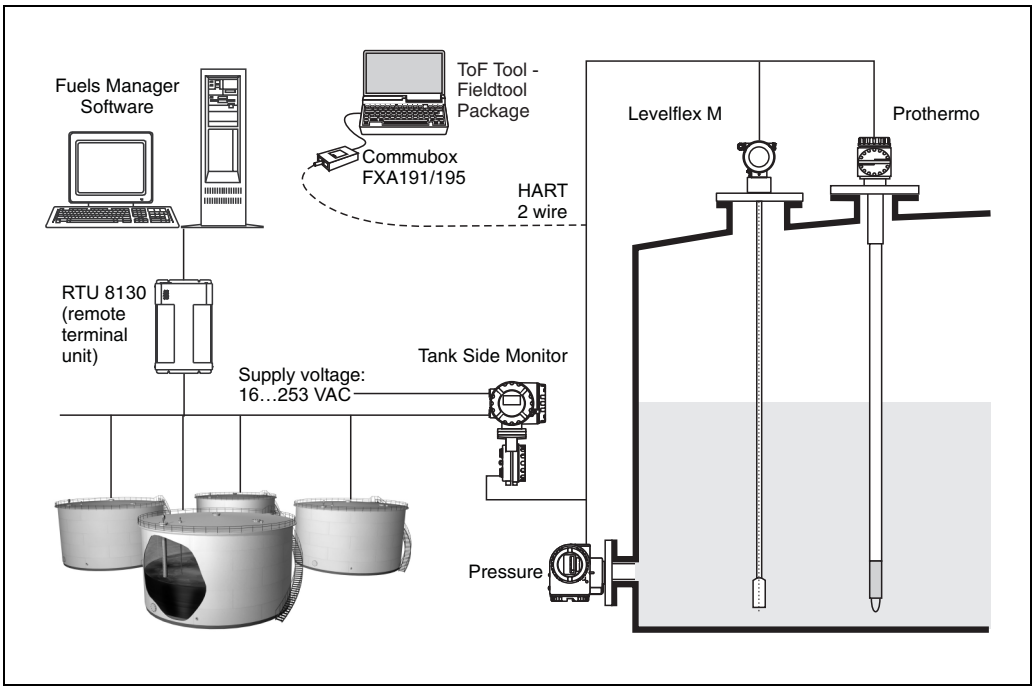
System integration via FOUNDATION Fieldbus

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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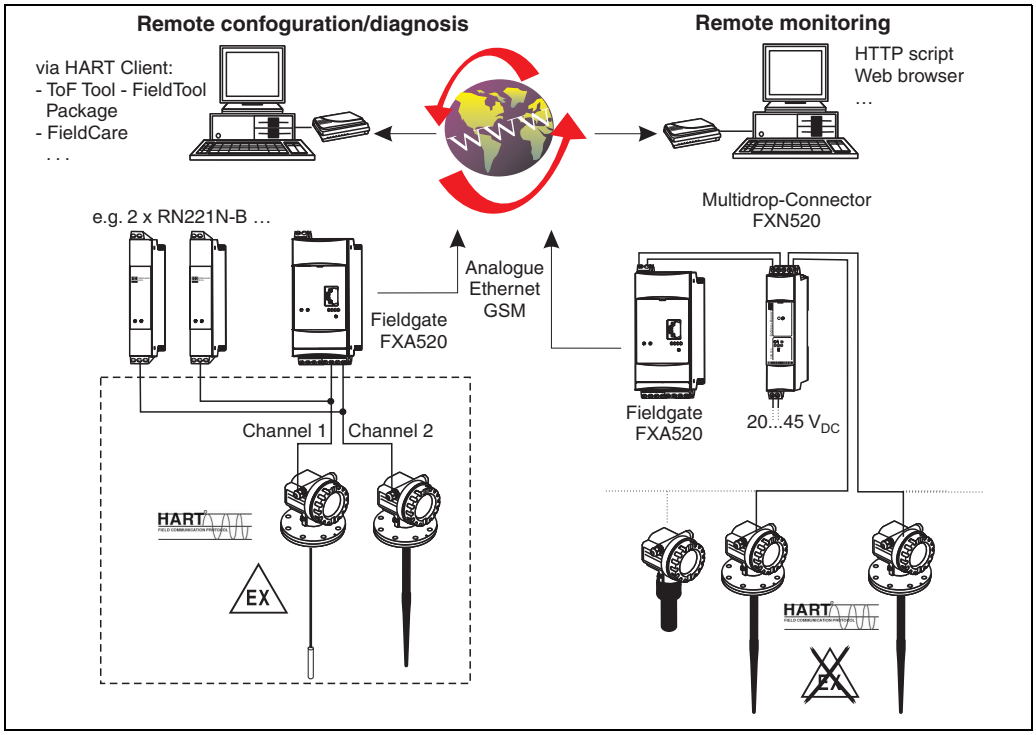
System integration via Fieldgate

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 34) 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 (Εr)	Typical bulk solids	Typical liquids	Measuring range	
				bare metallic probes	PA-coated rope probes
1	1.4...1.6		– Condensed gases, e.g. N_2, CO_2	4 m / 157", only coax probe	—
2	1.6...1.9	– Plastic granulate – White lime, special cement – Sugar	– Liquefied gas, e.g. Propane – Solvent – Frigen / Freon – Palm oil	25...30 m / 984...1181"	12,5...15 m / 492...590"
3	1.9...2.5	– Portland cement, plaster	– Mineral oils, fuels	30...35 m / 1181...1378"	—
		– Flour	—	—	15...25 m / 590...984"
4	2.5...4	– Grain, seeds – Ground stones – Sand	– Benzene, styrene, toluene – Furan – Naphthalene	35 m / 1378"	25...30 m / 984...1181"
5	4...7	– Naturally moist (ground) stones, ores – Salt	– Chlorobenzene, chloroform – Cellulose spray – Isocyanate, aniline	35 m / 1378"	35 m / 1378"
6	> 7	– Metallic powder – Carbon black – Coal	– Aqueous solutions – Alcohols – Ammonia	35 m / 1378"	35 m / 1378"

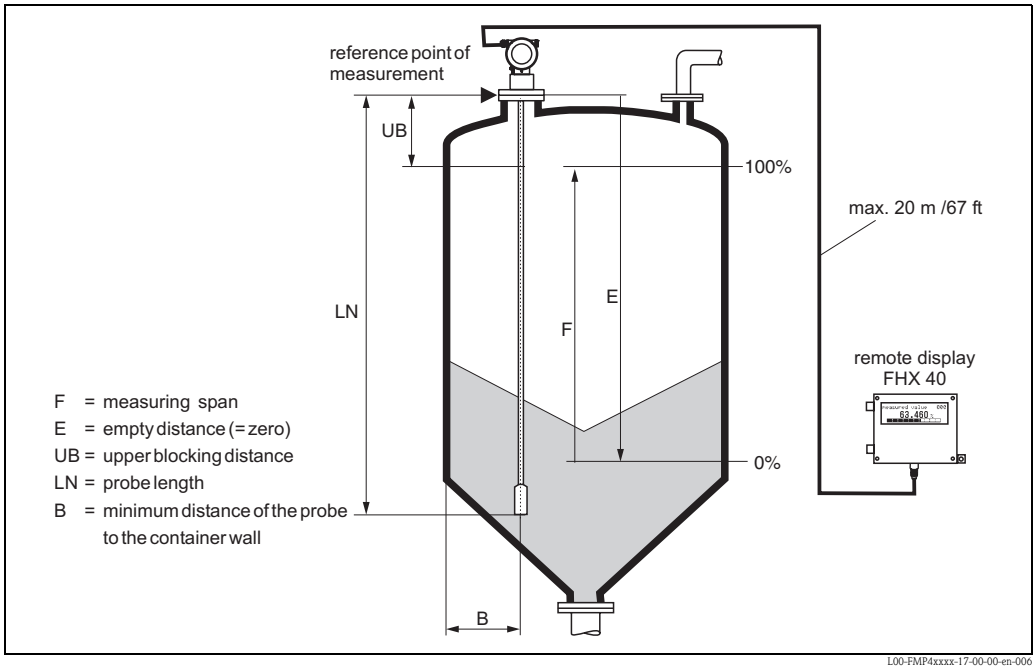
The respective lower group applies for very loose or loosened bulk solids.

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

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

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 34

Blocking distance and measuring range:

FMP40	LN [m / "]		UB [m / "]
	min	max	min
Rope probe	1 / 40	35 / 1378 [1]	0.2 / 8 [2]
6 mm rod probe	0.3 / 12	2 / 80	0.2 / 8 [2]
16 mm rod robe	0.3 / 12	4 / 178	0.2 / 8 [2]
Coax probe	0.3 / 12	4 / 178	0 / 0

1) Larger measuring range available on request.

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

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.

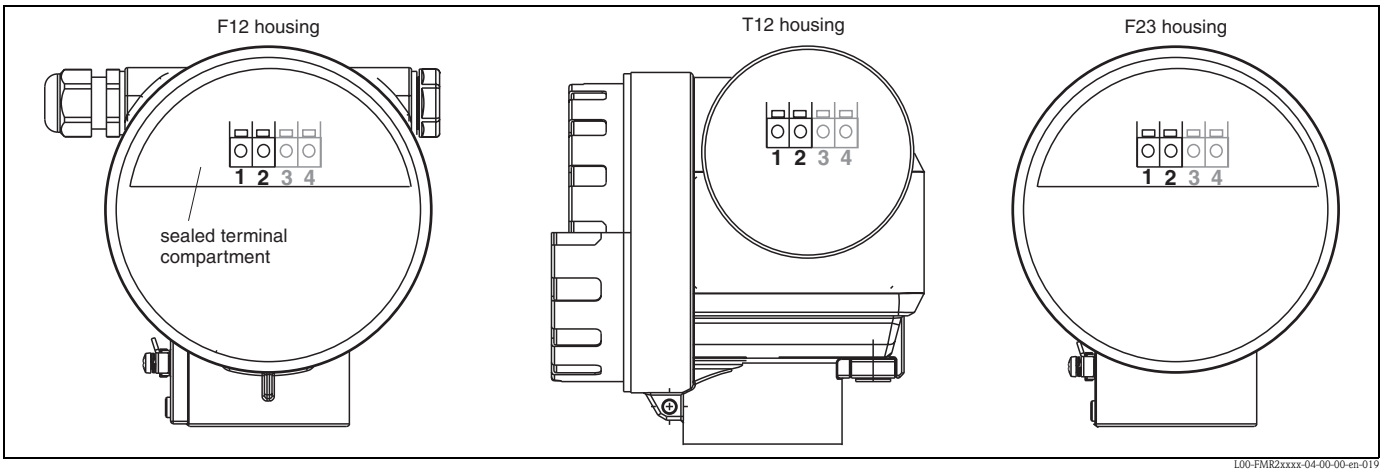
Auxiliary energy

Electrical connection

Terminal compartment

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

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

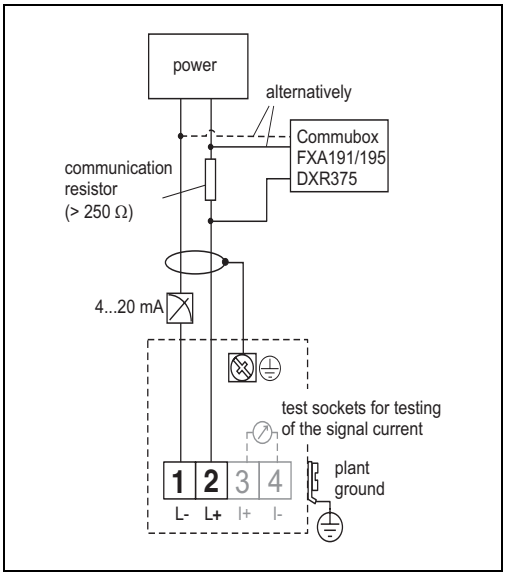
	Type	Clamping area
Standard, EEx ia, IS	Plastic M20x1.5	5...10 mm
EEx em, EEx nA	Metal M20x1.5	7...10.5 mm

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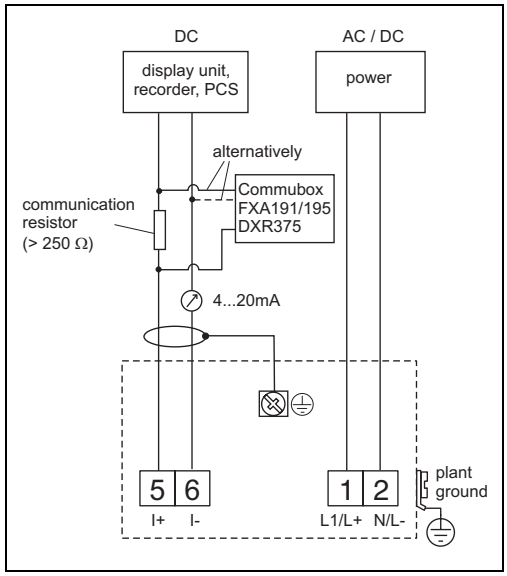
4-wire, 4...20 mA active with HART



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

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

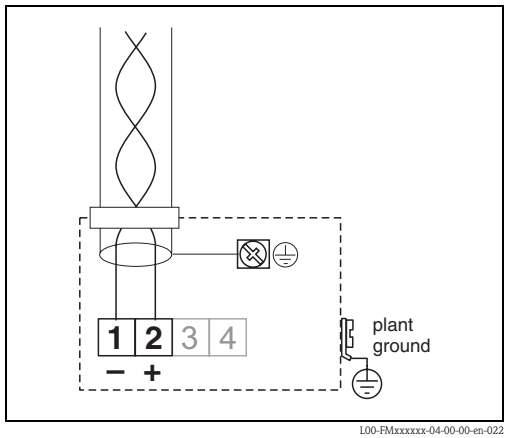
Cable specification
- A standard installation cable is sufficient if only the analogue signal is used. Use a screened cable when working with a superimposed communications signal (HART).

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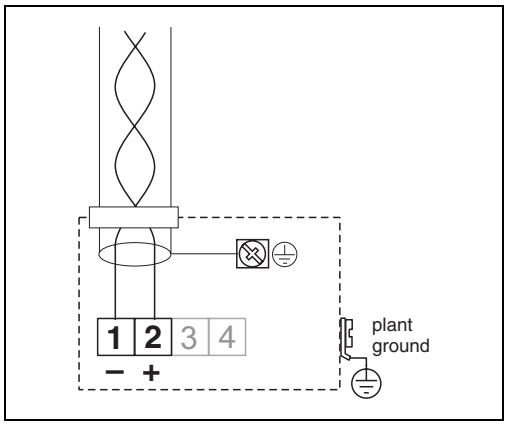
Note!
For further information on the cable specifications, see Operating Instructions BA034S "Guidelines for planning and commissioning PROFIBUS DP/PA", PNO Guideline 2.092 "PROFIBUS PA User and Installation Guideline" and IEC 61158-2 (MBP).

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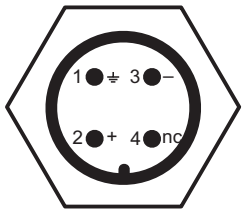
Note!
For further information on the cable specifications, see Operating Instructions BA013S "FOUNDATION Fieldbus Overview", FONDATION Fieldbus Guideline and IEC 61158-2 (MBP).

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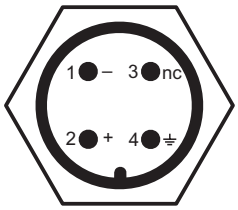
Pin	Meaning
1	Ground
2	Signal +
3	Signal –
4	not connected

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 43–45. 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

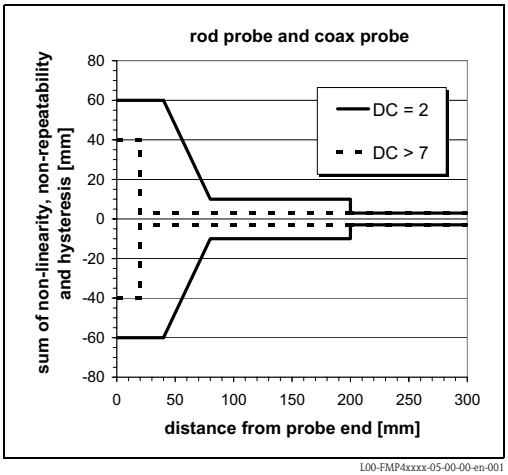
Maximum measured error

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:** – up to 10 m: ±3 mm – > 10 m: ± 0.03 % **for PA coated rope measuring range:** – up to 5 m: ±5 mm – > 5 m: ± 0.1 %	± 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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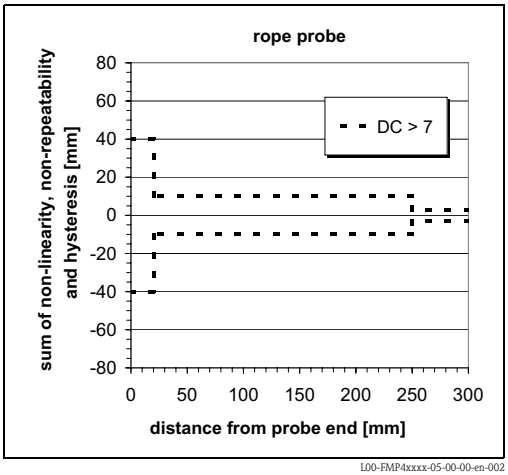

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If for rope probes the DC value is less than 7, then measurement is not possible in the area of the straining weight (0 ... 250 mm from end of probe; lower blocking distance).

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

Influence of ambiente temperature

The measurements are carried out in accordance with EN 61298-3:
- digital output (HART, PROFIBUS PA, FOUNDATION Fieldbus):
  - **FMP40**
    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

Operating conditions: Installation

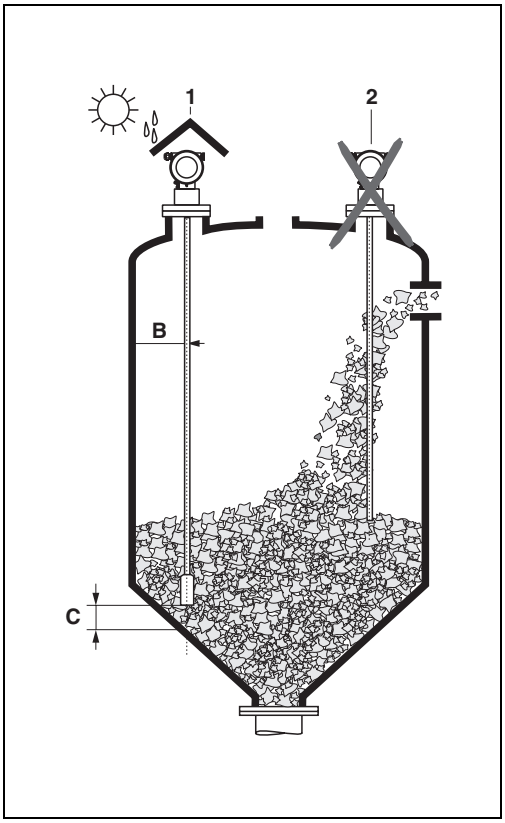
General installation instructions (for bulk solids + fluids)

Probe selection (see overview on Page 4-5)

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

Mounting location

- Do not mount rod or rope probes in the filling curtain (2)
- Mount rod and rope probes away from the wall (B) at such a distance that, in the event of 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.
- When installing rod and rope probes in plastic containers, the minimum distance of 300 mm also applies to metallic parts outside the container.
- Rod and rope probes may not, at times, contact metallic container walls or floors.
- Minimum distance of probe end to the container floor (C):
  – Rope probe: 150 mm
  – Rod probe: 50 mm
  – Coax probe: 10 mm
- When installing outdoors, it is recommended that you use a protective cover (1) see "Accessories" on Page 46.
- Avoid buckling the rope probe during installation or operation (e.g. through product movement against silo wall) by selecting a suitable mounting location.



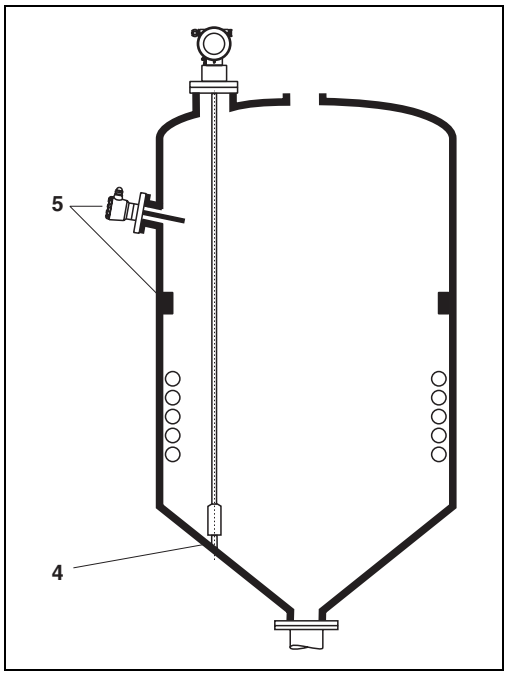
L00-FMP4xxxx-17-00-00-xx-003

Other installations

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

Optimization options

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



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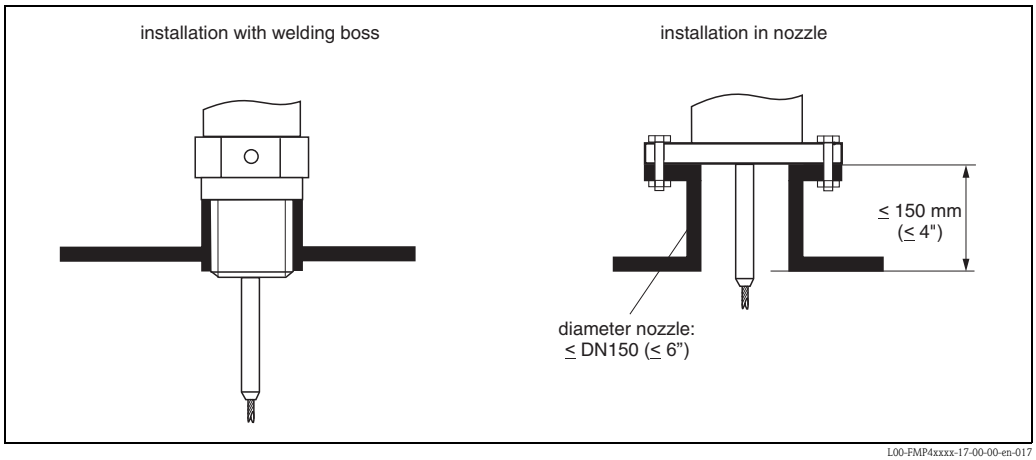
Type of probe installation

- Probes are mounted to the process connection with threaded connections or flanges and are usually also secured with these. If during this installation there is the danger that the probe end moves so much that it touches the tank floor or cone at times, the probe must, if necessary, be shortened and fixed down. The easiest way to fix the rope probes is to screw them to the internal thread on the lower end of the weight. Thread size, see Page 26.
- The ideal installation is mounting in a screwed joint / screw-in sleeve which is internally flush with the container ceiling.
- If installation takes place in a nozzle, the nozzle should be 50 ... 150 mm in diameter and should not be more than 150 mm high. Installation adapters are available for other dimensions, see Page 28.



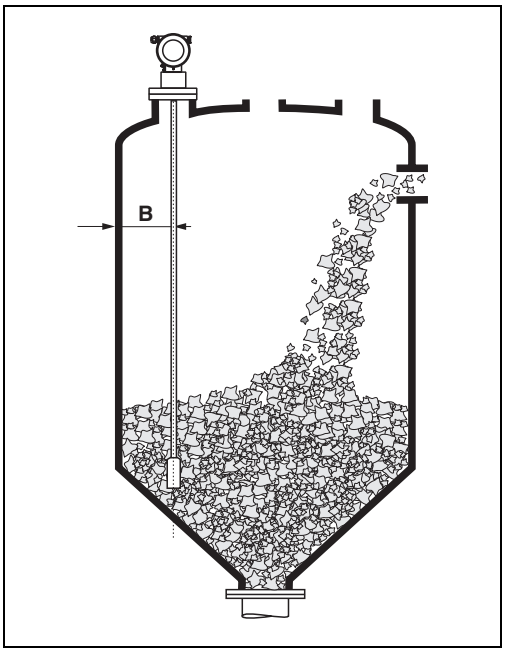
L00-FMP4xxxx-17-00-00-en-017

Probe length

The measuring range is directly dependent on the probe length.
It is better to order probes too long than too short since it is possible to shorten the probe if necessary.

Special notes for bulk solids

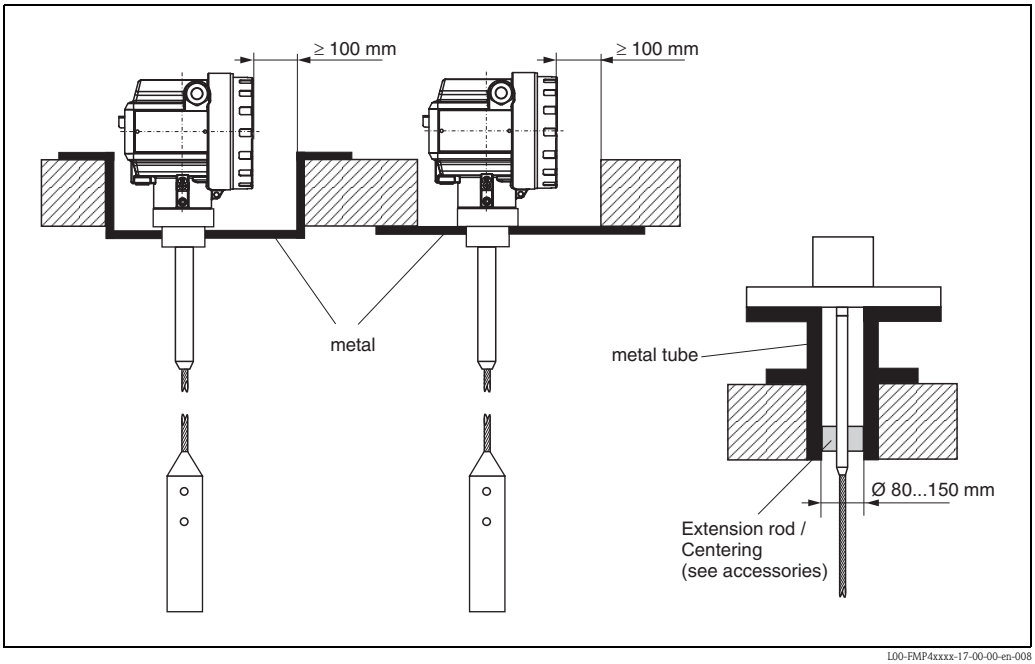
- In the case of bulk solids, as great a distance as possible from the filling curtain is especially important to avoid wear.
- In concrete silos, a **large distance** (B) should be observed between the probe and the concrete wall, if possible >= 1 m, but at least 0.5 m.
- The installation of rope probes must be carried out carefully. If possible, installation should be carried out when the silo is empty.
- Check the probe regularly for defect.



L00-FMP4xxxx-17-00-00-xx-005

Installation in concrete silos

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



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

The centering disk should be used for tube diameter > 150 mm to prevent build-up in the inner port of the tube.

Installation instructions for level measurement in bulk solid silos

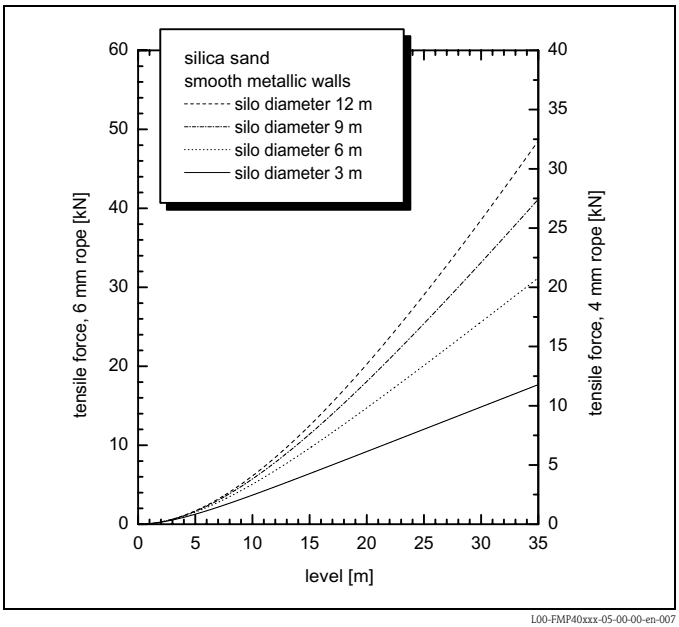
Tensile load

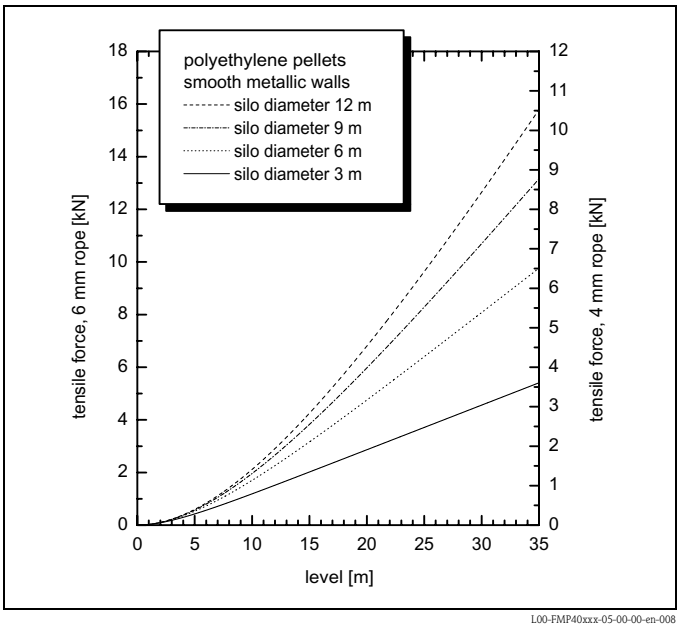
Bulk solids exert tensile forces (maximum admissible values see Page 4-5) on rope probes whose height increases with:

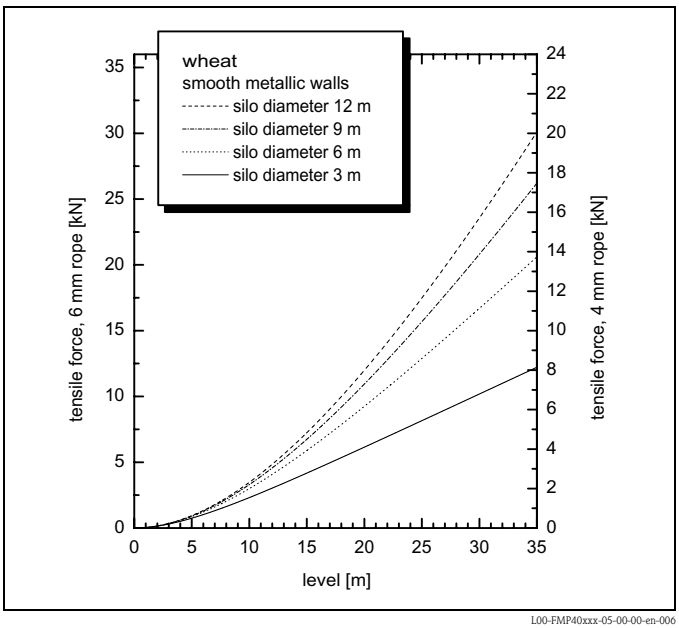
- the length of the probe, i.e. max. cover,
- the bulk density of the product,
- the silo diameter and
- the diameter of the probe rope

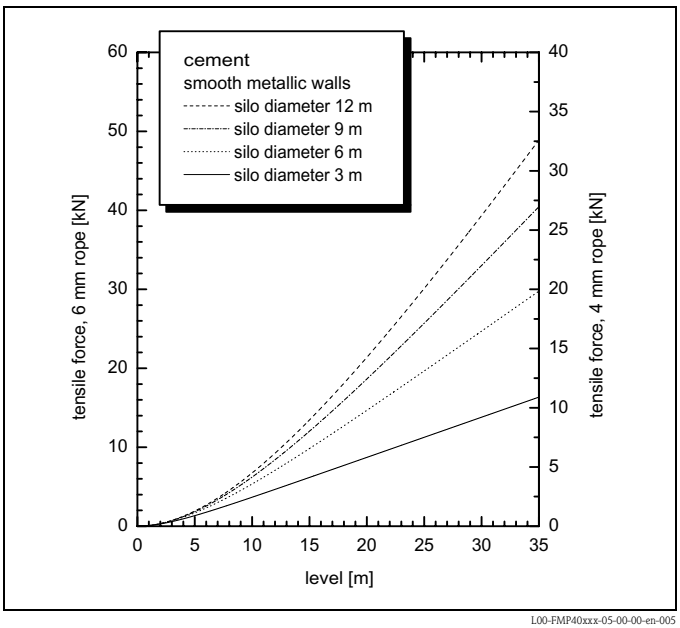
The following diagrams show typical loads for frequently occurring bulk solids as reference values. The calculation is performed for the following conditions:

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









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

The same forces also act on the silo cover.
On a fixed rope, the tensile forces are definitely greater, but this can not be calculated.
Observe the tensile strength of the probes or ensure that the tensile strength of the probes is not exceeded (see table, see Page 4-5).

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

Special notes for liquids

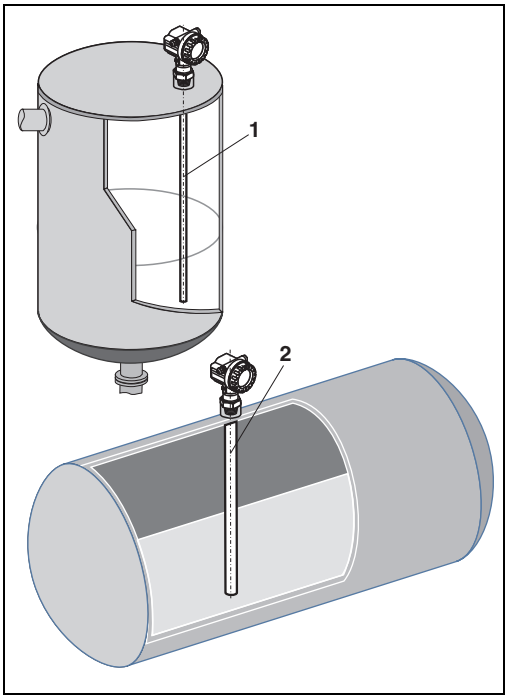
- When installing in agitation units, check whether a no-contact process (Ultrasonic or Level-Radar) would be better suited, especially if the agitator generates large mechanical loads on the probe.
- If Levelflex is, nevertheless, installed in tanks with agitators, it is better to use coax probes which have a greater lateral loading capacity, see Page 4-5.

Standard installation

Using a coax probe offers great advantages when the viscosity of the product is < 500 cst and it is certain that the product does not accumulate build-up:
- Greater reliability:
  As of dielectric constant=1.4, measurement functions independently of all electrical properties in all liquids.
- Internals in the tank and nozzle dimensions do not have any influence on measurement.
- Higher lateral load-bearing capacity than rod probes.
- For higher viscosity a rod probe is recommended, or using a non-contact measuring principle as the Level-Radar Micropilot M FMR2xx.

Installation in horizontal and upright cylindrical tanks

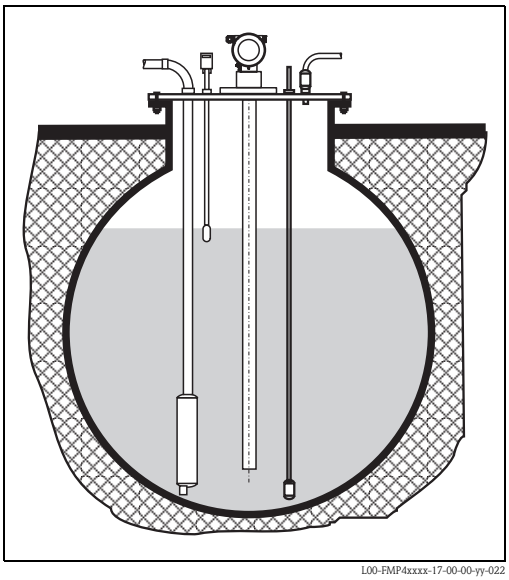
- Use a coax or rod probe for measuring ranges up to 4 m. For longer measuring ranges, a separable probe is available as special version, or the use of a 4 mm rope probe is recommended.
- Installation and possible fixing as with bulk solids.
- Any distance from wall, as long as occasional contact is prevented.
- When installing in tanks with a lot of internals or internals situated close to the probe: use a coax probe.



L00-FMP4xxxx-17-00-00-yy-021

Installation in underground tanks

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



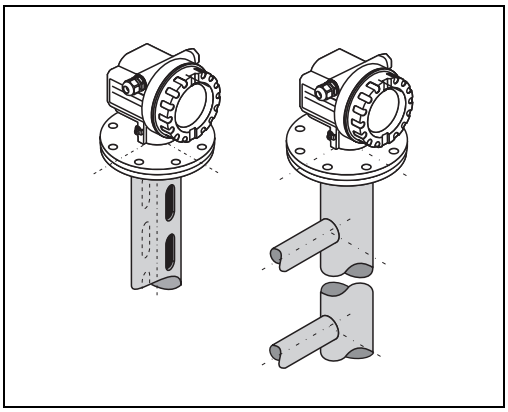
L00-FMP4xxxx-17-00-00-yy-022

Measurement in corrosive fluids

For measurement in corrosive liquids use Levelflex M FMP41C. When using plastic tanks it is also possible to mount the probe on the outside of the tank (see Installation in plastic containers on Page 27). Levelflex measures the level through the plastic in both cases.

Installation in stilling well or bypass

- A rod probe can be used for pipe diameters bigger than 40 mm.
- When installing a rod probe into a metallic pipe with internal diameter of up to 150 mm, you have all the advantages of a coax probe.
- Welded joints that protrude up to approx. 5 mm/ 0.2" inwards do not influence measurement.



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

Minimum blocking distance

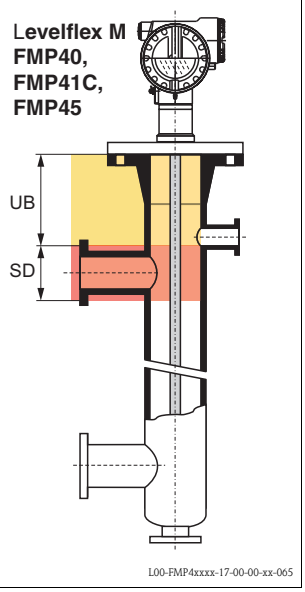
In the lower table, the recommended minimal settings for the upper blocking distance dependent upon the dielectric constant, lowest ambient temperature and nominal diameter of the tube are represented. Values validly for a 16mm rod in side gauge/bypass.

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".



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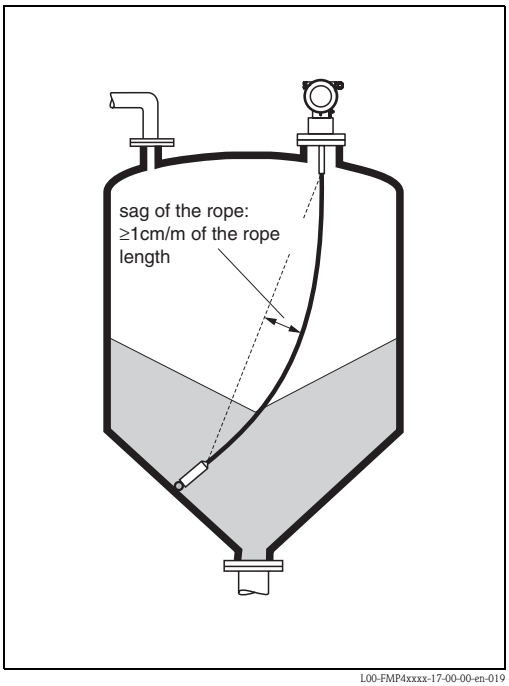
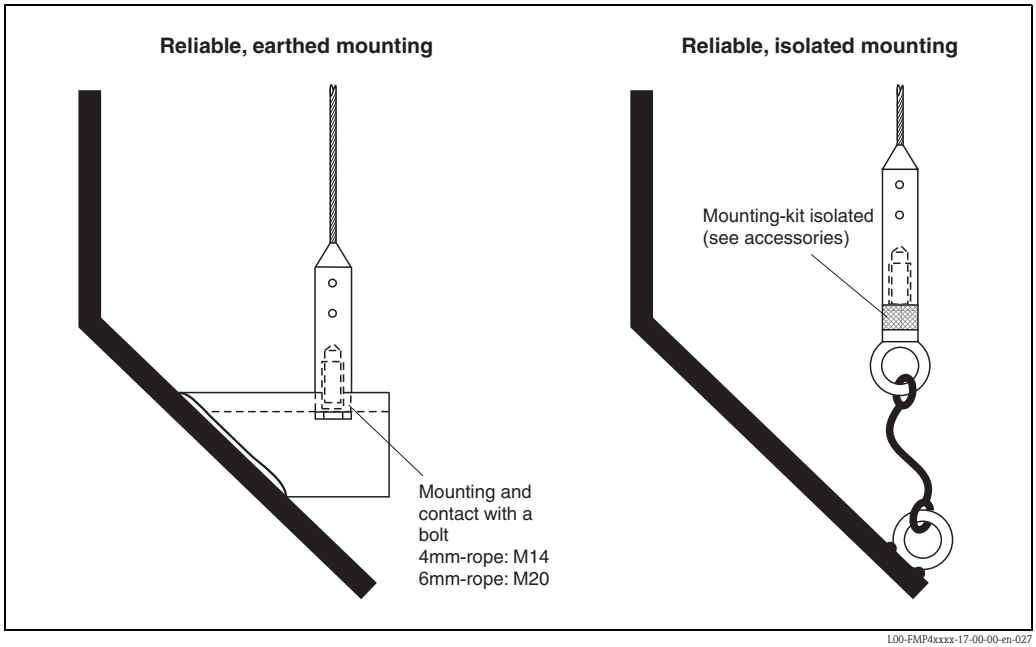
Notes on special installation situations

FIxing rope probe

- The end of the probe needs to be secured if the probe would otherwise touch the silo wall, the cone or another part, or the probe comes closer than 0.5 m to a concrete wall. This is what the internal thread in the probe weight is intended for:
  – for 4 mm rope: M14
  – for 6 mm rope: M20
- Preferably use the 6 mm rope probe due to the higher tensile strength when fixing a rope probe
- The fixing must be either reliably grounded or reliably insulated (see accessories on Page 49). If it is not possible to mount the probe weight with a safe earthed connection, it can be secured using an isolated eyelet, which is available as an accessory (Page 49).
- In order to prevent an extremely high tensile load and the risk of rope crack, the rope has to be slack. Make the rope longer than the required measuring range such that there is a sag in the middle of the rope that is
  ≥ 1 cm/m (1"/100") of the rope length.



L00-FMP4xxxx-17-00-00-en-019

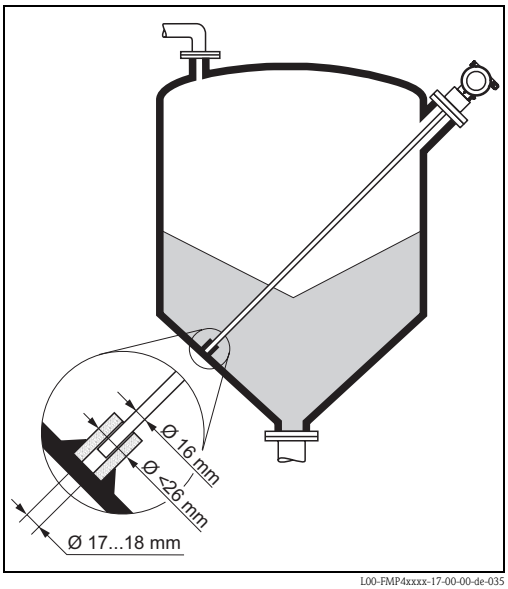


L00-FMP4xxxx-17-00-00-en-027

Installation from the side

- If installation from above is not possible, the Levelflex can also be mounted from the side.
- In this case, always fix the rope probe (see QVaS).
- Support rod and coax probe if the lateral load-bearing capacity is exceeded (see table, see Page 4-5). Only fix rod probes at the probe end.

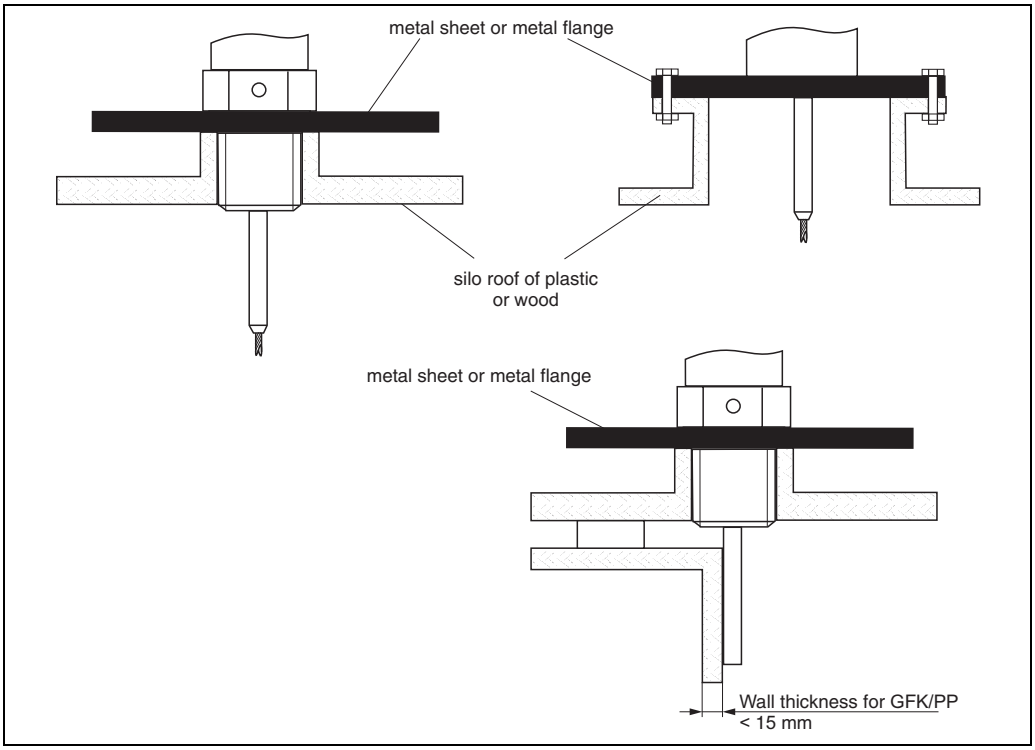
Caution!
Insulate or ground the rod probe when welding the sleeve as device will otherwise be destroyed!



L00-FMP4xxxx-17-00-00-de-035

Installation in plastic containers

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



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

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

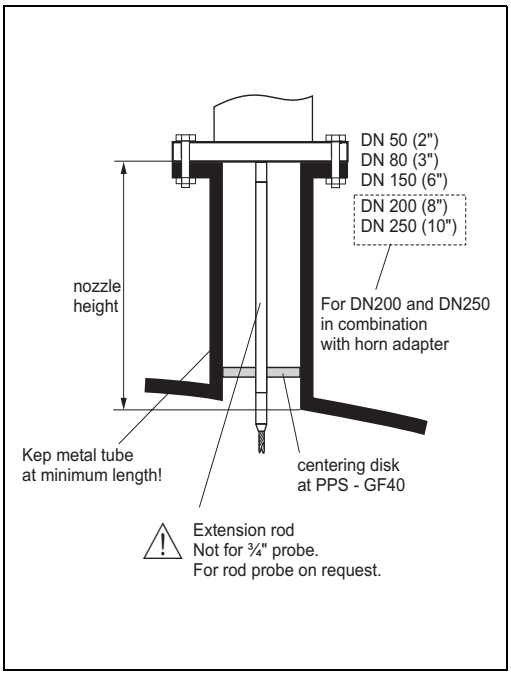
Installation in nozzles > 150 mm high

If, when installing probes in nozzles DN40...250 / 1½"...10" with nozzle height (HS) of > 150 mm/6", the probe could touch the lower edge of the nozzle due to moving materials in the container, we recommend using an extension rod with or without centering disk.

This accessory consists of the extension rod corresponding to the nozzle height, on which a centering disk is also mounted if the nozzles are narrow or when working in bulk solids. This component is delivered separately from the device. Please order the probe length correspondingly shorter. For the exact length of the rod see "extension rod/centering" on Page 45.

Order codes for specific nozzle nominal diameters and heights can be found on Page 45.

Only use centering disks with small diameters (DN40 and DN50) if there is no significant build-up in the nozzle above the disk.



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

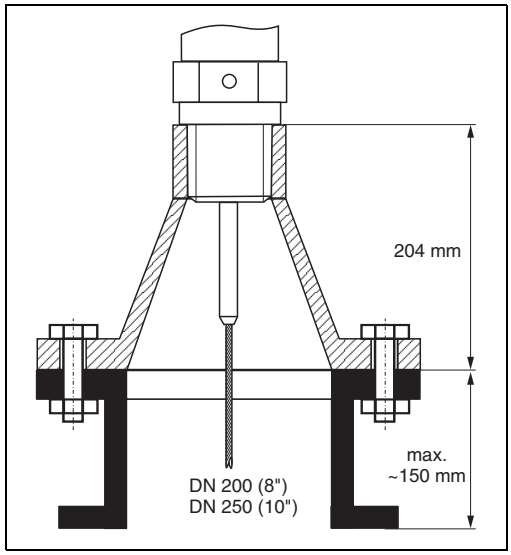
Installation in DN200/8" and DN250/10" nozzles

When installing the Levelflex in nozzles of > 210 mm / 8", signals are generated by reflections on the nozzle wall, which can sometimes lead to faulty measurements in the case of products with small dielectric constants.

With nozzle diameters of 200 mm / 8" or 250 mm / 10", therefore, a special flange with a “horn adapter” must be fitted.

Nozzles with nominal diameters greater than DN250 /10" should be avoided.

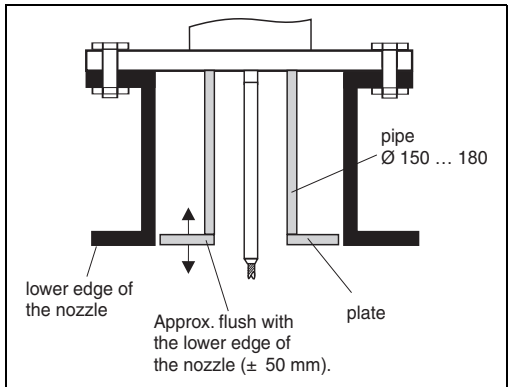
If the rope probe is strongly deflected: use an extension rod/centering HMP40, additionaly.



L00-FMP4xxxx-17-00-00-de-026

Installation in > DN300/12" nozzle

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



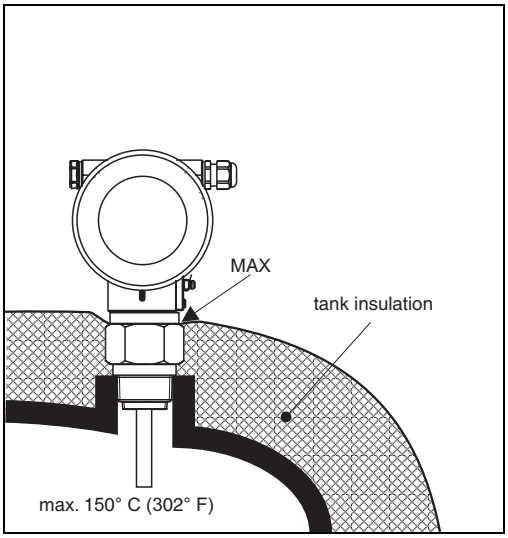
nozzle diameter	plate diameter
DN 300	280
≥ DN 400	≥ 350

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

Installing FMP40 with heat insulation

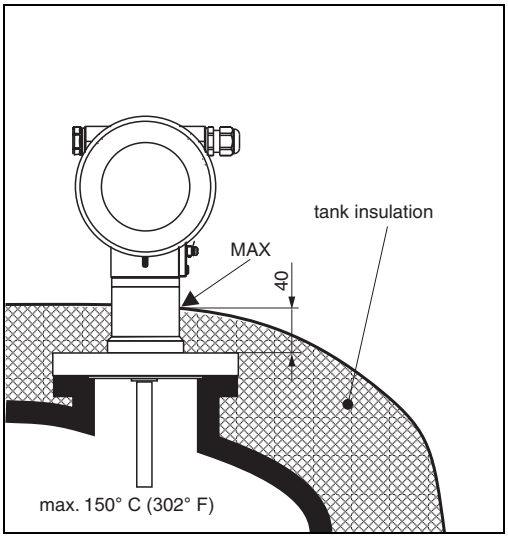
- If process temperatures are high, FMP40 must be included in normal tank insulation to prevent the electronics heating up as a result of heat radiation or convection.
- The insulation may not exceed beyond the points labelled "**MAX**" in the drawing.

Process connection with adapter G ¾, G 1½, ¾ NPT or 1½ NPT



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

Process connection with flange DN40...DN200



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

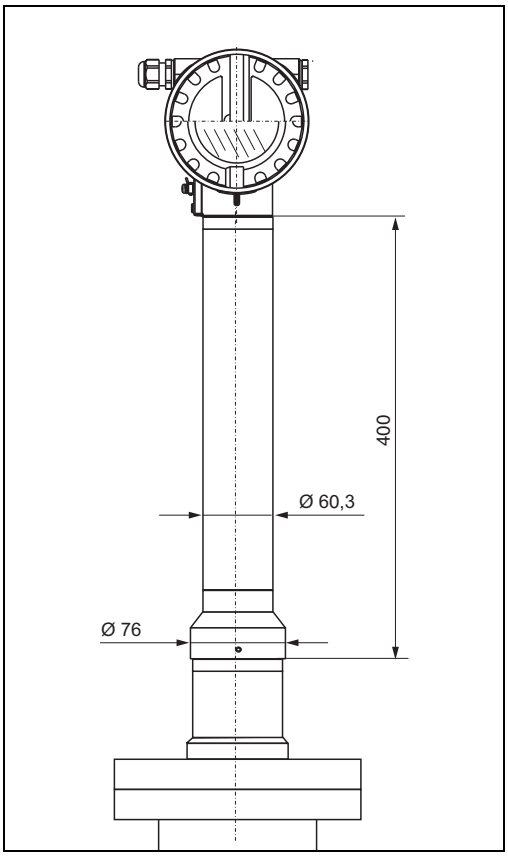
Installation for difficult to access process connections

For tight spaces or temperatures above that in the graphic (see Page 31), the electronics housing can be ordered with distance pipe or connecting cable (seperate housing).

Installation with distance pipe

When mounting please observe engineering hints on see Page 19 the following points:

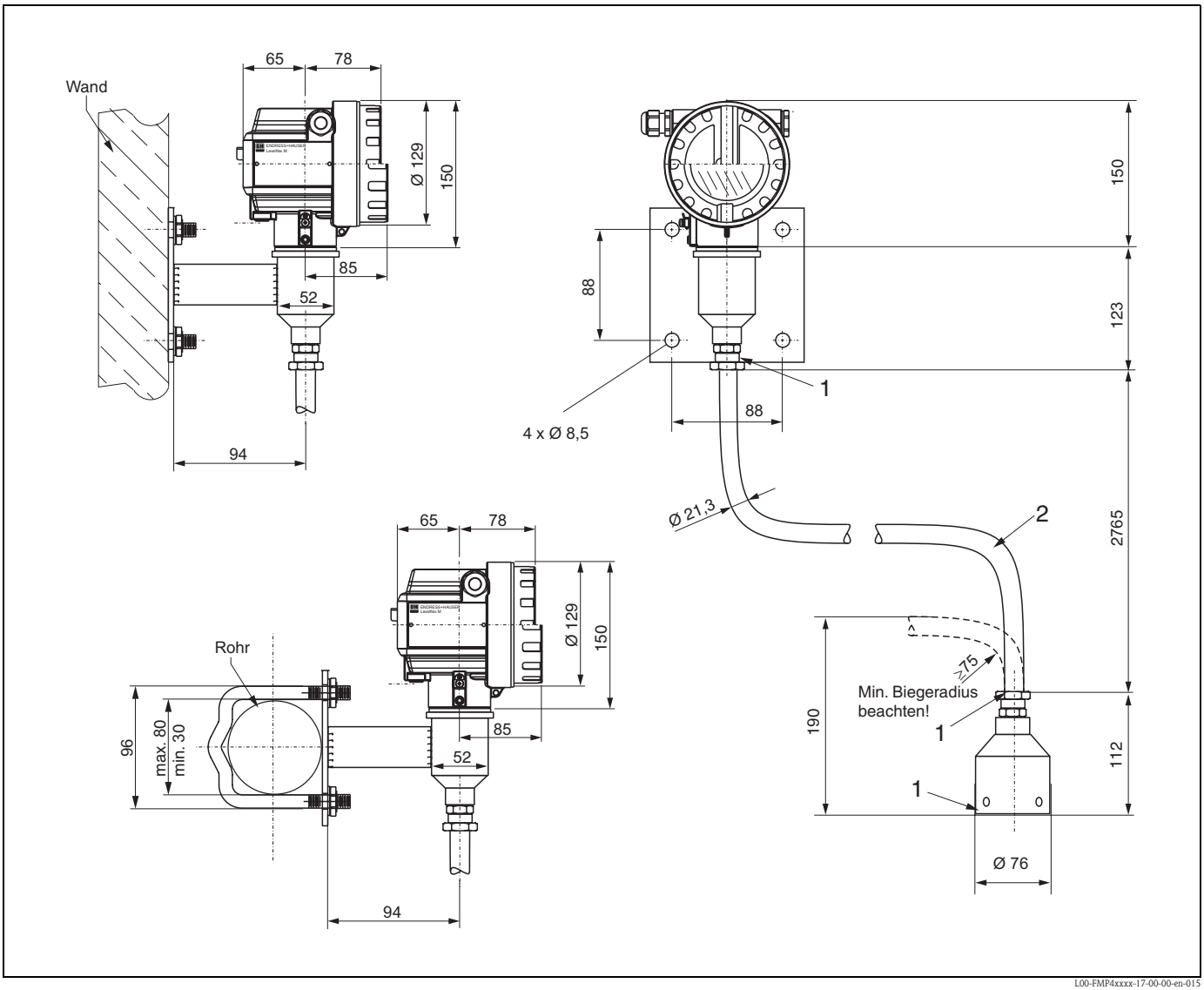
- After mounting, the housing can be turned 350°, in order make access to the display and the connection compartment easier.
- The max. measuring range is reduced to 34 m/1338".



L00-FMP4xxxx-17-00-00-de-014

Installation with separate housing

- Follow installation instructions on see Page 19.
- Mount housing on a wall or pipe (in vertical or horizontal position as required) as shown in the diagram.



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.

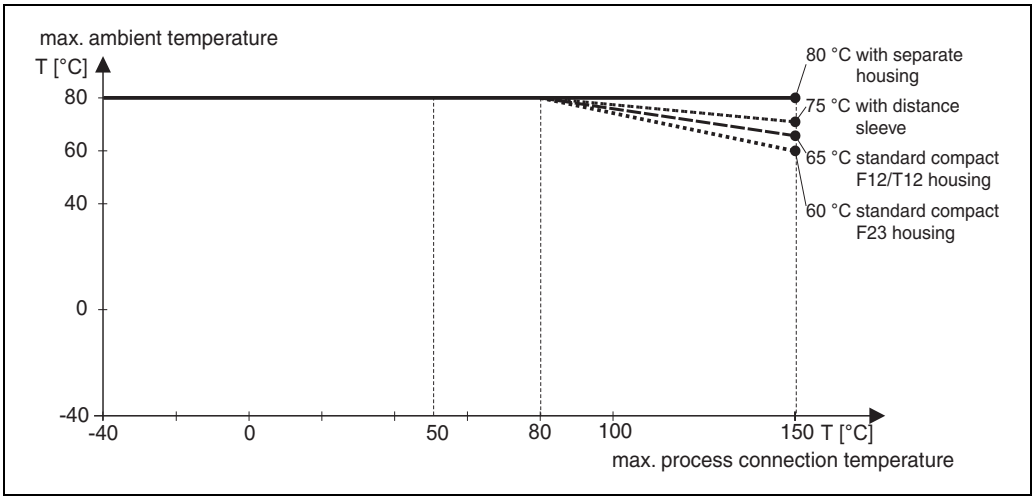
Operating conditions: Environment

Ambient temperature range

Ambient temperature for the electronic: -40 °C ... +80 °C
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

For process connection temperatures above 80 °C, the allowed ambient temperature at the housing is reduced according to the following diagram:



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)

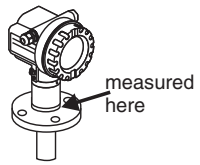
The measured value can be affected by strong electromagnetic fields when installing rod and rope probes without a shielding/metallic wall, e.g. plastic, and in wooden silos.
- Interference Emission to EN 61326, Electrical Equipment Class A.
- Interference Immunity: the measured value can be affected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

Operating conditions: Process

Process temperature range

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

O-ring-material	min. Temperature	max. Temperature [1]
FKM (Viton)	-30 °C/-22 °F	+150 °C/302 °F
EPDM	-40 °C/-40 °F	+120 °C/248 °F
FFKM (Kalrez)	-5 °C/23 °F [2]	+150 °C/302 °F



1) For PA coated probes, the maximal admissible temperature ist 100 °C (212 °F).

2) The min. temperature of FFKM may be -15 °C (5 °F) if the max. temperature of +80 °C (176 °F) is not exceeded.

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

Process pressure

All models: -1...40 bar/585,9 psi.
This range may be reduced by the selected process connection.
The pressure rating (PN) specified on the flanges refers to a reference temperature of 20 °C, for ASME flanges to 100 °F.

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

Materials used in the process

- Metall: see "Ordering information" on Page 43-45.
- O-ring seal: see "Ordering information" on Page 43-45.
- Rope coating: PA 12 (Vestamid L 1940), appropriate for the use in food.
- All probes with 1½" and flange connection:
  - on the lower edge of the process connections: PTFE (Dyneon TFM 1600).
  - Centering stars in the coax probes: PFA.
- all Probes with ¾" connection:
  - lower edge of the process connections: PPS-GF 40.

Dielectric constant

- with coax probe: $\varepsilon r \geq 1{,}4$
- Rod and rope probe: $\varepsilon r \geq 1{,}6$

Extension of the rope probes through tension and temperaturer

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

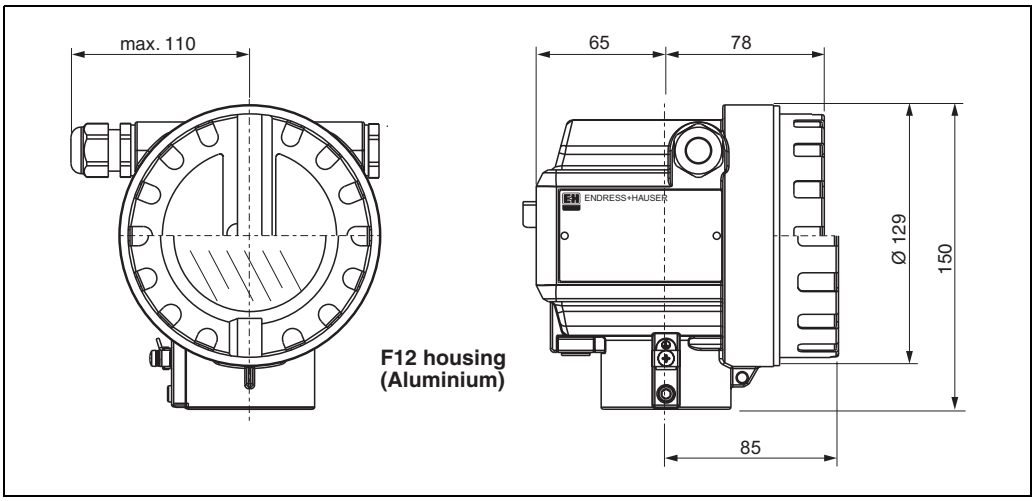
4 mm rope:
- Elongation through tension: at max. permitted tensile load (12 KN): 11 mm / m rope length
- Elongation through temperature increase from 30 °C to 150 °C: 2 mm / m rope length

Mechanical construction

Design, dimensions

Housing dimensions

Dimensions for process connection and type of antenne see Page 34.



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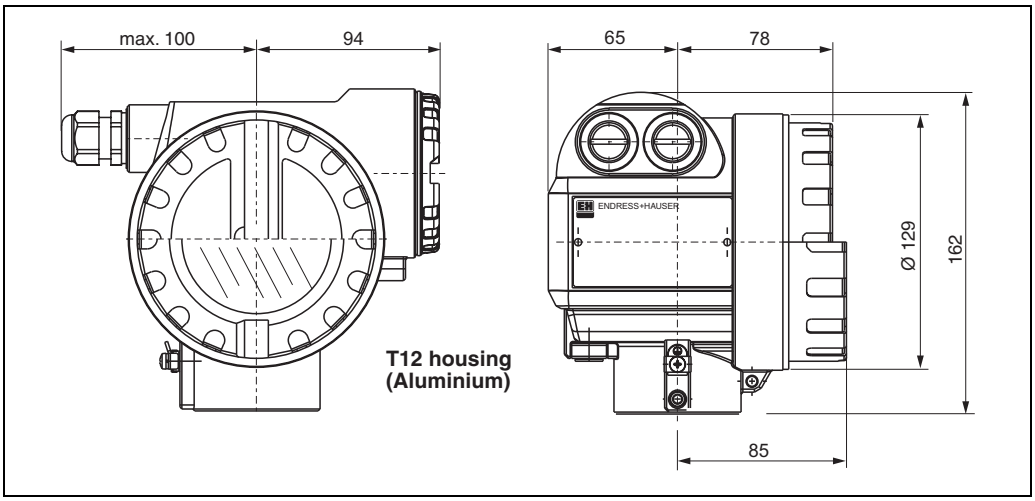

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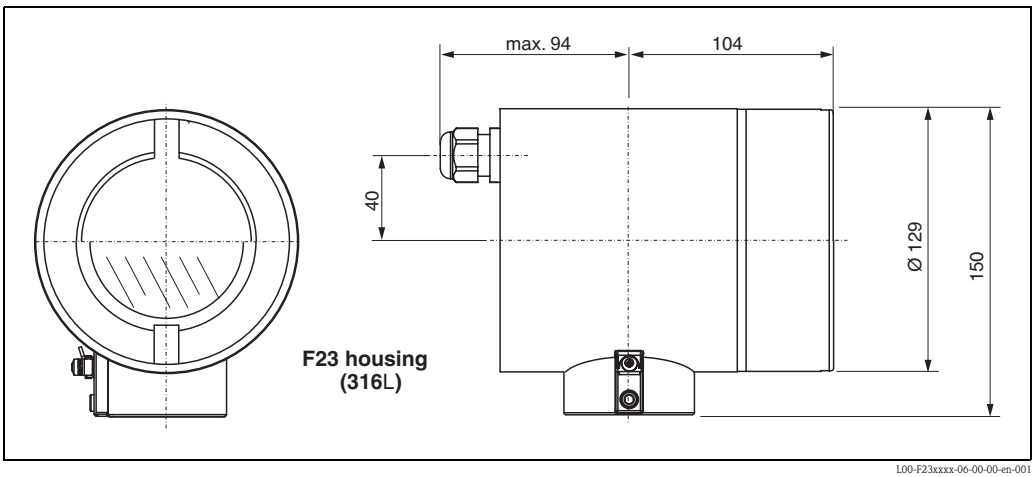
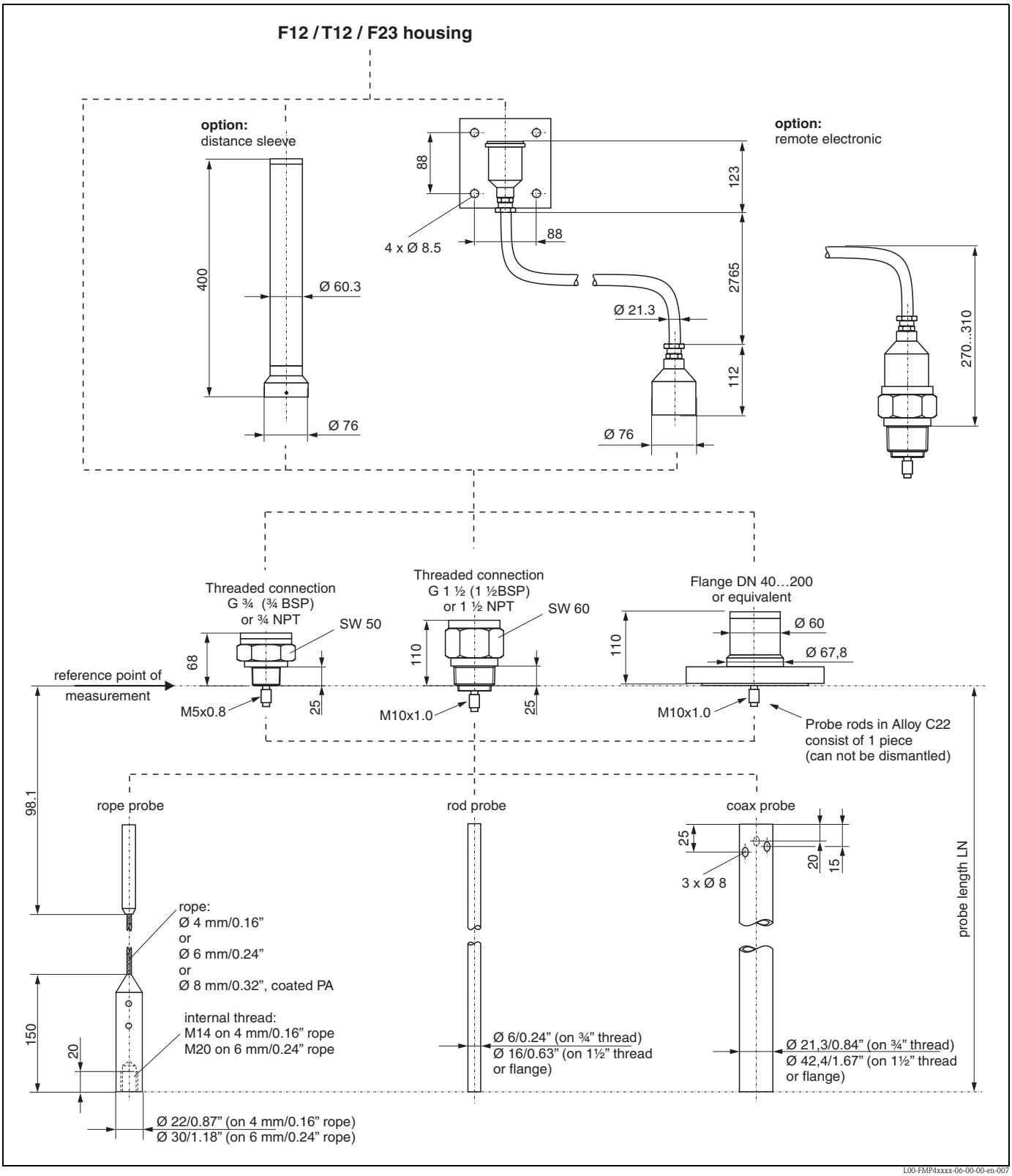


L00-F23xxxx-06-00-00-en-001

Levelflex M FMP40 - process connection, type of probe

Housing dimensions see Page 33.



Weight

Levelflex M	FMP 40 + rope probe 4 mm	FMP 40 + rod or rope probe 6 mm	FMP 40 + rod probe 16 mm	FMP 40 coax probe
Weight for F12 or T12 housing	Approx. 4 kg + Approx. 0.1 kg/m probe length + weight of flange	Approx. 4 kg + Approx. 0.2 kg/m probe length + weight of flange	Approx. 4 kg + Approx. 1.6 kg/m probe length + weight of flange	Approx. 4 kg + Approx. 3.5 kg/m probe length + weight of flange
Weight for F23 housing	Approx. 7.4 kg + Approx. 0.1 kg/m probe length + weight of flange	Approx. 7.4 kg + Approx. 0.2 kg/m probe length + weight of flange	Approx. 7.4 kg + Approx. 1.6 kg/m probe length + weight of flange	Approx. 7.4 kg + Approx. 3.5 kg/m probe length + weight of flange

Material

- 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 43-45.

Seal

See "Ordering information" on Page 43-45.

Probe

See "Ordering information" on Page 43-45.

Human interface

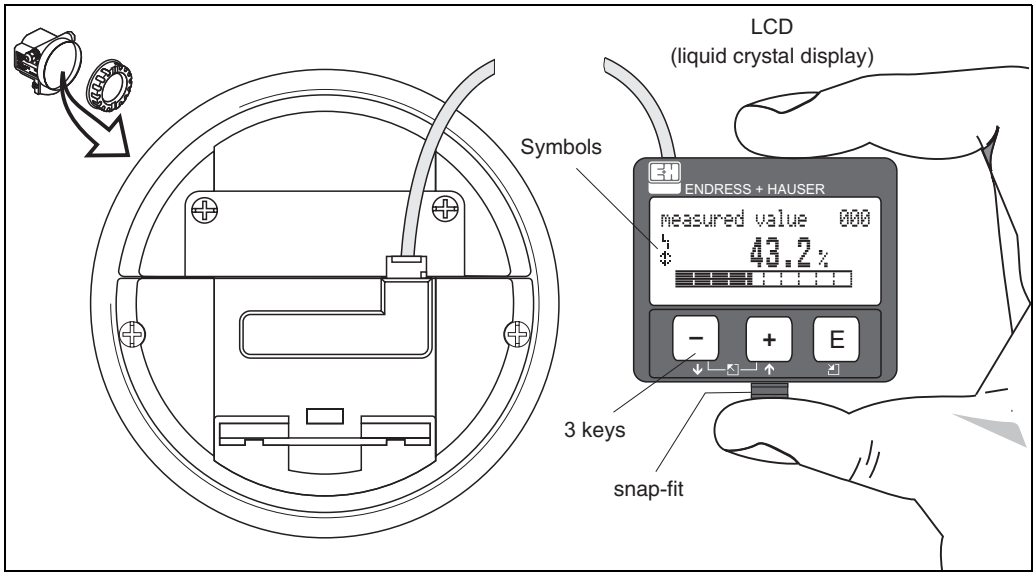
Operation concept

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.

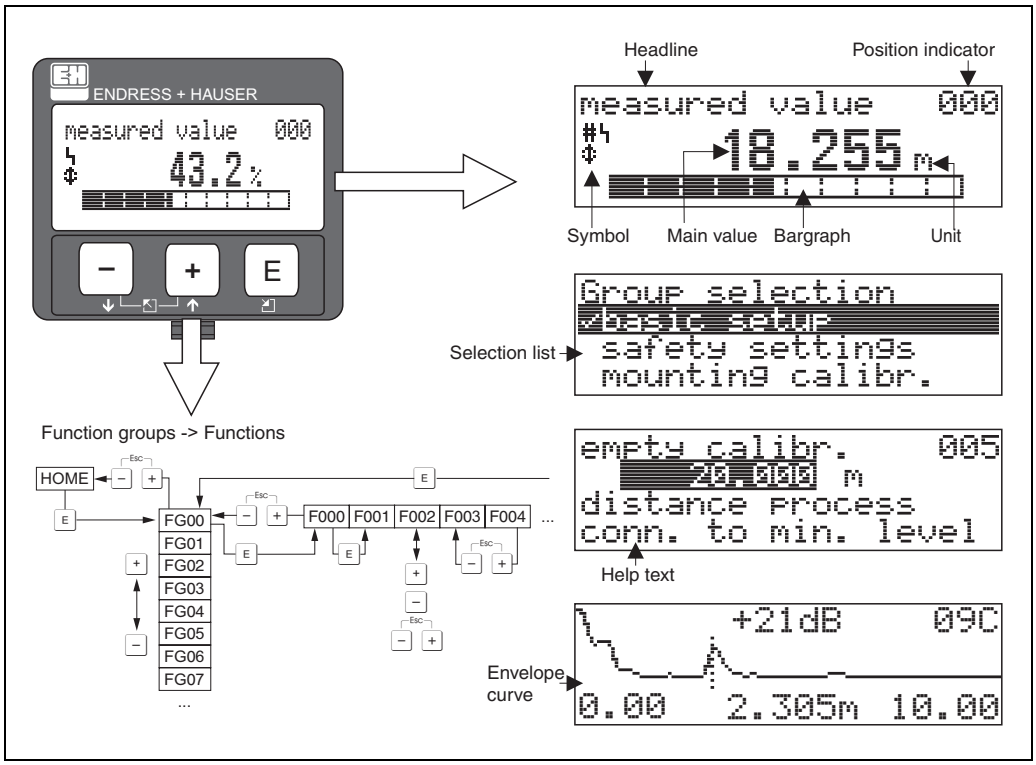
Function of the keys

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 (− and +) 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.



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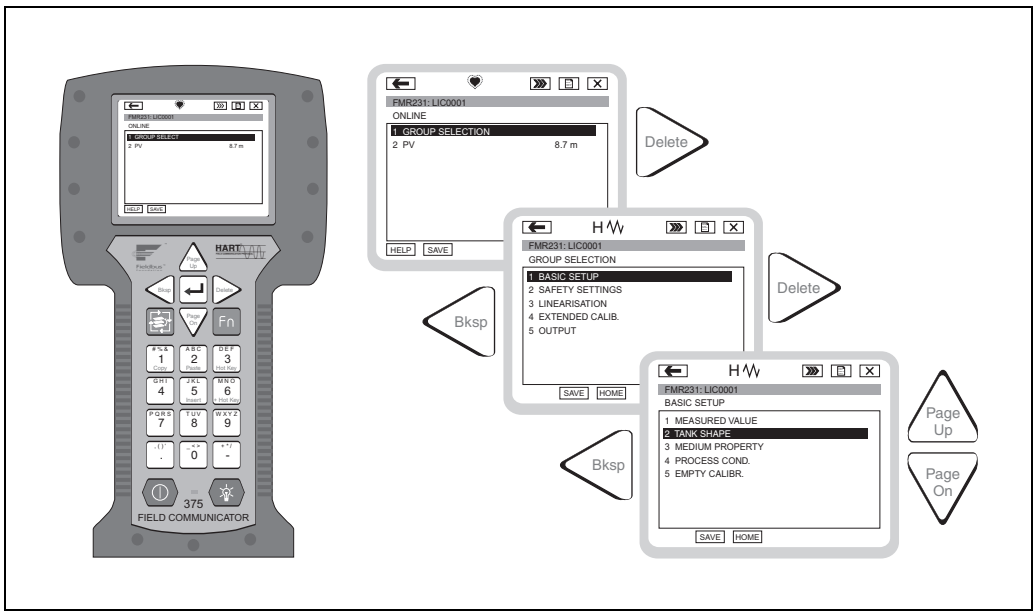
Operation with handheld unit Field Communicator DXR375

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

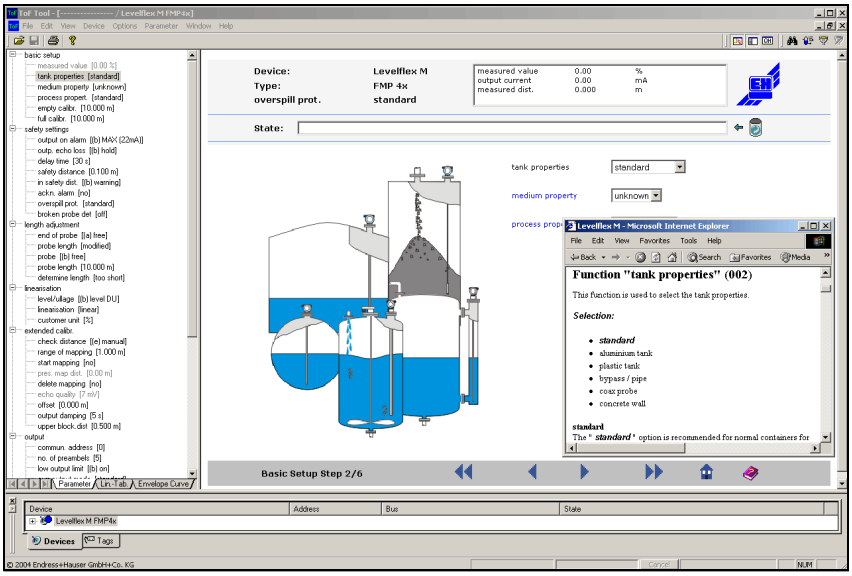
The Micropilot M can be remotely operated via HART, PROFIBUS PA and FOUNDATION Fieldbus. On-site adjustments are also possible.

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:



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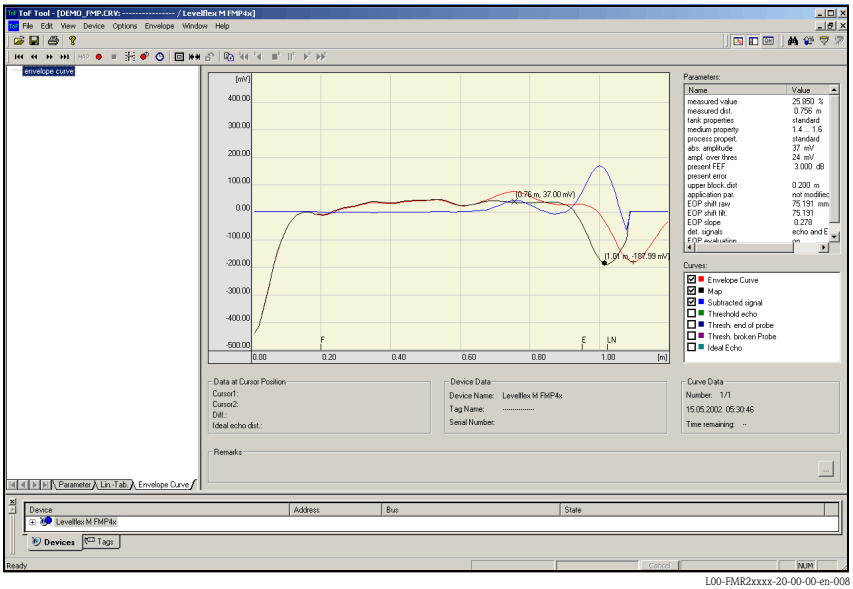
Signal analysis via envelope curve:



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

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

Operation with FieldCare

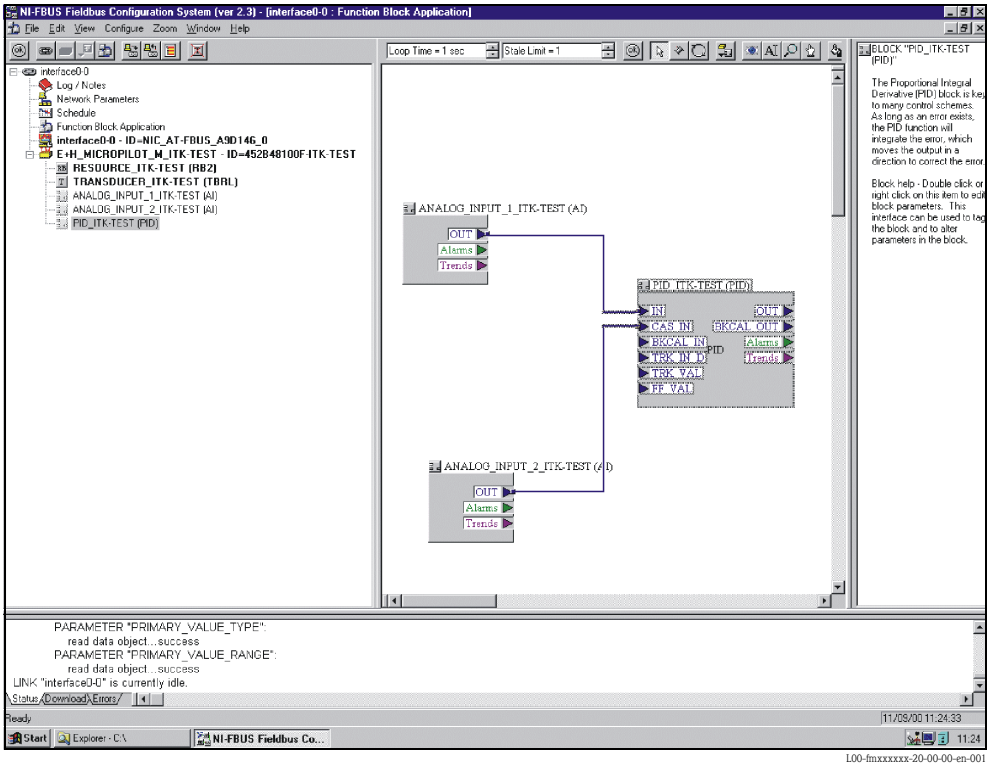
FieldCare is Endress+Hauser's FDT based Plant Asset Management Tool. It can configure all intelligent field devices in your plant and supports you in managing them. By using status information, it also provides a simple but effective means of checking their health.

- 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



L00-fmxxxxxx-20-00-00-en-001

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 43-45.

Overspill protection

WHG. See "Ordering information" on Page 43-45 (see ZE244F/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). Coax probes and probes mounted in closed metallic vessels also meet the requirement for a class B digital device (residential environment).

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

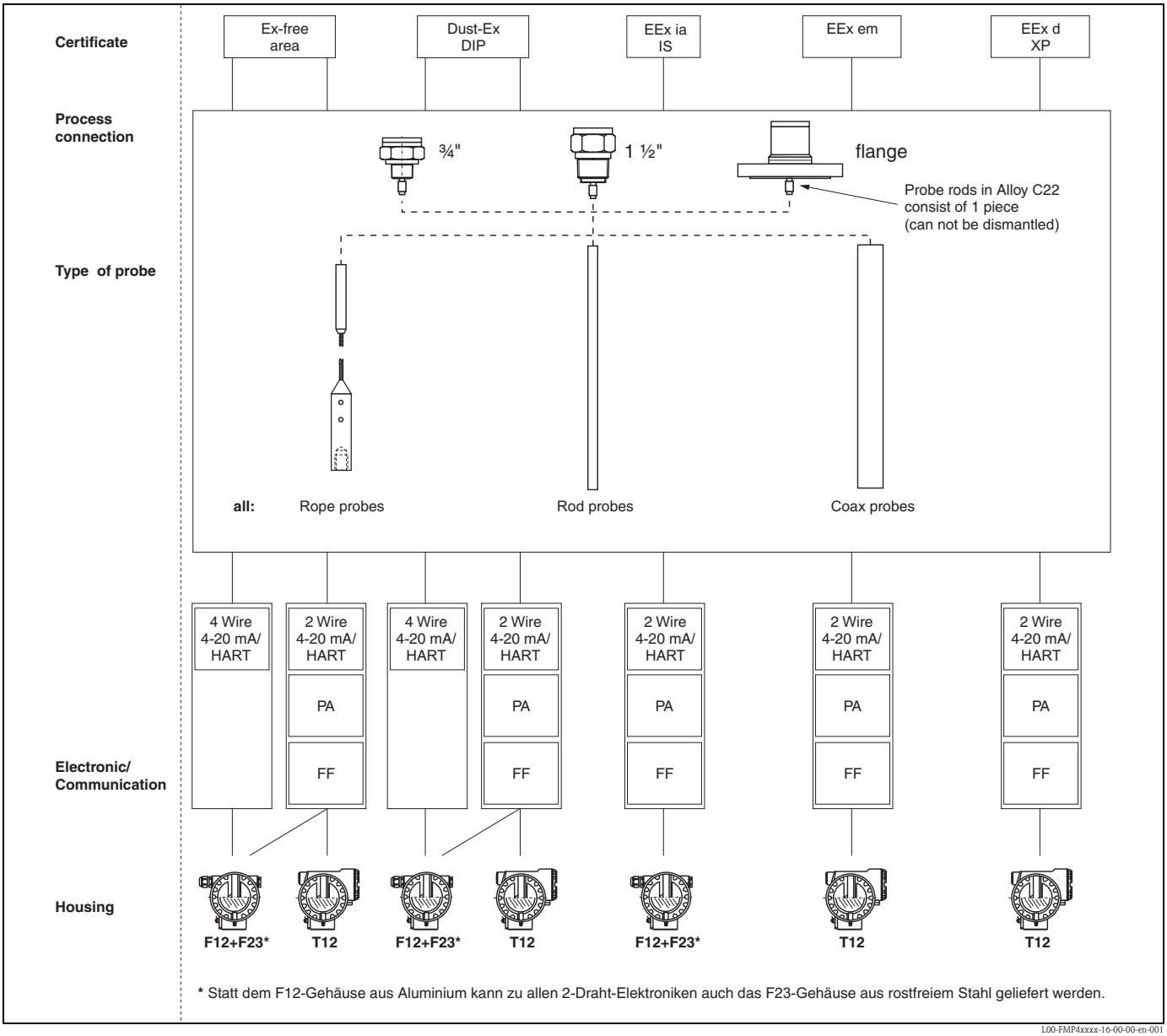
Emissions (equipment class B), compatibility (appendix A – industrial area)

NAMUR

Standards committee for measurement and control in the chemical industry

Ordering information

Levelflex M FMP40 **Instrument selection**



L00-FMP4xxxx-16-00-00-en-001

Temperature: (depended on o-ring)	**V** Viton, -30 °C...+150 °C (-22 °F...+302 °F)	
	E EPDM, -40 °C...+120 °C (-40 °F...+248 °F)	
	K Kalrez, -5 °C...+150 °C (23 °F...+302 °F)	
Pressure: (all types)	-1...40 bar (...580 psi)	
Wetted parts	Rope probes: Process connection: 1.4435 (SS316L), 1.4462 Rope: 1.4401 (SS316) Weight: 1.4435 (SS316L)	Rod probes: Process connection: 1.4435 (SS316L) Rod and coax pipe: 1.4435 (SS316L)

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

Note!
For orders with a display, the housing cover is delivered with an inspection glass. For orders without a display, a dummy cover is delivered.
Exception: For orders with the ATEX II 1/2 D dust ignition-proof certificate, a dummy cover is always delivered, even for orders with a built-in display.

Ordering structure Levelflex M FMP40

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 2G EEx em (ia) IIC T6/IECEx Zone1
	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 Ex ia IIC T4
	L	TIIS Ex d (ia) IIC T5
	D	AUS Ex DIP A20/A21
	Y	Special version

20		**Probe:**	
	A	Rope 4mm / 1/6", mainly liquids	
	B	Rope 6mm / 1/4", solid	
	H	Rope 6mm / 1/4", PA > steel, solid, T_{max} = 212 °F	
	P	Rod 6mm, liquids	
	1	Rod 12mm, liquids	
	K	Rod 16mm, mainly liquids	
	L	Coax, liquids	
	Y	Special version	

30		**Probe length:**	
	A	..... mm, rope 4mm, 316	
	B	..... mm, rope 6mm, 316	
	C	..... inch rope 1/6", 316	
	D	..... inch, rope 1/4", 316	
	E	..... mm, rope 6mm, PA > Stahl	
	F	..... inch, rope 1/4", PA > Stahl	
	K	..... mm, rod 16mm, 316L	
	L	..... mm, coax, 316L	
	M	..... inch, rod 16mm, 316L	
	N	..... inch, coax, 316L	
	P	..... mm, rod 6mm, 316L	
	R	..... inch, rod 6mm, 316L	
	1	..... mm rod 12mm, AlloyC22	
	2	..... mm coax, AlloyC22	
	3	..... inch, rod 12mm, AlloyC22	
	4	..... inch, coax, AlloyC22	
	Y	Special version	

40		**O-ring Material; Temperature:**	
	2	Viton; -30...150°C/-22...302°F	
	3	EPDM; -40...120°C/-40...248°F	
	4	Kalrez; -5...150°C/23...302°F	
	9	Special version	

FMP40-												Product designation (part 1)

Ordering structure Levelflex M FMP40 (continued)

50		**Process Connection:**
	ACJ	1-1/2" 150lbs RF, 316/316L flange ANSI B16.5
	ACM	1-1/2" 150lbs, AlloyC22 >316/316L flange ANSI B16.5
	ADJ	1-1/2" 300lbs RF, 316/316L flange ANSI B16.5
	ADM	1-1/2" 300lbs, AlloyC22 >316/316L flange ANSI B16.5
	AEJ	2" 150lbs RF, 316/316L flange ANSI B16.5
	AEM	2" 150lbs, AlloyC22 >316/316L flange ANSI B16.5
	AFJ	2" 300lbs RF, 316/316L flange ANSI B16.5
	AFM	2" 300lbs, AlloyC22 >316/316L flange ANSI B16.5
	ALJ	3" 150lbs RF, 316/316L flange ANSI B16.5
	ALM	3" 150lbs, AlloyC22 >316/316L flange ANSI B16.5
	AMJ	3" 300lbs RF, 316/316L flange ANSI B16.5
	AMM	3" 300lbs, AlloyC22 >316/316L flange ANSI B16.5
	APJ	4" 150lbs RF, 316/316L flange ANSI B16.5
	APM	4" 150lbs, AlloyC22 >316/316L flange ANSI B16.5
	AQJ	4" 300lbs RF, 316/316L flange ANSI B16.5
	AQM	4" 300lbs, AlloyC22 >316/316L flange ANSI B16.5
	AWJ	6" 150lbs RF, 316/316L flange ANSI B16.5
	AWM	6" 150lbs, AlloyC22 >316/316L flange ANSI B16.5
	A3J	8" 150lbs RF, 316/316L flange ANSI B16.5
	CFJ	DN40 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C)
	CFM	DN40 PN25/40, AlloyC22 >316L flange EN1092-1 (DIN2527)
	CGJ	DN50 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C)
	CGM	DN50 PN25/40, AlloyC22 >316L flange EN1092-1 (DIN2527)
	CMJ	DN80 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)
	CMM	DN80 PN10/16, AlloyC22 >316L flange EN1092-1 (DIN2527)
	CSJ	DN80 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C)
	CSM	DN80 PN25/40, AlloyC22 >316L flange EN1092-1 (DIN2527)
	CQJ	DN100 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)
	CQM	DN100 PN10/16, AlloyC22 >316L flange EN1092-1 (DIN2527)
	CTJ	DN100 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C)
	CTM	DN100 PN25/40, AlloyC22 >316L flange EN1092-1 (DIN2527)
	CWJ	DN150 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)
	CWM	DN150 PN10/16, AlloyC22 >316L flange EN1092-1 (DIN2527)
	CXJ	DN200 PN16 B1, 316L flange EN1092-1 (DIN2527 C)
	CRJ	Thread ISO228 G3/4, 316L
	GRJ	Thread ISO228 G1-1/2, 316L
	GRM	Thread ISO228 G1-1/2, AlloyC22
	CNJ	Thread ANSI NPT3/4, 316L
	GNJ	Thread ANSI NPT1-1/2, 316L
	GNM	Thread ANSI NPT1-1/2, AlloyC22
	KDJ	10K 40A RF, 316L flange JIS B2220
	KDM	10K 40A, AlloyC22 >316L flange JIS B2220
	KEJ	10K 50A RF, 316L flange JIS B2220
	KEM	10K 50A, AlloyC22 >316L flange JIS B2220
	KLJ	10K 80A RF, 316L flange JIS B2220
	KLM	10K 80A, AlloyC22 >316L flange JIS B2220
	KPJ	10K 100A RF, 316L flange JIS B2220
	KPM	10K 100A, AlloyC22 >316L flange JIS B2220
	YY9	Special version

60		**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

FMP40- Product designation (part 2)

Ordering structure Levelflex M FMP40 (continued)

70		**Operation:**
	1	W/o display, via communication
	2	4-line display VU331, Envelope curve display on site
	3	Prepared for FHX40, Remote display (Accessory)
	9	Special version
80		**Type of Probe:**
	1	Compact, basic version
	2	Temp. separator, 400mm
	3	Remote, cable 3m, top entry
	9	Special version
90		**Housing; Cable Entry:**
	A	F12 Alu, coated IP68; gland M20
	B	F12 Alu, coated IP68; thread G1/2
	C	F12 Alu, coated IP68; thread NPT1/2
	D	F12 Alu, coated IP68; plug M12
	E	F12 Alu, coated IP68; plug 7/8"
	G	T12 Alu, coated IP68; gland M20
	H	T12 Alu, coated IP68; thread G1/2
	J	T12 Alu, coated IP68; thread NPT1/2
	K	T12 Alu, coated IP68; plug M12
	L	T12 Alu, coated IP68; plug 7/8"
	M	T12 Alu, coated IP68; gland M20 + OVP
		OVP = overvoltage protection
	N	T12 Alu, coated IP68; thread G1/2 + OVP
		OVP = overvoltage protection
	P	T12 Alu, coated IP68; thread NPT1/2+OVP
		OVP = overvoltage protection
	Q	T12 Alu, coated IP68; plug M12 + OVP
		OVP = overvoltage protection
	R	T12 Alu, coated IP68; plug 7/8" + OVP
		OVP = overvoltage protection
	1	F23 316L IP68; gland M20
	2	F23 316L IP68; thread G1/2
	3	F23 316L IP68; thread NPT1/2
	4	F23 316L IP66; plug M12
	5	F23 316L IP68; plug 7/8"
	9	Special version
100		**Additional Option:**
	A	Basic version
	B	EN10204-3.1 material, rod/coax, (316L wetted parts) inspection certificate
	C	EN10204-3.1 material, rope, (316L wetted parts) inspection certificate
	N	EN10204-3.1 material, NACE MR0175 (316L wetted parts) inspection certificate
	S	GL/ABS marine certificate
	Y	Special version

FMP40- ⇓ Complete product designation

Please enter probe length in mm or inch / 0.1 inch

☐☐☐☐☐ mm

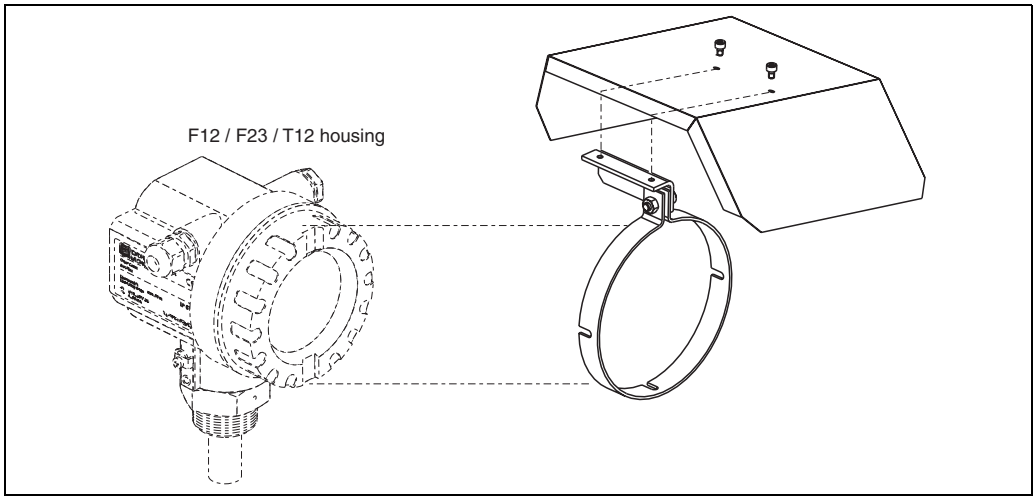
☐☐☐☐☐ inch / 0.1 inch

probe length LN s. Seite 34

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.



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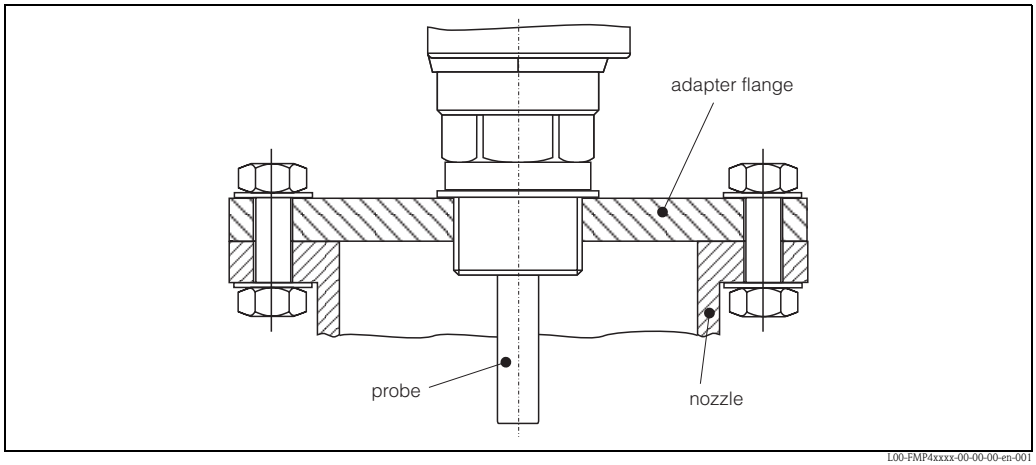
Adapter flange FAU70E / FAU70A



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

		Version
	12	DN 50 PN 16
	14	DN 80 PN 16
	15	DN 100 PN 16

			Thread
		3	G 1½, ISO 228

				Material
			2	1.4435

FAU70E					Complete product designation

		Version
	12	ANSI 2" 150 psi
	14	ANSI 3" 150 psi
	15	ANSI 4" 150 psi

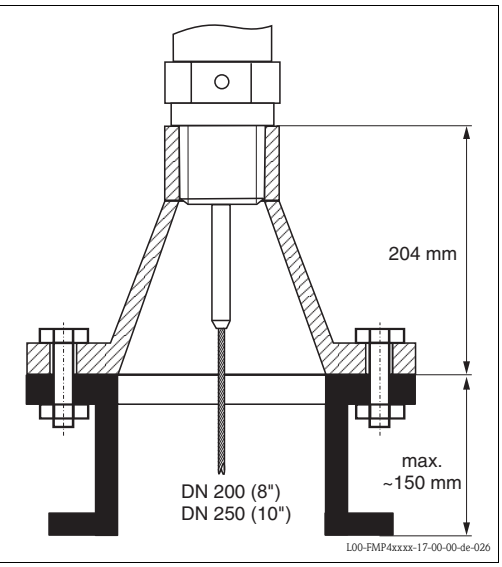
			Thread
		3	NPT 1½ - 11.5

				Material
			2	1.4435

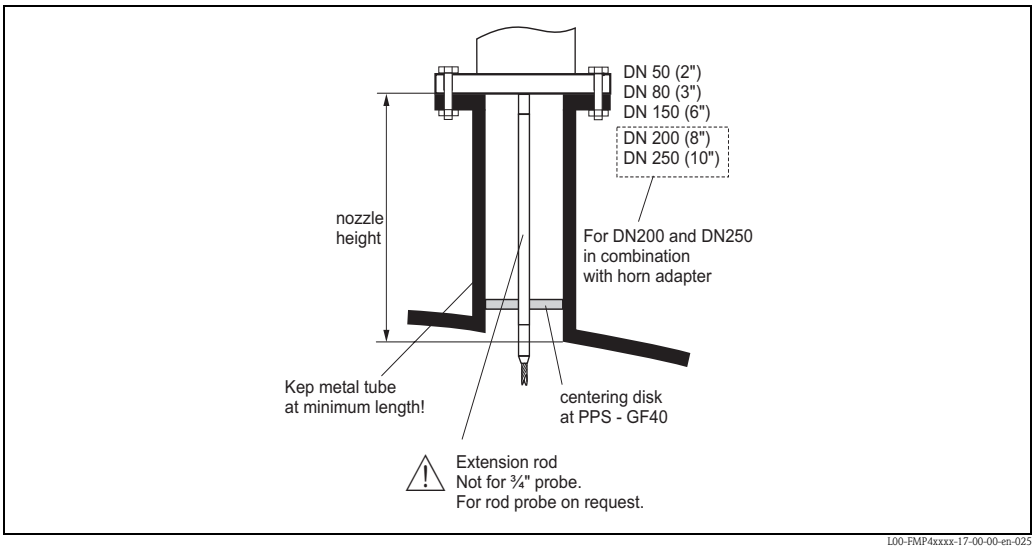
FAU70A					Complete product designation

Flange with horn adapter to adapt on the following nozzles

Horn adapter	Order-No.
G 1 1/2" at DN 200 / PN 16	52014251
G 1 1/2" at DN 250 / PN 16	52014252
NPT 1 1/2" at 8" / 150 psi	52014253
NPT 1 1/2" at 10" / 150 psi	52014254
Material: 1.4435	

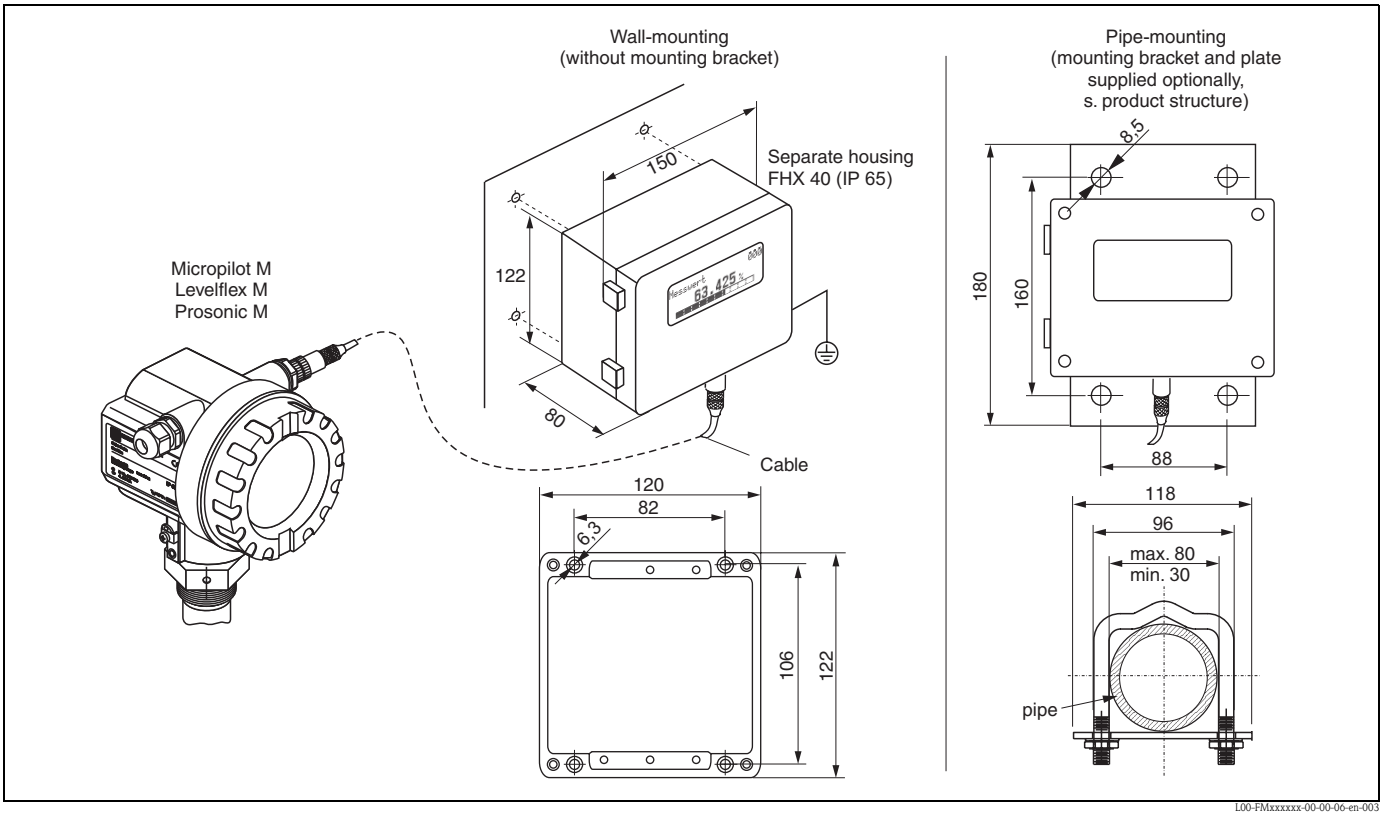


Extension rod / Centering



	Certificate				
	A				For non-hazardous areas
	1				ATEX II 1G (in preparation)
	2				ATEX II 1D
		Extension rod			
		1			115mm-rod for nozzle height 150...250mm / 6...10"
		2			215mm-rod for nozzle height 250...350mm / 10...14"
		3			315mm-rod for nozzle height 350...450mm / 14...18"
		4			415mm-rod for nozzle height 450...550mm / 14...22"
		9			Special version
			Centre disk		
			A		without centre disk
			B		DN40 / 1 1/2", inside diam. 40-45mm
			C		DN50 / 2", inside diam. 50...57mm
			D		DN80, inside diam. 80...85mm
			E		3", inside diam. 76...78mm
			G		DN100 / 4", inside diam. 100...110mm
			H		DN150 / 6", inside diam. 152...164mm
			J		DN200 / 8", inside diam. 201...215mm
			K		DN250 / 10", inside diam. 253...269mm
			Y		Special version
HMP40-					complete product designation

Remote display FHX40



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

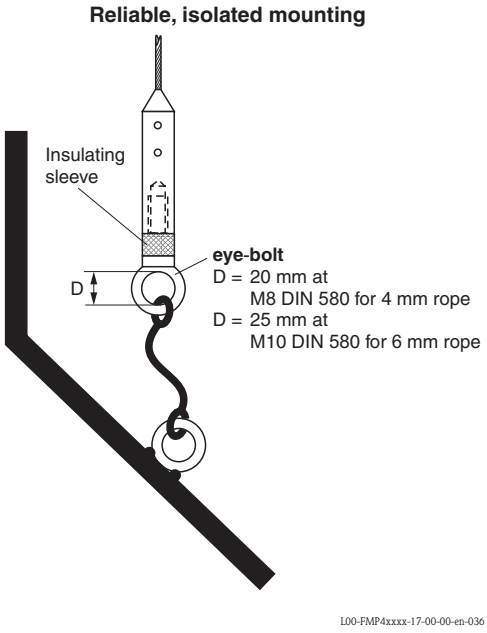
For connection of the remote display FHX40 use the cable which fits the communication version of the respective instrument.

Mounting-kit isolated

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

If a rope probe has to be fixed and a secure grounded mounting is not possible, we recommend using the insulating sleeve made of PPS-GF 40 with accompanying DIN 580 eye-bolt made of stainless steel.
Max. process temp. 150 °C.

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



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 FMP40

Correlation of operating instructions to the instrument:

Instrument	Ausgang	Kommunikation	Betriebsanleitung	Beschreibung der Gerätefunktionen	Kurzanleitung (im Gerät)
FMP40	B, G, H	HART	BA242F/00/en	BA245F/00/en	KA189F/00/a2
	D	PROFIBUS PA	BA243F/00/en	BA245F/00/en	KA189F/00/a2
	F	FOUNDATION Fieldbus	BA244F/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.

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

Instrument	Certificate	Explosion protection	Output	Communication	KEMA 02 ATEX	XA	WHG
FMP40	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	1109	XA164F-B	—
			D	PROFIBUS PA	1109	XA165F-B	—
			F	FOUNDATION Fieldbus	1109	XA165F-B	—
	6	ATEX II 1/2 G EEx ia IIC T6 + WHG	B	HART, 4...20 mA	1109	XA164F-B	ZE256F/00/de
			D	PROFIBUS PA	1109	XA165F-B	ZE256F/00/de
	2	ATEX II 1/2 D [1]	B, D, F, G, H	HART, 4...20 mA	1109	XA168F-B	—
	3	ATEX II 2 G EEx em [ia] IIC T6 IECEx Zone 1	B	HART, 4...20 mA	1109	XA167F-B	—
			D	PROFIBUS PA	1109	XA167F-B	—
			F	FOUNDATION Fieldbus	1109	XA167F-B	—
	4	ATEX II 1/3 D transp. cover [1]	B, D, F, G, H	HART, 4...20 mA	1109	XA168F-B	—
	5	ATEX II 1/2 G EEx ia IIC T6 ATEX II 1/3 D transp. cover	B	HART, 4...20 mA	1109	XA172F-B	—
						XA172F-B	—
				FOUNDATION Fieldbus	1109	XA172F-B	—
	7	ATEX II 1/2 G EEx d [ia] IIC T6	B	HART, 4...20 mA	1109	XA166F-B	ZE256F/00/de
						XA166F-B	ZE256F/00/de
				FOUNDATION Fieldbus	1109	XA166F-B	—
	8	ATEX II 1/2 G EEx ia IIC T6 ATEX II 1/3 D transp. cover + WHG	B	HART, 4...20 mA	1109	XA172F-B	ZE256F/00/de
			D	PROFIBUS PA	1109	XA172F-B	ZE256F/00/de
			F	FOUNDATION Fieldbus	1109	XA172F-B	—

1) In combination with electronics B, D or F: supply intrinsically safe.

Correlation of Control Drawings (ZD) to the instrument:

Instrument	Certificate	Explosion protection	Output	Communication	ZD
FMP40	M	FM DIP	G, H	HART, 4...20 mA	ZD078F/00/en
	S	FM IS	B	HART, 4...20 mA	ZD075F/00/en
			D	PROFIBUS PA	ZD076F/00/en
			F	FOUNDATION Fieldbus	ZD076F/00/en
	T	FM XP	B	HART	ZD077F/00/en
			D	PROFIBUS PA	ZD077F/00/en
			F	FOUNDATION Fieldbus	ZD077F/00/en
	P	CSA DIP	G, H	HART, 4...20 mA	ZD083F/00/en
	U	CSA IS	B	HART, 4...20 mA	ZD080F/00/en
			D	PROFIBUS PA	ZD081F/00/en
			F	FOUNDATION Fieldbus	ZD081F/00/en
	V	CSA XP	B	HART	ZD082F/00/en
			D	PROFIBUS PA	ZD082F/00/en
			F	FOUNDATION Fieldbus	ZD082F/00/en

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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