



Level



Pressure



Flow



Temperature

Liquid
Analysis

Registration

Systems
Components

Services



Solutions

Technical Information

Levelflex M FMP43

Run Time Measurement

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



Application

The Levelflex M FMP43 is used for continuous level measurement of liquids in applications with special hygienic requirements:

Materials

- All wetted components are FDA-listed and tested in accordance with USP Cl. VI.
- Choice of mechanically polished or electropolished metal surfaces up to 0.38 µm and low Δ ferrite content.

Design

- The design is flush-mounted and gap-free and meets ASME BPE requirements.
- The probe is completely dismountable; the probe rod, process connection and seals are replaceable.
- Aseptic process connections from DN25 (1") are available.
- The probe is autoclavable and suitable for CIP, SIP.

Approvals (hygiene)

- Approvals according to 3A and EHEDG
- Certificate of Compliance (CoC)

The following interfaces are available for system integration:

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

Your benefits

- **Measurement independent** of product properties such as:
 - density,
 - dielectric constant,
 - conductivity.
- **Measurement possible despite very turbulent surfaces or foam.**
- Easy menu-guided onsite operation via four-line plain text display.
- Convenient remote operation, diagnosis and documentation of the measuring point via the FieldCare operating program which is provided free of charge.
- Optional remote display and operation.
- Envelope curve presentation onsite 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
 - North America: FM, CSA
 - China: NEPSI (in preparation)

Table of contents

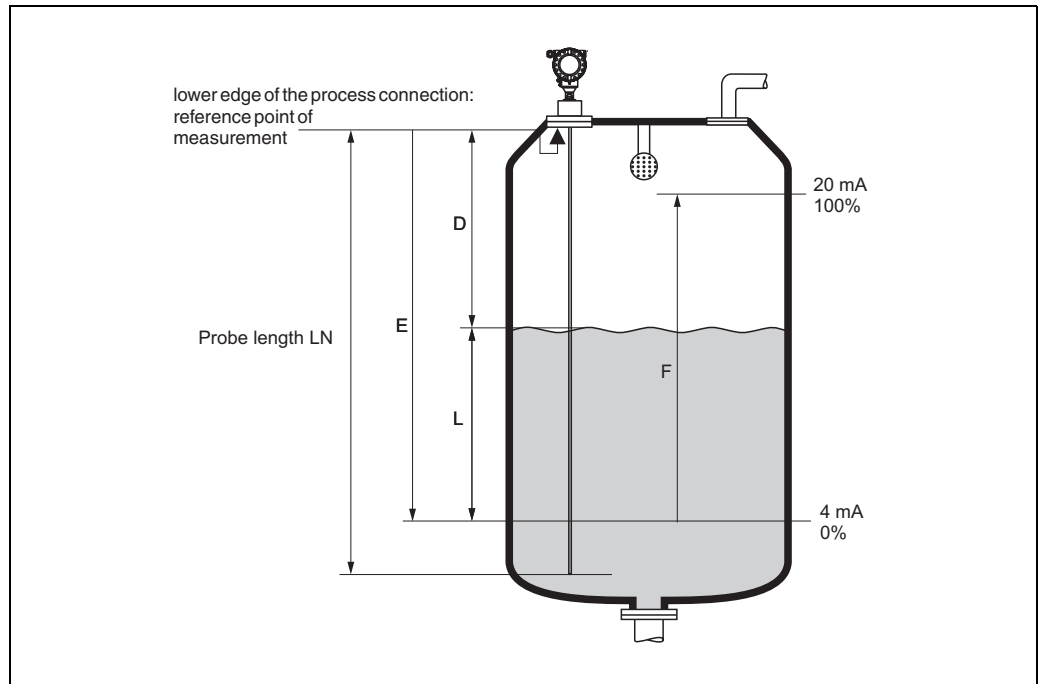
Function and system design	3
Measuring principle	3
Equipment architecture	4
Input	8
Measured variable	8
Measuring range	8
Blocking distance	8
Used frequency spectrum	8
Output	9
Output signal	9
Signal on alarm	9
Linearization	9
Data of the FOUNDATION Fieldbus interface	9
Auxiliary energy	11
Electrical connection	11
Ground connection	11
Cable gland	11
Terminals	11
Terminal assignment	12
Fieldbus plug connectors	13
Load HART	14
Supply voltage	14
Cable entry	14
Power consumption	14
Current consumption	15
FISCO	15
Overvoltage protector	15
Performance characteristics	16
Reference operating conditions	16
Maximum measured error	16
Resolution	17
Reaction time	17
Influence of ambient temperature	17
Operating conditions: Installation	18
General instructions	18
Cleaning of the probe	19
Special instructions	20
Notes on special installation situations	21
Installation for difficult to access process connections	22
Operating conditions: Environment	23
Ambient temperature range	23
Ambient temperature limits	23
Storage temperature	23
Climate class	23
Degree of protection	23
Vibration resistance	23
Cleaning of the probe	23
Electromagnetic compatibility (EMC)	23

Operating conditions: Process	24
Process temperature range	24
Process pressure	24
Materials used in the process	24
Dielectric constant	24
Mechanical construction	25
Design, dimensions	25
General information on flanges	29
Tolerance of probe length	29
Weight	29
Material	29
Process connection	29
Probe	29
Human interface	30
Operation concept	30
Display elements	30
Operating elements	31
Onsite operation	32
Remote operation	32
Remote operation	33
Certificates and approvals	35
CE mark	35
Ex approval	35
Suitability for hygienic processes	36
Pharma (CoC)	36
Overspill protection	36
Telecommunications	36
External standards and guidelines	36
Ordering information	37
Levellflex M FMP43	37
Accessories	40
Weather protection cover	40
Weld-in adapter	40
Remote display and operation FHX40	41
Commubox FXA191 HART	42
Commubox FXA195 HART	42
Commubox FXA291	42
ToF Adapter FXA291	42
Protective cover	42
Calibration kit	42
Additional documentation	43
Fields of activities	43
Competence brochure	43
Technical Information	43
Operating Instructions	43
Patents	43

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 → 26) 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 s. Seite 26

Dielectric constant

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

Input

The reflected pulses are transmitted from the probe to the electronics. There, a microprocessor 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 pulse:

$$D = c \cdot t / 2,$$

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.



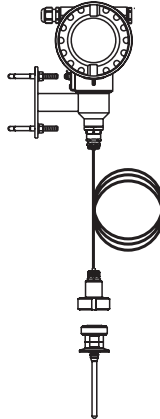
The Levelflex possesses functions for the interference echo suppression that can be activated by the user. They guarantee that interference echoes from e.g. internals and struts are not interpreted as level echoes.

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 linearization function with max. 32 points, that is based on a manually or semi-automatically input table, can be activated onsite or via remote operation. This function enables, for example, the conversion of the level into units of volume or weight.

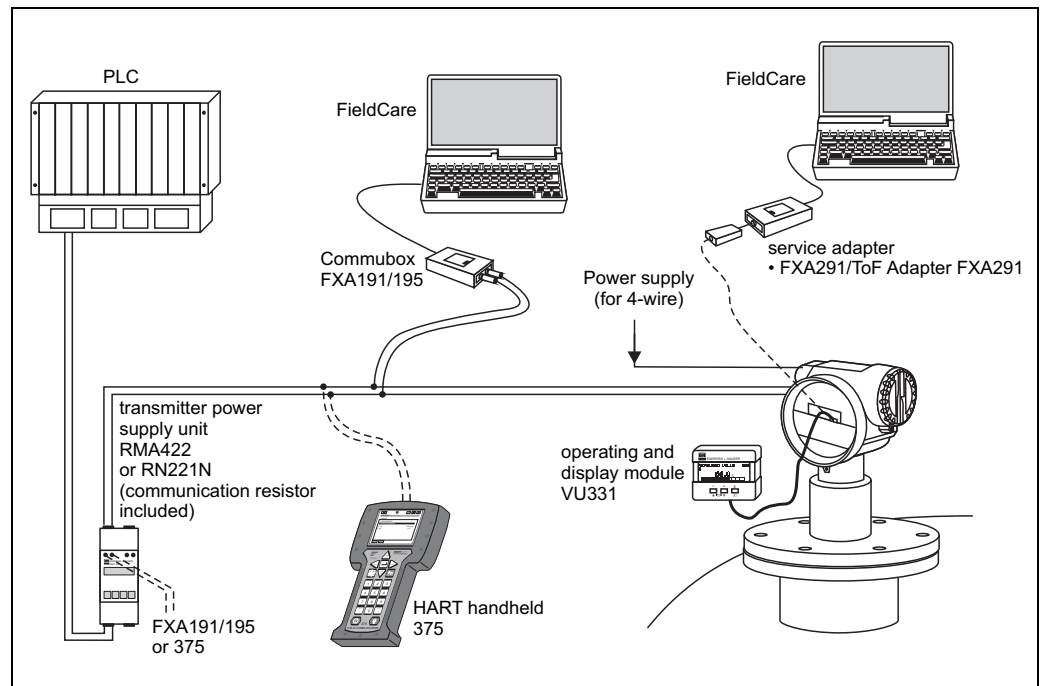
Equipment architecture

Probe selection

			
Probe type:	Rod probe, compact Standard version	Rod probe, compact Slotted nut for separation from housing	Rod probe, remote Slotted nut for separation from housing
Probe length:	0.3 to 4 m (12" to 157")		
Lateral load capacity:	<ul style="list-style-type: none"> ■ 10 Nm with 1.4435 / SS316L ■ 16 Nm with Hastelloy C22 (on request) 		
Options:		<ul style="list-style-type: none"> ■ Reference probe can be connected (Calibration kit FMP43 - order number: 71041382) ■ Autoclavable (Protective cover FMP43 - order no.: 71041379) 	
Feature 70	Option "1"	Option "5"	Option "6, 7"

Stand-alone

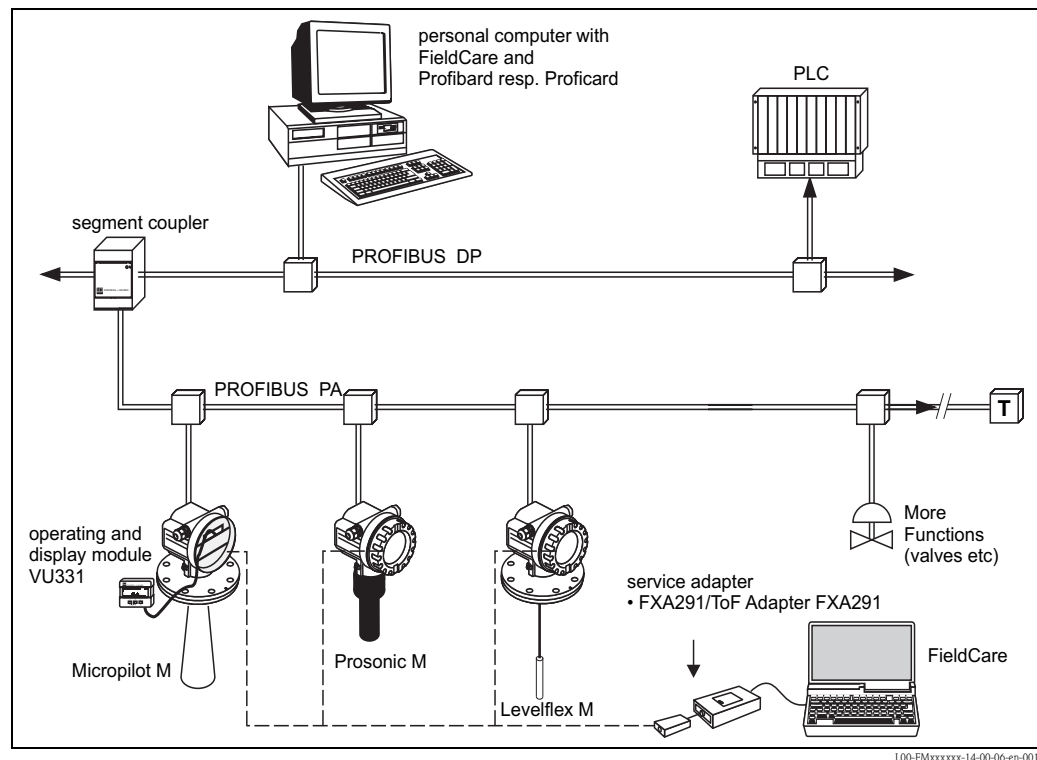
- Power supply directly from power line (4-wire) or from transmitter power supply unit (2-wire).
- Operation by onsite display or remote operation via HART protocol.



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

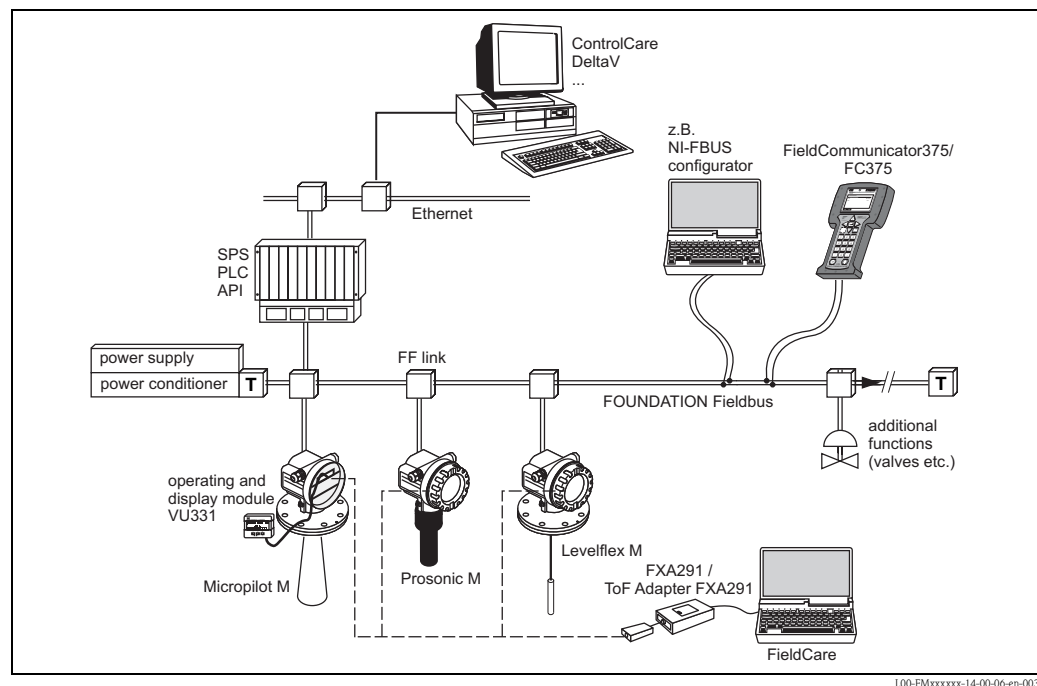
System integration via PROFIBUS PA

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 onsite as well as remote operation are possible.



System integration via FOUNDATION Fieldbus

Max. 32 transmitters (standard, Ex em or Ex d) can be connected to the bus. For protection type Ex ia IIC, the max. number of transmitters depends on the relevant regulations and standards for the interconnection of intrinsically safe circuits (EN 60079-14), verification of intrinsic safety. Both onsite as well as remote operation are possible. The complete measuring system comprises:



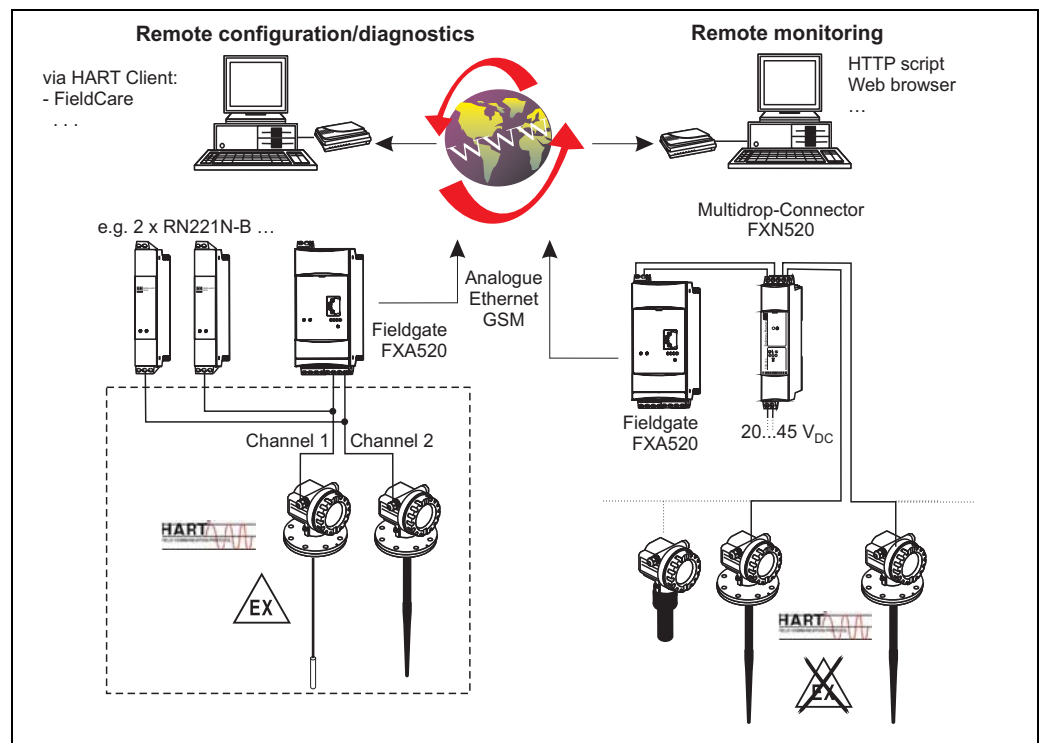
System integration via Fieldgate

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 onsite service operations can be avoided by using remote diagnosis and remote configuration and all others can at least be better planned and prepared.



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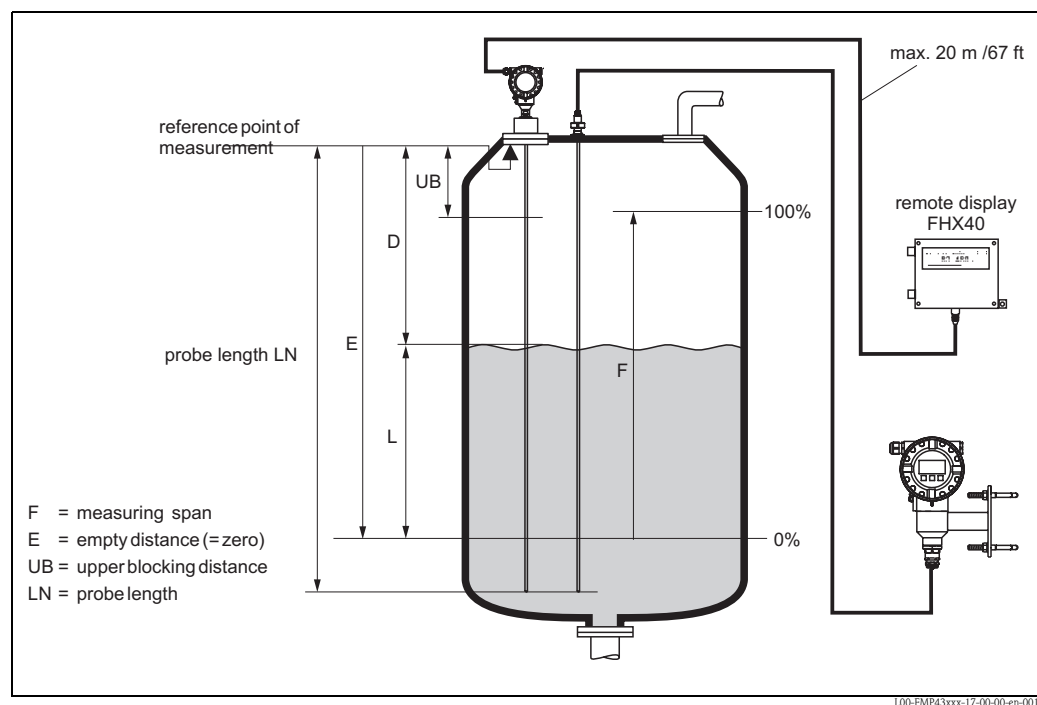


Note!

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

Input

Measured variable	<p>The measured variable is the distance between the reference point (see Fig on Seite 26) and the product surface.</p> <p>Subject to the input zero point empty distance (E, see Fig. on Seite 3) the level is calculated.</p> <p>Alternatively, the level can be converted by means of linearization (32 points) into other variables (volume, mass).</p>
Measuring range	<p>The measuring range spans the entire probe. The upper blocking distance set in the delivery status can be adapted as required (see recommendations in the "Blocking distance" chapter). The specified accuracy of the probe is reduced in the upper and lower range of the probe (see Table → 16), especially when using media with a smaller dielectric constant ($DK < 7$).</p>
Blocking distance	<p>The upper blocking distance (= UB) is the minimum distance from the reference point of the measurement (lower edge of process connection) to the maximum level.</p> <p>At the lowest part of the probe an exact measurement is not possible, see "Performance characteristics" on Page 16.</p>



Reference point of measurement, details s. Seite 26

The blocking distance is preset to 0.2 m when using rod probes. The blocking distance can be reduced when the probe is installed flush with a wall or in a nozzle with a max. height of 50 mm.

When using a spray ball the blocking distance may not be smaller than 50 mm.

Used frequency spectrum	100 MHz to 1.5 GHz
--------------------------------	--------------------

Output

Output signal

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

Signal on alarm

Error information can be accessed via the following interfaces:

- Local display:
 - Error symbol
 - Plain text display
- Current output, signal on error can be selected (e.g. according to NAMUR recommendation NE 43).
- Digital interface

Linearization

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

Data of the FOUNDATION Fieldbus interface

Basic Data

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

Virtual communication references (VCRs)

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

Link Settings

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

Transducer Blocks

Block	Content	Output values
Sensor Block	contains all parameters related to the measurement	<ul style="list-style-type: none"> ■ level or volume¹ (channel 1) ■ distance (channel 2)
Diagnsotic Block	contains diagnostiv information	no output values
Display Block	contains parameters to configure the local display	no output values

1) depending on the configuration of the sensor-block

Function Blocks

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

Auxiliary energy

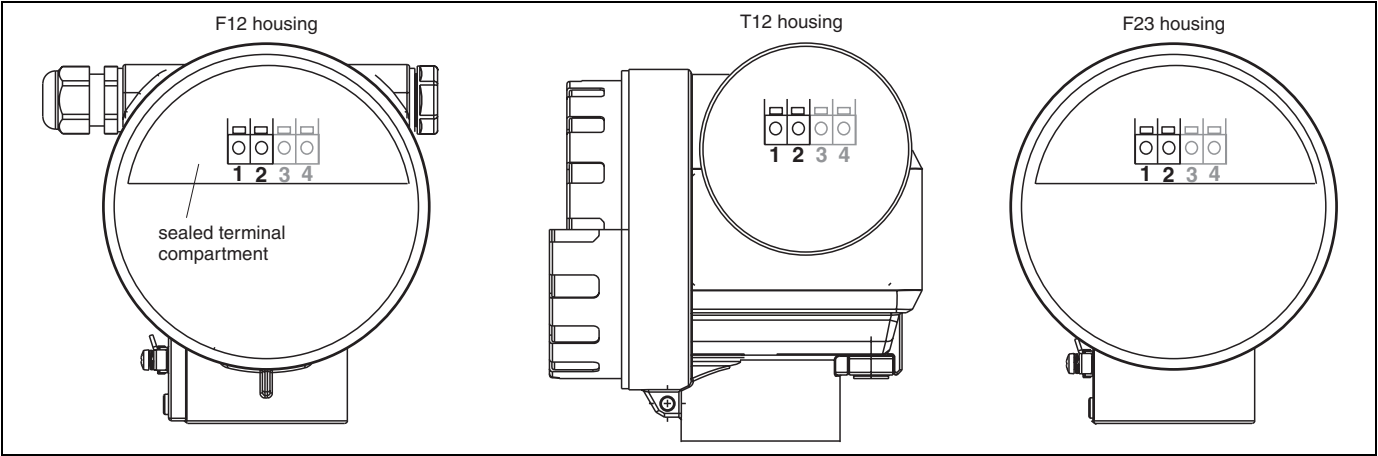
Electrical connection

Terminal compartment

Three housings are available:

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

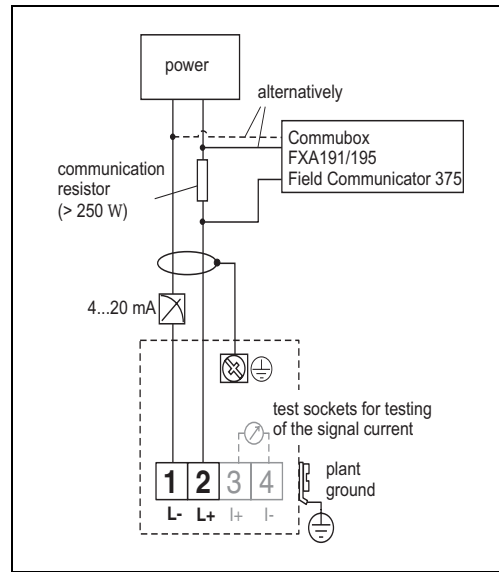
	Type	Clamping area
Standard, Ex ia, IS	Plastic M20x1.5	5 to 10 mm
Ex em, Ex nA	Metal M20x1.5	7 to 10.5 mm

Terminals

for wire cross-sections of 0.5 to 2.5 mm²

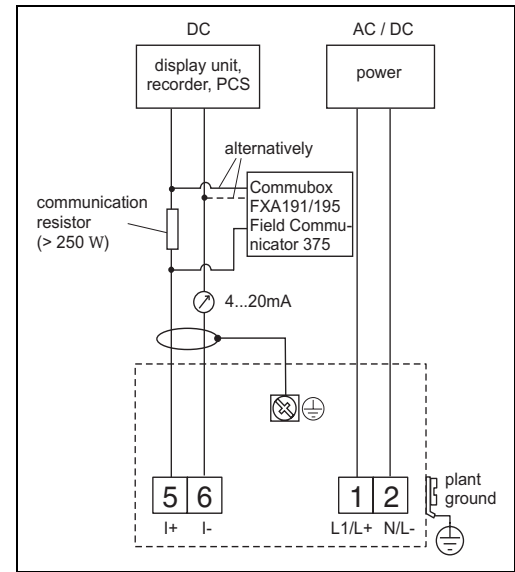
Terminal assignment

2-wire, 4 to 20 mA with HART



L00-FMxxxxxx-04-00-00-en-015

4-wire, 4 to 20 mA active with HART



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



Note!

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

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

Cable specifications:

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



Note!

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

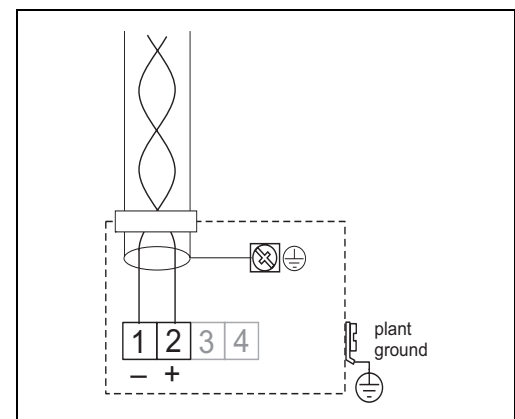
PROFIBUS PA

The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the auxiliary energy.

For further information on the network structure and grounding and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions BA034S "Guidelines for planning and commissioning PROFIBUS DP/PA" and the PNO Guideline.

Cable specifications:

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



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



Note!

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

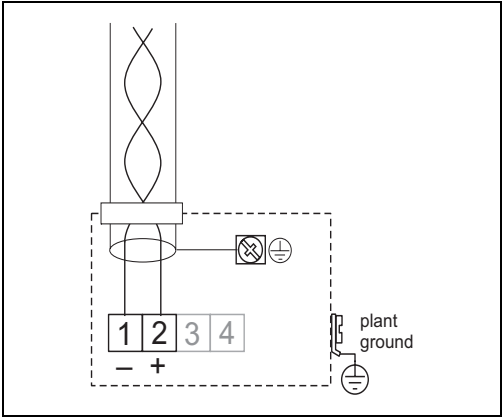
FOUNDATION Fieldbus

The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the auxiliary energy.

For further information on the network structure and grounding and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions BA013S "FOUNDATION Fieldbus Overview" and the FOUNDATION Fieldbus Guideline.

Cable specifications:

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



Note!

For further information on the cable specifications, see Operating Instructions BA013S "FOUNDATION Fieldbus Overview", FOUNDATION 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)

<p>L00-FMxxxxxx-04-00-00-yy-016</p>	Pin	Meaning
	1	ground
	2	signal +
	3	signal -
	4	not connected

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

<p>L00-FMxxxxxx-04-00-00-yy-017</p>	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
	Ex ia	4 mA	16 V	30 V
		20 mA	7.5 V	30 V
	Ex em Ex d	4 mA	16 V	30 V
		20 mA	11 V	30 V
Fixed current, adjustable e.g. for solar power operation (measured value transferred at HART)	standard	11 mA	10 V	36 V
	Ex ia	11 mA	10 V	30 V
Fixed current for HART Multidrop mode	standard	4 mA ¹⁾	16 V	36 V
	Ex ia	4 mA ¹⁾	16 V	30 V

1) Start up current 11 mA.

HART residual ripple, 2-wire: $U_{ss} \leq 200 \text{ mV}$
HART, 4-wire active

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

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

PROFIBUS PA and FOUNDATION Fieldbus

Supply voltage	9 V ... 32 V ¹⁾
Lift-off voltage	9 V

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

Cable entry

Cable gland: M20x1.5 (for Ex 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
HART

3,6...22 mA for HART Multidrop: start up current is 11mA.

PROFIBUS PA

Max. 11 mA.

FOUNDATION Fieldbus


Nominal current	15 mA
Starting current	≤ 15 mA
Error current	0 mA
FISCO/FNICO conformal	compliant
Polarity sensitive	no

FISCO

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

Overvoltage protector

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

- the measuring device with integrated overvoltage protection with 600 V gas discharge tubes within the T12-enclosure is used, refer to product overview Ordering information on →  37
- or**
- this protection is achieved by the use of other appropriate measures (external protection devices e.g. HAW262Z).

Performance characteristics

Reference operating conditions

- Temperature = $+20\text{ °C} \pm 5\text{ °C}$
- Pressure = 1013 mbar abs. $\pm 20\text{ mbar}$
- Relative humidity (air) = $65\% \pm 20\%$
- Metallic tank, no internals, distance to tank wall > 500 mm
- Medium: water (DK > 7), respectively oil (DK = 2)
- Probe length > 500 mm

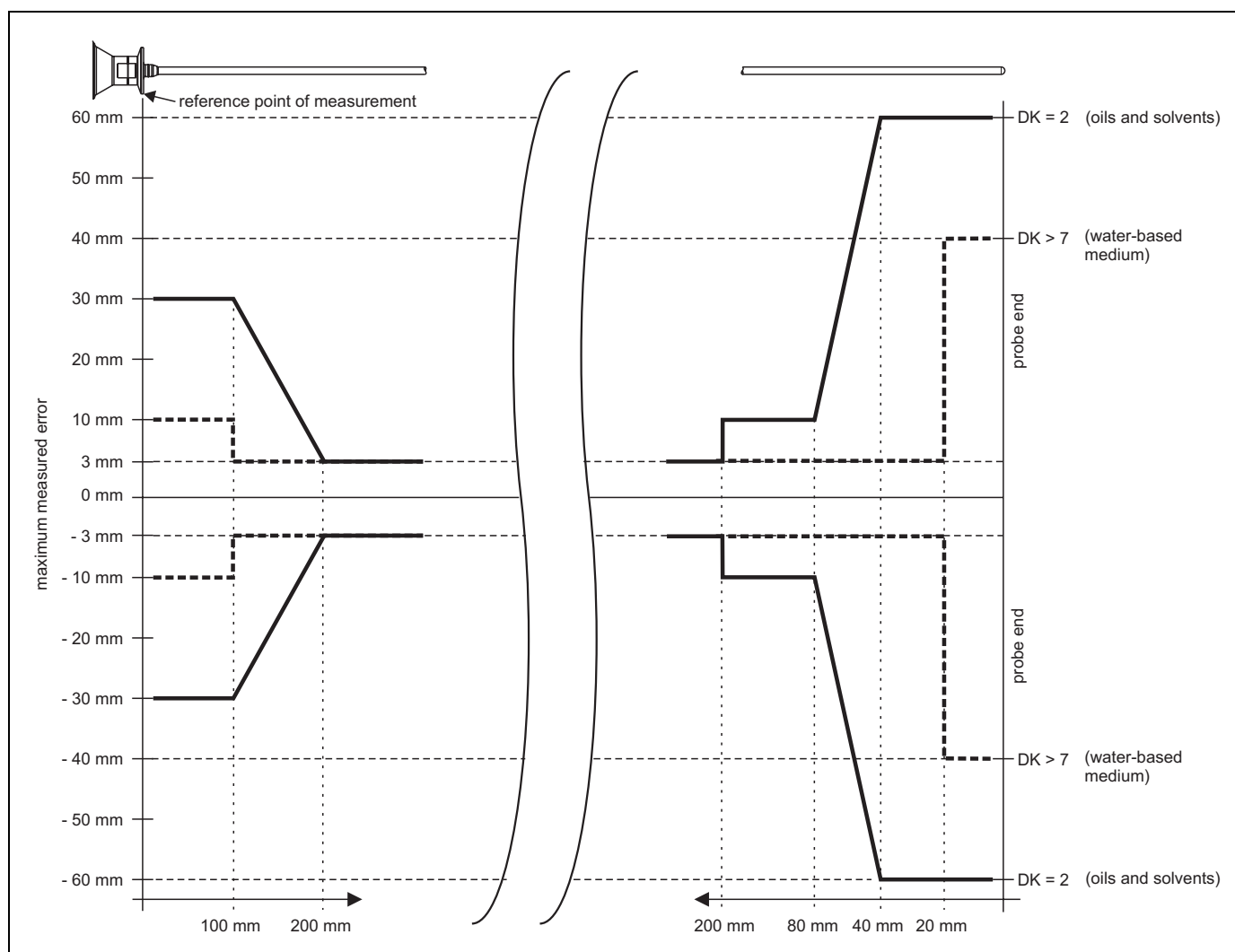
Maximum measured error

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

Output:	Digital	Analog
sum of non-linearity, non-repeatability and hysteresis	$\pm 3\text{ mm}$	$\pm 0.06\%$
Offset / Zero	$\pm 4\text{ mm}$	$\pm 0.03\%$

If the reference conditions are not met, the offset/zero arising from the installation setup may be up to $\pm 12\text{ mm}$. This additional offset/zero can be compensated for by entering a correction ("offset" function (057)) during commissioning.

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



L00-FMP43xxx-05-00-00-en-001

Resolution	<ul style="list-style-type: none"> ■ Digital: 1 mm ■ Analog: 0.03 % of measuring range
Reaction time	<p>The reaction time depends on the configuration.</p> <p>Shortest time:</p> <ul style="list-style-type: none"> ■ 2-wire electronics: 1 s ■ 4-wire electronics: 0.7 s
Influence of ambient temperature	<p>The measurements are carried out in accordance with EN 61298-3:</p> <ul style="list-style-type: none"> ■ digital output (HART, PROFIBUS PA, FOUNDATION Fieldbus): <ul style="list-style-type: none"> – average T_K: 0.6 mm/10 K, max. ± 3.5 mm over the entire temperature range -40 °C to +80 °C <p>2-wire</p> <ul style="list-style-type: none"> ■ Current output (additional error, in reference to the span of 16 mA): <ul style="list-style-type: none"> – Zero point (4 mA) average T_K: 0.032 %/10 K, max. 0.35 % over the entire temperature range -40 °C to +80 °C – Span (20 mA) average T_K: 0.05 %/10 K, max. 0.5 % over the entire temperature range -40 °C to +80 °C <p>4-wire</p> <ul style="list-style-type: none"> ■ Current output (additional error, in reference to the span of 16 mA): <ul style="list-style-type: none"> – Zero point (4 mA) average T_K: 0.02 %/10 K, max. 0.29 % over the entire temperature range -40 °C to +80 °C – Span (20 mA) average T_K: 0.06 %/10 K, max. 0.89 % over the entire temperature range -40 °C to +80 °C

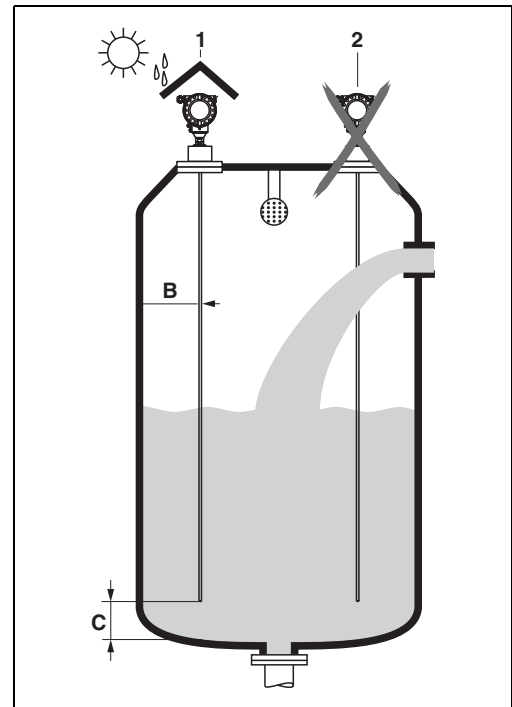
Operating conditions: Installation

General instructions

Probe selection (see overview on Seite 4)

Mounting location

- Do not mount the probe in the filling curtain (2).
- Mount the probe at such a distance away from the wall (B) that, in the event of buildup on the wall, there is still a minimum distance of 100 mm between the probe and the buildup.
- Mount the probe as far away as possible from internals.
- Minimum distance from the probe end to the tank floor is 10 mm.
- When installing outdoors, it is recommended that you use a weather protection cover (1). See "Accessories" on Seite 40.



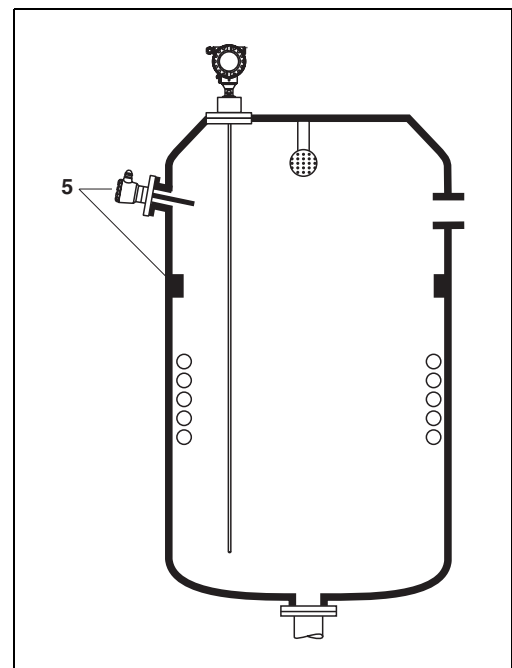
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Tank internals

- If the distance to the internals is < 300 mm, "mapping" must be carried out, and the measurement capability may be restricted.
- During operation, the probe must not touch any internals within the measuring range.

Optimization options

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



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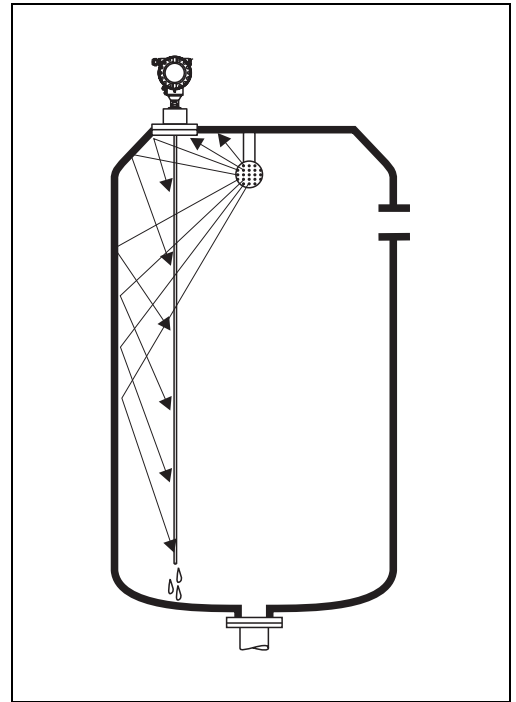
Note!

You must ensure that the probe does not come into contact with the container wall, container bottom and tank internals.

Cleaning of the probe

Installation close to tank wall

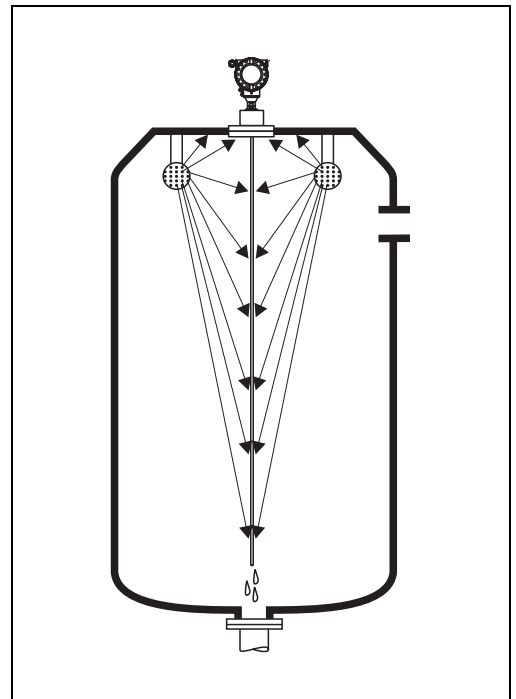
- By installing the probe close to the tank wall, the cleaning effect is improved in cases where a spray ball is used. The cleaning jet is deflected against the tank wall and onto the probe. This means that those parts of the probe are cleaned which would normally not be reached by the spray ball jet. If the probe is positioned in this way, only one spray ball is needed.



L00-FMP43xxx-17-00-00-xx-003

Installation in the center of the tank

- If the probe is mounted in the center of the tank, it may be necessary to use a second spray ball. The spray balls should then be mounted to the left and right of the probe.



L00-FMP43xxx-17-00-00-xx-004

Special instructions

When installing in tanks with agitator, observe the lateral loading capacity of rod probes:

- 10 Nm with 1.4435 / SS316L
- 16 Nm with Hasteloy C22 (on request).

The formula for calculating the bending torque M impacting on the probe:

$$M = c_w \cdot \frac{\rho}{2} \cdot v^2 \cdot d \cdot L \cdot (L_N - 0.5 \cdot L)$$

with

c_w : Friction factor

ρ [kg/m³]: Density of the medium

v [m/s]: Velocity of the medium perpendicular to the probe rod

d [m]: Diameter of the probe rod (8 mm)

L [m]: Level

L_N [m]: Probe length

Calculation example

Friction factor [c_w]

0.9 (on the assumption of a turbulent current (high Reynolds number))

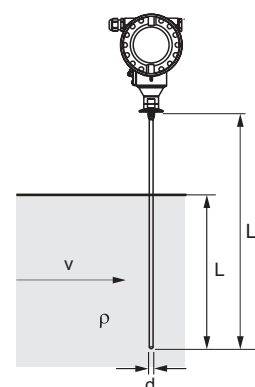
Density [ρ] in kg/m³

1000 (e.g. water)

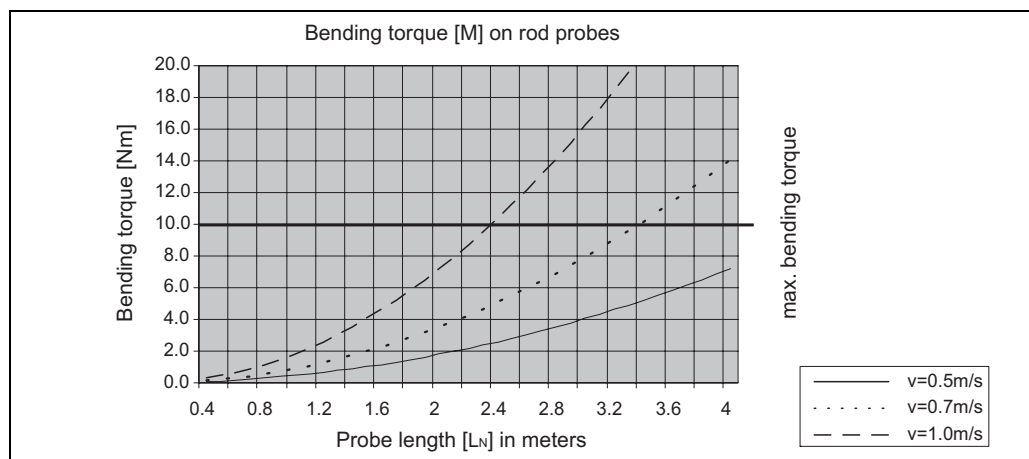
Probe diameter [d] in m

0.008

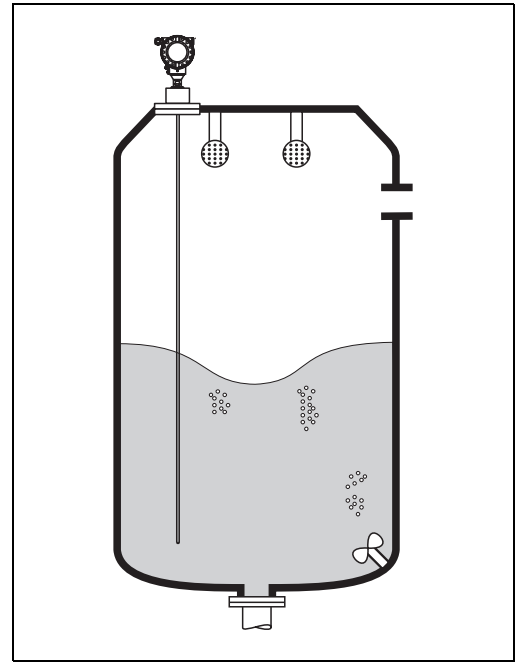
$L = L_N$ (worst case)



L00-FMP43xxx-16-00-00-xx-003



When installing in stirring tanks, observe lateral load-bearing capacity of rod probes (s. Seite 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.

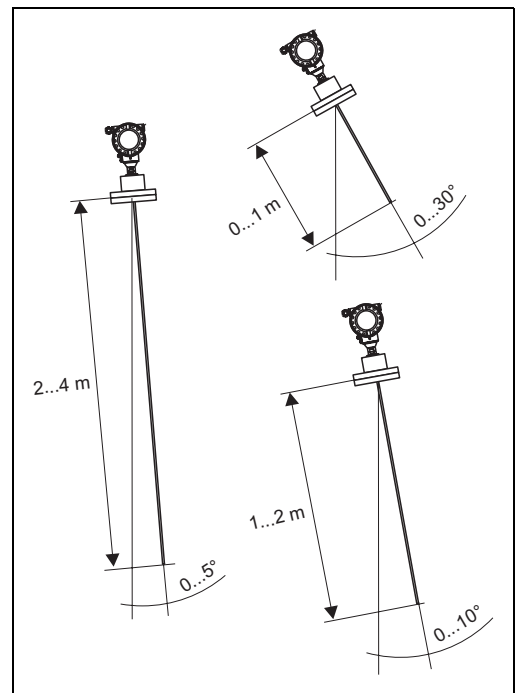


L00-FMP43xxx-17-00-00-xx-005

Notes on special installation situations

Installation at an angle

- For mechanical reasons, the probe should be installed as vertically as possible.
- The maximum mounting angle is
 - up to 1 m = 30°
 - up to 2 m = 10°
 - up to 4 m = 5°.

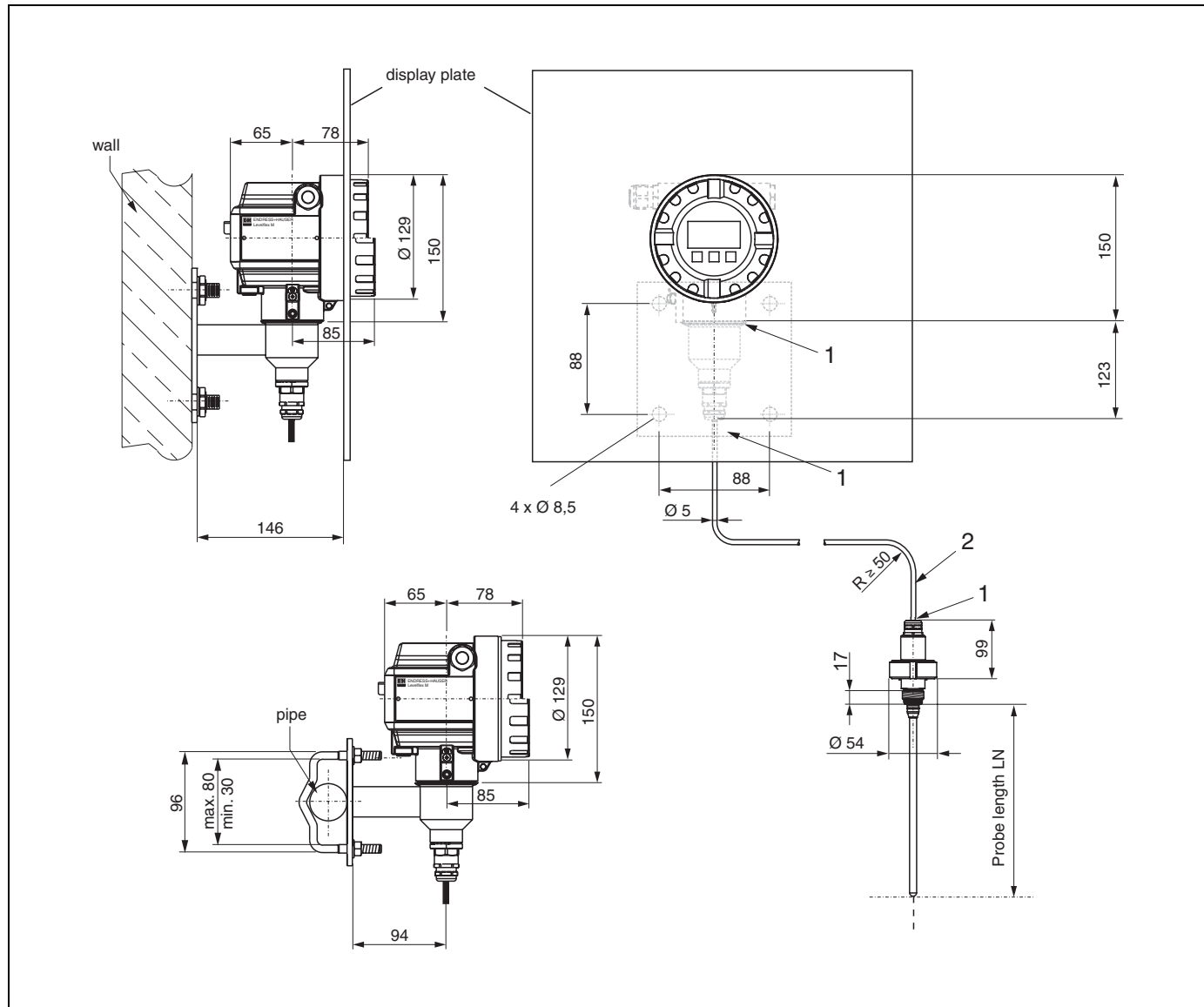


L00-FMP43xxx-17-00-00-xx-006

Installation for difficult to access process connections

Installation with separate housing

- Mount the housing on the wall or pipe (vertically or horizontally, as required) as shown in the diagram.
- The wall holder can also be used for mounting in display panels. For the cutout, please observe the dimensions on → 25.



100-FMP43xxx-17-00-00-es-002



Note!

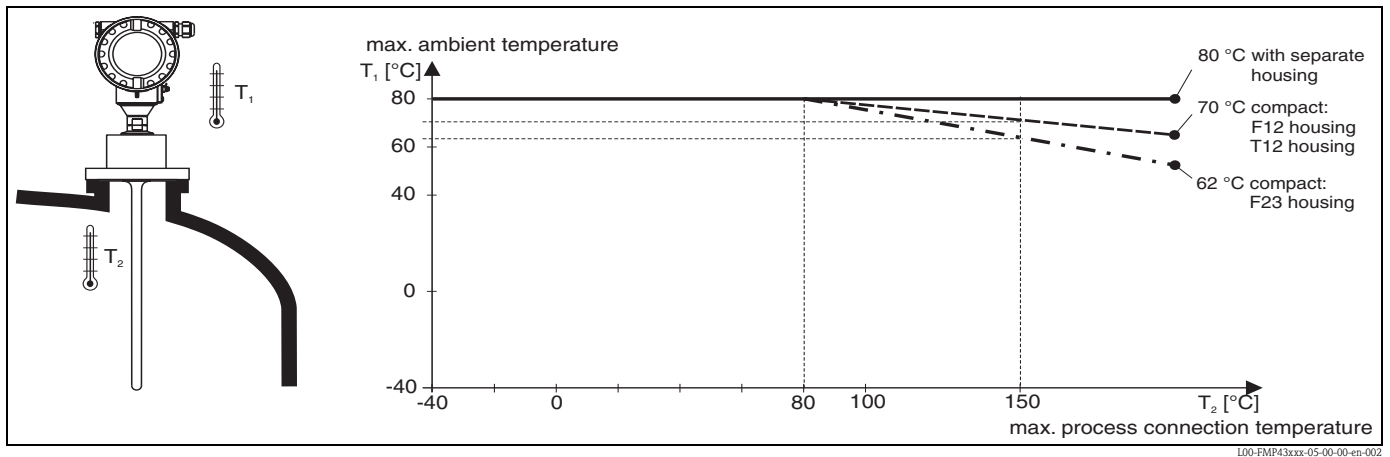
The cable can not be disassembled at these points (1).
The cable must not be kinked.

The ambient temperature for the connecting line (2) between the probe and electronics can be max. 150 °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	<p>Ambient temperature for electronics: -40 °C to +80 °C</p> <p>The functionality of the LCD display may be limited for temperatures $T_a < -20$ °C and $T_a > +60$ °C.</p> <p>A weather protection cover should be used for outdoor operation if the instrument is exposed to direct sunlight.</p>
----------------------------------	---

Ambient temperature limits	<p>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):</p>
-----------------------------------	--



Storage temperature	-20 °C to +80 °C (-4 °F to +176 °F)
----------------------------	-------------------------------------

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

Degree of protection	<ul style="list-style-type: none"> with closed housing tested according to <ul style="list-style-type: none"> Housing F12/T12: IP68, NEMA6P (24 h at 1.83 m under water) Housing F23: IP69K in combination with cable entries M20 G ½ and NPT ½ IP66, NEMA4X with open housing: IP20, NEMA1 (also ingress protection of the display) <p>Note!</p> <p>Degree of protection IP68 NEMA6P applies for M12 PROFIBUS PA plugs only when the PROFIBUS cable is plugged in.</p>
-----------------------------	---

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

Cleaning of the probe	<p>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 buildup, above all adhesion e.g. through crystallization, 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.</p>
------------------------------	---

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

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

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

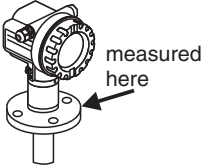
The measured value can be affected by strong electromagnetic fields when installing rod and rope probes without a shielding/metallic wall, e.g. plastic, and in wooden silos.

- Interference emission to EN 61326 - x series, electrical equipment Class A.
- Interference Immunity: the measured value can be affected by strong electromagnetic fields.

Operating conditions: Process

Process temperature range

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

O-ring material	Min. temperature	Max. temperature	
FFKM (Kalrez)	-20 °C	+150 °C	
EPDM	-20 °C	+130 °C	

Process pressure

$P_{\max} = 16 \text{ bar}$.

The specified range can be reduced by the selection of process connection (see from → 27).

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

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

- EN 1092-1 : 2001 Tab.18

With regard to their stability-temperature property, the materials 1.4435 and 1.4404 are grouped together under 13E0 in EN1092-1 Tab.18. The chemical composition of the two materials can be identical.

- ASME B 16.5a - 1998 Tab. 2-2.2 F316

- ASME B 16.5a - 1998 Tab. 2.3.8 N10276

- JIS B 2220

Materials used in the process

See chapter "Mechanical construction" from → 25.

Dielectric constant

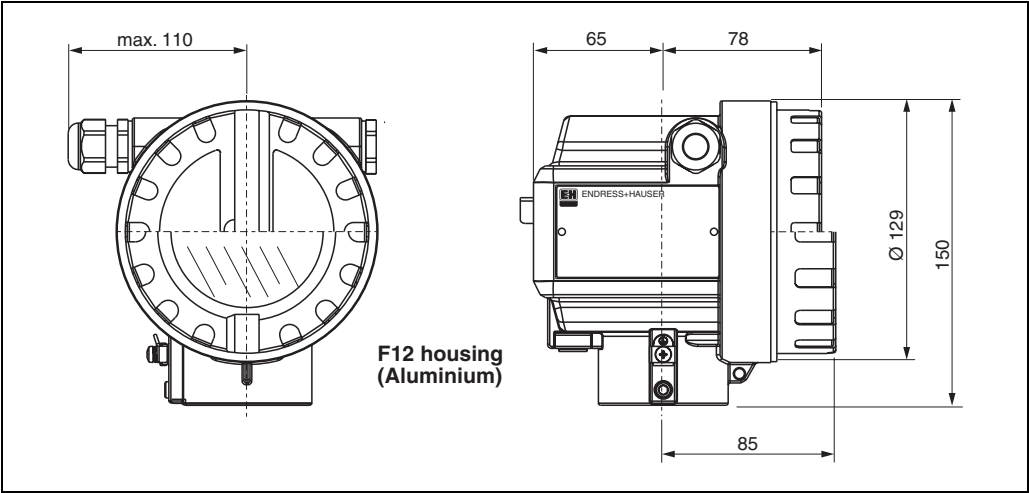
$\epsilon_r \geq 1.6$

Mechanical construction

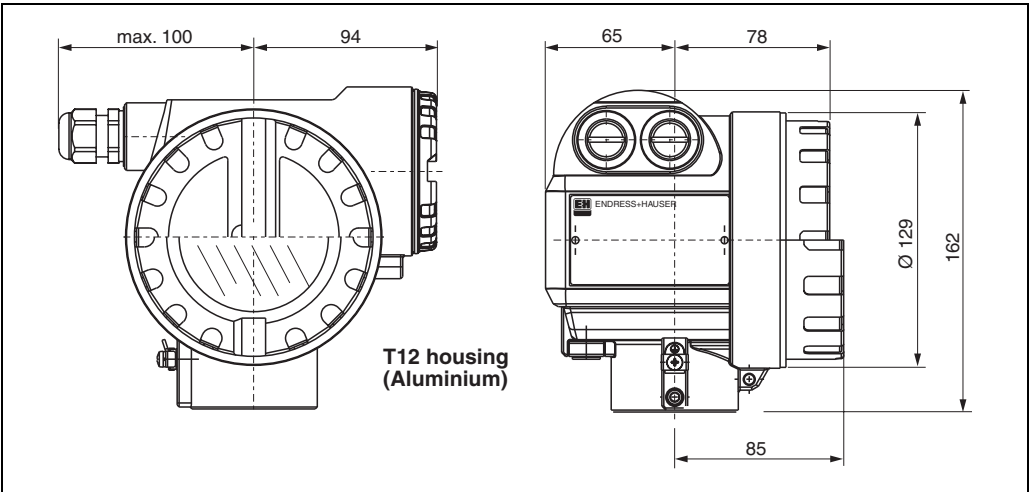
Design, dimensions

Housing (see Feature 80 in "Ordering information") - Dimensions and materials

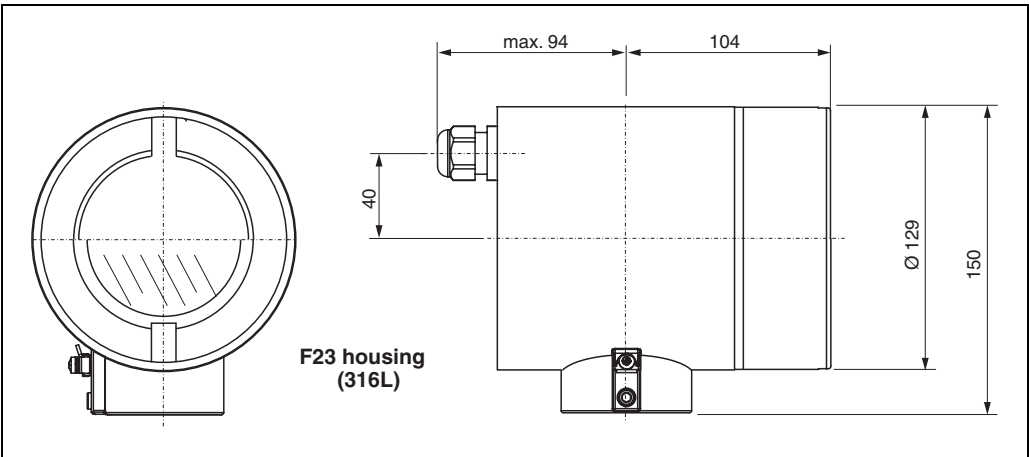
Dimensions for process connection and type of probe s. Seite 26.



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

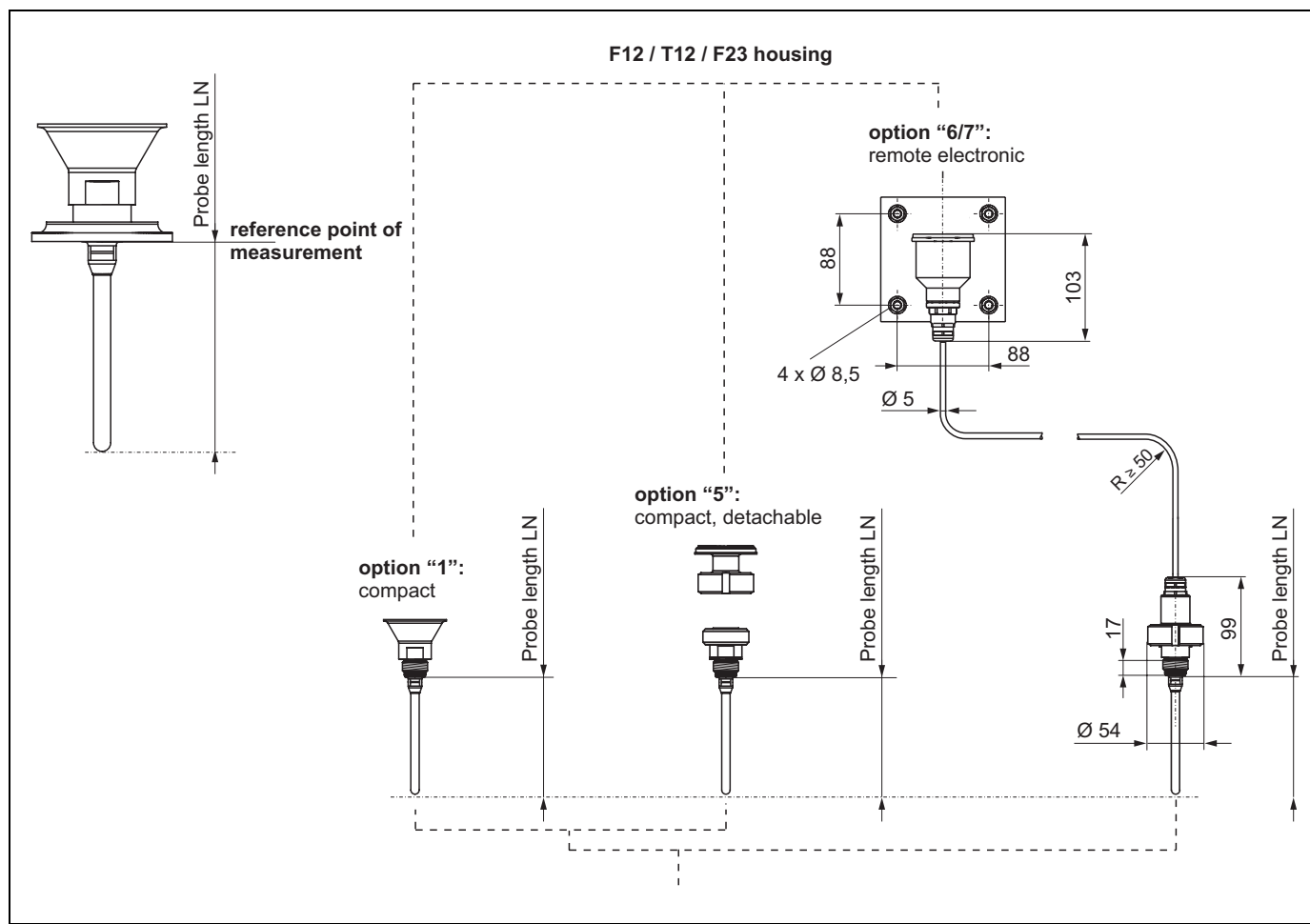


L00-T12xxxx-06-00-00-en-001

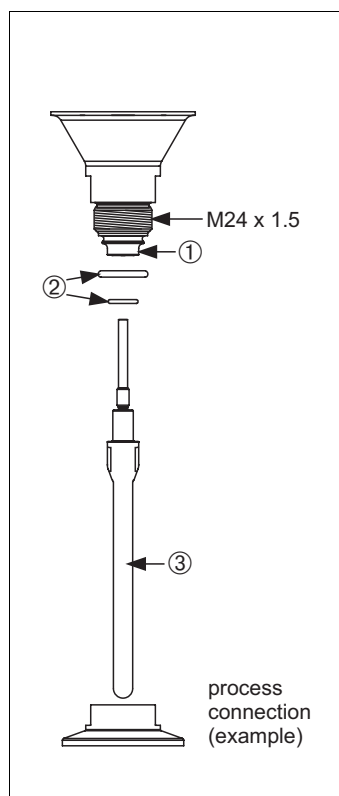


L00-F23xxxx-06-00-00-en-001

Probes (see Feature 70 in "Ordering information") - Dimensions and materials



L00-FMP43xxx-06-00-00-en-001



① Insulator

Material	Approval
Ketron PEEK LSG	FDA, 3A, USP Cl. VI

② O-ring (see Feature 30 in "Ordering information")

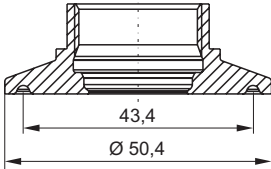
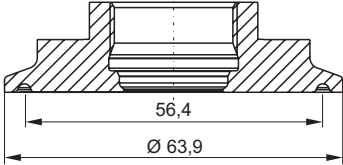
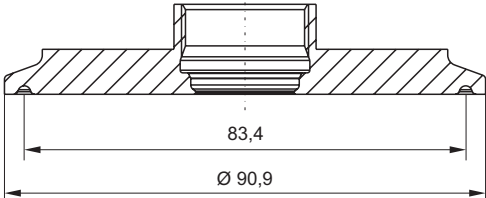
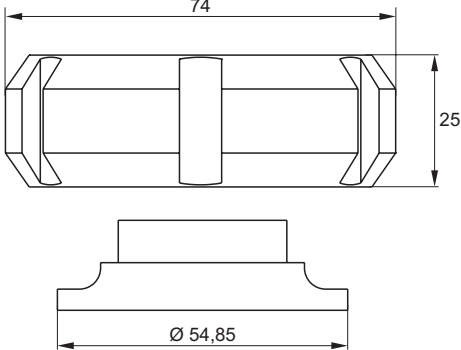
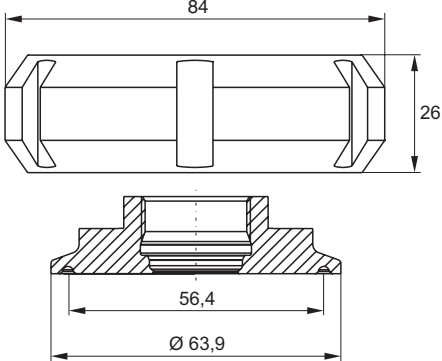
Material	Approval	Temperature range	Option
EPDM Freudenberg 70 EPDM 291	FDA, 3A, USP Cl. VI	- 20 °C to 130 °C (functional) - 20 °C to 121 °C (3A Class. II, USP Cl. VI)	5
FFKM DuPont Kalrez 6221		- 20 °C to 150 °C (functional) - 20 °C to 149 °C (3A Class. I, USP Cl. VI)	6

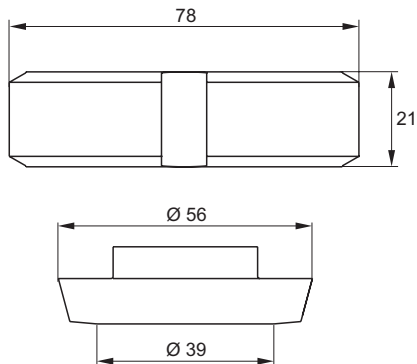
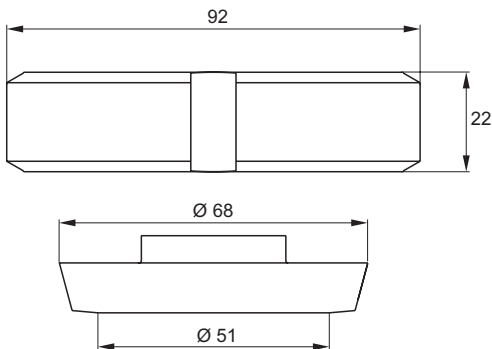
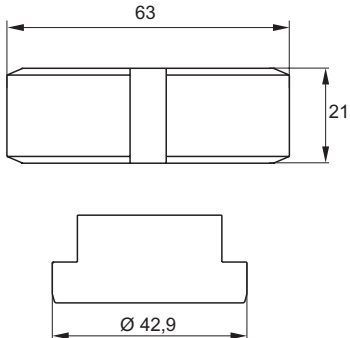
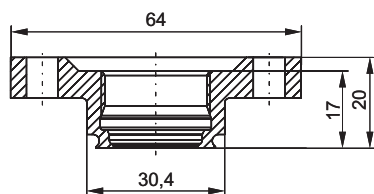
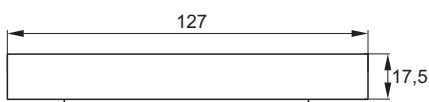
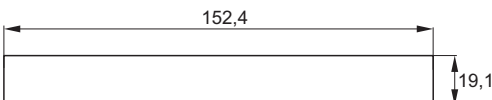
③ Probe (see Feature 20 in "Ordering information")

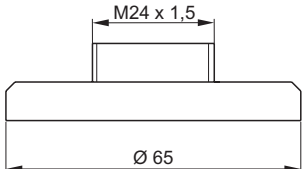
Material	Version	Option
316L (1.4435)	0.76 µm mechanically polished	K, M
	0.38 µm electropolished	S, T
Hastelloy C22	Special version available on request	Y

Process connections (see Feature 40 in "Ordering information") - Dimensions and materials

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

Process connection	Designation	Versions	Approvals	Option
	Tri-clamp ISO2852 DN25-38 (1 to 1-1/2")* $P_{\max} = 16 \text{ bar}$		<ul style="list-style-type: none"> ■ 0.76 µm ■ 0.38 µm electropolished <ul style="list-style-type: none"> ■ EHEDG ■ ASME-BPE compliant 	TCJ
	Tri-clamp ISO2852 DN40-51 (2")* $P_{\max} = 16 \text{ bar}$			TDJ
	Tri-clamp ISO2852 DN70-76.1 (3") $P_{\max} = 10 \text{ bar}$			TFJ
	SMS 1-1/2" PN25 with slotted nut* $P_{\max} = 16 \text{ bar}$	<ul style="list-style-type: none"> ■ 0.76 µm 	<ul style="list-style-type: none"> ■ EHEDG 	T7J
	SMS 2" PN25 with slotted nut* $P_{\max} = 16 \text{ bar}$			TXJ

Process connection	Designation	Versions	Approvals	Option
	DIN11851 DN40 PN40 with slotted nut F40* $P_{\max} = 16 \text{ bar}$	■ 0.76 μm	■ EHEDG	MQJ
	DIN11851 DN50 PN40 with slotted nut F50* $P_{\max} = 16 \text{ bar}$			MRJ
	DIN11864-1 A DN25 Pipe DIN11850 with slotted nut F25* $P_{\max} = 16 \text{ bar}$	■ 0.76 μm ■ 0.38 μm electropolished		MAJ
	NEUMO BioControl DN25 PN16* $P_{\max} = 16 \text{ bar}$			S1J
	1-1/2" 150lbs RF Flange ANSI B16.5* $P_{\max} = 16 \text{ bar}$	■ 0.76 μm		AEJ
	2" 150lbs RF Flange ANSI B16.5* $P_{\max} = 16 \text{ bar}$			AFJ

Process connection	Designation	Versions	Approvals	Option
	Thread M24 x 1.5 Weld-in adapter order number: 71041381 $P_{max} = 16 \text{ bar}$	Accessory: weld-in adapter ■ 0.76 μm		U1J

All metal parts used in the process in 316L (1.4435)

General information on flanges	The surface roughness of the surface in contact with the medium, including the sealing surface of the flanges (all standards) made of Hastelloy C, Monel or Tantalum, is RA 3.2. Lower surface roughness levels are available on request.
---------------------------------------	---

Tolerance of probe length

Tolerance	Rod length
+ 0 / - 3 mm	< 1000 mm
+ 0 / - 5 mm	1000 to < 4000 mm

Weight

Part	Weight
Housing T12	approx. 2.7 kg
Housing F12	approx. 1.8 kg
Housing F23	approx. 5 kg
Probe compact	approx. 0.7 kg
Probe compact, detachable	approx. 0.8 kg
Probe remote	approx. 2.1 kg
Probe rod	approx. 0.4 kg/m

Material

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

Process connection

See "Ordering information" on Seite 37.

Probe

See "Ordering information" on Seite 37.



Note!

The modular structure of the probe makes a simple possible exchanges of the process seals, the probe rod and the process coupling ring.

Human interface

Operation concept

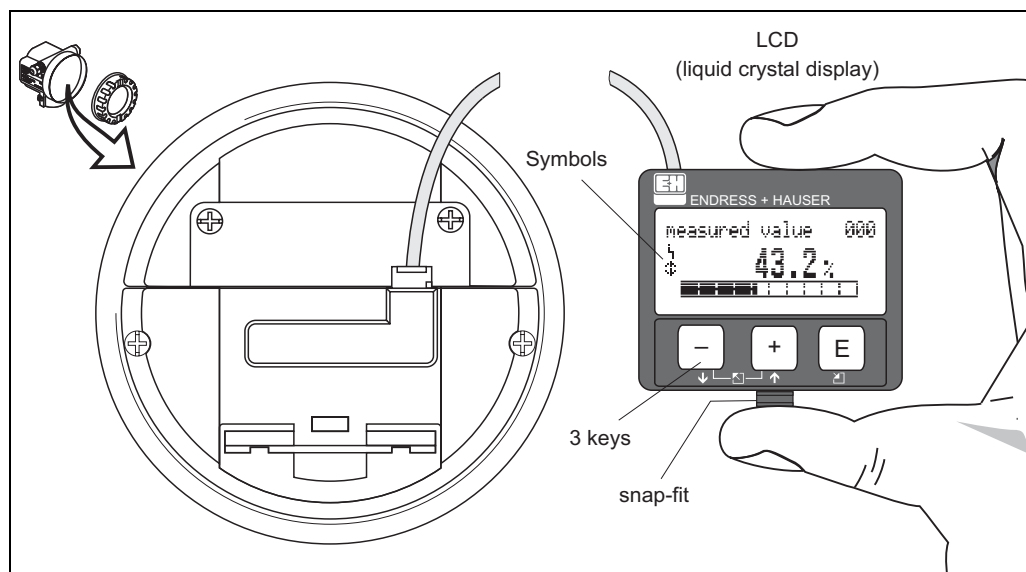
The display of the process value and the configuration of the Levelflex occur locally by means of a large 4-line alphanumeric display with plain text information. The guided menu system with integrated help texts ensures a quick and safe commissioning.

To access the display the cover of the electronic compartment may be removed even in hazardous area (IS and XP). Remote commissioning, including documentation of the measuring point and in-depth analysis functions, is supported via FieldCare, 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-FMxxxxx-07-00-00-es-001

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















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

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

Operating elements

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

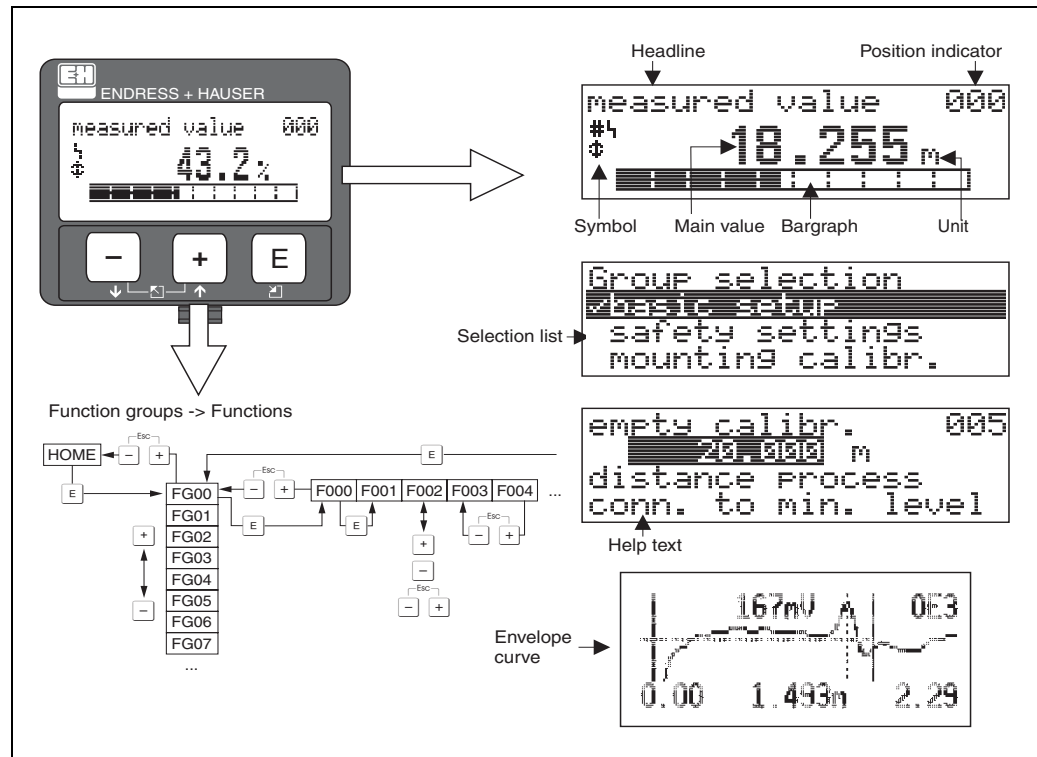
Function of the keys

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

Onsite 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.

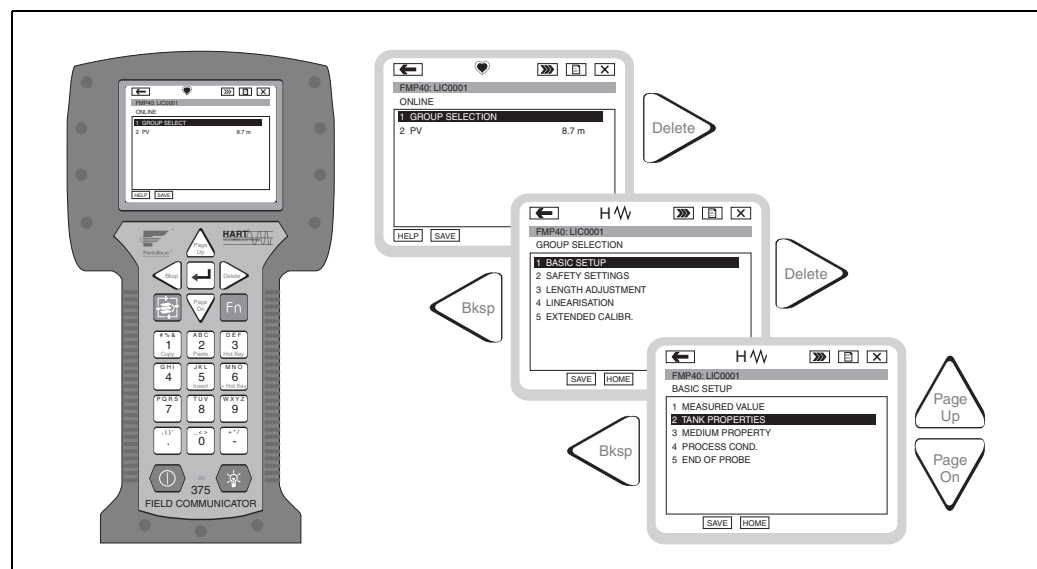


100-FMPxxxxx-07-00-00-en-002

Remote operation

Operation with handheld unit Field Communicator 375

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



100-FMPxxxxx-07-00-00-yy-005



Note!

- Further information on the HART handheld unit is given in the respective operating manual included in the transport bag of the Field Communicator 375.

Remote operation

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

Operation with FieldCare

FieldCare is an Endress+Hauser Plant Asset Management Tool based on FDT technology. You can use FieldCare to configure all your Endress+Hauser devices, as well as devices from other manufacturers that support the FDT standard. It is compatible with the following operating systems: Win2000, WinXP and Windows Vista.

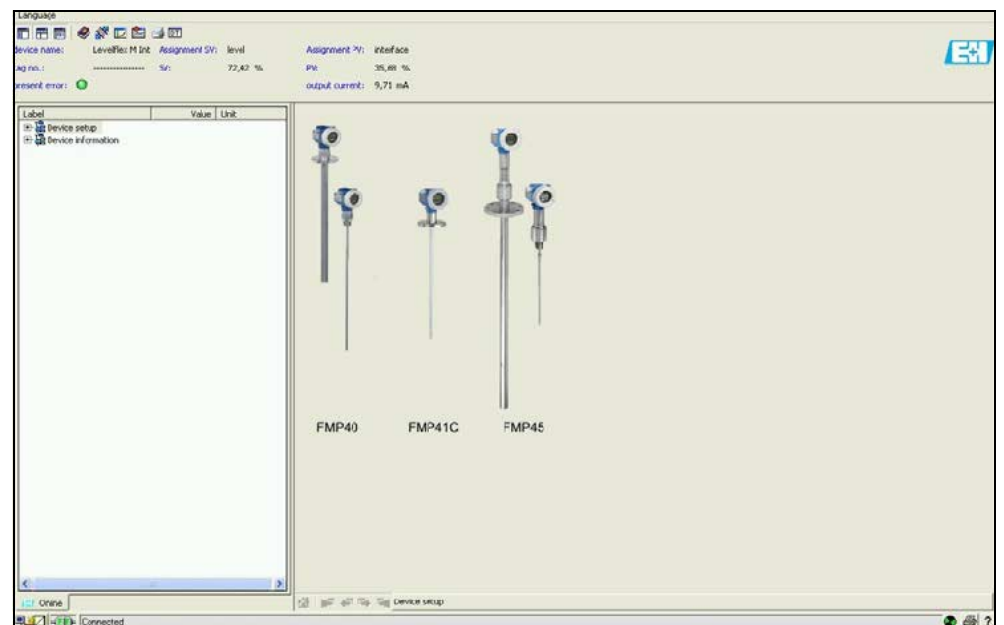
FieldCare supports the following functions:

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

Connection options:

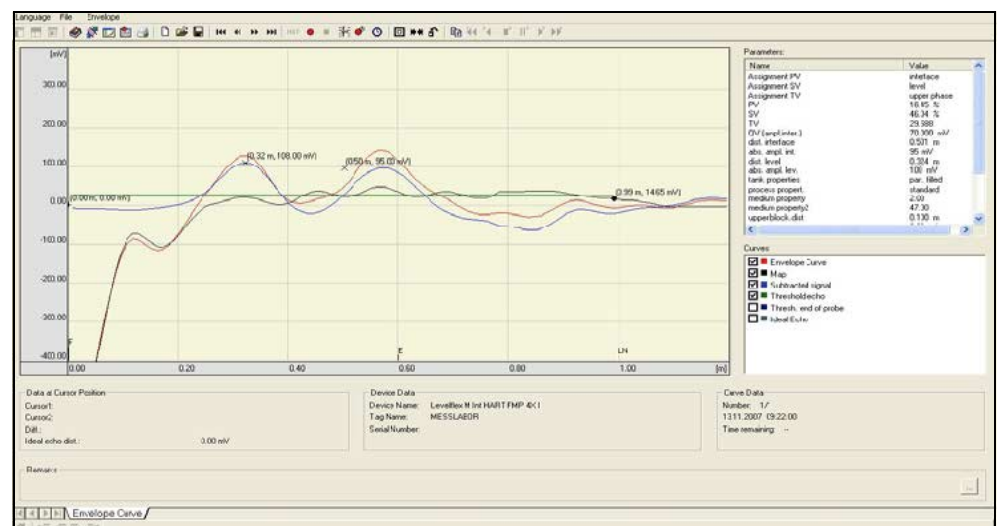
- HART via Commubox FXA191 and the RS 232 C serial port of a computer
- HART via Commubox FXA195 and the USB port of a computer
- PROFIBUS PA via segment coupler and PROFIBUS interface card

Menu-guided commissioning



L00-fmp-lxxx-20-00-00-en-033

Signal analysis via envelope curve



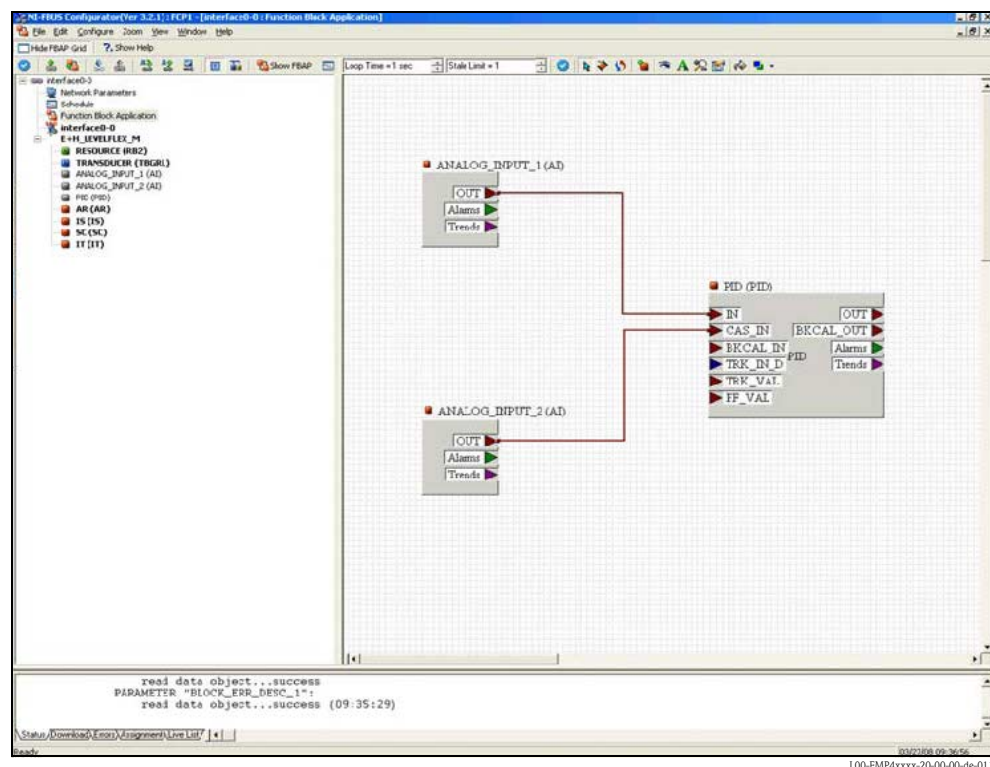
L00-fmp-lxxx-20-00-00-en-034

Operation with NI-FBUS Configurator (only FOUNDATION Fieldbus)

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

You can use the NI-FBUS Configurator to configure a fieldbus network as follows:

- Set block and device tags
- Set device addresses
- Create and edit function block control strategies (function block applications)
- Configure vendor-defined function and transducer blocks
- Create and edit schedules
- Read and write to function block control strategies (function block applications)
- Invoke Device Description (DD) methods
- Display DD menus
- Download a configuration
- Verify a configuration and compare it to a saved configuration
- Monitor a downloaded configuration
- Replace devices
- Save and print a configuration



Certificates and approvals

CE mark

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

Ex approval

See "Ordering information" on → 37

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

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

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

Feature		Variant	ZD021F	ZD101F	ZD109F	ZD106F	ZD078F	ZD077F	ZD076F	ZD075F	ZD117F	ZD116F	ZD114F	ZD113F	ZD083F	ZD082F	ZD081F	ZD080F	XA420F	XA379F	XA378F	XA416F	XA415F	XA414F	XA413F	XA412F	XA411F	XA410F
10 Approval:	Non-hazardous area	A																										
	*NEPSI Ex ia IIC T6	I																		X	X							
	*TIIS Ex ia IIC T4	K																										
	FM DIP Cl.II Div.1 Gr.E-G N.I.	M					X																					
	CSA General Purpose	N																										
	CSA DIP Cl.II Div.1 Gr.G +	P													X													
	FM IS Cl.I,II,III Div.1 Gr.A-G N.I.	S	X	X	X	X			X	X																		
	FM XP Cl.I,II,III Div.1 Gr.A-G	T						X																				
	CSA IS Cl.I,II,III Div.1 Gr.A-D,G+	U									X	X	X	X			X	X										
	CSA XP Cl.I,II,III Div.1 Gr.A-D,G+	V														X												
	ATEX II 1/2G Ex ia IIC T6	1																									X	X
	ATEX II 1/2D, Alu blind cover ¹⁾	2																X			X	X	X					
	ATEX II 2G Ex e mb (ia) IIC T6	3																						X				
	ATEX II 1/3D ¹⁾	4																X			X	X	X					
	ATEX II 1/2G Ex ia IIC T6,ATEX II 1/3D	5																X				X						
	ATEX II 1/2G Ex d (ia) IIC T6	7																									X	
50 Power supply Output:	2-wire 4-20mA SIL HART	B		X		X		X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X
	2-wire PROFIBUS PA	D	X	X		X		X	X		X	X	X	X	X	X	X			X		X	X	X	X	X	X	X
	2-wire FOUNDATION Fieldbus	F	X	X		X		X	X		X	X	X	X	X	X	X			X		X	X	X	X	X	X	X
	4-wire 90-250VAC 4-20mA SIL HART	G					X								X								X					
	4-wire 10.5-32VDC 4-20mA SIL HART	H					X								X								X					
80 Housing:	F12 Alu, coated IP68 NEMA6P	A	X				X		X	X					X		X	X					X	X			X	X
	F23 316L IP68 NEMA6P	B	X		X	X						X	X										X				X	X
	T12 Alu, coated IP68 NEMA6P	C						X								X					X			X	X			
	T12 Alu, coated IP68 NEMA6P + OVP	D	X	X	X						X	X											X				X	X

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

* in preparation

Suitability for hygienic processes

Overview of permitted process connections from → 27.



Note!

The gap-free connections can be cleaned without residue using the usual cleaning methods.

Many versions of the Levelflex M meet the requirements of 3A-Sanitary Standard No. 74. Endress+Hauser confirms this by attaching the 3A symbol.

Pharma (CoC)

Certificate of Compliance (CoC)

- See ordering information → 37, feature 100 "Additional Option:", option"P".
- Materials in Contact with process made of 316L with Δ ferrite < 3%
- Surface roughness $R_a < 0,38 \mu\text{m}/15 \mu\text{in}$
- Information on ASME BPE Conformity

Overspill protection

SIL 2, for 4 to 20 mA output signal (see SD174F/00/en "Functional Safety Manual").

Telecommunications

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

External standards and guidelines

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

EN 60529

Protection class of housing (IP-code)

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

■ NE 21

Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.

■ NE 43

Standardization of the signal level for the failure information of digital transmitters.

Ordering information

Levellflex M FMP43

Instrument selection

10 Approval	Ex-free area		Ex ia IS		Ex em		Ex d XP	
20 Probe								
30 O-ring Material								
40 Process connection	<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>1 1/2" Clamp</p> </div> <div style="text-align: center;"> <p>2" Clamp</p> </div> <div style="text-align: center;"> <p>3" Clamp</p> </div> <div style="text-align: center;"> <p>Slotted nut SMS 1 1/2"</p> </div> <div style="text-align: center;"> <p>Slotted nut SMS 2"</p> </div> <div style="text-align: center;"> <p>Slotted nut DIN 11851 F40</p> </div> <div style="text-align: center;"> <p>Slotted nut DIN 11851 F50</p> </div> <div style="text-align: center;"> <p>Endress+Hauser weld-in adapter</p> </div> <div style="text-align: center;"> <p>ASME flange 1 1/2" or 2"</p> </div> <div style="text-align: center;"> <p>Flange adapter Neumo Bio Control D25</p> </div> <div style="text-align: center;"> <p>Slotted nut DIN 11851 F25</p> </div> <div style="text-align: center;"> <p>Aseptic 11864-1 form A / DN25</p> </div> </div>							
70 Type of probe	<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>Option "1": compact</p> </div> <div style="text-align: center;"> <p>Option "5": compact, detachable</p> </div> <div style="text-align: center;"> <p>Option "6/7": Remote, detachable</p> </div> </div>							
50 Power Supply/ Output	4 Wire 4-20 mA/ HART		2 Wire 4-20 mA/ HART		2 Wire 4-20 mA/ HART		2 Wire 4-20 mA/ HART	
60 Operation	PA		PA		PA		PA	
	FF		FF		FF		FF	
80 Housing	F12+F23*		T12		F12+F23*		T12	
90 Cable entry	F12+F23*		T12		F12+F23*		T12	

* Instead of the F12 housing from aluminium also the F23 housing from stainless steel can be supplied to all 2-wire electronics.

L00-FMP43ccc-16-00-00-en-002



Note!

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

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

In this diagram, mutually exclusive variants are not identified.

10	Approval:			
	A			Non-hazardous area
	1			ATEX II 1/2 G Ex ia IIC T6
	7			ATEX II 1/2 G Ex d (ia) IIC T6
	5			ATEX II 1/2 G Ex ia IIC T6, ATEX II 1/3 D
	3			ATEX II 2G Ex e mb (ia) IIC T6
	2			ATEX II 1/2 D, Alu blind cover
	4			ATEX II 1/3 D
	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			*TIS Ex ia IIC T4
	I			*NEPSI Ex ia IIC T6
	Y			Special version, to be specified
20	Probe:			
				300 mm - 4000 mm/12 in - 157 in
	K		 mm, rod 8 mm, 316L, Ra < 0.76 µm/30 µin Price per 100 mm
	M		 in, rod 8 mm 316L, Ra < 0.76 µm/30 µin Price is based on one inch
	S		 mm, rod 8 mm, 316L, electropolished Ra < 0.38 µm/15 µin Price is based on 100 mm
	T		 in, rod 8 mm 316L, electropolished Ra < 0.38 µm/15 µin Price is based on one inch
	Y			Special version, to be specified
30	O-ring Material; Temperature:			
	5			EPDM, FDA, USP Cl. VI; - 20 °C to 130 °C
	6			Kalrez, FDA, USP Cl. VI; - 20 °C to 150 °C
	9			Special version, to be specified
40	Process Connection:			
				— Threaded boss —
	U1J			Thread M24, 316L, install > accessory weld-in adapter
				— Clamp connections —
	TCJ			Tri-clamp ISO2852 DN25-38 (1 to 1-1/2"), 316L, 3A, EHEDG
	TDJ			Tri-clamp ISO2852 DN40-51 (2"), 316L, 3A, EHEDG
	TFJ			Tri-clamp ISO2852 DN70-76.1 (3"), 316L, 3A, EHEDG
				— Hygienic connections —
	T7J			SMS 1-1/2" PN25, 316L, EHEDG
	TXJ			SMS 2" PN25, 316L, EHEDG
	MAJ			DIN11864-1 A DN25 tubr DIN11850, 316L, EHEDG
	MQJ			DIN11851 DN40 PN40, 316L, EHEDG
	MRJ			DIN11851 DN50 PN40, 316L, EHEDG
	S1J			NEUMO BioControl DN25 PN16, 316L, EHEDG
				— ANSI flanges —
	AEJ			1-1/2" 150 lbs RF, 316L flange ANSI B16.5
	AFJ			2" 150 lbs RF, 316L flange ANSI B16.5
	YY9			Special version, to be specified
50	Power Supply; Output:			
	B			2-wire ; 4 - 20mA SIL HART
	D			2-wire; PROFIBUS PA
	F			2-wire; FOUNDATION Fieldbus
	G			4-wire 90 - 250 VAC; 4 - 20mA SIL HART
	H			4-wire 10.5 - 32 VDC; 4 - 20mA SIL HART
	Y			Special version, to be specified
60	Operation:			
	1			W/o display, via communication
	2			4-line display VU331,
	3			Prepared for FHX40,
	9			Special version, to be specified
70	Type of Probe:			
	1			Compact, basic version
	5			Compact, detachable
	6			Remote, cable 3 m, detachable
	7			Remote, cable 6 m, detachable

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

Please enter probe length in mm or inch / 0.1 inch

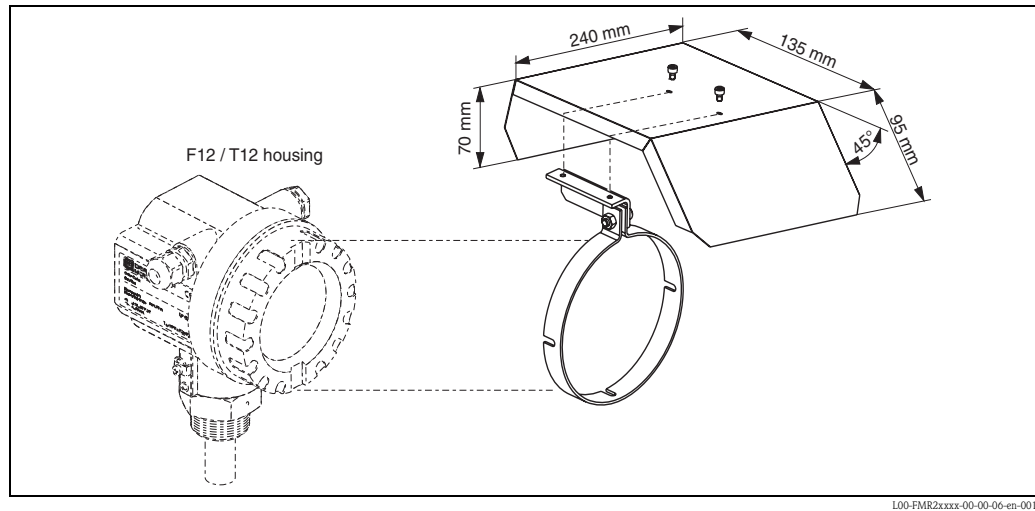
probe lenght LN → Seite 26

39

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.



Weld-in adapter

Welding adapter with M 24 x 1.5 - threads for the front-concise assembly of the sensor.

Material: corrosion-resistant steel
1.4435 (AISI 316L)

Weight: 0.22 kg

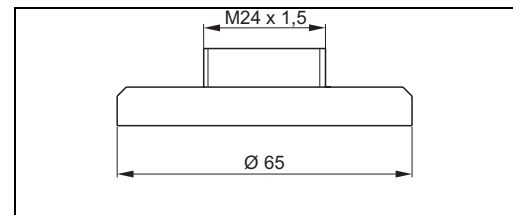
For details refer to BA361F/00/A6.

■ Standard

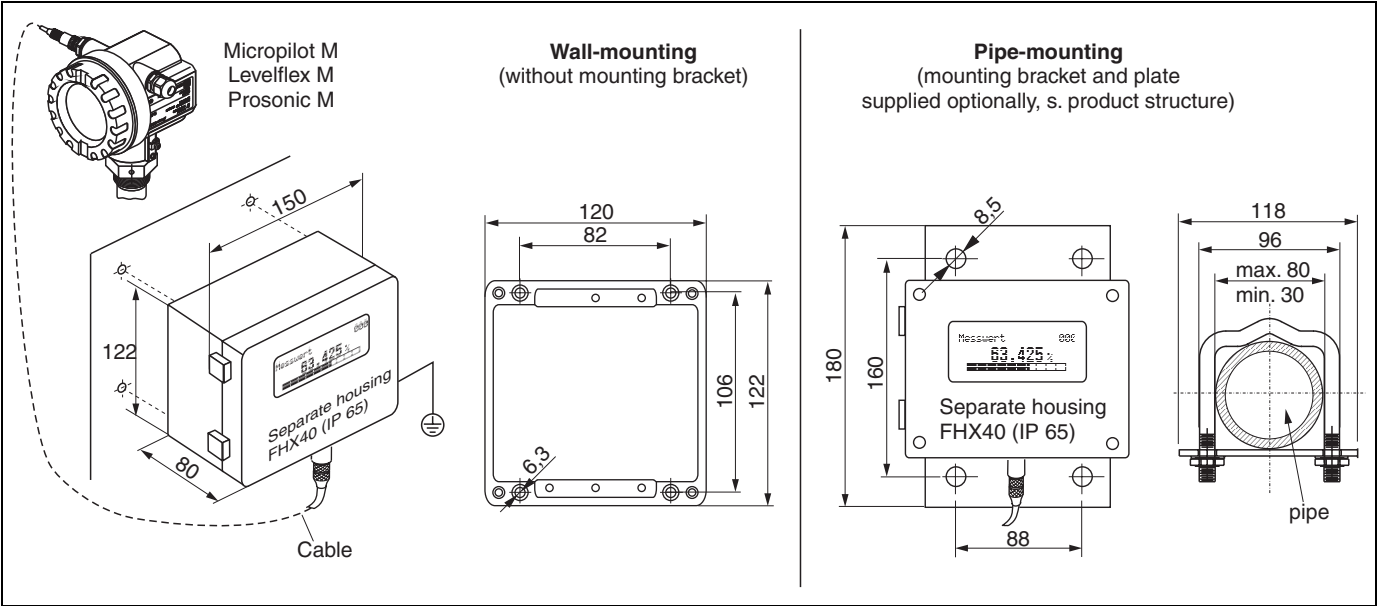
Order No.: 71041381

■ With 3.1 inspection certificate

Order No.: 71041383



Remote display and operation
FHX40




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

Technical data (cable and housing) and product structure:

Max. cable length	20 m (65 ft)
Temperature range	-30 °C...+70 °C (-22 °F...158 °F)
Degree of protection	IP65/67(housing); IP68 (cable) acc. to IEC 60529
Materials	Housing: AlSi12; cable glands: nickle plated brass
Dimensions [mm] / [inch]	122x150x80 (HxWxD) / 4.8x5.9x3.2

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

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

Commubox FXA191 HART	For intrinsically safe communication with FieldCare via the RS232C interface. For details refer to TI237F/00/en.
Commubox FXA195 HART	For intrinsically safe communication with FieldCare via the USB interface. For details refer to TI404F/00/en.
Commubox FXA291	<p>The Commubox FXA291 connects Endress+Hauser field instruments with CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a personal computer or a notebook. For details refer to TI405C/07/en.</p> <p> Note! For the following Endress+Hauser instruments you need the "ToF Adapter FXA291" as an additional accessory:</p> <ul style="list-style-type: none"> ■ Cerabar S PMC71, PMP7x ■ Deltabar S PMD7x, FMD7x ■ Deltapilot S FMB70 ■ Gammapiot M FMG60 ■ Levelflex M FMP4x ■ Micropilot FMR130/FMR131 ■ Micropilot M FMR2xx ■ Micropilot S FMR53x, FMR540 ■ Prosonic FMU860/861/862 ■ Prosonic M FMU4x ■ Tank Side Monitor NRF590 (with additional adapter cable)
ToF Adapter FXA291	<p>The ToF Adapter FXA291 connects the Commubox FXA291 via the USB interface of a personal computer or a notebook to the following Endress+Hauser instruments:</p> <ul style="list-style-type: none"> ■ Cerabar S PMC71, PMP7x ■ Deltabar S PMD7x, FMD7x ■ Deltapilot S FMB70 ■ Gammapiot M FMG60 ■ Levelflex M FMP4x ■ Micropilot FMR130/FMR131 ■ Micropilot M FMR2xx ■ Micropilot S FMR53x, FMR540 ■ Prosonic FMU860/861/862 ■ Prosonic M FMU4x ■ Tank Side Monitor NRF590 (with additional adapter cable) <p>For details refer to KA271F/00/a2.</p>
Protective cover	<p>With the protective cover the probe can be locked with dismantled electronics. For details refer to BA362F/00/A6. Order No.: 71041379</p> <div data-bbox="932 1382 1436 1536" data-label="Image"> </div> <p style="text-align: right; font-size: small;">100-FMP43xxx-00-00-00-xx-010</p>
Calibration kit	<p>The calibration kit is used to regularly test the accuracy and reproducibility of the Levelflex M FMP43 level measurement device. For details refer to BA360F/00/en. Order No.: 71041382</p>

Additional documentation

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

Fields of activities

Level measurement

Level limit detection and continuous level measurement in liquids and bulk solids, FA001F/00/en.

Competence brochure

Continuous Level Measurement in Liquids

Selection and engineering for the process industrie, CP023F/00/en.

Technical Information

Fieldgate FXA520

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

Operating Instructions

Levellflex M

Correlation of operating instructions to the instrument:

Device type	Output ¹	Communication	Operating Instructions	Description of device functions	Brief Operating Instructions (in device)
FMP43	B, G, H	HART	BA357F/00/en	BA245F/00/en	KA189F/00/a2
	D	PROFIBUS PA	BA358F/00/en	BA245F/00/en	KA189F/00/a2
	F	FOUNDATION Fieldbus	BA359F/00/en	BA245F/00/en	KA189F/00/a2

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

Engineering hints PROFIBUS PA

Guidelines for planning and commissioning, BA198F/00.

Patents

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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