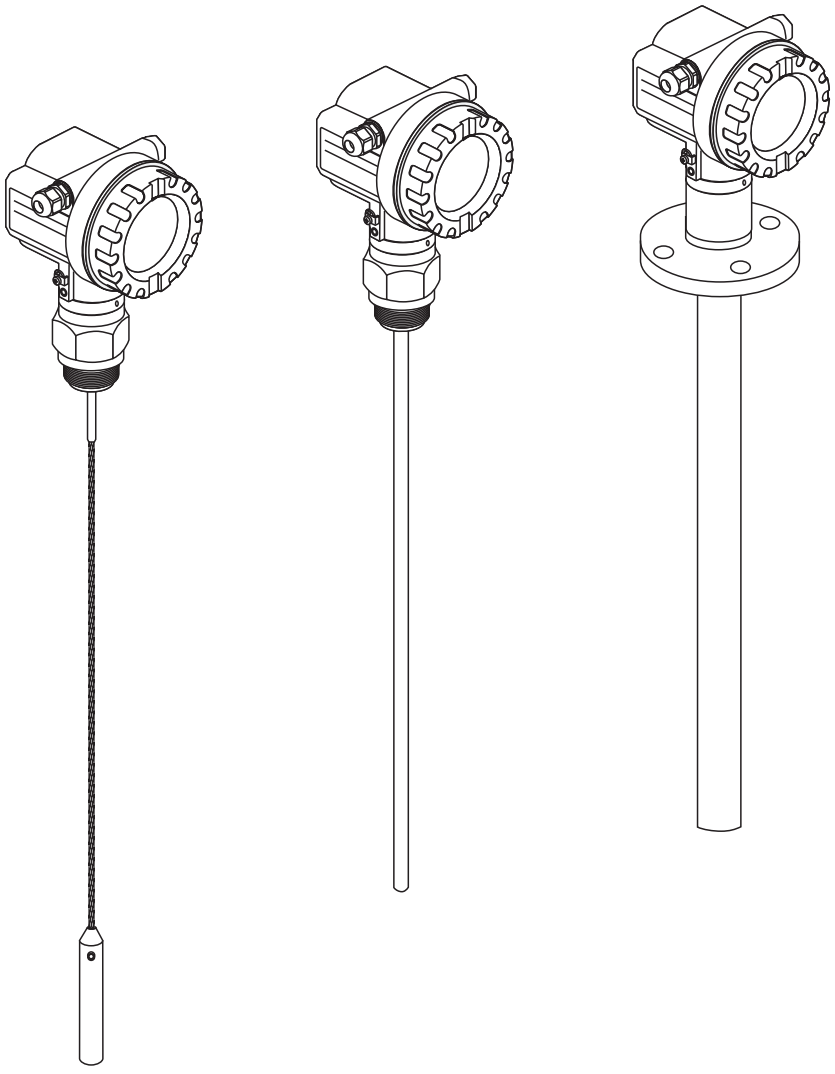
Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Operating Instructions

Levelflex M FMP40

Guided Level-Radar

FOUNDATION



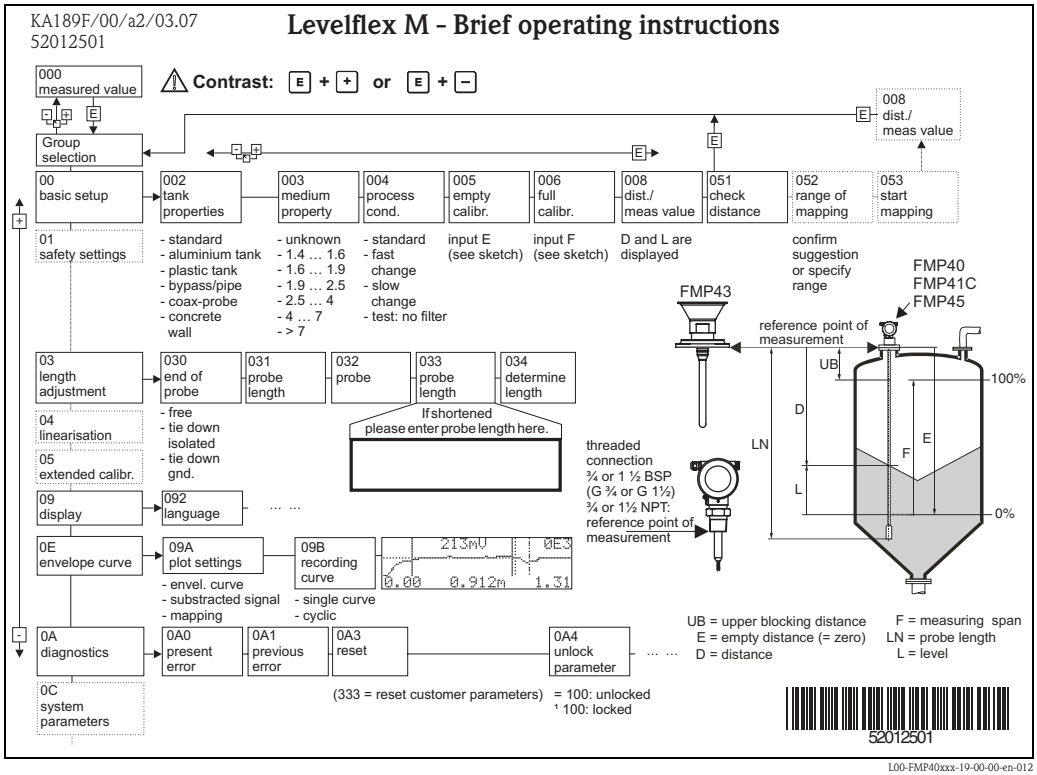
BA00244F/00/EN/13.10
71120272

Valid as of software version:
01.04.zz

Endress+Hauser

People for Process Automation

Brief Operating Instructions



Note!
This Operating Instructions explain how to install and commission the level transmitter. All functions that are required for a typical measuring task are taken into account here. In addition, the Levelflex M provides many other functions for optimizing the measuring point and conventing measured values. These functions are not included in these Operating Instructions.

An **overview of all device functions** can be found on → 110.

The Operating Instructions BA00245F/00/EN "Description of Instrument Functions" provide an **extensive description of all device functions**, which can be found on the enclosed CD-ROM.

The Operating Instructions can also be found on our homepage: www.endress.com

Table of contents

1 Safety instructions

1.1 Designated use

The Levelflex M is a compact level transmitter for the continuous measurement of solids and liquids, measuring prinziple: Guided Level Radar / TDR:
Time **D**omain **R**eflectometry.

1.2 Installation, commissioning and operation

The Levelflex M has been designed to operate safely in accordance with current technical, safety and EU standards. If installed incorrectly or used for applications for which it is not intended, however, it is possible that application-related dangers may arise, e.g. product overflow due to incorrect installation or calibration. For this reason, the device must be installed, connected, operated and maintained according to the instructions in this manual: personnel must be authorised and suitably qualified. The manual must have been read and understood, and the instructions followed. Modifications and repairs to the device are permissible only when they are expressly approved in the manual.

1.3 Operational safety and process safety

Alternative monitoring measures must be taken to ensure operational safety and process safety during configuration, testing and maintenance work on the device.

Hazardous areas

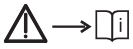
Measuring systems for use in hazardous environments are accompanied by separate "Ex documentation", which is an integral part of this Operating Manual. Strict compliance with the installation instructions and ratings as stated in this Additional documentation is mandatory.

- Ensure that all personnel are suitably qualified.
- Observe the specifications in the certificate as well as national and local regulations.

1.4 Notes on safety conventions and symbols

In order to highlight safety-relevant or alternative operating procedures in the manual, the following conventions have been used, each indicated by a corresponding symbol in the margin.

Safety conventions	
	**Warning!** A warning highlights actions or procedures which, if not performed correctly, will lead to personal injury, a safety hazard or destruction of the device.
	**Caution!** Caution highlights actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the device.
	**Note!** A note highlights actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an device response which is not planned.
Explosion protection	
	**Device certified for use in explosion hazardous area** If the device has this symbol embossed on its name plate it can be installed in an explosion hazardous area.
	**Explosion hazardous area** Symbol used in drawings to indicate explosion hazardous areas. Devices located in and wiring entering areas with the designation "explosion hazardous areas" must conform with the stated type of protection.
	**Safe area (non-explosion hazardous area)** Symbol used in drawings to indicate, if necessary, non-explosion hazardous areas. Devices located in safe areas still require a certificate if their outputs run into explosion hazardous areas.
Electrical symbols	
	**Direct voltage** A terminal to which or from which a direct current or voltage may be applied or supplied.
	Alternating voltage A terminal to which or from which an alternating (sine-wave) current or voltage may be applied or supplied.
	**Grounded terminal** A grounded terminal, which as far as the operator is concerned, is already grounded by means of an earth grounding system.
	**Protective grounding (earth) terminal** A terminal which must be connected to earth ground prior to making any other connection to the equipment.
	**Equipotential connection (earth bonding)** A connection made to the plant grounding system which may be of type e.g. neutral star or equipotential line according to national or company practice.
	**Temperature resistance of the connection cables** States, that the connection cables must be resistant to a temperature of at least 85 °C.

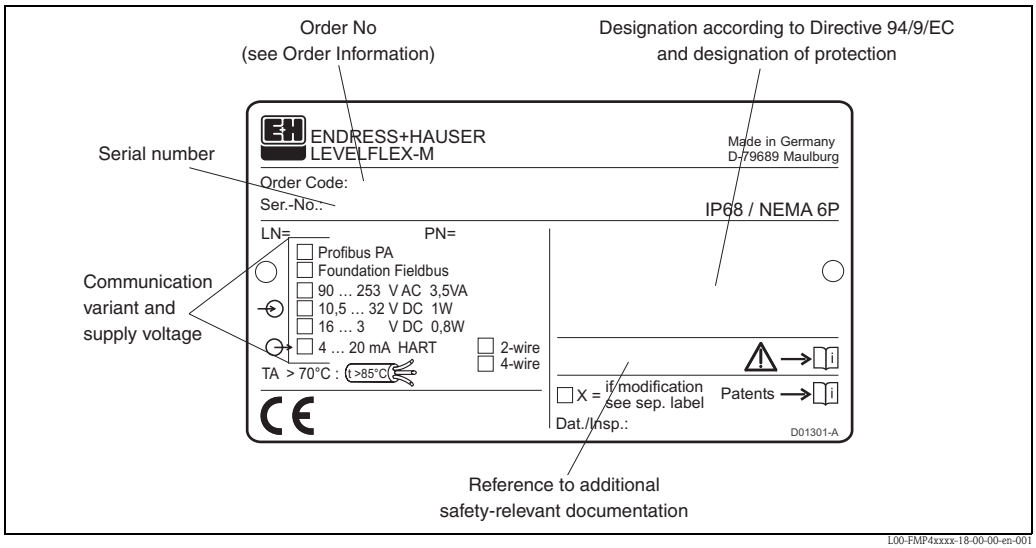
	**Safety instruction** For safety instructions refer to the manual for the appropriate device version.

2 Identification

2.1 Device designation

2.1.1 Nameplate

The following technical data are given on the device nameplate:



Information on the nameplate of the Levelflex M FMP40

2.1.2 Ordering structure

This overview does not mark options which are mutually exclusive.

10	Approval:	
	A	Non-hazardous area
	F	Non-hazardous area, WHG
	1	ATEX II 1/2G Ex ia IIC T6/IECEx Zone 0/1
	2	ATEX II 1/2D/IEC Ex td A20/21, Alu blind cover
	3	ATEX II 2G Ex emb (ia) IIC T6/IECEx Zone1
	4	ATEX II 1/3D/IEC Ex td A20/22
	5	ATEX II 1/2G Ex ia IIC T6, ATEX II 1/3D
	6	ATEX II 1/2G Ex ia IIC T6, WHG
	7	ATEX II 1/2G Ex d (ia) IIC T6/ IEC Ex d(ia) IIC T6
	8	ATEX II 1/2G Ex ia IIC T6, ATEX II 1/3D, WHG
	G	ATEX II 3G Ex nA II T6
	C	NEPSI Ex emb (ia) IIC T6
	I	NEPSI Ex ia IIC T6
	J	NEPSI Ex d (ia) IIC T6
	Q	NEPSI DIP
	R	NEPSI Ex nA II T6
	M	FM DIP Cl.II Div.1 Gr. E-G N.I.
	S	FM IS Cl.I,II,III Div.1 Gr. A-G N.I., zone 0, 1, 2
	T	FM XP Cl.I,II,III Div.1 Gr. A-G, zone 1, 2
	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., zone 0, 1, 2
	V	CSA XP Cl.I,II,III Div.1 Gr. A-D, G + coal dust, N.I., zone 1, 2
	W	IEC Ex td A20/21, Alu blind cover
	X	IEC Ex td A20/22
	K	TIIS Ex ia IIC T4 (in preparation)
	L	TIIS Ex d (ia) IIC T4
	Y	Special version, TSP-No. to be spec.

20	Probe:
A	Rope 4mm / 1/6", mainly liquid
B	Rope 6mm / 1/4", solid
H	Rope 6mm / 1/4", PA > steel, solid, T_{max} = 100°C / 212°F
P	Rod 6mm, liquid
1	Rod 12mm, liquid
K	Rod 16mm, mainly liquid
L	Coax, liquid
Y	Special version, TSP-No. to be spec.

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 > steel
F	..... inch, rope 1/4", PA > steel
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
S	..... mm, rod 16mm, 316L, 500mm divisible
T	..... mm, rod 16mm, 316L, 1000mm divisible
U	..... inch, rod 16mm, 316L, 20in divisible
V	..... inch, rod 16mm, 316L, 40in divisible
1	..... mm rod 12mm, AlloyC22
2	..... mm coax, AlloyC22
3	..... inch, rod 12mm, AlloyC22
4	..... inch, coax, AlloyC22
Y	Special version, TSP-No. to be spec.

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, TSP-No. to be spec.

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)

50	Process Connection:
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, TSP-No. to be spec.

60	Power Supply; Output:
B	2-wire; 4-20mA SIL HART
D	2-wire; PROFIBUS PA
F	2-wire; FOUNDATION Fieldbus
K	2-wire; 4-20mA HART, Interface measurement
G	4-wire 90-250VAC; 4-20mA SIL HART
H	4-wire 10.5-32VDC; 4-20mA SIL HART
Y	Special version, TSP-No. to be spec.

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, TSP-No. to be spec.

80	Type of Probe:
B	Compact, centering disk d=45mm, 316L, pipe diameter DN50/2"
C	Compact, centering disk d=75mm, 316L, pipe diameter DN80/3" + DN100/4"
D	Spacer, center rod d=45mm, 316L, pipe diameter DN50/2", spacer, 400mm
E	Spacer, center rod d=75mm, 316L,pipe diameter DN80/3" + DN100/4", spacer,400mm
F	Remote, cable 3m, top, center d=45mm, centering disk d=45mm, 316L pipe diameter DN50/2", 316L
G	Remote, cable 3m, top, center d=75mm, centering disk d=75mm, 316L, pipe diameter DN80/3" + DN100/4", 316L
H	Remote, cable 3m, side, center d=45mm, centering disk d=45mm, 316L, pipe diameter DN50/2"
I	Remote, cable 3m, side, center d=75mm, centering disk d=75mm, 316L, pipe diameter DN80/3" + DN100/4"
1	Compact, basic version
2	Spacer, 400mm
3	Remote, cable 3m, top entry
4	Remote, cable 3m, side entry
9	Special version, TSP-No. to be spec.

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 (Ex d > thread 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[1)]
N	T12 Alu, coated IP68; thread G1/2 + OVP[1)]
P	T12 Alu, coated IP68; thread NPT1/2+OVP[1)]
Q	T12 Alu, coated IP68; plug M12 + OVP[1)]
R	T12 Alu, coated IP68; plug 7/8" + OVP[1)]

90	**Housing; Cable Entry:**	
	1	F23 316L IP68; gland M20
	2	F23 316L IP68; thread G1/2
	3	F23 316L IP68; thread NPT1/2
	4	F23 316L IP68; plug M12
	5	F23 316L IP68; plug 7/8"
	Y	Special version, TSP-No. to be spec.

100	**Additional Option:**	
	A	Basic version
	B	EN10204-3.1 material, wetted parts, (316L wetted parts for rod/coax) inspection certificate
	C	EN10204-3.1 material, pressurized, (316L pressurized for rope version) inspection certificate
	H	5-point lienearity protocol, see additional spec.
	J	5-point, 3.1, NACE, 5-point linearity protocol, see additional spec. EN102043.1 material, NACE MR0175 (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, TSP-No. to be spec.

995		**Marking:**
	1	Tagging (TAG), see additional spec.
	2	Bus adress, see additional spec.

FMP40-	Complete product designation

[1] OVP = overvoltage protection

2.2 Scope of delivery

Caution!
It is essential to follow the instructions concerning the unpacking, transport and storage of measuring devices given in the chapter "Incoming acceptance, transport, storage", → 12!

The scope of delivery consists of:
- Assembled device
- Accessories (→ 84)
- Endress+Hauser operating program on the enclosed CD-ROM
- Brief operating instructions KA00189F/00/A2 (basic setup/troubleshooting), housed in the device
- Brief operating instructions KA01040F/00/EN for quick commissioning
- Approval documentation: if this is not included in the operating manual
- CD-ROM with further documentation, e.g.
  - Technical Information
  - Operating Instructions
  - Description of Instrument Functions

2.3 Certificates and approvals

CE mark, declaration of conformity
The device is designed to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate. The device complies with the applicable standards and regulations as listed in the EC declaration of conformity and thus complies with the statutory requirements of the EG directives. Endress+Hauser confirms the successful testing of the device by affixing to it the CE mark.

2.4 Registered trademarks

KALREZ®, VITON®, TEFLON®
Registered trademark of the company E.I. Du Pont de Nemours & Co., Wilmington, USA

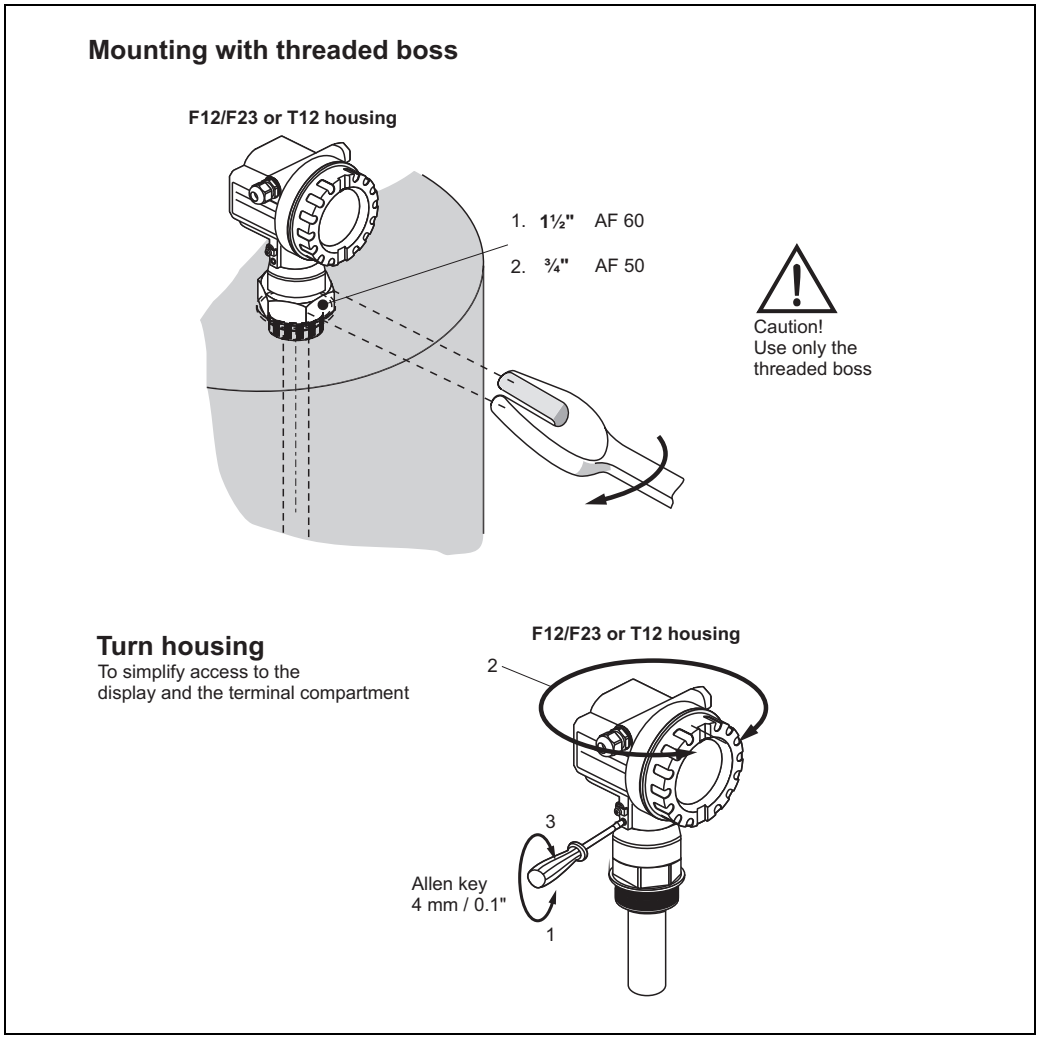
TRI-CLAMP®
Registered trademark of the company Ladish & Co., Inc., Kenosha, USA

ToF®
Registered trademark of the company Endress+Hauser GmbH+Co. KG, Maulburg, Germany

PulseMaster®
Registered trademark of the company Endress+Hauser GmbH+Co. KG, Maulburg, Germany

3 Mounting

3.1 Quick installation guide



1. When using an aramid fibre seal and a process pressure of 40 bar: 140 Nm
   Maximum permissible torque: 450 Nm
2. When using an aramid fibre seal and a process pressure of 40 bar: 25 Nm
   Maximum permissible torque: 45 Nm

3.2 Incoming acceptance, transport, storage

3.2.1 Incoming acceptance

Check the packing and contents for any signs of damage.
Check the shipment, make sure nothing is missing and that the scope of supply matches your order.

3.2.2 Transport

Caution!
Follow the safety instructions and transport conditions for devices of more than 18 kg.
Do not lift the measuring device by its probe rod in order to transport it.

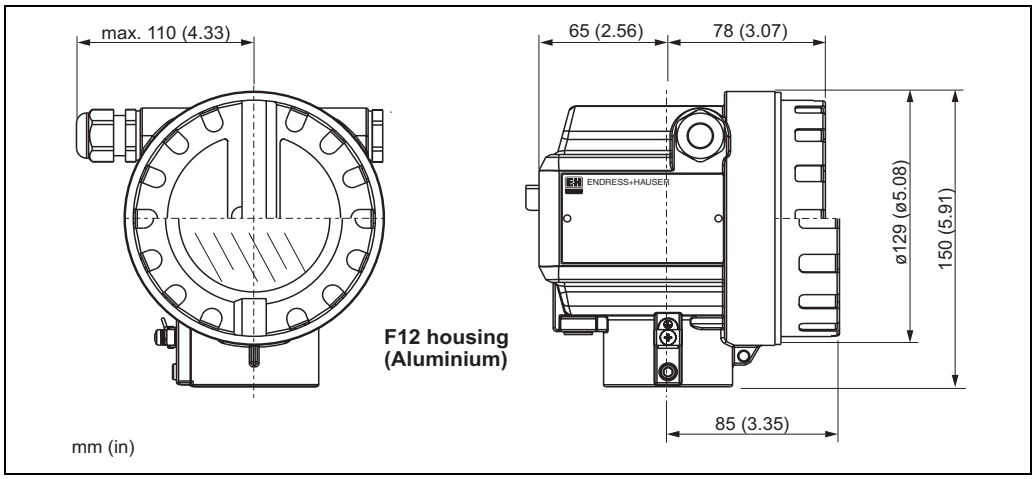
3.2.3 Storage

Pack the measuring device so that is protected against impacts for storage and transport. The original packing material provides the optimum protection for this.
The permissible storage temperature is -40 °C to +80 °C.

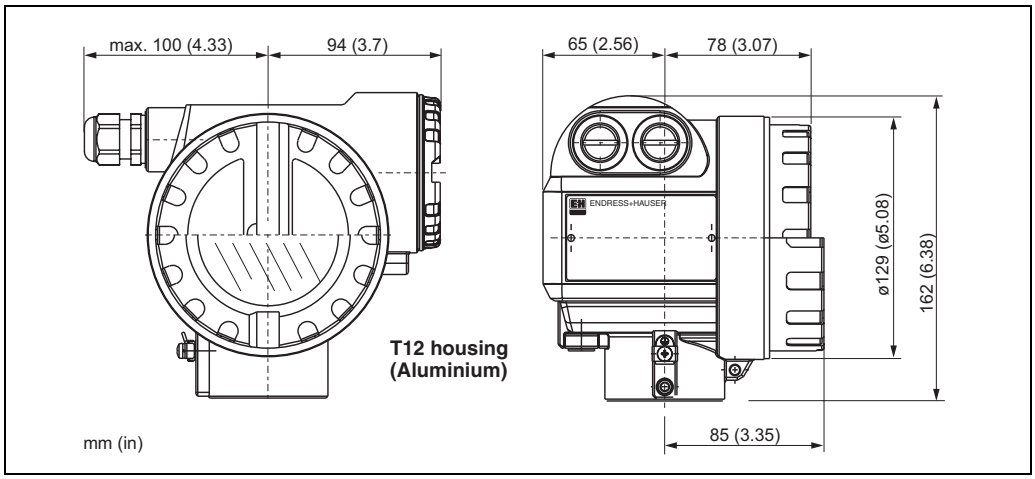
3.3 Installation conditions

3.3.1 Dimensions

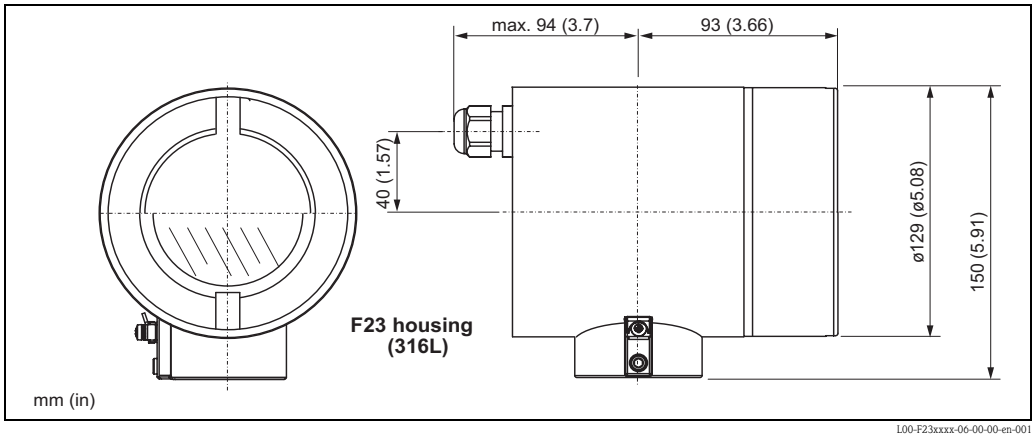
Housing dimensions



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

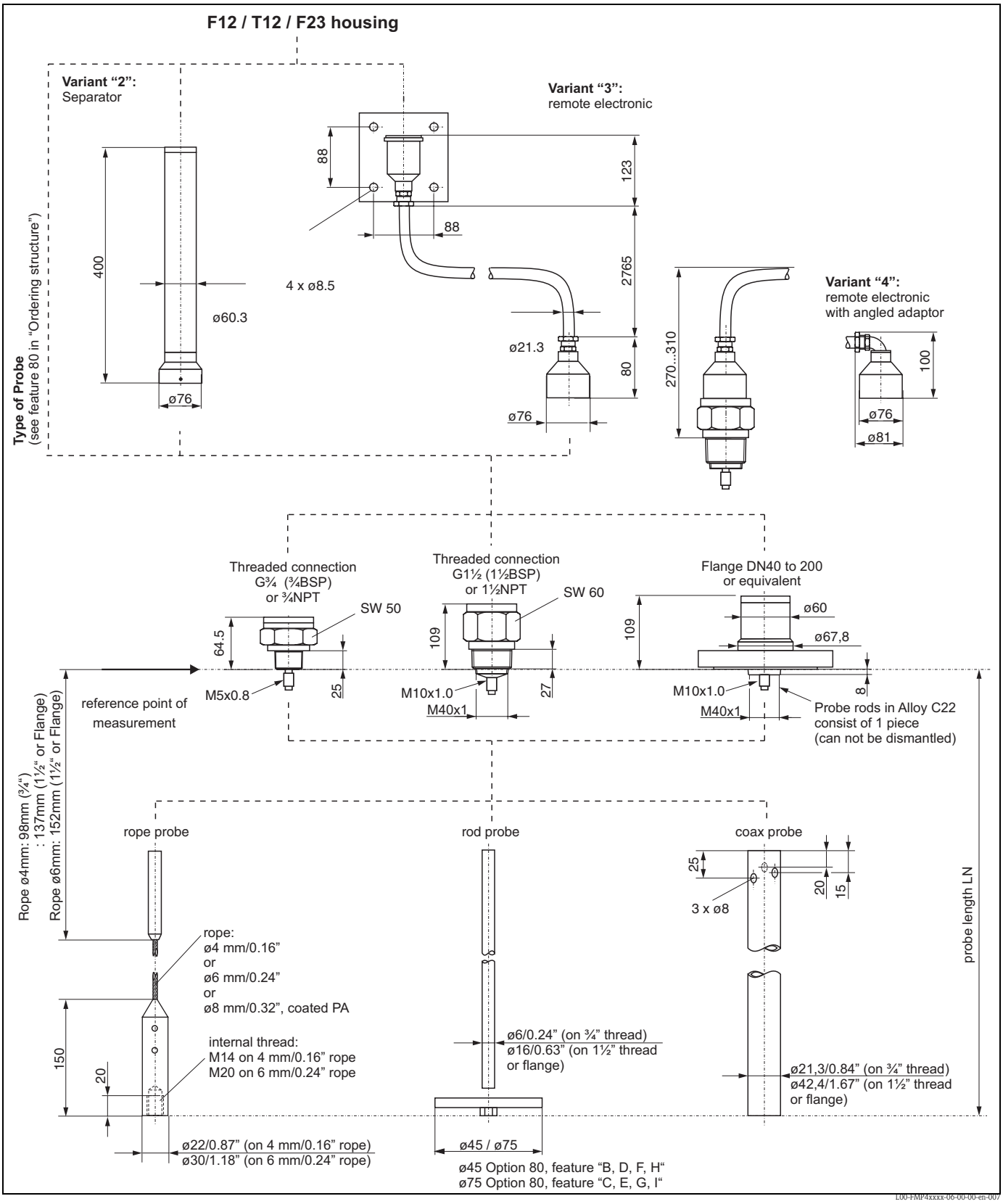


L00-T12xxxx-06-00-00-en-001



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

Process connection, probe type



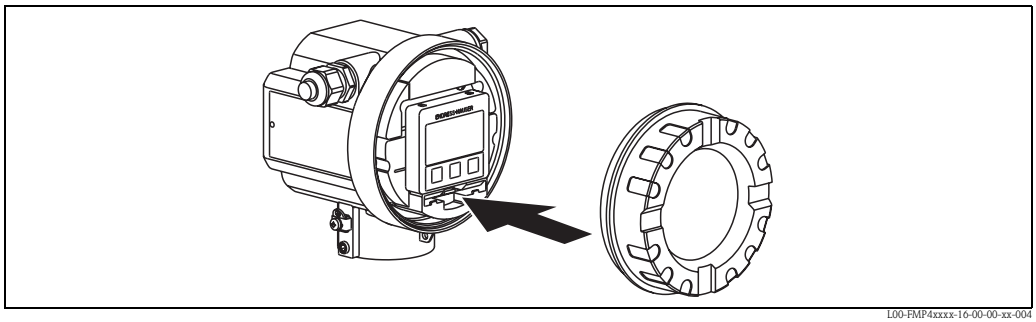
3.4 Installation

3.4.1 Mounting kit

For the mounting, you will require the following tool:
- The tool for flange mounting
- For the mounting of threaded connection:
  60 mm Open-end spanner for 1½", 50 mm Open-end spanner for ¾"
- 4 mm (0.1") Allen wrench for turning the housing

3.4.2 Shortening probes

Note!
When shortening the probe: Enter the new length of probe into the Quick Setup which can be found in the electronics housing under the display.



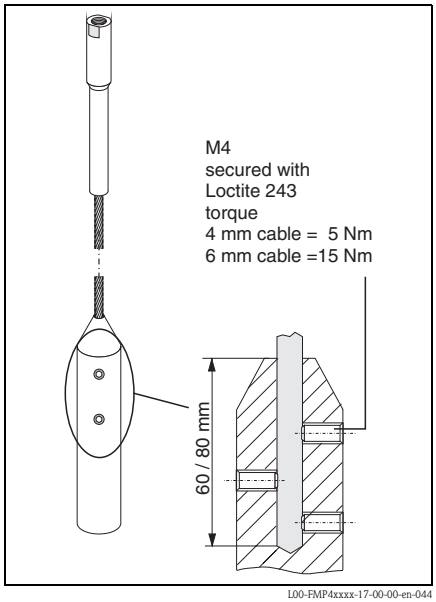
L00-FMP4xxxx-16-00-00-xx-004

Rod probe

The shortening is necessary if the distance to the container floor or outlet cone is less than 50 mm. The rods of a rod probe are shortened by sawing or separating at the bottom end.

Rope probes

The shortening is necessary if the distance to the container floor or outlet cone is less than 150 mm.
- Remove ballast weight:
  The weight is fixed to the probe rope with 3 Allen setscrews (M4, Allen key AF3). The screws are secured with Loctite. This may first have to be made plastic with a hot air apparatus.
- Remove released rope from the weight.
- Measure off new rope length.
- Wrap adhesive tape around the rope at the point to be shortened to prevent it from fanning out.
- Saw off the rope at a right angle or cut it off with a bolt cutter.
- Insert the rope completely into the weight,
  – 4 mm rope: 60 mm deep
  – 6 mm rope: 80 mm deep



L00-FMP4xxxx-17-00-00-en-044

The weight is then refixed to the rope:
- Reapply screw locking fluid (we recommend Loctite type 243) to the setscrews and screw into place.
- When doing so, observe the following torques:
  – 4 mm rope: 5 Nm
  – 6 mm rope: 15 Nm

Coax probes

The shortening is necessary if the distance to the container floor or outlet cone is less than 10 mm. Coax probes can be shortened max. 80 mm from the end. They have centering units inside which fix the rod centrally in the pipe. The centerings are held with borders on the rod. Shortening is possible up to approx. 10 mm below the centering.

3.4.3 Mounting probes in an empty silo

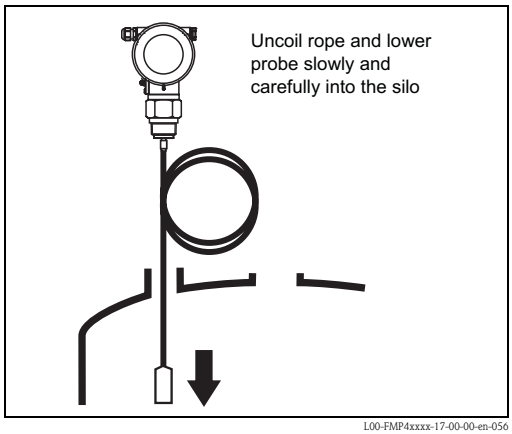
Caution!
If there is a risk of electrostatic discharge from the product, then both processconnection and rope must be earthed before the probe is lowered into the silo.

Levelflex can be screwed into a threaded socket or flange. Proceed as follows:

Insert probe

- Uncoil rope and lower it slowly and carefully into the silo.
- Do not kink the rope.
- Avoid any backlash, since this mightdamage the probe or the silo fittings.

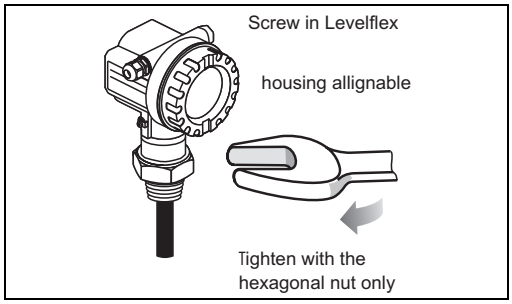
Note!
For flange mounting: if a seal is used, be sure to use unpainted metal bolts toensure good electrical contact betweenprobe flange and process flange.



L00-FMP4xxxx-17-00-00-en-056

Screw down

- Screw the Levelflex into the process connection or to flange.
- Maximum permissible torque:
  – G3/4" : 45 Nm
  – G1-1/2" : 450 Nm
  When using an aramid fibre seal and a process pressure of 40 bar:
  – G3/4" : 25 Nm
  – G1-1/2" : 140 Nm
- Levelflex functions in metal, concrete and plastic silos. When installing inmetal silos, take care to ensure goodmetallic contact between the processconnection and silo.



L00-FMP4xxxx-17-00-00-en-057

3.4.4 Mounting rope probes in a partially full silo

It is not always possible to empty a silo which is already in operation. Because the probe can be turned in the threaded boss, it can also be mounted when the silo is only partially filled. In order to avoid problems when Levelflex is mounted into a partially full silo, the following measures should be taken:

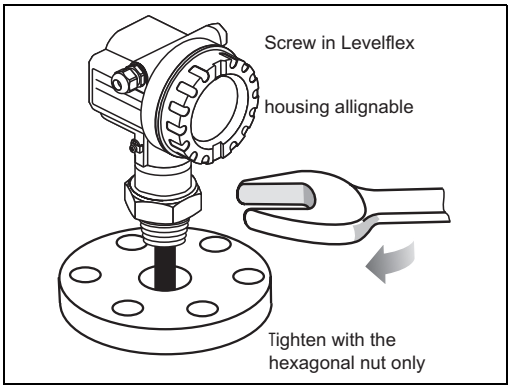
- Mount when the silo is as empty as if possible. A minimum of 2/3 of the silo must be empty.

After mounting, map must be made should the installation conditions require it.

Caution!
If there is a risk of electrostatic discharge from the product, the housing must be earthed before the probe is lowered into the silo.

Screw down

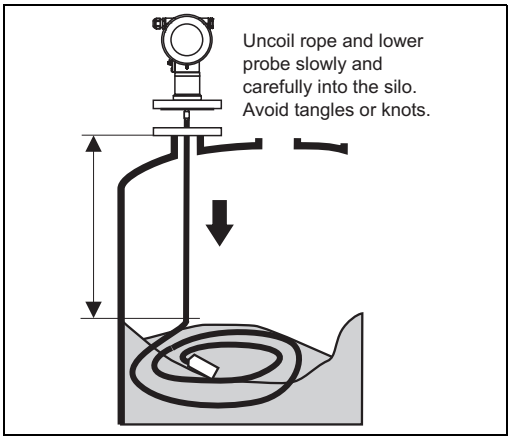
- If appropriate, screw the Levelflex into the threaded flange.
- Maximum permissible torque:
  – G3/4" : 45 Nm
  – G1-1/2" : 450 Nm
  When using an aramid fibre seal and a process pressure of 40 bar:
  – G3/4" : 25 Nm
  – G1-1/2" : 140 Nm
- For flange mounting: if a seal is used, be sure to use unpainted metal bolts to ensure good electrical contact between probe flange and process flange.
- When installing in metal silos, take care to ensure good metallic contact between the process connection and silo.



L00-FMP4xxxx-17-00-00-en-058

Insert probe

- Uncoil rope and lower it slowly and carefully into the silo.
- Avoid tangles.
- Avoid any backlash, since this might damage the silo fittings.
- If possible, make a visual check to see that the rope has not tangled or is lying such that it can knot when the level falls. This is particularly important if a flange was not used. Re-insert the probe if necessary.
- Screw the flange to the counterflange on the nozzle.



L00-FMP4xxxx-17-00-00-en-059

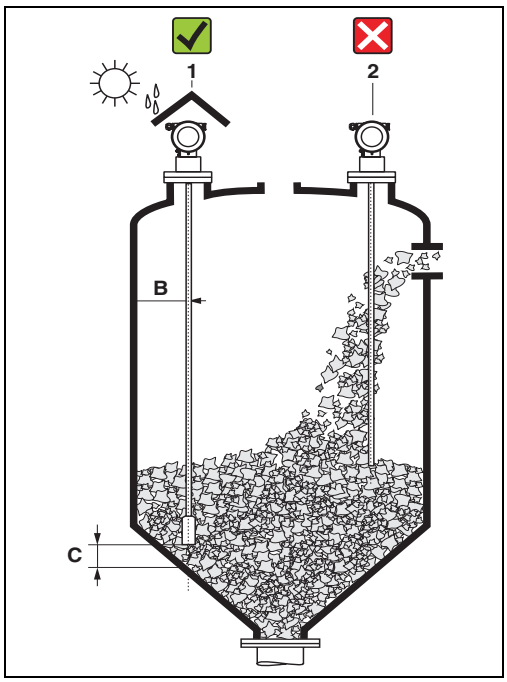
Note!
Before full accuracy is obtained the probe rope must hang fully extended.

3.4.5 Engineering hints for level measurement in bulk solids and fluids

- 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) ("Accessories", → 📄 84).
- 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

Minimum distance B of the probe to the container wall:

Wall	min. distance B
Metal	100 mm for smooth walls
Plastic	100 mm, min. 300 mm to metallic components outside of the tank
Concrete	0.5 m (20"), otherwise the max. possible measuring range is reduced

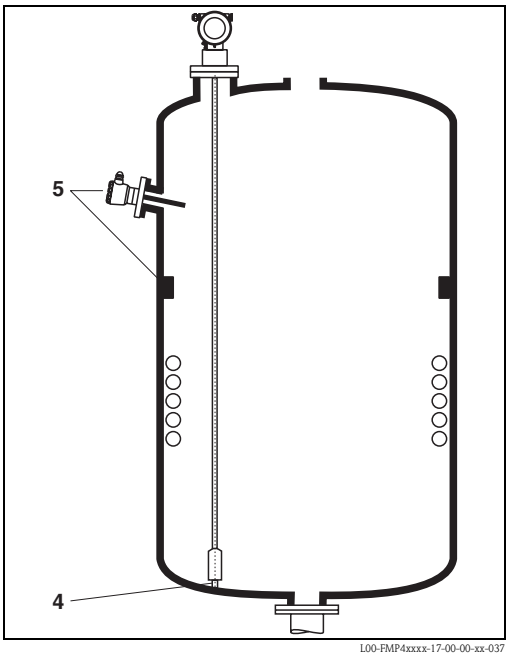
Distance to protruding internals min. 300 mm.

Other installations

- Select the mounting location such that the distance to internals (5) (e.g. limit switch, struts) > 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 (→ 📄 27)!

Optimization options

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

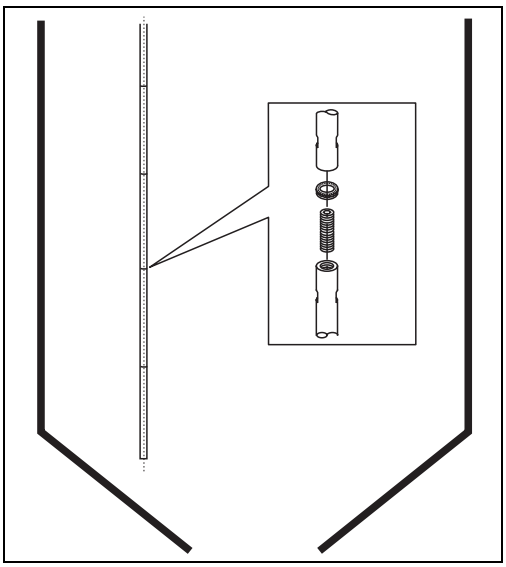


L00-FMP4xxxx-17-00-00-xx-037

Separable probes

If there is little mounting space (distance to the ceiling), it is advisable to use separable rod probes (∅16 mm).

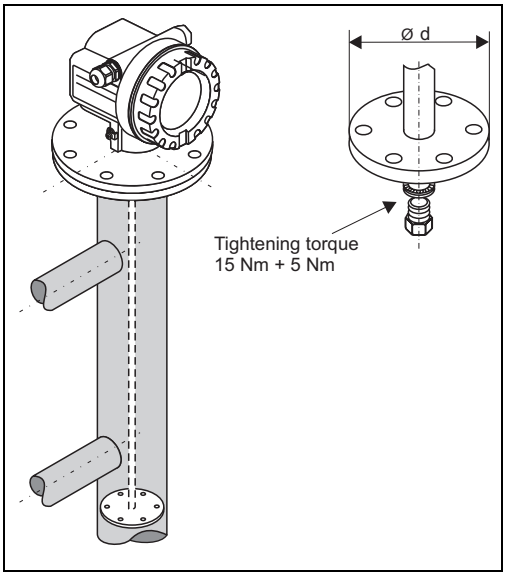
- max. probe length 10 m (394 in)
- max. sideways capacity 20 Nm
- probes are separable several times with the lengths:
  – 500 mm (19.68 in)
  – 1000 mm (39.37 in)
- torque: 15 Nm


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

Centering of probe end

If the centering disk is mounted at the end of the probe, it enables a reliable measuring.
See "Ordering structure", → 📄 6.

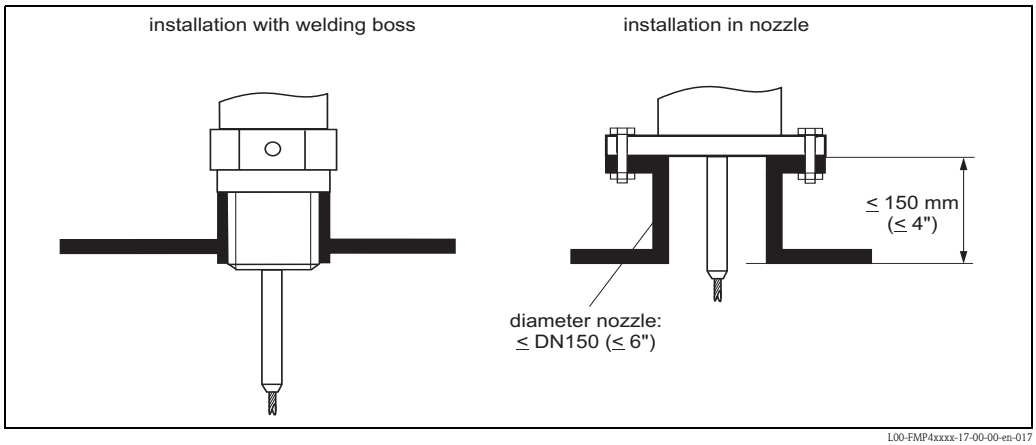
Centering disk for rod probes:
- d = 45 mm (DN50 (2"))
- d = 75 mm (DN80 (3") + DN100 (4"))



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

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, → 27).
- 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 to 150 mm in diameter and should not be more than 150 mm high. Installation adapters are available for other dimensions, → 84.



Welding the probe into the vessel

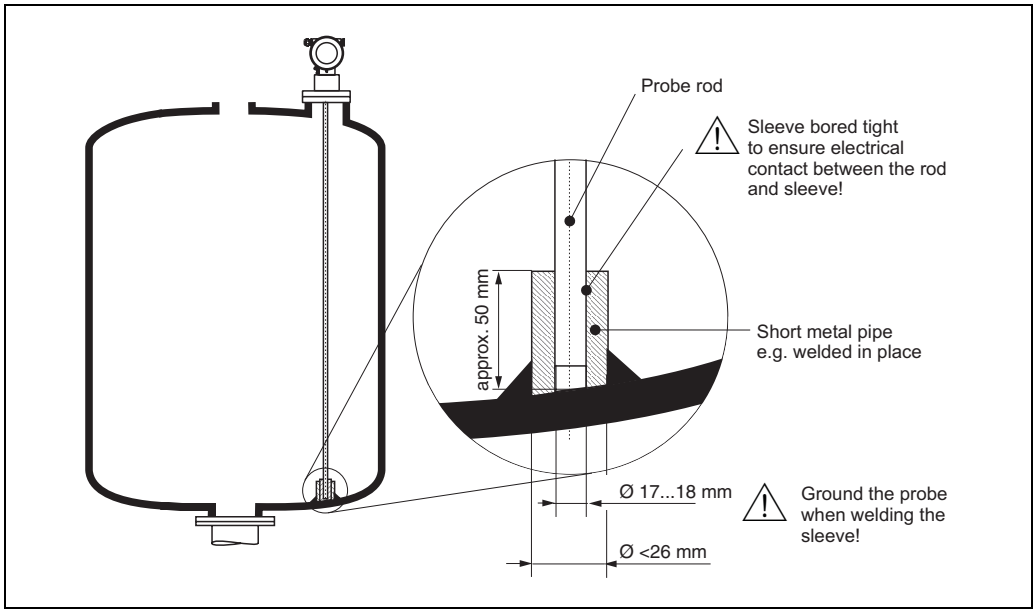
Caution!
Before welding the probe into the vessel, it must be grounded by a low-resistive connection. If this is not possible, the electronics as well as the HF module must be disconnected. Otherwise the electronics may be damaged.

Supporting probes against warping

For WHG approval:
For probe lengths ≥ 3 m a support is required (see figure).

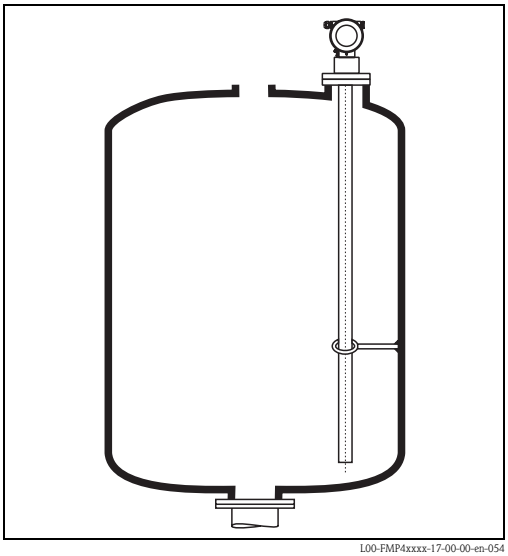
For GL/ABS approval:
Rod probes ∅ 16 mm ≤ 1 m permissible, Rod probes ∅ 6 mm not permissible.
For coax probes ≥ 1 m a support is required (see figure).

a. Rod probes



L00-FMP4xxxx-17-00-00-en-055

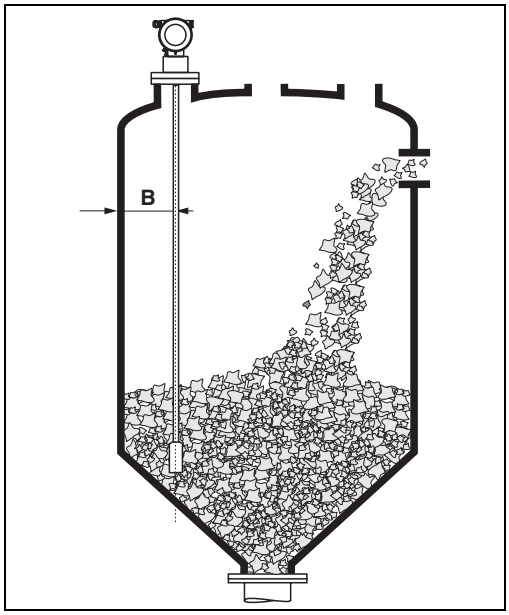
b. Coax probes



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

3.4.6 Special notes for bulk solids

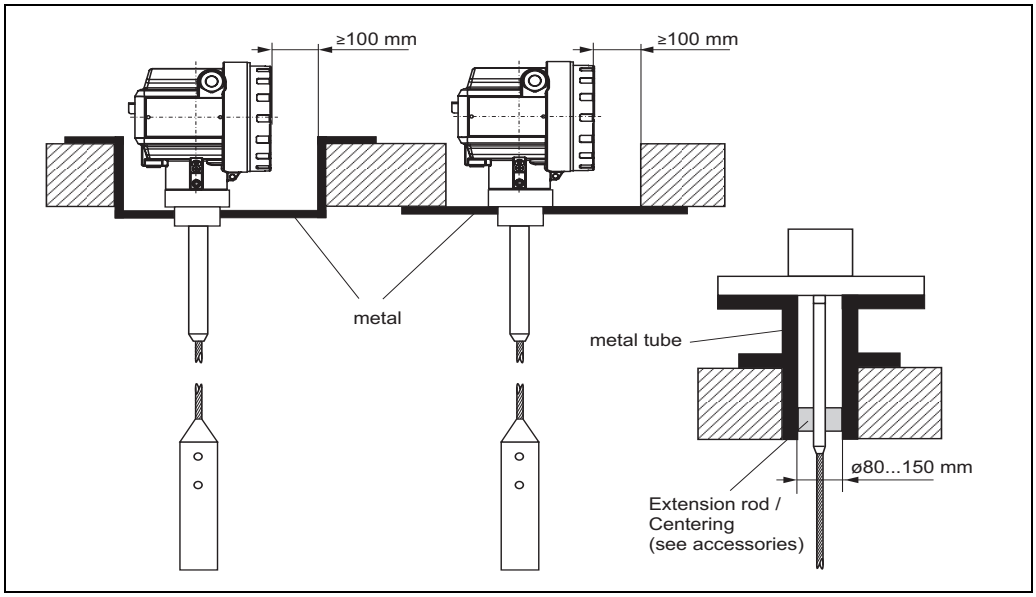
- In the case of bulk solids, as great a distance as possible from the filling curtain is especially important to avoid wear.
- In concrete silos, a **large distance** (B) should be observed between the probe and the concrete wall, if possible ≥ 1m, but at least 0.5 m
- The installation of rope probes 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

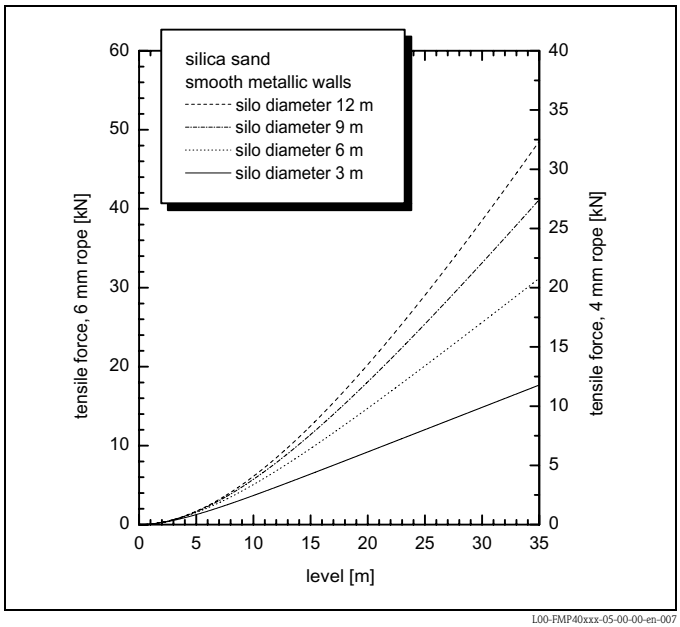
Strong dust generation can lead to build-up behind the center washer. This can cause an interference signal. For other installation possibilities please contact Endress+Hauser.

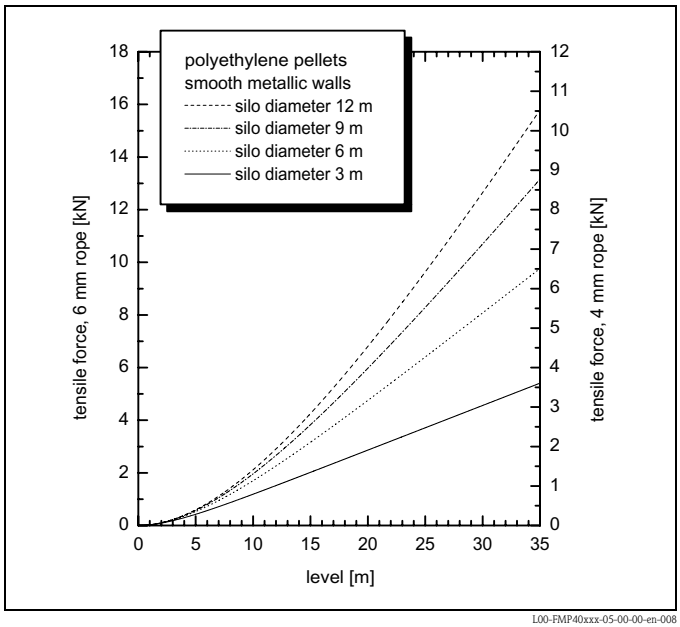
3.4.7 Installation in bulk solid silos

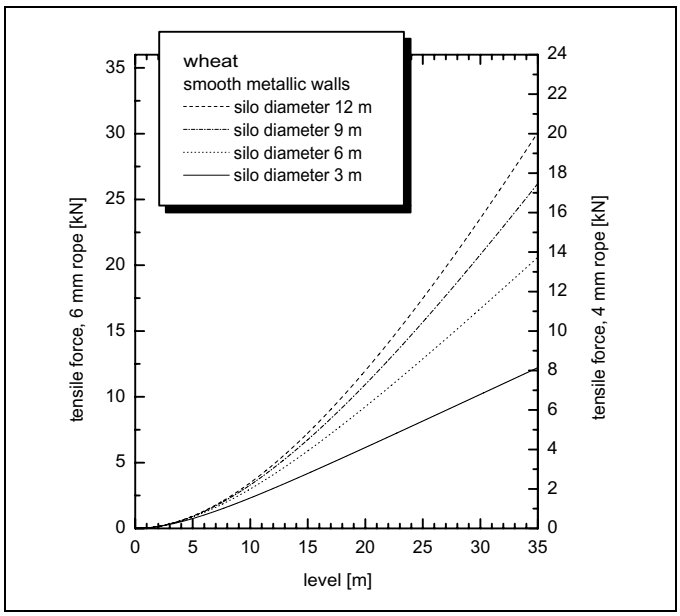
Tensile load

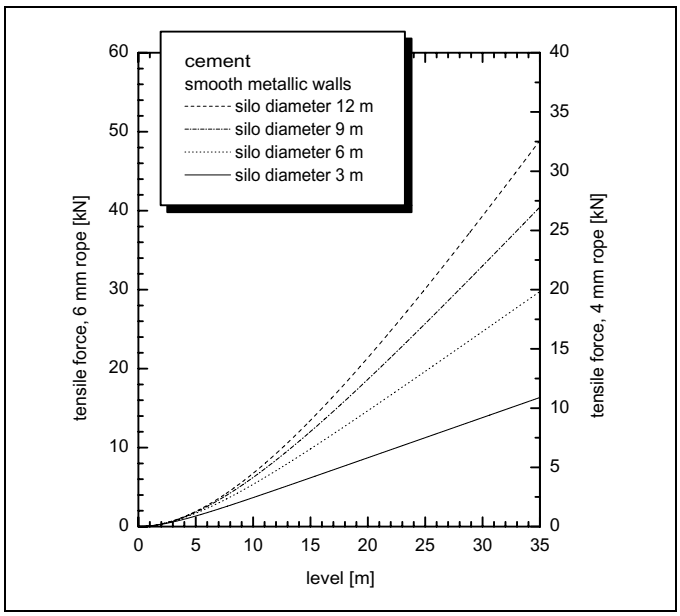
Bulk solids exert tensile forces on rope probes whose height increases with:
- the length of the probe, i.e. max. cover,
- the bulk density of the product,
- the silo diameter
- the diameter of the probe rope

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.

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.

3.4.8 Installation in liquid tanks

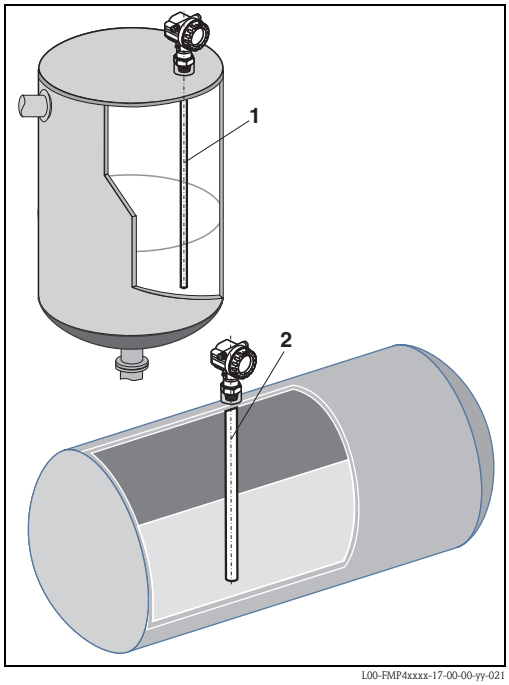
- When installing in agitation units, check whether a no-contact process (ultrasonic or radar) would be better suited, especially if the agitator generates large mechanical loads on the probe.
- If Levelflex is, nevertheless, installed in tanks with agitators, it is better to use coax probes which have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

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 with the Level-Radar Micropilot M.

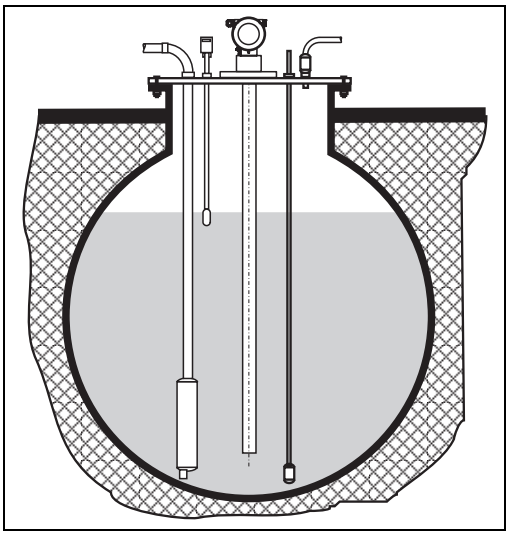
Installation in horizontal and upright cylindrical tanks

- Use the following types of probe for measuring ranges
  – up to 4 m (13 ft): rod probe (1) or coax probe (2)
  – up to 10 m (33 ft): separable probe
  – above 10 m (33 ft): 4 mm rope probe
- 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.

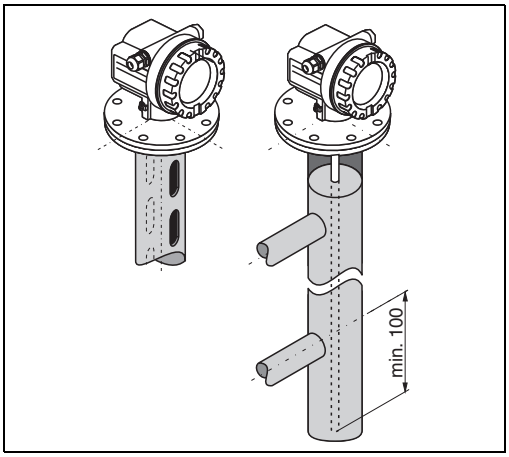


L00-FMP4xxxx-17-00-00-yy-022

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 (Installation instructions, → 28). Levelflex measures the level through the plastic in both cases.

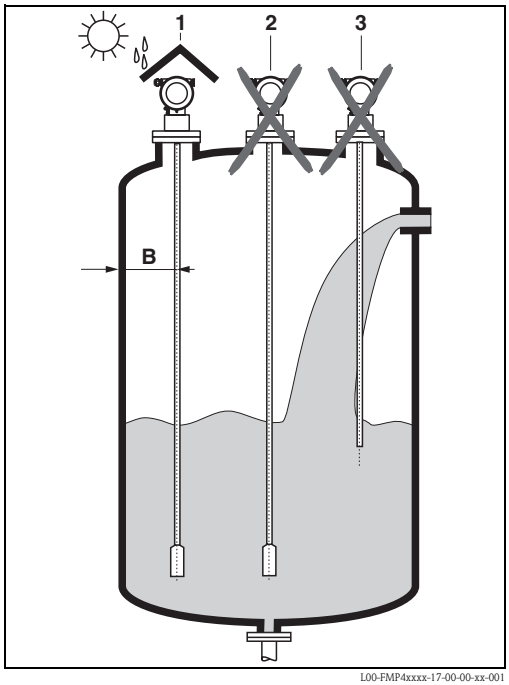
Installation in stilling well or bypass
- A rod probe can be used for pipe diameters bigger than 40 mm.
- When installing a rod probe into a metallic pipe with internal diameter of up to 150 mm, you have all the advantages of a coax probe.
- Welded joints that protrude up to approx. 5 mm (0.2") inwards do not influence measurement.
- If a rod probe is used, the probe length must be 100 mm longer than the lower disposal.
- It must be ensured that the probe does not come into contact with the side wall. Where necessary, use a centering disk at the lower end of the probe ("Type of Probe:", → 8)



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

Mounting Location

- Recommended distance B wall-mounted rope probe: ~1/6 to 1/4 of the container diameter.
- Not central (2) in metallic tanks.
- Not in the filling curtain (3).
- Please order the probe length such that it ends approx. 30 mm above the floor of the tank.
- Temperature conditions must be met.
- It is recommended that a protective cover (1) be used, in order to protect the transmitter against direct sunlight or rain. Mounting and demounting are carried out simply with a clamp ("Accessories", → 84).



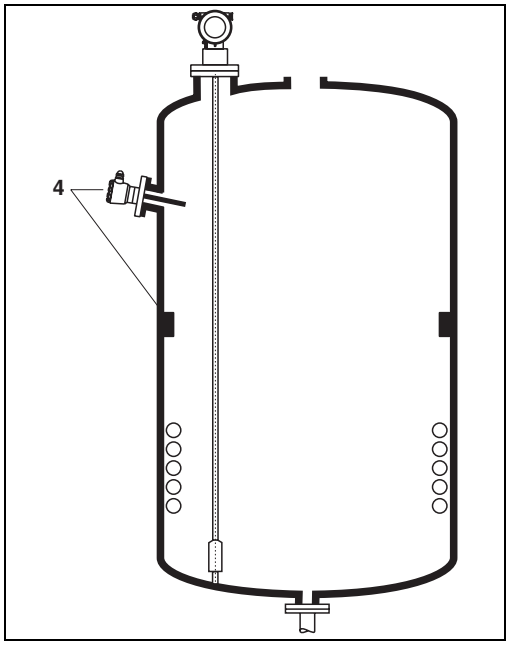
L00-FMP4xxxx-17-00-00-xx-001

Tank installations

Select the mounting location such that the distance to internals (4) (e.g. limit switch, struts) is > 300 mm.

Optimization options

- Interference echo suppression: Measurement can be optimised by electronically tuning out interference echoes.
- Bypass pipe and stilling well (only for liquids): for viscosities of up to 500 cSt, a bypass pipe, stilling well or a coax probe can be used to prevent interference.



L00-FMP4xxxx-17-00-00-xx-002

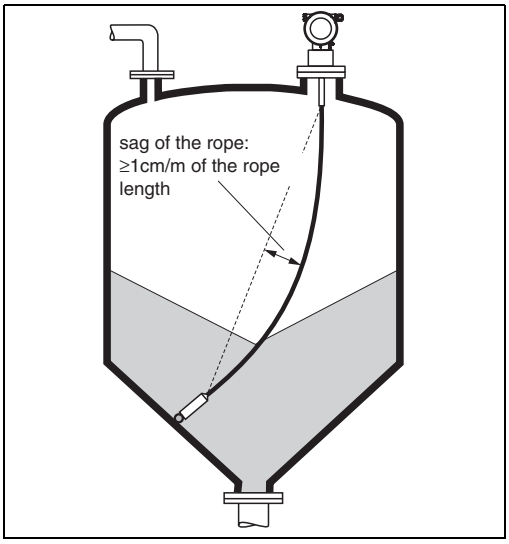
3.4.9 Notes on special installation situations

Welding the probe into the vessel

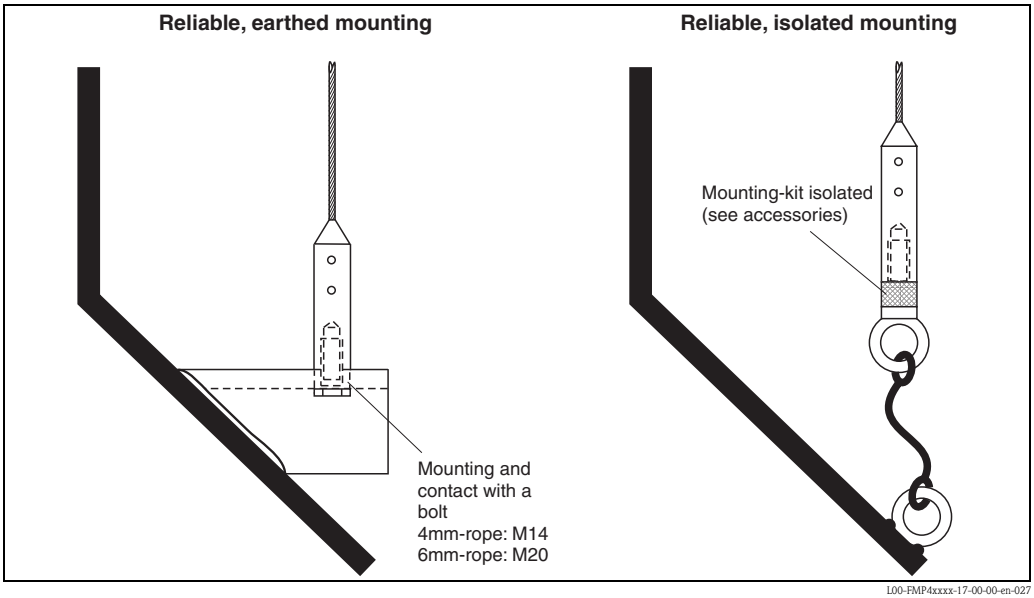
Caution!
Before welding the probe into the vessel, it must be grounded by a low-resistive connection. If this is not possible, the electronics as well as the HF module must be disconnected. Otherwise the electronics may be damaged.

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:
  – 4 mm rope: M14
  – 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 ("Accessories", → 📄 84)! 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 (→ 📄 89).
- 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 ≥ 1cm/m of the rope length.



L00-FMP4xxxx-17-00-00-de-019

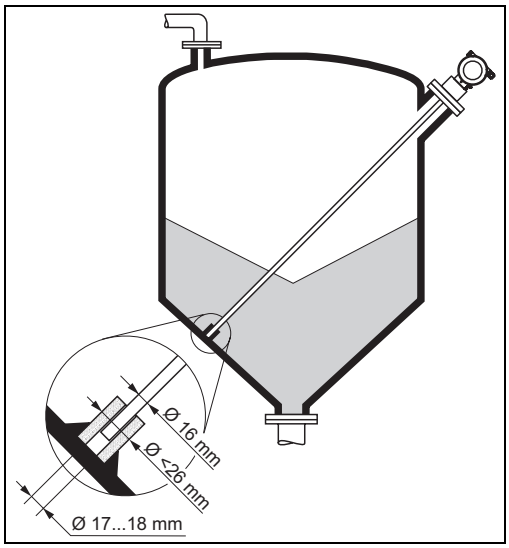


L00-FMP4xxxx-17-00-00-en-027

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 ("Fixing rope probe", → 27).
- Support coax probe if the lateral load-bearing capacity is exceeded. Only fix rod probes at the probe end.
- Connect rod probe metallically with the container wall.

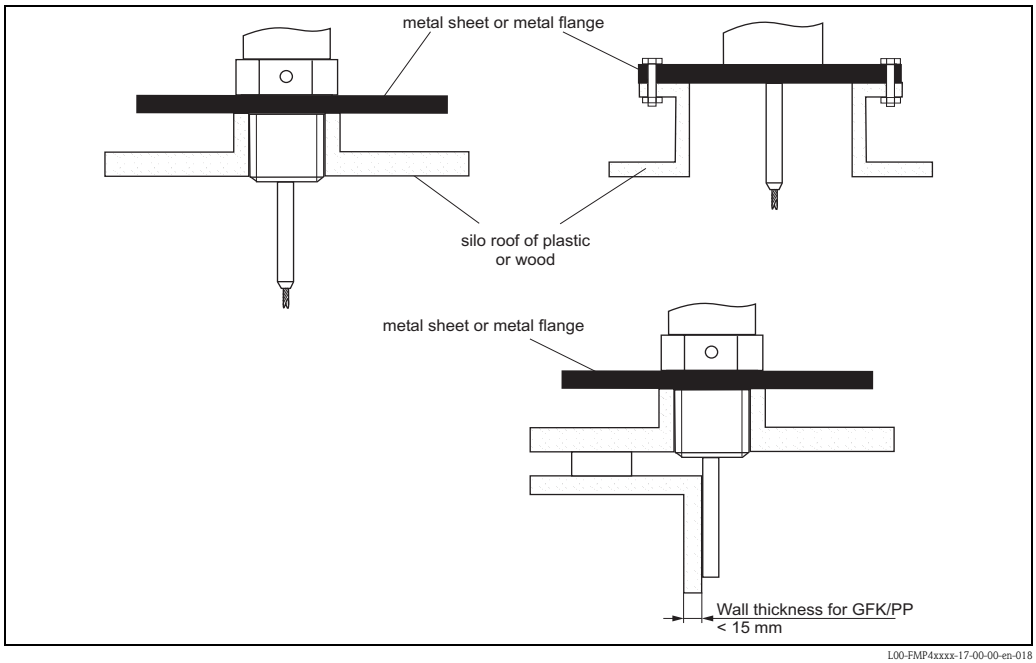
Caution!
Remove or ground the electronics when welding the sleeve as the device will otherwise be destroyed!



L00-FMP4xxxx-17-00-00-xx-037

Installation in plastic containers

Please note that the "guided level-radar" measuring principle requires a metallic surface at the process connection! When installing rod or robe 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.

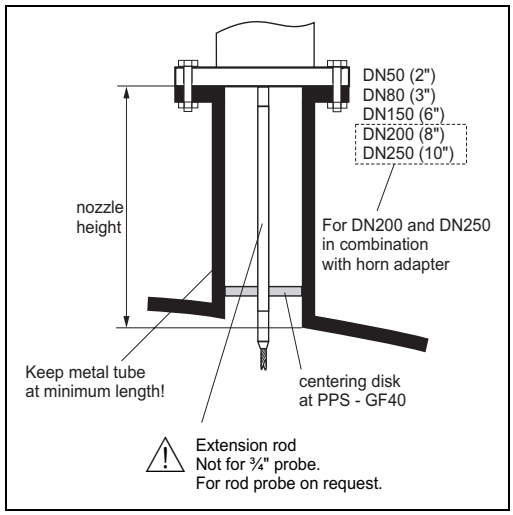


L00-FMP4xxxx-17-00-00-en-018

- 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.
- If measuring externally, an automatic probe length determination and a two point linearisation must be performed in order to compensate for the time-of-flight change caused by the plastic wall.

Installation in nozzles > 150 mm high

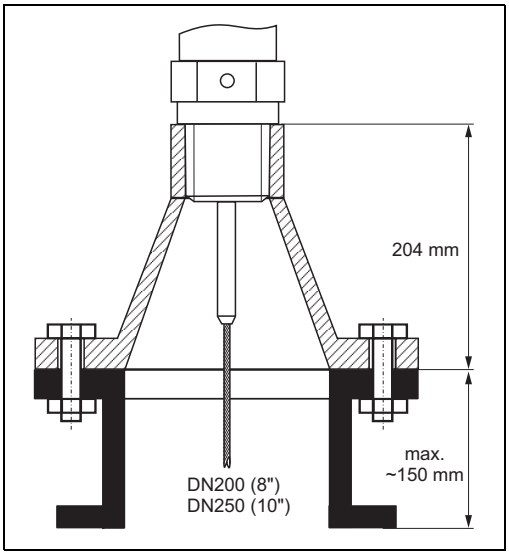
If, when installing probes in nozzles DN40 (1½")to 250 (10") with nozzle height of > 150 mm (6"), the probe could touch the lower edge due to moving materials in the container, we recommend using an extension rod with or without centering disk. This accessory consists of the extension rod corresponding 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", → 88.
Order codes for specific nozzle nominal diameters and heights can be found, → 88.
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

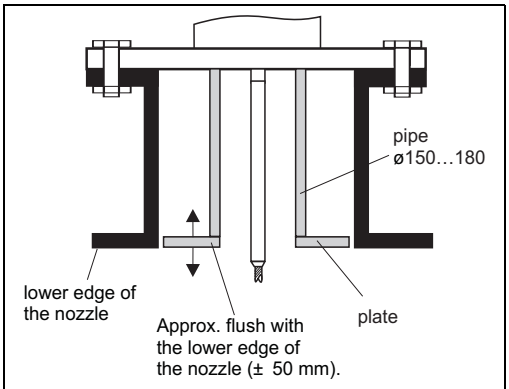
When installing the Levelflex in nozzles of > 200 mm (8"), signals are generated by reflections on the nozzle wall, which can sometimes lead to faulty measurements in the case of products with small dielectric constants. With nozzle diameters of 200 mm (8") or 250 mm (10"), therefore, a special flange with a "horn adaptor" 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 nozzles

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



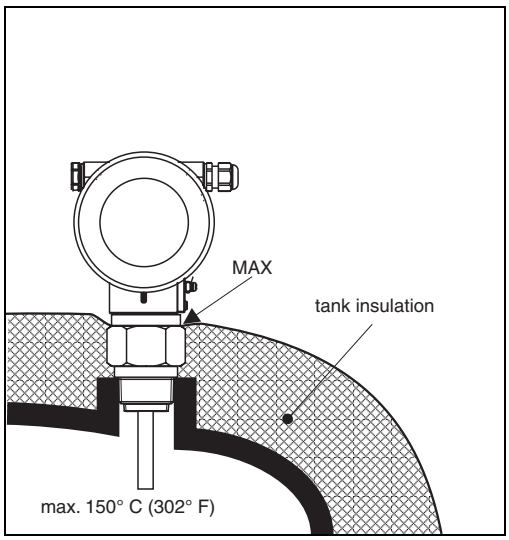
nozzle diameter	plate diameter
DN300	280
≥ DN400	≥ 350

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

Installing FMP40 with heat insulation

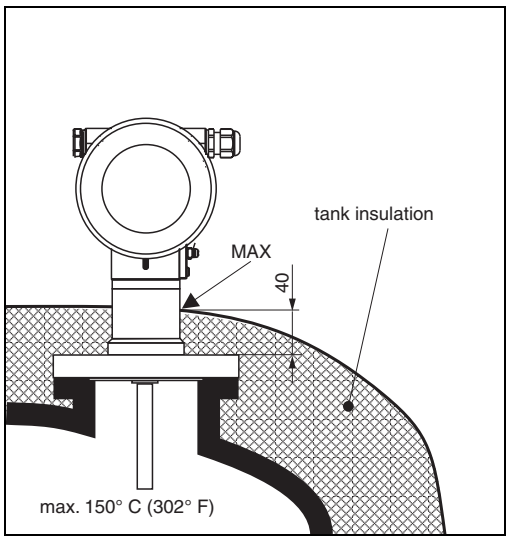
- If process temperatures are high, FMP40 must be included in normal tank insulation to prevent the electronics heating up as a result of heat radiation or convection.
- The insulation may not exceed beyond the points labelled "**MAX**" in the drawing.

Process connection with adapter G¾, G1½, ¾NPT or 1½NPT



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

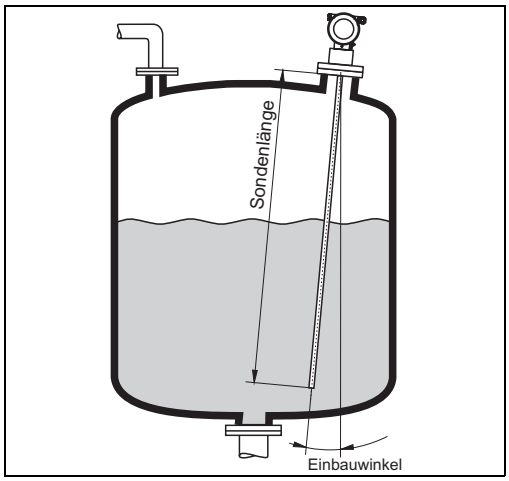
Process connection with flange DN40 to DN200



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

Installation at an angle

- For mechanical reasons, the probe should be installed as vertically as possible.
- With inclined installations the probe length has to be adjusted in dependence to the installation angle.
  - up to 1 m = 30°
  - up to 2 m = 10°
  - up to 4 m = 5°



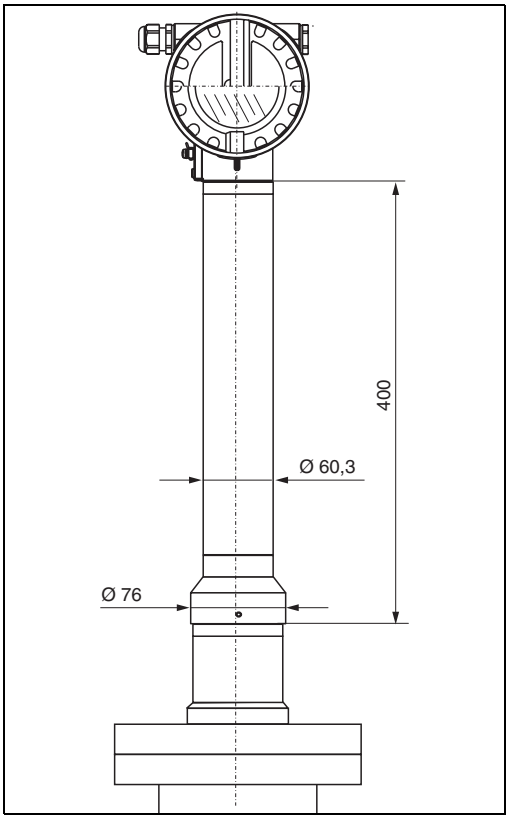
L00-FMP4xIxx-17-00-00-de-048

Installation for difficult to access process connections

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

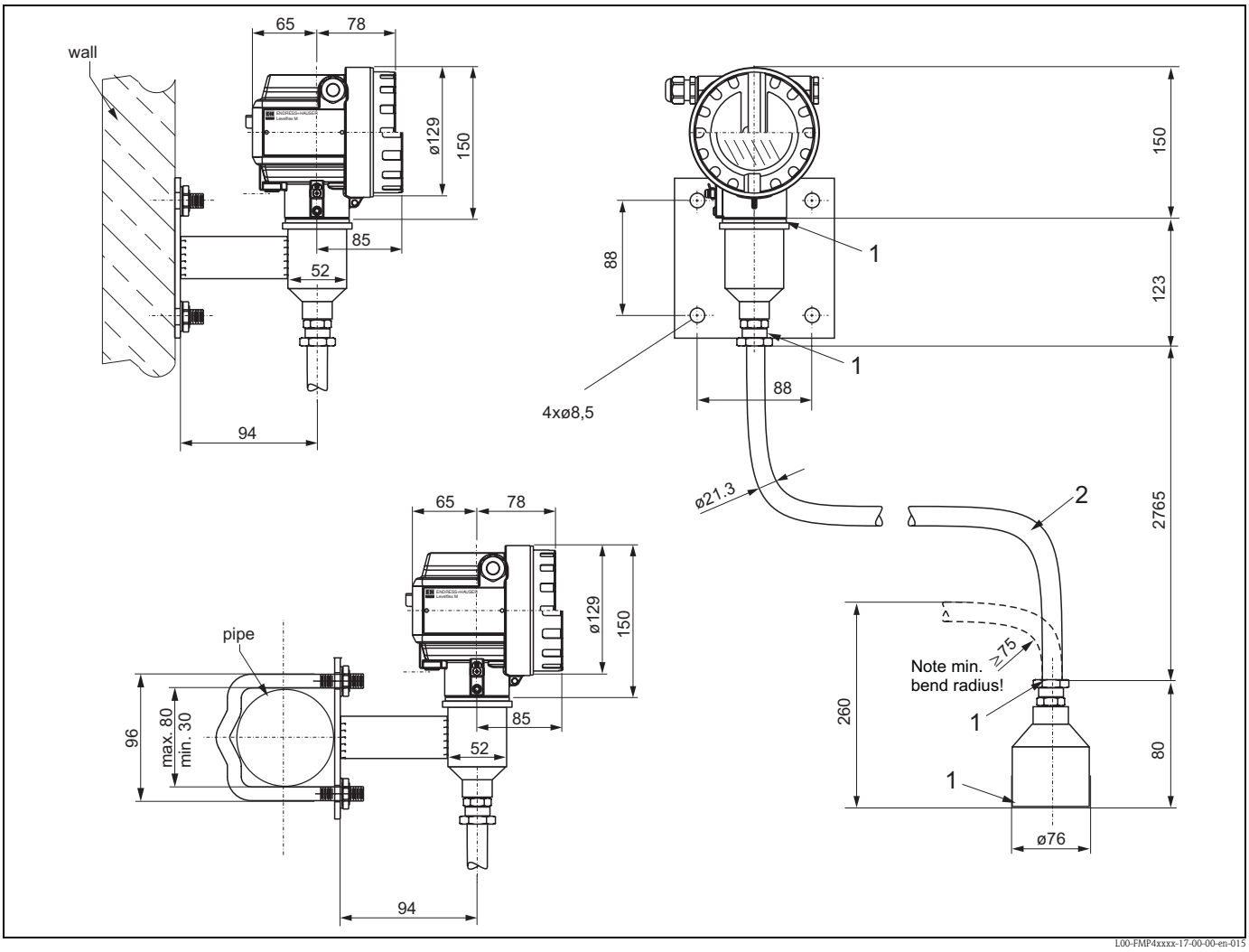
Installation with distance pipe

When installing, please observe the installation instructions (→ 🖹 18) and 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.



Installation with remote electronic

- Wall and pipe bracket is contained in the scope of delivery and is already mounted
- Follow installation instructions, → 18
- Mount housing on a wall or pipe as shown in the diagram

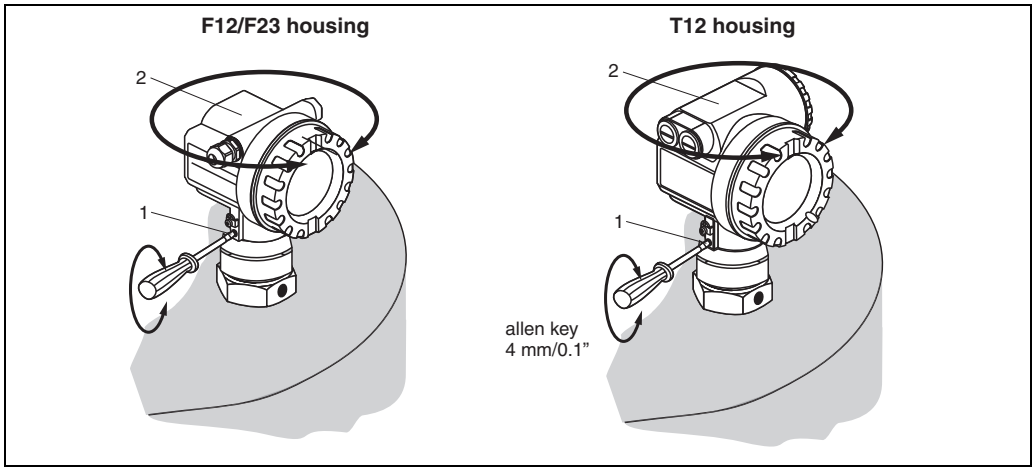


Note!
The protective hose cannot be disassembled at these points (1).

The ambient temperature for the connecting line (2) between the probe and the electronics must not be greater than 105 °C. The version with remote electronics consists of the probe, a connecting cable and the housing. If they are ordered as a complete unit they will be delivered assembled and cannot be separated.

3.4.10 Turn housing

After mounting, the housing can be turned 350° in order to simplify access to the display and the terminal compartment. Proceed as follows to turn the housing to the required position:
- Undo the fixing screws (1)
- Turn the housing (2) in the required direction
- Tighten up the fixing screws (1)



L00-FMP4xxxx-17-00-00-en-028

3.5 Post-installation check

After the measuring device has been installed, perform the following checks:
- Is the measuring device damaged (visual check)?
- Does the measuring device correspond to the measuring point specifications such as process temperature/pressure, ambient temperature, measuring range, etc.?
- Are the measuring point number and labeling correct (visual check)?
- Is the measuring device adequately protected against rain and direct sunlight (→ 84)?

4 Wiring

4.1 Quick wiring guide

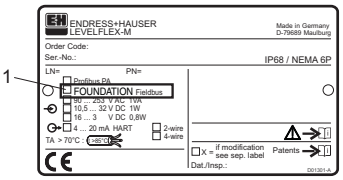
Wiring in F12/F23 housing

Caution!

Before connection please note the following:

FOUNDATION Fieldbus devices are marked on the nameplate (1). The voltage is determined by the FOUNDATION Fieldbus standard and the desired safety concept. (e.g. FISCO).

- Connect potential matching line to transmitter ground terminal (7) before connecting up the device.
- Tighten the locking screw (8): It forms the connection between the antenna and the housing earth potential.

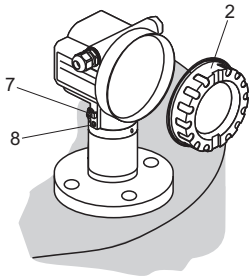


When you use the measuring system in hazardous areas, make sure you comply with national standards and the specifications in the safety instructions (XA's). Make sure you use the specific cable gland.

EX

On devices supplied with a certificate, the explosion protection is designed as follows:

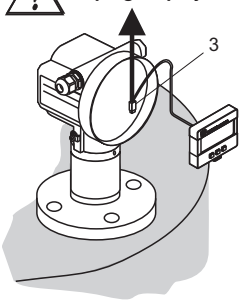
- Housing F12 - Ex ia: Power supply must be intrinsically safe.
- The electronics and the current output are galvanically separated from the probe circuit.



Connect up the Levelflex M as follows:

- Unscrew housing cover (2).
- Remove any display (3) if fitted.
- Remove cover plate from terminal compartment (4).
- Pull out terminal module slightly using pulling loop.
- Insert cable (5) through gland (6). Use screened, twisted wire pair.

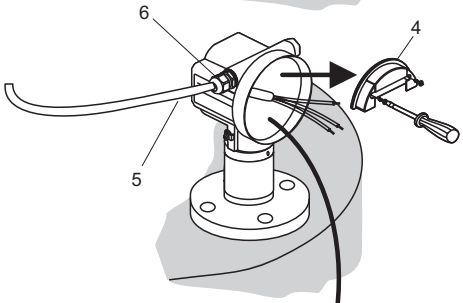
Unplug display connector!

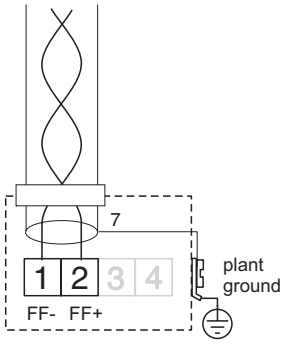


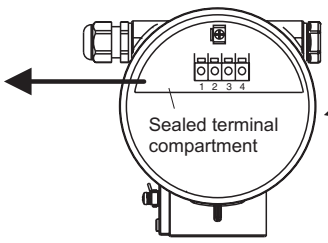
EX

Only ground screen conductor (7) on sensor side.

- Make connection (see pin assignment).
- Re-insert terminal module.
- Tighten cable gland (6).
- Tighten screws on cover plate (4).
- Insert display if fitted.
- Screw on housing cover (2). (on dust-Ex torque » 40 Nm).







L00-FMP41Cxx-04-00-00-en-005

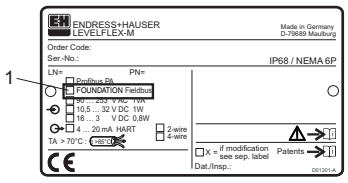
Wiring in T12 housing

Caution!

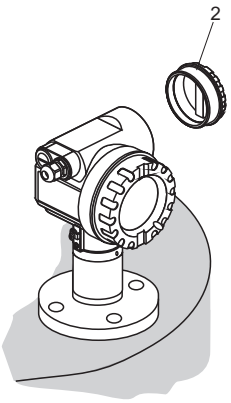
Before connection please note the following:

FOUNDATION Fieldbus devices are marked on the nameplate (1). The voltage is determined by the FOUNDATION Fieldbus standard and the desired safety concept. (see chapter 4.3).

- Connect potential matching line to transmitter earth terminal before connecting up the device.
- Tighten the locking screw:
  It forms the connection between the probe and the housing earth potential.



When you use the measuring system in hazardous areas, make sure you comply with national standards and the specifications in the safety instructions (XA's).
Make sure you use the specific cable gland.



Connect up the Levelflex M as follows:

EX

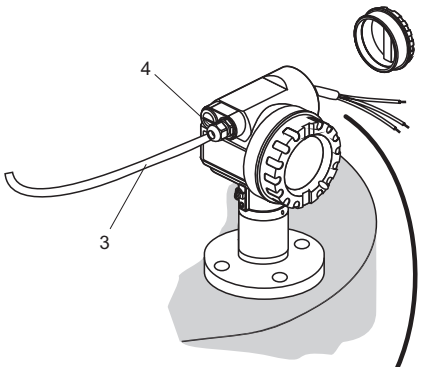
Before unscrew housing cover (2) at seperate connection room turn off the power supply!

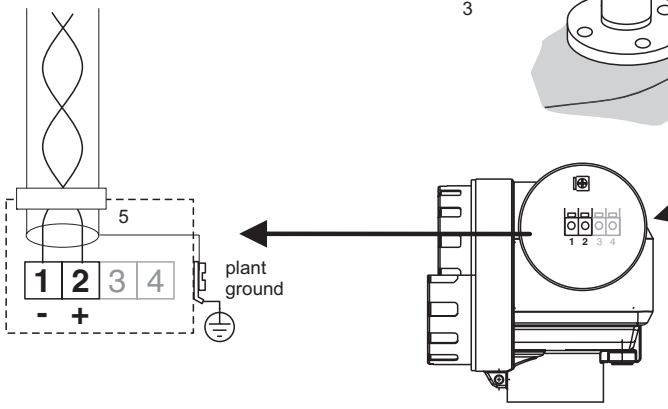
- Insert cable (3) through gland (5).
  Use screened, twisted wire pair.

EX

Only ground screening of the line (5) on sensor side.

- Make connection (see pin assignment).
- Tighten cable gland (4).
- Screw on housing cover (2).
- Switch on power supply.





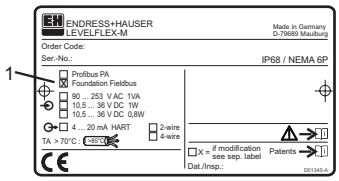
L00-FMP41Cxx-04-00-00-en-006

Wiring with FOUNDATION Fieldbus connector

Caution!

Before connection please note the following:

- Foundation Fieldbus devices are marked on the nameplate (1). The voltage is determined by the Foundation Fieldbus standard and the desired safety concept (e.g. FISCO).
- Connect potential matching line to transmitter earth terminal (4) before connecting up the device.

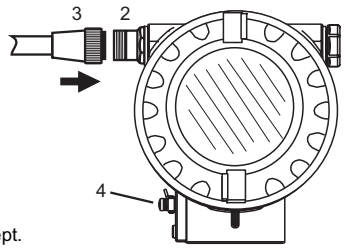


When you use the measuring system in hazardous areas, make sure you comply with national standards and the specifications in the safety instructions (XA's).

EX

On devices supplied with a certificate, the explosion protection is designed as follows:

- Housing F12 - Ex ia:
  Power supply must be intrinsically safe (e.g. FISCO).
- The electronics and the current output are galvanically separated from the antenna circuit.



The Levelflex M is connected as follows:

- Insert plug (2) into bushing (3).
- Screw firmly
- Ground the device according to the desired safety concept.

L00-FMP41Cxx-04-00-00-en-007

Cable specification FOUNDATION Fieldbus

Twisted, shielded pairs must be used. The cable specifications can be taken from the FF specification or IEC 61158-2. The following have been found suitable:

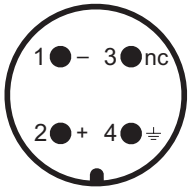
Non-Ex-area:
- Siemens 6XV1 830-5BH10
- Belden 3076F
- Kerpen CEL-PE/OSCR/PVC/FRLA FB-02YS(ST)YFL

Ex-area:
- Siemens 6XV1 830-5AH10
- Belden 3076F
- Kerpen CEL-PE/OSCR/PVC/FRLA FB-02YS(ST)YFL

Connectors

For the versions with a connector, the housing does not have to be opened for connecting the signal line.

PIN assignment for 7/8" connector



A0011176

PIN	Meaning
1	Signal –
2	Signal +
3	Not assigned
4	Earth

4.2 Connecting the measuring unit

4.2.1 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.

4.2.2 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

4.2.3 Terminals

For wire cross-sections of 0.5 to 2.5 mm^2

4.2.4 Cable entry

- Cable gland: M20x1.5 (only cable entry for Ex d)
- Cable entry: G½ or ½NPT
- FOUNDATION Fieldbus 7/8" plug

4.2.5 Supply voltage

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

Type	Terminal voltage
standard	9 V to 32 V
Ex ia (FISCO model)	9 V to 17,5 V
Ex ia (Entity concept)	9 V to 24 V

Supply voltage	9 V to 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).

4.2.6 Current consumption

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

4.2.7 Overvoltage protection

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

- the measuring device with integrated overvoltage protection with gas discharge tubes within the T12-enclosure is used, refer to "Ordering structure", → 📄 6
  or
- this protection is achieved by the use of other appropriate measures (external protection devices e.g. HAW562Z).

4.3 Recommended connection

For maximum EMC protection please observe the following points:

- The external ground terminal on the transmitter must be connected to ground.
- The continuity of the cable screening between tapping points must be ensured.
- If potential equalisation is present between the individual grounding points, ground the screening at each cable end or connect it to the device housing (as short as possible).
- If there are large differences in potential between grounding points, the grounding should run via a capacitor that is suitable for high frequency use (e.g. ceramic 10 nF/250 V~).

Caution!
Applications, which are subject to the explosion prevention, permit only under special conditions the repeated grounding of the protective screen, see to EN 60079-14.

4.4 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)

4.5 Post-connection check

After wiring the measuring device, perform the following checks:

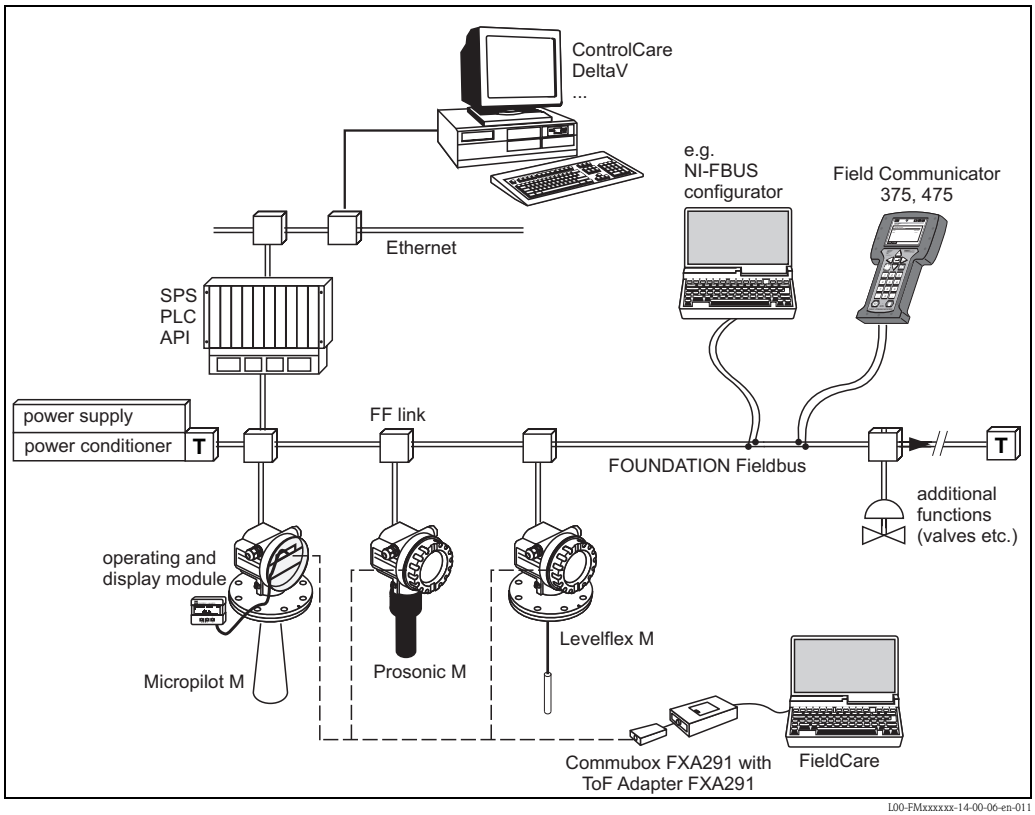
- Is the terminal allocation correct (→ 📄 34, 35)?
- Is the cable gland tight?
- Is the Foundation Fieldbus connector screwed tight?
- Is the housing cover screwed tight?
- If auxiliary power is available:
  Is the device ready for operation and is the liquid crystal display visible?

5 Operation

This chapter gives an overview of the different operating options for the device. The different methods of parameter access are described and the preconditions for each method are stated. The meaning of the parameters is not described in this chapter. Instead, refer to:

- Chapter 6: "Commissioning"
- Operating Instructions BA00245F/00/EN "Description of Instrument Functions"

5.1 Quick operation guide



5.1.1 On-site operation

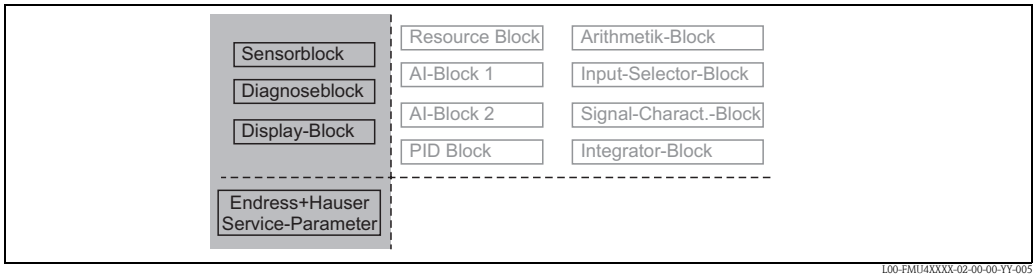
Options for on-site operation

- Display and operating module VU331
- Endress+Hauser operating software "FieldCare"

Parameter access by on-site operation

The following parameters can be accessed by on-site operation:

- Parameters of the device specific blocks (Sensor Block, Diagnostic Block, Display Block)
- Endress+Hauser service parameters
- in the Resource Block: "Instrument Tag", "Instrument ID", "Instrument Revision", "DD Revision" (read only)



The highlighted parameters can be edited by on-site operation.

5.1.2 Remote operation

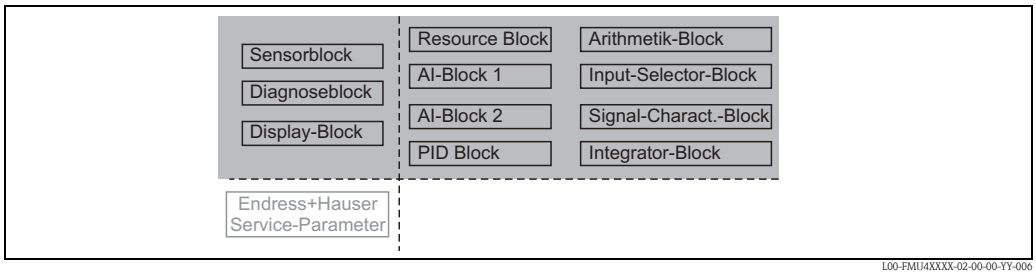
Options for remote operation

- FOUNDATION Fieldbus configuration tool (e.g. DeltaV or ControlCare)
- Handheld terminal Field Communicator 375, 475

Parameter access by remote operation

The following parameters can be accessed by remote operation:

- Parameters of the device specific blocks (Sensor Block, Diagnostic Block, Display Block)
- Parameters of the FOUNDATION Fieldbus function blocks

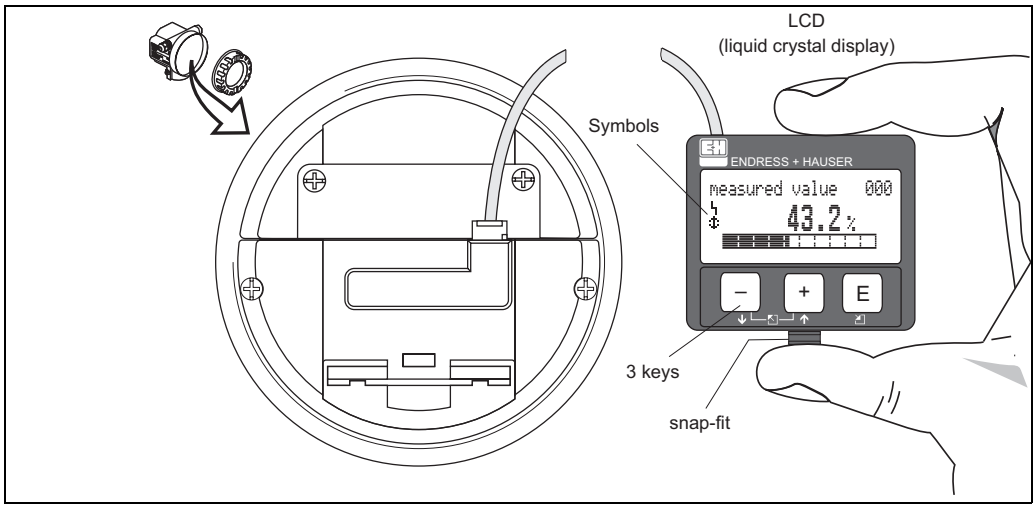


The highlighted parameters can be edited by remote operation.

5.2 Operation with the display and operating module VU331

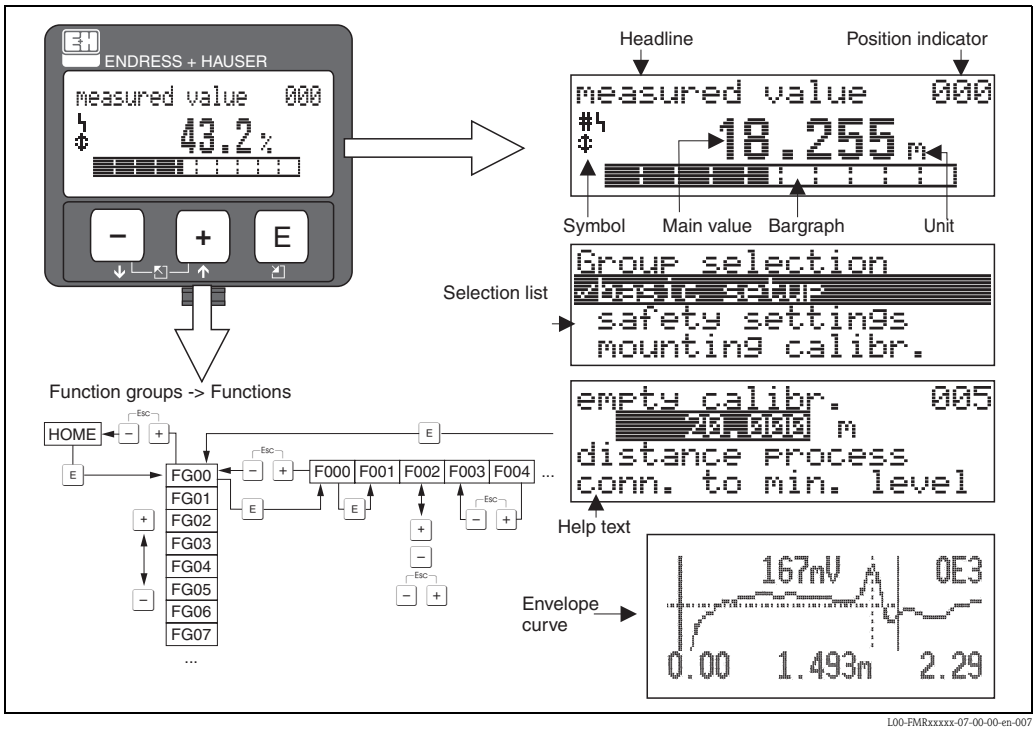
5.2.1 Liquid crystal display (LCD)

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



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.

5.2.2 Display



5.2.3 Display symbols

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

Sybmol	Meaning
	**ALARM_SYMBOL** This alarm symbol appears when the device is in an alarm state. If the symbol flashes, this indicates a warning.
	**LOCK_SYMBOL** This lock symbol appears when the device 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.

5.2.4 Key assignment

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

Functino of the keys

Key(s)	Meaning
+ or ↑	Navigate upwards in the selection list. Edit numeric value within a function.
− or ↓	Navigate downwards in the selection list. Edit numeric value within a function.
Esc − + or ←	Navigate to the left within a function group.
E	Navigate to the right within a function group, confirmation.
+ and E or − and E	Contrast settings of the LCD.
+ and − and E	Hardware lock / unlock After a hardware lock, an operation of the device 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.

5.2.5 The operating menu

General structure of the operating menu

The operating menu is made up of two levels:

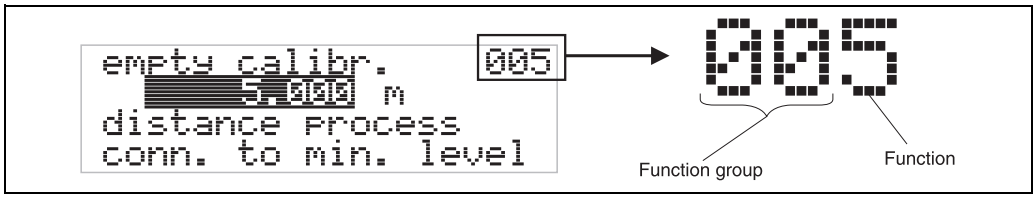
- **Function groups (00, 01, 03, ..., 0C, 0D)**: The individual operating options of the device are split up roughly into different function groups. The function groups that are available include, e.g.: **"basic setup"**, **"safety settings."**, **"output"**, **"display"**, etc.
- **Functions (001, 002, 003, ..., 0D8, 0D9)**: Each function group consists of one or more functions. The functions perform the actual operation or parameterisation of the device. Numerical values can be entered here and parameters can be selected and saved. The available functions of the **"basic setup" (00)** function group include, e.g.: **"tank shape" (002)**, **"medium property" (003)**, **"process cond." (004)**, **"empty calibr." (005)**, etc.

If, for example, the application of the device is to be changed, carry out the following procedure:

1. Select the **"basic setup" (00)** function group.
2. Select the **"tank shape" (002)** function (where the existing tank shape is selected).

Function codes

For easy orientation within the function menus, for each function a position is shown on the display.



L00-FMRxxxxx-07-00-00-de-005

The first two digits identify the function group:

- **basic setup** **00**
- **safety settings** **01**
- **linearisation** **04**

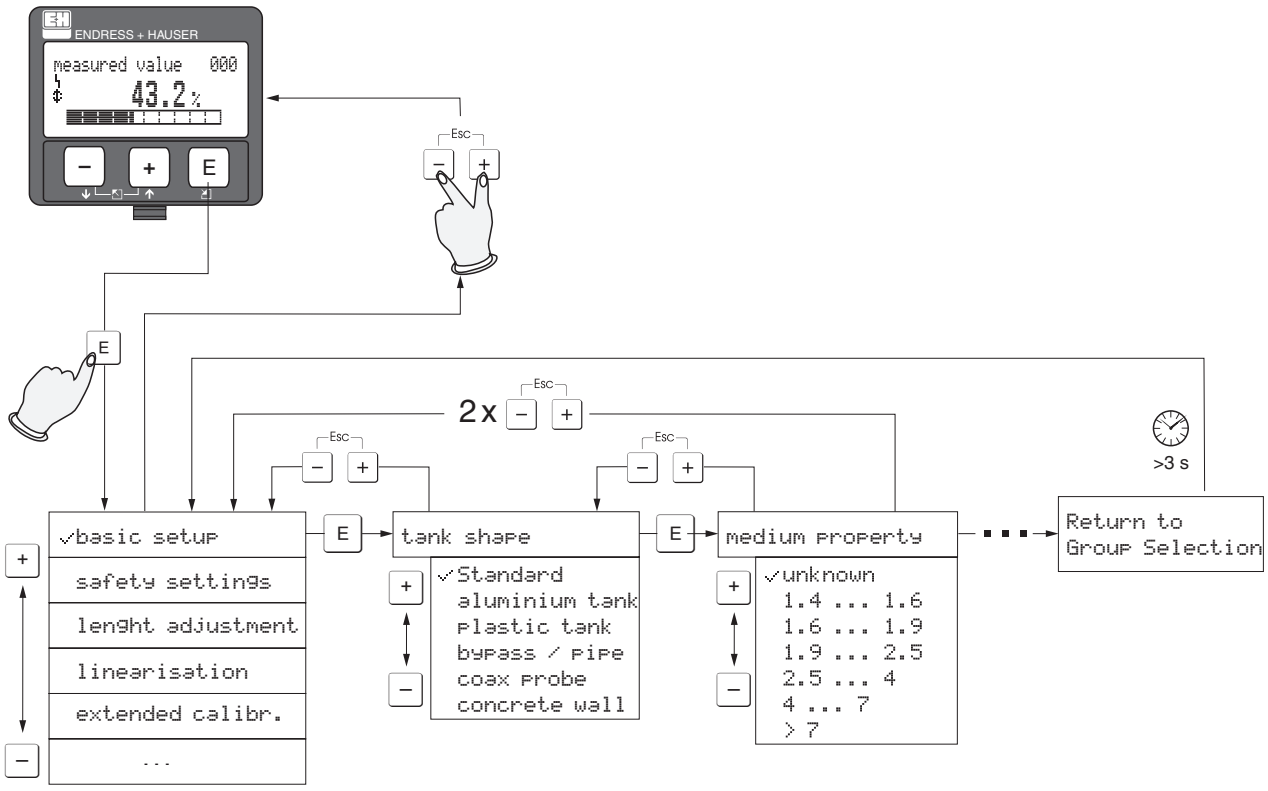
. . .

The third digit numbers the individual functions within the function group:

- **basic setup** **00** → **tank properties** **002**
  - **medium property** **003**
  - **process cond.** **004**
  - . . .

Hereafter the position is always given in brackets (e.g. "**tank properties**" **(002)**) after the described function.

Navigation within the menu



Selection and configuration in Operation menu:

1.) Change from Measured Value Display to **Group Selection** by pressing E

2.) Press − or + to select the required **Function Group** (e.g.. "basic setup (00)") and confirm by pressing E ➜ First f**unction** (e.g. "tank shape (002)") is selected.

Note!
The active selection is marked by a ✔ in front of the menu text.

3.) Activate Edit mode with + or −.

Selection menus:

a) Select the required **Parameter** in selected **function** (e.g. "tank shape (002)") with − or +.
b) E confirms selection ➜ ✔ appears in front of the selected parameter
c) E confirms the edited value ➜ system quits Edit mode
d) + / − (= Esc) interrupts selection ➜ system quits Edit mode

Typing in numerals and text:

a) Press + or − to edit the first character of the **numeral / text** (e.g. "empty calibr. (005)")
b) E positions the cursor at the next character ➜ continue with (a) until you have completed your input
c) if a ↵ symbol appears at the cursor, press E to accept the value entered ➜ system quits Edit mode
d) + / − (= Esc) interrupts the input, system quits Edit mode

4) Press E to select the next **function** (e.g. "medium property (003)")

5) Press + / − (= Esc) once ➜ return to previous **function** (e.g. "tank shape (002)")
Press + / − (= Esc) twice ➜ return to **Group selection**

6) Press + / − (= Esc) to return to **Measured value display**

L00-FMU4xxxx-19-00-00-en-020

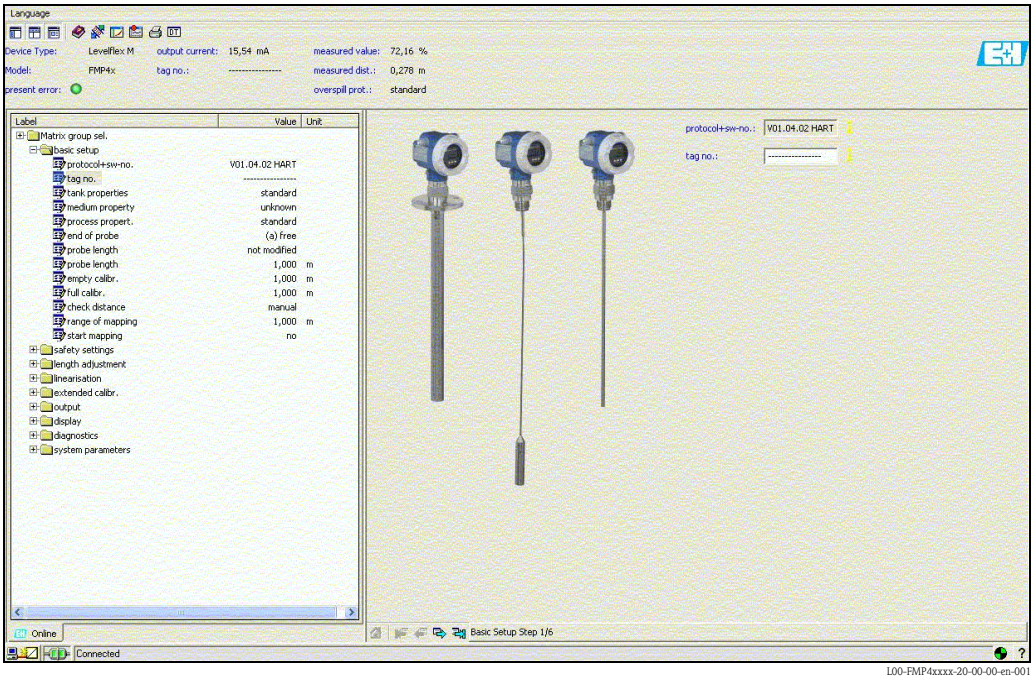
5.3 Operation with an Endress+Hauser operating program

The operating program FieldCare is an Endress+Hauser Plant Asset Management Tool based on FDT technology. You can use Field-Care to configure all your Endress+Hauser devices, as well as devices from other manufacturers that support the FDT standard. Hardware and software requirements you can find on the internet:
www.endress.com → select your country → search: FieldCare → FieldCare → Technical Data.

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

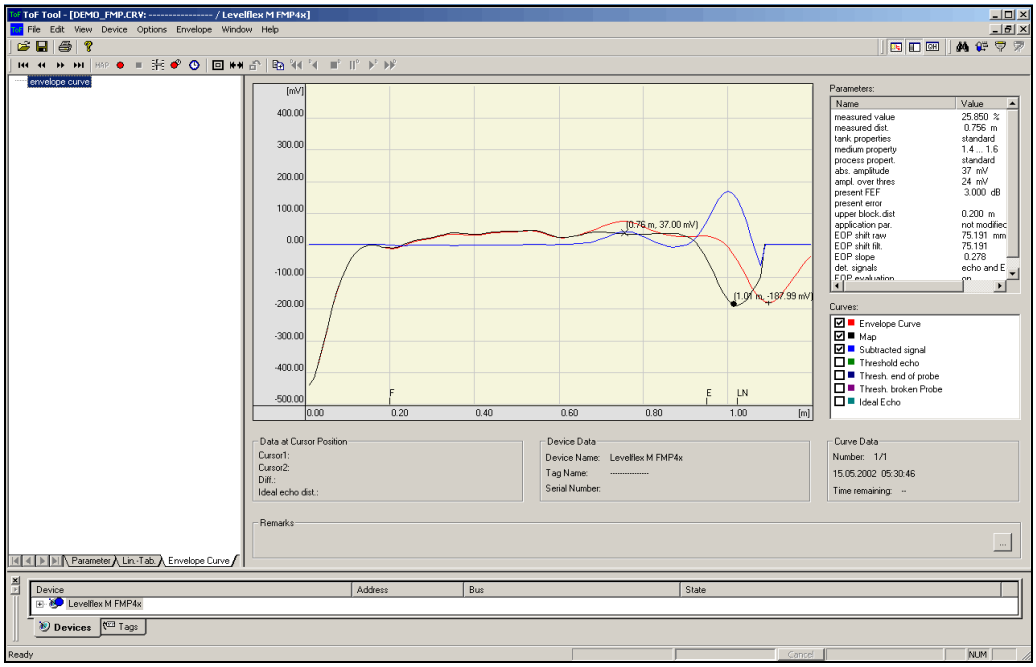
Connection options:
- Commubox FXA291 with ToF Adapter FXA291 via service interface

Menu-guided commissioning



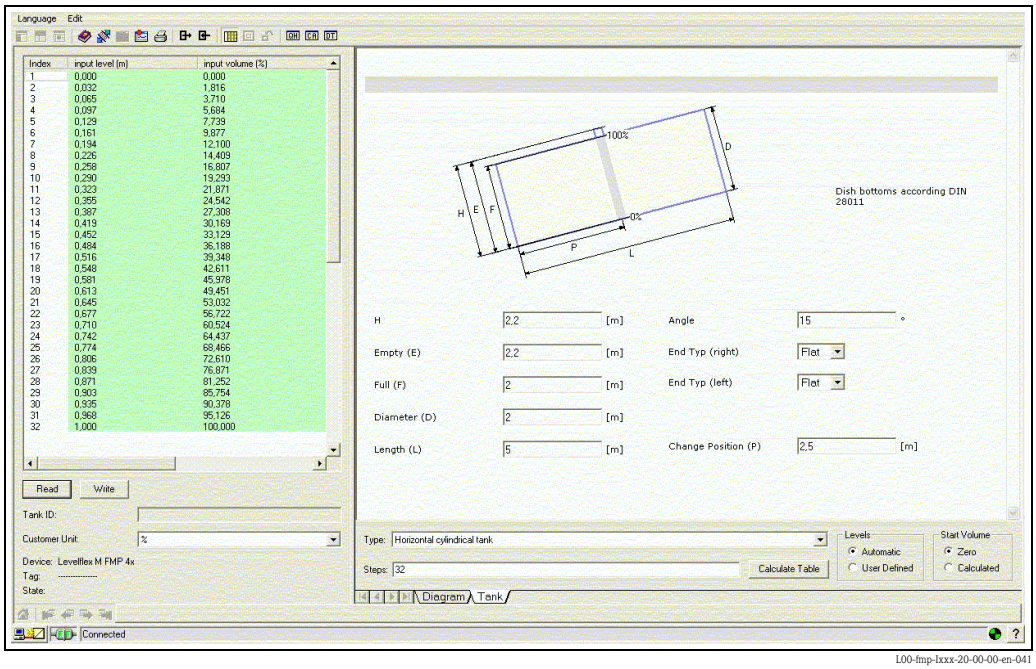
L00-FMP4xxxx-20-00-00-en-001

Signal analysis via envelope curve



L00-FMP4xxxx-20-00-00-en-007

Tank linearization



L00-fmp-lxxx-20-00-00-en-041

5.4 Operation with a FOUNDATION Fieldbus configuration program

5.4.1 FOUNDATION Fieldbus configuration programs

The user can obtain special configuration and operating programs offered by different manufacturers for use in configuration. These can be used for configuring both the FOUNDATION Fieldbus functions and all the device-specific parameters. The predefined function blocks allow uniform access to all the network and fieldbus device data.

5.4.2 Device Description files

File names

You will need the following files for commissioning and network configuration:
- **Device Description files**: *.sym, *.ffo
  These files describe the structure of the blocks and their parameters. They offer guided setups with the help of menus and methods.
- **Capability file**: *.cff
  This file enables offline configuration and describes the device capability in terms of communication stack and function blocks.

The file names consist of the following parts:
- Device Revision (0C3)[1)]
- DD Revision (0C4)[1] (use the most current version)
- CFF Revision (use the most current version)

Example:

- Instrument Revision (0C3) = 04
- DD Revision (0C4) = 01
- CFF Revision = 02
- -> files to be used: "0402.sym", "0402.ffo", "040102.cff"

Directory structure

The files are normally stored in the following directory structure:

- /452B48/1012/*.sym
  *.ffo
  *.cff

The directory names have the following meaning:

- 452B48: manufacturer ID of Endress+Hauser
- 1012: ID-Code of Levelflex M

1) "Instrument Revision" (0C3) and "DD Revision" (0C4) can be obtained through the display and operating module VU331. For details refer to section 5.2: "Operation with the display and operating module VU331"

Source of supply

Host System	Source of supply for the device Description and Network Configuration files
ABB (Field Controller 800) Allen Bradley (Control Logix) Endress+Hauser (ControlCare) Honeywell (Experion PKS) Invensys SMAR (System 302)	▪ www.endress.de (→ Download → Media type = "Software", "Instrument Drivers") ▪ CD-ROM (Endress+Hauser order code: 56003896) ▪ www.fieldbus.org
Emerson (Delta V)	▪ www.easydeltav.com
Yokogawa (CENTUM CS 3000)	▪ www.yokogawa.com

5.4.3 Representation of parameters

A FOUNDATION Fieldbus configuration tool offers two types of parameter representation:

- **Representation by parameter name**
  Examples: "PAROPERATIONCODE", "PARRESET"
- **Representation by parameter label**
  (identical to the labels on the display module VU331 and in an Endress+Hauser operation tool)
  Examples: "unlock parameter", "reset"

5.5 Operation with the handheld terminal Field Communicator 375, 475

5.5.1 Connection

The handheld terminal is directly connected to the FOUNDATION Fieldbus communication line. An additonal communication resistor is not required.

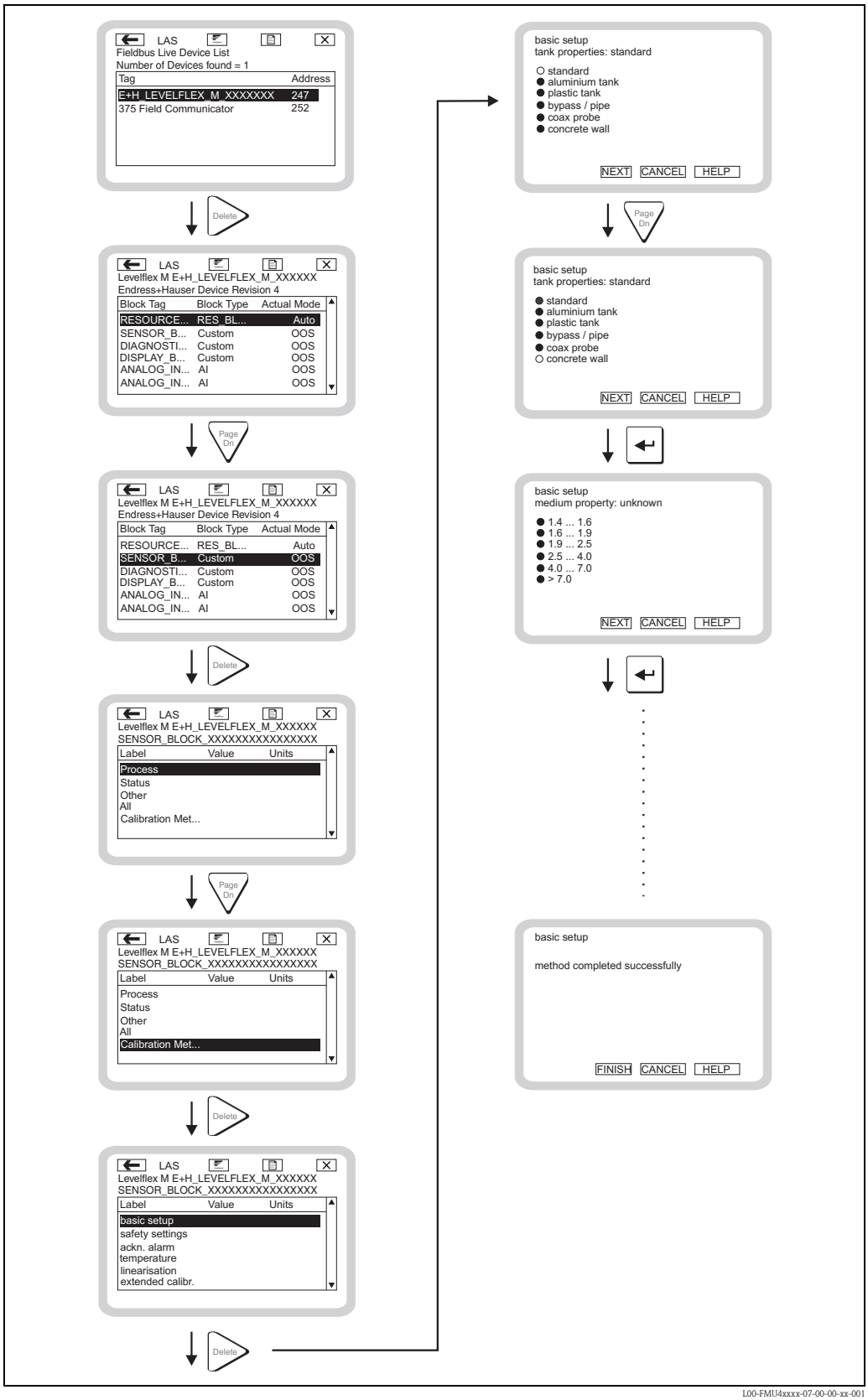
5.5.2 Device Descriptions

Make sure you have loaded the valid device Description files (DDs). DDs can be downloaded from the internet at "www.fieldcommunicator.com". The DDs can also be updated by the update functionality of the Field Communicator 375, 475.

5.5.3 User interface

The device parameters are arranged in blocks.
The handheld terminal Field Communicator 375, 475 uses this block structure to access the parameters. You can navigate within the structure by the arrow keys and the "Enter" key. Alternatively, you can use the touch-screen functionality of the handheld terminal for navigation. (Double-click on a name opens the respective block or parameter).

5.5.4 Example



L00-FMU4xxxx-07-00-00-xx-001

6 Commissioning

This chapter consists of the following sections:
- "Function check", → 50
- "Unlocking the device", → 50
- "Resetting the device", → 52
- "Basic setup", → 54
- "Commissioning by the display and operating module VU331", → 56
- "Blocking distance", → 66
- "Envelope curve", → 68
- "Basic setup with the Endress+Hauser operating program", → 72
- "Commissioning with a FOUNDATION Fieldbus configuration tool", → 78
- "Commissioning with the handheld terminal Field Communicator 375, 475", → 82

6.1 Function check

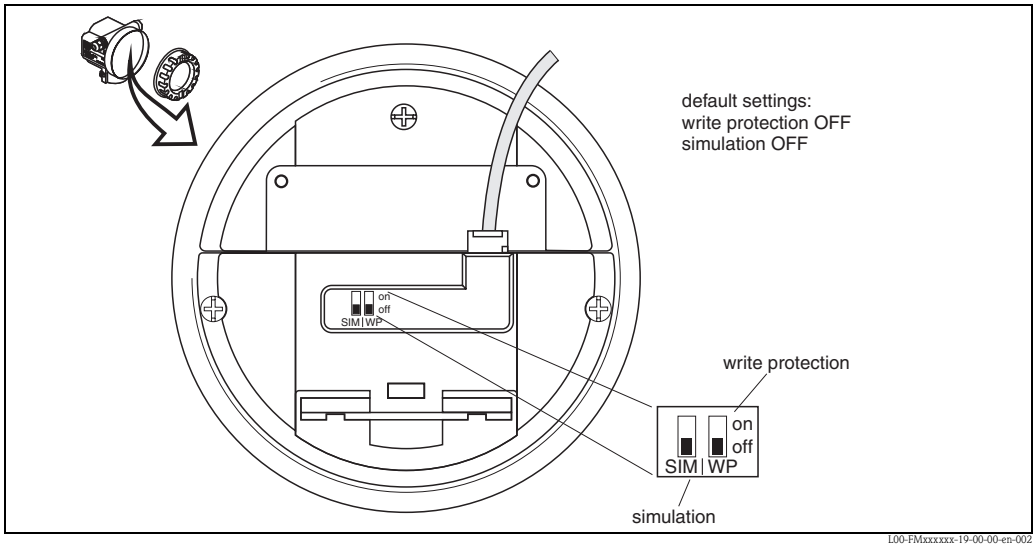
Make sure that all final checks have been completed before you start up your measuring point:
- Checklist "Post installation check", → 33.
- Checklist "Post connection check", → 38.

6.2 Unlocking the device

Before commissioning, make sure that the device is not locked against parameter changes.
On delivery, the device is unlocked. In other cases, however, it may have been locked in one of the following ways:

6.2.1 DIP switch (under the housing cover)

Locking and unlocking



WP = on: parametrization locked
WP = off: parametrization unlocked
SIM = on: simulation possible in Analog Input Block by configuration tool
SIM = off: simulation not possible in Analog Input Block by configuration tool

Parameters affected

Locking by the DIP switch affects **all** parameters.

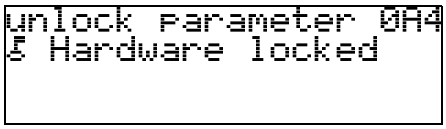
6.2.2 Key combination (display and operating module VU331)

Locking

Press −, + and E simultaneously.

Unlocking

If you try to change a parameter, the following appears:



L00-fmrxf0a4-20-00-00-de-001

Press −, + and E simultaneously. The **"unlock parameter" (0A4)** function appears. Enter "2457". Now parameters can be changed.

Parameters affected

Locking by the key combination affects the following parameters:
- Parameters of the device specific blocks (Sensor Block, Diagnostic Block, Display Block)
- Endress+Hauser service parameters

6.2.3 Locking parameter

Locking

Enter a number other than "2457" into the **"unlock parameter" (0A4)** function.
(FOUNDATION Fieldbus: Diagnsotic Block, parameter PAROPERATIONMODE)

Unlocking

Enter **"2457"** into the **"unlock parameter" (0A4)** function.
(FOUNDATION Fieldbus: Diagnostic Block, parameter PAROPERATIONMODE)

Parameters affected

Locking by the locking parameter affects the following parameters:
- Parameters of the device specific blocks (Sensor Block, Diagnostic Block, Display Block)
- Endress+Hauser service parameters

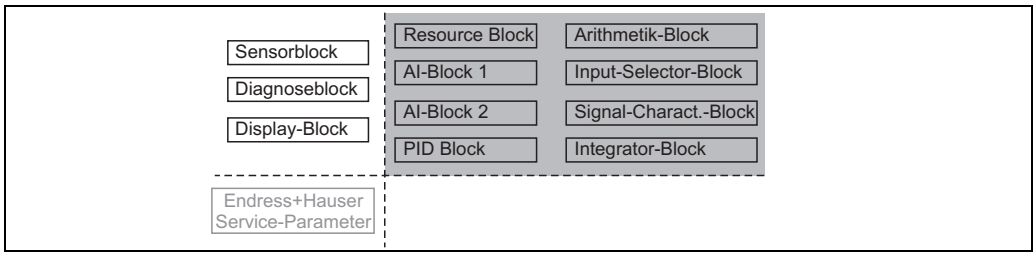
6.3 Resetting the device

It is advisable to reset the device parameters before the commissioning if you want to use a device with an unknown history.

6.3.1 Resetting the parameters of the FOUNDATION Fieldbus function blocks

Parameters affected

- All parameters of the FOUNDATION Fieldbus function blocks



Performing the reset

Resource Block, parameter RESTART; select the option "defaults".

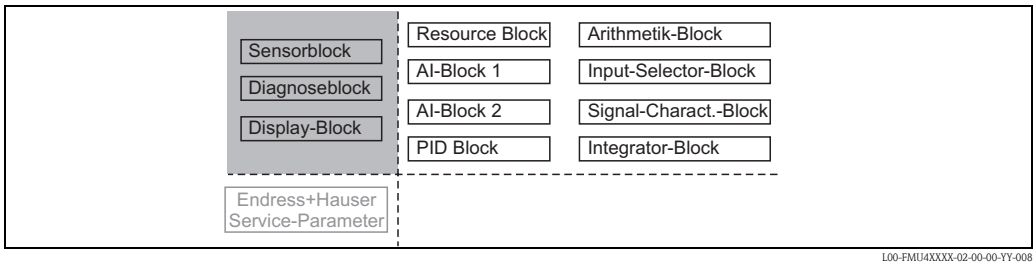
6.3.2 Resetting the parameters of the transducer blocks

Caution!
A reset may lead to impairment of the measurement. As a rule, a basic calibration is required after a reset.

Note!
The default values of each parameter are shown in bold in the menu overview in the appendix.

Parameters affected

- All parameters of the device specific blocks (Sensor Block, Diagnostic Block, Display Block)



Effects of the reset

- All customer parameters are reset to their default values.
- Customer interference echo suppression is **not** deleted.
- Linearisation is switched to **"linear"**, but the table values are kept. The table can be switched back on in the **"linearisation" (04)** function group in the **"linearisation" (041)** function. (FOUNDATION Fieldbus: Sensor Block, Parameter PARLINEARISATION (linearization))

Performing the reset

"diagnostics" (0A) function group, "reset" (0A3) function; enter "33333"
(FOUNDATION Fieldbus: Diagnostic Block, parameter PARRESET)

6.3.3 Resetting an interference echo suppression (tank map)

It is always adivable to reset the interference echo suppression (tank mapping) when:
- a device with an unknown history is used
- an incorrect suppression was input

Resetting the tank map with the VU331

1. In the **"extended calibr." (05)** function group select the **"selection" (050)** function.
2. Select **"extended map."**
3. Go to the **"cust. tank map" (055)** function and select the required option:
   – **"reset"**: deletes the existing tank map.
   – **"inactive"**: deactivates the tank map but does not delete it. It can be re-activated when required.
   – **"active"**: activates the tank map.

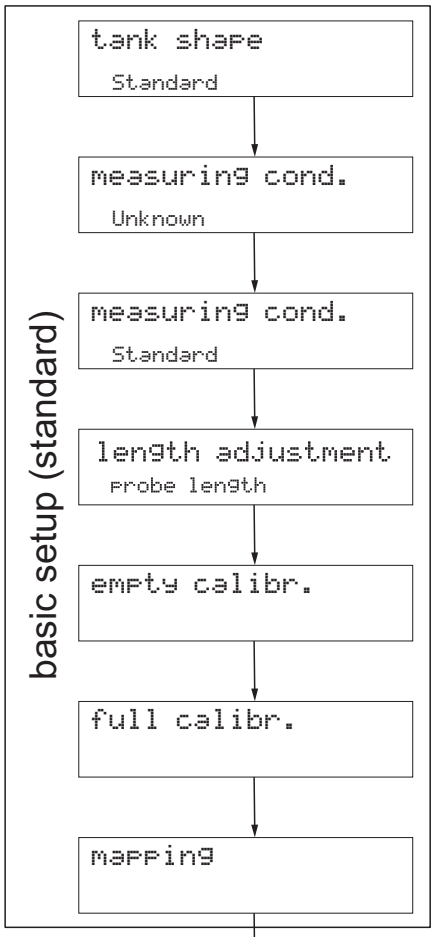
Resetting the tank map with an Endress+Hauser operating program

1. In the function group **"extended calibr."** select the **"cust. tank map" (055)** function.
2. Select the required option (**"reset"**, **"inactive"** or **"active"**)

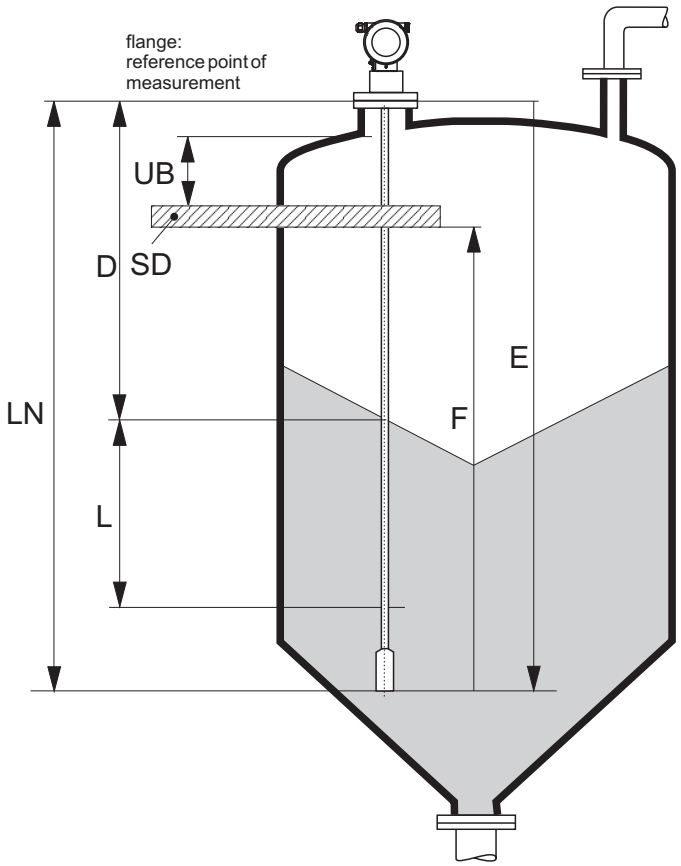
Resetting the tank map with a FOUNDATION Fieldbus configuration tool

1. In the **Sensor Block** select the parameter **PARCUSTTANKMAP (cust tank map)**.
2. Select the required option (**"reset"**, **"inactive"** or **"active"**).

6.4 Basic setup



(description see BA00245F/00/EN)



E = empty calibr. (= zero)
setting in 005
F = full calibr. (= span)
setting in 006
D = distance (distance flange / product)
display in 0A5
L = level
display in 0A6

LN = probe length
setting in 033
UB = upper blocking distance
setting in 059
SD = safety distance
setting in 015

L00-FMP4xxxx-19-00-00-en-031

Caution!
The basic setupis sufficient for successful commissioning in morst applications.
The Levelflex is precalibrated at the factory to the probe length ordered so that in most cases only the application parameters, which automatically adapt the device to the measuring conditions, need the entered. For digital outputs and the display module, the factory adjustment for zero point "E" and span "F" is 0 % and 100 %.
A linearization function with max. 32 points, which is bades on a table input manually or semi-automatically, can be activated onsite or via remote operation. This function allows the conversion of the level into units of volume or weight, for example.

Note!
The Levelflex M also makes it possible to monitor the probe for breakage. On delivery, this function is switched since any probe shortening would be mistaken for a broken probe. To activate this function, perform the following:

1. With the probe uncovered, perform a mapping ("**range of mapping**" **(052)** and "**start mapping.**" **(053)**).
2. Activate the "**broken probe det.**" **(019)** function with the "**safety settings.**" **(01)** function group.

Complex measuring operations necessitate additional functions that the user can use to customize the Levelflex as necessary to suit his specific requirements. The functions available to do this are described in detail in BA00245F/00/EN.
Comply with the following instructions when configuring the functions in the "**basic setup**" **(00)**:

- Select the functions as descriped, → 📄 39.
- Certain functions (e.g. starting interference echo suppression (053)) prompt you to vonfirm this function after entering the data. Press [+] or [−] to select "**YES**" and press [E] to confirm. The function is now started.
- If you do not press a key during a configurable time period (→ function group "**display (09)**"), the system return automatically to the measured value display position.

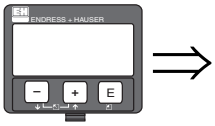
Note!

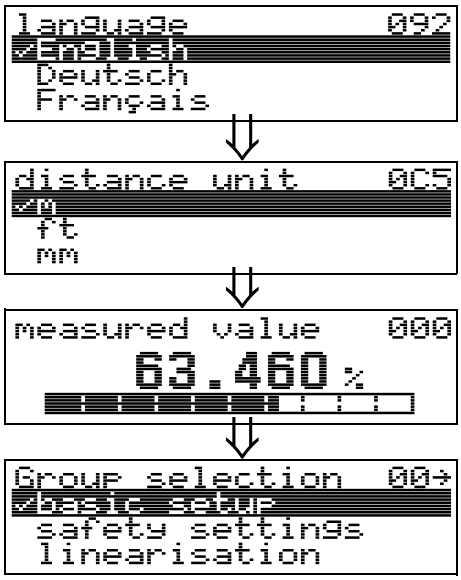
- The device continues to measure while data entry is in progress, i.e. the current measured values are output via the signal outputs in the normal way.
- If the envelope curve mode is active on the display, the measured values are updated in a slower cycle time. Thus, it is advisable to leave the envelope curve mode after the measuring point has been optimized.
- It he power supply fails, all preset and confured values remain safely stored in the EEPROM.
- All functions are described in detail, as is the overview of the operating menu itself, in the manual **"BA00245F - Description of Instrument Functions"** on the enclosed CD-ROM.

6.5 Commissioning by the display and operating module VU331

6.5.1 Power up device

When the device is switched on for the first time, the following messages appear in a sequence of 5 s on the display: software version, communication protocoll and language selection





Select the language (this message appears the first time the device is switched on)

Select the basic unit (this message appears the first time the device is switched on)

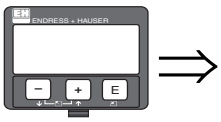
The current measured value is displayed

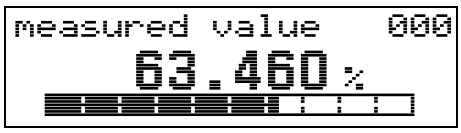
After pressing E, you are taken to the group selection

This selection enables you to perform the basic standard

The **"basic setup" (00)** function group lists all the functions which are required for a standard measurement tast to commission the Levelflex M. When you have complete your input for a function, the next function appears automatically. In this way, you are guided through the complete calibration.

Function "measured value" (000)





This function displays the current measured value in the selected unit (see "**customer unit**" **(042)** function). The number of digits after decimal point can be selected in the "**no.of decimals**" **(095)** function.

6.5.2 Function group "basic setup" (00)

Function "tank properties" (002)

This function is used to select the tank properties.

Selection:
- **standard**
- aluminium tank
- plastic tank
- bypass / pipe
- coax probe
- concrete wall

standard

The "**standard**" option is recommended for normal containers for rod and rope probes.

aluminium tank

The "**aluminium tank**" option is designed especially for high aluminium silos that cause an increased level of noise when empty. This option is only useful for probes longer than 4 m. For short probes (< 4 m) select the "**standard**" option!

Note!
If "**aluminium tank**" is selected, the device calibrates of its own accord when first filled, depending on the medium's properties. Slope errors can, therefore occur when beginning the first filling procedure.

plastic tank

Select the "**plastic tank**" option when installing probes in wood or plastic containers **without** metallic surfaces at the process connection (see installation in plastic containers). When using a metallic surface at the process connection, the "**standard**" optionis sufficient!

Note!
In principle the employment of a metallic surface area should be prefferred at the process connection!

bypass / pipe

The "**bypass / pipe**" option is designed especially for the installation of probes in a bypass or a stilling well. If this option is selected, the upper blocking distance is preset to 100 mm.

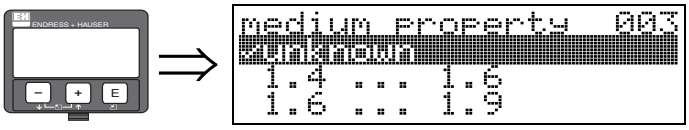
coax probe

Select the "**coax probe**" option when using a coaxial probe. When this setting is made, the evaluation is adapted to the high sensitivity of the coax probe. This option should, therefore, **not** be selected when using a rope or rod probes.

concrete wall

The "**concrete wall**" option takes into account the signal-damping property of concrete walls when mounting with < 1 m distance to the wall.

Function "medium property" (003)



This function is used to select the dielectric constant.

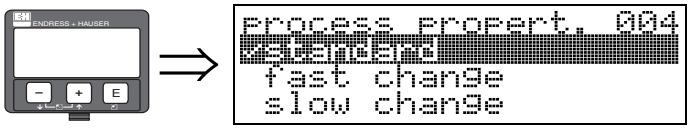
Selection:
- unknown
- 1.4 ... 1.6 (use coaxial or Rod probe ith installation in metallic pipes ≤ DN150)
- 1.6 ... 1.9
- 1.9 ... 2.5
- 2.5 ... 4.0
- 4.0 ... 7.0
- > 7.0

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	– Plasitc granulate – White lime, special cement – Sugar	– Liquefied gas, e.g. propane – Solvent – Frigen / Freon – Palm oil	25 m to 30m (984" to 1181")	12,5 m to 15 m (492" to 590")
3	1,9...2,5	– Portland cement, plaster	– Mineral oil, fuels	30 m to 35 m (1181" to 1378")	—
		– Flour	—	—	15 m to 25 m (590" to 984")
4	2,5...4	– Grain, seeds	—	—	25 m to 30 m (984" to 1181")
		– Ground stones – Sand	– Benzene, styrene, toluene – Furan – Naphthalin	35 m (1378")	25 m to 30 m (984" to 1181")
5	4...7	– Naturally moist (ground) stones, ores – Salt	– Chlorobenzene, chloroform – Cellulose spray – Isocyanat, aniline	35 m (1378")	35 m (1378")
6	> 7	– Metallic powder – Carbon black – Coal	– Aqueous solutions – Alkohols – Acids, alkalis	35 m (1378")	35 m (1378")

The lower group applies to very loose or loosened bulk solids. Reduction of the max. possible measuring range by means of:
- Extremly loose surfaces of bulk solids, e.g. bulk solids with low piled density when filled pneumatically.
- Build-up, primarily 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.

Function "process propert" (004)

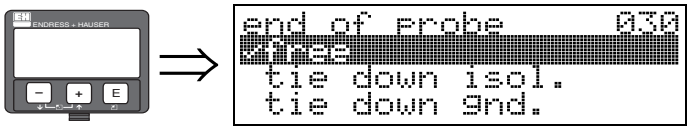


Use this funtcion to adapt the device to the filling speed in the tank. The setting impacts on an intelligent filter.

Selection:
- **standard**
- fast change
- slow change
- test: no filter

Selection:	standard	fast change	slow change	test: no filter
Application:	For all normal applications, bulk solids and fluids at low to medium filling speed and sufficiently large tanks.	Small tanks, primarily with fluids, at high filling speeds.	Applications with strong surface movement, e.g. coused by stirrer, primarily large tanks with slow to medium filling speed.	Shortest reaction time: ■ For test purposes ■ Measurement in small tanks at high filling speeds, if "rapid change" setting is too slow.
2-wire electronics:	Dead time: 4 s Rise time: 18 s	Dead time: 2 s Rise time: 5 s	Dead time: 6 s Rise time: 40 s	Dead time: 1 s Rise time: 0 s
4-wire electronics:	Dead time: 2 s Rise time: 11 s	Dead time: 1 s Rise time: 3 s	Dead time: 3 s Rise time: 25 s	Dead time: 0,7 s Rise time: 0 s

Function "end of probe" (030)

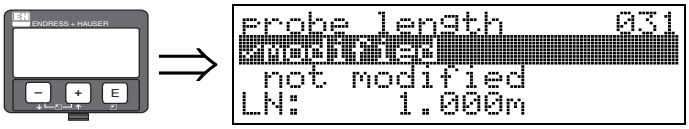


Use this function to select the polarity of the probe end signal. If the probe end is uncovered or in an insulated attachment, there is anegative probe end signal.
The signal from the probe end is positive if the attachement is grounded.

Selection:
- free
- tie down isol.
- tie down gnd. [2)]

2) If using a metallic centering of probe end.

Function "probe length" (031)

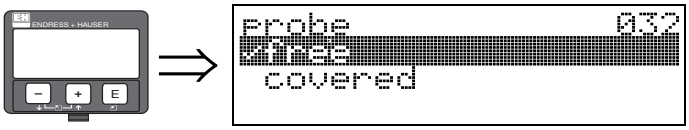


Use this function to select whether the probe length was changed after factory calibration. Only then is it necessary to enter or correct the probe length.

Selection:
- not modified
- modified

Note!
If "modified" was selected in the "**probe length**" **(031)** function, the probe length is defined in the next step.

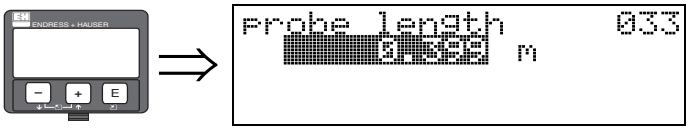
Function "probe" (032)



Use this function to select whether the probe is at the time of the commissioning uncovered or convered. If the probe is uncovered, the Levelflex can determine the probe length automatically "**determine length**" **(034)** function. If the probe is covered, a correct entry is required in the "**probe length**" **(033)** function.

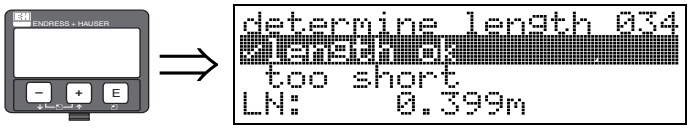
Selection:
- **free**
- covered

Function "probe length" (033)



Use this function, the probe length can be entered manually.

Function "determine length" (034)

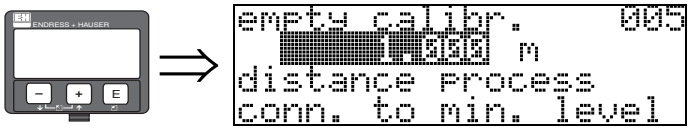


Use this function, the probe length can be determined automatically.
Due to the mounting conditions, the automatically determined probe length may be larger than the actual probe (typically 20 to 30 mm longer). This has no influence on the measuring accuracy.
When entering the empty value for a linearisation, please use the "empty calibration" instead of the automatically determined probe length.

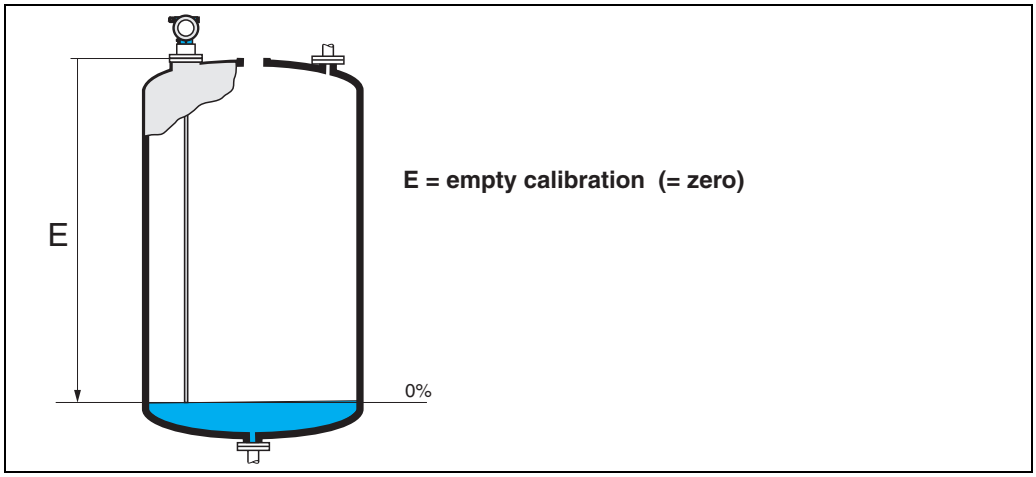
Selection:
- **length ok**
- length short
- length long

After selection "length too short" or "length too long", the calculation of the new value need approx. 10 s.

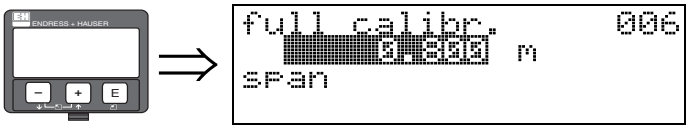
Function "empty calibr." (005)



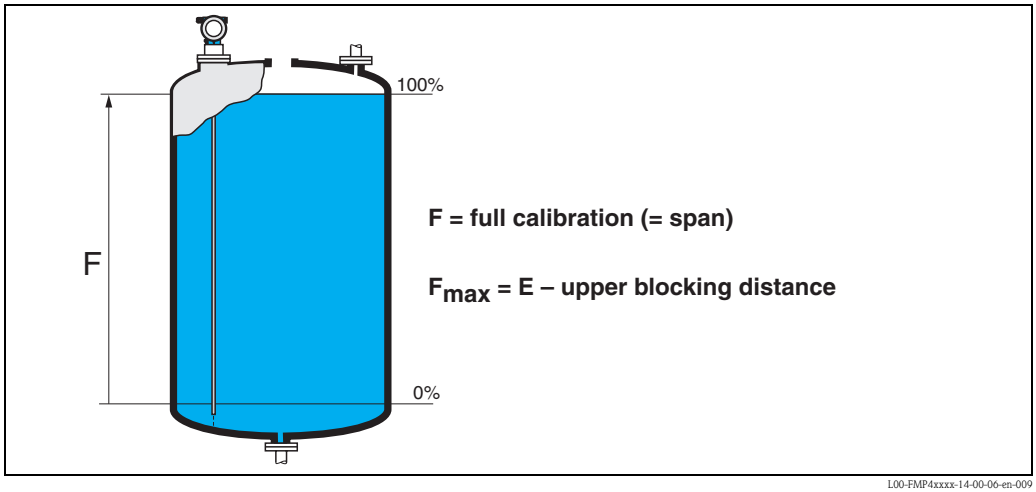
This function is used to enter the distance from the flange (reference point of the measurement) to the minimum level (= zero).



Function "full calibr." (006)

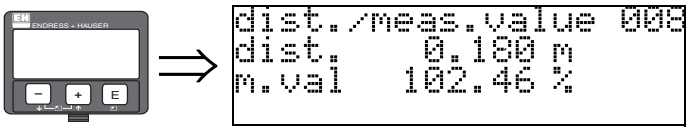


This function is used to enter the distance from the minimum level to the maximum level (= span).



Note!
The usable measuring range lies between the upper blocking distance and the probe end. The value for empty distance "E" and span "F" can be set independently of this.

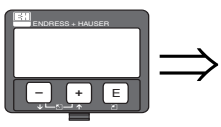
Function "dist./meas.value" (008)



The **distance** measured from the reference point to the product surface and the **meas. value** calculated with the aid of empty calibration are displayed. Check whether the values correspond to the actual measured value or the actual distance. The following cases can occur:

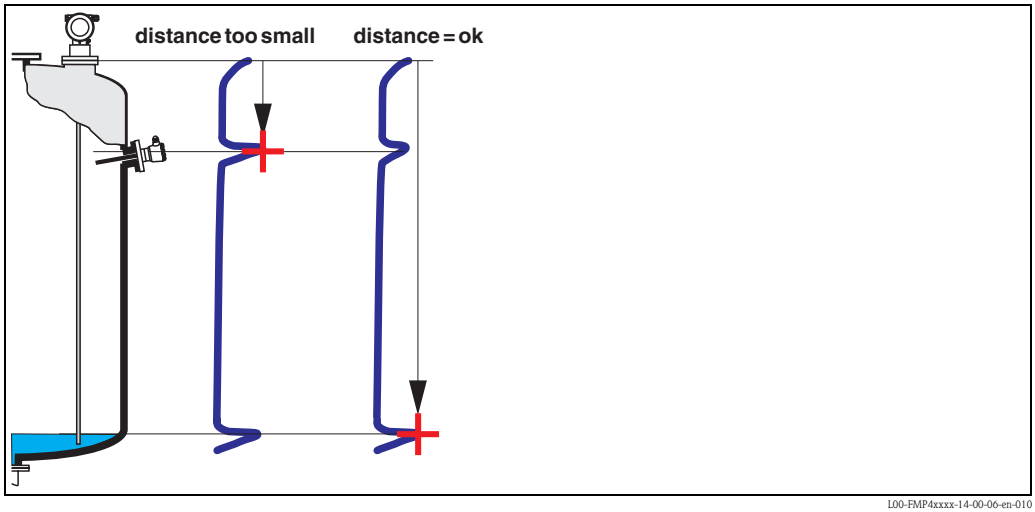
- Distance correct – meas. value correct → continue with the next function "**check distance**" **(051)**
- Distance correct – meas. value incorrect → Check "**empty calibr.**" **(005)**
- Distance incorrect – meas. value incorrect → continue with the next function "**check distance**" **(051)**

Function "check distance" (051)



This function triggers the mapping of interference echoes. To do so, the measured distance must be compared with the actual distance to the product surface. The following options are available:

Options:
- Distance = ok
- Dist. too small
- Dist. too big
- Dist. unknown
- **Manual**
- Probe free



L00-FMP4xxxx-14-00-06-en-010

Distance = ok
Use this function for partially covered probes. Choose "**manual**" or "**probe free**" if the probe is free.
- Mapping is carried out up to the currently measured echo
- The range to be suppressed is suggested in the "**range of mapping**" **(052)** function

It is wise to carry out a mapping even in this instance.

Note!
If the probe is free, the mapping should be confirmed with "**probe free**".

Dist. too small
- At the moment, an interference echo is being evaluated
- Therefore, a mapping is carried out including the echoes currently measured
- The range to be suppressed is suggested in the "**range of mapping**" **(052)** function

Dist. too big
- This error cannot be remedied by interference echo suppression
- Check application parameters **(002)**, **(003)**, **(004)** and "**empty calibr.**" **(005)**

Dist. unknown
If the actual distance is not known, no mapping can be carried out.

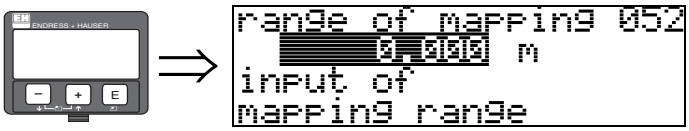
Manual
Mapping is also possible by manually entering the range to be suppressed. This entry is made in the "**range of mapping**" **(052)** function.

Caution!
The range of mapping must end 0.3 m (20") before the echo of the actual level.

Probe free
If the probe is uncovered, mapping is carried out along the whole probe length.

Caution!
Only begin mapping in this function if the probe is definitely uncovered. Otherwise, the device will not measure correctly!

Function "range of mapping" (052)



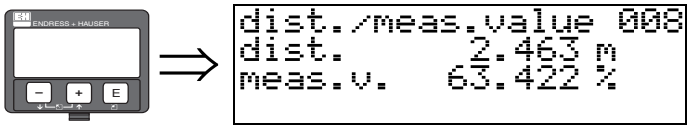
This function displays the suggested range of mapping. The reference point is always the reference point of the measurement (→ 54). This value can be edited by the operator.
For manual mapping, the default value is 0.3 m.

Function "start mapping"(053)

This function is used to start the interference echo suppression up to the distance entered in "**range of mapping**" **(052)**.

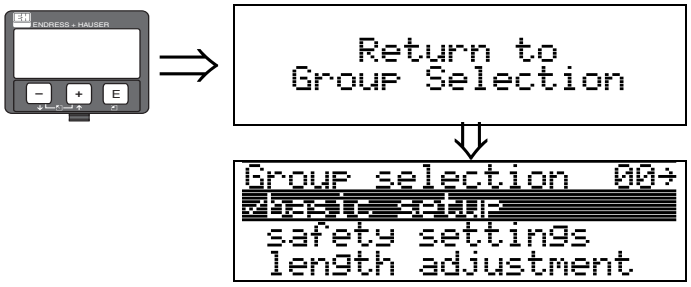
Options:
- off: no mapping is carried out
- on: mapping is started

Function "dist./meas.value" (008)



The distance measured from the reference point to the product surface and the measured value calculated with the aid of the empty calibration are displayed again. Check whether the values correspond to the actual meas. value or the actual distance. The following cases can occur:

- Distance correct – meas. value correct → basic setup completed
- Distance correct – meas. value incorrect → check "**empty calibr**" **(005)**
- Distance incorrect – meas. value incorrect → another interference echo suppression must be carried out "**check distance**" **(051)**.



After 3 s, the following message appears

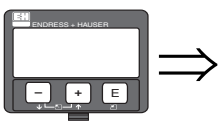
Note!
After the basic setup, it is recommended to evaluate the measurement with the aid of the envelope curve ("**envelope curve**" **(0E)** function group) (→ 68).

Return to group selection

After the interference echo suppression the basic setting is finished and the device jumps automatically back into the group selection.

6.6 Blocking distance

Function "upper block. dist" (059)



For rod probes and for rope probes with lengths of up to 8 m, the upper blocking distance is set to 0.2 m at the factory. For rope probes with lengths of more than 8 m, the upper blocking distance is preset to 2.5 % of the probe length. For media with DC > 7, the upper blocking distance for rod and rope probes can be reduced to 0.1 m, if the probe is mounted flush with the wall or in a nozzle of maximum 50 mm.

Blocking distance and measuring range

At the lower end of the probe there is no blocking distance but a transition region with reduced accuracy, see section "Maximum measured error", → 67.

FMP40	LN [m] min	LN [m] max	UB [m] min
Rope probe	1	35[1)]	0,2[2)]
6 mm rod probe	0,3	2	0,2[2]
16 mm rod probe	0,3	4	0,2[2]
Coax probe	0,3	4	0

1) Larger measuring range available on request

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

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

For stilling well applications

The upper blocking distance (UB) is preset to 100 mm when the "bypass/pipe" parameter has been selected in the "**tank properties**" **(002)** function.

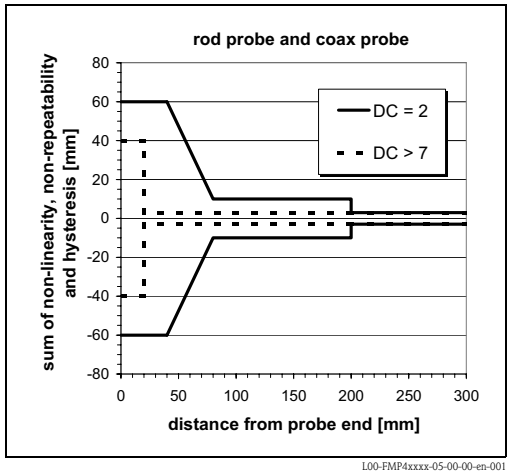
Maximum measured error

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

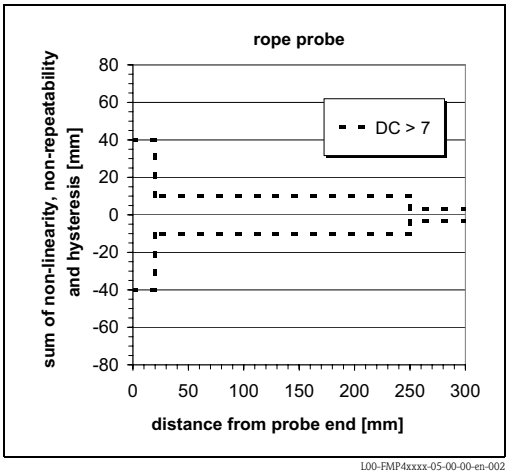
Output:	Digital	Analogue
sum of non-linearity, non-repeatability and hysteresis	measurig range: – up to 10 m: ±3 mm – > 10 m: ±0.03 % **for PA coated rope** measuring range: – up to 5 m: ±5 mm – > 5 m: ±0.1 %	±0.06 %
Offset / Zero	±4 mm	±0.03 %

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 (function "**offset**" **(057)**) during commissioning.

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

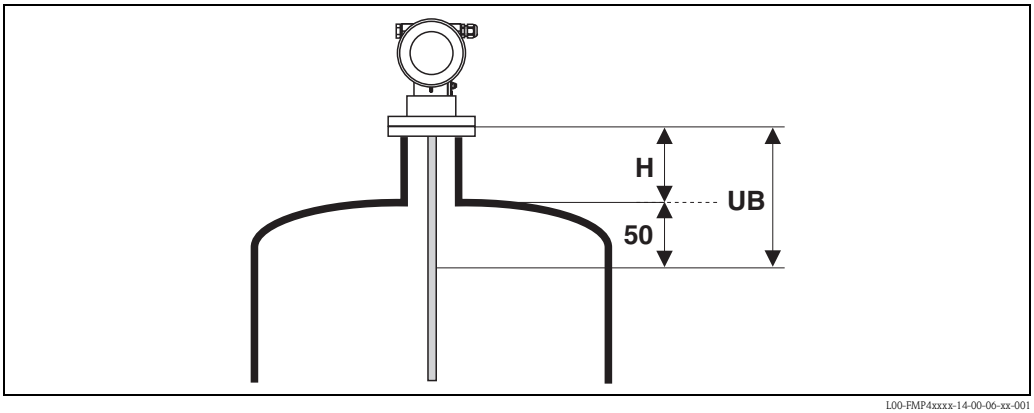


L00-FMP4xxxx-05-00-00-en-001



L00-FMP4xxxx-05-00-00-en-002

Note!
Please reenter the blocking distance in the function group "**extended calibr.**" **(05)** function "**upper block.dist**" **(059)** when installing the device in a high nozzle:
upper blocking distance (UB) = nozzle height (H) + 50 mm.

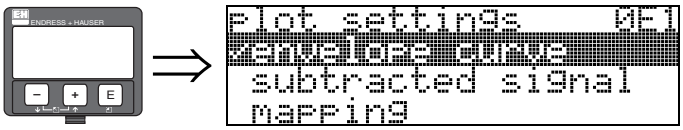


L00-FMP4xxxx-14-00-06-xx-001

6.7 Envelope curve

After the basic setup, an evaluation of the measurement with the aid of the envelope curve ("**envelope curve**" **(0E)** function group) is recommended.

6.7.1 Function "plot settings" (0E1)



Here you can select which information is shown on the display:
- **envelope curve**
- substracted signal
- mapping

Note!
The interference echo suppression (map) are explained in BA00245F/00/EN "Description of Instrument Functions".

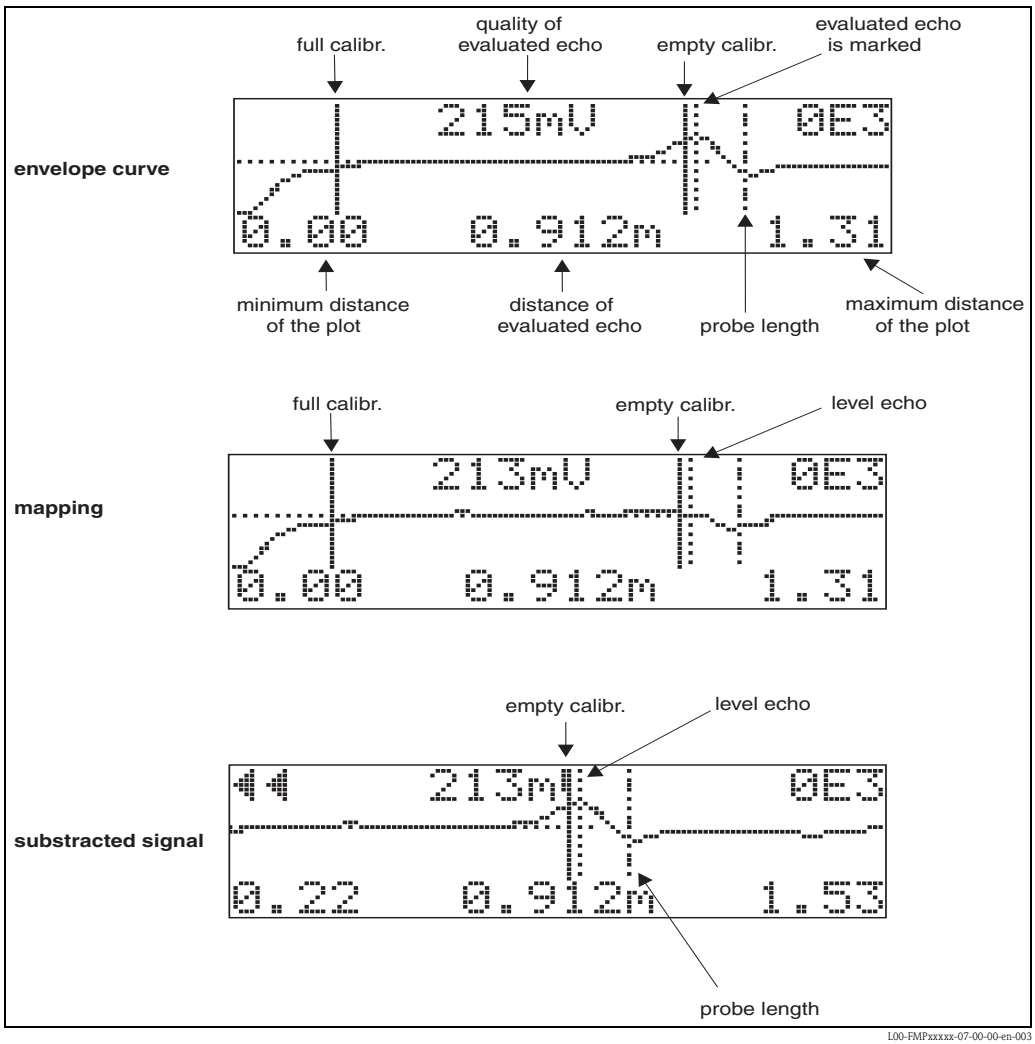
6.7.2 Function "recording curve" (0E2)

This function determines whether the envelope curve is read as
- **single curve** or
- cyclic

Note!
If the envelope curve mode is active on the display, the measured values are updated in a slower cycle time. Thus, it is advisable to leave the envelope curve mode after the measuring point has been optimised.

6.7.3 Function "envelope curve display" (0E3)

You can obtain the following information from the envelope curve display in this function:



Check that the following conditions are fulfilled:
- The echo quality at the end of measuring range should be at least 10dB
- There should be practically no interference echoes in front of the level signal

Note!
If the cyclical envelope curve display is still active on the display, the measured value is updated at a slower cycle time. We therefore advise you to exit the envelope curve display after optimising the measuring point. To do this, press [E]. (The device does not leave the envelope curve display automatically).

6.7.4 Envelope curve

The Levelflex emits individual pulses in quick succession and scans their reflection with a slightly variable delay. The energy values received are ordered by their time-of-flight. The graphic representation of this sequence is known as an "envelope curve".

6.7.5 Mapping (empty curve) and difference curve

To suppress interference signals, the envelope curve is not directly evaluated in the Levelflex.
The mapping (empty curve) is first subtracted from the envelope curve.
The system looks for level echoes in the resulting difference curve.
Difference curve = envelope curve – mapping (empty curve)
The mapping (empty curve) should be a good representation of the probe and the empty tank or silo. Ideally, only the signals from the medium being measured remain in the difference curve.

6.7.6 Mapping

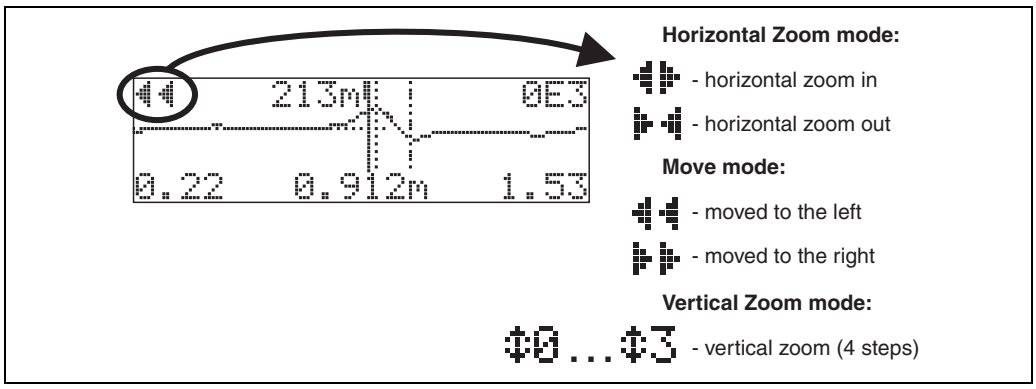
- Factory mapping
  Mapping (empty curve) is already available in the device when the device is delivered.
- Customer mapping
  In a partially filled state, the distance up to 10 cm before the actual total level can be mapped (range of mapping = actual distance from total level – 10 cm), or values > LN can be mapped in the case of empty tanks.
- Dynamic mapping
  It is not static like factory and customer-specific interference echo suppression. Instead, it follows directly from static mapping and constantly adapts to the changing features of the probe environment during ongoing operation. Thus, dynamic mapping does not have to be recorded explicitly.

6.7.7 Echo threshold

Maximum points in the difference curve are only accepted as reflection signals if they are above a specified threshold. This threshold depends on the location and is automatically calculated from the ideal echo curve of the probe used. The calculation of the threshold in question depends on the "Installation" customer parameter in the extended calibration function.

6.7.8 Navigation in the envelope curve display

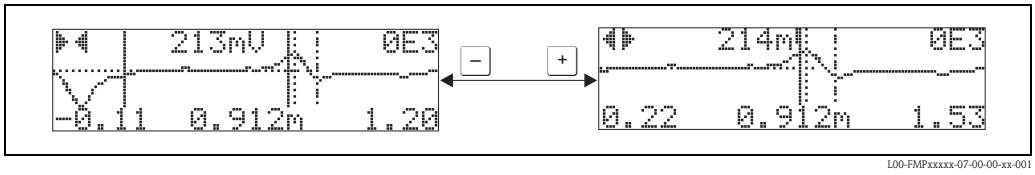
Using navigation, the envelope curve can be scaled horizontally and vertically and shifted to the left or the right. The active navigation mode is indicated by a symbol in the top left hand corner of the display.



L00-FMPxxxxx-07-00-00-en-004

Horizontal Zoom mode

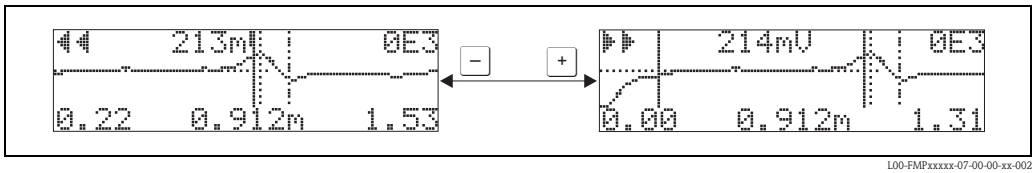
Firstly, go into the envelope curve display. Then press [+] or [−] to switch to the envelope curve navigation. You are then in Horizontal Zoom mode. Either ◀▶ or ▶◀ is displayed.
- [+] increases the horizontal scale.
- [−] reduces the horizontal scale.



L00-FMPxxxxx-07-00-00-xx-001

Move mode

Then press [E] to switch to Move mode. Either ▶▶ or ◀◀ is displayed.
- [+] shifts the curve to the right.
- [−] shifts the curve to the left.

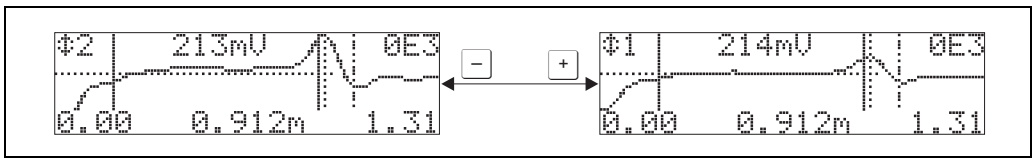


L00-FMPxxxxx-07-00-00-xx-002

Vertical Zoom mode

Press [E] once more to switch to Vertical Zoom mode. ⇕1 is displayed. You now have the following options.
- [+] increases the vertical scale.
- [−] reduces the vertical scale.

The display icon shows the current zoom factor (⇕0 to ⇕3).



L00-FMPxxxxx-07-00-00-xx-003

Exiting the navigation

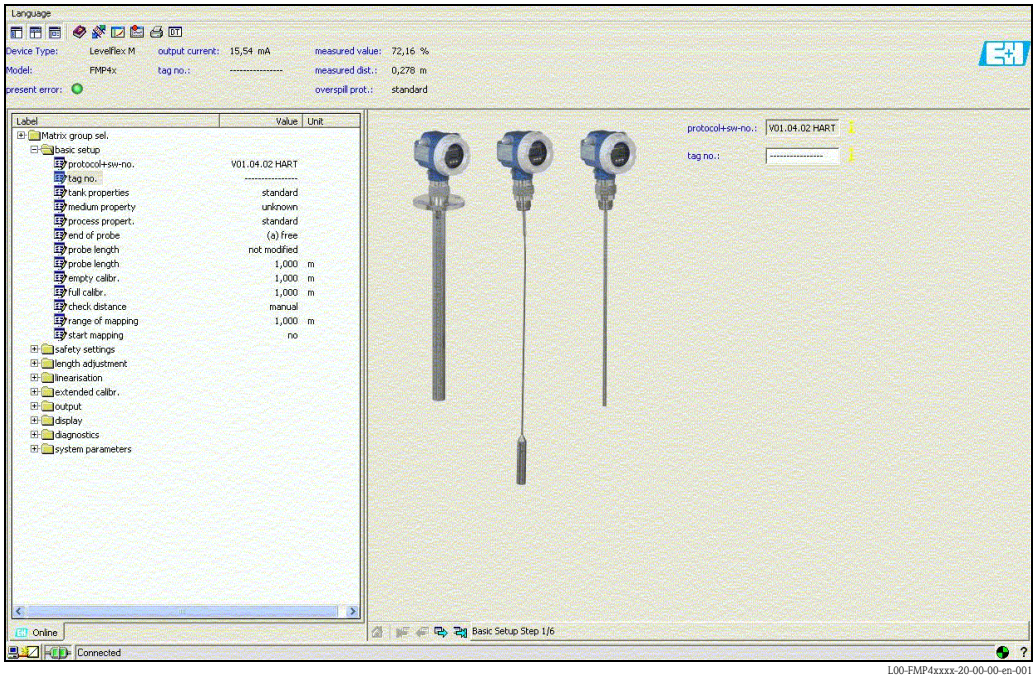
- Press [E] again to run through the different modes of the envelope curve navigation.
- Press [+] and [−] to exit the navigation. The set increases and shifts are retained. Only when you reactivate the "**recording curve**" **(0E2)** function the display settings return to their standard values.

6.8 Basic setup with the Endress+Hauser operating program

To carry out the basic setup with the operating program, proceed as follows:
- Start the operating program and establish a connection.
- Select the **"basic setup"** function group in the navigation window.

The following display appears on the screen:

Basic setup step 1/6:
- Status image
- The TAG number can be entered.

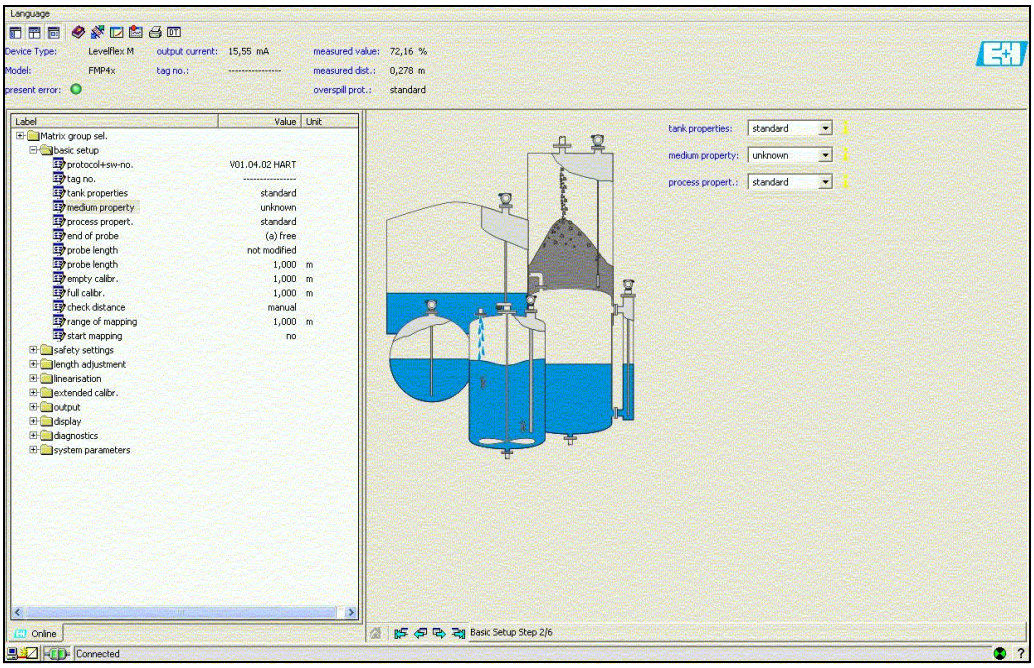


L00-FMP4xxxx-20-00-00-en-001

Note!
- Each parameter that is changed must be confirmed with the **RETURN** key!
- The "**Next**" button takes you to the next screen:

Basic setup step 2/6:

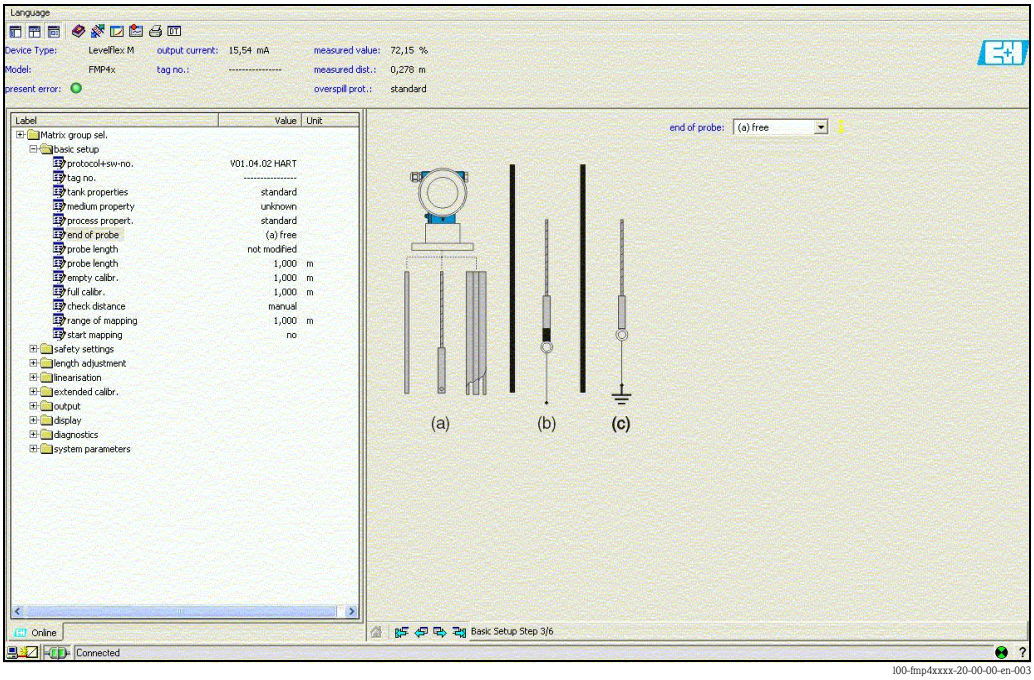
- Enter the application parameters (see chapter basic setup with "VU331"):
  - Tank properties
  - Medium properties
  - Process properties



l00-fmp4xxxx-20-00-00-en-002

Basic setup step 3/6:

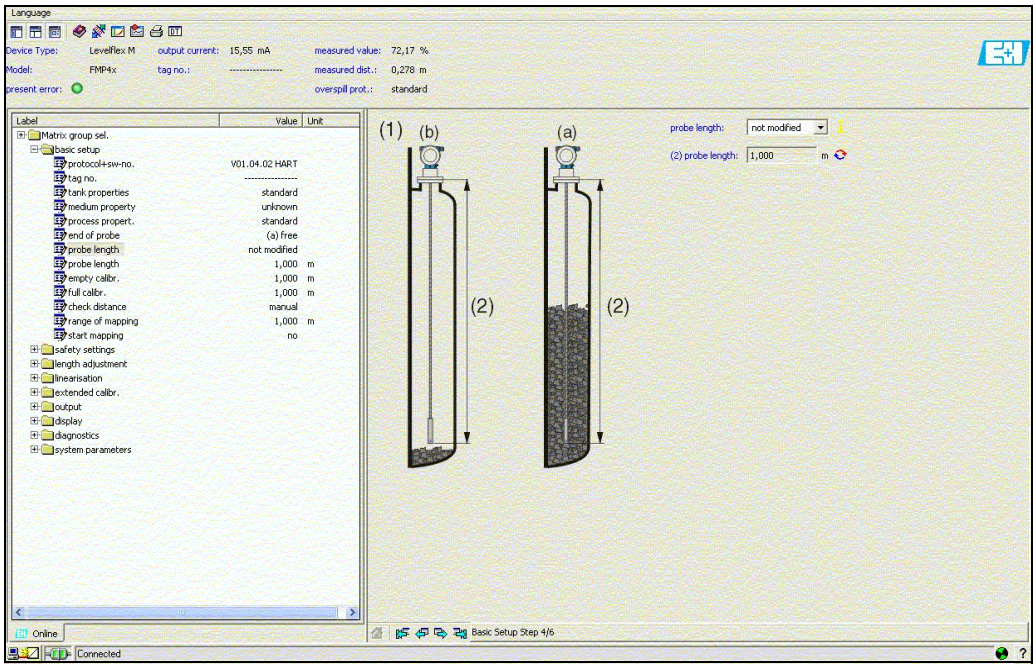
- Enter the application parameters (see chapter basic setup with "VU331"):
  - End of probe



l00-fmp4xxxx-20-00-00-en-003

Basic setup step 4/6:

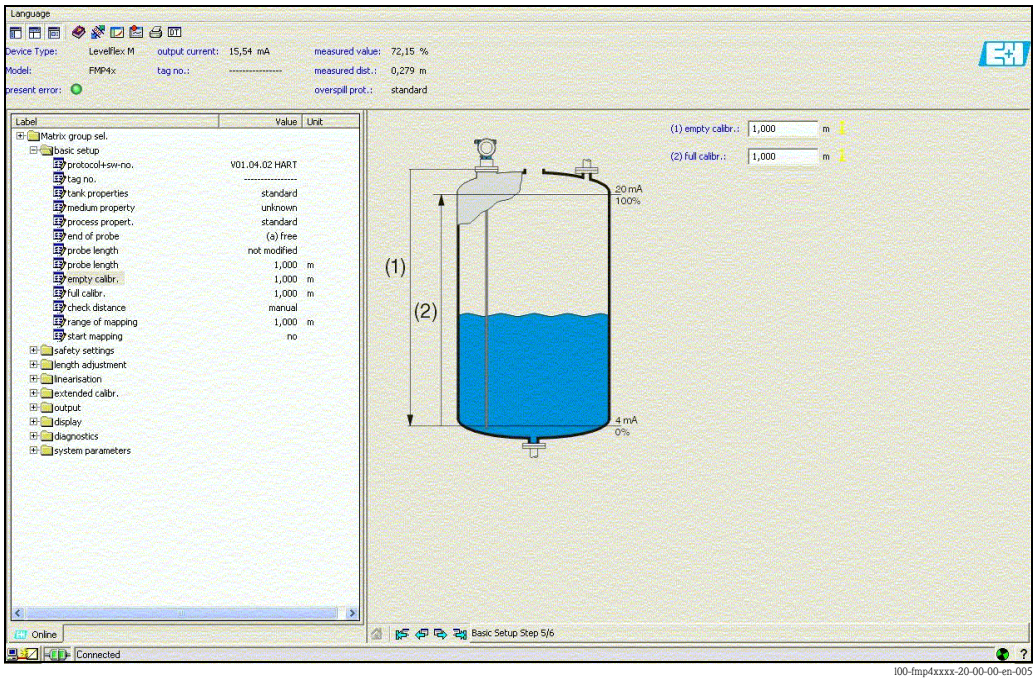
- Enter the application parameters (see chapter basic setup with "VU331"):
  - Probe length
  - Probe
  - Probe length
  - Determine length



l00-fmp4xxxx-20-00-00-en-004

Basic setup step 5/6:

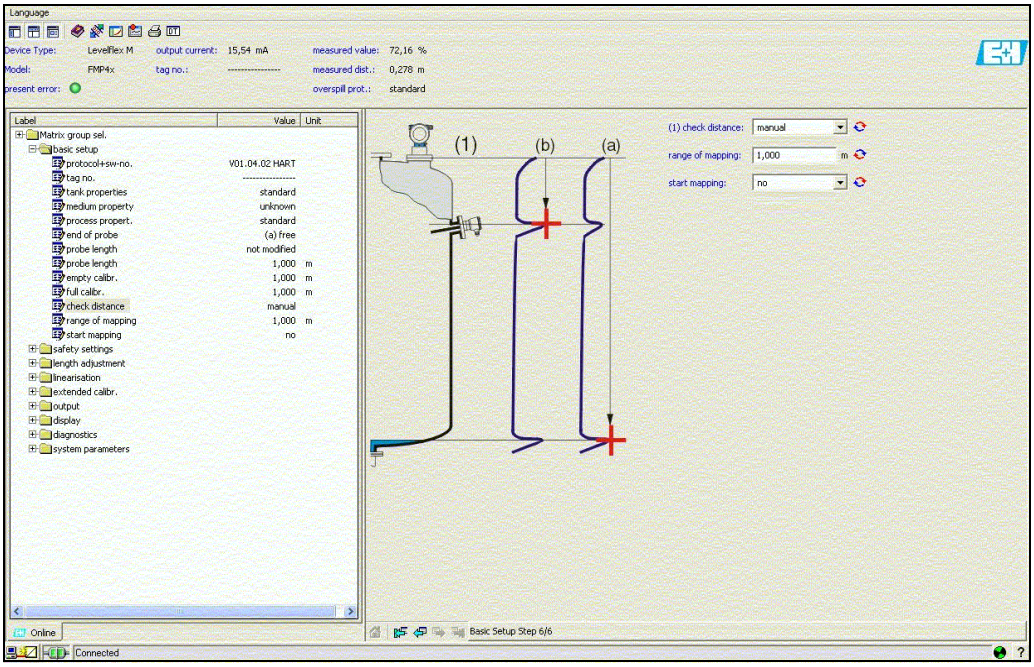
- Enter the application parameters (see chapter basic setup with "VU331"):
  - Empty calibration
  - Full calibration



l00-fmp4xxxx-20-00-00-en-005

Basic setup step 6/6:

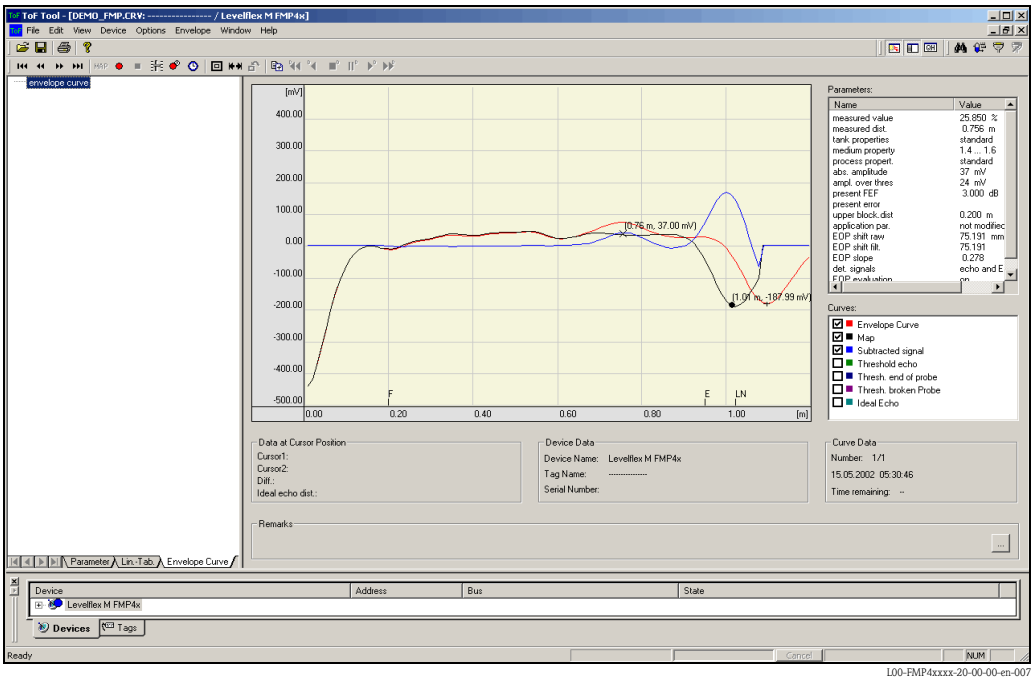
- Interference echo suppression takes place in this step
- The measured distance and the current measured value are always displayed in the header



100-fmp4xxxx-20-00-00-en-006.gif

6.8.1 Signal analysis via envelope curve

After the basic setup, it is recommended to evaluate the measurement with the aid of the envelope curve.



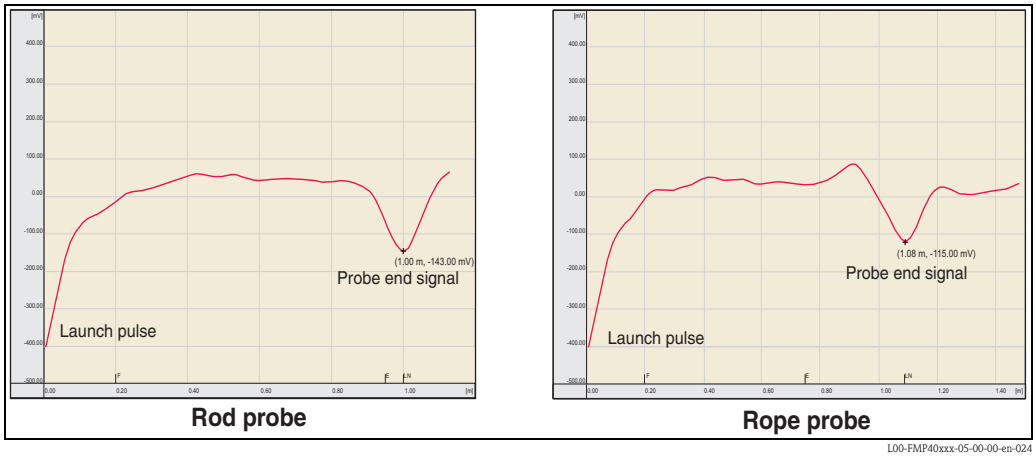
L00-FMP4xxxx-20-00-00-en-007

Note!
In the event of severe interference echoes, installing the Levelflex at another point can optimize the measurement routine.

Evaluating the measurement with the aid of the envelope curve

Typical curve shapes:

The following examples display typical curve shapes for a rope or rod probe in an empty tank. For all probe types, a negative probe end signal is shown. For rope probes, the end weight causes an additional preliminary positive echo (see rope probe diagram).

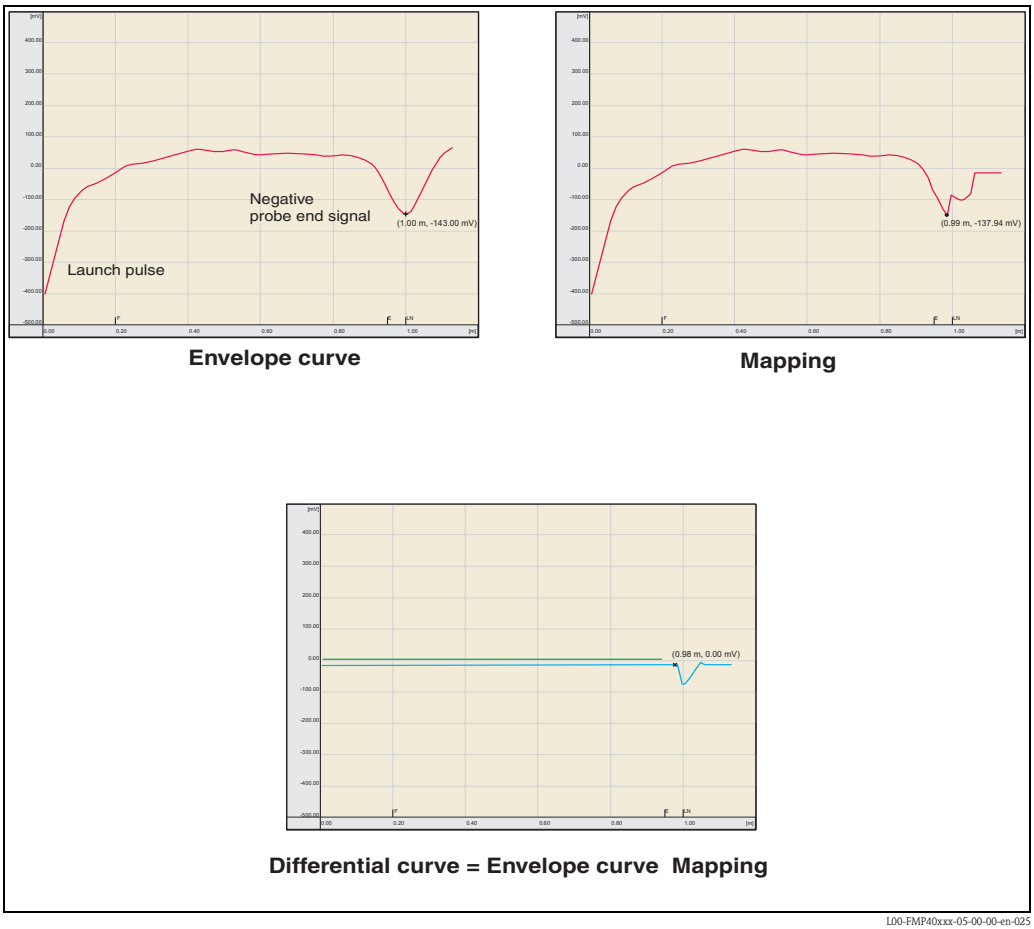


L00-FMP40xxx-05-00-00-en-024

Level echoes are indicated as positive signals in the envelope curve. Interference echoes can be both positive (e.g. reflections from internals) and negative (e.g. nozzles). The envelope curve, the map and the differential curve are used for the evaluation. Level echoes are searched for in the differential curve.

Evaluating the measurement:

- The map must correspond to the course of the envelope curve (for rod probes up to approx. 5 cm and for rope probes up to approx. 25 cm before the end of the probe) when the tank is empty.
- Amplitudes in the differential curve should be at a level of 0 mV when the tank is empty and lie within the span that is specified by the probe-specific blocking distances. In order to not detect any interference echoes, there must be no signals that exceed the echo threshold when the tank is empty.
- For partially-filled tanks, the map may only differ from the envelope curve at the position of the level echo. The level signal is then detected unequivocally as a positive signal in the differential curve. For detecting the level echo, the amplitude must lie above the echo threshold.



L00-FMP40xxx-05-00-00-en-025

6.8.2 User-specific applications (operation)

For details of setting the parameters of user-specific applications, see separate documentation BA00245F/00/EN "Description of Instrument Functions" on the enclosed CD-ROM.

6.9 Commissioning with a FOUNDATION Fieldbus configuration tool

Note!
For commissioning of the device with a FOUNDATION Fieldbus configuration tool you need to know the INSTRUMENT_ID, which consists of the following parts:

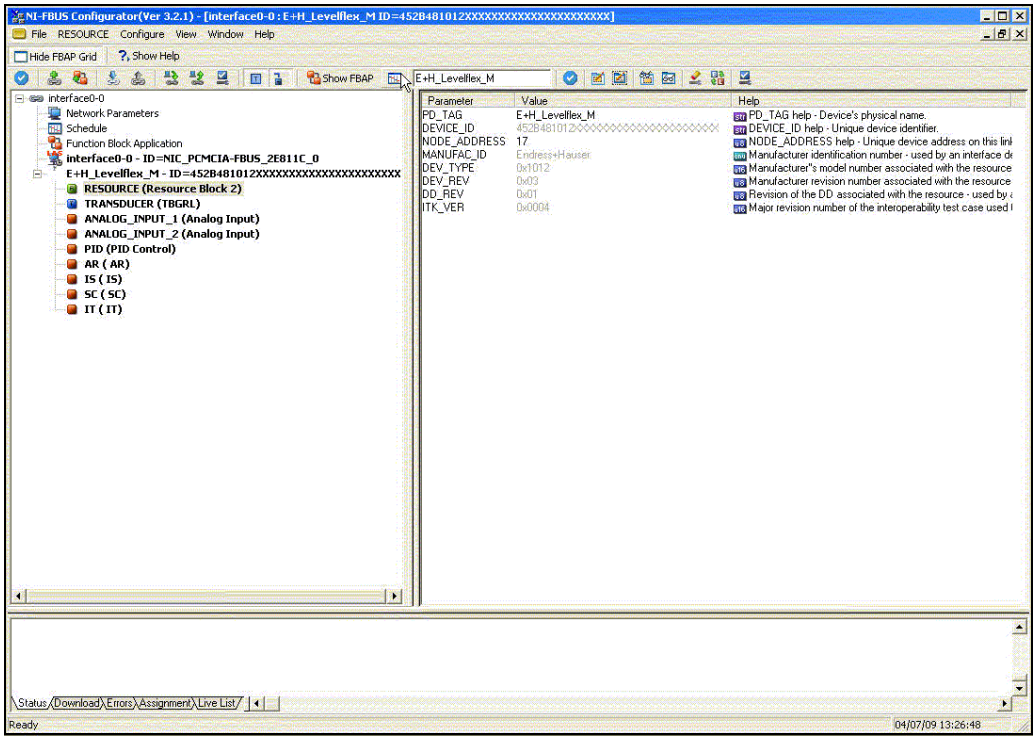
Instrument_ID = 452B481012-XXXXXXXX

whereby:

452B48	ID code for Endress+Hauser
1012	ID code for Levelflex M
XXXXXXXX	Instrument serial number, as printed on the nameplate

6.9.1 Fist setup

1. Open the configuration tool and load the device Descriptions (*.ffo, *.sym and - if required by the tool - *.cff). Ensure you use the correct files (→ 47).
2. The first time it is connected, the device reports as follows:



NI-FBUS-FMP-4x-en-002

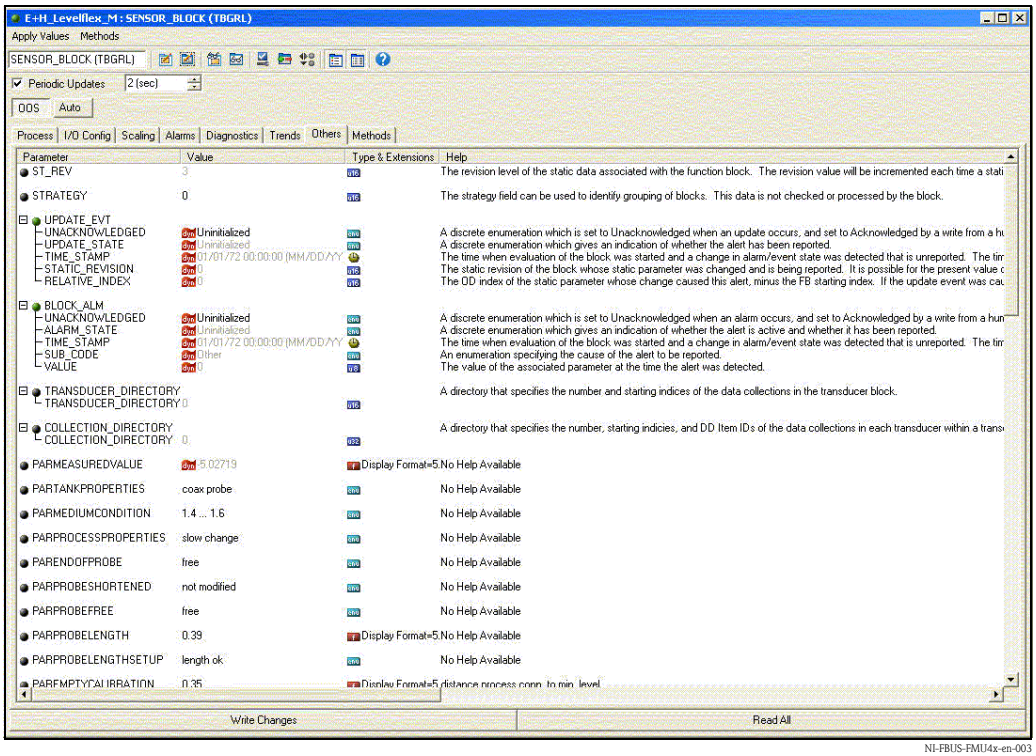
3. Identify the device using the INSTRUMENT_ID and assign the desired field device tag name (PD_TAG). Factory setting: PD_TAG = E+H_LEVELFLEX_M_XXXXXXXX

6.9.2 Parametrization of the Resource Block (Start Index: 400)

1. Enter the desired block name (optional).
   Factory setting: RESOURCE_XXXXXXXX
2. Opern the Resource Block
3. On delivery, write protection is disabled so that you can access the write parameters via FOUNDATION Fieldbus. Check this status by the parameter WRITE_LOCK:
   – Write protectin activated: WRITE_LOCK = LOCKED
   – Write protection deactivated: WRITE_LOCK = NOT LOCKED
   Deactivate the write protection if necessary, → 50.
4. Set the operating mode to AUTO in the parameter group MODE_BLK (parameter TARGET).

6.9.3 Parametrization of the Sensor Block (Start Index: 2000)

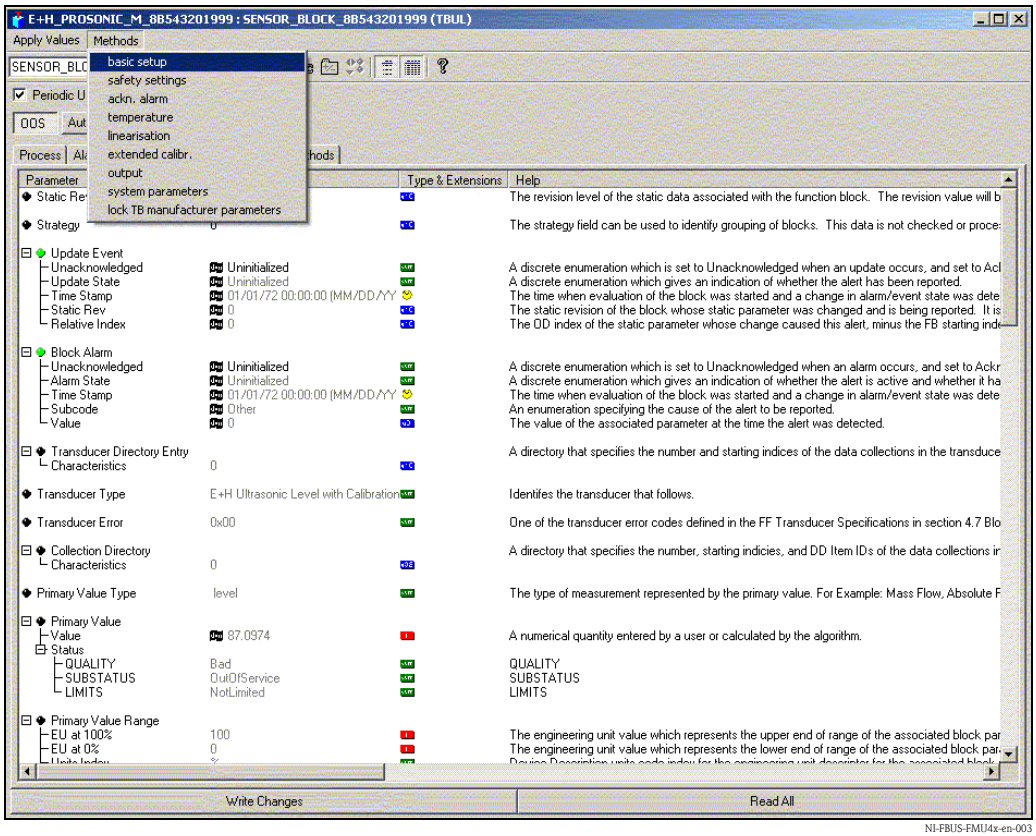
1. Enter the desired block name (optional)
   Factory setting: SENSOR_XXXXXXXX
2. Open the Sensor Block. The following display appears:



NI-FBUS-FMU4x-en-003

Note!
There are two possibilities to edit the parameters of the block:
- A parameter from the list can be opened for editing by a double click.
- You can open one of the FOUNDATION Fieldbus methods. Each method guides you automatically through a number of parameters which are required for a specific configuration task. The following sections describe the parametrization by the "basic setup" method.

3. Open the FOUNDATION Fieldbus method "basic setup":



4. The method contains the following parameters[3]:
   a. Application parameters (→ 57)
      – PARTANKPROPERTIES (tank properties)
      – PARMEDIUMCONDITION (medium property)
      – PARPROCESSPROPERTIES (process condition)
   b. Empty and full calibration (→ 61)
      – PAREMPTYCALIBRATION (empty calibration)
      – PARFULICALIBRATION (full calibration)
   c. Interference echo suppression (→ 63)
      – PARCHECKDISTANCE (check distance)
      – PARSUPPRESSIONDISTANCE (range of mapping)
      – PARSTARTMAPPINGRECORD (start maping)
      – PARPRESMAPRANGE (pres. map. dist.)
      – PARCUSTTANKMAP (cust. tank map)
5. Set the operating mode to AUTO in the parameter group MODE_BLK (parameter TARGET). Otherwise the measured value can not be processed correctly by the connected Analog Input Block.
6. If measuring errors occur or if the measuring value seems unreliable, it is advisable to check the quality of the measurement by the envelope curve display. This can be done in two different ways:
   – by the display and operating module VU331 (→ 41)
   – by an Endress+Hauser operating program (→ 45)

3) In the FOUNDATION Fieldbus configuration tool you can select from two types of parameter display:
- parameter names (e.g. "PARTANKSHAPE")
- label texts (e.g. "tank shape")

6.9.4 Parametrization of the Analog Input Blocks

Levelflex M has two Analog Input Blocks that can be assigned to the various process variables. The following descripiton provides an example for the Analog Input Block 1 (Start Index 500).

1. Enter the desired block name (optional).
   Factory setting: ANALOG_INPUT_1_XXXXXXXX
2. Open the Analog Input Block.
3. Set the operating mode to OOS (Out of Service) in the parameter group MODE_BLK (parameter TARGET).
4. Using the parameter CHANNEL select the process variable that is to be used as the input value for the function block algorithm (scaling and limit value monitoring). The following settings are possible:
   – CHANNEL = 1: level
   – CHANNEL = 2: distance
5. In the parameter gorup XD_SCALE select the desired engineering unit and the block input range (measuring range) for the process variable in question (see the example below).

   ☝ Caution!
   Make sure that the selected unit is suitable for the measurement variable of the selected process variable. Otherwies the parameter BLOCK_ERROR will display the error message "Block Configuration Error" and the block operating mode cannot be set to AUTO.
6. In the L_TYPE prameter, select the mode of linearization for the input variable (Direct, Indirect, Indirect Sq Root). For details, → 📄 119.

   ☝ Caution!
   Note that with the type of linearization "Direct" the configuration of the parameter group OUT_SCALE must agree with the configuration of the parameter group XD_SCALE. Otherwise the block operating mode cannot be set to AUTO. Such incorrect configuration is indicated in the parameter BLOCK_ERROR by the "Block Configuration Error" message.

Example:

- The measuring range of the sensor is 0 to 10 m.
- The output range to the automation system should be 0 to 10 m, too.

The following settings are to be made:

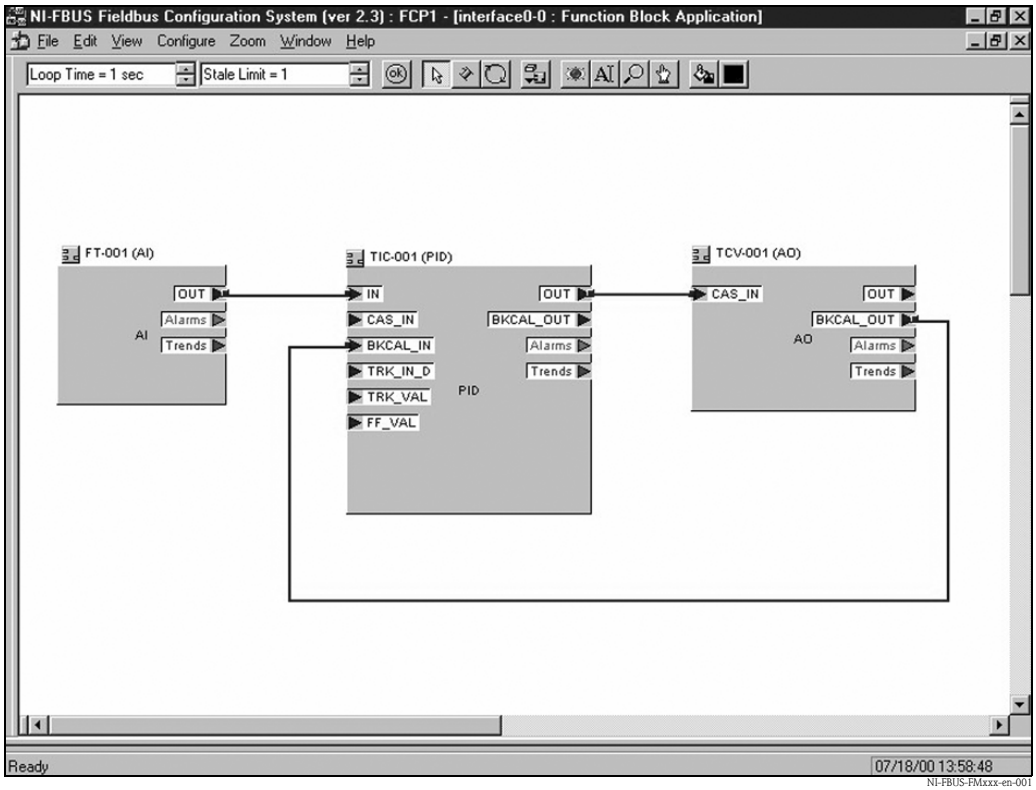
- Analog Input Block 1, Parameter CHANNEL → "1" (measured level)
- Parameter L_TYPE → DIRECT
- Parameter group XD_SCALE
  XD_SCALE 0% → 0
  XD_SCALE 100% → 10
  XD_SCALE_UNIT → m
- Parameter group OUT_SCALE
  OUT_SCALE 0% → 0
  OUT_SCALE 100% → 10
  OUT_SCALE_UNIT → m

7. If required, use the following parameters to define the limit values for alarm and warning messages:
   – HI_HI_LIM -> Limit value for the upper alarm
   – HI_LIM -> Limit value for the upper warning
   – LO_LIM -> Limit value for the lower warning
   – LO_LO_LIM -> Limit value for the lower alarm
   The limit values entered must be within the value range specified in the parameter group OUT_SCALE.

8. In addition to the limit values you must also specify the action taken if a limit value is exceeded using the alarm priorities (parameters HI_HI_PRI, HI_PRI, LO_PRI, LO_LO_PRI). Reporting to the the fieldbus host system only takes place if the alarm priority is higher than 2.
For details, → 118.

6.9.5 Connection of the function blocks

1. A concluding overall system configuration is essential so that the operating mode of the Analog Input Block can be set to AUTO and so that the field device is integrated into the system application. To do this, a configuration software (e.g. you host system software) is used to connect the function blocks – normally graphically – to the desired control strategy and then the sequence of the individual process control functions is specified.



Example: Connection of the function blocks with the NI-FBUS Configurator

2. Download the configuration data into the field devices by the download function of the FOUNDATION Fieldbus configuration tool.
3. Set the oerating mode of the AI Block to AUTO (parameter group MODE_BLK, parameter TARGET). However, this is only possible under the following conditions:
   – The function blocks are correctly connected with each other.
   – The parametrization of the AI Block is correct (→ 81, steps 5 and 6).
   – The Resource Block is in operating mode AUTO.

6.10 Commissioning with the handheld terminal Field Communicator 375, 475

The steps of the commissioning procedure are the same as with a FOUNDATION Fieldbus configuration tool (→ 78). The blocks should be parametrized in the following order:

- the RESOURCE BLOCK
- the SENSOR BLOCK (the "basic setup" method can be used for this, see chapter "basic setup")
- the ANALOG INPUT BLOCKS

7 Maintenance

The Levelflex M measuring device requires no special maintenance.

7.1 Exterior cleaning

When cleaning the Levelflex M , always use cleaning agents that do not attack the surface of the housing and the seals.

7.2 Repairs

The Endress+Hauser repair concept assumes that the measuring devices have a modular design and that customers are able to undertake repairs themselves ("Spare Parts", → 95). Please contact Endress+Hauser Service for further information on service and spare parts.

7.3 Repairs to Ex-approved devices

When carrying out repairs to Ex-approved devices, please note the following:
- Repairs to Ex-approved devices may only be carried out by trained personnel or by Endress+Hauser Service.
- Comply with the prevailing standards, national Ex-area regulations, safety instructions (XA) and certificates.
- Only use original spare parts from Endress+Hauser.
- When ordering a spare part, please note the device designation on the nameplate. Only replace parts with identical parts.
- Carry out repairs according to the instructions. On completion of repairs, carry our the specified routine test on the device.
- Only Endress+Hauser Service may convert a certified device into a different certified variant.
- Document all repair work and conversions.

7.4 Replacement

After a complete Levelflex M or electronic module has been replaced, the parameters can be downloaded into the device again via the communication interface. Prerequisite to this is that the data were uploaded to the PC beforehand using the FieldCare.
Measurement can continue without having to carry out a new setup.

- You may have to activate linearisation (see BA00245F/00/EN on the enclosed CD-ROM.)
- You may need to record the tank map again (see Basic Setup)

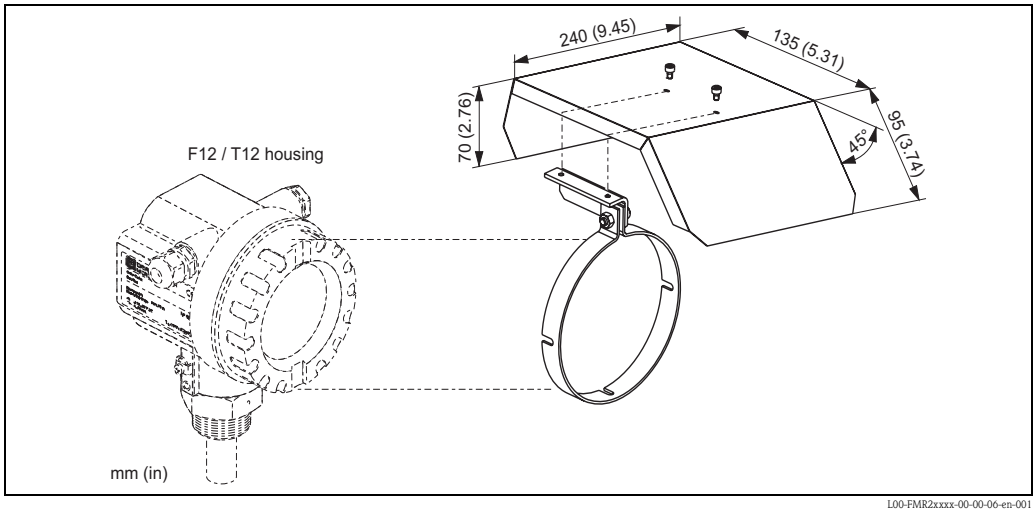
After an probe or electronic has been replaced, a new calibration must be carried out.
This is described in the repair instructions.

8 Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the Levelflex M.

8.1 Weather protection cover

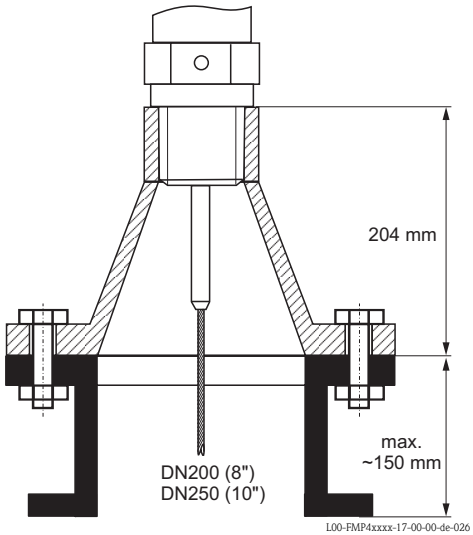
A Weather protection cover made of stainless steel is recommended for outdoor mounting (order code: 543199-0001). The shipment includes the protective cover and tension clamp.



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

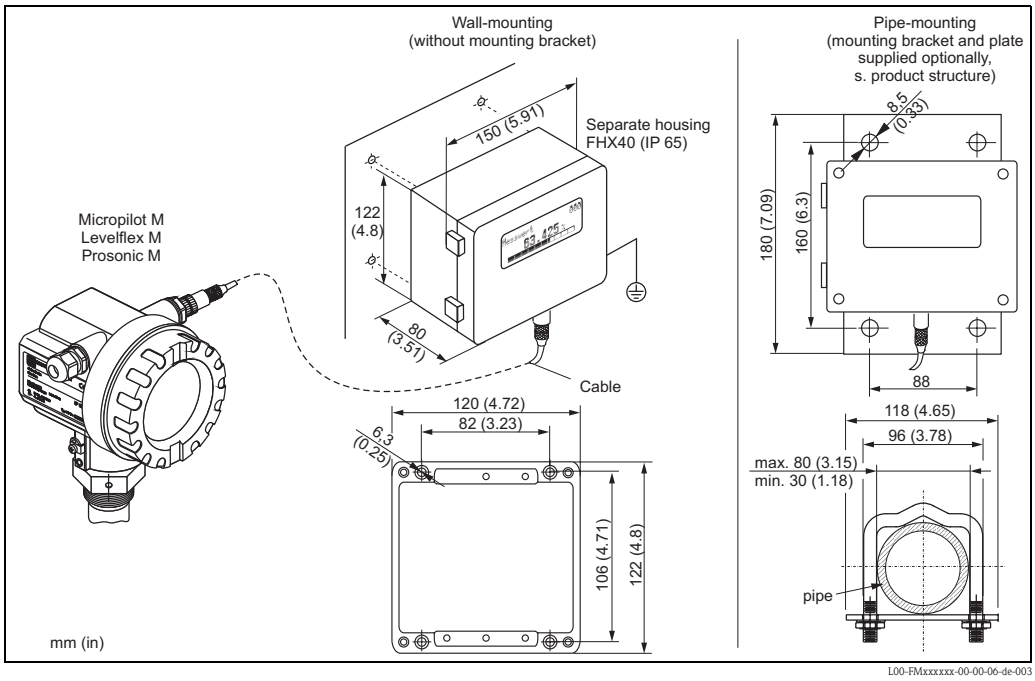
8.2 Flange with horn adapter to adapt on the following nozzles

Horn adapter	Order-No.
G1-1/2" at DN200 / PN16	52014251
G1-1/2" at DN250 / PN16	52014252
NPT1-1/2" at 8" / 150 psi	52014253
NPT1-1/2" at 10" / 150 psi	52014254
Material: 316L (1.4435)	



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

8.3 Remote display and operation FHX40



Technical data (cable and housing) and product structure:

Max. cable length	20 m (65 ft)
Temperature range	-30 °C to +70 °C (-22 °F to +158 °F)
Degree of protection	IP65/67 (housing), IP68 (cable) acc. to IEC 60529
Materials	Housing: AlSi12; cable glands: nickle plated brass
Dimensions [mm (in)]	122x150x80 (4.8x5.91x3.15) / HxWxD

010	**Approval:**	
	A	Non-hazardous area
	2	ATEX II 2G Ex ia IIC T6
	3	ATEX II 2D Ex ia IIIC T80°C
	G	IECEx Zone1 Ex ia IIC T6/T5
	S	FM IS Cl. I Div.1 Gr. A-D, zone 0
	U	CSA IS Cl. I Div.1 Gr. A-D, zone 0
	N	CSA General Purpose
	K	TIIS Ex ia IIC T6
	C	NEPSI Ex ia IIC T6/T5
	Y	Special version, TSP-No. to be spec.

020	**Cable:**	
	1	20m / 65ft (> for HART)
	5	20m / 65ft (> for PROFIBUS PA/FOUNDATION Fieldbus)
	9	Special version, TSP-No. to be spec.

030	**Additional option:**	
	A	Basic version
	B	Mounting bracket, pipe 1"/ 2"
	Y	Special version, TSP-No. to be spec.

FHX40 -	Complete product designation

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

8.4 Centering disks

If the probes with rod version are used in stilling well or bypass, it must be ensured that the probe does not come into contact with the wall. The centering disk fixes the rod probe in the middle of the pipe.

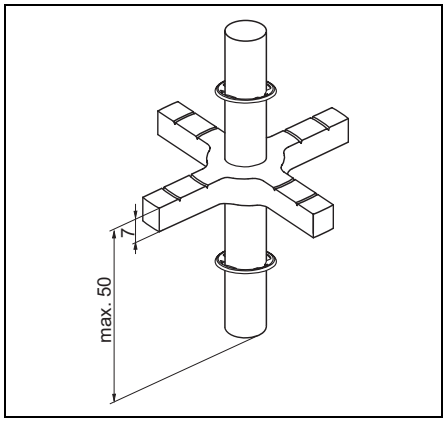
8.4.1 Centering disk PEEK Ø 1.89 - 3.74 inch

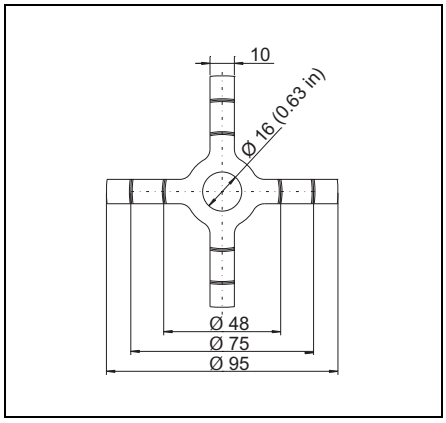
The centering disk is suitable for probes with a rod diameter of 16 mm and can be used in pipes from DN40 (1½") up to DN100 (4"). Markings on the 4-leg centering disk ensure a simple tailoring. Hence the centering disk can be adapted to the pipe diameter.
See also Operating Instruction BA00377F/00/EN.

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

Order-no. 71069064

Note!
If the centering disk is inserted in an bypass, it must be positioned below the lower bypass outlet. The has to be accounted for when choosing the probe length.
Generally, the centering disk should not be mounted higher than 50 mm from the probe end.
It is recommended not to insert the PEEK centering disk in the measuring range of the rod probe.



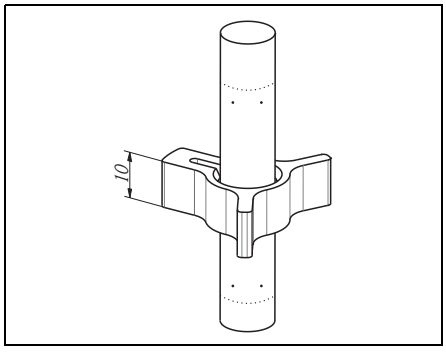


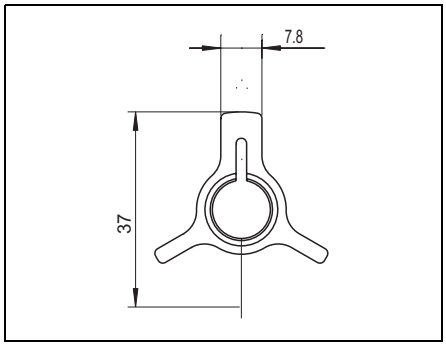
8.4.2 Centering disk PFA Ø 1.46 inch

The centering disk is suitable for probes with a rod diameter of 16 mm (also coated rod probes) and can be used in pipes from DN40 (1½") upto DN50 (2").
See also Operating Instruction BA00378F/00/EN.

- Measuring range: -200 °C to +150 °C

Order-no. 71069065





8.5 Commubox FXA291

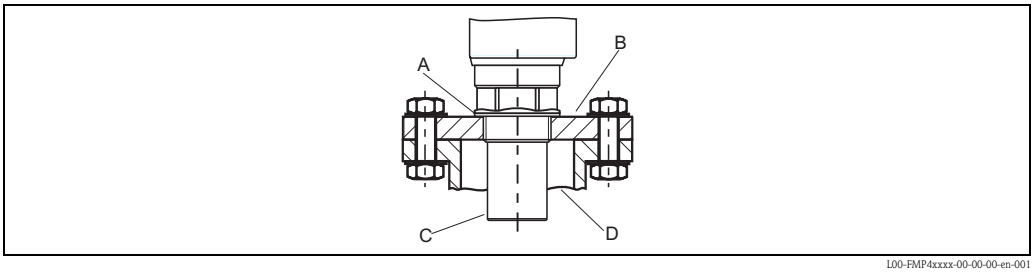
The Commubox FXA291 connects Endress+Hauser field devices with CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a personal computer or a notebook. For details refer to TI00405C/07/EN.

Note!
For the device you need the "ToF Adapter FXA291" as an additional accessory.

8.6 ToF Adapter FXA291

The ToF Adapter FXA291 connects the Commubox FXA291 via the USB interface of a personal computer or a notebook to the devices. For details refer to KA00271F/00/A2.

8.7 Screw in flange FAX50



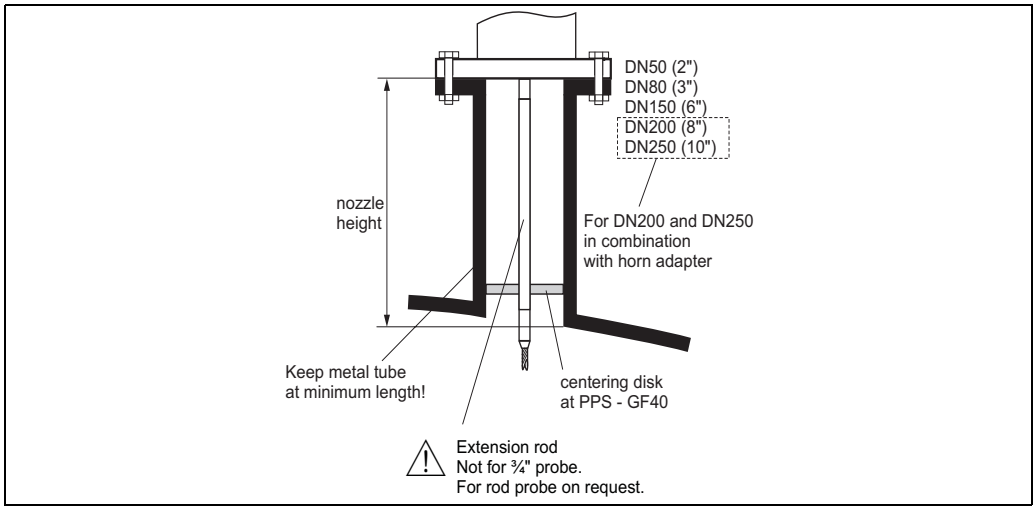
L00-FMP4xxxx-00-00-00-en-001

015	Diamter; Material	
	BR1	DN50 PN10/16 A, steel, flange EN1092-1
	BS1	DN80 PN10/16 A, steel, flange EN1092-1
	BT1	DN100 PN10/16 A, steel, flange EN1092-1
	JF1	2" 150lbs FF, steel, flange ANSI B16.5
	JG1	3" 150lbs FF, steel, flange ANSI B16.5
	JH1	4" 150lbs FF, steel, flange ANSI B16.5
	JK2	8" 150lbs FF, PP, max. 3bar abs / 44psia, flange ANSI B16.5
	XIF	UNI flange 2"/DN50/50, PVDF, max. 3bar abs/44psia, suitable for 2" 150lbs/DN50 PN16/10K 50
	XIG	UNI flange 2"/DN50/50, PP, max. 3bar abs/44psia, suitable for 2" 150lbs/DN50 PN16/10K 50
	XIJ	UNI flange 2"/DN50/50, 316L, max. 3bar abs/44psia, suitable for 2" 150lbs/DN50 PN16/10K 50
	XJF	UNI flange 3"/DN80/80, PVDF, max. 3bar abs/44psia, suitable for 3" 150lbs/DN80 PN16/10K 80
	XJG	UNI flange 3"/DN80/80, PP, max. 3bar abs/44psia, suitable for 3" 150lbs/DN80 PN16/10K 80
	XJJ	UNI flange 3"/DN80/80, 316L, max. 3bar abs/44psia, suitable for 3" 150lbs/DN80 PN16/10K 80
	XKF	UNI flange 4"/DN100/100, PVDF, max. 3bar abs/44psia, suitable for 4" 150lbs/DN100 PN16/10K 100
	XKG	UNI flange 4"/DN100/100, PP, max. 3bar abs/44psia, suitable for 4" 150lbs/DN100 PN16/10K 100
	XKJ	UNI flange 4"/DN100/100, 316L, max. 3bar abs/44psia, suitable for 4" 150lbs/DN100 PN16/10K 100
	XLF	UNI flange 6"/DN150/150, PVDF, max. 3bar abs/44psia, suitable for 6" 150lbs/DN150 PN16/10K 150
	XLG	UNI flange 6"/DN150/150, PP, max. 3bar abs/44psia, suitable for 6"/DN150 PN16/10K 150
	XLJ	UNI flange 6"/DN150/150, 316L, max. 3bar abs/44psia, suitable for 6" 150lbs/DN150 PN16/10K 150
	XMG	UNI flange DN200/200, PP, max. 3bar abs/44psia, suitable for DN200 PN16/10K 200
	XNG	UNI flange DN250/250, PP, max. 3bar abs/44psia, suitable for DN250 PN16/10K 250
	YYY	Special version, TSP-No. to be spec.

020		Sensor connection	
		A	Thread ISO228 G3/4
		B	Thread ISO228 G1
		C	Thread ISO228 G1-1/2
		D	Thread ISO228 G2
		E	Thread ANSI NPT3/4
		F	Thread ANSI NPT1
		G	Thread ANSI NPT1-1/2
		H	Thread ANSI NPT2
		Y	Special version, TSP-No. to be spec.

FAU70E			Complete product designation

8.8 Extension rod / Centering



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

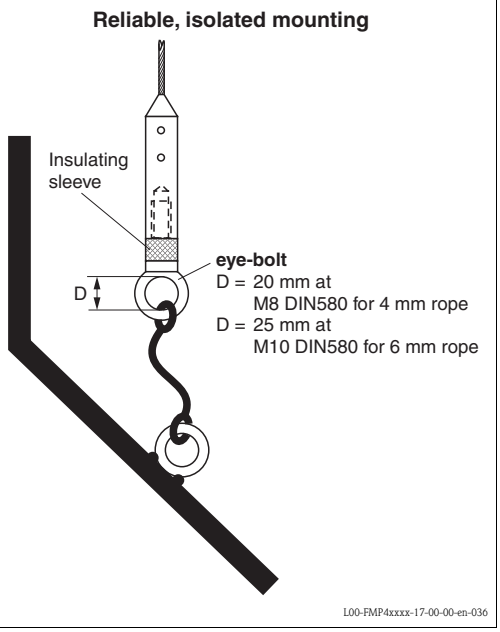
010	**Approval**				
	A	For non-hazardous areas			
	M	FM DIP Cl. II DIv.1 Gr. E - G N.I., zone 21, 22			
	P	CSA DIP Cl. II Div.1 Gr. G + Coal dust, N.I.			
	S	FM Cl. I, II, III DIv.1 Gr. A - G N.I., zone 0, 1, 2, 20, 21, 22			
	U	CSA Cl. I, II, III Div.1 Gr. A - G N.I., zone 0, 1, 2			
	1	ATEX II 1G			
	2	ATEX II 1D			
020		**Extension rod; Nozzle Height**			
		1	115mm; 150 - 250mm / 6 - 10"		
		2	215mm; 250 - 350mm / 10 - 14"		
		3	315mm; 350 - 450mm / 14 - 18"		
		4	415mm; 450 - 550mm / 14 - 22"		
		9	Special version, TSP-No. to be spec.		
030			**Center Washer**		
			A	Not selected	
			B	DN40 / 1-1/2", inside-d. = 40 - 45mm, PPS	
			C	DN50 / 2", inside-d. = 50 - 57mm, PPS	
			D	DN80 / 3", inside-d. = 80 - 85mm, PPS	
			E	DN80 / 3", inside-d. = 76 - 78mm, PPS	
			G	DN100 / 4", inside-d. = 100 - 110mm, PPS	
			H	DN150 / 6", inside-d.= 152 - 164mm, PPS	
			J	DN200 / 8", inside-d.= 210 - 215mm, PPS	
			K	DN250 / 10", inside-d.= 253 - 269mm, PPS	
			Y	Special version, TSP-No. to be spec.	
HMP40-					Complete product designation

8.9 Isolated tie down

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

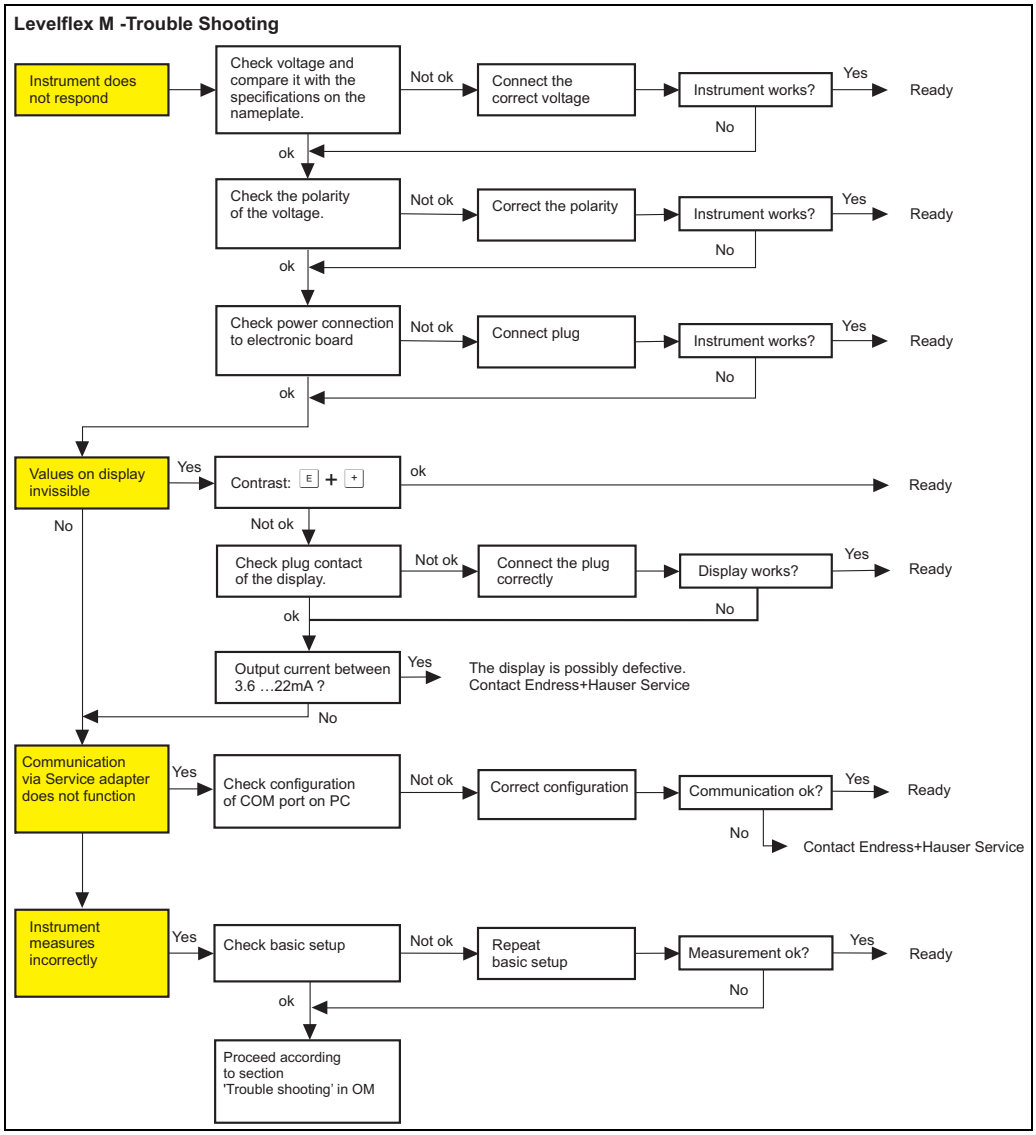
If a rope probe has to be fixed and asecure grounded mounting is not possible, we recommend using the insulating sleeve made of PEEK-GF30 with accompanying DIN 580 eye-bolt made of stainless steel.
Max. process temp. 150 °C.

Due to the risk of electrostatic charge, theinsulating sleeve is not suitable for use inhazardous areas.In these cases the fixing must be reliably grounded (→ 27).



9 Trouble-shooting

9.1 Trouble-shooting instructions

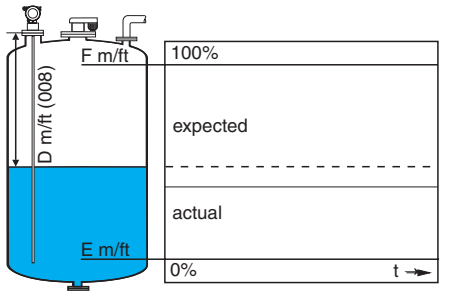
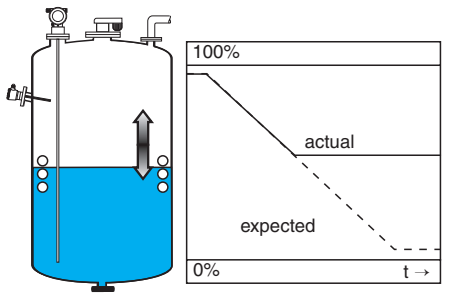


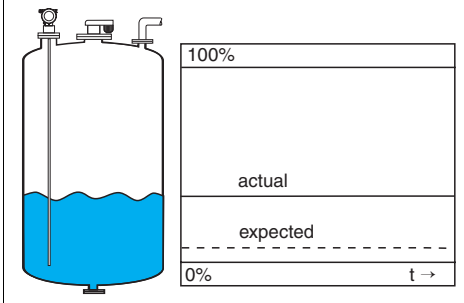
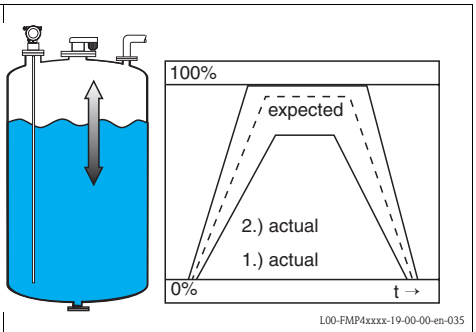
9.2 System error messages

Code	Description	Possible cause	Remedy
A102	checksum error general reset & new calibr. required	device has been powered off before data could be stored; emc problem; EEPROM defect	reset avoid emc problem; if alarm prevails after reset, exchange electronics
W103	initialising - please wait	EEPROM storage not yet finished	wait some seconds; if warning prevails, exchange electronics
A106	downloading please wait	processing data download	wait until warning disappears
A110	checksum error general reset & new calibr. required.	device has been powered off before data could be stored; emc problem; EEPROM defect	reset avoid emc problem; if alarm prevails after reset, exchange electronics
A111	electronics defect	RAM defective	reset if alarm prevails after reset, exchange electronics
A113	electronics defect	ROM defective	reset if alarm prevails after reset, exchange electronics
A114	electronics defect	EEPROM defective	reset if alarm prevails after reset, exchange electronics
A115	electronics defect	general hardware problem	Reset if alarm prevails after reset, exchange electronics
A116	download error repeat download	checksum of stored data not correct	restart download of data
A121	electronics defect	no factory calibration existant; EEPROM defective	contact service
W153	initialising - please wait	initialisation of electronics	wait some seconds; if warning prevails, power off device and power on again
A160	checksum error general reset & new calibr. required.	device has been powered off before data could be stored; emc problem; EEPROM defect	reset avoid emc problem; if alarm prevails after reset, exchange electronics
A164	electronics defect	hardware problem	reset if alarm prevails after reset, exchange electronics
A171	electronics defect	hardware problem	reset if alarm prevails after reset, exchange electronics
A221	Probe pulse deviation from average values	HF module or cable between HF module and electronics defective	Check contacts on HF module If fault cannot be eliminated: Replace HF module
A241	Broken probe	Broken probe orvalue for probe length is too long	Check the probe length in 033, Check the probe itself,if the probe is broken, change the probe, or change to a non contact system
		probe break monitoring enabled without mapping beforehand	disable probe break monitoring, perform mapping and then reactivate probe break monitoring

Code	Description	Possible cause	Remedy
A251	Feedthrough	Lost contact in the process feedthrough	Replace process feedtrough
A261	HF cable defective	HF cable defective or HF connector removed	Check HF connector, replace cable if defective
W275	Offset too high	Temperature at the electronics too high or HF module defective	Check temperature, replace HF module if defective
W512	recording of mapping please wait	mapping active	wait some seconds until alarm disappears
W601	linearisation ch1 curve not monotone	linearization not monotonously increasing	correct linearisation table
W611	less than 2 linearisation points for channel 1	number of entered linearization points < 2	correct linearisation table
W621	simulation ch. 1 on	simulation mode is active	switch off simulation mode
E641	no usable echo channel 1 check calibr.	echo lost due to application conditions of built up on antenna	check installation; clean probe (cf. Operating Instructions)
W650	Signal/noise ratio too low or no echo	noise on signal to high	eliminate electromagnetic interference
E651	level in safety distance - risk of overspill	level in safety distance	alarm will disappear as soon as level leaves safety distance
A671	linearisation ch1 not complete, not usable	linearisation table is in edit mode	activate linearisation table

9.3 Application errors

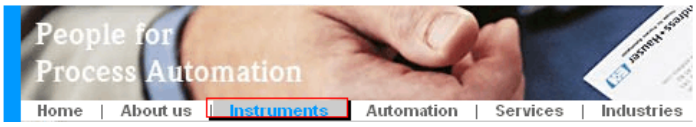
Error	Output	Possible cause		Remedy
A warning or alarm has occurred	Depending on the configuration	See table of error messages (→ 91)		1. See table of error messages (→ 91)
Measured value (00) is incorrect		Measured distance (008) OK?	yes →	1. Check empty calibr. (005) and full calibr. (006) 2. Check linearisation: → level/ullage (040) → max. scale (046) → diameter vessel (047) → Check table
		no ↓		
		An interference echo may have been evaluated.	yes →	1. Carry out tank mapping → basic setup
No change off measured value on filling/emptying		Interference echo from installations, nozzle or extension on the probe		1. Carry out tank mapping → basic setup 2. If necessary, clean probe 3. If necessary, select better mounting position

Error	Output	Possible cause	Remedy
E641 (loss of echo) after turn on the power supply	**If the device is configured to Hold by loss of echo the output is set to any value/current.**	noise level during the initialisation phase to high.	Repeat once more empty calibr. (005). Caution! Before conformation change with + or − to the edit mode.
Device displays a level when the tank is empty		Incorrect probe length	1. Carry out automatic probe length detection when the tank is empty. 2. Carry out mapping over entire probe when the tank is empty (probe free!).
Measured value incorrect (slope error in the entire measuring range)		Tank properties incorrect. Medium properties incorrect.	LN < 4 m and "Aluminium tank" tank properties selected → Calibration not possible. → Selection → Select standard → Thresholds too high Select lower medium properties.

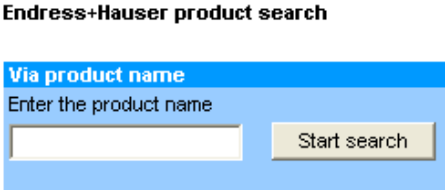
9.4 Spare Parts

An overview of the spare parts for your device is available in the internet at www.endress.com. To obtain information on the spare parts, proceed as follows:

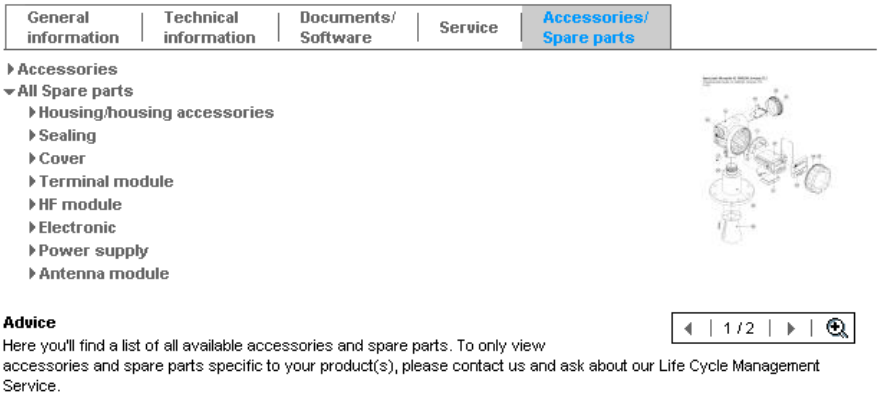
1. Go to "www.endress.com" and select your country.
2. Click "Instruments".



3. Enter the product name into the "product name" field.



4. Select the device.
5. Click the "Accessories/Spare parts" tab.



6. Select the required spare parts (You may also use the overview drawing on the right side of the screen.)

When ordering spare parts, always quote the serial number indicated on the nameplate. As far as necessary, the spare parts also include replacement instructions.

9.5 Return

The following procedures must be carried out before a transmitter is sent to Endress+Hauser e.g. for repair or calibration:

- Remove all residue which may be present. Pay special attention to the gasket grooves and crevices where fluid may be present. This is especially important if the fluid is dangerous to health, e.g. corrosive, poisonous, carcinogenic, radioactive, etc.
- Always enclose a duly completed "Declaration of contamination" form (a copy of the "Declaration of contamination" is included at the end of this operating manual).
  Only then can Endress +Hauser transport, examine and repair a returned device.
- Enclose special handling instructions if necessary, for example a safety data sheet as per EN 91/155/EEC.

Additionally specify:

- An exact description of the application
- The chemical and physical characteristics of the product
- A short description of the error that occurred (specify error code if possible)
- If necessary, give the error code

9.6 Disposal

In case of disposal please seperate the different components according to their material consistence.

9.7 Software history

Date	Software version	Software modifications	Documentation	Description of Instrument Functions
04.2002	01.02.00	Original software Operated via: – ToF Tool – Commuwin II (ab Version 2.05.03) – HART-Communicator DXR375 mit Rev.1 , DD1.	BA244F/00/en/05.02 52011934 BA244F/00/en/06.02 52011934 BA244F/00/en/02.03 52011934 BA244F/00/en/02.04 52011934	BA245F/00/en/03.02 52011936 BA245F/00/en/06.02 52011936 BA245F/00/en/02.03 52011936 BA245F/00/en/02.04 52011936
08.2003	01.02.02	■ Function group: envelope curve display ■ Katakana (japanese) ■ current turn down (HART only) ■ the customer tank map can be edited Operated via: ■ ToF Tool ■ Commuwin II (ab Version 2.08-1 Update C) ■ HART-Communicator DXR375 it Rev.1 , DD1.	—	—
07.2004	01.02.04	■ "mapping" function improved ■ Specification of the measuring accuracy at the end of probe	BA244F/00/en/06.04 52011934 BA244F/00/en/04.05 52011934 BA244F/00/en/01.06 52011934	BA245F/00/en/06.04 52011936 BA245F/00/en/01.06 52011936
01.2005	01.02.06	Function "echo lost" improved	—	—
03.2006	01.04.00	■ Function "detection window" ■ Description of Instrument Functions ■ Operating menu extended	BA244F/00/en/05.06 52011934 BA244F/00/en/11.06 52011934	BA245F/00/en/06.06 52011936
07.2007	01.04.02	"Echo" and "Linearisation" improved	—	—
10.2008	01.04.04	Function "LAS" improved	BA244F/00/en/03.09 71074798 BA244F/00/en/08.09 71102346 BA00244F/00/EN/13.10 71120272	—

9.8 Contact addresses of Endress+Hauser

Contact addresses can be found on our homepage: www.endress.com/worldwide. If you have any questions, please do not hesitate to contact your Endress+Hauser representative.

10 Technical data

10.1 Additional technical data

10.1.1 Input

Measured variable	The measured variable is the distance between a reference point (see Fig., → 🖹 14) and the product surface. Subject to the input empty distance "E" (see Fig., → 🖹 54), the level is calculated. Alternatively, the level can be converted by means of linearisation (32 points) into other variables (volume, mass).

10.1.2 Output

Output signal	■ FOUNDATION Fieldbus (H1): – signal coding: Manchester Bus Powered (MBP) – 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 (→ 🖹 42) – Plain text display ■ Current output, signal on error can be selected (e.g. according to NAMUR recommendation NE43) ■ Digital interface
Linearization	The linearization function of the Levelflex M allows the conversion of the measured value into any unit of length or volume and mass or %. Linearization tables for calculating the volume in cylindrical tanks are preprogrammed. Other tables of up to 32 value pairs can be entered manually or semi-automatically. The creation of a linearization table with FieldCare is particularly convenient.

Data of the FOUNDATION Fieldbus interface

Basic Data

Device Type	1012 (hex)
Device Revision	04 (hex)
DD Revision	02 (hex)
CFF Revision	02 (hex)
ITK Version	4.61
ITK-Certification Driver-No.	www.endress.com / www.fieldbus.org
Link-Master (LAS) cabable	yes
Link Master / Basic Device selectable	yes; Default: Basic Devce
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	■ level or volume[1] (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

10.1.3 Auxiliary energy

Terminals

Cable cross-section: 0.5 to 2.5 mm² (20 to 14 AWG)

Cable entry

- Cable gland: M20x1.5 (only cable entry for Ex d)
- Cable entry: G½ or ½NPT
- FOUNDATION Fieldbus 7/8" plug

Supply voltage

Type	Terminal voltage
standard	9 V to 32 V
Ex ia (FISCO model)	9 V to 17.5 V
Ex ia (Entity concept)	9 V to 24 V

Supply voltage	9V to 32V[1)]
Lift-off voltage	9V

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

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

FNICO

Yes

Polarity sensitive

No

In-rush current

≤ 15 mA

Basic current

Max. 15 mA

10.1.4 Performance characteristics

Reference operating conditions	■ temperature = +20 °C ±5 °C ■ pressure = 1013 mbar abs. ±20 mbar ■ humidity = 65 % ±20 % ■ Reflection factor ≥ 0.8 (surface of the water for coax probe, metal plate for rod and rope probe with min. 1 m ∅) ■ Flange for rod or rope probe ≥ 30 cm ∅ ■ Distance to obstructions ≥ 1 m
Maximum measured error	Is in Function group "basic setup".
Resolution	Digital: 1 mm
Reaction time	The reaction time is dependent on the configuration. Shortest time: ■ 2-wire electronics: 1 s
Influence of ambiente temperature	The measurements are carried out in accordance with EN 61298-3: ■ digital output: – average T_K: 0.6 mm/10 K, max. ±3.5 mm over the entire temperature range -40 °C to +80 °C

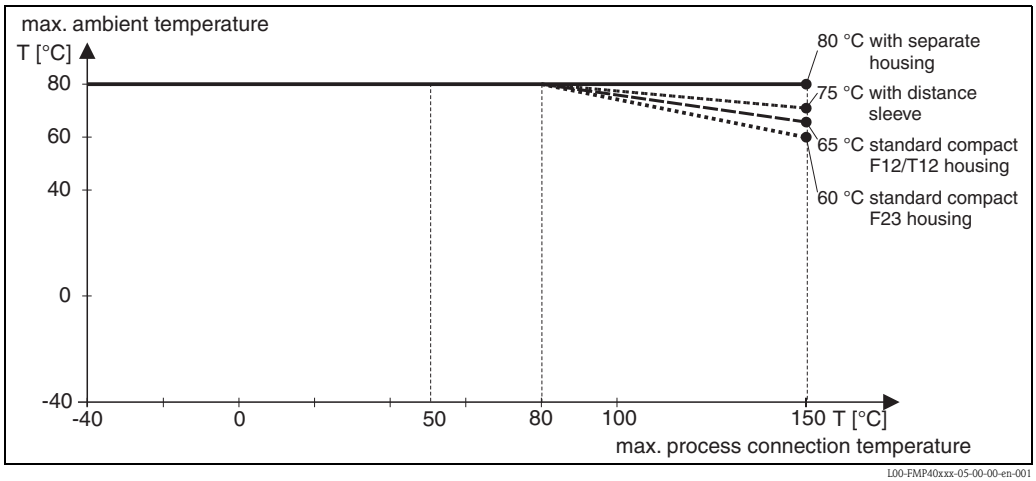
10.1.5 Operating conditions: Environment

Ambient temperature range

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

Ambient temperature limits

If temperatures above 80 °C are present at the process connection, the permitted ambient temperature is reduced according to the following diagram (temperature derating):



Storage temperature

-40 °C to +80 °C

Climate class

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

Vibration resistance

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

Cleaning the probe

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

Electromagnetic compatibility (EMC)

Electromagnetic compatibility to EN 61326 and NAMUR Recommendation EMC (NE21). Details are provided in the Declaration of Conformity. A standard installation cable is sufficient if only the analog signal is used.

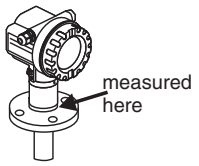
When installing the probes in metal and concrete tanks and when using a coax probe:
- Interference emission to EN 61326 - x series, electrical equipment Class B.
- Interference immunity to EN 61326 - x series, requirements for industrial areas and NAMUR Recommendation NE21 (EMC)

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.

10.1.6 Operating conditions: Process

Process temperature range

The maximum permitted temperature at the process connection (see Figure for 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.
- 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.

Process pressure

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

Please refer to the following standards for the pressure values permitted for higher temperatures:
- EN 1092-1: 2001 Tab.18
  With regard to their temperature stability properties, the materials 1.4404 and 1.4435 are grouped under 13E0 in EN 1092-1 Tab.18. The chemical composition of the two materials can be identical.
- ASME B 16.5a - 1998 Tab. 2-2.2 F316
- ASME B 16.5a - 1998 Tab. 2.3.8 N10276
- JIS B 2220

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

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

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

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

10.1.7 Mechanical construction

Material

Refer to TI00358F/00/EN, chapter "Material (not in contact with process)" and "Material (in contact with process)".

Tolerance of probe length

	Rod probes				Rope probes			
over		1 m (3.2 ft)	3 m (9.8 ft)	6 m (20 ft)		1 m (3.2 ft)	3 m (9.8 ft)	6 m (20 ft)
up to	1 m (3.2 ft)	3 m (9.8 ft)	6 m (20 ft)		1 m (3.2 ft)	3 m (9.8 ft)	6 m (20 ft)	
admissible tolerance (mm (in))	- 5 (- 0.2)	- 10 (- 0.4)	- 20 (- 0.8)	- 30 (- 1.2)	- 10 (- 0.4)	- 20 (- 0.8)	- 30 (- 1.2)	- 40 (- 1.6)

Weight

Levelflex M	**FMP40 + rope probe 4 mm**	**FMP40 + rod or rope probe 6 mm**	**FMP40 + rod probe 16 mm**	**FMP40 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

Process connection

See "Ordering structure", → 📄 6.

Seal

See "Ordering structure", → 📄 6.

Probe

See "Ordering structure", → 📄 6.

10.1.8 Certificates and approvals

CE approval	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.
Overfill protection	WHG. See "Ordering structure", → 🖹 6 – (see ZE00256F/DE)
Telecommunications	Complies with "Part 15" of the FCC rules for an "Unintentional Radiator". All probes meet the requirements for a "Class A Digital Device". Coax probes and probes mounted in closed metallic vessels also meet the requirement 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. ■ NE21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment. ■ NE43 Standardization of the signal level for the failure information of digital transmitters.

Ex approval

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

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

Feature		Variant	ZE256F	ZE258F	ZD117F	ZD116F	ZD114F	ZD113F	ZD110F	ZD109F	ZD107F	ZD106F	ZD021F	ZD083F	ZD082F	ZD081F	ZD080F	ZD078F	ZD077F	ZD076F	ZD075F	XA386F	XA381F	XA380F	XA379F	XA378F	XA376F	XA218F	XA330F	XA217F	XA216F	XA215F	XA213F	XA211F	XA212F	XA173F	XA173F	XA172F	XA168F	XA167F	XA166F	XA165F	XA164F
10 Approval:	Non-hazardous area	A																																								
	NEPSI Ex emb (ia) IIC T6	C																									X																
	Non-hazardous area, WHG	F	X																																								
	ATEX II 3G Ex nA II T6	G																										X															
	NEPSI Ex ia IIC T6	I																							X	X																	
	NEPSI Ex d(ia) IIC T6	J																						X																			
	*TIIS Ex ia IIC T4	K																																								
	TIIS Ex d (ia) IIC T4	L																																								
	FM DIP Cl.II Div.1 Gr. E-G N.I.	M																	X																							
	CSA General Purpose	N																																								
	CSA DIP Cl.II Div.1 Gr. G + coal dust, N.I.	P												X																												
	NEPSI DIP	Q																					X																			
	NEPSI Ex nA II T6	R																				X																				
	FM IS Cl.I,II,III Div.1 Gr. A-G N.I., zone 0, 1, 2	S							X	X	X	X	X							X	X																					
	FM XP Cl.I,II,III Div.1 Gr. A-G, zone 1, 2	T																	X																							
	CSA IS Cl.I,II,III Div.1 Gr. A-D, G + coal dust, N.I., zone 0, 1, 2	U			X	X	X	X								X	X																								
	CSA XP Cl.I,II,III Div.1 Gr. A-D, G + coal dust, N.I., zone 1, 2	V												X																												
	IEC Ex td A20/21, Alu blind cover	W																									X															
	IEC Ex tD A20/22	X																									X															
	ATEX II 1/2G Ex ia IIC T6 / IECEx zone 0/1	1																											X	X		X	X							X	X
	ATEX II 1/2D/IEC Ex td A20/21, Alu blind cover [1]	2																											X							X	X	X				
	ATEX II 2G Ex emb (ia) IIC T6 / IECEx zone 1	3																																					X				
	ATEX II 1/3D/ IEC Ex td A20/22 [1]	4																											X			X			X		X	X				
	ATEX II 1/2G Ex ia IIC T6, ATEX II 1/3D	5																											X			X					X					
	ATEX II 1/2G Ex ia IIC T6, WHG	6	X																											X	X		X	X							X	X
	ATEX II 1/2G Ex d (ia) IIC T6 / IEC Ex d (ia) IIC T6	7																																							X	
	ATEX II 1/2G Ex ia IIC T6, ATEX II 1/3D, WHG	8	X																											X			X					X				
60 Power supply Output:	2-wire 4-20mA SIL HART	B		X		X		X		X		X			X		X		X		X	X		X		X	X		X	X		X	X	X		X	X		X		X
	2-wire PROFIBUS PA	D		X	X		X		X		X		X		X	X			X	X		X		X	X		X	X		X	X	X		X		X	X	X	X		
	2-wire FOUNDATION Fieldbus	F		X	X		X		X		X		X		X	X			X	X		X		X	X		X	X		X	X	X		X		X	X	X	X		
	4-wire 90-250VAC 4-20mA SIL HART	G		X										X				X					X					X												X		
	4-wire 10.5-32VDC 4-20mA SIL HART	H		X										X				X					X					X												X		
	2-wire 4-20mA HART, Interface	K				X		X		X		X			X		X		X		X	X		X		X	X		X	X		X	X	X		X	X		X		X
70 Operation:	without display, via communication	1		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																					
	4-line display VU331	2		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																					
	applicable for FHX40	3					X	X		X	X	X	X	X	X	X	X	X	X	X																						
90 Housing, Cable entry:	F12 Alu, coated IP68 gland M20	A		X									X		X	X			X	X	X	X		X	X		X	X									X	X		X	X
	F12 Alu, coated IP68 thread G1/2	B											X	X		X	X	X		X	X	X		X	X		X										X	X		X	X
	F12 Alu, coated IP68 thread NPT1/2	C											X	X		X	X	X		X	X	X		X	X		X										X	X		X	X
	F12 Alu, coated IP68 Plug M12	D											X			X				X		X			X	X												X			X	X
	F12 Alu, coated IP68 Plug 7/8"	E											X			X				X		X			X	X												X			X	X
	T12 Alu, coated IP68 gland M20	G																						X			X										X	X			X	X	
	T12 Alu, coated IP68 thread G1/2	H													X					X				X			X										X	X			X	X	
	T12 Alu, coated IP68 thread NPT1/2	J													X					X				X			X										X	X			X	X	
	T12 Alu, coated IP68 Plug M12	K																																			X						
	T12 Alu, coated IP68 Plug 7/8"	L																																			X						
	T12 Alu, coated IP68 gland M20 + OV	M			X	X			X	X												X			X	X		X	X	X	X											
	T12 Alu, coated IP68 thread G1/2 + OV	N			X	X			X	X												X			X	X			X	X	X											
	T12 Alu, coated IP68 thread NPT1/2+OV	P			X	X			X	X												X			X	X			X	X	X											
	T12 Alu, coated IP68 Plug M12 + OVP	Q			X	X			X	X												X			X	X			X	X	X											
	T12 Alu, coated IP68 Plug 7/8" + OV	R			X	X			X	X												X			X	X			X	X	X											
	F23 316L IP68 gland M20	1					X	X			X	X	X									X			X	X		X				X	X	X								
	F23 316L IP68 thread G1/2	2					X	X			X	X	X									X			X	X						X	X	X								
	F23 316L IP68 thread NPT1/2	3					X	X			X	X	X									X			X	X						X	X	X								
	F23 316L IP68 Plug M12	4					X	X			X	X	X									X			X	X						X	X	X								
	F23 316L IP68 Plug 7/8"	5					X	X			X	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*

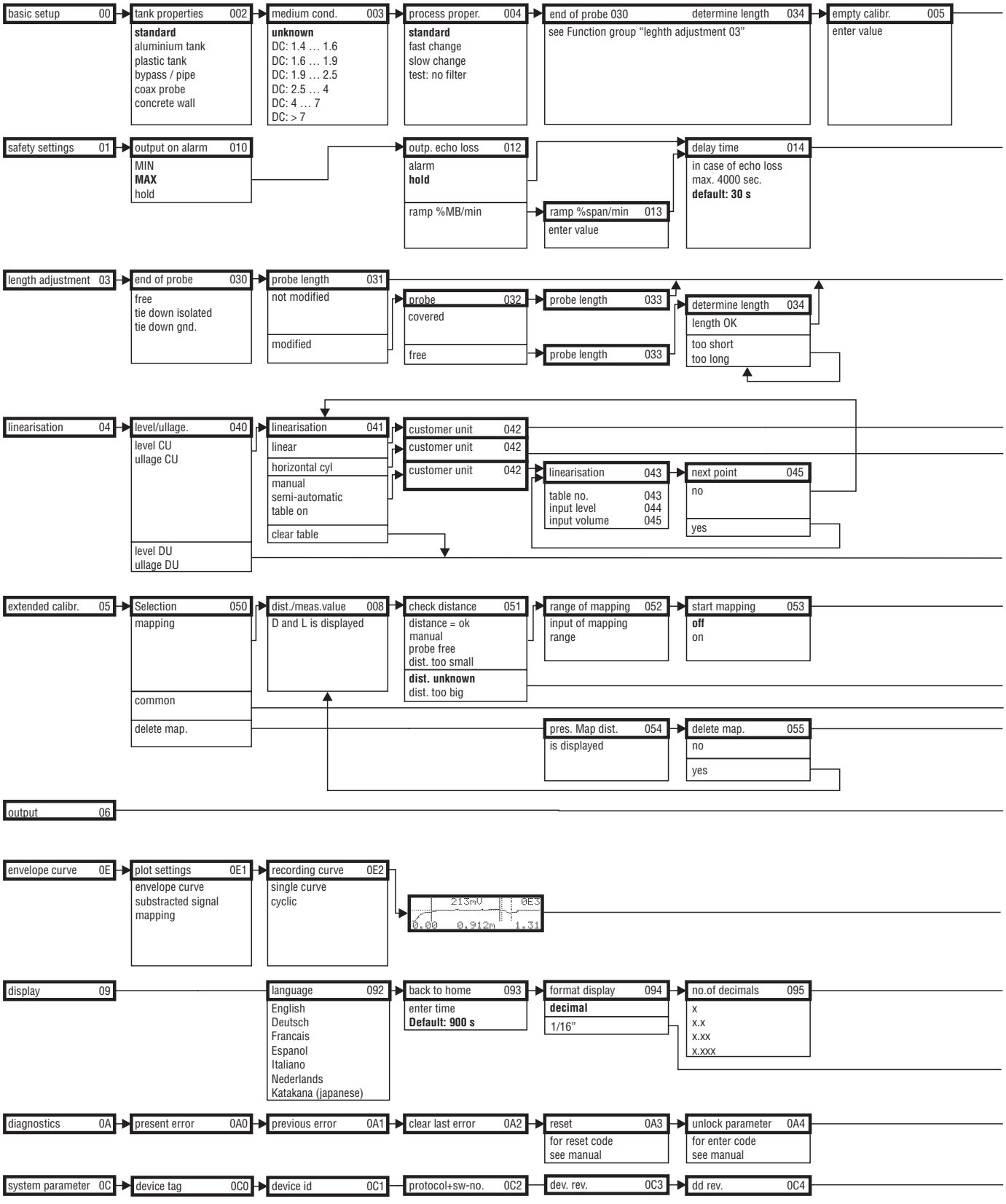
10.1.9 Additional documentation

Additional documentation

This supplementary documentation can be found on our product pages on www.endress.com:
- Technical Information (TI00358F/00/EN)
- Safety Manual "Functional safety manual" (SD00174F/00/EN)
- Certificate "Allgemeine bauaufsichtliche Zulassung" (ZE00256F/00/DE)
- Brief operating instructions (KA01040F/00/EN)

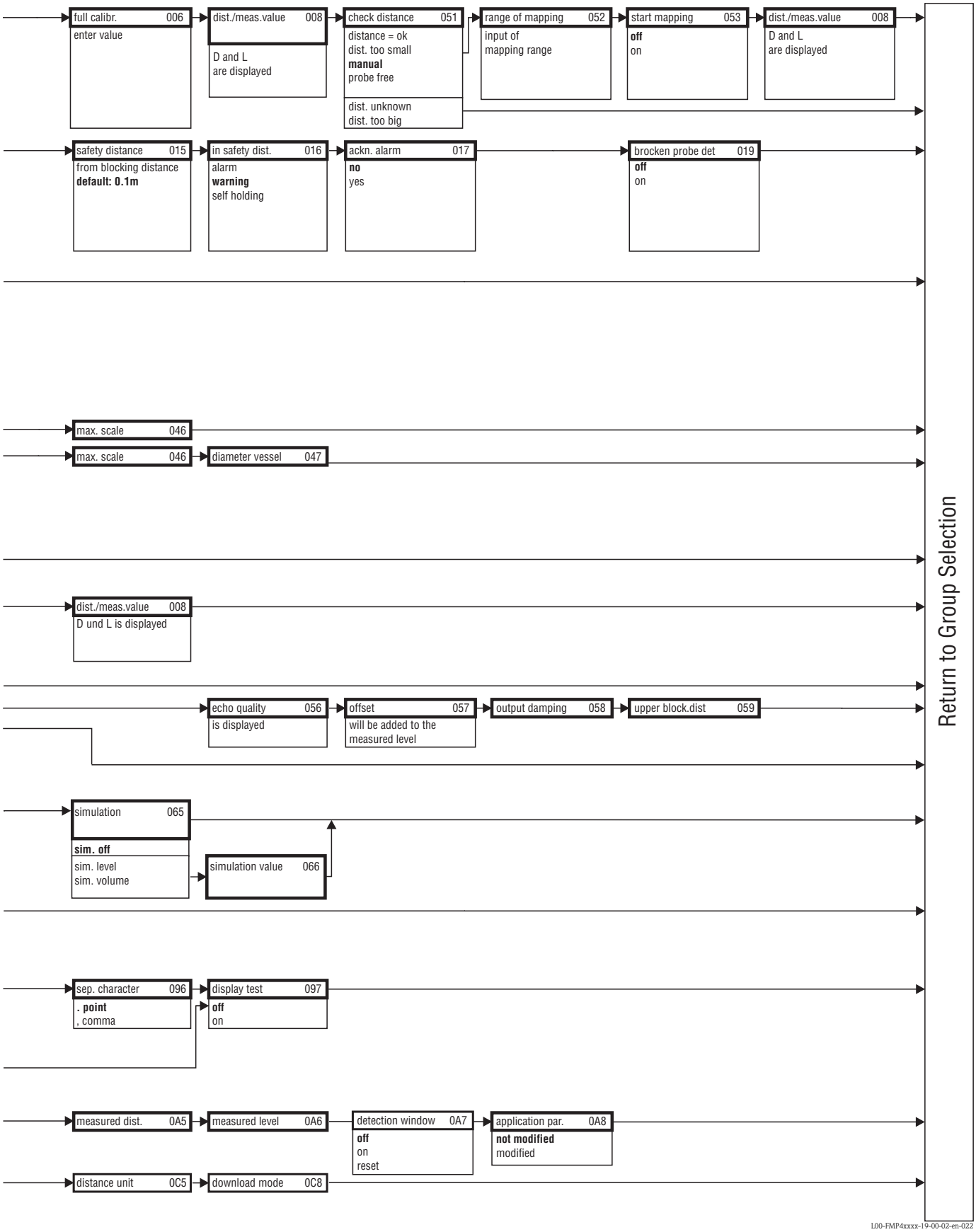
11 Appendix

11.1 Operating menu FOUNDATION Fieldbus



Note! The default values of the parameters are typed in boldface.

L00-FMP4xxxx-19-00-01-en-022


full calibr. 006
enter value
dist./meas.value 008
D and L
are displayed
check distance 051
distance = ok
dist. too small
manual
probe free
dist. unknown
dist. too big
range of mapping 052
input of
mapping range
start mapping 053
off
on
dist./meas.value 008
D and L
are displayed
safety distance 015
from blocking distance
default: 0.1m
in safety dist. 016
alarm
warning
self holding
ackn. alarm 017
no
yes
brocken probe det 019
off
on
max. scale 046
max. scale 046
diameter vessel 047
dist./meas.value 008
D und L is displayed
echo quality 056
is displayed
offset 057
will be added to the
measured level
output damping 058
upper block.dist 059
simulation 065
sim. off
sim. level
sim. volume
simulation value 066
sep. character 096
. point
, comma
display test 097
off
on
measured dist. 0A5
measured level 0A6
detection window 0A7
off
on
reset
application par. 0A8
not modified
modified
distance unit 0C5
download mode 0C8
Return to Group Selection
L00-FMP4xxxx-19-00-02-en-022

11.2 Description of functions

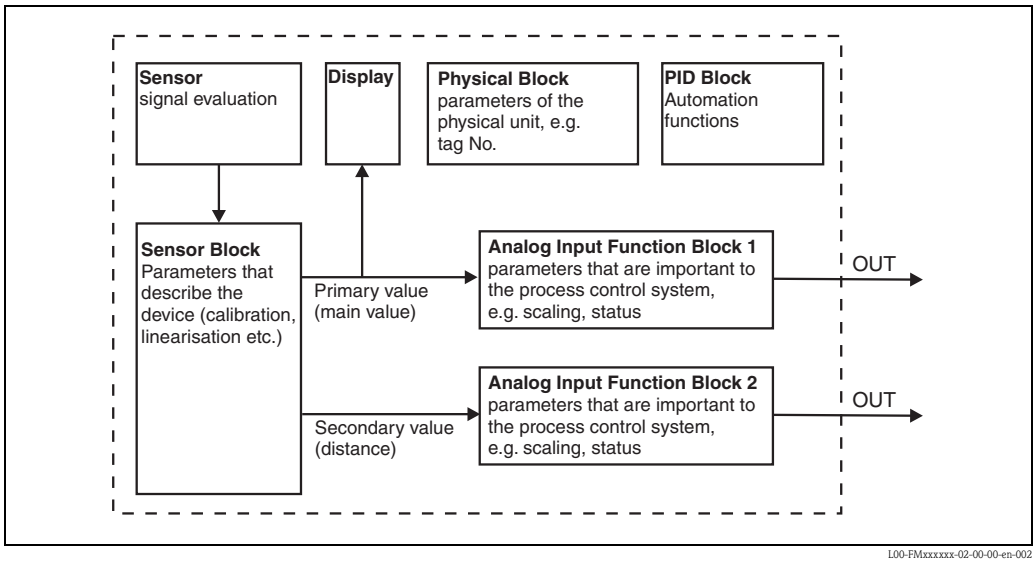
Note!
A detailed description of the function groups, functions and parameters is given in the documentation "BA00245F – Description of the Instrument Functions" on the enclosed CD-ROM.

11.3 Block model of the Levelflex M

The Micropilot M contains the follwoing blocks:
- **Resource Block (RB2)**
  see Operating Instructions BA013S/04/EN: "FOUNDATION Fieldbus - Overview"
- **Sensor Block (TBGRL)**
  contains the parameters relevant to the measurement of the Levelflex M
- **Diagnostic Block (DIAG)**
  contains the diagnostic parameters of the Levelflex M
- **Display Block (DISP)**
  contains the configuration parameters for the display module VU331
- **Analog-Input-Block 1 bzw. 2 (AI)**
  scale the signal of the Transducer Block and transmit them to the PLCS
- **PID Block (PID)**
  see Operating Instructions BA013S/04/EN: "FOUNDATION Fieldbus - Overview"
- **Arithmetic Block (AR)**
  see Operating Instructions BA013S/04/EN: "FOUNDATION Fieldbus - Overview"
- **Input Selector Block (IS)**
  see Operating Instructions BA013S/04/EN: "FOUNDATION Fieldbus - Overview"
- **Signal Characterizer Block (SC)**
  see Operating Instructions BA013S/04/EN: "FOUNDATION Fieldbus - Overview"
- **Integrator Block (IT)**
  see Operating Instructions BA013S/04/EN: "FOUNDATION Fieldbus - Overview"

11.3.1 Default Block configuration

The input and output variables of the blocks can be interconnected by a network configuration tool (e.g. NI-Fieldbus configurator). The figure below shows, how these connections are set by default.



11.4 Resource block

The resource block contains the parameters used to describe physical resources of the device. It has no linkable inputs or outputs.

11.4.1 Operation

The resource block is opened by a click on the resource line.
If the NI-FBUS Configurator is being used, a series of file tabs appears on the screen. The files can be opened to view and/or edit the parameters in the following table. A short description of the parameter function appears on the side of the screen. A change in the parameter is stored by pressing the WRITE CHANGES button when the block is out of service. Press the READ ALL button to check the values stored in the device.

11.4.2 Parameters

Parameter	Description
TAG_DESC	User description of the intended application of the block.
MODE_BLK	Lists the actual, target, permitted and normal operating modes of the block. – Target: changes the operating mode of the block – Actual: indicates the current operating mode of the block – Permitted: states which operating modes are allowed – Normal: indicates the normal operating mode of the block The possible operating modes of the resources block are: – AUTO: the block is operating as normal – OOS: the block is out of service. If the resource block is out of service, then all blocks within the device (resource) are forced into the same status.
RS_STATE	Indicates the state of the resource block application state machine – On-line: block in AUTO mode – Standby: block in OOS mode
WRITE_LOCK	Indicates the status of DIP-switch WP – LOCKED: device data can be modified – NOT LOCKED: device data can be modified
RESTART	Allows a manual restart: – UNINITIALISED: no status – RUN: normal operational status – RESOURCE: resets the resource block parameters – **DEFAULTS: Resets all FOUNDATION Fieldbus parameters within the device, but not the manufacturer specific parameters.** – PROCESSOR: make a warm start of the processor
BLOCK_ERROR	Shows error status of software and hardware components – Out-of-Service: the block is in OOS mode – Simulation active: shows the setting of DIP-switch SIM
BLOCK_ALM	Shows any configuration, hardware, connection and system problems in the lock. The cause of the alert is to be seen in the subcode field.

The function of the resource block parameters not described here can can be taken from the FOUNDATION Fieldbus specification, see "**www.fieldbus.org**".

11.5 Sensor Block

The Sensor Block contains the parameters required to calibrate the device. These parameters can also be addressed by using the VU331 display module. The calibration of the device is described in Chapter 6.

11.5.1 Operation

Parameter changes from the tool are made off-line while the device is operating. The changes are downloaded by first setting MODE_BLK = OOS then pressing the WRITE CHANGES button. In order to resume operation, change MODE-BLK to AUTO [4)].

11.5.2 Block administration parameters

Parameter	Description
MODE_BLK	See description in Resource block. The possible operating modes of the Sensor block are: – AUTO: the block is operating as normal – OOS: the block is out of service.
TAG_DESC	User description of the intended application of the block.
BLOCK_ERROR	Shows error status of software and hardware components – Out-of-Service: the block is in OOS mode

11.5.3 Output values

Parameter	Description
PRIMARY_VALUE	Main value (level or volume).
SECONDARY_VALUE	Measured distance.

11.5.4 Configuration parameters

The Sensor block also contains the configuration parameters, which are used to commission and calibrate the device. They are identical to the functions of the operating menu, except for the service parameters which are not accessible on the bus. Thus, the calibration procedure via the display module (→ 54) is equally valid for a calibration via a network configuration tool.
A complete list of the configuration parameters can be found in the BA00245F/00/EN "Description of Instrument Functions".

4) If MODE_BLK refuses to be changed to AUTO, an error is present. Control all parameters, perform the required changes and try again to change MODE_BLK to AUTO.

11.5.5 Methods

The FOUNDATION Fieldbus specification provides for the use of so-called methods to simplify the operation of the device. A method is an interactive sequence of steps that must be followed in order to obtain a particular function from the device.

The Levelflex M has got the following methods:
- Basic setup
- Safety settings
- Acknowledge alarm
- Length adjustment
- Linearisation
- Extended calibration
- Output
- System parameters
- Lock TB Manufacturer parameters

Most of these methods are identical to the respective function group in the operating menu.
A detailed description of them can be found in the BA00245F/00/EN "Description of Instrument functions".

11.5.6 Parameter list of the Levelflex M Sensor Block

Parameter	Position Indicator	rel. Index	Variable Name	Size [bytes]	Type	Access	Storage Class	Changeable in Mode
measured value	000	18	PARMEASUREDVALUE	4	FloatingPoint	RO	dynamic	Auto, OOS
tank properties	002	19	PARTANKPROPERTIES	1	Unsigned8	RW	static	OOS
medium property	003	20	PARMEDIUMCONDITION	1	Unsigned8	RW	static	OOS
process propert.	004	21	PARPROCESSPROPERTIES	1	Unsigned8	RW	static	OOS
end of probe	030	22	PARENDOFPROBE	1	Unsigned8	RW	static	OOS
probe length	031	23	PARPROBESHORTEND	1	Unsigned8	RW	dynamic	OOS
probe	032	24	PARPROBEFREE	1	Unsigned8	RW	dynamic	OOS
probe length	033	25	PARPROBELENGTH	4	FloatingPoint	RW	static	OOS
determine length	034	26	PARPROBELENGTHSETUP	1	Unsigned8	RW	dynamic	OOS
empty calibr.	005	27	PAREMPTYCALIBRATION	4	FloatingPoint	RW	static	OOS
full calibr.	006	28	PARFULLCALIBRATION	4	FloatingPoint	RW	static	OOS
echo quality	056	29	PARECHOQUALITY	2	Integer16	RO	dynamic	Auto, OOS
check distance	051	30	PARCHECKDISTANCE	1	Unsigned8	RW	dynamic	OOS
range of mapping	052	31	PARSUPPRESSIONDISTANCE	4	FloatingPoint	RW	dynamic	OOS
start mapping	053	32	PARSTARTMAPPINGRECORD	1	Unsigned8	RW	dynamic	OOS
pres. map dist.	054	33	PARPRESMAPRANGE	4	FloatingPoint	RO	dynamic	Auto, OOS
delete mapping	055	34	PARDELETEMAPPING	1	Unsigned8	RW	dynamic	OOS
offset	057	35	PAROFFSETOFMEASUREDDISTANCE	4	FloatingPoint	RW	static	OOS
output damping	058	36	PAROUTPUTDAMPING	4	FloatingPoint	RW	static	Auto, OOS
upper block.dist	059	37	PARHIGHBLOCKINGDISTANCE	4	FloatingPoint	RW	static	OOS
output on alarm	010	38	PAROUTPUTONALARM	1	Unsigned8	RW	static	OOS
outp. echo loss	012	39	PARREACTIONLOSTECHO	1	Unsigned8	RW	static	OOS
ramp %span/min	013	40	PARRAMPINPERCENTPERMIN	4	FloatingPoint	RW	static	OOS
delay time	014	41	PARDELAYTIMEONLOSTECHO	2	Unsigned16	RW	static	OOS
safety distance	015	42	PARLEVELWITHINSAFETYDISTANCE	4	FloatingPoint	RW	static	OOS
in safety dist.	016	43	PARINSAFETYDISTANCE	1	Unsigned8	RW	static	OOS

Parameter	Position Indicator	rel. Index	Variable Name	Size [bytes]	Type	Access	Storage Class	Changeable in Mode
ackn. alarm	017	44	PARACKNOWLEDGEALARM	1	Unsigned8	RW	dynamic	Auto, OOS
broken probe det	019	45	PARBROKENPROBEDETECTION	1	Unsigned8	RW	static	OOS
level/ullage	040	46	PARLEVELULLAGEMODE	1	Unsigned8	RW	static	OOS
linearisation	041	47	PARLINEARISATION	1	Unsigned8	RW	static	OOS
customer unit	042	48	PARCUSTOMERUNIT	2	Unsigned16	RW	static	OOS
table no.	043	49	PARTABLENUMBER	1	Unsigned8	RW	non-vol.	Auto, OOS
input level	044	50	PARINPUTLEVELHALFAUTOMATIC	4	FloatingPoint	RO	dynamic	Auto, OOS
input level	044	51	PARINPUTLEVELMANUAL	4	FloatingPoint	RW	dynamic	OOS
input volume	045	52	PARINPUTVOLUME	4	FloatingPoint	RW	dynamic	OOS
max. scale	046	53	PARMAXVOLUME	4	FloatingPoint	RW	static	OOS
diameter vessel	047	54	PARCYLINDERVESSEL	4	FloatingPoint	RW	static	OOS
simulation	065	55	PARSIMULATION	1	Unsigned8	RW	dynamic	OOS
simulation value	066	56	PARSIMULATIONVALUELEVEL	4	FloatingPoint	RW	dynamic	Auto, OOS
simulation value	066	57	PARSIMULATIONVALUEVOLUME	4	FloatingPoint	RW	dynamic	Auto, OOS
unlock parameter	0A4	58	PAROPERATIONCODE	2	Unsigned16	RW	non-vol.	OOS
measured dist.	0A5	59	PARMEASUREDDISTANCE	4	FloatingPoint	RO	dynamic	Auto, OOS
measured level	0A6	60	PARMEASUREDLEVEL	4	FloatingPoint	RO	dynamic	Auto, OOS
detection window	0A7	61	PARDETECTIONWINDOW	1	Unsigned8	RW	dynamic	OOS
application par.	0A8	62	PARAPPLICATIONPARAMETER	1	Unsigned8	RO	dynamic	Auto, OOS
distance unit	0C5	63	PARDISTANCEUNIT	2	Unsigned16	RW	static	OOS
download mode	0C8	64	PARDOWNLOADMODE	1	Unsigned8	RW	static	OOS
max meas dist	0D84	65	PARABSMAXMESSDIST	4	FloatingPoint	RO	dynamic	Auto, OOS
max sample dist.	0D88	66	PAREDITRANGEMAXSAMPLEDIST	4	FloatingPoint	RO	dynamic	Auto, OOS
present error	0A0	67	PARACTUALERROR	2	Unsigned16	RO	dynamic	Auto, OOS

11.6 Diagnostic Block

11.6.1 Operation

The diagnostic block contains the error messages of the device. These parameters can also be addressed by using the VU331 display module.
The diagnostic block is opened by clicking on the "diagnostic" line. Parameter changes from the tool are made off-line while the device is operating. The changes are downloaded by first setting MODE_BLK = OOS then pressing the WRITE CHANGES button. Press the READ ALL button to check the values stored in the device. In order to resume operation, change MODE_BLK to AUTO[5)].

11.6.2 Block administration parameters

Parameter	Description
MODE_BLK	See description in Resource block. The possible operating modes of the Sensor block are: – AUTO: the block is operating as normal. – OOS: the block is out of service.
TAG_DESC	User description of the intended application of the block.
BLOCK_ERROR	Shows the error status associated with the block components – Out-of-Service: the block is in OOS mode.

11.6.3 Methods

The FOUNDATION Fieldbus specification provides for the use of so-called methods to simplify the operation of the device. A method is an interactive sequence of steps that must be followed in order to obtain a particular function from the device.

The Levelflex M has got the following methods:
- Set to customer default
- Diagnostics

Most of these methods are identical to the respective function group in the operating menu.
A detailed description of them can be found in the BA00245F/00/EN "Description of Instrument functions".

11.6.4 Device specific parameters

Parameter	Position Indicator	rel. Index	Variable Name	Size [bytes]	Type	Access	Storage Class	Changeable in Mode
present error	0A0	13	PARACTUALERROR	2	Unsigned16	RO	dynamic	Auto, OOS
previous error	0A1	14	PARLASTERROR	2	Unsigned16	RO	non-vol.	Auto, OOS
clear last error	0A2	15	PARCLEARLASTERROR	1	Unsigned8	RW	dynamic	Auto, OOS
reset	0A3	16	PARRESET	2	Unsigned16	RW	dynamic	OOS
unlock parameter	0A4	17	PAROPERATIONCODE	2	Unsigned16	RW	non-vol.	OOS
protocol+sw-no.	0C2	18	PARPROTSOFTVERSIONSTRING	16	VisibleString	RO	const	Auto, OOS

5) If MODE_BLK refuses to be changed to AUTO, an error is present. Control all parameters, perform the required changes and try again to change MODE_BLK to AUTO.

11.7 Display Block

11.7.1 Operation

The display block contains the parameters required to parametrise the display module VU331 (which is contained in the remote display and operating unit FHX40). These parameters can also be addressed by using the VU331 display module.
The display block is opened by clicking on the "display" line. Parameter changes from the tool are made off-line while the device is operating. The changes are downloaded by first setting MODE_BLK = OOS then pressing the WRITE CHANGES button. Press the READ ALL button to check the values stored in the device. In order to resume operation, change MODE_BLK to AUTO[6].

11.7.2 Block administration parameters

Parameter	Description
MODE_BLK	See description in Resource block. The possible operating modes of the sensor block are: – AUTO: the block is operating as normal. – OOS: the block is out of service.
TAG_DESC	User description of the intended application of the block.
BLOCK_ERROR	Shows the error status associated with the block components – Out-of-Service: the block is in OOS mode.

11.7.3 Methods

The FOUNDATION Fieldbus specification provides for the use of so-called methods to simplify the operation of the device. A method is an interactive sequence of steps that must be followed in order to obtain a particular function from the device.

The Levelflex M has got the following methods:
- Display

Most of these methods are identical to the respective function group in the operating menu.
A detailed description of them can be found in the BA00245F/00/EN "Description of Instrument Functions".

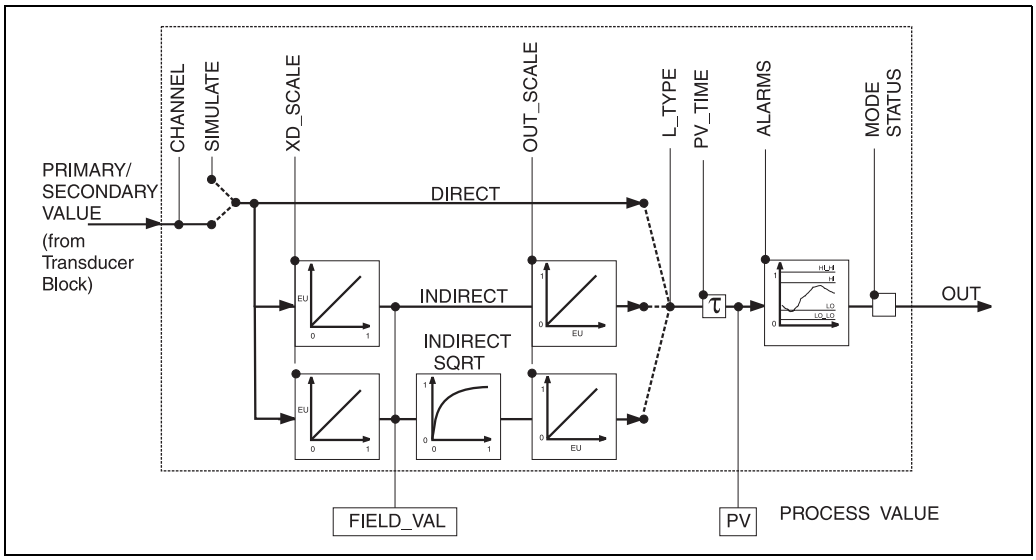
11.7.4 Device specific parameters

Parameter	Position Indicator	rel. Index	Variable Name	Size [bytes]	Type	Access	Storage Class	Changeable in Mode
language	092	13	PARLANGUAGE	1	Unsigned8	RW	non-vol.	Auto, OOS
back to home	093	14	PARBACKTOHOME	2	Integer16	RW	non-vol.	Auto, OOS
format display	094	15	PARFORMATDISPLAY_FT	1	Unsigned8	RW	non-vol.	Auto, OOS
no.of decimals	095	16	PARNOOFDECIMALS	1	Unsigned8	RW	non-vol.	Auto, OOS
sep. character	096	17	PARSEPARATIONCHARACTER	1	Unsigned8	RW	non-vol.	Auto, OOS
unlock parameter	0A4	18	PAROPERATIONCODE	2	Unsigned16	RW	non-vol.	OOS

6) If MODE_BLK refuses to be changed to AUTO, an error is present. Control all parameters, perform the required changes and try again to change MODE_BLK to AUTO.

11.8 Analog input block

The analog input block conditons the signal output by the Sensor block and outputs signal to the PCL or other function blocks.



11.8.1 Operation

The resource block is opened by a click on the resource line.
Parameter changes from the tool are made off-line while the device is operating. The changes are downloaded by first setting MODE_BLK = OOS then pressing the WRITE CHANGES button. Press the READ ALL button to check the values stored in the device. Normally operation is resumed as soon as MODE-BLK is set to AUTO.

11.8.2 Block administration parameters

Parameter	Description
MODE_BLK	See description in Resource block. The possible operating modes of the Sensor block are: – AUTO: the block is operating as normal – MAN: the block is operated with a manually entered primary value. – OOS: the block is out of service.
TAG_DESC	User description of the intended application of the block.
BLOCK_ERROR	Shows error status of software and hardware components – Out-of-Service: the block is in OOS mode – Simulation active: shows the setting of DIP-switch SIM. Input failure/process variable has BAD status. – configuration error

11.8.3 Output values

Parameter	Description
PV	Either the primary/secondary Sensor block value used to execute the block or a process value associated with it. Comprises value and status.
OUT	The primary value output as a result of executing the analog input block. Comprises value and status.
FIELD_VALUE	Raw value of field device in % of PV range with a status reflecting the Sensor condition before signal characterisation L_Type or filtering V_TIME. Comprises value and status.

11.8.4 Scaling parameters

Parameter	Description
CHANNEL	Selects the measured value to be input to the analogue input block – 0 = no channel defined – 1 = primary value: measured level/volume – 2 = secondary value: measured distance
XD_SCALE	Scales the Sensor block value in the required engineering units (EU).
OUT_SCALE	Scales the output value in the required engineering units (EU).
L_TYPE	Sets the linearization type: – DIRECT: the Sensor block value bypasses the scaling functions – INDIRECT:the Sensor block value is fed through the linear scaling functions – INDIRECT SQRT: the Sensor block value is fed through the square root scaling functions

The relationship between the output values and scaling paramaters for the Levelflex M is as follows:

$$\text{FIELD\_VAL} = 100 \times \frac{\text{CHANNEL\_VALUE} - \text{XD\_SCALE\_MIN}}{\text{XD\_SCALE\_MAX} - \text{XD\_SCALE\_MIN}}$$

The L_TYPE parameter influences the signal conversion:
- Direct:

$$\text{PV} = \text{CHANNEL\_VALUE}$$

- Indirect:

$$\text{PV} = \frac{\text{FIELD\_VALUE}}{100} \times (\text{OUT\_SCALE\_MAX} - \text{OUT\_SCALE\_MIN}) + \text{OUT\_SCALE\_MIN}$$

- Indirect square root:

$$\text{PV} = \sqrt{\frac{\text{FIELD\_VALUE}}{100}} \times (\text{OUT\_SCALE\_MAX} - \text{OUT\_SCALE\_MIN}) + \text{OUT\_SCALE\_MIN}$$

11.8.5 Output response parameters

Parameter	Description
LOW_CUT	Not relevant to level measurement! Determines a threshold for square root linearization below which the output value is set to zero.
PV_FTIME	Sets the time constant for the output value.

11.8.6 Alarm parameters

Parameter	Description
ACK_OPTION	Sets the way in which alarms and warnings are to be acknowledged.
ALARM_HYS	Sets the hysteresis (in output engineering units) for all configured alarms. A hysteresis of e.g. 2 % on a HI_HI_LIMIT of 95 % would cause the alarm to activate when the level reaches 95 % and to deactivate when the level drops below 93 %. A hysteresis of e.g. 2 % on a LO_LO_LIMIT of 5 % would cause the alarm to activate when the level drops below 5 % and to deactivate when the level rises to 7 %.
HI_HI_PRI	The priority (1 – 15) of the HI_HI alarm
HI_HI_LIM	Sets the HI_HI alarm limit in output engineering units
HI_PRI	The priority (1 – 15) of the HI alarm
HI_LIM	Sets the HI warning limit in output engineering units
LO_PRI	The priority (1 – 15) of the LO alarm
LO_LIM	Sets the LO warning limit in output engineering units
LO_LO_PRI	The priority (1 – 15) of the LO_LO alarm
LO_LO_LIM	Sets the LO_LO alarm limit in output engineering units

11.8.7 Alarm priorities

Parameter	Description
0	Alarm is suppressed
1	Recognised by the system but not reported
2	Reported to the operator, but does not require his attention
3 - 7	Advisroy alarms of increasing priority
8 - 15	Critical alarms of increasing priority

11.8.8 Alarm status

Parameter	Description
HI_HI_ALM	The status of the HI_HI alarm
HI_ALM	The status of the HI alarm
LO_ALM	The status of the LO alarm
LO_LO_ALM	The status of the LO_LO alarm

11.8.9 Simulation

The SIMULATE parameter allows the Sensor block output value to be simulated, provided simulation has also been enabled at the device DIP switch. The simulation must be enabled, a value and/or status entered and the block must be in AUTO mode. During simulation the Sensor output value is substituted by the simulated value.
A simulation is also possible by switching MODE_BLK to "MAN" and entering a value for OUT.

Parameter	Description
SIMULATE	Enables, sets and displays a simulated value, options: – enable/disable – simulated value – output value

11.9 Checklist for commissioning

The following checklist refers to the configuration via the NI-Fieldbus configurator. In general, the operation is rather similar for other network design tools.

1. Configure the network and integrate the device.
   – Identify the device by means of the device ID and serial number.
   – If appropriate, assign a new PD_TAG.
2. Configure the resource block.
   – Check the position of the hardware switch in WRITE_LOCK
   – If "locked" is displayed, change the position of the DIP-switch.
   – If appropriate, change the block tag (right-hand click on tree).
   – Set MODE_BLK_TARGET to Out-of-Service.
   – Reset the device to factory values by using the function RESTART => Defaults (this function may also be available with a right-hand click on the device name)
   – If appropriate, assign a tag description (TAG_DESC).
   – Set MODE_BLK_TARGET to Auto.
3. Configure the Sensor block.
   – If appropriate, change the block tag (right-hand click on tree).
   – Set MODE_BLK_TARGET to Out-of-Service.
   – If appropriate, assign a tag description (TAG_DESC)
   – Configure the device as described in → 54.
   – Set MODE_BLK_TARGET to Auto.
4. Configure the analog input block.
   – If appropriate, change the block tag (right-hand click on tree).
   – Set MODE_BLK_TARGET to Out-of-Service.
   – If appropriate, assign a tag description (TAG_DESC).
   – Set Channel to measured value or distance.
   – Set L_TYPE to "DIRECT" if the OUT value is to be in technical units e.g. ft to "INDIRECT" if the OUT value is to be scaled.
   – Set the desired output damping in PV_TIME.
   – If appropriate, set the advisory and critical alarms.
   – Set MODE_BLK_TARGET to Auto.
5. Link the function blocks in the function block editor.
6. Download the configuration (menu configure).
7. If appropriate, check the configuration by using the SIMULATE function.

11.10 List of start indices

The following list indicates the start indices for all blocks and objects:

Object	Start Index
Object Dictionary	298

Object	Start Index
Resource Block	400
Analog Input 1 Function Block	500
Analog Input 2 Function Block	600
PID Function Block	700
Arithmetic Function Block	800
Input Selector Function Block	900
Signal Characterizer Function Block	1000
Integrator Function Block	1100
Sensor Block	2000
Diagnostic Block	2200
Display Block	2400

Object	Start Index
View Objects Resource Block	3000
View Objects Analog Input 1 Function Block	3010
View Objects Analog Input 2 Function Block	3020
View Objects PID Function Block	3030
View Objects Arithmetic Function Block	3040
View Objects Input Selector Function Block	3050
View Objects Signal Characterizer Function Block	3060
View Objects Integrator Function Block	3070
View Objects Sensor Block	4000
View Object Diagnostic Block	4100
View Object Display Block	4200

11.11 Patents

This product may be protected by at least one of the following patents.
Further patents are pending.

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

Index

Endress+Hauser

People for Process Automation

Declaration of Hazardous Material and De-Contamination

Erklärung zur Kontamination und Reinigung

RA No. ☐☐☐☐☐☐☐☐

Please reference the Return Authorization Number (RA#), obtained from Endress+Hauser, on all paperwork and mark the RA# clearly on the outside of the box. If this procedure is not followed, it may result in the refusal of the package at our facility.

Bitte geben Sie die von E+H mitgeteilte Rücklieferungsnummer (RA#) auf allen Lieferpapieren an und vermerken Sie diese auch außen auf der Verpackung. Nichtbeachtung dieser Anweisung führt zur Ablehnung ihrer Lieferung.

Because of legal regulations and for the safety of our employees and operating equipment, we need the "Declaration of Hazardous Material and De-Contamination", with your signature, before your order can be handled. Please make absolutely sure to attach it to the outside of the packaging.

Aufgrund der gesetzlichen Vorschriften und zum Schutz unserer Mitarbeiter und Betriebseinrichtungen, benötigen wir die unterschriebene "Erklärung zur Kontamination und Reinigung", bevor Ihr Auftrag bearbeitet werden kann. Bringen Sie diese unbedingt außen an der Verpackung an.

Type of instrument / sensor
Geräte-/Sensortyp _____

Serial number
Seriennummer _____

☐ **Used as SIL device in a Safety Instrumented System /** *Einsatz als SIL Gerät in Schutzeinrichtungen*

Process data/ *Prozessdaten*

Temperature / *Temperatur* _____ [°F] _____ [°C]
Pressure / *Druck* _____ [psi] _____ [Pa]
Conductivity / *Leitfähigkeit* _____ [µS/cm]
Viscosity / *Viskosität* _____ [cp] _____ [mm^2/s]

Medium and warnings
Warnhinweise zum Medium

	Medium /concentration *Medium /Konzentration*	Identification CAS No.	 flammable *entzündlich*	 toxic *giftig*	 corrosive *ätzend*	 harmful/ irritant *gesundheits-schädlich/ reizend*	 other * *sonstiges**	 harmless *unbedenklich*
Process medium / *Medium im Prozess*								
Medium for process cleaning / *Medium zur Prozessreinigung*								
Returned part cleaned with / *Medium zur Endreinigung*								

* explosive; oxidising; dangerous for the environment; biological risk; radioactive
* *explosiv; brandfördernd; umweltgefährlich; biogefährlich; radioaktiv*

Please tick should one of the above be applicable, include safety data sheet and, if necessary, special handling instructions.
Zutreffendes ankreuzen; trifft einer der Warnhinweise zu, Sicherheitsdatenblatt und ggf. spezielle Handhabungsvorschriften beilegen.

Description of failure / *Fehlerbeschreibung* _____

_____

_____

Company data / *Angaben zum Absender*

Company / *Firma* _____

_____

Address / *Adresse*

_____

_____

Phone number of contact person / *Telefon-Nr. Ansprechpartner:*

_____

Fax / E-Mail _____

Your order No. / *Ihre Auftragsnr.* _____

"We hereby certify that this declaration is filled out truthfully and completely to the best of our knowledge.We further certify that the returned parts have been carefully cleaned. To the best of our knowledge they are free of any residues in dangerous quantities."

"Wir bestätigen, die vorliegende Erklärung nach unserem besten Wissen wahrheitsgetreu und vollständig ausgefüllt zu haben. Wir bestätigen weiter, dass die zurückgesandten Teile sorgfältig gereinigt wurden und nach unserem besten Wissen frei von Rückständen in gefahrbringender Menge sind."

_____ (place, date / *Ort, Datum*)

_____ Name, dept./ *Abt.* (please print / *bitte Druckschrift*)

_____ Signature / *Unterschrift*

www.endress.com/worldwide

Endress+Hauser

People for Process Automation

BA00244F/00/EN/13.10
71120272
CCS/FM+SGML 6.0/ProMoDo

71120272