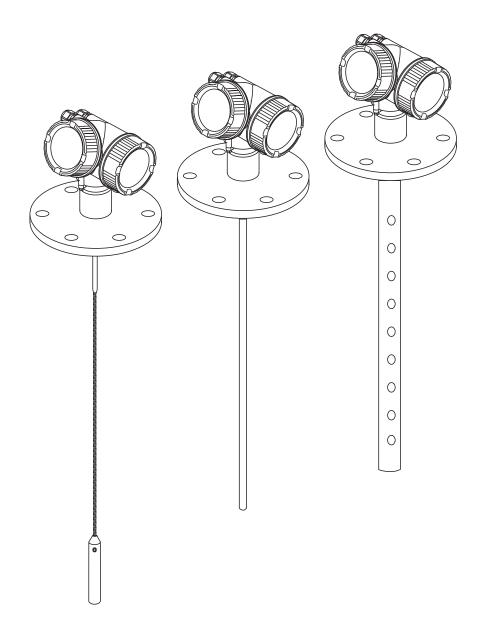
01.01.zz (Device firmware)

Operating Instructions Levelflex FMP51, FMP52, FMP54 PROFIBUS PA

Guided wave radar







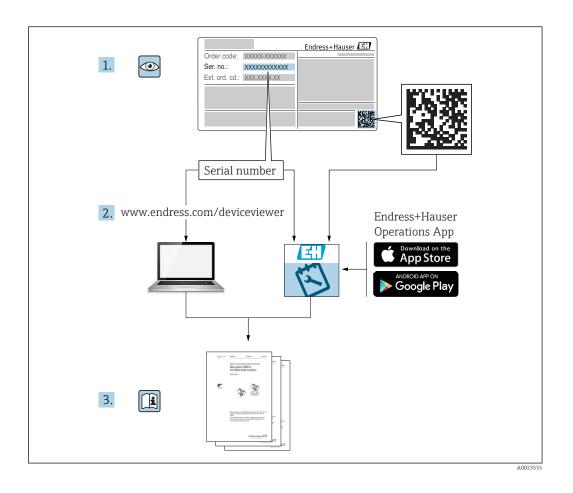


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1 Important document information

1.1 Document function

These Operating Instructions contain all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

1.2 Symbols

1.2.1 Safety symbols

Symbol	Meaning
▲ DANGER	DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
▲ WARNING	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
▲ CAUTION	CAUTION! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
NOTICE	NOTE! This symbol contains information on procedures and other facts which do not result in personal injury.

1.2.2 Electrical symbols

Symbol	Meaning
	Direct current
~	Alternating current
$\overline{\sim}$	Direct current and alternating current
±	Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	Protective Earth (PE) A terminal which must be connected to ground prior to establishing any other connections.
	The ground terminals are situated inside and outside the device: Inner ground terminal: Connects the protectiv earth to the mains supply. Outer ground terminal: Connects the device to the plant grounding system.

1.2.3 Tool symbols

Symbol	Meaning
A0013442	Torx screwdriver
A0011220	Flat blade screwdriver

Symbol	Meaning
06	Cross-head screwdriver
A0011219	
0 6	Allen key
A0011221	
Ø.	Hexagon wrench
A0011222	

1.2.4 Symbols for certain types of information

Symbol	Meaning
✓	Permitted Procedures, processes or actions that are permitted.
✓ ✓	Preferred Procedures, processes or actions that are preferred.
X	Forbidden Procedures, processes or actions that are forbidden.
i	Tip Indicates additional information.
	Reference to documentation.
A=	Reference to page.
	Reference to graphic.
>	Notice or individual step to be observed.
1., 2., 3	Series of steps.
L	Result of a step.
?	Help in the event of a problem.
	Visual inspection.

1.2.5 Symbols in graphics

Symbol	Meaning
1, 2, 3	Item numbers
1., 2., 3	Series of steps
A, B, C,	Views
A-A, B-B, C-C,	Sections
<u>/EX</u>	Hazardous area Indicates a hazardous area.
×	Safe area (non-hazardous area) Indicates the non-hazardous area.

1.2.6 Symbols at the device

Symbol	Meaning
★ → 🗐	Safety instructions Observe the safety instructions contained in the associated Operating Instructions.
	Temperature resistance of the connection cables Specifies the minimum value of the temperature resistance of the connection cables.

1.3 Supplementary documentation

Document	Purpose and content of the document
Technical Information TI01001F (FMP51, FMP52, FMP54)	Planning aid for your device The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.
Brief Operating Instructions KA01079F (FMP51/FMP52/ FMP54, PROFIBUS PA)	Guide that takes you quickly to the 1st measured value The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.
Description of Device Parameters GP01001F (FMP5x, PROFIBUS PA)	Reference for your parameters The document provides a detailed explanation of each individual parameter in the operating menu. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.
Special documentation SD00326F	Functional Safety Manual The document is part of the Operating Instructions and serves as a reference for application-specific parameters and notes.
Special documentation SD01872F	Manual for Heartbeat Verification and Heartbeat Monitoring The document contains descriptions of the additional parameters and technical data which are available with the Heartbeat Verification and Heartbeat Monitoring application packages.

- For an overview of the scope of the associated Technical Documentation, refer to the following:
 - The *W@M Device Viewer*: Enter the serial number from the nameplate (www.endress.com/deviceviewer)
 - The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

1.4 Terms and abbreviations

Term/abbreviation	Explanation
BA	Document type "Operating Instructions"
KA	Document type "Brief Operating Instructions"
TI	Document type "Technical Information"
SD	Document type "Special Documentation"
XA	Document type "Safety Instructions"
PN	Nominal pressure
MWP	Maximum Working Pressure The MWP can also be found on the nameplate.
ToF	Time of Flight
FieldCare	Scalable software tool for device configuration and integrated plant asset management solutions
DeviceCare	Universal configuration software for Endress+Hauser HART, PROFIBUS, FOUNDATION Fieldbus and Ethernet field devices
DTM	Device Type Manager
DD	Device Description for HART communication protocol
$\varepsilon_{\rm r}$ (DC value)	Relative dielectric constant
Operating tool	The term "operating tool" is used in place of the following operating software: FieldCare / DeviceCare, for operation via HART communication and PC SmartBlue (app), for operation using an Android or iOS smartphone or tablet.
BD	Blocking Distance; no signals are analyzed within the BD.
PLC	Programmable Logic Controller
CDI	Common Data Interface
PFS	Pulse Frequence Status (Switching output)

1.5 Registered trademarks

PROFIBUS®

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

Bluetooth®

The Bluetooth® word mark and logos are registered trademarks owned by the Bluetooth SIG, Inc. and any use of such marks by Endress+Hauser is under license. Other trademarks and trade names are those of their respective owners.

Apple[®]

Apple, the Apple logo, iPhone, and iPod touch are trademarks of Apple Inc., registered in the U.S. and other countries. App Store is a service mark of Apple Inc.

Android®

Android, Google Play and the Google Play logo are trademarks of Google Inc.

KALREZ®, VITON®

Registered trademark of DuPont Performance Elastomers L.L.C., Wilmington, USA

TFFI ON®

Registered trademark of E.I. DuPont de Nemours & Co., Wilmington, USA

TRI CLAMP®

Registered trademark of Alfa Laval Inc., Kenosha, USA

NORD-LOCK®

Registered trademark of Nord-Lock International AB

FISHER®

Registered trademark of Fisher Controls International LLC, Marshalltown, USA

MASONEILAN®

Registered trademark of Dresser, Inc., Addison, USA

2 Basic safety instructions

2.1 Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:

- ► Trained, qualified specialists must have a relevant qualification for this specific function and task.
- ► Are authorized by the plant owner/operator.
- ► Are familiar with federal/national regulations.
- ▶ Before starting work, read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application).
- ▶ Follow instructions and comply with basic conditions.

The operating personnel must fulfill the following requirements:

- ► Are instructed and authorized according to the requirements of the task by the facility's owner-operator.
- ▶ Follow the instructions in this manual.

2.2 Designated use

Application and measured materials

The measuring device described in these Operating Instructions is intended only for level and interface measurement of liquids. Depending on the version ordered the device can also measure potentially explosive, flammable, poisonous and oxidizing materials.

Observing the limit values specified in the "Technical data" and listed in the Operating Instructions and supplementary documentation, the measuring device may be used for the following measurements only:

- ► Measured process variable: Level and/or interface
- ► Calculated process variable: Volume oder mass in arbitrarily shaped vessels (calculated from the level by the linearization functionality)

To ensure that the measuring device remains in proper condition for the operation time:

- ▶ Use the measuring device only for measured materials against which the processwetted materials are adequately resistant.
- ▶ Observe the limit values in "Technical data".

Incorrect use

The manufacturer is not liable for damage caused by improper or non-designated use.

Verification for borderline cases:

► For special measured materials and cleaning agents, Endress+Hauser is glad to provide assistance in verifying the corrosion resistance of wetted materials, but does not accept any warranty or liability.

Residual risk

The electronics housing and its built-in components such as display module, main electronics module and I/O electronics module may heat to 80 $^{\circ}$ C (176 $^{\circ}$ F) during operation through heat transfer from the process as well as power dissipation within the electronics. During operation the sensor may assume a temperature near the temperature of the measured material.

Danger of burns due to heated surfaces!

► For high process temperatures: Install protection against contact in order to prevent burns.

2.3 Workplace safety

For work on and with the device:

► Wear the required personal protective equipment according to federal/national regulations.

With divisible probe rods, medium may penetrate into the joints between the indivual parts of the rod. This medium may escape when loosening the joints. In the case of dangerous (e.g. aggressive or toxic) media this may cause injuries.

▶ When loosening the joints between the individual parts of the probe rod: Wear appropriate protective equipment according to the medium.

2.4 Operational safety

Risk of injury.

- ▶ Operate the device in proper technical condition and fail-safe condition only.
- ▶ The operator is responsible for interference-free operation of the device.

Conversions to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers.

► If, despite this, modifications are required, consult with the manufacturer.

Repair

To ensure continued operational safety and reliability,

- ► Carry out repairs on the device only if they are expressly permitted.
- ▶ Observe federal/national regulations pertaining to repair of an electrical device.
- ▶ Use original spare parts and accessories from the manufacturer only.

Hazardous area

To eliminate a danger for persons or for the facility when the device is used in the hazardous area (e.g. explosion protection, pressure vessel safety):

- ▶ Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area.
- ► Observe the specifications in the separate supplementary documentation that is an integral part of these Instructions.

2.5 Product safety

This measuring device is designed in accordance with good engineering practice 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. It meets general safety standards and legal requirements.

NOTICE

Loss of degree of protection by opening of the device in humid environments

▶ If the device is opened in a humid environment, the degree of protection indicated on the nameplate is no longer valid. This may also impair the safe operation of the device.

2.5.1 **CE mark**

The measuring system meets the legal requirements of the applicable EC guidelines. These are listed in the corresponding EC Declaration of Conformity together with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

2.5.2 EAC conformity

The measuring system meets the legal requirements of the applicable EAC guidelines. These are listed in the corresponding EAC Declaration of Conformity together with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the EAC mark.

2.6 Safety Instructions (XA)

Depending on the approval, the following Safety Instructions (XA) are supplied with the device. They are an integral part of the Operating Instructions.

Feature 010	Approval	Available for		Feature 020	: "Power Sup	pply; Output"	
			A 1)	B ²⁾	C ₃₎	E ⁴⁾ /G ⁵⁾	K 6)/L 7)
BA	ATEX II 1G Ex ia IIC T6 Ga	FMP51FMP52FMP54	XA00496F	XA01125F	XA01126F	XA00516F	-
BB	ATEX II 1/2G Ex ia IIC T6 Ga/Gb	FMP51FMP52FMP54	XA00496F	XA01125F	XA01126F	XA00516F	-
ВС	ATEX II 1/2G Ex d[ia] IIC T6 Ga/Gb	FMP51FMP52FMP54	XA00499F	XA00499F	XA00499F	XA00519F	XA01133F
BD	ATEX II 1/3G Ex ic[ia] IIC T6 Ga/Gc	FMP51FMP52FMP54	XA00497F	XA01127F	XA01128F	XA00517F	-
BE	ATEX II 1D Ex t IIIC Da	FMP54	XA00501F	XA00501F	XA00501F	XA00521F	XA00501F
BF	ATEX II 1/2D Ex t IIIC Da/Db	FMP54	XA00501F	XA00501F	XA00501F	XA00521F	XA00501F
BG	ATEX II 3G Ex nA IIC T6 Gc	FMP51FMP52FMP54	XA00498F	XA01130F	XA01131F	XA00518F	XA01132F
ВН	ATEX II 3G Ex ic IIC T6 Gc	FMP51FMP52FMP54	XA00498F	XA01130F	XA01131F	XA00518F	-
BL	ATEX II 1/3G Ex nA[ia] IIC T6 Ga/Gc	FMP51FMP52FMP54	XA00497F	XA01127F	XA01128F	XA00517F	XA01129F
B2	ATEX II 1/2G Ex ia IIC T6 Ga/Gb, 1/2D Ex ia IIIC Da/Db	FMP51FMP52FMP54	XA00502F	XA00502F	XA00502F	XA00522F	-
В3	ATEX II 1/2G Ex d[ia] IIC T6 Ga/Gb, 1/2 D Ex t IIIC Da/Db	FMP51FMP52FMP54	XA00503F	XA00503F	XA00503F	XA00523F	XA01136F
B4	ATEX II 1/2G Ex ia IIC T6 Ga/Gb, Ex d[ia] IIC T6 Ga/Gb	FMP51FMP52FMP54	XA00500F	XA01134F	XA01135F	XA00520F	-
CD	CSA C/US DIP Cl.II,III Div.1 Gr.E-G	FMP54	XA00529F	XA00529F	XA00529F	XA00570F	XA00529F
C2	CSA C/US IS Cl.I,II,III Div.1 Gr.A-G, NI Cl.1 Div.2, Ex ia	FMP51FMP52FMP54	XA00530F	XA00530F	XA00530F	XA00571F	XA00530F
C3	CSA C/US XP Cl.I,II,III Div.1 Gr.A-G, NI Cl.1 Div.2, Ex d	FMP51FMP52FMP54	XA00529F	XA00529F	XA00529F	XA00570F	XA00529F
FB	FM IS Cl.I,II,III Div.1 Gr.A-G, AEx ia, NI Cl.1 Div.2	FMP51FMP52FMP54	XA00531F	XA00531F	XA00531F	XA00573F	XA00531F
FD	FM XP Cl.I,II,III Div.1 Gr.A-G, AEx d, NI Cl.1 Div.2	FMP51FMP52FMP54	XA00532F	XA00532F	XA00532F	XA00572F	XA00532F
FE	FM DIP CI.II,III Div.1 Gr.E-G	FMP54	XA00532F	XA00532F	XA00532F	XA00572F	XA00532F
GA	EAC Ex ia IIC T6 Ga	FMP51FMP52FMP54	XA01380F	XA01380F	XA01380F	XA01381F	XA01380F

Feature 010	Approval	Available for		Feature 020	: "Power Sup	ply; Output"	
			A 1)	B ²⁾	C ₃₎	E ⁴⁾ /G ⁵⁾	K ⁶⁾ /L ⁷⁾
GB	EAC Ex ia IIC T6 Ga/Gb	FMP51FMP52FMP54	XA01380F	XA01380F	XA01380F	XA01381F	XA01380F
GC	EAC Ex d[ia] IIC T6 Ga/Gb	FMP51FMP52FMP54	XA01382F	XA01382F	XA01382F	XA01383F	XA01382F
IA	IEC Ex ia IIC T6 Ga	FMP51FMP52FMP54	XA00496F	XA01125F	XA01126F	XA00516F	-
IB	IEC Ex ia IIC T6 Ga/Gb	FMP51FMP52FMP54	XA00496F	XA01125F	XA01126F	XA00516F	-
IC	IEC Ex d[ia] IIC T6 Ga/Gb	FMP51FMP52FMP54	XA00499F	XA00499F	XA00499F	XA00519F	XA01133F
ID	IEC Ex ic[ia] IIC T6 Ga/Gc	FMP51FMP52FMP54	XA00497F	XA01127F	XA01128F	XA00517F	-
IE	IEC Ex t IIIC Da	FMP54	XA00501F	XA00501F	XA00501F	XA00521F	XA00501F
IF	IEC Ex t IIIC Da/Db	FMP54	XA00501F	XA00501F	XA00501F	XA00521F	XA00501F
IG	IEC Ex nA IIC T6 Gc	FMP51FMP52FMP54	XA00498F	XA01130F	XA01131F	XA00518F	XA01132F
ΙΗ	IEC Ex ic IIC T6 Gc	FMP51FMP52FMP54	XA00498F	XA01130F	XA01131F	XA00518F	-
IL	IEC Ex nA[ia] IIC T6 Ga/Gc	FMP51FMP52FMP54	XA00497F	XA01127F	XA01128F	XA00517F	XA01129F
I2	IEC Ex ia IIC T6 Ga/Gb, Ex ia IIIC Da/Db	FMP51FMP52FMP54	XA00502F	XA00502F	XA00502F	XA00522F	-
I3	IEC Ex d [ia] IIC T6 Ga/Gb, Ex t IIIC Da/Db	FMP51FMP52FMP54	XA00503F	XA00503F	XA00503F	XA00523F	XA01136F
I4	IEC Ex II 1/2G Ex ia IIC T6 Ga/Gb, Ex d[ia] IIC T6 Ga/Gb	FMP51FMP52FMP54	XA00500F	XA01134F	XA01135F	XA00520F	-
JC	JPN Ex d[ia] IIC T4 Ga/Gb	FMP51FMP52	-	-	XA01718F	-	-
JD	JPN Ex d[ia] IIC T1 Ga/Gb	FMP54	-	-	XA01718F	-	-
JE	JPN Ex d[ia] IIC T2 Ga/Gb	FMP54	-	-	XA01718F	-	-
KA	KC Ex ia IIC T6 Ga	FMP51FMP52FMP54	XA01169F	-	XA01169F	-	-
KB	KC Ex ia IIC T6 Ga/Gb	FMP51FMP52FMP54	XA01169F	-	XA01169F	-	-
КС	KC Ex d[ia] IIC T6	FMP51FMP52FMP54	-	-	XA01170F	-	-
MA	INMETRO Ex ia IIC T6 Ga	FMP51FMP52FMP54	XA01038F	XA01038F	XA01038F	-	XA01038F

Feature 010	Approval	Available for	for Feature 020: "Power Supply; Output"				
			A 1)	B 2)	C ₃₎	E ⁴⁾ /G ⁵⁾	K ⁶⁾ /L ⁷⁾
MC	INMETRO Ex d[ia] IIC T6 Ga/Gb	FMP51FMP52FMP54	XA01041F	XA01041F	XA01041F	-	XA01041F
ME	INMETRO Ex t IIIC Da	FMP54	XA01043F	XA01043F	XA01043F	-	XA01043F
МН	INMETRO Ex ic IIC T6 Gc	FMP51FMP52FMP54	XA01040F	XA01040F	XA01040F	-	XA01040F
NA	NEPSI Ex ia IIC T6 Ga	FMP51FMP52FMP54	XA00634F	XA00634F	XA00634F	XA00640F	XA00634F
NB	NEPSI Ex ia IIC T6 Ga/Gb	FMP51FMP52FMP54	XA00634F	XA00634F	XA00634F	XA00640F	XA00634F
NC	NEPSI Ex d[ia] IIC T6 Ga/Gb	FMP51FMP52FMP54	XA00636F	XA00636F	XA00636F	XA00642F	XA00636F
NF	NEPSI DIP A20/21 T8590oC IP66	FMP54	XA00637F	XA00637F	XA00637F	XA00643F	XA00637F
NG	NEPSI Ex nA II T6 Gc	FMP51FMP52FMP54	XA00635F	XA00635F	XA00635F	XA00641F	XA00635F
NH	NEPSI Ex ic IIC T6 Gc	FMP51FMP52FMP54	XA00635F	XA00635F	XA00635F	XA00641F	XA00635F
N2	NEPSI Ex ia IIC T6 Ga/Gb, Ex iaD 20/21 T8590°C	FMP51FMP52FMP54	XA00638F	XA00638F	XA00638F	XA00644F	XA00638F
N3	NEPSI Ex d[ia] IIC T6 Ga/Gb, DIP A20/21 T8590°C IP66	FMP51FMP52FMP54	XA00639F	XA00639F	XA00639F	XA00645F	XA00639F
8A	FM/CSA IS+XP Cl.I,II,III Div.1 Gr.A-G	FMP51FMP52FMP54	XA00531F XA00532F	XA00531F XA00532F	XA00531F XA00532F	XA00572F XA00573F	

- 1) A: 2-wire; 4-20mA HART
- 2) B: 2-wire; 4-20mA HART, switch output
- 3) C: 2-wire; 4-20mA HART, 4-20mA
- 4) E: 2-wire; FOUNDATION Fieldbus, switch output
- 5) G: 2-wire; PROFIBUS PA, switch output
- 6) K: 4-wire 90-253VAC; 4-20mA HART
- 7) L: 4-wire 10,4-48VDC; 4-20mA HART

For certified devices the relevant Safety Instructions (XA) are indicated on the nameplate.

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2.6.1 Ex-marking in case of connected FHX50 remote display

If the device is prepared for the remote display FHX50 (product structure: feature 030: Display, Operation", option L or M), the Ex marking of some certificates changes according to the following table $^{1)}$:

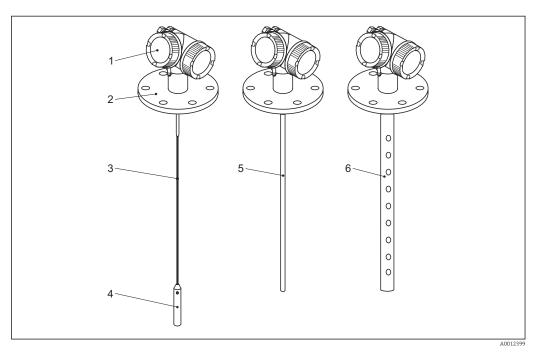
Feature 010 ("Approval")	Feature 030 ("Display, Operation")	Ex-marking
BE	L, M or N	ATEX II 1D Ex ta [ia] IIIC T ₅₀₀ xx°C Da
BF	L, M or N	ATEX II 1/2 D Ex ta [ia Db] IIIC Txx°C Da/Db
BG	L, M or N	ATEX II 3G Ex nA [ia Ga] IIC T6 Gc
ВН	L, M or N	ATEX II 3G Ex ic [ia Ga] IIC T6 Gc
B3	L, M or N	ATEX II 1/2G Ex d [ia] IIC T6 Ga/Gb, ATEX II 1/2D Ex ta [ia Db] IIIC Txx°C Da/Db
IE	L, M or N	IECEx Ex ta [ia] IIIC T500 xx°C Da
IF	L, M or N	IECEx ta [ia Db] IIIC Txx°C Da/Db
IG	L, M or N	IECEx Ex nA [ia Ga] IIC T6 Gc
IH	L, M or N	IECEx Ex ic [ia Ga] IIC T6 Gc
I3	L, M or N	IECEx Ex d [ia] IIC T6 Ga/Gb, IECEx Ex ta [ia Db] IIIC Txx°C Da/Db

¹⁾ The marking of certificates not mentioned in this table are not affected by the FHX50.

3 Product description

3.1 Product design

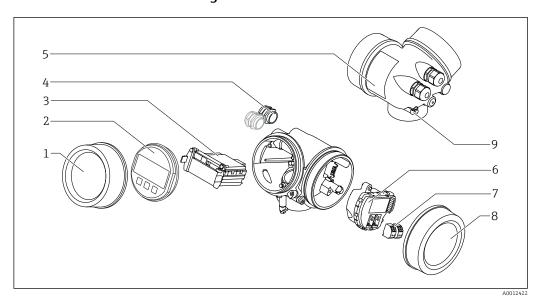
3.1.1 Levelflex FMP51/FMP52/FMP54/FMP55



■ 1 Design of the Levelflex

- 1 Electronics housing
- 2 Process connection (here as an example: flange)
- 3 Rope probe
- 4 End-of-probe weight
- 5 Rod probe
- 6 Coax probe

3.1.2 Electronics housing



■ 2 Design of the electronics housing

- 1 Electronics compartment cover
- 2 Display module
- 3 Main electronics module
- 4 Cable glands (1 or 2, depending on instrument version)
- 5 Nameplate
- 6 I/O electronics module
- 7 Terminals (pluggable spring terminals)
- 8 Connection compartment cover
- 9 Grounding terminal

4 Incoming acceptance and product identification

4.1 Incoming acceptance

Upon receipt of the goods check the following:

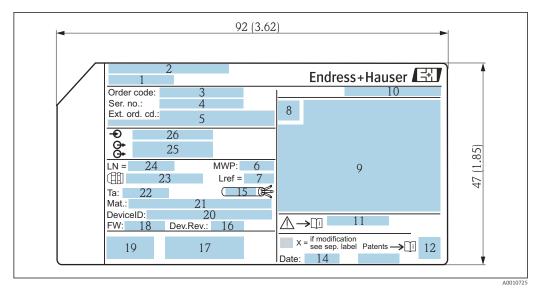
- Are the order codes on the delivery note and the product sticker identical?
- Are the goods undamaged?
- Do the nameplate data match the ordering information on the delivery note?
- If required (see nameplate): Are the Safety Instructions (XA) present?
- If one of these conditions is not satisfied, contact your Endress+Hauser Sales Center.

4.2 Product identification

The following options are available for identification of the measuring device:

- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter serial numbers from nameplates in *W@M Device Viewer* (www.endress.com/deviceviewer): All information about the measuring device is displayed.
- Enter the serial number from the nameplates into the *Endress+Hauser Operations App* or scan the 2-D matrix code (QR code) on the nameplate with the *Endress+Hauser Operations App*: all the information for the measuring device is displayed.

4.2.1 Nameplate



■ 3 Nameplate of the Levelflex; Dimensions: mm (in)

- 1 Device name
- 2 Address of manufacturer
- 3 Order code
- 4 Serial number (Ser. no.)
- 5 Extended order code (Ext. ord. cd.)
- 6 Process pressure
- 7 Gas phase compensation: reference distance
- 8 Certificate symbol
- 9 Certificate and approval relevant data
- 10 Degree of protection: e.g. IP, NEMA
- 11 Document number of the Safety Instructions: e.g. XA, ZD, ZE
- 12 2-D matrix code (QR code)
- 13 Modification mark
- 14 Manufacturing date: year-month
- 15 Permitted temperature range for cable
- 16 Device revision (Dev.Rev.)
- 17 Additional information about the device version (certificates, approvals, communication): e.g. SIL, PROFIBUS
- 18 Firmware version (FW)
- 19 CE mark, C-Tick
- 20 DeviceID
- 21 Material in contact with process
- 22 Permitted ambient temperature (T_a)
- 23 Size of the thread of the cable glands
- 24 Length of probe
- 25 Signal outputs
- 26 Operating voltage
- Only 33 digits of the extended order code can be indicated on the nameplate. If the extended order code exceeds 33 digits, the rest will not be shown. However, the complete extended order code can be viewed in the operating menu of the device in the **Extended order code 1 to 3** parameter.

5 Storage, Transport

5.1 Storage conditions

- Permitted storage temperature: -40 to +80 °C (-40 to +176 °F)
- Use the original packaging.

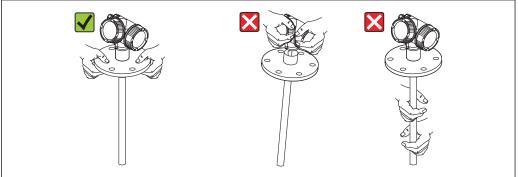
5.2 Transport product to the measuring point

A WARNING

Housing or probe may be damaged or break away.

Risk of injury!

- ► Transport the measuring device to the measuring point in its original packaging or at the process connection.
- ▶ Do not fasten lifting devices (hoisting slings, lifting eyes etc.) at the housing or the probe but at the process connection. Take into account the mass center of the device in order to avoid unintended tilting.
- ► Comply with the safety instructions, transport conditions for devices over 18kg (39.6lbs) (IEC61010).

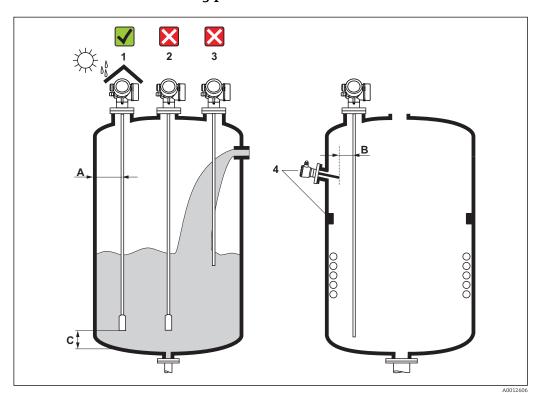


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6 Mounting

6.1 Mounting requirements

6.1.1 Suitable mounting position



 \blacksquare 4 Mounting requirements for Levelflex

Mounting distances

- Distance (A) between wall and rod or rope probe:
 - for smooth metallic walls: > 50 mm (2 in)
 - for plastic walls: > 300 mm (12 in) to metallic parts outside the vessel
 - for concrete walls: > 500 mm (20 in), otherwise the available measuring range may be reduced.
- Distance (B) between rod or rope probe and internal fittings in the vessel: > 300 mm (12 in)
- When using more than one Levelflex:
 - Minimum distance between the sensor axes: 100 mm (3.94 in)
- Distance (C) from end of probe to bottom of the vessel:
 - Rope probe: > 150 mm (6 in)
 - Rod probe: > 10 mm (0.4 in)
 - Coax probe: > 10 mm (0.4 in)
- For coax probes the distance to the wall and to internal fittings is arbitrary.

Additional conditions

- When mounting in the open, a weather protection cover (1) may be installed to protect the device against extreme weather conditions.
- In metallic vessels: Preferably do not mount the probe in the center of the vessel (2), as
 this would lead to increased interference echoes.
 If a central mounting position can not be avoided, it is crucial to perform an interference

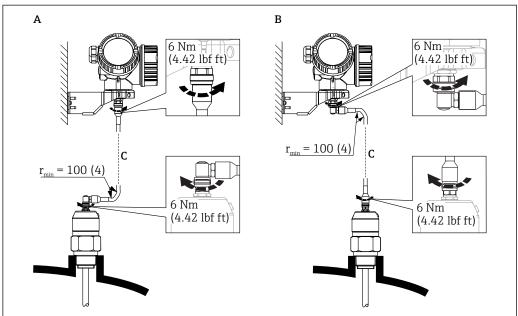
echo suppresion(mapping) after the commissioning of the device.

- Do not mount the probe in the filling curtain (3).
- Avoid buckling the rope probe during installation or operation (e.g. through product movement against silo wall) by selecting a suitable mounting location.
- With suspended rope probes (probe end not fixed at the bottom) the distance between the probe rope and internal fittings in the tank must not fall below 300 mm (12") during the entire process. A sporadic contact between the probe weight and the cone of the vessel, however, does not influence the measurement as long as the dielectric constant of the medium is at least DC = 1.8.
- When mounting the electronics housing into a recess (e.g. in a concrete ceiling), observe a minimum distance of 100 mm (4 inch) between the cover of the terminal compartment / electronics compartment and the wall. Otherwise the connection compartment / electronics compartment is not accessible after installation.

6.1.2 Applications with restricted mounting space

Mounting with remote sensor

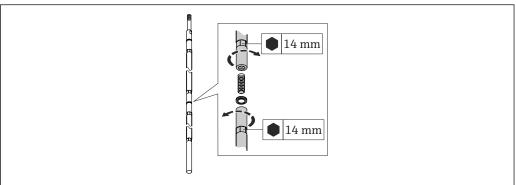
The device version with a remote sensor is suited for applications with restricted mounting space. In this case the electronics housing is mounted at a separate position from which it is easier accessible.



A0014704

- A Angled plug at the probe
- B Angled plug at the electronics housing
- C Length of the remote cable as ordered
- Product structure, feature 600 "Probe Design":
 - Option MB "Sensor remote, 3m/9ft cable"
 - Option MC "Sensor remote, 6m/18ft cable"
 - Option MB "Sensor remote, 9m/27ft cable"
- The remote cable is supplied with these device versions Minimum bending radius: 100 mm (4 inch)
- A mounting bracket for the electronics housing is supplied with these device versions. Mounting options:
 - Wall mounting
 - Pipe mounting; diameter: 42 to 60 mm (1-1/4 to 2 inch)
- The connection cable has got one straight and one angled plug (90°). Depending on the local conditions the angled plug can be connected at the probe or at the electronics housing.
- Probe, electronics and connection cable are adjusted to match each other. They are marked by a common serial number. Only components with the same serial number shall be connected to each other.

Divisible probes



A0021647

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

- max. probe length 10 m (394 in)
- max. sideways capacity 30 Nm
- probes are separable several times with the following lengths of the individual parts:
 - 500 mm (20 in)
 - 1000 mm (40 in)
- torque: 15 Nm
- The joints between the individual rod segments are secured by the included Nord-Lock washers. Install the pre-assembled washers in pairs, cam face to cam face.

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6.1.3 Notes on the mechanical load of the probe

Tensile load limit of rope probes

Sensor	Feature 060	Probe	Tensile load limit [kN]
FMP51	LA, LB, LC, LD MB, MD, ME, MF	Rope 4mm (1/6") 316	5
FMP52	OA, OB, OC, OD	Rope 4mm (1/6") PFA>316	2
FMP54	LA, LB	Rope 4mm (1/6") 316	10

Bending strength of rod probes

Sensor	Feature 060	Probe	Bending strength [Nm]
FMP51	AA, AB	Rod 8mm (1/3") 316L	10
	AC, AD	Rod 12mm (1/2") 316L	30
	AL, AM	Rod 12mm (1/2") AlloyC	30
	BA, BB, BC, BD	Rod 16mm (0.63") 316L divisible	30
FMP52	CA, CB	Rod 16mm (0.63") PFA>316L	30
FMP54	AE, AF	Rod 16mm (0.63") 316L	30
	BA, BB, BC, BD	Rod 16mm (0.63") 316L divisible	30

Bending load (torque) through fluid flow

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

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

with:

c_w: Friction factor

 ρ [kg/m³]: Density of the medium

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

d [m]: Diameter of the probe rod

L [m]: Level

LN [m]: Probe length

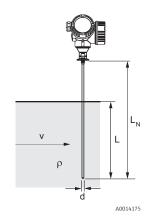
Calculation example

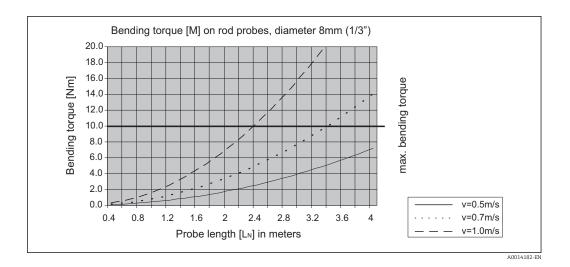
Friction factor $c_w \hspace{1cm} 0.9$ (on the assumption of a turbulent current - high

Reynolds number)

Density ρ [kg/m³] 1000 (e.g. water)

Probe diameter d [m] 0,008 $L=L_{N} \qquad \qquad \text{(worst case)} \label{eq:local_problem}$



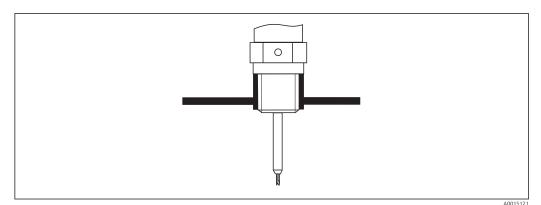


Bending strength of coax probes

Sensor	Feature 060	Process connection	Probe	Bending strength [Nm]
FMP51	UA, UB	Thread G¾ oder NPT¾	Coax 316L, Ø 21,3 mm	60
		■ Thread G1½ or NPT1½ ■ Flange	Coax 316L, Ø 42,4 mm	300
	UC, UD	Flange	Coax AlloyC, Ø 42,4 mm	300
FMP54	UA, UB	• Thread G1½ or NPT1½ • Flange	Coax 316L, Ø 42,4 mm	300

6.1.4 Notes on the process connection

Threaded connection



 \blacksquare 5 Mounting with threaded connection; flush with the container ceiling

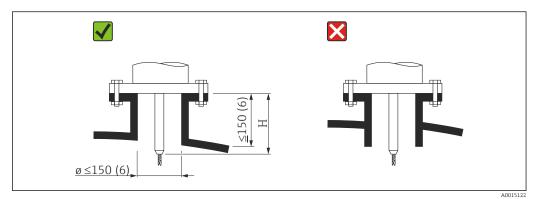
Seal

The thread as well as the type of seal comply to DIN 3852 Part 1, screwed plug form A. They can be sealed with the following types of sealing rings:

- Thread G3/4": According to DIN 7603 with the dimensions 27 x 32 mm
- Thread G1-1/2": According to DIN 7603 with the dimensions 48 x 55 mm

Please use a sealing ring according to this standard in the form A, C or D and of a material that is resistant to the application.

Nozzle mounting



H Length of the center rod or the rigid part of the rope probe

- Permissible nozzle diameter: \leq 150 mm (6 in). For larger diameters the near range measuring capability may be reduced. For nozzles \geq DN300: \rightarrow 🖺 33.
- Permissible nozzle height ²⁾: ≤ 150 mm (6 in). For a larger height the near range measuring capability may be reduced. Larger nozzle heights may be possible in special cases (see sections "Center rod for FMP51 and FMP52" and "Rod extension/centering HMP40 for FMP54").
- The end of the nozzle should be flush with the tank ceiling in order to avoid ringing effects.
- With thermally insulated vessels the nozzle should also be insulated in order to prevent condensate formation.

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²⁾ Larger nozzle heights on request

Center rod for FMP51 and FMP52

For rope probes it may be necessary to use a version with center rod in order to prevent the probe rod from coming into contact with the nozzle wall. Probes with center rod are available for FMP51 and FMP52.

Probe	Max. nozzle height (= length of the center rod)	Option to be selected in feature 060 ("Probe")
FMP51	150 mm	LA, LC
	6 inch	LB, LD
	300 mm	MB, ME
	12 inch	MD, MF
FMP52	150 mm	OA
	6 inch	ос
	300 mm	OB
	12 inch	OD

Rod extension/centering HMP40 for FMP54

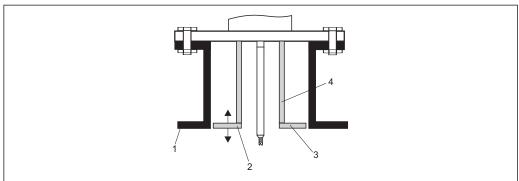
For FMP54 with rope probes the rod extension/centering HMP 40 is available as an accessory. It has to be used if otherwise the probe rope comes into contact with the lower edge of the nozzle.

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.

Centering disks with small diameters (DN40 and DN50) may only be used if there is no significant build-up in the nozzle above the disk. The nozzle must not become clogged by the product.

Installation in nozzles ≥ DN300

If installation in \geq 300mm/12" nozzles is unavoidable, installation must be carried out in accordance with the following sketch.



- Lower edge of the nozzle
- 2 3 Approx. flush with the lower edge of the nozzle (\pm 50 mm/2")
- Plate
- *Pipe* Φ 150 to 180 mm (6 to 7 inch)

Nozzle diameter	Plate diameter
300 mm (12")	280 mm (11")
≥ 400 mm (16")	≥ 350 mm (14")

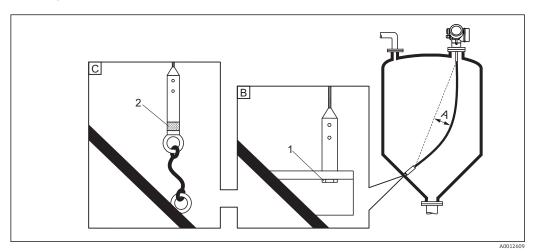
6.1.5 Mounting cladded flanges

- For cladded flanges of FMP52, observe the following:
 - Use flange screws according to the number of flange holes.
 - Tighten the screws with the required torque (see table).
 - Retighten the screws after 24 hours or after the first temperature cycle.
 - Depending on process pressure and process temperature check and retighten the screws at regular intervals.
- Usually, the PTFE flange cladding also serves as a seal between the nozzle and the device flange.

Flange size	Number of screws	Recommended torque [Nm]			
		minimum	maximum		
EN					
DN40/PN40	4	35	55		
DN50/PN16	4	45	65		
DN50/PN40	4	45	65		
DN80/PN16	8	40	55		
DN80/PN40	8	40	55		
DN100/PN16	8	40	60		
DN100/PN40	8	55	80		
DN150/PN16	8	75	115		
DN150/PN40	8	95	145		
ASME					
1½"/150lbs	4	20	30		
1½"/300lbs	4	30	40		
2"/150lbs	4	40	55		
2"/300lbs	8	20	30		
3"/150lbs	4	65	95		
3"/300lbs	8	40	55		
4"/150lbs	8	45	70		
4"/300lbs	8	55	80		
6"/150lbs	8	85	125		
6"/300lbs	12	60	90		
JIS	JIS				
10K 40A	4	30	45		
10K 50A	4	40	60		
10K 80A	8	25	35		
10K 100A	8	35	55		
10K 100A	8	75	115		

6.1.6 Securing the probe

Securing rope probes

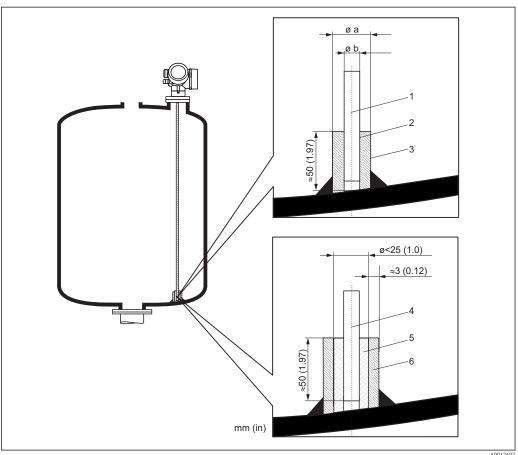


- A Sag of the rope: ≥ 1 cm per 1m of the probe length (0.12 inch per 1 ft of the probe length)
- B Reliably grounded end of probe
- C Reliably isolated end of probe
- 1: Mounting and contact with a bolt
- 2 Mounting kit isolated
- The end of the probe needs to be secured under the following conditions: if otherwise the probe sporadically comes into contact with the wall of the vessel, the outlet cone, internal fittings or other parts of the installation.
- The end of probe can be secured at its internal thread rope 4 mm (1/6"), 316: M 14
- The fixing must be either reliably grounded or reliably insulated. If it is not possible to mount the probe weight with a reliably insulated connection, it can be secured using an isolated eyelet, which is available as an accessory.
- In the case of a grounded fixing the search for a positive end-of-probe signal must be activated. Otherwise an automatic probe length correction is impossible.
 Navigation: Expert → Sensor → EOP evaluation → EOP search mode Setting: Positive EOP option
- In order to prevent an extremely high tensile load (e.g. due to thermal expansion) 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 $\geq 1 \text{cm}/(1 \text{ m rope length})$ [0.12 inch/(1 ft rope length)].

Tensile load limit of rope probes: $\rightarrow \triangle 27$

Securing rod probes

- For WHG approvals: For probe lengths \geq 3 m (10 ft) a support is required.
- In general, rod probes must be supported if there is a horizontal flow (e.g. from an agitator) or in the case of strong vibrations.
- Rod probes may only be supported at the end of the probe.



- Probe rod, uncoated
- Sleeve bored tight to ensure electrical contact between the rod and sleeve! 2
- 3 Short metal pipe, e.g. welded in place
- Probe rod, coated
- Plastic sleeve, e.g. PTFE, PEEK or PPS
- Short metal pipe, e.g. welded in place

φ probe	Φa [mm (inch)]	Φ b [mm (inch)]
8 mm (1/3")	< 14 (0.55)	8.5 (0.34)
12 mm (1/2")	< 20 (0.78)	12.5 (0.52)
16 mm (0.63in)	< 26 (1.02)	16.5 (0.65)

NOTICE

Poor grounding of the end of probe may cause measuring errors.

▶ Apply a narrow sleeve which has good electrical contact to the probe.

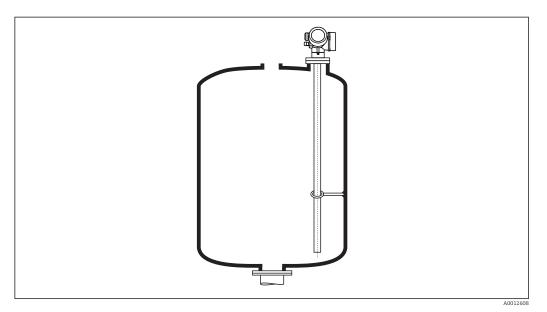
NOTICE

Welding may damage the main electronics module.

▶ Before welding: Ground the probe and dismount electronics.

Securing coax probes

For WHG approvals: For probe lengths \geq 3 m (10 ft) a support is required.

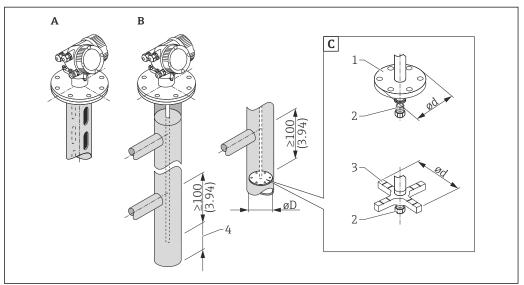


Coax probes can be supported at any point of the outer tube.

6.1.7 Special mounting conditions

Bypasses and stilling wells

In bypass and stilling well applications it is recommended to use a centering disks or stars.



A001261

- 6 Dimensions: mm (in)
- A Mounting in a stilling well
- B Mounting in a bypass
- C Center washer or centering star
- 1 Metallic center washer (316L) for level measurement
- 2 Fixing screw; torque: 25 Nm ± 5 Nm
- Non-metallic centering star (PEEK, PFA) for interface measurement
- 4 Minimum distance between end of probe and lower edge of the bypass; see table below

Allocation of probe type and center washer or centering star to pipe diameter

Feature 610 - Accessory mounted					
Application	Contoning		Center wash Centering st		Pipe
			φ d [mm (in)]	Material	φ D [mm (in)]
Level measurement	OA	Rod probe	75 (2,95)	316L	DN80/3" to DN100/4"
	OB	Rod probe	45 (1,77)	316L	DN50/2" to DN65/2½"
	OC	Rope probe	75 (2,95)	316L	DN80/3" to DN100/4"
Level or interface	OD	Rod probe	4895 (1,893,74)	PEEK 1)	≥ 50 mm (2")
measurement	OE	Rod probe	37 (1,46)	PFA ²⁾	≥ 40 mm (1.57")

- 1) Operation temperature: -60 to +250 °C (-76 to 482 °F)
- 2) Operation temperature: -200 to +250 °C (-328 to +482 °F)

Minimum distance between end of probe and lower edge of the bypass

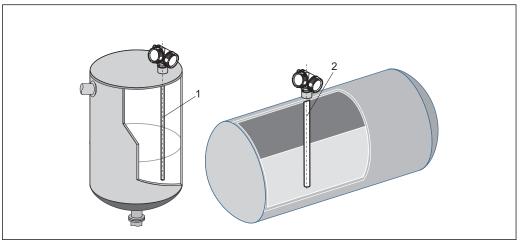
Type of probe	Minimum distance
Rope	10 mm (0.4 in)
Rod	10 mm (0.4 in)
Coax	10 mm (0.4 in)

- Pipe diameter: > 40 mm (1.6") for rod probes
- Rod probe installation can take place up to a diameter size of 150 mm (6 in). In the event of larger diameters, a coax probe is recommended.
- Side disposals, holes or slits and welded joints that protrude up to approx. 5 mm (0.2") inwards do not influence the measurement.
- The pipe may not exhibit any steps in diameter.
- The probe must be 100 mm longer than the lower disposal.
- Within the measuring range, the probe must not get into contact with the pipe wall. If necessary, secure the probe by retaining or tensioning. All rope probes are prepared for tensioning in containers (tensioning weight with anchor hole).
- If a metallic center washer is mounted at the end of the probe, it enables a reliable recognition of the end-of-probe signal (see feature 610 of the product structure).
 Note: For interface measurements only use the nonmetallic centering star made of PEEK or PFA (feature 610, options OD or OE).
- Coax probes can always be applied if there is enough mounting space.
- For bypasses with condensate formation (water) and a medium with low dielectric constant (e.g. hydrocarbons):

In the course of time the bypass is filled with condensate up to the lower disposal and for low levels the the level echo is superimposed by the condensate echo. Thus in this range the condensate level is measured instead of the correct level. Only higher levels are measured correctly. To prevent this, position the lower disposal 100 mm (4 in) below the lowest level to be measured and apply a metallic centering disk at the height of the lower edge of the lower disposal.

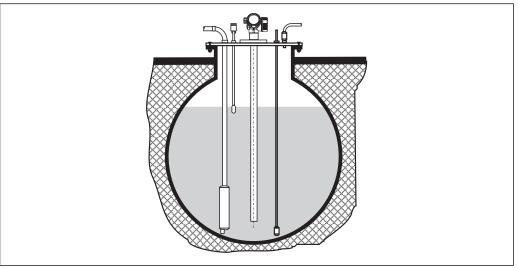
- With heat insulated tanks the bypass should also be insulated in order to prevent condensate formation.
- For information on bypass solutions from Endress+Hauser please contact your Endress+Hauser sales representative.

Installation in horizontal and upright cylindrical tanks



- 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.

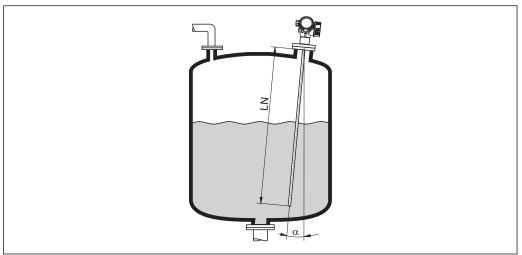
Underground tanks



A0014142

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

Installation at an angle



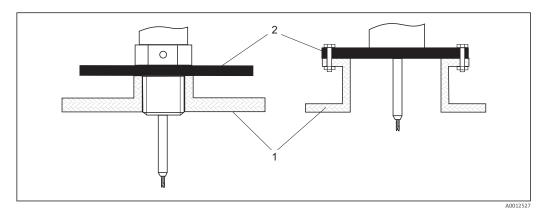
A0014145

- 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 LN = 1 m (3.3 ft): α = 30° Up to LN = 2 m (6.6 ft): α = 10° Up to LN = 4 m (13.1 ft): α = 5°

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Non-metallic vessels

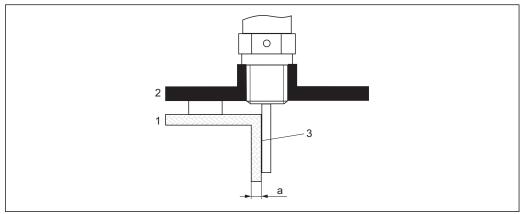


- Non-metallic vessel
- 2 Metal sheet or metal flange

To ensure reliable measurements in non-metallic vessels:

- Select an instrument version with metal flange (minimum size DN50/2").
- Or: mount a metal sheet with a diameter of at least 200 mm (8 in) to the probe at the process connection. Its orientation must be perpendicular to the probe.
- A metallic surface is not required for coax probes.

Plastic or glass tanks: Mounting the probe externally at the wall



A0014150

- 1 Plastic or glass tank
- 2 Metall sheet with threaded sleeve
- 3 No free space between tank wall and probe!

Requirements

- The dielectric constant of the medium must be at least DC > 7.
- The tank wall must be non-conductvie.
- Maximum wall thickness (a):
 - Plastic: < 15 mm (0.6")
 - Glass: < 10 mm (0.4")
- There may be no metallic reinforcements fixed to the tank.

Mounting conditions:

- The probe must be mounted directly to the tank wall (no open space)
- A plastic half pipe with a diameter of approx. 200 mm (8"), or some other protective unit, must be affixed externally to the probe to prevent any influences on the measurement.
- If the tank diameter is less than 300 mm (12"):

 A metallic grounding sheet must be installed at the opposite side of the tank. The sheet must be conductively connected to the process connection and cover about the half of the vessel's circumference.
- If the tank diameter exceeds 300 mm (12"):

 A metal sheet with a diameter of at least 200 mm (8") must be mounted to the probe at the process connection. Its orientation must be perpendicular to the probe (see above).

Calibration for external probe mounting

If the probe is mounted externally at the wall of the tank, the speed of signal propagation will be reduced. There are two possibilities to compensate for this effect.

Compensation with the gas phase compensation factor

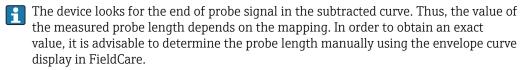
The effect of the dielectric wall can be compared to the effect of a dielectric gas phase. Thus it can be compensated for in the same manner. The compensation factor if given by the quotient of the actual probe length LN and the probe length meausred when the tank is empty.

The device looks for the end of probe signal in the subtracted curve. Thus, the value of the measured probe length depends on the mapping. In order to obtain an exact value, it is advisable to determine the probe length manually using the envelope curve display in FieldCare.

Step	Parameter	Action
1	Expert \rightarrow Sensor \rightarrow Gas phase compensation \rightarrow GPC mode	Select the Const. GPC factor option.
2	Expert \rightarrow Sensor \rightarrow Gas phase compensation \rightarrow Const. GPC factor	Enter quotient: "(Actual probe length)/(Measured probe length)".

Compensation via the calibration parameters

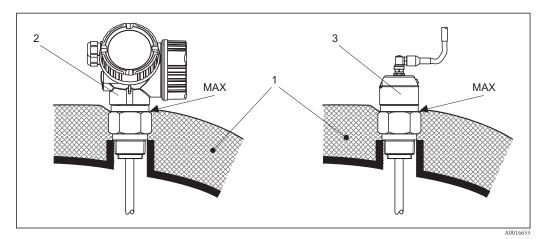
If an acutal gas phase has to be compensated for, the gas phase compensation functionality is no longer available for a correction of the external mounting. In this case the calibration parameters (**Empty calibration** and **Full calibration**) must be adjusted and a value longer than the actual probe length has to be entered into the **Present probe length** parameter. The correction factor for these three parameters is given by the quotient of the probe length measured when the tank is empty and the acutal probe length LN.



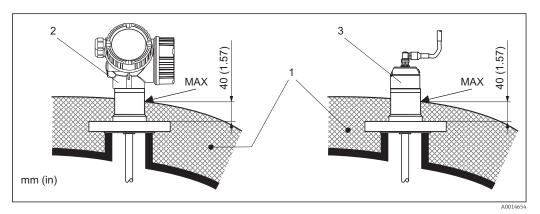
Step	Parameter	Action
1	Setup → Empty calibration	Increase parameter value by "(Measured probe length)/(Actual probe length)".
2	Setup → Full calibration	Increase parameter value by "(Measured probe length)/(Actual probe length)".
3	Setup \rightarrow Advanced setup \rightarrow Probe settings \rightarrow Probe length correction \rightarrow Confirm probe length	Select the Manual input option.
4	Setup \rightarrow Advanced setup \rightarrow Probe settings \rightarrow Probe length correction \rightarrow Present probe length	Enter measured probe length.

Vessels with heat insulation

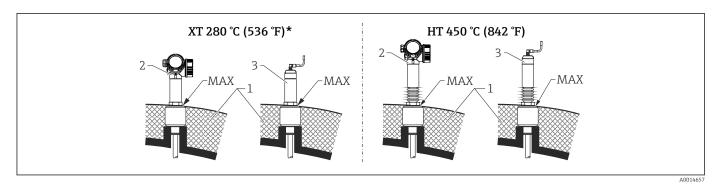
If process temperatures are high, the device must be included in normal tank insulation to prevent the electronics heating up as a result of heat radiation or convection. The insulation may not exceed beyond the points labeled "MAX" in the drawings.



- **№** 7 Process connection with thread - FMP51
- Tank insulation
- Compact device 2
- Sensor remote (feature 600) 3

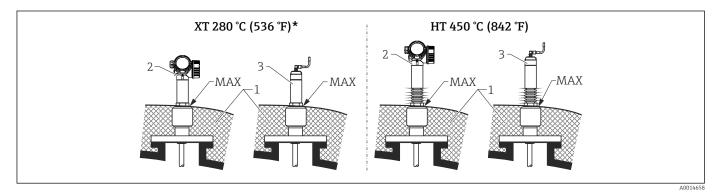


- ₽8 Process connection with flange - FMP51, FMP52
- Tank insulation
- Compact device 2
- Sensor remote (feature 600)



 \blacksquare 9 Process connection with thread - FMP54, sensor version XT and HT

- 1 Tank insulation
- 2 Compact device
- 3 Sensor remote (feature 600)
- * The XT version is not recommended for saturated steam above 200 $^{\circ}$ C (392 $^{\circ}$ F). Use the HT version instead.



■ 10 Process connection with flange - FMP54, sensor version XT and HT

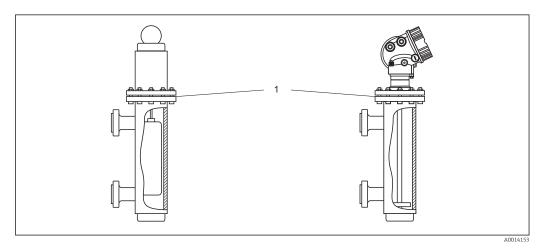
- 1 Tank insulation
- 2 Compact device
- 3 Sensor remote (feature 600)
- * The XT version is not recommended for saturated steam above 200 $^{\circ}$ C (392 $^{\circ}$ F). Use the HT version instead.

Replacing a displacer system in an existing displacer chamber

FMP51 and FMP54 are a perfect replacement for a conventional displacer system in an existing displacer chamber. Endress+Hauser offers flanges that suit Fisher and Masoneilan displacer chamber for this purpose (special product for FMP51; feature 100, options LNJ, LPJ, LQJ for FMP54). Thanks to menu-guided local operation, commissioning the Levelflex only takes a few minutes. Replacement is also possible when partially filled, and wet calibration is not required.

Your benefits:

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



1 Flange of the displacer chamber

Planning instructions:

- In normal cases, use a rod probe. When installing into a metallic displacer chamber up to 150 mm, you have all the advantages of a coax probe.
- It must be ensured that the probe does not come into contact with the side wall. Where necessary, use a center washer or centering star at the lower end of the probe (feature 610 of the product structure).
- The center washer or centering star must be adapted as accurately as possible to the internal diameter of the displacer chamber to also ensure perfect operation in the area of the probe end.

Additional information on interface measurement

- In the case of oil and water the centering disk or centering star should be positioned at the lower edge of the lower disposal (water level).
- The pipe may not exhibit any steps in diameter. Use the coax probe where necessary.
- In the case of rod probes, it must be ensured that the probe does not come into contact with the wall. If necessary, use a center washer or centering star at the end of the probe.
- A plastic centering star has to be used for interface measurement (feature 610, options OD and OE).

6.2 Mounting the device

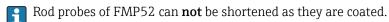
6.2.1 Required mounting tools

- For mounting thread 3/4": Hexagonal wrench 36 mm
- For mounting thread 1-1/2": Hexagonal wrench 55 mm
- To shorten rod or coax probes: Saw
- To shorten rope probes:
 - Allen key AF 3 mm (for 4mm ropes) or AF 4 mm (for 6 mm ropes)
 - Saw or bolt cutter
- For flanges and other process connections: appropriate mounting tools
- To turn the housing: Hexagonal wrench 8 mm

6.2.2 Shortening the probe

Shortening rod probes

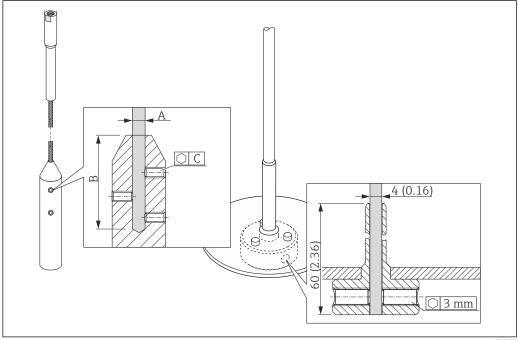
Rod probes must be shortened if the distance to the container floor or outlet cone is less than 10 mm (0.4 in). The rods of a rod probe are shortened by sawing at the bottom end.



Shortening rope probes

Rope probes must be shortened if the distance to the container floor or outlet cone is less than 150 mm (6 in).

Rope probes of FMP52 can **not** be shortened as they are coated.



A0012453

Rope material	A	В	С	Torque for set screws
316	4 mm (0.16 in)	40 mm (1.6 in)	3 mm	5 Nm (3.69 lbf ft)

- 1. Using an Allen key, loosen the set screws at the end-of-probe weight or the clamping sleeve of the centering disk. Note: The set screws have got a clamping coating in order to prevent accidental loosening. Thus an increased torque might be necessary to loosen them.
- 2. Remove released rope from the weight or sleeve.
- 3. Measure off new rope length.
- 4. Wrap adhesive tape around the rope at the point to be shortened to prevent it from fanning out.
- 5. Saw off the rope at a right angle or cut it off with a bolt cutter.
- 6. Insert the rope completely into the weight or sleeve.
- 7. Screw the set screws into place. Due to the clamping coating of the setscrews application of a screw locking fluid is not necessary.

Shortening coax probes

Coax probes must be shortened if the distance to the container floor or outlet cone is less than 10 mm (0.4 in).

Coax probes can be shortened max. 80 mm (3.2 in) 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 (0.4 in) below the centering unit.

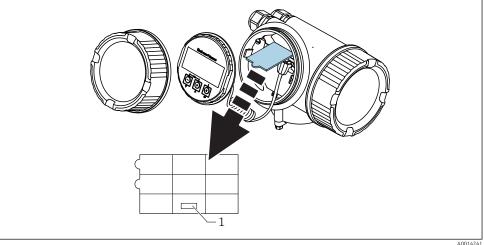
The coax probe is shortened by sawing the pipe at the bottom end.

Entering the new probe length

After shortening the probe:

1. Go to the **Probe settings** submenu and perform a probe length correction.





Field for the new probe length

For documentation purposes, enter the new probe length into the Quick Setup which can be found in the electronics housing behind the display module.

6.2.3 FMP54 with gas phase compensation: Mounting the probe rod

This section is only valid for FMP54 with gas phase compensation (product structure: feature 540 "Application Package", option EF or EG).

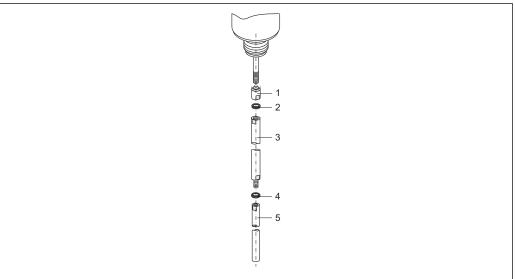
Coax probes

Coax probes with reference reflection are completely mounted and adjusted on delivery. After mounting they are ready for use. Additional settings are not necessary.

Rod probes

For rod probes with reference reflection the probe rod is delivered separately and has to be mounted as follows:

The joints between the individual rod segments are secured by the included Nord-Lock washers. Install the pre-assembled washers in pairs, cam face to cam face.

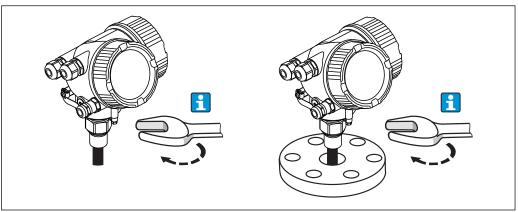


A0014545

- 1. Screw the counter nut onto the connection thread (M10x1) of the gland. Take care that the chamfer is oriented to the gland.
- 2. Place a pair of Nord-Lock washers on the thread.
- 3. Screw the probe rod with the larger diameter onto the thread and fasten it hand-tight.
- 4. Place the second pair of Nord-Lock washers on the threaded bolt.
- 5. Screw the probe rod with the smaller diameter onto the threaded bolt and tighten it with 15 Nm (torque wrench/spanner AF14).

6.2.4 Mounting the device

Mounting devices with thread



A0012528

Devices with mounting thread are screwed into a welding boss or a flange and are usually also secured with these.



- Tighten with the hexagonal nut only:
 - Thread 3/4": Hexagonal wrench 36 mm
 - Thread 1-1/2": Hexagonal wrench 55 mm
- Maximum permissible torque:
 - Thread 3/4": 45 Nm
 - Thread 1-1/2": 450 Nm
- Recommended torque when using the supplied aramid fibre seal and a process pressure of 40 bar (580 psi):
 - Thread 3/4": 25 Nm
 - Thread 1-1/2": 140 Nm
- When installing in metal containers, take care to ensure good metallic contact between the process connection and container.

Flange mounting

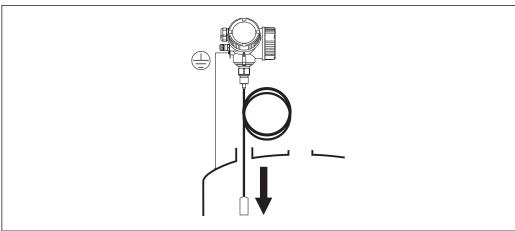
If a seal is used, be sure to use unpainted metal bolts to ensure good electrical contact between probe flange and process flange.

Mounting rope probes

NOTICE

Electrostatic discharges may damage the electronics.

► Earth the housing before lowering the rope into the vessel.



40012052

When lowering the rope probe into the vessel, observe the following:

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

6.2.5 Mounting the "Sensor remote" version

This section is only valid for devices of the version "Probe Design" = "Sensor remote" (feature 600, option MB/MC/MD).

For the version "Probe design" = "Sensor remote" the following is supplied:

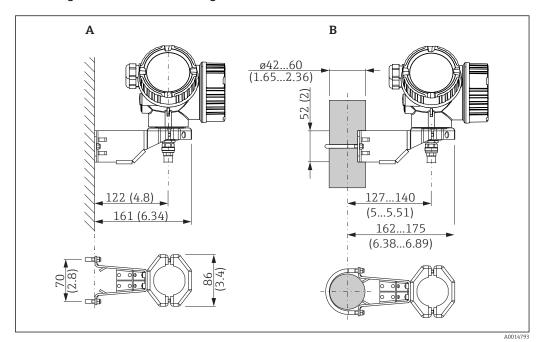
- The probe with the process connection
- The electronics housing
- The mounting bracket for wall or pipe mounting of the electronics housing
- The connection cable (length as ordered). The cable has got one straight and one angled plug (90°). Depending on the local conditions the angled plug can be connected at the probe or at the electronics housing.

A CAUTION

The plugs of the connection cable may be damaged by mechanical stress.

- ▶ Mount the probe and the electronics housing tightly before connecting the cable.
- ► Lay the cable such that it is not exposed to mechanical stress. Minimum bending radius: 100 mm (4").
- ▶ When connecting the cable: Connect the straight plug before the angled one. Torque for both coupling nuts: 6 Nm.
- Probe, electronics and connection cable are adjusted to match each other. They are marked by a common serial number. Only components with the same serial number shall be connected to each other.
- If the measuring point is exposed to strong vibrations, an additional locking compound (e.g. Loctite 243) can be applied at the plug connectors.

Mounting the electronics housing

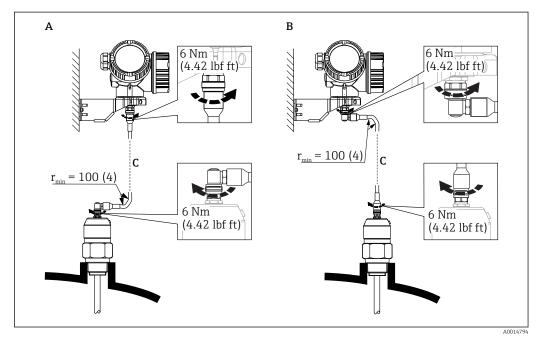


- $\blacksquare 11$ Mounting the electronics housing using the mounting bracket; dimensions: mm (in)
- A Wall mounting
- B Pipe mounting

Connecting the cable

Required tools:

Open-end wrench 18AF

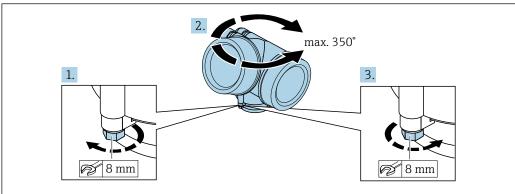


■ 12 Connecting the cable. There are the following possibilities:

- A Angled plug at the probe
- B Angled plug at the electronics housing
- C Length of the remote cable as ordered

6.2.6 Turning the transmitter housing

To provide easier access to the connection compartment or display module, the transmitter housing can be turned:

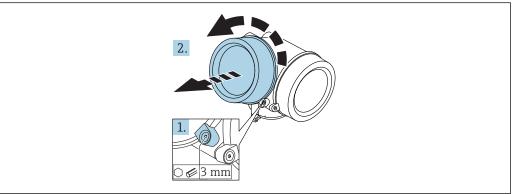


A0032242

- 1. Unscrew the securing screw using an open-ended wrench.
- 2. Rotate the housing in the desired direction.
- 3. Tighten the securing screw (1.5 Nm for plastic housing; 2.5 Nm for aluminum or stainless steel housing).

6.2.7 Turning the display

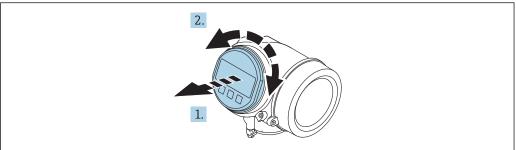
Opening cover



A0021430

- 1. Loosen the screw of the securing clamp of the electronics compartment cover using an Allen key (3 mm) and turn the clamp 90 $^{\circ}$ counterclockwise.
- 2. Unscrew cover and check lid gasket, replace if necessary.

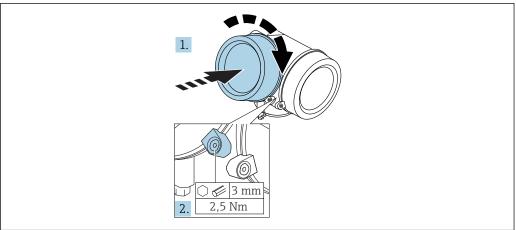
Turning the display module



A0036401

- 1. Pull out the display module with a gentle rotational movement.
- 2. Rotate the display module to the desired position: max. $8 \times 45^{\circ}$ in each direction.
- 3. Feed the coiled cable into the gap between the housing and main electronics module and plug the display module into the electronics compartment until it engages.

Closing electronics compartment cover



A0021451

- 1. Screw back firmly electronics compartment cover.
- 2. Turning securing clamp 90 $^{\circ}$ clockwise and tighten the clamp with 2.5 Nm using the Allen key (3 mm).

6.3 Post-installation check

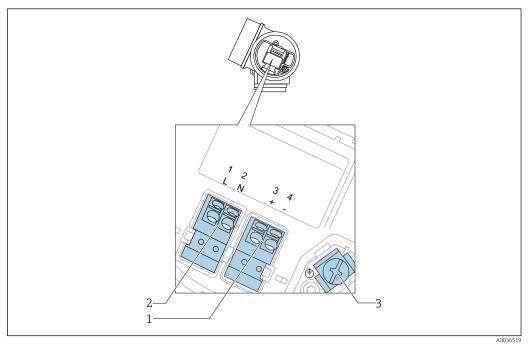
0	Is the device undamaged (visual inspection)?
	Does the device conform to the measuring point specifications?
0	For example: Process temperature Process pressure (refer to the chapter on "Material load curves" of the "Technical Information" document) Ambient temperature range Measuring range
0	Are the measuring point identification and labeling correct (visual inspection)?
0	Is the device adequately protected from precipitation and direct sunlight?
0	Are the securing screw and securing clamp tightened securely?

7 Electrical connection

7.1 Connection conditions

7.1.1 Terminal assignment

Terminal assignment 4-wire: 4-20 mA HART (90 to 253 V_{AC})



Terminal assignment 4-wire: 4-20 mA HART (90 to 253 V_{AC})

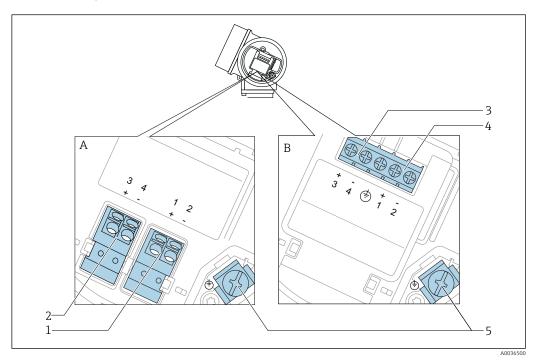
- 1 Connection 4-20 mA HART (active): terminals 3 and 4
- 2 Connection supply voltage: terminals 1 and 2
- 3 Terminal for cable screen

A CAUTION

To ensure electrical safety:

- $\,\blacktriangleright\,\,$ Do not disconnect the protective connection.
- ▶ Disconnect the supply voltage before disconnecting the protective earth.
- Connect protective earth to the internal ground terminal (3) before connecting the supply voltage. If necessary, connect the potential matching line to the external ground terminal.
- In order to ensure electromagnetic compatibility (EMC): Do **not** only ground the device via the protective earth conductor of the supply cable. Instead, the functional grounding must also be connected to the process connection (flange or threaded connection) or to the external ground terminal.
- An easily accessible power switch must be installed in the proximity of the device. The power switch must be marked as a disconnector for the device (IEC/EN61010).

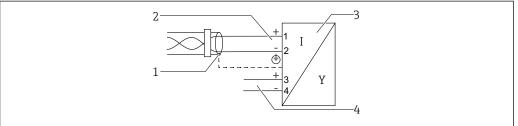
Terminal assignment PROFIBUS PA / FOUNDATION Fieldbus



■ 14 Terminal assignment PROFIBUS PA / FOUNDATION Fieldbus

- A Without integrated overvoltage protection
- *B* With integrated overvoltage protection
- 1 Connection PROFIBUS PA / FOUNDATION Fieldbus: terminals 1 and 2, without integrated overvoltage protection
- 2 Connection switch output (Open Collector): terminals 3 and 4, without integrated overvoltage protection
- 3 Connection switch output (Open Collector): terminals 3 and 4, with integrated overvoltage protection
- 4 Connection PROFIBUS PA / FOUNDATION Fieldbus: terminals 1 and 2, with integrated overvoltage protection
- 5 Terminal for cable screen

Block diagram PROFIBUS PA / FOUNDATION Fieldbus

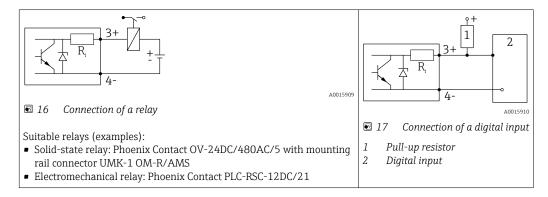


A003653

■ 15 Block diagram PROFIBUS PA / FOUNDATION Fieldbus

- 1 Cable screen; observe cable specifications
- Connection PROFIBUS PA / FOUNDATION Fieldbus
- 3 Measuring device
- 4 Switch output (open collector)

Connection examples for the switch output



For optimum interference immunity we recommend to connect an external resistor (internal resistance of the relay or Pull-up resistor) of $< 1000 \Omega$.

7.1.2 Cable specification

- Devices without integrated overvoltage protection
 Pluggable spring-force terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)
- Devices with integrated overvoltage protection
 Screw terminals for wire cross-sections 0.2 to 2.5 mm² (24 to 14 AWG)
- For ambient temperature $T_{IJ} \ge 60$ °C (140 °F): use cable for temperature $T_{IJ} + 20$ K.

PROFIBUS

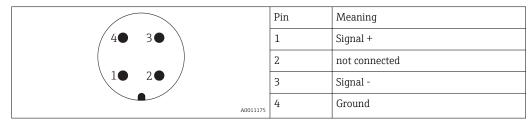
Use a twisted, screened two-wire cable, preferably cable type A.

For further information on the cable specifications, see Operating Instructions BA00034S "PROFIBUS DP/PA: Guidelines for planning and commissioning", PNO Guideline 2.092 "PROFIBUS PA User and Installation Guideline" and IEC 61158-2 (MBP).

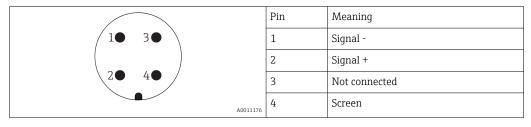
7.1.3 Device plug connectors

For the versions with fieldbus plug connector (M12 or 7/8"), the signal line can be connected without opening the housing.

Pin assignment of the M12 plug connector



Pin assignment of the 7/8" plug connector



7.1.4 Power supply

PROFIBUS PA, FOUNDATION Fieldbus

"Power supply; Output" 1)	"Approval" ²⁾	Terminal voltage
E: 2-wire; FOUNDATION Fieldbus, switch output G: 2-wire; PROFIBUS PA, switch output	 Non-Ex Ex nA Ex nA[ia] Ex ic Ex ic[ia] Ex d[ia] / XP Ex ta / DIP CSA GP 	9 to 32 V ³⁾
	Ex ia / ISEx ia + Ex d[ia] / IS + XP	9 to 30 V ³⁾

- 1) Feature 020 of the product structure
- 2) Feature 010 of the product structure
- 3) Input voltages up to 35 V will not spoil the device.

Polarity sensitive	No
FISCO/FNICO compliant according to IEC 60079-27	Yes

7.1.5 Overvoltage protection

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

Integrated overvoltage protection module

An integrated overvoltage protection module is available for 2-wire HART as well as PROFIBUS PA and FOUNDATION Fieldbus devices.

Product structure: Feature 610 "Accessory mounted", option NA "Overvoltage protection".

Technical data		
Resistance per channel	$2 \times 0.5 \Omega$ max.	
Threshold DC voltage	400 to 700 V	
Threshold impulse voltage	< 800 V	
Capacitance at 1 MHz	< 1.5 pF	
Nominal arrest impulse voltage (8/20 μs)	10 kA	

External overvoltage protection module

HAW562 or HAW569 from Endress+Hauser are suited as external overvoltage protection.

For detailed information please refer to the following documents:

• HAW562: TI01012K

■ HAW569: TI01013K

7.2 Connecting the measuring device

WARNING

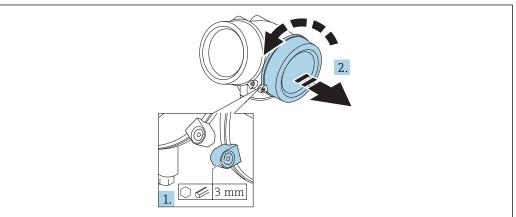
Risk of explosion!

- ► Observe applicable national standards.
- ► Comply with the specifications in the Safety Instructions (XA).
- ► Use specified cable glands only.
- ► Check to ensure that the power supply matches the information on the nameplate.
- ► Switch off the power supply before connecting the device.
- ► Connect the potential matching line to the outer ground terminal before applying the power supply.

Required tools/accessories:

- For devices with a cover lock: Allen key AF3
- Wire stripper
- When using stranded cables: One ferrule for every wire to be connected.

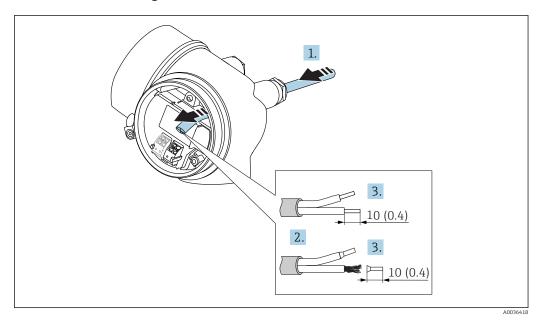
7.2.1 Opening connection compartment cover



A002149

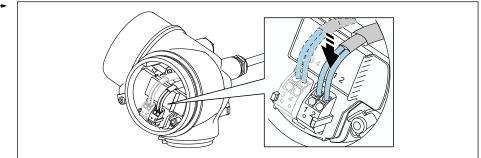
- 1. Loosen the screw of the securing clamp of the connection compartment cover using an Allen key (3 mm) and turn the clamp 90 ° clockwise.
- 2. Afterwards unscrew connection compartment cover and check lid gasket, replace if necessary.

7.2.2 Connecting



■ 18 Dimensions: mm (in)

- 1. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
- 2. Remove the cable sheath.
- 3. Strip the cable ends over a length of 10 mm (0.4 in). In the case of stranded cables, also fit ferrules.
- 4. Firmly tighten the cable glands.
- 5. Connect the cable in accordance with the terminal assignment.

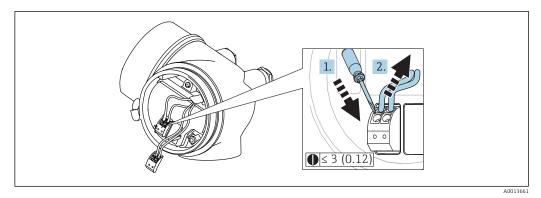


A0034682

6. If using shielded cables: Connect the cable shield to the ground terminal.

7.2.3 Plug-in spring-force terminals

In the case of devices without integrated overvoltage protection, electrical connection is via plug-in spring-force terminals. Rigid conductors or flexible conductors with ferrules can be inserted directly into the terminal without using the lever, and create a contact automatically.

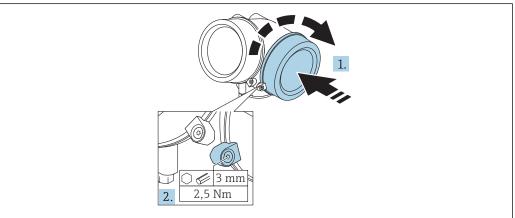


■ 19 Dimensions: mm (in)

To remove cables from the terminal:

- 1. Using a flat-blade screwdriver ≤ 3 mm, press down on the slot between the two terminal holes
- 2. while simultaneously pulling the cable end out of the terminal.

7.2.4 Closing connection compartment cover



A002149

- 1. Screw back firmly connection compartment cover.
- 2. Turning securing clamp 90 ° counterclockwise and tighten the clamp with 2.5 Nm (1.84 lbf ft) again using the Allen key (3 mm).

7.3 Post-connection check

Is the device or cable undamaged (visual check)?
Do the cables comply with the requirements ?
Do the cables have adequate strain relief?
Are all cable glands installed, securely tightened and leak-tight?
Does the supply voltage match the specifications on the nameplate?
Is the terminal assignment correct?

If required: Has protective ground connection been established ?
If supply voltage is present, is the device ready for operation and do values appear on the display module?
Are all housing covers installed and securely tightened?
Is the securing clamp tightened correctly?

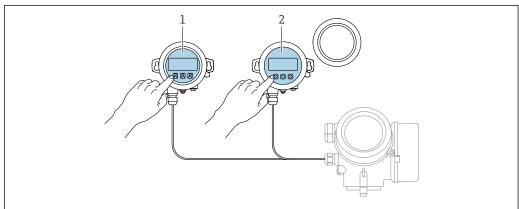
8 Operation options

8.1 Overview

8.1.1 Local operation

Operation with	Pushbuttons	Touch Control	
Order code for "Display; Operation"	Option C "SD02"	Option E "SD03"	
Display elements	A0036312 4-line display	4-line display white background lighting; switches to red in	
	Format for displaying measured variables and st	event of device error	
	Permitted ambient temperature for the display: $-20 \text{ to } +70 ^{\circ}\text{C}$ ($-4 \text{ to } +158 ^{\circ}\text{F}$) The readability of the display may be impaired at temperatures outside the temperature range.		
Operating elements	local operation with 3 push buttons (±, □, E) external operation via touch control; 3 optical keys: ±, □, E		
	Operating elements also accessible in various hazardous areas		
Additional functionality	Data backup function The device configuration can be saved in the display module.		
	Data comparison function The device configuration saved in the display module can be compared to the current device configuration.		
	Data transfer function The transmitter configuration can be transmitted to another device using the display module.		

8.1.2 Operation with remote display and operating module FHX50

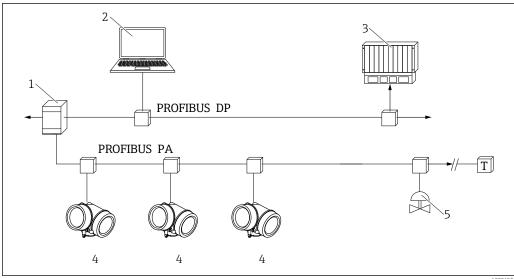


■ 20 FHX50 operating options

- Display and operating module SD03, optical keys; can be operated through the glass of the cover
- Display and operating module SD02, push buttons; cover must be removed

8.1.3 Remote operation

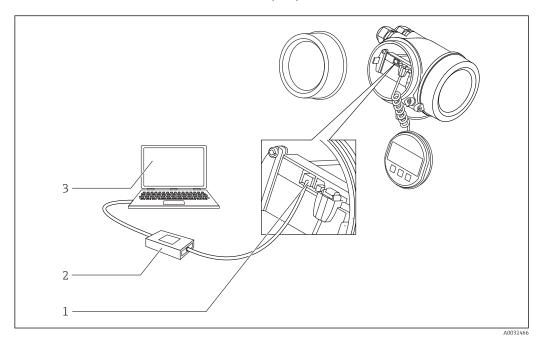
Via PROFIBUS PA protocol



₽ 21 Options for remote operation via PROFIBUS PA protocol

- Segment coupler
- 2 Computer with Profiboard/Proficard and operating tool (e.g. DeviceCare/FieldCare
- 3 PLC (Progrommable Logic Controller)
- Transmitter 4
- Additional functions (valves etc.)

DeviceCare/FieldCare via service interface (CDI)



DeviceCare/FieldCare via service interface (CDI)

- Service interface (CDI) of the instrument (= Endress+Hauser Common Data Interface) Commubox FXA291
- Computer with DeviceCare/FieldCare operating tool

8.2 Structure and function of the operating menu

8.2.1 Structure of the operating menu

Menu	Submenu / parameter	Meaning	
	Language ¹⁾	Defines the operating language of the on-site display	
Commissioning ²⁾		Launches the interactive wizard for guided commissioning. Additional settings generally do not need to be made in the other menus when the wizard is finished.	
Setup	Parameter 1 Parameter N	Once values have been set for these parameters, the measurement should generally be completely configured.	
	Advanced setup	Contains additional submenus and parameters: • to adapt the device to special measuring conditions. • to process the measured value (scaling, linearization). • to configure the signal output.	
Diagnostics	Diagnostic list	Contains up to 5 currently active error messages.	
	Event logbook 3)	Contains the last 20 messages (which are no longer active).	
	Device information	Contains information for identifying the device.	
	Measured values	Contains all current measured values.	
	Data logging	Contains the history of the individual measuring values.	
	Simulation	Is used to simulate measured values or output values.	
	Device check	Contains all parameters needed to check the measurement capability of the device.	
	Heartbeat 4)	Contains all the wizards for the Heartbeat Verification and Heartbeat Monitoring application packages.	
Expert ⁵⁾ Contains all parameters of the device (including those that are already in one of the other menus). This menu is organized according to the function blocks of the device. The parameters of the Expert menu are described in: GP01001F (PROFIBUS PA)	System	Contains all higher-order device parameters that do not concern the measurement or measured value communication.	
	Sensor	Contains all parameters needed to configure the measurement.	
	Output	Contains all parameters needed to configure the switch output (PFS).	

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Menu	Submenu / parameter	Meaning	
	Communication	Contains all parameters needed to configure the digital communication interface.	
	Diagnostics	Contains all parameters needed to detect and analyze operational errors.	

- 1) If operating via operating tools (e.g. FieldCare), the "Language" parameter is located under "Setup \rightarrow Advanced setup → Display"

 Only if operating via an FDT/DTM system only available with local operation
- 2)
- 3)
- 4)
- only available if operating via DeviceCare or FieldCare
 On entering the "Expert" menu, an access code is always requested. If a customer specific access code has 5) not been defined, "0000" has to be entered.

8.2.2 User roles and related access authorization

Access authorization to parameters

User role	Read access		Write access	
	Without access code (from the factory)	With access code	Without access code (from the factory)	With access code
Operator	V	V	V	
Maintenance	V	V	V	V

If an incorrect access code is entered, the user obtains the access rights of the **Operator** role.

The user role with which the user is currently logged on is indicated by the **Access status display** parameter (for display operation) or **Access status tooling** parameter (for tool operation).

8.2.3 Data access - Security

Write protection via access code

Using the device-specific access code, the parameters for the measuring device configuration are write-protected and their values can no longer be changed via local operation.

Define access code via local display

- Navigate to: Setup → Advanced setup → Administration → Define access code
 Define access code
- 2. Define a max. 4-digit numeric code as an access code.
- 3. Repeat the same code in **Confirm access code** parameter.
 - ► The 🖹-symbol appears in front of all write-protected parameters.

Define access code via operating tool (e.g. FieldCare)

- 1. Navigate to: Setup \rightarrow Advanced setup \rightarrow Administration \rightarrow Define access code
- 2. Define a max. 4-digit numeric code as an access code.
 - **▶** Write protection is active.

Parameters that can always be changed

The write protection does not include certain parameters that do not affect the measurement. Despite the defined access code, they can always be modified, even if the other parameters are locked.

The device automatically locks the write-protected parameters again if a key is not pressed for 10 minutes in the navigation and editing view. The device locks the write-protected parameters automatically after 60 s if the user skips back to the measured value display mode from the navigation and editing view.

- If write access is activated via access code, it can be also be deactivated only via the access code →

 73.
 - In the "Description of Device Parameters" documents, each write-protected parameter is identified with the 🗈-symbol.

Disabling write protection via access code

If the $\[eta \]$ -symbol appears on the local display in front of a parameter, the parameter is write-protected by a device-specific access code and its value cannot be changed at the moment using the local display $\[\rightarrow \]$ $\[\]$ 72.

The locking of the write access via local operation can be disabled by entering the device-specific access code.

- 1. After you press E, the input prompt for the access code appears.
- 2. Enter the access code.
 - The \(\mathbb{O}\)-symbol in front of the parameters disappears; all previously write-protected parameters are now re-enabled.

Deactivation of the write protection via access code

Via local display

- Navigate to: Setup → Advanced setup → Administration → Define access code
 Define access code
- 2. Enter **0000**.
- 3. Repeat **0000** in **Confirm access code** parameter.
 - The write protection is deactivated. Parameters can be changed without entering an access code.

Via an operating tool (e.g. FieldCare)

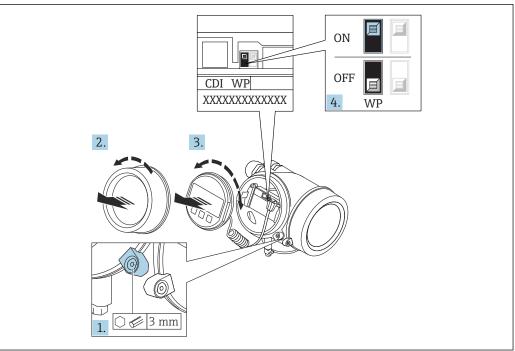
- 1. Navigate to: Setup \rightarrow Advanced setup \rightarrow Administration \rightarrow Define access code
- 2. Enter **0000**.
 - The write protection is deactivated. Parameters can be changed without entering an access code.

Write protection via write protection switch

Unlike parameter write protection via a user-specific access code, this allows write access to the entire operating menu - except for the **"Contrast display" parameter** - to be locked.

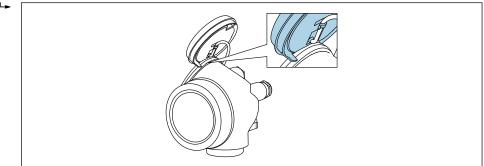
The parameter values are now read only and cannot be edited any more (exception "Contrast display" parameter):

- Via local display
- Via PROFIBUS PA protocol
- Via PROFIBUS DP protocol



A0026157

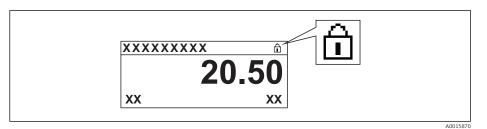
- 1. Loosen the securing clamp.
- 2. Unscrew the electronics compartment cover.
- 3. Pull out the display module with a gentle rotational movement. To make it easier to access the lock switch, attach the display module to the edge of the electronics compartment.



A0036086

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- 4. Setting the write protection switch (WP) on the main electronics module to the **ON** position enables hardware write protection. Setting the write protection switch (WP) on the main electronics module to the **OFF** position (factory setting) disables hardware write protection.
 - ☐ If the hardware write protection is enabled: The **Hardware locked** option is displayed in the **Locking status** parameter. In addition, on the local display the ☐ symbol appears in front of the parameters in the header of the operational display and in the navigation view.



If the hardware write protection is disabled: No option is displayed in the **Locking status** parameter. On the local display, the 🗃-symbol disappears from in front of the parameters in the header of the operational display and in the navigation view.

- 5. Feed the cable into the gap between the housing and main electronics module and plug the display module into the electronics compartment in the desired direction until it engages.
- 6. Reverse the removal procedure to reassemble the transmitter.

Enabling and disabling the keypad lock

The keypad lock makes it possible to block access to the entire operating menu via local operation. As a result, it is no longer possible to navigate through the operating menu or change the values of individual parameters. Users can only read the measured values on the operational display.

The keypad lock is switched on and off via the context menu.

Switching on the keypad lock

For the SD03 display only

The keypad lock is switched on automatically:

- If the device has not been operated via the display for > 1 minute.
- Each time the device is restarted.

To activate the keylock manually:

1. The device is in the measured value display.

Press E for at least 2 seconds.

- ► A context menu appears.
- 2. In the context menu select the **Keylock on** option.
 - The keypad lock is switched on.
- If the user attempts to access the operating menu while the keypad lock is active, the message **Keylock on** appears.

Switching off the keypad lock

1. The keypad lock is switched on.

Press E for at least 2 seconds.

- ► A context menu appears.
- 2. In the context menu select the **Keylock off** option.
 - ► The keypad lock is switched off.

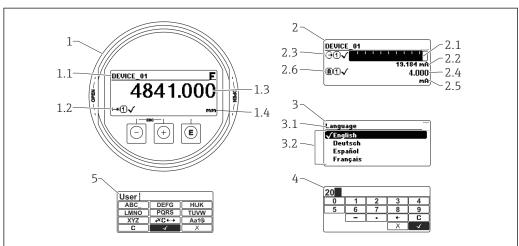
Bluetooth® wireless technology

Signal transmission via Bluetooth® wireless technology uses a cryptographic technique tested by the Fraunhofer Institute

- The device is not visible via *Bluetooth*® wireless technology without the SmartBlue app
- Only one point-to-point connection between one sensor and one smartphone or tablet is established

8.3 Display and operating module

8.3.1 Display appearance



A0012635

■ 23 Appearance of the display and operation module for on-site operation

- 1 Measured value display (1 value max. size)
- 1.1 Header containing tag and error symbol (if an error is active)
- 1.2 Measured value symbols
- 1.3 Measured value
- 1.4 Unit
- 2 Measured value display (1 bargraph + 1 value)
- 2.1 Bargraph for measured value 1
- 2.2 Measured value 1 (including unit)
- 2.3 Measured value symbols for measured value 1
- 2.4 Measured value 2
- 2.5 Unit for measured value 2
- 2.6 Measured value symbols for measured value 2
- Representation of a parameter (here: a parameter with selection list)
- 3.1 Header containing parameter name and error symbol (if an error is active)
- 3.2 Selection list; \square marks the current parameter value.
- 4 Input matrix for numbers
- 5 Input matrix for alphanumeric and special characters

Display symbols for the submenus

Symbol	Meaning		
A0018367	Display/operation Is displayed: in the main menu next to the selection "Display/operation" in the header, if you are in the "Display/operation" menu		
A0018364	Setup Is displayed: ■ in the main menu next to the selection "Setup" ■ in the header, if you are in the "Setup" menu		
A0018365	Expert Is displayed: in the main menu next to the selection "Expert" in the header, if you are in the "Expert" menu		
A0018366	Diagnostics Is displayed: in the main menu next to the selection "Diagnostics" in the header, if you are in the "Diagnostics" menu		

Status signals

A0032902	"Failure" A device error is present. The measured value is no longer valid.
C	"Function check" The device is in service mode (e.g. during a simulation).
S	 "Out of specification" The device is operated: Outside of its technical specifications (e.g. during startup or a cleaning) Outside of the configuration carried out by the user (e.g. level outside configured span)
N	"Maintenance required" Maintenance is required. The measured value is still valid.

Display symbols for the locking state

Symbol	Meaning
A0013148	Display parameter Marks display-only parameters which can not be edited.
A0013150	 Device locked In front of a parameter name: The device is locked via software and/or hardware. In the header of the measured value screen: The device is locked via hardware.

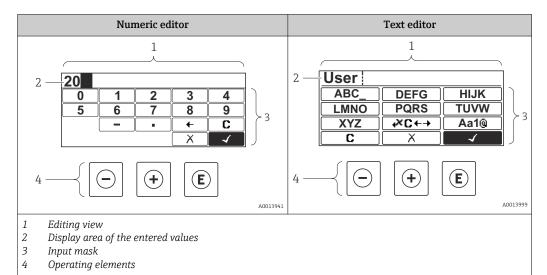
Measured value symbols

Symbol		Meaning	
Measured value	es		
[~~]		Level	
	A0032892		
⊢₩	A0032893	Distance	
()		Current output	
	A0032908		
(A)		Measured current	
	A0032894		
W		Terminal voltage	
	A0032895		
		Temperature of the electronics or the sensor	
	A0032896		
Measuring cha	nnels		
(1)		Measuring channel 1	
	A0032897		
(2)		Measuring channel 2	
	A0032898		
Status of the m	easured	value	
		Status "Alarm"	
	A0018361	The measurment is interrupted. The output assumes the defined alarm value. A diagnostic message is generated.	
\triangle	A0018360	Status "Warning" The device continues measuring. A diagnostic message is generated.	

8.3.2 Operating elements

Key	Meaning
	Minus key
_	For menu, submenu Moves the selection bar upwards in a picklist.
A0018330	For text and numeric editor In the input mask, moves the selection bar to the left (backwards).
	Plus key
+	For menu, submenu Moves the selection bar downwards in a picklist.
A0018329	For text and numeric editor In the input mask, moves the selection bar to the right (forwards).
	Enter key
	For measured value display Pressing the key briefly opens the operating menu. Pressing the key for 2 s opens the context menu.
E A0018328	 For menu, submenu Pressing the key briefly Opens the selected menu, submenu or parameter. Pressing the key for 2 s for parameter: If present, opens the help text for the function of the parameter.
	For text and numeric editor Pressing the key briefly Opens the selected group. Carries out the selected action. Pressing the key for 2 s confirms the edited parameter value.
	Escape key combination (press keys simultaneously)
— + + A0032909	For menu, submenu ■ Pressing the key briefly - Exits the current menu level and takes you to the next higher level. - If help text is open, closes the help text of the parameter. ■ Pressing the key for 2 s returns you to the measured value display ("home position").
	For text and numeric editor Closes the text or numeric editor without applying changes.
-+E	Minus/Enter key combination (press and hold down the keys simultaneously)
A0032910	Reduces the contrast (brighter setting).
++E A0032911	Plus/Enter key combination (press and hold down the keys simultaneously) Increases the contrast (darker setting).

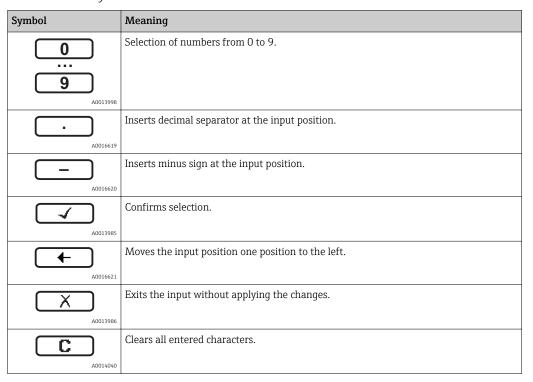
8.3.3 Entering numbers and text



Input mask

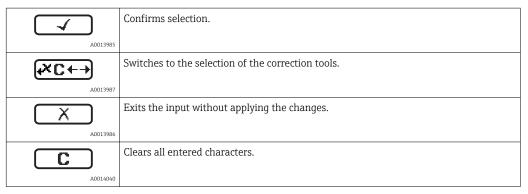
The following input symbols are available in the input mask of the numeric and text editor:

Numeric editor symbols



Text editor symbols

Symbol Meaning	
ABC_ XYZ	Selection of letters from A to Z
Aa1 @	Toggle Between upper-case and lower-case letters For entering numbers For entering special characters



Correction symbols under \nearrow

Symbol Meaning	
C	Clears all entered characters.
A0032907	
-	Moves the input position one position to the right.
A0018324	
4	Moves the input position one position to the left.
A0018326	
₽ X	Deletes one character immediately to the left of the input position.
A0032906	

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8.3.4 Opening the context menu

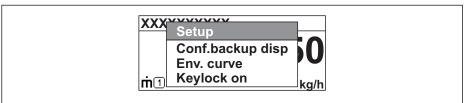
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- Setup
- Conf. backup disp.
- Env.curve
- Keylock on

Opening and closing the context menu

The user is in the operational display.

- 1. Press E for 2 s.
 - ► The context menu opens.



A0033110-F

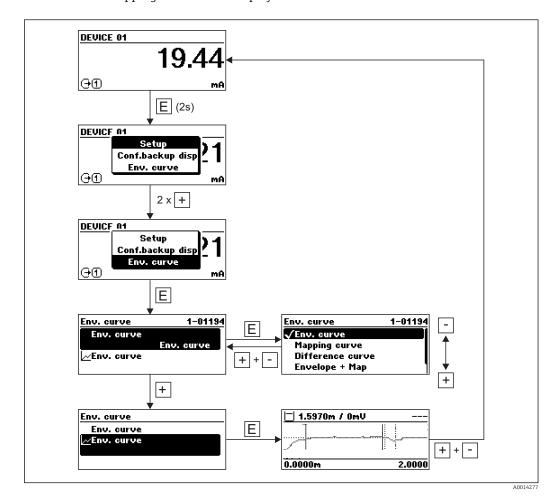
- 2. Press \Box + \pm simultaneously.
 - └ The context menu is closed and the operational display appears.

Calling up the menu via the context menu

- 1. Open the context menu.
- 2. Press ± to navigate to the desired menu.
- 3. Press 🗉 to confirm the selection.
 - ► The selected menu opens.

8.3.5 Envelope curve on the display and operating module

In order to assess the measuring signal, the envelope curve and - if a mapping has been recorded - the mapping curve can be displayed:

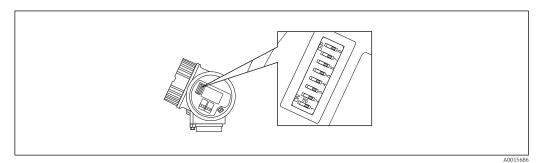


Integration into a PROFIBUS network 9

Overview of the device database files (GSD) 9.1

Manufacturer ID	17 (0x11)
Ident number	0x1558
Profile version	3.02
GSD file	Information and files under:
GSD file version	www.endress.comwww.profibus.org

9.2 Set device address



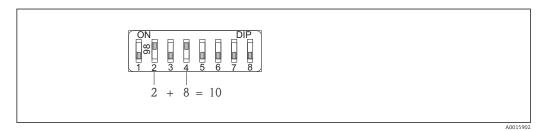
₹ 24 Address switches in terminal compartment

9.2.1 Hardware adressing

- 1. Set switch 8 to "OFF".
- 2. Define the address with switches 1 to 7 according to the table below.

The address change becomes effective after 10 seconds. The device restarts automatically.

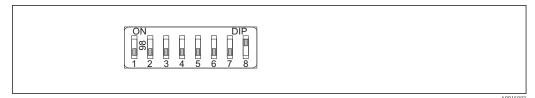
Switch	1	2	3	4	5	6	7
Value in position "ON"	1	2	4	8	16	32	64
Value in position "OFF"	0	0	0	0	0	0	0



Example of hardware addressing: switch 8 is in position "OFF"; switches 1 to 7 define the address.

9.2.2 Software addressing

- 1. Set switch 8 to "ON".
- 2. The device restarts automatically. The address remains the same as before (factory setting: 126).
- 3. Set the required address via the operating menu: Setup \rightarrow Device address

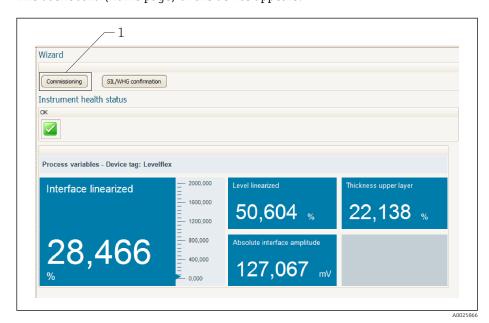


 \blacksquare 26 Example of software addressing; switch 8 is in position "ON"; the address is defined in the operating menu (Setup \Rightarrow Device address)

10 Commissioning via wizard

A wizard guiding the user through the initial setup is available in FieldCare and DeviceCare $^{3)}$.

- 1. Connect the device to FieldCare or DeviceCare $\rightarrow \triangleq 68$.
- 2. Open the device in FieldCare or DeviceCare.
 - ► The dashboard (home page) of the device appears:



"Commissioning" button calls up the wizard.

- 3. Click on "Commissioning" to call up the wizard.
- 4. Enter or select the appropriate value for each parameter. These values are immediately written to the device.
- 5. Click "Next" to switch to the next page.
- 6. After finishing the last page, click "End of sequence" to close the wizard.
- If the wizard is cancelled before all necessary parameters have been set, the device may be in an undefined state. A reset to the default settings is recommended in this case.

³⁾ DeviceCare is available for download at www.software-products.endress.com. The download requires a registration in the Endress+Hauser software portal.

11 Commissioning via operating menu

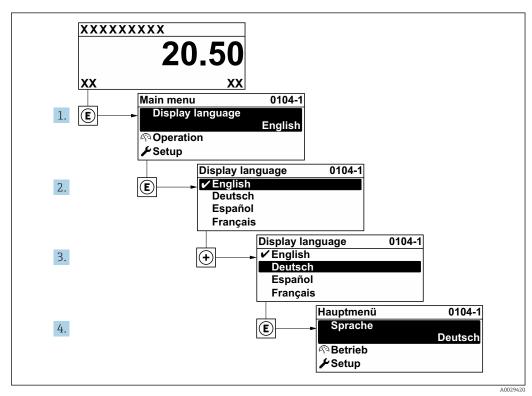
11.1 Installation and function check

Make sure that all final checks have been completed before you start up your measuring point:

- Checklist "Post-installation check" → 🖺 57
- Checklist "Post-connection check" → 🖺 65

11.2 Setting the operating language

Factory setting: English or ordered local language



■ 27 Using the example of the local display

11.3 Checking the reference distance

This section is only valid for FMP54 with gas phase compensation (product structure: feature 540 "Application Package", option EF or EG).

Coax probes with gas phase compensation are calibrated on delivery. Rod probes, on the other hand, must be recalibrated after mounting: $\frac{1}{2} \left(\frac{1}{2} \right) = \frac{1}{2} \left(\frac{1}{2} \right) \left(\frac{1}{2} \right)$

After mounting the rod probe in the stilling well or bypass, check and - if necessary - correct the setting of the reference distance in the unpressurized state. Whilst doing so the

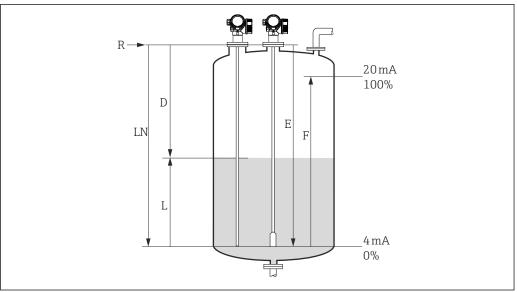
level should be at least 200 mm below the reference distance L_{ref} to achieve maximum accuracy.

Step	Parameter	Action
1	Expert → Sensor → Gas phase compensation → GPC mode	Select the On option, in order to activate gas phase compensation.
2	Expert → Sensor → Gas phase compensation → Present reference distance	Check whether the displayed reference distance matches the nominal value (300 mm or 550 mm, respectively; see the nameplate). If yes: nor further actions required. If no: continue with step 3.
3	Expert \rightarrow Sensor \rightarrow Gas phase compensation \rightarrow Reference distance	Enter the value displayed in Present reference distance parameter.

For a detailed description of all parameters concerning the gas phase compensation see:

GP01001F, "Levelflex - Description of device parameters - PROFIBUS PA"

11.4 Configuration of a level measurement



A0011360

- \blacksquare 28 Configuration parameters for level measurements in liquids
- LN Length of probe
- *R* Reference point of the measurement
- D Distance
- L Level
- *E* Empty calibration (= Zero point)
- F Full calibration (= Span)
- If for rope probes the DC value is less than 7, then measurement is not possible in the area of the straining weight. In these cases, the maximum recommended value for the empty calibration E is LN 250 mm (LN 10 in).
- 1. Setup → Device tag
 - ► Enter tag for measuring point.
- 2. Navigate to: Setup \rightarrow Device address
 - └ Enter bus address of the device (only in case of software addressing).
- 3. For devices with "interface measurement" application package:

Navigate to:Setup → Operating mode

- Select **Level** option.
- 4. Navigate to: Setup → Distance unit
 - ► Select distance unit.
- 5. Navigate to: Setup → Tank type
 - ► Select tank type.
- 6. For Tank type = Bypass / pipe:

Navigate to: Setup → Tube diameter

- ► Enter the diameter of the bypass or stilling well.
- 7. Navigate to: Setup → Medium group
 - Select medium group: (Water based (DC >= 4) or Others)
- 8. Navigate to: Setup → Empty calibration
 - ► Enter the distance E between the reference point R and the minimum level (0%).
- 9. Navigate to: Setup → Full calibration
 - ► Enter distance F between the minimum (0%) and maximum (100%) level.

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- 10. Navigate to: Setup \rightarrow Level
 - ► Displays the measured level L.
- 11. Navigate to: Setup \rightarrow Distance
 - └ Displays the distance D between the reference point R and the level L.
- 12. Navigate to: Setup \rightarrow Signal quality
 - ► Displays the signal quality of the level echo.
- 13. For operation via local display:

Navigate to: Setup → Mapping → Confirm distance

- Compare the displayed distance to the real distance in order to start the recording of the mapping curve if required ⁴⁾.
- 14. For operation via operating tool:

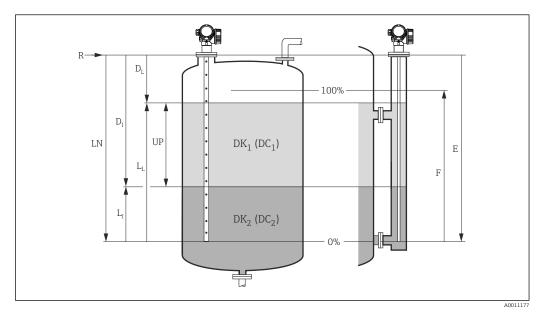
Navigate to: Setup → Confirm distance

Compare the displayed distance to the real distance in order to start the recording of the mapping curve if required ⁴⁾.

⁴⁾ For FMP54 with gas phase compensation (product structure: feature 540 "Application Package", option EF or EG) a map must NOT be recorded.

11.5 Configuration of an interface measurement

Only devices with the respective software option can be used for interface measurements. This option is selected in the product structure: Feature 540 "Application package", option EB "Interface measurement".



■ 29 Configuration parameters for interface measurements

- LN Length of probe
- *R* Reference pioint of the measurement
- DI "Interface distance" parameter (Distance from reference point to lower medium)
- LI Interface
- DL Distance
- LL Level
- UP Thickness upper layer
- *E* "Empty calibration" parameter (= zero point)
- F "Full calibration" parameter (= span)
- 1. Navigate to: Setup → Device tag
 - ► Enter tag for measuring point.
- 2. Navigate to: Setup \rightarrow Device address
 - Enter bus address of the device (only in case of software addressing).
- 3. Navigate to: Setup → Operating mode
 - Select **Interface** option.
- 4. Navigate to: Setup \rightarrow Distance unit
 - ► Select distance unit.
- 5. Navigate to: Setup → Tank type
 - Select tank type.
- 6. For Tank type = Bypass / pipe:

Navigate to: Setup → Tube diameter

- ► Enter the diameter of the bypass or stilling well.
- 7. Navigate to: Setup → Tank level
 - ► Select tank level (**Fully flooded** or **Partially filled**)
- 8. Navigate to: Setup \rightarrow Distance to upper connection
 - In bypasses: Enter distance from reference point R to lower edge of the upper connection; otherwise: Keep the factory setting

- 9. Navigate to: Setup \rightarrow DC value
 - \vdash Enter relative dielectric constant (ε_r) of the upper medium.
- 10. Navigate to: Setup → Empty calibration
 - ► Enter the distance E between the reference point R and the minimum level (0%).
- 11. Navigate to: Setup \rightarrow Full calibration
 - ► Enter distance F between the minimum (0%) and maximum (100%) level.
- 12. Navigate to: Setup \rightarrow Level
 - ightharpoonup Displays the measured level L_L.
- 13. Navigate to: Setup → Interface
 - ightharpoonup Displays the interface height L_I.
- 14. Navigate to: Setup → Distance
 - ightharpoonup Displays the distance D_L between the reference point R and the level L_L .
- 15. Navigate to: Setup → Interface distance
 - ightharpoonup Displays the distance D_I between the reference point R and the interface L_I .
- 16. Navigate to: Setup \rightarrow Signal quality
 - ► Displays the signal quality of the level echo.
- 17. For operation via local display:

Navigate to: Setup \rightarrow Mapping \rightarrow Confirm distance

- Compare the displayed distance to the real distance in order to start the recording of the mapping curve if required ⁵⁾.
- 18. For operation via operating tool (e.g. FieldCare):

Navigate to: Setup → Confirm distance

Angezeigte Distanz mit tatsächlichem Wert vergleichen, um gegebenenfalls die Aufnahme einer Störechoausblendungskurve zu starten ⁵⁾.

⁵⁾ For FMP54 with gas phase compensation (product structure: feature 540 "Application Package", option EF or EG) a map must NOT be recorded.

11.6 Recording the reference curve

After the configuration of the measurement it is recommended to record the current envelope curve as a reference curve. The reference curve can be used later on in the process for diagnostic purposes. To record the reference curve use the **Save reference curve** parameter.

Navigation in the menu

Expert \rightarrow Diagnostics \rightarrow Envelope diagnostics \rightarrow Save reference curve

Meaning of the options

- No
 - No action
- Yes

The current envelope curve is saved as reference curve.

- In devices which have been delivered with software version 01.00.zz, this submenu is only visible for the "Service" user role.
- The reference curve can only be displayed in the envelope curve diagram of FieldCare after it has been loaded from the device into FieldCare. This is performed by the "Load Reference Curve" function in FieldCare:



■ 30 The "Load Reference Curve" function

11.7 Configuration of the on-site display

11.7.1 Factory settings of the on-site display for level measurements

Parameter	Factory setting for devices with 1 current output	Factory setting for devices with 2 current outputs
Format display	1 value, max. size	1 value, max. size
Value 1 display	Level linearized	Level linearized
Value 2 display	Distance	Distance
Value 3 display	Current output 1	Current output 1
Value 4 display	None	Current output 2

11.7.2 Factory settings of the on-site display for interface measurements

Parameter	Factory setting for devices with 1 current output	Factory setting for devices with 2 current outputs
Format display	1 value, max. size	1 value, max. size
Value 1 display	Interface linearized	Interface linearized
Value 2 display	Level linearized	Level linearized
Value 3 display	Thickness upper layer	Current output 1
Value 4 display	Current output 1	Current output 2

11.7.3 Adjustment of the on-site display

The on-site display can be adjusted in the following menu: Setup \rightarrow Advanced setup \rightarrow Display

11.8 Configuration management

After commissioning, you can save the current device configuration, copy it to another measuring point or restore the previous device configuration. You can do so using the **Configuration management** parameter and its options.

Navigation path in the operating menu

Setup \rightarrow Advanced setup \rightarrow Configuration backup display \rightarrow Configuration management

Meaning of the options

Cancel

No action is executed and the user exits the parameter.

Execute backup

A backup copy of the current device configuration in the HistoROM (built-in in the device) is saved to the display module of the device. The backup copy comprises the transmitter and sensor data of the device.

Restore

The last backup copy of the device configuration is copied from the display module to the HistoROM of the device. The backup copy comprises the transmitter and sensor data of the device.

Duplicate

The transmitter configuration is duplicated to another device using the transmitter display module. The following parameters, which characterize the individual measuring point are **not** included in the transmitted configuration:

Medium type

Compare

The device configuration saved in the display module is compared to the current device configuration of the HistoROM. The result of this comparison is displayed in the **Comparison result** parameter.

Clear backup data

The backup copy of the device configuration is deleted from the display module of the device.

- While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.
- If an existing backup is restored to a different device using the **Restore** option, it may occur that some device functionalities are no longer available. In some cases even a device reset → 202 will not restore the original status..

In order to transmit a configuration to a different device, the **Duplicate** option should always be used.

11.9 Protection of the settings against unauthorized changes

There are two ways to protect the settings against unauthorized changes:

12 Diagnostics and troubleshooting

12.1 General trouble shooting

12.1.1 General errors

Error	Possible cause	Remedial action
Device does not respond.	Supply voltage not connected.	Connect the correct voltage.
	The cables do not contact the terminals properly.	Ensure electrical contact between the cable and the terminal.
Values on the display invisible	Contrast setting is too weak or too strong.	 Increase contrast by pressing
	The plug of the display cable is not connected correctly.	Connect the plut correctly.
	Display is defective.	Replace display.
"Communication error" is indicated	Electromagnetic interference	Check grounding of the device.
on the display when starting the device or connecting the display	Broken display cable or display plug.	Exchange display.
Duplicating of the parameters from one device to another via the display doesn't work. Only the "Save" and "Abort" options are available.	Display with backup is not recognized if no data backup has been performed at the device before.	Connect display (with the backup) and restart the device.
CDI communication does not work.	Wrong setting of the COM port on the computer.	Check the setting of the COM port on the computer and change it if necessary.
Device measures incorrectly.	Parametrization error	Check and adjust parameterization.

12.1.2 Parametrization errors

Parametrization errors for level measurements

Error	Possible cause	Remedial action
Measured value wrong	If measured distance(Setup → Distance) matches the real distance: Calibration error	 Check and adjust the Empty calibration parameter (→ ≜ 140) if necessary. Check and adjust the Full calibration parameter (→ ≜ 141) if necessary. Check and adjust linearization if necessary (Linearization submenu (→ ≜ 168)).
	If measured distance (Setup → Distance) does not match the real distance: An interference echo affects the measurement.	Perform mapping (Confirm distance parameter (→ 🖺 148)).
No change of the measured value when emptying/filling	An interference echo affects the measurement.	Perform mapping (Confirm distance parameter (→ 🖺 148)).
the tank	Build-up at the probe.	Clean the probe.
	Error in the echo tracking	Deactivate echo tracking: Expert → Sensor → Echo tracking → Evaluation mode = History off).
The diagnostic message Echo lost appears after switching on the supply voltage.	Echo threshold too high.	Check the Medium group parameter $(\rightarrow \boxminus 140)$. If necessary select a more detailed setting in the Medium property parameter $(\rightarrow \boxminus 156)$.
	Level echo suppressed.	Delete mapping and record new mapping curve if required (Record map parameter (→ 🖺 150)).
Device displays a level when the tank is empty.	Incorrect probe length	Carry out probe length correction (Confirm probe length parameter (→ 🖺 184)).
	Interference echo	Carry out mapping over entire probe while the tank is empty (Confirm distance parameter (→ 🖺 148)).
Wrong slope of the level in the entire measuring range	Wrong tank type selected.	Set Tank type parameter (→ 🗎 139) correctly.

Parametrization errors for interface measurements

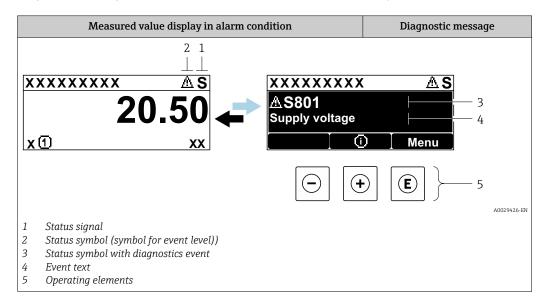
Error	Possible cause	Remedial action
With the setting Tank level = Fully flooded When, the	The total level is detected outside the upper blocking distance.	Increase blocking distance (Blocking distance parameter (→ 🖺 159)).
measured interface level jumps to higher values during draining operations.		Set Tank level parameter (→ 🗎 145) = Partially filled .
With the setting Tank level = Partially filled , the measured total level jumps to lower values during filling operations.	The total level runs into the upper blocking distance.	Decrease blocking distance (Blocking distance parameter (→ 🖺 159)).
Wrong slope of the measured interface level	Wrong dielectric constant (DC value).	Enter correct dielectric constant (DC value) of the upper medium (DC value parameter ($\rightarrow \boxtimes 146$)).
The measured values for the interface and the total level are identical	Echo threshold for the total level too high due to a wrong dielectric constant.	Enter correct dielectric constant (DC value) of the upper medium (DC value parameter ($\rightarrow \boxtimes 146$)).

Error	Possible cause	Remedial action
If the interface layers are thin, the total level jumps to the interface level.	The thickness of the upper medium is less than 60 mm (2.4 in).	Interface measurement is only possible if the thickness of the interface is greater than 60 mm (2.4 in).
The measured interface layer jumps.	Emulsion layer present.	Emulsion layers affect the measurement. Please contact Endress+Hauser.

12.2 Diagnostic information on local display

12.2.1 Diagnostic message

Faults detected by the self-monitoring system of the measuring device are displayed as a diagnostic message in alternation with the measured value display.



Status signals

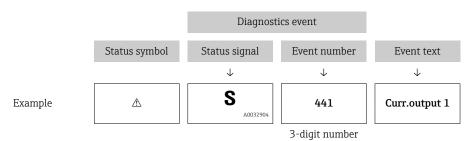
A0032902	"Failure (F)" option A device error is present. The measured value is no longer valid.
C	"Function check (C)" option The device is in service mode (e.g. during a simulation).
S	 "Out of specification (S)" option The device is operated: Outside of its technical specifications (e.g. during startup or a cleaning) Outside of the configuration carried out by the user (e.g. level outside configured span)
M	"Maintenance required (M)" option Maintenance is required. The measured value is still valid.

Status symbol (symbol for event level)

8	"Alarm" status The measurement is interrupted. The signal outputs take on the defined alarm condition. A diagnostic message is generated.
Φ	"Warning" status The device continues to measure. A diagnostic message is generated.

Diagnostics event and event text

The fault can be identified using the diagnostics event. The event text helps you by providing information about the fault. In addition, the corresponding symbol is displayed before the diagnostics event.



If two or more diagnostic messages are pending simultaneously, only the message with the highest priority is shown. Additional pending diagnostic messages can be shown in the **Diagnostic list** submenu.



Past diagnostic messages that are no longer pending are shown as follows:

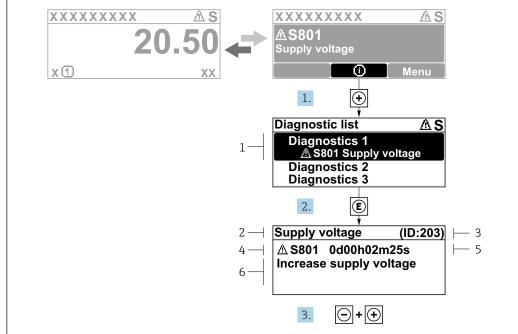
- On the local display:
- in the **Event logbook** submenu
- In FieldCare: via the "Event List /HistoROM" function.

Operating elements

Operating functions in menu, submenu		
+	Plus key Opens the message about the remedial measures.	
E	Enter key Opens the operating menu.	

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12.2.2 Calling up remedial measures



A0029431-EN

- 31 Message for remedial measures
- 1 Diagnostic information
- 2 Short text
- 3 Service ID
- 4 Diagnostic behavior with diagnostic code
- 5 Operation time of occurrence
- 6 Remedial measures

The user is in the diagnostic message.

- 1. Press ± (①-Symbol).
 - **→ Diagnostic list** submenu opens.
- 2. Select the desired diagnostic event with \pm or \Box and press \blacksquare .
 - ► The message for the remedial measures for the selected diagnostic event opens.
- 3. Press \Box + \pm simultaneously.
 - **→** The message for the remedial measures closes.

The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in **Diagnostic list** submenu or in **Previous diagnostics**.

- 1. Press E.
 - └ The message for the remedial measures for the selected diagnostic event opens.
- 2. Press \Box + \pm simultaneously.
 - ► The message for the remedial measures closes.

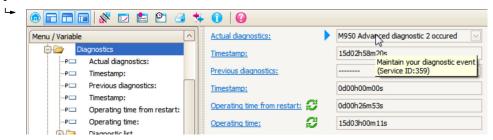
12.3 Diagnostic event in the operating tool

If a diagnostic event is present in the device, the status signal appears in the top left status in the operating tool along with the corresponding symbol for event level in accordance with NAMUR NE 107:

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)

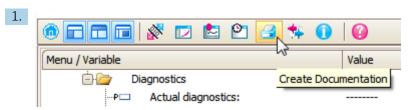
A: Via the operating menu

- 1. Navigate to the **Diagnostics** menu.
 - In the **Actual diagnostics** parameter, the diagnostic event is shown with event text.
- 2. On the right in the display range, hover the cursor over the **Actual diagnostics** parameter.

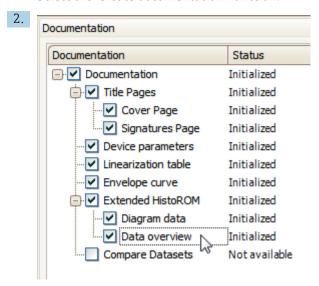


A tool tip with remedial measures for the diagnostic event appears.

B: Via the "Create documentation" function



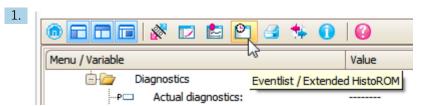
Select the "Create documentation" function.



Make sure "Data overview" is marked.

- 3. Click "Save as ..." and save a PDF of the protocol.
 - └ The protocol contains the diagnostic messages and remedy information.

C: Via the "Eventlist / Extended HistoROM" function



Select the "Eventlist / Extended HistoROM" function.



Select the "Load Eventlist" function.

The list of events, including remedy information, is shown in the "Data overview" window.

12.4 Diagnostic list

In the **Diagnostic list** submenu submenu, up to 5 currently pending diagnostic messages can be displayed. If more than 5 messages are pending, the messages with the highest priority are shown on the display.

Navigation path

Diagnostics → Diagnostic list

Calling up and closing the remedial measures

- 1. Press E.
 - The message for the remedial measures for the selected diagnostic event opens.
- 2. Press \Box + \pm simultaneously.
 - ► The message about the remedial measures closes.

12.5 List of diagnostic events

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
Diagnostic of s	ensor			
003	Broken probe detected	1. Check map 2. Check sensor	F	Alarm
046	Build-up detected	Clean sensor	F	Alarm
104	HF cable	and check sealing 1. Dry HF cable connection 2. Change HF cable	F	Alarm
105	HF cable	Tighten HF cable connection Check sensor Change HF cable	F	Alarm
106	Sensor	Check sensor Check HF cable Contact service	F	Alarm
Diagnostic of e	electronic			
242	Software incompatible	Check software Flash or change main electronics module	F	Alarm
252	Modules incompatible	Check electronic modules Change I/O or main electronic module	F	Alarm
261	Electronic modules	Restart device Check electronic modules Change I/O Modul or main electronics	F	Alarm
262	Module connection	Check module connections Change electronic modules	F	Alarm
270	Main electronic failure	Change main electronic module	F	Alarm
271	Main electronic failure	Restart device Change main electronic module	F	Alarm
272	Main electronic failure	Restart device Contact service	F	Alarm
273	Main electronic failure	Emergency operation via display Change main electronics	F	Alarm
275	I/O module failure	Change I/O module	F	Alarm
276	I/O module failure	Restart device Change I/O module	F	Alarm
282	Data storage	Restart device Contact service	F	Alarm
283	Memory content	Transfer data or reset device Contact service	F	Alarm
311	Electronic failure	Transfer data or reset device Contact service	F	Alarm
311	Electronic failure	Maintenance required! 1. Do not perform reset 2. Contact service	М	Warning
Diagnostic of c	onfiguration			
410	Data transfer	Check connection Retry data transfer	F	Alarm
412	Processing Download	Download active, please wait	С	Warning

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
435	Linearization	Check linearization table	F	Alarm
437	Configuration incompatible	Restart device Contact service	F	Alarm
438	Dataset	Check data set file Check device configuration Up- and download new configuration	М	Warning
482	Block in OOS	Set Block in AUTO mode	F	Alarm
484	Simulation failure mode	Deactivate simulation	С	Alarm
485	Simulation measured value	Deactivate simulation	С	Warning
494	Switch output simulation	Deactivate simulation switch output	С	Warning
495	Simulation diagnostic event	Deactivate simulation	С	Warning
497	Simulation block output	Deactivate simulation	С	Warning
585	85 Simulation distance Deactivate simulation	С	Warning	
Diagnostic of pr	rocess			
801	Energy too low	Increase supply voltage	S	Warning
825	Operating temperature	Check ambient temperature	S	Warning
825	Operating temperature	2. Check process temperature	F	Alarm
921	Change of reference	Check reference configuration Check pressure Check sensor	S	Warning
936	EMC interference	Check installation on EMC	F	Alarm
941	Echo lost	Check parameter 'DC value'	F	Alarm 1)
942	In safety distance	Check level Check safety distance Reset self holding	S	Alarm 1)
943	In blocking distance	Reduced accuracy Check level	S	Warning
944	Level range	Reduced accuracy Level at process connection	S	Warning
950	Advanced diagnostic 1 to 2 occured	Maintain your diagnostic event	М	Warning ¹⁾

¹⁾ Diagnostic behavior can be changed.

12.6 Event logbook

12.6.1 Event history

A chronological overview of the event messages that have occurred is provided in the $\bf Event \ list \ submenu \ ^{6)}.$

⁶⁾ This submenu is only available for operation via local display. In the case of operation via FieldCare, the event list can be displayed with the "Event List / HistoROM" functionality of FieldCare.

Navigation path

Diagnostics \rightarrow Event logbook \rightarrow Event list

A maximum of 100 event messages can be displayed in chronological order.

Die Ereignishistorie umfasst Einträge zu:

- Diagnostic events
- Information events

In addition to the operation time of its occurrence, each event is also assigned a symbol that indicates whether the event has occurred or is ended:

- Diagnostic event
 - €: Event has occurred
 - ⊖: Event has ended
- Information event
 - €: Event has occurred

Calling up and closing the remedial measures

- 1. Press E
 - └ The message for the remedial measures for the selected diagnostic event opens.
- 2. Press \Box + \pm simultaneously.
 - ► The message about the remedial measures closes.

12.6.2 Filtering the event logbook

Using the **Filter options** parameter, you can define which category of event messages is displayed in the **Event list** submenu.

Navigation path

Diagnostics \rightarrow Event logbook \rightarrow Filter options

Filter categories

- All
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- Information

12.6.3 Overview of information events

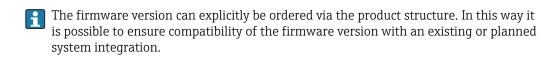
Info number	Info name
I1000	(Device ok)
I1089	Power on
I1090	Configuration reset
I1091	Configuration changed
I1092	Trend data deleted
I1110	Write protection switch changed
I1137	Electronic changed
I1151	History reset
I1154	Reset terminal voltage min/max
I1155	Reset electronic temperature
I1156	Memory error trend
I1157	Memory error event list

Info number	Info name	
I1185	Display backup done	
I1186	Restore via display done	
I1187	Settings downloaded with display	
I1188	Display data cleared	
I1189	Backup compared	
I1256	Display: access status changed	
I1264	Safety sequence aborted	
I1335	Firmware changed	
I1397	Fieldbus: access status changed	
I1398	CDI: access status changed	
I1512	Download started	
I1513	Download finished	
I1514	Upload started	
I1515	Upload finished	

12.7 Firmware history

Date	Firmware	Modifications	Documentation (FMP51, FMP52, FMP54, PROFIBUS)				Documentation (FMP51, FMP52, FMP54, PROFIBUS)		
	version		Operating Instructions	Description of Parameters	Technical Information				
07.2011	01.00.zz	Original software	BA01006F/00/EN/10.10	GP01001F/00/EN/10.10	TI01001F/00/EN/13.11				
02.2015	01.01.zz	 Support of SD03 additional languages HistoROM functionality enhanced "Advanced Diagnostic" function block integrated Improvements and bugfixes 	BA01006F/00/EN/15.14 BA01006F/00/EN/16.16 ¹⁾	GP01001F/00/EN/13.14	TI01001F/00/EN/18.14 TI01001F/00/EN/22.16 1)				

¹⁾ Contains information on the Heartbeat wizards which are available in the latest DTM version for DeviceCare and FieldCare.



13 Maintenance

The measuring device requires no special maintenance.

13.1 Exterior cleaning

When exterior-cleaning the device, always use cleaning agents that do not attack the surface of the hosuing and the seals.

14 Repairs

14.1 General information on repairs

14.1.1 Repair concept

The Endress+Hauser repair concept assumes that the devices have a modular design and that repairs can be done by the Endress+Hauser service or specially trained customers.

Spare parts are contained in suitable kits. They contain the related replacement instructions.

For more information on service and spare parts, contact the Service Department at Endress+Hauser.

14.1.2 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 the 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 out 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.

14.1.3 Replacement of an electronics module

If an electronics module has been replaced, it is not necessary to perform a new basic setup as the calibration parameters are stored in the HistoROM which is located in the housing. However, after exchanging the main electronics module it may be necessary to record a new mapping (interference echo suppression).

14.1.4 Replacement of a device

After a complete device or electronic module has been replaced, the parameters can be downloaded into the instrument again in one of the following ways:

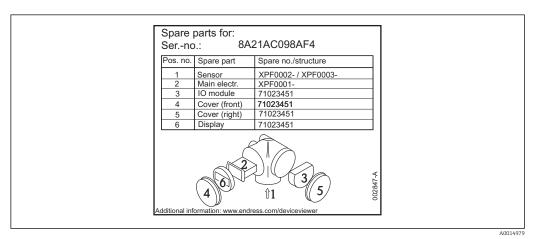
- Via the display module
 Condition: The configuration of the old device has been saved in the display module
 → 199.
- Via FieldCare

Condition: The configuration of the old device has been saved to the computer via FieldCare.

You can continue to measure without carrying out a new setup. Only a linearization and a tank map (interference echo suppression) have to be recorded again.

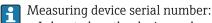
14.2 Spare parts

- A few interchangeable measuring device components are identified by a spare part nameplate. This contains information about the spare part.
- The connection compartment cover of the device contains a spare part nameplate that includes the following information:
 - A list of the most important spare parts for the measuring device, including their ordering information.
 - The URL for the W@M Device Viewer (www.endress.com/deviceviewer):
 There, all spare parts for the measuring device are listed, including the order code, and can be ordered. If available, the corresponding Installation Instructions can also be downloaded there.



■ 32 Example for spare part nameplate in connection compartment cover

22 Example for spare part nameplate in connection compartment covi



- Is located on the device and spare part nameplate.
- Can be read out via the "Serial number" parameter in the "Device information" submenu.

14.3 Return

The measuring device must be returned if it is need of repair or a factory calibration, or if the wrong measuring device has been delivered or ordered. Legal specifications require Endress+Hauser, as an ISO-certified company, to follow certain procedures when handling products that are in contact with the medium.

To ensure safe, swift and professional device returns, please refer to the procedure and conditions for returning devices provided on the Endress+Hauser website at http://www.endress.com/support/return-material

14.4 Disposal

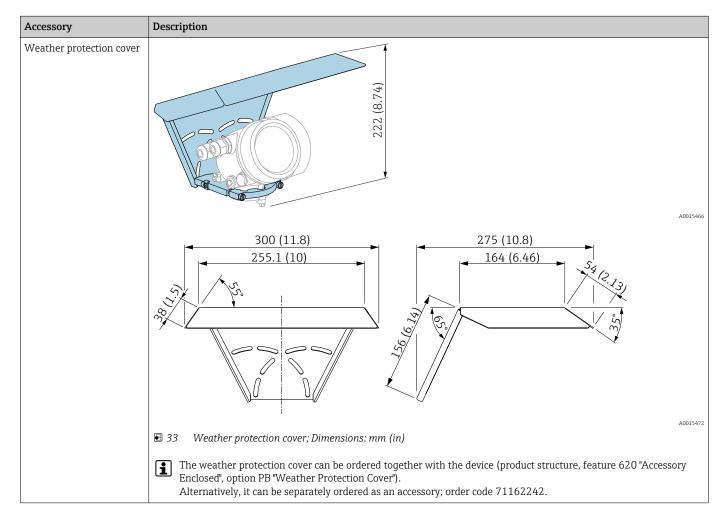
Observe the following notes during disposal:

- Observe valid federal/national regulations.
- Ensure proper separation and reuse of the device components.

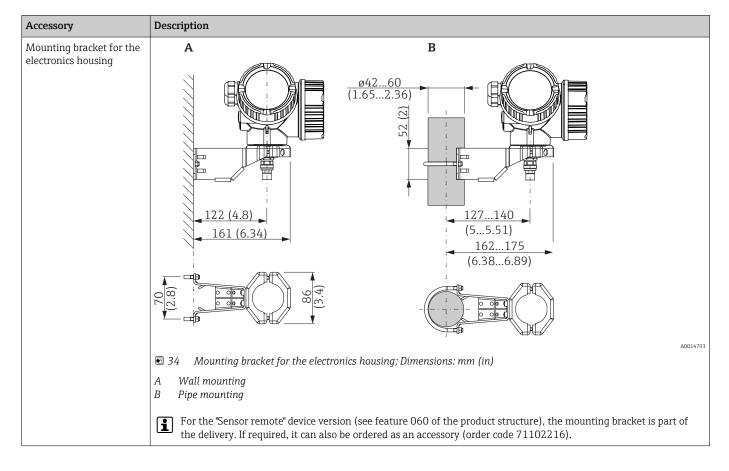
15 Accessories

15.1 Device-specific accessories

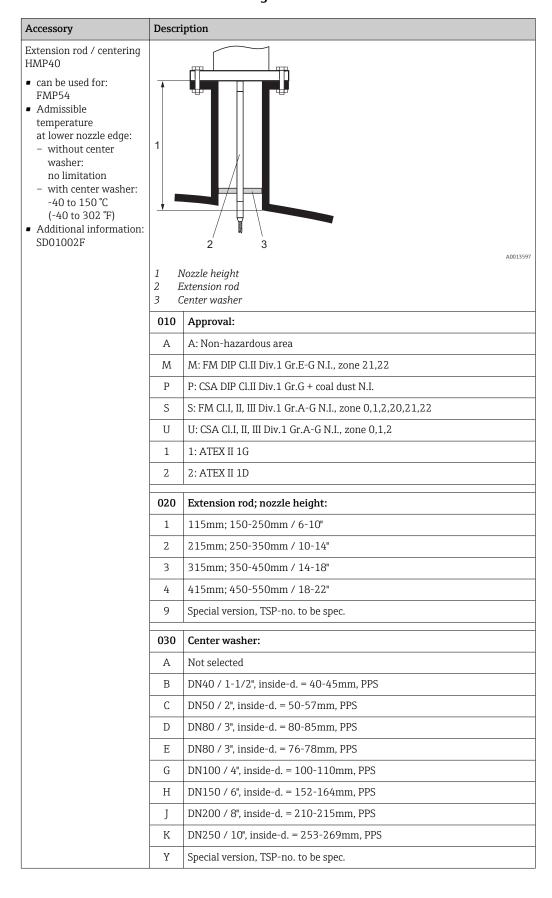
15.1.1 Weather protection cover



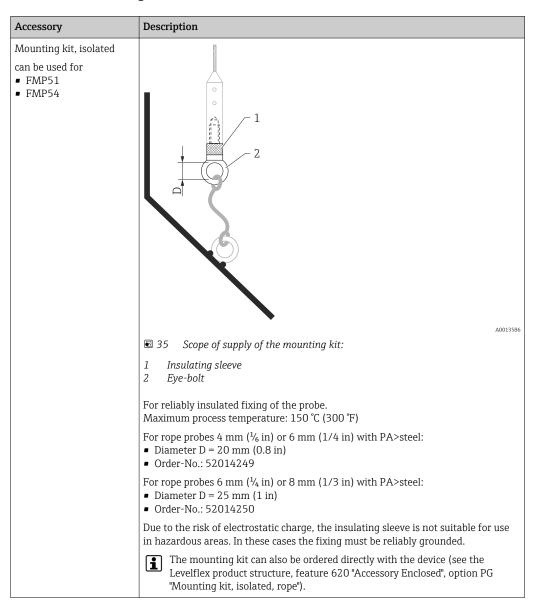
15.1.2 Mounting bracket for the electronics housing



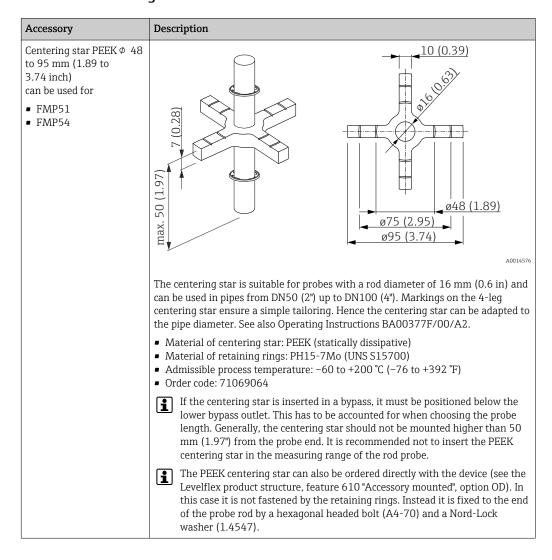
15.1.3 Extension rod / centering HMP40



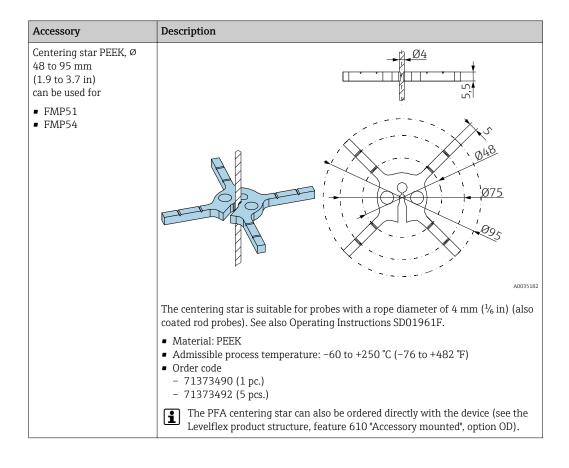
15.1.4 Mounting kit, isolated



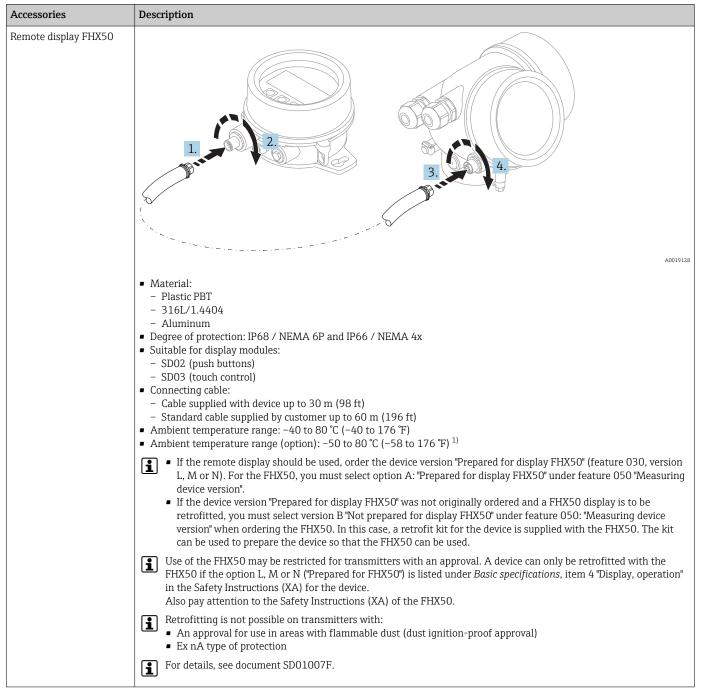
15.1.5 Centering star



Accessory Description Centering star PFA (0.39)■ Ø 16.4 mm (0.65 in) ■ Ø 37 mm (1.46 in) 10 A: ø16.4 (0.65) B: ø37 (1.46) can be used for FMP51 FMP52 ■ FMP54 A0014577 For 8 mm (0.3 in) probes For 12 mm (0.47 in) and 16 mm (0.63 in) probes The centering star is suitable for probes with a rod diameter of 8 mm (0.3 in), 12 mm (0.47 in) and 16 mm (0.63 in) (also coated rod probes) and can be used in pipes from DN40 (1½") up to DN50 (2"). See also Operating Instructions BA00378F/00/A2. Material: PFA ■ Admissible process temperature: -200 to +250 °C (-382 to +482 °F) Order code - Probe 8 mm (0.3 in): 71162453 - Probe 12 mm (0.47 in): 71157270 - Probe 16 mm (0.63 in): 71069065 The PFA centering star can also be ordered directly with the device (see the Levelflex product structure, feature 610 "Accessory mounted", option OE).



15.1.6 Remote display FHX50



1) This range is valid if option JN "Ambient temperature transmitter -50 °C (-58 °F)" has been selected in ordering feature 580 "Test, Certificate". If the temperature is permanently below -40 °C (-40 °F), failure rates may be increased.

15.1.7 Overvoltage protection

Accessory Description Overvoltage protection for 2-wire-devices OVP10 (1 channel) OVP20 (2 channel) A0021734 Technical data • Resistance per channel: 2 * 0.5 Ω_{max} ■ Threshold DC voltage: 400 to 700 V ■ Threshold impulse voltage: < 800 V • Capacitance at 1 MHz: < 1.5 pF • Nominal arrest impulse voltage (8/20 μs): 10 kA • Suited for wire cross-sections: 0.2 to 2.5 mm² (24 to 14 AWG) Ordering with device The overvoltage protection module is preferably ordered with the device. See product structure, feature 610"Accessory mounted", option NA "Overvoltage protection". Separate ordering of the module is only necessary if a device is to retrofitted with the overvoltage protection. Order code for retrofitting • For 1-channel devices (feature 020, option A) OVP10: 71128617 • For 2-channel devices (feature 020, option B, C, E or G) OVP20:71128619 Hosuing lid for retrofitting In order to keep the necessary safety distances, the housing lid needs to be replaced if the device is retrofitted with the overvoltage protection. Depending on the housing type, the order code of the suitable lid is as follows: • GT18 housing: Lid 71185516 • GT19 housing: Lid 71185518 GT20 housing: Lid 71185516 Restrictions for retrofitting Depending on the approval of the transmitter the usage of the OVP module may be restricted. A device may only be retrofitted with an OVP module if the option NA (overvoltage protection) is quoted unter Optional Specifications in the Safety Instructions (XA) pertaining to the device. For details refer to SD01090F.

15.1.8 Bluetooth module for HART devices

Accessory	Description
Bluetooth module	A0036493
	 Quick and easy commissioning via SmartBlue (app) No additional tools or adapters required Signal curve via SmartBlue (app) Encrypted single point-to-point data transmission (tested by Fraunhofer institue) and password protected communication via Bluetooth® wireless technology Range under reference conditions: 10 m (33 ft)
	When using the Bluetooth module the minimum supply voltage increases by up to 3 V. Ordering with device The Bluetooth module is preferably ordered with the device. See product structure, feature 610 "Accessory Mounted", option NF "Bluetooth". A separate order is only necessary in case of retrofitting.
	Order code for retrofitting Bluetooth module (BT10): 71377355
	Restrictions in case of retrofitting Depending on the approval of the transmitter, application of the Bluetooth module may be restricted. A device may only be retrofitted with a Bluetooth module if the option NF (Bluetooth) is listed in the associated Safety Instructions (XA) under Optional specifications.
	For details refer to SD02252F.

15.2 Communication-specific accessories

Accessory	Description
Commubox FXA291	Connects Endress+Hauser field devices with CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a computer. Order code: 51516983 For details refer to Technical Information TI00405C

15.3 Service-specific accessories

Accessory	Description
DeviceCare SFE100	Configuration tool for HART, PROFIBUS and FOUNDATION Fieldbus devices
	Technical Information TI01134S
	 DeviceCare is available for download at www.software-products.endress.com. The download requires a registration in the Endress+Hauser software portal. Alternatively, a DeviceCare DVD can be ordered with the device. Product structure: Feature 570 "Service", Option IV "Tooling DVD (DeviceCare Setup)".
FieldCare SFE500	FDT-based Plant Asset Management tool. Helps to configure and maintain all field devices of your plant. By supplying status information it also supports the diagnosis of the devices. Technical Information TI00028S

15.4 System components

Accessory	Description
Graphic Data Manager Memograph M	The graphic data manager Memograph M provides information on all the relevant process variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on an SD card or USB stick. For details refer to Technical Information TI00133R and Operating Instructions BA00247R

16 Operating menu

Navigation

16.1 Overview of the operating menu (display module)

Operating menu

→ 🖺 192 Language **⊁** Setup → 🗎 138 Device tag → 🖺 138 Device address → 🖺 138 Operating mode → 🖺 138 Distance unit → 🖺 139 Tank type → 🖺 139 Tube diameter → 🖺 139 Tank level → 🖺 145 Distance to upper connection → 🖺 146 DC value → 🖺 146 → 🖺 140 Medium group Empty calibration → 🖺 140 Full calibration → 🖺 141 → 🖺 142 Level → 🖺 147 Interface Distance → 🖺 143 → 🖺 148 Interface distance Signal quality → 🖺 144 ► Mapping → 🖺 151 Confirm distance → 🖺 151

Record map						_
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▶ Analog input 1 to 6 → ♠ 152 Channel → ♠ 152 PV filter time → ♠ 152 Fail safe type → ♠ 153 Fail safe value → ♠ 153 ▶ Advanced setup → ♠ 154 Access status display → ♠ 155 Enter access code → ♠ 155 ▶ Level → ♠ 156 Medium type → ♠ 156 Medium property → ♠ 157 Advanced process property → ♠ 158 Level unit → ♠ 159 Blocking distance → ♠ 159 Level correction → ♠ 160 ▶ Interface → ♠ 161 DC value lower medium → ♠ 161	1	Record map			→ 🖺 151	
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	Serial number	, →
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	Status PROFIBUS Master Config	\rightarrow
	PROFIBUS ident number	\rightarrow
► Measured valu	es	\rightarrow
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	Level linearized	\rightarrow
	Interface distance	\rightarrow
	Interface linearized	\rightarrow
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16.2 Overview of the operating menu (operating tool)

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	Level signal	→ 🖺 224
	Launch signal	→ 🖺 224
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"Setup" menu 16.3

- 📔 🗟 : Marks the navigation path to the parameter via the display and operating module.
 - : Marks the navigation path to the parameter via an operating tool (e.g. FieldCare).
 - 🗈 : Marks parameters which can be locked via the software locking.

Navigation ■ ■ Setup

Device tag		
Navigation		
Description	Enter tag for measuring point.	
User entry	Up to 32 alphanumerical characters	
Factory setting	FMP5x	
Device address		
Navigation	Setup → Device address	
Description	 for Address mode = Software: Enter bus address. for Address mode = Hardware: Displays bus address. 	
User entry	0 to 126	

Operating mode	
----------------	--

Navigation

126

The device has the "interface measurement" application package (available for FMP51, **Prerequisite**

FMP52, FMP54) 7).

Description Select operating mode.

Selection Level

■ Interface with capacitance *

■ Interface

138

Factory setting

Product structure: Feature 540 "Application Package", Option EB "Interface measurement"

Visibility depends on order options or device settings

Factory setting FMP51/FMP52/FMP54: **Level**

Distance unit

Description Length unit for distance calculation.

Selection SI units US units

mmftmin

Factory setting m

Tank type

Navigation $\blacksquare \Box$ Setup \rightarrow Tank type

Prerequisite Medium type (→ 🖺 156) = Liquid

Description Select tank type.

Selection • Metallic

Bypass / pipeNon metallicMounted outside

■ Coaxial

Factory setting Depending on the probe

Additional information

 Depending on the probe some of the options mentioned above may not be available or there may be additional options.

• For coax probes and probes with metallic center washer **Tank type** parameter corresponds to the type of probe and cannot be changed.

Tube diameter

Navigation $\blacksquare \Box$ Setup \rightarrow Tube diameter

Prerequisite ■ Tank type (→ 🗎 139) = Bypass / pipe

■ The probe is coated.

Description Specify diameter of bypass or stilling well.

User entry 0 to 9.999 m

Factory setting

0.0384 m

Medium group	
--------------	--

Navigation $\blacksquare \square$ Setup \rightarrow Medium group

Prerequisite ■ For FMP51/FMP52/FMP54/FMP55: Operating mode (→ 🖺 138) = Level

■ Medium type (→ 🖺 156) = Liquid

Description Select medium group.

Selection ■ Others

■ Water based (DC >= 4)

Factory setting Others

Additional information

This parameter roughly specifies the dielectric constant (DC) of the medium. For a more detailed definition of the DC use the **Medium property** parameter ($\rightarrow \implies 156$).

The **Medium group** parameter presets the **Medium property** parameter ($\rightarrow \implies 156$) as follows:

Medium group	Medium property (→ 🖺 156)
Others	Unknown
Water based (DC >= 4)	DC 4 7

The **Medium property** parameter can be changed at a later point of time. However, when doing so, the **Medium group** parameter retains its value. Only the **Medium property** parameter is relevant for the signal evaluation.

The measuring range may be reduced for small dielectric constants. For details refer to the Technical Information (TI) of the respective device.

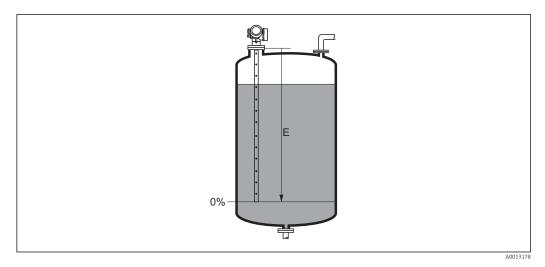
Empty calibration	
Empty Cambration	

Navigation \blacksquare Setup \rightarrow Empty calibration

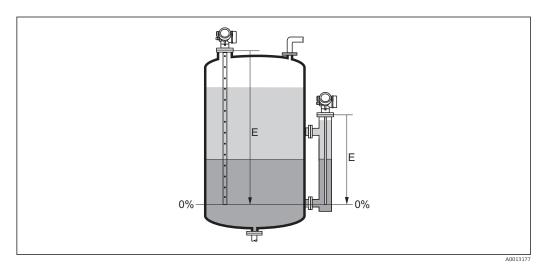
Description Distance process connection to min. level.

User entry Depending on the probe

Factory setting Depending on the probe



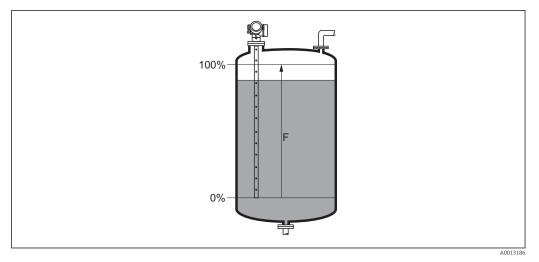
 \blacksquare 36 Empty calibration (E) for level measurements in liquids



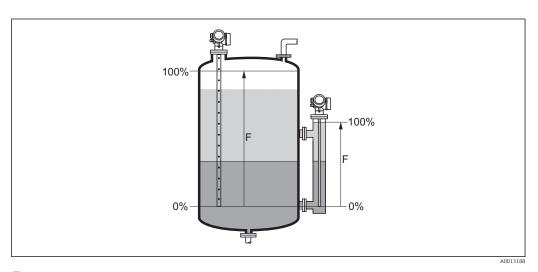
■ 37 Empty calibration (E) for interface measurements

In the case of interface measurements the **Empty calibration** parameter is valid for both, the total and the interface level.

Full calibration		
Navigation	Setup → Full calibration	
Description	Span: max. level - min level.	
User entry	Depending on the probe	
Factory setting	Depending on the probe	



■ 38 Full calibration (F) for level measurements in liquids



 \blacksquare 39 Full calibration (F) for interface measurements

In the case of interface measurements the **Full calibration** parameter is valid for both, the total and the interface level.

Level

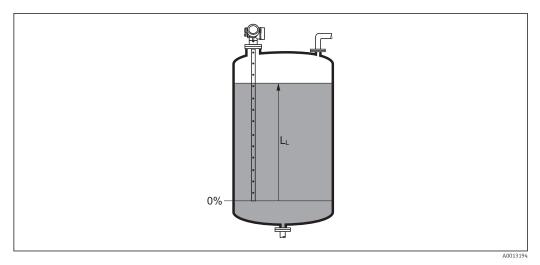
Navigation

Setup → Level

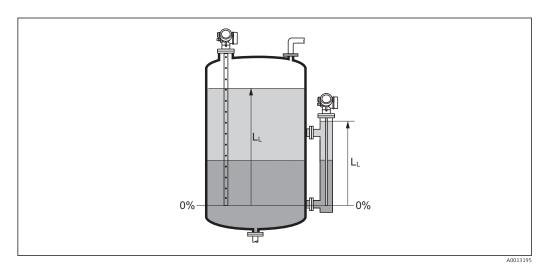
Description

Displays measured level L_{L} (before linearization).

142



Level in case of liquid measurements



■ 41 Level in case of interface measurements

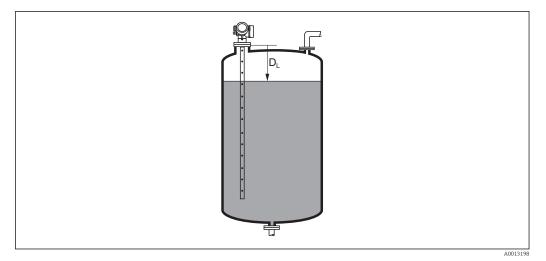
- The unit is defined in the **Level unit** parameter (→
 ☐ 159).
 In case of interface measurements, this parameter always refers to the total level.

Distance

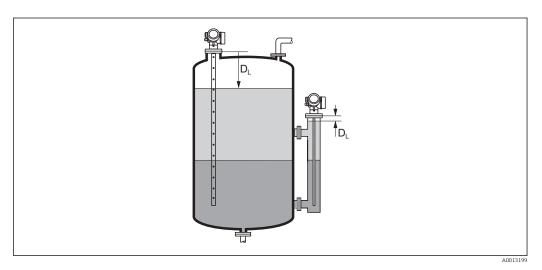
Navigation

Description

Displays the measured distance D_L between the reference point (lower edge of the flange or threaded connection) and the level.



■ 42 Distance for liquid measurements



43 Distance for interface measurements

The unit is defined in the **Distance unit** parameter ($\rightarrow \triangleq 139$).

Signal quality

Navigation

Description

Displays the signal quality of the evaluated echo.

Additional information

Meaning of the display options

Strong

The evaluated echo exceeds the threshold by at least 10 mV.

Medium

The evaluated echo exceeds the threshold by at least 5 mV.

Weak

The evaluated echo exceeds the threshold by less than 5 mV.

No signal

The device does not find a usable echo.

144

The signal quality indicated in this parameter always refers to the currently evaluated echo: either the level/interface echo 8) or the end-of-probe echo. To differentiate between these two, the quality of the end-of-probe echo is always displayed in brackets.

In case of a lost echo (Signal quality = No signal) the device generates the following error message:

- F941, for Output echo lost (\rightarrow 🖺 178) = Alarm.
- S941, if another option has been selected in **Output echo lost** (\rightarrow $\stackrel{\triangle}{=}$ **178**).

Navigation

Prerequisite Operating mode ($\rightarrow \triangleq 138$) = Interface

Specify whether the tank or bypass is completely flooded or not. Description

Selection ■ Partially filled • Fully flooded

Factory setting Partially filled

Additional information

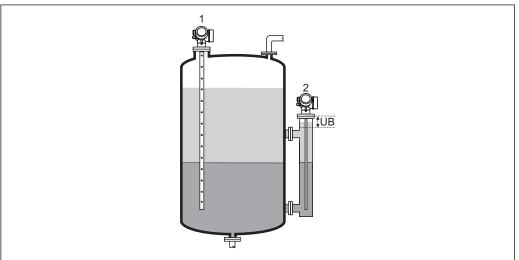
Meaning of the options

Partially filled

The device searches for 2 echo signals, one for the interface and one for the total level.

Fully flooded

The device searches for the interface level only. With this setting it is essential that the upper level signal always is within the upper blocking distance (UB) in order to avoid that it is evaluated by mistake.



- Partially filled
- Fully flooded
- UB Upper blocking distance

⁸⁾ Of these two echos the one with the lower quality is indicated.

Distance to upper connection

Navigation \blacksquare Setup \rightarrow Distance to upper connection

Prerequisite The device has the "Interface measurement" application package ⁹⁾.

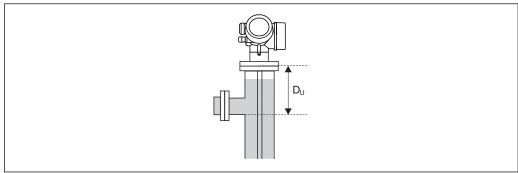
Description Specify distance D_U to upper connection.

User entry 0 to 200 m

Factory setting ■ For Tank level (→ 🖺 145) = Partially filled: 0 mm (0 in)

■ For **Tank level (→ 🖺 145)** = **Fully flooded**: 250 mm (9.8 in)

Additional information



A0013174

Dependence on the "Tank level" parameter

- Tank level (→ 🗎 145) = Partially filled:
 In this case the **Distance to upper connection** parameter does not influence the measurement. Thus, the default setting needs not to be changed.
- Tank level (→ 🗎 145) = Fully flooded: In this case enter the distance D_U between the reference point and the lower edge of the upper connection.

DC value

Navigation $\blacksquare \square$ Setup \rightarrow DC value

Prerequisite The device has the "interface measurement" application package ¹⁰).

Description Specify relative dielectric constant ε_r of the upper medium (DC₁).

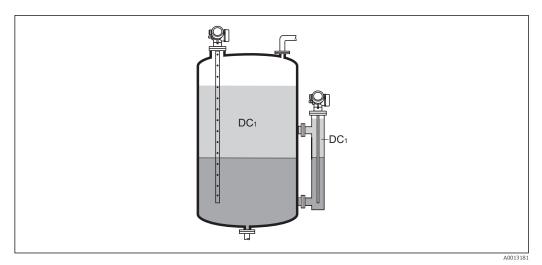
User entry 1.0 to 100

Factory setting 2.0

⁹⁾ Product structure: Feature 540 "Application Package", Option EB "Interface measurement"

¹⁰⁾ Product structure: Feature 540 "Application Package", Option EB "Interface measurement"

Additional information



DC1 Relative dielectric constant of the upper medium.

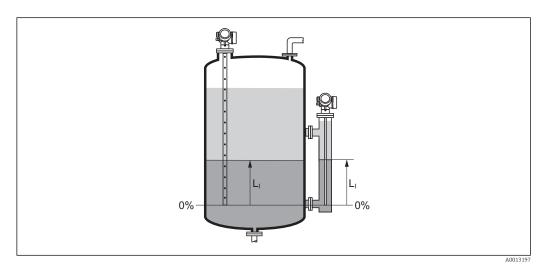
For dielectric constants (DC values) of many media commonly used in various industries refer to:

- the Endress+Hauser DC manual (CP01076F)
- the Endress+Hauser "DC Values App" (available for Android and iOS)

Interface

Prerequisite Operating mode (→ 🖺 138) = Interface or Interface with capacitance

Additional information



The unit is defined in the **Level unit** parameter ($\rightarrow \triangleq 159$).

Interface distance

Navigation

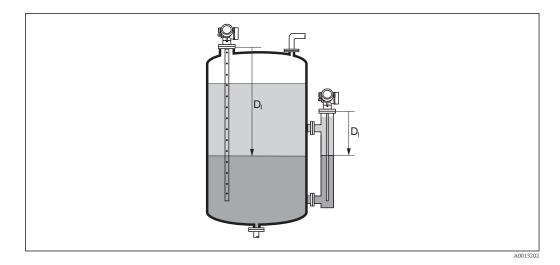
Prerequisite

Operating mode (→ 🖺 138) = Interface or Interface with capacitance

Description

Displays the measured distance D_I between the reference point (lower edge of flange or threaded connection) and the interface.

Additional information



The unit is defined in the **Distance unit** parameter ($\rightarrow \triangleq 139$).

Confirm distance

Navigation

 \square Setup \rightarrow Confirm distance

Description

Specify, whether the measured distance matches the real distance.

Depending on the selection the device automatically sets the range of mapping.

Selection

- Manual map
- Distance ok
- Distance unknown
- Distance too small '
- Distance too big *
- Tank empty
- Delete map

Factory setting

Distance unknown

^{*} Visibility depends on order options or device settings

Additional information

Meaning of the options

Manual map

To be selected if the range of mapping is to be defined manually in the **Mapping end point** parameter ($\Rightarrow \implies 150$). In this case it is not necessary to confirm the distance.

■ Distance ok

To be selected if the measured distance matches the actual distance. The device performs a mapping.

■ Distance unknown

To be selected if the actual distance is unknown. A mapping can not be performed in this case.

■ Distance too small

To be selected if the measured distance is smaller than the actual distance. The device searches for the next echo and returns to the **Confirm distance** parameter. The distance is recalculated and displayed. The comparison must be repeated until the displayed distance matches the actual distance. After this, the recording of the map can be started by selecting **Distance ok**.

■ Distance too big ¹¹⁾

To be selected if the measured distance exceeds the actual distance. The device adjusts the signal evaluation and returns to the **Confirm distance** parameter. The distance is recalculated and displayed. The comparison must be repeated until the displayed distance matches the actual distance. After this, the recording of the map can be started by selecting **Distance ok**.

Tank empty

To be selected if the tank is completely empty. The device records a mapping covering the complete measuring range.

To be selected if the tank is completely empty. The device records a mapping covering the complete measuring range minus **Map gap to LN**.

Factory map

To be selected if the present mapping curve (if one exists) is to be deleted. The device returns to the **Confirm distance** parameter and a new mapping can be recorded.

- When operating via the display module, the measured distance is displayed together with this parameter for reference purposes.
- For interface measurements the distance always refers to the toatal level (not the interface level).
- If the teaching procedure with the **Distance too small** option or the **Distance too big** option is quit before the distance has been confirmed, a map is **not** recorded and the teaching procedure is reset after 60 s.
- For FMP54 with gas phase compensation (product structure: feature 540 "Application Package", option EF or EG) a map must **not** be recorded.

Present mapping

Navigation

Setup → Present mapping

Description

Indicates up to which distance a mapping has already been recorded.

¹¹⁾ Only available for "Expert → Sensor → Echo tracking → **Evaluation mode** parameter" = "Short time history" or "Long time history"

Mapping end point

Navigation \square Setup \rightarrow Mapping end point

Prerequisite Confirm distance (→ 🗎 148) = Manual map or Distance too small

Description Specify new end of the mapping.

User entry 0 to 200 000.0 m

Factory setting 0.1 m

Additional information This parameter defines up to which distance the new mapping is to be recorded. The

distance is measured from the reference point, i.e. from the lower edge of the mounting flange or the threaded connection.

nange of the threaded connection

For reference purposes the **Present mapping** parameter ($\rightarrow \boxminus 149$) is displayed together with this parameter. It indicates up to which distance a mapping has already been recorded.

Record map

Prerequisite Confirm distance (→ 🖺 148) = Manual map or Distance too small

Description Start recording of the map.

Selection • No

Record mapDelete map

Factory setting No

Additional information Meaning of the options

No

The map is not recorded.

Record map

The map is recorded. After the recording is completed, the new measured distance and the new mapping range appear on the display. When operating via the local display, these values must be confirmed by pressing \square .

■ Delete map

The mapping (if one exists) is deleted and the device displays the recalculated measured distance and the mapping range. When operating via the local display, these values must be confirmed by pressing \square .

16.3.1 "Mapping" wizard

The **Mapping** wizard is only available when operating via the local display. When operating via an operating tool, all parameters concerning the mapping are located directly in the **Setup** menu (→ ≅ 138).

In the **Mapping** wizard two parameters are displayed simultaneously on the display module at any one time. The upper parameter can be edited, whereas the lower parameter is displayed for reference purposes only.

Confirm distance		
Navigation	Setup → Mapping → Confirm distance	
Description	→ 🖺 148	
Mapping end point		8
Navigation	Setup → Mapping → Mapping end point	
Description	→ 🗎 150	
Record map		â
Navigation	Setup → Mapping → Record map	
Description	→ 🖺 150	
Distance		
Navigation	Setup → Mapping → Distance	
Description	→ 🖺 143	

16.3.2 "Analog input 1 to 6" submenu

i

There is an **Analog input** submenu for each AI block of the device. The AI block is used to configure the measured value transmission to the bus.

Only the most basic properties of the AI blocks can be configured in this submenu. For a detailed configuration of the AI blocks refer to Expert \rightarrow Analog inputs \rightarrow Analog input 1 to 6.

Navigation \square Expert \rightarrow Analog inputs \rightarrow Analog input 1 to 6

Channel **Navigation** Description Standard parameter **CHANNEL** of the Analog Input Block according to the PROFIBUS Profile. Selection Level linearized Distance Interface linearized * Interface distance Thickness upper layer * ■ Terminal voltage ■ Electronic temperature Measured capacitance Absolute echo amplitude ■ Relative echo amplitude Absolute interface amplitude * Relative interface amplitude * Absolute EOP amplitude Noise of signal ■ EOP shift Calculated DC value * Sensor debug Analog output adv. diagnostics 1

Factory setting

Level linearized

Additional information

Allocates a measured value to the AI block.

■ Analog output adv. diagnostics 2

PV filter time

Navigation

Description

Standard parameter **PV_FTIME** of the Analog Input Block according to the PROFIBUS profile.

Visibility depends on order options or device settings

User entry Positive floating-point number

Factory setting 0

Additional information This parameter defines the damping constant τ (in seconds) for the output of the Analog

Input Block.

Fail safe type

Navigation $\blacksquare \blacksquare$ Expert \rightarrow Analog inputs \rightarrow Analog input 1 to 6 \rightarrow Fail safe type

Description Standard parameter **FSAFE TYPE** of the Analog Input Block according to the PROFIBUS

profile.

Selection • Fail safe value

■ Fallback value

Off

Factory setting Off

Additional information Meaning of the options

This parameter specifies the output value of the Analog Input block in the event of an

error.

■ Fail safe value

The output value in the event of an error is defined in the **Fail safe value** parameter

(→ 🖺 153). ■ Fallback value

The last output value that was valid before the error occurred is retained.

Off

The output value follows the current measured value. The status is set to BAD.

Fail safe value

Navigation \blacksquare Expert \rightarrow Analog input 1 to 6 \rightarrow Fail safe value

Prerequisite Fail safe type (→ 🖺 153) = Fail safe value

Description Standard parameter **FSAFE_VALUE** of the Analog Input Block according to the PROFIBUS

profile.

User entry Signed floating-point number

Factory setting 0

Additional information This parameter defines the output value of the Analog Input Block in case of an error.

16.3.3 "Advanced setup" submenu

Navigation Setup → Advanced setup

Locking status

Navigation

Description Indicates the write protection with the highest priority that is currently active.

User interface Hardware locked

- SIL locked
- WHG locked
- Temporarily locked

Additional information

Meaning and priorities of the types of write protection

■ Hardware locked (priority 1)

The DIP switch for hardware locking is activated on the main electronics module. This locks write access to the parameters.

■ SIL locked (priority 2)

The SIL mode is activated. Writing access to the relevant parameters is denied.

WHG locked (priority 3)

The WHG mode is activated. Writing access to the relevant parameters is denied.

■ Temporarily locked (priority 4)

Write access to the parameters is temporarily locked on account of internal processes in progress in the device (e.g. data upload/download, reset etc.). The parameters can be modified as soon as the processes are complete.

On the display module, the $\frac{1}{12}$ -symbol appears in front of parameters that cannot be modified since they are write-protected.

Access status tooling

Navigation Setup \rightarrow Advanced setup \rightarrow Access status tooling

Description Shows the access authorization to the parameters via the operating tool.

Additional information

The access authorization can be changed via the **Enter access code** parameter $(\rightarrow \triangleq 155)$.

If additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the **Locking status** parameter ($\rightarrow \equiv 154$).

Access status display

Navigation Setup \rightarrow Advanced setup \rightarrow Access status display

Prerequisite The device has a local display.

Description Indicates access authorization to parameters via local display.

Additional information

The access authorization can be changed via the **Enter access code** parameter $(\rightarrow \implies 155)$.

If additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the **Locking status** parameter ($\rightarrow \implies 154$).

Enter access code

Navigation \square Setup \rightarrow Advanced setup \rightarrow Enter access code

Description Enter access code to disable write protection of parameters.

User entry 0 to 9 999

Additional information

- If an incorrect access code is entered, the user retains his current access authorization.
- The write protection affects all parameters marked with the ③-symbol in this document. On the local display, the ⑤-symbol in front of a parameter indicates that the parameter is write-protected.
- If no key is pressed for 10 min, or the user switches from the navigation and editing mode back to the measured value display mode, the device automatically locks the writeprotected parameters after another 60 s.
- Please contact your Endress+Hauser Sales Center if you lose your access code.

"Level" submenu

The **Level** submenu ($\rightarrow \triangleq 156$) is only visible for **Operating mode** ($\rightarrow \triangleq 138$) = **Level**

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Level

Medium type

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Level \rightarrow Medium type

Description Specify type of medium.

User interface ■ Liquid ■ Solid

Factory setting FMP50, FMP51, FMP52, FMP53, FMP54, FMP55: Liquid

Additional information The Solid option is only available for Operating mode (→ 🖺 138) = Level

This parameter determines the value of several other parameters and strongly influences the complete signal evaluation. Therefore, it is strongly recommended **not to change** the factory setting.

Medium property

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Level \rightarrow Medium property

Prerequisite ■ Operating mode (→ 🗎 138) = Level

■ EOP level evaluation ≠ Fix DC

Description Specify relative dielectric constant ε_r of the medium.

UnknownDC 1.4 ... 1.6

• DC 1.4 ... 1.0

DC 1.6 ... 1.9DC 1.9 ... 2.5

■ DC 2.5 ... 4

■ DC 2.5 ... 4 ■ DC 4 ... 7

■ DC 7 ... 15

■ DC > 15

Factory setting Dependent on Medium type ($\rightarrow \stackrel{\triangle}{=} 156$) and Medium group ($\rightarrow \stackrel{\triangle}{=} 140$).

Selection

Additional information

Dependency on "Medium type" and "Medium group"

Medium type (→ 🗎 156)	Medium group (→ 🖺 140)	Medium property
Solid		Unknown
Liquid	Water based (DC >= 4)	DC 4 7
	Others	Unknown

- For dielectric constants (DC values) of many media commonly used in various industries refer to:
 - the Endress+Hauser DC manual (CP01076F)
 - the Endress+Hauser "DC Values App" (available for Android and iOS)
- For **EOP level evaluation** = **Fix DC**, the exact dielectric constant has to be entered into the **DC value** parameter ($\rightarrow \implies 146$). Therefore, the **Medium property** parameter is not available in this case.

Process property	

Navigation

Description

Specify typical rate of level change.

Selection

For "Medium type" = "Liquid"

- Very fast > 10 m (400 in)/min
- Fast > 1 m (40 in)/min
- Standard < 1 m (40in) /min
- Medium < 10 cm (4in) /min
- Slow < 1 cm (0.4in) /min
- No filter / test

For "Medium type" = "Solid"

- Very fast > 100 m (333 ft) /h
- Fast > 10 m (33 ft) /h
- Standard < 10 m (33 ft) /h
- Medium < 1 m (3ft) /h
- Slow < 0.1 m (0.3ft) /h
- No filter / test

Factory setting

Standard < 1 m (40in) /min

Additional information

The device adjusts the signal evaluation filters and the damping of the output signal to the typical rate of level change defined in this parameter:

For "Operating mode" = "Level" and "Medium type" = "Liquid"

Process property	Step response time / s
Very fast > 10 m (400 in)/min	5
Fast > 1 m (40 in)/min	5
Standard < 1 m (40in) /min	14
Medium < 10 cm (4in) /min	39
Slow < 1 cm (0.4in) /min	76
No filter / test	< 1

For "Operating mode" = "Level" and "Medium type" = "Solid"

Process property	Step response time / s
Very fast > 100 m (333 ft) /h	37
Fast > 10 m (33 ft) /h	37
Standard < 10 m (33 ft) /h	74
Medium < 1 m (3ft) /h	146
Slow < 0.1 m (0.3ft) /h	290
No filter / test	< 1

For "Operating mode" = "Interface" or "Interface with capacitance"

Process property	Step response time / s
Very fast > 10 m (400 in)/min	5
Fast > 1 m (40 in)/min	5
Standard < 1 m (40in) /min	23
Medium < 10 cm (4in) /min	47
Slow < 1 cm (0.4in) /min	81
No filter / test	2.2

Advanced process conditions

Navigation

Prerequisite

Operating mode ($\rightarrow \equiv 138$) = Level

Description

Specify additional process conditions (if required).

Selection

- None
- Oil/Water condensate
- Probe near tank bottom
- Build up
- Foam (>5cm/0,16ft)

Factory setting

None

Additional information

Meaning of the options

Oil/Water condensate (only Medium type = Liquid)

Makes sure that in the case of two-phase media only the total level is detected (example: oil/condensate application).

■ Probe near tank bottom (only for Medium type = Liquid)

Improves the empty detection, especially if the probe is mounted close to the tank bottom.

■ Build up

Increases **EOP** range upper area in order to ensure a safe empty-detection even if the end-of-probe signal has shifted due to build-up.

Enables a safe empty-detection even if the end-of-probe signal has shifted due to build-up.

■ Foam (>5cm/0,16ft) (only for Medium type = Liquid)

Optimizes the signal evaluation in applications with foam formation.

Level unit

Navigation

Description Select level unit.

Selection SIunits US units

• % ■ ft m ■ in

■ mm

Factory setting

Additional information The level unit may differ from the distance unit defined in the **Distance unit** parameter

(→ 🖺 139):

■ The unit defined in the **Distance unit** parameter is used for the basic calibration (**Empty** calibration ($\rightarrow \implies 140$) and Full calibration ($\rightarrow \implies 141$).

■ The unit defined in the **Level unit** parameter is used to display the (unlinearized) level.

Blocking distance

 \square Setup \rightarrow Advanced setup \rightarrow Level \rightarrow Blocking distance Navigation

Specify upper blocking distance UB. Description

User entry 0 to 200 m

• For coax probes: 0 mm (0 in) Factory setting

• For rod and rope probes up to 8 m (26 ft): 200 mm (8 in)

• For rod and rope probes above 8 m (26 ft): 0.025 * Sondenlänge

For FMP51/FMP52/FMP54 with the **Interface measurement** application package ¹²⁾ and

for FMP55:

100 mm (3.9 in) for all antenna types

Additional information Signals in the upper blocking distance are only evaluated if they have been outside the

blocking distance when the device was switched on and move into the blocking distance

¹²⁾ Ordering feature 540 "Application Package", option EB "Interface measurement"

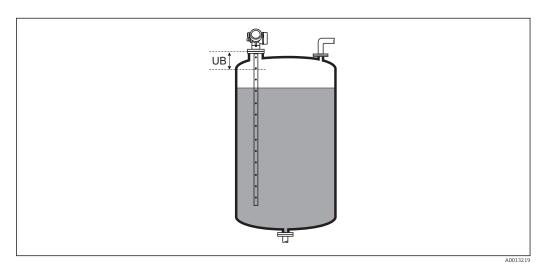
due to a level change during operation. Signals which are already in the blocking distance when the device is switched on, are ignored.

This behavior is only valid if the following two conditions are met:

- Expert → Sensor → Echo tracking → Evaluation mode = Short time history or Long time history)
- Expert → Sensor → Gas phase compensation → GPC mode= **On**, **Without correction** or **External correction**

If one of these conditions is not met, signals in the blocking distance will always be ignored.

- A different behavior for signals in the blocking distance can be defined in the **Blocking distance evaluation mode** parameter.
- If required, a different behavior for signals in the blocking distance can be defined by the Endress+Hauser service.



■ 44 Blocking distance (UB) for liquid measurements

Level correction

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Level \rightarrow Level correction

Description Specify level correction (if required).

User entry -200 000.0 to 200 000.0 %

Factory setting 0.0 %

Additional information The value specified in this parameter is added to the measured level (before linearization).

"Interface" submenu

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Interface

Process property

Navigation Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow Process property

Description Specify typical rate of change for the interface position.

Selection Fast > 1 m (40 in)/min

Standard < 1 m (40in) /min
 Medium < 10 cm (4in) /min
 Slow < 1 cm (0.4in) /min

■ No filter / test

Factory setting Standard < 1 m (40in) /min

Additional information

The device adjusts the signal evaluation filters and the damping of the output signal to the typical rate of level change defined in this parameter:

Process property	Step response time / s	
Fast > 1 m (40 in)/min	5	
Standard < 1 m (40in) /min	15	
Medium < 10 cm (4in) /min	40	
Slow < 1 cm (0.4in) /min	74	
No filter / test	2.2	

DC value lower medium

Navigation Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow DC value lower medium

Prerequisite Operating mode (→ 🖺 138) = Interface or Interface with capacitance

Description Specify the relative dielectric ocnstant ε_r of the lower medium.

User entry 1 to 100

Factory setting 80.0

Additional information

- For dielectric constants (DC values) of many media commonly used in various industries refer to:
 - the Endress+Hauser DC manual (CP01076F)
 - the Endress+Hauser "DC Values App" (available for Android and iOS)

The factory setting, $\varepsilon_{\rm r}$ = 80, is valid for water at 20 °C (68 °F).

Factory setting

 Level unit

 Navigation
 Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow Level unit

 Description
 Select level unit.

Selection $SI \ units$ $US \ units$ $\bullet \ \%$ $\bullet \$ ft $\bullet \$ $\bullet \$

%

■ m ■ mm

Additional information The level

The level unit may differ from the distance unit defined in the **Distance unit** parameter $(\rightarrow \boxminus 139)$:

- The unit defined in the **Distance unit** parameter is used for the basic calibration (**Empty calibration** ($\rightarrow \boxminus 140$) and **Full calibration** ($\rightarrow \boxminus 141$).
- The unit defined in the **Level unit** parameter is used to display the (unlinearized) level and interface position.

Blocking distance	
Navigation	

Description Specify upper blocking distance UB.

User entry 0 to 200 m

Factory setting ■ For coax probes: 100 mm (3.9 in)

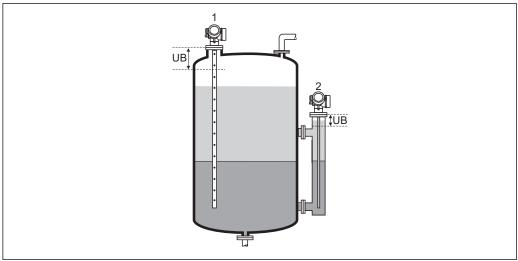
• For rod and rope probes up to 8 m (26 ft): 200 mm (8 in)

• For rod and rope probes above 8 m (26 ft): 0.025 * length of probe

Additional information Echoes from within the blocking distance are not taken into account in the signal evaluation. The upper blocking distance is used

• to suppress interference echoes at the top end of the probe.

• to suppress the echo of the total level in the case of flooded bypasses.



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- 1 Suppression of interference echoes at the top end of the probe.
- 2 Suppression of the level signal in case of a flooded bypass.
- UB Upper blocking distance

Level correction

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow Level correction

Description Specify level correction (if required).

User entry -200 000.0 to 200 000.0 %

Factory setting 0.0%

Additional information The value specified in this parameter is added to the measured total and interface levels

(before linearization).

Manual thickness upper layer

Navigation \square Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow Manual thickness upper layer

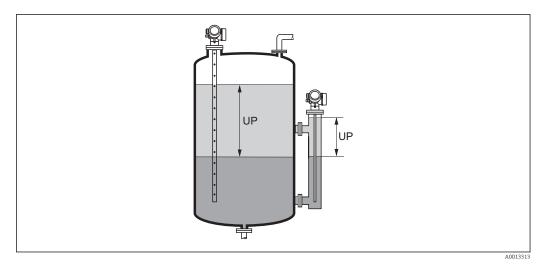
Description Specify the manually determined interface thickness UP (i.e. the thickness of the upper

medium).

User entry 0 to 200 m

Factory setting 0 m

Additional information



UP Interface thickness (= thickness of upper medium)

On the local display, the measured interface thickness is indicated together with the manual interface thickness. By comparing these two values the device can automatically adjust the dielectric constant of the upper medium.

Measured thickness up	per layer	
Navigation		
Description	Displays the measured interface thickness. (Thickness UP of the upper medium).	
DC value		Â
Navigation		
Description	Displays relatvie dielectric constant $\epsilon_{\rm r}$ of the upper medium (DC1) before correction.	
Calculated DC value		
Navigation		
Description	Displays calculated (i.e. corrected) relative dielectric constant $\epsilon_{\rm r}$ (DC1) of the upper medium.	

Use calculated DC value

Navigation \square Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow Use calculated DC value

Description Specify whether the calculated dielectric constant is to be used.

Selection ■ Save and exit

Cancel and exit

Factory setting Cancel and exit

Additional information Meaning of the options

Save and exit

The calculated constant is assumed to be the correct one.

Cancel and exit

The calculated dielectric constant is rejected; the previous dielectric constant remains active.

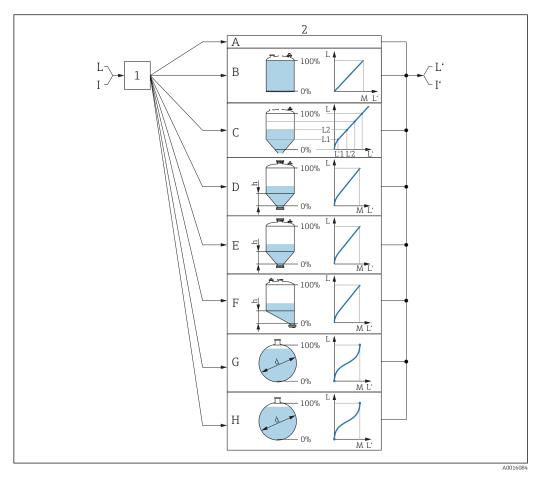
On the local display, the **Calculated DC value** parameter ($\Rightarrow \triangleq 164$) is displayed together with this parameter.

"Automatic DC calculation" wizard

- The **Automatic DC calculation** wizard is only available when operating via the local display. When operating via an operating tool, all parameters concerning the automatic DC calculation are located directly in the **Interface** submenu (→ ≜ 161)
- In the **Automatic DC calculation** wizard two parameters are displayed simultaneously on the display module at any one time. The upper parameter can be edited, whereas the lower parameter is displayed for reference purposes only.

Manual thickness upper la	ayer		
Navigation		Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow Automatic DC calculation \rightarrow Manual thickness upper layer	
Description	→ E	163	
DC value			
Navigation		$Setup \to Advanced \ setup \to Interface \to Automatic \ DC \ calculation \to DC \ value$	
Description	→	164	
Use calculated DC value			
Navigation		Setup \rightarrow Advanced setup \rightarrow Interface \rightarrow Automatic DC calculation \rightarrow Use calculation DC value	ated
Description	→ 🖺	165	

"Linearization" submenu

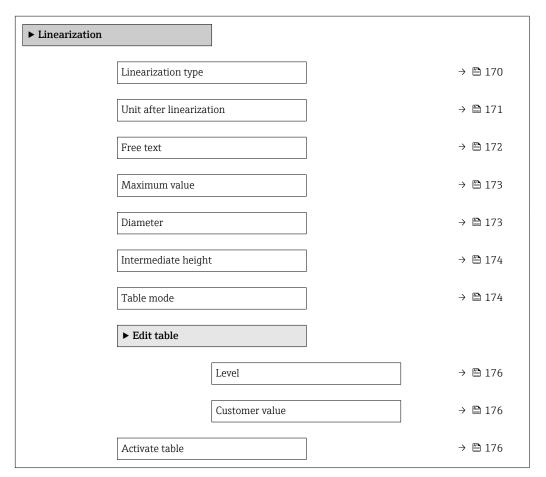


45 Linearization: Transformation of the level and (if relevant) the interface height into a volume or weight; the transformation is dependent on the shape of the vessel.

- 1 Selection of linearization type and unit
- 2 Configuration of the linearization
- A Linearization type ($\rightarrow \square 170$) = None
- *B* Linearization type (\Rightarrow 🖺 170) = Linear
- C Linearization type ($\Rightarrow \triangle 170$) = Table
- D Linearization type ($\rightarrow \equiv 170$) = Pyramid bottom
- E Linearization type ($\rightarrow \triangleq 170$) = Conical bottom
- *F* Linearization type ($\rightarrow \triangleq 170$) = Angled bottom
- G Linearization type ($\rightarrow \equiv 170$) = Horizontal cylinder
- *H* Linearization type (\rightarrow 🖺 170) = Sphere
- I For "Operating mode (→ \bigo 138)" = "Interface" or "Interface with capacitance": Interface before linearization (measured in distance units)
- "For "Operating mode ($\rightarrow \triangleq 138$)" = "Interface" or "Interface with capacitance": Interface after linearization (corresponds to volume or weight)
- L Level before linearization (measured in distance units)
- L' Level linearized ($\rightarrow riangleq 172$) (corresponds to volume or weight)
- *M* Maximum value (→ 🖺 173)
- d Diameter ($\rightarrow = 173$)
- h 🛾 Intermediate height (→ 🖺 174)

Structure of the submenu on the display module

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Linearization



Structure of the submenu in an operating tool (e.g. FieldCare)

Navigation \square Setup \rightarrow Advanced setup \rightarrow Linearization

► Linearization		
Line	earization type	→ 🖺 170
Uni	t after linearization	→ 🖺 171
Free	e text	→ 🖺 172
Lev	el linearized	→ 🖺 172
Inte	erface linearized	→ 🖺 173
Max	ximum value	→ 🖺 173
Dia	meter	→ 🖺 173
Inte	ermediate height	→ 🖺 174
Tab	le mode	→ 🖺 174
Tab	le number	→ 🖺 175
Lev	el	→ 🖺 176
Lev	el	→ 🖺 176
Cus	tomer value	→ 🖺 176
Act	ivate table	→ 🖺 176

Description of parameters

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Linearization

Linearization type

Navigation Setup \rightarrow Advanced setup \rightarrow Linearization type

Description Select linearization type.

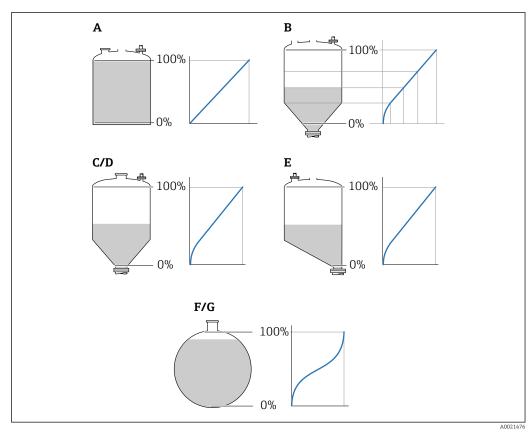
Selection ■ None

- Linear
- Table
- Pyramid bottom
- Conical bottom
- Angled bottom
- Horizontal cylinder
- Sphere

Factory setting

None

Additional information



■ 46 Linearization types

- A None
- B Table
- C Pyramid bottom
- D Conical bottom
- E Angled bottom
- F Sphere
- G Horizontal cylinder

Meaning of the options

None

The level is transmitted in the level unit without linearization.

■ Linear

The output value (volume/weight) is directly proportional to the level L. This is valid, for example, for vertical cylinders. The following additional parameters have to be specified:

- Unit after linearization (\rightarrow $\stackrel{\triangle}{=}$ 171)

Table

The relationship between the measured level L and the output value (volume/weight) is given by a linearization table consisting of up to 32 pairs of values "level - volume" or "level - weight", respectively. The following additional parameters have to be specified:

- Unit after linearization ($\rightarrow \stackrel{\triangle}{=} 171$)
- Table mode (→ 🖺 174)
- For each table point: **Level** (\rightarrow $\stackrel{\triangle}{=}$ **176**)
- For each table point: **Customer value** (→ 🖺 **176**)

Pyramid bottom

The output value corresponds to the volume or weight in a silo with pyramid bottom. The following additional parameters have to be specified:

- Unit after linearization (→ 🗎 171)
- **Maximum value** (→ 🗎 173): Maximum volume or weight
- **Intermediate height (→ 174)**: The height of the pyramid

Conical bottom

The output value corresponds to the volume or weight in a tank with conical bottom. The following additional parameters have to be specified:

- Unit after linearization (→ 🗎 171)
- **Maximum value** (→ 🖺 **173**): Maximum volume or weight
- **Intermediate height (→** 🗎 **174)**: The height of the conical part of the tank

Angled bottom

The output value corresponds to the volume or weight in a silo with an angled bottom. The following additional parameters have to be specified:

- Unit after linearization (→ 🗎 171)
- **Maximum value (→ 🖺 173)**: Maximum volume or weight
- **Intermediate height (→ 174)**: Height of the angled bottom

Horizontal cylinder

The output value corresponds to the volume or weight in a horizontal cylinder. The following additional parameters have to be specified:

- Unit after linearization (→ 🗎 171)
- **Maximum value** (→ 🗎 173): Maximum volume or weight
- Diameter (→ 🗎 173)

Sphere

The output value corresponds to the volume or weight in a spherical tank. The following additional parameters have to be specified:

- Unit after linearization (→ 🗎 171)
- **Maximum value** (→ 🖺 **173**): Maximum volume or weight
- Diameter (→ 🗎 173)

Unit after linearization

Navigation Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Unit after linearization

Prerequisite Linearization type ($\rightarrow \triangle 170$) $\neq \text{None}$

Description Select unit of the lineaized value.

SelectionSI unitsUS unitsImperial units• STon• IbimpGal• t• UsGal

ft³

- kg
- cm³
- dm³
 m³
- III-
- nil
- 1 • %

Custom-specific units

Free text

Factory setting

%

Additional information

The selected unit is only used to be indicated on the display. The measured value is **not** transformed according to the selected unit.

It is also possible to configure a distance-to-distance linearization, i.e. a transformation from the level unit to a different distance unit. To do so, select the **Linear** linearization mode. In order to define the new level unit, select the **Free text** option in the **Unit after linearization** parameter and enter the required unit into the **Free text** parameter ($\rightarrow \implies 172$).

Free text

Navigation $\blacksquare \square$ Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Free text

Prerequisite Unit after linearization (→ 🗎 171) = Free text

Description Enter unit symbol.

User entry Up to 32 alphanumerical characters (letters, numbers, special characters)

Factory setting Free text

Level linearized

Navigation \square Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Level linearized

Description Displays linearized level.

Additional information \blacksquare The unit is defined by the **Unit after linearization** parameter \rightarrow \blacksquare 171.

• For interface measurements, this parameter always refers to the total level.

Interface linear	

Navigation \square Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Interface linearized

Prerequisite Operating mode (→ 🖺 138) = Interface or Interface with capacitance

Description Displays the linearized interface height.

Additional information The unit is defined in the **Unit after linearization** parameter $\rightarrow \triangleq 171$.

Maximum value

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Maximum value

Prerequisite Linearization type $(\rightarrow \ \ \ \ \ \ \ \ \ \ \)$ has one of the following values:

Linear

Pyramid bottomConical bottomAngled bottomHorizontal cylinder

Sphere

User entry -50 000.0 to 50 000.0 %

Factory setting 100.0 %

Diameter

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Diameter

Prerequisite Linearization type ($\rightarrow \square$ 170) has one of the following values:

Horizontal cylinder

■ Sphere

User entry 0 to 9 999.999 m

Factory setting 2 m

Additional information The unit is defined in the **Distance unit** parameter ($\rightarrow \triangleq 139$).

Intermediate height

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Intermediate height

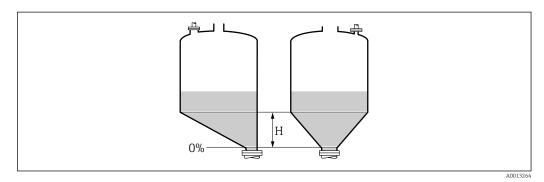
Prerequisite Linearization type $(\rightarrow \ \ \ \ \ \ \ \ \ \ \)$ has one of the following values:

Pyramid bottomConical bottomAngled bottom

User entry 0 to 200 m

Factory setting 0 m

Additional information



H Intermediate height

The unit is defined in the **Distance unit** parameter ($\rightarrow \triangleq 139$).

Table mode

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Table mode

Prerequisite Linearization type ($\rightarrow \equiv 170$) = Table

Description Select editing mode of the linearization table.

Selection • Manual

Semiautomatic*
Clear table
Sort table

Factory setting Manual

^{*} Visibility depends on order options or device settings

Additional information

Meaning of the options

Manual

The level and the associated linearized value are entered manually for each linearization point.

Semiautomatic

The level is measured by the device for each linearization point. The associated linearized value is entered manually.

Clear table

Deletes the existing linearization table.

Sort table

Rearranges the linerization points into an ascending order.

Conditions the linearization table must meet:

- The table may consist of up to 32 pairs of values "Level Linearized Value".
- The table must be monotonic (monotonically increasing or decreasing).
- The first linearization point must refer to the minimum level.
- The last linearization point must refer to the maximum level.
- Before entering a linearization table, the values for **Empty calibration** ($\rightarrow \implies 140$) and **Full calibration** ($\rightarrow \implies 141$) must be set correctly.

If values of the table need to be changed after the full or empty calibration have been changed, a correct evaluation is only ensured if the existing table is deleted and the complete table is entered again. To do so delete the existing table (**Table mode** $(\rightarrow B174) = Clear table$). Then enter a new table.

How to enter the table

■ Via FieldCare

The table points can be entered via the **Table number** ($\rightarrow \boxminus 175$), **Level** ($\rightarrow \boxminus 176$) and **Customer value** ($\rightarrow \boxminus 176$) parameters. As an alternative, the graphic table editor may be used: Device Operation \rightarrow Device Functions \rightarrow Additional Functions \rightarrow Linearization (Online/Offline)

Via local display

Select the **Edit table** submenu to call up the graphic table editor. The table is displayed and can be edited line by line.

The factory setting for the level unit is "%". If you want to enter the linearization table in physical units, you must select the appropriate unit in the **Level unit** parameter $(\rightarrow \implies 159)$ beforehand.

Table number		
Navigation		
Prerequisite	Linearization type (→ 🖺 170) = Table	
Description	Select table point you are going to enter or change.	
User entry	1 to 32	
Factory setting	1	

Level (Manual)		
Navigation		
Prerequisite	 Linearization type (→ 🖺 170) = Table Table mode (→ 🖺 174) = Manual 	
Description	Enter level value of the table point (value before linearization).	
User entry	Signed floating-point number	
Factory setting	0 %	
Level (Semiautomatic)		
Navigation		
Prerequisite	 ■ Linearization type (→ 🖺 170) = Table ■ Table mode (→ 🖺 174) = Semiautomatic 	
Description	Displays measured level (value before linearization). This value is transmitted to the table.	
Customer value		
Navigation		
Prerequisite	Linearization type (→ 🗎 170) = Table	
Description	Enter linearized value for the table point.	
User entry	Signed floating-point number	
Factory setting	0 %	
Activate table		
Navigation		
Prerequisite	Linearization type (→ 🗎 170) = Table	
Description	Activate (enable) or deactivate (disable) the linearization table.	
Selection	DisableEnable	

Factory setting

Disable

Additional information

Meaning of the options

Disable

The measured level is not linearized.

If **Linearization type** (\rightarrow \rightleftharpoons **170)** = **Table** at the same time, the device issues error message F435.

Enable

The measured level is linearized according to the table.



When editing the table, the **Activate table** parameter is automatically reset to **Disable** and must be reset to **Enable** after the table has been entered.

"Safety settings" submenu

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Safety settings

Output echo lost

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Safety settings \rightarrow Output echo lost

Description Output signal in case of a lost echo.

Selection ■ Last valid value

Ramp at echo lostValue echo lost

Alarm

Factory setting Last valid value

Additional information Meaning of the options

Last valid value

The last valid value is kept in the case of a lost echo.

Ramp at echo lost ¹³⁾

In the case of a lost echo the output value is continously shifted towards 0% or 100%. The slope of the ramp is defined in the **Ramp at echo lost** parameter ($\rightarrow \stackrel{\triangle}{=} 179$).

■ Value echo lost ¹³⁾

In the case of a lost echo the output assumes the value defined in the **Value echo lost** parameter ($\Rightarrow \triangleq 178$).

Alarm

In the case of a lost echo the device generates an alarm; see the Failure mode parameter

Value echo lost

Navigation $\blacksquare \square$ Setup \rightarrow Advanced setup \rightarrow Safety settings \rightarrow Value echo lost

Prerequisite Output echo lost $(\rightarrow \triangle 178) =$ Value echo lost

Description Output value in case of a lost echo

User entry 0 to 200 000.0 %

Factory setting 0.0 %

Additional information Use the unit which has been defined for the measured value output:

■ without linearization: **Level unit (→ 🖺 159)**

■ with linearization: **Unit after linearization** (→ 🗎 171)

Only visible if "Linearization type ($\Rightarrow \equiv 170$)" = "None"

Ramp at echo lost

Navigation $\blacksquare \square$ Setup \rightarrow Advanced setup \rightarrow Safety settings \rightarrow Ramp at echo lost

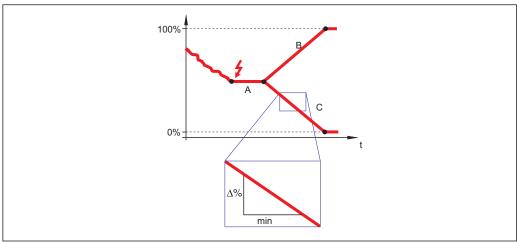
Prerequisite Output echo lost ($\Rightarrow \triangleq 178$) = Ramp at echo lost

Description Slope of the ramp in the case of a lost echo

User entry Signed floating-point number

Factory setting 0.0 %/min

Additional information



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- A Delay time echo lost
- *B* Ramp at echo lost ($\rightarrow \blacksquare 179$) (positive value)
- *C* Ramp at echo lost ($\Rightarrow \implies 179$) (negative value)
- The unit for the slope of the ramp is "percentage of the measuring range per minute" (%/min).
- For a negative slope of the ramp: The measured value is continuously decreased until it reaches 0%.
- For a positive slope of the ramp: The measured value is continuouly increased until it reaches 100%.

Blocking distance	

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Safety settings \rightarrow Blocking distance

Description Specify upper blocking distance UB.

User entry 0 to 200 m

Factory setting ■ For coax probes: 0 mm (0 in)

• For rod and rope probes up to 8 m (26 ft): 200 mm (8 in)

• For rod and rope probes above 8 m (26 ft): 0.025 * Sondenlänge

For FMP51/FMP52/FMP54 with the **Interface measurement** application package ¹⁴⁾ and for FMP55:

100 mm (3.9 in) for all antenna types

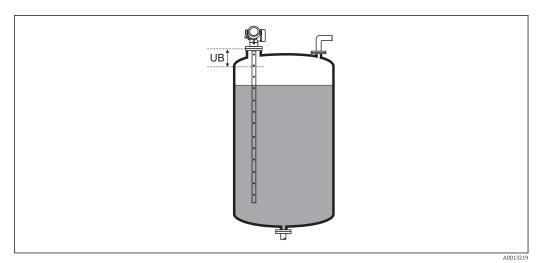
Additional information

Signals in the upper blocking distance are only evaluated if they have been outside the blocking distance when the device was switched on and move into the blocking distance due to a level change during operation. Signals which are already in the blocking distance when the device is switched on, are ignored.

- This behavior is only valid if the following two conditions are met:
 - Expert → Sensor → Echo tracking → Evaluation mode = Short time history or Long time history)
 - Expert → Sensor → Gas phase compensation → GPC mode= On, Without correction or External correction

If one of these conditions is not met, signals in the blocking distance will always be ignored.

- A different behavior for signals in the blocking distance can be defined in the **Blocking distance evaluation mode** parameter.
- If required, a different behavior for signals in the blocking distance can be defined by the Endress+Hauser service.



■ 47 Blocking distance (UB) for liquid measurements

¹⁴⁾ Ordering feature 540 "Application Package", option EB "Interface measurement"

"WHG confirmation" wizard

i

The **WHG confirmation** wizard is only available for devices with WHG approval (Feature 590: "Additional Approval", option LC: "WHG overfill prevention") which are currently not in the WHG-locked state.

The **WHG confirmation** wizard is used to lock the device according to WHG. For details refer to the "Functional Safety Manual" of the respective device, which describes the locking procedure and the parameters of the sequence.

Navigation Setup \rightarrow Advanced setup \rightarrow WHG confirmation

Factory setting

"Deactivate WHG" wizard

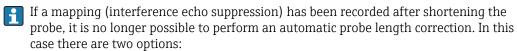
Reenter code

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Deactivate WHG

Reset write protection		
Navigation		
Description	Enter unlocking code.	
User entry	0 to 65 535	
Factory setting	0	
Code incorrect		
Navigation		
Description	Indicates that a wrong unlocking code has been entered. Select procedure.	
Selection	Reenter codeAbort sequence	

"Probe settings" submenu

The **Probe settings** submenu helps to ensure that the end of probe signal within the envelope curve is correctly assigned by the evaluation algorithm. The assignment is correct if the length of probe indicated by the device matches the acutal length of the probe. The automatic probe length correction can only be performed if the probe is installed in the vessel and is completely uncovered (no medium). For partially filled vessels and if the probe length is known, select **Confirm probe length** ($\rightarrow \implies 184$) = **Manual input** in order to enter the value manually.



- Delete the map using the **Record map** parameter ($\rightarrow \boxminus 150$) before performing the automatic probe length correction. After the probe length correction, a new map can be recorded using the **Record map** parameter ($\rightarrow \boxminus 150$).
- Alternative: Select **Confirm probe length (→ 🖺 184)** = **Manual input** and enter the probe length manually into the **Present probe length** parameter → 🖺 183.
- An automatic probe length correction is only possible after the correct option has been selected in the **Probe grounded** parameter ($\rightarrow \implies 183$).

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Probe settings

Probe grounded		
Navigation		
Prerequisite	Operating mode (→ 🖺 138) = Level	
Description	Specify whether the probe is grounded.	
Selection	■ No ■ Yes	
Factory setting	No	
Present probe length		<u> </u>
Navigation		
Description	 In most cases: Displays the length of the probe according to the currently measured end-of-probe signal. For Confirm probe length (→ 🖺 184) = Manual input: Enter actual length of probe. 	

Endress+Hauser 183

0 to 200 m

4 m

User entry

Factory setting

Confirm probe length

Navigation

Description

Select, whether the value displayed in the **Present probe length** parameter $\rightarrow \triangleq 183$ matches the actual length of the probe. Based on this input, the device performs a probe length correction.

Selection

- Probe length OK
- Probe length too small
- Probe length too big
- Probe covered
- Manual input
- Probe length unknown

Factory setting

Probe length OK

Additional information

Meaning of the options

■ Probe length OK

To be selected if the indicated length is correct. An adjustment is not required. The device quits the sequence.

■ Probe length too small

To be selected if the displayed length is smaller than the actual length of the probe. A different end of probe signal is allocated and the newly calculated length is displayed in the **Present probe length** parameter $\rightarrow \implies 183$. This procedure has to be repeated until the displayed value matches the actual length of the probe.

■ Probe length too big

To be selected if the displayed length is bigger than the actual length of the probe. A different end of probe signal is allocated and the newly calculated length is indicated in the **Present probe length** parameter $\rightarrow \triangleq 183$. This procedure has to be repeated until the displayed value matches the actual length of the probe.

■ Probe covered

To be selected if the probe is (partially or completely) covered. A probe length correction is impossible in this case. The device guits the sequence.

■ Manual input

To be selected if no automatic probe length correction is to be performed. Instead, the actual length of the probe must be entered manually into the **Present probe length** parameter $\rightarrow \implies 183^{15}$.

Probe length unknown

To be selected if the acutal length of the probe is unknown. A probe length correction is impossible in this case and the device quits the sequence.

[•]

¹⁵⁾ When operated via FieldCare, the **Manual input** option needs not to be selected explicitly. In FieldCare the length of the probe can always be edited.

"Probe length correction" wizard

The **Probe length correction** wizard is only available when operating via the local display. When operating via an operating tool, all parameters concerning the probe length correction are located directly in the **Probe settings** submenu ($\rightarrow \blacksquare$ 183).

Navigation

correction

Confirm probe length		
Navigation		
Description	→ 🗎 184	
Present probe length		
Navigation		
Description	→ 🗎 183	

"Switch output" submenu

The **Switch output** submenu ($\rightarrow \triangleq 186$) is only visible for devices with switch output. ¹⁶⁾

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Switch output

Switch output function

Navigation Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Switch output function

Description Select function for switch output.

Selection • Off • On

Diagnostic behavior

Limit

■ Digital Output

Factory setting Off

Additional information Meaning of the options

Off

The output is always open (non-conductive).

On

The output is always closed (conductive).

Diagnostic behavior

The output is normally closed and is only opened if a diagnostic event is present. The **Assign diagnostic behavior** parameter ($\rightarrow \implies 187$) determines for which type of event the output is opened.

Limit

The output is normally closed and is only opened if a measured variable exceeds or falls below a defined limit. The limit values are defined by the following parameters:

- Assign limit (→ 🖺 187)
- Switch-on value (→ \triangleq 188)
- Switch-off value (→

 189)
- Digital Output

The switching state of the output tracks the output value of a DI function block. The function block is selected in the **Assign status** parameter ($\rightarrow \stackrel{\triangle}{=} 186$).

The \mathbf{Off} and \mathbf{On} options can be used to simulate the switch output.

Assign status

Navigation $\blacksquare \square$ Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Assign status

Prerequisite Switch output function (→ 🗎 186) = Digital Output

Description Select device status for switch output.

¹⁶⁾ Ordering feature 020 "Power supply; Output", option B, E or G

Selection ■ Off

Digital output AD 1
Digital output AD 2
Digital output 1
Digital output 2
Digital output 3
Digital output 4

Factory setting Off

Additional information The Digital output AD 1 and Digital output AD 2 options refer to the Advanced

Diagnostic Blocks. A switch signal generated in these blocks can be transmitted via the

switch output.

Assign limit

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Assign limit

Prerequisite Switch output function ($\Rightarrow \triangleq 186$) = Limit

Selection ■ Off

■ Level linearized

Distance

Interface linearized *
 Interface distance *

Thickness upper layer *

■ Terminal voltage

■ Electronic temperature

Measured capacitance

Relative echo amplitude

Relative interface amplitude *

Absolute echo amplitude

Absolute interface amplitude *

Factory setting Off

Assign diagnostic behavior

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Assign diagnostic behavior

Prerequisite Switch output function (→ 🖺 186) = Diagnostic behavior

Description Select diagnostic behavior for switch output.

Selection • Alarm

Alarm or warning

Warning

^{*} Visibility depends on order options or device settings

Factory setting

Alarm

Switch-on value	
-----------------	--

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Switch-on value

Prerequisite Switch output function ($\rightarrow \triangleq 186$) = Limit

Description Enter measured value for the switch-on point.

User entry Signed floating-point number

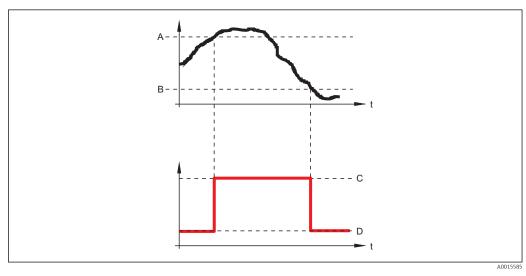
Factory setting 0

Additional information

The switching behavior depends on the relative position of the **Switch-on value** and **Switch-off value** parameters:

Switch-on value > Switch-off value

- The output is closed if the measured value is larger than **Switch-on value**.
- The output is opened if the measured value is smaller than **Switch-off value**.

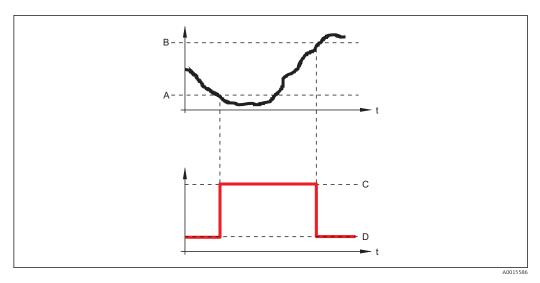


- A Switch-on value
- B Switch-off value
- C Output closed (conductive)
- D Output opened (non-conductive)

Switch-on value < Switch-off value

- The output is closed if the measured value is smaller than **Switch-on value**.
- The output is opened if the measured value is larger than **Switch-off value**.

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- A Switch-on value
- B Switch-off value
- C Output closed (conductive)
- D Output opened (non-conductive)

Switch-on delay

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Switch-on delay

Prerequisite ■ Switch output function (→ 🖺 186) = Limit

■ Assign limit (→ 🖺 187) ≠ Off

Description Define delay for the switch-on of status output.

User entry 0.0 to 100.0 s

Factory setting 0.0 s

Switch-off value

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Switch-off value

Prerequisite Switch output function (→ 🖺 186) = Limit

Description Enter measured value for the switch-off point.

User entry Signed floating-point number

Factory setting 0

Additional information The switching behavior depends on the relative position of the **Switch-on value** and

Switch-off value parameters; description: see the Switch-on value parameter

(→ 🖺 188).

Switch-off delay		î		
Navigation				
Prerequisite	 Switch output function (→ 🗎 186) = Limit Assign limit (→ 🖺 187) ≠ Off 			
Description	Define delay for the switch-off of status output.			
User entry	0.0 to 100.0 s			
Factory setting	0.0 s			
Failure mode				
Navigation				
Prerequisite	Switch output function (→ 🖺 186) = Limit or Digital Output			
Description	Define output behavior in alarm condition.			
Selection	Actual statusOpenClosed			
Factory setting	Open			
Additional information				
Switch status				
Navigation				
Description	Shows the current switch output status.			
Invert output signal				
Navigation	⊗ □ Setup $→$ Advanced setup $→$ Switch output $→$ Invert output signal			
Description	Invert the output signal.			
Selection	■ No ■ Yes			

Factory setting

No

Additional information

Meaning of the options

■ No

The behavior of the switch output is as described above.

Yes

The states **Open** and **Closed** are inverted as compared to the description above.

"Display" submenu

The **Display** submenu is only visible if a display module is connected to the device.

Navigation

Language

Navigation

Description

Set display language.

Selection

- English
- Deutsch *
- Français
- Español ⁷
- Italiano
- Nederlands
- Portuguesa
- Polski
- **■** русский язык (Russian) *
- Svenska
- Türkçe
- 中文 (Chinese) *
- 日本語 (Japanese) *
- 한국어 (Korean) *
 Bahasa Indonesia *
- tiếng Việt (Vietnamese) *
- čeština (Czech) *

Factory setting

The language selected in feature 500 of the product structure.

If no language has been selected: English

Additional information

Format display

Navigation

Description

Select how measured values are shown on the display.

Selection

- 1 value, max. size
- 1 bargraph + 1 value
- 2 values
- 1 value large + 2 values
- 4 values

Factory setting

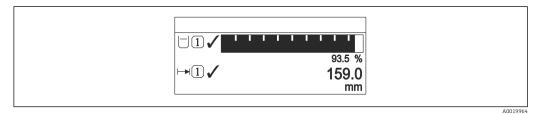
1 value, max. size

Visibility depends on order options or device settings

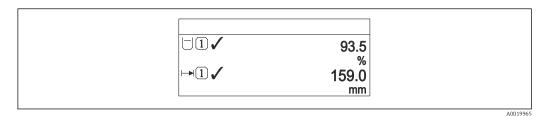
Additional information



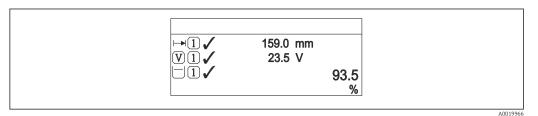
■ 48 "Format display" = "1 value, max. size"



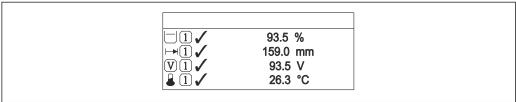
■ 49 "Format display" = "1 bargraph + 1 value"



■ 50 "Format display" = "2 values"

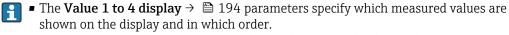


■ 51 "Format display" = "1 value large + 2 values"



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■ 52 "Format display" = "4 values"



■ If more measured values are specified than the current display mode permits, the values alternate on the device display. The display time until the next change is configured in the **Display interval** parameter (\rightarrow \cong 195).

Value 1 to 4 display

Navigation

Setup → Advanced setup → Display → Value 1 display

Description

Select the measured value that is shown on the local display.

Selection

- Level linearized
- Distance
- Interface linearized ⁷
- Interface distance
- Thickness upper layer *
- Terminal voltage
- Electronic temperature
- Measured capacitance
- Analog output 1
- Analog output 2
- Analog output 3
- Analog output 4
- Analog output adv. diagnostics 1
- Analog output adv. diagnostics 2

Factory setting

For level measurements

- Value 1 display: Level linearized
- Value 2 display: Distance
- Value 3 display: Current output 1
- Value 4 display: None

For interface measurements and one current output

- Value 1 display: Interface linearized
- Value 2 display: Level linearized
- Value 3 display: Thickness upper layer
- Value 4 display: Current output 1

For interface measurements and two current outputs

- Value 1 display: Interface linearized
- Value 2 display: Level linearized
- Value 3 display: Current output 1
- Value 4 display: Current output 2

Decimal places 1 to 4

Navigation

 \blacksquare Setup → Advanced setup → Display → Decimal places 1

Description

Select the number of decimal places for the display value.

Selection

- X
- X.X
- X.XX
- X.XXX
- X.XXXX

Factory setting

X.XX

^{*} Visibility depends on order options or device settings

Additional information The setting does not affect the measuring or computational accuracy of the device.

Display interval

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Display interval

Description Set time measured values are shown on display if display alternates between values.

User entry 1 to 10 s

Factory setting 5 s

Additional information This parameter is only relevant if the number of selected measuring values exceeds the

number of values the selected display format can display simultaneously.

Display damping

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Display damping

Description Set display reaction time to fluctuations in the measured value.

User entry 0.0 to 999.9 s

Factory setting 0.0 s

Header 🗈

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Header

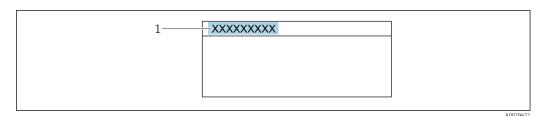
Description Select header contents on local display.

Selection ■ Device tag

■ Free text

Factory setting Device tag

Additional information



1 Position of the header text on the display

Meaning of the options

Device tag

Is defined in the **Device tag** parameter

■ Free text

Is defined in the **Header text** parameter ($\rightarrow \implies 196$)

Setup → Advanced setup → Display → Header text	
Header (→ 🗎 195) = Free text	
Enter display header text.	
The number of characters which can be displayed depends on the characters used.	
	Header (→ 🗎 195) = Free text Enter display header text.

Separator		
Navigation		
Description	Select decimal separator for displaying numerical values.	
Selection	•. •,	
Factory setting		

Number format		
Navigation		
Description	Choose number format for the display.	
Selection	Decimalft-in-1/16"	

Factory setting Decimal

Additional information The **ft-in-1/16"** option is only valid for distance units.

Decimal places menu

Navigation Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Decimal places menu

Description Select number of decimal places for the representation of numbers within the operating

menu.

Selection ■ x

X.XX.XXX.XXXX.XXXX

Factory setting x.xxxx

Additional information

Is only valid for numbers in the operating menu (e.g. Empty calibration, Full calibration), but not for the measured value display. The number of decimal places for the measured value display is defined in the Decimal places 1 to 4 → 194

The setting does not affect the accuracy of the measurement or the calculations.

Backlight

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Backlight

Prerequisite The device has the SD03 local display (with optical keys).

Description Switch the local display backlight on and off.

Selection ■ Disable

■ Enable

Factory setting Disable

Additional information Meaning of the options

Disable

Switches the backlight off.

Enable

Switches the backlight on.

Regardless of the setting in this parameter the backlight may be automatically switched off by the device if the supply voltage is too low.

Contrast display

Navigation

Description Adjust local display contrast setting to ambient conditions (e.g. lighting or reading angle).

20 to 80 % **User entry**

Factory setting Dependent on the display.

Additional information

Setting the contrast via push-buttons:
■ Darker: press the ⑤ ⑥ buttons simultaneously.

■ Brighter: press the 🕒 📵 buttons simultaneously.

"Configuration backup display" submenu

i

This submenu is only visible if a display module is connected to the device.

The configuration of the device can be saved to the display module at a certain point of time (backup). The saved configurateion can be restored to the device if required, e.g. in order to bring the device back into a defined state. The configuration can also be transferred to a different device of the same type using the display module.



Configurations can only be exchanged between devices which are in the same operating mode (see the **Operating mode** parameter ($\Rightarrow \implies 138$)).

Navigation

 \square Setup \rightarrow Advanced setup \rightarrow Configuration backup display

Onei	ating	time
ODEI	aunu	ume

Navigation Setup \rightarrow Advanced setup \rightarrow Configuration backup display \rightarrow Operating time

Description Indicates how long the device has been in operation.

Additional information *Maximum time*

9999 d (≈ 27 years)

Last backup

Navigation Setup \rightarrow Advanced setup \rightarrow Configuration backup display \rightarrow Last backup

Description Indicates when the last data backup was saved to the display module.

Configuration management

Navigation Setup \rightarrow Advanced setup \rightarrow Configuration backup display \rightarrow Configuration

management

Description Select action for managing the device data in the display module.

Selection • Cancel

■ Execute backup

Restore

Duplicate

Compare

Clear backup data

Factory setting Cancel

Additional information

Meaning of the options

Cancel

No action is executed and the user exits the parameter.

Execute backup

A backup copy of the current device configuration in the HistoROM (built-in in the device) is saved to the display module of the device.

Restore

The last backup copy of the device configuration is copied from the display module to the HistoROM of the device.

Duplicate

The transmitter configuration is duplicated to another device using the transmitter display module. The following parameters, which characterize the individual measuring point are **not** included in the transmitted configuration:

Medium type

Compare

The device configuration saved in the display module is compared to the current device configuration of the HistoROM. The result of this comparison is displayed in the **Comparison result** parameter ($\rightarrow \implies 200$).

Clear backup data

The backup copy of the device configuration is deleted from the display module of the device.

- While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.
- If an existing backup is restored to a different device using the **Restore** option, it may occur that some device functionalities are no longer available. In some cases even a device reset will not restore the original status.

In order to transmit a configuration to a different device, the **Duplicate** option should always be used.

Backup state				
Navigation				
Description Displays which backup action is currently in progress.				
Comparison result				
Navigation				
Description	Comparison between present device data and display backup.			

Additional information

Meaning of the display options

Settings identical

The current device configuration of the HistoROM is identical to the backup copy in the display module.

Settings not identical

The current device configuration of the HistoROM is not identical to the backup copy in the display module.

No backup available

There is no backup copy of the device configuration of the HistoROM in the display module.

Backup settings corrupt

The current device configuration of the HistoROM is corrupt or not compatible with the backup copy in the display module.

Check not done

The device configuration of the HistoROM has not yet been compared to the backup copy in the display module.

■ Dataset incompatible

The data sets are incompatible and can not be compared.

To start the comparison, set **Configuration management** ($\rightarrow \implies 199$) = **Compare**.

If the transmitter configuration has been duplicated from a different device by Configuration management (→ 🗎 199) = Duplicate, the new device configuration in the HistoROM is only partially identical to the configuration stored in the display module: Sensor specific properties (e.g. the mapping curve) are not duplicated. Thus, the result of the comparison will be Settings not identical.

"Administration" submenu

Navigation \square Setup \rightarrow Advanced setup \rightarrow Administration

Define access code

Navigation \square Setup \rightarrow Advanced setup \rightarrow Administration \rightarrow Define access code

Description Define release code for write access to parameters.

User entry 0 to 9 999

Factory setting 0

Additional information

- If the factory setting is not changed or 0 is defined as the access code, the parameters are not write-protected and the configuration data of the device can then always be modified. The user is logged on in the *Maintenance* role.
- The write protection affects all parameters marked with the symbol in this document. On the local display, the symbol in front of a parameter indicates that the parameter is write-protected.
- Once the access code has been defined, write-protected parameters can only be modified if the access code is entered in the **Enter access code** parameter $(\Rightarrow \implies 155)$.
- Please contact your Endress+Hauser Sales Center if you lose your access code.
- For display operation: The new access code is only valid after it has been confirmed in the **Confirm access code** parameter ($\rightarrow \triangleq 204$).

Device reset

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Administration \rightarrow Device reset

Description Reset the device configuration - either entirely or in part - to a defined state.

Selection • Cancel

- To factory defaults
- To delivery settings
- Of customer settings
- To transducer defaults
- Restart device

Factory setting Cancel

Additional information

Meaning of the options

Cancel

No action

■ To factory defaults

All parameters are reset to the order-code specific factory setting.

■ To delivery settings

All parameters are reset to the delivery setting. The delivery setting may differ from the factory default if customer specific settings have been ordered.

This option is only visible if customer specific settings have been ordered.

Of customer settings

All customer parameters are reset to their factory setting. Service parameters, however, remain unchanged.

■ To transducer defaults

Every measurment-related parameter is reset to its factory setting. Service parameters and communication-related parameters, however, remain unchanged.

Restart device

The restart resets every parameter which is stored in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.

Factory setting

0

"Define access code" wizard

The **Define access code** wizard is only available when operating via the local display. When operating via an operating tool, the **Define access code** parameter is located directly in the **Administration** submenu. The **Confirm access code** parameter is not available for operation via operating tool.

Define access code		
Navigation		access
Description	→ 🗎 202	
Confirm access code		<u> </u>
Navigation	Setup → Advanced setup → Administration → Define access code → Confirmation	n access
Description	Confirm the entered access code.	
User entry	0 to 9 999	

16.4 "Diagnostics" menu

Actual diagnostics Navigation Diagnostics → Actual diagnostics Description Displays current diagnostic message. Additional information The display consists of: Symbol for event behavior Code for diagnostic behavior Operating time of occurrence Event text If several messages are active at the same time, the messages with the highest priority is displayed. Information on what is causing the message, and remedy measures, can be viewed via the (i) symbol on the display. **Timestamp Navigation** Diagnostics → Timestamp **Previous diagnostics Navigation** Diagnostics → Previous diagnostics Description Displays the last diagnostic message which has been active before the current message. Additional information The display consists of: Symbol for event behavior Code for diagnostic behavior Operating time of occurrence ■ Event text

Endress+Hauser 205

The condition displayed may still apply. Information on what is causing the message,

and remedy measures, can be viewed via the (i) symbol on the display.

т	im	_	40	าท	nn

Navigation

□ Diagnostics → Timestamp

Operating time from restart

Description Displays the time the device has been in operation since the last device restart.

Operating time

Navigation \Box Diagnostics \rightarrow Operating time

Description Indicates how long the device has been in operation.

Additional information *Maximum time*

9999 d (≈ 27 years)

16.4.1 "Diagnostic list" submenu

Navigation \Box Diagnostics \rightarrow Diagnostic list

Diagnostics 1 to 5

Navigation \Box Diagnostics \rightarrow Diagnostic list \rightarrow Diagnostics 1

Description Display the current diagnostics messages with the highest to fifth-highest priority.

Additional information The display consists of:

Symbol for event behaviorCode for diagnostic behaviorOperating time of occurrence

■ Event text

Timestamp 1 to 5

Navigation □ Diagnostics → Diagnostic list → Timestamp

16.4.2 "Event logbook" submenu



The **Event logbook** submenu is only available when operating via the local display. When operating via FieldCare, the event list can be displayed in the FieldCare function "Event List / HistoROM".

Navigation

Diagnostics → Event logbook

Filter options

Navigation

Diagnostics \rightarrow Event logbook \rightarrow Filter options

Selection

- All
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- Information (I)

Factory setting

All

Additional information



- This parameter is only used for operation via the local display.
- The status signals are categorized according to NAMUR NE 107.

"Event list" submenu

The **Event list** submenu displays the history of past events of the category selected in the **Filter options** parameter ($\rightarrow \triangleq 208$). A maximum of 100 events are displayed in chronological order.

The following symbols indicate whether an event has occurred or has ended:

- ①: Event has occurred
- 🕒: Event has ended
- Information on what is causing the message, and remedy instructions, can be viewed via the ①-button.

Display format

- For event messages in category I: information event, event text, "recording event" symbol and time the event occurred
- For event messages in category F, M, C, S (status signal): diagnostics event, event text, "recording event" symbol and time the event occurred

Navigation \square Diagnostics \rightarrow Event logbook \rightarrow Event list

16.4.3 "Device information" submenu

Navigation \square Diagnostics \rightarrow Device information

Device tag

Navigation $\blacksquare \square$ Diagnostics \rightarrow Device information \rightarrow Device tag

Description Enter the name for the measuring point.

Factory setting FMP5x

Serial number

Navigation $\blacksquare \Box$ Diagnostics \rightarrow Device information \rightarrow Serial number

Description Shows the serial number of the measuring device.

Additional information

- Uses of the serial number
 - To identify the device quickly, e.g. when contacting Endress+Hauser.
 - To obtain specific information on the device using the Device Viewer: www.endress.com/deviceviewer
- The serial number is also indicated on the nameplate.

Firmware version

Navigation Diagnostics \rightarrow Device information \rightarrow Firmware version

Description Shows the device firmware version installed.

User interface xx.yy.zz

Additional information For firmware versions differing only in the last two digits ("zz") there is no difference concerning functionality or operation.

Device name

Navigation \blacksquare Diagnostics \rightarrow Device information \rightarrow Device name

Description Shows the name of the transmitter.

Order code

Navigation \Box Diagnostics \rightarrow Device information \rightarrow Order code

Description Shows the device order code.

Additional information The order code is generated from the extended roder code, which defines all device

features of the product structure. In contrast, the device features can not be read directly

from the order code.

Extended order code 1 to 3

Navigation

Description Display the three parts of the extended order code.

Additional information The extended order code indicates the version of all the features of the product structure

and thus uniquely identifies the device.

Status PROFIBUS Master Config

Navigation □ Diagnostics → Device information → Status PROFIBUS Master Config

Description Indicates whether the cyclic data exchange with the master is currently active.

User interface ■ Active

Not active

PROFIBUS ident number

Navigation \blacksquare Diagnostics \rightarrow Device information \rightarrow PROFIBUS ident number

Description Indicates the ident number of the device.

Additional information The **Ident number selector** parameter can be used to define which ident number is used.

16.4.4 "Measured values" submenu

Navigation \Box Diagnostics \rightarrow Measured values

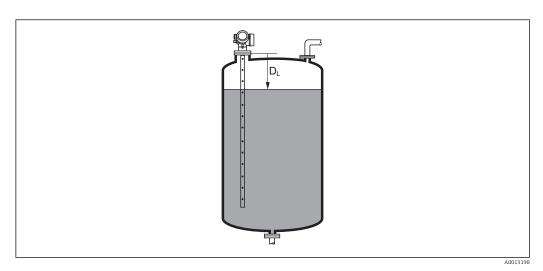
Distance

Navigation

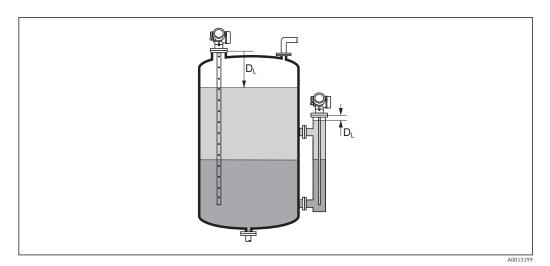
Description

Displays the measured distance D_L between the reference point (lower edge of the flange or threaded connection) and the level.

Additional information



■ 53 Distance for liquid measurements



■ 54 Distance for interface measurements

The unit is defined in the **Distance unit** parameter ($\rightarrow \triangleq 139$).

Level linearized

Description Displays linearized level.

Additional information

■ The unit is defined by the **Unit after linearization** parameter $\rightarrow \blacksquare 171$.

• For interface measurements, this parameter always refers to the total level.

Interface distance

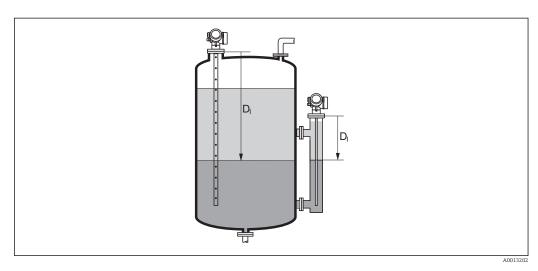
Navigation \blacksquare Diagnostics \rightarrow Measured values \rightarrow Interface distance

Prerequisite Operating mode (→ 🖺 138) = Interface or Interface with capacitance

 $\textbf{Description} \qquad \qquad \text{Displays the measured distance } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{ between the reference point (lower edge of flange or } D_I \text{$

threaded connection) and the interface.

Additional information



The unit is defined in the **Distance unit** parameter ($\rightarrow \triangleq 139$).

Interface linearized

Navigation \blacksquare Diagnostics \rightarrow Measured values \rightarrow Interface linearized

Prerequisite Operating mode (→ 🖺 138) = Interface or Interface with capacitance

Description Displays the linearized interface height.

Additional information The unit is defined in the **Unit after linearization** parameter $\rightarrow \triangleq 171$.

212

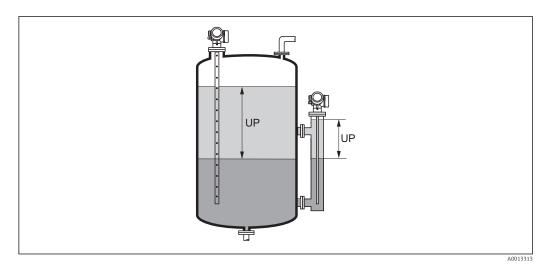
Thickness upper layer

Navigation \blacksquare Diagnostics \rightarrow Measured values \rightarrow Thickness upper layer

Prerequisite Operating mode (→ 🖺 138) = Interface or Interface with capacitance

Description Displays the upper interface thickness (UP).

Additional information



UP Thickness upper layer

Terminal voltage 1

Navigation \blacksquare Diagnostics \rightarrow Measured values \rightarrow Terminal voltage 1

Switch status

Navigation \blacksquare Diagnostics \rightarrow Measured values \rightarrow Switch status

Description Shows the current switch output status.

"Analog input 1 to 6" submenu 16.4.5

There is an **Analog input** submenu for each Analog Input Block of the device. Only the most important parameters of the respective block are available at this position of the operating menu. For a complete list of the block parameters refer to: Diagnostics → Analog inputs → Analog input 1 to 6

Navigation

Channel		
Navigation		
Description	Standard parameter CHANNEL of the Analog Input Block according to the PROFIBUS Profile.	
Selection	 Level linearized Distance Interface linearized* Interface distance* Thickness upper layer * Terminal voltage Electronic temperature Measured capacitance* Absolute echo amplitude Relative echo amplitude Relative interface amplitude * Relative interface amplitude * Roise of signal EOP shift Calculated DC value * Sensor debug Analog output adv. diagnostics 1 Analog output adv. diagnostics 2 	
Factory setting	Level linearized	
Additional information	Allocates a measured value to the AI block.	
Out value		
Navigation		
Description	Element Value of the standard parameter OUT in the Analog Input Block according to PROFIBUS Profile.	the
User entry	Signed floating-point number	

Visibility depends on order options or device settings

214

Factory setting

Additional information ■ For **Mode block actual = Man**:

Enter the output value of the Analog Input Block.

Else:

Displays the output value of the Analog Input Block.

Out status

Navigation Diagnostics \rightarrow Analog input 1 to 6 \rightarrow Out status

Description Element **Status** of the standard parameter **OUT** in the Analog Input Block according to

the PROFIBUS Profile.

User interface ■ Good

Uncertain

Bad

Additional information Only the two quality bits are evaluated in this parameter.

Out status HEX

Navigation \blacksquare Diagnostics \rightarrow Analog input 1 to 6 \rightarrow Out status HEX

Description Element **Status** of the standard parameter **OUT** in the Analog Input Block according to the

PROFIBUS Profile.

User entry 0 to 255

Factory setting 128

Additional information The complete status byte is displayed in the form of a two-digit hexadecimal number in

this parameter.

16.4.6 "Data logging" submenu

Assign channel 1 to 4

Navigation

Selection

- Off
- Level linearized
- Distance
- Unfiltered distance
- Interface linearized *
- Interface distance
- Unfiltered interface distance
- Thickness upper layer *
- Terminal voltage
- Electronic temperature
- Measured capacitance
- Absolute echo amplitude
- Relative echo amplitude
- Absolute interface amplitude *
- Relative interface amplitude
- Absolute EOP amplitude
- EOP shift
- Noise of signal
- Calculated DC value *
- Analog output adv. diagnostics 1
- Analog output adv. diagnostics 2

Factory setting

Off

Additional information

A total of 1000 measured values can be logged. This means:

- 1000 data points if 1 logging channel is used
- 500 data points if 2 logging channels are used
- 333 data points if 3 logging channels are used
- 250 data points if 4 logging channels are used

If the maximum number of data points is reached, the oldest data points in the data log are cyclically overwritten in such a way that the last 1000, 500, 333 or 250 measured values are always in the log (ring memory principle).



The logged data are deleted if a new option is selected in this parameter.

^{*} Visibility depends on order options or device settings

Logging interval

Navigation

- Diagnostics → Data logging → Logging interval
- Diagnostics → Data logging → Logging interval

User entry

1.0 to 3600.0 s

Factory setting

30.0 s

Additional information

This parameter defines the interval between the individual data points in the data log, and thus the maximum loggable process time T_{log} :

- If 1 logging channel is used: T $_{log}$ = 1000 \cdot t $_{log}$
- If 2 logging channels are used: $T_{log} = 500 \cdot t_{log}$
- If 3 logging channels are used: T log = 333 · t log
 If 4 logging channels are used: T log = 250 · t log

Once this time elapses, the oldest data points in the data log are cyclically overwritten such that a time of T_{log} always remains in the memory (ring memory principle).

The logged data are deleted if this parameter is changed.

Example

When using 1 logging channel

- $T_{log} = 1000 \cdot 1 \text{ s} = 1000 \text{ s} \approx 16.5 \text{ min}$
- $T_{log} = 1000 \cdot 10 \text{ s} = 1000 \text{ s} \approx 2.75 \text{ h}$
- $T_{log} = 1000 \cdot 80 \text{ s} = 80000 \text{ s} \approx 22 \text{ h}$
- $T_{log} = 1000 \cdot 3600 \text{ s} = 3600000 \text{ s} \approx 41 \text{ d}$

Clear logging data

Navigation

- Diagnostics → Data logging → Clear logging data
- Diagnostics → Data logging → Clear logging data

Selection

- Cancel
- Clear data

Factory setting

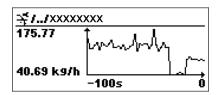
Cancel

"Display channel 1 to 4" submenu



The **Display channel 1 to 4** submenus are only available for operation via the local display. When operating via FieldCare, the logging diagram can be displayed in the FieldCare function "Event List / HistoROM".

The **Display channel 1 to 4** submenus invoke a diagram of the logging history of the respective channel.



- x-axis: depending on the number of selected channels, 250 to 1000 measured values of a process variable are displayed.
- y-axis: covers the approximate measured value span and constantly adapts this to the measurement.
- To return to the operating menu, press \pm and \Box simultaneaously.

Navigation

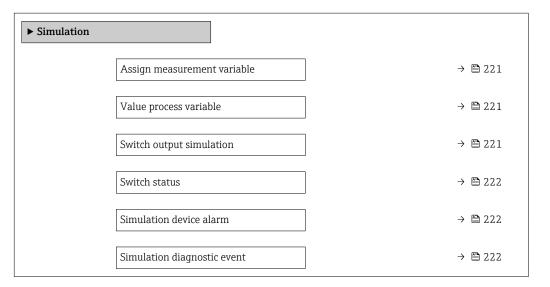
16.4.7 "Simulation" submenu

The **Simulation** submenu is used to simulate specific measuring values or other conditions. This helps to check the correct configuration of the device and connected control units.

Conditions which can be simulated

Condition to be simulated	Associated parameters
Specific value of a process variable	 Assign measurement variable (→ 🖺 221) Value process variable (→ 🖺 221)
Specific state of the switch output	 Switch output simulation (→ 🖺 221) Switch status (→ 🖺 222)
Existence of an alarm	Simulation device alarm (→ 🖺 222)
Existence of a specific diagnostic message	Simulation diagnostic event (→ 🖺 222)

Structure of the submenu



Description of parameters

Navigation $\blacksquare \blacksquare$ Expert \rightarrow Diagnostics \rightarrow Simulation

Assign measurement variable

Navigation \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Assign measurement variable

Selection ■ Off

Level

■ Interface

Level linearized

■ Interface linearized

■ Thickness linearized

Factory setting Off

Additional information

- The value of the variable to be simulated is defined in the **Value process variable** parameter (→ 🖺 221).
- If **Assign measurement variable** ≠ **Off**, a simulation is active. This is indicated by a diagnotic message of the *Function check* (*C*) category.

Value	nrocess	variable
vaiue	DIOCESS	variable

Navigation \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Value process variable

Prerequisite Assign measurement variable (→ 🖺 221) ≠ Off

User entry Signed floating-point number

Factory setting 0

Additional information

Downstream measured value processing and the signal output use this simulation value. In this way, users can verify whether the measuring device has been configured correctly.

Switch output simulation

Navigation \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Switch output simulation

Description Switch the simulation of the switch output on and off.

Selection ■ Off

■ On

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221

^{*} Visibility depends on order options or device settings

Factory setting

Off

Switch status

Navigation $\blacksquare \Box$ Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Switch status

Prerequisite Switch output simulation ($\Rightarrow \stackrel{\triangle}{=} 221$) = On

Description Select the status of the status output for the simulation.

Selection ■ Open ■ Closed

Factory setting Open

Additional information The switch status assumes the value defined in this parameter. This helps to check correct

operation of connected control units.

Simulation device alarm

Navigation \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Simulation device alarm

Description Switch the device alarm on and off.

Selection ■ Off

On

Factory setting Off

Additional information When selecting the **On** option, the device generates an alarm. This helps to check the

correct output behavior of the device in the case of an alarm.

An active simulation is indicated by the diagnostic message **♦ C484 Simulation failure**

mode.

Simulation diagnostic event

Navigation $\blacksquare \blacksquare$ Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Simulation diagnostic event

Description Select a diagnostic event for the simulation process that is activated.

Factory setting Off

Additional information When operated via the local display, the selection list can be filtered according to the event

categories (Diagnostic event category parameter).

"Device check" submenu 16.4.8

 □ □ Diagnostics → Device check Navigation

Start device check

Navigation

Description Start a device check.

Selection ■ No

Yes

Factory setting No

Additional information In the case of a lost echo a device check can not be performed.

Result device check

Navigation Diagnostics → Device check → Result device check

Description Displays the result of the device check.

Additional information

Meaning of the display options

■ Installation ok

Measurement possible without restrictions.

Accuracy reduced

A measurement is possible. However, the measuring accuracy may be reduced due to the signal amplitudes.

Measurement capability reduced

A measurement is currently possible. However, there is the risk of an echo loss. Check the mounting position of the device and the dielectric constant of the medium.

Check not done

No device check has been performed.

Last check time

Navigation

Description Displays the operating time at which the last device check has been performed.

T 1		1
Level	CIA	ทอเ
TEACI	SIU	наі

Navigation

Prerequisite Device check has been performed.

Description Displays result of the device check for the level signal.

User interface Check not done

■ Check not OK

■ Check OK

Additional information

For **Level signal** = **Check not OK**: Check the mounting position of the device and the dielectric constant of the medium.

Launch signal

Navigation

Prerequisite Device check has been performed.

Description Displays result of the display check for the launch signal.

User interface Check not done

> ■ Check not OK ■ Check OK

Additional information

For **Launch signal = Check not OK**: Check the mounting position of the device. In non-

metallic vessels use a metal plate or a metal flange.

Interface signal

Navigation

Prerequisite ■ Operating mode (→ 🗎 138) = Interface or Interface with capacitance

Device check has been performed.

Description Displays result of the device check for the interface signal.

User interface Check not done

■ Check not OK

■ Check OK

16.4.9 "Heartbeat" submenu

The **Heartbeat** submenu is only available via **FieldCare** or **DeviceCare**. It contains the wizards which are part of the **Heartbeat Verification** and **Heartbeat Monitoring** application packages.

Detailed description SD01872F

Navigation \square Diagnostics \rightarrow Heartbeat

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