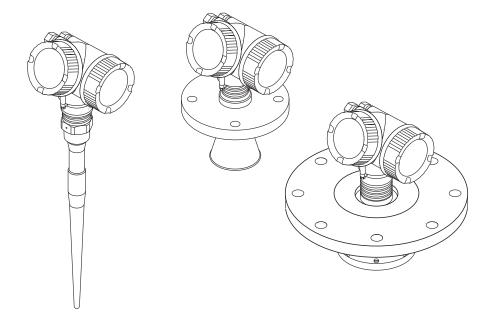
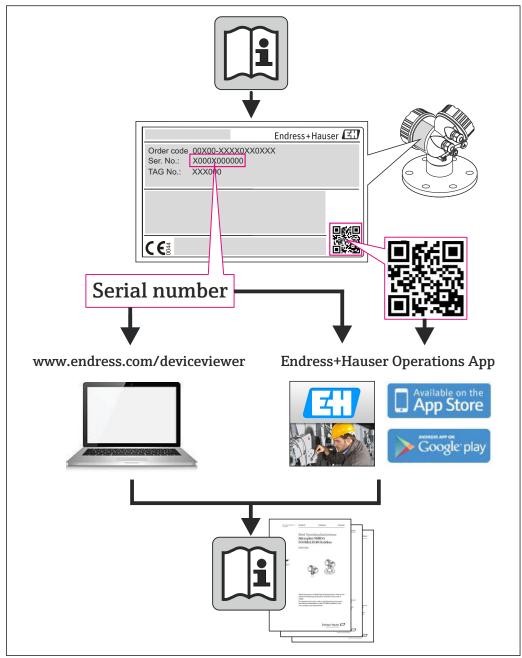
Operating Instructions Micropilot FMR53, FMR54 HART

Free space radar







A0023555

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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	ol Meaning Symbol		Meaning		
	Direct current	~	Alternating current		
≂	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 ground connection A terminal which must be connected to ground prior to establishing any other connections.	♦	Equipotential connection A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.		

1.2.3 Tool symbols

Symbol	Meaning
A0013442	Torx screwdriver
O 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
\checkmark	Permitted Procedures, processes or actions that are permitted.
	Preferred Procedures, processes or actions that are preferred.
×	Forbidden Procedures, processes or actions that are forbidden.
i	Tip Indicates additional information.
	Reference to documentation
A	Reference to page
	Reference to graphic
1. , 2. , 3	Series of steps
L-	Result of a sequence of actions
?	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
EX	Hazardous area Indicates a hazardous area.
Safe area (non-hazardous area) Indicates the non-hazardous area.	

1.2.6 Symbols at the device

5	Symbol	Meaning
4	↑ → 🗓	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 Additional documentation

Document	Purpose and content of the document			
Technical Information TI01041F (FMR53, FMR54)	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 KA01101F (FMR53/FMR54, HART)	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 GP01014F (FMR5x, HART)	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.			

- 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.

1.3.1 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 020 "Power Supply; Output"				
Feature 010	Approval	Available for	A 1)	B ²⁾	C ₃₎	E ⁴⁾ /G ⁵⁾	K ⁶⁾ /L ⁷⁾
BA	ATEX: II 1 G Ex ia IIC T6-T1 Ga	FMR53FMR54	XA00677F	XA01224F	XA001225	XA00685F	-
ВВ	ATEX: II 1/2 G Ex ia IIC T6-T1 Ga/Gb	FMR53FMR54	XA00677F	XA01224F	XA001225	XA00685F	-
ВС	ATEX: II 1/2 G Ex d [ia] IIC T6-T1 Ga/Gb	FMR53FMR54	XA00680F	XA00680F	XA01232F	XA00688F	XA01233F
BD	ATEX: II 1/2/3 G Ex ic [ia Ga] IIC T6-T1 Ga/Gb/Gc	FMR53FMR54	XA00678F	XA01226F	XA01227F	XA00686F	XA01228F
BG	ATEX: II 3 G Ex nA IIC T6-T1 Gc	FMR53FMR54	XA00679F	XA01229F	XA01230F	XA00687F	XA01231F
ВН	ATEX: II 3 G Ex ic IIC T6-T1 Gc	FMR53FMR54	XA00679F	XA01229F	XA01230F	XA00687F	XA01231F
BL	ATEX: II 1/2/3 G Ex nA [ia Ga] IIC T6-T1 Ga/Gb/Gc	FMR53FMR54	XA00678F	XA01226F	XA01227F	XA00686F	XA01228F

					ure 020 "Power Supply; Output"			
Feature 010	Approval	Available for	A 1)	B ²⁾	C ₃₎	E ⁴⁾ /G ⁵⁾	K ⁶⁾ /L ⁷⁾	
B2	ATEX: II 1/2 G Ex ia IIC T6-T1 Ga/Gb ATEX: II 1/2 D Ex ia IIIC Txx°C Da/Db	FMR53FMR54	XA00683F	XA00683F	XA01235F	XA00691F	-	
В3	ATEX: II 1/2 G Ex d [ia] IIC T6-T1 Ga/Gb ATEX: II 1/2 D Ex ta IIIC Txx°C Da/Db	FMR53FMR54	XA00684F	XA00684F	XA00684F	XA00692F	XA01236F	
B4	ATEX:II 1/2 G Ex ia IIC T6-T1 Ga/Gb ATEX: II 1/2 G Ex d [ia] IIC T6-T1 Ga/Gb	FMR53FMR54	XA00681F	XA00681F	XA01234F	XA00689F	-	
СВ	CSA C/US XP Cl.I Div.1 Gr.A-D	FMR54	XA01112F	XA01112F	XA01112F	XA01114F	-	
CC	CSA C/US XP Cl.I Div.1 Gr.A-D	FMR54	XA01113F	XA01113F	XA01113F	XA01115F	XA01113I	
C2	CSA C/US IS Cl.I,II,III Div.1 Gr.A-G, NI Cl.1 Div. 2, Ex ia	FMR53FMR54	XA01112F	XA01112F	XA01112F	XA01114F	-	
C3	CSA C/US XP Cl.I,II,III Div.1 Gr.A-G, NI Cl.1 Div.2, Ex d	FMR53FMR54	XA01113F	XA01113F	XA01113F	XA01115F	XA01113I	
FA	FM IS Cl.I Div.1 Gr.A-D	FMR54	XA01116F	XA01116F	XA01116F	XA01118F	-	
FB	FM IS Cl.I,II,III Div.1 Gr.A-G, AEx ia, NI Cl.1 Div.2	FMR53FMR54	XA01116F	XA01116F	XA01116F	XA01118F	-	
FC	FM XP Cl.I Div.1 Gr.A-D	FMR54	XA01117F	XA01117F	XA01117F	XA01119F	XA01117I	
FD	FM XP Cl.I,II,III Div.1 Gr.A-G, AEx d, NI Cl.1 Div.2	FMR53FMR54	XA01117F	XA01117F	XA01117F	XA01119F	XA01117	
IA	IECEx: Ex ia IIC T6-T1 Ga	FMR53FMR54	XA00677F	XA01224F	XA001225	XA00685F	-	
IB	IECEx: Ex ia IIC T6-T1 Ga/Gb	FMR53FMR54	XA00677F	XA01224F	XA001225	XA00685F	-	
IC	IECEx: Ex d [ia] IIC T6-T1 Ga/Gb	FMR53FMR54	XA00680F	XA00680F	XA01232F	XA00688F	XA012331	
ID	IECEx: Ex ic [ia Ga] IIC T6-T1 Ga/Gb/Gc	FMR53FMR54	XA00678F	XA01226F	XA01227F	XA00686F	XA01228I	
IG	IECEx: Ex nA IIC T6-T1 Gc	FMR53FMR54	XA00679F	XA01229F	XA01230F	XA00687F	XA01231I	
IH	IECEx: Ex ic IIC T6-T1 Gc	FMR53FMR54	XA00679F	XA01229F	XA01230F	XA00687F	XA01231I	
IL	IECEx: Ex nA [ia Ga] IIC T6-T1 Ga/Gb/Gc	FMR53FMR54	XA00678F	XA01226F	XA01227F	XA00686F	XA01228I	
I2	IECEx: Ex ia IIC T6-T1 Ga/Gb IECEx: Ex ia IIIC Txx°C Da/Db	FMR53FMR54	XA00683F	XA00683F	XA01235F	XA00691F	-	
I3	IECEx: Ex d [ia] IIC T6-T1 Ga/Gb IEXEx: Ex ta IIIC Txx°C Da/Db	FMR53FMR54	XA00684F	XA00684F	XA00684F	XA00692F	XA01236I	
I4	IECEx: Ex ia IIC T6-T1 Ga/Gb IECEx: Ex d [ia] IIC T6-T1 Ga/Gb	FMR53FMR54	XA00681F	XA00681F	XA01234F	XA00689F	-	
KA	KC Ex ia IIC T6 Ga	FMR53FMR54	XA01045F	XA01045F	XA01045F	XA01047F	-	
KB	KC Ex ia IIC T6 Ga/Gb	FMR53FMR54	XA01045F	XA01045F	XA01045F	XA01047F	-	
KC	KC Ex d[ia] IIC T6	FMR53FMR54	XA01046F	XA01046F	XA01046F	XA01048F	XA01046I	
MA	INMETRO: Ex ia IIC T6 Ga	FMR53FMR54	XA01286F	XA01287F	XA01288F	XA01296F	-	
MC	INMETRO: Ex d[ia] IIC T6 Ga/Gb	FMR53FMR54	XA01292F	XA01292F	XA01293F	XA01298F	XA01294	
МН	INMETRO: Ex ic IIC T6 Gc	FMR53FMR54	XA01289F	XA01290F	XA01291F	XA01297F	-	

			Feature 020 "Power Supply; Output"				
Feature 010	Approval	Available for	A 1)	B ²⁾	C ₃₎	E ⁴⁾ /G ⁵⁾	K ⁶⁾ /L ⁷⁾
NA	NEPSI Ex ia IIC T6 Ga	FMR53FMR54	XA01199F	XA01199F	XA01199F	XA01208F	-
NB	NEPSI Ex ia IIC T6 Ga/Gb	FMR53FMR54	XA01199F	XA01199F	XA01199F	XA01208F	-
NC	NEPSI Ex d[ia] IIC T6 Ga/Gb	FMR53FMR54	XA01202F	XA01202F	XA01202F	XA01211F	XA01202F
NG	NEPSI Ex nA II T6 Gc	FMR53FMR54	XA01201F	XA01201F	XA01201F	XA01210F	XA01201F
NH	NEPSI Ex ic IIC T6 Gc	FMR53FMR54	XA01201F	XA01201F	XA01201F	XA01210F	XA01201F
N2	NEPSI Ex ia IIC T6 Ga/Gb, Ex iaD 20/21 T85 90oC	FMR53FMR54	XA01205F	XA01205F	XA01205F	XA01214F	-
N3	NEPSI Ex d[ia] IIC T6 Ga/Gb, DIP A20/21 T8590oC IP66	FMR53FMR54	XA01206F	XA01206F	XA01206F	XA01215F	XA01206F
8A	FM/CSA IS+XP Cl.I,II,III Div.1 Gr.A-G	FMR53FMR54	XA01112FXA01113FXA01116FXA01117F	XA01113FXA01116F	XA01112FXA01113FXA01116FXA01117F	XA01114FXA01115FXA01118FXA01119F	-

- 1) 2-wire; 4-20mA HART
- 2) 2-wire; 4-20mA HART, switch output
- 3) 2-wire; 4-20mA HART, 4-20mA
- 4) 2-wire; FOUNDATION Fieldbus, switch output
- 5) 2-wire; PROFIBUS PA, switch output
- 6) 4-wire 90-253VAC; 4-20mA HART
- 7) 4-wire 10.4-48VDC; 4-20mA HART



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

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
BG	L or M	ATEX II 3G Ex nA [ia Ga] IIC T6 Gc
ВН	L or M	ATEX II 3G Ex ic [ia Ga] IIC T6 Gc
В3	L or M	ATEX II 1/2G Ex d [ia] IIC T6 Ga/Gb, ATEX II 1/2D Ex ta [ia Db] IIIC Txx°C Da/Db
IG	L or M	IECEx Ex nA [ia Ga] IIC T6 Gc
IH	L or M	IECEx Ex ic [ia Ga] IIC T6 Gc
I3	L or M	IECEx Ex d [ia] IIC T6 Ga/Gb, IECEx Ex ta [ia Db] IIIC Txx°C Da/Db
МН	L or M	Ex ic [ia Ga] IIC T6 Gc
NG	L or M	NEPSI Ex nA [ia Ga] IIC T6-T1 Gc
NH	L or M	NEPSI Ex ic [ia Ga] IIC T6-T1 Gc
N3	L or M	NEPSI Ex d [ia] IIC T6-T1 Ga/Gb, DIP A20/21 [ia D] TA, Txx°C IP6X

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

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 beginning work, the specialist staff must have read and understood the instructions in the Operating Instructions and supplementary documentation as well as in the certificates (depending on the application)
- ▶ Following instructions and basic conditions

The operating personnel must fulfill the following requirements:

- ► Being instructed and authorized according to the requirements of the task by the facility's owner-operator
- ► Following the instructions in these Operating Instructions

2.2 Designated use

Application and measured materials

The measuring device described in these Operating Instructions is intended for the continuous, contactless level measurement of liquids, pastes and sludge. Because of its operating frequency of about 6 GHz, a maximum radiated pulsed power of 12.03 mW and an average power output of 0.024 mW, the operation is completely harmless to humans and animals.

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 variables: level, distance, signal strength
- ► Calculated process variables: Volume or mass in arbitrarily shaped vessels; flow through measuring weirs or flumes (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.

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

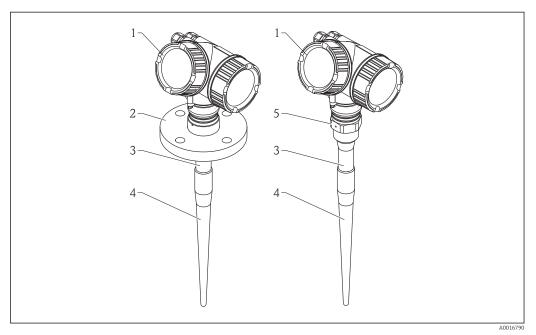
This measuring device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which they are safe to operate.

It meets general safety standards and legal requirements. It also complies with the EC directives listed in the device-specific EC Declaration of Conformity. Endress+Hauser confirms this by affixing the CE mark to the device.

3 Product description

3.1 Product design

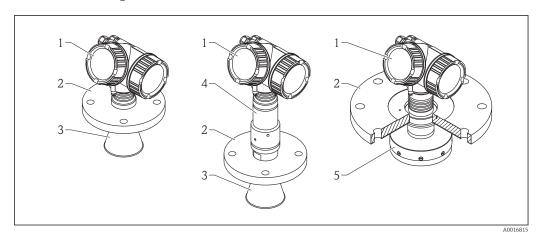
3.1.1 Micropilot FMR53



■ 1 Design of the Micropilot FMR53 (6 GHz)

- 1 Electronics housing
- 2 Flange
- 3 Inactive length
- 4 Active part of the antenna
- 5 Process connection (Thread)

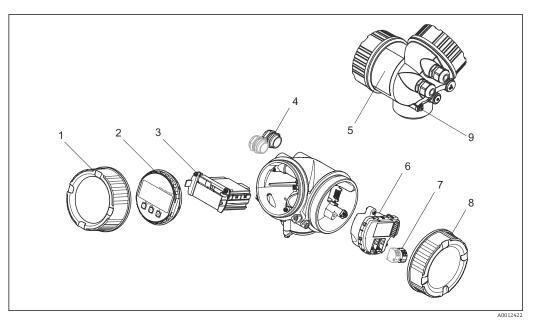
3.1.2 Micropilot FMR54



■ 2 Design of the Micropilot FMR54 (6 GHz)

- 1 Electronics housing
- 2 Flange
- 3 Horn antenna
- 4 High temperature antenna fitting
- 5 Planar antenna

3.1.3 **Electronics housing**



₽ 3 Design of the electronics housing

- 1 Electronics compartment cover
- 2 3 Display module Main electronics module
- 4 ${\it Cable glands (1 or 2, depending on instrument version)}$
- Nameplate
- I/O electronics module
- Terminals (pluggable spring terminals) Connection compartment cover
- 8
- Grounding terminal

3.2 Registered trademarks

HART®

Registered trademark of the HART Communication Foundation, Austin, USA

KALREZ®, VITON®

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

TEFLON⁶

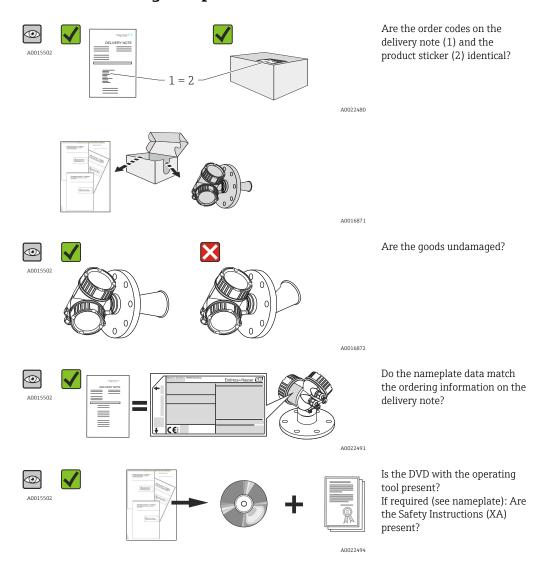
Registered trademark of E.I. DuPont de Nemours & Co., Wilmington, USA

TRI CLAMP®

Registered trademark of Alfa Laval Inc., Kenosha, USA

4 Incoming acceptance and product identification

4.1 Incoming acceptance



If one of these conditions is not satisfied, contact your Endress+Hauser Sales Center.

4.2 Product identification

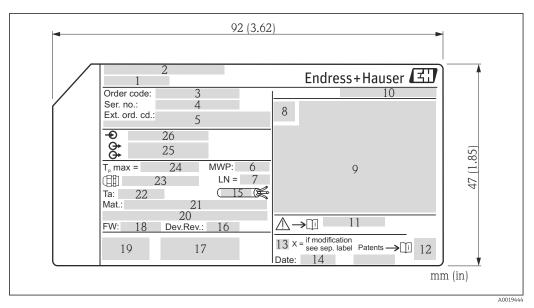
The following options are available for identification of the measuring device:

- Nameplate specifications
- Extended 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.

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.

4.2.1 Nameplate



Nameplate of the Micropilot

- 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 Antenna length (only for FMR51 with antenna extension)
- 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 Data Matrix Code
- 13 Modification mark
- 14 Manufacturing date: year-month
- 15 Temperature resistance of the cable
- 16 Geräterevision (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 Profibus PA: Profil-Version; FOUNDATION Fieldbus: Device ID
- 21 Material in contact with process
- 22 Permitted ambient temperature (T_a)
- 23 Size of the thread of the cable glands
- 24 Maximum process temperature
- 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: **Extended order code 1 to 3** parameter

5 Storage, Transport

5.1 Storage conditions

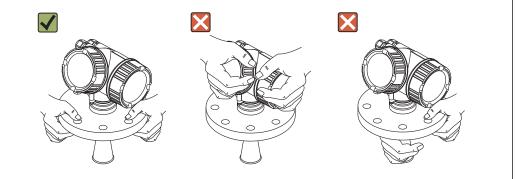
- Permitted storage temperature: -40 to +80 °C (-40 to +176 °F)
- Use the original packaging.

5.2 Transport product to the measuring point

NOTICE

Housing or antenna horn 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 antenna horn 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).

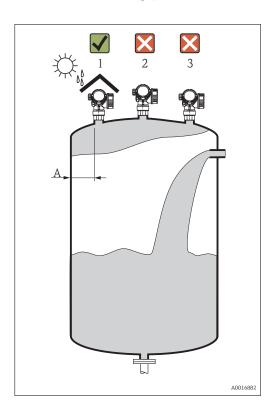


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6 Installation

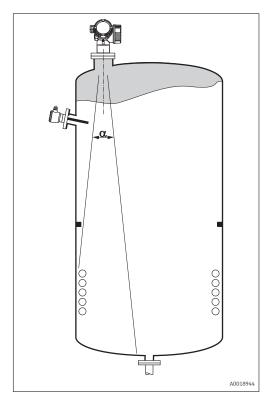
6.1 Installation conditions

6.1.1 Mounting position

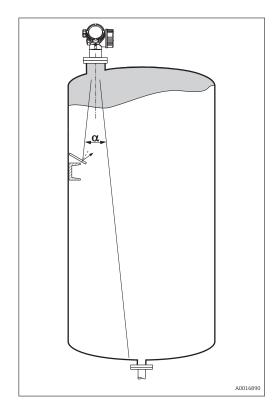


- Recommended distance A from wall to outer edge of nozzle: ~ 1/6 of tank diameter.
- Nevertheless the device should not be installed closer than 30 cm (11.8 in) to the tank wall.
- Not in the center (2), as interference can cause signal loss.
- Not above the fill stream (3).
- It is recommended to us a weather protection cover (1) in order to protect the device from direct sun or rain.

6.1.2 Vessel installations



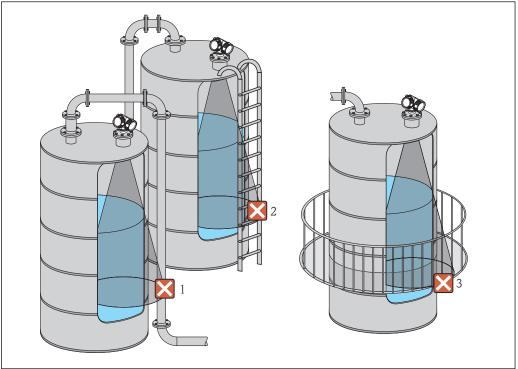
6.1.3 Reduction of interference echoes



Metallic screens mounted at a slope spread the radar signal and can, therefore, reduce interference echoes.

6.1.4 Measurement in a plastic vessel

If the outer wall of the vessel is made of a non-conductive material (e.g. GRP), microwaves can also be reflected off interfering installations outside the signal beam (e.g. metallic pipes (1), ladders (2), grates (3), ...). Therefore, there should be no such interfering installations in the signal beam. Please contact Endress+Hauser for further information.



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6.1.5 Optimization options

Antenna size

Mapping

The measurement can be optimized by means of electronic suppression of interference echoes.

See the **Confirm distance** parameter (\rightarrow $\stackrel{ riangle}{=}$ 107) for details.

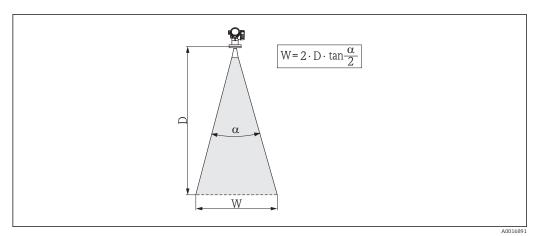
Antenna alignment

Stilling well

Metallic screens mounted at a slope

They spread the radar signals and can, therefore, reduce interference echoes.

6.1.6 Beam angle



 \blacksquare 5 Relationship between beam angle α , distance D and beamwidth diameter W

The beam angle is defined as the angle α where the energy density of the radar waves reaches half the value of the maximum energy density (3-dB-width). Microwaves are also emitted outside the signal beam and can be reflected off interfering installations.

Beam diameter W as a function of beam angle α and measuring distance \boldsymbol{D} :

FMR53			
Beam angle α	23°		
Measuring distance (D)	Beamwidth diameter W		
3 m (9.8 ft)	1.22 m (4 ft)		
6 m (20 ft)	2.44 m (8 ft)		
9 m (30 ft)	3.66 m (12 ft)		
12 m (39 ft)	4.88 m (16 ft)		
15 m (49 ft)	6.1 m (20 ft)		
20 m (66 ft)	8.14 m (27 ft)		

FMR54 - Horn antenna				
Antenna size	150 mm (6 in)	200 mm (8 in)	250 mm (10 in)	
Beam angle α	23°	19°	15°	
Distance (D)	nce (D) Beamwidth diameter W			
3 m (9.8 ft)	1.22 m (4 ft)	1 m (3.3 ft)	0.79 m (2.6 ft)	
6 m (20 ft)	2.44 m (8 ft)	2.01 m (6.6 ft)	1.58 m (5.2 ft)	
9 m (30 ft)	3.66 m (12 ft)	3.01 m (9.9 ft)	2.37 m (7.8 ft)	
12 m (39 ft)	4.88 m (16 ft)	4.02 m (13 ft)	3.16 m (10 ft)	
15 m (49 ft)	6.1 m (20 ft)	5.02 m (16 ft)	3.95 m (13 ft)	
20 m (66 ft)	8.14 m (27 ft)	6.69 m (22 ft)	5.27 m (17 ft)	

Endress+Hauser

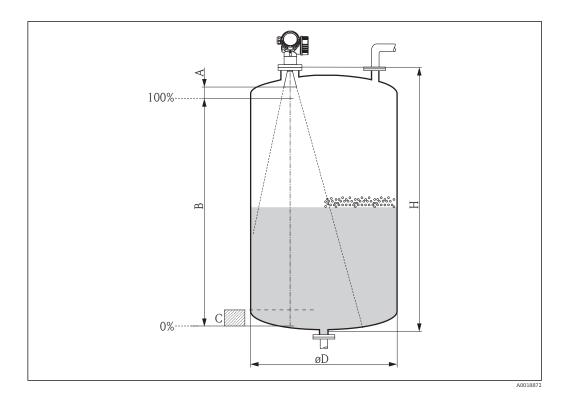
6.2 Measuring conditions

- In case of **boiling surfaces**, **bubbling** or tendency for **foaming** use FMR53 or FMR54. Depending on its consistence, foam can either absorb microwaves or reflect them off the foam surface. Measurement is possible under certain conditions. For FMR50, FMR51 and FMR52, the additional option "Advanced dynamics" is recommended in these cases (feature 540: "Application Package", option EM).
- In case of heavy steam development or condensate, the maximum measuring range of FMR50, FMR51 and FMR52 may decrease depending on density, temperature and composition of the steam → use FMR53 or FMR54.
- For the measurement of absorbing gases such as **ammonia NH**₃ or some **fluorocarbons** ²⁾, please use Levelflex or Micropilot FMR54 in a stilling well.
- The measuring range begins, where the beam hits the tank bottom. Particularly with dish bottoms or conical outlets the level cannot be detected below this point.
- For stilling well applications, the zero should be positioned at the end of the tube, as the electromagnetic waves do not propagate completely outside the tube. It must be taken into account that the accuracy may be reduced in the area **C**. In order to guarantee the required accuracy in these cases, it is recommended to position the zero-point at a distance **C** above the end of the tube (see figure).
- In case of media with a low dielectric constant ($\epsilon_r = 1.5$ to 4) ³⁾ the tank bottom can be visible through the medium at low levels (low height **C**). Reduced accuracy has to be expected in this range. If this is not acceptable, we recommend positioning the zero point at a distance **C** (see figure) above the tank bottom in these applications.
- In principle it is possible to measure up to the tip of the antenna with FMR51, FMR53 and FMR54. However, due to considerations regarding corrosion and build-up, the end of the measuring range should not be chosen any closer than **A** (see figure) to the tip of the antenna.
- When using FMR54 with planar antenna, especially for media with low dielectric constants, the end of the measuring range should not be closer than **A: 1 m (3.28 ft)** to the flange.
- The smallest possible measuring range **B** depends on the antenna version (see figure).
- The tank height should be at least **H** (see table).

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²⁾ Affected compounds are e.g. R134a, R227, Dymel 152a.

³⁾ Dielectric constants of important media commonly used in various industries are summarized in the DC manual (CP01076F) and in the Endress +Hauser "DC Values App" (available for Android and iOS).



 Device
 A
 B
 C
 H

 FMR53
 50 mm (1.97 in)
 A
 50 mm (1.97 in)
 A
 A
 A
 A
 A
 B
 C
 C
 H
 A
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6.3 Mounting cladded flanges

- For cladded flanges of FMR53, 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.

Flange size	Number of screws	Recommended torque [Nm]			
		minimum	maximum		
EN					
DN50/PN16	4	45	65		
DN80/PN16	8	40	55		
DN100/PN16	8	40	60		
DN150/PN16	8	75	115		
ASME	ASME				
2"/150lbs	4	40	55		
3"/150lbs	4	65	95		
4"/150lbs	8	45	70		
6"/150lbs	8	85	125		

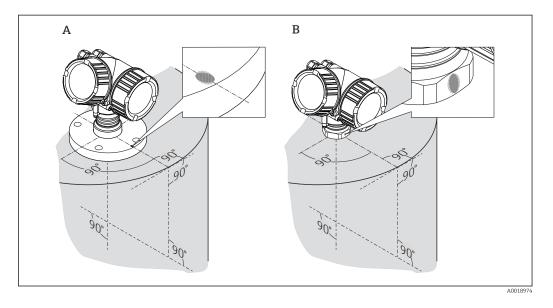
Flange size	Number of screws	Recommended torque [Nm]	
		minimum	maximum
JIS			
10K 50A	4	40	60
10K 80A	8	25	35
10K 100A	8	35	55
10K 100A	8	75	115

6.4 Installation in vessel (free space)

6.4.1 Rod antenna (FMR53)

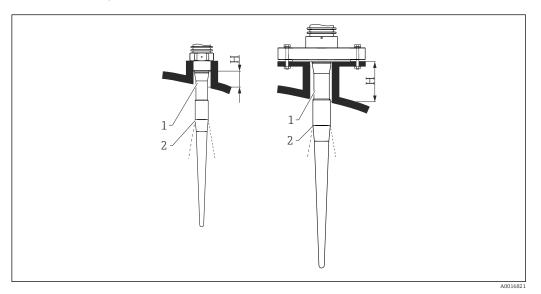
Alignment

- Align the antenna vertically to the product surface.
- A marking at the flange (somwhere between the flange holes) or the boss enables alignment of the antenna. This marking must be aligned towards the tank wall as well as possible.



Depending on the device version the marking may be a circle or two short parallel lines.

Nozzle mounting



■ 6 Nozzle height an diameter for the rod antenna (FMR53)

- 1 Inactive length of the antenna
- 2 Beam launched here

Antenna length	390 mm (15.4 in)	540 mm (21.3 in)	
Nozzle height H	< 100 mm (3.94 in)	< 250 mm (9.84 in)	

- The inactive part (1) of the rod antenna must extend below the nozzle.
- For flanges with PTFE cladding: Observe the notes on the mounting of cladded flanges →

 23.
 - Usually, the PTFE flange cladding also serves as a seal between the nozzle and the device flange.

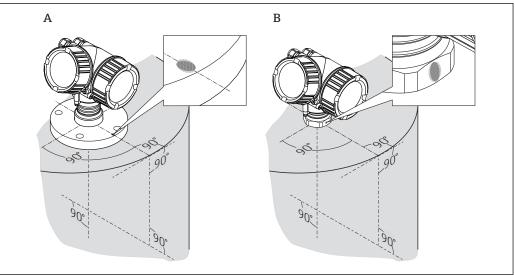
Threaded connection

- Tighten with the hexagonal nut only.
- Tool: 55 mm hexagonal wrench
- Maximum permissible torque:
 - Thread PVDF: 35 Nm (26 lbf ft)Thread 316L: 60 Nm (44 lbf ft)

6.4.2 Horn antenna (FMR54)

Alignment

- Align the antenna vertically to the product surface.
- A marking at the flange (somwhere between the flange holes) enables alignment of the antenna. This marking must be aligned towards the tank wall as well as possible.

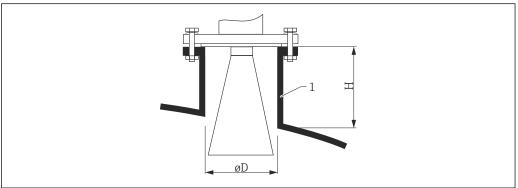


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Depending on the device version the marking may be a circle or two short parallel lines.

Nozzle mounting

The horn antenna must extend below the nozzle; if necessary select the device version with antenna extension 100 to 400 mm (4 to 16 in) $^{4)}$.



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■ 7 Nozzle height and diameter for the horn antenna (FMR54)

1 Mounting nozzle

Antenna 1)	Nozzle diameter D	Maximum nozzle height H_{max}^{2}
BE: 150mm/6"	146 mm (5.75 in)	205 mm (8.07 in)
BF: 200mm/8"	191 mm (7.52 in)	290 mm (11.4 in)
BG: 250mm/10"	241 mm (9.49 in)	380 mm (15 in)

- Feature 070 of the product structure; the antenna versions BC (Horn 80 mm/3") and BD (Horn 100 mm/4") should not be mounted directly into the tank. They are only suited for bypass and stilling well applications.
- 2) valid for antennas without antenna extension

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See product structure: feature 610 "Accessory Mounted", options OM, ON, OR, OS.

Measurement from the outside through plastic walls

- Dielectric constant of the medium: $\varepsilon_r > 10$
- If possible use the 250 mm (10 in) antenna.
- The distance between the lower edge of the antenna and the tank should be about 100 mm (4 in).
- If possible, avoid mounting location where condensation or build-up might occur.
- In case of outdoor mounting, the space between antenna and vessel has to be protected from the elements.
- Do not mount any potential reflectors (e.g. pipes) outside the tank in the signal beam.

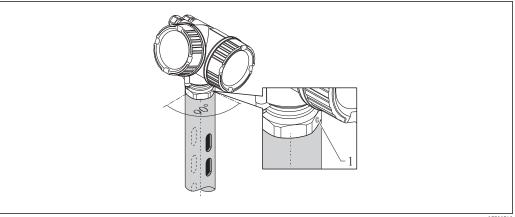
Suitable thickness of the tank ceiling

Penetrated material	PE	PTFE	PP	Plexiglas
DK / ε _r	2.3	2.1	2.3	3.1
Optimum thickness	16 mm (0.65 in)	17 mm (0.68 in)	16 mm (0.65 in)	14 mm (0.56 in)

6.4.3 Planar antenna (FMR54)

used for free space applications.

6.5 Installation in stilling well



₩ 8 Installation in stilling well

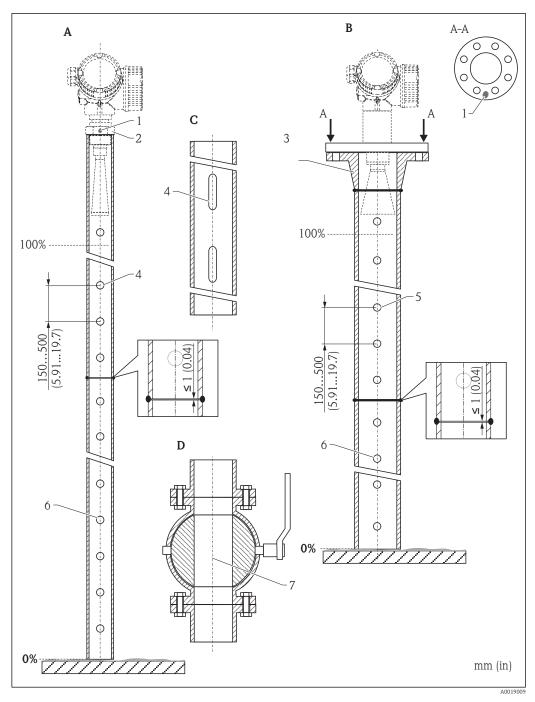
- Marking for antenna alignment
- For horn antenna: Align the marking towards the slots of the stilling well.
- No alignment is required for planar antennas.
- Measurements can be performed through an open full bore ball valve without any problems.
- After mounting, the housing can be turned 350° in order to facilitate access to the display and the terminal compartment $\rightarrow \equiv 32$.

6.5.1 Recommendations for the stilling well

- Metal (no enamel coating; plastic on request).
- Constant diameter.
- Diameter of stilling well not larger than antenna diameter.
- Diameter difference between horn antenna and inner diameter of the stilling well as small as possible.
- Weld seam as smooth as possible and on the same axis as the slots.
- Slots offset 180° (not 90°).

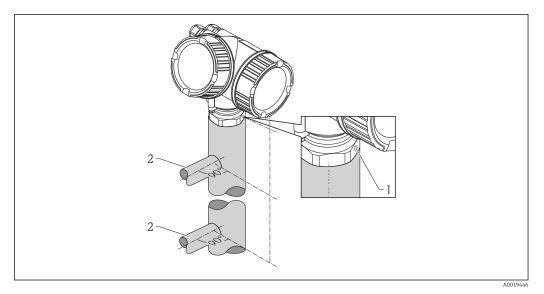
- Slot width or diameter of holes max. 1/10 of pipe diameter, de-burred. Length and number do not have any influence on the measurement.
- Select horn antenna as big as possible. For intermedaite sizes (e.g. 180 mm (7 in)) select next larger antenna and adapt it mechanically (for horn antennas)
- At any transition (i.e. when using a ball valve or mending pipe segments), no gap may be left exceeding 1 mm (0.04 in).
- The stilling well must be smooth on the inside (average roughness $R_z \le 6.3 \ \mu m$ (248 μin)). Use extruded or parallel welded metal pipe. An extension of the pipe is possible with welded flanges or pipe sleeves. Flange and pipe have to be properly aligned at the inside.
- Do not weld through the pipe wall. The inside of the stilling well must remain smooth. In case of unintentional welding through the pipe, the weld seam and any unevenness on the inside need to be carefully removed and smoothened. Otherwise, strong interference echoes will be generated and material build-up will be promoted.
- In the case of smaller nominal widths flanges must be welded to the pipe such that they allow for a correct orientation (marker aligned toward slots).
- The performance of Micropilot FMR54 with planar antenna is not dependent on the alignment or geometry of standard stilling wells. No special alignment is required. However, make sure that the planar antenna is installed vertically relative to the stilling well axis.

6.5.2 Examples for the construction of stilling wells



- Micropilot FMR50/FMR51: Horn 40mm(1½")
- B Micropilot FMR50/FMR51/FMR52/FMR54: Horn 80mm(3")
- C Stilling well with slots
- D Full bore ball valve
- 1 Marking for axial alignment
- 2 Threaded connection
- 3 e.g. welding neck flange DIN2633
- 4 ϕ hole max. $1/10 \phi$ stilling well
- 5 ϕ hole max. 1/10 ϕ stilling well; single sided or drilled through
- 6 Inside of holes deburred
- 7 Diameter of opening of ball valve must always be equivalent to pipe diameter; avoid edges and constrictions.

6.6 Installation in bypass



Installation in bypass

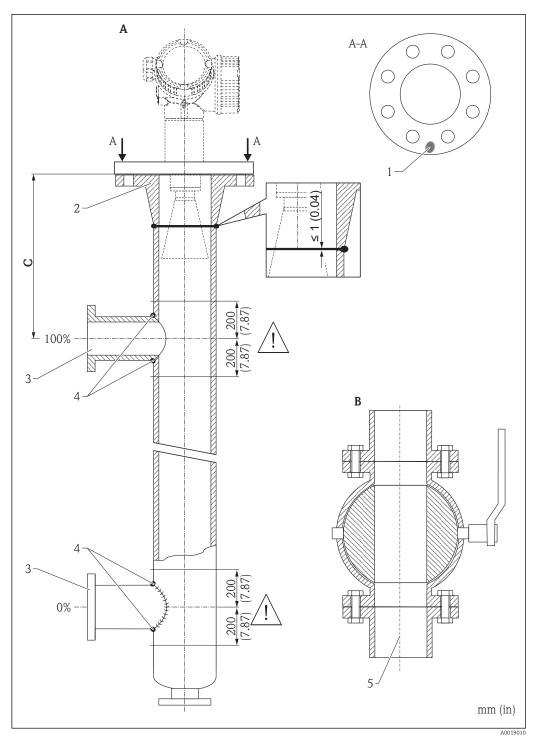
- 1 Marking for antenna alignment
- 2 Tank connectors
- Alighn the marker perpendicular (90°) to the tank connectors.
- Measurements can be performed through an open full bore ball valve without any problems.
- After mounting, the housing can be turned 350° in order to facilitate access to the display and the terminal compartment →

 32.

6.6.1 Recommendations for the bypass pipe

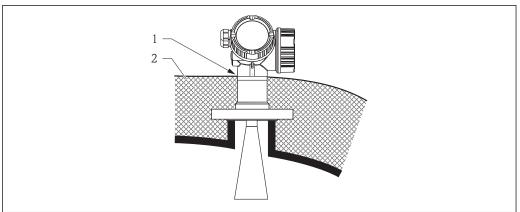
- Metal (no plastic or enamel coating).
- Constant diameter.
- Select horn antenna as big as possible. For intermediate sizes (e.g. 95 mm (3.5 in)) select next larger antenna and adapt it mechanically (for horn antennas).
- Diameter difference between horn antenna and inner diameter of the bypass as small as possible.
- At any transition (i.e. when using a ball valve or mending pipe segments), no gap may be created exceeding 1 mm (0.04 in).
- In the area of the tank connections ($\sim \pm 20$ cm (7.87 in)) a reduced accuracy of the measurement has to be expected.

6.6.2 Example for the construction of a bypass



- A Micropilot FMR50/FMR51/FMR52/FMR54: Horn 80mm(3")
- B Full bore ball valve
- C Minimum distance to upper connection pipe: 400 mm (15,7 in)
- 1 Marking for axial alignment
- 2 e.g. welding neck flange DIN2633
- 3 Diameter of the connection pipes as small as possible
- 4 Do not weld through the pipe wall; the inside of the bypass must remain smooth.
- 5 Diameter of opening of ball valve must always be equivalent to pipe diameter. Avoid edges and constrictions.

6.7 Vessels with heat insulation

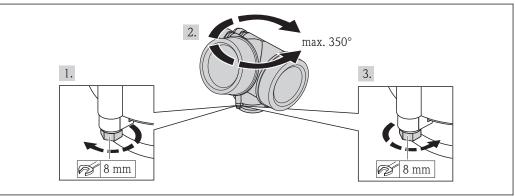


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If process temperatures are high, the device must be included in normal tank insulation to prevent the electronics heating up as a result of heat radiation or convection. The insulation may not exceed beyond the neck of the housing.

6.8 Turning the transmitter housing

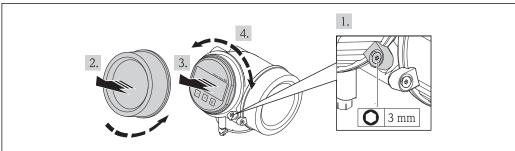
To provide easier access to the connection compartment or display module, the transmitter housing can be turned:



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- 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 plastics housing; 2,5 Nm for aluminium or stainless steel housing).

6.9 Turning the display module



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- 1. If present: Loosen the screw of the securing clamp of the electronics compartment cover using an Allen key and turn the clamp 90° conterclockwise.
- 2. Unscrew cover of the electronics compartment from the transmitter housing.
- 3. Pull out the display module with a gentle rotation movement.
- 4. Rotate the display module into the desired position: Max. $8 \times 45^{\circ}$ in each direction.
- 5. Feed the spiral cable into the gap between the housing and main electronics module and plug the display module into the electronics compartment until it engages.
- 6. Screw the cover of the electronics compartment firmly back onto the transmitter housing.
- 7. Tighten the securing clamp again using the Allen key (Torque: 2.5 Nm).

6.10 Post-installation check

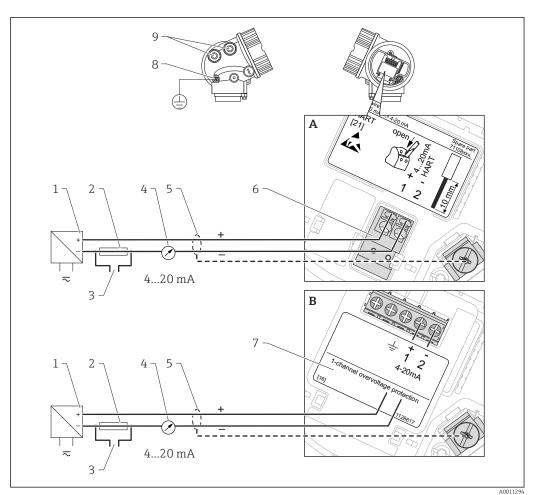
0	Is the device undamaged (visual inspection)?
O	Does the device conform to the measuring point specifications? For example: Process temperature Process pressure (refer to the chapter on "Material load curves" of the "Technical Information" document) Ambient temperature range Measuring range
0	Are the 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

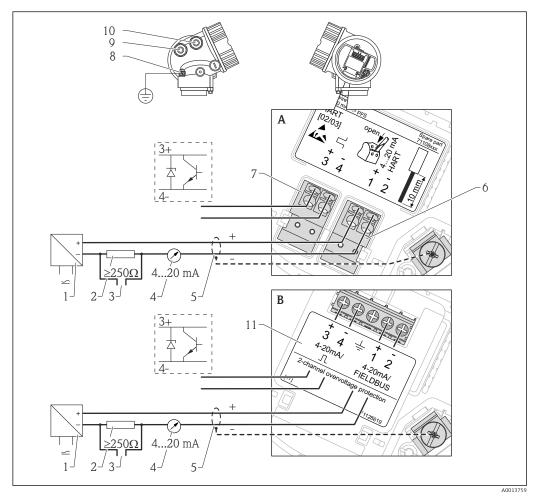
2-wire: 4-20mA HART



■ 10 Terminal assignment 2-wire; 4-20mA HART

- A Without integrated overvoltage protection
- B With integrated overvoltage protection
- 1 Active barrier with power supply (e.g. RN221N): Observe terminal voltage
- 2 HART communication resistor (\geq 250 Ω): Observe maximum load
- 3 Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)
- 4 Analog display device: Observe maximum load
- 5 Cable screen; observe cable specification
- 6 4-20mA HART (passive): Terminals 1 and 2
- 7 Overvoltage protection module
- 8 Terminal for potential equalization line
- 9 Cable entry

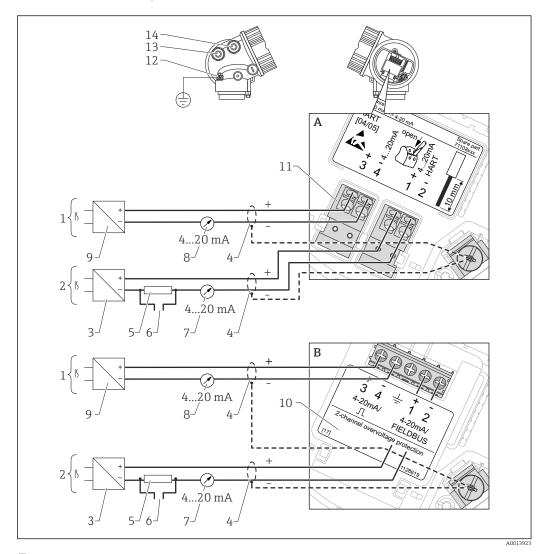
2-wire: 4-20mA HART, switch output



🛮 11 Terminal assignment 2-wire; 4-20mA HART, switch output

- A Without integrated overvoltage protection
- B With integrated overvoltage protection
- 1 Active barrier with power supply (e.g. RN221N): Observe terminal voltage
- 2 HART communication resistor (\geq 250 Ω): Observe maximum load
- 3 Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)
- 4 Analog display device: Observe maximum load
- 5 Cable screen; observe cable specification
- 6 4-20mA HART (passive): Terminals 1 and 2
- 7 Switch output (open collector): Terminals 3 and 4
- 8 Terminal for potential equalization line
- 9 Cable entry for 4-20mA HART line
- 10 Cable entry for switch output line
- 11 Overvoltage protection module

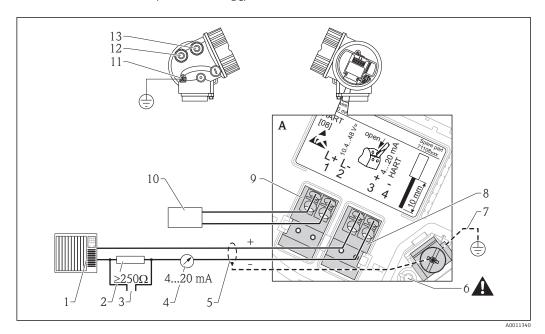
2-wire: 4-20mA HART, 4-20mA



■ 12 Terminal assignment 2-wire, 4-20 mA HART, 4...20mA

- A Without integrated overvoltage protection
- B With integrated overvoltage protection
- 1 Connection current output 2
- 2 Connection current output 1
- $3\qquad \textit{Supply voltage for current output 1 (e.g. RN221N); Observe terminal voltage}$
- 4 Cable screen; observe cable specification
- 5 HART communication resistor (\geq 250 Ω): Observe maximum load
- 6 Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)
- 7 Analog display device ; observe maximum load
- 8 Analog display device; observe maximum load
- 9 Supply voltage for current output 2 (e.g. RN221N); Obeserve terminal voltage
- 10 Overvoltage protection module
- 11 Current output 2: Terminals 3 and 4
- 12 Terminal for the potential equalization line
- 13 Cable entry for current output 1
- 14 Cable entry for current output 2
- This version is also suited for single-channel operation. In this case, current output 1 (terminals 1 and 2) must be used.

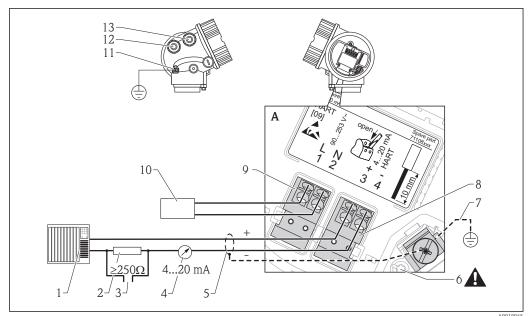
4-wire: 4-20mA HART (10.4 to 48 V_{DC})



■ 13 Terminal assignment 4-wire; 4-20mA HART (10.4 to 48 VDC)

- 1 Evaluation unit, e.g. PLC
- 2 HART communication resistor (\geq 250 Ω): Observe maximum load
- 3 Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)
- 4 Analog display device: Observe maximum load
- 5 Signal cable including screening (if required), observe cable specification
- 6 Protective connection; do not disconnect!
- 7 Protective earth, observe cable specification
- 8 4...20mA HART (active): Terminals 3 and 4
- 9 Supply voltage: Terminals 1 and 2
- 10 Supply voltage: Observe terminal voltage, observe cable specification
- 11 Terminal for potential equalization
- 12 Cable entry for signal line
- 13 Cable entry for power supply

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



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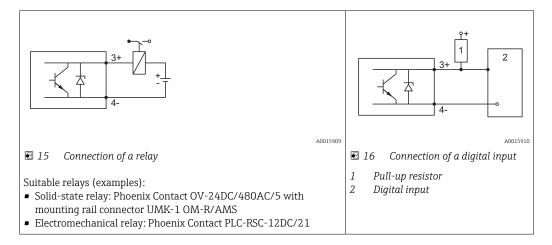
- 14 Terminal assignment 4-wire; 4-20mA HART (90 to 253 VAC)
- 1 Evaluation unit, e.g. PLC
- 2 HART communication resistor ($\geq 250 \Omega$): Observe maximum load
- 3 Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)
- 4 Analog display device: Observe maximum load
- 5 Signal cable including screening (if required), observe cable specification
- 6 Protective connection; do not disconnect!
- 7 Protective earth, observe cable specification
- 8 4...20mA HART (active): Terminals 3 and 4
- 9 Supply voltage: Terminals 1 and 2
- 10 Supply voltage: Observe terminal voltage, observe cable specification
- 11 Terminal for potential equalization
- 12 Cable entry for signal line
- 13 Cable entry for power supply

A CAUTION

To ensure electrical safety:

- ▶ Do not disconnect the protective connection (6).
- ▶ Disconnect the supply voltage before disconnecting the protective earth (7).
- Connect protective earth to the internal ground terminal (7) before connecting the supply voltage. If necessary, connect the potential matching line to the external ground terminal (11).
- 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).

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

- Minimum cross-section: See the "Terminal" specification in the Technical Information for the device.
- For ambient temperature $T_U \ge 60$ °C (140 °F): use cable for temperature $T_U + 20$ K.

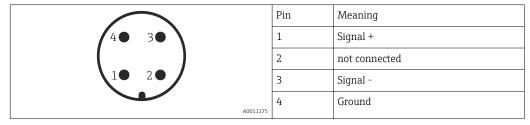
HART

- A normal device cable suffices if only the analog signal is used.
- A shielded cable is recommended if using the HART protocol. Observe grounding concept of the plant.
- For 4-wire devices: Standard device cable is sufficient for the power line.

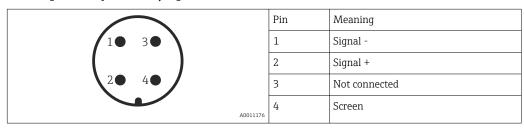
7.1.3 Device plug connectors

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

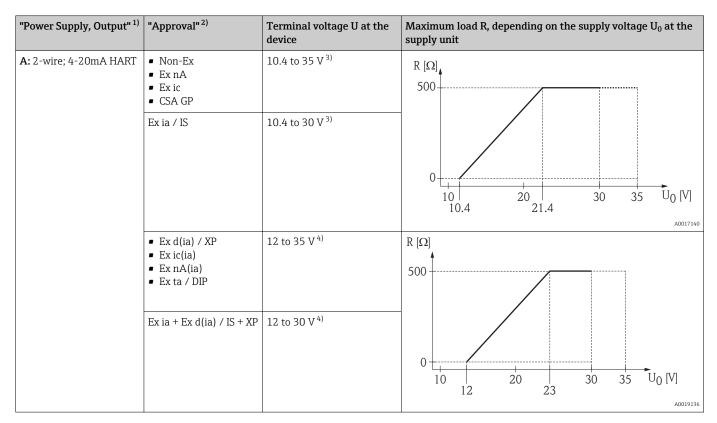


Pin assignment of the 7/8" plug connector



7.1.4 Supply voltage

2-wire, 4-20mA HART, passive



- 1) Feature 020 of the product structure
- 2) Feature 010 of the product structure
- For ambient temperatures $T_a \le -20$ °C (-4 °F) a minimum voltage of 15 V is required for the sartup of the device at the MIN error current (3,6 mA). The startup current can be parametrized. If the device is operated with a fixed current $I \ge 5,5$ mA (HART multidrop mode), a voltage of $U \ge 10,4$ V is sufficient throughout the entire range of ambient temperatures.
- For ambient temperatures $T_a \le -20$ °C (-4 °F) a minimum voltage of 16 V is required for the startup of the device at the MIN error current (3.6 mA).

"Power Supply, Output" 1)	"Approval" 2)	Terminal voltage U at the device	Maximum load R, depending on the supply voltage \mathbf{U}_0 at the supply unit
B: 2-wire; 4-20 mA HART, switch output	 Non-Ex Ex nA Ex nA(ia) Ex ic Ex ic(ia) Ex d(ia) / XP Ex ta / DIP CSA GP 	12 to 35 V ³⁾	R [Ω] 500
	 Ex ia / IS Ex ia + Ex d(ia) / IS + XP 	12 to 30 V ³⁾	10 20 30 35 U ₀ [V] 12 23

- 1) Feature 020 of the product structure
- 2) Feature 010 of the product structure
- 3) For ambient temperatures $T_a \le -30$ °C (-22 °F) a minimum voltage of 16 V is required for the startup of the device at the MIN error current (3.6 mA).

"Power Supply, Output" 1)	"Approval" 2)	Terminal voltage U at the device	Maximum load R, depending on the supply voltage \mathbf{U}_0 at the supply unit
C: 2-wire; 4-20mA HART, 4-20mA	any	12 to 30 V ³⁾	R [Ω] 500 10 20 30 U ₀ [V] 12 23

- Feature 020 of the product structure Feature 010 of the product structure 1)
- 2) For ambient temperatures $T_a \le -30 \,^{\circ}\text{C}$ (-22 °F) a minimum voltage of 16 V is required for the startup of the device at the MIN error current (3.6 mA).

Polarity reversal protection	Yes
Admissible residual ripple at f = 0 to 100 Hz	$U_{SS} < 1 \text{ V}$
Admissible residual ripple at f = 100 to 10000 Hz	U _{SS} < 10 mV

4-wire, 4-20mA HART, active

"Power supply; Output" 1)	Terminal voltage	Maximum load R _{max}
K: 4-wire 90-253VAC; 4-20mA HART	90 to 253 V _{AC} (50 to 60 Hz), overvoltage category II	500 Ω
L: 4-wire 10,4-48VDC; 4-20mA HART	10.4 to 48 V _{DC}	

1) Feature 020 of the product structure

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 $8/20~\mu s$), overvoltage protection has to be ensured by an integrated or external overvoltage protection module.

Integrated overvoltage protection

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 * 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	

External overvoltage protection

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

For detailed information please refer to the following documents:

HAW562: TI01012KHAW569: TI01013K

7.2 Connecting the device

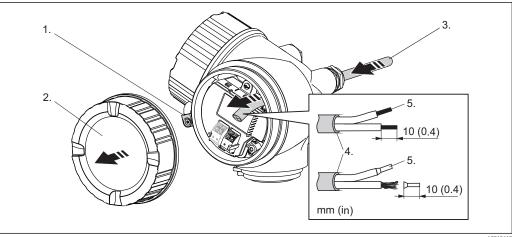
A WARNING

Explosion hazard!

- ► Comply with the relevant national standards.
- ▶ Observe the specifications in the Safety Instructions (XA).
- ▶ Only use the specified cable glands.
- ► Check whether the supply voltage matches the specifications on the nameplate.
- ▶ Before connecting the device: Switch the supply voltage off.
- ▶ Before switching on the supply voltage: Connect the potential bonding line to the exterior ground terminal.

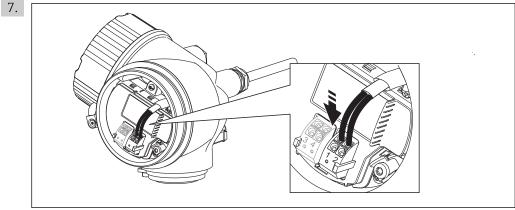
Required tools and accessories:

- For instruments with safety pin for the lid: AF 3 Allen key
- Wire stripping pliers
- When using stranded wires: Wire end sleeves.



A0012619

- 1. Loosen the screw of the securing clamp of the connection compartment cover and turn the clamp 90° counterclockwise.
- 2. Unscrew the connection compartment cover.
- 3. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.
- 4. Strip the cable.
- 5. Strip the cable ends 10 mm (0.4 in). For stranded cables, also attach wire end ferrules.
- 6. Firmly tighten the cable glands.



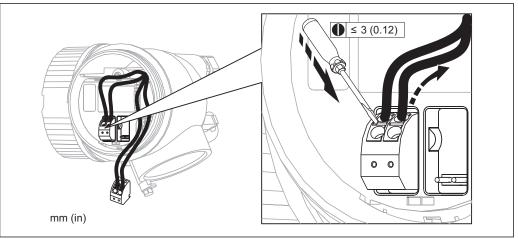
A0013837

- 8. When using screened cable: Connect the cable screen to the ground terminal.
- 9. Screw the cover onto the connection compartment.
- 10. For instruments with safety pin for the lid: Adjust the safety pin so that its edge is over the edge of the display lid. Tighten the safety pin.

7.2.1 Pluggable spring-force terminals

Instruments without integrated overvoltage protection have pluggable spring-force terminals. Rigid conductors or flexible conductors with cable sleeve can directly be inserted and are contacted automatically.

To remove cables from the terminal: Press on the groove between the terminals using a flat-tip screwdriver \leq 3 mm (0.12 inch) while pulling the cables out of the terminals.



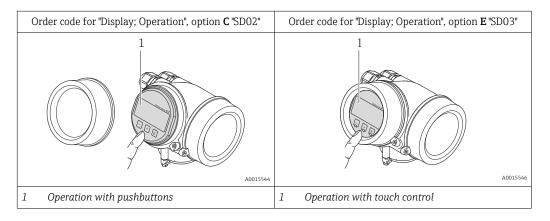
Post-connection check 7.3

0	Are cables or the device undamaged (visual inspection)?
0	Do the cables comply with the requirements?
0	Do the cables have adequate strain relief?
0	Are all cable glands installed, firmly tightened and correctly sealed?
0	Does the supply voltage match the specifications on the transmitter nameplate?
0	Is the terminal assignment correct → 🖺 34?
0	If required: Is the protective earth connected correctly?
0	If supply voltage is present: Is the device ready for operation and do values appear on the display module?
0	Are all housing covers installed and firmly tightened?
0	Is the securing clamp tightened correctly?

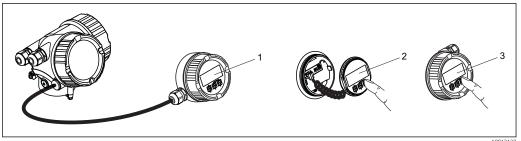
Operation options 8

8.1 Overview

8.1.1 Local operation



8.1.2 Operation with remote display and operating module FHX50

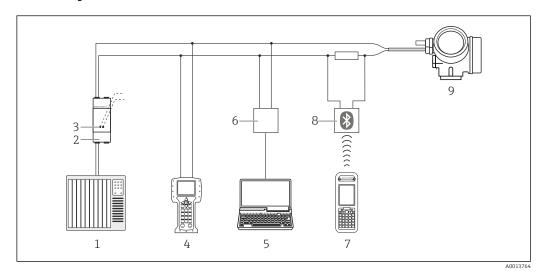


FHX50 operating options

- Housing of the remote display and operating module FHX50
- Display and operating module SD02, push buttons; cover must be removed
- Display and operating module SD03, optical keys; can be operated through the glass of the cover

8.1.3 Remote operation

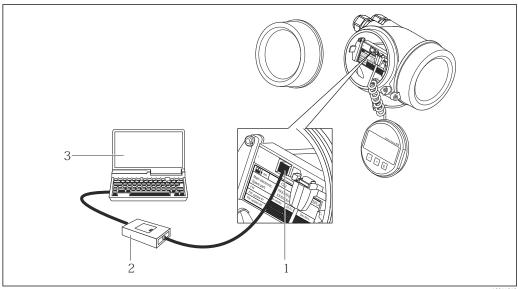
Via HART protocol



■ 18 Options for remote operation via HART protocol

- 1 PLC (programmable logic controller)
- 2 Transmitter power supply unit, e.g. RN221N (with communication resistor)
- 3 Connection for Commubox FXA191, FXA195 and Field Communicator 375, 475
- 4 Field Communicator 475
- $5 \qquad \textit{Computer with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)}$
- 6 Commubox FXA191 (RS232) or FXA195 (USB)
- 7 Field Xpert SFX350/SFX370
- 8 VIATOR Bluetooth modem with connecting cable
- 7 Transmitter

Via service interface (CDI)



- A001401
- 1 Service interface (CDI) of the measuring device (= Endress+Hauser Common Data Interface)
- 2 Commubox FXA291
- 3 Computer with "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 onsite display.
Setup	Parameter 1	When all these parameters have been assigned appropriate values, the
	Parameter N	measured should be completely configured in a standard application.
	Advanced setup	Contains further 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 2)	Contains the last 20 messages (which are no longer active).
	Device information	Contains information needed to identify the device.
	Measured values	Contains all current measured values.
	Data logging	Contains the history of the individual measuring values.
	Simulation	Used to simulate measured values or output values.
	Device check	Contains all parameters needed to check the measurement capability of the device.
Expert 3) Contains all parameters of the device (including those which are already contained	System	Contains all general device parameters which do not affect the measurement or the communication interface.
in one of the above submenus). This menu is organized according to the function blocks of the device.	Sensor	Contains all parameters needed to configure the measurement.
The parameter of the Expert menu are described in: GP01014F (HART)	Output	 Contains all parameters needed to configure the current output. Contains all parameters needed to configure the switch output (PFS).
	Communication	Contains all parameters needed to configure the digital communication interface.
	Diagnostics	Contains all parameters needed to detect and analyze operational errors.

In case of operation via operating tools (e.g. FieldCare), the "Language" parameter is located at "Setup \rightarrow Advanced setup → Display"

²⁾ 3) only available with local operation

On entering the "Expert" menu, an access code is always requested. If a customer specific access code has not been defined, "0000" has to be entered.

8.2.2 User roles and related access authorization

The two user roles **Operator** and **Maintenance** have different write access to the parameters if a device-specific access code has been defined. This protects the device

Access authorization to parameters

Use	er role	Read access		Write access	
		Without access code (from the factory)	With access code	Without access code (from the factory)	With access code
Op	erator	~	V	V	
Main	tenance	~	~	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 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

- 1. Navigate to: "Setup" menu → 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 a-symbol appears in front of all write-protected parameters.

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

- 1. Navigate to: "Setup" menu \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.

If no key is pressed for 10 minutes in the navigation and editing mode, the device automatically locks the write-protected parameters. If the user goes from the navigation and editing mode back to the measured value display mode, the device automatically locks the write-protected parameters after 60 s.



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

8.2.4 Disabling write protection via access code

If the $\widehat{\mathbb{B}}$ -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 $\rightarrow \cong 50$.

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

- 1. After you press ©, the input prompt for the access code appears.
- 2. Enter the access code.
 - The a-symbol in front of the parameters disappears; all previously write-protected parameters are now re-enabled.

8.2.5 Deactivation of the write protection via access code

Via local display

- 1. Navigate to "Setup" menu → 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 operating tool (e.g. FieldCare)

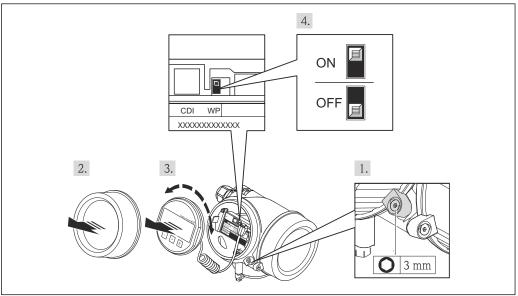
- 1. Navigate to "Setup" menu \rightarrow Advanced setup \rightarrow Administration \rightarrow Define access code
- 2. Enter **0000**.
 - The write protection is deactivated. Parameters can be changed without entering an access code.

8.2.6 Write protection via write protection switch

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

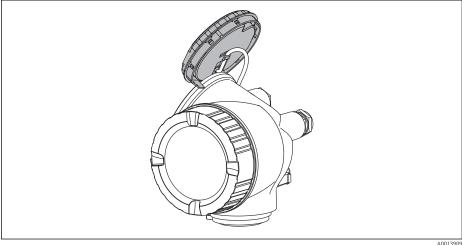
The parameter values are now read only and cannot be edited any more (exception "Contrast display" parameter):

- Via local display
- Via service interface (CDI)
- Via HART protocol



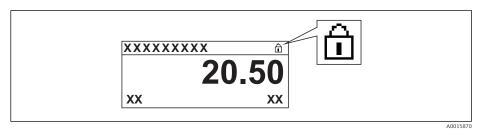
A00261

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



A0013909

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



If the hardware write protection is disabled: No option is displayed in the **Locking status** parameter. The \mathbb{G} -symbol disappears in the header of the measured value display and in the navigation view in front of the parameters.

- 5. Feed the spiral 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. Screw the electronics compartment cover closed and tighten the securing clamp.

8.2.7 Enabling and disabling the keypad lock

The keypad lock allows to disable access to the entire operating menu via local operation. Thus navigating through the operating menu or modifying the values of individual parameters is no longer possible. Only the measured values on the measured value display can be read off.

The keylock is enabled and disabled via a context menu.

Enabling the keylock

For the SD03 display:

The keylock is automatically activated:

- If the device has not been operated via the display for > 1 minute.
- After a restart of the device.

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. Select **Keylock on** from the context menu.
 - The keylock is enabled.
- When attempting to access the operating menu while the keylock is enabled, the **Keylock on** message appears.

Disabling the keylock

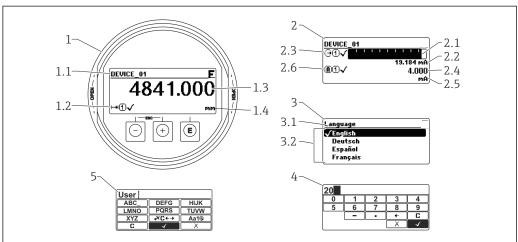
1. The keylock is enabled.

Press **E** for at least 2 seconds.

- ► A context menu appears.
- 2. Select **Keylock off** from the context menu.
 - The keylock is disabled.

8.3 Display and operating module

8.3.1 Display appearance



40012626

■ 19 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
A0011975	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
A0011974	Setup Is displayed: in the main menu next to the selection "Setup" in the header, if you are in the "Setup" menu
A0011976	Expert Is displayed: in the main menu next to the selection "Expert" in the header, if you are in the "Expert" menu
Q A0011977	Diagnostics Is displayed: in the main menu next to the selection "Diagnostics" in the header, if you are in the "Diagnostics" menu

Status signals

F	A0013956	"Failure" A device error is present. The measured value is no longer valid.
С	A0013959	"Function check" The device is in service mode (e.g. during a simulation).
s	A0013958	 "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)
М	A0013957	"Maintenance required" Maintenance is required. The measured value is still valid.

Display symbols for the locking state

Symbol	Meaning	
A0011978	Display parameter Marks display-only parameters which can not be edited.	
Д	Device locked	
A0011979	 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

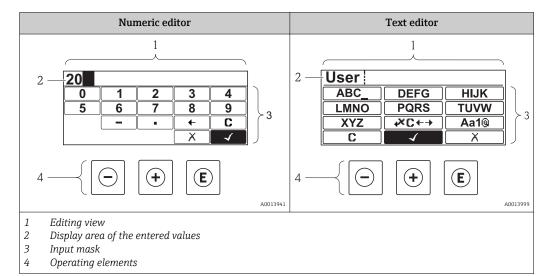
Symbol	Meaning			
Measured	Measured values			
A0011995	Level			
A0011996	Distance			
A0011998	Current output			
(A) A0011999	Measured current			
A0012106	Terminal voltage			
A0012104	Temperature of the electronics or the sensor			
Measuring	channels			
A0012000	Measuring channel 1			
(<u>2</u>)	Measuring channel 2			
Status of the	he measured value			
A0012102	Status "Alarm" The measurment is interrupted. The output assumes the defined alarm value. A diagnostic message is generated.			
A0012103	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.
Ai	.0013969	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.
A	.0013970	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)	.0013952	 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)
(-)+(+)	.0013971	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)
A	.0013953	Reduces the contrast (brighter setting).
++E		Plus/Enter key combination (press and hold down the keys simultaneously)
Ai	.0013954	Increases the contrast (darker setting).
-+++E		Minus/Plus/Enter key combination (press and hold down the keys simultaneously)
	.0013955	For measured value display Enables or disables the keypad lock.

58

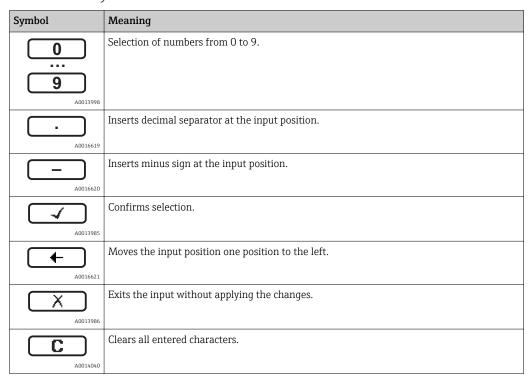
8.3.3 Entering numbers and text



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

A0013985	Confirms selection.
₹С← →	Switches to the selection of the correction tools.
X A0013986	Exits the input without applying the changes.
C A0014040	Clears all entered characters.
Correction symbols	under (₹C←→)
A0013989	Clears all entered characters.
A0013991	Moves the input position one position to the right.
A0013990	Moves the input position one position to the left.
A0013988	Deletes one character immediately to the left of the input position.

60

8.3.4 Opening the context menu

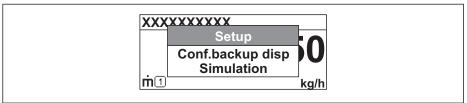
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- Setup
- Conf. backup disp.
- Simulation

Calling up and closing the context menu

The user is in the operational display.

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



A0014003-EN

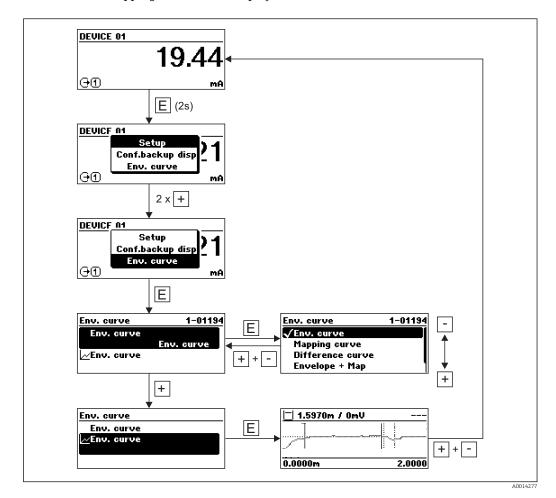
- 2. Press \Box + \pm simultaneously.
 - The context menu is closed and the operational display appears.

Calling up the menu via the context menu

- 1. Open the context menu.
- 2. Press 🛨 to navigate to the desired menu.
- 3. Press **E** to confirm the selection.
 - ightharpoonup 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:



9 System integration via HART protocol

9.1 Overview of the Device Description files (DD)

Manufacturer ID	0x11
Device type	0x28
HART specification	6.0
DD files	For information and files see: www.endress.com www.hartcomm.org

9.2 Measured values via HART protocol

On delivery the following measuring values are assigned to the HART device varaibles:

Device variable	Measuring value
Primary variable (PV)	Level linearized
Secondary variable (SV)	Unfiltered distance
Tertiary variable (TV)	Absolute echo amplitude
Quaternary variable (QV)	Relative echo amplitude

- The allocation of the device variables can be changed in the operating menu: Expert \rightarrow Communication \rightarrow Output
- In a HART multidrop loog only one device may use the output current for signal transmission. For all other devices the following must be set:
 - Current span (→ 🖺 137) = Fixed current
 - Fixed current (→ 🗎 137) = 4 mA

10 Commissioning via operating menu

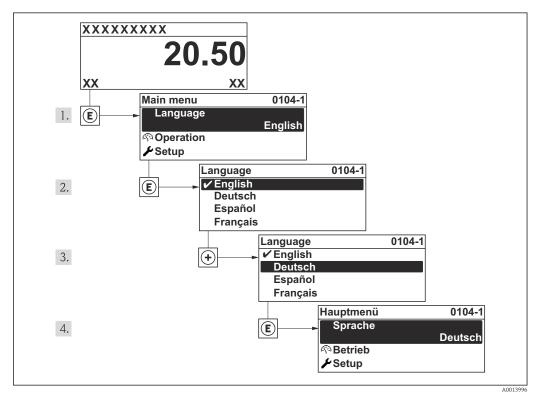
10.1 Installation and function check

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

- Checklist "Post-installation check" \rightarrow 🖺 33
- Checklist "Post-connection check" → 🖺 45

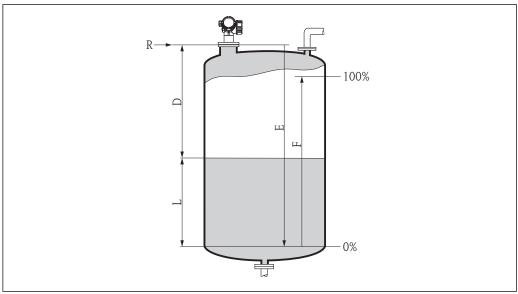
10.2 Setting the operating language

Factory setting: English or ordered local language



■ 20 Using the example of the local display

10.3 Configuration of a level measurement



- R Reference point of the measurement
- D Distance
- I. Level
- E Empty calibration (= zero)
- F Full calibration (= span)
- 1. Navigate to: "Setup" menu → Device tag
 - ► Enter device tag.
- 2. Navigate to: "Setup" menu → Distance unit
 - ► Select distance unit.
- 3. Navigate to: "Setup" menu → Tank type
 - ► Select tank type.
- 4. For **Tank type** parameter = Bypass / pipe:

Navigate to: "Setup" menu → Tube diameter

- ► Enter the diameter of the stilling well or bypass.
- 5. Navigate to: "Setup" menu → Medium group
 - Specify medium group: (Water based (DC >= 4) or Others)
- 6. Navigate to: "Setup" menu → Empty calibration
 - \rightarrow Enter empty distance E (Distance from reference point R to the 0% level) 5.
- 7. Navigate to: "Setup" menu \rightarrow Full calibration
 - ► Enter full distance F (Distance from the 0% to the 100% level).
- 8. Navigate to: "Setup" menu → Level
 - ► Indicates the measrued level L.
- 9. Navigate to: "Setup" menu → Distance
 - └ Indicates the measured distance from the reference point R to the level L.
- 10. Navigate to: "Setup" menu → Signal quality
 - └ Indicates the quality of the evaluated level echo.

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A0016933

⁵⁾ If, for example, the measuring range covers only an upper part of the tank (E << tank height), it is mandatory to enter the acutal tank height into the "Setup \rightarrow Advanced Setup \rightarrow Level \rightarrow Tank/silo height" parameter.

- 11. When operating via local display:
 - Navigate to: "Setup" menu \rightarrow Mapping \rightarrow Confirm distance
 - Compare distance indicated on the display to real distance in order to start the recording of an interference echo map.
- 12. When operating via operating tool:
 - Navigate to: "Setup" menu \rightarrow Confirm distance
 - Compare distance indicated on the display to real distance in order to start the recording of an interference echo map.
- 13. Navigate to: "Setup" menu \rightarrow Advanced setup \rightarrow Level \rightarrow Level unit
 - Select level unit: %, m, mm, ft, in (Factory setting: %)
- The response time of the device is preset by the **Tank type** parameter ($\rightarrow \implies 103$). More detailed settings are possible in the **Advanced setup** submenu.

10.4 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" menu → Diagnostics → Envelope diagnostics → 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.



■ 22 The "Load Reference Curve" function

10.5 Configuration of the on-site display

10.5.1 Factory settings of the on-site display

Parameter	Factory setting
Format display	1 value, max. size
Value 1 display	Level linearized
Value 2 display	None
Value 3 display	None
Value 4 display	None

10.5.2 Adjustment of the on-site display

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

10.6 Configuration of the current outputs

10.6.1 Factory setting of the current outputs

Current output	Allocated measuring vlaue	4mA value	20mA value
1	Level linearized	0% or the corresponding linearized value	100% or the corresponding linearized value
2 1)	Distance	0	Empty calibration

¹⁾ for devices with 2 current outputs

10.6.2 Adjustment of the current outputs

The current outputs can be adjusted in the following menus:

Basic settings

Setup \rightarrow Advanced setup \rightarrow Current output 1 to 2

Advanced settings

Expert \rightarrow Output 1 to 2 \rightarrow Current output 1 to 2 See "Description of Device Parameters", GP01014F

10.7 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" menu \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:

- HART date code
- HART short tag
- HART message
- HART descriptor
- HART address
- Device tag
- 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 → 155 will not restore the original status.

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

Protection of the settings against unauthorized 10.8 changes

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

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11 Diagnostics and troubleshooting

11.1 General trouble shooting

11.1.1 General errors

Error	Possible cause	Remedial action
Device does not respond.	Supply voltage does not match the value indicated on the nameplate.	Connect the correct voltage.
	The polarity of the supply voltage is wrong.	Correct the polarity.
	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 ⊕ and E simultaneously. Decrease contrast by pressing □ and E simultaneously.
	The plug of the display cable is not connected correctly.	Connect the plug correctly.
	Display is defective.	Replace display.
"Communication error" is indicated on the display when starting the device or connecting the display	Electromagnetic interference	Check grounding of the device.
	Broken display cable or display plug.	Exchange display.
Output current < 3.6 mA	Signal cable connection incorrect.	Check connection.
	Electronics is defective.	Replace electronics.
HART communication does not function.	Communication resistor missing or incorrectly installed.	Install the communication resistor (250Ω) correctly \rightarrow $\ \ \ \ \ \ \ \ \ \ \ \ \ $
	Commubox connected incorrectly.	Connect Commubox correctly $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $
	Commubox not switched to HART mode.	Set the selection switch of the Commubox to the HART position.
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.

11.1.2 Parametrization errors

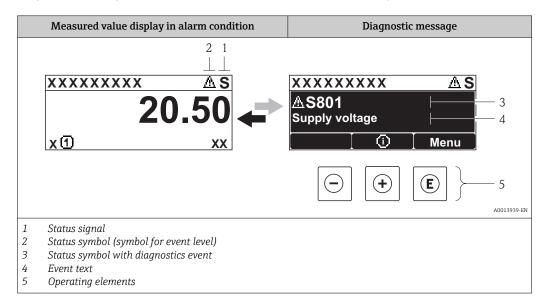
Error	Possible cause	Remdy
Measured value incorrect	If measured distance ("Setup" menu → Distance) matches the real distance: Calibration error	 Check and adjust Empty calibration parameter (→ ≧ 105) if necessary. Check and adjust Full calibration parameter (→ ≧ 105) if necessary. Check and adjust linearization if necessary (Linearization submenu (→ ≧ 121)).
	For measurements in bypasses / stilling well: Wrong tank type Wrong tube diameter	 Select Tank type (→ ■ 103) = Bypass / pipe. Enter correct diameter in Tube diameter parameter (→ ■ 104).
	Enter correct diamter in	Enter correct value in Level correction parameter ($\rightarrow \stackrel{\triangle}{=} 118$).

Error	Possible cause	Remdy
	If measured distance (Setup → Distance) does not match the real distance: Interference echo	Carry out tank mapping (Confirm distance parameter (→ 🖺 107)).
No change of measured value on filling / emptying	Interference echo from installations, nozzle or build-up on the antenna.	 Carry out tank mapping (Confirm distance parameter (→
If the surface is not calm (e.g. filling, emptying, agitator running), the measured value jumps sporadically to a higher level	Signal is weakened by the rough surface - the interference echoes are sometimes stronger.	 Carry out tank mapping (Confirm distance parameter (→ 🖺 107)). Select Tank type (→ 🖺 103) = Process vessel with agitator. Increase integration time ("Expert" menu → Sensor → Distance → Integration time) Optimize orientation of the antenna If necessary, select a better mounting position and/or larger antenna.
During filling/emptying the measxured value jumps downwards	Multiple echoes	 Check Tank type parameter (→ □ 103). If possible, do not select central installation position. If appropriate, use a stilling well.
Error message F941 or S941 "Echo lost"	Level echo is too weak.	Check Medium group parameter (→ ≧ 104). If necessary, select a more detailed setting in Medium property parameter (→ ≧ 115). Optimize alignment of antenna If necessary, select a better installation position and/or larger antenna.
	Level echo suppressed.	Delete mapping and record it again.
Device displays a level when the tank is empty.	Interference echo	Carry out mapping over entire measuring range when the tank is empty (Confirm distance parameter (→ 🖺 107)).
Wrong slope of the level in the entire measuring range	Wrong tank type selected.	Set Tank type parameter (→ 🖺 103) correctly.

11.2 Diagnostic information on local display

11.2.1 Diagnostic message

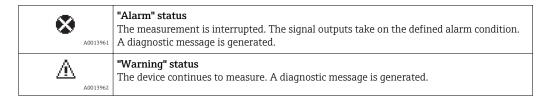
Faults detected by the self-monitoring system of the measuring device are displayed as a diagnostic message in alternation with the measured value display.



Status signals

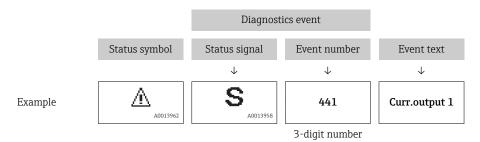
A0013956	"Failure" A device error is present. The measured value is no longer valid.
C	"Function check" The device is in service mode (e.g. during a simulation).
S	 "Out of specification" The device is operated: Outside of its technical specifications (e.g. during startup or a cleaning) Outside of the configuration carried out by the user (e.g. level outside configured span)
A0013957	"Maintenance required" Maintenance is required. The measured value is still valid.

Status symbol (symbol for event level)



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 **Diagnostic list** submenu $(\rightarrow \cong 160)$.

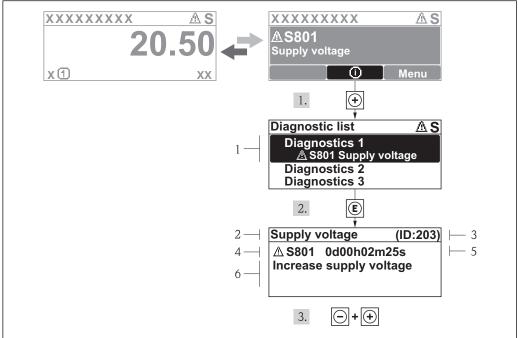
- i
 - Past diagnostic messages that are no longer pending are shown as follows:
 - On the local display:
 - in **Event logbook** submenu (→ 🗎 161)
 - In FieldCare:
 via the "Event List /HistoROM" function.

Operating elements

Operating function	Operating functions in menu, submenu		
Plus key Opens the message about the remedial measures.			
A0013952	Enter key Opens the operating menu.		

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11.2.2 Calling up remedial measures



A0013940-EN

- 23 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 ± (i) 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 = + ± simultaneously.
 - ► The message for the remedial measures closes.

11.3 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)

Calling up remedial measures

- 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.

11.4 Diagnostic list

In the Diagnostic list 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" menu → 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.

11.5 Overview of diagnostic events

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
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	1. Restart device 2. Change I/O module	F	Alarm
282	Data storage	1. Restart device 2. 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	M	Warning
Diagnostic of o	configuration			'
410	Data transfer	Check connection Retry data transfer	F	Alarm
411	Up-/download active	Up-/download active, please wait	С	Warning
431	Trim 1 to 2	Carry out trim	С	Warning
435	Linearization	Check linearization table	F	Alarm
437	Configuration incompatible	1. Restart device 2. Contact service	F	Alarm
438	Dataset	Check data set file Check device configuration Up- and download new configuration	М	Warning
441	Current output 1 to 2	Check process Check current output settings	S	Warning
484	Simulation failure mode	Deactivate simulation	С	Alarm

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
485	Simulation measured value	Deactivate simulation	С	Warning
491	Simulation current output 1 to 2	Deactivate simulation	С	Warning
494	Switch output simulation	Deactivate simulation switch output	С	Warning
495	Simulation diagnostic event	Deactivate simulation	С	Warning
585	Simulation distance	Deactivate simulation	С	Warning
586	Record map	Recording of mapping please wait	С	Warning
Diagnostic of p	rocess		'	-
801	Energy too low	Increase supply voltage	S	Warning
803	Current loop	1. Check wiring 2. Change I/O module	F	Alarm
825	Operating temperature	Check ambient temperature Check process temperature	S	Warning
825	Operating temperature	Check ambient temperature Check process temperature	F	Alarm
921	Change of reference	Check reference configuration Check pressure Check sensor	S	Warning
941	Echo lost	Check parameter 'DC value'	S	Warning
941	Echo lost	Check parameter 'DC value'	F	Alarm
942	In safety distance	Check level Check safety distance Reset self holding	S	Warning
942	In safety distance	Check level Check safety distance Reset self holding	S	Alarm
943	In blocking distance	Reduced accuracy Check level	S	Warning
950	Advanced diagnostic 1 to 2 occured	Maintain your diagnostic event	M	Warning 1)

¹⁾ Diagnostic status is changeable.

11.6 Event logbook

11.6.1 Event history

A chronological overview of the event messages that have occurred is provided in the **Event list** submenu ⁶⁾.

Navigation path

 ${\tt Diagnostics} \rightarrow {\tt Event \ logbook} \rightarrow {\tt Event \ list}$

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

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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.

The event history includes entries for:

- 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.

11.6.2 Filtering the event logbook

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

Navigation path

"Diagnostics" menu \rightarrow Event logbook \rightarrow Filter options

Filter categories

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

11.6.3 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
I1184	Display connected
I1185	Display backup done
I1186	Restore via display done

Info number	Info name
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

11.7 Firmware history

Date	Firmware Modifications		Documentation (FMR53/FMR54, HART)		
	version		Operating Instructions	Description of Parameters	Technical Information
12.2012	01.00.zz	Original software	BA01050F/00/EN/01.12	GP01014F/00/EN/01.12	TI01041F/00/EN/01.12
02.2015	01.01.zz	 Support of SD03 additional languages HistoROM functionality enhanced Improvements and bugfixes 	BA01050F/00/EN/03.14	GP01014F/00/EN/04.14	TI01041F/00/EN/05.14

The firmware version can explicitly be ordered via the product structure. In this way it is possible to ensure compatibility of the firmware version with an existing or planned system integration.

12 Maintenance

The measuring device requires no special maintenance.

12.1 Exterior cleaning

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

12.2 Replacing seals

The process seals of the sensors (at the process connection) must be replaced periodically, particularly if molded seals (aseptic construction) are used. The period between changes depends on the frequency of cleaning cycles and on the temperature of the measured substance and the cleaning temperature.

13 Repairs

13.1 General information on repairs

13.1.1 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.

13.1.2 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.

13.1.3 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).

13.1.4 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
 → 152.
- Via FieldCare

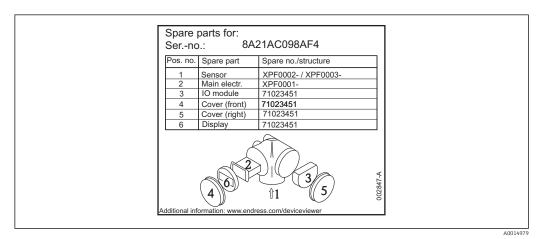
Condition: The configuration of the old device has been saved to the computer via FieldCare.

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.

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13.2 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.



■ 24 Example for spare part nameplate in connection compartment cover

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

13.3 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

13.4 Disposal

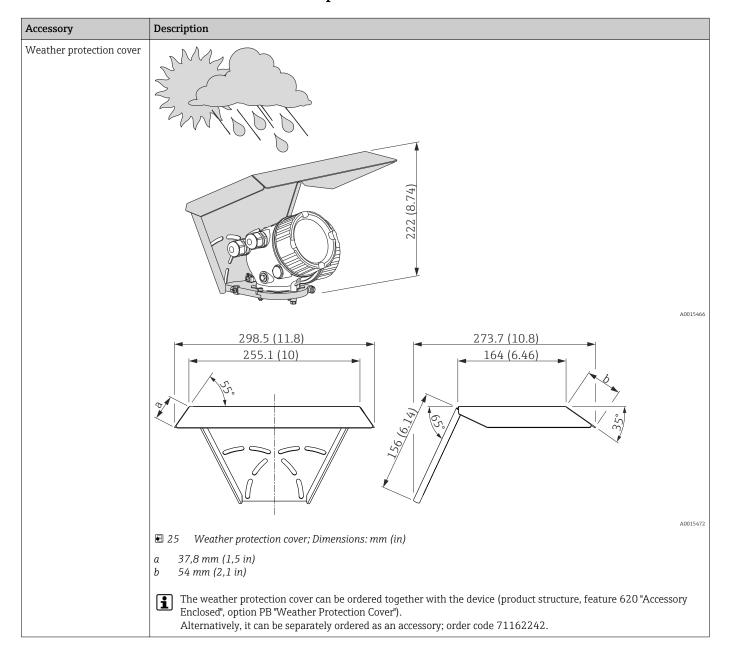
Observe the following notes during disposal:

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

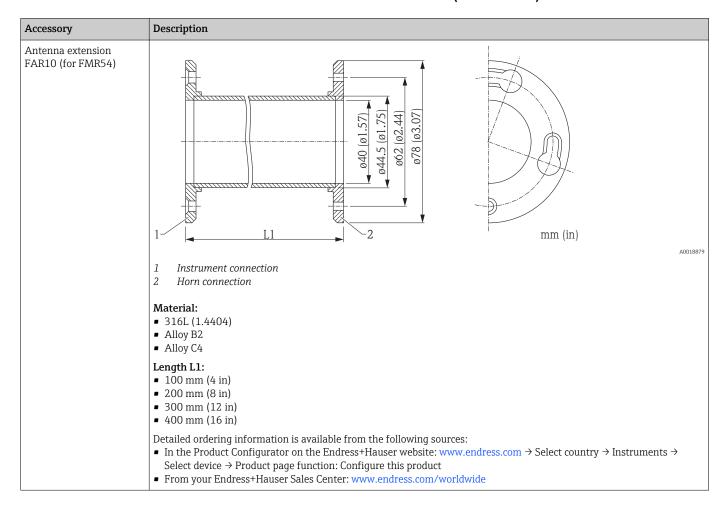
14 Accessories

14.1 Device-specific accessories

14.1.1 Weather protection cover



14.1.2 Antenna extension FAR10 (for FMR54)



14.1.3 Remote display FHX50

Accessory	Description
Remote display FHX50	
	A0019128
	 ■ Material: Plastics PBT 316L Ingress protection: IP68 / NEMA 6P and IP66 / NEMA 4x Suitable for the display modules: SD02 (push buttons) SD03 (touch control) Connection cable: Cable with M12 plug; supplied with the FHX50; up to 30 m (98 ft) Customer supplied standard cable; up to 60 m (196 ft) Ambient temperature: -40 to 80 °C (-40 to 176 °F)
	 If the remote display is to be used, the device must be ordered in the version "Prepared for display FHX50" (feature 030, option L or M). For the FHX50, on the other hand, the option A: "Prepared for display FHX50" has to be selected in feature 050: "Option Measurement Device". If a device has not been ordered in the version "Prepared for display FHX50", but is nevertheless to be equipped with an FHX50, it is essential to select the option B: "Not prepared for display FHX50" in feature 050: "Option Measurement Device" of the FHX50. In this case, a retrofit kit, needed to prepare the device for the remote display, is supplied together with the FHX50.
	For transmitters with approval, application of the FHX50 may be restricted. A device may only be retrofitted with the FHX50 if option L or M ("Prepared for FHX50") is quoted under <i>Basic specifications</i> , position 4 "Display, operation" in the associated Safety Instructions (XA). In addition to this, observe the Safety Instructions (XA) of the FHX50.
	Do not retrofit transmitters with: approval for use in areas with combustible dusts (Dust-Ex approval) type of protection Ex nA
	For details refer to the document SD01007F.

14.1.4 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)
	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 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.

14.1.5 Gas-tight feedthrough

Accessory	Description	
Gas-tight feedthrough	Chemically inert glass feedthrough; prevents migration of gases into the electronics housing. To be ordered with the device: product structure, feature 610 "Accessory Mounted", option NC "Gas-tight feedthrough"	

14.2 Communication-specific accessories

Accessory	Description
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface. For details refer to Technical Information TI00404F

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

Accessory	Description
HART Loop Converter HMX50	Evaluates the dynamic HART variables and converts them to analog current signals or limit values. Order code: 71063562
	For details refer to Technical Information TI00429F and Operating Instructions BA00371F

Accessory	Description			
WirelessHART Adapter SWA70	Connects field devices to a WirelessHART network. The WirelessHART adapter can be mounted directly at a HART device and is easly integrated into an existing HART network. It ensures safe data transmission and can be operated in parallel with other wireless networks. For details refer to Operating Instructions BA00061S			

Accessory	Description				
Fieldgate FXA320	Gateway for remote monitoring of connected 4-20mA measuring devices via web browser.				
	For details refer to Technical Information TI00025S and Operating Instructions BA00053S				

Accessory	Description
Fieldgate FXA520	Gateway for remote diagnosis and parametrization of connected HART measuring devices via web browser.
	For details refer to Technical Information TI00025S and Operating Instructions BA00051S

Accessory	Description
Field Xpert SFX350	Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION fieldbus devices in the non-Ex area . For details, see Operating Instructions BA01202S

Accessory	Description
Field Xpert SFX370	Field Xpert SFX370 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION fieldbus devices in the non-Ex area and the Ex area . For details, see Operating Instructions BA01202S

14.3 Service-specific accessories

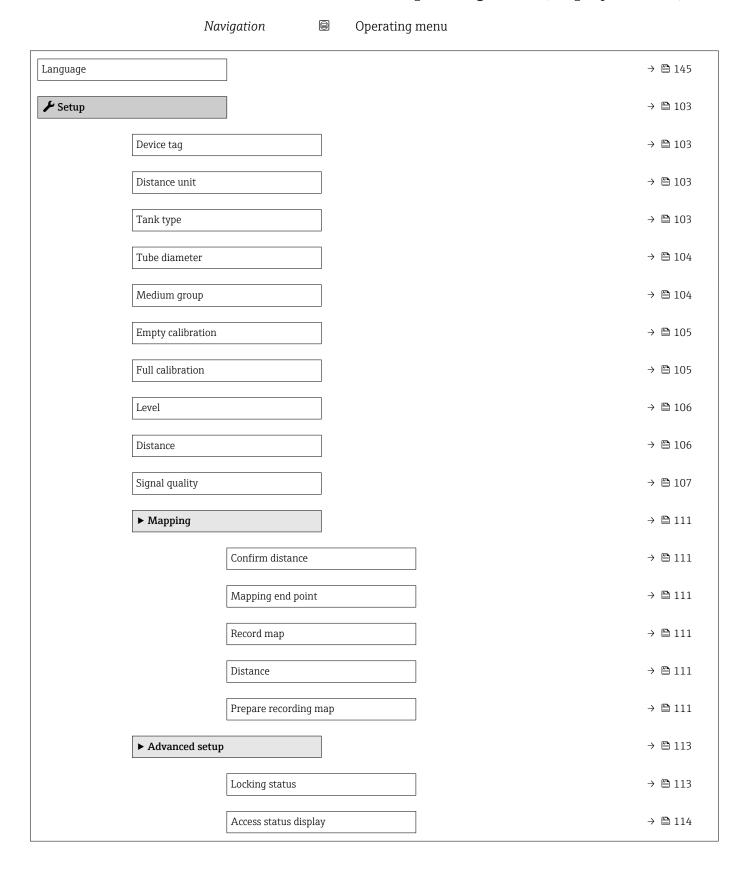
Accessory	Description
FieldCare	Endress+Hauser's FDT-based Plant Asset Management tool. Helps to configure and maintain all field devices of your plant. By supplying status information it also supports the diagnosis of the devices. For details refer to Operating Instructions BA00027S and BA00059S.

14.4 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
RN221N	Active barrier with power supply for safe separation of 4 to 20 mA current circuits. Provides bi-directional HART transmission.
	For details refer to Technical Information TI00073R and Operating Instructions BA00202R
RNS221	Transmitter supply for 2-wire sensors or transmitters exclusively for non-Ex areas. Provides bi-directional communication using the HART communication sockets.
	For details refer to Technical Information TI00081R and Operating Instructions KA00110R

15 Operating menu

15.1 Overview of the operating menu (display module)



90

	Enter access code			→ 🖺 114
	▶ Level			→ 🖺 115
		Medium type		→ 🖺 115
		Medium property		→ 🖺 115
		Max. filling speed liquid	1	→ 🖺 116
		Max. draining speed liqu	uid	→ 🖺 116
		Advanced process condi	itions	→ 🖺 116
		Level unit		→ 🖺 117
		Blocking distance		→ 🖺 117
		Level correction		→ 🖺 118
		Tank/silo height		→ 🖺 118
	► Linearization			→ 🖺 121
		Linearization type		→ 🖺 123
		Unit after linearization		→ 🖺 124
		Free text		→ 🖺 125
		Maximum value		→ 🖺 126
		Diameter		→ 🖺 126
		Intermediate height		→ 🖺 126
		Table mode		→ 🖺 127
		► Edit table		
		Lev	vel	→ 🖺 128
		Cus	stomer value	→ 🖺 129
		Activate table		→ 🖺 129
	► Safety settings			→ 🖺 131
		Output echo lost		→ 🖺 131
•				

	Value echo lost	→ 🖺 131
	Ramp at echo lost	→ 🖺 132
	Blocking distance	→ 🗎 117
► SIL/WHG co	onfirmation	→ 🖺 134
► Deactivate S	SIL/WHG	→ 🖺 135
	Reset write protection	→ 🖺 135
	Code incorrect	→ 🖺 135
► Current out	put 1 to 2	→ 🗎 136
	Assign current output	→ 🖺 136
	Current span	→ 🖺 137
	Fixed current	→ 🖺 137
	Damping output	→ 🖺 138
	Failure mode	→ 🖺 138
	Failure current	→ 🖺 139
	Output current 1 to 2	→ 🖺 139
► Switch outp	out	→ 🖺 140
	Switch output function	→ 🖺 140
	Assign status	→ 🖺 140
	Assign limit	→ 🖺 141
	Assign diagnostic behavior	→ 🖺 141
	Switch-on value	→ 🖺 141
	Switch-on delay	→ 🖺 143
	Switch-off value	→ 🖺 143
	Switch-off delay	→ 🖺 143
	Failure mode	→ 🗎 144

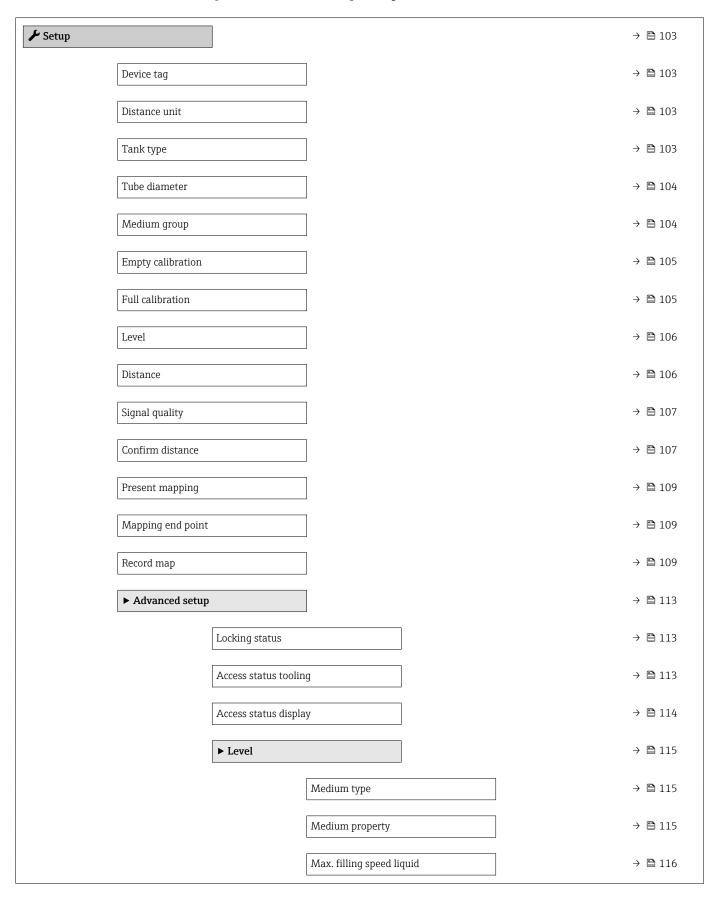
	Switch status	→ 🖺 144
	Invert output signal	→ 🖺 144
▶ Display		→ 🖺 145
	Language	→ 🖺 145
	Format display	→ 🖺 145
	Value 1 to 4 display	→ 🖺 147
	Decimal places 1 to 4	→ 🗎 147
	Display interval	→ 🖺 148
	Display damping	→ 🖺 148
	Header	→ 🖺 148
	Header text	→ 🖺 149
	Separator	→ 🖺 149
	Number format	→ 🖺 149
	Decimal places menu	→ 🖺 150
	Backlight	→ 🖺 150
	Contrast display	→ 🖺 151
► Configuration b	packup display	→ 🖺 152
	Operating time	→ 🖺 152
	Last backup	→ 🖺 152

		Configuration man	agement	→ 🖺 152
		Comparison result		→ 🖺 153
	► Administration]	→ 🖺 155
		► Define access co	ude	→ 🗎 157
		, Derme decemb es		
			Define access code	→ 🖺 157
			Confirm access code	→ 🖺 157
		Device reset		→ 🖺 155
억 Diagnostics				→ 🖺 158
Actual diagnostics				→ 🖺 158
Previous diagnosti	CS			→ 🖺 158
Operating time fro	m restart			→ 🖺 159
Operating time				→ 🖺 152
▶ Diagnostic list				→ 🖺 160
	Diagnostics 1 to 5]	→ 🖺 160
► Event logbook				→ 🖺 161
	Filter options			→ 🖺 161
	► Event list			→ 🗎 161
▶ Device informa	tion			→ 🖺 162
	Device tag]	→ 🖺 162
	Serial number]	→ 🖺 162
	Firmware version]	→ 🖺 162
	Device name			→ 🖺 162
	Order code			→ 🗎 163
	Extended order cod	le 1 to 3		→ 🖺 163
	Device revision			→ 🗎 163

	Device ID		→ 🖺 163
	Device type		→ 🖺 164
	Manufacturer ID		→ 🖺 164
► Measured value	es		→ 🖺 165
	Distance		→ 🖺 106
	Level linearized]	→ 🖺 125
	Output current 1 to 2		→ 🖺 139
	Measured current 1]	→ 🖺 166
	Terminal voltage 1]	→ 🖺 166
	Electronic temperature]	→ 🖺 166
▶ Data logging			→ 🖺 167
	Assign channel 1 to 4]	→ 🖺 167
	Logging interval]	→ 🖺 167
	Clear logging data		→ 🖺 168
	▶ Display channel 1 to 4		→ 🖺 169
► Simulation			→ 🖺 171
	Assign measurement variable		→ 🖺 172
	Value process variable		→ 🖺 172
	Simulation current output 1 to 2		→ 🖺 172
	Value current output 1 to 2		→ 🗎 173
	Switch output simulation		→ 🖺 173
	Switch status]	→ 🖺 173
	Simulation device alarm]	→ 🖺 174

Diagnostic event category	
Simulation diagnostic event	
▶ Device check	→ 🖺 175
Start device check	→ 🖺 175
Result device check	→ 🖺 175
Last check time	→ 🖺 175
Level signal	→ 🖺 176

15.2 Overview of the operating menu (operating tool)



	May draining speed liquid	→ 🖺 116
	Max. draining speed liquid	7 目 110
	Advanced process conditions	→ 🖺 116
	Level unit	→ 🖺 117
	Blocking distance	→ 🖺 117
	Level correction	→ 🖺 118
	Tank/silo height	→ 🖺 118
▶ Linearization		→ 🖺 121
	Linearization type	→ 🖺 123
	Unit after linearization	→ 🖺 124
	Free text	→ 🖺 125
	Level linearized	→ 🖺 125
	Maximum value	→ 🗎 126
	Diameter	→ 🖺 126
	Intermediate height	→ 🖺 126
	Table mode	→ 🖺 127
	Table number	→ 🖺 128
	Level	→ 🖺 128
	Level	→ 🖺 129
	Customer value	→ 🖺 129
	Activate table	→ 🖺 129
► Safety settings		→ 🖺 131
	Output echo lost	→ 🖺 131
	Value echo lost	→ 🖺 131
	Ramp at echo lost	→ 🖺 132
	Blocking distance	→ 🖺 117

► SIL/WHG conf	irmation	→ 🖺 134
► Deactivate SIL	/WHG	→ 🖺 135
	Reset write protection	→ 🗎 135
	Code incorrect	→ 🖺 135
► Current outpu	t 1 to 2	→ 🖺 136
	Assign current output	→ 🖺 136
	Current span	→ 🗎 137
	Fixed current	→ 🖺 137
	Damping output	→ 🗎 138
	Failure mode	→ 🗎 138
	Failure current	→ 🖺 139
	Output current 1 to 2	→ 🖺 139
► Switch output		→ 🖺 140
	Switch output function	→ 🖺 140
	Assign status	→ 🖺 140
	Assign limit	→ 🖺 141
	Assign diagnostic behavior	→ 🖺 141
	Switch-on value	→ 🖺 141
	Switch-on delay	→ 🗎 143
	Switch-off value	→ 🗎 143
	Switch-off delay	→ 🗎 143
	Failure mode	→ 🖺 144
	Switch status	→ 🖺 144
	Invert output signal	→ 🖺 144

	► Display		→ 🖺 145
		Language	→ 🖺 145
		Format display	→ 🖺 145
		Value 1 to 4 display	→ 🖺 147
		Decimal places 1 to 4	→ 🖺 147
		Display interval	→ 🖺 148
		Display damping	→ 🖺 148
		Header	→ 🖺 148
		Header text	→ 🖺 149
		Separator	→ 🖺 149
		Number format	→ 🖺 149
		Decimal places menu	→ 🖺 150
		Backlight	→ 🖺 150
		Contrast display	→ 🖺 151
	► Configuration b	ackup display	→ 🖺 152
		Operating time	→ 🖺 152
		Last backup	→ 🖺 152
		Configuration management	→ 🖺 152
		Backup state	→ 🖺 153
		Comparison result	→ 🖺 153
	► Administration		→ 🖺 155
		Define access code	→ 🖺 157
		Device reset	→ 🖺 155
C) Diagnostics	1		→ 🖺 158
♥ Diagnostics		7	
Actual diagnostics			→ 🖺 158

Timestamp		→ 🖺 158
Previous diagnostic	cs	→ 🖺 158
Timestamp		→ 🖺 159
Operating time fro	m restart	→ 🖺 159
Operating time		→ 🖺 152
▶ Diagnostic list		→ 🖺 160
	Diagnostics 1 to 5	→ 🖺 160
	Timestamp 1 to 5	→ 🖺 160
► Device informa	tion	→ 🖺 162
	Device tag	→ 🖺 162
	Serial number	→ 🖺 162
	Firmware version	→ 🖺 162
	Device name	→ 🖺 162
	Order code	→ 🖺 163
	Extended order code 1 to 3	→ 🖺 163
	Device revision	→ 🖺 163
	Device ID	→ 🖺 163
	Device type	→ 🖺 164
	Manufacturer ID	→ 🖺 164
► Measured value	es	→ 🖺 165
	Distance	→ 🖺 106
	Level linearized	→ 🖺 125
	Output current 1 to 2	→ 🖺 139
	Measured current 1	→ 🖺 166

	Terminal voltage 1		→ 🖺 166
	Electronic temperature		→ 🖺 166
► Data logging			→ 🖺 167
	Assign channel 1 to 4		→ 🖺 167
	Logging interval		→ 🖺 167
	Clear logging data		→ 🖺 168
► Simulation			→ 🖺 171
	Assign measurement variable		→ 🖺 172
	Value process variable		→ 🖺 172
	Simulation current output 1 to 2		→ 🖺 172
	Value current output 1 to 2		→ 🖺 173
	Switch output simulation		→ 🖺 173
	Switch status		→ 🗎 173
	Simulation device alarm		→ 🖺 174
	Simulation diagnostic event		
► Device check		-	→ 🖺 175
	Start device check		→ 🖺 175
	Result device check		→ 🖺 175
	Last check time		→ 🖺 175
	Level signal		→ 🖺 176
		1	

"Setup" menu 15.3



- 📵 : 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).
 - \blacksquare : Marks parameters which can be locked via the software locking \rightarrow \blacksquare 50.

■ ■ Setup Navigation

Device tag			â
Navigation	阊 冒 Setup → De	vice tag	
Description	Enter the name fo	r the measuring point.	
Factory setting	FMR5x		
Distance unit			
Navigation	@□ Setup → Dis	tance unit	
Description	Select distance uni	it.	
Selection	SI units ■ mm ■ m	US units ■ ft ■ in	
Factory setting	m		

Tank type

Navigation

Prerequsite Medium type (→ 🖺 115) = Liquid

Description Select tank type.

Selection ■ Bypass / pipe

- Stilling well
- Workbench test
- Open channel
- Sphere
- Storage vessel

Process vessel standard

Process vessel with agitator

Wave guide antenna

Factory setting Depending on the antenna

Additional information Depending on the antenna some of the options mentioned above may not be available or

there may be additional options.

Tube diameter

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

Prerequsite Tank type ($\rightarrow \triangleq 103$) = Bypass / pipe

Description Specify diameter of bypass or stilling well.

User entry 0 to 9.999 m

Factory setting 0 m

Medium group

Prerequsite Medium type ($\rightarrow \equiv 115$) = 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 ($\Rightarrow \implies 115$).

The **Medium group** parameter presets the **Medium property** parameter ($\rightarrow \triangleq 115$) as follows:

Medium group	Medium property (→ 🖺 115)
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

Navigation $\blacksquare \Box$ Setup \rightarrow Empty calibr.

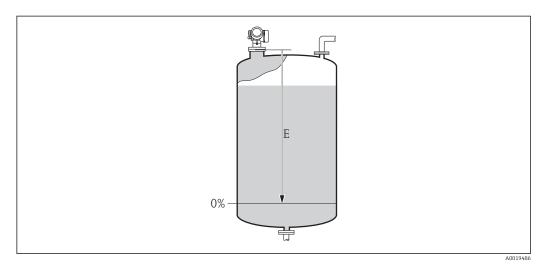
Description Specify the distance E between the process connection and the minimum level (0%). This

defines the starting point of the measuring range.

User entry Depending on the antenna

Factory setting Depending on the antenna

Additional information

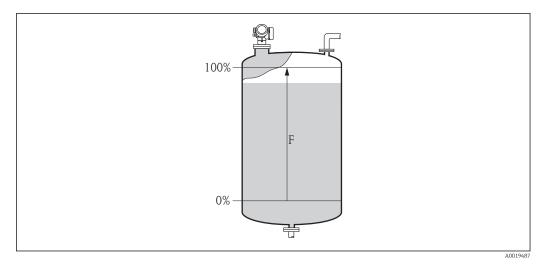


Empty calibration (E) for level measurements in liquids

The measuring range starts at the point at which the radar beam hits the tank or silo bottom. In the case of dished boiler ends or conical outlets levels below this point can not be measured.

Full calibration	
Navigation	
Description	Specify the distance F between the minimum level (0%) and the maximum level (100%).
User entry	Depending on the antenna
Factory setting	Depending on the antenna

Additional information



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

Level

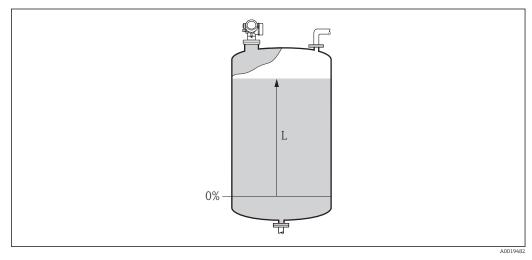
Navigation

Setup → Level

Description

Displays measured level L (before linearization).

Additional information



■ 28 Level in case of liquid measurements

The unit is defined in the **Level unit** parameter ($\rightarrow \equiv 117$).

Distance

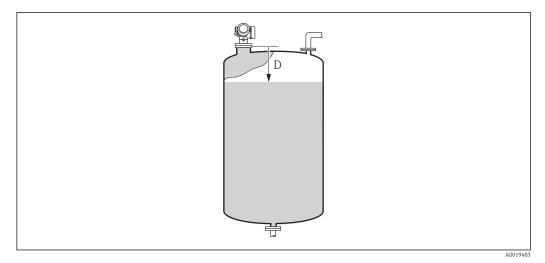
Navigation

Description

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

106

Additional information



■ 29 Distance for liquid measurements

The unit is defined in the **Distance unit** parameter ($\Rightarrow \triangleq 103$).

Signal quality

Navigation

Description

Displays the signal quality of the level echo.

Additional information

Meaning of the display options

Strong

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

Medium

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

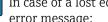
Weak

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

No signal

The device does not find a usable echo.

The signal quality indicated in this parameter always refers to the currently evaluated echo: either the level echo or the tank bottome echo. To differentiate between these two, the quality of the tank bottom echo 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 🗎 131) = Alarm.
- S941, if another option has been selected in **Output echo lost** (→ 🗎 **131**).

Confirm distance

Navigation Setup → 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 ⁷⁾
- Distance too big ⁷⁾
- Tank empty
- Factory map

Factory setting

Distance unknown

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 ($\Rightarrow \implies 109$). 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 ⁸⁾

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 as defined by the **Tank/silo height** parameter ($\rightarrow \blacksquare 118$). By default, **Tank/silo height** = **Empty calibration**.

Take into account that in case of conical outlets, for example, a measurement is only possible up to the point at which the radar hits the bottom of the tank or silo. If the **Tank empty** option is used, **Empty calibration** ($\rightarrow \implies 105$) and **Tank/silo height** may not reach below this point as otherwise the empty signal is suppressed.

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.
- 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.

Visibility depends on order options or device settings

Only available for "Expert \rightarrow Sensor \rightarrow Echo tracking \rightarrow **Evaluation mode** parameter" = "Short time history" or "Long time history"

Present mapping

Navigation \square Setup \rightarrow Present mapping

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

Mapping end point

Navigation \square Setup \rightarrow Map. end point

Prerequsite Confirm distance (→ 🗎 107) = Manual map or Distance too small

Description Specify new end of the mapping.

User entry 0.1 to 999 999.9 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.

i

For reference purposes the **Present mapping** parameter ($\rightarrow \boxminus 109$) is displayed together with this parameter. It indicates up to which distance a mapping has already been recorded.

Record map

Navigation \square Setup \rightarrow Record map

Prerequsite Confirm distance ($\rightarrow \equiv 107$) = Manual map or Distance too small

Description Start recording of the map.

Selection • No

Record mapOverlay mapFactory mapDelete partial 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 .

Overlay map

The new mapping curve is generated by overlaying the old and the current envelope curves.

Factory map

The factory map stored in the ROM of the device is used.

■ Delete partial map

The mapping curve is deleted up to **Mapping end point** ($\rightarrow \square 109$).

15.3.1 "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 ($\rightarrow \cong 103$).

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		6
Navigation	Setup → Mapping → Confirm distance	
Description	→ 🖺 107	
Mapping end point		<u> </u>
Navigation	Setup → Mapping → Map. end point	
Description	→ 🗎 109	
Record map		<u> </u>
Navigation	Setup → Mapping → Record map	
Description	→ 🗎 109	
Distance		
Navigation	Setup → Mapping → Distance	
Description	→ 🖺 106	

Prepare recording map

Navigation

Description

Endress+Hauser 111

Setup \rightarrow Mapping \rightarrow Prepare rec. map

Indicates the progress of the recording of the map.

User interface

- Init. recordingIn progressFinished

15.3.2 "Advanced setup" submenu

Navigation \square Setup \rightarrow Advanced setup

Locking status

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Locking status

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 a-symbol appears in front of parameters that cannot be modified since they are write-protected.

Access status tooling

Navigation \square Setup \rightarrow Advanced setup \rightarrow Access stat.tool

Description Indicates access authorization to parameters via operating tool (e.g. FieldCare).

User interface ■ Operator

- Maintenance
- Service

Additional information

The access authorization can be changed via the **Enter access code** parameter $(\rightarrow \implies 114)$.

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 ($\rightarrow \implies 113$).

Access status display

Navigation Setup \rightarrow Advanced setup \rightarrow Access stat.disp

Prerequsite The device has a local display.

Description Indicates access authorization to parameters via local display.

User interface ■ Operator ■ Maintenance

Service

Additional information

If a figure symbol appears in front of a parameter, the parameter cannot be changed via the local display with the current access authorization.

The access authorization can be changed via the **Enter access code** parameter $(\rightarrow \implies 114)$.

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 ($\rightarrow \implies 113$).

Enter access code

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Ent. 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 not symbol in this document. On the local display, the not 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 write-protected parameters after another 60 s.

Please contact your Endress+Hauser Sales Center if you lose your access code.

"Level" submenu

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

Medium type

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

Description Specify type of medium.

User interface ■ Liquid

■ Solid

Factory setting FMR50, FMR51, FMR52, FMR53, FMR54: Liquid

Additional information

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 $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Level \rightarrow Medium property

Selection • Unknown

DC 1.4 ... 1.6DC 1.6 ... 1.9DC 1.9 ... 2.5

■ DC 2.5 ... 4 ■ DC 4 ... 7

DC 7 ... 15DC > 15

Factory setting

Dependent on **Medium type** ($\rightarrow \equiv 115$) and **Medium group** ($\rightarrow \equiv 104$).

Additional information

Dependency on "Medium type" and "Medium group"

Medium type (→ 🗎 115)	Medium group (→ 🖺 104)	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)

Max. filling speed liquid

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Level \rightarrow Max. fill liquid

Prerequsite Medium type (→ 🖺 115) = Liquid

Description Select expected maximum filling speed.

Selection ■ Slow < 1cm (0,4in) /min

Medium < 10cm (4in) /min
 Standard < 1m (40in) /min
 Fast < 2m (80in) /min
 Very fast > 2m (80in) /min

■ No filter / test

Factory setting Depending on the **Tank type** parameter ($\Rightarrow \implies 103$)

Additional information Max. filling speed liquid is preset by Tank type ($\rightarrow \equiv 103$). It can, however, be adjusted to the process in the vessel at any time. If Tank type ($\rightarrow \equiv 103$) is changed again at a

later point of time, it may be necessary to repeat the fine adjustment.

Max. draining speed liquid

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Level \rightarrow Max drain liquid

Prerequsite Medium type ($\rightarrow \equiv 115$) = Liquid

Description Select expected maximum draining speed.

Selection ■ Slow < 1cm (0,4in) /min

Medium < 10cm (4in) /min
 Standard < 1m (40in) /min
 Fast < 2m (80in) /min

■ Very fast > 2m (80in) /min

■ No filter / test

Factory setting Depending on the **Tank type** parameter ($\Rightarrow \triangleq 103$)

Additional information Max. draining speed liquid ($\rightarrow \triangleq 116$) is preset by Tank type ($\rightarrow \triangleq 103$). It can,

however, be adjusted to the process in the vessel at any time. If **Tank type** ($\rightarrow \triangleq 103$) is changed again at a later point of time, it may be necessary to repeat the fine adjustment.

Advanced process conditions

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Level \rightarrow Adv. conditions

Description Specify additional process conditions (if required).

Selection •

Foam (>5cm/0,16ft)Changing DC values

Factory setting

None

Additional information

"Foam (>5cm/0,16ft)" option

This option makes sure that no tank history is used which has been recorded while foam was present at the surface and thus is no reliable map of the tank property. To achieve this, the setting **Evaluation mode** = **Long time history** is deactivated.

The **Foam (>5cm/0,16ft)** option is only available for liquid applications (FMR50, FMR51, FMR52, FMR53, FMR54).

"Changing DC values" option

A tank history which has been recorded with **Evaluation mode** = **Long time history** is only valid for a fixed dielectric constant. The **Changing DC values** option disables the setting **Evaluation mode** = **Long time history** and thus avoids wrong measuring values in the case of a changing dielectric constant.

i

■ mm

The **Changing DC values** option is only available for liquid applications (FMR50, FMR51, FMR52, FMR53, FMR54).

Level unit			Â
Navigation	©□ Setup → Adv	vanced setup → Level → Level unit	
Description	Select level unit.		
Selection	SI units ■ % ■ m	US units ■ ft ■ in	

Factory setting %

Additional information

The level unit may differ from the distance unit defined in the **Distance unit** parameter $(\rightarrow \implies 103)$:

- The unit defined in the **Distance unit** parameter is used for the basic calibration (**Empty calibration** ($\rightarrow \boxminus 105$) and **Full calibration** ($\rightarrow \boxminus 105$)).
- The unit defined in the **Level unit** parameter is used to display the (unlinearized) level.

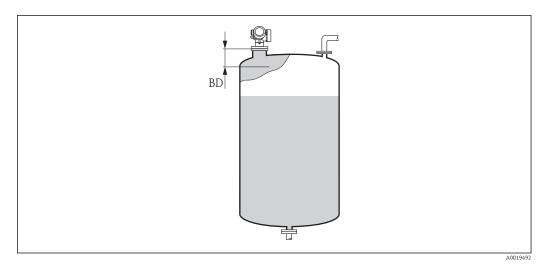
Blocking distance		
Navigation		
Description	Specify blocking distance BD.	

User entry 0 to 200 m

Factory setting FMR50, FMR51, FMR53, FMR54: antenna length

Additional information

No echos are evaluated within the blocking distance BD. Therefore, BD can be used to suppress interference echos in the vicinity of the antenna.



■ 30 Blocking distance (BD) 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).

Tank/silo height

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Level \rightarrow Tank/silo height

Description Specify total height of the tank or silo as measured from the process connection.

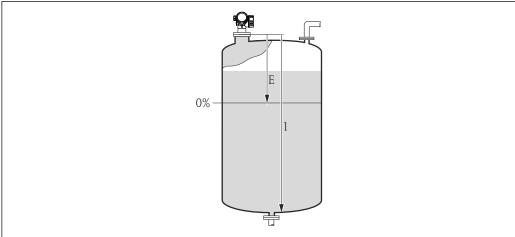
User entry -999.9999 to 999.9999 m

Factory setting Empty calibration ($\rightarrow \equiv 105$)

Additional information If the parametrized measuring range (**Empty calibration** (\rightarrow $\stackrel{\triangle}{=}$ 105)) differs significantly

from the tank or silo height, it is recommended to enter the tank or silo height. Example:

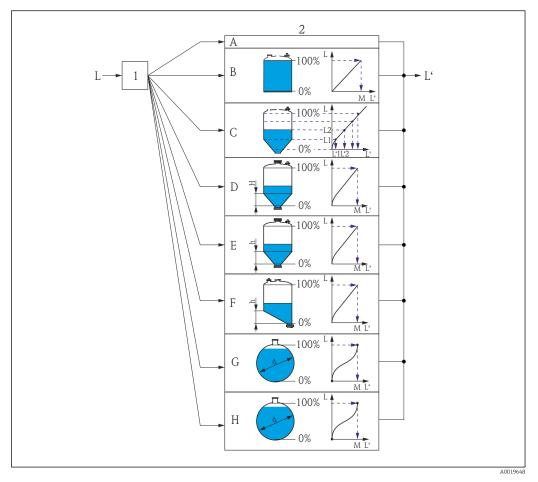
Continuous level monitoring in the upper third of a tank or silo.



A001096

- 31 "Tank/silo height" parameter (→ 🖺 118)' for measurements in liquids
- E Empty calibration (\rightarrow 🖺 105)
- 1 Tank/silo height (→ 🗎 118)
- For tanks with conical outlet, **Tank/silo height** should not be changed as in this type of applications **Empty calibration** (→ 🗎 105) is usually **not** << the tank or silo height.

"Linearization" submenu

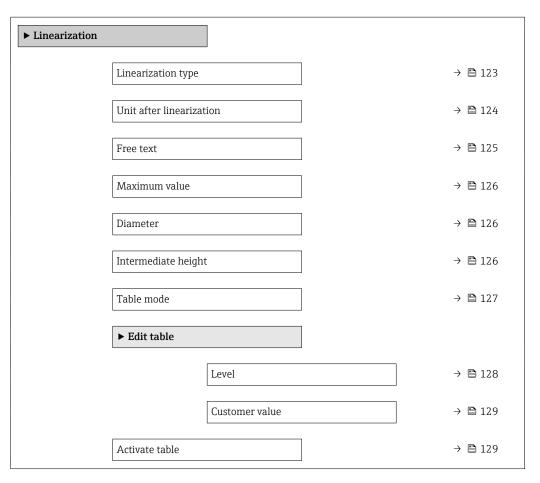


2 Linearization: Transformation of the level and (if relevant) the interface height into a volume or weight; the transformation is dependent on the shape of the vessel.

- 1 Selection of linearization type and unit
- 2 Configuration of the linearization
- A Linearization type ($\Rightarrow = 123$) = None
- *B* Linearization type (\Rightarrow \cong 123) = Linear
- C Linearization type ($\Rightarrow \triangleq 123$) = Table
- *D* Linearization type ($\rightarrow \blacksquare 123$) = Pyramid bottom
- *E* Linearization type ($\rightarrow \triangleq 123$) = Conical bottom
- F Linearization type ($\rightarrow \implies 123$) = Angled bottom
- *G* Linearization type (\rightarrow \blacksquare 123) = Horizontal cylinder
- *H* Linearization type ($\rightarrow \blacksquare 123$) = Sphere
- L Level before linearization (measured in distance units)
- L' Level linearized (\rightarrow $\stackrel{ riangle}{=}$ 125) (corresponds to volume or weight)
- M Maximum value ($\rightarrow \square$ 126)
- d Diameter (\rightarrow $\$ 126)
- h Intermediate height ($\rightarrow = 126$)

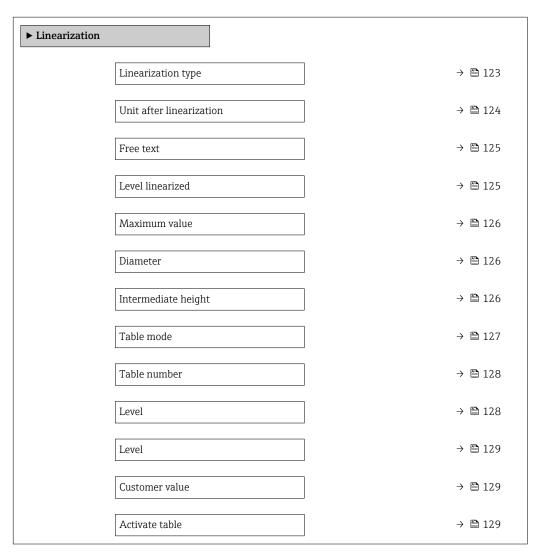
Structure of the submenu on the display module

Navigation \bigcirc 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



Description of parameters

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

Linearization type

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Lineariz. type

Description Select linearization type.

Selection ■ None

Linear

■ Table

Pyramid bottom

Conical bottom

Angled bottom

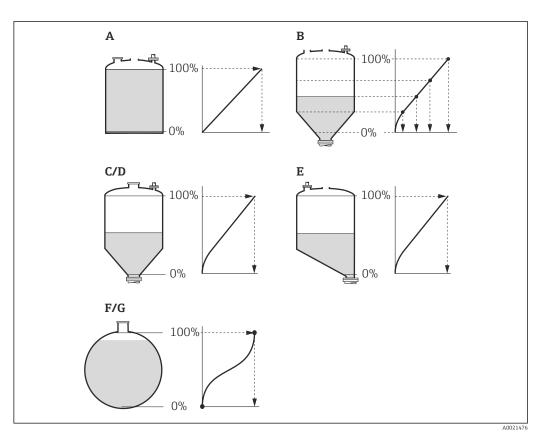
Horizontal cylinder

Sphere

Factory setting

None

Additional information



■ 33 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 $\stackrel{\triangle}{=}$ 124)
- **Maximum value (→ 🗎 126)**: Maximum volume or weight

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 (→ 🗎 124)
- Table mode (→ 🗎 127)
- For each table point: **Level** (\rightarrow $\stackrel{\triangle}{=}$ **128**)
- For each table point: **Customer value** (→ 🖺 **129**)

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 (→ 🗎 124)
- **Maximum value** (→ 🖺 **126**): Maximum volume or weight
- **Intermediate height (→ 🖺 126)**: 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 (→ 🗎 124)
- **Maximum value** (→ 🖺 **126**): Maximum volume or weight
- **Intermediate height (→ 126)**: 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 (→ 🗎 124)
- **Maximum value (→ 🖺 126)**: Maximum volume or weight
- **Intermediate height (→ 🖺 126)**: 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:

- **Maximum value** (→ 🖺 **126**): Maximum volume or weight

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 (→ 🗎 124)
- **Maximum value (→ 🖺 126)**: Maximum volume or weight
- Diameter (→ 🗎 126)

Unit after linearization

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Unit lineariz.

Prerequsite Linearization type (→ 🗎 123) ≠ None

Description Select unit of the lineaized value.

cm³
dm³
m³
hl
l
%

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 (→ ≅ 125).

Navigation

Setup → Advanced setup → Linearization → Free text

Prerequsite

Unit after linearization (→ 🖺 124) = Free text

Description

Enter unit symbol.

User entry

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

Level linearized

Factory setting

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

Description Displays linearized level.

Free text

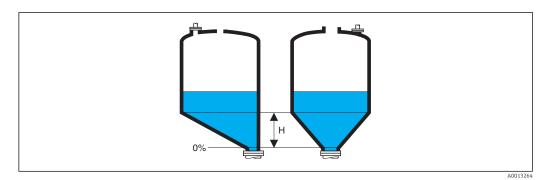
Additional information The unit is defined by the **Unit after linearization** parameter $\rightarrow \triangleq 124$.

Maximum value		<u> </u>
Navigation		
Prerequsite	Linearization type (→ 🖺 123) has one of the following values: ■ Linear ■ Pyramid bottom ■ Conical bottom ■ Angled bottom ■ Horizontal cylinder ■ Sphere	
Description	Specify the maximum content of the vessel (100%) measured in the units after linearization.	
User entry	-50 000.0 to 50 000.0 %	
Factory setting	100.0 %	
Diameter		
Navigation		
Prerequsite	 Linearization type (→ 🗎 123) has one of the following values: Horizontal cylinder Sphere 	
Description	Specify tank diameter.	
User entry	0 to 9 999.999 m	
Factory setting	2 m	
Additional information	The unit is defined in the Distance unit parameter ($\rightarrow \equiv 103$).	
Intermediate height		
Navigation	Setup → Advanced setup → Linearization → Intermed. height	
Prerequsite	 Linearization type (→ 🖺 123) has one of the following values: Pyramid bottom Conical bottom Angled bottom 	
Description	Specify intermediate height H.	
User entry	0 to 200 m	

Factory setting

0 m

Additional information



H Intermediate height

The unit is defined in the **Distance unit** parameter ($\Rightarrow \triangleq 103$).

Table mode

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

Prerequsite Linearization type (→ 🗎 123) = Table

Description Select editing mode of the linearization table.

Selection • Manual

Semiautomatic ⁹⁾
 Clear table

■ Sort table

Factory setting Manual

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.

⁹⁾ Visibility depends on order options or device settings

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** ($\Rightarrow \triangleq 105$) and **Full calibration** ($\Rightarrow \triangleq 105$) 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 \ \)$ **127**) = **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 \cong **128**), **Level** (\rightarrow \cong **128**) and **Customer value** (\rightarrow \cong **129**) 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 $(\Rightarrow \boxminus 117)$ beforehand.
- If a decreasing table is entered, the values for 20 mA and 4 mA of the current output are interchanged. That means: 20 mA refers to the lowest level, whereas 4 mA refers to the highest level. If required, the current output can be inverted in the **Measuring mode** parameter.

Table number		
Navigation		
Prerequsite	Linearization type (→ 🗎 123) = Table	
Description	Select table point you are going to enter or change.	
User entry	1 to 32	
Factory setting	1	
Level (Manual)		
Navigation		

Linearization type (→ 🗎 123) = Table
 Table mode (→ 🖺 127) = Manual

128

Prerequsite

Description Enter level value of the table point (value before linearization).

User entry Signed floating-point number

Factory setting 0 %

Level (Semiautomatic)

Navigation $riangleq ext{Setup} o ext{Advanced setup} o ext{Linearization} o ext{Level}$

Prerequsite

■ Linearization type (→ 🗎 123) = Table

■ Table mode (→ 🖺 127) = Semiautomatic

Description Displays measured level (value before linearization). This value is transmitted to the table.

Customer value

Navigation \square Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Customer value

Prerequsite Linearization type (→ 🗎 123) = Table

Description Enter linearized value for the table point.

User entry Signed floating-point number

Factory setting 0 %

Activate table

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Linearization \rightarrow Activate table

Prerequsite Linearization type (→ 🗎 123) = Table

Description Activate (enable) or deactivate (disable) the linearization table.

Selection • Disable

■ Enable

Factory setting Disable

Additional information

Meaning of the options

Disable

The measured level is not linearized.

If **Linearization type** (\rightarrow \rightleftharpoons **123**) = **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 $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Safety sett.

Output echo lost

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

Description Define the behavior of the 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

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 ($\Rightarrow \triangleq 132$).

Value echo lost

In the case of a lost echo the output assumes the value defined in the **Value echo lost** parameter ($\Rightarrow \triangleq 131$).

Alarm

In the case of a lost echo the device generates an alarm; see the **Failure mode** parameter $(\rightarrow \implies 138)$

Value echo lost

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Safety sett. \rightarrow Value echo lost

Prerequsite Output echo lost (→ 🖺 131) = Value echo lost

Description Define 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 (→ 🖺 117)

■ with linearization: Unit after linearization (→ 🖺 124)

Ramp at echo lost

Navigation

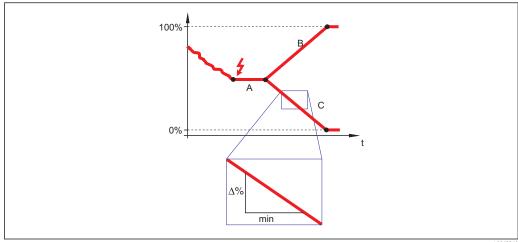
Prerequsite Output echo lost $(\rightarrow \triangleq 131)$ = Ramp at echo lost

Description Define the slope of the ramp in the case of a lost echo.

User entry Signed floating-point number

Factory setting 0.0 %/min

Additional information



- Α Delay time echo lost
- Ramp at echo lost ($\rightarrow \equiv 132$) (positive value) В
- Ramp at echo lost ($\rightarrow \equiv 132$) (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

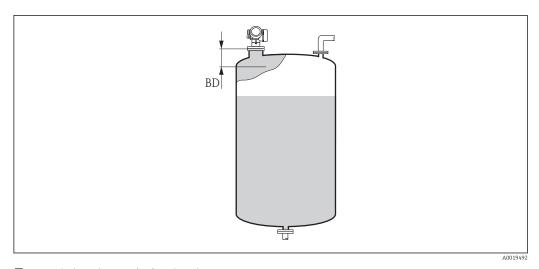
Description Specify blocking distance BD.

User entry 0 to 200 m

Factory setting FMR50, FMR51, FMR53, FMR54: antenna length

Additional information No echos are evaluated within the blocking distance BD. Therefore, BD can be used to

suppress interference echos in the vicinity of the antenna.



 \blacksquare 34 Blocking distance (BD) for liquid measurements

"SIL/WHG confirmation" wizard



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

The **SIL/WHG** confirmation wizard is required to lock the device according to SIL or 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

"Deactivate SIL/WHG" wizard

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Deactiv. SIL/WHG

Reset write protection

Navigation Setup \rightarrow Advanced setup \rightarrow Deactiv. SIL/WHG \rightarrow Res. write prot.

Description Enter unlocking code.

User entry 0 to 65 535

Factory setting 0

Code incorrect

Navigation \blacksquare Setup \rightarrow Advanced setup \rightarrow Deactiv. SIL/WHG \rightarrow Code incorrect

Description Indicates that a wrong unlocking code has been entered. Select procedure.

Selection ■ Reenter code

Abort sequence

Factory setting Reenter code

"Current output 1 to 2" submenu

The **Current output 2** submenu ($\rightarrow \triangleq 136$) is only available for devices with two current outputs.

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Curr.output 1 to 2

Assign current output 1 to 2

Navigation

Description

Select process variable for current output.

Selection

- Level linearized
- Distance
- Electronic temperature
- Relative echo amplitude
- Analog output adv. diagnostics 1
- Analog output adv. diagnostics 2
- Area of incoupling

Factory setting

- Current output 1: Level linearized
- Current output 2 ¹⁰⁾: Relative echo amplitude

Additional information

Definition of the current range for the process variables

Process variable	4 mA value	20 mA value
Level linearized	0 % ¹⁾ or the associated linearized value	$100\ \%^{2)}$ or the associated linearized value
Distance	0 (i.e. level is at the reference point) Empty calibration (\rightarrow 105) (i.e. level is a 0 %)	
Electronic temperature	-50 °C (-58 °F)	100 °C (212 °F)
Relative echo amplitude	0 dB	150 dB
Analog output adv. diagnostics 1/2	depending on the parametrization of the Advanced Diagnostics	
Area of incoupling	0	100

- 1) the 0% level is defined by **Empty calibration** parameter ($\rightarrow \equiv 105$)
- 2) The 100% level is defined by **Full calibration** parameter ($\rightarrow \equiv 105$)

It may be necessary to adjust the 4mA and 20mA values to the application (especially in the case of the **Analog output adv. diagnostics 1/2** and **Area of incoupling** options).

This can be done by the following parameters:

- Expert \rightarrow Output \rightarrow Curr.output 1 to 2 \rightarrow Turn down
- Expert \rightarrow Output \rightarrow Curr.output 1 to 2 \rightarrow 4 mA value
- Expert \rightarrow Output \rightarrow Curr.output 1 to 2 \rightarrow 20 mA value

⁰⁾ only for devices with two current outputs

Current span

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Curr.output 1 to 2 \rightarrow Current span

Description Select current range for process variable and alarm signal.

Selection ■ 4...20 mA

4...20 mA NAMUR4...20 mA USFixed current

Factory setting 4...20 mA NAMUR

Additional information *Meaning of the options*

Option	Current range for process variable	Lower alarm signal level	Upper alarm signal level
420 mA	4 to 20.5 mA	< 3.6 mA	> 21.95 mA
420 mA NAMUR	3.8 to 20.5 mA	< 3.6 mA	> 21.95 mA
420 mA US	3.9 to 20.8 mA	< 3.6 mA	> 21.95 mA
Fixed current	Constant current, defined in the Fixed current parameter ($\Rightarrow \implies 137$).		

- In the case of an error, the output current assumes the value defined in the **Failure** mode parameter (\rightarrow $\stackrel{\triangle}{=}$ 138).
 - If the measured value is out of the measuring range, diagnostic message **Current output** is issued.
- In a HART multidrop loop only one device can use the analog current to transmit a signal. For all other devices one must set:
 - **■** Current span = Fixed current
 - Fixed current (→ 🗎 137) = 4 mA

Fixed current

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Curr.output 1 to 2 \rightarrow Fixed current

Prerequsite Current span ($\rightarrow \triangleq 137$) = Fixed current

Description Define constant value of the current.

User entry 4 to 22.5 mA

Factory setting 4 mA

Damping output

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Curr.output 1 to 2 \rightarrow Damping out.

Description Define time constant τ for the damping of the output current.

User entry 0.0 to 999.9 s

Factory setting 0.0 s

Additional information Fluctuations of the measured value affect the output current with an exponential delay,

the time constant τ of which is defined in this parameter. With a small time constant the output reacts immediately to changes of the measured value. With a big time constant the reaction of the output is more delayed. For $\tau=0$ (factory setting) there is no damping.

Failure mode

Navigation Setup \rightarrow Advanced setup \rightarrow Curr.output 1 to 2 \rightarrow Failure mode

Prerequsite Current span ($\Rightarrow \equiv 137$) \neq Fixed current

Description Select behavior of the output current in case of an error.

Selection ■ Min.

Max.

Last valid valueActual valueDefined value

Factory setting Max.

Additional information Meaning of the options

■ Min

The current output adopts the value of the lower alarm level according to the **Current span** parameter ($\rightarrow \implies 137$).

Max

The current output adopts the value of the upper alarm level according to the **Current span** parameter ($\rightarrow \implies 137$).

Last valid value

The current remains constant at the last value it hat before the error occurred.

Actual value

The output current follows the actual measured value; the error is ignored.

Defined value

The output current assumes the value defined in the **Failure current** parameter ($\rightarrow \implies 139$).

The error behavior of other output channels is not influenced by these settings but is defined in separate parameters.

Failure current

Navigation Setup \rightarrow Advanced setup \rightarrow Curr.output 1 to 2 \rightarrow Failure current

Prerequsite Failure mode (→ 🖺 138) = Defined value

Description Enter current output value in alarm condition.

User entry 3.59 to 22.5 mA

Factory setting 22.5 mA

Output current 1 to 2

Navigation Setup \rightarrow Advanced setup \rightarrow Curr.output 1 to 2 \rightarrow Output curr. 1 to 2

Description Displays calculated output current.

"Switch output" submenu

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

Switch output function

Navigation

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 ($\rightarrow \implies 141$) 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 (→ 🗎 141)
- Switch-on value (→ \triangleq 141)
- Switch-off value (→ \triangleq 143)
- 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 ($\Rightarrow \triangleq 140$).

i

The **Off** and **On** options can be used to simulate the switch output.

Assign status

Navigation

Prerequsite

Switch output function (→ 🗎 140) = Digital Output

Description

Select device status for switch output.

Selection

- Off
- Digital output AD 1
- Digital output AD 2

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 Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Assign limit

Prerequsite Switch output function ($\Rightarrow \triangleq 140$) = Limit

Description Select process variable for limit monitoring.

Selection ■ Off

Level linearized

Distance

■ Terminal voltage

Electronic temperatureRelative echo amplitude

Area of incoupling

Factory setting Off

Assign diagnostic behavior

Navigation Setup \rightarrow Advanced setup \rightarrow Switch output \rightarrow Assign diag. beh

Prerequsite Switch output function (→ 🖺 140) = Diagnostic behavior

Description Select diagnostic behavior for switch output.

Selection • Alarm

Alarm or warning

Warning

Factory setting Alarm

Switch-on value

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

Prerequsite Switch output function ($\rightarrow \equiv 140$) = Limit

Description Enter measured value for the switch-on point.

User entry

Signed floating-point number

Factory setting

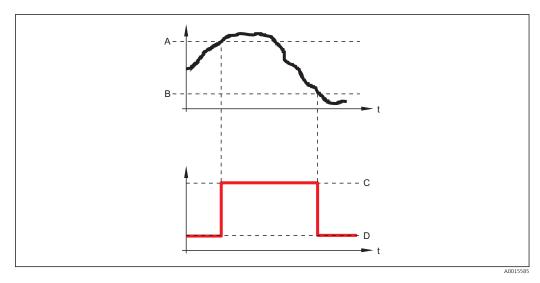
0

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

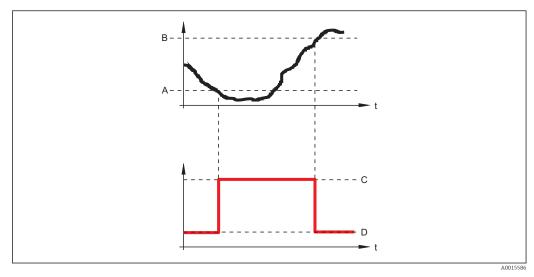
- The output is closed if the measured value is larger than **Switch-on value**.
- The output is opened if the measured value is smaller than **Switch-off value**.



- 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**.



- 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

Prerequsite • Switch output function ($\rightarrow \stackrel{\triangle}{=} 140$) = Limit

■ Assign limit (→ 🖺 141) ≠ Off

Description Define switch-on delay.

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

Prerequsite Switch output function ($\Rightarrow \triangleq 140$) = 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

 $(\rightarrow \triangleq 141).$

Switch-off delay

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

Prerequsite ■ Switch output function (→ 🖺 140) = Limit

■ Assign limit (>
141) ≠ Off

Description Define switch-off delay.

User entry 0.0 to 100.0 s

Factory setting 0.0 s

Failure mode		
Navigation		
Description	Define output behavior in alarm condition.	
Selection	Actual statusOpenClosed	
Factory setting	Open	
Switch status		
Navigation		
Description	Displays the current state of the switch output.	
Invert output signal		
Navigation		
Description	Specify whether the output signal is to be inverted.	
Selection	NoYes	
Factory setting	No	
Additional information	formation 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

i

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 ¹¹⁾
- Français ¹¹⁾
- Español ¹¹⁾
- Italiano ¹¹⁾
- Nederlands ¹¹⁾
- Portuguesa ¹¹⁾
- Polski ¹¹⁾
- **■** русский язык (Russian) ¹¹⁾
- Svenska ¹¹⁾
- Türkçe ¹¹⁾
- 中文 (Chinese) 11)
- 日本語 (Japanese) 11)
- 한국어 (Korean) ¹¹⁾
- (Arabic) أَلْعَرَبِيَّة (Arabic) الْعَرَبِيَّة
- Bahasa Indonesia ¹¹⁾
- ๑ ภาษาไทย (Thai) ¹¹⁾
- tiếng Việt (Vietnamese) ¹¹⁾
- čeština (Czech) 11)

Factory setting

The additional language selected in feature 500 of the product structure.

If no additional language has been selected: English

Additional information

The **English** option can be selected in every device. One additional operating language can be selected in the product structure when ordering a device (feature 500 "Additional

Operation Language") and will be selectable in the **Language** parameter.

Format display

Navigation

Description

Select how measured values are shown on the display.

¹¹⁾ Visibility depends on order options or device settings

Selection

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

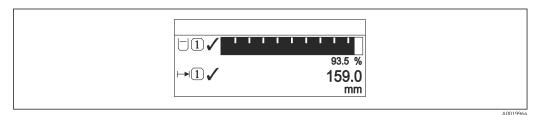
Factory setting

1 value, max. size

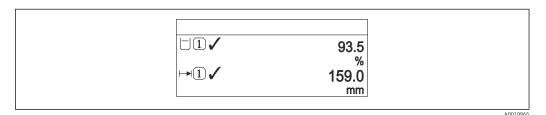
Additional information



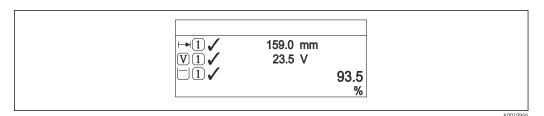
■ 35 "Format display" = "1 value, max. size"



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

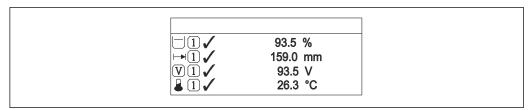


■ 37 "Format display" = "2 values"



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

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■ 39 "Format display" = "4 values"

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- The **Value 1 to 4 display** → 🖺 147 parameters specify which measured values are shown on the display and in which order.
- 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 ($\rightarrow \implies 148$).

Value 1 to 4 display	

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Value 1 display

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

Selection ■ None ¹²⁾

Level linearized

Distance

■ Current output 1 ¹³⁾

Measured current

Current output 2

■ Terminal voltage

■ Electronic temperature

Absolute echo amplitude

Relative echo amplitude

Analog output adv. diagnostics 1

■ Analog output adv. diagnostics 2

Area of incoupling

Factory setting ■ Value 1 display: Level linearized

Value 2 display: None

■ Value 3 display: None

■ Value 4 display: None

Decimal places 1 to 4

Navigation Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Decimal places 1

Description Select the number of decimal places for the display value.

Endress+Hauser

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¹²⁾ can not be selected for the 'Value 1 display" parameter.

^{13) &}quot;Visibility depends on order options or device settings"

Selection ■ x

x.xx.xxx.xxx

x.xxxx

Factory setting x.xx

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 $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Display damping

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

User entry 0.0 to 999.9 s

Factory setting 0.0 s

Header

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

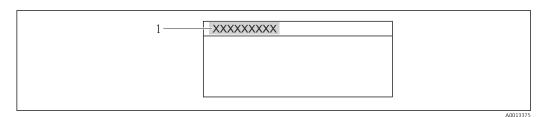
Description Select header contents on local display.

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 ($\rightarrow \equiv 103$).

■ Free text

Is defined in the **Header text** parameter ($\Rightarrow \triangleq 149$).

Header text

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Header text

Prerequsite Header ($\rightarrow = 148$) = Free text

Description Enter display header text.

Factory setting ------

Additional information The number of characters which can be displayed depends on the characters used.

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

Description Select decimal separator for displaying numerical values.

Selection • .

Separator

■ ,

Factory setting .

Number format

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Number format

Description Choose number format for the display.

Selection • Decimal

• ft-in-1/16"

Endress+Hauser

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Factory setting Decimal

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

Decimal places menu

Navigation $\blacksquare \square$ Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Dec. places menu

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

menu.

Selection ■ x

X.XX.XX

X.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** \Rightarrow \cong 147

parameters.

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

Backlight

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

Prerequsite 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 and buttons simultaneously.

■ Brighter: press the 🕞 and 🖲 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.

Navigation $\blacksquare \blacksquare$ Setup \rightarrow Advanced setup \rightarrow Conf.backup disp

Operating time

Navigation $\blacksquare \Box$ Setup \rightarrow Advanced setup \rightarrow Conf.backup disp \rightarrow Operating time

Description Indicates how long the device has been in operation.

User interface Days (d), hours (h), minutes (m), seconds (s)

Additional information *Maximum time*

9999 d (≈ 27 years)

Last backup

Navigation Setup \rightarrow Advanced setup \rightarrow Conf.backup disp \rightarrow Last backup

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

User interface Days (d), hours (h), minutes (m), seconds (s)

Configuration management

Navigation Setup \rightarrow Advanced setup \rightarrow Conf.backup disp \rightarrow Config. managem.

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:

- HART date code
- HART short tag
- HART message
- HART descriptor
- HART address
- Device tag
- 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 ($\rightarrow \implies 153$).

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	Setup → Advanced setup → Conf.backup disp → Compar. result	
Description	Displays the comparison result between the device and the display.	

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** ($\rightarrow \triangleq 152$) = **Compare**.
- If the transmitter configuration has been duplicated from a different device by Configuration management (→ 🗎 152) = 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 Def. 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 $(\rightarrow \implies 114)$.
- 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 ($\rightarrow \triangleq 157$).

Device reset

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

Description Select to which state the device is to be reset.

Selection • Cancel

To factory defaultsTo delivery settingsOf customer settingsTo 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.

"Define access code" wizard

i

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.

Navigation

0 to 9999

Setup → Advanced setup → Administration → Def. access code

Define access code			
Navigation		Setup \rightarrow Advanced setup \rightarrow Administration \rightarrow Def. access code \rightarrow Def. access code	е
Description $\rightarrow \implies 155$		155	
Confirm access code			<u> </u>
Navigation		Setup \rightarrow Advanced setup \rightarrow Administration \rightarrow Def. access code \rightarrow Confirm code	
Description	Conf	irm the entered access code.	

Factory setting 0

User entry

15.4 "Diagnostics" menu

Actual diagnostics Navigation \square Diagnostics \rightarrow Actual diagnos. 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 Description Displays timestamp for the **Actual diagnostics** parameter ($\rightarrow \equiv 158$). User interface Days (d), hours (h), minutes (m), seconds (s) **Previous diagnostics** Navigation □ □ Diagnostics → Prev.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

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.

Operating time of occurrence

■ Event text

Timestamp

Navigation □ Diagnostics → Timestamp

Description Displays timestamp for the **Previous diagnostics** parameter ($\Rightarrow \implies 158$).

User interface Days (d), hours (h), minutes (m), seconds (s)

Operating time from restart

Navigation \blacksquare Diagnostics \rightarrow Time fr. restart

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

User interface Days (d), hours (h), minutes (m), seconds (s)

Operating time

Description Indicates how long the device has been in operation.

User interface Days (d), hours (h), minutes (m), seconds (s)

Additional information *Maximum time*

9999 d (≈ 27 years)

15.4.1 "Diagnostic list" submenu

Navigation \Box Diagnostics \rightarrow Diagnostic list

Diagnostics 1 to 5

Navigation Diagnostics \rightarrow Diagnostic list \rightarrow Diagnostics 1 to 5

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

Description Displays timestamp for the **Diagnostics 1 to 5** parameter ($\rightarrow \implies 160$).

User interface Days (d), hours (h), minutes (m), seconds (s)

15.4.2 "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		â
Navigation		
Description	Select category (status signal) whose event messages are displayed in the events list.	
Selection	 All Failure (F) Function check (C) Out of specification (S) Maintenance required (M) Information (I) 	

Factory setting

A11

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 ($\rightarrow \implies 161$). A maximum of 20 events are displayed in chronological order. If the advanced HistoROM functionality has been activated in the device, the event list may comprise up to 100 entries.

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

15.4.3 "Device information" submenu

Navigation $\blacksquare \square$ Diagnostics \rightarrow Device info

Device tag

Navigation $\blacksquare \Box$ Diagnostics \rightarrow Device info \rightarrow Device tag

Description Enter the name for the measuring point.

Factory setting FMR5x

Serial number

Navigation \blacksquare Diagnostics \rightarrow Device info \rightarrow Serial number

Description Displays serial number of the 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 $\blacksquare \Box$ Diagnostics \rightarrow Device info \rightarrow Firmware version

Description Indicates the installed Firmware version.

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 \square Diagnostics \rightarrow Device info \rightarrow Device name

Description Displays device name.

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Order code

Navigation \blacksquare Diagnostics \rightarrow Device info \rightarrow Order code

Description Displays order code of the device.

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 \blacksquare Diagnostics \rightarrow Device info \rightarrow Ext. order cd. 1 to 3

Description Displays 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.

Device revision

Navigation \blacksquare Diagnostics \rightarrow Device info \rightarrow Device revision

Description Displays the device revision registered for this device at the HART Communication

Foundation.

Additional information The device revision is used to allocate the correct Device Description file (DD) to the device.

Device ID

Navigation $\blacksquare \Box$ Diagnostics \rightarrow Device info \rightarrow Device ID

Description Displays Device ID.

Additional information In addition to the Device type and Manufacturer ID, the Device ID is part of the unique

device identification (Unique ID) which characterizes each HART device unambiguously.

Device type	
Navigation	
Description	Displays the device type with which the device is registered with the the HART Communication Foundation.
Additional information	The device type is needed to allocate the correct Device Description file (DD) to the device.
Manufacturer ID	
Navigation	
Description	Displays the manufactured ID with which the device is registered with the HART Communication Foundation.

15.4.4 "Measured values" submenu

Navigation \Box Diagnostics \rightarrow Measured val.

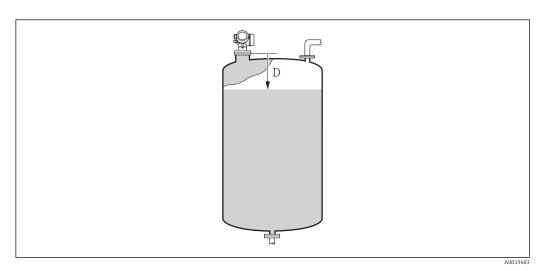
Distance

Navigation \blacksquare Diagnostics \rightarrow Measured val. \rightarrow Distance

Description Displays the measured distance D between the reference point (lower edge of the flange or

threaded connection) and the level.

Additional information



40 Distance for liquid measurements

The unit is defined in the **Distance unit** parameter ($\rightarrow \triangleq 103$).

Level linearized

Navigation □ Diagnostics → Measured val. → Level linearized

Description Displays linearized level.

Additional information The unit is defined by the **Unit after linearization** parameter $\rightarrow \triangleq 124$.

Output current 1 to 2

Navigation $\blacksquare \square$ Diagnostics \rightarrow Measured val. \rightarrow Output curr. 1 to 2

Description Displays calculated output current.

Measured	current	1
----------	---------	---

Navigation \blacksquare Diagnostics \rightarrow Measured val. \rightarrow Measur. curr. 1

Prerequsite Only available for current output 1

Description Displays the measured value of the output current.

Terminal voltage 1

Navigation $\blacksquare \Box$ Diagnostics \rightarrow Measured val. \rightarrow Terminal volt. 1

Description Dipslays terminal voltage at the current output.

Electronic temperature

Navigation \Box Diagnostics \rightarrow Measured val. \rightarrow Electronic temp.

Description Displays the current temperature of the electronics.

Additional information The unit is defined in the **Temperature unit** parameter.

15.4.5 "Data logging" submenu

The **Data logging** submenu is only available if the advanced functionality of the HistoROM has been activated in the device.

Assign channel 1 to 4

Navigation Diagnostics \rightarrow Data logging \rightarrow Assign chan. 1 to 4

Description Allocate a process variable to the respective data logging channel.

Selection • Off

- Level linearized
- Distance
- Current output 1
- Measured current
- Current output 2 ¹⁴⁾
- Terminal voltage
- Electronic temperature
- Absolute echo amplitude
- Relative echo amplitude
- Area of incoupling
- Analog output adv. diagnostics 1
- Analog output adv. diagnostics 2

Factory setting Off

Additional information A total of 500 measured values can be logged. This means:

- 500 data points if 1 logging channel is used
- 250 data points if 2 logging channels are used
- 166 data points if 3 logging channels are used
- 125 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 500, 250, 166 or 125 measured values are always in the log (ring memory principle).

The logged data are deleted if a new option is selected in this parameter.

Logging interval

Navigation □ Diagnostics → Data logging → Logging interval

User entry 1.0 to 3 600.0 s

¹⁴⁾ Visibility depends on order options or device settings

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: $T_{log} = 500 \cdot t_{log}$
- If 2 logging channels are used: $T_{log} = 250 \cdot t_{log}$
- If 3 logging channels are used: T log = 166 · t log
 If 4 logging channels are used: T log = 125 · 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

- $T_{log} = 500 \cdot 1 \text{ s} = 500 \text{ s} \approx 8.5 \text{ min}$
- $T_{log} = 500 \cdot 10 \text{ s} = 5000 \text{ s} \approx 1.5 \text{ h}$
- $T_{log} = 500 \cdot 80 \text{ s} = 40000 \text{ s} \approx 11 \text{ h}$
- $T_{log} = 500 \cdot 3600 \text{ s} = 1800000 \text{ s} \approx 20 \text{ d}$

Clear logging data

Navigation

Diagnostics → Data logging → Clear logging

Description

Initiate a deletion of the complete logging memory.

Selection

- Cancel
- Clear data

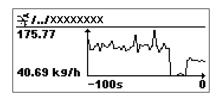
Factory setting

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

□ Diagnostics → Data logging → Displ.channel 1 to 4

15.4.6 "Simulation" submenu

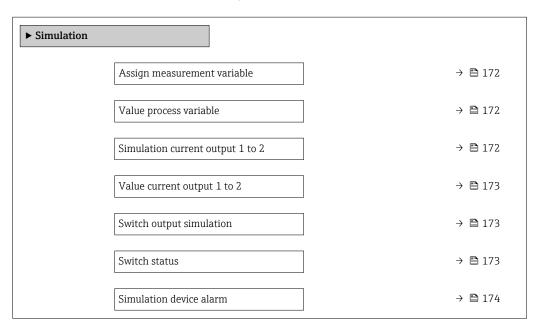
The **Simulation** submenu is used to simulate specific measuring values or other conditions. This helps to check the correct configuration of the device and connected control units.

Conditions which can be simulated

Condition to be simulated	Associated parameters
Specific value of a process variable	 Assign measurement variable (→ 🖺 172) Value process variable (→ 🖺 172)
Specific value of the output current	 Simulation current output (→
Specific state of the switch output	■ Switch output simulation (→ 🖺 173) ■ Switch status (→ 🖺 173)
Existence of an alarm	Simulation device alarm (→ 🖺 174)

Structure of the submenu

Navigation \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation



Description of parameters

Navigation $\blacksquare \square$ Expert \rightarrow Diagnostics \rightarrow Simulation

Assign measurement variable

Navigation \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Assign meas.var.

Description Selct process variable to be simulated.

Selection ■ Off

Level

Level linearized

Factory setting Off

Additional information

- The value of the variable to be simulated is defined in the **Value process variable** parameter $(\rightarrow \boxminus 172)$.
- If **Assign measurement variable** ≠ **Off**, a simulation is active. This is indicated by a diagnotic message of the *Function check (C)* category.

Value process variable

Navigation $\blacksquare \blacksquare$ Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Value proc. var.

Prerequsite Assign measurement variable (→ 🖺 172) ≠ Off

Description Specify value of the process value being simulated.

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.

Simulation current output 1 to 2

Navigation \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Sim.curr.out. 1 to 2

Description Switch the simulation of the current output on or off.

Selection ■ Off

On

Factory setting Off

172

Additional information

An active simulation is indicated by a diagnostic message of the $Function\ check\ (C)$

category.

Value current output 1 to 2

Navigation \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Value curr.out 1 to 2

Prerequsite Simulation current output $(\rightarrow \ \ \) = 0n$

Description Enter current value for the simulation

User entry 3.59 to 22.5 mA

Factory setting 3.59 mA

Additional information The current output assumes the value specified in this parameter. In this way, users can

verify the correct adjustment of the current output and the correct function of connected

control units.

Switch output simulation

Navigation \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Switch sim.

Description Switch the simulation of the switch output on or off.

Selection • Off

■ On

Factory setting Off

Switch status

Navigation \blacksquare Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Switch status

Prerequsite Switch output simulation ($\Rightarrow \triangleq 173$) = On

Description Define the switch state to be simulated.

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 $\blacksquare \Box$ Expert \rightarrow Diagnostics \rightarrow Simulation \rightarrow Sim. alarm

Description Switch alarm simulation on or 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.

15.4.7 "Device check" submenu

Navigation \Box Diagnostics \rightarrow Device check

Start device check

Navigation \blacksquare Diagnostics \rightarrow Device check \rightarrow Start dev. check

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 \Box Diagnostics \rightarrow Device check \rightarrow Result dev.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 $\blacksquare \Box$ Diagnostics \rightarrow Device check \rightarrow Last check time

Description Displays the operating time at which the last device check has been performed.

Level signal

Navigation \square Diagnostics \rightarrow Device check \rightarrow Level signal

Prerequsite Device check has been performed.

Displays result of the device check for the level signal. Description

User interface ■ Check not done

■ Check not OK

■ Check OK

For **Level signal** = **Check not OK**: Check the mounting position of the device and the dielectric constant of the medium. Additional information

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