

Operating Instructions Levelflex FMP50

Guided Level-Radar Level measurement in liquids





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1 Important document information

1.1 About this document

1.1.1 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.

1.1.2 Additional standard documentation on the device

Document	Purpose and content of the document
Technical Information TI01000F	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 FMP50 HART KA01053F	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 GP01000F	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.

The document types listed are available:

• On the CD supplied with the device

• In the Download Area of the Endress+Hauser Internet site: www.endress.com \rightarrow Download

1.1.3 Safety Instructions (XA) for Levelflex FMP50

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

Feature 010	Approval	Safety Instructions HART	Safety Instructions PROFIBUS FOUNDATION Fieldbus
BA	ATEX II 1 G Ex ia IIC T6 Ga	XA00496F	XA00516F
BB	ATEX II 1/2 G Ex ia IIC T6 Ga/Gb	XA00496F	XA00516F
BC	ATEX II 1/2 G Ex d[ia] IIC Tó Ga/Gb	XA00499F	XA00519F
BD	ATEX II 1/3 G Ex ic[a] IIC T6 Ga/Gc	XA00497F	XA00517F
BG	ATEX II 3 G Ex nA IIC T6 Gc	XA00498F	XA00518F
BH	ATEX II 3 G Ex ic IIC T6 Gc	XA00498F	XA00518F
BL	ATEX II 1/3G Ex nA(ia) IIC T6	XA00497F	XA00517F
B2	ATEX II 1/2 G Ex ia IIC T6, 1/2D Ex ia IIIC IP6x	XA00502F	XA00522F
B3	ATEX II 1/2 G Ex d[ia] IIC Tó Ga/Gb, II 1/2 D Ex t[ia] IIIC Txx°C Da/Db IP6x	XA00503F	XA00523F
B4	ATEX II 1/2 G Ex ia IIC Tó Ga/Gb, Ex d[ia] IIC Tó Ga/Gb	XA00500F	XA00520F
СВ	CSA C/US IS Cl.I Div.1 Gr.A-D	XA00530F	XA00571F
CC	CSA C/US XP Cl.I Div.1 Gr.A-D	XA00529F	XA00570F

Feature 010	Approval	Safety Instructions HART	Safety Instructions PROFIBUS FOUNDATION Fieldbus
C2	CSA C/US IS Cl.I,II,III Div.1 Gr.A-G, NI Cl.1 Div.2, Ex ia	XA00530F	XA00571F
C3	CSA C/US XP Cl.I,II,III Div.1 Gr.A-G, NI Cl.1 Div.2, Ex d	XA00529F	XA00570F
FA	FM IS Cl.I Div.1 Gr. A-D	XA00531F	XA00573F
FB	FM IS Cl.I,II,III Div.1 Gr.A-G, AEx ia, NI Cl.1 Div.2	XA00531F	XA00573F
FC	FM XP CI.I Div.1 Gr.A-D	XA00532F	XA00572F
FD	FM XP Cl.I,II,III Div.1 Gr.A-G, AEx d, NI Cl.1 Div.2	XA00532F	XA00572F
IA	IECEx zone 0 Ex ia IIC Tó Ga	XA00496F	XA00516F
IB	IECEx zone 0/1 Ex ia IIC T6 Ga/Gb	XA00496F	XA00516F
IC	IECEx zone 0/1 Ex d[ia] IIC Tó Ga/Gb	XA00499F	XA00519F
ID	IECEx zone 0/2 Ex ic[ia] IIC T6 Ga/Gc	XA00497F	XA00517F
IG	IECEx zone 2 Ex nA IIC Tó Gc	XA00498F	XA00518F
IH	IECEx zone 2 Ex ic IIC T6 Gc	XA00498F	XA00518F
IL	IECEx zone 0/2 Ex nA(ia) IIC Tó Ga/Gc	XA00497F	XA00517F
I2	IECEx zone 0/1 Ex ia IIC T6 Ga/Gb, zone 20/21 Ex ia IIIC A20/21 IP6x, Da/Db	XA00502F	XA00522F
I3	IECEx zone 0/1 Ex d[ia] IIC T6 Ga/Gb, Zone 20/21 Ex t[ia] IIIC Txx°C Da/Db IP6x	XA00503F	XA00523F
NA	NEPSI zone 0 Ex ia IIC Tó Ga	XA00634F	XA00640F
NB	NEPSI zone 0/1 Ex ia IIC T6 Ga/Gb	XA00634F	XA00640F
NC	NEPSI zone 0/1 Ex d(ia) IIC T6 Ga/Gb	XA00636F	XA00642F
NG	NEPSI zone 2 Ex nA II T6 Gc	XA00635F	XA00641F
NH	NEPSI zone 2 Ex ic IIC T6 Gc	XA00635F	XA00641F
N2	NEPSI zone 0/1 Ex ia IIC T6 Ga/Gb, zone 20/21 Ex iaD 20/21 T*	XA00638F	XA00644F
N3	NEPSI zone 0/1 Ex d(ia) IIC T6 Ga/Gb, DIP A20/21 T* IP66	XA00639F	XA00644F
8A	FM/CSA IS+XP Cl.I,II,III Div.1 Gr.A-G	XA00531F XA00532F	XA00572F XA00573F

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

1.2 Document conventions

1.2.1 Safety symbols

Symbol	Meaning
DANGER A0011189-EN	DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
WARNING A0011190-EN	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
	CAUTION! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
NOTICE A0011192-EN	NOTICE! This symbol contains information on procedures and other facts which do not result in personal injury.

1.2.2 Electrical symbols

Symbol	Meaning		
A0011197	A terminal to which DC voltage is applied or through which direct current flows.		
A0011198	Alternating current A terminal to which alternating voltage (sine-wave) is applied or through which alternating current flow		
	Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.		
A0011199	A terminal which must be connected to ground prior to establishing any other connections.		
A0011201	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
$\mathbf{O} \not \subseteq$	Torx screwdriver
A0013442	
	Flat blade screwdriver
A0011220	
A 0011219	Phillips head screwdriver
A0011221	Allen key
Ń	Hexagon wrench
A0011221	Allen key Hexagon wrench

1.2.4 Symbols for certain types of information

Symbol	Meaning		
A0011182	Allowed Indicates procedures, processes or actions that are allowed.		
A0011183	Preferred Indicates procedures, processes or actions that are preferred.		
A0011184	Forbidden Indicates procedures, processes or actions that are forbidden.		
A0011193	Tip Indicates additional information.		
A0011194	Reference to documentation Refers to the corresponding device documentation.		
A0011195	Reference to page Refers to the corresponding page number.		
A0011196	Reference to graphic A0011100 Refers to the corresponding graphic number and page number.		

Symbol	Meaning	
1. , 2. , 3	Series of steps	
~	Result of a sequence of actions	
?	Help in the event of a problem	

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 A0011187	Hazardous area Indicates a hazardous area.
A0011188	Safe area (non-hazardous area) Indicates a non-hazardous location.

2 Basic safety instructions

2.1 Requirements concerning the staff

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 only for level measurement of liquids. Depending on the version ordered the device can also measure potentially explosive, flammable, poisonous and oxidizing materials.

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

- ► Measured process variables: level
- Calculated process variables: Volume or mass in arbitrarily shaped vessels (calculated from the level by the linearization functionality)

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

- ► Use the measuring device only for measured materials against which the process-wetted 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 °C (176 °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 Endress+Hauser.

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 Endress+Hauser 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-ofthe- art safety requirements, has been tested, and left the factory in a condition in which they are safe to operate.

It fulfills general safety requirements and legal requirements. It also conforms to the EC directives listed in the device-specific EC declaration of conformity. Endress+Hauser confirms this fact by applying the CE mark.

Product description 3

Product design 3.1

3.1.1 Compact device Levelflex



- **1** Design of the Levelflex
- 1 Electronics housing
- Process connection (Thread) 2
- 3
- Rope probe End-of-probe weight 4
- 5 Rod probe

3.1.2 Electronics housing



Design of the electronics housing

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

9 Grounding terminal

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

TEFLON®

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

TRI CLAMP®

Registered trademark of Alfa Laval Inc., Kenosha, USA

3.3 Patents

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

US Patents	EP Patents
5.827.985	_
5.884.231	—
5.973.637	—
6.087.978	955 527

US Patents	EP Patents
6.140.940	_
6.481.276	_
6.512.358	1 301 914
6.559.657	1 020 735
6.640.628	—
6.691.570	_
6.847.214	_
7.441.454	_
7.477.059	—
-	1 389 337
7.965.087	_

4 Incoming acceptance and product identification

4.1 Incoming acceptance



A0016870

Is the order code on the delivery note (1) identical to the order code on the product sticker (2)?



A0014038

Do the nameplate data match the ordering information on the delivery note?

A0014037



Are the CD-ROMs (product documentation, operating tool) and documentation present? If required (see nameplate): Are the Safety Instructions (XA) present?

If one of the conditions does not comply, contact your Endress+Hauser distributor.

4.2 Product identification

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

- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter serial numbers from nameplates in *W*@*M* Device Viewer (www.endress.com/deviceviewer): All information about the measuring device is displayed.

For an overview of the scope of the Technical Documentation provided, refer to the following: enter serial numbers from nameplates in *W@M Device Viewer* (www.endress.com/deviceviewer)

4.2.1 Nameplate



3 Nameplate of the Levelflex

- 1 Device name
- 2 Address of manufacturer
- 3 Order code
- 4 Serial number (Ser. no.)
- 5 Extended order code (Ext. ord. cd.)
- 6 Process pressure
- 7 Gas phase compensation: reference distance
- 8 Certificate symbol
- 9 Certificate and approval relevant data
- 10 Degree of protection: e.g. IP, NEMA
- 11 Document number of the Safety Instructions: e.g. XA, ZD, ZE
- 12 Data Matrix Code
- 13 Modification mark
- 14 Manufacturing date: year-month
- 15 Permitted temperature range for 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 DeviceID
- 21 Material in contact with process
- 22 Permitted ambient temperature (T_a)
- 23 Size of the thread of the cable glands
- 24 Length of probe
- 25 Signal outputs
- 26 Operating voltage

4.2.2 Product structure FMP50

This overview does not mark options which are mutually exclusive.

Option with * = in preparation

010	Approval:
AA	Non-hazardous area
BA	ATEX II 1G Ex ia IIC T6
BB	ATEX II 1/2G Ex ia IIC T6
BC	ATEX II 1/2G Ex d(ia) IIC T6

010	Approval:		
BD	ATEX II 1/3G Ex ic(ia) IIC T6		
BG	ATEX II 3G Ex nA IIC To		
BH	ATEX II 3G Ex ic IIC T6		
BL	ATEX II 1/3G Ex nA(ia) IIC T6		
B2	*ATEX II 1/2G Ex ia IIC T6, 1/2D Ex ia IIIC IP6x		
B3	*ATEX II 1/2G Ex d(ia) IIC T6, 1/2D Ex tD IIIC IP6x		
B4	ATEX II 1/2G Ex ia IIC T6, Ex d(ia) IIC T6		
CA	CSA General Purpose		
CB	CSA C/US IS Cl.I Div.1 Gr.A-D		
CC	CSA C/US XP Cl.I Div.1 Gr.A-D		
C2	*CSA C/US IS Cl.I,II,III Div.1 Gr.A-G, NI Cl.1 Div.2, Ex ia		
C3	*CSA C/US XP Cl.I,II,III Div.1 Gr.A-G, NI Cl.1 Div.2, Ex d		
FA	FM IS Cl.I Div.1 Gr.A-D		
FB	*FM IS Cl.I,II,III Div.1 Gr.A-G, AEx ia, NI Cl.1 Div.2		
FC	FM XP Cl.I Div.1 Gr.A-D		
FD	*FM XP Cl.I,II,III Div.1 Gr.A-G, AEx d, NI Cl.1 Div.2		
IA	IECEx zone 0 Ex ia IIC T6 Ga		
IB	IECEx zone 0/1 Ex ia IIC T6 Ga/Gb		
IC	IECEx zone 0/1 Ex d(ia) IIC T6 Ga/Gb		
ID	IECEx zone 0/2 Ex ic(ia) IIC T6 Ga/Gc		
IG	IECEx zone 2 Ex nA IIC T6 Gc		
IH	IECEx zone 2 Ex ic IIC T6 Gc		
IL	IECXEx Zone 0/2 Ex nA(ia) IIC T6 Ga/Gc		
I2	*IECEx zone 0/1 Ex ia IIC T6 Ga/Gb, zone 20/21 Ex ia IIIC A20/21 IP6x Da/Db		
I3	*IECEx zone 0/1 Ex d(ia) IIC T6 Ga/Gb, zone 20/21 Ex tD IIIC A20/21 IP6x Da/Db		
NA	NEPSI zone 0 Ex ia IIC T6 Ga		
NB	NEPSI zone 0/1 Ex ia IIC T6 Ga/Gb		
NC	NEPSI zone 0/1 Ex d(ia) IIC T6 Ga/Gb		
NG	NEPSI zone 2 Ex nA II T6 Gc		
NH	NEPSI zone 2 Ex ic IIC T6 Gc		
N2	NEPSI zone 0/1 Ex ia IIC T6 Ga/Gb, zone 20/21 Ex iaD 20/21 T*		
N3	NEPSI zone 0/1 Ex d(ia) IIC T6 Ga/Gb, DIP A20/21 T* IP6x		
8A	*FM/CSA IS+XP Cl.I,II,III Div.1 Gr.A-G		
99	Special version, TSP-no. to be sepc.		
020	Power Supply, Output		
A	2-wire; 4-20mA HART		
С	2-wire; 4-20mA HART, 4-20mA		
Е	2-wire; FOUNDATION Fieldbus, switch output		
G	2-wire; PROFIBUS PA, switch output		
К	4-wire 90-253VAC; 4-20mA HART		
L	4-wire 10,4-48VDC; 4-20mA HART		
Y	Special version, TSP-no. to be sepc.		

030	Display, Operation:			
А	W/o, via communication			
С	SD02 4-line, push buttons + data backup function Special version, TSP-no. to be sepc.			
Y	Special version, TSP-no. to be sepc.			
0.40				
040	Housing:			
A	GT19 dual compartment, Plastics PB1			
v	G120 dual compartment, Alu coated			
I	special version, 15r-no. to be sept.			
050	Electrical connection:			
А	Gland M20, IP66/68 NEMA4X/6P			
В	Thread M20, IP66/68 NEMA4X/6P			
С	Thread G1/2, IP66/68 NEMA4X/6P			
D	Thread NPT1/2, IP66/68 NEMA4X/6P			
Ι	Plug M12, IP66/68 NEMA4X/6P			
М	Plug 7/8", IP66/68 NEMA4X/6P			
Y	Special version, TSP-no. to be sepc.			
060	be:			
AA	mm, rod 8mm 316L			
AB	inch, rod 1/3" 316L			
LA	mm, rope 4mm 316			
LB	inch, rope 1/6" 316			
YY	Special version, TSP-no. to be sepc.			
090	Seal:			
A1	Viton, -2080°C			
Y9	Special version, TSP-no. to be sepc.			
100	Process connection.			
GDI	Thread ISO228 G3/4, 316L			
RDI	Thread ANSI MNPT3/4. 316L			
YYY	Special version, TSP-no. to be sepc.			
500	Additional Operation Language:			
AA	English			
AD	German			
AD	ITERCII Spanish			
AD AE	Uralish Italian			
AE AF				
AC-	Portuguese			
AG	I OTTARRESE			

- AH Polish
- AI Russian
- AK Chinese simplified

500	Additional Operation Language:		
AL	Japanese		
AM	Korean		
AR	Czech		
550	Calibration:		
F4	5-point linearity protocol		
F9	Special version, TSP-no. to be sepc.		
570	Service: (Multiple options can be selected)		
IJ	Customized parametrization HART		
IK	Customized parametrization PA		
IL	Customized parametrization FF		
IW	W/o Tooling DVD (FieldCare setup)		
I9	Special version, TSP-no. to be sepc.		
580	Test, Certificate: (Multiple options can be selected)		
JA	3.1 Material certificate, wetted metallic parts, EN10204-3.1 inspection certificate		
К9	Special version, TSP-no. to be sepc.		
590	Additional Approval: (Multiple options can be selected)		
LA	SIL		
LC	*WHG overfill prevention		
L9	Special version, TSP-no. to be sepc.		
600	Probe Design: (Multiple options can be selected)		
MB	Sensor remote, 3m/9ft cable, detachable+mounting bracket		
M9	Special version, TSP-no. to be sepc.		
620	Accessory Enclosed: (Multiple options can be selected)		
PB	Weather protection cover		
PG	Mounting kit, insulated, rope		
RC	UNI flange 2" / DN50/50, 316L max 3bar abs/44psia, suitable for 2" 150lbs /DN50 PN16/10K 50		
RF	UNI flange 3" /DN80/80, 316L max 3bar abs/44psia, suitable for 3" 150lbs/DN80 PN16/10K 80		
RI	UNI flange 4" /DN100/100, 316L max 3bar abs/44psia, suitable for 4" 150lbs/DN100 PN16/10K 100		
R9	Special version, TSP-no. to be sepc.		
850	Firmware Version:		
75	01.01.zz, HART, DevRev02		
76	01.00.zz, FF, DevRev01		
77	01.00.zz, PROFIBUS PA, DevRev01		
78	01.00.zz, HART, DevRev01		
895	Tagging: (Multiple options can be selected) Image: (Multiple options can be selected)		
Z1	Tagging (TAG), see additional spec.		
Z2	Bus address, see additional spec.		

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

AWARNING

Risk of injury if the hosuing breaks away!

- ► Transport the measuring device to the measuring point in its original packaging or at the process connection.
- ► Comply with the safety instructions, transport conditions for devices over 18kg (39.6lbs).



6 Mounting

6.1 Mounting dimensions

6.1.1 Dimensions of the electronics housing



Housing GT19 (Plastics PBT); Dimensions in mm (in)



S Housing GT20 (Alu coated); Dimensions in mm (in)



6.1.2 Dimensions of the mounting bracket

6 Mounting bracket for the electronics housing

A Wall mounting

B Pipe mounting

For the "Sensor remote" device version (see feature 060 of the product structure), the mounting bracket is part of the delivery. If required, it can also be ordered as an accessory (order code 71102216).



FMP50 : Dimensions of process connection and probe 6.1.3

- Mounting bracket for probe design "Sensor remote" (Feature 600) Thread ISO228 G3/4 or ANSI MNPT3/4 (Feature 100) Α
- В
- С
- Rod probe 8mm or 1/3" (Feature 060) Rope probe 4mm or 1/6" (Feature 060) D
- LN Length of probe
- R Reference point of the measurement

6.2 Mounting requirements

6.2.1 Suitable mounting position



Mounting distances

- Distance (A) between wall and rod or rope probe:
 - for smooth metallic walls: > 50 mm (2")
 - for plastic walls: > 300 mm (12") mm to metallic parts outside the vessel
 - for concrete walls: $>500\ mm$ (20") , otherwise the available measuring range may be reduced.
- Distance (B) between rod or rope probe and internal fittings in the vessel: > 300 mm (12")
- Distance (C) from end of probe to bottom of the vessel:
 - Rope probe: > 150 mm (6 in)
 - Rod probe: > 10 mm (0.4 in)

Additional conditions

- When mounting in the open, a weather protection cover (1) may be installed to protect the device against extreme weather conditions.
- In metallic vessels: Preferably do not mount the probe in the center of the vessel (2), as this would lead to increased interference echoes.
 If a central mounting position can not be avoided, it is crucial to perform an interference echo suppresion(mapping) after the commissioning of the device.
- Do not mount the probe in the filling curtain (3).
- Avoid buckling the rope probe during installation or operation (e.g. through product movement against silo wall) by selecting a suitable mounting location.

With suspended rope probes (probe end not fixed at the bottom) the distance between the probe rope and internal fittings in the tank must not fall below 300 mm (12") during the entire process. A sporadic contact between the probe weight and the cone of the vessel, however, does not influence the measurement as long as the dielectric constant of the medium is at least DC = 1.8.

When mounting the electronics housing into a recess (e.g. in a concrete ceiling), observe a minimum distance of 100 mm (4 inch) between the cover of the terminal compartment / electronics compartment and the wall. Otherwise the connection compartment / electronics compartment is not accessible after installation.

6.2.2 Applications with restricted mounting space

Mounting with remote sensor

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



- A Angled plug at the probe
- B Angled plug at the electronics housing
- Levelflex version (see product structure):

Feature 600 "Probe Design", Option MB "Sensor remote, 3m/9ft cable, detachable+mounting bracket" ($\rightarrow \ge 19$)

- A connecting cable is supplied with this device version
 - Length: 3 m (9 ft)
 - Minimum bending radius: 100 mm (4 inch)
- A mounting bracket for the electronics housing is supplied with this device version. Mounting options:
 - Wall mounting
- Pipe mounting; diameter: 42 to 60 mm (1-1/4 to 2 inch)
- The connection cable has got one straight and one angled plug (90°). Depending on the local conditions the angled plug can be connected at the probe or at the electronics housing.

6.2.3 Notes on the mechanical load of the probe

Tensile load limit of rope probes

Sensor	Feature 060	Probe	Tensile load limit [kN]
FMP50	LA, LB	Rope 4mm (1/6") 316	2

Bending strength of rod probes

Sensor	Feature 060	Probe	Bending strength [Nm]
FMP50	AA, AB	Rod 8mm (1/3") 316L	10

Bending load (torque) through fluid flow

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

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

with:

 c_w : Friction factor

 ρ [kg/m³]: Density of the medium

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

d [m]: Diameter of the probe rod

L [m]: Level

LN [m]: Probe length

Calculation example

Friction factor $\ensuremath{c_w}$	0,9 (on the assumption of a turbulent current – high Reynolds number) $% \left({{\left({{{{\bf{n}}_{\rm{s}}}} \right)}_{\rm{s}}}} \right)$
Density $\rho~[kg/m^3]$	1000 (e.g. water)
Probe diameter d [m]	0,008
$L = L_{\rm N}$	(worst case)





6.2.4 Notes on the process connection

Probes are mounted to the process connection with threaded connections or flanges. If during this installation there is the danger that the probe end moves so much that it touches the tank floor or cone at times, the probe must, if necessary, be shortened and fixed down ($\rightarrow \ge 28$).

Threaded connection



⊡ 7 Mounting with threaded connection; flush with the container ceiling

Seal

The thread as well as the type of seal comply to DIN 3852 Part 1, screwed plug form A.

They can be sealed with the following types of sealing rings:

Thread G3/4": According to DIN 7603 with the dimensions 27 x 32 mm

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



For the length of the screwed plug refer to the dimensional drawing: FMP50: (→ 🖹 23)

6.2.5 Securing the probe

Securing rope probes



- A Sag of the rope: ≥ 1 cm per 1m of the probe length (0.12 inch per 1 ft of the probe length)
- B Reliably grounded end of probe
- C Reliably isolated end of probe
- 1: Mounting and contact with a bolt
- 2 Mounting kit isolated (\rightarrow 85)
- The end of the probe needs to be secured under the following conditions: if otherwise the probe sporadically comes into contact with the wall of the vessel, the outlet cone, internal fittings or other parts of the installation.
- The end of probe can be secured at its internal thread rope 4 mm (1/6"), 316: M 14
- The fixing must be either reliably grounded or reliably insulated. If it is not possible to mount the probe weight with a reliably insulated connection, it can be secured using an isolated eyelet, which is available as an accessory ($\rightarrow \ge 85$).
- In the case of a grounded fixing the Positive echo option must be selected in the Expert → Sensors → EOP evaluation → EOP search mode parameter. Otherwise the automatic probe length correction will not work.

Securing rod probes

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



- 1 Probe rod
- 2 Sleeve bored tight to ensure electrical contact between the rod and sleeve!
- *3 Short metal pipe, e.g. welded in place*

Ø probe	Ø a [mm (inch)]	Ø b [mm (inch)]
8 mm (1/3")	< 14 (0.55)	8.5 (0.34)

NOTICE

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

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

NOTICE

Welding may damage the main electronics module.

▶ Before welding: Ground the probe and dismount electronics.

6.2.6 Special mounting conditions

Bypasses and stilling wells

For information on bypass solutions from Endress+Hauser please contact your Endress +Hauser sales representative.



- 1 Mounting in a stilling well
- 2 Mounting in a bypass
- Pipe diameter: > 40 mm (1.6") for rod probes
- Rod probe installation can take place up to a diameter size of 100 mm. In the event of larger diameters, FMP51 with a coax probe is recommended.
- Side disposals, holes or slits and welded joints that protrude up to approx. 5 mm (0.2") inwards do not influence the measurement.
- The pipe may not exhibit any steps in diameter.
- The probe must be 100 mm longer than the lower disposal.
- Within the measuring range, the probe must not get into contact with the pipe wall. If necessary, use a center washer (see feature 610 of the product structure).

For bypasses with condensate formation (water) and a medium with low dielectric constant (e.g. hydrocarbons):

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

With heat insulated tanks the bypass should also be insulated in order to prevent condensate formation.

For rope probes with a length exceeding 2 m (6.7 ft) an additional weight or a spring should be mounted in addition to the center a washer (option OC) in order to tighten the rope. The mass of the center wahser is 155 g (5.5 oz).

Underground tanks



Use FMP51 with a coax probe for nozzles with large diameters in order to avoid reflections at the nozzle wall.

Installation at an angle



- For mechanical reasons, the probe should be installed as vertically as possible.
- With inclined installations the probe length has to be adjusted in dependence to the installation angle.
 - Up to LN = 1 m (3.3 ft): $\alpha = 30^{\circ}$
 - Up to LN = 2 m (6.6 ft): α = 10°
 - Up to LN = 4 m (13.1 ft): $\alpha = 5^\circ$

Non-metallic vessels



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

To measure, Levelflex with a rod probe needs a metallic surface at the process connection. Therefore:

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

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



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

Requirements

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

Mounting conditions:

- The probe must be mounted directly to the tank wall (no open space)
- A plastic half pipe with a diameter of approx. 200 mm (8"), or some other protective unit, must be affixed externally to the probe to prevent any influences on the measurement.
- If the tank diameter is less than 300 mm (12"):
 A metallic grounding sheet must be installed at the opposite side of the tank. The sheet must be conductively connected to the process connection and cover about the half of the vessel's
- circumference.
 If the tank diameter exceeds 300 mm (12"):
 A metal sheet with a diameter of at least 200 mm (8") must be mounted to the probe at the process connection. Its orientation must be perpendicular to the probe (see above).

Calibration for external probe mounting

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

Compensation with the gas phase compensation factor

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



	Step	Parameter	Action
	1	Expert \rightarrow Sensor \rightarrow Gas phase compensation \rightarrow GPC mode	Select Constant GPC factor option.
$\begin{array}{c} 2 \\ \text{factor} \end{array} \text{Expert} \rightarrow \text{Sensor} - \\ \end{array}$		$Expert \to Sensor \to Gas$ phase compensation $\to Constant$ GPC factor	Enter quotient: "(Actual probe length)/ (Measured probe length)".

Compensation via the calibration parameters

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



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

Vessels with heat insulation

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



Process connection with thread – FMP50

- 1 Tank insulation
- 2 Compact device
- *3 Sensor remote (feature 600)*

6.3 Mounting the device

6.3.1 Required mounting tools

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

6.3.2 Preparing the device for mounting

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



Shortening rod probes

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

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

Shortening rope probes

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

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



- 1. Loosen the 3 Allen set screws using an Allen key AF3 (for 4mm ropes) or AF4 (for 6 mm ropes). Note: The set screws have got a clamping coating in order to prevent accidental loosening. Thus an increased torque might be necessary to loosen them.
- 2. Remove released rope from the weight.
- 3. Measure off new rope length.
- 4. Wrap adhesive tape around the rope at the point to be shortened to prevent it from fanning out.
- 5. Saw off the rope at a right angle or cut it off with a bolt cutter.
- 6. Insert the rope completely into the weight: rope 4 mm (0.16 in): 60 mm (2.4 in) deep; rope 6 mm (0.24 in): 80 mm (3.2 in) deep.
- Screw the set screws into place. Due to the clamping coating of the setscrews application of a screw locking fluid is not necessary. Torque: rope 4 mm (0.16 in): 5 Nm (3.7 lbf ft); rope 6 mm (0.24 in): 15 Nm (11 lbf ft).

6.3.3 Mounting the device

Mounting devices with thread



Devices with mounting thread are screwed into a welding boss or a flange and are usually also secured with these.
F • Tighten with the hexagonal nut only:

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

Mounting rope probes

NOTICE

Electrostatic discharges may damage the electronics.

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



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

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

6.3.4 Mounting the "Sensor remote" version

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

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

- The probe with the process connection
- The electronics housing
- The mounting bracket for wall or pipe mounting of the electronics housing
- The connection cable (3m/9ft). The cable has got one straight and one angled plug (90°). Depending on the local conditions the angled plug can be connected at the probe or at the electronics housing.

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

- Mount the probe and the electronics housing tightly before connecting the cable.
- ► Lay the cable such that it is not exposed to mechanical stress. Minimum bending radius: 100 mm (4").
- ▶ When connecting the cable: Connect the straight plug before the angled one. Torque for both coupling nuts: 6 Nm.

If the meeasuring point is exposed to strong vibrations, an additional locking compound (e.g. Loctite 243) can be applied at the plug connectors.

Mounting the electronics housing



3 Mounting the electronics housing using the mounting bracket

A Wall mounting

B Pipe mounting

Connecting the cable

Required tools:

Open-end wrench 18AF



- [10 Connecting the cable. There are the following possibilities:
- A Angled plug at the probe
- B Angled plug at the electronics housing

6.3.5 Turning the transmitter housing

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



- 1. Unscrew the securing screw using an open-ended wrench.
- 2. Rotate the housing in the desired direction.
- 3. Firmly tighten the securing screw. (1,5 Nm for plastics housing; 2,5 Nm for aluminium or stainless steel housing).

6.3.6 Turning the display module



- 1. If present (i.e. for devices with Dust-Ex/DIP approval): Loosen the securing clamp of the electronics compartment cover using an Allen key.
- 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 in the housing above the main electronics module and plug the display module in the desired orientation onto the electronics compartment until it engages.
- 6. Screw the cover of the electronics compartment firmly back onto the transmitter housing.
- 7. If present (i.e. for devices with Dust-Ex/DIP approval): Tighten the securing clamp again using the Allen key (Torque: 2.5 Nm).

6.4 Post-installation check

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

Endress+Hauser

7 Electrical connection

7.1 Connection options

7.1.1 2 wire, 4-20 mA HART



☑ 11 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 ($\rightarrow \triangleq 46$)
- 2 HART communication resistor ($\geq 250 \Omega$): Observe maximum load ($\rightarrow \square 47$)
- 3 Connection for Commubox FXA195 or FieldXpert SFX100 (via VIATOR Bluetooth modem)
- 4 Analog display device: Observe maximum load ($\rightarrow \square 47$)
- 5 Cable screen; observe cable specification ($\rightarrow \square 45$)
- 6 Terminals for 4–20mA HART (passive)
- 7 Overvoltage protection module
- 8 Terminal for potential equalization line
- 9 Cable entry



7.1.2 2 wire, 4-20 mA HART, 4-20mA

[12 Terminal assignment 2-wire; 4-20mA HART, switch output

- A Without integrated overvoltage protection
- *B* With integrated overvoltage protection
- *1* Connection current output 2
- 2 Connection current output 1
- 3 Supply voltage for current output 1 (e.g. RN221N); Observe terminal voltage ($\rightarrow \stackrel{>}{=} 47$)
- 4 Cable screen; observe cable specification ($\rightarrow \ge 45$)
- 5 HART communication resistor ($\geq 250 \Omega$): Observe maximum load ($\rightarrow \square 47$)
- 6 Connection for Commubox FXA195 or FieldXpert SFX100 (via VIATOR Bluetooth modem)
- 7 Analog display device ; observe maximum load ($\rightarrow \stackrel{>}{=} 47$)
- 8 Analog display device ; observe maximum load ($\rightarrow \ge 47$)
- 9 Supply voltage for current output 2 (e.g. RN221N); Obesrve terminal voltage ($\rightarrow \stackrel{\text{l}}{=} 47$)
- 10 Overvoltage protection module
- 11 Terminals for current output 2
- *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.





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

- 1 Evaluation unit, e.g. PLC
- *2* HART communication resistor ($\geq 250 \Omega$): Observe maximum load ($\rightarrow \exists 47$)
- 3 Connection for Commubox FXA195 or FieldXpert SFX100 (via VIATOR Bluetooth modem)
- 4 Analog display device: Observe maximum load ($\rightarrow \triangleq 47$)
- 5 Signal cable including screening (if required), observe cable specification ($\rightarrow 145$)
- 6 Protective connection; do not disconnect!
- 7 Protective earth, observe cable specification ($\rightarrow \triangleq 45$)
- 8 Terminals for 4...20mA HART (active)
- 9 Terminals for supply voltage
- 10 Supply voltage: Observe terminal voltage($\rightarrow \exists 47$), observe cable specification ($\rightarrow \exists 45$)
- 11 Terminal for potential equalization
- 12 Cable entry for signal line
- 13 Cable entry for power supply

To ensure electrical safety:

- Do not disconnect the protective connection (7).
- Disconnect the supply voltage before disconnecting the protective earth (8).



Connect protective earth to the internal ground terminal (8) before connecting the supply voltage. If necessary, connect the potential matching line to the external ground terminal (12).

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).



7.1.4 4 wire: 4-20mA HART (90 to 253 V_{AC})

[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 ($\rightarrow \triangleq 47$)
- 3 Connection for Commubox FXA195 or FieldXpert SFX100 (via VIATOR Bluetooth modem)
- 4 Analog display device: Observe maximum load ($\rightarrow \square 47$)
- 5 Signal cable including screening (if required), observe cable specification ($\rightarrow \ge 45$)
- 6 Protective connection; do not disconnect!
- 7 Protective earth, observe cable specification ($\rightarrow \square 45$)
- 8 Terminals for 4...20mA HART (active)
- 9 Terminals for supply voltage
- 10 Supply voltage: Observe terminal voltage ($\rightarrow \square 47$), observe cable specification ($\rightarrow \square 45$)
- 11 Terminal for potential equalization
- 12 Cable entry for signal line
- 13 Cable entry for power supply

To ensure electrical safety:

- ▶ Do not disconnect the protective connection (7).
- ► Disconnect the supply voltage before disconnecting the protective earth (8).

Connect protective earth to the internal ground terminal (8) before connecting the supply voltage. If necessary, connect the potential matching line to the external ground terminal (12).

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).

7.2 Connection options

7.2.1 Cable specification

HART

- For ambient temperature $T_U \ge 60$ °C (140 °F): use cable for temperature $T_U + 20$ K.
- 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.

7.2.2 Cable diameter and cross-section of the strands

Type of protection	Cable gland	Admissible cable diameter	Admissible cross-section of the strands
StandardEx iaEx ic	Plastics M20x1,5	5 to 10 mm (0.2 to 0.39 in)	0.5 to 2.5 mm ² (20 to 14 AWG)
 Ex tD Ex nA FM approval CSA approval 	Metal M20x1.5	7 to 10 mm (0.28 to 0.39 in)	

7.2.3 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 $2 * 0.5 \Omega$ max		
Threshold DC voltage	400 to 700 V	
Threshold impulse voltage	< 800 V	
Capacitance at 1 MHz	< 1.5 pF	
Nominal arrest impulse voltage (8/20 µs)	10 kA	

External overvoltage protection

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

For detailed information please refer to the following documents:

- HAW562: TI01012K
- HAW569: TI01013K

7.3 Connection data

7.3.1 2-wire, 4-20mA HART, passive

"Power Supply, Output" ¹⁾	Outputs	Terminal voltage	"Approval" ²⁾
A: 2-wire; 4-20mA HART	1	11.5 to 35 V 3)	Non-Ex, Ex nA, CSA GP
		11.5 to 32 V ³⁾	Ex ic
		11.5 to 30 V ³⁾	Ex ia / IS
		13.5 to 30 V ⁴	Ex d / XP, Ex ic(ia), Ex tD / DIP
C: 2-wire; 4-20mA HART, 4-20mA	1	13.5 to 30 V ⁴	all
	2	12 to 30 V	all

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 14 V is required for the satrup 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 ≥ 4.5 mA (HART multidrop mode), a voltage of 10,4 V is sufficient throughout the entire range of ambient temperatures.
- 4) 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).



Residual ripple:

- \bullet < 1 V_{SS} (0 to 100 Hz)
- \bullet < 10 mV_{SS} (100 to 10000 Hz)

7.3.2 4-wire, 4-20mA HART, active

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

1) Feature 020 of the product structure

7.3.3 Maximum load

In order to ensure a sufficient terminal voltage at the device, the load resistance R (including wire resistance) must not exceed a value depending on the voltage U_0 supplied by the supply unit.





For 4-wire devices (feature 020, options "K" and "L") the admissible load is 0 to 500 $\Omega.$

7.4 Connecting the measuring device

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.



- 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.



Connect the cable in accordance with the terminal assignment ($\rightarrow \textcircled{1}41$).

- 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.

Pluggable spring-force terminals

Instruments without integrated overvoltage protection have pluggable spring-force terminals. Rigid or flexible conductors with or without 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 flattip screwdriver $\leq 3 \text{ mm} (0.12 \text{ inch})$ while pulling the cables out of the terminals.



7.5 Post-connection check

О	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 ($\rightarrow \triangleq 41$)?
0	If required: Is the protective earth connected correctly ($\rightarrow \triangleq 41$)?
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?
О	Is the securing clamp tightened correctly?

8 Operating options

8.1 Overview

8.1.1 On-site operation



□ 15 On-site operation options

- 1 Display module SD02, push buttons; cover must be open for operation
- 2 Operating options via CDI interface (= Endress+Hauser Common Data Interface)
- 2.1 Computer with operating tool (FieldCare)
- 2.2 Commubox FXA291, connected to the CDI interface of the device

8.1.2 Operation with remote display and operating module FHX50



☐ 16 FHX50 operating options

- *1* Housing of the remote display and operating module FHX50
- 2 Display and operating module SD02, push buttons; cover must be removed
- 3 Display and operating module SD03, optical keys; can be operated through the glass of the cover (in preparation)

8.1.3 Remote operation via HART



^{[] 17} Remote operating options via HART

- 1 PLC
- 2 Commubox FXA191 (RS232) or FXA195 (USB)
- 3 Computer with operating tool (e.g. FieldCare, AMS, Simatic PDM)
- 4 Handheld terminal DXR375/FC375
- 5 Field Xpert
- *6 VIATOR Bluetooth modem with connection cable*
- 7 Transmitter supply unit RMA422 or RN221N (communication resistor included)
- 8 Connection for Commubox FXA191, FXA195 or handheld terminal DXR375/FC375

In hazardous areas only use certified operating tools!

8.2 The operating menu

8.2.1 Structure



[18 Basic structure of the operating menu; gray: submenus; white: parameters

8.2.2 Submenus and user roles

The submenus are designed for different user roles. A user role is defined by typical tasks within the lifecycle of the device.

User role	Typical tasks	Submenu	Content/Meaning
Operator	Tasks in the ongoing process:	"Language"	Defines the operating language.
	 Configuration of the display. Reading measuring values. 	"Display/Operation"	Contains all parameters which are needed during the ongoing process: Configuration of the display (display values, display format, display contrast).
Maintenance	 Commissioning: Configuration of the measurement. Configuration of the measured value processing (scaling, linearization, limit detection etc.). Configuration of the measured value output (analog and digital communication interface). 	"Setup"	 Contains all commissioning parameters: Setup parameters When all these parameters have been assigned appropriate values, the measured should be completely configured in a standard application. "Advanced setup" submenu 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.
	Error handling	"Diagnostics"	 Contains all parameters needed to detect and analyze operational errors. Diagnostics list Contains up to 5 currently active error messages. Event logbook Contains the 10 last messages (which are no longer active). "Device info" submenu Contains information needed to identify the device. "Measured values" submenu Contains all current measured values. "Simulation" submenu Used to simulate measured values or output values.
Expert	 Tasks which require detailed knowledge about the instrument: Commissioning of measurements under demanding conditions. Optimization of the measurement under demanding conditions. Detailed configuration of the communication interface. Error diagnosis in diffcult cases. 	"Expert"	 Contains all parameters of the device (including those which are already contained in one of the above submenus). This menu is organized according to the function blocks of the device: "System" submenu Contains all general device parameters which do not affect the measurement or the communication interface. "Sensor" submenu Contains all parameters needed to configure the measurement. "Output" submenu Contains all parameters needed to configure the current output. "Diagnostics" submenu Contains all parameters needed to detect and analyze operational errors.

8.2.3 Locking the menu

Locking the menu via the locking switch (hardware locking)

The complete operating menu can be locked by the locking switch below the display and operating module. In the locked state most parameter values can be read but not changed.



- 1. Unscrew the lid from the compartment for the display and operating module.
- 2. Slightly turn the display and operating module to remove it from the compartment.
- 3. Set the locking switch (WP: Write Protection) into the desired position. (A): unlocked; (B): locked.
- 4. Attach the display and operating module in the desired orientation until it closes with a snap.
- 5. Screw the lid onto the compartment.

Locking the menu via parameter settings (software locking)

Step	Parameter	Action	Description
1	Setup \rightarrow Advanced setup \rightarrow Define access code	To lock the device: Enter a user-defined access code.	(→ 🖹 105)
2	Setup \rightarrow Advanced setup \rightarrow Enter access code	To unlock the device: Enter the previously defined access code.	(→ 🖹 104)
3	Setup \rightarrow Advanced setup \rightarrow Enter access code	To lock the device again: Enter a number other than the previously defined access code.	(→ 🖹 104)

8.3 Display and operating module

8.3.1 Display appearance



[] 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
- 3 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; ✓ 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
V 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

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.

Display symbols for the locking state

Symbol	Meaning	
A0011978	Display parameter Marks display-only parameters which can not be edited.	
Δ	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	Aeasured values		
	Level		
A0011996	Distance		
	Current output		
(A)	Measured current		
A0012100	Terminal voltage		
A0012104	Temperature of the electronics or the sensor		
Measuring	g channels		
	Measuring channel 1		
2	Measuring channel 2		
Status of t	he measured value		
A0012102	Status "Alarm" The measurment is interrupted. The output assumes the defined alarm value. A diagnostic message is generated.		
A0012102	Status "Warning" The device continues measuring. A diagnostic message is generated.		

8.3.2 Operating elements

Кеу	Meaning	
	Minus key	
Θ	<i>For menu, submenu</i> Moves the selection bar upwards in a picklist.	
A001396	For text and numeric editor In the input mask, moves the selection bar to the left (backwards).	
	Plus key	
(\pm)	<i>For menu, submenu</i> Moves the selection bar downwards in a picklist.	
A001397	For text and numeric editor In the input mask, moves the selection bar to the right (forwards).	
	Enter key	
	For measured value displayPressing the key briefly opens the operating menu.Pressing the key for 2 s opens the context menu.	
(E) A001395	 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)	
()+(+) A001397	 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"). 	
	<i>For text and numeric editor</i> Closes the text or numeric editor without applying changes.	
	Minus/Enter key combination (press and hold down the keys simultaneously)	
A001395	Reduces the contrast (brighter setting).	
(+)+E	Plus/Enter key combination (press and hold down the keys simultaneously)	
A001395	Increases the contrast (darker setting).	
(-)+(+)+(E)	Minus/Plus/Enter key combination (press and hold down the keys simultaneously)	
A001395	For measured value display Enables or disables the keypad lock.	

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

Symbol	Meaning
0	Selection of numbers from 0 to 9.
9	
- A0016619	Inserts decimal separator at the input position.
	Inserts minus sign at the input position.
A0013985	Confirms selection.
A0016621	Moves the input position one position to the left.
A0013986	Exits the input without applying the changes.
A0014040	Clears all entered characters.

Text editor symbols

Symbol	Meaning
(ABC_) (XYZ) A0013997	Selection of letters from A to Z
Aa1@)	 Toggle Between upper-case and lower-case letters For entering numbers For entering special characters

Confirms selection.			
AUDI3987 Switches to the	selection of the correction tools.		
A0013986 Exits the input v	vithout applying the changes.		
A0014040 Clears all entere	d characters.		
Operating symbols in the numeric	editor		
	A0016621	A0013986	
Confirms selection.	Moves the input position one position to the left.	Exits the input without applying the changes.	
		C	
Inserts decimal separator at the input position.	Inserts minus sign at the input position.	Clears all entered characters.	
Operating symbols in the text editor	or		
A0013985		X A0013986	
Confirms selection.	Switches to the selection of the correction tools.	Exits the input without applying the changes.	
A001404C	Aa1@		
Clears all entered characters.	 Toggle Between upper-case and lower-case letters For entering numbers For entering special characters 		
Correction symbols under $\varkappa \mathbb{C} \leftrightarrow$			
Clears all entered characters.			
A0013991 Moves the input	Moves the input position one position to the right.		
Moves the input position one position to the left.			
Deletes one character immediately to the left of the input position.			

Correction symbols under 🕶

·····			
C	(Ť)	Ţ	×
A0013989	A0013990	A0013991	A0013988
Clears all entered characters.	Moves the input position one position to the left.	Moves the input position one position to the right.	Deletes one character immediately to the left of the input position.

8.3.4 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 Device integration via the HART protocol

9.1 Overview of the Device Description files (DD)

HART

Manufacturer ID	0x11
Device type	0x34
HART specification	6
DD files	For information and files see: www.endress.com www.hartcomm.org

9.2 HART device variables and measuring values

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

Device variables for level measurements

Device variable	Measuring value
Primary device variable (PV)	Level linearized
Secondary device variable (SV)	Distance
Third device variable (TV)	Absolute echo amplitude
Fourth device variable (QV)	Relative echo amplitude

The allocation of the device variables can be changed in the operating menu: **Expert** \rightarrow **Communication** \rightarrow **HART output**.

10 Commissioning via operating menu (On-site display, FieldCare)

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" ($\rightarrow \ge 40$)
- Checklist "Post-connection check" (\rightarrow \supseteq 51)

10.2 Adjust the display contrast

- + \mathbb{E} (pressed simultaneously): increases the contrast.
- - + ε (pressed simultaneously): decreases the contrast.

10.3 Unlock the device

If the device has been locked, it must be unlocked before the measurement can be configured.

10.3.1 Revoke hardware locking



20 Mesured value screen of a hardware-locked device

The padlock in the header of the measured value screen indicates that the device is hardware-locked. In order to unlock the device, shift the locking switch (which is located below the display module and is marked by "WP") into the "off" position ($\rightarrow \triangleq 55$).

10.3.2 Revoke software locking



21 Input prompt for the access code to unlock software-locked parameters.

Parameters affected by the software lock are marked by a padlock in front of the parameter name. After pressing \square an input prompt appears. Enter the user defined locking code to unlock the device ($\rightarrow \square 56$).

10.4 Setting the operating language

10.4.1 Setting the operating language via the display module



10.4.2 Setting the language via operating tool (FieldCare)

Menu / Variable	Value	Language:	English	V
FMP5x FMP5 Access status tooling: Display/operation	Maintenance	Access status display: Locking status:	English Deutsch	
PCI Language:	English		SIL locked	
P Access status display:	Maintenance		Cust. trans. active	
-P Locking status:			WHG locked	
-PD Format display (1):	(b) 1 bargrapł		FDA locked	
PD Contrast display:		-	Temporarily locked	
Esplay interval (30).		Format display (1):	(b) 1 bargraph + 1 value	~
Diagnostics		Contrast display:		30
Expert		Display interval (36):		5

A0015305-EN



10.5 Configuration of a level measurement

22 Configuration parameters for level measurements in liquids

LN = Length of probe	R = Reference point of the measurement
<i>D</i> = <i>Distance</i>	E = Empty calibration (= Zero point)
L = Level	F = Full calibration (= span)

If for rope probes the DC value is less than 7, then measurement is not possible in the area of the straining weight. In these cases, the maximum recommended value for the empty calibration E is LN- 250 mm (LN- 10 in).

Step	Parameter	Action	Description
1	Setup \rightarrow Distance unit	Select distance unit.	(→ 🖻 98)
2	Setup \rightarrow Tank type	Select tank type.	(→ 🖹 98)
3	Setup \rightarrow Tube diameter ¹⁾	Enter the diameter of the bypass or stilling well.	(→ 🖹 99)
4	Setup \rightarrow Medium group	Select medium group ("water based": DC>4 or "other": DC ≥ 1.9) ² .	(→ 🖹 99)
5	Setup \rightarrow Empty calibration	Enter the distance E between the reference point R and the minimum level (0%) .	(→ 🖹 99)
6	Setup \rightarrow Full calibration	Enter distance F between the minimum (0%) and maximum (100%) level.	(→ 🖹 100)
7	Setup \rightarrow Level	Displays the measured level L.	(→ 🖹 100)
8	Setup \rightarrow Distance	Displays the distance D between the reference point R and the level L.	(→ 🖹 101)
9	Setup \rightarrow Signal quality	Displays the signal quality of the level echo.	(→ 🖹 101)
10	Setup \rightarrow Mapping \rightarrow Confirm distance	Compare the displayed distance to the real distance in order to start the recording of the mapping curve.	(→ 🖹 103)

1) only visible for coated probes and if "Tank type" = "Bypass/pipe"

If required, lower DCs can ben entered into "Setup → Advanced Setup → Level → Medium property". However, for DC<1.6 the measuring range may be reduced; for details please contact Endress+Hauser.

10.6 Configuration of the current outputs

10.6.1 Factory setting of the current outputs for level measurements

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 ($\rightarrow \ge 121$)
- Setup \rightarrow Advanced Setup \rightarrow Current output 2 (\rightarrow \supseteq 121)

Advanced settings

- Expert → Output → Curr. output 1; see document "Description of Device Parameters" GP01000F (HART) or GP01001F (PROFIBUS PA)
- Expert → Output → Curr. output 2; see document "Description of Device Parameters" GP01000F (HART) or GP01001F (PROFIBUS PA)

10.7 Configuration of the on-site display

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

Parameter	Factory setting for devices with 1 current output	Factory setting for devices with 2 current outputs
Format display	1 value, max. size	1 value, max. size
Value 1 display	Levele linearized	Levele linearized
Value 2 display	Distance	Distance
Value 3 display	Current output 1	Current output 1
Value 4 display	None	Current output 21

10.7.2 Adjustment of the on-site display

The on-site display can be adjusted in the following menu:

Setup \rightarrow Advanced setup \rightarrow Display ($\rightarrow \ge 125$)

10.8 Configuration management

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

Navigation path

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

Options	Description
Execute backup	A backup copy of the current device configuration in the HistoROM is saved to the display module of the device. The backup copy comprises the transmitter 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 data of the device.
Duplicate	The transmitter configuration from another device is duplicated to the device using the display module.
Compare	The device configuration saved in the display module is compared to the current device configuration of the HistoROM.
Clear backup data	The backup copy of the device configuration is deleted from the display module of the device.

HistoROM

A HistoROM is a "non-volatile" device memory in the form of an EEPROM.

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.

10.9 Protection of the settings against unauthorized changes

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

- Via locking switch (hardware locking) (\rightarrow \ge 55)
- Via parameter settings (software locking) ($\rightarrow \ge 56$)

11 Trouble shooting

11.1 Trouble-shooting instructions

Generel 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 simultaneously. Decrease contrast by pressing - and simultaneously.
	The plug of the display cable is not connected correctly.	Connect the plut correctly.
	Display is defective.	Replace 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 (250 Ω)correctly ($\rightarrow \triangleq 41$).
	Commubox connected incorrectly.	Connect Commubox correctly ($\rightarrow \square 53$).
	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 parameterization and adjust it if necessary (see table below).

Parametrization errors for level measurements

Error	Possible cause	Remedial action
Measured value wrong	If measured distance(Setup \rightarrow Distance) matches the real distance: Calibration error	 Check the Empty calibration parameter and adjust it if necessary(→ [□] 99). Check the Full calibration parameter and adjust it if necessary (→ [□] 100). Check linearization and adjust it if necessary (→ [□] 111).
	If measured distance(Setup \rightarrow Distance) does not match the real distance: An interference echo affects the measurement.	Perform mapping (interference echo suppression) ($\rightarrow \triangleq 103$).
No change of the measured value when emptying/filling the tank	An interference echo affects the measurement.	Perform mapping (interference echo suppression) ($\rightarrow \square$ 103).
	Build-up at the probe.	Clean the probe.

Error	Possible cause	Remedial action
Diagnostic event F941 or S941 "Echo lost" appears after switching on the supply voltage.	Echo threshold too high.	Check the Medium group parameter $(\rightarrow \stackrel{\frown}{=} 99)$. If necessary select a more detailed setting in the Medium property parameter $(\rightarrow \stackrel{\frown}{=} 107)$.
	Level echo suppressed.	Ausblendung löschen und gegebenenfalls neu aufnehmen.
Device displays a level when the tank is empty.	Incorrect probe length	Carry out probe length correction $(\rightarrow \stackrel{>}{\cong} 119).$
	Interference echo	Carry out mapping over entire probe when the tank is empty ($\rightarrow \triangleq 103$).
Wrong slope of the level in the entire measuring range	Wrong tank type selected.	Set the Tank type parameter correctly $(\rightarrow \stackrel{>}{\cong} 98)$.

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

F 40013956	"Failure" A device error is present. The measured value is no longer valid.
C 40013959	"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 the **Diagnostics list** submenu (Verweisziel existiert nicht, aber @y.link.required='true').

Past diagnostic messages that are no longer pending are shown in the **Event logbook** submenu (Verweisziel existiert nicht, aber @y.link.required='true').

Operating elements

Operating functions in menu, submenu	
(+)	Plus key
A0013970	Opens the message about the remedial measures.
(E)	Enter key
A0013952	Opens the operating menu.


11.2.2 Calling up remedial measures

The user is in the diagnostic message.

1. Press the \pm key (symbol).

✓ The message for the remedial measures for the diagnostic event opens.

2. Press - + + simultaneously.

 \checkmark The message about the remedial measures closes.

11.3 Diagnostic event in the operating tool

If a diagnostic event is present in the operating tool, the status signal appears in the top left status area 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)

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

11.4 Diagnostic list

In the **Diagnostics 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

 $Diagnostics \rightarrow Diagnostics list$

لمر المر //Diagnose Diagnostics	list
SF273 Main	electronic
Diagnostics	2
Diagnostics	3
	A0014006-EN

Calling up and closing the remedial measures

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

About the structure of the remedial measure message (\rightarrow 1 73)

11.5 Overview of diagnostic events

11.5.1 Sensor element failures

Diagnostic event		Maintenance instructions	Error
Code	Description		behavior
F003	Broken probe detected	 Check map. Check sensor. 	Alarm
F046	Build-up detected	Clean sensor.	Alarm
F083	Memory content	 Restart device. Restore S-Dat data. Change sensor. 	Alarm
F104	HF cable	 Dry HF cable connection and check sealing. Change HF cable. 	Alarm
F105	HF cable	 Tighten HF cable connection. Change HF cable. 	Alarm
F106	Sensor	 Check probe isolation. Change sensor. 	Alarm

11.5.2 Electronic failures

Diagnostic event		Maintenance instructions	Error
Code	Description		behavior
F242	Software incompatible	 Check software. Flash or change main electronics module. 	Alarm
F252	Modules incompatible	 Check electronic modules. Change I/O or main electronic module. 	Alarm
F261	Electronic modules	 Restart device. Check electronic modules. Change IO module or main electronics. 	Alarm
F262	Module connection	 Check module connection. Change electronic modules. 	Alarm
F270 M270	Main electronic failure	Change main electronic module.	Alarm Warning
F271	Main electronic failure	 Restart device. Change main electronic module. 	Alarm
F272 M272	Main electronic failure	 Restart device. Contact service. 	Alarm
F273	Main electronic failure	 Emergency operation via display. Change main electronics. 	Alarm
F275	I/O-Modul failure	Change I/O module.	Alarm
F276	I/O-Modul failure	 Restart device Change I/O module 	Alarm
F282	Electronic memory	 Restart device. Contact service. 	Alarm
F283	Memory content	1. Restart device. 2. Contact service.	Alarm
F311 M311	Electronic failure	 Transfer data or reset device. Contact service. 	Alarm Warning

11.5.3 Configuration failures

	Diagnostic event	Maintenance instructions	Error
Code	Description		behavior
F410	Data transfer	 Check connection. Check configuration (languages, outputs). Retry data transfer. 	Alarm
F411 C411	Up-/download	Up-/download active, please wait.	Alarm Warning
C431	Trim		Warning
F435	Linearization	Check linearization table.	Alarm
F437	Configuration incompatible	 Restart device. Contact service. 	Alarm
M438	Data set	 Check data set file. Check device configuration. Up- and download new configuration. 	Warning
S441	Current output 1	 Check process. Check current output settings. 	Warning
C484	Simulation failure mode	Deactivate simulation.	Alarm
C485	Simulation measured value	Deactivate simulation.	Warning
C491	Simulation current output	Deactivate simulation.	Warning
C585	Simulation distance	Deactivate simulation.	Alarm

11.5.4 Process induced failures

	Diagnostic event	Maintenance	Error behavior
Code	Description	instructions	
S801	Energy too low	 Increase voltage. Change I/O module 	Warning
F803 M803	Current loop 1	 Check wiring. Check I/O module. 	Alarm Warning
F825 S825	Operating temperature	 Check ambient temprature. Check process temperature. 	Alarm Warning
S921	Change of reference	 Check reference configuration. Check pressure. Check sensor. 	Warning
F936	EMC interference	Check installation on EMC.	Alarm
F941 S941	Echo lost	Check parameter "DC value"	Alarm/Warning ¹⁾
S942	In safety distance	 Check level. Check safety distance. Reset self holding. 	Warning/Alarm ²⁾
S943	In blocking distance	Check level.	Warning
S944	Level range	Reduced accuracy. Level at process connection.	Warning

	Diagnostic event	Maintenance instructions	Error behavior	
Code	Description			
S968	Level limited	 Check level. Check limit parameters. 	Warning	
F970	Linearization	 Check level. Check linearization settings. 	Alarm	

- The behavior of this error can be defined in the Setup menu (Setup → Advanced Setup → Safety settings → Output echo loss)
- The behavior of this error can be defined in the Expert menu (Expert → Sensor → Safety settings → In safety distance)

11.6 Event logbook

11.6.1 Event history

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

Navigation path

 $\text{Diagnostics} \rightarrow \text{Event logbook} \rightarrow \text{Events list}$



A maximum of 20 event messages can be displayed in chronological order. If the advanced HistoROM function is enabled in the device (order option), up to 100 entries can be displayed.

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 - + + simultaneously.

 \checkmark The message about the remedial measures closes.

About the structure of the remedial measure message ($\rightarrow \ge 73$)

• For filtering the displayed event messages (\rightarrow $\stackrel{>}{=}$ 78)

11.6.2 Filtering the event logbook

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

Navigation path

 $Diagnostics \rightarrow Event \ logbook \rightarrow Filter \ options$

Filter categories

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

11.6.3 Overview of information events

Unlike a diagnostic event, an information event is displayed in the event logbook only and not in the diagnose list.

Information event	Event text	
I1000	(device OK)	
I1089	PowerOn	
I1090	Configuration reset	
I1091	Configuration modified	
I1092	Data logging cleared	
I1110	Write protection switch changed	
I1111	Density adjust. error	
I1137	Electronics changed	
I1151	History reset	
I1154	Minimum/maximum terminal voltage reset	
I1155	Electronics temperature reset	
I1156	Trend block memory error	
I1157	Memory content events list	
I1185	Device saved in display	
I1186	Device with display restored	
I1187	Measuring point copied via display	
I1188	Display data cleared	
I1189	Device backup compared	
I1264	Safety sequence aborted	
I1335	Firmware changed	

Date	Software	Modifications	Documentation (FMP50, HART)			
versio	version		CD-ROM	Operating Instructions	Description of Parameters	Technical Information
07.2010	01.00.zz	Original software	CD00518F/00/ A2/05.10	BA01000F/00/EN/ 05.10	GP01000F/00/EN/ 05.10	TI01000F/00/EN/05.10
01.2011	01.01.zz	SIL integratedMinor bugfixes	CD00518F/00/ A2/13.10 CD00518F/00/ A2/14.11	BA01000F/00/EN/ 10.10 BA01000F/00/EN/ 13.11	GP01000F/00/EN/ 10.10 GP01000F/00/EN/ 13.11	TI01000F/00/EN/10.10 TI01000F/00/EN/13.11

11.7 Software history

12 Repairs

12.1 General information on repairs

12.1.1 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.

12.1.2 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.

12.1.3 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).

12.1.4 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 $(\rightarrow \exists 131)$.

■ 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.

12.2 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.



23 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 Maintenance

The measuring device requires no special maintenance.

13.1 Exterior cleaning

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

14 Accessories



14.1 Device-specific accessories







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 $TI404E/00$

Accessory	Description
Commubox FXA291	Connects Endress+Hauser field devices with CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a computer.

Accessory	Description
HART Loop Converter HMX50	Evaluates the dynamic HART variables and converts them to analog current signals or limit values.
	For details refer to Technical Information TI429F/00 and Operating Instructions $BA371F/00$

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 BA061S/04

Accessory	Description
Fieldgate FXA320	Gateway for remote monitoring of connected 4-20mA measuring devices via web browser.
	For details refer to Technical Information TI025S/04 and Operating Instructions BA053S/04

Accessory	Description
Fieldgate FXA520	Gateway for remote diagnosis and parametrization of connected HART measuring devices via web browser.
	For details refer to Technical Information TI025S/04/xx and Operating Instructions BA051S/04

Accessory	Description
Field Xpert SFX100	Compact, flexible and robust industry handheld terminal for remote parametrization and measured value inspection via the HART output or via FOUNDATION Fieldbus .

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 BA027S/04 and BA059S/04

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 TI133R/09 and Operating Instructions BA247R/09	
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 TI073R/09 and Operating Instructions BA202R/09	
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 TI081R/09 and Operating Instructions KA110R/09	

15 Return

The measuring device must be returned if repairs or a factory calibration are required, or if the wrong measuring device has been ordered or delivered. According to legal regulations, Endress +Hauser, as an ISO-certified company, is required to follow certain procedures when handling returned products that are in contact with medium.

To ensure swift, safe and professional device returns, please read the return procedures and conditions on the Endress+Hauser website at www.services.endress.com/return-material

16 Disposal

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

17 Overview of the operating menu

Language		(→ 🖹 94)
Display/operation \rightarrow	Access status display	(→ 🖹 95)
	Locking status	(→ 🖹 95)
	Format display	(→ 🖹 95)
	Contrast display	(→ 🖹 97)
	Display interval	(→ 🖹 98)
Setup →	Distance unit	(→ 🖹 98)
	Tank type	(→ 🖹 98)
	Tube diameter	(→ 🖹 99)
	Medium group	(→ 🖹 99)
	Empty calibration	(→ 🖹 99)
	Full calibration	(→ 🖹 100)
	Level	(→ 🖹 100)
	Distance	(→ 🖹 101)
	Signal quality	(→ 🖹 101)

Setup →	Mapping \rightarrow	Confirm distance	(→ 🖹 103)
		Mapping end point	(→ 🖹 103)
		Record map	(→ 🖹 104)

Setup \rightarrow	Advanced setup \rightarrow	Locking status	(→ 🖹 95)
		Access status display	(→ 🖹 95)
		Enter access code	(→ 🖹 104)
		Define access code	(→ 🖹 105)
		Device tag	(→ 🖹 105)

Setup \rightarrow	Advanced setup \rightarrow	Level \rightarrow	Medium type	(→ 🖹 107)
			Medium property	(→ 🖹 107)
			Process property	(→ 🖹 107)
			Advanced conditions	(→ 🖹 108)
			Level unit	(→ 🖹 109)
			Blocking distance	(→ 🖹 109)
			Level correction	(→ 🖹 110)

Setup →	Advanced setup \rightarrow	Linearization \rightarrow	Linearization type	(→ 🖹 111)
			Unit linearized	(→ 🖹 111)
			Free text	(→ 🖹 112)

			Maximum value	(→ 🖹 112)
			Diameter	(→ 🖹 113)
			Intermediate height	(→ 🖹 113)
			Table mode	(→ 🖹 113)
			Table number	(→ 🖹 114)
			Level	(→ 🖹 114)
			Customer value	(→ 🖻 115)
			Activate table	(→ 🖹 115)
etup →	Advanced setup \rightarrow	Safety settings \rightarrow	Output echo lost	(→ 🖹 116)
			Value echo lost	(→ 🖹 116)
			Ramp echo lost	(→ 🖹 116)
			Blocking distance	(→ 🖹 109)
Setup →	Advanced setup \rightarrow	SIL/WHG confirmation \rightarrow		(→ 🖹 118)
etup →	Advanced setup \rightarrow	Deactivate SIL/WHG→		(→ 🖹 118)
•	•			()
etup →	Advanced setup →	Probe length correction \rightarrow	Confirm length	(→ 🖹 119)
			Present length	(→ 🖹 120)
etup →	Advanced setup \rightarrow	Current output $1/2 \rightarrow$	Assign current	(→ 🖹 121)
			Current span	(→ 🖹 121)
			Fixed current	(→ 🖹 122)
			Damping	(→ 🖹 122)
			Failure mode	(→ 🖹 123)
			Failure current	(→ 🖹 123)
			Output current 1/2	(→ 🖹 124)
etup →	Advanced setup \rightarrow	Display →	Format display	(→ 🖹 95)
			Value 1 display	(→ 🖹 125)
			Decimal places 1	(→ 🖹 125)
			Value 2 display	(→ 🖹 126)
			Decimal places 2	(→ 🖹 126)
			Value 3 display	(→ 🖹 126)
			Decimal places 3	(→ 🖹 127)
			Value 4 display	(→ 🖹 127)

(→ 🖹 128)

(→ 🖹 98)

(→ 🖹 128)

Decimal places 4

Display interval

Display damping

			Header	() 🖹 120)
			Header toxt	(→ □ 129)
				(→ ≡ 129)
			Separator	(→ 🖿 130)
			Number format	(→ 🖹 130)
			Decimal places menu	(→ 🖹 130)
Setup \rightarrow	Advanced setup \rightarrow	Config. backup display \rightarrow	Operating time	(→ 🖹 131)
			Last backup	(→ 🖹 131)
			Configuration management	(→ 🖹 131)
			Comparison result	(→ 🖹 132)
Diagnostics \rightarrow	Actual diagnostics			(→ 🖹 133)
	Previous diagnostics			(→ 🖹 133)
	Operating time from restart			(→ 🖻 133)
	Operating time			(→ 🖻 131)
Diagnostics \rightarrow	Diagnostics list \rightarrow	Diagnostics 1		(→ 🖹 135)
		Diagnostics 2		(→ 🖹 135)

Diagnostics	Diagnostics 1	$(\rightarrow \equiv 155)$
	Diagnostics 2	(→ 🖹 135)
	Diagnostics 3	(→ 🖹 135)
	Diagnostics 4	(→ 🖹 135)
	Diagnostics 5	(→ 🖹 135)

Diagnostics \rightarrow	Event logbook \rightarrow	Filter options	(→ 🖹 136)
		Event list	(→ 🖹 136)

Diagnostics \rightarrow	Device information \rightarrow	Device	(→ 🖹 138)
		Serial number	(→ 🖹 138)
		Firmware version	(→ 🖹 138)
		Device name	(→ 🖹 138)
		Order code	(→ 🖹 138)
		Extended order code 1	(→ 🖹 139)
		Extended order code 2	(→ 🖹 139)
		Extended order code 3	(→ 🖹 139)
		Device revision	(→ 🖹 139)
		Device ID	(→ 🖹 139)
		Device type	(→ 🖹 140)
		Manufacturer ID	(→ 🖹 140)

Diagnostics \rightarrow	Measured value \rightarrow	Distance	(→ 🖹 101)
		Level linearized	(→ 🖹 141)

		Output current 1/2	(→ 🖹 124)
		Measured current 1	(→ 🖹 141)
		Terminal voltage 1	(→ 🖹 141)
Diagnostics \rightarrow	Data logging \rightarrow	Assign channel 1	(→ 🖹 142)
		Assign channel 2	(→ 🖹 142)
		Assign channel 3	(→ 🖹 142)
		Assign channel 4	(→ 🖹 142)
		Logging interval	(→ 🖹 142)
		Clear logging	(→ 🖹 143)
		Display channel 1	(→ 🖹 143)
		Display channel 2	(→ 🖹 143)
		Display channel 3	(→ 🖹 143)
		Display channel 4	(→ 🖹 143)
Diagnostics \rightarrow	Simulation \rightarrow	Assignment of measured variable	(→ 🖹 145)
		Value measured variable	(→ 🖹 145)
		Simulation current output 1/2	(→ 🖹 145)
		Value current output 1/2	(→ 🖹 146)
		Simulation device alarm	(→ 🖹 146)
Diagnostics \rightarrow	Device check \rightarrow	Start device check	(→ 🖹 147)
		Result device check	(→ 🖹 147)
		Last check time	(→ 🖹 147)
		Level signal	(→ 🖹 147)
		Launch signal	(→ 🖹 148)
L			
Diagnostics →	Device reset →	Device reset	(→ 🖹 149)
,	,		(~~ 🖂 177)

 Expert
 The "Expert" menu is described in the document GP01000F ("Description of device parameters").

18 Description of device parameters (operating menu)

• Similar the navigation path to the parameter via the display and operating module.

• E: Marks the navigation path to the parameter via an operating tool (e.g. FieldCare).

• Arks parameters which can be locked via the software locking ($\rightarrow \equiv 56$).

Language	
Navigation	$ \Box Language Display/operation \rightarrow Language $
Description	Language setting for the local display
Options	 English One additional operating language (see product structuture, feature 500, "Additional Operation Language")
Factory setting	English

18.1 "Display/operation" menu

This menu only appears if the device has a local display.

Access status display	
Navigation	Image: Display/operationImage: Access stat. disp.Image: Display/operationImage: Access stat. disp.Image: Display/operationImage: Access stat. disp.
Description	Use this function to view the access authorization to parameters via onsite operation. If $a_{\mathbb{E}}^{\oplus}$ 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 (→ ≧ 104). 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 (→ ≧ 95).
Display options	OperatorMaintenance
Additional information	For information on the "Operator" and "Maintenance" user roles: (\rightarrow \geqq 55)
Locking status	
Navigation	Image: Display/operation \rightarrow Locking statusImage: Setup \rightarrow Advanced setup \rightarrow Locking status
Description	Use this function to view the active write protection. If two or more types of write protection are active, the write protection with the highest priority is shown on the display.
	The symbol appears in front of parameters that cannot be modified since they are write- protected.
Display options	 Hardware locked (priority 1) The DIP switch for hardware locking is activated on the main electronics module. This locks write access to the parameters (e.g. via local display or operating tool). Temporarily locked (priority 2) 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. See access status (priority 3) The access authorization displayed in the Access status display parameter applies (→ 95).

Format display

Navigation	Image: Display/operation \rightarrow Format displayImage: Display \rightarrow Setup \rightarrow Advanced Setup \rightarrow Display \rightarrow Format display
Description	Use this function to select how the measured value is shown on the local display. The display format (size, bar graph etc.) and number of measured values displayed simultaneously (1 to 4) can be configured. This setting only applies to normal operation.
	 The Value 1 display - Value 4 display parameters are used to specify what measured values are shown on the display and in what order (→ 🖹 125). If more measured values are specified than the display mode selected permits, the values alternate on the device display. The display time until the next change is configured using the Display interval parameter (→ 🖹 98).
Options	 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

1 value, max. size



1 bargraph + 1 value

Levelflex								
େପ√ ''	I	I	I	I	I	I	I	'
∎1√					1	9.1	184 4.	l mA 000
								mA

2 values

Levelflex	
େପ√	19.229
	mA
@①√	4.000
	mA

1 value large + 2 values

Levelflex		
[]]]√	95.988%	
₽₫✓	2.005m	
େପ√		19.358
		mA

4 values

Levelflex	
∟⊡√	96.334%
⊢••••••••••••••••••••••••••••••••••••	1.833m
⋳⋳√	19.414mA
®①√	4.000mA

A0012019-EN

A0011948-EN

A0012011-EN

A0012013-EN

A0012016-EN

Contrast display	
Navigation	Display/operation \rightarrow Contrast display
Description	Use this function to adapt the display contrast to the ambient conditions (e.g. the lighting or reading angle).
	 Set the contrast via push-buttons: Brighter: press the buttons simultaneously Darker: press the buttons simultaneously
Input range	20 to 80 %

Factory setting 30 % **Display interval** A Navigation \square Display/operation \rightarrow Display interval \bigcirc \square Setup \rightarrow Advanced Setup \rightarrow Display \rightarrow Display interval Description Use this function to set the length of time the measured values are displayed if the values alternate on the display. This type of alternating display only occurs automatically if the number of measured values defined exceeds the number of values the selected display format can display simultaneously. The Value 1 display - Value 4 display parameters are used to specify what measured values are shown on the display ($\rightarrow \ge 125$). • The display format of the displayed measured values is specified using the **Format display** parameter ($\rightarrow \square 95$). 1 to 10 s Input range Facotry setting 5 s

18.2 "Setup" menu

Distance unit		Â
Navigation	$ \blacksquare \ \ \mathbb{Setup} \to \text{Distance unit} $	
Description	Defines the distance unit	
Selection	 m ft in mm 	
Factory setting	m	

Tank type

Navigation

 $\begin{array}{c} \hline \blacksquare & \operatorname{Setup} \to \operatorname{Tank} \operatorname{type} \\ \hline \blacksquare & \operatorname{Setup} \to \operatorname{Advanced} \operatorname{setup} \to \operatorname{Interface} \to \operatorname{Tank} \operatorname{type} \\ \end{array}$

Description

Defines the tank type

A

Selection	 Metallic Bypass/pipe Non metallic Mounted outside
Factory setting	Depending on the type of probe.

Tube diameter

Navigation	$ \blacksquare Setup \rightarrow Tube diameter $
Conditions	 Only visible if the following conditions are met: "Tank type" = "Bypass/pipe" The probe is coated.
Description	Defines the diameter of the bypass or stilling well.
Input range	0 to 9999 mm (0 to 390 inch)
Factory setting	80 mm (3.15 inch)

Medium group \bigodot Navigation \boxdot Setup \rightarrow Medium groupDescriptionDefines the medium group of the measured product.Selection \therefore Water bsed DC > 4
 \therefore Others DC ≥ 1.9 Factory settingOthers DC ≥ 1.9 Empty calibration \bigodot

Navigation

 \square Setup \rightarrow Empty calibration

æ

A

Description

Defines the empty calibration E. E is the distance between the reference point (lower edge of the flange or threaded connection) and the minimum level (0%).



Input range	Depending on the selected distance unit and the prob)e.

Factory settingDepending on the selected distance unit and the probe.

Full calibration

Navigation

Description

 $\blacksquare \ \blacksquare \ Setup \to Full \ calibration$

Defines the full calibration F. F is the distance between the minimum level (0%) and the maximum level (100%).



Input range Depending on the selected distance unit and the probe.

Factory setting Depending on the selected distance unit and the probe.

Level

Navigation

 \square Setup \rightarrow Level

A

Description

Displays the measured level L_L (before linearization)



Additional information

The value is displayed in the selected "Level unit" ($\rightarrow \ge 109$).

Distance

Navigation

Description

 $\bigcirc \ \square \ Setup \rightarrow Distance \\ \bigcirc \ \square \ Diagnostics \rightarrow Measured val. \rightarrow Distance$

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



Additional Information The value is displayed in the selected "Level unit" ($\rightarrow \ge 109$).

Signal quality		٦
Navigation	$ \blacksquare \ \texttt{Setup} \rightarrow \texttt{Signal quality} $	
Description	Displays the signal quality	

Display options

- Strong
 - The evaluated echo exceeds the threshold by at least 10 $\ensuremath{\text{mV}}$
- Medium
- The evaluated echo exceeds the threshold by at least 5 mV.
- Weak
- The evaluated echo exceeds the threshold by less than 5 mV.
- No signal
 - The device does not find a usable echo and generates the following error message
 - F941 if the **Alarm** option has been selected in the **Output echo lost** parameter ($\rightarrow \ge 116$).
 - S941 if another option has been selected in the **Output echo lost** parameter ($\rightarrow \ge 116$).

Additional information

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

18.2.1 "Mapping" sequence

Confirm distance	Â
Navigation	$ \blacksquare \ \ Setup \rightarrow Mapping \rightarrow Confirm \ distance $
Description	Confirmation whether the measured distance matches the actual distance. Depending on the selection, the device automatically determines the range over which the mapping will be recorded.
Selection	 Manual map To be selected if the range of mapping is to be defined manually in the Mapping end point parameter. 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 and quits the sequence ("End of sequence" appears on the display). Distance unknown To be selected if the actual distance is unknown. A mapping can not be performed and the device quits the sequence ("End of sequence" appears on the display). Distance too small To be selected if the measured distance is smaller than the actual distance. The device performs a mapping 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. Distance too big To be selected if the measured distance is bigger than 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. Tank empty To be selected if the tank is completely empty. The device records a mapping covering the complete length of the probe and quits the sequence ("End of sequence" appears on the display). Delete all 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.
Factory setting	Distance unknown
Additional information	 For reference purposes the measured distance is displayed together with this parameter. For interface measurements the distance always refers to the total level (not to the interface level). If the teaching procedure Distance too small or Distance too big is quit before the distance has been confirmed, a map is not recorded and the teaching procedure is reset after 60 s.
Mapping end point	ß
Navigation	$$ Setup \rightarrow Mapping \rightarrow Map. end point

Only visible if the **Manual map** option has been selected in the **Confirm distance** parameter.

Condition

Description	Definition of the distance up to which the mapping curve will be recorded.
Input range	0.1 m (0.33 ft) to length of probe (LN)
Factory setting	0.1 m (0.33 ft)
Additional information	The distance is measured from the reference point, i.e. from the lower edge of the mounting flange or the threaded connection. For reference purposes the Present mapping parameter is displayed together with this parameter. Present mapping states up to which distance a mapping has already been recorded.

Record map	
Navigation	$ \blacksquare \ \text{Setup} \rightarrow \text{Mapping} \rightarrow \text{Record map} $ Only visible if a value has been entered into the Mapping end point parameter.
Description	Starts the recording of the map.
Selection	 No The map is not recorded. The device quits the sequence ("End of sequence" is displayed). Record map The map is recorded. When the recording is completed, the new measured distance and the new mapping range appear on the display. These values must be confirmed by pressing ✓. The device quits the sequence. ("End of sequence" is displayed.) Delete all The mapping (if one exists) is deleted and the device displays the recalculated measured distance and the mapping range. These values must be confirmed by pressing ✓. The device quits the sequence. "End of sequence" is displayed.
Factory setting	No
	18.2.2 "Advanced setup" submenu
Locking status	(→ 🖹 95)

Access status display $(\rightarrow \textcircled{95})$

Enter access code

Navigation

 $\textcircled{\sc eq}$ Setup \rightarrow Advanced setup \rightarrow Enter access code

Description	Use this function to enable write-protected parameters via local operation or an operating tool. For local operation, the customer-specific access code defined in the Define access code parameter is entered ($\rightarrow \triangleq 105$). If an incorrect access code is entered, the user retains his current access authorization. The write protection affects all parameters marked with the symbol in the document. On the local display, the symbol in front of a parameter indicates that the parameter is write-protected. If no key is pressed for 10 minutes, or 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 another 60 s. Please contact your Endress+Hauser Sales Center if you lose your access code	
Input range	0 to 9999	
Define access code		
Navigation	$ \blacksquare \ \ Setup \rightarrow Advanced \ setup \rightarrow Define \ access \ code $	
Description	Use this function to restrict write-access to parameters to protect the configuration of the device against unintentional changes via local operation. A user-specific access code is specified for this purpose. The write protection affects all parameters marked with the result of the document. On the local display, the result of a parameter indicates that the parameter is write-protected.	
	the access code is entered in the Enter access code parameter ($\rightarrow \equiv 104$).	
	 Changing the access code Enter the current access code in the Enter access code parameter and confirm. Define the new access code. 	
	Please contact your Endress+Hauser Sales Center if you lose your access code	
Input range	0 to 9999	
Factory setting	0	
Additional information	User entry A message is displayed if the access code is not in the input range. Factory setting 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 role of <i>Maintenance</i> .	

Device tag

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Navigation

 $\bigcirc \ \boxdot \ Setup \to Advanced \ Setup \to Device \ tag$

Description

Use this function to enter a unique name for the measuring point so it can be identified quickly within the plant. The name is displayed in the header:



1 Header text

Input range

Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /)

Factory setting

Levelflex

The "Level" submenu

Medium type		A
Navigation	$ \blacksquare \ \texttt{Setup} \rightarrow \texttt{Advanced Setup} \rightarrow \texttt{Level} \rightarrow \texttt{Medium type} $	
Description	Defines the type of medium	
Options	LiquidSolid	
Factory setting	Liquid	
Medium property		A
Navigation	$ \blacksquare \ \ \ \ \ \ \ \ $	
Description	Defines the dielectric constant	
Options	 Unknown DC 1.4 1.6 DC 1.6 1.9 DC 1.9 2.5 DC 2.5 4 DC 4 7 DC 7 15 DC > 15 	
Factory setting	Unknown	
Additonal information	Dielectric constants of important media commonly used in the industry are summarized the document SD106F, which can be downloaded from the Endress+Hauser web page (www.endress.com).	in
Process property		A
Navigation	$ \blacksquare \text{Setup} \rightarrow \text{Advanced Setup} \rightarrow \text{Level} \rightarrow \text{Process property} $	
Description	Defines a typical rate of level change	

Options	<pre>For "Medium type" = "Liquid" Fast > 1 m(40")/min Standard < 1 m(40")/min Medium < 10 cm(4")/min Slow < 1 cm(0.4")/min No filter</pre>		
	For "Medium type" = "Solid" • Fast > 10 m(33ft)/h • Standard < 10 m(33ft)/h • Medium < 1 m(3ft)/h • Slow < 0.1 m(0.3ft)/h • No filter		
Factory setting	Standard < 1m(40")/min		
Additional information	The device adjusts the signal evaluation filters and the damping of the output signal to the typical rate of level change defined in this parameter:		
	For "Medium type" = "Liquid"		
	Process property	Step response time [s]	
	Fast > 1m(40")/min	3	
	Standard < 1 m(40")/min	13	
	Medium $< 10 \text{ cm}(4")/\text{min}$	38	
	Slow < 1 cm(0.4")/min	73	
	No filter	< 0.8	
	For "Medium type" = "Solid"		
	Process property	Step response time [s]	
	Fast > 10 m(33ft)/h	37	
	Standard < 10 m(33 ft)/h	74	
	Medium $< 1 m(3ft)/h$	145	
	Slow < 0.1 m (0.03 ft)/h	290	
	No filter	< 0.8	
	Other than the given values (e.g. intermediate values) can be defined in the		

"Expert" menu. For details please refer to GP01000F, "Levelflex FMP50/51/52/53/54/55/56/57 - Description of Device Parameters - HART".

Advanced conditions		
Navigation	$ \blacksquare \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	
Description	Defines additional process conditions (if necessary)	
Options	Build upNone	
	 Additionally for "Medium type" = "Liquid" Emulsion layer Probe near bottom 	
Factory setting	None	
Additional informationFor two-phase media the "Emulsion layer" option ensures that always the total level is detected
(Example: Oil/condensate application).
The "Probe near bottom" option helps to improve the empty detection, especially if the probe is
mounted close to the tank bottom.

Level unit		A
Navigation	$ \blacksquare \ \text{Setup} \rightarrow \text{Advanced setup} \rightarrow \text{Level} \rightarrow \text{Level unit} $	
Description	Defines the level unit	
Options	 % m mm ft in 	
Factory setting	%	
Additional information	The level unit may differ from the distance unit as defined in the Distance unit parameter $(\rightarrow \ge 98)$:	
	 The distance unit is used for the basic calibration ("Empty calibration" and "Full calibration" The level unit is used to display the (unlinearized) level. 	").

Blocking distance		
Navigation	$ \bigcirc \ \boxdot Setup \to Advanced setup \to Level \to Blocking dist. \\ \bigcirc \ \boxdot Setup \to Advanced setup \to Safety settings \to Blocking dist. $	
Description	Defines the upper blocking distance UB	
Input range	0 to 200 mm (0 to 7.8 in)	
Factory setting	 For level measurement: with coax probes: 0 mm with rod and rope probes up to 8 m (26 ft): 200 mm (8") with rod and rope probes exceeding 8 m (26 ft): 0,025 * (length of probe) 	

Additional information

No echos are evaluated within the blocking distance UB. Therefore, UB can be used to suppress interference echos within the upper end of the probe.



Level correction		
Navigation	$ \blacksquare Setup \rightarrow Advanced setup \rightarrow Level \rightarrow Level correction $	
Description	Defines a level correction	
Input range	Depending on the selected level unit: -100,0 to 100,0 % -200,0 to +200,0 m -656,2 to +656,2 ft -7874,0 to +7874,0 inch -200.000,0 to +200.000,0 mm	
Factory setting	0%	
Additional information	The value specified in this parameter is added to the measured level (before linearization).	

The "Linearization" submenu

Linearization type		٦
Navigation	$ \blacksquare \ \ Setup \to Advanced setup \to Linearization \to $	Linearization type
Description	Defines the type of linearization	
Selection	 None The level is transmitted to the output without linearization. Linear (A) Table (B) Pyramid bottom (C) Conical bottom (D) Angled bottom (E) Horizontal cylinder (F) Sphere (G) 	<figure></figure>
Factory setting	None	
Unit linearized		Â
Navigation	$ \blacksquare \ \Box \ Setup \rightarrow Advanced \ setup \rightarrow Linearization \rightarrow $	Unit linearized
Condition	Only visible if a linearization has been selected (i.e. ${f L}$	inearization type \neq None)

Description	Defines the unit of the linearized value.
Selection	 Free text t lb ton kg impGal UsGal cf cm³ dm³ m³ hl 1 %
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.

Free text		
Navigation	$ \blacksquare \ \blacksquare \ Setup \rightarrow Advanced \ setup \rightarrow Linearization \rightarrow Free \ text $	
Condition	Only visible for Unit lienarized = Free text.	
Description	Definiton of the unit	
Input range	Up to 32 alphanumerical characters (letters, numbers, special characters)	
Factory setting	Free text	

Maximum value	
Navigation	$ \blacksquare \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $
Condition	Only visible if one of the following linearization types has been selected:
	 Linear Pyramid bottom Conical bottom Angled bottom Horizontal cylinder Sphere
Description	Definition of the maximum content of the vessel (100%), as measured in the Unit linearized .
Input range	-50000 +50000

Factory setting

1	00	
L	00	

Diameter		A
Navigation	$ \blacksquare \ \ \hbox{Setup} \rightarrow \text{Advanced setup} \rightarrow \text{Linearization} \rightarrow \text{Diameter} $	
Condition	Only visible if one of the following linearization types has been selected:Horizontal cylinderSphere	
Description	Definition of the tank diameter	
Input range	0 9999.999 m (32808 ft)	
Factory setting	2 m (6.6 ft)	
Additional information	The value must be specified in the selected distance unit (\rightarrow \cong 98).	

Intermediate height		
Navigation	$ \blacksquare \ \ \ \ \ \ \ \ $	
Condition	Only visible if one of the following linearization types has been selected:	
	Pvramid bottom	

- Conical bottom

Description

Angled bottom

Definition of the intermediate height H



Input range	0 to 200 m (0 to 656 ft)
Factory setting	0 m (0 ft)
Additional information	The value must be specified in the selected distance unit ($\rightarrow \equiv 98$).

Navigation	$ \blacksquare \ \text{Setup} \rightarrow \text{Advanced setup} \rightarrow \text{Linearization} \rightarrow \text{Table mode} $
Condition	Only visible if the "Table" linearization type has been selected.
Description	Defines the method used to enter linearization points into the table.
Selection	 Manual The level and the associated linearized value are entered manually for each linearization point. Semi-automatic 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.
Factory setting	Manual
Additional information	 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.

Table number		
Navigation	$ \blacksquare \ \blacksquare \ Setup \rightarrow Advanced \ setup \rightarrow Linearization \rightarrow Table \ number $	
Condition	Only visible if the "Table" linearization type has been selected.	
Description	Index of the linearization point which is entered in the subsequent parameters.	
Input range	1 32	
Factory setting	1	

Level		A
Navigation	$ \blacksquare \ \ \hbox{Setup} \rightarrow \text{Advanced setup} \rightarrow \text{Linearization} \rightarrow \text{Level} $	
Condition	Only visible if the "Table" linearization type has been selected.	
Description	Definition or display of the (unlinearized) level of the respective linearization point.	
Input range	Depending on the parametrized measuring range. See the parameters Empty calibration ($\rightarrow \stackrel{\text{\cong}}{=} 99$) and Full calibration ($\rightarrow \stackrel{\text{\cong}}{=} 100$).	
Factory setting	0	

Additional informationFor Table mode = Manual: Level is a writable parameter.For Table mode = Semi-automatic: Level is a read-only parameter.

Customer value		
Navigation	$ \blacksquare \ \text{Setup} \rightarrow \text{Advanced setup} \rightarrow \text{Linearization} \rightarrow \text{Customer value} $	
Condition	Only visible if the "Table" linearization type has been selected.	
Description	Specification of the linearized value of the respective linearization point.	
Input range	$-3,0 \ge 10^{38} \dots +3,0 \ge 10^{38}$	
Factory setting	0	
Activate table		
Navigation	$ \blacksquare \ \text{Setup} \rightarrow \text{Advanced setup} \rightarrow \text{Linearization} \rightarrow \text{Activate table} $	
Condition	Only visible if the "Table" linearization type has been selected.	
Description	Enables or disables the linearization table.	
Selection	 Disable A linearization is not calculated. If the Linearization type parameter has been set to Tak the error message F435 is generated. Enable The measured value is linearized according to the table before being sent to the output. 	ole,
Factory setting	Disable	
Additional information	When editing the table, this parameter is automatically reset to the Disable option. After finishing the editing procedure it must be set to the Enable option again.	

The "Safety settings" submenu

Output echo lost A Navigation \square Setup \rightarrow Advanced setup \rightarrow Safety settings \rightarrow Output echo lost Description Defines the output signal in the case of a lost echo. Selection Last valid value The last valid value is kept in the case of a lost echo. Ramp 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 echo lost** parameter. Value echo lost In the case of a lost echo the output assumes the value defined in the Value echo lost parameter. Alarm In the case of a lost echo the device generates an alarm and the output assumes the value defined in the **Failure mode** parameter ($\rightarrow \ge 123$). Last valid value **Factory settings**

Value echo lost	Â
Navigation	\square Setup \rightarrow Advanced setup \rightarrow Safety settings \rightarrow Value echo lost
Condition	Only visible if the Value echo lost option has been selected in the Output echo lost parameter.
Description	Defines the constant output value in the case of a lost echo.
Input range	0 to 200000
Factory setting	0
Additional information	The unit is the same as for the output value: • Without linearization: As defined in the Level unit parameter ($\rightarrow \Rightarrow 109$)
	• With linearization: As defined in the Unit linearized parameter ($\rightarrow \exists 100$).

Ramp echo lost	Â
Navigation	$ \blacksquare \ \ \ \ \ \ \ \ $
Condition	Only visible if the Ramp echo lost option has been selected in the Output echo lost parameter.

Description

Defines the slope of the ramp in the case of a lost echo.





Delay echo lost Ramp echo lost (positive value) В

С Ramp echo lost (negative value)

		<u> </u>
Blocking distance	(→ 🖹 100)	<u></u>
Additional information	 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 reach 0%. For a positive slope of the ramp: The measured value is continuously increased until it reaches 100%.). .es
Factory setting	0 %/min	
Input range	-9999999,0 to + 9999999,0 %/min	

The "SIL/WHG confirmation" sequence

The "SIL/WHG confirmation" sequence 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** sequence is required to lock the device according to SIL or WHG.

For details refer to the "Functional Safety Manual", SD00326F which describes the locking procedure and the parameters of the sequence.

The "Deactivate SIL/WHG" sequence

The "Deactivate SIL/WHG" sequence 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 in the SIL- or WHG-locked state.

The **Deactivate SIL/WHG** sequence is required to unlock the device if it has been locked according to SIL or WHG.

For details refer to the "Functional Safety Manual", SD00326F which describes the unlocking procedure and the parameters of the sequence.

The "Probe length correction" sequence

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

- If a mapping (interference echo suppression) has been recorded after shortening the probe, it is no longer possible to perform an automatic probe length correction. In this case there are two options:
 - Delete the map ($\rightarrow \triangleq 103$) before performing the automatic probe length correction. Thereafter a new map can be recorded.
 - Alternative: Select the Manual input option in the Confirm length parameter and enter the probe length manually into the Present length parameter.

In the case of a grounded end of probe the **Positive EOP** option must be selected in the **Expert** \rightarrow **Sensors** \rightarrow **EOP** evaluation \rightarrow **EOP** search mode parameter. Otherwise the automatic probe length correction will not work.

Confirm length	Â
Navigation	$ \blacksquare \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $
Description	Confirm whether the value indicated in the Present length parameter matches the actual length of the probe.
Selection	 Probe length OK To be selected if the indicated length is correct. An adjustment is not required. The device quits the sequence. ("End of sequence" is displayed). Length too small To be selected if the indicated length is smaller than the actual length of the probe. A different end of probe signal is allocated and the newly calculated length is indicated in the Present length parameter. This procedure has to be repeated until the displayed value matches the actual length of the probe. Length too big To be selected if the indicated length is bigger than the actual length of the probe. A different end of probe signal is allocated and the newly calculated length is indicated in the Present length parameter. This procedure has to be repeated until the displayed value matches the actual length of the probe. Probe covered To be selected if the probe is (partially or completely) covered. A probe length correction is impossible in this case. The device quits the sequence. ("End of sequence" is displayed.) Manual input To be selected if no automatic probe length correction is to be performed. Instead, the Present length parameter appears and the actual length must be entered manually. In the DTM Manual input needs not to be selected explicitly. Here, manual editing of the probe length is always possible. Length unknown A probe length correction is impossible in this case. The device quits the sequence. ("End of sequence" is displayed.)
Factory setting	Probe length OK

A

Present length

Navigation	$ \blacksquare Setup \rightarrow Advanced setup \rightarrow Probe length corr. \rightarrow Pres. length $	
Description	Depending on the parametrization:	
	 In most cases: Displays the measured length of probe (according to the detected end of probe signal). Only for Confirm length = Manual input: Input parameter for the actual length of the probe. 	
Input range	0 to 200 m (0 to 656 ft)	
Factory setting	4 m (13 ft)	

The "Current output 1"/"Current output 2" submenus ¹⁾

Assign current		
Navigation	 Image: Setup → Advanced setup → Curr. output 1 → Assign curr. Image: Setup → Advanced setup → Curr. output 2 → Assign curr. 	
Description	Use this function to assign a process variable to the current output.	
Options	 Level linearized Distance Electronic temperature (-50 °C / -58 °F = 4mA; 100 °C / 212 °F = 20 mA) Relative echo amplitude (0 mV = 4 mA; 2000 mV = 20 mA) 	
Factory setting	 For level measurements Current output 1: Level linearized Current output 2: Relative echo amplitude ¹⁾ 	
1) only for devices with 2	current outputs	

only for devices with 2 current outputs

Current span	
Navigation	 Image: Setup → Advanced setup → Current output 1 → Current span Image: Setup → Advanced setup → Current output 2 → Current span
Description	Use this function to select the current span. The selection specifies the operational range for the process value and for the upper and lower level for signal on alarm.
	 In the event of an error, the current output adopts the value defined in the Failure mode parameter (→ ≧ 123). If the measured value is outside the measuring range, the device displays the message S441 Current output. The measuring range is defined by the Empty calibration (→ ≧ 99) and Full calibration (→ ≧ 100)parameters.
Options	 4 to 20 mA NAMUR 4 to 20 mA US 4 to 20 mA Fixed current
Factory setting	4 to 20 mA NAMUR

The "Current output 2" submenu is only available for devices with two current outputs. 1)

Additional information

Fixed current

The current value is set via the **Fixed current** parameter ($\rightarrow \ge 122$).

Example

Shows the relationship between the current span for the output of the process variable and the lower and upper alarm levels.



I Current

- 1 Current span for process value
- 2 Lower level for signal on alarm
- 3 Upper level for signal on alarm

Options	1	2	3
4 to 20 mA NAMUR	3.8 to 20.5 mA	< 3.6 mA	>21.95 mA
4 to 20 mA US	3.9 to 20.8 mA US	< 3.6 mA	>21.95 mA
4 to 20 mA	4 to 20.5 mA	< 3.6 mA	>21.95 mA

Navigation	$ \bigcirc \ \boxdot Setup \rightarrow Advanced setup \rightarrow Curr. output 1 \rightarrow Fixed current \bigcirc \ \boxdot Setup \rightarrow Advanced setup \rightarrow Curr. output 2 \rightarrow Fixed current $
Condition	Only visible if the Fixed current option has been selected in the Current span parameter.
Description	Defines the fixed value of the current.
Input range	3.6 to 20 mA
Factory setting	4.0 mA

Damping		
Navigation	$ \blacksquare Setup \rightarrow Advanced setup \rightarrow Current output 1/2 \rightarrow Damping $	
Description	Defines the time constant for the damping of the output current.	
Input range	0 to 999.9 s	
Factory setting	0 s (i.e.: no damping)	

Additional information	Fluctuations of the measured value affect the output current with an exponential delay, the time
	constant of which is defined in this parameter.
	With a small time constant the output reacts immediately to changes of the measrued value. With
	a big time constant the reaction of the output is more delayed.

Failure mode	
Navigation	□ Setup → Advanced setup → Curr. output 1→ Failure mode □ Setup → Advanced setup → Curr. output 2→ Failure mode
Prerequisite	One of the following options is selected in the Current span parameter: • 4 to 20 mA NAMUR
	 4 to 20 mA US 4 to 20 mA
Description	Use this function to select the value of the current output in the event of an alarm condition. This setting does not affect the error response mode of other outputs and totalizers. This is specified in separate parameters.
Options	 Min. The current output adopts the value of the lower level for signal on alarm. Max. The current output adopts the value of the upper level for signal on alarm. Last valid value The current output is based on the last measured value that was valid before the error occurred. Actual value The current output is based on the actual measured value on the basis of the current measurement; the error is ignored. Defined value The current output value is defined in the Failure current parameter (→ 123).
Factory setting	Max.
Additional information	Min. and Max.
	\blacksquare The signal on alarm level is specified using the Current span parameter (\rightarrow \triangleq 121).

Failure current		
Navigation	Setup → Advanced setup → Curr. output 1→ Failure current Setup → Advanced setup → Curr. output 2→ Failure current	
Prerequisite	The Defined value option is selected in the Failure mode parameter ($\rightarrow \ge 123$).	
Description	Use this function to define the value the current output adopts in an alarm condition.	
Input range	3.59 to 22.5 mA	
Factory setting	22.5 mA	

A

Output current 1 / Output current 2

Navigation \bigcirc >>>>></t

Description

Displays the output current in mA.

	The "Display" submenu	
	For operating tools: The Display submenu is only visible if a display module is connected to the device.	
Format display	(→ 🖹 95)	
Value 1 display		
Navigation	$ \blacksquare \ Setup \rightarrow Advanced \ setup \rightarrow Display \rightarrow Value \ 1 \ display $	
Description	Use this function to select one of the measured values to be shown on the local display. If several measured values are displayed at once, the measured value selected here will be the first value to be displayed. The value is only displayed during normal operation.	
	The Format display parameter is used to specify how many measured values are displayed simultaneously and how ($\rightarrow \triangleq 95$).	
Options	 None Level linearized Distance Current output 1 Current output 2 Measured current Terminal voltage Electronics temperature 	
Factory setting	For level measurements Level linearized	

Decimal places 1	٦
Navigation	$ \blacksquare Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Decimal places 1 $
Prerequisite	A measured value is specified in the Value 1 display parameter ($\rightarrow \ge 125$).
Description	Use this function to specify the number of decimal places for measured value 1. This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.
Options	 X X.X X.XX X.XXX X.XXXX
Factory setting	X.XX

Value 2 display	
Navigation	$ \blacksquare \ \ \texttt{Setup} \rightarrow \texttt{Advanced setup} \rightarrow \texttt{Display} \rightarrow \texttt{Value 2 display} $
Description	Use this function to select one of the measured values to be shown on the local display. If several measured values are displayed at once, the measured value selected here will be the second value to be displayed. The value is only displayed during normal operation.
	The Format display parameter is used to specify how many measured values are displayed simultaneously and how ($\rightarrow \stackrel{\text{l}}{\Rightarrow} 95$).
Options	 None Level linearized Distance Current output 1 Current output 2 Measured current Terminal voltage Electronics temperature
Factory setting	For level measurements Distance

Decimal places 2	
Navigation	$ \blacksquare \ \Box Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Decimal places 2 $
Prerequisite	A measured value is specified in the Value 2 display parameter ($\rightarrow \ge 126$).
Description	Use this function to specify the number of decimal places for measured value 2. This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display. Defines the number of decimal places for the second display value.
Options	 X X.X X.XX X.XXX X.XXXX
Factory setting	X.XX
Value 3 display	

Navigation

 $\textcircled{\ } \boxdot \ Setup \rightarrow \mathsf{Advanced \ setup} \rightarrow \mathsf{Display} \rightarrow \mathsf{Value \ 3 \ display}$

Options	■ X ■ X.X
Description	Use this function to specify the number of decimal places for measured value 3. This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.
Prerequisite	A measured value is specified in the Value 3 display parameter ($\rightarrow \ge 126$).
Navigation	\square \square Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Decimal places 3
Decimal places 3	
Factory setting	For level measurements Current output 1
Options	 None Level linearized Distance Current output 1 Current output 2 Measured current Terminal voltage Electronics temperature
	The Format display parameter is used to specify how many measured values are displayed simultaneously and how ($\rightarrow \ge 95$).
Description	than two measured values are displayed at once, the measured value selected here will be the third value to be displayed. The value is only displayed during normal operation.

Use this function to select one of the measured values to be shown on the local display. If four measured values are displayed at once, the measured value selected here will be the fourth value to be displayed. The value is only displayed during normal operation.

The **Format display** parameter is used to specify how many measured values are displayed simultaneously and how ($\rightarrow \equiv 95$).

Description

Options	 None Level linearized Distance Current output 1 Current output 2 Measured current Terminal voltage Electronics temperature
Factory setting	For level measurements and 1 current output None
	For level measurements and 2 current outputs Current output 2

Decimal places 4	
Navigation	$ \blacksquare \ \ Setup \rightarrow Advanced \ setup \rightarrow Display \rightarrow Decimal \ places \ 4 $
Prerequisite	A measured value is specified in the Value 4 display parameter ($\rightarrow \ge 127$).
Description	Use this function to specify the number of decimal places for measured value 4. This setting doe not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.
Selection	 x x.x x.xx x.xxx x.xxxx
Factory setting	X.XX
Display interval	(→ 🖹 98)

Display damping	
Navigation	$ \blacksquare \ \ \texttt{Setup} \rightarrow \texttt{Advanced setup} \rightarrow \texttt{Display} \rightarrow \texttt{Display damping} $
Description	Use this function to set the reaction time of the local display to fluctuations in the measured value caused by process conditions. A time constant is entered for this purpose: if a low time constant is entered, the display reacts very quickly to fluctuating measured variables. If a high time constant is entered, the display reaction is damped.
Input range	0 to 999 s
Factory setting	0 s

Header	
Navigation	$ \blacksquare Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Header $
Description	Use this function to select the contents of the header of the local display. The header text only appears during normal operation.
	A001337
Options	 Device tag Free text
Factory setting	Device tag
Additional information	Device tag Is defined in the Device tag parameter ($\rightarrow \triangleq 105$).
	Free text Is defined in the Header text parameter ($\rightarrow \ge 129$).
Header text	
Navigation	$ \blacksquare Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Header text $
Prerequisite	The Free text option is selected in the Header parameter ($\rightarrow \triangleq 129$).
Description	Use this function to enter a customer-specific text for the header of the local display. The header text only appears during normal operation.

1 Position of the header text on the display

User entry Max. 12 characters, such as letters, numbers or special characters (e.g. @, %, /)

Factory setting -----

User entry

Additional information

The number of characters displayed depends on the characters used.

Separator		ß
Navigation	$ \blacksquare \ \ \texttt{Setup} \rightarrow \texttt{Advanced setup} \rightarrow \texttt{Display} \rightarrow \texttt{Separator} $	
Description	Use this function to select the decimal separator.	
Options	 . (point) , (comma) 	
Factory setting	. (point)	
Number format		
Navigation	\square Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Number format	
Description	Selection of the number format for the representation of measured values.	
Selection	Decimalft-in-1/16" (Only valid for distance units)	
Factory setting	Decimal	
Decimal places menu		
Navigation	\square Setup \rightarrow Advanced setup \rightarrow Display \rightarrow Dec. places menu	
Description	Number of decimal places for the representation of numbers within the operating menu.	
Selection	 X X.X X.XX X.XXX X.XXX 	

Factory setting

X.XXXX

Additional informationThis parameter only determines the representation of numbers within the operating menu (e.g.
Empty calibration, Full calibration). It does not affect the measured value representation.
For measured values, the number of decimal places is defined in the Decimal places 1 to
Decimal places 4 parameters ($\rightarrow \supseteq 125$).

The "Configuration backup display" submenu



The Configuration backup display 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.

Operating time		8
Navigation	$ \blacksquare \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	
Description	Use this function to display the length of time the device has been in operation up to now.	
Display format	Days (d), hours (h), minutes (m) and seconds (s)	
Additional information	<i>Display</i> The maximum number of days is 9999, which is equivalent to 27 years.	

Last backup	ß

Navigation	\square Setup \rightarrow Advanced setup \rightarrow Conf. backup display \rightarrow Last backup
Description	Use this function to display the time when a backup copy of the data was last saved to the display module.
Display format	Days (d), hours (h), minutes (m) and seconds (s)

Configuration management	B

 \bigcirc Setup \rightarrow Advanced setup \rightarrow Conf. backup display \rightarrow Config. managem.

Description Use this function to select an action to save the data to the display module. 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.

Navigation

 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. Compare The device configuration saved in the display module is compared to the current device configuration of the HistoROM. Clear backup data The backup copy of the device configuration is deleted from the display module of the device.
Cancel
Compare The result can be viewed in the Comparison result parameter ($\rightarrow \square 132$). <i>HistoROM</i>

Comparison result	
Navigation	□ $□$ Setup → Advanced setup → Conf. backup display → Compar. result
Description	Use this function to view the last result of comparing the current device configuration to the backup copy in the display module.
	The comparison is started via the Compare settings option in the Configuration management parameter ($\rightarrow \ge 131$).
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 vet been compared to the backup copy in

18.3 The "Diagnostics" menu

Actual diagnostics	
Navigation	$ \blacksquare \ \Box agnostics \rightarrow Actual diagnos. $
Description	Use this function to display the current diagnostics message. If two or more messages occur simultaneously, the message with the highest priority is shown on the display.
	Information on what is causing the message, and remedy measures, can be viewed via the (\mathbf{j}) symbol on the display.
User interface	Symbol for event behavior, diagnostics event, time the event occurred and event text
Additional information	User interface
	Example for display format: <u>A</u> S441 01d4h12min30s Current output 1

Previous diagnostics	
Navigation	\square Diagnostics \rightarrow Prev. diagnsotics
Description	Use this function to display the diagnostics message last displayed before the current message. This condition can still apply.
	Information on what is causing the message, and remedy measures, can be viewed via the (i) symbol on the display.
Zusätzliche Information	Anzeige
	Beispiel zum Anzeigeformat:
	MC41101d5n14min20s Up-/Download aktiv
Additional information	User interface
	Example for display format: <u>A</u> C411 01d5h14min20s Upload/download active

Operating time from restart

Navigation	$ \blacksquare \ \text{Diagnostics} \rightarrow \text{Operatint time fr. restart} $
Description	Use this function to display the time the device has been in operation since the last device restart.
User interface	Days (d), hours (h), minutes (m) and seconds (s)

"Diagnsotics list" submenu 18.3.1

Up to 5 diagnostics messages currently pending are displayed in this submenu. If more than 5 messages are pending, the messages with the highest priority are shown on the display.



Information on what is causing the message, and remedy measures, can be viewed via the (i) symbol on the display.

Information on diagnostics measures in the device and an overview of all the diagnostics messages: $(\rightarrow \textcircled{1}71)$

Diagnsotics 1-5	
Navigation	 Diagnostics → Diagnose list → Diagnostics 1 Diagnostics → Diagnose list → Diagnostics 2 Diagnostics → Diagnose list → Diagnostics 3 Diagnostics → Diagnose list → Diagnostics 4 Diagnostics → Diagnose list → Diagnostics 5
Description	Use this function to display the current diagnostics messages with the highest priority to the fifth- highest priority.
User interface	Symbol for event behavior, diagnostics event, time the event occurred and event text
Additional information	User interface
	Example 1 for display format: <u>A</u> S441 01d4h12min30s Current output 1
	Example 2 for display format: F276 10d8h12min22s I/O module error

18.3.2 The "Event logbook" submenu

Filter options	
Navigation	$ \blacksquare \ \Box agnostics \rightarrow Event \ logbook \rightarrow Filter \ options $
Description	Use this function to select the category (status signal) whose event messages are displayed in the events list.
	The status signals are categorized according to NAMUR NE 107: $F = failure, M = maintenance request, C = function check, S = out of specification$
Options	 All Failure (F) Maintenance required (M) Function check (C) Out of specification (S) Information (I)
Factory setting	All
Event list	
Navigation	$ \blacksquare \ \Box \ Diagnostics \rightarrow Event \ logbook \rightarrow Event \ list $
Description	Use this function to display the history of event messages of the category selected in the Filter options parameter ($\rightarrow \ge 136$). A maximum of 20 event messages are displayed in chronological order. If the advanced HistoROM function is enabled in the device, the event list can contain up to 100 entries.
	The following symbols indicate whether an event has occurred or has ended (status symbols): ■ ④: Event has occurred ■ ④: Event has ended
	Information on what is causing the message, and remedy measures, can be viewed via the (j) symbol on the display.
User interface	 For event messages in category I (status signal): status signal, event number, time event occurred, event text For event messages in category F, M, C, S (status signal): diagnostics event, status symbol, time event occurred, event text

Additional information

User interface

Example 1 for display format: I 1091 ① 24d12h13m00s Configuration modified

HistoROM

A HistoROM is a "non-volatile" device memory in the form of an EEPROM.

 $\hfill \ensuremath{\square}$ To order the HistoROM with advanced capabilities, see the "Accessories" section of the "Technical Information" document.

18.3.3 "Device information" submenu

Device	
Navigation	$ \blacksquare \ \text{Diagnostics} \rightarrow \text{Device info} \rightarrow \text{Device} $
Description	Use this function to view the device designation.
Display	Max. 32–digit character string comprising letters, numbers or special characters (e.g. @, $\%$, /)
Factory setting	Levelflex
Serial number	
Navigation	$ \blacksquare Diagnostics \rightarrow Device info \rightarrow Serial number $
Description	 Use this function to view the serial number of the device. It can also be found on the nameplate. 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
Display	Max. 11-digit character string comprising letters and numbers
Firmware version	
Navigation	$ \blacksquare \ \Box agnostics \rightarrow Device info \rightarrow Firmware version $
Description	Use this function to view the device firmware version installed.
Display	Max. 6-digit character string in the format xx.yy.zz
Device name	
Navigation	$ \blacksquare \ \text{Diagnostics} \rightarrow \text{Device info} \rightarrow \text{Device name} $
Description	Use this function to view the name of the transmitter. It can also be found on the nameplate of the transmitter.

Order code

Navigation	\square \square Diagnostics \rightarrow Device info \rightarrow Order code	
Description	Use this function to view the order code of the device. It can also be found on the nameplate. The order code is generated by a one-to-one transformation from the extended order code, which defines all the device features of the product structure. In contrast, the device features can not be read directly from the order code. I Uses of the order code To order an identical spare device. To identify the device quickly and easily, e.g. when contacting Endress+Hauser.	
Display	Max. 20-digit character string comprising letters, numbers, punctuation marks or +, -	
Extended order code 1-3		
Navigation	Image: Diagnostics \rightarrow Device info \rightarrow Extended order code 1Image: Diagnostics \rightarrow Device info \rightarrow Extended order code 2Image: Diagnostics \rightarrow Device info \rightarrow Extended order code 3	
Description	Use this function to display the first, second or third part of the extended order code. On account of length restrictions, the extended order code is split into a maximum of 3 parameters. The extended order code indicates the selected options of all the features of the product structure for the device and thus uniquely identifies the device. It can also be found on the nameplate.	
	 To order an identical spare device. To check the ordered device features against the shipping note. 	
Display	Max. 20-digit character string	
Device revision		
Navigation	$ \blacksquare \ \Box agnostics \rightarrow Device info \rightarrow Device revision $	
Prerequisite	Device with HART protocol	
Description	Use this function to view the device revision with which the device is registered with the HART Communication Foundation. It is needed to assign the appropriate device description file (DD) to the device.	
Display	2-digit hexadecimal number	
Device ID		
Navigation	$ \square Diagnostics \rightarrow Device info \rightarrow Device ID $	
Prerequisite	Device with HART protocol	

Use this function to view the device ID for identifying the device in a HART network.



Display

6-digit hexadecimal number

Device typeNavigation□ Diagnostics → Device info → Device typePrerequisiteDevice with HART protocolDescriptionUse this function to view the device type with which the device is registered with the HART
Communication Foundation. The device type is specified by the manufacturer. It is needed to
assign the appropriate device description file (DD) to the device.Display2-digit hexadecimal numberFactory setting0x34 (for Levelflex FMP5x)

Manufacturer ID	
Navigation	$ \blacksquare \ \Box \ Diagnostics \rightarrow Device info \rightarrow Manufacturer ID $
Prerequisite	Device with HART protocol
Description	Use this function to view the manufacturer ID with which the device is registered with the HART Communication Foundation.
Display	2-digit hexadecimal number
Factory setting	Ox11 (for Endress+Hauser)

Distance	$(\rightarrow \triangleq 101)$	
Level linearized		
Navigation	$ \blacksquare \ \Box \ Diagnostics \rightarrow Measured \ val. \rightarrow Level \ linearized $	
Description	Displays the linearized level.	
Output current 1 / Output current 2	(→ 🖹 124)	
Measured current 1		
Navigation	$ \blacksquare \ \Box agnostics \rightarrow Measured val. \rightarrow Measured current 1 $	
Description	Use this function to view the current value of the current output currently measured.	
Display ran ge	3.59 to 22.5 mA	
Terminal voltage 1		
Navigation	\square Diagnostics \rightarrow Measured val. \rightarrow Terminal volt. 1	
Description	Use this function to view the current terminal voltage that is present at the current output.	
Display range	12 to 36 V	

18.3.4 "Measured value" submenu

18.3.5 "Data logging" submenu

Assign channel 1-4

Navigation	Image: Diagnostics \rightarrow Data logging \rightarrow Assign channel 1Image: Diagnostics \rightarrow Data logging \rightarrow Assign channel 2Image: Diagnostics \rightarrow Data logging \rightarrow Assign channel 3Image: Diagnostics \rightarrow Data logging \rightarrow Assign channel 4
Description	Use this function to assign a process variable to the data logging channel. A total of 1000 measured values can be logged. This means: 1000 data points if 1 logging channel is used 500 data points if 2 logging channels are used 333 data points if 3 logging channels are used 250 data points if 4 logging channels are used
	If the maximum number of data points is reached, the oldest data points in the data log are cyclically overwritten in such a way that the last 1000, 500, 333 or 250 measured values are always in the log (ring memory principle).
Auswahl	 Off Level Distance Current output 1 Measured current Terminal voltage Electronics temperature Absolute echo amplitude Relative echo amplitude Signal to noise Tank noise EOPshift
Factory setting	Off
Logging interval	

Navigation

 \square Diagnostics \rightarrow Data logging \rightarrow Logging interval

Description	Definition of the logging interval t $_{log}$ for data logging. This defines the interval between the individual data points in the data log, and thus the maximum loggable process time T $_{log}$:	
	 If 1 logging channel is used: T log = 1000 · t log If 2 logging channels are used: T log = 500 · t log If 3 logging channels are used: T log = 333 · t log If 4 logging channels are used: T log = 250 · t log 	
	Once this time elapses, the oldest data points in the data log are cyclically overwritten such that a time of T $_{log}$ always remains in the memory (ring memory principle).	
	The log contents are cleared if the length of the logging interval is changed.	
Input range	1.0 to 3600.0 s	
Factory setting	10.0 s	
Additional information	Example If 1 logging channel is used: • $T_{log} = 1000 \cdot 1 \ s = 1000 \ s \cong 15 \ min$ • $T_{log} = 1000 \cdot 10 \ s = 10000 \ s \cong 3 \ h$ • $T_{log} = 1000 \cdot 80 \ s = 80000 \ s \cong 1 \ d$ • $T_{log} = 1000 \cdot 3600 \ s = 3600000 \ s \cong 41 \ d$	

Clear logging data		ß
Navigation	$ \blacksquare \ \Box \ Diagnostics \rightarrow Data \ logging \rightarrow Clear \ logging \ data $	
Description	Use this function to clear the entire logging data.	
Options	 Cancel The data are not cleared. All the data are retained. 	

The logging data are cleared. The logging process starts from scratch.

Clear data

Cancel

Display channel 1-4

Factory setting

Navigation

Diagnostics → Data logging → Display channel 1
 Diagnostics → Data logging → Display channel 2
 Diagnostics → Data logging → Display channel 3
 Diagnostics → Data logging → Display channel 4

Description

Use this function to view the measured value trend for the logging channel in the form of a chart.



A0013859

- x-axis: depending on the number of channels selected displays 250 to 1000 measured values of a process variable.
- y-axis: displays the approximate measured value span and constantly adapts this to the ongoing measurement.

The process variable whose measured value curve is displayed is specified in the **Assign** channel 1 - Assign channel 4 parameter ($\rightarrow \ge 142$).
18.3.6 "Simulation" submenu

Assignment of measured variable

Navigation	$ \blacksquare \ \Box a gnostics \rightarrow Simulation \rightarrow Assign. meas. var. $
Description	Use this function to select a process variable for the simulation process that is activated. The display alternates between the measured value and a diagnostics message of the "function check" category (C) while simulation is in progress:
	The simulation value of the selected process variable is defined in the Value process variable parameter ($\rightarrow \ge 145$).
Selection	OffLevelLevel linearized
Factory setting	Off

Value process variable		A
Navigation	$ \blacksquare \ \Box agnostics \rightarrow Simulation \rightarrow Value \ proc. \ var. $	
Prerequisite	One of the following options is selected in the Assignment of measured variable parameter	:
	LevelLevel linearized	
Description	Use this function to enter a simulation value for the selected process variable. Subsequent measured value processing and the signal output use this simulation value. In this way, users coverify whether the measuring device has been configured correctly.	an
Input range	Depends on the process variable selected	
Factory setting	The current value of the selected process variable (at the moment the simulation is activated).	

Simulation current output 1-2		A
Navigation	Diagnostics \rightarrow Simulation \rightarrow Sim.curr.out. 1 Diagnostics \rightarrow Simulation \rightarrow Sim.curr.out. 2 (for devices with 2 current outputs)	

DescriptionUse this function to switch simulation of the current output on and off. The display alternates
between the measured value and a diagnostics message of the "function check" category (C)
while simulation is in progress:

The simulation value is defined in the Value current output 1-2 parameter ($\rightarrow \ge 146$).

Options	 On Current simulation is active. Off Current simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.
Factory setting	Off
Value current output 1-2	Â
Navigation	$ \begin{array}{c} \hline \bigcirc & \bigcirc \\ \hline \bigcirc & \bigcirc \\ \hline \end{array} \end{array} \begin{array}{c} \text{Diagnostics} \rightarrow \text{Simulation} \rightarrow \text{Value curr.out. 1} \\ \hline \bigcirc & \bigcirc \\ \hline \end{array} \begin{array}{c} \text{Diagnostics} \rightarrow \text{Simulation} \rightarrow \text{Value curr.out. 2} (\text{only for devices with 2 current outputs}) \\ \end{array} $
Prerequisite	The On option is selected in the Simulation current output 1-2 parameter .
Description	Use this function to enter a current value for the simulation. In this way, users can verify the correct adjustment of the current output and the correct function of downstream switching units.
Input range	3.6 to 22.5 mA
Factory setting	Current value at the moment the simulation is activated.

Simulation device alarm	
Navigation	□ □ Diagnostics → Simulation → Sim. alarm
Description	Use this function to switch the device alarm on and off. In this way, users can verify the correct adjustment of the current output and the correct function of downstream switching units. The display alternates between the measured value and a diagnostics message of the " <i>function check</i> " <i>category</i> (C) while simulation is in progress:
Options	OnOff
Factory setting	Off

Start device check		
Navigation	$ \blacksquare \ \Box a gnostics \rightarrow Device check \rightarrow Start device check $	
Description	Start of a device check.	
Selection	 No No device check is performed. Yes A device check is performed. If the error S941 "Echo lost" is present, a device check is not possible. First you have to eliminte the cause of this error. 	
Factory setting	No	
Result device check		
Navigation	$ \blacksquare \ \Box agnostics \rightarrow Device check \rightarrow Result device check $	
Description	Indicates the result of the device check.	
Display	 Installation ok Accuracy reduced A measurement is possible. However, the measuring accuracy may be reduced due to the 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 	signal e

18.3.7 The "Device check" submenu

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.
Additional information	Display format Days (d), hours (h), minutes (m), seconds (s): 0000d00h00m00s

Level signal

medium.

Navigation	$ \square \ Diagnostics \rightarrow Device check \rightarrow Level signal $
Conditions	Only visible if a device check has been performed.
Description	Displays the result of the device check for the level signal.
Display	 Check not done Check not ok Check the mounting position of the device and the dielectric constant of the

Check ok

Launch signal Navigation \square Diagnostics \rightarrow Device check \rightarrow Launch signal Condition Only visible if a device check has been performed. Description Displays the result of the device check for the launch signal (fiducial). • Check not done Display

- Check not ok Check the mounting position of the device. In non-metallic vessels use a metal plate or a metal flange.
- Check ok

18.3.8 "Device reset" submenu

Device reset	
Navigation	$ \blacksquare \ \Box \ Diagnostics \rightarrow Device \ reset \rightarrow Device \ reset $
Description	Use this function to reset the device configuration – either entirely or in part – to a defined state.
Options	 Cancel No action is executed and the user exits the parameter. To factory defaults Every parameter is reset to the order-code specific factory setting. To delivery settings Every parameter is reset to the delivery setting. The delivery setting may differ from the factory default if customer specific settings have been ordered. Of customer settings Every customer parameter is reset to its factory setting. Service parameters, however, retain their current value. To transducer defaults Every measurment-related parameter is reset to its factory setting. Service parameters and communication-related parameters, however, retain their current value. Restart device The restart resets every parameter whose data are in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration is not modified.
Factory setting	Cancel

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Endress+Hauser

People for Process Automation

Declaration of Hazardous Material and De-Contamination *Erklärung zur Kontamination und Reinigung*



Please reference the Return Authorization Number (RA#), obtained from Endress+Hauser, on all paperwork and mark the RA# clearly on the outside of the box. If this procedure is not followed, it may result in the refusal of the package at our facility. Bitte geben Sie die von E+H mitgeteilte Rücklieferungsnummer (RA#) auf allen Lieferpapieren an und vermerken Sie diese auch außen auf der Verpackung. Nichtbeachtung dieser Anweisung führt zur Ablehnung ihrer Lieferung.

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

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

Type of instrument / sensor

Geräte-/Sensortyp

Serial number Seriennummer

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

Process data/ Prozessdaten

Temperature / *Temperatur* [°F] [°C] Conductivity / *Leitfähigkeit* [µS/cm]

Pressure / Druck [psi] [Pa] Viscosity / Viskosität [cp] [mm²/s]

Δ

Medium and warnings

Warnhinweise zum Medium

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

 * explosive; oxidizing; dangerous for the environment; biological risk; radioactive

* explosiv; brandfördernd; umweltgefährlich; biogefährlich; radioaktiv

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

Description of failure / Fehlerbeschreibung ____

Company data / Angaben zum Absender

Company / Firma _

Address / Adresse

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

Fax / E-Mail

Your order No. / Ihre Auftragsnr. _

"We hereby certify that this declaration is filled out truthfully and completely to the best of our knowledge.We further certify that the returned parts have been carefully cleaned. To the best of our knowledge they are free of any residues in dangerous quantities." *"Wir bestätigen, die vorliegende Erklärung nach unserem besten Wissen wahrheitsgetreu und vollständig ausgefüllt zu haben. Wir bestätigen*

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

P/SF/Konta XIV

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