



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Description of Device Parameters

Levelflex

FMP50, FMP51, FMP52, FMP53, FMP54, FMP55, FMP56, FMP57

Guided Level-Radar

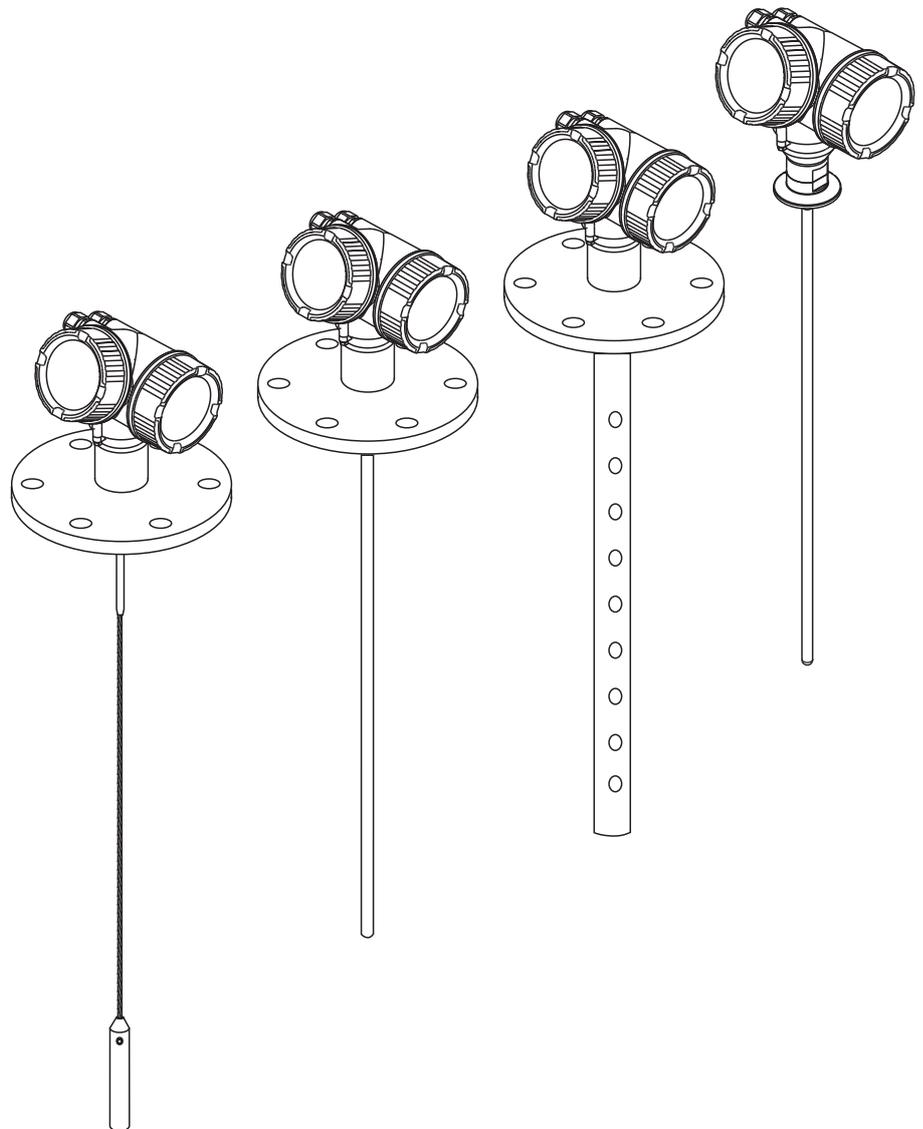


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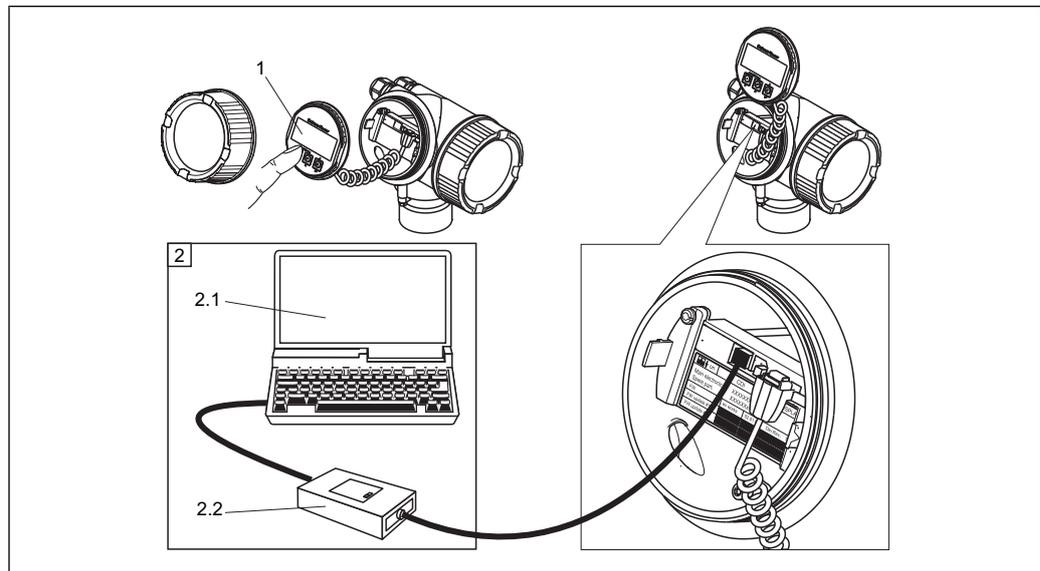
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1 Operating options

1.1 Overview

1.1.1 On-site operation



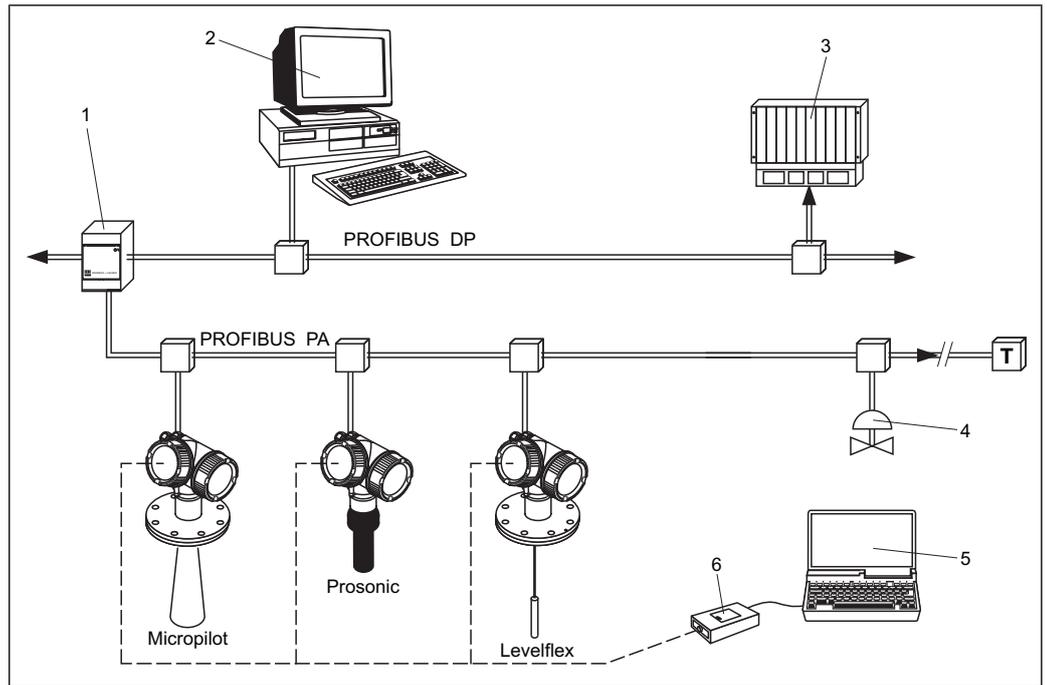
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1 On-site operation options

- 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

1.1.2 System integration via PROFIBUS PA

A maximum of 32 devices (8 if mounted in an explosion hazardous location EEx ia IIC according to FISCO-model) can be connected to the bus. The segment coupler provides the operating voltage to the bus. Both on-site as well as remote operation are possible.



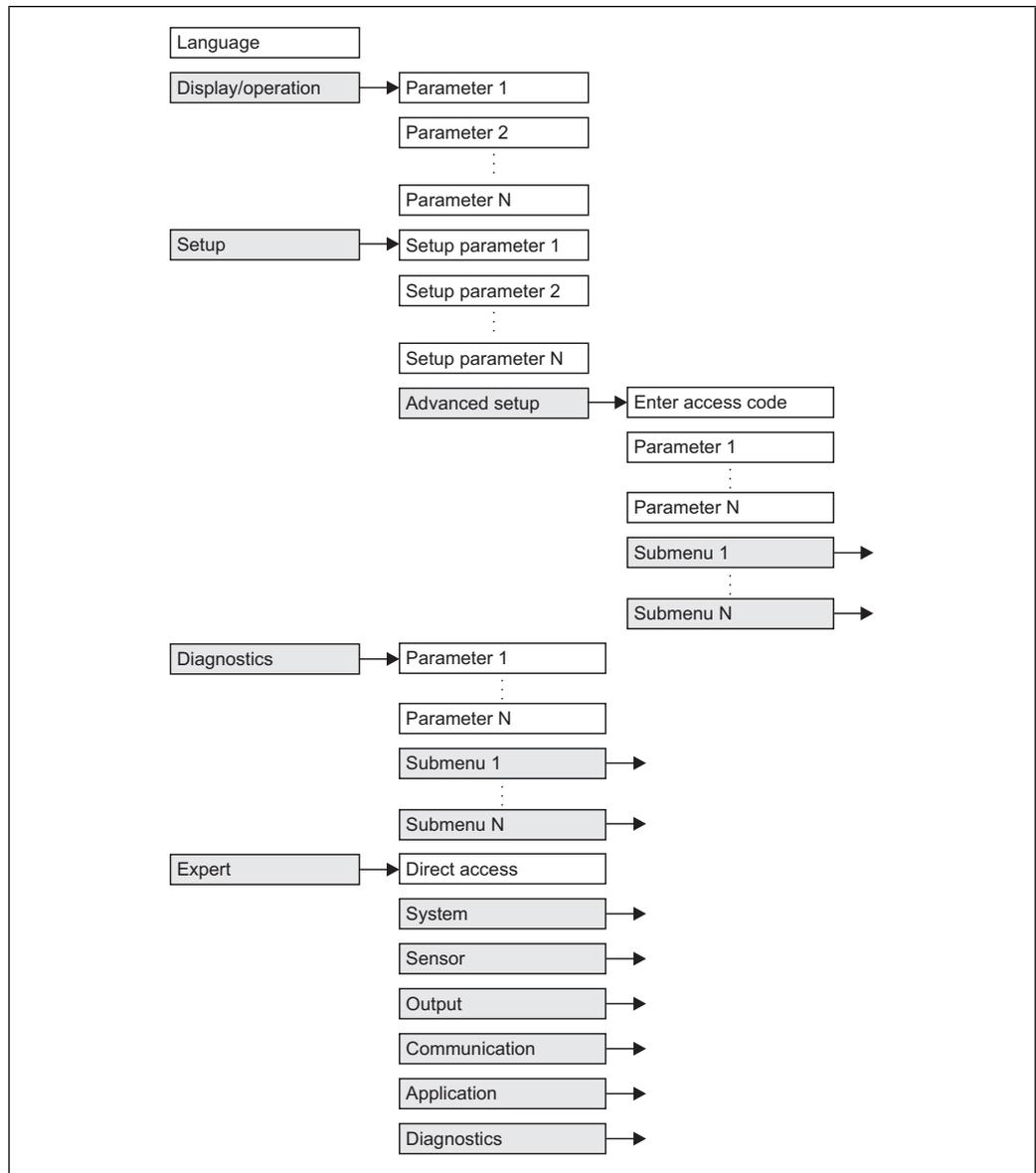
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2 The complete measuring system consists of devices and:

- 1 Segment coupler
- 2 Computer with Profiboard/Proficard and operating tool (FieldCare)
- 3 PLC (programmable logic controller)
- 4 More functions (valves etc.)
- 5 Computer with operating tool (FieldCare)
- 6 Commubox FXA291 (CDI interface)

1.2 The operating menu

1.2.1 Structure



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

1.2.2 Submenus and user roles

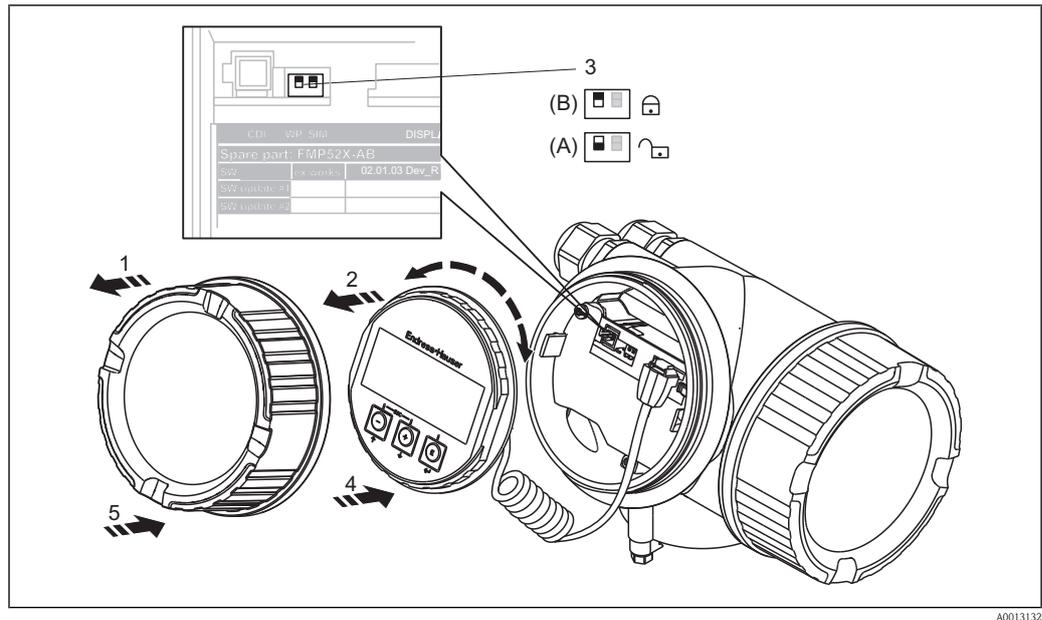
The submenus are designed for different user roles. A user role is defined by typical tasks within the lifecycle of the device.

User role	Typical tasks	Submenu	Content/Meaning
Operator	Tasks in the ongoing process: <ul style="list-style-type: none"> ■ Configuration of the display. ■ Reading measuring values. 	"Language"	Defines the operating language.
		"Display/Operation"	Contains all parameters which are needed during the ongoing process: Configuration of the display (display values, display format, display contrast ...).
Maintenance	Commissioning: <ul style="list-style-type: none"> ■ 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: <ul style="list-style-type: none"> ■ 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: <ul style="list-style-type: none"> – 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. <ul style="list-style-type: none"> ■ 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: <ul style="list-style-type: none"> ■ Commissioning of measurements under demanding conditions. ■ Optimization of the measurement under demanding conditions. ■ Detailed configuration of the communication interface. ■ Error diagnosis in difficult 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: <ul style="list-style-type: none"> ■ "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. ■ "Communication" submenu Contains all parameters needed to configure the digital communication interface. ■ "Diagnostics" submenu Contains all parameters needed to detect and analyze operational errors.

1.2.3 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.



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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.

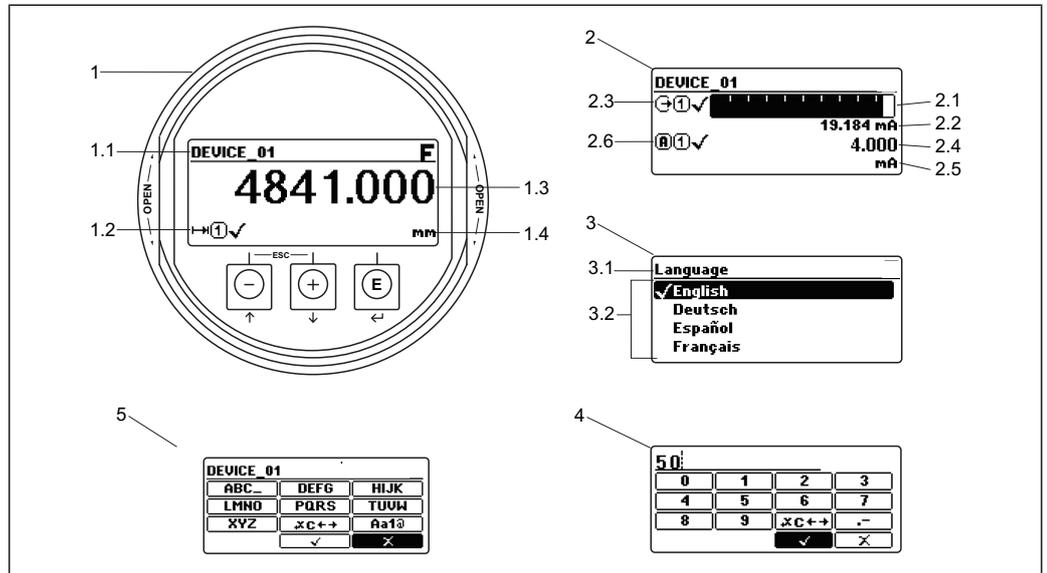
Locking the menu via parameter settings (software locking)

Step	Parameter	Action
1	Setup → Advanced setup → Define access code	To lock the device: Enter a user-defined access code.
2	Setup → Advanced setup → Enter access code	To unlock the device: Enter the previously defined access code.
3	Setup → Advanced setup → Enter access code	To lock the device again: Enter a number other than the previously defined access code.

1.3 Display and operating module

1.3.1 Display appearance

Overview



A0012635

4 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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> in the main menu next to the selection "Setup" in the header, if you are in the "Setup" menu
 A0011976	Expert Is displayed: <ul style="list-style-type: none"> in the main menu next to the selection "Expert" in the header, if you are in the "Expert" menu
 A0011977	Diagnostics Is displayed: <ul style="list-style-type: none"> in the main menu next to the selection "Diagnostics" in the header, if you are in the "Diagnostics" menu

Error symbols

Symbol	Meaning
 A0012088	"Out of specification" The device is currently operated beyond its technical specifications (e.g. during start-up or cleaning)
 A0012100	"Service mode" The device is currently in the service mode (e.g. during a simulation).
 A0012101	"Maintenance required" Maintenance of the device is required. The measured value remains valid.
 A0012086	"Failure" A failure occurred. The measured value is no longer valid.

Display symbols for the locking state

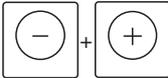
Symbol	Meaning
 A0011978	Display parameter Marks display-only parameters which can not be edited.
 A0011979	Device locked <ul style="list-style-type: none"> In front of a parameter name: The device is locked via software and/or hardware. In the header of the measured value screen: The device is locked via hardware.

Measured value symbols

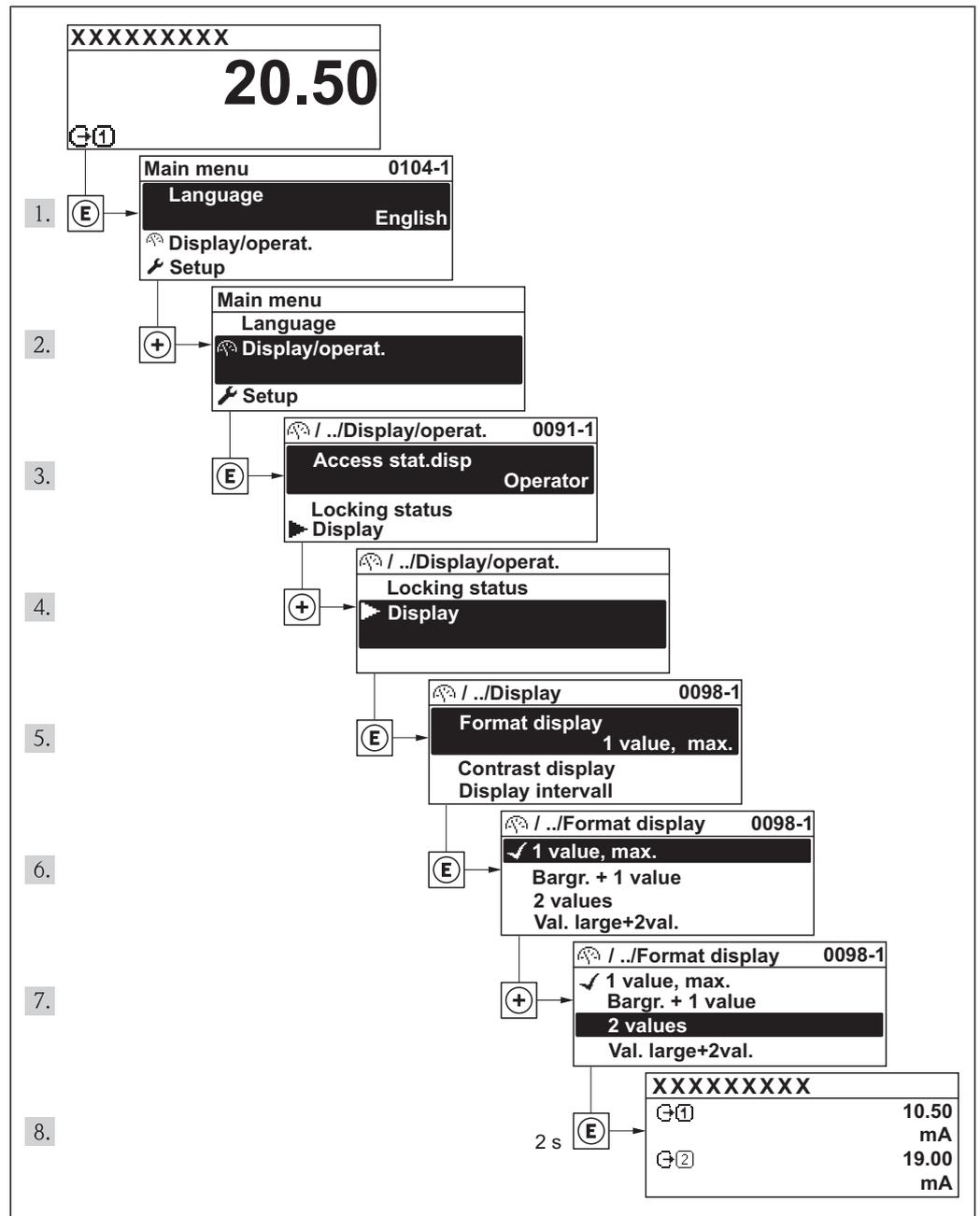
Symbol	Meaning
Measured values	
 <small>A0011995</small>	Level
 <small>A0011996</small>	Distance
 <small>A0011998</small>	Current output
 <small>A0011999</small>	Measured current
 <small>A0012106</small>	Terminal voltage
 <small>A0012104</small>	Temperature of the electronics or the sensor
Measuring channels	
 <small>A0012000</small>	Measuring channel 1
 <small>A0012107</small>	Measuring channel 2
Status of the measured value	
 <small>A0012102</small>	Status "Alarm" The measurement is interrupted. The output assumes the defined alarm value. A diagnostic message is generated.
 <small>A0012103</small>	Status "Warning" The device continues measuring. A diagnostic message is generated.

1.3.2 Navigation and selection from a list

Use the operating keys to navigate within the operating menu and to select options from a list.

Key	Meaning
 <small>A0011971</small>	<p>"Minus" key Henceforth represented by .</p> <ul style="list-style-type: none"> ■ In a selection list: Moves the selection bar upward. ■ In an input matrix: Moves the selection bar backward.
 <small>A0011972</small>	<p>"Plus" key Henceforth represented by .</p> <ul style="list-style-type: none"> ■ In a selection list: Moves the selection bar downward. ■ In an input matrix: Moves the selection bar forward.
 <small>A0011973</small>	<p>"Enter" key Henceforth represented by .</p> <ul style="list-style-type: none"> ■ Opens the marked submenu or parameter. ■ Confirms a changed parameter value.
 <small>A0012661</small>	<p>"Escape" key combination (press keys simultaneously) Henceforth represented by  + .</p> <ul style="list-style-type: none"> ■ Closes a parameter without accepting the changes. ■ Quits the current menu layer and returns to the next higher layer.

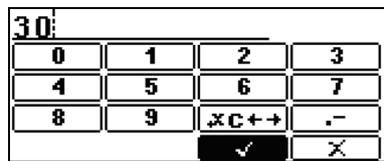
Example: Change "Format display" to "2 values"



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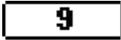
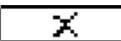
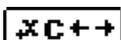
1.3.3 Entering numbers

When opening a numeric parameter, the input matrix for numbers appears:



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Matrix fields for entering numbers

Matrix field	Meaning
 <small>A0011982</small> ...  <small>A0011983</small>	Selects the numbers 0 to 9.
 <small>A0011986</small>	Inserts a decimal separator at the current position
 <small>A0011984</small>	Confirms the selection.
 <small>A0011985</small>	Terminates the editing without accepting the changes.
 <small>A0011987</small>	Opens the selection page for number-correction tools.

Matrix fields under for correcting numbers

Matrix field	Meaning
 <small>A0011988</small>	Deletes the character left to the cursor.
 <small>A0011989</small>	Deletes all characters.
 <small>A0011991</small>	Moves the cursor one step to the left.
 <small>A0011992</small>	Moves the cursor one step to the right.
 <small>A0011993</small>	Terminates the editing without accepting the changes.

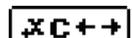
1.3.4 Entering text

When opening a text parameter, the input matrix for letters, numbers and special characters appears:

Levelflex		
ABC_	DEFG	HIJK
LMNO	PQRS	TUVW
XYZ	xC++	Aa1@
	✓	✗

A0012110

Matrix fields for entering letters, numbers and special characters

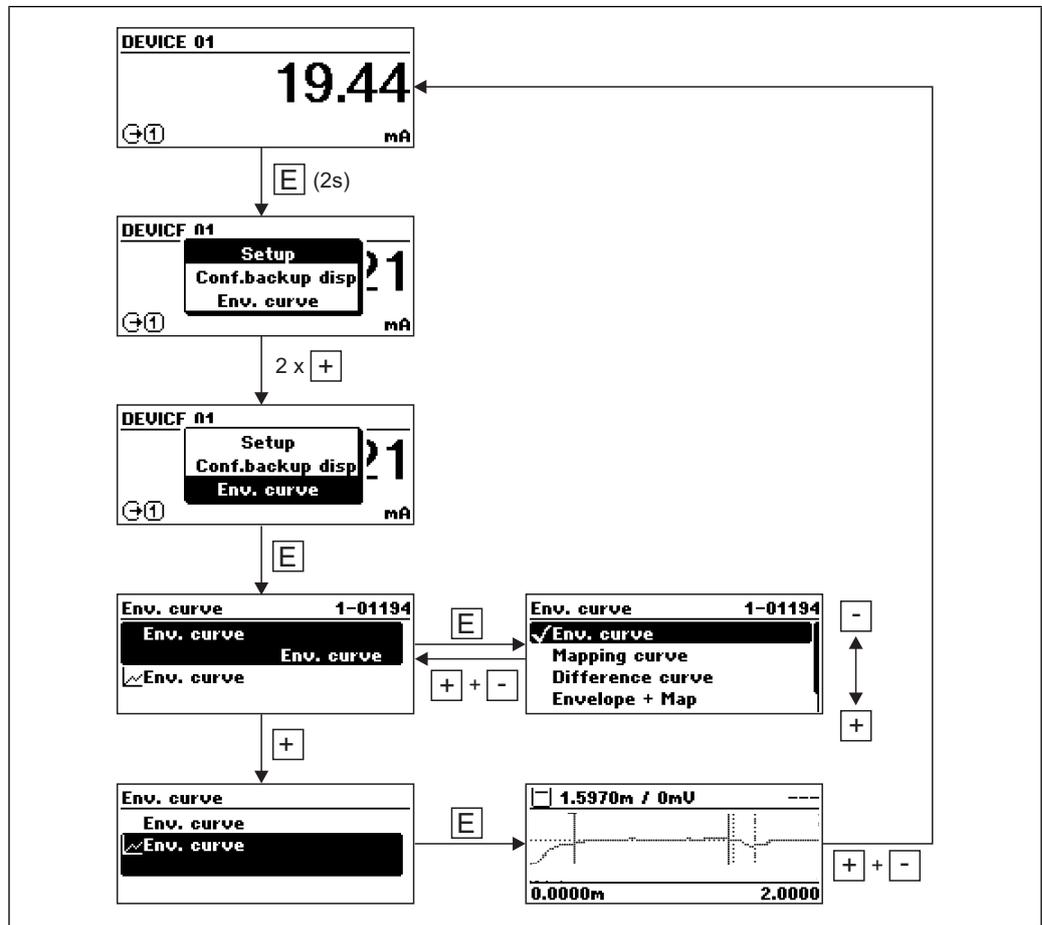
Matrix field	Meaning
 <small>A0012001</small> ...  <small>A0012002</small>	Selects the letters A to Z.
 <small>A0012004</small>	Switches <ul style="list-style-type: none"> ■ between lower case and upper case letters ■ to the input matrix for numbers ■ to the input matrix for special characters.
 <small>A0011984</small>	Confirms the selection.
 <small>A0011985</small>	Terminates the editing without accepting the changes.
 <small>A0011987</small>	Opens the selection page for number-correction tools.

Matrix fields under for correcting letters, numbers and special characters

Matrix field	Meaning
 <small>A0011988</small>	Deletes the character left to the cursor.
 <small>A0011989</small>	Deletes all characters.
 <small>A0011991</small>	Moves the cursor one step to the left.
 <small>A0011992</small>	Moves the cursor one step to the right.
 <small>A0011993</small>	Terminates the editing without accepting the changes.

1.3.5 Envelope curve on the display and operating module

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



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2 Overview of the operating menu

 The following table lists all parameters the "Expert" menu may contain. The page number refers to where a description of the parameter can be found.

Depending on the device version and parametrization some parameters will not be available in a given situation. For details on the conditions refer to the "Prerequisite" category in the description of the respective parameter.

Navigation		Direct access	Description
Expert →	Direct access	0106	(→  25)
	Locking status	0122	(→  25)
	Access status	0091	(→  25)
System →	Define access code	0093	(→  26)

Navigation			Direct access	Description
Expert →	System →	Display →	Language	0104 (→  26)
			Format display	0098 (→  27)
			Value 1 display	0107 (→  28)
			Decimal places 1	0095 (→  29)
			Value 2 display	0108 (→  29)
			Decimal places 2	0117 (→  30)
			Value 3 display	0110 (→  30)
			Decimal places 3	0118 (→  31)
			Value 4 display	0109 (→  32)
			Decimal places 4	0119 (→  32)
			Display interval	0096 (→  33)
			Display damping	0094 (→  33)
			Header	0097 (→  33)
			Header text	0112 (→  34)
			Separator	0101 (→  35)
			Number format	0099 (→  35)
Decimal places menu	0573 (→  35)			
Contrast display	0105 (→  36)			
Access status display	0091 (→  25)			

Navigation			Direct access	Description
Expert →	System →	Configuration backup display →	Operating time	0652 (→  36)
			Last backup	0102 (→  36)
			Configuration management	0100 (→  37)
			Comparison result	0103 (→  37)

Navigation				Direct access	Description
Expert →	System →	Management →	Device reset	-	(→ 38)
			Activate SW option	0029	(→ 39)

Navigation				Direct access	Description
Expert →	Sensor →		Distance unit	0551	(→ 39)
			Temperature unit	0557	(→ 39)
			Operating mode	1046	(→ 39)
			Tank type	1175	(→ 40)
			Tube diameter	1117	(→ 40)
			Bin type	1176	(→ 41)
			Process property	1081	(→ 41)
			Advanced process conditions	1177	(→ 42)
			Application parameter	1126	(→ 43)

Navigation				Direct access	Description
Expert →	Sensor →	Medium →	Medium group	1208	(→ 43)
			Medium type	1049	(→ 43)
			Medium property	1165	(→ 44)
			DC value lower medium	1154	(→ 44)
			DC value	1201	(→ 45)
			Calculated DC value	1118	(→ 45)

Navigation				Direct access	Description
Expert →	Sensor →	Level →	Distance offset	2309	(→ 46)
			Empty calibration	2343	(→ 46)
			Full calibration	2308	(→ 46)
			Level unit	0576	(→ 47)
			Level limit mode	2314	(→ 47)
			High limit	2312	(→ 48)
			Low limit	2313	(→ 48)
			Level correction	2325	(→ 49)
			Output mode	2317	(→ 49)
			Level	2319	(→ 49)
			Level linearized	2318	(→ 50)
			Interface	2352	(→ 50)
			Interface linearized	2382	(→ 51)
			Upper interface thickness	2330	(→ 51)

Navigation				Direct access	Description
Expert →	Sensor →	Linearization →	Linearization type	2339	(→ 52)
			Unit after linearization	2340	(→ 53)

Navigation			Direct access	Description
		Free text	2341	(→ 54)
		Maximum value	2315	(→ 54)
		Diameter	2342	(→ 55)
		Intermediate height	2310	(→ 55)
		Table mode	2303	(→ 56)
		Level	2383	(→ 56)
		Customer value	2384	(→ 57)
		Activate table	2304	(→ 57)

Navigation			Direct access	Description
Expert →	Sensor →	Information →	Signal quality	1047 (→ 57)
			Absolute echo amplitude	1127 (→ 58)
			Relative echo amplitude	1089 (→ 58)
			Absolute interface amplitude	1129 (→ 58)
			Relative interface amplitude	1090 (→ 58)
			Absolute EOP amplitude	1128 (→ 59)
			Found echos	1068 (→ 59)
			Used calculation	1115 (→ 59)
			Tank trace state	1206 (→ 60)
			Measurement frequency	1180 (→ 60)
			Electronic temperature	1062 (→ 60)

Navigation			Direct access	Description
Expert →	Sensor →	Sensor properties →	Probe length correction	- (→ 61)
			Confirm probe length	1080 (→ 61)
			Present probe length	1078 (→ 61)
			Sensor module	1101 (→ 62)

Navigation			Direct access	Description
Expert →	Sensor →	Distance →	Distance	1124 (→ 62)
			Interface distance	1067 (→ 62)
			Unfiltered interface distance	1042 (→ 63)
			Dead time	1199 (→ 63)
			Integration time	1092 (→ 64)
			Blocking distance	1144 (→ 64)

Navigation			Direct access	Description
Expert →	Sensor →	Gas phase compensation →	GPC mode	1034 (→ 65)
			External pressure selector	1073 (→ 65)
			Gas phase compensation factor	1209 (→ 66)
			Present reference distance	1076 (→ 66)

Navigation			Direct access	Description
		Reference distance	1033	(→  66)
		Reference echo threshold	1168	(→  67)
		Const. GPC factor	1217	(→  67)

Navigation			Direct access	Description
Expert →	Sensor →	Sensor diagnostics →	Broken probe detection	1032 (→  67)
			Start self check	1133 (→  68)
			Result self check	1134 (→  68)
			Noise of signal	1105 (→  68)

Navigation			Direct access	Description
Expert →	Sensor →	Safety settings →	Output echo lost	2307 (→  68)
			Value echo lost	2316 (→  69)
			Ramp at echo lost	2323 (→  69)
			Delay time echo lost	1193 (→  70)
			Safety distance	1093 (→  70)
			In safety distance	1018 (→  71)
			Acknowledge alarm	1130 (→  71)

Navigation			Direct access	Description
Expert →	Sensor →	Envelope curve →	Envelope curve	1207 (→  72)

Navigation			Direct access	Description
Expert →	Sensor →	Mapping →	Confirm distance	1045 (→  72)
			Distance	1124 (→  73)
			Mapping end point	1022 (→  73)
			Present mapping	1182 (→  74)
			Record map	1213 (→  74)

Navigation			Direct access	Description
Expert →	Sensor →	EOP evaluation →	EOP shift	1027 (→  75)
			DC value	1201 (→  75)
			Calculated DC value	1118 (→  45)

Navigation			Direct access	Description
Expert →	Sensor →	Echo tracking →	Evaluation mode	1112 (→  75)
			History reset	1145 (→  75)

Navigation			Direct access	Description
Expert →	Sensor →	Interface →	Tank level	1111 (→ ⓘ 76)
			Interface property	1107 (→ ⓘ 77)
			Interface criterion	1184 (→ ⓘ 77)
			Measured capacity	1066 (→ ⓘ 78)
			Build-up ratio	1210 (→ ⓘ 78)
			Build-up threshold	1211 (→ ⓘ 78)
			Empty capacity	1122 (→ ⓘ 78)

Navigation			Direktzugriff	Beschreibung
Experte →	Kommunikation →	Analog input 1...6 →	Channel	1561 (→ ⓘ 84)
			PV filter time	1524 (→ ⓘ 85)
			Fail safe type	1525 (→ ⓘ 85)
			Fail safe value	1526 (→ ⓘ 85)
			Out value	1552 (→ ⓘ 85)
			Out status	1564 (→ ⓘ 86)
			Out status HEX	1549 (→ ⓘ 86)

Navigation			Direktzugriff	Beschreibung
Experte →	Kommunikation →	Digital input 1...4 →	Channel	2187 (→ ⓘ 87)
			Invert	2188 (→ ⓘ 87)
			Fail safe type	2189 (→ ⓘ 87)
			Fail safe value	2190 (→ ⓘ 88)
			Out value	2194 (→ ⓘ 88)
			Out status	2203 (→ ⓘ 88)
			Out status HEX	2193 (→ ⓘ 88)

Navigation			Direktzugriff	Beschreibung
Experte →	Kommunikation →	Analog output 1...4 →	Set point value	1661 (→ ⓘ 89)
			Set point status	1660 (→ ⓘ 89)
			Fail sfe time	1635 (→ ⓘ 89)
			Fail safe type	1636 (→ ⓘ 89)
			Fail safe value	1637 (→ ⓘ 90)
			Out value	1647 (→ ⓘ 90)
			Out status	1669 (→ ⓘ 90)
			Out status HEX	1645 (→ ⓘ 90)

Navigation			Direktzugriff	Beschreibung
Experte →	Kommunikation →	Digital output 1...4 →	Set point value	1715 (→ ⓘ 91)
			Set point status	1714 (→ ⓘ 91)
			Invert	1692 (→ ⓘ 91)
			Fail sfe time	1697 (→ ⓘ 92)

Navigation		Direktzugriff	Beschreibung
	Fail safe type	1696	(→ ⓘ 92)
	Fail safe value	1693	(→ ⓘ 92)
	Out value	1704	(→ ⓘ 92)
	Out status	1723	(→ ⓘ 93)
	Out status HEX	1703	(→ ⓘ 93)

Navigation		Direct access	Description
Expert →	Diagnostics →	Actual diagnostics	0691 (→ ⓘ 93)
		Previous diagnostics	0690 (→ ⓘ 94)
		Operating time from restart	0653 (→ ⓘ 94)
		Operating time	0652 (→ ⓘ 94)

Navigation		Direct access	Description
Expert →	Diagnostics →	Diagnostics list →	Diagnsotics 1 0692 (→ ⓘ 94)
			Diagnsotics 2 0693 (→ ⓘ 94)
			Diagnsotics 3 0694 (→ ⓘ 94)
			Diagnsotics 4 0695 (→ ⓘ 94)
			Diagnsotics 5 0696 (→ ⓘ 94)

Navigation		Direct access	Description
Expert →	Diagnostics →	Event logbook →	Filter options 0705 (→ ⓘ 95)
			Event list - (→ ⓘ 95)

Navigation		Direct access	Description
Expert →	Diagnostics →	Device information →	Device 0011 (→ ⓘ 96)
			Serial number 0009 (→ ⓘ 96)
			Firmware version 0010 (→ ⓘ 96)
			Device name 0013 (→ ⓘ 97)
			Order code 0008 (→ ⓘ 97)
			Extended order code 1 0023 (→ ⓘ 97)
			Extended order code 2 0021 (→ ⓘ 97)
			Extended order code 3 0022 (→ ⓘ 97)
			ENP version 0012 (→ ⓘ 98)

Navigation		Direct access	Description
Expert →	Diagnostics →	Data logging →	Assign channel 1 0851 (→ ⓘ 98)
			Assign channel 2 0852 (→ ⓘ 98)
			Assign channel 3 0853 (→ ⓘ 98)
			Assign channel 4 0854 (→ ⓘ 98)
			Logging interval 0856 (→ ⓘ 99)
			Clear logging data 0855 (→ ⓘ 100)

Navigation		Direct access	Description
	Display channel 1	-	(→ ⓘ 100)
	Display channel 2	-	(→ ⓘ 100)
	Display channel 3	-	(→ ⓘ 100)
	Display channel 4	-	(→ ⓘ 100)

Navigation			Direct access	Description
Expert →	Diagnostics →	Min/max values →	Max. level value	2357 (→ ⓘ 100)
			Time max. level	2385 (→ ⓘ 101)
			Min. level value	2358 (→ ⓘ 101)
			Time min. level	2386 (→ ⓘ 101)
			Max. draining speed	2320 (→ ⓘ 101)
			Max. filling speed	2360 (→ ⓘ 101)
			Max. interface value	2361 (→ ⓘ 102)
			Time max. interface	2388 (→ ⓘ 102)
			Min. interface value	2362 (→ ⓘ 102)
			Time min. interface	2387 (→ ⓘ 102)
			I max. drain speed	2363 (→ ⓘ 102)
			I max. fill speed	2359 (→ ⓘ 103)
			Reset min./max.	2324 (→ ⓘ 103)
			Max. electronics temperature	1031 (→ ⓘ 103)
			Time max. electronics temperature	1204 (→ ⓘ 103)
			Min. electronics temperature	1040 (→ ⓘ 104)
			Time min. electronics temperature	1205 (→ ⓘ 104)
			Reset min./max. temp.	1173 (→ ⓘ 104)

Navigation			Direct access	Description
Expert →	Diagnostics →	Simulation →	Assign measurement variable	2328 (→ ⓘ 104)
			Value process variable	2329 (→ ⓘ 105)
			Switch output simulation	0462 (→ ⓘ 105)
			Switch status	0463 (→ ⓘ 106)
			Simulation device alarm	0654 (→ ⓘ 106)

Navigation			Direct access	Description
Expert →	Diagnostics →	Device check →	Start device check	1013 (→ ⓘ 106)
			Result device check	1014 (→ ⓘ 107)
			Last check time	1203 (→ ⓘ 107)
			Level signal	1016 (→ ⓘ 107)
			Launch signal	1012 (→ ⓘ 107)
			Interface signal	1015 (→ ⓘ 108)

Navigation				Direct access	Description
Expert →	Diagnostics →	Device reset →	Device reset	1013	(→  108)

3 The "Expert" menu

Direct access (0106)

Write access	Maintenance
Navigation	Expert → Direct access
Description	Enter the direct access code to access a parameter directly.
Input range	0 to 9 999
Additional information	The direct access code is indicated in brackets following the parameter name, e.g. Locking status (0122) .

Locking status (0122)

Write access	Read-only parameter
Navigation	  Expert → Locking status
Description	<p>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.</p> <p> The -symbol appears in front of parameters that cannot be modified since they are write-protected.</p>
Display options	<ul style="list-style-type: none"> ■ 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 (→  25).

Access status display (0091)

Write access	Read-only parameter
Navigation	  Expert → Access status display   Expert → System → Display → Access status display

Description Use this function to view the access authorization to parameters via onsite operation. If a -symbol appears in front of a parameter, the parameter cannot be changed via the local display with the current access authorization.

 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 (→  25).

Display options

- Operator
- Maintenance
- Service

3.1 Expert → System

Define access code (0093)

Write access Maintenance

Navigation   Expert → System → 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  symbol in the document. On the local display, the  symbol in front of a parameter indicates that the parameter is write-protected.

 When trying to change a write-protected parameter, a prompt to enter the access code appears.

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 1 to 9999

3.1.1 Expert → System → Display

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

Language (0104)

Write access Operator

Navigation  Expert → System → Display → Language

Description Language setting for the local display

- Options**
- English
 - One additional operating language (see product structure, feature 500, "Additional Operation Language")

Factory setting English

Format display (0098)

Write access Operator

Navigation   Expert → System → Display → 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.



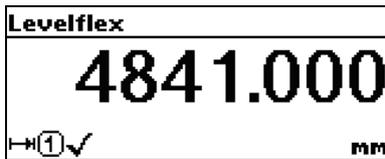
- The **Value 1 display - Value 4 display** parameters are used to specify what measured values are shown on the display and in what order (→ [28](#)) (→ [29](#)) (→ [30](#)) (→ [32](#)).
- If more measured values are specified than the display mode selected permits, the values alternate on the device display. The display time until the next change is configured using the **Display interval** parameter (→ [33](#)).

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

Factory setting 1 value, max. size

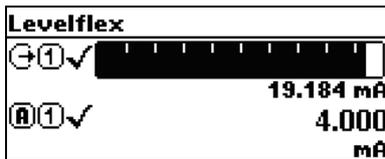
Additional information

1 value, max. size



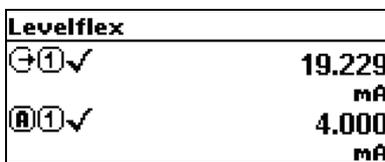
A0011948-EN

1 bargraph + 1 value



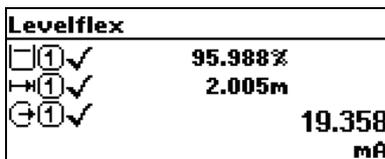
A0012011-EN

2 values



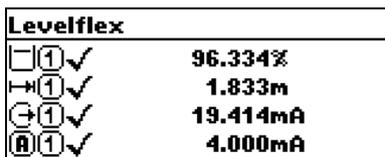
A0012013-EN

1 value large + 2 values



A0012016-EN

4 values



A0012019-EN

Value 1 display (0107)



Write access

Operator

Navigation

Expert → System → Display → 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 (→ 27).

- Options**
- None
 - Level linearized
 - Distance
 - Interface (only for **Operating mode = Interface** or **Interface with capacity**)
 - Interface distance (only for **Operating mode = Interface** or **Interface with capacity**)
 - Upper interface thickness (only for **Operating mode = Interface** or **Interface with capacity**)
 - Current output 1
 - Current output 2
 - Measured current
 - Terminal voltage
 - Electronics temperature
 - Measured capacity (only for **Operating mode = Interface with capacity**)

- Factory setting**
- For level measurements**
Level linearized
- For interface measurements**
Interface

Decimal places 1 (0095) 

- Write access** Maintenance
- Navigation**   Expert → System → Display → Decimal places 1
- Prerequisite** A measured value is specified in the **Value 1 display** parameter (→  28).
- 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 (0108) 

- Write access** Operator
- Navigation**   Expert → System → Display → 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 (→  27).

Options

- None
- Level linearized
- Distance
- Interface (only for **Operating mode = Interface** or **Interface with capacity**)
- Interface distance (only for **Operating mode = Interface** or **Interface with capacity**)
- Upper interface thickness (only for **Operating mode = Interface** or **Interface with capacity**)
- Current output 1
- Current output 2
- Measured current
- Terminal voltage
- Electronics temperature
- Measured capacity (only for **Operating mode = Interface with capacity**)

Factory setting**For level measurements**

Distance

For interface measurements

Level linearized

Decimal places 2 (0117)**Write access**

Maintenance

Navigation  Expert → System → Display → Decimal places 2**Prerequisite**A measured value is specified in the **Value 2 display** parameter (→  29).**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 (0110)**Write access**

Operator

Navigation	  Expert → System → Display → Value 3 display
Description	<p>Use this function to select one of the measured values to be shown on the local display. If more 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.</p> <p> The Format display parameter is used to specify how many measured values are displayed simultaneously and how (→  27).</p>
Options	<ul style="list-style-type: none"> ■ None ■ Level linearized ■ Distance ■ Interface (only for Operating mode = Interface or Interface with capacity) ■ Interface distance (only for Operating mode = Interface or Interface with capacity) ■ Upper interface thickness (only for Operating mode = Interface or Interface with capacity) ■ Current output 1 ■ Current output 2 ■ Measured current ■ Terminal voltage ■ Electronics temperature ■ Measured capacity (only for Operating mode = Interface with capacity)
Factory setting	<p>For level measurements Current output 1</p> <p>For interface measurements and 1 current output Upper interface thickness</p> <p>For interface measurements and 2 current outputs Current output 1</p>

Decimal places 3 (0118)



Write access	Maintenance
Navigation	  Expert → System → Display → Decimal places 3
Prerequisite	A measured value is specified in the Value 3 display parameter (→  30).
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.
Options	<ul style="list-style-type: none"> ■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx
Factory setting	x.xx

Value 4 display (0109) 	
Write access	Operator
Navigation	  Expert → System → Display → Value 4 display
Description	<p>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.</p> <p> The Format display parameter is used to specify how many measured values are displayed simultaneously and how (→  27).</p>
Options	<ul style="list-style-type: none"> ■ None ■ Level linearized ■ Distance ■ Interface (only for Operating mode = Interface or Interface with capacity) ■ Interface distance (only for Operating mode = Interface or Interface with capacity) ■ Upper interface thickness (only for Operating mode = Interface or Interface with capacity) ■ Current output 1 ■ Current output 2 ■ Measured current ■ Terminal voltage ■ Electronics temperature ■ Measured capacity (only for Operating mode = Interface with capacity)
Factory setting	<p>For level measurements and 1 current output None</p> <p>For level measurements and 2 current outputs Current output 2</p> <p>For interface measurements and 1 current output Current output 1</p> <p>For interface measurements and 2 current outputs Current output 2</p>

Decimal places 4 (0119) 	
Write access	Maintenance
Navigation	  Expert → System → Display → Decimal places 4
Prerequisite	A measured value is specified in the Value 4 display parameter (→  32).
Description	Use this function to specify the number of decimal places for measured value 4. 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.

- Selection**
- x
 - x.x
 - x.xx
 - x.xxx
 - x.xxxx

Factory setting x.xx

Display interval (0096)



Write access Maintenance

Navigation Expert → System → Display → 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 (→ 28) (→ 29) (→ 30) (→ 32).
- The display format of the displayed measured values is specified using the **Format display** parameter (→ 27)

Input range 1 to 10 s

Factory setting 5 s

Display damping (0094)



Write access Maintenance

Navigation Expert → System → Display → 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 (0097)



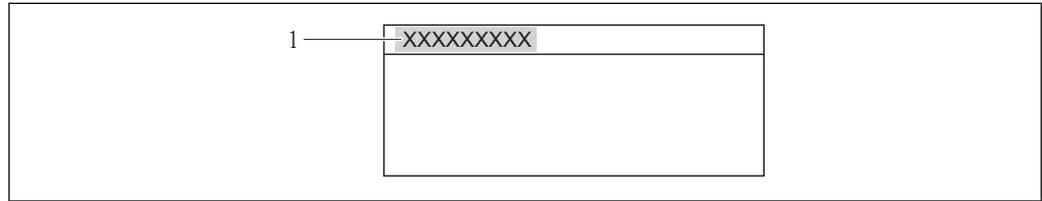
Write access Maintenance

Navigation

  Expert → System → Display → Header

Description

Use this function to select the contents of the header of the local display. The header text only appears during normal operation.



A0013375

1 Position of the header text on the display

Options

- Device tag
- Free text

Factory setting

Device tag

Additional information

Device tag

Is defined in the **Setup → Adv. Setup → Device tag** parameter.

Free text

Is defined in the **Header text** parameter (→  34).

Header text (0112)



Write access

Maintenance

Navigation

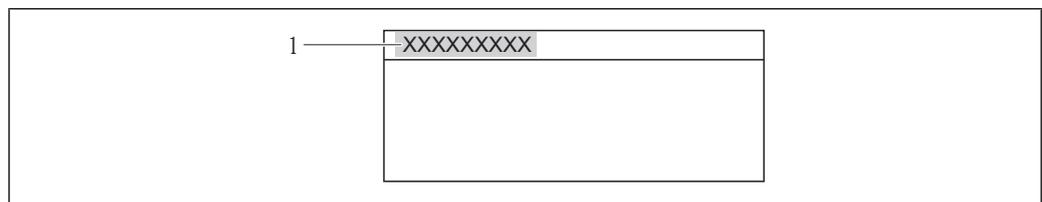
  Expert → System → Display → Header text

Prerequisite

The **Free text** option is selected in the **Header** parameter (→  33).

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.



A0013375

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

Additional information

User entry

The number of characters displayed depends on the characters used.

Separator (0101)



Write access	Maintenance
Navigation	Expert → System → Display → Separator
Description	Use this function to select the decimal separator.
Options	<ul style="list-style-type: none"> ■ . (point) ■ , (comma)
Factory setting	. (point)

Number format (0099)



Write access	Maintenance
Navigation	Expert → System → Display → Number format
Description	Selection of the number format for the representation of measured values.
Selection	<ul style="list-style-type: none"> ■ Decimal ■ ft-in-1/16" (Only valid for distance units)
Factory setting	Decimal

Decimal places menu (0573)



Write access	Maintenance
Navigation	Expert → System → Display → Decimal places menu
Description	Number of decimal places for the representation of numbers within the operating menu.
Selection	<ul style="list-style-type: none"> ■ x ■ x.X ■ x.XX ■ x.XXX ■ x.XXXX
Factory setting	x.xxxx
Additional information	<p>This 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 (→ 29) (→ 30) (→ 32).</p>

Contrast display (0105)	
<hr/>	
Write access	Operator
Navigation	 Expert → System → Display → 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: <ul style="list-style-type: none"> ■ Brighter: press the  +  buttons simultaneously ■ Darker: press the  +  buttons simultaneously
Input range	20 to 80 %
Factory setting	30 %
<hr/>	
Access status display	(→  25)

3.1.2 Expert → System → Configuration backup display

 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 configuration can be restored to the device if required, e.g. in order to bring the device back into a defined state. The configuration can also be transferred to a different device of the same type using the display module.

 Configurations can only be exchanged between devices which are in the same operating mode (see the **Setup → Operating mode** parameter).

Operating time (0652)		
<hr/>		
Write access	Display-only parameter	
Navigation	  Expert → System → Configuration backup display → Operating time	
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.	
<hr/>		
Last backup (0102)		

Write access	Display-only parameter
Navigation	  Expert → System → Configuration backup display → 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 (0100)



Write access	Maintenance
Navigation	  Expert → System → Configuration backup display → Configuration management
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.
Options	<ul style="list-style-type: none"> ■ Cancel No action is executed and the user exits the parameter. ■ Execute backup A backup copy of the current device configuration in the HistoROM (built-in in the device) is saved to the display module of the device. The backup copy comprises the transmitter and sensor data of the device. ■ Restore The last backup copy of the device configuration is copied from the display module to the HistoROM of the device. The backup copy comprises the transmitter and sensor data of the device. ■ Duplicate The transmitter configuration is duplicated to another device using the transmitter display module. ■ 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.
Factory setting	Cancel
Additional information	<p><i>Compare</i> The result can be viewed in the Comparison result parameter (→  37).</p> <p><i>HistoROM</i> A HistoROM is a "non-volatile" device memory in the form of an EEPROM.</p>

Comparison result (0103)



Write access	Display-only parameter
Navigation	  Expert → System → Configuration backup display → Comparison 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 (→  37).
Display options	<ul style="list-style-type: none"> ■ Settings identical The current device configuration of the HistoROM is identical to the backup copy in the display module. ■ Settings not identical The current device configuration of the HistoROM is not identical to the backup copy in the display module. ■ No backup available There is no backup copy of the device configuration of the HistoROM in the display module. ■ Backup settings corrupt The current device configuration of the HistoROM is corrupt or not compatible with the backup copy in the display module. ■ Check not done The device configuration of the HistoROM has not yet been compared to the backup copy in the display module.

3.1.3 Expert → System → Management

Device reset	
Write access	Maintenance
Navigation	  Expert → System → Management → Device reset
Description	Use this function to reset the device configuration - either entirely or in part - to a defined state.
Options	<ul style="list-style-type: none"> ■ 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 measurement-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
Additional information	<i>To delivery settings</i>  This option is not visible if no customer-specific settings have been ordered.

Activate SW option (0029)



Write access	Maintenance
Navigation	Expert → System → Management → Activate SW option
Description	Enter a code to activate specific software options.

3.2 Expert → Sensor

Distance unit (0551)

Write access	Maintenance
Navigation	Expert → Sensor → Distance unit
Description	Defines the distance unit.
Options	<ul style="list-style-type: none"> ■ m ■ ft ■ in ■ mm
Factory setting	m

Temperature unit (0557)

Write access	Maintenance
Navigation	Expert → Sensor → Temperature unit
Description	Defines the temperature unit
Options	<ul style="list-style-type: none"> ■ °C ■ °F ■ K ■ °R
Factory setting	°C

Operating mode (1046)



Write access	Maintenance
Navigation	  Expert → Sensor → Operating mode
Prerequisite	Only visible for FMP55 and for devices with "interface measurement" application package (product structure: Feature 540 "Application package", Option EB "Interface measurement").
Description	Defines the operating mode
Selection	<ul style="list-style-type: none"> ■ Level ■ Interface with capacity (only for FMP55) ■ Interface
Factory setting	<ul style="list-style-type: none"> ■ Level (for FMP51, FMP52, FMP54) ■ Interface with capacity (for FMP55)

Tank type (1175)


Write access	Maintenance
Navigation	  Expert → Sensor → Tank type
Prerequisite	Only visible for Medium type = Liquid
Description	Defines the tank type
Options	<ul style="list-style-type: none"> ■ Metallic ■ Bypass/pipe ■ Non metallic ■ Mounted outside <p>Depending on the probe there may be further options.</p>
Factory setting	Depending on the type of probe.
Additional safety	For coax probes the tank type is always set to "Coax" and can not be changed.

Tube diameter (1117)


Write access	Maintenance
Navigation	  Expert → Sensor → Tube diameter
Prerequisite	Only visible if the following conditions are met: <ul style="list-style-type: none"> ■ "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)

Bin type (1176) 

Write access	Maintenance
Navigation	  Expert → Sensor → Bin type
Prerequisite	Only visible for Medium type = Solid
Description	Defines the bin type
Options	<ul style="list-style-type: none"> ■ Concrete ■ Plastics / wood ■ Metallic ■ Aluminium
Factory setting	Metallic

Process property (1081) 

Write access	Maintenance		
Navigation	  Expert → Sensor → Process property		
Description	Defines a typical rate of level change.		
Options	<p>For "Medium type" = "Liquid"</p> <ul style="list-style-type: none"> ■ Fast > 1 m(40")/min ■ Standard < 1 m(40")/min ■ Medium < 10 cm(4")/min ■ Slow < 1 cm(0.4")/min ■ No filter <p>For "Medium type" = "Solid"</p> <ul style="list-style-type: none"> ■ 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	<p>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:</p> <p>For level measurements with "Medium type" = "Liquid"</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Process property</td> <td style="width: 50%;">Step response time [s]</td> </tr> </table>	Process property	Step response time [s]
Process property	Step response time [s]		

Fast > 1m(40")/min	3
Standard < 1 m(40")/min	13
Medium < 10 cm(4")/min	38
Slow < 1 cm(0.4")/min	73
No filter	< 0.8
For level measurements with "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 (0.03ft)/h	290
No filter	< 0.8
For interface measurements	
Process property	Step response time [s]
Fast > 1m(40")/min	5
Standard < 1 m(40")/min	15
Medium < 10 cm(4")/min	40
Slow < 1 cm(0.4")/min	74
No filter	2.2
 Other than the given values (e.g. intermediate values) can be defined by the following parameters:	
Dead time (1199): (→  63)	
Integration time (1092): (→  64)	

Advanced process conditions (1177)

Write access	Maintenance
Navigation	  Expert → Sensor → Advanced process conditions
Description	Defines additional process conditions (if necessary)
Options	<ul style="list-style-type: none"> ■ Build up ■ None <p>Additionally for "Medium type" = "Liquid"</p> <ul style="list-style-type: none"> ■ Emulsion layer ■ Probe near bottom
Factory setting	None
Additional information	<p>"Advanced conditions" should only be applied in the "Level" operating mode.</p> <p>For two-phase media the "Emulsion layer" option ensures that always the total level is detected (Example: Oil/condensate application).</p> <p>The "Probe near bottom" option helps to improve the empty detection, especially if the probe is mounted close to the tank bottom.</p>

Application parameter (1126)



Write access	Read-only parameter
Navigation	Expert → Sensor → Application parameter
Description	Indicates whether application parameters have beend changed after the basic setup.
Display options	<ul style="list-style-type: none"> ■ Changed ■ Not changed
Additional information	<p>Indicates whether a setting which depends on the application parameters ("Process property", "Advanced process conditions", "Tank type" and "Pipe diameter") has been changed after the basic setup.</p> <ul style="list-style-type: none"> ■ Changed Parameters have been changed. The device is no longer in the state defined by the application parameters. ■ Not changed There have been no changes. The device is still in the state defined by the application parameters.

3.2.1 Expert → Sensor → Medium

Medium group (1208)



Write access	Maintenance
Navigation	Expert → Sensor → Medium → Medium group
Prerequisite	Only visible for level measurements in liquids
Description	Defines the medium group of the measured product.
Options	<ul style="list-style-type: none"> ■ Water based (DC ≥ 4) ■ Others (DC > 1,9)
Factory setting	Others DC ≥ 1,9
Additional information	If required, lower DCs can be entered into "Expert → Sensor → Medium → Medium property". However, for DC<1.6 the measuring range may be reduced; for details please refer to the Technical Information (TI) of the respective device type.

Medium type (1049)

Write access	Service
Navigation	Expert → Sensor → Medium → Medium type

Description Defines the type of medium

Options

- Liquid
- Solid

Factory setting Liquid

Medium property (1165)

Write access Maintenance

Navigation   Expert → Sensor → Medium → Medium property

Prerequisite Only visible for level measurements.

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

Additional information  Dielectric constants of important media commonly used in the industry are summarized in the document SD106F, which can be downloaded from the Endress+Hauser web page (www.endress.com).

DC lower medium (1154)

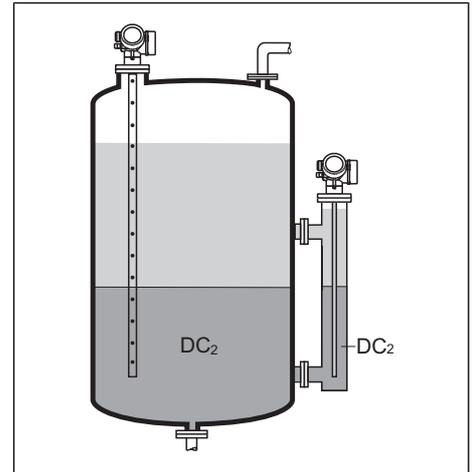


Write access Maintenance

Navigation   Expert → Sensor → Medium → DC lower medium

Prerequisite Only visible for **Operating mode = Interface** oder **Interface + capacitance**

Description Defines the dielectric constant of the lower medium (DC₂)



A0013252

Input range 10 ... 100

Factory setting 80 (Dielectric constant of water at 20 °C / 68 °F)

Additional information  Dielectric constants of important media commonly used in the industry are summarized in the document SD106F, which can be downloaded from the Endress+Hauser web page (www.endress.com).

DC value (1201) 

Write access Maintenance

Navigation   Expert → Sensor → Medium → DC value
  Expert → Sensor → EOP evaluation → DC value

Description Dielectric constant of the upper medium (without correction by the automatic DC calculation)

Calculated DC value (1118) 

Write access Display-only parameter

Navigation   Expert → Sensor → Medium → Calculated DC
  Expert → Sensor → EOP evaluation → Calculated DC

Description Displays the calculated DC of the upper medium.

Additional information

- **For level measurement:**
 Calculated from end-of-probe signal and level echo
 A correct calculation is only possible for media with low DC and low signal damping such that the level signal and the end-of-probe signal can be evaluated simultaneously. Media of this type are for example: Oil, solvents or granular plastics.
- **For interface measurement with FMP55:**
 Calculated from echo signal and capacity.

3.2.2 Expert → Sensor → Level

Distance offset (2309)

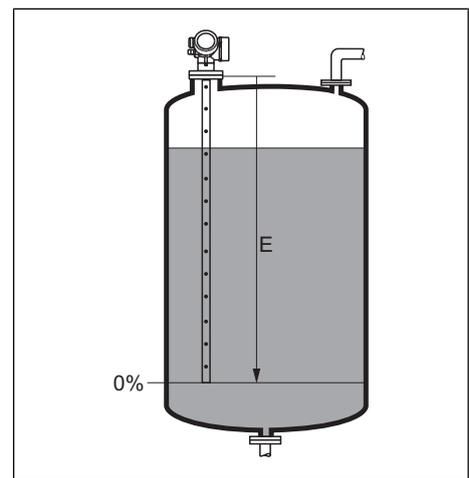


Write access	Maintenance
Navigation	Expert → Sensor → Level → Distance offset
Description	Definition of the distance offset
Input range	-200.000,0 ... +200.000,0 mm (-60 ... +60 ft)
Factory setting	0.0 mm
Additional Information	<p>The value specified in this parameter is added to the measured distance between the reference point of the measurement and the level echo.</p> <ul style="list-style-type: none"> ■ Positive values increase the distance and thus decrease the level. ■ Negative values decrease the distance and thus increase the level. <p> A value entered into this parameter is taken into account in the calculation of the level. However, it does not influence the indicated distance.</p>

Empty calibration (2343)



Write access	Maintenance
Navigation	  Expert → Sensor → Level → Empty calibration
Description	<p>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%).</p>



A0013178

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

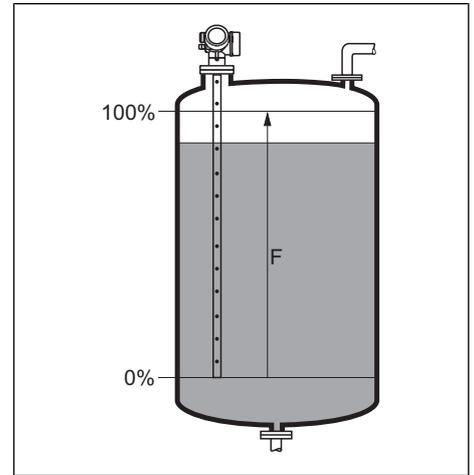
Full calibration (2308)



Write access Maintenance

Navigation   Expert → Sensor → Level → Full calibration

Description 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 unit (0576)



Write access Maintenance

Navigation   Expert → Sensor → Level → 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 defined in the **Distance unit** parameter :

- The distance unit is used for the basic calibration ("Empty calibration" and "Full calibration").
- The level unit is used to display the (unlinearized) level.

Level limit mode (2314)



Write access Maintenance

Navigation Expert → Sensor → Level → Level limit mode

Description Defines the typ of level limitation

Options

- Off
- Low limit
- High limit
- Low and high limit

Factory setting Low limit

High limit (2312)



Write access Maintenance

Navigation Expert → Sensor → Level → High limit

Prerequisite **Level limit mode = High limit or Low and high limit**

Description Defines the upper limit of the level signal.

Input range **Depending on the selected distance unit:**

- 0.0 to 100.0 %
- 0.0 to +200.0 m
- 0.2 to +656.2 ft
- 0.0 to +7874.0 inch
- 00.0 to +200,000.0 mm

Factory setting 100%

Additional information Levels exceeding the value specified in this parameter will be ignored. Instead, the device uses the value specified in this parameter (for measured value transformation and output).

Low limit (2313)



Write access Maintenance

Navigation Expert → Sensor → Level → Low limit

Prerequisite **Level limit mode = Low limit or Low and high limit**

Description Defines the lower limit of the level signal.

Input range **Depending on the selecte distance un it:**

- 0.0 to 100.0 %
- 0.0 to +200.0 m
- 0.0 to +656.2 ft
- 0.0 to +7874.0 inch
- 00.0 to +200,000.0 mm

Factory setting 0%

Additional information Levels falling below the value specified in this parameter will be ignored. Instead, the device uses the value specified in this parameter (for measured value transformation and output).

Level correction (2325)



Write access	Maintenance
Navigation	Expert → Sensor → Level → Level correction
Description	Defines a level correction
Input range	<p>Depending on the selected level unit:</p> <ul style="list-style-type: none"> ■ -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).

Output mode (2317)



Write access	Maintenance
Navigation	Expert → Sensor → Level → Output mode
Description	Defines the output mode
Options	<ul style="list-style-type: none"> ■ Ullage ■ Level linearized
Factory setting	Level linearized
Additional information	<ul style="list-style-type: none"> ■ Ullage The unfilled space of the tank or silo is indicated. ■ Level linearized The level is indicated (more precisely: the linearized value if a linearization has been activated).

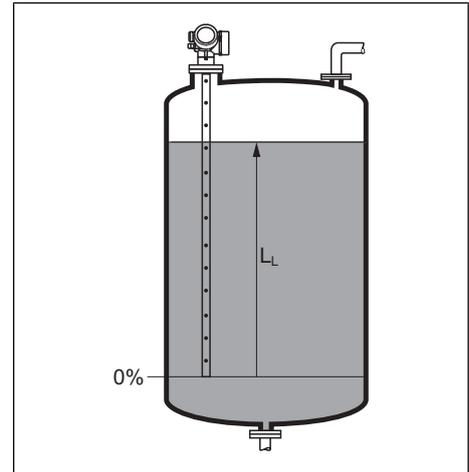
Level (2319)



Write access	Display-only parameter
Navigation	Expert → Sensor → Level → Level

Description

Displays the measured level L_L (before linearization)



A0013194

Additional information

The value is displayed in the selected "Level unit" (→ [47](#)).

Level linearized (2318)**Write access**

Display-only parameter

Navigation

Expert → Sensor → Level → Level linearized

Description

Displays the linearized level.

Additional information

The unit of this parameter is defined in the **Unit after lienearization** parameter.

Interface (2352)**Write access**

Read-only parameter

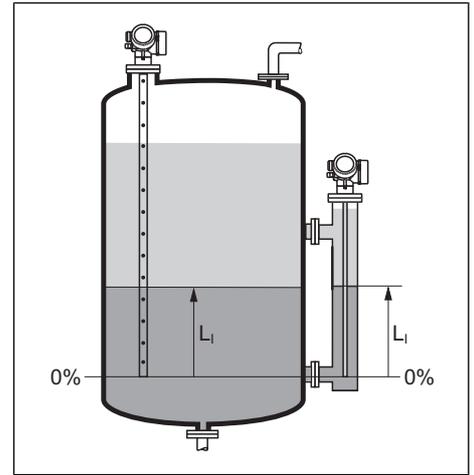
Navigation

Expert → Sensor → Level → Interface

Prerequisite

Only available if **Operating mode** = **Interface** or **Interface + capacitance**.

Description Displays the interface level L_I (before linearization)



Additional information The value is displayed in the selected "Level unit" (→ 47).

Interface linearized (2382)

Write access Read-only parameter

Navigation Expert → Sensor → Level → Interface linearized

Prerequisite Only available if **Operating mode** = **Interface** or **Interface + capacitance**.

Description Displays the linearized interface level L_I .

Additional information The unit of this parameter is defined in the **Unit after linearization** parameter.

Upper interface thickness (2330)

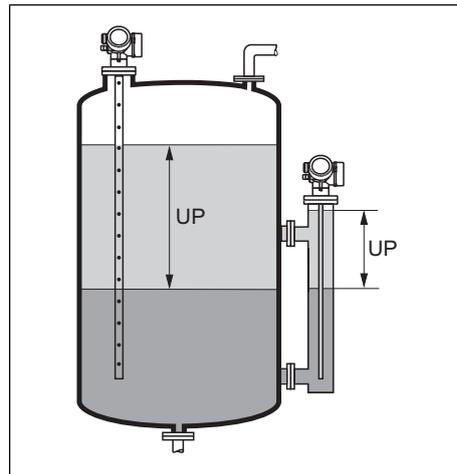
Write access Read-only parameter

Navigation Expert → Sensor → Level → Upper interface thickness

Prerequisite Only available if **Operating mode** = **Interface** or **Interface + capacitance**.

Description

Displays the thickness of the upper medium, UP



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3.2.3 Expert → Sensor → Linearization**Linearization type (2339)****Write access**

Maintenance

Navigation

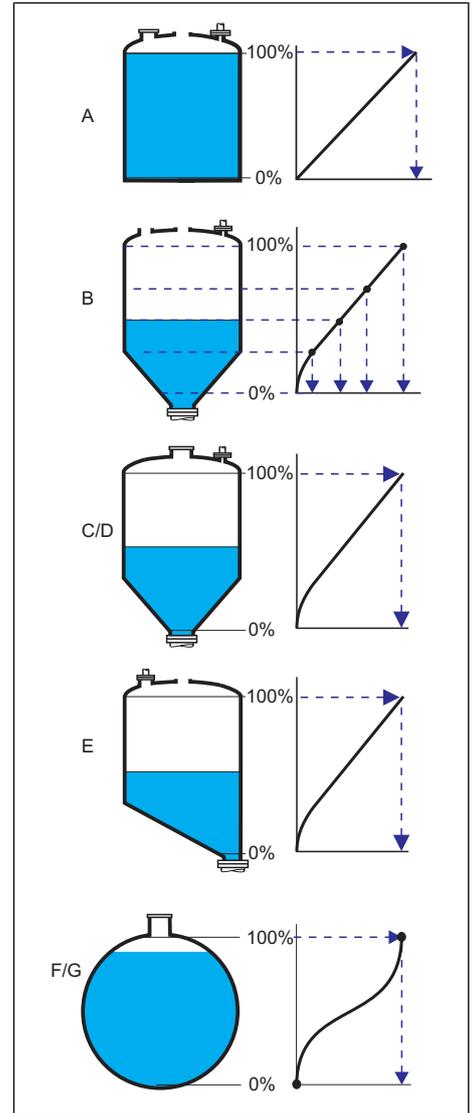
Expert → Sensor → Linearization → Linearization type

Description

Defines the type of linearization

Options

- 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)



A0013299

Factory setting None

Unit after linearization (2340)



Write access Maintenance

Navigation Expert → Sensor → Linearization → Unit after linearization

Prerequisite Only visible if a linearization has been selected (i.e. **Linearization type** ≠ **None**)

Description Defines the unit of the linearized value.

Selection	<ul style="list-style-type: none"> ■ Free text ■ t ■ lb ■ ton ■ kg ■ impGal ■ UsGal ■ cf ■ cm³ ■ dm³ ■ m³ ■ hl ■ l ■ %
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 (2341)


Write access	Maintenance
Navigation	Expert → Sensor → Linearization → Free text
Prerequisite	Only visible for Unit linearized = Free text .
Description	Definiton of the unit
Input range	Up to 32 alphanumerical characters (letters, numbers, special characters)
Factory setting	Free text

Maximum value (2315)


Write access	Maintenance
Navigation	Expert → Sensor → Linearization → Maximum value
Prerequisites	Only visible if one of the following linearization types has been selected: <ul style="list-style-type: none"> ■ 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 100

Diameter (2342)



Write access Maintenance

Navigation Expert → Sensor → Linearization → Diameter

Prerequisites Only visible if one of the following linearization types has been selected:

- Horizontal cylinder
- Sphere

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 (→ 39).

Intermediate height (2310)



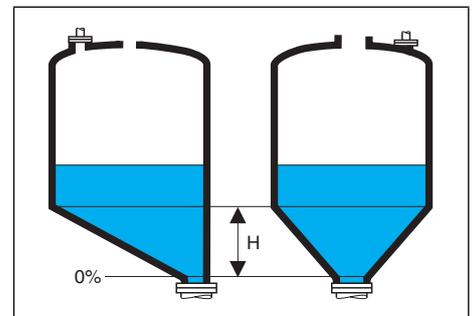
Write access Maintenance

Navigation Expert → Sensor → Linearization → Intermediate height

Prerequisites Only visible if one of the following linearization types has been selected:

- Pyramid bottom
- Conical bottom
- Angled bottom

Description Definition of the intermediate height H



A0013264

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 (→  39).

Table mode (2303)

Write access Maintenance

Navigation   Expert → Sensor → Linearization → Table mode

Prerequisite Only visible if the "Table" linearization type has been selected.

Description Defines the method used to enter linearization points into the table.

- Options**
- 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 linearization 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.

Level (2383)

Write access Maintenance

Navigation   Expert → Sensor → Linearization → Level

Prerequisite 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** (→  46) and **Full calibration** (→  46).

Factory setting 0

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

Customer value (2384)		
Write access	Maintenance	
Navigation	  Expert → Sensor → Linearization → Customer value	
Prerequisite	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 x 10 ³⁸ ... +3,0 x 10 ³⁸	
Factory setting	0	

Activate table (2304)		
Write access	Maintenance	
Navigation	  Expert → Sensor → Linearization → Activate table	
Prerequisite	Only visible if the "Table" linearization type has been selected.	
Description	Enables or disables the linearization table.	
Options	<ul style="list-style-type: none"> ■ Disable A linearization is not calculated. If the Linearization type parameter has been set to Table, the error message F435 is generated. ■ Enable The measured value is linearized according to the table before being sent to the output. 	
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.	

3.2.4 Experte → Sensor → Information

Signal quality (1047)		
Write access	Read-only parameter	
Navigation	  Expert → Sensor → Information → Signal quality	
Description	Displays the signal quality.	

Display options

- Strong
The evaluated echo exceeds the threshold by at least 10 mV
- Medium
The evaluated echo exceeds the threshold by at least 5 mV.
- Weak
The evaluated echo exceeds the threshold by less than 5 mV.
- No signal
The device does not find a usable echo and generates the following error message
 - F941 if the **Alarm** option has been selected in the **Output echo lost** parameter (→  68).
 - S941 if another option has been selected in the **Output echo lost** parameter (→  68).

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.

Absolute echo amplitude (1127)**Write access**

Read-only parameter

Navigation

Expert → Sensor → Information → Absolute echo amplitude

Description

Displays the absolute amplitude of the level echo.

Relative echo amplitude (1089)**Write access**

Read-only parameter

Navigation

Expert → Sensor → Information → Relative echo amplitude

Description

Displays the relative amplitude of the level echo.

Absolute interface amplitude (1129)**Write access**

Read-only parameter

Navigation

Expert → Sensor → Information → Absolute interface amplitude

Prerequisite

Only visible for **Operating mode** = **Interface** or **Interface with capacity**.

Description

Displays the absolute amplitude of the interface echo.

Relative interface amplitude (1090)

Write access	Read-only parameter
Navigation	Expert → Sensor → Information → Relative interface amplitude
Prerequisite	Only visible for Operating mode = Interface or Interface with capacity .
Description	Displays the relative amplitude of the interface echo.

Absolute EOP amplitude (1128)



Write access	Read-only parameter
Navigation	Expert → Sensor → Information → Absolute EOP amplitude
Description	Displays the absolute amplitude of the end-of-probe signal.

Found echoes (1068)



Write access	Read-only parameter
Navigation	Expert → Sensor → Information → Found echoes
Description	Indicates which echoes have been found.
Display options	<ul style="list-style-type: none"> ■ None ■ Level ■ Interface ■ EOP ■ Level and interface ■ Level and EOP ■ Interface and EOP ■ Level, interface and EOP

Used calculation (1115)



Write access	Read-only parameter
Navigation	Expert → Sensor → Information → Used calculation
Description	Indicates which echoes are used for the calculation fo the measured value.

Anzeige	<ul style="list-style-type: none"> ■ None ■ Level linearized ■ EOP ■ EOP (TT) ■ Multiple echo (TT) ■ EOP (LN) ■ Level and EOP ■ Interface ■ Measured capacity (only for FMP55) ■ EOP ■ Interface and EOP ■ Level and interface ■ Level, interface and EOP ■ Level and interface with capa. (only for FMP55) ■ Level and EOP
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Tank trace state (1206)


Write access	Read-only parameter
Navigation	Expert → Sensor → Information → Tank trace state
Description	Indicates the current state of the tank trace.
Display	<ul style="list-style-type: none"> ■ Not active ■ EOP (TT) ■ Multiple echo (TT) ■ EOP + Multiple echo (TT)

Measurement frequency (1180)

Write access	Read-only parameter
Navigation	Expert → Sensor → Information → Measurement frequency
Description	Displays the current measurement frequency (number of pulses per second).

Electronic temperature (1062)


Write access	Read-only parameter
Navigation	Expert → Sensor → Information → Electronic temperature
Description	Displays the current temperature of the electronics.
Additional information	The unit is define in the Temperature unit parameter .

3.2.5 Expert → Sensor → Sensor properties

Probe length correction → Confirm probe length (1080) 	
Write access	Maintenance
Navigation	  Expert → Sensor → Sensor properties → Probe length correction → Confirm probe length
Description	Confirm whether the value indicated in the Present length parameter matches the actual length of the probe.
Options	<ul style="list-style-type: none"> ■ 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
Additional information	<p> 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:</p> <ul style="list-style-type: none"> ■ Delete the map (→  72) 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.
Probe length correction → Present probe length (1078) 	

Write access	Maintenance
Navigation	  Expert → Sensor → Sensor properties → Probe length correction → Present probe length

Description	Depending on the parametrization: <ul style="list-style-type: none"> ■ 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)

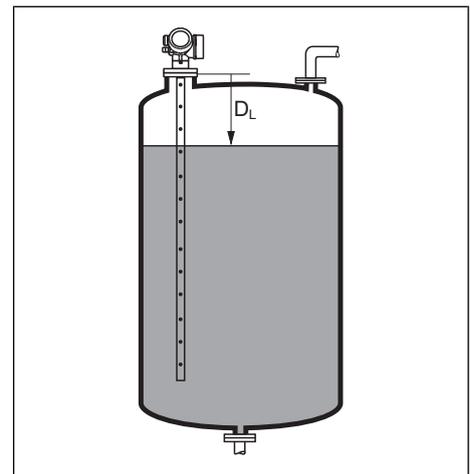
Sensor module (1101)


Write access	Read-only parameter
Navigation	Expert → Sensor → Sensor properties → Sensor module
Description	Indicates the type of sensor module.

3.2.6 Expert → Sensor → Distance

Distance (1124)


Write access	Read-only parameter
Navigation	Expert → Sensor → Distance → Distance
Description	Displays the measured distance D_L from the reference point (lower edge of the flange or threaded connection) to the level.



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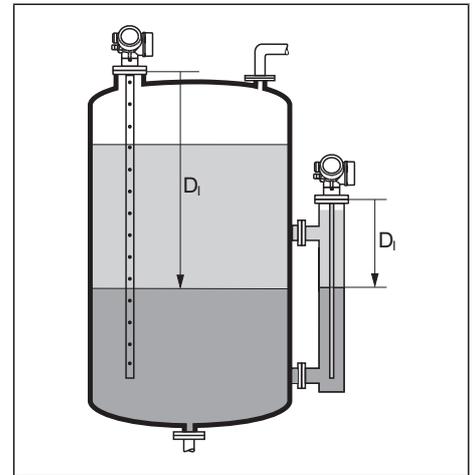
Interface distance (1067)


Write access	Read-only parameter
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Navigation   Expert → Sensor → Distance → Interface distance

Prerequisite Only visible for **Operating mode** = **Interface** or **Interface + capacitance**

Description Displays the measured distance D_1 from the reference point (lower edge of the flange or threaded connection) to the interface layer.



A0013202

Unfiltered interface distance (1042)



Write access Read-only parameter

Navigation   Expert → Sensor → Distance → Unfiltered interface distance

Prerequisite Only visible for **Operating mode** = **Interface** or **Interface + capacitance**

Description Displays the unfiltered distance D_1 from the reference point (lower edge of the flange or threaded connection) to the interface.

Dead time (1199)



Write access Maintenance

Navigation   Expert → Sensor → Distance → Dead time

Description Defines the dead time (in seconds).

Input range 0 to 60 s

Factory setting 1 s

Additional information Sudden changes of the measured distance are ignored during the time span defined in this parameter. In this way it is possible to prevent short-term interferences from disturbing the output signal.

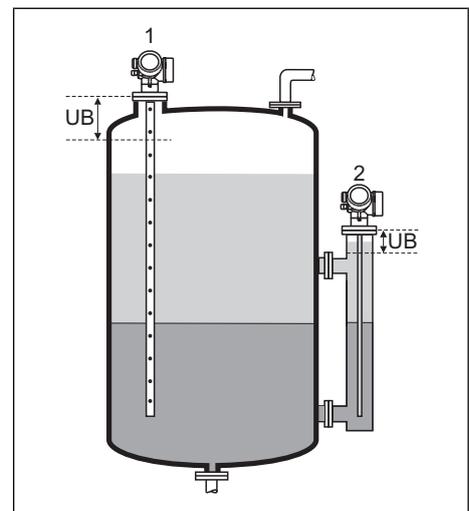
Integration time (1092)

Write access	Maintenance
Navigation	  Expert → Sensor → Distance → Integration time
Description	Defines the integration time (in seconds).
Input range	0 to 200 000 s
Factory setting	5 s
Additional information	With an integration time $\neq 0$ the measured value is not calculated from the currently measured distance but from the mean of the previous distances. The integration time defines the time span from which distances are taken into account. Increasing the integration time results in a smoother signal but at the same times slows down the reaction of the device to level changes.

Blocking distance (1144)



Write access	Maintenance
Navigation	  Expert → Sensor → Distance → Blocking distance
Description	Defines the upper blocking distance, UB
Input range	0 to 200 m (0 to 656 ft)
Factory setting	<ul style="list-style-type: none"> ■ For coax probes: 0 mm ■ For rod and rope probes up to 8 m (26 ft): 200 m (8") ■ For rod and rope probes exceeding 8 m (26 ft): $0.025 \cdot \text{probe length}$
Additional information	<p>Echoes from within the blocking distance are not taken into account in the signal evaluation. The upper blocking distance is used</p> <ul style="list-style-type: none"> ■ to suppress interference echoes at the top of the probe (1). ■ to suppress the echo of the total level in the case of flooded bypasses (2).



A0013220

3.2.7 Expert → Sensor → Gas phase compensation

The gas phase compensation (GPC) is used to compensate for run time shifts due to a high pressure in the atmosphere above the liquid measured.

There are two methods for gas phase compensation:

- Gas phase compensation with an artificial interference echo (reference echo) which must be under the influence of the gas phase. For example, a rod or coax probe with reference echo can be used for this. The position of the reference echo depends on the pressure of the gas phase. The Levelflex uses this echo shift to calculate the correction factor for the distance measurement.
- Gas phase compensation with an external pressure measurement: The device receives the externally measured pressure p of the gas phase through an Analog Input block and uses the user defined gas phase compensation factor F to calculate the dielectric constant ϵ of the gas phase according to the following formula:

$$\epsilon = 1 + Fp$$

ϵ is then used to calculate the correction of the measured distances.

 For FMP51, FMP52 and FMP54:

The **Gas phase compensation** submenu is only available for **Operating mode = Level**.

GPC mode (1034)		
Write access	Maintenance	
Navigation	  Expert → Sensor → Gas phase compensation → GPC mode	
Description	Selection of the GPC mode	
Options	<ul style="list-style-type: none"> ■ Off There is no gas phase compensation taking place. ■ On This option can only be selected for probes with reference echo. The gas phase compensation is calculated from the position of this reference echo. ■ Without correction The correction factor is calculated from the reference echo but not applied to the measurement. ■ External correction The device receives the externally measured pressure through an AO block and uses it together with the gas phase compensation factor F to calculate the gas phase compensation. ■ Const. GPC factor The correction factor is a constant defined by the user. A reference echo is not needed. 	
Factory setting	Off	

External pressure selector (1073)		
Write access	Maintenance	
Navigation	  Expert → Sensor → Gas phase compensation → External pressure selector	
Condition	GPC mode = External correction	

Description	Defines the AO block through which the external pressure used for gas phase compensation is received.
Options	<ul style="list-style-type: none"> ■ None ■ Analog output 1 ■ Analog output 2 ■ Analog output 3 ■ Analog output 4
Factory setting	None

Gas phase compensation factor (1209)


Write access	Maintenance
Navigation	Expert → Sensor → Gas phase compensation → Gas phase compensation factor
Condition	GPC mode = External correction
Description	Defines the gas phase compensation factor F .
Range of values	$-10^{38} \dots + 10^{38}$
Factory setting	0
Additional information	Suitable value for saturated steam in the temperature range 100 to 350 °C (212 to 662 °F): $F = 0.00505 / \text{bar}$

Present reference distance (1076)


Write access	Read-only parameter
Navigation	Expert → Sensor → Gas phase compensation → Present reference distance
Prerequisite	GPC mode = On or Without correction
Description	Displays the currently measured distance of the reference echo.

Reference distance (1033)


Write access	Maintenance
Navigation	Expert → Sensor → Gas phase compensation → Reference distance
Prerequisite	GPC mode = On oder Without correction

Description	Specification of the actual distance of the reference echo.
Input range	0 to 200 m
Factory setting	0.3 m

Reference echo threshold (1168)



Write access	Maintenance
Navigation	Expert → Sensor → Gas phase compensation → Reference echo threshold
Prerequisite	GPC mode = On oder Without correction
Description	Definition of the threshold for the reference echo
Input range	-999 to +999 mV
Factory setting	-80 mV
Additional information	Only echoes exceeding the defined threshold are accepted as reference echo. If the threshold is positive, the reference echo must be positive as well. If the threshold is negative, the reference echo must be negative as well.

Const. GPC factor (1217)



Write access	Maintenance
Navigation	Expert → Sensor → Gas phase compensation → Const. GPC factor
Prerequisite	GPC mode = Const. GPC factor
Description	Definition of a constant correction factor for the measured distance.
Input range	0.5 to 1.5
Factory setting	1 (i.e.: without correction)

3.2.8 Expert → Sensor → Sensor diagnostics

Broken probe detection (1032)



Write access	Maintenance
Navigation	Expert → Sensor → Sensor diagnostics → Broken probe detection

Description	Switches the broken probe detection on or off.
Options	<ul style="list-style-type: none"> ■ Off ■ On
Factory setting	Off
Additional information	If the broken probe detection is switched on: As soon as a broken probe is detected, the device generates the diagnostic event F003 "Broken probe detected" and goes into the alarm state.

Start self check (1133)


Write access	Maintenance
Navigation	Expert → Sensor → Sensor diagnostics → Start self check
Description	Starts a self check of the device.

Result self check (1134)


Write access	Maintenance
Navigation	Expert → Sensor → Sensor diagnostics → Result self check
Description	Displays the result of the self check of the device.

Noise of signal (1105)


Write access	Read-only parameter
Navigation	Expert → Sensor → Sensor diagnostics → Noise of signal
Description	Displays the noise of signal in the envelope curve (in mV).

3.2.9 Expert → Sensor → Safety settings

Output echo lost (2307)


Write access	Maintenance
Navigation	Expert → Sensor → Safety settings → Output echo lost

Description	Defines the output signal in the case of a lost echo.
Options	<ul style="list-style-type: none"> ■ 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 continuously 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 .

Factory settings Last valid value

Value echo lost (2316)



Write access	Maintenance
Navigation	Expert → Sensor → Safety settings → Value echo lost
Prerequisite	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 ... 200000
Factory setting	0
Additional information	<p>The unit is the same as for the output value:</p> <ul style="list-style-type: none"> ■ Without linearization: As defined in the Level unit parameter (→ 47). ■ With linearization: As defined in the Unit after linearization parameter (→ 53).

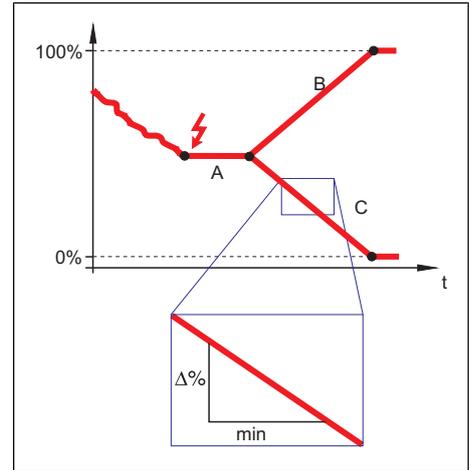
Ramp at echo lost (2323)



Write access	Maintenance
Navigation	Expert → Sensor → Safety settings → Ramp at echo lost
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.



- A Delay echo lost
- B Ramp echo lost (positive value)
- C Ramp echo lost (negative value)

Input range

-9999999.0 ... + 9999999.0 %/min

Factory setting

0 %/min

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 shifted downwards until it reaches 0%.
- For a positive slope of the ramp: The measured value is continuously shifted upwards until it reaches 100%.

Delay echo lost (1193)



Write access

Maintenance

Navigation

Expert → Sensor → Safety settings → Delay echo lost

Description

Defines the delay in the case of a lost echo.

Input range

0 ... 99999.9 s

Factory setting

60 s

Additional information

After an echo loss, the device waits for the time specified in this parameter before reacting as specified in the **Output echo lost** parameter. This helps to avoid interruptions of the measurement by short-term interferences.

Safety distance (1093)



Write access

Maintenance

Navigation

Expert → Sensor → Safety settings → Safety distance

Description	Definition of the safety distance
Input range	-200 to +200 m
Factory setting	0 m
Additional information	The safety distance is located directly below the blocking distance (→  64). The safety distance can be used to generate a warning before the level rises into the blocking distance. The In safety distance parameter defines the reaction of the device if the level rises into the safety distance.

In safety distance (1018)



Write access	Maintenance
Navigation	  Expert → Sensor → Safety settings → In safety distance
Description	Defines the behavior if the level rises into the safety distance.
Options	<ul style="list-style-type: none"> ■ Off (i.e. no reaction) ■ Alarm The device assumes the alarm state and generates the diagnostic event S942 "In safety distance". ■ Warning The device assumes the warning state and generates the diagnostic event S942 "In safety distance". ■ Self holding The device assumes the defined alarm state. Additionally, the diagnostic event S942 "In safety distance" is generated. If the level drops out of the safety distance, the alarm remains active. The measurement is continued only after a reset of the self holding via the Acknowledge Alarm parameter.
Factory setting	Warning

Acknowledge alarm (1130)

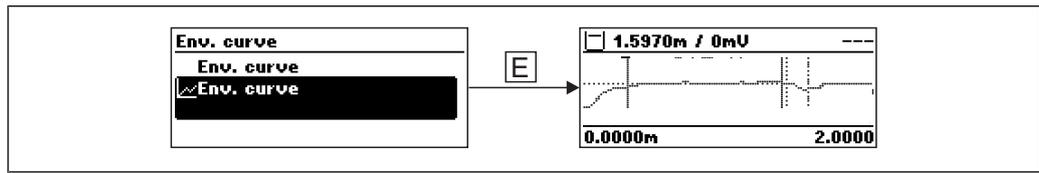


Write access	Maintenance
Navigation	  Expert → Sensor → Safety settings → Acknowledge alarm
Prerequisite	In safety distance = Self holding
Description	Resets the self holding alarm of the device.
Options	<ul style="list-style-type: none"> ■ No The alarm is not reset. ■ Yes The alarm is reset. The measurement is resumed.
Factory setting	No

3.2.10 Expert → Sensor → Envelope curve

Envelope curve (1207)

Write access	Maintenance
Navigation	  Expert → Sensor → Envelope curve → Envelope curve
Description	Defines which curves are included in the envelope curve display on the display module.
Options	<ul style="list-style-type: none"> ■ Envelope curve ■ Mapping curve ■ Subtracted curve ■ Envelope curve + Map ■ Subtracted curve + Threshold
Factory setting	Envelope curve
Additional information	The display of the selected curve can be accessed in the following way:



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3.2.11 Expert → Sensor → Mapping

Confirm distance (1045)

Write access	Maintenance
Navigation	  Expert → Sensor → Mapping → 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.

Options

- **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).

-  For FMP55 with rod probes in the "Interface with capacity" operating mode the mapping must be recorded with the tank being empty, and the "Tank empty" option has to be selected. Otherwise the device can not register the correct empty distance.
For FMP55 with coax probes a mapping must be recorded at least in the upper part of the probe, as tightening the flange has an influence on the envelope curve. However, even with coax probes it is recommended to record the mapping with the tank being completely empty.
-  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.
-  For FMP54 with gas phase compensation (product structure: feature 540 "Application Package", option EF or EG) a map must NOT be recorded.

Distance (1124)

Write access

Read-only parameter

Navigation

  Expert → Sensor → Mapping → Distance

Description

Displays the currently measured distance.

Mapping end point (1022)



Write access	Maintenance
Navigation	  Expert → Sensor → Mapping → Mapping end point
Prerequisite	Only visible if the Manual map option has been selected in the Confirm distance parameter.
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.

Present mapping (1182)

Write access	Read-only parameter
Navigation	  Expert → Sensor → Mapping → Present mapping
Description	Indicates up to which distance a mapping has already been recorded.

Record map (1213)



Write access	Maintenance
Navigation	  Expert → Sensor → Mapping → Record map
Prerequisite	Only visible if a value has been entered into the Mapping end point parameter.
Description	Starts the recording of the map.
Selection	<ul style="list-style-type: none"> ■ 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

3.2.12 Expert → Sensor → EOP evaluation

EOP shift (10275)

Write access	Read-only parameter
Navigation	  Expert → Sensor → EOP evaluation → EOP shift
Description	Displays the current shift of the end-of-probe signal (EOP).

DC value (1201) (→ 45)

Calculated DC value (1118) (→ 45)

3.2.13 Expert → Sensor → Echo tracking

Evaluation mode (1112)

Write access	Maintenance
Navigation	  Expert → Sensor → Echo tracking → Evaluation mode
Description	Selection of the evaluation mode for echo tracking.
Options	<ul style="list-style-type: none"> ■ History off The envelope curve is evaluated only statically. ■ Short time history In addition to the static algorithms a dynamic echo trace is continuously created. ■ Long time history (Only available for level measurements) In addition to the static algorithms and the dynamic echo trace a tank trace is continuously created. Using the tank trace the device can determine the level even if the level echo ist lost temporarily.
Factory setting	<ul style="list-style-type: none"> ■ For level measurements: Long time history ■ For interface measurements: Short time history

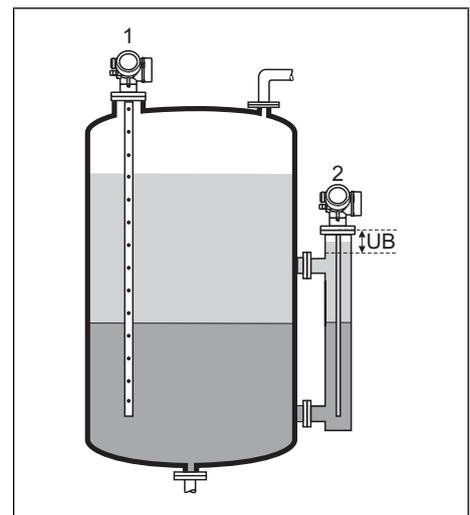
History reset (1145)

Write access	Maintenance
Navigation	  Expert → Sensor → Echo tracking → History reset

Description	Resets the history of the echo and tank tracking.
Options	<ul style="list-style-type: none"> ■ Reset done Does not initiate an action but is only a display option. It is displayed as soon as the reset operation has been accomplished. ■ Reset echo tracking The echo trace is reset. The tank trace, however, is maintained. ■ Delete history <ul style="list-style-type: none"> – The echo and tank trace are reset. – Additionally for Measuring mode = Interface with capacity: All calibrations are reset.
Factory setting	Reset done

3.2.14 Expert → Sensor → Interface

Tank level (1111)	🔒
Write access	Maintenance
Navigation	🏠 📄 Expert → Sensor → Interface → Tank level
Prerequisite	Operation mode = Interface
Description	Selection of the tank level
Selection	<ul style="list-style-type: none"> ■ Partially filled ■ Flooded
Factory setting	Partially filled
Additional information	<ul style="list-style-type: none"> ■ Partially filled: The device searches for 2 echo signals, one for the interface and one for the total level. ■ Flooded: The device searches for the interface level only. With this setting it is essential that the upper level signal always is within the upper blocking distance (UB) so that it is not evaluated by mistake.



A0013173

- 1 Partially filled
2 Flooded
UB Upper blocking distance

Interface property (1107) 	
Write access	Maintenance
Navigation	  Expert → Sensor → Interface → Interface property
Prerequisite	Only visible for Operating mode = Interface with capacity
Description	Determines how the Guided Radar and the Capacitance Measurement interact.
Selection	<ul style="list-style-type: none"> ■ Standard ■ Build up ■ Emulsion layer ■ Special: automatic DC
Factory setting	Standard
Additional information	<ul style="list-style-type: none"> ■ Standard Condition: The dielectric constant of the upper medium is known. Signal evaluation: As long as a clear interface is detected, the specific capacitance (pF/m) is continuously adjusted. Therefore build-up has only little influence on the measurement. If an emulsion layer is present, the total level is determined via the Guided Radar whereas the interface level is determined via the Capacitance Measurement. ■ Build up Condition: The dielectric constant of the upper medium and the specific capacitance (pF/m) are known. Signal evaluation: As long as a clear interface is detected, the interface level is determined via the Guided Radar as well as via the Capacitance Measurement. If these two values start to diverge from each other due to build-up formation, an error message is generated. If an emulsion layer is present, the total level is determined via the Guided Radar whereas the interface level is determined via the Capacitance Measurement. ■ Emulsion layer Condition: The dielectric constant of the upper medium and the specific capacitance (pF/m) are known. Signal evaluation: The total level is always determined via the Guided Radar. The interface level is always determined via the Capacitance Measurement. ■ Special: automatic DC Note: Contact Endress+Hauser before selecting this option. Condition: The specific capacitance (pF/m) is known. Signal evaluation: As long as a clear interface is detected, both the total and the interface level are determined via the Guided Radar. The dielectric constant of the upper medium is continuously adjusted. If an emulsion layer is present, the total level is determined via the Guided Radar whereas the interface level is determined via the Capacitance Measurement.

Interface criterion (1184) 	
Write access	Read-only parameter
Navigation	  Expert → Sensor → Interface → Interface criterion
Prerequisite	Only visible for Operating mode = Interface

Description Displays the threshold (in mV) for the recognition of the interface signal.

Measured capacity (1066)

Write access Read-only parameter

Navigation   Expert → Sensor → Interface → Measured capacity

Prerequisite Only visible for **Operating mode = Interface with capacity**

Description Displays the measured capacity (pF).

Build-up ratio (1210)

Write access Read-only parameter

Navigation   Expert → Sensor → Interface → Build-up ratio

Prerequisite Only visible for FMP55 with **Interface property = Build up**

Description Indicates by which amount the interface distance measured by the radar and the interface distance calculated from the capacitance differ:

$$| (D_{\text{Radar}} - D_{\text{Kapa}}) / D_{\text{Radar}} |$$
 If this ratio exceeds the value defined in the **Build-up threshold** parameter, the respective error message is generated.

Build-up threshold (1211)

Write access Maintenance

Navigation   Expert → Sensor → Interface → Build-up threshold

Prerequisite Only visible for FMP55 with **Interface property = Build up**

Description Defines the threshold for build-up detection. If the build-up ratio exceeds the value defined in this parameter, the respective error message is generated.

Input range $-3 \times 10^{38} \dots +3 \times 10^{38}$

Factory setting 0.1

Empty capacity (1122)



Write access	Maintenance
Navigation	  Expert → Sensor → Interface → Empty capacity
Prerequisite	Only visible for FMP55 with Operating mode = Interface with capacity
Description	Defines the capacity for the empty tank.
Input	0 to 10000 pF
Factory setting	0 pF
Additional information	As a rule the device determines the empty capacity automatically if during commissioning the Tank empty option is selected in the Confirm distance parameter. In exceptional cases - if emptying the tank during commissioning is impossible - a calculated value can be entered manually.

3.3 Expert → Output

3.3.1 "Switch output" submenu

Switch output function

Navigation	  Setup → Advanced setup → Switch output → Switch output function
Description	Defines the function of the switch output (open collector).
Options	<ul style="list-style-type: none"> ■ Off The output is always open (not conductive). ■ On The output is always closed (conductive). ■ Event level The output is normally closed and is only opened if a diagnostic event is present. The Assign diagnostic level parameter determines at which type of event the output is opened. ■ Limit The output is normally closed and is only opened if a measured variable exceeds or falls below a defined limit. The limit values are defined by the parameters Assign limit , Switch-on value and Switch-off value . ■ Digital output The switching state of the output tracks the output value of a DI function block. The function block is selected in the Assign status parameter.
Factory setting	Off

Assign status

Navigation	  Setup → Advanced setup → Switch output → Assign status
-------------------	--

Prerequisite	Only visible for Switch output function = Digital output .
Description	Allocates a DI block to the switch output.
Options	<ul style="list-style-type: none"> ■ Off No digital block is allocated. ■ Digital output 1 ■ Digital output 2 ■ Digital output 3 ■ Digital output 4
Factory setting	Off

Assign limit

Navigation	  Setup → Advanced setup → Switch output → Assign limit
Prerequisite	Only visible for Switch output function = Limit .
Description	Defines the variable to be checked for limit transgression and allocates it to the switch output.
Options	<ul style="list-style-type: none"> ■ Off No measured variable is allocated. ■ Level linearized ■ Distance ■ Interface linearized ■ Interface distance ■ Upper interface thickness ■ Terminal voltage ■ Electronic temperature ■ Measured capacity ■ Relative echo amplitude ■ Relative interface amplitude
Factory setting	Off

Assign diagnostic level

Navigation	  Setup → Advanced setup → Switch output → Assign diagnostic level
Prerequisite	Only visible for Switch output function = Event level .
Description	Defines to which class of diagnostic events the output reacts.
Options	<ul style="list-style-type: none"> ■ Alarm ■ Alarm + warning ■ Warning
Factory setting	Alarm

Switch-on value
Switch-off value

Navigation	 Setup → Advanced setup → Switch output → Switch-on value / Switch-off value
Prerequisite	Only visible for Switch output function = Limit and Assign limit ≠ Off .
Description	Define the switch-on point and switch-off point for the limit evaluation.
Range of values	Depending on the selected measuring variable (Parameter Assign limit).
Factory setting	Depending on the selected measuring variable (Parameter Assign limit).

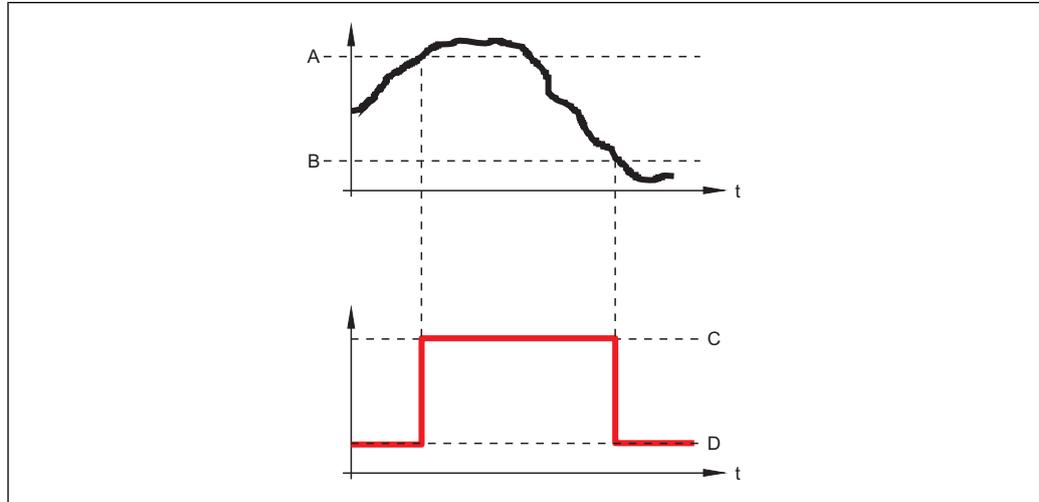
Additional information

The switching behavior depends on the relative position of the two switch points.

Switch-on point > Switch-off point:

The output is closed if the measured value exceeds the switch-on point.

The output is opened if the measured value falls below the switch-off point.



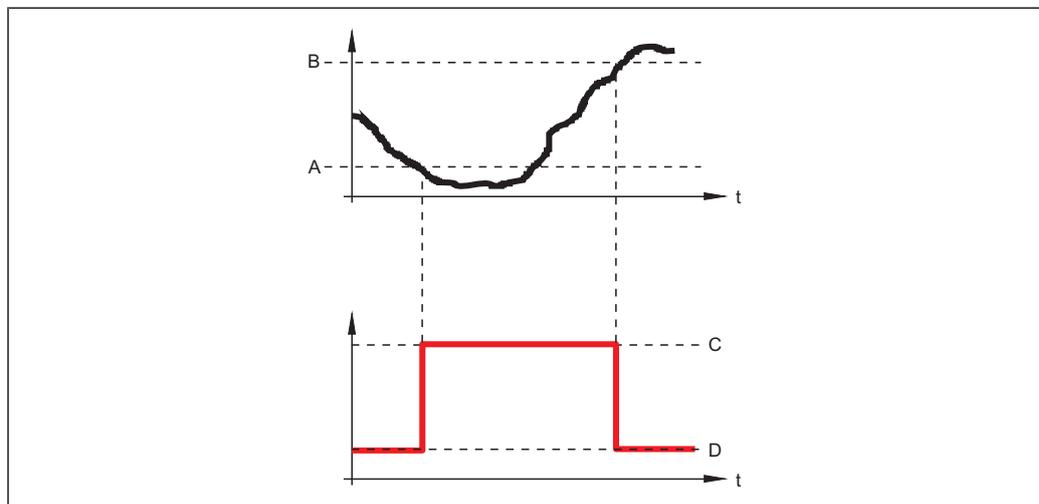
A0015585

- A Switch-on point
- B Switch-off point
- C Output closed
- D Output opened

Switch-on point < Switch-off point:

The output is closed if the measured value falls below the switch-on point.

The output is opened if the measured value exceeds the switch-off point.



A0015586

- A Switch-on point
- B Switch-off point
- C Output closed
- D Output opened

Switch-on delay**Navigation**

Setup → Advanced setup → Switch output → Switch-on delay

Prerequisite	Only visible for Switch output function = Limit and Assign limit ≠ Off .
Description	Defines the delay for the switching on of the output.
Range of values	0 to 100 s
Factory setting	0 s

Switch-off delay

Navigation	  Setup → Advanced setup → Switch output → Switch-off delay
Prerequisite	Only visible for Switch output function = Limit and Assign limit ≠ Off .
Description	Defines the delay for the switching off of the output.
Range of values	0 to 100 s
Factory setting	0 s

Switch output failure mode

Navigation	  Setup → Advanced setup → Switch output → Switch output failure mode
Description	Defines the switching state of the output in the case of an error.
Options	<ul style="list-style-type: none"> ■ Actual status The switch output remains in the state it was in when the error occurred ■ Open ■ Closed
Factory setting	Open

Switch status

Navigation	  Setup → Advanced setup → Switch output → Switch status   Diagnostics → Measured value → Switch status
Description	Indicates the current state of the switch output.
Display options	<ul style="list-style-type: none"> ■ Open ■ Closed

Invert output signal

Navigation	  Setup → Advanced setup → Switch output → Invert output signal
Description	Allows to invert the behavior of the switch output.
Options	<ul style="list-style-type: none"> ■ No The behavior of the switch output is as described above. ■ Yes The states Open and Closed are inverted as compared to the description above.

3.4 Expert → Communication

3.4.1 "Analog input 1" ... "Analog input 6" submenus

The **Analog input 1** to **Analog input 6** submenus are used to configure the AO blocks of the device.

Channel (1561)

Navigation	  Expert → Communication → Analog input 1...6 → Channel
Description	Allocates a measured value to the AI block.
Options	<ul style="list-style-type: none"> ■ Level linearized ■ Distance ■ Interface linearized (only for Operating mode = Interface) ■ Interface linearized (only for Operating mode = Interface or Interface with capacity) ■ Interface distance (only for Operating mode = Interface) ■ Interface distance (only for Operating mode = Interface or Interface with capacity) ■ Upper interface thickness (only for Operating mode = Interface) ■ Upper interface thickness (only for Operating mode = Interface or Interface with capacity) ■ Terminal voltage ■ Electronic temperature ■ Measured capacity (only for Operating mode = Interface with capacity) ■ Absolute echo amplitude ■ Relative echo amplitude ■ Absolute interface amplitude (only for Operating mode = Interface) ■ Absolute interface amplitude (only for Operating mode = Interface or Interface with capacity) ■ Relative interface amplitude (only for Operating mode = Interface) ■ Relative interface amplitude (only for Operating mode = Interface or Interface with capacity) ■ Absolute EOP amplitude ■ Noise of signal ■ EOP shift ■ Calculated DC value (only for Operating mode = Interface with capacity)
Factory setting	Level linearized

PV filter time (1524)

Navigation	  Expert → Communication → Analog input 1...6 → PV filter time
Description	Enter damping constant for AI block.
Range of values	0 to 3.4 10 ³⁸ s
Factory setting	0 s

Fail safe type (1525)

Navigation	  Expert → Communication → Analog input 1...6 → Fail safe type
Description	Defines the output value of the AI block in case of an error.
Options	<ul style="list-style-type: none"> ■ Fail safe value The output value in case of an error is defined in the Fail safe value parameter. ■ Failback value The last valid output value before the error occurred is maintained. ■ Off The output value tracks the current measuring value. The status is set to BAD.
Factory setting	Off

Fail safe value (1526)

Navigation	  Expert → Communication → Analog input 1...6 → Fail safe value
Prerequisite	Only visible for Fail safe type = Fail safe value .
Description	Defines the output value of the AI block in case of an error.
Range of values	Depending on the allocated measuring variable.
Factory setting	Depending on the allocated measuring variable.

Out value (1552)

Navigation	  Expert → Communication → Analog input 1...6 → Out value
Description	Indicates the output value of the AI block.

Out status (1564)

Navigation	  Expert → Communication → Analog input 1...6 → Out status
Description	Indicates the status of the output value of the AI block.
Display options	<ul style="list-style-type: none">■ Good■ Uncertain■ Bad
Additional information	For the meaning of the status refer to BA00034S, "PROFIBUS DP/PA - Guidelines for planning and commissioning"

Out status HEX (1549)

Navigation	  Expert → Communication → Analog input 1...6 → Out status HEX
Description	Indicates the hexadecimal code for the status of the output value of the AI block (status byte).
Additional information	The hexadecimal code gives more detailed information on the device status than the Out status parameter. For the meaning of the hexadecimal code refer to BA00034S, "PROFIBUS DP/PA - Guidelines for planning and commissioning".

3.4.2 "Digital input 1" ... "Digital input 4" submenus

The **Digital input 1** to **Digital input 4** submenus are used to configure the DI blocks of the device.

Channel (2187)

Navigation	  Expert → Communication p → Digital input 1...4 → Channel
Description	Allocates a switching variable to the DI block.
Options	<ul style="list-style-type: none"> ■ None ■ Switch output The DI block tracks the behavior of the switch output.
Factory setting	None
Additional information	<p>If Switch output is selected, the digital output value tracks the state of the switch output:</p> <ul style="list-style-type: none"> ■ Switch output open: 0 ■ Switch output closed: 1 <p>This allocation can be inverted by the Invert parameter.</p>

Invert (2188)

Navigation	  Expert → Communication → Digital input 1...4 → Invert
Description	Allows to invert the digital output signal (i.e. to swap the states "0" and "1").
Options	<ul style="list-style-type: none"> ■ Off ■ On
Factory setting	Off (i.e. no inversion)

Fail safe type (2189)

Navigation	  Expert → Communication → Digital input 1...4 → Fail safe type
Description	Defines the output value of the DI block in case of an error.
Options	<ul style="list-style-type: none"> ■ Fail safe value The output value in case of an error is define in the Fail safe value parameter. ■ Failback value The last valid output value before the error occurred is maintained. ■ Off The output value tracks the current measuring value. The status is set to BAD.
Factory setting	Off

Fail safe value (2190)

Navigation	  Expert → Communication → Digital input 1...4 → Fail safe value
Prerequisite	Only visible for Fail safe type = Fail safe value .
Description	Defines the output value of the DI block in case of an error.
Range of values	00 ... FF(hex)
Factory setting	00(hex)

Out value (2194)

Navigation	  Expert → Communication → Digital input 1...4 → Out value
Description	Indicates the output value of the DI block.

Out status (2203)

Navigation	  Expert → Communication → Digital input 1...4 → Out status
Description	Indicates the status of the output value of the DI block.
Display options	<ul style="list-style-type: none"> ■ Good ■ Uncertain ■ Bad

Out status HEX (2193)

Navigation	  Expert → Communication → Digital input 1...4 → Out status HEX
Description	Indicates the hexadecimal code for the status of the output value of the AI block (status byte).
Additional information	<p>The hexadecimal code give more detailed information on the device state than the Out status parameter.</p> <p>For the meaning of the hexadecimal code refer to BA00034S, "PROFIBUS DP/PA - Guidelines for planning and commissioning".</p>

3.4.3 "Analog output 1" ... "Analog output 4" submenus

The **Analog output 1** to **Analog oputput 4** submenus are used to configure the AO blocks of the device.

Set point value (1661)

Navigation	  Expert → Communication → Analog output 1...4 → Set point value
Description	Enter the set point for the AO block.
Range of values	Any IEEE floating point number: -3,4 10 ³⁸ ... +3,4 10 ³⁸
Factory setting	0

Set point status (1660)

Navigation	  Expert → Communication → Analog output 1...4 → Set point status
Description	Enter the status byte for the set point of the AO block.
Range of values	0 to 255
Factory setting	0

Fail safe time (1635)

Navigation	  Expert → Communication → Analog output 1...4 → Fail safe time
Description	Defines the fail-safe time, i.e. the time which passes after the occurrence of an error until the AO block assumes the defined error state.
Range of values	Any positive IEEE floating point number: 0 to 3.4 10 ³⁸ s
Factory setting	0 s

Fail safe type (1636)

Navigation	  Expert → Communication → Analog output 1...4 → Fail safe type
Description	Defines the output behavior of the AO block in the case of an error.

Options	<ul style="list-style-type: none"> ■ Fail safe value The output assumes the value defined in Fail safe value. ■ Fallback value The output maintains the value it had at the moment the error occurred. ■ Off The output assumes a value according to the current state of the block. The error is ignored.
Factory setting	Fallback value

Fail safe value (1637)

Navigation	  Expert → Communication → Analog output 1...4 → Fail safe value
Prerequisite	Only visible for Fail safe type = Fail safe value
Description	Defines the value the output assumes in the case of an error.
Range of values	Any IEEE floating point number: -3,4 10 ³⁸ ... + 3,4 10 ³⁸
Factory setting	0

Out value (1647)

Navigation	  Expert → Communication → Analog output 1...4 → Out value
Description	Displays the current output value of the block.

Out status (1669)

Navigation	  Expert → Communication → Analog output 1...4 → Out status
Description	Displays the current status of the output value of the block.
Display options	<ul style="list-style-type: none"> ■ Good ■ Uncertain ■ Bad

Out status HEX (1645)

Navigation	  Expert → Communication → Analog output 1...4 → Out status HEX
-------------------	---

Description	Displays the hexadecimal status of the output value of the block.
Additional information	The hexadecimal code give more detailed information on the device state than the Out status parameter. For the meaning of the hexadecimal code refer to BA00034S, "PROFIBUS DP/PA - Guidelines for planning and commissioning".

3.4.4 "Digital output 1" ... "Digital output 4" submenu

The **Digital output 1** to **Digital output 4** submenus are used to configure the DO blocks of the device.

Set point value (1715)

Navigation	  Expert → Communication → Digital output 1...4 → Set point value
Description	Enter the set point for the DO block.
Range of values	0 to 255
Factory setting	0

Set point status (1714)

Navigation	  Expert → Communication → Digital output 1...4 → Set point status
Description	Enter the status byte for the set point of the DO block.
Range of values	0 to 255
Factory setting	0

Invert (1692)

Navigation	  Expert → Communication → Digital output 1...4 → Invert
Description	Allows to invert the digital output signal (i.e. to swap the states "0" and "1").
Option	<ul style="list-style-type: none"> ■ Off ■ On
Factory setting	Off

Fail safe time (1697)

Navigation	  Expert → Communication → Digital output 1...4 → Fail safe time
Description	Defines the fail-safe time, i.e. the time which passes after the occurrence of an error until the DO block assumes the defined error state.
Range of values	Any positive IEEE floating point number: 0 to $3.4 \cdot 10^{38}$ s
Factory setting	0

Fail safe type (1696)

Navigation	  Expert → Communication → Digital output 1...4 → Fail safe type
Description	Defines the output behavior of the DO block in the case of an error.
Options	<ul style="list-style-type: none"> ■ Fail safe value The output assumes the value defined in Fail safe value. ■ Fallback value The output maintains the value it had at the moment the error occurred. ■ Off The output assumes a value according to the current state of the block. The error is ignored.
Factory setting	Fallback value

Fail safe value (1693)

Navigation	  Expert → Communication → Digital output 1...4 → Fail safe value
Prerequisite	Only visible for Fail safe type = Fail safe value
Description	Defines the value the output assumes in the case of an error.
Range of values	0 to 255
Factory setting	0

Out value (1704)

Navigation	  Expert → Communication → Digital output 1...4 → Out value
-------------------	---

Description Displays the current output value of the block.

Out status (1723)

Navigation   Expert → Communication → Digital output 1...4 → Out status

Description Displays the current status of the output value of the block.

Display options

- Good
- Uncertain
- Bad

Out status HEX (1703)

Navigation   Expert → Communication → Digital output 1...4 → Out status HEX

Description Displays the hexadecimal status of the output value of the block.

Additional information The hexadecimal code give more detailed information on the device state than the **Out status** parameter.
For the meaning of the hexadecimal code refer to BA00034S, "PROFIBUS DP/PA - Guidelines for planning and commissioning".

3.5 Expert → Diagnostics

Actual diagnostics (0691)

Write access Read-only parameter

Navigation   Expert → Diagnostics → Actual diagnostics

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  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:
▲S441 01d4h12min30s
Current output 1

Previous diagnostics (0690)

Write access	Read-only parameter
Navigation	  Expert → Diagnostics → Previous diagnostics
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  symbol on the display.
User interface	Symbol for event behavior, diagnostics event, time the event occurred and event text
Additional information	<i>User interface</i> Example for display format: ▲C411 01d5h14min20s Upload/download active

Operating time from restart (0653)

Write access	Read-only parameter
Navigation	  Expert → Diagnostics → Operating time from 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)

Operating time (0652) (→  36)

3.5.1 Expert → Diagnostics → Diagnostics list

Diagnostics 1 - 5 (0692 - 0696)

Write access	Read-only parameters
Navigation	  Expert → Diagnostics → Diagnostics list → Diagnostics 1   Expert → Diagnostics → Diagnostics list → Diagnostics 2   Expert → Diagnostics → Diagnostics list → Diagnostics 3   Expert → Diagnostics → Diagnostics list → Diagnostics 4   Expert → Diagnostics → Diagnostics 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 and event text

Additional information *User interface*
 Example 1 for display format:
 ▲S441 01d4h12min30s
 Current output 1

 Example 2 for display format:
 ⊗F276 10d8h12min22s
 I/O module error

3.5.2 Expert → Diagnostics → Event logbook

Filter options (0705) 	
Write access	Maintenance
Navigation	  Expert → Diagnostics → Event logbook → Filter options
Description	Use this function to select the category 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	<ul style="list-style-type: none"> ■ All ■ Failure (F) ■ Maintenance required (M) ■ Function check (C) ■ Out of specification (S) ■ Information (I)
Factory setting	All

Event list 	
Navigation	  Expert → Diagnostics → Event logbook → Event list
Description	Use this function to display the history of event messages of the category selected in the Filter options parameter (→  95). 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: <ul style="list-style-type: none"> ■ : Event has occurred ■ : Event has ended  Information on what is causing the message, and remedy measures, can be viewed via the  -button.

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

Additional information *User interface*

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

Example 2 for display format:
S441  01d4h12min30s
Current output 1

HistoROM

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

3.5.3 Expert → Diagnostics → Device information

Device (0011)

- Write access** Read-only parameter
- Navigation**   Expert → Diagnostics → Device information → Device
- Description** Use this function to view the device designation.

Serial number (0009)

- Write access** Read-only parameter
- Navigation**   Expert → Diagnostics → Device information → 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
- User interface** Max. 11-digit character string comprising letters and numbers

Firmware version (0010)

- Write access** Read-only parameter

Navigation   Expert → Diagnostics → Device information → Firmware version

Description Use this function to view the device firmware version installed.

Anzeige Max. 6-digit character string in the format xx.yy.zz

Device name (0013)

Write access Read-only parameter

Navigation   Expert → Diagnostics → Device information → Device name

Description Use this function to view the name of the device. It can also be found on the nameplate.

Order code (0008)

Write access Read-only parameter

Navigation   Expert → Diagnostics → Device information → 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 from the extended order code, which defines all the device features of the product structure. In contrast, only some of the device features can be read directly from the order code.



Uses of the order code

- To order an identical spare device.
- To identify the device quickly and easily, e.g. when contacting Endress+Hauser.

Extended order code 1 - 3 (0021 - 0023)

Write access Read-only parameter

Navigation   Expert → Diagnostics → Device information → Extended order code 1
  Expert → Diagnostics → Device information → Extended order code 2
  Expert → Diagnostics → Device information → Extended order code 3

Description Use these parameters 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 version 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.



Uses of the extended order code

- To order an identical spare device
- To check the ordered device features against the shipping note.

ENP version (0012)

Write access	Read-only parameter
Navigation	 Expert → Diagnostics → Device information → ENP version
Description	Use this function to view the version of the electroni nameplate (ENP).
User interface	6-digit number in the format xx.yy.zz

3.5.4 Expert → Diagnostics → Data logging

 The menu is only displayed if the extended function of the HistoROM is enabled in the device.

Assign channel 1 -4 (0851 - 0854)



Write access	Maintenance
Navigation	  Expert → Diagnostics → Data logging → Assign channel 1   Expert → Diagnostics → Data logging → Assign channel 2   Expert → Diagnostics → Data logging → Assign channel 3   Expert → Diagnostics → Data logging → Assign channel 4
Description	<p>Use this function to assign a process variable to the data logging channel.</p> <p>A total of 1000 measured values can be logged. This means</p> <ul style="list-style-type: none"> ■ 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. <p>Once 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).</p> <p> The log contents are cleared if the option selected is changed.</p>

Auswahl	<ul style="list-style-type: none"> ■ Off ■ Level ■ Distance ■ Interface ■ Interface distance ■ Obere Trennschichtdicke ■ Current output 1 ■ Measured current ■ Terminal voltage ■ Electronics temperature ■ Absolute echo amplitude ■ Relative echo amplitude ■ Absolute interface amplitude (for interface measurements) ■ Relativ interface amplitude (for interface measurements) ■ Absolute EOP amplitude ■ Signal noise ■ EOP shift ■ Dielectric constant of the upper medium (for interface measurements)
Factory setting	Off

Logging interval (0856)


Write access	Maintenance
Navigation	Expert → Diagnostics → Data logging → Logging interval
Description	<p>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}.</p> <ul style="list-style-type: none"> ■ If 1 logging channel is used: $T_{\log} = 1000 \cdot t_{\log}$ ■ If 2 logging channels are used: $T_{\log} = 500 \cdot t_{\log}$ ■ If 3 logging channels are used: $T_{\log} = 333 \cdot t_{\log}$ ■ If 4 logging channels are used: $T_{\log} = 250 \cdot t_{\log}$ <p>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). Nach Ablauf dieser Zeit werden die ältesten im Speicher vorhandenen Datenpunkte zyklisch überschrieben, so dass immer eine Zeit von T_{\log} im Speicher bleibt (Ringspeicher-Prinzip).</p> <p> The log contents are cleared if the length of the logging interval is changed.</p>
Input range	1 to 3600 s
Factory setting	10 s
Additional information	<p><i>Example</i></p> <p>If 1 logging channel is used:</p> <ul style="list-style-type: none"> ■ $T_{\log} = 1000 \cdot 1 \text{ s} = 1\,000 \text{ s} \cong 15 \text{ min}$ ■ $T_{\log} = 1000 \cdot 10 \text{ s} = 10\,000 \text{ s} \cong 3 \text{ h}$ ■ $T_{\log} = 1000 \cdot 80 \text{ s} = 80\,000 \text{ s} \cong 1 \text{ d}$ ■ $T_{\log} = 1000 \cdot 3\,600 \text{ s} = 3\,600\,000 \text{ s} \cong 41 \text{ d}$

Clear logging data (0855)**Write access**

Maintenance

Navigation

Expert → Diagnostics → Data logging → 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.
- Clear data
The logging data are cleared. The logging process starts from scratch.

Factory setting

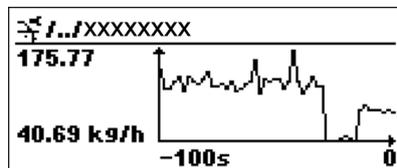
Cancel

Display channel 1 - Display channel 4**Navigation**

- Expert → Diagnostics → Data logging → Display channel 1
- Expert → Diagnostics → Data logging → Display channel 2
- Expert → Diagnostics → Data logging → Display channel 3
- Expert → 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** parameters (→ 98).

3.5.5 Expert → Diagnostics → Min/max values**Max. level value (2357)****Write access**

Display-only parameter

Navigation

Expert → Diagnostics → Min/max values → Max. level value

Description

Use this parameter to view the maximum level measured until now (drag indicator).

Time max. level (2385)



Write access Read-only parameter

Navigation   Expert → Diagnostics → Min/max values → Time max. level

Description Use this parameter to view the operating time at which the maximum level has been measured.

Min. level value (2358)



Write access Read-only parameter

Navigation   Expert → Diagnostics → Min/max values → Min. level value

Description Use this parameter to view the minimum level measured until now (drag indicator).

Time min. level (2386)



Write access Read-only parameter

Navigation   Expert → Diagnostics → Min/max values → Time min. level

Description Use this parameter to view the operating time at which the minimum level has been measured.

Max. draining speed (2320)



Write access Read-only parameter

Navigation   Expert → Diagnostics → Min/max values → Max. draining speed

Description Use this parameter to view the maximum draining speed measured until now (drag indicator).

Max. filling speed (2360)



Write access Read-only parameter

Navigation   Expert → Diagnostics → Min/max values → Max. filling speed

Description Use this parameter to view the maximum filling speed measured until now (drag indicator).

Max. interface value (2361)



Write access Read-only parameter

Navigation Expert → Diagnostics → Min/max values → Max. interface value

Description Use this parameter to view the maximum interface level measured until now (drag indicator).

Time max. interface (2388)



Write access Read-only parameter

Navigation Expert → Diagnostics → Min/max values → Time max. interface

Description Use this parameter to view the operating time at which the maximum interface level has been measured.

Min. interface value (2362)



Write access Read-only parameter

Navigation Expert → Diagnostics → Min/max values → Min. interface level

Description Use this parameter to view the minimum interface level measured until now (drag indicator).

Time min. interface (2387)



Write access Read-only parameter

Navigation Expert → Diagnostics → Min/max values → Time min. interface

Description Use this parameter to view the operating time at which the minimum interface level has been measured.

I max. drain speed (2363)



Write access Read-only parameter

Navigation   Expert → Diagnostics → Min/max values → I max. drain speed

Description Use this parameter to view the maximum draining speed of the interface measured until now (drag indicator).

I max. fill speed (2359) 

Write access Read-only parameter

Navigation   Expert → Diagnostics → Min/max values → I max. fill speed

Description Use this parameter to view the maximum filling speed of the interface measured until now (drag indicator).

Reset min./max. (2324) 

Write access Service

Navigation   Expert → Diagnostics → Min/max values → Reset min./max.

Description Resets the drag indicator of the selected process variable.
Access to this parameter is reserved to the Endress+Hauser service staff. It can only be accessed after entering the service code.

Max. electronics temperature (1031) 

Write access Read-only parameter

Navigation   Expert → Diagnostics → Min/max values → Max. electronics temperature

Description Use this parameter to view the maximum electronics temperature measured until now (drag indicator).

Time max. electronics temperature (1204) 

Write access Read-only parameter

Navigation   Expert → Diagnostics → Min/max values → Time max. electronics temperature

Description Use this parameter to view the operating time at which the maximum electronics temperature has been measured.

Min. electronics temperature (1040)

Write access Read-only parameter

Navigation   Expert → Diagnostics → Min/max values → Min. electronics temperature

Description Use this parameter to view the minimum electronics temperature measured until now (drag indicator).

Time min. electronics temperature (1205)

Write access Read-only parameter

Navigation   Expert → Diagnostics → Min/max values → Time min. electronics temperature

Description Use this parameter to view the operating time at which the minimum electronics temperature has been measured.

Reset min./max. temperature (1173)

Write access Service

Navigation   Expert → Diagnostics → Min/max values → Reset min./max. temperature

Description Resets the drag indicator of the electronics temperature.
Access to this parameter is reserved to the Endress+Hauser service staff. It can only be accessed after entering the service code.

3.5.6 Expert → Diagnostics → Simulation

Assign simulation process variable (2328)

Write access Maintenance

Navigation   Expert → Diagnostics → Simulation → Assign proc. 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 " <i>function check</i> " category (C) while simulation is in progress.  The simulation value of the selected process variable is defined in the Value process variable parameter.
Options	<ul style="list-style-type: none"> ■ Off ■ Level ■ Interface ■ Upper interface thickness ■ Level linearized ■ Interface linearized ■ Thickness linearized
Factory setting	Off

Value process variable (2329) 

Write access	Maintenance
Navigation	  Expert → Diagnostics → Simulation → Value proc. var.
Prerequisite	One of the following options is selected in the Assign simulation process variable parameter: <ul style="list-style-type: none"> ■ Level ■ Interface ■ Upper interface thickness ■ Level linearized ■ Interface linearized ■ Thickness linearized
Beschreibung	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 can verify whether the measuring device has been configured correctly.
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.

Switch output simulation (0462) 

Navigation	  Expert → Diagnostics → Simulation → Switch output simulation
Description	Use this parameter to activate or deactivate the simulation of the switch output.
Auswahl	<ul style="list-style-type: none"> ■ Off ■ On
Werkseinstellung	Off (i.e. no simulation)

Switch status (0463)		
Navigation	  Expert → Diagnostics → Simulation → Switch status	
Prerequisite	Only visible for Switch output simulation = On .	
Description	Use this parameter to define the switch status for the simulation.	
Auswahl	<ul style="list-style-type: none"> ■ Open ■ Closed 	
Werkseinstellung	Open	

Simulation device alarm (0654)		
Navigation	  Expert → Diagnostics → Simulation → Simulation device 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> " category (C) while simulation is in progress:	
Options	<ul style="list-style-type: none"> ■ On ■ Off 	
Factory setting	Off	

3.5.7 Expert → Diagnostics → Device check

Start device check (1013)		
Write access	Maintenance	
Navigation	  Expert → Diagnostics → Device check → Start device check	
Description	Start of a device check.	
Selection	<ul style="list-style-type: none"> ■ 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 eliminate the cause of this error.	
Factory setting	No	

Result device check (1014)

Write access	Read-only parameter
Navigation	  Expert → Diagnostics → Device check → Result device check
Description	Indicates the result of the device check.
Display	<ul style="list-style-type: none"> ■ Installation ok ■ Accuracy reduced A measurement is possible. However, the measuring accuracy may be reduced due to the signal amplitudes. ■ Measurement capability reduced A measurement is currently possible. However, there is the risk of an echo loss. Check the mounting position of the device and the dielectric constant of the medium. ■ Check not done

Last check time (1203)

Write access	Read-only parameter
Navigation	  Expert → Diagnostics → Device check → Last check time
Description	Displays the operating time at which the last device check has been performed.
Additional information	<i>Display format</i> Days (d), hours (h), minutes (m), seconds (s): 0000d00h00m00s

Level signal (1016)

Write access	Read-only parameter
Navigation	  Expert → Diagnostics → Device check → Level signal
Prerequisite	Only visible if a device check has been performed.
Description	Displays the result of the device check for the level signal.
Display	<ul style="list-style-type: none"> ■ Check not done ■ Check not ok Check the mounting position of the device and the dielectric constant of the medium. ■ Check ok

Launch signal (1012)

Write access	Read-only parameter
Navigation	  Expert → Diagnostics → Device check → Launch signal
Prerequisite	Only visible if a device check has been performed.
Description	Displays the result of the device check for the launch signal (fiducial).
Display	<ul style="list-style-type: none"> ■ Check not done ■ Check not ok Check the mounting position of the device. In non-metallic vessels use a metal plate or a metal flange. ■ Check ok

Interface signal (1015)

Write access	Read-only parameter
Navigation	  Expert → Diagnostics → Device check → Interface signal
Condition	Only visible for devices with interface measurement option and if a device check has been performed.
Description	Displays the result of the device check for the interface signal.
Display	<ul style="list-style-type: none"> ■ Check not done ■ Check not ok ■ Check ok

3.5.8 Expert → Diagnostics → Device reset

Device reset (1013)



Write access	Maintenance
Navigation	  Expert → Diagnostics → Device reset → 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 measurement-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

Additional information*To delivery settings*

This option is not visible if no customer-specific settings have been ordered.

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