

Description of Device Parameters

Proline Promag 300

Electromagnetic flowmeter
HART

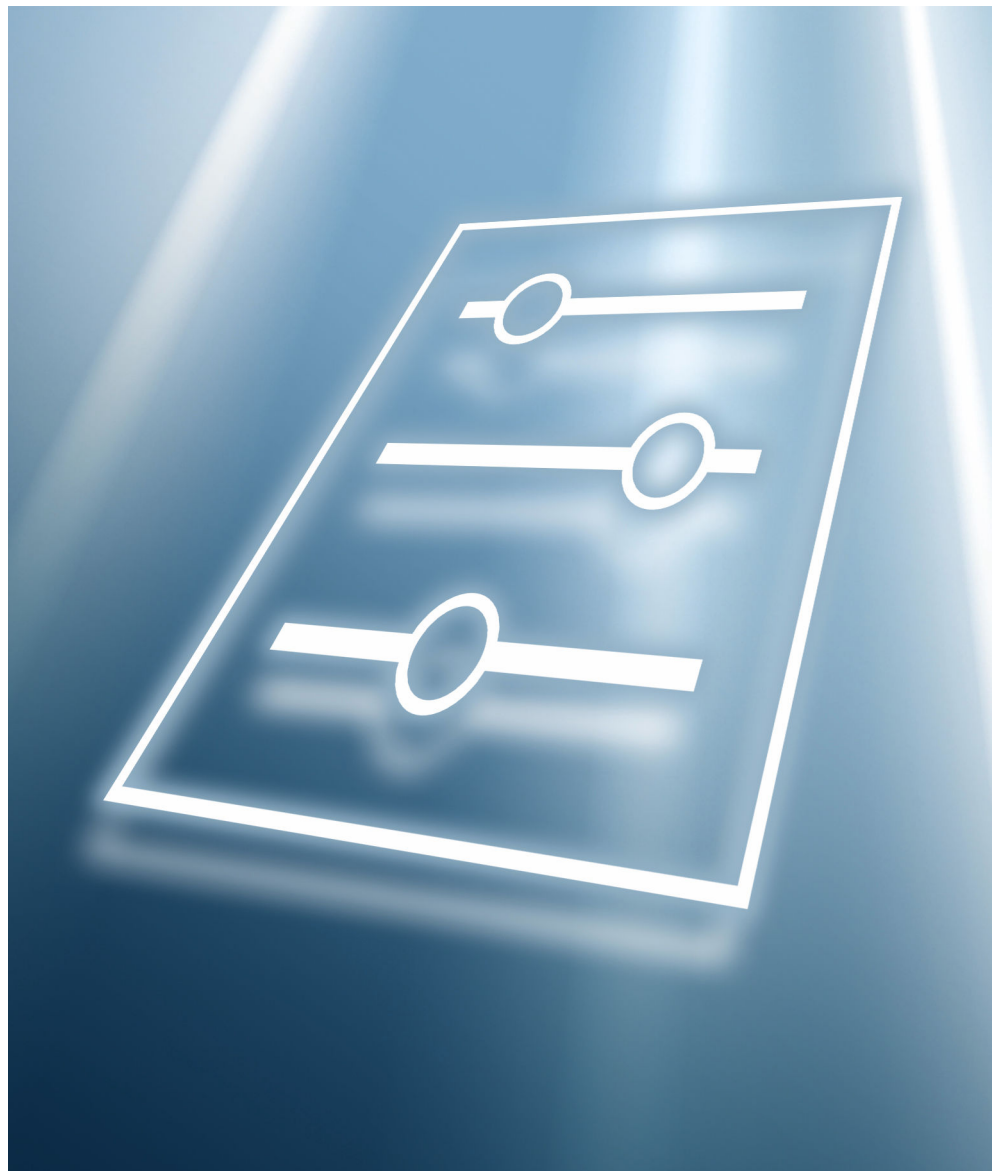


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1 About this document

1.1 Document function

The document is part of the Operating Instructions and serves as a reference for parameters, providing a detailed explanation of each individual parameter of the operating menu.

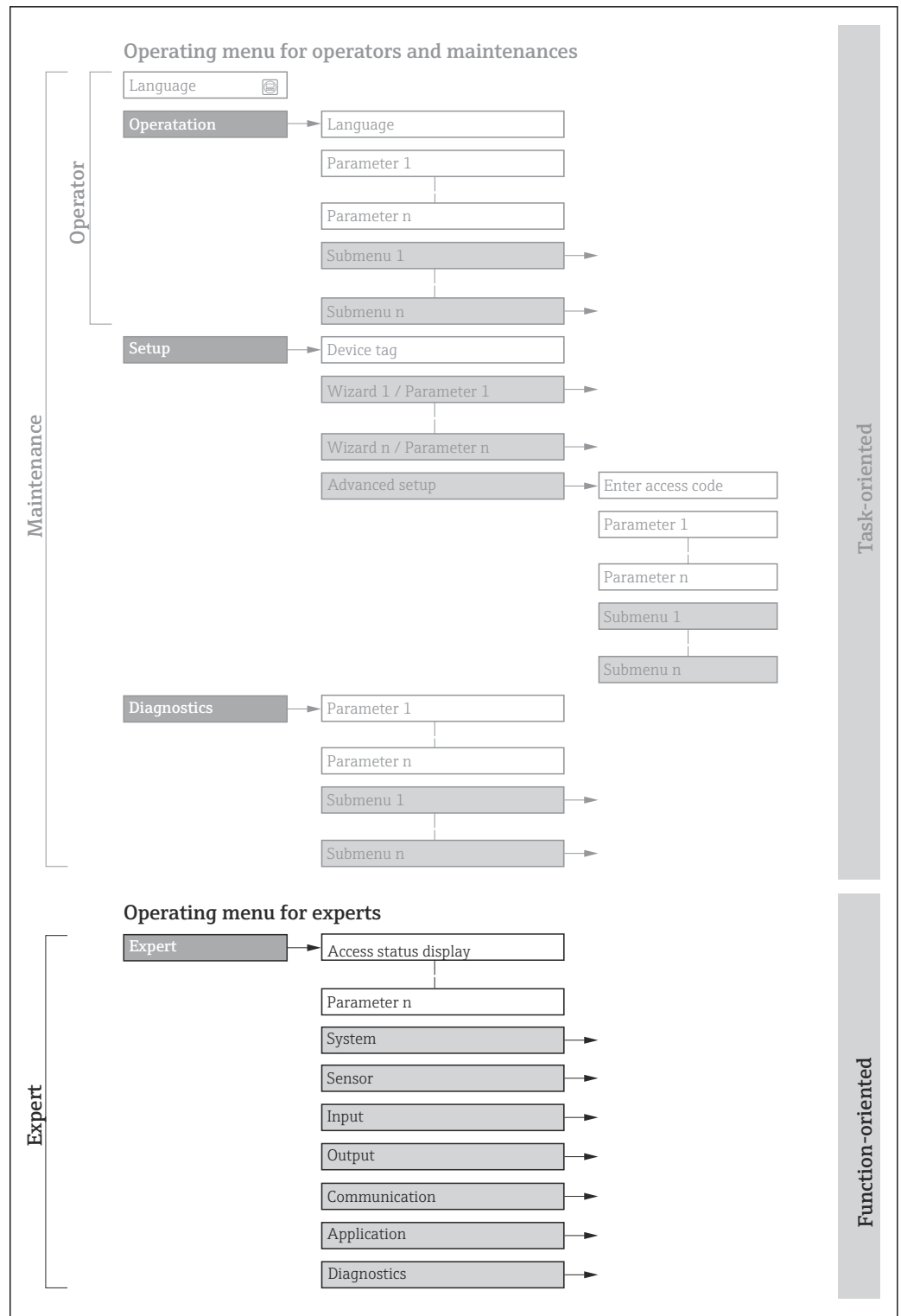
1.2 Target group

The document is aimed at specialists who work with the device over the entire life cycle and perform specific configurations.

1.3 Using this document

1.3.1 Information on the document structure

The document lists the submenus and their parameters according to the structure from the **Expert** menu (→  8), which is displayed when the **"Maintenance" user role** is enabled.



1 Sample graphic for the schematic layout of the operating menu



Additional information regarding:

- The arrangement of the parameters according to the menu structure of the **Operation** menu, **Setup** menu, **Diagnostics** menu with a brief description: Operating Instructions → 7
- Operating concept of the operating menus: Operating Instructions → 7

1.3.2 Structure of a parameter description

The individual parts of a parameter description are described in the following section:

Complete parameter name		Write-protected parameter = 
Navigation	 Navigation path to the parameter via the local display (direct access code) or web browser  Navigation path to the parameter via the operating tool The names of the menus, submenus and parameters are abbreviated to the form in which they appear on the display and in the operating tool.	
Prerequisite	The parameter is only available under these specific conditions	
Description	Description of the parameter function	
Selection	List of the individual options for the parameter ■ Option 1 ■ Option 2	
User entry	Parameter entry range	
User interface	Display value/data of the parameter	
Factory setting	Default setting ex works	
Additional information	Additional explanations (e.g. in examples): ■ On individual options ■ On display values/data ■ On the input range ■ On the factory setting ■ On the parameter function	

1.4 Symbols used

1.4.1 Symbols for certain types of information

Symbol	Meaning
	Tip Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
 A0028662	Operation via local display
 A0028663	Operation via operating tool
 A0028665	Write-protected parameter

1.4.2 Symbols in graphics

Symbol	Meaning
1, 2, 3 ...	Item numbers
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections

1.5 Documentation

1.5.1 Standard documentation

Operating Instructions

Measuring device	Documentation code
Promag H 300	BA01392D
Promag P 300	BA01393D
Promag W 300	BA01918D

1.5.2 Supplementary device-dependent documentation

Special Documentation

Contents	Documentation code
Information on the Pressure Equipment Directive	SD01614D
Radio approvals for WLAN interface for A309/A310 display module	SD01793D
Web server	SD01658D
Remote display and operating module DKX001	SD01763D
OPC-UA Server	SD02043D

Contents	Documentation code
Heartbeat Technology	SD01640D
Web server	SD01654D

2 Overview of the Expert operating menu

The following table provides an overview of the menu structure of the expert operating menu and its parameters. The page reference indicates where the associated description of the submenu or parameter can be found.

► Expert	
Direct access (0106)	→ 11
Locking status (0004)	→ 12
User role (0005)	→ 13
Enter access code (0003)	→ 13
► System	→ 14
► Display	→ 14
► Configuration backup	→ 27
► Diagnostic handling	→ 30
► Administration	→ 40
► Sensor	→ 45
► Measured values	→ 46
► System units	→ 57
► Process parameters	→ 73
► External compensation	→ 89
► Sensor adjustment	→ 93
► Calibration	→ 100
► Build-up index adjustment	→ 101
► I/O configuration	→ 103
I/O module 1 to n terminal numbers (3902-1 to n)	→ 104
I/O module 1 to n information (3906-1 to n)	→ 104

I/O module 1 to n type (3901–1 to n)	→ 105
Apply I/O configuration (3907)	→ 105
I/O alteration code (2762)	→ 105
► Input	→ 106
► Current input 1 to n	→ 106
► Status input 1 to n	→ 109
► Output	→ 111
► Current output 1 to n	→ 111
► Pulse/frequency/switch output 1 to n	→ 124
► Relay output 1 to n	→ 144
► Double pulse output	→ 151
► Communication	→ 155
► HART input	→ 156
► HART output	→ 161
► Diagnostic configuration	→ 188
► Web server	→ 178
► WLAN settings	→ 181
► OPC-UA configuration	→ 188
► Application	→ 197
Reset all totalizers (2806)	→ 197
► Totalizer 1 to n	→ 198
► Custody transfer	→ 202
► Diagnostics	→ 202
Actual diagnostics (0691)	→ 203

Previous diagnostics (0690)	→  204
Operating time from restart (0653)	→  205
Operating time (0652)	→  205
▶ Diagnostic list	→  205
▶ Event logbook	→  210
▶ Custody transfer logbook	→  211
▶ Device information	→  212
▶ Main electronic module + I/O module 1	→  216
▶ Sensor electronic module (ISEM)	→  217
▶ I/O module 2	→  218
▶ I/O module 3	→  219
▶ Display module	→  220
▶ Data logging	→  221
▶ Min/max values	→  229
▶ Heartbeat Technology	→  233
▶ Simulation	→  247

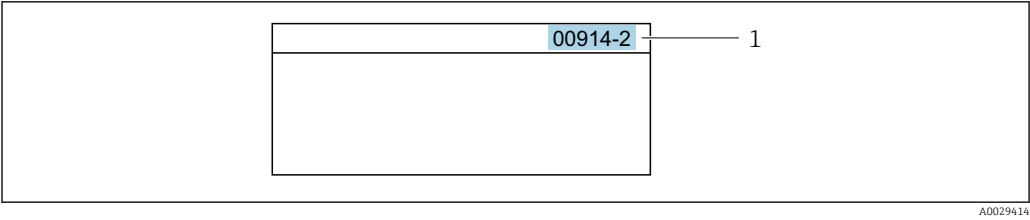
3 Description of device parameters

In the following section, the parameters are listed according to the menu structure of the local display. Specific parameters for the operating tools are included at the appropriate points in the menu structure.

Expert		
Direct access (0106)	→	11
Locking status (0004)	→	12
User role (0005)	→	13
Enter access code (0003)	→	13
► System	→	14
► Sensor	→	45
► I/O configuration	→	103
► Input	→	106
► Output	→	111
► Communication	→	155
► Application	→	197
► Diagnostics	→	202

Direct access

Navigation	Expert → Direct access (0106)
Description	Use this function to enter the access code to enable direct access to the desired parameter via the local display. A parameter number is assigned to each parameter for this purpose.
User entry	0 to 65 535
Additional information	User entry The direct access code consists of a 5-digit number (at maximum) and the channel number, which identifies the channel of a process variable: e.g. 00914-2. In the navigation view, this appears on the right-hand side in the header of the selected parameter.



1 Direct access code

- Note the following when entering the direct access code:
- The leading zeros in the direct access code do not have to be entered.
Example: Enter "914" instead of "00914"
 - If no channel number is entered, channel 1 is opened automatically.
Example: Enter 00914 → **Assign process variable** parameter
 - If a different channel is opened: Enter the direct access code with the corresponding channel number.
Example: Enter 00914-2 → **Assign process variable** parameter

Locking status

Navigation Expert → Locking status (0004)

Description Displays the active write protection.

- User interface
- Hardware locked
 - SIL locked
 - CT active - defined parameters
 - CT active - all parameters
 - Temporarily locked

Additional information *User interface*

If two or more types of write protection are active, the write protection with the highest priority is shown on the local display. In the operating tool all active types of write protection are displayed.

Detailed information on access authorization is provided in the "User roles and associated access authorization" and "Operating concept" sections of the Operations Instructions for the device → 7

Selection

Options	Description
None	The access authorization displayed in the Access status parameter (→ 13) applies . Only appears on local display.
Hardware locked (priority 1)	The DIP switch for hardware locking is activated on the PCB board. This locks write access to the parameters (e.g. via local display or operating tool) .
SIL locked (priority 2)	The SIL mode is enabled. This locks write access to the parameters (e.g. via local display or operating tool).

Options	Description
CT active - all parameters (priority 3)	 Only available for Promag H. The DIP switch for custody transfer mode is activated on the PCB board. Locks the parameters that are relevant for custody transfer and also parameters that are predefined by Endress+Hauser and are not relevant for custody transfer (e.g. on local display or operating tool).  For detailed information on custody transfer mode, see the Special Documentation for the device → 7
CT active - defined parameters (priority 4)	 Only available for Promag H. The DIP switch for the custody transfer mode is activated on the PCB board. Only locks the parameters that are relevant for custody transfer (e.g. on the local display or operating tool).  For detailed information on custody transfer mode, see the Special Documentation for the device → 7
Temporarily locked (priority 5)	Write access to the parameters is temporarily locked on account of internal processes running in the device (e.g. data upload/download, reset, etc.). Once the internal processing has been completed, the parameters can be changed once again.

User role

Navigation	 Expert → User role (0005)
Description	Displays the access authorization to the parameters via the local display, Web browser or operating tool.
User interface	■ Maintenance ■ Service
Factory setting	Maintenance
Additional information	<i>Description</i>  Access authorization can be modified via the Enter access code parameter (→ 13).  If additional write protection is active, this restricts the current access authorization even further. <i>User interface</i>  Detailed information on access authorization is provided in the "User roles and associated access authorization" and "Operating concept" sections of the Operations Instructions for the device → 7

Enter access code

Navigation	 Expert → Ent. access code (0003)
Description	Use this function to enter the user-specific release code to remove parameter write protection.

User entry Max. 16-digit character string comprising numbers, letters and special characters

3.1 "System" submenu

Navigation  Expert → System

► System	
► Display	→  14
► Configuration backup	→  27
► Diagnostic handling	→  30
► Administration	→  40

3.1.1 "Display" submenu

Navigation  Expert → System → Display

► Display	
Display language (0104)	→  15
Format display (0098)	→  16
Value 1 display (0107)	→  18
0% bargraph value 1 (0123)	→  19
100% bargraph value 1 (0125)	→  19
Decimal places 1 (0095)	→  20
Value 2 display (0108)	→  20
Decimal places 2 (0117)	→  20
Value 3 display (0110)	→  21
0% bargraph value 3 (0124)	→  21
100% bargraph value 3 (0126)	→  22
Decimal places 3 (0118)	→  22

Value 4 display (0109)	→  23
Decimal places 4 (0119)	→  23
Display interval (0096)	→  24
Display damping (0094)	→  24
Header (0097)	→  25
Header text (0112)	→  25
Separator (0101)	→  26
Contrast display (0105)	→  26
Backlight (0111)	→  27

Display language

Navigation

  Expert → System → Display → Display language (0104)

Prerequisite

A local display is provided.

Description

Use this function to select the configured language on the local display.

Selection

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

Factory setting

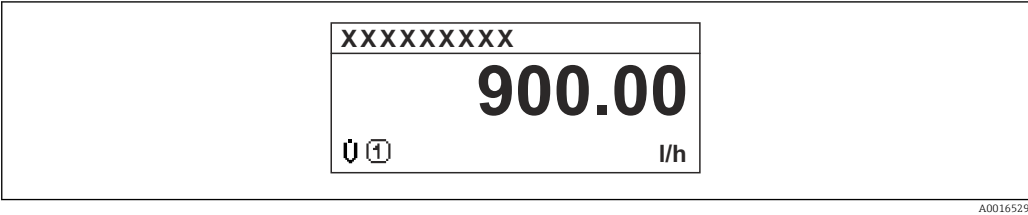
English (alternatively, the ordered language is preset in the device)

Format display

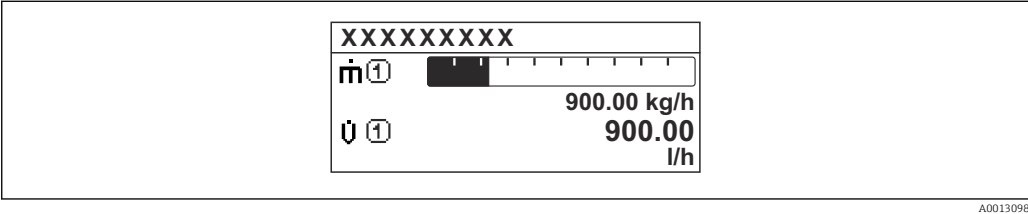
Navigation	 Expert → System → Display → Format display (0098)
Prerequisite	A local display is provided.
Description	Use this function to select how the measured value is shown on the local display.
Selection	■ 1 value, max. size ■ 1 bargraph + 1 value ■ 2 values ■ 1 value large + 2 values ■ 4 values
Factory setting	1 value, max. size
Additional information	<i>Description</i> The display format (size, bar graph etc.) and number of measured values displayed simultaneously (1 to 8) can be configured. This setting only applies to normal operation.  The Value 1 display parameter (→  18)...Value 8 display parameter are used to specify which measured values are shown on the local display and in what order. ■ If more measured values are specified than the display mode selected permits, then the values alternate on the device display. The display time until the next change is configured using the Display interval parameter (→  24). <i>Custody transfer mode</i>  Only available for Promag H. ■ Once the measuring device has been enabled for custody transfer mode, depending on the custody transfer approval selected the display can switch between showing the relevant information and the custody transfer counter. ■ In addition, a padlock symbol appears in the header of the display (.  For detailed information on custody transfer mode, see the Special Documentation for the device →  7

Possible measured values shown on the local display:

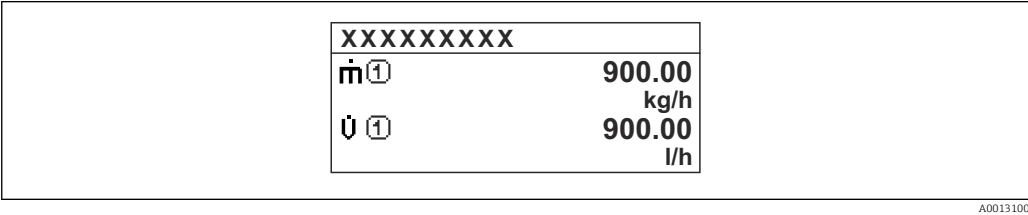
"1 value, max. size" option



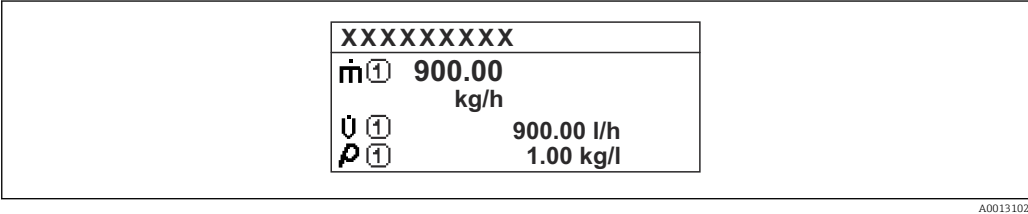
"1 bargraph + 1 value" option



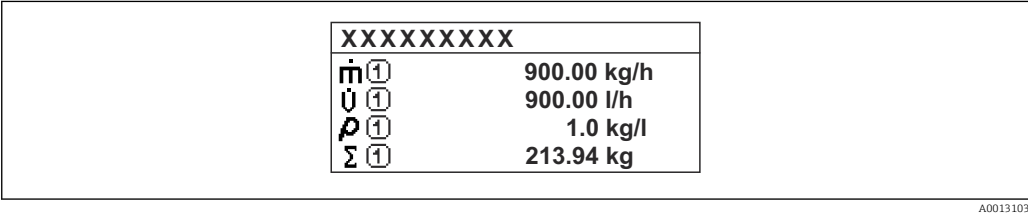
"2 values" option



"1 value large + 2 values" option



"4 values" option



Value 1 display	
Navigation	Expert → System → Display → Value 1 display (0107)
Prerequisite	A local display is provided.
Description	Use this function to select one of the measured values shown on the local display.
Selection	■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity* ■ Conductivity* ■ Corrected conductivity* ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Current output 1 ■ Current output 2* ■ Current output 3* ■ Current output 4* ■ Temperature* ■ Electronics temperature ■ HBSI* ■ Noise* ■ Coil current shot time* ■ Reference electrode potential against PE* ■ Build-up index* ■ Test point 1 ■ Test point 2 ■ Test point 3
Factory setting	Volume flow
Additional information	<i>Description</i> 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 (→ 16) is used to specify how many measured values are displayed simultaneously and how. <i>Custody transfer mode</i> Only available for Promag H. Once the measuring device has been enabled for custody transfer mode, depending on the custody transfer approval selected the display can switch to show the relevant information. For detailed information on custody transfer mode, see the Special Documentation for the device → 7 <i>Dependency</i> The unit of the displayed measured value is taken from the System units submenu (→ 57).

* Visibility depends on order options or device settings

0% bargraph value 1 	
Navigation	  Expert → System → Display → 0% bargraph 1 (0123)
Prerequisite	A local display is provided.
Description	Use this function to enter the 0% bar graph value to be shown on the display for the measured value 1.
User entry	Signed floating-point number
Factory setting	Country-specific: ■ 0 l/h ■ 0 gal/min (us)
Additional information	<i>Description</i>  The Format display parameter (→  16) is used to specify that the measured value is to be displayed as a bar graph. <i>User entry</i>  The unit of the displayed measured value is taken from the System units submenu (→  57).
100% bargraph value 1 	
Navigation	  Expert → System → Display → 100% bargraph 1 (0125)
Prerequisite	A local display is provided.
Description	Use this function to enter the 100% bar graph value to be shown on the display for the measured value 1.
User entry	Signed floating-point number
Factory setting	Depends on country and nominal diameter →  258
Additional information	<i>Description</i>  The Format display parameter (→  16) is used to specify that the measured value is to be displayed as a bar graph. <i>User entry</i>  The unit of the displayed measured value is taken from the System units submenu (→  57).

Decimal places 1

Navigation	 Expert → System → Display → Decimal places 1 (0095)
Prerequisite	A measured value is specified in the Value 1 display parameter (→  18).
Description	Use this function to select the number of decimal places for measured value 1.
Selection	■ X ■ X.X ■ X.XX ■ X.XXX ■ X.XXXX
Factory setting	X.XX
Additional information	<i>Description</i>  This setting does not affect the accuracy of the device for measuring or calculating the value.

Value 2 display

Navigation	 Expert → System → Display → Value 2 display (0108)
Prerequisite	A local display is provided.
Description	Use this function to select a measured value that is shown on the local display.
Selection	For the picklist, see the Value 1 display parameter (→  18)
Factory setting	None
Additional information	<i>Description</i> 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 (→  16) is used to specify how many measured values are displayed simultaneously and how. <i>Dependency</i>  The unit of the displayed measured value is taken from the System units submenu (→  57).

Decimal places 2

Navigation	 Expert → System → Display → Decimal places 2 (0117)
Prerequisite	A measured value is specified in the Value 2 display parameter (→  20).

Description	Use this function to select the number of decimal places for measured value 2.
Selection	■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx
Factory setting	x.xx
Additional information	<i>Description</i>  This setting does not affect the accuracy of the device for measuring or calculating the value.

Value 3 display

Navigation	  Expert → System → Display → Value 3 display (0110)
Prerequisite	A local display is provided.
Description	Use this function to select a measured value that is shown on the local display.
Selection	For the picklist, see the Value 1 display parameter (→  18)
Factory setting	None
Additional information	<i>Description</i> If several 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.  The Format display parameter (→  16) is used to specify how many measured values are displayed simultaneously and how. <i>Selection</i>  The unit of the displayed measured value is taken from the System units submenu (→  57).

0% bargraph value 3

Navigation	  Expert → System → Display → 0% bargraph 3 (0124)
Prerequisite	A selection was made in the Value 3 display parameter (→  21).
Description	Use this function to enter the 0% bar graph value to be shown on the display for the measured value 3.
User entry	Signed floating-point number

Factory setting	Country-specific: ■ 0 l/h ■ 0 gal/min (us)
Additional information	<i>Description</i>  The Format display parameter (→  16) is used to specify that the measured value is to be displayed as a bar graph. <i>User entry</i>  The unit of the displayed measured value is taken from the System units submenu (→  57).

100% bargraph value 3



Navigation	  Expert → System → Display → 100% bargraph 3 (0126)
Prerequisite	A selection was made in the Value 3 display parameter (→  21).
Description	Use this function to enter the 100% bar graph value to be shown on the display for the measured value 3.
User entry	Signed floating-point number
Factory setting	0
Additional information	<i>Description</i>  The Format display parameter (→  16) is used to specify that the measured value is to be displayed as a bar graph. <i>User entry</i>  The unit of the displayed measured value is taken from the System units submenu (→  57).

Decimal places 3



Navigation	  Expert → System → Display → Decimal places 3 (0118)
Prerequisite	A measured value is specified in the Value 3 display parameter (→  21).
Description	Use this function to select the number of decimal places for measured value 3.
Selection	■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx
Factory setting	x.xx

Additional information*Description*

This setting does not affect the accuracy of the device for measuring or calculating the value.

Value 4 display**Navigation**

Expert → System → Display → Value 4 display (0109)

Prerequisite

A local display is provided.

Description

Use this function to select a measured value that is shown on the local display.

Selection

For the picklist, see the **Value 1 display** parameter (→ 18)

Factory setting

None

Additional information*Description*

If several measured values are displayed at once, the measured value selected here will be the fourth value to be displayed. The value is only displayed during normal operation.



The **Format display** parameter (→ 16) is used to specify how many measured values are displayed simultaneously and how.

Selection

The unit of the displayed measured value is taken from the **System units** submenu (→ 57).

Custody transfer mode

Only available for Promag H.

Once the measuring device has been enabled for custody transfer mode, depending on the custody transfer approval selected the display can switch to showing the custody transfer counter.



For detailed information on custody transfer mode, see the Special Documentation for the device → 7

Decimal places 4**Navigation**

Expert → System → Display → Decimal places 4 (0119)

Prerequisite

A measured value is specified in the **Value 4 display** parameter (→ 23).

Description

Use this function to select the number of decimal places for measured value 4.

Selection

- x
- x.x
- x.xx
- x.xxx
- x.xxxx

Factory setting x.xx

Additional information *Description*



This setting does not affect the accuracy of the device for measuring or calculating the value.

Display interval

Navigation Expert → System → Display → Display interval (0096)

Prerequisite A local display is provided.

Description Use this function to enter the length of time the measured values are displayed if the values alternate on the display.

User entry 1 to 10 s

Factory setting 5 s

Additional information *Description*

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** parameter (→ 18)...**Value 8 display** parameter are used to specify which measured values are shown on the local display.
- The display format for the measured values displayed is defined in the **Format display** parameter (→ 16).

Custody transfer mode



Only available for Promag H.

Once the measuring device has been enabled for custody transfer mode, depending on the custody transfer approval selected the display can switch between showing the relevant information and the custody transfer counter.



For detailed information on custody transfer mode, see the Special Documentation for the device → 7

Display damping



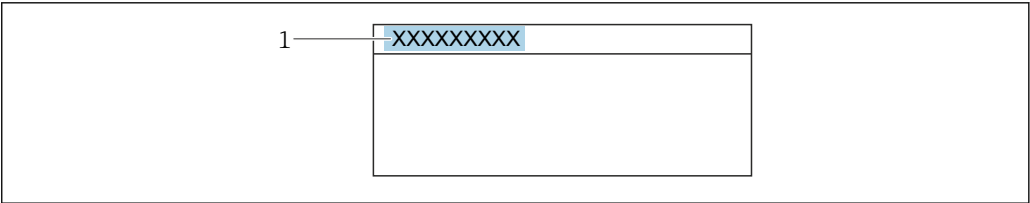
Navigation Expert → System → Display → Display damping (0094)

Prerequisite A local display is provided.

Description Use this function to enter a time constant for the reaction time of the local display to fluctuations in the measured value caused by process conditions.

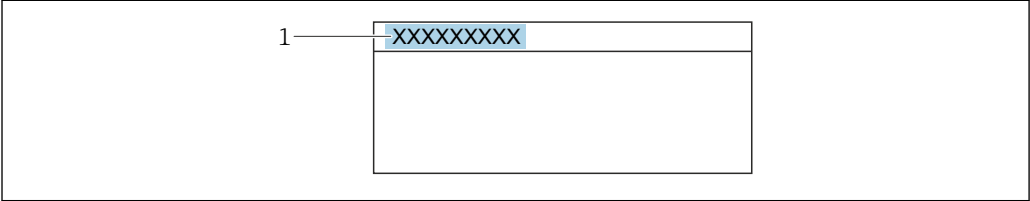
User entry 0.0 to 999.9 s

Factory setting	0.0 s
Additional information	<i>User entry</i> Use this function to enter a time constant (PT1 element ¹⁾) for display damping: ■ If a low time constant is entered, the display reacts particularly quickly to fluctuating measured variables. ■ On the other hand, the display reacts more slowly if a high time constant is entered.  Damping is switched off if 0 is entered (factory setting).

Header	
Navigation	 Expert → System → Display → Header (0097)
Prerequisite	A local display is provided.
Description	Use this function to select the contents of the header of the local display.
Selection	■ Device tag ■ Free text
Factory setting	Device tag
Additional information	<i>Description</i> The header text only appears during normal operation.  A0029422 1 <i>Position of the header text on the display</i> <i>Selection</i> ■ Device tag Is defined in the Device tag parameter (→  212). ■ Free text Is defined in the Header text parameter (→  25).

Header text	
Navigation	 Expert → System → Display → Header text (0112)
Prerequisite	The Free text option is selected in the Header parameter (→  25).

1) proportional transmission behavior with first order delay

Description	Use this function to enter a customer-specific text for the header of the local display.
User entry	Max. 12 characters, such as letters, numbers or special characters (e.g. @, %, /)
Factory setting	-----
Additional information	Description The header text only appears during normal operation.  A0029422 1 Position of the header text on the display User entry The number of characters displayed depends on the characters used.

Separator

Navigation	Expert → System → Display → Separator (0101)
Prerequisite	A local display is provided.
Description	Use this function to select the decimal separator.
Selection	▪ . (point) ▪ , (comma)
Factory setting	. (point)

Contrast display

Navigation	Expert → System → Display → Contrast display (0105)
Prerequisite	A local display is provided.
Description	Use this function to enter a value to adapt the display contrast to the ambient conditions (e.g. the lighting or viewing angle).
User entry	20 to 80 %
Factory setting	Depends on the display

Backlight

Navigation	 Expert → System → Display → Backlight (0111)
Prerequisite	One of the following conditions is met: ▪ Order code for "Display; operation", option F "4-line, illum.; touch control" ▪ Order code for "Display; operation", option G "4-line, illum.; touch control +WLAN" ▪ Order code for "Display; operation", option O "Remote display 4-line illuminated; 10m/30ft cable; touch control"
Description	Use this function to switch the backlight of the local display on and off.
Selection	▪ Disable ▪ Enable
Factory setting	Enable

3.1.2 "Configuration backup" submenu

Navigation  Expert → System → Config. backup

► Configuration backup		
Operating time (0652)	→	 27
Last backup (2757)	→	 28
Configuration management (2758)	→	 28
Backup state (2759)	→	 29
Comparison result (2760)	→	 29

Operating time

Navigation	 Expert → System → Config. backup → Operating time (0652)
Description	Use this function to display the length of time the device has been in operation.
User interface	Days (d), hours (h), minutes (m) and seconds (s)
Additional information	<i>User interface</i> The maximum number of days is 9999, which is equivalent to 27 years.

Last backup

Navigation	 Expert → System → Config. backup → Last backup (2757)
Description	Displays the time since a backup copy of the data was last saved to the device memory.
User interface	Days (d), hours (h), minutes (m) and seconds (s)

Configuration management



Navigation	 Expert → System → Config. backup → Config. managem. (2758)
Description	Use this function to select an action to save the data to the device memory.
Selection	■ Cancel ■ Execute backup ■ Restore * ■ Compare * ■ Clear backup data
Factory setting	Cancel
Additional information	<i>Selection</i>

Options	Description
Cancel	No action is executed and the user exits the parameter.
Execute backup	A backup copy of the current device configuration is saved from the HistoROM backup to the memory of the device. The backup copy includes the transmitter data of the device. The following message appears on local display: Backup active, please wait!
Restore	The last backup copy of the device configuration is restored from the device memory to the device's HistoROM backup. The backup copy includes the transmitter data of the device. The following message appears on local display: Restore active! Do not interrupt power supply!
Compare	The device configuration saved in the device memory is compared with the current device configuration of the HistoROM backup. The following message appears on local display: Comparing files The result can be viewed in Comparison result parameter.
Clear backup data	The backup copy of the device configuration is deleted from the memory of the device. The following message appears on local display: Deleting file

HistoROM

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

* Visibility depends on order options or device settings

Backup state

Navigation  Expert → System → Config. backup → Backup state (2759)

Description Displays the status of the data backup process.

User interface

- None
- Backup in progress
- Restoring in progress
- Delete in progress
- Compare in progress
- Restoring failed
- Backup failed

Factory setting None

Comparison result

Navigation  Expert → System → Config. backup → Compar. result (2760)

Description Displays the last result of the comparison of the data records in the device memory and in the HistoROM.

User interface

- Settings identical
- Settings not identical
- No backup available
- Backup settings corrupt
- Check not done
- Dataset incompatible

Factory setting Check not done

Additional information *Description*



The comparison is started via the **Compare** option in the **Configuration management** parameter (→  28).

Selection

Options	Description
Settings identical	The current device configuration of the HistoROM is identical to the backup copy in the device memory. If the transmitter configuration of another device has been transmitted to the device via HistoROM in the Configuration management parameter, the current device configuration of the HistoROM is only partially identical to the backup copy in the device memory: The settings for the transmitter are not identical.
Settings not identical	The current device configuration of the HistoROM is not identical to the backup copy in the device memory.
No backup available	There is no backup copy of the device configuration of the HistoROM in the device memory.
Backup settings corrupt	The current device configuration of the HistoROM is corrupt or not compatible with the backup copy in the device memory.

Options	Description
Check not done	The device configuration of the HistoROM has not yet been compared to the backup copy in the device memory.
Dataset incompatible	The backup copy in the device memory is not compatible with the device.

HistoROM

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

3.1.3 "Diagnostic handling" submenu

Navigation  Expert → System → Diagn. handling

► Diagnostic handling

Alarm delay (0651) →  30

► Diagnostic behavior →  31

Alarm delay

Navigation  Expert → System → Diagn. handling → Alarm delay (0651)

Description Use this function to enter the time interval until the device generates a diagnostic message.

 The diagnostic message is reset without a time delay.

User entry 0 to 60 s

Factory setting 0 s

Additional information *Effect*
This setting affects the following diagnostic messages:

- 170 coil resistance
- 832 Electronics temperature too high
- 833 Electronics temperature too low
- 834 Process temperature too high
- 835 Process temperature too low
- 962 empty pipe

"Diagnostic behavior" submenu

Each item of diagnostic information is assigned a specific diagnostic behavior at the factory. The user can change this assignment for specific diagnostic information in the **Diagnostic behavior** submenu (→  31).

The following options are available in the **Assign behavior of diagnostic no. xxx** parameters:

Options	Description
Alarm	The device stops measurement. The signal outputs and totalizers assume the defined alarm condition. A diagnostic message is generated. The background lighting changes to red.
Warning	The device continues to measure. The signal outputs and totalizers are not affected. A diagnostic message is generated.
Logbook entry only	The device continues to measure. The diagnostic message is displayed only in the Event logbook submenu (→  210) (Event list submenu (→  210)) and is not displayed in alternation with the operational display.
Off	The diagnostic event is ignored, and no diagnostic message is generated or entered.



For a list of all the diagnostic events, see the Operating Instructions for the device
→  7

Navigation

  Expert → System → Diagn. handling → Diagn. behavior

► Diagnostic behavior	
Assign behavior of diagnostic no. 043 (0650)	→  32
Assign behavior of diagnostic no. 143 (0644)	→  33
Assign behavior of diagnostic no. 302 (0739)	→  33
Assign behavior of diagnostic no. 376 (0645)	→  33
Assign behavior of diagnostic no. 377 (0777)	→  34
Assign behavior of diagnostic no. 441 (0657)	→  34
Assign behavior of diagnostic no. 442 (0658)	→  34
Assign behavior of diagnostic no. 443 (0659)	→  35
Assign behavior of diagnostic no. 444 (0740)	→  35

Assign behavior of diagnostic no. 531 (0741)	→  35
Assign behavior of diagnostic no. 543 (0643)	→  36
Assign behavior of diagnostic no. 599 (0646)	→  36
Assign behavior of diagnostic no. 832 (0681)	→  36
Assign behavior of diagnostic no. 833 (0682)	→  37
Assign behavior of diagnostic no. 834 (0700)	→  37
Assign behavior of diagnostic no. 835 (0702)	→  38
Assign behavior of diagnostic no. 842 (0638)	→  38
Assign behavior of diagnostic no. 961 (0736)	→  39
Assign behavior of diagnostic no. 962 (0745)	→  39
Assign behavior of diagnostic no. 937 (0743)	→  38
Assign behavior of diagnostic no. 938 (0642)	→  39

Assign behavior of diagnostic no. 043 (Sensor short circuit)

Navigation	  Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 043 (0650)
Description	Use this function to change the diagnostic behavior of the 043 Sensor short circuit diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	 For a detailed description of the options available: →  31

Assign behavior of diagnostic no. 143 (HBSI limit exceeded)



Navigation	Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 143 (0644)
Description	Change behavior of diagnostic event with diagnostic number 143 'HBSI limit exceeded'.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	For a detailed description of the options available: → 31

Assign behavior of diagnostic no. 302 (Device verification active)



Navigation	Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 302 (0739)
Description	Use this function to change the diagnostic behavior of the 302 Device verification active diagnostic message.
Selection	■ Off ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	For a detailed description of the options available: → 31

Assign behavior of diagnostic no. 376 (Sensor electronics (ISEM) faulty)



Navigation	Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 376 (0645)
Description	Use this function to change the diagnostic behavior of the 376 Sensor electronics (ISEM) faulty diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	For a detailed description of the options available: → 31

Assign behavior of diagnostic no. 377 (Sensor electronics (ISEM) faulty)



Navigation	Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 377 (0777)
Description	Use this function to change the diagnostic behavior of the 377 Sensor electronics (ISEM) faulty diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	For a detailed description of the options available: → 31

Assign behavior of diagnostic no. 441 (Current output 1 to n)



Navigation	Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 441 (0657)
Description	Use this function to change the diagnostic behavior of the 441 Current output 1 to n diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	For a detailed description of the options available: → 31

Assign behavior of diagnostic no. 442 (Frequency output 1 to n)



Navigation	Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 442 (0658)
Prerequisite	The measuring device has a pulse/frequency/switch output.
Description	Use this function to change the diagnostic behavior of the 442 Frequency output 1 to n diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning

Additional information  For a detailed description of the options available: →  31

Assign behavior of diagnostic no. 443 (Pulse output 1 to n)



Navigation	 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 443 (0659)
Prerequisite	The measuring device has a pulse/frequency/switch output.
Description	Use this function to change the diagnostic behavior of the 443 Pulse output 1 to n diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	 For a detailed description of the options available: →  31

Assign behavior of diagnostic no. 444 (Current input 1 to n)



Navigation	 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 444 (0740)
Prerequisite	The device has one current input.
Description	Use this function to change the diagnostic behavior of the 444 Current input 1 to n diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	 For a detailed description of the options available: →  31

Assign behavior of diagnostic no. 531 (Empty pipe detection)



Navigation	 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 531 (0741)
Description	Use this function to change the diagnostic behavior of the 531 Empty pipe detection diagnostic message.

Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	 For a detailed description of the options available: →  31

Assign behavior of diagnostic no. 543 (Double pulse output)



Navigation	  Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 543 (0643)
Description	Use this function to change the diagnostic behavior of the 543 Double pulse output diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	 For a detailed description of the options available: →  31

Assign behavior of diagnostic no. 599 (Custody transfer logbook full)



Navigation	  Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 599 (0646)
Description	Use this function to select the diagnostic behavior of the △S599 Custody transfer logbook full diagnostic message
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning

Assign behavior of diagnostic no. 832 (Electronics temperature too high)



Navigation	  Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 832 (0681)
Description	Use this function to change the diagnostic behavior of the 832 Electronics temperature too high diagnostic message.

Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Logbook entry only
Additional information	 For a detailed description of the options available: →  31

Assign behavior of diagnostic no. 833 (Electronics temperature too low)

Navigation	  Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 833 (0682)
Description	Use this function to change the diagnostic behavior of the 833 Electronics temperature too low diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Logbook entry only
Additional information	 For a detailed description of the options available: →  31

Assign behavior of diagnostic no. 834 (Process temperature too high)

Navigation	  Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 834 (0700)
Description	Use this function to change the diagnostic behavior of the 834 Process temperature too high diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	 For a detailed description of the options available: →  31

Assign behavior of diagnostic no. 835 (Process temperature too low)



Navigation	 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 835 (0702)
Description	Use this function to change the diagnostic behavior of the 835 Process temperature too low diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	 For a detailed description of the options available: →  31

Assign behavior of diagnostic no. 842 (Process limit)



Navigation	 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 842 (0638)
Description	Use this function to change the diagnostic behavior of the 842 Process limit diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Off
Additional information	 For a detailed description of the options available: →  31

Assign behavior of diagnostic no. 937 (EMC interference)



Navigation	 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 937 (0743)
Description	Use this function to change the diagnostic behavior of the 937 EMC interference diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	 For a detailed description of the options available: →  31

Assign behavior of diagnostic no. 938 (EMC interference)



Navigation	Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 938 (0642)
Description	Use this function to change the diagnostic behavior of the 938 EMC interference diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Alarm
Additional information	For a detailed description of the options available: → 31

Assign behavior of diagnostic no. 961 (Electrode potential out of specification)



Navigation	Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 961 (0736)
Description	Use this function to change the diagnostic behavior of the 861 Process fluid diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Alarm
Additional information	For a detailed description of the options available: → 31

Assign behavior of diagnostic no. 962 (Pipe empty)



Navigation	Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 962 (0745)
Description	Use this function to change the diagnostic behavior of the 862 Pipe empty diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning

Additional information  For a detailed description of the options available: →  31

3.1.4 "Administration" submenu

Navigation   Expert → System → Administration

▶ Administration		
▶ Define access code	→ 	40
▶ Reset access code	→ 	41
Device reset (0000)	→ 	42
Transmitter identifier (2765)	→ 	43
Activate SW option (0029)	→ 	43
Software option overview (0015)	→ 	44

"Define access code" wizard

 The **Define access code** wizard (→  40) is only available when operating via the local display or Web browser.

If operating via the operating tool, the **Define access code** parameter can be found directly in the **Administration** submenu. There is no **Confirm access code** parameter if the device is operated via the operating tool.

Navigation  Expert → System → Administration → Def. access code

▶ Define access code		
Define access code	→ 	40
Confirm access code	→ 	41

Define access code

Navigation   Expert → System → Administration → Def. access code → Def. access code

Description Use this function to enter a user-specific release code to restrict write-access to the parameters. This protects the device configuration against any inadvertent modifications via the local display, Web browser, FieldCare or DeviceCare (via CDI-RJ45 service interface).

User entry	Max. 16-digit character string comprising numbers, letters and special characters
Additional information	<i>Description</i> The write protection affects all parameters in the document marked with the  symbol. On the local display, the  symbol in front of a parameter indicates that the parameter is write-protected. The parameters that cannot be write-accessed are grayed out in the Web browser.  Once the access code has been defined, write-protected parameters can only be modified if the access code is entered in the Enter access code parameter (→  13).  If you lose the access code, please contact your Endress+Hauser sales organization. <i>User entry</i> A message is displayed if the access code is not in the input range. <i>Factory setting</i> If the factory setting is not changed or 0 is defined as the access code, the parameters are not write-protected and the device configuration data can be modified. The user is logged on in the "Maintenance" role.

Confirm access code	
Navigation	  Expert → System → Administration → Def. access code → Confirm code
Description	Enter the defined release code a second time to confirm the release code.
User entry	Max. 16-digit character string comprising numbers, letters and special characters

"Reset access code" submenu

Navigation   Expert → System → Administration → Reset acc. code

▶ Reset access code

Operating time (0652)

→  41

Reset access code (0024)

→  42

Operating time	
Navigation	  Expert → System → Administration → Reset acc. code → Operating time (0652)
Description	Use this function to display the length of time the device has been in operation.

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

Additional information *User interface*

The maximum number of days is 9999, which is equivalent to 27 years.

Reset access code

Navigation  Expert → System → Administration → Reset acc. code → Reset acc. code (0024)

Description Use this function to enter a reset code to reset the user-specific access codes to the factory setting .

User entry Character string comprising numbers, letters and special characters

Factory setting 0x00

Additional information *Description*



For a reset code, contact your Endress+Hauser service organization.

User entry

The reset code can only be entered via:

- Web browser
- DeviceCare, FieldCare (via CDI RJ45 interface)
- Fieldbus

Additional parameters in the "Administration" submenu

Device reset



Navigation  Expert → System → Administration → Device reset (0000)

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

Selection

- Cancel
- To delivery settings
- Restart device
- Restore S-DAT backup *

Factory setting Cancel

* Visibility depends on order options or device settings

Additional information*Options*

Options	Description
Cancel	No action is executed and the user exits the parameter.
To delivery settings	Every parameter for which a customer-specific default setting was ordered is reset to the customer-specific value. All other parameters are reset to the factory setting.
Restart device	The restart resets every parameter with data stored in volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.
Restore S-DAT backup	Restores the data that is saved on the S-DAT. Additional information: This function can be used to resolve the memory issue "083 Memory content inconsistent" or to restore the S-DAT data when a new S-DAT has been installed.  This option is displayed only in an alarm condition.

Transmitter identifier**Navigation** Expert → System → Administration → Transm. identif. (2765)**Description**

Select transmitter identifier.

User interface

- Unknown
- 500
- 300

Factory setting

300

Activate SW option**Navigation** Expert → System → Administration → Activate SW opt. (0029)**Description**

Use this function to enter an activation code to enable an additional, ordered software option.

User entry

Max. 10-digit string consisting of numbers.

Factory setting

Depends on the software option ordered

Additional information*Description*

If a measuring device was ordered with an additional software option, the activation code is programmed in the device at the factory.

User entry To activate a software option subsequently, please contact your Endress+Hauser sales organization.**NOTE!****The activation code is linked to the serial number of the measuring device and varies according to the device and software option.**

If an incorrect or invalid code is entered, this results in the loss of software options that have already been activated.

- ▶ Before you enter a new activation code, make a note of the current activation code .
- ▶ Enter the new activation code provided by Endress+Hauser when the new software option was ordered.
- ▶ Once the activation code has been entered, check if the new software option is displayed in the **Software option overview** parameter (→  44).
- ↳ The new software option is active if it is displayed.
- ↳ If the new software option is not displayed or all software options have been deleted, the code entered was either incorrect or invalid.
- ▶ If the code entered is incorrect or invalid, enter the old activation code .
- ▶ Have your Endress+Hauser sales organization check the new activation code remembering to specify the serial number or ask for the code again.

Example for a software option

Order code for "Application package", option **EA** "Extended HistoROM"

 The software options currently enabled are displayed in the **Software option overview** parameter (→  44).

Web browser

 Once a software option has been activated, the page must be loaded again in the Web browser.

Software option overview

Navigation	  Expert → System → Administration → SW option overv. (0015)
Description	Displays all the software options that are enabled in the device.
User interface	■ Extended HistoROM * ■ SIL ■ Electrode cleaning circuit * ■ Custody transfer ■ OPC-UA ■ Build-up index ■ Heartbeat Monitoring * ■ Heartbeat Verification *

* Visibility depends on order options or device settings

Additional information

Description

Displays all the options that are available if ordered by the customer.

"Extended HistoROM" option

Order code for "Application package", option EA "Extended HistoROM"

"SIL" option

Order code for "Additional approval", option LA "SIL"

"Electrode cleaning circuit" option

Order code for "Application package", option **EC** "ECC electrode cleaning"

"Heartbeat Verification" option and "Heartbeat Monitoring" option

Order code for "Application package", option EB "Heartbeat Verification + Monitoring"

"Custody transfer" option

The measuring device has an approval for custody transfer measurement.

 Detailed information on the national and international approvals for custody transfer that are currently available can be supplied by your Endress+Hauser sales organization.

"OPC-UA" option

 Only available for the HART communication protocol.

Order code for "Application package", option EL "OPC-UA Server"

3.2 "Sensor" submenu

Navigation  Expert → Sensor

► Sensor	
► Measured values	→  46
► System units	→  57
► Process parameters	→  73
► External compensation	→  89
► Sensor adjustment	→  93
► Calibration	→  100
► Build-up index adjustment	→  101

3.2.1 "Measured values" submenu

Navigation  Expert → Sensor → Measured val.

► Measured values		
► Process variables	→ 	46
► Totalizer	→ 	49
► Input values	→ 	51
► Output values	→ 	52

"Process variables" submenu

Navigation  Expert → Sensor → Measured val. → Process variab.

► Process variables		
Volume flow (1838)	→ 	46
Mass flow (1847)	→ 	47
Corrected volume flow (1851)	→ 	47
Flow velocity (1854)	→ 	47
Conductivity (1850)	→ 	47
Corrected conductivity (1853)	→ 	48
Temperature (1852)	→ 	48
Density (1857)	→ 	48

Volume flow

Navigation  Expert → Sensor → Measured val. → Process variab. → Volume flow (1838)

Description Displays the volume flow that is currently measured.

User interface Signed floating-point number

Additional information

Mass flow

Navigation	 Expert → Sensor → Measured val. → Process variab. → Mass flow (1847)
Description	Displays the mass flow that is currently calculated.
User interface	Signed floating-point number
Additional information	<i>Dependency</i>  The unit is taken from the Mass flow unit parameter (→  61)

Corrected volume flow

Navigation	 Expert → Sensor → Measured val. → Process variab. → CorrecVolumeFlow (1851)
Description	Displays the corrected volume flow that is currently measured.
User interface	Signed floating-point number
Additional information	<i>Dependency</i>  The unit is taken from the Corrected volume flow unit parameter (→  63)

Flow velocity

Navigation	 Expert → Sensor → Measured val. → Process variab. → Flow velocity (1854)
Description	Displays the flow velocity that is currently calculated.
User interface	Signed floating-point number

Conductivity

Navigation	 Expert → Sensor → Measured val. → Process variab. → Conductivity (1850)
Description	Displays the conductivity that is currently measured.
User interface	Signed floating-point number
Additional information	<i>Dependency</i>  The unit is taken from the Conductivity unit parameter (→  59)

Corrected conductivity

Navigation	 Expert → Sensor → Measured val. → Process variab. → CorrConductivity (1853)
Prerequisite	One of the following conditions is met: ■ Order code for "Sensor option", option CI "Medium temperature measurement" or ■ The temperature is read into the flowmeter from an external device.
Description	Displays the conductivity that is currently corrected.
User interface	Positive floating-point number
Additional information	<i>Dependency</i>  The unit is taken from the Conductivity unit parameter (→  59)

Temperature

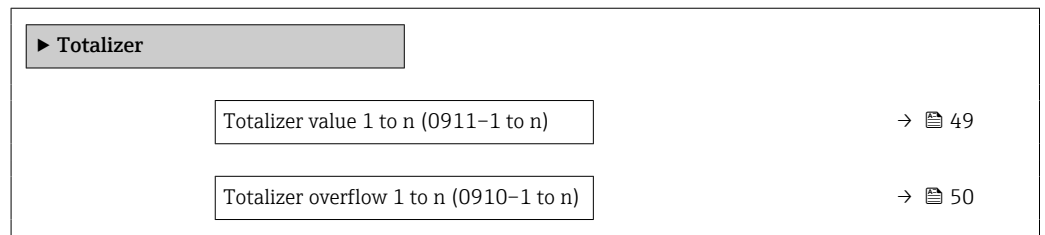
Navigation	 Expert → Sensor → Measured val. → Process variab. → Temperature (1852)
Prerequisite	One of the following conditions is met: ■ Order code for "Sensor option", option CI "Medium temperature measurement" or ■ The temperature is read into the flowmeter from an external device.
Description	Displays the temperature that is currently calculated.
User interface	Positive floating-point number
Additional information	<i>Dependency</i>  The unit is taken from the Temperature unit parameter (→  60)

Density

Navigation	 Expert → Sensor → Measured val. → Process variab. → Density (1857)
Description	Displays the current fixed density or density read in from an external device.
User interface	Signed floating-point number
Additional information	<i>Dependency</i>  The unit is taken from the Density unit parameter (→  62)

"Totalizer" submenu

Navigation  Expert → Sensor → Measured val. → Totalizer

**Totalizer value 1 to n**

Navigation	 Expert → Sensor → Measured val. → Totalizer → Totalizer val. 1 to n (0911-1 to n)
Prerequisite	A process variable is selected in the Assign process variable parameter (→  198) of the Totalizer 1 to n submenu.
Description	Displays the current totalizer counter reading.
User interface	Signed floating-point number
Additional information	<i>Description</i> As the operating tool can only display a maximum of 7 digits, if the display range is exceeded the current counter reading is the sum of the totalizer value and the overflow value from the Totalizer overflow 1 to n parameter.  In the event of an error, the totalizer adopts the mode defined in the Failure mode parameter (→  201). <i>User interface</i> The value of the process variable totalized since measuring began can be positive or negative. This depends on the settings in the Totalizer operation mode parameter (→  200).  The unit of the selected process variable is specified for the totalizer in the Unit totalizer parameter (→  198). <i>Example</i> Calculation of the current totalizer reading when the value exceeds the 7-digit display range of the operating tool: ■ Value in the Totalizer value 1 parameter: 1 968 457 m³ ■ Value in the Totalizer overflow 1 parameter: $1 \cdot 10^7$ (1 overflow) = 10 000 000 m³ ■ Current totalizer reading: 11 968 457 m³

Totalizer overflow 1 to n 	
Navigation	  Expert → Sensor → Measured val. → Totalizer → Tot. overflow 1 to n (0910–1 to n)
Prerequisite	A process variable is selected in the Assign process variable parameter (→  198) of the Totalizer 1 to n submenu.
Description	Displays the current totalizer overflow.
User interface	Integer with sign
Additional information	<i>Description</i> If the current totalizer reading exceeds 7 digits, which is the maximum value range that can be displayed by the operating tool, the value above this range is output as an overflow. The current totalizer value is therefore the sum of the overflow value and the totalizer value from the Totalizer value 1 to n parameter. <i>User interface</i>  The unit of the selected process variable is specified for the totalizer in the Unit totalizer parameter (→  198). <i>Example</i> Calculation of the current totalizer reading when the value exceeds the 7-digit display range of the operating tool: ■ Value in the Totalizer value 1 parameter: 1 968 457 m³ ■ Value in the Totalizer overflow 1 parameter: $2 \cdot 10^7$ (2 overflows) = 20 000 000 [m³] ■ Current totalizer reading: 21 968 457 m³
Totalizer 1 to n value	

Navigation	  Expert → Sensor → Measured val. → Totalizer → Tot. 1 to n value
Description	Shows the totalizer value reported to the controller for further processing.
User interface	Signed floating-point number
Factory setting	0 m ³

Totalizer 1 to n status	
Navigation	  Expert → Sensor → Measured val. → Totalizer → Tot. 1 to n status
Description	Shows the status of the totalizer value reported to the controller for further processing ('Good', 'Uncertain', 'Bad').
User interface	■ Good ■ Uncertain ■ Bad

Factory setting Good

Totalizer 1 to n status (Hex)

Navigation	 Expert → Sensor → Measured val. → Totalizer → Status 1 to n (Hex)
Description	Shows the status of the totalizer value reported to the controller for further processing (Hex).
User interface	0 to 255
Factory setting	128

"Input values" submenu

Navigation  Expert → Sensor → Measured val. → Input values

▶ Input values	
▶ Current input 1 to n	→  51
▶ Value status input 1 to n	→  52

"Current input 1 to n" submenu

Navigation  Expert → Sensor → Measured val. → Input values → Current input 1 to n

▶ Current input 1 to n	
Measured values 1 to n (1603-1 to n)	→  51
Measured current 1 to n (1604-1 to n)	→  52

Measured values 1 to n

Navigation	 Expert → Sensor → Measured val. → Input values → Current input 1 to n → Measured val. 1 to n (1603-1 to n)
Description	Displays the current input value.
User interface	Signed floating-point number

Measured current 1 to n

Navigation	 Expert → Sensor → Measured val. → Input values → Current input 1 to n → Measur. curr. 1 to n (1604–1 to n)
Description	Displays the current value of the current input.
User interface	0 to 22.5 mA

"Value status input 1 to n" submenu

Navigation	 Expert → Sensor → Measured val. → Input values → Val.stat.inp. 1 to n
------------	---

► Value status input 1 to n

Value status input (1353–1 to n) →  52

Value status input

Navigation	 Expert → Sensor → Measured val. → Input values → Val.stat.inp. 1 to n → Val.stat.inp. (1353–1 to n)
Description	Displays the current input signal level.
User interface	■ High ■ Low

"Output values" submenu

Navigation	 Expert → Sensor → Measured val. → Output values
------------	---

► Output values

► Value current output 1 to n →  53

► Pulse/frequency/switch output 1 to n →  53

► Relay output 1 to n	→ 55
► Double pulse output	→ 56

"Value current output 1 to n" submenu

Navigation  Expert → Sensor → Measured val. → Output values → Val. curr.outp 1 to n

► Value current output 1 to n	
Output current 1 to n (0361-1 to n)	→ 53
Measured current 1 to n (0366-1 to n)	→ 53

Output current 1 to n

Navigation	 Expert → Sensor → Measured val. → Output values → Val. curr.outp 1 to n → Output curr. 1 to n (0361-1 to n)
Description	Displays the current value currently calculated for the current output.
User interface	0 to 22.5 mA

Measured current 1 to n

Navigation	 Expert → Sensor → Measured val. → Output values → Val. curr.outp 1 to n → Measur. curr. 1 to n (0366-1 to n)
Description	Displays the actual measured value of the output current.
User interface	0 to 30 mA

"Pulse/frequency/switch output 1 to n" submenu

Navigation  Expert → Sensor → Measured val. → Output values → PFS output 1 to n

► Pulse/frequency/switch output 1 to n
--

Output frequency 1 to n (0471-1 to n)	→ 54
Pulse output 1 to n (0456-1 to n)	→ 54
Switch state 1 to n (0461-1 to n)	→ 55

Output frequency 1 to n

Navigation	Expert → Sensor → Measured val. → Output values → PFS output 1 to n → Output freq. 1 to n (0471-1 to n)
Prerequisite	In the Operating mode parameter (→ 127), the Frequency option is selected.
Description	Displays the actual value of the output frequency which is currently measured.
User interface	0.0 to 12 500.0 Hz

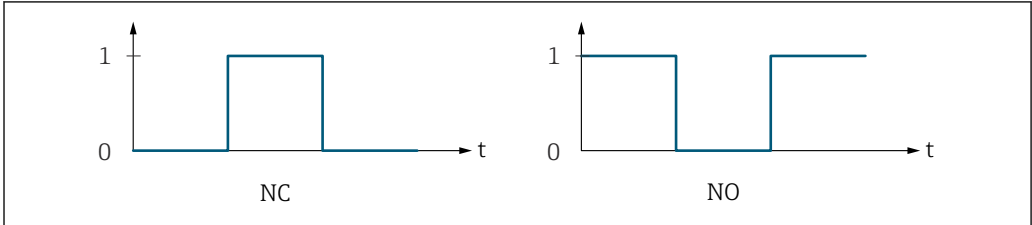
Pulse output 1 to n

Navigation	Expert → Sensor → Measured val. → Output values → PFS output 1 to n → Pulse output 1 to n (0456-1 to n)
Prerequisite	The Pulse option is selected in the Operating mode parameter (→ 127) parameter.
Description	Displays the pulse frequency currently output.
User interface	Positive floating-point number

Additional information

Description

- The pulse output is an open collector output.
- This is configured at the factory in such a way that the transistor is conductive for the duration of the pulse (NO contact) and is safety-oriented.



0 Non-conductive
1 Conductive
NC NC contact (normally closed)
NO NO contact (normally open)

The output behavior can be reversed via the **Invert output signal** parameter (→ 144) i.e. the transistor does not conduct for the duration of the pulse.

In addition, the behavior of the output in the event of a device alarm (**Failure mode** parameter (→  131)) can be configured.

Switch state 1 to n

Navigation	  Expert → Sensor → Measured val. → Output values → PFS output 1 to n → Switch state 1 to n (0461–1 to n)
Prerequisite	The Switch option is selected in the Operating mode parameter (→  127).
Description	Displays the current switch status of the status output.
User interface	■ Open ■ Closed
Additional information	<i>User interface</i> ■ Open The switch output is not conductive. ■ Closed The switch output is conductive.

"Relay output 1 to n" submenu

Navigation

  Expert → Sensor → Measured val. → Output values → Relay output 1 to n

► Relay output 1 to n

Switch state (0801–1 to n)

→  55

Switch cycles (0815–1 to n)

→  56

Max. switch cycles number (0817–1 to n)

→  56

Switch state

Navigation	  Expert → Sensor → Measured val. → Output values → Relay output 1 to n → Switch state (0801–1 to n)
Description	Displays the current status of the relay output.
User interface	■ Open ■ Closed

Additional information	User interface ■ Open The relay output is not conductive. ■ Closed The relay output is conductive.
------------------------	---

Switch cycles

Navigation	 Expert → Sensor → Measured val. → Output values → Relay output 1 to n → Switch cycles (0815–1 to n)
Description	Displays all the switch cycles performed.
User interface	Positive integer

Max. switch cycles number

Navigation	 Expert → Sensor → Measured val. → Output values → Relay output 1 to n → Max. cycles no. (0817–1 to n)
Description	Displays the maximum number of guaranteed switch cycles.
User interface	Positive integer

"Double pulse output" submenu

Navigation

 Expert → Sensor → Measured val. → Output values → Double pulse out

► Double pulse output

Pulse output (0987)

→  56

Pulse output

Navigation	 Expert → Sensor → Measured val. → Output values → Double pulse out → Pulse output (0987)
Description	Displays the pulse frequency of the double pulse output which is currently output.
User interface	Positive floating-point number

Additional information  For a detailed description and example: **Pulse output** parameter (→  54)

3.2.2 "System units" submenu

Navigation   Expert → Sensor → System units

► System units

Volume flow unit

Volume unit

Conductivity unit

Temperature unit

Mass flow unit

Mass unit

Density unit

Corrected volume flow unit

Corrected volume unit

Date/time format

Volume flow unit

Navigation   Expert → Sensor → System units → Volume flow unit (0553)

Description Use this function to select the unit for the volume flow.

Selection*SI units*

- cm³/s
- cm³/min
- cm³/h
- cm³/d
- dm³/s
- dm³/min
- dm³/h
- dm³/d
- m³/s
- m³/min
- m³/h
- m³/d
- ml/s
- ml/min
- ml/h
- ml/d
- l/s
- l/min
- l/h
- l/d
- hl/s
- hl/min
- hl/h
- hl/d
- Ml/s
- Ml/min
- Ml/h
- Ml/d

US units

- af/s
- af/min
- af/h
- af/d
- ft³/s
- ft³/min
- ft³/h
- ft³/d
- kft³/s
- kft³/min
- kft³/h
- kft³/d
- MMft³/s
- MMft³/min
- MMft³/h
- Mft³/d
- fl oz/s (us)
- fl oz/min (us)
- fl oz/h (us)
- fl oz/d (us)
- gal/s (us)
- gal/min (us)
- gal/h (us)
- gal/d (us)
- Mgal/s (us)
- Mgal/min (us)
- Mgal/h (us)
- Mgal/d (us)
- bbl/s (us;liq.)
- bbl/min (us;liq.)
- bbl/h (us;liq.)
- bbl/d (us;liq.)
- bbl/s (us;beer)
- bbl/min (us;beer)
- bbl/h (us;beer)
- bbl/d (us;beer)
- bbl/s (us;oil)
- bbl/min (us;oil)
- bbl/h (us;oil)
- bbl/d (us;oil)
- bbl/s (us;tank)
- bbl/min (us;tank)
- bbl/h (us;tank)
- bbl/d (us;tank)
- kgal/s (us)
- kgal/min (us)
- kgal/h (us)
- kgal/d (us)

Imperial units

- gal/s (imp)
- gal/min (imp)
- gal/h (imp)
- gal/d (imp)
- Mgal/s (imp)
- Mgal/min (imp)
- Mgal/h (imp)
- Mgal/d (imp)
- bbl/s (imp;beer)
- bbl/min (imp;beer)
- bbl/h (imp;beer)
- bbl/d (imp;beer)
- bbl/s (imp;oil)
- bbl/min (imp;oil)
- bbl/h (imp;oil)
- bbl/d (imp;oil)

Factory setting

Depends on country:

- l/h
- gal/min (us)

Additional information	<i>Effect</i> The selected unit applies for: Volume flow parameter (→ ⓘ 46)		
	<i>Selection</i> ⓘ For an explanation of the abbreviated units: → ⓘ 266		
	<i>Customer-specific units</i> ⓘ The unit for the customer-specific volume is specified in the User volume text parameter (→ ⓘ 65).		
Volume unit ⓘ			
Navigation	ⓘ ⓘ Expert → Sensor → System units → Volume unit (0563)		
Description	Use this function to select the unit for the volume.		
Selection	<i>SI units</i> ■ cm³ ■ dm³ ■ m³ ■ ml ■ l ■ hl ■ Ml Mega	<i>US units</i> ■ af ■ ft³ ■ Mft³ ■ Mft³ ■ fl oz (us) ■ gal (us) ■ kgal (us) ■ Mgal (us) ■ bbl (us;oil) ■ bbl (us;liq.) ■ bbl (us;beer) ■ bbl (us;tank)	<i>Imperial units</i> ■ gal (imp) ■ Mgal (imp) ■ bbl (imp;beer) ■ bbl (imp;oil)
Factory setting	Country-specific: ■ m³ ■ gal (us)		
Additional information	<i>Selection</i> ⓘ For an explanation of the abbreviated units: → ⓘ 266		
	<i>Customer-specific units</i> ⓘ The unit for the customer-specific volume is specified in the User volume text parameter (→ ⓘ 65).		
Conductivity unit ⓘ			

Navigation	ⓘ ⓘ Expert → Sensor → System units → Conductiv. unit (0582)
Prerequisite	The On option is selected in the Conductivity measurement parameter (→ ⓘ 76) parameter.

Description Use this function to select the unit for the conductivity.

- Selection**
- SI units*
- nS/cm
 - µS/cm
 - µS/m
 - µS/mm
 - mS/m
 - mS/cm
 - S/cm
 - S/m
 - kS/m
 - MS/m

Factory setting µS/cm

Additional information *Effect*

The selected unit applies for:

- **Conductivity** parameter (→ ⓘ 47)
- **Corrected conductivity** parameter (→ ⓘ 48)

Selection

 For an explanation of the abbreviated units: → ⓘ 266

Temperature unit ⓘ

Navigation ⓘ ⓘ Expert → Sensor → System units → Temperature unit (0557)

Description Use this function to select the unit for the temperature.

- Selection**
- | <i>SI units</i> | <i>US units</i> |
|-----------------|-----------------|
| ■ °C | ■ °F |
| ■ K | ■ °R |

Factory setting Country-specific:

- °C
- °F

Additional information *Effect*

The selected unit applies for:

- **Temperature** parameter (→ ⓘ 48)
- **Maximum value** parameter (→ ⓘ 230)
- **Minimum value** parameter (→ ⓘ 230)
- **External temperature** parameter (→ ⓘ 91)
- **Maximum value** parameter (→ ⓘ 233)
- **Minimum value** parameter (→ ⓘ 233)

Selection

 For an explanation of the abbreviated units: → ⓘ 266

Mass flow unit

Navigation

Expert → Sensor → System units → Mass flow unit (0554)

Description

Use this function to select the unit for the mass flow.

Selection

SI units

■ g/s

■ g/min

■ g/h

■ g/d

■ kg/s

■ kg/min

■ kg/h

■ kg/d

■ t/s

■ t/min

■ t/h

■ t/d

US units

■ oz/s

■ oz/min

■ oz/h

■ oz/d

■ lb/s

■ lb/min

■ lb/h

■ lb/d

■ STon/s

■ STon/min

■ STon/h

■ STon/d

Factory setting

Country-specific:

■ kg/h

■ lb/min

Additional information

Effect

The selected unit applies for:

Mass flow

parameter (→ 47)

Selection

For an explanation of the abbreviated units: → 266

Customer-specific units

The unit for the customer-specific mass is specified in the **User mass text** parameter (→ 67).

Mass unit

Navigation

Expert → Sensor → System units → Mass unit (0574)

Description

Use this function to select the unit for the mass.

Selection

SI units

■ g

■ kg

■ t

US units

■ oz

■ lb

■ STon

Factory setting

Country-specific:

■ kg

■ lb

Additional information

Selection

 For an explanation of the abbreviated units: →  266

Customer-specific units

 The unit for the customer-specific mass is specified in the **User mass text** parameter (→  67).

Density unit



Navigation

  Expert → Sensor → System units → Density unit (0555)

Description

Use this function to select the unit for the density.

Selection

SI units

- g/cm³
- g/m³
- kg/l
- kg/dm³
- kg/m³
- SD4°C
- SD15°C
- SD20°C
- SG4°C
- SG15°C
- SG20°C

US units

- lb/ft³
- lb/gal (us)
- lb/bbl (us;liq.)
- lb/bbl (us;beer)
- lb/bbl (us;oil)
- lb/bbl (us;tank)

Imperial units

- lb/gal (imp)
- lb/bbl (imp;beer)
- lb/bbl (imp;oil)

Factory setting

Country-specific:

- kg/l
- lb/ft³

Additional information

Effect

The selected unit applies for:

- **External density** parameter (→  90)
- **Fixed density** parameter (→  89)

Selection

- SD = specific density

The specific density is the ratio of the medium density to the water density at a water temperature of +4 °C (+39 °F), +15 °C (+59 °F), +20 °C (+68 °F).

- SG = specific gravity

The specific gravity is the ratio of the medium density to the water density at a water temperature of +4 °C (+39 °F), +15 °C (+59 °F), +20 °C (+68 °F).

 For an explanation of the abbreviated units: →  266

Corrected volume flow unit		
Navigation	 Expert → Sensor → System units → Cor.volflow unit (0558)	
Description	Use this function to select the unit for the corrected volume flow.	
Selection	SI units ■ NI/s ■ NI/min ■ NI/h ■ NI/d ■ Nhl/s ■ Nhl/min ■ Nhl/h ■ Nhl/d ■ Nm³/s ■ Nm³/min ■ Nm³/h ■ Nm³/d ■ SI/s ■ SI/min ■ SI/h ■ SI/d ■ Sm³/s ■ Sm³/min ■ Sm³/h ■ Sm³/d US units ■ Sft³/s ■ Sft³/min ■ Sft³/h ■ Sft³/d ■ MSft³/s ■ MSft³/min ■ MSft³/h ■ MSft³/D ■ MMSft³/s ■ MMSft³/min ■ MMSft³/h ■ MMSft³/d ■ Sgal/s (us) ■ Sgal/min (us) ■ Sgal/h (us) ■ Sgal/d (us) ■ Sbbl/s (us;liq.) ■ Sbbl/min (us;liq.) ■ Sbbl/h (us;liq.) ■ Sbbl/d (us;liq.) ■ Sbbl/s (us;oil) ■ Sbbl/min (us;oil) ■ Sbbl/h (us;oil) ■ Sbbl/d (us;oil) Imperial units ■ Sgal/s (imp) ■ Sgal/min (imp) ■ Sgal/h (imp) ■ Sgal/d (imp)	
Factory setting	Country-specific: ■ NI/h ■ Sft³/h	
Additional information	Result The selected unit applies for: Corrected volume flow parameter (→  47) Selection  For an explanation of the abbreviated units: →  266 Customer-specific units  The unit for the customer-specific corrected volume is defined in the User corrected volume text parameter (→  68).	
Corrected volume unit		

Selection	SI units ■ NI ■ Nhl ■ Nm³ ■ Sl ■ Sm³
-----------	---

US units

■

 Sft³

■

 MSft³

■

 MMSft³

■

 Sgal (us)

■

 Sbbl (us;liq.)

■

 Sbbl (us;oil)

Imperial units

Sgal (imp)

Date/time format

🔒

Navigation

🔒

🔒

 Expert → Sensor → System units → Date/time format (2812)

Description Use this function to select the desired time format for calibration history.

- Selection
- dd.mm.yy hh:mm
 - dd.mm.yy hh:mm am/pm
 - mm/dd/yy hh:mm
 - mm/dd/yy hh:mm am/pm

Factory setting dd.mm.yy hh:mm

Additional information

Selection

i

 For an explanation of the abbreviated units: →

📄

 266

"User-specific units" submenu

Navigation

🔒

🔒

 Expert → Sensor → System units → User-spec. units

▶ User-specific units

User volume text (0567)

→

📄

 65

User volume offset (0569)

→

📄

 66

User volume factor (0568)	→  66
User mass text (0560)	→  67
User mass offset (0562)	→  67
User mass factor (0561)	→  67
User corrected volume text (0592)	→  68
User corrected volume offset (0602)	→  68
User corrected volume factor (0590)	→  68
User density text (0570)	→  69
User density offset (0571)	→  69
User density factor (0572)	→  69
User specific-enthalpy text (0585)	→  70
User specific-enthalpy offset (0584)	→  70
User specific-enthalpy factor (0583)	→  70
User energy text (0600)	→  71
User energy offset (0599)	→  71
User energy factor (0586)	→  71
User pressure text (0581)	→  72
User pressure offset (0580)	→  72
User pressure factor (0579)	→  72

User volume text

Navigation	 Expert → Sensor → System units → User-spec. units → Volume text (0567)
Description	Use this function to enter a text for the user-specific unit of volume and volume flow. The corresponding time units (s, min, h, d) for volume flow are generated automatically.
User entry	Max. 10 characters such as letters, numbers or special characters (@, %, /)

Factory setting User vol.

Additional information *Result*



The defined unit is shown as an option in the choose list of the following parameters:

- **Volume flow unit** parameter (→ 57)
- **Volume unit** parameter (→ 59)

Example

If the text GLAS is entered, the choose list of the **Volume flow unit** parameter (→ 57) shows the following options:

- GLAS/s
- GLAS/min
- GLAS/h
- GLAS/d

User volume offset

Navigation Expert → Sensor → System units → User-spec. units → Volume offset (0569)

Description Use this function to enter the offset for adapting the user-specific volume unit and volume flow unit (without time).

User entry Signed floating-point number

Factory setting 0

Additional information *Description*



Value in user-specific unit = (factor × value in base unit) + offset

User volume factor

Navigation Expert → Sensor → System units → User-spec. units → Volume factor (0568)

Description Use this function to enter a quantity factor (without time) for the user-specific volume and volume flow unit.

User entry Signed floating-point number

Factory setting 1.0

User mass text 	
Navigation	  Expert → Sensor → System units → User-spec. units → Mass text (0560)
Description	Use this function to enter a text for the user-specific unit of mass and mass flow. The corresponding time units (s, min, h, d) for mass flow are generated automatically.
User entry	Max. 10 characters such as letters, numbers or special characters (@, %, /)
Factory setting	User mass
Additional information	<i>Result</i>  The defined unit is shown as an option in the choose list of the following parameters: ■ Mass flow unit parameter (→  61) ■ Mass unit parameter (→  61) <i>Example</i> If the text GLAS is entered, the following options are displayed in the picklist for the Mass flow unit parameter (→  61): ■ GLAS/s ■ GLAS/min ■ GLAS/h ■ GLAS/d
User mass offset 	
Navigation	  Expert → Sensor → System units → User-spec. units → Mass offset (0562)
Description	Use this function to enter the offset for adapting the user-specific mass unit and mass flow unit (without time).
User entry	Signed floating-point number
Factory setting	0
Additional information	<i>Description</i>  Value in user-specific unit = (factor × value in basic unit) + offset
User mass factor 	
Navigation	  Expert → Sensor → System units → User-spec. units → Mass factor (0561)
Description	Use this function to enter a quantity factor (without time) for the user-specific mass and mass flow unit.
User entry	Signed floating-point number

Factory setting 1.0

User corrected volume text



Navigation Expert → Sensor → System units → User-spec. units → Corr. vol. text (0592)

Description Use this function to enter a text for the user-specific unit of the corrected volume and corrected volume flow. The corresponding time units (s, min, h, d) for mass flow are generated automatically.

User entry Max. 10 characters such as letters, numbers or special characters (@, %, /)

Factory setting UserCrVol.

Additional information *Result*



The defined unit is shown as an option in the choose list of the following parameters:

- **Corrected volume flow unit** parameter (→ 63)
- **Corrected volume unit** parameter (→ 63)

Example

If the text GLAS is entered, the choose list of the **Corrected volume flow unit** parameter (→ 63) shows the following options:

- GLAS/s
- GLAS/min
- GLAS/h
- GLAS/d

User corrected volume offset



Navigation Expert → Sensor → System units → User-spec. units → Corr vol. offset (0602)

Description Use this function to enter the offset for adapting the user-specific corrected volume unit and corrected volume flow unit (without time).



Value in user-specific unit = (factor × value in base unit) + offset

User entry Signed floating-point number

Factory setting 0

User corrected volume factor



Navigation Expert → Sensor → System units → User-spec. units → Cor.vol. factor (0590)

Description Use this function to enter a quantity factor (without time) for the user-specific corrected volume unit and corrected volume flow unit.

User entry Signed floating-point number

Factory setting 1.0

User density text

Navigation   Expert → Sensor → System units → User-spec. units → Density text (0570)

Description Use this function to enter a text or the user-specific unit of density.

User entry Max. 10 characters such as letters, numbers or special characters (@, %, /)

Factory setting User dens.

Additional information *Result*



The defined unit is shown as an option in the choose list of the **Density unit** parameter (→  62).

Example

Enter text "CE_L" for centners per liter

User density offset

Navigation   Expert → Sensor → System units → User-spec. units → Density offset (0571)

Description Use this function to enter the zero point shift for the user-specific density unit.



Value in user-specific unit = (factor × value in basic unit) + offset

User entry Signed floating-point number

Factory setting 0

User density factor

Navigation   Expert → Sensor → System units → User-spec. units → Density factor (0572)

Description Use this function to enter a quantity factor for the user-specific density unit.

User entry Signed floating-point number

Factory setting 1.0

User specific-enthalpy text


Navigation	Expert → Sensor → System units → User-spec. units → Spec. enth. text (0585)
User entry	Max. 10 characters such as letters, numbers or special characters (@, %, /)
Factory setting	User enth.
Additional information	<i>Result</i> <i>Example</i> If the text CAL is entered, the choose list of the Calorific value unit parameter shows the following options: ■ CAL/Nm³ ■ CAL/m³ ■ CAL/ft³ ■ CAL/Sft³

User specific-enthalpy offset


Navigation	Expert → Sensor → System units → User-spec. units → Spec. enth. off. (0584)
Description	Use this function to enter the offset for adapting the user-specific calorific value unit (without volume).
User entry	Signed floating-point number
Factory setting	0

User specific-enthalpy factor


Navigation	Expert → Sensor → System units → User-spec. units → Spec. enth. fac. (0583)
Description	Use this function to enter a quantity factor (without volume) for the user-specific calorific value unit.
User entry	Signed floating-point number
Factory setting	1.0
Additional information	<i>Example</i> 1 W × min = 60 J → 0.166 W × min = 1 J → user entry: 0.0166

User energy text		
Navigation	 Expert → Sensor → System units → User-spec. units → Energy text (0600)	
Description	Use this function to enter a text for the user-specific energy unit.	
User entry	Max. 10 characters such as letters, numbers or special characters (@, %, /)	
Factory setting	User en.	
Additional information	<i>Result</i>  The defined unit is shown as an option in the choose list of the following parameters: ■ Energy unit parameter ■ Energy flow unit parameter <i>Example</i> If the text W is entered, the choose list of the Energy flow unit parameter shows the following options: ■ W/s ■ W/min ■ W/h ■ W/d	
User energy offset		
Navigation	 Expert → Sensor → System units → User-spec. units → Energy offset (0599)	
Description	Use this function to enter the offset for adapting the user-specific energy unit (without time).	
User entry	Signed floating-point number	
Factory setting	0	
User energy factor		
Navigation	 Expert → Sensor → System units → User-spec. units → Energy factor (0586)	
Description	Use this function to enter a quantity factor for the user-specific energy unit.	
User entry	Signed floating-point number	
Factory setting	1.0	

User pressure text		
Navigation	  Expert → Sensor → System units → User-spec. units → Pressure text (0581)	
Description	Use this function to enter a text for the user-specific pressure unit.	
User entry	Max. 10 characters such as letters, numbers or special characters (@, %, /)	
Factory setting	User pres.	
Additional information	<i>Result</i>  The defined unit is shown as an option in the choose list of the Pressure unit parameter.	
User pressure offset		
Navigation	  Expert → Sensor → System units → User-spec. units → Pressure offset (0580)	
Description	Use this function to enter the offset for adapting the user-specific pressure unit.	
User entry	Signed floating-point number	
Factory setting	0	
User pressure factor		
Navigation	  Expert → Sensor → System units → User-spec. units → Pressure factor (0579)	
Description	Use this function to enter a quantity factor for the user-specific pressure unit.	
User entry	Signed floating-point number	
Factory setting	1.0	
Additional information	<i>Example</i> $1 \text{ Dyn/cm}^2 = 0.1 \text{ Pa} \rightarrow 10 \text{ Dyn/cm}^2 = 1 \text{ Pa} \rightarrow \text{user entry: } 10$	

3.2.3 "Process parameters" submenu

Navigation  Expert → Sensor → Process param.

► Process parameters		
Filter options (6710)	→ 	73
Flow damping (6661)	→ 	75
Flow override (1839)	→ 	75
Conductivity measurement (6514)	→ 	76
Conductivity damping (1803)	→ 	76
Conductivity temperature coefficient (1891)	→ 	77
Temperature damping (1886)	→ 	77
Corrected volume flow reference density (1885)	→ 	77
► Low flow cut off	→ 	78
► Empty pipe detection	→ 	80
► Electrode cleaning cycle	→ 	83
► Build-up index	→ 	85
► HBSI	→ 	88

Filter options



Navigation	 Expert → Sensor → Process param. → Filter options (6710)
Description	Use this function to select a filter option.
Selection	■ Adaptive ■ Adaptive CIP on ■ Dynamic ■ Dynamic CIP on ■ Binomial ■ Binomial CIP on
Factory setting	Binomial

Additional information*Description*

The user can choose from a range of filter combinations which can optimize the measurement result depending on the application. Each change in the filter setting affects the output signal of the measuring device. The response time of the output signal increases as the filter depth increases.

Selection■ **Adaptive**

- Strong flow damping with a short output signal response time.
- Some time is needed before a stable output signal can be generated.
- Not suitable for pulsating flow as the average flow can be different here.

■ **Dynamic**

- Average flow damping with a delayed output signal response time.
- The average flow is displayed correctly over a measuring interval determined over a long period.

■ **Binomial**

- Weak flow damping with a short output signal response time.
- The average flow is displayed correctly over a measuring interval determined over a long period.

■ **CIP**

- This filter makes the **Adaptive**, **Dynamic** and **Binomial** filter options additionally available.
- If the CIP filter has detected a change in the medium (abrupt increase in the noise level, e.g. quickly changing medium conductivity values during CIP cleaning), flow damping is greatly increased and the raw value (before flow damping) is limited by the mean value (delimiter). This eliminates extremely high measured errors (up to several 100 m/s).
- If the CIP filter is enabled, the response time of the entire measuring system increases and the output signal is delayed accordingly.

*Examples**Possible applications for the filters*

Application	Adaptive	Adaptive CIP	Dynamic	Dynamic CIP	Binomial	Binomial CIP
Pulsating flow (flow is negative intermittently)	---	---	++	--	++	--
Flow changes frequently (flow is dynamic)	-	--	++	-	++	-
Clear signal, fast control loop (< 1 s)	--	--	+ ¹⁾		++	-
Poor signal, slow control loop (response time of a few seconds)	++	-	--	---	---	---
Permanently bad signal	++	--	-	---	-	---
Short and severe signal distortion after a while		++		++		++
Replacement of a Promag 50/53: system damping Promag 100 = 0.5 * system damping Promag 50/53					+++	+++
Replacement of a Promag 10: system damping Promag 100 = system damping Promag 10 + 2			+++			
For a stable flow signal (no other requirements)	+++					

1) Value of flow damping < 6

Flow damping



Navigation	Expert → Sensor → Process param. → Flow damping (6661)
Description	Use this function to enter a value for flow damping. Reduction of the variability of the flow measured value (in relation to interference). For this purpose, the depth of the flow filter is adjusted: when the filter setting increases, the reaction time of the device also increases.
User entry	0 to 15
Factory setting	4
Additional information	<i>Input range 0 to 15</i> - Value = 0: no damping - Value = 1: minor damping - Value = 15: strong damping The damping depends on the measuring period and the filter type selected. - An increase or decrease in the damping depends on the application. <i>Effect</i> The damping affects the following variables of the device: - Outputs → 111 - Low flow cut off → 78 - Totalizers → 198

Flow override



Navigation	Expert → Sensor → Process param. → Flow override (1839)
Description	Use this function to select whether to interrupt the evaluation of measured values. This is useful for the cleaning processes of a pipeline, for example.
Selection	- Off - On
Factory setting	Off
Additional information	<i>Description</i> Flow override is active - The 453 Flow override diagnostic message is output. - Output values - Temperature: continues to be output - Totalizer 1...3: stop being totalized The Flow override option can also be activated in the Status input submenu: Assign status input parameter (→ 110).

Conductivity measurement



Navigation	Expert → Sensor → Process param. → Conduct. measur. (6514)
Prerequisite	The On option is selected in the Conductivity measurement parameter (→ 76) parameter.
Description	Use this function to enable and disable conductivity measurement.
Selection	■ Off ■ On
Factory setting	Off
Additional information	<i>Description</i> For conductivity measurement to work, the medium must have a minimum conductivity of 5 µS/cm.

Conductivity damping



Navigation	Expert → Sensor → Process param. → Conduct. damping (1803)
Prerequisite	The On option is selected in the Conductivity measurement parameter (→ 76).
Description	Use this function to enter a time constant for conductivity damping (PT1 element).
User entry	0 to 999.9 s
Factory setting	0 s
Additional information	<i>Description</i> The damping is performed by a PT1 element ²⁾. <i>User entry</i> ■ Value = 0: no damping ■ Value > 0: damping is increased Damping is switched off if 0 is entered (factory setting).

2) Proportional behavior with first-order lag

Conductivity temperature coefficient 	
Navigation	  Expert → Sensor → Process param. → Cond. temp.coeff (1891)
Prerequisite	One of the following conditions is met: ■ Order code for "Sensor option", option CI "Medium temperature measurement" or ■ The temperature is read into the flowmeter from an external device.
Description	Use this function to enter the temperature coefficient for the conductivity.
User entry	Signed floating-point number
Factory setting	2.1 %/K
Temperature damping 	
Navigation	  Expert → Sensor → Process param. → Temp. damping (1886)
Prerequisite	One of the following conditions is met: ■ Order code for "Sensor option", option CI "Medium temperature measurement" or ■ The temperature is read into the flowmeter from an external device.
Description	Use this function to enter the time constant for temperature damping.
User entry	0 to 999.9 s
Factory setting	0 s
Corrected volume flow reference density 	
Navigation	  Expert → Sensor → Process param. → CVolFlowRefDens (1885)
Description	Use this function to enter a fixed value for the reference density.
User entry	Positive floating-point number
Factory setting	Country-specific: ■ 1 kg/l ■ 1 lb/ft³
Additional information	<i>Dependency</i>  The unit is taken from the Density unit parameter (→  62)

"Low flow cut off" submenu

Navigation  Expert → Sensor → Process param. → Low flow cut off

► Low flow cut off

Assign process variable (1837)

→  78

On value low flow cutoff (1805)

→  78

Off value low flow cutoff (1804)

→  79

Pressure shock suppression (1806)

→  79

Assign process variable

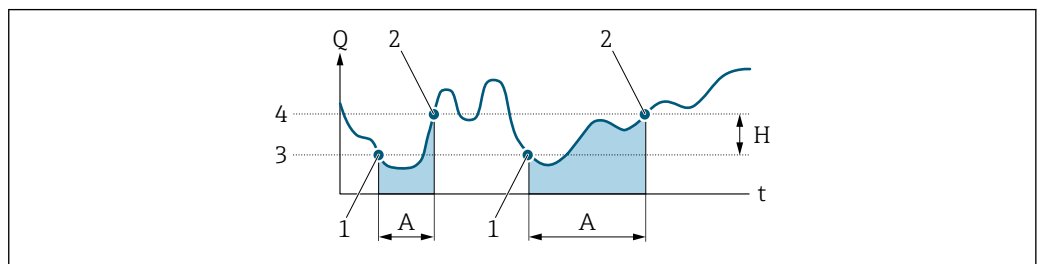
Navigation	 Expert → Sensor → Process param. → Low flow cut off → Assign variable (1837)
Description	Use this function to select the process variable for low flow cutoff detection.
Selection	■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow
Factory setting	Volume flow

On value low flow cutoff

Navigation	 Expert → Sensor → Process param. → Low flow cut off → On value (1805)
Prerequisite	A process variable is selected in the Assign process variable parameter (→  78).
Description	Use this function to enter a switch-on value for low flow cut off. Low flow cut off is activated if the value entered is not equal to 0 →  79.
User entry	Positive floating-point number
Factory setting	Depends on country and nominal diameter →  260
Additional information	Dependency  The unit depends on the process variable selected in the Assign process variable parameter (→  78).

Off value low flow cutoff

Navigation	Expert → Sensor → Process param. → Low flow cut off → Off value (1804)
Prerequisite	A process variable is selected in the Assign process variable parameter (→ 78).
Description	Use this function to enter a switch-off value for low flow cut off. The switch-off value is entered as a positive hysteresis from the switch-on value → 78.
User entry	0 to 100.0 %
Factory setting	50 %
Additional information	<i>Example</i>



A0012887

- Q* Flow
t Time
H Hysteresis
A Low flow cut off active
1 Low flow cut off is activated
2 Low flow cut off is deactivated
3 On value entered
4 Off value entered

Pressure shock suppression

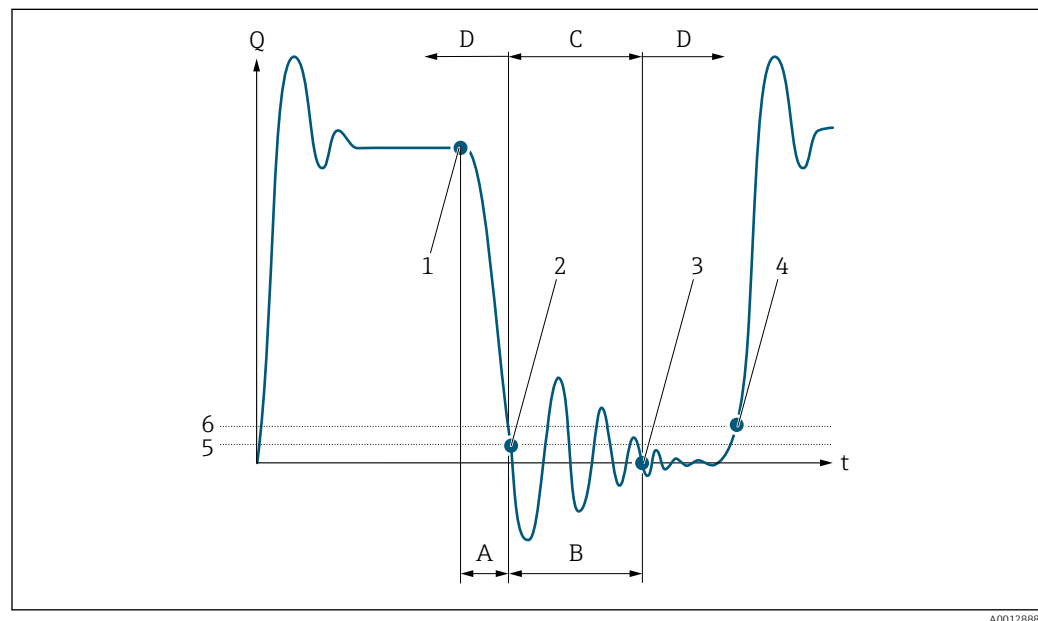
Navigation	Expert → Sensor → Process param. → Low flow cut off → Pres. shock sup. (1806)
Prerequisite	A process variable is selected in the Assign process variable parameter (→ 78).
Description	Use this function to enter the time interval for signal suppression (= active pressure shock suppression).
User entry	0 to 100 s
Factory setting	0 s
Additional information	<i>Description</i> Pressure shock suppression is enabled ■ Prerequisite: Flow rate < on-value of low flow cut off ■ Output values ■ Current output: outputs the current corresponding to zero flow ■ Flow displayed: 0 ■ Totalizer: the totalizers are pegged at the last correct value

Pressure shock suppression is disabled

- Prerequisite: the time interval set in this function has elapsed.
- If the flow also exceeds the off value for low flow cut off, the device starts processing and displaying the current flow value again.

Example

When closing a valve, momentarily strong fluid movements may occur in the pipeline, which are registered by the measuring system. These totalized flow values lead to a false totalizer status, particularly during batching processes.



A0012888

- Q Flow
 t Time
 A After run
 B Pressure shock
 C Pressure shock suppression active according to the time entered
 D Pressure shock suppression inactive
 1 Valve closes
 2 Flow falls below the on-value of the low flow cut off: pressure shock suppression is activated
 3 The time entered has elapsed: pressure shock suppression is deactivated
 4 The current flow value is processed and displayed again
 5 On value for low flow cut off
 6 Off value for low flow cut off

"Empty pipe detection" submenu

Navigation Expert → Sensor → Process param. → Empty pipe det.

► Empty pipe detection	
Empty pipe detection (1860)	→ 81
Switch point empty pipe detection (6562)	→ 81

Response time empty pipe detection (1859)	→  81
New adjustment (6560)	→  82
Progress (6571)	→  82
Empty pipe adjust value (6527)	→  82
Full pipe adjust value (6548)	→  83
Measured value EPD (6559)	→  83

Empty pipe detection

Navigation	  Expert → Sensor → Process param. → Empty pipe det. → Empty pipe det. (1860)
Description	Use this function to switch empty pipe detection on and off.
Selection	■ Off ■ On
Factory setting	Off

Switch point empty pipe detection

Navigation	  Expert → Sensor → Process param. → Empty pipe det. → Switch point EPD (6562)
Prerequisite	The On option is selected in the Empty pipe detection parameter (→  81).
Description	Use this function to enter the percentage threshold value of the resistance in relation to the adjustment values.
User entry	0 to 100 %
Factory setting	50 %

Response time empty pipe detection

Navigation	  Expert → Sensor → Process param. → Empty pipe det. → Response time (1859)
Prerequisite	A process variable is selected in the Assign process variable parameter (→  81).

Description	Use this function to enter the minimum time (hold time) the signal must be present before diagnostic message S962 "Empty pipe" is triggered in the event of a partially filled or empty measuring pipe.
--------------------	---

User entry	0 to 100 s
-------------------	------------

Factory setting	1 s
------------------------	-----

New adjustment

Navigation	  Expert → Sensor → Process param. → Empty pipe det. → New adjustment (6560)
-------------------	--

Prerequisite	The On option is selected in the Empty pipe detection parameter (→  81).
---------------------	---

Description	For selecting whether to perform an empty pipe or full pipe adjustment.
--------------------	---

Selection	■ Cancel ■ Empty pipe adjust ■ Full pipe adjust
------------------	---

Factory setting	Cancel
------------------------	--------

Progress

Navigation	  Expert → Sensor → Process param. → Empty pipe det. → Progress (6571)
-------------------	--

Prerequisite	The On option is selected in the Empty pipe detection parameter (→  81).
---------------------	---

Description	Use this function to view the progress.
--------------------	---

User interface	■ Ok ■ Busy ■ Not ok
-----------------------	--

Empty pipe adjust value

Navigation	  Expert → Sensor → Process param. → Empty pipe det. → Empty pipe value (6527)
-------------------	--

Prerequisite	■ In the Empty pipe detection parameter (→  81), the On option is selected. ■ Adjustment value > full pipe value.
---------------------	---

Description	Use this function to display the adjustment value when the measuring pipe is empty.
--------------------	---

User interface	Positive floating-point number
-----------------------	--------------------------------

Factory setting	1 000 000 Ohm
------------------------	---------------

Full pipe adjust value		
Navigation	  Expert → Sensor → Process param. → Empty pipe det. → Full pipe value (6548)	
Prerequisite	▪ In the Empty pipe detection parameter (→  81), the On option is selected. ▪ Adjustment value < empty pipe value.	
Description	Use this function to display the adjustment value when the measuring pipe is full.	
User interface	Positive floating-point number	
Factory setting	1 000 Ohm	

Navigation	  Expert → Sensor → Process param. → Empty pipe det. → Meas. value EPD (6559)
Prerequisite	In the Empty pipe detection parameter (→  81), the On option is selected.
Description	Displays the current measured value.
User interface	Positive floating-point number

"Electrode cleaning circuit" submenu

Navigation   Expert → Sensor → Process param. → ECC

► Electrode cleaning cycle		
Electrode cleaning cycle (6528)	→	 84
ECC duration (6555)	→	 84
ECC recovery time (6556)	→	 84
ECC interval (6557)	→	 85
ECC polarity (6631)	→	 85

Electrode cleaning cycle 	
Navigation	  Expert → Sensor → Process param. → Elec. clean cycl → Elec. clean cycl (6528)
Prerequisite	For the following order code: "Application package", option EC "ECC electrode cleaning"
Description	Use this function to enable and disable cyclic electrode cleaning.
Selection	■ Off ■ On
Factory setting	On
Additional information	Conductive deposits on the electrodes and on the walls of the measuring tube (e.g. magnetite) can falsify measurement values. The Electrode Cleaning Circuitry (ECC) was developed to prevent such conductive deposits developing in the vicinity of the electrodes. ECC functions as described above for all available electrode materials except tantalum. If tantalum is used as the electrode material, the ECC protects the electrode surface only against oxidation.
ECC duration 	
Navigation	  Expert → Sensor → Process param. → Elec. clean cycl → ECC duration (6555)
Prerequisite	For the following order code: "Application package", option EC "ECC electrode cleaning"
Description	Use this function to enter the duration of electrode cleaning in seconds.
User entry	0.01 to 30 s
Factory setting	2 s
ECC recovery time 	
Navigation	  Expert → Sensor → Process param. → Elec. clean cycl → ECC recov. time (6556)
Prerequisite	For the following order code: "Application package", option EC "ECC electrode cleaning"
Description	Use this function to enter the recovery time after electrode cleaning to prevent signal output interference. The current output values are frozen in the meanwhile.
User entry	1 to 600 s
Factory setting	60 s

ECC interval		
Navigation	Expert → Sensor → Process param. → Elec. clean cycl → ECC interval (6557)	
Prerequisite	For the following order code: "Application package", option EC "ECC electrode cleaning"	
Description	Use this function to enter the pause duration until the next electrode cleaning.	
User entry	0.5 to 168 h	
Factory setting	0.5 h	

ECC polarity	
Navigation	Expert → Sensor → Process param. → Elec. clean cycl → ECC polarity (6631)
Prerequisite	For the following order code: "Application package", option EC "ECC electrode cleaning"
Description	Displays the polarity of the electrode cleaning circuit.
User interface	■ Positive ■ Negative
Factory setting	Depends on the electrode material: ■ Tantalum: Negative option ■ Platinum, Alloy C22, stainless steel: Positive option

"Coating detection" submenu

- Build-up detection is only available:
 - In conjunction with the Promag W sensor
 - In the compact device version (transmitter and sensor form a mechanical unit)
 - For detailed information on build-up detection: see the Special Documentation for the **Heartbeat Verification + Monitoring** application package

Navigation Expert → Sensor → Process param. → Build-up detect.

► Build-up index	
Build-up index operating mode	→ 86
Build-up index damping	→ 86
Build-up index	→ 86

Build-up limit	→ 87
Build-up limit hysteresis	→ 87

Build-up index operating mode

Navigation	 Expert → Sensor → Process param. → Build-up index → BuildUpIndexMode (6734)
Description	Select mode of operation for build-up index.
Selection	■ Off ■ Slow ■ Standard ■ Fast
Factory setting	Off

Build-up index damping

Navigation	 Expert → Sensor → Process param. → Build-up index → BuildUpIndexDamp (6840)
Description	Enter damping value for build-up index. Damping value: ■ 0 = minimum damping ■ 15 = maximum damping The damping value should only be increased if the measured value is unstable.
User entry	0 to 15
Factory setting	0

Build-up index

Navigation	 Expert → Sensor → Process param. → Build-up index → Build-up index (12111)
Description	Shows current build-up index value.
User interface	0.0 to 100.0 %
Factory setting	0.0 %
Additional information	The formation of build-up is output as a percentage in the Build-up index value (→ 86) parameter. The higher the percentage, the thicker the build-up.

Build-up index value ($\rightarrow$  86) = 0%

- No build-up present
- Measuring tube as-delivered state (initial value)
- Measuring tube was cleaned thoroughly after formation of build-up

Build-up index value ($\rightarrow$  86) = 100%

- Value for the maximum measurable build-up thickness
- The thickness of the build-up at 100% varies depending on the process
- A value of 100% should not be equated with a blocked measuring tube

The percentage indicated in the Build-up index value ($\rightarrow$  86) parameter does not provide direct information about the absolute thickness or the composition of the build-up. Therefore, to make optimum use of the build-up detection function, it is necessary to first compare the formation of build-up in the process, as known from experience, with the associated Build-up index value ($\rightarrow$  86). The aim is to determine the Build-up index value ($\rightarrow$  86) at the time the cleaning is usually performed.

On the basis of the Build-up index value ($\rightarrow$  86) during cleaning, it is possible to make a valid assessment of the condition inside the measuring tube and to plan the cleaning using the build-up limit and build-up detection hysteresis parameters.

In addition, conclusions about possible effects on neighboring processes can be drawn from the Build-up index value ($\rightarrow$  86).

Build-up limit

Navigation	  Expert $\rightarrow$ Sensor $\rightarrow$ Process param. $\rightarrow$ Build-up index $\rightarrow$ Build-up limit (6466)
Description	Enter limit value for the build-up index.
User entry	0 to 100 %
Factory setting	50 %

Build-up limit hysteresis

Navigation	  Expert $\rightarrow$ Sensor $\rightarrow$ Process param. $\rightarrow$ Build-up index $\rightarrow$ BuildUpLimitHyst (6467)
Description	Enter hysteresis for build-up limit value. If the value for build-up detection hysteresis is higher than the Build-up limit ($\rightarrow$  87), the "Build-up detected" diagnostic information is not reset until the measuring tube has been cleaned and a restart has been performed.
User entry	0 to 100 %
Factory setting	20 %

"HBSI" submenu

Navigation  Expert → Sensor → Process param. → HBSI

► HBSI

HBSI limit (6472)

HBSI hysteresis (6473)

HBSI (12116)

→  88

→  88

→  88

HBSI limit

Navigation	 Expert → Sensor → Process param. → HBSI → HBSI limit (6472)
Description	Enter HBSI limit value.
User entry	0 to 100 %
Factory setting	4 %

HBSI hysteresis

Navigation	 Expert → Sensor → Process param. → HBSI → HBSI hysteresis (6473)
Description	Enter hysteresis for HBSI limit value.
User entry	0 to 100 %
Factory setting	1 %

HBSI

Navigation	 Expert → Sensor → Process param. → HBSI → HBSI (12116)
Description	Displays the relative change of the entire sensor, with all its electrical, mechanical and electromechanical components incorporated in the sensor housing (including the measuring tube, electrodynamic pick-ups, excitation system, cables etc.), in % of the reference value.
User interface	–100.0 to 100.0 %

3.2.4 "External compensation" submenu

Navigation  Expert → Sensor → External comp.

► External compensation		
Density source (6615)	→ 	89
Fixed density (6623)	→ 	89
External density (6630)	→ 	90
Linear expansion coefficient (1817)	→ 	92
Square expansion coefficient (1818)	→ 	92
Reference density (1892)	→ 	92
Reference temperature (1816)	→ 	91
Temperature source (6712)	→ 	90
External temperature (6673)	→ 	91

Density source

Navigation	 Expert → Sensor → External comp. → Density source (6615)
Description	Use this function to select the density source.
Selection	■ Fixed density ■ External density * ■ Current input 1 * ■ Current input 2 * ■ Current input 3 * ■ Calculated value
Factory setting	Fixed density

Fixed density

Navigation	 Expert → Sensor → External comp. → Fixed density (6623)
Prerequisite	The Fixed density option is selected in the Density source parameter (→  89).

* Visibility depends on order options or device settings

Description	Use this function to enter a fixed value for the density.
User entry	Positive floating-point number
Factory setting	Depends on country: ■ 1 000 kg/m³ ■ 62 lb/ft³
Additional information	<i>Dependency</i>  The unit is taken from the Density unit parameter (→  62)

External density

Navigation	  Expert → Sensor → External comp. → External density (6630)
Prerequisite	The External density option is selected in the Density source parameter (→  89).
Description	Displays the density read in from the external device.
User entry	Positive floating-point number
Additional information	<i>Dependency</i>  The unit is taken from the Density unit parameter (→  62)

Temperature source

Navigation	  Expert → Sensor → External comp. → Temp. source (6712)
Description	Use this function to select the temperature source.
Selection	■ Internal temperature sensor * ■ Off ■ External value * ■ Current input 1 * ■ Current input 2 * ■ Current input 3 *
Factory setting	Off

* Visibility depends on order options or device settings

External temperature

Navigation	 Expert → Sensor → External comp. → External temp. (6673)
Prerequisite	The External value option is selected in the Temperature source parameter (→  90).
Description	Displays the temperature read in from the external device.
User entry	Floating point number with sign
Additional information	<i>Dependency</i>  The unit is taken from the Temperature unit parameter (→  60)

Reference temperature



Navigation	 Expert → Sensor → External comp. → Ref. temperature (1816)
Prerequisite	The Fixed density option or External density option are selected in the Density source parameter (→  89).
Description	Use this function to enter a reference temperature for calculating the reference density.
User interface	–273.15 to 99 999 °C
Factory setting	Country-specific: ■ +20 °C ■ +68 °F
Additional information	<i>Dependency</i>  The unit is taken from the Temperature unit parameter (→  60)

Reference density calculation

$$\rho_n = \rho \cdot (1 + \alpha \cdot \Delta t + \beta \cdot \Delta t^2)$$

A0023403

- ρ_N : reference density
- ρ : fluid density currently measured
- t : fluid temperature currently measured
- t_N : reference temperature at which the reference density is calculated (e.g. 20 °C)
- Δt : $t - t_N$
- α : linear expansion coefficient of the fluid, unit = [1/K]; K = Kelvin
- β : square expansion coefficient of the fluid, unit = [1/K²]

Linear expansion coefficient

Navigation	  Expert → Sensor → External comp. → Linear exp coeff (1817)
Prerequisite	The Calculated value option is selected in the Density source parameter (→  89) parameter.
Description	Use this function to enter a linear, fluid-specific expansion coefficient for calculating the reference density.
User interface	Signed floating-point number
Factory setting	$-2.0295 \cdot 10^{-04} \text{ 1/K}$

Square expansion coefficient

Navigation	  Expert → Sensor → External comp. → Square exp coeff (1818)
Prerequisite	The Calculated value option is selected in the Density source parameter (→  89) parameter.
Description	For fluid with a non-linear expansion pattern: use this function to enter a quadratic, fluid-specific expansion coefficient for calculating the reference density.
User interface	Signed floating-point number
Factory setting	$-3.8436 \cdot 10^{-06} \text{ 1/K}^2$

Reference density

Navigation	  Expert → Sensor → External comp. → Ref. density (1892)
Prerequisite	The Calculated value option is selected in the Density source parameter (→  89) parameter.
Description	Displays the reference density.
User interface	Positive floating-point number
Additional information	<i>Description</i> The reference density is required for density calculation. <i>Deviation of the process temperature from the reference temperature:</i> $\Delta T = T - T_{\text{ref}}$ ΔT: Deviation T: Process temperature T_{ref}: Reference temperature (→  91)

Temperature-compensated density:

$$\rho_{\text{comp}} = \rho_{\text{ref}}(1 + \alpha\Delta T + \beta\Delta T^2)$$

ρ_{comp} : Calculated density

ρ_{ref} : Reference density

ΔT : Deviation of the process temperature from the reference temperature

α : Linear expansion coefficient (→ 92)

β : Square expansion coefficient (→ 92)

Example for water (factory setting)

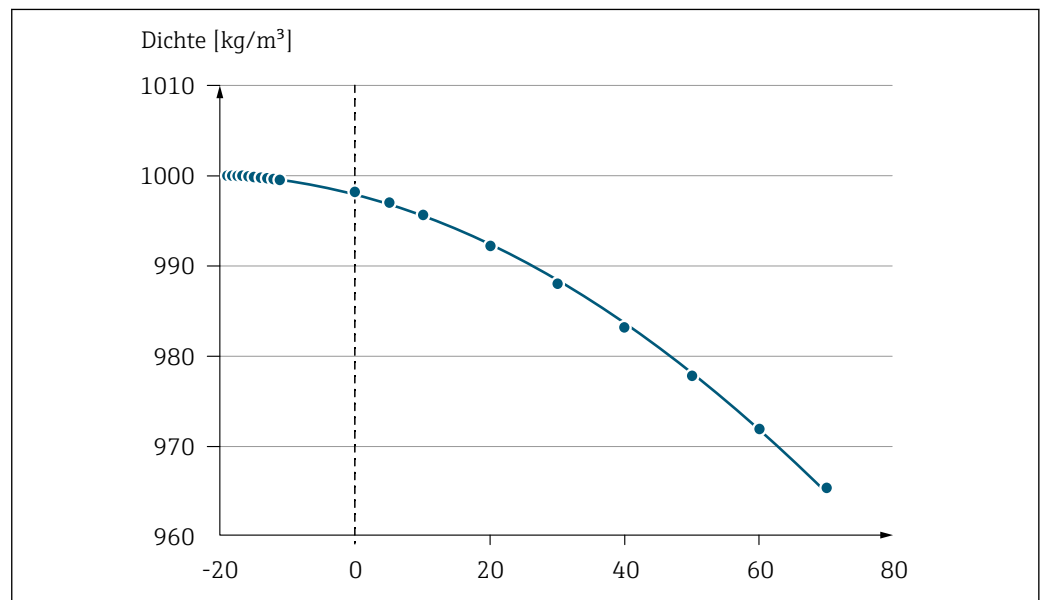
For a reference temperature of $T_{\text{ref}} = 20\text{ °C}$

A quadratic fit of a number of density values results in the following coefficients:

■ $\alpha = -2.0295 \cdot 10^{-4} \text{ 1/K}$

■ $\beta = -3.8436 \cdot 10^{-6} \text{ 1/K}^2$

■ $\rho_{\text{ref}} = 997.82 \text{ kg/m}^3$



2 Quadratic fit

Dependency

i The unit is taken from the **Density unit** parameter (→ 62)

3.2.5 "Sensor adjustment" submenu

Navigation Expert → Sensor → Sensor adjustm.

▶ Sensor adjustment

Installation direction (1809)

→ 94

Integration time (6533)	→ 94
Measuring period (6536)	→ 94
► Process variable adjustment	→ 95

Installation direction



Navigation	 Expert → Sensor → Sensor adjustm. → Install. direct. (1809)
Description	Use this function to change the sign of the medium flow direction.
Selection	■ Forward flow ■ Reverse flow
Factory setting	Forward flow
Additional information	<i>Description</i>  Before changing the sign: ascertain the actual direction of fluid flow with reference to the direction indicated by the arrow on the sensor nameplate.

Integration time



Navigation	 Expert → Sensor → Sensor adjustm. → Integration time (6533)
Description	Use this function to display the duration of the integration time.
User interface	1 to 65 ms
Factory setting	Depends on country and nominal diameter

Measuring period



Navigation	 Expert → Sensor → Sensor adjustm. → Measuring period (6536)
Description	Use this function to display the time of a full measuring period.
User interface	0 to 1 000 ms
Factory setting	Depends on country and nominal diameter

"Process variable adjustment" submenu

Navigation   Expert → Sensor → Sensor adjustm. → Variable adjust

► Process variable adjustment		
Volume flow offset (1831)	→	 95
Volume flow factor (1832)	→	 96
Mass flow offset (1841)	→	 96
Mass flow factor (1846)	→	 96
Conductivity offset (1848)	→	 97
Conductivity factor (1849)	→	 97
Corrected volume flow offset (1866)	→	 97
Corrected volume flow factor (1867)	→	 98
Temperature offset (1868)	→	 98
Temperature factor (1869)	→	 98
Corrected conductivity offset (1870)	→	 99
Corrected conductivity factor (1871)	→	 99
Flow velocity offset (1879)	→	 99
Flow velocity factor (1880)	→	 100

Volume flow offset



Navigation	  Expert → Sensor → Sensor adjustm. → Variable adjust → Vol. flow offset (1831)
Description	Use this function to enter the zero point shift for the volume flow trim. The volume flow unit on which the shift is based is m³/s.
User entry	Signed floating-point number
Factory setting	0 m³/s
Additional information	<i>Description</i>  Corrected value = (factor × value) + offset

Volume flow factor 	
Navigation	  Expert → Sensor → Sensor adjustm. → Variable adjust → Vol. flow factor (1832)
Description	Enter quantity factor for the volume flow value.
User entry	Positive floating-point number
Factory setting	1
Additional information	<i>Description</i>  Corrected value = (factor × value) + offset
Mass flow offset 	
Navigation	  Expert → Sensor → Sensor adjustm. → Variable adjust → Mass flow offset (1841)
Description	Use this function to enter the zero point shift for the mass flow trim. The mass flow unit on which the shift is based is kg/s.
User entry	Signed floating-point number
Factory setting	0 kg/s
Additional information	<i>Description</i>  Corrected value = (factor × value) + offset
Mass flow factor 	
Navigation	  Expert → Sensor → Sensor adjustm. → Variable adjust → Mass flow factor (1846)
Description	Use this function to enter a quantity factor (without time) for the mass flow. This multiplication factor is applied over the mass flow range.
User entry	Positive floating-point number
Factory setting	1
Additional information	<i>Description</i>  Corrected value = (factor × value) + offset

Conductivity offset 	
Navigation	  Expert → Sensor → Sensor adjustm. → Variable adjust → Conduct. offset (1848)
Prerequisite	The On option is selected in the Conductivity measurement parameter (→  76).
Description	Use this function to enter the zero point shift for the conductivity trim. The conductivity unit on which the shift is based is S/m.
User entry	Signed floating-point number
Factory setting	0 S/m
Additional information	<i>Description</i>  Corrected value = (factor × value) + offset
Conductivity factor 	
Navigation	  Expert → Sensor → Sensor adjustm. → Variable adjust → Conduct. factor (1849)
Prerequisite	The On option is selected in the Conductivity measurement parameter (→  76).
Description	Use this function to enter a quantity factor for the conductivity. This multiplication factor is applied over the conductivity range.
User entry	Positive floating-point number
Factory setting	1
Additional information	<i>Description</i>  Corrected value = (factor × value) + offset
Corrected volume flow offset 	
Navigation	  Expert → Sensor → Sensor adjustm. → Variable adjust → Corr. vol offset (1866)
Description	Use this function to enter the zero point shift for the corrected volume flow trim. The corrected volume flow unit on which the shift is based is 1 Nm ³ /s.
User entry	Signed floating-point number
Factory setting	0 Nm ³ /s
Additional information	<i>Description</i>  Corrected value = (factor × value) + offset

Corrected volume flow factor


Navigation	Expert → Sensor → Sensor adjustm. → Variable adjust → Corr. vol factor (1867)
Description	Use this function to enter a quantity factor (without time) for the corrected volume flow. This multiplication factor is applied over the corrected volume flow range.
User entry	Positive floating-point number
Factory setting	1
Additional information	<i>Description</i>  Corrected value = (factor × value) + offset

Temperature offset


Navigation	Expert → Sensor → Sensor adjustm. → Variable adjust → Temp. offset (1868)
Prerequisite	One of the following conditions is met: ■ Order code for "Sensor option", option CI "Medium temperature measurement" - or ■ The temperature is read into the flowmeter from an external device.
Description	Use this function to enter the zero point shift for the temperature trim. The temperature unit on which the shift is based is 1 K.
User entry	Signed floating-point number
Factory setting	0 K
Additional information	<i>Description</i>  Corrected value = (factor × value) + offset

Temperature factor


Navigation	Expert → Sensor → Sensor adjustm. → Variable adjust → Temp. factor (1869)
Prerequisite	One of the following conditions is met: ■ Order code for "Sensor option", option CI "Medium temperature measurement" - or ■ The temperature is read into the flowmeter from an external device.
Description	Use this function to enter a quantity factor (without time) for the temperature. This multiplication factor is applied over the temperature range.
User entry	Positive floating-point number

Factory setting 1

Additional information *Description*



Corrected value = (factor × value) + offset

Corrected conductivity offset



Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Corr.cond.offset (1870)

Prerequisite The **On** option is selected in the **Conductivity measurement** parameter (→ 76).

Description Use this function to enter the zero point shift to trim the corrected conductivity. The conductivity unit on which the shift is based is µS/cm.

User entry Signed floating-point number

Factory setting 0 S/m

Additional information *Description*



Corrected value = (factor × value) + offset

Corrected conductivity factor



Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Corr.cond.factor (1871)

Prerequisite The **On** option is selected in the **Conductivity measurement** parameter (→ 76).

Description Use this function to enter a quantity factor for the corrected conductivity. In each case, this factor refers to the conductivity in µS/cm.

User entry Positive floating-point number

Factory setting 1

Additional information *Description*



Corrected value = (factor × value) + offset

Flow velocity offset



Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Flow vel. offset (1879)

Description Use this function to enter the zero point shift for the flow velocity trim. The flow velocity unit on which the shift is based is m/s.

User entry	Signed floating-point number
Factory setting	0 m/s
Additional information	<i>Description</i>  Corrected value = (factor × value) + offset

Flow velocity factor

Navigation	 Expert → Sensor → Sensor adjustm. → Variable adjust → Flow vel. factor (1880)
Description	Use this function to enter a quantity factor (without time) for the flow velocity. This multiplication factor is applied over the flow velocity range.
User entry	Positive floating-point number
Factory setting	1
Additional information	<i>Description</i>  Corrected value = (factor × value) + offset

3.2.6 "Calibration" submenu

Navigation  Expert → Sensor → Calibration

► Calibration

Nominal diameter (2807)

→  100

Calibration factor (6522)

→  101

Zero point (6546)

→  101

Conductivity calibration factor (6718)

→  101

Nominal diameter

Navigation	 Expert → Sensor → Calibration → Nominal diameter (2807)
Description	Displays the nominal diameter of the sensor.

User interface	DNxx / x"
Factory setting	Depends on the size of the sensor
Additional information	<i>Description</i>  The value is also specified on the sensor nameplate.

Calibration factor

Navigation	  Expert → Sensor → Calibration → Cal. factor (6522)
Description	Displays the current calibration factor for the sensor.
User interface	Positive floating-point number
Factory setting	Depends on nominal diameter and calibration.

Zero point

Navigation	  Expert → Sensor → Calibration → Zero point (6546)
Description	This function shows the zero point correction value for the sensor.
User interface	Signed floating-point number
Factory setting	Depends on nominal diameter and calibration

Conductivity calibration factor

Navigation	  Expert → Sensor → Calibration → Cond. cal. fact. (6718)
Prerequisite	In the Conductivity measurement parameter (→  76), the On option is selected.
Description	Displays the calibration factor for the conductivity measurement.
User interface	0.01 to 10 000

3.2.7 "Build-up index adjustment" wizard

Complete this wizard to adjust the reference values of the build-up index for each electrode (E1 and E2) and activate the build-up index for build-up measurement.

Navigation

 Expert → Sensor → BuildUpIndAdjust

► Build-up index adjustment

Prerequisites

→  102

Progress (2808)

→  102

Build-up index reference value E 1 (6475)

→  102

Signal to noise ratio (6469)

→  103

Build-up index reference value E 2 (6474)

→  103

Signal to noise ratio (6469)

→  103

Build-up index operating mode (6734)

→  103

Prerequisites

Navigation

 Expert → Sensor → BuildUpIndAdjust → Prerequisites

Description

The following conditions must be met before performing a build-up index adjustment.

- User interface
- The sensor is free of build-up
 - The measuring tube is completely filled

Progress

Navigation

  Expert → Sensor → BuildUpIndAdjust → Progress (2808)

Description

The progress of the process is indicated.

User interface

0 to 100 %

Build-up index reference value E 1

Navigation

  Expert → Sensor → BuildUpIndAdjust → BuildUpIndRefE 1 (6475)

Description

Shows the reference value 'Build-up free sensor' measured for electrode E1.

User interface

0 to 1

Signal to noise ratio

Navigation	  Expert → Sensor → BuildUpIndAdjust → SNR (6469)
Description	Shows the signal to noise ratio during the measurement. A value between 1.0 - 2.0 is sufficient to excellent.
User interface	Signed floating-point number

Build-up index reference value E 2

Navigation	  Expert → Sensor → BuildUpIndAdjust → BuildUpIndRefE 2 (6474)
Description	Shows the reference value 'Build-up free sensor' measured for electrode E2.
User interface	0 to 1

Build-up index operating mode

Navigation	  Expert → Sensor → BuildUpIndAdjust → BuildUpIndexMode (6734)
Description	Select mode of operation for build-up index.
Selection	■ Off ■ Slow ■ Standard ■ Fast

3.3 "I/O configuration" submenu

Navigation   Expert → I/O config.

► I/O configuration

I/O module 1 to n terminal numbers
(3902-1 to n)

I/O module 1 to n information
(3906-1 to n)

I/O module 1 to n type (3901-1 to n)

→  104

→  104

→  105

Apply I/O configuration (3907)	→ 105
I/O alteration code (2762)	→ 105

I/O module 1 to n terminal numbers

Navigation	  Expert → I/O config. → I/O 1 to n terminals (3902–1 to n)
Description	Displays the terminal numbers used by the I/O module.
User interface	■ Not used ■ 26-27 (I/O 1) ■ 24-25 (I/O 2) ■ 22-23 (I/O 3)

I/O module 1 to n information

Navigation	  Expert → I/O config. → I/O 1 to n info (3906–1 to n)
Description	Displays information about the plugged in I/O module.
User interface	■ Not plugged ■ Invalid ■ Not configurable ■ Configurable ■ HART
Additional information	<i>"Not plugged" option</i> The I/O module is not plugged in. <i>"Invalid" option</i> The I/O module is not plugged correctly. <i>"Not configurable" option</i> The I/O module is not configurable. <i>"Configurable" option</i> The I/O module is configurable. <i>"Fieldbus" option</i> The I/O module is configured for HART.

I/O module 1 to n type



Navigation	 Expert → I/O config. → I/O 1 to n type (3901–1 to n)
Prerequisite	For the following order code: ■ "Output; input 2", option D "Configurable I/O initial setting off" ■ "Output; input 3", option D "Configurable I/O initial setting off"
Description	Use this function to select the I/O module type for the configuration of the I/O module.
Selection	■ Off ■ Current output * ■ Current input * ■ Status input * ■ Pulse/frequency/switch output * ■ Double pulse output * ■ Relay output *
Factory setting	Off

Apply I/O configuration



Navigation	 Expert → I/O config. → Apply I/O config (3907)
Description	Use this function to activate the newly configured I/O module type.
Selection	■ No ■ Yes
Factory setting	No

I/O alteration code



Navigation	 Expert → I/O config. → I/O alterat.code (2762)
Description	Use this function to enter the ordered activation code to activate the I/O configuration change.
User entry	Positive integer
Factory setting	0
Additional information	<i>Description</i> The I/O configuration is changed in the I/O module type parameter (→  105).

* Visibility depends on order options or device settings

3.4 "Input" submenu

Navigation  Expert → Input

► Input

► Current input 1 to n

→  106

► Status input 1 to n

→  109

3.4.1 "Current input 1 to n" submenu

Navigation  Expert → Input → Current input 1 to n

► Current input 1 to n

Terminal number (1611-1 to n)

→  106

Signal mode (1610-1 to n)

→  107

Current span (1605-1 to n)

→  107

0/4 mA value (1606-1 to n)

→  107

20 mA value (1607-1 to n)

→  108

Failure mode (1601-1 to n)

→  108

Failure value (1602-1 to n)

→  109

Terminal number

Navigation	 Expert → Input → Current input 1 to n → Terminal no. (1611-1 to n)
Description	Displays the terminal numbers used by the current input module.
User interface	■ Not used ■ 24-25 (I/O 2) ■ 22-23 (I/O 3)
Additional information	"Not used" option The current input module does not use any terminal numbers.

Signal mode



Navigation	 Expert → Input → Current input 1 to n → Signal mode (1610–1 to n)
Prerequisite	The measuring device is not approved for use in the hazardous area with type of protection Ex-i.
Description	Use this function to select the signal mode for the current input.
Selection	■ Passive ■ Active *
Factory setting	Active

Current span



Navigation	 Expert → Input → Current input 1 to n → Current span (1605–1 to n)
Description	Use this function to select the current range for the process value output and the upper and lower level for signal on alarm.
Selection	■ 4...20 mA (4... 20.5 mA) ■ 4...20 mA NE (3.8...20.5 mA) ■ 4...20 mA US (3.9...20.8 mA) ■ 0...20 mA (0... 20.5 mA)
Factory setting	Country-specific: ■ 4...20 mA NE (3.8...20.5 mA) ■ 4...20 mA US (3.9...20.8 mA)
Additional information	<i>Examples</i>  Sample values for the current range: Current span parameter (→  113)

0/4 mA value



Navigation	 Expert → Input → Current input 1 to n → 0/4 mA value (1606–1 to n)
Description	Use this function to enter a value for the 4 mA current.
User entry	Signed floating-point number
Factory setting	0

* Visibility depends on order options or device settings

Additional information

Current input behavior

The current input behaves differently depending on the settings configured in the following parameters:

- Current span (→  107)
- Failure mode (→  108)

Configuration examples

 Pay attention to the configuration examples for **4 mA value** parameter (→  115).

20 mA value



Navigation

  Expert → Input → Current input 1 to n → 20 mA value (1607-1 to n)

Description

Use this function to enter a value for the 20 mA current.

User entry

Signed floating-point number

Factory setting

Depends on country and nominal diameter

Additional information

Configuration examples

 Pay attention to the configuration examples for **4 mA value** parameter (→  115).

Failure mode



Navigation

  Expert → Input → Current input 1 to n → Failure mode (1601-1 to n)

Description

Use this function to select the input behavior when measuring a current outside the configured **Current span** parameter (→  107).

Selection

- Alarm
- Last valid value
- Defined value

Factory setting

Alarm

Additional information

Options

- Alarm
An error message is set.
- Last valid value
The last valid measured value is used.
- Defined value
A user-defined measured value is used (**Failure value** parameter (→  109)).

Failure value		
Navigation	Expert → Input → Current input 1 to n → Failure value (1602-1 to n)	
Prerequisite	In the Failure mode parameter (→ 108), the Defined value option is selected.	
Description	Use this function to enter the value that the device uses if it does not receive an input signal from the external device, or if the input signal is invalid.	
User entry	Signed floating-point number	
Factory setting	0	

3.4.2 "Status input 1 to n" submenu

Navigation Expert → Input → Status input 1 to n

► Status input 1 to n

Terminal number (1358-1 to n)

→ 109

Assign status input (1352-1 to n)

→ 110

Value status input (1353-1 to n)

→ 110

Active level (1351-1 to n)

→ 111

Response time status input (1354-1 to n)

→ 111

Terminal number	
Navigation	Expert → Input → Status input 1 to n → Terminal no. (1358-1 to n)
Description	Displays the terminal numbers used by the status input module.
User interface	■ Not used ■ 24-25 (I/O 2) ■ 22-23 (I/O 3)
Additional information	<i>"Not used" option</i> The status input module does not use any terminal numbers.

Assign status input 	
Navigation	 Expert → Input → Status input 1 to n → Assign stat.inp. (1352–1 to n)
Description	Use this function to select the function for the status input.
Selection	■ Off ■ Reset totalizer 1 ■ Reset totalizer 2 ■ Reset totalizer 3 ■ Reset all totalizers ■ Flow override
Factory setting	Off
Additional information	<i>Custody transfer mode</i>  Only available for Promag H. NOTE! Before enabling the measuring device for custody transfer mode, make sure that the Off option is selected in the Assign status input.  For detailed information on custody transfer mode, see the Special Documentation for the device →  7
Additional information	<i>Selection</i> ■ Off The status input is switched off. ■ Reset totalizer 1...3 The individual totalizers are reset. ■ Reset all totalizers All totalizers are reset. ■ Flow override The Flow override (→  75) is activated.  Note on the Flow override (→  75): ■ The Flow override (→  75) is enabled as long as the level is at the status input (continuous signal). ■ All other assignments react to a change in level (pulse) at the status input.
Value status input	

Navigation	 Expert → Input → Status input 1 to n → Val.stat.inp. (1353–1 to n)
Description	Displays the current input signal level.
User interface	■ High ■ Low

Active level		
Navigation	 Expert → Input → Status input 1 to n → Active level (1351–1 to n)	
Description	Use this function to determine the input signal level at which the assigned function is activated.	
Selection	■ High ■ Low	
Factory setting	High	
Response time status input		

Navigation	 Expert → Input → Status input 1 to n → Response time (1354–1 to n)
Description	Use this function to enter the minimum time period for which the input signal level must be present before the selected function is activated.
User entry	5 to 200 ms
Factory setting	50 ms

3.5 "Output" submenu

Navigation  Expert → Output

► Output	
► Current output 1 to n	→  111
► Pulse/frequency/switch output 1 to n	→  124
► Relay output 1 to n	→  144
► Double pulse output	→  151

3.5.1 "Current output 1 to n" submenu

Navigation  Expert → Output → Curr.output 1 to n

► Current output 1 to n

Terminal number	→  112
Signal mode	→  112
Process variable current output	→  113
Current range output	→  113
Fixed current	→  114
Lower range value output	→  115
Upper range value output	→  117
Measuring mode current output	→  117
Damping current output	→  122
Failure behavior current output	→  123
Failure current	→  124
Output current 1 to n	→  124
Measured current 1 to n	→  124

Terminal number

Navigation	  Expert → Output → Curr.output 1 to n → Terminal no. (0379–1 to n)
Description	Displays the terminal numbers used by the current output module.
User interface	■ Not used ■ 26-27 (I/O 1) ■ 24-25 (I/O 2) ■ 22-23 (I/O 3)
Additional information	<i>"Not used" option</i> The current output module does not use any terminal numbers.

Signal mode



Navigation	  Expert → Output → Curr.output 1 to n → Signal mode (0377–1 to n)
Description	Use this function to select the signal mode for the current output.

- Selection**
- Active *
 - Passive *

Factory setting Active

Process variable current output

Navigation   Expert → Output → Curr.output 1 to n → Proc.var. outp (0359–1 to n)

Description Use this function to select a process variable for the current output.

- Selection**
- Off
 - Volume flow
 - Mass flow
 - Corrected volume flow
 - Flow velocity
 - Conductivity
 - Corrected conductivity *
 - Temperature *
 - Electronics temperature
 - Noise *
 - Coil current shot time *
 - Reference electrode potential against PE *
 - HBSI *
 - Build-up index *
 - Test point 1
 - Test point 2
 - Test point 3

Factory setting Volume flow

Current range output

Navigation   Expert → Output → Curr.output 1 to n → Curr.range out (0353–1 to n)

Description Select current range for process value output and upper/lower level for alarm signal.

- Selection**
- 4...20 mA NE (3.8...20.5 mA)
 - 4...20 mA US (3.9...20.8 mA)
 - 4...20 mA (4... 20.5 mA)
 - 0...20 mA (0... 20.5 mA)
 - Fixed value

Factory setting Depends on country:

- 4...20 mA NE (3.8...20.5 mA)
- 4...20 mA US (3.9...20.8 mA)

* Visibility depends on order options or device settings

Additional information

Description

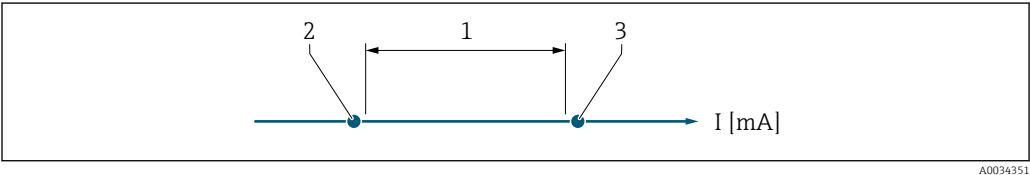
-  In the event of a device alarm, the current output adopts the value specified in the **Failure mode** parameter (→  123).
- If the measured value is outside the measuring range, the **△S441 Current output 1 to n** diagnostic message is displayed.
- The measuring range is specified via the **Lower range value output** parameter (→  115) and **Upper range value output** parameter (→  117).

"Fixed current" option

- This option is used for a HART Multidrop network.
- It can only be used for the 4...20 mA HART current output (current output 1).
- The current value is set via the **Fixed current** parameter (→  114).

Example

Shows the relationship between the current range for the output of the process value and the two signal on alarm levels:



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

Selection

Selection	1	2	3
4...20 mA NE (3.8...20.5 mA)	3.8 to 20.5 mA	< 3.6 mA	> 21.95 mA
4...20 mA US (3.9...20.8 mA)	3.9 to 20.8 mA US	< 3.6 mA	> 21.95 mA
4...20 mA (4... 20.5 mA)	4 to 20.5 mA	< 3.6 mA	> 21.95 mA
0...20 mA (0... 20.5 mA)	0 to 20.5 mA	0 mA	> 21.95 mA

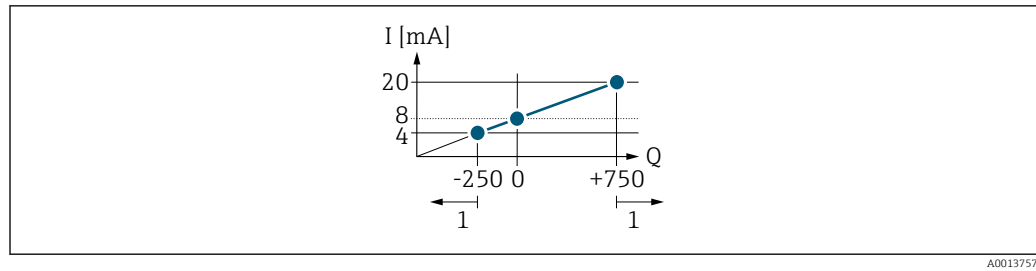
-  If the flow exceeds or falls below the upper or lower signal on alarm level, the **△S441 Current output 1 to n** diagnostic message is displayed.

Fixed current

- Navigation**   Expert → Output → Curr.output 1 to n → Fixed current (0365–1 to n)
- Prerequisite** The **Fixed current** option is selected in the **Current span** parameter (→  113).
- Description** Use this function to enter a constant current value for the current output.
- User entry** 0 to 22.5 mA
- Factory setting** 22.5 mA

**Lower range value output**

Navigation	Expert → Output → Curr.output 1 to n → Low.range outp (0367-1 to n)
Prerequisite	One of the following options is selected in the Current span parameter (→ 113): ■ 4...20 mA NE (3.8...20.5 mA) ■ 4...20 mA US (3.9...20.8 mA) ■ 4...20 mA (4... 20.5 mA) ■ 0...20 mA (0... 20.5 mA)
Description	Use this function to enter a value for the start of measuring range.
User entry	Signed floating-point number
Factory setting	Depends on country: ■ 0 l/h ■ 0 gal/min (us)
Additional information	<i>Description</i> Positive and negative values are permitted depending on the process variable assigned in the Assign current output parameter (→ 113). In addition, the value can be greater than or smaller than the value assigned for the 20 mA current in the Upper range value output parameter (→ 117). <i>Dependency</i> The unit depends on the process variable selected in the Assign current output parameter (→ 113). <i>Current output behavior</i> The current output behaves differently depending on the settings configured in the following parameters: ■ Current span (→ 113) ■ Failure mode (→ 123) <i>Configuration examples</i> Some examples of parameter settings and their effect on the current output are given in the following section. Configuration example A Measurement mode with Forward flow option ■ Lower range value output parameter (→ 115) = not equal to zero flow (e.g. -250 m³/h) ■ Upper range value output parameter (→ 117) = not equal to zero flow (e.g. +750 m³/h) ■ Calculated current value = 8 mA at zero flow



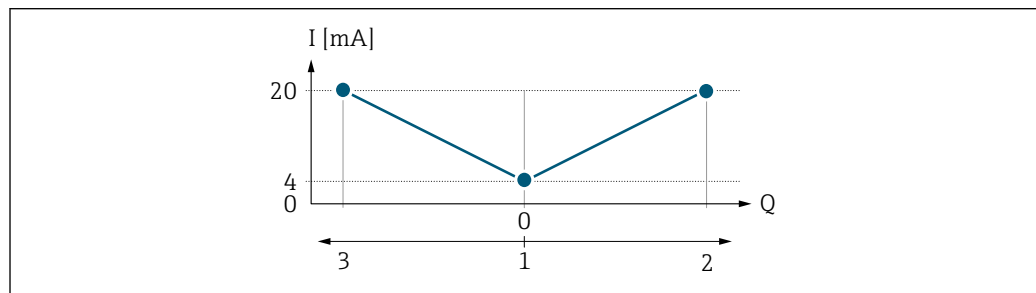
A0013757

Q Flow
I Current
 1 Measuring range is exceeded or undershot

The operational range of the measuring device is defined by the values entered for the **Lower range value output** parameter (→ 115) and **Upper range value output** parameter (→ 117). If the effective flow exceeds or falls below this operational range, the **△S441 Current output 1 to n** diagnostic message is output.

Configuration example B

Measurement mode with **Forward/Reverse flow** option



A0013758

I Current
Q Flow
 1 Start of measuring range output (0/4 mA)
 2 Forward flow
 3 Reverse flow

The current output signal is independent of the direction of flow (absolute amount of the measured variable). The values for the **Lower range value output** parameter (→ 115) and **Upper range value output** parameter (→ 117) must have the same algebraic sign. The value for the **Upper range value output** parameter (→ 117) (e.g. reverse flow) corresponds to the mirrored value for the **Upper range value output** parameter (→ 117) (e.g. forward flow).

Configuration example C

Measurement mode with **Reverse flow compensation** option

If flow is characterized by severe fluctuations (e.g. when using reciprocating pumps), flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 s → 117.

Upper range value output	
Navigation	Expert → Output → Curr.output 1 to n → Upp.range outp (0372-1 to n)
Prerequisite	One of the following options is selected in the Current span parameter (→ 113): ■ 4...20 mA NE (3.8...20.5 mA) ■ 4...20 mA US (3.9...20.8 mA) ■ 4...20 mA (4... 20.5 mA) ■ 0...20 mA (0... 20.5 mA)
Description	Use this function to enter a value for the end of measuring range.
User entry	Signed floating-point number
Factory setting	Depends on country and nominal diameter → 258
Additional information	<i>Description</i> Positive and negative values are permitted depending on the process variable assigned in the Assign current output parameter (→ 113). In addition, the value can be greater than or smaller than the value assigned for the 0/4 mA current in the Lower range value output parameter (→ 115). <i>Dependency</i> The unit depends on the process variable selected in the Assign current output parameter (→ 113). <i>Example</i> ■ Value assigned to 0/4 mA = -250 m³/h ■ Value assigned to 20 mA = +750 m³/h ■ Calculated current value = 8 mA (at zero flow) If the Forward/Reverse flow option is selected in the Measuring mode parameter (→ 117), different algebraic signs cannot be entered for the values for the Lower range value output parameter (→ 115) and Upper range value output parameter (→ 117). The △S441 Current output 1 to n diagnostic message is displayed. <i>Configuration examples</i> Pay attention to the configuration examples for the Lower range value output parameter (→ 115).
Measuring mode current output	

Navigation Expert → Output → Curr.output 1 to n → Meas.mode outp (0351-1 to n)

Prerequisite One of the following options is selected in the **Assign current output** parameter (→ 113):

- Volume flow
- Mass flow
- Corrected volume flow
- Flow velocity

- Conductivity *
- Corrected conductivity *
- Temperature *
- Electronics temperature

One of the following options is selected in the **Current span** parameter (→  113):

- 4...20 mA NE (3.8...20.5 mA)
- 4...20 mA US (3.9...20.8 mA)
- 4...20 mA (4... 20.5 mA)
- 0...20 mA (0... 20.5 mA)

Description

Use this function to select the measuring mode for the current output.

Selection

- Forward flow
- Forward/Reverse flow *
- Reverse flow compensation

Factory setting

Forward flow

Additional information

Description

 The process variable that is assigned to the current output via the **Assign current output** parameter (→  113) is displayed below the parameter.

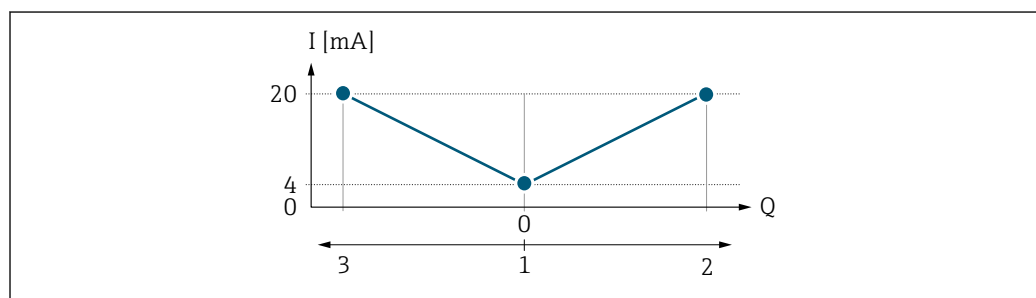
"Forward flow" option

The current output signal is proportional to the process variable assigned. The measuring range is defined by the values that are assigned to the **Lower range value output** parameter (→  115) and the **Upper range value output** parameter (→  117).

The flow components outside the scaled measuring range are taken into account for signal output as follows:

- Both values are defined such that they are not equal to zero flow e.g.:
 - start of measuring range = $-5 \text{ m}^3/\text{h}$
 - end of measuring range = $10 \text{ m}^3/\text{h}$
- If the effective flow exceeds or falls below this measuring range, the **△S441 Current output 1 to n** diagnostic message is output.

"Forward/Reverse flow" option



A0013758

- I* Current
Q Flow
 1 Start of measuring range output (0/4 mA)
 2 Forward flow
 3 Reverse flow

* Visibility depends on order options or device settings

- The current output signal is independent of the direction of flow (absolute amount of the measured variable). The values for the **Lower range value output** parameter (→  115) and **Upper range value output** parameter (→  117) must have the same algebraic sign.
- The value for the **Upper range value output** parameter (→  117) (e.g. reverse flow) corresponds to the mirrored value for the **Upper range value output** parameter (→  117) (e.g. forward flow).

"Reverse flow compensation" option

The **Reverse flow compensation** option is primarily used to compensate for intermittent backflow that can arise with displacement pumps due to wear or high-viscosity medium. The reverse flow is recorded in a buffer memory and offset against the next forward flow.

If buffering cannot be processed within approx. 60 s, the  **S441 Current output 1 to n** diagnostic message is displayed.

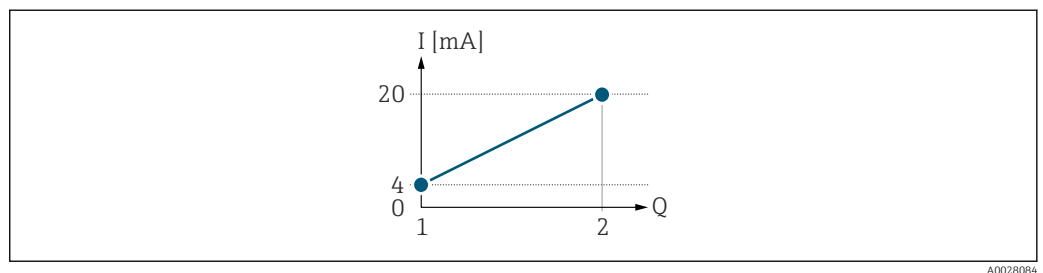
In the event of prolonged and undesired reverse flow, flow values can accumulate in the buffer memory. Due to the configuration of the current output, these values are not factored in, however, i.e. there is no compensation for the reverse flow.

If this option is set, the measuring device does not smoothen the flow signal. The flow signal is not attenuated.

Examples of how the current output behaves

Example 1

Defined measuring range: lower range value and upper range value with the **same** sign



 3 Measuring range

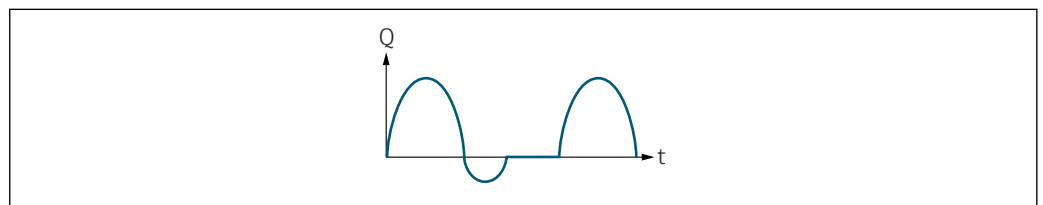
I Current

Q Flow

1 Lower range value (Start of measuring range output)

2 Upper range value (end of measuring range output)

With the following flow response:



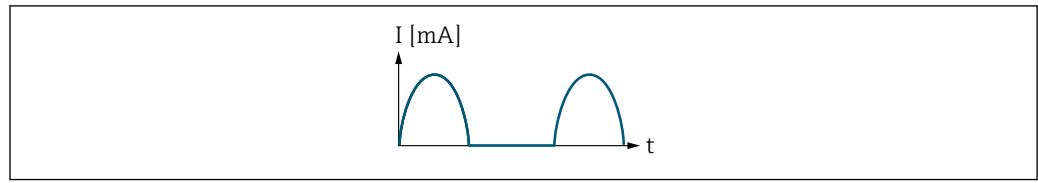
 4 Flow response

Q Flow

t Time

With **Forward flow** option

The current output signal is proportional to the process variable assigned. The flow components outside the scaled measuring range are not taken into account for signal output..

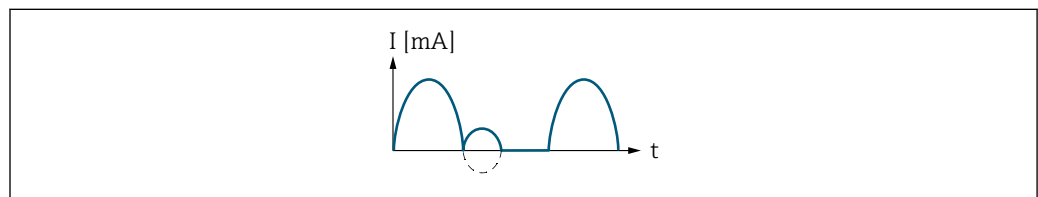


A0028092

I Current
 t Time

With **Forward/Reverse flow** option

The current output signal is independent of the direction of flow.

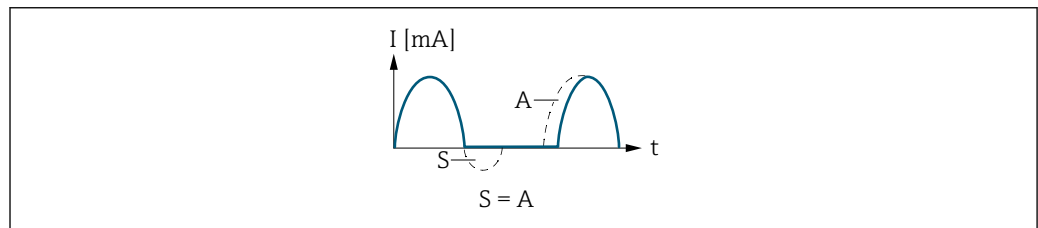


A0028093

I Current
 t Time

With **Reverse flow compensation** option

Flow components outside the measuring span are buffered, balanced and output after a maximum delay of 60 s.

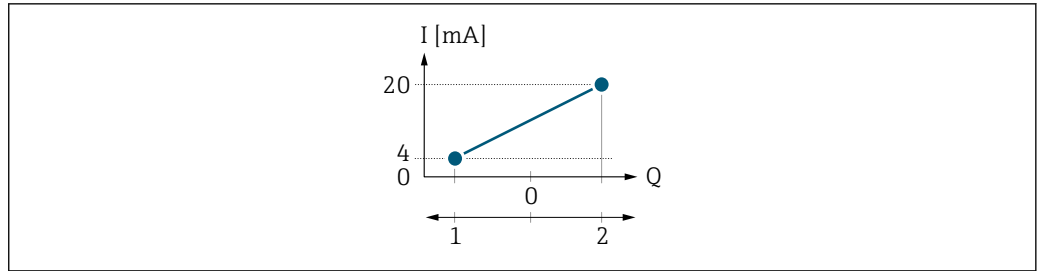


A0028094

I Current
 t Time
 S Flow components saved
 A Balancing of saved flow components

Example 2

Defined measuring range: lower range value and upper range value with **different** signs



A0028095

5 Measuring range

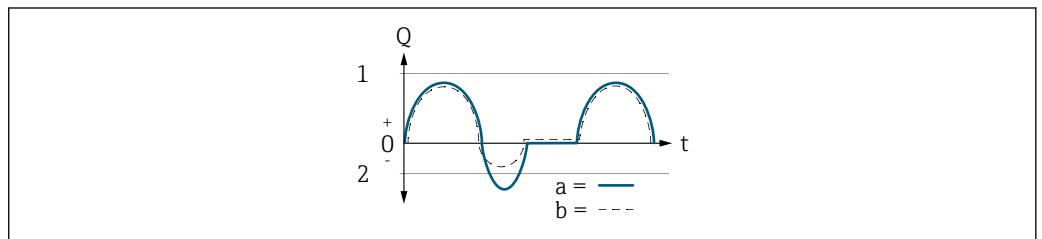
I Current

Q Flow

1 Lower range value (Start of measuring range output)

2 Upper range value (end of measuring range output)

With flow a (—) outside, b (---) inside the measuring range



A0028098

Q Flow

t Time

1 Lower range value (Start of measuring range output)

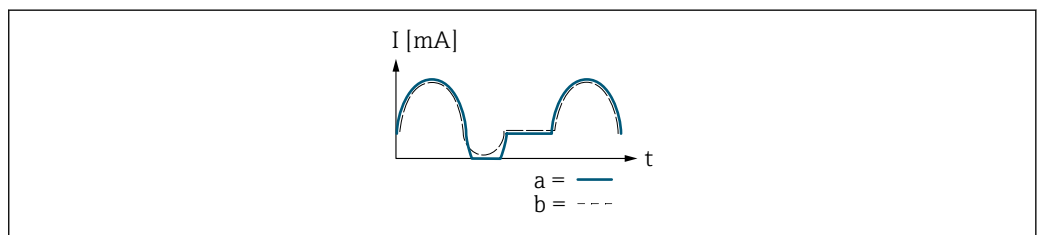
2 Upper range value (end of measuring range output)

With **Forward flow** option

- a (—): The flow components outside the scaled measuring range cannot be taken into account for signal output.

The **△S441 Current output 1 to n** diagnostic message is output.

- b (---): The current output signal is proportional to the process variable assigned.



A0028100

I Current

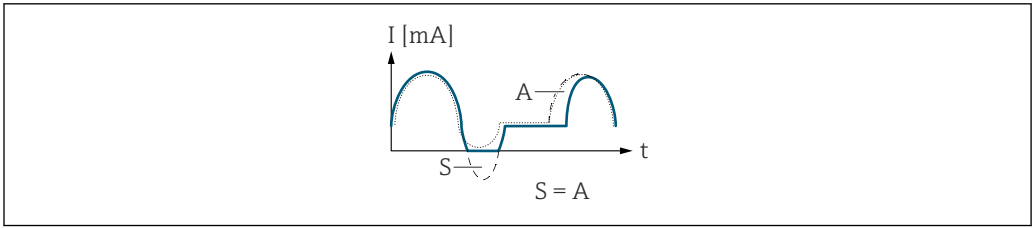
t Time

With **Forward/Reverse flow** option

This option cannot be selected here since the values for the **Lower range value output** parameter (→ 115) and **Upper range value output** parameter (→ 117) have different algebraic signs.

With **Reverse flow compensation** option

Flow components outside the measuring span are buffered, balanced and output after a maximum delay of 60 s.



I Current
t Time
S Flow components saved
A Balancing of saved flow components

Damping current output



Navigation  Expert → Output → Curr.output 1 to n → Damp.curr.outp (0363-1 to n)

Prerequisite A process variable is selected in the **Assign current output** parameter (→  113) and one of the following options is selected in the **Current span** parameter (→  113):

- 4...20 mA NE (3.8...20.5 mA)
- 4...20 mA US (3.9...20.8 mA)
- 4...20 mA (4... 20.5 mA)
- 0...20 mA (0... 20.5 mA)

Description Use this function to enter a time constant for the reaction time of the current output signal to fluctuations in the measured value caused by process conditions.

User entry 0.0 to 999.9 s

Factory setting 1.0 s

Additional information *User entry*

Use this function to enter a time constant (PT1 element³⁾) for current output damping:

- If a low time constant is entered, the current output reacts particularly quickly to fluctuating measured variables.
- On the other hand, the current output reacts more slowly if a high time constant is entered.

 Damping is switched off if **0** is entered (factory setting).

3) proportional transmission behavior with first order delay

**Failure behavior current output****Navigation**

 Expert → Output → Curr.output 1 to n → Fail.behav.out (0364-1 to n)

Prerequisite

A process variable is selected in the **Assign current output** parameter (→  113) and one of the following options is selected in the **Current span** parameter (→  113):

- 4...20 mA NE (3.8...20.5 mA)
- 4...20 mA US (3.9...20.8 mA)
- 4...20 mA (4... 20.5 mA)
- 0...20 mA (0... 20.5 mA)

Description

Use this function to select the value of the current output in the event of a device alarm.

Selection

- Min.
- Max.
- Last valid value
- Actual value
- Fixed value

Factory setting

Max.

Additional information*Description*

This setting does not affect the failsafe mode of other outputs and totalizers. This is specified in separate parameters.

"Min." option

The current output adopts the value of the lower level for signal on alarm.



The signal on alarm level is defined via the **Current span** parameter (→  113).

"Max." option

The current output adopts the value of the upper level for signal on alarm.



The signal on alarm level is defined via the **Current span** parameter (→  113).

"Last valid value" option

The current output adopts the last measured value that was valid before the device alarm occurred.

"Actual value" option

The current output adopts the measured value on the basis of the current flow measurement; the device alarm is ignored.

"Defined value" option

The current output adopts a defined measured value.



The measured value is defined via the **Failure current** parameter (→  124).

Failure current

Navigation	  Expert → Output → Curr.output 1 to n → Fail. current (0352-1 to n)
Prerequisite	The Defined value option is selected in the Failure mode parameter (→  123).
Description	Use this function to enter a fixed value that the current output adopts in the event of a device alarm.
User entry	0 to 22.5 mA
Factory setting	22.5 mA

Output current 1 to n

Navigation	  Expert → Output → Curr.output 1 to n → Output curr. 1 to n (0361-1 to n)
Description	Displays the current value currently calculated for the current output.
User interface	3.59 to 22.5 mA

Measured current 1 to n

Navigation	  Expert → Output → Curr.output 1 to n → Measur. curr. 1 to n (0366-1 to n)
Description	Displays the actual measured value of the output current.
User interface	0 to 30 mA

3.5.2 "Pulse/frequency/switch output 1 to n" submenu

Navigation   Expert → Output → PFS output 1 to n

► Pulse/frequency/switch output
1 to n

Terminal number (0492-1 to n)

→  126

Signal mode (0490-1 to n)

→  126

Operating mode (0469-1 to n)

→  127

Assign pulse output 1 to n (0460-1 to n)	→  128
Pulse scaling (0455-1 to n)	→  129
Pulse width (0452-1 to n)	→  129
Measuring mode (0457-1 to n)	→  130
Failure mode (0480-1 to n)	→  131
Pulse output 1 to n (0456-1 to n)	→  132
Assign frequency output (0478-1 to n)	→  132
Minimum frequency value (0453-1 to n)	→  133
Maximum frequency value (0454-1 to n)	→  133
Measuring value at minimum frequency (0476-1 to n)	→  133
Measuring value at maximum frequency (0475-1 to n)	→  134
Measuring mode (0479-1 to n)	→  134
Damping output 1 to n (0477-1 to n)	→  135
Response time (0491-1 to n)	→  136
Failure mode (0451-1 to n)	→  136
Failure frequency (0474-1 to n)	→  137
Output frequency 1 to n (0471-1 to n)	→  137
Switch output function (0481-1 to n)	→  137
Assign diagnostic behavior (0482-1 to n)	→  138
Assign limit (0483-1 to n)	→  139
Switch-on value (0466-1 to n)	→  141
Switch-off value (0464-1 to n)	→  141

Assign flow direction check (0484-1 to n)	→  142
Assign status (0485-1 to n)	→  142
Switch-on delay (0467-1 to n)	→  142
Switch-off delay (0465-1 to n)	→  143
Failure mode (0486-1 to n)	→  143
Switch state 1 to n (0461-1 to n)	→  143
Invert output signal (0470-1 to n)	→  144

Terminal number

Navigation	  Expert → Output → PFS output 1 to n → Terminal no. (0492-1 to n)
Description	Displays the terminal numbers used by the pulse/frequency/switch output module.
User interface	■ Not used ■ 24-25 (I/O 2) ■ 22-23 (I/O 3)
Additional information	"Not used" option The pulse/frequency/switch output module does not use any terminal numbers.

Signal mode

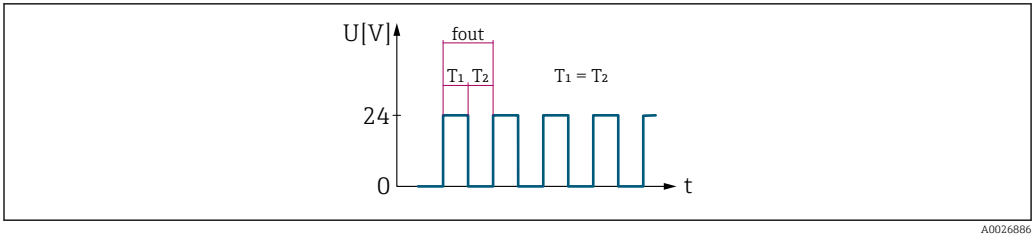


Navigation	  Expert → Output → PFS output 1 to n → Signal mode (0490-1 to n)
Description	Use this function to select the signal mode for the pulse/frequency/switch output.
Selection	■ Passive ■ Active * ■ Passive NE
Factory setting	Passive

* Visibility depends on order options or device settings

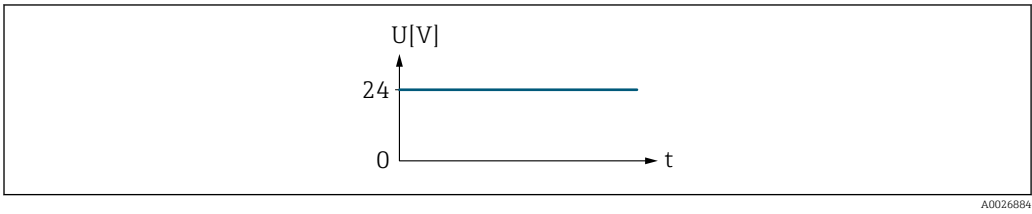
Operating mode	
Navigation	Expert → Output → PFS output 1 to n → Operating mode (0469-1 to n)
Description	Use this function to select the operating mode of the output as a pulse, frequency or switch output.
Selection	■ Pulse ■ Frequency ■ Switch
Factory setting	Pulse
Additional information	<i>"Pulse" option</i> Quantity-dependent pulse with configurable pulse width ■ Whenever a specific mass, volume or corrected volume is reached (pulse value), a pulse is output, the duration of which was set previously (pulse width). ■ The pulses are never shorter than the set duration. Example ■ Flow rate approx. 100 g/s ■ Pulse value 0.1 g ■ Pulse width 0.05 ms ■ Pulse rate 1 000 Impuls/s
	6 Quantity-proportional pulse (pulse value) with pulse width to be configured B Pulse width entered P Pauses between the individual pulses
	<i>"Frequency" option</i> Flow-proportional frequency output with on/off ratio of 1:1 An output frequency is output that is proportional to the value of a process variable, such as volume flow, mass flow, corrected volume flow, flow velocity, conductivity, corrected conductivity, temperature or electronics temperature. Example ■ Flow rate approx. 100 g/s ■ Max. frequency 10 kHz ■ Flow rate at max. frequency 1 000 g/s ■ Output frequency approx. 1 000 Hz

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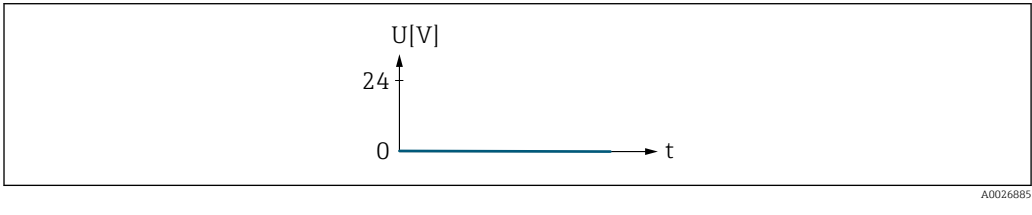
7 Flow-proportional frequency output

"Switch" option
Contact for displaying a condition (e.g. alarm or warning if a limit value is reached)
Example
Alarm response without alarm



8 No alarm, high level

Example
Alarm response in case of alarm

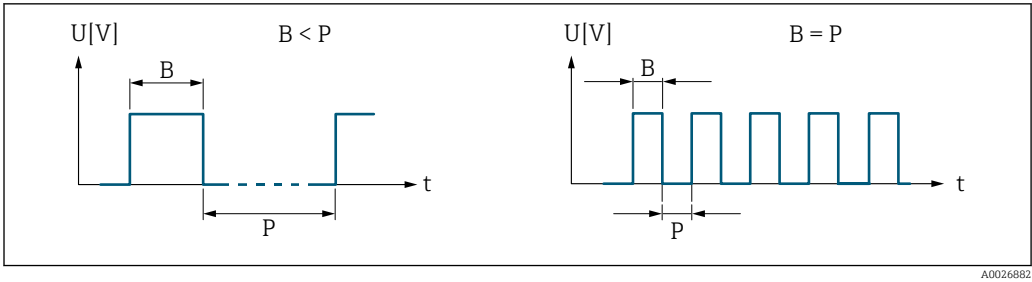


9 Alarm, low level

Assign pulse output 1 to n 🔗

Navigation	🔗🔗 Expert → Output → PFS output 1 to n → Assign pulse 1 to n (0460–1 to n)
Prerequisite	The Pulse option is selected in the Operating mode parameter (→ 📖 127).
Description	Use this function to select the process variable for the pulse output.
Selection	■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow
Factory setting	Off

Pulse scaling 	
Navigation	 Expert → Output → PFS output 1 to n → Pulse scaling (0455-1 to n)
Prerequisite	The Pulse option is selected in the Operating mode parameter (→  127) and a process variable is selected in the Assign pulse output parameter (→  128).
Description	Use this function to enter the value for the measured value that a pulse is equivalent to.
User entry	Positive floating point number
Factory setting	Depends on country and nominal diameter →  259
Additional information	<i>User entry</i> Weighting of the pulse output with a quantity. The lower the pulse value, the ■ better the resolution. ■ the higher the frequency of the pulse response.
Pulse width 	
Navigation	 Expert → Output → PFS output 1 to n → Pulse width (0452-1 to n)
Prerequisite	The Pulse option is selected in the Operating mode parameter (→  127) and a process variable is selected in the Assign pulse output parameter (→  128).
Description	Use this function to enter the duration of the output pulse.
User entry	0.05 to 2 000 ms
Factory setting	100 ms
Additional information	<i>Description</i> ■ Define how long a pulse is (duration). ■ The maximum pulse rate is defined by $f_{\max} = 1 / (2 \times \text{pulse width})$. ■ The interval between two pulses lasts at least as long as the set pulse width. ■ The maximum flow is defined by $Q_{\max} = f_{\max} \times \text{pulse value}$. ■ If the flow exceeds these limit values, the measuring device displays the 443 Pulse output 1 to n diagnostic message.



B Pulse width entered
P Pauses between the individual pulses

Example

- Pulse value: 0.1 g
- Pulse width: 0.1 ms
- $f_{\max}: 1 / (2 \times 0.1 \text{ ms}) = 5 \text{ kHz}$
- $Q_{\max}: 5 \text{ kHz} \times 0.1 \text{ g} = 0.5 \text{ kg/s}$

Measuring mode



Navigation

  Expert → Output → PFS output 1 to n → Measuring mode (0457-1 to n)

Prerequisite

In the **Operating mode** parameter (→  127), the **Pulse** option is selected, and one of the following options is selected in the **Assign pulse output** parameter (→  128):

- Mass flow
- Volume flow
- Corrected volume flow

Description

Use this function to select the measuring mode for the pulse output.

Selection

- Forward flow
- Forward/Reverse flow
- Reverse flow
- Reverse flow compensation

Factory setting

Forward flow

Additional information*Selection*

- **Forward flow**
Positive flow is output, negative flow is not output.
- **Forward/Reverse flow**
Positive and negative flow are output (absolute value), but a distinction is not made between positive and negative flow.
- **Reverse flow**
Negative flow is output, positive flow is not output.
- **Reverse flow compensation**
The flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 s.

 For a detailed description of the options available, see the **Measuring mode** parameter (→  117)

Examples

 For a detailed description of the configuration examples, see the **Measuring mode** parameter (→  117)

Failure mode**Navigation**

  Expert → Output → PFS output 1 to n → Failure mode (0480–1 to n)

Prerequisite

The **Pulse** option is selected in the **Operating mode** parameter (→  127) and a process variable is selected in the **Assign pulse output** parameter (→  128).

Description

Use this function to select the failure mode of the pulse output in the event of a device alarm.

Selection

- **Actual value**
- **No pulses**

Factory setting

No pulses

Additional information*Description*

The dictates of safety render it advisable to ensure that the pulse output shows a predefined behavior in the event of a device alarm.

Selection

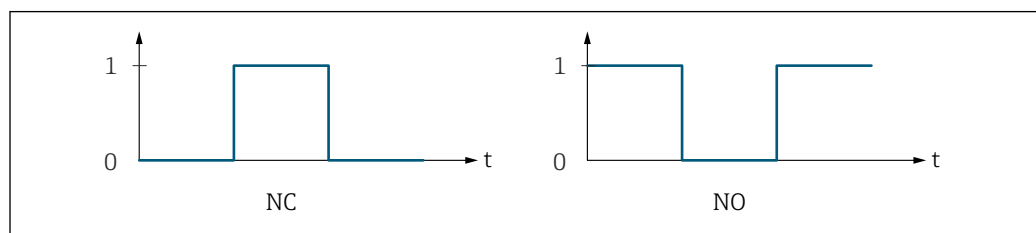
- **Actual value**
In the event of a device alarm, the pulse output continues on the basis of the current flow measurement. The fault is ignored.
- **No pulses**
In the event of a device alarm, the pulse output is "switched off".

NOTICE! A device alarm is a measuring device error that must be taken seriously. It can affect the measurement quality such that the quality can no longer be guaranteed. The **Actual value** option is only recommended if it can be guaranteed that all possible alarm conditions will not affect the measurement quality.

Pulse output 1 to n

Navigation	 Expert → Output → PFS output 1 to n → Pulse output 1 to n (0456–1 to n)
Prerequisite	The Pulse option is selected in the Operating mode parameter (→  127) parameter.
Description	Displays the pulse frequency currently output.
User interface	Positive floating-point number
Additional information	<i>Description</i>

- The pulse output is an open collector output.
- This is configured at the factory in such a way that the transistor is conductive for the duration of the pulse (NO contact) and is safety-oriented.



A0028726

0 Non-conductive
 1 Conductive
 NC NC contact (normally closed)
 NO NO contact (normally open)

The output behavior can be reversed via the **Invert output signal** parameter (→  144) i.e. the transistor does not conduct for the duration of the pulse.

In addition, the behavior of the output in the event of a device alarm (**Failure mode** parameter (→  131)) can be configured.

Assign frequency output



Navigation	 Expert → Output → PFS output 1 to n → Assign freq. (0478–1 to n)
Prerequisite	In the Operating mode parameter (→  127), the Frequency option is selected.
Description	Use this function to select the process variable for the frequency output.
Selection	■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity* ■ Corrected conductivity* ■ Temperature* ■ Electronics temperature

* Visibility depends on order options or device settings

- Noise *
- Coil current shot time *
- Reference electrode potential against PE *
- HBSI *
- Build-up index *
- Test point 1
- Test point 2
- Test point 3

Factory setting Off

Minimum frequency value



Navigation	Expert → Output → PFS output 1 to n → Min. freq. value (0453-1 to n)
Prerequisite	The Frequency option is selected in the Operating mode parameter (→ 127) and a process variable is selected in the Assign frequency output parameter (→ 132).
Description	Use this function to enter the minimum frequency.
User entry	0.0 to 10 000.0 Hz
Factory setting	0.0 Hz

Maximum frequency value



Navigation	Expert → Output → PFS output 1 to n → Max. freq. value (0454-1 to n)
Prerequisite	The Frequency option is selected in the Operating mode parameter (→ 127) and a process variable is selected in the Assign frequency output parameter (→ 132).
Description	Use this function to enter the end value frequency.
User entry	0.0 to 10 000.0 Hz
Factory setting	10 000.0 Hz

Measuring value at minimum frequency



Navigation	Expert → Output → PFS output 1 to n → Val. at min.freq (0476-1 to n)
Prerequisite	The Frequency option is selected in the Operating mode parameter (→ 127) and a process variable is selected in the Assign frequency output parameter (→ 132).

* Visibility depends on order options or device settings

Description	Use this function to enter the measured value for the start value frequency.
User entry	Signed floating-point number
Factory setting	Depends on country and nominal diameter
Additional information	<i>Dependency</i>  The entry depends on the process variable selected in the Assign frequency output parameter (→  132).

Measuring value at maximum frequency


Navigation	  Expert → Output → PFS output 1 to n → Val. at max.freq (0475–1 to n)
Prerequisite	The Frequency option is selected in the Operating mode parameter (→  127) and a process variable is selected in the Assign frequency output parameter (→  132).
Description	Use this function to enter the measured value for the end value frequency.
User entry	Signed floating-point number
Factory setting	Depends on country and nominal diameter
Additional information	<i>Description</i> Use this function to enter the maximum measured value at the maximum frequency. The selected process variable is output as a proportional frequency. <i>Dependency</i>  The entry depends on the process variable selected in the Assign frequency output parameter (→  132).

Measuring mode


Navigation	  Expert → Output → PFS output 1 to n → Measuring mode (0479–1 to n)
Prerequisite	One of the following options is selected in the Assign current output parameter (→  113): ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity* ■ Corrected conductivity* ■ Temperature* ■ Electronics temperature
Description	Use this function to select the measuring mode for the frequency output.

* Visibility depends on order options or device settings

Selection	■ Forward flow ■ Forward/Reverse flow ■ Reverse flow compensation
Factory setting	Forward flow
Additional information	<i>Selection</i>  For a detailed description of the options available, see the Measuring mode parameter (→  117) <i>Examples</i>  For a detailed description of the configuration examples, see the Measuring mode parameter (→  117)

Damping output 1 to n

Navigation	  Expert → Output → PFS output 1 to n → Damping out. 1 to n (0477–1 to n)
Prerequisite	One of the following options is selected in the Assign current output parameter (→  113): ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity[*] ■ Corrected conductivity[*] ■ Temperature[*] ■ Electronics temperature
Description	Use this function to enter a time constant for the reaction time of the output signal to fluctuations in the measured value.
User entry	0 to 999.9 s
Factory setting	0.0 s
Additional information	<i>User entry</i> Use this function to enter a time constant (PT1 element⁴⁾) for frequency output damping: ■ If a low time constant is entered, the current output reacts particularly quickly to fluctuating measured variables. ■ On the other hand, the current output reacts more slowly if a high time constant is entered.  Damping is switched off if 0 is entered (factory setting). The frequency output is subject to separate damping that is independent of all preceding time constants.

* Visibility depends on order options or device settings

4) proportional transmission behavior with first order delay

Response time	
Navigation	 Expert → Output → PFS output 1 to n → Response time (0491-1 to n)
Prerequisite	One of the following options is selected in the Assign current output parameter (→  113): ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity[*] ■ Corrected conductivity[*] ■ Temperature[*] ■ Electronics temperature
Description	Displays the response time. This specifies how quickly the pulse/frequency/switch output reaches the measured value change of 63 % of 100 % of the measured value change.
User interface	Positive floating-point number
Additional information	<i>Description</i>  The response time is made up of the time specified for the following dampings: ■ Damping of pulse/frequency/switch output →  122 and ■ Depending on the measured variable assigned to the output. Flow damping
Failure mode	
Navigation	 Expert → Output → PFS output 1 to n → Failure mode (0451-1 to n)
Prerequisite	The Frequency option is selected in the Operating mode parameter (→  127) and a process variable is selected in the Assign frequency output parameter (→  132).
Description	Use this function to select the failure mode of the frequency output in the event of a device alarm.
Selection	■ Actual value ■ Defined value ■ 0 Hz
Factory setting	0 Hz

* Visibility depends on order options or device settings

Additional information	<i>Selection</i> ■ Actual value In the event of a device alarm, the frequency output continues on the basis of the current flow measurement. The device alarm is ignored. ■ Defined value In the event of a device alarm, the frequency output continues on the basis of a predefined value. The Failure frequency (→  137) replaces the current measured value, making it possible to bypass the device alarm. The actual measurement is switched off for the duration of the device alarm. ■ 0 Hz In the event of a device alarm, the frequency output is "switched off". NOTICE! A device alarm is a measuring device error that must be taken seriously. It can affect the measurement quality such that the quality can no longer be guaranteed. The Actual value option is only recommended if it can be guaranteed that all possible alarm conditions will not affect the measurement quality.
-------------------------------	---

Failure frequency

Navigation	  Expert → Output → PFS output 1 to n → Failure freq. (0474–1 to n)
Prerequisite	In the Operating mode parameter (→  127), the Frequency option is selected, in the Assign frequency output parameter (→  132) a process variable is selected, and in the Failure mode parameter (→  136), the Defined value option is selected.
Description	Use this function to enter the value for the frequency output in the event of a device alarm in order to bypass the alarm.
User entry	0.0 to 12 500.0 Hz
Factory setting	0.0 Hz

Output frequency 1 to n

Navigation	  Expert → Output → PFS output 1 to n → Output freq. 1 to n (0471–1 to n)
Prerequisite	In the Operating mode parameter (→  127), the Frequency option is selected.
Description	Displays the actual value of the output frequency which is currently measured.
User interface	0.0 to 12 500.0 Hz

Switch output function

Navigation	  Expert → Output → PFS output 1 to n → Switch out funct (0481–1 to n)
Prerequisite	The Switch option is selected in the Operating mode parameter (→  127).

Description	Use this function to select a function for the switch output.
Selection	■ Off ■ On ■ Diagnostic behavior ■ Limit ■ Flow direction check ■ Status
Factory setting	Off
Additional information	<i>Selection</i> ■ Off The switch output is permanently switched off (open, non-conductive). ■ On The switch output is permanently switched on (closed, conductive). ■ Diagnostic behavior Indicates if the diagnostic event is present or not. Is used to output diagnostic information and to react to it appropriately at the system level. ■ Limit Indicates if a specified limit value has been reached for the process variable. Is used to output diagnostic information relating to the process and to react to it appropriately at the system level. ■ Flow direction check Indicates the flow direction (forward or reverse flow). ■ Status Displays the device status depending on whether empty pipe detection or low flow cut off is selected.

Assign diagnostic behavior



Navigation	Expert → Output → PFS output 1 to n → Assign diag. beh (0482–1 to n)
Prerequisite	■ In the Operating mode parameter (→ 127), the Switch option is selected. ■ In the Switch output function parameter (→ 137), the Diagnostic behavior option is selected.
Description	Use this function to select the diagnostic event category that is displayed for the switch output.
Selection	■ Alarm ■ Alarm or warning ■ Warning
Factory setting	Alarm

Additional information*Description*

If no diagnostic event is pending, the switch output is closed and conductive.

Selection

- Alarm
The switch output signals only diagnostic events in the alarm category.
- Alarm or warning
The switch output signals diagnostic events in the alarm and warning category.
- Warning
The switch output signals only diagnostic events in the warning category.

Assign limit**Navigation**

Expert → Output → PFS output 1 to n → Assign limit (0483–1 to n)

Prerequisite

- In the **Operating mode** parameter (→ 127), the **Switch** option is selected.
- In the **Switch output function** parameter (→ 137), the **Limit** option is selected.

Description

Use this function to select a process variable for the limit function.

Selection

- Off
- Volume flow
- Mass flow
- Corrected volume flow
- Flow velocity
- Conductivity *
- Corrected conductivity *
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Temperature *
- Electronics temperature

Factory setting

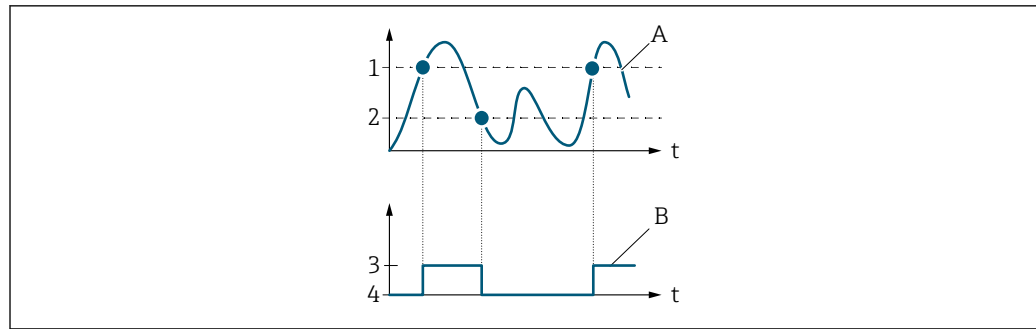
Volume flow

Additional information*Description*

Behavior of status output when Switch-on value > Switch-off value:

- Process variable > Switch-on value: transistor is conductive
- Process variable < Switch-off value: transistor is non-conductive

* Visibility depends on order options or device settings

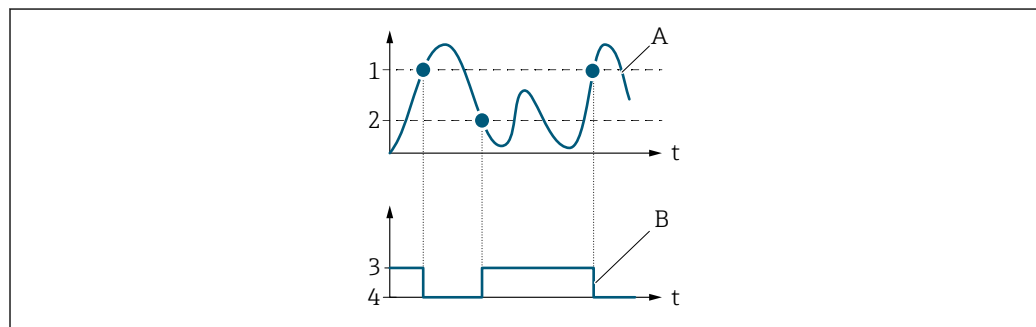


A0026891

- 1 Switch-on value
- 2 Switch-off value
- 3 Conductive
- 4 Non-conductive
- A Process variable
- B Status output

Behavior of status output when Switch-on value < Switch-off value:

- Process variable < Switch-on value: transistor is conductive
- Process variable > Switch-off value: transistor is non-conductive

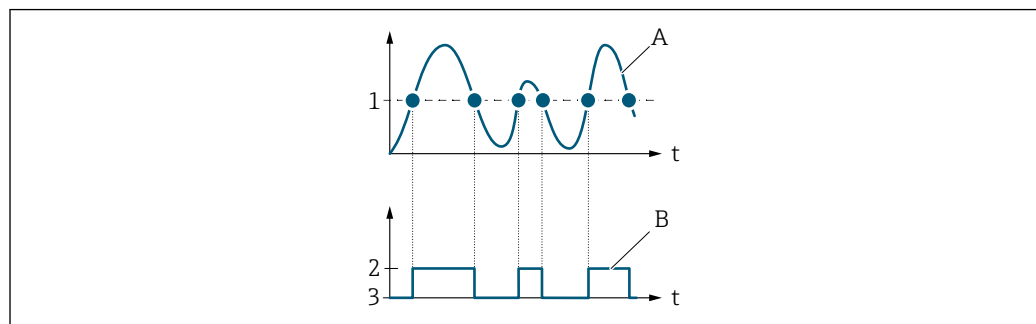


A0026892

- 1 Switch-off value
- 2 Switch-on value
- 3 Conductive
- 4 Non-conductive
- A Process variable
- B Status output

Behavior of status output when Switch-on value = Switch-off value:

- Process variable > Switch-on value: transistor is conductive
- Process variable < Switch-off value: transistor is non-conductive



A0026893

- 1 Switch-on value = Switch-off value
- 2 Conductive
- 3 Non-conductive
- A Process variable
- B Status output

Switch-on value	
Navigation	Expert → Output → PFS output 1 to n → Switch-on value (0466–1 to n)
Prerequisite	▪ The Switch option is selected in the Operating mode parameter (→ 127). ▪ The Limit option is selected in the Switch output function parameter (→ 137).
Description	Use this function to enter the measured value for the switch-on point.
User entry	Signed floating-point number
Factory setting	Country-specific: ▪ 0 l/h ▪ 0 gal/min (us)
Additional information	<i>Description</i> Use this function to enter the limit value for the switch-on value (process variable > switch-on value = closed, conductive). When using a hysteresis: Switch-on value > Switch-off value. <i>Dependency</i> The unit depends on the process variable selected in the Assign limit parameter (→ 139).
Switch-off value	
Navigation	Expert → Output → PFS output 1 to n → Switch-off value (0464–1 to n)
Prerequisite	▪ The Switch option is selected in the Operating mode parameter (→ 127). ▪ The Limit option is selected in the Switch output function parameter (→ 137).
Description	Use this function to enter the measured value for the switch-off point.
User entry	Signed floating-point number
Factory setting	Country-specific: ▪ 0 l/h ▪ 0 gal/min (us)
Additional information	<i>Description</i> Use this function to enter the limit value for the switch-off value (process variable < switch-off value = open, non-conductive). When using a hysteresis: Switch-on value > Switch-off value. <i>Dependency</i> The unit depends on the process variable selected in the Assign limit parameter (→ 139).

Assign flow direction check 	
Navigation	 Expert → Output → PFS output 1 to n → Assign dir.check (0484-1 to n)
Prerequisite	■ The Switch option is selected in the Operating mode parameter (→  127). ■ The Flow direction check option is selected in the Switch output function parameter (→  137).
Description	Use this function to select a process variable for monitoring the flow direction.
Selection	■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow
Factory setting	Volume flow

Assign status 	
Navigation	 Expert → Output → PFS output 1 to n → Assign status (0485-1 to n)
Prerequisite	■ The Switch option is selected in the Operating mode parameter (→  127). ■ The Status option is selected in the Switch output function parameter (→  137).
Description	Use this function to select a device status for the switch output.
Selection	■ Empty pipe detection ■ Low flow cut off ■ Build-up index * ■ HBSI limit exceeded *
Factory setting	Empty pipe detection
Additional information	<i>Selection</i> If empty pipe detection or low flow cut off are active, the output is conductive. Otherwise, the switch output is non-conductive.

Switch-on delay 	
Navigation	 Expert → Output → PFS output 1 to n → Switch-on delay (0467-1 to n)
Prerequisite	■ The Switch option is selected in the Operating mode parameter (→  127). ■ The Limit option is selected in the Switch output function parameter (→  137).
Description	Use this function to enter a delay time for switching on the switch output.

* Visibility depends on order options or device settings

User entry 0.0 to 100.0 s

Factory setting 0.0 s

Switch-off delay

Navigation   Expert → Output → PFS output 1 to n → Switch-off delay (0465–1 to n)

Prerequisite

- The **Switch** option is selected in the **Operating mode** parameter (→  127).
- The **Limit** option is selected in the **Switch output function** parameter (→  137).

Description Use this function to enter a delay time for switching off the switch output.

User entry 0.0 to 100.0 s

Factory setting 0.0 s

Failure mode

Navigation   Expert → Output → PFS output 1 to n → Failure mode (0486–1 to n)

Description Use this function to select a failsafe mode for the switch output in the event of a device alarm.

Selection

- Actual status
- Open
- Closed

Factory setting Open

Additional information *Options*

- Actual status
In the event of a device alarm, faults are ignored and the current behavior of the input value is output by the switch output. The **Actual status** option behaves in the same way as the current input value.
- Open
In the event of a device alarm, the switch output's transistor is set to **non-conductive**.
- Closed
In the event of a device alarm, the switch output's transistor is set to **conductive**.

Switch state 1 to n

Navigation   Expert → Output → PFS output 1 to n → Switch state 1 to n (0461–1 to n)

Prerequisite The **Switch** option is selected in the **Operating mode** parameter (→  127).

Description

Displays the current switch status of the status output.

- User interface
- Open

■ Closed

- Additional information
- User interface

■ Open

The switch output is not conductive.

■ Closed

The switch output is conductive.

Invert output signal

Navigation

Expert → Output → PFS output 1 to n → Invert outp.sig. (0470-1 to n)

Description

Use this function to select whether to invert the output signal.

- Selection
- No

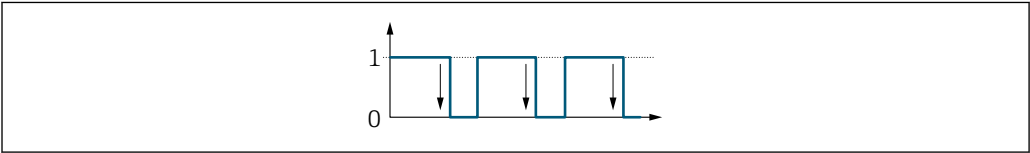
■ Yes

Factory setting

No

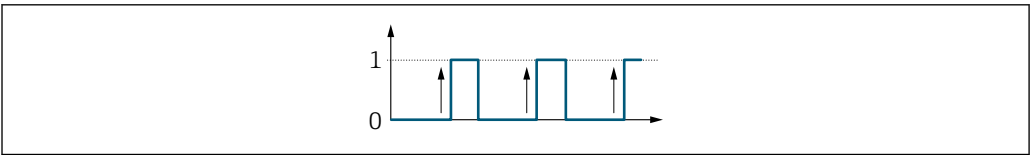
- Additional information
- Selection

No option (passive - negative)



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Yes option (passive - positive)



A0026692

3.5.3 "Relay output 1 to n" submenu

Navigation

Expert → Output → Relay output 1 to n

► Relay output 1 to n

Terminal number (0812-1 to n)

→ 145

Relay output function (0804-1 to n)	→ 145
Assign flow direction check (0808-1 to n)	→ 146
Assign limit (0807-1 to n)	→ 146
Assign diagnostic behavior (0806-1 to n)	→ 147
Assign status (0805-1 to n)	→ 148
Switch-off value (0809-1 to n)	→ 148
Switch-off delay (0813-1 to n)	→ 148
Switch-on value (0810-1 to n)	→ 149
Switch-on delay (0814-1 to n)	→ 149
Failure mode (0811-1 to n)	→ 149
Switch state (0801-1 to n)	→ 150
Powerless relay status (0816-1 to n)	→ 150

Terminal number

Navigation	Expert → Output → Relay output 1 to n → Terminal no. (0812-1 to n)
Description	Displays the terminal numbers used by the relay output module.
User interface	- Not used 24-25 (I/O 2) 22-23 (I/O 3)
Additional information	"Not used" option The relay output module does not use any terminal numbers.

Relay output function

Navigation	Expert → Output → Relay output 1 to n → Relay outp.func. (0804-1 to n)
Description	Use this function to select an output function for the relay output.

Selection	■ Closed ■ Open ■ Diagnostic behavior ■ Limit ■ Flow direction check ■ Digital Output
Factory setting	Closed
Additional information	<i>Selection</i> ■ Closed The relay output is permanently switched on (closed, conductive). ■ Open The relay output is permanently switched off (open, non-conductive). ■ Diagnostic behavior Indicates if the diagnostic event is present or not. Is used to output diagnostic information and to react to it appropriately at the system level. ■ Limit Indicates if a specified limit value has been reached for the process variable. Is used to output diagnostic information relating to the process and to react to it appropriately at the system level. ■ Flow direction check Indicates the flow direction (forward or reverse flow). ■ Digital Output Indicates the device status depending on whether empty pipe detection or low flow cut off is selected.

Assign flow direction check

Navigation	  Expert → Output → Relay output 1 to n → Assign dir.check (0808–1 to n)
Prerequisite	The Flow direction check option is selected in the Relay output function parameter (→  145).
Description	Use this function to select a process variable for monitoring the flow direction.
Selection	■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow
Factory setting	Volume flow

Assign limit

Navigation	  Expert → Output → Relay output 1 to n → Assign limit (0807–1 to n)
Prerequisite	The Limit option is selected in the Relay output function parameter (→  145).
Description	Use this function to select a process variable for the limit value function.

Selection	■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity * ■ Corrected conductivity * ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Temperature * ■ Electronics temperature
------------------	--

Factory setting	Volume flow
------------------------	-------------

Assign diagnostic behavior

Navigation	  Expert → Output → Relay output 1 to n → Assign diag. beh (0806-1 to n)
Prerequisite	In the Relay output function parameter (→  145), the Diagnostic behavior option is selected.
Description	Use this function to select the category of the diagnostic events that are displayed for the relay output.
Selection	■ Alarm ■ Alarm or warning ■ Warning
Factory setting	Alarm
Additional information	<i>Description</i>  If no diagnostic event is pending, the relay output is closed and conductive. <i>Selection</i> ■ Alarm The relay output signals only diagnostic events in the alarm category. ■ Alarm or warning The relay output signals diagnostic events in the alarm and warning category. ■ Warning The relay output signals only diagnostic events in the warning category.

* Visibility depends on order options or device settings

Assign status 	
Navigation	  Expert → Output → Relay output 1 to n → Assign status (0805–1 to n)
Prerequisite	In the Relay output function parameter (→  145), the Digital Output option is selected.
Description	Use this function to select the device status for the relay output.
Selection	▪ Partially filled pipe detection ▪ Low flow cut off ▪ HBSI limit exceeded *
Factory setting	Partially filled pipe detection
Switch-off value 	
Navigation	  Expert → Output → Relay output 1 to n → Switch-off value (0809–1 to n)
Prerequisite	In the Relay output function parameter (→  145), the Limit option is selected.
Description	Use this function to enter the measured value for the switch-off point.
User entry	Signed floating-point number
Factory setting	Country-specific: ▪ 0 l/h ▪ 0 gal(us)/min
Additional information	<i>Description</i> Use this function to enter the limit value for the switch-off value (process variable < switch-off value = open, non-conductive).  When using a hysteresis: Switch-on value > Switch-off value. <i>Dependency</i>  The unit is dependent on the process variable selected in the Assign limit parameter (→  146).
Switch-off delay 	
Navigation	  Expert → Output → Relay output 1 to n → Switch-off delay (0813–1 to n)
Prerequisite	In the Relay output function parameter (→  145), the Limit option is selected.
Description	Use this function to enter a delay time for switching off the switch output.

* Visibility depends on order options or device settings

User entry 0.0 to 100.0 s

Factory setting 0.0 s

Switch-on value

Navigation   Expert → Output → Relay output 1 to n → Switch-on value (0810–1 to n)

Prerequisite The **Limit** option is selected in the **Relay output function** parameter (→  145).

Description Use this function to enter the measured value for the switch-on point.

User entry Signed floating-point number

Factory setting Country-specific:
 ■ 0 l/h
 ■ 0 gal(us)/min

Additional information *Description*
 Use this function to enter the limit value for the switch-on value (process variable > switch-on value = closed, conductive).



When using a hysteresis: Switch-on value > Switch-off value.

Dependency



The unit is dependent on the process variable selected in the **Assign limit** parameter (→  146).

Switch-on delay

Navigation   Expert → Output → Relay output 1 to n → Switch-on delay (0814–1 to n)

Prerequisite In the **Relay output function** parameter (→  145), the **Limit** option is selected.

Description Use this function to enter a delay time for switching on the switch output.

User entry 0.0 to 100.0 s

Factory setting 0.0 s

Failure mode

Navigation   Expert → Output → Relay output 1 to n → Failure mode (0811–1 to n)

Description Use this function to select the failure mode of the relay output in the event of a device alarm.

Selection	■ Actual status ■ Open ■ Closed
Factory setting	Open
Additional information	<i>Selection</i> ■ Actual status In the event of a device alarm, faults are ignored and the current behavior of the input value is output by the relay output. The Actual status option behaves in the same way as the current input value. ■ Open In the event of a device alarm, the relay output's transistor is set to non-conductive. ■ Closed In the event of a device alarm, the relay output's transistor is set to conductive.

Switch state

Navigation	 Expert → Output → Relay output 1 to n → Switch state (0801–1 to n)
Description	Displays the current status of the relay output.
User interface	■ Open ■ Closed
Additional information	<i>User interface</i> ■ Open The relay output is not conductive. ■ Closed The relay output is conductive.

Powerless relay status



Navigation	 Expert → Output → Relay output 1 to n → Powerless relay (0816–1 to n)
Description	Use this function to select the quiescent state for the relay output.
Selection	■ Open ■ Closed
Factory setting	Open
Additional information	<i>Selection</i> ■ Open The relay output is not conductive. ■ Closed The relay output is conductive.

3.5.4 "Double pulse output" submenu

Navigation  Expert → Output → Double pulse out

► Double pulse output		
Master terminal number (0981)	→ 	151
Slave terminal number (0990)	→ 	152
Signal mode (0991)	→ 	152
Assign pulse output 1 (0982-1)	→ 	152
Value per pulse (0983)	→ 	152
Pulse width (0986)	→ 	153
Phase shift (0992)	→ 	153
Measuring mode (0984)	→ 	153
Failure mode (0985)	→ 	154
Pulse output (0987)	→ 	155
Invert output signal (0993)	→ 	155

Master terminal number

Navigation  Expert → Output → Double pulse out → Master term. no. (0981)

Description Displays the master terminal number for the double pulse output.

User interface

- Not used
- 24-25 (I/O 2)
- 22-23 (I/O 3)

Additional information

"Not used" option

The double pulse output does not use any terminal numbers.

Slave terminal number

Navigation  Expert → Output → Double pulse out → Slave term. no. (0990)

Description Displays the slave terminal number for the double pulse output.

User interface

- Not used
- 24-25 (I/O 2)
- 22-23 (I/O 3)

Additional information *"Not used" option*
The double pulse output does not use any terminal numbers.

Signal mode

Navigation  Expert → Output → Double pulse out → Signal mode (0991)

Description Use this function to select the signal mode for the double pulse output.

Selection

- Passive
- Active *
- Passive NE

Factory setting Passive

Assign pulse output 1

Navigation  Expert → Output → Double pulse out → Assign pulse 1 (0982-1)

Description Use this function to select a process variable for the double pulse output.

Selection

- Off
- Volume flow
- Mass flow
- Corrected volume flow

Factory setting Off

Value per pulse

Navigation  Expert → Output → Double pulse out → Value per pulse (0983)

Description Use this function to enter the value for the measured value that a pulse is equivalent to.

* Visibility depends on order options or device settings

User entry	Signed floating-point number
Factory setting	Depends on country and nominal diameter →  259

Additional information	<i>User entry</i> Weighting of the pulse output with a quantity. The lower the pulse value, the ■ better the resolution. ■ the higher the frequency of the pulse response.
-------------------------------	---

Pulse width



Navigation	  Expert → Output → Double pulse out → Pulse width (0986)
Description	Use this function to enter the duration of the output pulse.
User entry	0.5 to 2 000 ms
Factory setting	0.5 ms
Additional information	 For a detailed description and example: Pulse width parameter (→  129)

Phase shift



Navigation	  Expert → Output → Double pulse out → Phase shift (0992)
Description	Use this function to select the degree of phase shift.
Selection	■ 90° ■ 180°
Factory setting	90°
Additional information	<i>Selection</i> ■ 90° Phase shift by a quarter period. ■ 180° Phase shift by a half period, which is equivalent to a phase reversal.

Measuring mode



Navigation	  Expert → Output → Double pulse out → Measuring mode (0984)
Description	Use this function to select the measuring mode for the double pulse output.

Selection	■ Forward flow ■ Forward/Reverse flow ■ Reverse flow ■ Reverse flow compensation
Factory setting	Forward flow
Additional information	<i>Selection</i> ■ Forward flow Positive flow is output, negative flow is not output. ■ Forward/Reverse flow Positive and negative flow are output (absolute value), but a distinction is not made between positive and negative flow. ■ Reverse flow Negative flow is output, positive flow is not output. ■ Reverse flow compensation The flow components outside the span are buffered, balanced and output after a maximum delay of 60 s.  For a detailed description of the options available, see the Measuring mode parameter (→  117) <i>Examples</i>  For a detailed description of the configuration examples, see the Measuring mode parameter (→  117)

Failure mode


Navigation	  Expert → Output → Double pulse out → Failure mode (0985)
Description	Use this function to select the failure mode of the double pulse output in the event of a device alarm.
Selection	■ Actual value ■ No pulses
Factory setting	No pulses
Additional information	<i>Description</i> The dictates of safety render it advisable to ensure that the double pulse output shows a predefined behavior in the event of a device alarm. <i>Selection</i> ■ Actual value In the event of a device alarm, the double pulse output continues on the basis of the current flow measurement. The fault is ignored. ■ No pulses In the case of the double pulse output, if a device alarm occurs one pulse output is stopped and the other pulse output runs at the maximum pulse frequency. NOTICE! A device alarm is a measuring device error that must be taken seriously. It can affect the measurement quality such that the quality can no longer be guaranteed. The Actual value option is only recommended if it can be guaranteed that all possible alarm conditions will not affect the measurement quality.

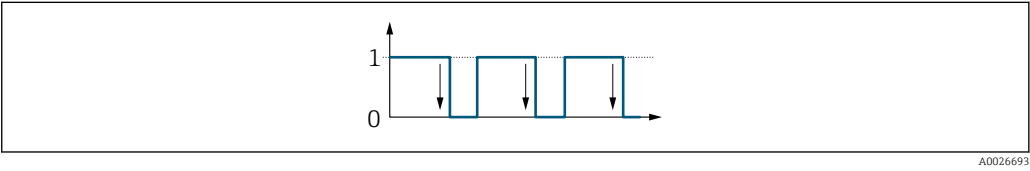
Pulse output

Navigation	Expert → Output → Double pulse out → Pulse output (0987)
Description	Displays the pulse frequency of the double pulse output which is currently output.
User interface	Positive floating-point number
Additional information	For a detailed description and example: Pulse output parameter (→ 54)

Invert output signal

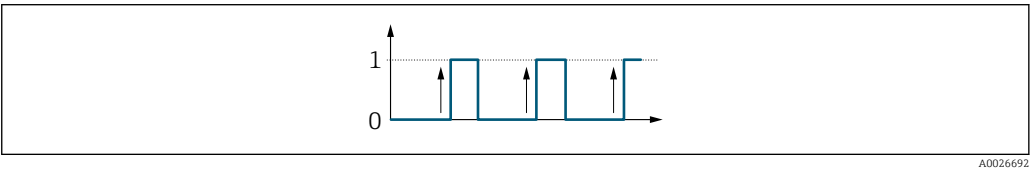


Navigation	Expert → Output → Double pulse out → Invert outp.sig. (0993)
Description	Use this function to select whether to invert the output signal.
Selection	■ No ■ Yes
Factory setting	No
Additional information	<i>Selection</i> No option (passive - negative)



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Yes option (passive - positive)



A0026692

3.6 "Communication" submenu

Navigation Expert → Communication

► Communication

► HART input

→ 156

▶ HART output	→ 161
▶ Diagnostic configuration	→ 188
▶ Web server	→ 178
▶ WLAN settings	→ 181
▶ OPC-UA configuration	→ 188

3.6.1 "HART input" submenu

Navigation  Expert → Communication → HART input

▶ HART input	
▶ Configuration	→ 156
▶ Input	→ 161

"Configuration" submenu

Navigation  Expert → Communication → HART input → Configuration

▶ Configuration	
Capture mode (7001)	→ 157
Device ID (7007)	→ 157
Device type (7008)	→ 157
Manufacturer ID (7009)	→ 158
Burst command (7006)	→ 158
Slot number (7010)	→ 159
Timeout (7005)	→ 159
Failure mode (7011)	→ 160
Failure value (7012)	→ 160

Capture mode 	
Navigation	  Expert → Communication → HART input → Configuration → Capture mode (7001)
Description	Use this function to select the capture mode via burst or master communication.
Selection	■ Off ■ Burst network ■ Master network
Factory setting	Off
Additional information	<i>"Burst network" option</i> The device records data transmitted via burst in the network. <i>"Master network" option</i> In this case, the device must be located in a HART network in which a HART master (control) queries the measured values of the up to 64 network participants. The device reacts only to the responses of a specific device in the network. Device ID, device type, manufacturer ID and the HART commands used by the master must be defined.
Device ID 	
Navigation	  Expert → Communication → HART input → Configuration → Device ID (7007)
Prerequisite	The Master network option is selected in the Capture mode parameter (→  157).
Description	Use this function to enter the device ID of the HART slave device whose data are to be recorded.
User entry	6-digit value: ■ Via local operation: enter as hexadecimal or decimal number ■ Via operating tool: enter as decimal number
Factory setting	0
Additional information	 In addition to the device ID and manufacturer ID, the device type is part of the unique ID. Each HART device is uniquely identified by the unique device ID.
Device type 	
Navigation	  Expert → Communication → HART input → Configuration → Device type (7008)
Prerequisite	In the Capture mode parameter (→  157), the Master network option is selected.
Description	Use this function to enter the device type of the HART slave device whose data are to be recorded.

User entry	2-digit hexadecimal number
Factory setting	0x00
Additional information	 In addition to the device ID and manufacturer ID, the device type is part of the unique ID. Each HART device is uniquely identified by the unique device ID.

Manufacturer ID

Navigation	  Expert → Communication → HART input → Configuration → Manufacturer ID (7009)
Prerequisite	The Master network option is selected in the Capture mode parameter (→  157).
Description	Use this function to enter the manufacturer ID of the HART slave device whose data are to be recorded.
User entry	2-digit value: ▪ Via local operation: enter as hexadecimal or decimal number ▪ Via operating tool: enter as decimal number
Factory setting	0
Additional information	 In addition to the device ID and manufacturer ID, the device type is part of the unique ID. Each HART device is uniquely identified by the unique device ID.

Burst command

Navigation	  Expert → Communication → HART input → Configuration → Burst command (7006)
Prerequisite	The Burst network option or the Master network option are selected in the Capture mode parameter (→  157).
Description	Use this function to select the burst command to be recorded.
Selection	▪ Command 1 ▪ Command 3 ▪ Command 9 ▪ Command 33
Factory setting	Command 1

Additional information*Selection*

- **Command 1**
Use this function to capture the primary variable.
- **Command 3**
Use this function to capture the dynamic HART variables and the current.
- **Command 9**
Use this function to capture the dynamic HART variables including the associated status.
- **Command 33**
Use this function to capture the dynamic HART variables including the associated unit.

Slot number**Navigation**

Expert → Communication → HART input → Configuration → Slot number (7010)

Prerequisite

The **Burst network** option or the **Master network** option is selected in the **Capture mode** parameter (→ 157).

Description

Use this function to enter the position of the process variable to be recorded in the burst command.

User entry

1 to 8

Factory setting

1

Additional information*User entry*

Slot	Command			
	1	3	9	33
1	PV	PV	HART variable (slot 1)	HART variable (slot 1)
2	–	SV	HART variable (slot 2)	HART variable (slot 2)
3	–	TV	HART variable (slot 3)	HART variable (slot 3)
4	–	QV	HART variable (slot 4)	HART variable (slot 4)
5	–	–	HART variable (slot 5)	–
6	–	–	HART variable (slot 6)	–
7	–	–	HART variable (slot 7)	–
8	–	–	HART variable (slot 8)	–

Timeout**Navigation**

Expert → Communication → HART input → Configuration → Timeout (7005)

Prerequisite

The **Burst network** option or the **Master network** option is selected in the **Capture mode** parameter (→ 157).

Description

Use this function to enter the maximum permitted interval between two HART frames.

User entry

1 to 120 s

Factory setting 5 s

Additional information *Description*



If the interval is exceeded, the measuring device displays the **✖F882 Input signal** diagnostic message.

Failure mode

Navigation Expert → Communication → HART input → Configuration → Failure mode (7011)

Prerequisite In the **Capture mode** parameter (→ 157), the **Burst network** option or **Master network** option is selected.

Description Use this function to select the device behavior if no data are recorded within the maximum permitted interval.

Selection

- Alarm
- Last valid value
- Defined value

Factory setting Alarm

Additional information *Options*

- Alarm
An error message is set.
- Last valid value
The last valid measured value is used.
- Defined value
A user-defined measured value is used: (**Failure value** parameter (→ 160)).

Failure value

Navigation Expert → Communication → HART input → Configuration → Failure value (7012)

Prerequisite The following conditions are met:

- In the **Capture mode** parameter (→ 157), the **Burst network** option or **Master network** option is selected.
- In the **Failure mode** parameter (→ 160), the **Defined value** option is selected.

Description Use this function to enter the measured value to be used if no data are recorded within the maximum permitted interval.

User entry Signed floating-point number

Factory setting 0

"Input" submenu

Navigation  Expert → Communication → HART input → Input

► Input

Value (7003)

→  161

Status (7004)

→  161

Value

Navigation  Expert → Communication → HART input → Input → Value (7003)

Description Displays the value of the device variable recorded by the HART input.

User interface Signed floating-point number

Status

Navigation  Expert → Communication → HART input → Input → Status (7004)

Description Displays the value of the device variable recorded by the HART input in accordance with the HART specification.

User interface

- Manual/Fixed
- Good
- Poor accuracy
- Bad

3.6.2 "HART output" submenu

Navigation  Expert → Communication → HART output

► HART output

► Configuration

→  162

► Burst configuration

→  164

► Information	→ ⓘ 170
► Output	→ ⓘ 174

"Configuration" submenu

Navigation ⓘ ⓘ Expert → Communication → HART output → Configuration

► Configuration	
HART short tag (0220)	→ ⓘ 162
Device tag (0215)	→ ⓘ 162
HART address (0219)	→ ⓘ 163
No. of preambles (0217)	→ ⓘ 163
Fieldbus writing access (0273)	→ ⓘ 163

HART short tag ⓘ

Navigation	ⓘ ⓘ Expert → Communication → HART output → Configuration → HART short tag (0220)
Description	Use this function to enter a brief description for the measuring point. This can be edited and displayed via HART protocol or using the local display.
User entry	Max. 8 characters: A to Z, 0 to 9 and certain special characters (e.g. punctuation marks, @, %).
Factory setting	PROMAG

Device tag ⓘ

Navigation	ⓘ ⓘ Expert → Communication → HART output → Configuration → Device tag (0215)
Description	Use this function to enter the name for the measuring point.
User entry	Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /).
Factory setting	Promag

HART address 	
Navigation	  Expert → Communication → HART output → Configuration → HART address (0219)
Description	Use this function to enter the address via which the data exchange takes place via HART protocol.
User entry	0 to 63
Factory setting	0
Additional information	<i>Description</i> For addressing in a HART Multidrop network, the Fixed current option must be set in the Current span parameter (→  113) (current output 1).
No. of preambles 	
Navigation	  Expert → Communication → HART output → Configuration → No. of preambles (0217)
Description	Use this function to enter the number of preambles in the HART protocol.
User entry	2 to 20
Factory setting	5
Additional information	<i>User entry</i> As every modem component can "swallow" a byte, 2-byte preambles at least must be defined.
Fieldbus writing access 	
Navigation	  Expert → Communication → HART output → Configuration → Fieldb.writ.acc. (0273)
Description	Use this function to restrict access to the measuring device via fieldbus (HART interface).
Selection	■ Read + write ■ Read only
Factory setting	Read + write

Additional information

Description

If read and/or write protection is enabled, the parameter can only be controlled and reset via local operation. Access is no longer possible via operating tools.

Selection

- Read + write
The parameters are readable and writable.
- Read only
The parameters are only readable.

"Burst configuration 1 to n" submenu

Navigation

 Expert → Communication → HART output → Burst config.
→ Burst config. 1 to n

► Burst configuration 1 to n		
Burst mode 1 to n (2032-1 to n)	→	 165
Burst command 1 to n (2031-1 to n)	→	 165
Burst variable 0 (2033)	→	 166
Burst variable 1 (2034)	→	 167
Burst variable 2 (2035)	→	 167
Burst variable 3 (2036)	→	 167
Burst variable 4 (2037)	→	 168
Burst variable 5 (2038)	→	 168
Burst variable 6 (2039)	→	 168
Burst variable 7 (2040)	→	 168
Burst trigger mode (2044-1 to n)	→	 169
Burst trigger level (2043-1 to n)	→	 169
Min. update period (2042-1 to n)	→	 170
Max. update period (2041-1 to n)	→	 170

Burst mode 1 to n 	
Navigation	  Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst mode 1 to n (2032–1 to n)
Description	Use this function to select whether to activate the HART burst mode for burst message X.
Selection	■ Off ■ On
Factory setting	Off
Additional information	<i>Options</i> ■ Off The measuring device transmits data only when requested by the HART master. ■ On The measuring device transmits data regularly without being requested.
Burst command 1 to n 	
Navigation	  Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst command 1 to n (2031–1 to n)
Description	Use this function to select the HART command that is sent to the HART master.
Selection	■ Command 1 ■ Command 2 ■ Command 3 ■ Command 9 ■ Command 33 ■ Command 48
Factory setting	Command 2
Additional information	<i>Selection</i> ■ Command 1 Read out the primary variable. ■ Command 2 Read out the current and the main measured value as a percentage. ■ Command 3 Read out the dynamic HART variables and the current. ■ Command 9 Read out the dynamic HART variables including the related status. ■ Command 33 Read out the dynamic HART variables including the related unit. ■ Command 48 Read out the complete device diagnostics. <i>"Command 33" option</i> The HART device variables are defined via Command 107.

The following measured variables (HART device variables) can be read out:

- Volume flow
- Mass flow
- Corrected volume flow
- Flow velocity
- Conductivity^{*}
- Corrected conductivity^{*}
- Electronics temperature
- Temperature^{*}
- HART input
- Totalizer 1...3
- Percent of range
- Measured current
- Primary variable (PV)
- Secondary variable (SV)
- Tertiary variable (TV)
- Quaternary variable (QV)

Commands

-  ■ Information about the defined details of the command: HART specifications
- The measured variables (HART device variables) are assigned to the dynamic variables in the **Output** submenu (→  111).

Burst variable 0

Navigation

  Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 0 (2033)

Description

For HART command 9 and 33: select the HART device variable or the process variable.

Selection

- Volume flow
- Mass flow
- Corrected volume flow
- Flow velocity
- Conductivity^{*}
- Corrected conductivity^{*}
- Electronics temperature
- HBSI^{*}
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Density
- Temperature^{*}
- HART input
- Percent of range
- Measured current
- Primary variable (PV)
- Secondary variable (SV)
- Tertiary variable (TV)
- Quaternary variable (QV)
- Not used

* Visibility depends on order options or device settings

Factory setting Volume flow

Additional information *Selection*

If a burst message is not configured, the **Not used** option is set.

Burst variable 1



Navigation  Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 1 (2034)

Description For HART command 9 and 33: select the HART device variable or the process variable.

Selection See the **Burst variable 0** parameter (→  166).

Factory setting Not used

Burst variable 2



Navigation  Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 2 (2035)

Description For HART command 9 and 33: select the HART device variable or the process variable.

Selection See the **Burst variable 0** parameter (→  166).

Factory setting Not used

Burst variable 3



Navigation  Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 3 (2036)

Description For HART command 9 and 33: select the HART device variable or the process variable.

Selection See the **Burst variable 0** parameter (→  166).

Factory setting Not used

Burst variable 4



Navigation	  Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 4 (2037)
Description	For HART command 9: select the HART device variable or the process variable.
Selection	See the Burst variable 0 parameter (→  166).
Factory setting	Not used

Burst variable 5



Navigation	  Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 5 (2038)
Description	For HART command 9: select the HART device variable or the process variable.
Selection	See the Burst variable 0 parameter (→  166).
Factory setting	Not used

Burst variable 6



Navigation	  Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 6 (2039)
Description	For HART command 9: select the HART device variable or the process variable.
Selection	See the Burst variable 0 parameter (→  166).
Factory setting	Not used

Burst variable 7



Navigation	  Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 7 (2040)
Description	For HART command 9: select the HART device variable or the process variable.
Selection	See the Burst variable 0 parameter (→  166).
Factory setting	Not used

Burst trigger mode 	
Navigation	  Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Trigger mode (2044-1 to n)
Description	Use this function to select the event that triggers burst message X.
Selection	■ Continuous ■ Window[*] ■ Rising[*] ■ Falling[*] ■ On change
Factory setting	Continuous
Additional information	<i>Selection</i> ■ Continuous The message is sent continuously, at least at intervals corresponding to the time frame specified in the Burst min period parameter (→  170). ■ Window The message is sent if the specified measured value has changed by the value in the Burst trigger level parameter (→  169). ■ Rising The message is sent if the specified measured value exceeds the value in the Burst trigger level parameter (→  169). ■ Falling The message is sent if the specified measured value drops below the value in the Burst trigger level parameter (→  169). ■ On change The message is sent if a measured value changes in the burst message.

Burst trigger level 	
Navigation	  Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Trigger level (2043-1 to n)
Description	For entering the burst trigger value.
User entry	Signed floating-point number
Additional information	<i>Description</i> Together with the option selected in the Burst trigger mode parameter (→  169) the burst trigger value determines the time of burst message X.

* Visibility depends on order options or device settings

Min. update period

Navigation	  Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Min. upd. per. (2042-1 to n)
Description	Use this function to enter the minimum time span between two burst commands of burst message X.
User entry	Positive integer
Factory setting	1 000 ms

Max. update period

Navigation	  Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Max. upd. per. (2041-1 to n)
Description	Use this function to enter the maximum time span between two burst commands of burst message X.
User entry	Positive integer
Factory setting	2 000 ms

"Information" submenu

Navigation   Expert → Communication → HART output → Information

► Information		
Device revision (0204)	→	 171
Device ID (0221)	→	 171
Device type (0209)	→	 171
Manufacturer ID (0259)	→	 172
HART revision (0205)	→	 172
HART descriptor (0212)	→	 172
HART message (0216)	→	 172
Hardware revision (0206)	→	 173

Software revision (0224)	→ 173
HART date code (0202)	→ 173

Device revision

Navigation	 Expert → Communication → HART output → Information → Device revision (0204)
Description	Displays the device revision with which the device is registered with the HART Communication Foundation.
User interface	2-digit hexadecimal number
Factory setting	7
Additional information	<i>Description</i>  The device revision is needed to assign the appropriate device description file (DD) to the device.

Device ID

Navigation	 Expert → Communication → HART output → Information → Device ID (0221)
Description	Use this function to view the device ID for identifying the measuring device in a HART network.
User interface	6-digit hexadecimal number
Additional information	<i>Description</i>  In addition to the device type and manufacturer ID, the device ID is part of the unique ID. Each HART device is uniquely identified by the unique device ID.

Device type

Navigation	 Expert → Communication → HART output → Information → Device type (0209)
Description	Displays the device type with which the measuring device is registered with the HART Communication Foundation.
User interface	2-digit hexadecimal number
Factory setting	0x3A (for Promag 300)

Additional information*Description*

The device type is specified by the manufacturer. It is needed to assign the appropriate device description file (DD) to the device.

Manufacturer ID**Navigation**

Expert → Communication → HART output → Information → Manufacturer ID (0259)

Description

Use this function to view the manufacturer ID with which the measuring device is registered with the HART Communication Foundation.

User interface

2-digit hexadecimal number

Factory setting

0x11 (for Endress+Hauser)

HART revision**Navigation**

Expert → Communication → HART output → Information → HART revision (0205)

Description

Use this function to display the HART protocol revision of the measuring device.

User interface

5 to 7

Factory setting

7

HART descriptor**Navigation**

Expert → Communication → HART output → Information → HART descriptor (0212)

Description

Use this function to enter a description for the measuring point. This can be edited and displayed via HART protocol or using the local display.

User entry

Max. 16 characters such as letters, numbers or special characters (e.g. @, %, /)

Factory setting

Promag300/500

HART message**Navigation**

Expert → Communication → HART output → Information → HART message (0216)

Description

Use this function to enter a HART message which is sent via the HART protocol when requested by the master.

User entry	Max. 32 characters such as letters, numbers or special characters (e.g. @, %, /)
Factory setting	Promag300/500

Hardware revision

Navigation	 Expert → Communication → HART output → Information → Hardware rev. (0206)
Description	Displays the hardware revision of the measuring device.
User interface	0 to 255
Factory setting	2

Software revision

Navigation	 Expert → Communication → HART output → Information → Software rev. (0224)
Description	Displays the software revision of the measuring device.
User interface	0 to 255
Factory setting	7

HART date code



Navigation	 Expert → Communication → HART output → Information → HART date code (0202)
Description	Use this function to enter the date information for individual use.
User entry	Date entry format: yyyy-mm-dd
Factory setting	2009-07-20
Additional information	<i>Example</i> Device installation date

"Output" submenu

Navigation  Expert → Communication → HART output → Output

► Output		
Assign PV (0234)	→ 	174
Primary variable (PV) (0201)	→ 	175
Assign SV (0235)	→ 	175
Secondary variable (SV) (0226)	→ 	176
Assign TV (0236)	→ 	176
Tertiary variable (TV) (0228)	→ 	177
Assign QV (0237)	→ 	177
Quaternary variable (QV) (0203)	→ 	178

Assign PV

Navigation  Expert → Communication → HART output → Output → Assign PV (0234)

Description Use this function to select a measured variable (HART device variable) for the primary dynamic variable (PV).

- Selection
- Off *
 - Volume flow
 - Mass flow
 - Corrected volume flow
 - Flow velocity
 - Conductivity *
 - Corrected conductivity *
 - Temperature *
 - Electronics temperature
 - Noise *
 - Coil current shot time *
 - Reference electrode potential against PE *
 - HBSI *
 - Build-up index *
 - Test point 1
 - Test point 2
 - Test point 3

Factory setting Volume flow

* Visibility depends on order options or device settings

Primary variable (PV)

Navigation	 Expert → Communication → HART output → Output → Primary var (PV) (0201)
Description	Displays the current measured value of the primary dynamic variable (PV).
User interface	Signed floating-point number
Additional information	<i>User interface</i> The measured value displayed depends on the process variable selected in the Assign PV parameter (→  174). <i>Dependency</i>  The unit of the displayed measured value is taken from the System units submenu (→  57).

Assign SV

Navigation	 Expert → Communication → HART output → Output → Assign SV (0235)
Description	Use this function to select a measured variable (HART device variable) for the secondary dynamic variable (SV).
Selection	■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity * ■ Corrected conductivity * ■ Temperature * ■ Electronics temperature ■ Density ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Current input 1 * ■ Current input 2 * ■ Current input 3 * ■ HART input ■ Noise * ■ Coil current shot time * ■ Reference electrode potential against PE * ■ Build-up index * ■ Test point 1 ■ Test point 2 ■ Test point 3 ■ HBSI *
Factory setting	Totalizer 1

* Visibility depends on order options or device settings

Secondary variable (SV)

Navigation	 Expert → Communication → HART output → Output → Second.var(SV) (0226)
Description	Displays the current measured value of the secondary dynamic variable (SV).
User interface	Signed floating-point number
Additional information	<i>User interface</i> The measured value displayed depends on the process variable selected in the Assign SV parameter (→  175). <i>Dependency</i>  The unit of the displayed measured value is taken from the System units submenu (→  57).

Assign TV

Navigation	 Expert → Communication → HART output → Output → Assign TV (0236)
Description	Use this function to select a measured variable (HART device variable) for the tertiary (third) dynamic variable (TV).
Selection	■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity * ■ Corrected conductivity * ■ Temperature * ■ Electronics temperature ■ Density ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Current input 1 * ■ Current input 2 * ■ Current input 3 * ■ HART input ■ Noise * ■ Coil current shot time * ■ Reference electrode potential against PE * ■ Build-up index * ■ Test point 1 ■ Test point 2 ■ Test point 3 ■ HBSI *
Factory setting	Totalizer 2

* Visibility depends on order options or device settings

Tertiary variable (TV)

Navigation	 Expert → Communication → HART output → Output → Tertiary var(TV) (0228)
Description	Displays the current measured value of the tertiary dynamic variable (TV).
User interface	Signed floating-point number
Additional information	<i>User interface</i> The measured value displayed depends on the process variable selected in the Assign TV parameter (→  176). <i>Dependency</i>  The unit of the displayed measured value is taken from the System units submenu (→  57).

Assign QV



Navigation	 Expert → Communication → HART output → Output → Assign QV (0237)
Description	Use this function to select a measured variable (HART device variable) for the quaternary (fourth) dynamic variable (QV).
Selection	■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity * ■ Corrected conductivity * ■ Temperature * ■ Electronics temperature ■ Density ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Current input 1 * ■ Current input 2 * ■ Current input 3 * ■ HART input ■ Noise * ■ Coil current shot time * ■ Reference electrode potential against PE * ■ Build-up index * ■ Test point 1 ■ Test point 2 ■ Test point 3 ■ HBSI *
Factory setting	Totalizer 3

* Visibility depends on order options or device settings

Quaternary variable (QV)

Navigation	 Expert → Communication → HART output → Output → Quaterna.var(QV) (0203)
Description	Displays the current measured value of the quaternary dynamic variable (QV).
User interface	Signed floating-point number
Additional information	<i>User interface</i> The measured value displayed depends on the process variable selected in the Assign QV parameter (→  177). <i>Dependency</i>  The unit of the displayed measured value is taken from the System units submenu (→  57).

3.6.3 "Web server" submenu

Navigation

 Expert → Communication → Web server

► Web server

Web server language (7221)

→  178

MAC address (7214)

→  179

DHCP client (7212)

→  179

IP address (7209)

→  180

Subnet mask (7211)

→  180

Default gateway (7210)

→  180

Web server functionality (7222)

→  181

Login page (7273)

→  181

Web server language

Navigation	 Expert → Communication → Web server → Webserv.language (7221)
Description	Use this function to select the language configured for the Web server.

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

Factory setting	English
------------------------	---------

MAC address

Navigation	  Expert → Communication → Web server → MAC Address (7214)
-------------------	--

Description	Displays the MAC ⁵⁾ address of the measuring device.
--------------------	---

User interface	Unique 12-digit character string comprising letters and numbers
-----------------------	---

Factory setting	Each measuring device is given an individual address.
------------------------	---

Additional information	<i>Example</i> For the display format 00:07:05:10:01:5F
-------------------------------	---

DHCP client

Navigation	  Expert → Communication → Web server → DHCP client (7212)
-------------------	--

Description	Use this function to activate and deactivate the DHCP client functionality.
--------------------	---

Selection	■ Off ■ On
------------------	---

Factory setting	On
------------------------	----

5) Media Access Control

Additional information	<i>Effect</i> If the DHCP client functionality of the web server is selected, the IP address (→ ⓘ 180), Subnet mask (→ ⓘ 180) and Default gateway (→ ⓘ 180) are set automatically. ⓘ ■ Identification is via the MAC address of the measuring device. ■ The IP address (→ ⓘ 180) in the IP address parameter (→ ⓘ 180) is ignored as long as the DHCP client parameter (→ ⓘ 179) is active. This is also the case, in particular, if the DHCP server cannot be reached. The IP address (→ ⓘ 180) in the parameter of the same name is only used if the DHCP client parameter (→ ⓘ 179) is inactive.
------------------------	--

IP address	ⓘ
------------	---

Navigation	📄📄 Expert → Communication → Web server → IP address (7209)
Description	Display or enter the IP address of the Web server integrated in the measuring device.
User entry	4 octet: 0 to 255 (in the particular octet)
Factory setting	192.168.1.212

Subnet mask	ⓘ
-------------	---

Navigation	📄📄 Expert → Communication → Web server → Subnet mask (7211)
Description	Display or enter the subnet mask.
User entry	4 octet: 0 to 255 (in the particular octet)
Factory setting	255.255.255.0

Default gateway	ⓘ
-----------------	---

Navigation	📄📄 Expert → Communication → Web server → Default gateway (7210)
Description	Display or enter the Default gateway (→ ⓘ 180).
User entry	4 octet: 0 to 255 (in the particular octet)
Factory setting	0.0.0.0

Web server functionality

Navigation

Expert → Communication → Web server → Webserver funct. (7222)

Description

Use this function to switch the Web server on and off.

Selection

- Off
- HTML Off
- On

Factory setting

On

Additional information

Description

Once disabled, the Web server functionality can only be enabled again via the local display, the FieldCare operating tool or the DeviceCare operating tool.

Selection

Option	Description
Off	■ The Web server is completely disabled. ■ Port 80 is locked.
HTML Off	The HTML version of the Web server is not available.
On	■ The complete Web server functionality is available. ■ JavaScript is used. ■ The password is transferred in an encrypted state. ■ Any change to the password is also transferred in an encrypted state.

Login page

Navigation

Expert → Communication → Web server → Login page (7273)

Description

Use this function to select the format of the login page.

Selection

- Without header
- With header

Factory setting

With header

3.6.4 "WLAN settings" wizard

Navigation Expert → Communication → WLAN settings

► WLAN settings

WLAN (2702)

→ 182

WLAN mode (2717)	→  183
SSID name (2714)	→  183
Network security (2705)	→  183
Security identification (2718)	→  184
User name (2715)	→  184
WLAN password (2716)	→  184
WLAN IP address (2711)	→  185
WLAN MAC address (2703)	→  185
WLAN subnet mask (2709)	→  185
WLAN MAC address (2703)	→  185
WLAN passphrase (2706)	→  185
WLAN MAC address (2703)	→  185
Assign SSID name (2708)	→  186
SSID name (2707)	→  186
2.4 GHz WLAN channel (2704)	→  186
Select antenna (2713)	→  187
Connection state (2722)	→  187
Received signal strength (2721)	→  187
WLAN IP address (2711)	→  185
Gateway IP address (2719)	→  188
IP address domain name server (2720)	→  188

WLAN

Navigation   Expert → Communication → WLAN settings → WLAN (2702)

Description Use this function to enable and disable the WLAN connection.

Selection

- Disable
- Enable

Factory setting Enable

WLAN mode

Navigation   Expert → Communication → WLAN settings → WLAN mode (2717)

Description Use this function to select the WLAN mode.

Selection

- WLAN access point
- WLAN Client

Factory setting WLAN access point

SSID name

Navigation   Expert → Communication → WLAN settings → SSID name (2714)

Prerequisite The client is activated.

Description Use this function to enter the user-defined SSID name (max. 32 characters) of the WLAN network.

User entry –

Factory setting –

Network security

Navigation   Expert → Communication → WLAN settings → Network security (2705)

Description Use this function to select the type of security for the WLAN interface.

Selection

- Unsecured
- WPA2-PSK
- EAP-PEAP with MSCHAPv2 *
- EAP-PEAP MSCHAPv2 no server authentic. *
- EAP-TLS *

Factory setting WPA2-PSK

* Visibility depends on order options or device settings

Additional information*Selection*

- Unsecured
Access the WLAN connection without identification.
- WPA2-PSK
Access the WLAN connection with a network key.
- EAP-PEAP with MSCHAPv2
Access the WLAN connection with a password-based authentication protocol.
- EAP-PEAP MSCHAPv2 no server authentic.
Access the WLAN connection with a password-based protocol without server authentication.
- EAP-TLS
Access the WLAN connection with a certificate-based, two-way authentication of the client and network.

Security identification

Navigation Expert → Communication → WLAN settings → Sec. identific. (2718)**Description**

Use this function to select the security settings (download via the menu: Data Management > Security > Download WLAN).

User interface

- Trusted issuer certificate
- Device certificate
- Device private key

User name

**Navigation** Expert → Communication → WLAN settings → User name (2715)**Description**

Use this function to enter the username of the WLAN network.

User entry

–

Factory setting

–

WLAN password

**Navigation** Expert → Communication → WLAN settings → WLAN password (2716)**Description**

Use this function to enter the WLAN password for the WLAN network.

User entry

–

Factory setting

–

WLAN IP address



Navigation	  Expert → Communication → WLAN settings → WLAN IP address (2711)
Description	Use this function to enter the IP address of the measuring device's WLAN connection.
User entry	4 octet: 0 to 255 (in the particular octet)
Factory setting	192.168.1.212

WLAN MAC address

Navigation	  Expert → Communication → WLAN settings → WLAN MAC address (2703)
Description	Displays the MAC ⁶⁾ address of the measuring device.
User interface	Unique 12-digit character string comprising letters and numbers
Factory setting	Each measuring device is given an individual address.
Additional information	<i>Example</i> For the display format 00:07:05:10:01:5F

WLAN subnet mask



Navigation	  Expert → Communication → WLAN settings → WLAN subnet mask (2709)
Description	Use this function to enter the subnet mask.
User entry	4 octet: 0 to 255 (in the particular octet)
Factory setting	255.255.255.0

WLAN passphrase



Navigation	  Expert → Communication → WLAN settings → WLAN passphrase (2706)
Prerequisite	The WPA2-PSK option is selected in the Security type parameter (→  183).
Description	Use this function to enter the network key.

6) Media Access Control

User entry 8 to 32-digit character string comprising numbers, letters and special characters (without spaces)

Factory setting Serial number of the measuring device (e.g. L100A802000)

Assign SSID name

Navigation   Expert → Communication → WLAN settings → Assign SSID name (2708)

Description Use this function to select which name is used for the SSID ⁷⁾.

Selection

- Device tag
- User-defined

Factory setting User-defined

Additional information *Selection*

- Device tag
The device tag name is used as the SSID.
- User-defined
A user-defined name is used as the SSID.

SSID name

Navigation   Expert → Communication → WLAN settings → SSID name (2707)

Prerequisite

- The **User-defined** option is selected in the **Assign SSID name** parameter (→  186).
- The **WLAN access point** option is selected in the **WLAN mode** parameter (→  183).

Description Use this function to enter a user-defined SSID name.

User entry Max. 32-digit character string comprising numbers, letters and special characters

Factory setting EH_device designation_last 7 digits of the serial number (e.g. EH_Promag_300_A802000)

2.4 GHz WLAN channel

Navigation   Expert → Communication → WLAN settings → WLAN channel (2704)

Description Use this function to enter the 2.4 GHz WLAN channel.

User entry 1 to 11

7) Service Set Identifier

Factory setting 6

Additional information *Description*



- It is only necessary to enter a 2.4 GHz WLAN channel if multiple WLAN devices are in use.
- If just one measuring device is in use, it is recommended to keep the factory setting.

Select antenna



Navigation  Expert → Communication → WLAN settings → Select antenna (2713)

Description Use this function to select whether the external or internal antenna is used for reception.

Selection

- External antenna
- Internal antenna

Factory setting Internal antenna

Connection state

Navigation  Expert → Communication → WLAN settings → Connection state (2722)

Description The connection status is displayed.

User interface

- Connected
- Not connected

Factory setting Not connected

Received signal strength

Navigation  Expert → Communication → WLAN settings → Rec.sig.strength (2721)

Description Displays the signal strength received.

User interface

- Low
- Medium
- High

Factory setting High

Gateway IP address

Navigation	 Expert → Communication → WLAN settings → Gateway IP addr. (2719)
Description	Use this function to enter the IP address of the gateway.
User interface	Character string comprising numbers, letters and special characters
Factory setting	192.168.1.212

IP address domain name server

Navigation	 Expert → Communication → WLAN settings → IP address DNS (2720)
Description	Use this function to enter the IP address of the domain name server.
User interface	Character string comprising numbers, letters and special characters
Factory setting	192.168.1.212

3.6.5 "OPC-UA configuration" submenu

 For detailed information on the parameter descriptions for the **OPC-UA server** application package, refer to the Special Documentation for the device →  7

Navigation  Expert → Communication → OPC-UA config.



3.6.6 "Diagnostic configuration" submenu

 For a list of all the diagnostic events, see the Operating Instructions for the device →  7

Assign a category to the particular diagnostic event:

Category	Meaning
Failure (F)	A device error is present. The measured value is no longer valid.
Function check (C)	The device is in service mode (e.g. during a simulation).
Out of specification (S)	The device is being operated: ■ Outside its technical specification limits (e.g. outside the process temperature range) ■ Outside of the configuration carried out by the user (e.g. maximum flow in parameter 20 mA value)

Category	Meaning
Maintenance required (M)	Maintenance is required. The measured value is still valid.
No effect (N)	Has no effect on the condensed status ¹⁾ .

1) Condensed status according to NAMUR recommendation NE107

Navigation

 Expert → Communication → Diag. config.

► Diagnostic configuration		
Event category 043 (0285)	→	 190
Event category 376 (0286)	→	 190
Event category 377 (0287)	→	 190
Event category 441 (0210)	→	 191
Event category 442 (0230)	→	 191
Event category 443 (0231)	→	 191
Event category 444 (0211)	→	 192
Event category 531 (0262)	→	 192
Event category 543 (0276)	→	 193
Event category 599 (0279)	→	 193
Event category 832 (0218)	→	 193
Event category 833 (0225)	→	 194
Event category 834 (0227)	→	 194
Event category 835 (0229)	→	 195
Event category 842 (0295)	→	 195
Event category 961 (0261)	→	 195
Event category 962 (0214)	→	 196
Event category 937 (0260)	→	 196
Event category 938 (0284)	→	 196

Event category 043 (Sensor short circuit)



Navigation	 Expert → Communication → Diag. config. → Event category 043 (0285)
Description	Use this option to select a category for the 043 Sensor short circuit diagnostic message.
Selection	■ Failure (F) ■ Function check (C) ■ Out of specification (S) ■ Maintenance required (M) ■ No effect (N)
Factory setting	Out of specification (S)
Additional information	 For a detailed description of the event categories available for selection: →  188

Event category 376 (Sensor electronics (ISEM) faulty)



Navigation	 Expert → Communication → Diag. config. → Event category 376 (0286)
Description	Use this option to select a category for the 376 Sensor electronics (ISEM) faulty diagnostic message.
Selection	■ Failure (F) ■ Function check (C) ■ Out of specification (S) ■ Maintenance required (M) ■ No effect (N)
Factory setting	Out of specification (S)
Additional information	 For a detailed description of the event categories available for selection: →  188

Event category 377 (Sensor electronics (ISEM) faulty)



Navigation	 Expert → Communication → Diag. config. → Event category 377 (0287)
Description	Use this option to select a category for the 377 Sensor electronics (ISEM) faulty diagnostic message.
Selection	■ Failure (F) ■ Function check (C) ■ Out of specification (S) ■ Maintenance required (M) ■ No effect (N)
Factory setting	Out of specification (S)

Additional information  For a detailed description of the event categories available for selection: →  188

Event category 441 (Current output 1 to n)



Navigation  Expert → Communication → Diag. config. → Event category 441 (0210)

Description Use this function to select a category for the **441 Current output 1 to n** diagnostic message.

Selection

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information  For a detailed description of the event categories available for selection: →  188

Event category 442 (Frequency output 1 to n)



Navigation  Expert → Communication → Diag. config. → Event category 442 (0230)

Prerequisite The pulse/frequency/switch output is available.

Description Use this function to select a category for the **442 Frequency output 1 to n** diagnostic message.

Selection

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information  For a detailed description of the event categories available for selection: →  188

Event category 443 (Pulse output 1 to n)



Navigation  Expert → Communication → Diag. config. → Event category 443 (0231)

Prerequisite The pulse/frequency/switch output is available.

Description Use this function to select a category for the **443 Pulse output 1 to n** diagnostic message.

Selection	■ Failure (F) ■ Function check (C) ■ Out of specification (S) ■ Maintenance required (M) ■ No effect (N)
Factory setting	Out of specification (S)
Additional information	 For a detailed description of the event categories available for selection: →  188

Event category 444 (Current input 1 to n)

Navigation	 Expert → Communication → Diag. config. → Event category 444 (0211)
Prerequisite	The current input is available.
Description	Use this function to select a category for the 444 Current input 1 to n diagnostic message.
Selection	■ Failure (F) ■ Function check (C) ■ Out of specification (S) ■ Maintenance required (M) ■ No effect (N)
Factory setting	Out of specification (S)
Additional information	<i>Selection</i>  For a detailed description of the event categories available for selection: →  188

Event category 531 (Empty pipe detection)

Navigation	 Expert → Communication → Diag. config. → Event category 531 (0262)
Description	Use this option to select a category for the 531 Empty pipe detection diagnostic message.
Selection	■ Failure (F) ■ Function check (C) ■ Out of specification (S) ■ Maintenance required (M) ■ No effect (N)
Factory setting	Out of specification (S)
Additional information	 For a detailed description of the event categories available for selection: →  188

Event category 543 (Double pulse output)



Navigation	Expert → Communication → Diag. config. → Event category 543 (0276)
Description	Use this option to select a category for the 543 Double pulse output diagnostic message.
Selection	■ Failure (F) ■ Function check (C) ■ Out of specification (S) ■ Maintenance required (M) ■ No effect (N)
Factory setting	Out of specification (S)
Additional information	For a detailed description of the event categories available for selection: → 188

Event category 599 (Custody transfer logbook full)



Navigation	Expert → Communication → Diag. config. → Event category 599 (0279)
Description	Select category for diagnostic message.
Selection	■ Failure (F) ■ Function check (C) ■ Out of specification (S) ■ Maintenance required (M) ■ No effect (N)
Factory setting	Out of specification (S)
Additional information	<i>Selection</i> For a detailed description of the event categories available for selection: → 188

Event category 832 (Electronics temperature too high)



Navigation	Expert → Communication → Diag. config. → Event category 832 (0218)
Description	Use this function to select a category for the 832 Electronics temperature too high diagnostic message.
Selection	■ Failure (F) ■ Function check (C) ■ Out of specification (S) ■ Maintenance required (M) ■ No effect (N)
Factory setting	Out of specification (S)

Additional information	<i>Selection</i>  For a detailed description of the event categories available for selection: →  188
------------------------	---

Event category 833 (Electronics temperature too low)	
--	---

Navigation	 Expert → Communication → Diag. config. → Event category 833 (0225)
Description	Use this option to select a category for the 833 Electronics temperature too low diagnostic message.
Selection	■ Failure (F) ■ Function check (C) ■ Out of specification (S) ■ Maintenance required (M) ■ No effect (N)
Factory setting	Out of specification (S)
Additional information	<i>Selection</i>  For a detailed description of the event categories available for selection: →  188

Event category 834 (Process temperature too high)	
---	---

Navigation	 Expert → Communication → Diag. config. → Event category 834 (0227)
Description	Use this option to select a category for the 834 Process temperature too high diagnostic message.
Selection	■ Failure (F) ■ Function check (C) ■ Out of specification (S) ■ Maintenance required (M) ■ No effect (N)
Factory setting	Out of specification (S)
Additional information	<i>Selection</i>  For a detailed description of the event categories available for selection: →  188

Event category 835 (Process temperature too low)



Navigation	Expert → Communication → Diag. config. → Event category 835 (0229)
Description	Use this option to select a category for the 835 Process temperature too low diagnostic message.
Selection	■ Failure (F) ■ Function check (C) ■ Out of specification (S) ■ Maintenance required (M) ■ No effect (N)
Factory setting	Out of specification (S)
Additional information	<i>Selection</i> For a detailed description of the event categories available for selection: → 188

Event category 861 (Process fluid)



Navigation	Expert → Communication → Diag. config. → Event category 961 (0261)
Description	Use this option to select a category for the 861 Process fluid diagnostic message.
Selection	■ Failure (F) ■ Function check (C) ■ Out of specification (S) ■ Maintenance required (M) ■ No effect (N)
Factory setting	Out of specification (S)
Additional information	For a detailed description of the event categories available for selection: → 188

Event category 842 (Process limit)



Navigation	Expert → Communication → Diag. config. → Event category 842 (0295)
Description	Use this function to assign a category to the 842 Process limit diagnostic message.
Selection	■ Failure (F) ■ Function check (C) ■ Out of specification (S) ■ Maintenance required (M) ■ No effect (N)
Factory setting	Out of specification (S)

Additional information*Selection*

For a detailed description of the event categories available for selection: → 188

Event category 862 (Pipe empty)**Navigation**

Expert → Communication → Diag. config. → Event category 962 (0214)

DescriptionUse this option to select a category for the **862 Pipe empty** diagnostic message.**Selection**

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting

Out of specification (S)

Additional information

For a detailed description of the event categories available for selection: → 188

Event category 937 (EMC interference)**Navigation**

Expert → Communication → Diag. config. → Event category 937 (0260)

DescriptionUse this option to select a category for the **937 EMC interference** diagnostic message.**Selection**

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting

Out of specification (S)

Additional information

For a detailed description of the event categories available for selection: → 188

Event category 938 (EMC interference)**Navigation**

Expert → Communication → Diag. config. → Event category 938 (0284)

DescriptionUse this option to select a category for the **938 EMC interference** diagnostic message.

Selection	■ Failure (F) ■ Function check (C) ■ Out of specification (S) ■ Maintenance required (M) ■ No effect (N)
Factory setting	Failure (F)
Additional information	 For a detailed description of the event categories available for selection: →  188

3.7 "Application" submenu

Navigation  Expert → Application

▶ Application	
Reset all totalizers (2806)	→  197
▶ Totalizer 1 to n	→  198
▶ Custody transfer	→  202

Reset all totalizers

Navigation	 Expert → Application → Reset all tot. (2806)
Description	Use this function to reset all totalizers to the value 0 and restart the totaling process. This deletes all the flow values previously totaled.
Selection	■ Cancel ■ Reset + totalize
Factory setting	Cancel
Additional information	Selection

Options	Description
Cancel	No action is executed and the user exits the parameter.
Reset + totalize	Resets all totalizers to 0 and restarts the totaling process. This deletes all the flow values previously totaled.

3.7.1 "Totalizer 1 to n" submenu

Navigation  Expert → Application → Totalizer 1 to n

► Totalizer 1 to n		
Assign process variable (0914-1 to n)	→ 	198
Unit totalizer 1 to n (0915-1 to n)	→ 	198
Totalizer operation mode (0908-1 to n)	→ 	200
Control Totalizer 1 to n (0912-1 to n)	→ 	200
Preset value 1 to n (0913-1 to n)	→ 	201
Failure mode (0901-1 to n)	→ 	201

Assign process variable

Navigation  Expert → Application → Totalizer 1 to n → Assign variable (0914-1 to n)

Description Use this function to select a process variable for the Totalizer 1 to n.

- Selection
- Off
 - Volume flow
 - Mass flow
 - Corrected volume flow

Factory setting Volume flow

Additional information *Description*
 If the option selected is changed, the device resets the totalizer to 0.

Selection
If the **Off** option is selected, only the **Assign process variable** parameter (→  198) is still displayed in the **Totalizer 1 to n** submenu. All other parameters in the submenu are hidden.

Unit totalizer 1 to n

Navigation  Expert → Application → Totalizer 1 to n → Unit totalizer 1 to n (0915-1 to n)

Prerequisite A process variable is selected in the **Assign process variable** parameter (→  198) of the **Totalizer 1 to n** submenu.

Description Use this function to select the process variable unit for the Totalizer 1 to n (→ 198).

- Selection**
- | <i>SI units</i> | <i>US units</i> |
|-------------------|---------------------|
| ■ g [*] | ■ oz [*] |
| ■ kg [*] | ■ lb [*] |
| ■ t [*] | ■ STon [*] |

* Visibility depends on order options or device settings

or

- | <i>SI units</i> | <i>US units</i> | <i>Imperial units</i> |
|--------------------------------|---------------------------------|-------------------------------|
| ■ cm ³ [*] | ■ af [*] | ■ gal (imp) [*] |
| ■ dm ³ [*] | ■ ft ³ [*] | ■ Mgal (imp) [*] |
| ■ m ³ [*] | ■ Mft ³ [*] | ■ bbl (imp;beer) [*] |
| ■ ml [*] | ■ Mft ³ [*] | ■ bbl (imp;oil) [*] |
| ■ l [*] | ■ fl oz (us) [*] | |
| ■ hl [*] | ■ gal (us) [*] | |
| ■ Ml Mega [*] | ■ kgal (us) [*] | |
| | ■ Mgal (us) [*] | |
| | ■ bbl (us;liq.) [*] | |
| | ■ bbl (us;beer) [*] | |
| | ■ bbl (us;oil) [*] | |
| | ■ bbl (us;tank) [*] | |

* Visibility depends on order options or device settings

or

- | <i>SI units</i> | <i>US units</i> | <i>Imperial units</i> |
|--------------------------------|-----------------------------------|---------------------------|
| ■ Nl [*] | ■ Sft ³ [*] | ■ Sgal (imp) [*] |
| ■ Nhl [*] | ■ MSft ³ [*] | |
| ■ Nm ³ [*] | ■ MMSft ³ [*] | |
| ■ Sl [*] | ■ Sgal (us) [*] | |
| ■ Sm ³ [*] | ■ Sbbl (us;liq.) [*] | |
| | ■ Sbbl (us;oil) [*] | |

* Visibility depends on order options or device settings

or

- Other units*
None^{*}

* Visibility depends on order options or device settings

- Factory setting**
- Depends on country:
- l
 - gal (us)

Additional information*Description*

The unit is selected separately for each totalizer. It is independent of the selection made in the **System units** submenu (→ 57).

Selection

The selection is dependent on the process variable selected in the **Assign process variable** parameter (→ 198).

Totalizer operation mode**Navigation**

Expert → Application → Totalizer 1 to n → Operation mode (0908-1 to n)

Prerequisite

A process variable is selected in the **Assign process variable** parameter (→ 198) of the **Totalizer 1 to n** submenu.

Description

Use this function to select how the totalizer summates the flow.

Selection

- Net
- Forward
- Reverse

Factory setting

Net

Additional information*Selection*

- Net flow total
Flow values in the forward and reverse flow direction are totalized and balanced against one another. Net flow is registered in the flow direction.
- Forward flow total
Only the flow in the forward flow direction is totalized.
- Reverse flow total
Only the flow in the reverse flow direction is totalized (= reverse flow quantity).

Control Totalizer 1 to n**Navigation**

Expert → Application → Totalizer 1 to n → Control Tot. 1 to n (0912-1 to n)

Prerequisite

A process variable is selected in the **Assign process variable** parameter (→ 198) of the **Totalizer 1 to n** submenu.

Description

Use this function to select the control of totalizer value 1-3.

Selection

- Totalize
- Reset + hold *
- Preset + hold *
- Reset + totalize
- Preset + totalize *
- Hold *

* Visibility depends on order options or device settings

Factory setting Totalize

Additional information *Selection*

Options	Description
Totalize	The totalizer is started or continues running.
Reset + hold	The totaling process is stopped and the totalizer is reset to 0.
Preset + hold ¹⁾	The totaling process is stopped and the totalizer is set to its defined start value from the Preset value parameter.
Reset + totalize	The totalizer is reset to 0 and the totaling process is restarted.
Preset + totalize ¹⁾	The totalizer is set to the defined start value in the Preset value parameter and the totaling process is restarted.
Hold	Totalizing is stopped.

1) Visible depending on the order options or device settings

Preset value 1 to n

Navigation  Expert → Application → Totalizer 1 to n → Preset value 1 to n (0913-1 to n)

Prerequisite A process variable is selected in the **Assign process variable** parameter (→  198) of the **Totalizer 1 to n** submenu.

Description Use this function to enter a start value for the Totalizer 1 to n.

User entry Signed floating-point number

Factory setting 0 l

Additional information *User entry*

 The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→  198).

Example

This configuration is suitable for applications such as iterative filling processes with a fixed batch quantity.

Failure mode



Navigation  Expert → Application → Totalizer 1 to n → Failure mode (0901-1 to n)

Prerequisite A process variable is selected in the **Assign process variable** parameter (→  198) of the **Totalizer 1 to n** submenu.

Description Use this function to select how a totalizer behaves in the event of a device alarm.

Selection	■ Hold ■ Continue ■ Last valid value + continue
Factory setting	Hold
Additional information	Description  This setting does not affect the failsafe mode of other totalizers and the outputs. This is specified in separate parameters. Selection ■ Stop The totalizer is stopped in the event of a device alarm. ■ Actual value The totalizer continues to count based on the actual (current) measured value; the device alarm is ignored. ■ Last valid value The totalizer continues to count based on the last valid measured value before the device alarm occurred.

3.7.2 "Custody transfer" submenu

-  Only available for Promag H.

 For detailed information on the parameter descriptions for custody transfer measurement, see the Special Documentation for the device →  7

Navigation  Expert → Application → Custody transfer

▶ Custody transfer

3.8 "Diagnostics" submenu

Navigation  Expert → Diagnostics

▶ Diagnostics

Actual diagnostics (0691)

→  203

Previous diagnostics (0690)

→  204

Operating time from restart (0653)

→  205

Operating time (0652)

→  205

▶ Diagnostic list

→  205

▶ Event logbook

→  210

► Custody transfer logbook	→ 211
► Device information	→ 212
► Main electronic module + I/O module 1	→ 216
► Sensor electronic module (ISEM)	→ 217
► I/O module 2	→ 218
► I/O module 3	→ 219
► Display module	→ 220
► Data logging	→ 221
► Min/max values	→ 229
► Heartbeat Technology	→ 233
► Simulation	→ 247

Actual diagnostics

Navigation	 Expert → Diagnostics → Actual diagnos. (0691)
Prerequisite	A diagnostic event has occurred.
Description	Displays the current diagnostic message. If two or more messages occur simultaneously, the message with the highest priority is shown on the display.
User interface	Symbol for diagnostic behavior, diagnostic code and short message.
Additional information	<i>Display</i>  Additional pending diagnostic messages can be viewed in the Diagnostic list submenu (→ 205).  Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the  key. <i>Example</i> For the display format: ⊗F271 Main electronics failure

Timestamp	
Navigation	 Expert → Diagnostics → Timestamp
Description	Displays the operating time when the current diagnostic message occurred.
User interface	Days (d), hours (h), minutes (m) and seconds (s)
Additional information	<i>Display</i>  The diagnostic message can be viewed via the Actual diagnostics parameter (→  203). <i>Example</i> For the display format: 24d12h13m00s
Previous diagnostics	
Navigation	  Expert → Diagnostics → Prev.diagnostics (0690)
Prerequisite	Two diagnostic events have already occurred.
Description	Displays the diagnostic message that occurred before the current message.
User interface	Symbol for diagnostic behavior, diagnostic code and short message.
Additional information	<i>Display</i>  Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the  key. <i>Example</i> For the display format: ⊗F271 Main electronics failure
Timestamp	
Navigation	 Expert → Diagnostics → Timestamp
Description	Displays the operating time when the last diagnostic message before the current message occurred.
User interface	Days (d), hours (h), minutes (m) and seconds (s)

Additional information	Display
	 The diagnostic message can be viewed via the Previous diagnostics parameter (→  204).
	Example For the display format: 24d12h13m00s

Operating time from restart

Navigation	  Expert → Diagnostics → Time fr. restart (0653)
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

Navigation	  Expert → Diagnostics → Operating time (0652)
Description	Use this function to display the length of time the device has been in operation.
User interface	Days (d), hours (h), minutes (m) and seconds (s)
Additional information	User interface
	The maximum number of days is 9999, which is equivalent to 27 years.

3.8.1 "Diagnostic list" submenu

Navigation   Expert → Diagnostics → Diagnostic list

► Diagnostic list		
Diagnostics 1 (0692)	→	 206
Diagnostics 2 (0693)	→	 206
Diagnostics 3 (0694)	→	 207
Diagnostics 4 (0695)	→	 208
Diagnostics 5 (0696)	→	 209

Diagnostics 1

Navigation	 Expert → Diagnostics → Diagnostic list → Diagnostics 1 (0692)
Description	Displays the current diagnostics message with the highest priority.
User interface	Symbol for diagnostic behavior, diagnostic code and short message.
Additional information	<i>Display</i>  Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the  key. <i>Examples</i> For the display format: ■  F271 Main electronics failure ■  F276 I/O module failure

Timestamp 1

Navigation	 Expert → Diagnostics → Diagnostic list → Timestamp
Description	Displays the operating time when the diagnostic message with the highest priority occurred.
User interface	Days (d), hours (h), minutes (m) and seconds (s)
Additional information	<i>Display</i>  The diagnostic message can be viewed via the Diagnostics 1 parameter (→  206). <i>Example</i> For the display format: 24d12h13m00s

Diagnostics 2

Navigation	 Expert → Diagnostics → Diagnostic list → Diagnostics 2 (0693)
Description	Displays the current diagnostics message with the second-highest priority.
User interface	Symbol for diagnostic behavior, diagnostic code and short message.

Additional information*Display*

Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the key.

Examples

For the display format:

- F271 Main electronics failure
- F276 I/O module failure

Timestamp 2

Navigation

Expert → Diagnostics → Diagnostic list → Timestamp

Description

Displays the operating time when the diagnostic message with the second-highest priority occurred.

User interface

Days (d), hours (h), minutes (m) and seconds (s)

Additional information*Display*

The diagnostic message can be viewed via the **Diagnostics 2** parameter (→ 206).

Example

For the display format:

24d12h13m00s

Diagnostics 3

Navigation

Expert → Diagnostics → Diagnostic list → Diagnostics 3 (0694)

Description

Displays the current diagnostics message with the third-highest priority.

User interface

Symbol for diagnostic behavior, diagnostic code and short message.

Additional information*Display*

Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the key.

Examples

For the display format:

- F271 Main electronics failure
- F276 I/O module failure

Timestamp 3

Navigation	 Expert → Diagnostics → Diagnostic list → Timestamp
Description	Displays the operating time when the diagnostic message with the third-highest priority occurred.
User interface	Days (d), hours (h), minutes (m) and seconds (s)
Additional information	<i>Display</i>  The diagnostic message can be viewed via the Diagnostics 3 parameter (→  207). <i>Example</i> For the display format: 24d12h13m00s

Diagnostics 4

Navigation	 Expert → Diagnostics → Diagnostic list → Diagnostics 4 (0695)
Description	Displays the current diagnostics message with the fourth-highest priority.
User interface	Symbol for diagnostic behavior, diagnostic code and short message.
Additional information	<i>Display</i>  Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the  key. <i>Examples</i> For the display format: ■  F271 Main electronics failure ■  F276 I/O module failure

Timestamp 4

Navigation	 Expert → Diagnostics → Diagnostic list → Timestamp
Description	Displays the operating time when the diagnostic message with the fourth-highest priority occurred.
User interface	Days (d), hours (h), minutes (m) and seconds (s)

Additional information*Display*

The diagnostic message can be viewed via the **Diagnostics 4** parameter (→  208).

Example

For the display format:

24d12h13m00s

Diagnostics 5

Navigation

Expert → Diagnostics → Diagnostic list → Diagnostics 5 (0696)

Description

Displays the current diagnostics message with the fifth-highest priority.

User interface

Symbol for diagnostic behavior, diagnostic code and short message.

Additional information*Display*

Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the  key.

Examples

For the display format:

-  F271 Main electronics failure
-  F276 I/O module failure

Timestamp 5

Navigation

Expert → Diagnostics → Diagnostic list → Timestamp

Description

Displays the operating time when the diagnostic message with the fifth-highest priority occurred.

User interface

Days (d), hours (h), minutes (m) and seconds (s)

Additional information*Display*

The diagnostic message can be viewed via the **Diagnostics 5** parameter (→  209).

Example

For the display format:

24d12h13m00s

3.8.2 "Event logbook" submenu

Viewing event messages

Event messages are displayed in chronological order. The event history includes both diagnostic events and information events. The symbol in front of the timestamp indicates whether the event has started or ended.

Navigation  Expert → Diagnostics → Event logbook

▶ Event logbook

Filter options (0705) →  210

▶ Event list →  210

Filter options

Navigation	 Expert → Diagnostics → Event logbook → Filter options (0705)
Description	Use this function to select the category whose event messages are displayed in the event list of the local display.
Selection	■ All ■ Failure (F) ■ Function check (C) ■ Out of specification (S) ■ Maintenance required (M) ■ Information (I)
Factory setting	All
Additional information	Description  The status signals are categorized in accordance with VDI/VDE 2650 and NAMUR Recommendation NE 107: ■ F = Failure ■ C = Function Check ■ S = Out of Specification ■ M = Maintenance Required

"Event list" submenu

 The **Event list** submenu is only displayed if operating via the local display.

If operating via the FieldCare operating tool, the event list can be read out with a separate FieldCare module.

If operating via the Web browser, the event messages can be found directly in the **Event logbook** submenu.

Navigation  Expert → Diagnostics → Event logbook → Event list



Event list

Navigation	 Expert → Diagnostics → Event logbook → Event list
Description	Displays the history of event messages of the category selected in the Filter options parameter (→  210).
User interface	■ For a "Category I" event message Information event, short message, symbol for event recording and operating time when error occurred ■ For a "Category F, C, S, M" event message (status signal) Diagnostics code, short message, symbol for event recording and operating time when error occurred
Additional information	<i>Description</i> A maximum of 20 event messages are displayed in chronological order. If the Extended HistoROM application package (order option) 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: ■ : Occurrence of the event ■ : End of the event <i>Examples</i> For the display format: ■ I1091 Configuration modified  24d12h13m00s ■  F271 Main electronics failure  01d04h12min30s <i>HistoROM</i> A HistoROM is a "non-volatile" device memory in the form of an EEPROM.

3.8.3 "Custody transfer logbook" submenu

-  Only available for Promag H.
-  For detailed information on the parameter descriptions for custody transfer measurement, see the Special Documentation for the device →  7

Navigation  Expert → Diagnostics → Cust.transf.log.

► Custody transfer logbook

3.8.4 "Device information" submenu

Navigation  Expert → Diagnostics → Device info

► Device information

Device tag (0011)

Serial number (0009)

Firmware version (0010)

Device name (0020)

Order code (0008)

Extended order code 1 (0023)

Extended order code 2 (0021)

Extended order code 3 (0022)

Configuration counter (0233)

ENP version (0012)

→  212

→  213

→  213

→  214

→  214

→  214

→  215

→  215

→  215

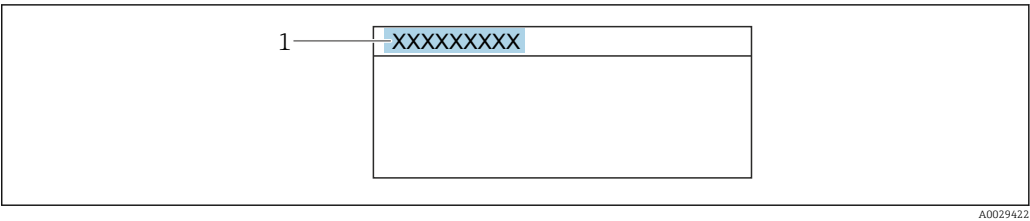
→  215

Device tag

Navigation	 Expert → Diagnostics → Device info → Device tag (0011)
Description	Displays a unique name for the measuring point so it can be identified quickly within the plant. It is displayed in the header.
User interface	Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /).
Factory setting	Promag

Additional information

User interface



1 Position of the header text on the display

The number of characters displayed depends on the characters used.

Serial number

Navigation

Expert → Diagnostics → Device info → Serial number (0009)

Description

Displays the serial number of the measuring device.
 The number can be found on the nameplate of the sensor and transmitter.

User interface

Max. 11-digit character string comprising letters and numbers.

Additional information

Description

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

Firmware version

Navigation

Expert → Diagnostics → Device info → Firmware version (0010)

Description

Displays the device firmware version installed.

User interface

Character string in the format xx.yy.zz

Additional information

Display

- The Firmware version is also located:
- On the title page of the Operating instructions
 - On the transmitter nameplate

Device name	
Navigation	 Expert → Diagnostics → Device info → Device name (0020)
Description	Displays the name of the transmitter. It can also be found on the nameplate of the transmitter.
User interface	Promag 300/500
Order code	
Navigation	 Expert → Diagnostics → Device info → Order code (0008)
Description	Displays the device order code.
User interface	Character string composed of letters, numbers and certain punctuation marks (e.g. /).
Additional information	<i>Description</i>  The order code can be found on the nameplate of the sensor and transmitter in the "Order code" field. The order code is generated from the extended order code through a process of reversible transformation. The extended order code indicates the attributes for all the device features in the product structure. The device features are not directly readable 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	
Navigation	 Expert → Diagnostics → Device info → Ext. order cd. 1 (0023)
Description	Displays the first part of the extended order code. On account of length restrictions, the extended order code is split into a maximum of 3 parameters.
User interface	Character string
Additional information	<i>Description</i> The extended order code indicates the version of all the features of the product structure for the measuring device and thus uniquely identifies the measuring device.  The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.

Extended order code 2		
Navigation	  Expert → Diagnostics → Device info → Ext. order cd. 2 (0021)	
Description	Displays the second part of the extended order code.	
User interface	Character string	
Additional information	For additional information, see Extended order code 1 parameter (→  214)	
Extended order code 3		
Navigation	  Expert → Diagnostics → Device info → Ext. order cd. 3 (0022)	
Description	Displays the third part of the extended order code.	
User interface	Character string	
Additional information	For additional information, see Extended order code 1 parameter (→  214)	
Configuration counter		
Navigation	  Expert → Diagnostics → Device info → Config. counter (0233)	
Description	Displays the number of parameter modifications for the device. When the user changes a parameter setting, this counter is incremented.	
User interface	0 to 65 535	
ENP version		
Navigation	  Expert → Diagnostics → Device info → ENP version (0012)	
Description	Displays the version of the electronic nameplate.	
User interface	Character string	
Factory setting	2.02.00	
Additional information	<i>Description</i> This electronic nameplate stores a data record for device identification that includes more data than the nameplates attached to the outside of the device.	

3.8.5 "Main electronic module + I/O module 1" submenu

Navigation  Expert → Diagnostics → Main elec.+I/O1

► Main electronic module + I/O module 1

Firmware version

→  216

Build no. software

→  216

Bootloader revision

→  216

Firmware version

Navigation  Expert → Diagnostics → Main elec.+I/O1 → Firmware version (0072)

Description Use this function to display the software revision of the module.

User interface Positive integer

Build no. software

Navigation  Expert → Diagnostics → Main elec.+I/O1 → Build no. softw. (0079)

Description Use this function to display the software build number of the module.

User interface Positive integer

Bootloader revision

Navigation  Expert → Diagnostics → Main elec.+I/O1 → Bootloader rev. (0073)

Description Use this function to display the bootloader revision of the software.

User interface Positive integer

3.8.6 "Sensor electronic module (ISEM)" submenu

Navigation  Expert → Diagnostics → Sens. electronic

► Sensor electronic module (ISEM)

Firmware version (0072)

→  217

Build no. software (0079)

→  217

Bootloader revision (0073)

→  217

Firmware version

Navigation  Expert → Diagnostics → Sens. electronic → Firmware version (0072)

Description Use this function to display the software revision of the module.

User interface Positive integer

Build no. software

Navigation  Expert → Diagnostics → Sens. electronic → Build no. softw. (0079)

Description Use this function to display the software build number of the module.

User interface Positive integer

Bootloader revision

Navigation  Expert → Diagnostics → Sens. electronic → Bootloader rev. (0073)

Description Use this function to display the bootloader revision of the software.

User interface Positive integer

3.8.7 "I/O module 2" submenu

Navigation  Expert → Diagnostics → I/O module 2

► I/O module 2		
I/O module 2 terminal numbers (3902-2)	→ 	218
Firmware version (0072)	→ 	218
Build no. software (0079)	→ 	218
Bootloader revision (0073)	→ 	219

I/O module 2 terminal numbers

Navigation	 Expert → Diagnostics → I/O module 2 → I/O 2 terminals (3902-2)
Description	Displays the terminal numbers used by the I/O module.
User interface	■ Not used ■ 26-27 (I/O 1) ■ 24-25 (I/O 2) ■ 22-23 (I/O 3)

Firmware version

Navigation	 Expert → Diagnostics → I/O module 2 → Firmware version (0072)
Description	Use this function to display the software revision of the module.
User interface	Positive integer

Build no. software

Navigation	 Expert → Diagnostics → I/O module 2 → Build no. softw. (0079)
Description	Use this function to display the software build number of the module.
User interface	Positive integer

Bootloader revision

Navigation	 Expert → Diagnostics → I/O module 2 → Bootloader rev. (0073)
Description	Use this function to display the bootloader revision of the software.
User interface	Positive integer

3.8.8 "I/O module 3" submenu

Navigation  Expert → Diagnostics → I/O module 3

► I/O module 3		
I/O module 3 terminal numbers (3902–3)	→ 	219
Firmware version (0072)	→ 	219
Build no. software (0079)	→ 	220
Bootloader revision (0073)	→ 	220

I/O module 3 terminal numbers

Navigation	 Expert → Diagnostics → I/O module 3 → I/O 3 terminals (3902–3)
Description	Displays the terminal numbers used by the I/O module.
User interface	■ Not used ■ 26-27 (I/O 1) ■ 24-25 (I/O 2) ■ 22-23 (I/O 3)

Firmware version

Navigation	 Expert → Diagnostics → I/O module 3 → Firmware version (0072)
Description	Use this function to display the software revision of the module.
User interface	Positive integer

Build no. software

Navigation	 Expert → Diagnostics → I/O module 3 → Build no. softw. (0079)
Description	Use this function to display the software build number of the module.
User interface	Positive integer

Bootloader revision

Navigation	 Expert → Diagnostics → I/O module 3 → Bootloader rev. (0073)
Description	Use this function to display the bootloader revision of the software.
User interface	Positive integer

3.8.9 "Display module" submenu

Navigation

 Expert → Diagnostics → Display module

► Display module

Firmware version (0072)

→  220

Build no. software (0079)

→  221

Bootloader revision (0073)

→  221

Firmware version

Navigation	 Expert → Diagnostics → Display module → Firmware version (0072)
Description	Use this function to display the software revision of the module.
User interface	Positive integer

Build no. software	
Navigation	 Expert → Diagnostics → Display module → Build no. softw. (0079)
Description	Use this function to display the software build number of the module.
User interface	Positive integer

Navigation	 Expert → Diagnostics → Display module → Bootloader rev. (0073)
Description	Use this function to display the bootloader revision of the software.
User interface	Positive integer

3.8.10 "Data logging" submenu

Navigation  Expert → Diagnostics → Data logging

► Data logging	
Assign channel 1 (0851)	→  222
Assign channel 2 (0852)	→  223
Assign channel 3 (0853)	→  223
Assign channel 4 (0854)	→  223
Logging interval (0856)	→  224
Clear logging data (0855)	→  224
Data logging (0860)	→  225
Logging delay (0859)	→  225
Data logging control (0857)	→  226
Data logging status (0858)	→  226
Entire logging duration (0861)	→  227

► Display channel 1	→ ⓘ 227
► Display channel 2	→ ⓘ 228
► Display channel 3	→ ⓘ 228
► Display channel 4	→ ⓘ 229

Assign channel 1 ⓘ

Navigation ⓘ ⓘ Expert → Diagnostics → Data logging → Assign chan. 1 (0851)

Prerequisite The **Extended HistoROM** application package is available.
 ⓘ The software options currently enabled are displayed in the **Software option overview** parameter (→ ⓘ 44).

Description Use this function to select a process variable for the data logging channel.

- Selection**
- Off
 - Volume flow
 - Mass flow
 - Corrected volume flow
 - Flow velocity
 - Conductivity *
 - Corrected conductivity *
 - Temperature *
 - Electronics temperature
 - Current output 1
 - Current output 2 *
 - Current output 3 *
 - Current output 4 *
 - Noise *
 - Coil current shot time *
 - Reference electrode potential against PE *
 - HBSI *
 - Build-up index *
 - Test point 1
 - Test point 2
 - Test point 3

Factory setting Off

Additional information *Description*
A total of 1000 measured values can be logged. This means:

- 1000 data points if 1 logging channel is used
- 500 data points if 2 logging channels are used
- 333 data points if 3 logging channels are used
- 250 data points if 4 logging channels are used

* Visibility depends on order options or device settings

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).



The log contents are cleared if the option selected is changed.

Assign channel 2



Navigation

Expert → Diagnostics → Data logging → Assign chan. 2 (0852)

Prerequisite

The **Extended HistoROM** application package is available.



The software options currently enabled are displayed in the **Software option overview** parameter (→ 44).

Description

Use this function to select a process variable for the data logging channel.

Selection

For the picklist, see the **Assign channel 1** parameter (→ 222)

Factory setting

Off

Assign channel 3



Navigation

Expert → Diagnostics → Data logging → Assign chan. 3 (0853)

Prerequisite

The **Extended HistoROM** application package is available.



The software options currently enabled are displayed in the **Software option overview** parameter (→ 44).

Description

Use this function to select a process variable for the data logging channel.

Selection

For the picklist, see the **Assign channel 1** parameter (→ 222)

Factory setting

Off

Assign channel 4



Navigation

Expert → Diagnostics → Data logging → Assign chan. 4 (0854)

Prerequisite

The **Extended HistoROM** application package is available.



The software options currently enabled are displayed in the **Software option overview** parameter (→ 44).

Description

Use this function to select a process variable for the data logging channel.

Selection

For the picklist, see the **Assign channel 1** parameter (→ 222)

Factory setting Off

Logging interval

Navigation   Expert → Diagnostics → Data logging → Logging interval (0856)

Prerequisite The **Extended HistoROM** application package is available.

 The software options currently enabled are displayed in the **Software option overview** parameter (→  44).

Description Use this function to enter the logging interval $T_{\log}$ for data logging.

User entry 0.1 to 3 600.0 s

Factory setting 1.0 s

Additional information *Description*

This defines the interval between the individual data points in the data log, and thus the maximum loggable process time $T_{\log}$:

- If 1 logging channel is used: $T_{\log} = 1000 \times t_{\log}$
- If 2 logging channels are used: $T_{\log} = 500 \times t_{\log}$
- If 3 logging channels are used: $T_{\log} = 333 \times t_{\log}$
- If 4 logging channels are used: $T_{\log} = 250 \times t_{\log}$

Once this time elapses, the oldest data points in the data log are cyclically overwritten such that a time of $T_{\log}$ always remains in the memory (ring memory principle).

 The log contents are cleared if the length of the logging interval is changed.

Example

If 1 logging channel is used:

- $T_{\log} = 1000 \times 1 \text{ s} = 1\,000 \text{ s} \approx 15 \text{ min}$
- $T_{\log} = 1000 \times 10 \text{ s} = 10\,000 \text{ s} \approx 3 \text{ h}$
- $T_{\log} = 1000 \times 80 \text{ s} = 80\,000 \text{ s} \approx 1 \text{ d}$
- $T_{\log} = 1000 \times 3\,600 \text{ s} = 3\,600\,000 \text{ s} \approx 41 \text{ d}$

Clear logging data

Navigation   Expert → Diagnostics → Data logging → Clear logging (0855)

Prerequisite The **Extended HistoROM** application package is available.

 The software options currently enabled are displayed in the **Software option overview** parameter (→  44).

Description Use this function to clear the entire logging data.

Selection

- Cancel
- Clear data

Factory setting	Cancel
Additional information	<i>Selection</i> ■ Cancel The data is not cleared. All the data is retained. ■ Clear data The logging data is cleared. The logging process starts from the beginning.

Data logging



Navigation	Expert → Diagnostics → Data logging → Data logging (0860)
Description	Use this function to select the data logging method.
Selection	■ Overwriting ■ Not overwriting
Factory setting	Overwriting
Additional information	<i>Selection</i> ■ Overwriting The device memory applies the FIFO principle. ■ Not overwriting Data logging is canceled if the measured value memory is full (single shot).

Logging delay



Navigation	Expert → Diagnostics → Data logging → Logging delay (0859)
Prerequisite	In the Data logging parameter (→ 225), the Not overwriting option is selected.
Description	Use this function to enter the time delay for measured value logging.
User entry	0 to 999 h
Factory setting	0 h
Additional information	<i>Description</i> Once data logging has been started with the Data logging control parameter (→ 226), the device does not save any data for the duration of the delay time entered.

Data logging control 	
Navigation	  Expert → Diagnostics → Data logging → Data log.control (0857)
Prerequisite	In the Data logging parameter (→  225), the Not overwriting option is selected.
Description	Use this function to start and stop measured value logging.
Selection	■ None ■ Delete + start ■ Stop
Factory setting	None
Additional information	<i>Selection</i> ■ None Initial measured value logging status. ■ Delete + start All the measured values recorded for all the channels are deleted and measured value logging starts again. ■ Stop Measured value logging is stopped.
Data logging status	
Navigation	  Expert → Diagnostics → Data logging → Data log. status (0858)
Prerequisite	In the Data logging parameter (→  225), the Not overwriting option is selected.
Description	Displays the measured value logging status.
User interface	■ Done ■ Delay active ■ Active ■ Stopped
Factory setting	Done
Additional information	<i>Selection</i> ■ Done Measured value logging has been performed and completed successfully. ■ Delay active Measured value logging has been started but the logging interval has not yet elapsed. ■ Active The logging interval has elapsed and measured value logging is active. ■ Stopped Measured value logging is stopped.

Entire logging duration

Navigation	 Expert → Diagnostics → Data logging → Logging duration (0861)
Prerequisite	In the Data logging parameter (→  225), the Not overwriting option is selected.
Description	Displays the total logging duration.
User interface	Positive floating-point number
Factory setting	0 s

"Display channel 1" submenu

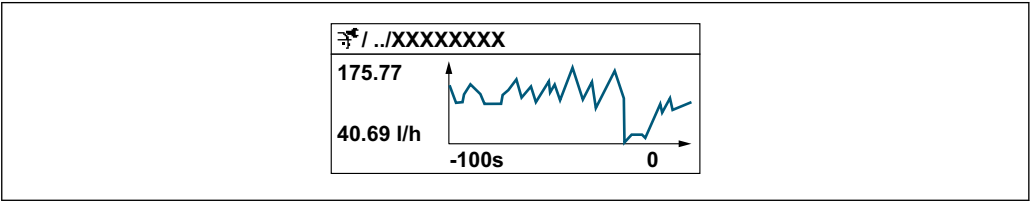
Navigation  Expert → Diagnostics → Data logging → Displ.channel 1

► Display channel 1

Display channel 1 →  227

Display channel 1

Navigation	 Expert → Diagnostics → Data logging → Displ.channel 1
Prerequisite	The Extended HistoROM application package is available.  The software options currently enabled are displayed in the Software option overview parameter (→  44). One of the following options is selected in the Assign channel 1 parameter (→  222): ■ Conductivity[*] ■ Corrected conductivity[*] ■ Temperature[*]
Description	Displays the measured value trend for the logging channel in the form of a chart.
Additional information	<i>Description</i>



 10 Chart of a measured value trend

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

- 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.

"Display channel 2" submenu

Navigation  Expert → Diagnostics → Data logging → Displ.channel 2

► Display channel 2

Display channel 2 →  228

Display channel 2

Navigation	 Expert → Diagnostics → Data logging → Displ.channel 2
Prerequisite	A process variable is specified in the Assign channel 2 parameter.
Description	See the Display channel 1 parameter →  227

"Display channel 3" submenu

Navigation  Expert → Diagnostics → Data logging → Displ.channel 3

► Display channel 3

Display channel 3 →  228

Display channel 3

Navigation	 Expert → Diagnostics → Data logging → Displ.channel 3
Prerequisite	A process variable is specified in the Assign channel 3 parameter.
Description	See the Display channel 1 parameter →  227

"Display channel 4" submenu

Navigation  Expert → Diagnostics → Data logging → Displ.channel 4

► Display channel 4

Display channel 4 →  229

Display channel 4

Navigation	 Expert → Diagnostics → Data logging → Displ.channel 4
Prerequisite	A process variable is specified in the Assign channel 4 parameter.
Description	See the Display channel 1 parameter →  227

3.8.11 "Min/max values" submenu

Navigation   Expert → Diagnostics → Min/max val.

► Min/max values

► Electronics temperature →  230

► Main electronics temperature →  231

► Sensor electronics temperature (ISEM) →  232

► Medium temperature →  232

Reset min/max values

Navigation	  Expert → Diagnostics → Min/max val. → Reset min/max (6541)
Description	Use this function to select measured variables whose minimum, maximum and average measured values are to be reset.
Selection	■ Cancel ■ Terminal voltage ■ IO module temperature

Factory setting

Cancel

"Main electronics temperature" submenu

Navigation  Expert → Diagnostics → Min/max val. → Main elect.temp.

▶ Electronics temperature

Minimum value (6547)

→  230

Maximum value (6545)

→  230

Minimum value

Navigation	 Expert → Diagnostics → Min/max val. → Electronics temp → Minimum value (6547)
Description	Displays the lowest previously measured temperature value of the main electronics module.
User interface	Signed floating-point number
Additional information	Dependency  The unit is taken from the Temperature unit parameter (→  60)

Maximum value

Navigation	 Expert → Diagnostics → Min/max val. → Electronics temp → Maximum value (6545)
Description	Displays the highest previously measured temperature value of the main electronics module.
User interface	Signed floating-point number
Additional information	Dependency  The unit is taken from the Temperature unit parameter (→  60)

"Main electronics temperature" submenu

Navigation

 Expert → Diagnostics → Min/max val. → Main elect.temp.

► Main electronics temperature

Minimum electronics temperature
(0688)

→  231

Maximum electronics temperature
(0665)

→  231

Minimum electronics temperature

Navigation	  Expert → Diagnostics → Min/max val. → Main elect.temp. → Min.electr.temp. (0688)
Description	Shows the lowest previously measured temperature for the main electronic module in the transmitter.
User interface	Signed floating-point number
Additional information	Dependency  The unit is taken from the Temperature unit parameter (→  60)

Maximum electronics temperature

Navigation	  Expert → Diagnostics → Min/max val. → Main elect.temp. → Max.electr.temp. (0665)
Description	Shows the highest previously measured temperature for the main electronic module in the transmitter.
User interface	Signed floating-point number
Additional information	Dependency  The unit is taken from the Temperature unit parameter (→  60)

"Sensor electronics temperature (ISEM)" submenu

Navigation  Expert → Diagnostics → Min/max val. → Sensor elec.temp

► Sensor electronics temperature (ISEM)

Minimum value (6547)

→  232

Maximum value (6545)

→  232

Minimum value

Navigation	 Expert → Diagnostics → Min/max val. → Sensor elec.temp → Minimum value (6547)
Description	Displays the lowest previously measured temperature value of the main electronics module.
User interface	Signed floating-point number
Additional information	<i>Dependency</i>  The unit is taken from the Temperature unit parameter (→  60)

Maximum value

Navigation	 Expert → Diagnostics → Min/max val. → Sensor elec.temp → Maximum value (6545)
Description	Displays the highest previously measured temperature value of the main electronics module.
User interface	Signed floating-point number
Additional information	<i>Dependency</i>  The unit is taken from the Temperature unit parameter (→  60)

"Temperature" submenu

Navigation  Expert → Diagnostics → Min/max val. → Temperature

► Medium temperature

Minimum value (6681)	→ 233
Maximum value (6680)	→ 233

Minimum value

Navigation	Expert → Diagnostics → Min/max val. → Medium temp. → Minimum value (6681)
Prerequisite	One of the following conditions is met: ■ Order code for "Sensor option", option CI "Medium temperature measurement" or ■ The temperature is read into the flowmeter from an external device.
Description	Displays the lowest previously measured medium temperature value.
User interface	Signed floating-point number
Additional information	<i>Dependency</i> The unit is taken from the Temperature unit parameter (→ 60)

Maximum value

Navigation	Expert → Diagnostics → Min/max val. → Medium temp. → Maximum value (6680)
Prerequisite	One of the following conditions is met: ■ Order code for "Sensor option", option CI "Medium temperature measurement" or ■ The temperature is read into the flowmeter from an external device.
Description	Displays the highest previously measured medium temperature value.
User interface	Signed floating-point number
Additional information	<i>Dependency</i> The unit is taken from the Temperature unit parameter (→ 60)

3.8.12 "Heartbeat Technology" submenu

For detailed information on the parameter descriptions for the **Heartbeat Verification+Monitoring**: Special Documentation for the device → 7

Navigation  Expert → Diagnostics → Heartbeat Techn.

▶ Heartbeat Technology

▶ Heartbeat base settings

→  234

▶ Performing verification

→  235

▶ Verification results

→  241

▶ Monitoring results

→  245

"Heartbeat base settings" submenu

Navigation  Expert → Diagnostics → Heartbeat Techn. → Base settings

▶ Heartbeat base settings

Plant operator (2754)

→  234

Location (2755)

→  234

Partially filled pipe (6465)

→  235

Plant operator

Navigation  Expert → Diagnostics → Heartbeat Techn. → Base settings → Plant operator (2754)

Description Use this function to enter the plant operator.

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

Location

Navigation  Expert → Diagnostics → Heartbeat Techn. → Base settings → Location (2755)

Description Use this function to enter the location.

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

Partially filled pipe		
Navigation	Expert → Diagnostics → Heartbeat Techn. → Base settings → Part.filled pipe (6465)	
Description	Indicate, if the measuring tube is partially filled during the verification process in order to avoid evaluating the EPD electrode cable.	
Selection	No Yes	
Factory setting	No	

"Performing verification" wizard

Navigation

Expert → Diagnostics → Heartbeat Techn. → Perform.verific.

► Performing verification

Year (2846)

→ 236

Month (2845)

→ 236

Day (2842)

→ 237

Hour (2843)

→ 237

AM/PM (2813)

→ 237

Minute (2844)

→ 238

Verification mode (12105)

→ 238

External device information (12101)

→ 238

Start verification (12127)

→ 239

Remaining lockout period (12117)

→ 239

Lockout period (12114)

→ 239

Progress (2808)

→ 240

Measured values (12102)

→ 240

Output values (12103)

→ 240

Status (12153)	→ 241
Verification result (12149)	→ 241

Year

Navigation	Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Year (2846)
Prerequisite	Can be edited if Heartbeat Verification is not active.
Description	Use this function to enter the year of recalibration.
User entry	9 to 99
Factory setting	10

Month

Navigation	Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Month (2845)
Prerequisite	Can be edited if Heartbeat Verification is not active.
Description	Use this function to select the month of recalibration.
Selection	■ January ■ February ■ March ■ April ■ May ■ June ■ July ■ August ■ September ■ October ■ November ■ December
Factory setting	January

Day



Navigation  Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Day (2842)

Prerequisite  Can be edited if Heartbeat Verification is not active.

Description Use this function to enter the day of the month of recalibration.

User entry 1 to 31 d

Factory setting 1 d

Hour



Navigation  Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Hour (2843)

Prerequisite  Can be edited if Heartbeat Verification is not active.

Description Use this function to enter the hour of recalibration.

User entry 0 to 23 h

Factory setting 12 h

AM/PM



Navigation  Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → AM/PM (2813)

Prerequisite  Can be edited if Heartbeat Verification is not active.

The **dd.mm.yy hh:mm am/pm** option or the **mm/dd/yy hh:mm am/pm** option is selected in the **Date/time format** parameter (2812) (→  64).

Description Use this function to select the time entry in the morning (**AM** option) or afternoon (**PM** option) in the case of 12-hour notation.

Selection

- AM
- PM

Factory setting AM

Minute		
Navigation	 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Minute (2844)	
Prerequisite	 Can be edited if Heartbeat Verification is not active.	
Description	Use this function to enter the minutes of recalibration.	
User entry	0 to 59 min	
Factory setting	0 min	
Verification mode		
Navigation	 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Verificat. mode (12105)	
Prerequisite	Can be edited if verification status is not active.	
Description	Select verification mode. Standard verification: Verification is performed automatically by the device and without manual checking of external measured variables. Extended verification: Similar to internal verification but with the entry of external measured variables (see also "Measured values" parameter).	
Selection	■ Standard verification ■ Extended verification	
Factory setting	Standard verification	
External device information		
Navigation	 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Ext. device info (12101)	
Prerequisite	With the following conditions: ■ The Extended verification option is selected in the Verification mode parameter (→  238). ■ Can be edited if the verification status is not active.	
Description	Record measuring equipment for extended verification.	
User entry	Free text entry	
Factory setting	–	

Start verification



Navigation	 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Start verificat. (12127)
Description	Start the verification. To carry out a complete verification, select the selection parameters individually. Once the external measured values have been recorded, verification is started using the Start option.
Selection	■ Cancel ■ Output 1 low value * ■ Output 1 high value * ■ Output 2 low value * ■ Output 2 high value * ■ Output 3 low value * ■ Output 3 high value * ■ Frequency output 1 * ■ Pulse output 1 * ■ Frequency output 2 * ■ Pulse output 2 * ■ Double pulse output * ■ Start
Factory setting	Cancel

Remaining lockout period

Navigation	 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → RemainLockoutPer (12117)
Description	Shows the remaining number of hours until the lockout period has elapsed.
User interface	0 to 99 h
Factory setting	0 h

Lockout period



Navigation	 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Lockout period (12114)
Description	Enter the lockout period in hours. When the device is in custody transfer mode, it is not possible to perform a verification during this time.
User entry	0 to 99 h

* Visibility depends on order options or device settings

Factory setting 48 h

Progress

Navigation  Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Progress (2808)

Description The progress of the process is indicated.

User interface 0 to 100 %

Measured values



Navigation  Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Measured val. (12102)

Prerequisite One of the following options is selected in the **Start verification** parameter (→  239):

- Output 1 low value
- Output 1 high value
- Output 2 low value
- Output 2 high value
- Output 3 low value
- Output 3 high value
- Frequency output 1
- Pulse output 1
- Frequency output 2
- Pulse output 2
- Double pulse output

Description Use this function to enter the measured values (actual values) for the external measured variables:.

- Current output: Output current in [mA]
- Pulse/frequency output: Output frequency in [Hz]
- Double pulse output: Output frequency in [Hz]

User entry Signed floating-point number

Factory setting 0

Output values

Navigation  Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Output values (12103)

Description Displays the simulated output values (target values) for the external measured variables:.

- Current output: Output current in [mA].
- Pulse/frequency output: Output frequency in [Hz].

User interface	Signed floating-point number
Factory setting	-

Status

Navigation	 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Status (12153)
Description	Displays the current status of the verification.
User interface	■ Done ■ Busy ■ Failed ■ Not done

Verification result

Navigation	 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Verific. result (12149)
Description	Displays the overall result of the verification.  Detailed description of results classification:
User interface	■ Not supported ■ Passed ■ Not done ■ Failed
Factory setting	Not done

"Verification results" submenu

Navigation	 Expert → Diagnostics → Heartbeat Techn. → Verific. results
► Verification results Date/time (manually entered) (12142) →  242 Verification ID (12141) →  242 Operating time (12126) →  242 Verification result (12149) →  243	

Sensor (12152)	→ 243
Sensor electronic module (ISEM) (12151)	→ 243
I/O module (12145)	→ 244
System status (12109)	→ 244

Date/time (manually entered)

Navigation	Expert → Diagnostics → Heartbeat Techn. → Verific. results → Date/time (12142)
Prerequisite	The verification has been performed.
Description	Date and time.
User interface	dd.mmmm.yyyy; hh:mm
Factory setting	1 January 2010; 12:00

Verification ID

Navigation	Expert → Diagnostics → Heartbeat Techn. → Verific. results → Verification ID (12141)
Prerequisite	The verification has been performed.
Description	Displays consecutive numbering of the verification results in the measuring device.
User interface	0 to 65 535
Factory setting	0

Operating time

Navigation	Expert → Diagnostics → Heartbeat Techn. → Verific. results → Operating time (12126)
Prerequisite	The verification has been performed.
Description	Indicates how long the device has been in operation up to the verification.
User interface	Days (d), hours (h), minutes (m), seconds (s)

Factory setting –

Verification result

Navigation  Expert → Diagnostics → Heartbeat Techn. → Verific. results → Verific. result (12149)

Description Displays the overall result of the verification.
 Detailed description of results classification:

User interface

- Not supported
- Passed
- Not done
- Failed

Factory setting Not done

Sensor

Navigation  Expert → Diagnostics → Heartbeat Techn. → Verific. results → Sensor (12152)

Prerequisite The **Failed** option result is shown in the **Overall result** parameter (→  241).

Description Displays the result for the sensor.
 Detailed description of results classification:

User interface

- Not supported
- Passed
- Not done
- Failed

Factory setting Not done

Sensor electronic module (ISEM)

Navigation  Expert → Diagnostics → Heartbeat Techn. → Verific. results → Sens. electronic (12151)

Prerequisite The **Failed** option result is shown in the **Overall result** parameter (→  241).

Description Displays the result for the sensor electronics module (ISEM).
 Detailed description of results classification:

User interface	■ Not supported ■ Passed ■ Not done ■ Failed
-----------------------	---

Factory setting	Not done
------------------------	----------

I/O module

Navigation	 Expert → Diagnostics → Heartbeat Techn. → Verific. results → I/O module (12145)
-------------------	---

Prerequisite	In the Overall result parameter (→  241), the Failed option was displayed.
---------------------	---

Description	Displays the result for I/O module monitoring of the I/O module. ■ For current output: Accuracy of the current ■ For pulse output: Accuracy of the pulses ■ For frequency output: Accuracy of the frequency ■ Current input: Accuracy of the current ■ Double pulse output: Accuracy of the pulses ■ Relay output: Number of switching cycles
--------------------	---

 Detailed description of results classification:

User interface	■ Not supported ■ Passed ■ Not done ■ Not plugged ■ Failed
-----------------------	--

Factory setting	Not done
------------------------	----------

System status

Navigation	 Expert → Diagnostics → Heartbeat Techn. → Verific. results → System status (12109)
-------------------	--

Prerequisite	The Failed option result is shown in the Overall result parameter (→  241).
---------------------	--

Description	Displays the system condition. Tests the measuring device for active errors.
--------------------	---

 Detailed description of results classification:

User interface	■ Not supported ■ Passed ■ Not done ■ Failed
-----------------------	---

Factory setting	Not done
------------------------	----------

"Monitoring results" submenu

Navigation

 Expert → Diagnostics → Heartbeat Techn. → Monitor. results

► Monitoring results

Noise (12158)

→  245

Coil current shot time (12150)

→  245

Reference electrode potential against PE (12155)

→  245

Build-up index (12111)

→  246

HBSI (12116)

→  246

Noise

Navigation	 Expert → Diagnostics → Heartbeat Techn. → Monitor. results → Noise (12158)
Description	Indicates the degree to which the differential signal from both measuring electrodes is dispersed.
User interface	0 to $3.0 \cdot 10^{+38} \mu V$

Coil current shot time

Navigation	 Expert → Diagnostics → Heartbeat Techn. → Monitor. results → CoilCurrShotTime (12150)
Description	Indicates the rise time of the coil current for the buildup of the magnetic field.
User interface	2 to 500 ms

Reference electrode potential against PE

Navigation	 Expert → Diagnostics → Heartbeat Techn. → Monitor. results → RefElectrPotPE (12155)
Description	Displays the voltage of the reference electrode in relation to the potential of the measuring tube.
User interface	-30 to +30 V

Build-up index

Navigation	 Expert → Diagnostics → Heartbeat Techn. → Monitor. results → Build-up index (12111)
Description	Shows current build-up index value.
User interface	0.0 to 100.0 %
Factory setting	0.0 %
Additional information	The formation of build-up is output as a percentage in the Build-up index value (→  86) parameter. The higher the percentage, the thicker the build-up. Build-up index value (→  86) = 0% ■ No build-up present ■ Measuring tube as-delivered state (initial value) ■ Measuring tube was cleaned thoroughly after formation of build-up Build-up index value (→  86) = 100% ■ Value for the maximum measurable build-up thickness ■ The thickness of the build-up at 100% varies depending on the process ■ A value of 100% should not be equated with a blocked measuring tube The percentage indicated in the Build-up index value (→  86) parameter does not provide direct information about the absolute thickness or the composition of the build-up. Therefore, to make optimum use of the build-up detection function, it is necessary to first compare the formation of build-up in the process, as known from experience, with the associated Build-up index value (→  86). The aim is to determine the Build-up index value (→  86) at the time the cleaning is usually performed. On the basis of the Build-up index value (→  86) during cleaning, it is possible to make a valid assessment of the condition inside the measuring tube and to plan the cleaning using the build-up limit and build-up detection hysteresis parameters. In addition, conclusions about possible effects on neighboring processes can be drawn from the Build-up index value (→  86).

HBSI

Navigation	 Expert → Diagnostics → Heartbeat Techn. → Monitor. results → HBSI (12116)
Description	Displays the relative change of the entire sensor, with all its electrical, mechanical and electromechanical components incorporated in the sensor housing (including the measuring tube, electrodynamic pick-ups, excitation system, cables etc.), in % of the reference value.
User interface	-100.0 to 100.0 %

3.8.13 "Simulation" submenu

Navigation

  Expert → Diagnostics → Simulation

► Simulation		
Assign simulation process variable (1810)	→ 	248
Process variable value (1811)	→ 	248
Current input 1 to n simulation (1608-1 to n)	→ 	255
Value current input 1 to n (1609-1 to n)	→ 	256
Status input simulation 1 to n (1355-1 to n)	→ 	256
Input signal level 1 to n (1356-1 to n)	→ 	257
Current output 1 to n simulation (0354-1 to n)	→ 	249
Current output value (0355)	→ 	249
Frequency output 1 to n simulation (0472-1 to n)	→ 	250
Frequency output 1 to n value (0473-1 to n)	→ 	250
Pulse output simulation 1 to n (0458-1 to n)	→ 	250
Pulse value 1 to n (0459-1 to n)	→ 	251
Switch output simulation 1 to n (0462-1 to n)	→ 	251
Switch state 1 to n (0463-1 to n)	→ 	252
Relay output 1 to n simulation (0802-1 to n)	→ 	252
Switch state 1 to n (0803-1 to n)	→ 	253
Pulse output simulation (0988)	→ 	253
Pulse value (0989)	→ 	254

Device alarm simulation (0654)	→ 254
Diagnostic event category (0738)	→ 255
Diagnostic event simulation (0737)	→ 255

Assign simulation process variable

Navigation	Expert → Diagnostics → Simulation → Assign proc.var. (1810)
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 diagnostic message of the "Function check" category (C) while simulation is in progress.
Selection	■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity[*] ■ Corrected conductivity[*] ■ Temperature[*]
Factory setting	Off
Additional information	<i>Description</i> The simulation value of the process variable selected is defined in the Process variable value parameter (→ 248).

Process variable value

Navigation	Expert → Diagnostics → Simulation → Proc. var. value (1811)
Prerequisite	A process variable is selected in the Assign simulation process variable parameter (→ 248).
Description	Use this function to enter a simulation value for the selected process variable. Subsequent measured value processing and the signal output use this simulation value. In this way, users can verify whether the measuring device has been configured correctly.
User entry	Depends on the process variable selected
Factory setting	0

* Visibility depends on order options or device settings

Additional information*User entry*

The unit of the displayed measured value is taken from the **System units** submenu (→ 57).

Current output 1 to n simulation**Navigation**

Expert → Diagnostics → Simulation → Curr.outp 1 to n sim. (0354–1 to n)

Description

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

Selection

- Off
- On

Factory setting

Off

Additional information*Description*

The desired simulation value is defined in the **Value current output 1 to n** parameter.

Selection

- Off
Current simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.
- On
Current simulation is active.

Current output value**Navigation**

Expert → Diagnostics → Simulation → Curr.outp val. (0355)

Expert → Diagnostics → Simulation → Value curr.out 1 to n (0355–1 to n)

Prerequisite

In the **Current output 1 to n simulation** parameter, the **On** option is selected.

Description

Use this function to enter a current value for the simulation. In this way, users can verify the correct adjustment of the current output and the correct function of downstream switching units.

User entry

3.59 to 22.5 mA

Additional information*Dependency*

The input range is dependent on the option selected in the **Current span** parameter (→ 113).

Frequency output 1 to n simulation		
Navigation	 Expert → Diagnostics → Simulation → Freq.outp 1 to n sim. (0472–1 to n)	
Prerequisite	In the Operating mode parameter (→  127), the Frequency option is selected.	
Description	Use this function to switch simulation of the frequency output on and off. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.	
Selection	■ Off ■ On	
Factory setting	Off	
Additional information	<i>Description</i>  The desired simulation value is defined in the Frequency value 1 to n parameter. <i>Selection</i> ■ Off Frequency simulation is switched off. The device is in normal measuring mode or another process variable is being simulated. ■ On Frequency simulation is active.	
Frequency output 1 to n value		
Navigation	 Expert → Diagnostics → Simulation → Freq.outp 1 to n val. (0473–1 to n)	
Prerequisite	In the Frequency simulation 1 to n parameter, the On option is selected.	
Description	Use this function to enter a frequency value for the simulation. In this way, users can verify the correct adjustment of the frequency output and the correct function of downstream switching units.	
User entry	0.0 to 12 500.0 Hz	
Pulse output simulation 1 to n		
Navigation	 Expert → Diagnostics → Simulation → Puls.outp.sim. 1 to n (0458–1 to n)	
Prerequisite	In the Operating mode parameter (→  127), the Pulse option is selected.	
Description	Use this function to switch simulation of the pulse output on and off. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.	

Selection	■ Off ■ Fixed value ■ Down-counting value
Factory setting	Off
Additional information	<i>Description</i>  The desired simulation value is defined in the Pulse value 1 to n parameter. <i>Selection</i> ■ Off Pulse simulation is switched off. The device is in normal measuring mode or another process variable is being simulated. ■ Fixed value Pulses are continuously output with the pulse width specified in the Pulse width parameter (→  129). ■ Down-counting value The pulses specified in the Pulse value parameter (→  251) are output.

Pulse value 1 to n

Navigation	 Expert → Diagnostics → Simulation → Pulse value 1 to n (0459–1 to n)
Prerequisite	In the Pulse output simulation 1 to n parameter, the Down-counting value option is selected.
Description	Use this function to enter a pulse value for the simulation. In this way, users can verify the correct adjustment of the pulse output and the correct function of downstream switching units.
User entry	0 to 65 535

Switch output simulation 1 to n

Navigation	 Expert → Diagnostics → Simulation → Switch sim. 1 to n (0462–1 to n)
Prerequisite	In the Operating mode parameter (→  127), the Switch option is selected.
Description	Use this function to switch simulation of the switch output on and off. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.
Selection	■ Off ■ On
Factory setting	Off

Additional information	<i>Description</i>  The desired simulation value is defined in the Switch state 1 to n parameter. <i>Selection</i> ■ Off Switch simulation is switched off. The device is in normal measuring mode or another process variable is being simulated. ■ On Switch simulation is active.
-------------------------------	---

Switch state 1 to n	
----------------------------	---

Navigation	 Expert → Diagnostics → Simulation → Switch state 1 to n (0463–1 to n)
Description	Use this function to select a switch value for the simulation. In this way, users can verify the correct adjustment of the switch output and the correct function of downstream switching units.
Selection	■ Open ■ Closed
Additional information	<i>Selection</i> ■ Open Switch simulation is switched off. The device is in normal measuring mode or another process variable is being simulated. ■ Closed Switch simulation is active.

Relay output 1 to n simulation	
---------------------------------------	---

Navigation	 Expert → Diagnostics → Simulation → Relay out. 1 to n sim (0802–1 to n)
Description	Use this function to switch simulation of the relay output on and off. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.
Selection	■ Off ■ On
Factory setting	Off

Additional information	Description  The desired simulation value is defined in the Switch state 1 to n parameter.
	Selection ■ Off Relay simulation is switched off. The device is in normal measuring mode or another process variable is being simulated. ■ On Relay simulation is active.
Switch state 1 to n 	
Navigation	 Expert → Diagnostics → Simulation → Switch state 1 to n (0803–1 to n)
Prerequisite	The On option is selected in the Switch output simulation 1 to n parameter parameter.
Description	Use this function to select a relay value for the simulation. In this way, users can verify the correct adjustment of the relay output and the correct function of downstream switching units.
Selection	■ Open ■ Closed
Additional information	Selection ■ Open Relay simulation is switched off. The device is in normal measuring mode or another process variable is being simulated. ■ Closed Relay simulation is active.
Pulse output simulation 	
Navigation	 Expert → Diagnostics → Simulation → Puls.outp.sim. (0988)
Description	Use this function to switch simulation of the double pulse output on and off. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.
Selection	■ Off ■ Fixed value ■ Down-counting value
Factory setting	Off

Additional information	Description	
	 The desired simulation value is defined in the Pulse value parameter (→  254).	
	Selection	
	■ Off Simulation of the double pulse output is switched off. The device is in normal measuring mode or another process variable is being simulated. ■ Fixed value Pulses are continuously output with the pulse width specified in the Pulse width parameter (→  153). ■ Down-counting value The pulses specified in the Pulse value parameter (→  254) are output.	
Pulse value		
Navigation	  Expert → Diagnostics → Simulation → Pulse value (0989)	
Prerequisite	In the Pulse output simulation parameter (→  253), the Down-counting value option is selected.	
Description	Use this function to enter a pulse value for simulation of the double pulse output. In this way, users can verify the correct adjustment of the double pulse output and the correct function of downstream switching units.	
User entry	0 to 65 535	
Device alarm simulation		
Navigation	  Expert → Diagnostics → Simulation → Dev. alarm sim. (0654)	
Description	Use this function to switch the device alarm on and off.	
Selection	■ Off ■ On	
Factory setting	Off	
Additional information	Description	
	The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.	

Diagnostic event category


Navigation	Expert → Diagnostics → Simulation → Event category (0738)
Description	Use this function to select the category of the diagnostic events that are displayed for the simulation in the Diagnostic event simulation parameter (→ 255).
Selection	■ Sensor ■ Electronics ■ Configuration ■ Process
Factory setting	Process

Diagnostic event simulation


Navigation	Expert → Diagnostics → Simulation → Diag. event sim. (0737)
Description	Use this function to select a diagnostic event for the simulation process that is activated.
Selection	■ Off ■ Diagnostic event picklist (depends on the category selected)
Factory setting	Off
Additional information	<i>Description</i> For the simulation, you can choose from the diagnostic events of the category selected in the Diagnostic event category parameter (→ 255).

Current input 1 to n simulation


Navigation	Expert → Diagnostics → Simulation → Curr.inp 1 to n sim. (1608–1 to n)
Description	Option for switching simulation of the current input on and off. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress. The desired simulation value is defined in the Value current input 1 to n parameter.
Selection	■ Off ■ On
Factory setting	Off

Additional information	Selection
	■ Off Current simulation is switched off. The device is in normal measuring mode or another process variable is being simulated. ■ On Current simulation is active.
Value current input 1 to n	
Navigation	 Expert → Diagnostics → Simulation → Value curr.inp 1 to n (1609-1 to n)
Prerequisite	In the Current input 1 to n simulation parameter, the On option is selected.
Description	Use this function to enter the current value for the simulation. In this way, users can verify the correct configuration of the current input and the correct function of upstream feed-in units.
User entry	0 to 22.5 mA
Status input simulation 1 to n	
Navigation	 Expert → Diagnostics → Simulation → Status inp.sim 1 to n (1355-1 to n)
Description	Use this function to switch simulation of the status input on and off. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.
Selection	■ Off ■ On
Factory setting	Off
Additional information	Description
	 The desired simulation value is defined in the Input signal level parameter (→  257).
	Selection
	■ Off Simulation for the status input is switched off. The device is in normal measuring mode or another process variable is being simulated. ■ On Simulation for the status input is active.

Input signal level 1 to n		
Navigation	 Expert → Diagnostics → Simulation → Signal level 1 to n (1356–1 to n)	
Prerequisite	In the Status input simulation parameter (→  256), the On option is selected.	
Description	Use this function to select the signal level for the simulation of the status input. In this way, users can verify the correct configuration of the status input and the correct function of upstream feed-in units.	
Selection	■ High ■ Low	

4 Country-specific factory settings

4.1 SI units

 Not valid for USA and Canada.

4.1.1 System units

Process variable	Unit
Volume flow	l/h
Volume	m ³
Conductivity	µS/cm
Temperature	°C
Mass flow	kg/h
Mass	kg
Density	kg/l
Corrected volume flow	NI/h
Corrected volume	Nm ³

4.1.2 Full scale values

 The factory settings apply to the following parameters:

- 20 mA value (full scale value of the current output)
- 100% bar graph value 1

Nominal diameter [mm]	(v ~ 2.5 m/s) [dm ³ /min]
2	0.5
4	2
8	8
15	25
25	75
32	125
40	200
50	300
65	500
80	750
100	1200
125	1850

Nominal diameter [mm]	(v ~ 2.5 m/s) [m ³ /h]
150	150
200	300
250	500
300	750

Nominal diameter [mm]	(v ~ 2.5 m/s) [m³/h]
350	1000
400	1200
450	1500
500	2000
600	2500
700	3500
750	4000
800	4500
900	6000
1000	7000
1200	10000
1400	14000
1600	18000
1800	23000
2000	28500
2200	34000
2400	40000
2600	48000
2800	55500
3000	63500

4.1.3 Output current span

Output	Current range
Current output 1...n	4 to 20 mA NAMUR

4.1.4 Pulse value

Nominal diameter [mm]	(~ 2 pulse/s at v ~ 2.5 m/s) [dm³]
2	0.005
4	0.025
8	0.1
15	0.2
25	0.5
32	1
40	1.5
50	2.5
65	5
80	5
100	10
125	15

Nominal diameter [mm]	(~ 2 pulse/s at v ~ 2.5 m/s) [m³]
150	0.03
200	0.05
250	0.05
300	0.1
350	0.1
400	0.15
450	0.25
500	0.25
600	0.3
700	0.5
750	0.5
800	0.75
900	0.75
1000	1
1200	1.5
1400	2
1600	2.5
1800	3
2000	3.5
2200	4.5
2400	5.5
2600	7
2800	8
3000	9

4.1.5 Switch-on point low flow cut off



The switch-on point depends on the type of medium and the nominal diameter.

Nominal diameter [mm]	(v ~ 0.04 m/s) [dm³/min]
2	0.01
4	0.05
8	0.1
15	0.5
25	1
32	2
40	3
50	5
65	8
80	12
100	20
125	30

Nominal diameter [mm]	(v ~ 0.04 m/s) [m³/h]
150	2.5
200	5
250	7.5
300	10
350	15
400	20
450	25
500	30
600	40
700	50
750	60
800	75
900	100
1000	125
1200	150
1400	225
1600	300
1800	350
2000	450
2200	540
2400	650
2600	775
2800	875
3000	1025

4.2 US units

 Only valid for USA and Canada.

4.2.1 System units

Process variable	Unit
Volume flow	gal/min (us)
Volume	gal (us)
Temperature	°F
Mass flow	lb/min
Mass	lb
Density	lb/ft³
Corrected volume flow	Sft³/h
Corrected volume	Sft³

4.2.2 Full scale values



The factory settings apply to the following parameters:

- 20 mA value (full scale value of the current output)
- 100% bar graph value 1

Nominal diameter [in]	(v ~ 2.5 m/s) [gal/min]
1/12	0.1
1/8	0.5
3/8	2
1/2	6
1	18
1 1/2	50
2	75
3	200
4	300
5	450
6	600
8	1200
10	1500
12	2400
14	3600
15	4800
16	4800
18	6000
20	7500
24	10500
28	13500
30	16500
32	19500
36	24000
40	30000
42	33000
48	42000

Nominal diameter [in]	(v ~ 2.5 m/s) [Mgal/d]
54	75
60	95
66	120
72	140
78	175
84	190
90	220
96	265

Nominal diameter [in]	(v ~ 2.5 m/s) [Mgal/d]
102	300
108	340
114	375
120	415

4.2.3 Output current span

Output	Current range
Current output 1...n	4 to 20 mA US

4.2.4 Pulse value

Nominal diameter [in]	(~ 2 pulse/s at v ~ 2.5 m/s) [gal]
$\frac{1}{12}$	0.001
$\frac{1}{8}$	0.005
$\frac{3}{8}$	0.02
$\frac{1}{2}$	0.1
1	0.2
$1\frac{1}{2}$	0.5
2	0.5
3	2
4	2
5	5
6	5
8	10
10	15
12	25
14	30
15	50
16	50
18	50
20	75
24	100
28	125
30	150
32	200
36	225
40	250
42	250
48	400

Nominal diameter [in]	(~ 2 pulse/s at v ~ 2.5 m/s) [Mgal]
54	0.0005
60	0.0005
66	0.0008
72	0.0008
78	0.001
84	0.0011
90	0.0013
96	0.0015
102	0.0017
108	0.0020
114	0.0022
120	0.0024

4.2.5 Switch-on point low flow cut off



The switch-on point depends on the type of medium and the nominal diameter.

Nominal diameter [in]	(v ~ 0.04 m/s) [gal/min]
1/12	0.002
1/8	0.008
3/8	0.025
1/2	0.15
1	0.25
1 1/2	0.75
2	1.25
3	2.5
4	4
5	7
6	12
8	15
10	30
12	45
14	60
15	60
16	60
18	90
20	120
24	180
28	210
30	270
32	300
36	360

Nominal diameter [in]	(v ~ 0.04 m/s) [gal/min]
40	480
42	600
48	600

Nominal diameter [in]	(v ~ 0.04 m/s) [Mgal/d]
54	1.3
60	1.3
66	2.2
72	2.6
78	3.0
84	3.2
90	3.6
96	4.0
102	5.0
108	5.0
114	6.0
120	7.0

5 Explanation of abbreviated units

5.1 SI units

Process variable	Units	Explanation
Density	g/cm ³ , g/m ³	Gram/volume unit
	kg/dm ³ , kg/l, kg/m ³	Kilogram/volume unit
	SD4°C, SD15°C, SD20°C	Specific density: The specific density is the ratio of the density of the fluid to the density of water at a water temperature of 4 °C (39 °F), 15 °C (59 °F), 20 °C (68 °F).
	SG4°C, SG15°C, SG20°C	Specific gravity: The specific gravity is the ratio of the density of the fluid to the density of water at a water temperature of 4 °C (39 °F), 15 °C (59 °F), 20 °C (68 °F).
Conductivity	µS/mm	Microsiemens/length unit
	nS/cm, µS/cm, mS/cm, S/cm	Nano-, Micro-, Milli-, Siemens/length unit
	µS/m, mS/m, S/m, kS/m, MS/m	Micro-, Milli-, Siemens, Kilo-, Megasiemens/length unit
Mass	g, kg, t	Gram, kilogram, metric ton
Mass flow	g/s, g/min, g/h, g/d	Gram/time unit
	kg/s, kg/min, kg/h, kg/d	Kilogram/time unit
	t/s, t/min, t/h, t/d	Metric ton/time unit
Temperature	°C, K	Celsius, Kelvin
Volume	cm ³ , dm ³ , m ³	Cubic centimeter, cubic decimeter, cubic meter
	ml, l, hl, Ml Mega	Milliliter, liter, hectoliter, megaliter
Time	s, m, h, d, y	Second, minute, hour, day, year

5.2 US units

Process variable	Units	Explanation
Density	lb/ft ³ , lb/gal (us)	Pound/cubic foot, pound/gallon
	lb/bbl (us;liq.), lb/bbl (us;beer), lb/bbl (us;oil), lb/bbl (us;tank)	Pound/volume unit
Mass	oz, lb, STon	Ounce, pound, standard ton
Mass flow	oz/s, oz/min, oz/h, oz/d	Ounce/time unit
	lb/s, lb/min, lb/h, lb/d	Pound/time unit
	STon/s, STon/min, STon/h, STon/d	Standard ton/time unit
Corrected volume	Sft ³ , Sgal (us), Sbbl (us;liq.)	Standard cubic foot, standard gallon, standard barrel
Corrected volume flow	Sft ³ /s, Sft ³ /min, Sft ³ /h, Sft ³ /d	Standard cubic foot/time unit
	Sgal/s (us), Sgal/min (us), Sgal/h (us), Sgal/d (us)	Standard gallon/time unit
	Sbbl/s (us;liq.), Sbbl/min (us;liq.), Sbbl/h (us;liq.), Sbbl/d (us;liq.)	Barrel/time unit (normal liquids)
Temperature	°F, °R	Fahrenheit, Rankine
Volume	af	Acre foot
	ft ³	Cubic foot

Process variable	Units	Explanation
	fl oz (us), gal (us), kgal (us), Mgal (us)	Fluid ounce, gallon, kilogallon, million gallon
	bbl (us;liq.), bbl (us;beer), bbl (us;oil), bbl (us;tank)	Barrel (normal liquids), barrel (beer), barrel (petrochemicals), barrel (filling tanks)
Volume flow	af/s, af/min, af/h, af/d	Acre foot/time unit
	ft ³ /s, ft ³ /min, ft ³ /h, ft ³ /d	Cubic foot/time unit
	fl oz/s (us), fl oz/min (us), fl oz/h (us), fl oz/d (us)	Fluid ounce/time unit
	gal/s (us), gal/min (us), gal/h (us), gal/d (us)	Gallon/time unit
	kgal/s (us), kgal/min (us), kgal/h (us), kgal/d (us)	Kilogallon/time unit
	Mgal/s (us), Mgal/min (us), Mgal/h (us), Mgal/d (us)	Million gallon/time unit
	bbl/s (us;liq.), bbl/min (us;liq.), bbl/h (us;liq.), bbl/d (us;liq.)	Barrel/time unit (normal liquids) Normal liquids: 31.5 gal/bbl
	bbl/s (us;beer), bbl/min (us;beer), bbl/h (us;beer), bbl/d (us;beer)	Barrel /time unit (beer) Beer: 31.0 gal/bbl
	bbl/s (us;oil), bbl/min (us;oil), bbl/h (us;oil), bbl/d (us;oil)	Barrel/time unit (petrochemicals) Petrochemicals: 42.0 gal/bbl
	bbl/s (us;tank), bbl/min (us;tank), bbl/h (us;tank), bbl/d (us;tank)	Barrel/time unit (filling tank) Filling tanks: 55.0 gal/bbl
Time	s, m, h, d, y	Second, minute, hour, day, year
	am, pm	Ante meridiem (before midday), post meridiem (after midday)

5.3 Imperial units

Process variable	Units	Explanation
Density	lb/gal (imp), lb/bbl (imp;beer), lb/bbl (imp;oil)	Pound/volume unit
Corrected volume	Sgal (imp)	Standard gallon
Corrected volume flow	Sgal/s (imp), Sgal/min (imp), Sgal/h (imp), Sgal/d (imp)	Standard gallon/time unit
Volume	gal (imp), Mgal (imp)	Gallon, mega gallon
	bbl (imp;beer), bbl (imp;oil)	Barrel (beer), barrel (petrochemicals)
Volume flow	gal/s (imp), gal/min (imp), gal/h (imp), gal/d (imp)	Gallon/time unit
	Mgal/s (imp), Mgal/min (imp), Mgal/h (imp), Mgal/d (imp)	Mega gallon/time unit
	bbl/s (imp;beer), bbl/min (imp;beer), bbl/h (imp;beer), bbl/d (imp;beer)	Barrel /time unit (beer) Beer: 36.0 gal/bbl
	bbl/s (imp;oil), bbl/min (imp;oil), bbl/h (imp;oil), bbl/d (imp;oil)	Barrel/time unit (petrochemicals) Petrochemicals: 34.97 gal/bbl
Time	s, m, h, d, y	Second, minute, hour, day, year
	am, pm	Ante meridiem (before midday), post meridiem (after midday)

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