

Description of Device Parameters

Proline Prosonic Flow I 400

Ultrasonic time-of-flight flowmeter
HART

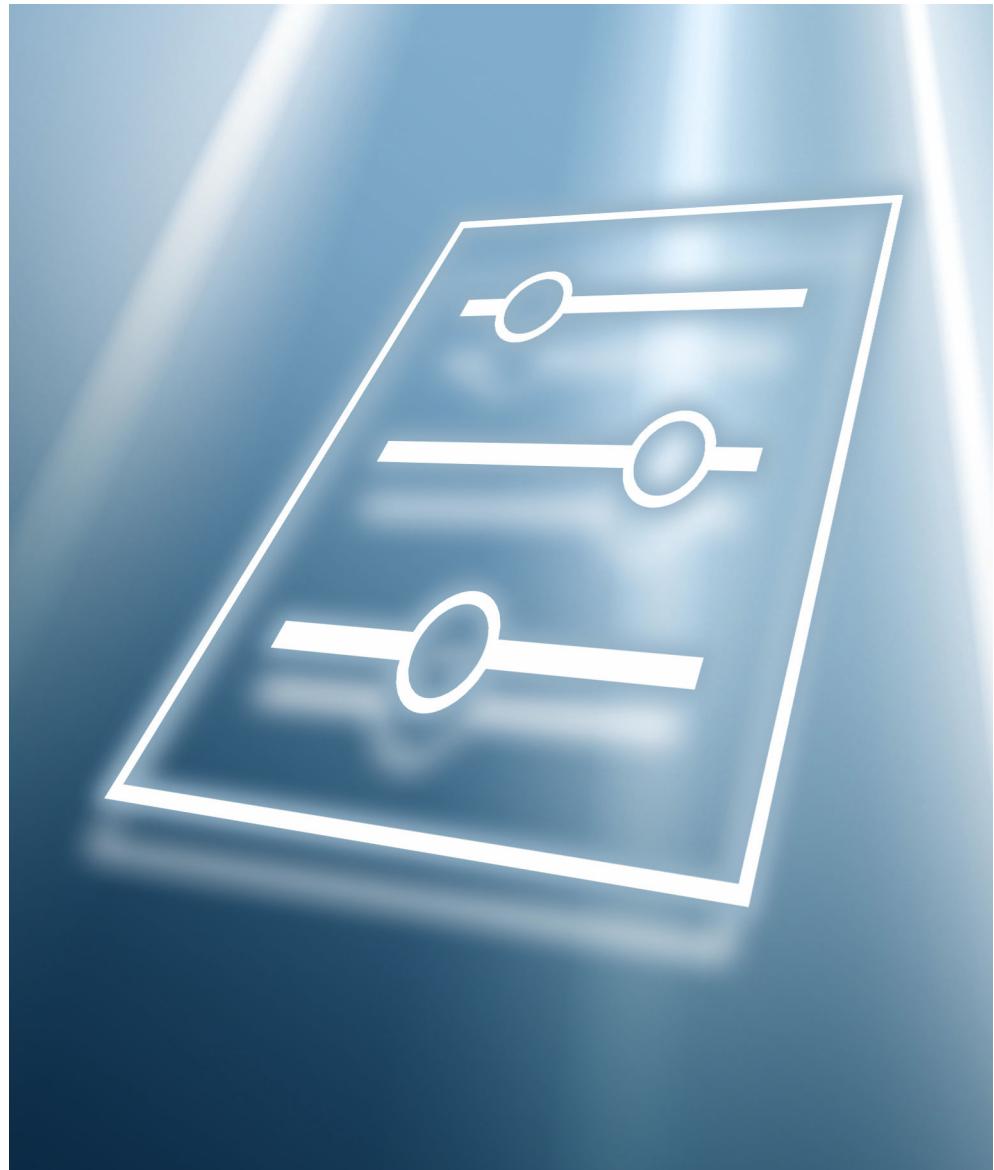


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1 About this document

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 Expert operating menu.

It is used to perform tasks that require detailed knowledge of the function of the device:

- Commissioning measurements under difficult conditions
- Optimal adaptation of the measurement to difficult conditions
- Detailed configuration of the communication interface
- Error diagnostics in difficult cases

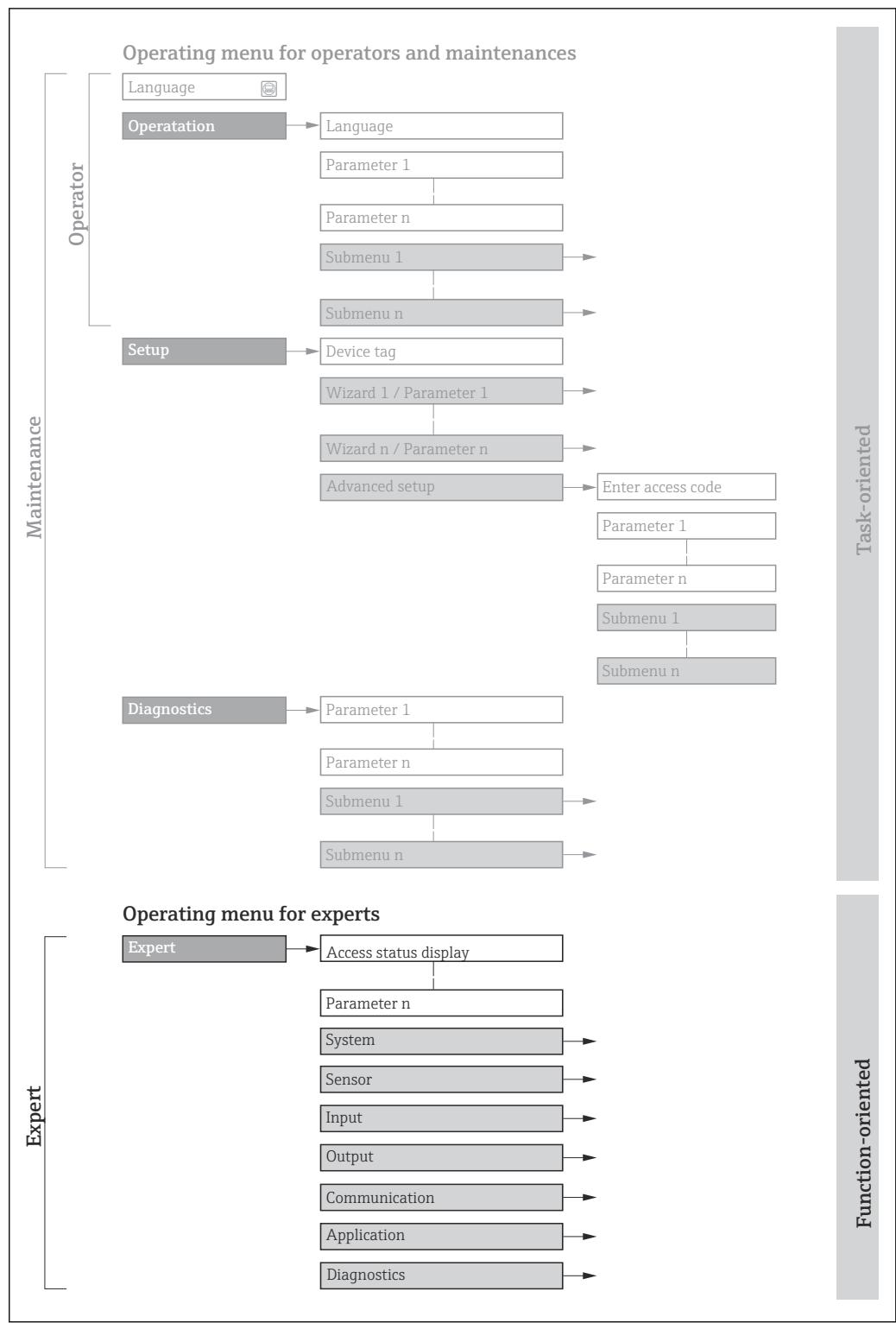
1.2 Target group

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
- Operating concept of the operating menus: Operating Instructions

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 <ul style="list-style-type: none"> ▪ Option 1 ▪ Option 2
User entry	Input range for the parameter
Display	Display value/data for the parameter
Factory setting	Default setting ex works
Additional information	Additional explanations (e.g. in examples): <ul style="list-style-type: none"> ▪ 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
	Operation via local display <small>A0028662</small>
	Operation via operating tool <small>A0028663</small>
	Write-protected parameter <small>A0028665</small>

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
Prosonic Flow I 400	BA02085D

1.5.2 Supplementary device-dependent documentation

Special Documentation

Contents	Documentation code
Radio approvals for WLAN interface for A309/A310 display module	SD01793D
Heartbeat Technology	SD02712D
Web server	SD02713D

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)	→ ↗ 10
Locking status (0004)	→ ↗ 11
User role (0005)	→ ↗ 12
Enter access code (0003)	→ ↗ 12
▶ System	→ ↗ 12
▶ Display	→ ↗ 13
▶ Diagnostic handling	→ ↗ 32
▶ Administration	→ ↗ 39
▶ Sensor	→ ↗ 44
▶ Measured values	→ ↗ 44
▶ System units	→ ↗ 53
▶ Measuring point 1	→ ↗ 59
▶ Process parameters	→ ↗ 65
▶ External compensation	→ ↗ 69
▶ Sensor adjustment	→ ↗ 73
▶ Calibration	→ ↗ 77
▶ Input	→ ↗ 78
▶ Status input	→ ↗ 79
▶ Output	→ ↗ 81
▶ Current output 1	→ ↗ 81
▶ Pulse/frequency/switch output 1 to n	→ ↗ 93

▶ Communication	→ 111
▶ HART input	→ 111
▶ HART output	→ 117
▶ Web server	→ 133
▶ Diagnostic configuration	→ 137
▶ WLAN settings	→ 143
▶ Application	→ 149
Reset all totalizers (2806)	→ 149
▶ Totalizer 1 to n	→ 150
▶ Diagnostics	→ 154
Actual diagnostics (0691)	→ 155
Previous diagnostics (0690)	→ 155
Operating time from restart (0653)	→ 156
Operating time (0652)	→ 156
▶ Diagnostic list	→ 157
▶ Event logbook	→ 161
▶ Device information	→ 163
▶ Main electronic module	→ 167
▶ Sensor electronic module (ISEM)	→ 168
▶ Display module	→ 169
▶ Heartbeat Technology	→ 177
▶ Simulation	→ 178

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)	→ 10
Locking status (0004)	→ 11
User role (0005)	→ 12
Enter access code (0003)	→ 12
▶ System	→ 12
▶ Sensor	→ 44
▶ Input	→ 78
▶ Output	→ 81
▶ Communication	→ 111
▶ Application	→ 149
▶ Diagnostics	→ 154

Direct access

**Navigation**

Expert → Direct access (0106)

Description

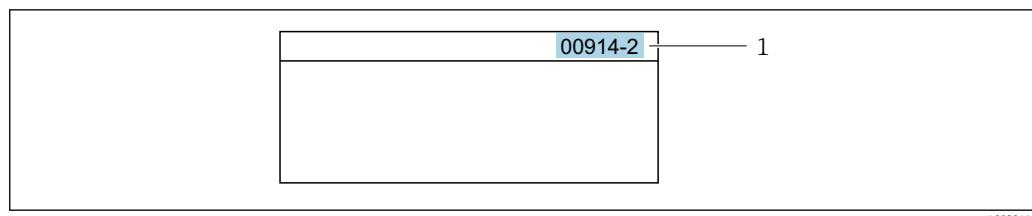
Use this function to enter the access code to enable direct access to the desired parameter via the local display. A parameter number is assigned to each parameter for this purpose.

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
- 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

Selection

Options	Description
None	The access status displayed in the Access status display parameter (→ 31) applies. Only appears on local display.
Hardware locked (priority 1)	The DIP switch for hardware locking is activated on the main electronics module. This locks write access to the parameters (e.g. via local display or operating tool).
Temporarily locked	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

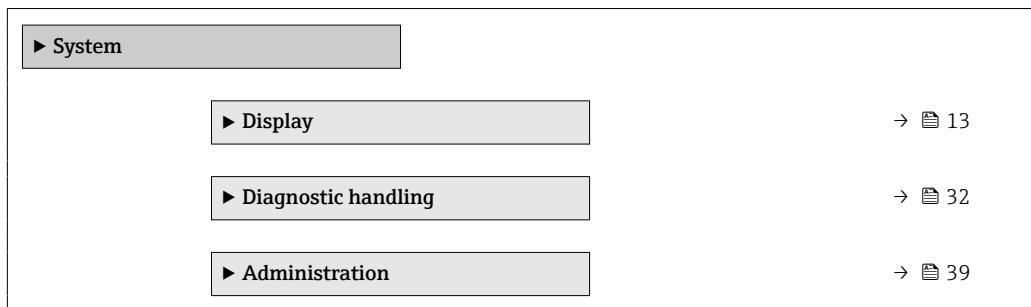
Navigation	  Expert → User role (0005)
Description	Displays the access authorization to the parameters via the operating tool or Web browser.
User interface	<ul style="list-style-type: none">▪ Operator▪ Maintenance
Factory setting	Maintenance
Additional information	<p><i>Description</i></p> <p> Access authorization can be modified via the Enter access code parameter (→  12).</p> <p> If additional write protection is active, this restricts the current access authorization even further.</p> <p><i>User interface</i></p> <p> 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</p>

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



3.1.1 "Display" submenu

Navigation

Expert → System → Display

► Display	
Display language (0104)	→ 14
Format display (0098)	→ 14
Value 1 display (0107)	→ 17
0% bargraph value 1 (0123)	→ 17
100% bargraph value 1 (0125)	→ 18
Decimal places 1 (0095)	→ 18
Value 2 display (0108)	→ 19
Decimal places 2 (0117)	→ 19
Value 3 display (0110)	→ 20
0% bargraph value 3 (0124)	→ 20
100% bargraph value 3 (0126)	→ 21
Decimal places 3 (0118)	→ 21
Value 4 display (0109)	→ 21
Decimal places 4 (0119)	→ 22
Display interval (0096)	→ 28
Display damping (0094)	→ 29
Header (0097)	→ 29
Header text (0112)	→ 30
Separator (0101)	→ 30
Contrast display (0105)	→ 31
Backlight (0111)	→ 31

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)
- Bahasa Indonesia
- tiêng 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*Description*

The display format (size, bar graph etc.) and number of measured values displayed simultaneously (1 to 4) can be configured. This setting only applies to normal operation.



- The **Value 1 display** parameter (→ 17) to **Value 4 display** parameter (→ 21) 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 via the **Display interval** parameter (→ 28).

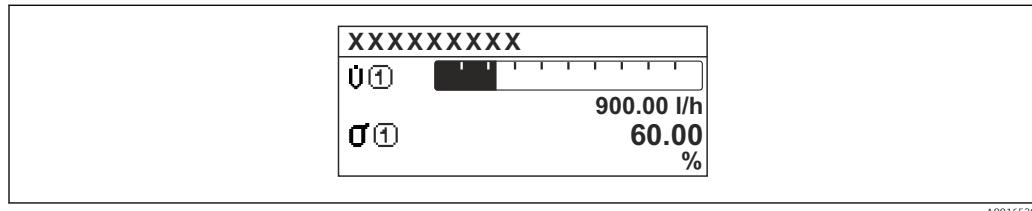
Possible measured values shown on the local display:

"1 value, max. size" option



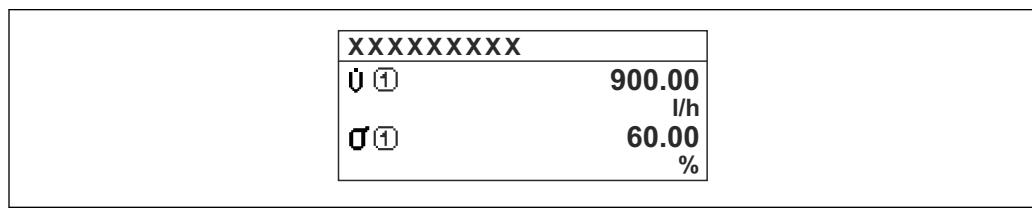
A0016529

"1 bargraph + 1 value" option



A0016530

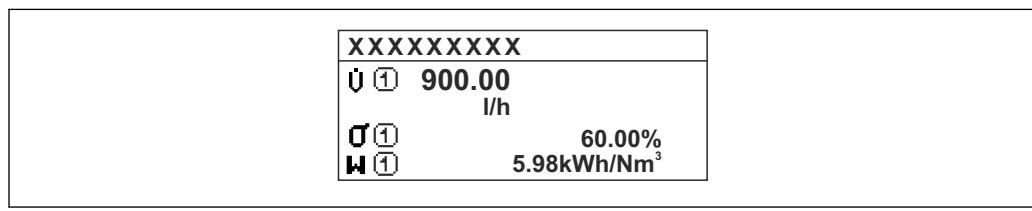
"2 values" option



A0016531

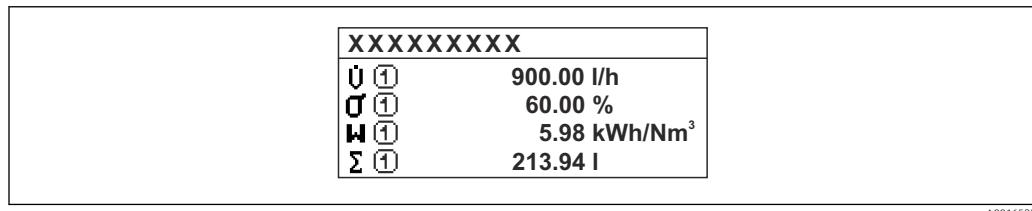
Fig. 2

"1 value large + 2 values" option



A0016532

"4 values" option



A0016533

Value 1 display

Navigation	Expert → System → Display → Value 1 display (0107)
Prerequisite	A local display is provided.
Description	Use this function to select a measured value that is shown on the local display.
Selection	<ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Sound velocity ■ Flow velocity ■ Signal strength * ■ Signal to noise ratio * ■ Turbulence * ■ Acceptance rate * ■ Temperature * ■ Density * ■ Electronics temperature ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Current output 1
Factory setting	Volume flow
Additional information	<p><i>Description</i></p> <p>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.</p> <p> The Format display parameter (→ 14) is used to specify how many measured values are displayed simultaneously and how.</p> <p><i>Dependency</i></p> <p> The unit of the displayed measured value is taken from the System units submenu (→ 53).</p>

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

* Visibility depends on order options or device settings

Additional information*Description*

The **Format display** parameter (→ 14) is used to specify that the measured value is to be displayed as a bar graph.

User entry

The unit of the displayed measured value is taken from the **System units** submenu (→ 53).

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

Additional information*Description*

The **Format display** parameter (→ 14) is used to specify that the measured value is to be displayed as a bar graph.

User entry

The unit of the displayed measured value is taken from the **System units** submenu (→ 53).

Decimal places 1**Navigation**

Expert → System → Display → Decimal places 1 (0095)

Prerequisite

A measured value is defined in the **Value 1 display** parameter (→ 17).

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*Description*

This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.

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 (→ 17)

Factory setting

None

Additional information*Description*

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 (→ 14) is used to specify how many measured values are displayed simultaneously and how.

Dependency

The unit of the displayed measured value is taken from the **System units** submenu (→ 53).

Decimal places 2**Navigation**

Expert → System → Display → Decimal places 2 (0117)

Prerequisite

A measured value is specified in the **Value 2 display** parameter (→ 19).

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*Description*

This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.

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 (→ 17)
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 (→ 14) 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 (→ 53).

0% bargraph value 3

Navigation	Expert → System → Display → 0% bargraph 3 (0124)
Prerequisite	A selection was made in the Value 3 display parameter (→ 20).
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
Additional information	<i>Description</i> The Format display parameter (→ 14) 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 (→ 53).

100% bargraph value 3

Navigation	Expert → System → Display → 100% bargraph 3 (0126)
Prerequisite	A selection was made in the Value 3 display parameter (→ 20).
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 (→ 14) 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 (→ 53).

Decimal places 3

Navigation	Expert → System → Display → Decimal places 3 (0118)
Prerequisite	A measured value is specified in the Value 3 display parameter (→ 20).
Description	Use this function to select the number of decimal places for measured value 3.
Selection	<ul style="list-style-type: none"><input type="checkbox"/> x<input type="checkbox"/> x.X<input type="checkbox"/> x.XX<input type="checkbox"/> x.XXX<input type="checkbox"/> x.XXXX
Factory setting	x.XX
Additional information	<i>Description</i> This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.

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 (→ 17)

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.

i The **Format display** parameter (→ 14) is used to specify how many measured values are displayed simultaneously and how.

Selection

i The unit of the displayed measured value is taken from the **System units** submenu (→ 53).

Decimal places 4



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

Prerequisite A measured value is specified in the **Value 4 display** parameter (→ 21).

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*

i This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.

Value 5 display



Navigation Expert → System → Display → Value 5 display (0145)

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 (→ 17)

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 (→ 14) 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 (→ 53).

0% bargraph value 5**Navigation**

 Expert → System → Display → 0% bargraph 5 (0153)

Prerequisite

An option was selected in the **Value 5 display** parameter (→ 22).

Description

Use this function to enter the 0% bar graph value to be shown on the display for the measured value 5.

User entry

Signed floating-point number

Factory setting

Depends on country

Additional information*Description*

 The **Format display** parameter (→ 14) is used to specify that the measured value is to be displayed as a bar graph.

User entry

 The unit of the displayed measured value is taken from the **System units** submenu (→ 53).

100% bargraph value 5**Navigation**

 Expert → System → Display → 100% bargraph 5 (0155)

Prerequisite

An option was selected in the **Value 5 display** parameter (→ 22).

Description

Use this function to enter the 100% bar graph value to be shown on the display for the measured value 5.

User entry

Signed floating-point number

Factory setting

0

Additional information*Description*

The **Format display** parameter (→ 14) is used to specify that the measured value is to be displayed as a bar graph.

User entry

The unit of the displayed measured value is taken from the **System units** submenu (→ 53).

Decimal places 5**Navigation**

Expert → System → Display → Decimal places 5 (0149)

Prerequisite

A measured value is specified in the **Value 5 display** parameter (→ 22).

Description

Use this function to select the number of decimal places for measured value 5.

Selection

- X
- X.X
- X.XX
- X.XXX
- X.XXXX
- X.XXXXX
- X.XXXXXX

Factory setting

X.XX

Additional information*Description*

This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.

Value 6 display**Navigation**

Expert → System → Display → Value 6 display (0146)

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 (→ 17)

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 (→ 14) 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 (→ 53).

Decimal places 6**Navigation**

Expert → System → Display → Decimal places 6 (0150)

Prerequisite

A measured value is specified in the **Value 6 display** parameter (→ 24).

Description

Use this function to select the number of decimal places for measured value 6.

Selection

- X
- X.X
- X.XX
- X.XXX
- X.XXXX
- X.XXXXX
- X.XXXXXX

Factory setting

X.XX

Additional information*Description*

This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.

Value 7 display**Navigation**

Expert → System → Display → Value 7 display (0147)

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 (→ 17)

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 (→ 14) 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 (→ 53).

Decimal places 7**Navigation**

  Expert → System → Display → Decimal places 7 (0151)

Prerequisite

A measured value is specified in the **Value 7 display** parameter (→ 25).

Description

Use this function to select the number of decimal places for measured value 7.

Selection

- X
- X.X
- X.XX
- X.XXX
- X.XXXX
- X.XXXXX
- X.XXXXXX

Factory setting

X.XX

Additional information*Description*

 This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.

0% bargraph value 7**Navigation**

  Expert → System → Display → 0% bargraph 7 (0154)

Prerequisite

An option was selected in the **Value 7 display** parameter (→ 25).

Description

Use this function to enter the 0% bar graph value to be shown on the display for the measured value 7.

User entry

Signed floating-point number

Factory setting

Depends on country

Additional information*Description*

The **Format display** parameter (→ 14) is used to specify that the measured value is to be displayed as a bar graph.

User entry

The unit of the displayed measured value is taken from the **System units** submenu (→ 53).

100% bargraph value 7**Navigation**

Expert → System → Display → 100% bargraph 7 (0156)

Prerequisite

An option was selected in the **Value 7 display** parameter (→ 25).

Description

Use this function to enter the 100% bar graph value to be shown on the display for the measured value 7.

User entry

Signed floating-point number

Factory setting

0

Additional information*Description*

The **Format display** parameter (→ 14) is used to specify that the measured value is to be displayed as a bar graph.

User entry

The unit of the displayed measured value is taken from the **System units** submenu (→ 53).

Value 8 display**Navigation**

Expert → System → Display → Value 8 display (0148)

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 (→ 17)

Factory setting

None

Additional information*Description*

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

 The **Format display** parameter (→ 14) 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 (→ 53).

Decimal places 8**Navigation**

  Expert → System → Display → Decimal places 8 (0152)

Prerequisite

A measured value is specified in the **Value 8 display** parameter (→ 27).

Description

Use this function to select the number of decimal places for measured value 8.

Selection

- X
- X.X
- X.XX
- X.XXX
- X.XXXX
- X.XXXXX
- X.XXXXXX

Factory setting

X.XX

Additional information*Description*

 This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.

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 (→ 17) to **Value 4 display** parameter (→ 21) are used to specify which measured values are shown on the local display.
- The display format of the displayed measured values is specified using the **Format display** parameter (→ 14).

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*User entry*

Use this function to enter a time constant (PT1 element¹⁾) 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

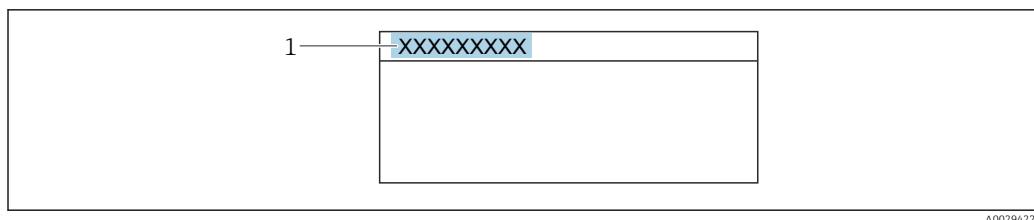
Factory setting

Device tag

Additional information*Description*

The header text only appears during normal operation.

1) proportional transmission behavior with first order delay



A0029422

1 Position of the header text on the display

Selection

- Device tag
Is defined in the **Device tag** parameter (→ 164).
- Free text
Is defined in the **Header text** parameter (→ 30).

Header text



Navigation

Expert → System → Display → Header text (0112)

Prerequisite

The **Free text** option is selected in the **Header** parameter (→ 29).

Description

Use this function to enter a customer-specific text for the header of the local display.

User entry

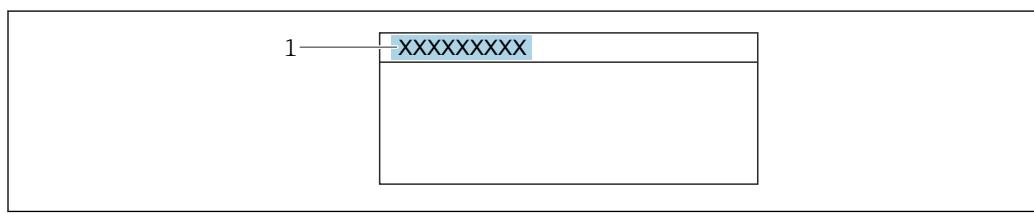
Max. 12 characters, such as letters, numbers or special characters (e.g. @, %, /)

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 50 %

Backlight

Navigation  Expert → System → Display → Backlight (0111)

Prerequisite A local display is provided.

Description Use this function to switch the backlight of the local display on and off.

Selection

- Disable
- Enable

Factory setting Enable

Access status display

Navigation  Expert → System → Display → Access stat.disp (0091)

Prerequisite A local display is provided.

Description Displays the access authorization to the parameters via the local display.

User interface

- Operator
- Maintenance

Factory setting Operator

Additional information**Description**

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

 Access authorization can be modified via the **Enter access code** parameter (→ [32](#) 12).

 For information about the **Enter access code** parameter: see the "Disabling write protection via the access code" section of the Operating Instructions for the device

 If additional write protection is active, this restricts the current access authorization even further.

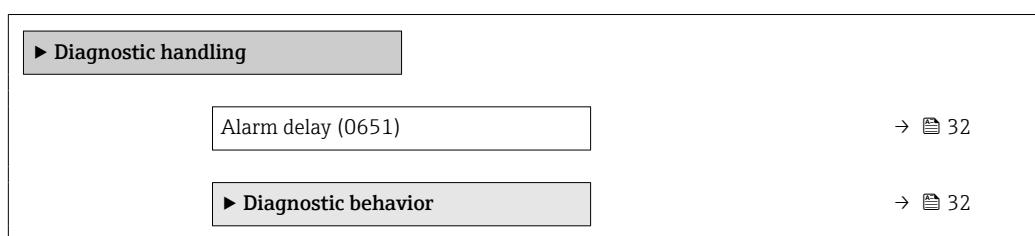
User interface

 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

3.1.2 "Diagnostic handling" submenu

Navigation

  Expert → System → Diagn. handling



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

"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 (→ [32](#) 32).

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 (→ 161) (Event list submenu (→ 162)) 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. 019 (0635)	→ 34
Assign behavior of diagnostic no. 160 (0776)	→ 34
Assign behavior of diagnostic no. 302 (0742)	→ 34
Assign behavior of diagnostic no. 441 (0657)	→ 35
Assign behavior of diagnostic no. 442 (0658)	→ 35
Assign behavior of diagnostic no. 443 (0659)	→ 36
Assign behavior of diagnostic no. 833 (0676)	→ 36
Assign behavior of diagnostic no. 832 (0675)	→ 36
Assign behavior of diagnostic no. 840 (0680)	→ 37
Assign behavior of diagnostic no. 842 (0638)	→ 37
Assign behavior of diagnostic no. 870 (0726)	→ 37

Assign behavior of diagnostic no. 930 (0639)	→ 38
Assign behavior of diagnostic no. 931 (0640)	→ 38

Assign behavior of diagnostic no. 019 (Device initialization active)



Navigation

Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 019 (0635)

Description

Use this function to change the diagnostic behavior of the **△S019 Device initialization active** diagnostic message.

Selection

- Off
- Alarm
- Warning
- Logbook entry only

Factory setting

Warning

Additional information

For a detailed description of the options available: → 33

Assign behavior of diagnostic no. 160 (Signal path switched off)



Navigation

Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 160 (0776)

Description

Use this function to change the diagnostic behavior of the **160 Signal path switched off** diagnostic message.

Selection

- Off
- Alarm
- Warning
- Logbook entry only

Factory setting

Warning

Additional information

For a detailed description of the options available: → 33

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



Navigation

Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 302 (0742)

Description

Use this function to change the diagnostic behavior of the **302 Device verification active** diagnostic message.

Selection	<ul style="list-style-type: none">▪ Off▪ Warning▪ Logbook entry only
------------------	--

Factory setting	Warning
------------------------	---------

Additional information	 For a detailed description of the options available: → 33
-------------------------------	---

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	<ul style="list-style-type: none">▪ Off▪ Alarm▪ Warning▪ Logbook entry only
------------------	--

Factory setting	Warning
------------------------	---------

Additional information	<i>Selection</i>  For a detailed description of the options available: → 33
-------------------------------	---

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	<ul style="list-style-type: none">▪ Off▪ Alarm▪ Warning▪ Logbook entry only
------------------	--

Factory setting	Warning
------------------------	---------

Additional information	 For a detailed description of the options available: → 33
-------------------------------	---

Assign behavior of diagnostic no. 443 (Pulse output)



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 diagnostic message.
Selection	<ul style="list-style-type: none">▪ Off▪ Alarm▪ Warning▪ Logbook entry only
Factory setting	Warning
Additional information	<i>Selection</i> For a detailed description of the options available: → 33

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



Navigation	Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 832 (0675)
Description	Use this function to change the diagnostic behavior of the 832 Electronics temperature too high diagnostic message.
Selection	<ul style="list-style-type: none">▪ Off▪ Alarm▪ Warning▪ Logbook entry only
Factory setting	Warning
Additional information	For a detailed description of the options available: → 33

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



Navigation	Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 833 (0676)
Description	Use this function to change the diagnostic behavior of the 833 Electronics temperature too low diagnostic message.
Selection	<ul style="list-style-type: none">▪ Off▪ Alarm▪ Warning▪ Logbook entry only

Factory setting Warning

Additional information Selection



For a detailed description of the options available: → [33](#)

Assign behavior of diagnostic no. 840 (Sensor range)



Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 840 (0680)

Description Use this function to change the diagnostic behavior of the **840 Sensor range** diagnostic message.

Selection

- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available: → [33](#)



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: → [33](#)



Assign behavior of diagnostic no. 870 (Measuring inaccuracy increased)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 870 (0726)

Description Use this function to change the diagnostic behavior of the **870 Measuring inaccuracy increased** diagnostic message.

Selection	<ul style="list-style-type: none">▪ Off▪ Alarm▪ Warning▪ Logbook entry only
------------------	--

Factory setting	Warning
------------------------	---------

Additional information	<i>Selection</i>
	 For a detailed description of the options available: → 33

Assign behavior of diagnostic no. 930 (Process fluid)



Navigation  Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 930 (0639)

Description Use this function to change the diagnostic behavior of the **△S930 Process fluid** diagnostic message.

Selection	<ul style="list-style-type: none">▪ Off▪ Alarm▪ Warning▪ Logbook entry only
------------------	--

Factory setting	Alarm
------------------------	-------

Additional information	 For a detailed description of the options available: → 33
-------------------------------	---

Assign behavior of diagnostic no. 931 (Process fluid)



Navigation  Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 931 (0640)

Description Use this function to change the diagnostic behavior of the **△S931 Process fluid** diagnostic message.

Selection	<ul style="list-style-type: none">▪ Off▪ Alarm▪ Warning▪ Logbook entry only
------------------	--

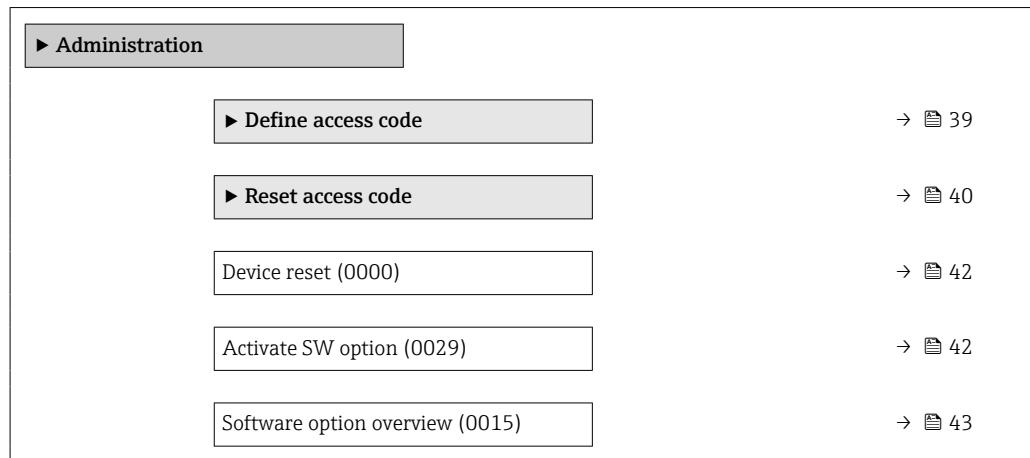
Factory setting	Alarm
------------------------	-------

Additional information	 For a detailed description of the options available: → 33
-------------------------------	---

3.1.3 "Administration" submenu

Navigation

Expert → System → Administration



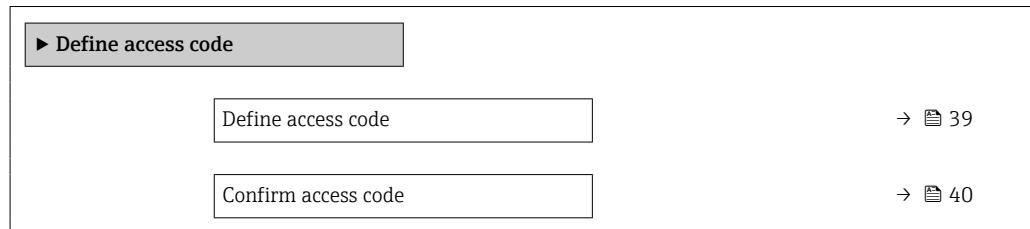
"Define access code" wizard

i The **Define access code** wizard (→ 39) is only available when operating via the local display or Web browser.

If operating via the operating tool, the **Define access code** parameter (→ 41) 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



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 configuration of the device against any inadvertent changes via the local display or Web browser.

User entry 0 to 9 999

Factory setting 0

Additional information *Description*

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.

i 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 (→ [12](#)).

i If you lose the access code, please contact your Endress+Hauser sales organization.

User entry

A message is displayed if the access code is not in the input range.

Factory setting

If the factory setting is not changed or **0** is defined as the access code, the parameters are not write-protected and the device configuration data can be modified. The user is logged on in the "**Maintenance**" role.

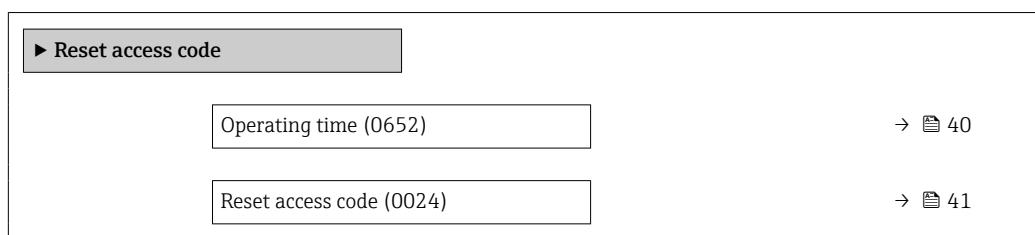
Confirm access code



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	0 to 9 999
Factory setting	0

"Reset access code" submenu

Navigation Expert → System → Administration → Reset acc. code



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

Define access code

**Navigation**

Expert → System → Administration → Def. access code

Description

Use this function to enter a user-specific release code to restrict write-access to the parameters. This protects the configuration of the device against any inadvertent changes via the operating tool.

User entry

0 to 9 999

Factory setting

0

Additional information*Description*

The write protection affects all parameters in the document marked with the  symbol.

 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 (→  12).

 If you lose the access code, please contact your Endress+Hauser sales organization.

User entry

A message is displayed if the access code is not in the input range.

Factory setting

If the factory setting is not changed or **0** is defined as the access code, the parameters are not write-protected and the device configuration data can be modified. The user is logged on in the "**Maintenance**" role.

Device reset**Navigation**

  Expert → System → Administration → Device reset (0000)

Description

Use this function to choose whether to 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

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

* Visibility depends on order options or device settings

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 (→  43).
- ↳ 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 (→  43).

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
- PFS output 2 + status input
- Heartbeat Verification
- Heartbeat Monitoring

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"

"PFS output 2 + status input" option

Order code for "Output; input", option I "4-20mA HART, 2x pul./freq./switch output; status input"

"Heartbeat Verification" option and "Heartbeat Monitoring" option

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

3.2 "Sensor" submenu

Navigation

Expert → Sensor

► Sensor	
► Measured values	→ 44
► System units	→ 53
► Measuring point 1	→ 59
► Process parameters	→ 65
► External compensation	→ 69
► Sensor adjustment	→ 73
► Calibration	→ 77

3.2.1 "Measured values" submenu

Navigation

Expert → Sensor → Measured val.

► Measured values	
► Process variables	→ 45
► System values	→ 47
► Totalizer	→ 48

► Input values	→  50
► Output values	→  50

"Process variables" submenu**Navigation**

  Expert → Sensor → Measured val. → Process variab.

► Process variables	
Volume flow (1838)	→  45
Mass flow (1847)	→  45
Flow velocity (1852)	→  46
Sound velocity (1850)	→  46
Density (1851)	→  46
Temperature (1853)	→  46

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

Dependency

 The unit is taken from the **Volume flow unit** parameter (→  53)

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

Dependency

 The unit is taken from the **Mass flow unit** parameter (→  55)

Flow velocity

Navigation	 Expert → Sensor → Measured val. → Process variab. → Flow velocity (1852)
Description	Displays the average flow velocity that is currently calculated.
User interface	Signed floating-point number
Additional information	<i>Dependency</i>  The unit is taken from the Velocity unit parameter (→  56)

Sound velocity

Navigation	 Expert → Sensor → Measured val. → Process variab. → Sound velocity (1850)
Description	Displays the sound velocity that is currently measured.
User interface	Signed floating-point number
Additional information	<i>Dependency</i>  The unit is taken from the Velocity unit parameter (→  56)

Density

Navigation	 Expert → Sensor → Measured val. → Process variab. → Density (1851)
Prerequisite	A fixed density is not entered.
Description	Displays the density that is currently calculated.
User interface	Signed floating-point number
Additional information	<i>Dependency</i>  The unit is taken from the Density unit parameter (→  57)

Temperature

Navigation	 Expert → Sensor → Measured val. → Process variab. → Temperature (1853)
Prerequisite	A fixed temperature is not entered.
Description	Displays the medium temperature that is currently measured.

User interface Signed floating-point number

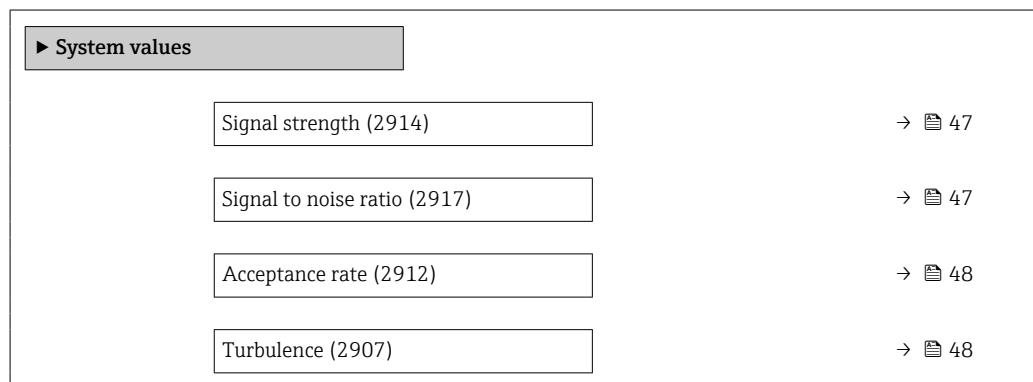
Additional information *Dependency*

 The unit is taken from the **Temperature unit** parameter (→ [57](#))

"System values" submenu

Navigation

 Expert → Sensor → Measured val. → System values



Signal strength

Navigation  Expert → Sensor → Measured val. → System values → Signal strength (2914)

Description Displays the current signal strength.

User interface Signed floating-point number

Additional information *Description*

A drop in the signal strength over time can be an indicator of process changes, such as the development of deposits in the measuring pipe at the measuring point. This can only be quantified by performing a direct process comparison with different deposit layer thicknesses and associated signal strengths.

Signal to noise ratio

Navigation  Expert → Sensor → Measured val. → System values → SNR (2917)

Description Displays the current signal to noise ratio.

User interface Signed floating-point number

Additional information*Description*

A low value or a drop in the signal to noise ratio over time is an indicator of poor signal quality.

Acceptance rate

Navigation

Expert → Sensor → Measured val. → System values → Acceptance rate (2912)

Description

Displays the ratio of the number of ultrasonic signals accepted for flow calculation and the total number of ultrasonic signals emitted.

Multipath measuring devices only: Displays the minimum of all acceptance rates measured.

User interface

0 to 100 %

Turbulence

Navigation

Expert → Sensor → Measured val. → System values → Turbulence (2907)

Description

Displays the current turbulence.

User interface

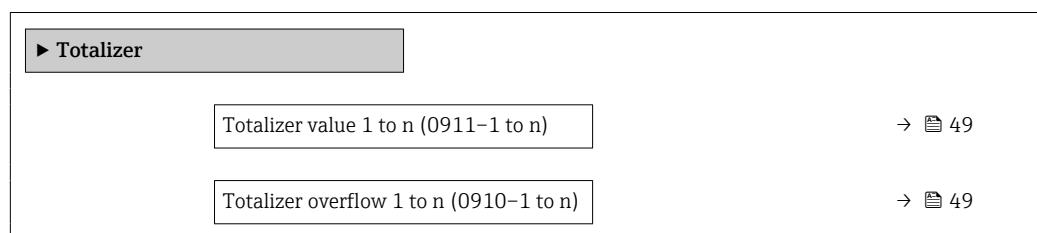
Signed floating-point number

Additional information*Description*

A high turbulence value indicates a disturbance in the flow profile.

"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 One of the following options is selected in the **Assign process variable** parameter (→ [150](#)) of the **Totalizer 1 to n** submenu:

- Volume flow
- Mass flow

Description Displays the current totalizer counter reading.

User interface Signed floating-point number

Additional information *Description*

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 (→ [153](#)).

User interface

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 (→ [152](#)).

The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ [151](#)).

Example

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: $1\,968\,457 \text{ m}^3$
- Value in the **Totalizer overflow 1** parameter: $1 \cdot 10^7$ (1 overflow) = $10\,000\,000 \text{ m}^3$
- Current totalizer reading: $11\,968\,457 \text{ m}^3$

Totalizer overflow 1 to n

Navigation Expert → Sensor → Measured val. → Totalizer → Tot. overflow 1 to n (0910–1 to n)

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ [150](#)) of the **Totalizer 1 to n** submenu:

- Volume flow
- Mass flow

Description Displays the current totalizer overflow.

User interface Integer with sign

Additional information *Description*

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.

User interface

i The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ 151).

Example

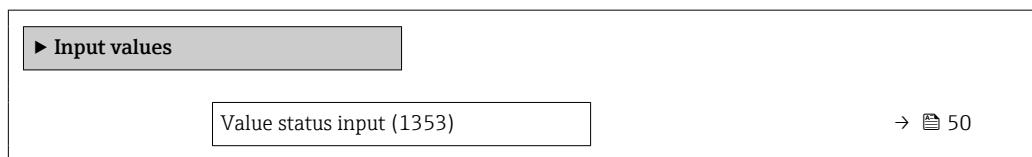
Calculation of the current totalizer reading when the value exceeds the 7-digit display range of the operating tool:

- Value in the **Totalizer value 1** parameter: 1968457 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

"Input values" submenu

Navigation

Expert → Sensor → Measured val. → Input values



Value status input

Navigation

Expert → Sensor → Measured val. → Input values → Val.stat.inp. (1353)

Prerequisite

For the following order code:
"Output; input", option I "4-20mA HART, 2x pul./freq./switch output; status input"

Description

Displays the current input signal level.

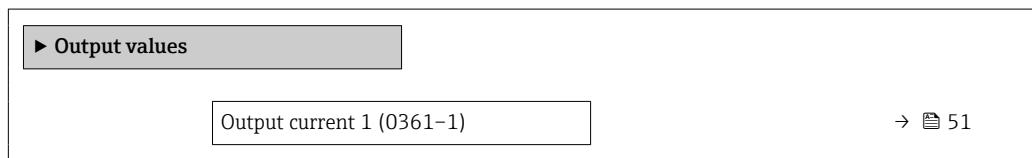
User interface

- High
- Low

"Output values" submenu

Navigation

Expert → Sensor → Measured val. → Output values



Measured current 1 (0366-1)	→ 51
Pulse output 1 (0456-1)	→ 51
Output frequency 1 (0471-1)	→ 52
Switch state 1 (0461-1)	→ 52
Output frequency 2 (0471-2)	→ 52
Pulse output 2 (0456-2)	→ 51
Switch state 2 (0461-2)	→ 52

Output current 1

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

Measured current 1

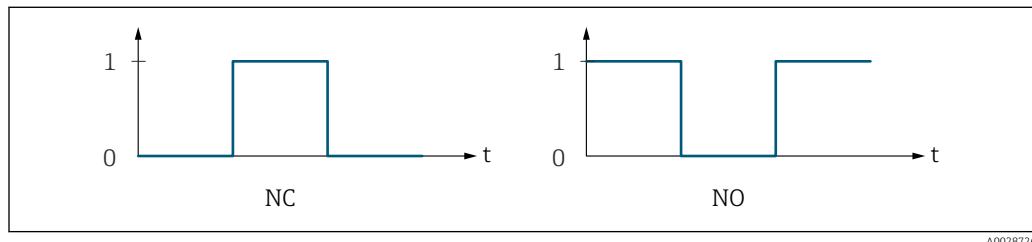
Navigation	Expert → Sensor → Measured val. → Output values → Measur. curr. 1 (0366-1)
Description	Displays the actual measured value of the output current.
User interface	0 to 30 mA

Pulse output 1 to n

Navigation	Expert → Sensor → Measured val. → Output values → Pulse output 1 (0456-1) Expert → Sensor → Measured val. → Output values → Pulse output 2 (0456-2)
Prerequisite	The Pulse option is selected in the Operating mode parameter (→ 94) 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.
- The **Value per pulse** parameter (→ 96) and **Pulse width** parameter (→ 97) can be used to define the value (i.e. the measured value amount that corresponds to a pulse) and the duration of the pulse.



0 Non-conductive
 1 Conductive
 NC Normally closed
 NO Normally opened

The output behavior can be reversed via the **Invert output signal** parameter (→ 110) 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 (→ 98)) can be configured.

Output frequency 1 to n**Navigation**

- ④ ④ Expert → Sensor → Measured val. → Output values → Output freq. 1 (0471-1)
- ④ ④ Expert → Sensor → Measured val. → Output values → Output freq. 2 (0471-2)

Prerequisite

In the **Operating mode** parameter (→ 94), 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 state 1 to n**Navigation**

- ④ ④ Expert → Sensor → Measured val. → Output values → Switch state 1 (0461-1)
- ④ ④ Expert → Sensor → Measured val. → Output values → Switch state 2 (0461-2)

Prerequisite

In the **Operating mode** parameter (→ 94), the **Switch** option is selected.

Description

Displays the current switch status of the status output.

User interface

- Open
- Closed

Additional information*Selection*

- Open
The switch output is not conductive.
- Closed
The switch output is conductive.

3.2.2 "System units" submenu

Navigation Expert → Sensor → System units

► System units	
Volume flow unit (0553)	→  53
Volume unit (0563)	→  55
Mass flow unit (0554)	→  55
Mass unit (0574)	→  56
Velocity unit (0566)	→  56
Temperature unit (0557)	→  57
Density unit (0555)	→  57
Kinematic viscosity unit (0578)	→  58
Length unit (0551)	→  58
Date/time format (2812)	→  58

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

<i>SI units</i>	<i>US units</i>	<i>Imperial units</i>
■ cm ³ /s	■ af/s	■ gal/s (imp)
■ cm ³ /min	■ af/min	■ gal/min (imp)
■ cm ³ /h	■ af/h	■ gal/h (imp)
■ cm ³ /d	■ af/d	■ gal/d (imp)
■ dm ³ /s	■ ft ³ /s	■ Mgal/s (imp)
■ dm ³ /min	■ ft ³ /min	■ Mgal/min (imp)
■ dm ³ /h	■ ft ³ /h	■ Mgal/h (imp)
■ dm ³ /d	■ ft ³ /d	■ Mgal/d (imp)
■ m ³ /s	■ kft ³ /s	■ bbl/s (imp;beer)
■ m ³ /min	■ kft ³ /min	■ bbl/min (imp;beer)
■ m ³ /h	■ kft ³ /h	■ bbl/h (imp;beer)
■ m ³ /d	■ kft ³ /d	■ bbl/d (imp;beer)
■ ml/s	■ fl oz/s (us)	■ bbl/s (imp;oil)
■ ml/min	■ fl oz/min (us)	■ bbl/min (imp;oil)
■ ml/h	■ fl oz/h (us)	■ bbl/h (imp;oil)
■ ml/d	■ fl oz/d (us)	■ bbl/d (imp;oil)
■ l/s	■ gal/s (us)	
■ l/min	■ gal/min (us)	
■ l/h	■ gal/h (us)	
■ l/d	■ gal/d (us)	
■ hl/s	■ Mgal/s (us)	
■ hl/min	■ Mgal/min (us)	
■ hl/h	■ Mgal/h (us)	
■ hl/d	■ Mgal/d (us)	
■ Ml/s	■ bbl/s (us;liq.)	
■ Ml/min	■ bbl/min (us;liq.)	
■ Ml/h	■ bbl/h (us;liq.)	
■ Ml/d	■ 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)	

Factory setting

Depends on country:

- m³/h
- ft³/min

Additional information*Effect*

The selected unit applies for:

Volume flow parameter (→  45)*Selection*

 For an explanation of the abbreviated units: →  186

Volume unit**Navigation**

Expert → Sensor → System units → Volume unit (0563)

Description

Use this function to select the unit for the volume.

Selection*SI units*

- cm³
- dm³
- m³
- ml
- l
- hl
- Ml Mega

US units

- af
- ft³
- Mft³
- fl oz (us)
- gal (us)
- kgal (us)
- Mgal (us)
- bbl (us;oil)
- bbl (us;liq.)
- bbl (us;beer)
- bbl (us;tank)

Imperial units

- gal (imp)
- Mgal (imp)
- bbl (imp;beer)
- bbl (imp;oil)

Factory setting

Country-specific:

- m³
- ft³

Additional information*Selection*

For an explanation of the abbreviated units: → 186

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

Selection

 For an explanation of the abbreviated units: → [186](#)

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: → [186](#)

Velocity unit**Navigation**

  Expert → Sensor → System units → Velocity unit (0566)

Description

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

Selection*SI units*

m/s

US units

ft/s

Factory setting

Country-specific:

- m/s
- ft/s

Additional information*Effect*

The selected unit applies for:
■ Flow velocity (→ [46](#))
■ Sound velocity (→ [46](#))

Selection

 For an explanation of the abbreviated units: → [186](#)

Temperature unit**Navigation**

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

Description

Use this function to select the unit for the temperature.

Selection*SI units*

- °C
- K

US units

- °F
- °R

Factory setting

Country-specific:

- °C
- °F

Additional information*Effect*

The selected unit applies for:

- Temperature (→ 46)
- Electronic temperature
- External temperature
- Reference temperature

Selection

For an explanation of the abbreviated units: → 186

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/dm³
- lb/ft³

Additional information*Selection*

For an explanation of the abbreviated units: → 186

Kinematic viscosity unit

Navigation Expert → Sensor → System units → Kin. visc. unit (0578)

Description Use this function to select the unit for the kinematic viscosity.

Selection *SI units*

- cSt
- m²/s
- St

Factory setting Country-specific:

- m²/s
- cSt

Length unit

Navigation Expert → Sensor → System units → Length unit (0551)

Description Use this function to select the unit of length for the.

Selection *SI units*

- m
- mm

US units

- ft
- in

Factory setting Country-specific:

- mm
- in

Additional information *Selection*

For an explanation of the abbreviated units: → 186

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*

For an explanation of the abbreviated units: → 186

3.2.3 "Measuring point" submenu*Navigation*

Expert → Sensor → Meas. point

► Measuring point 1	
Measuring point configuration (5675-1)	→ 60
Process fluid (2926-1)	→ 60
Medium temperature (3053-1)	→ 60
Sound velocity (2929-1)	→ 61
Viscosity (2932-1)	→ 61
Pipe dimensions (2943-1)	→ 61
Pipe circumference (2934-1)	→ 61
Pipe outer diameter (2910-1)	→ 62
Pipe wall thickness (2916-1)	→ 62
Liner thickness (2935-1)	→ 62
Cable length (2939-1)	→ 62
Result sensor type / sensor distance (3066-1)	→ 63
Result path length / arc length (3067-1)	→ 63
► Mounting deviations signal path 1 to n	

Measuring point configuration

Navigation	 Expert → Sensor → Meas. point 1 → Meas. pt config. (5675-1)
Description	Use this function to enter the measuring point configuration.
Selection	<ul style="list-style-type: none">■ 1 measuring point - signal path 1■ 1 measuring point - signal path 2 *■ 1 measuring point - 2 signal paths *
Factory setting	Depending on the sensor version

Process fluid

Navigation	 Expert → Sensor → Meas. point 1 → Process fluid (2926-1)
Description	Select process fluid.
Selection	<ul style="list-style-type: none">■ Water■ Sea water■ Distilled water■ Ammonia NH3■ Benzene■ Ethanol■ Glycol■ Milk■ Methanol■ User-specific liquid
Factory setting	Water

Medium temperature

Navigation	 Expert → Sensor → Meas. point 1 → Medium temp. (3053-1)
Description	Enter a fixed value for process temperature.
User entry	-200 to 550 °C
Factory setting	20 °C

* Visibility depends on order options or device settings

Sound velocity

Navigation	Expert → Sensor → Meas. point 1 → Sound velocity (2929-1)
Prerequisite	The User-specific liquid option is selected in the Process fluid parameter (→ 60).
Description	Enter sound velocity of fluid.
User entry	200 to 3 000 m/s
Factory setting	1 482.4 m/s

Viscosity

Navigation	Expert → Sensor → Meas. point 1 → Viscosity (2932-1)
Prerequisite	The User-specific liquid option is selected in the Process fluid parameter (→ 60).
Description	Enter medium viscosity at installation temperature.
User entry	1E-10 to 0.01 m ² /s
Factory setting	1E-6 m ² /s

Pipe dimensions

Navigation	Expert → Sensor → Meas. point 1 → Pipe dimensions (2943-1)
Description	Select if pipe dimensions are defined by diameter or circumference.
Selection	<ul style="list-style-type: none">■ Diameter■ Pipe circumference
Factory setting	Diameter

Pipe circumference

Navigation	Expert → Sensor → Meas. point 1 → Pipe circumfer. (2934-1)
Prerequisite	The Pipe circumference option is selected in the Pipe dimensions parameter (→ 61).
Description	Define the pipe circumference.
User entry	30 to 62 800 mm

Factory setting 314.159 mm

Pipe outer diameter



Navigation Expert → Sensor → Meas. point 1 → Pipe outer diam. (2910–1)

Prerequisite The **Diameter** option is selected in the **Pipe dimensions** parameter (→ 61).

Description Define the outer diameter of the pipe.

User entry 10 to 5 000 mm

Factory setting 100 mm

Pipe wall thickness



Navigation Expert → Sensor → Meas. point 1 → Wall thickness (2916–1)

Description Enter the pipe wall thickness.

User entry Positive floating point number

Factory setting 3 mm

Liner thickness



Navigation Expert → Sensor → Meas. point 1 → Liner thickness (2935–1)

Description Define the thickness of liner.

User entry 0 to 100 mm

Factory setting 0 mm

Cable length



Navigation Expert → Sensor → Meas. point 1 → Cable length (2939–1)

Description Enter length of sensor cables.

User entry 0 to 200 000 mm

Factory setting As per order

Result sensor type / sensor distance

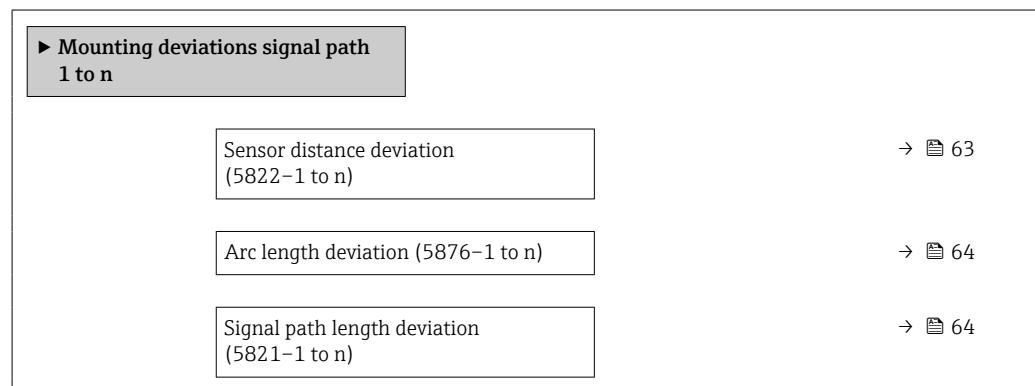
Navigation	  Expert → Sensor → Meas. point 1 → Sens. type/dist. (3066-1)
Description	Shows the sensor type and sensor distance calculated for installation.
User interface	e.g. I-100-A / 500 mm
Factory setting	-

Result path length / arc length

Navigation	  Expert → Sensor → Meas. point 1 → Path/arc length (3067-1)
Description	Shows the path length calculated and (if applicable) the calculated arc length.
User interface	e.g. 1085 mm / 257.56 mm
Factory setting	-

"Mounting deviations signal path 1 to n" submenu

Navigation   Expert → Sensor → Meas. point 1 → Deviat. path 1 to n



Sensor distance deviation

Navigation	  Expert → Sensor → Meas. point 1 → Deviat. path 1 to n → Sens. dist. dev. (5822-1 to n)
Description	Enter the deviation between the nominal sensor distance and the welded position.
User entry	Signed floating-point number

Factory setting	0 mm
Additional information	<i>Description</i> If the welded position is greater than the nominal sensor distance, enter a positive deviation (e.g. 5 mm (0.20 in)). If the welded position is smaller than the nominal sensor distance, enter a negative deviation (e.g. -5 mm (-0.20 in)).

Arc length deviation



Navigation	 Expert → Sensor → Meas. point 1 → Deviat. path 1 to n → Arc length dev. (5876-1 to n)
Description	Enter the radial deviation between given radial distance and the real mounting position of the sensor.
User entry	Signed floating-point number
Factory setting	0 mm
Additional information	<i>Description</i> If the actual radial distance is greater than the nominal value, enter a positive deviation (e.g. 5 mm (0.20 in)). If the actual radial distance is smaller than the nominal value, enter a negative deviation (e.g. -5 mm (-0.20 in)).

Signal path length deviation

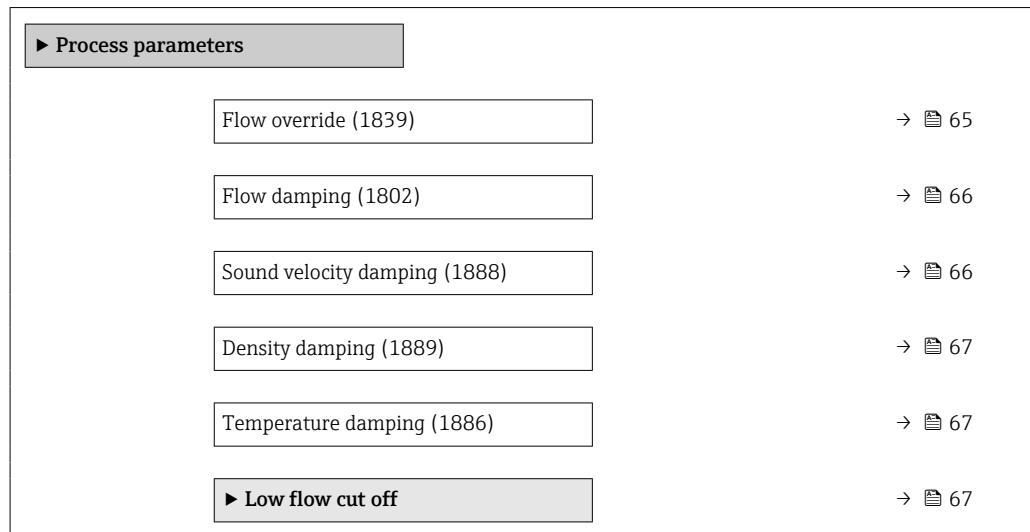


Navigation	 Expert → Sensor → Meas. point 1 → Deviat. path 1 to n → Path length dev. (5821-1 to n)
Description	Enter the deviation between the nominal signal path length and the welded position.
User entry	Signed floating-point number
Factory setting	0 mm
Additional information	<i>Description</i> If the actual signal path length is greater than the nominal value, enter a positive deviation (e.g. 5 mm (0.20 in)). If the actual signal path length is smaller than the nominal value, enter a negative deviation (e.g. -5 mm (-0.20 in)).

3.2.4 "Process parameters" submenu

Navigation

Expert → Sensor → Process param.



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

Effect

This setting affects all the functions and outputs of the measuring device.

Description

Flow override is active

- The **453 Flow override** diagnostic message is output.
- Output values
 - Output: value at zero flow
 - Temperature: continues to be output
 - Sound velocity: 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 (→ 79).

Flow damping



Navigation

Expert → Sensor → Process param. → Flow damping (1802)

Description

Use this function to enter a time constant for flow damping (PT1 element). 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 999.9 s

Factory setting

1 s

Additional information

Description

The damping is performed by a PT1 element²⁾.

User entry

- Value = 0: no damping
- Value > 0: damping is increased

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

Effect

The damping affects the following variables of the device:

- Outputs → [81](#)
- Low flow cut off → [67](#)
- Totalizers → [150](#)

Sound velocity damping



Navigation

Expert → Sensor → Process param. → Sound vel. damp. (1888)

Description

Use this function to enter the time constant for sound velocity damping. Reduction of the variability of the measured sound velocity or sound velocity measured value (in relation to interference). For this purpose, the depth of the sound velocity filter is adjusted: when the filter setting increases, the reaction time of the device also increases.

User entry

0 to 999.9 s

Factory setting

1 s

2) Proportional behavior with first-order lag

Density damping

Navigation Expert → Sensor → Process param. → Density damping (1889)

Description Use this function to enter the time constant for density damping.

User entry 0 to 999.9 s

Factory setting 0 s

Temperature damping

Navigation Expert → Sensor → Process param. → Temp. damping (1886)

Description Use this function to enter the time constant for temperature damping.

User entry 0 to 999.9 s

Factory setting 10 s

"Low flow cut off" submenu

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

▶ Low flow cut off	
Assign process variable (1837)	→ 67
On value low flow cutoff (1805)	→ 68
Off value low flow cutoff (1804)	→ 68

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
- Flow velocity

Factory setting Flow velocity

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 (→ 67).

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 → 68.

User entry Positive floating-point number

Factory setting 0.3 m/s

Additional information *Dependency*

The unit depends on the process variable selected in the **Assign process variable** parameter (→ 67).

Off value low flow cutoff



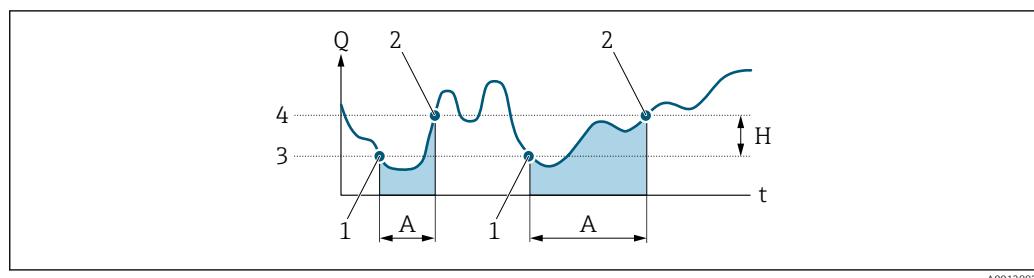
Navigation Expert → Sensor → Process param. → Low flow cut off → Off value (1804)

Prerequisite A process variable is selected in the **Assign process variable** parameter (→ 67).

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 → 68.

User entry 0 to 100.0 %

Factory setting 50 %

Additional information*Example*

- 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

3.2.5 "External compensation" submenu

Navigation

Expert → Sensor → External comp.

► External compensation	
Temperature compensation (3025)	→ 70
External temperature (3058)	→ 70
Medium temperature (2925)	→ 70
Density source (3048)	→ 70
External density (3060)	→ 71
Fixed density (3171)	→ 71
Linear expansion coefficient (3153)	→ 71
Square expansion coefficient (3172)	→ 72
Fixed reference density (3178)	→ 72
Reference temperature (3147)	→ 72

Temperature compensation

Navigation Expert → Sensor → External comp. → Temp. compensat. (3025)

Prerequisite The **Calculated value** option is selected in the **Density source** parameter (→ 70).

Description Select temperature mode for temperature compensation.

Selection

- Fixed value
- External value

Factory setting Fixed value

External temperature

Navigation Expert → Sensor → External comp. → External temp. (3058)

Prerequisite The **Calculated value** option is selected in the **Density source** parameter (→ 70) and the **External value** option is selected in the **Temperature compensation** parameter (→ 70).

Description Shows the external process temperature read in from the external device.

User interface -273.15 to 99 999 °C

Factory setting –

Medium temperature

Navigation Expert → Sensor → External comp. → Medium temp. (2925)

Description Enter a fixed value for process temperature.

User entry -50 to 550 °C

Factory setting 20 °C

Density source

Navigation Expert → Sensor → External comp. → Density source (3048)

Description Select the density source for the calculation of the mass.

Selection	<ul style="list-style-type: none"> ■ Fixed density ■ External density ■ Calculated value
------------------	---

Factory setting	Fixed density
------------------------	---------------

External density

Navigation	  Expert → Sensor → External comp. → External density (3060)
Prerequisite	The External density option is selected in the Density source parameter (→  70).
Description	Shows the density read in from the external device.
User interface	Positive floating-point number
Factory setting	0 kg/l

Fixed density



Navigation	  Expert → Sensor → External comp. → Fixed density (3171)
Prerequisite	The Fixed density option is selected in the Density source parameter (→  70).
Description	Enter fixed value for medium density.
User entry	1E-05 to 15 kg/l
Factory setting	1 kg/l

Linear expansion coefficient



Navigation	  Expert → Sensor → External comp. → Linear exp coeff (3153)
Prerequisite	The Calculated value option is selected in the Density source parameter (→  70).
Description	Use this function to enter a linear, medium-specific expansion coefficient for calculating the density.
User entry	$1.0 \cdot 10^{-6}$ to $2.0 \cdot 10^{-3}$
Factory setting	$2.06 \cdot 10^{-4}$

Square expansion coefficient



Navigation Expert → Sensor → External comp. → Square exp coeff (3172)

Prerequisite The **Calculated value** option is selected in the **Density source** parameter (→ 70).

Description For media with a non-linear expansion pattern: use this function to enter a quadratic, medium-specific expansion coefficient for calculating the density.

User entry $1.0 \cdot 10^{-6}$ to $2.0 \cdot 10^{-3}$

Factory setting $2.06 \cdot 10^{-4}$

Fixed reference density



Navigation Expert → Sensor → External comp. → Fix ref.density (3178)

Prerequisite The **Calculated value** option is selected in the **Density source** parameter (→ 70).

Description Use this function to enter a fixed value for the reference density.

User entry 1E-05 to 15 kg/l

Factory setting 1 kg/l

Additional information *Reference density calculation*

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

A0044558

- ρ : currently used density for mass flow calculation
- ρ_N : reference density
- t : currently read-in or fixed temperature according to the setting in the **Temperature compensation** parameter (→ 70)
- t_N : reference temperature at which the reference density applies (e.g. 20 °C)
- Δt : $t - t_N$
- α : linear expansion coefficient of the medium, unit = [1/K]; K = Kelvin
- β : square expansion coefficient of the medium, unit = [1/K²]

Reference temperature



Navigation Expert → Sensor → External comp. → Ref. temperature (3147)

Prerequisite The **Calculated value** option is selected in the **Density source** parameter (→ 70).

Description Enter the reference temperature at which the reference density applies.

User entry -200 to 450 °C

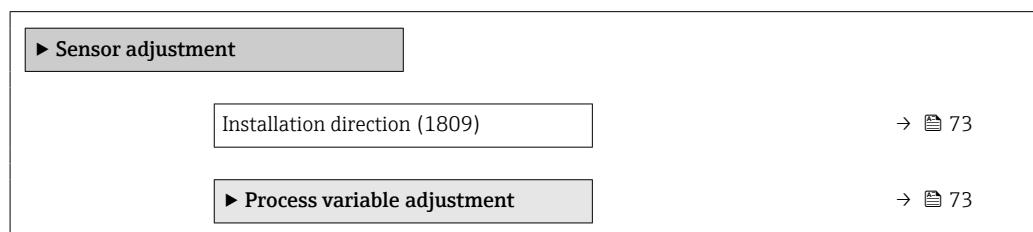
Factory setting

20 °C

3.2.6 "Sensor adjustment" submenu

Navigation

Expert → Sensor → Sensor adjustm.



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

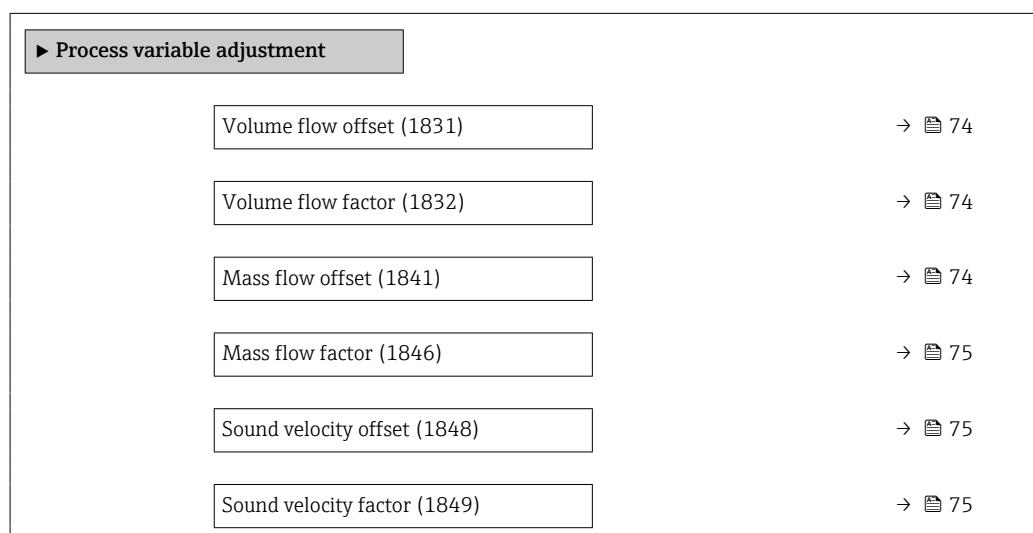
Factory setting

Forward flow

"Process variable adjustment" submenu

Navigation

Expert → Sensor → Sensor adjustm. → Variable adjust



Temperature offset (1870)	→ 76
Temperature factor (1871)	→ 76

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. The value is entered in the selected volume flow unit.

User entry

Signed floating-point number

Factory setting

0 m³/h

Additional information

Description

Corrected value = (factor × value) + offset

Volume flow factor



Navigation

Expert → Sensor → Sensor adjustm. → Variable adjust → Vol. flow factor (1832)

Description

Use this function to enter a quantity factor (without time) for the volume flow. This multiplication factor is applied over the volume flow range.

User entry

Positive floating-point number

Factory setting

1

Additional information

Description

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/h. The value is entered in the selected mass flow unit.

User entry

Signed floating-point number

Factory setting

0 kg/h

Additional information *Description*

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*Description*

Corrected value = (factor × value) + offset

**Sound velocity offset****Navigation**

Expert → Sensor → Sensor adjustm. → Variable adjust → S. veloc. offset (1848)

Description

Use this function to enter the zero point shift for the sound velocity trim. The sound velocity unit on which the shift is based is m/s. The value is entered in the selected velocity unit.

User entry

Signed floating-point number

Factory setting

0 m/s

Additional information*Description*

Corrected value = (factor × value) + offset

**Sound velocity factor****Navigation**

Expert → Sensor → Sensor adjustm. → Variable adjust → S. veloc. factor (1849)

Description

Use this function to enter a quantity factor (without time) for the sound velocity. This multiplication factor is applied over the sound velocity range.

User entry

Positive floating-point number

Factory setting

1

Additional information	Description
	 Corrected value = (factor × value) + offset

Temperature offset



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

Prerequisite The **Calculated value** option is selected in the **Density source** parameter (→ 70) and the **External value** option is selected in the **Temperature compensation** parameter (→ 70).

Description Use this function to enter the zero point shift for the temperature trim. The temperature unit on which the shift is based is K.

User entry Signed floating-point number

Factory setting 0

Additional information	Description
	 Corrected value = (factor × value) + offset

Temperature factor



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

Prerequisite The **Calculated value** option is selected in the **Density source** parameter (→ 70) and the **External value** option is selected in the **Temperature compensation** parameter (→ 70).

Description Use this function to enter a quantity factor for the temperature. In each case, this factor refers to the temperature in K.

User entry Positive floating-point number

Factory setting 1

Additional information	Description
	 Corrected value = (factor × value) + offset

Density offset

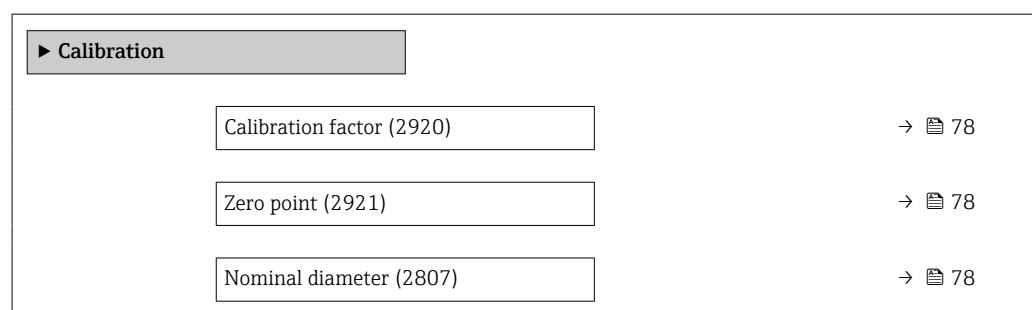
Navigation	Expert → Sensor → Sensor adjustm. → Variable adjust → Density offset (1877)
Prerequisite	The External density option or Calculated value option is selected in the Density source parameter (→ 70).
Description	Use this function to enter the zero point shift for the density trim. The value is entered in the selected density unit.
User entry	Signed floating-point number
Factory setting	0 kg/m ³

Density factor

Navigation	Expert → Sensor → Sensor adjustm. → Variable adjust → Density factor (1878)
Prerequisite	The External density option or Calculated value option is selected in the Density source parameter (→ 70).
Description	Use this function to enter a quantity factor for the density.
User entry	Positive floating-point number
Factory setting	1

3.2.7 "Calibration" submenu

Navigation Expert → Sensor → Calibration



Calibration factor

Navigation  Expert → Sensor → Calibration → Cal. factor (2920)

Description Displays the current calibration factor for the sensor.

User interface Signed floating-point number

Factory setting 1

Zero point

Navigation  Expert → Sensor → Calibration → Zero point (2921)

Description Displays the current zero point correction value for the sensor.

User interface Signed floating-point number

Factory setting 0

Nominal diameter

Navigation  Expert → Sensor → Calibration → Nominal diameter (2807)

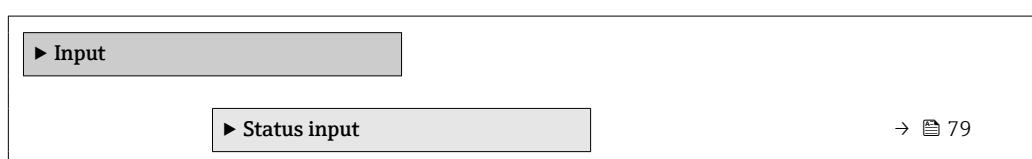
Description Displays the nominal diameter of the sensor.

User interface -----

Factory setting -----

3.3 "Input" submenu

Navigation  Expert → Input



3.3.1 "Status input 1 to n" submenu

Navigation

Expert → Input → Status input 1 to n

▶ Status input	
Assign status input (1352)	→ 79
Value status input (1353)	→ 80
Active level (1351)	→ 80
Response time status input (1354)	→ 80

Assign status input



Navigation

Expert → Input → Status input → Assign stat.inp. (1352)

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

Selection

- 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 (→ [65](#)) is activated.



Note on the Flow override (→ [65](#)):

- The Flow override (→ [65](#)) 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 → Val.stat.inp. (1353)

Prerequisite For the following order code:
"Output; input", option I "4-20mA HART, 2x pul./freq./switch output; status input"

Description Displays the current input signal level.

User interface

- High
- Low

Active level



Navigation   Expert → Input → Status input → Active level (1351)

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 → Response time (1354)

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.

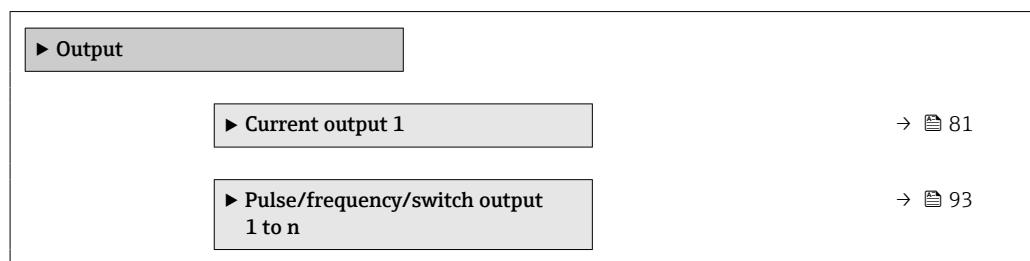
User entry 5 to 200 ms

Factory setting 50 ms

3.4 "Output" submenu

Navigation

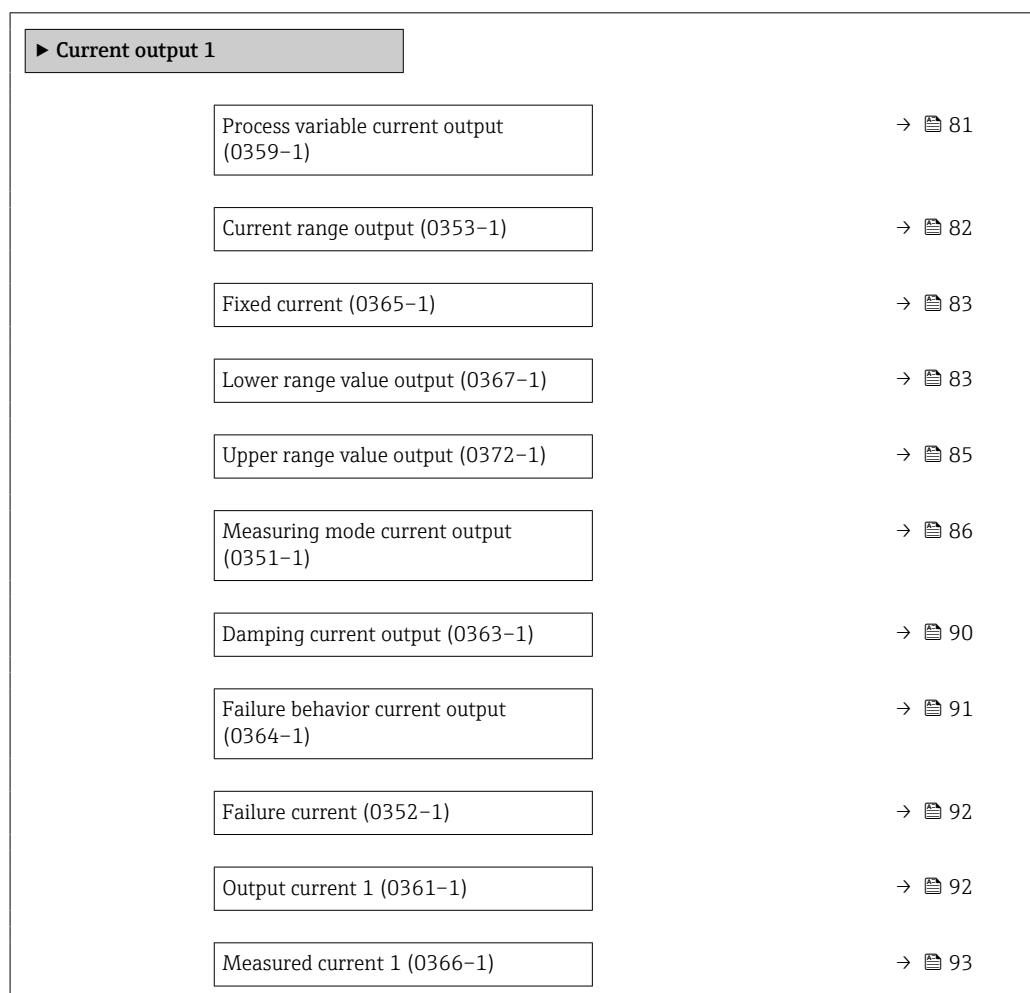
◀ ▶ Expert → Output



3.4.1 "Current output 1" submenu

Navigation

◀ ▶ Expert → Output → Curr.output 1



Process variable current output



Navigation

◀ ▶ Expert → Output → Curr.output 1 → Proc.var. outp (0359-1)

Description

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

Selection	<ul style="list-style-type: none"> ■ Off * ■ Volume flow ■ Mass flow ■ Sound velocity ■ Flow velocity ■ Signal strength * ■ Signal to noise ratio * ■ Turbulence * ■ Acceptance rate * ■ Temperature * ■ Density * ■ Electronics temperature
Factory setting	Volume flow

Current range output



Navigation	Expert → Output → Curr.output 1 → Curr.range out (0353-1)
Description	Use this function to select the current range for outputting the process value and for the upper and lower level for signal on alarm.
Selection	<ul style="list-style-type: none"> ■ 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: <ul style="list-style-type: none"> ■ 4...20 mA NE (3.8...20.5 mA) ■ 4...20 mA US (3.9...20.8 mA)
Additional information	<p>Description</p> <p> ■ In the event of a device alarm, the current output adopts the value specified in the Failure mode parameter (→ 91). ■ If the measured value is outside the measuring range, the △S441 Current output 1 diagnostic message is displayed. ■ The measuring range is specified via the 0/4 mA value parameter (→ 83) and 20 mA value parameter (→ 85).</p>

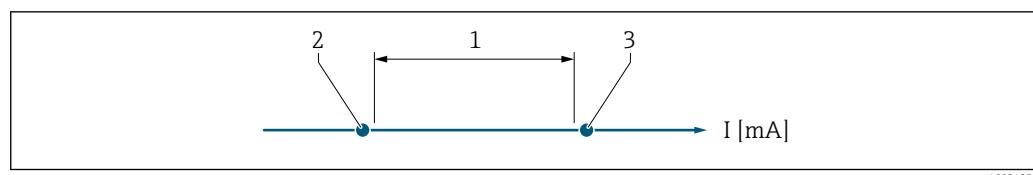
"Fixed current" option

- This option is used for a HART Multidrop network.
- It can only be used for the 4 to 20 mA HART current output (current output 1).
- The current value is set via the **Fixed current** parameter (→ [83](#)).

Example

Shows the relationship between the current range for outputting the process value and the two sign on alarm levels:

* Visibility depends on order options or device settings



- 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** diagnostic message is displayed.

Fixed current



Navigation

Expert → Output → Curr.output 1 → Fixed current (0365-1)

Prerequisite

The **Fixed current** option is selected in the **Current span** parameter (→ 82).

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 → Low.range outp (0367-1)

Prerequisite

One of the following options is selected in the **Current span** parameter (→ 82):

- 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 0/4 mA current.

User entry

Signed floating-point number

Factory setting

Country-specific:

- m^3/h
- ft^3/h

Additional information*Description*

Positive and negative values are permitted depending on the process variable assigned in the **Assign current output** parameter (→ 81). In addition, the value can be greater than or smaller than the value assigned for the 20 mA current in the **20 mA value** parameter (→ 85).

Dependency

i The unit depends on the process variable selected in the **Assign current output** parameter (→ 81).

Current output behavior

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

- Current span (→ 82)
- Measuring mode (→ 86)
- Failure mode (→ 91)

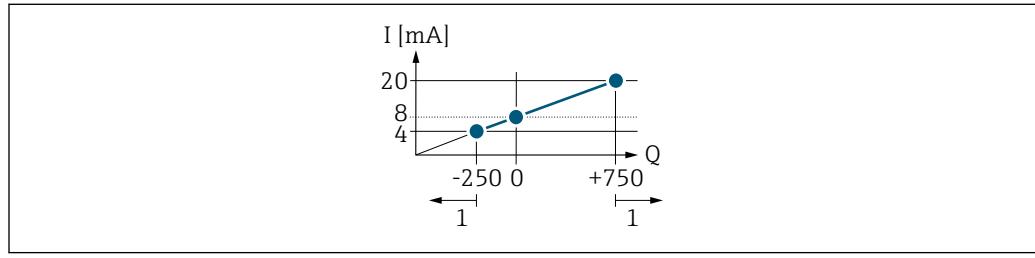
Configuration examples

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

- **0/4 mA value** parameter (→ 83) = not equal to zero flow (e.g. $-250 \text{ m}^3/\text{h}$)
- **20 mA value** parameter (→ 85) = not equal to zero flow (e.g. $+750 \text{ m}^3/\text{h}$)
- Calculated current value = 8 mA at zero flow

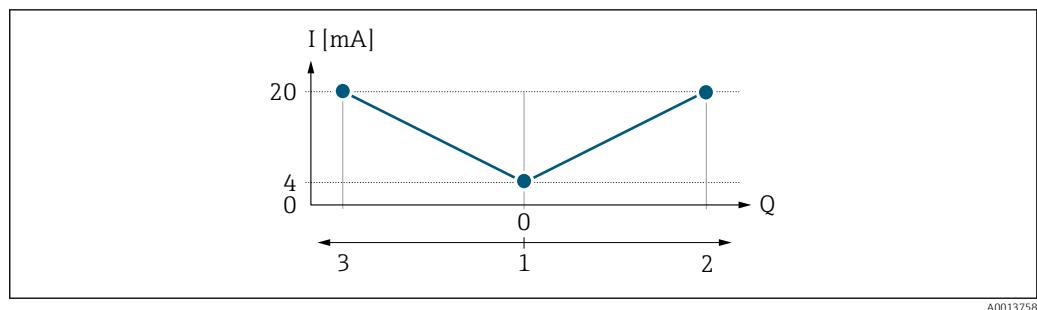


Q Flow
 I Current
 1 Measuring range is exceeded or undershot

The operational range of the measuring device is defined by the values entered for the **0/4 mA value** parameter (→ 83) and **20 mA value** parameter (→ 85). If the effective flow exceeds or falls below this operational range, the **△S441 Current output 1** diagnostic message is displayed.

Configuration example B

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



- I Current
 Q Flow
 1 Value assigned to the 0/4 mA current
 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 **0/4 mA value** parameter (→ 83) and **20 mA value** parameter (→ 85) must have the same algebraic sign. The value for the **20 mA value** parameter (→ 85) (e.g. reverse flow) corresponds to the mirrored value for the **20 mA value** parameter (→ 85) (e.g. 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 → 86.

Upper range value output



Navigation

Expert → Output → Curr.output 1 → Upp.range outp (0372-1)

Prerequisite

In the **Current span** parameter (→ 82), one of the following options is selected:

- 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 20 mA current.

User entry

Signed floating-point number

Factory setting

Depends on country and nominal diameter

Additional information

Description

Positive and negative values are permitted depending on the process variable assigned in the **Assign current output** parameter (→ 81). In addition, the value can be greater

than or smaller than the value assigned for the 0/4 mA current in the **0/4 mA value** parameter (→ 83).

Dependency

 The unit depends on the process variable selected in the **Assign current output** parameter (→ 81).

Example

- 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 (→ 86), different signs cannot be entered for the values of the **0/4 mA value** parameter (→ 83) and **20 mA value** parameter (→ 85). The **△S441 Current output 1** diagnostic message is displayed.

Configuration examples

 Observe the configuration examples for the **0/4 mA value** parameter (→ 83).

Measuring mode current output



Navigation

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

Prerequisite

One of the following options is selected in the **Current span** parameter (→ 82):

- 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 (→ 81) 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 0/4 mA and 20 mA current value.

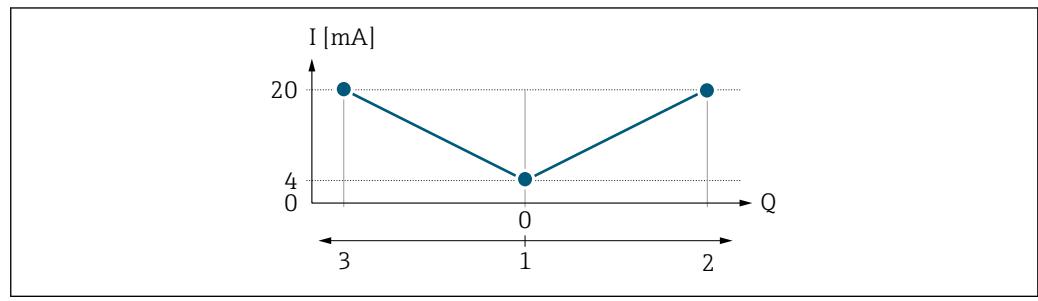
* Visibility depends on order options or device settings

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.:

- 0/4 mA current value = $-5 \text{ m}^3/\text{h}$
- 20 mA current value = $10 \text{ m}^3/\text{h}$

"Forward/Reverse flow" option



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- | | |
|---|--------------------------------------|
| I | Current |
| Q | Flow |
| 1 | Value assigned to the 0/4 mA current |
| 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 **0/4 mA value** parameter (→ 83) and **20 mA value** parameter (→ 85) must have the same sign.
- The value for the **20 mA value** parameter (→ 85) (e.g. reverse flow) corresponds to the mirrored value for the **20 mA value** parameter (→ 85) (e.g. forward flow).

"Reverse flow compensation" option

The **Reverse flow compensation** option is primarily used to compensate for abrupt reverse flow that can occur with positive displacement pumps as a result of wear or high viscosity. The reverse flow is recorded in a buffer memory and offset against the next forward flow.

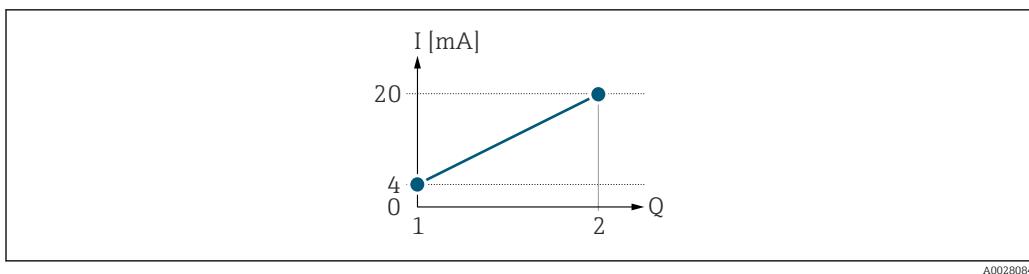
In the event of prolonged and undesired reverse flow, flow values can accumulate in the buffer memory. Due to the configuration of the current output, these values are not factored in, however, i.e. there is no compensation for the reverse flow.

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



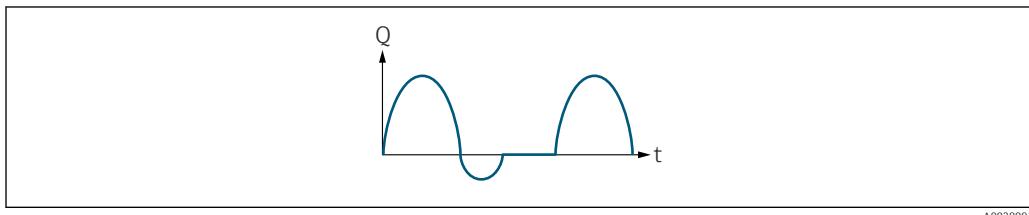
A0028084

Fig. 3 Measuring range I Current Q Flow

1 Lower range value (value assigned to 0/4 mA current)

2 Upper range value (value assigned to 20 mA current)

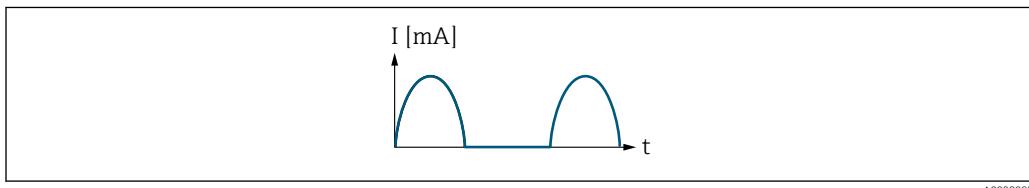
With the following flow response:



A0028091

Fig. 4 Flow response Q Flow t TimeWith **Forward flow** option

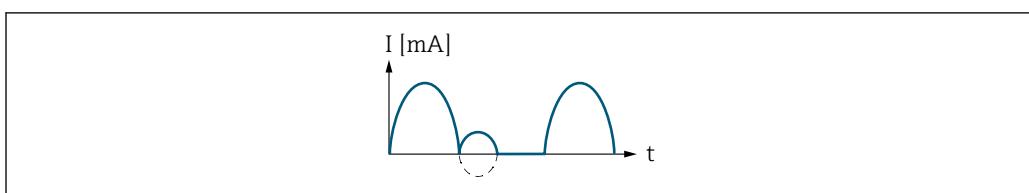
The current output signal is proportional to the process variable assigned. The flow components outside the scaled measuring range are not taken into account for signal output:



A0028092

 I Current t TimeWith **Forward/Reverse flow** option

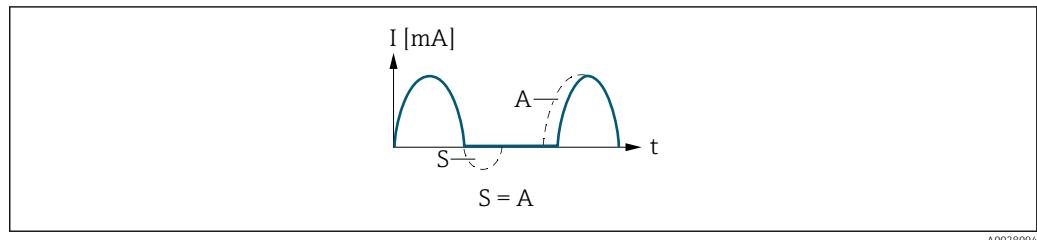
The current output signal is independent of the direction of flow.



A0028093

 I Current t TimeWith **Reverse flow compensation** option

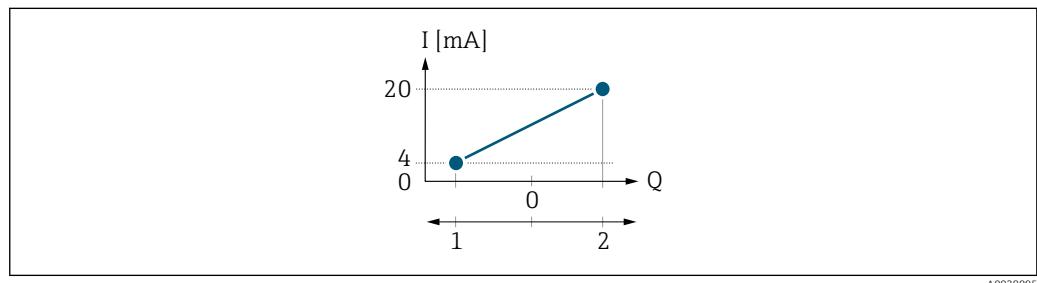
Flow components outside of the measuring range are buffered, balanced and output after a maximum delay of 60 s.



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

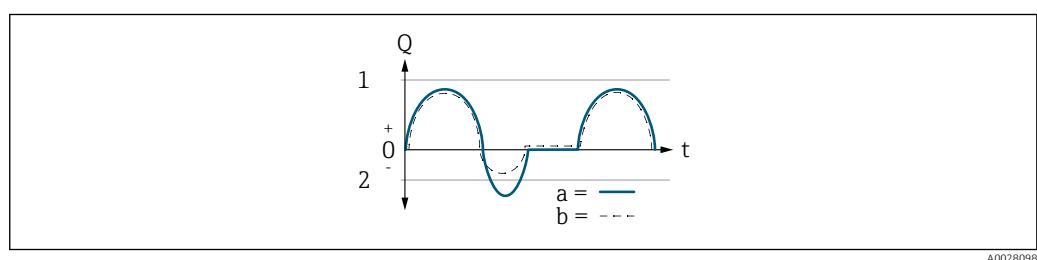
Example 2

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



5 Measuring range
 I Current
 Q Flow
1 Lower range value (value assigned to 0/4 mA current)
2 Upper range value (value assigned to 20 mA current)

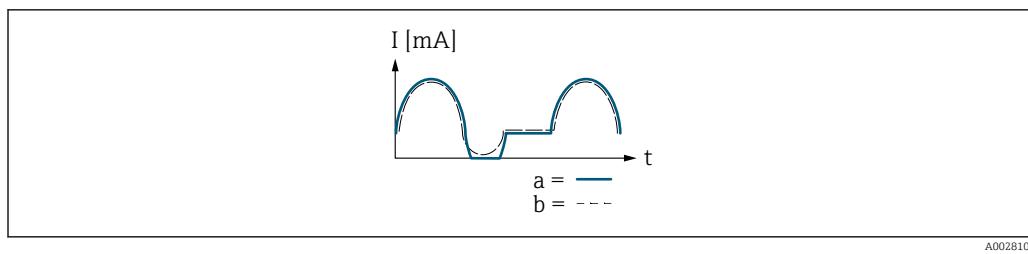
With flow a (-) outside, b (- -) inside the measuring range



Q Flow
 t Time
1 Lower range value (value assigned to 0/4 mA current)
2 Upper range value (value assigned to 20 mA current)

With **Forward flow** option

- a (-): The flow components outside the scaled measuring range cannot be taken into account for signal output.
- b (- -): The current output signal is proportional to the process variable assigned.



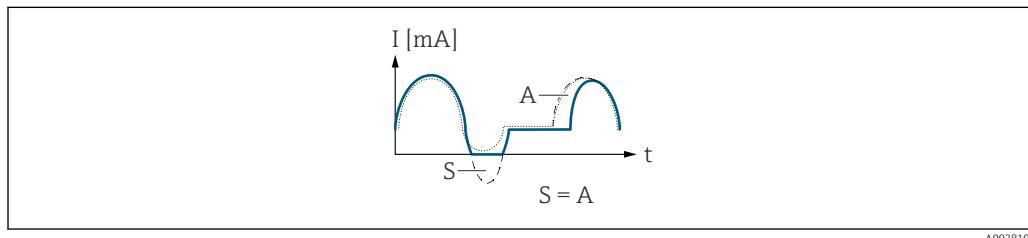
I Current
t Time

With Forward/Reverse flow option

This option cannot be selected here since the values for the **0/4 mA value** parameter (→ 83) and **20 mA value** parameter (→ 85) have different algebraic signs.

With Reverse flow compensation option

Flow components outside of the measuring range 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 → Damp.curr.outp (0363-1)

Prerequisite

A process variable is selected in the **Assign current output** parameter (→ 81) and one of the following options is selected in the **Current span** parameter (→ 82):

- 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).

Failure behavior current output**Navigation**

Diagram: Expert → Output → Curr.output 1 → Fail.behav.out (0364-1)

Prerequisite

A process variable is selected in the **Assign current output** parameter (→ 81) and one of the following options is selected in the **Current span** parameter (→ 82):

- 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.

3) proportional transmission behavior with first order delay

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 (→  82).

"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 (→  82).

"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 (→  92).

Failure current**Navigation**

  Expert → Output → Curr.output 1 → Fail. current (0352-1)

Prerequisite

The **Defined value** option is selected in the **Failure mode** parameter (→  91).

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**Navigation**

  Expert → Output → Curr.output 1 → Output curr. 1 (0361-1)

Description

Displays the current value currently calculated for the current output.

User interface

0 to 22.5 mA

Measured current 1

Navigation   Expert → Output → Curr.output 1 → Measur. curr. 1 (0366-1)

Description Displays the actual measured value of the output current.

User interface 0 to 30 mA

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

Navigation

  Expert → Output → PFS output 1 to n

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

Operating mode (0469-1 to n)

→  94

Assign pulse output 1 to n
(0460-1 to n)

→  96

Pulse scaling (0455-1 to n)

→  96

Pulse width (0452-1 to n)

→  97

Measuring mode (0457-1 to n)

→  97

Failure mode (0480-1 to n)

→  98

Pulse output 1 to n (0456-1 to n)

→  99

Assign frequency output (0478-1 to n)

→  99

Minimum frequency value
(0453-1 to n)

→  100

Maximum frequency value
(0454-1 to n)

→  100

Measuring value at minimum
frequency (0476-1 to n)

→  100

Measuring value at maximum
frequency (0475-1 to n)

→  101

Measuring mode (0479-1 to n)

→  101

Damping output 1 to n (0477-1 to n)

→  102

Response time (0491-1 to n)	→ 102
Failure mode (0451-1 to n)	→ 103
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Switch output function (0481-1 to n)	→ 104
Assign diagnostic behavior (0482-1 to n)	→ 104
Assign limit (0483-1 to n)	→ 105
Switch-on value (0466-1 to n)	→ 107
Switch-off value (0464-1 to n)	→ 107
Assign flow direction check (0484-1 to n)	→ 108
Assign status (0485-1 to n)	→ 108
Switch-on delay (0467-1 to n)	→ 109
Switch-off delay (0465-1 to n)	→ 109
Failure mode (0486-1 to n)	→ 109
Switch state 1 to n (0461-1 to n)	→ 110
Invert output signal (0470-1 to n)	→ 110

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

* Visibility depends on order options or device settings

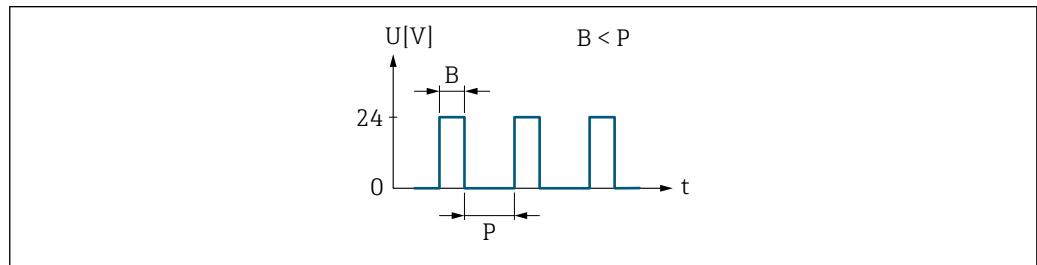
Additional information**"Pulse" option**

Quantity-dependent pulse with configurable pulse width

- Whenever a specific volume or mass 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

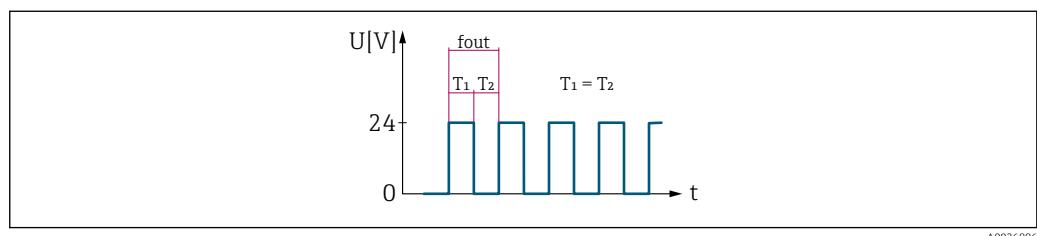
"Frequency" option

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, temperature, sound velocity, flow velocity, acceptance rate, turbulence, signal strength or signal to noise ratio.

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



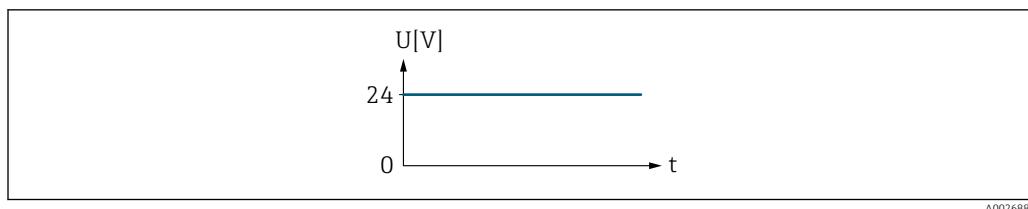
■ 7 Flow-proportional frequency output

"Switch" option

Contact for displaying a condition (e.g. alarm or warning if a limit value is reached)

Example

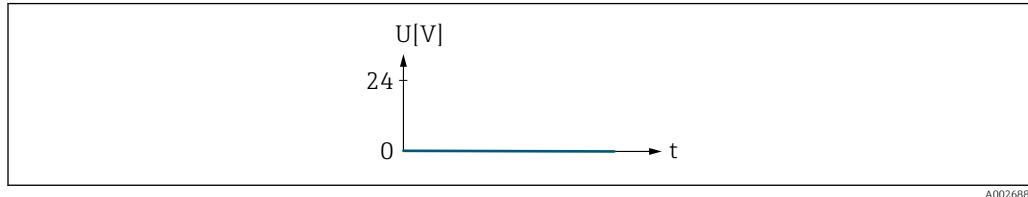
Alarm response without alarm



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 (→ 94).

Description

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

Selection

- Off
- Volume flow
- Mass 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 (→ 94) and a process variable is selected in the **Assign pulse output** parameter (→ 96).

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

Additional information

User entry

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 (→ 94) and a process variable is selected in the **Assign pulse output** parameter (→ 96).

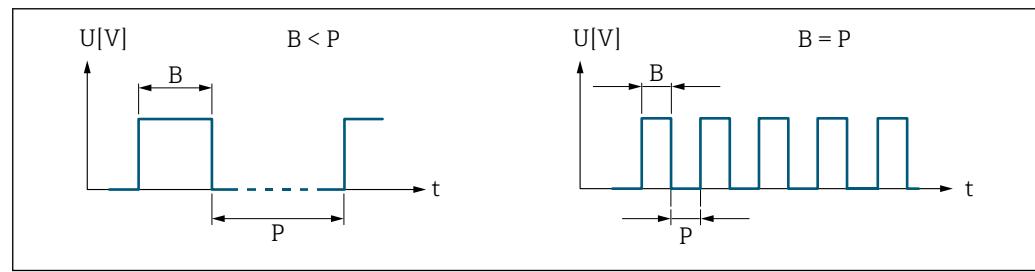
Description Use this function to enter the duration of the output pulse.

User entry 0.05 to 2 000 ms

Factory setting 100 ms

Additional information *Description*

- 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)

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 (→ 86)

Examples

 For a detailed description of the configuration examples, see the **Measuring mode** parameter (→ 86)

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 (→ 94) and a process variable is selected in the **Assign pulse output** parameter (→ 96).

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 (→ 94) parameter.

Description

Displays the pulse frequency currently output.

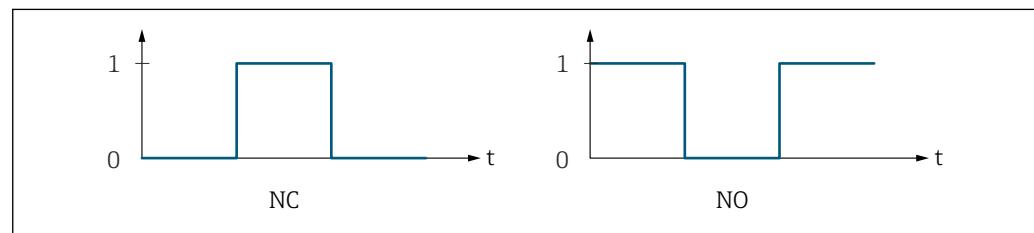
User interface

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.
- The **Value per pulse** parameter (→ 96) and **Pulse width** parameter (→ 97) can be used to define the value (i.e. the measured value amount that corresponds to a pulse) and the duration of the pulse.



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- | | |
|----|------------------------------|
| 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 (→ 110) 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 (→ 98)) can be configured.

Assign frequency output



Navigation

Expert → Output → PFS output 1 to n → Assign freq. (0478–1 to n)

Prerequisite

The **Frequency** option is selected in the **Operating mode** parameter (→ 94).

Description

Use this function to select the process variable for the frequency output.

Selection

- Off
- Volume flow
- Mass flow

- Sound velocity
- Flow velocity
- Signal strength *
- Signal to noise ratio *
- Turbulence *
- Acceptance rate *
- Temperature *
- Density *
- Electronics temperature

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 (→ 94) and a process variable is selected in the **Assign frequency output** parameter (→ 99).

Description Use this function to enter the minimum frequency.

User entry 0.0 to 10 000 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 (→ 94) and a process variable is selected in the **Assign frequency output** parameter (→ 99).

Description Use this function to enter the end value frequency.

User entry 0.0 to 10 000 Hz

Factory setting 10 000 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 (→ 94) and a process variable is selected in the **Assign frequency output** parameter (→ 99).

* 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	<p><i>Dependency</i></p>  The entry depends on the process variable selected in the Assign frequency output parameter (→ 99).

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 (→ 94) and a process variable is selected in the Assign frequency output parameter (→ 99).
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	<p><i>Dependency</i></p>  The entry depends on the process variable selected in the Assign frequency output parameter (→ 99).

Measuring mode



Navigation	 Expert → Output → PFS output 1 to n → Measuring mode (0479–1 to n)
Description	Use this function to select the measuring mode for the frequency output.
Selection	<ul style="list-style-type: none"> ▪ Forward flow ▪ Forward/Reverse flow ▪ Reverse flow compensation
Factory setting	Forward flow

Additional information*Selection*

 For a detailed description of the options available, see the **Measuring mode** parameter (→ 86)

Examples

 For a detailed description of the configuration examples, see the **Measuring mode** parameter (→ 86)

Damping output 1 to n**Navigation**

 Expert → Output → PFS output 1 to n → Damping out. 1 to n (0477-1 to n)

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*User entry*

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.

Response time**Navigation**

 Expert → Output → PFS output 1 to n → Response time (0491-1 to n)

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*Description*

 The response time is made up of the time specified for the following dampings:

- Damping of pulse/frequency/switch output → 90 and
- Depending on the measured variable assigned to the output.
Flow damping

4) proportional transmission behavior with first order delay

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 (→ 94) and a process variable is selected in the **Assign frequency output** parameter (→ 99).

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

Additional information*Selection*

- 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 (→ 103) 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

The **Frequency** option is selected in the **Operating mode** parameter (→ 94) and a process variable is selected in the **Assign frequency output** parameter (→ 99).

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 (→ 94), 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 (→ 94).
Description	Use this function to select a function for the switch output.
Selection	<ul style="list-style-type: none">▪ Off▪ On▪ Diagnostic behavior▪ Limit▪ Flow direction check▪ Status
Factory setting	Off
Additional information	<i>Selection</i> <ul style="list-style-type: none">▪ 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.▪ Status Displays the device status 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	<ul style="list-style-type: none">▪ In the Operating mode parameter (→ 94), the Switch option is selected.▪ In the Switch output function parameter (→ 104), the Diagnostic behavior option is selected.

Description	Use this function to select the diagnostic event category that is displayed for the switch output.
Selection	<ul style="list-style-type: none"> ▪ Alarm ▪ Alarm or warning ▪ Warning
Factory setting	Alarm
Additional information	<p><i>Description</i></p> <p> If no diagnostic event is pending, the switch output is closed and conductive.</p> <p><i>Selection</i></p> <ul style="list-style-type: none"> ▪ 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.

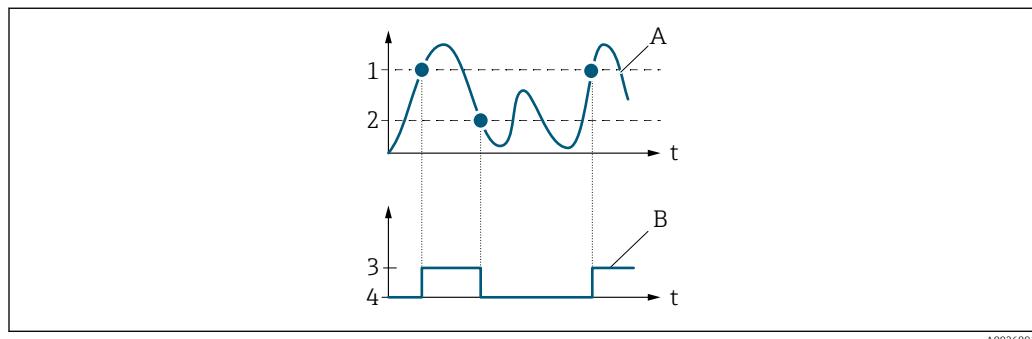
Assign limit	
Navigation	 Expert → Output → PFS output 1 to n → Assign limit (0483-1 to n)
Prerequisite	<ul style="list-style-type: none"> ▪ The Switch option is selected in the Operating mode parameter (→ 94). ▪ The Limit option is selected in the Switch output function parameter (→ 104).
Description	Use this function to select a process variable for the limit function.
Selection	<ul style="list-style-type: none"> ▪ Off ▪ Volume flow ▪ Mass flow ▪ Sound velocity ▪ Flow velocity ▪ Signal strength * ▪ Signal to noise ratio * ▪ Turbulence * ▪ Acceptance rate * ▪ Temperature * ▪ Density * ▪ Electronics temperature ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3
Factory setting	Volume flow

* Visibility depends on order options or device settings

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



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1 Switch-on value

2 Switch-off value

3 Conductive

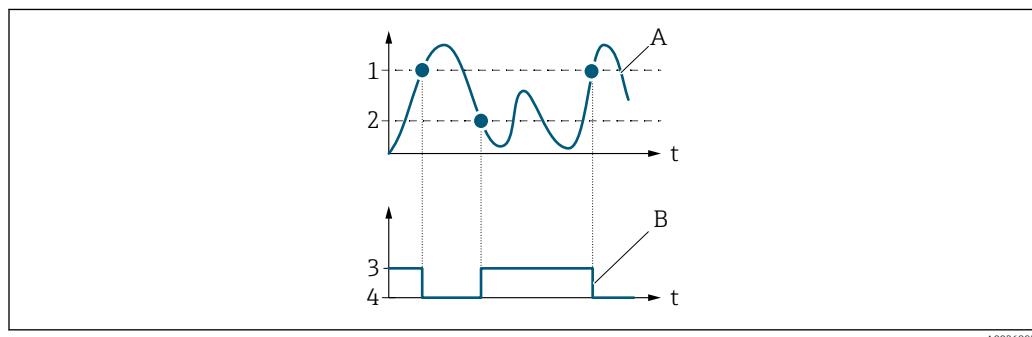
4 Non-conductive

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



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1 Switch-off value

2 Switch-on value

3 Conductive

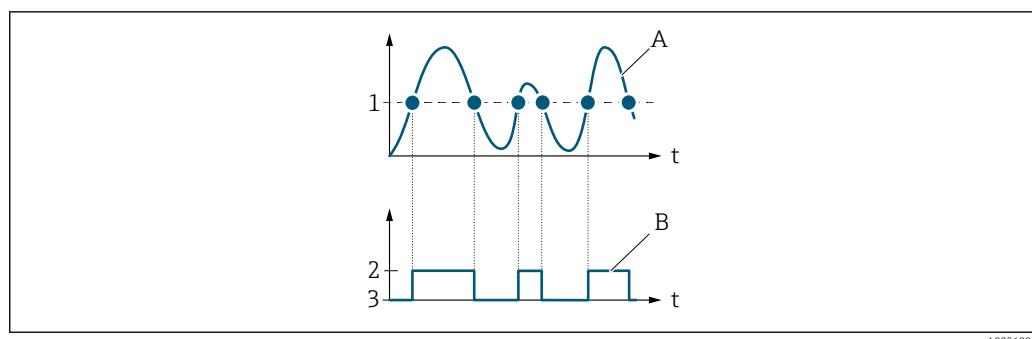
4 Non-conductive

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



- 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 (→ 94).
- The **Limit** option is selected in the **Switch output function** parameter (→ 104).

Description

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

User entry

Signed floating-point number

Factory setting

Country-specific

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 depends on the process variable selected in the **Assign limit** parameter (→ 105).

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 (→ 94).
- The **Limit** option is selected in the **Switch output function** parameter (→ 104).

Description

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

User entry

Signed floating-point number

Factory setting	Country-specific
Additional information	<p><i>Description</i></p> <p>Use this function to enter the limit value for the switch-off value (process variable < switch-off value = open, non-conductive).</p> <p> When using a hysteresis: Switch-on value > Switch-off value.</p> <p><i>Dependency</i></p> <p> The unit depends on the process variable selected in the Assign limit parameter (→ 105).</p>

Assign flow direction check



Navigation	  Expert → Output → PFS output 1 to n → Assign dir.check (0484-1 to n)
Prerequisite	<ul style="list-style-type: none">■ The Switch option is selected in the Operating mode parameter (→ 94).■ The Flow direction check option is selected in the Switch output function parameter (→ 104).
Description	Use this function to select a process variable for monitoring the flow direction.
Selection	<ul style="list-style-type: none">■ Off■ Volume flow■ Mass flow■ Flow velocity
Factory setting	Volume flow

Assign status



Navigation	  Expert → Output → PFS output 1 to n → Assign status (0485-1 to n)
Prerequisite	<ul style="list-style-type: none">■ The Switch option is selected in the Operating mode parameter (→ 94).■ The Status option is selected in the Switch output function parameter (→ 104).
Description	Use this function to select a device status for the switch output.
Selection	<ul style="list-style-type: none">■ Off■ Low flow cut off
Factory setting	Low flow cut off
Additional information	<p><i>Selection</i></p> <p>If low flow cut off are active, the output is conductive. Otherwise, the switch output is non-conductive.</p>

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 (→ [94](#)).
- The **Limit** option is selected in the **Switch output function** parameter (→ [104](#)).

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

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 (→ [94](#)).
- The **Limit** option is selected in the **Switch output function** parameter (→ [104](#)).

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 (→  94).

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)

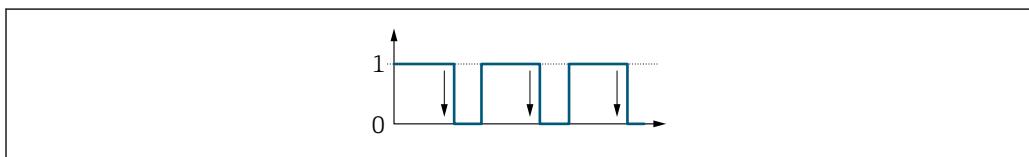
Description Use this function to select whether to invert the output signal.

Selection

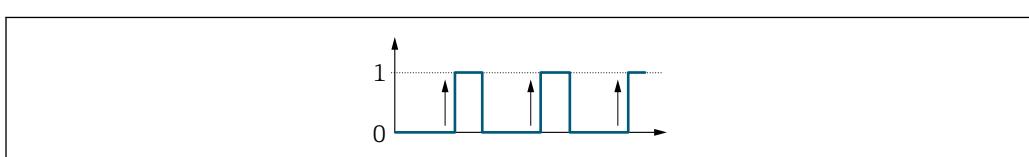
- No
- Yes

Factory setting No

Additional information *Selection*
No option (passive - negative)



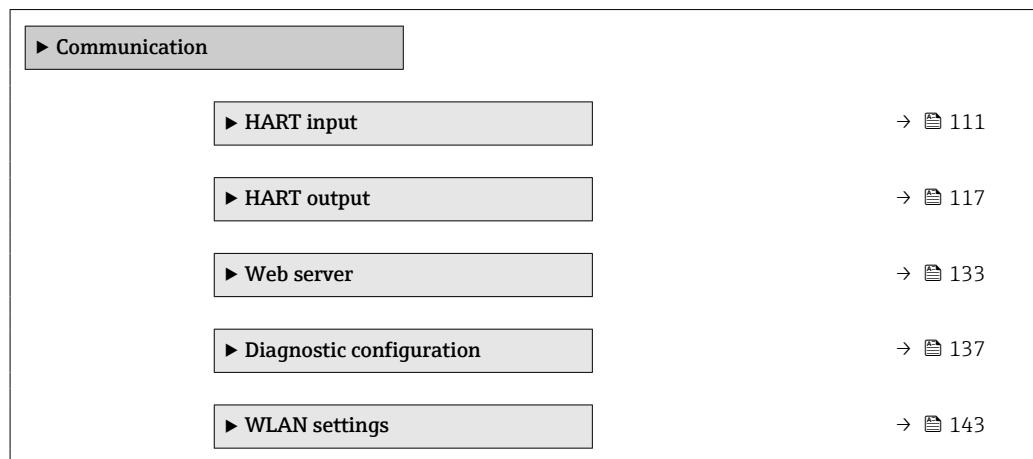
Yes option (passive - positive)



3.5 "Communication" submenu

Navigation

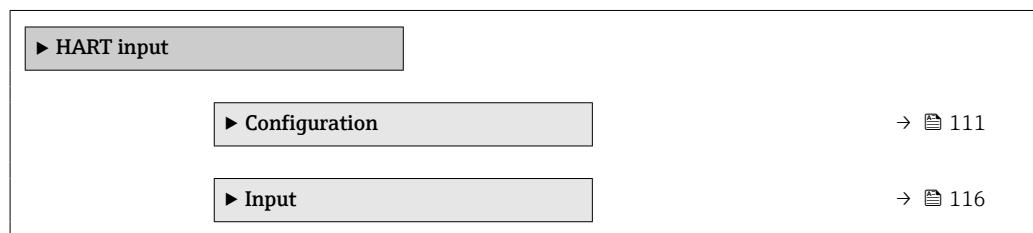
Expert → Communication



3.5.1 "HART input" submenu

Navigation

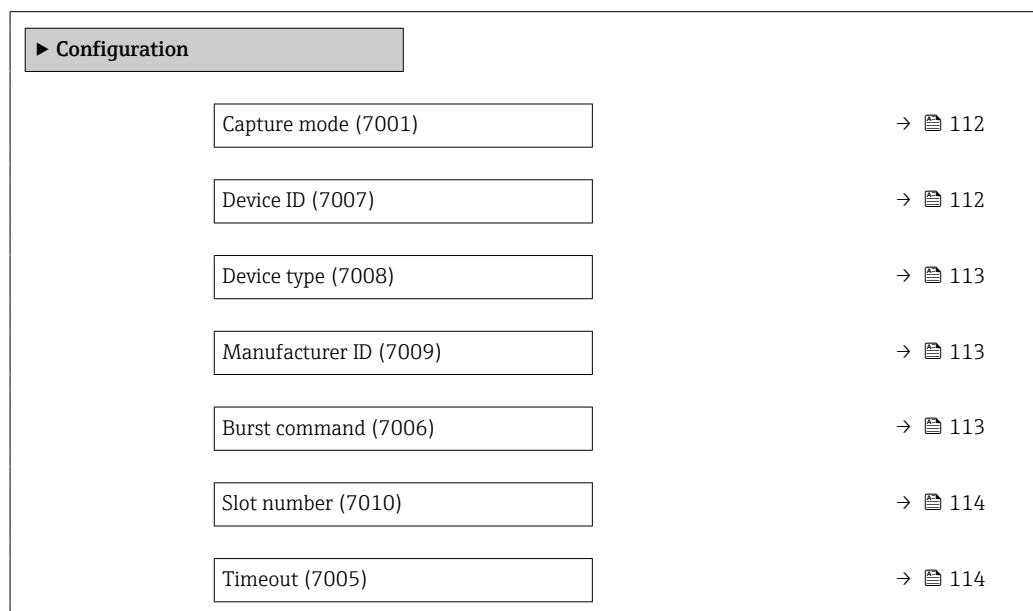
Expert → Communication → HART input



"Configuration" submenu

Navigation

Expert → Communication → HART input → Configuration



Failure mode (7011)	→ 115
Failure value (7012)	→ 115

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

"Burst network" option

The device records data transmitted via burst in the network.

An external pressure sensor must be in the burst mode.

"Master network" option

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 (→ 112).

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 (→ 112), 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 (→ 112).
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 (→ 112).
Description	Use this function to select the burst command to be recorded.
Selection	<ul style="list-style-type: none"> ■ Command 1 ■ Command 3 ■ Command 9 ■ Command 33

Factory setting	Command 1
Additional information	<p><i>Selection</i></p> <ul style="list-style-type: none"> ■ 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 (→  112).
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	<i>User entry</i>

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 (→  112).
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	<p><i>Description</i></p> <p> If the interval is exceeded, the measuring device displays the XF882 Input signal diagnostic message.</p>

Failure mode

Navigation	 Expert → Communication → HART input → Configuration → Failure mode (7011)
Prerequisite	In the Capture mode parameter (→ 112), 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	<ul style="list-style-type: none"> ■ Alarm ■ Last valid value ■ Defined value
Factory setting	Alarm
Additional information	<p><i>Options</i></p> <ul style="list-style-type: none"> ■ 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 (→ 115)).

Failure value

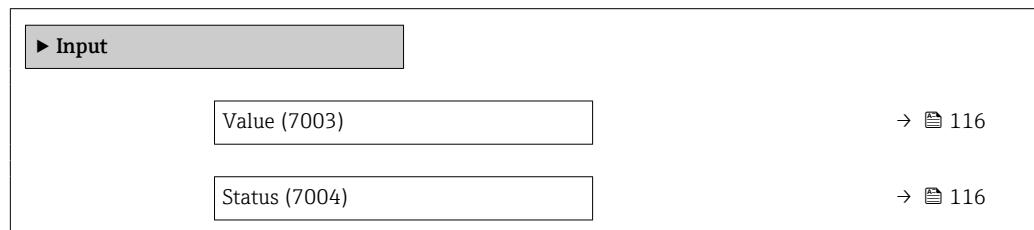
Navigation	 Expert → Communication → HART input → Configuration → Failure value (7012)
Prerequisite	The following conditions are met: <ul style="list-style-type: none"> ■ In the Capture mode parameter (→ 112), the Burst network option or Master network option is selected. ■ In the Failure mode parameter (→ 115), 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

Additional information*Dependency*

The unit is taken from the **Pressure unit** parameter

"Input" submenu**Navigation**

Expert → Communication → HART input → Input



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

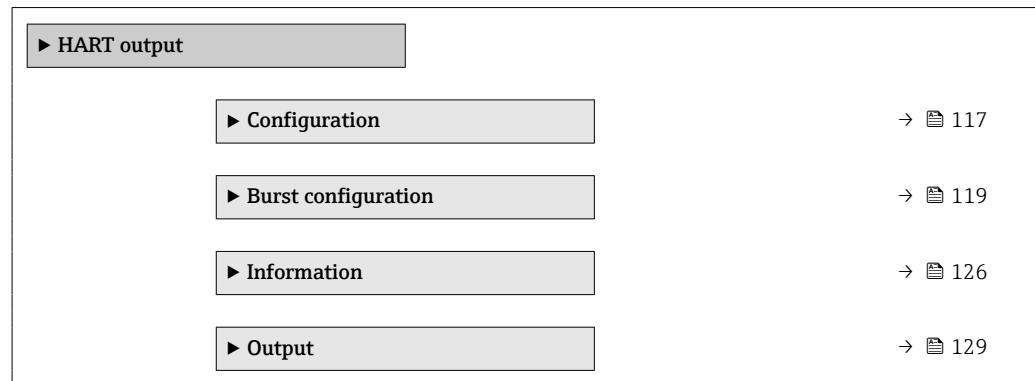
Additional information*Description*

If the measuring device reads in an invalid pressure measured value, the **F882 Input signal** diagnostic message is output

3.5.2 "HART output" submenu

Navigation

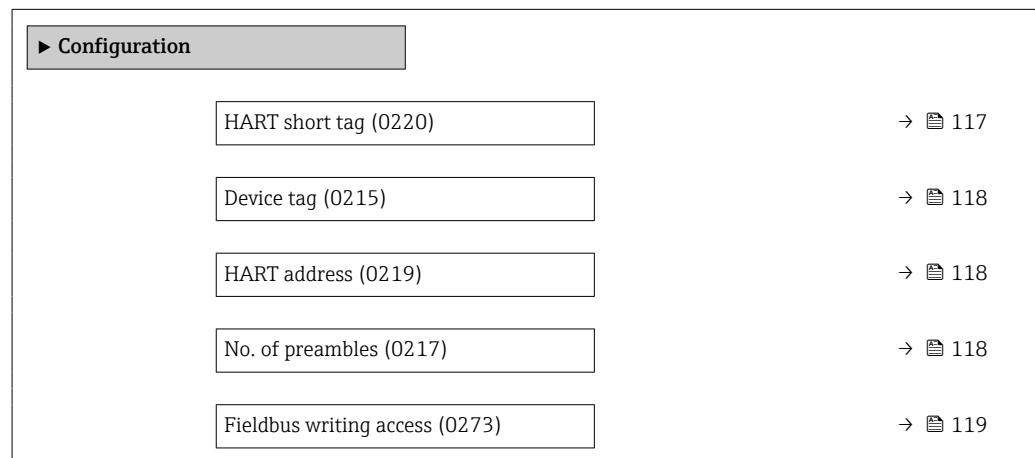
Expert → Communication → HART output



"Configuration" submenu

Navigation

Expert → Communication → HART output → Configuration



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

PROSONIC

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 Prosonic Flow

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 *Description*

For addressing in a HART Multidrop network, the **Fixed current** option must be set in the **Current span** parameter (→ 82) (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 *User entry*

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	<ul style="list-style-type: none"> ■ Read + write ■ Read only
Factory setting	Read + write
Additional information	<p><i>Description</i></p> <p>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.</p> <p><i>Selection</i></p> <ul style="list-style-type: none"> ■ 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)	→ 120
Burst command 1 to n (2031-1 to n)	→ 120
Burst variable 0 (2033)	→ 121
Burst variable 1 (2034)	→ 122
Burst variable 2 (2035)	→ 122
Burst variable 3 (2036)	→ 123
Burst variable 4 (2037)	→ 123
Burst variable 5 (2038)	→ 123
Burst variable 6 (2039)	→ 123
Burst variable 7 (2040)	→ 124

Burst trigger mode (2044-1 to n)	→ 124
Burst trigger level (2043-1 to n)	→ 125
Min. update period (2042-1 to n)	→ 125
Max. update period (2041-1 to n)	→ 125

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

Options

- 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*Selection*

- 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.

"Command 33" option

The HART device variables are defined via Command 107.

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

- Volume flow
- Mass flow
- Temperature *
- Totalizer 1...3
- Sound velocity
- Flow velocity
- Acceptance rate *
- Turbulence *
- Signal strength *
- Signal to noise ratio *
- 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 (→ 81).

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

- Not used
- Volume flow
- Mass flow
- Sound velocity
- Flow velocity

* Visibility depends on order options or device settings

- Signal strength *
- Signal to noise ratio *
- Turbulence *
- Acceptance rate *
- Temperature *
- Density
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Measured current
- Percent of range
- Primary variable (PV)
- Quaternary variable (QV)
- Secondary variable (SV)
- Tertiary variable (TV)

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 (→ [121](#)).

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 (→ [121](#)).

Factory setting Not used

* Visibility depends on order options or device settings

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 (→ 121).
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 (→ 121).
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 (→ 121).
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 (→ 121).
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 (→ [121](#)).

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*Selection*

- Continuous
The message is sent continuously, at least at intervals corresponding to the time frame specified in the **Burst min period** parameter (→ [125](#)).
- Window
The message is sent if the specified measured value has changed by the value in the **Burst trigger level** parameter (→ [125](#)).
- Rising
The message is sent if the specified measured value exceeds the value in the **Burst trigger level** parameter (→ [125](#)).
- Falling
The message is sent if the specified measured value drops below the value in the **Burst trigger level** parameter (→ [125](#)).
- On change
The message is sent if a measured value changes in the burst message.

* Visibility depends on order options or device settings

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 (→ 124) the burst trigger value determines the time of burst message X.

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)	→  126
Device ID (0221)	→  127
Device type (0209)	→  127
Manufacturer ID (0259)	→  127
HART revision (0205)	→  127
HART descriptor (0212)	→  128
HART message (0216)	→  128
Hardware revision (0206)	→  128
Software revision (0224)	→  128
HART date code (0202)	→  129

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

1

Additional information**Description**

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	0x69 (for Prosonic Flow I 400)
Additional information	<i>Description</i>  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 Pros. Flow 400

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 Pros. Flow 400

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 1

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 1

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	<p><i>Example</i> Device installation date</p>

"Output" submenu

Navigation Expert → Communication → HART output → Output

► Output	
Assign PV (0234)	→ 130
Primary variable (PV) (0201)	→ 130
Assign SV (0235)	→ 130
Secondary variable (SV) (0226)	→ 131
Assign TV (0236)	→ 131
Tertiary variable (TV) (0228)	→ 132
Assign QV (0237)	→ 132
Quaternary variable (QV) (0203)	→ 133

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
- Sound velocity
- Flow velocity
- Signal strength *
- Signal to noise ratio *
- Turbulence *
- Acceptance rate *
- Temperature *
- Density *
- Electronics temperature

Factory setting

Volume flow

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

User interface

The measured value displayed depends on the process variable selected in the **Assign PV** parameter (→ 130).

Dependency

The unit of the displayed measured value is taken from the **System units** submenu (→ 53).

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).

* Visibility depends on order options or device settings

Selection

- Volume flow
- Mass flow
- Sound velocity
- Flow velocity
- Signal strength *
- Signal to noise ratio *
- Turbulence *
- Acceptance rate *
- Temperature *
- Density
- Electronics temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3
- HART input

Factory setting

Totalizer 1

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*User interface*

The measured value displayed depends on the process variable selected in the **Assign SV** parameter (→  130).

Dependency

 The unit of the displayed measured value is taken from the **System units** submenu (→  53).

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
- Sound velocity
- Flow velocity
- Signal strength *
- Signal to noise ratio *
- Turbulence *

* Visibility depends on order options or device settings

- Acceptance rate *
- Temperature *
- Density *
- Electronics temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3
- HART input

Factory setting Totalizer 2

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 *User interface*

The measured value displayed depends on the process variable selected in the **Assign TV** parameter (→ 131).

Dependency

The unit of the displayed measured value is taken from the **System units** submenu (→ 53).

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
- Sound velocity
- Flow velocity
- Signal strength *
- Signal to noise ratio *
- Turbulence *
- Acceptance rate *
- Temperature *
- Density *
- Electronics temperature
- Totalizer 1

* Visibility depends on order options or device settings

- Totalizer 2
- Totalizer 3
- HART input

Factory setting Totalizer 3

Quaternary variable (QV)

Navigation  Expert → Communication → HART output → Output → Quatern.var(QV) (0203)

Description Displays the current measured value of the quaternary dynamic variable (QV).

User interface Signed floating-point number

Additional information *User interface*

The measured value displayed depends on the process variable selected in the **Assign QV** parameter (→  132).

Dependency

 The unit of the displayed measured value is taken from the **System units** submenu (→  53).

3.5.3 "Web server" submenu

Navigation

 Expert → Communication → Web server

 Web server	
Web server language (7221)	→  134
MAC address (7214)	→  134
DHCP client (7212)	→  135
IP address (7209)	→  135
Subnet mask (7211)	→  135
Default gateway (7210)	→  136
Web server functionality (7222)	→  136
Login page (7273)	→  136

Web server language

Navigation	  Expert → Communication → Web server → Webserv.language (7221)
Description	Use this function to select the Web server language setting.
Selection	<ul style="list-style-type: none">■ English■ Deutsch■ Français■ Español■ Italiano■ Nederlands■ Portuguesa■ Polski■ русский язык (Russian)■ Svenska■ Türkçe■ 中文 (Chinese)■ 日本語 (Japanese)■ 한국어 (Korean)■ العربية (Arabic) *■ Bahasa Indonesia■ ภาษาไทย (Thai) *■ 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

* Visibility depends on order options or device settings

5) Media Access Control

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

Additional information*Effect*

If the DHCP client functionality of the web server is selected, the IP address (→ 135), Subnet mask (→ 135) and Default gateway (→ 136) are set automatically.



- Identification is via the MAC address of the measuring device.
- The IP address (→ 135) in the **IP address** parameter (→ 135) is ignored as long as the **DHCP client** parameter (→ 135) is active. This is also the case, in particular, if the DHCP server cannot be reached. The IP address (→ 135) in the parameter of the same name is only used if the **DHCP client** parameter (→ 135) 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 (→ 136).

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
- On

Factory setting

On

Additional information**Description**

Once disabled, the Web server functionality can only be re-enabled via or the operating tool FieldCare.

Selection

Option	Description
Off	<ul style="list-style-type: none">■ The web server is completely disabled.■ Port 80 is locked.
On	<ul style="list-style-type: none">■ The complete functionality of the web server 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

3.5.4 "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)
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 019 (0277)	→ 138
Event category 160 (0272)	→ 138
Event category 441 (0210)	→ 138
Event category 442 (0230)	→ 139
Event category 443 (0231)	→ 139
Event category 832 (0218)	→ 139
Event category 833 (0225)	→ 140
Event category 840 (0267)	→ 140
Event category 842 (0295)	→ 141
Event category 870 (0250)	→ 141
Event category 930 (0296)	→ 142
Event category 931 (0297)	→ 142

Event category 019 (Device initialization active)

Navigation	Expert → Communication → Diag. config. → Event category 019 (0277)
Description	Use this function to assign a category to the △S019 Device initialization active diagnostic message.
Selection	<ul style="list-style-type: none">■ 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: → 137

Event category 160 (Signal path switched off)

Navigation	Expert → Communication → Diag. config. → Event category 160 (0272)
Description	Use this function to select a category for the 160 Signal path switched off diagnostic message.
Selection	<ul style="list-style-type: none">■ Failure (F)■ Function check (C)■ Out of specification (S)■ Maintenance required (M)■ No effect (N)
Factory setting	Maintenance required (M)
Additional information	For a detailed description of the event categories available for selection: → 137

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	<ul style="list-style-type: none">■ Failure (F)■ Function check (C)■ Out of specification (S)■ Maintenance required (M)■ No effect (N)
Factory setting	Out of specification (S)

Additional informationFor a detailed description of the event categories available for selection: → [137](#)**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.

DescriptionUse 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 informationFor a detailed description of the event categories available for selection: → [137](#)**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.

DescriptionUse 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 informationFor a detailed description of the event categories available for selection: → [137](#)**Event category 832 (Electronics temperature too high)****Navigation**

Expert → Communication → Diag. config. → Event category 832 (0218)

DescriptionUse 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

Selection

 For a detailed description of the event categories available for selection: → [137](#)

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

Selection

 For a detailed description of the event categories available for selection: → [137](#)

Event category 841 (Sensor range)**Navigation**

 Expert → Communication → Diag. config. → Event category 840 (0267)

Description

Use this function to select a category for the **841 Sensor range** 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: → [137](#)

Event category 842 (Process limit)



Navigation Expert → Communication → Diag. config. → Event category 842 (0295)

Description Use this function to select a category for 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: → [137](#)

Event category 870 (Measuring inaccuracy increased)



Navigation Expert → Communication → Diag. config. → Event category 870 (0250)

Description Use this function to select a category for the **870 Measuring inaccuracy increased** 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: → [137](#)

Event category 881 (Sensor signal path 1 to n)



Navigation Expert → Communication → Diag. config. → Event category 881 (0268)

Description Use this function to select a category for the **881 Sensor signal path 1 to n** diagnostic message.

Selection

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Maintenance required (M)

Additional information  For a detailed description of the event categories available for selection: → [137](#)

Event category 930 (Process fluid)



Navigation  Expert → Communication → Diag. config. → Event category 930 (0296)

Description Use this function to select a category for the **△S930 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 *Selection*

 For a detailed description of the event categories available for selection: → [137](#)

Event category 931 (Process fluid)



Navigation  Expert → Communication → Diag. config. → Event category 931 (0297)

Description Use this function to select a category for the **△S931 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 *Selection*

 For a detailed description of the event categories available for selection: → [137](#)

3.5.5 "WLAN settings" wizard

Navigation

Expert → Communication → WLAN settings

► WLAN settings	
WLAN (2702)	→ 144
WLAN mode (2717)	→ 144
SSID name (2714)	→ 144
Network security (2705)	→ 144
Security identification (2718)	→ 145
User name (2715)	→ 145
WLAN password (2716)	→ 145
WLAN IP address (2711)	→ 146
WLAN MAC address (2703)	→ 146
WLAN subnet mask (2709)	→ 146
WLAN MAC address (2703)	→ 146
WLAN passphrase (2706)	→ 146
WLAN MAC address (2703)	→ 146
Assign SSID name (2708)	→ 147
SSID name (2707)	→ 147
2.4 GHz WLAN channel (2704)	→ 147
Select antenna (2713)	→ 148
Connection state (2722)	→ 148
Received signal strength (2721)	→ 148
WLAN IP address (2711)	→ 146
Gateway IP address (2719)	→ 149
IP address domain name server (2720)	→ 149

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

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	<ul style="list-style-type: none"> ■ Unsecured ■ WPA2-PSK ■ EAP-PEAP with MSCHAPv2 * ■ EAP-PEAP MSCHAPv2 no server authentic. * ■ EAP-TLS
Factory setting	WPA2-PSK
Additional information	<p><i>Selection</i></p> <ul style="list-style-type: none"> ■ Unsecured Access the WLAN connection without identification. ■ WPA2-PSK Access the WLAN connection with a network key.

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	<ul style="list-style-type: none"> ■ 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	–

* Visibility depends on order options or device settings

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 (→ 144).
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	<ul style="list-style-type: none"> ■ Device tag ■ User-defined
Factory setting	User-defined
Additional information	<p><i>Selection</i></p> <ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ The User-defined option is selected in the Assign SSID name parameter (→ 147). ■ The WLAN access point option is selected in the WLAN mode parameter (→ 144).
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_Prosonic_Flow_400_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

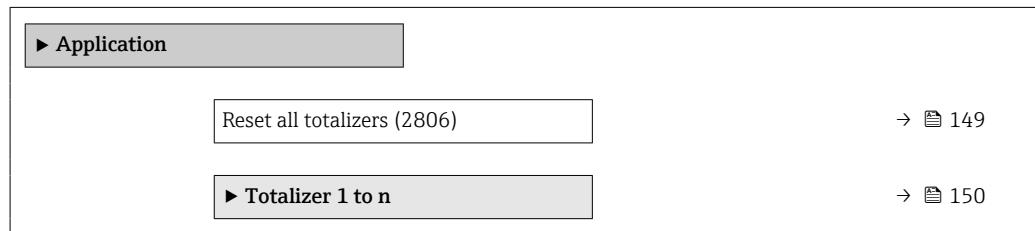
Navigation	Expert → Communication → WLAN settings → Gateway IP addr. (2719)
Description	Use this function to enter the IP address of the gateway.
User interface	Character string comprising numbers, letters and special characters
Factory setting	192.168.1.212

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 "Application" submenu

Navigation   Expert → Application



Reset all totalizers

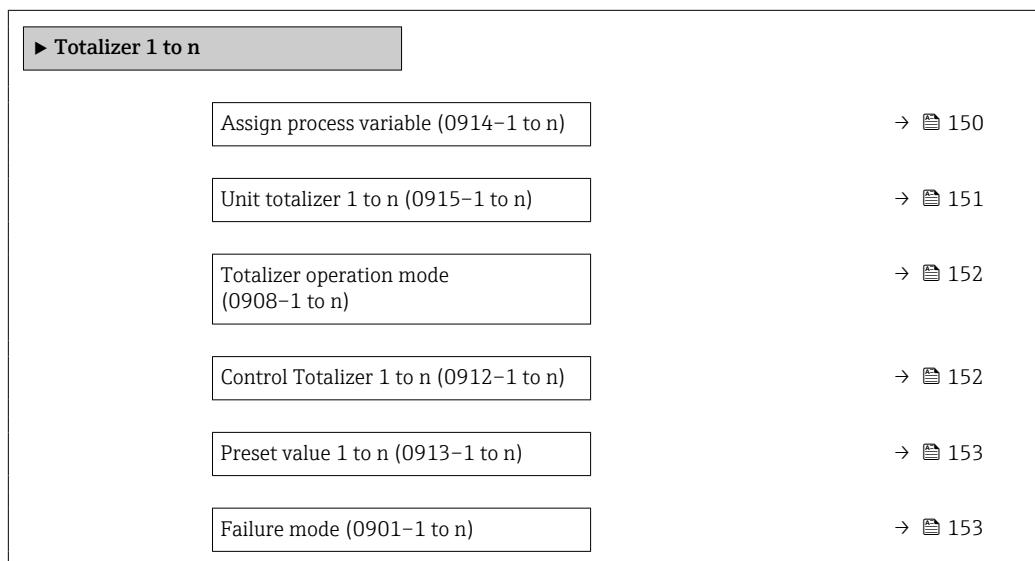
Navigation	Expert → Application → Reset all tot. (2806)
Description	Use this function to reset all totalizers to the value 0 and restart the totaling process. This deletes all the flow values previously totalized.
Selection	<ul style="list-style-type: none"> ■ Cancel ■ Reset + totalize
Factory setting	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 totalized.

3.6.1 "Totalizer 1 to n" submenu*Navigation*

Expert → Application → Totalizer 1 to n

**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

Factory setting

Volume flow

*Additional information**Description*

i 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 (→ 150) 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 (→ 150) of the **Totalizer 1 to n** submenu.

Description

Use this function to select the process variable unit for the Totalizer 1 to n (→ 150).

Selection

- g *
- kg *
- t *
- oz *
- lb *
- STon *
- cm³ *
- dm³ *
- m³ *
- ml *
- l *
- hl *
- Ml Mega *
- af *
- ft³ *
- Mft³ *
- Mft³ *
- fl oz (us) *
- gal (us) *
- kgal (us) *
- Mgal (us) *
- bbl (us;liq.) *
- bbl (us;beer) *
- bbl (us;oil) *
- bbl (us;tank) *
- gal (imp) *
- Mgal (imp) *
- bbl (imp;beer) *
- bbl (imp;oil) *
- None

Factory setting

Country-specific:

- m³
- ft³

Additional information*Description*

The unit is selected separately for each totalizer. It is independent of the selection made in the **System units** submenu (→ 53).

Selection

The selection is dependent on the process variable selected in the **Assign process variable** parameter (→ 150).

* Visibility depends on order options or device settings

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 (→ [150](#)) of the **Totalizer 1 to n** submenu.

Description

Use this function to select how the totalizer summates the flow.

Selection

- Net flow total
- Forward flow total
- Reverse flow total

Factory setting

Net flow total

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 (→ [150](#)) 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

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	The totaling process is stopped and the totalizer is set to its defined start value from the Preset value parameter.

Options	Description
Reset + totalize	The totalizer is reset to 0 and the totaling process is restarted.
Preset + totalize	The totalizer is set to the defined start value from the Preset value parameter and the totaling process is restarted.

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 (→ 150) 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	Country-specific: ■ 0 m ³ ■ 0 ft ³
Additional information	<p><i>User entry</i></p> <p> The unit of the selected process variable is specified for the totalizer in the Unit totalizer parameter (→ 151).</p> <p><i>Example</i></p> <p>This configuration is suitable for applications such as iterative filling processes with a fixed batch quantity.</p>

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 (→ 150) 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	<ul style="list-style-type: none"> ■ Stop ■ Actual value ■ Last valid value
Factory setting	Stop

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 "Diagnostics" submenu

Navigation

Expert → Diagnostics

► Diagnostics	
Actual diagnostics (0691)	→ 155
Previous diagnostics (0690)	→ 155
Operating time from restart (0653)	→ 156
Operating time (0652)	→ 156
► Diagnostic list	→ 157
► Event logbook	→ 161
► Device information	→ 163
► Main electronic module	→ 167
► Sensor electronic module (ISEM)	→ 168
► Display module	→ 169
► Heartbeat Technology	→ 177
► Simulation	→ 178

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 (→  157).  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 (→  155). <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*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.

Example

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 (→  155).

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.

3.7.1 "Diagnostic list" submenu

Navigation
 Expert → Diagnostics → Diagnostic list

► Diagnostic list	
Diagnostics 1 (0692)	→  157
Diagnostics 2 (0693)	→  158
Diagnostics 3 (0694)	→  159
Diagnostics 4 (0695)	→  159
Diagnostics 5 (0696)	→  160

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*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:

-  S442 Frequency output
-  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 *Display*

 The diagnostic message can be viewed via the **Diagnostics 1** parameter (→ 157).

Example

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:
■  S442 Frequency output
■  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 (→ 158).

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	<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: ■  AS442 Frequency output ■  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 (→  159).
	<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*Display*

Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the **[E]** key.

Examples

For the display format:

- Δ S442 Frequency output
- \otimes 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 (→ 159).

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 **[E]** key.

Examples

For the display format:

- Δ S442 Frequency output
- \otimes F276 I/O module failure

Timestamp 5

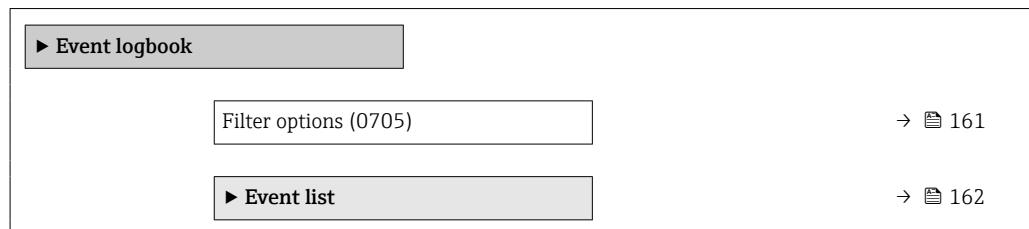
Navigation	█ Expert → Diagnostics → Diagnostic list → Timestamp
Description	Displays the operating time when the diagnostic message with the fifth-highest priority occurred.
User interface	Days (d), hours (h), minutes (m) and seconds (s)
Additional information	<p><i>Display</i></p> <p> The diagnostic message can be viewed via the Diagnostics 5 parameter (→ 160).</p>
	<p><i>Example</i></p> <p>For the display format: 24d12h13m00s</p>

3.7.2 "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

**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	<ul style="list-style-type: none"> ■ All ■ Failure (F) ■ Function check (C) ■ Out of specification (S) ■ Maintenance required (M) ■ Information (I)

Factory setting All

Additional information *Description*

- i** 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

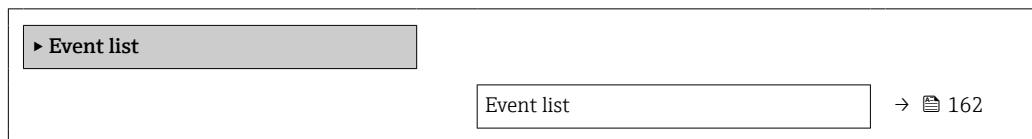
i The **Event list** submenu is only displayed if operating via the local display.

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 (→ 161).

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

Description

A maximum of 20 event messages are displayed in chronological order.

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

- ⊖: Occurrence of the event
- ⊕: End of the event

Examples

For the display format:

- I1091 Configuration modified
⊖ 24d12h13m00s
- ΔS442 Frequency output
⊖ 01d04h12min30s

 Additional information, such as remedial measures, can be retrieved via the **INFO** key.

HistoROM

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

 To order the **Extended HistoROM** application package, see the "Application packages" section of the "Technical Information" document

3.7.3 "Device information" submenu

Navigation

  Expert → Diagnostics → Device info

 Device information	
Device tag (0011)	→  164
Serial number (0009)	→  164
Firmware version (0010)	→  164
Device name (0013)	→  165
Order code (0008)	→  165
Extended order code 1 (0023)	→  165
Extended order code 2 (0021)	→  166
Extended order code 3 (0022)	→  166
Configuration counter (0233)	→  166
ENP version (0012)	→  166

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

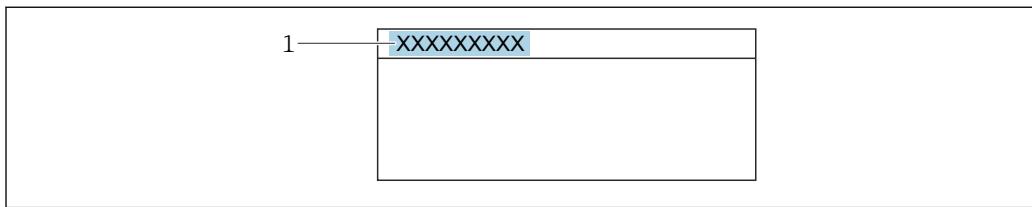
Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /).

Factory setting

Prosonic Flow

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 (0013)

Description

Displays the name of the transmitter. It can also be found on the nameplate of the transmitter.

User interface

Max. 32 characters such as letters or numbers.

Factory setting

Pros. Flow 400

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*Description*

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*Description*

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 (→ 165)

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 (→ 165)

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

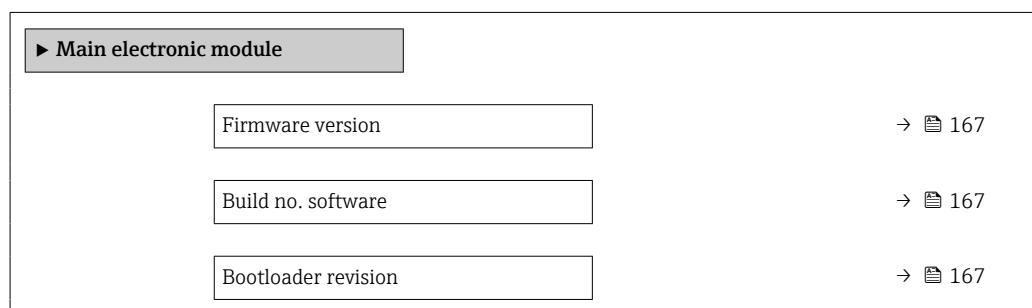
Additional information *Description*

This electronic nameplate stores a data record for device identification that includes more data than the nameplates attached to the outside of the device.

3.7.4 "Main electronic module + I/O module 1" submenu

Navigation

Expert → Diagnostics → Mainboard module



Firmware version

Navigation

Expert → Diagnostics → Main elec. mod. → 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. mod. → 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. mod. → Bootloader rev. (0073)

Description

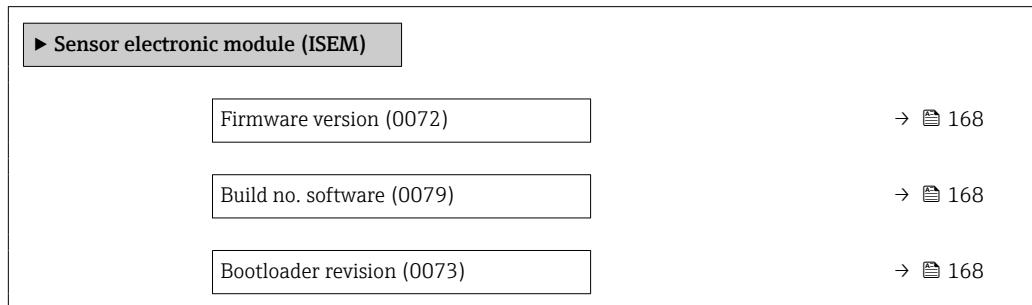
Use this function to display the bootloader revision of the software.

User interface	Positive integer
----------------	------------------

3.7.5 "Sensor electronic module (ISEM)" submenu

Navigation

Expert → Diagnostics → Sens. electronic



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.

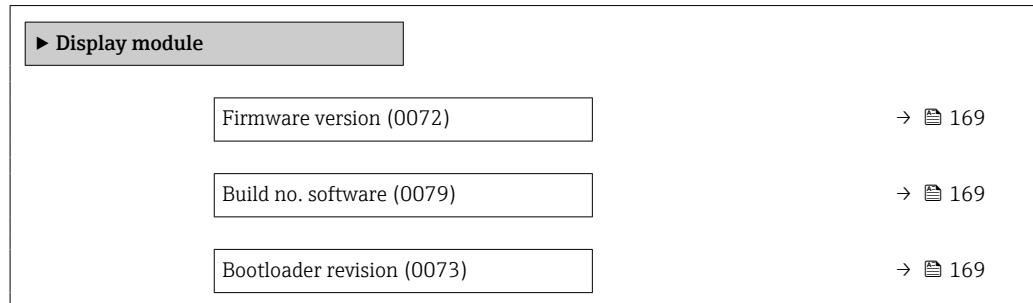
User interface

Positive integer

3.7.6 "Display module" submenu

Navigation

Expert → Diagnostics → Display module



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

Bootloader revision

Navigation

Expert → Diagnostics → Display module → Bootloader rev. (0073)

Description

Use this function to display the bootloader revision of the software.

User interface

Positive integer

3.7.7 "Data logging" submenu

Navigation

Expert → Diagnostics → Data logging

▶ Data logging	
Assign channel 1 (0851)	→ 170
Assign channel 2 (0852)	→ 171
Assign channel 3 (0853)	→ 172
Assign channel 4 (0854)	→ 172
Logging interval (0856)	→ 172
Clear logging data (0855)	→ 173
Data logging (0860)	→ 173
Logging delay (0859)	→ 174
Data logging control (0857)	→ 174
Data logging status (0858)	→ 175
Entire logging duration (0861)	→ 175
▶ Display channel 1	
▶ Display channel 2	
▶ Display channel 3	
▶ Display channel 4	

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 (→ 43).

Description

Use this function to select a process variable for the data logging channel.

Selection	<ul style="list-style-type: none"> ■ Off ■ Volume flow ■ Mass flow ■ Sound velocity ■ Flow velocity ■ Signal strength * ■ Signal to noise ratio * ■ Turbulence * ■ Acceptance rate * ■ Temperature * ■ Density * ■ Electronics temperature ■ Current output 1
Factory setting	Off
Additional information	<p><i>Description</i></p> <p>A total of 1000 measured values can be logged. This means:</p> <ul style="list-style-type: none"> ■ 1000 data points if 1 logging channel is used ■ 500 data points if 2 logging channels are used ■ 333 data points if 3 logging channels are used ■ 250 data points if 4 logging channels are used <p>Once the maximum number of data points is reached, the oldest data points in the data log are cyclically overwritten in such a way that the last 1000, 500, 333 or 250 measured values are always in the log (ring memory principle).</p> <p> The log contents are cleared if the option selected is changed.</p>

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 (→  43).
Description	Use this function to select a process variable for the data logging channel.
Selection	For the picklist, see the Assign channel 1 parameter (→  170)
Factory setting	Off

* Visibility depends on order options or device settings

Assign channel 3**Navigation**

Expert → Diagnostics → Data logging → Assign chan. 3 (0853)

Prerequisite

The **Extended HistoROM** application package is available.

i The software options currently enabled are displayed in the **Software option overview** parameter (→ 43).

Description

Use this function to select a process variable for the data logging channel.

Selection

For the picklist, see the **Assign channel 1** parameter (→ 170)

Factory setting

Off

Assign channel 4**Navigation**

Expert → Diagnostics → Data logging → Assign chan. 4 (0854)

Prerequisite

The **Extended HistoROM** application package is available.

i The software options currently enabled are displayed in the **Software option overview** parameter (→ 43).

Description

Use this function to select a process variable for the data logging channel.

Selection

For the picklist, see the **Assign channel 1** parameter (→ 170)

Factory setting

Off

Logging interval**Navigation**

Expert → Diagnostics → Data logging → Logging interval (0856)

Prerequisite

The **Extended HistoROM** application package is available.

i The software options currently enabled are displayed in the **Software option overview** parameter (→ 43).

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:

- $T_{\log} = 1000 \times 1 \text{ s} = 1000 \text{ s} \approx 15 \text{ min}$
- $T_{\log} = 1000 \times 10 \text{ s} = 10000 \text{ s} \approx 3 \text{ h}$
- $T_{\log} = 1000 \times 80 \text{ s} = 80000 \text{ s} \approx 1 \text{ d}$
- $T_{\log} = 1000 \times 3600 \text{ s} = 3600000 \text{ s} \approx 41 \text{ d}$

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 (→  43).

Description

Use this function to clear the entire logging data.

Selection

- Cancel
- Clear data

Factory setting

Cancel

Additional information*Selection*

- 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> <ul style="list-style-type: none">▪ 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 (→ 173), 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> <p>Once measured value logging has been started with the Data logging control parameter (→ 174), the device does not save any data for the duration of the time delay entered.</p>

Data logging control



Navigation	Expert → Diagnostics → Data logging → Data log.control (0857)
Prerequisite	In the Data logging parameter (→ 173), the Not overwriting option is selected.
Description	Use this function to start and stop measured value logging.
Selection	<ul style="list-style-type: none">▪ None▪ Delete + start▪ Stop
Factory setting	None
Additional information	<i>Selection</i> <ul style="list-style-type: none">▪ 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.

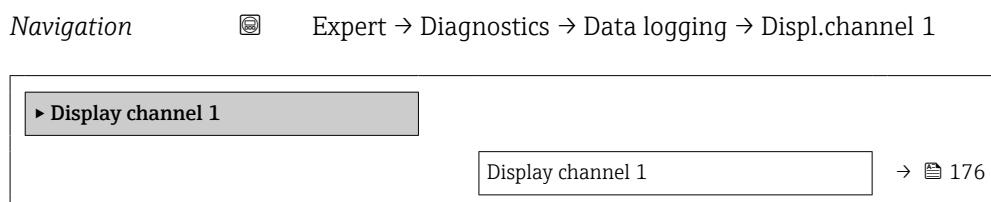
Data logging status

Navigation	 Expert → Diagnostics → Data logging → Data log. status (0858)
Prerequisite	In the Data logging parameter (→ 173), the Not overwriting option is selected.
Description	Displays the measured value logging status.
User interface	<ul style="list-style-type: none"> ■ Done ■ Delay active ■ Active ■ Stopped
Factory setting	Done
Additional information	<p><i>Selection</i></p> <ul style="list-style-type: none"> ■ 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 (→ 173), 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



Display channel 1

Navigation

 Expert → Diagnostics → Data logging → Displ.channel 1

Prerequisite

The **Extended HistoROM** application package is available.

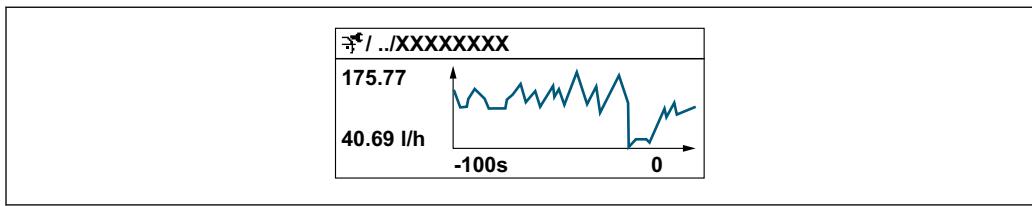
 The software options currently enabled are displayed in the **Software option overview** parameter (→  43).

Description

Displays the measured value trend for the logging channel in the form of a chart.

Additional information

Description



A0034352

 10 Chart of a measured value trend

- 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

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 →  176

"Display channel 3" submenu

Navigation



Expert → Diagnostics → Data logging → Displ.channel 3



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 → 176

"Display channel 4" submenu

Navigation

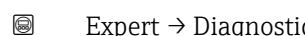


Expert → Diagnostics → Data logging → Displ.channel 4



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 → 176

3.7.8 "Heartbeat" submenu



For detailed information on the parameter descriptions for the **Heartbeat Verification+Monitoring**: Special Documentation for the device → 7

Navigation



Expert → Diagnostics → HBT



3.7.9 "Simulation" submenu

Navigation

Expert → Diagnostics → Simulation

▶ Simulation	
Assign simulation process variable (1810)	→ 178
Process variable value (1811)	→ 179
Status input simulation 1 (1355-1)	→ 179
Input signal level 1 (1356-1)	→ 180
Current output 1 simulation (0354-1)	→ 180
Current output value (0355)	→ 181
Frequency output 1 to n simulation (0472-1 to n)	→ 181
Frequency output 1 to n value (0473-1 to n)	→ 181
Pulse output simulation 1 to n (0458-1 to n)	→ 182
Pulse value 1 to n (0459-1 to n)	→ 182
Switch output simulation 1 to n (0462-1 to n)	→ 183
Switch state 1 to n (0463-1 to n)	→ 183
Device alarm simulation (0654)	→ 184
Diagnostic event category (0738)	→ 184
Diagnostic event simulation (0737)	→ 184

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	<ul style="list-style-type: none"> ■ Off ■ Volume flow ■ Mass flow ■ Sound velocity ■ Flow velocity * ■ Temperature * ■ Density *
Factory setting	Off
Additional information	<p><i>Description</i></p> <p> The simulation value of the process variable selected is defined in the Process variable value parameter (→ 179).</p>

Process variable value



Navigation	 Expert → Diagnostics → Simulation → Proc. var. value (1811)
Prerequisite	A process variable is selected in the Assign simulation process variable parameter (→ 178).
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
Additional information	<p><i>User entry</i></p> <p> The unit of the displayed measured value is taken from the System units submenu (→ 53).</p>

Status input simulation 1



Navigation	 Expert → Diagnostics → Simulation → Status inp.sim 1 (1355-1)
Prerequisite	For the following order code: "Output; input", option I "4-20mA HART, 2x pul./freq./switch output; status input"
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	<ul style="list-style-type: none"> ■ Off ■ On

* Visibility depends on order options or device settings

Factory setting	Off
Additional information	<i>Description</i>
	 The desired simulation value is defined in the Input signal level parameter (→ 180).
	<i>Selection</i>
	<ul style="list-style-type: none">▪ 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



Navigation	 Expert → Diagnostics → Simulation → Signal level 1 (1356-1)
Prerequisite	In the Status input simulation parameter (→ 179), 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	<ul style="list-style-type: none">▪ High▪ Low

Current output 1 simulation



Navigation	 Expert → Diagnostics → Simulation → Curr.outp 1 sim. (0354-1)
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	<ul style="list-style-type: none">▪ Off▪ On
Factory setting	Off
Additional information	<i>Description</i>
	 The desired simulation value is specified in the Value current output 1 parameter (→ 181).
	<i>Selection</i>
	<ul style="list-style-type: none">▪ 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 output 1

Navigation	Expert → Diagnostics → Simulation → Curr.outp val. (0355)
	Expert → Diagnostics → Simulation → Value curr.out 1 (0355-1)
Prerequisite	In the Current output 1 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	0 to 22.5 mA
Additional information	<p><i>User entry</i></p> The value must be entered with a period (.) as the separator.

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 (→ 94), 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	<ul style="list-style-type: none"> ▪ Off ▪ On
Factory setting	Off
Additional information	<p><i>Description</i></p> The desired simulation value is defined in the Frequency value 1 to n parameter.
	<p><i>Selection</i></p> <ul style="list-style-type: none"> ▪ 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 (→ 94), 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 *Description*

The desired simulation value is defined in the **Pulse value 1 to n** parameter.

Selection

- 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 (→ 97).
- Down-counting value
The pulses specified in the **Pulse value** parameter (→ 182) 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 (→ 94), 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*Description*

The desired simulation value is defined in the **Switch state 1 to n** parameter.

Selection

- 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*Selection*

- 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.

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 (→ 184).

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 *Description*

For the simulation, you can choose from the diagnostic events of the category selected in the **Diagnostic event category** parameter (→ 184).

4 Country-specific factory settings

4.1 SI units

 Not valid for USA and Canada.

4.1.1 System units

Mass	kg
Mass flow	kg/h
Volume	m ³
Volume flow	m ³ /h
Velocity	m/s
Temperature	°C

4.1.2 Output current span

Current output 1	4 to 20 mA NAMUR
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4.2 US units

 Only valid for USA and Canada.

4.2.1 System units

Mass	lb
Mass flow	lb/min
Volume	ft ³
Volume flow	ft ³ /min
Velocity	ft/s
Temperature	°F

4.2.2 Output current span

Current output 1	4 to 20 mA US
------------------	---------------

5 Explanation of abbreviated units

5.1 SI units

Process variable	Units	Explanation
Volume	$\text{cm}^3, \text{dm}^3, \text{m}^3$	Cubic centimeter, cubic decimeter, cubic meter
	ml, l	Milliliter, liter
Volume flow	$\text{dm}^3/\text{s}, \text{dm}^3/\text{min}, \text{dm}^3/\text{h}, \text{dm}^3/\text{d}$	Cubic decimeter/time unit
	$\text{m}^3/\text{s}, \text{m}^3/\text{min}, \text{m}^3/\text{h}, \text{m}^3/\text{d}$	Cubic meter/time unit
	l/s, l/min, l/h, l/d	Liter/time unit
Mass	g, kg, t	Gram, kilogram, metric ton
Mass flow	g/s, g/min	Gram/time unit
	kg/s, kg/min, kg/h, kg/d	Kilogram/time unit
	t/h, t/d	Metric ton/time unit
Density	kg/l	Kilogram/liter
Velocity	m/s	Meter/time unit
Kinematic viscosity	m^2/s	Square meter/second
Temperature	$^{\circ}\text{C}, \text{K}$	Celsius, Kelvin
Length	mm	Millimeters
Time	m, h, d, y	Minute, hour, day, year

5.2 US units

Process variable	Units	Explanation
Volume	ft^3	Cubic foot
Volume flow	$\text{ft}^3/\text{s}, \text{ft}^3/\text{min}, \text{ft}^3/\text{h}, \text{ft}^3/\text{d}$	Cubic foot/time unit
Mass	oz, lb, STon	Ounce, pound, standard ton
Mass flow	oz/s, oz/min	Ounce/time unit
	lb/s, lb/min, lb/h, lb/d	Pound/time unit
	STon/h, STon/d	Standard ton/time unit
Density	lb/ ft^3	Pound/cubic foot
Velocity	ft/s	Foot/time unit
Kinematic viscosity	cSt	Centistokes
Temperature	$^{\circ}\text{F}, ^{\circ}\text{R}$	Fahrenheit, Rankine
Length	in	Inch
Time	m, h, d, y	Minute, hour, day, year
	am, pm	Ante meridiem (before midday), post meridiem (after midday)

5.3 Imperial units

Process variable	Units	Explanation
Volume	bbl (imp;beer)	Barrel (beer)
Volume flow	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
Time	m, h, d, y	Minute, hour, day, year
	am, pm	Ante meridiem (before midday), post meridiem (after midday)

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