Description of Device Parameters
Proline Prosonic Flow W 400

Ultrasonic time-of-flight flowmeter
Modbus RS485
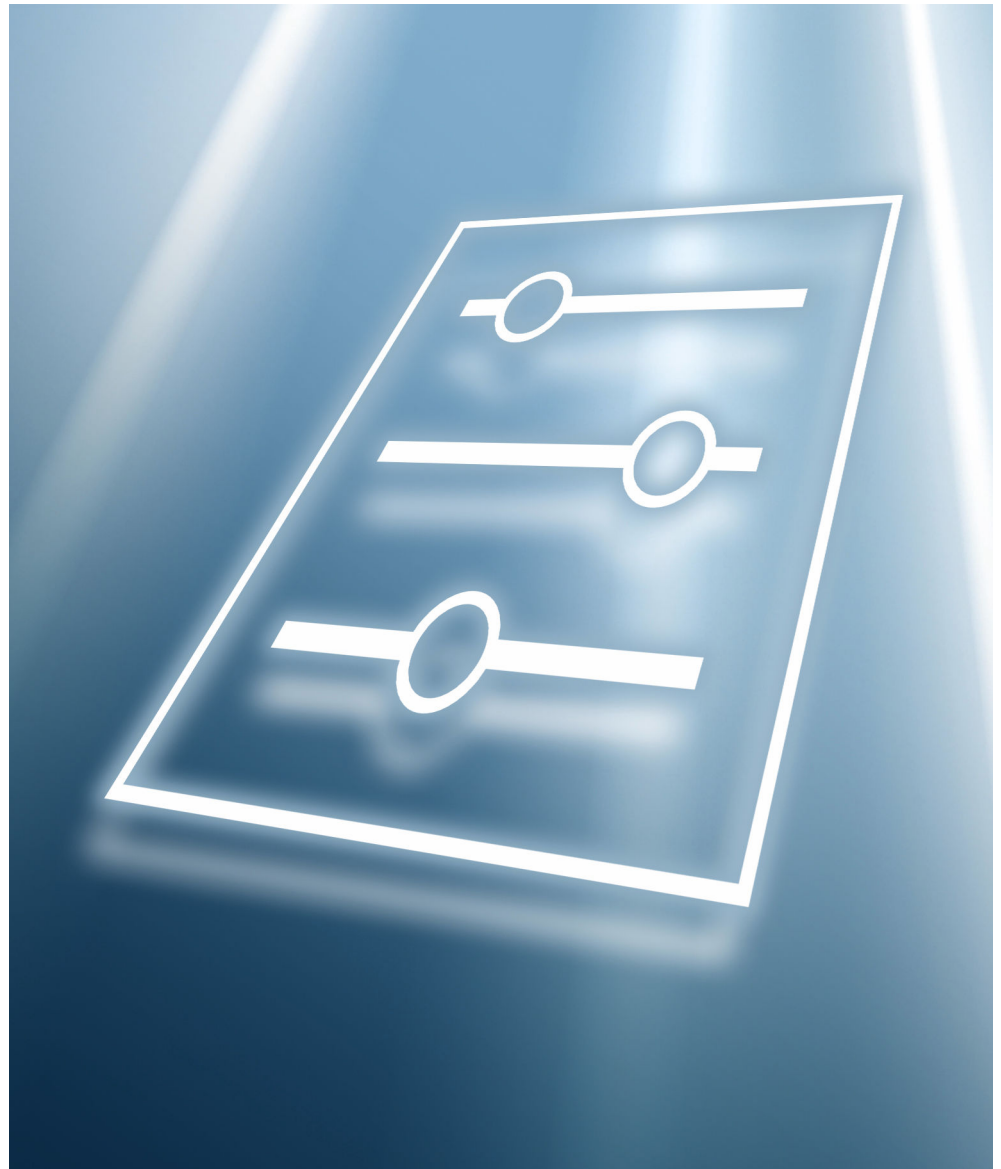
Endress+Hauser

People for Process Automation

Table of contents

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.

Operating menu for operators and maintenances

Language

Operatation → Language

Parameter 1

Parameter n

Submenu 1

Submenu n

Setup → Device tag

Wizard 1 / Parameter 1

Wizard n / Parameter n

Advanced setup → Enter access code

Parameter 1

Parameter n

Submenu 1

Submenu n

Diagnostics → Parameter 1

Parameter n

Submenu 1

Submenu n

Operating menu for experts

Expert → Access status display

Parameter n

System

Sensor

Input

Output

Communication

Application

Diagnostics

A0029160-EN

 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 • Option 1 • Option 2
User entry		Parameter entry range
Display		Display value/data of the parameter
Factory setting		Default setting ex works
Additional information		Additional explanations (e.g. in examples): • For individual options • For display value/data • For the input range • For the factory setting • For the parameter function

1.4   Symbols used

1.4.1   Symbols for certain types of information

Symbol	Meaning
🛈	**Tip** Indicates additional information.
📖	Reference to documentation
📄	Reference to page
🖼	Reference to graphic
📟 A0028662	Operation via local display
🖥 A0028663	Operation via operating tool
🔒 A0028665	Write-protected parameter

1.4.2 Symbols in graphics

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

1.5 Documentation

1.5.1 Standard documentation

Operating Instructions

Measuring device	Documentation code
Prosonic Flow W 400	BA02302D

1.5.2 Supplementary device-dependent documentation

Special Documentation

Content	Documentation code
Radio approvals for WLAN interface for A309/A310 display module	SD01793D
FlowDC	
Heartbeat Technology	SD03132D

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.

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)	→ 🗎	11
Enter access code (0003)	→ 🗎	12
▶ System	→ 🗎	12
▶ Sensor	→ 🗎	37
▶ Output	→ 🗎	77
▶ Communication	→ 🗎	107
▶ Application	→ 🗎	124
▶ Diagnostics	→ 🗎	129

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.
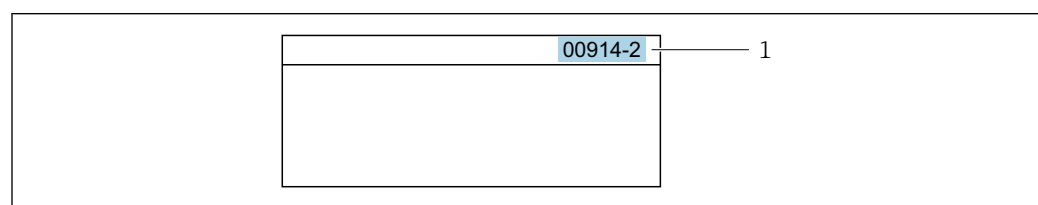
User entry   0 to 65 535

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.

A0029414

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

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Locking status

Navigation   ◉◉   Expert → Locking status (0004)

Description   Displays the active write protection.

User interface   • Hardware locked
               • Temporarily locked

Additional information   *Display*

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

Options

Options	Description
None	The access authorization displayed in the **Access status display** parameter (→ 📄 24) 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   • Operator
               • Maintenance

Factory setting   Maintenance

Additional information   *Description*

ℹ️ Access authorization can be modified via the **Enter access code** parameter
(→ 🔖 12).

ℹ️ 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

Enter access code

Navigation   📟🔲 Expert → Ent. access code (0003)

Description   Use this function to enter the user-specific release code to remove parameter write
protection.

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

3.1 "System" submenu

Navigation   📟🔲 Expert → System

▶ System	
▶ Display	→ 🔖 12
▶ Diagnostic handling	→ 🔖 25
▶ Administration	→ 🔖 32

3.1.1 "Display" submenu

Navigation   📟🔲 Expert → System → Display

▶ Display	
Display language (0104)	→ 🔖 13
Format display (0098)	→ 🔖 14
Value 1 display (0107)	→ 🔖 16

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)
- 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) and number of simultaneously displayed measured values (1 to 4) can be configured. This setting only applies to normal operation.

- The **Value 1 display** parameter (→ 🖺 16)…**Value 4 display** parameter (→ 🖺 20) are used to specify which measured values are shown on the local display and in what order.
- If more measured values are specified than the display mode selected permits, then the values alternate on the device display. The display time until the next change is configured using the **Display interval** parameter (→ 🖺 21).

Possible measured values shown on the local display:

"1 value, max. size" option

A0016529
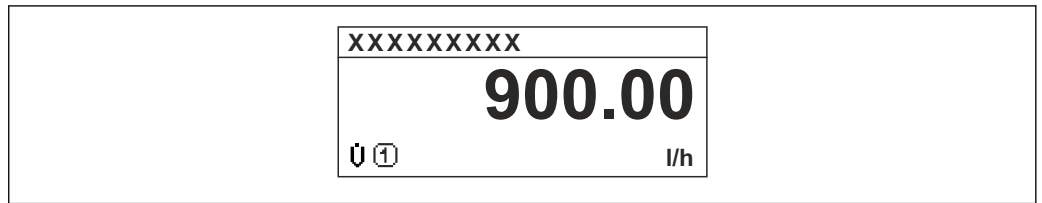
"1 bargraph + 1 value" option

A0016530

"2 values" option

A0016531
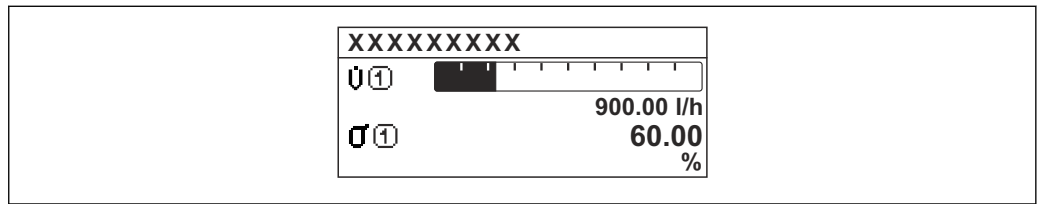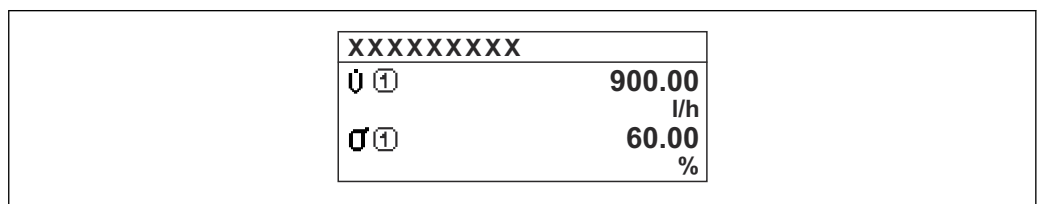
 2

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

Factory setting	Volume flow

Additional information	*Description*

If several measured values are displayed one below the other, the measured value selected here will be the first 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.

Dependency

ℹ The unit of the displayed measured value is taken from the **System units** submenu (→ 🖺 45).

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

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* 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 (→ 🗎 45).

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 (→ 🗎 45).

Decimal places 1   🔒

Navigation	🎛🖥 Expert → System → Display → Decimal places 1 (0095)
Prerequisite	A measured value is specified in the **Value 1 display** parameter (→ 🗎 16).
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 accuracy of the device for measuring or calculating the value.

Value 2 display	🔒

Navigation	🔘🖥 Expert → System → Display → Value 2 display (0108)
Prerequisite	A local display is provided.
Description	Use this function to select a measured value that is shown on the local display.
Selection	For the picklist, see **Value 1 display** parameter (→ 🖺 16)
	or
	For the picklist, see **Value 1 display** parameter (→ 🖺 16)
Factory setting	None
Additional information	*Description*
	If several measured values are displayed one below the other, the measured value selected here will be the second 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.

Dependency

ℹ The unit of the displayed measured value is taken from the **System units** submenu (→ 🖺 45).

Decimal places 2	🔒

Navigation	🔘🖥 Expert → System → Display → Decimal places 2 (0117)
Prerequisite	A measured value is specified in the **Value 2 display** parameter (→ 🖺 18).
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*

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

Value 3 display	🔒

Navigation	🔘🔲 Expert → System → Display → Value 3 display (0110)

Prerequisite	A local display is provided.

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

Selection	For the picklist, see **Value 1 display** parameter (→ 🗎 16)

Factory setting	None

Additional information	*Description*

If several measured values are displayed one below the other, the measured value selected here will be the third value to be displayed. The value is only displayed during normal operation.

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

Options

ℹ️ The unit of the displayed measured value is taken from the **System units** submenu (→ 🗎 45).

0% bargraph value 3	🔒

Navigation	🔘🔲 Expert → System → Display → 0% bargraph 3 (0124)

Prerequisite	A selection was made in the **Value 3 display** parameter (→ 🗎 19).

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	*Description*

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

User entry

ℹ️ The unit of the displayed measured value is taken from the **System units** submenu (→ 🗎 45).

100% bargraph value 3	🔒

Navigation	🔎🔲 Expert → System → Display → 100% bargraph 3 (0126)
Prerequisite	A selection was made in the **Value 3 display** parameter (→ 🖺 19).
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	*Description*

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

User entry

> ℹ The unit of the displayed measured value is taken from the **System units** submenu (→ 🖺 45).

Decimal places 3	🔒

|	
Navigation	🔎🔲 Expert → System → Display → Decimal places 3 (0118)
Prerequisite	A measured value is specified in the **Value 3 display** parameter (→ 🖺 19).
Description	Use this function to select the number of decimal places for measured value 3.
Selection	• x • x.x • x.xx • x.xxx • x.xxxx
Factory setting	x.xx
Additional information	*Description*

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

Value 4 display	🔒

Navigation	🔎🔲 Expert → System → Display → Value 4 display (0109)
Prerequisite	A local display is provided.
Description	Use this function to select a measured value that is shown on the local display.

Selection	For the picklist, see **Value 1 display** parameter (→ 🗎 16)

Factory setting	None

Additional information	*Description*
	If several measured values are displayed one below the other, the measured value selected here will be the fourth value to be displayed. The value is only displayed during normal operation.

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

Options

ℹ️ The unit of the displayed measured value is taken from the **System units** submenu (→ 🗎 45).

Decimal places 4   🔒

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

Prerequisite	A measured value is specified in the **Value 4 display** parameter (→ 🗎 20).

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*

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

Display interval

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

Prerequisite	A local display is provided.

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

User entry	1 to 10 s

Factory setting	5 s

Additional information   *Description*

This type of alternating display only occurs automatically if the number of measured values defined exceeds the number of values the selected display format can display simultaneously.

- The **Value 1 display** parameter (→ 🖺 16)...**Value 4 display** parameter (→ 🖺 20) are used to specify which measured values are shown on the local display.
- The display format for the measured values displayed is defined in the **Format display** parameter (→ 🖺 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 element [1]) for display damping:
- At a low time constant, the display reacts quickly to fluctuating measured variables.
- If a high time constant is entered, the display reacts more slowly.

The damping is not active if the value **0** (factory setting) is entered.

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.

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1)   proportional transmission behavior with first order delay
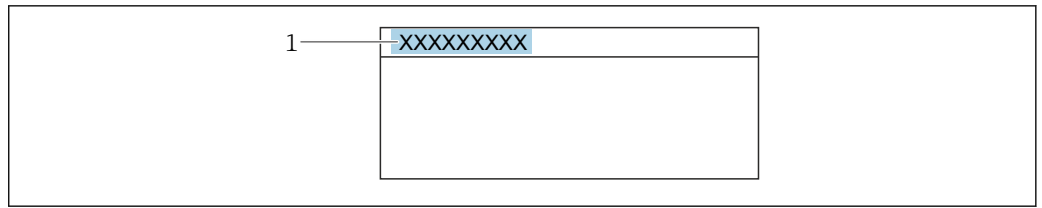
1   Position of the header text on the display

Selection

- Device tag
Is defined in the **Device tag** parameter (→ 🖹 139).
- Free text
Is defined in the **Header text** parameter (→ 🖹 23).

Header text

Navigation	🖩🖳 Expert → System → Display → Header text (0112)
Prerequisite	The **Free text** option is selected in the **Header** parameter (→ 🖹 22).
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.
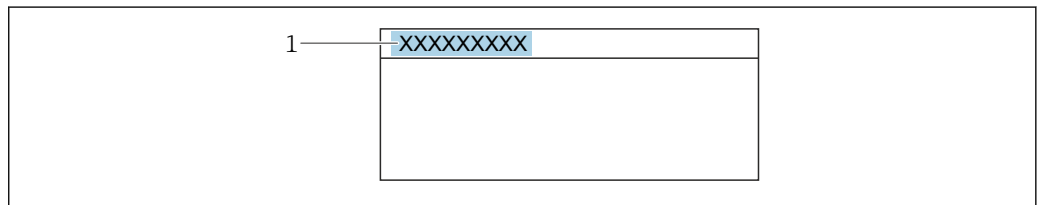
1   Position of the header text on the display

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 (→ 🖺 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

▸ Diagnostic handling	
Alarm delay (0651)	→ 🖺 25
▸ Diagnostic behavior	→ 🖺 25
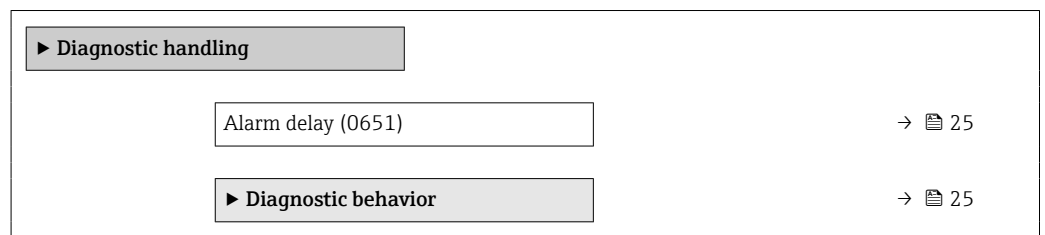
Alarm delay   ⍀

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 (→ 🖺 25).

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

Options	Description
Alarm	The device stops measurement. The measured value output via Modbus RS485 and the totalizers assume the defined alarm condition. A diagnostic message is generated. The background lighting changes to red.
Warning	The device continues to measure. The measured value output via Modbus RS485 and the totalizers are not affected. A diagnostic message is generated.
Logbook entry only	The device continues to measure. The diagnostic message is only displayed in the **Event logbook** submenu (**Event list** submenu) and is not displayed in alternating sequence 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)	→ 🖺 27
Assign behavior of diagnostic no. 160 (0776)	→ 🖺 27
Assign behavior of diagnostic no. 302 (0742)	→ 🖺 27
Assign behavior of diagnostic no. 441 (0657)	→ 🖺 28
Assign behavior of diagnostic no. 442 (0658)	→ 🖺 28
Assign behavior of diagnostic no. 443 (0659)	→ 🖺 29
Assign behavior of diagnostic no. 832 (0675)	→ 🖺 29
Assign behavior of diagnostic no. 833 (0676)	→ 🖺 29
Assign behavior of diagnostic no. 841 (0680)	→ 🖺 30
Assign behavior of diagnostic no. 842 (0638)	→ 🖺 30
Assign behavior of diagnostic no. 870 (0726)	→ 🖺 30

Assign behavior of diagnostic no. 930 (0639)	→	🖺 31
Assign behavior of diagnostic no. 931 (0640)	→	🖺 31

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	ℹ️ For a detailed description of the options available: → 🖺 26

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	ℹ️ For a detailed description of the options available: → 🖺 26

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	• Off
	• Warning
	• Logbook entry only

Factory setting	Warning

Additional information	For a detailed description of the options available: → 🗎 26

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

Navigation	🖳🖳 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 441 (0657)

Description	Use this function to change the diagnostic behavior of the **441 Current output 1 to n** diagnostic message.

Selection	• Off
	• Alarm
	• Warning
	• Logbook entry only

Factory setting	Warning

Additional information	*Selection*
	For a detailed description of the options available: → 🗎 26

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

Navigation	🖳🖳 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 442 (0658)

Prerequisite	The measuring device has a pulse/frequency/switch output.

Description	Use this function to change the diagnostic behavior of the **442 Frequency output 1 to n** diagnostic message.

Selection	• Off
	• Alarm
	• Warning
	• Logbook entry only

Factory setting	Warning

Additional information	For a detailed description of the options available: → 🗎 26

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	• Off • Alarm • Warning • Logbook entry only
Factory setting	Warning
Additional information	*Selection* ℹ️ For a detailed description of the options available: → 🖺 26

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	• Off • Alarm • Warning • Logbook entry only
Factory setting	Warning
Additional information	ℹ️ For a detailed description of the options available: → 🖺 26

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	• Off • Alarm • Warning • Logbook entry only

Factory setting   Warning

Additional information   *Selection*

                         For a detailed description of the options available: → 🖺 26

Assign behavior of diagnostic no. 841   🔒

Navigation   🔘🔲 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 841 (0680)

Description   Use this function to change the diagnostic behavior of the △S841 **Flow velocity too high** diagnostic message.

Selection   • Off
                        • Alarm
                        • Warning
                        • Logbook entry only

Factory setting   Warning

Additional information   For a detailed description of the options available: → 🖺 26

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: → 🖺 26

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	• Off
	• Alarm
	• Warning
	• Logbook entry only

Factory setting	Off

Additional information	*Selection*

    ℹ️ For a detailed description of the options available: → 🖺 26

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	• Off
	• Alarm
	• Warning
	• Logbook entry only

Factory setting	Alarm

| Additional information	ℹ️ For a detailed description of the options available: → 🖺 26

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	• Off
	• Alarm
	• Warning
	• Logbook entry only

Factory setting	Alarm

Additional information	ℹ️ For a detailed description of the options available: → 🖺 26

Assign behavior of diagnostic no. 953 (Asymmetry noise signal too high path 1 to n)   🔒

Navigation	🔲🔳 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 953 (0636)
Description	Use this function to change the diagnostic behavior of the △M953 **Asymmetry noise signal too high path 1 to n** diagnostic message.
Selection	▪ Off ▪ Alarm ▪ Warning ▪ Logbook entry only
Factory setting	Warning
Additional information	ℹ️ For a detailed description of the options available: → 🖺 26

3.1.3 "Administration" submenu

Navigation   🔲🔳 Expert → System → Administration

▶ **Administration**	
▶ Define access code	→ 🖺 32
▶ Reset access code	→ 🖺 34
Device reset (0000)	→ 🖺 35
Activate SW option (0029)	→ 🖺 35
Software option overview (0015)	→ 🖺 36

"Define access code" wizard

ℹ️ The **Define access code** wizard (→ 🖺 32) is only available when operating via the local display or Web browser.

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

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

```
▶ Define access code

                    Define access code                                        → 🖺 33

                    Confirm access code                                       → 🖺 33
```

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*

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.

🛈   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.

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

▶ Reset access code	
Operating time (0652)	→ 🖹 34
Reset access code (0024)	→ 🖹 34
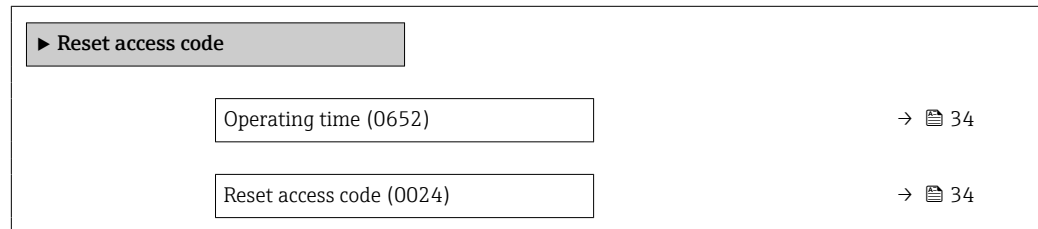
Operating time

Navigation   ⊞⊟   Expert → System → Administration → Reset acc. code → Operating time (0652)

Description   Displays the length of time the device has been in operation.

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

Additional information   *Indication*

Maximum number of days: 9 999(corresponds to approx. 27 years and 5 months)

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*

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

User entry

The reset code can only be entered via:
• Web browser
• DeviceCare, FieldCare (via CDI RJ45 interface)
• Fieldbus

Additional parameters in the "Administration" submenu

Device reset   🔒

Navigation   〖▣〗 Expert → System → Administration → Device reset (0000)

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

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

Factory setting   Cancel

Additional information   *Selection*

Options	Description
Cancel	No action is executed and the user exits the parameter.
To delivery settings	Every parameter for which a customer-specific default setting was ordered is reset to the customer-specific value. All other parameters are reset to the factory setting.
Restart device	The restart resets every parameter with data stored in volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.

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 of numbers.

---

*   Visibility depends on order options or device settings

Factory setting   Depends on the software option ordered

Additional information   *Description*

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

ℹ️ To activate a software option subsequently, please contact your Endress+Hauser sales organization.

Entering the activation code

ℹ️ 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 (→ 🖹 36).

↳ 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"

ℹ️ The software options currently enabled are displayed in the **Software option overview** parameter (→ 🖹 36).

Web browser

ℹ️ 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
                           • 4-20mA,2x pulse/freq./switch output
                           • Heartbeat Monitoring
                           • Heartbeat Verification
                           • Flow disturbance compensation

                           or

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"

"Heartbeat Verification" option and "Heartbeat Monitoring" option

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

"Flow disturbance compensation" option

This option is available by default if 2 sensor pairs have been ordered.

3.2   "Sensor" submenu

Navigation   ▣□   Expert → Sensor

```
‣ Sensor
             ‣ Measured values                    → 🖺 37

             ‣ System units                       → 🖺 45

             ‣ Measuring point 1                  → 🖺 52

             ‣ Installation status                → 🖺 62

             ‣ Process parameters                 → 🖺 64

             ‣ External compensation              → 🖺 68

             ‣ Sensor adjustment                  → 🖺 72

             ‣ Calibration                        → 🖺 76
```

3.2.1   "Measured values" submenu

Navigation   ▣□   Expert → Sensor → Measured val.

```
‣ Measured values
             ‣ Process variables                  → 🖺 38

             ‣ System values                      → 🖺 40
```

▶ Totalizer	→ 🗎 41
▶ Output values	→ 🗎 43

"Process variables" submenu

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

▶ Process variables	
Volume flow (1838)	→ 🗎 38
Mass flow (1847)	→ 🗎 38
Flow velocity (1852)	→ 🗎 39
Sound velocity (1850)	→ 🗎 39
Density (1851)	→ 🗎 39
Temperature (1853)	→ 🗎 39

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*

ℹ️   The unit is taken from the **Volume flow unit** parameter (→ 🗎 46)

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*

ℹ️   The unit is taken from the **Mass flow unit** parameter (→ 🗎 48)

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	*Dependency*

ⓘ The unit is taken from the **Velocity unit** parameter (→ 🗎 49)

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	*Dependency*

ⓘ The unit is taken from the **Velocity unit** parameter (→ 🗎 49)

Temperature

Navigation	ⓘ▣ Expert → Sensor → Measured val. → Process variab. → Temperature (1853)
Prerequisite	Temperature is not entered as a fixed value.
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 (→ 🗎 50)

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 | *Dependency* |
| | The unit is taken from the **Density unit** parameter (→ 🖺 50) |

"System values" submenu

Navigation   Expert → Sensor → Measured val. → System values

▶ System values	
Signal strength (2914)	→ 🖺 40
Signal to noise ratio (2917)	→ 🖺 40
Acceptance rate (2912)	→ 🖺 41
Turbulence (2907)	→ 🖺 41

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. , e.g. buildup 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	
Totalizer 1 to n value (0911–1 to n)	→ 🖺 42
Totalizer 1 to n overflow (0910–1 to n)	→ 🖺 42

Totalizer 1 to n value

Navigation	🗐🗒 Expert → Sensor → Measured val. → Totalizer → Tot. 1 to n value (0911–1 to n)
Description	Displays the current totalizer counter value.
User interface	Signed floating-point number
Factory setting	0 l

Totalizer 1 to n overflow   🔒

Navigation	🗐🗒 Expert → Sensor → Measured val. → Totalizer → Tot. 1 to n overflow (0910–1 to n)
Description	Displays the current totalizer overflow.
User interface	–32 000.0 to 32 000.0
Factory setting	0

"Input values" submenu

Navigation   🗐🗒 Expert → Sensor → Measured val. → Input values

```
┌─────────────────────────────────────────────────────────────────────────┐
│ ▶ Input values                                                          │
│                                                                          │
│              ┌────────────────────────────────┐                         │
│              │ Value status input (1353)       │           → 🖺 42      │
│              └────────────────────────────────┘                         │
└─────────────────────────────────────────────────────────────────────────┘
```
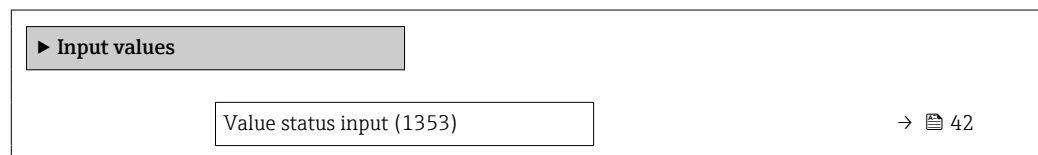
Value status input

Navigation	🗐🗒 Expert → Sensor → Measured val. → Input values → Val. status 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

▸ Output values		
Output current (0361)	→ 🖺 43	
Measured current (0366)	→ 🖺 43	
Pulse output (0456)	→ 🖺 44	
Output frequency (0471)	→ 🖺 44	
Switch state (0461)	→ 🖺 45	
Output frequency (0471)	→ 🖺 44	
Pulse output (0456)	→ 🖺 44	
Switch state (0461)	→ 🖺 45	
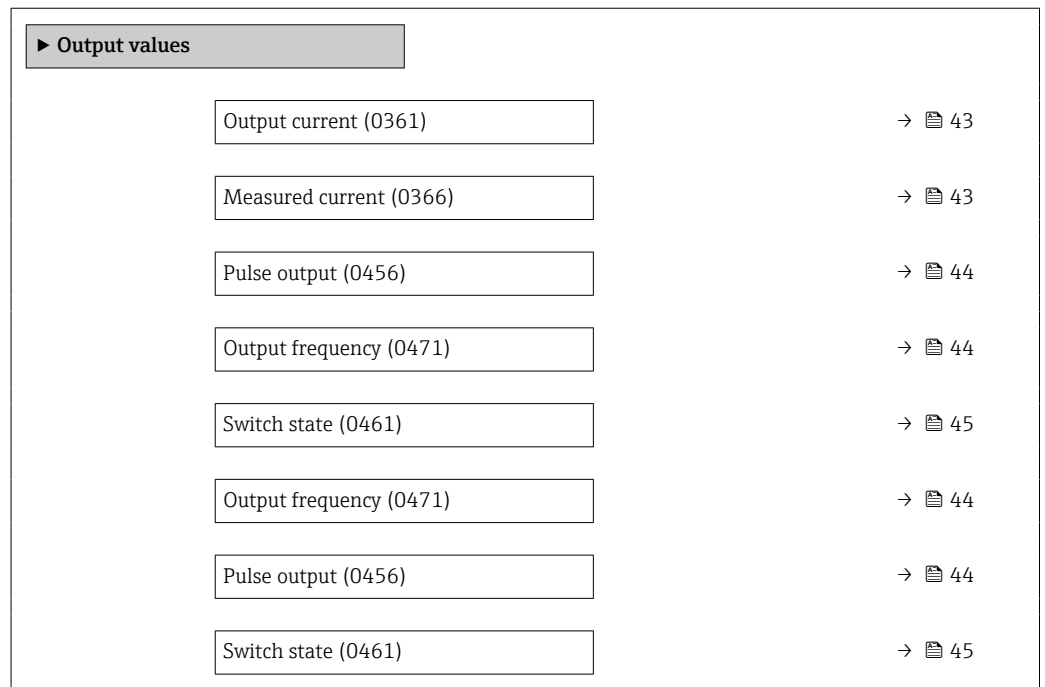
Output current

Navigation   ■□   Expert → Sensor → Measured val. → Output values → Output curr. (0361)

Description   Displays the current value currently calculated for the current output.

User interface   0 to 22.5 mA

Measured current

Navigation   ■□   Expert → Sensor → Measured val. → Output values → Measur. curr. (0366)

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 (0456)
	🎛🖳 Expert → Sensor → Measured val. → Output values → Pulse output (0456)
Prerequisite	The **Pulse** option is selected in the **Operating mode** parameter (→ 🖻 91) 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 (→ 🖻 93) and **Pulse width** parameter (→ 🖻 94) can be used to define the value (i.e. the measured value amount that corresponds to a pulse) and the duration of the pulse.

A0028726

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

The output behavior can be reversed via the **Invert output signal** parameter (→ 🖻 107) 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 (→ 🖻 95)) can be configured.

Output frequency 1 to n	

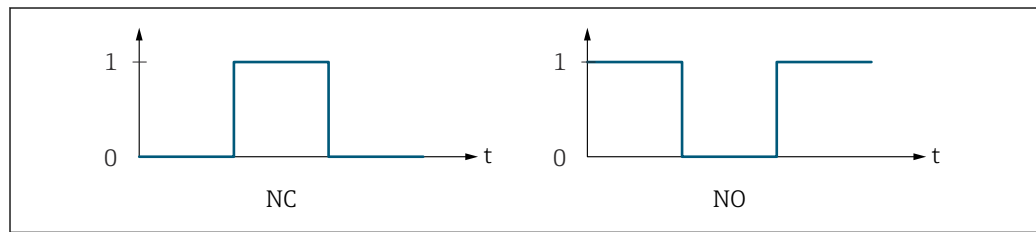|	
Navigation	🎛🖳 Expert → Sensor → Measured val. → Output values → Output freq. (0471)
	🎛🖳 Expert → Sensor → Measured val. → Output values → Output freq. (0471)
Prerequisite	In the **Operating mode** parameter (→ 🖻 91), the **Frequency** option is selected.
Description	Displays the actual value of the output frequency which is currently measured.
User interface	0.0 to 12 500.0 Hz

Switch state 1 to n	

Navigation	🔘🖥 Expert → Sensor → Measured val. → Output values → Switch state (0461)
	🔘🖥 Expert → Sensor → Measured val. → Output values → Switch state (0461)
Prerequisite	In the **Operating mode** parameter (→ 🗎 91), 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)	→ 🗎 46
Volume unit (0563)	→ 🗎 47
Mass flow unit (0554)	→ 🗎 48
Mass unit (0574)	→ 🗎 49
Velocity unit (0566)	→ 🗎 49
Temperature unit (0557)	→ 🗎 50
Density unit (0555)	→ 🗎 50
Kinematic viscosity unit (0578)	→ 🗎 51
Length unit (0551)	→ 🗎 51
Date/time format (2812)	→ 🗎 51

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
- cm³/s
- cm³/min
- cm³/h
- cm³/d
- dm³/s
- dm³/min
- dm³/h
- dm³/d
- m³/s
- m³/min
- m³/h
- m³/d
- ml/s
- ml/min
- ml/h
- ml/d
- l/s
- l/min
- l/h
- l/d
- hl/s
- hl/min
- hl/h
- hl/d
- Ml/s
- Ml/min
- Ml/h
- Ml/d
- af/s
- af/min
- af/h
- af/d
- ft³/s
- ft³/min
- ft³/h
- ft³/d
- Mft³/s
- Mft³/min
- Mft³/h
- Mft³/d
- fl oz/s (us)
- fl oz/min (us)
- fl oz/h (us)
- fl oz/d (us)
- gal/s (us)
- gal/min (us)
- gal/h (us)
- gal/d (us)
- Mgal/s (us)
- Mgal/min (us)
- Mgal/h (us)
- Mgal/d (us)

- bbl/s (us;liq.)
- bbl/min (us;liq.)
- bbl/h (us;liq.)
- bbl/d (us;liq.)
- bbl/s (us;beer)
- bbl/min (us;beer)
- bbl/h (us;beer)
- bbl/d (us;beer)
- bbl/s (us;oil)
- bbl/min (us;oil)
- bbl/h (us;oil)
- bbl/d (us;oil)
- bbl/s (us;tank)
- bbl/min (us;tank)
- bbl/h (us;tank)
- bbl/d (us;tank)
- gal/s (imp)
- gal/min (imp)
- gal/h (imp)
- gal/d (imp)
- Mgal/s (imp)
- Mgal/min (imp)
- Mgal/h (imp)
- Mgal/d (imp)
- bbl/s (imp;beer)
- bbl/min (imp;beer)
- bbl/h (imp;beer)
- bbl/d (imp;beer)
- bbl/s (imp;oil)
- bbl/min (imp;oil)
- bbl/h (imp;oil)
- bbl/d (imp;oil)
- kgal/s (us)
- kgal/min (us)
- kgal/h (us)
- kgal/d (us)

Factory setting   Country-specific:
- m³/h
- ft³/min

Additional information   *Result*

The selected unit applies to:
Volume flow parameter (→ 🖺 38)

Selection

ℹ️ For an explanation of the abbreviated units: → 🖺 172

Volume unit   🔒

Navigation   🖩🖳 Expert → Sensor → System units → Volume unit (0563)

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

Selection	• cm³
	• dm³
	• m³
	• ml
	• l
	• hl
	• Ml
	• af
	• ft³
	• Mft³
	• fl oz (us)
	• gal (us)
	• kgal (us)
	• Mgal (us)
	• bbl (us;oil)
	• bbl (us;liq.)
	• bbl (us;beer)
	• bbl (us;tank)
	• 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: → 🖹 172

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*	*US units*
	• g/s	• oz/s
	• g/min	• oz/min
	• g/h	• oz/h
	• g/d	• oz/d
	• kg/s	• lb/s
	• kg/min	• lb/min
	• kg/h	• lb/h
	• kg/d	• lb/d
	• t/s	• STon/s
	• t/min	• STon/min
	• t/h	• STon/h
	• t/d	• STon/d

Factory setting	Country-specific:
	• kg/h
	• lb/min

Additional information	*Result*
	The selected unit applies to: **Mass flow** parameter
	Selection
	For an explanation of the abbreviated units: → 172

Mass unit

Navigation	Expert → Sensor → System units → Mass unit (0574)
Description	Use this function to select the unit for the mass.
Selection	*SI units* *US units*
	g • oz
	• kg • lb
	• t • STon
Factory setting	Country-specific: • kg • lb
Additional information	*Selection*
	For an explanation of the abbreviated units: → 172

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* *US units*
	m/s ft/s
Factory setting	Depends on country: • m/s • ft/s
Additional information	*Effect*
	The selected unit applies to: • Flow velocity (→ 39) • Sound velocity (→ 39)
	Options
	For an explanation of the abbreviated units: → 172

Temperature unit	🔒

Navigation	🔘🖥 Expert → Sensor → System units → Temperature unit (0557)
Description	Use this function to select the unit for the temperature.

Selection	*SI units*	*US units*
	▪ ℃	▪ ℉
	▪ K	▪ °R

Factory setting	Country-specific: ▪ ℃ ▪ ℉

Additional information	*Result*
	The selected unit applies to: ▪ Temperature (→ 🖻 39) ▪ Electronic temperature ▪ External temperature ▪ Reference temperature
	Selection
	ℹ️ For an explanation of the abbreviated units: → 🖻 172

Density unit	🔒

Navigation	🔘🖥 Expert → Sensor → System units → Density unit (0555)
Description	Use this function to select the unit for the density.

Selection	*SI units*	*US units*	*Imperial units*
	▪ g/cm³	▪ lb/ft³	▪ lb/gal (imp)
	▪ g/m³	▪ lb/gal (us)	▪ lb/bbl (imp;beer)
	▪ kg/l	▪ lb/bbl (us;liq.)	▪ lb/bbl (imp;oil)
	▪ kg/dm³	▪ lb/bbl (us;beer)	
	▪ kg/m³	▪ lb/bbl (us;oil)	
	▪ SD4℃	▪ lb/bbl (us;tank)	
	▪ SD15℃		
	▪ SD20℃		
	▪ SG4℃		
	▪ SG15℃		
	▪ SG20℃		

Factory setting	Country-specific: ▪ kg/dm³ ▪ lb/ft³

Additional information	*Selection*
	ℹ️ For an explanation of the abbreviated units: → 🖻 172

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 • St • mm²/s • m²/s

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 of.

Selection	*SI units* • m • mm	*US units* • ft • in

Factory setting	Country-specific: • mm • in

Additional information	*Selection*

ℹ️ For an explanation of the abbreviated units: → 🔖 172

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   *Options*

     For an explanation of the abbreviated units: → 🖺 172

3.2.3   "Measuring point " submenu

Navigation   🔘🖳   Expert → Sensor → Meas. point

▶ Measuring point 1		
Measuring point configuration (5675–1)	→ 🖺	53
Medium (2926–1)	→ 🖺	53
Medium temperature (3053–1)	→ 🖺	54
Sound velocity (2929–1)	→ 🖺	54
Viscosity (2932–1)	→ 🖺	54
Pipe material (2927–1)	→ 🖺	55
Pipe sound velocity (2933–1)	→ 🖺	55
Pipe dimensions (2943–1)	→ 🖺	55
Pipe circumference (2934–1)	→ 🖺	56
Pipe outer diameter (2910–1)	→ 🖺	56
Pipe wall thickness (2916–1)	→ 🖺	56
Liner material (2928–1)	→ 🖺	56
Liner sound velocity (2936–1)	→ 🖺	57
Liner thickness (2935–1)	→ 🖺	57
Sensor type (2924–1)	→ 🖺	57
Signal filter (3011–1)	→ 🖺	58
Sensor coupling (2957–1)	→ 🖺	58
Mounting type (2938–1)	→ 🖺	58

Cable length (2939–1)	→ 🖹	59
FlowDC inlet configuration (3049–1)	→ 🖹	59
Intermediate pipe length (2945–1)	→ 🖹	60
Inlet diameter (3054–1)	→ 🖹	60
Transition length (3065–1)	→ 🖹	60
Inlet run (3050–1)	→ 🖹	61
Relative sensor position (2985–1)	→ 🖹	61
Result sensor type / mounting type (2946–1)	→ 🖹	61
Result sensor distance / measuring aid (2947–1)	→ 🖹	62

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	• 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

Medium   🔒

Navigation	🖩🖳 Expert → Sensor → Meas. point 1 → Medium (2926–1)
Description	Select the medium.
Selection	• Water • Sea water • Distilled water • Ammonia NH3 • Benzene • Ethanol • Glycol

_____

* Visibility depends on order options or device settings

• Milk
• Methanol
• User-specific liquid

Factory setting   Water

Medium temperature

Navigation	🔱🖳 Expert → Sensor → Meas. point 1 → Medium temp. (3053–1)
Description	Enter the medium temperature for the installation.
User entry	–200 to 550 °C
Factory setting	20 °C

Sound velocity

Navigation	🔱🖳 Expert → Sensor → Meas. point 1 → Sound velocity (2929–1)
Prerequisite	The **User-specific liquid** option is selected in **Medium** parameter (→ 🗎 53).
Description	Enter the sound velocity of the medium.

ℹ️ If the sound velocity is not known, it can be determined with the following tools:
   • Endress+Hauser sound velocity sensor sets
   • Prosonic Flow 93T with sound velocity sensors
   • Iterative measurement of sound velocity and distance adjustment of sensor distance using flow sensors

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 **Medium** parameter (→ 🗎 53).
Description	Enter medium viscosity at installation temperature.
User entry	0.01 to 10 000 mm²/s
Factory setting	1 mm²/s

Pipe material	🔒

Navigation	🖮🖳 Expert → Sensor → Meas. point 1 → Pipe material (2927–1)
Description	Select pipe material.
Selection	• Carbon steel • Ductile cast iron • Stainless steel • 1.4301 (UNS S30400) • 1.4401 (UNS S31600) • 1.4550 (UNS S34700) • Hastelloy C • PVC • PE • LDPE • HDPE • GRP • PVDF • PA • PP • PTFE • Pyrex glass • Asbestos cement • Copper • Unknown pipe material
Factory setting	Stainless steel

Pipe sound velocity	🔒

Navigation	🖮🖳 Expert → Sensor → Meas. point 1 → Pipe sound vel. (2933–1)
Prerequisite	The **Unknown pipe material** option is selected in the **Pipe material** parameter (→ 🖺 55).
Description	Enter sound velocity of pipe material.
User entry	800.0 to 3 800.0 m/s
Factory setting	3 120.0 m/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	• 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 (→ 📄 55).

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 **Pipe dimensions** parameter (→ 📄 55).

Description   Define the outer diameter of the pipe.

User entry   0 to 20 000 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 material   🔒

Navigation   🔢🖥 Expert → Sensor → Meas. point 1 → Liner material (2928–1)

Description   Select liner material.

Selection	• None • Cement • Rubber • Epoxy resin • Unknown liner material

Factory setting   None

Liner sound velocity

Navigation   🖩🖳 Expert → Sensor → Meas. point 1 → Liner sound vel. (2936–1)

Prerequisite   The **Unknown liner material** option is selected in the **Liner material** parameter
                        (→ 🖺 56).

Description   Define the sound velocity of liner material.

User entry   800.0 to 3 800.0 m/s

Factory setting   2 400.0 m/s

Liner thickness

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

Prerequisite   One of the following options is selected in the **Liner material** parameter (→ 🖺 56):
                        • Cement
                        • Rubber
                        • Epoxy resin
                        • Unknown liner material

Description   Define the thickness of liner.

User entry   0 to 100 mm

Factory setting   0 mm

Sensor type

Navigation   🖩🖳 Expert → Sensor → Meas. point 1 → Sensor type (2924–1)

Description   Select sensor type.

Selection   • C-030-A
                        • C-050-A
                        • C-100-A
                        • C-100-B

- C-100-C
- C-200-A
- C-200-B
- C-200-C
- C-500-A

Factory setting   As per order

Signal filter   🔒

Navigation	🖩🖳 Expert → Sensor → Meas. point 1 → Signal filter (3011–1)

Description   Switch the signal filter on or off. The signal filter is an adaptive filter that is applied to the raw flow signal.

Selection   • Off
                   • On

Factory setting   On

Sensor coupling   🔒

Navigation	🖩🖳 Expert → Sensor → Meas. point 1 → Sensor coupling (2957–1)

Prerequisite   The following option is selected in **Sensor type** parameter (→ 🖺 57):
                   • C-030-A
                   • C-050-A
                   • C-100-A
                   • C-100-B
                   • C-100-C
                   • C-200-A
                   • C-200-B
                   • C-200-C
                   • C-500-A

Description   Select coupling medium.

Selection   • Coupling pad
                   • Coupling paste

Factory setting   Coupling pad

Mounting type   🔒

Navigation	🖩🖳 Expert → Sensor → Meas. point 1 → Mounting type (2938–1)

Description   Select the number of traverses (number of times the signal passes through the medium).

Selection	• 1 traverse
	• 2 traverses
	• 3 traverses
	• 4 traverses
	• Automatic

Factory setting	2 traverses

Additional information	*Options*

- 1 traverse
  The signal traverses the medium directly from one sensor to another.
- 2 traverses
  The signal traverses the medium twice. The sensors are mounted on the same side of the pipe and the signal is reflected once before it reaches the second transducer.
- 3 traverses
  The signal traverses the medium three times. The sensors are mounted on the opposite side of the pipe and the signal is reflected twice before it reaches the second transducer.
- 4 traverses
  The signal traverses the medium four times. The sensors are mounted on the same side of the pipe and the signal is reflected three times before it reaches the second transducer.
- Automatic

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

FlowDC inlet configuration   🔒

Navigation	🔘🔲 Expert → Sensor → Meas. point 1 → FlowDC inl. conf (3049–1)

Prerequisite	The **1 measuring point - 2 signal paths** option is selected in **Measuring point configuration** parameter (→ 🔖 53).

Description	Select FlowDC inlet configuration.

Selection	• Off
	• Single elbow
	• Double elbow
	• Double elbow 3D
	• 45° bend

- 2 x 45˚ bend
- Concentric diameter change
- Other *

Factory setting   Off

Intermediate pipe length   🔒

Navigation   ⊞⊟ Expert → Sensor → Meas. point 1 → Interm. pipe l. (2945–1)

Prerequisite   The **1 measuring point - 2 signal paths** option is selected in **Measuring point configuration** parameter (→ 🖹 53).

Description   Enter the length of the intermediate pipe between the two bends.

User entry   Positive floating-point number

Factory setting   0 mm

Inlet diameter   🔒

Navigation   ⊞⊟ Expert → Sensor → Meas. point 1 → Inlet diameter (3054–1)

Prerequisite   • The **1 measuring point - 2 signal paths** option is selected in the **Measuring point configuration** parameter (→ 🖹 53).
                         • The **Concentric diameter change** option is selected in the **Inlet configuration** parameter (→ 🖹 59).

Description   Enter the outer diameter of the pipe before the cross-section change. For convenience, the same measuring pipe wall thickness as for the clamp-on system is applied.

User entry   1 to 10 000 mm

Factory setting   88.9 mm

Transition length   🔒

Navigation   ⊞⊟ Expert → Sensor → Meas. point 1 → Transit. length (3065–1)

Prerequisite   • In the **Measuring point configuration** parameter (→ 🖹 53), the **1 measuring point - 2 signal paths** option is selected.
                         • In the **Inlet configuration** parameter (→ 🖹 59), the **Concentric diameter change** option is selected.

---

* Visibility depends on order options or device settings

Description	Enter the length of the concentric change in diameter .
User entry	0 to 20 000 mm
Factory setting	0 mm

Inlet run

Navigation	Expert → Sensor → Meas. point 1 → Inlet run (3050–1)
Prerequisite	The **1 measuring point - 2 signal paths** option is selected in **Measuring point configuration** parameter (→ 🖺 53).
Description	Enter length of the available straight inlet run.
User entry	0 to 300 000 mm
Factory setting	0 mm

Relative sensor position

Navigation	Expert → Sensor → Meas. point 1 → Rel. sensor pos. (2985–1)
Prerequisite	The **1 measuring point - 2 signal paths** option is selected in the **Measuring point configuration** parameter (→ 🖺 53) and the **Off** option is not selected in **FlowDC inlet configuration** parameter (→ 🖺 59).
Description	Shows the correct position for the sensor.
User interface	• 90° • 180°

Result sensor type / mounting type

Navigation	Expert → Sensor → Meas. point 1 → Sensor/mounting (2946–1)
Description	Shows the selected sensor type and (if applicable automatically) selected mounting type.
User interface	e.g. **C-100-A** option / **(2) V-mounting** option

---

Result sensor distance / measuring aid

Navigation   @ ≋ Expert → Sensor → Meas. point 1 → Dist./meas. aid (2947–1)

Description   Shows the calculated sensor distance and vernier or wire length (if applicable) required for installation.

User interface   e.g. 201.3 mm / B 21

3.2.4   "Installation status" submenu

Navigation   @ ≋   Expert → Sensor → Install. status

▶ Installation status	
Installation status (2958)	→ 🖹 62
Signal strength (2914)	→ 🖹 63
Signal to noise ratio (2917)	→ 🖹 63
Sound velocity (2915)	→ 🖹 63
Sound velocity deviation (2986)	→ 🖹 64

Installation status

Navigation   @ ≋ Expert → Sensor → Install. status → Install. status (2958)

Description   Displays the device status after installation according to the displayed measured values.
- **Good** option: No further optimization required
  Signal strength > 40 dB, SNR > 35, sound velocity deviation (measured to expected) < 2%
- **Acceptable** option: Measuring performance ok, optimize if possible. You should always aim for the status **Good** option.
  Signal strength > 25 dB, SNR > 35, sound velocity deviation (measured to expected) < 3%
- **Bad** option: Optimization is required. Poor and unstable measuring performance.

🛈 Check the following points to optimize the sensor installation:
- Number of traverses, change if necessary (e.g. from 2 traverses to 1 traverse)
- Sensor distance
- Alignment of sensors
- Sufficient coupling medium available (coupling pad or coupling gel)
- Check the measuring point parameters in the configuration

User interface	• Good
	• Acceptable
	• Bad

Factory setting	Good

Signal strength

Navigation	ᘖᗃ Expert → Sensor → Install. status → 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. , e.g. buildup 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	ᘖᗃ Expert → Sensor → Install. status → 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.

Sound velocity

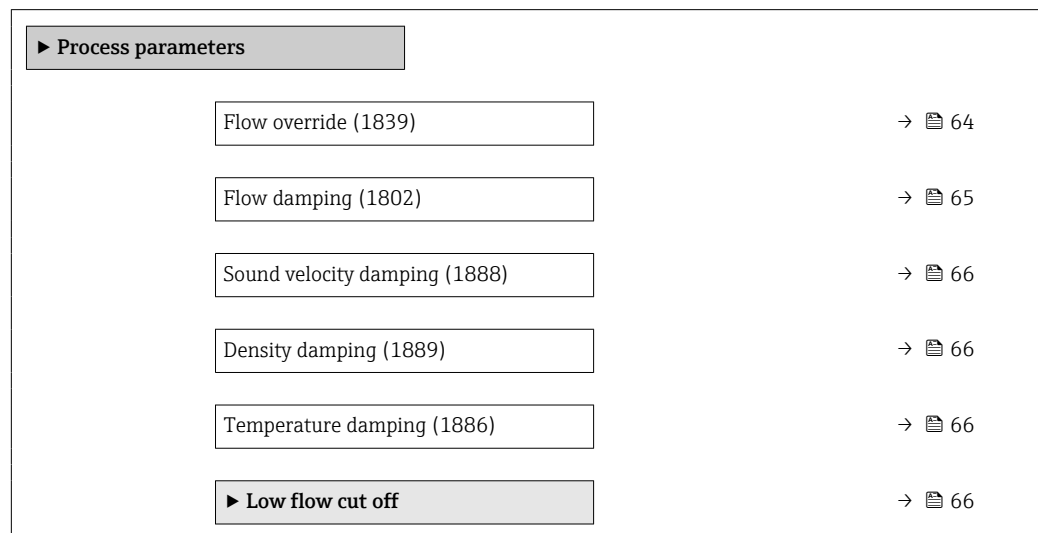| Navigation	ᘖᗃ Expert → Sensor → Install. status → Sound velocity (2915)
Description	Displays the sound velocity that is currently measured.
	The difference between the configured sound velocity and the measured sound velocity should not be > 2%.
User interface	Signed floating-point number

Sound velocity deviation

Navigation   @@ Expert → Sensor → Install. status → SoundVelocDeviat (2986)

Description   Shows the deviation of the installation sound velocity from the measured sound velocity.

User interface   Signed floating-point number

Factory setting   0 %

3.2.5 "Process parameters" submenu

Navigation   @@ Expert → Sensor → Process param.

▶ Process parameters	
Flow override (1839)	→ 🖺 64
Flow damping (1802)	→ 🖺 65
Sound velocity damping (1888)	→ 🖺 66
Density damping (1889)	→ 🖺 66
Temperature damping (1886)	→ 🖺 66
▶ Low flow cut off	→ 🖺 66

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*

ℹ 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

ℹ The **Flow override** option can also be activated in the **Status input** submenu: **Assign status input** parameter.

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*

ℹ The damping is performed by a PT1 element [2].

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

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

Effect

ℹ The damping affects the following variables of the device:
- Outputs
- Low flow cut off → 🕮 66
- Totalizers → 🕮 124

---

2)   Proportional behavior with first-order lag

Sound velocity damping

Navigation	圓圖 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

Density damping

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

▶ Low flow cut off	
Assign process variable (1837)	→ 🖻 67

On value low flow cutoff (1805)	→ 🗎 67
Off value low flow cutoff (1804)	→ 🗎 67

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 → 🗎 67.
User entry	Positive floating-point number
Factory setting	0.3 m/s
Additional information	*Dependency*

ℹ 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→ 🗎 67.
User entry	0 to 100.0 %

Factory setting   50 %

Additional information   *Example*

A0012887
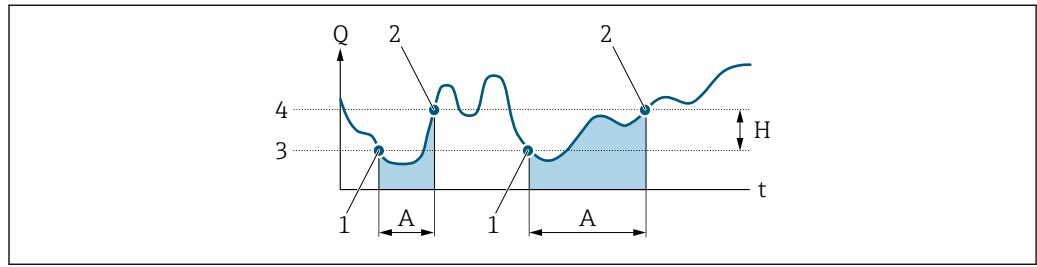
Q   *Flow*
t   *Time*
H   *Hysteresis*
A   *Low flow cut off active*
1   *Low flow cut off is activated*
2   *Low flow cut off is deactivated*
3   *On value entered*
4   *Off value entered*

3.2.6   "External compensation" submenu

Navigation   ▣▤   Expert → Sensor → External comp.

► **External compensation**	
Temperature compensation (3025)	→ 🕮 69
External value (3058)	→ 🕮 69
Fixed value (2925)	→ 🕮 69
Density source (3048)	→ 🕮 69
External value (3060)	→ 🕮 70
Fixed density (3171)	→ 🕮 70
Linear expansion coefficient (3153)	→ 🕮 70
Square expansion coefficient (3172)	→ 🕮 71
Fixed reference density (3178)	→ 🕮 71
Reference temperature (3147)	→ 🕮 71

Temperature compensation	🔒

Navigation	🆔🖥 Expert → Sensor → External comp. → Temp. compensat. (3025)
Prerequisite	The **Calculated value** option is selected in the **Density source** parameter (→ 🖹 69).
Description	Select temperature mode for temperature compensation.
Selection	• Fixed value • External value
Factory setting	Fixed value

Fixed value	🔒

Navigation	🆔🖥 Expert → Sensor → External comp. → Fixed value (2925)
Prerequisite	The **Fixed value** option is selected in **Temperature compensation** parameter (→ 🖹 69).
Description	Enter a fixed value for the process temperature.
User entry	−50 to 550 ℃
Factory setting	20 ℃

External value	

Navigation	🆔🖥 Expert → Sensor → External comp. → External value (3058)
Description	Shows the process temperature read from the external device.
User entry	−273.15 to 99 999 ℃
Factory setting	–

Density source	🔒

Navigation	🆔🖥 Expert → Sensor → External comp. → Density source (3048)
Description	Select the density source for the mass calculation.
Selection	• Fixed value • External density • Calculated value

Factory setting	Fixed value

External value

Navigation	⌨▤ Expert → Sensor → External comp. → External value (3060)
Prerequisite	The **External density** option is selected in the **Density source** parameter (→ 🖹 69).
Description	Shows the density read from the external device.
User entry	Positive floating-point number
Factory setting	0 kg/m³

Fixed density

Navigation	⌨▤ Expert → Sensor → External comp. → Fixed density (3171)
Prerequisite	The **Fixed density** option is selected in the **Density source** parameter (→ 🖹 69).
Description	Enter fixed value for medium density.
User entry	0.01 to 15 000 kg/m³
Factory setting	1 000 kg/m³

Linear expansion coefficient

Navigation	⌨▤ Expert → Sensor → External comp. → Linear exp coeff (3153)
Prerequisite	The **Calculated value** option is selected in the **Density source** parameter (→ 🖹 69).
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 (→ 🗎 69).
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 (→ 🗎 69).
Description	Use this function to enter a fixed value for the reference density.
User entry	0.01 to 15 000 kg/m³
Factory setting	1 000 kg/m³
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 (→ 🗎 69)
- 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 (→ 🗎 69).
Description	Enter the reference temperature at which the reference density applies.
User entry	−200 to 450 °C

Factory setting　　　　20 ℃

3.2.7　"Sensor adjustment" submenu

Navigation　　　　　�@🔲　Expert → Sensor → Sensor adjustm.

```
▶ Sensor adjustment

                    Installation direction (1809)                    → 🔖 72

                    ▶ Process variable adjustment                    → 🔖 72
```

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

```
▶ Process variable adjustment

                    Volume flow offset (1831)                    → 🔖 73

                    Volume flow factor (1832)                    → 🔖 73

                    Mass flow offset (1841)                      → 🔖 74

                    Mass flow factor (1846)                      → 🔖 74

                    Sound velocity offset (1848)                 → 🔖 74

                    Sound velocity factor (1849)                 → 🔖 75
```

Density offset (1866)	→ 🗏 75
Density factor (1867)	→ 🗏 75
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	⌂

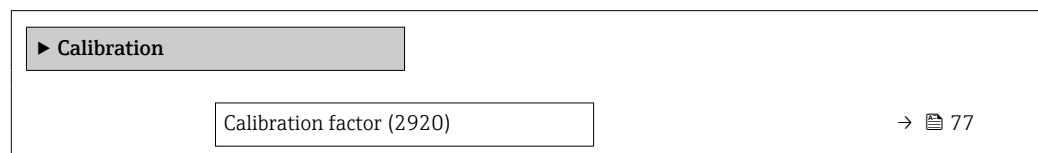| Navigation	⌂⊟ Expert → Sensor → Sensor adjustm. → Variable adjust → Mass flow factor (1846)
Description	Use this function to enter a quantity factor (without time) for the mass flow. This multiplication factor is applied over the mass flow range.
User entry	Positive floating-point number
Factory setting	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*
	ℹ️ Corrected value = (factor × value) + offset

Density offset 🔒

Navigation	🖲🖵 Expert → Sensor → Sensor adjustm. → Variable adjust → Density offset (1866)
Description	Use this function to enter the zero point shift for the energy flow trim. The energy flow unit on which the shift is based is 1 W.
User entry	Signed floating-point number
Factory setting	0 kg/m³
Additional information	*Description*
	ℹ️ Corrected value = (factor × value) + offset

Density factor 🔒

Navigation	🖲🖵 Expert → Sensor → Sensor adjustm. → Variable adjust → Density factor (1867)
Description	Use this function to enter a quantity factor (without time) for the energy flow. This multiplication factor is applied over the energy flow range.
User entry	Positive floating-point number
Factory setting	1
Additional information	*Description*
	ℹ️ 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 (→ 🖻 69) and the **External value** option is selected in the **Temperature compensation** parameter (→ 🖻 69).

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*

                                        ℹ 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 (→ 🖻 69) and the **External value** option is selected in the **Temperature compensation** parameter (→ 🖻 69).

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*

                                        ℹ Corrected value = (factor × value) + offset

3.2.8   "Calibration" submenu

Navigation   🔊🖥 Expert → Sensor → Calibration

▸ **Calibration**	
Calibration factor (2920)	→ 🖻 77

Zero point (2921)	→ 🖹 77
Nominal diameter (2807)	→ 🖹 77

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   "Output" submenu

Navigation   🎛🖥 Expert → Output

▶ Output

▶ **Current output 1**	→ 🖹 78
▶ **Pulse/frequency/switch output 1 to n**	→ 🖹 90

3.3.1   "Current output 1" submenu

Navigation   🔞🖳   Expert → Output → Curr.output 1

▶ Current output 1	
Process variable current output (0359–1)	→ 🖹 78
Current range output (0353–1)	→ 🖹 79
Fixed current (0365–1)	→ 🖹 80
Lower range value output (0367–1)	→ 🖹 80
Upper range value output (0372–1)	→ 🖹 82
Measuring mode current output (0351–1)	→ 🖹 83
Damping current output (0363–1)	→ 🖹 87
Failure behavior current output (0364–1)	→ 🖹 88
Failure current (0352–1)	→ 🖹 89
Output current (0361–1)	→ 🖹 89
Measured current (0366–1)	→ 🖹 90

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   • Off [*]
                         • Volume flow
                         • Mass flow

---

[*]   Visibility depends on order options or device settings

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

Factory setting	Volume flow

Current range output	🔒

Navigation	🔢🔲 Expert → Output → Curr.output 1 → Curr.range out (0353–1)

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

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

Factory setting	Depends on country: • 4...20 mA NE (3.8...20.5 mA) • 4...20 mA US (3.9...20.8 mA)

Additional information	*Description*

ℹ️ • In the event of a device alarm, the current output adopts the value specified in the **Failure mode** parameter (→ 🔲 88).
   • 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 (→ 🔲 80) and **20 mA value** parameter (→ 🔲 82).

"Fixed current" option

The current value is set via the **Fixed current** parameter (→ 🔲 80).

Example

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

---

*   Visibility depends on order options or device settings
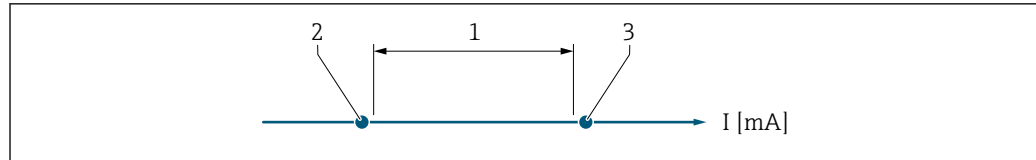
1   Current range for process value
2   Lower level for signal on alarm
3   Upper level for signal on alarm

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 (→ 🖻 79).

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   In **Current span** parameter (→ 🖻 79), 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 0/4 mA current.

User entry   Signed floating-point number

Factory setting   Depends on country:
- m³/h
- ft³/h

Additional information   *Description*

Positive and negative values are permitted depending on the process variable assigned in the **Assign current output** parameter (→ �'78). 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 (→ �'82).

Dependency

ℹ️   The unit depends on the process variable selected in the **Assign current output** parameter (→ �'78).

Current output behavior

The current output behaves differently depending on the settings configured in the following parameters:
- Current span (→ �'79)
- Measuring mode (→ �'83)
- Failure mode (→ �'88)

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 (→ �'80) = not equal to zero flow (e.g. −250 m³/h)
- **20 mA value** parameter (→ 🖑82) = not equal to zero flow (e.g. +750 m³/h)
- Calculated current value = 8 mA at zero flow
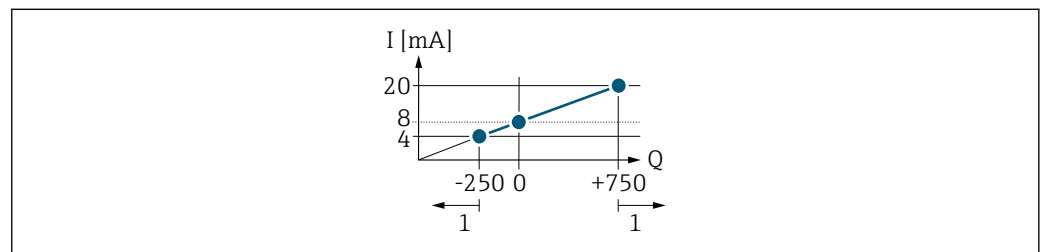
Q   Flow
I   Current
1   Measuring range is exceeded or undershot

The operational range of the measuring device is defined by the values entered for the **0/4 mA value** parameter (→ 🖑80) and **20 mA value** parameter (→ 🖑82). If the effective flow exceeds or falls below this operational range, the ⚠️**S441 Current output 1** diagnostic message is output.

Configuration example B
Measurement mode with **Forward/Reverse flow** option
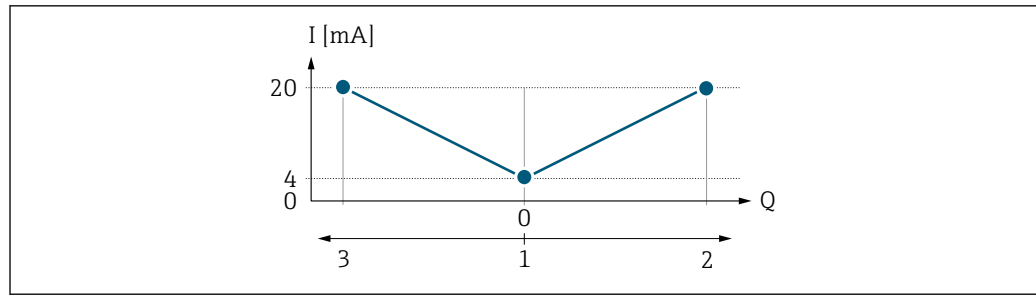
A0013758

I   *Current*
Q   *Flow*
1   *Value assigned to 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 (→ 🖩 80) and **20 mA value** parameter (→ 🖩 82) must have the same algebraic sign. The value for the **20 mA value** parameter (→ 🖩 82) (e.g. reverse flow) corresponds to the mirrored value for the **20 mA value** parameter (→ 🖩 82) (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 → 🖩 83.

Upper range value output	🔒

Navigation	🔢🖥 Expert → Output → Curr.output 1 → Upp.range outp (0372–1)
Prerequisite	In **Current span** parameter (→ 🖩 79), 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 (→ 🖩 78). 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 (→ 🖺 80).

Dependency

The unit depends on the process variable selected in the **Assign current output** parameter (→ 🖺 78).

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 (→ 🖺 83), different algebraic signs cannot be entered for the values for the **0/4 mA value** parameter (→ 🖺 80) and **Upper range value output** parameter (→ 🖺 82). The ⚠S441 **Current output 1** diagnostic message is displayed.

Configuration examples

Observe the configuration examples for the **0/4 mA value** parameter (→ 🖺 80).

Measuring mode current output	🔒

Navigation	🔘🖳 Expert → Output → Curr.output 1 → Output mode (0351–1)
Prerequisite	One of the following options is selected in the **Current span** parameter (→ 🖺 79): • 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 (→ 🖺 78) 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 m³/h
- 20 mA current value = 10 m³/h

"Forward/Reverse flow" option
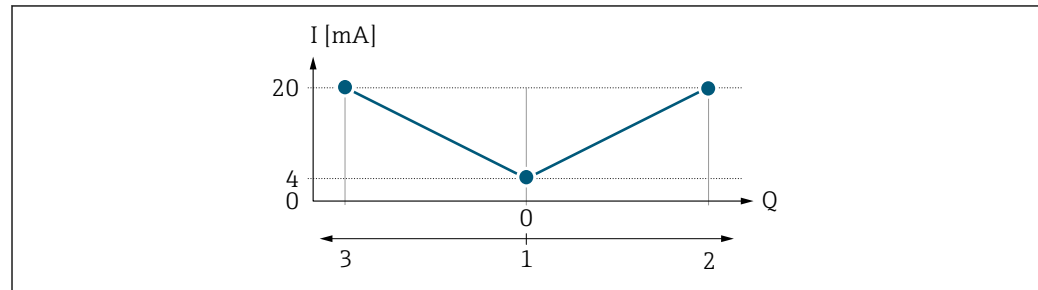
A0013758

I   Current
Q   Flow
1   Value assigned to 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 (→ 🖺 80) and **20 mA value** parameter (→ 🖺 82) must have the same sign.
- The value for the **20 mA value** parameter (→ 🖺 82) (e.g. reverse flow) corresponds to the mirrored value for the **20 mA value** parameter (→ 🖺 82) (e.g. forward flow).

"Reverse flow compensation" option

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

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

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

Examples of how the current output behaves

Example 1

Defined measuring range: lower range value and upper range value with the **same** sign
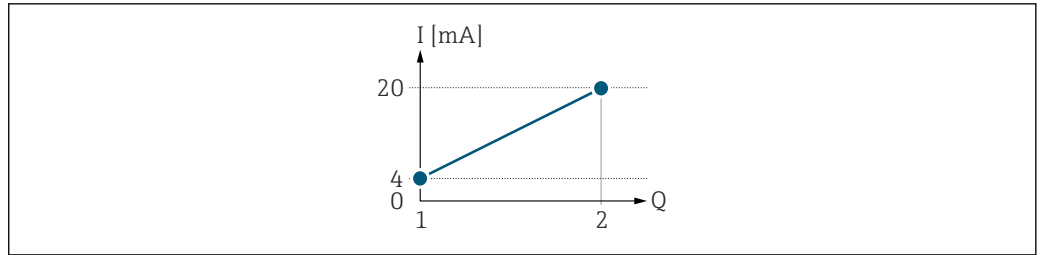
⊠ 3   Measuring range

I   Current
Q   Flow
1   Lower range value (Value assigned to 0/4 mA current)
2   Upper range value (end of measuring range output)

With the following flow response:
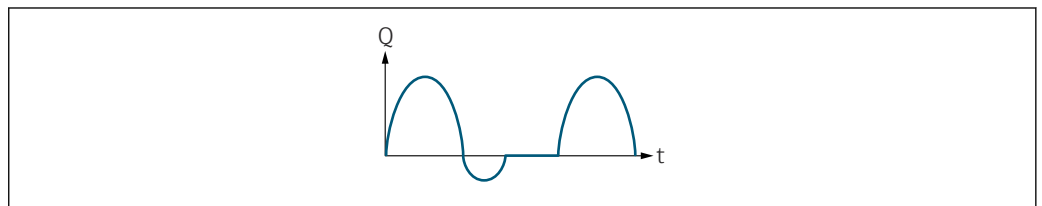
⊠ 4   Flow response

Q   Flow
t   Time

With **Forward flow** option

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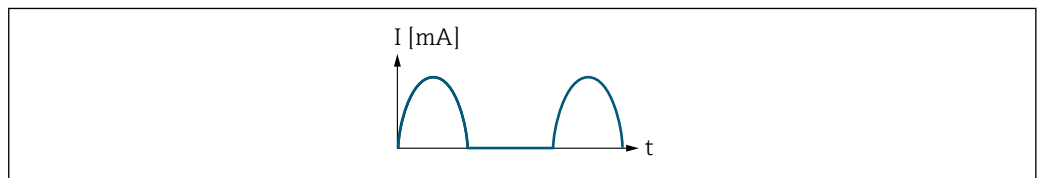
I   Current
t   Time

With **Forward/Reverse flow** option

The current output signal is independent of the direction of flow.
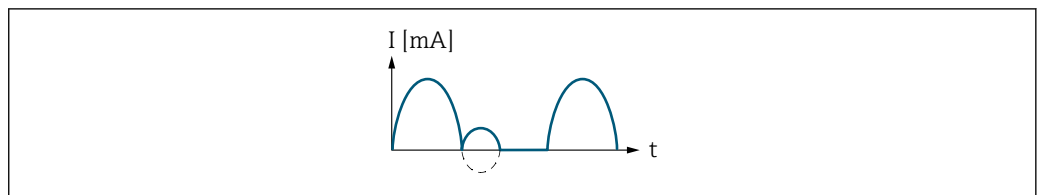
I   Current
t   Time

With **Reverse flow compensation** option

Flow components outside the measuring span are buffered, balanced and output after a maximum delay of 60 s.
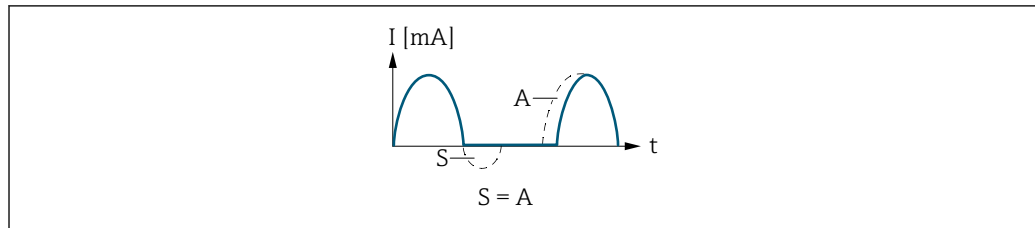
I   *Current*
t   *Time*
S   *Flow components saved*
A   *Balancing of saved flow components*

Example 2

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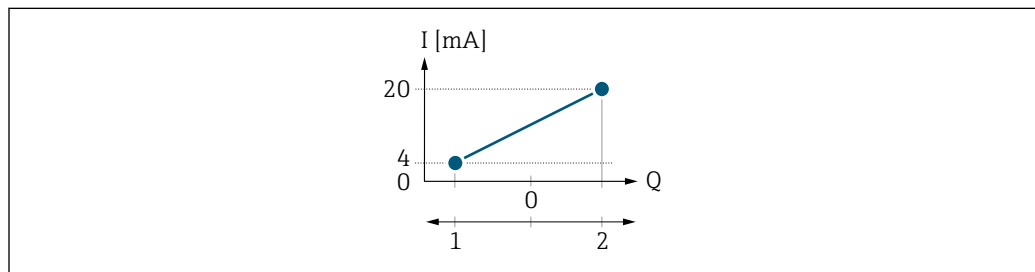
🖾 *5*   *Measuring range*

I   *Current*
Q   *Flow*
1   *Lower range value (Value assigned to 0/4 mA current)*
2   *Upper range value (end of measuring range output)*

With flow a (—) outside, b (- -) inside the measuring range
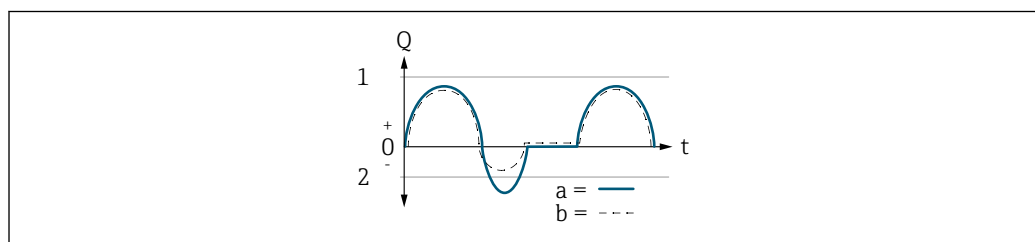
Q   *Flow*
t   *Time*
1   *Lower range value (Value assigned to 0/4 mA current)*
2   *Upper range value (end of measuring range output)*

With **Forward flow** option

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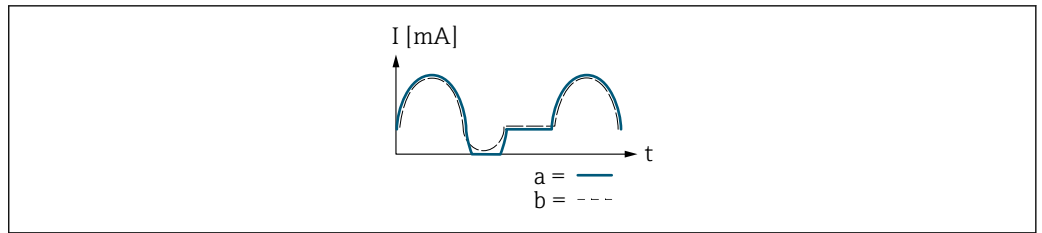
I   Current
t   Time

With Forward/Reverse flow option

This option cannot be selected here since the values for the **0/4 mA value** parameter
(→ 🖺 80) and **20 mA value** parameter (→ 🖺 82) have different signs.

With Reverse flow compensation option

Flow components outside the measuring span are buffered, balanced and output after a
maximum delay of 60 s.
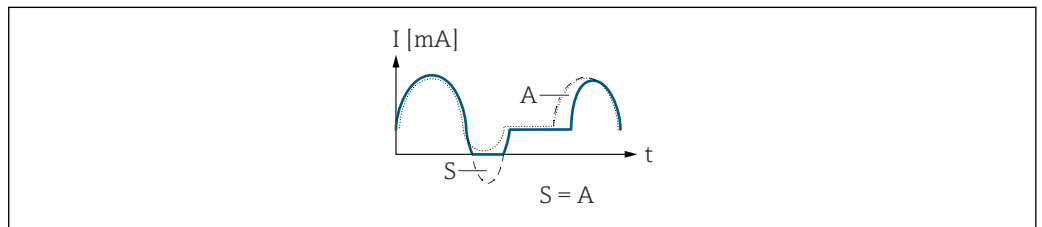
I   Current
t   Time
S   Flow components saved
A   Balancing of saved flow components

Damping current output	🔒

Navigation	🔘🖳 Expert → Output → Curr.output 1 → Damp.curr.outp (0363–1)
Prerequisite	A process variable is selected in the **Assign current output** parameter (→ 🖺 78) and one of the following options is selected in the **Current span** parameter (→ 🖺 79): • 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 element [3]) for current output damping:
	• If a low time constant is entered, the current output reacts quickly to fluctuating measured variables.
	• If a high time constant is entered, the current output reacts more slowly.
	ℹ Damping is switched off if **0** is entered (factory setting).

Failure behavior current output   🔒

Navigation	�⊟ Expert → Output → Curr.output 1 → Failure behav. (0364–1)
Prerequisite	A process variable is selected in the **Assign current output** parameter (→ 🔖 78) and one of the following options is selected in the **Current span** parameter (→ 🔖 79):
	• 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 (→ 🖹 79).

"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 (→ 🖹 79).

"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 (→ 🖹 89).

 Failure current   🔒

Navigation	🖩🔲 Expert → Output → Curr.output 1 → Fail. current (0352–1)
Prerequisite	The **Defined value** option is selected in the **Failure mode** parameter (→ 🖹 88).
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

Navigation   🔤🖥 Expert → Output → Curr.output 1 → Measur. curr. (0366–1)

Description   Displays the actual measured value of the output current.

User interface   0 to 30 mA

3.3.2   "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)	→ 🔖 91
Assign pulse output (0460–1 to n)	→ 🔖 93
Pulse scaling (0455–1 to n)	→ 🔖 93
Pulse width (0452–1 to n)	→ 🔖 94
Measuring mode (0457–1 to n)	→ 🔖 94
Failure mode (0480–1 to n)	→ 🔖 95
Pulse output (0456–1 to n)	→ 🔖 96
Assign frequency output (0478–1 to n)	→ 🔖 96
Minimum frequency value (0453–1 to n)	→ 🔖 97
Maximum frequency value (0454–1 to n)	→ 🔖 97
Measuring value at minimum frequency (0476–1 to n)	→ 🔖 97
Measuring value at maximum frequency (0475–1 to n)	→ 🔖 98
Measuring mode (0479–1 to n)	→ 🔖 98
Damping output (0477–1 to n)	→ 🔖 98

Response time (0491–1 to n)	→ 🖹	99
Failure mode (0451–1 to n)	→ 🖹	99
Failure frequency (0474–1 to n)	→ 🖹	100
Output frequency (0471–1 to n)	→ 🖹	100
Switch output function (0481–1 to n)	→ 🖹	100
Assign diagnostic behavior (0482–1 to n)	→ 🖹	101
Assign limit (0483–1 to n)	→ 🖹	102
Switch-on value (0466–1 to n)	→ 🖹	104
Switch-off value (0464–1 to n)	→ 🖹	104
Assign flow direction check (0484–1 to n)	→ 🖹	105
Assign status (0485–1 to n)	→ 🖹	105
Switch-on delay (0467–1 to n)	→ 🖹	105
Switch-off delay (0465–1 to n)	→ 🖹	106
Failure mode (0486–1 to n)	→ 🖹	106
Switch state (0461–1 to n)	→ 🖹	106
Invert output signal (0470–1 to n)	→ 🖹	107

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 mass or volume is reached (pulse value), a pulse is output, the duration of which was set previously (pulse width).
- The pulses are never shorter than the set duration.

Example
- Flow rate approx. 100 g/s
- Pulse value 0.1 g
- Pulse width 0.05 ms
- Pulse rate 1 000 Impuls/s
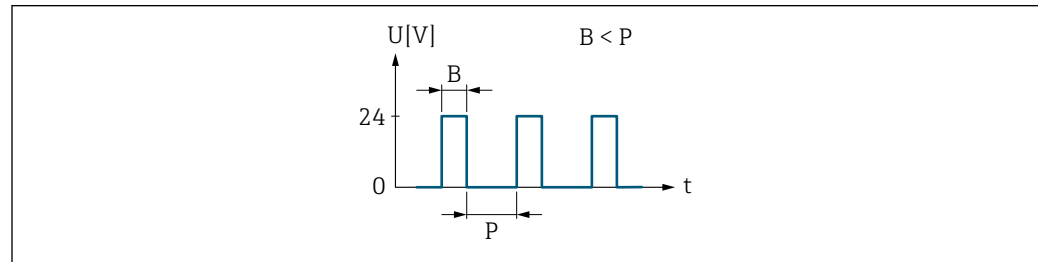
🖼 *6   Quantity-proportional pulse (pulse value) with pulse width to be configured*

B   Pulse width entered
P   Pauses between the individual pulses

"Frequency" option

Flow-proportional frequency output with 1:1 on/off ratio
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
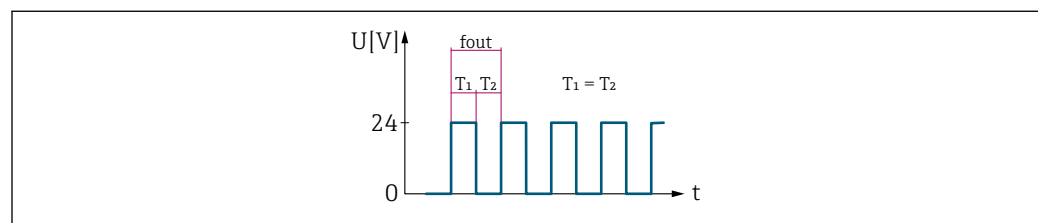
🖼 *7   Flow-proportional frequency output*

"Switch" option

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

Example
Alarm response without alarm

U[V]

24

0   t
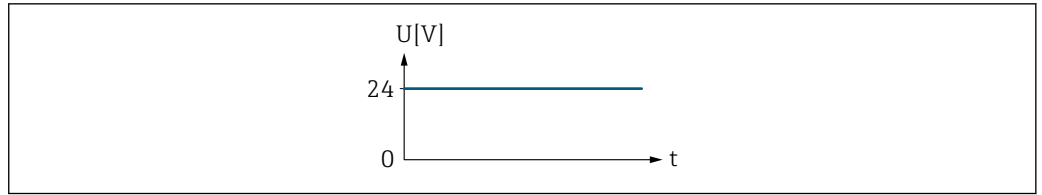
A0026884

⊠ 8   No alarm, high level

Example
Alarm response in case of alarm

U[V]

24

0   t
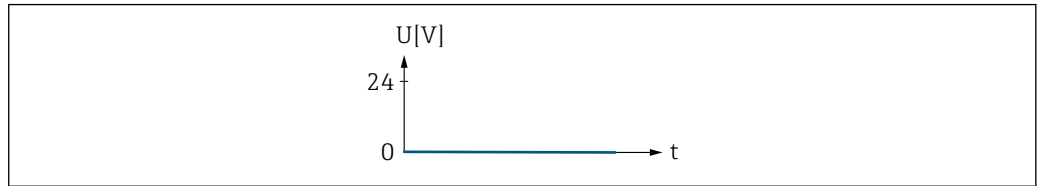
A0026885

⊠ 9   Alarm, low level

Assign pulse output

Navigation	�!🔲 Expert → Output → PFS output 1 to n → Assign pulse (0460–1 to n)
Prerequisite	The **Pulse** option is selected in **Operating mode** parameter (→ 🖺 91).
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 (→ 🖺 91) and a process variable is selected in the **Assign pulse output** parameter (→ 🖺 93).
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 (→ 🖹 91) and a process variable is selected in the **Assign pulse output** parameter (→ 🖹 93).

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.
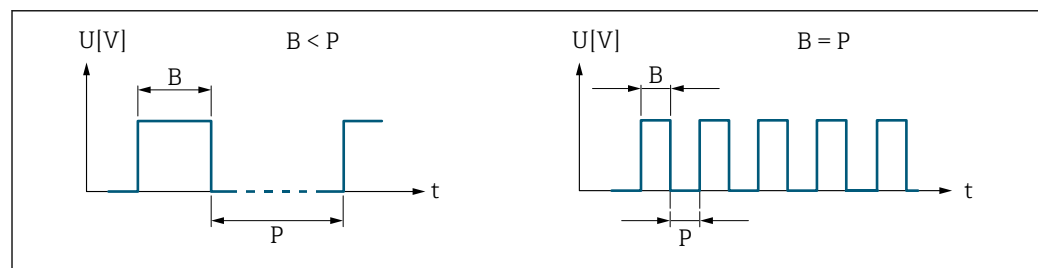
B   Pulse width entered
P   Pauses between the individual pulses

Example

- Pulse value: 0.1 g
- Pulse width: 0.1 ms
- f_{max}: 1 / (2 × 0.1 ms) = 5 kHz
- Q_{max}: 5 kHz × 0.1 g = 0.5 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	*Options* • 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.

### 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 (→ 🖺 91) and a process variable is selected in the **Assign pulse output** parameter (→ 🖺 93).

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. *Options* • 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 indicates a serious fault with the measuring device. The measurement quality may possibly be influenced and may no longer be guaranteed. The **Actual value** option is only recommended if it is ensured that all possible alarm conditions do not influence the measurement quality.

| Pulse output | |

Navigation   ⊞⊟ Expert → Output → PFS output 1 to n → Pulse output (0456–1 to n)

Prerequisite   The **Pulse** option is selected in the **Operating mode** parameter (→ 🖹 91) 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 (→ 🖹 93) and **Pulse width** parameter (→ 🖹 94) 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   NC contact (normally closed)
NO   NO contact (normally open)

The output behavior can be reversed via the **Invert output signal** parameter (→ 🖹 107) 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 (→ 🖹 95)) 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 **Operating mode** parameter (→ 🖹 91).

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

Selection   • Off
                              • Volume flow
                              • Mass flow
                              • Flow velocity
                              • Sound velocity
                              • Temperature
                              • Density
                              • Electronics temperature

- Signal strength [*]
- Signal to noise ratio [*]
- Acceptance rate [*]
- Turbulence [*]

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 (→ 🔲 91) and a process variable is selected in the **Assign frequency output** parameter (→ 🔲 96).

Description   Use this function to enter the minimum frequency.

User entry   0.0 to 10 000.0 Hz

Factory setting   0.0 Hz

| Maximum frequency value | 🔒 |

| Navigation | 🔲🔳 Expert → Output → PFS output 1 to n → Max. freq. value (0454–1 to n) |

Prerequisite   The **Frequency** option is selected in the **Operating mode** parameter (→ 🔲 91) and a process variable is selected in the **Assign frequency output** parameter (→ 🔲 96).

Description   Use this function to enter the end value frequency.

User entry   0.0 to 10 000.0 Hz

Factory setting   10 000.0 Hz

| Measuring value at minimum frequency | 🔒 |

| Navigation | 🔲🔳 Expert → Output → PFS output 1 to n → Val. at min.freq (0476–1 to n) |

Prerequisite   The **Frequency** option is selected in the **Operating mode** parameter (→ 🔲 91) and a process variable is selected in the **Assign frequency output** parameter (→ 🔲 96).

Description   Use this function to enter the measured value for the start value frequency.

User entry   Signed floating-point number

---

*   Visibility depends on order options or device settings

Factory setting Depends on country and nominal diameter

Additional information *Dependency*

ℹ The entry depends on the process variable selected in the **Assign frequency output** parameter (→ 🗎 96).

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 (→ 🗎 91) and a process variable is selected in the **Assign frequency output** parameter (→ 🗎 96).

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 *Description*

Use this function to enter the maximum measured value at the maximum frequency. The selected process variable is output as a proportional frequency.

Dependency

ℹ The entry depends on the process variable selected in the **Assign frequency output** parameter (→ 🗎 96).

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 • Forward flow
• Forward/Reverse flow
• Reverse flow compensation

Factory setting Forward flow

Damping output 🔒

Navigation 🔘🔲 Expert → Output → PFS output 1 to n → Damping out. (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 element [4]) 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 63 % of 100 % of the measured value change when the measured value changes.

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 → 🖹 87
  and
- Depending on the measured variable assigned to the output.
  Flow damping

Failure mode   🔒

Navigation	🔲🔳 Expert → Output → PFS output 1 to n → Failure mode (0451–1 to n)

Prerequisite	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖹 91) and a process variable is selected in the **Assign frequency output** parameter (→ 🖹 96).

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

---

4)   proportional transmission behavior with first order delay

Additional information   *Options*

- 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 (→ 🖺 100) 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 indicates a serious fault with the measuring device. The measurement quality may possibly be influenced and may no longer be guaranteed. The **Actual value** option is only recommended if it is ensured that all possible alarm conditions do not influence the measurement quality.

Failure frequency   🔒

Navigation   😵🖳 Expert → Output → PFS output 1 to n → Failure freq. (0474–1 to n)

Prerequisite   In the **Operating mode** parameter (→ 🖺 91), the **Frequency** option is selected, in the **Assign frequency output** parameter (→ 🖺 96) a process variable is selected, and in the **Failure mode** parameter (→ 🖺 99), the **Defined value** option is selected.

Description   Enter frequency output value in alarm condition.

User entry   0.0 to 12 500.0 Hz

Factory setting   0.0 Hz

Output frequency

Navigation   😵🖳 Expert → Output → PFS output 1 to n → Output freq. (0471–1 to n)

Prerequisite   In the **Operating mode** parameter (→ 🖺 91), 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 (→ 🖺 91).

Description	Use this function to select a function for the switch output.
Selection	• Off • On • Diagnostic behavior • Limit • Flow direction check • Status
Factory setting	Off
Additional information	*Options* • 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	• In the **Operating mode** parameter (→ 🗎 91), the **Switch** option is selected. • In the **Switch output function** parameter (→ 🗎 100), the **Diagnostic behavior** option is selected.
Description	Use this function to select the diagnostic event category that is displayed for the switch output.
Selection	• Alarm • Alarm or warning • Warning
Factory setting	Alarm

Additional information   *Description*

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

Selection

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

Assign limit   🔒

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

Prerequisite   • The **Switch** option is selected in **Operating mode** parameter (→ 🔲 91).
                        • The **Limit** option is selected in **Switch output function** parameter (→ 🔲 100).

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

Selection   • Off
                        • Volume flow
                        • Mass flow
                        • Flow velocity
                        • Sound velocity
                        • Temperature
                        • Density
                        • Electronics temperature
                        • Signal strength *
                        • Signal to noise ratio *
                        • Acceptance rate *
                        • Turbulence *
                        • Totalizer 1
                        • Totalizer 2
                        • Totalizer 3

Factory setting   Volume flow

Additional information *Description*

                        Behavior of status output when Switch-on value > Switch-off value:
                        • Process variable > Switch-on value: transistor is conductive
                        • Process variable < Switch-off value: transistor is non-conductive

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* Visibility depends on order options or device settings
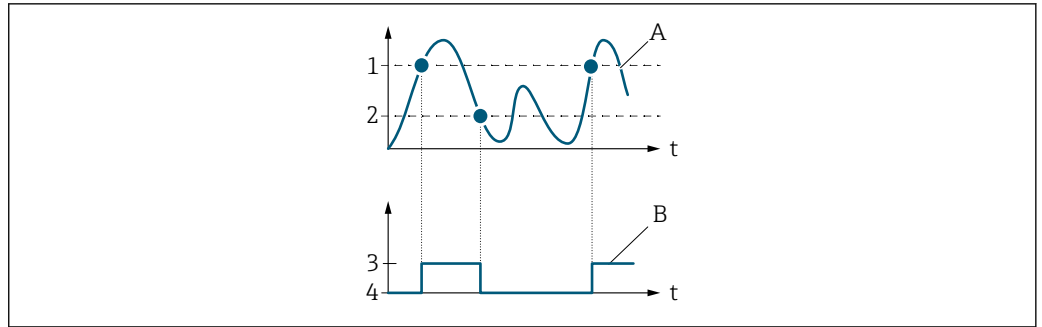
1   *Switch-on value*
2   *Switch-off value*
3   *Conductive*
4   *Non-conductive*
A   *Process variable*
B   *Status output*

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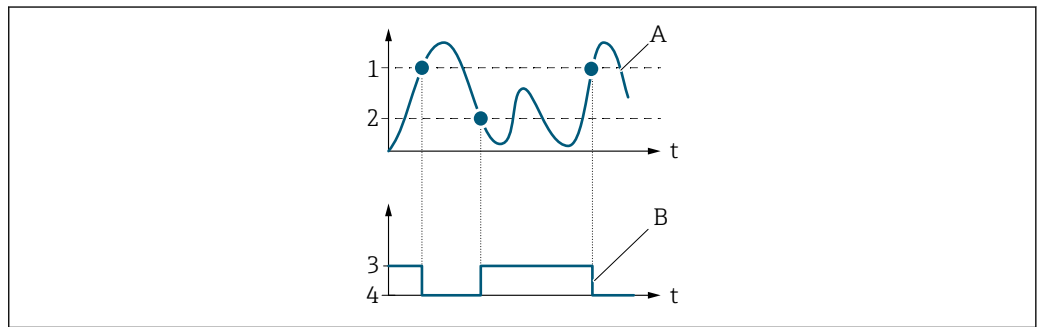
1   *Switch-off value*
2   *Switch-on value*
3   *Conductive*
4   *Non-conductive*
A   *Process variable*
B   *Status output*

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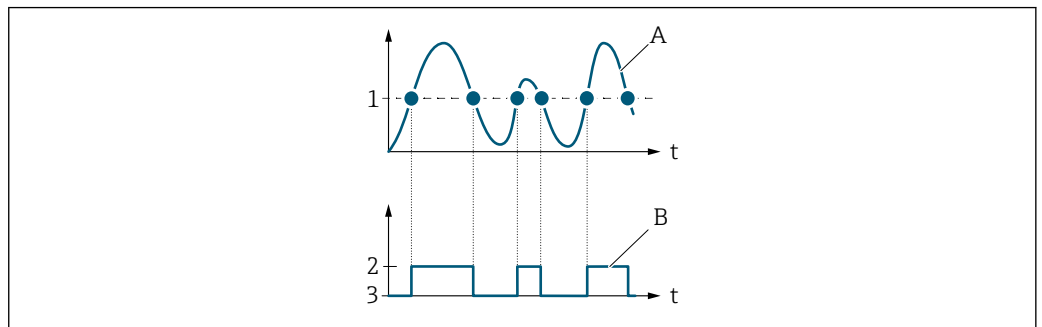
1   *Switch-on value = Switch-off value*
2   *Conductive*
3   *Non-conductive*
A   *Process variable*
B   *Status output*

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 (→ 🖹 91). • The **Limit** option is selected in the **Switch output function** parameter (→ 🖹 100).
Description	Use this function to enter the measured value for the switch-on point.
User entry	Signed floating-point number
Factory setting	Depends on country
Additional information	*Description* Use this function to enter the limit value for the switch-on value (process variable > switch-on value = closed, conductive). ℹ When using a hysteresis: Switch-on value > Switch-off value. *Dependency* ℹ The unit depends on the process variable selected in the **Assign limit** parameter (→ 🖹 102).

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 (→ 🖹 91). • The **Limit** option is selected in the **Switch output function** parameter (→ 🖹 100).
Description	Use this function to enter the measured value for the switch-off point.
User entry	Signed floating-point number
Factory setting	Depends on country
Additional information	*Description* Use this function to enter the limit value for the switch-off value (process variable < switch-off value = open, non-conductive). ℹ When using a hysteresis: Switch-on value > Switch-off value. *Dependency* ℹ The unit depends on the process variable selected in the **Assign limit** parameter (→ 🖹 102).

Assign flow direction check	🔒

Navigation	🔀🖳 Expert → Output → PFS output 1 to n → Assign dir.check (0484–1 to n)
Prerequisite	• The **Switch** option is selected in the **Operating mode** parameter (→ 🖺 91). • The **Flow direction check** option is selected in the **Switch output function** parameter (→ 🖺 100).
Description	Use this function to select a process variable for monitoring the flow direction.
Selection	
Factory setting	Volume flow

Assign status	🔒

Navigation	🔀🖳 Expert → Output → PFS output 1 to n → Assign status (0485–1 to n)
Prerequisite	• The **Switch** option is selected in **Operating mode** parameter (→ 🖺 91). • The **Status** option is selected in **Switch output function** parameter (→ 🖺 100).
Description	Select the device function whose status you want to display.
Selection	• Off • Low flow cut off
Factory setting	Low flow cut off
Additional information	*Options* When the switch-on point for the selected device function is reached, the output is switched on (closed, conductive). Otherwise, the output is non-conductive.

Switch-on delay	🔒

Navigation	🔀🖳 Expert → Output → PFS output 1 to n → Switch-on delay (0467–1 to n)
Prerequisite	• The **Switch** option is selected in the **Operating mode** parameter (→ 🖺 91). • The **Limit** option is selected in the **Switch output function** parameter (→ 🖺 100).
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	圖圖 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 (→ 🔲 91). • The **Limit** option is selected in the **Switch output function** parameter (→ 🔲 100).
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	圖圖 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

Navigation	圖圖 Expert → Output → PFS output 1 to n → Switch state (0461–1 to n)
Prerequisite	The **Switch** option is selected in the **Operating mode** parameter (→ 🔲 91).
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)
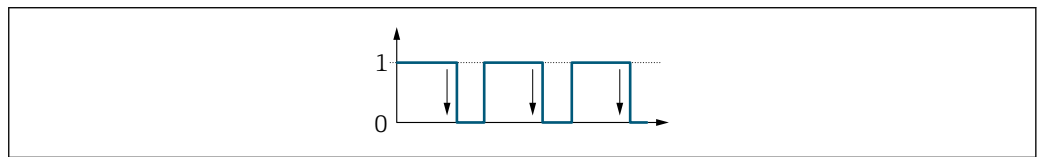
Yes option (passive - positive)
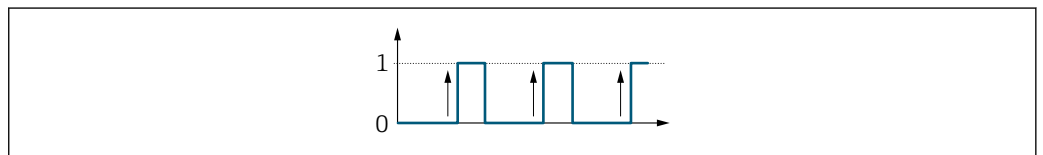
3.4   "Communication" submenu

Navigation   Expert → Communication

▶ Communication	
▶ Modbus configuration	→ 🖹 108
▶ Modbus information	→ 🖹 112
▶ Modbus data map	→ 🖹 113

| ▶ Web server | → 🕮 114 |
| ▶ WLAN settings | → 🕮 117 |

3.4.1   "Modbus configuration" submenu

Navigation   🖳   Expert → Communication → Modbus config.

▶ Modbus configuration	
Bus address	→ 🕮 108
Baudrate	→ 🕮 108
Data transfer mode	→ 🕮 109
Parity	→ 🕮 109
Byte order	→ 🕮 110
Telegram delay	→ 🕮 111
Failure mode	→ 🕮 111
Fieldbus writing access	→ 🕮 112

Bus address   🔒

Navigation   🖳🖳   Expert → Communication → Modbus config. → Bus address (7112)

Description   For entering the device address.

User entry   1 to 247

Factory setting   247

Baudrate   🔒

Navigation   🖳🖳   Expert → Communication → Modbus config. → Baudrate (7111)

Description   Use this function to select a transmission rate.

Selection	• 1200 BAUD
	• 2400 BAUD
	• 4800 BAUD
	• 9600 BAUD
	• 19200 BAUD
	• 38400 BAUD
	• 57600 BAUD
	• 115200 BAUD
	• 230400 BAUD

Factory setting	19200 BAUD

Data transfer mode   🔒

Navigation	🖩🖥 Expert → Communication → Modbus config. → Data trans. mode (7115)
Description	Use this function to select the data transmission mode.
Selection	• ASCII
	• RTU
Factory setting	RTU
Additional information	*Options*
	• ASCII
	Transmission of data in the form of readable ASCII characters. Error protection via LRC.
	• RTU
	Transmission of data in binary form. Error protection via CRC16.

Parity   🔒

Navigation	🖩🖥 Expert → Communication → Modbus config. → Parity (7122)
Description	Use this function to select the parity bit.
Selection	• Odd
	• Even
	• None / 1 stop bit
	• None / 2 stop bits
Factory setting	Even
Additional information	*Options*
	Picklist **ASCII** option:
	• 0 = **Even** option
	• 1 = **Odd** option

Picklist **RTU** option:
- 0 = **Even** option
- 1 = **Odd** option
- 2 = **None / 1 stop bit** option
- 3 = **None / 2 stop bits** option

Byte order	🔒

Navigation   🔲🔲   Expert → Communication → Modbus config. → Byte order (7113)

Description   Use this function to select the sequence in which the bytes are transmitted. The transmission sequence must be coordinated with the Modbus master.

Selection
- 0-1-2-3
- 3-2-1-0
- 1-0-3-2
- 2-3-0-1

Factory setting   1-0-3-2

Additional information   *Description*

The byte sequence is not standardized by the Modbus protocol. However, if the host system and the measuring device do not use the same byte sequence, correct data exchange is not possible.

Changing the byte sequence in the host system often requires a extensive knowledge and significant programming efforts. Endress+Hauser introduced the **Byte order** parameter (→ 🖺 110) for this reason.

This makes it possible to use the standard settings of the host system and change the byte sequence on the measuring device by trial and error. If correct data exchange cannot be achieved by changing the byte sequence, the settings for the byte sequence of the host system must be adapted accordingly.

Byte transmission sequence

Byte addressing, i.e. the transmission sequence of the bytes, is not specified in the Modbus specification. For this reason, it is important to coordinate or match the addressing method between the master and slave during commissioning. This can be configured in the measuring device using the **Byte order** parameter (→ 🖺 110).

The bytes are transmitted depending on the selection in the **Byte order** parameter (→ 🖺 110):

FLOAT				
	Sequence			
Options	1.	2.	3.	4.
1 – 0 – 3 – 2 *	Byte 1 (MMMMMMMM)	Byte 0 (MMMMMMMM)	Byte 3 (SEEEEEEE)	Byte 2 (EMMMMMMM)
0 – 1 – 2 – 3	Byte 0 (MMMMMMMM)	Byte 1 (MMMMMMMM)	Byte 2 (EMMMMMMM)	Byte 3 (SEEEEEEE)
2 – 3 – 0 – 1	Byte 2 (EMMMMMMM)	Byte 3 (SEEEEEEE)	Byte 0 (MMMMMMMM)	Byte 1 (MMMMMMMM)

3 – 2 – 1 – 0	Byte 3 (SEEEEEEE)	Byte 2 (EMMMMMMM)	Byte 1 (MMMMMMMM)	Byte 0 (MMMMMMMM)
* = factory setting, S = sign, E = exponent, M = mantissa				

INTEGER		
	Sequence	
Options	1.	2.
1 – **0** – 3 – 2 * 3 – 2 – **1** – **0**	Byte 1 (MSB)	Byte 0 (LSB)
0 – **1** – 2 – 3 2 – 3 – **0** – **1**	Byte 0 (LSB)	Byte 1 (MSB)
* = factory setting, MSB = most significant byte, LSB = least significant byte		

STRING Presentation taking the example of a device parameter with a data length of 18 bytes.					
	Sequence				
Options	1.	2.	...	17.	18.
1 – **0** – 3 – 2 * 3 – 2 – **1** – **0**	Byte 17 (MSB)	Byte 16	...	Byte 1	Byte 0 (LSB)
0 – **1** – 2 – 3 2 – 3 – **0** – **1**	Byte 16	Byte 17 (MSB)	...	Byte 0 (LSB)	Byte 1
* = factory setting, MSB = most significant byte, LSB = least significant byte					

Telegram delay   🔒

Navigation   🖩🖵 Expert → Communication → Modbus config. → Telegram delay (7146)

Description   Use this function to enter a delay time after which the measuring device replies to the request telegram of the Modbus master. This allows communication to be adapted to slow Modbus RS485 masters.

User entry   0 to 100 ms

Factory setting   6 ms

Failure mode   🔒

Navigation   🖩🖵 Expert → Communication → Modbus config. → Failure mode (7116)

Description   Use this function to select the measured value output in the event of a diagnostic message via Modbus communication.

Selection   • NaN value
• Last valid value

Factory setting   NaN value

Additional information   *Options*

- NaN value
  The device outputs the NaN value [5].
- Last valid value
  The device outputs the last valid measured value before the fault occurred.

ℹ️ This effect of this parameter depends on the option selected in the **Assign diagnostic behavior** parameter.

Fieldbus writing access

Navigation   ⓘⓘ Expert → Communication → Modbus config. → Fieldb.writ.acc. (7156)

Description   Use this function to restrict access to the measuring device via fieldbus (Modbus protocol).

Selection
- Read + write
- Read only

Factory setting   Read + write

Additional information   *Description*

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

ℹ️ This does not affect cyclic measured value transmission to the higher-order system, which is always guaranteed.

Selection

- Read + write
  The parameters are read and write parameters.
- Read only
- The parameters are read only parameters.

3.4.2   "Modbus information" submenu

Navigation   ▣   Expert → Communication → Modbus info

► Modbus information	
Device ID (7153)	→ 🗎 113
Device revision (7154)	→ 🗎 113

---

5)   Not a Number

Device ID	

Navigation	回目 Expert → Communication → Modbus info → Device ID (7153)
Description	Displays the device ID for identifying the measuring device.
User interface	4-digit hexadecimal number

Device revision	

Navigation	回目 Expert → Communication → Modbus info → Device revision (7154)
Description	Displays the device revision.
User interface	4-digit hexadecimal number

3.4.3 "Modbus data map" submenu

Navigation 目 Expert → Communication → Modbus data map

▶ Modbus data map

Scan list register 0 to 15 (7114) → 🖺 113

Scan list register 0 to 15	🔒

Navigation	回目 Expert → Communication → Modbus data map → Scan list reg.0 to 15 (7114)
Description	Use this function to enter the scan list register. By entering the register address (1-based), up to 16 device parameters can be grouped by assigning them to the scan list registers 0 to 15. The data of the device parameters assigned here are read out via the register addresses 5051 to 5081.
User entry	1 to 65 535
Factory setting	1

3.4.4   "Web server" submenu

Navigation   🖩🖳   Expert → Communication → Web server

```
┌─────────────────────────────────────────────────────────────────────────────┐
│ ► Web server                                                                  │
│                                                                               │
│                    ┌─────────────────────────────┐                            │
│                    │ Web server language (7221)  │            → 🗎 114        │
│                    └─────────────────────────────┘                            │
│                                                                               │
│                    ┌─────────────────────────────┐                            │
│                    │ MAC address (7214)          │            → 🗎 115        │
│                    └─────────────────────────────┘                            │
│                                                                               │
│                    ┌─────────────────────────────┐                            │
│                    │ DHCP client (7212)          │            → 🗎 115        │
│                    └─────────────────────────────┘                            │
│                                                                               │
│                    ┌─────────────────────────────┐                            │
│                    │ IP address (7209)           │            → 🗎 115        │
│                    └─────────────────────────────┘                            │
│                                                                               │
│                    ┌─────────────────────────────┐                            │
│                    │ Subnet mask (7211)          │            → 🗎 116        │
│                    └─────────────────────────────┘                            │
│                                                                               │
│                    ┌─────────────────────────────┐                            │
│                    │ Default gateway (7210)      │            → 🗎 116        │
│                    └─────────────────────────────┘                            │
│                                                                               │
│                    ┌─────────────────────────────┐                            │
│                    │ Web server functionality (7222) │        → 🗎 116        │
│                    └─────────────────────────────┘                            │
│                                                                               │
│                    ┌─────────────────────────────┐                            │
│                    │ Login page (7273)           │            → 🗎 117        │
│                    └─────────────────────────────┘                            │
└─────────────────────────────────────────────────────────────────────────────┘
```

Web server language

Navigation   🖩🖳   Expert → Communication → Web server → Webserv.language (7221)

Description   Use this function to select the language configured for the Web server.

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

Factory setting   English

MAC address

Navigation	⊞⊟ Expert → Communication → Web server → MAC Address (7214)
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	*Example*

For the display format
00:07:05:10:01:5F

DHCP client 🔒

Navigation	⊞⊟ Expert → Communication → Web server → DHCP client (7212)
Description	Use this function to activate and deactivate the DHCP client functionality.
Selection	• Off • On
Factory setting	On
Additional information	*Effect*

If the DHCP client functionality of the web server is selected, the IP address (→ 🖺 115),
Subnet mask (→ 🖺 116) and Default gateway (→ 🖺 116) are set automatically.

ℹ️ • Identification is via the MAC address of the measuring device.
• The IP address (→ 🖺 115) in the **IP address** parameter (→ 🖺 115) is ignored as
long as the **DHCP client** parameter (→ 🖺 115) is active. This is also the case, in
particular, if the DHCP server cannot be reached. The IP address (→ 🖺 115) in the
parameter of the same name is only used if the **DHCP client** parameter (→ 🖺 115)
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

---

6) Media Access Control

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 (→ 🗎 116).
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 enabled again via the FieldCare operating tool or the DeviceCare operating tool.

Selection

Option	Description
Off	• The Web server is completely disabled. • Port 80 is locked.
On	• The complete Web server functionality is available. • JavaScript is used. • The password is transferred in an encrypted state. • Any change to the password is also transferred in an encrypted state.

Login page	🔒

Navigation　　　　　　　▣▤　Expert → Communication → Web server → Login page (7273)

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

Selection　　　　　　　• Without header
　　　　　　　　　　　　　• With header

Factory setting　　　　　With header

3.4.5　"WLAN settings" wizard

Navigation　　　　▣　Expert → Communication → WLAN settings

```
‣ WLAN settings
```

WLAN (2702)	→ 🖺 118
WLAN mode (2717)	→ 🖺 118
SSID name (2714)	→ 🖺 118
Network security (2705)	→ 🖺 119
Security identification (2718)	→ 🖺 119
User name (2715)	→ 🖺 120
WLAN password (2716)	→ 🖺 120
WLAN IP address (2711)	→ 🖺 120
WLAN MAC address (2703)	→ 🖺 120
WLAN subnet mask (2709)	→ 🖺 121
WLAN MAC address (2703)	→ 🖺 120
WLAN passphrase (2706)	→ 🖺 121
WLAN MAC address (2703)	→ 🖺 120
Assign SSID name (2708)	→ 🖺 121
SSID name (2707)	→ 🖺 122

2.4 GHz WLAN channel (2704)	→ 🖺 122
Select antenna (2713)	→ 🖺 122
Connection state (2722)	→ 🖺 122
Received signal strength (2721)	→ 🖺 123
WLAN IP address (2711)	→ 🖺 120
Gateway IP address (2719)	→ 🖺 123
IP address domain name server (2720)	→ 🖺 123

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

Factory setting	WPA2-PSK

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

Security identification

Navigation	🔲🖳 Expert → Communication → WLAN settings → Sec. identific. (2718)

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

User interface	• Trusted issuer certificate
	• Device certificate
	• Device private key

---

* Visibility depends on order options or device settings

Endress+Hauser   119

User name	🔒

Navigation	🖩🖵 Expert → Communication → WLAN settings → User name (2715)
Description	Use this function to enter the username of the WLAN network.
User entry	–
Factory setting	–

WLAN password	🔒

Navigation	🖩🖵 Expert → Communication → WLAN settings → WLAN password (2716)
Description	Use this function to enter the WLAN password for the WLAN network.
User entry	–
Factory setting	–

WLAN IP address	🔒

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

WLAN MAC address	

Navigation	🖩🖵 Expert → Communication → WLAN settings → WLAN MAC address (2703)
Description	Displays the MAC [7] 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	*Example* For the display format

---

7)   Media Access Control

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 (→ 🖺 119).
Description	Use this function to enter the network key.
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 [8].
Selection	• Device tag • User-defined
Factory setting	User-defined

Additional information	*Selection*
	
	• Device tag
	  The device tag name is used as the SSID.
	• User-defined
	  A user-defined name is used as the SSID.

---

[8]   Service Set Identifier

SSID name	🔒

Navigation	🎛️🖥️ Expert → Communication → WLAN settings → SSID name (2707)
Prerequisite	• The **User-defined** option is selected in the **Assign SSID name** parameter (→ 🖹 121). • The **WLAN access point** option is selected in the **WLAN mode** parameter (→ 🖹 118).
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
Factory setting	6
Additional information	*Description*
	ℹ️ • 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

3.5   "Application" submenu

Navigation   ␇␈   Expert → Application

```
‣ Application

          Reset all totalizers (2806)                          →  🖺  124

          ‣ Totalizer 1 to n                                   →  🖺  124
```

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 previously aggregated flow values.

Selection   • Cancel
                            • Reset + totalize

Factory setting   Cancel

Additional information   *Selection*

Options	Description
Cancel	No action is executed and the user exits the parameter.
Reset + totalize	Resets all totalizers to 0 and restarts the totaling process. This deletes all the previously aggregated flow values.

3.5.1   "Totalizer 1 to n" submenu

Navigation   ␇␈   Expert → Application → Totalizer 1 to n

```
‣ Totalizer 1 to n

          Assign process variable 1 to n                       →  🖺  125
          (0914–1 to n)

          Process variable unit 1 to n                         →  🖺  125
          (0915–1 to n)

          Totalizer 1 to n operation mode                      →  🖺  126
          (0908–1 to n)

          Totalizer 1 to n control (0912–1 to n)               →  🖺  127
```

| Preset value 1 to n (0913–1 to n) | → 🗎 127 |
| Totalizer 1 to n failure behavior (0901–1 to n) | → 🗎 128 |

Assign process variable 1 to n 🔒

Navigation	🎛️🖥️ Expert → Application → Totalizer 1 to n → AssignVariab. 1 to n (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*

ℹ️ If the option selected is changed, the device resets the totalizer to 0.

Options

If the **Off** option is selected, only the **Assign process variable** parameter (→ 🗎 125) is still displayed in the **Totalizer 1 to n** submenu. All other parameters in the submenu are hidden.

Process variable unit 1 to n 🔒

Navigation	🎛️🖥️ Expert → Application → Totalizer 1 to n → VariableUnit 1 to n (0915–1 to n)
Prerequisite	A process variable is selected in the **Assign process variable** parameter (→ 🗎 125) of the **Totalizer 1 to n** submenu.
Description	Use this function to select the process variable unit for the Totalizer 1 to n (→ 🗎 124).
Selection	• g * • kg * • t * • oz * • lb * • STon * • cm³ * • dm³ * • m³ * • ml * • l *

---

* Visibility depends on order options or device settings

- 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	Depends on country: • m³ • ft³

Additional information   *Description*

ℹ️ The unit is selected separately for each totalizer. It is independent of the selection
made in the **System units** submenu (→ 🖺 45).

Options

The selection is dependent on the process variable selected in the **Assign process variable**
parameter (→ 🖺 125).

Totalizer 1 to n operation mode   🔒

Navigation	🔢🖥 Expert → Application → Totalizer 1 to n → Operat. mode 1 to n (0908–1 to n)
Prerequisite	A process variable is selected in the **Assign process variable** parameter (→ 🖺 125) of the **Totalizer 1 to n** submenu.
Description	Use this function to select how the totalizer summates the flow.
Selection	• Net • Forward • Reverse
Factory setting	Net flow total

---

* Visibility depends on order options or device settings

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).

Totalizer 1 to n control

Navigation	🔘🖳 Expert → Application → Totalizer 1 to n → Tot. 1 to n control (0912–1 to n)
Prerequisite	A process variable is selected in the **Assign process variable** parameter (→ 🖺 125) 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 [1]	The totaling process is stopped and the totalizer is set to its defined start value from the **Preset value** parameter.
Reset + totalize	The totalizer is reset to 0 and the totaling process is restarted.
Preset + totalize [1]	The totalizer is set to the defined start value in the **Preset value** parameter and the totaling process is restarted.

1)   Visible depending on the order options or device settings

---

Preset value 1 to n

Navigation	🔘🖳 Expert → Application → Totalizer 1 to n → Preset value 1 to n (0913–1 to n)
Prerequisite	A process variable is selected in the **Assign process variable** parameter (→ 🖺 125) 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	Depends on country: • 0 m³ • 0 ft³

Additional information	*User entry*

ℹ The unit of the selected process variable is defined in the **Unit totalizer** parameter
(→ 🖹 125) for the totalizer.

Example

This configuration is suitable for applications such as iterative filling processes with a fixed batch quantity.

Totalizer 1 to n failure behavior   🔒

Navigation	🎛🖥 Expert → Application → Totalizer 1 to n → FailureBehav. 1 to n (0901–1 to n)

Prerequisite	A process variable is selected in the **Assign process variable** parameter (→ 🖹 125) of the **Totalizer 1 to n** submenu.

Description	Use this function to select how a totalizer behaves in the event of a device alarm.

Selection	• Hold • Continue • Last valid value + continue

Factory setting	Stop

Additional information	*Description*

ℹ 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.

3.5.2 "Inventory counter" submenu

Navigation   �’🔲   Expert → Application → Inventory count.

```
▸ Inventory counter

                    Unit (0974)                                          → 🗎 129
```
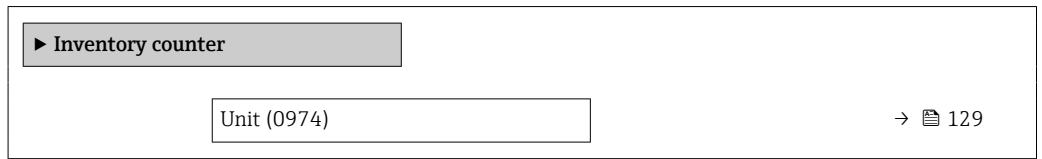
Unit

Navigation   🔘🔲   Expert → Application → Inventory count. → Unit (0974)

Description   Displays the unit of the inventory counter.

User interface   *SI units*   *US units*   *Imperial units*

SI units	US units	Imperial units
• cm³	• ft³	• gal (imp)
• dm³	• af	• Mgal (imp)
• m³	• fl oz (us)	• bbl (imp;beer)
• ml	• gal (us)	• bbl (imp;oil)
• l	• kgal (us)	
• hl	• Mgal (us)	
• Ml Mega	• bbl (us;oil)	
	• bbl (us;liq.)	
	• bbl (us;beer)	
	• bbl (us;tank)	

Additional information   *Description*

ℹ️ The parameter cannot be configured or reset.

3.6 "Diagnostics" submenu

Navigation   🔘🔲   Expert → Diagnostics

```
▸ Diagnostics

            Actual diagnostics (0691)                                  → 🗎 133

            Previous diagnostics (0690)                                → 🗎 133

            Operating time from restart (0653)                         → 🗎 134

            Operating time (0652)                                      → 🗎 134
```

Frequency output 1 to n value (0473–1 to n)	→ 🖹 167
Pulse output simulation 1 to n (0458–1 to n)	→ 🖹 167
Pulse value 1 to n (0459–1 to n)	→ 🖹 168
Switch output simulation 1 to n (0462–1 to n)	→ 🖹 168
Switch state 1 to n (0463–1 to n)	→ 🖹 169
Device alarm simulation (0654)	→ 🖹 169
Diagnostic event category (0738)	→ 🖹 170
Diagnostic event simulation (0737)	→ 🖹 170

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　　*Display*

ℹ️ Additional pending diagnostic messages can be viewed in the **Diagnostic list** submenu (→ 🖹 134).

ℹ️ 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.

Example

For the display format:
⊗F271 Main electronic failure

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 electronic failure

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	Displays the length of time the device has been in operation.
User interface	Days (d), hours (h), minutes (m) and seconds (s)
Additional information	*Indication*

Maximum number of days: 9 999(corresponds to approx. 27 years and 5 months)

3.6.1   "Diagnostic list" submenu

Navigation   ⊞⊟   Expert → Diagnostics → Diagnostic list

▶ **Diagnostic list**		
Diagnostics 1 (0692)	→ 🖹	135
Diagnostics 2 (0693)	→ 🖹	135
Diagnostics 3 (0694)	→ 🖹	136

| Diagnostics 4 (0695) | → 🖺 137 |
| Diagnostics 5 (0696) | → 🖺 138 |

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*

ℹ️ 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*

ℹ️ The diagnostic message can be viewed via the **Diagnostics 1** parameter (→ 🖺 135).

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*

ℹ️ 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*

ℹ️ The diagnostic message can be viewed via the **Diagnostics 2** parameter (→ 🕮 135).

Example

For the display format:
24d12h13m00s

Diagnostics 3

Navigation	🔁🔲 Expert → Diagnostics → Diagnostic list → Diagnostics 3 (0694)
Description	Displays the current diagnostics message with the third-highest priority.
User interface	Symbol for diagnostic behavior, diagnostic code and short message.
Additional information	*Display*

ℹ️ 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 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	*Display*

ℹ️ The diagnostic message can be viewed via the **Diagnostics 3** parameter (→ 🕮 136).

Example

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*

ℹ️ Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the Ε key.

Examples

For the display format:
- ⚠S442 Frequency output
- ⊗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*

ℹ️   The diagnostic message can be viewed via the **Diagnostics 4** parameter (→ 🕮 137).

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*

ℹ️   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 5

Navigation   🖥️   Expert → Diagnostics → Diagnostic list → Timestamp

Description   Displays the operating time when the diagnostic message with the fifth-highest priority occurred.

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

Additional information   *Display*

ℹ️   The diagnostic message can be viewed via the **Diagnostics 5** parameter (→ 🕮 138).

Example

For the display format:
24d12h13m00s

3.6.2   "Device information" submenu

Navigation   🖩🖳   Expert → Diagnostics → Device info

▶ Device information		
Device tag (0011)	→ 🖺	139
Serial number (0009)	→ 🖺	140
Firmware version (0010)	→ 🖺	140
Device name (0013)	→ 🖺	140
Order code (0008)	→ 🖺	141
Extended order code 1 (0023)	→ 🖺	141
Extended order code 2 (0021)	→ 🖺	141
Extended order code 3 (0022)	→ 🖺	142
ENP version (0012)	→ 🖺	142

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*
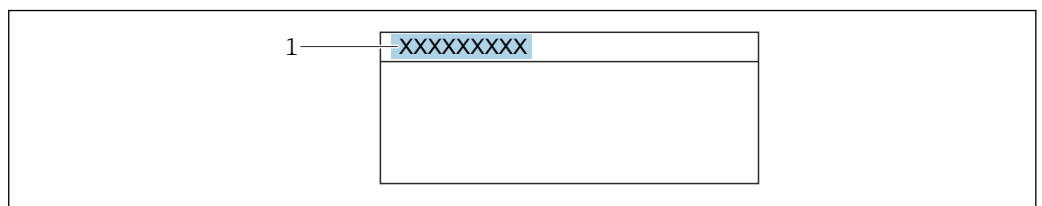
1   Position of the header text on the display

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	Shows the name of the transmitter.
	🛈 The name can be found on the nameplate of the transmitter.
User interface	Max. 32 characters such as letters or numbers.
Factory setting	Pros. Flow400 MB

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*

ℹ️ 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.

ℹ️ 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.

ℹ️ 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 (→ 📖 141)

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 (→ 🖺 141)

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.

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

Navigation   🔘🔲 Expert → Diagnostics → Mainboard module

```
► Main electronic module

        Firmware version (0072)                              → 🖺 143
```

Build no. software (0079)	→ 🖹 143
Bootloader revision (0073)	→ 🖹 143

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

3.6.4 "Sensor electronic module (ISEM)" submenu

Navigation 🖩🖳 Expert → Diagnostics → Sens. electronic

▸ Sensor electronic module (ISEM)

Firmware version (0072)	→ 🖹 144
Build no. software (0079)	→ 🖹 144
Bootloader revision (0073)	→ 🖹 144

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

3.6.5 "Display module" submenu

Navigation   🔘🖥 Expert → Diagnostics → Display module

▸ **Display module**	
Firmware version (0072)	→ 🖥 145
Build no. software (0079)	→ 🖥 145
Bootloader revision (0073)	→ 🖥 145

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

3.6.6   "Data logging" submenu

Navigation   @@ Expert → Diagnostics → Data logging

▸ Data logging	
Assign channel 1 (0851)	→ 🖺 146
Assign channel 2 (0852)	→ 🖺 147
Assign channel 3 (0853)	→ 🖺 147
Assign channel 4 (0854)	→ 🖺 147
Logging interval (0856)	→ 🖺 148
Clear logging data (0855)	→ 🖺 148

Data logging (0860)	→ 🗎 149
Logging delay (0859)	→ 🗎 149
Data logging control (0857)	→ 🗎 149
Data logging status (0858)	→ 🗎 150
Entire logging duration (0861)	→ 🗎 150

Assign channel 1   🔒

Navigation	🔘🔲 Expert → Diagnostics → Data logging → Assign chan. 1 (0851)
Prerequisite	The **Extended HistoROM** application package is available.
	ℹ️ The software options currently enabled are displayed in the **Software option overview** parameter (→ 🗎 36).
Description	Use this function to assign a process variable to the data logging channel.
Selection	• Off • Volume flow • Mass flow • Flow velocity • Sound velocity • Temperature • Density • Signal strength * • Signal to noise ratio * • Acceptance rate * • Turbulence * • Electronics temperature • Current output 1
Factory setting	Off
Additional information	*Description*
	A total of 1000 measured values can be logged. This means: • 1000 data points if 1 logging channel is used • 500 data points if 2 logging channels are used • 333 data points if 3 logging channels are used • 250 data points if 4 logging channels are used
	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).
	ℹ️ The log contents are cleared if the option selected is changed.

---

* Visibility depends on order options or device settings

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 (→ 🖺 36).
Description	Use this function to assign a process variable to the logging channel.
Selection	For the picklist, see **Assign channel 1** parameter (→ 🖺 146)
Factory setting	Off

Assign channel 3	🔒

Navigation	🔘🔲 Expert → Diagnostics → Data logging → Assign chan. 3 (0853)
Prerequisite	The **Extended HistoROM** application package is available.
	ⓘ The software options currently enabled are displayed in the **Software option overview** parameter (→ 🖺 36).
Description	Use this function to assign a process variable to the logging channel.
Selection	For the picklist, see **Assign channel 1** parameter (→ 🖺 146)
Factory setting	Off

Assign channel 4	🔒

Navigation	🔘🔲 Expert → Diagnostics → Data logging → Assign chan. 4 (0854)
Prerequisite	The **Extended HistoROM** application package is available.
	ⓘ The software options currently enabled are displayed in the **Software option overview** parameter (→ 🖺 36).
Description	Use this function to assign a process variable to the logging channel.
Selection	For the picklist, see **Assign channel 1** parameter (→ 🖺 146)
Factory setting	Off

Logging interval	🔒

Navigation	🔘🔲 Expert → Diagnostics → Data logging → Logging interval (0856)

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

ℹ️ The software options currently enabled are displayed in the **Software option overview** parameter (→ 🔲 36).

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).

ℹ️ The log contents are cleared if the length of the logging interval is changed.

Example

If 1 logging channel is used:
- $T_{log} = 1000 \times 1 \text{ s} = 1\ 000 \text{ s} \approx 15 \text{ min}$
- $T_{log} = 1000 \times 10 \text{ s} = 10\ 000 \text{ s} \approx 3 \text{ h}$
- $T_{log} = 1000 \times 80 \text{ s} = 80\ 000 \text{ s} \approx 1 \text{ d}$
- $T_{log} = 1000 \times 3\ 600 \text{ s} = 3\ 600\ 000 \text{ s} \approx 41 \text{ d}$

Clear logging data	🔒

Navigation	🔘🔲 Expert → Diagnostics → Data logging → Clear logging (0855)

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

ℹ️ The software options currently enabled are displayed in the **Software option overview** parameter (→ 🔲 36).

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	*Selection*

- 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 (→ 🖺 149), 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	*Description*

Once data logging has been started with the **Data logging control** parameter (→ 🖺 149), the device does not save any data for the duration of the delay time entered.

Data logging control   🔒

Navigation	🔵🖳 Expert → Diagnostics → Data logging → Data log.control (0857)
Prerequisite	In the **Data logging** parameter (→ 🖺 149), the **Not overwriting** option is selected.

Description	Use this function to start and stop measured value logging.

Selection	• None • Delete + start • Stop

Factory setting	None

Additional information	*Selection* • 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 (→ 🖻 149), the **Not overwriting** option is selected.

Description	Displays the measured value logging status.

User interface	• Done • Delay active • Active • Stopped

Factory setting	Done

Additional information	*Selection* • 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 (→ 🖻 149), the **Not overwriting** option is selected.

Description	Displays the total logging duration.

User interface	Positive floating-point number

Factory setting	0 s

"Display channel 1" submenu

Navigation   ⊡   Expert → Diagnostics → Data logging → Displ.channel 1

▶ Display channel 1		
	Display channel 1	→ 🗎 151

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 (→ 🗎 36).

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

Additional information   *Description*
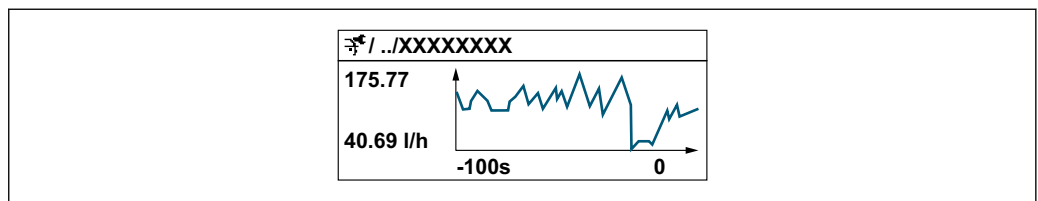
🖾 *10   Chart of a measured value trend*

- 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		
	Display channel 2	→ 🖹 152

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 → 🖹 151

"Display channel 3" submenu

Navigation   Expert → Diagnostics → Data logging → Displ.channel 3

▸ Display channel 3		
	Display channel 3	→ 🖹 152

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 → 🖹 151

"Display channel 4" submenu

Navigation   Expert → Diagnostics → Data logging → Displ.channel 4

▸ Display channel 4		
	Display channel 4	→ 🖹 153

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 → 🖺 151

3.6.7   "Heartbeat Technology" submenu

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

Navigation   Expert → Diagnostics → Heartbeat Techn.

```
▶ Heartbeat Technology

         ▶ Heartbeat base settings                  → 🖺 153

         ▶ Performing verification                  → 🖺 154

         ▶ Verification results                     → 🖺 160
```

"Heartbeat base settings" submenu

Navigation   Expert → Diagnostics → Heartbeat Techn. → Base settings

```
▶ Heartbeat base settings

              Plant operator (2754)                 → 🖺 153

              Location (2755)                        → 🖺 154
```

Plant operator   🔒

Navigation   Expert → Diagnostics → Heartbeat Techn. → Base settings → Plant operator (2754)

Description   Use this function to enter the plant operator.

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

Location	🔒

Navigation   🖩🗐 Expert → Diagnostics → Heartbeat Techn. → Base settings → Location (2755)

Description   Use this function to enter the location.

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

"Performing verification" wizard

Navigation   🖩🗐 Expert → Diagnostics → Heartbeat Techn. → Perform.verific.

```
‣ Performing verification
```

Year (2846)	→ 🖺 155
Month (2845)	→ 🖺 155
Day (2842)	→ 🖺 155
Hour (2843)	→ 🖺 156
AM/PM (2813)	→ 🖺 156
Minute (2844)	→ 🖺 156
Verification mode (12105)	→ 🖺 157
External device information (12101)	→ 🖺 157
Start verification (12127)	→ 🖺 157
Progress (2808)	→ 🖺 158
Measured values (12102)	→ 🖺 158
Output values (12103)	→ 🖺 159
Status (12153)	→ 🖺 159
Verification result (12149)	→ 🖺 159

Year   🔒

Navigation	🎛🖳 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Year (2846)
Prerequisite	ℹ️ Can be edited if Heartbeat Verification is not active.
Description	Use this function to enter the year of recalibration.
User entry	9 to 99
Factory setting	21

Month   🔒

Navigation	🎛🖳 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Month (2845)
Prerequisite	ℹ️ Can be edited if Heartbeat Verification is not active.
Description	Use this function to select the month of recalibration.
Selection	• January • February • March • April • May • June • July • August • September • October • November • December
Factory setting	January

Day   🔒

Navigation	🎛🖳 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Day (2842)
Prerequisite	ℹ️ Can be edited if Heartbeat Verification is not active.
Description	Use this function to enter the day of the month of recalibration.
User entry	1 to 31 d
Factory setting	1 d

Hour	🔒

Navigation	🔘🖥 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Hour (2843)
Prerequisite	ℹ️ Can be edited if Heartbeat Verification is not active.
Description	Use this function to enter the hour of recalibration.
User entry	0 to 23 h
Factory setting	12 h

AM/PM	🔒

Navigation	🔘🖥 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → AM/PM (2813)
Prerequisite	ℹ️ Can be edited if Heartbeat Verification is not active.
	The **dd.mm.yy hh:mm am/pm** option or the **mm/dd/yy hh:mm am/pm** option is selected in the **Date/time format** parameter (2812) (→ 🔖 51).
Description	Use this function to select the time entry in the morning (**AM** option) or afternoon (**PM** option) in the case of 12-hour notation.
Selection	• AM • PM
Factory setting	AM

Minute	🔒

Navigation	🔘🖥 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Minute (2844)
Prerequisite	ℹ️ Can be edited if Heartbeat Verification is not active.
Description	Use this function to enter the minutes of recalibration.
User entry	0 to 59 min
Factory setting	0 min

Verification mode	🔒

Navigation	🗝🖳 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Verificat. mode (12105)
Prerequisite	Can be edited if the verification status is not active.
Description	Select verification mode.
	Standard verification: Verification is performed automatically by the device and without manual checking of external measured variables.
	Extended verification: Similar to internal verification but with the entry of external measured variables (see also "Measured values" parameter).
Selection	• Standard verification
	• Extended verification
Factory setting	Standard verification

External device information	🔒

Navigation	🗝🖳 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Ext. device info (12101)
Prerequisite	With the following conditions:
	• The **Extended verification** option is selected in the **Verification mode** parameter (→ 🖱 157).
	• Can be edited if Heartbeat Verification is not active.
Description	Record measuring equipment for extended verification.
User entry	Free text entry
Factory setting	–

Start verification	🔒

Navigation	🗝🖳 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Start verificat. (12127)
Description	Start the verification.
	To carry out a complete verification, select the selection parameters individually. Once the external measured values have been recorded, verification is started using the **Start** option.

Selection	• Cancel
	• Output 1 low value *
	• Output 1 high value *
	• Frequency output 1 *
	• Pulse output 1 *
	• Frequency output 2 *
	• Pulse output 2 *
	• Start
	• Start with testkit *

Factory setting	Cancel

Progress

Navigation	🖩🖥 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Progress (2808)
Description	The progress of the process is indicated.
User interface	0 to 100 %

Measured values   🔒

Navigation	🖩🖥 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Measured val. (12102)
Prerequisite	One of the following options is selected in the **Start verification** parameter (→ 🗎 157):
	• Output 1 low value
	• Output 1 high value
	• Output 2 low value
	• Output 2 high value
	• Frequency output 1
	• Pulse output 1
	• Frequency output 2
	• Pulse output 2
Description	Use this function to enter the measured values (actual values) for the external measured variables:.
	• Current output: Output current in [mA]
	• Pulse/frequency output: Output frequency in [Hz]
User entry	Signed floating-point number
Factory setting	0

---

*   Visibility depends on order options or device settings

Output values	

| Navigation	⊠⊟ Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Output values (12103)
Description	Displays the simulated output values (target values) for the external measured variables:. Pulse/frequency output: Output frequency in [Hz].
User interface	Signed floating-point number
Factory setting	0

Status	

Navigation	⊠⊟ Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Status (12153)
Description	Displays the current status of the verification.
User interface	• Done • Busy • Failed • Not done
Factory setting	Done

Verification result	

Navigation	⊠⊟ Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Verific. result (12149)
Description	Displays the overall result of the verification. ℹ️ Detailed description of the classification of the results:
User interface	• Not supported • Passed • Not done • Failed
Factory setting	Not done

"Verification results" submenu

Navigation   Expert → Diagnostics → Heartbeat Techn. → Verific. results

▶ Verification results	
Date/time (manually entered) (12142)	→ 🖹 160
Verification ID (12141)	→ 🖹 160
Operating time (12126)	→ 🖹 161
Verification result (12149)	→ 🖹 161
Sensor (12152)	→ 🖹 161
Sensor electronic module (ISEM) (12151)	→ 🖹 162
I/O module (12145)	→ 🖹 162
System status (12109)	→ 🖹 162

Date/time (manually entered)

Navigation   Expert → Diagnostics → Heartbeat Techn. → Verific. results → Date/time (12142)

Prerequisite   The verification has been performed.

Description   Date and time.

User interface   dd.mmmm.yyyy; hh:mm

Factory setting   1 January 2010; 12:00

Verification ID

Navigation   Expert → Diagnostics → Heartbeat Techn. → Verific. results → Verification ID (12141)

Prerequisite   The verification has been performed.

Description   Displays consecutive numbering of the verification results in the measuring device.

User interface   0 to 65 535

Factory setting   0

Operating time

Navigation	⊞⊟ Expert → Diagnostics → Heartbeat Techn. → Verific. results → Operating time (12126)
Prerequisite	The verification has been performed.
Description	Indicates how long the device has been in operation up to the verification.
User interface	Days (d), hours (h), minutes (m), seconds (s)
Factory setting	–

Verification result

Navigation	⊞⊟ Expert → Diagnostics → Heartbeat Techn. → Verific. results → Verific. result (12149)
Description	Displays the overall result of the verification.
	ℹ Detailed description of the classification of the results:
User interface	• Not supported • Passed • Not done • Failed
Factory setting	Not done

Sensor

Navigation	⊞⊟ Expert → Diagnostics → Heartbeat Techn. → Verific. results → Sensor (12152)
Prerequisite	The **Failed** option was shown in the **Overall result** parameter (→ 🗎 159).
Description	Displays the result for the sensor.
	ℹ Detailed description of the classification of the results:
User interface	• Not supported • Passed • Not done • Failed
Factory setting	Not done

Sensor electronic module (ISEM)

Navigation	@≣ Expert → Diagnostics → Heartbeat Techn. → Verific. results → Sens. electronic (12151)
Prerequisite	In the **Overall result** parameter (→ 🖹 159), the **Failed** option was displayed.
Description	Shows the overall result for the "sensor electronic module" test group.
User interface	• Not supported • Passed • Not done • Failed
Factory setting	Not done

I/O module

Navigation	@≣ Expert → Diagnostics → Heartbeat Techn. → Verific. results → I/O module (12145)
Prerequisite	The **Failed** option was shown in the **Overall result** parameter (→ 🖹 159).
Description	Displays the result for I/O module monitoring of the I/O module. • For pulse output: Accuracy of pulses (for external verification only) • For frequency output: Accuracy of frequency (for external verification only) 🛈 **Heartbeat Verification** does not check the digital inputs and outputs and does not issue a result for this. 🛈 Detailed description of the classification of the results:
User interface	• Not supported • Passed • Not done • Failed
Factory setting	Not done

System status

Navigation	@≣ Expert → Diagnostics → Heartbeat Techn. → Verific. results → System status (12109)
Prerequisite	The **Failed** option was shown in the **Overall result** parameter (→ 🖹 159).
Description	Displays the system condition. Tests the measuring device for active errors. 🛈 Detailed description of the classification of the results:

User interface
- Not supported
- Passed
- Not done
- Failed

Factory setting   Not done

3.6.8   "Simulation" submenu

Navigation   ▣▣   Expert → Diagnostics → Simulation

‣ Simulation	
Assign simulation process variable (1810)	→ 🖺 164
Process variable value (1811)	→ 🖺 164
Current output 1 simulation (0354–1)	→ 🖺 165
Current output value (0355)	→ 🖺 166
Frequency output 1 to n simulation (0472–1 to n)	→ 🖺 166
Frequency output 1 to n value (0473–1 to n)	→ 🖺 167
Pulse output simulation 1 to n (0458–1 to n)	→ 🖺 167
Pulse value 1 to n (0459–1 to n)	→ 🖺 168
Switch output simulation 1 to n (0462–1 to n)	→ 🖺 168
Switch state 1 to n (0463–1 to n)	→ 🖺 169
Device alarm simulation (0654)	→ 🖺 169
Diagnostic event category (0738)	→ 🖺 170
Diagnostic event simulation (0737)	→ 🖺 170

Assign simulation process variable	🔒

Navigation	🔘🖥️ Expert → Diagnostics → Simulation → Assign proc.var. (1810)
Description	Use this function to select a process variable for the simulation process that is activated. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.
Selection	• Off • Volume flow • Mass flow • Flow velocity • Sound velocity • Temperature • Density
Factory setting	Off
Additional information	*Description* ℹ️ The simulation value of the process variable selected is defined in the **Process variable value** parameter (→ 🔲 164).

Process variable value	🔒

Navigation	🔘🖥️ Expert → Diagnostics → Simulation → Proc. var. value (1811)
Prerequisite	A process variable is selected in the **Assign simulation process variable** parameter (→ 🔲 164).
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	*User entry* ℹ️ The unit of the displayed measured value is taken from the **System units** submenu (→ 🔲 45).

Simulation status input	🔒

Navigation	🔘🖥️ Expert → Diagnostics → Simulation → Sim. status inp. (1355)
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	• Off • On
Factory setting	Off
Additional information	*Description* The desired simulation value is defined in the **Input signal level** parameter (→ 🗐 165). *Selection* • Off Simulation for the status input is switched off. The device is in normal measuring mode or another process variable is being simulated. • On Simulation for the status input is active.

Value status input

Navigation	🎛🔲 Expert → Diagnostics → Simulation → Val. status inp. (1356)
Prerequisite	In the **Simulation status input** parameter (→ 🗐 164), the **On** option is selected.
Description	Use this function to select the signal level for the simulation of the status input. In this way, users can verify the correct configuration of the status input and the correct function of upstream feed-in units.
Selection	• High • Low

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	• Off • On
Factory setting	Off

Additional information   *Description*

The desired simulation value is specified in the **Value current output 1** parameter (→ 🖺 166).

Selection

• Off
Current simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.
• On
Current simulation is active.

Value current 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   *User entry*

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 (→ 🖺 91), the **Frequency** option is selected.

Description   Use this function to switch simulation of the frequency output on and off. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.

Selection   • Off
                          • On

Factory setting   Off

Additional information *Description*

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

Selection

• 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 (→ 🖺 91), 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 (→ 🖺 94).
    • Down-counting value
    The pulses specified in the **Pulse value** parameter (→ 🖺 168) 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 (→ 🖺 91), 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*

ℹ️   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 (→ 📄 170).

Selection	• Sensor
	• Electronics
	• Configuration
	• Process

Factory setting	Process

Diagnostic event simulation	🔒

Navigation	🔘⌨	Expert → Diagnostics → Simulation → Diagnostic event (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 (→ 📄 170).

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	m³
Volume flow	m³/h
Velocity	m/s
Temperature	°C

4.1.2   Output current span

Output	Current range
Current output 1	4 to 20 mA NAMUR

4.2   US units

Only valid for USA and Canada.

4.2.1   System units

Mass	lb
Mass flow	lb/min
Volume	ft³
Volume flow	ft³/min
Velocity	ft/s
Temperature	°F

4.2.2   Output current span

Output	Current range
Current output 1	4 to 20 mA US

5 Explanation of abbreviated units

5.1 SI units

Process variable	Units	Explanation
Volume	cm³, dm³, m³	Cubic centimeter, cubic decimeter, cubic meter
	ml, l	Milliliter, liter
Volume flow	dm³/s, dm³/min, dm³/h, dm³/d	Cubic decimeter/time unit
	m³/s, m³/min, m³/h, m³/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	m2/s	Square meter/second
Temperature	℃ , K	Celsius, Kelvin
Length	mm	Millimeters
Time	m, h, d, y	Minute, hour, day, year

5.2 US units

Process variable	Units	Explanation
Volume	ft³	Cubic foot
Volume flow	ft³/s, ft³/min, ft³/h, ft³/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/ft³	Pound/cubic foot
Velocity	ft/s	Foot/time unit
Kinematic viscosity	cSt	Centistokes
Temperature	℉, ℉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)

6 Modbus RS485 register information

6.1 Notes

6.1.1 Structure of the register information

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

Navigation: navigation path to the parameter					
Parameter	Register	Data type	Access type	User interface/ Selection/User entry	→ 📖
Name of parameter	Indicated in decimal numerical format	• Float length = 4 byte • Integer length = 2 byte • String length, depending on parameter	Possible type of access to parameter: • Read access via function codes 03, 04 or 23 • Write access via function codes 06, 16 or 23	**Options** List of the individual options for the parameter • Option 1 • Option 2 • Option 3 (+) ℹ️ (+) = Factory setting depends on country, order options or device settings **User entry** Specific value or input range for the parameter	Page number information and cross-reference to the standard parameter description

NOTICE

If non-volatile device parameters are modified via the MODBUS RS485 function codes 06, 16 or 23, the change is saved in the EEPROM of the measuring device.
The number of writes to the EEPROM is technically restricted to a maximum of 1 million.
▶ Make sure to comply with this limit since, if it is exceeded, data loss and measuring device failure will result.
▶ Avoid constantly writing non-volatile device parameters via the MODBUS RS485.

6.1.2 Address model

The Modbus RS485 register addresses of the measuring device are implemented in accordance with the "Modbus Applications Protocol Specification V1.1".

In addition, systems are used that work with the register address model "Modicon Modbus Protocol Reference Guide (PI-MBUS-300 Rev. J)".

Depending on the function code used, a number is added at the start of the register address with this specification:
• "3" → "Read" access
• "4" → "Write" access

Function code	Access type	Register in accordance with "Modbus Applications Protocol Specification"	Register in accordance with "Modicon Modbus Protocol Reference Guide"
03 04 23	Read	XXXX Example: mass flow = 2007	3XXXX Example: mass flow = 32007
06 16 23	Write	XXXX Example: reset totalizer = 6401	4XXXX Example: reset totalizer = 46401

## 6.2   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.

Navigation   ⊞⊟   Expert

⇨ Expert		
Direct access (0106)	→ 🗎	186
Locking status (0004)	→ 🗎	186
User role (0005)	→ 🗎	187
Enter access code (0003)	→ 🗎	187
▶ System	→ 🗎	187
▶ Display	→ 🗎	187
Display language (0104)	→ 🗎	187
Format display (0098)	→ 🗎	187
Value 1 display (0107)	→ 🗎	187
0% bargraph value 1 (0123)	→ 🗎	187
100% bargraph value 1 (0125)	→ 🗎	187
Decimal places 1 (0095)	→ 🗎	187
Value 2 display (0108)	→ 🗎	187
Decimal places 2 (0117)	→ 🗎	188
Value 3 display (0110)	→ 🗎	188
0% bargraph value 3 (0124)	→ 🗎	188
100% bargraph value 3 (0126)	→ 🗎	188
Decimal places 3 (0118)	→ 🗎	188
Value 4 display (0109)	→ 🗎	188
Decimal places 4 (0119)	→ 🗎	188

	WLAN password (2716)	→ 🖺 203	
	WLAN IP address (2711)	→ 🖺 203	
	WLAN MAC address (2703)	→ 🖺 203	
	WLAN subnet mask (2709)	→ 🖺 203	
	WLAN MAC address (2703)	→ 🖺 204	
	WLAN passphrase (2706)	→ 🖺 204	
	WLAN MAC address (2703)	→ 🖺 204	
	Assign SSID name (2708)	→ 🖺 204	
	SSID name (2707)	→ 🖺 204	
	2.4 GHz WLAN channel (2704)	→ 🖺 204	
	Select antenna (2713)	→ 🖺 204	
	Connection state (2722)	→ 🖺 204	
	Received signal strength (2721)	→ 🖺 204	
	WLAN IP address (2711)	→ 🖺 204	
	Gateway IP address (2719)	→ 🖺 204	
	IP address domain name server (2720)	→ 🖺 204	
‣ Application		→ 🖺 204	
	Reset all totalizers (2806)	→ 🖺 204	
	‣ Totalizer 1 to n	→ 🖺 205	
		Assign process variable 1 to n (0914–1 to n)	→ 🖺 205
		Process variable unit 1 to n (0915–1 to n)	→ 🖺 205
		Totalizer 1 to n operation mode (0908–1 to n)	→ 🖺 205
		Totalizer 1 to n control (0912–1 to n)	→ 🖺 205

	Preset value 1 to n (0913–1 to n)	→ 🕮	205
	Totalizer 1 to n failure behavior (0901–1 to n)	→ 🕮	205
‣ Diagnostics		→ 🕮	206
	Actual diagnostics (0691)	→ 🕮	206
	Previous diagnostics (0690)	→ 🕮	206
	Operating time from restart (0653)	→ 🕮	206
	Operating time (0652)	→ 🕮	206
	‣ Diagnostic list	→ 🕮	206
		Diagnostics 1 (0692)	→ 🕮	206
		Diagnostics 2 (0693)	→ 🕮	206
		Diagnostics 3 (0694)	→ 🕮	206
		Diagnostics 4 (0695)	→ 🕮	206
		Diagnostics 5 (0696)	→ 🕮	206
	‣ Device information	→ 🕮	206
		Device tag (0011)	→ 🕮	206
		Serial number (0009)	→ 🕮	206
		Firmware version (0010)	→ 🕮	206
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‣ Heartbeat base settings	→ 🕮 208	
‣ Performing verification	→ 🕮 208	
‣ Verification results	→ 🕮 209	
‣ Simulation	→ 🕮 210	
Assign simulation process variable (1810)	→ 🕮 210	
Process variable value (1811)	→ 🕮 210	
Current output 1 simulation (0354-1)	→ 🕮 210	
Current output value (0355)	→ 🕮 210	
Frequency output 1 to n simulation (0472-1 to n)	→ 🕮 210	
Frequency output 1 to n value (0473-1 to n)	→ 🕮 210	
Pulse output simulation 1 to n (0458-1 to n)	→ 🕮 210	
Pulse value 1 to n (0459-1 to n)	→ 🕮 210	
Switch output simulation 1 to n (0462-1 to n)	→ 🕮 210	
Switch state 1 to n (0463-1 to n)	→ 🕮 210	
Device alarm simulation (0654)	→ 🕮 210	
Diagnostic event category (0738)	→ 🕮 210	
Diagnostic event simulation (0737)	→ 🕮 210	

6.3   Register information

Navigation: Expert					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🕮
Direct access (0106)	3878	Integer	Read / Write	0 to 65 535	10
Locking status (0004)	4918	Integer	Read	256 = Hardware locked 512 = Temporarily locked	11

Navigation: Expert					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🗎
User role (0005)	2178	Integer	Read	0 = Operator **1 = Maintenance**	11
Enter access code (0003)	2177	Integer	Read / Write	Max. 16-digit character string comprising numbers, letters and special characters	12

6.3.1   "System" submenu

"Display" submenu

Navigation: Expert → System → Display					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🗎
Display language (0104)	3673	Integer	Read / Write	0 = English 1 = Deutsch 2 = Français 3 = Español 4 = Italiano 5 = Nederlands 8 = Svenska 11 = 日本語 (Japanese) 12 = Portuguesa 13 = Polski 14 = русский язык (Russian) 15 = čeština (Czech) 16 = 中文 (Chinese) 18 = Türkçe 20 = 한국어 (Korean)	13
Format display (0098)	3625	Integer	Read / Write	0 = 1 value, max. size 1 = 1 bargraph + 1 value 2 = 2 values 3 = 1 value large + 2 values 4 = 4 values	14
Value 1 display (0107)	3963	Integer	Read / Write	1 = Mass flow 2 = Volume flow 3 = Flow velocity 4 = Sound velocity 5 = Totalizer 1 6 = Totalizer 2 7 = Totalizer 3 8 = Temperature 14 = Density 15 = Signal strength [*] 16 = Signal to noise ratio [*] 17 = Turbulence [*] 20 = Acceptance rate [*] 39 = Electronics temperature	16
0% bargraph value 1 (0123)	4136 to 4137	Float	Read / Write	Signed floating-point number	16
100% bargraph value 1 (0125)	4142 to 4143	Float	Read / Write	Signed floating-point number	17
Decimal places 1 (0095)	3365	Integer	Read / Write	0 = x 1 = x.x 2 = x.xx 3 = x.xxx 4 = x.xxxx	17
Value 2 display (0108)	3964	Integer	Read / Write	For the picklist, see **Value 1 display** parameter (→ 🗎 16) For the picklist, see **Value 1 display** parameter (→ 🗎 16)	18

Navigation: Expert → System → Display					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🗏
Decimal places 2 (0117)	4049	Integer	Read / Write	0 = x 1 = x.x **2 = x.xx** 3 = x.xxx 4 = x.xxxx	18
Value 3 display (0110)	3966	Integer	Read / Write	For the picklist, see **Value 1 display** parameter (→ 🗏 16)	19
0% bargraph value 3 (0124)	4138 to 4139	Float	Read / Write	Signed floating-point number	19
100% bargraph value 3 (0126)	4140 to 4141	Float	Read / Write	Signed floating-point number	20
Decimal places 3 (0118)	4050	Integer	Read / Write	0 = x 1 = x.x **2 = x.xx** 3 = x.xxx 4 = x.xxxx	20
Value 4 display (0109)	3965	Integer	Read / Write	For the picklist, see **Value 1 display** parameter (→ 🗏 16)	20
Decimal places 4 (0119)	4051	Integer	Read / Write	0 = x 1 = x.x **2 = x.xx** 3 = x.xxx 4 = x.xxxx	21
Display interval (0096)	3604 to 3605	Float	Read / Write	1 to 10 s	21
Display damping (0094)	3554 to 3555	Float	Read / Write	0.0 to 999.9 s	22
Header (0097)	3624	Integer	Read / Write	**0 = Device tag** 1 = Free text	22
Header text (0112)	3968 to 3973	String	Read / Write	Max. 12 characters, such as letters, numbers or special characters (e.g. @, %, /)	23
Separator (0101)	3671	Integer	Read / Write	▪ . (point) ▪ , (comma)	23
Contrast display (0105)	3674 to 3675	Float	Read / Write	20 to 80 %	24
Backlight (0111)	3967	Integer	Read / Write	0 = Disable **1 = Enable**	24

*   Visibility depends on order options or device settings

"Diagnostic handling" submenu

Navigation: Expert → System → Diagnostic handling					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🗏
Alarm delay (0651)	6808 to 6809	Float	Read / Write	0 to 60 s	25

"Diagnostic behavior" submenu

Navigation: Expert → System → Diagnostic handling → Diagnostic behavior					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 📖
Assign behavior of diagnostic no. 019 (0635)	48299	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	27
Assign behavior of diagnostic no. 160 (0776)	2873	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	27
Assign behavior of diagnostic no. 302 (0742)	6484	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning**	27
Assign behavior of diagnostic no. 441 (0657)	4742	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	28
Assign behavior of diagnostic no. 442 (0658)	4919	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	28
Assign behavior of diagnostic no. 443 (0659)	5000	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	29
Assign behavior of diagnostic no. 832 (0675)	6440	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	29
Assign behavior of diagnostic no. 833 (0676)	6439	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	29
Assign behavior of diagnostic no. 841 (0680)	2434	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	30
Assign behavior of diagnostic no. 842 (0638)	9661	Integer	Read / Write	**0 = Off** 1 = Logbook entry only 2 = Warning 3 = Alarm	30
Assign behavior of diagnostic no. 870 (0726)	33279	Integer	Read / Write	**0 = Off** 1 = Logbook entry only 2 = Warning 3 = Alarm	30
Assign behavior of diagnostic no. 930 (0639)	30668	Integer	Read / Write	0 = Off 1 = Logbook entry only 2 = Warning **3 = Alarm**	31
Assign behavior of diagnostic no. 931 (0640)	30930	Integer	Read / Write	0 = Off 1 = Logbook entry only 2 = Warning **3 = Alarm**	31

"Administration" submenu

Navigation: Expert → System → Administration					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖹
Device reset (0000)	6817	Integer	Read / Write	**0 = Cancel** 1 = Restart device 2 = To delivery settings 25 = Restore S-DAT backup *	35
Activate SW option (0029)	2795	Integer	Read / Write	Max. 10-digit string of numbers.	35
Software option overview (0015)	2902	Integer	Read	1 = Extended HistoROM 8 = 4-20mA,2x pulse/freq./switch output 512 = Flow disturbance compensation 16384 = Heartbeat Monitoring 32768 = Heartbeat Verification	36

* Visibility depends on order options or device settings

"Define access code" wizard

"Reset access code" submenu

Navigation: Expert → System → Administration → Reset access code					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖹
Operating time (0652)	2631	String	Read	Days (d), hours (h), minutes (m) and seconds (s)	34
Reset access code (0024)	8880 to 8895	String	Read / Write	Character string comprising numbers, letters and special characters	34

6.3.2 "Sensor" submenu

"Measured values" submenu

"Process variables" submenu

Navigation: Expert → Sensor → Measured values → Process variables					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖹
Volume flow (1838)	2007 to 2008	Float	Read	Signed floating-point number	38
Mass flow (1847)	2009 to 2010	Float	Read	Signed floating-point number	38
Flow velocity (1852)	2015 to 2016	Float	Read	Signed floating-point number	39
Sound velocity (1850)	2013 to 2014	Float	Read	Signed floating-point number	39
Density (1851)	2011 to 2012	Float	Read	Signed floating-point number	39
Temperature (1853)	2017 to 2018	Float	Read	Signed floating-point number	39

"System values" submenu

Navigation: Expert → Sensor → Measured values → System values					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖹
Signal strength (2914)	4959 to 4960	Float	Read	Signed floating-point number	40
Signal to noise ratio (2917)	4983 to 4984	Float	Read	Signed floating-point number	40
Acceptance rate (2912)	4551 to 4552	Float	Read	0 to 100 %	41
Turbulence (2907)	22772 to 22773	Float	Read	Signed floating-point number	41

"Totalizer" submenu

Navigation: Expert → Sensor → Measured values → Totalizer					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖹
Totalizer 1 to n value (0911–1 to n)	1: 2610 to 2611 2: 2810 to 2811 3: 3010 to 3011	Float	Read	Signed floating-point number	42
Totalizer 1 to n overflow (0910–1 to n)	1: 2612 to 2613 2: 2812 to 2813 3: 3012 to 3013	Float	Read	−32 000.0 to 32 000.0	42

"Output values" submenu

Navigation: Expert → Sensor → Measured values → Output values					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖹
Output current (0361)	--	Float	Read		
Measured current (0366)	--	Float	Read		
Pulse output (0456)	--	Float	Read		
Output frequency (0471)	--	Float	Read		
Switch state (0461)	--	Integer	Read		
Output frequency (0471)	--	Float	Read		
Pulse output (0456)	--	Float	Read		
Switch state (0461)	--	Integer	Read		

"System units" submenu

Navigation: Expert → Sensor → System units					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖺
Volume flow unit (0553)	2103	Integer	Read / Write	= = = = 0 = cm³/s 1 = cm³/min 2 = cm³/h 3 = cm³/d 4 = dm³/s 5 = dm³/min 6 = dm³/h 7 = dm³/d 8 = m³/s 9 = m³/min **10 = m³/h** [(+)] 11 = m³/d 12 = ml/s 13 = ml/min 14 = ml/h 15 = ml/d 16 = l/s 17 = l/min 18 = l/h 19 = l/d 20 = hl/s 21 = hl/min 22 = hl/h 23 = hl/d 24 = Ml/s 25 = Ml/min 26 = Ml/h 27 = Ml/d 32 = af/s 33 = af/min 34 = af/h 35 = af/d 36 = ft³/s 37 = ft³/min 38 = ft³/h 39 = ft³/d 40 = fl oz/s (us) 41 = fl oz/min (us) 42 = fl oz/h (us) 43 = fl oz/d (us) 44 = gal/s (us) 45 = gal/min (us) 46 = gal/h (us) 47 = gal/d (us) 48 = Mgal/s (us) 49 = Mgal/min (us) 50 = Mgal/h (us) 51 = Mgal/d (us) 52 = bbl/s (us;liq.) 53 = bbl/min (us;liq.) 54 = bbl/h (us;liq.) 55 = bbl/d (us;liq.) 56 = bbl/s (us;beer) 57 = bbl/min (us;beer) 58 = bbl/h (us;beer) 59 = bbl/d (us;beer) 60 = bbl/s (us;oil) 61 = bbl/min (us;oil) 62 = bbl/h (us;oil) 63 = bbl/d (us;oil) 64 = bbl/s (us;tank)	46

Navigation: Expert → Sensor → System units					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 📖
				65 = bbl/min (us;tank) 66 = bbl/h (us;tank) 67 = bbl/d (us;tank) 68 = gal/s (imp) 69 = gal/min (imp) 70 = gal/h (imp) 71 = gal/d (imp) 72 = Mgal/s (imp) 73 = Mgal/min (imp) 74 = Mgal/h (imp) 75 = Mgal/d (imp) 76 = bbl/s (imp;beer) 77 = bbl/min (imp;beer) 78 = bbl/h (imp;beer) 79 = bbl/d (imp;beer) 80 = bbl/s (imp;oil) 81 = bbl/min (imp;oil) 82 = bbl/h (imp;oil) 83 = bbl/d (imp;oil) 88 = kgal/s (us) 89 = kgal/min (us) 90 = kgal/h (us) 91 = kgal/d (us)	
Volume unit (0563)	2104	Integer	Read / Write	= = 0 = cm³ 1 = dm³ **2 = m³ (+)** 3 = ml 4 = l 5 = hl 8 = af 9 = ft³ 10 = fl oz (us) 11 = gal (us) 12 = Mgal (us) 13 = bbl (us;liq.) 14 = bbl (us;beer) 15 = bbl (us;oil) 16 = bbl (us;tank) 17 = gal (imp) 18 = Mgal (imp) 19 = bbl (imp;beer) 20 = bbl (imp;oil) 22 = kgal (us)	47

Navigation: Expert → Sensor → System units					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖻
Mass flow unit (0554)	2101	Integer	Read / Write	0 = g/s 1 = g/min 2 = g/h 3 = g/d 4 = kg/s 5 = kg/min **6 = kg/h** [(+)] 7 = kg/d 8 = t/s 9 = t/min 10 = t/h 11 = t/d 12 = oz/s 13 = oz/min 14 = oz/h 15 = oz/d 16 = lb/s 17 = lb/min 18 = lb/h 19 = lb/d 20 = STon/s 21 = STon/min 22 = STon/h 23 = STon/d	48
Mass unit (0574)	2102	Integer	Read / Write	50 = g **51 = kg** [(+)] 52 = t 53 = oz 54 = lb 55 = STon	49
Velocity unit (0566)	2600	Integer	Read / Write	20 = ft/s **21 = m/s** [(+)]	49
Temperature unit (0557)	2109	Integer	Read / Write	**0 = °C** [(+)] 1 = K 2 = °F 3 = °R	50
Density unit (0555)	2107	Integer	Read / Write	0 = g/cm³ **2 = kg/dm³** [(+)] 3 = kg/l 4 = kg/m³ 5 = SD4°C 6 = SD15°C 7 = SD20°C 8 = SG4°C 9 = SG15°C 10 = SG20°C 11 = lb/ft³ 12 = lb/gal (us) 13 = lb/bbl (us;liq.) 14 = lb/bbl (us;beer) 15 = lb/bbl (us;oil) 16 = lb/bbl (us;tank) 17 = lb/gal (imp) 18 = lb/bbl (imp;beer) 19 = lb/bbl (imp;oil) 21 = g/m³	50
Kinematic viscosity unit (0578)	2112	Integer	Read / Write	**0 = m²/s** [(+)] 2 = cSt 3 = St 240 = mm²/s	51

Navigation: Expert → Sensor → System units					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🕮
Length unit (0551)	2087	Integer	Read / Write	44 = ft 45 = m 47 = in **49 = mm** **(+)**	51
Date/time format (2812)	2150	Integer	Read / Write	**0 = dd.mm.yy hh:mm** 1 = mm/dd/yy hh:mm am/pm 2 = dd.mm.yy hh:mm am/pm 3 = mm/dd/yy hh:mm	51

"Measuring point 1" submenu

| Navigation: Expert → Sensor → Measuring point 1					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🕮
Measuring point configuration (5675–1)	4285	Integer	Read / Write	0 = 1 measuring point - signal path 1 1 = 1 measuring point - 2 signal paths * 2 = 1 measuring point - signal path 2 *	53
Medium (2926–1)	5049	Integer	Read / Write	**0 = Water** 1 = Distilled water 2 = Sea water 3 = Ammonia NH3 4 = Benzene 6 = Ethanol 7 = Glycol 9 = Milk 10 = Methanol 255 = User-specific liquid	53
Medium temperature (3053–1)	36110 to 36111	Float	Read / Write	−200 to 550 ℃	54
Sound velocity (2929–1)	5171 to 5172	Float	Read / Write	200 to 3 000 m/s	54
Viscosity (2932–1)	5223 to 5224	Float	Read / Write	0.01 to 10 000 mm²/s	54
Pipe material (2927–1)	5102	Integer	Read / Write	**0 = Stainless steel** 1 = Carbon steel 2 = Ductile cast iron 3 = Hastelloy C 6 = Copper 10 = PA 11 = PE 12 = PTFE 13 = PVC 14 = PVDF 15 = LDPE 16 = HDPE 17 = GRP 18 = PP 20 = Pyrex glass 22 = Asbestos cement 104 = 1.4301 (UNS S30400) 116 = 1.4401 (UNS S31600) 147 = 1.4550 (UNS S34700) 255 = Unknown pipe material	55
Pipe sound velocity (2933–1)	5326 to 5327	Float	Read / Write	800.0 to 3 800.0 m/s	55
Pipe dimensions (2943–1)	5114	Integer	Read / Write	**0 = Diameter** 1 = Pipe circumference	55
Pipe circumference (2934–1)	5334 to 5335	Float	Read / Write	30 to 62 800 mm	56
Pipe outer diameter (2910–1)	4971 to 4972	Float	Read / Write	0 to 20 000 mm	56
Pipe wall thickness (2916–1)	4975 to 4976	Float	Read / Write	Positive floating point number	56

Navigation: Expert → Sensor → Measuring point 1					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 📄
Liner material (2928–1)	5118	Integer	Read / Write	1 = Cement 2 = Rubber 3 = Epoxy resin **251 = None** 255 = Unknown liner material	56
Liner sound velocity (2936–1)	5342 to 5343	Float	Read / Write	800.0 to 3 800.0 m/s	57
Liner thickness (2935–1)	5338 to 5339	Float	Read / Write	0 to 100 mm	57
Sensor type (2924–1)	4928	Integer	Read / Write	0 = C-030-A 0 = C-050-A 0 = C-100-A 0 = C-100-B 0 = C-100-C 0 = C-200-A 0 = C-200-B 0 = C-200-C 0 = C-500-A	57
Signal filter (3011–1)	52344	Integer	Read / Write	0 = Off **1 = On**	58
Sensor coupling (2957–1)	27037	Integer	Read / Write	**0 = Coupling pad** 1 = Coupling paste	58
Mounting type (2938–1)	4998	Integer	Read / Write	1 = 1 traverse **2 = 2 traverses** 3 = 3 traverses 4 = 4 traverses 250 = Automatic	58
Cable length (2939–1)	5346 to 5347	Float	Read / Write	0 to 200 000 mm	59
FlowDC inlet configuration (3049–1)	21570	Integer	Read / Write	**0 = Off** 1 = Single elbow 2 = Double elbow 3 = Double elbow 3D 4 = Concentric diameter change 5 = 45° bend 6 = 2 x 45° bend 22 = Other [*]	59
Intermediate pipe length (2945–1)	32808 to 32809	Float	Read / Write	Positive floating-point number	60
Inlet diameter (3054–1)	36730 to 36731	Float	Read / Write	1 to 10 000 mm	60
Transition length (3065–1)	27608 to 27609	Float	Read / Write	0 to 20 000 mm	60
Inlet run (3050–1)	36023 to 36024	Float	Read / Write	0 to 300 000 mm	61
Relative sensor position (2985–1)	5122	Integer	Read	90 = 90° 180 = 180°	61
Result sensor type / mounting type (2946–1)	5187 to 5199	String	Read	e.g. **C-100-A** option / **(2) V-mounting** option	61
Result sensor distance / measuring aid (2947–1)	5203 to 5215	String	Read	e.g. 201.3 mm / B 21	62

* Visibility depends on order options or device settings

"Installation status" submenu

Navigation: Expert → Sensor → Installation status					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🕮
Installation status (2958)	27532	Integer	Read	0 = Bad 1 = Acceptable **128 = Good**	62
Signal strength (2914)	4959 to 4960	Float	Read	Signed floating-point number	63
Signal to noise ratio (2917)	4983 to 4984	Float	Read	Signed floating-point number	63
Sound velocity (2915)	4967 to 4968	Float	Read	Signed floating-point number	63
Sound velocity deviation (2986)	46176 to 46177	Float	Read	Signed floating-point number	64

"Process parameters" submenu

Navigation: Expert → Sensor → Process parameters					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🕮
Flow override (1839)	5503	Integer	Read / Write	**0 = Off** 1 = On	64
Flow damping (1802)	5510 to 5511	Float	Read / Write	0 to 999.9 s	65
Sound velocity damping (1888)	25344 to 25345	Float	Read / Write	0 to 999.9 s	66
Density damping (1889)	25492 to 25493	Float	Read / Write	0 to 999.9 s	66
Temperature damping (1886)	2483 to 2484	Float	Read / Write	0 to 999.9 s	66

"Low flow cut off" submenu

Navigation: Expert → Sensor → Process parameters → Low flow cut off					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🕮
Assign process variable (1837)	5101	Integer	Read / Write	0 = Off 1 = Mass flow 2 = Volume flow **3 = Flow velocity**	67
On value low flow cutoff (1805)	5138 to 5139	Float	Read / Write	Positive floating-point number	67
Off value low flow cutoff (1804)	5104 to 5105	Float	Read / Write	0 to 100.0 %	67

"External compensation" submenu

Navigation: Expert → Sensor → External compensation					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🕮
Temperature compensation (3025)	28563	Integer	Read / Write	**1 = Fixed value** 10 = External value	69
External value (3058)	28647 to 28648	Float	Read / Write	−273.15 to 99 999 ℃	69
Fixed value (2925)	4979 to 4980	Float	Read / Write	−50 to 550 ℃	69
Density source (3048)	21485	Integer	Read / Write	**0 = Fixed value** 1 = External density 2 = Calculated value	69
External value (3060)	36025 to 36026	Float	Read / Write	Positive floating-point number	70
Fixed density (3171)	25234 to 25235	Float	Read / Write	0.01 to 15 000 kg/m³	70
Linear expansion coefficient (3153)	26402 to 26403	Float	Read / Write	$1.0 \cdot 10^{-6}$ to $2.0 \cdot 10^{-3}$	70
Square expansion coefficient (3172)	36021 to 36022	Float	Read / Write	$1.0 \cdot 10^{-6}$ to $2.0 \cdot 10^{-3}$	71

Navigation: Expert → Sensor → External compensation					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 📄
Fixed reference density (3178)	27177 to 27178	Float	Read / Write	0.01 to 15 000 kg/m³	71
Reference temperature (3147)	26383 to 26384	Float	Read / Write	−200 to 450 ℃	71

"Sensor adjustment" submenu

Navigation: Expert → Sensor → Sensor adjustment					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 📄
Installation direction (1809)	5501	Integer	Read / Write	**0 = Forward flow** 1 = Reverse flow	72

"Process variable adjustment" submenu

Navigation: Expert → Sensor → Sensor adjustment → Process variable adjustment					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 📄
Volume flow offset (1831)	5521 to 5522	Float	Read / Write	Signed floating-point number	73
Volume flow factor (1832)	5519 to 5520	Float	Read / Write	Positive floating-point number	73
Mass flow offset (1841)	5525 to 5526	Float	Read / Write	Signed floating-point number	74
Mass flow factor (1846)	5523 to 5524	Float	Read / Write	Positive floating-point number	74
Sound velocity offset (1848)	5529 to 5530	Float	Read / Write	Signed floating-point number	74
Sound velocity factor (1849)	5527 to 5528	Float	Read / Write	Positive floating-point number	75
Density offset (1866)	2044 to 2045	Float	Read / Write	Signed floating-point number	75
Density factor (1867)	2076 to 2077	Float	Read / Write	Positive floating-point number	75
Temperature offset (1870)	5533 to 5534	Float	Read / Write	Signed floating-point number	76
Temperature factor (1871)	5531 to 5532	Float	Read / Write	Positive floating-point number	76

"Calibration" submenu

Navigation: Expert → Sensor → Calibration					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 📄
Calibration factor (2920)	4559 to 4560	Float	Read	Signed floating-point number	77
Zero point (2921)	4963 to 4964	Float	Read	Signed floating-point number	77
Nominal diameter (2807)	2048 to 2057	String	Read	--------------	77

6.3.3   "Output" submenu

"Current output 1" submenu

Navigation: Expert → Output → Current output 1					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🕮
Process variable current output (0359–1)	5927	Integer	Read / Write	0 = Off * 1 = Mass flow **2 = Volume flow** 3 = Flow velocity 4 = Sound velocity 8 = Temperature 14 = Density 15 = Signal strength * 16 = Signal to noise ratio * 17 = Turbulence * 20 = Acceptance rate * 39 = Electronics temperature	78
Current range output (0353–1)	5923	Integer	Read / Write	0 = 4...20 mA (4...20.5 mA) 1 = 4...20 mA US (3.9...20.8 mA) 2 = 4...20 mA NE (3.8...20.5 mA) 3 = 0...20 mA (0...20.5 mA) 4 = Fixed value	79
Fixed current (0365–1)	5987 to 5988	Float	Read / Write	0 to 22.5 mA	80
Lower range value output (0367–1)	6195 to 6196	Float	Read / Write	Signed floating-point number	80
Upper range value output (0372–1)	5915 to 5916	Float	Read / Write	Signed floating-point number	82
Measuring mode current output (0351–1)	5899	Integer	Read / Write	**0 = Forward flow** 2 = Reverse flow compensation 13 = Forward/Reverse flow *	83
Damping current output (0363–1)	5903 to 5904	Float	Read / Write	0.0 to 999.9 s	87
Failure behavior current output (0364–1)	5911	Integer	Read / Write	0 = Min. **1 = Max.** 4 = Actual value 5 = Last valid value 6 = Fixed value	88
Failure current (0352–1)	5979 to 5980	Float	Read / Write	0 to 22.5 mA	89
Output current (0361–1)	5931 to 5932	Float	Read	0 to 22.5 mA	89
Measured current (0366–1)	5779 to 5780	Float	Read	0 to 30 mA	90

*   Visibility depends on order options or device settings

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

Navigation: Expert → Output → Pulse/frequency/switch output 1 to n					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🕮
Operating mode (0469–1 to n)	1: 4479 2: 4480	Integer	Read / Write	**0 = Pulse** * 1 = Switch * 53 = Frequency *	91
Assign pulse output (0460–1 to n)	1: 2461 2: 2462	Integer	Read / Write	**0 = Off** 1 = Mass flow 2 = Volume flow	93
Pulse scaling (0455–1 to n)	1: 3034 to 3035 2: 3036 to 3037	Float	Read / Write	Positive floating point number	93
Pulse width (0452–1 to n)	1: 2836 to 2837 2: 2838 to 2839	Float	Read / Write	0.05 to 2 000 ms	94

Navigation: Expert → Output → Pulse/frequency/switch output 1 to n

Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖹
Measuring mode (0457–1 to n)	1: 2394 2: 2395	Integer	Read / Write	**0 = Forward flow** 1 = Reverse flow 2 = Reverse flow compensation 13 = Forward/Reverse flow	94
Failure mode (0480–1 to n)	1: 2948 2: 2949	Integer	Read / Write	0 = Actual value **1 = No pulses**	95
Pulse output (0456–1 to n)	1: 3082 to 3083 2: 3084 to 3085	Float	Read	Positive floating-point number	96
Assign frequency output (0478–1 to n)	1: 2614 2: 2615	Integer	Read / Write	**0 = Off** 1 = Mass flow 2 = Volume flow 3 = Flow velocity 4 = Sound velocity 8 = Temperature 14 = Density 15 = Signal strength * 16 = Signal to noise ratio * 17 = Turbulence * 20 = Acceptance rate * 39 = Electronics temperature	96
Minimum frequency value (0453–1 to n)	1: 3526 to 3527 2: 3528 to 3529	Float	Read / Write	0.0 to 10 000.0 Hz	97
Maximum frequency value (0454–1 to n)	1: 2996 to 2997 2: 2998 to 2999	Float	Read / Write	0.0 to 10 000.0 Hz	97
Measuring value at minimum frequency (0476–1 to n)	1: 5887 to 5888 2: 5889 to 5890	Float	Read / Write	Signed floating-point number	97
Measuring value at maximum frequency (0475–1 to n)	1: 3514 to 3515 2: 3516 to 3517	Float	Read / Write	Signed floating-point number	98
Measuring mode (0479–1 to n)	1: 2922 2: 2923	Integer	Read / Write	**0 = Forward flow** 2 = Reverse flow compensation 13 = Forward/Reverse flow	98
Damping output (0477–1 to n)	1: 3522 to 3523 2: 3524 to 3525	Float	Read / Write	0 to 999.9 s	98
Response time (0491–1 to n)	1: 5875 to 5876 2: 5877 to 5878	Float	Read	Positive floating-point number	99
Failure mode (0451–1 to n)	1: 2367 2: 2368	Integer	Read / Write	0 = Actual value **1 = 0 Hz** 2 = Defined value	99
Failure frequency (0474–1 to n)	1: 3510 to 3511 2: 3512 to 3513	Float	Read / Write	0.0 to 12 500.0 Hz	100
Output frequency (0471–1 to n)	1: 3462 to 3463 2: 3464 to 3465	Float	Read	0.0 to 12 500.0 Hz	100
Switch output function (0481–1 to n)	1: 3022 2: 3023	Integer	Read / Write	**0 = Off** 1 = On 2 = Diagnostic behavior 3 = Flow direction check 4 = Limit 5 = Status	100
Assign diagnostic behavior (0482–1 to n)	1: 3096 2: 3097	Integer	Read / Write	**0 = Alarm** 1 = Warning 2 = Alarm or warning	101

Navigation: Expert → Output → Pulse/frequency/switch output 1 to n					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖺
Assign limit (0483–1 to n)	1: 3184 2: 3185	Integer	Read / Write	0 = Off 1 = Mass flow **2 = Volume flow** 3 = Flow velocity 4 = Sound velocity 5 = Totalizer 1 6 = Totalizer 2 7 = Totalizer 3 8 = Temperature 14 = Density 15 = Signal strength * 16 = Signal to noise ratio * 17 = Turbulence * 20 = Acceptance rate * 39 = Electronics temperature	102
Switch-on value (0466–1 to n)	1: 3242 to 3243 2: 3244 to 3245	Float	Read / Write	Signed floating-point number	104
Switch-off value (0464–1 to n)	1: 3234 to 3235 2: 3236 to 3237	Float	Read / Write	Signed floating-point number	104
Assign flow direction check (0484–1 to n)	1: 3363 2: 3364	Integer	Read / Write		105
Assign status (0485–1 to n)	1: 3374 2: 3375	Integer	Read / Write	0 = Off **1 = Low flow cut off**	105
Switch-on delay (0467–1 to n)	1: 6247 to 6248 2: 6249 to 6250	Float	Read / Write	0.0 to 100.0 s	105
Switch-off delay (0465–1 to n)	1: 6239 to 6240 2: 6241 to 6242	Float	Read / Write	0.0 to 100.0 s	106
Failure mode (0486–1 to n)	1: 3384 2: 3385	Integer	Read / Write	0 = Actual status **1 = Open** 6 = Closed	106
Switch state (0461–1 to n)	1: 2485 2: 2486	Integer	Read	1 = Open 6 = Closed	106
Invert output signal (0470–1 to n)	1: 2583 2: 2584	Integer	Read / Write	0 = Yes **1 = No**	107

*   Visibility depends on order options or device settings

6.3.4 "Communication" submenu

"Modbus configuration" submenu

Navigation: Expert → Communication → Modbus configuration					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖺
Bus address (7112)	4910	Integer	Read / Write	1 to 247	108
Baudrate (7111)	4912	Integer	Read / Write	0 = 1200 BAUD 1 = 2400 BAUD 2 = 4800 BAUD 3 = 9600 BAUD **4 = 19200 BAUD** 5 = 38400 BAUD 6 = 57600 BAUD 7 = 115200 BAUD 8 = 230400 BAUD	108
Data transfer mode (7115)	4913	Integer	Read / Write	**0 = RTU** 1 = ASCII	109

Navigation: Expert → Communication → Modbus configuration					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 📄
Parity (7122)	4914	Integer	Read / Write	**0 = Even** 1 = Odd 2 = None / 2 stop bits 3 = None / 1 stop bit	109
Byte order (7113)	4915	Integer	Read / Write	0 = 0-1-2-3 1 = 3-2-1-0 2 = 2-3-0-1 **3 = 1-0-3-2**	110
Telegram delay (7146)	4916 to 4917	Float	Read / Write	0 to 100 ms	111
Failure mode (7116)	4920	Integer	Read / Write	1 = Last valid value **255 = NaN value**	111
Fieldbus writing access (7156)	6807	Integer	Read / Write	**0 = Read + write** 1 = Read only	112

"Modbus information" submenu

Navigation: Expert → Communication → Modbus information					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 📄
Device ID (7153)	2547	Integer	Read	4-digit hexadecimal number	113
Device revision (7154)	4481	Integer	Read	4-digit hexadecimal number	113

"Modbus data map" submenu

Navigation: Expert → Communication → Modbus data map					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 📄
Scan list register 0 to 15 (7114)	0: 5001 1: 5002 2: 5003 3: 5004 4: 5005 5: 5006 6: 5007 7: 5008 8: 5009 9: 5010 10: 5011 11: 5012 12: 5013 13: 5014 14: 5015 15: 5016	Integer	Read / Write	1 to 65 535	113

"Web server" submenu

Navigation: Expert → Communication → Web server					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖹
Web server language (7221)	4219	Integer	Read / Write	**0 = English** 1 = Deutsch 2 = Français 3 = Español 4 = Italiano 5 = Nederlands 8 = Svenska 11 = 日本語 (Japanese) 12 = Portuguesa 13 = Polski 14 = русский язык (Russian) 15 = čeština (Czech) 16 = 中文 (Chinese) 18 = Türkçe 20 = 한국어 (Korean)	114
MAC address (7214)	4210 to 4218	String	Read	Unique 12-digit character string comprising letters and numbers	115
DHCP client (7212)	21781	Integer	Read / Write	0 = Off **1 = On**	115
IP address (7209)	4155 to 4162	String	Read / Write	4 octet: 0 to 255 (in the particular octet)	115
Subnet mask (7211)	4163 to 4170	String	Read / Write	4 octet: 0 to 255 (in the particular octet)	116
Default gateway (7210)	4171 to 4178	String	Read / Write	4 octet: 0 to 255 (in the particular octet)	116
Web server functionality (7222)	4220	Integer	Read / Write	0 = Off **1 = On**	116
Login page (7273)	5802	Integer	Read / Write	0 = Without header **1 = With header**	117

"WLAN settings" wizard

Navigation: Expert → Communication → WLAN settings					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖹
WLAN (2702)	6178	Integer	Read / Write	0 = Disable **1 = Enable**	118
WLAN mode (2717)	28777	Integer	Read / Write	**0 = WLAN access point**	118
SSID name (2714)	28940 to 28955	String	Read / Write	–	118
Network security (2705)	6206	Integer	Read / Write	0 = Unsecured **1 = WPA2-PSK** 2 = EAP-PEAP with MSCHAPv2 * 3 = EAP-TLS * 4 = EAP-PEAP MSCHAPv2 no server authentic. *	119
Security identification (2718)	28817	Integer	Read	1 = Trusted issuer certificate 2 = Device certificate 4 = Device private key	119
User name (2715)	28956 to 28971	String	Read / Write	–	120
WLAN password (2716)	28972 to 28987	String	Read / Write	–	120
WLAN IP address (2711)	8643 to 8650	String	Read / Write	4 octet: 0 to 255 (in the particular octet)	120
WLAN MAC address (2703)	8602 to 8610	String	Read	Unique 12-digit character string comprising letters and numbers	120
WLAN subnet mask (2709)	8651 to 8658	String	Read / Write	4 octet: 0 to 255 (in the particular octet)	121

Navigation: Expert → Communication → WLAN settings					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖹
WLAN MAC address (2703)	8602 to 8610	String	Read	Unique 12-digit character string comprising letters and numbers	120
WLAN passphrase (2706)	8611 to 8626	String	Read / Write	8 to 32-digit character string comprising numbers, letters and special characters (without spaces)	121
WLAN MAC address (2703)	8602 to 8610	String	Read	Unique 12-digit character string comprising letters and numbers	120
Assign SSID name (2708)	6218	Integer	Read / Write	0 = Device tag **1 = User-defined**	121
SSID name (2707)	8627 to 8642	String	Read / Write	Max. 32-digit character string comprising numbers, letters and special characters	122
2.4 GHz WLAN channel (2704)	6182	Integer	Read / Write	1 to 11	122
Select antenna (2713)	6102	Integer	Read / Write	0 = External antenna **1 = Internal antenna**	122
Connection state (2722)	29221	Integer	Read	**0 = Not connected** 1 = Connected	122
Received signal strength (2721)	28818	Integer	Read	0 = Low **1 = High** 2 = Medium	123
WLAN IP address (2711)	8643 to 8650	String	Read / Write	4 octet: 0 to 255 (in the particular octet)	120
Gateway IP address (2719)	29227 to 29234	String	Read	Character string comprising numbers, letters and special characters	123
IP address domain name server (2720)	29283 to 29290	String	Read	Character string comprising numbers, letters and special characters	123

* Visibility depends on order options or device settings

6.3.5   "Application" submenu

Navigation: Expert → Application					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖹
Reset all totalizers (2806)	2609	Integer	Read / Write	**0 = Cancel** 1 = Reset + totalize	124

"Totalizer 1 to n" submenu

Navigation: Expert → Application → Totalizer 1 to n					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 📖
Assign process variable 1 to n (0914–1 to n)	1: 2601 2: 2801 3: 3001	Integer	Read / Write	0 = Off 1 = Mass flow 2 = Volume flow	125
Process variable unit 1 to n (0915–1 to n)	1: 4604 2: 4605 3: 4606	Integer	Read / Write	0 = cm³ * 1 = dm³ * 2 = m³ * 3 = ml * 4 = l * 5 = hl * 6 = Ml Mega * 8 = af * 9 = ft³ * 10 = fl oz (us) * 11 = gal (us) * 12 = Mgal (us) * 13 = bbl (us;liq.) * 14 = bbl (us;beer) * 15 = bbl (us;oil) * 16 = bbl (us;tank) * 17 = gal (imp) * 18 = Mgal (imp) * 19 = bbl (imp;beer) * 20 = bbl (imp;oil) * 22 = kgal (us) * 23 = Mft³ * 50 = g * 51 = kg * 52 = t * 53 = oz * 54 = lb * 55 = STon * 111 = Mft³ * 251 = None *	125
Totalizer 1 to n operation mode (0908–1 to n)	1: 2605 2: 2805 3: 3005	Integer	Read / Write	0 = Net 1 = Forward 2 = Reverse	126
Totalizer 1 to n control (0912–1 to n)	1: 2608 2: 2808 3: 3008	Integer	Read / Write	**0 = Totalize** 1 = Reset + totalize 2 = Preset + hold 3 = Reset + hold 4 = Preset + totalize 5 = Hold	127
Preset value 1 to n (0913–1 to n)	1: 2590 to 2591 2: 2592 to 2593 3: 2594 to 2595	Float	Read / Write	Signed floating-point number	127
Totalizer 1 to n failure behavior (0901–1 to n)	1: 2606 2: 2806 3: 3006	Integer	Read / Write	0 = Hold 1 = Continue 2 = Last valid value + continue	128

*   Visibility depends on order options or device settings

6.3.6 "Diagnostics" submenu

Navigation: Expert → Diagnostics					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🕮
Actual diagnostics (0691)	2732	Integer	Read	Symbol for diagnostic behavior, diagnostic code and short message.	133
Previous diagnostics (0690)	2734	Integer	Read	Symbol for diagnostic behavior, diagnostic code and short message.	133
Operating time from restart (0653)	2624	String	Read	Days (d), hours (h), minutes (m) and seconds (s)	134
Operating time (0652)	––	String	Read		

"Diagnostic list" submenu

Navigation: Expert → Diagnostics → Diagnostic list					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🕮
Diagnostics 1 (0692)	2736	Integer	Read	Symbol for diagnostic behavior, diagnostic code and short message.	135
Diagnostics 2 (0693)	2738	Integer	Read	Symbol for diagnostic behavior, diagnostic code and short message.	135
Diagnostics 3 (0694)	2740	Integer	Read	Symbol for diagnostic behavior, diagnostic code and short message.	136
Diagnostics 4 (0695)	2742	Integer	Read	Symbol for diagnostic behavior, diagnostic code and short message.	137
Diagnostics 5 (0696)	2744	Integer	Read	Symbol for diagnostic behavior, diagnostic code and short message.	138

"Device information" submenu

Navigation: Expert → Diagnostics → Device information					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🕮
Device tag (0011)	2026 to 2041	String	Read	Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /).	139
Serial number (0009)	7003 to 7008	String	Read	Max. 11-digit character string comprising letters and numbers.	140
Firmware version (0010)	7277 to 7280	String	Read	Character string in the format xx.yy.zz	140
Device name (0013)	7263 to 7270	String	Read	Max. 32 characters such as letters or numbers.	140
Order code (0008)	2058 to 2067	String	Read	Character string composed of letters, numbers and certain punctuation marks (e.g. /).	141
Extended order code 1 (0023)	2212 to 2221	String	Read	Character string	141
Extended order code 2 (0021)	2222 to 2231	String	Read	Character string	141
Extended order code 3 (0022)	2232 to 2241	String	Read	Character string	142
ENP version (0012)	4003 to 4010	String	Read	Character string	142

"Main electronic module" submenu

Navigation: Expert → Diagnostics → Main electronic module					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖹
Firmware version (0072)	7039	Integer	Read	Positive integer	143
Build no. software (0079)	2326	Integer	Read	Positive integer	143
Bootloader revision (0073)	2264	Integer	Read	Positive integer	143

"Sensor electronic module (ISEM)" submenu

Navigation: Expert → Diagnostics → Sensor electronic module (ISEM)					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖹
Firmware version (0072)	7039	Integer	Read	Positive integer	144
Build no. software (0079)	2326	Integer	Read	Positive integer	144
Bootloader revision (0073)	2264	Integer	Read	Positive integer	144

"Display module" submenu

Navigation: Expert → Diagnostics → Display module					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖹
Firmware version (0072)	7039	Integer	Read	Positive integer	145
Build no. software (0079)	2326	Integer	Read	Positive integer	145
Bootloader revision (0073)	2264	Integer	Read	Positive integer	145

"Data logging" submenu

Navigation: Expert → Diagnostics → Data logging					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🖹
Assign channel 1 (0851)	2445	Integer	Read / Write	**0 = Off** 1 = Mass flow 2 = Volume flow 3 = Flow velocity 4 = Sound velocity 8 = Temperature 14 = Density 15 = Signal strength [*] 16 = Signal to noise ratio [*] 17 = Turbulence [*] 20 = Acceptance rate [*] 39 = Electronics temperature 121 = Current output 1	146
Assign channel 2 (0852)	2446	Integer	Read / Write	For the picklist, see **Assign channel 1** parameter (→ 🖹 146)	147
Assign channel 3 (0853)	2548	Integer	Read / Write	For the picklist, see **Assign channel 1** parameter (→ 🖹 146)	147
Assign channel 4 (0854)	4286	Integer	Read / Write	For the picklist, see **Assign channel 1** parameter (→ 🖹 146)	147
Logging interval (0856)	4288 to 4289	Float	Read / Write	0.1 to 3 600.0 s	148
Clear logging data (0855)	4287	Integer	Read / Write	**0 = Cancel** 2 = Clear data	148
Data logging (0860)	5950	Integer	Read / Write	**0 = Overwriting** 1 = Not overwriting	149

Navigation: Expert → Diagnostics → Data logging					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🗎
Logging delay (0859)	5938	Integer	Read / Write	0 to 999 h	149
Data logging control (0857)	5930	Integer	Read / Write	**0 = None** 1 = Stop 2 = Delete + start	149
Data logging status (0858)	5937	Integer	Read	**0 = Done** 1 = Stopped 2 = Active 3 = Delay active	150
Entire logging duration (0861)	2827 to 2828	Float	Read	Positive floating-point number	150

*   Visibility depends on order options or device settings

"Heartbeat Technology" submenu

"Heartbeat base settings" submenu

Navigation: Expert → Diagnostics → Heartbeat Technology → Heartbeat base settings					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🗎
Plant operator (2754)	3414 to 3429	String	Read / Write	Max. 32 characters such as letters, numbers or special characters (e.g. @, %, /)	153
Location (2755)	3430 to 3445	String	Read / Write	Max. 32 characters such as letters, numbers or special characters (e.g. @, %, /)	154

"Performing verification" submenu

Navigation: Expert → Diagnostics → Heartbeat Technology → Performing verification					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 🗎
Year (2846)	2495	Integer	Read / Write	9 to 99	155
Month (2845)	2494	Integer	Read / Write	**0 = January** 1 = February 2 = March 3 = April 4 = May 5 = June 6 = July 7 = August 8 = September 9 = October 10 = November 11 = December	155
Day (2842)	2493	Integer	Read / Write	1 to 31 d	155
Hour (2843)	2492	Integer	Read / Write	0 to 23 h	156
AM/PM (2813)	2496	Integer	Read / Write	**0 = AM** 1 = PM	156
Minute (2844)	2467	Integer	Read / Write	0 to 59 min	156
Verification mode (12105)	2366	Integer	Read / Write	**0 = Standard verification** 1 = Extended verification	157
External device information (12101)	20493 to 20508	String	Read / Write	Free text entry	157

Navigation: Expert → Diagnostics → Heartbeat Technology → Performing verification					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 📖
Start verification (12127)	2270	Integer	Read / Write	**0 = Cancel** 1 = Start 3 = Start with testkit [*] 10 = Output 1 low value [*] 11 = Output 1 high value [*] 20 = Pulse output 1 [*] 21 = Frequency output 1 [*] 22 = Pulse output 2 [*] 23 = Frequency output 2 [*]	157
Progress (2808)	6797	Integer	Read	0 to 100 %	158
Measured values (12102)	5512 to 5513	Float	Read / Write	Signed floating-point number	158
Output values (12103)	5516 to 5517	Float	Read	Signed floating-point number	159
Status (12153)	2079	Integer	Read	0 = Failed **1 = Done** 3 = Not done 8 = Busy	159
Verification result (12149)	2355	Integer	Read	0 = Failed 2 = Passed **3 = Not done** 250 = Not supported	159

*   Visibility depends on order options or device settings

"Verification results" submenu

Navigation: Expert → Diagnostics → Heartbeat Technology → Verification results					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 📖
Date/time (manually entered) (12142)	2372 to 2381	String	Read	dd.mmmm.yyyy; hh:mm	160
Verification ID (12141)	2315	Integer	Read	0 to 65 535	160
Operating time (12126)	3346	String	Read	Days (d), hours (h), minutes (m), seconds (s)	161
Verification result (12149)	2355	Integer	Read	0 = Failed 2 = Passed **3 = Not done** 250 = Not supported	161
Sensor (12152)	2384	Integer	Read	0 = Failed 2 = Passed **3 = Not done** 250 = Not supported	161
Sensor electronic module (ISEM) (12151)	2385	Integer	Read	0 = Failed 2 = Passed **3 = Not done** 250 = Not supported	162
I/O module (12145)	2386	Integer	Read	0 = Failed 2 = Passed **3 = Not done** 250 = Not supported	162
System status (12109)	5790	Integer	Read	0 = Failed 2 = Passed **3 = Not done** 250 = Not supported	162

"Simulation" submenu

Navigation: Expert → Diagnostics → Simulation					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 📄
Assign simulation process variable (1810)	6813	Integer	Read / Write	**0 = Off** 1 = Mass flow 2 = Volume flow 3 = Flow velocity 4 = Sound velocity 8 = Temperature 14 = Density	164
Process variable value (1811)	6814 to 6815	Float	Read / Write	Depends on the process variable selected	164
Current output 1 simulation (0354–1)	5939	Integer	Read / Write	**0 = Off** 1 = On	165
Current output value (0355)	5995 to 5996	Float	Read / Write	0 to 22.5 mA	166
Frequency output 1 to n simulation (0472–1 to n)	1: 6203 2: 6204	Integer	Read / Write	**0 = Off** 1 = On	166
Frequency output 1 to n value (0473–1 to n)	1: 6207 to 6208 2: 6209 to 6210	Float	Read / Write	0.0 to 12 500.0 Hz	167
Pulse output simulation 1 to n (0458–1 to n)	1: 6215 2: 6216	Integer	Read / Write	**0 = Off** 1 = Down-counting value 2 = Fixed value	167
Pulse value 1 to n (0459–1 to n)	1: 6219 2: 6220	Integer	Read / Write	0 to 65 535	168
Switch output simulation 1 to n (0462–1 to n)	1: 6223 2: 6224	Integer	Read / Write	**0 = Off** 1 = On	168
Switch state 1 to n (0463–1 to n)	1: 6227 2: 6228	Integer	Read / Write	1 = Open 6 = Closed	169
Device alarm simulation (0654)	6812	Integer	Read / Write	**0 = Off** 1 = On	169
Diagnostic event category (0738)	4261	Integer	Read / Write	0 = Sensor 1 = Electronics 2 = Configuration **3 = Process**	170
Diagnostic event simulation (0737)	4259	Integer	Read / Write	• Off • Diagnostic event picklist (depends on the category selected)	170

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