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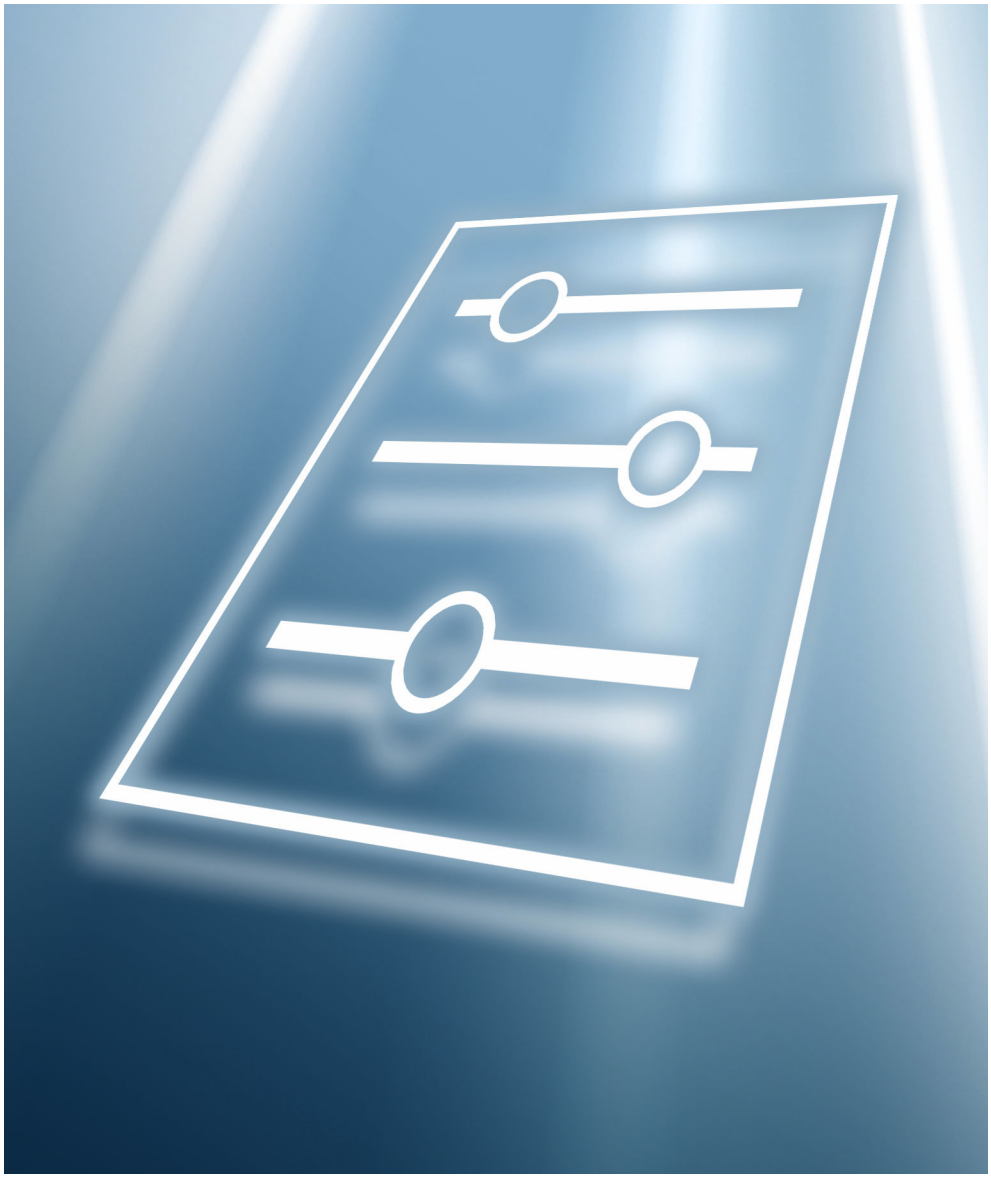
Valid as of version
01.00.zz (Device firmware)

Description of Device Parameters
Proline Teqwave M 500

Total solids measurement via microwave transmission
Modbus RS485



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1 About this document

1.1 Document function

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

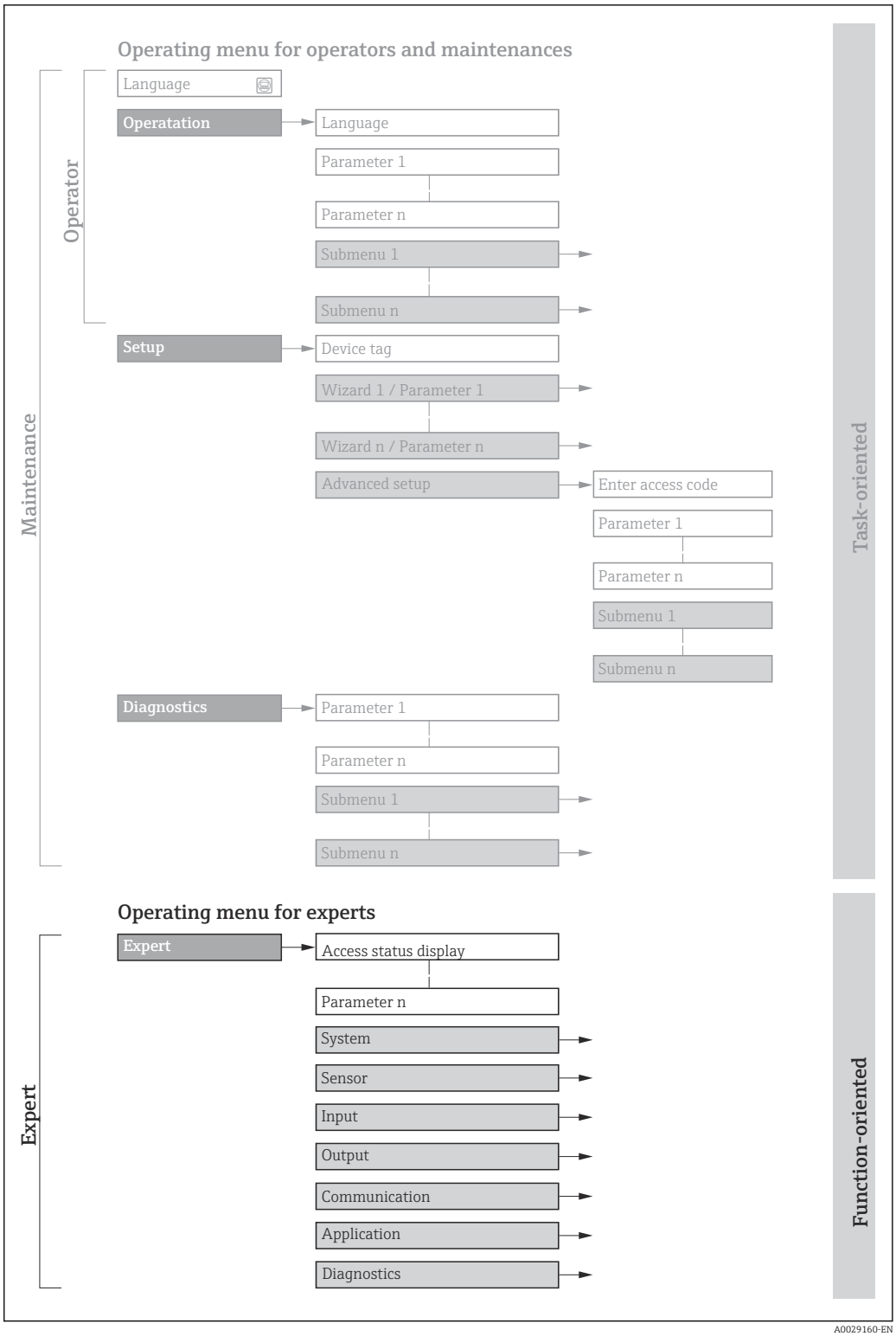
1.2 Target group

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

1.3 Using this document

1.3.1 Information on the document structure

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



1 *Sample graphic for the schematic layout of the operating menu*

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

1.3.2 Structure of a parameter description

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

Complete parameter name	Write-protected parameter = 🔒

Navigation	Navigation path to the parameter via the local display 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

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

Technical information

Device	Documentation code
Proline Teqwave MW 500	TI01764D

Operating instructions

Device	Documentation code
Proline Teqwave MW 500 Modbus RS485	BA02323D

1.5.2 Device-dependent additional documentation

Special Documentation

Contents	Documentation code
Heartbeat Verification application package (Modbus RS485)	SD03171D
Modbus RS485 register information	SD03461D

2 Overview of the Expert operating menu

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

Expert

- Locking status → 11
- User role → 12
- Enter access code → 13
- ▶ **System** → 13
  - ▶ **Display** → 13
  - ▶ **Configuration backup** → 32
  - ▶ **Diagnostic handling** → 35
  - ▶ **Administration** → 40
- ▶ **Sensor** → 45
  - ▶ **Measured values** → 45
  - ▶ **System units** → 54
  - ▶ **Process parameters** → 57
  - ▶ **External process variables** → 61
  - ▶ **Sensor adjustment** → 62
  - ▶ **Factory adjustment** → 65
- ▶ **I/O configuration** → 66
  - I/O module 1 to n terminal numbers → 66
  - I/O module 1 to n information → 66
  - I/O module 1 to n type → 67
  - Apply I/O configuration → 67
  - I/O alteration code → 68

▶ **Input**	→ 📄 68
▶ **Current input 1 to n**	→ 📄 68
▶ **Status input 1 to n**	→ 📄 71
▶ **Output**	→ 📄 73
▶ **Current output 1 to n**	→ 📄 74
▶ **Pulse/frequency/switch output 1 to n**	→ 📄 85
▶ **Relay output 1 to n**	→ 📄 103
▶ **Communication**	→ 📄 109
▶ **Modbus configuration**	→ 📄 110
▶ **Modbus information**	→ 📄 115
▶ **Modbus data map**	→ 📄 116
▶ **Web server**	→ 📄 116
▶ **WLAN settings**	→ 📄 119
▶ **Application**	→ 📄 126
Reset all totalizers	→ 📄 126
▶ **Totalizer 1**	→ 📄 127
▶ **Diagnostics**	→ 📄 131
Actual diagnostics	→ 📄 131
Timestamp	→ 📄 132
Previous diagnostics	→ 📄 132
Timestamp	→ 📄 133
Operating time from restart	→ 📄 133
Operating time	→ 📄 133
▶ **Diagnostic list**	→ 📄 134

▶ Device information	→ 138
▶ Main electronic module + I/O module 1	→ 141
▶ Sensor electronic module (ISEM)	→ 142
▶ I/O module 2	→ 143
▶ I/O module 3	→ 145
▶ I/O module 4	→ 146
▶ Display module	→ 147
▶ Data logging	→ 148
▶ Min/max values	→ 155
▶ Heartbeat Technology	→ 160
▶ Simulation	→ 160

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.

Navigation Expert

Expert	
Locking status	→ 11
User role	→ 12
Enter access code	→ 13
▶ System	→ 13
▶ Sensor	→ 45
▶ I/O configuration	→ 66
▶ Input	→ 68
▶ Output	→ 73
▶ Communication	→ 109
▶ Application	→ 126
▶ Diagnostics	→ 131

Locking status

Navigation Expert → Locking status

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** parameter (→ 12) applies . Only appears on local display.
Hardware locked (priority 1)	The DIP switch for hardware locking is activated on the PCB board. This locks write access to the parameters (e.g. via local display or operating tool) .
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

Description

Displays the access authorization to the parameters via the local display, Web browser or operating tool.

User interface

- Maintenance
- Service

Factory setting

Maintenance

Additional information

Description

Access authorization can be modified via the **Enter access code** parameter (→ 13).

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

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

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**	→ 13
▶ **Configuration backup**	→ 32
▶ **Diagnostic handling**	→ 35
▶ **Administration**	→ 40

3.1.1 "Display" submenu

Navigation Expert → System → Display

▶ **Display**	
Format display	→ 14
Value 1 display	→ 17
0% bargraph value 1	→ 17
100% bargraph value 1	→ 18
Decimal places 1	→ 18
Value 2 display	→ 19
Decimal places 2	→ 19
Value 3 display	→ 20

0% bargraph value 3	→ 📄 20
100% bargraph value 3	→ 📄 21
Decimal places 3	→ 📄 21
Value 4 display	→ 📄 22
Decimal places 4	→ 📄 22
Display language	→ 📄 23
Display interval	→ 📄 29
Display damping	→ 📄 29
Header	→ 📄 30
Header text	→ 📄 30
Separator	→ 📄 31
Backlight	→ 📄 31

Format display

Navigation Expert → System → Display → Format display

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

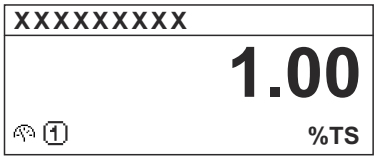
Description

The display format (size, bar graph) and number of simultaneously displayed measured values (1 to 8) can be configured. This setting only applies to normal operation.

- The **Value 1 display** parameter (→ 17)...**Value 8 display** parameter (→ 28) 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 (→ 29).

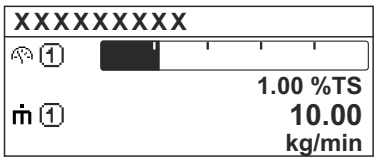
Possible measured values shown on the local display:

"1 value, max. size" option



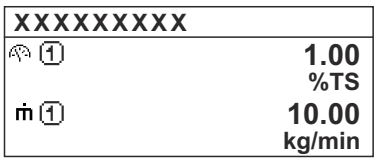
A0054319

"1 bargraph + 1 value" option



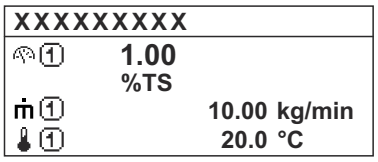
A0054322

"2 values" option



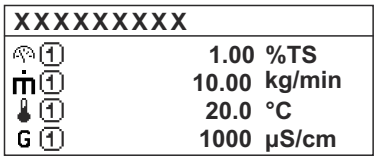
A0054323

"1 value large + 2 values" option



A0054324

"4 values" option



A0054328

Value 1 display

Navigation Expert → System → Display → Value 1 display

Prerequisite
- A local display is provided.
- The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.

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

Selection
- Total solids
- Temperature
- Electronics temperature
- Conductivity
- Corrected conductivity
- Load rate *
- Totalizer 1 *
- Current output 1 *
- Current output 2 *
- Current output 3 *
- Current output 4 *

Factory setting Total solids

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.

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

Dependency

The unit of the displayed measured value is taken from the **System units** submenu (→ 54).

0% bargraph value 1

Navigation Expert → System → Display → 0% bargraph 1

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 0 %TS

* 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 (→ 54).

100% bargraph value 1

Navigation Expert → System → Display → 100% bargraph 1

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 (→ 54).

Decimal places 1

Navigation Expert → System → Display → Decimal places 1

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

Description Use this function to select the number of decimal places for measured value 1.

Selection

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

Factory setting x.xx

Additional information

Description

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

Value 2 display

Navigation Expert → System → Display → Value 2 display

Prerequisite
- A local display is provided.
- The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.

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

Selection
- None
- Total solids
- Temperature
- Electronics temperature
- Conductivity
- Corrected conductivity
- Load rate *
- Totalizer 1 *
- Current output 1 *
- Current output 2 *
- Current output 3 *
- Current output 4 *

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.

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

Dependency

The unit of the displayed measured value is taken from the **System units** submenu (→ 54).

Decimal places 2

Navigation Expert → System → Display → Decimal places 2

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

Description Use this function to select the number of decimal places for measured value 2.

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

* Visibility depends on order options or device settings

Factory setting x.xx

Additional information *Description*

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

Prerequisite
- A local display is provided.
- The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.

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 (→ 17)

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.

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

Options

The unit of the displayed measured value is taken from the **System units** submenu (→ 54).

0% bargraph value 3

Navigation Expert → System → Display → 0% bargraph 3

Prerequisite A selection was made in the **Value 3 display** parameter (→ 20).

Description Use this function to enter the 0% bar graph value to be shown on the display for the measured value 3.

User entry Signed floating-point number

Factory setting 0

Additional information

Description

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

User entry

The unit of the displayed measured value is taken from the **System units** submenu (→ 54).

100% bargraph value 3

Navigation Expert → System → Display → 100% bargraph 3

Prerequisite A selection was made in the **Value 3 display** parameter (→ 20).

Description Use this function to enter the 100% bar graph value to be shown on the display for the measured value 3.

User entry Signed floating-point number

Factory setting 0

Additional information

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 (→ 54).

Decimal places 3

Navigation Expert → System → Display → Decimal places 3

Prerequisite A measured value is specified in the **Value 3 display** parameter (→ 20).

Description Use this function to select the number of decimal places for measured value 3.

Selection

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

Factory setting x.xx

Additional information

Description

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

Value 4 display

Navigation Expert → System → Display → Value 4 display

Prerequisite
- A local display is provided.
- The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.

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 (→ 17)

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.

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

Options

The unit of the displayed measured value is taken from the **System units** submenu (→ 54).

Decimal places 4

Navigation Expert → System → Display → Decimal places 4

Prerequisite A measured value is specified in the **Value 4 display** parameter (→ 22).

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

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

Factory setting x.xx

Additional information *Description*

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

Display language

Navigation Expert → System → Display → Display language

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)

Value 5 display

Navigation Expert → System → Display → Value 5 display

Prerequisite
- A local display is provided.
- The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.

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 (→ 17)

Factory setting None

Additional information *Description*

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

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

Options

The unit of the displayed measured value is taken from the **System units** submenu (→ 54).

0% bargraph value 5

Navigation Expert → System → Display → 0% bargraph 5

Prerequisite An option was selected in the **Value 5 display** parameter (→ 23).

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

User entry Signed floating-point number

Factory setting 0

Additional information *Description*

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

User entry

The unit of the displayed measured value is taken from the **System units** submenu (→ 54).

100% bargraph value 5

Navigation Expert → System → Display → 100% bargraph 5

Prerequisite An option was selected in the **Value 5 display** parameter (→ 23).

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

User entry Signed floating-point number

Factory setting 0

Additional information *Description*

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

User entry

The unit of the displayed measured value is taken from the **System units** submenu (→ 54).

Decimal places 5

Navigation Expert → System → Display → Decimal places 5

Prerequisite A measured value is specified in the **Value 5 display** parameter (→ 23).

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

Selection
- x
- x.x
- x.xx
- x.xxx
- x.xxxx
- x.xxxxx
- x.xxxxxx

Factory setting x.xx

Additional information *Description*

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

Value 6 display

Navigation Expert → System → Display → Value 6 display

Prerequisite
- A local display is provided.
- The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.

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 (→ 17)

Factory setting None

Additional information *Description*

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

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

Options

The unit of the displayed measured value is taken from the **System units** submenu (→ 54).

Decimal places 6

Navigation Expert → System → Display → Decimal places 6

Prerequisite A measured value is specified in the **Value 6 display** parameter (→ 25).

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

Selection

- x
- x.x
- x.xx
- x.xxx
- x.xxxx
- x.xxxxx
- x.xxxxxx

Factory setting

x.xx

Additional information

Description

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

Value 7 display

Navigation

Expert → System → Display → Value 7 display

Prerequisite

- A local display is provided.
- The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.

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 (→ 17)

Factory setting

None

Additional information

Description

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

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

Options

The unit of the displayed measured value is taken from the **System units** submenu (→ 54).

0% bargraph value 7

Navigation

Expert → System → Display → 0% bargraph 7

Prerequisite

An option was selected in the **Value 7 display** parameter (→ 26).

Description

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

User entry

Signed floating-point number

Factory setting 0

Additional information *Description*

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

User entry

The unit of the displayed measured value is taken from the **System units** submenu (→ 54).

100% bargraph value 7

Navigation Expert → System → Display → 100% bargraph 7

Prerequisite An option was selected in the **Value 7 display** parameter (→ 26).

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

User entry Signed floating-point number

Factory setting 0

Additional information *Description*

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

User entry

The unit of the displayed measured value is taken from the **System units** submenu (→ 54).

Decimal places 7

Navigation Expert → System → Display → Decimal places 7

Prerequisite A measured value is specified in the **Value 7 display** parameter (→ 26).

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

Selection

- x
- x.x
- x.xx
- x.xxx
- x.xxxx
- x.xxxxx
- x.xxxxxx

Factory setting x.xx

Additional information *Description*

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

Value 8 display

Navigation Expert → System → Display → Value 8 display

Prerequisite
- A local display is provided.
- The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.

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 (→ 17)

Factory setting None

Additional information *Description*

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

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

Options

The unit of the displayed measured value is taken from the **System units** submenu (→ 54).

Decimal places 8

Navigation Expert → System → Display → Decimal places 8

Prerequisite A measured value is specified in the **Value 8 display** parameter (→ 28).

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

Selection
- x
- x.x
- x.xx
- x.xxx
- x.xxxx
- x.xxxxx
- x.xxxxxx

Factory setting x.xx

Additional information *Description*

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

Display interval

Navigation Expert → System → Display → Display interval

Prerequisite A local display is provided.

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

User entry 1 to 10 s

Factory setting 5 s

Additional information *Description*

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

- The **Value 1 display** parameter (→ 17)...**Value 8 display** parameter (→ 28) 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

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.

1) proportional transmission behavior with first order delay

Header

Navigation Expert → System → Display → Header

Prerequisite A local display is provided.

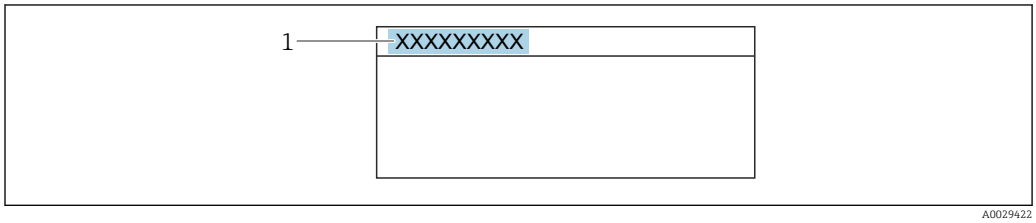
Description Use this function to select the contents of the header of the local display.

Selection
- Device tag
- Free text

Factory setting Device tag

Additional information *Description*

The header text only appears during normal operation.



1 Position of the header text on the display

Selection
- Device tag
  Is defined in the **Device tag** parameter (→ 138).
- Free text
  Is defined in the **Header text** parameter (→ 30).

Header text

Navigation Expert → System → Display → Header text

Prerequisite The **Free text** option is selected in the **Header** parameter (→ 30).

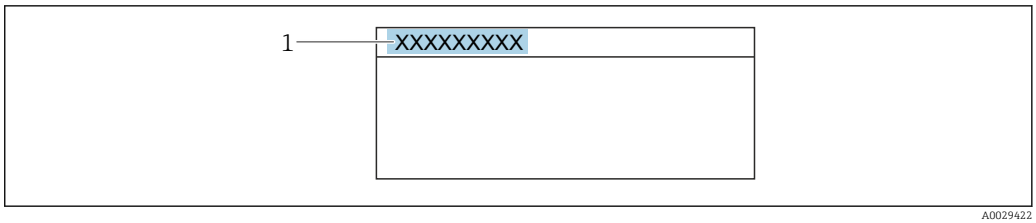
Description Use this function to enter a customer-specific text for the header of the local display.

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

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

Prerequisite A local display is provided.

Description Use this function to enter a value to adapt the display contrast to the ambient conditions (e.g. the lighting or viewing angle).

User entry 20 to 80 %

Factory setting Depends on the display

Backlight

Navigation Expert → System → Display → Backlight

Prerequisite One of the following conditions is met:
- Order code for "Display; operation", option **F** "4-line, illum.; touch control"
- Order code for "Display; operation", option **G** "4-line, illum.; touch control +WLAN"

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

Selection
- Disable
- Enable

Factory setting Enable

3.1.2 "Configuration backup" submenu

Navigation Expert → System → Config. backup

▶ Configuration backup	
Operating time	→ 32
Last backup	→ 32
Configuration management	→ 33
Backup state	→ 33
Comparison result	→ 34

Operating time

Navigation Expert → System → Config. backup → Operating time

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)

Last backup

Navigation Expert → System → Config. backup → Last backup

Description Displays the time since a backup copy of the data was last saved to the device memory.

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

Configuration management

Navigation Expert → System → Config. backup → Config. managem.

Description Use this function to select an action to save the data to the device memory.

Selection
- Cancel
- Execute backup
- Restore *
- Compare *
- Clear backup data

Factory setting Cancel

Additional information *Selection*

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

HistoROM

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

Backup state

Navigation Expert → System → Config. backup → Backup state

Description Displays the status of the data backup process.

User interface
- None
- Backup in progress
- Restoring in progress
- Delete in progress

* Visibility depends on order options or device settings

- Compare in progress
- Restoring failed
- Backup failed

Factory setting None

Comparison result

Navigation Expert → System → Config. backup → Compar. result

Description Anzeige des letzten Ergebnisses vom Vergleich der Datensätze im Gerätespeicher und im HistoROM.

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

Factory setting Check not done

Additional information *Beschreibung*

The comparison is started via the **Compare** option in the **Configuration management** parameter (→ 33).

Auswahl

Optionen	Beschreibung
Settings identical	Die aktuelle Gerätekonfiguration des HistoROM stimmt mit ihrer Sicherungskopie im Gerätespeicher überein. Wenn die Messumformerkonfiguration eines anderen Geräts auf das Gerät via HistoROM in **Configuration management** parameter übertragen wurde, stimmt die aktuelle Gerätekonfiguration des HistoROM mit ihrer Sicherungskopie im Gerätespeicher nur zum Teil überein: Die Einstellungen bezüglich Messumformer sind nicht identisch.
Settings not identical	Die aktuelle Gerätekonfiguration des HistoROM stimmt nicht mit ihrer Sicherungskopie im Gerätespeicher überein.
No backup available	Von der Gerätekonfiguration des HistoROM existiert keine Sicherungskopie im Gerätespeicher.
Backup settings corrupt	Die aktuelle Gerätekonfiguration des HistoROM ist mit ihrer Sicherungskopie im Gerätespeicher nicht kompatibel oder fehlerhaft.
Check not done	Es wurde noch kein Vergleich zwischen der Gerätekonfiguration des HistoROM und ihrer Sicherungskopie im Gerätespeicher durchgeführt.
Dataset incompatible	Die Sicherungskopie im Gerätespeicher ist mit dem Gerät nicht kompatibel.

HistoROM

Ein HistoROM ist ein "nichtflüchtiger" Gerätespeicher in Form eines EEPROM.

3.1.3 "Diagnostic handling" submenu

Navigation Expert → System → Diagn. handling

▶ **Diagnostic handling**		
	Alarm delay	→ 35
	▶ **Diagnostic behavior**	→ 35

Alarm delay

Navigation Expert → System → Diagn. handling → Alarm delay

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

The diagnostic message is reset without a time delay.

User entry 0 to 60 s

Factory setting 0 s

Additional information *Effect*

This setting affects the following diagnostic messages:
- 832 Electronics temperature too high
- 833 Electronics temperature too low
- 834 Process temperature too high
- 835 Process temperature too low
- 881 Signal to noise ratio too low
- 907 Permittivity out of specification
- 908 Volume fraction out of specification
- 909 Conductivity out of specification

"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 (→ 35).

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.

Options	Description
Logbook entry only	The device continues to measure. The diagnostic message is only displayed in the **Event logbook** submenu (→ 136) (**Event list** submenu (→ 137)) 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

Navigation Expert → System → Diagn. handling → Diagn. behavior

▶ **Diagnostic behavior**

Assign behavior of diagnostic no. 302	→ 38
Assign behavior of diagnostic no. 444	→ 37
Assign behavior of diagnostic no. 441	→ 36
Assign behavior of diagnostic no. 442	→ 37
Assign behavior of diagnostic no. 443	→ 37
Assign behavior of diagnostic no. 832	→ 38
Assign behavior of diagnostic no. 833	→ 39
Assign behavior of diagnostic no. 834	→ 39
Assign behavior of diagnostic no. 835	→ 39
Assign behavior of diagnostic no. 907	→ 40
Assign behavior of diagnostic no. 908	→ 40

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

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 441

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

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available: → 35

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

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 442

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: → 35

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

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 443

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

Description Use this function to change the diagnostic behavior of the **443 Pulse output 1 to n** diagnostic message.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available: → 35

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

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 444

Prerequisite The device has one current input.

Description Use this function to change the diagnostic behavior of the **444 Current input 1 to n** diagnostic message.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available: → 35

Assign behavior of diagnostic no. 302

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 302

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: → 35

Assign behavior of diagnostic no. 832

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 832

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 For a detailed description of the options available: → 35

Assign behavior of diagnostic no. 833

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 833

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 For a detailed description of the options available: → 35

Assign behavior of diagnostic no. 834

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 834

Description Use this function to change the diagnostic behavior of the **834 Process temperature too high** diagnostic message.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available: → 35

Assign behavior of diagnostic no. 835

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 835

Description Use this function to change the diagnostic behavior of the **835 Process temperature too low** diagnostic message.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available: → 35

Assign behavior of diagnostic no. 907

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 907

Description Use this function to change the diagnostic behavior of the **907 Permittivity out of specification** diagnostic message.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available: → 35

Assign behavior of diagnostic no. 908

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 908

Description Use this function to change the diagnostic behavior of the **908 Volume fraction out of specification** diagnostic message.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available: → 35

3.1.4 "Administration" submenu

Navigation Expert → System → Administration

▶ **Administration**	
▶ **Define access code**	→ 41
▶ **Reset access code**	→ 42
Device reset	→ 43
Transmitter identifier	→ 44

Activate SW option	→ 44
Software option overview	→ 45

"Define access code" wizard

The **Define access code** wizard (→ 41) 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	→ 41
Confirm access code	→ 42

Define access code

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

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

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

Additional information

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 (→ 13).

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

"Reset access code" submenu

Navigation Expert → System → Administration → Reset acc. code

▶ **Reset access code**		
	Operating time	→ 42
	Reset access code	→ 42

Operating time

Navigation Expert → System → Administration → Reset acc. code → Operating time

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

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

User entry Character string comprising numbers, letters and special characters

Factory setting 0x00

Additional information

Description

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

User entry

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

Additional parameters in the "Administration" submenu

Device reset

Navigation Expert → System → Administration → Device reset

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.
Restore S-DAT backup	Restores the data that is saved on the S-DAT. Additional information: This function can be used to resolve the memory issue "083 Memory content inconsistent" or to restore the S-DAT data when a new S-DAT has been installed. This option is displayed only in an alarm condition.

* Visibility depends on order options or device settings

Transmitter identifier

Navigation Expert → System → Administration → Transm. identif.

Description Select transmitter identifier.

User interface
- Unknown
- 500
- 300

Factory setting 500

Activate SW option

Navigation Expert → System → Administration → Activate SW opt.

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

User entry Max. 10-digit string of numbers.

Factory setting Depends on the software option ordered

Additional information

Description

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

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

Entering the activation code

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.

▸ 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"

Web browser

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

Software option overview

Navigation Expert → System → Administration → SW option overv.

Description Displays all the software options that are enabled in the device.

User interface

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"

3.2 "Sensor" submenu

Navigation Expert → Sensor

▶ Sensor	
▶ Measured values	→ 45
▶ System units	→ 54
▶ Process parameters	→ 57
▶ External process variables	→ 61
▶ Sensor adjustment	→ 62
▶ Factory adjustment	→ 65

3.2.1 "Measured values" submenu

Navigation Expert → Sensor → Measured val.

▶ Measured values	
▶ Process variables	→ 46
▶ Totalizer	→ 47
▶ Input values	→ 48
▶ Output values	→ 50

"Process variables" submenu

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

▶ Process variables	
Total solids	→ 46
Temperature	→ 46
Electronics temperature	→ 46
Conductivity	→ 47
Corrected conductivity	→ 47
Load rate	→ 47

Total solids

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

Description Shows total solids (fraction of total weight or concentration per volume unit).

User interface Signed floating-point number

Temperature

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

Description Shows the medium temperature currently measured.

User interface Signed floating-point number

Electronics temperature

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

Description Shows the electronics temperature currently measured.

User interface Signed floating-point number

Conductivity

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

Description Shows the conductivity currently measured.

User interface Floating-point number

Corrected conductivity

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

Description Shows the conductivity measured compensated for temperature.

User interface Floating-point number

Load rate

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

Prerequisite The volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.

Description Shows the total solids flow rate.

User interface Signed floating-point number

"Totalizer" submenu

Navigation Expert → Sensor → Measured val. → Totalizer

▶ Totalizer	
Totalizer 1 value	→ 48
Totalizer 1 overflow	→ 48

Totalizer 1 value

Navigation Expert → Sensor → Measured val. → Totalizer → Tot. 1 value

Description Displays the current totalizer reading.

User interface Signed floating-point number

Additional information *Description*

As it is only possible to display a maximum of 7 digits in the operating tool, the current counter value is the sum of the totalizer value and the overflow value from the **Totalizer overflow 1 to n** parameter if the display range is exceeded.

In the event of an error, the totalizer adopts the mode defined in the **Failure mode** parameter (→ 130).

Display

The unit of the selected process variable is defined in the **Unit totalizer** parameter (→ 128) for the totalizer.

Totalizer 1 overflow

Navigation Expert → Sensor → Measured val. → Totalizer → Tot. 1 overflow

Description Displays the current totalizer overflow.

User interface Integer with sign

Additional information *Description*

If the current totalizer reading exceeds 7 digits, which is the maximum value range that can be displayed by the operating tool, the value above this range is output as an overflow. The current totalizer value is therefore the sum of the overflow value and the totalizer value from the **Totalizer value 1 to n** parameter.

Display

The unit of the selected process variable is defined in the **Unit totalizer** parameter (→ 128) for the totalizer.

"Input values" submenu

Navigation Expert → Sensor → Measured val. → Input values

▶ **Input values**

▶ **Current input 1 to n**	→ 📄 49
▶ **Value status input 1 to n**	→ 📄 49

"Current input 1 to n" submenu

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

▶ **Current input 1 to n**	
Measured values 1 to n	→ 📄 49
Measured current 1 to n	→ 📄 49

Measured values 1 to n

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

Description Displays the current input value.

User interface Signed floating-point number

Measured current 1 to n

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

Description Displays the current value of the current input.

User interface 0 to 22.5 mA

"Value status input 1 to n" submenu

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

▶ **Value status input 1 to n**	
Value status input	→ 📄 50

Value status input

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

Description Displays the current input signal level.

User interface
- High
- Low

"Output values" submenu

Navigation Expert → Sensor → Measured val. → Output values

▶ **Output values**	
▶ **Value current output 1 to n**	→ 📄 50
▶ **Pulse/frequency/switch output 1 to n**	→ 📄 51
▶ **Relay output 1 to n**	→ 📄 53

"Value current output 1 to n" submenu

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

▶ **Value current output 1 to n**	
Output current	→ 📄 50
Measured current	→ 📄 51

Output current

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

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 → Current output 1 to n → Measur. curr.

Description Displays the actual measured value of the output current.

User interface 0 to 30 mA

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

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

▶ **Pulse/frequency/switch output 1 to n**		
	Output frequency	→ 📄 51
	Pulse output	→ 📄 51
	Switch state	→ 📄 52

Output frequency

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

Prerequisite In the **Operating mode** parameter (→ 📄 87), the **Frequency** option is selected.

Description Displays the actual value of the output frequency which is currently measured.

User interface 0.0 to 12 500.0 Hz

Pulse output

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

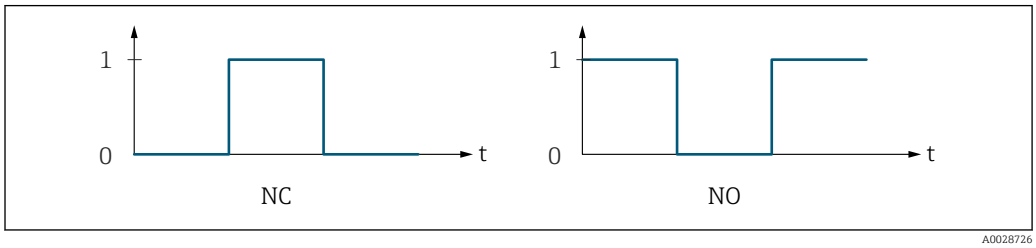
Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 📄 87) parameter.

Description Displays the pulse frequency currently output.

User interface Positive floating-point number

Additional information *Description*

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



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

The output behavior can be reversed via the **Invert output signal** parameter (→ 📄 103) 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 (→ 📄 91)) can be configured.

Switch state

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

Prerequisite The **Switch** option is selected in the **Operating mode** parameter (→ 📄 87).

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.

"Relay output 1 to n" submenu

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

▶ Relay output 1 to n	
Switch state	→ 📄 53
Switch cycles	→ 📄 53
Max. switch cycles number	→ 📄 53

Switch state

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

Description Displays the current status of the relay output.

User interface
- Open
- Closed

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

Switch cycles

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

Description Displays all the switch cycles performed.

User interface Positive integer

Max. switch cycles number

Navigation Expert → Sensor → Measured val. → Output values → Relay output 1 to n → Max. cycles no.

Description Displays the maximum number of guaranteed switch cycles.

User interface Positive integer

3.2.2 "System units" submenu

Navigation Expert → Sensor → System units

▶ System units	
Total solids unit	→ 54
Density unit	→ 55
Mass flow unit	→ 55
Mass unit	→ 55
Volume flow unit	→ 56
Temperature unit	→ 56
Conductivity unit	→ 56
Date/time format	→ 57

Total solids unit

Navigation Expert → Sensor → System units → TotalSolidsUnit

Description Select total solids unit.

Selection

SI units
- %TS
- ppm
- g/l
- mg/l
- kg/m³
- mg/cm³

US units
- lb/gal (us)
- lb/ft³

Factory setting Depends on country

Density unit

Navigation Expert → Sensor → System units → Density unit

Description Select density unit.

Selection

SI units
- g/l
- mg/l
- kg/m³
- mg/cm³

US units
- lb/gal (us)
- lb/ft³

Factory setting Depends on country

Mass flow unit

Navigation Expert → Sensor → System units → Mass flow unit

Prerequisite The volume flow of the medium is read in via the Current input 1 to n (→ 49).

Description Select mass flow unit.

Selection

SI units
- kg/h
- kg/d
- t/h
- t/d

US units
- oz/h
- oz/d
- lb/h
- lb/d
- STon/h
- STon/d

Factory setting Depends on country

Mass unit

Navigation Expert → Sensor → System units → Mass unit

Prerequisite The volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.

Description Select mass unit.

Selection

SI units
- kg
- t

US units
- oz
- lb
- STon

Factory setting Depends on country

Volume flow unit

Navigation Expert → Sensor → System units → Volume flow unit

Prerequisite The volume flow of the medium is read in via the Current input 1 to n (→ 49).

Description Select volume flow unit.

Selection

SI units
- l/h
- l/s
- dm^3/min
- m^3/h
- m^3/s

Factory setting l/h

Temperature unit

Navigation Expert → Sensor → System units → Temperature unit

Description Select temperature unit.

Selection

SI units	*US units*
▪ ℃	▪ ℉
▪ K	▪ ℉

Factory setting Depends on country

Conductivity unit

Navigation Expert → Sensor → System units → Conductiv. unit

Description Select conductivity unit.

Selection

SI units
- nS/cm
- µS/cm
- µS/m
- µS/mm
- mS/m
- mS/cm
- S/cm
- S/m

Factory setting µS/cm

Date/time format

Navigation Expert → Sensor → System units → Date/time format

Description Select date and time format.

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

3.2.3 "Process parameters" submenu

Navigation Expert → Sensor → Process param.

▶ **Process parameters**	
Temperature damping	→ 57
Conductivity damping	→ 58
Total solids override	→ 58
▶ **Total solids monitoring**	→ 58
▶ **Partially filled pipe detection**	→ 60

Temperature damping

Navigation Expert → Sensor → Process param. → Temp. damping

Description Enter a time constant for damping (PT1 element) of the temperature measured value. Damping reduces the effect of measured value fluctuations.

User entry 0 to 999.9 s

Factory setting 0 s

Conductivity damping

Navigation Expert → Sensor → Process param. → Conduct. damping

Description Enter a time constant for damping (PT1 element) of the conductivity measured value. Damping reduces the effect of measured value fluctuations.

User entry 0 to 999.9 s

Factory setting 0 s

Total solids override

Navigation Expert → Sensor → Process param. → TotalSolOverride

Description If suppression of the total solids measurement is enabled (**On** option), zero is output for the measured value. This is suitable for the cleaning processes for the pipeline, for example.

Selection
- Off
- On

Factory setting Off

"Total solids monitoring" submenu

Navigation Expert → Sensor → Process param. → TotSolidsMonitor

▶ Total solids monitoring	
Assign process variable	→ 58
Lower range limit	→ 59
Upper range limit	→ 59
Response time	→ 59

Assign process variable

Navigation Expert → Sensor → Process param. → TotSolidsMonitor → Assign variable

Description Select the process variable for total solids monitoring.

Selection
- Off
- Total solids

Factory setting Total solids

Lower range limit

Navigation Expert → Sensor → Process param. → TotSolidsMonitor → LowerRangeLimit

Description Enter the lower limit value for the measuring range of the total solids.

User entry Signed floating-point number

Factory setting −1 %TS

Upper range limit

Navigation Expert → Sensor → Process param. → TotSolidsMonitor → UpperRangeLimit

Description Enter the upper limit value for the measuring range of the total solids.

User entry Signed floating-point number

Factory setting 51 %TS

Response time

Navigation Expert → Sensor → Process param. → TotSolidsMonitor → Response time

Description Enter a delay until the diagnostic message is generated in the event the measuring range is exceeded.

User entry 0 to 100 s

Factory setting 60 s

"Partially filled pipe detection" submenu

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

▶ Partially filled pipe detection	
Partially filled pipe detection	→ 60
Threshold	→ 60
Response time	→ 60

Partially filled pipe detection

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

Description If activated, a diagnostic message is generated if the antennas are no longer in full contact with the medium.

Selection
- Off
- On

Factory setting Off

Threshold

Navigation Expert → Sensor → Process param. → Partial pipe det → Threshold

Description Enter threshold for partially filled pipe detection. If the measured value drops below the threshold, a diagnostic message is generated.

User entry Decibel as negative floating point number

Factory setting −6 dB

Response time

Navigation Expert → Sensor → Process param. → Partial pipe det → Response time

Description Enter a delay until the diagnostic message is generated in the event the pipe is detected as partially filled.

User entry 0 to 20.0 s

Factory setting 3 s

3.2.4 "External compensation" submenu

Navigation Expert → Sensor → External comp.

▶ **External process variables**

Volume flow source	→ 61
Volume flow	→ 61

Volume flow source

Navigation Expert → Sensor → ExternalProcVar. → VolumeFlowSource

Description Select the input via which the measured value of the volume flow is read in. The volume flow is used to calculate the load rate.

Selection
- Off
- Current input 1 *
- Current input 2 *
- Current input 3 *
- External value

Factory setting Off

Volume flow

Navigation Expert → Sensor → ExternalProcVar. → Volume flow

Description Shows the volume flow reported by the external measuring device.

User entry Signed floating-point number

* Visibility depends on order options or device settings

3.2.5 "Sensor adjustment" submenu

Navigation Expert → Sensor → Sensor adjustm.

▶ **Sensor adjustment**		
	Measuring interval	→ 62
	▶ **Process variable adjustment**	→ 62

Measuring interval

Navigation Expert → Sensor → Sensor adjustm. → Measur. interval

Description Displays the interval between two measuring periods.

User interface 0 to 10 000 ms

"Process variable adjustment" submenu

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust

▶ **Process variable adjustment**		
	Temperature offset	→ 63
	Temperature factor	→ 63
	Conductivity offset	→ 63
	Conductivity factor	→ 63
	Corrected conductivity offset	→ 64
	Corrected conductivity factor	→ 64
	Electronics temperature offset	→ 64
	Electronics temperature factor	→ 64
	Load rate offset	→ 65
	Load rate factor	→ 65

Temperature offset

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Temp. offset

Description Enter the offset by which to shift the zero point for temperature.

User entry Signed floating-point number

Factory setting 0

Temperature factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Temp. factor

Description Enter the multiplication factor to apply to the temperature value.

User entry Positive floating-point number

Factory setting 1

Conductivity offset

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Conduct. offset

Description Enter the offset by which to shift the zero point for conductivity.

User entry Signed floating-point number

Factory setting 0

Conductivity factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Conduct. factor

Description Enter the multiplication factor to apply to the conductivity value.

User entry Positive floating-point number

Factory setting 1

Corrected conductivity offset

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Corr.cond.offset

Description Enter the offset by which to shift the zero point for the corrected conductivity.

User entry Signed floating-point number

Factory setting 0

Corrected conductivity factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Corr.cond.factor

Description Enter the multiplication factor to apply to the corrected conductivity value.

User entry Positive floating-point number

Factory setting 1

Electronics temperature offset

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → ElectrTempOffset

Description Enter the offset by which to shift the zero point for the electronics temperature.

User entry Signed floating-point number

Factory setting 0

Electronics temperature factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → ElectrTempFactor

Description Enter the multiplication factor to apply to the electronics temperature.

User entry Positive floating-point number

Factory setting 1

Load rate offset

Navigation	Expert → Sensor → Sensor adjustm. → Variable adjust → Load rate offset
Prerequisite	The volume flow of the medium is read in via the Current input 1 to n (→ 49).
Description	Enter the offset by which to shift the zero point for the load rate.
User entry	Signed floating-point number
Factory setting	0

Load rate factor

Navigation	Expert → Sensor → Sensor adjustm. → Variable adjust → Load rate factor
Prerequisite	The volume flow of the medium is read in via the Current input 1 to n (→ 49).
Description	Enter the multiplication factor to apply to the load rate value.
User entry	Positive floating-point number
Factory setting	1

3.2.6 "Factory adjustment" submenu

Navigation Expert → Sensor → FactoryAdjustm.

▶ **Factory adjustment**	
Nominal diameter	→ 65
Date/time	→ 66

Nominal diameter

Navigation	Expert → Sensor → FactoryAdjustm. → Nominal diameter
Description	Shows the nominal diameter of the sensor.
User interface	Character string comprising numbers, letters and special characters

Date/time

Navigation Expert → Sensor → FactoryAdjustm. → Date/time

Description Shows the date and time of the factory adjustment.

User interface Character string comprising numbers, letters and special characters

3.3 "I/O configuration" submenu

Navigation Expert → I/O config.

▶ I/O configuration	
I/O module 1 to n terminal numbers	→ 66
I/O module 1 to n information	→ 66
I/O module 1 to n type	→ 67
Apply I/O configuration	→ 67
I/O alteration code	→ 68

I/O module 1 to n terminal numbers

Navigation Expert → I/O config. → I/O 1 to n terminals

Description Displays the terminal numbers used by the I/O module.

User interface
- Not used
- 26-27 (I/O 1)
- 24-25 (I/O 2)
- 22-23 (I/O 3)
- 20-21 (I/O 4)

I/O module 1 to n information

Navigation Expert → I/O config. → I/O 1 to n info

Description Displays information about the plugged in I/O module.

User interface

- Not plugged
- Invalid
- Not configurable
- Configurable
- MODBUS

Additional information

"Not plugged" option

The I/O module is not plugged in.

"Invalid" option

The I/O module is not plugged correctly.

"Not configurable" option

The I/O module is not configurable.

"Configurable" option

The I/O module is configurable.

"MODBUS" option

The I/O module is configured for Modbus.

I/O module 1 to n type

Navigation

Expert → I/O config. → I/O 1 to n type

Prerequisite

For the following order code:
- "Output; input 2", option **D** "Configurable I/O initial setting off"
- "Output; input 3", option **D** "Configurable I/O initial setting off"
- "Output; input 4", option **D** "Configurable I/O initial setting off"

Description

Use this function to select the I/O module type for the configuration of the I/O module.

Selection

- Off
- Current output *
- Current input *
- Status input *
- Pulse/frequency/switch output *
- Relay output *

Factory setting

Off

Apply I/O configuration

Navigation

Expert → I/O config. → Apply I/O config

Description

Use this function to activate the newly configured I/O module type.

* Visibility depends on order options or device settings

Selection
- No
- Yes

Factory setting No

I/O alteration code

Navigation Expert → I/O config. → I/O alterat.code

Description Use this function to enter the ordered activation code to activate the I/O configuration change.

User entry Positive integer

Factory setting 0

Additional information *Description*

The I/O configuration is changed in the **I/O module type** parameter (→ 67).

3.4 "Input" submenu

Navigation Expert → Input

▶ **Input**	
▶ **Current input 1 to n**	→ 68
▶ **Status input 1 to n**	→ 71

3.4.1 "Current input 1 to n" submenu

Navigation Expert → Input → Current input 1 to n

▶ **Current input 1 to n**	
Terminal number	→ 69
Signal mode	→ 69
Current span	→ 69
0/4 mA value	→ 70
20 mA value	→ 70

Failure mode	→ 📄 71
Failure value	→ 📄 71

Terminal number

Navigation Expert → Input → Current input 1 to n → Terminal no.

Description Displays the terminal numbers used by the current input module.

User interface
- Not used
- 24-25 (I/O 2)
- 22-23 (I/O 3)
- 20-21 (I/O 4)

Additional information *"Not used" option*

The current input module does not use any terminal numbers.

Signal mode

Navigation Expert → Input → Current input 1 to n → Signal mode

Description Use this function to select the signal mode for the current input.

Selection
- Passive
- Active *

Factory setting Passive

Current span

Navigation Expert → Input → Current input 1 to n → Current span

Description Use this function to select the current range for the process value output and the upper and lower level for signal on alarm.

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

* Visibility depends on order options or device settings

Factory setting

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

Additional information

Examples

Sample values for the current range: **Current span** parameter (→ 75)

0/4 mA value

Navigation

Expert → Input → Current input 1 to n → 0/4 mA value

Description

Enter 4 mA value.

User entry

Signed floating-point number

Factory setting

0 % TS

Additional information

Current input behavior

The current input behaves differently depending on the settings configured in the following parameters:
- Current span (→ 69)
- Failure mode (→ 71)

Configuration examples

Pay attention to the configuration examples for **4 mA value** parameter (→ 77).

20 mA value

Navigation

Expert → Input → Current input 1 to n → 20 mA value

Description

Enter 20 mA value.

User entry

Signed floating-point number

Factory setting

12 %TS

Additional information

Configuration examples

Pay attention to the configuration examples for **4 mA value** parameter (→ 77).

Failure mode

Navigation Expert → Input → Current input 1 to n → Failure mode

Description Use this function to select the input behavior when measuring a current outside the configured **Current span** parameter (→ 69).

Selection
- Alarm
- Last valid value
- Defined value

Factory setting Alarm

Additional information *Options*
- Alarm
  An error message is set.
- Last valid value
  The last valid measured value is used.
- Defined value
  A user-defined measured value is used (**Failure value** parameter (→ 71)).

Failure value

Navigation Expert → Input → Current input 1 to n → Failure value

Prerequisite In the **Failure mode** parameter (→ 71), the **Defined value** option is selected.

Description Use this function to enter the value that the device uses if it does not receive an input signal from the external device, or if the input signal is invalid.

User entry Signed floating-point number

Factory setting 0

3.4.2 "Status input 1 to n" submenu

Navigation Expert → Input → Status input 1 to n

▶ Status input 1 to n	
Terminal number	→ 72
Assign status input	→ 72
Value status input	→ 73

Active level	→ 73
Response time status input	→ 73

Terminal number

Navigation Expert → Input → Status input 1 to n → Terminal no.

Description Displays the terminal numbers used by the status input module.

User interface
- Not used
- 24-25 (I/O 2)
- 22-23 (I/O 3)
- 20-21 (I/O 4)

Additional information *"Not used" option*

The status input module does not use any terminal numbers.

Assign status input

Navigation Expert → Input → Status input 1 to n → Assign stat.inp.

Description Use this function to select the function for the status input.

Selection
- Off
- Reset totalizer 1
- Flow override

Factory setting Off

Additional information *Options*

- Off
  The status input is switched off.
- Reset totalizer 1
  The totalizer is reset.
- Flow override
  The Flow override is activated.

Note on the Flow override:
- The Flow override is enabled as long as the level is at the status input (continuous signal).
- All other assignments react to a change in level (pulse) at the status input.

Value status input

Navigation Expert → Input → Status input 1 to n → Val.stat.inp.

Description Displays the current input signal level.

User interface
- High
- Low

Active level

Navigation Expert → Input → Status input 1 to n → Active level

Description Use this function to determine the input signal level at which the assigned function is activated.

Selection
- High
- Low

Factory setting High

Response time status input

Navigation Expert → Input → Status input 1 to n → Response time

Description Use this function to enter the minimum time period for which the input signal level must be present before the selected function is activated.

User entry 5 to 200 ms

Factory setting 50 ms

3.5 "Output" submenu

Navigation Expert → Output

▶ **Output**

▶ **Current output 1 to n** → 74

▶ **Pulse/frequency/switch output 1 to n**	→ 📄 85
▶ **Relay output 1 to n**	→ 📄 103

3.5.1 "Current output 1 to n" submenu

Navigation Expert → Output → Curr.output 1 to n

▶ **Current output 1 to n**	
Terminal number	→ 📄 74
Signal mode	→ 📄 75
Process variable current output	→ 📄 75
Current range output	→ 📄 75
Fixed current	→ 📄 76
Lower range value output	→ 📄 77
Upper range value output	→ 📄 78
Measuring mode current output	→ 📄 78
Damping current output	→ 📄 83
Failure behavior current output	→ 📄 83
Failure current	→ 📄 84
Output current	→ 📄 84
Measured current	→ 📄 85

Terminal number

Navigation Expert → Output → Curr.output 1 to n → Terminal no.

Description Displays the terminal numbers used by the current output module.

User interface
- Not used
- 24-25 (I/O 2)
- 22-23 (I/O 3)
- 20-21 (I/O 4)

Additional information *"Not used" option*

The current output module does not use any terminal numbers.

Signal mode

Navigation Expert → Output → Curr.output 1 to n → Signal mode

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

Selection
- Active *
- Passive *

Factory setting Active

Process variable current output

Navigation Expert → Output → Curr.output 1 to n → Proc.var. outp

Prerequisite The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.

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

Selection
- Off
- Total solids
- Temperature
- Electronics temperature
- Conductivity
- Corrected conductivity
- Load rate *

Factory setting Total solids

Current range output

Navigation Expert → Output → Curr.output 1 to n → Curr.range out

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

* Visibility depends on order options or device settings

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

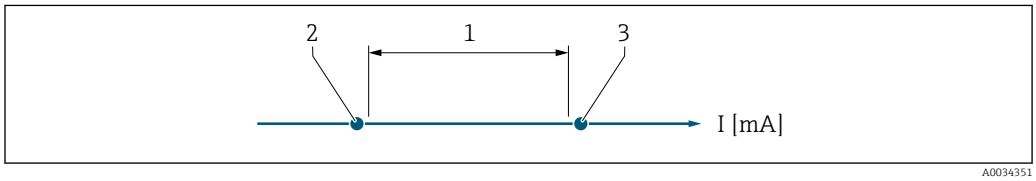
- In the event of a device alarm, the current output adopts the value specified in the **Failure mode** parameter (→ 83).
- The measuring range is specified via the **Lower range value output** parameter (→ 77) and **Upper range value output** parameter (→ 78).

"Fixed current" option

The current value is set via the **Fixed current** parameter (→ 76).

Example

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



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

Selection

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

Fixed current

Navigation

Expert → Output → Curr.output 1 to n → Fixed current

Prerequisite

The **Fixed current** option is selected in the **Current span** parameter (→ 75).

Description

Use this function to enter a constant current value for the current output.

User entry

0 to 22.5 mA

Factory setting

22.5 mA

Lower range value output

Navigation Expert → Output → Curr.output 1 to n → Low.range outp

Prerequisite In **Current span** parameter (→ 75), 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 start of measuring range.

User entry Floating point number with sign

Factory setting 0 %TS

Additional information

Description

Positive and negative values are permitted depending on the process variable assigned in the **Assign current output** parameter (→ 75). In addition, the value can be greater than or smaller than the value assigned for the 20 mA current in the **Upper range value output** parameter (→ 78).

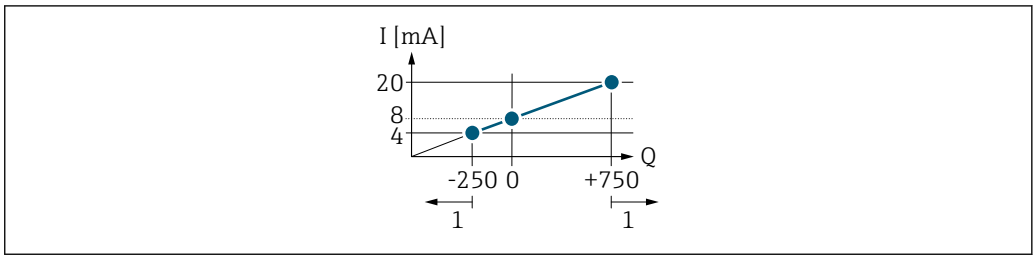
Dependency

The unit depends on the process variable selected in the **Assign current output** parameter (→ 75).

Current output behavior

The current output behaves differently depending on the settings configured in the following parameters:
- Current span (→ 75)
- Failure mode (→ 83)

Configuration examples



Q Flow
I Current
1 Measuring range is exceeded or undershot

Upper range value output

Navigation Expert → Output → Curr.output 1 to n → Upp.range outp

Prerequisite In **Current span** parameter (→ 75), 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 end of measuring range.

User entry Floating point number with sign

Factory setting 12 %TS

Additional information *Description*

Positive and negative values are permitted depending on the process variable assigned in the **Assign current output** parameter (→ 75). In addition, the value can be greater than or smaller than the value assigned for the 0/4 mA current in the **Lower range value output** parameter (→ 77).

Dependency

The unit depends on the process variable selected in the **Assign current output** parameter (→ 75).

Example

Configuration examples

Pay attention to the configuration examples for the **Lower range value output** parameter (→ 77).

Measuring mode current output

Navigation Expert → Output → Curr.output 1 to n → Output mode

Prerequisite The following option is selected in the **Process variable current output** parameter (→ 75):
Load rate

One of the following options is selected in the **Current span** parameter (→ 75):
- 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

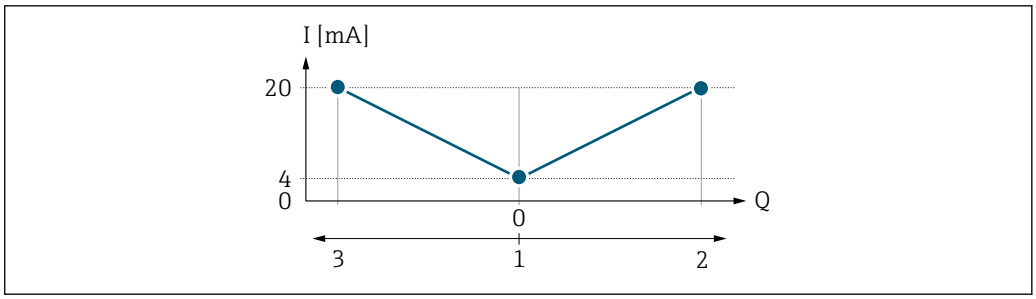
The process variable that is assigned to the current output via the **Assign current output** parameter (→ 📖 75) is displayed below the parameter.

"Forward flow" option

The current output signal is proportional to the process variable assigned. The measuring range is defined by the values that are assigned to the **Lower range value output** parameter (→ 📖 77) and the **Upper range value output** parameter (→ 📖 78).

The flow components outside the scaled measuring range are taken into account for signal output as follows:
Both values are defined such that they are not equal to zero flow e.g.:
- Start of measuring range = −50 kg/h
- End of measuring range = 100 kg/h

"Forward/Reverse flow" option



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

- The current output signal is independent of the direction of flow (absolute amount of the measured variable). The values for the **Lower range value output** parameter (→ 📖 77) and **Upper range value output** parameter (→ 📖 78) must have the same sign.
- The value for the **Upper range value output** parameter (→ 📖 78) (e.g. reverse flow) corresponds to the mirrored value for the **Upper range value output** parameter (→ 📖 78) (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.

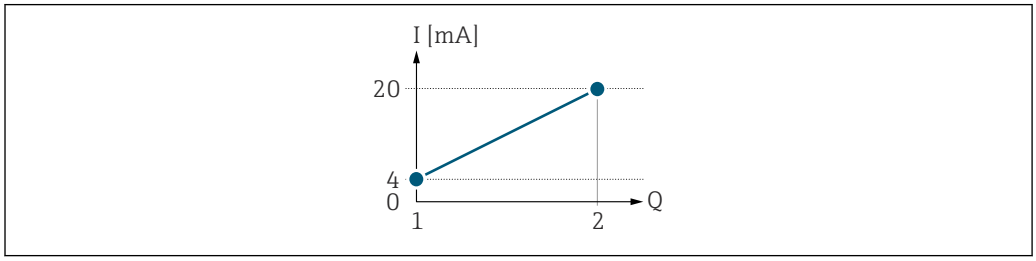
* Visibility depends on order options or device settings

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

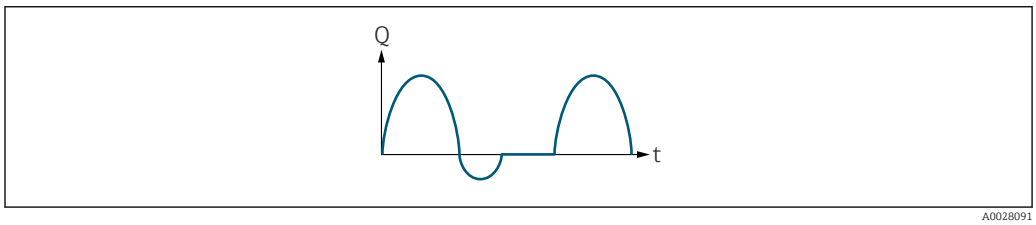
Defined measuring range: lower range value and upper range value with the **same** sign



2 Measuring range

I Current
Q Flow
1 Lower range value (Start of measuring range output)
2 Upper range value (end of measuring range output)

With the following flow response:

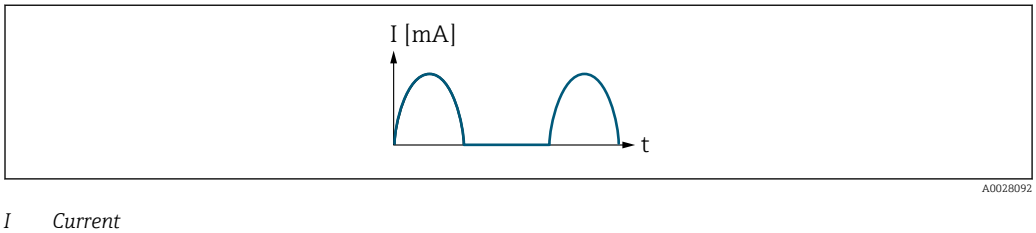


3 Flow response

Q Flow
t Time

With **Forward flow** option

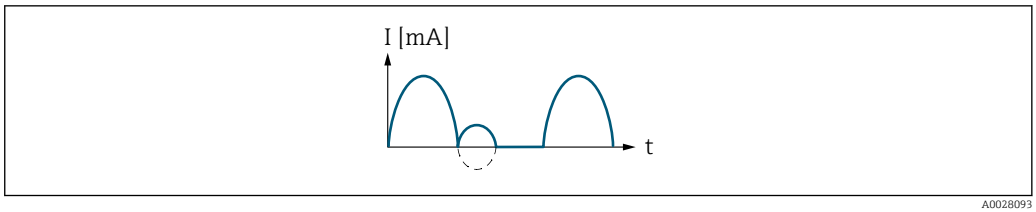
The current output signal is proportional to the process variable assigned. The flow components outside the scaled measuring range are not taken into account for signal output:.



I Current
t Time

With **Forward/Reverse flow** option

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

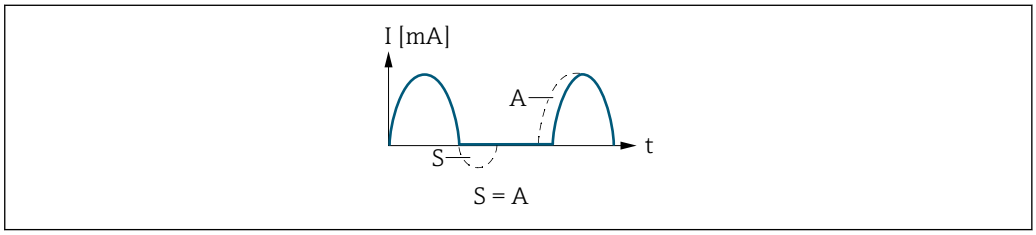


A0028093

I *Current*
t *Time*

With **Reverse flow compensation** option

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

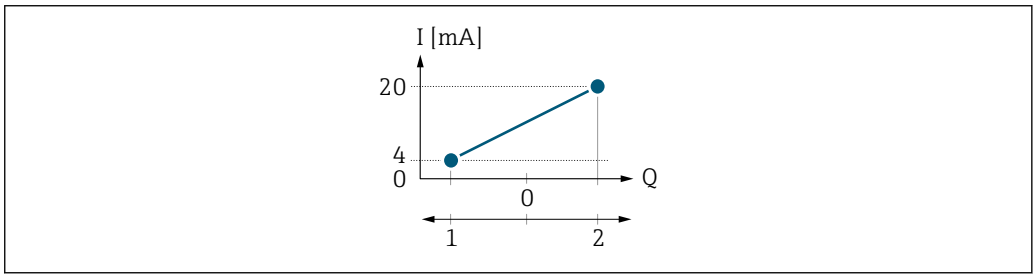


A0028094

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

Example 2

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

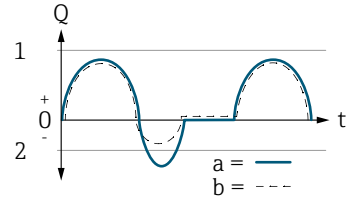


A0028095

4 *Measuring range*

I *Current*
Q *Flow*
1 *Lower range value (Start of measuring range output)*
2 *Upper range value (end of measuring range output)*

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

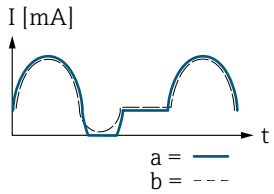


A0028098

Q Flow
t Time
1 Lower range value (Start of measuring range output)
2 Upper range value (end of measuring range output)

With **Forward flow** option

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



A0028100

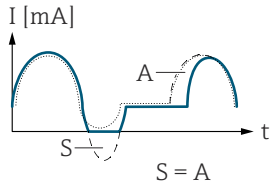
I Current
t Time

With **Forward/Reverse flow** option

This option cannot be selected here since the values for the **Lower range value output** parameter (→ 📄 77) and **Upper range value output** parameter (→ 📄 78) 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.



A0028101

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

Damping current output

Navigation Expert → Output → Curr.output 1 to n → Damp.curr.outp

Prerequisite A process variable is selected in the **Assign current output** parameter (→ 75) and one of the following options is selected in the **Current span** parameter (→ 75):
- 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 [2]) 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.

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

Failure behavior current output

Navigation Expert → Output → Curr.output 1 to n → Failure behav.

Prerequisite A process variable is selected in the **Assign current output** parameter (→ 75) and one of the following options is selected in the **Current span** parameter (→ 75):
- 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.

2) 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 (→ 75).

"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 (→ 75).

"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 (→ 84).

Failure current

Navigation Expert → Output → Curr.output 1 to n → Fail. current

Prerequisite The **Defined value** option is selected in the **Failure mode** parameter (→ 83).

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

Navigation Expert → Output → Curr.output 1 to n → Output curr.

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

User interface 3.59 to 22.5 mA

Measured current

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

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

Navigation Expert → Output → PFS output 1 to n

▶ **Pulse/frequency/switch output 1 to n**	
Terminal number	→ 86
Signal mode	→ 87
Operating mode	→ 87
Assign pulse output	→ 88
Pulse scaling	→ 89
Pulse width	→ 89
Measuring mode	→ 90
Failure mode	→ 91
Pulse output	→ 91
Assign frequency output	→ 92
Minimum frequency value	→ 92
Maximum frequency value	→ 93
Measuring value at minimum frequency	→ 93
Measuring value at maximum frequency	→ 93
Measuring mode	→ 94

Damping output	→ 📄 94
Response time	→ 📄 95
Failure mode	→ 📄 95
Failure frequency	→ 📄 96
Output frequency	→ 📄 96
Switch output function	→ 📄 96
Assign diagnostic behavior	→ 📄 97
Assign limit	→ 📄 98
Switch-on value	→ 📄 100
Switch-off value	→ 📄 100
Assign flow direction check	→ 📄 101
Assign status	→ 📄 101
Switch-on delay	→ 📄 101
Switch-off delay	→ 📄 102
Failure mode	→ 📄 102
Switch state	→ 📄 102
Invert output signal	→ 📄 103

Terminal number

Navigation Expert → Output → PFS output 1 to n → Terminal no.

Description Displays the terminal numbers used by the pulse/frequency/switch output module.

User interface
- Not used
- 24-25 (I/O 2)
- 22-23 (I/O 3)
- 20-21 (I/O 4)

Additional information *"Not used" option*

The pulse/frequency/switch output module does not use any terminal numbers.

Signal mode

Navigation Expert → Output → PFS output 1 to n → Signal mode

Description Use this function to select the signal mode for the pulse/frequency/switch output.

Selection
- Passive
- Active *
- Passive NE

Factory setting Passive

Operating mode

Navigation Expert → Output → PFS output 1 to n → Operating mode

Prerequisite If the **Pulse** option is selected, the **Load rate** option must be selected in the **Assign pulse output** parameter (→ 88).

Description Use this function to select the operating mode of the output as a pulse, frequency or switch output.

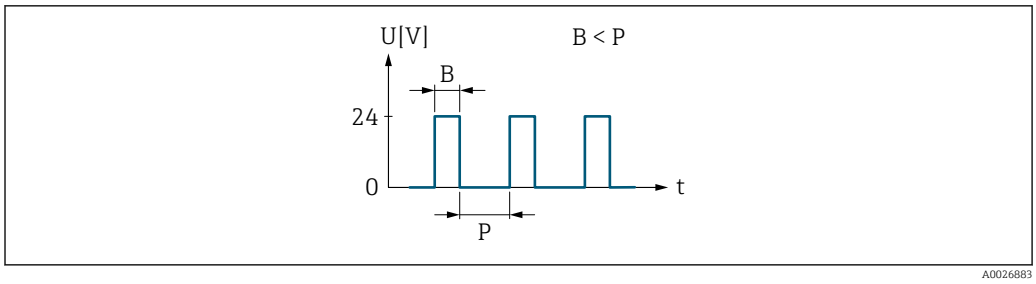
Selection
- Pulse
- Frequency
- Switch

Factory setting Pulse

Additional information *"Pulse" option*

Example
- Flow rate approx. 100 g/s
- Pulse value0.1 g
- Pulse width 0.05 ms
- Pulse rate 1 000 Impuls/s

* Visibility depends on order options or device settings

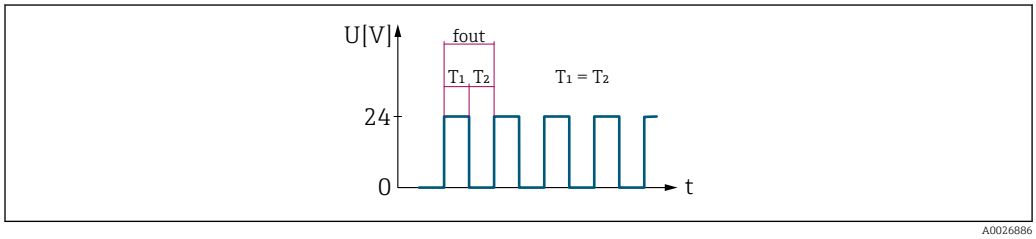


5 Quantity-proportional pulse (pulse value) with pulse width to be configured

B Pulse width entered
P Pauses between the individual pulses

"Frequency" option

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



6 Flow-proportional frequency output

Assign pulse output

Navigation Expert → Output → PFS output 1 to n → Assign pulse

Prerequisite The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.

Prerequisite The **Pulse** option is selected in **Operating mode** parameter (→ 87).

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

Selection
- Off
- Load rate *

Factory setting Off

* Visibility depends on order options or device settings

Pulse scaling

Navigation Expert → Output → PFS output 1 to n → Pulse scaling

Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 87) and a process variable is selected in the **Assign pulse output** parameter (→ 88).

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

Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 87) and a process variable is selected in the **Assign pulse output** parameter (→ 88).

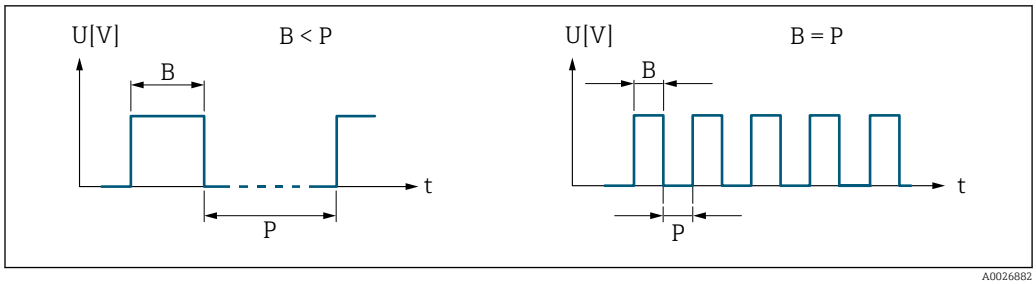
Description Use this function to enter the duration of the output pulse.

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

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.

For a detailed description of the options available, see the **Measuring mode** parameter (→ 78)

Examples

For a detailed description of the configuration examples, see the **Measuring mode** parameter (→ 78)

Failure mode

Navigation Expert → Output → PFS output 1 to n → Failure mode

Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 87) and a process variable is selected in the **Assign pulse output** parameter (→ 88).

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

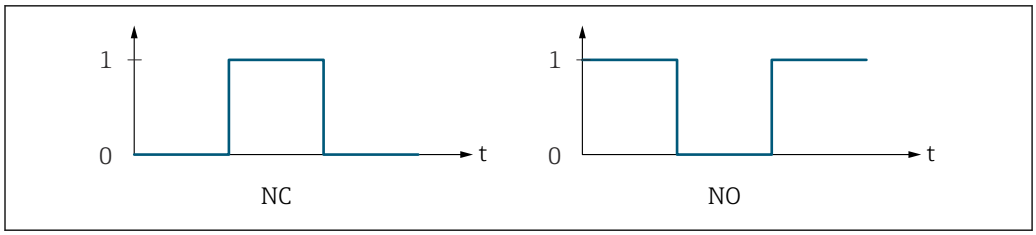
Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 87) parameter.

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.



A0028726

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

The output behavior can be reversed via the **Invert output signal** parameter (→ 📖 103) 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 (→ 📖 91)) can be configured.

Assign frequency output

Navigation Expert → Output → PFS output 1 to n → Assign freq.

Prerequisite
- The **Frequency** option is selected in **Operating mode** parameter (→ 📖 87).
- The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 📖 49) or the fieldbus.

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

Selection
- Off
- Total solids
- Temperature
- Electronics temperature
- Conductivity
- Corrected conductivity
- Load rate *

Factory setting Off

Minimum frequency value

Navigation Expert → Output → PFS output 1 to n → Min. freq. value

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 📖 87) and a process variable is selected in the **Assign frequency output** parameter (→ 📖 92).

Description Use this function to enter the minimum frequency.

User entry 0.0 to 10 000.0 Hz

* Visibility depends on order options or device settings

Factory setting 0.0 Hz

Maximum frequency value

Navigation Expert → Output → PFS output 1 to n → Max. freq. value

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 87) and a process variable is selected in the **Assign frequency output** parameter (→ 92).

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

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 87) and a process variable is selected in the **Assign frequency output** parameter (→ 92).

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

User entry Signed floating-point number

Factory setting Depends on country and nominal diameter

Additional information *Dependency*

The entry depends on the process variable selected in the **Assign frequency output** parameter (→ 92).

Measuring value at maximum frequency

Navigation Expert → Output → PFS output 1 to n → Val. at max.freq

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 87) and a process variable is selected in the **Assign frequency output** parameter (→ 92).

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

The entry depends on the process variable selected in the **Assign frequency output** parameter (→ 92).

Measuring mode

Navigation Expert → Output → PFS output 1 to n → Measuring mode

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

Additional information

Options

For a detailed description of the options available, see the **Measuring mode** parameter (→ 78)

Examples

For a detailed description of the configuration examples, see the **Measuring mode** parameter (→ 78)

Damping output

Navigation Expert → Output → PFS output 1 to n → Damping out.

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 [3]) 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

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 87) and an option is selected in the **Assign frequency output** parameter (→ 92).

Description Shows how quickly the output reaches 63% of a measured value change.

User interface Positive floating-point number

Factory setting 0 s

Failure mode

Navigation Expert → Output → PFS output 1 to n → Failure mode

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 87) and a process variable is selected in the **Assign frequency output** parameter (→ 92).

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

3) 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 (→ 96) 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.

Prerequisite In the **Operating mode** parameter (→ 87), the **Frequency** option is selected, in the **Assign frequency output** parameter (→ 92) a process variable is selected, and in the **Failure mode** parameter (→ 95), 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.

Prerequisite In the **Operating mode** parameter (→ 87), 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

Prerequisite The **Switch** option is selected in the **Operating mode** parameter (→ 87).

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

- Off
  The switch output is permanently switched off (open, non-conductive).
- On
  The switch output is permanently switched on (closed, conductive).
- Diagnostic behavior
  The switch output is switched on (closed, conductive), if there is a pending diagnostic event of the assigned behavioral category.
- Limit
  The switch output is switched on (closed, conductive), if a limit value specified for the process variable is reached.
- Flow direction check
  The switch output is switched on (closed, conductive), when the flow direction changes (forward or reverse flow).
- Status
  The switch output is switched on (closed/conductive) to display the device status for the selected detection method, e.g. empty pipe detection.

Assign diagnostic behavior

Navigation

Expert → Output → PFS output 1 to n → Assign diag. beh

Prerequisite

- In the **Operating mode** parameter (→ 87), the **Switch** option is selected.
- In the **Switch output function** parameter (→ 96), the **Diagnostic behavior** option is selected.

Description

Use this function to select the diagnostic event category that is displayed for the switch output.

Selection

- Alarm
- Alarm or warning
- Warning

Factory setting

Alarm

Additional information

Description

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

Selection

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

Assign limit

Navigation Expert → Output → PFS output 1 to n → Assign limit

Prerequisite

- The **Switch** option is selected in **Operating mode** parameter (→ 87).
- The **Limit** option is selected in **Switch output function** parameter (→ 96).
- The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.

Description

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

Selection

- Off
- Total solids
- Temperature
- Electronics temperature
- Conductivity
- Corrected conductivity
- Load rate *
- Totalizer 1 *

Factory setting

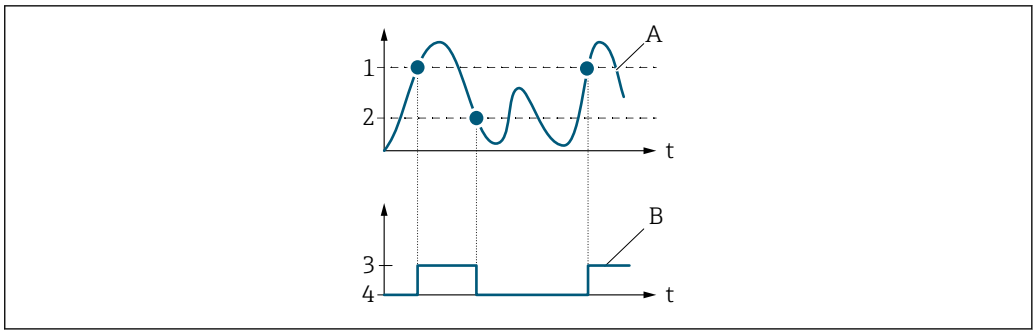
Temperature

Additional information

Description

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

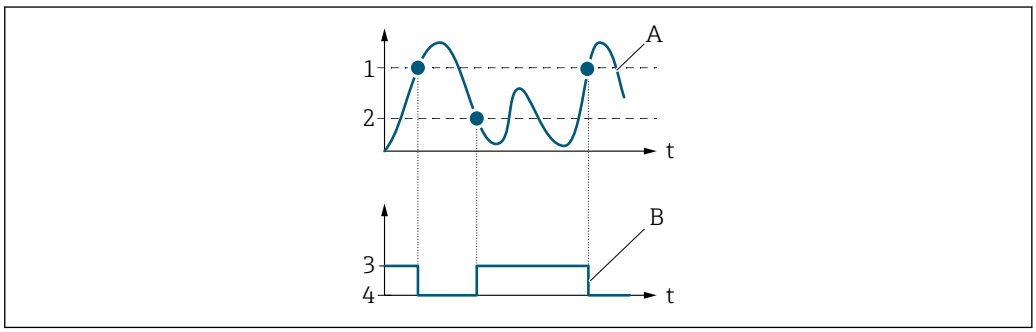
* Visibility depends on order options or device settings



A0026891

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

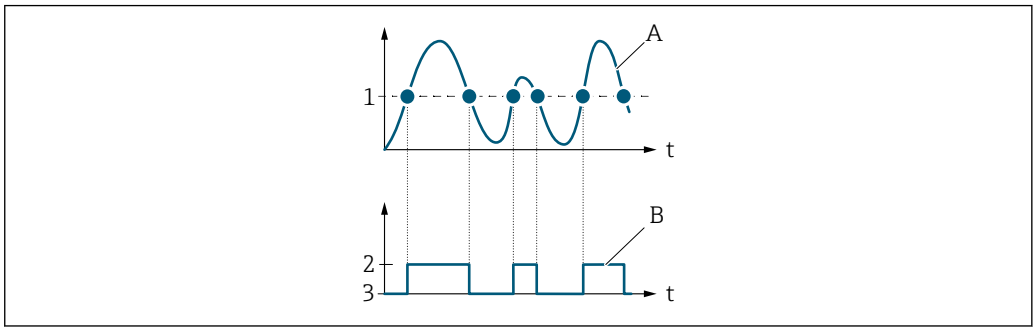
Behavior of status output when Switch-on value < Switch-off value:
- Process variable < Switch-on value: transistor is conductive
- Process variable > Switch-off value: transistor is non-conductive



A0026892

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

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



A0026893

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

Switch-on value

Navigation Expert → Output → PFS output 1 to n → Switch-on value

Prerequisite
- The **Switch** option is selected in the **Operating mode** parameter (→ 87).
- The **Limit** option is selected in the **Switch output function** parameter (→ 96).

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

User entry Floating point number with sign

Factory setting 0 °C

Additional information

Description

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

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

Dependency

The unit depends on the process variable selected in the **Assign limit** parameter (→ 98).

Switch-off value

Navigation Expert → Output → PFS output 1 to n → Switch-off value

Prerequisite
- The **Switch** option is selected in the **Operating mode** parameter (→ 87).
- The **Limit** option is selected in the **Switch output function** parameter (→ 96).

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

User entry Floating point number with sign

Factory setting 0 °C

Additional information

Description

Use this function to enter the limit value for the switch-off value (process variable < switch-off value = open, non-conductive).

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

Dependency

The unit depends on the process variable selected in the **Assign limit** parameter (→ 98).

Assign flow direction check

Navigation Expert → Output → PFS output 1 to n → Assign dir.check

Prerequisite
- The **Switch** option is selected in the **Operating mode** parameter (→ 87).
- The **Flow direction check** option is selected in the **Switch output function** parameter (→ 96).

Description Use this function to select a process variable for monitoring the flow direction.

Selection

Factory setting Off

Assign status

Navigation Expert → Output → PFS output 1 to n → Assign status

Prerequisite
- The **Switch** option is selected in **Operating mode** parameter (→ 87).
- The **Status** option is selected in **Switch output function** parameter (→ 96).

Description Select the device function whose status you want to display.

Selection
- Off
- Partially filled pipe detection

Factory setting Partially filled pipe detection

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

Prerequisite
- The **Switch** option is selected in the **Operating mode** parameter (→ 87).
- The **Limit** option is selected in the **Switch output function** parameter (→ 96).

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

User entry 0.0 to 100.0 s

Factory setting 0.0 s

Switch-off delay

Navigation Expert → Output → PFS output 1 to n → Switch-off delay

Prerequisite
- The **Switch** option is selected in the **Operating mode** parameter (→ 87).
- The **Limit** option is selected in the **Switch output function** parameter (→ 96).

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

User entry 0.0 to 100.0 s

Factory setting 0.0 s

Failure mode

Navigation Expert → Output → PFS output 1 to n → Failure mode

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 Expert → Output → PFS output 1 to n → Switch state

Prerequisite The **Switch** option is selected in the **Operating mode** parameter (→ 87).

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.

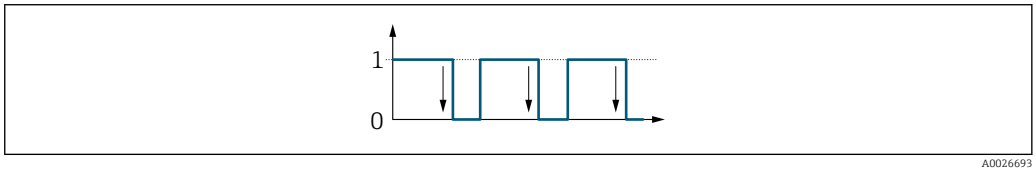
Description Use this function to select whether to invert the output signal.

Selection
- No
- Yes

Factory setting No

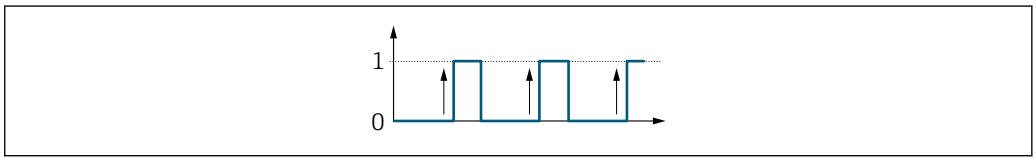
Additional information *Selection*

No option (passive - negative)



A0026693

Yes option (passive - positive)



A0026692

3.5.3 "Relay output 1 to n" submenu

Navigation Expert → Output → Relay output 1 to n

▶ Relay output 1 to n	
Terminal number	→ 104
Relay output function	→ 104
Assign flow direction check	→ 105

Assign limit	→ 105
Assign diagnostic behavior	→ 106
Assign status	→ 106
Switch-off value	→ 107
Switch-off delay	→ 107
Switch-on value	→ 107
Switch-on delay	→ 108
Failure mode	→ 108
Switch state	→ 109
Powerless relay status	→ 109

Terminal number

Navigation Expert → Output → Relay output 1 to n → Terminal no.

Description Displays the terminal numbers used by the relay output module.

User interface
- Not used
- 24-25 (I/O 2)
- 22-23 (I/O 3)
- 20-21 (I/O 4)

Additional information *"Not used" option*

The relay output module does not use any terminal numbers.

Relay output function

Navigation Expert → Output → Relay output 1 to n → Relay outp.func.

Description Use this function to select an output function for the relay output.

Selection
- Closed
- Open
- Diagnostic behavior
- Limit
- Flow direction check
- Status

Factory setting Closed

Additional information *Selection*

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

Assign flow direction check

Navigation Expert → Output → Relay output 1 to n → Assign dir.check

Prerequisite The **Flow direction check** option is selected in the **Relay output function** parameter (→ 104).

Description Use this function to select a process variable for monitoring the flow direction.

Selection

Factory setting Off

Assign limit

Navigation Expert → Output → Relay output 1 to n → Assign limit

Prerequisite

- The **Limit** option is selected in **Relay output function** parameter (→ 104).
- The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.

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

Selection

- Off
- Total solids
- Temperature
- Electronics temperature
- Conductivity

- Corrected conductivity
- Load rate *
- Totalizer 1 *

Factory setting Temperature

Assign diagnostic behavior

Navigation Expert → Output → Relay output 1 to n → Assign diag. beh

Prerequisite In the **Relay output function** parameter (→ 104), the **Diagnostic behavior** option is selected.

Description Use this function to select the category of the diagnostic events that are displayed for the relay output.

Selection
- Alarm
- Alarm or warning
- Warning

Factory setting Alarm

Additional information *Description*

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

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

Assign status

Navigation Expert → Output → Relay output 1 to n → Assign status

Prerequisite In the **Relay output function** parameter (→ 104), the **Digital Output** option is selected.

Description Use this function to select the device status for the relay output.

Selection
- Off
- Partially filled pipe detection

Factory setting Off

* Visibility depends on order options or device settings

Switch-off value

Navigation Expert → Output → Relay output 1 to n → Switch-off value

Prerequisite The **Limit** option is selected in the **Relay output function** parameter (→ 104).

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

User entry Floating point number with sign

Factory setting 0 °C

Additional information *Description*

Use this function to enter the limit value for the switch-off value (process variable < switch-off value = open, non-conductive).

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

Dependency

The unit is dependent on the process variable selected in the **Assign limit** parameter (→ 105).

Switch-off delay

Navigation Expert → Output → Relay output 1 to n → Switch-off delay

Prerequisite In the **Relay output function** parameter (→ 104), the **Limit** option is selected.

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

Switch-on value

Navigation Expert → Output → Relay output 1 to n → Switch-on value

Prerequisite The **Limit** option is selected in the **Relay output function** parameter (→ 104).

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

User entry Floating point number with sign

Factory setting 0 °C

Additional information

Description

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

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

Dependency

The unit is dependent on the process variable selected in the **Assign limit** parameter (→ 105).

Switch-on delay

Navigation Expert → Output → Relay output 1 to n → Switch-on delay

Prerequisite In the **Relay output function** parameter (→ 104), the **Limit** option is selected.

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

User entry 0.0 to 100.0 s

Factory setting 0.0 s

Failure mode

Navigation Expert → Output → Relay output 1 to n → Failure mode

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

Selection
- Actual status
- Open
- Closed

Factory setting Open

Additional information

Selection

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

Switch state

Navigation Expert → Output → Relay output 1 to n → Switch state

Description Displays the current status of the relay output.

User interface
- Open
- Closed

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

Powerless relay status

Navigation Expert → Output → Relay output 1 to n → Powerless relay

Description Use this function to select the quiescent state for the relay output.

Selection
- Open
- Closed

Factory setting Open

Additional information *Selection*
- Open
  The relay output is not conductive.
- Closed
  The relay output is conductive.

3.6 "Communication" submenu

Navigation Expert → Communication

▶ Communication	
▶ Modbus configuration	→ 110
▶ Modbus information	→ 115
▶ Modbus data map	→ 116
▶ Web server	→ 116

3.6.1 "Modbus configuration" submenu

Navigation Expert → Communication → Modbus config.

▶ **Modbus configuration**

Bus address	→ 110
Baudrate	→ 110
Data transfer mode	→ 111
Parity	→ 111
Byte order	→ 112
Telegram delay	→ 113
Failure mode	→ 113
Bus termination	→ 114
Fieldbus writing access	→ 114

Bus address

Navigation Expert → Communication → Modbus config. → Bus address

Description For entering the device address.

User entry 1 to 247

Factory setting 247

Baudrate

Navigation Expert → Communication → Modbus config. → Baudrate

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

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

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

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 (→ 112) 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 (→ 112).

The bytes are transmitted depending on the selection in the **Byte order** parameter (→ 112):

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 (MMMMMMM)	Byte 1 (MMMMMMM)
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

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

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 [4].
- Last valid value
  The device outputs the last valid measured value before the fault occurred.

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

Bus termination

Navigation

Expert → Communication → Modbus config. → Bus termination

Description

Displays whether the terminating resistor is enabled or disabled.

User interface

- Off
- On

Factory setting

Off

Additional information

Selection

- Off
  The terminating resistor is disabled.
- On
  The terminating resistor is enabled.

For detailed information about enabling the terminating resistor, see the Operating Instructions for the device, "Enabling the terminating resistor" section

Fieldbus writing access

Navigation

Expert → Communication → Modbus config. → Fieldb.writ.acc.

Description

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

Selection

- Read + write
- Read only

Factory setting

Read + write

4) Not a Number

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.

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.

3.6.2 "Modbus information" submenu

Navigation Expert → Communication → Modbus info

▶ Modbus information	
Device ID	→ 115
Device revision	→ 115

Device ID

Navigation Expert → Communication → Modbus info → Device ID

Description Displays the device ID for identifying the measuring device.

User interface 4-digit hexadecimal number

Device revision

Navigation Expert → Communication → Modbus info → Device revision

Description Displays the device revision.

User interface 4-digit hexadecimal number

3.6.3 "Modbus data map" submenu

Navigation Expert → Communication → Modbus data map

▶ Modbus data map	
Scan list register 0 to 15	→ 116

Scan list register 0 to 15

Navigation Expert → Communication → Modbus data map → Scan list reg.0 to 15

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

3.6.4 "Web server" submenu

Navigation Expert → Communication → Web server

▶ Web server	
Web server language	→ 117
MAC address	→ 117
DHCP client	→ 117
IP address	→ 118
Subnet mask	→ 118
Default gateway	→ 118
Web server functionality	→ 119
Login page	→ 119

Web server language

Navigation Expert → Communication → Web server → Webserv.language

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

Description Displays the MAC [5] address of the measuring device.

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

Factory setting Each measuring device is given an individual address.

Additional information *Example*

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

DHCP client

Navigation Expert → Communication → Web server → DHCP client

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

Selection
- Off
- On

5) Media Access Control

Factory setting On

Additional information *Effect*

If the DHCP client functionality of the web server is selected, the IP address (→ 118), Subnet mask (→ 118) and Default gateway (→ 118) are set automatically.

- Identification is via the MAC address of the measuring device.
- The IP address (→ 118) in the **IP address** parameter (→ 118) is ignored as long as the **DHCP client** parameter (→ 117) is active. This is also the case, in particular, if the DHCP server cannot be reached. The IP address (→ 118) in the parameter of the same name is only used if the **DHCP client** parameter (→ 117) is inactive.

IP address

Navigation Expert → Communication → Web server → IP address

Description Display or enter the IP address of the Web server integrated in the measuring device.

User entry 4 octet: 0 to 255 (in the particular octet)

Factory setting 192.168.1.212

Subnet mask

Navigation Expert → Communication → Web server → Subnet mask

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

Description Display or enter the Default gateway (→ 118).

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.

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

Selection
- Off
- HTML Off
- On

Factory setting On

Additional information *Description*

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

Selection

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

Login page

Navigation Expert → Communication → Web server → Login page

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

Selection
- Without header
- With header

Factory setting With header

3.6.5 "WLAN settings" wizard

Navigation Expert → Communication → WLAN settings

▶ **WLAN settings**

WLAN	→ 120

WLAN mode	→ 121
SSID name	→ 121
Network security	→ 121
Security identification	→ 122
User name	→ 122
WLAN password	→ 122
WLAN IP address	→ 123
WLAN MAC address	→ 123
WLAN subnet mask	→ 123
WLAN MAC address	→ 123
WLAN passphrase	→ 123
WLAN MAC address	→ 123
Assign SSID name	→ 124
SSID name	→ 124
2.4 GHz WLAN channel	→ 124
Select antenna	→ 125
Connection state	→ 125
Received signal strength	→ 125
WLAN IP address	→ 123
Gateway IP address	→ 126
IP address domain name server	→ 126

WLAN

Navigation Expert → Communication → WLAN settings → WLAN

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

Description Use this function to select the WLAN mode.

Selection
- WLAN access point
- WLAN Client

Factory setting WLAN access point

SSID name

Navigation Expert → Communication → WLAN settings → SSID name

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

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

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

Factory setting WPA2-PSK

* Visibility depends on order options or device settings

Additional information *Selection*

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

Security identification

Navigation Expert → Communication → WLAN settings → Sec. identific.

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

User interface

- Trusted issuer certificate
- Device certificate
- Device private key

User name

Navigation Expert → Communication → WLAN settings → User name

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

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

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

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

WLAN subnet mask

Navigation Expert → Communication → WLAN settings → WLAN subnet mask

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

Prerequisite The **WPA2-PSK** option is selected in the **Security type** parameter (→ 121).

Description Use this function to enter the network key.

6) Media Access Control

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

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

Assign SSID name

Navigation Expert → Communication → WLAN settings → Assign SSID name

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

Selection
- Device tag
- User-defined

Factory setting User-defined

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

SSID name

Navigation Expert → Communication → WLAN settings → SSID name

Prerequisite
- The **User-defined** option is selected in the **Assign SSID name** parameter (→ 124).
- The **WLAN access point** option is selected in the **WLAN mode** parameter (→ 121).

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

2.4 GHz WLAN channel

Navigation Expert → Communication → WLAN settings → WLAN channel

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

User entry 1 to 11

Factory setting 6

7) Service Set Identifier

Additional information *Description*

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

Select antenna

Navigation Expert → Communication → WLAN settings → Select antenna

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

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

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.

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

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

3.7 "Application" submenu

Navigation Expert → Application

▶ **Application**		
	Reset all totalizers	→ 126
	▶ **Totalizer 1**	→ 127

Reset all totalizers

Navigation Expert → Application → Reset all tot.

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 the totalizer to 0 and restarts the totaling process. The previously aggregated load quantity is thus deleted.

3.7.1 "Totalizer 1 to n" submenu

Navigation Expert → Application → Totalizer 1 to n

▶ Totalizer 1	
Assign process variable 1	→ 127
Process variable unit 1	→ 128
Totalizer 1 operation mode	→ 128
Totalizer 1 control	→ 129
Preset value 1	→ 130
Totalizer 1 failure behavior	→ 130

Assign process variable 1

Navigation Expert → Application → Totalizer 1 → AssignVariab. 1

Prerequisite The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.

Description Use this function to select a process variable for the Totalizer 1 to n.

Selection
- Off
- Load rate *

Factory setting Off

* Visibility depends on order options or device settings

Additional information

Description

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 (→ 127) is still displayed in the **Totalizer 1 to n** submenu. All other parameters in the submenu are hidden.

Process variable unit 1

Navigation Expert → Application → Totalizer 1 → VariableUnit 1

Prerequisite A process variable is selected in the **Assign process variable** parameter (→ 127) of the **Totalizer 1 to n** submenu.

Description Use this function to select the process variable unit for the Totalizer 1 to n (→ 127).

Selection

SI units
- kg
- t

US units
- oz
- lb
- STon

or

Other units
None *

*	Visibility depends on order options or device settings

Factory setting Depends on country

Additional information

Description

The unit is selected separately for the totalizer and is independent of the option selected in the **System units** submenu (→ 54).

Options

The selection is dependent on the process variable selected in the **Assign process variable** parameter (→ 127).

Totalizer 1 operation mode

Navigation Expert → Application → Totalizer 1 → Operat. mode 1

Prerequisite A process variable is selected in the **Assign process variable** parameter (→ 127) of the **Totalizer 1 to n** submenu.

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

Selection
- Net
- Forward
- Reverse

Factory setting
Net

Additional information
Selection
- Net flow total
  Flow values in the forward and reverse flow direction are totalized and balanced against one another. Net flow is registered in the flow direction.
- Forward flow total
  Only the flow in the forward flow direction is totalized.
- Reverse flow total
  Only the flow in the reverse flow direction is totalized (= reverse flow quantity).

Totalizer 1 control

Navigation
Expert → Application → Totalizer 1 → Tot. 1 control

Prerequisite
A process variable is selected in the **Assign process variable** parameter (→ 127) 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.
Hold	Totalizing is stopped.

1) Visible depending on the order options or device settings

Preset value 1

Navigation Expert → Application → Totalizer 1 → Preset value 1

Prerequisite A process variable is selected in the **Assign process variable** parameter (→ 127) of the **Totalizer 1 to n** submenu.

Description Use this function to enter a start value for the Totalizer 1 to n.

User entry Signed floating-point number

Factory setting 0 kg

Additional information *User entry*

The unit of the selected process variable is defined in the **Unit totalizer** parameter (→ 128) for the totalizer.

Totalizer 1 failure behavior

Navigation Expert → Application → Totalizer 1 → FailureBehav. 1

Prerequisite A process variable is selected in the **Assign process variable** parameter (→ 127) of the **Totalizer 1 to n** submenu.

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

Selection
- Hold
- Continue
- Last valid value + continue

Factory setting Hold

Additional information *Description*

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

Selection

- Stop
  The totalizer is stopped in the event of a device alarm.
- Actual value
  The totalizer continues to count based on the actual (current) measured value; the device alarm is ignored.
- Last valid value
  The totalizer continues to count based on the last valid measured value before the device alarm occurred.

3.8 "Diagnostics" submenu

Navigation Expert → Diagnostics

▶ **Diagnostics**

- Actual diagnostics → 131
- Previous diagnostics → 132
- Operating time from restart → 133
- Operating time → 133
- ▶ **Diagnostic list** → 134
- ▶ **Event logbook** → 136
- ▶ **Device information** → 138
- ▶ **Main electronic module + I/O module 1** → 141
- ▶ **Sensor electronic module (ISEM)** → 142
- ▶ **I/O module 2** → 143
- ▶ **I/O module 3** → 145
- ▶ **I/O module 4** → 146
- ▶ **Display module** → 147
- ▶ **Data logging** → 148
- ▶ **Min/max values** → 155
- ▶ **Heartbeat Technology** → 160
- ▶ **Simulation** → 160

Actual diagnostics

Navigation Expert → Diagnostics → Actual diagnos.

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

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

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

Timestamp

Navigation

Expert → Diagnostics → Timestamp

Description

Displays the operating time when the current diagnostic message occurred.

User interface

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

Additional information

Display

The diagnostic message can be viewed via the **Actual diagnostics** parameter (→ 131).

Example

For the display format:
24d12h13m00s

Previous diagnostics

Navigation

Expert → Diagnostics → Prev.diagnostics

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 E key.

Example

For the display format:
⊗F271 Main electronic failure

Timestamp

Navigation Expert → Diagnostics → Timestamp

Description Displays the operating time when the last diagnostic message before the current message occurred.

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

Additional information *Display*

The diagnostic message can be viewed via the **Previous diagnostics** parameter (→ 132).

Example

For the display format:
24d12h13m00s

Operating time from restart

Navigation Expert → Diagnostics → Time fr. restart

Description Use this function to display the time the device has been in operation since the last device restart.

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

Operating time

Navigation Expert → Diagnostics → Operating time

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)

3.8.1 "Diagnostic list" submenu

Navigation Expert → Diagnostics → Diagnostic list

▶ Diagnostic list	
Diagnostics 1	→ 134
Diagnostics 2	→ 134
Diagnostics 3	→ 135
Diagnostics 4	→ 135
Diagnostics 5	→ 136

Diagnostics 1

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 1

Description Displays the current diagnostics message with the highest priority.

User interface Symbol for diagnostic behavior, diagnostic code and short message.

Additional information *Display*

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

Examples

For the display format:
- ⊗F271 Main electronic failure
- ⊗F276 I/O module failure

Diagnostics 2

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 2

Description Displays the current diagnostics message with the second-highest priority.

User interface Symbol for diagnostic behavior, diagnostic code and short message.

Additional information

Display

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

Examples

For the display format:
- ⊗F271 Main electronic failure
- ⊗F276 I/O module failure

Diagnostics 3

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 3

Description Displays the current diagnostics message with the third-highest priority.

User interface Symbol for diagnostic behavior, diagnostic code and short message.

Additional information

Display

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

Examples

For the display format:
- ⊗F271 Main electronic failure
- ⊗F276 I/O module failure

Diagnostics 4

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 4

Description Displays the current diagnostics message with the fourth-highest priority.

User interface Symbol for diagnostic behavior, diagnostic code and short message.

Additional information

Display

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

Examples

For the display format:
- ⊗F271 Main electronic failure
- ⊗F276 I/O module failure

Diagnostics 5

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 5

Description Displays the current diagnostics message with the fifth-highest priority.

User interface Symbol for diagnostic behavior, diagnostic code and short message.

Additional information *Display*

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

Examples

For the display format:
- ⊗F271 Main electronic failure
- ⊗F276 I/O module failure

3.8.2 "Event logbook" submenu

Displays event messages

Event messages are displayed in chronological order. The event history includes both diagnostic events and information events. The symbol in front of the timestamp indicates whether the event has started or ended.

Navigation Expert → Diagnostics → Event logbook

▶ **Event logbook**		
	Filter options	→ 136

Filter options

Navigation Expert → Diagnostics → Event logbook → Filter options

Description Use this function to select the category whose event messages are displayed in the event list of the local display.

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

Factory setting All

Additional information *Description*

The status signals are categorized in accordance with VDI/VDE 2650 and NAMUR Recommendation NE 107:
- F = Failure
- C = Function Check
- S = Out of Specification
- M = Maintenance Required

"Event list" submenu

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

If operating via the FieldCare operating tool, the event list can be read out with a separate FieldCare module.

If operating via the Web browser, the event messages can be found directly in the **Event logbook** submenu.

Navigation Expert → Diagnostics → Event logbook → Event list

▸ **Event list**		
	Event list	→ 137

Event list

Navigation Expert → Diagnostics → Event logbook → Event list

Description Displays the history of event messages of the category selected in the **Filter options** parameter (→ 136).

User interface
- For a "Category I" event message
  Information event, short message, symbol for event recording and operating time when error occurred
- For a "Category F, C, S, M" event message (status signal)
  Diagnostics code, short message, symbol for event recording and operating time when error occurred

Additional information *Description*

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

If the **Extended HistoROM** application package (order option) is enabled in the device, the event list can contain up to 100 entries .

The following symbols indicate whether an event has occurred or has ended:
- ⊕: Occurrence of the event
- ⊖: End of the event

Examples

For the display format:
- I1091 Configuration modified
  ⊕ 24d12h13m00s
- ⊗F271 Main electronic failure
  ⊕ 01d04h12min30s

HistoROM

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

3.8.3 "Device information" submenu

Navigation Expert → Diagnostics → Device info

▶ Device information	
Device tag	→ 138
Serial number	→ 139
Firmware version	→ 139
Device name	→ 140
Order code	→ 140
Extended order code 1	→ 140
Extended order code 2	→ 140
Extended order code 3	→ 141
ENP version	→ 141

Device tag

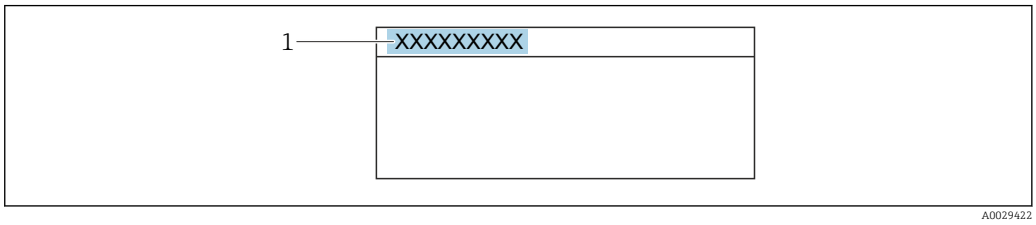
Navigation Expert → Diagnostics → Device info → Device tag

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 Teqwave M

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

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

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

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

User interface Character string comprising numbers, letters and special characters

Order code

Navigation Expert → Diagnostics → Device info → Order code

Description Displays the device order code.

User interface Character string composed of letters, numbers and certain punctuation marks (e.g. /).

Additional information *Description*

The order code is generated from the extended order code through a process of reversible transformation. The extended order code indicates the attributes for all the device features in the product structure. The device features are not directly readable from the order code.

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

Extended order code 1

Navigation Expert → Diagnostics → Device info → Ext. order cd. 1

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.

Extended order code 2

Navigation Expert → Diagnostics → Device info → Ext. order cd. 2

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 (→ 140)

Extended order code 3

Navigation Expert → Diagnostics → Device info → Ext. order cd. 3

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 (→ 140)

ENP version

Navigation Expert → Diagnostics → Device info → ENP version

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.

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

Navigation Expert → Diagnostics 1 → Main elec.+I/O1

▶ **Main electronic module + I/O module 1**		
	Firmware version	→ 142
	Build no. software	→ 142
	Bootloader revision	→ 142

Firmware version

Navigation Expert → Diagnostics → Main elec.+I/O1 → Firmware version

Description Use this function to display the software revision of the module.

User interface Positive integer

Build no. software

Navigation Expert → Diagnostics → Main elec.+I/O1 → Build no. softw.

Description Use this function to display the software build number of the module.

User interface Positive integer

Bootloader revision

Navigation Expert → Diagnostics → Main elec.+I/O1 → Bootloader rev.

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

User interface Positive integer

3.8.5 "Sensor electronic module (ISEM)" submenu

Navigation Expert → Diagnostics → Sens. electronic

▶ Sensor electronic module (ISEM)	
Firmware version	→ 143
Build no. software	→ 143
Bootloader revision	→ 143

Firmware version

Navigation	Expert → Diagnostics → Sens. electronic → Firmware version
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.
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.
Description	Use this function to display the bootloader revision of the software.
User interface	Positive integer

3.8.6 "I/O module 2" submenu

Navigation Expert → Diagnostics → I/O module 2

▶ **I/O module 2**	
I/O module 2 terminal numbers	→ 144
Firmware version	→ 144
Build no. software	→ 144
Bootloader revision	→ 144

I/O module 2 terminal numbers

Navigation Expert → Diagnostics → I/O module 2 → I/O 2 terminals

Description Displays the terminal numbers used by the I/O module.

User interface
- Not used
- 26-27 (I/O 1)
- 24-25 (I/O 2)
- 22-23 (I/O 3)
- 20-21 (I/O 4)

Firmware version

Navigation Expert → Diagnostics → I/O module 2 → Firmware version

Description Use this function to display the software revision of the module.

User interface Positive integer

Build no. software

Navigation Expert → Diagnostics → I/O module 2 → Build no. softw.

Description Use this function to display the software build number of the module.

User interface Positive integer

Bootloader revision

Navigation Expert → Diagnostics → I/O module 2 → Bootloader rev.

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

User interface Positive integer

3.8.7 "I/O module 3" submenu

Navigation Expert → Diagnostics → I/O module 3

▶ I/O module 3	
I/O module 3 terminal numbers	→ 145
Firmware version	→ 145
Build no. software	→ 145
Bootloader revision	→ 146

I/O module 3 terminal numbers

Navigation Expert → Diagnostics → I/O module 3 → I/O 3 terminals

Description Displays the terminal numbers used by the I/O module.

User interface
- Not used
- 26-27 (I/O 1)
- 24-25 (I/O 2)
- 22-23 (I/O 3)
- 20-21 (I/O 4)

Firmware version

Navigation Expert → Diagnostics → I/O module 3 → Firmware version

Description Use this function to display the software revision of the module.

User interface Positive integer

Build no. software

Navigation Expert → Diagnostics → I/O module 3 → Build no. softw.

Description Use this function to display the software build number of the module.

User interface Positive integer

Bootloader revision

Navigation Expert → Diagnostics → I/O module 3 → Bootloader rev.

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

User interface Positive integer

3.8.8 "I/O module 4" submenu

Navigation Expert → Diagnostics → I/O module 4

▶ I/O module 4	
I/O module 4 terminal numbers	→ 146
Firmware version	→ 146
Build no. software	→ 147
Bootloader revision	→ 147

I/O module 4 terminal numbers

Navigation Expert → Diagnostics → I/O module 4 → I/O 4 terminals

Description Displays the terminal numbers used by the I/O module.

User interface
- Not used
- 26-27 (I/O 1)
- 24-25 (I/O 2)
- 22-23 (I/O 3)
- 20-21 (I/O 4) *

Firmware version

Navigation Expert → Diagnostics → I/O module 4 → Firmware version

Description Use this function to display the software revision of the module.

* Visibility depends on order options or device settings

User interface Positive integer

Build no. software

Navigation Expert → Diagnostics → I/O module 4 → Build no. softw.

Description Use this function to display the software build number of the module.

User interface Positive integer

Bootloader revision

Navigation Expert → Diagnostics → I/O module 4 → Bootloader rev.

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

User interface Positive integer

3.8.9 "Display module" submenu

Navigation Expert → Diagnostics → Display module

▶ **Display module**		
	Firmware version	→ 147
	Build no. software	→ 148
	Bootloader revision	→ 148

Firmware version

Navigation Expert → Diagnostics → Display module → Firmware version

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.

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.

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

User interface Positive integer

3.8.10 "Data logging" submenu

Navigation Expert → Diagnostics → Data logging

▶ Data logging	
Assign channel 1	→ 149
Assign channel 2	→ 149
Assign channel 3	→ 150
Assign channel 4	→ 150
Logging interval	→ 150
Clear logging data	→ 151
Data logging	→ 152
Logging delay	→ 152
Data logging control	→ 152
Data logging status	→ 153
Entire logging duration	→ 153

Assign channel 1

Navigation Expert → Diagnostics → Data logging → Assign chan. 1

Prerequisite
- The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.
- The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 45).

Description Use this function to assign a process variable to the data logging channel.

Selection
- Off
- Total solids
- Temperature
- Electronics temperature
- Conductivity
- Corrected conductivity
- Load rate *
- Current output 1 *
- Current output 2 *
- Current output 3 *
- Current output 4 *

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).

The log contents are cleared if the option selected is changed.

Assign channel 2

Navigation Expert → Diagnostics → Data logging → Assign chan. 2

Prerequisite
- The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.
- The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 45).

Description Use this function to assign a process variable to the logging channel.

* Visibility depends on order options or device settings

Selection For the picklist, see **Assign channel 1** parameter (→ 149)

Factory setting Off

Assign channel 3

Navigation Expert → Diagnostics → Data logging → Assign chan. 3

Prerequisite
- The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.
- The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 45).

Description Use this function to assign a process variable to the logging channel.

Selection For the picklist, see **Assign channel 1** parameter (→ 149)

Factory setting Off

Assign channel 4

Navigation Expert → Diagnostics → Data logging → Assign chan. 4

Prerequisite
- The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.
- The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 45).

Description Use this function to assign a process variable to the logging channel.

Selection For the picklist, see **Assign channel 1** parameter (→ 149)

Factory setting Off

Logging interval

Navigation Expert → Diagnostics → Data logging → Logging interval

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

The software options currently enabled are displayed in the **Software option overview** parameter (→ 45).

Description Use this function to enter the logging interval T_{log} for data logging.

User entry 0.1 to 3 600.0 s

Factory setting 1.0 s

Additional information *Description*

This defines the interval between the individual data points in the data log, and thus the maximum loggable process time T_{log}:
- If 1 logging channel is used: $T_{log} = 1000 \times t_{log}$
- If 2 logging channels are used: $T_{log} = 500 \times t_{log}$
- If 3 logging channels are used: $T_{log} = 333 \times t_{log}$
- If 4 logging channels are used: $T_{log} = 250 \times t_{log}$

Once this time elapses, the oldest data points in the data log are cyclically overwritten such that a time of T_{log} always remains in the memory (ring memory principle).

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

Example

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

Clear logging data

Navigation Expert → Diagnostics → Data logging → Clear logging

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

The software options currently enabled are displayed in the **Software option overview** parameter (→ 45).

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

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

Prerequisite In the **Data logging** parameter (→ 152), 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 (→ 152), 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

Prerequisite In the **Data logging** parameter (→ 152), 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

Prerequisite In the **Data logging** parameter (→ 152), 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

Prerequisite In the **Data logging** parameter (→ 152), 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	→ 154

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 (→ 45).

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

Additional information *Description*

- 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	→ 154

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 → 154

"Display channel 3" submenu

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

▸ **Display channel 3**		
	Display channel 3	→ 155

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 → 154

"Display channel 4" submenu

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

▸ **Display channel 4**		
	Display channel 4	→ 155

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 → 154

3.8.11 "Min/max values" submenu

Navigation Expert → Diagnostics → Min/max val.

▸ **Min/max values**		
	▸ **Electronics temperature**	→ 156

▶ Main electronics temperature	→ 156
▶ Sensor electronics temperature (ISEM)	→ 157
▶ Medium temperature	→ 158
▶ Total solids	→ 159
▶ Conductivity	→ 159

"Electronics temperature" submenu

Navigation Expert → Diagnostics → Min/max val. → Electronics temp

▶ Electronics temperature

Minimum value

Navigation Expert → Diagnostics → Min/max val. → Electronics temp → Minimum value

Description Shows the lowest electronics temperature measured to date.

User interface Positive floating-point number

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Electronics temp → Maximum value

Description Shows the highest electronics temperature measured to date.

User interface Positive floating-point number

"Main electronics temperature" submenu

Navigation Expert → Diagnostics → Min/max val. → Main elect.temp.

▶ Main electronics temperature

Maximum value	→ 157
Minimum value	→ 157

Minimum value

Navigation Expert → Diagnostics → Min/max val. → Main elect.temp. → Minimum value

Description Displays the lowest previously measured temperature value of the electronics module in the transmitter.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 56)

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Main elect.temp. → Maximum value

Description Displays the highest previously measured temperature value of the electronics module in the transmitter.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 56)

"Sensor electronics temperature (ISEM)" submenu

Navigation Expert → Diagnostics → Min/max val. → Sensor elec.temp

▶ **Sensor electronics temperature (ISEM)**	
Maximum value	→ 158
Minimum value	→ 158

Minimum value

Navigation Expert → Diagnostics → Min/max val. → Sensor elec.temp → Minimum value

Description Shows the lowest temperature measured to date for the sensor electronic module.

User interface Signed floating-point number

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Sensor elec.temp → Maximum value

Description Shows the highest temperature measured to date for the sensor electronic module.

User interface Signed floating-point number

"Medium temperature" submenu

Navigation Expert → Diagnostics → Min/max val. → Medium temp.

▶ **Medium temperature**		
	Maximum value	→ 158
	Minimum value	→ 158

Minimum value

Navigation Expert → Diagnostics → Min/max val. → Medium temp. → Minimum value

Description Shows the lowest medium temperature measured to date.

User interface Signed floating-point number

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Medium temp. → Maximum value

Description Shows the highest medium temperature measured to date.

User interface Signed floating-point number

"Total solids" submenu

Navigation Expert → Diagnostics → Min/max val. → Total solids

▶ Total solids	
Maximum value	→ 159
Minimum value	→ 159

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Total solids → Maximum value

Description Shows the highest total solids value measured to date.

User interface Positive floating-point number

Minimum value

Navigation Expert → Diagnostics → Min/max val. → Total solids → Minimum value

Description Shows the lowest total solids value measured to date.

User interface Positive floating-point number

"Conductivity" submenu

Navigation Expert → Diagnostics → Min/max val. → Conductivity

▶ Conductivity	
Maximum value	→ 160
Minimum value	→ 160

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Conductivity → Maximum value

Description Shows the highest conductivity measured to date.

User interface Positive floating-point number

Minimum value

Navigation Expert → Diagnostics → Min/max val. → Conductivity → Minimum value

Description Shows the lowest conductivity measured to date.

User interface Positive floating-point number

3.8.12 "Heartbeat Technology" submenu

For detailed information on the parameter descriptions of the **Heartbeat Verification** application package, see the Special Documentation for the device → 📄 7

Navigation Expert → Diagnostics → Heartbeat Techn.

3.8.13 "Simulation" submenu

Navigation Expert → Diagnostics → Simulation

▶ **Simulation**	
Assign simulation process variable	→ 📄 161
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Current input 1 to n simulation	→ 📄 162
Value current input 1 to n	→ 📄 162
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Frequency output 1 to n simulation	→ 164
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Pulse value 1 to n	→ 166
Switch output simulation 1 to n	→ 166
Switch state 1 to n	→ 167
Relay output 1 to n simulation	→ 167
Switch state 1 to n	→ 168
Device alarm simulation	→ 168
Diagnostic event category	→ 169
Diagnostic event simulation	→ 169

Assign simulation process variable

Navigation Expert → Diagnostics → Simulation → Assign proc.var.

Prerequisite The **Load rate** option is only available if the volume flow of the medium is read in via the Current input 1 to n (→ 49) or the fieldbus.

Description Select a process variable for the simulation process that is activated.

Selection
- Off
- Load rate *
- Total solids
- Temperature
- Electronics temperature
- Conductivity
- Corrected conductivity

Factory setting Off

* Visibility depends on order options or device settings

Process variable value

Navigation Expert → Diagnostics → Simulation → Proc. var. value

Description Enter the simulation value for the selected process variable.

User entry Signed floating-point number

Factory setting 0

Current input 1 to n simulation

Navigation Expert → Diagnostics → Simulation → Curr.inp 1 to n sim.

Description Option for switching simulation of the current input on and off. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.

The desired simulation value is defined in the **Value current input 1 to n** parameter.

Selection
- Off
- On

Factory setting Off

Additional information *Selection*
- Off
  Current simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.
- On
  Current simulation is active.

Value current input 1 to n

Navigation Expert → Diagnostics → Simulation → Value curr.inp 1 to n

Prerequisite In the **Current input 1 to n simulation** parameter, the **On** option is selected.

Description Use this function to enter the current value for the simulation. In this way, users can verify the correct configuration of the current input and the correct function of upstream feed-in units.

User entry 0 to 22.5 mA

Status input 1 to n simulation

Navigation Expert → Diagnostics → Simulation → Status inp 1 to n sim

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 (→ 163).

Selection
- Off
  Simulation for the status input is switched off. The device is in normal measuring mode or another process variable is being simulated.
- On
  Simulation for the status input is active.

Input signal level 1 to n

Navigation Expert → Diagnostics → Simulation → Signal level 1 to n

Prerequisite In the **Status input simulation** parameter (→ 163), 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 to n simulation

Navigation Expert → Diagnostics → Simulation → Curr.outp 1 to n sim.

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

Selection
- Off
- On

Factory setting Off

Additional information *Description*

The desired simulation value is defined in the **Value current output 1 to n** parameter.

Selection

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

Current output value

Navigation Expert → Diagnostics → Simulation → Curr.outp val.

Prerequisite In the **Current output 1 to n simulation** parameter, the **On** option is selected.

Description Use this function to enter a current value for the simulation. In this way, users can verify the correct adjustment of the current output and the correct function of downstream switching units.

User entry 3.59 to 22.5 mA

Additional information *Dependency*

The input range is dependent on the option selected in the **Current span** parameter (→ 75).

Frequency output 1 to n simulation

Navigation Expert → Diagnostics → Simulation → Freq.outp 1 to n sim.

Prerequisite In the **Operating mode** parameter (→ 87), 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

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.

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

Prerequisite In the **Operating mode** parameter (→ 87), 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 (→ 89).
- Down-counting value
  The pulses specified in the **Pulse value** parameter (→ 166) are output.

Pulse value 1 to n

Navigation Expert → Diagnostics → Simulation → Pulse value 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

Prerequisite In the **Operating mode** parameter (→ 87), the **Switch** option is selected.

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

Selection
- Off
- On

Factory setting Off

Additional information

Description

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

Selection

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

Switch state 1 to n

Navigation Expert → Diagnostics → Simulation → Switch state 1 to n

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.

Relay output 1 to n simulation

Navigation Expert → Diagnostics → Simulation → Relay out. 1 to n sim

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

Selection
- Off
- On

Factory setting Off

Additional information

Description

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

Selection

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

Switch state 1 to n

Navigation Expert → Diagnostics → Simulation → Switch state 1 to n

Prerequisite The **On** option is selected in the **Switch output simulation 1 to n** parameter parameter.

Description Use this function to select a relay value for the simulation. In this way, users can verify the correct adjustment of the relay output and the correct function of downstream switching units.

Selection

- Open
- Closed

Additional information

Selection

- Open
  Relay simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.
- Closed
  Relay simulation is active.

Device alarm simulation

Navigation Expert → Diagnostics → Simulation → Dev. alarm sim.

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

Description Use this function to select the category of the diagnostic events that are displayed for the simulation in the **Diagnostic event simulation** parameter (→ 169).

Selection
- Sensor
- Electronics
- Configuration
- Process

Factory setting Process

Diagnostic event simulation

Navigation Expert → Diagnostics → Simulation → Diagnostic event

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 (→ 169).

4 Country-specific factory settings

4.1 SI units

The country-specific factory setting in SI units is made for all countries except the USA and Canada.

4.1.1 System units

Process variable	Unit
Total solids	%TS
Density	g/l
Mass flow	kg/h
Mass	kg
Volume	l/h
Temperature	°C
Conductivity	µS/cm
Load rate	kg/h

For further information on system units, see: **System units** submenu (→ 54)

4.1.2 Output current span

Output	Current range
Current output 1 to n	4 to 20 mA NAMUR

For further information on the current ranges, see: **Current range output** parameter (→ 75)

4.2 US units

The country-specific factory setting in US units is made for the USA and Canada.

4.2.1 System units

Process variable	Unit
Total solids	%TS
Density	lb/ft³
Mass flow	lb/h
Mass	lb
Volume	l/h
Temperature	°F

Process variable	Unit
Conductivity	µS/cm
Load rate	lb/h

For further information on system units, see: **System units** submenu (→ 54)

4.2.2 Output current span

Output	Current range
Current output 1 to n	4 to 20 mA US

For further information on the current ranges, see: **Current range output** parameter (→ 75)

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