

Description of Device Parameters

Proline Prowirl 200

Vortex flowmeter
Modbus TCP

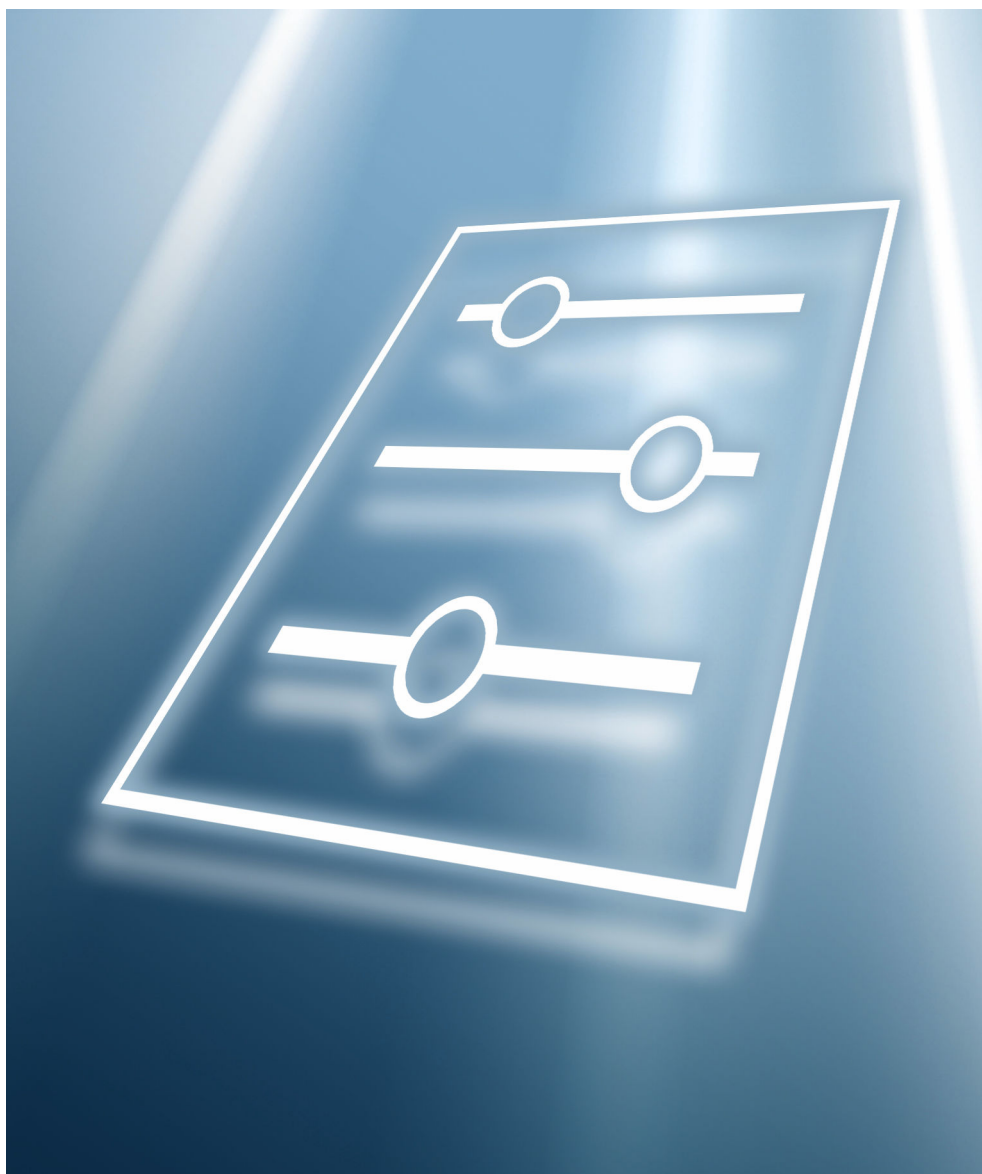


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1 About this document

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.

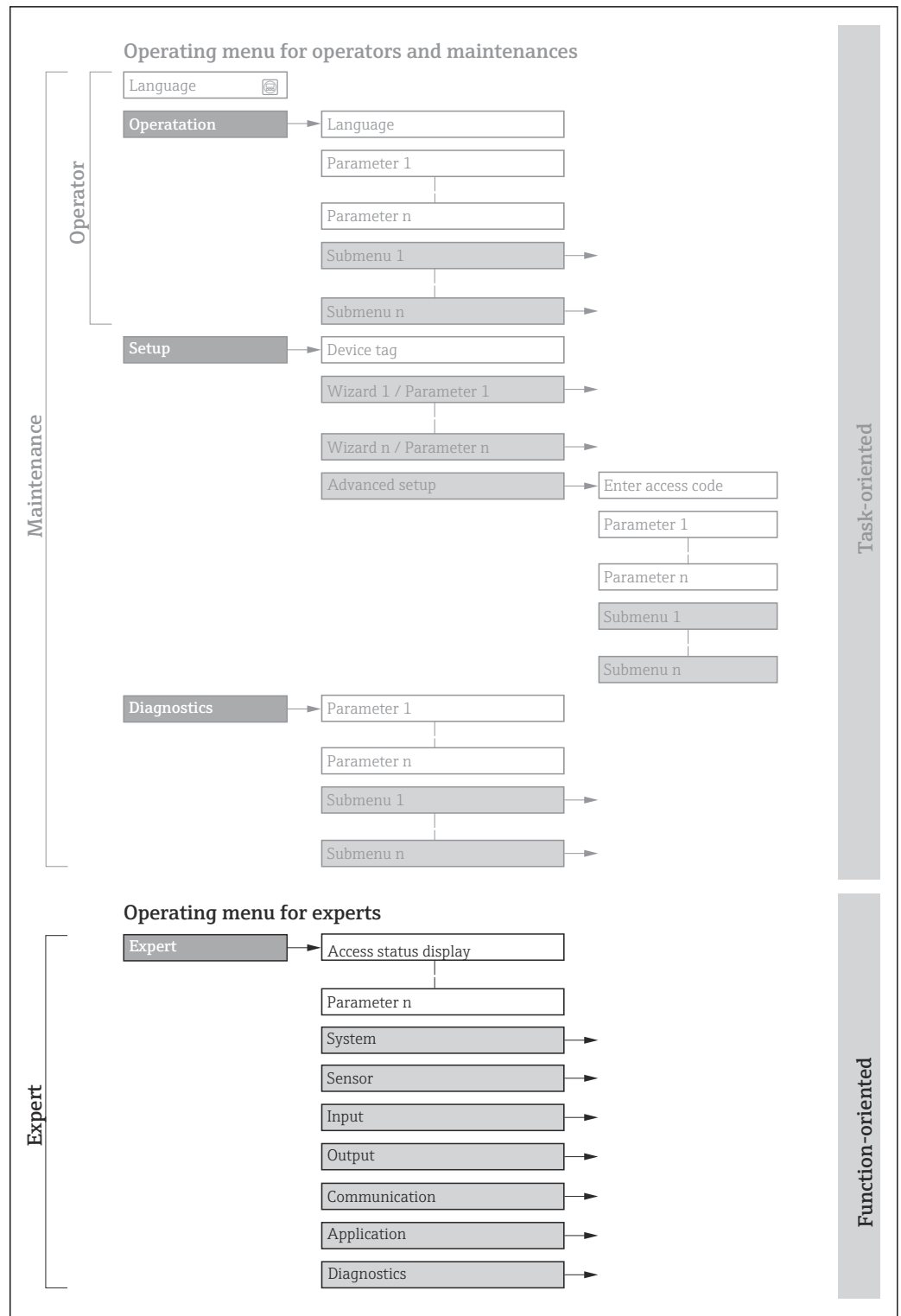
1.2 Target group

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 → 7
- Operating concept of the operating menus: Operating Instructions → 7

1.3.2 Structure of a parameter description

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

Complete parameter name		Write-protected parameter = 
Navigation	 Navigation path to the parameter via the local display (direct access code)  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

Operating Instructions

Measuring instrument	Documentation code
Prowirl D 200	BA02397D
Prowirl F 200	BA02398D
Prowirl O 200	BA02399D
Prowirl R 200	BA02400D

1.5.2 Supplementary device-dependent documentation

Special Documentation

Contents	Documentation code
Information on the Pressure Equipment Directive	SD01614D
Wet steam detection	SD03348D
Wet steam measurement	SD03349D
Protective cover	SD00333F
Modbus TCP system integration	SD03409D

2 Overview of the Expert operating menu

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

Navigation  Expert

Expert		
Locking status	→ 	10
User role	→ 	11
Enter access code	→ 	11
▶ System	→ 	12
▶ Display	→ 	12
▶ Diagnostic handling	→ 	25
▶ Administration	→ 	38
▶ Sensor	→ 	44
▶ Measured values	→ 	44
▶ System units	→ 	58
▶ Process parameters	→ 	72
▶ Measurement mode	→ 	76
▶ External compensation	→ 	103
▶ Sensor adjustment	→ 	107
▶ Calibration	→ 	114
▶ Communication	→ 	115
▶ Modbus configuration	→ 	116
▶ Modbus information	→ 	118
▶ Modbus data map	→ 	119

▶ APL port	→ 120
▶ Web server	→ 122
▶ Application	→ 125
Reset all totalizers	→ 125
▶ Totalizer 1 to n	→ 126
▶ Diagnostics	→ 130
Actual diagnostics	→ 131
Previous diagnostics	→ 131
Operating time from restart	→ 132
Operating time	→ 132
▶ Diagnostic list	→ 132
▶ Event logbook	→ 134
▶ Device information	→ 135
▶ Sensor information	→ 139
▶ Main electronic module	→ 140
▶ I/O module	→ 141
▶ Display module	→ 142
▶ Data logging	→ 143
▶ Min/max values	→ 148
▶ Heartbeat Technology	→ 153
▶ Simulation	→ 162

3 Description of device parameters

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

Expert		
Locking status	→	10
User role	→	11
Enter access code	→	11
► System	→	12
► Sensor	→	44
► Communication	→	115
► Application	→	125
► Diagnostics	→	130

Locking status

Navigation	Expert → Locking status
Description	Displays the active write protection.
User interface	■ Hardware locked ■ Temporarily locked

Additional information*User interface*

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



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

Selection

Options	Description
None	The access authorization displayed in the Access status display parameter applies . Only appears on local display.
Hardware locked (priority 1)	The DIP switch for hardware locking is activated on the main electronics module. This locks write access to the parameters (e.g. via local display or operating tool) .
Temporarily locked	Write access to the parameters is temporarily locked on account of internal processes running in the device (e.g. data upload/download, reset, etc.). Once the internal processing has been completed, the parameters can be changed again.

User role**Navigation**

Expert → User role

Description

Displays the access authorization to the parameters via the operating tool.

User interface

- Operator
- Maintenance

Factory setting

Maintenance

Additional information*Description*

The access authorization can be modified via the **Enter access code** parameter.



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 in the operating tool.

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

3.1 "System" submenu

Navigation  Expert → System

► System		
► Display		→  12
► Diagnostic handling		→  25
► Administration		→  38

3.1.1 "Display" submenu

Navigation  Expert → System → Display

► Display		
Display language		→  13
Format display		→  14
Value 1 display		→  16
0% bargraph value 1		→  16
100% bargraph value 1		→  17
Decimal places 1		→  17
Value 2 display		→  18
Decimal places 2		→  18
Value 3 display		→  19
0% bargraph value 3		→  19
100% bargraph value 3		→  20
Decimal places 3		→  20
Value 4 display		→  21

Decimal places 4	→  21
Display interval	→  22
Display damping	→  22
Header	→  23
Header text	→  23
Separator	→  24
Contrast display	→  24
Backlight	→  25

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) ■ العربية (Arabic) * ■ Bahasa Indonesia ■ ภาษาไทย (Thai) * ■ tiếng Việt (Vietnamese) * ■ čeština (Czech)
Factory setting	English

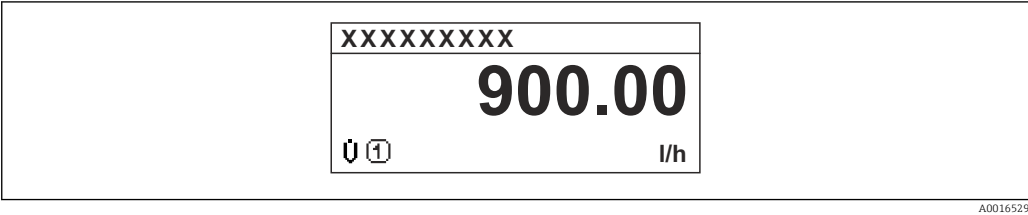
* Visibility depends on order options or device settings

Format display

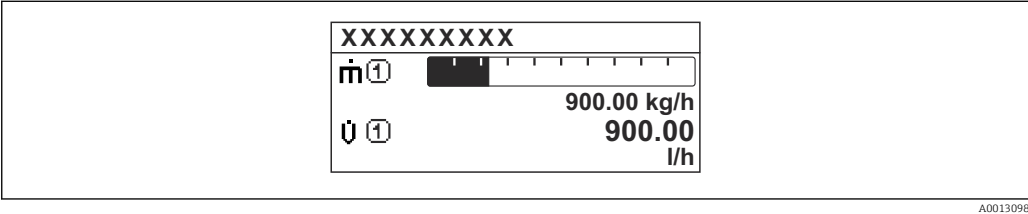
Navigation	 Expert → System → Display → Format display
Prerequisite	A local display is provided.
Description	Use this function to select how the measured value is shown on the local display.
Selection	■ 1 value, max. size ■ 1 bargraph + 1 value ■ 2 values ■ 1 value large + 2 values ■ 4 values
Factory setting	1 value, max. size
Additional information	<i>Description</i> The display format (size, bar graph) and number of simultaneously displayed measured values (1 to 4) can be configured. This setting only applies to normal operation.  ■ The Value 1 display parameter (→  16)...Value 4 display parameter (→  21) are used to specify which measured values are shown on the local display and in what order. ■ If more measured values are specified than the display mode selected permits, then the values alternate on the device display. The display time until the next change is configured using the Display interval parameter (→  22).

Possible measured values shown on the local display:

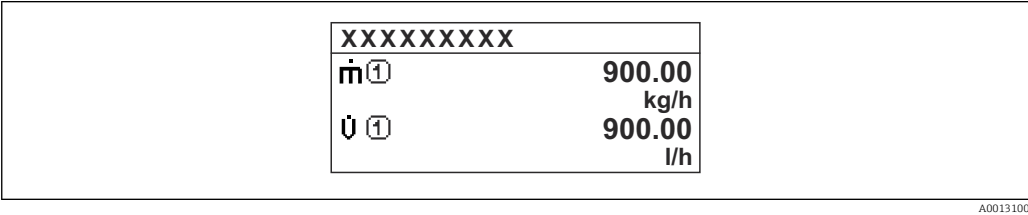
"1 value, max. size" option



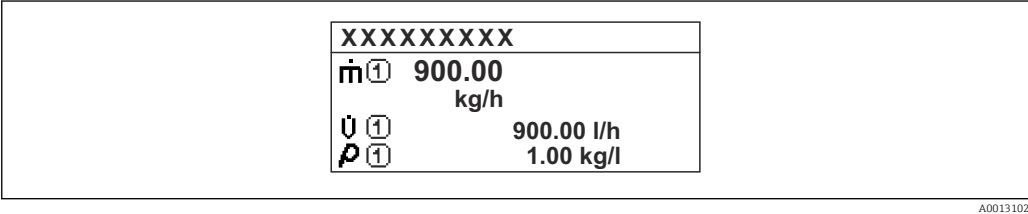
"1 bargraph + 1 value" option



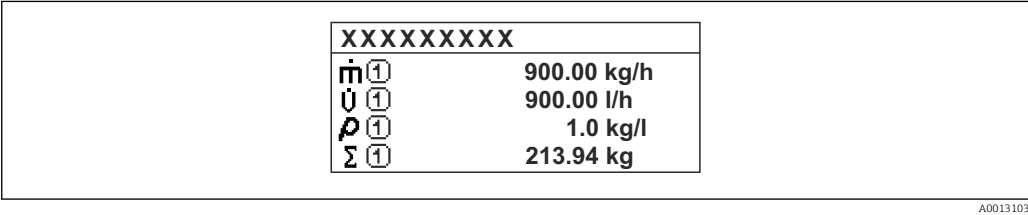
"2 values" option



"1 value large + 2 values" option



"4 values" option



Value 1 display	
Navigation	 Expert → System → Display → Value 1 display
Prerequisite	A local display is provided.
Description	Use this function to select a measured value that is shown on the local display.
Selection	■ Volume flow ■ Corrected volume flow ■ Mass flow ■ Flow velocity ■ Temperature ■ Vortex frequency ■ Vortex kurtosis ■ Vortex amplitude ■ Calculated saturated steam pressure * ■ Steam quality * ■ Total mass flow * ■ Condensate mass flow * ■ Energy flow * ■ Heat flow difference * ■ Reynolds number * ■ Density * ■ Pressure * ■ Specific volume * ■ Degrees of superheat * ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3
Factory setting	Volume flow
Additional information	<i>Description</i> 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. <i>Dependency</i>  The unit of the displayed measured value is taken from the System units submenu (→  58).

0% bargraph value 1	
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Navigation  Expert → System → Display → 0% bargraph 1

Prerequisite A local display is provided.

* Visibility depends on order options or device settings

Description	Use this function to enter the 0% bar graph value to be shown on the display for the measured value 1.
User entry	Signed floating-point number
Factory setting	Country-specific: ■ 0 m³/h ■ 0 ft³/h
Additional information	<i>Description</i>  The Format display parameter (→  14) is used to specify that the measured value is to be displayed as a bar graph. <i>User entry</i>  The unit of the displayed measured value is taken from the System units submenu (→  58).

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 →  165
Additional information	<i>Description</i>  The Format display parameter (→  14) is used to specify that the measured value is to be displayed as a bar graph. <i>User entry</i>  The unit of the displayed measured value is taken from the System units submenu (→  58).

Decimal places 1



Navigation	  Expert → System → Display → Decimal places 1
Prerequisite	A measured value is specified in the Value 1 display parameter (→  16).
Description	Use this function to select the number of decimal places for measured value 1.

Selection	■ X ■ X.X ■ X.XX ■ X.XXX ■ X.XXXX
Factory setting	X.XX
Additional information	<i>Description</i>  This setting does not affect the accuracy of the device for measuring or calculating the value.

Value 2 display

Navigation	 Expert → System → Display → Value 2 display
Prerequisite	A local display is provided.
Description	Use this function to select a measured value that is shown on the local display.
Selection	For the picklist, see Value 1 display parameter (→  16)
Factory setting	None
Additional information	<i>Description</i> 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. <i>Dependency</i>  The unit of the displayed measured value is taken from the System units submenu (→  58).

Decimal places 2

Navigation	 Expert → System → Display → Decimal places 2
Prerequisite	A measured value is specified in the Value 2 display parameter (→  18).
Description	Use this function to select the number of decimal places for measured value 2.
Selection	■ X ■ X.X ■ X.XX ■ X.XXX ■ X.XXXX

Factory setting x.xx

Additional information *Description*



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.

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

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

Factory setting None

Additional information *Description*

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



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 (→ 58).

0% bargraph value 3

Navigation Expert → System → Display → 0% bargraph 3

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

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

User entry Signed floating-point number

Factory setting Country-specific:
 ■ 0 m³/h
 ■ 0 ft³/h

Additional information	<i>Description</i>  The Format display parameter (→  14) is used to specify that the measured value is to be displayed as a bar graph. <i>User entry</i>  The unit of the displayed measured value is taken from the System units submenu (→  58).
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100% bargraph value 3	
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Navigation	  Expert → System → Display → 100% bargraph 3
Prerequisite	A selection was made in the Value 3 display parameter (→  19).
Description	Use this function to enter the 100% bar graph value to be shown on the display for the measured value 3.
User entry	Signed floating-point number
Factory setting	0
Additional information	<i>Description</i>  The Format display parameter (→  14) is used to specify that the measured value is to be displayed as a bar graph. <i>User entry</i>  The unit of the displayed measured value is taken from the System units submenu (→  58).

Decimal places 3	
-------------------------	---

Navigation	  Expert → System → Display → Decimal places 3
Prerequisite	A measured value is specified in the Value 3 display parameter (→  19).
Description	Use this function to select the number of decimal places for measured value 3.
Selection	■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx
Factory setting	x.xx
Additional information	<i>Description</i>  This setting does not affect the accuracy of the device for measuring or calculating the value.

Value 4 display



Navigation	Expert → System → Display → Value 4 display
Prerequisite	A local display is provided.
Description	Use this function to select a measured value that is shown on the local display.
Selection	For the picklist, see Value 1 display parameter (→ 16)
Factory setting	None
Additional information	<i>Description</i> 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. <i>Options</i> The unit of the displayed measured value is taken from the System units submenu (→ 58).

Decimal places 4



Navigation	Expert → System → Display → Decimal places 4
Prerequisite	A measured value is specified in the Value 4 display parameter (→ 21).
Description	Use this function to select the number of decimal places for measured value 4.
Selection	■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx
Factory setting	x.xx
Additional information	<i>Description</i> This setting does not affect the accuracy of the device for measuring or calculating the value.

Display interval

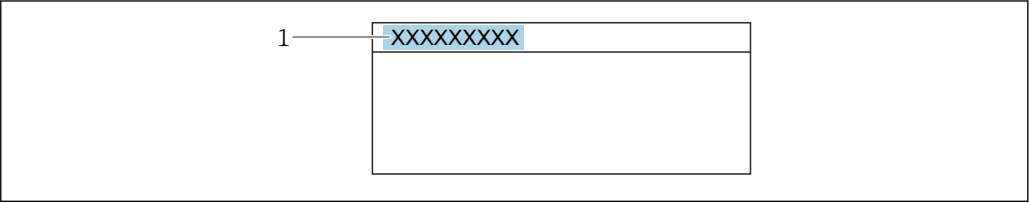
Navigation	 Expert → System → Display → Display interval
Prerequisite	A local display is provided.
Description	Use this function to enter the length of time the measured values are displayed if the values alternate on the display.
User entry	1 to 10 s
Factory setting	5 s
Additional information	<i>Description</i> This type of alternating display only occurs automatically if the number of measured values defined exceeds the number of values the selected display format can display simultaneously.  The Value 1 display parameter (→  16)...Value 4 display parameter (→  21) 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

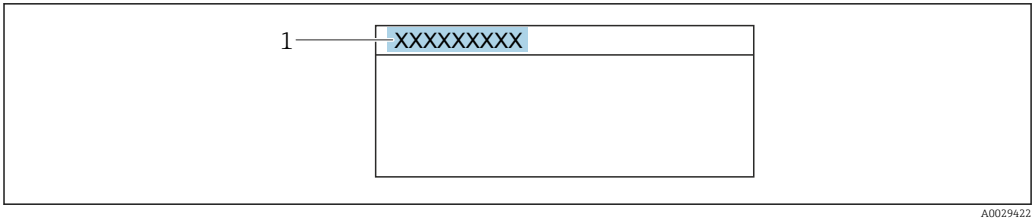


Navigation	 Expert → System → Display → Display damping
Prerequisite	A local display is provided.
Description	Use this function to enter a time constant for the reaction time of the local display to fluctuations in the measured value caused by process conditions.
User entry	0.0 to 999.9 s
Factory setting	5.0 s
Additional information	<i>User entry</i> 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	<i>Description</i> The header text only appears during normal operation.
	 A0029422
<i>1 Position of the header text on the display</i>	
<i>Selection</i> Free text Is defined in the Header text parameter (→  23).	

Header text	
Navigation	 Expert → System → Display → Header text
Prerequisite	The Free text option is selected in the Header parameter (→  23).
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	-----
<i>Description</i> The header text only appears during normal operation.	



A0029422

1 Position of the header text on the display

User entry

The number of characters displayed depends on the characters used.

Separator



Navigation	 Expert → System → Display → Separator
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
Additional information	Set the contrast via the push-buttons: ■ Brighter: Press and hold down the   keys simultaneously. ■ Darker: Press and hold down the   keys simultaneously.

Backlight	
Navigation	 Expert → System → Display → Backlight
Prerequisite	Order code for "Display; operation", option E "SD03 4-line, illum.; touch control + data backup function"
Description	Switch the local display backlight on and off.
Selection	■ Disable ■ Enable
Factory setting	Disable

3.1.2 "Diagnostic handling" submenu

Navigation  Expert → System → Diagn. handling

► Diagnostic handling

Alarm delay

→  25

► Diagnostic behavior

→  26

► Diagnostic limits

→  36

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	<i>Description</i> This setting affects the following diagnostic messages: ■ 046 Sensor limit exceeded ■ 828 Ambient temperature too low ■ 829 Ambient temperature too high ■ 832 Electronics temperature too high ■ 833 Electronics temperature too low	

- 834 Process temperature too high
- 835 Process temperature too low
- 841 Flow velocity too high
- 844 Sensor range exceeded
- 870 Measuring inaccuracy increased
- 871 Near steam saturation limit
- 872 Wet steam detected
- 945 Sensor range exceeded
- 946 Vibration detected
- 947 Vibration exceeded

"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 (→  26).

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

Options	Description
Alarm	For local display with touch control: the background lighting changes to red.
Warning	
Logbook entry only	The device continues to measure. The diagnostic message is only displayed in the Event logbook submenu (→  134) (Event list submenu) and is not displayed in alternating sequence with the operational display.
Off	The diagnostic event is ignored, and no diagnostic message is generated or entered.

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

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

► Diagnostic behavior

Assign behavior of diagnostic no. 022

→  27

Assign behavior of diagnostic no. 122

→  28

Assign behavior of diagnostic no. 350

→  28

Assign behavior of diagnostic no. 371

→  28

Assign behavior of diagnostic no. 828

→  29

Assign behavior of diagnostic no. 829

→  29

Assign behavior of diagnostic no. 832

→  30

Assign behavior of diagnostic no. 833

→  30

Assign behavior of diagnostic no. 834	→  31
Assign behavior of diagnostic no. 835	→  31
Assign behavior of diagnostic no. 841	→  31
Assign behavior of diagnostic no. 844	→  32
Assign behavior of diagnostic no. 870	→  32
Assign behavior of diagnostic no. 871	→  33
Assign behavior of diagnostic no. 872	→  33
Assign behavior of diagnostic no. 873	→  34
Assign behavior of diagnostic no. 874	→  34
Assign behavior of diagnostic no. 945	→  35
Assign behavior of diagnostic no. 947	→  35
Assign behavior of diagnostic no. 972	→  35

Assign behavior of diagnostic no. 022 (Temperature sensor defective)

Navigation	 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 022
Prerequisite	With order code for "Sensor version": "Mass (integrated temperature measurement)" option
Description	Use this function to change the diagnostic behavior of the 022 Temperature sensor defective diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Alarm
Additional information	<i>Selection</i>  For a detailed description of the options available:

Assign behavior of diagnostic no. 122 (Temperature sensor defective)



Navigation	 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 122
Prerequisite	With order code for "Sensor version": "Mass (integrated temperature measurement)" option
Description	Use this function to change the diagnostic behavior of the 122 Temperature sensor defective diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	<i>Selection</i>  For a detailed description of the options available:

Assign behavior of diagnostic no. 350 (Preamplifier defective)



Navigation	 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 350
Description	Use this function to change the diagnostic behavior of the 350 Preamplifier defective diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Alarm
Additional information	<i>Selection</i>  For a detailed description of the options available:

Assign behavior of diagnostic no. 371 (Temperature sensor defective)



Navigation	 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 371
Description	Use this function to change the diagnostic behavior of the 371 Temperature sensor defective diagnostic message.

Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	<i>Selection</i>  For a detailed description of the options available:

Assign behavior of diagnostic no. 828 (Ambient temperature too low)



Navigation	 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 828
Description	Use this function to change the diagnostic behavior of the 828 Ambient temperature too low diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	<i>Description</i> The ambient temperature of the pre-amplifier is too low. <i>Selection</i>  For a detailed description of the options available:

Assign behavior of diagnostic no. 829 (Ambient temperature too high)



Navigation	 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 829
Description	Use this function to change the diagnostic behavior of the 829 Ambient temperature too high diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning

Additional information	<i>Description</i>
	The ambient temperature of the pre-amplifier is too high.
	<i>Selection</i>
	 For a detailed description of the options available:

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



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	<i>Description</i>
	The electronics temperature of the transmitter is too high.
	<i>Selection</i>
	 For a detailed description of the options available:

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



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	<i>Description</i>
	The electronics temperature of the transmitter is too low.
	<i>Selection</i>
	 For a detailed description of the options available:

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



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	<i>Description</i> The process temperature is too high. <i>Selection</i> For a detailed description of the options available:

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



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	<i>Description</i> The process temperature is too low. <i>Selection</i> For a detailed description of the options available:

Assign behavior of diagnostic no. 841 (Flow velocity too high)



Navigation	Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 841
Description	Use this function to change the diagnostic behavior of the 841 Flow velocity too high diagnostic message.

Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	<i>Description</i> The flow velocity is too high. <i>Selection</i>  For a detailed description of the options available:

Assign behavior of diagnostic no. 844 (Sensor range exceeded)

Navigation	  Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 844
Description	Use this function to change the diagnostic behavior of the 844 Sensor range exceeded diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	<i>Description</i> The sensor range has been exceeded: "overspeeding". <i>Selection</i>  For a detailed description of the options available:

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

Navigation	  Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 870
Description	Use this function to change the diagnostic behavior of the 870 Measuring inaccuracy increased diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning

Additional information*Description*

The Reynolds number is too low.

Selection

For a detailed description of the options available:

Assign behavior of diagnostic no. 871 (Near steam saturation limit)
**Navigation**

Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 871

Prerequisite

In the **Select medium** parameter (→ 76), the **Steam** option is selected.

Description

Use this function to change the diagnostic behavior of the **871 Near steam saturation limit** diagnostic message.

Selection

- Off
- Alarm
- Warning
- Logbook entry only

Factory setting

Off

Additional information*Selection*

For a detailed description of the options available:

Assign behavior of diagnostic no. 872 (Wet steam detected)
**Navigation**

Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 872

Prerequisite

The **Wet Steam Detection** application package has been enabled.



The software options currently enabled are displayed in the **Software option overview** parameter (→ 42).

Description

Use this function to change the diagnostic behavior of the **872 Wet steam detected** diagnostic message.

Selection

- Off
- Alarm
- Warning
- Logbook entry only

Factory setting

Warning

Additional information*Selection*

For a detailed description of the options available:

Assign behavior of diagnostic no. 873 (Water detected)



Navigation	  Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 873
Prerequisite	In the Select medium parameter (→  76), the Steam option is selected.
Description	Use this function to change the diagnostic behavior of the 873 Water detected diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Off
Additional information	<i>Selection</i>  For a detailed description of the options available:

Assign behavior of diagnostic no. 874 (X% spec invalid)



Navigation	  Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 874
Prerequisite	In the Select medium parameter (→  76), the Steam option is selected.
Description	Use this function to change the diagnostic behavior of the 874 X% spec invalid diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Off
Additional information	<i>Description</i> The conditions for calculating the steam quality are not met. <i>Selection</i>  For a detailed description of the options available:

Assign behavior of diagnostic no. 945 (Sensor range exceeded)

Navigation	  Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 945
Prerequisite	With order code for "Sensor version": "Mass (integrated temperature measurement)" option
Description	Use this function to change the diagnostic behavior of the 945 Sensor range exceeded diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Warning
Additional information	<i>Description</i> The sensor range is outside the pressure-temperature curve of the measuring tube. <i>Selection</i>  For a detailed description of the options available:

Assign behavior of diagnostic no. 947 (Vibration exceeded)

Navigation	  Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 947
Description	Use this function to change the diagnostic behavior of the 947 Vibration exceeded diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Alarm
Additional information	<i>Selection</i>  For a detailed description of the options available:

Assign behavior of diagnostic no. 972 (Degrees of superheat limit exceeded)

Navigation	  Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 972
Prerequisite	If the Steam option is selected in the Select medium parameter (→  76).

Description	Use this function to change the diagnostic behavior of the 972 Degrees of superheat limit exceeded diagnostic message.
Selection	■ Off ■ Alarm ■ Warning ■ Logbook entry only
Factory setting	Off
Additional information	Description The upper limit for superheated steam was exceeded. Selection  For a detailed description of the options available:

"Diagnostic limits" submenu

Navigation  Expert → System → Diagn. handling → Diagn. limits

► Diagnostic limits

Reynolds number limit

→  36

Steam quality limit

→  37

Degrees of superheat limit

→  37

Reynolds number limit

Navigation	 Expert → System → Diagn. handling → Diagn. limits → Re number limit
Prerequisite	With order code for "Sensor version": Option "Mass (integrated temperature measurement)"
Description	Use this function to enter the lower limit value for the Reynolds number. If the Reynolds number falls short of this limit value, the 870 Measuring inaccuracy increased diagnostic message is triggered.
User entry	4 000 to 100 000
Factory setting	5 000

Additional information*Limit value*

If the Reynolds number falls short of the limit value configured here, the diagnostic behavior selected in the **Assign behavior of diagnostic no. 870** parameter (→ 32) is triggered.

Steam quality limit**Navigation**

Expert → System → Diagn. handling → Diagn. limits → SteamQualLimit

Prerequisite

The following conditions are met:

- The **Steam** option is selected in the **Select medium** parameter (→ 76) parameter.
- The **Calculated value** option is selected in the **Steam quality** parameter (→ 77) parameter.

Description

Use this function to enter the threshold value for the steam quality which, if undershot, triggers the **△S872 Wet steam detected** diagnostic message.

User entry

0 to 100 %

Factory setting

80 %

Additional information*Limit value*

This limit value has a hysteresis of 5 %, i.e. the diagnostic message is reset at a threshold value of +5 % or if 100 % is reached (at 85 % for the factory setting of 80 %).



If the steam quality has dropped below the limit value configured here, the diagnostic behavior selected in the **Assign behavior of diagnostic no. 872** parameter (0746) (→ 33) is triggered.

Degrees of superheat limit**Navigation**

Expert → System → Diagn. handling → Diagn. limits → Degr.superh.lim.

Prerequisite

In the **Select medium** parameter (→ 76), the **Steam** option is selected.

Description

Use this function to enter the threshold value for the degree of superheat which, if exceeded, triggers the **972 Degrees of superheat limit exceeded** diagnostic message.

User entry

0 to 500 K

Factory setting

5 K

Additional information

Limit value

This limit value has a hysteresis of 1 K, i.e. the diagnostic message is triggered if the threshold value +1 K is reached and is reset again when the value drops below the threshold value.

 If the degree of superheat has exceeded the limit value configured here, the diagnostic behavior selected in the **Assign behavior of diagnostic no. 972** parameter (→  35) is triggered.

3.1.3 "Administration" submenu

Navigation  Expert → System → Administration

▶ Administration

▶ Define access code

▶ Reset access code

Device reset

Activate SW option

Software option overview

Activate sensor emergency mode

→  38

→  40

→  41

→  41

→  42

→  43

"Define access code" wizard

 The **Define access code** wizard (→  38) is only available when operating via the local display.

If operating via the operating tool, the **Define access code** parameter (→  40) 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

Confirm access code

→  39

→  39

Define access code


Navigation	Expert → System → Administration → Def. access code → Def. access code
Description	Use this function to enter a user-specific release code to restrict write-access to the parameters. This protects the configuration of the device against any inadvertent changes via the local display.
User entry	0 to 9999
Factory setting	0
Additional information	<i>Description</i> The write protection affects all parameters in the document marked with the symbol. On the local display, the symbol in front of a parameter indicates that the parameter is write-protected. 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. If you lose the access code, please contact your Endress+Hauser sales organization. <i>User entry</i> A message is displayed if the access code is not in the input range. <i>Factory setting</i> If the factory setting is not changed or 0 is defined as the access code, the parameters are not write-protected and the device configuration data can be modified. The user is logged on in the "Maintenance" role.

Confirm access code


Navigation	Expert → System → Administration → Def. access code → Confirm code
Description	Enter the defined release code a second time to confirm the release code.
User entry	0 to 9999
Factory setting	0

"Define access code" wizard

Navigation  Expert → System → Administration → Reset acc. code

▶ Reset access code

Reset access code

→  40

Reset access code

Navigation	 Expert → System → Administration → Reset acc. code → Reset acc. code
Description	Enter the code provided by Endress+Hauser Technical Support to reset the Maintenance code.
User entry	Character string comprising numbers, letters and special characters (32)
Factory setting	0x00

Additional parameters in the "Administration" submenu

Define access code



Navigation	 Expert → System → Administration → Def. access code
Description	Use this function to enter a user-specific release code to restrict write-access to the parameters. This protects the configuration of the device against any inadvertent changes via the operating tool.
User entry	0 to 9 999
Factory setting	0

Additional information*Description*

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



Once the access code has been defined, write-protected parameters can only be modified if the access code is entered in the **Enter access code** parameter.



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

User entry

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

Factory setting

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

Device reset**Navigation**

Expert → System → Administration → Device reset

Description

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

Selection

- Cancel
- To delivery settings
- Restart device

Factory setting

Cancel

Additional information*Selection*

Options	Description
Cancel	No action is executed and the user exits the parameter.
To factory defaults	Every parameter is reset to the factory setting.
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.  This option is not visible if no customer-specific settings have been ordered.
Restart device	The restart resets every parameter with data stored in volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.

Activate SW option**Navigation**

Expert → System → Administration → Activate SW opt.

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	<i>Description</i> If a measuring device was ordered with an additional software option, the activation code is programmed in the device at the factory. The activation code is documented in the parameter protocol supplied.  To activate a software option subsequently, please contact your Endress+Hauser sales organization. <i>Entering the activation code</i>  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 from the parameter protocol. ▶ Enter the new activation code provided by Endress+Hauser when the new software option was ordered. ▶ Once the activation code has been entered, check if the new software option is displayed in the Software option overview parameter (→  42). ↳ The new software option is active if it is displayed. ↳ If the new software option is not displayed or all software options have been deleted, the code entered was either incorrect or invalid. ▶ If the code entered is incorrect or invalid, enter the old activation code from the parameter protocol. ▶ Have your Endress+Hauser sales organization check the new activation code remembering to specify the serial number or ask for the code again. <i>Example for a software option</i> Order code for "Application package", option EA "Extended HistoROM"  The software options currently enabled are displayed in the Software option overview parameter (→  42).

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	<i>Description</i> Displays all the options that are available if ordered by the customer. <i>"Extended HistoROM" option</i> Order code for "Application package", option EA "Extended HistoROM" <i>"Mass flow" option, "Natural gas" option, "Air + industrial gas" option</i> Order code for "Sensor version": "Mass (integrated temperature measurement)" option <i>"Wet steam detection" option</i>  Only available for Prowirl F. Order code for "Application package", option ES "Wet steam detection" <i>"Heartbeat Verification" option</i> Order code for "Application package", option EB "Heartbeat Verification"
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Activate sensor emergency mode



Navigation	 Expert → System → Administration → Sens. emerg.mode
Prerequisite	The device has identified an error during verification of the characteristics in the sensor data storage or electronics module. A diagnostic message of status type ⊗F is output.
Description	Use this function to switch on the emergency mode of the sensor to use the backup of the sensor characteristics or main electronics characteristics stored in the HistoROM.
Selection	■ Cancel ■ Ok
Factory setting	Cancel
Additional information	<i>Description</i>  This parameter becomes visible if the data in the S-DAT or on-board memory cannot be read on account of a defect or error. There is a copy of the data on the HistoROM (FT10). If the emergency mode is activated, this copy is used and the device measure correctly again at least up until the next device switch-off/switch-on. After switch-on/switch-off, the emergency mode would have to be reactivated again. This ensures that the client can operate the device until a new spare part arrives. The status signal of the output diagnostic message changes from F (failure) to M (maintenance required), the diagnostic behavior changes from Alarm to Warning: △M. The diagnostic message is output until the characteristics in the sensor data storage are again correct.  Information on what is causing the diagnostic message, and remedy measures, can be viewed by pressing the -button.  Information on status signals and diagnostic behavior: Operating Instructions about the device, "Diagnostic message" chapter

3.2 "Sensor" submenu

Navigation  Expert → Sensor

► Sensor		
► Measured values	→ 	44
► System units	→ 	58
► Process parameters	→ 	72
► Measurement mode	→ 	76
► External compensation	→ 	103
► Sensor adjustment	→ 	107
► Calibration	→ 	114

3.2.1 "Measured values" submenu

Navigation  Expert → Sensor → Measured val.

► Measured values		
► Process variables	→ 	44
► Totalizer	→ 	56

"Process variables" submenu

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

► Process variables		
Volume flow	→ 	45
Corrected volume flow	→ 	46
Mass flow	→ 	46
Flow velocity	→ 	46
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Vortex kurtosis	→  50
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Steam quality	→  51
Total mass flow	→  52
Condensate mass flow	→  52
Energy flow	→  52
Heat flow difference	→  52
Reynolds number	→  53
Density	→  53
Specific volume	→  53
Pressure	→  54
Saturation temperature	→  54
Degrees of superheat	→  55
Compressibility factor	→  55

Volume flow

Navigation	  Expert → Sensor → Measured val. → Process variab. → Volume flow
Description	Use this function to view the volume flow currently measured.
User interface	Signed floating-point number
Additional information	<i>Description</i> The volume flow is calculated from the measured mass flow and the measured density. <i>Dependency</i>  The unit is taken from the Volume flow unit parameter (→  59)

Corrected volume flow

Navigation	  Expert → Sensor → Measured val. → Process variab. → CorrecVolumeFlow
Description	Use this function to view the corrected volume flow currently calculated.
User interface	Signed floating-point number
Additional information	<i>Description</i> The corrected volume flow is derived from the measured mass flow and the reference density of the fluid (density at reference temperature, measured or fixed entry). <i>Dependency</i>  The unit is taken from the Corrected volume flow unit parameter (→  63)

Mass flow

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

Flow velocity

Navigation	  Expert → Sensor → Measured val. → Process variab. → Flow velocity
Description	Shows the flow velocity currently calculated.
User interface	Signed floating-point number
Factory setting	1 m/s

Temperature

Navigation	  Expert → Sensor → Measured val. → Process variab. → Temperature
Description	Use this function to view the temperature currently measured.
User interface	Signed floating-point number

Additional information*Dependency*The unit is taken from the **Temperature unit** parameter (→ 65)**Vortex frequency****Navigation**

Expert → Sensor → Measured val. → Process variab. → Vortex frequency

Description

Displays the measured variable for the flow in the measuring tube which is recorded directly with the DSC sensor.

User interface**Measuring range depending on the nominal diameter:**
0.1 to 3 100 Hz**Additional information***Description*

The filter settings specify the measuring range of the vortex frequency depending on the nominal diameter.

*Filter settings for liquids**Prowirl D*

Nominal diameter	Minimum vortex frequency	Maximum vortex frequency
	$f_{vmin}^{1)}$ [Hz]	f_{vmax} [Hz]
DN 15 (½")	11.5	666.5
DN 25 (1")	6.7	388.8
DN 40 (1½")	3.9	224.3
DN 50 (2")	3.0	172.8
DN 80 (3")	2.1	122.8
DN 100 (4")	1.7	101.4
DN 150 (6")	1.1	66.6

1) For factory setting **Turndown** parameter (7755) (→ 74)*Prowirl F*

Nominal diameter	Minimum vortex frequency	Maximum vortex frequency
	$f_{vmin}^{1)}$ [Hz]	f_{vmax} [Hz]
DN 15 (½")	8.9	570
DN 25 (1")	5.1	330
DN 40 (1½")	3.2	210
DN 50 (2")	2.5	160
DN 80 (3")	1.7	110
DN 100 (4")	1.3	82
DN 150 (6")	0.84	54
DN 200 (8")	0.64	41

Nominal diameter	Minimum vortex frequency	Maximum vortex frequency
	$f_{vmin}^{1)}$ [Hz]	f_{vmax} [Hz]
DN 250 (10")	0.51	33
DN 300 (12")	0.43	27

1) For factory setting **Turndown** parameter (7755) (→ 74)

Prowirl O

Nominal diameter	Minimum vortex frequency	Maximum vortex frequency
	$f_{vmin}^{1)}$ [Hz]	f_{vmax} [Hz]
DN 15 (½")	12.0	570
DN 25 (1")	6.9	330
DN 40 (1½")	4.9	230
DN 50 (2")	3.9	180
DN 80 (3")	2.5	119
DN 100 (4")	1.9	91
DN 150 (6")	1.3	60
DN 200 (8")	0.92	43
DN 250 (10")	0.73	34
DN 300 (12")	0.61	29

1) For factory setting **Turndown** parameter (7755) (→ 74)

Prowirl R

Nominal diameter	Minimum vortex frequency	Maximum vortex frequency
	$f_{vmin}^{1)}$ [Hz]	f_{vmax} [Hz]
DN 25 (1") > DN 15 (½") DN 40 (1½") >> DN 15 (½")	12.0	570
DN 40 (1½") > DN 25 (1") DN 50 (2") >> DN 25 (1")	6.9	330
DN 50 (2") > DN 40 (1½") DN 80 (3") >> DN 40 (1½")	4.4	210
DN 80 (3") > DN 50 (2") DN 100 (4") >> DN 50 (2")	3.4	160
DN 100 (4") > DN 80 (3") DN 150 (6") >> DN 80 (3")	2.3	110

Nominal diameter	Minimum vortex frequency	Maximum vortex frequency
	$f_{vmin}^{1)}$ [Hz]	f_{vmax} [Hz]
DN 150 (6") > DN 100 (4") DN 200 (8") >> DN 100 (4")	1.7	82
DN 200 (8") > DN 150 (6") DN 250 (10") >> DN 150 (6")	1.1	54

1) For factory setting **Turndown** parameter (7755) (→ 74)

Filter settings for gases/steam

Prowirl D

DN [mm (in)]	Minimum vortex frequency	Maximum vortex frequency
	$f_{vmin}^{1)}$ [Hz]	f_{vmax} [Hz]
DN 15 (½")	209.9	3 100
DN 25 (1")	67.1	3 100
DN 40 (1½")	13.7	1869.1
DN 50 (2")	10.5	2 303.8
DN 80 (3")	7.5	1 636.9
DN 100 (4")	6.2	1 352.3
DN 150 (6")	4.1	888.6

1) For factory setting **Turndown** parameter (7755) (→ 74)

Prowirl F

DN [mm (in)]	Minimum vortex frequency	Maximum vortex frequency
	$f_{vmin}^{1)}$ [Hz]	f_{vmax} [Hz]
DN 15 (½")	45	2 900
DN 25 (1")	26	2 700
DN 40 (1½")	16	1 700
DN 50 (2")	13	2 100
DN 80 (3")	8.5	1 400
DN 100 (4")	6.4	1 100
DN 150 (6")	4.3	720
DN 200 (8")	3.2	540
DN 250 (10")	2.6	430
DN 300 (12")	2.2	370

1) For factory setting **Turndown** parameter (7755) (→ 74)

Prowirl O

DN [mm (in)]	Minimum vortex frequency	Maximum vortex frequency
	$f_{vmin}^{1)}$ [Hz]	f_{vmax} [Hz]
DN 15 (½")	60	2 900
DN 25 (1")	34	2 700
DN 40 (1½")	25	1 900
DN 50 (2")	19	2 500
DN 80 (3")	13	1 600
DN 100 (4")	9.6	1 200
DN 150 (6")	6.3	800
DN 200 (8")	4.6	580
DN 250 (10")	3.6	460
DN 300 (12")	3.1	390

1) For factory setting **Turndown** parameter (7755) (→  74)

Prowirl R

DN [mm (in)]	Minimum vortex frequency	Maximum vortex frequency
	$f_{vmin}^{1)}$ [Hz]	f_{vmax} [Hz]
DN 25 (1") > DN 15 (½") DN 40 (1½") >> DN 15 (½")	60	2 900
DN 40 (1½") > DN 25 (1") DN 50 (2") >> DN 25 (1")	34	2 700
DN 50 (2") > DN 40 (1½") DN 80 (3") >> DN 40 (1½")	22	1 700
DN 80 (3") > DN 50 (2") DN 100 (4") >> DN 50 (2")	17	2 100
DN 100 (4") > DN 80 (3") DN 150 (6") >> DN 80 (3")	11	1 400
DN 150 (6") > DN 100 (4") DN 200 (8") >> DN 100 (4")	8.6	1 100
DN 200 (8") > DN 150 (6") DN 250 (10") >> DN 150 (6")	5.7	720

1) For factory setting **Turndown** parameter (7755) (→  74)

Vortex kurtosis**Navigation**

  Expert → Sensor → Measured val. → Process variab. → Vortex kurtosis

Description

Displays the statistical variable kurtosis for appraising the signal quality (without a unit).

User interface

0 to 10

Additional information	<i>Description</i> This parameter is used in the Wet steam detection/measurement application package for calculating the steam quality. In single-phase and two-phase media, the kurtosis values can only reasonably be in the range from 1.5 to 3. Values outside the range indicate unstable flow. The values 0 or 8 indicate that it is not possible to calculate the kurtosis value.
Vortex amplitude	
Navigation	 Expert → Sensor → Measured val. → Process variab. → Vortex amplitude
Description	Displays the average vortex amplitude (without a unit).
User interface	0 to 1
Additional information	<i>Description</i> The vortex amplitude is used by the system for flow detection/measurement. If there is no flow, the amplitude should be 0 or even slightly negative. If an amplitude > 0 is displayed and a frequency simultaneously measured even though there is no flow, this is an indication of vibration problems.  ▪ Limit values depend on the medium, nominal diameter and flow velocity ▪ Definition of a limit value not possible ▪ Considered based on the individual application
Calculated saturated steam pressure	
Navigation	 Expert → Sensor → Measured val. → Process variab. → CalcSatSteamPres
Description	Shows the saturated steam pressure currently calculated.
User interface	Signed floating-point number
Factory setting	1E-05 bar
Steam quality	
Navigation	 Expert → Sensor → Measured val. → Process variab. → Steam quality
Description	Shows the current steam quality.
User interface	Signed floating-point number
Factory setting	1 %

Total mass flow

Navigation	 Expert → Sensor → Measured val. → Process variab. → Total mass flow
Description	Shows the total mass flow (steam and condensate) currently calculated.
User interface	Signed floating-point number
Factory setting	3 599.99999999971 kg/h

Condensate mass flow

Navigation	 Expert → Sensor → Measured val. → Process variab. → CondensMassFlow
Description	Shows the condensate mass flow currently calculated.
User interface	Signed floating-point number
Factory setting	3 599.99999999971 kg/h

Energy flow

Navigation	 Expert → Sensor → Measured val. → Process variab. → Energy flow
Description	Shows the energy flow currently calculated.
User interface	Signed floating-point number
Factory setting	0.001 kW

Heat flow difference

Navigation	 Expert → Sensor → Measured val. → Process variab. → Heat flow diff.
Description	Shows the heat flow difference currently calculated.
User interface	Signed floating-point number
Factory setting	0.001 kW

Reynolds number

Navigation	 Expert → Sensor → Measured val. → Process variab. → Reynolds number
Description	Shows the Reynolds number currently calculated.
User interface	Signed floating-point number
Factory setting	1

Density

Navigation	 Expert → Sensor → Measured val. → Process variab. → Density
Prerequisite	With order code for "Sensor version": Option "Mass (integrated temperature measurement)"
Description	Displays the density currently calculated.
User interface	Positive floating-point number
Additional information	<i>Description</i> Depending on the selected medium the density is calculated with pressure and temperature and the corresponding method (e.g. IAPWS, NEL40...). <i>Dependency</i>  The unit is taken from the Density unit parameter (→  69)

Specific volume

Navigation	 Expert → Sensor → Measured val. → Process variab. → Specific volume
Prerequisite	With order code for "Sensor version": Option "Mass (integrated temperature measurement)"
Description	Displays the current value for the specific volume.
User interface	Positive floating-point number
Additional information	<i>Description</i> The specific volume is a process variable that is common in steam applications.  For the calculation: reciprocal value of the density (Density parameter (→  53)) <i>Dependency</i>  The unit is taken from the Specific volume unit parameter (→  69).

Pressure

Navigation	 Expert → Sensor → Measured val. → Process variab. → Pressure
Prerequisite	One of the following conditions is met: ▪ Order code for "Sensor version", ▪ Option "Mass (integrated temperature measurement)" ▪ or ▪ The Pressure option is selected in the External value parameter (→  104) parameter.
Description	Displays the current process pressure.
User interface	0 to 250 bar
Additional information	<i>Description</i> The value of the pressure which is read in (e.g. via the current input module) is displayed. If the Pressure option is not selected as the external value in the External value parameter (→  104), the input value for the fixed process pressure (Fixed process pressure parameter (→  107)) is displayed. <i>Dependency</i>  The unit is taken from the Pressure unit parameter (→  64)

Saturation temperature

Navigation	 Expert → Sensor → Measured val. → Process variab. → Saturation temp.
Prerequisite	The Steam option is selected in the Select medium parameter (→  76) parameter.
Description	Displays the saturation temperature currently calculated.
User interface	Country-specific: ▪ °C ▪ °F
Additional information	The saturation temperature describes the temperature limit at which steam begins to condense. This value is calculated using the current process pressure (Pressure parameter (→  54)) according to IAPWS-IF97. <i>Dependency</i>  The unit is taken from the Temperature unit parameter (→  65)

Degrees of superheat

Navigation	  Expert → Sensor → Measured val. → Process variab. → Degree superheat
Prerequisite	In the Select medium parameter (→  76), the Steam option is selected.
Description	Displays the degree of superheating currently calculated.
User interface	0 to 500 K
Additional information	<i>Description</i> The degree of superheating describes the difference between the temperature (Temperature parameter) and the saturation temperature (Saturation temperature parameter (→  54)). If the temperature is below the current saturation temperature, the degree of superheating has the value 0.

Compressibility factor

Navigation	  Expert → Sensor → Measured val. → Process variab. → CompressFactor
Prerequisite	The following conditions are met: Order code for "Sensor version" Option "Mass (integrated temperature measurement)" The Gas option or the Steam option is selected in the Select medium parameter (→  76).
Description	Displays the compressibility factor currently calculated.
User interface	0 to 2
Additional information	<i>Description</i> The compressibility factor describes the deviation of the medium from the ideal behavior under the current process conditions. If the medium is a user-specific gas/liquid, the compressibility factor is entered as the Z-factor (Z-factor parameter (→  86)).

Enthalpy

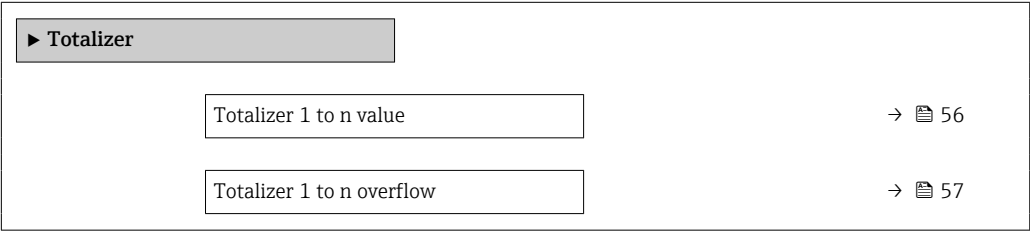
Navigation	  Expert → Sensor → Measured val. → Process variab. → Enthalpy
Prerequisite	With order code for "Sensor version": ■ Option "Mass (integrated temperature measurement)" - or ■ Option "Mass (integrated pressure/temperature measurement)"
Description	Displays the enthalpy.

User interface

The unit is taken from the **Specific enthalpy unit** parameter.

"Totalizer" submenu

Navigation  Expert → Sensor → Measured val. → Totalizer



Totalizer 1 to n value

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

Prerequisite

One of the following options is selected in the **Assign process variable** parameter (→  126) of the **Totalizer 1 to n** submenu:

- Volume flow
- Corrected volume flow
- Mass flow
- Total mass flow *
- Condensate mass flow *
- Energy flow *
- Heat flow difference *

Description

Displays the current totalizer reading.

User interface

Signed floating-point number

* Visibility depends on order options or device settings

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*Example*

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

- Value in the **Totalizer value 1** parameter: 1 968 457 m³
- Value in the **Totalizer overflow 1** parameter: $1 \cdot 10^7$ (1 overflow) = 10 000 000 m³
- Current totalizer value: 11 968 457 m³

Totalizer 1 to n overflow**Navigation**

Expert → Sensor → Measured val. → Totalizer → Tot. 1 to n overflow

Prerequisite

One of the following options is selected in the **Assign process variable** parameter (→ 126) of the **Totalizer 1 to n** submenu:

- Volume flow
- Corrected volume flow
- Mass flow
- Total mass flow *
- Condensate mass flow *
- Energy flow *
- Heat flow difference *

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.

* Visibility depends on order options or device settings

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



Example

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

- Value in the **Totalizer value 1** parameter: 1 968 457 m³
- Value in the **Totalizer overflow 1** parameter: $2 \cdot 10^7$ (2 overflows) = 20 000 000 [m³]
- Current totalizer value: 21 968 457 m³

3.2.2 "System units" submenu

Navigation Expert → Sensor → System units

► System units

Volume flow unit	→ 59
Volume unit	→ 61
Mass flow unit	→ 61
Mass unit	→ 62
Corrected volume flow unit	→ 63
Corrected volume unit	→ 63
Pressure unit	→ 64
Temperature unit	→ 65
Energy flow unit	→ 65
Energy unit	→ 66
Calorific value unit	→ 67
Calorific value unit	→ 68
Velocity unit	→ 68
Density unit	→ 69

Specific volume unit	→  69
Dynamic viscosity unit	→  70
Specific heat capacity unit	→  70
Length unit	→  71
Date/time format	→  71

Volume flow unit



Navigation   Expert → Sensor → System units → Volume flow unit

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

Selection*SI units*

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

US units

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

Imperial units

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

Factory setting

Country-specific:

- m³/h
- ft³/min

Additional information	Effect
	The selected unit applies to: Volume flow parameter
	Options

 For an explanation of the abbreviated units: →  169

Volume unit

Navigation  Expert → Sensor → System units → Volume unit

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

Selection	SI units	US units	Imperial units
	■ ml ■ l ■ hl ■ Ml Mega ■ cm³ ■ dm³ ■ m³	■ af ■ ft³ ■ Mft³ ■ Mft³ ■ fl oz (us) ■ gal (us) ■ kgal (us) ■ Mgal (us) ■ bbl (us;oil) ■ bbl (us;liq.) ■ bbl (us;beer) ■ bbl (us;tank)	■ gal (imp) ■ Mgal (imp) ■ bbl (imp;beer) ■ bbl (imp;oil)

Factory setting Country-specific:

- m³
- ft³

Additional information	Options
	 For an explanation of the abbreviated units: →  169

Mass flow unit

Navigation  Expert → Sensor → System units → Mass flow unit

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

Selection	<i>SI units</i>	<i>US units</i>
	■ g/s	■ oz/s
	■ g/min	■ oz/min
	■ g/h	■ oz/h
	■ g/d	■ oz/d
	■ kg/s	■ lb/s
	■ kg/min	■ lb/min
	■ kg/h	■ lb/h
	■ kg/d	■ lb/d
	■ t/s	■ STon/s
	■ t/min	■ STon/min
	■ t/h	■ STon/h
	■ t/d	■ STon/d
Factory setting	Country-specific:	
	■ kg/h	
	■ lb/min	
Additional information	<i>Effect</i>	
	The selected unit applies to:	
	■ Mass flow parameter	
	■ Total mass flow parameter	
	■ Condensate mass flow parameter	
	<i>Options</i>	
	 For an explanation of the abbreviated units: →  169	

Mass unit

Navigation	 Expert → Sensor → System units → Mass unit	
Description	Use this function to select the unit for the mass.	
Selection	<i>SI units</i>	<i>US units</i>
	■ g ■ kg ■ t	■ oz ■ lb ■ STon
Factory setting	Country-specific: ■ kg ■ lb	
Additional information	<i>Options</i>  For an explanation of the abbreviated units: →  169	

Corrected volume flow unit 																																											
Navigation	  Expert → Sensor → System units → Cor.volflow unit																																										
Description	Use this function to select the unit for the corrected volume flow.																																										
Selection	<table> <thead> <tr> <th><i>SI units</i></th><th><i>US units</i></th></tr> </thead> <tbody> <tr><td>■ NI/s</td><td>■ Sft³/s</td></tr> <tr><td>■ NI/min</td><td>■ Sft³/min</td></tr> <tr><td>■ NI/h</td><td>■ Sft³/h</td></tr> <tr><td>■ NI/d</td><td>■ Sft³/d</td></tr> <tr><td>■ Nhl/s</td><td>■ MSft³/s</td></tr> <tr><td>■ Nhl/min</td><td>■ MSft³/min</td></tr> <tr><td>■ Nhl/h</td><td>■ MSft³/h</td></tr> <tr><td>■ Nhl/d</td><td>■ MSft³/D</td></tr> <tr><td>■ Nm³/s</td><td>■ MMSft³/s</td></tr> <tr><td>■ Nm³/min</td><td>■ MMSft³/min</td></tr> <tr><td>■ Nm³/h</td><td>■ MMSft³/h</td></tr> <tr><td>■ Nm³/d</td><td>■ MMSft³/d</td></tr> <tr><td>■ SI/s</td><td>■ Sbbbl/s (us;oil)</td></tr> <tr><td>■ SI/min</td><td>■ Sbbbl/min (us;oil)</td></tr> <tr><td>■ SI/h</td><td>■ Sbbbl/h (us;oil)</td></tr> <tr><td>■ SI/d</td><td>■ Sbbbl/d (us;oil)</td></tr> <tr><td>■ Sm³/s</td><td></td></tr> <tr><td>■ Sm³/min</td><td></td></tr> <tr><td>■ Sm³/h</td><td></td></tr> <tr><td>■ Sm³/d</td><td></td></tr> </tbody> </table>	<i>SI units</i>	<i>US units</i>	■ NI/s	■ Sft ³ /s	■ NI/min	■ Sft ³ /min	■ NI/h	■ Sft ³ /h	■ NI/d	■ Sft ³ /d	■ Nhl/s	■ MSft ³ /s	■ Nhl/min	■ MSft ³ /min	■ Nhl/h	■ MSft ³ /h	■ Nhl/d	■ MSft ³ /D	■ Nm ³ /s	■ MMSft ³ /s	■ Nm ³ /min	■ MMSft ³ /min	■ Nm ³ /h	■ MMSft ³ /h	■ Nm ³ /d	■ MMSft ³ /d	■ SI/s	■ Sbbbl/s (us;oil)	■ SI/min	■ Sbbbl/min (us;oil)	■ SI/h	■ Sbbbl/h (us;oil)	■ SI/d	■ Sbbbl/d (us;oil)	■ Sm ³ /s		■ Sm ³ /min		■ Sm ³ /h		■ Sm ³ /d	
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■ Sm ³ /min																																											
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■ Sm ³ /d																																											
Factory setting	Country-specific: ■ Nm ³ /h ■ Sft ³ /h																																										
Additional information	<i>Effect</i> The selected unit applies to: Corrected volume flow parameter <i>Options</i>  For an explanation of the abbreviated units: →  169																																										

Corrected volume unit 													
Navigation	  Expert → Sensor → System units → Corr. vol. unit												
Description	Use this function to select the unit for the corrected volume.												
Selection	<table> <thead> <tr> <th><i>SI units</i></th><th><i>US units</i></th></tr> </thead> <tbody> <tr><td>■ NI</td><td>■ Sft³</td></tr> <tr><td>■ Nhl</td><td>■ MSft³</td></tr> <tr><td>■ Nm³</td><td>■ MMSft³</td></tr> <tr><td>■ SI</td><td>■ Sbbbl (us;oil)</td></tr> <tr><td>■ Sm³</td><td></td></tr> </tbody> </table>	<i>SI units</i>	<i>US units</i>	■ NI	■ Sft ³	■ Nhl	■ MSft ³	■ Nm ³	■ MMSft ³	■ SI	■ Sbbbl (us;oil)	■ Sm ³	
<i>SI units</i>	<i>US units</i>												
■ NI	■ Sft ³												
■ Nhl	■ MSft ³												
■ Nm ³	■ MMSft ³												
■ SI	■ Sbbbl (us;oil)												
■ Sm ³													

Factory setting	Country-specific: ■ Nm³ ■ Sft³
Additional information	<i>Options</i>  For an explanation of the abbreviated units: →  169

Pressure unit

Navigation	  Expert → Sensor → System units → Pressure unit		
Prerequisite	With order code for "Sensor version": "Mass (integrated temperature measurement)" option		
Description	Use this function to select the unit for the pipe pressure.		
Selection	<i>SI units</i> ■ MPa ■ kPa ■ Pa ■ bar ■ mbar a ■ torr ■ atm ■ kgf/cm² ■ gf/cm²	<i>US units</i> psi	<i>Other units</i> ■ inH2O (4°C) ■ inH2O (68°F) ■ mmH2O (4°C) ■ mmH2O (68°F) ■ ftH2O (68°F) ■ inHg (0°C) ■ mmHg (0°C)
Factory setting	Country-specific: ■ bar ■ psi		
Additional information	<i>Effect</i> The unit is taken from: ■ Calculated saturated steam pressure parameter ■ Atmospheric pressure parameter (→  104) ■ Maximum value parameter (→  151) ■ Fixed process pressure parameter (→  107) ■ Pressure parameter (→  54) ■ Reference pressure parameter (→  83) <i>Options</i>  For an explanation of the abbreviated units: →  169		

Temperature unit

Navigation	  Expert → Sensor → System units → Temperature unit
Description	Use this function to select the unit for the temperature.
Selection	<i>SI units</i> ■ °C ■ K <i>US units</i> ■ °F ■ °R
Factory setting	Country-specific: ■ °C ■ °F
Additional information	<i>Effect</i> The selected unit applies to: ■ Temperature parameter ■ Maximum value parameter ■ Minimum value parameter ■ Average value parameter ■ Maximum value parameter (→  150) ■ Minimum value parameter (→  149) ■ Maximum value parameter (→  150) ■ Minimum value parameter (→  150) ■ 2nd temperature delta heat parameter (→  106) ■ Fixed temperature parameter (→  106) ■ Reference combustion temperature parameter (→  82) ■ Reference temperature parameter (→  83) ■ Saturation temperature parameter (→  54) <i>Options</i>  For an explanation of the abbreviated units: →  169

Energy flow unit

Navigation	  Expert → Sensor → System units → Energy flow unit
Prerequisite	With order code for "Sensor version": "Mass (integrated temperature measurement)" option
Description	Use this function to select the unit for the energy flow.

Selection	<i>SI units</i>	<i>Imperial units</i>
	■ kW ■ MW ■ GW ■ kJ/s ■ kJ/min ■ kJ/h ■ kJ/d ■ MJ/s ■ MJ/h ■ MJ/min ■ MJ/d ■ GJ/s ■ GJ/min ■ GJ/h ■ GJ/d ■ kcal/s ■ kcal/min ■ kcal/h ■ kcal/d ■ Mcal/s ■ Mcal/min ■ Mcal/h ■ Mcal/d ■ Gcal/s ■ Gcal/min ■ Gcal/h ■ Gcal/d	■ Btu/s ■ Btu/min ■ Btu/h ■ Btu/day ■ MBtu/s ■ MBtu/min ■ MBtu/h ■ MBtu/d ■ MMBtu/s ■ MMBtu/min ■ MMBtu/h ■ MMBtu/d
Factory setting	Depends on country: ■ kW ■ Btu/h	
Additional information	<i>Result</i>	
	The selected unit applies to: ■ Heat flow difference parameter ■ Energy flow parameter	
	<i>Selection</i>	
	 For an explanation of the abbreviated units: →  169	

Energy unit

Navigation	  Expert → Sensor → System units → Energy unit
Prerequisite	With order code for "Sensor version": "Mass (integrated temperature measurement)" option
Description	Use this function to select the unit for energy.

Selection	<i>SI units</i>	<i>Imperial units</i>
	■ kWh ■ MWh ■ GWh ■ kJ ■ MJ ■ GJ ■ kcal ■ Mcal ■ Gcal	■ Btu ■ MBtu ■ MMBtu
Factory setting	Depends on country: ■ kWh ■ Btu	
Additional information	<i>Selection</i>  For an explanation of the abbreviated units: →  169	

Calorific value unit



Navigation	 Expert → Sensor → System units → Cal. value unit	
Prerequisite	The following conditions are met: ■ Order code for "Sensor version", "Mass (integrated temperature measurement)" option ■ The Gross calorific value volume option or Net calorific value volume option is selected in the Calorific value type parameter (→  81).	
Description	Use this function to select the unit for the calorific value.	
Selection	<i>SI units</i>	<i>Imperial units</i>
	■ kJ/Nm³ ■ MJ/Nm³ ■ kWh/Nm³ ■ MWh/Sm³ ■ kJ/Sm³ ■ MJ/Sm³ ■ kWh/Sm³ ■ MWh/Nm³	■ Btu/Sm³ ■ MBtu/Sm³ ■ Btu/Sft³ ■ MBtu/Sft³
Factory setting	Depends on country: ■ kJ/Nm³ ■ Btu/Sft³	
Additional information	<i>Result</i>	
	The selected unit applies to: Reference gross calorific value parameter (→  82)	
	<i>Selection</i>  For an explanation of the abbreviated units: →  169	

Calorific value unit (Mass)
**Navigation**

Expert → Sensor → System units → Cal. value unit

Prerequisite

The following conditions are met:

- Order code for "Sensor version",
"Mass (integrated temperature measurement)" option
- The **Gross calorific value mass** option or **Net calorific value mass** option is selected in the **Calorific value type** parameter (→ 81).

Description

Use this function to select the unit for the calorific value (mass).

Selection

SI units

- kJ/kg
- MJ/kg
- kWh/kg
- MWh/kg

US units

- kJ/lb
- MJ/lb
- kWh/lb
- MWh/lb

Imperial units

- Btu/lb
- MBtu/lb

Factory setting

Depends on country:

- kJ/kg
- Btu/lb

Additional information

Selection

For an explanation of the abbreviated units: → 169

Velocity unit
**Navigation**

Expert → Sensor → System units → Velocity unit

Description

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

Selection

SI units

m/s

US units

ft/s

Factory setting

Depends on country:

- m/s
- ft/s

Additional information

Result

The selected unit applies to:

- **Flow velocity** parameter
- **Maximum value** parameter (→ 151)

Selection

For an explanation of the abbreviated units: → 169

Density unit		
Navigation	  Expert → Sensor → System units → Density unit	
Description	Use this function to select the unit for the density.	
Selection	<i>SI units</i> ■ g/cm³ ■ kg/l ■ kg/dm³ ■ kg/m³ ■ SG4°C ■ SG15°C ■ SG20°C <i>US units</i> ■ lb/ft³ ■ lb/gal (us) ■ lb/bbl (us;liq.) ■ lb/bbl (us;beer) ■ lb/bbl (us;oil) ■ lb/bbl (us;tank) <i>Imperial units</i> ■ lb/gal (imp) ■ lb/bbl (imp;beer) ■ lb/bbl (imp;oil)	
Factory setting	Country-specific: ■ kg/m³ ■ lb/ft³	
Additional information	<i>Effect</i> The selected unit applies to: ■ Density parameter (→  53) ■ Fixed density parameter (→  105) ■ Reference density parameter (→  82) <i>Options</i> ■ SD = specific density The specific density is the ratio of the medium density to the water density at a water temperature of +4 °C (+39 °F), +15 °C (+59 °F), +20 °C (+68 °F). ■ SG = specific gravity The specific gravity is the ratio of the medium density to the water density at a water temperature of +4 °C (+39 °F), +15 °C (+59 °F), +20 °C (+68 °F).  For an explanation of the abbreviated units: →  169	
Specific volume unit		

Additional information	<i>Result</i> The selected unit applies to: Specific volume parameter (→  53)
Additional information	<i>Selection</i>  For an explanation of the abbreviated units: →  169

Dynamic viscosity unit

Navigation	  Expert → Sensor → System units → Dyn. visc. unit
Description	Use this function to select the unit for dynamic viscosity.
Selection	<i>SI units</i> ■ cP ■ Pa s ■ P
Factory setting	Pa s
Additional information	<i>Result</i> The selected unit applies to: ■ Dynamic viscosity parameter (→  87) (gases) ■ Dynamic viscosity parameter (→  87) (liquids)
Additional information	<i>Selection</i>  For an explanation of the abbreviated units: →  169

Specific heat capacity unit

Navigation	  Expert → Sensor → System units → SpecHeatCapaUnit
Prerequisite	The following conditions are met: ■ Selected medium: ■ The User-specific gas option is selected in the Select gas type parameter (→  78). - Or ■ The User-specific liquid option is selected in the Liquid type parameter (→  79). ■ The Heat option is selected in the Enthalpy type parameter (→  81).
Description	Use this function to select the unit for the specific heat capacity.
Selection	<i>SI units</i> ■ kJ/(kgK) ■ MJ/(kgK) ■ kWh/(kgK) ■ kcal/(kgK) <i>Imperial units</i> Btu/(lb°R)

Factory setting kJ/(kgK)

Additional information *Result*

The selected unit applies to:

Specific heat capacity parameter (→  85)

Selection

 For an explanation of the abbreviated units: →  169

Length unit

Navigation   Expert → Sensor → System units → Length unit

Description Select length unit for nominal diameter.

Selection ■ m
 ■ mm
 ■ ft
 ■ in

Factory setting mm

Date/time format

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

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

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

Factory setting dd.mm.yy hh:mm

Additional information *Selection*

 For an explanation of the abbreviated units: →  169

3.2.3 "Process parameters" submenu

Navigation  Expert → Sensor → Process param.

► Process parameters	
Flow override	→  72
Flow damping	→  72
► Low flow cutoff	→  73

Flow override

Navigation	 Expert → Sensor → Process param. → Flow override
Description	Use this function to select whether to interrupt the evaluation of measured values. This is useful for the cleaning processes of a pipeline, for example.
Selection	■ Off ■ On
Factory setting	Off
Additional information	<i>Effect</i>  This setting affects all the functions and outputs of the measuring device. <i>Description</i> Flow override is active ■ The 453 Flow override diagnostic message is output. ■ Output values ■ Output: value at zero flow ■ Temperature: continues to be output ■ Totalizer 1...3: stop being totalized  The Flow override option can also be activated in the Status input submenu: Assign status input parameter.

Flow damping

Navigation	 Expert → Sensor → Process param. → Flow damping
Description	Use this function to enter a value for flow damping. Reduction of the variability of the flow measured value (in relation to interference). For this purpose, the depth of the flow filter is adjusted: when the filter setting increases, the reaction time of the device also increases.
User entry	0 to 999.9 s

Factory setting 5 s

Additional information *User entry*

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

Result

 The damping affects the following variables of the device:

- Outputs
- Low flow cut off
- Totalizers

"Low flow cutoff" submenu

Navigation   Expert → Sensor → Process param. → Low flow cutoff

► Low flow cutoff

Sensitivity

→  73

Turndown

→  74

Low flow cutoff

→  74

On value low flow cutoff

→  75

Off value low flow cutoff

→  75

Sensitivity

Navigation   Expert → Sensor → Process param. → Low flow cutoff → Sensitivity

Description Use this function to enter a value to control the device sensitivity in the lower flow range.

User entry 1 to 9

Factory setting 5

Additional information *Description*

The measuring signal must have a certain minimum signal amplitude so that the signals can be evaluated without any errors. Using the nominal diameter, the corresponding flow can also be derived from this amplitude.

The minimum signal amplitude depends on the setting for the sensitivity of the DSC sensor, the steam quality **x** and the force of the vibrations present **a**.

The value **mf** corresponds to the lowest measurable flow velocity without vibration (no wet steam) for a density of 1 kg/m³ (0.0624 lb/ft³).

The value **mf** can be set in the range of 20 to 6 m/s (65.6 to 19.7 ft/s) (factory setting 11 m/s (36.1 ft/s)) with the **Sensitivity** parameter (value range 1 to 9, factory setting 5).

The lowest flow velocity that can be measured on account of the signal amplitude **v_{AmpMin}** is derived from the **Sensitivity** parameter and steam quality **x** or from the force of vibrations present **a**.

User entry

Increasing the sensitivity makes it possible to measure smaller flow signals. Reducing the sensitivity improves performance in relation to interference in the lower flow range.

Turndown



Navigation

Expert → Sensor → Process param. → Low flow cutoff → Turndown

Description

Use this function to enter a setting for the turndown.

User entry

50 to 100 %

Factory setting

100 %

Additional information

Description

The measuring range can be limited with this parameter, if necessary. The upper end of the measuring range is not affected. The start of the low end of the measuring range can be changed to a higher flow value, making it possible to cut off low flows, for example.

User entry

Reducing the turndown limits the lower measuring range in relation to the minimum measurable vortex frequency.

Low flow cutoff



Navigation

Expert → Sensor → Process param. → Low flow cutoff → Low flow cutoff

Description

Use this function to select the process variable for low flow cutoff detection.

Selection

- Off
- Volume flow
- Corrected volume flow
- Mass flow
- Reynolds number *

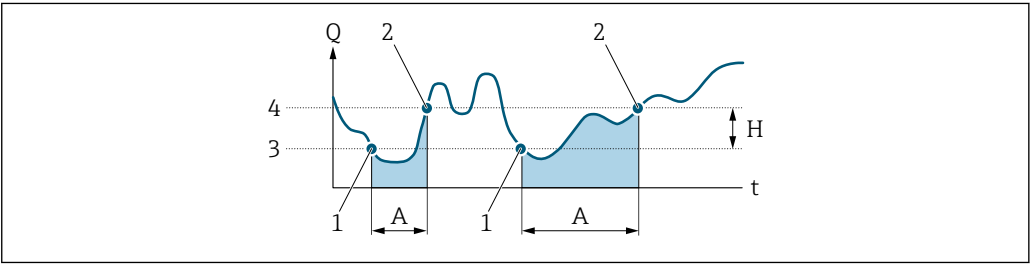
Factory setting

Off

* Visibility depends on order options or device settings

On value low flow cutoff		
Navigation	 Expert → Sensor → Process param. → Low flow cutoff → On value	
Prerequisite	A process variable is selected in the Assign process variable parameter (→  74).	
Description	Use this function to enter a switch-on value for low flow cut off. Low flow cut off is activated if the value entered is not equal to 0 →  75.	
User entry	Positive floating-point number	
Factory setting	0	
Additional information	<i>Dependency</i>  The unit depends on the process variable selected in the Assign process variable parameter (→  74).	

Off value low flow cutoff		
Navigation	 Expert → Sensor → Process param. → Low flow cutoff → Off value	
Prerequisite	A process variable is selected in the Assign process variable parameter (→  74).	
Description	Use this function to enter a switch-off value for low flow cut off. The switch-off value is entered as a positive hysteresis from the switch-on value →  75.	
User entry	0 to 100.0 %	
Factory setting	50 %	
Additional information	<i>Example</i>	



A0012887

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

3.2.4 "Measurement mode" submenu

Navigation  Expert → Sensor → Measurement mode

► Measurement mode		
Select medium	→ 	76
Steam calculation mode	→ 	76
Steam quality	→ 	77
Steam quality value	→ 	77
Select gas type	→ 	78
Liquid type	→ 	79
Density calculation	→ 	79
Enthalpy calculation	→ 	80
► Medium properties	→ 	80

Select medium

Navigation	 Expert → Sensor → Measurement mode → Select medium
Description	Use this function to select the type of medium for the measuring application.
Selection	■ Gas ■ Liquid ■ Steam
Factory setting	Steam

Steam calculation mode

Navigation	 Expert → Sensor → Measurement mode → Steam calc. mode
Prerequisite	The Steam option is selected in the Select medium parameter (→  76) parameter.
Description	Use this function to select the steam calculation mode for saturated steam measurement.
Selection	■ Saturated steam (T-compensated) ■ Automatic (p-/T-compensated)

Factory setting Saturated steam (T-compensated)

Additional information *Selection*

- Saturated steam (T-compensated)
Temperature-compensated
- Automatic (p-/T-compensated)
Pressure/temperature-compensated

Steam quality



Navigation Expert → Sensor → Measurement mode → Steam quality

Prerequisite The following conditions are met:

- Order code for "Application package":
 - Option ES "Wet steam detection"
 - Option EU "Wet steam measurement"
- The **Steam** option is selected in the **Select medium** parameter (→ 76) parameter.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 42).

Description Use this function to select the compensation mode for the steam quality.

Selection

- Fixed value
- Calculated value

Factory setting Fixed value

Additional information *Selection*

For detailed information on setting the parameter in steam applications, see the Special Documentation for the **Wet Steam Detection** and **Wet Steam Measurement** application package → 7

Steam quality value



Navigation Expert → Sensor → Measurement mode → Steam qual. val.

Prerequisite The following conditions are met:

- The **Steam** option is selected in the **Select medium** parameter (→ 76) parameter.
- The **Fixed value** option is selected in the **Steam quality** parameter (→ 77) parameter.

Description Use this function to enter a fixed value for the steam quality.

User entry 0 to 100 %

Factory setting 100 %

Additional information *User entry*

For detailed information on setting the parameter in steam applications, see the Special Documentation for the **Wet Steam Detection** and **Wet Steam Measurement** application package → 7

Select gas type**Navigation**

Expert → Sensor → Measurement mode → Select gas type

Prerequisite

The following conditions are met:

- Order code for "Sensor version",
Option "Mass (integrated temperature measurement)"
- The **Gas** option is selected in the **Select medium** parameter (→ 76) parameter.

Description

Use this function to select the type of gas for the measuring application.

Selection

- Single gas
- Gas mixture
- Air
- Natural gas
- User-specific gas

Factory setting

User-specific gas

Additional information

"User-specific gas" option

Applications: calculation of the mass flow of a user-specific gas

Calculated variables: the mass flow, the density, the corrected volume flow and the heat quantity are calculated from the measured volume flow and the measured temperature. Either the specific thermal capacity or the calorific value must be entered for calculating the heat quantity.

Formulae for calculation:

- Mass flow: $m = q \cdot \rho(T)$
- Density: $\rho = \rho_1(T_1) / (1 + \beta_p \cdot [T - T_1])$
- Corrected volume flow: $v_n = q \cdot (\rho(T) / \rho_{ref})$
- Heat quantity in the case of delta heat: $E = q \cdot \rho(T) \cdot c_p \cdot \Delta T$
- Heat quantity in the case of combustion: $E = q \cdot \rho(T) \cdot h$

m = Mass flow

q = Volume flow (measured)

v_n = Corrected volume flow

T = Process temperature (measured)

T_1 = Temperature at which the value for ρ_1 applies.

ρ = Density

ρ_{ref} = Reference density

= Density (→ 53) at which the value for T_1 applies.

β_p = Linear expansion coefficient (→ 84) of the liquid at T_1



Possible combinations of these values: **Linear expansion coefficient** parameter (→ 84)

Liquid type	
Navigation	Expert → Sensor → Measurement mode → Liquid type
Prerequisite	The following conditions are met: ■ Order code for "Sensor version", Option "Mass (integrated temperature measurement)" ■ The Liquid option is selected in the Select medium parameter (→ 76) parameter.
Description	Use this function to select the type of liquid for the measuring application.
Selection	■ Water ■ LPG (Liquefied Petroleum Gas) ■ User-specific liquid
Factory setting	Water
Additional information	<i>"User-specific liquid" option</i> Applications: calculation of the mass flow of a user-specific liquid, such as thermal oil. Calculated variables: the mass flow, the density, the corrected volume flow and the heat quantity are calculated from the measured volume flow and the measured temperature. Either the specific thermal capacity or the calorific value must be entered for calculating the heat quantity. Formulae for calculation: ■ Mass flow: $m = q \cdot \rho(T)$ ■ Density: $\rho = \rho_1(T_1) / (1 + \beta_p \cdot [T - T_1])$ ■ Corrected volume flow: $v_n = q \cdot (\rho(T) / \rho_{ref})$ ■ Heat quantity in the case of delta heat: $E = q \cdot \rho(T) \cdot c_p \cdot \Delta T$ ■ Heat quantity in the case of combustion: $E = q \cdot \rho(T) \cdot h$ m = Mass flow q = Volume flow (measured) v_n = Corrected volume flow T = Process temperature (measured) T_1 = Temperature at which the value for ρ_1 applies. ρ = Density ρ_{ref} = Reference density = Density (→ 53) at which the value for T_1 applies. β_p = Linear expansion coefficient (→ 84) of the liquid at T_1 Possible combinations of these values: Linear expansion coefficient parameter (→ 84)

Density calculation	
Navigation	Expert → Sensor → Measurement mode → Density calc.
Prerequisite	The following conditions are met: ■ In the Select medium parameter (→ 76), the Gas option is selected. ■ In the Select gas type parameter (→ 78), the Natural gas option is selected.

Description	Use this function to select the standard on the basis of which the density is calculated.
Selection	■ AGA Nx19 ■ ISO 12213- 2 ■ ISO 12213- 3
Factory setting	AGA Nx19

Enthalpy calculation

Navigation	Expert → Sensor → Measurement mode → Enthalpy calc.
Prerequisite	The following conditions are met: ■ Order code for "Sensor version", Option "Mass (integrated temperature measurement)" ■ In the Select medium parameter (→ 76), the Gas option is selected and in the Select gas type parameter (→ 78), the Natural gas option is selected.
Description	Use this function to select the standard on the basis of which the enthalpy is calculated.
Selection	■ AGA5 ■ ISO 6976
Factory setting	AGA5

"Medium properties" submenu

Navigation Expert → Sensor → Measurement mode → Medium property

► Medium properties		
Enthalpy type		→ 81
Calorific value type		→ 81
Reference combustion temperature		→ 82
Reference density		→ 82
Reference gross calorific value		→ 82
Reference pressure		→ 83
Reference temperature		→ 83
Reference Z-factor		→ 84

Linear expansion coefficient	→ 84
Relative density	→ 85
Specific heat capacity	→ 85
Calorific value	→ 86
Z-factor	→ 86
Dynamic viscosity	→ 87
Dynamic viscosity	→ 87
► Gas composition	→ 88

Enthalpy type

Navigation	Expert → Sensor → Measurement mode → Medium property → Enthalpy type
Prerequisite	The following conditions are met: ■ In the Select gas type parameter (→ 78), the User-specific gas option is selected. - Or ■ In the Liquid type parameter (→ 79), the User-specific liquid option is selected.
Description	Use this function to select the type of enthalpy.
Selection	■ Heat ■ Calorific value
Factory setting	Heat

Calorific value type

Navigation	Expert → Sensor → Measurement mode → Medium property → Cal. value type
Description	Select calculation based on gross calorific value or net calorific value.
Selection	■ Gross calorific value volume ■ Net calorific value volume ■ Gross calorific value mass ■ Net calorific value mass
Factory setting	Gross calorific value mass

Reference combustion temperature



Navigation	 Expert → Sensor → Measurement mode → Medium property → Ref. comb. temp.
Prerequisite	The Reference combustion temperature parameter (→  82) is visible.
Description	Use this function to enter the reference combustion temperature for calculating the natural gas energy value.
User entry	–200 to 450 °C
Factory setting	20 °C
Additional information	<i>Dependency</i>  The unit is taken from the Temperature unit parameter (→  65)

Reference density



Navigation	 Expert → Sensor → Measurement mode → Medium property → Ref.density
Prerequisite	The following conditions are met: ▪ In the Select gas type parameter (→  78), the User-specific gas option is selected. - Or ▪ In the Liquid type parameter (→  79), the Water option or User-specific liquid option is selected.
Description	Use this function to enter a fixed value for the reference density.
User entry	0.01 to 15 000 kg/m ³
Factory setting	1 000 kg/m ³
Additional information	<i>Dependency</i>  The unit is taken from the Density unit parameter (→  69)

Reference gross calorific value



Navigation	 Expert → Sensor → Measurement mode → Medium property → Ref. GrossCalVal
Prerequisite	The following conditions are met: ▪ In the Select medium parameter (→  76), the Gas option is selected. ▪ In the Select gas type parameter (→  78), the Natural gas option is selected. ▪ In the Density calculation parameter (→  79), the ISO 12213- 3 option is selected.
Description	Use this function to enter the reference gross calorific value of the natural gas.

User entry	Positive floating-point number
Factory setting	50 000 kJ/Nm ³
Additional information	<i>Dependency</i>  The unit is taken from the Calorific value unit parameter (→  67)

Reference pressure

Navigation	  Expert → Sensor → Measurement mode → Medium property → Ref. pressure
Prerequisite	The following conditions are met: ▪ Order code for "Sensor version", Option "Mass (integrated temperature measurement)" ▪ The Gas option is selected in the Select medium parameter (→  76) parameter.
Description	Use this function to enter the reference pressure for calculating the reference density.
User entry	0 to 250 bar
Factory setting	1.01325 bar
Additional information	<i>Dependency</i>  The unit is taken from the Pressure unit parameter (→  64)

Reference temperature

Navigation	  Expert → Sensor → Measurement mode → Medium property → Ref. temperature
Prerequisite	The following conditions are met: ▪ In the Select medium parameter (→  76), the Gas option is selected. - Or ▪ In the Select medium parameter (→  76), the Liquid option is selected.
Description	Use this function to enter the reference temperature for calculating the reference density.
User entry	-200 to 450 °C
Factory setting	0 °C
Additional information	<i>Dependency</i>  The unit is taken from the Temperature unit parameter (→  65)

Reference Z-factor



Navigation	Expert → Sensor → Measurement mode → Medium property → Ref. Z-factor
Prerequisite	In the Select gas type parameter (→ 78), the User-specific gas option is selected.
Description	Use this function to enter the real gas constant Z for gas under reference conditions.
User entry	0.1 to 2
Factory setting	1

Linear expansion coefficient



Navigation	Expert → Sensor → Measurement mode → Medium property → Linear exp coeff
Prerequisite	The following conditions are met: ■ The Liquid option is selected in the Select medium parameter (→ 76). ■ The User-specific liquid option is selected in the Liquid type parameter (→ 79).
Description	Use this function to enter the linear, medium-specific expansion coefficient for calculating the reference density for user-specific liquids.
User entry	$1.0 \cdot 10^{-6}$ to $2.0 \cdot 10^{-3}$
Factory setting	$2.06 \cdot 10^{-4}$
Additional information	<i>User entry</i> ■ If the value in this parameter is changed, it is advisable to reset the totalizer. ■ The expansion coefficient can be determined using the Applicator. ■ If two density and temperature value pairs are known (density ρ_1 at temperature T_1 and density ρ_2 at temperature T_2), the expansion coefficient can be calculated according to the following formula: $\beta_p = ((\rho_1/\rho_2) - 1)/(T_1 - T_2)$

Sample values

The closer the process temperature is to the specific temperature value, the better the calculation of the density for application-specific liquids. If the process temperature deviates greatly from the value indicated, the expansion coefficient should be calculated according to the formula (see above).

Medium (liquid)	Temperature value [K]	Density value [kg/m³]	Expansion coefficient [10^{-4} 1/K]
Air	123.15	594	18.76
Ammonia	298.15	602	25
Argon	133.15	1028	111.3
n-butane	298.15	573	20.7
Carbon dioxide	298.15	713	106.6
Chlorine	298.15	1398	21.9

Medium (liquid)	Temperature value [K]	Density value [kg/m ³]	Expansion coefficient [10 ⁻⁴ 1/K]
Cyclohexane	298.15	773	11.6
n-decane	298.15	728	10.2
Ethane	298.15	315	175.3
Ethylene	298.15	386	87.7
n-heptane	298.15	351	12.4
n-hexane	298.15	656	13.8
Hydrogen chloride	298.15	796	70.9
i-butane	298.15	552	22.5
Methane	163.15	331	73.5
Nitrogen	93.15	729	75.3
n-octane	298.15	699	11.1
Oxygen	133.15	876	95.4
n-pentane	298.15	621	16.2
Propane	298.15	493	32.1
Vinyl chloride	298.15	903	19.3
Table values according to Carl L. Yaws (2001): Matheson Gas Data Book, 7th edition			

Relative density



Navigation

Expert → Sensor → Measurement mode → Medium property → Relative density

Prerequisite

The following conditions are met:

- In the **Select medium** parameter (→ 76), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 78), the **Natural gas** option is selected.
- In the **Density calculation** parameter (→ 79), the **ISO 12213- 3** option is selected.

Description

Use this function to enter the relative density of the natural gas.

User entry

0.55 to 0.9

Factory setting

0.664

Specific heat capacity



Navigation

Expert → Sensor → Measurement mode → Medium property → Spec. heat cap.

Prerequisite

The following conditions are met:

- Selected medium:
 - In the **Select gas type** parameter (→ 78), the **User-specific gas** option is selected.
 - Or
 - In the **Liquid type** parameter (→ 79), the **User-specific liquid** option is selected.
- In the **Enthalpy type** parameter (→ 81), the **Heat** option is selected.

Description	Use this function to enter the specific heat capacity of the medium.
User entry	0 to 50 kJ/(kgK)
Factory setting	4.187 kJ/(kgK)
Additional information	<i>Dependency</i>  The unit is taken from the Specific heat capacity unit parameter (→  70)

Calorific value

Navigation	  Expert → Sensor → Measurement mode → Medium property → Calorific value
Prerequisite	The following conditions are met: ■ Selected medium: ■ In the Select gas type parameter (→  78), the User-specific gas option is selected. - Or ■ In the Liquid type parameter (→  79), the User-specific liquid option is selected. ■ In the Enthalpy type parameter (→  81), the Calorific value option is selected. ■ In the Calorific value type parameter (→  81), the Gross calorific value volume option or Gross calorific value mass option is selected.
Description	Use this function to enter the calorific value for calculating the energy flow.
User entry	Positive floating-point number
Factory setting	50 000 kJ/kg

Z-factor

Navigation	  Expert → Sensor → Measurement mode → Medium property → Z-factor
Prerequisite	In the Select gas type parameter (→  78), the User-specific gas option is selected.
Description	Use this function to enter the real gas constant Z for gas under operating conditions.
User entry	0.1 to 2.0
Factory setting	1

Dynamic viscosity (Liquids)**Navigation** Expert → Sensor → Measurement mode → Medium property → Dynam. viscosity**Prerequisite**

The following conditions are met:

- Order code for "Sensor version",
 - Option "Volume"
 - or
 - Option "Volume high temperature"
- The **Liquid** option is selected in the **Select medium** parameter (→  76) parameter.
- or
- The **User-specific liquid** option is selected in the **Liquid type** parameter (→  79).

Description

Use this function to enter a fixed value for the dynamic viscosity for a liquid.

User entry

Positive floating-point number

Factory setting

1 cP

Additional information*Description*

The viscosity entered is used to linearize the measured error in the lower Reynolds number range if the calculated viscosity is not available e.g. "Volume flow" sensor version or the fluid is a user-specific liquid (see table).

Dependencies

Sensor version	Medium	Dyn. viscosity
Volume flow	All	x
Mass flow	All except ¹⁾	–
	¹⁾	x
x	Dynamic viscosity as the input value	

1) User-specific liquid

DependencyThe unit is taken from the **Dynamic viscosity unit** parameter (→  70).**Dynamic viscosity (Gases)****Navigation** Expert → Sensor → Measurement mode → Medium property → Dynam. viscosity**Prerequisite**

The following conditions are met:

- Order code for "Sensor version",
 - Option "Volume"
 - or
 - Option "Volume high temperature"
- The **Gas** option or the **Steam** option is selected in the **Select medium** parameter (→  76).
- or
- The **User-specific gas** option is selected in the **Select gas type** parameter (→  78).

Description

Use this function to enter a fixed value for the dynamic viscosity for a gas or steam.

User entry

Positive floating-point number

Factory setting

0.015 cP

Additional information

Description

The viscosity entered is used to linearize the measured error in the lower Reynolds number range if the calculated viscosity is not available e.g. "Volume flow" sensor version or the fluid is a user-specific gas (see table).

Dependencies

Sensor version	Medium	Dyn. viscosity
Volume flow	All	x
Mass flow	All except ¹⁾	–
	¹⁾	x
x	Dynamic viscosity as the input value	

1) User-specific gas

Dependency

 The unit is taken from the **Dynamic viscosity unit** parameter (→  70).

"Gas composition" submenu

Navigation   Expert → Sensor → Measurement mode → Medium property
→ Gas composition

► Gas composition

Gas type

→  90

Gas mixture

→  90

Mol% Ar

→  91

Mol% C2H3Cl

→  92

Mol% C2H4

→  92

Mol% C2H6

→  92

Mol% C3H8

→  93

Mol% CH4

→  93

Mol% Cl ₂	→  94
Mol% CO	→  94
Mol% CO ₂	→  94
Mol% H ₂	→  95
Mol% H ₂ O	→  95
Mol% H ₂ S	→  96
Mol% HCl	→  96
Mol% He	→  96
Mol% i-C ₄ H ₁₀	→  97
Mol% i-C ₅ H ₁₂	→  97
Mol% Kr	→  97
Mol% N ₂	→  98
Mol% n-C ₁₀ H ₂₂	→  98
Mol% n-C ₄ H ₁₀	→  99
Mol% n-C ₅ H ₁₂	→  99
Mol% n-C ₆ H ₁₄	→  99
Mol% n-C ₇ H ₁₆	→  100
Mol% n-C ₈ H ₁₈	→  100
Mol% n-C ₉ H ₂₀	→  100
Mol% Ne	→  101
Mol% NH ₃	→  101
Mol% O ₂	→  102
Mol% SO ₂	→  102
Mol% Xe	→  102

Mol% other gas	→ 103
Relative humidity	→ 103

Gas type

Navigation	  Expert → Sensor → Measurement mode → Medium property → Gas composition → Gas type
Prerequisite	The following conditions are met: ■ In the Select medium parameter (→  76), the Gas option is selected. ■ In the Select gas type parameter (→  78), the Single gas option is selected.
Description	Use this function to select the type of gas for the measuring application.
Selection	■ Hydrogen H2 ■ Helium He ■ Neon Ne ■ Argon Ar ■ Krypton Kr ■ Xenon Xe ■ Nitrogen N2 ■ Oxygen O2 ■ Chlorine Cl2 ■ Ammonia NH3 ■ Carbon monoxide CO ■ Carbon dioxide CO2 ■ Sulfur dioxide SO2 ■ Hydrogen sulfide H2S ■ Hydrogen chloride HCl ■ Methane CH4 ■ Ethane C2H6 ■ Propane C3H8 ■ Butane C4H10 ■ Ethylene C2H4 ■ Vinyl chloride C2H3Cl
Factory setting	Methane CH4

Gas mixture

Navigation	  Expert → Sensor → Measurement mode → Medium property → Gas composition → Gas mixture
Prerequisite	The following conditions are met: ■ In the Select medium parameter (→  76), the Gas option is selected. ■ In the Select gas type parameter (→  78), the Gas mixture option is selected.
Description	Use this function to select the gas mixture for the measuring application.

Selection	■ Air ■ Hydrogen H₂ ■ Helium He ■ Neon Ne ■ Argon Ar ■ Krypton Kr ■ Xenon Xe ■ Nitrogen N₂ ■ Oxygen O₂ ■ Chlorine Cl₂ ■ Ammonia NH₃ ■ Carbon monoxide CO ■ Carbon dioxide CO₂ ■ Sulfur dioxide SO₂ ■ Hydrogen sulfide H₂S ■ Hydrogen chloride HCl ■ Methane CH₄ ■ Propane C₃H₈ ■ Ethane C₂H₆ ■ Butane C₄H₁₀ ■ Ethylene C₂H₄ ■ Vinyl chloride C₂H₃Cl ■ Water ■ Other
Factory setting	Methane CH ₄

Mol% Ar



Navigation	Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% Ar
Prerequisite	The following conditions are met: In the Select medium parameter (→ 76), the Gas option is selected. ■ In the Select gas type parameter (→ 78), the Gas mixture option is selected and in the Gas mixture parameter (→ 90), the Argon Ar option is selected. Or ■ In the Select gas type parameter (→ 78), the Natural gas option is selected and in the Density calculation parameter (→ 79), the ISO 12213- 2 option is selected.
Description	Use this function to enter the amount of the gas constituent in the gas mixture.
User entry	0 to 100 %
Factory setting	0 %

Mol% C ₂ H ₃ Cl		
Navigation	  Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% C ₂ H ₃ Cl	
Prerequisite	The following conditions are met: ■ In the Select medium parameter (→  76), the Gas option is selected. ■ In the Select gas type parameter (→  78), the Gas mixture option is selected. ■ In the Gas mixture parameter (→  90), the Vinyl chloride C₂H₃Cl option is selected.	
Description	Use this function to enter the amount of the gas constituent in the gas mixture.	
User entry	0 to 100 %	
Factory setting	0 %	
Mol% C ₂ H ₄		
Navigation	  Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% C ₂ H ₄	
Prerequisite	The following conditions are met: ■ In the Select medium parameter (→  76), the Gas option is selected. ■ In the Select gas type parameter (→  78), the Gas mixture option is selected. ■ In the Gas mixture parameter (→  90), the Ethylene C₂H₄ option is selected.	
Description	Use this function to enter the amount of the gas constituent in the gas mixture.	
User entry	0 to 100 %	
Factory setting	0 %	
Mol% C ₂ H ₆		
Navigation	  Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% C ₂ H ₆	
Prerequisite	The following conditions are met: In the Select medium parameter (→  76), the Gas option is selected. ■ In the Select gas type parameter (→  78), the Gas mixture option is selected and in the Gas mixture parameter (→  90), the Ethane C₂H₆ option is selected. Or ■ In the Select gas type parameter (→  78), the Natural gas option is selected and in the Density calculation parameter (→  79), the ISO 12213- 2 option is selected.	
Description	Use this function to enter the amount of the gas constituent in the gas mixture.	
User entry	0 to 100 %	

Factory setting 0 %

Mol% C3H8

Navigation   Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% C3H8

Prerequisite The following conditions are met:
 In the **Select medium** parameter (→  76), the **Gas** option is selected.
 ■ In the **Select gas type** parameter (→  78), the **Gas mixture** option is selected and in the **Gas mixture** parameter (→  90), the **Propane C3H8** option is selected.
 Or
 ■ In the **Select gas type** parameter (→  78), the **Natural gas** option is selected and in the **Density calculation** parameter (→  79), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% CH4

Navigation   Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% CH4

Prerequisite The following conditions are met:
 In the **Select medium** parameter (→  76), the **Gas** option is selected.
 ■ In the **Select gas type** parameter (→  78), the **Gas mixture** option is selected and in the **Gas mixture** parameter (→  90), the **Methane CH4** option is selected.
 Or
 ■ In the **Select gas type** parameter (→  78), the **Natural gas** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 100 %

Mol% Cl2 	
Navigation	  Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% Cl2
Prerequisite	The following conditions are met: ■ In the Select medium parameter (→  76), the Gas option is selected. ■ In the Select gas type parameter (→  78), the Gas mixture option is selected. ■ In the Gas mixture parameter (→  90), the Chlorine Cl2 option is selected.
Description	Use this function to enter the amount of the gas constituent in the gas mixture.
User entry	0 to 100 %
Factory setting	0 %
Mol% CO 	
Navigation	  Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% CO
Prerequisite	The following conditions are met: In the Select medium parameter (→  76), the Gas option is selected. ■ In the Select gas type parameter (→  78), the Gas mixture option is selected and in the Gas mixture parameter (→  90), the Carbon monoxide CO option is selected. Or ■ In the Select gas type parameter (→  78), the Natural gas option is selected and in the Density calculation parameter (→  79), the ISO 12213- 2 option is selected.
Description	Use this function to enter the amount of the gas constituent in the gas mixture.
User entry	0 to 100 %
Factory setting	0 %
Mol% CO2 	
Navigation	  Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% CO2
Prerequisite	The following conditions are met: In the Select medium parameter (→  76), the Gas option is selected. ■ In the Select gas type parameter (→  78), the Gas mixture option is selected and in the Gas mixture parameter (→  90), the Carbon dioxide CO2 option is selected. Or ■ In the Select gas type parameter (→  78), the Natural gas option is selected.
Description	Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% H2



Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% H2

Prerequisite The following conditions are met:
 In the **Select medium** parameter (→ 76), the **Gas** option is selected.
 ■ In the **Select gas type** parameter (→ 78), the **Gas mixture** option is selected and in the **Gas mixture** parameter (→ 90), the **Hydrogen H2** option is selected.
 Or
 ■ In the **Select gas type** parameter (→ 78), the **Natural gas** option is selected and in the **Density calculation** parameter (→ 79), the **AGA Nx19** option is **not** selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% H2O



Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% H2O

Prerequisite The following conditions are met:
 ■ In the **Select medium** parameter (→ 76), the **Gas** option is selected.
 ■ In the **Select gas type** parameter (→ 78), the **Natural gas** option is selected.
 ■ In the **Density calculation** parameter (→ 79), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% H2S		
Navigation	  Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% H2S	
Prerequisite	The following conditions are met: In the Select medium parameter (→  76), the Gas option is selected. ■ In the Select gas type parameter (→  78), the Gas mixture option is selected and in the Gas mixture parameter (→  90), the Hydrogen sulfide H2S option is selected. Or ■ In the Select gas type parameter (→  78), the Natural gas option is selected and in the Density calculation parameter (→  79), the ISO 12213- 2 option is selected.	
Description	Use this function to enter the amount of the gas constituent in the gas mixture.	
User entry	0 to 100 %	
Factory setting	0 %	
Mol% HCl		
Navigation	  Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% HCl	
Prerequisite	The following conditions are met: ■ In the Select medium parameter (→  76), the Gas option is selected. ■ In the Select gas type parameter (→  78), the Gas mixture option is selected. ■ In the Gas mixture parameter (→  90), the Hydrogen chloride HCl option is selected.	
Description	Use this function to enter the amount of the gas constituent in the gas mixture.	
User entry	0 to 100 %	
Factory setting	0 %	
Mol% He		
Navigation	  Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% He	
Prerequisite	The following conditions are met: In the Select medium parameter (→  76), the Gas option is selected. ■ In the Select gas type parameter (→  78), the Gas mixture option is selected and in the Gas mixture parameter (→  90), the Helium He option is selected. Or ■ In the Select gas type parameter (→  78), the Natural gas option is selected and in the Density calculation parameter (→  79), the ISO 12213- 2 option is selected.	
Description	Use this function to enter the amount of the gas constituent in the gas mixture.	

User entry 0 to 100 %

Factory setting 0 %

Mol% i-C4H10



Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% i-C4H10

Prerequisite The following conditions are met:

- In the **Select medium** parameter (→ 76), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 78), the **Natural gas** option is selected.
- In the **Density calculation** parameter (→ 79), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% i-C5H12



Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% i-C5H12

Prerequisite The following conditions are met:

- In the **Select medium** parameter (→ 76), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 78), the **Natural gas** option is selected.
- In the **Density calculation** parameter (→ 79), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% Kr



Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% Kr

Prerequisite The following conditions are met:

- In the **Select medium** parameter (→ 76), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 78), the **Gas mixture** option is selected.
- In the **Gas mixture** parameter (→ 90), the **Krypton Kr** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% N2



Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% N2

Prerequisite The following conditions are met:
 In the **Select medium** parameter (→ 76), the **Gas** option is selected.
 ■ In the **Select gas type** parameter (→ 78), the **Gas mixture** option is selected and in the **Gas mixture** parameter (→ 90), the **Nitrogen N2** option is selected.
 Or
 ■ In the **Select gas type** parameter (→ 78), the **Natural gas** option is selected and in the **Density calculation** parameter (→ 79), the **AGA Nx19** option or the **ISO 12213-2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% n-C10H22



Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% n-C10H22

Prerequisite The following conditions are met:
 ■ In the **Select medium** parameter (→ 76), the **Gas** option is selected.
 ■ In the **Select gas type** parameter (→ 78), the **Natural gas** option is selected.
 ■ In the **Density calculation** parameter (→ 79), the **ISO 12213-2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% n-C₄H₁₀

Navigation	 Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% n-C ₄ H ₁₀
Prerequisite	The following conditions are met: ■ In the Select medium parameter (→  76), the Gas option is selected. ■ In the Select gas type parameter (→  78), the Gas mixture option is selected and in the Gas mixture parameter (→  90), the Butane C₄H₁₀ option is selected. - Or ■ In the Select gas type parameter (→  78), the Natural gas option is selected and in the Density calculation parameter (→  79), the ISO 12213- 2 option is selected. - Or ■ In the Select medium parameter (→  76), the Liquid option is selected and in the Liquid type parameter (→  79), the LPG option is selected.
Description	Use this function to enter the amount of the gas constituent in the gas mixture.
User entry	0 to 100 %
Factory setting	0 %

Mol% n-C₅H₁₂

Navigation	 Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% n-C ₅ H ₁₂
Prerequisite	The following conditions are met: ■ In the Select medium parameter (→  76), the Gas option is selected. ■ In the Select gas type parameter (→  78), the Natural gas option is selected. ■ In the Density calculation parameter (→  79), the ISO 12213- 2 option is selected.
Description	Use this function to enter the amount of the gas constituent in the gas mixture.
User entry	0 to 100 %
Factory setting	0 %

Mol% n-C₆H₁₄

Navigation	 Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% n-C ₆ H ₁₄
Prerequisite	The following conditions are met: ■ In the Select medium parameter (→  76), the Gas option is selected. ■ In the Select gas type parameter (→  78), the Natural gas option is selected. ■ In the Density calculation parameter (→  79), the ISO 12213- 2 option is selected.
Description	Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% n-C7H16



Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% n-C7H16

Prerequisite The following conditions are met:

- In the **Select medium** parameter (→ 76), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 78), the **Natural gas** option is selected.
- In the **Density calculation** parameter (→ 79), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% n-C8H18



Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% n-C8H18

Prerequisite The following conditions are met:

- In the **Select medium** parameter (→ 76), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 78), the **Natural gas** option is selected.
- In the **Density calculation** parameter (→ 79), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% n-C9H20



Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% n-C9H20

Prerequisite The following conditions are met:

- In the **Select medium** parameter (→ 76), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 78), the **Natural gas** option is selected.
- In the **Density calculation** parameter (→ 79), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% Ne



Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% Ne

Prerequisite The following conditions are met:

- In the **Select medium** parameter (→ 76), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 78), the **Gas mixture** option is selected.
- In the **Gas mixture** parameter (→ 90), the **Neon Ne** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% NH3



Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% NH3

Prerequisite The following conditions are met:

- In the **Select medium** parameter (→ 76), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 78), the **Gas mixture** option is selected.
- In the **Gas mixture** parameter (→ 90), the **Ammonia NH3** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% O2		
Navigation	  Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% O2	
Prerequisite	The following conditions are met: In the Select medium parameter (→  76), the Gas option is selected. ■ In the Select gas type parameter (→  78), the Gas mixture option is selected and in the Gas mixture parameter (→  90), the Oxygen O2 option is selected. Or ■ In the Select gas type parameter (→  78), the Natural gas option is selected and in the Density calculation parameter (→  79), the ISO 12213- 2 option is selected.	
Description	Use this function to enter the amount of the gas constituent in the gas mixture.	
User entry	0 to 100 %	
Factory setting	0 %	
Mol% SO2		
Navigation	  Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% SO2	
Prerequisite	The following conditions are met: ■ In the Select medium parameter (→  76), the Gas option is selected. ■ In the Select gas type parameter (→  78), the Gas mixture option is selected. ■ In the Gas mixture parameter (→  90), the Sulfur dioxide SO2 option is selected.	
Description	Use this function to enter the amount of the gas constituent in the gas mixture.	
User entry	0 to 100 %	
Factory setting	0 %	
Mol% Xe		
Navigation	  Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% Xe	
Prerequisite	The following conditions are met: ■ In the Select medium parameter (→  76), the Gas option is selected. ■ In the Select gas type parameter (→  78), the Gas mixture option is selected. ■ In the Gas mixture parameter (→  90), the Xenon Xe option is selected.	
Description	Use this function to enter the amount of the gas constituent in the gas mixture.	
User entry	0 to 100 %	

Factory setting 0 %

Mol% other gas

Navigation   Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% other gas

Prerequisite The following conditions are met:
 ■ In the **Select medium** parameter (→  76), the **Gas** option is selected.
 ■ In the **Select gas type** parameter (→  78), the **Gas mixture** option is selected.
 ■ In the **Gas mixture** parameter (→  90), the **Other** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Relative humidity

Navigation   Expert → Sensor → Measurement mode → Medium property → Gas composition → Rel. humidity

Prerequisite The following conditions are met:
 ■ In the **Select medium** parameter (→  76), the **Gas** option is selected.
 ■ In the **Select gas type** parameter (→  78), the **Air** option is selected.

Description Use this function to enter the humidity content of the air in %.

User entry 0 to 100 %

Factory setting 0 %

3.2.5 "External compensation" submenu

Navigation   Expert → Sensor → External comp.

▶ External compensation

External value

→  104

Atmospheric pressure

→  104

Delta heat calculation

→  105

Fixed density	→  105
Fixed density	→  105
Fixed temperature	→  106
2nd temperature delta heat	→  106
Fixed process pressure	→  107

External value

Navigation   Expert → Sensor → External comp. → External value

Prerequisite With order code for "Sensor version":
"Mass (integrated temperature measurement)" option

Description Use this function to select the process variable which is taken from an external device.
 For detailed information on setting the parameter in steam applications, see the Special Documentation for the **Wet Steam Detection** and **Wet Steam Measurement** application package →  7

- Selection**
- Off
 - Pressure
 - Gauge pressure
 - Density
 - 2nd temperature delta heat

Factory setting Off

Atmospheric pressure

Navigation   Expert → Sensor → External comp. → Atmosph. press.

Prerequisite In the **External value** parameter (→  104), the **Gauge pressure** option is selected.

Description Use this function to enter the value for the ambient pressure to be used for pressure correction.

User entry 0 to 250 bar

Factory setting 1.01325 bar

Additional information *Dependency*
 The unit is taken from the **Pressure unit** parameter (→  64)

Delta heat calculation 	
Navigation	  Expert → Sensor → External comp. → Delta heat calc.
Prerequisite	The Delta heat calculation parameter (→  105) is visible.
Description	Use this function to select the option for calculating the heat transferred via a heat exchanger (=delta heat).
Selection	■ Off ■ Device on cold side ■ Device on warm side
Factory setting	Device on warm side

Fixed density 	
Navigation	  Expert → Sensor → External comp. → Fixed density
Prerequisite	With order code for "Sensor version": ■ Option "Volume" - or ■ Option "Volume high temperature"
Description	Use this function to enter a fixed value for the density if the medium is a liquid.
User entry	0.01 to 15 000 kg/m ³
Factory setting	1 000 kg/m ³
Additional information	<i>Description</i> The density entered is used to linearize the measured error in the lower Reynolds number range if the calculated density is not available e.g. "Volume flow" sensor version or the fluid is a user-specific gas (see table). <i>Dependency</i>  The unit is taken from the Density unit parameter (→  69)

Fixed density 	
Navigation	  Expert → Sensor → External comp. → Fixed density
Prerequisite	With order code for "Sensor version": ■ Option "Volume" - or ■ Option "Volume high temperature"

Description	Use this function to enter a fixed value for the density if the medium is gas or steam.
User entry	0.01 to 15 000 kg/m ³
Factory setting	5 kg/m ³
Additional information	<i>Description</i> The density entered is used to linearize the measured error in the lower Reynolds number range if the calculated density is not available e.g. "Volume flow" sensor version or the fluid is a user-specific gas (see table). <i>Dependency</i>  The unit is taken from the Density unit parameter (→  69)

Fixed temperature



Navigation	  Expert → Sensor → External comp. → Fixed temp.
Description	Use this function to enter a fixed value for the process temperature.
User entry	–200 to 450 °C
Factory setting	20 °C
Additional information	<i>Dependency</i>  The unit is taken from the Temperature unit parameter (→  65)

2nd temperature delta heat



Navigation	  Expert → Sensor → External comp. → 2ndTempDeltaHeat
Prerequisite	The 2nd temperature delta heat parameter (→  106) is visible.
Description	Use this function to enter the second temperature value for calculating the delta heat.
User entry	–200 to 450 °C
Factory setting	20 °C
Additional information	<i>Dependency</i>  The unit is taken from the Temperature unit parameter (→  65)

Fixed process pressure	
Navigation	 Expert → Sensor → External comp. → Fix. proc.press.
Prerequisite	The following conditions are met: ▪ Order code for "Sensor version", Option "Mass flow (integrated temperature measurement)" ▪ In the External value parameter (→  104) the Pressure option is not selected.
Description	Use this function to enter a fixed value for the process pressure.
User entry	0 to 250 bar abs.
Factory setting	0 bar abs.
Additional information	<i>User entry</i>  For detailed information on setting the parameter in steam applications, see the Special Documentation for the Wet Steam Detection and Wet Steam Measurement application package →  7 <i>Dependency</i>  The unit is taken from the Pressure unit parameter (→  64)

3.2.6 "Sensor adjustment" submenu

Navigation  Expert → Sensor → Sensor adjustm.

► Sensor adjustment	
► Installation settings	→  107
► Installation settings	→  110

"Installation settings" submenu

Navigation  Expert → Sensor → Sensor adjustm. → Install.settings

► Installation settings	
Inlet configuration	→  108
Inlet run	→  108
Mating pipe diameter	→  109
Installation factor	→  109

Inlet configuration



Navigation

Expert → Sensor → Sensor adjustm. → Install.settings → Inlet config.

Prerequisite

The **inlet run correction** feature:

- Is a standard feature and can only be used in the Prowirl F 200.
- Can be used for the following pressure ratings and nominal diameters:
 - DN 15 to 150 (NPS 1 to 6)
 - EN (DIN)
 - ASME B16.5, Sch. 40/80
 - JIS B2220

Description

Use this function to select the inlet configuration.

Selection

- Off
- Single elbow
- Double elbow
- Double elbow 3D
- Reduction

Factory setting

Off

Inlet run



Navigation

Expert → Sensor → Sensor adjustm. → Install.settings → Inlet run

Prerequisite

The **inlet run correction** feature:

- Is a standard feature and can only be used in the Prowirl F 200.
- Can be used for the following pressure ratings and nominal diameters:
 - DN 15 to 150 (NPS 1 to 6)
 - EN (DIN)
 - ASME B16.5, Sch. 40/80
 - JIS B2220

Description

Use this function to enter the length of the straight inlet run.

User entry

0 to 20 m

Factory setting

0 m

Additional information

Dependency

The unit is taken from the **Length unit** parameter (→ 71)

Mating pipe diameter	
Navigation	Expert → Sensor → Sensor adjustm. → Install.settings → D mating pipe
Description	Use this function to enter the diameter of the mating pipe to enable diameter mismatch correction.
User entry	0 to 1 m (0 to 3 ft)
Factory setting	Country-specific: ■ 0 m ■ 0 ft
Additional information	<i>Description</i> The device has diameter mismatch correction. This can be enabled by entering the actual internal diameter of the mating pipe in the Mating pipe diameter parameter. <i>User entry</i> If the value entered is 0, diameter mismatch correction is disabled. If the standard internal diameter of the ordered process connection differs from the internal diameter of the mating pipe, an additional measuring uncertainty of up to 2 % must be expected if diameter mismatch correction is disabled. <i>Limit values</i> Diameter mismatch correction should be enabled only within the following limit values: Flange connection: ■ DN 15 (½"): ±20 % of the internal diameter ■ DN 25 (1"): ±15 % of the internal diameter ■ DN 40 (1½"): ±12 % of the internal diameter ■ DN ≥ 50 (2"): ±10 % of the internal diameter Disc (wafer version): ■ DN 15 (½"): ±15 % of the internal diameter ■ DN 25 (1"): ±12 % of the internal diameter ■ DN 40 (1½"): ±9 % of the internal diameter ■ DN ≥ 50 (2"): ±8 % of the internal diameter <i>Dependency</i> The unit is taken from the Length unit parameter (→ 71)
Installation factor	
Navigation	Expert → Sensor → Sensor adjustm. → Install.settings → Install. factor
Description	Use this function to enter the factor to adjust installation conditions.
User entry	Positive floating-point number
Factory setting	1.0

Additional information

Description

The calculated volume flow and all measured variables derived from this are multiplied by the installation factor.

"Installation settings" submenu

Navigation   Expert → Sensor → Sensor adjustm. → Install.settings

► Installation settings

Disable pressure cell

→  110

Reference pressure

→  111

Pressure cell adjustment

→  111

Pressure cell offset value

→  112

Disable pressure cell

Navigation   Expert → Sensor → Sensor adjustm. → Install.settings → Disable pr. cell

Prerequisite

With order code for "Sensor version":

- Option "Mass steam (integrated pressure/temperature measurement)"
- Option "Mass gas/liquid (integrated pressure/temperature measurement)"

 Only available for Prowirl F, R, O.

Description

Use this function to deactivate integrated pressure measurement.

Selection

- No
- Yes

Factory setting

No

Additional information

Description

If pressure measurement is disabled, the measuring device calculates with the value from the **Fixed process pressure** parameter (→  107) or with the value from the **External value** parameter (→  104). This makes it possible to replace the pressure cell with

minimum impact on the output variable. The setting is not stored persistently and is reset to the factory setting following a restart.

Selection

- No
Pressure cell is not disabled.
- Yes
Pressure cell is disabled.

Reference pressure



Navigation

Expert → Sensor → Sensor adjustm. → Install.settings → Ref. pressure

Prerequisite

With order code for "Sensor version":

- Option "Mass steam (integrated pressure/temperature measurement)"
- Option "Mass gas/liquid (integrated pressure/temperature measurement)"

Only available for Prowirl F, R, O.

Description

Use this function to enter the reference pressure for determining the offset value for integrated pressure measurement.

User entry

Positive floating-point number

Factory setting

1.01325 bar

Additional information

Dependency

The unit is taken from the **Pressure unit** parameter (→ 64)

Pressure cell adjustment



Navigation

Expert → Sensor → Sensor adjustm. → Install.settings → Press. cell adj.

Prerequisite

With order code for "Sensor version":

- Option "Mass steam (integrated pressure/temperature measurement)"
- Option "Mass gas/liquid (integrated pressure/temperature measurement)"

Only available for Prowirl F, R, O.

Description

Description: adjustment process for an offset correction of the integrated pressure measurement.

Selection

- Cancel
- Yes
- Discard offset

Factory setting

Cancel

Additional information	<i>Selection</i>
	■ Cancel Cancel the offset adjustment and keep the current offset value ■ Yes Accept the current values for reference pressure and measured pressure for calculating the offset value ■ Discard offset Reset the existing offset value to 0

Pressure cell offset value

Navigation	 Expert → Sensor → Sensor adjustm. → Install.settings → p cell offs.val
Prerequisite	With order code for "Sensor version": ■ Option "Mass steam (integrated pressure/temperature measurement)" ■ Option "Mass gas/liquid (integrated pressure/temperature measurement)"  Only available for Prowirl F, R, O.
Description	Displays the current offset value that the measuring device uses to correct the internal pressure measured value.
User interface	Signed floating-point number
Additional information	<i>Dependency</i>  The unit is taken from the Pressure unit parameter (→  64)

"Additional settings" submenu

Navigation  Expert → Sensor → Sensor adjustm. → Add. settings

► Additional settings

Temperature calculation mode



Navigation	 Expert → Sensor → Sensor adjustm. → Add. settings → Temp. calc. mode
Description	Select the temperature sensor to use for calculations.
Selection	■ Off ■ PT 1 ■ PT 2 ■ PT1 + PT2

Factory setting Off

Min. flow coefficient



Navigation  Expert → Sensor → Sensor adjustm. → Add. settings → Min. flow coeff.

Description Serves to maintain compatibility with older software versions. Do not change the default value 11.

User entry 0 to 50

Factory setting 6.0

Min. vortex frequency liquid



Navigation  Expert → Sensor → Sensor adjustm. → Add. settings → Min. freq. liq.

Description Enter minimum vortex frequency measured.

User entry Positive floating-point number

Factory setting 2.0 Hz

Max. vortex frequency liquid



Navigation  Expert → Sensor → Sensor adjustm. → Add. settings → Max. freq. liq.

Description Enter maximum vortex frequency measured.

User entry Positive floating-point number

Factory setting 388.2 Hz

Min. vortex frequency gas



Navigation  Expert → Sensor → Sensor adjustm. → Add. settings → Min. freq. gas

Description Enter minimum vortex frequency measured.

User entry Positive floating-point number

Factory setting 71.1 Hz

Max. vortex frequency gas

Navigation	  Expert → Sensor → Sensor adjustm. → Add. settings → Max. freq. gas
Description	Enter maximum vortex frequency measured.
User entry	Positive floating-point number
Factory setting	3 072 Hz

Sensor adjustment

Navigation	  Expert → Sensor → Sensor adjustm. → Add. settings → Sensor adjustm.
Description	Perform a sensor adjustment to record the reference data.
Selection	■ Cancel ■ Start
Factory setting	Cancel

DSP mode

Navigation	  Expert → Sensor → Sensor adjustm. → Add. settings → DSP mode
Description	Is non-functional (for future use).
Selection	■ Mode 1 ■ Mode 2 ■ Mode 3 ■ Mode 4

3.2.7 "Calibration" submenu

Navigation   Expert → Sensor → Calibration

► Calibration

Calibration factor

→  115

Meter body properties

→  115

Calibration factor

Navigation	  Expert → Sensor → Calibration → Cal. factor
Description	Displays the calibration factor. The calibration factor is determined during device calibration.
User interface	Positive floating-point number
Factory setting	This value is always > 0 when the device is delivered from the factory.
Additional information	<i>Description</i> Factor by which the measured vortex frequency must be divided in order to calculate the volume flow. <i>Unit</i> In 1/m³, or vortex pulses per cubic meter

Meter body properties

Navigation	  Expert → Sensor → Calibration → Meter body prop.
Description	Displays informative text about the measuring tube.
User interface	Max. 32 characters such as letters, numbers or special characters (e.g. @, %, /)
Factory setting	-----
Additional information	<i>Description</i> Summarized information about the meter body. <i>Example</i> DN25F-PN40: nominal diameter DN25, flange type, pressure rating 40 bar

3.3 "Communication" submenu

Navigation   Expert → Communication

► Communication

► Modbus configuration

→  116

► Modbus information

→  118

► Modbus data map	→ 119
► APL port	→ 120
► Web server	→ 122

3.3.1 "Modbus configuration" submenu

Navigation Expert → Communication → Modbus config.

► Modbus configuration	
Byte order	→ 116
Failure mode	→ 117
Fieldbus write access	→ 118

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 (→ 116) 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 (→  116).

The bytes are transmitted depending on the selection in the **Byte order** parameter (→  116):

FLOAT				
	Sequence			
Options	1.	2.	3.	4.
1 - 0 - 3 - 2 *	Byte 1 (MMMMMMMM)	Byte 0 (MMMMMMMM)	Byte 3 (SEEEEEEE)	Byte 2 (EMMMMMMM)
0 - 1 - 2 - 3	Byte 0 (MMMMMMMM)	Byte 1 (MMMMMMMM)	Byte 2 (EMMMMMMM)	Byte 3 (SEEEEEEE)
2 - 3 - 0 - 1	Byte 2 (EMMMMMMM)	Byte 3 (SEEEEEEE)	Byte 0 (MMMMMMMM)	Byte 1 (MMMMMMMM)
3 - 2 - 1 - 0	Byte 3 (SEEEEEEE)	Byte 2 (EMMMMMMM)	Byte 1 (MMMMMMMM)	Byte 0 (MMMMMMMM)
* = factory setting, S = sign, E = exponent, M = mantissa				

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

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

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 ²⁾. ■ 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.
------------------------	--

Fieldbus write 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
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.

3.3.2 "Modbus information" submenu

Navigation  Expert → Communication → Modbus info

► Modbus information

Device ID

→  119

Device revision

→  119

2) Not a Number

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

3.3.3 "Modbus data map" submenu

Navigation  Expert → Communication → Modbus data map

► Modbus data map

Scan list register 0 to 15

→  119

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		
Additional information	To read out the current values of the device parameters defined in the scan list register, the Modbus client accesses the data area of the Modbus data map.	
Client access to data area		Via register addresses 5051-5081

Data area					
Device parameter value	Modbus register	I/O data	Delivery status of registers 5001-5016	Data type*	Access**
Value of scan list register 0	5051	Volume flow	35944	Integer/Real	Read/write
Value of scan list register 1	5053	Mass flow	35958	Integer/Real	Read/write
Value of scan list register 2	5055	Corrected volume flow	35946	Integer/Real	Read/write
Value of scan list register 3	5057	Flow velocity	5085	Integer/Real	Read/write
Value of scan list register 4	5059	Temperature	35952	Integer/Real	Read/write
Value of scan list register 5	5061	Totalizer 1	2610	Integer/Real	Read/write
Value of scan list register 6	5063	Totalizer 2	2810	Integer/Real	Read/write
Value of scan list register 7	5065	Totalizer 3	3010	Integer/Real	Read/write
Value of scan list register 8	5067	Actual diagnostics (no.)	6859	Integer/Real	Read/write
Value of scan list register 9	5069	Tot1 Control	2608	Integer/Real	Read/write
Value of scan list register 10	5071	Tot2 Control	2808	Integer/Real	Read/write
Value of scan list register 11	5073	Tot3 Control	3008	Integer/Real	Read/write
Value of scan list register 12	5075	-	-	Integer/Real	Read/write
Value of scan list register 13	5077	-	-	Integer/Real	Read/write
Value of scan list register 14	5079	-	-	Integer/Real	Read/write
Value of scan list register 15	5081	-	-	Integer/Real	Read/write
* Data type depends on the device parameters entered in the scan list.					
** Data access depends on the device parameters entered in the scan list. If the device parameter entered supports read and write access, the parameter can also be accessed via the data area.					

3.3.4 "APL port" submenu

Navigation  Expert → Communication → APL port → IP address

► APL port

IP address

→  121

Subnet mask

→  121

Default gateway	→  121
MAC address	→  122
DHCP client	→  122

IP address

Navigation	  Expert → Communication → APL port → IP address
Description	Display or enter the IP address of the web server integrated in the measuring instrument.
User entry	4 octet: 0 to 255 (in the particular octet)
Factory setting	192.168.1.212

Subnet mask

Navigation	  Expert → Communication → APL port → 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 → APL port → Default gateway
Description	Display or enter the Default gateway (→  121).
User entry	4 octet: 0 to 255 (in the particular octet)
Factory setting	0.0.0.0

MAC address

Navigation	 Expert → Communication → APL port → MAC Address
Description	Displays the MAC ³⁾ address of the measuring instrument.
User interface	Unique 12-digit character string comprising letters and numbers
Factory setting	Each measuring instrument is given an individual address.
Additional information	<i>Example</i> For the display format 00:07:05:10:01:5F

DHCP client

Navigation	 Expert → Communication → APL port → DHCP client
Description	Use this function to activate and deactivate the DHCP client functionality.
Selection	■ Off ■ On
Factory setting	On
Additional information	<i>Result</i> If the DHCP client functionality of the web server is activated, the IP address (→  121), Subnet mask (→  121) and Default gateway (→  121) are set automatically.  ■ Identification is via the MAC address of the measuring device. ■ The IP address (→  121) in the IP address parameter (→  121) is ignored as long as the DHCP client parameter (→  122) is active. This is also the case, in particular, if the DHCP server cannot be reached. The IP address (→  121) in the parameter of the same name is only used if the DHCP client parameter (→  122) is inactive.

3.3.5 "Web server" submenu

Navigation  Expert → Communication → Web server

► Web server

Web server language →  123

3) Media Access Control

IP address	→  123
Subnet mask	→  124
Default gateway	→  124
Web server functionality	→  124
Login page	→  125

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) ■ العربية (Arabic) * ■ Bahasa Indonesia ■ ภาษาไทย (Thai) * ■ tiếng Việt (Vietnamese) * ■ čeština (Czech)
Factory setting	English

IP address



Navigation	  Expert → Communication → Web server → IP address
Description	Display or enter the IP address of the web server integrated in the measuring instrument.
User entry	4 octet: 0 to 255 (in the particular octet)

* Visibility depends on order options or device settings

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 (→  121).

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 FieldCare operating tool or the DeviceCare operating tool.

Selection

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

Login page



Navigation

 Expert → Communication → Web server → Login page

Description

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

Selection

- Without header
- With header

Factory setting

With header

3.4 "Application" submenu

Navigation

 Expert → Application

 Application	
Reset all totalizers	→  125
 Totalizer 1 to n	→  126

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 all totalizers to 0 and restarts the totaling process. This deletes all the previously aggregated flow values.

3.4.1 "Totalizer 1 to n" submenu

Navigation

 Expert → Application → Totalizer 1 to n

► Totalizer 1 to n

Assign process variable 1 to n

→  126

Mass unit

→  127

Volume unit

→  127

Corrected volume unit

→  128

Totalizer 1 to n control

→  128

Preset value 1 to n

→  129

Totalizer 1 to n failure behavior

→  130

Assign process variable 1 to n

Navigation

 Expert → Application → Totalizer 1 to n → AssignVariab. 1 to n

Description

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

- Selection
- Off
 - Volume flow
 - Corrected volume flow
 - Mass flow
 - Total mass flow *
 - Condensate mass flow *
 - Energy flow *
 - Heat flow difference *

* Visibility depends on order options or device settings

- Factory setting**
- Totalizer 1: Volume flow
 - Totalizer 2: Mass flow
 - Totalizer 3: Corrected volume flow

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 (→  126) is still displayed in the **Totalizer 1 to n** submenu. All other parameters in the submenu are hidden.

Mass unit

Navigation  Expert → Application → Totalizer 1 to n → Mass unit

Prerequisite The **Mass flow** option is selected in the **Assign process variable** parameter (→  126) of the **Totalizer 1 to n** submenu.

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

- Selection**
- | <i>SI units</i> | <i>US units</i> |
|-----------------|-----------------|
| ■ g | ■ oz |
| ■ kg | ■ lb |
| ■ t | ■ STon |

- Factory setting**
- Country-specific:
- kg
 - lb

Additional information *Selection*

 For an explanation of the abbreviated units: →  169

Volume unit

Navigation  Expert → Application → Totalizer 1 to n → Volume unit

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

Selection	<i>SI units</i>	<i>US units</i>	<i>Imperial units</i>
	■ cm³ ■ dm³ ■ m³ ■ ml ■ l ■ hl ■ Ml Mega	■ af ■ ft³ ■ Mft³ ■ Mft³ ■ fl oz (us) ■ gal (us) ■ kgal (us) ■ Mgal (us) ■ bbl (us;oil) ■ bbl (us;liq.) ■ bbl (us;beer) ■ bbl (us;tank)	■ gal (imp) ■ Mgal (imp) ■ bbl (imp;beer) ■ bbl (imp;oil)

Factory setting m³

Additional information *Selection*



For an explanation of the abbreviated units: → 169

Corrected volume unit

Navigation Expert → Application → Totalizer 1 to n → Corr. vol. unit

Prerequisite The **Corrected volume flow** option is selected in the **Assign process variable** parameter (→ 126) of the **Totalizer 1 to n** submenu.

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

Selection	<i>SI units</i>	<i>US units</i>	<i>Imperial units</i>
	■ Nl ■ Nhl ■ Nm³ ■ Sl ■ Sm³	■ Sft³ ■ MSft³ ■ MMSft³ ■ Sgal (us) ■ Sbbbl (us;liq.) ■ Sbbbl (us;oil)	Sgal (imp)

Factory setting Sm³

Additional information *Selection*



For an explanation of the abbreviated units: → 169

Totalizer 1 to n control

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

Prerequisite A process variable is selected in the **Assign process variable** parameter (→ 126) of the **Totalizer 1 to n** submenu.

Description Use this function to select the control of totalizer value 1-3.

Selection

- Totalize
- Reset + hold
- Preset + hold
- Reset + totalize
- Preset + totalize
- Hold

Factory setting Totalize

Additional information *Selection*

Options	Description
Totalize	The totalizer is started or continues running.
Reset + hold	The totaling process is stopped and the totalizer is reset to 0.
Preset + hold ¹⁾	The totaling process is stopped and the totalizer is set to its defined start value from the Preset value parameter.
Reset + totalize	The totalizer is reset to 0 and the totaling process is restarted.
Preset + totalize ¹⁾	The totalizer is set to the defined start value in the Preset value parameter and the totaling process is restarted.

1) Visible depending on the order options or device settings

Preset value 1 to n

Navigation  Expert → Application → Totalizer 1 to n → Preset value 1 to n

Prerequisite A process variable is selected in the **Assign process variable** parameter (→  126) of the **Totalizer 1 to n** submenu.

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

User entry Signed floating-point number

Factory setting Depends on country:

- 0 m³
- 0 ft³

Additional information *User entry*



Example

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

Totalizer 1 to n failure behavior



Navigation	 Expert → Application → Totalizer 1 to n → FailureBehav. 1 to n
Description	Select totalizer behavior in the event of a device alarm.
Selection	■ Hold ■ Continue ■ Last valid value + continue
Factory setting	Hold

3.5 "Diagnostics" submenu

Navigation  Expert → Diagnostics

► Diagnostics	
Actual diagnostics	→  131
Previous diagnostics	→  131
Operating time from restart	→  132
Operating time	→  132
► Diagnostic list	→  132
► Event logbook	→  134
► Device information	→  135
► Sensor information	→  139
► Main electronic module	→  140
► I/O module	→  141
► Display module	→  142
► Data logging	→  143
► Min/max values	→  148

▶ Heartbeat Technology	→ 153
▶ Simulation	→ 162

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	<i>Display</i>  Additional pending diagnostic messages can be viewed in the Diagnostic list submenu (→ 132).  Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the  key. <i>Example</i> For the display format: ⊗F271 Main electronic failure

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	<i>Display</i>  Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the  key. <i>Example</i> For the display format: ⊗F271 Main electronic failure

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	<i>Indication</i> Maximum number of days: 9 999(corresponds to approx. 27 years and 5 months)

3.5.1 "Diagnostic list" submenu

Navigation   Expert → Diagnostics → Diagnostic list

► Diagnostic list

Diagnostics 1

→  132

Diagnostics 2

→  133

Diagnostics 3

→  133

Diagnostics 4

→  134

Diagnostics 5

→  134

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	<i>Display</i>  Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the  key. <i>Examples</i> For the display format: ■  S442 Frequency output ■  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	<i>Display</i>  Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the  key. <i>Examples</i> For the display format: ■  S442 Frequency output ■  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	<i>Display</i>  Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the  key. <i>Examples</i> For the display format: ■  S442 Frequency output ■  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: ▪  S442 Frequency output ▪  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  key. Examples For the display format: ▪  S442 Frequency output ▪  F276 I/O module failure

3.5.2 "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

→  135

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

3.5.3 "Device information" submenu

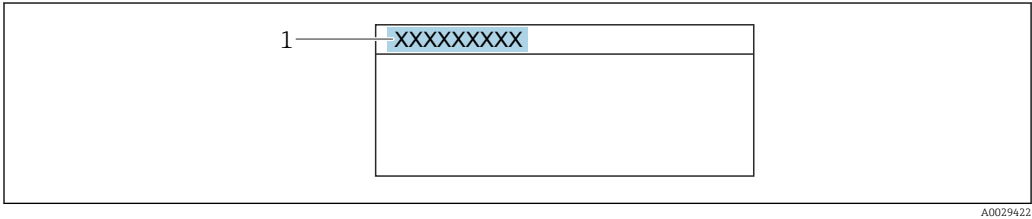
Navigation Expert → Diagnostics → Device info

► Device information		
Device tag		→ 136
Serial number		→ 136
Firmware version		→ 137
Device name		→ 137
Order code		→ 137
Extended order code 1		→ 138
Extended order code 2		→ 138
Extended order code 3		→ 138

Configuration counter	→ 138
ENP version	→ 139

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	Character string comprising numbers, letters and special characters
Factory setting	Prowirl
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	<i>Display</i>  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	Shows the name of the transmitter.
	 The name can be found on the nameplate of the transmitter.
User interface	Character string comprising numbers, letters and special characters
Factory setting	Prowirl200 MBAPL
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	<i>Description</i>  The order code can be found on the nameplate of the sensor and transmitter in the "Order code" field. The order code is generated from the extended order code through a process of reversible transformation. The extended order code indicates the attributes for all the device features in the product structure. The device features are not directly readable from the order code.  Uses of the order code ■ To order an identical spare device. ■ To identify the device quickly and easily, e.g. when contacting Endress+Hauser.

Extended order code 1

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

Displays the first part of the extended order code

On account of length restrictions, the extended order code is split into a maximum of 3 parameters.

User interface

Character string

Additional information*Description*

The extended order code indicates the version of all the features of the product structure for the measuring device and thus uniquely identifies the measuring device.



The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.

Extended order code 2

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

Displays the second part of the extended order code.

User interface

Character string

Additional informationFor additional information, see **Extended order code 1** parameter (→  138)

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 informationFor additional information, see **Extended order code 1** parameter (→  138)

Configuration counter

Navigation Expert → Diagnostics → Device info → Config. counter**Description**

Displays the number of parameter modifications for the device. When the user changes a parameter setting, this counter is incremented.

User interface

0 to 65 535

ENP version	
Navigation	  Expert → Diagnostics → Device info → ENP version
Description	Displays the version of the electronic nameplate.
User interface	Character string
Factory setting	2.02.00
Additional information	<i>Description</i> This electronic nameplate stores a data record for device identification that includes more data than the nameplates attached to the outside of the device.

3.5.4 "Sensor information" submenu

Navigation   Expert → Diagnostics → Sensor info

► Sensor information

DSC sensor serial number

→  139

DSC sensor serial number	
Navigation	  Expert → Diagnostics → Sensor info → DSC serial no.
Description	Displays the serial number of the DSC sensor that is used in the measuring tube.
User interface	Character string
Additional information	<i>Description</i> The serial number and other individual values of the DSC sensor, such as temperature range and reference values, are stored on the S-DAT.  If the DSC sensor is replaced, the S-DAT must also always be replaced.

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

Navigation  Expert → Diagnostics → Main elec. mod.

► Main electronic module

Firmware version

→  140

Build no. software

→  140

Bootloader revision

→  140

Firmware version

Navigation  Expert → Diagnostics → Main elec. mod. → 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. mod. → 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. mod. → Bootloader rev.

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

User interface Positive integer

3.5.6 "I/O module" submenu

Navigation  Expert → Diagnostics → I/O module

► I/O module

Firmware version

→  141

Build no. software

→  141

Bootloader revision

→  141

Firmware version

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

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

User interface Positive integer

3.5.7 "Display module" submenu

Navigation  Expert → Diagnostics → Display module

► Display module

Firmware version

→  142

Build no. software

→  142

Bootloader revision

→  142

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

3.5.8 "Data logging" submenu

Navigation  Expert → Diagnostics → Data logging

► Data logging		
Assign channel 1	→ 	143
Assign channel 2	→ 	144
Assign channel 3	→ 	144
Assign channel 4	→ 	145
Logging interval	→ 	145
Clear logging data	→ 	146
Data logging	→ 	146
Logging delay	→ 	147
Data logging control	→ 	147
Data logging status	→ 	147
Entire logging duration	→ 	148

Assign channel 1



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

Prerequisite The **Extended HistoROM** application package is available.
 The software options currently enabled are displayed in the **Software option overview** parameter (→  42).

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

- Selection
- Off
 - Volume flow
 - Corrected volume flow
 - Mass flow
 - Flow velocity
 - Temperature
 - Vortex frequency
 - Calculated saturated steam pressure *

* Visibility depends on order options or device settings

- Steam quality *
- Total mass flow *
- Condensate mass flow *
- Energy flow *
- Heat flow difference *
- Reynolds number *
- Density *
- Pressure *
- Specific volume *
- Degrees of superheat *
- Electronics temperature

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 **Extended HistoROM** application package is available.

 The software options currently enabled are displayed in the **Software option overview** parameter (→  42).

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

Selection For the picklist, see **Assign channel 1** parameter (→  143)

Factory setting Off

Assign channel 3

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

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

 The software options currently enabled are displayed in the **Software option overview** parameter (→  42).

* Visibility depends on order options or device settings

Description	Use this function to assign a process variable to the logging channel.
Selection	For the picklist, see Assign channel 1 parameter (→  143)
Factory setting	Off

Assign channel 4

Navigation	  Expert → Diagnostics → Data logging → Assign chan. 4
Prerequisite	The Extended HistoROM application package is available.  The software options currently enabled are displayed in the Software option overview parameter (→  42).
Description	Use this function to assign a process variable to the logging channel.
Selection	For the picklist, see Assign channel 1 parameter (→  143)
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 (→  42).
Description	Use this function to enter the logging interval $T_{\log}$ for data logging.
User entry	1.0 to 3 600.0 s
Factory setting	1.0 s
Additional information	<i>Description</i> This defines the interval between the individual data points in the data log, and thus the maximum loggable process time $T_{\log}$: ■ If 1 logging channel is used: $T_{\log} = 1000 \times t_{\log}$ ■ If 2 logging channels are used: $T_{\log} = 500 \times t_{\log}$ ■ If 3 logging channels are used: $T_{\log} = 333 \times t_{\log}$ ■ If 4 logging channels are used: $T_{\log} = 250 \times t_{\log}$

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

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

Example

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

Clear logging data

Navigation  Expert → Diagnostics → Data logging → Clear logging

Prerequisite The **Extended HistoROM** application package is available.
 The software options currently enabled are displayed in the **Software option overview** parameter (→  42).

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 (→  146), the Not overwriting option is selected.
Description	Use this function to enter the time delay for measured value logging.
User entry	0 to 999 h
Factory setting	0 h
Additional information	<i>Description</i> Once data logging has been started with the Data logging control parameter (→  147), 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 (→  146), the Not overwriting option is selected.
Description	Use this function to start and stop measured value logging.
Selection	■ None ■ Delete + start ■ Stop
Factory setting	None
Additional information	<i>Selection</i> ■ None Initial measured value logging status. ■ Delete + start All the measured values recorded for all the channels are deleted and measured value logging starts again. ■ Stop Measured value logging is stopped.

Data logging status

Navigation	 Expert → Diagnostics → Data logging → Data log. status
Prerequisite	In the Data logging parameter (→  146), 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 (→ 146), the Not overwriting option is selected.
Description	Displays the total logging duration.
User interface	Positive floating-point number
Factory setting	0 s

3.5.9 "Min/max values" submenu

Navigation

Expert → Diagnostics → Min/max val.

▶ Min/max values

Reset min/max values

→

149

▶ Preamplifier temperature

→

149

▶ Medium temperature

→

150

▶ Flow velocity

→

151

▶ External pressure

→

151

► Measuring tube pressure	→ 152
► Pressure cell temperature	→ 152

Reset min/max values

Navigation	 Expert → Diagnostics → Min/max val. → Reset min/max
Description	Use this function to select measured variables whose minimum, maximum and average measured values are to be reset.
Selection	■ Cancel ■ Flow velocity ■ Pressure
Factory setting	Cancel

"Preamplifier temperature" submenu

Navigation	 Expert → Diagnostics → Min/max val. → Preamplif. temp
► Preamplifier temperature Minimum value → 149 Maximum value → 150	

Minimum value

Navigation	 Expert → Diagnostics → Min/max val. → Preamplif. temp → Minimum value
Description	Displays the lowest previously measured temperature value of the pre-amplifier module.
User interface	0 to 1 000 °C
Additional information	Dependency  The unit is taken from the Temperature unit parameter (→ 65)

Maximum value

Navigation	 Expert → Diagnostics → Min/max val. → Preamplif. temp → Maximum value
Description	Displays the highest previously measured temperature value of the pre-amplifier module.
User interface	0 to 1 000 °C
Additional information	<i>Dependency</i>  The unit is taken from the Temperature unit parameter (→  65)

"Medium temperature" submenu

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

► Medium temperature

Minimum value

→  150

Maximum value

→  150

Minimum value

Navigation	 Expert → Diagnostics → Min/max val. → Medium temp. → Minimum value
Description	Displays the lowest previously measured medium temperature.
User interface	0 to 1 000 °C
Additional information	<i>Dependency</i>  The unit is taken from the Temperature unit parameter (→  65)

Maximum value

Navigation	 Expert → Diagnostics → Min/max val. → Medium temp. → Maximum value
Description	Displays the highest previously measured medium temperature.
User interface	0 to 1 000 °C

Additional information

Dependency

 The unit is taken from the **Temperature unit** parameter (→  65)

"Flow velocity" submenu

Navigation   Expert → Diagnostics → Min/max val. → Flow velocity

► Flow velocity

Maximum value

→  151

Maximum value

Navigation   Expert → Diagnostics → Min/max val. → Flow velocity → Maximum value

Description Displays the highest previously measured flow velocity.

User interface Positive floating-point number

Additional information Dependency

 The unit is taken from the **Velocity unit** parameter (→  68)

"External pressure" submenu

Navigation   Expert → Diagnostics → Min/max val. → External press.

► External pressure

Maximum value

→  151

Maximum value

Navigation   Expert → Diagnostics → Min/max val. → External press. → Maximum value

Description Displays the highest previously measured value for external pressure measurement.

User interface Positive floating-point number

Additional information

Dependency

 The unit is taken from the **Pressure unit** parameter (→  64)

"Measuring tube pressure" submenu

Navigation   Expert → Diagnostics → Min/max val. → Meas.tube press.

► Measuring tube pressure

Maximum value →  152

Maximum value

Navigation

  Expert → Diagnostics → Min/max val. → Meas.tube press. → Maximum value

Description

Displays the highest previously measured value for internal pressure measurement.

User interface

Positive floating-point number

Factory setting

0 bar

Additional information

Dependency

 The unit is taken from the **Pressure unit** parameter (→  64)

"Pressure cell temperature" submenu

Navigation   Expert → Diagnostics → Min/max val. → Press.cell temp.

► Pressure cell temperature

Maximum value →  153

Minimum value →  153

Maximum value	
Navigation	 Expert → Diagnostics → Min/max val. → Press.cell temp. → Maximum value
Description	Displays the highest previously measured temperature of the pressure cell.
User interface	0 to 1 000 °C
Factory setting	0 °C
Additional information	<i>Dependency</i>  The unit is taken from the Temperature unit parameter (→  65)
Minimum value	

Navigation	 Expert → Diagnostics → Min/max val. → Press.cell temp. → Minimum value
Description	Displays the lowest previously measured temperature of the pressure cell.
User interface	0 to 1 000 °C
Factory setting	1 000 °C
Additional information	<i>Dependency</i>  The unit is taken from the Temperature unit parameter (→  65)

3.5.10 "Heartbeat Technology" submenu

 For detailed information on the parameter descriptions for the **Heartbeat Verification**: Special Documentation for the device

Navigation  Expert → Diagnostics → Heartbeat Techn.

▶ Heartbeat Technology	
▶ Heartbeat base settings	→  154
▶ Performing verification	→  154
▶ Verification results	→  158

"Heartbeat base settings" submenu

Navigation  Expert → Diagnostics → Heartbeat Techn. → Base settings

▶ Heartbeat base settings

Plant operator

→  154

Location

→  154

Plant operator

Navigation  Expert → Diagnostics → Heartbeat Techn. → Base settings → Plant operator

Description Use this function to enter the plant operator.

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

Location

Navigation  Expert → Diagnostics → Heartbeat Techn. → Base settings → Location

Description Use this function to enter the location.

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

"Performing verification" wizard

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

▶ Performing verification

Year

→  155

Month

→  155

Day

→  156

Hour

→  156

AM/PM

→  156

Minute	→  157
Start verification	→  157
Progress	→  157
Status	→  157
Verification result	→  158

Year

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

Month

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

Day		
Navigation	 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Day	
Prerequisite	 Can be edited if Heartbeat Verification is not active.	
Description	Use this function to enter the day of the month of recalibration.	
User entry	1 to 31 d	
Factory setting	1 d	
Hour		
Navigation	 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Hour	
Prerequisite	 Can be edited if Heartbeat Verification is not active.	
Description	Use this function to enter the hour of recalibration.	
User entry	0 to 23 h	
Factory setting	12 h	
AM/PM		
Navigation	 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → AM/PM	
Prerequisite	 Can be edited if Heartbeat Verification is not active. The dd.mm.yy hh:mm am/pm option or the mm/dd/yy hh:mm am/pm option is selected in the Date/time format parameter (2812) (→  71).	
Description	Use this function to select the time entry in the morning (AM option) or afternoon (PM option) in the case of 12-hour notation.	
Selection	■ AM ■ PM	
Factory setting	AM	

Minute 	
Navigation	  Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Minute
Prerequisite	 Can be edited if Heartbeat Verification is not active.
Description	Use this function to enter the minutes of recalibration.
User entry	0 to 59 min
Factory setting	0 min
Start verification 	
Navigation	  Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Start verificat.
Description	Start the verification. To carry out a complete verification, select the selection parameters individually. Once the external measured values have been recorded, verification is started using the Start option.
Selection	■ Cancel ■ Start
Factory setting	Cancel
Progress	
Navigation	  Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Progress
Description	The progress of the process is indicated.
User interface	0 to 100 %
Status	
Navigation	  Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Status
Description	Displays the current status of the verification.
User interface	■ Done ■ 0% ■ Failed ■ Not done

Verification result

Navigation	 Expert → Diagnostics → Heartbeat Techn. → Perform.verific. → Verific. result
Description	Displays the overall result of the verification.  Detailed description of the classification of the results:
User interface	■ Not supported ■ Passed ■ Not done ■ Failed

"Verification results" submenu

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

► Verification results		
Date/time (manually entered)	→	 158
Verification ID	→	 159
Operating time	→	 159
Verification result	→	 159
Sensor	→	 160
Preamplifier module	→	 160
Main electronic module	→	 160
I/O module	→	 161
System status	→	 161

Date/time (manually entered)

Navigation	 Expert → Diagnostics → Heartbeat Techn. → Verific. results → Date/time
Prerequisite	The verification has been performed.
Description	Date and time.

User interface dd.mmmm.yyyy; hh:mm

Factory setting 1 January 2010; 12:00

Verification ID

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

Prerequisite The verification has been performed.

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

User interface 0 to 65 535

Factory setting 0

Operating time

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

Prerequisite The verification has been performed.

Description Indicates how long the device has been in operation up to the verification.

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

Factory setting –

Verification result

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

Description Displays the overall result of the verification.



Detailed description of the classification of the results:

User interface

- Not supported
- Passed
- Not done
- Failed

Sensor

Navigation	 Expert → Diagnostics → Heartbeat Techn. → Verific. results → Sensor
Prerequisite	The Failed option was shown in the Overall result parameter (→  158).
Description	Displays the result for the sensor.  Detailed description of the classification of the results:
User interface	■ Not supported ■ Passed ■ Not done ■ Failed
Factory setting	Not done

Preamplifier module

Navigation	 Expert → Diagnostics → Heartbeat Techn. → Verific. results → Preamplifier
Prerequisite	The Failed option was shown in the Overall result parameter (→  158).
Description	Displays the result for the sensor electronics module (ISEM).  Detailed description of the classification of the results:
User interface	■ Not supported ■ Passed ■ Not done ■ Failed
Factory setting	Not done

Main electronic module

Navigation	 Expert → Diagnostics → Heartbeat Techn. → Verific. results → Main elec. mod.
Prerequisite	The Failed option is shown in the Overall result parameter (→  158).
Description	Displays the result for the main electronics module.  Detailed description of the classification of the results:
User interface	■ Not supported ■ Passed ■ Not done ■ Failed

Factory setting Not done

I/O module

Navigation  Expert → Diagnostics → Heartbeat Techn. → Verific. results → I/O module

Prerequisite The **Failed** option was shown in the **Overall result** parameter (→  158).

Description Displays the result for I/O module monitoring of the I/O module.

- For pulse output: Accuracy of pulses (for external verification only)
- For frequency output: Accuracy of frequency (for external verification only)

 **Heartbeat Verification** does not check the digital inputs and outputs and does not issue a result for this.

 Detailed description of the classification of the results:

User interface

- Not supported
- Passed
- Not done
- Failed

Factory setting Not done

System status

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

Prerequisite The **Failed** option was shown in the **Overall result** parameter (→  158).

Description Displays the system condition. Tests the measuring device for active errors.

 Detailed description of the classification of the results:

User interface

- Not supported
- Passed
- Not done
- Failed

Factory setting Not done

3.5.11 "Simulation" submenu

Navigation  Expert → Diagnostics → Simulation

► Simulation		
Process variable simulation	→ 	162
Process value	→ 	163
Device alarm simulation	→ 	163
Diagnostic event category	→ 	163
Diagnostic event simulation	→ 	164

Process variable simulation



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

Description Use this function to select a process variable for the simulation process that is activated. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.

- Selection
- Off
 - Volume flow
 - Corrected volume flow
 - Mass flow
 - Flow velocity
 - Temperature
 - Calculated saturated steam pressure *
 - Steam quality *
 - Total mass flow *
 - Condensate mass flow *
 - Energy flow
 - Heat flow difference *
 - Reynolds number

Factory setting Off

Additional information Description

 The simulation value of the process variable selected is defined in the **Value process variable** parameter (→  163).

* Visibility depends on order options or device settings

Process value 	
Navigation	  Expert → Diagnostics → Simulation → Process value
Prerequisite	A process variable is selected in the Assign simulation process variable parameter (→  162).
Description	Use this function to enter a simulation value for the selected process variable. Subsequent measured value processing and the signal output use this simulation value. In this way, users can verify whether the measuring device has been configured correctly.
User entry	Depends on the process variable selected
Factory setting	0
Additional information	<i>User entry</i>  The unit of the displayed measured value is taken from the System units submenu (→  58).
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	<i>Description</i> 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 (→  164).
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	<i>Description</i>  For the simulation, you can choose from the diagnostic events of the category selected in the Diagnostic event category parameter (→  163).

4 Country-specific factory settings

4.1 SI units



Not valid for USA and Canada.

4.1.1 System units

Volume flow	m ³ /h option
Volume	m ³ option
Mass flow	kg/h option
Mass	kg option
Corrected volume flow	Nm ³ /h option
Corrected volume	Nm ³ option
Pressure	bar option
Temperature	°C option
Energy flow	kW option
Energy	kWh option
Calorific value (volume)	kJ/Nm ³ option
Calorific value (mass)	kJ/kg option
Velocity	m/s option
Density	kg/m ³ option
Dynamic viscosity	Pa s option
Specific heat capacity	kJ/(kgK) option
Length	mm option

4.1.2 Full scale values



The factory settings apply to the following parameters:
100% bar graph value 1

Nominal diameter [mm]	[m ³ /h]
15 25 > 15 40 >> 15	25
25 40 > 25 50 >> 25	125
40 50 > 40 80 >> 40	308
50 80 > 50 100 >> 50	513
80 100 > 80 150 >> 80	1 152

Nominal diameter [mm]	[m³/h]
100 150 > 100 200 >> 100	1995
150 200 > 150 250 >> 150	4539
200 250 > 200 300 >> 200	8713
250 300 > 250 350 >> 250	13735
300 350 > 300 400 >> 300	19701

4.1.3 Pulse value

Nominal diameter	Volume flow	Mass flow
[mm]	(~ 2 pulse/s) [m³/pulse]	(~ 2 pulse/s) [kg/pulse]
15 25 > 15 40 >> 15	0.00067	0.0034
25 40 > 25 50 >> 25	0.0035	0.018
40 50 > 40 80 >> 40	0.0085	0.044
50 80 > 50 100 >> 50	0.023	0.12
80 100 > 80 150 >> 80	0.051	0.26
100 150 > 100 200 >> 100	0.089	0.46
150 200 > 150 250 >> 150	0.20	1.04
200 250 > 200 300 >> 200	0.39	1.99
250 300 > 250 350 >> 250	0.61	3.14
300 350 > 300 400 >> 300	0.88	4.51

4.2 US units



Only valid for USA and Canada.

4.2.1 System units

Volume flow	ft ³ /min option
Volume	ft ³ option
Mass flow	lb/min option
Mass	lb option
Corrected volume flow	Sft ³ /min option
Corrected volume	Sft ³ option
Pressure	psi option
Temperature	°F option
Energy flow	Btu/h option
Energy	Btu option
Calorific value (volume)	Btu/Sft ³ option
Calorific value (mass)	Btu/lb option
Velocity	ft/s option
Density	lb/ft ³ option
Length	in option

4.2.2 Full scale values



The factory settings apply to the following parameters:
100% bar graph value 1

Nominal diameter [in]	[ft ³ /h]
½ 1 > ½ 1½ >> ½	882
1 1½ > 1 2 >> 1	4414
1½ 2 > 1½ 3 >> 1½	10876
2 3 > 2 4 >> 2	18116
3 4 > 3 6 >> 3	40682
4 6 > 4 8 >> 4	70452
6 8 > 6 10 >> 6	160293

Nominal diameter [in]	[ft ³ /h]
8 10 > 8 12 >> 8	307 696
10 12 > 10 14 >> 10	485 046
12 14 > 12 16 >> 12	695 734

4.2.3 Pulse value

Nominal diameter	Volume flow	Volume flow
[in]	~ 2 pulse/s [gal/pulse]	~ 2 pulse/s [lb/pulse]
½ 1 > ½ 1½ >> ½	0.18	0.0076
1 1½ > 1 2 >> 1	0.92	0.039
1½ 2 > 1½ 3 >> 1½	2.25	0.097
2 3 > 2 4 >> 2	6.02	0.26
3 4 > 3 6 >> 3	13.50	0.58
4 6 > 4 8 >> 4	23.42	1.01
6 8 > 6 10 >> 6	53.29	2.29
8 10 > 8 12 >> 8	102.29	4.40
10 12 > 10 14 >> 10	161.26	6.93
12 14 > 12 16 >> 12	231.30	9.94

5 Explanation of abbreviated units

5.1 SI units

Process variable	Units	Explanation
Calorific value (volume)	kWh/Nm ³ , MWh/Nm ³ , kJ/Nm ³ , MJ/Nm ³	Kilowatt hour, megawatt hour, kilojoule, megajoule/standard cubic meter
	kWh/Sm ³ , MWh/Sm ³ , kJ/Sm ³ , MJ/Sm ³	Kilowatt hour, megawatt hour, kilojoule, megajoule/standard cubic meter
Calorific value (mass)	kWh/kg, MWh/kg, kJ/kg, MJ/kg	Kilowatt hour, megawatt hour, kilojoule, megajoule/kilogram
Density	g/cm ³	Gram/volume unit
	kg/dm ³ , kg/l, kg/m ³	Kilogram/volume unit
	SD4°C, SD15°C, SD20°C	Specific density: The specific density is the ratio of the fluid density to the water density at a water temperature of 4 °C (39 °F), 15 °C (59 °F), 20 °C (68 °F).
	SG4°C, SG15°C, SG20°C	Specific gravity: The specific gravity is the ratio of the fluid density to the water density at a water temperature of 4 °C (39 °F), 15 °C (59 °F), 20 °C (68 °F).
Pressure	Pa a, kPa a, MPa a	Pascal, kilopascal, megapascal
	mbar a	Millibar (absolute)
	bar, torr, atm	Bar, torr, physical atmosphere
	gf/cm ² , kgf/cm ²	Gram force, kilogram force/square centimeter
Dynamic viscosity	Pa s	Pascal second
	cP, P	Centipoise, poise
Energy	kWh, MWh, GWh	Kilowatt hour, megawatt hour, gigawatt hour
	kJ, MJ, GJ	Kilojoule, megajoule, gigajoule
	kcal, Mcal, Gcal	Kilocalories, megacalories, gigacalories
Energy flow	kW, MW, GW	Kilowatt, megawatt
	kJ/s, kJ/min, kJ/h, kJ/d	Kilojoule/time unit
	MJ/s, MJ/min, MJ/h, MJ/d	Megajoule/time unit
	GJ/s, GJ/min, GJ/h, GJ/d	Gigajoule/time unit
	kcal/s, kcal/min, kcal/h, kcal/d	Kilocalories/time unit
	Mcal/s, Mcal/min, Mcal/h, Mcal/d	Megacalories/time unit
	Gcal/s, Gcal/min, Gcal/h, Gcal/d	Gigacalories/time unit
Velocity	m/s	Meter/time unit
Length	mm, m	Millimeter, meter
Mass	g, kg, t	Gram, kilogram, metric ton
Mass flow	g/s, g/min, g/h, g/d	Gram/time unit
	kg/s, kg/min, kg/h, kg/d	Kilogram/time unit
	t/s, t/min, t/h, t/d	Metric ton/time unit
Corrected volume	Nl, Nm ³ , Sm ³	Normal liter, normal cubic meter, standard cubic meter
Corrected volume flow	Nl/s, Nl/min, Nl/h, Nl/d	Normal liter/time unit
	Nm ³ /s, Nm ³ /min, Nm ³ /h, Nm ³ /d	Normal cubic meter/time unit
	Sm ³ /s, Sm ³ /min, Sm ³ /h, Sm ³ /d	Standard cubic meter/time unit

Process variable	Units	Explanation
Specific heat capacity	kJ/(kgK), MJ/(kgK)	Kilojoule, megajoule/kilogram Kelvin
	kWh/(kgK)	Kilowatt hour/kilogram Kelvin
	kcal/(kgK)	Kilocalories/kilogram Kelvin
Temperature	°C , K	Celsius, Kelvin
Volume	cm ³ , dm ³ , m ³	Cubic centimeter, cubic decimeter, cubic meter
	ml, l	Milliliter, liter
Volume flow	cm ³ /s, cm ³ /min, cm ³ /h, cm ³ /d	Cubic centimeter/time unit
	dm ³ /s, dm ³ /min, dm ³ /h, dm ³ /d	Cubic decimeter/time unit
	m ³ /s, m ³ /min, m ³ /h, m ³ /d	Cubic meter/time unit
	ml/s, ml/min, ml/h, ml/d	Milliliter/time unit
	l/s, l/min, l/h, l/d	Liter/time unit
Time	s, m, h, d, y	Second, minute, hour, day, year

5.2 US units

Process variable	Units	Explanation
Calorific value (mass)	kWh/lb, MWh/lb, kJ/lb, MJ/lb	Kilowatt hour, kilojoule, British thermal unit, thousand British thermal units/pound
Density	lb/ft ³ , lb/gal (us)	Pound/cubic foot, pound/gallon
	lb/bbl (us;liq.), lb/bbl (us;beer), lb/bbl (us;oil), lb/bbl (us;tank)	Pound/volume unit
Pressure	psi	Psi
Velocity	ft/s	Foot/time unit
Length	in, ft	Inch, foot
Mass	oz, lb, STon	Ounce, pound, standard ton
Mass flow	oz/s, oz/min, oz/h, oz/d	Ounce/time unit
	lb/s, lb/min, lb/h, lb/d	Pound/time unit
	STon/s, STon/min, STon/h, STon/d	Standard ton/time unit
Corrected volume	Sft ³	Standard cubic foot
Corrected volume flow	Sft ³ /s, Sft ³ /min, Sft ³ /h, Sft ³ /d	Standard cubic foot/time unit
Temperature	°F, °R	Fahrenheit, Rankine
Volume	af	Acre foot
	ft ³	Cubic foot
	fl oz (us), gal (us), kgal (us), Mgal (us)	Fluid ounce, gallon, kilogallon, million gallon
	bbl (us;liq.), bbl (us;beer), bbl (us;oil), bbl (us;tank)	Barrel (normal liquids), barrel (beer), barrel (petrochemicals), barrel (filling tanks)
Volume flow	af/s, af/min, af/h, af/d	Acre foot/time unit
	ft ³ /s, ft ³ /min, ft ³ /h, ft ³ /d	Cubic foot/time unit
	fl oz/s (us), fl oz/min (us), fl oz/h (us), fl oz/d (us)	Fluid ounce/time unit
	gal/s (us), gal/min (us), gal/h (us), gal/d (us)	Gallon/time unit

Process variable	Units	Explanation
	kgal/s (us), kgal/min (us), kgal/h (us), kgal/d (us)	Kilogallon/time unit
	Mgal/s (us), Mgal/min (us), Mgal/h (us), Mgal/d (us)	Million gallon/time unit
	bbl/s (us;liq.), bbl/min (us;liq.), bbl/h (us;liq.), bbl/d (us;liq.)	Barrel/time unit (normal liquids) Normal liquids: 31.5 gal/bbl
	bbl/s (us;beer), bbl/min (us;beer), bbl/h (us;beer), bbl/d (us;beer)	Barrel /time unit (beer) Beer: 31.0 gal/bbl
	bbl/s (us;oil), bbl/min (us;oil), bbl/h (us;oil), bbl/d (us;oil)	Barrel/time unit (petrochemicals) Petrochemicals: 42.0 gal/bbl
	bbl/s (us;tank), bbl/min (us;tank), bbl/h (us;tank), bbl/d (us;tank)	Barrel/time unit (filling tank) Filling tanks: 55.0 gal/bbl
Time	s, m, h, d, y	Second, minute, hour, day, year
	am, pm	Ante meridiem (before midday), post meridiem (after midday)

5.3 Imperial units

Process variable	Units	Explanation
Calorific value (volume)	Btu/Sm ³ , MBtu/Sm ³	British thermal unit, thousand British thermal units/standard cubic meter
	Btu/Sft ³ , MBtu/Sft ³	British thermal unit, thousand British thermal units/standard cubic foot
Calorific value (mass)	Btu/lb, MBtu/lb	British thermal unit, thousand British thermal units/pound
Density	lb/gal (imp), lb/bbl (imp;beer), lb/bbl (imp;oil)	Pound/volume unit
Energy	Btu, MBtu, MMBtu	British thermal unit, thousand British thermal units, million British thermal units
Energy flow	Btu/s, Btu/min, Btu/h, Btu/day	British thermal unit/time unit
	MBtu/s, MBtu/min, MBtu/h, MBtu/d	Thousand British thermal units/time unit
	MMBtu/s, MMBtu/min, MMBtu/h, MMBtu/d	Million British thermal units/time unit
Specific heat capacity	Btu/(lb°R)	British thermal unit/pound degree Rankine
Volume	gal (imp), Mgal (imp)	Gallon, mega gallon
	bbl (imp;beer), bbl (imp;oil)	Barrel (beer), barrel (petrochemicals)
Volume flow	gal/s (imp), gal/min (imp), gal/h (imp), gal/d (imp)	Gallon/time unit
	Mgal/s (imp), Mgal/min (imp), Mgal/h (imp), Mgal/d (imp)	Mega gallon/time unit
	bbl/s (imp;beer), bbl/min (imp;beer), bbl/h (imp;beer), bbl/d (imp;beer)	Barrel /time unit (beer) Beer: 36.0 gal/bbl
	bbl/s (imp;oil), bbl/min (imp;oil), bbl/h (imp;oil), bbl/d (imp;oil)	Barrel/time unit (petrochemicals) Petrochemicals: 34.97 gal/bbl
Time	s, m, h, d, y	Second, minute, hour, day, year
	am, pm	Ante meridiem (before midday), post meridiem (after midday)

5.4 Other units

Process variable	Units	Explanation
Pressure	mmH ₂ O (4 °C)	Millimeter of water column (4 °C)
	mmH ₂ O (68 °F)	Millimeter of water column (68 °F)
	mmHg (0 °C)	Millimeter of mercury column (0 °C)
	inH ₂ O (4 °C)	Inch of water column (4 °C)
	inH ₂ O (68 °F)	Inch of water column (68 °F)
	ftH ₂ O (68 °F)	Foot of water column (68 °F)
	inHg (0 °C)	Inch of mercury (0 °C)

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