Description of Device Parameters
Proline Promag 400
HART

Electromagnetic flowmeter
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<td>4.2.5</td>
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1  About this document

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

It is used to perform tasks that require detailed knowledge of the function of the device:
- Commissioning measurements under difficult conditions
- Optimal adaptation of the measurement to difficult conditions
- Detailed configuration of the communication interface
- Error diagnostics in difficult cases

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

1.3  Using this document

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

<table>
<thead>
<tr>
<th>Complete parameter name</th>
<th>Write-protected parameter</th>
</tr>
</thead>
</table>

**Navigation**
- Navigation path to the parameter via the local display (direct access code) or web browser
- Navigation path to the parameter via the operating tool
  The names of the menus, submenus and parameters are abbreviated to the form in which they appear on the display and in the operating tool.

**Prerequisite**
The parameter is only available under these specific conditions

**Description**
Description of the parameter function

**Selection**
List of the individual options for the parameter
- Option 1
- Option 2

**User entry**
Input range for the parameter

**User interface**
Display value/data for the parameter

**Factory setting**
Default setting ex works

**Additional information**
Additional explanations (e.g. in examples):
- On individual options
- On display values/data
- On the input range
- On the factory setting
- On the parameter function

1.4  Symbols used

1.4.1  Symbols for certain types of information

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Tip" /></td>
<td>Indicates additional information.</td>
</tr>
<tr>
<td><img src="image" alt="Reference" /></td>
<td>Reference to documentation</td>
</tr>
<tr>
<td><img src="image" alt="Reference" /></td>
<td>Reference to page</td>
</tr>
<tr>
<td><img src="image" alt="Reference" /></td>
<td>Reference to graphic</td>
</tr>
<tr>
<td><img src="image" alt="Operation" /></td>
<td>Operation via local display</td>
</tr>
<tr>
<td><img src="image" alt="Operation" /></td>
<td>Operation via operating tool</td>
</tr>
<tr>
<td><img src="image" alt="Write-protected" /></td>
<td>Write-protected parameter</td>
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</table>
1.4.2 Symbols in graphics

<table>
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<th>Symbol</th>
<th>Meaning</th>
<th>Symbol</th>
<th>Meaning</th>
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<tbody>
<tr>
<td>1, 2, 3 ...</td>
<td>Item numbers</td>
<td>A, B, C, ...</td>
<td>Views</td>
</tr>
<tr>
<td>A-A, B-B, C-C, ...</td>
<td>Sections</td>
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1.5 Documentation

1.5.1 Standard documentation

Operating Instructions

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<td>Promag L 400</td>
<td>BA01062D</td>
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<tr>
<td>Promag W 400</td>
<td>BA01063D</td>
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1.5.2 Supplementary device-dependent documentation

Special Documentation

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<td>Display modules A309/A310</td>
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<tr>
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# 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.

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<td></td>
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<tr>
<td>Locking status (0004)</td>
<td>→ 12</td>
<td></td>
</tr>
<tr>
<td>Access status (0005)</td>
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<tr>
<td>Enter access code (0003)</td>
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<tr>
<td>System</td>
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<tr>
<td>Calibration</td>
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<td></td>
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<td></td>
</tr>
<tr>
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<td>→ 117</td>
<td></td>
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<td>-------</td>
<td></td>
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<td>▪ Diagnostic configuration</td>
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<td>▪ Reset all totalizers (2806)</td>
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<td>▪ Custody transfer logbook</td>
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<td>▪ Device information</td>
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</tr>
<tr>
<td>▪ Sensor electronic module (ISEM)</td>
<td>→ 177</td>
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</tr>
<tr>
<td>▪ Display module</td>
<td>→ 178</td>
<td></td>
</tr>
<tr>
<td>▪ Minimum/maximum values</td>
<td>→ 179</td>
<td></td>
</tr>
<tr>
<td>▪ Data logging</td>
<td>→ 181</td>
<td></td>
</tr>
</tbody>
</table>
Overview of the Expert operating menu

Proline Promag 400 HART

- Heartbeat Technology → 189
- Simulation → 189
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.

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<th>Expert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct access (0106)</td>
</tr>
<tr>
<td>Locking status (0004)</td>
</tr>
<tr>
<td>Access status (0005)</td>
</tr>
<tr>
<td>Enter access code (0003)</td>
</tr>
<tr>
<td>System</td>
</tr>
<tr>
<td>Sensor</td>
</tr>
<tr>
<td>Input</td>
</tr>
<tr>
<td>Output</td>
</tr>
<tr>
<td>Communication</td>
</tr>
<tr>
<td>Application</td>
</tr>
<tr>
<td>Diagnostics</td>
</tr>
</tbody>
</table>

Direct access

**Navigation**

Expert → Direct access (0106)

**Description**

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

**User entry**

0 to 65,535

**Additional information**

*User entry*

The direct access code consists of a 5-digit number (at maximum) and the channel number, which identifies the channel of a process variable: e.g. 00914-2. In the navigation view, this appears on the right-hand side in the header of the selected parameter.
1  Direct access code

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

### Locking status

#### Navigation

Expert → Locking status (0004)

#### Description

Displays the active write protection.

#### User interface

- Hardware locked
- CT active - defined parameters
- CT active - all parameters
- Temporarily locked

#### Additional information

*User interface*

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

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

### Selection

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>The access status displayed in the Access status display parameter (→ 28) applies. Only appears on local display.</td>
</tr>
<tr>
<td>Hardware locked (priority 1)</td>
<td>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).</td>
</tr>
<tr>
<td>CT active - defined parameters (priority 2)</td>
<td>The DIP switch for custody transfer mode is activated on the I/O module. This locks write access to defined parameters (e.g. via local display or operating tool). Only available for Promag W. For detailed information on custody transfer mode, see the Special Documentation for the device → 7</td>
</tr>
</tbody>
</table>
### Options

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT active - all parameters (priority 3)</td>
<td>Only available for Promag W.</td>
</tr>
<tr>
<td></td>
<td>The DIP switch for custody transfer mode is activated on the I/O module. This locks write access to all the parameters (e.g. via local display or operating tool).</td>
</tr>
<tr>
<td></td>
<td>For detailed information on custody transfer mode, see the Special Documentation for the device → 7</td>
</tr>
<tr>
<td>Temporarily locked (Priority 4)</td>
<td>Write access to the parameters is temporarily locked on account of internal processes running in the device (e.g. data upload/download, reset etc.). Once the internal processing has been completed, the parameters can be changed once again.</td>
</tr>
</tbody>
</table>

### Access status

**Navigation**

Expert → Access status (0005)

**Description**

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

**User interface**

- Operator
- Maintenance

**Factory setting**

Maintenance

**Additional information**

*Description*

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

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

*User interface*

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

### Enter access code

**Navigation**

Expert → Ent. access code (0003)

**Description**

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

**User entry**

Max. 16-digit character string comprising numbers, letters and special characters
3.1 "System" submenu

Navigation: Expert → System

- System
  - Display
  - Diagnostic handling
  - Administration

3.1.1 "Display" submenu

Navigation: Expert → System → Display

- Display
  - Display language (0104)
  - Format display (0098)
  - Value 1 display (0107)
  - 0% bargraph value 1 (0123)
  - 100% bargraph value 1 (0125)
  - Decimal places 1 (0095)
  - Value 2 display (0108)
  - Decimal places 2 (0117)
  - Value 3 display (0110)
  - 0% bargraph value 3 (0124)
  - 100% bargraph value 3 (0126)
  - Decimal places 3 (0118)
  - Value 4 display (0109)
  - Decimal places 4 (0119)
  - Display interval (0096)
Display language

**Navigation**

师范大学 → 系统 → 显示 → 显示语言 (0104)

**Prerequisite**

A local display is provided.

**Description**

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

**Selection**

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

**Factory setting**

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

* Visibility depends on order options or device settings
Description of device parameters

PROLINE PROMAG 400 HART

Format display

Navigation

Expert → System → Display → Format display (0098)

Prerequisite

A local display is provided.

Description

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

Selection

- 1 value, max. size
- 1 bargraph + 1 value
- 2 values
- 1 value large + 2 values
- 4 values

Factory setting

1 value, max. size

Additional information

Description

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

- The Value 1 display parameter (→ 18) to Value 4 display parameter (→ 23) are used to specify which measured values are shown on the local display and in what order.
- If more measured values are specified than the display mode selected permits, then the values alternate on the device display. The display time until the next change is configured via the Display interval parameter (→ 24).

Custody transfer mode

- Only available for Promag W.
- Once the measuring device has been enabled for custody transfer mode, the display automatically switches to the 1 value large + 2 values option.
- In addition, a padlock symbol appears in the header of the display (🔒).
- For detailed information on custody transfer mode, see the Special Documentation for the device → 7
Possible measured values shown on the local display:

"1 value, max. size" option

![1 value, max. size](image1)

"1 bargraph + 1 value" option

![1 bargraph + 1 value](image2)

"2 values" option

![2 values](image3)

"1 value large + 2 values" option

![1 value large + 2 values](image4)

"4 values" option

![4 values](image5)
**Value 1 display**

**Navigation**

Expert → System → Display → Value 1 display (0107)

**Prerequisite**

A local display is provided.

**Description**

Use this function to select one of the measured values shown on the local display.

**Selection**

- Volume flow
- Mass flow
- Corrected volume flow
- Flow velocity
- Conductivity
- Corrected conductivity
- Electronic temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Current output 1
- Noise
- Coil current shot time
- Reference electrode potential against PE
- Build-up measured value
- Test point 1
- Test point 2
- Test point 3

**Factory setting**

Volume flow

**Additional information**

*Description*

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

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

**Custody transfer mode**

Only available for Promag W.

Once the measuring device has been enabled for custody transfer mode, the display automatically switches to the **Totalizer 1** option.

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

*Dependency*

The unit of the displayed measured value is taken from the **System units** submenu (→ 51).

* Visibility depends on order options or device settings
0% bargraph value 1

Navigation
Expert → System → Display → 0% bargraph 1 (0123)

Prerequisite
A local display is provided.

Description
Use this function to enter the 0% bar graph value to be shown on the display for the measured value 1.

User entry
Signed floating-point number

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

Additional information
Description
The Format display parameter (→ 16) is used to specify that the measured value is to be displayed as a bar graph.

User entry
The unit of the displayed measured value is taken from the System units submenu (→ 51).

100% bargraph value 1

Navigation
Expert → System → Display → 100% bargraph 1 (0125)

Prerequisite
A local display is provided.

Description
Use this function to enter the 100% bar graph value to be shown on the display for the measured value 1.

User entry
Signed floating-point number

Factory setting
Depends on country and nominal diameter → 197

Additional information
Description
The Format display parameter (→ 16) is used to specify that the measured value is to be displayed as a bar graph.

User entry
The unit of the displayed measured value is taken from the System units submenu (→ 51).
### Decimal places 1

**Navigation**

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

**Prerequisite**

A measured value is defined in the **Value 1 display** parameter (→ [18]).

**Description**

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

**Selection**

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

**Factory setting**

`x.xx`

**Additional information**

*Description*

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

*Custody transfer mode*

[Only available for Promag W.]

Once the device has been enabled for custody transfer mode, the number of decimal places for the 1st display value changes depending on the approval for custody transfer and the nominal diameter.

For detailed information on custody transfer mode, see the Special Documentation for the device (→ [7]).

### Value 2 display

**Navigation**

[Expert → System → Display → Value 2 display (0108)]

**Prerequisite**

A local display is provided.

**Description**

Use this function to select one of the measured values shown on the local display.

**Selection**

For the picklist, see the **Value 2 display** parameter (→ [20]).

**Factory setting**

None
Additional information  

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

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

Custody transfer mode

Only available for Promag W.

Once the measuring device has been enabled for custody transfer mode, the display automatically switches to the Volume flow option.

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

Dependency

The unit of the displayed measured value is taken from the System units submenu (→ 51).

---

Decimal places 2

**Navigation**

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

**Prerequisite**

A measured value is specified in the Value 2 display parameter (→ 20).

**Description**

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

**Selection**

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

**Factory setting**

x.xx

**Additional information**  

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

---

Value 3 display

**Navigation**

Expert → System → Display → Value 3 display (0110)

**Prerequisite**

A local display is provided.

**Description**

Use this function to select one of the measured values shown on the local display.

**Selection**

For the picklist, see the Value 2 display parameter (→ 20)
Description of device parameters

Proline Promag 400 HART

Factory setting

None

Additional information

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

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

Selection

The unit of the displayed measured value is taken from the System units submenu (→ 51).

0% bargraph value 3

Navigation

Expert → System → Display → 0% bargraph 3 (0124)

Prerequisite

A selection was made in the Value 3 display parameter (→ 21).

Description

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

User entry

Signed floating-point number

Factory setting

Country-specific:

- 0 l/h
- 0 gal/min (us)

Additional information

Description

The Format display parameter (→ 16) is used to specify that the measured value is to be displayed as a bar graph.

User entry

The unit of the displayed measured value is taken from the System units submenu (→ 51).

100% bargraph value 3

Navigation

Expert → System → Display → 100% bargraph 3 (0126)

Prerequisite

A selection was made in the Value 3 display parameter (→ 21).

Description

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

User entry

Signed floating-point number

Factory setting

0
Description of device parameters

Additional information

**Description**

The **Format display** parameter (→ 16) is used to specify that the measured value is to be displayed as a bar graph.

**User entry**

The unit of the displayed measured value is taken from the **System units** submenu (→ 51).

---

### Decimal places 3

**Navigation**

[Expert → System → Display → Decimal places 3 (0118)]

**Prerequisite**

A measured value is specified in the **Value 3 display** parameter (→ 21).

**Description**

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

**Selection**

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

**Factory setting**

x.xx

**Additional information**

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

---

### Value 4 display

**Navigation**

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

**Prerequisite**

A local display is provided.

**Description**

Use this function to select one of the measured values shown on the local display.

**Selection**

For the picklist, see the **Value 2 display** parameter (→ 20)

**Factory setting**

None
Additional information

**Description**

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

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

**Selection**

The unit of the displayed measured value is taken from the **System units** submenu (→ 51).

**Custody transfer mode**

Only available for Promag W.

Once the measuring device has been enabled for custody transfer mode, the display automatically switches to the **Custody transfer counter** option.

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

---

### Decimal places 4

**Navigation**

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

**Prerequisite**

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

**Description**

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

**Selection**

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

**Factory setting**

x.xx

**Additional information**

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

---

### Display interval

**Navigation**

Expert → System → Display → Display interval (0096)

**Prerequisite**

A local display is provided.

**Description**

Use this function to enter the length of time the measured values are displayed if the values alternate on the display.
Proline Promag 400 HART

Description of device parameters

User entry
1 to 10 s

Factory setting
5 s

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

- The Value 1 display parameter (→ 18) to Value 4 display parameter (→ 23) are used to specify which measured values are shown on the local display.
- The display format of the displayed measured values is specified using the Format display parameter (→ 16).

Custody transfer mode

Only available for Promag W.

Once the measuring device has been enabled for custody transfer mode, the following settings change automatically:
- The value displayed for the following parameters changes:
  - Value 1 display parameter (→ 18): Totalizer 1 option
  - Value 2 display parameter (→ 20): Volume flow option
  - Value 4 display parameter (→ 23): Custody transfer counter option
- The interval period changes to 10 s.

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

Display damping

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

Prerequisite
A local display is provided.

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

User entry
0.0 to 999.9 s

Factory setting
0.0 s

Additional information
User entry
Use this function to enter a time constant (PT1 element 1) for display damping:
- If a low time constant is entered, the display reacts particularly quickly to fluctuating measured variables.
- On the other hand, the display reacts more slowly if a high time constant is entered.

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

---

1) proportional transmission behavior with first order delay
Description of device parameters

Header

Navigation  

Prerequisite  
A local display is provided.

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

Selection  
- Device tag
- Free text

Factory setting  
Device tag

Additional information  
Description
The header text only appears during normal operation.

```
1   Position of the header text on the display

Selection
- Device tag
  Is defined in the Device tag parameter (→ 173).
- Free text
  Is defined in the Header text parameter (→ 26).
```

Header text

Navigation  

Prerequisite  
In the Header parameter (→ 26), the Free text option is selected.

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

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

Factory setting  
-------------

Additional information  
Description
The header text only appears during normal operation.
1  Position of the header text on the display

User entry
The number of characters displayed depends on the characters used.

Separator

<table>
<thead>
<tr>
<th>Navigation</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A local display is provided.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Use this function to select the decimal separator.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Selection</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>. (point)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>, (comma)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factory setting</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>. (point)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Contrast display

<table>
<thead>
<tr>
<th>Navigation</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A local display is provided.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Use this function to enter a value to adapt the display contrast to the ambient conditions (e.g. the lighting or viewing angle).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>User entry</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20 to 80 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factory setting</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>50 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Backlight

<table>
<thead>
<tr>
<th>Navigation</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A local display is provided.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Use this function to switch the backlight of the local display on and off.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Selection

- Disable
- Enable

Factory setting

Enable

Access status display

Navigation

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

Prerequisite

A local display is provided.

Description

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

User interface

- Operator
- Maintenance

Factory setting

Operator

Additional information

Description

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

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

For information about the Enter access code parameter: see the "Disabling write protection via the access code" section of the Operating Instructions for the device → 7

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 → 7

3.1.2 "Diagnostic handling" submenu

Navigation

Expert → System → Diagn. handling

Alarm delay (0651) → 29

Diagnostic behavior → 29
Alarm delay

**Navigation**

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

**Description**

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

The diagnostic message is reset without a time delay.

**User entry**

0 to 60 s

**Factory setting**

0 s

**Additional information**

This setting affects the following diagnostic messages:

- 170 Coil resistance
- 832 Electronic temperature too high
- 833 Electronic temperature too low
- 834 Process temperature too high
- 835 Process temperature too low
- 962 Pipe empty

"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 (→ 29).

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

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm</td>
<td>The device stops measurement. The signal outputs and totalizers assume the defined alarm condition. A diagnostic message is generated. The background lighting changes to red.</td>
</tr>
<tr>
<td>Warning</td>
<td>The device continues to measure. The signal outputs and totalizers are not affected. A diagnostic message is generated.</td>
</tr>
<tr>
<td>Logbook entry only</td>
<td>The device continues to measure. The diagnostic message is displayed only in the Event logbook submenu (→ 170) (Event list submenu (→ 171)) and is not displayed in alternation with the operational display.</td>
</tr>
<tr>
<td>Off</td>
<td>The diagnostic event is ignored, and no diagnostic message is generated or entered.</td>
</tr>
</tbody>
</table>

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

**Navigation**

Expert → System → Diagn. handling → Diagn. behavior

Assign behavior of diagnostic no. 043 (0650) → 31
<table>
<thead>
<tr>
<th>Description of device parameters</th>
<th>Proline Promag 400 HART</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assign behavior of diagnostic no. 302 (0739)</td>
<td>→ 31</td>
</tr>
<tr>
<td>Assign behavior of diagnostic no. 376 (0645)</td>
<td>→ 31</td>
</tr>
<tr>
<td>Assign behavior of diagnostic no. 377 (0777)</td>
<td>→ 32</td>
</tr>
<tr>
<td>Assign behavior of diagnostic no. 441 (0657)</td>
<td>→ 32</td>
</tr>
<tr>
<td>Assign behavior of diagnostic no. 442 (0658)</td>
<td>→ 32</td>
</tr>
<tr>
<td>Assign behavior of diagnostic no. 443 (0659)</td>
<td>→ 33</td>
</tr>
<tr>
<td>Assign behavior of diagnostic no. 531 (0741)</td>
<td>→ 33</td>
</tr>
<tr>
<td>Assign behavior of diagnostic no. 832 (0681)</td>
<td>→ 33</td>
</tr>
<tr>
<td>Assign behavior of diagnostic no. 833 (0682)</td>
<td>→ 34</td>
</tr>
<tr>
<td>Assign behavior of diagnostic no. 834 (0700)</td>
<td>→ 34</td>
</tr>
<tr>
<td>Assign behavior of diagnostic no. 835 (0702)</td>
<td>→ 35</td>
</tr>
<tr>
<td>Assign behavior of diagnostic no. 842 (0638)</td>
<td>→ 35</td>
</tr>
<tr>
<td>Assign behavior of diagnostic no. 962 (0745)</td>
<td>→ 35</td>
</tr>
<tr>
<td>Assign behavior of diagnostic no. 937 (0743)</td>
<td>→ 36</td>
</tr>
<tr>
<td>Assign behavior of diagnostic no. 938 (0642)</td>
<td>→ 36</td>
</tr>
<tr>
<td>Assign behavior of diagnostic no. 961 (0736)</td>
<td>→ 36</td>
</tr>
</tbody>
</table>
Assign behavior of diagnostic no. 043 (Sensor short circuit)

Navigation

Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 043 (0650)

Description

Use this function to change the diagnostic behavior of the 043 Sensor short circuit diagnostic message.

Selection

• Off
• Alarm
• Warning
• Logbook entry only

Factory setting

Warning

Additional information

Detailed description of the options available for selection: →  29

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

Navigation

Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 302 (0739)

Description

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

Selection

• Alarm
• Warning

Factory setting

Warning

Additional information

Detailed description of the options available for selection: →  29

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

Navigation

Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 376 (0645)

Description

Use this function to change the diagnostic behavior of the 376 Sensor electronic (ISEM) faulty diagnostic message.

Selection

• Off
• Alarm
• Warning
• Logbook entry only

Factory setting

Warning

Additional information

Detailed description of the options available for selection: →  29
Assign behavior of diagnostic no. 377 (Sensor electronic (ISEM) faulty)

**Navigation**
- Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 377 (0777)

**Description**
Use this function to change the diagnostic behavior of the 377 Sensor electronic (ISEM) faulty diagnostic message.

**Selection**
- Off
- Alarm
- Warning
- Logbook entry only

**Factory setting**
Warning

**Additional information**
Detailed description of the options available for selection: ➔ 29

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

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

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

**Selection**
- Off
- Alarm
- Warning
- Logbook entry only

**Factory setting**
Warning

**Additional information**
Detailed description of the options available for selection: ➔ 29

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

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

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

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

**Selection**
- Off
- Alarm
- Warning
- Logbook entry only

**Factory setting**
Warning
Assign behavior of diagnostic no. 443 (Pulse output 1 to n)

Navigation

iframe

Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 443 (0659)

Prerequisite

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

Description

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

Selection

- Off
- Alarm
- Warning
- Logbook entry only

Factory setting

Warning

Additional information

iframe

Detailed description of the options available for selection: → 29

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

Navigation

iframe

Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 531 (0741)

Description

Use this function to change the diagnostic behavior of the 531 Empty pipe detection diagnostic message.

Selection

- Off
- Alarm
- Warning
- Logbook entry only

Factory setting

Warning

Additional information

iframe

Detailed description of the options available for selection: → 29

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

Navigation

iframe

Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 832 (0681)

Description

Use this function to change the diagnostic behavior of the 832 Electronic temperature too high diagnostic message.
Description of device parameters

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting
Logbook entry only

Additional information
Detailed description of the options available for selection: → 29

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

Navigation
Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 833 (0682)

Description
Use this function to change the diagnostic behavior of the 833 Electronic temperature too low diagnostic message.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting
Logbook entry only

Additional information
Detailed description of the options available for selection: → 29

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

Navigation
Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 834 (0700)

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

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting
Warning

Additional information
Detailed description of the options available for selection: → 29
<table>
<thead>
<tr>
<th>Assignment of diagnostic behavior</th>
<th>Description</th>
<th>Selection</th>
<th>Factory setting</th>
<th>Additional information</th>
</tr>
</thead>
</table>
| Assign behavior of diagnostic no. 835 (Process temperature too low) | Use this function to change the diagnostic behavior of the **835 Process temperature too low** diagnostic message. | - Off  
- Alarm  
- Warning  
- Logbook entry only | Warning | Detailed description of the options available for selection: → 29 |
| Assign behavior of diagnostic no. 842 | Change behavior of diagnostic event with diagnostic number 842 'Process limit'. | - Off  
- Alarm  
- Warning  
- Logbook entry only | Off | |
| Assign behavior of diagnostic no. 962 (Pipe empty) | Use this function to change the diagnostic behavior of the **862 Pipe empty** diagnostic message. | - Off  
- Alarm  
- Warning  
- Logbook entry only | Warning | Detailed description of the options available for selection: → 29 |
Assign behavior of diagnostic no. 937 (EMC interference)

Description
Use this function to change the diagnostic behavior of the **937 EMC interference** diagnostic message.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting
Warning

Additional information
Detailed description of the options available for selection: → 29

Assign behavior of diagnostic no. 938 (EMC interference)

Description
Use this function to change the diagnostic behavior of the **938 EMC interference** diagnostic message.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting
Alarm

Additional information
Detailed description of the options available for selection: → 29

Assign behavior of diagnostic no. 961

Description
Select diagnostic behavior for the selected diagnostic number.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting
Alarm
3.1.3 "Administration" submenu

**Navigation**

Expert → System → Administration

<table>
<thead>
<tr>
<th>▶ Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>▶ Define access code</td>
</tr>
<tr>
<td>▶ Reset access code</td>
</tr>
<tr>
<td>Reset device (0000)</td>
</tr>
<tr>
<td>Activate SW option (0029)</td>
</tr>
<tr>
<td>Software option overview (0015)</td>
</tr>
</tbody>
</table>

"Define access code" wizard

The Define access code wizard (→ 37) is only available when operating via the local display or Web browser.

If operating via the operating tool, the Define access code parameter (→ 39) 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

<table>
<thead>
<tr>
<th>▶ Define access code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Define access code</td>
</tr>
<tr>
<td>Confirm access code</td>
</tr>
</tbody>
</table>

**Define access code**

**Navigation**

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

**Description**

Use this function to enter a user-specific release code to restrict write-access to the parameters. This protects the configuration of the device against any inadvertent changes via the local display or Web browser.

**User entry**

0 to 9999

**Factory setting**

0

**Additional information**

The write protection affects all parameters in the document marked with the symbol. On the local display, the symbol in front of a parameter indicates that the parameter is write-protected.
The parameters that cannot be write-accessed are grayed out in the Web browser.

- Once the access code has been defined, write-protected parameters can only be modified if the access code is entered in the **Enter access code** parameter (→ 13).
- If you lose the access code, please contact your Endress+Hauser sales organization.

**User entry**

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

**Factory setting**

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

---

### Confirm access code

<table>
<thead>
<tr>
<th>Navigation</th>
<th>Expert → System → Administration → Def. access code → Confirm code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Enter the defined release code a second time to confirm the release code.</td>
</tr>
<tr>
<td>User entry</td>
<td>0 to 9999</td>
</tr>
<tr>
<td>Factory setting</td>
<td>0</td>
</tr>
</tbody>
</table>

---

### "Reset access code" submenu

| Navigation | Expert → System → Administration → Reset acc. code |

**Operating time**

| Navigation | Expert → System → Administration → Reset acc. code → Operating time (0652) |
| Description | Use this function to display the length of time the device has been in operation. |
| User interface | Days (d), hours (h), minutes (m) and seconds (s) |
**Additional information**  
*User interface*

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

---

### Reset access code

**Navigation**

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

**Description**

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

**User entry**

Character string comprising numbers, letters and special characters

**Factory setting**

0x00

**Additional information**

**Description**

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

**User entry**

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

---

### Additional parameters in the "Administration" submenu

---

### Define access code

**Navigation**

Expert → System → Administration → Def. access code

**Description**

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

**User entry**

0 to 9999

**Factory setting**

0
**Description of device parameters**

**Proline Promag 400 HART**

---

**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 (→ 13).
- If you lose the access code, please contact your Endress+Hauser sales organization.

*User entry*

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

*Factory setting*

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

---

**Reset device**

*Navigation*

Expert → System → Administration → Reset device (0000)

*Description*

Use this function to choose whether to reset the device configuration - either entirely or in part - to a defined state.

*Selection*

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

*Factory setting*

Cancel

---

**Activate SW option**

*Navigation*

Expert → System → Administration → Activate SW opt. (0029)

*Description*

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

*User entry*

Max. 10-digit string consisting of numbers.

*Factory setting*

Depends on the software option ordered

---

* Visibility depends on order options or device settings
**Additional information**

*Description*

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

*User entry*

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

**NOTE!**

*The activation code is linked to the serial number of the measuring device and varies according to the device and software option.*

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

- Before you enter a new activation code, make a note of the current activation code.
- Enter the new activation code provided by Endress+Hauser when the new software option was ordered.
- Once the activation code has been entered, check if the new software option is displayed in the *Software option overview* parameter (→ 41).
  - The new software option is active if it is displayed.
  - If the new software option is not displayed or all software options have been deleted, the code entered was either incorrect or invalid.
- If the code entered is incorrect or invalid, enter the old activation code.
- Have your Endress+Hauser sales organization check the new activation code remembering to specify the serial number or ask for the code again.

*Example for a software option*

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

The software options currently enabled are displayed in the *Software option overview* parameter (→ 41).

*Web browser*

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

---

**Software option overview**

<table>
<thead>
<tr>
<th>Navigation</th>
<th>Expert → System → Administration → SW option overv. (0015)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Displays all the software options that are enabled in the device.</td>
</tr>
</tbody>
</table>
| User interface | - Extended HistoROM  
                   - PFS output 2 + status input  
                   - Certified pulse output  
                   - Electrode cleaning circuit  
                   - Heartbeat Verification  
                   - Custody transfer  
                   - Build-up detection  
                   - Heartbeat Monitoring |
Additional information

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

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

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

*Certified pulse output* option
Only available for Promag W.
Order code for "Output; input", option J "4-20mA HART, certified pulse output, switch output; status input"

*Electrode cleaning circuit* option
Only available for Promag L and W.
Order code for "Application package", option EC "ECC electrode cleaning"

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

*Custody transfer* option
The measuring device has an approval for custody transfer measurement.
Only available for Promag W.
Detailed information on the national and international approvals for custody transfer that are currently available can be supplied by your Endress+Hauser sales organization.

---

3.2  "Sensor" submenu

**Navigation**  
[ Expert ➔ Sensor ]

- **Sensor**
  - **Measured values** ➔ 43
  - **System units** ➔ 51
  - **Process parameters** ➔ 58
  - **External compensation** ➔ 74
3.2.1 "Measured values" submenu

*Navigation*  
Expert → Sensor → Measured val.

### "Process variables" submenu

*Navigation*  

**Volume flow**

*Navigation*  

*Description*  
Displays the volume flow that is currently measured.
## Description of device parameters

### Proline Promag 400 HART

<table>
<thead>
<tr>
<th>Parameter</th>
<th>User interface</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>User interface</strong></td>
<td>Signed floating-point number</td>
<td></td>
</tr>
<tr>
<td><strong>Additional information</strong></td>
<td><strong>Dependency</strong></td>
<td>The unit is taken from the <strong>Volume flow unit</strong> parameter (→  51)</td>
</tr>
<tr>
<td><strong>Mass flow</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Displays the mass flow that is currently calculated.</td>
<td></td>
</tr>
<tr>
<td><strong>User interface</strong></td>
<td>Signed floating-point number</td>
<td></td>
</tr>
<tr>
<td><strong>Additional information</strong></td>
<td><strong>Dependency</strong></td>
<td>The unit is taken from the <strong>Mass flow unit</strong> parameter (→  55)</td>
</tr>
<tr>
<td><strong>Corrected volume flow</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Displays the corrected volume flow that is currently measured.</td>
<td></td>
</tr>
<tr>
<td><strong>User interface</strong></td>
<td>Signed floating-point number</td>
<td></td>
</tr>
<tr>
<td><strong>Additional information</strong></td>
<td><strong>Dependency</strong></td>
<td>The unit is taken from the <strong>Corrected volume flow unit</strong> parameter (→  57)</td>
</tr>
<tr>
<td><strong>Flow velocity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Displays the flow velocity that is currently calculated.</td>
<td></td>
</tr>
<tr>
<td><strong>User interface</strong></td>
<td>Signed floating-point number</td>
<td></td>
</tr>
</tbody>
</table>

### Conductivity

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Navigation</th>
<th>Prerequisite</th>
</tr>
</thead>
</table>
Proline Promag 400 HART

Description of device parameters

**Description**
Displays the conductivity that is currently measured.

**User interface**
Signed floating-point number

**Additional information**
*Dependency*
The unit is taken from the **Conductivity unit** parameter (→ 53)

---

**Corrected conductivity**

**Navigation**

**Prerequisite**
The following conditions are met:
- The **On** option is selected in the **Conductivity measurement** parameter (→ 62).
- The **Internal temperature sensor** option or the **External value** option is selected in the **Temperature source** parameter (→ 75).

**Description**
Displays the conductivity that is currently corrected.

**User interface**
Positive floating-point number

**Additional information**
*Dependency*
The unit is taken from the **Conductivity unit** parameter (→ 53)

---

**Temperature**

**Navigation**

**Prerequisite**
The **Internal temperature sensor** option or the **External value** option is selected in the **Temperature source** parameter (→ 75).

**Description**
Displays the temperature that is currently calculated.

**User interface**
Positive floating-point number

**Additional information**
*Dependency*
The unit is taken from the **Temperature unit** parameter (→ 54)

---

**Density**

**Navigation**

**Description**
Displays the current fixed density or density read in from an external device.
Description of device parameters

User interface
Signed floating-point number

Additional information
Dependency
ℹ️ The unit is taken from the **Density unit** parameter (→ 56)

"Totalizer" submenu

**Navigation**
Expert → Sensor → Measured val. → Totalizer

**Totalizer value 1 to n**

**Navigation**
Expert → Sensor → Measured val. → Totalizer → Totalizer val. 1 to n (0911–1 to n)

**Prerequisite**
One of the following options is selected in the **Assign process variable** parameter (→ 158) of the **Totalizer 1 to n** submenu:
- Volume flow
- Mass flow
- Corrected volume flow

**Description**
Displays the current totalizer counter reading.

**User interface**
Signed floating-point number
Additional information  

Description

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

In the event of an error, the totalizer adopts the mode defined in the **Failure mode** parameter (→ 162).

User interface

The value of the process variable totalized since measuring began can be positive or negative. This depends on the settings in the **Totalizer operation mode** parameter (→ 160).

The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ 159).

Example

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

- Value in the **Totalizer value 1** parameter: 1968457 m³
- Value in the **Totalizer overflow 1** parameter: 1 \cdot 10^7 (1 overflow) = 10000000 m³
- Current totalizer reading: 11968457 m³

### Totalizer overflow 1 to n

<table>
<thead>
<tr>
<th>Navigation</th>
<th>㎜ ㎜  Expert → Sensor → Measured val. → Totalizer → Tot. overflow 1 to n (0910–1 to n)</th>
</tr>
</thead>
</table>
| Prerequisite | One of the following options is selected in the **Assign process variable** parameter (→ 158) of the **Totalizer 1 to n** submenu:  
- Volume flow  
- Mass flow  
- Corrected volume flow |
| Description | Displays the current totalizer overflow. |
| User interface | Integer with sign |
| Additional information | Description  

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

**User interface**

- The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ 159).

**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 ⋅ 10⁷ (2 overflows) = 20 000 000 [m³]
- Current totalizer reading: 21 968 457 m³

**"Input values" submenu**

**Navigation**

- Expert → Sensor → Measured val. → Input values

**Value status input**

**Navigation**

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

**Prerequisite**

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

**Description**

Displays the current input signal level.

**User interface**

- High
- Low

**"Output values" submenu**

**Navigation**

- Expert → Sensor → Measured val. → Output values

- Output current 1 (0361–1)
### Output current 1

**Navigation**

Expert → Sensor → Measured val. → Output values → Output curr. 1 (0361–1)

**Description**

Displays the current value currently calculated for the current output.

**User interface**

0 to 22.5 mA

---

### Measured current 1

**Navigation**

Expert → Sensor → Measured val. → Output values → Measur. curr. 1 (0366–1)

**Description**

Displays the actual measured value of the output current.

**User interface**

0 to 30 mA

---

### Pulse output 1 to n

**Navigation**

Expert → Sensor → Measured val. → Output values → Pulse output 1 (0456–1)

**Prerequisite**

The Pulse option is selected in the Operating mode parameter (→ 100) parameter.

**Description**

Displays the pulse frequency currently output.

**User interface**

Positive floating-point number
Additional information

**Description**

- The pulse output is an open collector output.
- This is configured at the factory in such a way that the transistor is conductive for the duration of the pulse (NO contact) and is safety-oriented.
- The **Value per pulse** parameter (→ 102) and **Pulse width** parameter (→ 103) can be used to define the value (i.e. the measured value amount that corresponds to a pulse) and the duration of the pulse.

![Diagram](https://example.com/diagram.png)

**NC**: Non-conductive

**NO**: Conductive

**NC**: Normally closed

**NO**: Normally opened

The output behavior can be reversed via the **Invert output signal** parameter (→ 117) i.e. the transistor does not conduct for the duration of the pulse.

In addition, the behavior of the output in the event of a device alarm (**Failure mode** parameter (→ 104)) can be configured.

---

### Output frequency 1 to n

**Navigation**

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

**Prerequisite**

In the **Operating mode** parameter (→ 100), the **Frequency** option is selected.

**Description**

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

**User interface**

0.0 to 12500.0 Hz

---

### Switch status 1 to n

**Navigation**

- Expert → Sensor → Measured val. → Output values → Switch status 1 (0461–1)
- Expert → Sensor → Measured val. → Output values → Switch status 2 (0461–2)

**Prerequisite**

In the **Operating mode** parameter (→ 100), the **Switch** option is selected.

**Description**

Displays the current switch status of the status output.

**User interface**

- Open
- Closed
Additional information

Selection

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

3.2.2 "System units" submenu

Navigation

Expert → Sensor → System units

<table>
<thead>
<tr>
<th>System units</th>
<th>→ 51</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume flow unit (0553)</td>
<td></td>
</tr>
<tr>
<td>Volume unit (0563)</td>
<td>→ 53</td>
</tr>
<tr>
<td>Conductivity unit (0582)</td>
<td>→ 53</td>
</tr>
<tr>
<td>Temperature unit (0557)</td>
<td>→ 54</td>
</tr>
<tr>
<td>Mass flow unit (0554)</td>
<td>→ 55</td>
</tr>
<tr>
<td>Mass unit (0574)</td>
<td>→ 55</td>
</tr>
<tr>
<td>Density unit (0555)</td>
<td>→ 56</td>
</tr>
<tr>
<td>Corrected volume flow unit (0558)</td>
<td>→ 57</td>
</tr>
<tr>
<td>Corrected volume unit (0575)</td>
<td>→ 57</td>
</tr>
<tr>
<td>Date/time format (2812)</td>
<td>→ 58</td>
</tr>
</tbody>
</table>

Volume flow unit

Navigation

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

Description

Use this function to select the unit for the volume flow.
## Description of device parameters

### Selection

<table>
<thead>
<tr>
<th>SI units</th>
<th>US units</th>
<th>Imperial units</th>
</tr>
</thead>
<tbody>
<tr>
<td>cm³/s</td>
<td>af/s</td>
<td>gal/s (imp)</td>
</tr>
<tr>
<td>cm³/min</td>
<td>af/min</td>
<td>gal/min (imp)</td>
</tr>
<tr>
<td>cm³/h</td>
<td>af/h</td>
<td>gal/h (imp)</td>
</tr>
<tr>
<td>cm³/d</td>
<td>af/d</td>
<td>gal/d (imp)</td>
</tr>
<tr>
<td>dm³/s</td>
<td>ft³/s</td>
<td>Mgal/s (imp)</td>
</tr>
<tr>
<td>dm³/min</td>
<td>ft³/min</td>
<td>Mgal/min (imp)</td>
</tr>
<tr>
<td>dm³/h</td>
<td>ft³/h</td>
<td>Mgal/h (imp)</td>
</tr>
<tr>
<td>dm³/d</td>
<td>ft³/d</td>
<td>Mgal/d (imp)</td>
</tr>
<tr>
<td>m³/s</td>
<td>MMft³/s</td>
<td>bbl/s (imp;beer)</td>
</tr>
<tr>
<td>m³/min</td>
<td>MMft³/min</td>
<td>bbl/min (imp;beer)</td>
</tr>
<tr>
<td>m³/h</td>
<td>MMft³/h</td>
<td>bbl/h (imp;beer)</td>
</tr>
<tr>
<td>m³/d</td>
<td>MMft³/d</td>
<td>bbl/d (imp;beer)</td>
</tr>
<tr>
<td>ml/s</td>
<td>fl oz/s (us)</td>
<td>bbl/s (imp;oil)</td>
</tr>
<tr>
<td>ml/min</td>
<td>fl oz/min (us)</td>
<td>bbl/min (imp;oil)</td>
</tr>
<tr>
<td>ml/h</td>
<td>fl oz/h (us)</td>
<td>bbl/h (imp;oil)</td>
</tr>
<tr>
<td>ml/d</td>
<td>fl oz/d (us)</td>
<td>bbl/d (imp;oil)</td>
</tr>
<tr>
<td>l/s</td>
<td>gal/s (us)</td>
<td>bbl/s (us;liq.)</td>
</tr>
<tr>
<td>l/min</td>
<td>gal/min (us)</td>
<td>bbl/min (us;liq.)</td>
</tr>
<tr>
<td>l/h</td>
<td>gal/h (us)</td>
<td>bbl/h (us;liq.)</td>
</tr>
<tr>
<td>l/d</td>
<td>gal/d (us)</td>
<td>bbl/d (us;liq.)</td>
</tr>
<tr>
<td>hl/s</td>
<td>Mgal/s (us)</td>
<td>bbl/s (us;liq.;oil)</td>
</tr>
<tr>
<td>hl/min</td>
<td>Mgal/min (us)</td>
<td>bbl/min (us;liq.;oil)</td>
</tr>
<tr>
<td>hl/h</td>
<td>Mgal/h (us)</td>
<td>bbl/h (us;liq.;oil)</td>
</tr>
<tr>
<td>hl/d</td>
<td>Mgal/d (us)</td>
<td>bbl/d (us;liq.;oil)</td>
</tr>
<tr>
<td>Ml/s</td>
<td>bbl/s (us;liq.)</td>
<td>bbl/s (us;liq.;oil;beer)</td>
</tr>
<tr>
<td>Ml/min</td>
<td>bbl/min (us;liq.)</td>
<td>bbl/min (us;liq.;oil;beer)</td>
</tr>
<tr>
<td>Ml/h</td>
<td>bbl/h (us;liq.)</td>
<td>bbl/h (us;liq.;oil;beer)</td>
</tr>
<tr>
<td>Ml/d</td>
<td>bbl/d (us;liq.)</td>
<td>bbl/d (us;liq.;oil;beer)</td>
</tr>
</tbody>
</table>

### Factory setting

<table>
<thead>
<tr>
<th>Country-specific:</th>
</tr>
</thead>
<tbody>
<tr>
<td>l/h</td>
</tr>
<tr>
<td>gal/min (us)</td>
</tr>
</tbody>
</table>
Additional information

**Effect**
The selected unit applies for:

**Volume flow parameter** (→ 43)

**Selection**

For an explanation of the abbreviated units: → 204

**Customer-specific units**

The unit for the customer-specific volume is specified in the **User volume text** parameter.

---

**Volume unit**

**Navigation**

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

**Description**

Use this function to select the unit for the volume.

**Selection**

<table>
<thead>
<tr>
<th>SI units</th>
<th>US units</th>
<th>Imperial units</th>
</tr>
</thead>
<tbody>
<tr>
<td>cm³</td>
<td>af</td>
<td>gal (imp)</td>
</tr>
<tr>
<td>dm³</td>
<td>ft³</td>
<td>Mgal (imp)</td>
</tr>
<tr>
<td>m³</td>
<td>Mft³</td>
<td>bbl (imp;beer)</td>
</tr>
<tr>
<td>ml</td>
<td>fl oz (us)</td>
<td>bbl (imp;oil)</td>
</tr>
<tr>
<td>l</td>
<td>gal (us)</td>
<td></td>
</tr>
<tr>
<td>hl</td>
<td>kgal (us)</td>
<td></td>
</tr>
<tr>
<td>Ml Mega</td>
<td>Mgal (us)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bbl (us;oil)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bbl (us;lig,)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bbl (us;beer)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bbl (us;tank)</td>
<td></td>
</tr>
</tbody>
</table>

**Factory setting**

Country-specific:

- m³
- gal (us)

**Additional information**

For an explanation of the abbreviated units: → 204

**Customer-specific units**

The unit for the customer-specific volume is specified in the **User volume text** parameter.

---

**Conductivity unit**

**Navigation**

Expert → Sensor → System units → Conductiv. unit (0582)

**Prerequisite**

The **On** option is selected in the **Conductivity measurement** parameter (→ 62) parameter.
Description

Use this function to select the unit for the conductivity.

Selection

*SI units*

- nS/cm
- µS/cm
- µS/m
- µS/mm
- mS/m
- mS/cm
- S/cm
- S/m
- kS/m
- MS/m

Factory setting

µS/cm

Additional information

Effect

The selected unit applies for:

Conductivity parameter (→ 44)

Selection

For an explanation of the abbreviated units: → 204

Temperature unit

Navigation

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

Description

Use this function to select the unit for the temperature.

Selection

*SI units*  
- °C  
- K

*US units*  
- °F  
- °R

Factory setting

Country-specific:

- °C
- °F

Additional information

Effect

The selected unit applies for:

- Maximum value parameter (→ 180)
- Minimum value parameter (→ 179)

Selection

For an explanation of the abbreviated units: → 204
Mass flow unit

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

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

Selection  

<table>
<thead>
<tr>
<th>SI units</th>
<th>US units</th>
</tr>
</thead>
<tbody>
<tr>
<td>g/s</td>
<td>oz/s</td>
</tr>
<tr>
<td>g/min</td>
<td>oz/min</td>
</tr>
<tr>
<td>g/h</td>
<td>oz/h</td>
</tr>
<tr>
<td>g/d</td>
<td>oz/d</td>
</tr>
<tr>
<td>kg/s</td>
<td>lb/s</td>
</tr>
<tr>
<td>kg/min</td>
<td>lb/min</td>
</tr>
<tr>
<td>kg/h</td>
<td>lb/h</td>
</tr>
<tr>
<td>kg/d</td>
<td>lb/d</td>
</tr>
<tr>
<td>t/s</td>
<td>STon/s</td>
</tr>
<tr>
<td>t/min</td>
<td>STon/min</td>
</tr>
<tr>
<td>t/h</td>
<td>STon/h</td>
</tr>
<tr>
<td>t/d</td>
<td>STon/d</td>
</tr>
</tbody>
</table>

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

Additional information  
Effect  
The selected unit applies for:  
Mass flow parameter (→ 44)

Selection  
For an explanation of the abbreviated units: → 204

Customer-specific units  
The unit for the customer-specific mass is specified in the User mass text parameter.

Mass unit

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

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

Selection  

<table>
<thead>
<tr>
<th>SI units</th>
<th>US units</th>
</tr>
</thead>
<tbody>
<tr>
<td>g</td>
<td>oz</td>
</tr>
<tr>
<td>kg</td>
<td>lb</td>
</tr>
<tr>
<td>t</td>
<td>STon</td>
</tr>
</tbody>
</table>

Factory setting  
Country-specific:
- kg
- lb
Additional information

Selection

For an explanation of the abbreviated units: → 204

Customer-specific units

The unit for the customer-specific mass is specified in the User mass text parameter.

Density unit

Navigation

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

Description

Use this function to select the unit for the density.

Selection

SI units

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

US units

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

Imperial units

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

Factory setting

Country-specific:

- kg/l
- lb/ft³

Additional information

Effect

The selected unit applies for:

- External density parameter (→ 75)
- Fixed density parameter (→ 74)

Selection

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

For an explanation of the abbreviated units: → 204
Corrected volume flow unit

Navigation

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

Selection

**SI units**  |  **US units**  |  **Imperial units**
---|---|---
Nl/s  | Sft³/s  | Sgal/s (imp)
Nl/min  | Sft³/min  | Sgal/min (imp)
Nl/h  | Sft³/h  | Sgal/h (imp)
Nl/d  | Sft³/d  | Sgal/d (imp)
Nhl/s  |  | 
Nhl/min  |  | 
Nhl/h  |  | 
Nhl/d  |  | 
Nm³/s  |  | 
Nm³/min  |  | 
Nm³/h  |  | 
Nm³/d  |  | 
Sl/s  | MMSft³/s  | 
Sl/min  | MMSft³/min  | 
Sl/h  | MMSft³/h  | 
Sl/d  | MMSft³/d  | 
Sm³/s  |  | 
Sm³/min  |  | 
Sm³/h  |  | 
Sm³/d  |  | 

Factory setting

Country-specific:

Nl/h
Sft³/h

Additional information

For an explanation of the abbreviated units: → 204

Corrected volume unit

Navigation

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

Selection

**SI units**  |  **US units**  |  **Imperial units**
---|---|---
Nl  | Sft³  | Sgal (imp)
Nhl  | MMSft³  | 
Nm³  | Sgal (us)  | 
Sl  | Sbbl (us;liq.)  | 
Sm³  | Sbbl (us;oil)  | 

Factory setting

Country-specific:

Nm³
Sft³
3.2.3 "Process parameters" submenu

Navigation  

- Filter options (6710)
- Flow damping (6661)
- Flow override (1839)
- Conductivity measurement (6514)
- Conductivity damping (1803)
- Conductivity temperature coefficient (1891)
- Temperature damping (1886)
- Reference density (1885)
- Low flow cut off
Filter options

Navigation
Expert → Sensor → Process param. → Filter options (6710)

Description
Use this function to select a filter option.

Selection
- Adaptive
- Adaptive CIP on
- Dynamic
- Dynamic CIP on
- Binomial
- Binomial CIP on

Factory setting
Binomial

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

**Selection**

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

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

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

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

**Examples**

**Possible applications for the filters**

<table>
<thead>
<tr>
<th>Application</th>
<th>Adaptive</th>
<th>Adaptive CIP</th>
<th>Dynamic</th>
<th>Dynamic CIP</th>
<th>Binomial</th>
<th>Binomial CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulsating flow (flow is negative intermittently)</td>
<td>– – –</td>
<td>– –</td>
<td>++</td>
<td>– –</td>
<td>++</td>
<td></td>
</tr>
<tr>
<td>Flow changes frequently (flow is dynamic)</td>
<td>– –</td>
<td>–</td>
<td>++</td>
<td>–</td>
<td>++</td>
<td></td>
</tr>
<tr>
<td>Clear signal, fast control loop (&lt; 1 s)</td>
<td>– –</td>
<td>–</td>
<td>++</td>
<td>–</td>
<td>++</td>
<td></td>
</tr>
<tr>
<td>Poor signal, slow control loop (response time of a few seconds)</td>
<td>++</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Permanently bad signal</td>
<td>++</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Short and severe signal distortion after a while</td>
<td>++</td>
<td>++</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Replacement of a Promag 50/53: system damping Promag 400 = 0.5 * system damping Promag 50/53</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Replacement of a Promag 10: system damping Promag 400 = system damping Promag 10 + 2</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>For a stable flow signal (no other requirements)</td>
<td>++</td>
<td>++</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
</tbody>
</table>

1) Value of flow damping < 6
Flow damping

**Navigation**

Expert → Sensor → Process param. → Flow damping (6661)

**Description**

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

**User entry**

0 to 15

**Factory setting**

4

**Additional information**

*Input range 0 to 15*

- Value = 0: no damping
- Value = 1: minor damping
- Value = 15: strong damping

- The damping depends on the measuring period and the filter type selected.
- An increase or decrease in the damping depends on the application.

**Effect**

The damping affects the following variables of the device:

- Outputs → 87
- Low flow cut off → 64
- Totalizers → 158

Flow override

**Navigation**


**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**

*Result*

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

**Description**

*Flow override is active*

- The 453 Flow override diagnostic message is output.
- Output values
  - Output: value at zero flow
  - Temperature: continues to be output
  - Totalizers 1-3: stop being totalized

- The Flow override option can also be activated in the **Status input** submenu: Assign status input parameter (→ 85).
**Conductivity measurement**

**Navigation**


**Prerequisite**

The **On** option is selected in the **Conductivity measurement** parameter (→ 62) parameter.

**Description**

Use this function to enable and disable conductivity measurement.

**Selection**

- Off
- On

**Factory setting**

Off

**Additional information**

**Description**

For conductivity measurement to work, the medium must have a minimum conductivity of 5 µS/cm.

---

**Conductivity damping**

**Navigation**


**Prerequisite**

The **On** option is selected in the **Conductivity measurement** parameter (→ 62).

**Description**

Use this function to enter a time constant for conductivity damping (PT1 element).

**User entry**

0 to 999.9 s

**Factory setting**

0 s

**Additional information**

**Description**

The damping is performed by a PT1 element.

**User entry**

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

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

---

2) Proportional behavior with first-order lag
Conductivity temperature coefficient

Navigation

Prerequisite
The Internal temperature sensor option or the External value option is selected in the Temperature source parameter (→ 75).

Description
Use this function to enter the temperature coefficient for the conductivity.

User entry
Signed floating-point number

Factory setting
2.1 %/K

Temperature damping

Navigation

Prerequisite
The Internal temperature sensor option or the External value option is selected in the Temperature source parameter (→ 75).

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

User entry
0 to 999.9 s

Factory setting
0 s

Reference density

Navigation
Expert → Sensor → Process param. → Ref.density (1885)

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

User entry
Positive floating-point number

Factory setting
Country-specific:
- 1 kg/l
- 1 lb/ft³

Additional information
Dependency
The unit is taken from the Density unit parameter (→ 56)
"Low flow cut off" submenu

**Navigation**

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

---

**Assign process variable**

**Description**

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

**Selection**

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

**Factory setting**

Volume flow

---

**On value low flow cutoff**

**Prerequisite**

A process variable is selected in the Assign process variable parameter (→ 64).

**Description**

Use this function to enter a switch-on value for low flow cutoff. Low flow cutoff is activated if the value entered is not equal to 0 → 65.

**User entry**

Positive floating-point number

**Factory setting**

Depends on country and nominal diameter → 199

**Additional information**

**Dependency**

The unit depends on the process variable selected in the Assign process variable parameter (→ 64).
**Off value low flow cutoff**

**Navigation**

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

**Prerequisite**

A process variable is selected in the **Assign process variable** parameter (→ 64).

**Description**

Use this function to enter a switch-off value for low flow cut off. The off value is entered as a positive hysteresis from the on value (→ 64).

**User entry**

0 to 100.0 %

**Factory setting**

50 %

**Additional information**

**Example**

![Diagram](image)

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

**Pressure shock suppression**

**Navigation**


**Prerequisite**

A process variable is selected in the **Assign process variable** parameter (→ 64).

**Description**

Use this function to enter the time interval for signal suppression (= active pressure shock suppression).

**User entry**

0 to 100 s

**Factory setting**

0 s

**Additional information**

**Description**

**Pressure shock suppression is enabled**

- **Prerequisite:**
  Flow rate < on-value of low flow cut off
- **Output values**
  - Current output: outputs the current corresponding to zero flow
  - Flow displayed: 0
  - Totalizer: the totalizers are pegged at the last correct value
**Pressure shock suppression is disabled**

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

**Example**

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

![Diagram](image.png)

**Legend**

- **Q**: Flow
- **t**: Time
- **A**: Drip
- **B**: Pressure shock
- **C**: Pressure shock suppression active as per the time entered
- **D**: Pressure shock suppression inactive

1. Valve closes
2. Flow falls below the on-value of the low flow cut off; pressure shock suppression is activated
3. The time entered has elapsed; pressure shock suppression is deactivated
4. The actual flow value is processed again and output
5. On-value for low flow cut off
6. Off-value for low flow cut off

---

**"Empty pipe detection" submenu**

**Navigation**

[Expert] → [Sensor] → [Process param.] → [Empty pipe det.]

- [Empty pipe detection (1860)]
- [Switch point empty pipe detection (6562)]
### Empty pipe detection

**Navigation**


**Description**

Use this function to switch empty pipe detection on and off.

**Selection**

- Off
- On

**Factory setting**

Off

### Switch point empty pipe detection

**Navigation**

👩‍💻 Expert → Sensor → Process param. → Empty pipe det. → Switch point EPD (6562)

**Prerequisite**

The **On** option is selected in the Empty pipe detection parameter (→ 67).

**Description**

Use this function to enter the percentage threshold value of the resistance in relation to the adjustment values.

**User entry**

0 to 100 %

**Factory setting**

50 %

### Response time empty pipe detection

**Navigation**


**Prerequisite**

A process variable is selected in the Assign process variable parameter (→ 67).
### Description

Use this function to enter the minimum length of time (debouncing time) the signal must be present for the **Pipe empty** diagnostic message to be triggered if the measuring pipe is empty or partially full.

**User entry**

0 to 100 s

**Factory setting**

1 s

---

### New adjustment

**Navigation**


**Prerequisite**

The On option is selected in the **Empty pipe detection** parameter (→ 67).

**Description**

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

**Selection**

- Cancel
- Empty pipe adjust
- Full pipe adjust

**Factory setting**

Cancel

---

### Progress

**Navigation**


**Prerequisite**

The On option is selected in the **Empty pipe detection** parameter (→ 67).

**Description**

Use this function to view the progress.

**User interface**

- Ok
- Busy
- Not ok

---

### Empty pipe adjust value

**Navigation**

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

**Prerequisite**

- In the **Empty pipe detection** parameter (→ 67), the On option is selected.
- Adjustment value > full pipe value.

**Description**

Displays the adjustment value when the measuring pipe is empty.

**User interface**

Positive floating-point number
Full pipe adjust value

**Navigation**

**Prerequisite**
- In the *Empty pipe detection* parameter (→ 67), the *On* option is selected.
- Adjustment value < empty pipe value.

**Description**
Displays the adjustment value when the measuring pipe is full.

**User interface**
Positive floating-point number

---

Measured value EPD

**Navigation**

**Prerequisite**
In the *Empty pipe detection* parameter (→ 67), the *On* option is selected.

**Description**
Displays the current measured value.

**User interface**
Positive floating-point number

---

"Electrode cleaning circuit" submenu

**Navigation**
Expert → Sensor → Process param. → ECC

**[Electrode cleaning circuit]**

- Electrode cleaning circuit (6528) → 70
- ECC duration (6555) → 70
- ECC recovery time (6556) → 70
- ECC cleaning cycle (6557) → 71
- ECC Polarity (6631) → 71
Electrode cleaning circuit

**Navigation**
Expert → Sensor → Process param. → ECC → ECC (6528)

**Prerequisite**
For the following order code:
*Application package*, option **EC** *ECC electrode cleaning*

**Description**
Use this function to enable and disable cyclic electrode cleaning.

**Selection**
- Off
- On

**Factory setting**
Off

**Additional information**
Conductive deposits on the electrodes and on the walls of the measuring tube (e.g. magnetite) can falsify measurement values. The Electrode Cleaning Circuitry (ECC) was developed to prevent such conductive deposits developing in the vicinity of the electrodes. ECC functions as described above for all available electrode materials except tantalum. If tantalum is used as the electrode material, the ECC protects the electrode surface only against oxidation.

ECC duration

**Navigation**
Expert → Sensor → Process param. → ECC → ECC duration (6555)

**Prerequisite**
For the following order code:
*Application package*, option **EC** *ECC electrode cleaning*

**Description**
Use this function to enter the duration of electrode cleaning in seconds.

**User entry**
0.01 to 30 s

**Factory setting**
2 s

ECC recovery time

**Navigation**
Expert → Sensor → Process param. → ECC → ECC recov. time (6556)

**Prerequisite**
For the following order code:
*Application package*, option **EC** *ECC electrode cleaning*

**Description**
Use this function to enter the recovery time after electrode cleaning to prevent signal output interference. The current output values are frozen in the meanwhile.

**User entry**
1 to 600 s

**Factory setting**
5 s
ECC cleaning cycle

**Navigation**

Expert → Sensor → Process param. → ECC → ECC clean. cycle (6557)

**Prerequisite**

For the following order code:
"Application package", option EC "ECC electrode cleaning"

**Description**

Use this function to enter the pause duration until the next electrode cleaning.

**User entry**

0.5 to 168 h

**Factory setting**

0.7 h

ECC Polarity

**Navigation**

Expert → Sensor → Process param. → ECC → ECC Polarity (6631)

**Prerequisite**

For the following order code:
"Application package", option EC "ECC electrode cleaning"

**Description**

Displays the polarity of the electrode cleaning circuit.

**User interface**

- Positive
- Negative

**Factory setting**

Depends on the electrode material:
- Tantalum: **Negative** option
- Platinum, Alloy C22, stainless steel: **Positive** option

"Coating detection" submenu

Build-up detection is only available:
- In conjunction with the Promag W sensor
- In the compact device version (transmitter and sensor form a mechanical unit)
- For detailed information on build-up detection: see the Special Documentation for the Heartbeat Verification + Monitoring application package →  7

**Navigation**


<table>
<thead>
<tr>
<th>Build-up detection</th>
<th>→ 72</th>
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<tr>
<td>Build-up detection damping</td>
<td>→ 72</td>
</tr>
<tr>
<td>Build-up measured value</td>
<td>→ 72</td>
</tr>
</tbody>
</table>
Build-up detection

**Navigation**

**Description**
Select mode for build-up detection.

**Selection**
- Off
- Slow
- Standard
- Fast

**Factory setting**
Off

Build-up detection damping

**Navigation**

**Description**
Enter damping value for build-up detection.

**Damping value:**
- 0 = minimum damping
- 15 = maximum damping

The damping value should only be increased if the measured value is unstable.

**User entry**
0 to 15

**Factory setting**
0

Build-up measured value

**Navigation**

**Description**
Shows current build-up measured value.

**User interface**
0.0 to 100.0 %

**Factory setting**
0.0 %

**Additional information**
The formation of build-up is output as a percentage in the Build-up index value (→ 72) parameter. The higher the percentage, the thicker the build-up.
Build-up index value (→ 72) = 0%
- No build-up present
- Measuring tube as-delivered state (initial value)
- Measuring tube was cleaned thoroughly after formation of build-up

Build-up index value (→ 72) = 100%
- Value for the maximum measurable build-up thickness
- The thickness of the build-up at 100% varies depending on the process
- A value of 100% should not be equated with a blocked measuring tube

The percentage indicated in the Build-up index value (→ 72) parameter does not provide direct information about the absolute thickness or the composition of the build-up. Therefore, to make optimum use of the build-up detection function, it is necessary to first compare the formation of build-up in the process, as known from experience, with the associated Build-up index value (→ 72). The aim is to determine the Build-up index value (→ 72) at the time the cleaning is usually performed.

On the basis of the Build-up index value (→ 72) during cleaning, it is possible to make a valid assessment of the condition inside the measuring tube and to plan the cleaning using the build-up limit and build-up detection hysteresis parameters.

In addition, conclusions about possible effects on neighboring processes can be drawn from the Build-up index value (→ 72).

---

### Build-up limit

**Navigation**


**Description**
Enter limit value for the build-up measured value.

**User entry**
0 to 100%

**Factory setting**
50%

---

### Build-up limit hysteresis

**Navigation**


**Description**
Enter hysteresis for build-up detection.

If the value for build-up detection hysteresis is higher than the Build-up limit (→ 73), the "Build-up detected" diagnostic information is not reset until the measuring tube has been cleaned and a restart has been performed.

**User entry**
0 to 100%

**Factory setting**
20%
3.2.4 "External compensation" submenu

**Navigation**  

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Selection</th>
</tr>
</thead>
</table>
| Density source (6615) | • Fixed density  
• External density |
| Fixed density (6623) | |
| External density (6630) | |
| Temperature source (6712) | |
| External temperature (6673) | |
| Reference temperature (1816) | |

**Density source**

**Navigation**  
Expert → Sensor → External comp. → Density source (6615)

**Description**  
Use this function to select the density source.

**Selection**  
• Fixed density  
• External density

**Factory setting**  
Fixed density

**Fixed density**

**Navigation**  
Expert → Sensor → External comp. → Fixed density (6623)

**Prerequisite**  
The **Fixed density** option is selected in the **Density source** parameter (→ 74).

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

**User entry**  
Positive floating-point number

**Factory setting**  
Depends on country:  
• 1000 kg/m³  
• 62 lb/ft³

**Additional information**  
**Dependency**  
The unit is taken from the **Density unit** parameter (→ 56)
External density

**Navigation**

Expert → Sensor → External comp. → External density (6630)

**Prerequisite**

The **External density** option is selected in the Density source parameter (→ 74).

**Description**

Displays the density read in from the external device.

**User entry**

Positive floating-point number

**Additional information**

*Dependency*

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

Temperature source

**Navigation**

Expert → Sensor → External comp. → Temp. source (6712)

**Description**

Use this function to select the temperature source.

**Selection**

- Internal temperature sensor *
- Off
- External value

**Factory setting**

Off

External temperature

**Navigation**


**Prerequisite**

The **External value** option is selected in the Temperature source parameter (→ 75).

**Description**

Displays the temperature read in from the external device.

**User entry**

Floating point number with sign

**Additional information**

*Dependency*

The unit is taken from the **Temperature unit** parameter (→ 54)

* Visibility depends on order options or device settings
Description of device parameters

Proline Promag 400 HART

Reference temperature

Navigation

Expert → Sensor → External comp. → Ref. temperature (1816)

Prerequisite

The Fixed density option or External density option are selected in the Density source parameter (→ 74).

Description

Use this function to enter a reference temperature for calculating the reference density.

User interface

−273.15 to 99999 °C

Factory setting

Country-specific:

• +20 °C
• +68 °F

Additional information

Dependency

The unit is taken from the Temperature unit parameter (→ 54)

Reference density calculation

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

• \(\rho_n\): reference density
• \(\rho\): fluid density currently measured
• \(t\): fluid temperature currently measured
• \(t_N\): reference temperature at which the reference density is calculated (e.g. 20 °C)
• \(\Delta t\): \(t - t_N\)
• \(\alpha\): linear expansion coefficient of the fluid, unit = [1/K]; K = Kelvin
• \(\beta\): square expansion coefficient of the fluid, unit = [1/K²]

3.2.5 "Sensor adjustment" submenu

Navigation


Sensor adjustment

Installation direction (1809) → 77
Integration time (6533) → 77
Measuring period (6536) → 77

Process variable adjustment → 77
Installation direction

**Navigation**

Expert → Sensor → Sensor adjustm. → Install. direct. (1809)

**Description**

Use this function to change the sign of the medium flow direction.

**Selection**

- Flow in arrow direction
- Flow against arrow direction

**Factory setting**

Flow in arrow direction

**Additional information**

*Description*

Before changing the sign: ascertain the actual direction of fluid flow with reference to the direction indicated by the arrow on the sensor nameplate.

Integration time

**Navigation**

Expert → Sensor → Sensor adjustm. → Integration time (6533)

**Description**

Displays the duration of the integration time.

*The duration of the measuring period should always be longer than the duration of the integration time.*

**User interface**

1 to 65 ms

Measuring period

**Navigation**

Expert → Sensor → Sensor adjustm. → Measuring period (6536)

**Description**

Display the time of a full measuring period.

*The duration of the measuring period should always be longer than the duration of the integration time.*

**User interface**

2 to 1000 ms

"Process variable adjustment“ submenu

**Navigation**

Expert → Sensor → Sensor adjustm. → Variable adjust

*Process variable adjustment*

Volume flow offset (1831) → 79
Volume flow factor (1832) → 78

Mass flow offset (1841) → 79

Mass flow factor (1846) → 79

Conductivity offset (1848) → 80

Conductivity factor (1849) → 80

Corrected volume flow offset (1866) → 80

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Temperature factor (1869) → 81

Corrected conductivity offset (1870) → 82

Corrected conductivity factor (1871) → 82

Flow velocity offset (1879) → 82

Flow velocity factor (1880) → 83

**Volume flow factor**

**Navigation**


**Description**

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

**User entry**

Positive floating-point number

**Factory setting**

1

**Additional information**

*Description*

Corrected value = (factor × value) + offset
Volume flow offset

**Navigation**

**Description**
Use this function to enter the zero point shift for the volume flow trim. The volume flow unit on which the shift is based is m³/s.

**User entry**
Signed floating-point number

**Factory setting**
0 m³/s

**Additional information**
Description

Corrected value = (factor × value) + offset

Mass flow factor

**Navigation**
Expert → Sensor → Sensor adjustm. → Variable adjust → Mass flow factor (1846)

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

**User entry**
Positive floating-point number

**Factory setting**
1

**Additional information**
Description

Corrected value = (factor × value) + offset

Mass flow offset

**Navigation**

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

**User entry**
Signed floating-point number

**Factory setting**
0 kg/s

**Additional information**
Description

Corrected value = (factor × value) + offset
**Conductivity offset**

**Navigation**
Expert → Sensor → Sensor adjustm. → Variable adjust → Conduct. offset (1848)

**Prerequisite**
The **On** option is selected in the **Conductivity measurement** parameter (→ 62).

**Description**
Use this function to enter the zero point shift for the conductivity trim. The conductivity unit on which the shift is based is S/m.

**User entry**
Signed floating-point number

**Factory setting**
0 S/m

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

**Conductivity factor**

**Navigation**
Expert → Sensor → Sensor adjustm. → Variable adjust → Conduct. factor (1849)

**Prerequisite**
The **On** option is selected in the **Conductivity measurement** parameter (→ 62).

**Description**
Use this function to enter a quantity factor for the conductivity. This multiplication factor is applied over the conductivity range.

**User entry**
Positive floating-point number

**Factory setting**
1

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

**Corrected volume flow offset**

**Navigation**

**Description**
Use this function to enter the zero point shift for the corrected volume flow trim. The corrected volume flow unit on which the shift is based is 1 Nm³/s.

**User entry**
Signed floating-point number

**Factory setting**
0 Nm³/s

**Additional information**
*Description*
Corrected value = (factor × value) + offset
### Corrected volume flow factor

**Navigation**

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

**User entry**
Positive floating-point number

**Factory setting**
1

**Additional information**

Description

Corrected value = (factor × value) + offset

---

### Temperature offset

**Navigation**

**Prerequisite**
The temperature is read into the flowmeter from an external device.

**Description**
Use this function to enter the zero point shift for the temperature trim. The temperature unit on which the shift is based is 1 K.

**User entry**
Signed floating-point number

**Factory setting**
0 K

**Additional information**

Description

Corrected value = (factor × value) + offset

---

### Temperature factor

**Navigation**

**Prerequisite**
The temperature is read into the flowmeter from an external device.

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

**User entry**
Positive floating-point number

**Factory setting**
1

**Additional information**

Description

Corrected value = (factor × value) + offset
Corrected conductivity offset

**Navigation**  

**Prerequisite**  
The **On** option is selected in the **Conductivity measurement** parameter (→ 62) parameter.

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

**User entry**  
Signed floating-point number

**Factory setting**  
0 S/m

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

Corrected conductivity factor

**Navigation**  

**Prerequisite**  
The **On** option is selected in the **Conductivity measurement** parameter (→ 62) parameter.

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

**User entry**  
Positive floating-point number

**Factory setting**  
1

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

Flow velocity offset

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

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

**User entry**  
Signed floating-point number

**Factory setting**  
0 m/s
Additional information

Description

Corrected value = (factor × value) + offset

Flow velocity factor

Navigation


Description

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

User entry

Positive floating-point number

Factory setting

1

Additional information

Description

Corrected value = (factor × value) + offset

3.2.6 "Calibration" submenu

Navigation

Expert → Sensor → Calibration

Nominal diameter

Navigation

Expert → Sensor → Calibration → Nominal diameter (2807)

Description

Displays the nominal diameter of the sensor.

User interface

DNxx / x'

Factory setting

Depends on the size of the sensor
### Calibration factor

<table>
<thead>
<tr>
<th>Navigation</th>
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</tr>
</thead>
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<td>Description</td>
<td>Displays the current calibration factor for the sensor.</td>
</tr>
<tr>
<td>User interface</td>
<td>Positive floating-point number</td>
</tr>
<tr>
<td>Factory setting</td>
<td>Depends on nominal diameter and calibration.</td>
</tr>
</tbody>
</table>

#### Zero point

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<th>Navigation</th>
<th>Expert → Sensor → Calibration → Zero point (6546)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>This function shows the zero point correction value for the sensor.</td>
</tr>
<tr>
<td>User interface</td>
<td>Signed floating-point number</td>
</tr>
<tr>
<td>Factory setting</td>
<td>Depends on nominal diameter and calibration</td>
</tr>
</tbody>
</table>

### Conductivity calibration factor

<table>
<thead>
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<th>Navigation</th>
<th>Expert → Sensor → Calibration → Cond. cal. fact. (6718)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>The <strong>On</strong> option is selected in the <strong>Conductivity measurement</strong> parameter (→ 62) parameter.</td>
</tr>
<tr>
<td>Description</td>
<td>Displays the calibration factor for the conductivity measurement.</td>
</tr>
<tr>
<td>User interface</td>
<td>0.01 to 10000</td>
</tr>
</tbody>
</table>
3.3 "Input" submenu

Navigation  ⚡ Expert → Input

3.3.1 "Status input 1 to n" submenu

Navigation  ⚡ Expert → Input → Status input → Status input 1 to n

Assign status input

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

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

Selection

- Off
- Reset totalizer 1
- Reset totalizer 2
- Reset totalizer 3
- Reset all totalizers
- Flow override

Factory setting  Off

Additional information  Custody transfer mode

Operate only available for Promag W.

NOTE!  Before enabling the measuring device for custody transfer mode, make sure that the Off option is selected in the Assign status input.

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

**Selection**

- **Off**
  The status input is switched off.
- **Reset totalizer 1...3**
  The individual totalizers are reset.
- **Reset all totalizers**
  All totalizers are reset.
- **Flow override**
  The Flow override (→ 61) is activated.

**Note on the Flow override (→ 61):**
- The Flow override (→ 61) is enabled as long as the level is at the status input (continuous signal).
- All other assignments react to a change in level (pulse) at the status input.

---

Value status input

**Navigation**

![expert] Expert → Input → Status input → Val.stat.inp. (1353)

**Prerequisite**

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

**Description**

Displays the current input signal level.

**User interface**

- **High**
- **Low**

---

Active level

**Navigation**

![expert] Expert → Input → Status input → Active level (1351)

**Description**

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

**Selection**

- **High**
- **Low**

**Factory setting**

High

---

Response time status input

**Navigation**

![expert] Expert → Input → Status input → Response time (1354)

**Description**

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

*Navigation*  

Expert → Output

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<th>Page</th>
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</thead>
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</tr>
<tr>
<td>Pulse/frequency/switch output 1 to n</td>
<td>99</td>
</tr>
</tbody>
</table>

3.4.1  "Current output 1" submenu

*Navigation*  

Expert → Output → Curr.output 1

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<th>Submenu</th>
<th>Page</th>
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</thead>
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<td>Assign current output 1 (0359–1)</td>
<td>88</td>
</tr>
<tr>
<td>Current span (0353–1)</td>
<td>88</td>
</tr>
<tr>
<td>Fixed current (0365–1)</td>
<td>89</td>
</tr>
<tr>
<td>0/4 mA value (0367–1)</td>
<td>90</td>
</tr>
<tr>
<td>20 mA value (0372–1)</td>
<td>91</td>
</tr>
<tr>
<td>Measuring mode (0351–1)</td>
<td>92</td>
</tr>
<tr>
<td>Damping output 1 (0363–1)</td>
<td>96</td>
</tr>
<tr>
<td>Failure mode (0364–1)</td>
<td>97</td>
</tr>
<tr>
<td>Failure current (0352–1)</td>
<td>98</td>
</tr>
<tr>
<td>Output current 1 (0361–1)</td>
<td>98</td>
</tr>
<tr>
<td>Measured current 1 (0366–1)</td>
<td>99</td>
</tr>
</tbody>
</table>
Assign current output 1

Navigation

Expert → Output → Curr.output 1 → Assign curr. 1 (0359–1)

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

Selection
- Volume flow
- Mass flow
- Corrected volume flow
- Flow velocity
- Conductivity
- Corrected conductivity
- Temperature
- Electronic temperature
- Reference electrode potential against PE
- Coil current shot time
- Noise
- Build-up measured value
- Test point 1
- Test point 2
- Test point 3

Factory setting
Volume flow

Current span

Navigation

Expert → Output → Curr.output 1 → Current span (0353–1)

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

Selection
- 4...20 mA NAMUR (3.8...20.5 mA)
- 4...20 mA US (3.9...20.8 mA)
- 4...20 mA (4... 20.5 mA)
- 0...20 mA (0... 20.5 mA)
- Fixed current

Factory setting
Country-specific:
- 4...20 mA NAMUR (3.8...20.5 mA)
- 4...20 mA US (3.9...20.8 mA)

* Visibility depends on order options or device settings
Additional information  

**Description**

- In the event of a device alarm, the current output adopts the value specified in the **Failure mode** parameter (→ 97).
- If the measured value is outside the measuring range, the **S441 Current output 1** diagnostic message is displayed.
- The measuring range is specified via the **0/4 mA value** parameter (→ 90) and **20 mA value** parameter (→ 91).

"Fixed current" option

- This option is used for a HART Multidrop network.
- It can only be used for the 4...20 mA HART current output (current output 1).
- The current value is set via the **Fixed current** parameter (→ 89).

**Example**

Shows the relationship between the current range for the output of the process value and the lower and upper alarm levels:

![Diagram showing current ranges and alarm levels]

<table>
<thead>
<tr>
<th>Selection</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>4...20 mA NAMUR (3.8...20.5 mA)</td>
<td>3.8 to 20.5 mA</td>
<td>&lt; 3.6 mA</td>
<td>&gt; 21.95 mA</td>
</tr>
<tr>
<td>4...20 mA US (3.9...20.8 mA)</td>
<td>3.9 to 20.8 mA US</td>
<td>&lt; 3.6 mA</td>
<td>&gt; 21.95 mA</td>
</tr>
<tr>
<td>4...20 mA (4...20.5 mA)</td>
<td>4 to 20.5 mA</td>
<td>&lt; 3.6 mA</td>
<td>&gt; 21.95 mA</td>
</tr>
<tr>
<td>0...20 mA (0...20.5 mA)</td>
<td>0 to 20.5 mA</td>
<td>&lt; 0 mA</td>
<td>&gt; 21.95 mA</td>
</tr>
</tbody>
</table>

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

**Fixed current**

**Navigation**  

[Expert → Output → Curr. output 1 → Fixed current (0365–1)]

**Prerequisite**  

The **Fixed current** option is selected in the **Current span** parameter (→ 88).

**Description**  

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

**User entry**  

0 to 22.5 mA

**Factory setting**  

22.5 mA
**0/4 mA value**

**Navigation**  
Expert → Output → Curr.output 1 → 0/4 mA value (0367–1)

**Prerequisite**  
One of the following options is selected in the Current span parameter (→ 88):  
- 4...20 mA NAMUR (3.8...20.5 mA)  
- 4...20 mA US (3.9...20.8 mA)  
- 4...20 mA (4... 20.5 mA)  
- 0...20 mA (0... 20.5 mA)

**Description**  
Use this function to enter a value for the 0/4 mA current.

**User entry**  
Signed floating-point number

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

**Additional information**  

**Description**  
Positive and negative values are permitted depending on the process variable assigned in the Assign current output parameter (→ 88). In addition, the value can be greater than or smaller than the value assigned for the 20 mA current in the 20 mA value parameter (→ 91).

**Dependency**  

The unit depends on the process variable selected in the Assign current output parameter (→ 88).

**Current output behavior**  
The current output behaves differently depending on the settings configured in the following parameters:  
- Current span (→ 88)  
- Measuring mode (→ 92)  
- Failure mode (→ 97)

**Configuration examples**  
Some examples of parameter settings and their effect on the current output are given in the following section.

**Configuration example A**  
Measurement mode with Forward flow option  
- 0/4 mA value parameter (→ 90) = not equal to zero flow (e.g. −250 m³/h)  
- 20 mA value parameter (→ 91) = not equal to zero flow (e.g. +750 m³/h)  
- Calculated current value = 8 mA at zero flow

---

Q: Flow  
I: Current  
1: Measuring range is exceeded or undershot
The operational range of the measuring device is defined by the values entered for the **0/4 mA value** parameter (→ 90) and **20 mA value** parameter (→ 91). If the effective flow exceeds or falls below this operational range, the **S441 Current output 1** diagnostic message is displayed.

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

![Graph](image)

<table>
<thead>
<tr>
<th>1</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q</td>
<td>Flow</td>
</tr>
<tr>
<td>1</td>
<td>Value assigned to the 0/4 mA current</td>
</tr>
<tr>
<td>2</td>
<td>Forward flow</td>
</tr>
<tr>
<td>3</td>
<td>Reverse flow</td>
</tr>
</tbody>
</table>

The current output signal is independent of the direction of flow (absolute amount of the measured variable). The values for the **0/4 mA value** parameter (→ 90) and **20 mA value** parameter (→ 91) must have the same algebraic sign. The value for the **20 mA value** parameter (→ 91) (e.g. reverse flow) corresponds to the mirrored value for the **20 mA value** parameter (→ 91) (e.g. flow).

**Configuration example C**  
Measurement mode with **Reverse flow compensation** option

If flow is characterized by severe fluctuations (e.g. when using reciprocating pumps), flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 s → 92.

### 20 mA value

**Navigation**

[Expert] → [Output] → [Curr.output 1] → 20 mA value (0372–1)

**Prerequisite**

In the **Current span** parameter (→ 88), one of the following options is selected:

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

**Description**

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

**User entry**

Signed floating-point number

**Factory setting**

Depends on country and nominal diameter → 197

**Additional information**

Description

Positive and negative values are permitted depending on the process variable assigned in the **Assign current output** parameter (→ 88). In addition, the value can be greater...
than or smaller than the value assigned for the 0/4 mA current in the 0/4 mA value parameter (→ 89).

Dependency

The unit depends on the process variable selected in the Assign current output parameter (→ 88).

Example

- Value assigned to 0/4 mA = −250 m³/h
- Value assigned to 20 mA = +750 m³/h
- Calculated current value = 8 mA (at zero flow)

If the Forward/Reverse flow option is selected in the Measuring mode parameter (→ 92), different signs cannot be entered for the values of the 0/4 mA value parameter (→ 90) and 20 mA value parameter (→ 91). The ΔS441 Current output 1 diagnostic message is displayed.

Configuration examples

Observe the configuration examples for the 0/4 mA value parameter (→ 90).

---

### Measuring mode

**Navigation**

Expert → Output → Curr.output 1 → Measuring mode (0351–1)

**Prerequisite**

One of the following options is selected in the Assign current output parameter (→ 88):

- Volume flow
- Mass flow
- Flow velocity

One of the following options is selected in the Current span parameter (→ 88):

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

**Description**

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

**Selection**

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

**Factory setting**

Forward flow

**Additional information**

The process variable that is assigned to the current output via the Assign current output parameter (→ 88) is displayed below the parameter.

*Forward flow* option

The current output signal is proportional to the process variable assigned. The measuring range is defined by the values that are assigned to the 0/4 mA and 20 mA current value.

* Visibility depends on order options or device settings
The flow components outside the scaled measuring range are taken into account for signal output as follows:

- Both values are defined such that they are not equal to zero flow e.g.:
  - 0/4 mA current value = –5 m³/h
  - 20 mA current value = 10 m³/h
- If the effective flow exceeds or falls below this measuring range, the **S441 Current output 1** diagnostic message is displayed.

**'Forward/Reverse flow' option**

- The current output signal is independent of the direction of flow (absolute amount of the measured variable). The values for the 0/4 mA value parameter (→ S441 90) and 20 mA value parameter (→ S441 91) must have the same sign.
- The value for the 20 mA value parameter (→ S441 91) (e.g. reverse flow) corresponds to the mirrored value for the 20 mA value parameter (→ S441 91) (e.g. forward flow).

**'Reverse flow compensation' option**

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

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

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

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

**Examples of how the current output behaves**

**Example 1**

Defined measuring range: lower range value and upper range value with the same sign.
2 Measuring range

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Current</td>
</tr>
<tr>
<td>Q</td>
<td>Flow</td>
</tr>
</tbody>
</table>

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

With the following flow response:

3 Flow response

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Q</td>
<td>Flow</td>
</tr>
<tr>
<td>t</td>
<td>Time</td>
</tr>
</tbody>
</table>

With **Forward flow** option

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

With **Forward/Reverse flow** option

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

With **Reverse flow compensation** option
Flow components outside of the measuring range are buffered, balanced and output after a maximum delay of 60 s.

\[ I \ [mA] \]
\[ t \]
\[ S = A \]

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

**Example 2**

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

\[ Q \]
\[ t \]

- **Q**: Flow
- **t**: Time

1. **Lower range value (value assigned to 0/4 mA current)**
2. **Upper range value (value assigned to 20 mA current)**

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

**With Forward flow option**

- **a (—)**: The flow components outside the scaled measuring range cannot be taken into account for signal output. The **S441 Current output** diagnostic message is output.
- **b (—)**: The current output signal is proportional to the process variable assigned.
**Description of device parameters**

**Proline Promag 400 HART**

[![Graph of I vs. t](image-url)](image-url)

\[ I \text{ [mA]} \]
\[ t \]
\[ a = \]
\[ b = \]
\[ S = A \]

1 **Current**

2 **Time**

3 **Flow components saved**

4 **Balancing of saved flow components**

---

**With Forward/Reverse flow option**

This option cannot be selected here since the values for the 0/4 mA value parameter (→ 90) and 20 mA value parameter (→ 91) have different algebraic signs.

**With Reverse flow compensation option**

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

---

### Damping output 1

**Navigation**

Expert → Output → Curr.output 1 → Damping out. 1 (0363–1)

**Prerequisite**

A process variable is selected in the **Assign current output** parameter (→ 88) and one of the following options is selected in the **Current span** parameter (→ 88):

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

**Description**

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

**User entry**

0.0 to 999.9 s

**Factory setting**

1.0 s
### Additional information

**User entry**

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

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

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

### Failure mode

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<th>Navigation</th>
<th>Expert → Output → Curr.output 1 → Failure mode (0364–1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>A process variable is selected in the Assign current output parameter (→ 88) and one of the following options is selected in the Current span parameter (→ 88):</td>
</tr>
<tr>
<td></td>
<td>• 4...20 mA NAMUR (3.8...20.5 mA)</td>
</tr>
<tr>
<td></td>
<td>• 4...20 mA US (3.9...20.8 mA)</td>
</tr>
<tr>
<td></td>
<td>• 4...20 mA (4...20.5 mA)</td>
</tr>
<tr>
<td></td>
<td>• 0...20 mA (0...20.5 mA)</td>
</tr>
<tr>
<td>Description</td>
<td>Use this function to select the value of the current output in the event of a device alarm.</td>
</tr>
<tr>
<td>Selection</td>
<td>• Min.</td>
</tr>
<tr>
<td></td>
<td>• Max.</td>
</tr>
<tr>
<td></td>
<td>• Last valid value</td>
</tr>
<tr>
<td></td>
<td>• Actual value</td>
</tr>
<tr>
<td></td>
<td>• Defined value</td>
</tr>
<tr>
<td>Factory setting</td>
<td>Max.</td>
</tr>
</tbody>
</table>

---

3) proportional transmission behavior with first order delay
Additional information

**Description**

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

**“Min.” option**

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

The signal on alarm level is defined via the **Current span** parameter (→ 88).

**“Max.” option**

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

The signal on alarm level is defined via the **Current span** parameter (→ 88).

**“Last valid value” option**

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

**“Actual value” option**

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

**“Defined value” option**

The current output adopts a defined measured value.

The measured value is defined via the **Failure current** parameter (→ 98).

### Failure current

**Navigation**

[Expert → Output → Curr.output 1 → Failure current (0352–1)]

**Prerequisite**

The **Defined value** option is selected in the **Failure mode** parameter (→ 97).

**Description**

Use this function to enter a fixed value that the current output adopts in the event of a device alarm.

**User entry**

0 to 22.5 mA

**Factory setting**

22.5 mA

### Output current 1

**Navigation**

[Expert → Output → Curr.output 1 → Output curr. 1 (0361–1)]

**Description**

Displays the current value currently calculated for the current output.

**User interface**

0 to 22.5 mA
Proline Promag 400 HART

Description of device parameters

Measured current 1

**Navigation**

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

**Description**

Displays the actual measured value of the output current.

**User interface**

0 to 30 mA

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

**Navigation**

Expert → Output → PFS output 1 to n

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<td>Assign pulse output 1 to n (0460–1 to n)</td>
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<tr>
<td>Pulse scaling (0455–1 to n)</td>
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<tr>
<td>Pulse width (0452–1 to n)</td>
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<tr>
<td>Measuring mode (0457–1 to n)</td>
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<td>Failure mode (0480–1 to n)</td>
</tr>
<tr>
<td>Pulse output 1 to n (0456–1 to n)</td>
</tr>
<tr>
<td>Assign frequency output (0478–1 to n)</td>
</tr>
<tr>
<td>Minimum frequency value (0453–1 to n)</td>
</tr>
<tr>
<td>Maximum frequency value (0454–1 to n)</td>
</tr>
<tr>
<td>Measuring value at minimum frequency (0476–1 to n)</td>
</tr>
<tr>
<td>Measuring value at maximum frequency (0475–1 to n)</td>
</tr>
<tr>
<td>Measuring mode (0479–1 to n)</td>
</tr>
<tr>
<td>Damping output 1 to n (0477–1 to n)</td>
</tr>
</tbody>
</table>
Description of device parameters

### Proline Promag 400 HART

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<td>109</td>
</tr>
<tr>
<td>Failure frequency (0474–1 to n)</td>
<td>110</td>
</tr>
<tr>
<td>Output frequency 1 to n (0471–1 to n)</td>
<td>110</td>
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<tr>
<td>Switch output function (0481–1 to n)</td>
<td>111</td>
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<tr>
<td>Assign diagnostic behavior (0482–1 to n)</td>
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<td>Switch-on value (0466–1 to n)</td>
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<td>117</td>
</tr>
</tbody>
</table>

### Operating mode

#### Navigation

Expert → Output → PFS output 1 to n → Operating mode (0469–1 to n)

#### Description

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

#### Selection

- Pulse *
- Frequency *
- Switch *

#### Factory setting

Pulse

* Visibility depends on order options or device settings
Additional information

‘Pulse’ option

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

Example
- Flow approx. 100 g/s
- Pulse value 0.1 g
- Pulse width 0.05 ms
- Pulse rate 1000 Impuls/s

![Diagram](image1)

5 Quantity-dependent pulse (pulse value) with configurable pulse width

B Pulse width entered
P Pauses between the individual pulses

‘Frequency’ option

Flow-dependent frequency output with 1:1 on/off ratio
An output frequency is output that is proportional to the value of a process variable, such as mass flow, volume flow, flow velocity, conductivity or electronic temperature.

Example
- Flow approx. 100 g/s
- Max. frequency 10 kHz
- Flow at max. frequency 1000 g/s
- Output frequency approx. 1000 Hz

![Diagram](image2)

6 Flow-dependent frequency output

‘Switch’ option

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

Example
Alarm response without alarm
**Assign pulse output 1 to n**

**Navigation**

Enter Output → PFS output 1 to n → Assign pulse 1 to n (0460–1 to n)

**Prerequisite**

The Pulse option is selected in the Operating mode parameter (→ 100).

**Description**

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

**Selection**

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

**Factory setting**

Off

**Pulse scaling**

**Navigation**

Enter Output → PFS output 1 to n → Pulse scaling (0455–1 to n)

**Prerequisite**

The Pulse option is selected in the Operating mode parameter (→ 100) and a process variable is selected in the Assign pulse output parameter (→ 102).

**Description**

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

**User entry**

Positive floating point number

**Factory setting**

Depends on country and nominal diameter → 198
Additional information  

**User entry**

Weighting of the pulse output with a quantity.

The lower the pulse value, the
- better the resolution.
- the higher the frequency of the pulse response.

---

**Pulse width**

**Navigation**

Expert → Output → PFS output 1 to n → Pulse width (0452–1 to n)

**Prerequisite**

The **Pulse** option is selected in the **Operating mode** parameter (→ 100) and a process variable is selected in the **Assign pulse output** parameter (→ 102).

**Description**

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

**User entry**

0.05 to 2 000 ms

**Factory setting**

100 ms

**Additional information**

**Description**

- Define how long a pulse is (duration).
- The maximum pulse rate is defined by $f_{\text{max}} = 1 / (2 \times \text{pulse width})$.
- The interval between two pulses lasts at least as long as the set pulse width.
- The maximum flow is defined by $Q_{\text{max}} = f_{\text{max}} \times \text{pulse value}$.
- If the flow exceeds these limit values, the measuring device displays the **443 Pulse output 1 to n** diagnostic message.

**Example**

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

**Navigation**

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

**Prerequisite**

In the Operating mode parameter (→ 100), the Pulse option is selected, and one of the following options is selected in the Assign pulse output parameter (→ 102):

- Mass flow
- Volume flow

**Description**

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

**Selection**

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

**Factory setting**

Forward flow

**Additional information**

Selection

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

For a detailed description of the options available, see the Measuring mode parameter (→ 92)

**Examples**

For a detailed description of the configuration examples, see the Measuring mode parameter (→ 92)

# Failure mode

**Navigation**

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

**Prerequisite**

The Pulse option is selected in the Operating mode parameter (→ 100) and a process variable is selected in the Assign pulse output parameter (→ 102).

**Description**

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

**Selection**

- Actual value
- No pulses

**Factory setting**

No pulses
Additional information

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

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

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

Pulse output 1 to n

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

Prerequisite
The Pulse option is selected in the Operating mode parameter (→  100) parameter.

Description
Displays the pulse frequency currently output.

User interface
Positive floating-point number

Additional information

Description
The pulse output is an open collector output.
This is configured at the factory in such a way that the transistor is conductive for the duration of the pulse (NO contact) and is safety-oriented.
- The Value per pulse parameter (→  102) and Pulse width parameter (→  103) can be used to define the value (i.e. the measured value amount that corresponds to a pulse) and the duration of the pulse.

The output behavior can be reversed via the Invert output signal parameter (→  117) i.e. the transistor does not conduct for the duration of the pulse.

In addition, the behavior of the output in the event of a device alarm (Failure mode parameter (→  104)) can be configured.
**Assign frequency output**

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

**Prerequisite**
The Frequency option is selected in the Operating mode parameter (→ 100).

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

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

**Factory setting**
Off

**Minimum frequency value**

**Navigation**
Expert → Output → PFS output 1 to n → Min. freq. value (0453–1 to n)

**Prerequisite**
The Frequency option is selected in the Operating mode parameter (→ 100) and a process variable is selected in the Assign frequency output parameter (→ 106).

**Description**
Use this function to enter the minimum frequency.

**User entry**
0.0 to 10000.0 Hz

**Factory setting**
0.0 Hz

**Maximum frequency value**

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

**Prerequisite**
The Frequency option is selected in the Operating mode parameter (→ 100) and a process variable is selected in the Assign frequency output parameter (→ 106).

* Visibility depends on order options or device settings
<table>
<thead>
<tr>
<th>Description</th>
<th>Use this function to enter the end value frequency.</th>
</tr>
</thead>
<tbody>
<tr>
<td>User entry</td>
<td>0.0 to 10 000.0 Hz</td>
</tr>
<tr>
<td>Factory setting</td>
<td>10 000.0 Hz</td>
</tr>
</tbody>
</table>

**Description of device parameters**

### Measuring value at minimum frequency

**Navigation**

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

**Prerequisite**

The **Frequency** option is selected in the **Operating mode** parameter (→ 100) and a process variable is selected in the **Assign frequency output** parameter (→ 106).

**Description**

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

**User entry**

Signed floating-point number

**Factory setting**

Depends on country and nominal diameter

**Additional information**

**Dependency**

The entry depends on the process variable selected in the **Assign frequency output** parameter (→ 106).

### Measuring value at maximum frequency

**Navigation**

Expert → Output → PFS output 1 to n → Val. at max.freq (0475–1 to n)

**Prerequisite**

The **Frequency** option is selected in the **Operating mode** parameter (→ 100) and a process variable is selected in the **Assign frequency output** parameter (→ 106).

**Description**

Use this function to enter the measured value for the end value frequency.

**User entry**

Signed floating-point number

**Factory setting**

Depends on country and nominal diameter

**Additional information**

**Description**

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

**Dependency**

The entry depends on the process variable selected in the **Assign frequency output** parameter (→ 106).
Description of device parameters

Proline Promag 400 HART

Measuring mode

Navigation

Expert → Output → PFS output 1 to n → Measuring mode (0479–1 to n)

Prerequisite

In the Operating mode parameter (→ 100), the Frequency option is selected, and one of the following options is selected in the Assign frequency output parameter (→ 106):

- Volume flow
- Mass flow
- Flow velocity
- Conductivity
- Electronic temperature

Description

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

Selection

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

Factory setting

Forward flow

Additional information

Selection

For a detailed description of the options available, see the Measuring mode parameter (→ 92)

Examples

For a detailed description of the configuration examples, see the Measuring mode parameter (→ 92)

Damping output 1 to n

Navigation

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

Prerequisite

In the Operating mode parameter (→ 100), the Frequency option is selected, and one of the following options is selected in the Assign frequency output parameter (→ 106):

- Volume flow
- Mass flow
- Flow velocity
- Conductivity
- Electronic temperature

Description

Use this function to enter a time constant for the reaction time of the output signal to fluctuations in the measured value.

User entry

0 to 999.9 s

Factory setting

0.0 s

* Visibility depends on order options or device settings
### Response time

**Navigation**

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

**Prerequisite**

In the **Operating mode** parameter (→ 100), the **Frequency** option is selected, and one of the following options is selected in the **Assign frequency output** parameter (→ 106):
- Volume flow
- Mass flow
- Flow velocity
- Conductivity
- Electronic temperature

**Description**

Displays the response time. This specifies how quickly the pulse/frequency/switch output reaches the measured value change of 63 % of 100 % of the measured value change.

**User interface**

Positive floating-point number

**Additional information**

The response time is made up of the time specified for the following dampings:
- Damping of pulse/frequency/switch output → 96
  and
- Depending on the measured variable assigned to the output.

Flow damping

### Failure mode

**Navigation**

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

**Prerequisite**

The **Frequency** option is selected in the **Operating mode** parameter (→ 100) and a process variable is selected in the **Assign frequency output** parameter (→ 106).

**Description**

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

---

4) proportional transmission behavior with first order delay

* Visibility depends on order options or device settings
### Selection
- **Actual value**
- **Defined value**
- **0 Hz**

### Factory setting
**0 Hz**

### Additional information
**Selection**
- **Actual value**
  In the event of a device alarm, the frequency output continues on the basis of the current flow measurement. The device alarm is ignored.
- **Defined value**
  In the event of a device alarm, the frequency output continues on the basis of a predefined value. The Failure frequency (→ 110) replaces the current measured value, making it possible to bypass the device alarm. The actual measurement is switched off for the duration of the device alarm.
- **0 Hz**
  In the event of a device alarm, the frequency output is "switched off".

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

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Switch output function

**Navigation**
Expert → Output → PFS output 1 to n → Switch out funct (0481–1 to n)

**Prerequisite**
The Switch option is selected in the Operating mode parameter (→ 100) parameter.

**Description**
Use this function to select a function for the switch output.

**Selection**
- Off
- On
- Diagnostic behavior
- Limit
- Flow direction check
- Status

**Factory setting**
Off

**Additional information**

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

Assign diagnostic behavior

**Navigation**
Expert → Output → PFS output 1 to n → Assign diag. beh (0482–1 to n)

**Prerequisite**
- In the Operating mode parameter (→ 100), the Switch option is selected.
- In the Switch output function parameter (→ 111), the Diagnostic behavior option is selected.

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

**Selection**
- Alarm
- Alarm or warning
- Warning

**Factory setting**
Alarm
Additional information  

**Description**

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

**Selection**

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

**Assign limit**

**Navigation**

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

**Prerequisite**

- The **Switch** option is selected in the Operating mode parameter (→ 100).
- The **Limit** option is selected in the Switch output function parameter (→ 111).

**Description**

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

**Selection**

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

**Factory setting**

Volume flow

**Additional information**

**Description**

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

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

* Visibility depends on order options or device settings
Behavior of status output when \( \text{Switch-on value} < \text{Switch-off value} \):
- Process variable < Switch-on value: transistor is conductive
- Process variable > Switch-off value: transistor is non-conductive

Behavior of status output when \( \text{Switch-on value} = \text{Switch-off value} \):
- Process variable > Switch-on value: transistor is conductive
- Process variable < Switch-off value: transistor is non-conductive
### Switch-on value

**Navigation**

- Expert → Output → PFS output 1 to n → Switch-on value (0466–1 to n)

**Prerequisite**

- The **Switch** option is selected in the **Operating mode** parameter (→ 100).
- The **Limit** option is selected in the **Switch output function** parameter (→ 111).

**Description**

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

**User entry**

Signed floating-point number

**Factory setting**

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

**Additional information**

**Description**

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

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

**Dependency**

- The unit depends on the process variable selected in the Assign limit parameter (→ 112).

### Switch-off value

**Navigation**

- Expert → Output → PFS output 1 to n → Switch-off value (0464–1 to n)

**Prerequisite**

- The **Switch** option is selected in the **Operating mode** parameter (→ 100).
- The **Limit** option is selected in the **Switch output function** parameter (→ 111).

**Description**

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

**User entry**

Signed floating-point number

**Factory setting**

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

**Additional information**

**Description**

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

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

**Dependency**

- The unit depends on the process variable selected in the Assign limit parameter (→ 112).
Assign flow direction check

Navigation

Expert → Output → PFS output 1 to n → Assign dir.check (0484–1 to n)

Prerequisite

- The Switch option is selected in the Operating mode parameter (→ 100).
- The Flow direction check option is selected in the Switch output function parameter (→ 111).

Description

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

Selection

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

Factory setting

Volume flow

Assign status

Navigation

Expert → Output → PFS output 1 to n → Assign status (0485–1 to n)

Prerequisite

- The Switch option is selected in the Operating mode parameter (→ 100).
- The Status option is selected in the Switch output function parameter (→ 111).

Description

Use this function to select a device status for the switch output.

Selection

- Empty pipe detection
- Low flow cut off
- Build-up detection *

Factory setting

Empty pipe detection

Additional information

Options

If empty pipe detection or low flow cut off are enabled, the output is conductive. Otherwise, the switch output is non-conductive.

Switch-on delay

Navigation

Expert → Output → PFS output 1 to n → Switch-on delay (0467–1 to n)

Prerequisite

- The Switch option is selected in the Operating mode parameter (→ 100).
- The Limit option is selected in the Switch output function parameter (→ 111).

Description

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

User entry

0.0 to 100.0 s

* Visibility depends on order options or device settings
Description of device parameters

**Switch-off delay**

**Navigation**

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

**Prerequisite**

- The Switch option is selected in the Operating mode parameter (→ 100).
- The Limit option is selected in the Switch output function parameter (→ 111).

**Description**

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

**User entry**

0.0 to 100.0 s

**Factory setting**

0.0 s

---

**Failure mode**

**Navigation**

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

**Description**

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

**Selection**

- Actual status
- Open
- Closed

**Factory setting**

Open

**Additional information**

**Options**

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

---

**Switch status 1 to n**

**Navigation**

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

**Prerequisite**

The Switch option is selected in the Operating mode parameter (→ 100).

**Description**

Displays the current switch status of the status output.
**User interface**
- Open
- Closed

**Additional information**

*User interface*
- Open
  The switch output is not conductive.
- Closed
  The switch output is conductive.

---

**Invert output signal**

**Navigation**

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

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

**Selection**
- No
- Yes

**Factory setting**
No

**Additional information**

*Selection*

No option (passive - negative)

![Diagram of No option](image1)

Yes option (passive - positive)

![Diagram of Yes option](image2)

---

3.5 "Communication" submenu

**Navigation**

Expert → Communication

- Communication
  - HART input → 118
  - HART output → 123
3.5.1 "HART input" submenu

**Navigation**

Expert → Communication → HART input

"Configuration" submenu

**Navigation**

Expert → Communication → HART input → Configuration

### Capture mode

**Navigation**

Expert → Communication → HART input → Configuration → Capture mode (7001)

**Description**

Use this function to select the capture mode via burst or master communication.
Selection

- Off
- Burst network
- Master network

Factory setting

Off

Additional information

'Burst network' option
The device records data transmitted via burst in the network.

'Master network' option
In this case, the device must be located in a HART network in which a HART master (control) queries the measured values of the up to 64 network participants. The device reacts only to the responses of a specific device in the network. Device ID, device type, manufacturer ID and the HART commands used by the master must be defined.

Device ID

Navigation

Expert → Communication → HART input → Configuration → Device ID (7007)

Prerequisite

The Master network option is selected in the Capture mode parameter (→ 118).

Description

Use this function to enter the device ID of the HART slave device whose data are to be recorded.

User entry

6-digit value:
- Via local operation: enter as hexadecimal or decimal number
- Via operating tool: enter as decimal number

Factory setting

0

Additional information

In addition to the device ID and manufacturer ID, the device type is part of the unique ID. Each HART device is uniquely identified by the unique device ID.

Device type

Navigation

Expert → Communication → HART input → Configuration → Device type (7008)

Prerequisite

In the Capture mode parameter (→ 118), the Master network option is selected.

Description

Use this function to enter the device type of the HART slave device whose data are to be recorded.

User entry

2-digit hexadecimal number

Factory setting

0x00

Additional information

In addition to the device ID and manufacturer ID, the device type is part of the unique ID. Each HART device is uniquely identified by the unique device ID.
Description of device parameters

**Manufacturer ID**

**Navigation**

Expert → Communication → HART input → Configuration → Manufacturer ID

**Prerequisite**

The Master network option is selected in the Capture mode parameter (→ 118).

**Description**

Use this function to enter the manufacturer ID of the HART slave device whose data are to be recorded.

**User entry**

2-digit value:

- Via local operation: enter as hexadecimal or decimal number
- Via operating tool: enter as decimal number

**Factory setting**

0

**Additional information**

In addition to the device ID and manufacturer ID, the device type is part of the unique ID. Each HART device is uniquely identified by the unique device ID.

---

**Burst command**

**Navigation**

Expert → Communication → HART input → Configuration → Burst command (7006)

**Prerequisite**

The Burst network option or the Master network option are selected in the Capture mode parameter (→ 118).

**Description**

Use this function to select the burst command to be recorded.

**Selection**

- Command 1
- Command 3
- Command 9
- Command 33

**Factory setting**

Command 1

**Additional information**

**Selection**

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

Navigation

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

Prerequisite

The Burst network option or the Master network option is selected in the Capture mode parameter (→ 118).

Description

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

User entry

1 to 8

Factory setting

1

Additional information

User entry

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<td>PV</td>
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<tr>
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</tr>
<tr>
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<td>-</td>
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<tr>
<td>4</td>
<td>-</td>
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</tr>
<tr>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
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<td>-</td>
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<td>-</td>
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<tr>
<td>8</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>

Timeout

Navigation

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

Prerequisite

The Burst network option or the Master network option is selected in the Capture mode parameter (→ 118).

Description

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

User entry

1 to 120 s

Factory setting

5 s

Additional information

Description

If the interval is exceeded, the measuring device displays the F882 Input signal diagnostic message.
### Failure mode

**Navigation**

Zoom ➔ Expert ➔ Communication ➔ HART input ➔ Configuration ➔ Failure mode (7011)

**Prerequisite**

In the Capture mode parameter (➔ 118), the Burst network option or Master network option is selected.

**Description**

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

**Selection**

- Alarm
- Last valid value
- Defined value

**Factory setting**

Alarm

**Additional information**

Options

- Alarm
  An error message is set.
- Last valid value
  The last valid measured value is used.
- Defined value
  A user-defined measured value is used: (Failure value parameter (➔ 122)).

### Failure value

**Navigation**

Zoom ➔ Expert ➔ Communication ➔ HART input ➔ Configuration ➔ Failure value (7012)

**Prerequisite**

The following conditions are met:

- In the Capture mode parameter (➔ 118), the Burst network option or Master network option is selected.
- In the Failure mode parameter (➔ 122), the Defined value option is selected.

**Description**

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

**User entry**

Signed floating-point number

**Factory setting**

0
"Input" submenu

**Navigation**

Expert → Communication → HART input → Input

| **Value** (7003) | → 123 |
| **Status** (7004) | → 123 |

**Value**

**Navigation**

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

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

**User interface**
Signed floating-point number

**Status**

**Navigation**

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

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

**User interface**
- Manual/Fixed
- Good
- Poor accuracy
- Bad

3.5.2 "HART output" submenu

**Navigation**

Expert → Communication → HART output

| **HART output** | → 124 |
| **Configuration** | → 124 |
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**Description of device parameters**

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"Configuration" submenu

**Navigation**  
Expert → Communication → HART output → Configuration

**Configuration**

- HART short tag (0220)  
- Device tag (0215)  
- HART address (0219)  
- No. of preambles (0217)  
- Fieldbus writing access (0273)

### HART short tag

**Navigation**  
Expert → Communication → HART output → Configuration → HART short tag (0220)

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

**User entry**  
Max. 8 characters: A to Z, 0 to 9 and certain special characters (e.g. punctuation marks, @, %).

**Factory setting**  
PROMAG

### Device tag

**Navigation**  
Expert → Communication → HART output → Configuration → Device tag (0215)

**Description**  
Use this function to enter the name for the measuring point.

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

**Factory setting**  
Promag
**HART address**

**Navigation**
> Expert → Communication → HART output → Configuration → HART address (0219)

**Description**
Use this function to enter the address via which the data exchange takes place via HART protocol.

**User entry**
0 to 63

**Factory setting**
0

**Additional information**
*Description*
For addressing in a HART Multidrop network, the **Fixed current** option must be set in the **Current span** parameter (→ 88) (current output 1).

**No. of preambles**

**Navigation**
> Expert → Communication → HART output → Configuration → No. of preambles (0217)

**Description**
Use this function to enter the number of preambles in the HART protocol.

**User entry**
2 to 20

**Factory setting**
5

**Additional information**
*User entry*
As every modem component can ’swallow’ a byte, 2-byte preambles at least must be defined.

**Fieldbus writing access**

**Navigation**
> Expert → Communication → HART output → Configuration → Fieldb.writ.acc. (0273)

**Description**
Use this function to restrict access to the measuring device via fieldbus (HART interface).

**Selection**
- Read + write
- Read only

**Factory setting**
Read + write
Additional information

Description

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

Selection

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

"Burst configuration 1 to n" submenu

Navigation

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

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</table>
**Burst mode 1 to n**

**Navigation**
Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst mode 1 to n (2032–1 to n)

**Description**
Use this function to select whether to activate the HART burst mode for burst message X.

**Selection**
- Off
- On

**Factory setting**
Off

**Additional information**
**Options**
- Off
  The measuring device transmits data only when requested by the HART master.
- On
  The measuring device transmits data regularly without being requested.

---

**Burst command 1 to n**

**Navigation**
Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst command 1 to n (2031–1 to n)

**Description**
Use this function to select the HART command that is sent to the HART master.

**Selection**
- Command 1
- Command 2
- Command 3
- Command 9
- Command 33
- Command 48

**Factory setting**
Command 2

**Additional information**

**Selection**
- Command 1
  Read out the primary variable.
- Command 2
  Read out the current and the main measured value as a percentage.
- Command 3
  Read out the dynamic HART variables and the current.
- Command 9
  Read out the dynamic HART variables including the related status.
- Command 33
  Read out the dynamic HART variables including the related unit.
- Command 48
  Read out the complete device diagnostics.

"Command 33" option
The HART device variables are defined via Command 107.
The following measured variables (HART device variables) can be read out:
- Volume flow
- Mass flow
- Flow velocity
- Conductivity
- Electronic temperature
- Density
- HART input
- Totalizer 1...3
- Percent of range
- Measured current
- Primary variable (PV)
- Secondary variable (SV)
- Tertiary variable (TV)
- Quaternary variable (QV)

**Commands**

- Information about the defined details of the command: HART specifications
- The measured variables (HART device variables) are assigned to the dynamic variables in the **Output** submenu (→ 87).

### Burst variable 0

**Navigation**

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

**Description**

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

**Selection**

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

**Factory setting**

Volume flow

* Visibility depends on order options or device settings
**Additional information**  
*Selection*

The **Not used** option is set if a burst message is not configured.

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<td><strong>Selection</strong></td>
<td>See the <strong>Burst variable 0</strong> parameter (→ 128).</td>
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<td>For HART command 9 and 33: select the HART device variable or the process variable.</td>
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<td><strong>Selection</strong></td>
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<tr>
<td><strong>Navigation</strong></td>
<td>Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 3 (2036)</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>For HART command 9 and 33: select the HART device variable or the process variable.</td>
</tr>
<tr>
<td><strong>Selection</strong></td>
<td>See the <strong>Burst variable 0</strong> parameter (→ 128).</td>
</tr>
<tr>
<td><strong>Factory setting</strong></td>
<td>Not used</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Burst variable 4</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Navigation</strong></td>
<td>Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 4 (2037)</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>For HART command 9: select the HART device variable or the process variable.</td>
</tr>
</tbody>
</table>
Description of device parameters

Proline Promag 400 HART

Selection
See the Burst variable 0 parameter (→ 128).

Factory setting
Not used

Burst variable 5

Navigation
Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 5 (2038)

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

Selection
See the Burst variable 0 parameter (→ 128).

Factory setting
Not used

Burst variable 6

Navigation
Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 6 (2039)

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

Selection
See the Burst variable 0 parameter (→ 128).

Factory setting
Not used

Burst variable 7

Navigation
Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 7 (2040)

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

Selection
See the Burst variable 0 parameter (→ 128).

Factory setting
Not used

Burst trigger mode

Navigation
Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Trigger mode (2044–1 to n)

Description
Use this function to select the event that triggers burst message X.
Selection

- Continuous
- Window *
- Rising *
- Falling *
- On change

Factory setting

Continuous

Additional information

Selection

- Continuous
  The message is sent continuously, at least at intervals corresponding to the time frame specified in the Burst min period parameter (→ 131).
- Window
  The message is sent if the specified measured value has changed by the value in the Burst trigger level parameter (→ 131).
- Rising
  The message is sent if the specified measured value exceeds the value in the Burst trigger level parameter (→ 131).
- Falling
  The message is sent if the specified measured value drops below the value in the Burst trigger level parameter (→ 131).
- On change
  The message is sent if a measured value changes in the burst message.

Burst trigger level

<table>
<thead>
<tr>
<th>Navigation</th>
<th>Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Trigger level (2043–1 to n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>For entering the burst trigger value.</td>
</tr>
<tr>
<td>User entry</td>
<td>Signed floating-point number</td>
</tr>
<tr>
<td>Additional information</td>
<td>Description</td>
</tr>
</tbody>
</table>

Min. update period

<table>
<thead>
<tr>
<th>Navigation</th>
<th>Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Min. upd. per. (2042–1 to n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Use this function to enter the minimum time span between two burst commands of burst message X.</td>
</tr>
<tr>
<td>User entry</td>
<td>Positive integer</td>
</tr>
</tbody>
</table>

* Visibility depends on order options or device settings
Description of device parameters

**Proline Promag 400 HART**

### Factory setting

1000 ms

### Max. update period

**Navigation**

Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Max. upd. per. (2041–1 to n)

**Description**

Use this function to enter the maximum time span between two burst commands of burst message X.

**User entry**

Positive integer

**Factory setting**

2000 ms

### "Information" submenu

**Navigation**

Expert → Communication → HART output → Information

<table>
<thead>
<tr>
<th>Information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Device revision (0204)</td>
<td></td>
</tr>
<tr>
<td>Device ID (0221)</td>
<td></td>
</tr>
<tr>
<td>Device type (0209)</td>
<td></td>
</tr>
<tr>
<td>Manufacturer ID (0259)</td>
<td></td>
</tr>
<tr>
<td>HART revision (0205)</td>
<td></td>
</tr>
<tr>
<td>HART descriptor (0212)</td>
<td></td>
</tr>
<tr>
<td>HART message (0216)</td>
<td></td>
</tr>
<tr>
<td>Hardware revision (0206)</td>
<td></td>
</tr>
<tr>
<td>Software revision (0224)</td>
<td></td>
</tr>
<tr>
<td>HART date code (0202)</td>
<td></td>
</tr>
</tbody>
</table>

→ 133
→ 133
→ 133
→ 134
→ 134
→ 134
→ 134
→ 135
→ 135
→ 135
### Device revision

**Navigation**  
Expert → Communication → HART output → Information → Device revision (0204)

**Description**  
Displays the device revision with which the device is registered with the HART Communication Foundation.

**User interface**  
2-digit hexadecimal number

**Factory setting**  
9

**Additional information**  
*Description*  
The device revision is needed to assign the appropriate device description file (DD) to the device.

### Device ID

**Navigation**  
Expert → Communication → HART output → Information → Device ID (0221)

**Description**  
Use this function to view the device ID for identifying the measuring device in a HART network.

**User interface**  
6-digit hexadecimal number

**Additional information**  
*Description*  
In addition to the device type and manufacturer ID, the device ID is part of the unique ID. Each HART device is uniquely identified by the unique device ID.

### Device type

**Navigation**  
Expert → Communication → HART output → Information → Device type (0209)

**Description**  
Displays the device type with which the measuring device is registered with the HART Communication Foundation.

**User interface**  
2-digit hexadecimal number

**Factory setting**  
0x69 (for Promag 400)

**Additional information**  
*Description*  
The device type is specified by the manufacturer. It is needed to assign the appropriate device description file (DD) to the device.
### Manufacturer ID

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

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

**User interface**  
2-digit hexadecimal number

**Factory setting**  
0x11 (for Endress+Hauser)

### HART revision

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

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

**User interface**  
5 to 7

**Factory setting**  
7

### HART descriptor

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

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

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

**Factory setting**  
Promag 400

### HART message

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

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

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

**Factory setting**  
Promag 400
### Hardware revision

**Navigation**  
Expert → Communication → HART output → Information → Hardware rev. (0206)

**Description**  
Displays the hardware revision of the measuring device.

**User interface**  
0 to 255

**Factory setting**  
1

### Software revision

**Navigation**  
Expert → Communication → HART output → Information → Software rev. (0224)

**Description**  
Displays the software revision of the measuring device.

**User interface**  
0 to 255

**Factory setting**  
9

### HART date code

**Navigation**  
Expert → Communication → HART output → Information → HART date code (0202)

**Description**  
Use this function to enter the date information for individual use.

**User entry**  
Date entry format: yyyy-mm-dd

**Factory setting**  
2009-07-20

**Additional information**  
*Example*  
Device installation date

---

**"Output" submenu**

**Navigation**  
Expert → Communication → HART output → Output

* [Assign PV (0234)](0234)  
* [Primary variable (PV) (0201)](0201)
**Assign PV**

**Navigation**

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

**Description**

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

**Selection**

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

**Factory setting**

Volume flow

---

**Primary variable (PV)**

**Navigation**

Expert → Communication → HART output → Output → Primary var (PV) (0201)

**Description**

Displays the current measured value of the primary dynamic variable (PV).

**User interface**

Signed floating-point number

* Visibility depends on order options or device settings
Additional information

User interface
The measured value displayed depends on the process variable selected in the Assign PV parameter (→ 136).

Dependency
The unit of the displayed measured value is taken from the System units submenu (→ 51).

Assign SV

Navigation

Expert → Communication → HART output → Output → Assign SV (0235)

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

Selection
- Volume flow
- Mass flow
- Corrected volume flow
- Flow velocity
- Conductivity
- Corrected conductivity
- Temperature
- Electronic temperature
- Density
- Totalizer 1
- Totalizer 2
- Totalizer 3
- HART input
- Noise
- Coil current shot time
- Reference electrode potential against PE
- Build-up measured value
- Test point 1
- Test point 2
- Test point 3

Factory setting
Totalizer 1

Secondary variable (SV)

Navigation

Expert → Communication → HART output → Output → Second.var(SV) (0226)

Description
Displays the current measured value of the secondary dynamic variable (SV).

User interface
Signed floating-point number

* Visibility depends on order options or device settings
Additional information

_user interface_

The measured value displayed depends on the process variable selected in the Assign SV parameter (→ 137).

_dependency_

The unit of the displayed measured value is taken from the System units submenu (→ 51).

Assign TV

<table>
<thead>
<tr>
<th>Navigation</th>
<th>Expert → Communication → HART output → Output → Assign TV (0236)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Use this function to select a measured variable (HART device variable) for the tertiary (third) dynamic variable (TV).</td>
</tr>
</tbody>
</table>
| Selection | • Volume flow  
• Mass flow  
• Corrected volume flow  
• Flow velocity  
• Conductivity  
• Corrected conductivity *  
• Temperature  
• Electronic temperature  
• Density  
• Totalizer 1  
• Totalizer 2  
• Totalizer 3  
• HART input  
• Noise *  
• Coil current shot time *  
• Reference electrode potential against PE *  
• Build-up measured value *  
• Test point 1  
• Test point 2  
• Test point 3 |
| Factory setting | Totalizer 2 |

Tertiary variable (TV)

<table>
<thead>
<tr>
<th>Navigation</th>
<th>Expert → Communication → HART output → Output → Tertiary var(TV) (0228)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Displays the current measured value of the tertiary dynamic variable (TV).</td>
</tr>
<tr>
<td>User interface</td>
<td>Signed floating-point number</td>
</tr>
</tbody>
</table>

* Visibility depends on order options or device settings
Additional information

User interface

The measured value displayed depends on the process variable selected in the Assign TV parameter (→ 138).

Dependency

The unit of the displayed measured value is taken from the System units submenu (→ 51).

Assign QV

Navigation

Expert → Communication → HART output → Output → Assign QV (0237)

Description

Use this function to select a measured variable (HART device variable) for the quaternary (fourth) dynamic variable (QV).

Selection

- Volume flow
- Mass flow
- Corrected volume flow
- Flow velocity
- Conductivity
- Corrected conductivity
- Temperature
- Electronic temperature
- Density
- Totalizer 1
- Totalizer 2
- Totalizer 3
- HART input
- Noise
- Coil current shot time
- Reference electrode potential against PE
- Build-up measured value
- Test point 1
- Test point 2
- Test point 3

Factory setting

Totalizer 3

Quaternary variable (QV)

Navigation

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

Description

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

User interface

Signed floating-point number

* Visibility depends on order options or device settings
Description of device parameters

**Additional information**  
*User interface*

The measured value displayed depends on the process variable selected in the Assign QV parameter (→ 139).

**Dependency**

- The unit of the displayed measured value is taken from the System units submenu (→ 51).

---

### 3.5.3 "Web server" submenu

**Navigation**

Expert → Communication → Web server

#### Web server language

**Navigation**

Expert → Communication → Web server → Webserv.language (7221)

**Description**

Use this function to select the Web server language setting.

**Selection**

- English
- Deutsch
- Français
- Español
- Italiano
- Nederlands
- Portuguesa
- Polski
- русский язык (Russian)
- Svenska
### MAC address

**Navigation**

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

**Description**

Displays the MAC\(^5\) address of the measuring device.

**User interface**

Unique 12-digit character string comprising letters and numbers

**Factory setting**

Each measuring device is given an individual address.

**Additional information**

*Example*

For the display format

00:07:05:10:01:5F

### DHCP client

**Navigation**

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

**Description**

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

**Selection**

- Off
- On

**Factory setting**

On

**Additional information**

*Effect*

If the DHCP client functionality of the web server is selected, the IP address (→ 142), Subnet mask (→ 142) and Default gateway (→ 142) are set automatically.

- Identification is via the MAC address of the measuring device.
- The IP address (→ 142) in the IP address parameter (→ 142) is ignored as long as the DHCP client parameter (→ 141) is active. This is also the case, in particular, if the DHCP server cannot be reached. The IP address (→ 142) in the parameter of the same name is only used if the DHCP client parameter (→ 141) is inactive.

---

1 Visibility depends on order options or device settings
2 Media Access Control
### IP address

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

### Subnet mask

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

### Default gateway

| **Navigation** | Expert → Communication → Web server → Default gateway (7210) |
| **Description** | Display or enter the Default gateway (→ 142). |
| **User entry** | 4 octet: 0 to 255 (in the particular octet) |
| **Factory setting** | 0.0.0.0 |

### Web server functionality

| **Navigation** | Expert → Communication → Web server → Webserver funct. (7222) |
| **Description** | Use this function to switch the Web server on and off. |
| **Selection** | Off, On |
| **Factory setting** | On |
Additional information

Description

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

Selection

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
| Off    | • The web server is completely disabled.  
• Port 80 is locked. |
| On     | • The complete functionality of the web server is available. 
• JavaScript is used.  
• The password is transferred in an encrypted state. 
• Any change to the password is also transferred in an encrypted state. |

Login page

Navigation

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

Description

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

Selection

• Without header
• With header

Factory setting

With header

3.5.4 "WLAN settings" wizard

Navigation

Expert → Communication → WLAN settings

[WLAN settings]

WLAN (2702) → 144
WLAN mode (2717) → 144
SSID name (2714) → 145
Network security (2705) → 145
Security identification (2718) → 145
User name (2715) → 146
WLAN password (2716) → 146
WLAN IP address (2711) → 146
### WLAN

**Navigation**  
Experts → Communication → WLAN settings → WLAN (2702)

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

**Selection**  
- Disable
- Enable

**Factory setting**  
Enable

### WLAN mode

**Navigation**  
Experts → Communication → WLAN settings → WLAN mode (2717)

**Description**  
Use this function to select the WLAN mode.
Selection
WLAN access point

Factory setting
WLAN access point

SSID name

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

Prerequisite
The client is activated.

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

User entry
–

Factory setting
–

Network security

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

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

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

Factory setting
WPA2-PSK

Additional information
Selection
- Unsecured
  Access the WLAN connection without identification.
- WPA2-PSK
  Access the WLAN connection with a network key.

Security identification

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

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

* Visibility depends on order options or device settings
User interface

- Trusted issuer certificate
- Device certificate
- Device private key

User name

Navigation

Expert → Communication → WLAN settings → User name (2715)

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

User entry
-

Factory setting
-

WLAN password

Navigation

Expert → Communication → WLAN settings → WLAN password (2716)

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

User entry
-

Factory setting
-

WLAN IP address

Navigation

Expert → Communication → WLAN settings → WLAN IP address (2711)

Description
Use this function to enter the IP address of the measuring device's WLAN connection.

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

Factory setting
192.168.1.212

WLAN MAC address

Navigation

Expert → Communication → WLAN settings → WLAN MAC address (2703)

Description
Displays the MAC\(^6\) address of the measuring device.

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

---

\(^6\) Media Access Control
**Factory setting**  
Each measuring device is given an individual address.

**Additional information**  
*Example*  
For the display format  
00:07:05:10:01:5F

---

### WLAN subnet mask

**Navigation**  
Expert → Communication → WLAN settings → WLAN subnet mask (2709)

**Description**  
Use this function to enter the subnet mask.

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

**Factory setting**  
255.255.255.0

---

### WLAN passphrase

**Navigation**  
Expert → Communication → WLAN settings → WLAN passphrase (2706)

**Prerequisite**  
The WPA2-PSK option is selected in the Security type parameter (→ 145).

**Description**  
Use this function to enter the network key.

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

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

---

### Assign SSID name

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

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

**Selection**  
- Device tag  
- User-defined

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

SSID name

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

Prerequisite
- The User-defined option is selected in the Assign SSID name parameter (→ 147).
- The WLAN access point option is selected in the WLAN mode parameter (→ 144).

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

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

Factory setting

2.4 GHz WLAN channel

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

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

User entry
1 to 11

Factory setting
6

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

Select antenna

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

Description
Use this function to select whether the external or internal antenna is used for reception.

Selection
- External antenna
- Internal antenna

Factory setting
Internal antenna
Connection state

**Navigation**
- Expert → Communication → WLAN settings → Connection state (2722)

**Description**
The connection status is displayed.

**User interface**
- Connected
- Not connected

**Factory setting**
Not connected

Received signal strength

**Navigation**
- Expert → Communication → WLAN settings → Rec.sig.strength (2721)

**Description**
Displays the signal strength received.

**User interface**
- Low
- Medium
- High

**Factory setting**
High

Gateway IP address

**Navigation**
- Expert → Communication → WLAN settings → Gateway IP addr. (2719)

**Description**
Use this function to enter the IP address of the gateway.

**User interface**
Character string comprising numbers, letters and special characters (#15)

**Factory setting**
192.168.1.212

IP address domain name server

**Navigation**
- Expert → Communication → WLAN settings → IP address DNS (2720)

**Description**
Use this function to enter the IP address of the domain name server.

**User interface**
Character string comprising numbers, letters and special characters (#15)

**Factory setting**
192.168.1.212
3.5.5 "Diagnostic configuration" submenu

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

Assign a category to the particular diagnostic event:

<table>
<thead>
<tr>
<th>Category</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure (F)</td>
<td>A device error is present. The measured value is no longer valid.</td>
</tr>
<tr>
<td>Function check (C)</td>
<td>The device is in service mode (e.g. during a simulation).</td>
</tr>
<tr>
<td>Out of specification (S)</td>
<td>The device is being operated:</td>
</tr>
<tr>
<td></td>
<td>• Outside its technical specification limits (e.g. outside the process temperature range)</td>
</tr>
<tr>
<td></td>
<td>• Outside of the configuration carried out by the user (e.g. maximum flow in parameter 20 mA value)</td>
</tr>
<tr>
<td>Maintenance required (M)</td>
<td>Maintenance is required. The measured value is still valid.</td>
</tr>
<tr>
<td>No effect (N)</td>
<td>Has no effect on the condensed status 1).</td>
</tr>
</tbody>
</table>

1) Condensed status according to NAMUR recommendation NE107


**Diagnostic configuration**

- Event category 043 → 151
- Event category 376 → 151
- Event category 377 → 151
- Event category 441 → 152
- Event category 442 → 153
- Event category 443 → 153
- Event category 531 → 153
- Event category 832 → 154
- Event category 833 → 154
- Event category 834 → 155
- Event category 835 → 155
- Event category 861 → 155
- Event category 842 → 156
- Event category 962 → 156
Event category 043 (Sensor short circuit)

**Navigation**  
Endress+Hauser  
Expert → Communication → Diag. config. → Event category 043 (0285)

**Description**  
Use this option to select a category for the **043 Sensor short circuit** diagnostic message.

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

**Factory setting**  
Out of specification (S)

**Additional information**  
For a detailed description of the event categories available for selection: → β 150

Event category 376 (Sensor electronic (ISEM) faulty)

**Navigation**  
Endress+Hauser  
Expert → Communication → Diag. config. → Event category 376 (0286)

**Description**  
Use this option to select a category for the **376 Sensor electronic (ISEM) faulty** diagnostic message.

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

**Factory setting**  
Out of specification (S)

**Additional information**  
For a detailed description of the event categories available for selection: → β 150

Event category 377 (Sensor electronic (ISEM) faulty)

**Navigation**  
Endress+Hauser  
Expert → Communication → Diag. config. → Event category 377 (0287)

**Description**  
Use this option to select a category for the **377 Sensor electronic (ISEM) faulty** diagnostic message.
Selection

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

Factory setting

Out of specification (S)

Additional information

For a detailed description of the event categories available for selection: →  150

Event category 004 (Sensor)

Navigation

Expert → Communication → Diag. config. → Event category 004 (0238)

Description

Use this option to select a category for the 004 Sensor diagnostic message.

Selection

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

Factory setting

Out of specification (S)

Additional information

For a detailed description of the event categories available for selection: →  150

Event category 441 (Current output 1)

Navigation

Expert → Communication → Diag. config. → Event category 441 (0210)

Description

Use this option to select a category for the 441 Current output 1 diagnostic message.

Selection

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

Factory setting

Out of specification (S)

Additional information

For a detailed description of the event categories available for selection: →  150
**Event category 442 (Frequency output 1 to n)**

**Navigation**  
🔗 Expert → Communication → Diag. config. → Event category 442 (0230)

**Prerequisite**  
The pulse/frequency/switch output is available.

**Description**  
Use this option to select a category for the **442 Frequency output 1 to n** diagnostic message.

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

**Factory setting**  
Out of specification (S)

**Additional information**  
ℹ️ For a detailed description of the event categories available for selection: → 150

---

**Event category 443 (Pulse output 1 to n)**

**Navigation**  
🔗 Expert → Communication → Diag. config. → Event category 443 (0231)

**Prerequisite**  
The pulse/frequency/switch output is available.

**Description**  
Use this option to select a category for the **443 Pulse output 1 to n** diagnostic message.

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

**Factory setting**  
Out of specification (S)

**Additional information**  
ℹ️ For a detailed description of the event categories available for selection: → 150

---

**Event category 531 (Empty pipe detection)**

**Navigation**  
🔗 Expert → Communication → Diag. config. → Event category 531 (0262)

**Description**  
Use this option to select a category for the **531 Empty pipe detection** diagnostic message.
Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting
Out of specification (S)

Additional information
For a detailed description of the event categories available for selection: →  150

Event category 832 (Electronic temperature too high)

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

Description
Use this function to select a category for the 832 Electronic temperature too high diagnostic message.

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

Factory setting
Out of specification (S)

Additional information
Selection
For a detailed description of the event categories available for selection: →  150

Event category 833 (Electronic temperature too low)

Navigation
Expert → Communication → Diag. config. → Event category 833 (0225)

Description
Use this option to select a category for the 833 Electronic temperature too low diagnostic message.

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

Factory setting
Out of specification (S)

Additional information
Selection
For a detailed description of the event categories available for selection: →  150
Event category 834 (Process temperature too high)

**Navigation**  
Expert → Communication → Diag. config. → Event category 834 (0227)

**Description**  
Use this option to select a category for the 834 Process temperature too high diagnostic message.

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

**Factory setting**  
Out of specification (S)

**Additional information**  
For a detailed description of the event categories available for selection: → 150

Event category 835 (Process temperature too low)

**Navigation**  
Expert → Communication → Diag. config. → Event category 835 (0229)

**Description**  
Use this option to select a category for the 835 Process temperature too low diagnostic message.

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

**Factory setting**  
Out of specification (S)

**Additional information**  
For a detailed description of the event categories available for selection: → 150

Event category 861

**Navigation**  
Expert → Communication → Diag. config. → Event category 861 (0261)

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

**Factory setting**  
Out of specification (S)
Event category 842

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

Description
Change status signal of diagnostic event with diagnostic number 842 'Process limit'.

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

Factory setting
Out of specification (S)

Event category 862 (Pipe empty)

Navigation
Expert → Communication → Diag. config. → Event category 962 (0214)

Description
Use this option to select a category for the 862 Pipe empty diagnostic message.

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

Factory setting
Out of specification (S)

Additional information
For a detailed description of the event categories available for selection: → 150

Event category 937 (EMC interference)

Navigation
Expert → Communication → Diag. config. → Event category 937 (0260)

Description
Use this option to select a category for the 937 EMC interference diagnostic message.

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

Factory setting
Out of specification (S)

Additional information
For a detailed description of the event categories available for selection: → 150
Event category 938 (EMC interference)

Navigation

Expert → Communication → Diag. config. → Event category 938 (0284)

Description

Use this option to select a category for the 938 EMC interference diagnostic message.

Selection

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

Factory setting

Failure (F)

Additional information

For a detailed description of the event categories available for selection: → 150

3.6 "Application" submenu

Navigation

Expert → Application

Reset all totalizers

Navigation

Expert → Application → Reset all tot. (2806)

Description

Use this function to reset all totalizers to the value 0 and restart the totaling process. This deletes all the flow values previously totalized.

Selection

• Cancel
• Reset + totalize

Factory setting

Cancel
### Additional information

**Selection**

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancel</td>
<td>No action is executed and the user exits the parameter.</td>
</tr>
<tr>
<td>Reset + totalize</td>
<td>Resets all totalizers to 0 and restarts the totaling process. This deletes all the flow values previously totalized.</td>
</tr>
</tbody>
</table>

### 3.6.1 "Totalizer 1 to n" submenu

**Navigation**

Expert → Application → Totalizer 1 to n

---

**Assign process variable**

**Navigation**

Expert → Application → Totalizer 1 to n → Assign variable (0914–1 to n)

**Description**

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

**Selection**

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

**Factory setting**

Volume flow
Additional information

Description

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

Selection

If the Off option is selected, only the Assign process variable parameter (→ 158) is still displayed in the Totalizer 1 to n submenu. All other parameters in the submenu are hidden.

Unit totalizer 1 to n

Navigation

Expert → Application → Totalizer 1 to n → Unit totalizer 1 to n (0915–1 to n)

Prerequisite

A process variable is selected in the Assign process variable parameter (→ 158) of the Totalizer 1 to n submenu.

Description

Use this function to select the process variable unit for the Totalizer 1 to n (→ 158).

Selection

SI units

- g
- kg
- t

US units

- oz
- lb
- STon

* Visibility depends on order options or device settings

or

SI units

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

US units

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

* Visibility depends on order options or device settings

or

SI units

- Nl
- NhL
- Nm³
- Sl
- Sm³

US units

- Sft³
- MMSft³
- Sgal (us)
- Sgal (us;liq.)
- Sbbl (us;liq.)
- Sbbl (us;oil)

* Visibility depends on order options or device settings

Imperial units

- gal (imp)
- Mgal (imp)
- bbl (imp;beer)
- bbl (imp;oil)
- Sgal (imp)
- Sft³
- MMSft³
- Sgal (us)
- Sgal (us;liq.)
- Sbbl (us;liq.)
- Sbbl (us;oil)
Description of device parameters

Proline Promag 400 HART

or

* Other units
  None*

* Visibility depends on order options or device settings

Factory setting

Country-specific:
- l
- gal (us)

Additional information

Description
The unit is selected separately for each totalizer. It is independent of the selection made in the System units submenu (→ 51).

Selection
The selection is dependent on the process variable selected in the Assign process variable parameter (→ 158).

Custody transfer mode

Only available for Promag W.

Totalizer 1 is configured for the unit m³ option in custody transfer mode.

Totalizer operation mode

Navigation

Expert → Application → Totalizer 1 to n → Operation mode (0908–1 to n)

Prerequisite
A process variable is selected in the Assign process variable parameter (→ 158) of the Totalizer 1 to n submenu.

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

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

Factory setting
Net flow total

Additional information

Selection
- Net flow total
  Flow values in the forward and reverse flow direction are totalized and balanced against one another. Net flow is registered in the flow direction.
- Forward flow total
  Only the flow in the forward flow direction is totalized.
- Reverse flow total
  Only the flow in the reverse flow direction is totalized (= reverse flow quantity).
Control Totalizer 1 to n

Navigation
Expert → Application → Totalizer 1 to n → Control Tot. 1 to n (0912–1 to n)

Prerequisite
A process variable is selected in the Assign process variable parameter (→ 158) 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

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totalize</td>
<td>The totalizer is started or continues running.</td>
</tr>
<tr>
<td>Reset + hold</td>
<td>The totaling process is stopped and the totalizer is reset to 0.</td>
</tr>
<tr>
<td>Preset + hold</td>
<td>The totaling process is stopped and the totalizer is set to its defined start value from the Preset value parameter.</td>
</tr>
<tr>
<td>Reset + totalize</td>
<td>The totalizer is reset to 0 and the totaling process is restarted.</td>
</tr>
<tr>
<td>Preset + totalize</td>
<td>The totalizer is set to the defined start value from the Preset value parameter and the totaling process is restarted.</td>
</tr>
</tbody>
</table>

Preset value 1 to n

Navigation
Expert → Application → Totalizer 1 to n → Preset value 1 to n (0913–1 to n)

Prerequisite
A process variable is selected in the Assign process variable parameter (→ 158) of the Totalizer 1 to n submenu.

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

User entry
Signed floating-point number

Factory setting
0 l

Additional information

User entry
The unit of the selected process variable is specified for the totalizer in the Unit totalizer parameter (→ 159).

Example
This configuration is suitable for applications such as iterative filling processes with a fixed batch quantity.
**Description of device parameters**

**Failure mode**

**Navigation**

Expert → Application → Totalizer 1 to n → Failure mode (0901–1 to n)

**Prerequisite**

A process variable is selected in the **Assign process variable** parameter (→ 158) of the **Totalizer 1 to n** submenu.

**Description**

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

**Selection**

- Stop
- Actual value
- Last valid value

**Factory setting**

Stop

**Additional information**

*Description*

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

*Selection*

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

3.6.2 "Custody transfer" submenu

Only available for Promag W.

For detailed information on the parameter descriptions for custody transfer measurement, see the Special Documentation for the device → 7

**Navigation**

Expert → Application → Custody transfer

3.7 "Diagnostics" submenu

**Navigation**

Expert → Diagnostics

**Active diagnostics (0691)**

→ 163
### Active diagnostics

**Navigation**

- Expert → Diagnostics → Active diagnos. (0691)

**Prerequisite**

A diagnostic event has occurred.

**Description**

Displays the current diagnostic message. If two or more messages occur simultaneously, the message with the highest priority is shown on the display.

**User interface**

Symbol for diagnostic behavior, diagnostic code and short message.
Additional information

- **Display**
  - Additional pending diagnostic messages can be viewed in the Diagnostic list submenu (→ 166).
- Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the key.

**Example**
For the display format:

| 24d12h13m00s |

**Timestamp**

**Navigation**
- Expert → Diagnostics → Timestamp

**Description**
Displays the operating time when the current diagnostic message occurred.

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

**Additional information**

- The diagnostic message can be viewed via the Active diagnostics parameter (→ 163).

**Example**
For the display format:

| 24d12h13m00s |

**Previous diagnostics**

**Navigation**
- Expert → Diagnostics → Prev.diagnostics (0690)

**Prerequisite**
Two diagnostic events have already occurred.

**Description**
Displays the diagnostic message that occurred before the current message.

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

**Additional information**

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

**Example**
For the display format:

| 24d12h13m00s |
**Timestamp**

**Navigation**  
Expert → Diagnostics → Timestamp

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

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

**Additional information**  
*Display*  
The diagnostic message can be viewed via the **Previous diagnostics** parameter (→ 164).

*Example*  
For the display format:  
24d12h13m00s

**Operating time from restart**

**Navigation**  
Expert → Diagnostics → Time fr. restart (0653)

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

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

**Operating time**

**Navigation**  
Expert → Diagnostics → Operating time (0652)

**Description**  
Use this function to display the length of time the device has been in operation.

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

**Additional information**  
*User interface*  
The maximum number of days is 9999, which is equivalent to 27 years.
3.7.1 "Diagnostic list" submenu

**Navigation**

Expert → Diagnostics → Diagnostic list

### Diagnostics 1

**Navigation**

Expert → Diagnostics → Diagnostic list → Diagnostics 1 (0692)

**Description**

Displays the current diagnostics message with the highest priority.

**User interface**

Symbol for diagnostic behavior, diagnostic code and short message.

**Additional information**

**Display**

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

**Examples**

For the display format:
- $\Delta$S442 Frequency output
- $\times$F276 I/O module failure

### Timestamp

**Navigation**

Expert → Diagnostics → Diagnostic list → Timestamp

**Description**

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

**User interface**

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

**Display**

The diagnostic message can be viewed via the Diagnostics 1 parameter (→ 166).

**Example**

For the display format:
24d12h13m00s

### Diagnostics 2

#### Navigation

Expert → Diagnostics → Diagnostic list → Diagnostics 2 (0693)

#### Description

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

#### User interface

Symbol for diagnostic behavior, diagnostic code and short message.

#### Additional information

**Display**

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

**Examples**

For the display format:
- AS442 Frequency output
- F276 I/O module failure

### Timestamp

#### Navigation

Expert → Diagnostics → Diagnostic list → Timestamp

#### Description

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

#### User interface

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

#### Additional information

**Display**

The diagnostic message can be viewed via the Diagnostics 2 parameter (→ 167).

**Example**

For the display format:
24d12h13m00s
Diagnostics 3

Navigation

Expert → Diagnostics → Diagnostic list → Diagnostics 3 (0694)

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

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

Additional information

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

Examples
For the display format:
- \(\Delta S442\) Frequency output
- \(\times F276\) I/O module failure

Timestamp

Navigation

Expert → Diagnostics → Diagnostic list → Timestamp

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

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

Additional information

Display
The diagnostic message can be viewed via the Diagnostics 3 parameter (→ 168).

Example
For the display format:
24d12h13m00s

Diagnostics 4

Navigation

Expert → Diagnostics → Diagnostic list → Diagnostics 4 (0695)

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

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

Display

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

Examples

For the display format:
- S442 Frequency output
- F276 I/O module failure

Timestamp

Navigation

Expert → Diagnostics → Diagnostic list → Timestamp

Description

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

User interface

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

Additional information

Display

The diagnostic message can be viewed via the parameter (→ 168).

Example

For the display format:
24d12h13m00s

Diagnostics 5

Navigation

Expert → Diagnostics → Diagnostic list → Diagnostics 5 (0696)

Description

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

User interface

Symbol for diagnostic behavior, diagnostic code and short message.

Additional information

Display

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

Examples

For the display format:
- S442 Frequency output
- F276 I/O module failure
Description of device parameters

Proline Promag 400 HART

Timestamp

Navigation

Expert → Diagnostics → Diagnostic list → Timestamp

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

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

Additional information

Display

The diagnostic message can be viewed via the Diagnostics 5 parameter (→ 169).

Example
For the display format:
24d12h13m00s

3.7.2 "Event logbook" submenu
Displays previous event messages

Navigation
Expert → Diagnostics → Event logbook

Filter options

Navigation
Expert → Diagnostics → Event logbook → Filter options (0705)

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

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

Factory setting
All
Additional information

Description

The status signals are categorized in accordance with VDI/VDE 2650 and NAMUR Recommendation NE 107:

- **F** = Failure
- **C** = Function Check
- **S** = Out of Specification
- **M** = Maintenance Required

"Event list" submenu

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

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

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

Navigation

Expert → Diagnostics → Event logbook → Event list

Event list

Navigation

Expert → Diagnostics → Event logbook → Event list

Description

Displays the history of event messages of the category selected in the Filter options parameter (→ 170).

User interface

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

Additional information

Description

A maximum of 20 event messages are displayed in chronological order.
The following symbols indicate whether an event has occurred or has ended:

- •: Occurrence of the event
- •: End of the event

**Examples**

For the display format:

- I1091 Configuration modified
  • 24d12h13m00s
- AS442 Frequency output
  • 01d04h12min30s

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

**HistoROM**

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

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

### 3.7.3 "Custody transfer logbook" submenu

Only available for Promag W.

For detailed information on the parameter descriptions for custody transfer measurement, see the Special Documentation for the device → 7

**Navigation**

Expert → Diagnostics → Cust.transf.log.

### 3.7.4 "Device information" submenu

**Navigation**

Expert → Diagnostics → Device info
**Device tag**

**Navigation**
Expert → Diagnostics → Device info → Device tag (0011)

**Description**
Displays a unique name for the measuring point so it can be identified quickly within the plant. The name is displayed in the header.

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

**Factory setting**
Promag

**Additional information**

![Device Tag Diagram]

1. Position of the header text on the display

The number of characters displayed depends on the characters used.

---

**Serial number**

**Navigation**
Expert → Diagnostics → Device info → Serial number (0009)

**Description**
Displays the serial number of the measuring device.

The number can be found on the nameplate of the sensor and transmitter.

**User interface**
Max. 11-digit character string comprising letters and numbers.

**Additional information**

- Uses of the serial number
  - To identify the measuring device quickly, e.g. when contacting Endress+Hauser.
  - To obtain specific information on the measuring device using the Device Viewer: www.endress.com/deviceviewer
### Firmware version

**Navigation**

Expert → Diagnostics → Device info → Firmware version (0010)

**Description**

Displays the device firmware version installed.

**User interface**

Character string in the format xx.yy.zz

**Additional information**

* Display

  The Firmware version is also located:
  - On the title page of the Operating instructions
  - On the transmitter nameplate

### Device name

**Navigation**

Expert → Diagnostics → Device info → Device name (0013)

**Description**

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

**User interface**

Max. 32 characters such as letters or numbers.

**Factory setting**

Promag 400

### Order code

**Navigation**

Expert → Diagnostics → Device info → Order code (0008)

**Description**

Displays the device order code.

**User interface**

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

**Additional information**

**Description**

The order code can be found on the nameplate of the sensor and transmitter in the 'Order code' field.

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

**Uses of the order code**

- To order an identical spare device.
- To identify the device quickly and easily, e.g. when contacting Endress+Hauser.
Extended order code 1

Navigation
Expert → Diagnostics → Device info → Ext. order cd. 1 (0023)

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

User interface
Character string

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

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

Extended order code 2

Navigation
Expert → Diagnostics → Device info → Ext. order cd. 2 (0021)

Description
Displays the second part of the extended order code.

User interface
Character string

Additional information
For additional information, see Extended order code 1 parameter (→ 175)

Extended order code 3

Navigation
Expert → Diagnostics → Device info → Ext. order cd. 3 (0022)

Description
Displays the third part of the extended order code.

User interface
Character string

Additional information
For additional information, see Extended order code 1 parameter (→ 175)

Configuration counter

Navigation
Expert → Diagnostics → Device info → Config. counter (0233)

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

User interface
0 to 65535
### ENP version

**Navigation**
- Expert → Diagnostics → Device info → ENP version (0012)

**Description**
Displays the version of the electronic nameplate.

**User interface**
Character string

**Factory setting**
2.02.00

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

### 3.7.5 "Main electronic module + I/O module 1" submenu

**Navigation**
- Expert → Diagnostics → Mainboard module

#### Mainboard module

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</thead>
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</tr>
<tr>
<td>Build no. software</td>
<td>Expert → Diagnostics → Mainboard module → Build no. softw. (0079)</td>
</tr>
<tr>
<td>Bootloader revision</td>
<td>Expert → Diagnostics → Mainboard module → Bootloader revision (0079)</td>
</tr>
</tbody>
</table>

**Software revision**

**Navigation**
- Expert → Diagnostics → Mainboard module → Software rev. (0072)

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

**User interface**
Positive integer

**Build no. software**

**Navigation**
- Expert → Diagnostics → Mainboard module → Build no. softw. (0079)

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

**User interface**
Positive integer
## Bootloader revision

**Navigation**  

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

**User interface**  
Positive integer

### 3.7.6 "Sensor electronic module (ISEM)" submenu

**Navigation**  
[Expert] → Diagnostics → Sens. electronic

**Software revision**  

<table>
<thead>
<tr>
<th>Submenu</th>
<th>Submenu</th>
<th>Description</th>
<th>User interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software revision (0072)</td>
<td>177</td>
<td>Use this function to display the software revision of the module.</td>
<td>Positive integer</td>
</tr>
<tr>
<td>Build no. software (0079)</td>
<td>177</td>
<td></td>
<td>Positive integer</td>
</tr>
<tr>
<td>Bootloader revision (0073)</td>
<td>178</td>
<td></td>
<td>Positive integer</td>
</tr>
</tbody>
</table>

**Build no. software**

**Navigation**  
[Expert] → Diagnostics → Sens. electronic → Build no. softw. (0079)

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

**User interface**  
Positive integer
Description of device parameters

Bootloader revision

**Navigation**

Expert → Diagnostics → Sens. electronic → Bootloader rev. (0073)

**Description**

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

**User interface**

Positive integer

---

3.7.7 "Display module" submenu

**Navigation**

Expert → Diagnostics → Display module

**User interface**

Positive integer

---

Software revision

**Navigation**

Expert → Diagnostics → Display module → Software rev. (0072)

**Description**

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

**User interface**

Positive integer

---

Build no. software

**Navigation**

Expert → Diagnostics → Display module → Build no. softw. (0079)

**Description**

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

**User interface**

Positive integer
Bootloader revision

**Navigation**
Operate → Diagnostics → Display module → Bootloader rev. (0073)

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

**User interface**
Positive integer

### 3.7.8 "Minimum/maximum values" submenu

**Navigation**
Operate → Diagnostics → Min/max val.

**Additional information**
Positive integer

### "Main electronic temperature" submenu

**Navigation**
Operate → Diagnostics → Min/max val. → Main elect.temp.

**Additional information**
Positive integer

### Minimum value

**Navigation**
Operate → Diagnostics → Min/max val. → Main elect.temp. → Minimum value (6547)

**Description**
Displays the lowest previously measured temperature value of the main electronics module.

**User interface**
Signed floating-point number

**Additional information**
**Dependency**
The unit is taken from the Temperature unit parameter.
Maximum value

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

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

User interface
Signed floating-point number

Additional information
Dependency
The unit is taken from the Temperature unit parameter (→ 54)

"Medium temperature" submenu

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

Minimum value

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

Description
Displays the lowest previously measured medium temperature value.

User interface
Signed floating-point number

Additional information
Dependency
The unit is taken from the Temperature unit parameter (→ 54)

Maximum value

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

Description
Displays the highest previously measured medium temperature value.

User interface
Signed floating-point number
Additional information

Dependency

The unit is taken from the Temperature unit parameter (→ 54)

3.7.9 "Data logging" submenu

Navigation

Expert → Diagnostics → Data logging

<table>
<thead>
<tr>
<th>Data logging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assign channel 1 (0851)</td>
</tr>
<tr>
<td>Assign channel 2 (0852)</td>
</tr>
<tr>
<td>Assign channel 3 (0853)</td>
</tr>
<tr>
<td>Assign channel 4 (0854)</td>
</tr>
<tr>
<td>Logging interval (0856)</td>
</tr>
<tr>
<td>Clear logging data (0855)</td>
</tr>
<tr>
<td>Data logging (0860)</td>
</tr>
<tr>
<td>Logging delay (0859)</td>
</tr>
<tr>
<td>Data logging control (0857)</td>
</tr>
<tr>
<td>Data logging status (0858)</td>
</tr>
<tr>
<td>Entire logging duration (0861)</td>
</tr>
<tr>
<td>Display channel 1</td>
</tr>
<tr>
<td>Display channel 2</td>
</tr>
<tr>
<td>Display channel 3</td>
</tr>
<tr>
<td>Display channel 4</td>
</tr>
</tbody>
</table>
Assign channel 1

**Navigation**
Expert → Diagnostics → Data logging → Assign chan. 1 (0851)

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

The software options currently enabled are displayed in the Software option overview parameter (→ 41).

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

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

**Factory setting**
Off

**Additional information**
Description
A total of 1000 measured values can be logged. This means:
- 1000 data points if 1 logging channel is used
- 500 data points if 2 logging channels are used
- 333 data points if 3 logging channels are used
- 250 data points if 4 logging channels are used

Once the maximum number of data points is reached, the oldest data points in the data log are cyclically overwritten in such a way that the last 1000, 500, 333 or 250 measured values are always in the log (ring memory principle).

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

Assign channel 2

**Navigation**
Expert → Diagnostics → Data logging → Assign chan. 2 (0852)

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

The software options currently enabled are displayed in the Software option overview parameter (→ 41).

* Visibility depends on order options or device settings
Description

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

Selection

For the picklist, see the Assign channel 1 parameter (→ 182)

Factory setting

Off

Assign channel 3

Navigation

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

Prerequisite

The Extended HistoROM application package is available. The software options currently enabled are displayed in the Software option overview parameter (→ 41).

Description

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

Selection

For the picklist, see the Assign channel 1 parameter (→ 182)

Factory setting

Off

Assign channel 4

Navigation

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

Prerequisite

The Extended HistoROM application package is available. The software options currently enabled are displayed in the Software option overview parameter (→ 41).

Description

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

Selection

For the picklist, see the Assign channel 1 parameter (→ 182)

Factory setting

Off

Logging interval

Navigation

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

Prerequisite

The Extended HistoROM application package is available. The software options currently enabled are displayed in the Software option overview parameter (→ 41).

Description

Use this function to enter the logging interval $T_{\text{log}}$ for data logging.

User entry

0.1 to 3 600.0 s
Factory setting  1.0 s

Additional information  

Description

This defines the interval between the individual data points in the data log, and thus the maximum loggable process time $T_{\log}$:

- If 1 logging channel is used: $T_{\log} = 1000 \times t_{\log}$
- If 2 logging channels are used: $T_{\log} = 500 \times t_{\log}$
- If 3 logging channels are used: $T_{\log} = 333 \times t_{\log}$
- If 4 logging channels are used: $T_{\log} = 250 \times t_{\log}$

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

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

Example

If 1 logging channel is used:

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

- Overwriting
- Not overwriting

Factory setting

Overwriting

Additional information

**Selection**

- Overwriting
  The device memory applies the FIFO principle.
- Not overwriting
  Data logging is canceled if the measured value memory is full (single shot).

**Logging delay**

Navigation

Expert → Diagnostics → Data logging → Logging delay (0859)

Prerequisite

In the **Data logging** parameter (→ 184), the **Not overwriting** option is selected.

Description

Use this function to enter the time delay for measured value logging.

User entry

0 to 999 h

Factory setting

0 h

Additional information

**Description**

Once measured value logging has been started with the **Data logging control** parameter (→ 185), the device does not save any data for the duration of the time delay entered.

**Data logging control**

Navigation

Expert → Diagnostics → Data logging → Data log.control (0857)

Prerequisite

In the **Data logging** parameter (→ 184), the **Not overwriting** option is selected.

Description

Use this function to start and stop measured value logging.

Selection

- None
- Delete + start
- Stop

Factory setting

None

Additional information

**Selection**

- None
  Initial measured value logging status.
- Delete + start
  All the measured values recorded for all the channels are deleted and measured value logging starts again.
- Stop
  Measured value logging is stopped.
Data logging status

Navigation

Expert → Diagnostics → Data logging → Data log. status (0858)

Prerequisite

In the Data logging parameter (→  184), the Not overwriting option is selected.

Description

Displays the measured value logging status.

User interface

- Done
- Delay active
- Active
- Stopped

Factory setting

Done

Additional information

Selection

- Done
  Measured value logging has been performed and completed successfully.
- Delay active
  Measured value logging has been started but the logging interval has not yet elapsed.
- Active
  The logging interval has elapsed and measured value logging is active.
- Stopped
  Measured value logging is stopped.

 Entire logging duration

Navigation

Expert → Diagnostics → Data logging → Logging duration (0861)

Prerequisite

In the Data logging parameter (→  184), the Not overwriting option is selected.

Description

Displays the total logging duration.

User interface

Positive floating-point number

Factory setting

0 s

"Display channel 1" submenu

Navigation

Expert → Diagnostics → Data logging → Displ.channel 1

Display channel 1

→  187
Display channel 1

Navigation

Expert → Diagnostics → Data logging → Displ.channel 1

Prerequisite

The Extended HistOrg application package is available.

The software options currently enabled are displayed in the Software option overview parameter (→ 41).

One of the following options is selected in the Assign channel 1 parameter (→ 182):

• Volume flow
• Corrected volume flow
• Mass flow
• Flow velocity
• Conductivity
• Corrected conductivity* 
• Temperature
• Electronic temperature
• Current output 1

Description

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

Additional information

Description

Chart of a measured value trend

• x-axis: depending on the number of channels selected displays 250 to 1000 measured values of a process variable.
• y-axis: displays the approximate measured value span and constantly adapts this to the ongoing measurement.

“Display channel 2” submenu

Navigation

Expert → Diagnostics → Data logging → Displ.channel 2

Visibility depends on order options or device settings
Description of device parameters

Proline Promag 400 HART

**Display channel 2**

**Navigation**

Expert → Diagnostics → Data logging → Displ.channel 2

**Prerequisite**

A process variable is defined in the **Assign channel 2** parameter.

**Description**

See the **Display channel 1** parameter → 187

"**Display channel 3**" submenu

**Navigation**

Expert → Diagnostics → Data logging → Displ.channel 3

**Prerequisite**

A process variable is defined in the **Assign channel 3** parameter.

**Description**

See the **Display channel 1** parameter → 187

"**Display channel 4**" submenu

**Navigation**

Expert → Diagnostics → Data logging → Displ.channel 4

**Prerequisite**

A process variable is defined in the **Assign channel 4** parameter.
Description

See the Display channel 1 parameter → 187

3.7.10 "Heartbeat" submenu

For detailed information on the parameter descriptions for the Heartbeat Verification+Monitoring application package, refer to the Special Documentation for the device → 7

Navigation

Expert → Diagnostics → HBT

3.7.11 "Simulation" submenu

Navigation

Expert → Diagnostics → Simulation

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</table>
Description of device parameters

Assign simulation process variable

Navigation

Expert → Diagnostics → Simulation → Assign proc.var. (1810)

Description

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

Selection

- Off
- Volume flow
- Mass flow
- Corrected volume flow
- Flow velocity
- Conductivity
- Corrected conductivity
- Temperature

Factory setting

Off

Additional information

Description

The simulation value of the process variable selected is defined in the Process variable value parameter (→ 190).

Process variable value

Navigation

Expert → Diagnostics → Simulation → Proc. var. value (1811)

Prerequisite

A process variable is selected in the Assign simulation process variable parameter (→ 190).

Description

Use this function to enter a simulation value for the selected process variable. Subsequent measured value processing and the signal output use this simulation value. In this way, users can verify whether the measuring device has been configured correctly.

User entry

Depends on the process variable selected

Factory setting

0

Additional information

User entry

The unit of the displayed measured value is taken from the System units submenu (→ 51).

* Visibility depends on order options or device settings
**Status input simulation 1**

**Navigation**

Expert → Diagnostics → Simulation → Status inp.sim 1 (1355–1)

**Prerequisite**

For the following order code:

• "Output; input", option I "4-20mA HART, 2x pul./freq./switch output; status input"
• "Output; input", option J "4-20mA HART, certified pulse output, switch output; status input"

**Description**

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

**Selection**

- Off
- On

**Factory setting**

Off

**Additional information**

*Description*

The desired simulation value is defined in the **Input signal level** parameter (→ 191).

*Selection*

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

---

**Input signal level 1**

**Navigation**

Expert → Diagnostics → Simulation → Signal level 1 (1356–1)

**Prerequisite**

In the **Status input simulation** parameter (→ 191), the **On** option is selected.

**Description**

Use this function to select the signal level for the simulation of the status input. In this way, users can verify the correct configuration of the status input and the correct function of upstream feed-in units.

**Selection**

- High
- Low
### Current output 1 simulation

**Navigation**

[Expert → Diagnostics → Simulation → Curr. out. 1 sim.](0354–1)

**Description**

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

**Selection**

- Off
- On

**Factory setting**

Off

**Additional information**

**Description**

The desired simulation value is specified in the **Value current output 1** parameter (→ 192).

**Selection**

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

### Value current output 1

**Navigation**

[Expert → Diagnostics → Simulation → Value curr.out 1](0355–1)

**Prerequisite**

In the **Current output 1 simulation** parameter, the **On** option is selected.

**Description**

Use this function to enter a current value for the simulation. In this way, users can verify the correct adjustment of the current output and the correct function of downstream switching units.

**User entry**

0 to 22.5 mA

**Additional information**

**User entry**

The value must be entered with a period (.) as the separator.

### Frequency output simulation 1 to n

**Navigation**

[Expert → Diagnostics → Simulation → FreqOutputSim 1 to n](0472–1 to n)

**Prerequisite**

In the **Operating mode** parameter (→ 100), the **Frequency** option is selected.
**Description**

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

**Selection**

- Off
- On

**Factory setting**

Off

**Additional information**

*Description*

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

*Selection*

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

---

### Frequency value 1 to n

**Navigation**

Expert → Diagnostics → Simulation → Freq value 1 to n (0473–1 to n)

**Prerequisite**

In the **Frequency output simulation 1 to n** parameter, the **On** option is selected.

**Description**

Use this function to enter a frequency value for the simulation. In this way, users can verify the correct adjustment of the frequency output and the correct function of downstream switching units.

**User entry**

0.0 to 12 500.0 Hz

---

### Pulse output simulation 1 to n

**Navigation**

Expert → Diagnostics → Simulation → Puls.outp.sim. 1 to n (0458–1 to n)

**Prerequisite**

In the **Operating mode** parameter (→ 100), the **Pulse** option is selected.

**Description**

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

**Selection**

- Off
- Fixed value
- Down-counting value

**Factory setting**

Off
**Additional information**

**Description**

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

**Selection**

- Off
  - Pulse simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.
- Fixed value
  - Pulses are continuously output with the pulse width specified in the **Pulse width** parameter (→ 103).
- Down-counting value
  - The pulses specified in the **Pulse value** parameter (→ 194) are output.

---

### Pulse value 1 to n

**Navigation**

Expert → Diagnostics → Simulation → Pulse value 1 to n (0459–1 to n)

**Prerequisite**

In the **Pulse output simulation 1 to n** parameter, the Down-counting value option is selected.

**Description**

Use this function to enter a pulse value for the simulation. In this way, users can verify the correct adjustment of the pulse output and the correct function of downstream switching units.

**User entry**

0 to 65535

---

### Switch output simulation 1 to n

**Navigation**

Expert → Diagnostics → Simulation → Switch sim. 1 to n (0462–1 to n)

**Prerequisite**

In the **Operating mode** parameter (→ 100), the Switch option is selected.

**Description**

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

**Selection**

- Off
- On

**Factory setting**

Off
Additional information

**Description**

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

**Selection**

- **Off**
  
  Switch simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.

- **On**
  
  Switch simulation is active.

### Switch status 1 to n

**Navigation**

Expert → Diagnostics → Simulation → Switch status 1 to n (0463–1 to n)

**Description**

Use this function to select a switch value for the simulation. In this way, users can verify the correct adjustment of the switch output and the correct function of downstream switching units.

**Selection**

- **Open**
  
  Switch simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.

- **Closed**
  
  Switch simulation is active.

**Additional information**

**Selection**

- **Open**
  
  Switch simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.

- **Closed**
  
  Switch simulation is active.

### Device alarm simulation

**Navigation**

Expert → Diagnostics → Simulation → Dev. alarm sim. (0654)

**Description**

Use this function to switch the device alarm on and off.

**Selection**

- **Off**
  
  Factory setting
  
  Off

**Additional information**

**Description**

The display alternates between the measured value and a diagnostic message of the 'Function check' category (C) while simulation is in progress.
Diagnostic event category

Navigation
[Expert → Diagnostics → Simulation → Event category (0738)]

Description
Use this function to select the category of the diagnostic events that are displayed for the simulation in the Diagnostic event simulation parameter (→ 196).

Selection
- Sensor
- Electronics
- Configuration
- Process

Factory setting
Process

Diagnostic event simulation

Navigation
[Expert → Diagnostics → Simulation → Diag. event sim. (0737)]

Description
Use this function to select a diagnostic event for the simulation process that is activated.

Selection
- Off
- Diagnostic event picklist (depends on the category selected)

Factory setting
Off

Additional information
Description
For the simulation, you can choose from the diagnostic events of the category selected in the Diagnostic event category parameter (→ 196).
4 Country-specific factory settings

4.1 SI units

Not valid for USA and Canada.

4.1.1 System units

<table>
<thead>
<tr>
<th>Volume flow</th>
<th>l/h option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>m³ option</td>
</tr>
<tr>
<td>Conductivity</td>
<td>µS/cm</td>
</tr>
<tr>
<td>Temperature</td>
<td>°C option</td>
</tr>
<tr>
<td>Mass flow</td>
<td>kg/h option</td>
</tr>
<tr>
<td>Mass</td>
<td>kg option</td>
</tr>
<tr>
<td>Density</td>
<td>kg/l option</td>
</tr>
</tbody>
</table>

4.1.2 Full scale values

The factory settings apply to the following parameters:

- 20 mA value (full scale value of the current output)
- 100% bar graph value 1

For detailed information about the full scale value for measuring devices for custody transfer, see the Special Documentation for the device → 7

<table>
<thead>
<tr>
<th>Nominal diameter [mm]</th>
<th>[v ~ 2.5 m/s] [dm³/min]</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>32</td>
<td>125</td>
</tr>
<tr>
<td>40</td>
<td>200</td>
</tr>
<tr>
<td>50</td>
<td>300</td>
</tr>
<tr>
<td>65</td>
<td>500</td>
</tr>
<tr>
<td>80</td>
<td>750</td>
</tr>
<tr>
<td>100</td>
<td>1200</td>
</tr>
<tr>
<td>125</td>
<td>1850</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nominal diameter [mm]</th>
<th>[v ~ 2.5 m/s] [m³/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td>250</td>
<td>500</td>
</tr>
<tr>
<td>300</td>
<td>750</td>
</tr>
<tr>
<td>350</td>
<td>1000</td>
</tr>
<tr>
<td>375</td>
<td>1200</td>
</tr>
<tr>
<td>400</td>
<td>1200</td>
</tr>
<tr>
<td>500</td>
<td>2000</td>
</tr>
<tr>
<td>600</td>
<td>2500</td>
</tr>
</tbody>
</table>
### Country-specific factory settings

#### Proline Promag 400 HART

<table>
<thead>
<tr>
<th>Nominal diameter [mm]</th>
<th>(v ~ 2.5 m/s) [m³/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>700</td>
<td>3500</td>
</tr>
<tr>
<td>750</td>
<td>4000</td>
</tr>
<tr>
<td>800</td>
<td>4500</td>
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<td>900</td>
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<td>14000</td>
</tr>
<tr>
<td>1600</td>
<td>18000</td>
</tr>
<tr>
<td>1800</td>
<td>23000</td>
</tr>
<tr>
<td>2000</td>
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</tr>
<tr>
<td>2800</td>
<td>55500</td>
</tr>
<tr>
<td>3000</td>
<td>63500</td>
</tr>
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#### 4.1.3 Output current span

Current output 1 4 to 20 mA NAMUR

#### 4.1.4 Pulse value

For detailed information about the pulse value for measuring devices for custody transfer, see the Special Documentation for the device → 7

<table>
<thead>
<tr>
<th>Nominal diameter [mm]</th>
<th>(~ 2 pulse/s at v ~ 2.5 m/s) [dm³]</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>0.5</td>
</tr>
<tr>
<td>32</td>
<td>1</td>
</tr>
<tr>
<td>40</td>
<td>1.5</td>
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<tr>
<td>50</td>
<td>2.5</td>
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<tr>
<td>65</td>
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<tr>
<td>80</td>
<td>5</td>
</tr>
<tr>
<td>100</td>
<td>10</td>
</tr>
<tr>
<td>125</td>
<td>15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nominal diameter [mm]</th>
<th>(~ 2 pulse/s at v ~ 2.5 m/s) [m³]</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>0.03</td>
</tr>
<tr>
<td>200</td>
<td>0.05</td>
</tr>
<tr>
<td>250</td>
<td>0.05</td>
</tr>
<tr>
<td>300</td>
<td>0.1</td>
</tr>
<tr>
<td>350</td>
<td>0.1</td>
</tr>
<tr>
<td>375</td>
<td>0.15</td>
</tr>
</tbody>
</table>
### 4.1.5 Switch-on point low flow cut off

The switch-on point depends on the type of medium and the nominal diameter.

<table>
<thead>
<tr>
<th>Nominal diameter [mm]</th>
<th>(~ 2 pulse/s at v ~ 2.5 m/s) [m³/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>0.15</td>
</tr>
<tr>
<td>500</td>
<td>0.25</td>
</tr>
<tr>
<td>600</td>
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</tr>
<tr>
<td>700</td>
<td>0.5</td>
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<tr>
<td>750</td>
<td>0.5</td>
</tr>
<tr>
<td>800</td>
<td>0.75</td>
</tr>
<tr>
<td>900</td>
<td>0.75</td>
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<td>1000</td>
<td>1</td>
</tr>
<tr>
<td>1200</td>
<td>1.5</td>
</tr>
<tr>
<td>1400</td>
<td>2</td>
</tr>
<tr>
<td>1600</td>
<td>2.5</td>
</tr>
<tr>
<td>1800</td>
<td>3</td>
</tr>
<tr>
<td>2000</td>
<td>3.5</td>
</tr>
<tr>
<td>2200</td>
<td>4.5</td>
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<td>2400</td>
<td>5.5</td>
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<td>7</td>
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<tr>
<td>3000</td>
<td>9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nominal diameter [mm]</th>
<th>(v ~ 0.04 m/s) [dm³/min]</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>1</td>
</tr>
<tr>
<td>32</td>
<td>2</td>
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<tr>
<td>40</td>
<td>3</td>
</tr>
<tr>
<td>50</td>
<td>5</td>
</tr>
<tr>
<td>65</td>
<td>8</td>
</tr>
<tr>
<td>80</td>
<td>12</td>
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<tr>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>125</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nominal diameter [mm]</th>
<th>(v ~ 0.04 m/s) [m³/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>2.5</td>
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<tr>
<td>200</td>
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<tr>
<td>250</td>
<td>7.5</td>
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<td>350</td>
<td>15</td>
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<tr>
<td>375</td>
<td>20</td>
</tr>
<tr>
<td>400</td>
<td>20</td>
</tr>
</tbody>
</table>
Country-specific factory settings

<table>
<thead>
<tr>
<th>Nominal diameter [mm]</th>
<th>(v ~ 0.04 m/s) [m³/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>450</td>
<td>25</td>
</tr>
<tr>
<td>500</td>
<td>30</td>
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<td>600</td>
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<td>700</td>
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<td>750</td>
<td>60</td>
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<td>800</td>
<td>75</td>
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<td>1000</td>
<td>125</td>
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<tr>
<td>1200</td>
<td>150</td>
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<tr>
<td>1400</td>
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<tr>
<td>1600</td>
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<tr>
<td>1800</td>
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<td>2000</td>
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</tr>
<tr>
<td>2800</td>
<td>875</td>
</tr>
<tr>
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</table>

4.2  US units

*Only valid for USA and Canada.*

4.2.1  System units

<table>
<thead>
<tr>
<th>Volume flow</th>
<th>gal/min (us) option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>gal (us) option</td>
</tr>
<tr>
<td>Temperature</td>
<td>°F option</td>
</tr>
<tr>
<td>Mass flow</td>
<td>lb/min option</td>
</tr>
<tr>
<td>Mass</td>
<td>lb option</td>
</tr>
<tr>
<td>Density</td>
<td>lb/ft³ option</td>
</tr>
</tbody>
</table>

4.2.2  Full scale values

*The factory settings apply to the following parameters:
- 20 mA value (full scale value of the current output)
- 100% bar graph value 1

*For detailed information about the full scale value for measuring devices for custody transfer, see the Special Documentation for the device → 7*

<table>
<thead>
<tr>
<th>Nominal diameter [in]</th>
<th>(v ~ 2.5 m/s) [gal/min]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>1½</td>
<td>50</td>
</tr>
</tbody>
</table>
### Nominal diameter [in]

<table>
<thead>
<tr>
<th>Nominal diameter [in]</th>
<th>((v \sim 2.5 \text{ m/s}) [\text{gal/\text{min}}])</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>75</td>
</tr>
<tr>
<td>3</td>
<td>200</td>
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<tr>
<td>4</td>
<td>300</td>
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<tr>
<td>6</td>
<td>600</td>
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<tr>
<td>8</td>
<td>1200</td>
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<tr>
<td>10</td>
<td>1500</td>
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<tr>
<td>12</td>
<td>2400</td>
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<td>14</td>
<td>3600</td>
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<td>15</td>
<td>4800</td>
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<td>16</td>
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<td>7500</td>
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<td>24</td>
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<tr>
<td>28</td>
<td>13500</td>
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<tr>
<td>30</td>
<td>16500</td>
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<tr>
<td>32</td>
<td>19500</td>
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<td>36</td>
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<tr>
<td>42</td>
<td>33000</td>
</tr>
<tr>
<td>48</td>
<td>42000</td>
</tr>
</tbody>
</table>

### Nominal diameter [in]

<table>
<thead>
<tr>
<th>Nominal diameter [in]</th>
<th>((v \sim 2.5 \text{ m/s}) [\text{Mgal/d}])</th>
</tr>
</thead>
<tbody>
<tr>
<td>54</td>
<td>75</td>
</tr>
<tr>
<td>60</td>
<td>95</td>
</tr>
<tr>
<td>66</td>
<td>120</td>
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<tr>
<td>72</td>
<td>140</td>
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<tr>
<td>78</td>
<td>175</td>
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<tr>
<td>84</td>
<td>190</td>
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<tr>
<td>90</td>
<td>220</td>
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<td>96</td>
<td>265</td>
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<td>108</td>
<td>340</td>
</tr>
<tr>
<td>114</td>
<td>375</td>
</tr>
<tr>
<td>120</td>
<td>415</td>
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</table>

#### 4.2.3 Output current span

| Current output 1 | 4 to 20 mA US |
### 4.2.4 Pulse value

For detailed information about the pulse value for measuring devices for custody transfer, see the Special Documentation for the device → 7

<table>
<thead>
<tr>
<th>Nominal diameter [in]</th>
<th>(~ 2 pulse/s at v ~ 2.5 m/s) [gal]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>1½</td>
<td>0.5</td>
</tr>
<tr>
<td>2</td>
<td>0.5</td>
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<td>3</td>
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<tr>
<td>4</td>
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<td>6</td>
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<td>10</td>
<td>15</td>
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<td>12</td>
<td>25</td>
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<td>14</td>
<td>30</td>
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<td>15</td>
<td>50</td>
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<tr>
<td>16</td>
<td>50</td>
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<td>18</td>
<td>50</td>
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<td>20</td>
<td>75</td>
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<td>24</td>
<td>100</td>
</tr>
<tr>
<td>28</td>
<td>125</td>
</tr>
<tr>
<td>30</td>
<td>150</td>
</tr>
<tr>
<td>32</td>
<td>200</td>
</tr>
<tr>
<td>36</td>
<td>225</td>
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<tr>
<td>42</td>
<td>250</td>
</tr>
<tr>
<td>48</td>
<td>400</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nominal diameter [in]</th>
<th>(~ 2 pulse/s at v ~ 2.5 m/s) [Mgal]</th>
</tr>
</thead>
<tbody>
<tr>
<td>54</td>
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<td>60</td>
<td>0.0005</td>
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<tr>
<td>66</td>
<td>0.0008</td>
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<tr>
<td>72</td>
<td>0.0008</td>
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<tr>
<td>78</td>
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<td>84</td>
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<tr>
<td>90</td>
<td>0.0013</td>
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<tr>
<td>96</td>
<td>0.0015</td>
</tr>
<tr>
<td>102</td>
<td>0.0017</td>
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<tr>
<td>108</td>
<td>0.0020</td>
</tr>
<tr>
<td>114</td>
<td>0.0022</td>
</tr>
<tr>
<td>120</td>
<td>0.0024</td>
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</tbody>
</table>
4.2.5 Switch-on point low flow cut off

The switch-on point depends on the type of medium and the nominal diameter.

<table>
<thead>
<tr>
<th>Nominal diameter [in]</th>
<th>(v \sim 0.04 \text{ m/s}) [gal/min]</th>
<th>(v \sim 0.04 \text{ m/s}) [Mgal/d]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.25</td>
<td>1.3</td>
</tr>
<tr>
<td>1½</td>
<td>0.75</td>
<td>1.3</td>
</tr>
<tr>
<td>2</td>
<td>1.25</td>
<td>2.2</td>
</tr>
<tr>
<td>3</td>
<td>2.5</td>
<td>2.6</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>3.0</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
<td>3.2</td>
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<td>3.6</td>
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<td>60</td>
<td>6.0</td>
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<tr>
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<td>6.0</td>
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<td>18</td>
<td>90</td>
<td>7.0</td>
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<tr>
<td>20</td>
<td>120</td>
<td>9.0</td>
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<td>22.0</td>
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<tr>
<td>48</td>
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<td>24.0</td>
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</table>
5 Explanation of abbreviated units

5.1 SI units

<table>
<thead>
<tr>
<th>Process variable</th>
<th>Units</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>g/cm³, g/m³</td>
<td>Gram/volume unit</td>
</tr>
<tr>
<td></td>
<td>kg/dm³, kg/l, kg/m³</td>
<td>Kilogram/volume unit</td>
</tr>
<tr>
<td>SD4°C, SD15°C, SD20°C</td>
<td>Specific density: The specific density is the ratio of the density of the fluid to the density of water at a water temperature of 4 °C (39 °F), 15 °C (59 °F), 20 °C (68 °F).</td>
<td></td>
</tr>
<tr>
<td>SGA4°C, SG15°C, SG20°C</td>
<td>Specific gravity: The specific gravity is the ratio of the density of the fluid to the density of water at a water temperature of 4 °C (39 °F), 15 °C (59 °F), 20 °C (68 °F).</td>
<td></td>
</tr>
<tr>
<td>Conductivity</td>
<td>µS/mm</td>
<td>Microsiemens/length unit</td>
</tr>
<tr>
<td></td>
<td>nS/cm, µS/cm, mS/cm, S/cm</td>
<td>Nano-, Micro-, Milli-, Siemens/length unit</td>
</tr>
<tr>
<td></td>
<td>µS/m, mS/m, S/m, kS/m, MS/m</td>
<td>Micro-, Milli-, Siemens, Kilo-, Megasiemens/length unit</td>
</tr>
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<td>Mass</td>
<td>g, kg, t</td>
<td>Gram, kilogram, metric ton</td>
</tr>
<tr>
<td>Mass flow</td>
<td>g/s, g/min, g/h, g/d</td>
<td>Gram/time unit</td>
</tr>
<tr>
<td></td>
<td>kg/s, kg/min, kg/h, kg/d</td>
<td>Kilogram/time unit</td>
</tr>
<tr>
<td></td>
<td>t/s, t/min, t/h, t/d</td>
<td>Metric ton/time unit</td>
</tr>
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<td>°C, K</td>
<td>Celsius, Kelvin</td>
</tr>
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<td>Volume</td>
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<td>Cubic centimeter, cubic decimeter, cubic meter</td>
</tr>
<tr>
<td></td>
<td>ml, l, hl, Ml Mega</td>
<td>Milliliter, liter, hectoliter, megaliter</td>
</tr>
<tr>
<td>Volume flow</td>
<td>cm³/s, cm³/min, cm³/h, cm³/d</td>
<td>Cubic centimeter/time unit</td>
</tr>
<tr>
<td></td>
<td>dm³/s, dm³/min, dm³/h, dm³/d</td>
<td>Cubic decimeter/time unit</td>
</tr>
<tr>
<td></td>
<td>m³/s, m³/min, m³/h, m³/d</td>
<td>Cubic meter/time unit</td>
</tr>
<tr>
<td></td>
<td>ml/s, ml/min, ml/h, ml/d</td>
<td>Milliliter/time unit</td>
</tr>
<tr>
<td></td>
<td>l/s, l/min, l/h, l/d</td>
<td>Liter/time unit</td>
</tr>
<tr>
<td></td>
<td>hl/s, hl/min, hl/h, hl/d</td>
<td>Hectoliter/time unit</td>
</tr>
<tr>
<td></td>
<td>Ml/s, Ml/min, Ml/h, Ml/d</td>
<td>Megaliter/time unit</td>
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<tr>
<td>Time</td>
<td>s, m, h, d, y</td>
<td>Second, minute, hour, day, year</td>
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5.2 US units

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<tr>
<th>Process variable</th>
<th>Units</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>lb/ft³, lb/gal (us)</td>
<td>Pound/cubic foot, pound/gallon</td>
</tr>
<tr>
<td></td>
<td>lb/bbl (us;liq.), lb/bbl (us;beer), lb/bbl (us;oil)</td>
<td>Pound/volume unit</td>
</tr>
<tr>
<td>Mass</td>
<td>oz, lb, STon</td>
<td>Ounce, pound, standard ton</td>
</tr>
<tr>
<td>Mass flow</td>
<td>oz/s, oz/min, oz/h, oz/d</td>
<td>Ounce/time unit</td>
</tr>
<tr>
<td></td>
<td>lb/s, lb/min, lb/h, lb/d</td>
<td>Pound/time unit</td>
</tr>
<tr>
<td></td>
<td>STon/s, STon/min, STon/h, STon/d</td>
<td>Standard ton/time unit</td>
</tr>
<tr>
<td>Temperature</td>
<td>°F, °R</td>
<td>Fahrenheit, Rankine</td>
</tr>
<tr>
<td>Volume</td>
<td>af</td>
<td>Acre foot</td>
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</table>
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<th>Units</th>
<th>Explanation</th>
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<tr>
<td>ft³</td>
<td></td>
<td>Cubic foot</td>
</tr>
<tr>
<td>fl oz (us), gal (us), kgal (us), Mgal (us)</td>
<td></td>
<td>Fluid ounce, gallon, kilogallon, million gallon</td>
</tr>
<tr>
<td>bbl (us;liq.), bbl (us;beer), bbl (us;oil), bbl (us;tank)</td>
<td></td>
<td>Barrel (normal liquids), barrel (beer), barrel (petrochemicals), barrel (filling tanks)</td>
</tr>
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</table>

#### Volume flow

<table>
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<th>Units</th>
<th>Explanation</th>
</tr>
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<td>af/s, af/min, af/h, af/d</td>
<td></td>
<td>Acre foot/time unit</td>
</tr>
<tr>
<td>ft³/s, ft³/min, ft³/h, ft³/d</td>
<td></td>
<td>Cubic foot/time unit</td>
</tr>
<tr>
<td>fl oz/s (us), fl oz/min (us), fl oz/h (us), fl oz/d (us)</td>
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<td>Fluid ounce/time unit</td>
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<tr>
<td>gal/s (us), gal/min (us), gal/h (us), gal/d (us)</td>
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<td>Gallon/time unit</td>
</tr>
<tr>
<td>kgal/s (us), kgal/min (us), kgal/h (us), kgal/d (us)</td>
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<td>Kilogallon/time unit</td>
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<tr>
<td>Mgal/s (us), Mgal/min (us), Mgal/h (us), Mgal/d (us)</td>
<td></td>
<td>Million gallon/time unit</td>
</tr>
<tr>
<td>bbl/s (us;liq.), bbl/min (us;liq.), bbl/h (us;liq.), bbl/d (us;liq.)</td>
<td></td>
<td>Barrel/time unit (normal liquids) Normal liquids: 3.15 gal/bbl</td>
</tr>
<tr>
<td>bbl/s (us;beer), bbl/min (us;beer), bbl/h (us;beer), bbl/d (us;beer)</td>
<td></td>
<td>Barrel/time unit (beer) Beer: 31.0 gal/bbl</td>
</tr>
<tr>
<td>bbl/s (us;oil), bbl/min (us;oil), bbl/h (us;oil), bbl/d (us;oil)</td>
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<td>Barrel/time unit (petrochemicals) Petrochemicals: 42.0 gal/bbl</td>
</tr>
<tr>
<td>bbl/s (us;tank), bbl/min (us;tank), bbl/h (us;tank), bbl/d (us;tank)</td>
<td></td>
<td>Barrel/time unit (filling tank) Filling tanks: 55.0 gal/bbl</td>
</tr>
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#### Time

<table>
<thead>
<tr>
<th>Time</th>
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<th>Explanation</th>
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<tr>
<td>s, m, h, d, y</td>
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<td>Second, minute, hour, day, year</td>
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<tr>
<td>am, pm</td>
<td></td>
<td>Ante meridiem (before midday), post meridiem (after midday)</td>
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### 5.3 Imperial units

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<th>Units</th>
<th>Explanation</th>
</tr>
</thead>
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<td>Density</td>
<td>lb/gal (imp), lb/bbl (imp;beer), lb/bbl (imp;oil)</td>
<td>Pound/volume unit</td>
</tr>
<tr>
<td>Volume</td>
<td>gal (imp), Mgal (imp)</td>
<td>Gallon, mega gallon</td>
</tr>
<tr>
<td>bbl (imp;beer), bbl (imp;oil)</td>
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<td>Barrel (beer), barrel (petrochemicals)</td>
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#### Volume flow

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<th>Volume flow</th>
<th>Units</th>
<th>Explanation</th>
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<td>gal/s (imp), gal/min (imp), gal/h (imp), gal/d (imp)</td>
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<td>Gallon/time unit</td>
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<tr>
<td>Mgal/s (imp), Mgal/min (imp), Mgal/h (imp), Mgal/d (imp)</td>
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<td>Mega gallon/time unit</td>
</tr>
<tr>
<td>bbl/s (imp;beer), bbl/min (imp;beer), bbl/h (imp;beer), bbl/d (imp;beer)</td>
<td></td>
<td>Barrel/time unit (beer) Beer: 36.0 gal/bbl</td>
</tr>
<tr>
<td>bbl/s (imp;oil), bbl/min (imp;oil), bbl/h (imp;oil), bbl/d (imp;oil)</td>
<td></td>
<td>Barrel/time unit (petrochemicals) Petrochemicals: 34.97 gal/bbl</td>
</tr>
</tbody>
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#### Time

<table>
<thead>
<tr>
<th>Time</th>
<th>Units</th>
<th>Explanation</th>
</tr>
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<tbody>
<tr>
<td>s, m, h, d, y</td>
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<td>Second, minute, hour, day, year</td>
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<tr>
<td>am, pm</td>
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<td>Ante meridiem (before midday), post meridiem (after midday)</td>
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