Description of Device Parameters

Proline t-mass A, B 150

HART

Thermal Mass Flowmeter
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1 Document information

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.

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
This document lists the submenus and their parameters according to the structure of the Expert menu (→ 8) menu that are available once the "Operator" user role or the "Maintenance" user role is enabled.

For information on the arrangement of the parameters according to the structure of the Operation menu, Setup menu, Diagnostics menu (→ 115), along with a brief description, see the Operating Instructions for the device.
For information about the operating philosophy, see the "Operating philosophy" chapter in the device's Operating Instructions.
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)
- 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 to documentation" /></td>
<td>Reference to documentation</td>
</tr>
<tr>
<td><img src="image" alt="Reference to page" /></td>
<td>Reference to page</td>
</tr>
<tr>
<td><img src="image" alt="Reference to graphic" /></td>
<td>Reference to graphic</td>
</tr>
<tr>
<td><img src="image" alt="Operation via local display" /></td>
<td>Operation via local display</td>
</tr>
<tr>
<td><img src="image" alt="Operation via operating tool" /></td>
<td>Operation via operating tool</td>
</tr>
<tr>
<td><img src="image" alt="Write-protected parameter" /></td>
<td>Write-protected parameter</td>
</tr>
</tbody>
</table>
1.4.2 Symbols in graphics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<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>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 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.

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>🍀 Expert</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Direct access (0106)</td>
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<td></td>
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<tr>
<td></td>
<td>Locking status (0004)</td>
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<tr>
<td></td>
<td>Access status display (0091)</td>
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<tr>
<td></td>
<td>Enter access code (0092)</td>
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<tr>
<td></td>
<td>System</td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>Define access code (0093)</td>
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<tr>
<td></td>
<td>Display</td>
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<tr>
<td></td>
<td>Configuration backup display</td>
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<td>Diagnostic handling</td>
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<td></td>
<td>Management</td>
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<tr>
<td></td>
<td>Sensor</td>
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</tr>
<tr>
<td></td>
<td>Measured values</td>
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<tr>
<td></td>
<td>System units</td>
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</tr>
<tr>
<td></td>
<td>Process parameters</td>
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<td></td>
<td>Measurement mode</td>
<td></td>
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<tr>
<td></td>
<td>Calculated values</td>
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<td></td>
<td>Sensor adjustment</td>
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<tr>
<td></td>
<td>Calibration</td>
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<td></td>
<td>Output</td>
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<tr>
<td></td>
<td>Current output 1</td>
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</tr>
<tr>
<td></td>
<td>Pulse-Frequency-Switch output 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Overview of the Expert operating menu

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  - **Totalizer** → 112
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  - **Data logging** → 128
  - **Min/max values** → 134
  - **Simulation** → 136
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.

<table>
<thead>
<tr>
<th>Expert</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct access (0106)</td>
<td>→ 10</td>
</tr>
<tr>
<td>Locking status (0004)</td>
<td>→ 11</td>
</tr>
<tr>
<td>Access status display (0091)</td>
<td>→ 11</td>
</tr>
<tr>
<td>Enter access code (0092)</td>
<td>→ 12</td>
</tr>
</tbody>
</table>

- **System**
- **Sensor**
- **Output**
- **Communication**
- **Application**
- **Diagnostics**

**Direct access**

- **Navigation**
  - Expert → Direct access (0106)

- **Description**
  - Input of the access code to enable direct access to the desired parameter via the local display. For this reason, each parameter is assigned a parameter number that appears in the navigation view on the right in the header of the selected parameter.

- **User entry**
  - 0 to 65535

- **Additional information**
  - The direct access code consists of a 4-digit number and the channel number, which identifies the channel of a process variable: e.g. 0914-1
  - The leading zeros in the direct access code do not have to be entered. Example: Input of "914" instead of "0914"
  - If no channel number is entered, channel 1 is jumped to automatically. Example: Enter 0914 → Assign process variable parameter
  - If a different channel is jumped to: Enter the direct access code with the corresponding channel number. Example: Enter 0914-3 → Assign process variable parameter
Locking status

Navigation
Expert → Locking status (0004)

Description
Use this function to view the active write protection.

User interface
- Hardware locked
- Temporarily locked

Additional information

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 selected.

If additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the Locking status parameter (→ 11).

"Hardware locked" option (priority 1)
The DIP switch for hardware locking is activated on the main electronics module. This locks write access to the parameters (e.g. via local display or operating tool).

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.

"Temporarily locked" option (priority 2)
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.

Access status display

Navigation
Expert → Access stat.disp (0091)

Prerequisite
A local display is provided.

Description
Use this function to view the access authorization to the parameters via the local display.

User interface
- Operator
- Maintenance

Factory setting
Operator
Description of device parameters

Proline t-mass A, B 150 HART

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.

The access authorization can be modified via the Enter access code parameter (→ 12).

For information on the Enter access code parameter (→ 12), see the ‘Disabling write protection via access code’ section of the Operating Instructions for the device.

If additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the Locking status parameter (→ 11).

User interface

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.

Access status tooling

Navigation

Expert → Access stat.tool (0005)

Description

Use this function to view the access authorization to the parameters via the operating tool.

User interface

Operator

Maintenance

Factory setting

Maintenance

Additional information

Description

The access authorization can be modified via the Enter access code parameter (→ 12).

If additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the Locking status parameter (→ 11).

Display

Information on access authorization is provided in the ‘User roles and associated access authorization’ and ‘Operating concept’ sections of the Operations Instructions for the device.

Enter access code

Navigation

Expert → Ent. access code (0092)

Description

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

User entry

0 to 9999

Endress+Hauser
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 in the operating tool.

**User entry**

0 to 9,999

---

3.1 "System" submenu

**Navigation**

Expert → System → Def. access code (0093)

**Description**

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

**User entry**

0 to 9,999

**Factory setting**

0
Additional information

Description

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

Once the access code has been defined, write-protected parameters can only be modified if the access code is entered in the Enter access code parameter (→ 12).

If you lose the access code, please contact your Endress+Hauser Sales Center.

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.

3.1.1 "Display" submenu

Navigation

Expert → System → Display

<table>
<thead>
<tr>
<th>Display</th>
</tr>
</thead>
<tbody>
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<tr>
<td>Format display (0098) → 16</td>
</tr>
<tr>
<td>Value 1 display (0107) → 18</td>
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<tr>
<td>0% bargraph value 1 (0123) → 18</td>
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<tr>
<td>100% bargraph value 1 (0125) → 19</td>
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<tr>
<td>Decimal places 1 (0095) → 19</td>
</tr>
<tr>
<td>Value 2 display (0108) → 19</td>
</tr>
<tr>
<td>Decimal places 2 (0117) → 20</td>
</tr>
<tr>
<td>Value 3 display (0110) → 20</td>
</tr>
<tr>
<td>0% bargraph value 3 (0124) → 21</td>
</tr>
<tr>
<td>100% bargraph value 3 (0126) → 21</td>
</tr>
<tr>
<td>Decimal places 3 (0118) → 22</td>
</tr>
<tr>
<td>Value 4 display (0109) → 22</td>
</tr>
</tbody>
</table>
**Language**

**Navigation**

Expert → System → Display → Language (0104)

**Prerequisite**

A local display is provided.

**Description**

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

**Selection**

- English
- Deutsch *
- Français *
- Español *
- Italiano *
- Nederlands *
- Portuguesa *
- Polski *
- русский язык (Russian) *
- 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
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

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 (→ 22) 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 (→ 23).
Possible measured values shown on the local display:

“1 value, max. size” option

```
+-----------------+-----------------+-----------------+
|                 |                 |                 |
| 900.00          | 900.00          |                 |
| l/h             | l/h             |                 |
```

“1 bargraph + 1 value” option

```
+-----------------+-----------------+-----------------+
|                 |                 |                 |
|                 |                 |                 |
|                 | 900.00 l/h      |                 |
|                 |                 |                 |
|                 |                 | 60.00 %         |
+-----------------+-----------------+-----------------+
```

“2 values” option

```
+-----------------+-----------------+-----------------+
|                 |                 |                 |
|                 | 900.00          |                 |
|                 |                 |                 |
|                 |                 | 60.00 %         |
```

“1 value large + 2 values” option

```
+-----------------+-----------------+-----------------+
|                 |                 |                 |
|                 | 900.00          |                 |
|                 |                 |                 |
|                 |                 | 60.00%          |
|                 |                 | 5.98 kWh/Nm^3   |
```

“4 values” option

```
+-----------------+-----------------+-----------------+-----------------+
|                 |                 |                 |                 |
|                 | 900.00          | 60.00 %         | 5.98 kWh/Nm^3   |
|                 | l/h             |                 |                 |
|                 |                 |                 |                 |
|                 |                 |                 | 213.94 l        |
```

Endress+Hauser
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 to be shown on the local display.

Selection  
- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature
- Totalizer
- Current output

Factory setting  
Mass 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.

Selection
The unit of the displayed measured value is taken from the System units submenu (→ 43).

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 kg/h
- 0 lb/min

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 (→ 43).
### 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 → 142

**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 (→ 43).

### Decimal places 1

**Navigation**

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

**Prerequisite**

A measured value is specified 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.

### 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 to be shown on the local display.

Selection: For the picklist, see the **Value 1 display** parameter (→  18)

Factory setting: None

Additional information: 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.*

**Selection**

- The unit of the displayed measured value is taken from the **System units** submenu (→  43).

---

**Decimal places 2**

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**

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

Selection: Picklist, see **Value display** parameter (→  18)

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 (→ 43).

0% bargraph value 3

Navigation

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

Prerequisite

A selection has been made in the Value 3 display parameter (→ 20).

Description

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

User entry

Signed floating-point number

Factory setting

Country-specific:
- 0 kg/h
- 0 lb/min

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 (→ 43).

100% bargraph value 3

Navigation

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

Prerequisite

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

Description

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

User entry

Signed floating-point number

Factory setting

0
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 (→ 43).

**Decimal places 3**

**Navigation**

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

**Prerequisite**

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

**Description**

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

**Selection**

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

**Factory setting**

x.xx

**Additional information**

*Description*

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

**Value 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 to be shown on the local display.

**Selection**

Picklist, see **Value 1 display** parameter (→ 18)

**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 (→ 43).

### Decimal places 4

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

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

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

**Selection**

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

**Factory setting**  
x.xx

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

### Display interval

**Navigation**  
Expert → System → Display → Display interval (0096)

**Prerequisite**  
A local display is provided.

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

**User entry**  
1 to 10 s

**Factory setting**  
5 s
Additional information

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

- The Value 1 display parameter (→ 18) to Value 4 display parameter (→ 22) 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).

Display damping

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

Prerequisite
A local display is provided.

Description
Use this function to enter 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
A time constant is entered:
- 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.

Header

Navigation
Expert → System → Display → Header (0097)

Prerequisite
A local display is provided.

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

Selection
- Device tag
- Free text

Factory setting
Device tag

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

**Selection**
- Device tag
  Is defined in the **Device tag** parameter (→ 125).
- Free text
  Is defined in the **Header text** parameter (→ 25).

**Header text**

**Navigation**
- Expert → System → Display → Header text (0112)

**Prerequisite**
The **Free text** option is selected in the **Header** parameter (→ 24).

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

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

**Factory setting**

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

1  Position of the header text on the display

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

**Separator**

**Navigation**
- Expert → System → Display → Separator (0101)

**Prerequisite**
A local display is provided.
### Description of device parameters

**Proline t-mass A, B 150 HART**

<table>
<thead>
<tr>
<th>Description</th>
<th>Use this function to select the decimal separator.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selection</td>
<td><strong>• . (point)</strong>&lt;br&gt;<strong>• , (comma)</strong></td>
</tr>
<tr>
<td>Factory setting</td>
<td><strong>. (point)</strong></td>
</tr>
</tbody>
</table>

### Contrast display

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</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>A local display is provided.</td>
</tr>
<tr>
<td>Description</td>
<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>
</tr>
<tr>
<td>User entry</td>
<td><strong>20 to 50 %</strong></td>
</tr>
<tr>
<td>Factory setting</td>
<td>Depends on the display</td>
</tr>
<tr>
<td>Additional information</td>
<td><em>Set the contrast via the push-buttons:</em>&lt;br&gt;• Brighter: Press and hold down the   keys simultaneously.&lt;br&gt;• Darker: Press and hold down the   keys simultaneously.*</td>
</tr>
</tbody>
</table>

### Backlight

<table>
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</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>Order code for &quot;Display; operation&quot;, option E &quot;SD03 4-line, illum.; touch control + data backup function&quot;</td>
</tr>
<tr>
<td>Description</td>
<td>Use this function to switch the backlight of the local display on and off.</td>
</tr>
<tr>
<td>Selection</td>
<td><strong>• Disabled</strong>&lt;br&gt;<strong>• Enabled</strong></td>
</tr>
<tr>
<td>Factory setting</td>
<td>Disabled</td>
</tr>
</tbody>
</table>

### Access status display

<table>
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</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>A local display is provided.</td>
</tr>
<tr>
<td>Description</td>
<td>Displays the access authorization to the parameters via the local display.</td>
</tr>
</tbody>
</table>
User interface
- Operator
- Maintenance

Factory setting
Description

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.

The access authorization can be modified via the Enter access code parameter (→ 12).

For information on the Enter access code parameter (→ 12), see the "Disabling write protection via access code" section of the Operating Instructions for the device.

If additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the Locking status parameter (→ 11).

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

3.1.2 "Configuration backup display" submenu

Navigation
Expert → System → Conf.backup disp

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<td>Last backup (0102)</td>
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<tr>
<td>Configuration management (0100)</td>
</tr>
<tr>
<td>Comparison result (0103)</td>
</tr>
</tbody>
</table>

Operating time

Navigation
Expert → System → Conf.backup disp → 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.
### Last backup

**Navigation**

Expert → System → Conf.backup disp → Last backup (0102)

**Prerequisite**

A local display is provided.

**Description**

Use this function to display the time since a backup copy of the data was last saved to the display module.

**User interface**

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

### Configuration management

**Navigation**

Expert → System → Conf.backup disp → Config. managem. (0100)

**Prerequisite**

A local display is provided.

**Description**

Use this function to select an action to save the data to the display module.

**Selection**

- Cancel
- Execute backup
- Restore
- Duplicate
- Compare
- Clear backup data

**Factory setting**

Cancel

**Additional information**

Description

Configuration via the local display is disabled while the action is performed.

For information on the status message in the operating tool, see: **Backup state**

Parameter (→ 29)

**Selection**

- Cancel
  
No action is executed and the user exits the parameter.

- Execute backup
  
  - A backup copy of the current device configuration in the HistoROM is saved to the display module of the device. The backup copy includes the transmitter data of the device.
  
  - The following message appears on local display: Backup active, please wait!

- Restore
  
  - The last backup copy of the device configuration is copied from the display module to the HistoROM of the device. The backup copy comprises the transmitter data of the device.
  
  - The following message appears on local display: Restore active! Do not interrupt power supply!
• Duplicate
  - The transmitter configuration from another device is duplicated to the device using the display module.
  - The following message appears on local display: Copy active! Do not interrupt power supply!
• Compare
  - The device configuration saved in the display module is compared to the current device configuration of the HistOROM.
  - The following message appears on local display: Comparing files
  - The result can be viewed in Comparison result parameter (→ 29).
• Clear backup data
  - The backup copy of the device configuration is deleted from the display module of the device.
  - The following message appears on local display: Deleting file

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

### Backup state

<table>
<thead>
<tr>
<th>Navigation</th>
<th>Expert → System → Conf.backup disp → Backup state (0121)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>A local display is provided.</td>
</tr>
<tr>
<td>Description</td>
<td>Use this function to view the status of the data backup process.</td>
</tr>
<tr>
<td>User interface</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Store in progress</td>
</tr>
<tr>
<td></td>
<td>Restore in progress</td>
</tr>
<tr>
<td></td>
<td>Import in progress</td>
</tr>
<tr>
<td></td>
<td>Delete in progress</td>
</tr>
<tr>
<td></td>
<td>Compare in progress</td>
</tr>
<tr>
<td>Factory setting</td>
<td>None</td>
</tr>
</tbody>
</table>

### Comparison result

<table>
<thead>
<tr>
<th>Navigation</th>
<th>Expert → System → Conf.backup disp → Compar. result (0103)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>A local display is provided.</td>
</tr>
<tr>
<td>Description</td>
<td>Use this function to view the last result of comparing the current device configuration to the backup copy in the display module.</td>
</tr>
<tr>
<td>User interface</td>
<td>Settings identical</td>
</tr>
<tr>
<td></td>
<td>Settings not identical</td>
</tr>
<tr>
<td></td>
<td>No backup available</td>
</tr>
<tr>
<td></td>
<td>Backup settings corrupt</td>
</tr>
<tr>
<td></td>
<td>Check not done</td>
</tr>
<tr>
<td></td>
<td>Dataset incompatible</td>
</tr>
</tbody>
</table>
**Factory setting**

Check not done

**Additional information**

*Description*

The comparison is started via the **Compare** option in the **Configuration management** parameter (→ 28).

*Selection*

- **Settings identical**
  - The current device configuration of the HistoROM is identical to the backup copy in the display module.
  - If the transmitter configuration of another device has been copied to the device via the display module and the **Duplicate** option in the **Configuration management** parameter (→ 28), the current device configuration of the HistoROM only partly matches the backup copy in the display module: The settings for the transmitter are not identical.

- **Settings not identical**
  The current device configuration of the HistoROM is not identical to the backup copy in the display module.

- **No backup available**
  There is no backup copy of the device configuration of the HistoROM in the display module.

- **Backup settings corrupt**
  The current device configuration of the HistoROM is corrupt or not compatible with the backup copy in the display module.

- **Check not done**
  The device configuration of the HistoROM has not yet been compared to the backup copy in the display module.

- **Dataset incompatible**
  The backup copy in the display module is not compatible with the device.

*HistoROM*

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

---

**3.1.3 "Diagnostic handling" submenu**

*Navigation*

Expert → System → Diagn. handling

<table>
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<th>→ 31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm delay (0651)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagnostic behavior</th>
<th>→ 31</th>
</tr>
</thead>
</table>
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

"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 (→ 31).

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.</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 (→ 122) (Event list submenu (→ 124)) 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.

Navigation

Expert → System → Diagn. handling → Diagn. behavior
Assign behavior of diagnostic no. 441 (Current output 1)

Navigation

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

Description

Option for changing the diagnostic behavior of the diagnostic message 441 Current output 1.

Selection

- Off
- Alarm
- Warning
- Logbook entry only

Factory setting

Warning

Additional information

For a detailed description of the options available, see → 31

Assign behavior of diagnostic no. 442 (Frequency output)

Navigation

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

Prerequisite

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

Description

Option for changing the diagnostic behavior of the diagnostic message 442 Frequency output.

Selection

- Off
- Alarm
- Warning
- Logbook entry only

Factory setting

Warning
Assign behavior of diagnostic no. 443 (Pulse output)

Navigation

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

Prerequisite

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

Description

Option for changing the diagnostic behavior of the diagnostic message 443 Pulse output.

Selection

- Off
- Alarm
- Warning
- Logbook entry only

Factory setting

Warning

Assign behavior of diagnostic no. 801 (Supply voltage too low)

Navigation

Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 801 (0660)

Description

Option for changing the diagnostic behavior of the diagnostic message 801 Supply voltage too low.

Selection

- Off
- Alarm
- Warning
- Logbook entry only

Factory setting

Warning

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

Navigation

Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 832 (0675)

Description

Option for changing the diagnostic behavior of the diagnostic message 832 Electronic temperature too high.
Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting
Warning

Additional information
For a detailed description of the options available, see → 31

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

Navigation
Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 833 (0676)

Description
Option for changing the diagnostic behavior of the diagnostic message **833 Electronic temperature too low**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting
Warning

Additional information
For a detailed description of the options available, see → 31

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

Navigation
Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 834 (0677)

Description
Option for changing the diagnostic behavior of the diagnostic message **834 Process temperature too high**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting
Warning

Additional information
For a detailed description of the options available, see → 31
Assign behavior of diagnostic no. 835 (Process temperature too low)

**Navigation**

Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 835 (0678)

**Description**
Option for changing the diagnostic behavior of the diagnostic message **835 Process temperature too low**.

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

**Factory setting**
Warning

**Additional information**
For a detailed description of the options available, see →  31

### 3.1.4 "Management" submenu

**Navigation**

Expert → System → Management

---

**Device reset**

**Navigation**

Expert → System → Management → Device reset (0000)

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

**Selection**
- Cancel
- To factory defaults
- To delivery settings
- Restart device

**Factory setting**
Cancel
Additional information

*"Cancel" option*
No action is executed and the user exits the parameter.

*"To factory defaults" option*
Every parameter is reset to its factory setting.

*"To delivery settings" option*
Every parameter for which a customer-specific default setting was ordered is reset to this customer-specific value. All other parameters are reset to the factory setting.

This option is not visible if no customer-specific settings have been ordered.

*"Restart device" option*
The restart resets every parameter whose data are in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.

---

### Activate SW option

**Navigation**

[Expert → System → Management → 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

**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.
▸ 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"
Reset write protection

Navigation

Expert → System → Management → Res. write prot. (0019)

Description
The functionality of this parameter is not available for the t-mass 150 measuring device.

3.2 "Sensor" submenu

Navigation
Expert → Sensor

3.2.1 "Measured values" submenu

Navigation
Expert → Sensor → Measured val.
"Process variables" submenu

**Navigation**


**Mass flow**

**Navigation**


**Prerequisite**

The following conditions are met:
- The **Enabled** option is selected in the **Operating mode** parameter (→ 64).
- The **Mass flow** option is selected in the **Flow reference in use** parameter (→ 65).

**Description**

Displays the mass flow that is currently measured.

**User interface**

Signed floating-point number

**Additional information**

**Dependency**

The unit is taken from the **Mass flow unit** parameter (→ 44)

**Corrected volume flow**

**Navigation**


**Prerequisite**

The following conditions are met:
- The **Enabled** option is selected in the **Operating mode** parameter (→ 64).
- The **Corrected volume flow** option is selected in the **Flow reference in use** parameter (→ 65).

**Description**

Displays the corrected volume flow currently calculated.

**User interface**

Signed floating-point number
Additional information

Description
The corrected volume flow is derived from the measured volume flow corrected to the selected reference conditions.

Dependency
The unit is taken from the Corrected volume flow unit parameter (→ 45).

FAD volume flow

Navigation

Prerequisite
The following conditions are met:
- The Enabled option is selected in the Operating mode parameter (→ 64).
- The FAD volume flow option is selected in the Flow reference in use parameter (→ 65).

Description
Displays the FAD volume flow that is currently measured.

User interface
Signed floating-point number

Additional information
Dependency
The unit is taken from the FAD volume flow unit parameter (→ 47).

Temperature

Navigation

Description
Displays the temperature currently measured.

User interface
Signed floating-point number

Additional information
Dependency
The unit is taken from the Temperature unit parameter (→ 48).

1) Free Air Delivery
"Totalizer" submenu

Navigation

Expert → Sensor → Measured val. → Totalizer

Prerequisite

One of the following options is selected in the Assign process variable parameter (→ 112) of the Totalizer submenu:
- Mass flow
- Corrected volume flow
- FAD volume flow

Description

Displays the current totalizer reading.

User interface

Signed floating-point number

Additional information

Description

As it is only possible to display a maximum of 7 digits in the operating tool, the current counter value is the sum of the totalizer value and the overflow value from the Totalizer overflow parameter (→ 41) if the display range is exceeded.

In the event of an error, the totalizer adopts the mode defined in the Failure mode parameter (→ 115).

User interface

The unit of the selected process variable is specified for the totalizer in the Unit totalizer parameter (→ 113).

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 ⋅ 10⁷ (1 overflow) = 10000000 [m³]
- Current totalizer reading: 11968457 m³
Totalizer overflow

Navigation

Expert → Sensor → Measured val. → Totalizer → Tot. overflow (0910)

Prerequisite

One of the following options is selected in the Assign process variable parameter (→ 112) of the Totalizer submenu:

- Mass flow
- Corrected volume flow
- FAD volume flow

Description

Displays the current totalizer overflow.

User interface

Integer with sign

Additional information

Description

If the current totalizer reading has more than 7 digits, which is the maximum value range of the operating tool that can be displayed, 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 parameter (→ 40)

Display

The unit of the selected process variable is specified for the totalizer in the Unit totalizer parameter (→ 113).

Example

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

- Value in the Totalizer value 1 parameter: 1968457 m³
- Value in the Totalizer overflow 1 parameter: 2 \cdot 10^7 (2 overflows) = 20000000 [m³]
- Current totalizer reading: 21968457 m³

"Output values" submenu

Navigation

Expert → Sensor → Measured val. → Output values

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<td>→ 42</td>
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<td>Output frequency (0471)</td>
<td>→ 43</td>
</tr>
<tr>
<td>Switch status (0461)</td>
<td>→ 43</td>
</tr>
</tbody>
</table>
## Output current

**Navigation**

[ Expert → Sensor → Measured val. → Output values → Output curr. (0361) ]

**Description**

Displays the actual calculated value of the output current.

**User interface**

3.59 to 22.5 mA

## Pulse output

**Navigation**

[ Expert → Sensor → Measured val. → Output values → Pulse output (0456) ]

**Prerequisite**

In the **Operating mode** parameter (→ 86), the **Pulse** option is selected.

**Description**

Displays the pulse frequency currently output.

**User interface**

Positive floating-point number

**Additional information**

- 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 (→ 88) and **Pulse width** parameter (→ 88) can be used to define the value (i.e. the measured value amount that corresponds to a pulse) and the duration of the pulse.

![Pulse output diagram](image)

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

The output behavior can be reversed via the **Invert output signal** parameter (→ 101) 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 (→ 89)) can be configured.
### Output frequency

**Navigation**

Expert → Sensor → Measured val. → Output values → Out frequency (0471)

**Prerequisite**

In the **Operating mode** parameter (→ 86), the **Frequency** option is selected.

**Description**

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

**User interface**

0.0 to 1.250.0 Hz

---

### Switch status

**Navigation**

Expert → Sensor → Measured val. → Output values → Switch status (0461)

**Prerequisite**

In the **Operating mode** parameter (→ 86), 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>
</tr>
</thead>
<tbody>
<tr>
<td>Mass flow unit (0554)</td>
</tr>
<tr>
<td>Mass unit (0574)</td>
</tr>
<tr>
<td>Corrected volume flow unit (0558)</td>
</tr>
<tr>
<td>Corrected volume unit (0575)</td>
</tr>
<tr>
<td>FAD volume flow unit (0601)</td>
</tr>
<tr>
<td>FAD volume unit (0591)</td>
</tr>
</tbody>
</table>
Description of device parameters

Proline t-mass A, B 150 HART

<table>
<thead>
<tr>
<th>Density unit (0555)</th>
<th>→ 48</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature unit (0557)</td>
<td>→ 48</td>
</tr>
<tr>
<td>Length unit (0551)</td>
<td>→ 49</td>
</tr>
<tr>
<td>Pressure unit (0564)</td>
<td>→ 49</td>
</tr>
<tr>
<td>Date/time format (2812)</td>
<td>→ 50</td>
</tr>
<tr>
<td>▶ User specific units</td>
<td>→ 50</td>
</tr>
</tbody>
</table>

---

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

**Custom-specific units**

- User mass/s
- User mass/min
- User mass/h
- User mass/d

**Factory setting**

Country-specific:

- kg/h
- lb/h
Additional information

Result

The selected unit applies for:

**Mass flow parameter** (→ 38)

Selection

For an explanation of the abbreviated units: → 146

**Customer-specific units**

The unit for the customer-specific mass is specified in the **User mass text** parameter (→ 51).

---

**Mass unit**

**Navigation**

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

**Description**

Use this function to select the unit for the mass.

**Selection**

*SI units*

- g
- kg
- t

*US units*

- oz
- lb
- STon

*Imperial units*

- LTon

**Custom-specific units**

User mass

**Factory setting**

Country-specific:

- kg
- lb

**Additional information**

Selection

For an explanation of the abbreviated units: → 146

**Customer-specific units**

The unit for the customer-specific mass is specified in the **User mass text** parameter (→ 51).

---

**Corrected volume flow unit**

**Navigation**

Expert → Sensor → System units → Cor.volflow unit (0558)

**Description**

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

Proline t-mass A, B 150 HART

Selection

**SI units**
- Nl/s
- Nl/min
- Nl/h
- Nl/d
- Nm³/s
- Nm³/min
- Nm³/h
- Nm³/d
- Sl/s
- Sl/min
- Sl/h
- Sl/d
- Sm³/s
- Sm³/min
- Sm³/h
- Sm³/d

**US units**
- St³/s
- St³/min
- St³/h
- St³/d

Factory setting

Country-specific:
- Nm³/h
- St³/min

Additional information

Result

The selected unit applies for:

**Corrected volume flow** parameter (→ 38)

Selection

For an explanation of the abbreviated units: → 146

Corrected volume unit

Navigation

Expert → Sensor → System units → Corr. vol. unit (0575)

Description

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

Selection

**SI units**
- Nl
- Nm³
- Sl
- Sm³

**US units**
- St³

Factory setting

Country-specific:
- Nm³
- St³

Additional information

Selection

For an explanation of the abbreviated units: → 146
FAD volume flow unit

Navigation

Expert → Sensor → System units → FAD vol.fl. unit (0601)

Description

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

Selection

<table>
<thead>
<tr>
<th>SI units</th>
<th>US units</th>
</tr>
</thead>
<tbody>
<tr>
<td>l FAD/s</td>
<td>cf FAD/s</td>
</tr>
<tr>
<td>l FAD/min</td>
<td>cf FAD/min</td>
</tr>
<tr>
<td>l FAD/h</td>
<td>cf FAD/h</td>
</tr>
<tr>
<td>l FAD/d</td>
<td>cf FAD/d</td>
</tr>
<tr>
<td>m³ FAD/s</td>
<td></td>
</tr>
<tr>
<td>m³ FAD/min</td>
<td></td>
</tr>
<tr>
<td>m³ FAD/h</td>
<td></td>
</tr>
<tr>
<td>m³ FAD/d</td>
<td></td>
</tr>
</tbody>
</table>

Factory setting

Country-specific:
- m³ FAD/h
- cf FAD/min

Additional information

Effect

The selected unit applies to:
FAD volume flow parameter (→ 39)

Selection

For an explanation of the abbreviated units: → 146

FAD volume unit

Navigation

Expert → Sensor → System units → FAD volume unit (0591)

Description

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

Selection

<table>
<thead>
<tr>
<th>SI units</th>
<th>US units</th>
</tr>
</thead>
<tbody>
<tr>
<td>l FAD</td>
<td>cf FAD</td>
</tr>
<tr>
<td>m³ FAD</td>
<td></td>
</tr>
</tbody>
</table>

Factory setting

Country-specific:
- m³ FAD
- cf FAD

Additional information

Selection

For an explanation of the abbreviated units: → 146

---

2) Free air delivery
3) Free air delivery
**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
  - kg/dm³
  - kg/l
  - kg/m³
- **US units**
  - lb/ft³

**Factory setting**
Country-specific:
- kg/m³
- lb/ft³

**Additional information**
The selected unit applies for:
- FAD density parameter (→ 59)

**Result**
For an explanation of the abbreviated units: → 146

**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**
The selected unit applies for:
- Temperature parameter (→ 39)
- FAD temperature parameter (→ 59)
- Reference combustion temperature parameter
- Reference temperature parameter (→ 57)
- Maximum value parameter (→ 134)
- **Minimum value** parameter (→ 134)
- **Maximum value** parameter (→ 135)
- **Minimum value** parameter (→ 135)

**Selection**

For an explanation of the abbreviated units: → 146

### Length unit

**Navigation**

[Expert] → Sensor → System units → Length unit (0551)

**Description**

Use this function to select the unit of length.

**Selection**

**SI units**
- mm
- m

**US units**
- in
- ft

**Factory setting**

Country-specific:
- mm
- in

**Additional information**

**Effect**

The selected unit applies for:
- **Duct internal height** parameter (→ 61)
- **Insertion depth** parameter (→ 63)
- **Pipe inner diameter** parameter (→ 61)
- **Mounting set height** parameter (→ 62)
- **Pipe wall thickness** parameter (→ 62)
- **Duct internal width** parameter (→ 61)

**Selection**

For an explanation of the abbreviated units: → 146

### Pressure unit

**Navigation**

[Expert] → Sensor → System units → Pressure unit (0564)

**Description**

Use this function to select the unit for the pipe pressure.

**Selection**

**SI units**
- kPa a
- MPa a
- bar
- mbar a

**US units**
- psi a
Description of device parameters

**Factory setting**

Country-specific:
- bar
- psi

**Additional information**

*Result*

The unit is taken from:
- FAD pressure parameter (→ 58)
- Reference pressure parameter (→ 57)

*Selection*

For an explanation of the abbreviated units: → 146

---

**Date/time format**

**Navigation**

Expert → Sensor → System units → Date/time format (2812)

**Description**

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

**Selection**

- dd.mm.yy hh:mm
- dd.mm.yy hh:mm am/pm
- mm/dd/yy hh:mm
- mm/dd/yy hh:mm am/pm

**Factory setting**

dd.mm.yy hh:mm

**Additional information**

*Selection*

For an explanation of the abbreviated units: → 146

---

"User specific units" submenu

**Navigation**

Expert → Sensor → System units → User spec. units

<table>
<thead>
<tr>
<th>User specific units</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>User mass text (0560)</td>
<td>→ 51</td>
</tr>
<tr>
<td>User mass offset (0562)</td>
<td>→ 51</td>
</tr>
<tr>
<td>User mass factor (0561)</td>
<td>→ 51</td>
</tr>
</tbody>
</table>
### User mass text

**Navigation**

Expert → Sensor → System units → User spec. units → User mass text (0560)

**Description**

Use this function to enter a text for the user-specific unit of mass and mass flow. The corresponding time units (s, min, h, d) for mass flow are generated automatically.

**User entry**

Max. 10 characters such as letters, numbers or special characters (@, %, /)

**Factory setting**

User mass

**Additional information**

Result

The defined unit is shown as an option in the choose list of the following parameters:
- Mass flow unit parameter (→ 44)
- Mass unit parameter (→ 45)

**Example**

If the text GLAS is entered, the following options are displayed in the picklist for the Mass flow unit parameter (→ 44):
- GLAS/s
- GLAS/min
- GLAS/h
- GLAS/d

---

### User mass offset

**Navigation**

Expert → Sensor → System units → User spec. units → User mass offset (0562)

**Description**

Use this function to enter the offset for adapting the user-specific mass unit and mass flow unit (without time).

**User entry**

Signed floating-point number

**Factory setting**

0

**Additional information**

**Description**

Value in user-specific unit = (factor × value in base unit) + offset

---

### User mass factor

**Navigation**

Expert → Sensor → System units → User spec. units → User mass factor (0561)

**Description**

Use this function to enter a quantity factor (without time) for the user-specific mass and mass flow unit.

**User entry**

Signed floating-point number
### Factory setting

**1.0**

---

### 3.2.3 "Process parameters" submenu

**Navigation**


---

#### Flow override

**Description**

Use this function to select whether to interrupt the evaluation of measured values. This is useful for the cleaning processes of a pipeline, for example.

**Selection**

- Off
- On

**Factory setting**

Off

**Additional information**

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

**Description**

**Flow override is active**

- The diagnostic message diagnostic message **C453 Flow override** is displayed.
- Output values
  - Output: Value at zero flow
  - Temperature: proceeding output
  - Totalizers 1-3: Stop being totalized

---

### Flow damping

**Navigation**

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

**Description**

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

**User entry**

0 to 999.9 s

**Factory setting**

0 s

**Additional information**

*User entry*

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

**Result**

The damping affects the following variables of the device:

- Outputs → 77
- Low flow cut off → 53
- Totalizers → 112

"Low flow cut off" submenu

**Navigation**

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

**Assign process variable**

**Navigation**

Expert → Sensor → Process param. → Low flow cut off → Assign variable (1837)

**Description**

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

**Selection**

- Off
- Mass flow
- Corrected volume flow
- FAD volume flow

**Factory setting**

Mass flow
Description of device parameters

On value low flow cutoff

Navigation  
Expert → Sensor → Process param. → Low flow cut off → On value (1805)

Prerequisite  
One of the following options is selected in the Assign process variable parameter (→ 53):
- Mass flow
- Corrected volume flow
- FAD volume flow

Description  
Use this function to enter a switch-on value for low flow cut off. Low flow cut off is activated if the value entered is not equal to 0 → 54.

User entry  
Positive floating-point number

Factory setting  
Depends on country and nominal diameter → 143

Additional information  
Dependency  
The unit depends on the process variable selected in the Assign process variable parameter (→ 53).

Off value low flow cutoff

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

Prerequisite  
One of the following options is selected in the Assign process variable parameter (→ 53):
- Mass flow
- Corrected volume flow
- FAD volume flow

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 → 54.

User entry  
0 to 100.0 %

Factory setting  
50 %
Endress+Hauser

3.2.4 "Measurement mode" submenu

Navigation

Expert → Sensor → Measurement mode

Prerequisite

The Disabled option is selected in the Operating mode parameter (→  64) parameter.

Description

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

Selection

- Air
- Argon Ar
- Carbon dioxide CO2
- Nitrogen N2

Factory setting

Air
3.2.5 "Calculated values" submenu

Navigation  

Expert → Sensor → Calculated value

"Reference values" submenu

Navigation  

Expert → Sensor → Calculated value → Reference values

Reference conditions

Navigation  

Expert → Sensor → Calculated value → Reference values → Ref. conditions (3439)

Description  

Use this function to select the reference conditions for calculating the reference density.

Selection  

- 1013.25mbara, 0°C
- 1013.25mbara, 15°C
- 1013.25mbara, 20°C
- 1013.25mbara, 25°C
- 1000mbara, 0°C
- 1000mbara, 15°C
- 1000mbara, 20°C
- 1000mbara, 25°C
- 14.696Psia, 59°F
- 14.696Psia, 60°F
- 14.730Psia, 60°F
- User defined
Reference pressure

Navigation

Expert → Sensor → Calculated value → Reference values → Ref. pressure (3378)

Prerequisite

The User defined option is selected in the Reference conditions parameter (→  56) parameter.

Description

Use this function to enter the reference pressure for calculating the reference density.

User entry

0.1 to 99 bar

Factory setting

1.01325 bar

Additional information

Dependency

The unit is taken from the Pressure unit parameter (→  49)

Reference temperature

Navigation

Expert → Sensor → Calculated value → Reference values → Ref. temperature (3379)

Prerequisite

The User defined option is selected in the Reference conditions parameter (→  56) parameter.

Description

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

User entry

–50 to 150 °C

Factory setting

0 °C

Additional information

Dependency

The unit is taken from the Temperature unit parameter (→  48)

Reference density

Navigation

Expert → Sensor → Calculated value → Reference values → Ref.density (3377)

Description

Displays the calculated reference density.

User interface

0 to 9.9 · 10^5 kg/m³
Additional information  

Dependency

The unit is taken from the **Density unit** parameter (→ 48)

---

**FAD conditions**

**Navigation**

Expert → Sensor → Calculated value → Reference values → FAD conditions (3438)

**Prerequisite**

The **Air** option is selected in the **Select gas type** parameter (→ 55) parameter.

**Description**

Use this function to select the reference conditions for calculating the FAD density.

**Selection**

- 1000mbara, 20°C
- 14.504Psia, 68°F
- User defined

**Factory setting**

1000mbara, 20°C

---

**FAD pressure**

**Navigation**

Expert → Sensor → Calculated value → Reference values → FAD pressure (3373)

**Prerequisite**

The following conditions are met:

- The **Air** option is selected in the **Select gas type** parameter (→ 55) parameter.
- The **User defined** option is selected in the **FAD conditions** parameter (→ 58) parameter.

**Description**

Use this function to enter the reference pressure for calculating the FAD density.

**User entry**

0.1 to 99 bar

**Factory setting**

1 bar

**Additional information**  

Dependency

The unit is taken from the **Pressure unit** parameter (→ 49)

---

4) Free air delivery  
5) Free air delivery
**FAD temperature**

**Navigation**
Expert → Sensor → Calculated value → Reference values → FAD temperature (3374)

**Prerequisite**
The following conditions are met:
- The **Air** option is selected in the **Select gas type** parameter (→ 55) parameter.
- The **User defined** option is selected in the **FAD conditions** parameter (→ 58) parameter.

**Description**
Use this function to enter the reference temperature for calculating the FAD density.

**User entry**
-50 to 150 °C

**Factory setting**
20 °C

**Additional information**
*Dependency*
- The unit is taken from the **Temperature unit** parameter (→ 48)

---

**FAD density**

**Navigation**
Expert → Sensor → Calculated value → Reference values → FAD density (3372)

**Prerequisite**
The **Air** option is selected in the **Select gas type** parameter (→ 55) parameter.

**Description**
Displays the calculated FAD density.

**User interface**
0 to $9.9 \cdot 10^5$ kg/m³

**Additional information**
*Dependency*
- The unit is taken from the **Density unit** parameter (→ 48)

---

### 3.2.6 "Sensor adjustment“ submenu

**Navigation**

- **Sensor adjustment** → 60
- **Installation settings** → 60
- **In-situ adjustment** → 64

---

6) Free air delivery
7) Free air delivery
"Installation settings" submenu

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation factor (3470)</td>
<td>→  60</td>
</tr>
<tr>
<td>Pipe shape (3441)</td>
<td>→  60</td>
</tr>
<tr>
<td>Pipe inner diameter (3476)</td>
<td>→  61</td>
</tr>
<tr>
<td>Duct internal height (3405)</td>
<td>→  61</td>
</tr>
<tr>
<td>Duct internal width (3411)</td>
<td>→  61</td>
</tr>
<tr>
<td>Orientation (3437)</td>
<td>→  62</td>
</tr>
<tr>
<td>Pipe wall thickness (3409)</td>
<td>→  62</td>
</tr>
<tr>
<td>Mounting set height (3435)</td>
<td>→  62</td>
</tr>
<tr>
<td>Insertion depth (3406)</td>
<td>→  63</td>
</tr>
</tbody>
</table>

**Installation factor**

**Navigation**  
Expert → Sensor → Sensor adjustm. → Install.settings → Install. factor (3470)

**Prerequisite**  
The Disabled option is selected in the Operating mode parameter (→  64) parameter.

**Description**  
Use this function to enter the installation factor.

**User entry**  
0 to 9999

**Factory setting**  
1

**Pipe shape**

**Navigation**  
Expert → Sensor → Sensor adjustm. → Install.settings → Pipe shape (3441)

**Prerequisite**  
The sensor is an insert version.

**Description**  
Use this function to select the shape of the pipe.

**Selection**  
- Circular
- Rectangular
**Pipe inner diameter**

**Navigation**


**Prerequisite**

The following conditions are met:
- The sensor is an insert version.
- The Circular option is selected in the Pipe shape parameter (→ 60) parameter.

**Description**

Enter the inner diameter of the pipe.

**User entry**

45 to 99999 mm

**Factory setting**

50 mm

**Additional information**

Dependency

The unit is taken from the Length unit parameter (→ 49)

**Duct internal height**

**Navigation**

Expert → Sensor → Sensor adjustm. → Install.settings → Duct int. height (3405)

**Prerequisite**

The following conditions are met:
- The sensor is an insert version.
- The Rectangular option is selected in the Pipe shape parameter (→ 60) parameter.

**Description**

Use this function to enter the height of the rectangular pipe.

**User entry**

45 to 99999 mm

**Factory setting**

50 mm

**Additional information**

Dependency

The unit is taken from the Length unit parameter (→ 49)

**Duct internal width**

**Navigation**

Expert → Sensor → Sensor adjustm. → Install.settings → Duct int. width (3411)

**Prerequisite**

The following conditions are met:
- The sensor is an insert version.
- The Rectangular option is selected in the Pipe shape parameter (→ 60) parameter.
### Description of device parameters

**Proline t-mass A, B 150 HART**

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>Use this function to enter the width of the rectangular pipe.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>User entry</strong></td>
<td>45 to 99999 mm</td>
</tr>
<tr>
<td><strong>Factory setting</strong></td>
<td>50 mm</td>
</tr>
</tbody>
</table>
| **Additional information** | *Dependency*  
  The unit is taken from the **Length unit** parameter (→ 49) |

#### Orientation

<table>
<thead>
<tr>
<th><strong>Navigation</strong></th>
<th>Expert → Sensor → Sensor adjustm. → Install.settings → Orientation (3437)</th>
</tr>
</thead>
</table>
| **Prerequisite** | The following conditions are met:  
  - The sensor is an insert version.  
  - The **Rectangular** option is selected in the **Pipe shape** parameter (→ 60) parameter. |
| **Description** | Use this function to select the orientation of the sensor. |
| **Selection** |  
  - Vertical  
  - Horizontal |
| **Factory setting** | Vertical |

#### Pipe wall thickness

<table>
<thead>
<tr>
<th><strong>Navigation</strong></th>
<th>Expert → Sensor → Sensor adjustm. → Install.settings → Wall thickness (3409)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prerequisite</strong></td>
<td>The sensor is an insert version.</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Use this function to enter the pipe wall thickness.</td>
</tr>
<tr>
<td><strong>User entry</strong></td>
<td>2 to 999.9 mm</td>
</tr>
<tr>
<td><strong>Factory setting</strong></td>
<td>4.5 mm</td>
</tr>
</tbody>
</table>
| **Additional information** | *Dependency*  
  The unit is taken from the **Length unit** parameter (→ 49) |

#### Mounting set height

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prerequisite</strong></td>
<td>The sensor is an insert version.</td>
</tr>
</tbody>
</table>
Description
Use this function to enter the mounting set height.

User entry
0 to 999 mm

Factory setting
106 mm

Additional information
Description

For more detailed information on determining the mounting set height, please see the Operating Instructions for the device, section "Insertion depth"

Dependency
The unit is taken from the Length unit parameter (→ 49)

Insertion depth

Navigation
Expert → Sensor → Sensor adjustm. → Install.settings → Insertion depth (3406)

Prerequisite
The sensor is an insert version.

Description
Displays the calculated insertion depth of the sensor.

User interface
0 to 999 000 mm

Factory setting
50 mm

Additional information
Description

The insertion depth depends on the internal diameter of the pipe.

\[(0.3 \cdot A) + B + (C1 + C2)\]
Description of device parameters

Proline t-mass A, B 150 HART

A: **Internal pipe diameter DN (circular pipe) or internal dimension (rectangular duct)**
B: **Thickness of pipe wall or of duct wall**
C1: **Length of mounting set**
C2: **Length of sensor compression fitting**

For more detailed information on determining the insertion depth, please see the Operating Instructions for the device, section "Insertion depth"

**Dependency**

The unit is taken from the **Length unit** parameter (→ 49)

"In-situ adjustment" submenu

**Navigation**


**Operating mode**

Use this function to activate/deactivate in-situ adjustment.

**Selection**

- Disabled
- Enabled

**Factory setting**

Disabled
"Adjustment values in use" submenu

**Navigation**


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<tr>
<td>Power coefficient 8 → 69</td>
</tr>
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</table>

**Flow reference in use**

**Navigation**


**Description**

Use this function to select the flow reference value used.
### User interface
- Mass flow
- Corrected volume flow
- FAD volume flow

### Factory setting
Mass flow

---

**Flow reference value 1**

**Navigation**


**Description**
Displays the Flow reference value 1 (→ 66) defined for the adjustment.

**User interface**
Signed floating-point number

---

**Power coefficient 1**

**Navigation**


**Description**
Displays the Power coefficient 1 defined for the adjustment.

**User interface**
Positive floating-point number

---

**Flow reference value 2**

**Navigation**


**Description**
Displays the Flow reference value 2 defined for the adjustment.

**User interface**
Signed floating-point number

---

**Power coefficient 2**

**Navigation**


**Description**
Displays the Power coefficient 2 defined for the adjustment.

**User interface**
Positive floating-point number
Flow reference value 3

Navigation

Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Flow ref. val. 3 (3419)

Description
Displays the Flow reference value 3 defined for the adjustment.

User interface
Signed floating-point number

Power coefficient 3

Navigation

Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Power coeff. 3 (3427)

Description
Displays the Power coefficient 3 defined for the adjustment.

User interface
Positive floating-point number

Flow reference value 4

Navigation


Description
Displays the Flow reference value 4 defined for the adjustment.

User interface
Signed floating-point number

Power coefficient 4

Navigation


Description
Displays the Power coefficient 4 defined for the adjustment.

User interface
Positive floating-point number

Flow reference value 5

Navigation

Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Flow ref. val. 5 (3421)

Description
Displays the Flow reference value 5 defined for the adjustment.
### Description of device parameters

**Proline t-mass A, B 150 HART**

<table>
<thead>
<tr>
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#### Power coefficient 5

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<tr>
<td>Description</td>
<td>Displays the Power coefficient 5 defined for the adjustment.</td>
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#### Power coefficient 6

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<tbody>
<tr>
<td>Description</td>
<td>Displays the Power coefficient 6 defined for the adjustment.</td>
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<tr>
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#### Flow reference value 7

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<td>Description</td>
<td>Displays the Flow reference value 7 defined for the adjustment.</td>
</tr>
<tr>
<td>User interface</td>
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Proline t-mass A, B 150 HART

Description of device parameters

Power coefficient 7

Navigation

Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Power coeff. 7 (3431)

Description
Displays the Power coefficient 7 defined for the adjustment.

User interface
Positive floating-point number

Flow reference value 8

Navigation

Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Flow ref. val. 8 (3424)

Description
Displays the Flow reference value 8 defined for the adjustment.

User interface
Signed floating-point number

Power coefficient 8

Navigation


Description
Displays the Power coefficient 8 defined for the adjustment.

User interface
Positive floating-point number

"New adjustment" submenu

Navigation


- Select flow reference (3382) → 70
- Perform adjustment → 70
- Use adjustment → 75
Select flow reference

Navigation
Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Select flow ref. (3382)

Description
Use this function to select the process variable used as flow reference value for the adjustment.

Selection
- Mass flow
- Corrected volume flow
- FAD volume flow

Factory setting
Mass flow

"Perform adjustment" submenu

Navigation

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Power coefficient 7 (3398) → 74
Flow reference value 8 (3391) → 75
Power coefficient 8 (3399) → 75

Clear values

Navigation

Description
Use this function to delete the existing adjustment values.

Selection
- Cancel
- Clear values

Factory setting
Cancel

Flow reference value 1

Navigation

Description
Use this function to enter a flow rate used as reference for flow point 1.

User entry
Signed floating-point number

Factory setting
0 kg/h

Power coefficient 1

Navigation

Description
Displays the automatically assigned power coefficient 1 which is directly proportional to the flow: heater power/measured temperature difference.

User interface
Positive floating-point number
Flow reference value 2

**Navigation**


**Description**

Use this function to enter a flow rate used as reference for flow point 2.

**User entry**

Signed floating-point number

**Factory setting**

0 kg/h

Power coefficient 2

**Navigation**


**Description**

Displays the automatically assigned power coefficient 2 which is directly proportional to the flow: heater power/measured temperature difference.

**User interface**

Positive floating-point number

Flow reference value 3

**Navigation**


**Description**

Use this function to enter a flow rate used as reference for flow point 3.

**User entry**

Signed floating-point number

**Factory setting**

0 kg/h

Power coefficient 3

**Navigation**


**Description**

Displays the automatically assigned power coefficient 3 which is directly proportional to the flow: heater power/measured temperature difference.

**User interface**

Positive floating-point number
Flow reference value 4

**Navigation**

**Description**
Use this function to enter a flow rate used as reference for flow point 4.

**User entry**
Signed floating-point number

**Factory setting**
0 kg/h

Power coefficient 4

**Navigation**

**Description**
Displays the automatically assigned power coefficient 4 which is directly proportional to the flow: heater power/measured temperature difference.

**User interface**
Positive floating-point number

Flow reference value 5

**Navigation**

**Description**
Use this function to enter a flow rate used as reference for flow point 5.

**User entry**
Signed floating-point number

**Factory setting**
0 kg/h

Power coefficient 5

**Navigation**

**Description**
Displays the automatically assigned power coefficient 5 which is directly proportional to the flow: heater power/measured temperature difference.

**User interface**
Positive floating-point number
Flow reference value 6

**Navigation**


**Description**

Use this function to enter a flow rate used as reference for flow point 6.

**User entry**

Signed floating-point number

**Factory setting**

0 kg/h

Power coefficient 6

**Navigation**


**Description**

Displays the automatically assigned power coefficient 6 which is directly proportional to the flow: heater power/measured temperature difference.

**User interface**

Positive floating-point number

Flow reference value 7

**Navigation**


**Description**

Use this function to enter a flow rate used as reference for flow point 7.

**User entry**

Signed floating-point number

**Factory setting**

0 kg/h

Power coefficient 7

**Navigation**


**Description**

Displays the automatically assigned power coefficient 7 which is directly proportional to the flow: heater power/measured temperature difference.

**User interface**

Positive floating-point number
### Flow reference value 8

**Navigation**

**Description**
Use this function to enter a flow rate used as reference for flow point 8.

**User entry**
Signed floating-point number

**Factory setting**
0 kg/h

### Power coefficient 8

**Navigation**

**Description**
Displays the automatically assigned power coefficient 8 which is directly proportional to the flow: heater power/measured temperature difference.

**User interface**
Positive floating-point number

"Use adjustment" submenu

**Navigation**
Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Use adjustment

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### Data validity

**Navigation**

**Description**
Displays whether the performed adjustment is usable.

**User interface**
- Ok
- Too few points
- Invalid pair of values
- Values too close
- Out of range
### Description of device parameters

#### Prerequisite
In the **Data validity** parameter (→ 75) the **Ok** option is displayed.

#### Description
Use this function to select whether the new adjustment values are to be used.

#### Selection
- **Cancel**
- **Ok**

#### Factory setting
**Cancel**

### 3.2.7 "Calibration" submenu

**Navigation**

Expert → Sensor → Calibration

**Flow conditioner**

**Navigation**

Expert → Sensor → Calibration → Flow conditioner (3404)

**Description**
Displays whether the measuring device was calibrated with or without a flow conditioner.

**User interface**
- **No**
- **Yes**

**Calibration date/time**

**Navigation**

Expert → Sensor → Calibration → Cal date/time (3436)

**Description**
Displays the date of the last factory calibration of the measuring device.

**User interface**
Format: dd.mm.yyyy
Additional information

Description

The date remains unchanged in the case of onsite calibration.

3.3 "Output" submenu

Navigation

Expert → Output

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3.3.1 "Current output 1" submenu

Navigation

Expert → Output → Curr.output 1

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</table>
Description of device parameters

Proline t-mass A, B 150 HART

Assign current output

Navigation

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

Description

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

Selection

- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature

Factory setting

Mass 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
- 4...20 mA US
- 4...20 mA
- Fixed current

Factory setting

Country-specific:
- 4...20 mA NAMUR
- 4...20 mA US

Additional information

Description

- In the event of a device alarm, the current output adopts the value specified in the Failure mode parameter (→ 82).
- If the measured value is outside the measuring range, the diagnostic message S441 Current output 1 is displayed.
- The measuring range is specified via the 4 mA value parameter (→ 79) and 20 mA value parameter (→ 80).

"Fixed current" option

The current value is set via the Fixed current parameter (→ 79).

Example

Shows the relationship between the current span for the output of the process variable and the lower and upper alarm levels:
Proline t-mass A, B 150 HART

Description of device parameters

![Flowchart]

1. **Current**
2. **Current span for process value**
3. **Lower level for signal on alarm**
4. **Upper level for signal on alarm**

### Selection

<table>
<thead>
<tr>
<th>Selection</th>
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<th>2</th>
<th>3</th>
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<tbody>
<tr>
<td>4...20 mA NAMUR</td>
<td>3.8 to 20.5 mA</td>
<td>&lt; 3.6 mA</td>
<td>&gt; 21.95 mA</td>
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<tr>
<td>4...20 mA US</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</td>
<td>4 to 20.5 mA</td>
<td>&lt; 3.6 mA</td>
<td>&gt; 21.95 mA</td>
</tr>
</tbody>
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If the flow exceeds or falls below the upper or lower signal on alarm level, the diagnostic message **S441 Current output 1** is displayed.

### Fixed current

**Navigation**

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

**Prerequisite**

In the **Current span** parameter (→ 78), the **Fixed current** option is selected.

**Description**

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

**User entry**

3.59 to 22.5 mA

**Factory setting**

4 mA

**Additional information**

*Example*

This setting can be used for HART multidrop, for example.

### 4 mA value

**Navigation**

Expert → Output → Curr.output 1 → 4 mA value (0367–1)

**Prerequisite**

One of the following options is selected in the **Current span** parameter (→ 78):
- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

**Description**

Use this function to enter a value for the 4 mA current.

**User entry**

Signed floating-point number
Description of device parameters

Factory setting

0 kg/h

Additional information

Description

Positive and negative values are permitted depending on the process variable assigned in the Assign current output parameter (→ 78). In addition, the value can be greater than or smaller than the value assigned for the 20 mA current in the 20 mA value parameter (→ 80).

Dependency

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

Current output behavior

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

- Current span (→ 78)
- Failure mode (→ 82)

Configuration examples

A configuration example and its effect on the current output is explained in the following section.

Configuration example

In Forward flow

- 4 mA value parameter (→ 79) = not equal to zero flow (e.g. -250 m³/h)
- 20 mA value parameter (→ 80) = not equal to zero flow (e.g. +750 m³/h)
- Calculated current value = 8 mA at zero flow

The operational range of the measuring device is defined by the values entered for the 4 mA value parameter (→ 79) and 20 mA value parameter (→ 80). If the effective flow exceeds or falls below this operational range, the diagnostic message ΔS441 Current output 1 is displayed.

20 mA value

Navigation

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

Prerequisite

One of the following options is selected in the Current span parameter (→ 78):

- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 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 → 142

**Additional information**
*Description*
Positive and negative values are permitted depending on the process variable assigned in the **Assign current output** parameter (→ 78). In addition, the value can be greater than or smaller than the value assigned for the 4 mA current in the **4 mA value** parameter (→ 79).

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

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

*Configuration examples*
Pay attention to the configuration examples for **4 mA value** parameter (→ 79).

---

**Damping**

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

**Prerequisite**
One of the following options is selected in the **Assign current output** parameter (→ 78):
- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature

One of the following options is selected in the **Current span** parameter (→ 78):
- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

**Description**
Use this function to enter 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:
- 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.

**Response time**

**Navigation**

Expert → Output → Curr.output 1 → Response time (0378–1)

**Prerequisite**

One of the following options is selected in the **Assign current output** parameter (→ 78):
- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature

One of the following options is selected in the **Current span** parameter (→ 78):
- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

**Description**

Displays the response time. This specifies how quickly the current output reaches the measured value change of 63 % of 100 % of the measured value change.

**User interface**

Positive floating-point number

**Additional information**

*Description*

The response time is made up of the time specified for the following dampings:
- Current output damping → 81
  and
- Depending on the measured variable assigned to the output.
  Flow damping

**Failure mode**

**Navigation**

Expert → Output → Curr.output 1 → Failure mode (0364–1)

**Prerequisite**

One of the following options is selected in the **Assign current output** parameter (→ 78):
- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature

One of the following options is selected in the **Current span** parameter (→ 78):
- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA
**Description**

Use this function to select the value of the current output in the event of a device alarm.

**Selection**

- Min.
- Max.
- Last valid value
- Actual value
- Defined value

**Factory setting**

Max.

**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.

*Max.* option

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

*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.

**Failure current**

**Navigation**

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

**Prerequisite**

In the Failure mode parameter (→ 82), the Defined value option is selected.

**Description**

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

**User entry**

3.59 to 22.5 mA

**Factory setting**

22.5 mA
Description of device parameters

Proline t-mass A, B 150 HART

---

### 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**

3.59 to 22.5 mA

---

### Start-up mode

**Navigation**

Expert → Output → Curr.output 1 → Start-up mode (0368–1)

**Prerequisite**

In the Current span parameter (→ 78), one of the following options is selected:

- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

**Description**

Use this function to select the current value that the current output adopts during the device start-up phase as long as no measured value is present.

**Selection**

- Min.
- Max.
- Defined value

**Factory setting**

Min.

**Additional information**

*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 (→ 78).

*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 (→ 78).

*Defined value* option

The current output outputs a defined current value.

The current value is defined via the Start-up current parameter (→ 84).

---

### Start-up current

**Navigation**

Expert → Output → Curr.output 1 → Start-up current (0369–1)

**Prerequisite**

The Defined value option is selected in the Start-up mode parameter (→ 84).
Description
Use this function to enter a fixed current value that the current output adopts during the device start-up phase as long as no measured value is present.

User entry
3.59 to 22.5 mA

Factory setting
3.59 mA

3.3.2 "Pulse-Frequency-Switch output" submenu

Navigation ⚙️ Expert → Output → PFS-output

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**Operating mode**

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</table>

**Navigation**

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

**Description**

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

**Selection**

- Pulse
- Frequency
- Switch

**Factory setting**

Pulse

**Additional information**

*Pulse* option

Quantity-dependent pulse with configurable pulse width

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

**Example**

- Flow rate approx. 100 g/s
- Pulse value 0.1 g
- Pulse width 0.05 ms
- Pulse rate 1000 Impuls/s
5 Quantity-proportional pulse (pulse value) with pulse width to be configured

\[ B \] Pulse width entered

\[ P \] Pauses between the individual pulses

"Frequency" option

Example

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

6 Flow-proportional frequency output

"Switch" option

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

Example

Alarm response without alarm

7 No alarm, high level

Example

Alarm response in case of alarm

8 Alarm, low level
Assign pulse output

**Navigation**
Expert → Output → PFS-output 1 → Assign pulse (0460–1)

**Prerequisite**
The Pulse option is selected in the Operating mode parameter (→ 86) parameter.

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

**Selection**
- Off
- Mass flow
- Corrected volume flow
- FAD volume flow

**Factory setting**
Off

Value per pulse

**Navigation**
Expert → Output → PFS-output 1 → Value per pulse (0455–1)

**Prerequisite**
The Pulse option is selected in the Operating mode parameter (→ 86) and one of the following options is selected in the Assign pulse output parameter (→ 88):
- Mass flow
- Corrected volume flow
- FAD volume flow

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

**User entry**
Signed floating-point number

**Factory setting**
Depends on country and nominal diameter → 143

**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 → Pulse width (0452–1)

**Prerequisite**
The Pulse option is selected in the Operating mode parameter (→ 86) and one of the following options is selected in the Assign pulse output parameter (→ 88):
- Mass flow
- Corrected volume flow
- FAD volume flow

**Description**
Use this function to enter the duration of the output pulse.
User entry
0.5 to 2000 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 diagnostic message  \textbf{S443 Pulse output 1 to n}.

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

Failure mode

Prerequisite
The Pulse option is selected in the Operating mode parameter (→ 86) and one of the following options is selected in the Assign pulse output parameter (→ 88):
- Mass flow
- Corrected volume flow
- FAD volume flow

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
Description of device parameters

Proline t-mass A, B 150 HART

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

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

Prerequisite

In the Operating mode parameter (→ 86), the Pulse option is selected.

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 (→ 88) and Pulse width parameter (→ 88) 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 of pulse output](image)

0  Non-conductive
1  Conductive
NC  NC contact (normally closed)
NO  NO contact (normally open)
The output behavior can be reversed via the **Invert output signal** parameter (→ 101) 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 (→ 89)) can be configured.

### Assign frequency output

**Navigation**

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

**Prerequisite**

The **Frequency** option is selected in the **Operating mode** parameter (→ 86) parameter.

**Description**

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

**Selection**

- Off
- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature

**Factory setting**

Off

### Minimum frequency value

**Navigation**

Expert → Output → PFS-output 1 → Min. freq. value (0453–1)

**Prerequisite**

The **Frequency** option is selected in the **Operating mode** parameter (→ 86) and one of the following options is selected in the **Assign frequency output** parameter (→ 91):

- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature

**Description**

Use this function to enter the start value frequency.

**User entry**

0.0 to 1 000.0 Hz

**Factory setting**

0.0 Hz
Maximum frequency value

**Navigation**

Expert → Output → PFS-output 1 → Max. freq. value (0454–1)

**Prerequisite**

The Frequency option is selected in the Operating mode parameter (→ 86) and one of the following options is selected in the Assign frequency output parameter (→ 91):
- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature

**Description**

Use this function to enter the end value frequency.

**User entry**

0.0 to 1000.0 Hz

**Factory setting**

1000.0 Hz

---

Measuring value at minimum frequency

**Navigation**

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

**Prerequisite**

The Frequency option is selected in the Operating mode parameter (→ 86) and one of the following options is selected in the Assign frequency output parameter (→ 91):
- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature

**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 (→ 91).

---

Measuring value at maximum frequency

**Navigation**

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

**Prerequisite**

The Frequency option is selected in the Operating mode parameter (→ 86) and one of the following options is selected in the Assign frequency output parameter (→ 91):
- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature
### 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 (→ 91).

---

### Damping output

**Navigation**
Expert → Output → PFS-output 1 → Damping out. (0477–1)

**Prerequisite**
The Frequency option is selected in the Operating mode parameter (→ 86) and one of the following options is selected in the Assign frequency output parameter (→ 91):
- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature

**Description**
Use this function to enter the reaction time of the output signal to fluctuations in the measured value.

**User entry**
0 to 999.9 s

**Factory setting**
0.0 s

**Additional information**
**Description**
Use this function to enter a time constant (PT1 element) for frequency output damping. The frequency output is subject to separate damping that is independent of all preceding time constants.

---

### Response time

**Navigation**
Expert → Output → PFS-output 1 → Response time (0491–1)

**Prerequisite**
The Frequency option is selected in the Operating mode parameter (→ 86) and one of the following options is selected in the Assign frequency output parameter (→ 91):
- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature
Description of device parameters

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

User interface
Positive floating-point number

Additional information
Description

The response time is made up of the time specified for the following dampings:
- Damping of pulse/frequency/switch output → 81
- Depending on the measured variable assigned to the output.

Flow damping

Failure mode

Navigation

Expert → Output → PFS-output 1 → Failure mode (0451-1)

Prerequisite
The Frequency option is selected in the Operating mode parameter (→ 86) and one of the following options is selected in the Assign frequency output parameter (→ 91):
- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature

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

Selection
- Actual value
- Defined value
- 0 Hz

Factory setting
0 Hz

Additional information
Selection

- Actual value
  In the event of a device alarm, the frequency output continues on the basis of the current flow measurement. The device alarm is ignored.
- Defined value
  In the event of a device alarm, the frequency output continues on the basis of a predefined value. The Failure frequency (→ 95) replaces the current measured value, making it possible to bypass the device alarm. The actual measurement is switched off for the duration of the device alarm.
- 0 Hz
  In the event of a device alarm, the frequency output is "switched off".

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

**Navigation**

Expert → Output → PFS-output 1 → Failure freq. (0474–1)

**Prerequisite**

The **Frequency** option is selected in the **Operating mode** parameter (→ 86) and one of the following options is selected in the **Assign frequency output** parameter (→ 91):

- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature

**Description**

Use this function to enter the value for the frequency output in the event of a device alarm in order to bypass the alarm.

**User entry**

0.0 to 1,250.0 Hz

**Factory setting**

0.0 Hz

### Output frequency

**Navigation**

Expert → Output → PFS-output 1 → Out frequency (0471–1)

**Prerequisite**

In the **Operating mode** parameter (→ 86), the **Frequency** option is selected.

**Description**

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

**User interface**

0.0 to 1,250.0 Hz

### Switch output function

**Navigation**

Expert → Output → PFS-output 1 → Switch out funct (0481–1)

**Prerequisite**

In the **Operating mode** parameter (→ 86) the **Switch** option is selected.

**Description**

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

**Selection**

- Off
- On
- Diagnostic behavior
- Limit
- 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.
- **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 ➜ Assign diag. beh (0482–1) |

**Prerequisite**
- The **Switch** option is selected in the **Operating mode** parameter (→ 86).
- The **Diagnostic behavior** option is selected in the **Switch output function** parameter (→ 95).

**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.

**Options**
- **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 → Assign limit (0483–1)]

**Prerequisite**

- The **Switch** option is selected in the **Operating mode** parameter (→ 86) parameter.
- The **Limit** option is selected in the **Switch output function** parameter (→ 95) parameter.

**Description**

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

**Selection**

- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature
- Totalizer 1

**Factory setting**

Mass 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

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
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
Additional information

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

![Tip icon]
When using a hysteresis: Switch-on value > Switch-off value.

**Dependency**

The unit depends on the process variable selected in the **Assign limit** parameter (→ 97).

---

### Switch-off value

**Navigation**

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

**Prerequisite**

- The **Switch** option is selected in the **Operating mode** parameter (→ 86).
- The **Limit** option is selected in the **Switch output function** parameter (→ 95).

**Description**

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

**User entry**

Signed floating-point number

**Factory setting**

0 kg/h

**Additional information**

**Description**

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

![Tip icon]
When using a hysteresis: Switch-on value > Switch-off value.

**Dependency**

The unit depends on the process variable selected in the **Assign limit** parameter (→ 97).

---

### Assign status

**Navigation**

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

**Prerequisite**

- The **Switch** option is selected in the **Operating mode** parameter (→ 86).
- The **Status** option is selected in the **Switch output function** parameter (→ 95).

**Description**

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

**Selection**

Low flow cut off

**Factory setting**

Low flow cut off
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 → Switch-on delay (0467–1)

Prerequisite
- The Switch option is selected in the Operating mode parameter (→  86).
- The Limit option is selected in the Switch output function parameter (→  95).

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

User entry
0.0 to 100.0 s

Factory setting
0.0 s

Switch-off delay

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

Prerequisite
- The Switch option is selected in the Operating mode parameter (→  86).
- The Limit option is selected in the Switch output function parameter (→  95).

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 → Failure mode (0486–1)

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

Navigation

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

Prerequisite

The Switch option is selected in the Operating mode parameter (→ 86).

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 → Invert outp.sig. (0470–1)

Description

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

Selection

- No
- Yes

Factory setting

No

Additional information

Selection

No option (passive - negative)

Yes option (passive - positive)
3.4 "Communication" submenu

Navigation

Expert → Communication

3.4.1 "HART output" submenu

Navigation

Expert → Communication → HART output

"Configuration" submenu

Navigation

Expert → Communication → HART output → Configuration
### Burst mode

**Navigation**

Expert → Communication → HART output → Configuration → Burst mode (0208)

**Description**

Use this function to select whether to activate or deactivate the HART burst mode for burst message X.

**Selection**

- Off
- On

**Factory setting**

Off

**Additional information**

- **Selection**
  - 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

**Navigation**

Expert → Communication → HART output → Configuration → Burst command (0207)

**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

**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
    
    Command 33: Read out the dynamic HART variables including the related unit.
Description of device parameters

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<th>Factory setting</th>
<th>Additional information</th>
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</thead>
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<td><strong>HART address</strong></td>
<td>Use this function to enter the address via which the data exchange takes place via HART protocol.</td>
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<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>No. of preambles</strong></td>
<td>Use this function to enter the number of preambles in the HART protocol.</td>
<td>2 to 20</td>
<td>5</td>
<td>As every modem component can ‘swallow’ a byte, 2-byte preambles at least must be defined.</td>
</tr>
<tr>
<td><strong>HART short tag</strong></td>
<td>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.</td>
<td>Max. 8 characters: A-Z, 0-9 and certain special characters (e.g. punctuation marks, @, %).</td>
<td>T-MASS</td>
<td></td>
</tr>
</tbody>
</table>
"Information" submenu

Navigation  
Expert → Communication → HART output → Information

- **Device revision (0204)**  
  - Device revision
  - Factory setting: 0x02
  - Additional information: The device revision is needed to assign the appropriate device description file (DD) to the device.

- **Device ID (0221)**
- **Device type (0222)**
- **Manufacturer ID (0223)**
- **HART revision (0205)**
- **HART descriptor (0212)**
- **HART message (0216)**
- **HART date code (0202)**
- **Hardware revision (0206)**
- **Software revision (0224)**
### 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 (0222)

**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**  
0x66 (for t-mass A, B 150)

**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 (0223)

**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

6

### 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**

t-mass 150

### 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**

t-mass 150

### 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
Description of device parameters

Proline t-mass A, B 150 HART

**Hardware revision**

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<tbody>
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<td>Description</td>
<td>Displays the hardware revision of the measuring device.</td>
</tr>
<tr>
<td>User interface</td>
<td>0 to 255</td>
</tr>
<tr>
<td>Factory setting</td>
<td>1</td>
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</table>

**Software revision**

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</thead>
<tbody>
<tr>
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<td>Displays the software revision of the measuring device.</td>
</tr>
<tr>
<td>User interface</td>
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<tr>
<td>Factory setting</td>
<td>0</td>
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"Output" submenu

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## 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

- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature

### Factory setting

Mass flow

## Primary variable (PV)

### Navigation

Expert → Communication → HART output → Output → Primary var (PV) (0201)

### Description

Displays the current measured value of the primary dynamic variable (PV).

### User interface

Signed floating-point number

### Additional information

**User interface**

The measured value displayed depends on the process variable selected in the Assign PV parameter (→ 109).

**Dependency**

The unit of the displayed measured value is taken from the System units submenu (→ 43).

## 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

- None
- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature
- Totalizer

### Factory setting

Totalizer
Secondary variable (SV)

**Navigation**

Expert → Communication → HART output → Output → Second.var(SV) (0226)

**Description**

Displays the current measured value of the secondary dynamic variable (SV).

**User interface**

Signed floating-point number

**Additional information**

*User interface*

The measured value displayed depends on the process variable selected in the Assign SV parameter (→ 109).

*Dependency*

The unit of the displayed measured value is taken from the System units submenu (→ 43).

Assign TV

**Navigation**

Expert → Communication → HART output → Output → Assign TV (0236)

**Description**

Use this function to select a measured variable (HART device variable) for the tertiary (third) dynamic variable (TV).

**Selection**

- None
- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature
- Totalizer

**Factory setting**

None

Tertiary variable (TV)

**Navigation**

Expert → Communication → HART output → Output → Tertiary var(TV) (0228)

**Description**

Displays the current measured value of the tertiary dynamic variable (TV).

**User interface**

Signed floating-point number

**Additional information**

*User interface*

The measured value displayed depends on the process variable selected in the Assign TV parameter (→ 110).

*Dependency*

The unit of the displayed measured value is taken from the System units submenu (→ 43).
**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**
- None
- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature
- Totalizer

**Factory setting**
None

---

**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

**Additional information**

*User interface*
The measured value displayed depends on the process variable selected in the Assign QV parameter (→ 111).

*Dependency*
The unit of the displayed measured value is taken from the System units submenu (→ 43).

---

### 3.5 "Application" submenu

**Navigation**
Expert → Application

- **Reset all totalizers** → 112
- **Totalizer** → 112
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  
- Cancel
  No action is executed and the user exits the parameter.
- Reset + totalize
  All totalizers are reset to 0 and the totaling process is restarted.

3.5.1 "Totalizer" submenu

Navigation  
Expert → Application → Totalizer

Assign process variable

Navigation  
Expert → Application → Totalizer → Assign variable (0914)

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

Selection  
- Off
- Mass flow
- Corrected volume flow
- FAD volume flow
**Factory setting**

Mass 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 Assign process variable parameter (→ 112) is still displayed in the Totalizer submenu. All other parameters in the submenu are hidden.

### Unit

**Navigation**

Expert → Application → Totalizer → Unit (0915)

**Prerequisite**

One of the following options is selected in the Assign process variable parameter (→ 112) Totalizer submenu:

- Mass flow
- Corrected volume flow
- FAD volume flow

**Description**

Use this function to select the unit for the process variable for Totalizer (→ 40).

**Selection**

- g
- kg
- t
- oz
- lb
- STon
- LTon
- User mass
- Nl
- Nm³
- Sl
- Sm³
- Sft³
- cf FAD
- m³ FAD
- l FAD

**Factory setting**

Country-specific:

- kg
- lb

**Additional information**

*Selection*

The selection is independent of the process variable selected in the Assign process variable parameter (→ 112).
**Control Totalizer**

**Navigation**

Expert → Application → Totalizer → Control Tot. (0912)

**Prerequisite**

One of the following options is selected in the Assign process variable parameter (→ 112) of the Totalizer submenu:
- Mass flow
- Corrected volume flow
- FAD volume flow

**Description**

Use this function to select the control of the totalizer value.

**Selection**

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

**Factory setting**

Totalize

**Additional information**

Selection

- Totalize
  The totalizer is started or continues totalizing with the current counter reading.
- Reset + hold
  The totaling process is stopped and the totalizer is reset to 0.
- Preset + hold
  The totaling process is stopped and the totalizer is set to its defined start value from the Preset value parameter (→ 114).
- Reset + totalize
  The totalizer is reset to 0 and the totaling process is restarted.
- Preset + totalize
  The totalizer is set to the defined start value from the Preset value parameter (→ 114) and the totaling process is restarted.

**Preset value**

**Navigation**

Expert → Application → Totalizer → Preset value (0913)

**Prerequisite**

One of the following options is selected in the Assign process variable parameter (→ 112) of the Totalizer submenu:
- Mass flow
- Corrected volume flow
- FAD volume flow

**Description**

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

**User entry**

Signed floating-point number

**Factory setting**

0 kg
Additional information

The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ 113).

**Example**

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

---

**Failure mode**

**Navigation**

Expert → Application → Totalizer → Failure mode (0901)

**Prerequisite**

One of the following options is selected in the **Assign process variable** parameter (→ 112) of the **Totalizer** submenu:

- Mass flow
- Corrected volume flow
- FAD volume flow

**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**

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

**Selection**

- Stop
  Totalizing is stopped when a device alarm occurs.
- Actual value
  The totalizer continues to count based on the actual 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 "Diagnostics" submenu

**Navigation**

Expert → Diagnostics

**Actual diagnostics** (0691) → 116
Actual diagnostics

**Navigation**

Expert → Diagnostics → Actual diagnos. (0691)

**Prerequisite**

A diagnostic event has occurred.

**Description**

Displays the current diagnostic message. If two or more messages occur simultaneously, the message with the highest priority is shown on the display.

**User interface**

Symbol for diagnostic behavior, diagnostic code and short message.

**Additional information**

*Display*

Additional pending diagnostic messages can be viewed in the Diagnostic list submenu (→ 118).

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

*Example*

For the display format:

F271 Main electronic failure

**Timestamp**

**Navigation**

Expert → Diagnostics → Timestamp

**Description**

Displays the operating time when the current diagnostic message occurred.

**User interface**

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

*Display*

The diagnostic message can be viewed via the **Actual diagnostics** parameter (→ 116).

*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**

*Display*

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

*Example*

For the display format:
F271 Main electronic failure

---

**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 (→ 117).

*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.

3.6.1 "Diagnostic list" submenu

Navigation

Expert → Diagnostics → Diagnostic list

Diagnostic list

| Diagnostic list |  
|----------------|---
| Diagnostics 1 (0692) |  
| Diagnostics 2 (0693) |  
| Diagnostics 3 (0694) |  
| Diagnostics 4 (0695) |  
| Diagnostics 5 (0696) |  

Diagnostics 1

Navigation

Expert → Diagnostics → Diagnostic list → Diagnostics 1 (0692)

Description
Displays the current diagnostics message with the highest priority.
### User interface
Symbol for diagnostic behavior, diagnostic code and short message.

### Additional information
*Display*

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

#### Examples
For the display format:
- ⌙ S442 Frequency output
- ⌚ F276 I/O module failure

---

### Timestamp

#### Navigation
Expert → Diagnostics → Diagnostic list → Timestamp

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

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

#### Additional information
*Display*

ℹ️ The diagnostic message can be viewed via the **Diagnostics 1** parameter (→ ⌚ 118).

#### Example
For the display format:
24d12h13m00s

---

### Diagnostics 2

#### Navigation
Expert → Diagnostics → Diagnostic list → Diagnostics 2 (0693)

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

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

#### Additional information
*Display*

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

#### Examples
For the display format:
- ⌙ S442 Frequency output
- ⌚ F276 I/O module failure
Description of device parameters

Timestamp

Navigation

Display

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 (→  119).

Example
For the display format:
24d12h13m00s

Diagnostics 3

Navigation

Display

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:
• △S442 Frequency output
• ✖F276 I/O module failure

Timestamp

Navigation

Display

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 (→ 120).

*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 **Diagnostics 4** parameter (→ 121).

*Example*

For the display format:

24d12h13m00s
Description of device parameters

Proline t-mass A, B 150 HART

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:
- ΔS442 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 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 (→ 122).

Example

For the display format:
24d12h13m00s

3.6.2 "Event logbook" submenu

Navigation  
Expert → Diagnostics → Event logbook

Event logbook

Filter options (0705) → 123

Event list → 124

Endress+Hauser
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.

Navigation  
Expert → Diagnostics → Event logbook → Event list

Event list

Description
Displays the history of event messages of the category selected in the Filter options parameter (→ 123).

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

Additional information

A maximum of 20 event messages are displayed in chronological order.
If the advanced HistoROM function is enabled in the device, the event list can contain up to 100 entries.
The following symbols indicate whether an event has occurred or has ended:
- •  Occurrence of the event
- •  End of the event

Examples
For the display format:
- I1091 Configuration modified
  24d12h13m00s
- A5442 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 HistoROM advanced capabilities application package, see the 'Accessories' section of the 'Technical Information' document.
3.6.3 "Device information" submenu

Navigation  
Expert → Diagnostics → Device info

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<td>Configuration counter (0233)</td>
</tr>
</tbody>
</table>

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  
t-mass

Additional information  
User interface

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.

![Information icon] The number can be found on the nameplate of the sensor and transmitter.

**User interface**

A maximum of 11-digit character string comprising letters and numbers.

**Additional information**

**Description**

**Uses of the serial number**

- To identify the measuring device quickly, e.g. when contacting Endress+Hauser.
- To obtain specific information on the measuring device using the Device Viewer: www.endress.com/deviceviewer

### Firmware version

**Navigation**

Expert → Diagnostics → Device info → Firmware version (0010)

**Description**

Displays the device firmware version installed.

**User interface**

Character string in the format xx.yy.zz

**Additional information**

**Display**

The Firmware version is also located:

- On the title page of the Operating instructions
- On the transmitter nameplate

### Device name

**Navigation**

Expert → Diagnostics → Device info → Device name (0013)

**Description**

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

**User interface**

t-mass 150

### Order code

**Navigation**

Expert → Diagnostics → Device info → Order code (0008)

**Description**

Displays the device order code.

**User interface**

Character string composed of letters, numbers and certain punctuation marks (e.g. /).
**Additional information**  
*Description*

The order code can be found on the nameplate of the sensor and transmitter in the 'Order code' field.

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

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

---

**Extended order code 1**

**Navigation**

Expert → Diagnostics → Device info → Ext. order cd. 1 (0023)

**Description**

Displays the first part of the extended order code.

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

**User interface**

Character string

**Additional information**  
*Description*

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

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

---

**Extended order code 2**

**Navigation**

Expert → Diagnostics → Device info → Ext. order cd. 2 (0021)

**Description**

For displaying the second part of the extended order code.

**User interface**

Character string

**Additional information**

For additional information, see **Extended order code 1** parameter (→ 127)

---

**Extended order code 3**

**Navigation**

Expert → Diagnostics → Device info → Ext. order cd. 3 (0022)

**Description**

For displaying the third part of the extended order code.

**User interface**

Character string
**Description of device parameters**

**Proline t-mass A, B 150 HART**

---

**Additional information**  
For additional information, see **Extended order code 1** parameter (→ 127)

---

### 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.

---

### 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

---

### 3.6.4 "Data logging" submenu

**Navigation**  
Expert → Diagnostics → Data logging

---

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<td>Logging interval (0856)</td>
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<td>Clear logging data (0855)</td>
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</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.

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

**Selection**
- Off
- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature
- Current output

**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.
### Description of device parameters

**Proline t-mass A, B 150 HART**

---

**Description**
Options for the assignment of a process variable to the data logging channel.

**Selection**
Picklist, see Assign channel 1 parameter (→ 129)

**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.

**Description**
Options for the assignment of a process variable to the data logging channel.

**Selection**
Picklist, see Assign channel 1 parameter (→ 129)

**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.

**Description**
Options for the assignment of a process variable to the data logging channel.

**Selection**
Picklist, see Assign channel 1 parameter (→ 129)

**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.

**Description**
Use this function to enter the logging interval $t_{log}$ for data logging.

**User entry**
1.0 to 3 600.0 s

---
**Description of device parameters**

**Factory setting**

10.0 s

**Additional information**

*Description*

This defines the interval between the individual data points in the data log, and thus the maximum loggable process time $T_{\text{log}}$:

- If 1 logging channel is used: $T_{\text{log}} = 1000 \times t_{\text{log}}$
- If 2 logging channels are used: $T_{\text{log}} = 500 \times t_{\text{log}}$
- If 3 logging channels are used: $T_{\text{log}} = 333 \times t_{\text{log}}$
- If 4 logging channels are used: $T_{\text{log}} = 250 \times t_{\text{log}}$

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

*Example*

If 1 logging channel is used:

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

*Clear logging data*

**Navigation**

Expert → Diagnostics → Data logging → Clear logging (0855)

**Prerequisite**

The Extended HistoROM application package is available.

*Example*

The software options currently enabled are displayed in the **Software option overview** parameter.

**Description**

Option to clear the entire logging data.

**Selection**

- Cancel
- Clear data

**Factory setting**

Cancel

**Additional information**

*Selection*

- Cancel
  
  The data is not cleared. All the data is retained.
- Clear data
  
  The logging data is cleared. The logging process starts from the beginning.
"Display channel 1" submenu

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

Display channel 1

Prerequisite

The Extended HistOROM application package is available.

The software options currently enabled are displayed in the Software option overview parameter.

One of the following options is selected in the Assign channel 1 parameter ( ➤ 129):

- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature
- Current output

Description

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

Additional information

Description

- x-axis: depending on the number of channels selected displays 250 to 1000 measured values of a process variable.
- y-axis: displays the approximate measured value span and constantly adapts this to the ongoing measurement.

"Display channel 2" submenu

Navigation  ➤ Expert → Diagnostics → Data logging → Displ.channel 2

Display channel 2

Prerequisite

The Extended HistOROM application package is available.

The software options currently enabled are displayed in the Software option overview parameter.

One of the following options is selected in the Assign channel 2 parameter ( ➤ 129):

- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature
- Current output

Description

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

Additional information

Description

- x-axis: depending on the number of channels selected displays 250 to 1000 measured values of a process variable.
- y-axis: displays the approximate measured value span and constantly adapts this to the ongoing measurement.
Display channel 2

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 →  132

"Display channel 3" submenu

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

Display channel 3

Navigation  Expert → Diagnostics → Data logging → Displ.channel 3
Prerequisite  A process variable is defined in the Assign channel 3 parameter.
Description  See the Display channel 1 parameter →  132

"Display channel 4" submenu

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

Display channel 4

Navigation  Expert → Diagnostics → Data logging → Displ.channel 4
Prerequisite  A process variable is defined in the Assign channel 4 parameter.
Description

See the Display channel 1 parameter → 132

3.6.5 "Min/max values" submenu

Navigation

Expert → Diagnostics → Min/max val.

"Electronic temperature" submenu

Navigation

Expert → Diagnostics → Min/max val. → Electronic temp.

Minimum value

Description

Displays the lowest previously measured temperature value of the main electronics module.

User interface

-273.15 to 726.75 °C

Additional information

Dependency

The unit is taken from the Temperature unit parameter (→ 48)

Maximum value

Description

Displays the highest previously measured temperature value of the main electronics module.
Proline t-mass A, B 150 HART

Description of device parameters

User interface

-273.15 to 726.75 °C

Additional information

Dependency

The unit is taken from the Temperature unit parameter (→ 48)

"Process temperature" submenu

Navigation


Minimum value

-273.15 to 726.75 °C

User interface

-273.15 to 726.75 °C

Additional information

Dependency

The unit is taken from the Temperature unit parameter (→ 48)

Maximum value

-273.15 to 726.75 °C

User interface

-273.15 to 726.75 °C

Additional information

Dependency

The unit is taken from the Temperature unit parameter (→ 48)
3.6.6 "Simulation" submenu

**Navigation**

Expert → Diagnostics → Simulation

**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
- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature

**Factory setting**

Off

**Additional information**

The simulation value of the process variable selected is defined in the Value process variable parameter (→ 137).
Value process variable

**Navigation**
Expert → Diagnostics → Simulation → Value proc. var. (1811)

**Prerequisite**
One of the following options is selected in the **Assign simulation process variable** parameter (→ 136):
- Mass flow
- Corrected volume flow
- FAD volume flow
- Temperature

**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 (→ 43).

Simulation current output 1

**Navigation**
Expert → Diagnostics → Simulation → Sim.curr.out. 1 (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 (→ 138).

**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.
Description of device parameters

Value current output 1

**Navigation**

Expert → Diagnostics → Simulation → Value curr.out 1 (0355–1)

**Prerequisite**

In the **Simulation current output 1** parameter, the **On** option is selected.

**Description**

Use this function to enter a current value for the simulation. In this way, users can verify the correct adjustment of the current output and the correct function of downstream switching units.

**User entry**

3.59 to 22.5 mA

Frequency simulation

**Navigation**

Expert → Diagnostics → Simulation → Frequency sim. (0472)

**Prerequisite**

In the **Operating mode** parameter (→ 86), 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** parameter (→ 138).

**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

**Navigation**

Expert → Diagnostics → Simulation → Freq. value (0473)

**Prerequisite**

In the **Frequency simulation** parameter (→ 138), 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 1250 Hz
Factory setting 0.0 Hz

Pulse simulation

Navigation  

Prerequisite
In the Operating mode parameter (→ 86), 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

Selection

The desired simulation value is defined in the Pulse value parameter (→ 139).

Pulse value

Navigation  

Prerequisite
In the Pulse simulation parameter (→ 139), 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

Navigation

Expert → Diagnostics → Simulation → Switch sim. (0462)

Prerequisite

In the Operating mode parameter (→ 86), 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 parameter (→ 140).

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

Navigation

Expert → Diagnostics → Simulation → Switch status (0463)

Prerequisite

In the Switch output simulation parameter (→ 140), the On option is selected.

Description

Use this function to select a switch value for the simulation. In this way, users can verify the correct adjustment of the switch output and the correct function of downstream switching units.

Selection

- Open
- Closed

Factory setting

Open

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.
### Simulation device alarm

**Navigation**

Expert → Diagnostics → Simulation → Sim. alarm (0654)

**Description**

Use this function to switch the device alarm on and off.

**Selection**

- Off
- On

**Factory setting**

Off

**Additional information**

Description

The display alternates between the measured value and a diagnostic message of the “Function check” category (C) while simulation is in progress.

### Diagnostic event category

**Navigation**

Expert → Diagnostics → Simulation → Event category (0738)

**Description**

Use this function to select the category of the diagnostic events that are displayed for the simulation in the Simulation diagnostic event parameter (→ 141).

**Selection**

- Sensor
- Electronics
- Configuration
- Process

**Factory setting**

Sensor

### Simulation diagnostic event

**Navigation**

Expert → Diagnostics → Simulation → Sim. diag. event (0737)

**Description**

Use this function to select a diagnostic event for the simulation process that is activated.

**Selection**

- Off
- Diagnostic event picklist (depends on the category selected)

**Factory setting**

Off

**Additional information**

Description

For the simulation, you can choose from the diagnostic events of the category selected in the Diagnostic event category parameter (→ 141).
4 Country-specific factory settings

4.1 SI units

Not valid for USA and Canada.

4.1.1 System units

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass flow</td>
<td>kg/h</td>
</tr>
<tr>
<td>Mass</td>
<td>kg</td>
</tr>
<tr>
<td>Corrected volume flow</td>
<td>Nm³/h</td>
</tr>
<tr>
<td>Corrected volume</td>
<td>Nm³</td>
</tr>
<tr>
<td>FAD volume flow</td>
<td>m³ FAD/h</td>
</tr>
<tr>
<td>FAD volume</td>
<td>m³ FAD</td>
</tr>
<tr>
<td>Density</td>
<td>kg/m³</td>
</tr>
<tr>
<td>Reference density</td>
<td>kg/Nm³</td>
</tr>
<tr>
<td>Temperature</td>
<td>°C</td>
</tr>
<tr>
<td>Length</td>
<td>mm</td>
</tr>
<tr>
<td>Pressure</td>
<td>bar a</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

**t-mass A**

<table>
<thead>
<tr>
<th>DN [mm]</th>
<th>[kg/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>53</td>
</tr>
<tr>
<td>25</td>
<td>200</td>
</tr>
<tr>
<td>40</td>
<td>555</td>
</tr>
<tr>
<td>50</td>
<td>910</td>
</tr>
</tbody>
</table>

**t-mass B**

<table>
<thead>
<tr>
<th>DN [mm]</th>
<th>[kg/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>175</td>
<td>7500</td>
</tr>
</tbody>
</table>

4.1.3 Output current span

Current output 1  4 to 20 mA NAMUR
4.1.4  Pulse value

\textit{t-mass A} \\

<table>
<thead>
<tr>
<th>Nominal diameter [mm]</th>
<th>[kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>0.1</td>
</tr>
<tr>
<td>25</td>
<td>1</td>
</tr>
<tr>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>50</td>
<td>10</td>
</tr>
</tbody>
</table>

\textit{t-mass B} \\

<table>
<thead>
<tr>
<th>Nominal diameter [mm]</th>
<th>[kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>175</td>
<td>100</td>
</tr>
</tbody>
</table>

4.1.5  On value low flow cut off

The switch-on point depends on the type of medium and the nominal diameter.

\textit{t-mass A} \\

<table>
<thead>
<tr>
<th>Nominal diameter [mm]</th>
<th>[kg/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>0.53</td>
</tr>
<tr>
<td>25</td>
<td>2</td>
</tr>
<tr>
<td>40</td>
<td>5.55</td>
</tr>
<tr>
<td>50</td>
<td>9.1</td>
</tr>
</tbody>
</table>

\textit{t-mass B} \\

<table>
<thead>
<tr>
<th>Nominal diameter [mm]</th>
<th>[kg/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>175</td>
<td>75</td>
</tr>
</tbody>
</table>

4.2  US units

Only valid for USA and Canada.

4.2.1  System units

<table>
<thead>
<tr>
<th>Unit</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass flow</td>
<td>lb/h</td>
</tr>
<tr>
<td>Mass flow</td>
<td>lb/min</td>
</tr>
<tr>
<td>Mass</td>
<td>lb</td>
</tr>
<tr>
<td>Corrected volume flow</td>
<td>ft³/min</td>
</tr>
<tr>
<td>Corrected volume</td>
<td>ft³</td>
</tr>
<tr>
<td>FAD volume flow</td>
<td>cf FAD/min</td>
</tr>
<tr>
<td>FAD volume</td>
<td>cf FAD</td>
</tr>
<tr>
<td>Density</td>
<td>lb/ft³</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

**t-mass A**

<table>
<thead>
<tr>
<th>DN [in]</th>
<th>[lb/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>½</td>
<td>116</td>
</tr>
<tr>
<td>1</td>
<td>440</td>
</tr>
<tr>
<td>1½</td>
<td>1220</td>
</tr>
<tr>
<td>2</td>
<td>2002</td>
</tr>
</tbody>
</table>

**t-mass B**

<table>
<thead>
<tr>
<th>DN [in]</th>
<th>[lb/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>16500</td>
</tr>
</tbody>
</table>

4.2.3 Output current span

Current output 1  4 to 20 mA US

4.2.4 Pulse value

**t-mass A**

<table>
<thead>
<tr>
<th>Nominal diameter [in]</th>
<th>[lb]</th>
</tr>
</thead>
<tbody>
<tr>
<td>½</td>
<td>0.2</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1½</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
</tr>
</tbody>
</table>

**t-mass B**

<table>
<thead>
<tr>
<th>Nominal diameter [in]</th>
<th>[lb]</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>200</td>
</tr>
</tbody>
</table>

4.2.5 On value low flow cut off

The switch-on point depends on the type of medium and the nominal diameter.
### t-mass A

<table>
<thead>
<tr>
<th>Nominal diameter [in]</th>
<th>[lb/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>½</td>
<td>1.16</td>
</tr>
<tr>
<td>1</td>
<td>4.4</td>
</tr>
<tr>
<td>1½</td>
<td>12.2</td>
</tr>
<tr>
<td>2</td>
<td>20.02</td>
</tr>
</tbody>
</table>

### t-mass B

<table>
<thead>
<tr>
<th>Nominal diameter [in]</th>
<th>[lb/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>165</td>
</tr>
</tbody>
</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</td>
<td>Gram/volume unit</td>
</tr>
<tr>
<td></td>
<td>kg/l, kg/dm³, kg/m³</td>
<td>Kilogram/volume unit</td>
</tr>
<tr>
<td>Pressure</td>
<td>kPa a, MPa a</td>
<td>Kilopascal, megapascal (absolute)</td>
</tr>
<tr>
<td></td>
<td>bar</td>
<td>Bar</td>
</tr>
<tr>
<td></td>
<td>mbar a</td>
<td>Millibar (absolute)</td>
</tr>
<tr>
<td>FAD volume</td>
<td>1 FAD, m³ FAD</td>
<td>FAD liter, FAD cubic meter</td>
</tr>
<tr>
<td>FAD volume flow</td>
<td>1 FAD/s, 1 FAD/min, 1 FAD/h, 1 FAD/d</td>
<td>FAD liter/time unit</td>
</tr>
<tr>
<td></td>
<td>m³ FAD/s, m³ FAD/min, m³ FAD/h, m³ FAD/d</td>
<td>FAD cubic meter/time unit</td>
</tr>
<tr>
<td>Length</td>
<td>mm, m</td>
<td>Millimeter, meter</td>
</tr>
<tr>
<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>
<tr>
<td>Corrected volume</td>
<td>Nl, Nm³, Sl, Sm³</td>
<td>Normal liter, normal cubic meter, standard liter, standard cubic meter</td>
</tr>
<tr>
<td>Corrected volume flow</td>
<td>Nl/s, Nl/min, Nl/h, Nl/d</td>
<td>Normal liter/time unit</td>
</tr>
<tr>
<td></td>
<td>Nm³/s, Nm³/min, Nm³/h, Nm³/d</td>
<td>Normal cubic meter/time unit</td>
</tr>
<tr>
<td></td>
<td>Sl/s, Sl/min, Sl/h, Sl/d</td>
<td>Standard liter/time unit</td>
</tr>
<tr>
<td></td>
<td>Sm³/s, Sm³/min, Sm³/h, Sm³/d</td>
<td>Standard cubic meter/time unit</td>
</tr>
<tr>
<td>Temperature</td>
<td>°C, K</td>
<td>Celsius, Kelvin</td>
</tr>
<tr>
<td>Time</td>
<td>s, m, h, d, y</td>
<td>Second, minute, hour, day, year</td>
</tr>
</tbody>
</table>

5.2  US units

<table>
<thead>
<tr>
<th>Process variable</th>
<th>Units</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>lb/ft³</td>
<td>Pound/cubic foot</td>
</tr>
<tr>
<td>Pressure</td>
<td>psi a</td>
<td>Psi absolute</td>
</tr>
<tr>
<td>FAD volume</td>
<td>cf FAD</td>
<td>FAD cubic foot</td>
</tr>
<tr>
<td>FAD volume flow</td>
<td>cf FAD/s, cf FAD/min, cf FAD/h, cf FAD/d</td>
<td>FAD cubic foot/time unit</td>
</tr>
<tr>
<td>Length</td>
<td>in, ft</td>
<td>Inch, foot</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>Corrected volume</td>
<td>Sft³</td>
<td>Standard cubic foot</td>
</tr>
<tr>
<td>Process variable</td>
<td>Units</td>
<td>Explanation</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----------------------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>Corrected volume flow</td>
<td>Sft³/s, Sft³/min, Sft³/h, Sft³/d</td>
<td>Standard cubic foot/time unit</td>
</tr>
<tr>
<td>Temperature</td>
<td>°F, °R</td>
<td>Fahrenheit, Rankine</td>
</tr>
<tr>
<td>Time</td>
<td>s, m, h, d, y</td>
<td>Second, minute, hour, day, year</td>
</tr>
<tr>
<td></td>
<td>am, pm</td>
<td>Ante meridiem (before midday), post meridiem (after midday)</td>
</tr>
</tbody>
</table>

### 5.3 Imperial units

<table>
<thead>
<tr>
<th>Process variable</th>
<th>Units</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass</td>
<td>LTon</td>
<td>Long ton</td>
</tr>
<tr>
<td>Mass flow</td>
<td>LTon/s, LTon/min, LTon/h, LTon/d</td>
<td>Long ton/time unit</td>
</tr>
<tr>
<td>Time</td>
<td>s, m, h, d, y</td>
<td>Second, minute, hour, day, year</td>
</tr>
<tr>
<td></td>
<td>am, pm</td>
<td>Ante meridiem (before midday), post meridiem (after midday)</td>
</tr>
</tbody>
</table>
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