Brief Operating Instructions

Proline t-mass B 150

Thermal Mass Flow Measuring System

These Instructions are Brief Operating Instructions; they do not replace the Operating Instructions included in the scope of supply.

For detailed information, refer to the Operating Instructions and other documentation on the CD-ROM provided or visit "www.endress.com/deviceviewer".

Endress+Hauser
People for Process Automation
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1 Document information

1.1 Document conventions

1.1.1 Safety symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>![DANGER]</td>
<td>DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.</td>
</tr>
<tr>
<td>![WARNING]</td>
<td>WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.</td>
</tr>
<tr>
<td>![CAUTION]</td>
<td>CAUTION! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.</td>
</tr>
<tr>
<td>![NOTICE]</td>
<td>NOTICE! This symbol contains information on procedures and other facts which do not result in personal injury.</td>
</tr>
</tbody>
</table>

1.1.2 Electrical symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Direct current]</td>
<td>Direct current A terminal to which DC voltage is applied or through which direct current flows.</td>
</tr>
<tr>
<td>![Alternating current]</td>
<td>Alternating current A terminal to which alternating voltage (sine-wave) is applied or through which alternating current flows.</td>
</tr>
<tr>
<td>![Ground connection]</td>
<td>Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.</td>
</tr>
<tr>
<td>![Protective ground connection]</td>
<td>Protective ground connection A terminal which must be connected to ground prior to establishing any other connections.</td>
</tr>
<tr>
<td>![Equipotential connection]</td>
<td>Equipotential connection A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.</td>
</tr>
</tbody>
</table>

1.1.3 Tool symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Phillips head screwdriver]</td>
<td>Phillips head screwdriver</td>
</tr>
<tr>
<td>![Flat blade screwdriver]</td>
<td>Flat blade screwdriver</td>
</tr>
<tr>
<td>![Allen key]</td>
<td>Allen key</td>
</tr>
<tr>
<td>![Hexagon wrench]</td>
<td>Hexagon wrench</td>
</tr>
</tbody>
</table>
1.1.4 Symbols for certain types of information

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| ![Allowed](A0011182) | Allowed  
Indicates procedures, processes or actions that are allowed. |
| ![Preferred](A0011183) | Preferred  
Indicates procedures, processes or actions that are preferred. |
| ![Forbidden](A0011184) | Forbidden  
Indicates procedures, processes or actions that are forbidden. |
| ![Tip](A0011185) | Tip  
Indicates additional information. |
| ![Reference to documentation](A0011186) | Reference to documentation  
Refers to the corresponding device documentation. |
| ![Reference to page](A0011187) | Reference to page  
Refers to the corresponding page number. |
| ![Reference to graphic](A0011188) | Reference to graphic  
Refers to the corresponding graphic number and page number. |
| ![Series of steps](1, 2, 3,...) | Series of steps |
| ![Result of a sequence of actions](✓) | Result of a sequence of actions |

1.1.5 Symbols in graphics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3,...</td>
<td>Item numbers</td>
</tr>
<tr>
<td>1, 2, 3,...</td>
<td>Series of steps</td>
</tr>
<tr>
<td>A, B, C,...</td>
<td>Views</td>
</tr>
<tr>
<td>A, B-C, C-C,...</td>
<td>Sections</td>
</tr>
<tr>
<td><img src="A0011189" alt="Flow direction" /></td>
<td>Flow direction</td>
</tr>
</tbody>
</table>
| ![Hazardous area](A0011190) | Hazardous area  
Indicates a hazardous area. |
| ![Safe area (non-hazardous area)](A0011191) | Safe area (non-hazardous area)  
Indicates a non-hazardous location. |
2 Basic safety instructions

2.1 Requirements for the personnel
The personnel must fulfill the following requirements for its tasks:
► Trained, qualified specialists must have a relevant qualification for this specific function and task
► Are authorized by the plant owner/operator
► Are familiar with federal/national regulations
► Before beginning work, the specialist staff must have read and understood the instructions in the Operating Instructions and supplementary documentation as well as in the certificates (depending on the application)
► Following instructions and basic conditions

2.2 Designated use
Application and media
The measuring device described in these Instructions is intended only for flow measurement of gases.
To ensure that the measuring device remains in proper condition for the operation time:
► Only use the measuring device in full compliance with the data on the nameplate and the general conditions listed in the Operating Instructions and supplementary documentation.
► Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area (e.g. explosion protection, pressure vessel safety).
► Use the measuring device only for media against which the process-wetted materials are adequately resistant.

Incorrect use
The manufacturer is not liable for damage caused by improper or non-designated use.
If the sensor gland is opened, the accuracy specifications of the measuring device no longer apply. In such situations, the measuring device must be removed and returned for recalibration and to the manufacturer.

⚠️ WARNING
Risk of injury if the process connection and sensor gland are opened under pressure.
► The process connection and the sensor gland should only be opened in an unpressurized state.

⚠️ NOTICE
Dust and moisture can enter the transmitter when the transmitter housing is opened.
► Only open the transmitter housing briefly, ensuring that no dust or moisture enters the housing.

⚠️ NOTICE
Danger of breakage of the sensor due to corrosive or abrasive fluids!
► Verify the compatibility of the process fluid with the sensor material.
► Ensure the resistance of all fluid-wetted materials in the process.
► Observe the specified maximum process pressure.
Verification for borderline cases:
► For special fluids and fluids for cleaning, Endress+Hauser is glad to provide assistance in verifying the corrosion resistance of fluid-wetted materials, but does not accept any warranty or liability.

Residual risks
The external surface temperature of the housing can increase by max. 15 K due to the power consumption of the electronic components. Hot process fluids passing through the measuring device will further increase the surface temperature of the housing. The surface of the sensor, in particular, can reach temperatures which are close to the fluid temperature.

Possible burn hazard due to fluid temperatures!
► For elevated fluid temperature, ensure protection against contact to prevent burns.

2.3 Workplace safety
For work on and with the device:
► Wear the required personal protective equipment according to federal/national regulations.

For welding work on the piping:
► Do not ground the welding unit via the measuring device.

2.4 Operational safety
Risk of injury.
► Operate the device in proper technical condition and fail-safe condition only.
► The operator is responsible for interference-free operation of the device.

2.5 Product safety
This measuring device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which they are safe to operate.

It meets general safety standards and legal requirements. It also complies with the EC directives listed in the device-specific EC Declaration of Conformity. Endress+Hauser confirms this by affixing the CE mark to the device.
3  Product description

3.1  Product design

1  Electronics compartment cover
2  Display module
3  Terminal block
4  Electronics module
5  Cable gland
6  Transmitter housing
7  Sensor
8  S-DAT
4 Incoming acceptance and product identification

4.1 Incoming acceptance

- [Checkmark]
- [Diagram of product and container]
- [Checkmark]
- [Checkmark]

- [Checkmark]
- [Checkmark]
- [Checkmark]

- [Checkmark]
- [Checkmark]
- [Checkmark]

- [Checkmark]
- [Checkmark]
- [Checkmark]
If one of the conditions does not comply, contact your Endress+Hauser distributor.

### 4.2 Product identification

The following options are available for identification of the measuring device:

- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter serial numbers from nameplates in *W@M Device Viewer* (www.endress.com/deviceviewer): All information about the measuring device is displayed.

For an overview of the scope of the Technical Documentation provided, refer to the following:

The *W@M Device Viewer*: Enter the serial number from the nameplate (www.endress.com/deviceviewer)

---

1. **Example of a nameplate**

1. Order code
2. Serial number (Ser. no.)
3. Extended order code (Ext. ord. cd.)

For detailed information about interpreting the nameplate specifications, refer to the Operating Instructions for the device on the CD-ROM provided.
5 Storage and transport

5.1 Storage conditions
Observe the following notes for storage:
- Store in original packaging.
- Do not remove the protection cap mounted on the transducer.
- Protect from direct sunlight.
- Select a storage location where moisture cannot collect in the measuring device.
- Store in a dry and dust-free place.
- Do not store outdoors.
- Storage temperature(\(\geq 15\))

5.2 Transporting the product
Observe the following notes during transport:
- Transport the measuring device to the measuring point in the original packaging.
- Do not remove the protection cap mounted on the transducer. It prevents mechanical damage and contamination.

5.3 Packaging disposal
For detailed information about disposing of the packaging materials, refer to the Operating Instructions for the device on the CD-ROM provided.
6 Installation

6.1 Installation conditions

For mechanical reasons and to protect the pipe, support is recommended for heavy sensors (e.g. with a hot-tap retractable assembly).

6.1.1 Mounting position

Orientation

The direction of the arrow on the sensor helps you to install the sensor according to the flow direction.

<table>
<thead>
<tr>
<th>Orientation</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical orientation</td>
<td>![Image]</td>
</tr>
<tr>
<td>Horizontal orientation, transmitter head up</td>
<td>![Image]</td>
</tr>
<tr>
<td>Horizontal orientation, transmitter head down</td>
<td>![Image]</td>
</tr>
<tr>
<td>Inclined mounting position, transmitter head down</td>
<td>![Image]</td>
</tr>
</tbody>
</table>

1) In the case of saturated or unclean gases, upward flow in a vertical pipe section is preferred to minimize condensation or contamination.
2) Not recommended in the case of extreme vibrations or unstable installations.
3) Suitable only for clean and dry gases. If buildup or condensate are always present: Mount the sensor in an inclined position.
4) Select inclined mounting position (α = approx. 135°) if the gas is very wet or saturated with water.

Requirement for pipework

The measuring device must be professionally installed, and the following points must be observed:
Further information → ISO standard 14511

Correctly aligned flanges and seals

Incorrectly sized seal  Incorrectly aligned flanges and seals  Internal diameter of pipe does not correspond to internal diameter of sensor

Choosing the sensor length

 ► Determining the dimensions A, B, C1 and C2
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

Determining C1 and C2 (Endress+Hauser original parts only)

<table>
<thead>
<tr>
<th>Mounting Boss</th>
<th>C1 + C2</th>
</tr>
</thead>
<tbody>
<tr>
<td>DK6MB-BXA G1A</td>
<td>99 mm (3.90 in)</td>
</tr>
<tr>
<td>DK6MB-DXA G3/4A</td>
<td>99 mm (3.90 in)</td>
</tr>
<tr>
<td>DK6MB-AXA 1&quot; NPT</td>
<td>107 mm (4.21 in)</td>
</tr>
<tr>
<td>DK6MB-CXA 3/4&quot; NPT</td>
<td>102 mm (4.02 in)</td>
</tr>
</tbody>
</table>

Determining C1 and C2 (not limited to Endress+Hauser original parts)

<table>
<thead>
<tr>
<th>C1</th>
<th>Length of pipe connection used</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2 (G1A)</td>
<td>39 mm (1.54 in)</td>
</tr>
<tr>
<td>C2 (G3/4A)</td>
<td>39 mm (1.54 in)</td>
</tr>
<tr>
<td>C2 (1&quot; NPT)</td>
<td>47 mm (1.85 in)</td>
</tr>
<tr>
<td>C2 (3/4&quot; NPT)</td>
<td>42 mm (1.65 in)</td>
</tr>
</tbody>
</table>

Calculating insertion depth

\[(0.3 \cdot A) + B + (C1 + C2)\]
Mounting conditions for mounting boss

\[ D = 31.0 \, \text{mm} \pm 0.05 \, \text{mm} \, (1.22 \text{ in} \pm 0.02 \text{ in}) \]

- When installing in rectangular ducts with thin walls:
  - Use suitable support brackets.

Align the insertion version with the direction of flow.

Check and ensure that the sensor on the pipe/duct is aligned at a 90° angle to the direction of flow. Rotate the sensor so that the arrow marking on the sensor body corresponds to the direction of flow. The line marking on the body used to adjust the insertion depth must be aligned with the direction of flow.

Inlet and outlet runs

For the dimensions and installation lengths of the device, see the "Technical Information" document, "Mechanical construction" section
Recommended inlet and outlet runs

1. reduction
2. expansion
3. 90° elbow or T-piece
4. 2 × 90° elbow
5. Control valve
6. 2 × 90° elbow (3-dimensional)

Outlet run for pressure or temperature transmitter

PT  Pressure measuring device
TT  Temperature measuring device

6.1.2 Requirements from environment and process

Ambient temperature range

<table>
<thead>
<tr>
<th>Measuring device</th>
<th>−40 to +60 °C (−40 to +140 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local display</td>
<td>−20 to +60 °C (−4 to +140 °F), the readability of the display may be impaired at temperatures outside the temperature range.</td>
</tr>
</tbody>
</table>

If operating outdoors:
Avoid direct sunlight, particularly in warm climatic regions.

**System pressure**

**Sensor**
Depending on the version, please note the details on the name plate.
Max. 20 bar g (290 psi g)

**Thermal insulation**

![Diagram of thermal insulation](image)

### 6.2 Mounting the measuring device

#### 6.2.1 Required tools

**For transmitter**
For turning the transmitter housing (in increments of 90°): Allen screw 4 mm (0.15 in)

**For sensor**
For the sensor gland: Corresponding mounting tools

#### 6.2.2 Preparing the measuring device

1. Remove all remaining transport packaging.
2. Remove the protective cap from the sensor.
3. Remove stick-on label on the electronics compartment cover.

#### 6.2.3 Mounting the measuring device

**WARNING**

**Danger due to improper process sealing!**

- Ensure that the gaskets are clean and undamaged (G 1 A, G ¾ A).
- Ensure that the correct sealing material has been used (e.g. Teflon tape for NPT 1", NPT ¾").
- Install the gaskets correctly.
1. Ensure that the direction of the arrow on the sensor matches the flow direction of the medium.

2. Ensure the insertion depth and alignment are correct. Thread adapter nut: when mounting for the first time, tighten it fingertight + 1½ turns. For all other mounting routines, tighten it fingertight and 1 additional turn.

3. Install the measuring device or turn the transmitter housing so that the cable entries do not point upwards.

6.2.4 Turning the transmitter housing

To provide easier access to the connection compartment or display module, the transmitter housing can be turned clockwise or counterclockwise to 4 indexed positions by a maximum of 2 x 90°:
6.2.5 Turning the display module

6.3 Post-mounting check

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the device damaged (visual inspection)?</td>
<td></td>
</tr>
<tr>
<td>Does the measuring device conform to the measuring point specifications?</td>
<td></td>
</tr>
<tr>
<td>For example:</td>
<td></td>
</tr>
<tr>
<td>■ Process temperature</td>
<td></td>
</tr>
<tr>
<td>■ Process pressure (refer to the chapter on &quot;Material load curves&quot; of the &quot;Technical Information&quot; document on the CD-ROM provided)</td>
<td></td>
</tr>
<tr>
<td>■ Ambient temperature range (→ 15)</td>
<td></td>
</tr>
<tr>
<td>■ Measuring range</td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Status</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Has the correct orientation for the sensor been selected (→ 11)?</td>
<td></td>
</tr>
<tr>
<td>- According to sensor type</td>
<td></td>
</tr>
<tr>
<td>- According to medium properties</td>
<td></td>
</tr>
<tr>
<td>- According to medium temperature</td>
<td></td>
</tr>
<tr>
<td>- According to process pressure</td>
<td></td>
</tr>
<tr>
<td>Does the arrow on the sensor match the direction of flow of the medium through the piping (→ 11)?</td>
<td></td>
</tr>
<tr>
<td>Have sufficient inlet and outlet runs been provided upstream and downstream of the measuring point?</td>
<td></td>
</tr>
<tr>
<td>Correctly aligned in the direction of flow?</td>
<td></td>
</tr>
<tr>
<td>Correct sensor immersion depth?</td>
<td></td>
</tr>
<tr>
<td>Is the device adequately protected from precipitation and direct sunlight?</td>
<td></td>
</tr>
<tr>
<td>Is the device protected against overheating?</td>
<td></td>
</tr>
<tr>
<td>Is the device protected against excessive vibrations?</td>
<td></td>
</tr>
<tr>
<td>Check gas property (e.g. purity, dryness, cleanliness).</td>
<td></td>
</tr>
<tr>
<td>Are the measuring point identification and labeling correct (visual inspection)?</td>
<td></td>
</tr>
</tbody>
</table>
7 Electrical connection

7.1 Connection conditions

7.1.1 Required tools
- For cable entries: Use corresponding tools
- Wire stripper
- When using stranded cables: Crimping tool for wire end ferrule
- Flat blade screwdriver ≤ 3 mm (0.12 in)

7.1.2 Requirements for connecting cable
The connecting cables provided by the customer must fulfill the following requirements.

Electrical safety
In accordance with applicable federal/national regulations.

Cable specification
Permitted temperature range:
- –40 °C (–40 °F)... ≥ 80 °C (176 °F)
- Minimum requirement for cable temperature range: ambient temperature +20 K

Current output
For 4-20 mA HART: Shielded cable recommended. Observe grounding concept of the plant.

Pulse/frequency/switching output
Standard installation cable is sufficient

Cable diameter
- Included cable glands: M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
- Core cross-sections 0.5 to 1.5 mm² (21 to 16 AWG)

7.1.3 Requirements for the supply unit

Device supply voltage
DC 24 V (18 to 30 V)
The power supply circuit must comply with SELV/PELV requirements.

Pulse/frequency/status supply voltage
An external power supply is required for each output.

<table>
<thead>
<tr>
<th>Order characteristic for &quot;Output&quot;</th>
<th>Maximum terminal voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option B, K</td>
<td>DC 30 V</td>
</tr>
</tbody>
</table>

Load
0 to 750 Ω, depending on the external supply voltage of the power supply unit
7.1.4 Terminal assignment

The terminal assignment for the electrical connection can be found on the nameplate of the electronics module.

![Diagram of terminal assignment](image)

7.1.5 Preparing the measuring device

1. Remove dummy plug if present.

2. **NOTICE!** Insufficient sealing of the housing. Operational reliability of the measuring device could be defeated. Use suitable cable glands corresponding to the degree of protection.

   - If measuring device is delivered without cable glands:
     - Provide suitable cable gland for corresponding connecting cable. (→ 20)

3. If measuring device is delivered with cable glands:

   - Observe cable specification (→ 20).

7.2 Connecting the measuring device

**NOTICE**

Limitation of electrical safety due to incorrect connection!

- SELV/PELV-compliant 24 V DC (18 to 30 V) power supply.
- 4 to 20 mA HART active
- Maximum output values: DC 24V, 22 mA, load 0 to 750 Ω
7.2.1 Connecting the cables

NOTICE! Housing degree of protection voided due to insufficient sealing of the housing.
Screw in the thread without using any lubricant. The threads on the cover are coated with a dry lubricant.
Reverse the removal procedure to reassemble the transmitter.

For HART communication: When connecting the cable shielding to the ground terminal, observe the grounding concept of the facility.

7.3 Ensuring the degree of protection
The measuring device fulfills all the requirements for the IP66 and IP67 (Type 4X enclosure) degree of protection.

To guarantee IP 66 and IP 67 degree of protection (Type 4X enclosure), carry out the following steps after the electrical connection:

1. Check whether the housing seals of the connection and electronics compartment are clean and inserted correctly. Dry, clean or replace the seals if necessary.
2. Tighten all housing screws and screw covers.
3. Firmly tighten the cable glands.
4. To ensure that moisture does not enter the cable entry, route the cable so that it loops down before the cable entry ("water trap").

5. Insert dummy plugs into unused cable entries.

7.4 Post-connection check

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are cables or the device undamaged (visual inspection)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are the power supply and signal cables correctly connected?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the supply voltage correspond to the specifications in the connection diagram?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do the cables comply with the requirements (→ 20)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do the cables have adequate strain relief? Are they routed securely?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the cable route completely isolated? Without loops and cross-overs?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are all the screw terminals firmly tightened?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are all the cable glands installed, firmly tightened and leak-tight? Cable run with &quot;water trap&quot; (→ 20)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the supply voltage match the specifications on the transmitter nameplate (→ 20)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the terminal assignment correct (→ 20)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If supply voltage is present, is the device ready for operation and do values appear on the display module?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are all housing covers installed and firmly tightened?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8 Operation options

8.1 Structure and function of the operating menu

8.1.1 Structure of the operating menu
8.1.2 Operating philosophy

The individual parts of the operating menu are assigned to certain user roles. Each user role contains typical tasks within the device lifecycle.

For detailed information about the operating philosophy of the instrument, refer to the Operating Instructions for the device on the CD-ROM provided.
8.2  Access to the operating menu via the local display

1  Operational display with measured value shown as "1 value, max." (example)
1.1  Device tag
1.2  Display area for measured values (4-line)
1.3  Explanatory symbols for the measured value: measured value type, measuring channel number, symbol for event behavior
1.4  Status area
1.5  Measured value
1.6  Unit for the measured value
1.7  Operating elements

2  Operational display with measured value shown as "1 bar graph + 1 value" (example)
2.1  Bar graph display for measured value 1
2.2  Measured value 1 with unit
2.3  Explanatory symbols for measured value 1: measured value type, measuring channel number
2.4  Measured value 2
2.5  Unit for measured value 2
2.6  Explanatory symbols for measured value 2: measured value type, measuring channel number

3  Navigation view: picklist of a parameter
3.1  Navigation path and status area
3.2  Display area for navigation: ✓ designates the current parameter value

4  Editing view: text editor with input mask
5  Editing view: numeric editor with input mask
8.2.1 Operational display

Status area

<table>
<thead>
<tr>
<th>Status signals</th>
<th>F</th>
<th>C</th>
<th>S</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure</td>
<td>A0013956</td>
<td>A0013959</td>
<td>A0013958</td>
<td>A0013957</td>
</tr>
<tr>
<td>Function check</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Out of specification</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance required</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagnostic behavior</th>
<th>Locking</th>
<th>Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm</td>
<td>A0013961</td>
<td>A0013962</td>
</tr>
<tr>
<td>Warning</td>
<td>A0013963</td>
<td>A0013965</td>
</tr>
<tr>
<td>Device locked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote operation enabled</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Display area

Measured variables

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="A0013711" alt="Corrected volume flow, FAD" /></td>
<td>Corrected volume flow, FAD</td>
</tr>
<tr>
<td><img src="A0013710" alt="Mass flow" /></td>
<td>Mass flow</td>
</tr>
<tr>
<td><img src="A0013947" alt="Temperature" /></td>
<td>Temperature</td>
</tr>
<tr>
<td><img src="A0013943" alt="Totalizer" /></td>
<td>Totalizer</td>
</tr>
<tr>
<td><img src="A0013945" alt="Current output" /></td>
<td>Current output</td>
</tr>
</tbody>
</table>

Symbols for measurement channel numbers

| ![Measurement channel 1 to 4](A0016325) | Measurement channel 1 to 4 |

The measurement channel number is displayed only if more than one channel is present for the same measured variable type.

Symbols for diagnostic behavior

The diagnostic behavior pertains to a diagnostic event that is relevant to the displayed measured variable.

For more information about the symbols, refer to the "Status area" section (→ 27).

8.2.2 Navigation view

Status area

The following appears in the status area of the navigation view in the top right corner:

- Of the submenu
  - The direct access code for the parameter you are navigating to (e.g. 0022-1)
  - If a diagnostic event is present, the diagnostic behavior and status signal
- In the wizard
  - If a diagnostic event is present, the diagnostic behavior and status signal
### Display area

<table>
<thead>
<tr>
<th>Icons for menus</th>
<th>Display/operat.</th>
<th>Setup</th>
<th>Diagnostics</th>
<th>Expert</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="A0013972" alt="Icon" /></td>
<td><img src="A0013974" alt="Icon" /></td>
<td><img src="A0013975" alt="Icon" /></td>
<td><img src="A0013966" alt="Icon" /></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Icons for submenus, wizards, parameters</th>
<th>Lock symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="A0013967" alt="Icon" /></td>
<td><img src="A0013968" alt="Icon" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Icon for submenus</th>
<th>Submenu</th>
<th>Wizard</th>
<th>Parameters within a wizard</th>
<th>Parameter locked</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="A0013967" alt="Icon" /></td>
<td><img src="A0013968" alt="Icon" /></td>
<td><img src="A0013972" alt="Icon" /></td>
<td><img src="A0013963" alt="Icon" /></td>
<td></td>
</tr>
</tbody>
</table>

### 8.2.3 Editing view

#### Input mask

<table>
<thead>
<tr>
<th>Operating symbols in the numeric editor</th>
<th>Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="A0013985" alt="Icon" /></td>
<td>Confirms selection.</td>
</tr>
<tr>
<td><img src="A0016621" alt="Icon" /></td>
<td>Moves the input position one position to the left.</td>
</tr>
<tr>
<td><img src="A0013986" alt="Icon" /></td>
<td>Exits the input without applying the changes.</td>
</tr>
<tr>
<td><img src="A0016619" alt="Icon" /></td>
<td>Inserts decimal separator at the input position.</td>
</tr>
<tr>
<td><img src="A0016620" alt="Icon" /></td>
<td>Inserts minus sign at the input position.</td>
</tr>
<tr>
<td><img src="A0014040" alt="Icon" /></td>
<td>Clears all entered characters.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operating symbols in the text editor</th>
<th>Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="A0013985" alt="Icon" /></td>
<td>Confirms selection.</td>
</tr>
<tr>
<td><img src="A0013947" alt="Icon" /></td>
<td>Switches to the selection of the correction tools.</td>
</tr>
<tr>
<td><img src="A0013986" alt="Icon" /></td>
<td>Exits the input without applying the changes.</td>
</tr>
<tr>
<td><img src="A0014040" alt="Icon" /></td>
<td>Clears all entered characters.</td>
</tr>
<tr>
<td><img src="A0013981" alt="Icon" /></td>
<td>Toggles:</td>
</tr>
<tr>
<td><img src="A0014041" alt="Icon" /></td>
<td>Between upper-case and lower-case letters</td>
</tr>
<tr>
<td><img src="A0013988" alt="Icon" /></td>
<td>For entering numbers</td>
</tr>
<tr>
<td><img src="A0013991" alt="Icon" /></td>
<td>For entering special characters</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Correction symbols under [CC]</th>
<th>Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="A0013980" alt="Icon" /></td>
<td>Clears all entered characters.</td>
</tr>
<tr>
<td><img src="A0013990" alt="Icon" /></td>
<td>Moves the input position one position to the left.</td>
</tr>
<tr>
<td><img src="A0013991" alt="Icon" /></td>
<td>Moves the input position one position to the right.</td>
</tr>
<tr>
<td><img src="A0013988" alt="Icon" /></td>
<td>Deletes one character immediately to the left of the input position.</td>
</tr>
</tbody>
</table>
8.2.4 Operating elements

<table>
<thead>
<tr>
<th>Key</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minus key</td>
<td></td>
</tr>
</tbody>
</table>
*In a menu, submenu*
Moves the selection bar upwards in a choose list.

*With a Wizard*
Confirms the parameter value and goes to the previous parameter.

*With a text and numeric editor*
In the input mask, moves the selection bar to the left (backwards).

| Plus key | 
*In a menu, submenu*
Moves the selection bar downwards in a choose list.

*With a Wizard*
Confirms the parameter value and goes to the next parameter.

*With a text and numeric editor*
Moves the selection bar to the right (forwards) in an input screen.

| Enter key | 
*For operational display*
- Pressing the key briefly opens the operating menu.
- Pressing the key for 2 s opens the context menu.

*In a menu, submenu*
- Pressing the key briefly:
  - Opens the selected menu, submenu or parameter.
  - Starts the wizard.
  - If help text is open, closes the help text of the parameter.
- Pressing the key for 2 s for parameter:
  - If present, opens the help text for the function of the parameter.

*With a Wizard*
Opens the editing view of the parameter.

*With a text and numeric editor*
- Pressing the key briefly:
  - Opens the selected group.
  - Carries out the selected action.
- Pressing the key for 2 s confirms the edited parameter value.

| Escape key combination (press keys simultaneously) | 
*In a menu, submenu*
- Pressing the key briefly:
  - Exits the current menu level and takes you to the next higher level.
  - If help text is open, closes the help text of the parameter.
- Pressing the key for 2 s returns you to the operational display (“home position”).

*With a Wizard*
Exits the wizard and takes you to the next higher level.

*With a text and numeric editor*
Closes the text or numeric editor without applying changes.
### Operation options

#### Proline t-mass B 150

<table>
<thead>
<tr>
<th>Key</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| − + E | **Minus/Enter key combination (press the keys simultaneously)**  
Reduces the contrast (brighter setting). |
| + + E | **Plus/Enter key combination (press and hold down the keys simultaneously)**  
Increases the contrast (darker setting). |
| − + + E | **Minus/Plus/Enter key combination (press the keys simultaneously)**  
*For operational display*  
Enables or disables the keypad lock. |

### 8.2.5 Opening the context menu

Using the context menu, the user can call up the following three menus quickly and directly from the measured value display:

- Setup
- Conf. backup disp.
- Simulation

#### Calling up and closing the context menu

The user is in the measured value display.

1. 2 s Press **E** for  
   - The context menu opens.

2. Press − + simultaneously.  
   - The context menu is closed and the measured value display appears.

#### Calling up the menu via the context menu

1. Open the context menu.  
2. Press ▼ to navigate to the desired menu.  
3. Press **E** to confirm the selection.  
   - The selected menu opens.

### 8.2.6 Calling up help text

Help text is available for some parameters and can be called up from the navigation view. The help text provides a brief explanation of the parameter function and thereby supports swift and safe commissioning.
**Calling up and closing the help text**

The user is in the navigation view and the selection bar is on a parameter.

1. **Press ² for**
   - ✔ The help text for the selected parameter opens.

2. Press ² + ² simultaneously.
   - ✔ The help text is closed.

**8.2.7 User roles and related access authorization**

The two user roles "Operator" and "Maintenance" have different write access to the parameters if the customer defines a user-specific access code. This protects the device configuration via the local display from unauthorized access (→ ³ 36).

**Access authorization to parameters**

<table>
<thead>
<tr>
<th>User role</th>
<th>Read access</th>
<th>Write access</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Without code</td>
<td>With code</td>
</tr>
<tr>
<td></td>
<td>(from the factory)</td>
<td>(from the factory)</td>
</tr>
<tr>
<td>Operator</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Maintenance</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

1) Despite the defined access code, certain parameters can always be modified and thus are excepted from the write protection, as they do not affect the measurement (e.g. "Format display").

For detailed information about parameters which can always be modified, refer to the Operating Instructions for the device on the CD-ROM provided.

If an incorrect access code is entered, the user obtains the access rights of the "Operator" role.

- The user role with which the user is currently logged on is indicated by the Access status display parameter. Navigation path: Display/operation → Access status display

**8.2.8 Disabling write protection via access code**

If the -symbol appears on the local display in front of a parameter, the parameter is write-protected by a user-specific access code and its value cannot be changed at the moment using the local display (→ ³ 36).

The locking of the write access via local operation can be disabled by entering the customer-defined access code via the respective access option.

1. After you press ², the input prompt for the access code appears.

2. Enter the access code.
   - ✔ The -symbol in front of the parameters disappears; all previously write-protected parameters are now re-enabled.
8.2.9 Enabling and disabling the keypad lock

The keypad lock makes it possible to block access to the entire operating menu via local operation. As a result, it is no longer possible to navigate through the operating menu or change the values of individual parameters. Users can only read the measured values on the operational display.

The keypad lock is enabled and disabled in the same way:

The user is in the operational display.

► By simultaneously pressing the \( S + O + F \) keys.

✔ After enabling the keypad lock:

![Keypad lock enabled](image)

8.3 Access to the operating menu via the operating tool

For detailed information about access to the operating menu via operating tool, refer to the Operating Instructions for the device on the CD-ROM provided.

8.3.1 Via HART protocol

This communication interface is present in the following device version:

- Order characteristic for "Output", option A: 4-20 mA HART
- Order characteristic for "Output", option B: 4-20 mA HART, pulse/frequency-switching output
2 Options for remote operation via HART protocol

1 Control system (e.g. PLC)
2 Field Communicator 475
3 Computer with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)
4 Commubox FXA195 (USB)
5 Field Xpert SFX100
6 VIATOR Bluetooth modem with connecting cable
7 Transmitter

9 Commissioning

9.1 Function check
Before commissioning the device, make sure that the post-installation and post-connection checks have been performed.

- "Post-mounting check" checklist (→ 18)
- "Post-connection check" checklist (→ 23)

9.2 Switching on the measuring device
After a successful function check, switch on the measuring device.

After a successful startup, the local display switches automatically from the startup display to the measured value display.

If nothing appears on the local display or a diagnostic message is displayed, refer to the device's operating instructions which can be found on the CD-ROM supplied with the device.
9.3 Setting the operating language

Factory setting: English or ordered local language

9.4 Configuring the measuring device

The Setup menu and its guided wizards enable fast commissioning of the measuring device. The wizards guide you systematically through all parameters that are required for configuration, such as parameters for measurement, outputs and the local display.

Overview of the "Setup" menu
9.5 Defining the tag name

To enable fast identification of the measuring point within the system, you can enter a unique designation using the **Device tag** parameter and thus change the factory setting.

**Navigation path**
Setup → Advanced setup → Device tag
User entry
Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /)
In the factory configuration, the tag name appears at the top left in the header.

9.6 Protecting settings from unauthorized access

The following options exist for protecting the configuration of the measuring device from unintentional modification after commissioning:
- Write protection via access code (→ 36)
- Write protection via lock switch (→ 36)
- Write protection via keypad lock (→ 29)

9.6.1 Write protection via access code

Using the customer-specific access code, the parameters for the measuring device configuration are write-protected and their values can no longer be changed via local operation.

Define access code

1. Navigating to the "Define access code" parameter: Setup → Advanced setup → Def. access code
2. Define a max. 4-digit numeric code as an access code.
   ✓ The -symbol appears in front of all write-protected parameters.

The device automatically locks the write-protected parameters again if a key is not pressed for 10 minutes in the navigation and editing view. The device locks the write-protected parameters automatically after 60 s if the user skips back to the measured value display mode from the navigation and editing view.

If write access is activated via access code, it can be also be deactivated only via the access code (→ 31).

9.6.2 Write protection via lock switch

Unlike write protection via user-specific access code, this allows write access to the entire operating menu – other than the Contrast display parameter – to be locked.

The values of the parameters are still visible, but can no longer be changed (except for Contrast display), either via the local display, the service interface (CDI) or HART protocol.
1. Unscrew the electronics compartment cover.
2. Pull out the display module with a gentle rotational movement.
3. To make it easier to access the lock switch, attach the display module to the edge of the electronics compartment.
4. Setting the lock switch (WP) on the electronics module to the ON position enables the hardware write protection.
   ✓ The symbol appears in the header of the measured value display and in the navigation view in front of the parameters.
5. Feed the ribbon cable into the gap between the housing and electronics module and plug the display module into the electronics compartment in the desired direction until it engages.
6. Screw down the electronics compartment cover

10 Diagnostic information and remedial measures

Faults detected by the self-monitoring system of the measuring device are displayed as a diagnostic message in alternation with the operational display. The message on the remedial measures can be called up from the diagnostic message, and contains important information on the fault.
3 Message for remedial measures

1 Short text
2 Diagnostic behavior with diagnostic code
3 Service ID
4 Operation time of occurrence
5 Remedial measures

The user is in the diagnostic message.

1. Press \( \text{[} \) (\( \text{1} \) symbol).
   ✅ The message for the remedial measures for the diagnostic event opens.

2. Press \( \text{[} + \text{[} \) simultaneously.
   ✅ The message about the remedial measures closes.