Operating Instructions

Micropilot FMR62

HART

Free space radar
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 Important document information

1.1 Document function

These Operating Instructions contain all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

1.2 Symbols

1.2.1 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>NOTE! This symbol contains information on procedures and other facts which do not result in personal injury.</td>
</tr>
</tbody>
</table>

1.2.2 Electrical symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>---</td>
<td>Direct current</td>
</tr>
<tr>
<td>~</td>
<td>Alternating current</td>
</tr>
<tr>
<td>≡</td>
<td>Direct current and alternating current</td>
</tr>
<tr>
<td></td>
<td>Ground connection</td>
</tr>
<tr>
<td></td>
<td>A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.</td>
</tr>
<tr>
<td></td>
<td>Protective ground connection</td>
</tr>
<tr>
<td></td>
<td>A terminal which must be connected to ground prior to establishing any other connections.</td>
</tr>
<tr>
<td></td>
<td>Equipotential connection</td>
</tr>
<tr>
<td></td>
<td>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>
1.2.3 Tool symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="AE01344" alt="Torx screwdriver" /></td>
<td>Torx screwdriver</td>
</tr>
<tr>
<td><img src="AE01122" alt="Flat blade screwdriver" /></td>
<td>Flat blade screwdriver</td>
</tr>
<tr>
<td><img src="AE01123" alt="Cross-head screwdriver" /></td>
<td>Cross-head screwdriver</td>
</tr>
<tr>
<td><img src="AE01124" alt="Allen key" /></td>
<td>Allen key</td>
</tr>
<tr>
<td><img src="AE01125" alt="Hexagon wrench" /></td>
<td>Hexagon wrench</td>
</tr>
</tbody>
</table>

1.2.4 Symbols for certain types of information

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔️</td>
<td>Permitted</td>
</tr>
<tr>
<td>✔️ ✔️</td>
<td>Preferred</td>
</tr>
<tr>
<td>✗</td>
<td>Forbidden</td>
</tr>
<tr>
<td>📩</td>
<td>Tip</td>
</tr>
<tr>
<td>📚</td>
<td>Reference to documentation</td>
</tr>
<tr>
<td>📚</td>
<td>Reference to page</td>
</tr>
<tr>
<td>📚</td>
<td>Reference to graphic</td>
</tr>
<tr>
<td>🔴</td>
<td>Notice or individual step to be observed</td>
</tr>
<tr>
<td>1, 2, 3 ...</td>
<td>Series of steps</td>
</tr>
<tr>
<td>▶️</td>
<td>Result of a step</td>
</tr>
<tr>
<td>🔧</td>
<td>Help in the event of a problem</td>
</tr>
<tr>
<td>🎫</td>
<td>Visual inspection</td>
</tr>
</tbody>
</table>

1.2.5 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>🎫 ...</td>
<td>Series of steps</td>
</tr>
<tr>
<td>A, B, C, ...</td>
<td>Views</td>
</tr>
<tr>
<td>A-A, B-B, C-C, ...</td>
<td>Sections</td>
</tr>
<tr>
<td>Symbol</td>
<td>Meaning</td>
</tr>
<tr>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td><img src="image" alt="Hazardous area" /></td>
<td>Hazardous area Indicates a hazardous area.</td>
</tr>
<tr>
<td><img src="image" alt="Safe area (non-hazardous area)" /></td>
<td>Safe area (non-hazardous area) Indicates the non-hazardous area.</td>
</tr>
</tbody>
</table>

### 1.2.6 Symbols at the device

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Safety instructions" /></td>
<td>Safety instructions Observe the safety instructions contained in the associated Operating Instructions.</td>
</tr>
<tr>
<td><img src="image" alt="Temperature resistance of the connection cables" /></td>
<td>Temperature resistance of the connection cables Specifies the minimum value of the temperature resistance of the connection cables.</td>
</tr>
</tbody>
</table>

### 1.3 Documentation

<table>
<thead>
<tr>
<th>Document</th>
<th>Purpose and content of the document</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Information TI01303F</td>
<td>Planning aid for your device The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.</td>
</tr>
<tr>
<td>Brief Operating Instructions KA01252F</td>
<td>Guide that takes you quickly to the 1st measured value The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.</td>
</tr>
<tr>
<td>Description of Device Parameters GP01101F</td>
<td>Reference for your parameters The document provides a detailed explanation of each individual parameter in the operating menu. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.</td>
</tr>
<tr>
<td>Special Documentation SD01087F</td>
<td>Functional Safety Manual The document is part of the Operating Instructions and serves as a reference for application-specific parameters and notes.</td>
</tr>
<tr>
<td>Special Documentation SD01870F</td>
<td>Manual for Heartbeat Verification and Heartbeat Monitoring The document contains a description of the additional parameters and technical data that are available with the Heartbeat Verification and Heartbeat Monitoring application packages.</td>
</tr>
</tbody>
</table>

For an overview of the scope of the associated Technical Documentation, refer to the following:
- The W@M Device Viewer: enter the serial number from the nameplate ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer))
- The Endress+Hauser Operations App: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.
1.4 Terms and abbreviations

<table>
<thead>
<tr>
<th>Term/abbreviation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA</td>
<td>Document type &quot;Operating Instructions&quot;</td>
</tr>
<tr>
<td>KA</td>
<td>Document type &quot;Brief Operating Instructions&quot;</td>
</tr>
<tr>
<td>TI</td>
<td>Document type &quot;Technical Information&quot;</td>
</tr>
<tr>
<td>SD</td>
<td>Document type &quot;Special Documentation&quot;</td>
</tr>
<tr>
<td>XA</td>
<td>Document type &quot;Safety Instructions&quot;</td>
</tr>
<tr>
<td>PN</td>
<td>Nominal pressure</td>
</tr>
</tbody>
</table>
| MWP               | Maximum Working Pressure  
The MWP can also be found on the nameplate. |
| ToF               | Time of Flight |
| FieldCare         | Scalable software tool for device configuration and integrated plant asset management solutions |
| DeviceCare        | Universal configuration software for Endress+Hauser HART, PROFIBUS, FOUNDATION Fieldbus and Ethernet field devices |
| DTM               | Device Type Manager |
| DD                | Device Description for HART communication protocol |
| DC                | Relative dielectric constant $\varepsilon_r$ |
| Operating tool    | The term 'operating tool' is used in place of the following operating software: FieldCare / DeviceCare, for operation via HART communication and PC |
| BD                | Blocking Distance; no signals are analyzed within the BD. |
1.5 Registered trademarks

HART®
Registered trademark of the HART Communication Foundation, Austin, USA

KALREZ®, VITON®
Registered trademark of DuPont Performance Elastomers L.L.C., Wilmington, USA

TEFLON®
Registered trademark of E.I. DuPont de Nemours & Co., Wilmington, USA

TRI CLAMP®
Registered trademark of Ladish Co. Inc., Kenosha, USA
2 Basic safety instructions

2.1 Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:

‣ 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 starting work, read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application).
‣ Follow instructions and comply with basic conditions.

The operating personnel must fulfill the following requirements:

‣ Are instructed and authorized according to the requirements of the task by the facility's owner-operator.
‣ Follow the instructions in this manual.

2.2 Designated use

Application and media

The measuring device described in these Operating Instructions is intended for continuous, non-contact level measurement in liquids, pastes and sludges. The operating frequency is approx. 80 GHz with a maximum emitted peak power of 6.3 mW and an average power output of 63 µW. Operation does not pose any danger whatsoever to humans and animals.

If the limit values specified in the "Technical data" and the conditions listed in the instructions and additional documentation are observed, the measuring device may be used for the following measurements only:

‣ Measured process variables: level, distance, signal strength
‣ Calculable process variables: volume or mass in any shape of vessel

To ensure that the measuring device remains in proper condition for the operation time:

‣ Use the measuring device only for media against which the process-wetted materials are adequately resistant.
‣ Observe the limit values in "Technical data".

Incorrect use

The manufacturer is not liable for damage caused by improper or non-designated use.

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

Due to heat transfer from the process as well as power loss in the electronics, the temperature of the electronics housing and the assemblies it contains (e.g. display module, main electronics module and I/O electronics module) may rise to 80 °C (176 °F). When in operation, the sensor may reach a temperature close to the medium temperature.

Danger of burns from contact with surfaces!
‣ 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.

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.

Conversions to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers.
- If, despite this, modifications are required, consult with the manufacturer.

Repair

To ensure continued operational safety and reliability,
- Carry out repairs on the device only if they are expressly permitted.
- Observe federal/national regulations pertaining to repair of an electrical device.
- Use original spare parts and accessories from the manufacturer only.

Hazardous area

To eliminate a danger for persons or for the facility when the device is used in the hazardous area (e.g. explosion protection, pressure vessel safety):
- Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area.
- Observe the specifications in the separate supplementary documentation that is an integral part of these Instructions.

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 it is safe to operate. It meets general safety standards and legal requirements.

2.5.1 CE mark

The measuring system meets the legal requirements of the applicable EC guidelines. These are listed in the corresponding EC Declaration of Conformity together with the standards applied.
Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

2.5.2 EAC conformity

The measuring system meets the legal requirements of the applicable EAC guidelines. These are listed in the corresponding EAC Declaration of Conformity together with the standards applied.
Endress+Hauser confirms successful testing of the device by affixing to it the EAC mark.
## 2.6 Safety Instructions (XA)

Depending on the approval, the following Safety Instructions (XA) are supplied with the device. They are an integral part of the Operating Instructions.

<table>
<thead>
<tr>
<th>Feature 010</th>
<th>Approval</th>
<th>Feature 020 <em>Power Supply; Output</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>B2</td>
<td>C3</td>
</tr>
<tr>
<td>E4/G5</td>
<td>K4/L7</td>
<td></td>
</tr>
<tr>
<td>BA</td>
<td>ATEX II 1G Ex ia IIC T6 Ga</td>
<td>XA01549F XA01549F XA01549F XA01557F</td>
</tr>
<tr>
<td>BB</td>
<td>ATEX II 1/2G Ex ia IIC T6 Ga/Gb</td>
<td>XA01549F XA01549F XA01549F XA01557F</td>
</tr>
<tr>
<td>BC</td>
<td>ATEX II 1/2G Ex ia/d [ia Ga] IIC T6 Ga/Gb</td>
<td>XA01552F XA01552F XA01552F XA01560F XA01552F</td>
</tr>
<tr>
<td>BD</td>
<td>ATEX II 1/2/3G Ex ia/ia/c [ia Ga] IIC T6 Ga/Gb/Gc</td>
<td>XA01550F XA01550F XA01550F XA01558F</td>
</tr>
<tr>
<td>BG</td>
<td>ATEX II 3G Ex ec IIC T6 Gc</td>
<td>XA01551F XA01551F XA01551F XA01559F</td>
</tr>
<tr>
<td>BH</td>
<td>ATEX II 3G Ex ic IIC T6 Gc</td>
<td>XA01551F XA01551F XA01551F XA01559F</td>
</tr>
<tr>
<td>BL</td>
<td>ATEX II 1/2/3G Ex ia/ec [ia Ga] IIC T6 Ga/Gb/Gc</td>
<td>XA01550F XA01550F XA01550F XA01558F XA01550F</td>
</tr>
<tr>
<td>B2</td>
<td>ATEX II 1/2G Ex ia IIC T6 Ga/Gb, 1/2D Ex ia IIC T85°C Da/Db</td>
<td>XA01555F XA01555F XA01555F XA01563F</td>
</tr>
<tr>
<td>B3</td>
<td>ATEX II 1/2G Ex ia/d [ia Ga] IIC T6, Ga/Gb 1/2D Ex ta/tb IIC T85°C Da/Db</td>
<td>XA01556F XA01556F XA01556F XA01564F XA01556F</td>
</tr>
<tr>
<td>B4</td>
<td>ATEX II 1/2G Ex ia IIC T6 Ga/Gb, Ex ia/db [ia Ga] IIC T6 Ga/Gb</td>
<td>XA01553F XA01553F XA01553F XA01561F</td>
</tr>
<tr>
<td>CD</td>
<td>CSA C/US DIP CI.II,III Div.1 Gr. E-G</td>
<td>* A</td>
</tr>
<tr>
<td>C2</td>
<td>CSA C/US IS CI.II,III Div.1 Gr. A-G, Ni Cl.1 Div.2, Ex ia</td>
<td>* A</td>
</tr>
<tr>
<td>C3</td>
<td>CSA C/US XP CI.II,III Div.1 Gr. A-G, Ni Cl.1 Div.2, Ex db</td>
<td>* A</td>
</tr>
<tr>
<td>C5</td>
<td>CSA C/US IS CI.I Div.1 Gr. A-D, Ni Cl.1 Div.2, Ex ia</td>
<td>* A</td>
</tr>
<tr>
<td>FA</td>
<td>FM IS CI.1 Div.1 Gr. A-D</td>
<td>* A</td>
</tr>
<tr>
<td>FB</td>
<td>FM IS CI.II,III Div.1 Gr. A-G, AEx ia, Ni Cl.1 Div.2</td>
<td>* A</td>
</tr>
<tr>
<td>FD</td>
<td>FM XP CI.II,III Div.1 Gr. A-G, AEx db, Ni Cl.1 Div.2</td>
<td>* A</td>
</tr>
<tr>
<td>FE</td>
<td>FM DIP CI.II,III Div.1 Gr. E-G</td>
<td>* A</td>
</tr>
<tr>
<td>GA</td>
<td>EAC Ex ia IIC T6 Ga</td>
<td>* A</td>
</tr>
<tr>
<td>GB</td>
<td>EAC Ex ia IIC T6 Ga/Gb</td>
<td>* A</td>
</tr>
<tr>
<td>GC</td>
<td>EAC Ex ia/d [ia Ga] IIC T6 Ga/Gb</td>
<td>* A</td>
</tr>
<tr>
<td>GR</td>
<td>Non-hazardous area + EAC marking</td>
<td>* A</td>
</tr>
<tr>
<td>IA</td>
<td>IEC Ex ia IIC T6 Ga</td>
<td>XA01549F XA01549F XA01557F</td>
</tr>
<tr>
<td>IB</td>
<td>IEC Ex ia IIC T6 Ga/Gb</td>
<td>XA01549F XA01549F XA01557F</td>
</tr>
<tr>
<td>IC</td>
<td>IEC Ex ia/d [ia Ga] IIC T6 Ga/Gb</td>
<td>XA01552F XA01552F XA01552F XA01560F XA01552F</td>
</tr>
<tr>
<td>ID</td>
<td>IEC Ex ia/ia/c [ia Ga] IIC T6 Ga/Gb/Gc</td>
<td>XA01550F XA01550F XA01550F XA01558F</td>
</tr>
<tr>
<td>IG</td>
<td>IEC Ex ec IIC T6 Gc</td>
<td>XA01551F XA01551F XA01551F XA01559F XA01551F</td>
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<tr>
<td>IH</td>
<td>IEC Ex ic IIC T6 Gc</td>
<td>XA01551F XA01551F XA01551F XA01559F</td>
</tr>
<tr>
<td>IL</td>
<td>IEC Ex ia/ea/ia [ia Ga] IIC T6 Ga/Gb/Gc</td>
<td>XA01550F XA01550F XA01550F XA01558F</td>
</tr>
<tr>
<td>I2</td>
<td>IEC Ex ia IIC T6 Ga/Gb, Ex ia IIC T85°C Da/Db</td>
<td>XA01555F XA01555F XA01555F XA01563F</td>
</tr>
<tr>
<td>I3</td>
<td>IEC Ex ia/d [ia Ga] IIC T6 Ga/Gb, Ex ta/tb IIC T85°C Da/Db</td>
<td>XA01556F XA01556F XA01556F XA01556F</td>
</tr>
<tr>
<td>I4</td>
<td>IEC Ex ia IIC T6 Ga/Gb, Ex ia/db [ia Ga] IIC T6 Ga/Gb</td>
<td>XA01553F XA01553F XA01553F XA01561F</td>
</tr>
<tr>
<td>KA</td>
<td>KC Ex ia IIC T6 Ga</td>
<td>* A</td>
</tr>
<tr>
<td>KB</td>
<td>KC Ex ia IIC T6 Ga/Gb</td>
<td>* A</td>
</tr>
<tr>
<td>KC</td>
<td>KC Ex ia/d [ia Ga] IIC T6 Ga/Gb</td>
<td>* A</td>
</tr>
<tr>
<td>MA</td>
<td>INMETRO Ex ia IIC T6 Ga</td>
<td>* A</td>
</tr>
<tr>
<td>MC</td>
<td>INMETRO Ex ia/d [ia Ga] IIC T6 Ga/Gb</td>
<td>* A</td>
</tr>
</tbody>
</table>
### Basic safety instructions

<table>
<thead>
<tr>
<th>Feature 010</th>
<th>Approval</th>
<th>Feature 020 &quot;Power Supply; Output&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>MH</td>
<td>INMETRO Ex ic IIC T6 Gc</td>
<td>x (0)</td>
</tr>
<tr>
<td>NA</td>
<td>NEPSI Ex ia IIC T6 Ga</td>
<td>x (0)</td>
</tr>
<tr>
<td>NB</td>
<td>NEPSI Ex ia IIC T6 Ga/Gb</td>
<td>x (0)</td>
</tr>
<tr>
<td>NC</td>
<td>NEPSI Ex ia/db [ia Ga] IIC T6 Ga/Gb</td>
<td>x (0)</td>
</tr>
<tr>
<td>NG</td>
<td>NEPSI Ex ec IIC T6 Gc</td>
<td>x (0)</td>
</tr>
<tr>
<td>NH</td>
<td>NEPSI Ex ic IIC T6 Gc</td>
<td>x (0)</td>
</tr>
<tr>
<td>N2</td>
<td>NEPSI Ex ia IIC T6 Ga/Gb, Ex iaD 2O/21 T85...90°C</td>
<td>x (0)</td>
</tr>
<tr>
<td>N3</td>
<td>NEPSI Ex d[ia] IIC T6 Ga/Gb, DIP A2O/21 T85...90°C I.P66</td>
<td>x (0)</td>
</tr>
<tr>
<td>8A</td>
<td>FM/CSA IS+XP Cl.II.III Div.1 Gr.A-G</td>
<td>x (0)</td>
</tr>
<tr>
<td>1)</td>
<td>2-wire; 4-20mA HART</td>
<td></td>
</tr>
<tr>
<td>2)</td>
<td>2-wire; 4-20mA HART, switch output</td>
<td></td>
</tr>
<tr>
<td>3)</td>
<td>2-wire; 4-20mA HART, 4-20mA</td>
<td></td>
</tr>
<tr>
<td>4)</td>
<td>2-wire; FOUNDATION Fieldbus, switch output</td>
<td></td>
</tr>
<tr>
<td>5)</td>
<td>2-wire; PROFIBUS PA, switch output</td>
<td></td>
</tr>
<tr>
<td>6)</td>
<td>4-wire 90-253VAC, 4-20mA HART</td>
<td></td>
</tr>
<tr>
<td>7)</td>
<td>4-wire 10.4-48VDC, 4-20mA HART</td>
<td></td>
</tr>
<tr>
<td>8)</td>
<td>in preparation</td>
<td></td>
</tr>
</tbody>
</table>

The nameplate indicates the Safety Instructions (XA) that are relevant to the device.

If the device is prepared for the remote display FHX50 (product structure: feature 030: Display, Operation", option L or M), the Ex marking of some certificates changes according to the following table 1):

<table>
<thead>
<tr>
<th>Feature 010 (&quot;Approval&quot;)</th>
<th>Feature 030 (&quot;Display, Operation&quot;)</th>
<th>Ex marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>B3</td>
<td>L 1)</td>
<td>Il 1/2 G Ex db [ia] IIC T6 Ga/Gb, Il 1/2 D Ex ta [ia Db] IIC Txx°C Da/Db</td>
</tr>
<tr>
<td>I3</td>
<td>L 2)</td>
<td>Ex db [ia] IIC T6 Ga/Gb, Ex ta [ia Db] IIC Txx°C Da/Db</td>
</tr>
</tbody>
</table>

1) The marking of certificates not mentioned in this table are not affected by the FHX50.
3 Product description

3.1 Product design

3.1.1 Micropilot FMR62

![Diagram of Micropilot FMR62 with labels 1 to 5]

1. Design of the Micropilot FMR62
   1. Integrated antenna PEEK
   2. Process connection (Thread)
   3. Electronics housing
   4. Flange
   5. PTFE cladded antenna flush mount

![Diagram of Micropilot FMR62 with labels 1 to 4]

2. Design of the Micropilot FMR62
   1. PTFE cladded antenna flush mount
   2. Sanitary adapter DIN11851
   3. Electronics housing
   4. Tri-Clamp ISO2852
3.1.2 Electronics housing

Design of the electronics housing

1. Electronics compartment cover
2. Display module
3. Main electronics module
4. Cable glands (1 or 2, depending on instrument version)
5. Nameplate
6. I/O electronics module
7. Terminals (pluggable spring terminals)
8. Connection compartment cover
9. Grounding terminal
4 Incoming acceptance and product identification

4.1 Incoming acceptance

Check the following during incoming acceptance:
- Are the order codes on the delivery note and the product sticker identical?
- Are the goods undamaged?
- Do the nameplate data match the ordering information on the delivery note?
- Is the DVD with the operating tool present?
- If required (see nameplate): Are the safety instructions (XA) present?

If one of these conditions does not apply, please contact your Endress+Hauser sales office.

4.2 Product identification

The following options are available for identification of the measuring device:
- Nameplate specifications
- Extended order code with breakdown of the device features on the delivery note
- Enter the serial number on the nameplate into W@M Device Viewer (www.endress.com/deviceviewer): all the information about the measuring device is displayed.
- Enter the serial number on the nameplate into the Endress+Hauser Operations App or scan the 2-D matrix code (QR code) on the nameplate with the Endress+Hauser Operations App: all the information about the measuring device is displayed.

For an overview of the scope of the associated Technical Documentation, refer to the following:
- The W@M Device Viewer: enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The Endress+Hauser Operations App: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.


1. Device name
2. Manufacturer's address
3. Order code
4. Serial number (ser. no.)
5. Extended order code (Ext. ord. cd.)
6. Process pressure
7. Antenna length (for FMR51 with variable antenna extension) reference length
8. Certificate symbol
9. Certificate and approval relevant data
10. Degree of protection: e.g. IP, NEMA
11. Document number of the Safety Instructions: e.g. XA, ZD, ZE
12. 2-D matrix code (QR code)
13. Modification mark
14. Manufacturing date: year-month
15. Temperature resistance of cable
16. Device revision (Dev.Rev.)
17. Additional information about the device version (certificates, approvals, communication protocol)
18. Firmware version (FW)
19. CE mark, C-Tick
20. Profibus PA: Profile Version; FOUNDATION Fieldbus: Device ID
21. Materials in contact with process
22. Permitted ambient temperature (T_a)
23. Size of the cable gland thread
24. Maximum process temperature
25. Signal outputs
26. Supply voltage

Up to 33 characters of the extended order code are indicated on the nameplate. If the extended order code contains additional characters, these cannot be displayed.

However, the complete extended order code can also be displayed via the device operating menu: **Extended order code 1 to 3 parameter**
5 Storage, Transport

5.1 Storage conditions
- Permitted storage temperature: –40 to +80 °C (–40 to +176 °F)
- Use original packaging.

5.2 Transporting the product to the measuring point

NOTICE
Housing or sensor may become damaged or pull off.
Risk of injury!
- Transport the measuring device to the measuring point in its original packaging or by the process connection.
- Always secure lifting equipment (slings, eyes, etc.) at the process connection and never lift the device by the electronic housing or sensor. Pay attention to the center of gravity of the device so that it does not tilt or slip unintentionally.
- Follow the safety instructions and transport conditions for devices over 18 kg (39.6 lbs), (IEC61010).
6 Installation

6.1 Installation conditions

6.1.1 Mounting position

- Recommended distance **A** wall - nozzle outer edge: ~1/6 of the container diameter. However, the device must not under any circumstances be mounted closer than 15 cm (5.91 in) to the tank wall.
- Not in the center (2) as interference can cause signal loss.
- Not above the filling curtain (3).
- The use of a weather protection cover (1) is recommended to protect the transmitter from direct sunlight or rain.
6.1.2 Internal container fittings

Avoid the location of internal fittings (limit switches, temperature sensors, struts, vacuum rings, heating coils, baffles etc.) inside the signal beam. Take into account the beam angle.
6.1.3  Avoiding interference echoes

Metal deflection plates installed at an angle to scatter the radar signals help prevent interference echoes.

6.1.4  Optimization options

- Antenna size
  The larger the antenna the smaller the beam angle $\alpha$, resulting in fewer interference echoes.

- Mapping
  Measurement can be optimized by electronically suppressing interference echoes. See also Confirm distance parameter.

6.1.5  Beam angle

$$W = 2 \cdot D \cdot \tan \frac{\alpha}{2}$$

Relationship between beam angle $\alpha$, distance $D$ and beamwidth diameter $W$
The beam angle is defined as the angle $\alpha$ where the energy density of the radar waves reaches half the value of the maximum energy density (3dB width). Microwaves are also emitted outside the signal beam and can be reflected off interfering installations.

<table>
<thead>
<tr>
<th>Antenna</th>
<th>Beam angle $\alpha$</th>
<th>Distance (D)</th>
<th>Beamwidth diameter W</th>
</tr>
</thead>
<tbody>
<tr>
<td>integrated, integrated, PEEK, 20 mm / 3/4&quot; PEEK, 40 mm / 1-1/2&quot; PTFE cladded flush mount 50 mm / 2&quot; PTFE cladded flush mount 80 mm / 3&quot;</td>
<td>14 ° 8 ° 7 ° 3 °</td>
<td>5 m (16 ft) 10 m (33 ft) 15 m (49 ft) 20 m (66 ft) 25 m (82 ft) 30 m (98 ft) 35 m (115 ft) 40 m (131 ft) 45 m (148 ft) 50 m (164 ft) 60 m (197 ft) 70 m (230 ft) 80 m (262 ft)</td>
<td>1.32 m (4.33 ft) 2.63 m (8.63 ft) 2.09 m (6.87 ft) 2.79 m (9.16 ft) - - - - - -</td>
</tr>
</tbody>
</table>

1) Feature 070 in the product structure

### 6.2 Installation: integrated antenna

#### 6.2.1 Radial alignment of the antenna

Radial alignment of the antenna is not necessary because the effect of polarization is negligible due to the narrow beam angle.
6.2.2 Information concerning nozzles

The maximum nozzle length $H_{\text{max}}$ depends on the nozzle diameter $D$:

![Diagram showing the relationship between inner nozzle diameter and maximum nozzle height]

<table>
<thead>
<tr>
<th>Inner nozzle diameter $D$</th>
<th>Maximum nozzle height $H_{\text{max}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>min. 40 mm (1.5 in) ¹</td>
<td>≤150 mm (6 in)</td>
</tr>
<tr>
<td>min. 50 mm (2 in) ²</td>
<td>≤150 mm (6 in)</td>
</tr>
<tr>
<td>80 mm (3 in)</td>
<td>≤200 mm (8 in)</td>
</tr>
<tr>
<td>100 mm (4 in)</td>
<td>≤300 mm (12 in)</td>
</tr>
<tr>
<td>150 mm (6 in)</td>
<td>≤500 mm (20 in)</td>
</tr>
</tbody>
</table>

1) Only with antenna GE (integrated, PEEK 20mm / 3/4"
2) Minimum for antenna GF (integrated, PEEK 40mm / 1-1/2"

- Note the following if the antenna does not project out of the nozzle:
  - The end of the nozzle must be smooth and free from burrs. The edge of the nozzle should be rounded if possible.
  - Mapping must be performed.
  - Please contact Endress+Hauser for applications with nozzles that are higher than indicated in the table.

6.2.3 Information concerning threaded connections

- When screwing in, turn by the hex bolt only.
- Tool: open-ended wrench 36 mm (Sensor 3/4"
  open-ended wrench 55 mm (Sensor 1 1/2"
- Maximum permissible torque: 50 Nm (36 lbf ft)

6.3 Installation: flush mount antenna

6.3.1 Aligning the antenna axis

Radial alignment of the antenna is not necessary because the effect of polarization is negligible due to the narrow beam angle.
6.3.2 Information concerning nozzles

<table>
<thead>
<tr>
<th>Inner nozzle diameter $D$</th>
<th>Maximum nozzle height $H_{\text{max}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>min. 50 mm (2 in) 1)</td>
<td>≤ 150 mm (6 in)</td>
</tr>
<tr>
<td>80 mm (3 in) 2)</td>
<td>≤ 200 mm (8 in)</td>
</tr>
<tr>
<td>100 mm (4 in)</td>
<td>≤ 300 mm (12 in)</td>
</tr>
<tr>
<td>150 mm (6 in)</td>
<td>≤ 500 mm (20 in)</td>
</tr>
</tbody>
</table>

1) Only with antenna GM (PTFE cladded flush mount DN50)
2) Minimum for antenna GN (PTFE cladded flush mount DN80)

Note the following if the antenna does not project out of the nozzle:
- The end of the nozzle must be smooth and free from burrs. The edge of the nozzle should be rounded if possible.
- Mapping must be performed.
- Please contact Endress+Hauser for applications with nozzles that are higher than indicated in the table.

6.3.3 Mounting cladded flanges

Note the following for cladded flanges:
- Use the same number of flange screws as the number of flange bores provided.
- Tighten the screws with the necessary torque (see Table).
- Retighten after 24 hours or after the first temperature cycle.
- Depending on the process pressure and temperature, check and retighten the screws, where necessary, at regular intervals.

The PTFE flange cladding normally acts simultaneously as a seal between the nozzle and the device flange.

<table>
<thead>
<tr>
<th>Flange size</th>
<th>Number of screws</th>
<th>Recommended tightening torque [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td>EN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DN50/PN16</td>
<td>4</td>
<td>45</td>
</tr>
<tr>
<td>DN80/PN16</td>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td>DN100/PN16</td>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td>DN150/PN16</td>
<td>8</td>
<td>75</td>
</tr>
<tr>
<td>ASME</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2&quot;/150lbs</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>3&quot;/150lbs</td>
<td>4</td>
<td>65</td>
</tr>
<tr>
<td>4&quot;/150lbs</td>
<td>8</td>
<td>45</td>
</tr>
<tr>
<td>6&quot;/150lbs</td>
<td>8</td>
<td>85</td>
</tr>
</tbody>
</table>
### 6.4 Container with heat insulation

If process temperatures are high, the device should be included in the usual container insulation system (2) to prevent the electronics from heating as a result of thermal radiation or convection. The insulation should not be higher than the neck of the device (1).

### 6.5 Turning the transmitter housing

To provide easier access to the connection compartment or display module, the transmitter housing can be turned:

1. Unscrew the securing screw using an open-ended wrench.
2. Rotate the housing in the desired direction.
3. Tighten the securing screw (1.5 Nm for plastic housing; 2.5 Nm for aluminum or stainless steel housing).
6.6  Turning the display module

1. If present: Loosen the screw of the securing clamp of the electronics compartment cover using an Allen screw and turn the clamp 90° counterclockwise.
2. Unscrew cover of the electronics compartment from the transmitter housing.
3. Pull out the display module with a gentle rotational movement.
4. Rotate the display module to the desired position: max. 8 × 45° in each direction.
5. Feed the coiled cable into the gap between the housing and main electronics module and plug the display module into the electronics compartment until it engages.
6. Screw the electronics compartment cover back onto the transmitter housing.
7. Tighten the securing clamp with an Allen screw (torque: 2.5 Nm).

6.7  Post-installation check

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Is the device undamaged (visual inspection)?</td>
</tr>
<tr>
<td></td>
<td>Does the device conform to the measuring point specifications?</td>
</tr>
<tr>
<td></td>
<td>For example:</td>
</tr>
<tr>
<td></td>
<td>• Process temperature</td>
</tr>
<tr>
<td></td>
<td>• Process pressure (refer to the chapter on 'Material load curves' of the 'Technical Information' document)</td>
</tr>
<tr>
<td></td>
<td>• Ambient temperature range</td>
</tr>
<tr>
<td></td>
<td>• Measuring range</td>
</tr>
<tr>
<td></td>
<td>Are the measuring point identification and labeling correct (visual inspection)?</td>
</tr>
<tr>
<td></td>
<td>Is the device adequately protected from precipitation and direct sunlight?</td>
</tr>
<tr>
<td></td>
<td>Are the securing screw and securing clamp tightened securely?</td>
</tr>
</tbody>
</table>
7 Electrical connection

7.1 Connection conditions

7.1.1 Terminal assignment

2-wire: 4-20mA HART

---

Diagram with terminal assignments:

- **A**: Without integrated overvoltage protection
- **B**: With integrated overvoltage protection
- **1**: Active barrier with power supply (e.g., RN221N): Observe terminal voltage
- **2**: HART communication resistor (≥ 250 Ω): Observe maximum load
- **3**: Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)
- **4**: Analog display device: Observe maximum load
- **5**: Cable screen; observe cable specification
- **6**: 4-20mA HART (passive): Terminals 1 and 2
- **7**: Overvoltage protection module
- **8**: Terminal for potential equalization line
- **9**: Cable entry
2-wire: 4-20mA HART, switch output

7 Terminal assignment 2-wire; 4-20mA HART, switch output
A Without integrated overvoltage protection
B With integrated overvoltage protection
1 Active barrier with power supply (e.g. RN221N): Observe terminal voltage
2 HART communication resistor (≥ 250 Ω): Observe maximum load
3 Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)
4 Analog display device: Observe maximum load
5 Cable screen; observe cable specification
6 4-20mA HART (passive): Terminals 1 and 2
7 Switch output (open collector): Terminals 3 and 4
8 Terminal for potential equalization line
9 Cable entry for 4-20mA HART line
10 Cable entry for switch output line
11 Overvoltage protection module
2-wire: 4-20mA HART, 4-20mA

This version is also suited for single-channel operation. In this case, current output 1 (terminals 1 and 2) must be used.
4-wire: 4-20mA HART (10.4 to 48 V$_{DC}$)

Terminal assignment 4-wire: 4-20mA HART (10.4 to 48 V$_{DC}$)

1. Evaluation unit, e.g. PLC
2. HART communication resistor ($\geq 250 \, \Omega$): Observe maximum load
3. Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)
4. Analog display device: Observe maximum load
5. Signal cable including screening (if required), observe cable specification
6. Protective connection; do not disconnect!
7. Protective earth, observe cable specification
8. 4...20mA HART (active): Terminals 3 and 4
9. Supply voltage: Terminals 1 and 2
10. Supply voltage: Observe terminal voltage, observe cable specification
11. Terminal for potential equalization
12. Cable entry for signal line
13. Cable entry for power supply
4-wire: 4-20mA HART (90 to 253 V_{AC})

10 Terminal assignment 4-wire; 4-20mA HART (90 to 253 V_{AC})

1 Evaluation unit, e.g. PLC
2 HART communication resistor (≥ 250 Ω): Observe maximum load
3 Connection for Commubox FXA195 or FieldXpert SFX350/SFX370 (via VIATOR Bluetooth modem)
4 Analog display device: Observe maximum load
5 Signal cable including screening (if required), observe cable specification
6 Protective connection; do not disconnect!
7 Protective earth, observe cable specification
8 4...20mA HART (active): Terminals 3 and 4
9 Supply voltage: Terminals 1 and 2
10 Supply voltage: Observe terminal voltage, observe cable specification
11 Terminal for potential equalization
12 Cable entry for signal line
13 Cable entry for power supply

**CAUTION**

To ensure electrical safety:

- Do not disconnect the protective connection (6).
- Disconnect the supply voltage before disconnecting the protective earth (7).

Connect protective earth to the internal ground terminal (7) before connecting the supply voltage. If necessary, connect the potential matching line to the external ground terminal (11).

In order to ensure electromagnetic compatibility (EMC): Do not only ground the device via the protective earth conductor of the supply cable. Instead, the functional grounding must also be connected to the process connection (flange or threaded connection) or to the external ground terminal.

An easily accessible power switch must be installed in the proximity of the device. The power switch must be marked as a disconnecter for the device (IEC/EN61010).
Connection examples for the switch output

Suitable relays (examples):
- Solid-state relay: Phoenix Contact OV-24DC/480AC/5 with mounting rail connector UMK-1 OM-R/AMS
- Electromechanical relay: Phoenix Contact PLC-RSC-12DC/21

For optimum interference immunity we recommend to connect an external resistor (internal resistance of the relay or Pull-up resistor) of < 1000 Ω.

7.1.2 Cable specification

- **Devices without integrated overvoltage protection**
  Pluggable spring-force terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)

- **Devices with integrated overvoltage protection**
  Screw terminals for wire cross-sections 0.2 to 2.5 mm² (24 to 14 AWG)
  - For ambient temperature $T_U \geq 60 ^\circ C$ (140 °F): use cable for temperature $T_U + 20 K$.

**HART**
- A normal device cable suffices if only the analog signal is used.
- A shielded cable is recommended if using the HART protocol. Observe grounding concept of the plant.
- For 4-wire devices: Standard device cable is sufficient for the power line.
7.1.3  Device plug connectors

For the versions with fieldbus plug connector (M12 or 7/8"), the signal line can be connected without opening the housing.

Pin assignment of the M12 plug connector

<table>
<thead>
<tr>
<th>Pin</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Signal +</td>
</tr>
<tr>
<td>2</td>
<td>not connected</td>
</tr>
<tr>
<td>3</td>
<td>Signal -</td>
</tr>
<tr>
<td>4</td>
<td>Ground</td>
</tr>
</tbody>
</table>

Pin assignment of the 7/8" plug connector

<table>
<thead>
<tr>
<th>Pin</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Signal -</td>
</tr>
<tr>
<td>2</td>
<td>Signal +</td>
</tr>
<tr>
<td>3</td>
<td>Not connected</td>
</tr>
<tr>
<td>4</td>
<td>Screen</td>
</tr>
</tbody>
</table>
7.1.4 Supply voltage

2-wire, 4-20mA HART, passive

<table>
<thead>
<tr>
<th>&quot;Power supply, output&quot;</th>
<th>&quot;Approval&quot; 2)</th>
<th>Terminal voltage U at device</th>
<th>Maximum load R, depending on the supply voltage U₀ of the power supply unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-wire; 4-20mA HART</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Non-hazardous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ex na</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ex ic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• CSA GP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ex ia / IS</td>
<td></td>
<td>14 to 35 V</td>
<td></td>
</tr>
<tr>
<td>• Ex d(ia) / XP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ex ic(ia)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ex nA(ia)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ex ta / DIP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ex ia + Ex d(ia) / IS + XP</td>
<td></td>
<td>14 to 30 V</td>
<td></td>
</tr>
</tbody>
</table>

1) Feature 020 in the product structure
2) Feature 010 in the product structure
3) At ambient temperatures Tₐ ≤ -20 °C, a terminal voltage U ≥ 16 V is required to start the device with the min. error current (3.6 mA).

<table>
<thead>
<tr>
<th>&quot;Power supply, output&quot;</th>
<th>&quot;Approval&quot; 2)</th>
<th>Terminal voltage U at device</th>
<th>Maximum load R, depending on the supply voltage U₀ of the power supply unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>B:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-wire; 4-20 mA HART</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Non-hazardous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ex na</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ex nA(ia)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ex ic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ex ic(ia)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ex nA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ex ta / DIP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• CSA GP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ex ia / IS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ex ia + Ex d(ia) / IS + XP</td>
<td></td>
<td>16 to 30 V</td>
<td></td>
</tr>
</tbody>
</table>

1) Feature 020 in the product structure
2) Feature 010 in the product structure
### Electrical connection

#### Power supply, output

<table>
<thead>
<tr>
<th>&quot;Power supply, output&quot;</th>
<th>&quot;Approval&quot;</th>
<th>Terminal voltage $U$ at device</th>
<th>Maximum load $R$, depending on the supply voltage $U_0$ of the power supply unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>C: 2-wire; 4-20mA HART, 4-20mA</td>
<td>All</td>
<td>16 to 30 V</td>
<td>$R$ [Ω]</td>
</tr>
</tbody>
</table>

#### Approval

1) Feature 020 in the product structure  
2) Feature 010 in the product structure

#### Technical data

<table>
<thead>
<tr>
<th>Technical data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance per channel</td>
<td>$2 \times 0.5 , \Omega$ max.</td>
</tr>
<tr>
<td>Threshold DC voltage</td>
<td>400 to 700 V</td>
</tr>
<tr>
<td>Threshold impulse voltage</td>
<td>$&lt; 800 , V$</td>
</tr>
<tr>
<td>Capacitance at 1 MHz</td>
<td>$&lt; 1.5 , pF$</td>
</tr>
<tr>
<td>Nominal arrest impulse voltage (8/20 µs)</td>
<td>10 kA</td>
</tr>
</tbody>
</table>

---

### 4-wire, 4-20mA HART, active

#### Power supply; output

<table>
<thead>
<tr>
<th>&quot;Power supply; output&quot;</th>
<th>Terminal voltage $U$</th>
<th>Maximum load $R_{\text{max}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>R: 4-wire 90-253VAC; 4-20mA HART</td>
<td>90 to 253 V&lt;sub&gt;AC&lt;/sub&gt; (50 to 60 Hz), overvoltage category II</td>
<td>500 Ω</td>
</tr>
<tr>
<td>L: 4-wire 10.4-48VDC; 4-20mA HART</td>
<td>10.4 to 48 V&lt;sub&gt;DC&lt;/sub&gt;</td>
<td></td>
</tr>
</tbody>
</table>

1) Feature 020 in the product structure

#### 7.1.5 Overvoltage protection

If the measuring device is used for level measurement in flammable liquids which requires the use of overvoltage protection according to DIN EN 60079-14, standard for test procedures 60060-1 (10 kA, pulse 8/20 µs), overvoltage protection has to be ensured by an integrated or external overvoltage protection module.

**Integrated overvoltage protection**

An integrated overvoltage protection module is available for 2-wire HART as well as PROFIBUS PA and FOUNDATION Fieldbus devices.

Product structure: Feature 610 "Accessory mounted", option NA "Overvoltage protection".
External overvoltage protection
HAW562 or HAW569 from Endress+Hauser are suited as external overvoltage protection.

For detailed information please refer to the following documents:
- HAW562: TI01012K
- HAW569: TI01013K

7.1.6 Connecting the measuring device

**WARNING**

Risk of explosion!
- Observe applicable national standards.
- Comply with the specifications in the Safety Instructions (XA).
- Use specified cable glands only.
- Check to ensure that the power supply matches the information on the nameplate.
- Switch off the power supply before connecting the device.
- Connect the potential matching line to the outer ground terminal before applying the power supply.

Required tools/accessories:
- For devices with a cover lock: Allen key AF3
- Wire stripper
- When using stranded cables: One ferrule for every wire to be connected.

---

1. Loosen the screw of the securing clamp on the connection compartment cover and turn the securing clamp 90° counterclockwise.
2. Unscrew the connection compartment cover.
3. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.
4. Remove the cable sheath.
5. Strip the cable ends over a length of 10 mm (0.4 in). In the case of stranded cables, also fit ferrules.
6. Firmly tighten the cable glands.
Connect the cable in accordance with the terminal assignment → 27.
8. If using shielded cables: Connect the cable shield to the ground terminal.
9. Fit the cover of the connection compartment back on.
10. If present, turn the cover lock so that it is located over the edge of the cover and then tighten.

Plug-in spring-force terminals
In the case of devices without integrated overvoltage protection, electrical connection is via plug-in spring-force terminals. Rigid conductors or flexible conductors with ferrules can be inserted directly into the terminal without using the lever, and create a contact automatically.

To remove cables from the terminal:
1. Using a flat-blade screwdriver ≤ 3 mm, press down on the slot between the two terminal holes
2. while simultaneously pulling the cable end out of the terminal.

7.1.7 Post-connection check

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Is the device or cable undamaged (visual check)?</td>
</tr>
<tr>
<td></td>
<td>Do the cables comply with the requirements?</td>
</tr>
<tr>
<td></td>
<td>Do the cables have adequate strain relief?</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Are all cable glands installed, securely tightened and leak-tight?</td>
</tr>
<tr>
<td></td>
<td>Does the supply voltage match the specifications on the nameplate?</td>
</tr>
<tr>
<td></td>
<td>Is the terminal assignment correct → 27?</td>
</tr>
<tr>
<td></td>
<td>If required: Has protective ground connection been established?</td>
</tr>
<tr>
<td></td>
<td>If supply voltage is present, is the device ready for operation and do values appear on the display module?</td>
</tr>
<tr>
<td></td>
<td>Are all housing covers installed and securely tightened?</td>
</tr>
<tr>
<td></td>
<td>Is the securing clamp tightened correctly?</td>
</tr>
</tbody>
</table>
8 Operation options

8.1 Overview

8.1.1 Local operation

<table>
<thead>
<tr>
<th>Operation with</th>
<th>Pushbuttons</th>
<th>Touch Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order code for</td>
<td>Option C &quot;SD02&quot;</td>
<td>Option E &quot;SD03&quot;</td>
</tr>
<tr>
<td>&quot;Display; Operation&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Display elements

- 4-line display
- 4-line display with white background lighting; switches to red in event of device error

Format for displaying measured variables and status variables can be individually configured

Permitted ambient temperature for the display: –20 to +70 °C (–4 to +158 °F)

The readability of the display may be impaired at temperatures outside the temperature range.

Operating elements

- Local operation with 3 push buttons (↑, ↓, ⬅)
- External operation via touch control; 3 optical keys: ↑, ↓, ⬅

Operating elements also accessible in various hazardous areas

Additional functionality

- Data backup function
  - The device configuration can be saved in the display module.
- Data comparison function
  - The device configuration saved in the display module can be compared to the current device configuration.
- Data transfer function
  - The transmitter configuration can be transmitted to another device using the display module.
8.1.2 Operation with remote display and operating module FHX50

1. Housing of the remote display and operating module FHX50
2. Display and operating module SD02, push buttons; cover must be removed
3. Display and operating module SD03, optical keys; can be operated through the glass of the cover

8.1.3 Remote operation

Via HART protocol

1. PLC (programmable logic controller)
2. Transmitter power supply unit, e.g. RN221N (with communication resistor)
3. Connection for Commubox FXA191, FXA195 and Field Communicator 375, 475
4. Field Communicator 475
5. Computer with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)
6. Commubox FXA191 (RS232) or FXA195 (USB)
7. Field Xpert SFX350/SFX370
8. VIATOR Bluetooth modem with connecting cable
9. Transmitter
Via service interface (CDI)

1 Service interface (CDI) of the measuring device (= Endress+Hauser Common Data Interface)
2 Commubox FXA291
3 Computer with "FieldCare" operating tool
## 8.2 Structure and function of the operating menu

### 8.2.1 Structure of the operating menu

<table>
<thead>
<tr>
<th>Menu</th>
<th>Submenu / parameter</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language ¹</td>
<td></td>
<td>Defines the operating language of the on-site display</td>
</tr>
<tr>
<td>Commissioning ²</td>
<td></td>
<td>Launches the interactive wizard for guided commissioning. Additional settings generally do not need to be made in the other menus when the wizard is finished.</td>
</tr>
<tr>
<td>Setup</td>
<td>Parameter 1...</td>
<td>Once values have been set for these parameters, the measurement should generally be completely configured.</td>
</tr>
<tr>
<td></td>
<td>Parameter N</td>
<td></td>
</tr>
<tr>
<td>Advanced setup</td>
<td></td>
<td>Contains additional submenus and parameters:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• to adapt the device to special measuring conditions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• to process the measured value (scaling, linearization).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• to configure the signal output.</td>
</tr>
<tr>
<td>Diagnostics</td>
<td>Diagnostic list</td>
<td>Contains up to 5 currently active error messages.</td>
</tr>
<tr>
<td></td>
<td>Event logbook ³</td>
<td>Contains the last 20 messages (which are no longer active).</td>
</tr>
<tr>
<td></td>
<td>Device information</td>
<td>Contains information for identifying the device.</td>
</tr>
<tr>
<td></td>
<td>Measured values</td>
<td>Contains all current measured values.</td>
</tr>
<tr>
<td></td>
<td>Data logging</td>
<td>Contains the history of the individual measuring values.</td>
</tr>
<tr>
<td></td>
<td>Simulation</td>
<td>Is used to simulate measured values or output values.</td>
</tr>
<tr>
<td></td>
<td>Device check</td>
<td>Contains all parameters needed to check the measurement capability of the device.</td>
</tr>
<tr>
<td></td>
<td>Heartbeat ⁴</td>
<td>Contains all the wizards for the Heartbeat Verification and Heartbeat Monitoring application packages.</td>
</tr>
<tr>
<td>Expert ⁶</td>
<td></td>
<td>Contains all parameters of the device (including those that are already in one of the other menus). This menu is organized according to the function blocks of the device. The parameters of the Expert menu are described in: GP01101F (HART)</td>
</tr>
<tr>
<td>System</td>
<td></td>
<td>Contains all higher-order device parameters that do not concern the measurement or measured value communication.</td>
</tr>
<tr>
<td>Sensor</td>
<td></td>
<td>Contains all parameters needed to configure the measurement.</td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td>• Contains all parameters needed to configure the current output.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Contains all parameters needed to configure the switch output (PFS).</td>
</tr>
</tbody>
</table>
### Menu

<table>
<thead>
<tr>
<th>Submenu / parameter</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communication</strong></td>
<td>Contains all parameters needed to configure the digital communication interface.</td>
</tr>
<tr>
<td><strong>Diagnostics</strong></td>
<td>Contains all parameters needed to detect and analyze operational errors.</td>
</tr>
</tbody>
</table>

1) If operating via operating tools (e.g. FieldCare), the 'Language' parameter is located under 'Setup → Advanced setup → Display'.
2) Only if operating via an FDT/DTM system.
3) Only available with local operation.
4) Only available if operating via DeviceCare or FieldCare.
5) On entering the 'Expert' menu, an access code is always requested. If a customer specific access code has not been defined, '0000' has to be entered.
8.2.2 User roles and related access authorization

The two user roles **Operator** and **Maintenance** have different write access to the parameters if a device-specific access code has been defined. This protects the device configuration via the local display from unauthorized access → 45.

**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 access code (from the factory)</td>
<td>With access code</td>
</tr>
<tr>
<td></td>
<td>Without access code (from the factory)</td>
<td>With access code</td>
</tr>
<tr>
<td>Operator</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Maintenance</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

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 (for display operation) or **Access status tooling** parameter (for tool operation).
8.2.3 Write protection via access code

Using the device-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 via local display

1. Navigate to: Setup → Advanced setup → Administration → Define access code
2. Define a max. 4-digit numeric code as an access code.
3. Repeat the same code in Confirm access code parameter.
   - The علامة -symbol appears in front of all write-protected parameters.

Define access code via operating tool (e.g. FieldCare)

1. Navigate to: Setup → Advanced setup → Administration → Define access code
2. Define a max. 4-digit numeric code as an access code.
   - Write protection is active.

Parameters that can always be changed

The write protection does not include certain parameters that do not affect the measurement. Despite the defined access code, they can always be modified, even if the other parameters are locked.

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 → علامة 46.
- In the "Description of Device Parameters" documents, each write-protected parameter is identified with the علامات -symbol.
8.2.4  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 device-specific access code and its value cannot be changed at the moment using the local display → 45.

The locking of the write access via local operation can be disabled by entering the device-specific access code.

1. After you press , 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.

8.2.5  Deactivation of the write protection via access code

Via local display

1. Navigate to: Setup → Advanced setup → Administration → Define access code → Define access code
2. 0000.
3. Repeat 0000 in Confirm access code parameter.
   - The write protection is deactivated. Parameters can be changed without entering an access code.

Via an operating tool (e.g. FieldCare)

1. Navigate to: Setup → Advanced setup → Administration → Define access code
2. 0000.
   - The write protection is deactivated. Parameters can be changed without entering an access code.

8.2.6  Write protection via write protection switch

Unlike parameter write protection via a user-specific access code, this allows write access to the entire operating menu - except for the Contrast display parameter - to be locked. The parameter values are now read only and cannot be edited any more (exception Contrast display parameter):

- Via local display
- Via service interface (CDI)
- Via service interface (CDI-RJ45)
- Via HART protocol
1. Loosen the securing clamp.
2. Unscrew the electronics compartment cover.
3. Pull out the display module with a gentle rotational movement. To make it easier to access the lock switch, attach the display module to the edge of the electronics compartment.
   - Display module is attached to the edge of the electronics compartment.
4. Setting the write protection switch (WP) on the main electronics module to the **ON** position enables hardware write protection. Setting the write protection switch (WP) on the main electronics module to the **OFF** position (factory setting) disables hardware write protection.

If the hardware write protection is enabled: The **Hardware locked** option is displayed in the **Locking status** parameter. In addition, on the local display the -symbol appears in front of the parameters in the header of the operational display and in the navigation view.

If the hardware write protection is disabled: No option is displayed in the **Locking status** parameter. On the local display, the -symbol disappears from in front of the parameters in the header of the operational display and in the navigation view.

5. Feed the cable into the gap between the housing and main electronics module and plug the display module into the electronics compartment in the desired direction until it engages.

6. Reverse the removal procedure to reassemble the transmitter.
8.2.7 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 switched on and off via the context menu.

Switching on the keypad lock

For the SD03 display only

The keypad lock is switched on automatically:
- If the device has not been operated via the display for > 1 minute.
- Each time the device is restarted.

To activate the keylock manually:

1. The device is in the measured value display.
   Press \( \text{\textbullet} \) for at least 2 seconds.
   \( \leftarrow \) A context menu appears.
2. In the context menu select the Keylock on option.
   \( \leftarrow \) The keypad lock is switched on.

If the user attempts to access the operating menu while the keypad lock is active, the message Keylock on appears.

Switching off the keypad lock

1. The keypad lock is switched on.
   Press \( \text{\textbullet} \) for at least 2 seconds.
   \( \leftarrow \) A context menu appears.
2. In the context menu select the Keylock off option.
   \( \leftarrow \) The keypad lock is switched off.
8.3 Display and operating module

8.3.1 Display appearance

![Image of display module](image_url)

1. Measured value display (1 value max. size)
1.1 Header containing tag and error symbol (if an error is active)
1.2 Measured value symbols
1.3 Measured value
1.4 Unit
2. Measured value display (1 bargraph + 1 value)
2.1 Bargraph for measured value 1
2.2 Measured value 1 (including unit)
2.3 Measured value symbols for measured value 1
2.4 Measured value 2
2.5 Unit for measured value 2
2.6 Measured value symbols for measured value 2
3. Representation of a parameter (here: a parameter with selection list)
3.1 Header containing parameter name and error symbol (if an error is active)
3.2 Selection list; Ø marks the current parameter value.
4. Input matrix for numbers
5. Input matrix for alphanumeric and special characters
### Display symbols for the submenus

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| ![Display/operation](image) | **Display/operation**  
Is displayed:  
- in the main menu next to the selection 'Display/operation'  
- in the header, if you are in the 'Display/operation' menu |
| ![Setup](image) | **Setup**  
Is displayed:  
- in the main menu next to the selection 'Setup'  
- in the header, if you are in the 'Setup' menu |
| ![Expert](image) | **Expert**  
Is displayed:  
- in the main menu next to the selection 'Expert'  
- in the header, if you are in the 'Expert' menu |
| ![Diagnostics](image) | **Diagnostics**  
Is displayed:  
- in the main menu next to the selection 'Diagnostics'  
- in the header, if you are in the 'Diagnostics' menu |

### Status signals

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| ![Failure](image) | **“Failure”**  
A device error is present. The measured value is no longer valid. |
| ![Function check](image) | **“Function check”**  
The device is in service mode (e.g. during a simulation). |
| ![Out of specification](image) | **“Out of specification”**  
The device is operated:  
- Outside of its technical specifications (e.g. during startup or a cleaning)  
- Outside of the configuration carried out by the user (e.g. level outside configured span) |
| ![Maintenance required](image) | **“Maintenance required”**  
Maintenance is required. The measured value is still valid. |

### Display symbols for the locking state

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| ![Display parameter](image) | **Display parameter**  
Marks display-only parameters which can not be edited. |
| ![Device locked](image) | **Device locked**  
- In front of a parameter name: The device is locked via software and/or hardware.  
- In the header of the measured value screen: The device is locked via hardware. |
### Measured value symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Level</td>
<td><img src="image" alt="Symbol" /></td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Distance</td>
<td><img src="image" alt="Symbol" /></td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Current output</td>
<td><img src="image" alt="Symbol" /></td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Measured current</td>
<td><img src="image" alt="Symbol" /></td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Terminal voltage</td>
<td><img src="image" alt="Symbol" /></td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Temperature of the electronics or the sensor</td>
<td><img src="image" alt="Symbol" /></td>
</tr>
</tbody>
</table>

### Measuring channels

<table>
<thead>
<tr>
<th>Measuring channel 1</th>
<th><img src="image" alt="Symbol" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring channel 2</td>
<td><img src="image" alt="Symbol" /></td>
</tr>
</tbody>
</table>

### Status of the measured value

<table>
<thead>
<tr>
<th>Status</th>
<th>Meaning</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Status &quot;Alarm&quot;</td>
<td><img src="image" alt="Symbol" /></td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>The measurement is interrupted. The output assumes the defined alarm value. A diagnostic message is generated.</td>
<td><img src="image" alt="Symbol" /></td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Status &quot;Warning&quot;</td>
<td><img src="image" alt="Symbol" /></td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>The device continues measuring. A diagnostic message is generated.</td>
<td><img src="image" alt="Symbol" /></td>
</tr>
</tbody>
</table>
### 8.3.2 Operating elements

<table>
<thead>
<tr>
<th>Key</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| ![Minus key](image) | **Minus key**  
*For menu, submenu*  
Moves the selection bar upwards in a picklist.  
*For text and numeric editor*  
In the input mask, moves the selection bar to the left (backwards). |
| ![Plus key](image) | **Plus key**  
*For menu, submenu*  
Moves the selection bar downwards in a picklist.  
*For text and numeric editor*  
In the input mask, moves the selection bar to the right (forwards). |
| ![Enter key](image) | **Enter key**  
*For measured value display*  
- Pressing the key briefly opens the operating menu.  
- Pressing the key for 2 s opens the context menu.  
*For menu, submenu*  
- Pressing the key briefly  
  - Opens the selected menu, submenu or parameter.  
  - Pressing the key for 2 s for parameter:  
    - If present, opens the help text for the function of the parameter.  
*For 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](image) | **Escape key combination (press keys simultaneously)**  
*For 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.  
*For text and numeric editor*  
Closes the text or numeric editor without applying changes. |
| ![Minus/Enter key combination](image) | **Minus/Enter key combination (press and hold down the keys simultaneously)**  
Reduces the contrast (brighter setting). |
| ![Plus/Enter key combination](image) | **Plus/Enter key combination (press and hold down the keys simultaneously)**  
Increases the contrast (darker setting). |
8.3.3 Entering numbers and text

Input mask
The following input symbols are available in the input mask of the numeric and text editor:

**Numeric editor symbols**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Selection of numbers from 0 to 9.</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
</tr>
<tr>
<td>.</td>
<td>Inserts decimal separator at the input position.</td>
</tr>
<tr>
<td>–</td>
<td>Inserts minus sign at the input position.</td>
</tr>
<tr>
<td>✓</td>
<td>Confirms selection.</td>
</tr>
<tr>
<td>←</td>
<td>Moves the input position one position to the left.</td>
</tr>
<tr>
<td>X</td>
<td>Exits the input without applying the changes.</td>
</tr>
<tr>
<td>C</td>
<td>Clears all entered characters.</td>
</tr>
</tbody>
</table>

**Text editor symbols**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABC</td>
<td>Selection of letters from A to Z</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
<tr>
<td>XYZ</td>
<td></td>
</tr>
<tr>
<td>Aa1</td>
<td>Toggle</td>
</tr>
<tr>
<td></td>
<td>• Between upper-case and lower-case letters</td>
</tr>
<tr>
<td></td>
<td>• For entering numbers</td>
</tr>
<tr>
<td></td>
<td>• For entering special characters</td>
</tr>
</tbody>
</table>
### Operation options

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>✅</td>
<td>Confirms selection.</td>
</tr>
<tr>
<td>🧨 →⧢</td>
<td>Switches to the selection of the correction tools.</td>
</tr>
<tr>
<td>✗</td>
<td>Exits the input without applying the changes.</td>
</tr>
<tr>
<td>⬅</td>
<td>Clears all entered characters.</td>
</tr>
</tbody>
</table>

### Correction symbols under 🧨 →⧢

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>🧨</td>
<td>Clears all entered characters.</td>
</tr>
<tr>
<td>⬅</td>
<td>Moves the input position one position to the right.</td>
</tr>
<tr>
<td>⬅</td>
<td>Moves the input position one position to the left.</td>
</tr>
<tr>
<td>⬅️</td>
<td>Deletes one character immediately to the left of the input position.</td>
</tr>
</tbody>
</table>
8.3.4 Opening the context menu

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

- Setup
- Conf. backup disp.
- Env.curve
- Keylock on

Kontextmenü aufrufen und schließen

The user is in the operational display.

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

2. Press  +  simultaneously.
   - The context menu is closed and the operational 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  to confirm the selection.
   - The selected menu opens.
8.3.5 Envelope curve on the display and operating module

In order to assess the measuring signal, the envelope curve and - if a mapping has been recorded - the mapping curve can be displayed:
9 System integration via HART protocol

9.1 Overview of the Device Description files (DD)

<table>
<thead>
<tr>
<th>Manufacturer ID</th>
<th>17 (0x11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device type</td>
<td>0x112B</td>
</tr>
<tr>
<td>HART specification</td>
<td>7.0</td>
</tr>
</tbody>
</table>
| DD files        | For information and files see:  
|                 | • www.endress.com  
|                 | • www.hartcomm.org |

9.2 Measured values via HART protocol

On delivery the following measuring values are assigned to the HART device variables:

<table>
<thead>
<tr>
<th>Device variable</th>
<th>Measuring value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary variable (PV)</td>
<td>Level linearized</td>
</tr>
<tr>
<td>Secondary variable (SV)</td>
<td>Distance</td>
</tr>
<tr>
<td>Tertiary variable (TV)</td>
<td>Absolute echo amplitude</td>
</tr>
<tr>
<td>Quaternary variable (QV)</td>
<td>Relative echo amplitude</td>
</tr>
</tbody>
</table>

The allocation of the device variables can be changed in the operating menu:  
Expert → Communication → Output

In a HART multidrop loop only one device may use the output current for signal transmission. For all other devices the following must be set:

- "Current span" parameter = "Fixed current" option
- "Fixed current" parameter = 4 mA
10 Commissioning via wizard

A wizard guiding the user through the initial setup is available in FieldCare and DeviceCare.

1. Connect the device to FieldCare or DeviceCare → 40.
2. Open the device in FieldCare or DeviceCare.
   - The dashboard (home page) of the device appears:

   ![Dashboard Image]

   1 "Commissioning" button calls up the wizard.

3. Click on "Commissioning" to call up the wizard.
4. Enter or select the appropriate value for each parameter. These values are immediately written to the device.
5. Click 'Next' to switch to the next page.
6. After finishing the last page, click 'End of sequence' to close the wizard.

If the wizard is cancelled before all necessary parameters have been set, the device may be in an undefined state. A reset to the default settings is recommended in this case.
11 Commissioning via operating menu

11.1 Installation and function check

Make sure that all final checks have been completed before you start up your measuring point:

- Checklist 'Post-installation check' → 26
- Checklist 'Post-connection check' → 37

11.2 Setting the operating language

Factory setting: English or ordered local language

![Diagram of operating menu settings]

Using the example of the local display
11.3 Configuration of a level measurement

1. Setup → Device tag
   ➔ Enter device tag.
2. Setup → Distance unit
   ➔ Select distance unit.
3. Setup → Tank type
   ➔ Select distance unit.
4. Setup → Medium group
   ➔ Specify medium group ("Water based": DC >4 or "Others": DC >1.9)
5. Setup → Empty calibration
   ➔ Enter empty distance E (Distance from reference point R to the 0% level)
6. If the measuring range covers only an upper part of the tank or silo (E is much less-than the tank/silo height), it is mandatory to enter the actual tank or silo height into the parameter. If there is an outlet cone, the tank or silo height should not be adjusted as usually E is not much less-than the tank/silo height in these applications.
   Setup → Advanced setup → Level → Tank/silo height
7. Setup → Full calibration
   ➔ Enter full distance F (Distance from the 0% to the 100% level).
8. Setup → Level
   ➔ Indicates the measured level L.
9. Setup → Distance
   ➔ Indicates the measured distance from the reference point R to the level L.
10. Setup → Signal quality
    ➔ Indicates the quality of the evaluated level echo.
11. Setup → Mapping → Confirm distance
    ➔ Compare distance indicated on the display to real distance in order to start the recording of an interference echo map.
12. Setup → Advanced setup → Level → Level unit
   ✪ Select level unit: %, m, mm, ft, in (Factory setting: %)

ℹ️ The response time of the device is preset by the "Tank type" parameter. An enhanced setting is possible in the "Advanced setup" submenu.
11.4 Recording the reference curve

After the configuration of the measurement it is recommended to record the current envelope curve as a reference curve. The reference curve can be used later on in the process for diagnostic purposes. To record the reference curve use the **Save reference curve** parameter.

**Navigation in the menu**
Expert → Diagnostics → Envelope diagnostics → Save reference curve

**Meaning of the options**
- **No**
  - No action
- **Yes**
  - The current envelope curve is saved as reference curve.

The reference curve can only be displayed in the envelope curve diagram of FieldCare after it has been loaded from the device into FieldCare. This is performed by the "Load Reference Curve" function in FieldCare.

![19 The 'Load Reference Curve' function](image-url)
11.5  Configuration of the on-site display

11.5.1  Factory settings of the on-site display

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Factory setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td>English</td>
</tr>
<tr>
<td>Value 1 display</td>
<td>Level linearized</td>
</tr>
<tr>
<td>Value 2 display</td>
<td>None</td>
</tr>
<tr>
<td>Value 3 display</td>
<td>None</td>
</tr>
<tr>
<td>Value 4 display</td>
<td>None</td>
</tr>
</tbody>
</table>

11.5.2  Adjustment of the on-site display

The on-site display can be adjusted in the following submenu:
Setup → Advanced setup → Display

11.6  Configuration of the current outputs

11.6.1  Factory setting of the current outputs

<table>
<thead>
<tr>
<th>Current output</th>
<th>Allocated measuring value</th>
<th>4 mA value</th>
<th>20 mA value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Level linearized</td>
<td>0% or the corresponding linearized value</td>
<td>100% or the corresponding linearized value</td>
</tr>
<tr>
<td>2 1)</td>
<td>Distance</td>
<td>0</td>
<td>Empty calibration</td>
</tr>
</tbody>
</table>

1) for devices with 2 current outputs

11.6.2  Adjustment of the current outputs

The current outputs can be adjusted in the following menus:

**Basic settings**
Setup → Advanced setup → Current output 1 to 2

**Advanced settings**
Expert → Output → Current output 1
See "Description of Device Parameters", GP01101F
11.7 Configuration management

After commissioning, you can save the current device configuration, copy it to another measuring point or restore the previous device configuration. You can do so using the Configuration management parameter and its options.

Navigation path in the operating menu
Setup → Advanced setup → Configuration backup display → Configuration management

Meaning of the options
- **Cancel**
  No action is executed and the user exits the parameter.
- **Execute backup**
  A backup copy of the current device configuration in the HistoROM (built-in in the device) is saved to the display module of the device. The backup copy comprises the transmitter and sensor data of the device.
- **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 and sensor data of the device.
- **Duplicate**
  The transmitter configuration is duplicated to another device using the transmitter display module. The following parameters, which characterize the individual measuring point are not included in the transmitted configuration:
  - HART date code
  - HART short tag
  - HART message
  - HART descriptor
  - HART address
  - Device tag
  - Medium type
- **Compare**
  The device configuration saved in the display module is compared to the current device configuration of the HistoROM. The result of this comparison is displayed in the Comparison result parameter angezeigt.
- **Clear backup data**
  The backup copy of the device configuration is deleted from the display module of the device.

While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.

If an existing backup is restored to a different device using the Restore option, it may occur that some device functionalities are no longer available. In some cases even a device reset → 146 will not restore the original status.

In order to transmit a configuration to a different device, the Duplicate option should always be used.
11.8 Protection of the settings against unauthorized changes

There are two ways to protect the settings against unauthorized changes:

- Via parameter settings (software locking) → 45
- Via locking switch (hardware locking) → 46
12 Diagnostics and troubleshooting

12.1 General troubleshooting

12.1.1 General errors

<table>
<thead>
<tr>
<th>Error</th>
<th>Possible cause</th>
<th>Remedial action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device does not respond.</td>
<td>Supply voltage does not match the value indicated on the nameplate.</td>
<td>Connect the correct voltage.</td>
</tr>
<tr>
<td></td>
<td>The polarity of the supply voltage is wrong.</td>
<td>Correct the polarity.</td>
</tr>
<tr>
<td></td>
<td>The cables do not contact the terminals properly.</td>
<td>Ensure electrical contact between the cable and the terminal.</td>
</tr>
</tbody>
</table>
| Values on the display invisible | Contrast setting is too weak or too strong. | • Increase contrast by pressing \[\text{d}\] and \[\text{u}\] simultaneously.  
• Decrease contrast by pressing \[\text{u}\] and \[\text{d}\] simultaneously. |
| | The plug of the display cable is not connected correctly. | Connect the plug correctly. |
| | Display is defective. | Replace display. |
| ’Communication error’ is indicated on the display when starting the device or connecting the display | Electromagnetic interference | Check grounding of the device. |
| | Broken display cable or display plug. | Replace display. |
| Output current <3.6 mA | Signal cable connection incorrect. | Check connection. |
| | Electronics is defective. | Replace electronics. |
| HART communication does not function. | Communication resistor missing or incorrectly installed. | Install the communication resistor(250 Ω) correctly → 27. |
| | Commubox connected incorrectly. | Connect Commubox correctly → 41. |
| | Commubox not switched to HART mode. | Set the selection switch of the Commubox to the HART position. |
| CDI communication does not work. | Wrong setting of the COM port on the computer. | Check the setting of the COM port on the computer and change it if necessary. |
| Device measures incorrectly. | Parametrization error | Check and adjust parameterization. |

12.1.2 Parametrization errors

<table>
<thead>
<tr>
<th>Error</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| Measured value incorrect | If measured distance (Setup → Distance) matches the real distance: Calibration error | • Check and adjust Empty calibration parameter if necessary.  
• Check and adjust Full calibration parameter if necessary.  
• Check and adjust linearization if necessary (Linearization submenu). |
<p>| | Level correction set incorrectly | Enter correct value in Level correction parameter. |
| | If measured distance (Setup → Distance) does not match the real distance: Interference echo | Carry out tank mapping (Confirm distance parameter). |</p>
<table>
<thead>
<tr>
<th>Error</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| No change of measured value on filling / emptying | Interference echo from installations, nozzle or build-up on the antenna. | • Carry out tank mapping (Confirm distance parameter).  
• If necessary, clean antenna  
• If necessary, select better mounting position |
| If the surface is not calm (e.g. filling, emptying, agitator running), the measured value jumps sporadically to a higher level | Signal is weakened by the rough surface - the interference echoes are sometimes stronger. | • Carry out tank mapping (Confirm distance parameter).  
• Select "Tank type" parameter = "Process vessel with agitator" option.  
• Increase integration time (Expert → Sensor → Distance → Integration time)  
• Optimize orientation of the antenna  
• If necessary, select a better mounting position and/or larger antenna. |
| During filling/emptying the measured value jumps downwards | Multiple echoes | • Check Tank type parameter.  
• If possible, do not select central installation position.  
• If appropriate, use a stilling well. |
| Error message F941 or S941 "Echo lost" | Level echo is too weak. | • Check Medium group parameter.  
• If necessary, select a more detailed setting in Medium property parameter.  
• Optimize alignment of antenna  
• If necessary, select a better installation position and/or larger antenna. |
| Device displays a level when the tank is empty. | Interference echo | Carry out mapping over entire measuring range when the tank is empty (Confirm distance parameter). |
| Wrong slope of the level in the entire measuring range | Wrong tank type selected. | Set Tank type parameter correctly. |
12.2 Diagnostic information on local display

12.2.1 Diagnostic message

Faults detected by the self-monitoring system of the measuring device are displayed as a diagnostic message in alternation with the measured value display.

### Measured value display in alarm condition

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

### Diagnostic message

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>S</td>
</tr>
<tr>
<td>S801</td>
<td>Supply voltage</td>
</tr>
</tbody>
</table>

#### Status signals

- **F**  
  *Failure (F)* option
  
  A device error is present. The measured value is no longer valid.

- **C**  
  *Function check (C)* option
  
  The device is in service mode (e.g. during a simulation).

- **S**  
  *Out of specification (S)* option
  
  The device is operated:
  - Outside of its technical specifications (e.g. during startup or a cleaning)
  - Outside of the configuration carried out by the user (e.g. level outside configured span)

- **M**  
  *Maintenance required (M)* option
  
  Maintenance is required. The measured value is still valid.

#### Status symbol (symbol for event level)

- **Φ**  
  *Alarm* status
  
  The measurement is interrupted. The signal outputs take on the defined alarm condition. A diagnostic message is generated.

- **△**  
  *Warning* status
  
  The device continues to measure. A diagnostic message is generated.
Diagnostics and troubleshooting

The fault can be identified using the diagnostics event. The event text helps you by providing information about the fault. In addition, the corresponding symbol is displayed before the diagnostics event.

<table>
<thead>
<tr>
<th>Status symbol</th>
<th>Status signal</th>
<th>Event number</th>
<th>Event text</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\Delta)</td>
<td>S</td>
<td>441</td>
<td>Curr.output 1</td>
</tr>
</tbody>
</table>

Example: \(\Delta\ S \text{A0032904} \downarrow 441 \downarrow \text{Curr.output 1}\)

If two or more diagnostic messages are pending simultaneously, only the message with the highest priority is shown. Additional pending diagnostic messages can be shown in the Diagnostic list submenu.

Past diagnostic messages that are no longer pending are shown as follows:
- On the local display:
  - in the Event logbook submenu
- In FieldCare:
  - via the "Event List /HistoROM" function.

Operating elements

<table>
<thead>
<tr>
<th>Operating functions in menu, submenu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plus key</td>
</tr>
<tr>
<td>Enter key</td>
</tr>
</tbody>
</table>

Plus key:
Opens the message about the remedial measures.

Enter key:
Opens the operating menu.
12.2.2   Calling up remedial measures

The user is in the diagnostic message.

1. Press \( \triangleright \) (\( \bigtriangledown \)-Symbol).
   \( \Rightarrow \) Diagnostic list submenu opens.

2. Select the desired diagnostic event with \( \Delta \) or \( \bigtriangledown \) and press \( \bigtriangledown \).
   \( \Rightarrow \) The message for the remedial measures for the selected diagnostic event opens.

3. Press \( \Delta \) + \( \bigtriangledown \) simultaneously.
   \( \Rightarrow \) The message for the remedial measures closes.

The user is in the Diagnostics menu at an entry for a diagnostics event, e.g. in Diagnostic list submenu or in Previous diagnostics.

1. Press \( \bigtriangledown \).
   \( \Rightarrow \) The message for the remedial measures for the selected diagnostic event opens.

2. Press \( \Delta \) + \( \bigtriangledown \) simultaneously.
   \( \Rightarrow \) The message for the remedial measures closes.
12.3 Diagnostic event in the operating tool

If a diagnostic event is present in the device, the status signal appears in the top left status in the operating tool along with the corresponding symbol for event level in accordance with NAMUR NE 107:

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)

Calling up remedial measures

1. Navigate to the Diagnostics menu.
   - In the Actual diagnostics parameter, the diagnostic event is shown with event text.

2. On the right in the display range, hover the cursor over the Actual diagnostics parameter.
   - A tool tip with remedial measures for the diagnostic event appears.

12.4 Diagnostic list

In the Diagnostic list submenu, up to 5 currently pending diagnostic messages can be displayed. If more than 5 messages are pending, the messages with the highest priority are shown on the display.

Navigation path
Diagnostics → Diagnostic list

Calling up and closing the remedial measures

1. Press ⊘.
   - The message for the remedial measures for the selected diagnostic event opens.

2. Press ⊘ + ⊘ simultaneously.
   - The message about the remedial measures closes.
### 12.5 Overview of diagnostic events

<table>
<thead>
<tr>
<th>Diagnostic number</th>
<th>Short text</th>
<th>Remedy instructions</th>
<th>Status signal [from the factory]</th>
<th>Diagnostic behavior [from the factory]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diagnostic of sensor</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>046</td>
<td>Build-up detected</td>
<td>Clean sensor</td>
<td>F</td>
<td>Alarm (^1)</td>
</tr>
<tr>
<td>102</td>
<td>Sensor incompatible error</td>
<td>1. Restart device 2. Contact service</td>
<td>F</td>
<td>Alarm</td>
</tr>
<tr>
<td>151</td>
<td>Sensor electronic failure</td>
<td>Replace sensor electronic module</td>
<td>F</td>
<td>Alarm</td>
</tr>
<tr>
<td><strong>Diagnostic of electronic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>242</td>
<td>Software incompatible</td>
<td>1. Check software 2. Flash or change main electronics module</td>
<td>F</td>
<td>Alarm</td>
</tr>
<tr>
<td>252</td>
<td>Modules incompatible</td>
<td>1. Check electronic modules 2. Change I/O or main electronic module</td>
<td>F</td>
<td>Alarm</td>
</tr>
<tr>
<td>261</td>
<td>Electronic modules</td>
<td>1. Restart device 2. Check electronic modules 3. Change I/O Modul or main electronics</td>
<td>F</td>
<td>Alarm</td>
</tr>
<tr>
<td>262</td>
<td>Module connection</td>
<td>1. Check module connections 2. Change electronic modules</td>
<td>F</td>
<td>Alarm</td>
</tr>
<tr>
<td>270</td>
<td>Main electronic failure</td>
<td>Change main electronic module</td>
<td>F</td>
<td>Alarm</td>
</tr>
<tr>
<td>271</td>
<td>Main electronic failure</td>
<td>1. Restart device 2. Change main electronic module</td>
<td>F</td>
<td>Alarm</td>
</tr>
<tr>
<td>272</td>
<td>Main electronic failure</td>
<td>1. Restart device 2. Contact service</td>
<td>F</td>
<td>Alarm</td>
</tr>
<tr>
<td>273</td>
<td>Main electronic failure</td>
<td>1. Emergency operation via display 2. Change main electronics</td>
<td>F</td>
<td>Alarm</td>
</tr>
<tr>
<td>275</td>
<td>I/O module defective</td>
<td>Change I/O module</td>
<td>F</td>
<td>Alarm</td>
</tr>
<tr>
<td>276</td>
<td>I/O module faulty</td>
<td>1. Restart device 2. Change I/O module</td>
<td>F</td>
<td>Alarm</td>
</tr>
<tr>
<td>276</td>
<td>I/O module failure</td>
<td>F</td>
<td>Alarm</td>
<td></td>
</tr>
<tr>
<td>282</td>
<td>Data storage</td>
<td>1. Restart device 2. Contact service</td>
<td>F</td>
<td>Alarm</td>
</tr>
<tr>
<td>283</td>
<td>Memory content</td>
<td>1. Transfer data or reset device 2. Contact service</td>
<td>F</td>
<td>Alarm</td>
</tr>
<tr>
<td>311</td>
<td>Electronic failure</td>
<td>Maintenance required! 1. Do not perform reset 2. Contact service</td>
<td>M</td>
<td>Warning</td>
</tr>
<tr>
<td><strong>Diagnostic of configuration</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>410</td>
<td>Data transfer</td>
<td>1. Check connection 2. Retry data transfer</td>
<td>F</td>
<td>Alarm</td>
</tr>
<tr>
<td>411</td>
<td>Up-/download active</td>
<td>Up-/download active, please wait</td>
<td>C</td>
<td>Warning</td>
</tr>
<tr>
<td>412</td>
<td>Processing download</td>
<td>Download active, please wait</td>
<td>C</td>
<td>Warning</td>
</tr>
<tr>
<td>431</td>
<td>Trim 1 to 2</td>
<td>Carry out trim</td>
<td>C</td>
<td>Warning</td>
</tr>
<tr>
<td>435</td>
<td>Linearization</td>
<td>Check linearization table</td>
<td>F</td>
<td>Alarm</td>
</tr>
<tr>
<td>437</td>
<td>Configuration incompatible</td>
<td>1. Restart device 2. Contact service</td>
<td>F</td>
<td>Alarm</td>
</tr>
</tbody>
</table>
## Diagnostic and troubleshooting

### Micropilot FMR62 HART

<table>
<thead>
<tr>
<th>Diagnostic number</th>
<th>Short text</th>
<th>Remedy instructions</th>
<th>Status signal [from the factory]</th>
<th>Diagnostic behavior [from the factory]</th>
</tr>
</thead>
</table>
| 438               | Dataset                           | 1. Check data set file  
2. Check device configuration  
3. Up- and download new configuration | M                                | Warning                              |
| 441               | Current output 1 to 2             | 1. Check process  
2. Check current output settings | S                                | Warning                              |
| 484               | Failure mode simulation           | Deactivate simulation                                                                | C                                | Alarm                                |
| 485               | Simulation measured value         | Deactivate simulation                                                                | C                                | Warning                              |
| 491               | Current output 1 to 2 simulation  | Deactivate simulation                                                                | C                                | Warning                              |
| 494               | Switch output simulation          | Deactivate simulation switch output                                                 | C                                | Warning                              |
| 495               | Diagnostic event simulation       | Deactivate simulation                                                                | C                                | Warning                              |
| 585               | Simulation distance               | Deactivate simulation                                                                | C                                | Warning                              |
| 586               | Record map                        | Recording of mapping please wait                                                   | C                                | Warning                              |

### Diagnostic of process

<table>
<thead>
<tr>
<th>Event</th>
<th>Description</th>
<th>Remedy instructions</th>
<th>Status signal</th>
<th>Diagnostic behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>801</td>
<td>Energy too low</td>
<td>Increase supply voltage</td>
<td>S</td>
<td>Warning</td>
</tr>
</tbody>
</table>
| 803   | Current loop                       | 1. Check wiring  
2. Change I/O module | F              | Alarm             |
| 825   | Operating temperature              | 1. Check ambient temperature  
2. Check process temperature | S              | Warning             |
| 921   | Change of reference                | 1. Check reference configuration  
2. Check pressure  
3. Check sensor | S              | Warning             |
| 941   | Echo lost                          | Check parameter 'DC value' | S              | Warning             |
| 942   | In safety distance                 | 1. Check level  
2. Check safety distance  
3. Reset self holding | S              | Alarm             |
| 943   | In blocking distance               | Reduced accuracy  
Check level | S              | Warning             |
| 950   | Advanced diagnostic 1 to 4 occured | Maintain your diagnostic event | M              | Warning             |
| 952   | Foam detected                      | Check process conditions | F              | Alarm             |

1) Diagnostic behavior can be changed.

### 12.6 Event logbook

#### 12.6.1 Event history

A chronological overview of the event messages that have occurred is provided in the **Event list** submenu

---

2) This submenu is only available for operation via local display. In the case of operation via FieldCare, the event list can be displayed with the "Event List / HistoROM" functionality of FieldCare.
**Navigation path**
Diagnostics → Event logbook → Event list

A maximum of 100 event messages can be displayed in chronological order.

Die Ereignishistorie umfasst Einträge zu:
- Diagnostic events
- Information events

In addition to the operation time of its occurrence, each event is also assigned a symbol that indicates whether the event has occurred or is ended:
- Diagnostic event
  - ⚠: Event has occurred
  - ○: Event has ended
- Information event
  - ○: Event has occurred

**Calling up and closing the remedial measures**

1. Press ⬧
   - The message for the remedial measures for the selected diagnostic event opens.
2. Press ⬨ + ⬧ simultaneously.
   - The message about the remedial measures closes.

**12.6.2 Filtering the event logbook**

Using the **Filter options** parameter, you can define which category of event messages is displayed in the **Event list** submenu.

**Navigation path**
Diagnostics → Event logbook → Filter options

**Filter categories**
- All
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- Information

**12.6.3 Overview of information events**

<table>
<thead>
<tr>
<th>Info number</th>
<th>Info name</th>
</tr>
</thead>
<tbody>
<tr>
<td>I1000</td>
<td>-------(Device ok)</td>
</tr>
<tr>
<td>I1089</td>
<td>Power on</td>
</tr>
<tr>
<td>I1090</td>
<td>Configuration reset</td>
</tr>
<tr>
<td>I1091</td>
<td>Configuration changed</td>
</tr>
<tr>
<td>I1092</td>
<td>Embedded HistoROM deleted</td>
</tr>
<tr>
<td>I1110</td>
<td>Write protection switch changed</td>
</tr>
<tr>
<td>I1137</td>
<td>Electronic changed</td>
</tr>
<tr>
<td>I1151</td>
<td>History reset</td>
</tr>
<tr>
<td>I1154</td>
<td>Reset terminal voltage min/max</td>
</tr>
<tr>
<td>I1155</td>
<td>Reset electronic temperature</td>
</tr>
<tr>
<td>I1156</td>
<td>Memory error trend</td>
</tr>
<tr>
<td>I1157</td>
<td>Memory error event list</td>
</tr>
</tbody>
</table>
### 12.7 Firmware history

<table>
<thead>
<tr>
<th>Date</th>
<th>Firmware version</th>
<th>Modifications</th>
<th>Documentation (FMR62, HART)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.2017</td>
<td>01.00.zz</td>
<td>Original software</td>
<td>BA01619F/00/EN/01.17  1) GP01101F/00/EN/01.17</td>
</tr>
</tbody>
</table>

1) contains information on the Heartbeat wizards which are available in the latest DTM version for DeviceCare and FieldCare.

The firmware version can explicitly be ordered via the product structure. In this way it is possible to ensure compatibility of the firmware version with an existing or planned system integration.
13  Maintenance
The measuring device requires no special maintenance.

13.1  Exterior cleaning
When exterior-cleaning the device, always use cleaning agents that do not attack the surface of the housing and the seals.

13.2  Replacing seals
The process seals of the sensors (at the process connection) must be replaced periodically, particularly if molded seals (aseptic construction) are used. The period between changes depends on the frequency of cleaning cycles and on the temperature of the measured substance and the cleaning temperature.
14  Repairs

14.1  General information on repairs

14.1.1  Repair concept
The Endress+Hauser repair concept assumes that the devices have a modular design and that repairs can be done by the Endress+Hauser service or specially trained customers. Spare parts are contained in suitable kits. They contain the related replacement instructions.

For more information on service and spare parts, contact the Service Department at Endress+Hauser.

14.1.2  Repairs to Ex-approved devices
When carrying out repairs to Ex-approved devices, please note the following:
- Repairs to Ex-approved devices may only be carried out by trained personnel or by the Endress+Hauser Service.
- Comply with the prevailing standards, national Ex-area regulations, safety instructions (XA) and certificates.
- Only use original spare parts from Endress+Hauser.
- When ordering a spare part, please note the device designation on the nameplate. Only replace parts with identical parts.
- Carry out repairs according to the instructions. On completion of repairs, carry out the specified routine test on the device.
- Only Endress+Hauser Service may convert a certified device into a different certified variant.
- Document all repair work and conversions.

14.1.3  Replacement of an electronics module
If an electronics module has been replaced, it is not necessary to perform a new basic setup as the calibration parameters are stored in the HistoROM which is located in the housing. However, after exchanging the main electronics module it may be necessary to record a new mapping (interference echo suppression).

14.1.4  Replacement of a device
After a complete device or electronic module has been replaced, the parameters can be downloaded into the instrument again in one of the following ways:
- Via the display module
  Condition: The configuration of the old device has been saved in the display module → 143.
- Via FieldCare
  Condition: The configuration of the old device has been saved to the computer via FieldCare.

You can continue to measure without carrying out a new setup. Only a linearization and a tank map (interference echo suppression) have to be recorded again.
14.2  Spare parts

- A few interchangeable measuring device components are identified by a spare part nameplate. This contains information about the spare part.
- The connection compartment cover of the device contains a spare part nameplate that includes the following information:
  - A list of the most important spare parts for the measuring device, including their ordering information.
  - The URL for the W@M Device Viewer (www.endress.com/deviceviewer):
    There, all spare parts for the measuring device are listed, including the order code, and can be ordered. If available, the corresponding Installation Instructions can also be downloaded there.

![Example for spare part nameplate in connection compartment cover](image)

14.3  Return

The measuring device must be returned if it is need of repair or a factory calibration, or if the wrong measuring device has been delivered or ordered. Legal specifications require Endress+Hauser, as an ISO-certified company, to follow certain procedures when handling products that are in contact with the medium.

To ensure safe, swift and professional device returns, please refer to the procedure and conditions for returning devices provided on the Endress+Hauser website at http://www.endress.com/support/return-material

14.4  Disposal

Observe the following notes during disposal:
- Observe valid federal/national regulations.
- Ensure proper separation and reuse of the device components.
15 Accessories

15.1 Device-specific accessories

15.1.1 Weather protection cover

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weather protection</td>
<td>aversal; Dimensions: mm (in)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>22 Weather protection cover; Dimensions: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>37.8 mm (1.5 in)</td>
</tr>
<tr>
<td>b</td>
<td>54 mm (2.1 in)</td>
</tr>
</tbody>
</table>

The weather protection cover can be ordered together with the device (product structure, feature 620 "Accessory Enclosed", option PB "Weather Protection Cover"). Alternatively, it can be separately ordered as an accessory; order code 71162242.
## 15.1.2 Remote display FHX50

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Description</th>
</tr>
</thead>
</table>
| Remote display FHX50 | *Material:*  
  - Plastic PBT  
  - 316L/1.4404  

  *Degree of protection:* IP68 / NEMA 6P and IP66 / NEMA 4x  

  *Suitable for display modules:*  
  - SD02 (push buttons)  
  - SD03 (touch control)  

  *Connecting cable:*  
  - Cable supplied with device up to 30 m (98 ft)  
  - Standard cable supplied by customer up to 60 m (196 ft)  

  *Ambient temperature range:* −40 to 80 °C (−40 to 176 °F)  

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

- If the remote display should be used, order the device version "Prepared for display FHX50" (feature 030, version L or M). For the FHX50, you must select option A: "Prepared for display FHX50" under feature 050 "Measuring device version".
- If the device version "Prepared for display FHX50" was not originally ordered and a FHX50 display is to be retrofitted, you must select version B "Not prepared for display FHX50" under feature 050: "Measuring device version" when ordering the FHX50. In this case, a retrofit kit for the device is supplied with the FHX50. The kit can be used to prepare the device so that the FHX50 can be used.

Use of the FHX50 may be restricted for transmitters with an approval. A device can only be retrofitted with the FHX50 if the option L or M ("Prepared for FHX50") is listed under Basic specifications, item 4 "Display, operation" in the Safety Instructions (XA) for the device. Also pay attention to the Safety Instructions (XA) of the FHX50.

Retrofitting is not possible on transmitters with:  
- An approval for use in areas with flammable dust (dust ignition-proof approval)  
- Ex nA type of protection

For details, see document SD01007F.
15.1.3 Overvoltage protection

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
</thead>
</table>
| Overvoltage protection for 2-wire-devices | OVP10 (1 channel)  
OVP20 (2 channel) |

**Technical data**
- Resistance per channel: $2 \times 0.5 \Omega_{\text{max}}$
- Threshold DC voltage: 400 to 700 V
- Threshold impulse voltage: < 800 V
- Capacitance at 1 MHz: < 1.5 pF
- Nominal arrest impulse voltage (8/20 μs): 10 kA
- Suited for wire cross-sections: 0.2 to 2.5 mm² (24 to 14 AWG)

**Ordering with device**
The overvoltage protection module is preferably ordered with the device. See product structure, feature 610 'Accessory mounted', option NA 'Overvoltage protection'. Separate ordering of the module is only necessary if a device is to retrofitted with the overvoltage protection.

**Order code for retrofitting**
- For 1-channel devices (feature 020, option A)
  OVP10: 71128617
- For 2-channel devices (feature 020, option B, C, E or G)
  OVP20: 71128619

**Housing lid for retrofitting**
In order to keep the necessary safety distances, the housing lid needs to be replaced if the device is retrofitted with the overvoltage protection. Depending on the housing type, the order code of the suitable lid is as follows:
- GT18 housing: Lid 71185516
- GT19 housing: Lid 71185518
- GT20 housing: Lid 71185516

**Restrictions for retrofitting**
Depending on the approval of the transmitter the usage of the OVP module may be restricted. A device may only be retrofitted with an OVP module if the option NA (overvoltage protection) is quoted under Optional Specifications in the Safety Instructions (XA) pertaining to the device.

For details refer to SD01090F.

15.1.4 Gas-tight feedthrough

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas-tight feedthrough</td>
<td>Chemically inert glass feedthrough; prevents gases from entering the electronics housing</td>
</tr>
</tbody>
</table>

To order with the device: product structure, feature 610 'Accessory mounted', option NC 'Gas-tight feedthrough'
## 15.2 Communication-specific accessories

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commubox FXA195 HART</td>
<td>For intrinsically safe HART communication with FieldCare via the USB interface. For details refer to Technical Information TI00404F</td>
</tr>
<tr>
<td>Commubox FXA291</td>
<td>Connects Endress+Hauser field devices with CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a computer. Order code: 51516983 For details refer to Technical Information TI00405C</td>
</tr>
<tr>
<td>HART Loop Converter HMX50</td>
<td>Evaluates the dynamic HART variables and converts them to analog current signals or limit values. Order code: 71063562 For details refer to Technical Information TI00429F and Operating Instructions BA00371F</td>
</tr>
<tr>
<td>WirelessHART Adapter SWA70</td>
<td>Connects field devices to a WirelessHART network. The WirelessHART adapter can be mounted directly at a HART device and is easily integrated into an existing HART network. It ensures safe data transmission and can be operated in parallel with other wireless networks. For details refer to Operating Instructions BA00061S</td>
</tr>
<tr>
<td>Fieldgate FXA320</td>
<td>Gateway for remote monitoring of connected 4-20mA measuring devices via web browser. For details refer to Technical Information TI00025S and Operating Instructions BA00053S</td>
</tr>
<tr>
<td>Fieldgate FXA520</td>
<td>Gateway for remote diagnosis and parametrization of connected HART measuring devices via web browser. For details refer to Technical Information TI00025S and Operating Instructions BA00051S</td>
</tr>
<tr>
<td>Fieldgate FXA42</td>
<td>Programmable Ethernet, 2G/3G and WLAN gateway for data transmission between digital and analog measuring devices and inventory management software For details refer to Technical Information TI01297S and Brief Operating Instructions KA01246S</td>
</tr>
</tbody>
</table>
Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION fieldbus devices in the non-Ex area. For details, see Operating Instructions BA01202S.

Field Xpert SFX370 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION fieldbus devices in the non-Ex area and the Ex area. For details, see Operating Instructions BA01202S.

15.3 Service-specific accessories

FieldCare / DeviceCare is Endress+Hauser's FDT-based Plant Asset Management tool. Helps to configure and maintain all field devices of your plant. By supplying status information it also supports the diagnosis of the devices. For details refer to Operating Instructions BA00027S and BA00059S.

15.4 System components

Graphic Data Manager Memograph M provides information on all the relevant process variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on an SD card or USB stick. For details refer to Technical Information TI00133R and Operating Instructions BA00247R.

RN221N is an active barrier with power supply for safe separation of 4 to 20 mA current circuits. Provides bi-directional HART transmission. For details refer to Technical Information TI00073R and Operating Instructions BA00202R.

RNS221 is a transmitter supply for 2-wire sensors or transmitters exclusively for non-Ex areas. Provides bi-directional communication using the HART communication sockets. For details refer to Technical Information TI00081R and Operating Instructions KA00110R.
# 16 Operating menu

## 16.1 Overview of the operating menu (display module)

*Navigation ➔ Operating menu*

<table>
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<th>Page</th>
</tr>
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<tbody>
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<td>Language</td>
<td>137</td>
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<td><strong>Setup</strong></td>
<td>98</td>
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<tr>
<td>Device tag</td>
<td>98</td>
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<tr>
<td>Distance unit</td>
<td>98</td>
</tr>
<tr>
<td>Tank type</td>
<td>98</td>
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<tr>
<td>Medium group</td>
<td>99</td>
</tr>
<tr>
<td>Empty calibration</td>
<td>99</td>
</tr>
<tr>
<td>Full calibration</td>
<td>100</td>
</tr>
<tr>
<td>Level</td>
<td>101</td>
</tr>
<tr>
<td>Distance</td>
<td>101</td>
</tr>
<tr>
<td>Signal quality</td>
<td>101</td>
</tr>
<tr>
<td><strong>Mapping</strong></td>
<td>104</td>
</tr>
<tr>
<td>Confirm distance</td>
<td>104</td>
</tr>
<tr>
<td>Mapping end point</td>
<td>104</td>
</tr>
<tr>
<td>Present mapping</td>
<td>103</td>
</tr>
<tr>
<td>Record map</td>
<td>103</td>
</tr>
<tr>
<td>Distance</td>
<td>101</td>
</tr>
<tr>
<td>Prepare recording map</td>
<td>104</td>
</tr>
<tr>
<td><strong>Advanced setup</strong></td>
<td>106</td>
</tr>
<tr>
<td>Locking status</td>
<td>106</td>
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<tr>
<td>Access status display</td>
<td>107</td>
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</tbody>
</table>
### Operating menu

<table>
<thead>
<tr>
<th>Menu Item</th>
<th>Page</th>
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<tbody>
<tr>
<td>Enter access code</td>
<td>107</td>
</tr>
<tr>
<td>Level</td>
<td>108</td>
</tr>
<tr>
<td>Medium type</td>
<td>108</td>
</tr>
<tr>
<td>Medium property</td>
<td>108</td>
</tr>
<tr>
<td>Max. filling speed liquid</td>
<td>109</td>
</tr>
<tr>
<td>Max. draining speed liquid</td>
<td>109</td>
</tr>
<tr>
<td>Level unit</td>
<td>110</td>
</tr>
<tr>
<td>Blocking distance</td>
<td>110</td>
</tr>
<tr>
<td>Level correction</td>
<td>111</td>
</tr>
<tr>
<td>Tank/silo height</td>
<td>111</td>
</tr>
<tr>
<td>Linearization</td>
<td>113</td>
</tr>
<tr>
<td>Linearization type</td>
<td>115</td>
</tr>
<tr>
<td>Unit after linearization</td>
<td>116</td>
</tr>
<tr>
<td>Free text</td>
<td>117</td>
</tr>
<tr>
<td>Maximum value</td>
<td>118</td>
</tr>
<tr>
<td>Diameter</td>
<td>118</td>
</tr>
<tr>
<td>Intermediate height</td>
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<td>Table mode</td>
<td>119</td>
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<tr>
<td>Edit table</td>
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<tr>
<td>Level</td>
<td>120</td>
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<td>Customer value</td>
<td>121</td>
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<tr>
<td>Activate table</td>
<td>121</td>
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<td>Safety settings</td>
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<tr>
<td>Output echo lost</td>
<td>122</td>
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<tr>
<td>Value echo lost</td>
<td>122</td>
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</tbody>
</table>
Ramp at echo lost → 123
Blocking distance → 110

▶ SIL/WHG confirmation → 125

▶ Deactivate SIL/WHG → 126
  Reset write protection → 126
  Code incorrect → 126

▶ Current output 1 to 2 → 127
  Assign current output → 127
  Current span → 127
  Fixed current → 128
  Damping output → 128
  Failure mode → 129
  Failure current → 129
  Output current 1 to 2 → 130

▶ Switch output → 131
  Switch output function → 131
  Assign status → 131
  Assign limit → 132
  Assign diagnostic behavior → 132
  Switch-on value → 133
  Switch-on delay → 134
  Switch-off value → 134
  Switch-off delay → 135
  Failure mode → 135
### Operating menu

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<th>Feature</th>
<th>Page</th>
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</thead>
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<td>Switch status</td>
<td>135</td>
</tr>
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<td>Invert output signal</td>
<td>135</td>
</tr>
<tr>
<td><strong>Display</strong></td>
<td>137</td>
</tr>
<tr>
<td>Language</td>
<td>137</td>
</tr>
<tr>
<td>Format display</td>
<td>137</td>
</tr>
<tr>
<td>Value 1 to 4 display</td>
<td>139</td>
</tr>
<tr>
<td>Decimal places 1 to 4</td>
<td>139</td>
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<tr>
<td>Display interval</td>
<td>139</td>
</tr>
<tr>
<td>Display damping</td>
<td>140</td>
</tr>
<tr>
<td>Header</td>
<td>140</td>
</tr>
<tr>
<td>Header text</td>
<td>141</td>
</tr>
<tr>
<td>Separator</td>
<td>141</td>
</tr>
<tr>
<td>Number format</td>
<td>141</td>
</tr>
<tr>
<td>Decimal places menu</td>
<td>141</td>
</tr>
<tr>
<td>Backlight</td>
<td>142</td>
</tr>
<tr>
<td>Contrast display</td>
<td>142</td>
</tr>
<tr>
<td><strong>Configuration backup display</strong></td>
<td>143</td>
</tr>
<tr>
<td>Operating time</td>
<td>143</td>
</tr>
<tr>
<td>Last backup</td>
<td>143</td>
</tr>
<tr>
<td>Configuration management</td>
<td>143</td>
</tr>
<tr>
<td>Menu</td>
<td>Page</td>
</tr>
<tr>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Backup state</td>
<td>144</td>
</tr>
<tr>
<td>Comparison result</td>
<td>144</td>
</tr>
<tr>
<td><strong>Administration</strong></td>
<td>146</td>
</tr>
<tr>
<td>Define access code</td>
<td>148</td>
</tr>
<tr>
<td>Confirm access code</td>
<td>148</td>
</tr>
<tr>
<td>Device reset</td>
<td>146</td>
</tr>
<tr>
<td><strong>Diagnostics</strong></td>
<td>149</td>
</tr>
<tr>
<td>Actual diagnostics</td>
<td>149</td>
</tr>
<tr>
<td>Previous diagnostics</td>
<td>149</td>
</tr>
<tr>
<td>Operating time from restart</td>
<td>150</td>
</tr>
<tr>
<td>Operating time</td>
<td>143</td>
</tr>
<tr>
<td><strong>Diagnostic list</strong></td>
<td>151</td>
</tr>
<tr>
<td>Diagnostics 1 to 5</td>
<td>151</td>
</tr>
<tr>
<td><strong>Event logbook</strong></td>
<td>152</td>
</tr>
<tr>
<td>Filter options</td>
<td>152</td>
</tr>
<tr>
<td><strong>Event list</strong></td>
<td>152</td>
</tr>
<tr>
<td><strong>Device information</strong></td>
<td>153</td>
</tr>
<tr>
<td>Device tag</td>
<td>153</td>
</tr>
<tr>
<td>Serial number</td>
<td>153</td>
</tr>
<tr>
<td>Firmware version</td>
<td>153</td>
</tr>
<tr>
<td>Device name</td>
<td>153</td>
</tr>
<tr>
<td>Order code</td>
<td>154</td>
</tr>
<tr>
<td>Extended order code 1 to 3</td>
<td>154</td>
</tr>
<tr>
<td>Device revision</td>
<td>154</td>
</tr>
</tbody>
</table>
### Operating menu

#### Micropilot FMR62 HART

<table>
<thead>
<tr>
<th>Device ID</th>
<th>→  154</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device type</td>
<td>→  155</td>
</tr>
<tr>
<td>Manufacturer ID</td>
<td>→  155</td>
</tr>
</tbody>
</table>

#### Measured values

<table>
<thead>
<tr>
<th>Distance</th>
<th>→  156</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level linearized</td>
<td>→  117</td>
</tr>
<tr>
<td>Output current 1 to 2</td>
<td>→  130</td>
</tr>
<tr>
<td>Measured current 1</td>
<td>→  156</td>
</tr>
<tr>
<td>Terminal voltage 1</td>
<td>→  156</td>
</tr>
<tr>
<td>Sensor temperature</td>
<td>→  157</td>
</tr>
</tbody>
</table>

#### Data logging

<table>
<thead>
<tr>
<th>Assign channel 1 to 4</th>
<th>→  158</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logging interval</td>
<td>→  158</td>
</tr>
<tr>
<td>Clear logging data</td>
<td>→  159</td>
</tr>
</tbody>
</table>

#### Display channel 1 to 4

#### Simulation

<table>
<thead>
<tr>
<th>Assign measurement variable</th>
<th>→  162</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process variable value</td>
<td>→  163</td>
</tr>
<tr>
<td>Current output 1 to 2 simulation</td>
<td>→  163</td>
</tr>
<tr>
<td>Value current output 1 to 2</td>
<td>→  164</td>
</tr>
<tr>
<td>Switch output simulation</td>
<td>→  164</td>
</tr>
<tr>
<td>Switch status</td>
<td>→  164</td>
</tr>
<tr>
<td>Device alarm simulation</td>
<td>→  165</td>
</tr>
<tr>
<td>Feature</td>
<td>Page</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Diagnostic event category</td>
<td>165</td>
</tr>
<tr>
<td>Diagnostic event simulation</td>
<td>165</td>
</tr>
<tr>
<td><strong>Device check</strong></td>
<td>167</td>
</tr>
<tr>
<td>Start device check</td>
<td>167</td>
</tr>
<tr>
<td>Result device check</td>
<td>167</td>
</tr>
<tr>
<td>Last check time</td>
<td>167</td>
</tr>
</tbody>
</table>
16.2 Overview of the operating menu (operating tool)

Navigation  Operating menu

Setup

- Device tag  ➔ 98
- Distance unit  ➔ 98
- Tank type  ➔ 98
- Medium group  ➔ 99
- Empty calibration  ➔ 99
- Full calibration  ➔ 100
- Level  ➔ 101
- Distance  ➔ 101
- Signal quality  ➔ 101
- Confirm distance  ➔ 101
- Present mapping  ➔ 103
- Mapping end point  ➔ 103
- Record map  ➔ 103

Advanced setup

- Locking status  ➔ 106
- Access status tooling  ➔ 106
- Enter access code  ➔ 107

Level

- Medium type  ➔ 108
- Medium property  ➔ 108
- Max. filling speed liquid  ➔ 109
- Max. draining speed liquid  ➔ 109
<table>
<thead>
<tr>
<th>Menu</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level unit</td>
<td>110</td>
</tr>
<tr>
<td>Blocking distance</td>
<td>110</td>
</tr>
<tr>
<td>Level correction</td>
<td>111</td>
</tr>
<tr>
<td>Tank/silo height</td>
<td>111</td>
</tr>
<tr>
<td><strong>Linearization</strong></td>
<td></td>
</tr>
<tr>
<td>Linearization type</td>
<td>115</td>
</tr>
<tr>
<td>Unit after linearization</td>
<td>116</td>
</tr>
<tr>
<td>Free text</td>
<td>117</td>
</tr>
<tr>
<td>Level linearized</td>
<td>117</td>
</tr>
<tr>
<td>Maximum value</td>
<td>118</td>
</tr>
<tr>
<td>Diameter</td>
<td>118</td>
</tr>
<tr>
<td>Intermediate height</td>
<td>118</td>
</tr>
<tr>
<td>Table mode</td>
<td>119</td>
</tr>
<tr>
<td>Table number</td>
<td>120</td>
</tr>
<tr>
<td>Level</td>
<td>120</td>
</tr>
<tr>
<td>Level</td>
<td>121</td>
</tr>
<tr>
<td>Customer value</td>
<td>121</td>
</tr>
<tr>
<td>Activate table</td>
<td>121</td>
</tr>
<tr>
<td><strong>Safety settings</strong></td>
<td></td>
</tr>
<tr>
<td>Output echo lost</td>
<td>122</td>
</tr>
<tr>
<td>Value echo lost</td>
<td>122</td>
</tr>
<tr>
<td>Ramp at echo lost</td>
<td>123</td>
</tr>
<tr>
<td>Blocking distance</td>
<td>110</td>
</tr>
<tr>
<td><strong>SIL/WHG confirmation</strong></td>
<td>125</td>
</tr>
</tbody>
</table>

*Note: The page number for 121 indicates a page number error in the document.*
Deactivate SIL/WHG
- Reset write protection
- Code incorrect

Current output 1 to 2
- Assign current output
- Current span
- Fixed current
- Damping output
- Failure mode
- Failure current
- Output current 1 to 2

Switch output
- Switch output function
- Assign status
- Assign limit
- Assign diagnostic behavior
- Switch-on value
- Switch-on delay
- Switch-off value
- Switch-off delay
- Failure mode
- Switch status
- Invert output signal

Display
- Language
<table>
<thead>
<tr>
<th>Feature</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format display</td>
<td>137</td>
</tr>
<tr>
<td>Value 1 to 4 display</td>
<td>139</td>
</tr>
<tr>
<td>Decimal places 1 to 4</td>
<td>139</td>
</tr>
<tr>
<td>Display interval</td>
<td>139</td>
</tr>
<tr>
<td>Display damping</td>
<td>140</td>
</tr>
<tr>
<td>Header</td>
<td>140</td>
</tr>
<tr>
<td>Header text</td>
<td>141</td>
</tr>
<tr>
<td>Separator</td>
<td>141</td>
</tr>
<tr>
<td>Number format</td>
<td>141</td>
</tr>
<tr>
<td>Decimal places menu</td>
<td>141</td>
</tr>
<tr>
<td>Backlight</td>
<td>142</td>
</tr>
<tr>
<td>Contrast display</td>
<td>142</td>
</tr>
<tr>
<td><strong>Configuration backup display</strong></td>
<td>143</td>
</tr>
<tr>
<td>Operating time</td>
<td>143</td>
</tr>
<tr>
<td>Last backup</td>
<td>143</td>
</tr>
<tr>
<td>Configuration management</td>
<td>143</td>
</tr>
<tr>
<td>Backup state</td>
<td>144</td>
</tr>
<tr>
<td>Comparison result</td>
<td>144</td>
</tr>
<tr>
<td><strong>Administration</strong></td>
<td>146</td>
</tr>
<tr>
<td>Define access code</td>
<td>146</td>
</tr>
<tr>
<td>Device reset</td>
<td>146</td>
</tr>
<tr>
<td><strong>Diagnostics</strong></td>
<td>149</td>
</tr>
<tr>
<td>Actual diagnostics</td>
<td>149</td>
</tr>
<tr>
<td>Timestamp</td>
<td>149</td>
</tr>
<tr>
<td>Previous diagnostics</td>
<td>149</td>
</tr>
</tbody>
</table>
### Operating menu

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timestamp</td>
<td>150</td>
</tr>
<tr>
<td>Operating time from restart</td>
<td>150</td>
</tr>
<tr>
<td>Operating time</td>
<td>143</td>
</tr>
<tr>
<td>Diagnostic list</td>
<td>151</td>
</tr>
<tr>
<td>Diagnostics 1 to 5</td>
<td>151</td>
</tr>
<tr>
<td>Timestamp</td>
<td>151</td>
</tr>
<tr>
<td>Device information</td>
<td>153</td>
</tr>
<tr>
<td>Device tag</td>
<td>153</td>
</tr>
<tr>
<td>Serial number</td>
<td>153</td>
</tr>
<tr>
<td>Firmware version</td>
<td>153</td>
</tr>
<tr>
<td>Device name</td>
<td>153</td>
</tr>
<tr>
<td>Order code</td>
<td>154</td>
</tr>
<tr>
<td>Extended order code 1 to 3</td>
<td>154</td>
</tr>
<tr>
<td>Device revision</td>
<td>154</td>
</tr>
<tr>
<td>Device ID</td>
<td>154</td>
</tr>
<tr>
<td>Device type</td>
<td>155</td>
</tr>
<tr>
<td>Manufacturer ID</td>
<td>155</td>
</tr>
<tr>
<td>Measured values</td>
<td>156</td>
</tr>
<tr>
<td>Distance</td>
<td>156</td>
</tr>
<tr>
<td>Level linearized</td>
<td>117</td>
</tr>
<tr>
<td>Output current 1 to 2</td>
<td>130</td>
</tr>
<tr>
<td>Measured current 1</td>
<td>156</td>
</tr>
<tr>
<td>Terminal voltage 1</td>
<td>156</td>
</tr>
<tr>
<td>Sensor temperature</td>
<td>157</td>
</tr>
</tbody>
</table>
### Operating menu

<table>
<thead>
<tr>
<th>Data logging</th>
<th>→ 158</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assign channel 1 to 4</td>
<td></td>
</tr>
<tr>
<td>Logging interval</td>
<td></td>
</tr>
<tr>
<td>Clear logging data</td>
<td>→ 159</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Simulation</th>
<th>→ 162</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assign measurement variable</td>
<td>→ 163</td>
</tr>
<tr>
<td>Process variable value</td>
<td>→ 163</td>
</tr>
<tr>
<td>Current output 1 to 2 simulation</td>
<td>→ 163</td>
</tr>
<tr>
<td>Value current output 1 to 2</td>
<td>→ 164</td>
</tr>
<tr>
<td>Switch output simulation</td>
<td>→ 164</td>
</tr>
<tr>
<td>Switch status</td>
<td>→ 164</td>
</tr>
<tr>
<td>Device alarm simulation</td>
<td>→ 165</td>
</tr>
<tr>
<td>Diagnostic event simulation</td>
<td>→ 165</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Device check</th>
<th>→ 167</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start device check</td>
<td>→ 167</td>
</tr>
<tr>
<td>Result device check</td>
<td>→ 167</td>
</tr>
<tr>
<td>Last check time</td>
<td>→ 167</td>
</tr>
</tbody>
</table>

| Heartbeat                         | → 168 |
16.3  "Setup" menu

- : Marks the navigation path to the parameter via the display and operating module.
- : Marks the navigation path to the parameter via an operating tool (e.g. FieldCare).
- : Marks parameters which can be locked via the software locking → 45.

Device tag

Navigation  

Setup → Device tag

Description  
Enter a unique name for the measuring point to identify the device quickly within the plant.

Factory setting  
FMR6x

Distance unit

Navigation  

Setup → Distance unit

Description  
Select distance unit.

Selection  

<table>
<thead>
<tr>
<th>SI units</th>
<th>US units</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>ft</td>
</tr>
<tr>
<td>m</td>
<td>in</td>
</tr>
</tbody>
</table>

Factory setting  
m

Tank type

Navigation  

Setup → Tank type

Description  
Optimizes the signal filters for the respective tank type.

Selection  

- Open channel
- Sphere
- Storage vessel
- Process vessel standard
- Process vessel with agitator
- Wave guide antenna
- Workbench test

Factory setting  
Process vessel standard
Additional information

- **Workbench test** deactivates all filters. This option is intended for tests only.
- Depending on the antenna some of the options mentioned above may not be available or there may be additional options.

**Medium group**

**Navigation**

Set up → Medium group

**Prerequisite**

Medium type (→ 108) = Liquid

**Description**

Select medium group.

**Selection**

- Others
- Water based (DC >= 4)

**Factory setting**

Others

**Additional information**

This parameter roughly specifies the dielectric constant (DC) of the medium. For a more detailed definition of the DC use the Medium property parameter (→ 108).

The Medium group parameter (→ 99) presets the Medium property parameter (→ 108) as follows:

<table>
<thead>
<tr>
<th>Medium group (→ 99)</th>
<th>Medium property (→ 108)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Others</td>
<td>Unknown</td>
</tr>
<tr>
<td>Water based (DC &gt;= 4)</td>
<td>DC 4 ... 7</td>
</tr>
</tbody>
</table>

The Medium property parameter (→ 108) can be changed subsequently. However, when doing so, the Medium group parameter (→ 99) retains its value. Only the Medium property is relevant for the signal evaluation.

The measuring range may be reduced for small dielectric constants. For details refer to the Technical Information (TI) of the respective device.

**Empty calibration**

**Navigation**

Set up → Empty calibration

**Description**

Specify the distance E between the process connection and the minimum level (0%). This defines the starting point of the measuring range.

**User entry**

Depending on the antenna

**Factory setting**

Depending on the antenna
Additional information

The measuring range starts at the point at which the radar beam hits the tank or silo bottom. In the case of dished boiler ends or conical outlets levels below this point can not be measured.

Full calibration

Navigation

Setup → Full calibration

Description

Specify the distance F between the minimum level (0%) and maximum level (100%).

User entry

Depending on the antenna

Factory setting

Depending on the antenna

Additional information

Full calibration (F) for level measurements in liquids
Level

Navigation

Setup → Level

Description
Displays measured level L (before linearization).

Additional information

The unit is defined in the Level unit parameter (→ 110).

Distance

Navigation

Setup → Distance

Description
Distance between lower edge of flange or thread and medium surface.

Signal quality

Navigation

Setup → Signal quality

Description
Shows the quality of the evaluated level signal.

Confirm distance

Navigation

Setup → Confirm distance

Description
Specify, whether the measured distance matches the real distance. Depending on the selection the device automatically sets the range of mapping.
Selection

- Manual map
- Distance ok
- Distance unknown
- Distance too small *
- Distance too big *
- Tank empty
- Factory map

Factory setting

Distance unknown

Additional information

Meaning of the options

- **Manual map**
  To be selected if the range of mapping is to be defined manually in the **Mapping end point** parameter. In this case it is not necessary to confirm the distance.

- **Distance ok**
  To be selected if the measured distance matches the actual distance. The device performs a mapping.

- **Distance unknown**
  To be selected if the actual distance is unknown. A mapping can not be performed in this case.

- **Distance too small**
  To be selected if the measured distance is smaller than the actual distance. The device searches for the next echo and returns to the **Confirm distance** parameter. The distance is recalculated and displayed. The comparison must be repeated until the displayed distance matches the actual distance. After this, the recording of the map can be started by selecting **Distance ok**.

- **Distance too big**
  To be selected if the measured distance exceeds the actual distance. The device adjusts the signal evaluation and returns to the **Confirm distance** parameter. The distance is recalculated and displayed. The comparison must be repeated until the displayed distance matches the actual distance. After this, the recording of the map can be started by selecting **Distance ok**.

- **Tank empty**
  To be selected if the tank is completely empty. The device records a mapping covering the complete measuring range as defined by the **Tank/silo height** parameter. By default, **Tank/silo height** = **Empty calibration**.
  Take into account that in case of conical outlets, for example, a measurement is only possible up to the point at which the radar hits the bottom of the tank or silo. If the **Tank empty** option is used, **Empty calibration** (→ 99) and **Tank/silo height** may not reach below this point as otherwise the empty signal is suppressed.

- **Factory map**
  The factory map permanently stored in the device is used.

When operating via the display module, the measured distance is displayed together with this parameter for reference purposes.

If the teaching procedure with the **Distance too small** option or **Distance too big** option is quit before the distance has been confirmed, a map is not recorded and the teaching procedure is reset after 60 s.

* Visibility depends on order options or device settings

3) Only available for "Expert → Sensor → Echo tracking → Evaluation mode parameter " ≠ "History off option"
### Present mapping

<table>
<thead>
<tr>
<th>Navigation</th>
<th>Setup → Present mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Present end of mapping.</td>
</tr>
</tbody>
</table>

### Mapping end point

<table>
<thead>
<tr>
<th>Navigation</th>
<th>Setup → Mapping end point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>Confirm distance (→ 101) = Manual map or Distance too small</td>
</tr>
<tr>
<td>Description</td>
<td>Defines the new end point of the mapping.</td>
</tr>
<tr>
<td>User entry</td>
<td>0.0001 to 999 999.9 m</td>
</tr>
<tr>
<td>Factory setting</td>
<td>0.1 m</td>
</tr>
</tbody>
</table>

### Record map

<table>
<thead>
<tr>
<th>Navigation</th>
<th>Setup → Record map</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>Confirm distance = Manual map or Distance too small</td>
</tr>
<tr>
<td>Description</td>
<td>Starts the recording of the map.</td>
</tr>
<tr>
<td>Selection</td>
<td>• No</td>
</tr>
<tr>
<td></td>
<td>• Record map</td>
</tr>
<tr>
<td></td>
<td>• Overlay map</td>
</tr>
<tr>
<td></td>
<td>• Factory map</td>
</tr>
<tr>
<td></td>
<td>• Delete partial map</td>
</tr>
<tr>
<td>Factory setting</td>
<td>No</td>
</tr>
</tbody>
</table>
16.3.1 "Mapping" wizard

The Mapping wizard is only available when operating via the local display. When operating via an operating tool, all parameters concerning the mapping are located directly in the Setup menu (→ 98).

In the Mapping wizard two parameters are displayed simultaneously on the display module at any one time. The upper parameter can be edited, whereas the lower parameter is displayed for reference purposes only.

**Navigation**

Setup → Mapping

<table>
<thead>
<tr>
<th><strong>Confirm distance</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Navigation</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Mapping end point</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Navigation</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Record map</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Navigation</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Distance</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Navigation</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Prepare recording map</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Navigation</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>
**User interface**

- Init. recording
- In progress
- Finished
16.3.2  "Advanced setup" submenu

**Navigation**  
Setup → Advanced setup

**Description**  
Indicates the write protection with the highest priority that is currently active.

**User interface**
- Hardware locked
- SIL locked
- WHG locked
- Temporarily locked

**Additional information**
**Meaning and priorities of the types of write protection**
- **Hardware locked (priority 1)**
  The DIP switch for hardware locking is activated on the main electronics module. This locks write access to the parameters.
- **SIL locked (priority 2)**
  The SIL mode is activated. Writing access to the relevant parameters is denied.
- **WHG locked (priority 3)**
  The WHG mode is activated. Writing access to the relevant parameters is denied.
- **Temporarily locked (priority 4)**
  Write access to the parameters is temporarily locked on account of internal processes in progress in the device (e.g. data upload/download, reset etc.). The parameters can be modified as soon as the processes are complete.

On the display module, the - symbol appears in front of parameters that cannot be modified since they are write-protected.

---

**Access status tooling**

**Navigation**  
Setup → Advanced setup → Access status tooling

**Description**  
Indicates access authorization to parameters via operating tool (e.g. FieldCare).

**User interface**
- Operator
- Maintenance
- Service

**Additional information**
- The access authorization can be changed via the Enter access code parameter (→ 107).
- 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 (→ 106).
Access status display

Navigation  
Setup → Advanced setup → Access status display

Prerequisite  
The device has a local display.

Description  
Indicates access authorization to parameters via local display.

User interface  
• Operator
• Maintenance
• Service

Additional information  
1 If a symbol appears in front of a parameter, the parameter cannot be changed via the local display with the current access authorization.
2 The access authorization can be changed via the Enter access code parameter (→ 107).
3 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 (→ 106).

Enter access code

Navigation  
Setup → Advanced setup → Enter access code

Description  
Enter access code to disable write protection of parameters.

User entry  
0 to 9999

Additional information  
• For local operation, the customer-specific access code, which has been defined in the Define access code parameter (→ 146), has to be entered.
• If an incorrect access code is entered, the user retains his current access authorization.
• The write protection affects all parameters marked with the symbol in this document. On the local display, the symbol in front of a parameter indicates that the parameter is write-protected.
• If no key is pressed for 10 min, or the user switches from the navigation and editing mode back to the measured value display mode, the device automatically locks the write-protected parameters after another 60 s.
1 Please contact your Endress+Hauser Sales Center if you lose your access code.
"Level" submenu

Navigation  Setup → Advanced setup → Level

Medium type

Navigation  Setup → Advanced setup → Level → Medium type

Description  Specify medium type.

User interface
- Liquid
- Solid

Factory setting  Liquid

Additional information  This parameter determines the value of several other parameters and strongly influences the complete signal evaluation. Therefore, it is strongly recommended not to change the factory setting.

Medium property

Navigation  Setup → Advanced setup → Level → Medium property

Description  Specify relative dielectric constant $\varepsilon_r$ of the medium.

Selection
- Unknown
- DC 1.4 ... 1.6
- DC 1.6 ... 1.9
- DC 1.9 ... 2.5
- DC 2.5 ... 4
- DC 4 ... 7
- DC 7 ... 15
- DC > 15

Factory setting  Depending on the Medium type (→ 108) and Medium group (→ 99) parameters.

Additional information  Dependence on 'Medium type' and 'Medium group'

<table>
<thead>
<tr>
<th>Medium type (→ 108)</th>
<th>Medium group (→ 99)</th>
<th>Medium property (→ 108)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid</td>
<td>Unknown</td>
<td></td>
</tr>
<tr>
<td>Liquid</td>
<td>Water based (DC &gt;= 4)</td>
<td>DC 4 ... 7</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

For dielectric constants (DC values) of many media commonly used in various industries refer to:
- the Endress+Hauser DC manual (CP01076F)
- the Endress+Hauser "DC Values App" (available for Android and iOS)
Max. filling speed liquid

Navigation
Setup → Advanced setup → Level → Max. filling speed liquid

Prerequisite
Medium type (→ 108) = Liquid

Description
Select expected maximum filling speed.

Selection
- Slow < 1cm (0.4in) /min
- Medium < 10cm (4in) /min
- Standard < 1m (40in) /min
- Fast < 2m (80in) /min
- Very fast > 2m (80in) /min
- No filter / test

Factory setting
Depending on the Tank type parameter (→ 98)

Additional information
By selecting the maximum expected filling and draining speed the signal evaluation is automatically optimized for the process.

- The filling and draining speeds can be set separately as the filling and draining procedures may be different.
- With the No filter / test option all signal evaluation filters are deactivated. This option should exclusively be used for tests.
- Max. filling speed liquid is preset by Tank type. It can, however, be adjusted to the process in the vessel at any time. If Tank type is changed again, it may be necessary to repeat the fine adjustment.

Max. draining speed liquid

Navigation
Setup → Advanced setup → Level → Max. draining speed liquid

Prerequisite
Tank type (→ 98) = Liquid

Description
Select expected maximum draining speed.

Selection
- Slow < 1cm (0.4in) /min
- Medium < 10cm (4in) /min
- Standard < 1m (40in) /min
- Fast < 2m (80in) /min
- Very fast > 2m (80in) /min
- No filter / test

Factory setting
Depending on the Tank type parameter (→ 98)
Operating menu

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Additional information
By selecting the maximum expected filling and draining speed the signal evaluation is automatically optimized for the process.

- The filling and draining speeds can be set separately as the filling and draining procedures may be different.

- With the **No filter / test** option all signal evaluation filters are deactivated. This option should exclusively be used for tests.

- **Max. draining speed liquid** is preset by **Tank type**. It can, however, be adjusted to the process in the vessel at any time. If **Tank type** is changed again, it may be necessary to repeat the fine adjustment.

---

Level unit

**Navigation**

- Setup → Advanced setup → Level → Level unit

**Description**
Select level unit.

**Selection**

- **SI units**
  - %
  - m
  - mm

- **US units**
  - ft
  - in

**Factory setting**
%

**Additional information**
The level unit may differ from the distance unit defined in the **Distance unit** parameter (→ 98):

- The unit defined in the **Distance unit** parameter is used for the basic calibration (**Empty calibration** (→ 99) and **Full calibration** (→ 100)).
- The unit defined in the **Level unit** parameter is used to display the (unlinearized) level.

---

Blocking distance

**Navigation**

- Setup → Advanced setup → Level → Blocking distance

**Description**
Dead band in front of the process connection.

**User entry**
0 to 200 m

**Factory setting**
0 m

**Additional information**

<table>
<thead>
<tr>
<th>Read access</th>
<th>Operator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write access</td>
<td>Maintenance</td>
</tr>
</tbody>
</table>

No echos are evaluated within the blocking distance BD. Therefore, BD can be used to suppress interference echos in the vicinity of the antenna.
**Level correction**

**Navigation**

Setup → Advanced setup → Level → Level correction

**Description**

Specify level correction (if required).

**User entry**

-200 000.0 to 200 000.0 %

**Factory setting**

0.0 %

**Additional information**

The value specified in this parameter is added to the measured level (before linearization).

---

**Tank/silo height**

**Navigation**

Setup → Advanced setup → Level → Tank/silo height

**Description**

Specify total height of the tank or silo as measured from the process connection.

**User entry**

-999.9999 to 999.9999 m

**Factory setting**

Empty calibration (→ 99)

**Additional information**

If the parametrized measuring range differs significantly from the tank or silo height, it is recommended to enter the tank or silo height. Example: Continuous level monitoring in the upper third of a tank or silo.

For tanks with conical outlet, **Empty distance** should not be changed as in this type of applications **Empty calibration** (→ 99) is usually **not** much less-than the tank or silo height.
"Linearization" submenu

1. Selection of linearization type and unit
2. Configuration of the linearization
   A. Linearization type (→ 115) = None
   B. Linearization type (→ 115) = Linear
   C. Linearization type (→ 115) = Table
   D. Linearization type (→ 115) = Pyramid bottom
   E. Linearization type (→ 115) = Conical bottom
   F. Linearization type (→ 115) = Angled bottom
   G. Linearization type (→ 115) = Horizontal cylinder
   H. Linearization type (→ 115) = Sphere
L. Level before linearization (measured in distance units)
L'. Level linearized (→ 117) (corresponds to volume or weight)
M. Maximum value (→ 118)
d. Diameter (→ 118)
h. Intermediate height (→ 118)

27. Linearization: Transformation of the level and (if relevant) the interface height into a volume or weight; the transformation is dependent on the shape of the vessel.
Structure of the submenu on the display module

Navigation ➔ Setup → Advanced setup → Linearization

### Linearization

<table>
<thead>
<tr>
<th>Option</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linearization type</td>
<td>115</td>
</tr>
<tr>
<td>Unit after linearization</td>
<td>116</td>
</tr>
<tr>
<td>Free text</td>
<td>117</td>
</tr>
<tr>
<td>Maximum value</td>
<td>118</td>
</tr>
<tr>
<td>Diameter</td>
<td>118</td>
</tr>
<tr>
<td>Intermediate height</td>
<td>118</td>
</tr>
<tr>
<td>Table mode</td>
<td>119</td>
</tr>
</tbody>
</table>

### Edit table

<table>
<thead>
<tr>
<th>Option</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>120</td>
</tr>
<tr>
<td>Customer value</td>
<td>121</td>
</tr>
<tr>
<td>Activate table</td>
<td>121</td>
</tr>
</tbody>
</table>
Structure of the submenu in an operating tool (e.g. FieldCare)

Navigation → Setup → Advanced setup → Linearization

<table>
<thead>
<tr>
<th>Linearization type</th>
<th>→ 115</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit after linearization</td>
<td>→ 116</td>
</tr>
<tr>
<td>Free text</td>
<td>→ 117</td>
</tr>
<tr>
<td>Level linearized</td>
<td>→ 117</td>
</tr>
<tr>
<td>Maximum value</td>
<td>→ 118</td>
</tr>
<tr>
<td>Diameter</td>
<td>→ 118</td>
</tr>
<tr>
<td>Intermediate height</td>
<td>→ 118</td>
</tr>
<tr>
<td>Table mode</td>
<td>→ 119</td>
</tr>
<tr>
<td>Table number</td>
<td>→ 120</td>
</tr>
<tr>
<td>Level</td>
<td>→ 120</td>
</tr>
<tr>
<td>Level</td>
<td>→ 121</td>
</tr>
<tr>
<td>Customer value</td>
<td>→ 121</td>
</tr>
<tr>
<td>Activate table</td>
<td>→ 121</td>
</tr>
</tbody>
</table>
Description of parameters

Navigation  ➔ ➔ Setup → Advanced setup → Linearization

Linearization type

Description
Select linearization type.

Selection
- None
- Linear
- Table
- Pyramid bottom
- Conical bottom
- Angled bottom
- Horizontal cylinder
- Sphere

Factory setting
None

Additional information

28 Linearization types

A None
B Table
C Pyramid bottom
D Conical bottom
E Angled bottom
F Sphere
G Horizontal cylinder
Operating menu

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Meaning of the options

- None
  The level is transmitted in the level unit without linearization.

- Linear
  The output value (volume/weight) is directly proportional to the level L. This is valid, for example, for vertical cylinders. The following additional parameters have to be specified:
  - Unit after linearization (→ 116)
  - Maximum value (→ 118): Maximum volume or weight

- Table
  The relationship between the measured level L and the output value (volume/weight) is given by a linearization table consisting of up to 32 pairs of values "level - volume" or "level - weight", respectively. The following additional parameters have to be specified:
  - Unit after linearization (→ 116)
  - Table mode (→ 119)
    - For each table point: Level (→ 120)
    - For each table point: Customer value (→ 121)
  - Activate table (→ 121)

- Pyramid bottom
  The output value corresponds to the volume or weight in a silo with pyramid bottom. The following additional parameters have to be specified:
  - Unit after linearization (→ 116)
  - Maximum value (→ 118): Maximum volume or weight
  - Intermediate height (→ 118): The height of the pyramid

- Conical bottom
  The output value corresponds to the volume or weight in a tank with conical bottom. The following additional parameters have to be specified:
  - Unit after linearization (→ 116)
  - Maximum value (→ 118): Maximum volume or weight
  - Intermediate height (→ 118): The height of the conical part of the tank

- Angled bottom
  The output value corresponds to the volume or weight in a silo with an angled bottom. The following additional parameters have to be specified:
  - Unit after linearization (→ 116)
  - Maximum value (→ 118): Maximum volume or weight
  - Intermediate height (→ 118): Height of the angled bottom

- Horizontal cylinder
  The output value corresponds to the volume or weight in a horizontal cylinder. The following additional parameters have to be specified:
  - Unit after linearization (→ 116)
  - Maximum value (→ 118): Maximum volume or weight
  - Diameter (→ 118)

- Sphere
  The output value corresponds to the volume or weight in a spherical tank. The following additional parameters have to be specified:
  - Unit after linearization (→ 116)
  - Maximum value (→ 118): Maximum volume or weight
  - Diameter (→ 118)

<table>
<thead>
<tr>
<th>Unit after linearization</th>
</tr>
</thead>
</table>

Navigation

Setup → Advanced setup → Linearization → Unit after linearization

Prerequisite

Linearization type (→ 115) ≠ None

Description

Select unit of the linearized value.
### Selection

- **SI units**
  - STon
  - t
  - kg
  - cm³
  - dm³
  - m³
  - hl
  - l
  - %
  - mm
  - m

- **US units**
  - lb
  - UsGal
  - ft³
  - ft
  - in

- **Imperial units**
  - impGal

- **Custom-specific units**
  - Free text

### Factory setting

- %

### Additional information

The selected unit is only used to be indicated on the display. The measured value is **not** transformed according to the selected unit.

It is also possible to configure a distance-to-distance linearization, i.e. a transformation from the level unit to a different distance unit. To do so, select the **Linear** linearization mode. In order to define the new level unit, select the **Free text** option in the **Unit after linearization** parameter and enter the required unit into the **Free text** parameter (→  117).

### Free text

#### Navigation

Setup → Advanced setup → Linearization → Free text

#### Prerequisite

**Unit after linearization** (→  116) = Free text

#### Description

Enter unit symbol.

#### User entry

Up to 32 alphanumerical characters (letters, numbers, special characters)

#### Factory setting

Free text

### Level linearized

#### Navigation

Setup → Advanced setup → Linearization → Level linearized

#### Description

Displays linearized level.

#### Additional information

The unit is defined by the **Unit after linearization** parameter (→  116).
### Maximum value

**Navigation**
- Setup → Advanced setup → Linearization → Maximum value

**Prerequisite**
Linearization type (→ 115) has one of the following values:
- Linear
- Pyramid bottom
- Conical bottom
- Angled bottom
- Horizontal cylinder
- Sphere

**Description**
Specify the maximum content of the vessel (100%) measured in the units after linearization.

**User entry**
-50 000.0 to 50 000.0 %

**Factory setting**
100.0 %

### Diameter

**Navigation**
- Setup → Advanced setup → Linearization → Diameter

**Prerequisite**
Linearization type (→ 115) has one of the following values:
- Horizontal cylinder
- Sphere

**Description**
Specify tank diameter.

**User entry**
0 to 9 999.999 m

**Factory setting**
2 m

**Additional information**
The unit is defined in the Distance unit parameter (→ 98).

### Intermediate height

**Navigation**
- Setup → Advanced setup → Linearization → Intermediate height

**Prerequisite**
Linearization type (→ 115) has one of the following values:
- Pyramid bottom
- Conical bottom
- Angled bottom

**Description**
Specify intermediate height H.

**User entry**
0 to 200 m

**Factory setting**
0 m
Additional information

The unit is defined in the Distance unit parameter (→ 98).

Table mode

**Navigation**

Setup → Advanced setup → Linearization → Table mode

**Prerequisite**

Linearization type (→ 115) = Table

**Description**

Select editing mode of the linearization table.

**Selection**

- Manual
- Semiautomatic
- Clear table
- Sort table

**Factory setting**

Manual

**Additional information**

**Meaning of the options**

- **Manual**
  The level and the associated linearized value are entered manually for each linearization point.
- **Semiautomatic**
  The level is measured by the device for each linearization point. The associated linearized value is entered manually.
- **Clear table**
  Deletes the existing linearization table.
- **Sort table**
  Rearranges the linearization points into an ascending order.

**Conditions the linearization table must meet:**

- The table may consist of up to 32 pairs of values 'Level - Linearized Value'.
- The table must be monotonic (monotonically increasing or decreasing).
- The first linearization point must refer to the minimum level.
- The last linearization point must refer to the maximum level.

Before entering a linearization table, the values for Empty calibration (→ 99) and Full calibration (→ 100) must be set correctly.

If values of the table need to be changed after the full or empty calibration have been changed, a correct evaluation is only ensured if the existing table is deleted and the complete table is entered again. To do so delete the existing table (Table mode (→ 119) = Clear table). Then enter a new table.
How to enter the table

- Via FieldCare
  The table points can be entered via the Table number (→ ➞ 120), Level (→ ➞ 120) and Customer value (→ ➞ 121) parameters. As an alternative, the graphic table editor may be used: Device Operation → Device Functions → Additional Functions → Linearization (Online/Offline)

- Via local display
  Select the Edit table submenu to call up the graphic table editor. The table is displayed and can be edited line by line.

  The factory setting for the level unit is "%". If you want to enter the linearization table in physical units, you must select the appropriate unit in the Level unit parameter (→ ➞ 110) beforehand.

  If a decreasing table is entered, the values for 20 mA and 4 mA of the current output are interchanged. That means: 20 mA refers to the lowest level, whereas 4 mA refers to the highest level. If required, the current output can be inverted in the Measuring mode parameter.

<table>
<thead>
<tr>
<th>Table number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Navigation</strong></td>
</tr>
<tr>
<td><strong>Prerequisite</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>User entry</strong></td>
</tr>
<tr>
<td><strong>Factory setting</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level (Manual)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Navigation</strong></td>
</tr>
</tbody>
</table>
| **Prerequisite** | Linearization type (→ ➞ 115) = Table  
|                   | Table mode (→ ➞ 119) = Manual |
| **Description** | Enter level value of the table point (value before linearization). |
| **User entry** | Signed floating-point number |
| **Factory setting** | 0 % |
Level (Semiautomatic)

Navigation
- Setup → Advanced setup → Linearization → Level

Prerequisite
- Linearization type (→ 115) = Table
- Table mode (→ 119) = Semiautomatic

Description
Displays measured level (value before linearization). This value is transmitted to the table.

Customer value

Navigation
- Setup → Advanced setup → Linearization → Customer value

Prerequisite
Linearization type (→ 115) = Table

Description
Enter linearized value for the table point.

User entry
Signed floating-point number

Factory setting
0 %

Activate table

Navigation
- Setup → Advanced setup → Linearization → Activate table

Prerequisite
Linearization type (→ 115) = Table

Description
Activate (enable) or deactivate (disable) the linearization table.

Selection
- Disable
- Enable

Factory setting
Disable

Additional information
- **Meaning of the options**
  - **Disable**
    The measured level is not linearized.
    If Linearization type (→ 115) = Table at the same time, the device issues error message F435.
  - **Enable**
    The measured level is linearized according to the table.

![Tip]
When editing the table, the Activate table parameter is automatically reset to Disable and must be reset to Enable after the table has been entered.
"Safety settings" submenu

Navigation  Setup → Advanced setup → Safety settings

Output echo lost

Navigation  Setup → Advanced setup → Safety settings → Output echo lost

Description  Define the behavior of the output signal in case of a lost echo.

Selection
- Last valid value
- Ramp at echo lost
- Value echo lost
- Alarm

Factory setting  Last valid value

Additional information  Meaning of the options
- Last valid value
  The last valid value is kept in the case of a lost echo.
- Ramp at echo lost
  In the case of a lost echo the output value is continuously shifted towards 0% or 100%.
  The slope of the ramp is defined in the Ramp at echo lost parameter (→ 123).
- Value echo lost
  In the case of a lost echo the output assumes the value defined in the Value echo lost parameter (→ 122).
- Alarm
  In the case of a lost echo the device generates an alarm; see the Failure mode parameter (→ 129)

Value echo lost

Navigation  Setup → Advanced setup → Safety settings → Value echo lost

Prerequisite  Output echo lost (→ 122) = Value echo lost

Description  Define output value in case of a lost echo.

User entry  0 to 200 000.0 %

Factory setting  0.0 %

Additional information  Use the unit which has been defined for the measured value output:
- without linearization: Level unit (→ 110)
- with linearization: Unit after linearization (→ 116)

4) Only visible if "Linearization type (→ 115)" = 'None'
Ramp at echo lost

Navigation
Setup → Advanced setup → Safety settings → Ramp at echo lost

Prerequisite
Output echo lost (→ 122) = Ramp at echo lost

Description
Define the slope of the ramp in the case of a lost echo.

User entry
Signed floating-point number

Factory setting
0.0 %/min

Additional information

- The unit for the slope of the ramp is "percentage of the measuring range per minute" (%/min).
- For a negative slope of the ramp: The measured value is continuously decreased until it reaches 0%.
- For a positive slope of the ramp: The measured value is continuously increased until it reaches 100%.

Blocking distance

Navigation
Setup → Advanced setup → Safety settings → Blocking distance

Description
Specify blocking distance BD.

User entry
0 to 200 m

Factory setting
0 mm (0 in)

Additional information
Signals in the blocking distance are only evaluated if they have been outside the blocking distance when the device was switched on and move into the blocking distance due to a
level change during operation. Signals which are already in the blocking distance when the device is switched on, are ignored.

If required, a different behavior for signals in the blocking distance can be defined by the Endress+Hauser service.

![Blocking distance (BD) for liquid measurements](image_url)
"SIL/WHG confirmation" wizard

The **SIL/WHG confirmation** wizard is only available for devices with SIL or WHG approval (Feature 590: "Additional Approval", option LA: "SIL" or LC: "WHG overfill prevention") which are currently **not** in the SIL- or WHG-locked state.

The **SIL/WHG confirmation** wizard is required to lock the device according to SIL or WHG. For details refer to the "Functional Safety Manual" of the respective device, which describes the locking procedure and the parameters of the sequence.

**Navigation**  
Setup → Advanced setup → SIL/WHG confirmation
"Deactivate SIL/WHG" wizard

The **Deactivate SIL/WHG** wizard (→ 126) is only visible if the device is SIL-locked or WHG-locked. For details refer to the "Functional Safety Manual" of the respective device.

**Navigation**  
Setup → Advanced setup → Deactivate SIL/WHG

---

### Reset write protection

**Navigation**  
Setup → Advanced setup → Deactivate SIL/WHG → Reset write protection

**Description**  
Enter unlocking code.

**User entry**  
0 to 65535

**Factory setting**  
0

---

### Code incorrect

**Navigation**  
Setup → Advanced setup → Deactivate SIL/WHG → Code incorrect

**Description**  
Indicates that a wrong unlocking code has been entered. Select procedure.

**Selection**
- Reenter code
- Abort sequence

**Factory setting**  
Reenter code
"Current output 1 to 2" submenu

The Current output 2 submenu (→ 127) is only available for devices with two current outputs.

Navigation  Setup → Advanced setup → Current output 1 to 2

Assign current output 1 to 2

Navigation  Setup → Advanced setup → Current output 1 to 2 → Assign current output

Description  Select process variable for current output.

Selection
- Level linearized
- Distance
- Electronic temperature
- Relative echo amplitude
- Analog output adv. diagnostics 1
- Analog output adv. diagnostics 2

Additional information  Definition of the current range for the process variables

<table>
<thead>
<tr>
<th>Process variable</th>
<th>4 mA value</th>
<th>20 mA value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level linearized</td>
<td>0 % 1) or the associated linearized value</td>
<td>100 % 2) or the associated linearized value</td>
</tr>
<tr>
<td>Distance</td>
<td>0 (i.e. level is at the reference point)</td>
<td>Empty calibration (→ 99) (i.e. level is at 0 %)</td>
</tr>
<tr>
<td>Electronic temperature</td>
<td>-50 °C (-58 °F)</td>
<td>100 °C (212 °F)</td>
</tr>
<tr>
<td>Analog output adv. diagnostics 1/2</td>
<td></td>
<td>depending on the parametrization of the Advanced Diagnostics</td>
</tr>
</tbody>
</table>

1) the 0% level is defined by Empty calibration parameter (→ 99)
2) The 100% level is defined by Full calibration parameter (→ 100)

This can be done by the following parameters:
- Expert → Output → Current output 1 to 2 → Turn down
- Expert → Output → Current output 1 to 2 → 4 mA value
- Expert → Output → Current output 1 to 2 → 20 mA value

Current span

Navigation  Setup → Advanced setup → Current output 1 to 2 → Current span

Description  Select current range for process variable and alarm signal.

Selection
- 4...20 mA
- 4...20 mA NAMUR
- 4...20 mA US
- Fixed current

Factory setting  4...20 mA NAMUR
### Additional information

#### Meaning of the options

<table>
<thead>
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<th>Current range for process variable</th>
<th>Lower alarm signal level</th>
<th>Upper alarm signal level</th>
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</thead>
<tbody>
<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>
<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>
</tr>
<tr>
<td>4...20 mA US</td>
<td>3.9 to 20.8 mA</td>
<td>&lt; 3.6 mA</td>
<td>&gt; 21.95 mA</td>
</tr>
<tr>
<td>Fixed current</td>
<td>Constant current, defined in the <strong>Fixed current</strong> parameter (→ 128).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- In the case of an error, the output current assumes the value defined in the **Failure mode** parameter (→ 129).
- If the measured value is out of the measuring range, diagnostic message **Current output** is issued.

In a HART multidrop loop only one device can use the analog current to transmit a signal. For all other devices one must set:

- **Current span** = **Fixed current**
- **Fixed current** (→ 128) = 4 mA

#### Fixed current

**Navigation**

Setup → Advanced setup → Current output 1 to 2 → Fixed current

**Prerequisite**

Current span (→ 127) = Fixed current

**Description**

Define constant value of the current.

**User entry**

4 to 22.5 mA

**Factory setting**

4 mA

#### Damping output

**Navigation**

Setup → Advanced setup → Current output 1 to 2 → Damping output

**Description**

Define time constant $\tau$ for the damping of the output current.

**User entry**

0.0 to 999.9 s

**Factory setting**

0.0 s

**Additional information**

Fluctuations of the measured value affect the output current with an exponential delay, the time constant $\tau$ of which is defined in this parameter. With a small time constant the output reacts immediately to changes of the measured value. With a big time constant the reaction of the output is more delayed. For $\tau = 0$ (factory setting) there is no damping.
### Failure mode

**Navigation**
- Setup → Advanced setup → Current output 1 to 2 → Failure mode

**Prerequisite**
- Current span (→ 127) ≠ Fixed current

**Description**
Select behavior of the output current in case of an error.

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

**Factory setting**
Max.

**Additional information**
**Meaning of the options**
- **Min.**
  The current output adopts the value of the lower alarm level according to the Current span parameter (→ 127).
- **Max.**
  The current output adopts the value of the upper alarm level according to the Current span parameter (→ 127).
- **Last valid value**
  The current remains constant at the last value it had before the error occurred.
- **Actual value**
  The output current follows the actual measured value; the error is ignored.
- **Defined value**
  The output current assumes the value defined in the Failure current parameter (→ 129).

The error behavior of other output channels is not influenced by these settings but is defined in separate parameters.

### Failure current

**Navigation**
- Setup → Advanced setup → Current output 1 to 2 → Failure current

**Prerequisite**
- Failure mode (→ 129) = Defined value

**Description**
Enter current output value in alarm condition.

**User entry**
3.59 to 22.5 mA

**Factory setting**
22.5 mA
Output current 1 to 2

Navigation

Setup → Advanced setup → Current output 1 to 2 → Output current 1 to 2

Description

Displays calculated output current.
"Switch output" submenu

The Switch output submenu (→ 131) is only visible for devices with switch output. 5)

Navigation  ➤ Setup → Advanced setup → Switch output

Switch output function

Navigation  ➤ Setup → Advanced setup → Switch output → Switch output function

Description
Select function for switch output.

Selection
- Off
- On
- Diagnostic behavior
- Limit
- Digital Output

Factory setting
Off

Additional information  Meaning of the options
- Off
  The output is always open (non-conductive).
- On
  The output is always closed (conductive).
- Diagnostic behavior
  The output is normally closed and is only opened if a diagnostic event is present. The Assign diagnostic behavior parameter (→ 132) determines for which type of event the output is opened.
- Limit
  The output is normally closed and is only opened if a measured variable exceeds or falls below a defined limit. The limit values are defined by the following parameters:
  - Assign limit (→ 132)
  - Switch-on value (→ 133)
  - Switch-off value (→ 134)
- Digital Output
  The switching state of the output tracks the output value of a DI function block. The function block is selected in the Assign status parameter (→ 131).

The Off and On options can be used to simulate the switch output.

Assign status

Navigation  ➤ Setup → Advanced setup → Switch output → Assign status

Prerequisite
Switch output function (→ 131) = Digital Output

Description
Select device status for switch output.

5) Ordering feature 020 'Power supply; Output', option B, E or G
Selection

- Off
- Digital output AD 1
- Digital output AD 2
- Digital output AD 3
- Digital output AD 4

Factory setting

Off

Additional information

The Digital output AD 1 and Digital output AD 2 options refer to the Advanced Diagnostic Blocks. A switch signal generated in these blocks can be transmitted via the switch output.

Assign limit

Navigation

Setup → Advanced setup → Switch output → Assign limit

Prerequisite

Switch output function (→ 131) = Limit

Description

Select process variable for limit monitoring.

Selection

- Off
- Level linearized
- Distance
- Terminal voltage
- Electronic temperature
- Relative echo amplitude
- Area of incoupling

Factory setting

Off

Assign diagnostic behavior

Navigation

Setup → Advanced setup → Switch output → Assign diagnostic behavior

Prerequisite

Switch output function (→ 131) = Diagnostic behavior

Description

Select diagnostic behavior for switch output.

Selection

- Alarm
- Alarm or warning
- Warning

Factory setting

Alarm
Switch-on value

**Navigation**

Setup → Advanced setup → Switch output → Switch-on value

**Prerequisite**

Switch output function (→ 131) = Limit

**Description**

Enter measured value for the switch-on point.

**User entry**

Signed floating-point number

**Factory setting**

0

**Additional information**

The switching behavior depends on the relative position of the **Switch-on value** and **Switch-off value** parameters:

**Switch-on value > Switch-off value**

- The output is closed if the measured value is larger than **Switch-on value**.
- The output is opened if the measured value is smaller than **Switch-off value**.

**Switch-on value < Switch-off value**

- The output is closed if the measured value is smaller than **Switch-on value**.
- The output is opened if the measured value is larger than **Switch-off value**.
**Switch-on delay**

**Navigation**
Setup → Advanced setup → Switch output → Switch-on delay

**Prerequisite**
- Switch output function (→ 131) = Limit
- Assign limit (→ 132) = Off

**Description**
Define switch-on delay.

**User entry**
0.0 to 100.0 s

**Factory setting**
0.0 s

**Switch-off value**

**Navigation**
Setup → Advanced setup → Switch output → Switch-off value

**Prerequisite**
Switch output function (→ 131) = Limit

**Description**
Enter measured value for the switch-off point.

**User entry**
Signed floating-point number

**Factory setting**
0

**Additional information**
The switching behavior depends on the relative position of the Switch-on value and Switch-off value parameters; description: see the Switch-on value parameter (→ 133).
Switch-off delay

**Navigation**
- Setup → Advanced setup → Switch output → Switch-off delay

**Prerequisite**
- Switch output function (→ 131) = Limit
- Assign limit (→ 132) = Off

**Description**
Define switch-off delay.

**User entry**
0.0 to 100.0 s

**Factory setting**
0.0 s

Failure mode

**Navigation**
- Setup → Advanced setup → Switch output → Failure mode

**Description**
Define output behavior in alarm condition.

**Selection**
- Actual status
- Open
- Closed

**Factory setting**
Open

Switch status

**Navigation**
- Setup → Advanced setup → Switch output → Switch status

**Description**
Displays the current state of the switch output.

Invert output signal

**Navigation**
- Setup → Advanced setup → Switch output → Invert output signal

**Description**
Specify whether the output signal is to be inverted.

**Selection**
- No
- Yes

**Factory setting**
No
Additional information

Meaning of the options

• No
  The behavior of the switch output is as described above.

• Yes
  The states Open and Closed are inverted as compared to the description above.
"Display" submenu

The Display submenu is only visible if a display module is connected to the device.

Navigation:
Setup → Advanced setup → Display

Language

Navigation:
Setup → Advanced setup → Display → Language

Description:
Set display language.

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

Factory setting:
The language selected in feature 500 of the product structure.
If no language has been selected: English

Format display

Navigation:
Setup → Advanced setup → Display → Format display

Description:
Select how measured values are shown on the 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

* Visibility depends on order options or device settings
30. "Format display" = "1 value, max. size"

31. "Format display" = "1 bargraph + 1 value"

32. "Format display" = "2 values"

33. "Format display" = "1 value large + 2 values"

34. "Format display" = "4 values"

- The Value 1 to 4 display → 139 parameters specify which measured values are shown on the display and in which order.
- If more measured values are specified than the current display mode permits, the values alternate on the device display. The display time until the next change is configured in the Display interval parameter (→ 139).
**Value 1 to 4 display**

**Navigation**

Setup → Advanced setup → Display → Value 1 display

**Description**

Select the measured value that is shown on the local display.

**Selection**

- Level linearized
- Distance
- Absolute echo amplitude
- Relative echo amplitude
- Area of incoupling
- Current output 1
- Measured current
- Current output 2 *
- Terminal voltage
- Electronic temperature
- Analog output adv. diagnostics 1
- Analog output adv. diagnostics 2
- Analog output adv. diagnostics 3
- Analog output adv. diagnostics 4

**Factory setting**

- Value 1 display: Level linearized
- Value 2 display: None
- Value 3 display: None
- Value 4 display: None

**Decimal places 1 to 4**

**Navigation**

Setup → Advanced setup → Display → Decimal places 1

**Description**

Select the number of decimal places for the display value.

**Selection**

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

**Factory setting**

x.xx

**Additional information**

The setting does not affect the measuring or computational accuracy of the device.

**Display interval**

**Navigation**

Setup → Advanced setup → Display → Display interval

**Description**

Set time measured values are shown on display if display alternates between values.

* Visibility depends on order options or device settings
Operating menu

User entry 1 to 10 s
Factory setting 5 s
Additional information This parameter is only relevant if the number of selected measuring values exceeds the number of values the selected display format can display simultaneously.

Display damping

Navigation  Setup → Advanced setup → Display → Display damping
Description Define display reaction time to fluctuations in the measured value.
User entry 0.0 to 999.9 s
Factory setting 0.0 s

Header

Navigation  Setup → Advanced setup → Display → Header
Description Select header contents on local display.
Selection • Device tag
• Free text
Factory setting Device tag
Additional information 1 Position of the header text on the display

Meaning of the options
• Device tag
Is defined in the Device tag parameter (→ 98)
• Free text
Is defined in the Header text parameter (→ 141)
Header text

**Navigation**  
Setup → Advanced setup → Display → Header text

**Prerequisite**  
Header (→ 140) = Free text

**Description**  
Enter display header text.

**Factory setting**  
----------

**Additional information**  
The number of characters which can be displayed depends on the characters used.

Separator

**Navigation**  
Setup → Advanced setup → Display → Separator

**Description**  
Select decimal separator for displaying numerical values.

**Selection**  
• .  
• ,

**Factory setting**  
.  

Number format

**Navigation**  
Setup → Advanced setup → Display → Number format

**Description**  
Choose number format for the display.

**Selection**  
• Decimal  
• ft-in-1/16''

**Factory setting**  
Decimal

**Additional information**  
The ft-in-1/16'' option is only valid for distance units.

Decimal places menu

**Navigation**  
Setup → Advanced setup → Display → Decimal places menu

**Description**  
Select number of decimal places for the representation of numbers within the operating menu.
Operating menu

Micropilot FMR62 HART

Selection

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

Factory setting

x.xxx

Additional information

- Is only valid for numbers in the operating menu (e.g. Empty calibration, Full calibration), but not for the measured value display. The number of decimal places for the measured value display is defined in the Decimal places 1 to 4 → 139 parameters.
- The setting does not affect the accuracy of the measurement or the calculations.

Backlight

Navigation

Setup → Advanced setup → Display → Backlight

Prerequisite

The device has the SD03 local display (with optical keys).

Description

Switch the local display backlight on and off.

Selection

- Disable
- Enable

Factory setting

Disable

Additional information

Meaning of the options

- **Disable**
  - Switches the backlight off.
- **Enable**
  - Switches the backlight on.

Regarding the setting in this parameter the backlight may be automatically switched off by the device if the supply voltage is too low.

Contrast display

Navigation

Setup → Advanced setup → Display → Contrast display

Description

Adjust local display contrast setting to ambient conditions (e.g. lighting or reading angle).

User entry

20 to 80 %

Factory setting

Dependent on the display.

Additional information

- Setting the contrast via push-buttons:
  - Darker: press the and buttons simultaneously.
  - Brighter: press the and buttons simultaneously.
"Configuration backup display" submenu

This submenu is only visible if a display module is connected to the device.

The configuration of the device can be saved to the display module at a certain point of time (backup). The saved configuration can be restored to the device if required, e.g. in order to bring the device back into a defined state. The configuration can also be transferred to a different device of the same type using the display module.

Navigation ➔ Setup → Advanced setup → Configuration backup display

Operating time

Navigation ➔ Setup → Advanced setup → Configuration backup display → Operating time

Description Indicates how long the device has been in operation.

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

Additional information Maximum time
9 999 d (≈ 27 years)

Last backup

Navigation ➔ Setup → Advanced setup → Configuration backup display → Last backup

Description Indicates when the last data backup was saved to the display module.

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

Configuration management

Navigation ➔ Setup → Advanced setup → Configuration backup display → Configuration management

Description Select action for managing the device data in the display module.

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

Factory setting Cancel
### Additional information

#### Meaning of the options

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

- **Execute backup**
  A backup copy of the current device configuration in the HistoROM (built-in in the device) is saved to the display module of the device.

- **Restore**
  The last backup copy of the device configuration is copied from the display module to the HistoROM of the device.

- **Duplicate**
  The transmitter configuration is duplicated to another device using the transmitter display module. The following parameters, which characterize the individual measuring point, are **not** included in the transmitted configuration:
  - HART date code
  - HART short tag
  - HART message
  - HART descriptor
  - HART address
  - Device tag
  - Medium type

- **Compare**
  The device configuration saved in the display module is compared to the current device configuration of the HistoROM. The result of this comparison is displayed in the **Comparison result** parameter (→ 144).

- **Clear backup data**
  The backup copy of the device configuration is deleted from the display module of the device.

  > While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.

  > If an existing backup is restored to a different device using the Restore option, it may occur that some device functionalities are no longer available. In some cases even a device reset will not restore the original status.

  In order to transmit a configuration to a different device, the **Duplicate** option should always be used.

### Backup state

**Navigation**

Setup → Advanced setup → Configuration backup display → Backup state

**Description**

Displays which backup action is currently in progress.

### Comparison result

**Navigation**

Setup → Advanced setup → Configuration backup display → Comparison result

**Description**

Displays the comparison result between the device and the display.
Additional information

Meaning of the display options

- **Settings identical**
  The current device configuration of the HistoROM is identical to the backup copy in the display module.

- **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 data sets are incompatible and can not be compared.

ℹ️ To start the comparison, set **Configuration management (→ 143) = Compare.**

ℹ️ If the transmitter configuration has been duplicated from a different device by **Configuration management (→ 143) = Duplicate,** the new device configuration in the HistoROM is only partially identical to the configuration stored in the display module: Sensor specific properties (e.g. the mapping curve) are not duplicated. Thus, the result of the comparison will be **Settings not identical.**
"Administration" submenu

Navigation  
\\
Setup → Advanced setup → Administration

Define access code

Navigation  
\\
Setup → Advanced setup → Administration → Define access code

Description

Define release code for write access to parameters.

User entry

0 to 9999

Factory setting

0

Additional information

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

The write protection affects all parameters marked with the symbol in this document. On the local display, the symbol in front of a parameter indicates that the parameter is write-protected.

Once the access code has been defined, write-protected parameters can only be modified if the access code is entered in the Enter access code parameter (→  107).

Please contact your Endress+Hauser Sales Center if you lose your access code.

For display operation: The new access code is only valid after it has been confirmed in the Confirm access code parameter (→  148).

Device reset

Navigation  
\\
Setup → Advanced setup → Administration → Device reset

Description

Select to which state the device is to be reset.

Selection

- Cancel
- To factory defaults
- To delivery settings
- Of customer settings
- To transducer defaults
- Restart device

Factory setting

Cancel
Additional information

Meaning of the options

- **Cancel**
  No action

- **To factory defaults**
  All parameters are reset to the order-code specific factory setting.

- **To delivery settings**
  All parameters are reset to the delivery setting. The delivery setting may differ from the factory default if customer specific settings have been ordered.
  This option is only visible if customer specific settings have been ordered.

- **Of customer settings**
  All customer parameters are reset to their factory setting. Service parameters, however, remain unchanged.

- **To transducer defaults**
  Every measurement-related parameter is reset to its factory setting. Service parameters and communication-related parameters, however, remain unchanged.

- **Restart device**
  The restart resets every parameter which is stored in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.
"Define access code" wizard

The **Define access code** wizard is only available when operating via the local display. When operating via an operating tool, the **Define access code** parameter is located directly in the **Administration** submenu. The **Confirm access code** parameter is not available for operation via operating tool.

**Navigation**

Setup → Advanced setup → Administration → Define access code

---

### Define access code

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### Confirm access code

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</thead>
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<td>Confirm the entered access code.</td>
</tr>
<tr>
<td>User entry</td>
<td>0 to 9 999</td>
</tr>
<tr>
<td>Factory setting</td>
<td>0</td>
</tr>
</tbody>
</table>
16.4  "Diagnostics" menu

Navigation

Diagnostics → Actual diagnostics

Description

Displays current diagnostic message.

Additional information

The display consists of:
- Symbol for event behavior
- Code for diagnostic behavior
- Operating time of occurrence
- Event text

If several messages are active at the same time, the messages with the highest priority is displayed.

Information on what is causing the message, and remedy measures, can be viewed via the symbol on the display.

Timestamp

Navigation

Diagnostics → Timestamp

Description

Displays timestamp for the Actual diagnostics parameter (→ 149).

User interface

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

Previous diagnostics

Navigation

Diagnostics → Previous diagnostics

Description

Displays the last diagnostic message which has been active before the current message.

Additional information

The display consists of:
- Symbol for event behavior
- Code for diagnostic behavior
- Operating time of occurrence
- Event text

The condition displayed may still apply. Information on what is causing the message, and remedy measures, can be viewed via the symbol on the display.
# Operating menu

## Timestamp

**Navigation**

Diagnose → Timestamp

**Description**

Displays timestamp for the Previous diagnostics parameter (→ 149).

**User interface**

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

## Operating time from restart

**Navigation**

Diagnose → Operating time from restart

**Description**

Displays the time the device has been in operation since the last device restart.

**User interface**

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

## Operating time

**Navigation**

Diagnose → Operating time

**Description**

Indicates how long the device has been in operation.

**User interface**

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

**Additional information**

Maximum time

9999 d (≈ 27 years)
16.4.1 "Diagnostic list" submenu

*Navigation*  
Diagnoses → Diagnostic list → Diagnostic list

**Diagnostics 1 to 5**

**Navigation**  
Diagnoses → Diagnostic list → Diagnostics 1 to 5

**Description**  
Display the current diagnostics messages with the highest to fifth-highest priority.

**Additional information**  
The display consists of:
- Symbol for event behavior
- Code for diagnostic behavior
- Operating time of occurrence
- Event text

**Timestamp 1 to 5**

**Navigation**  
Diagnoses → Diagnostic list → Timestamp

**Description**  
Displays timestamp for the Diagnostics 1 to 5 parameter (→ 151).

**User interface**  
Days (d), hours (h), minutes (m), seconds (s)
16.4.2 "Event logbook" submenu

The Event logbook submenu is only available when operating via the local display. When operating via FieldCare, the event list can be displayed in the FieldCare function "Event List / HistoROM".

Navigation Diagnostics → Event logbook

Filter options

Navigation Diagnostics → Event logbook → Filter options

Description Select category (status signal) whose event messages are displayed in the events list.

Selection

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

Factory setting All

Additional information

- This parameter is only used for operation via the local display.
- The status signals are categorized according to NAMUR NE 107.

"Event list" submenu

The Event list submenu displays the history of past events of the category selected in the Filter options parameter (→ 152). A maximum of 100 events are displayed in chronological order.

The following symbols indicate whether an event has occurred or has ended:

- Event has occurred
- Event has ended

Information on what is causing the message, and remedy instructions, can be viewed via the -button.

Display format

- For event messages in category I: information event, event text, "recording event" symbol and time the event occurred
- For event messages in category F, M, C, S (status signal): diagnostics event, event text, "recording event" symbol and time the event occurred

Navigation Diagnostics → Event logbook → Event list
### Device tag

**Navigation**  
Diagnostics → Device information → Device tag

**Description**  
Enter the name for the measuring point.

**Factory setting**  
FMR6x

### Serial number

**Navigation**  
Diagnostics → Device information → Serial number

**Description**  
Displays serial number of the device.

**Additional information**  

- **Uses of the serial number**
  - To identify the device quickly, e.g. when contacting Endress+Hauser.
  - To obtain specific information on the device using the Device Viewer: [www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)
  
  The serial number is also indicated on the nameplate.

### Firmware version

**Navigation**  
Diagnostics → Device information → Firmware version

**Description**  
Indicates the installed Firmware version.

**User interface**  
xx.yy.zz

**Additional information**  

- For firmware versions differing only in the last two digits ("zz") there is no difference concerning functionality or operation.

### Device name

**Navigation**  
Diagnostics → Device information → Device name

**Description**  
Displays device name.
Operating menu

Micropilot FMR62 HART

Order code

**Navigation**

Diagnostics → Device information → Order code

**Description**

Displays order code of the device.

**Additional information**

The order code is generated from the extended order code, which defines all device features of the product structure. In contrast, the device features cannot be read directly from the order code.

Extended order code 1 to 3

**Navigation**

Diagnostics → Device information → Extended order code 1 to 3

**Description**

Displays the three parts of the extended order code.

**Additional information**

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

Device revision

**Navigation**

Diagnostics → Device information → Device revision

**Description**

Displays the device revision registered for this device at the HART Communication Foundation.

**Additional information**

The device revision is used to allocate the correct Device Description file (DD) to the device.

Device ID

**Navigation**

Diagnostics → Device information → Device ID

**Description**

Displays Device ID.

**Additional information**

In addition to the Device type and Manufacturer ID, the Device ID is part of the unique device identification (Unique ID) which characterizes each HART device unambiguously.
### Device type

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<th>Navigation</th>
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</thead>
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<tr>
<td>Description</td>
<td>Shows the device type with which the measuring device is registered with the HART Communication Foundation.</td>
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</table>

### Manufacturer ID

<table>
<thead>
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<tr>
<td>Factory setting</td>
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16.4.4 "Measured values" submenu

**Navigation**  ➜ Diagnostics ➜ Measured values

---

**Distance**

**Navigation**  ➜ Diagnostics ➜ Measured values ➜ Distance

**Description**
Distance between the lower edge of the flange or threaded connection and the level.

---

**Level linearized**

**Navigation**  ➜ Diagnostics ➜ Measured values ➜ Level linearized

**Description**
Displays linearized level.

**Additional information**

The unit is defined by the **Unit after linearization** parameter ➜ 116.

---

**Output current 1 to 2**

**Navigation**  ➜ Diagnostics ➜ Measured values ➜ Output current 1 to 2

**Description**
Displays calculated output current.

---

**Measured current 1**

**Navigation**  ➜ Diagnostics ➜ Measured values ➜ Measured current 1

**Prerequisite**
Only available for current output 1

**Description**
Displays the measured value of the output current.

---

**Terminal voltage 1**

**Navigation**  ➜ Diagnostics ➜ Measured values ➜ Terminal voltage 1

**Description**
Dipslays terminal voltage at the current output.
Sensor temperature

**Navigation**

Diagnostics → Measured values → Sensor temperature

**Description**

Indicates the current sensor temperature.
16.4.5 "Data logging" submenu

Navigation ➔ Diagnostics → Data logging

Assign channel 1 to 4

Description
Allocate a process variable to the respective data logging channel.

Selection
- Off
- Level linearized
- Distance
- Current output 1
- Measured current
- Current output 2 *
- Terminal voltage
- Electronic temperature
- Analog output adv. diagnostics 1
- Analog output adv. diagnostics 2
- Analog output adv. diagnostics 3
- Analog output adv. diagnostics 4

Factory setting
Off

Additional information
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

If 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 logged data are deleted if a new option is selected in this parameter.

Logging interval

Navigation ➔ Diagnostics → Data logging → Logging interval

Description
Define logging interval $t_{\log}$.

User entry
1.0 to 3 600.0 s

Factory setting
30.0 s

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

This parameter 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: $T_{\text{log}} = 1000 \cdot t_{\text{log}}$
- If 2 logging channels are used: $T_{\text{log}} = 500 \cdot t_{\text{log}}$
- If 3 logging channels are used: $T_{\text{log}} = 333 \cdot t_{\text{log}}$
- If 4 logging channels are used: $T_{\text{log}} = 250 \cdot t_{\text{log}}$

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).

⚠️ The logged data are deleted if this parameter is changed.

**Example**

**When using 1 logging channel**

- $T_{\text{log}} = 1000 \cdot 1 \text{ s} = 1000 \text{ s} \approx 16.5 \text{ min}$
- $T_{\text{log}} = 1000 \cdot 10 \text{ s} = 10000 \text{ s} \approx 2.75 \text{ h}$
- $T_{\text{log}} = 1000 \cdot 80 \text{ s} = 80000 \text{ s} \approx 22 \text{ h}$
- $T_{\text{log}} = 1000 \cdot 3600 \text{ s} = 3600000 \text{ s} \approx 41 \text{ d}$

---

**Clear logging data**

**Navigation**

[ ][ ][ ][ ] Diagnostics → Data logging → Clear logging data

**Description**

Initiate a deletion of the complete logging memory.

**Selection**

- Cancel
- Clear data

**Factory setting**

Cancel
"Display channel 1 to 4" submenu

The Display channel 1 to 4 submenus are only available for operation via the local display. When operating via FieldCare, the logging diagram can be displayed in the FieldCare function "Event List / HistoROM".

The Display channel 1 to 4 submenus invoke a diagram of the logging history of the respective channel.

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

To return to the operating menu, press ▼ and ▶ simultaneously.

Navigation  Diagnostics → Data logging → Display channel 1 to 4
16.4.6 "Simulation" submenu

The Simulation submenu is used to simulate specific measuring values or other conditions. This helps to check the correct configuration of the device and connected control units.

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</tr>
<tr>
<td>Device alarm simulation</td>
<td></td>
</tr>
</tbody>
</table>
### Description of parameters

*Navigation*  
Diagnostics → Simulation

---

#### Assign measurement variable

**Navigation**  
Diagnostics → Simulation → Assign measurement variable

**Description**  
Select process variable to be simulated.

**Selection**  
- Off
- Level
- Level linearized

**Factory setting**  
Off

**Additional information**  
- The value of the variable to be simulated is defined in the *Process variable value* parameter (→ 163).
- If *Assign measurement variable = Off*, a simulation is active. This is indicated by a diagnostic message of the *Function check (C)* category.

#### Process variable value

**Navigation**  
Diagnostics → Simulation → Process variable value

**Prerequisite**  
Assign measurement variable (→ 163) ≠ Off

**Description**  
Specify value of the process value being simulated.

**User entry**  
Signed floating-point number

**Factory setting**  
0

**Additional information**  
Downstream 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.

#### Current output 1 to 2 simulation

**Navigation**  
Diagnostics → Simulation → Current output 1 to 2 simulation

**Description**  
Switch the simulation of the current output on or off.

**Selection**  
- Off
- On

**Factory setting**  
Off
### Additional information
An active simulation is indicated by a diagnostic message of the *Function check (C)* category.

### Value current output 1 to 2

**Navigation**
- Diagnostics → Simulation → Value current output 1 to 2

**Prerequisite**
- Current output simulation (➔ 163) = On

**Description**
Enter current value for the simulation

**User entry**
3.59 to 22.5 mA

**Factory setting**
3.59 mA

**Additional information**
The current output assumes the value specified in this parameter. In this way, users can verify the correct adjustment of the current output and the correct function of connected control units.

### Switch output simulation

**Navigation**
- Diagnostics → Simulation → Switch output simulation

**Description**
Switch the simulation of the switch output on or off.

**Selection**
- Off
- On

**Factory setting**
Off

### Switch status

**Navigation**
- Diagnostics → Simulation → Switch status

**Prerequisite**
- Switch output simulation (➔ 164) = On

**Description**
Define the switch state to be simulated.

**Selection**
- Open
- Closed

**Factory setting**
Open

**Additional information**
The switch status assumes the value defined in this parameter. This helps to check correct operation of connected control units.
Device alarm simulation

Navigation  Diagnostics → Simulation → Device alarm simulation

Description  Switch alarm simulation on or off.

Selection  • Off
  • On

Factory setting  Off

Additional information  When selecting the On option, the device generates an alarm. This helps to check the correct output behavior of the device in the case of an alarm. An active simulation is indicated by the diagnostic message C484 Failure mode simulation.

Diagnostic event category

Navigation  Diagnostics → Simulation → Diagnostic event category

Description  Select event category for the simulation.

Selection  • Sensor
  • Electronics
  • Configuration
  • Process

Factory setting  Process

Additional information  Only events of the selected category are available in the selection list of the Diagnostic event simulation parameter (→ 165).

When operated via tool, all diagnostic messages are always available in Diagnostic event simulation. Therefore, Diagnostic event category appears only on the local display.

Diagnostic event simulation

Navigation  Diagnostics → Simulation → Diagnostic event simulation

Prerequisite  Access status display (→ 107)/Access status tooling (→ 106) = Service

Description  Select diagnostic event to be simulated.

Factory setting  Off
Additional information

When operated via the local display, the selection list can be filtered according to the event categories (Diagnostic event category parameter → 165)).
### 16.4.7 "Device check" submenu

*Navigation*  
Diagnostics → Device check

#### Start device check

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<tr>
<td><strong>Selection</strong></td>
<td></td>
</tr>
</tbody>
</table>
  - No  
  - Yes |
| **Factory setting** | No |

#### Result device check

| Navigation | Diagnostics → Device check → Result device check |

#### Last check time

| Navigation | Diagnostics → Device check → Last check time |
| **Description** | Indicates the operating time at which the last device check has been performed. |
16.4.8 "Heartbeat" submenu

The Heartbeat submenu is only available via FieldCare or DeviceCare. It contains the wizards which are part of the Heartbeat Verification and Heartbeat Monitoring application packages.

Detailed description
SD01870F

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