Operating Instructions

RIA15

Process indicator
Loop-powered 4 to 20 mA process indicator
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2 Endress+Hauser
1 About this document

1.1 Document conventions

1.1.1 Safety symbols

This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.

This symbol contains information on procedures and other facts which do not result in personal injury.

1.1.2 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>G</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>Potential equalization connection (PE: protective earth)</td>
</tr>
<tr>
<td></td>
<td>Ground terminals that must be connected to ground prior to establishing any other connections.</td>
</tr>
<tr>
<td></td>
<td>The ground terminals are located on the interior and exterior of the device:</td>
</tr>
<tr>
<td></td>
<td>• Interior ground terminal: potential equalization is connected to the supply network.</td>
</tr>
<tr>
<td></td>
<td>• Exterior ground terminal: device is connected to the plant grounding system.</td>
</tr>
</tbody>
</table>

1.1.3 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>Procedures, processes or actions that are permitted.</td>
</tr>
<tr>
<td>✔ ✔</td>
<td>Preferred</td>
</tr>
<tr>
<td>✔</td>
<td>Procedures, processes or actions that are preferred.</td>
</tr>
<tr>
<td>✘</td>
<td>Forbidden</td>
</tr>
<tr>
<td>✔</td>
<td>Procedures, processes or actions that are forbidden.</td>
</tr>
<tr>
<td>📘</td>
<td>Tip</td>
</tr>
<tr>
<td></td>
<td>Indicates additional information.</td>
</tr>
<tr>
<td>📜</td>
<td>Reference to documentation</td>
</tr>
<tr>
<td>📜</td>
<td>Reference to page</td>
</tr>
</tbody>
</table>
### 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>A, B, C, ...</td>
<td>Views</td>
</tr>
<tr>
<td>⚠️</td>
<td>Hazardous area</td>
</tr>
<tr>
<td>✔️</td>
<td>Safe area (non-hazardous area)</td>
</tr>
</tbody>
</table>

### Tool symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="AE011221" alt="Image" /></td>
<td>Flat-blade screwdriver</td>
</tr>
<tr>
<td><img src="AE011221" alt="Image" /></td>
<td>Allen key</td>
</tr>
<tr>
<td><img src="AE011221" alt="Image" /></td>
<td>Open-ended wrench</td>
</tr>
<tr>
<td><img src="AE011241" alt="Image" /></td>
<td>Torx screwdriver</td>
</tr>
</tbody>
</table>

### Documentation

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

- **Device Viewer** ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)): Enter the serial number from the nameplate
- **Endress+Hauser Operations app**: Enter serial number from nameplate or scan matrix code on nameplate.
1.2.1 Document function

The following documentation may be available depending on the version ordered:

<table>
<thead>
<tr>
<th>Document type</th>
<th>Purpose and content of the document</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Information (TI)</td>
<td>Planning aid for your device&lt;br&gt;The document contains all the technical data on the device and provides&lt;br&gt;an overview of the accessories and other products that can be ordered for&lt;br&gt;the device.</td>
</tr>
<tr>
<td>Brief Operating Instructions (KA)</td>
<td>Guide that takes you quickly to the 1st measured value&lt;br&gt;The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.</td>
</tr>
<tr>
<td>Operating Instructions (BA)</td>
<td>Your reference document&lt;br&gt;The Operating Instructions contain all the information that is required in&lt;br&gt;the various phases of the life cycle of the device: from product&lt;br&gt;identification, incoming acceptance and storage, to mounting,&lt;br&gt;connection, operation and commissioning through to troubleshooting,&lt;br&gt;maintenance and disposal.</td>
</tr>
<tr>
<td>Description of Device Parameters (GP)</td>
<td>Reference for your parameters&lt;br&gt;The document provides a detailed explanation of each individual&lt;br&gt;parameter. The description is aimed at those who work with the device&lt;br&gt;over the entire life cycle and perform specific configurations.</td>
</tr>
<tr>
<td>Safety Instructions (XA)</td>
<td>Depending on the approval, safety instructions for electrical equipment in hazardous areas are also supplied with the device. The Safety Instructions&lt;br&gt;are an integral part of the Operating Instructions.&lt;br&gt;Information on the Safety Instructions (XA) relevant to the device is&lt;br&gt;provided on the nameplate.</td>
</tr>
<tr>
<td>Supplementary device-dependent documentation (SD/FY)</td>
<td>Always comply strictly with the instructions in the relevant supplementary documentation. The supplementary documentation is an integral part of the device documentation.</td>
</tr>
</tbody>
</table>

2 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 Intended use

The process indicator displays analog process variables on its screen.

The device is powered via the 4 to 20 mA current loop and does not require an additional power supply.
The manufacturer accepts no liability for damages resulting from improper or non-intended use. The device must not be converted or modified in any way.

Panel-mounted device:
The device is designed for installation in a panel and must only be operated in an installed state.

Field device:
The device is designed for mounting in the field.

The device may be operated only under the permitted ambient conditions → 27.

2.3 Workplace safety

When working on and with the device:
▷ Wear the required personal protective equipment as per national regulations.

2.4 Operational safety

Damage to the device!
▷ Operate the device in proper technical condition and fail-safe condition only.
▷ The operator is responsible for the interference-free operation of the device.

Modifications to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers!
▷ If modifications are nevertheless 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 the repair of an electrical device.
▷ Use only original spare parts and accessories.

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. It also complies with the EU directives listed in the device-specific EU Declaration of Conformity. The manufacturer confirms this by affixing the CE mark to the device.

2.6 IT security

Our warranty is valid only if the product is installed and used as described in the Operating Instructions. The product is equipped with security mechanisms to protect it against any inadvertent changes to the settings.

IT security measures, which provide additional protection for the product and associated data transfer, must be implemented by the operators themselves in line with their security standards.
3  Incoming acceptance and product identification

3.1  Incoming acceptance

Proceed as follows on receipt of the device:

1. Check whether the packaging is intact.
2. If damage is discovered:
   Report all damage immediately to the manufacturer.
3. Do not install damaged components, as the manufacturer cannot otherwise
   guarantee the material resistance or compliance with the original safety
   requirements, and can also not be held responsible for the consequences that may
   result.
4. Compare the scope of delivery against the contents of your order.
5. Remove all the packaging material used for transportation.
6. Do the data on the nameplate match the ordering information on the delivery note?
7. Are the technical documentation and all other necessary documents provided, e.g.
   certificates?

If one of the conditions is not satisfied, contact your Sales Center.

3.2  Product identification

The following options are available for identification of the device:

- Nameplate specifications
- Enter the serial number from the nameplate in the Device Viewer
  (www.endress.com/deviceviewer): All the information on the device and an overview of
  the Technical Documentation provided 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 device and the technical documentation
  pertaining to the device is displayed.

3.2.1  Nameplate

The right device?

The nameplate provides you with the following information on the device:

- Manufacturer identification, device designation
- Order code
- Extended order code
- Serial number
- Tag name (TAG)
- Technical values: supply voltage, current consumption, ambient temperature,
  communication-specific data (optional)
- Degree of protection
- Approvals with symbols

- Compare the information on the nameplate with the order.
3.2.2  Name and address of manufacturer

<table>
<thead>
<tr>
<th>Name of manufacturer:</th>
<th>Endress+Hauser Wetzer GmbH + Co. KG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address of manufacturer:</td>
<td>Obere Wank 1, D-87484 Nesselwang or <a href="http://www.endress.com">www.endress.com</a></td>
</tr>
</tbody>
</table>

3.3  Certificates and approvals

- For certificates and approvals valid for the device: see the data on the nameplate
- Approval-related data and documents: [www.endress.com/deviceviewer](http://www.endress.com/deviceviewer) → (enter the serial number)

3.4  Storage and transport

Note the following:
The permitted storage temperature is –40 to 85 °C (–40 to 185 °F); it is possible to store the device at borderline temperatures for a limited period (48 hours maximum).

- Pack the device for storage and transportation in such a way that it is reliably protected against impact and external influences. The original packaging offers the best protection.

Avoid the following environmental influences during storage and transport:
- Direct sunlight
- Vibration
- Aggressive media

4  Mounting

4.1  Installation conditions

Permitted ambient temperature: –40 to 60 °C (–40 to 140 °F)

- At temperatures below –25 °C (–13 °F) the readability of the display can no longer be guaranteed.

4.2  Installation Instructions

- For device dimensions, see "Technical data".

4.2.1  Panel housing

- Degree of protection: IP65 front, IP20 rear (not evaluated by UL)
- Mounting position: horizontal
Installation in a panel with a panel cutout 92x45 mm (3.62x1.77 in), max. panel thickness 13 mm (0.51 in)

1. Slot the device into the panel cutout from the front.
2. Fit the mounting clips on the side of the housing and tighten the threaded rods (tightening torque: 0.4 to 0.6 Nm).

4.2.2 Field housing
- Degree of protection for aluminum housing: IP66/67, NEMA 4X (not evaluated by UL)
- Degree of protection for plastic housing: IP66/67 (not evaluated by UL)

Pipe mounting (with optional mounting kit)
The device can be mounted on a pipe with a diameter of up to 50.8 mm (2 in) with the mounting kit (optionally available).
Mounting the process indicator on a pipe

1. Release the 4 housing screws.
2. Open the housing.
3. Secure the mounting plate to the rear of the device with 4 screws supplied. The optional weather protection cover can be secured between the device and the mounting plate.
4. Guide the two gripper clamps through the mounting plate, fit them around the pipe and tighten.

Wall mounting

Wall mounting without a mounting kit

1. Open the housing.
2. Use the device as a stencil for 4 6 mm (0.24 in) bore holes, 99 mm (3.9 in) apart on the horizontal plane, 66 mm (2.6 in) apart on the vertical plane.
3. Secure the indicator on the wall with 4 screws.
4. Close the cover and tighten the housing screws.

Wall mounting with mounting kit (optionally available)
1. Use the mounting plate as a stencil for 2 6 mm (0.24 in) bore holes, 82 mm (3.23 in) apart, and secure the plate on the wall with 2 screws (not supplied).
2. Open the housing.
3. Secure the indicator on the mounting plate with the 4 screws supplied.
4. Close the cover and tighten the screws.

4.3 Post-installation check

4.3.1 Display unit in the panel-mount housing
- Is the seal undamaged?
- Are the mounting clips securely fastened on the housing of the device?
- Are the threaded rods properly tightened?
- Is the device located in the center of the panel cutout?

4.3.2 Display unit in the field housing
- Is the seal undamaged?
- Is the housing firmly screwed to the mounting plate?
- Is the mounting bracket firmly secured on the wall/pipe?
- Are the housing screws firmly tightened?

5 Wiring

⚠️ WARNING
Danger! Electric voltage
- The entire connection of the device must take place while the device is de-energized.
Only certified devices (optionally available) may be connected in the hazardous area
▶ Observe the corresponding notes and wiring diagrams in the Ex-specific supplement to these Operating Instructions.

**NOTICE**

Device destroyed if current too high
▶ The device must be powered only by a power unit with an energy-limited circuit in accordance with UL/EN/IEC 61010-1, Section 9.4 and the requirements in Table 18.
▶ Do not operate the device at a voltage source without a current limiter. Instead, operate the device only in the current loop with a transmitter.

- **Panel housing:**
  The terminals are located on the rear of the housing.

- **Field housing:**
  The terminals are located inside the housing. The device has two M16 cable entries. The housing must be opened for wiring purposes.

**Operation of the spring terminals**

1. If using rigid cables or flexible cables with a ferrule, insert only the cable into the terminal to connect. No tools required. If using flexible cables without ferrules, the spring mechanism must be activated as shown in step 2.
2. In order to loosen the cable, push the spring mechanism in completely using a screwdriver or other suitable tool and pull out the cable.

### 5.1 Quick wiring guide

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Positive connection, current measurement</td>
</tr>
<tr>
<td>-</td>
<td>Negative connection, current measurement (without backlighting)</td>
</tr>
<tr>
<td>LED</td>
<td>Negative connection, current measurement (with backlighting)</td>
</tr>
<tr>
<td>▼</td>
<td>Auxiliary terminals (electrically connected internally)</td>
</tr>
</tbody>
</table>
| —        | Functional grounding:
  • Panel-mounted device:
    Terminal on the rear of the housing
  • Field device:
    Terminal in the housing |
### 5.2 Wiring with switchable backlighting

An additional current-limited power source (e.g. active barrier from the Endress+Hauser RN product family) is required to implement switchable backlighting. This power source is used to supply the LED backlighting of up to seven RIA15 process indicators without generating an additional voltage drop in the measuring loop. The backlighting can be switched on and off using an external switch.

The following shows connection examples for the hazardous area. Wiring is similar for the non-hazardous area; however, it is not necessary to use Ex-certified devices.
5.2.1 Connection diagram for a process indicator

1. Process indicator RIA15
2. 3-wire connector, e.g. WAGO 221 series
3. 2-wire sensor
4. Terminal block on DIN rail
5. Active barrier (e.g. RN product family from Endress+Hauser)
6. 4 to 20 mA output to the control unit
7. Power supply
8. Power source (e.g. RN product family from Endress+Hauser)
9. Switch to activate backlighting
10. Power supply
5.2.2 Connection diagram for multiple process indicators

1. Process indicator RIA15
2. 3-wire connector, e.g. WAGO 221 series
3. 2-wire sensor
4. Terminal block on DIN rail
5. Active barrier (e.g. RN product family from Endress+Hauser)
6. 4 to 20 mA output to the control unit
7. Power supply
8. Power source (e.g. RN product family from Endress+Hauser)
9. Switch to activate backlighting
10. Power supply
11. Can be extended to 7 devices
5.3  Inserting the cable, field housing

Inserting the cable, field housing, connection without transmitter power supply (example)

1. Release the housing screws.
2. Open the housing.
3. Open the cable gland (M16) and insert the cable.
4. Connect the cable including the functional grounding and close the cable gland.

5.4  Connecting to functional grounding

5.4.1  Panel-mounted device

For EMC reasons, the functional grounding should always be connected. When the device is used in the hazardous area (with optional Ex approval) the connection is obligatory.
5.4.2 Field device

For EMC reasons, the functional grounding should always be connected. When used in the hazardous area (with optional Ex approval), the connection is obligatory and the field housing must be grounded via a grounding screw fitted on the outside of the housing.

5.5 Ensuring the degree of protection

5.5.1 Field housing

The devices meet all the requirements of IP67. It is absolutely essential to comply with the following points to ensure this protection is guaranteed after mounting or servicing the device:

- The housing seal must be clean and undamaged when inserted into the groove. The seal must be cleaned, dried or replaced if necessary.
- The cables used for connection must be of the specified outside diameter (e.g. M16 x 1.5, cable diameter 5 to 10 mm (0.2 to 0.39 in)).
- Mount the measuring device in such a way that the cable entries point downwards.
- Replace unused cable entries with dummy plugs.
- The housing cover and the cable entries must be firmly tightened.
5.5.2 Panel housing
The front of the device meets the requirements of IP65. It is absolutely essential to comply with the following points to ensure this protection is guaranteed after mounting or servicing the device:
- The seal between the front of the housing and the panel must be clean and undamaged. The seal must be cleaned, dried or replaced if necessary.
- The threaded rods of the panel mounting clips must be firmly tightened (tightening torque: 0.4 to 0.6 Nm).

5.6 Post-connection check

<table>
<thead>
<tr>
<th>Device condition and specifications</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are cables or the device damaged?</td>
<td>Visual inspection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical connection</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the supply current match the specifications on the nameplate?</td>
<td>-</td>
</tr>
<tr>
<td>Are the cables, incl. functional grounding, connected correctly and strain-relieved?</td>
<td>-</td>
</tr>
<tr>
<td>Field housing: Are the cable glands securely closed?</td>
<td>-</td>
</tr>
</tbody>
</table>

6 Operation

![Display and operating elements of the process indicator](image)

- Symbol: operating menu disabled
- Symbol: error
- Symbol: warning
- Operating keys "", "+", "E"
- 14-segment display for unit/TAG
- Bar graph with indicators for under range and over range
- 5-digit 7-segment display for measured value, digit height 17 mm (0.67 in)

The device is operated using three operating keys on the front of the housing. The device setup can be disabled with a 4-digit user code. If the setup is disabled, a padlock symbol appears on the display when an operating parameter is selected.

- **Enter key**; for calling up the operating menu, confirming the selection/configuration of parameters in the operating menu
- **Selecting and setting/changing values in the operating menu**; pressing the "+" and "+" keys simultaneously takes the user back up a menu level. The configured value is not saved
6.1 Operating functions

The operating functions of the process indicator are divided into the following menus. The individual parameters and settings are described in the "Commissioning" section.

If the operating menu is disabled by means of a user code, the individual menus and parameters can be displayed but not changed. To change a parameter, the user code must be entered. As the display unit can only display digits in the 7-segment display and not alphanumeric characters, the procedure for number parameters is different to that for text parameters.

If the operating position contains only numbers as parameters, the operating position is displayed in the 14-segment display and the configured parameter is displayed in the 7-segment display. To edit, press the 'E'-button followed by the user code.

If the operating position contains text parameters, only the operating position is initially displayed in the 14-segment display. If the 'E' button is pressed again, the configured parameter is displayed in the 14-segment display. To edit, press the '+' button followed by the user code.

| Setup (SETUP) | Basic device settings → § 20 |
| Diagnostics (DIAG) | Device information, display of error messages → § 20 |
| Expert (EXPRT) | Expert settings for the device setup → § 20 |

The Expert menu is protected from editing by an access code (default 0000).

7 Commissioning

7.1 Post-installation check and switching on the device

Perform the final checks before commissioning the device:

- Checklist for "post-installation check" → § 11.
- Checklist for "post-connection check" → § 18.

The device starts after being connected to the 4 to 20 mA circuit. The firmware version appears on the display during the start-up phase.

When the device is being commissioned for the first time, program the setup in accordance with the descriptions in the Operating Instructions.

If you are commissioning a device that is already configured or preset, the device immediately starts measuring the current as defined in the settings.

Remove the protective film from the display as this would otherwise affect the readability of the display.
## 7.2 Operating matrix

### Setup menu (SETUP)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values (default in bold)</th>
<th>Displayed when</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECIM</td>
<td>0 DEC</td>
<td></td>
<td>Number of decimal places for the 4 to 20 mA display mode.</td>
</tr>
<tr>
<td></td>
<td>1 DEC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 DEC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 DEC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 DEC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC__4</td>
<td>Numerical value –19999 to 99999 Default: 0.0</td>
<td>5-digit value (number of decimal places as configured under DECIM) for scaling the measured value at 4 mA Example: SC__4 = 0.0 → 0.0 displayed at measuring current 4 mA The unit selected under UNIT is used to display the value.</td>
<td></td>
</tr>
<tr>
<td>SC__20</td>
<td>Numerical value –19999 to 99999 Default: 100.0</td>
<td>5-digit value (number of decimal places as configured under DECIM) for scaling the measured value at 20 mA Example: SC__20 = 100.0 → 100.0 displayed at measuring current 20 mA The unit selected under UNIT is used to display the value.</td>
<td></td>
</tr>
<tr>
<td>UNIT</td>
<td>% °C °F K USER</td>
<td>Use this function to select the unit for displaying the value. If 'USER' is selected, a user-defined unit can be entered in the TEXT parameter.</td>
<td></td>
</tr>
<tr>
<td>TEXT</td>
<td>Customized text, 5-digit</td>
<td>User-defined unit, only visible if the 'USER' option has been selected under UNIT.</td>
<td></td>
</tr>
</tbody>
</table>

### Diagnostics menu (DIAG)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AERR</td>
<td>Read only</td>
<td>The current diagnostic message appears on the display. If several messages occur simultaneously, the message with the highest priority is shown on the display.</td>
</tr>
<tr>
<td>LERR</td>
<td>Read only</td>
<td>The last diagnostic message with the highest priority appears on the display.</td>
</tr>
<tr>
<td>FWVER</td>
<td>Read only</td>
<td>The firmware version appears on the display.</td>
</tr>
</tbody>
</table>

### Expert menu (EXPRT); a code must be entered

In addition to all the parameters in the Setup menu, the Expert menu also contains the parameters described in this table. If you call up the Expert menu, you will be asked to enter the user code (UCODE, default: 0000).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values (default in bold)</th>
<th>Displayed when</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSTM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UCODE</td>
<td>Numerical value 0000 to 9999 Default: 0000</td>
<td>4-digit user code With the user code it is possible to protect the device setup from unauthorized modifications. If the setup is disabled, a padlock symbol appears on the display when an operating parameter is selected. The user code is not active with the default setting '0000'. This means that setup parameters can be changed without entering the code. The code must always be entered for the Expert menu, even for the default setting.</td>
<td></td>
</tr>
<tr>
<td>FRSET</td>
<td>NO YES</td>
<td>Resets the device setup. The values are reset to the preset values for preconfigured devices, and to the default values for all other devices. Select &quot;YES&quot; and press &quot;E&quot; by way of confirmation to reset the device.</td>
<td></td>
</tr>
<tr>
<td>INPUT</td>
<td></td>
<td></td>
<td>The following parameters are available in addition to the parameters from the Setup menu.</td>
</tr>
</tbody>
</table>
In addition to all the parameters in the Setup menu, the Expert menu also contains the parameters described in this table. If you call up the Expert menu, you will be asked to enter the user code (UCODE, default: 0000).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values (default in bold)</th>
<th>Displayed when</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CURV</td>
<td>LINAR SQRT</td>
<td></td>
<td>Use this to select the calculation function for the process value LINAR (scaling with SC__4 and SC_20): Process value = (mA value - 4)/16 * (SC_20 - SC__4) + SC__4 + OFFST SQRT (square root extraction and scaling): Process value = Square root((mA value - 4)/16) * (SC_20 - SC__4) + SC__4 + OFFST Negative values when calculating the square root are set to 0. Example for SQRT: • mA value = 8.0 • SC__4 = 0.0 • SC_20 = 100.0 • OFFST = 0.0 Display value = 50.0</td>
</tr>
<tr>
<td>NAMUR</td>
<td>NO YES</td>
<td></td>
<td>Used for determining the maximum permissible errors in accordance with standard NAMUR NE 43 → 21</td>
</tr>
<tr>
<td>RNGLO</td>
<td>Numerical value</td>
<td>NAMUR = NO</td>
<td>Lower range limit. An error message is displayed if the measured current falls below this limit.</td>
</tr>
<tr>
<td>RNGHI</td>
<td>Numerical value</td>
<td>NAMUR = NO</td>
<td>Upper range limit. An error message is displayed if the measured current exceeds this limit.</td>
</tr>
<tr>
<td>OFFST</td>
<td>Numerical value</td>
<td>-19 999 to 99 999</td>
<td>Use this function to enter an offset value to display the measured value.</td>
</tr>
</tbody>
</table>

8 Troubleshooting

8.1 Error limits as per NAMUR NE 43

The device can be set to error limits as per NAMUR NE 43 → 20. The device displays an error message if a value is outside these limits.

<table>
<thead>
<tr>
<th>Current value</th>
<th>Error</th>
<th>Diagnostic code</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 3.6 mA</td>
<td>Under range</td>
<td>F100</td>
</tr>
<tr>
<td>3.6 mA &lt; x ≤ 3.8 mA</td>
<td>Unpermitted measured value</td>
<td>S901</td>
</tr>
<tr>
<td>20.5 mA ≤ x &lt; 21.0 mA</td>
<td>Unpermitted measured value</td>
<td>S902</td>
</tr>
<tr>
<td>&gt; 21.0 mA</td>
<td>Over range</td>
<td>F100</td>
</tr>
</tbody>
</table>

8.2 Diagnostic messages

If several errors are pending simultaneously, the device always displays the error with the highest priority.

1 = Highest priority

<table>
<thead>
<tr>
<th>Diagnostic number</th>
<th>Short text</th>
<th>Remedial action</th>
<th>Status signal</th>
<th>Diagnostic behavior</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnostics for the sensor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F100</td>
<td>Sensor error</td>
<td>• Check electrical wiring • Check the sensor • Check sensor settings</td>
<td>F</td>
<td>Alarm</td>
<td>6</td>
</tr>
</tbody>
</table>
### 8.3 Firmware history

**Release**

The firmware version on the nameplate and in the Operating Instructions indicates the device release: XX.YY.ZZ (example 1.02.01).

**XX**

- Change to main version
- No longer compatible The device and Operating Instructions change.

**YY**

- Change to functions and operation
- Compatible The Operating Instructions change.

**ZZ**

- Fixes and internal changes
- No changes to the Operating Instructions

<table>
<thead>
<tr>
<th>Date</th>
<th>Firmware version</th>
<th>Software changes</th>
<th>Documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/2012</td>
<td>ISU00XA: 1.00.01</td>
<td>Original software</td>
<td>BA01073K/09/EN/02.13</td>
</tr>
<tr>
<td>03/2013</td>
<td>ISU00XA: 1.01.00</td>
<td>HART® option, only relevant for HART® version</td>
<td>BA01073K/09/EN/03.13</td>
</tr>
<tr>
<td>07/2013</td>
<td>ISU00XA: 1.02.00</td>
<td>HART® level measurement, only relevant for HART® version</td>
<td>BA01073K/09/EN/04.13</td>
</tr>
<tr>
<td>11/2014</td>
<td>ISU00XA: 1.03.00</td>
<td>New EXP1-EXP4 parameter for HART® option, only relevant for HART® version</td>
<td>BA01073K/09/EN/05.14</td>
</tr>
<tr>
<td>05/2016</td>
<td>ISU00XA: 1.04.00</td>
<td>New menus and parameters in 'FMR20 basic commissioning', relevant only to HART® version</td>
<td>BA01073K/09/EN/06.15</td>
</tr>
<tr>
<td>07/2019</td>
<td>ISU00XA: 1.06.xx</td>
<td>Display of the mA value in 4–20 mA mode via + or - key held down</td>
<td>BA01073K/09/EN/07.23</td>
</tr>
</tbody>
</table>

### 9 Maintenance

No special maintenance work is required for the device.
9.1  Cleaning
A clean, dry cloth can be used to clean the device.

10  Repair

10.1  General information
The device has a modular design and repairs can be carried out by the customer's electrotechnical personnel. For more information on service and spare parts, contact the supplier.

10.1.1  Repair of Ex-certified devices
- Only specialist personnel or the manufacturer may undertake repairs on Ex-certified devices.
- The prevailing standards, national hazardous area regulations, safety instructions and certificates must be observed.
- Only use original spare parts from the manufacturer.
- When ordering spare parts, check the device designation on the nameplate. Parts may only be replaced by identical parts.
- Carry out repairs according to the instructions. On completion of the repair, carry out the routine test specified for the device.
- A certified device may only be converted to another certified device version by the manufacturer only.
- Document all repairs and modifications.

10.2  Spare parts
Spare parts currently available for the device can be found online at: http://www.products.endress.com/spareparts_consumables. Always quote the serial number of the device when ordering spare parts!
## 10.3 Return

The requirements for safe device return can vary depending on the device type and national legislation.

1. Refer to the web page for information:
   
   http://www.endress.com/support/return-material

   Select the region.

2. Return the device if repairs or a factory calibration are required, or if the wrong device was ordered or delivered.

## 10.4 Disposal

If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

## 11 Accessories

Various accessories, which can be ordered with the device or subsequently from Endress + Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.
11.1 Device-specific accessories

Weather protection cover

Mounting kit for wall/pipe mounting

Active barrier from the Endress+Hauser RN product family

M16 cable gland with integrated pressure compensation membrane
12 Technical data

12.1 Input

<table>
<thead>
<tr>
<th>Voltage drop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard device with 4 to 20 mA communication</td>
</tr>
<tr>
<td>Display lighting</td>
</tr>
</tbody>
</table>

Measured variable

The 4 to 20 mA current signal is the input variable. HART® signals are not affected.

Measuring range

4 to 20 mA (scalable, reverse polarity protection)
Max. input current 200 mA

12.2 Power supply

Supply voltage

NOTICE
SELV/Class 2 device

The device may be powered only by a power unit with an energy-limited circuit in accordance with UL/EN/IEC 61010-1 Paragraph 9.4 or Class 2 as per UL 1310: 'SELV or Class 2 circuit'.

The process indicator is loop-powered and does not require any external power supply. The voltage drop is 1 V in the standard version with 4 to 20 mA communication and an additional 2.9 V if display lighting is used.

12.3 Performance characteristics

Reference operating conditions

Reference temperature 25 °C ±5 °C (77 °F ±9 °F)
Humidity 20 to 60 % relative humidity

Maximum measured error

<table>
<thead>
<tr>
<th>Input</th>
<th>Range</th>
<th>Measured error of measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>4 to 20 mA</td>
<td>±0.1 %</td>
</tr>
<tr>
<td></td>
<td>Over range up to 22 mA</td>
<td></td>
</tr>
</tbody>
</table>

Resolution

Signal resolution > 13 bit

Influence of ambient temperature

< 0.02 %/K (0.01 %/°F) of measuring range

Warm-up period

10 minutes
12.4 Installation

Mounting location
- **Panel housing**
  The device is designed for use in a panel.
  Required panel cutout 45x92 mm (1.77x3.62 in)

- **Field housing**
  The field housing version is designed for use in the field. The unit is mounted directly on a wall, or on a pipe with a diameter of up to 2" with the aid of an optional mounting bracket. An optional weather protection cover protects the device from the effects of weather conditions.

Orientation
- **Panel housing**
  The orientation is horizontal.

- **Field housing**
  The device must be mounted in such a way that the cable entries point downwards.

12.5 Environment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature range</td>
<td>−40 to 60 °C (−40 to 140 °F)</td>
</tr>
<tr>
<td></td>
<td><strong>At temperatures below −25 °C (−13 °F) the readability of the display can no longer be guaranteed.</strong></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>−40 to 85 °C (−40 to 185 °F)</td>
</tr>
<tr>
<td>Climate class</td>
<td>IEC 60654-1, Class B2</td>
</tr>
<tr>
<td>Operating altitude</td>
<td>Up to 5 000 m (16 400 ft) above MSL in accordance with IEC61010-1</td>
</tr>
<tr>
<td>Degree of protection</td>
<td><strong>Panel housing</strong></td>
</tr>
<tr>
<td></td>
<td>IP65 at front, IP20 at rear</td>
</tr>
<tr>
<td></td>
<td><strong>Field housing</strong></td>
</tr>
<tr>
<td></td>
<td>Aluminum housing: degree of protection IP66/67, NEMA 4x</td>
</tr>
<tr>
<td></td>
<td>Plastic housing: degree of protection IP66/67</td>
</tr>
<tr>
<td>Electromagnetic compatibility</td>
<td><strong>Interference immunity:</strong></td>
</tr>
<tr>
<td></td>
<td>As per IEC61326 (Industrial Environments) / NAMUR NE 21</td>
</tr>
<tr>
<td></td>
<td>Maximum measured error &lt; 1 % o. MR</td>
</tr>
<tr>
<td></td>
<td><strong>Interference emission:</strong></td>
</tr>
<tr>
<td></td>
<td>As per IEC61326, Class B</td>
</tr>
<tr>
<td>Electrical safety</td>
<td>Class III, overvoltage protection category II, pollution degree 2</td>
</tr>
</tbody>
</table>
12.6 Mechanical construction

Design, dimensions

Panel-mount housing

Required panel cutout 45x92 mm (1.77x3.62 in), max. panel thickness 13 mm (0.51 in).

Field housing

Weight

Panel-mount housing
115 g (0.25 lb.)

Field housing
- Aluminum: 520 g (1.15 lb)
- Plastic: 300 g (0.66 lb)

Materials

Panel-mount housing
- Front: aluminum
- Rear panel: polycarbonate PC
### 12.7 Operability

**Local operation**

The device is operated with the 3 operating keys on the front of the housing. The device setup can be disabled with a 4-digit user code. If the setup is disabled, a padlock symbol appears on the display when an operating parameter is selected.

| Enter key | Enter key; calling up the operating menu, confirming the option/setting parameters in the operating menu |
| Selecting and setting values in the operating menu; pressing the − and + keys simultaneously takes the user back up a menu level. The configured value is not saved (ESC) |

### 12.8 Certificates and approvals

Current certificates and approvals for the product are available at [www.endress.com](http://www.endress.com) on the relevant product page:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select Downloads.

| Functional safety | A SIL version of the device is optionally available. It can be used in safety equipment in accordance with IEC 61508 up to SIL 2. Refer to Safety Manual FY01098K for the use of the device in safety instrumented systems according to IEC 61508. |
| Marine approval | Marine approval (optional) |
| UL approval | More information under UL Product iq™, search for keyword "E225237" |
| Other standards and guidelines | The manufacturer confirms compliance with all the relevant external standards and guidelines. |