Operating Instructions
Levelflex FMP55
FOUNDATION Fieldbus
Guided wave radar
1. Order code
2. www.endress.com/deviceviewer
3. Endress+Hauser Operations App
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1 Important document information

1.1 Purpose of this document
These Operating Instructions contain all the information that is required in the 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

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

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

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

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

1.2.2 Electrical symbols

~
Alternating current

≈
Direct current and alternating current

−−−−
Direct current

\(\)
Ground connection

A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.

接地 (PE)
Ground terminals that must be connected to ground prior to establishing any other connections.

The ground terminals are located on the interior and exterior of the device:
- Interior ground terminal: protective earth is connected to the mains supply.
- Exterior ground terminal: device is connected to the plant grounding system.

1.2.3 Tool symbols

️️
Phillips head screwdriver
Flat blade screwdriver

Torx screwdriver

Allen key

Open-ended wrench

1.2.4 Symbols for certain types of information and graphics

Permitted
Procedures, processes or actions that are permitted

Preferred
Procedures, processes or actions that are preferred

Forbidden
Procedures, processes or actions that are forbidden

Tip
Indicates additional information

Reference to documentation

Reference to graphic

Notice or individual step to be observed

Series of steps

Result of a step

Visual inspection

Operation via operating tool

Write-protected parameter

1, 2, 3, ...
Item numbers

A, B, C, ...
Views

Safety instructions
Observe the safety instructions contained in the associated Operating Instructions

Temperature resistance of the connection cables
Specifies the minimum value of the temperature resistance of the connection cables
1.3  Documentation

The following types of documentation are available in the Download Area of the Endress + Hauser website (www.endress.com/downloads):

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

- **Device Viewer** (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.

1.3.1  Technical Information (TI)

**Planning aid**
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.

1.3.2  Brief Operating Instructions (KA)

**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.

1.3.3  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.

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

1.3.4  Functional Safety Manual (FY)

Depending on the SIL approval, the Functional Safety Manual (FY) is an integral part of the Operating Instructions and applies in addition to the Operating Instructions, Technical Information and ATEX Safety Instructions.

The different requirements that apply for the protective function are described in the Functional Safety Manual (FY).

1.4  Terms and abbreviations

**BA**
Document type 'Operating Instructions'

**KA**
Document type 'Brief Operating Instructions'

**TI**
Document type 'Technical Information'

**SD**
Document type 'Special Documentation'

**XA**
Document type 'Safety Instructions'

**PN**
Nominal pressure

**MWP**
Maximum working pressure
The MWP is indicated 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

$\varepsilon_r$ (Dk value)
Relative dielectric constant

PLC
Programmable logic controller (PLC)

CDI
Common Data Interface

Operating tool
The term ‘operating tool’ is used in place of the following operating software:
SmartBlue (app), for operation using an Android or iOS smartphone or tablet

BD
Blocking Distance; no signals are analyzed within the BD.

PLC
Programmable logic controller (PLC)

CDI
Common Data Interface

PFS
Pulse Frequency Status (Switch output)

MBP
Manchester Bus Powered

PDU
Protocol Data Unit

1.5 Registered trademarks

FOUNDATION™ Fieldbus
Registration-pending trademark of the FieldComm Group, Austin, Texas, USA

Bluetooth®
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TEFLON®
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**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 Intended use

Application and media

The measuring device described in this manual is intended only for the level and interface measurement of liquids. Depending on the version ordered, the measuring device can also measure potentially explosive, flammable, poisonous and oxidizing media.

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 and/or interface height
‣ Calculable process variables: volume or mass in any shape of vessel (calculated from the level by the linearization functionality)

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

‣ Use the measuring device only for media to which the process-wetted materials have an adequate level of resistance.
‣ Observe the limit values in the "Technical data".

Incorrect use

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

Clarification of 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 contained therein (e.g. display module, main electronics module and I/O electronics module) may rise up 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!

‣ In the event of high medium temperatures, ensure protection against contact to prevent burns.
2.3  Workplace safety
When working on and with the device:
‣ Wear the required protective equipment according to federal or national regulations.

2.4  Operational safety
Risk of injury!
‣ Operate the device only if it is in proper technical condition, free from errors and faults.
‣ 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 from the manufacturer.

Hazardous area
To eliminate danger to persons or the installation when the device is used in the hazardous area (e.g. explosion protection, pressure vessel safety):
‣ Check the nameplate to verify whether the ordered device can be put to its intended use in the hazardous area.
‣ Observe the specifications in the separate supplementary documentation, which is an integral part of this manual.

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 the general safety standards and legal requirements.

**NOTICE**
Loss of degree of protection by opening of the device in humid environments
‣ If the device is opened in a humid environment, the degree of protection indicated on the nameplate is no longer valid. This may also impair the safe operation of the device.

2.5.1  CE mark
The measuring system meets the legal requirements of the applicable EU directives. These are listed in the corresponding EU Declaration of Conformity together with the standards applied.

The manufacturer 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 along with the standards applied.

The manufacturer confirms successful testing of the device by affixing to it the EAC mark.
3 Product description

3.1 Product design

3.1.1 Levelflex FMP51/FMP52/FMP54/FMP55

1 Design of the Levelflex

1 Electronics housing
2 Process connection (here as an example: flange)
3 Rope probe
4 End-of-probe weight
5 Rod probe
6 Coax probe
3.1.2 Electronics housing

2 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?
- If required (see nameplate): are the Safety Instructions (XA) provided?

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

4.2 Product identification

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

- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter the serial number from the nameplate in W@M Device Viewer (www.endress.com/deviceviewer): all the information about the 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.
4.2.1 Nameplate

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 temperature

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

5.2 Transporting the product to the measuring point

⚠️ WARNING

Housing or rod may become damaged or pull off. Danger 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 probe. 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 weighing more than 18 kg (39.6 lbs) (IEC 61010).
NOTICE

Transport lock in the FMP55 with coax probe

- The coax tube is not firmly connected to the electronics housing in the FMP55 with coax probe. It is fixed onto the mounting flange with two cable ties during transportation. These cable ties must not be released during transportation or installation of the device to prevent the spacer from sliding at the probe rod. They may only be removed immediately before screwing the process connection flange into place.
6 Mounting

6.1 Mounting requirements

6.1.1 Suitable mounting position

- Rod probes/rope probes: mount in the bypass/stilling well.
- Coax probes can be mounted at any distance from the wall.
- When mounting outdoors, a weather protection cover can be used to protect the device against extreme weather conditions.
- Minimum distance from the end of the probe to the bottom of the vessel: 10 mm (0.4 in)
6.1.2 Mounting under confined conditions

Mounting with remote probe

The device version with a remote probe is suitable for applications with restricted mounting space. In this case, the electronics housing is mounted at a separate position from the probe.

- Product structure, feature 600 "Probe design":
  - Version MB "Sensor remote, 3m cable"
- The connecting cable is included in the delivery with these versions.
  - Minimum bending radius: 100 mm (4 inch)
- The mounting bracket for the electronics housing is included in the delivery with these versions. Mounting options:
  - Wall mounting
  - Mounting on DN32 to DN50 (1-1/4 to 2 inch) post or pipe
- The connection cable has one straight plug and one plug angled at 90°. Depending on the local conditions the angled plug can be connected at the probe or at the electronics housing.

The probe, electronics and connection cable are mutually compatible and bear a common serial number. Only components with the same serial number may be connected to one another.
6.1.3 Notes on the mechanical load of the probe

Tensile loading capacity of rope probes

*FMP55*

Rope 4mm (1/6") PFA>316
2 kN

Lateral loading capacity (flexural strength) of rod probes

*FMP55*

Rod 16mm (0.63") PFA>316L
30 Nm

6.1.4 Lateral loading capacity (flexural strength) of coax probes

*FMP55*

Probe Ø 42.4 mm 316L
300 Nm
6.1.5 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>
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<tr>
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<th>Number of screws</th>
<th>Tightening torque</th>
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<td><strong>EN</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DN40/PN40</td>
<td>4</td>
<td>35 to 55 Nm</td>
</tr>
<tr>
<td>DN50/PN16</td>
<td>4</td>
<td>45 to 65 Nm</td>
</tr>
<tr>
<td>DN50/PN40</td>
<td>4</td>
<td>45 to 65 Nm</td>
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<tr>
<td>DN80/PN16</td>
<td>8</td>
<td>40 to 55 Nm</td>
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<td>DN80/PN40</td>
<td>8</td>
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<td>55 to 80 Nm</td>
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<td>75 to 115 Nm</td>
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<tr>
<td>DN150/PN40</td>
<td>8</td>
<td>95 to 145 Nm</td>
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<tr>
<td><strong>ASME</strong></td>
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<td></td>
</tr>
<tr>
<td>1½&quot;/150lbs</td>
<td>4</td>
<td>20 to 30 Nm</td>
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<td>1½&quot;/300lbs</td>
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<td>30 to 40 Nm</td>
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<td>4½/300lbs</td>
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<td>55 to 80 Nm</td>
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<td>6½/150lbs</td>
<td>8</td>
<td>85 to 125 Nm</td>
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<tr>
<td>6½/300lbs</td>
<td>12</td>
<td>60 to 90 Nm</td>
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<td><strong>JIS</strong></td>
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<td></td>
</tr>
<tr>
<td>10K 40A</td>
<td>4</td>
<td>30 to 45 Nm</td>
</tr>
<tr>
<td>10K 50A</td>
<td>4</td>
<td>40 to 60 Nm</td>
</tr>
<tr>
<td>10K 80A</td>
<td>8</td>
<td>25 to 35 Nm</td>
</tr>
<tr>
<td>10K 100A</td>
<td>8</td>
<td>35 to 55 Nm</td>
</tr>
<tr>
<td>10K 100A</td>
<td>8</td>
<td>75 to 115 Nm</td>
</tr>
</tbody>
</table>
6.1.6 Securing the probe

Securing coax probes

For WHG approval: A support is required for probe lengths ≥ 3 m (10 ft).

Coax probes can be secured (fixed) at any point in the ground tube.
6.1.7 Special installation situations

**Bypasses and stilling wells**

The use of centering disks/stars/weights (available as accessories) is recommended in bypass and stilling well applications.

As the measuring signal penetrates many plastics, installation in plastic bypasses or stilling wells can produce incorrect results. For this reason use a metal bypass or stilling well.

- Pipe diameter: > 40 mm (1.6 in) (for rod probes).
- A rod probe can be installed in pipes with a diameter of up to 150 mm (6 in). The use of a coax probe is recommended for larger pipe diameters.
- Side outlets, holes, slots and welds - with a maximum inward projection of 5 mm (0.2 in) - do not affect the measurement.
- There should not be any changes in the diameter of the pipe.
- The probe must be 100 mm (4 in) longer than the lower outlet.
- The probes must not touch the pipe wall within the measuring range. Support or brace the probe if necessary. All rope probes are prepared for bracing in vessels (tensioning weight with anchor hole).
- The probes must not touch the pipe wall within the measuring range. If necessary, use a PFA centering star.
- Coax probes can be used within any restrictions provided that the pipe diameter permits their installation.

For bypasses with condensate formation (water) and a medium with a low dielectric constant (e.g. hydrocarbons):

Over time, the bypass fills with condensate up to the lower outlet. When levels are low, the level echo is masked by the echo of the condensate as a result. In this range, the level of the condensate is output and the correct value is only output when levels are higher. For this reason, ensure that the lower outlet is 100 mm (4 in) below the lowest level to be measured and fit a metal centering disk at the level of the lower edge of the lower outlet.

In thermally insulated vessels, the bypass should also be insulated in order to prevent condensate formation.
Assignment of centering disk/centering star/centering weight to the pipe diameter
Underground tanks

In the case of nozzles with large diameters, use a coax probe to avoid reflections at the nozzle wall.

**Non-metal vessels**

Use a coax probe if mounting in non-metal vessels.
Vessel with thermal insulation

If process temperatures are high, the device must be included in normal vessel insulation (1) in order to prevent the electronics heating up as a result of thermal radiation or convection. The insulation may not go beyond the points labeled 'MAX' in the drawings.

![Diagram showing vessel with thermal insulation](image)

5 Process connection with flange

1 Vessel insulation
2 Compact device
3 Sensor, remote
6.2 Mounting the measuring device

6.2.1 Tool list

For flanges and other process connections: use an appropriate mounting tool

6.2.2 Mounting the device

Mounting devices with a flange

If a seal is used to mount the device, use uncoated metal screws to ensure good electrical contact between the process flange and the probe flange.

Mounting rope probes

NOTICE

Electrostatic discharge can damage the electronics.

- Ground the housing before lowering the rope probe into the vessel.

Pay attention to the following when introducing the rope probe into the vessel:

- Uncoil the rope slowly and lower it carefully into the vessel.
- Make sure the rope does not bend or buckle.
- Avoid uncontrolled swinging of the weight, as this could damage internal fittings in the vessel.

6.2.3 Mounting the "Sensor, remote" version

This section only applies for devices with the version 'Probe design' = "Sensor, remote" (feature 600, version MB/MC/MD).

The following is included in the delivery with the version "Probe design" = "Remote":
- The probe with process connection
- The electronics housing
- The mounting bracket for mounting the electronics housing on a wall or post
- The connection cable (length as ordered). The cable has one straight plug and one plug angled at 90°. Depending on the local conditions the angled plug can be connected at the probe or at the electronics housing.

⚠️ **CAUTION**

**Mechanical stress can damage the plugs of the connection cable or cause them to become loose.**

- Mount the probe and the electronics housing securely before connecting the connecting cable.
- Lay the connecting cable in such a way that it is not exposed to mechanical stress. Minimum bending radius: 100 mm (4 in).
- When connecting the cable, connect the straight plug before you connect the angled plug. Torque for the union nuts of both plugs: 6 Nm.

The probe, electronics and connection cable are mutually compatible and bear a common serial number. Only components with the same serial number may be connected to one another.

In the event of strong vibrations, a locking compound, e.g. Loctite 243, can also be used on the plug-in connectors.

### Mounting the electronics housing

![Diagram of mounting options]

6 Mounting the electronics housing with the mounting bracket. Unit of measurement mm (in)

A Wall mounting

B Post mounting

### Connecting the connecting cable

![Connection diagram]

AF 18 mm
7  Connecting the connecting cable. The cable can be connected in the following ways: Unit of measurement mm (in)

A  Angled plug at the probe
B  Angled plug at the electronics housing
C  Length of the remote cable as ordered

6.2.4 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).
### 6.2.5 Turning the display

**Opening the cover**

1. Loosen the screw of the securing clamp of the electronics compartment cover using an Allen key (3 mm) and turn the clamp 90° counterclockwise.
2. Unscrew the electronics compartment cover and check the cover seal; replace it if necessary.

**Turning the display module**

1. Pull out the display module with a gentle rotational movement.
2. Turn the display module to the desired position: Max. 8 × 45° in each direction.
3. 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.

**Closing the cover of the electronics compartment**

1. Screw down the cover of the electronics compartment.
2. Turn the securing clamp 90° in the clockwise direction and, using an Allen key (3 mm), tighten the screw of the securing clamp on the electronics compartment cover with 2.5 Nm.

### 6.3 Post-installation check

☐ Is the device undamaged (visual inspection)?
☐ Does the device comply with the measuring point specifications?
  • Process temperature
  • Process pressure
  • Ambient temperature range
  • Measuring range

☐ Are the measuring point identification and labeling correct (visual inspection)?

☐ Is the device adequately protected against precipitation and direct sunlight?

☐ Is the device adequately protected against impact?

☐ Are all mounting and safety screws securely tightened?

☐ Is the device properly secured?
7 Electrical connection

7.1 Connecting requirements

7.1.1 Terminal assignment

Terminal assignment, 4-wire: 4 to 20 mA HART (90 to 253 V\textsubscript{AC})

iens o

CAUTION

To ensure electrical safety:

- Do not disconnect the protective ground connection.
- Disconnect the device from the supply voltage before disconnecting the protective ground.

Connect protective ground to the inner ground terminal (3) before connecting the supply voltage. If necessary, connect the potential matching line to the outer ground terminal.

In order to ensure electromagnetic compatibility (EMC): do not ground the device exclusively via the protective ground 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 disconnector for the device (IEC/EN61010).
Terminal assignment PROFIBUS PA / FOUNDATION Fieldbus

A  Without integrated overvoltage protection
B  With integrated overvoltage protection
1  Connection, PROFIBUS PA / FOUNDATION Fieldbus: terminals 1 and 2, without integrated overvoltage protection
2  Connection, switch output (open collector): terminals 3 and 4, without integrated overvoltage protection
3  Connection, switch output (open collector): terminals 3 and 4, with integrated overvoltage protection
4  Connection, PROFIBUS PA / FOUNDATION Fieldbus: terminals 1 and 2, with integrated overvoltage protection
5  Terminal for cable shield

Block diagram PROFIBUS PA / FOUNDATION Fieldbus

1  Cable screen; observe cable specification
2  Connection PROFIBUS PA / FOUNDATION Fieldbus
3  Measuring device
4  Switch output (open collector)
Connection examples for the switch output

<table>
<thead>
<tr>
<th>3+</th>
<th>4-</th>
<th>R</th>
<th>i</th>
</tr>
</thead>
</table>

11 Connection of a relay

<table>
<thead>
<tr>
<th>3+</th>
<th>21</th>
<th>+</th>
<th>4-</th>
<th>R</th>
<th>i</th>
</tr>
</thead>
</table>

12 Connection to a digital input

1 Pull-up resistor
2 Digital input

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 ≥ 60 °C (140 °F): use cable for temperature T_u +20 K.

FOUNDATION Fieldbus

Endress+Hauser recommends using twisted, shielded two-wire cables.

For further information on the cable specifications, see Operating Instructions BA00013S "FOUNDATION Fieldbus Overview", FOUNDATION Fieldbus Guideline and IEC 61158-2 (MBP).

7.1.3 Device plug

In the case of the device versions with a plug, the housing does not need to be opened to connect the signal cable.

| 1 | 3 | 2 | 4 |

13 Pin assignment of 7/8" plug

1 Signal -
2 Signal +
3 Not assigned
4 Shielding
7.1.4 Supply voltage

**PROFIBUS PA, FOUNDATION Fieldbus**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Approval</th>
<th>Terminal voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>E: 2-wire; FOUNDATION Fieldbus, switch output</td>
<td>Non-hazardous</td>
<td>9 to 32 V</td>
</tr>
<tr>
<td>G: 2-wire; PROFIBUS PA, switch output</td>
<td>Ex nA</td>
<td>9 to 32 V</td>
</tr>
<tr>
<td></td>
<td>Ex nA</td>
<td>ia</td>
</tr>
<tr>
<td></td>
<td>Ex ic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ex ic</td>
<td>ia</td>
</tr>
<tr>
<td></td>
<td>Ex ta / DIP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CSA GP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ex ia / IS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ex ia + Ex d</td>
<td>ia</td>
</tr>
</tbody>
</table>

1) Feature 020 in the product structure
2) Feature 010 in the product structure
3) Input voltages up to 35 V do not destroy the device.

- **Polarity-dependent**
  - No

- **FISCO/FNICO compliant according to IEC 60079-27**
  - Yes

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), an overvoltage protection module has to be installed.

**Integrated overvoltage protection module**

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".

**Technical data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance per channel</td>
<td>2 × 0.5 Ω 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>

**External overvoltage protection module**

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
7.2 Connecting the device

**WARNING**

Explosion Hazard!
- 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.

7.2.1 Opening cover

1. Loosen the screw of the securing clamp of the connection compartment cover using an Allen key (3 mm) and turn the clamp 90° counterclockwise.
2. Unscrew the connection compartment cover and check the cover seal; replace it if necessary.

7.2.2 Connecting

1. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.
2. Remove the cable sheath.
3. Strip the cable ends 10 mm (0.4 in). In the case of stranded cables, also fit wire end ferrules.
4. Firmly tighten the cable glands.

*Engineering unit: mm (in)*
5. Connect the cable according to the terminal assignment.

6. If using shielded cables: Connect the cable shield to the ground terminal.

7.2.3 Plug-in spring-force terminals

The electrical connection of device versions without an integrated overvoltage protection 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 the cable from the terminal again:

1. Using a flat-blade screwdriver ≤ 3 mm, press down on the slot between the two terminal holes
2. Simultaneously pull the cable end out of the terminal.

7.2.4 Closing the cover of the connection compartment

1. Screw down the cover of the connection compartment.
2. Turn the securing clamp 90 ° in the clockwise direction and, using an Allen key (3 mm), tighten the screw of the securing clamp on the connection compartment cover with 2.5 Nm.

7.3 Post-connection check

☐ Is the device or cable undamaged (visual inspection)?
☐ Do the cables used comply with the requirements?
☐ Do the mounted cables have adequate strain relief?
☐ Are all the cable glands installed, firmly tightened and leak-tight?
☐ Does the supply voltage match the specifications on the nameplate?
☐ Is the terminal assignment correct?
☐ If necessary, has a protective ground connection been established?
☐ If supply voltage is present, is the device ready for operation and do values appear on the display module?
☐ Are all the housing covers installed and tightened?
☐ Is the securing clamp firmly tightened?
8 Operation methods

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 &quot;Display; Operation&quot;</td>
<td>Option C &quot;SD02&quot;</td>
<td>Option E &quot;SD03&quot;</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

16 FHX50 operating options
1 Display and operating module SD03, optical keys; can be operated through the glass of the cover
2 Display and operating module SD02, push buttons; cover must be removed

8.1.3 Remote operation

Via FOUNDATION Fieldbus

17 FOUNDATION Fieldbus system architecture with associated components
1 FFblue Bluetooth modem
2 Field Xpert SFX350/SFX370
3 DeviceCare/FieldCare
4 NI-FF interface card
### Operation methods

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN</td>
<td>Industrial network</td>
</tr>
<tr>
<td>FF-HSE</td>
<td>High Speed Ethernet</td>
</tr>
<tr>
<td>FF-H1</td>
<td>FOUNDATION Fieldbus-H1</td>
</tr>
<tr>
<td>LD</td>
<td>Linking Device FF-HSE/FF-H1</td>
</tr>
<tr>
<td>PS</td>
<td>Bus Power Supply</td>
</tr>
<tr>
<td>SB</td>
<td>Safety Barrier</td>
</tr>
<tr>
<td>BT</td>
<td>Bus Terminator</td>
</tr>
</tbody>
</table>

#### Via service interface (CDI)

1. **Computer with FieldCare/DeviceCare operating tool**
2. **Commubox FXA291**
3. **Service interface (CDI) of the measuring device (= Endress+Hauser Common Data Interface)**
## 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</td>
<td><em>Language 1</em></td>
<td>Defines the operating language of the local display</td>
</tr>
<tr>
<td>Commissioning</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>...</td>
<td></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>• For more customized configuration of the measurement (adaptation to special measuring conditions).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• For converting the measured value (scaling, linearization).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• For scaling the output signal.</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</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</td>
<td>Contains all the wizards for the Heartbeat Verification and Heartbeat Monitoring application packages.</td>
</tr>
<tr>
<td>Expert</td>
<td></td>
<td>Contains all the parameters of the device (including those that are already contained in one of the other menus). This menu is organized according to the function blocks of the device.</td>
</tr>
<tr>
<td></td>
<td>GP01015F (FOUNDATION Fieldbus)</td>
<td></td>
</tr>
<tr>
<td>System</td>
<td></td>
<td>Contains all higher-level device parameters that do not pertain either to the measurement or to 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 switch output (PFS).</td>
</tr>
</tbody>
</table>
### Operation methods

#### 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 you are 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 if operating via the local display
4. Only available if operating via DeviceCare or FieldCare
5. When you call up the “Expert” menu, you are always asked for an access code. If a customer-specific access code has not been defined, “0000” must 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 (Verweisziel existiert nicht, aber @y.link.required=true).

**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>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  Data access - Security

**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 → Define access code
2. Define a max. 4-digit numeric code as an access code.
3. Repeat the numeric code in the **Confirm access code** parameter to confirm it.
   - The ☑-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, these parameters 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. If the user goes from the navigation and editing mode back to the measured value display mode, the device automatically locks the write-protected parameters after 60 s.

- If write access is activated via an access code, it can only be deactivated again via this access code → ☑ 46.
- In the 'Description of Device Parameters' documents, each write-protected parameter is identified with the ☑-symbol.
Disabling write protection via access code

If the ☐ symbol appears in front of a parameter on the local display, the parameter is write-protected by a device-specific access code and its value cannot currently be changed via 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.

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. Enter 0000.
3. Repeat 0000 in the Confirm access code parameter to confirm.
   ⬤ 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. Enter 0000.
   ⬤ The write protection is deactivated. Parameters can be changed without entering an access code.

Write protection via write protection switch

Unlike parameter write protection via a user-specific access code, this allows the user to lock write access to the entire operating menu - apart from the "Contrast display" parameter.

The parameter values are now read only and cannot be edited any more (exception "Contrast display" parameter):
- Via local display
- Via FOUNDATION Fieldbus
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 write protection switch, attach the display module 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 hardware write protection is enabled, the **Hardware locked** option is displayed in the **Locking status** parameter. In addition, on the local display the 

![Diagram showing hardware locked status]

If hardware write protection is disabled, no option is displayed in the **Locking status** parameter. On the local display, the 

![Diagram showing unlock status]

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.
Enabling and disabling the keypad lock

Access to the entire operating menu via local operation can be locked via the keypad lock. When access is locked, 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 a context menu.

Switching on the keypad lock

1. **SD03 display module 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  for at least 2 seconds.
   ➔ A context menu appears.

2. In the context menu select the Keylock on option.
   ➔ The keypad lock is switched on.

3. 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  for at least 2 seconds.
   ➔ A context menu appears.

2. In the context menu select the Keylock off option.
   ➔ The keypad lock is switched off.

Bluetooth® wireless technology

Signal transmission via Bluetooth® wireless technology uses a cryptographic technique tested by the Fraunhofer Institute

- The device is not visible via Bluetooth® wireless technology without the SmartBlue app
- Only one point-to-point connection between one sensor and one smartphone or tablet is established
8.3 Display and operating module

8.3.1 Display

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 (bar graph + 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. Parameter display (here: parameter with picklist)
   3.1 Header containing parameter name and error symbol (if an error is active)
   3.2 Picklist; ☑️ 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/operat.](A0018367) | Is displayed:  
- In the main menu next to the "Display/operat." selection  
- In the header on the left in the "Display/operat." menu |
| ![Setup](A0018364) | Is displayed:  
- In the main menu next to the "Setup" selection  
- In the header on the left in the "Setup" menu |
| ![Expert](A0018365) | Is displayed:  
- In the main menu next to the "Expert" selection  
- In the header on the left in the "Expert" menu |
| ![Diagnostics](A0018366) | Is displayed:  
- In the main menu next to the "Diagnostics" selection  
- In the header on the left in the "Diagnostics" menu |

Status signals

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| ![Failure](A0032902) | "Failure"  
A device error has occurred. The measured value is no longer valid. |
| ![Function check](A0032903) | "Function check"  
The device is in the service mode (e.g. during a simulation). |
| ![Out of specification](A0032904) | "Out of specification"  
The device is operated:  
- Outside of its technical specifications (e.g. during startup or a cleaning)  
- Outside of the configuration performed by the user (e.g. level outside the configured range) |
| ![Maintenance required](A0032905) | "Maintenance required"  
Maintenance is required. The measured value is still valid. |

Display symbols for locking status

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| ![Read-only parameter](A0013148) | Read-only parameter  
The parameter shown is only for display purposes and cannot be edited. |
| ![Device locked](A0013150) | 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>
</tr>
</thead>
<tbody>
<tr>
<td><img src="#" alt="Symbol" /></td>
<td>Level</td>
</tr>
<tr>
<td><img src="#" alt="Symbol" /></td>
<td>Distance</td>
</tr>
<tr>
<td><img src="#" alt="Symbol" /></td>
<td>Current output</td>
</tr>
<tr>
<td><img src="#" alt="Symbol" /></td>
<td>Measured current</td>
</tr>
<tr>
<td><img src="#" alt="Symbol" /></td>
<td>Terminal voltage</td>
</tr>
<tr>
<td><img src="#" alt="Symbol" /></td>
<td>Electronics or sensor temp.</td>
</tr>
</tbody>
</table>

#### Measuring channels

<table>
<thead>
<tr>
<th>Channel</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Measuring channel 1</td>
</tr>
<tr>
<td>2</td>
<td>Measuring channel 2</td>
</tr>
</tbody>
</table>

#### Status of the measured value

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

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

Input mask

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

**Numeric editor**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Symbol" /></td>
<td>Selection of numbers from 0 to 9.</td>
</tr>
<tr>
<td><img src="image2.png" alt="Symbol" /></td>
<td>Inserts decimal separator at the cursor position.</td>
</tr>
<tr>
<td><img src="image3.png" alt="Symbol" /></td>
<td>Inserts minus sign at the cursor position.</td>
</tr>
<tr>
<td><img src="image4.png" alt="Symbol" /></td>
<td>Confirms selection.</td>
</tr>
<tr>
<td><img src="image5.png" alt="Symbol" /></td>
<td>Moves the input position one position to the left.</td>
</tr>
<tr>
<td><img src="image6.png" alt="Symbol" /></td>
<td>Exits the input without applying the changes.</td>
</tr>
<tr>
<td><img src="image7.png" alt="Symbol" /></td>
<td>Clears all entered characters.</td>
</tr>
</tbody>
</table>

**Text editor**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image8.png" alt="Symbol" /></td>
<td>Selection of letters from A to Z</td>
</tr>
</tbody>
</table>
Operation methods

Text correction under

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Clears all entered characters.</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Moves the input position one position to the right.</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Moves the input position one position to the left.</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></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.
- Envelope curve
- Keylock on

Calling up and closing the context menu

The user is in the operational display.

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

2. Press globalskey + globalskey 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  globalskey to navigate to the desired menu.
3. Press ▼ to confirm the selection.
   ← The selected menu opens.
8.3.5 **Envelope curve display 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 shown on the display and operating module:
9 Integration into a FOUNDATION Fieldbus network

9.1 Device Description (DD)

You require the following to configure a device and integrate it into an FF network:

- An FF configuration program
- The Cff file (Common File Format: *.cff)
- The device description (DD) in one of the following formats
  - Device Description format 4: *sym, *ffo
  - Device Description format 5: *sy5, *ff5

Information on the device-specific DD

<table>
<thead>
<tr>
<th>Manufacturer ID</th>
<th>452B48hex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device Type</td>
<td>100Fhex</td>
</tr>
<tr>
<td>Device Revision</td>
<td>05hex</td>
</tr>
<tr>
<td>DD Revision</td>
<td>Information and files at:</td>
</tr>
<tr>
<td></td>
<td>- <a href="http://www.endress.com">www.endress.com</a></td>
</tr>
<tr>
<td></td>
<td>- <a href="http://www.fieldcommgroup.org">www.fieldcommgroup.org</a></td>
</tr>
<tr>
<td>CFF Revision</td>
<td></td>
</tr>
</tbody>
</table>

9.2 Integration into the FOUNDATION Fieldbus network

- For more in-depth information on integrating the device into the FF system, see the description for the configuration software used.
- When integrating the field devices into the FF system, make sure you are using the right files. You can read out the required version by means of the Device Revision/DEV_REV and DD Revision/DD_REV parameters in the Resource Block.

The device is integrated into the FF network as follows:

1. Start the FF configuration program.
2. Download the Cff and device description files (*.ffo, *.sym (for format 4) *ff5, *sy5 (for format 5) to the system.
3. Configure the interface.
4. Configure the device for the measuring task and for the FF system.

9.3 Device identification and addressing

FOUNDATION Fieldbus identifies the device using its ID code (Device ID) and automatically assigns it a suitable field address. The identity code cannot be changed. The device appears in the network display once you have started the FF configuration program and integrated the device into the network. The blocks available are displayed under the device name.

If the device description has not yet been loaded, the blocks report 'Unknown' or '(UNK)'.

9.4 Block model

9.4.1 Blocks of the device software

The device has the following blocks:

- Resource Block (device block)
- Transducer Blocks
  - Setup Transducer Block (TRDSUP)
  - Advanced Setup Transducer Block (TRDASUP)
  - Display Transducer Block (TRDDISP)
  - Diagnostic Transducer Block (TRDDIAG)
  - Expert Configuration Transducer Block (TRDEXP)
  - Expert Information Transducer Block (TRDEXPIN)
  - Service Sensor Transducer Block (TRDSRVSB)
  - Service Information Transducer Block (TRDSRVIF)
  - Data Transfer Transducer Block (TRDHROM)
- Function Blocks
  - 2 Analog Input Blocks (AI)
  - 1 Discrete Input Block (DI)
  - 1 PID Block (PID)
  - 1 Arithmetic Block (AR)
  - 1 Signal Characterizer Block (SC)
  - 1 Input Selector Block (IS)
  - 1 Integrator Block (IT)
  - 1 Analog Alarm Block (AAL)
In addition to the pre-instantiated blocks already mentioned, the following blocks can also be instantiated:

- 5 Analog Input Blocks (AI)
- 2 Discrete Input Blocks (DI)
- 3 PID Blocks (PID)
- 3 Arithemetic Blocks (AR)
- 2 Signal Characterizer Blocks (SC)
- 5 Input Selector Blocks (IS)
- 3 Integrator Blocks (IT)
- 2 Analog Alarm Blocks (AAL)

Up to 20 blocks can be instantiated in the device altogether, including the blocks already instantiated. For instantiating blocks, see the appropriate Operating Instructions of the configuration program used.

Endress+Hauser Guideline BA00062S.

The guideline provides an overview of the standard function blocks that are described in FOUNDATION Fieldbus Specifications FF 890 - 894. It is designed to help operators use the blocks implemented in the Endress+Hauser field devices.

### 9.4.2 Block configuration when device is delivered

![Block configuration diagram]

#### 20 Block configuration when device is delivered

- **S** Sensor
- **PV** Primary value: Level linearized
- **SV** Secondary value: Distance

### 9.5 Assignment of the measured values (CHANNEL) in an AI Block

The input value of an Analog Input Block is defined by the **CHANNEL** parameter.

<table>
<thead>
<tr>
<th>Channel</th>
<th>Measured value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Uninitialized</td>
</tr>
<tr>
<td>89</td>
<td>Measured capacitance</td>
</tr>
<tr>
<td>144</td>
<td>EOP shift</td>
</tr>
</tbody>
</table>
### 9.6 Index tables of Endress+Hauser parameters

The following tables list the manufacturer-specific device parameters for the Resource Blocks. For the FOUNDATION Fieldbus parameters, see the document BA062S "Guidline - FOUNDATION Fieldbus Function Blocks", which can be downloaded from www.endress.com.

#### 9.6.1 Setup Transducer Block

<table>
<thead>
<tr>
<th>Name</th>
<th>Label</th>
<th>Index</th>
<th>Data type</th>
<th>Size (Bytes)</th>
<th>Storage Class</th>
<th>Write access</th>
<th>MODE_BL</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>confirm_distance</td>
<td>Confirm distance</td>
<td>82</td>
<td>ENUM16</td>
<td>2</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 133</td>
</tr>
<tr>
<td>filtered_dist_val</td>
<td>Distance</td>
<td>76</td>
<td>FLOAT</td>
<td>4</td>
<td>Dynamic</td>
<td></td>
<td></td>
<td>→ 130</td>
</tr>
<tr>
<td>interface_distance</td>
<td>Interface distance</td>
<td>79</td>
<td>FLOAT</td>
<td>4</td>
<td>Dynamic</td>
<td></td>
<td></td>
<td>→ 132</td>
</tr>
<tr>
<td>map_end_x</td>
<td>Present mapping</td>
<td>84</td>
<td>FLOAT</td>
<td>4</td>
<td>Dynamic</td>
<td></td>
<td></td>
<td>→ 134</td>
</tr>
<tr>
<td>mapping_end_point</td>
<td>Mapping end point</td>
<td>83</td>
<td>FLOAT</td>
<td>4</td>
<td>Static</td>
<td>x</td>
<td>AUTO</td>
<td>→ 134</td>
</tr>
<tr>
<td>record_map</td>
<td>Record map</td>
<td>86</td>
<td>ENUM16</td>
<td>2</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 135</td>
</tr>
<tr>
<td>operating_mode</td>
<td>Operating mode</td>
<td>50</td>
<td>ENUM16</td>
<td>2</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 136</td>
</tr>
<tr>
<td>signal_quality</td>
<td>Signal quality</td>
<td>81</td>
<td>ENUM16</td>
<td>2</td>
<td>Dynamic</td>
<td></td>
<td></td>
<td>→ 130</td>
</tr>
<tr>
<td>medium_group</td>
<td>Medium group</td>
<td>55</td>
<td>ENUM16</td>
<td>2</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 127</td>
</tr>
<tr>
<td>tank_type</td>
<td>Tank type</td>
<td>52</td>
<td>ENUM16</td>
<td>2</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 126</td>
</tr>
<tr>
<td>tube_diameter</td>
<td>Tube diameter</td>
<td>53</td>
<td>FLOAT</td>
<td>4</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 127</td>
</tr>
<tr>
<td>dc_value</td>
<td>DC value</td>
<td>68</td>
<td>ENUM16</td>
<td>2</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 131</td>
</tr>
<tr>
<td>empty_calibration</td>
<td>Empty calibration</td>
<td>56</td>
<td>FLOAT</td>
<td>4</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 128</td>
</tr>
<tr>
<td>full_calibration</td>
<td>Full calibration</td>
<td>57</td>
<td>FLOAT</td>
<td>4</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 128</td>
</tr>
<tr>
<td>distance_unit</td>
<td>Distance unit</td>
<td>51</td>
<td>ENUM16</td>
<td>2</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 126</td>
</tr>
<tr>
<td>interface</td>
<td>Interface</td>
<td>70</td>
<td>FLOAT</td>
<td>4</td>
<td>Dynamic</td>
<td></td>
<td></td>
<td>→ 131</td>
</tr>
<tr>
<td>output_unit_after_linearization</td>
<td>Unit after linearization</td>
<td>62</td>
<td>ENUM16</td>
<td>2</td>
<td>Static</td>
<td></td>
<td></td>
<td>→ 152</td>
</tr>
</tbody>
</table>
### Advanced Setup Transducer Block

<table>
<thead>
<tr>
<th>Name</th>
<th>Label</th>
<th>Index</th>
<th>Data type</th>
<th>Size (Bytes)</th>
<th>Storage Class</th>
<th>Write access</th>
<th>MODE_BLK</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>calculated_dc_value</td>
<td>Calculated DC value</td>
<td>61</td>
<td>FLOAT</td>
<td>4</td>
<td>Dynamic</td>
<td></td>
<td></td>
<td>→ 145</td>
</tr>
<tr>
<td>blocking_distance</td>
<td>Blocking distance</td>
<td>55</td>
<td>FLOAT</td>
<td>4</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 160</td>
</tr>
<tr>
<td>interface_property</td>
<td>Interface property</td>
<td>57</td>
<td>ENUM16</td>
<td>2</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 141</td>
</tr>
<tr>
<td>dc_value_lower_medium</td>
<td>DC value lower medium</td>
<td>58</td>
<td>ENUM16</td>
<td>2</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 142</td>
</tr>
<tr>
<td>present_probe_length_ro</td>
<td>Present probe length</td>
<td>80</td>
<td>FLOAT</td>
<td>4</td>
<td>Dynamic</td>
<td>x</td>
<td>OOS</td>
<td>→ 162</td>
</tr>
<tr>
<td>confirm_probe_length</td>
<td>Confirm probe length</td>
<td>79</td>
<td>ENUM16</td>
<td>2</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 163</td>
</tr>
<tr>
<td>meas_upper_iface_thickness</td>
<td>Measured thickness upper layer</td>
<td>60</td>
<td>FLOAT</td>
<td>4</td>
<td>Dynamic</td>
<td></td>
<td></td>
<td>→ 145</td>
</tr>
<tr>
<td>manual_interface_thickness</td>
<td>Manual thickness upper layer</td>
<td>59</td>
<td>FLOAT</td>
<td>4</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 144</td>
</tr>
<tr>
<td>use_calculated_dc_value</td>
<td>Use calculated DC value</td>
<td>62</td>
<td>ENUM16</td>
<td>2</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 146</td>
</tr>
<tr>
<td>linearization_type</td>
<td>Linearization type</td>
<td>71</td>
<td>ENUM16</td>
<td>2</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 151</td>
</tr>
<tr>
<td>activate_table</td>
<td>Activate table</td>
<td>70</td>
<td>ENUM16</td>
<td>2</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 157</td>
</tr>
<tr>
<td>table_mode</td>
<td>Table mode</td>
<td>69</td>
<td>ENUM16</td>
<td>2</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 155</td>
</tr>
<tr>
<td>custom_table_sel_level</td>
<td>Level</td>
<td>73</td>
<td>FLOAT</td>
<td>4</td>
<td>Static</td>
<td>x</td>
<td>OOS</td>
<td>→ 129</td>
</tr>
<tr>
<td>custom_table_sel_value</td>
<td>Customer value</td>
<td>74</td>
<td>FLOAT</td>
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Levelflex FMP55 FOUNDATION Fieldbus
Integration into a FOUNDATION Fieldbus network

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### 9.6.5 Expert Configuration Transducer Block

The parameters of the **Expert Configuration Transducer Block** are described in GP01015F: "Levelflex FMP5x - Description of Device Parameters - FOUNDATION Fieldbus"
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Integration into a FOUNDATION Fieldbus network

Levelflex FMP55 FOUNDATION Fieldbus

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#### 9.6.6 Expert Information Transducer Block

The parameters of the **Expert Information Transducer Block** are described in GP01015F: "Levelflex FMP5x - Description of Device Parameters - FOUNDATION Fieldbus"

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<td>Noise of signal</td>
<td>63</td>
<td>FLOAT</td>
<td>4</td>
<td>Dynamic</td>
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</tr>
</tbody>
</table>
### 9.6.7 Service Sensor Transducer Block

The parameters of the Service Sensor Transducer Block can only be operated by authorized Endress+Hauser service personnel.
9.6.8 Service Information Transducer Block

The parameters of the Service Information Transducer Block can only be operated by authorized Endress+Hauser service personnel.

9.6.9 Data Transfer Transducer Block

The parameters of the Data Transfer Transducer Block are described in GP01015F: "Levelflex FMP5x - Description of Device Parameters - FOUNDATION Fieldbus"

<table>
<thead>
<tr>
<th>Name</th>
<th>Label</th>
<th>Index</th>
<th>Data type</th>
<th>Size (Bytes)</th>
<th>Storage Class</th>
<th>Write access</th>
<th>MODE_BLK</th>
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<tbody>
<tr>
<td>used_calculation</td>
<td>Used calculation</td>
<td>87</td>
<td>ENUM16</td>
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<td>101</td>
<td>UINT16</td>
<td>2</td>
<td>Static</td>
<td>x</td>
<td>AUTO</td>
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<tr>
<td>bdt_transferred_ctrl</td>
<td></td>
<td>102</td>
<td>BYEARRAY</td>
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<td>Static</td>
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<td>bdt_data_trans</td>
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<td>bdt_prepare</td>
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<td>Static</td>
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<td></td>
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<td>bdt_status</td>
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<td>SW option active overview</td>
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<td>BIT_ENUM32</td>
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<td>4</td>
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<td>Electric probe length</td>
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<td>FLOAT</td>
<td>4</td>
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<tr>
<td>empty_calibration_ro</td>
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<td>Full calibration</td>
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<td>FLOAT</td>
<td>4</td>
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<tr>
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<td>Distance unit</td>
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<td>OOS</td>
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<tr>
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<td>Trend operation hours</td>
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<tr>
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<td>Trend sup pack size</td>
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<td>gpc_mode_ro</td>
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<td>OOS</td>
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<td>AUTO</td>
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<td>Line mapping array Y</td>
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<td>Mapping end point</td>
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<td>AUTO</td>
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<tr>
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<td>Mapping start point</td>
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<td>4</td>
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<td>AUTO</td>
</tr>
<tr>
<td>function_block_table</td>
<td>Function block table</td>
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<tr>
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<td>Custom full value</td>
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<tr>
<td>reset_ordered_configuration</td>
<td>Reset ordered configuration</td>
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<tr>
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<td>4</td>
<td>Static</td>
<td>x</td>
<td>AUTO</td>
</tr>
</tbody>
</table>
### 9.7 Methods

The FOUNDATION Fieldbus Specification includes the use of methods to make device operation easier. A method is a sequence of interactive steps to be carried out in the specified order so as to configure certain device functions.

The following methods are available for the device:

- **Restart**
  
  This method is located in the Resource Block and directly prompts the setting of the Device reset parameter. This resets the device configuration to a defined state.

- **ENP Restart**
  
  This method is located in the Resource Block and directly prompts the setting of the parameters of the Electronic Name Plate (ENP).

- **Setup**
  
  This method is located in the SETUP Transducer Block and allows to set the most important parameters in this block for device configuration (measuring units, type of tank or vessel, type of medium, empty and full calibration).

- **Linearization**
  
  This method is located in the ADV_SETUP Transducer Block and allows to manage the linearization table by which the measured value is converted into volume, mass or flow.

- **Self Check**
  
  This method is located in the EXPERT_CONFIG Transducer Block and prompts the device self check parameters.
Commissioning using the Commissioning Wizard

A Wizard is provided in FieldCare and DeviceCare \(^{1}\) that guides the user through the initial commissioning process.

1. Connect the device with FieldCare or DeviceCare.
2. Open the device in FieldCare or DeviceCare.
   - The dashboard (homepage) of the device is displayed:

   ![Dashboard Image]

   "Commissioning" button calls up the wizard

3. Click "Commissioning" to launch the Wizard.
4. Enter the appropriate value in each parameter or select the appropriate option. These values are written directly to the device.
5. Click "Next" to go to the next page.
6. Once all the pages have been completed, click "Finish" to close the Wizard.

If you cancel the Wizard before all the necessary parameters have been entered, the device may be in an undefined state. In such situations, it is advisable to reset the device to the factory default settings.

---

\(^{1}\) DeviceCare is available for download at www.software-products.endress.com. To download the software, it is necessary to register in the Endress + Hauser software portal.
11 Commissioning via operating menu

11.1 Function check
Before commissioning your measuring point, ensure that the post-installation and post-connection checks have been performed:

11.2 Setting the operating language
Factory setting: English or ordered local language

21 Taking the example of the local display
11.3 Configuring interface measurement

![Diagram showing measurements](image)

**2.2 Configuration parameters for interface measurement**

- **LN** Probe length
- **R** Reference point of measurement
- **DI** Interface distance (distance from flange to lower medium)
- **LI** Interface
- **DL** Distance
- **LL** Level
- **UP** Thickness upper layer
- **E** Empty calibration (= zero point)
- **F** Full calibration (= span)

1. Navigate to: Setup → Device tag
   - Enter device tag.
2. Navigate to: Setup → Operating mode
   - Select the **Interface with capacitance** option.
3. Navigate to: Setup → Distance unit
   - Select the distance unit.
4. Navigate to: Setup → Tank type
   - Select tank type.
5. For **Tank type** parameter = Bypass / pipe:
   - Navigate to: Setup → Tube diameter
     - Specify the diameter of the bypass or stilling well.
6. Navigate to: Setup → DC value
   - Specify the relative dielectric constant ($\varepsilon_r$) of the upper medium.
7. Navigate to: Setup → Empty calibration
   - Specify the empty distance $E$ (distance from reference point $R$ to 0% mark).
8. Navigate to: Setup → Full calibration
   - Specify the full distance $F$ (distance from the 0% mark to the 100% mark).
9. Navigate to: Setup → Level
   - Displays the measured level $L_L$.
10. Navigate to: Setup → Interface
    - Displays the interface height $L_I$. 
11. Navigate to: Setup → Distance
   ◼ Displays the distance $D_R$ between the reference point $R$ and the level $L_R$.

12. Navigate to: Setup → Interface distance
   ◼ Displays the distance $D_I$ between the reference point $R$ and the interface $L_I$.

13. Navigate to: Setup → Signal quality
   ◼ Displays the signal quality of the analyzed level echo.

14. Operation via local display:
   Navigate to: Setup → Mapping → Confirm distance
   ◼ Ensure that the tank is fully drained. Then select the Tank empty option.

15. Via an operating tool (e.g. FieldCare):
   Navigate to: Setup → Confirm distance
   ◼ Ensure that the tank is fully drained. Then select the Tank empty option.

**NOTICE**
Wrong measurement due to incorrect dielectric constant of the lower medium
➤ The dielectric constant (DC value) of the lower medium must be specified if the lower medium is not water when Operating mode = Interface with capacitance. Navigation: Setup → Advanced setup → Interface → DC value lower medium

**NOTICE**
Wrong measurement due to incorrect empty capacitance
➤ In the case of rod and rope probes in the bypass, a correct measurement is only possible for Operating mode = Interface with capacitance after the empty capacitance has been determined. For this purpose, select Confirm distance = Tank empty after installing the probe when the tank is completely empty. A calculated empty capacitance can be entered for rod probes in the following parameters in exceptional cases only (if the tank cannot be emptied during commissioning): Expert → Sensor → Interface → Empty capacitance.

The empty capacitance is always calibrated ex works in the case of coax probes.
11.4  Recording the reference envelope curve

After the measurement has been configured, it is recommended to record the current envelope curve as a reference envelope curve. This can then be used later for diagnostic purposes. The Save reference curve parameter is used to record the envelope curve.

Path 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 a reference curve.

This submenu is only visible for the "Service" user role in devices supplied with software version 01.00.zz.

The reference envelope curve can only be displayed in the envelope curve diagram of FieldCare after it has been loaded from the device into FieldCare. The 'Load Reference Curve' function in FieldCare is used for this.
11.5 Configuring the local display

11.5.1 Factory setting of local display for interface measurements

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Factory setting for devices with 1 current output</th>
<th>Factory setting for devices with 2 current outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format display</td>
<td>1 value, max. size</td>
<td>1 value, max. size</td>
</tr>
<tr>
<td>Value 1 display</td>
<td>Interface linearized</td>
<td>Interface linearized</td>
</tr>
<tr>
<td>Value 2 display</td>
<td>Level linearized</td>
<td>Level linearized</td>
</tr>
<tr>
<td>Value 3 display</td>
<td>Thickness upper layer</td>
<td>Current output 1</td>
</tr>
<tr>
<td>Value 4 display</td>
<td>Current output 1</td>
<td>Current output 2</td>
</tr>
</tbody>
</table>

11.5.2 Adjusting the local display

The local display can be adjusted in the following submenu:
Setup → Advanced setup → Display
11.6 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 the options available.

Path in the 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 is saved from the HistoROM (integrated in the device) 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 of the device is duplicated to another device using the display module. The following parameters, which characterize the individual measuring point are **not** transferred:
  - Medium type

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

- **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 copy is restored on a device other than the original device using the Restore option, in some cases individual device functions may not be available. In some cases it is also not possible to restore the original state by resetting to the "as-delivered" state.

  The Duplicate option should always be used to copy the configuration to another device.
11.7 Protecting settings from unauthorized access

The settings can be protected from unauthorized access in two ways:

- Locking via parameters (software locking)
- Locking via write protection switch (hardware locking)
12 Commissioning (block-oriented operation)

12.1 Function check
Before commissioning your measuring point, ensure that the post-installation and post-connection checks have been performed:

- ‘Post-installation check’ checklist → 31
- ‘Post-connection check’ checklist → 38

12.2 Block configuration

12.2.1 Preparatory steps
1. Switch on the measuring device.
2. Make a note of the \texttt{DEVICE\_ID}.
3. Open the configuration program.
4. Load \texttt{Cff} and device description files into the host system or the configuration program. Make sure you are using the right system files.
5. Identify the device using the \texttt{DEVICE\_ID} (see Point 2). Assign the desired tag name to the device via the \texttt{Pd-tag/FF\_PD\_TAG} parameter.

12.2.2 Configuring the Resource Block
1. Open the Resource Block.
2. If necessary, disable the lock for device operation.
3. If necessary, change the block name. Factory setting: RS-xxxxxxxxxxx (RB2)
4. If necessary, assign a description to the block via the \texttt{Description of the identification tag/TAG\_DESC} parameter.
5. If necessary, change other parameters as required.

12.2.3 Configuring the Transducer Blocks
The measurement and the display module are configured via the Transducer Blocks. The basic procedure is the same for all Transducer Blocks:

1. If necessary, change the block name.
2. Set the block mode to \texttt{OOS} via the \texttt{Block mode/MODE\_BLK} parameter, \texttt{TARGET} element.
3. Configure the device in accordance with the measuring task.
4. Set the block mode to \texttt{Auto} via the \texttt{Block mode/MODE\_BLK} parameter, \texttt{TARGET} element.

\textbf{Important:} The block mode must be set to \texttt{Auto} to ensure the smooth operation of the device.
### 12.2.4 Configuring the Analog Input Blocks

The device has 2 Analog Input Blocks that can be assigned as required to the various process variables.

<table>
<thead>
<tr>
<th>Analog Input Block</th>
<th>CHANNEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI 1</td>
<td>32949: Level linearized</td>
</tr>
<tr>
<td>AI 2</td>
<td>32856: Distance</td>
</tr>
</tbody>
</table>

1. If necessary, change the block name.
2. Set the block mode to OOS via the Block mode/MODE_BLK parameter, TARGET element.
3. Via the Channel/CHANNEL parameter, select the process variable which should be used as the input value for the Analog Input Block.
4. Via the Transducer scale/XD_SCALE parameter, select the desired unit and the block input range for the process variable → 79. Make sure that the selected unit suits the process variable that is selected. If the process variable and the unit do not suit one another, the Block error/ BLOCK_ERR parameter reports the Block Configuration Error and the block mode cannot be set to Auto.
5. Via the Linearization type/L_TYPE parameter, select the type of linearization for the input variable (factory setting: Direct). Make sure that the settings for the Transducer scale/XD_SCALE and Output scale/OUT_SCALE parameters are the same for the Direct linearization type. If the values and units do not match, the Block error/ BLOCK_ERR parameter reports the Block Configuration Error and the block mode cannot be set to Auto.
6. Enter the alarms and critical alarm messages via the High alarm limit/ HI_HI_LIM, High early warning limit/HI_LIM, Low alarm limit/ LO_LO_LIM and Low early warning limit/LO_LIM parameters. The limit values entered must be within the value range specified for the Output scale/OUT_SCALE parameter → 79.
7. Specify the alarm priorities via the Priority for high limit value alarm/HI_HI_PRI, Priority for high early warning/HI_PRI, Priority for low limit value alarm/LO_LO_PRI and Priority for low limit value early warning/LO_PRI parameters. Reporting to the field host system only takes place with alarms with a priority greater than 2.
8. Set the block mode to Auto via the Block mode/MODE_BLK parameter, TARGET element. For this purpose, the Resource Block must also be set to the Auto block mode.

### 12.2.5 Additional configuration

1. Link the function blocks and output blocks.
2. After specifying the active LAS, download all the data and parameters to the field device.

### 12.3 Scaling the measured value in the AI Block

The measured value can be scaled if the L_TYPE = Indirect linearization type has been selected in the AI Block. XD_SCALE defines the input range with the EU_0 and EU_100 elements. This is mapped linearly to the output range, defined by OUTSCALE also with the elements EU_0 and EU_100.
24 Scaling the measured value in the AI Block

- If you have selected the Direct mode in the L_TYPE parameter, you cannot change the values and units for XD_SCALE and OUT_SCALE.
- The L_TYPE, XD_SCALE and OUT_SCALE parameters can only be changed in the OOS block mode.

### 12.4 Selecting the language

<table>
<thead>
<tr>
<th>Step</th>
<th>Block</th>
<th>Parameter</th>
<th>Action</th>
</tr>
</thead>
</table>
| 1    | DISPLAY (TRDDISP) | Language (language) | Select the language \(^1\). Options:  
  - 32805: Arabic  
  - 32824: Chinese  
  - 32842: Czech  
  - 32881: Dutch  
  - 32888: English  
  - 32917: French  
  - 32920: German  
  - 32945: Italian  
  - 32946: Japanese  
  - 32948: Korean  
  - 33026: Polish  
  - 33027: Portuguese  
  - 33062: Russian  
  - 33083: Spanish  
  - 33103: Thai  
  - 33120: Vietnamese  
  - 33155: Indonesian  
  - 33166: Turkish |

\(^1\) The languages the device supports are specified when the device is ordered. See feature 500 'Additional operating language' in the product structure for this purpose.

### 12.5 Configuring interface measurement

The Setup method can also be used to configure the measurement. This method can be called via the SETUP Transducer Block (TRDSUP).
### 25 Configuration parameters for interface measurement

- **R** = Reference point of measurement
- **E** = Empty calibration (= zero point)
- **F** = Full calibration (= span)
- **LN** = Probe length
- **UP** = Thickness of upper medium

<table>
<thead>
<tr>
<th>Step</th>
<th>Block</th>
<th>Parameter</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SETUP (TRDSUP)</td>
<td>Operating mode</td>
<td>Select 32940: Interface+capacitance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(operating_mode)</td>
<td>(operating_mode)</td>
</tr>
<tr>
<td>2</td>
<td>SETUP (TRDSUP)</td>
<td>Distance unit</td>
<td>Options:</td>
</tr>
<tr>
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<td></td>
<td>(distance_unit)</td>
<td>1010: m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1013: mm</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>1018: in</td>
</tr>
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<td></td>
<td></td>
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<td>1019: ft</td>
</tr>
<tr>
<td>3</td>
<td>SETUP (TRDSUP)</td>
<td>Tank type (tank_type)</td>
<td>Select tank type.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Options:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>32816: Bypass/stilling well</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>33288: Metal</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>33302: Coax</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>33432: Double cable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>33433: Double rod</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>33437: Rope, metal centering disk</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>33438: Rod, metal centering disk</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>33441: Non-metal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>33444: Installation outside</td>
</tr>
<tr>
<td>4</td>
<td>SETUP (TRDSUP)</td>
<td>Tube diameter</td>
<td>Specify the diameter of the bypass or stilling well.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(tube_diameter) ²</td>
<td>(tube_diameter)</td>
</tr>
<tr>
<td>5</td>
<td>SETUP (TRDSUP)</td>
<td>DC value (dc_value)</td>
<td>Specify the empty distance E (distance from reference point R to 0% mark).</td>
</tr>
<tr>
<td>6</td>
<td>SETUP (TRDSUP)</td>
<td>Empty calibration</td>
<td>Specify the full distance F (distance from the 0% mark to the 100% mark).</td>
</tr>
<tr>
<td>7</td>
<td>SETUP (TRDSUP)</td>
<td>Full calibration</td>
<td>Displays the measured level L.</td>
</tr>
<tr>
<td>8</td>
<td>SETUP (TRDSUP)</td>
<td>Level (level)</td>
<td>Displays the interface height L&lt;sub&gt;I&lt;/sub&gt;.</td>
</tr>
<tr>
<td>9</td>
<td>SETUP (TRDSUP)</td>
<td>Interface (interface)</td>
<td></td>
</tr>
</tbody>
</table>
Commissioning (block-oriented operation)

Levelflex FMP55 FOUNDATION Fieldbus

<table>
<thead>
<tr>
<th>Step</th>
<th>Block</th>
<th>Parameter</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>SETUP (TRDSUP)</td>
<td>Distance (filtered_dist_val)</td>
<td>Displays the distance D between the reference point R and the level L.</td>
</tr>
<tr>
<td>11</td>
<td>SETUP (TRDSUP)</td>
<td>Interface distance (interface_distance)</td>
<td>Displays the distance D&lt;sub&gt;i&lt;/sub&gt; between the reference point R and the interface L&lt;sub&gt;i&lt;/sub&gt;.</td>
</tr>
<tr>
<td>12</td>
<td>SETUP (TRDSUP)</td>
<td>Signal quality (signal_quality)</td>
<td>Displays the signal quality of the analyzed level echo.</td>
</tr>
<tr>
<td>13</td>
<td>SETUP (TRDSUP)</td>
<td>Confirm distance (confirm_distance)</td>
<td>Make sure the vessel is completely empty. Then select the 33100: Empty tank option.</td>
</tr>
</tbody>
</table>

1) Only available for coated probes and "Tank type" = "Bypass/stilling well"

**NOTICE**

Wrong measurement due to incorrect dielectric constant of the lower medium

- The dielectric constant (DC value) of the lower medium must be specified if the lower medium is not water in the operating mode 32940: Interface+capacitance. Block: ADV_SETUP (TRDASUP); parameter: DC value lower medium (dc_value_lower_medium).

**NOTICE**

Wrong measurement due to incorrect empty capacitance

- In the case of rod and rope probes in the bypass, a correct measurement is only possible in the operating mode 32940: Interface+capacitance once the empty capacitance has been determined. For this purpose, select the 'Empty tank' option in the 'Confirm distance' parameter after installing the probe when the tank is completely empty (Step 13 in the table above). A calculated empty capacitance can be entered for rod probes in exceptional cases only (if the tank cannot be emptied during commissioning). Block: EXPERT_CONFIG (TRDEXP); parameter: Empty capacity (empty_capacity).

The empty capacitance is always calibrated ex works in the case of coax probes.

### 12.6 Configuring the local display

#### 12.6.1 Factory setting of local display for interface measurements

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Factory setting for devices with 1 current output</th>
<th>Factory setting for devices with 2 current outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Format display</td>
<td>1 value, large format</td>
<td>1 value, large format</td>
</tr>
<tr>
<td>Value 1 display</td>
<td>Interface</td>
<td>Interface</td>
</tr>
<tr>
<td>Value 2 display</td>
<td>Level linearized</td>
<td>Level linearized</td>
</tr>
<tr>
<td>Value 3 display</td>
<td>Upper interface thickness</td>
<td>Current output 1</td>
</tr>
<tr>
<td>Value 4 display</td>
<td>Current output 1</td>
<td>Current output 2</td>
</tr>
</tbody>
</table>

The local display can be customized in the Transducer Block DISPLAY (TRDDISP).

### 12.7 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.
Path in the menu
Setup → Extended setup → Data backup → Configuration management

Block operation
Block: DISPLAY (TRDDISP)
Parameter: Configuration management (configuration_management)

Functions of the parameter options

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>33097: Backup</td>
<td>A backup copy of the current device configuration in the HistoROM is saved to the display module of the device. The backup copy includes the transmitter data of the device.</td>
</tr>
<tr>
<td>33057: Restore</td>
<td>The last backup copy of the device configuration is copied from the display module to the HistoROM of the device. The backup copy includes the transmitter data of the device.</td>
</tr>
<tr>
<td>33838: Duplicate</td>
<td>The transmitter configuration from another device is duplicated to the device using the display module.</td>
</tr>
<tr>
<td>265: Compare</td>
<td>The device configuration saved in the display module is compared to the current device configuration of the HistoROM.</td>
</tr>
<tr>
<td>32848: Delete data backup</td>
<td>The backup copy of the device configuration is deleted from the display module of the device.</td>
</tr>
</tbody>
</table>

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

1 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.

* In devices with FOUNDATION Fieldbus communication, the "PD-Tag" parameter is also accepted when duplicating the parameters. If necessary, set this parameter to the desired value after duplication.
12.8 Configuring event behavior according to FOUNDATION Fieldbus specification FF912

The device complies with FOUNDATION Fieldbus specification FF912. Among other things this means that:

- The diagnostic category as per NAMUR Recommendation NE107 is transmitted over the fieldbus in a format that is independent of the manufacturer:
  - F: Failure
  - C: Function check
  - S: Out of specification
  - M: Maintenance required
- The diagnostic category of the predefined event groups can be adapted by the user according to the requirements of the individual application.
- Certain events can be separated from their group and be treated individually:
  - 941: Lost echo
  - 942: In safety distance
- Additional information and troubleshooting measures are transmitted over the fieldbus with the event message.

Diagnostic messages according to FF912 are only available in the host if the Multi-bit Alarm Support option is activated in the FEATURE_SEL parameter of the Resource Block. For reasons of compatibility, this option is not enabled when the device is delivered:
12.8.1 Event groups

The diagnostic events are divided into 16 groups according to the source and the weighting. A default event category is assigned to each group at the factory. Here, one bit of the assignment parameters belongs to every event group.

<table>
<thead>
<tr>
<th>Event weighting</th>
<th>Default event category</th>
<th>Event source</th>
<th>Bit</th>
<th>Events in this group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest weighting</td>
<td>Failure (F)</td>
<td>Sensor</td>
<td>31</td>
<td>F003: Broken probe detected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F046: Buildup detected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F083: Memory content</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F104: HF cable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F105: HF cable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F106: Sensor</td>
</tr>
<tr>
<td>Electronics</td>
<td></td>
<td></td>
<td>30</td>
<td>F242: Software incompatible</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F252: Modules incompatible</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F261: Electronic modules</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F262: Module connection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F270: Main electronic failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F271: Main electronic failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F272: Main electronic failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F273: Main electronic failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F275: I/O module failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F276: I/O module failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F282: Data storage</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F283: Memory content</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F311: Memory content</td>
</tr>
<tr>
<td>Configuration</td>
<td></td>
<td></td>
<td>29</td>
<td>F410: Data transfer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F411: Upload/download</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F435: Linearization</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F437: Configuration incompatible</td>
</tr>
<tr>
<td>Process</td>
<td></td>
<td></td>
<td>28</td>
<td>F803: Loop current 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F825: Operating temperature</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F936: EMC interference</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F941: Echo lost 1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F970: Linearization</td>
</tr>
<tr>
<td>1)</td>
<td></td>
<td></td>
<td></td>
<td>This event can be removed from the group and treated separately; see the &quot;Configurable area&quot; section.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event weighting</th>
<th>Default event category</th>
<th>Event source</th>
<th>Bit</th>
<th>Events in this group</th>
</tr>
</thead>
<tbody>
<tr>
<td>High weighting</td>
<td>Function check (C)</td>
<td>Sensor</td>
<td>27</td>
<td>Not used in Levelflex</td>
</tr>
<tr>
<td>Electronics</td>
<td></td>
<td></td>
<td>26</td>
<td>Not used in Levelflex</td>
</tr>
<tr>
<td>Configuration</td>
<td></td>
<td></td>
<td>25</td>
<td>C411: Upload/download</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C431: Trim</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C484: Failure mode simulation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C485: Simulation measured value</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C491: Simulation current output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C585: Simulation distance</td>
</tr>
<tr>
<td>Process</td>
<td></td>
<td></td>
<td>24</td>
<td>Not used in Levelflex</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event weighting</th>
<th>Default event category</th>
<th>Event source</th>
<th>Bit</th>
<th>Events in this group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low weighting</td>
<td>Out of specification (S)</td>
<td>Sensor</td>
<td>23</td>
<td>Not used in Levelflex</td>
</tr>
<tr>
<td>Electronics</td>
<td></td>
<td></td>
<td>22</td>
<td>Not used in Levelflex</td>
</tr>
</tbody>
</table>
### Event weighting

<table>
<thead>
<tr>
<th>Event weighting</th>
<th>Default event category</th>
<th>Event source</th>
<th>Bit</th>
<th>Events in this group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td></td>
<td></td>
<td>21</td>
<td>S441: Current output 1</td>
</tr>
<tr>
<td>Process</td>
<td></td>
<td></td>
<td>20</td>
<td>S801: Energy too low</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S825: Operating temperature</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S921: Change of reference</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S942: In safety distance 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S943: In blocking distance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S944: Level range</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S968: Level limited</td>
</tr>
</tbody>
</table>

1) This event can be removed from the group and treated separately; see the ‘Configurable area’ section.

---

<table>
<thead>
<tr>
<th>Event weighting</th>
<th>Default event category</th>
<th>Event source</th>
<th>Bit</th>
<th>Events in this group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowest weighting</td>
<td>Maintenance required (M)</td>
<td>Sensor</td>
<td>19</td>
<td>Not used in Levelflex</td>
</tr>
<tr>
<td>Electronics</td>
<td></td>
<td></td>
<td>18</td>
<td>M270: Main electronics error</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M272: Main electronics error</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M311: Memory content</td>
</tr>
<tr>
<td>Configuration</td>
<td>M438: Dataset</td>
<td></td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td>M801: Loop current 1</td>
<td></td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>
12.8.2 Assignment parameters

Event categories are assigned to the event groups via four assignment parameters. These are located in the RESOURCE (RB2) Block:

- **FD_FAIL_MAP**: For the Failure (F) event category
- **FD_CHECK_MAP**: For the Function check (C) event category
- **FD_OFFSPEC_MAP**: For the Out of specification (S) event category
- **FD_MAINT_MAP**: For the Maintenance required (M) event category

Each of these parameters consists of 32 bits with the following meaning:

- **Bit 0**: Reserved by the Fieldbus Foundation
- **Bits 1 to 15**: Configurable area; certain diagnostic events can be assigned here independently of the event group they belong to. They are then removed from the event group and their behavior can be configured individually.
- **Bits 16-31**: Standard range; these bits are permanently assigned to the event groups. If the bit is set to 1, this event group is assigned to the individual event category.

The following table indicates the default setting of the assignment parameters. In the default setting, there is a clear assignment between the event weighting and the event category (i.e. the assignment parameter).

### Default setting of assignment parameters

<table>
<thead>
<tr>
<th>Event source</th>
<th>Standard range</th>
<th>Configurable area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event weighing</td>
<td>Highest weighting</td>
<td>High weighting</td>
</tr>
<tr>
<td>Event source</td>
<td>S E C P</td>
<td>S E C P</td>
</tr>
<tr>
<td>Bit</td>
<td>31 30 29 28</td>
<td>27 26 25 24</td>
</tr>
<tr>
<td>FD_FAIL_MAP</td>
<td>1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0</td>
<td>0</td>
</tr>
<tr>
<td>FD_CHECK_MAP</td>
<td>0 0 0 0 1 1 1 1 0 0 0 0 0 0 0 0 0</td>
<td>0</td>
</tr>
<tr>
<td>FD_OFFSPEC_MAP</td>
<td>0 0 0 0 0 0 0 1 1 1 1 0 0 0 0 0 0</td>
<td>0</td>
</tr>
<tr>
<td>FD_MAINT_MAP</td>
<td>0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1</td>
<td>0</td>
</tr>
</tbody>
</table>

1) S: Sensor; E: Electronics; C: Configuration; P: Process

Proceed as follows to change the diagnostic behavior of an event group:

1. Open the assignment parameter in which the group is currently assigned.
2. Change the event group bit from 1 to 0. When operating via FieldCare, this is done by unchecking the corresponding check box (see the next example).
3. Open the assignment parameter to which the group should be assigned.
4. Change the event group bit from 0 to 1. When operating via FieldCare, this is done by checking the corresponding check box (see the next example).

**Example**

The **Highest weighting / configuration error** group contains the events **410: Data transfer**, **411: Upload/download**, **435: Linearization** and **437: Configuration**.
incompatible. These should be categorized as **Function check (C)** and no longer as **Failure (F)**.

1. In the FieldCare navigation window, navigate to **Expert → Communication → Field diagnostics → Alarm detection enable**.

2. In the Fail Map column, look for the **Configuration Highest Severity** group and uncheck the corresponding check box (A). Check the relevant check box in the **Check Map** (B) column. Note that you must press the Enter key to confirm every entry.
Please ensure that the corresponding bit is set in at least one of the assignment parameters for each event group. Otherwise no category will be transmitted with the event over the bus, and the control system will therefore generally ignore the presence of the event.

The detection of diagnostic events is parameterized on the **Alarm detection enable** FieldCare page but the transmission of messages over the bus is not. The latter is performed on the **Alarm broadcast enable** page. The operation of this page is identical to the operation of the **Alarm detection enable** page. The Resource Block must be in the **Auto** mode for the status information to be transmitted over the bus.
12.8.3 Configurable area

The event category can be individually defined for the following events - irrespective of the event group they are assigned to in the default setting:

- **F941**: Lost echo
- **S942**: In safety distance

To change the event category, the event first has to be assigned to one of the bits 1 to 15. The FF912_ConfigArea_1 to FF912_ConfigArea_15 parameters in the DIAGNOSTIC (TRDDIAG) Block are used for this purpose. Then the corresponding bit can be set from 0 to 1 in the desired assignment parameter.

**Example**

Error 942 "In safety distance" should no longer be categorized as Out of specification (S) and should be categorized as Function check (C) instead.

1. In the FieldCare navigation window, navigate to Expert → Communication → Field diagnostics → Alarm detection enable.

2. In the default setting, all bits in the Configurable Area Bits column have the value not used.

3. Select one of these bits (here for example: Configurable Area Bit 1) and select the In safety distance option from the corresponding selection list. Press Enter to confirm the option selected.
4. Go to the Offspec Map column and check the check box for the corresponding bit (here: Configurable Area Bit 1). Press ENTER to confirm your entries.

A change to the In safety distance error category does not affect an error that already exists. The new category is only assigned if this error occurs again after the change has been made.

12.8.4 Transmission of event messages over the bus

Event priority

Event messages are only transmitted over the bus if their priority is between 2 and 15. Priority 1-events are displayed but are not transmitted over the bus. Priority 0-events are ignored. In the factory setting, the priority of all events is 0. The priority can be individually changed for the four assignment parameters. The following four parameters of the Resource Block are used for this purpose:

Suppression of certain events

It is possible to suppress certain events during transmission over the bus using a mask. While these events are displayed they are not transmitted over the bus. This mask is in FieldCare under Expert → Communication → Field diagnostics → Alarm broadcast enable. The mask is a negative selection mask, i.e. if a field is selected the associated events are not transmitted over the bus.

12.9 Protecting settings from unauthorized access

The settings can be protected from unauthorized access in the following ways:

- Locking via write protection switch (hardware locking)
- Locking via the operating menu (software locking)
- Locking via block operation:
  - Block: DISPLAY (TRDDISP); parameter: Define access code
  - Block: EXPERT_CONFIG (TRDEXP); parameter: Enter access code
13 Diagnostics and troubleshooting

13.1 General troubleshooting

13.1.1 General errors

<table>
<thead>
<tr>
<th>Error</th>
<th>Possible cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device does not respond.</td>
<td>Supply voltage not connected.</td>
<td>Connect the correct voltage.</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 \( \uparrow \) and \( \downarrow \) simultaneously.  
|                                                    |                                                   | • Decrease contrast by pressing \( \downarrow \) and \( \uparrow \) 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.                             |
| Duplication of parameters via display from one device to another not working. Only the 'Save' and 'Cancel' options are available. | Display with backup is not properly detected if a data backup was not carried out on the new device previously. | Connect display (with backup) and restart device. |
| 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.                       | Parameter configuration error                      | Check and correct the parameter configuration. |
### 13.1.2 Parametrization errors

#### Parametrization errors for level measurements

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured value is incorrect</td>
<td>If measured distance (Setup → Distance) matches the real distance: Calibration error</td>
<td>• Check the Empty calibration parameter (→ 128) and correct if necessary. &lt;br&gt;• Check the Full calibration parameter (→ 128) and correct if necessary. &lt;br&gt;• Check the linearization and correct if necessary (Linearization submenu (→ 149)).</td>
</tr>
<tr>
<td></td>
<td>If measured distance (Setup → Distance) does not match the real distance: An interference echo is present.</td>
<td>Carry out mapping (Confirm distance parameter (→ 133)).</td>
</tr>
<tr>
<td>No change of measured value on filling/emptying</td>
<td>An interference echo is present.</td>
<td>Carry out mapping (Confirm distance parameter (→ 133)).</td>
</tr>
<tr>
<td></td>
<td>Buildup at the probe.</td>
<td>Clean the probe.</td>
</tr>
<tr>
<td></td>
<td>Error in the echo tracking.</td>
<td>Deactivate echo tracking (Expert → Sensor → Echo tracking → Evaluation mode = History off).</td>
</tr>
<tr>
<td>Echo lost diagnostic message appears after the supply voltage is switched on.</td>
<td>Echo threshold too high.</td>
<td>Check the Medium group parameter (→ 127).&lt;br&gt; If necessary, select a more detailed setting with the Medium property parameter.</td>
</tr>
<tr>
<td></td>
<td>Level echo suppressed.</td>
<td>Delete the map and record it again if necessary (Record map parameter (→ 135)).</td>
</tr>
<tr>
<td>Device displays a level when the tank is empty.</td>
<td>Incorrect probe length</td>
<td>Perform probe length correction (Confirm probe length parameter (→ 163)).</td>
</tr>
<tr>
<td></td>
<td>Interference echo</td>
<td>Carry out mapping over the entire probe length when the tank is empty (Confirm distance parameter (→ 133)).</td>
</tr>
<tr>
<td>Wrong slope of the level over the entire measuring range</td>
<td>Wrong tank type selected.</td>
<td>Select the correct Tank type parameter (→ 126).</td>
</tr>
</tbody>
</table>

#### Parametrization errors for interface measurements

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incorrect slope of the interface measured value</td>
<td>The dielectric constant (DC value) of the upper medium is incorrectly set.</td>
<td>Enter the correct dielectric constant (DC value) of the upper medium (DC value parameter (→ 131)).</td>
</tr>
<tr>
<td>The measured value for the interface and the total level are identical.</td>
<td>The echo threshold for the total level is too high due to an incorrect dielectric constant.</td>
<td>Enter the correct dielectric constant (DC value) of the upper medium (DC value parameter (→ 131)).</td>
</tr>
<tr>
<td>The total level jumps to the interface level in the case of thin interfaces.</td>
<td>The thickness of the upper medium is lower than 60 mm.</td>
<td>Measurement of the interface is only possible for interface heights greater than 60 mm.</td>
</tr>
</tbody>
</table>
13.2 Diagnostic information on local display

13.2.1 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.

<table>
<thead>
<tr>
<th>Measured value display in alarm condition</th>
<th>Diagnostic message</th>
</tr>
</thead>
<tbody>
<tr>
<td>XXXXXXXXXX △ S</td>
<td>XXXXXXXXXX △ S</td>
</tr>
<tr>
<td>20.50</td>
<td></td>
</tr>
<tr>
<td>X 4</td>
<td></td>
</tr>
<tr>
<td>S801</td>
<td>Menu</td>
</tr>
<tr>
<td>Supply voltage</td>
<td></td>
</tr>
</tbody>
</table>

1  Status signal
2  Status symbol (symbol for event level)
3  Status symbol with diagnostic event
4  Event text
5  Operating elements

Status signals

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| F | *Failure (F)* option  
A device error has occurred. The measured value is no longer valid. |
| C | *Function check (C)* option  
The device is in the 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 performed by the user (e.g. level outside the configured range) |
| M | *Maintenance required (M)* option  
Maintenance is required. The measured value is still valid. |

Status symbol (symbol for event level)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| ☣ | *Alarm* status  
The measurement is interrupted. The signal outputs adopt the defined alarm condition. A diagnostic message is generated. |
| △ | *Warning* status  
The device continues to measure. A diagnostic message is generated. |
Diagnostic event and event text

The fault can be identified by means of the diagnostic event. The event text helps you by providing information about the fault. In addition, the associated status symbol is displayed in front of the diagnostic event.

<table>
<thead>
<tr>
<th>Diagnostic event</th>
<th>Status symbol</th>
<th>Status signal</th>
<th>Event number</th>
<th>Event text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example</td>
<td>Δ</td>
<td>S</td>
<td>441</td>
<td>Curr.output 1</td>
</tr>
</tbody>
</table>

3-digit number

If two or more diagnostic events occur simultaneously, only the diagnostic message with the highest priority is shown. Additional queued 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>
13.2.2 Calling up remedial measures

The user is in the diagnostic message.

1. Press \( \text{ð} \) (\( \text{ð} \) symbol).
   \( \text{ð} \) The Diagnostic list submenu opens.

2. Select the desired diagnostic event with \( \text{ð} \) or \( \text{ð} \) and press \( \text{ð} \).
   \( \text{ð} \) The message for the remedial measures for the selected diagnostic event opens.

3. Press \( \text{ð} \) + \( \text{ð} \) simultaneously.
   \( \text{ð} \) The message about the remedial measures closes.

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

1. Press \( \text{ð} \).
   \( \text{ð} \) The message for the remedial measures for the selected diagnostic event opens.

2. Press \( \text{ð} \) + \( \text{ð} \) simultaneously.
   \( \text{ð} \) The message about the remedial measures closes.
13.3 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)

A: Via the operating menu

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.

B: Via the "Create documentation" function

1. Select the 'Create documentation' function.

2. Make sure 'Data overview' is marked.
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3. Click “Save as ...” and save a PDF of the protocol.
   ➔ The protocol contains the diagnostic messages and remedy information.

C: Via the "Eventlist / Extended HistoROM" function

1. Select the "Eventlist / Extended HistoROM" function.

2. Select the "Load Eventlist" function.
   ➔ The list of events, including remedy information, is shown in the "Data overview" window.

13.4  Diagnostic messages in the DIAGNOSTIC Transducer Block (TRDDIAG)

- The Actual diagnostics parameter displays the message with the highest priority. Every message is also output as per the FOUNDATION Fieldbus Specification by means of the XD_ERROR and BLOCK_ERROR parameters.
- A list of diagnostic messages is displayed in the Diagnostics 1 to Diagnostics 5 parameters. If more than 5 messages are currently active, only those with the highest priority are displayed.
- You can view a list of alarms which are no longer active (event log) via the Previous diagnostics parameter.

13.5  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.
13.6 Event logbook

13.6.1 Event history
A chronological overview of the event messages that have occurred is provided in the Event list submenu 2).

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.

13.6.2 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

13.6.3 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>
</tbody>
</table>

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.
<table>
<thead>
<tr>
<th>Info number</th>
<th>Info name</th>
</tr>
</thead>
<tbody>
<tr>
<td>I1092</td>
<td>Trend data 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>
<tr>
<td>I1185</td>
<td>Display backup done</td>
</tr>
<tr>
<td>I1186</td>
<td>Restore via display done</td>
</tr>
<tr>
<td>I1187</td>
<td>Settings downloaded with display</td>
</tr>
<tr>
<td>I1188</td>
<td>Display data cleared</td>
</tr>
<tr>
<td>I1189</td>
<td>Backup compared</td>
</tr>
<tr>
<td>I1256</td>
<td>Display: access status changed</td>
</tr>
<tr>
<td>I1264</td>
<td>Safety sequence aborted</td>
</tr>
<tr>
<td>I1335</td>
<td>Firmware changed</td>
</tr>
<tr>
<td>I1397</td>
<td>Fieldbus: access status changed</td>
</tr>
<tr>
<td>I1398</td>
<td>CDI: access status changed</td>
</tr>
<tr>
<td>I1512</td>
<td>Download started</td>
</tr>
<tr>
<td>I1513</td>
<td>Download finished</td>
</tr>
<tr>
<td>I1514</td>
<td>Upload started</td>
</tr>
<tr>
<td>I1515</td>
<td>Upload finished</td>
</tr>
</tbody>
</table>
## 13.7 Firmware history

<table>
<thead>
<tr>
<th>Date</th>
<th>Firmware version</th>
<th>Modifications</th>
<th>Operating Instructions</th>
<th>Description of Device Parameters</th>
<th>Technical Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>04.2012</td>
<td>01.00.zz</td>
<td>Original software</td>
<td>BA01054F/00/EN/01.12</td>
<td>GP01015F/00/EN/01.12</td>
<td>TI01003F/00/EN/14.12</td>
</tr>
</tbody>
</table>
| 05.2015  | 01.01.zz         | • Support of SD03  
                    • Additional languages  
                    • HistorOM functionality enhanced  
                    • "Advanced Diagnostics" function block integrated  
                    • Improvements and bugfixes | BA01054F/00/EN/03.15   | BA01054F/00/EN/04.16 1)       | BA01015F/00/EN/02.15   |
                    |                  |                                                                               |                        |                                  |                        |

1) Contains information on the Heartbeat wizards available in the current 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.
14  Maintenance

No special maintenance work is required.

14.1  Exterior cleaning

When cleaning the exterior, always use cleaning agents that do not corrode the surface of the housing and the seals.

14.2  General cleaning instructions

Dirt or buildup may form on the probe depending on the application. A thin, even layer has little impact on the measurement. Thick layers can dampen the signal and reduce the measuring range. Very uneven deposit formation or caking (e.g. due to crystallization) can result in incorrect measurements. In such cases, use a non-contact measuring principle, or regularly inspect the probe for contamination.

Cleaning with sodium hydroxide solution (e.g. in CIP procedures): if the coupling is wetted, larger measurement errors can occur than under reference operating conditions. Wetting can cause temporary incorrect measurements.

14.3  Cleaning coax probes

The ground tube can be removed towards the bottom for cleaning purposes. When disassembling and reassembling, make sure that the spacers between the probe rod and ground tube are not displaced. A spacer is located approx. 10 cm (4 in) from the end of the probe. Depending of the length of the probe there may be additional spacers evenly distributed along the probe.
15 Repair

15.1 General information

15.1.1 Repair concept
Under the Endress+Hauser repair concept, devices have a modular design and repairs can be carried out by Endress+Hauser Service or by properly trained customers.
Spare parts are grouped into logical kits with the associated replacement instructions.
For more information on service and spare parts, please contact Endress+Hauser Service.

15.1.2 Repair of Ex-certified devices

**WARNING**
Incorrect repair can compromise electrical safety!
Explosion Hazard!
- Repairs to Ex-certified devices must be carried out by Endress+Hauser Service or by specialist personnel according to national regulations.
- Relevant standards and national regulations on hazardous areas, safety instructions and certificates must be observed.
- Use only original Endress+Hauser spare parts.
- Please note the device designation on the nameplate. Only identical parts may be used as replacements.
- Carry out repairs according to the instructions.
- Only the Endress+Hauser service team is permitted to modify a certified device and convert it to another certified version.

15.1.3 Replacing electronics modules
When electronics modules have been replaced the device does not need to be recalibrated as the parameters are saved in the HistoROM inside the housing. It may be necessary when replacing the main electronics to record a new interference echo suppression.

15.1.4 Replacing a device
Once a complete device has been replaced, the parameters can be transferred back into the device using one of the following methods:
- Using the display module
  Prerequisite: The configuration of the old device was saved previously to the display module.
- Via FieldCare
  Prerequisite: The configuration of the old device was saved previously to the computer using FieldCare.

You can continue measuring without performing a new calibration. Only interference echo suppression may need to be carried out once again.
15.2 **Spare parts**

- Some replaceable measuring device components are identified by means of a spare part nameplate. This contains information about the spare part.
- In the connection compartment cover of the device there is a spare part nameplate which contains the following information:
  - A list of the most important spare parts for the measuring device, including their ordering information.
  - The URL to the W@M Device Viewer ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)):
    All the spare parts for the measuring device, along with the order code, are listed here and can be ordered. If available, users can also download the associated Installation Instructions.

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

**Measuring device serial number:**
- Located on the device and spare part nameplate.
- Can be read out via the 'Serial number' parameter in the 'Device information' submenu.

15.3 **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](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.

15.4 **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.
16 Accessories

16.1 Device-specific accessories

16.1.1 Weather protection cover

The weather protection cover can be ordered together with the device via the "Accessory enclosed" product structure.

Material

316L

Order number for accessories:

71162242
## 16.1.2 Mounting bracket for electronics housing

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting bracket for electronics housing</td>
<td><img src="image1" alt="Diagram A" /> <img src="image2" alt="Diagram B" /></td>
</tr>
</tbody>
</table>

### Diagram A
- 122 (4.8)
- 161 (6.34)
- 127...140 (5...5.51)
- 162...175 (6.38...6.89)

### Diagram B
- ø42...60 (1.65...2.36)
- 52 (2)

### Notes
- **32** Mounting bracket for electronics housing; engineering unit: mm (in)
- **A** Wall mounting
- **B** Post mounting

With "remote sensor" device versions (see feature 060 in the product structure), the mounting bracket is included in the scope of delivery. However, it can also be ordered separately as an accessory (order number: 71102216).
### 16.1.3 Centering star

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centering star PFA</td>
<td></td>
</tr>
<tr>
<td>• Ø 16.4 mm (0.65 in)</td>
<td></td>
</tr>
<tr>
<td>• Ø 37 mm (1.46 in)</td>
<td></td>
</tr>
<tr>
<td>suitable for</td>
<td></td>
</tr>
<tr>
<td>FMP55</td>
<td></td>
</tr>
</tbody>
</table>

A: ø16.4 (0.65)
B: ø37 (1.46)

The centering star is suitable for probes with a rod diameter of 8 mm (0.3 in), 12 mm (0.47 in) and 16 mm (0.63 in) (including coated rod probes) and can be used in pipes from DN40 to DN50. See also Operating Instructions BA00378F/00/A2.

- Material: PFA
- Permitted process temperature range: −200 to +250 °C (−328 to +482 °F)
- Order number
  - Probe 8 mm (0.3 in): 71162453
  - Probe 12 mm (0.47 in): 71157270
  - Probe 16 mm (0.63 in): 71069065

ℹ️ The PFA centering star can also be ordered directly with the device (Levelflex product structure, feature 610 'Accessory mounted', option OE).
### Centering star PEEK, ⌀ 48 to 95 mm (1.9 to 3.7 in) suitable for FMP55

**Material:** PEEK  
**Permitted process temperature range:** –60 to +250 °C (–76 to +482 °F)

- **Order number:**  
  - 71373490 (1x)  
  - 71373492 (5x)

The centering star is suitable for probes with a rope diameter of 4 mm (1/6 in) (including coated rope probes). See also Operating Instructions SD01961F.

- **Material:** PEEK  
- **Permitted process temperature range:** –60 to +250 °C (–76 to +482 °F)

16.1.4 Remote display FHX50

**Technical data**

- **Material:**
  - Plastic PBT  
  - 316L/1.4404  
  - Aluminum
- **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: -40 to 80 °C (−40 to 176 °F)
- Ambient temperature (option): -50 to 80 °C (−58 to 176 °F) 3)

Ordering information
- If the remote display is to be used, the device version "Prepared for display FHX50" must be ordered.
  For the FHX50, the option "Prepared for display FHX50" must be selected under "Measuring device version".
- If a measuring device has not been ordered with the version "Prepared for display FHX50" and is to be retrofitted with an FHX50, the version "Not prepared for display FHX50" must be ordered for the FHX50 under "Measuring device version". 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 may only be retrofitted with the FHX50 if the option "Prepared for FHX50" is listed in the associated Safety Instructions (XA) under Basic specifications, "Display, operation".

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)
- Type of protection Ex nA

For details, see the 'Special Documentation' SD01007F

16.1.5 Overvoltage protection

The surge arrester for loop-powered devices can be ordered together with the device via the "Accessory mounted" section of the product order structure.

The surge arrester can be used for loop-powered devices.
- 1-channel devices - OVP10
- 2-channel devices - OVP20

Technical data
- Resistance per channel: $2 \times 0.5 \, \Omega_{\text{max}}$
- Threshold DC voltage: 400 to 700 V
- Threshold surge voltage: < 800 V

3) This range applies if the option JN "Transmitter ambient temperature" -50 °C (−58 °F) was selected in feature 580 "Test, Certificate". If the temperature is permanently below −40 °C (−40 °F), higher failure rates can be expected.
• Capacitance at 1 MHz: < 1.5 pF
• Nominal leakage current (8/20 μs): 10 kA
• Suitable for conductor cross-sections: 0.2 to 2.5 mm² (24 to 14 AWG)

If retrofitting:
• Order number for 1-channel devices (OVP10): 71128617
• Order number for 2-channel devices (OVP20): 71128619
• The use of the OVP module may be restricted depending on the transmitter approval. A device may only be retrofitted with the OVP module if the option NA (overvoltage protection) is listed under Optional specifications in the Safety Instructions (XA) associated with the device.
• In order to keep the necessary safety distances when using the surge arrester module, the housing cover also needs to be replaced when the device is retrofitted. Depending on the housing type, the suitable cover can be ordered using the following order number:
  • Housing GT18: 71185516
  • Housing GT19: 71185518
  • Housing GT20: 71185517

For details, see the "Special Documentation" SD01090F

16.1.6 Bluetooth module BT10 for HART devices
The Bluetooth module BT10 can be ordered together with the device via the "Accessory mounted" section of the product order structure.

Technical data
• Quick and easy setup with the SmartBlue app
• No additional tools or adapters needed
• Signal curve via SmartBlue (app)
• Encrypted single point-to-point data transmission (tested by Fraunhofer Institute) and password-protected communication via Bluetooth® wireless technology
• Range under reference conditions:
  > 10 m (33 ft)
• When the Bluetooth module is used, the minimum supply voltage of the device increases by up to 3 V.
If retrofitting:
- Order number: 71377355
- The use of the Bluetooth module may be restricted depending on the transmitter approval. A device may only be retrofitted with the Bluetooth module if the option NF (Bluetooth module) is listed under Optional specifications in the Safety Instructions (XA) associated with the device.

For details, see the "Special Documentation" SD02252F

16.2 Communication-specific accessories

Commubox FXA291
Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop
Order number: 51516983

For details, see "Technical Information" TI00405C

Field Xpert SFX350
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
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

16.3 Service-specific accessories

DeviceCare SFE100
Configuration tool for HART, PROFIBUS and FOUNDATION Fieldbus field devices
Technical Information TI01134S

FieldCare SFE500
FDT-based plant asset management tool
It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.
Technical Information TI00028S

16.4 System components

Memograph M graphic data manager
The Memograph M graphic data manager 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 a SD card or USB stick.
Technical Information TI00133R and Operating Instructions BA00247R
17 Operating menu

17.1 Overview of the operating menu (display module)

*Navigation*  ▶ Operating menu

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<tbody>
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<td>Language</td>
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<tbody>
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</tr>
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<tr>
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</table>
### Analog Inputs

- **Analog Input 1 to 5**
  - Block tag
  - Channel
  - Process Value Filter Time

### Advanced Setup

- Locking status
- Access status display
- Enter access code

### Interface

- Process property
- Interface property
- DC value lower medium
- Level unit
- Blocking distance
- Level correction

### Automatic DC Calculation

- Manual thickness upper layer
- DC value
- Use calculated DC value

### Linearization

- Linearization type
- Unit after linearization
- Free text
- Maximum value
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<td>Table mode</td>
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<td>Level</td>
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<td><strong>Safety settings</strong></td>
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<td>Blocking distance</td>
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<td><strong>Probe settings</strong></td>
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<tr>
<td>Header text</td>
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<tr>
<td>Number format</td>
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<td><strong>Configuration backup display</strong></td>
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Operating menu

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- Distance  
  - 130
- Level linearized  
  - 154
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  - 132
- Interface linearized  
  - 154
- Thickness upper layer  
  - 190
- Terminal voltage 1  
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  - 192
- Value  
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**Simulation**
- Assign measurement variable  
  - 200
- Process variable value  
  - 200
- Switch output simulation  
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**Levelflex FMP55 FOUNDATION Fieldbus**

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17.2 Overview of the operating menu (operating tool)

Navigation  Operating menu

Setup

Operating mode
Distance unit
Tank type
Tube diameter
Medium group
Empty calibration
Full calibration
Level
Distance
Signal quality
DC value
Interface
Interface distance
Confirm distance
Present mapping
Mapping end point
Record map

Analog inputs

Analog input 1 to 5
Block tag
### Levelflex FMP55 FOUNDATION Fieldbus

#### Operating menu

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<td>Level</td>
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<td>Customer value</td>
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<tr>
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<td>Blocking distance</td>
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#### Probe settings

<table>
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<tbody>
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<td>Switch-off delay</td>
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<td>Invert output signal</td>
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<td><strong>Display</strong></td>
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<td>Language</td>
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<tr>
<td>Format display</td>
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<tr>
<td>Value 1 to 4 display</td>
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<tr>
<td>Decimal places 1 to 4</td>
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<tr>
<td>Display interval</td>
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<tr>
<td>Display damping</td>
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<td>Header</td>
<td>174</td>
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<tr>
<td>Header text</td>
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<td>Number format</td>
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<td>Contrast display</td>
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<tr>
<td><strong>Configuration backup display</strong></td>
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Operating menu

- **Backup state**
  - → 178

- **Comparison result**
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- **Administration**
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  - Define access code
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  - Device reset
  - → 180

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  - → 187

  - Device tag
  - → 187

  - Serial number
  - → 187

  - Firmware version
  - → 187

  - Device name
  - → 188

  - Order code
  - → 188

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- **Measured values**
  - → 189

  - Distance
  - → 130

  - Level linearized
  - → 154
## Operating menu

**Levellflex FMP55 FOUNDATION Fieldbus**

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</tr>
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<td>Status</td>
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### Data logging

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<tr>
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### Simulation

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</tr>
<tr>
<td>Switch output simulation</td>
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<tr>
<td>Switch status</td>
<td>201</td>
</tr>
<tr>
<td>Simulation device alarm</td>
<td>201</td>
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</tbody>
</table>

### Device check

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<td>Signal Type</td>
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<td>Level signal</td>
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<td>Interface signal</td>
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</tr>
<tr>
<td>Heartbeat</td>
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</tbody>
</table>
17.3 "Setup" menu

- : Indicates how to navigate to the parameter using the display and operating module
- : Indicates how to navigate to the parameter using operating tools (e.g. FieldCare)
- : Indicates parameters that can be locked via the access code.

Navigation

Setup → Operating mode

Prerequisite
The device has the "interface measurement" application package. FMP55 always contains this package.

Description
Select operating mode.

Selection
  - Level
  - Interface with capacitance *
  - Interface *

Factory setting
FMP55: Interface with capacitance

Additional information
The Interface with capacitance option is only available for FMP55.

Distance unit

Navigation

Setup → Distance unit

Description
Length unit for distance calculation.

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>

Tank type

Navigation

Setup → Tank type

Prerequisite
Medium type = Liquid

Description
Select tank type.

---

4) Product structure: Feature 540 "Application Package", Option EB "Interface measurement"

* Visibility depends on order options or device settings
Selection

- Metallic
- Bypass / pipe
- Non metallic
- Mounted outside
- Coaxial

Factory setting
Depending on the probe

Additional information
- Depending on the probe some of the options mentioned above may not be available or there may be additional options.
- For coax probes and probes with metallic center washer Tank type parameter corresponds to the type of probe and cannot be changed.

Tube diameter

Navigation

Setup → Tube diameter

Prerequisite

- Tank type (→ 126) = Bypass / pipe
- The probe is coated.

Description
Specify diameter of bypass or stilling well.

User entry
0 to 9.999 m

Medium group

Navigation

Setup → Medium group

Prerequisite

- For FMP51/FMP52/FMP54/FMP55: Operating mode (→ 126) = Level
- Medium type = Liquid

Description
Select medium group.

Selection

- Others
- Water based (DC >= 4)

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.
The Medium group parameter presets the Medium property parameter as follows:

<table>
<thead>
<tr>
<th>Medium group</th>
<th>Medium property</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 can be changed at a later point of time. However, when doing so, the Medium group parameter retains its value. Only the Medium property parameter 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**

Setup → Empty calibr.

**Description**

Distance process connection to min. level.

**User entry**

Depending on the probe

**Factory setting**

Depending on the probe

**Additional information**

In the case of interface measurements the Empty calibration parameter is valid for both, the total and the interface level.

---

### Full calibration

**Navigation**

Setup → Full calibr.

**Description**

Span: max. level - min level.
User entry
Depending on the probe

Factory setting
Depending on the probe

Additional information

In the case of interface measurements the Full calibration parameter is valid for both, the total and the interface level.

Level

Navigation
Setup → Level

Description
Displays measured level \( L_L \) (before linearization).

Additional information

- The unit is defined in the Level unit parameter (→ 143).
- In case of interface measurements, this parameter always refers to the total level.
Operating menu

Levelflex FMP55 FOUNDATION Fieldbus

Distance

Navigation

Setup → Distance

Description
Displays the measured distance $D_L$ between the reference point (lower edge of the flange or threaded connection) and the level.

Additional information

The unit is defined in the Distance unit parameter (→ 126).

Signal quality

Navigation

Setup → Signal quality

Description
Displays the signal quality of the evaluated echo.

Additional information

Meaning of the display options

- **Strong**
  The evaluated echo exceeds the threshold by at least 10 mV.
- **Medium**
  The evaluated echo exceeds the threshold by at least 5 mV.
- **Weak**
  The evaluated echo exceeds the threshold by less than 5 mV.
- **No signal**
  The device does not find a usable echo.

The signal quality indicated in this parameter always refers to the currently evaluated echo: either the level/interface echo $^5)$ or the end-of-probe echo. To differentiate between these two, the quality of the end-of-probe echo is always displayed in brackets.

In case of a lost echo (Signal quality = No signal) the device generates the following error message:

- F941, for Output echo lost (→ 159) = Alarm.
- S941, if another option has been selected in Output echo lost (→ 159).

$^5)$ Of these two echos the one with the lower quality is indicated.
**DC value**

**Navigation**

Setup → DC value

**Prerequisite**

The device has the "Interface measurement" application package 6).

**Description**

Specify the relative dielectric constant $\varepsilon_r$ of the upper medium (DC1).

**User entry**

1.0 to 100

**Additional information**

For the dielectric constants (DC values) of many media commonly used in industry, please refer to:

- Dielectric constant (DC value) Compendium CP01076F
- The Endress+Hauser "DC Values app" (available for Android and iOS)

---

**Interface**

**Navigation**

Setup → Interface

**Prerequisite**

Operating mode (→ 126) = Interface or Interface with capacitance

**Description**

Displays the measured interface level $L_I$ (before linearization).

---

6) Product structure: feature 540 "Application packages", option EB "Interface measurement"
Additional information

The unit is defined in the **Level unit** parameter (→ 143).

Interface distance

**Navigation**

Setup → Interface dist.

**Prerequisite**

Operating mode (→ 126) = Interface or Interface with capacitance

**Description**

Displays the measured distance $D_I$ between the reference point (lower edge of flange or threaded connection) and the interface.

Additional information

The unit is defined in the **Distance unit** parameter (→ 126).
## Confirm distance

<table>
<thead>
<tr>
<th>Navigation</th>
<th>Setup → Confirm distance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Specify, whether the measured distance matches the real distance. Depending on the selection the device automatically sets the range of mapping.</td>
</tr>
<tr>
<td><strong>Selection</strong></td>
<td>Manual map&lt;br&gt;Distance ok&lt;br&gt;Distance unknown&lt;br&gt;Distance too small *&lt;br&gt;Distance too big *&lt;br&gt;Tank empty&lt;br&gt;Delete map</td>
</tr>
<tr>
<td><strong>Additional information</strong></td>
<td><strong>Meaning of the options</strong></td>
</tr>
<tr>
<td></td>
<td>Manual map&lt;br&gt;To be selected if the range of mapping is to be defined manually in the Mapping end point parameter (→ 134). In this case it is not necessary to confirm the distance.</td>
</tr>
<tr>
<td></td>
<td>Distance ok&lt;br&gt;To be selected if the measured distance matches the actual distance. The device performs a mapping.</td>
</tr>
<tr>
<td></td>
<td>Distance unknown&lt;br&gt;To be selected if the actual distance is unknown. A mapping can not be performed in this case.</td>
</tr>
<tr>
<td></td>
<td>Distance too small&lt;br&gt;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.</td>
</tr>
</tbody>
</table>

* Visibility depends on order options or device settings
• **Distance too big** \(^7\)  
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.

• **Factory map**  
To be selected if the present mapping curve (if one exists) is to be deleted. The device returns to the **Confirm distance** parameter and a new mapping can be recorded.

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

  For interface measurements the distance always refers to the total level (not the interface level).

  For FMP55 with rope probes and **Operating mode** (→ 126) = Interface with **capacitance** the mapping must be recorded with the tank being empty, and the **Tank empty** option must be selected. Otherwise the device can not register the correct empty capacitance.

  For FMP55 with coax probes a mapping must be recorded at least in the upper part of the probe, as tightening the flange has an influence on the envelope curve. However, even with coax probes it is recommended to record the mapping with the tank being completely empty (and selecting the **Tank empty** option).

  If the teaching procedure with the **Distance too small** option or the **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.

---

**Present mapping**

**Navigation**  
Setup → Present mapping

**Description**  
Indicates up to which distance a mapping has already been recorded.

---

**Mapping end point**

**Navigation**  
Setup → Map. end point

**Prerequisite**  
**Confirm distance** (→ 133) = Manual map or **Distance too small**

**Description**  
Specify new end of the mapping.

**User entry**  
0 to 200 000.0 m

---

\(^7\) Only available for "Expert → Sensor → Echo tracking → **Evaluation mode** parameter" = "Short time history" or "Long time history"
Additional information

This parameter defines up to which distance the new mapping is to be recorded. The distance is measured from the reference point, i.e. from the lower edge of the mounting flange or the threaded connection.

For reference purposes the Present mapping parameter (→ 134) is displayed together with this parameter. It indicates up to which distance a mapping has already been recorded.

Record map

Navigation

Setup → Record map

Prerequisite

Confirm distance (→ 133) = Manual map or Distance too small

Description

Start recording of the map.

Selection

- No
- Record map
- Delete map

Additional information

Meaning of the options

- No
  The map is not recorded.
- Record map
  The map is recorded. After the recording is completed, the new measured distance and the new mapping range appear on the display. When operating via the local display, these values must be confirmed by pressing √.
- Delete map
  The mapping (if one exists) is deleted and the device displays the recalculated measured distance and the mapping range. When operating via the local display, these values must be confirmed by pressing √.
17.3.1 "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 (→ 126).

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

---

**Confirm distance**

*Navigation*  
Setup → Mapping → Confirm distance

*Description*  
→ 133

---

**Mapping end point**

*Navigation*  
Setup → Mapping → Map. end point

*Description*  
→ 134

---

**Record map**

*Navigation*  
Setup → Mapping → Record map

*Description*  
→ 135

---

**Distance**

*Navigation*  
Setup → Mapping → Distance

*Description*  
→ 130
17.3.2  "Analog input 1 to 5" submenu

There is an analog inputs submenu for every AI block of the device. The AI block is used to configure the measured value transmission to the bus.

Only the most basic properties of the AI block can be configured in this submenu. For a detailed configuration of the AI blocks refer to the expert menu.

Navigation  Setup → Analog inputs → Analog input 1 to 5

Block tag

Navigation  Setup → Analog inputs → Analog input 1 to 7 → Block tag

Description  Defined to be unique throughout the control system at one plant site. The tag may be changed using the FB_Tag service.

User entry  Character string comprising numbers, letters and special characters (32)

Channel

Navigation  Setup → Analog inputs → Analog input 1 to 7 → Channel

Description  Use this function to select the input value that should be processed in the Analog Input function block.

Selection

- Uninitialized
- Level linearized
- Absolute echo amplitude
- Absolute EOP amplitude
- Absolute interface amplitude *
- Distance
- Electronic temperature
- EOP shift
- Interface linearized *
- Interface distance *
- Measured capacitance
- Relative echo amplitude
- Relative interface amplitude *
- Noise of signal
- Terminal voltage
- Thickness upper layer *
- Calculated DC value *
- Analog output adv. diagnostics 2
- Analog output adv. diagnostics 1

* Visibility depends on order options or device settings
Process Value Filter Time

**Navigation**

Setup → Analog inputs → Analog input 1 to 7 → PV Filter Time

**Description**

Use this function to enter the filter time specification for the filtering of the unconverted input value (PV).

**User entry**

Positive floating-point number

**Additional information**

*Factory setting*

If the value 0 s is entered, filtering will not be performed.
17.3.3  "Advanced setup" submenu

**Navigation**  
Setup → Advanced setup

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

**User interface**  
- Hardware 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 stat.tool

**Description**  
Shows the access authorization to the parameters via the operating tool.

**Additional information**  
The access authorization can be changed via the Enter access code parameter (→ 140).

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 (→ 139).

**Access status display**

**Navigation**  
Setup → Advanced setup → Access stat.disp

**Prerequisite**  
The device has a local display.
### Description
Indicates access authorization to parameters via local display.

### Additional information
- The access authorization can be changed via the **Enter access code** parameter (→ 140).
- 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 (→ 139).

### Enter access code

<table>
<thead>
<tr>
<th>Navigation</th>
<th>Setup → Advanced setup → Ent. access code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Enter access code to disable write protection of parameters.</td>
</tr>
<tr>
<td>User entry</td>
<td>0 to 9999</td>
</tr>
</tbody>
</table>

### Additional information
- The customer-specific access code that was defined in the **Define access code** parameter (→ 180) must be entered for local operation.
- If an incorrect access code is entered, users retain their current access authorization.
- The write protection affects all parameters marked with the symbol in the 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 minutes or the user goes 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.
- Please contact your Endress+Hauser Sales Center if you lose your access code.
"Interface" submenu

Navigation

Setup → Advanced setup → Interface

Process property

Description
Specify typical rate of change for the interface position.

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

Additional information
The device adjusts the signal evaluation filters and the damping of the output signal to the typical rate of level change defined in this parameter:

<table>
<thead>
<tr>
<th>Process property</th>
<th>Step response time / s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast &gt; 1 m (40 in)/min</td>
<td>5</td>
</tr>
<tr>
<td>Standard &lt; 1 m (40 in)/min</td>
<td>15</td>
</tr>
<tr>
<td>Medium &lt; 10 cm (4 in) /min</td>
<td>40</td>
</tr>
<tr>
<td>Slow &lt; 1 cm (0.4 in) /min</td>
<td>74</td>
</tr>
<tr>
<td>No filter / test</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Interface property

Navigation

Setup → Advanced setup → Interface → Interface prop.

Prerequisite
Operating mode (→ 126) = Interface with capacitance

Description
Select interface property.
The interface property determines how the Guided Radar and the Capacitance Measurement interact.

Selection
- Special: automatic DC
- Build up
- Standard
- Emulsion layer
Additional information

Meaning of the options

- **Special: automatic DC**
  - Condition:
    The specific capacitance (pF/m) is known.
  - Signal evaluation:
    As long as a clear interface is detected, both the total and the interface level are determined via the Guided Radar. The dielectric constant of the upper medium is continuously adjusted. If an emulsion layer is present, the total level is determined via the Guided Radar whereas the interface level is determined via the Capacitance Measurement.

- **Build up**
  - Condition:
    The dielectric constant of the upper medium and the specific capacitance (pF/m) are known.
  - Signal evaluation:
    As long as a clear interface is detected, the interface level is determined via the Guided Radar as well as via the Capacitance Measurement. If these two values start to diverge from each other due to build-up formation, an error message is generated. If an emulsion layer is present, the total level is determined via the Guided Radar whereas the interface level is determined via the Capacitance Measurement.

- **Standard**
  - Condition:
    The dielectric constant of the upper medium is known.
  - Signal evaluation:
    As long as a clear interface is detected, the specific capacitance (pF/m) is continuously adjusted. Therefore build-up has only little influence on the measurement. If an emulsion layer is present, the total level is determined via the Guided Radar whereas the interface level is determined via the Capacitance Measurement.

- **Oil/Water condensate**
  - Condition:
    The dielectric constant of the upper medium and the specific capacitance (pF/m) are known.
  - Signal evaluation:
    The total level is always determined via the Guided Radar. The interface level is always determined via the Capacitance Measurement.

---

8) The specific capacitance of the media depends on the DC value and the geometry of the probe, which may differ noticeably. For rod probes < 2 m, the probe geometry is measured after production and the resulting specific capacitance for conductive media is preset on delivery.
**Additional information**

For the dielectric constants (DC values) of many media commonly used in industry, please refer to:
- Dielectric constant (DC value) Compendium CP01076F
- The Endress+Hauser "DC Values app" (available for Android and iOS)

The factory setting, $\varepsilon_r = 80$, applies for water at 20 °C (68 °F).

**Level unit**

**Navigation**

Setup → Advanced setup → Interface → Level unit

**Description**

Select level unit.

**Selection**

SI units
- %
- m
- mm

US units
- ft
- in

**Additional information**

The level unit may differ from the distance unit defined in the **Distance unit** parameter (→ 126):
- The unit defined in the **Distance unit** parameter is used for the basic calibration (Empty calibration (→ 128) and Full calibration (→ 128)).
- The unit defined in the **Level unit** parameter is used to display the (unlinearized) level and interface position.

**Blocking distance**

**Navigation**

Setup → Advanced setup → Interface → Blocking dist.

**Description**

Specify upper blocking distance UB.

**User entry**

0 to 200 m

**Factory setting**

- For coax probes: 100 mm (3.9 in)
- For rod and rope probes up to 8 m (26 ft): 200 mm (8 in)
- For rod and rope probes above 8 m (26 ft): 0.025 * length of probe

**Additional information**

Echoes from within the blocking distance are not taken into account in the signal evaluation. The upper blocking distance is used
- to suppress interference echoes at the top end of the probe.
- to suppress the echo of the total level in the case of flooded bypasses.
Operating menu

Levelflex FMP55 FOUNDATION Fieldbus

**Level correction**

**Navigation**

Setup → Advanced setup → Interface → Level correction

**Description**

Specify level correction (if required).

**User entry**

−200 000.0 to 200 000.0 %

**Additional information**

The value specified in this parameter is added to the measured total and interface levels (before linearization).

**Manual thickness upper layer**

**Navigation**

Setup → Advanced setup → Interface → Man.thick.up.lay

**Description**

Specify the manually determined interface thickness UP (i.e. the thickness of the upper medium).

**User entry**

0 to 200 m
### Measured thickness upper layer

**Navigation**  
Setup → Advanced setup → Interface → Meas.thick.u.lay

**Description**  
Displays the measured interface thickness. (Thickness UP of the upper medium).

### DC value

**Navigation**  
Setup → Advanced setup → Interface → DC value

**Description**  
Displays relative dielectric constant \( \varepsilon_r \) of the upper medium (DC1) before correction.

### Calculated DC value

**Navigation**  
Setup → Advanced setup → Interface → Calc. DC value

**Description**  
Displays calculated (i.e. corrected) relative dielectric constant \( \varepsilon_r \) (DC1) of the upper medium.

---

**Additional information**  

On the local display, the measured interface thickness is indicated together with the manual interface thickness. By comparing these two values the device can automatically adjust the dielectric constant of the upper medium.

**UP  Interface thickness (= thickness of upper medium)**

---

Endress+Hauser
Use calculated DC value

Navigation  
Setup → Advanced setup → Interface → Use calc. DC

Description  
Specify whether the calculated dielectric constant is to be used.

Selection  
- Save and exit
- Cancel and exit

Additional information  
**Meaning of the options**
- **Save and exit**  
The calculated constant is assumed to be the correct one.
- **Cancel and exit**  
The calculated dielectric constant is rejected; the previous dielectric constant remains active.

On the local display, the **Calculated DC value** parameter (→ 145) is displayed together with this parameter.
"Automatic DC calculation" wizard

The **Automatic DC calculation** wizard is only available when operating via the local display. When operating via an operating tool, all parameters concerning the automatic DC calculation are located directly in the **Interface** submenu (→ 141)

In the **Automatic DC calculation** 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 → Advanced setup → Interface → Autom. DC calc.

<table>
<thead>
<tr>
<th>Manual thickness upper layer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Navigation</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Use calculated DC value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Navigation</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>
"Linearization" submenu

1. Selection of linearization type and unit
2. Configuration of the linearization
   A. Linearization type (→ 151) = None
   B. Linearization type (→ 151) = Linear
   C. Linearization type (→ 151) = Table
   D. Linearization type (→ 151) = Pyramid bottom
   E. Linearization type (→ 151) = Conical bottom
   F. Linearization type (→ 151) = Angled bottom
   G. Linearization type (→ 151) = Horizontal cylinder
   H. Linearization type (→ 151) = Sphere
   I. For "Operating mode (→ 126) = Interface" or "Interface with capacitance": interface before linearization (measured in the level unit)
   I'. For "Operating mode (→ 126) = Interface" or "Interface with capacitance": interface after linearization (corresponds to volume or weight)
   L. Level before linearization (measured in level unit)
   L'. Level linearized (→ 154) (corresponds to volume or weight)
   M. Maximum value (→ 154)
   d. Diameter (→ 154)
   h. Intermediate height (→ 155)
**Structure of the submenu on the local display**

**Navigation**  ➡️  **Setup → Advanced setup → Linearization**

- **Linearization**
  - Linearization type
  - Unit after linearization
  - Free text
  - Maximum value
  - Diameter
  - Intermediate height
  - Table mode

- **Edit table**
  - Level
  - Customer value

- Activate table
Structure of the submenu in the operating tool (e.g. FieldCare)

Navigation

Setup → Advanced setup → Linearization

- Linearization type
- Unit after linearization
- Free text
- Level linearized
- Interface linearized
- Maximum value
- Diameter
- Intermediate height
- Table mode
- Table number
- Level
- Level
- Customer value
- Activate table
Description of the parameters

Navigation       ➔ ➔ Setup → Advanced setup → Linearization

**Linearization type**

**Navigation**       ➔ ➔ Setup → Advanced setup → Linearization → Lineariz. type

**Description**
Select linearization type.

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

**Additional information**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C/D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Table</td>
<td>Pyramid bottom</td>
<td>Conical bottom</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>C/D</td>
<td>E</td>
</tr>
<tr>
<td>Sphere</td>
<td>Horizontal cylinder</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*38 Linearization types*  
A  None  
B  Table  
C  Pyramid bottom  
D  Conical bottom  
E  Angled bottom  
F  Sphere  
G  Horizontal cylinder
Meaning of the options

- None
  The level is output in the level unit without being converted (linearized) beforehand.

- Linear
  The output value (volume/weight) is proportional to the level L. This applies, for example, to vertical cylindrical tanks and silos. The following parameters must also be specified:
  - Unit after linearization (→ 152)
  - Maximum value (→ 154): maximum volume or weight

- Table
  The relationship between the measured level L and the output value (volume/weight) is defined by a linearization table consisting of up to 32 pairs of values "level - volume" or "level - weight" respectively. The following parameters must also be specified:
  - Unit after linearization (→ 152)
  - Table mode (→ 155)
  - For every point in the table: Level (→ 157)
  - For every point in the table: Customer value (→ 157)
  - Activate table (→ 157)

- Pyramid bottom
  The output value corresponds to the volume or weight in a silo with a pyramid bottom. The following parameters must also be specified:
  - Unit after linearization (→ 152)
  - Maximum value (→ 154): maximum volume or weight
  - Intermediate height (→ 155): the height of the pyramid

- Conical bottom
  The output value corresponds to the volume or weight in a tank with a conical bottom. The following parameters must also be specified:
  - Unit after linearization (→ 152)
  - Maximum value (→ 154): maximum volume or weight
  - Intermediate height (→ 155): the height of the cone

- Angled bottom
  The output value corresponds to the volume or weight in a silo with an angled bottom. The following parameters must also be specified:
  - Unit after linearization (→ 152)
  - Maximum value (→ 154): maximum volume or weight
  - Intermediate height (→ 155): height of the angled bottom

- Horizontal cylinder
  The output value corresponds to the volume or weight in a horizontal cylinder. The following parameters must also be specified:
  - Unit after linearization (→ 152)
  - Maximum value (→ 154): maximum volume or weight
  - Diameter (→ 154)

- Sphere
  The output value corresponds to the volume or weight in a spherical tank. The following parameters must also be specified:
  - Unit after linearization (→ 152)
  - Maximum value (→ 154): maximum volume or weight
  - Diameter (→ 154)

Unit after linearization

Navigation

- Setup → Advanced setup → Linearization → Unit lineariz.

Prerequisite

- Linearization type (→ 151) ≠ None
Description
Select the unit for the linearized value.

Selection
Selection/input (uint16)
- 1095 = [short Ton]
- 1094 = [lb]
- 1088 = [kg]
- 1092 = [Ton]
- 1048 = [US Gal.]
- 1049 = [Imp. Gal.]
- 1043 = [ft³]
- 1571 = [cm³]
- 1035 = [dm³]
- 1034 = [m³]
- 1038 = [l]
- 1041 = [hl]
- 1342 = [%]
- 1010 = [m]
- 1012 = [mm]
- 1018 = [ft]
- 1019 = [inch]
- 1351 = [l/s]
- 1352 = [l/min]
- 1353 = [l/h]
- 1347 = [m³/s]
- 1348 = [m³/min]
- 1349 = [m³/h]
- 1356 = [ft³/s]
- 1357 = [ft³/min]
- 1358 = [ft³/h]
- 1362 = [US Gal./s]
- 1363 = [US Gal./min]
- 1364 = [US Gal./h]
- 1367 = [Imp. Gal./s]
- 1358 = [Imp. Gal./min]
- 1359 = [Imp. Gal./h]
- 32815 = [Ml/s]
- 32816 = [Ml/min]
- 32817 = [Ml/h]
- 1355 = [Ml/d]

Additional information
The selected unit is only used for display purposes. The measured value is not converted on the basis of the selected unit.

Distance-to-distance linearization is also possible, i.e. a linearization from the level unit to another length unit. Select the Linear linearization mode for this purpose. To specify the new level unit, select the Free text option in the Unit after linearization parameter and enter the unit in the Free text parameter (→ 153).

Free text

Navigation
Setup → Advanced setup → Linearization → Free text

Prerequisite
Unit after linearization (→ 152) = Free text

Description
Enter unit symbol.
**User entry**

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

---

**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 → 152.
- For interface measurements, this parameter always refers to the total level.

---

**Interface linearized**

**Navigation**

Setup → Advanced setup → Linearization → Interf. lineariz

**Prerequisite**

Operating mode (→ 126) = Interface or Interface with capacitance

**Description**

Displays the linearized interface height.

**Additional information**

The unit is defined in the Unit after linearization parameter → 152.

---

**Maximum value**

**Navigation**

Setup → Advanced setup → Linearization → Maximum value

**Prerequisite**

Linearization type (→ 151) has one of the following values:

- Linear
- Pyramid bottom
- Conical bottom
- Angled bottom
- Horizontal cylinder
- Sphere

**User entry**

-50 000.0 to 50 000.0 %

---

**Diameter**

**Navigation**

Setup → Advanced setup → Linearization → Diameter

**Prerequisite**

Linearization type (→ 151) has one of the following values:

- Horizontal cylinder
- Sphere
User entry 0 to 9999.999 m

Additional information The unit is defined in the Distance unit parameter (→ 126).

Intermediate height

Navigation

Navigation: Setup → Advanced setup → Linearization → Intermed. height

Prerequisite

Prerequisite: Linearization type (→ 151) has one of the following values:
- Pyramid bottom
- Conical bottom
- Angled bottom

User entry 0 to 200 m

Additional information

The unit is defined in the Distance unit parameter (→ 126).

Table mode

Navigation

Navigation: Setup → Advanced setup → Linearization → Table mode

Prerequisite

Prerequisite: Linearization type (→ 151) = Table

Description

Select editing mode of the linearization table.

Selection

- Manual
- Semiautomatic *
- Clear table
- Sort table

* Visibility depends on order options or device settings
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 (→ 128)** and **Full calibration (→ 128)** 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** → **Clear table**). Then enter a new table.

How to enter the table

- **Via FieldCare**
  The table points can be entered via the **Table number (→ 156)**, **Level (→ 157)** and **Customer value (→ 157)** 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 (→ 143) beforehand.

<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>
</tbody>
</table>
Level (Manual)

Navigation
Setup → Advanced setup → Linearization → Level

Prerequisite
- Linearization type (→ 151) = Table
- Table mode (→ 155) = Manual

Description
Enter level value of the table point (value before linearization).

User entry
Signed floating-point number

Level (Semiautomatic)

Navigation
Setup → Advanced setup → Linearization → Level

Prerequisite
- Linearization type (→ 151) = Table
- Table mode (→ 155) = 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 (→ 151) = Table

Description
Enter linearized value for the table point.

User entry
Signed floating-point number

Activate table

Navigation
Setup → Advanced setup → Linearization → Activate table

Prerequisite
Linearization type (→ 151) = Table

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

Selection
- Disable
- Enable
Additional information

Meaning of the options

- **Disable**
  The measured level is not linearized.
  If **Linearization type (→ 151) = Table** at the same time, the device issues error message F435.

- **Enable**
  The measured level is linearized according to the table.

> 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 sett. → Output echo lost

Description  
Output signal in case of a lost echo.

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

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 9)
  In the case of a lost echo the output value is contionuously shifted towards 0% or 100%.
  The slope of the ramp is defined in the Ramp at echo lost parameter (→ 160).
- Value echo lost 9)
  In the case of a lost echo the output assumes the value defined in the Value echo lost parameter (→ 159).
- Alarm
  In the case of a lost echo the device generates an alarm; see the Failure mode parameter

Value echo lost

Navigation  
Setup → Advanced setup → Safety sett. → Value echo lost

Prerequisite  
Output echo lost (→ 159) = Value echo lost

Description  
Output value in case of a lost echo

User entry  
0 to 200 000.0 %

Additional information  
Use the unit which has been defined for the measured value output:
- without linearization: Level unit (→ 143)
- with linearization: Unit after linearization (→ 152)

9) Only visible if "Linearization type (→ 151)" = "None"
**Ramp at echo lost**

**Navigation**

Setup → Advanced setup → Safety sett. → Ramp echo lost

**Prerequisite**

Output echo lost (→ 159) = Ramp at echo lost

**Description**

Slope of the ramp in the case of a lost echo

**User entry**

Signed floating-point number

**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 sett. → Blocking dist.

**Description**

Specify upper blocking distance UB.

**User entry**

0 to 200 m

**Factory setting**

- For coax probes: 0 mm (0 in)
- For rod and rope probes up to 8 m (26 ft): 200 mm (8 in)
- For rod and rope probes above 8 m (26 ft): 0.025 * Sondenlänge
For FMP51/FMP52/FMP54 with the **Interface measurement** application package\(^{10}\) and for FMP55:
100 mm (3.9 in) for all antenna types

### Additional information

Signals in the upper 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.

This behavior is only valid if the following two conditions are met:
- Expert → Sensor → Echo tracking → Evaluation mode = **Short time history** or **Long time history**
- Expert → Sensor → Gas phase compensation → GPC mode = **On**, **Without correction** or **External correction**

If one of these conditions is not met, signals in the blocking distance will always be ignored.

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

The **Probe settings** submenu helps to ensure that the end of probe signal within the envelope curve is correctly assigned by the evaluation algorithm. The assignment is correct if the length of probe indicated by the device matches the actual length of the probe. The automatic probe length correction can only be performed if the probe is installed in the vessel and is completely uncovered (no medium). For partially filled vessels and if the probe length is known, select **Confirm probe length** (→ 163) = **Manual input** in order to enter the value manually.

If a mapping (interference echo suppression) has been recorded after shortening the probe, it is no longer possible to perform an automatic probe length correction. In this case there are two options:

- Delete the map using the **Record map** parameter (→ 135) before performing the automatic probe length correction. After the probe length correction, a new map can be recorded using the **Record map** parameter (→ 135).
- Alternative: Select **Confirm probe length** (→ 163) = **Manual input** and enter the probe length manually into the **Present probe length** parameter → 162.

An automatic probe length correction is only possible after the correct option has been selected in the **Probe grounded** parameter (→ 162).

**Navigation**

Setup → Advanced setup → Probe settings

---

**Probe grounded**

**Navigation**

Setup → Advanced setup → Probe settings → Probe grounded

**Prerequisite**

**Operating mode** (→ 126) = Level

**Description**

Specify whether the probe is grounded.

**Selection**

- No
- Yes

**Present probe length**

**Navigation**

Setup → Advanced setup → Probe settings → Pres. length

**Description**

- In most cases:
  Displays the length of the probe according to the currently measured end-of-probe signal.
- For **Confirm probe length** (→ 163) = **Manual input**:
  Enter actual length of probe.

**User entry**

0 to 200 m
Confirm probe length

Navigation

Setup → Advanced setup → Probe settings → Confirm length

Description

Select, whether the value displayed in the Present probe length parameter → 162 matches the actual length of the probe. Based on this input, the device performs a probe length correction.

Selection

- Probe length OK
- Probe length too small
- Probe length too big
- Probe covered
- Manual input
- Probe length unknown

Additional information

Meaning of the options

- **Probe length OK**
  To be selected if the indicated length is correct. An adjustment is not required. The device quits the sequence.

- **Probe length too small**
  To be selected if the displayed length is smaller than the actual length of the probe. A different end of probe signal is allocated and the newly calculated length is displayed in the Present probe length parameter → 162. This procedure has to be repeated until the displayed value matches the actual length of the probe.

- **Probe length too big**
  To be selected if the displayed length is bigger than the actual length of the probe. A different end of probe signal is allocated and the newly calculated length is indicated in the Present probe length parameter → 162. This procedure has to be repeated until the displayed value matches the actual length of the probe.

- **Probe covered**
  To be selected if the probe is (partially or completely) covered. A probe length correction is impossible in this case. The device quits the sequence.

- **Manual input**
  To be selected if no automatic probe length correction is to be performed. Instead, the actual length of the probe must be entered manually into the Present probe length parameter → 162.

- **Probe length unknown**
  To be selected if the actual length of the probe is unknown. A probe length correction is impossible in this case and the device quits the sequence.

---

11) When operated via FieldCare, the Manual input option needs not to be selected explicitly. In FieldCare the length of the probe can always be edited.
"Probe length correction" wizard

The **Probe length correction** wizard is only available when operating via the local display. When operating via an operating tool, all parameters concerning the probe length correction are located directly in the **Probe settings** submenu (→ 162).

**Navigation**

Setup → Advanced setup → Probe settings → Prob. length corr

**Confirm probe length**

**Navigation**

Setup → Advanced setup → Probe settings → Prob. length corr → Confirm length

**Description**

→ 163

**Present probe length**

**Navigation**

Setup → Advanced setup → Probe settings → Prob. length corr → Pres. length

**Description**

→ 162
"Switch output" submenu

The Switch output submenu (→ 165) is only visible for devices with switch output. 

Navigation  Setup → Advanced setup → Switch output

Switch output function

Description
Select function for switch output.

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

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 (→ 166) 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 (→ 166)
  - Switch-on value (→ 167)
  - Switch-off value (→ 168)
- 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 (→ 165).

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 (→ 165) = Digital Output

Selection
- Off
- Digital output AD 1
- Digital output AD 2

12) Ordering feature 020 'Power supply; Output', option B, E or G
- Digital output 1
- Digital output 2
- Digital output 3
- Digital output 4
- Digital output 5
- Digital output 6
- Digital output 7
- Digital output 8

### 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 (→ 165) = Limit

**Selection**

- Off
- Level linearized
- Distance
- Interface linearized *
- Interface distance *
- Thickness upper layer *
- Terminal voltage
- Electronic temperature
- Measured capacitance *
- Relative echo amplitude
- Relative interface amplitude *
- Absolute echo amplitude
- Absolute interface amplitude *

### Assign diagnostic behavior

**Navigation**  
Setup → Advanced setup → Switch output → Assign diag. beh

**Prerequisite**  
Switch output function (→ 165) = Diagnostic behavior

**Description**  
Select diagnostic behavior for switch output.

**Selection**

- Alarm
- Alarm or warning
- Warning

* Visibility depends on order options or device settings
Switch-on value

Navigation  

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

Prerequisite  

Switch output function (→  165) = Limit

Description  

Enter measured value for the switch-on point.

User entry  

Signed floating-point number

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 (→ 165) = Limit
- Assign limit (→ 166) ≠ Off

**Description**  
Define delay for the switch-on of status output.

**User entry**  
0.0 to 100.0 s

---

### Switch-off value

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

**Prerequisite**  
Switch output function (→ 165) = Limit

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

**User entry**  
Signed floating-point number

**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 (→ 167).
Switch-off delay

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

Prerequisite  
- Switch output function (→ 165) = Limit  
- Assign limit (→ 166) ≠ Off

Description  
Define delay for the switch-off of status output.

User entry  
0.0 to 100.0 s

Failure mode

Navigation  
Setup → Advanced setup → Switch output → Failure mode

Prerequisite  
Switch output function (→ 165) = Limit or Digital Output

Description  
Define output behavior in alarm condition.

Selection  
- Actual status  
- Open  
- Closed

Additional information

Switch status

Navigation  
Setup → Advanced setup → Switch output → Switch status

Description  
Shows the current switch output status.

Invert output signal

Navigation  
Setup → Advanced setup → Switch output → Invert outp.sig.

Description  
Invert the output signal.

Selection  
- No  
- Yes
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

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**

Additional information

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

* Visibility depends on order options or device settings
Additional information

40  "Format display" = "1 value, max. size"

41  "Format display" = "1 bargraph + 1 value"

42  "Format display" = "2 values"

43  "Format display" = "1 value large + 2 values"

44  "Format display" = "4 values"

- The **Value 1 to 4 display** → 173 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 (→ 174).
### 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
- Interface linearized *
- Interface distance *
- Thickness upper layer *
- Terminal voltage
- Electronic temperature
- Measured capacitance *
- Analog output adv. diagnostics 1
- Analog output adv. diagnostics 2
- Analog output 1
- Analog output 2
- Analog output 3
- Analog output 4
- Analog output 5
- Analog output 6
- Analog output 7
- Analog output 8

**Factory setting**

**For interface measurements and one current output**

- Value 1 display: Interface linearized
- Value 2 display: Level linearized
- Value 3 display: Thickness upper layer
- Value 4 display: Current output 1

**For interface measurements and two current outputs**

- Value 1 display: Interface linearized
- Value 2 display: Level linearized
- Value 3 display: Current output 1
- Value 4 display: Current output 2

### 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

**Additional information**

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

* Visibility depends on order options or device settings
Display interval

**Navigation**
Setup → Advanced setup → Display → Display interval

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

**User entry**
1 to 10 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**
Set display reaction time to fluctuations in the measured value.

**User entry**
0.0 to 999.9 s

Header

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

**Description**
Select header contents on local display.

**Selection**
- Device tag
- Free text

**Additional information**

1  Position of the header text on the display

*Meaning of the options*

- **Device tag**
  Is defined in the [Device tag](#) parameter.
- **Free text**
  Is defined in the [Header text](#) parameter (→ 175).
Header text

Navigation
Setup → Advanced setup → Display → Header text

Prerequisite
Header (→ 174) = Free text

Description
Enter display header text.

User entry
Character string comprising numbers, letters and special characters (12)

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
. ,

Number format

Navigation
Setup → Advanced setup → Display → Number format

Description
Choose number format for the display.

Selection
• Decimal
• ft-in-1/16''

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

Decimal places menu

Navigation
Setup → Advanced setup → Display → Dec. places menu

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

Selection
• x
• x.x
• x.xx
• x.xxx
• x.xxxx
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 → 173 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

Additional information Meaning of the options
- Disable
  Switches the backlight off.
- Enable
  Switches the backlight on.

Regardless of 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 buttons simultaneously.
- Brighter: press the 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.

Configurations can only be exchanged between devices which are in the same operating mode (see the Operating mode parameter (→ 126)).

Navigation  Setup → Advanced setup → Conf.backup disp

---

**Operating time**

**Navigation**  Setup → Advanced setup → Conf.backup disp → Operating time

**Description**  Indicates how long the device has been in operation.

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

---

**Last backup**

**Navigation**  Setup → Advanced setup → Conf.backup disp → Last backup

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

---

**Configuration management**

**Navigation**  Setup → Advanced setup → Conf.backup disp → Config. managem.

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

**Selection**  
• Cancel  
• Execute backup  
• Restore  
• Duplicate  
• Compare  
• Clear backup data  
• Display incompatible
### Backup state

<table>
<thead>
<tr>
<th>Navigation</th>
<th>Setup → Advanced setup → Conf.backup disp → Backup state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Displays which backup action is currently in progress.</td>
</tr>
</tbody>
</table>

### Comparison result

<table>
<thead>
<tr>
<th>Navigation</th>
<th>Setup → Advanced setup → Conf.backup disp → Compar. result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Comparison between present device data and display backup.</td>
</tr>
</tbody>
</table>
Additional information

<table>
<thead>
<tr>
<th>Meaning of the display options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settings identical</td>
</tr>
<tr>
<td>The current device configuration of the HistoROM is identical to the backup copy in the display module.</td>
</tr>
<tr>
<td>Settings not identical</td>
</tr>
<tr>
<td>The current device configuration of the HistoROM is not identical to the backup copy in the display module.</td>
</tr>
<tr>
<td>No backup available</td>
</tr>
<tr>
<td>There is no backup copy of the device configuration of the HistoROM in the display module.</td>
</tr>
<tr>
<td>Backup settings corrupt</td>
</tr>
<tr>
<td>The current device configuration of the HistoROM is corrupt or not compatible with the backup copy in the display module.</td>
</tr>
<tr>
<td>Check not done</td>
</tr>
<tr>
<td>The device configuration of the HistoROM has not yet been compared to the backup copy in the display module.</td>
</tr>
<tr>
<td>Dataset incompatible</td>
</tr>
<tr>
<td>The data sets are incompatible and can not be compared.</td>
</tr>
</tbody>
</table>

To start the comparison, set **Configuration management (→ 177) = Compare.**

If the transmitter configuration has been duplicated from a different device by **Configuration management (→ 177) = 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

**Description**
Define release code for write access to parameters.

**User entry**
0 to 9999

**Additional information**
- If the factory setting is not changed or if 0 is entered, the parameters are not write-protected and the device configuration data can therefore always be modified. The user is logged on in the "Maintenance" role.
- The write protection affects all parameters marked with the symbol in the 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 (→ 140).
- Please contact your Endress+Hauser Sales Center if you lose the access code.
- If operating via the local display: the new access code is only valid once it has been confirmed in the Confirm access code parameter (→ 182).

**Device reset**

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

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

**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 → Def. access code

<table>
<thead>
<tr>
<th>Define access code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Navigation</strong> ➔ Setup → Advanced setup → Administration → Def. access code</td>
</tr>
<tr>
<td><strong>Description</strong> ➔ 180</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Confirm access code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Navigation</strong> ➔ Setup → Advanced setup → Administration → Def. access code → Confirm code</td>
</tr>
<tr>
<td><strong>Description</strong> Confirm the entered access code.</td>
</tr>
<tr>
<td><strong>User entry</strong> 0 to 9999</td>
</tr>
</tbody>
</table>
17.4 "Diagnostics" menu

Navigation Diagnostics → Diagnostics → Actual diagnos.

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

Previous diagnostics

Navigation Diagnostics → Prev.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

Diagnostics → Timestamp

Operating time from restart

Navigation

Diagnostics → Time fr. restart

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

Operating time

Navigation

Diagnostics → Operating time

Description
Indicates how long the device has been in operation.

Additional information

Maximum time
9 999 d (≈ 27 years)
### 17.4.1 "Diagnostic list" submenu

**Navigation**  
Diagnostics → Diagnostic list

---

#### Diagnostics 1 to 5

**Navigation**  
Diagnostics → Diagnostic list → Diagnostics 1

**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**  
Diagnostics → Diagnostic list → Timestamp 1 to 5
17.4.2  "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

Selection

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

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 (→ 186). 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 ①+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
17.4.3 "Device information" submenu

**Device tag**

**Description**
Enter tag for measuring point.

**User interface**
Character string comprising numbers, letters and special characters

**Serial number**

**Additional information**

- 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

The serial number is also indicated on the nameplate.

**Firmware version**

**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 info → Device name
- Diagnostics → Device info → Device name

### Order code

**Navigation**
- Diagnostics → Device info → Order code
- Diagnostics → Device info → Order code

**User interface**
Character string comprising numbers, letters and special characters

**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 info → Ext. order cd. 1
- Diagnostics → Device info → Ext. order cd. 1

**Description**
Display the three parts of the extended order code.

**User interface**
Character string comprising numbers, letters and special characters

**Additional information**
The extended order code indicates the version of all the features of the product structure and thus uniquely identifies the device.
17.4.4  "Measured values" submenu

**Navigation**  Diagnostics → Measured val.

**Distance**

**Navigation**  Diagnostics → Measured val. → Distance

**Description**  Displays the measured distance $D_L$ between the reference point (lower edge of the flange or threaded connection) and the level.

**Additional information**

45  Distance for interface measurements

- The unit is defined in the **Distance unit** parameter (→ 126).

**Level linearized**

**Navigation**  Diagnostics → Measured val. → Level linearized

**Description**  Displays linearized level.

**Additional information**

- The unit is defined by the **Unit after linearization** parameter (→ 152).
- For interface measurements, this parameter always refers to the total level.

**Interface distance**

**Navigation**  Diagnostics → Measured val. → Interface dist.

**Prerequisite**  Operating mode (→ 126) = Interface or Interface with capacitance
## Operating menu

### Description
Displays the measured distance $D_I$ between the reference point (lower edge of flange or threaded connection) and the interface.

### Additional information

![Diagram](image)

- The unit is defined in the **Distance unit** parameter (→ 126).

## Interface linearized

### Navigation

[Diagnoses] → **Measured val.** → **Interf. lineariz**

### Prerequisite

**Operating mode** (→ 126) = **Interface** or **Interface with capacitance**

### Description
Displays the linearized interface height.

### Additional information

- The unit is defined in the **Unit after linearization** parameter (→ 152).

## Thickness upper layer

### Navigation

[Diagnoses] → **Measured val.** → **Thickn.upp.layer**

### Prerequisite

**Operating mode** (→ 126) = **Interface** or **Interface with capacitance**

### Description
Displays the upper interface thickness (UP).
Additional information

The unit is defined by the Unit after linearization parameter → 152.

Terminal voltage 1

Navigation

17.4.5 "Analog input 1 to 5" submenu

There is an Analog inputs submenu for every AI block of the device. The AI block is used to configure the measured value transmission to the bus.

Only the most basic properties of the AI block can be configured in this submenu. For a detailed configuration of the AI blocks refer to the Expert menu.

Navigation

Block tag

Navigation

Description

User entry

Character string comprising numbers, letters and special characters (32)
## Channel

### Navigation

Diagnostics → Analog inputs → Analog input 1 to 7 → Channel

### Description

Use this function to select the input value that should be processed in the Analog Input function block.

### Selection

- uninitialized
- level linearized
- absolute echo amplitude
- absolute EOP amplitude
- absolute interface amplitude *
- distance
- electronic temperature
- EOP shift
- interface linearized *
- interface distance *
- measured capacitance *
- relative echo amplitude
- relative interface amplitude *
- noise of signal
- terminal voltage
- thickness upper layer *
- calculated DC value *
- analog output adv. diagnostics 2
- analog output adv. diagnostics 1

* Visibility depends on order options or device settings

## Status

### Navigation

Diagnostics → Analog inputs → Analog input 1 to 7 → Status

### Description

Indicates the status of the output of the AI block according to the FOUNDATION Fieldbus specification.

## Value

### Navigation

Diagnostics → Analog inputs → Analog input 1 to 7 → Value

### Description

Indicates the output value of the AI block.
**Units index**

**Navigation**

Diagnostics → Analog inputs → Analog input 1 to 7 → Units index

**Description**

Indicates the unit of the output value.
17.4.6  "Data logging" submenu

**Navigation**  
"Diagnostics → Data logging → Assign chan. 1 to 4"

**Selection**
- Off
- Level linearized
- Distance
- Unfiltered distance
- Interface linearized *
- Interface distance
- Unfiltered interface distance
- Thickness upper layer *
- Terminal voltage
- Electronic temperature
- Measured capacitance
- Absolute echo amplitude
- Relative echo amplitude
- Absolute interface amplitude *
- Relative interface amplitude
- Absolute EOP amplitude
- EOP shift
- Noise of signal
- Calculated DC value *
- Analog output adv. diagnostics 1
- Analog output adv. diagnostics 2
- Analog output 1
- Analog output 2
- Analog output 3
- Analog output 4

**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.

* Visibility depends on order options or device settings
Logging interval

Navigation

- Diagnostics → Data logging → Logging interval
- Diagnostics → Data logging → Logging interval

User entry

1.0 to 3 600.0 s

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
- Diagnostics → Data logging → Clear logging

Selection

- Cancel
- Clear data
"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 simultaneaously.

Navigation  Diagnostics → Data logging → Displ.channel 1 to 4
17.4.7 "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.

*Conditions which can be simulated*

<table>
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<tr>
<th>Condition to be simulated</th>
<th>Associated parameters</th>
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</thead>
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<td>• Assign measurement variable (→ 200)</td>
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<td>• Switch status (→ 201)</td>
</tr>
<tr>
<td>Existence of an alarm</td>
<td>Simulation device alarm (→ 201)</td>
</tr>
</tbody>
</table>

*Enable/disable simulation*

The simulation of measured values can be enabled or disabled via a hardware switch (SIM switch) at the electronics. Simulating a measured value is only possible if the SIM switch is in the ON position.

The switch output can always be simulated, irrespective of the position of the SIM switch.

1. Loosen the securing clamp.
2. Unscrew the housing cover.
3. Pull out the display module with a gentle rotation movement. To make it easier to access the SIM switch, attach the display module to the edge of the electronics compartment.
   ![Display module is attached to the edge of the electronics compartment.](image)

4. SIM switch in the **ON** position: measured values can be simulated. SIM switch in the **OFF** position (factory setting): Simulation of measured values is disabled.

5. Feed the spiral 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. Screw the electronics compartment cover closed and tighten the securing clamp.
Structure of the submenu

Navigation

Expert → Diagnostics → Simulation

- **Simulation**
  - Assign measurement variable → \( 200 \)
  - Process variable value → \( 200 \)
  - Switch output simulation → \( 200 \)
  - Switch status → \( 201 \)
  - Simulation device alarm → \( 201 \)
Description of parameters

Navigation  Expert → Diagnostics → Simulation

Assign measurement variable

Navigation  Expert → Diagnostics → Simulation → Assign meas.var.

Selection
- Off
- Level
- Interface *
- Level linearized
- Interface linearized
- Thickness linearized

Additional information
- The value of the variable to be simulated is defined in the Process variable value parameter (→ 200).
- 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  Expert → Diagnostics → Simulation → Proc. var. value

Prerequisite Assign measurement variable (→ 200) ≠ Off

User entry Signed floating-point number

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.

Switch output simulation

Navigation  Expert → Diagnostics → Simulation → Switch sim.

Description Switch the simulation of the switch output on and off.

Selection
- Off
- On

* Visibility depends on order options or device settings
Switch status

**Navigation**
Expert → Diagnostics → Simulation → Switch status

**Prerequisite**
Switch output simulation (→ 200) = On

**Description**
Select the status of the status output for the simulation.

**Selection**
- Open
- Closed

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

Simulation device alarm

**Navigation**
Expert → Diagnostics → Simulation → Sim. alarm

**Description**
Switch the device alarm on and off.

**Selection**
- Off
- On

**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 C484 Simulation failure mode diagnostic message.

Diagnostic event simulation

**Navigation**
Expert → Diagnostics → Simulation → Diag. event sim.

**Description**
Select a diagnostic event to simulate this event.

**Additional information**
When operated via the local display, the selection list can be filtered according to the event categories (Diagnostic event category parameter).
### 17.4.8  "Device check" submenu

**Navigation**  
Diagnostics → Device check → Device check → Start dev. check

**Description**  
Start a device check.

**Selection**  
- No
- Yes

**Additional information**  
In the case of a lost echo a device check can not be performed.

### Result device check

**Navigation**  
Diagnostics → Device check → Result dev.check

**Description**  
Displays the result of the device check.

**Additional information**  
**Meaning of the display options**

- **Installation ok**  
  Measurement possible without restrictions.

- **Accuracy reduced**  
  A measurement is possible. However, the measuring accuracy may be reduced due to the signal amplitudes.

- **Measurement capability reduced**  
  A measurement is currently possible. However, there is the risk of an echo loss. Check the mounting position of the device and the dielectric constant of the medium.

- **Check not done**  
  No device check has been performed.

### Last check time

**Navigation**  
Diagnostics → Device check → Last check time

**Description**  
Displays the operating time at which the last device check has been performed.

**User interface**  
Character string comprising numbers, letters and special characters
**Level signal**

**Navigation**

Diagnoses → Device check → Level signal

**Prerequisite**

Device check has been performed.

**Description**

Displays result of the device check for the level signal.

**User interface**

- Check not done
- Check not OK
- Check OK

**Additional information**

For **Level signal = Check not OK**: Check the mounting position of the device and the dielectric constant of the medium.

**Launch signal**

**Navigation**

Diagnoses → Device check → Launch signal

**Prerequisite**

Device check has been performed.

**Description**

Displays result of the display check for the launch signal.

**User interface**

- Check not done
- Check not OK
- Check OK

**Additional information**

For **Launch signal = Check not OK**: Check the mounting position of the device. In non-metallic vessels use a metal plate or a metal flange.

**Interface signal**

**Navigation**

Diagnoses → Device check → Interface signal

**Prerequisite**

- Operating mode (→ 126) = Interface or Interface with capacitance
- Device check has been performed.

**Description**

Displays result of the device check for the interface signal.

**User interface**

- Check not done
- Check not OK
- Check OK
17.4.9 "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
SD01872F

Navigation  Diagnostics → Heartbeat
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