Brief Operating Instructions
Prosonic S FMU95
PROFIBUS DP

Ultrasonic measuring technology
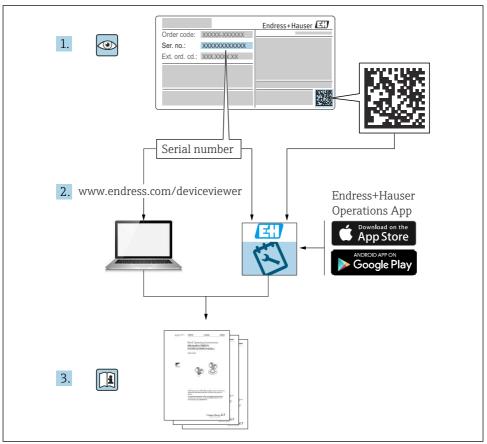Level measurement
5 or 10 sensors

These Instructions are Brief Operating Instructions; they are
not a substitute for the Operating Instructions pertaining to
the device.

Detailed information about the device can be found in the
Operating Instructions and the other documentation:
Available for all device versions via:
- Internet: www.endress.com/deviceviewer
- Smart phone/tablet: *Endress+Hauser Operations App*

Endress+Hauser [EH]

People for Process Automation

1 Associated documentation

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2 About this document

2.1 Symbols

2.1.1 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.

2.1.2 Symbols for certain types of information and graphics

ℹ Tip
Indicates additional information

📖
Reference to documentation

🖼
Reference to graphic

▶
Notice or individual step to be observed

1. , 2. , 3.
Series of steps

1, 2, 3, ...
Item numbers

A, B, C, ...
Views

3   Basic safety instructions

3.1   Intended use

Prosonic S FMU95 is a transmitter for ultrasonic sensors FDU90, FDU91, FDU91F, FDU92, FDU93 and FDU95. To support existing installations, the following sensors can also be connected: FDU80, FDU80F, FDU81, FDU81F, FDU82, FDU83, FDU84, FDU85, FDU86, FDU96.

3.2   Installation, commissioning and operation

This device has been safely built with state-of-the-art technology and meets the applicable requirements and EU Directives. However, if it is used improperly or for applications for which it is not intended, application-related hazards may arise, e.g. product overflow due to incorrect installation or configuration. Installation, electrical connection, commissioning, operation and maintenance of the measuring system must therefore be carried out exclusively by trained specialists authorized to perform such work by the system operator. Technical personnel must

have read and understood these Operating Instructions and must adhere to them. Modifications and repairs to the device may only be carried out if they are expressly permitted in the Operating Instructions.

3.3 Operational safety and process safety

Alternative monitoring measures must be taken to ensure operational safety and process safety during configuration, testing and maintenance work on the device.

3.3.1 Hazardous area

When using the measuring system in hazardous areas, the applicable national standards must be observed. The device is accompanied by separate "Ex documentation", which is an integral part of these Operating Instructions. The installation specifications, connection data and safety instructions listed in this supplementary documentation must be observed.

- Ensure that the technical personnel is sufficiently trained.
- Comply with the metrological and safety-related requirements for the measuring point.

The transmitter may only be mounted in suitable areas. Sensors with an approval for hazardous areas may be connected to transmitters that do not have an Ex approval.

⚠ WARNING

Explosion Hazard

▸ Do not connect FDU83, FDU84, FDU85 and FDU86 sensors with an ATEX, FM, or CSA certificate to the Prosonic S transmitter.

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 label 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?

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

4.2   Product identification

The measuring device can be identified in the following ways:
- 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.

4.3   Storage and transport

- Pack the device so that it is protected against impact for storage and transportation. The
  original packaging provides optimum protection.
- Permitted storage temperature: −40 to +60 °C (−40 to 140 °F)
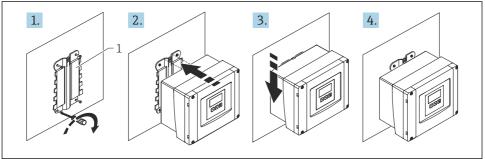
5   Mounting

5.1   Mounting the polycarbonate field housing

5.1.1   Mounting location

- Shaded location, protected from direct sunlight. Use a weather protection cover if necessary.
- If mounting outdoors: use a surge arrester.
- Altitude: install at a maximum altitude of 2 000 m (6 560 ft) over MSL
- Minimum clearance to the left: 55 mm (2.17 in); the housing cover cannot be opened
  otherwise.

5.1.2   Wall mounting

- The housing bracket supplied can also be used as a drilling template.
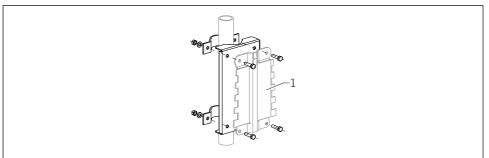- Mount the housing bracket on a level surface so that it cannot become warped or bent.

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🖼 *1   Wall-mounted polycarbonate field housing*

1   Housing bracket (supplied)

5.1.3   Post mounting

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🖼 *2   Mounting plate for mounting the polycarbonate field housing on a post*
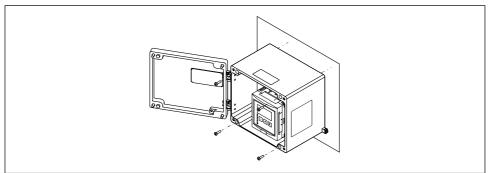
1   Housing bracket (supplied)

5.2   Mounting the aluminum field housing

5.2.1   Mounting location

- Shaded location, protected from direct sunlight
- If mounting outdoors: use a surge arrester
- Altitude: install at a maximum altitude of 2 000 m (6 560 ft) over MSL
- Minimum clearance to the left: 55 mm (2.17 in), the housing cover cannot be opened otherwise

5.2.2   Mounting the device

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🔲 *3   Wall-mounted aluminum field housing*

5.3   Mounting the DIN rail housing

5.3.1   Mounting location

• In cabinet outside hazardous areas
• At a sufficient distance from high-voltage electric cables, motor cables, contactors or frequency converters
• Altitude: install at a maximum altitude of 2 000 m (6 560 ft) over MSL
• Minimum clearance to the left: 10 mm (0.4 in); the housing cover cannot be opened otherwise.
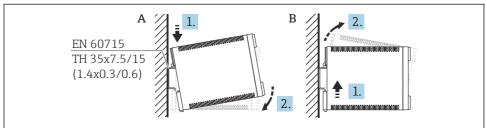
5.3.2   Mounting the device

⚠ WARNING

The DIN rail housing meets protection class IP06.
If the housing is damaged, there is a risk of electric shock at live parts.
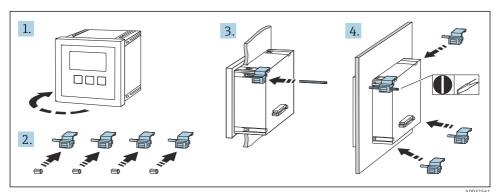▶ Install the device in a stable cabinet.

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🔲 *4   Mounting/disassembling the DIN rail housing. Unit of measurement mm (in)*
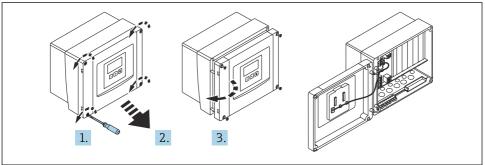
A   Mounting
B   Disassembly

5.4   Mounting the remote display and operating module

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6   Electrical connection

6.1   Terminal compartment of polycarbonate field housing

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⊠ 5   *Access to terminal compartment in polycarbonate field housing*

Cable entries
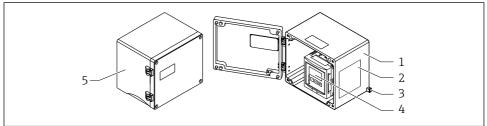Precut openings on the bottom of the housing for the following cable entries:
- M20x1.5 (10 openings)
- M16x1.5 (5 openings)
- M25x1.5 (1 opening)

6.2   Terminal compartment of aluminum field housing

⚠ WARNING

To ensure explosion protection:

▶ Ensure that all the terminals are located in the field housing. (Exception: terminal for protective ground on the outside of the field housing).
▶ Connect the housing to the local ground potential (PML).
▶ To route the cables, only use cable glands that meet the explosion protection requirements at the place of operation.
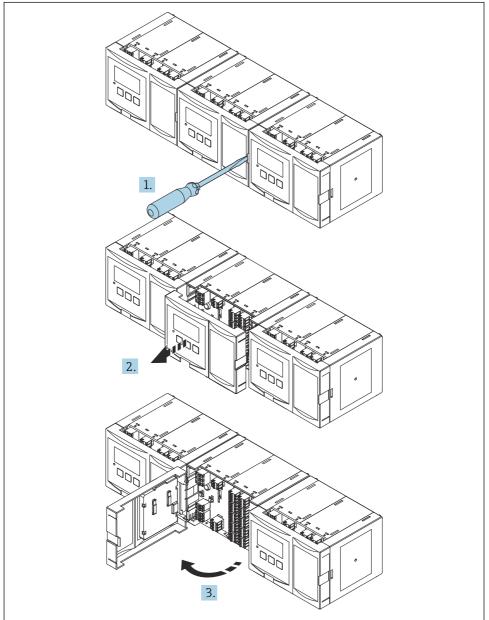

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⊡ 6   *Access to terminal compartment in aluminum field housing*

1   Aluminum field housing, open
2   Nameplate
3   Terminal for protective ground
4   Display and operating module
5   Aluminum field housing, closed

Cable entries
- 12 M20x1.5 openings for cable entries are located on the bottom of the field housing.
- To establish the electrical connection: guide the cables through the cable entries and into the housing. The electrical connection is then established in the same way as in the DIN rail housing.
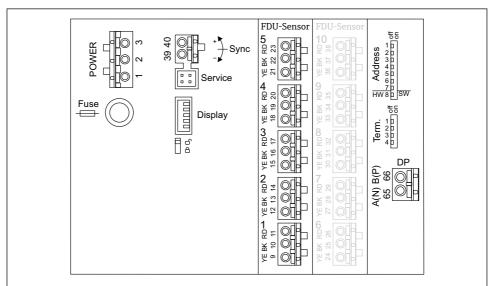
6.3   Terminal compartment of DIN rail housing

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6.4 Terminal assignment

6.4.1 Terminal type

Prosonic S has plug-in spring terminals. Rigid conductors or flexible conductors with ferrules can be inserted directly into the terminal without using the lever, and create a contact automatically.

6.4.2 Terminal areas

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  7   Terminal areas of Prosonic S FMU95

6.4.3 Terminals for power supply (AC version)

- Terminal 1: L (90 to 253 V_{AC})
- Terminal 2: N
- Terminal 3: potential equalization
- Fuse: 400 mA T

6.4.4 Terminals for power supply (DC version)

- Terminal 1: L+ (10.5 to 32 V_{DC})
- Terminal 2: L-
- Terminal 3: potential equalization
- Fuse: 2AT

6.4.5   Terminals for level inputs

In all device versions
- Sensor 1: terminals 9 (yellow), 10 (black), 11 (red)
- Sensor 2: terminals 12 (yellow), 13 (black), 14 (red)
- Sensor 3: terminals 15 (yellow), 16 (black), 17 (red)
- Sensor 4: terminals 18 (yellow), 19 (black), 20 (red)
- Sensor 5: terminals 21 (yellow), 22 (black), 23 (red)

In device versions with 10 sensor inputs
- Sensor 6: terminals 24 (yellow), 25 (black), 26 (red)
- Sensor 7: terminals 27 (yellow), 28 (black), 29 (red)
- Sensor 8: terminals 30 (yellow), 31 (black), 32 (red)
- Sensor 9: terminals 33 (yellow), 34 (black), 35 (red)
- Sensor 10: terminals 36 (yellow), 37 (black), 38 (red)

6.4.6   Terminals for synchronization

Terminal area A
Terminals 39, 40: synchronization of multiple Prosonic S transmitters

6.4.7   Terminals for PROFIBUS DP

- Terminal 65: PROFIBUS A (RxT/TxD - N)
- Terminal 66: PROFIBUS B (RxT/TxD - P)

6.4.8   Other elements on the terminal areas

- **Display**
  Connection of the display or the remote display and operating module
- **Service**
  Service interface; for connection of a PC/notebook via Commubox FXA291
-
  Write protection switch: locks the device to prevent modifications to the configuration.
- **Term.**
  Bus termination
- **Address**
  Device bus address
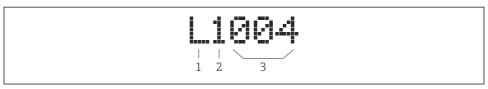
6.5   Special connection instructions

For special connection instructions for the individual terminals, see the Operating Instructions for the device.

7   Operation options

7.1   Structure and function of the operating menu

7.1.1   Submenus and parameter sets

Parameters that belong together are grouped into one parameter set in the operating menu. Each parameter set is identified by a five-digit code.

🔲 *8   Identification of the parameter sets:*

1   Submenu
2   Number of the associated input or output (for multi-channel devices)
3   Number of the parameter set within the submenu

7.1.2   Types of parameter

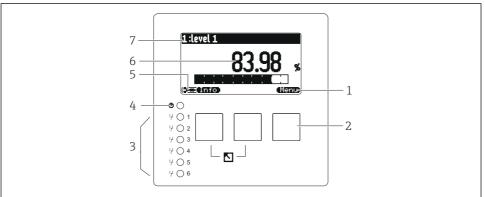**Read-only parameters**

- Symbol: ▧
- Cannot be edited.

Editable parameters

- Symbol: ▱
- Can be opened for editing by pressing ▭.

7.2   Access to the operating menu via the local display

7.2.1   Display and operating elements

Elements of the display and operating module

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1   Soft key symbols
2   Keys
3   Light emitting diodes to indicate the relay switching states
4   LED to indicate the operational state
5   Display symbol
6   Parameter value with unit (here: primary value)
7   Name of displayed parameter

Keys (soft key operation)

The current key function is indicated by soft key symbols above the key.

-
  Moves the selection bar downwards in a picklist.

-
  Moves the selection bar upwards in a picklist.

-
  - Opens the selected submenu, parameter set or parameter.
  - Confirms the edited parameter value.

-
  Goes to the previous parameter set within the submenu.

-
  Goes to the next parameter set within the submenu.

-
  Selects the option in a picklist which is currently marked by the selection bar.

-
  Increases the selected digit of an alphanumeric parameter.

- ▬▬
  Decreases the selected digit of an alphanumeric parameter.
- ▬◢◣▬
  - Opens the list of errors which are currently detected.
  - If a warning is present, the symbol flashes.
  - If an alarm is present, the symbol is displayed permanently.
- ▭▭▭
  Displays the next page of measured values (only available if several pages of measured values have been defined; see the "Display" menu).
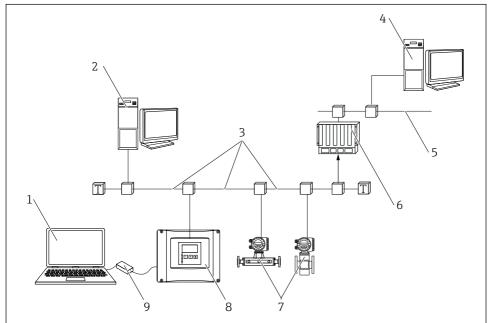- **Info**
  Opens the "Shortcut" menu, which contains the most important read-only parameters.
- **Menu**
  Opens the main menu from where you can access **all** the device parameters.

7.3 Access to the operating menu via PROFIBUS DP

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⊡ *9   Operation method, PROFIBUS DP*

1   Computer with DeviceCare/FieldCare
2   Computer with DeviceCare/FieldCare
3   PROFIBUS DP
4   Computer with DeviceCare/FieldCare
5   Ethernet
6   PLC
7   Field devices
8   Prosonic S transmitter
9   Commubox FXA291

8 Commissioning

8.1 Switching on the device

Parameters that need to be configured when the device is switched on for the first time
- **Language**
  Select the language of the display.
- **Distance unit**
  Select the unit of length in which the distance is measured.
- **Temperature unit**
  Select the unit for the sensor temperature.

8.2 Device configuration

8.2.1 Parameter set "LVL N sensor sel."

Navigation
Level → Level (LVL) N → Basic setup → LVL N sensor sel.

Parameter
- **Input**
  Assign a sensor to the channel.
- **Sensor selection**
  Specify the sensor type.
  Select the **Automatic** option for FDU9x sensors.
  Select the **Manual** option for FDU8x sensors.
- **Detected**
  Only displayed if **Sensor selection** = **Automatic**
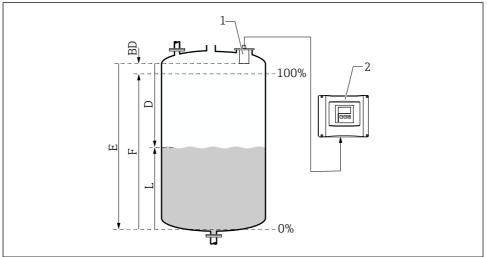 Displays the sensor type detected automatically.

8.2.2 Parameter set "LVL N appl. para."

Tank shape
Select the applicable option.

For more information, see the Operating Instructions.

8.2.3 Parameter set "LVL N empty cal."

☒ *10   Empty and full calibration for level measurement*

1   FDU9x sensor
2   FMU90/FMU95 transmitter
BD   Blocking distance
D   Distance between sensor membrane and product surface
E   Empty E
F   Full F
L   Level

Navigation
Level → Level (LVL) N → Basic setup → LVL N empty cal.

Parameter "Empty E"
Specify the distance E from the reference point of the sensor to the minimum level (zero point). The zero point should not be lower than the point where the ultrasonic wave hits the bottom of the tank.

8.2.4 Parameter set "LVL N full cal."

Navigation
Level → Level (LVL) N → Basic setup → LVL N full cal.

Parameter
- **Full F**
  Specify the span F (the distance from the minimum level to the maximum level).
  F may not project into the blocking distance BD of the sensor.
- **Blocking distance**
  Indicates the blocking distance BD of the sensor.

8.2.5   Parameter set "LVL N unit"

Navigation
Level → Level (LVL) N → Basic setup → LVL N unit

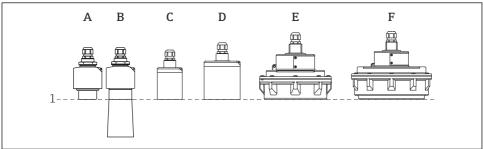**Parameter**
- **Unit level**
  Select the level unit.
  The level is output in this unit if linearization is not performed.
- **Level N**
  Displays the level F currently measured (from the zero point to the surface of the product)
  in the selected unit.
- **Distance**
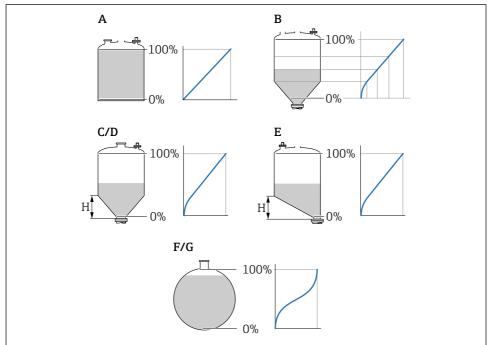 Displays the distance D currently measured between the sensor membrane (reference point
  of the measurement) and the surface of the product.

1   Reference point of measurement
A   FDU90 without flooding protection tube
B   FDU90 with flooding protection tube
C   FDU91/FDU91F
D   FDU92
E   FDU93
F   FDU95

8.2.6 Parameter set "LVL N Linearisat."

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⊠ *11   Types of linearization*

A   None
B   Table
C   Pyramid bottom
D   Conical bottom
E   Angled bottom
F   Sphere
G   Horizontal cyl
H   Intermediate height

Navigation
Level → Level (LVL) N → Basic setup → LVL N Linearisat.

Parameter
- **Type**
  Select the type of linearization (see above)
- **Customer unit**
  Specify the unit for the linearized value.
- **Max. scale**
  Specify the maximum vessel content (100 %) in the selected customer unit.
  Not displayed if **Type** = **Table**.
  If **Type** = **Horizontal cyl.** or **Sphere**, the **Max. scale** must always refer to a completely full tank.
- **Diameter**
  Only displayed if **Type** = **Horizontal cyl.** or **Sphere**.
  Specify the diameter D of the tank.
- **Intermediate height (H)**
  Only displayed if **Type** = **Angled bottom**, **Pyramid bottom** or **Conical bottom**
  Specify the intermediate height H of the vessel (see above).
- **Edit**
  Only displayed if **Type** = **Table**.
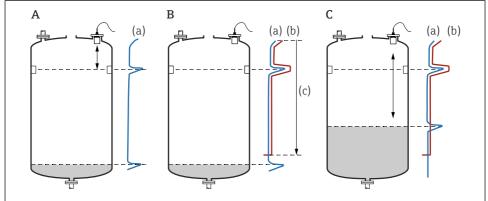 Opens the **Edit** parameter set to enter the linearization table.
- **Status table**
  Activates or deactivates the linearization table.
- **Mode**
  Specifies whether the linearization refers to the level or the ullage.

8.2.7   Parameter set "Check value"

- This parameter set starts inference echo suppression (mapping).
- To record all the interference echoes, perform mapping at the minimum level possible (ideally with an empty vessel).
  - If it is not possible to empty the vessel during commissioning, record preliminary mapping when the vessel is partially filled. Repeat mapping when the level reaches approximately 0 % for the first time.

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⊠ *12   Operating principle of the interference echo suppression (mapping) function*

A   The echo curve (a) contains an interference echo and the level echo. Without mapping, the
*   interference echo would also be evaluated. This is not desired.*
B   Mapping generates the mapping curve (b). This suppresses all the echoes that are inside the range of
*   mapping (c).*
C   Afterwards, only echoes that are higher than the mapping curve are evaluated. The interference echo
*   is below the mapping curve and is therefore ignored (not evaluated).*

Navigation
Level → Level (LVL) N → Basic setup → LVL N check value

Parameter
- **Actual distance**
  Displays the distance D currently measured between the sensor membrane and the surface of the product.
- **Check distance**
  Compare the distance displayed with the actual value and enter the result of the comparison. Based on the entry, the device automatically determines the range of mapping.
  - **Distance = ok**
    The displayed distance and actual distance match.
    → Continue with the parameter set **LVL N dist. map.**.
  - **Dist. too small**
    The displayed distance is smaller than the actual distance.
    → Continue with the parameter set **LVL N dist. map.**.
  - **Dist. too big**
    The displayed distance is larger than the actual distance.
    → Mapping is not possible.
    → Setup for sensor N ends.
  - **Dist. unknown**
    Actual distance is unknown.
    → Mapping is not possible.
    → Setup for sensor N ends.
  - **Manual**
    The range of mapping is to be defined manually.
    → Continue with the parameter set **LVL N dist. map.**.

8.2.8   Parameter set "LVL N dist. map."

Navigation
Level → Level (LVL) N → Basic setup → LVL N dist. map.

Parameter

- **Actual distance**

  Displays the distance D currently measured between the sensor membrane and the surface of the product.

- **Range of mapping**

  Specifies the range, starting from the sensor membrane, in which mapping is performed.
  - If **Check distance** = **Distance = Ok** or **Dist. too small**:

    Confirm the preset value.
  - If **Check distance** = **Manual**:

    Enter the desired mapping range.

- **Start mapping**

  Select **Yes** to start recording the mapping curve.

  → The **LVL N status** parameter set appears.

  → If the displayed distance is still too small: keep recording mapping curves until the displayed distance and the actual distance match.

- **Status**

  Specifies the mapping status:
  - **Enable map**

    The mapping curve is taken into consideration during signal evaluation.
  - **Disable map**

    The mapping curve is not taken into consideration during signal evaluation but remains stored in the device.
  - **Delete map**

    The mapping curve is deleted.

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