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Operating Instructions
Smartec CLD132

Measuring system with inductive conductivity sensor for conductivity and concentration measurement

Endress+Hauser
People for Process Automation

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1 About this document

1.1 Warnings

Structure of information	Meaning
DANGER **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation **will** result in a fatal or serious injury.
WARNING **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation **can** result in a fatal or serious injury.
CAUTION **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.
NOTICE **Cause/situation** If necessary, Consequences of non-compliance (if applicable) ▶ Action/note	This symbol alerts you to situations which may result in damage to property.

1.2 Symbols

- Additional information, tips
- Permitted
- Recommended
- Forbidden or not recommended
- Reference to device documentation
- Reference to page
- Reference to graphic
- Result of a step

1.3 Symbols on the device

- Reference to device documentation

1.4 Documentation

The following manuals which complement these Operating Instructions can be found on the product pages on the Internet:
- Technical Information Smartec CLD132, TI00207C
- Operating instructions for HART communication Smartec CLD132, BA00212C
- Operating instructions for PROFIBUS communication Smartec CLD132/134, BA00213C

2 Basic safety instructions

2.1 Requirements of the personnel

- Installation, commissioning, operation and maintenance of the measuring system may be carried out only by specially trained technical personnel.
- The technical personnel must be authorized by the plant operator to carry out the specified activities.
- The electrical connection may be performed only by an electrical technician.
- The technical personnel must have read and understood these Operating Instructions and must follow the instructions contained therein.
- Faults at the measuring point may only be rectified by authorized and specially trained personnel.

Repairs not described in the Operating Instructions provided must be carried out only directly at the manufacturer's site or by the service organization.

2.2 Intended use

Smartec is a practical and reliable measuring system designed to determine the conductivity of liquid media.

Use of the device for any purpose other than that described, poses a threat to the safety of people and of the entire measuring system and is therefore not permitted.

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

2.3 Workplace safety

As the user, you are responsible for complying with the following safety conditions:
- Installation guidelines
- Local standards and regulations

Electromagnetic compatibility
- The product has been tested for electromagnetic compatibility in accordance with the applicable international standards for industrial applications.
- The electromagnetic compatibility indicated applies only to a product that has been connected in accordance with these Operating Instructions.

2.4 Operational safety

Before commissioning the entire measuring point:

1. Verify that all connections are correct.
2. Ensure that electrical cables and hose connections are undamaged.
3. Do not operate damaged products, and protect them against unintentional operation.
4. Label damaged products as defective.

During operation:

▶ If faults cannot be rectified:
products must be taken out of service and protected against unintentional operation.

2.5 Product security

The product is designed 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. The relevant regulations and international standards have been observed.

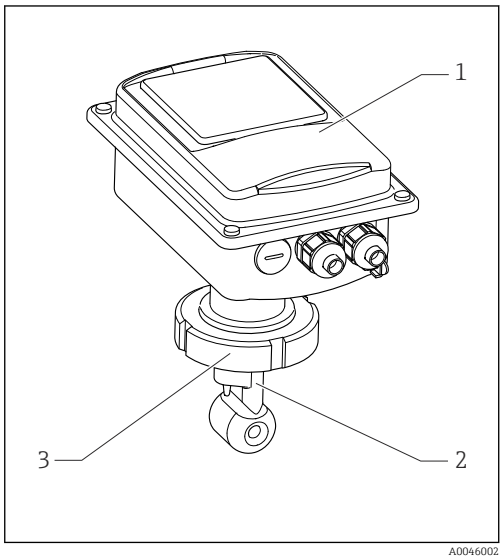
We only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

3 Product description

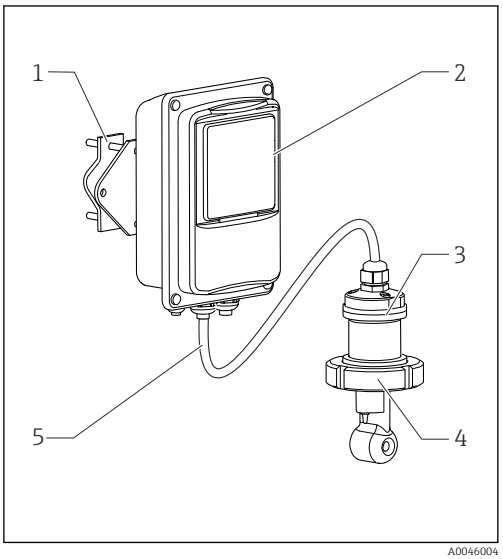
3.1 Product design

3.1.1 Overview



1 *Compact version*

1 *Transmitter*
2 *Sensor*
3 *Process connection*



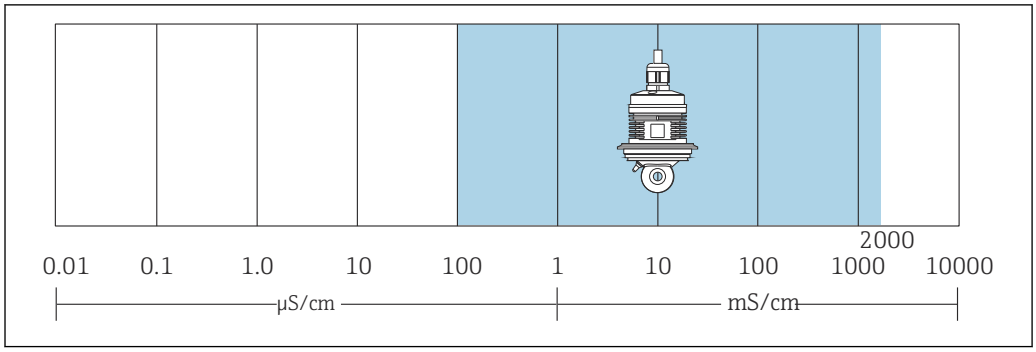
2 *Remote version*

1 *Wall holder unit*
2 *Transmitter*
3 *Sensor*
4 *Process connection*
5 *Sensor cable*

3.1.2 Basic version and function upgrade

Functions of the basic version	Additional options and associated functions
▪ Measurement ▪ Calibration of cell constant ▪ Calibration of residual coupling ▪ Entry of installation factor ▪ Device parameter read-out ▪ Linear current output for measured value ▪ Current output simulation for measured value ▪ Service functions ▪ Choice of temperature compensation (including a user-configurable coefficient table) ▪ Choice of concentration measurement (4 fixed curves, 1 user-configurable table) ▪ Relay as a alarm contact	▪ Second current output for temperature (additional hardware option) ▪ HART communication ▪ PROFIBUS communication **Remote parameter set configuration (additional software option):** ▪ Remote switching of max. 4 parameter sets (measuring ranges) ▪ Temperature coefficients can be determined ▪ Temperature compensation can be selected (including 4 user-configurable coefficient tables) ▪ Choice of concentration measurement (4 fixed curves, 4 user-configurable tables) ▪ Measuring system checked with PCS alarm (live check) ▪ Relay can be configured as limit contactor or alarm contact

3.1.3 Measuring range



3 Recommended measuring range of the sensor (highlighted in blue)

4 Incoming acceptance and product identification

4.1 Incoming acceptance

1. Verify that the packaging is undamaged.
   ↳ Notify the supplier of any damage to the packaging.
   Keep the damaged packaging until the issue has been resolved.
2. Verify that the contents are undamaged.
   ↳ Notify the supplier of any damage to the delivery contents.
   Keep the damaged goods until the issue has been resolved.
3. Check that the delivery is complete and nothing is missing.
   ↳ Compare the shipping documents with your order.
4. Pack the product for storage and transportation in such a way that it is protected against impact and moisture.
   ↳ The original packaging offers the best protection.
   Make sure to comply with the permitted ambient conditions.

If you have any questions, please contact your supplier or your local Sales Center.

4.2 Product identification

4.2.1 Nameplate

The nameplate provides you with the following information on your device:
- Manufacturer identification
- Order code
- Serial number
- Ambient and process conditions
- Input and output values
- Activation codes
- Safety information and warnings
- Protection class

▶ Compare the information on the nameplate with the order.

4.2.2 Identifying the product

Product page

www.endress.com/CLD132

Interpreting the order code

The order code and serial number of your product can be found in the following locations:
- On the nameplate
- In the delivery papers

Obtaining information on the product

1. Go to www.endress.com.
2. Page search (magnifying glass symbol): Enter valid serial number.
3. Search (magnifying glass).
   ↳ The product structure is displayed in a popup window.

4. Click the product overview.
   ↳ A new window opens. Here you fill information pertaining to your device, including the product documentation.

4.3 Scope of delivery

The scope of delivery of the "compact version" comprises:
- Compact measuring system Smartec with integrated sensor
- Terminal strip set
- Bellows (for device version -*GE1*****)
- Operating Instructions BA00207C
- For versions with HART communication:
  Operating Instructions for field communication with HART BA00212C
- For versions with PROFIBUS interface:
  - Operating Instructions for field communication with PROFIBUS BA00213C
  - M12 connector (for device version -******PF*)

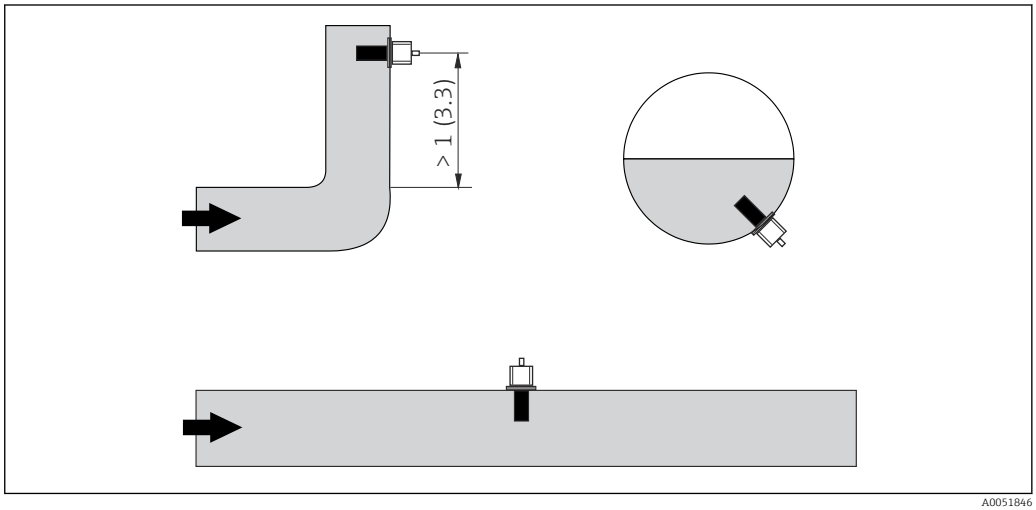
The scope of delivery of the "remote version" comprises:
- Smartec transmitter
- CLS52 inductive conductivity sensor with fixed cable
- Terminal strip set
- Bellows (for device version -*GE1*****)
- Operating Instructions BA00207C
- For versions with HART communication:
  Operating Instructions for field communication with HART BA00212C
- For versions with PROFIBUS interface:
  - Operating Instructions for field communication with PROFIBUS BA00213C
  - M12 connector (for device version -******PF*)

5 Mounting

5.1 Mounting requirements

5.1.1 Orientations

The sensor must be completely immersed in the medium. Avoid air bubbles in the area of the sensor.



4 *Orientation of conductivity sensors*

Changes in the flow direction (after pipe bends) can cause turbulence in the medium. Install the sensor at a distance of at least 1 m (3.3 ft) downstream from a pipe bend.

5.1.2 Air set

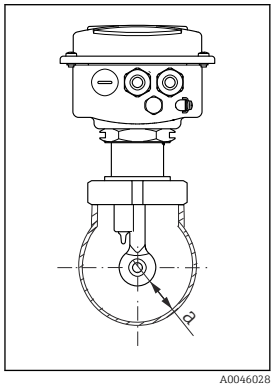
The device must be operational, i.e. the power supply and the sensor must be connected.

- Before mounting the sensor:
  Perform an air set. → 56

5.1.3 Wall distance

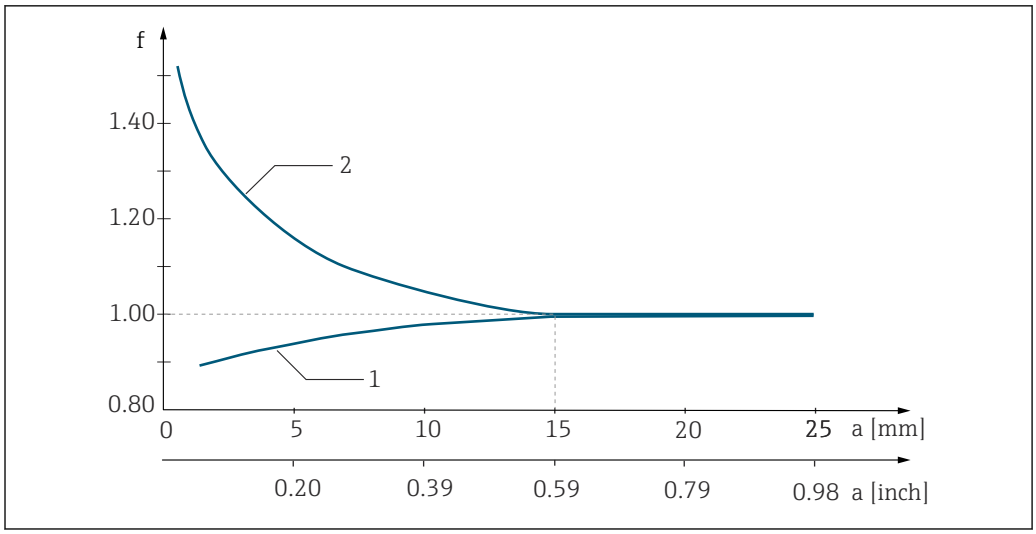
The distance between the sensor and the internal wall of the pipe influences the measurement accuracy.

The ionic current in the liquid is affected by the walls in confined installation conditions. This effect is compensated by what is referred to as the installation factor.
The installation factor can be disregarded (f = 1.00) if the distance to the wall is sufficient (a > 15 mm, from DN 65).
If the distance to the wall is shorter, the installation factor increases for electrically insulating pipes (f > 1) and decreases for electrically conductive pipes (f < 1).
The procedure for determining the installation factor is described in the "Calibration" section.



5 *Installation situation*

a Wall distance

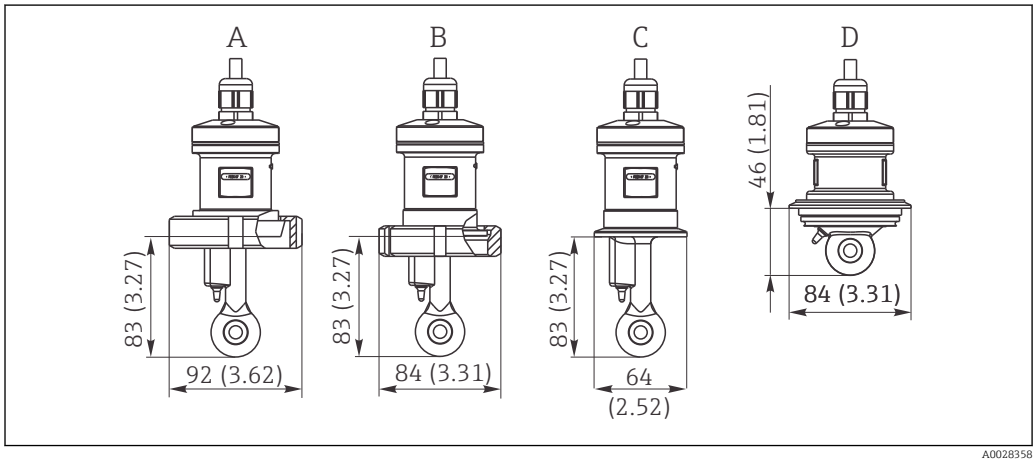


6 *Relationship between installation factor f and wall distance a*

1 Electrically conductive pipe wall
2 Electrically insulating pipe wall

5.1.4 Process connections

Remote version



7 *Process connections for CLS52, dimensions in mm(inch)*

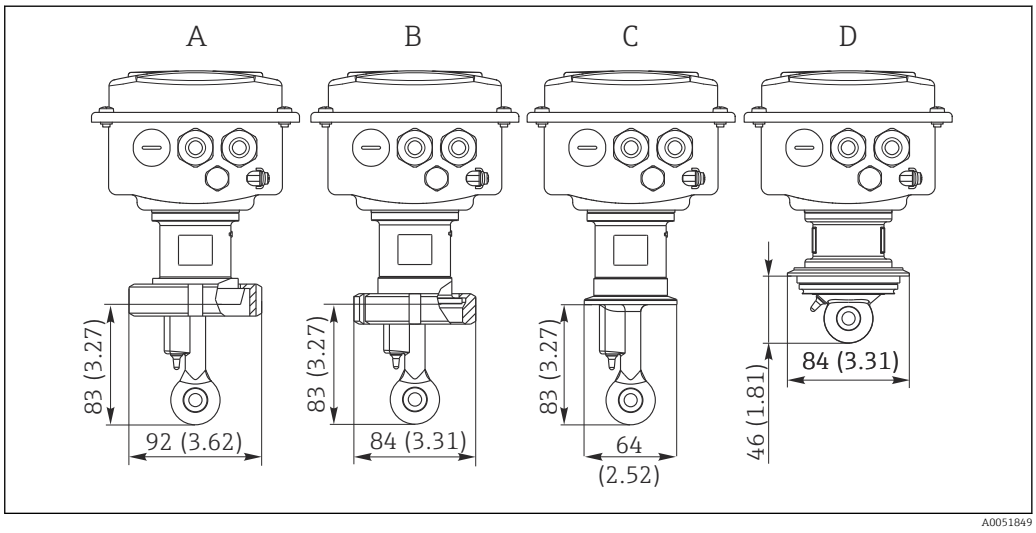
A Sanitary connection DN 50 (DIN 11851)
B SMS 2"
C Clamp 2" (ISO 2852)
D Varivent N DN 40 to DN 125

Clamp connection

Both sheet-metal brackets and solid brackets can be used to secure the sensor. Sheet-metal brackets have a lower dimensional stability, uneven bearing surfaces causing point loads, and sometimes sharp edges that can damage the clamp.

We urgently recommend you only use solid brackets due to their higher dimensional stability. Solid brackets can be used over the entire specified pressure/temperature range.

Compact version



8 *Process connections for compact version, dimensions in mm (inch)*

A Sanitary connection DN 50 (DIN 11851)
B SMS 2"
C Clamp 2" (ISO 2852)
D Varivent N DN 40 to DN 125

Clamp connection

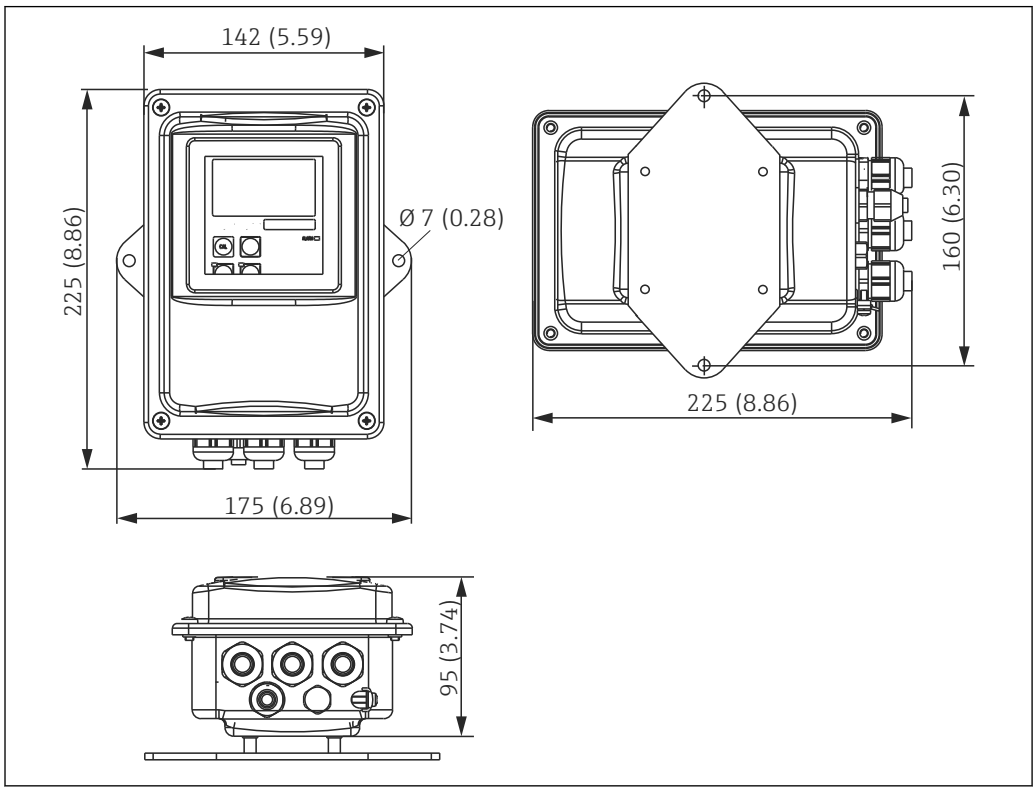
Both sheet-metal brackets and solid brackets can be used to secure the sensor. Sheet-metal brackets have a lower dimensional stability, uneven bearing surfaces causing point loads, and sometimes sharp edges that can damage the clamp.

We urgently recommend you only use solid brackets due to their higher dimensional stability. Solid brackets can be used over the entire specified pressure/temperature range.

5.2 Mounting the measuring device

5.2.1 Remote version

Transmitter wall mounting

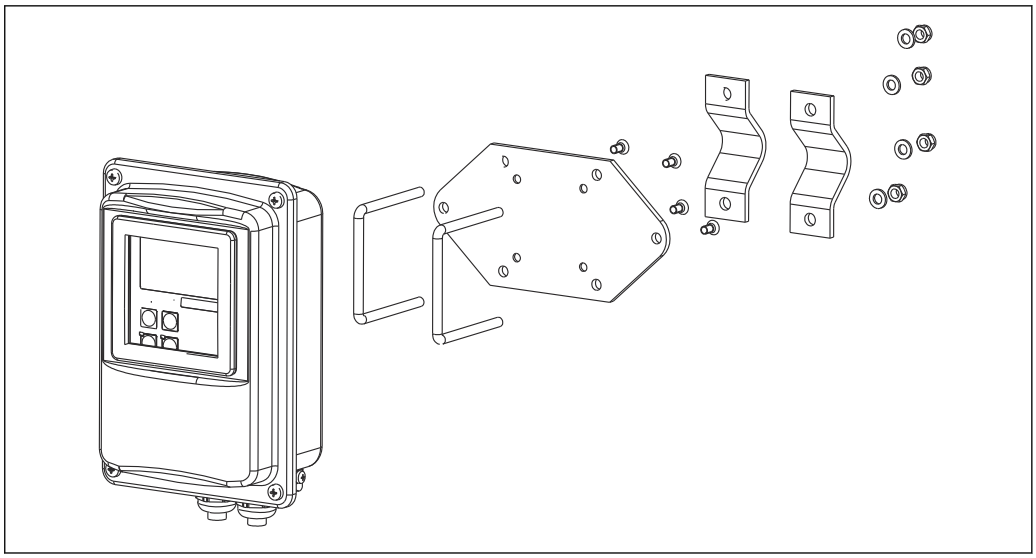


9 *Wall mounting*

1. Wall plugs and screws must be provided by the customer.
   Drill holes in the wall and fit suitable wall plugs.
2. Secure the mounting plate to the transmitter.
3. Mount the plate together with the transmitter on the wall.

Pipe mounting of the transmitter

You require a post mounting kit to secure the device on horizontal and vertical pipes or posts (max. Ø 60 mm (2.36"). → 72



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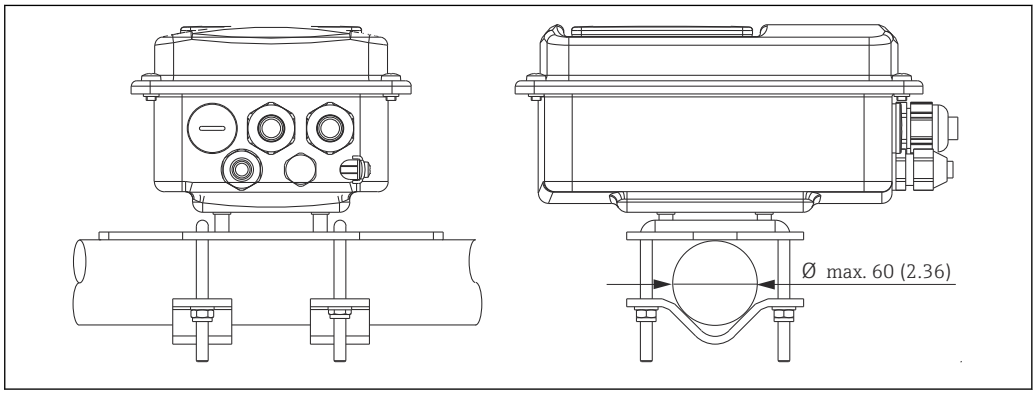
10 Mounting kit for pipe mounting of the remote version

1. Unscrew the pre-assembled mounting plate.
2. Insert the holding bars of the mounting kit through the pre-drilled holes of the mounting plate and screw the mounting plate back onto the transmitter.
3. Using the clip, attach the bracket with the transmitter to the post or pipe.



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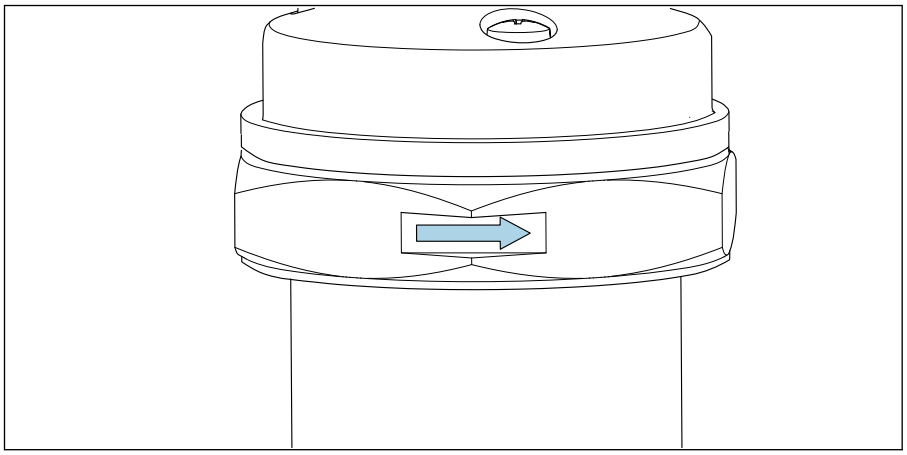
11 Mounted transmitter

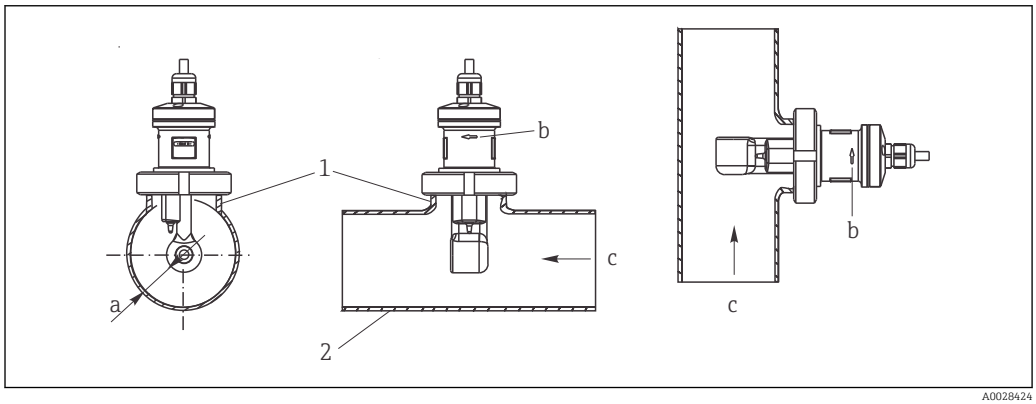
Sensor mounting

1. Before installation in the process connection:
   Perform an air set. → 11
2. Mount the sensor via the process connection.

3.



Align the sensor in such a way that the medium flows through the flow opening of the sensor in the direction of medium flow. Use the arrow on the sensor to help you align the device.



12 *Installation of CLS52 in pipes with horizontal flow (center) and vertical flow (right)*

a *Sensor distance from wall*
b *Orientation arrow for flow direction*
c *Direction of flow*
1 *Mounting bosses*
2 *Pipe*

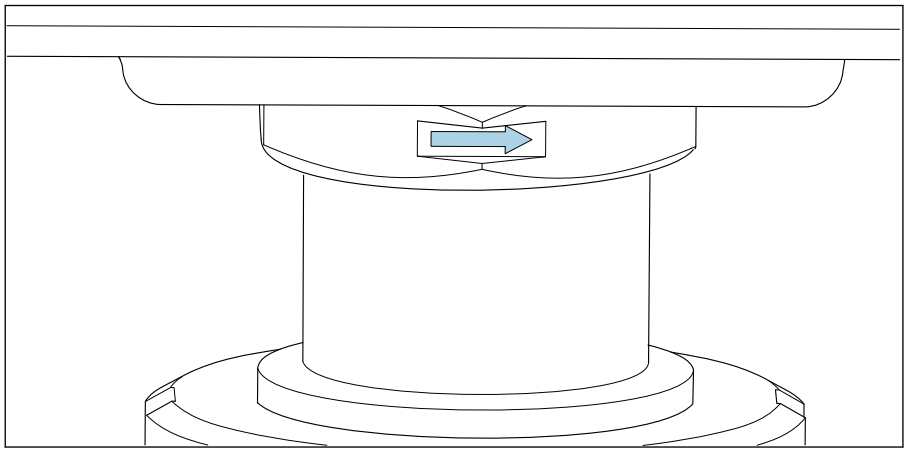
5.2.2 Compact version

Before mounting

▶ Perform an air set for the sensor. → 11

Observe the limits for medium and ambient temperature when using the compact device.→ 74

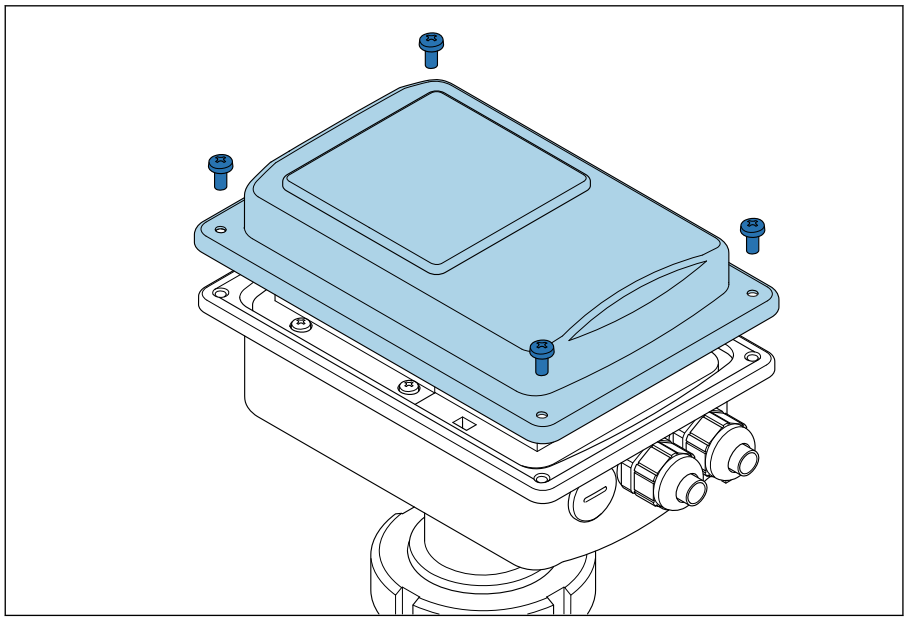
1. Mount the compact device directly on a pipe nozzle or tank nozzle via the sensor process connection.
2. Choose the installation depth of the sensor in the medium to ensure the coil former is completely immersed in the medium.
3. Pay attention to the distance from the wall. → 11

4. 

Align the sensor so that the medium flows through the flow opening of the sensor in the direction of medium flow. Use the orientation arrow on the intermediate piece for alignment.

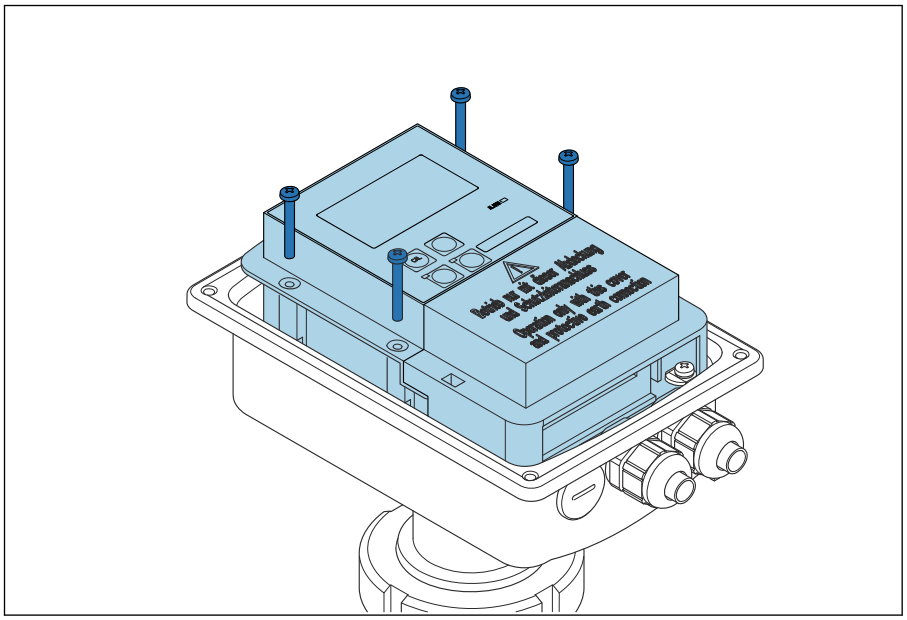
5. Tighten the flange.

Changing the alignment of the transmitter housing

1. 

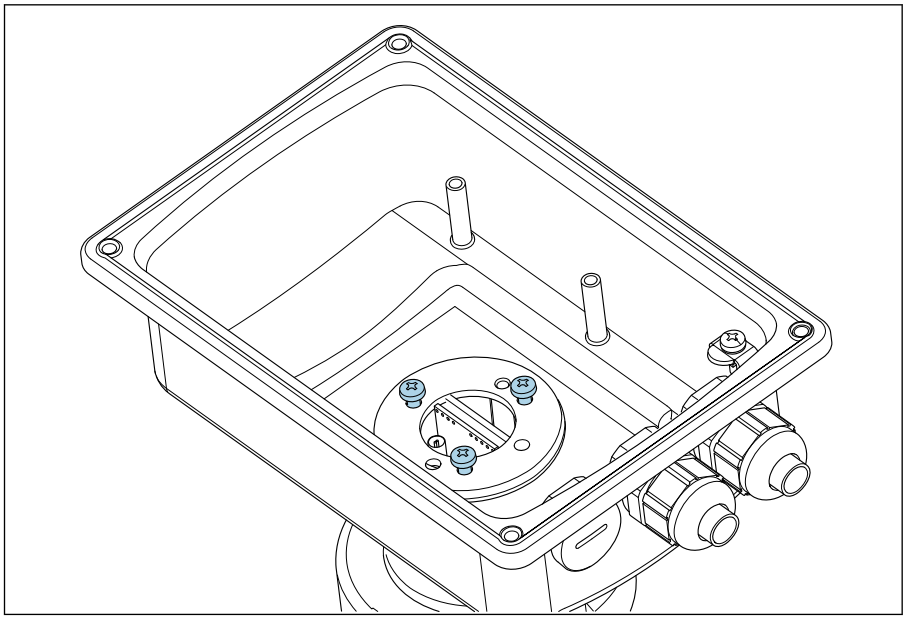
Unscrew the housing cover.

2.



Loosen the screws of the electronics box and carefully remove the box from the housing.

3.



Loosen the three screws until the housing can be rotated.

4. Align the housing.
5. Tighten the screws again. Ensure the maximum torque of 1.5 Nm is not exceeded!
6. Insert and mount the electronics box, then replace and install the cover.

5.3 Post-mounting checks

1. After installation, check the measuring system for damage.
2. Check that the sensor is aligned with the flow direction of the medium.
3. Check that the coil former of the sensor is completely wetted by the medium.

6 Electrical connection

6.1 Connecting requirements

⚠ WARNING

Device is live!

Incorrect connection may result in injury or death!

- The electrical connection may be performed only by an electrical technician.
- The electrical technician must have read and understood these Operating Instructions and must follow the instructions contained therein.
- **Prior** to commencing connection work, ensure that no voltage is present on any cable.

6.2 Connecting the measuring device

⚠ WARNING

Risk of electric shock!

- At the supply point, the power supply must be isolated from dangerous live cables by double or reinforced insulation in the case of devices with a 24 V power supply.

NOTICE

The device does not have a power switch

- A protected circuit breaker must be provided in the vicinity of the device at the place of installation.
- The circuit breaker must be a switch or power switch, and you must label it as the circuit breaker for the device.

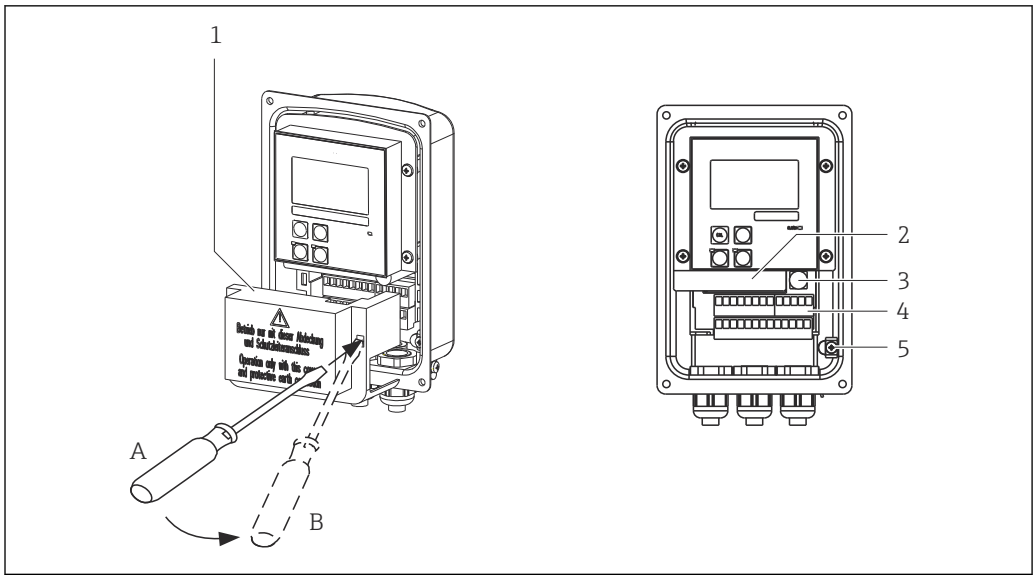
6.2.1 Wiring

Risk of electric shock!

- Ensure that the device is de-energized.

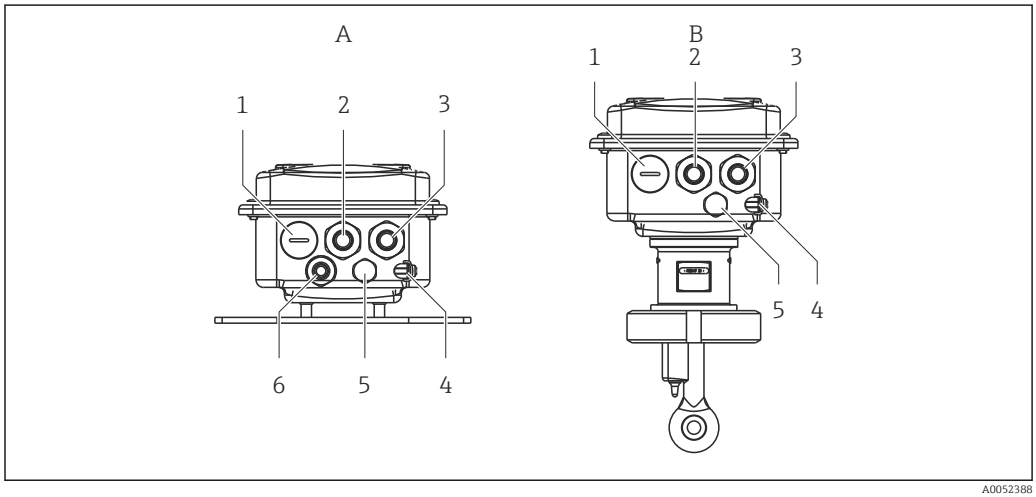
To connect the transmitter, follow the steps below:

1. Loosen the 4 Phillips screws on the housing cover.
2. Remove the housing cover.
3. Remove the cover frame from the terminal blocks. To do this, insert the screwdriver according to into the recess (A) and push the tab inward (B).
4. Insert the cables through the open cable glands into the housing according to the terminal assignment in .
5. Connect the power supply according to the terminal assignment in .
6. Connect the alarm contact according to the terminal assignment in .
7. Connect the functional earth (FE) according to the drawing, .
8. For the separate version: Connect the sensor according to the terminal assignment in . In the case of the separate version, the conductivity sensor is connected via the multi-core, shielded sensor cable. Termination instructions are supplied with the cable. Use a junction box VBM (see the "Accessories" section) to extend the measuring cable. The maximum total cable length if extended using a junction box is 55 m (180 ft.).
9. Tighten the cable glands.



13 View of open housing

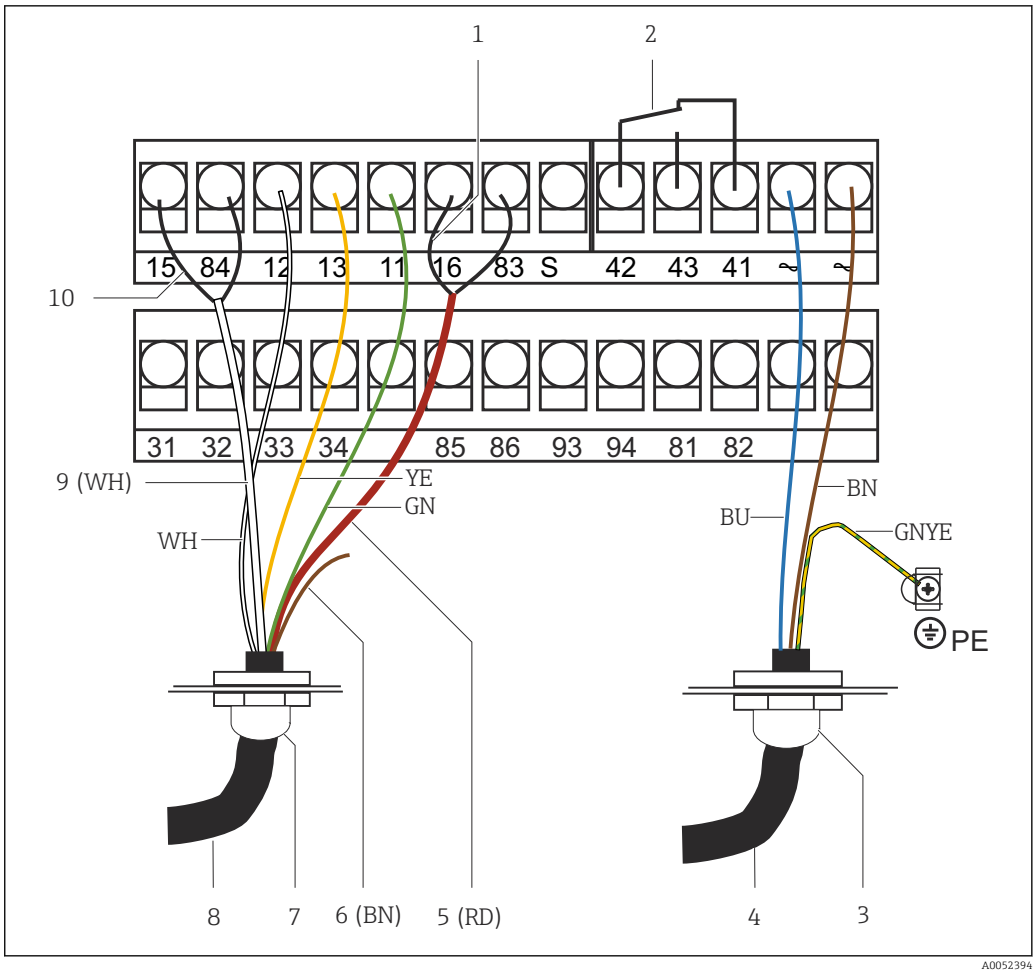
1 Cover frame
2 Removable electronics box
3 Fuse
4 Terminals
5 Protective earth



14 Arrangement of cable entries

A Separate version
1 Dummy plug, analog output, binary input
2 Cable entry for alarm contact
3 Cable entry for power supply
4 Functional earth (FE)
5 Pressure compensation element PCE (Goretex® filter)
6 Cable entry for sensor connection, Pg 9

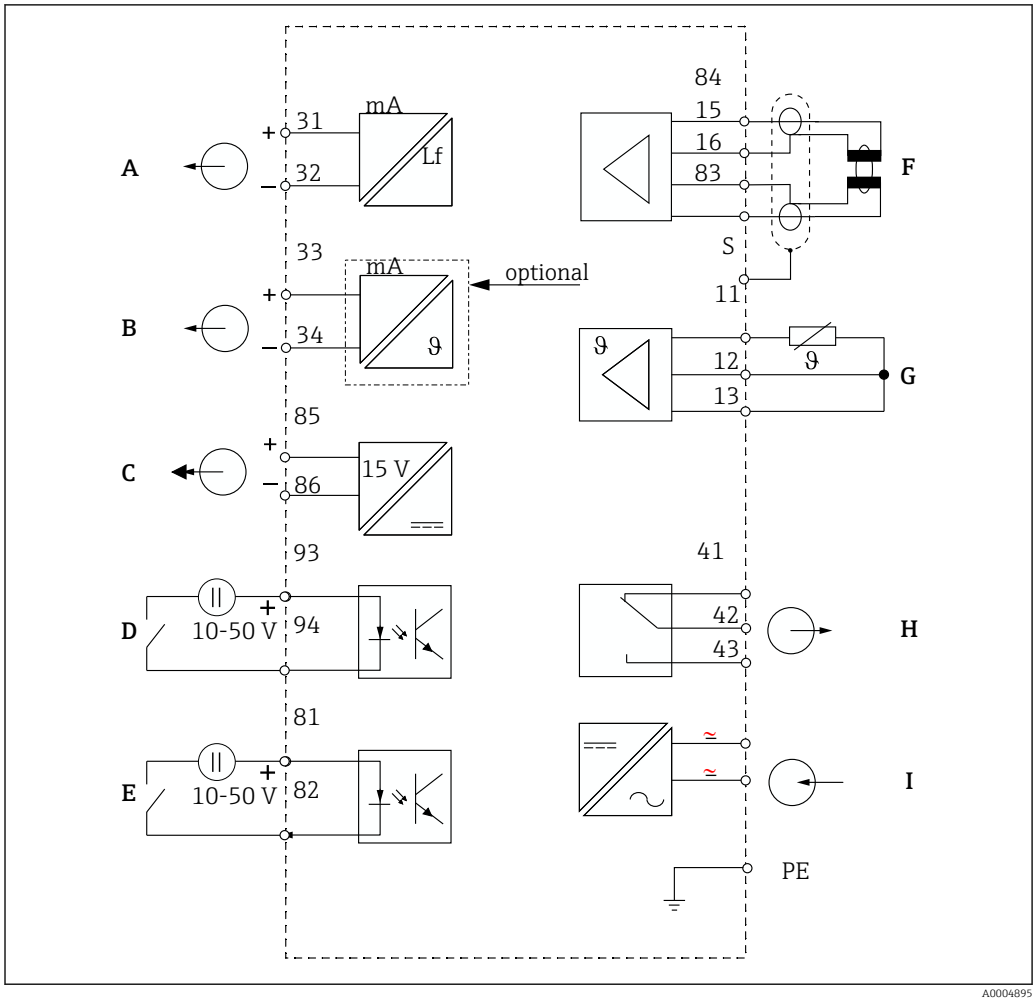
B Compact version
1 Dummy plug, analog output, binary input
2 Cable entry for alarm contact
3 Cable entry for power supply
4 Functional earth (FE)
5 Pressure compensation element PCE (Goretex® filter)



15 *Electrical connection*

1 *Shielding*
2 *Alarm (current-free contact position)*
3 *Pg 13.5*
4 *Power supply*
5 *Coax (RD)*
6 *Not used (BN)*
7 *Pg 13.5*
8 *Sensor*
9 *Coax (WH)*
10 *Shielding*

6.2.2 Wiring diagram

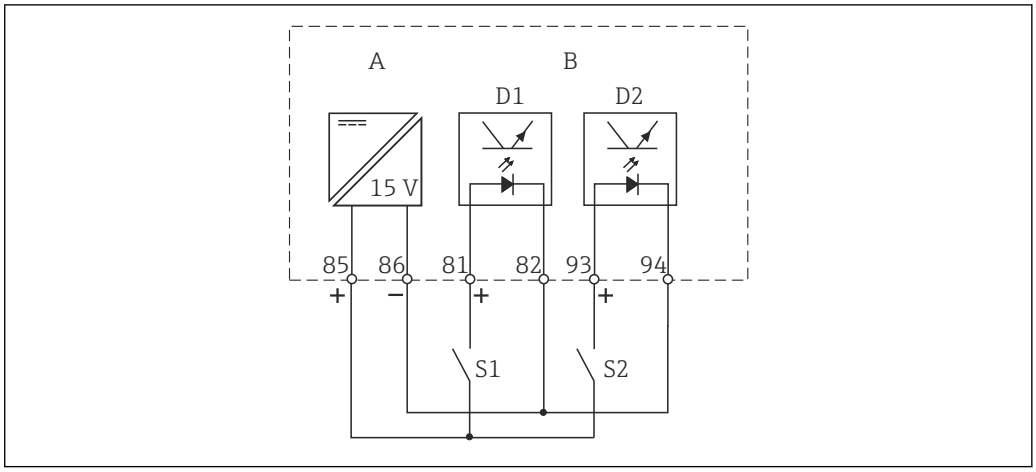


16 *Electrical connection*

A Signal output 1, conductivity
B Signal output 2, temperature
C Auxiliary voltage output
D Binary input 2 (MRS 1+2)
E Binary input 1 (hold / MRS 3+4)
F Conductivity sensor
G Temperature sensor
H Alarm (current-free contact position)
I Power supply

MRS: remote parameter set configuration (measuring range switching)

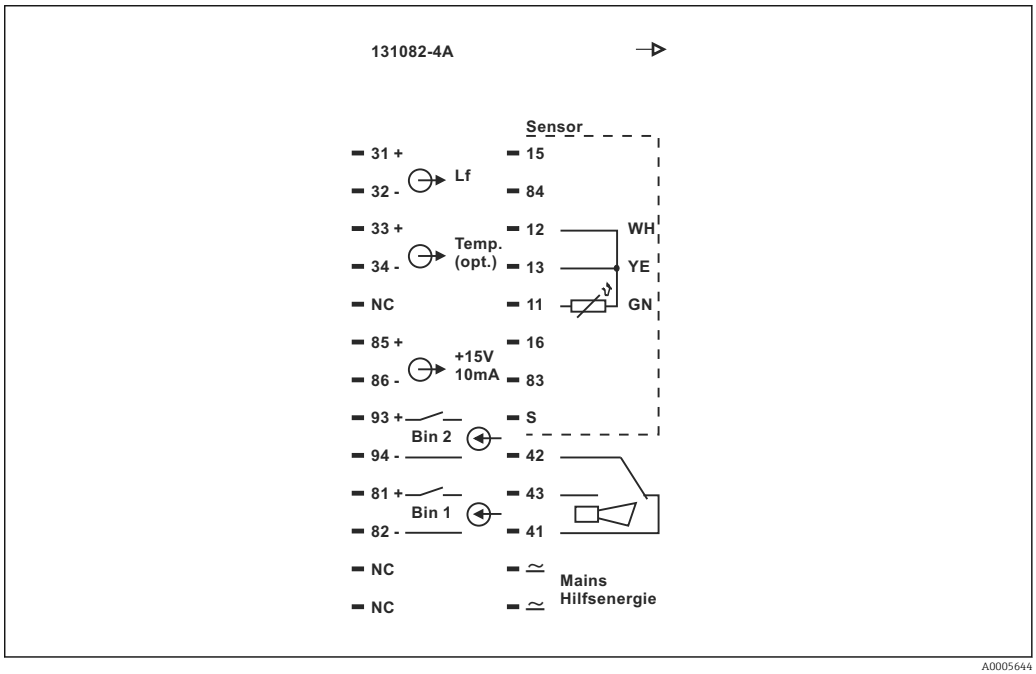
6.2.3 Connecting the binary inputs



17 *Connection of the binary inputs when using external contacts*

A Auxiliary voltage output
B Contact inputs D1 and D2
S1 External current-free contact
S2 External current-free contact

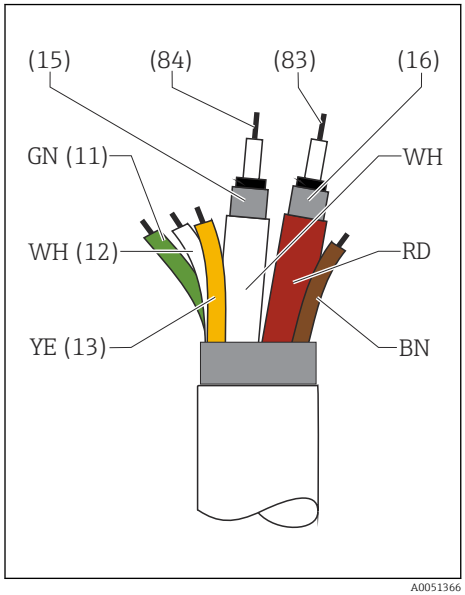
6.2.4 Connection compartment sticker



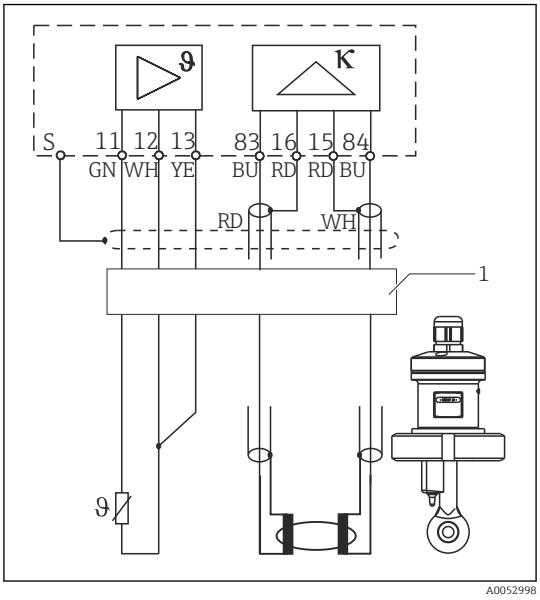
18 *Connection compartment sticker for Smartec*

- The device has Class I equipment protection. The metal housing must be connected to PE.
- Terminals marked NC may not be connected.
- Unmarked terminals may not be connected.

6.2.5 Structure and termination of the measuring cable

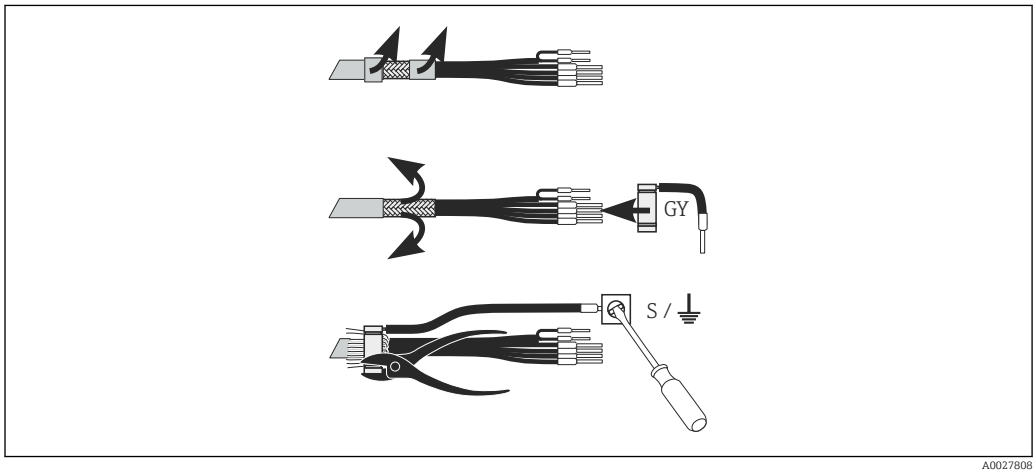


19 *Structure of the sensor cable*



20 *Electrical connection of the sensor in the remote version*

1 Sensor cable

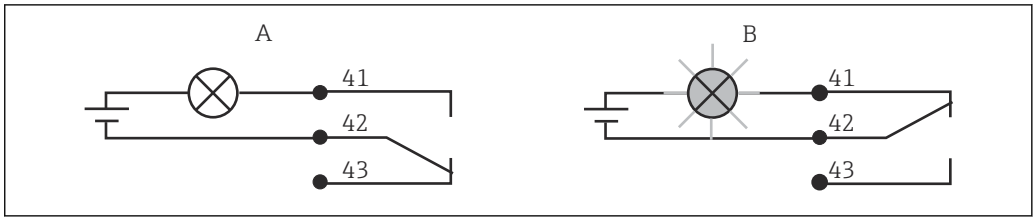


21 *Shield connection*

Connecting the measuring cable

1. Feed the cable through a cable gland into the connection compartment.
2. Strip approx. 3 cm of the shielding braid and fold it back over the cable insulation.
3. Guide the crimping ring of the screen connection supplied over the prepared shielding braid and close the ring tight with a pair of pliers.
4. Connect the strand of the screen connection to the terminal bearing the grounding symbol.
5. Connect the remaining wires according to the wiring diagram.
6. Finally, tighten the cable gland.

6.2.6 Alarm contact



22 *Recommended fail-safe switching for the alarm contact*

A Normal operating status
B Alarm condition

Normal operating status

Device in operation and no error message present (alarm LED off):
- Relay energized
- Contact 42/43 closed

Alarm condition

Error message present (alarm LED red) or device defective or de-energized (alarm LED off):
- Relay de-energized
- Contact 41/42 closed

6.3 Post-connection check

▶ Once the electrical connection is set up, carry out the following checks:

Device condition and specifications	Notes
Are the devices and cables free from damage on the outside?	Visual inspection

Electrical connection	Notes
Does the supply voltage correspond to that specified on the nameplate?	230 V AC 115 V AC 100 V AC 24 V AC/DC
Do the cables used meet the necessary specifications?	Use an original E+H cable for electrode/ sensor connection; see Accessories section
Are the connected cables provided with strain relief?	
Is the cable type route completely isolated?	Run the power supply and signal cables separately along the entire cable route so that no interference can occur. Separate cable ducts are optimal.
Is the cable run correct, without loops and cross-overs?	
Are the power cable and signal cables connected correctly and in accordance with the wiring diagram?	
Are all the screw terminals tightened?	
Are all the cable entries fitted, tightened and leak-proof?	
Are all housing covers installed and firmly tightened?	Check seals for damage.

7 Operation options

7.1 Overview of operation options

7.1.1 Operation options

You have the following ways of operating the transmitter:
- On site via the key field
- Via the HART interface (optional, with corresponding order version) with:
  - HART handheld terminal
  - PC with HART modem and the Fieldcare software package
- Via PROFIBUS PA/DP (optional, with corresponding order version) by PC with a corresponding interface and the Fieldcare software package or via a programmable logic controller (PLC).

For operation via HART or PROFIBUS PA/DP, please read the relevant sections in the additional Operating Instructions:
- PROFIBUS PA/DP, field communication with Smartec S CLD132, BA 213C/07
- HART®, field communication with Smartec S CLD132, BA 212C/07

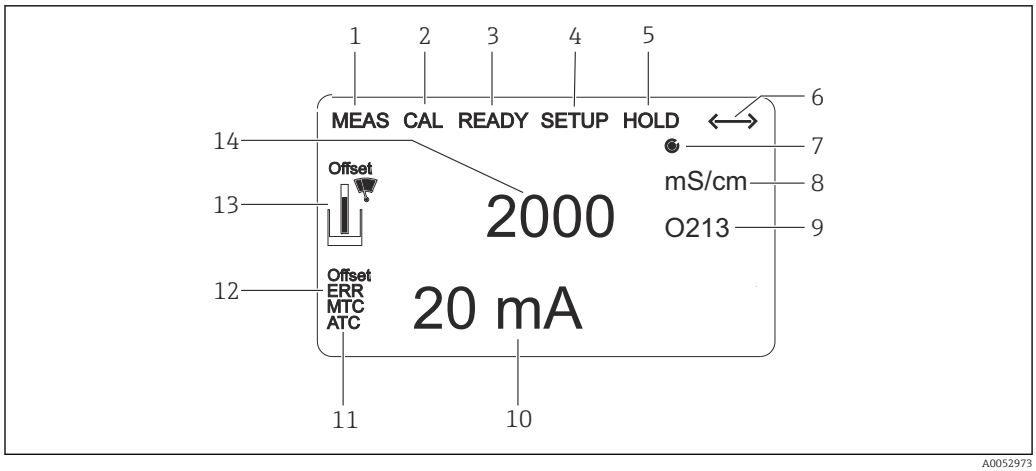
The following section only explains operation via the keys.

7.1.2 Display and operating elements

LED display

ALARM ○ A0027809	Alarm indication, e.g. for continuous limit violation. Temperature sensor failure or system error (see error list).

LC display



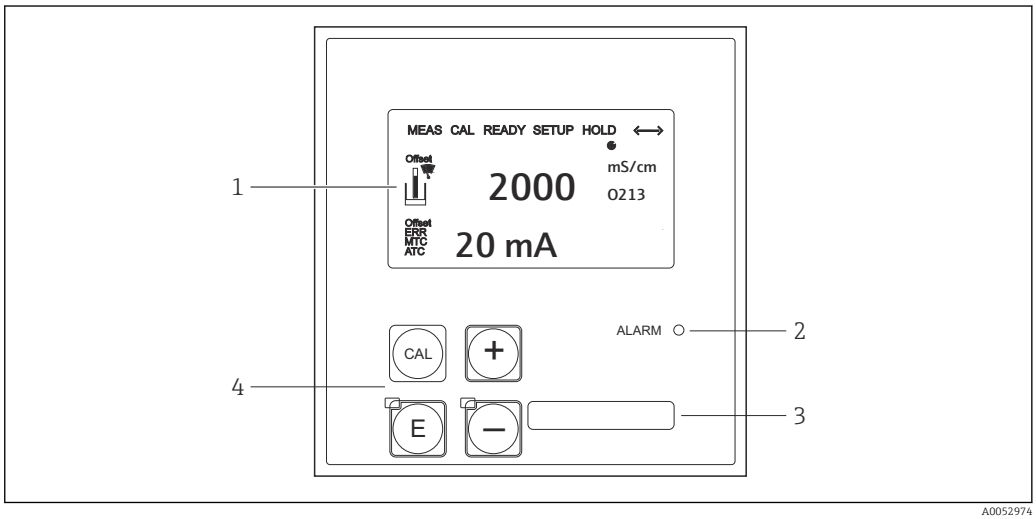
23 *LC display*

1 *Indicator for measuring mode (normal operation)*
2 *Indicator for calibration mode*
3 *Indicator for calibration completed*
4 *Indicator for setup mode (configuration)*
5 *Indicator for "Hold" mode (current outputs remain in defined state)*
6 *Signal reception indicator for devices with communication*
7 *Indicator of relay operating state: ○ inactive, ◉ active*
8 *In measuring mode: measured variable - in setup mode: configured variable*

9 Function code indicator
10 In measuring mode: secondary measured value - in setup/calibr. mode: e.g. Setting value
11 Indicator for manual/automat. temperature compensation
12 "Error" indicator
13 Sensor symbol flashes during calibration
14 In measuring mode: main measured value - in Setup/calibr. mode: e.g. Parameter

Operating elements

The operating elements are covered by the housing cover. The display and the alarm LEDs are visible through the viewing window. To operate the device, loosen the four screws and open the housing cover.

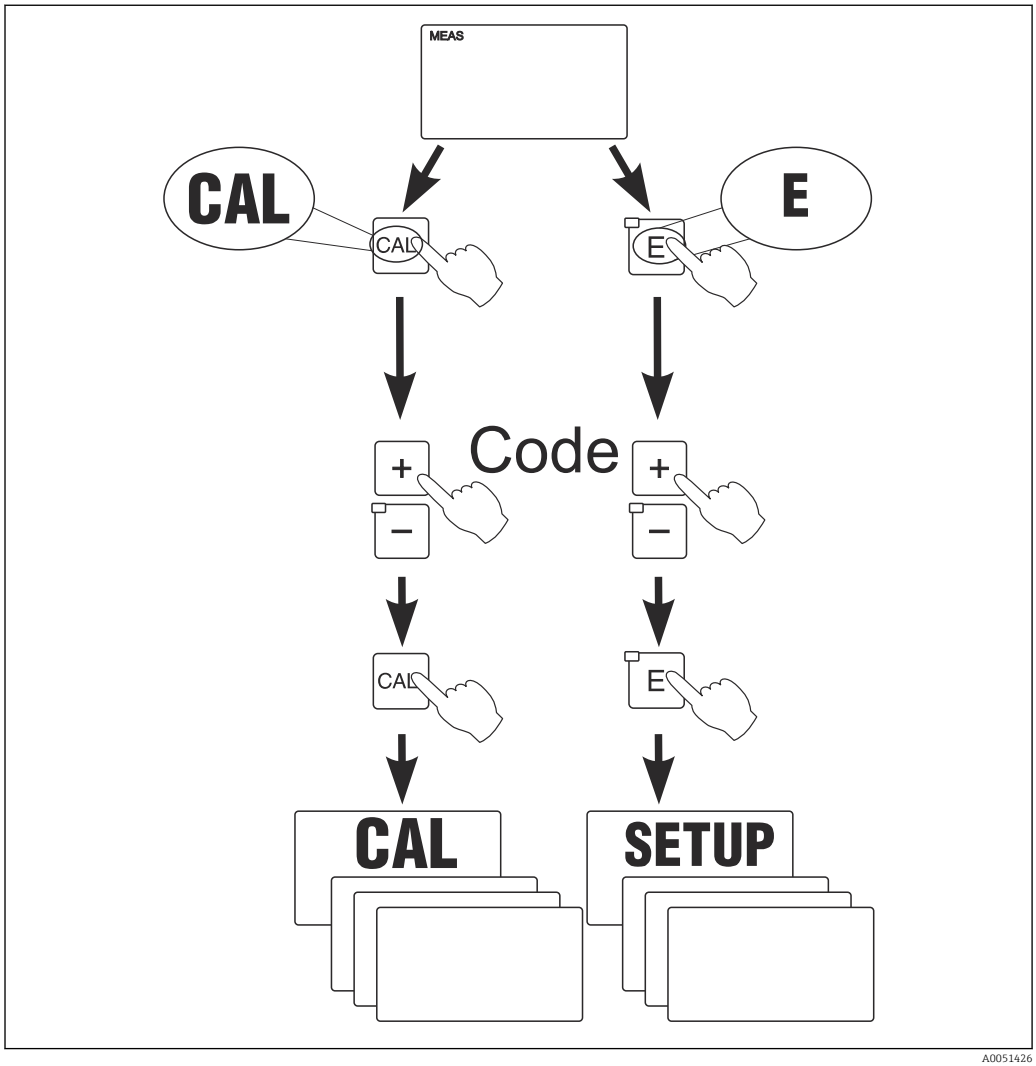


24 Display and keys

1 LC display for displaying the measured values and configuration data
2 LED for alarm function
3 Field for user-defined information
4 Four operating keys for calibration and device configuration

7.2 Access to operating menu via local display

7.2.1 Operation concept



25 *Operating modes*

If no key is pressed in the setup mode for approx. 15 min, the device automatically returns to the measuring mode. Any active hold (hold during setup) is canceled.

Access codes

All device access codes are fixed and cannot be altered. When the device requests the access code, it distinguishes between different codes.

- **CAL key + code 22**: access to Calibration and Offset menu
- **ENTER key + code 22**: access to the menus for the parameters which make configuration and user-specific settings possible
- **PLUS + ENTER keys** simultaneously (min. 3 s): lock the keyboard
- **CAL + MINUS keys** simultaneously (min. 3 s): unlock the keyboard
- **CAL or ENTER key + any code**: access to read mode, i.e. all the settings can be read but not modified.

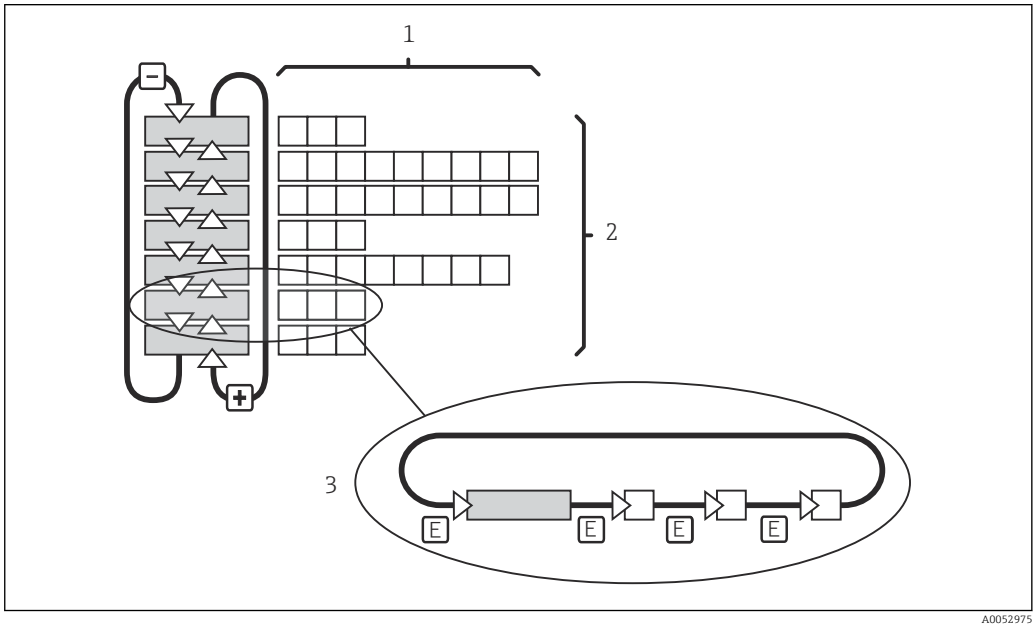
Menu structure

The configuration and calibration functions are arranged in function groups.

- In the setup mode, select a function group with the PLUS and MINUS keys.
- In the function group itself, switch from function to function with the ENTER key.
- Within the function, select the desired option with the PLUS and MINUS keys or edit the settings with these keys. Then confirm with the ENTER key and continue.
- Press the PLUS and MINUS keys simultaneously (Escape function) to exit programming (return to the main menu).
- Press the PLUS and MINUS keys simultaneously again to switch to the measuring mode.

If a modified setting is not confirmed by pressing ENTER, the old setting is retained.

An overview of the menu structure is provided in the Appendix to these Operating Instructions.



26 *Menu structure*

1 Functions (selection of parameters, entry of numbers)
2 Function groups, scroll backwards and forwards with the PLUS and MINUS keys
3 Switch from function to function with the ENTER key

Hold function: "Freeze" the outputs

- Hold settings can be found in the "Service" function group.
- During a hold, all contacts assume a quiescent state.
- An active hold has priority over all other automatic functions.
- With every hold, the I-component of the controller is set to "0".
- Any alarm delay is reset to "0".
- This function can also be activated externally via the hold input (see Wiring diagram; binary input 1).
- A manual hold (field S3) remains active even after a power failure.

8 Commissioning

8.1 Installation and function check

⚠ WARNING

Incorrect connection, incorrect supply voltage
Safety risks for staff and device malfunctions
- ▶ Check that all connections have been established correctly in accordance with the wiring diagram.
- ▶ Ensure that the supply voltage matches the voltage indicated on the nameplate.

8.2 Switching on the measuring device

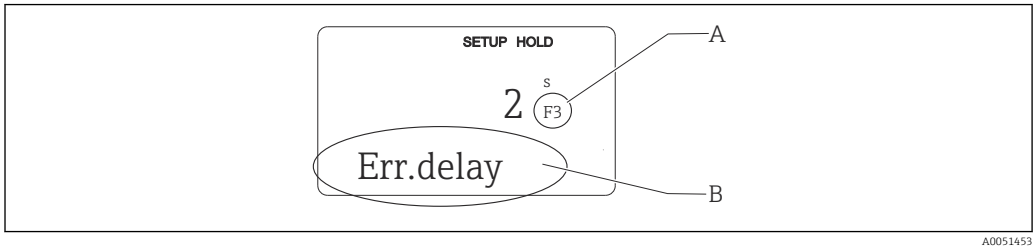
After power-up, the device performs a self-test and then switches to the measuring mode.

If the device is in measuring mode, configure it according to the instructions in the "Quick Setup" section. The values set by the user are kept even in the event of a power failure.

The following function groups are available (the function groups that are only available with a function upgrade are marked accordingly):

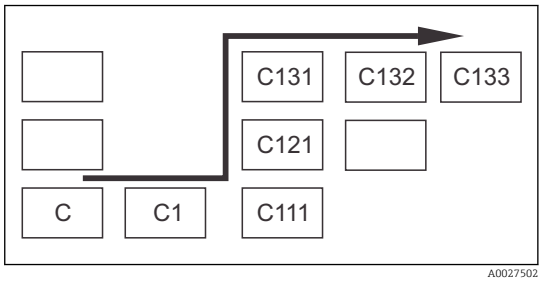
Setup mode
- SETUP 1 (A)
- SETUP 2 (B)
- CURRENT OUTPUT (O)
- ALARM (F)
- CHECK (P)
- RELAY (R)
- ALPHA TABLE (T)
- CONCENTRATION MEASUREMENT (K)
- SERVICE (S)
- E+H SERVICE (E)
- INTERFACE (I)
- TEMPERATURE COEFFICIENT (D)
- MRS (M)

Calibration mode
CALIBRATION (C)



27 *Information for the user on the display*

A Function position in the function group
B Additional information



To make it easier to select and find function groups and functions, a code for the corresponding field is displayed for each function. → 27
The structure of this code is shown in → 28. The function groups are indicated as letters in the first column (see the names of the function groups). The functions of the individual groups are displayed incrementally by row and by column.

28 Function code

For a detailed explanation of the function groups available in the transmitter, see the "Device configuration" section.

Factory settings

The first time the device is switched on, the factory setting is set for all the functions. The table below provides an overview of the most important settings.

For all other factory settings, see the description of the individual function groups in the "System configuration" section (the factory setting is highlighted in **bold**).

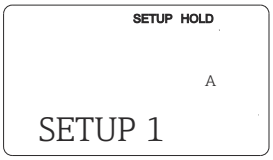
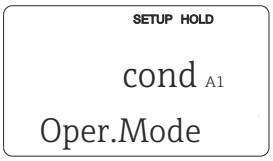
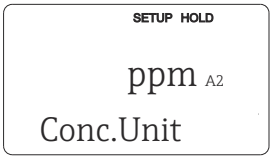
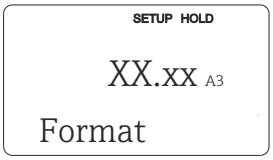
Function	Factory setting
Type of measurement	Inductive measurement of conductivity, Temperature measurement in °C
Type of temperature compensation	Linear with reference temperature 25 °C (77 °F)
Temperature compensation	Automatic (ATC on)
Relay function	Alarm
Hold	Active during configuration and calibration
Measuring range	100 µS/cm to 2000 mS/cm (measuring range selected automatically)
Current outputs 1* and 2*	4 to 20 mA
Current output 1: measured value for 4 mA signal current	0 µS/cm
Current output 1: measured value for 20 mA signal current	2000 mS/cm
Current output 2: temperature value for 4 mA signal current*	0 °C (32 °F)
Current output 2: temperature value for 20 mA signal current*	150 °C (302 °F)

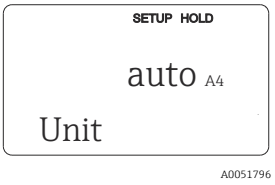
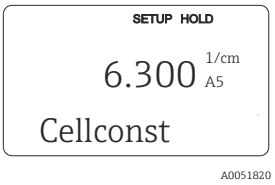
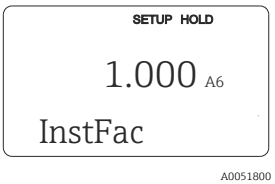
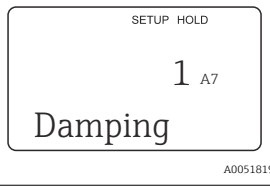
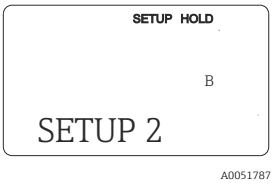
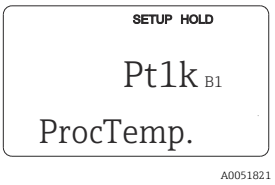
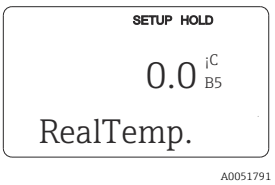
* with appropriate version

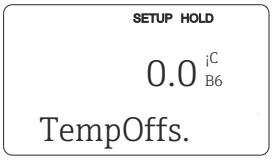
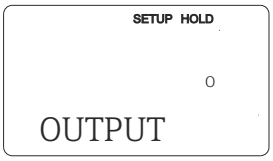
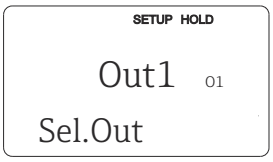
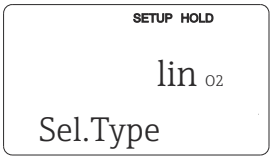
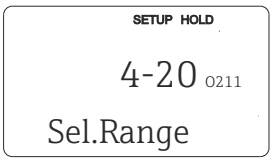
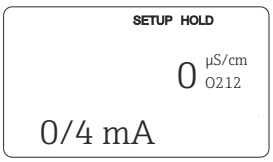
8.3 Configuring the measuring device

8.3.1 Quick Setup

After power-up, you must make some settings to configure the most important functions of the transmitter which are required for correct measurement. The following section gives an example of this.

User entry		Range of adjustment (factory settings in bold)	Display
1.	Press the ENTER key.		
2.	Enter code 22 to open access to the menus. Press the ENTER key.		
3.	Press the MINUS key until the display shows the "Service" function group.		 A0051806
4.	Press the ENTER key to make the settings.		
5.	In S1, select the language, e.g. "ENG" for English. Confirm the entry by pressing the ENTER key.	**ENG = English** GER = German FRA = French ITA = Italian NEL = Dutch ESP = Spanish	 A0051807
6.	At the same time, press the PLUS key and press the MINUS key to exit the "Service" function group.		
7.	Press the MINUS key until the display shows the "Setup 1" function group.		 A0051794
8.	Press the ENTER key to make the settings for "Setup 1".		
9.	In A1, select the desired mode of operation, e.g. "cond" = conductivity. Confirm the entry by pressing the ENTER key.	**Cond = conductivity** Conc = concentration	 A0051798
10.	In A2, press the ENTER key to accept the factory setting.	% **ppm** mg/l TDS = total dissolved solids None	 A0051799
11.	In A3, press ENTER to accept the standard setting.	**XX.xx** X.xxx XXX.x XXXX	 A0051795

User entry		Range of adjustment (factory settings in bold)	Display
12.	In A4, press ENTER to accept the standard setting.	**auto**, µS/cm, mS/cm, S/cm, µS/m, mS/m, S/m	
13.	In A5, enter the exact cell constant of the sensor. The cell constant is contained in the quality certificate of the sensor.	0.10 ... **6.3** ... 99.99	
14.	In A6, press ENTER to accept the standard setting. If the distance to the wall is less than 15 mm, calculate the installation factor. See "Installation conditions" and "Calibration" sections.	0.10 ... **1** ... 5.00	
15.	If measuring conditions are unstable and stabilization of the display is required, enter the appropriate damping factor in A7. Confirm the entry by pressing the ENTER key. The display returns to the initial display of the "Setup 1" function group.	**1** 1 ... 60	
16.	Press the MINUS key to go to the "Setup 2" function group. Press the ENTER key to make the settings for "Setup2".		
17.	In B1, select the temperature sensor. The device is supplied with the CLS52 sensor featuring a Pt 100 temperature sensor as standard. Confirm the entry by pressing the ENTER key.	**Pt100** Pt1k = Pt 1000 NTC30 Fixed	
18.	In B2, select the appropriate type of temperature compensation for the process, e.g. "lin" = linear. Confirm the entry by pressing the ENTER key. For detailed information, see the "Temperature compensation with table" section.	None **Lin = linear** NaCl = table salt (IEC 60746) Tab 1 to 4	
19.	In B3, enter the temperature coefficient α. Confirm the entry by pressing the ENTER key. For detailed information on determining the temperature coefficient, see the "Temperature compensation with table" and "Determining the temperature coefficient" sections.	**2.1 %/K** 0.0 to 20.0 %/K	
20.	The current temperature is displayed in B5. If necessary, adjust the temperature sensor to an external measurement. Confirm the entry by pressing the ENTER key.	Actual value displayed and entered -35.0 to 250.0 °C	

User entry		Range of adjustment (factory settings in bold)	Display
21.	The difference between the measured and entered temperature is displayed. Press the ENTER key. The display returns to the initial display of the "Setup 2" function group.	**0.0 °C** -5.0 to 5.0 °C	 A0051792
22.	Press the MINUS key to go to the "Current output" function group. Press the ENTER key to make the settings for the current outputs.		 A0051395
23.	In O1, select the current output, e.g. "Out 1" = output 1. Confirm the entry by pressing the ENTER key.	**Out 1** Out 2	 A0051396
24.	In O2, select the linear characteristic. Confirm the entry by pressing the ENTER key.	**Lin = linear (1)** Sim = simulation (2)	 A0051397
25.	In O211, select the current range for the current output, e.g. 4 to 20 mA. Confirm the entry by pressing the ENTER key.	**4 to 20mA** 0 to 20 mA	 A0051398
26.	In O212, specify the conductivity at which the minimum current value is applied at the transmitter output, e.g. 0 µS/cm. Confirm the entry by pressing the ENTER key.	**0.00 µS/cm** 0.00 µS/cm to 2000 mS/cm	 A0051399
27.	In O213, specify the conductivity at which the maximum current value is applied at the transmitter output, e.g. 930 mS/cm. Confirm the entry by pressing the ENTER key. The display returns to the initial display of the "Current output" function group.	**2000 mS/cm** 0.00 µS/cm to 2000 mS/cm	 A0051822
28.	Press PLUS and MINUS simultaneously to switch to the measurement mode.		

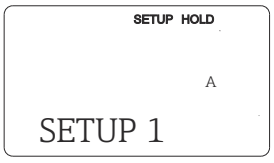
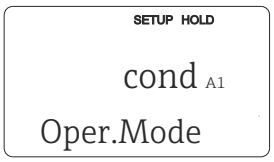
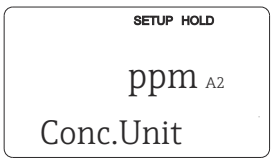
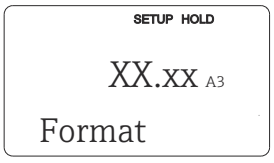
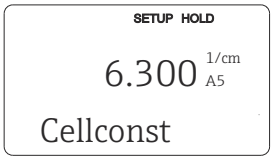
Perform an air set before installing the inductive conductivity sensor. See the "Calibration" section for more information.

The following sections describe all the functions of the device.

8.3.2 Setup 1 (conductivity/concentration)

In the SETUP 1 function group, you can change the settings for the measuring mode and the sensor.

You will have already made all the settings in this menu during initial commissioning. However, you can change the settings at any time.

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
A	**SETUP 1**			Configuration of basic functions
A1	Select mode of operation	**Cond = conductivity** *conc= concentration*		Display varies depending on the device: ▪ cond ▪ conc When the operating mode is changed, all user settings are automatically reset.
A2	Select the concentration unit to be displayed	% **ppm** mg/l TDS = total dissolved solids None		
A3	Select the display format for the concentration unit	**XX.xx** X.xxx XXX.x XXXX		
A4	Select the unit to be displayed	**auto**, µS/cm, mS/cm, S/cm, µS/m, mS/m, S/m		If "auto" is selected, the highest possible resolution is automatically selected.
A5	Enter the cell constant for the connected sensor	0.10 ... **5.9** ... 99.99		The exact cell constant is provided on the sensor quality certificate.

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
A6	Installation factor	0.10 ... **1** ... 5.00	SETUP HOLD 1.000 A6 InstFac A0051800	The installation factor can be edited here. The correct factor is determined in the C1(3) function group, see the "Calibration" section, or use the installation factor chart.
A7	Enter the value for measured value damping	**1** 1 ... 60	SETUP HOLD 1 A7 Damping A0051797	Measured value damping causes averaging over the specified number of individual measured values. This is used, for example, to stabilize the display if the measurement is unstable. There is no damping if "1" is entered.

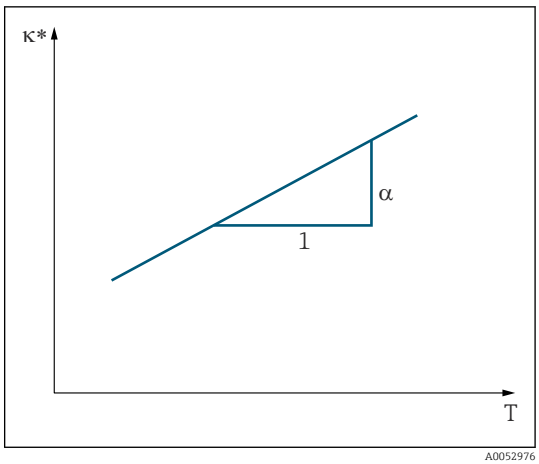
8.3.3 Setup 2 (temperature)

Temperature compensation only needs to be performed in the conductivity mode (select in field A1).

The temperature coefficient specifies the change in the conductivity per degree of temperature change. It depends both on the chemical composition of the solution and the temperature itself.

There are 4 compensation types available to record the dependency:

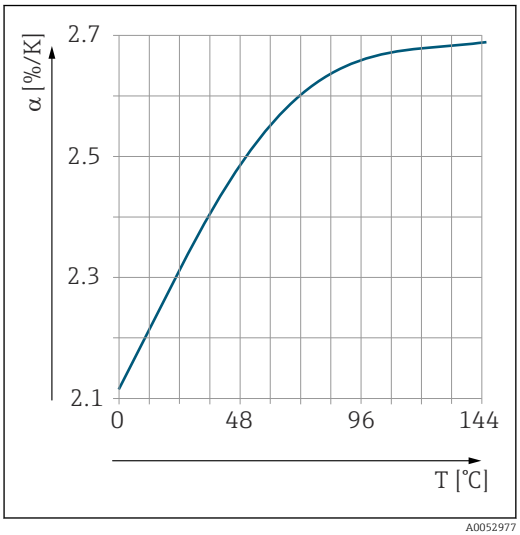
Linear temperature compensation
The change between two temperature points is taken to be constant, i.e. α = const. The α value can be edited for linear compensation. The reference temperature can be edited in field B7. The factory setting is 25 °C.



29 *Linear temperature compensation*

* *Uncompensated conductivity*

NaCl compensation
In the case of NaCl compensation (as per IEC 60746), a fixed non-linear curve specifying the relationship between the temperature coefficient and temperature is saved in the device. This curve applies to low concentrations of up to approx. 5 % NaCl.

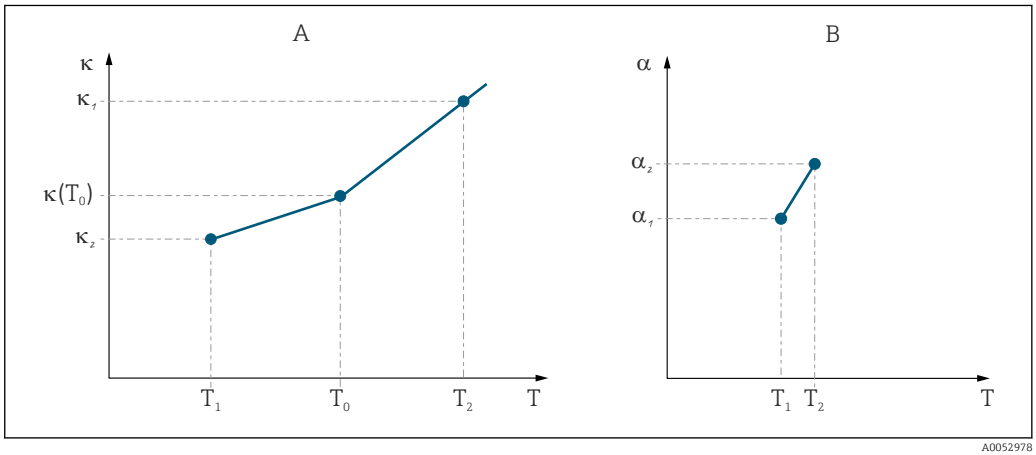


30 *NaCl compensation*

Temperature compensation with table

For devices with the Plus Package, it is possible to enter a table with temperature coefficients α as a function of the temperature. The following conductivity data of the medium under measurement are required to use the alpha table function for temperature compensation:

Value pairs comprising the temperature T and conductivity κ with:
- $\kappa(T_0)$ for the reference temperature T_0
- $\kappa(T)$ for the temperatures that occur in the process



31 *Determination of the temperature coefficient*

A Required data
B Calculated α values

Use the following formula to calculate the α values for the temperatures that are relevant in the process.

$$\alpha = \frac{100\%}{\kappa(T_0)} \cdot \frac{\kappa(T) - \kappa(T_0)}{T - T_0}\,;\; T \neq T_0$$

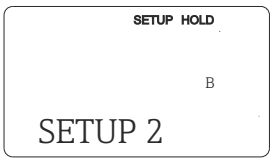
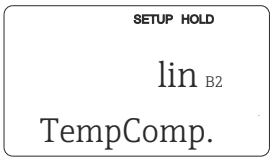
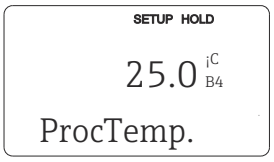
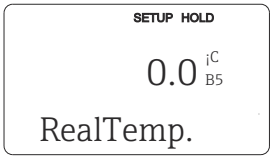
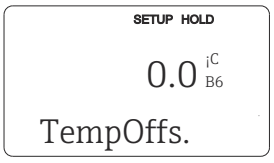
A0009162

Enter the α-T value pairs obtained in this way in fields T4 and T5 of the ALPHA TABLE function group.

Setup 2 function group

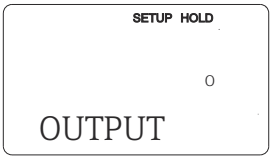
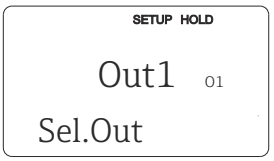
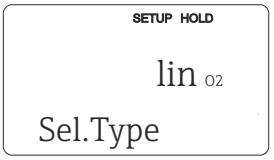
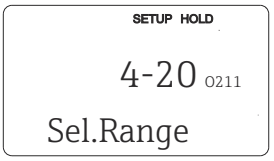
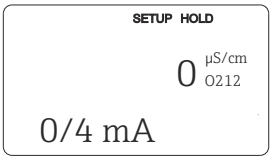
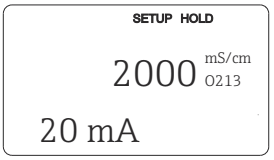
Use this function group to change the settings for temperature measurement.

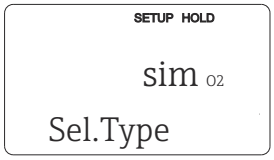
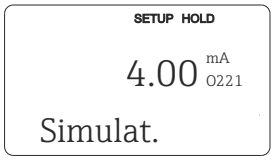
You already made all the settings for this function group during initial commissioning. However, you can change the values chosen at any time.

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
B	**SETUP 2 function group**		 A0051787	Settings for temperature measurement
B1	Select the temperature sensor	Pt100 Pt1k = Pt 1000 NTC30 Fixed	 A0051786	"fixed": No temperature measurement; a fixed temperature value is specified instead.
B2	Select the type of temperature compensation	None **Lin = linear** NaCl = table salt (IEC 60746) Tab 1 to 4	 A0051788	This option does not appear for concentration measurement. The Tab 2 to 4 option is only available on devices with the additional function "Remote parameter set configuration".
B3	Enter temperature coefficient α	**2.10 %/K** 0.00 to 20.00 %/K	 A0051789	Only if B2 = lin. Any table entered is also not active in this case.
B4	Enter the process temperature	**25.0 °C** -10.0 to 150.0 °C	 A0051790	Only if B1 = fixed. The value entered can only be in °C.
B5	Display the temperature and adjust the temperature sensor	Actual value displayed and entered -35.0 to 250.0 °C	 A0051791	With the value entered here, the temperature sensor can be adjusted to an external measurement. Omitted if B1 = fixed.
B6	Enter the temperature difference	**0.0 °C** -5.0 to 5.0 °C	 A0051792	The difference between the actual value entered and the measured temperature is displayed. Omitted if B1 = fixed.

8.3.4 Current outputs

The individual outputs are configured in the CURRENT OUTPUT function group. In addition, you can also simulate a current output value (O2 (2)) to check the current outputs.

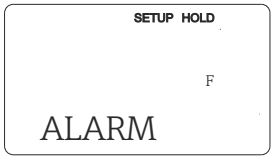
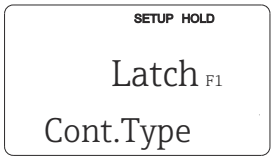
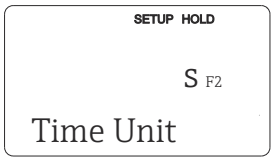
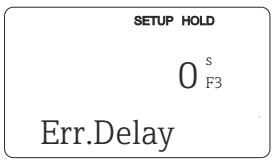
Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
O	**CURRENT OUTPUT function group**		 A0051395	Configuration of the current output (does not apply for PROFIBUS).
O1	Select current output	**Out 1** *Out 2*	 A0051396	A characteristic can be selected for every output.
O2 (1)	Enter the linear characteristic	**Lin = linear (1)** Sim = simulation (2)	 A0051397	The slope of the characteristic can be positive or negative.
O211	Enter the current range	**4 to 20mA** 0 to 20 mA	 A0051398	
O212	0/4 mA value: Enter the associated measured value	Cond:**0.00 µS/cm** Conc: **0.00 %** Temp: **-10.0 °C** Entire measuring range	 A0051399	Here you can enter the measured value at which the min. current value (0/4 mA) is applied at the transmitter output. Display format from A3. (Spread, see Technical data.)
O213	20 mA value: Enter the associated measured value	Cond: **2000 mS/cm** Conc: **99.99 %** Temp: **60 °C** Entire measuring range	 A0051400	Enter the measured value corresponding to the max. current value (20 mA) at the transmitter output. Display format from A3. (Spread, see Technical data.)

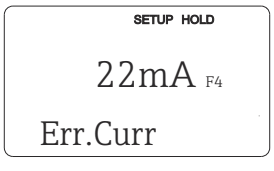
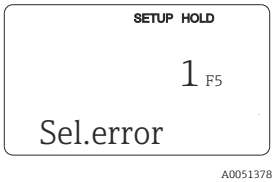
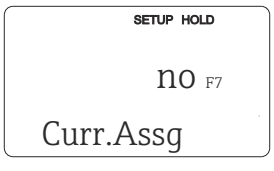
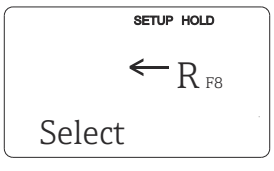
Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
	Simulate current output	Lin = linear (1) **Sim = simulation (2)**		The option (1) must be selected to quit the simulation.
O221	Enter simulation value	**Actual value** 0.00 to 22.00 mA		Entering a current value results in this value being directly output at the current output.

8.3.5 Alarm

You can use the "Alarm" function group to define various alarms and configure output contacts.

Each individual error can be defined to be effective or not (at the contact or as an error current).

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
F	**ALARM**			Alarm function settings.
F1	Select contact type	**Latch = latching contact** Momen = momentary contact		The option selected here only applies to the alarm contact.
F2	Select the time unit for the alarm delay	**s** min		
F3	Enter alarm delay	**0 s (min)** 0 to 2000 s (min)		Depending on the option selected in F2, the alarm delay can be entered in s or min. The alarm delay does not affect the LED; it indicates the alarm immediately.

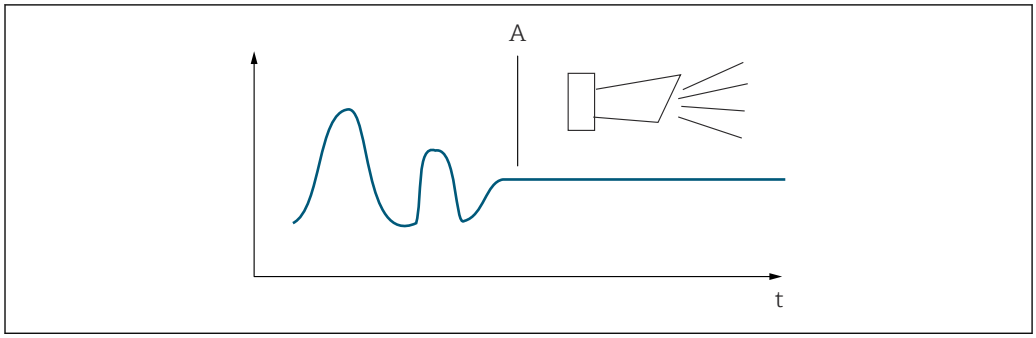
Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
F4	Select error current	**22 mA** 2.4 mA	 A0051377	This selection must be made even if all error messages are suppressed in F5. If "0-20 mA" was selected in O311, "2.4 mA" may not be used.
F5	Select the error number	**1** 1 … 255	 A0051378	Here you can select all the errors which should trigger an alarm. The errors are selected by the error numbers. Please refer to the table in the "System error messages" section for the meaning of the individual error numbers. The factory settings remain in effect for all errors that are not edited.
F6	Set alarm contact to be effective for the selected error	**Yes** No	 A0051379	If “No” is selected, all the other alarm settings are deactivated (e.g. alarm delay). The settings themselves are retained. This setting **only** applies to the error currently selected in F5. The factory setting is **No** from E080 onwards!
F7	Set error current to be effective for the selected error	**No** Yes	 A0051380	The option selected in F4 becomes effective or is suppressed when an error occurs. This setting **only** applies to the error currently selected in F5.
F8	Select return to menu or next error	Next = next error number **←R**	 A0051381	If ←R is selected, you return to F. If Next is selected, you go to F5.

8.3.6 Check

PCS alarm (process check system)

The PCS alarm is only available for devices with remote parameter set configuration. This function is used to check the measuring signal for deviations. An alarm is triggered if the measuring signal remains constant for a specific period of time (several measured values).

This type of sensor behavior can be caused by contamination, a cable open circuit or similar.



32 *PCS alarm (live check)*

A Constant measuring signal = alarm triggered after PCS alarm time has elapsed

An active PCS alarm is automatically cleared as soon as the measuring signal changes.

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
P	**CHECK function group**		SETUP HOLD P CHECK A0051382	Settings for sensor and process monitoring
P1	PCS alarm (live check)	**Off** 1 h 2 h 4 h	SETUP HOLD off P1 PCS alarm A0051383	This function is used to monitor the measuring signal. If the measuring signal does not change in the period of time set here, an alarm is triggered. Monitoring limit: 0.3 % of mean value over selected period of time. (Error no.: E152.)

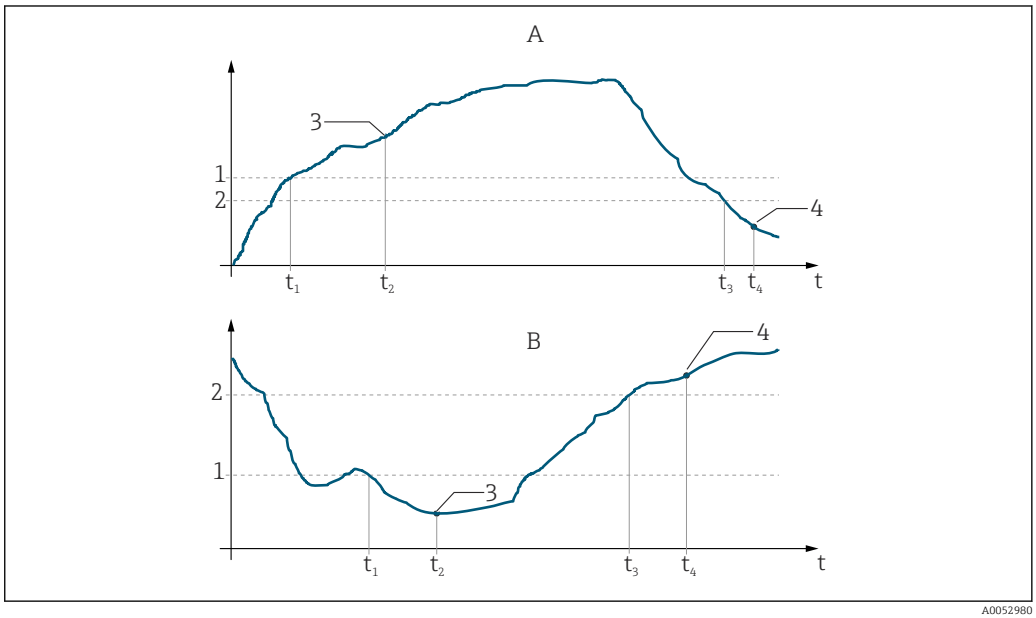
8.3.7 Relay configuration

There are three ways to configure the relay (selection in field R1) on devices with remote parameter set configuration:

- **Alarm**
  The relay closes the contact 41/42 (current-free, safe state) as soon as an alarm occurs and the setting in the “Alarm contact” column is “Yes”. These settings can be changed as required (field F5 ff).
- **Limit**
  The relay only closes contact 42/43 if one of the set limit values is exceeded or not reached (), but not in the event of an alarm signal.
- **Alarm + Limit**
  The relay closes the contact 41/42 if an alarm occurs. When a limit value is exceeded, the relay only closes this contact if error E067 is set to "Yes" during relay assignment (field F6).

Refer to the switch states in for a graphic representation of the relay contact states.

- When measured values increase (maximum function), the relay goes into alarm state (limit exceeded) at time t2 after the switch-on point (t1) has been exceeded and the pickup delay (t2 – t1) has elapsed.
- When measured values decrease, the relay returns to the normal state when the measured value drops below the switch-off point and once the dropout delay (t4 -t3) has elapsed.
- If the pickup and dropout delays are set to 0 s, the switch-on and switch-off points are also switch points of the contacts. The same settings can also be applied for a minimum function, following the same procedure as for the maximum function.

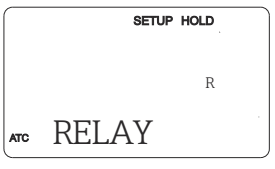
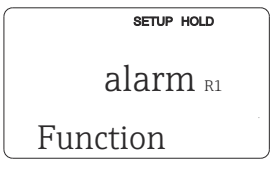


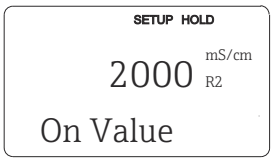
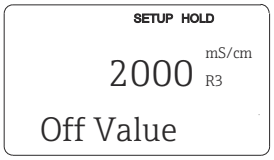
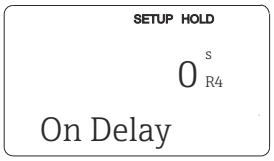
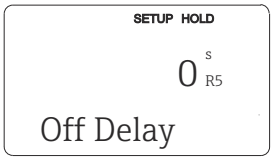
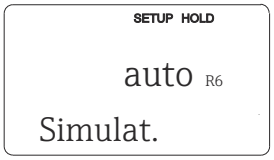
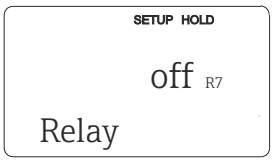
33 *Relation between switch-on and switch-off points and pickup and dropout delays*

A Switch-on point > switch-off point: Max. function
B Switch-on point < switch-off point: Min. function
1 Switch-on value
2 Switch-off point
3 Contact ON
4 Contact OFF

Relay function group

Functions marked in italics are not supported by the basic device version.

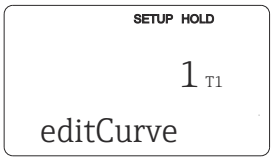
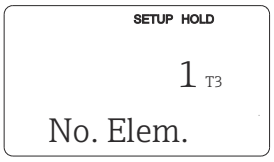
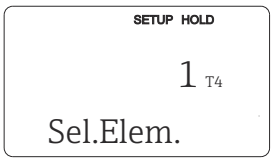
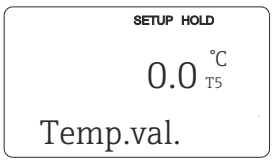
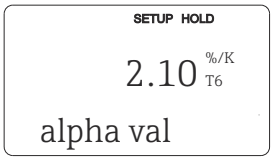
Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
R	**RELAY**			Relay contact settings
R1	Select the function	**Alarm** LV Alarm + LV		If “Alarm” is selected, fields R2 to R5 are not relevant. LV = limit value

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
R2	Enter the switch-on point of the contact	Cond: **2000 mS/cm** Conc: **99.99 %** Entire measuring range	 A0051456	Only the operating mode selected in A1 is displayed. Never set the switch-on point and the switch-off point to the same value!
R3	Enter the switch-off point of the contact	Cond: **2000 mS/cm** Conc: **99.99 %** Entire measuring range	 A0051457	By entering the switch-off point, either a max. contact (switch-off point < switch-on point) or a min. contact (switch-off point > switch-on point) is selected and a hysteresis function which is always required is implemented.
R4	Enter pickup delay	**0 s** 0 to 2000 s	 A0051458	
R5	Enter dropout delay	**0 s** 0 to 2000 s	 A0051459	
R6	Select simulation	**Auto** Manual	 A0051460	A selection can only be made if limit value has been selected in R1.
R7	Switch relay on or off	**Off** On	 A0051461	A selection can only be made if manual has been selected in R6. The relay can be switched on and off.

8.3.8 Temperature compensation with table

With this function group, you can perform temperature compensation with a table (field B2 in the SETUP 2 function group).

Enter the α-T value pairs in the T5 and T6 fields.

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
T	**ALPHA TABLE function group**			Settings for temperature compensation.
T1	Select the table	**1** 1 … 4		Select the table to be edited. Options 1 to 4 are only available if the device is equipped with the additional "remote parameter set configuration" function.
T2	Select table option	**Read** Edit		
T3	Enter number of table value pairs	**1** 1 … 10		Up to 10 value pairs can be entered in the α table. These pairs are numbered from 1 to 10 and can be edited individually or consecutively.
T4	Select table value pair	**1** 1 to number of table value pairs Assign		"Assign" takes the user to T8.
T5	Enter temperature value	**0.0 °C** -10.0 to 150.0 °C		The temperature values must be at least 1 K apart. Factory setting for the temperature value in the table value pairs: 0.0 °C; 10.0 °C; 20.0 °C; 30.0 °C …
T6	Enter temperature coefficient α	**2.10 %/K** 0.00 to 20.00 %/K		
T8	Message as to whether table status is OK	**Yes** No		"Yes" takes the user back to T. "No" takes the user back to T3.

8.3.9 Concentration measurement

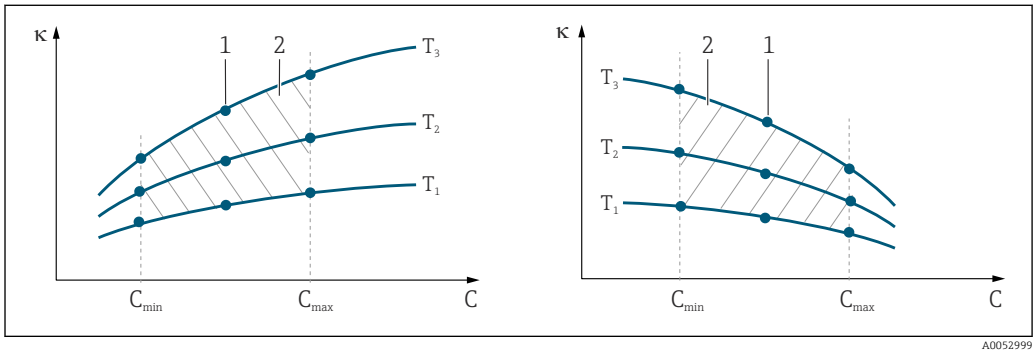
The transmitter can convert from conductivity values to concentration values. For this purpose, the operating mode is first set to concentration measurement (see field A1).

In the measuring device you must enter the basic data on the basis of which the concentration is to be calculated. For the most common substances, the required data are already saved in your device. The substances are selected in field K1.

To determine the concentration of a sample that is not stored in the device, the conductivity characteristics of the medium are required. These can be found either in the data sheets of the medium or can be determined.

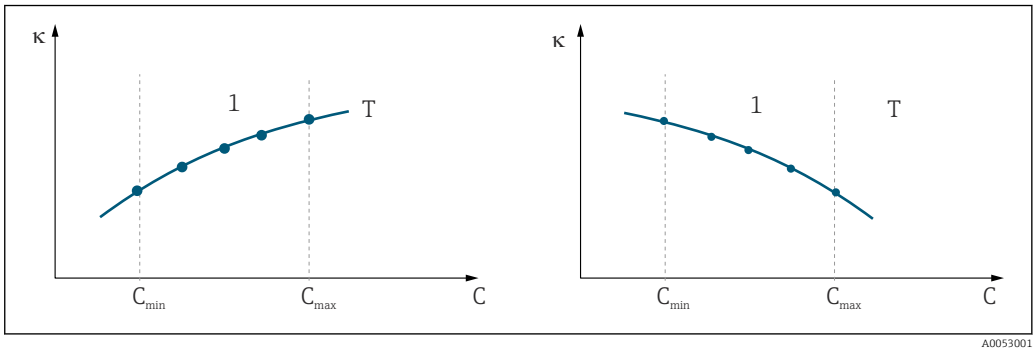
1. Create samples of the medium in the concentrations that occur in the process.
2. Measure the uncompensated conductivity of these samples at temperatures that also occur in the process. The uncompensated conductivity is measured by pressing the PLUS key several times in measuring mode (see the "Function of the keys" section) or by deactivating temperature compensation (Setup 2, field B 2).
   - For variable process temperatures:
     For this purpose, it is necessary to measure the conductivity of the samples for at least 2 temperatures (preferably for the minimum and maximum temperature of the process). The temperature values of the various samples must be identical in each case. The temperatures must be at least 0.5 °C apart.
     At least two samples of different concentrations, taken at two different temperatures in each case, are required as the transmitter needs at least four points in the table (this must include the minimum and maximum concentration values).
   - For constant process temperatures:
     Measure the samples of different concentrations at this temperature. At least two samples are required.

The quality of the measurement data should be as shown in the four charts below.



34 *Example of measured data for variable temperatures*

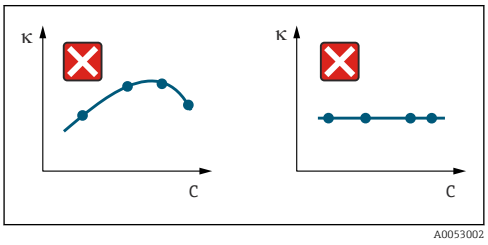
κ *Conductivity*
C *Concentration*
T *Temperature*
1 *Measuring point*
2 *Measuring range*



35 *Example of measured data for constant temperatures*

κ *Conductivity*
C *Concentration*
T *Constant temperature*
1 *Measuring range*

The characteristic curves received from the measuring points must increase or decrease very monotonically in the range of the process conditions, i.e. neither maximum points, nor minimum points, nor ranges with a constant behavior can occur. The curve profiles opposite are therefore not permitted.



36 *Impermissible curve profiles*

κ *Conductivity*
C *Concentration*

Value entry

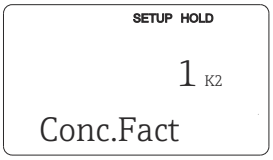
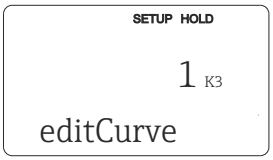
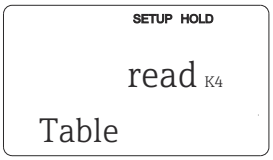
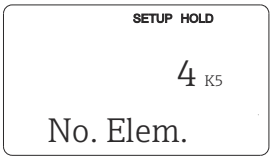
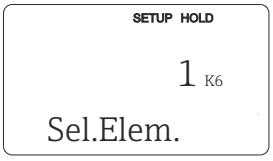
Enter the three characteristic values for each measured sample in the fields K6 to K8 (value triplets of conductivity, temperature, and concentration).

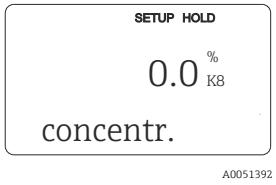
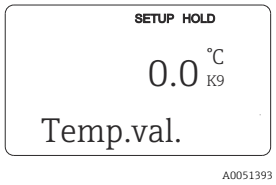
- Variable process temperature:
  Enter at least the four value triplets required.
- Constant process temperature:
  Enter at least the two value triplets required.

- If the measured values for conductivity and temperature in measuring operation are outside the values entered in the concentration table, the accuracy of the concentration measurement deteriorates considerably and error message E078 or E079 is displayed. Therefore, take the limit values of the process into consideration when determining the characteristic curves.
  If you enter an additional value triplet of 0 µS/cm and 0% for every temperature used when the characteristic curve is increasing, you can work from the start of the measuring range with sufficient accuracy and without an error message.
- Temperature compensation of the concentration measurement is performed automatically with the tables entered. Therefore, the temperature coefficient entered in "Setup 2" is not active here.

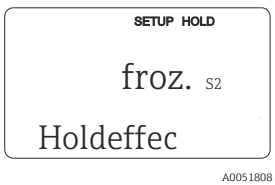
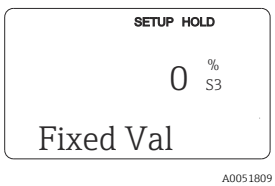
mS/cm	%	°C (°F)
240	96	60 (140)
380	96	90 (194)
220	97	60 (140)
340	97	90 (194)
120	99	60 (140)
200	99	90 (194)

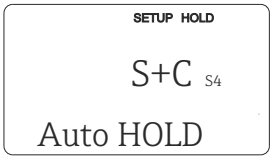
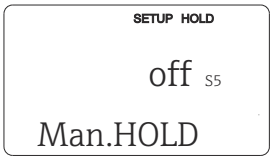
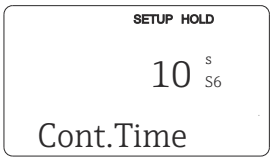
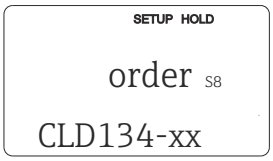
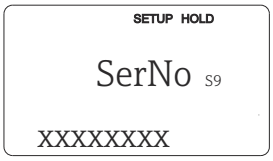
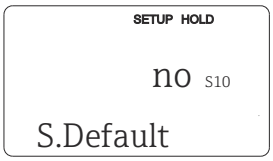
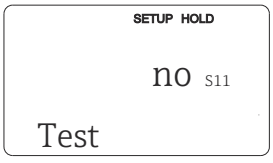
Concentration function group

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
K	**CONCENTRATION function group**		 A0051384	Settings for concentration measurement. Four fixed and four editable concentration fields are stored in this function group.
K1	Select the concentration curve on which the calculation of the display value is based	**NaOH 0 to 15 %** H_2SO_4 0 to 30 % H_3PO_4 0 to 15 % HNO_3 0 to 25 % Tab 1 to 4	 A0051385	The User Tables 2 to 4 option is only available if the device is equipped with the additional "remote parameter set configuration" function.
K2	Select the correction factor	**1** 0.5 ... 1.5	 A0051386	Select a correction factor if necessary (only possible for a user table).
K3	Select the table to be edited	**1** 1 ... 4	 A0051387	If a curve is being edited, another curve should be used to calculate the current display values (see K1). Options 1 to 4 can only be selected if the device is equipped with the additional "remote parameter set configuration" function.
K4	Select table option	**Read** Edit	 A0051388	This option is valid for all concentration curves.
K5	Enter number of measuring points	**4** 1 ... 16	 A0051389	Each measuring point consists of three numeric values.
K6	Select measuring point	**1** 1 to number of measuring points in K5 Assign	 A0051390	Any measuring point can be edited. "Assign" takes the user to K10
K7	Enter uncompensated conductivity value	**0.0 mS/cm** 0.0 to 9999 mS/cm	 A0051391	

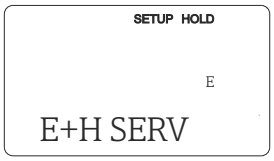
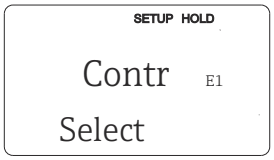
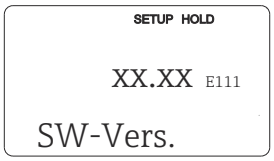
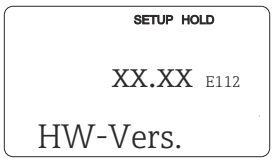
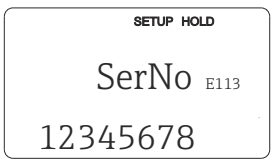
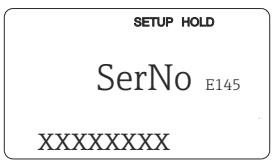
Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
K8	Enter concentration value for K6	**0.00 %** 0.00 ... 99.99 %	 A0051392	
K9	Enter temperature value for K6	**0.0 °C** -35.0 to 250.0 °C	 A0051393	
K10	Message as to whether table status is OK	**Yes** No	 A0051394	Back to K.

8.3.10 Service

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
S	**SERVICE**		 A0051806	Service function settings.
S1	Select the language	**ENG = English** GER = German FRA = French ITA = Italian NL = Dutch ESP = Spanish	 A0051807	This field must be configured once during device configuration. Then you can exit S1 and continue.
S2	HOLD effect	**froz. = last value** fix = fixed value	 A0051808	Last: display shows the last value before the device switched to hold. Fixed: when a hold is active, a fixed value specified in S3 is displayed.
S3	Enter the fixed value	**0** 0 ... 100 % (of the current output value)	 A0051809	Only if S2 = fixed value

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
S4	Configure a hold	**S+C = setup and calibration** CAL = calibrate Setup = configure None = no hold	 A0051810	S = setup C = calibration
S5	Manual hold	**Off** On	 A0051811	
S6	Enter hold dwell period	**10 s** 0 to 999 s	 A0051818	
S7	SW upgrade Enter the release code for remote parameter set configuration	**0** 0 ... 9999	 A0051813	If an incorrect code is entered, you are taken back to the measurement menu. The number is edited with the PLUS or MINUS key and confirmed with the ENTER key.
S8	Order number is displayed		 A0051805	If the device is upgraded, the order code is **not** changed automatically.
S9	Serial number is displayed		 A0051814	
S10	Reset the device to the basic settings	**No** Sens = sensor data Facty = factory settings	 A0051815	Sens = sensor data are cleared (temperature offset, air set value, cell constant, installation factor) Facty = all the data are cleared and reset to the factory setting! Following a reset, set the cell constant (field A5) to **6.3** and the temperature sensor (field B1) to **Pt1k**.
S11	Perform device test	**No** Displ = display test	 A0051816	

8.3.11 E+H Service

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
E	**E+H SERVICE function group**		 A0051403	Settings for E+H Service
E1	Select module	**Contr = controller (1)** Trans = transmitter (2) MainB = mainboard (3) Sens = sensor (4)	 A0051404	
E111 E121 E131 E141	The software version is displayed		 A0051843	E111: device software version E121-141: module firmware version (if available)
E112 E122 E132 E142	Hardware version is displayed		 A0051406	Cannot be edited
E113 E123 E133 E143	Serial number is displayed		 A0051405	Cannot be edited
E145 E146 E147 E148	Enter and accept the serial number		 A0051408	

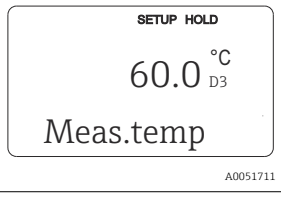
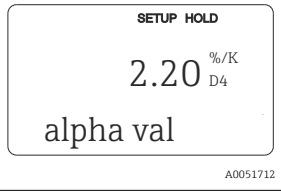
8.3.12 Interfaces

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
I	**INTERFACE function group**		SETUP HOLD I INTERFACE A0051423	Communication settings (only for HART or PROFIBUS device version).
I1	Enter bus address	Address HART: **0** to 15 or PROFIBUS: 0 to **126**	SETUP HOLD 126 I1 Address A0051424	Each address may only be assigned once in a network. If a device address ≠ 0 is selected for a HART device, the current output is automatically set to 4 mA and the device prepares for multi-drop operation.
I2	The tag name is displayed		SETUP HOLD Tag I2 @@@@@@@@ A0051425	

8.3.13 Determination of the temperature coefficient

The temperature coefficient can only be determined using the method below on devices equipped with the remote parameter set configuration function (measuring range switching, MRS), (see "Product structure"). Standard device versions can be upgraded to include the remote parameter set configuration function (see the "Accessories" section).

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
D	**TEMPERATURE COEFFICIENT**		SETUP HOLD D DET.ALPHA A0051708	Settings for the temperature coefficient. Calculator function: the α–value is calculated from the compensated value + uncompensated value + temperature value.
D1	Enter the compensated conductivity	**Actual value** 0 ... 9999	SETUP HOLD 2000 µS/cm D1 Cond.comp A0051709	Displays the current compensated conductivity. Edit the value to the target value (e.g. from a comparison measurement).
D2	The uncompensated conductivity is displayed	**Actual value** 0 ... 9999	SETUP HOLD 2077 µS/cm D2 Cond.unc. A0051710	The current value for uncompensated conductivity cannot be edited.

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
D3	Enter the current temperature	**Actual value** -35.0 to 250.0 °C		
D4	The determined α-value is displayed			Used in B3, for example. The value must be entered manually.

8.3.14 Remote parameter set configuration (measuring range switching, MRS)

You can order remote parameter set configuration via binary inputs either directly when ordering the device (see "Product structure") or subsequently after purchasing the device (see the "Accessories" section).

Complete parameter sets for up to 4 substances can be entered with the remote parameter set configuration function.

The following can be set individually for each parameter set:
- Operating mode (conductivity or concentration)
- Temperature compensation
- Current output (main parameter and temperature)
- Concentration table
- Limit relay

Assignment of binary inputs

The transmitter has two binary inputs. They can be defined in field M1 as follows:

Assignment of field M1	Assignment of binary inputs
M1 = 0	No MRS active. Binary input 1 can be used for an external hold.
M1 = 1	Binary input 2 can be used to switch between 2 parameter sets (measuring ranges). Binary input 1 can be used for an external hold.
M1 = 2	Binary inputs 1 and 2 can be used to switch between 4 parameter sets (measuring ranges). This is the setting used in the following example.

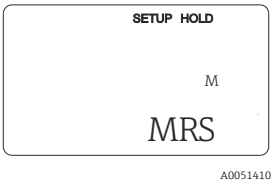
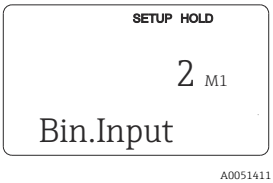
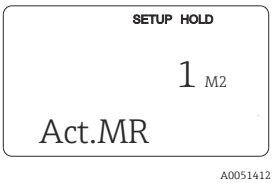
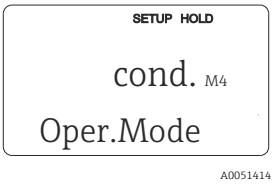
Setting of 4 parameter sets

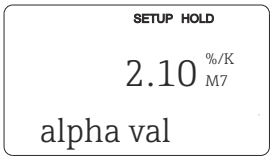
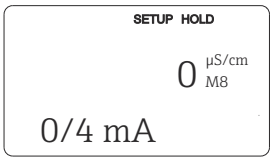
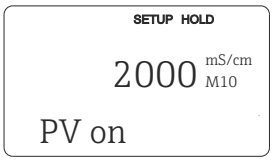
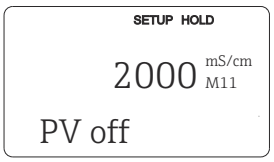
Example: CIP cleaning

Binary input 1		0	0	1	1
Binary input 2		0	1	0	1
	Parameter set	1	2	3	4
Coding / software field	Medium	Beer	Water	Alkali	Acid
M4	Mode of operation	Conductivity	Conductivity	Concentration	Concentration
M8, M9	Current output	1 to 3 mS/cm	0.1 to 0.8 mS/cm	0.5 to 5%	0.5 to 1.5 %

Binary input 1		0	0	1	1
Binary input 2		0	1	0	1
M6	Temp.comp.	User tab. 1	Linear	-	-
M5	Conc.tab.	-	-	NaOH	User tab.
M10, M11	Limit values	On: 2.3 mS/cm Off: 2.5 mS/cm	On: 0.7 µS/cm Off: 0.8 µS/cm	On: 2 % Off: 2.1 %	On: 1.3 % Off: 1.4 %

MRS function group (remote parameter set configuration)

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
M	**MRS (remote parameter set configuration)**		 A0051410	Settings for remote parameter set configuration. M1 + M2: apply to the measuring mode M3 to M11: apply to the configuration of the parameter sets
M1	Select the binary inputs	**1** 0, 1, 2	 A0051411	0 = no MRS 1 = 2 parameter sets can be selected via binary input 2. Binary input 1 for hold. 2 = 4 parameter sets can be selected via binary inputs 1+2.
M2	Display active parameter set or if M1 = 0 select the active parameter set	**1** 1 to 4 if M1 =0	 A0051412	Select if M1 = 0. Display depends on binary inputs if M1 = 1 or 2
M3	Select parameter set to be configured in M4 to M8	**1** 1 to 4 if M1=0 1 to 2 if M1=1 1 to 4 if M1=2	 A0051413	Selection of the parameter set **to be defined** (the **active** parameter set is selected in M2 or with the binary inputs).
M4	Select operating mode	**Cond = conductivity** Conc = concentration	 A0051414	The operating mode can be defined individually for each parameter set.
M5	Select medium	**NaOH**, H2SO4, H3PO4, HNO3 Tab 1 to 4	 A0051415	Can only be selected if M4 = conc

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
M6	Select temperature compensation	None, **lin**, NaCl, Tab 1 to 4 if M4 = cond	 A0051416	Can only be selected if M4 = cond
M7	Enter α-value	**2.10 %/K** 0 to 20 %/K	 A0051418	Can only be entered if M6 = lin
M8	Enter the measured value for the 0/4 mA value	Cond.: **0** to 2000 mS/cm Conc.: unit: A2, format: A3	 A0051422	
M9	Enter the measured value for the 20 mA value	Cond.: 0 to **2000 mS/cm** Conc.: unit: A2, format: A3	 A0051419	
M10	Enter the switch-on point for the limit value	Cond.: 0 to **2000 mS/cm** Conc.: unit: A2, format: A3	 A0051420	
M11	Enter the switch-off point for the limit value	Cond.: 0 to **2000 mS/cm** Conc.: unit: A2, format: A3	 A0051421	By entering the switch-off point, either a max. contact (switch-off point < switch-on point) or a min. contact (switch-off point > switch-on point) is selected and a hysteresis function is implemented. It is not permitted to set the switch-off point to equal the switch-on point.

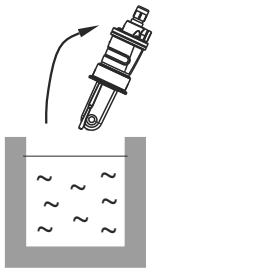
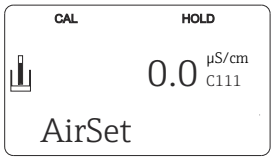
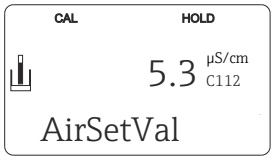
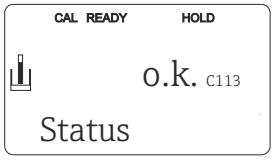
If remote parameter set configuration is selected, the parameter sets that are entered are processed internally but the values of the first measuring range are displayed in the fields A1, B1, B3, R2, K1, O212, O213.

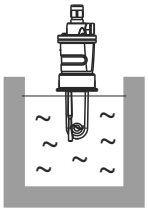
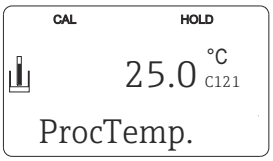
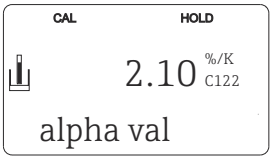
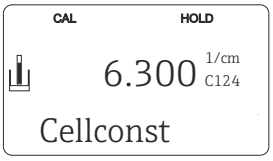
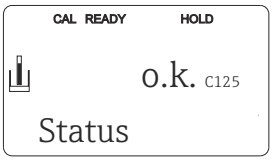
8.3.15 Calibration

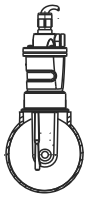
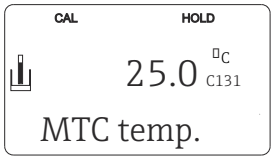
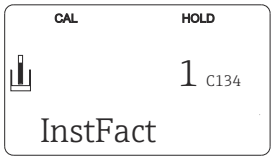
Use the CAL key to access the calibration function group.

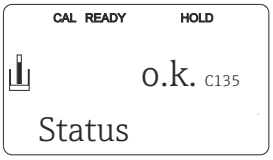
The sensor is calibrated and adjusted in this function group. The calibration can be performed in two different ways:
- By measuring in a calibration solution of known conductivity.
- By entering the exact cell constant of the conductivity sensor.

Observe the following:
- During initial commissioning of inductive conductivity sensors, an air set is absolutely essential for residual coupling compensation (from field C111) so that the measuring system can return precise measurement data.
- If the calibration is aborted by simultaneously pressing the PLUS and MINUS keys (return to C114, C126 or C136), or if the calibration is incorrect, the original calibration data are used again. A calibration error is indicated by “ERR” and the sensor symbol flashes on the display.
  Repeat calibration!
- For each calibration, the device automatically switches to hold (factory setting).

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
C	**CALIBRATION function group:**		 A0051823	Settings for calibration.
C1(1)	Compensation of residual coupling	**Airs = air set (1)** Cellc = cell constant (2) InstF = installation factor (3)	 A0051824	When commissioning inductive conductivity sensors, an air set is **mandatory**. The sensor air set must be performed in air. The sensor must be dry.
Remove the sensor from the liquid and dry it **completely**.			 A0005690	
C111	Residual coupling start calibration (air set)	**Current measured value**	 A0051827	Press CAL to start the calibration.
C112	The residual coupling is displayed (air set)	-80.0 to 80.0 µS/cm	 A0051828	Residual coupling of measuring system (sensor and transmitter).
C113	Calibration status is displayed	o.k. E xxx	 A0051829	If the calibration status is not o.k., a reason for the error is provided on the second line of the display.

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
C114	Store calibration result?	**Yes** No New	 A0051830	If C113 = E xxx, then only No or **New.** If New, return to C. If Yes/No, return to "Measurement".
C1(2)	Cell constant calibration	Airs = air set (1) **Cellc = cell constant (2)** InstF = installation factor (3)	 A0051825	The sensor should be immersed in such a way that there is sufficient distance to the vessel wall (the installation factor has no influence if a > 15 mm).
Immerse the sensor in the calibration solution. The following section describes calibration with the temperature-compensated conductivity value of the reference solution. If calibration is to be performed with the uncompensated conductivity value, you must set the temperature coefficient α to zero.			 A0005691	
C121	Enter calibration temperature (MTC)	**25 °C** -35.0 to 250.0 °C	 A0051841	Only available if B1 = fixed.
C122	Enter the α value of the calibration solution	**2.10 %/K** 0.00 to 20.00 %/K	 A0051831	The value is given in the Technical Information for all E+H calibration solutions. You can also use the printed-on table to calculate the value. Set α to 0 for calibration with uncompensated values.
C123	Enter the correct conductivity value of the calibration solution	**Current measured value** 0.0 µS/cm to 9999 mS/cm	 A0051832	The value is always displayed in mS/cm.
C124	The calculated cell constant is displayed	0.1 ... **6.3** ... 99.99 cm^{-1}	 A0051842	The calculated cell constant is displayed and accepted in A5.
C125	Calibration status is displayed	o.k. E xxx	 A0051833	If the calibration status is not o.k., a reason for the error is provided on the second line of the display.

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
C126	Store calibration result?	**Yes** No New	 A0051834	If C125 = E xxx, then only No or **New**. If New, return to C. If Yes/No, return to "Measurement".
C1(3)	Calibration with sensor matching for inductive conductivity sensors	Airs = air set (1) Cellc = cell constant (2) **InstF = installation factor (3)**	 A0051826	Sensor adjustment with compensation for wall effects. The measured value is influenced by the distance between the sensor and the pipe wall and by the material of the pipe (conductive or insulating). The installation factor indicates these dependencies. See the "Installation instructions" section.
The sensor is installed at the place of operation.			 A0005693	
C131	Enter the process temperature (MTC)	**25 °C** -35.0 to 250.0 °C	 A0051835	Only available if B1 = fixed.
C132	Enter the α value of the calibration solution	**2.10 %/K** 0.00 to 20.00 %/K	 A0051836	The value is given in the TI for all E+H calibration solutions. You can also use the printed-on table to calculate the value. Set α to 0 for calibration with uncompensated values.
C133	Enter the correct conductivity value of the calibration solution	**Current measured value** 0.0 µS/cm to 9999 mS/cm	 A0051837	Determine the correct conductivity value of the medium by performing a reference measurement.
C134	Calculated installation factor is displayed	**1** 0.10 ... 5.00	 A0051838	

Coding	Field	Range of adjustment (factory settings in bold)	Display	Info
C135	Calibration status is displayed	o.k. E xxx	 A0051839	If the calibration status is not o.k., a reason for the error is provided on the second line of the display.
C136	Store calibration result?	**Yes** No New	 A0051840	If C135 = E xxx, then only No or **New**. If New, return to C. If Yes/No, return to "Measurement".

8.3.16 Communication interfaces

For devices with a communication interface, please also refer to the separate Operating Instructions BA00212C/07/EN (HART) or BA00213C/07/EN (PROFIBUS).

9 Diagnostics and troubleshooting

9.1 General troubleshooting

The transmitter continuously monitors its functions itself. If an error occurs which the device recognizes, this is indicated on the display. The error number is shown below the display of the main measured value. If more than one error occurs, you can call these up with the MINUS key.

Refer to the "System error messages" table for the possible error numbers and remedial measures.

Should a malfunction occur without any transmitter error message, please refer to the "Process-specific errors" or the "Device-specific errors" tables to localize and rectify the error. These tables provide you with additional information on any spare parts required.

9.2 Diagnostic information on local display

9.2.1 System error messages

You can display and select the error messages with the MINUS key.

Error No.	User interface	Tests/remedial action	Alarm contact		Failure current	
			Facty	User	Facty	User
E001	EEPROM memory error	▪ Switch off device and switch it on again. ▪ Load software compatible with hardware. ▪ Load measurement-parameter specific device software. ▪ If the error persists, send in the device for repair to your local sales center or replace the device.	Yes		No	
E002	Device not calibrated, calibration data invalid, no user data or user data invalid (EEPROM error), device software not suitable for hardware (controller)		Yes		No	
E003	Download error	The download file may not access locked functions (e.g. temperature table in basic version)	Yes		No	
E007	Transmitter malfunction, device software not compatible with transmitter version		Yes		No	
E008	Sensor or sensor connection faulty	Check sensor and sensor connection (see the "Device check by medium simulation" section or contact E+H Service).	Yes		No	
E010	No temperature sensor connected or temperature sensor short-circuited (temperature sensor faulty)	Check temperature sensor and connections; where necessary check the measuring device with a temperature simulator.	Yes		No	

Error No.	User interface	Tests/remedial action	Alarm contact		Failure current	
			Facty	User	Facty	User
E025	Limit value for air set offset exceeded	Repeat air set (in air) or replace sensor. Clean and dry the cell before the air set.	Yes		No	
E036	Calibration range of sensor exceeded	Clean sensor and recalibrate; if necessary, check the sensor, cable and connections.	Yes		No	
E037	Below calibration range of sensor		Yes		No	
E045	Calibration aborted	Repeat the calibration.	Yes		No	
E049	Calibration range of installation factor exceeded	Check pipe diameter, clean sensor and perform calibration again.	Yes		No	
E050	Below calibration range of installation factor		Yes		No	
E055	Below main parameter measuring range	Immerse the sensor in conductive medium or perform an air set.	Yes		No	
E057	Main parameter measuring range exceeded	Check measurement, control and connections (for simulation, see the "Device check by medium simulation" section).	Yes		No	
E059	Below temperature measuring range		Yes		No	
E061	Temperature measuring range exceeded		Yes		No	
E063	Below current output range 1	Check measured value and current output assignment (function group O).	Yes		No	
E064	Current output range 1 exceeded		Yes		No	
E065	Below current output range 2	Check measured value and current output assignment.	Yes		No	
E066	Current output range 2 exceeded		Yes		No	
E067	Limit contactor set value exceeded	Check measured value, limit setting and metering devices. Only active if R1 = alarm +LV or LV.	Yes		No	
E077	Temperature outside α value table range	Check measurement and tables.	Yes		No	
E078	Temperature outside concentration table		Yes		No	
E079	Conductivity outside concentration table		Yes		No	
E080	Parameter range of current output 1 too small	Spread current output.	No		No	
E081	Parameter range of current output 2 too small	Spread current output.	No		No	
E100	Current simulation active		No		No	

Error No.	User interface	Tests/remedial action	Alarm contact		Failure current	
			Facty	User	Facty	User
E101	Service function yes	Switch off service function or switch device off and then on again.	No		No	
E102	Manual mode active		No		No	
E106	Download yes	Wait for download to finish.	No		No	
E116	Download error	Repeat download.	No		No	
E150	Distance between temperature values in α value table too small	Enter correct α value table (temperatures must be entered at intervals of at least 1K).	No		No	
E152	Live check alarm	Check sensor and connection.	No		No	

9.2.2 Process-specific errors

Use the following table to localize and rectify any errors occurring.

Problem	Possible cause	Tests/remedial action	Tools, spare parts
Incorrect reading compared to comparison measurement	Device calibrated incorrectly	Calibrate the device according to the "Calibration" section	Calibration solution or cell certificate
	Sensor fouled	Clean sensor	See the "Cleaning of conductivity sensors" section
	Incorrect temperature measurement	Check temperature measured value in measuring device and reference device	Temperature measuring device, precision thermometer
	Temperature compensation incorrect	Check compensation method (none / ATC / MTC) and compensation type (linear/substance/user table)	Please note: the transmitter has separate calibration and operating temperature coefficients
	Reference device is calibrated incorrectly	Calibrate reference device or use verified device	Calibration solution, Operating Instructions of reference device
	Incorrect ATC setting in reference device	Compensation method and compensation type must be identical on both devices.	Operating Instructions of reference device
Implausible measured values in general: ▪ Continuous measured value overflow ▪ Measured value constantly 000 ▪ Measured value too low ▪ Measured value too high ▪ Measured value frozen ▪ Current output value not as expected	Short-circuit/moisture in sensor	Check sensor	See the "Checking inductive conductivity sensors" section.
	Short-circuit in cable or socket	Check cable and socket	
	Disconnection in sensor	Check sensor	See the "Checking inductive conductivity sensors" section.
	Disconnection in cable or socket	Check cable and socket	
	Incorrect cell constant setting	Check cell constant	Sensor nameplate or certificate
	Incorrect output assignment	Check assignment of measured value to current signal	

Problem	Possible cause	Tests/remedial action	Tools, spare parts
	Incorrect output function	Check preset value (0-20 / 4 -20 mA) and curve shape (linear / table)	
	Air pockets in assembly	Check assembly and installation position	
	Incorrect temperature measurement/ temperature sensor defective	Check the device with an equivalent resistor / check Pt 1000 in the sensor.	
	Transmitter module defective	Check with new module	See the "Device-specific errors" and "Spare parts" sections.
	Device in impermissible operating condition (does not respond when key pressed)	Switch off device and switch it on again	EMC problem: if this persists, check the grounding, shields and line routing or have checked by E+H Service.
Incorrect conductivity measured value in the process	No/incorrect temperature compensation	ATC: select type of compensation; if linear, set suitable coefficients. MTC: set process temperature.	
	Incorrect temperature measurement	Check temperature measured value.	Reference device, thermometer
	Bubbles in medium	Suppress formation of bubbles by: ▪ Gas bubble trap ▪ Creating counterpressure (orifice plate) ▪ Measurement in bypass	
	Incorrect sensor alignment	The central bore of the sensor must point in the flow direction of the medium.	Compact version: remove the electronics box to turn the sensor. Remote version: turn the sensor in the flange.
	Flow rate too high (can lead to bubble formation)	Reduce flow rate or select less turbulent mounting location.	
	Interference current in medium	Ground medium close to sensor; remove/repair source of interference.	Most frequent cause of currents in medium: defective submersible motors
	Sensor fouling or buildup on sensor	Clean sensor (see the "Cleaning the conductivity sensors" section).	For heavily contaminated media: Use spray cleaning
Incorrect temperature value	Incorrect sensor connection	Check connections using wiring diagram. Three-wire connection always required.	Wiring diagram, "Electrical connection" section
	Measuring cable defective	Check cable for interruptions/short-circuit/shunt.	Ohmmeter
	Incorrect sensor type	Set type of temperature sensor at the device (field B1).	
Fluctuations in measured value	Interference on measuring cable	Connect cable shield as per wiring diagram	See the "Electrical connection" section
	Interference on signal output cable	Check cable routing, possibly route cable separately	Route signal output and measuring input lines separately
	Interference current in medium	Eliminate source of interference or ground medium as close as possible to sensor.	

Problem	Possible cause	Tests/remedial action	Tools, spare parts
Limit contact not working	Relay configured for alarm	Activate limit value switch.	See field R1.
	Pickup delay setting too long	Shorten pickup delay time	See field R4.
	"Hold" function active	“Auto hold” for calibration, “Hold” input activated; “Hold” active via keyboard	See fields S2 to S5
Limit contact working constantly	Dropout delay setting too long	Shorten dropout delay time	See field R5.
	Control loop interruption	Check measured value, current output value, actuators, chemical supply	
No conductivity current output signal	Cable disconnected or short-circuited	Disconnect cable and measure directly at device	mA meter 0–20 mA
	Output defective	See the "Device-specific errors" section	
Fixed conductivity current output signal	Current simulation active	Switch off simulation.	See field O22
	Impermissible operating state of processor system	Switch off device and switch it on again.	EMC problem: if problem persists, check the installation, shielding and grounding or have checked by Endress +Hauser Service.
Incorrect current output signal	Incorrect current assignment	Check current assignment: 0–20 mA or 4–20 mA?	Field O211
	Total load in the current loop too high (> 500 Ω)	Disconnect output and measure directly at device	mA meter for 0–20 mA DC
	EMC (interference coupling)	Disconnect both output cables and measure directly at device	Use shielded cables, ground shields at both ends, where necessary route cable in another cable duct
No temperature output signal	Device does not have a second current output	Check version using nameplate, if necessary replace the LSCH-x1 module	LSCH-x2 module, see "Spare parts" section
	Device with PROFIBUS-PA	PA device has no current output!	
Extension package functions not available (Live check, current curve 2-4, alpha value curve 2-4, user concentration curve 1-4)	Extension package not enabled (enable by entering a code which depends on the serial number and which is supplied by Endress +Hauser when an extension package is ordered)	▪ If retrofitting the E-Package: code is supplied by E+H → enter this code. ▪ After replacing a defective LSCH/ LSCP module: first enter device serial number manually (see nameplate), then enter the existing code number.	For a detailed description, see the "Replacing the central module" section.
No HART communication	No HART central module	Verify using nameplate: HART = -xxx5xx and -xxx6xx	Upgrade to LSCH-H1 / -H2
	No or incorrect DD (device description)	For more information, see BA00212C/07/EN, "HART field communication with Smartec S CLD132”.	
	HART interface missing		
	Current output < 4 mA		
	Load too small (must be > 230 Ω)		
	HART receiver (e.g. FXA 191) not connected via load but via power supply		

Problem	Possible cause	Tests/remedial action	Tools, spare parts
	Incorrect device address (addr. = 0 for single operation, addr. > 0 for multidrop operation)		
	Line capacitance too high		
	Interference on line		
	Several devices set to same address	Assign addresses correctly	No communication possible if several devices set to the same address
No PROFIBUS communication	No PA/DP central module	Check using the nameplate: PA = -xxx3xx /DP = xxx4xx	Upgrade to LSCP module, see the "Spare parts" section
	Incorrect device software version (without PROFIBUS)	For more information, see BA00213C/07/EN "PROFIBUS PA/DP - Field communication for Smartec S CLD132".	
	With Commuwin (CW) II: CW II version and device software version incompatible		
	No or incorrect DD/DLL		
	Incorrect baud rate setting for segment coupler in DPV-1 server		
	Bus user (master) has wrong address or address assigned twice		
	Bus user (slave) has wrong address		
	Bus line not terminated		
	Line problems (too long, cross-section too small, not shielded, shield not grounded, wires not twisted)		
	Bus voltage too low (Bus voltage typ. 24 V DC for non-Ex)	The voltage at the device's PA/DP connector must be at least 9 V	

9.2.3 Device-specific errors

The following table helps you during the diagnosis and points to any spare parts required.

Depending on the degree of difficulty and the measuring equipment present, diagnosis is carried out by:
- Trained operator personnel
- The user's trained electrical technicians
- Company responsible for system installation/operation
- Endress+Hauser Service

Information on the exact spare part designations and on how to install these parts can be found in the "Spare parts" section.

Problem	Possible cause	Tests/remedial action	Execution, tools, spare parts
Display dark, no light-emitting diode active	No line voltage	Check whether line voltage is present	Electrical technician / e.g. multimeter
	Supply voltage wrong/too low	Compare actual line voltage and nameplate data	User (data for energy supply company or multimeter)
	Connection faulty	▪ Terminal not tightened ▪ Insulation jammed ▪ Wrong terminals used	Electrical technician
	Device fuse defective	Compare line voltage and the nameplate data and replace fuse	Electrical technician/ suitable fuse; see exploded drawing in the "Spare parts" section
	Power unit defective	Replace power unit, note version	Onsite diagnosis by Endress+Hauser Service, test module necessary
	Central module defective	Replace central module, note version	Onsite diagnosis by Endress+Hauser Service, replacement module necessary
	Ribbon cable between the central module and power supply unit loose or defective	Check ribbon cable, replace if necessary	See the "Spare parts" section
Display dark, light-emitting diode active	Central module defective (module: LSCH/LSCP)	Replace central module, note version	Onsite diagnosis by Endress+Hauser Service, test module necessary
Values appear on display but: ▪ Display does not change and / or ▪ Device cannot be operated	Ribbon cable or transmitter module not mounted correctly	Reinsert the transmitter module, use additional fastening screw M3 if necessary. Check if ribbon cable is inserted correctly.	Perform using the installation drawings in the "Spare parts" section.
	Impermissible operating system condition	Switch off device and switch it on again.	Possible EMC problem: if this persists, check the installation or have checked by Endress +Hauser Service.
Device gets hot	Voltage wrong/too high	Compare line voltage and nameplate data	User, electrical technician
	Heating from process or solar radiation	Improve positioning or use the remote version. Use a sun guard outdoors.	
	Power unit defective	Replace power unit.	Diagnosis only by Endress +Hauser Service
Incorrect conductivity measured value and/or temperature measured value	Transmitter module defective (module: MKIC), please first carry out tests and take measures as described in the "Process-specific errors" section.	Measuring input test: ▪ Simulation with resistor, see table in the "Device check by medium simulation" section ▪ 1000 Ω resistance at terminals 11/ 12 + 13 = display 0 °C	If the test is negative: replace module (note version). Perform using the exploded drawings in the "Spare parts" section.
Incorrect current output signal	Incorrect adjustment	Test with built-in current simulation (field O221). For this, disconnect the two lines and connect the mA meter directly to the current output.	If simulation value incorrect: adjustment in factory or new LSCH/LSCP module required. If simulation value correct: check current loop for load and shunts.
	Load too large		
	Shunt / short to ground in current loop		

Problem	Possible cause	Tests/remedial action	Execution, tools, spare parts
	Incorrect mode of operation	Check whether 0–20 mA or 4–20 mA is selected.	
No current output signal	Current output stage defective (LSCH/LSCP module)	Test with built-in current simulation, connect the mA meter directly to the current output	If test negative: Replace central module (note version)
Additional functions missing (extended functions or measuring range switching)	No or incorrect release code used	If retrofitting: check whether the correct serial number was used when ordering the extended functions or the MRS.	Handled by Endress +Hauser Sales
	Incorrect device serial number saved in LSCH/ LSCP module	Check whether serial number on the nameplate matches SNR in LSCH/ LSCP (field S 10).	The **device** serial number in the LSCH/LSCP module is required for the extended functions.
Additional functions (extended functions or measuring range switching) missing after replacement of LSCH/LSCP module	LSCH or LSCP replacement modules have the **device** serial number 0000 when they leave the factory. The Plus Package or Chemoclean are not enabled on leaving the factory.	For LSCH/LSCP with SNR 0000, a **device** serial number can be entered once in fields E115 to E118. Then enter the release code for the extension package.	For a detailed description, see the "Replacing the central module" section.
No HART or PROFIBUS PA/DP interface function	Incorrect central module	HART: LSCH-H1 or H2 module, PROFIBUS-PA: LSCP-PA module, PROFIBUS-DP: LSCP-DP module, See field E111 to 113.	Replace central module; User or Endress+Hauser Service.
	Incorrect device software	SW version, see field E111.	
	Incorrect configuration	See the troubleshooting list in the "Process-specific errors" section.	

10 Maintenance

⚠ WARNING

Process pressure and temperature, contamination, electrical voltage

Risk of serious or fatal injury

- ▶ If the sensor has to be removed during maintenance work, avoid hazards posed by pressure, temperature and contamination.
- ▶ Make sure the device is de-energized before you open it.
- ▶ Power can be supplied to switching contacts from separate circuits. De-energize these circuits before working on the terminals.

Take all the necessary precautions in time to ensure the operational safety and reliability of the entire measuring point.

The maintenance of the measuring point comprises:

- Calibration
- Cleaning the controller, assembly and sensor
- Checking the cables and connections

When performing any work on the device, bear in mind any potential impact this may have on the process control system or on the process itself.

NOTICE

Electrostatic discharge (ESD)

Risk of damaging the electronic components

- ▶ Take personal protective measures to avoid ESD, such as discharging beforehand at PE or permanent grounding with a wrist strap.
- ▶ For your own safety, only use genuine spare parts. With genuine parts, the function, accuracy and reliability are also ensured after maintenance work.

10.1 Maintenance work

10.1.1 Cleaning the conductivity sensors

As there is no galvanic contact with the medium, inductive sensors are considerably less sensitive to dirt and fouling than conventional conductive sensors.

However, dirt can clog the measuring channel which, in turn, can alter the cell constant. In such cases, an inductive sensor also needs to be cleaned.

Clean away fouling on the sensor as follows depending on the type of fouling:

- Oily and greasy films:
  Clean with grease remover, e.g. alcohol, acetone, possibly hot water and dishwashing detergent.
- Lime and metal hydroxide buildup:
  Dissolve buildup with diluted hydrochloric acid (3 %) and then rinse thoroughly with plenty of clear water.
- Sulfidic buildup (from flue gas desulfurization or sewage treatment plants):
  Use a mixture of hydrochloric acid (3 %) and thiocarbamide (commercially available) and then rinse thoroughly with plenty of clear water.
- Buildup containing proteins (e.g. food industry):
  Use a mixture of hydrochloric acid (0.5 %) and pepsin (commercially available) and then rinse thoroughly with plenty of clear water.

10.1.2 Testing inductive conductivity sensors

The following applies for the CLS52 sensor.

The sensor cables must be disconnected at the device or junction box for all tests described here!

- Testing the transmitting and receiving coils:
  Measure between the inner connector and the shield at the white and red coaxial cables in the case of the remote version, and at the white and brown coaxial cables in the case of the compact version.
  - Ohmic resistance approx. 0.5 to 2 Ω.
  - Inductance approx. 180 to 360 mH (for 2 kHz, series circuit as equivalent circuit diagram)
- Testing the coil shunt:
  A shunt between the two sensor coils is not allowed. The resistance measured must be > 20 MΩ.
  Test with the ohmmeter from the brown or red coaxial cable to the white coaxial cable.
- Temperature sensor test:
  To test the Pt 100 in the sensor, you can use the table in the "Device check by medium simulation" section.
  In the case of the remote sensor version, measure between the green and white wires and between the green and yellow wires. The resistance values must be identical.
  In the case of the compact version, measure between the two red strands.
- Temperature sensor shunt test:
  Shunts are not permitted between the temperature sensor and the coils. Check with ohmmeter for > 20 MΩ
  Measure between the temperature sensor wires (green + white + yellow or red + red) and the coils (red and white coaxial cable or brown and white coaxial cable).

10.1.3 Device check by medium simulation

The inductive conductivity sensor cannot be simulated.

However, the entire CLD132 measuring system including the inductive conductivity sensor can be tested using equivalent resistors. Note the cell constant $k_{nominal}$ = 5.9 cm^{-1} for CLS52.

For accurate simulation, the actual cell constant used (visible in field C124) must be used to calculate the display value.

Conductivity [mS/cm] = k[cm^{-1}] ·1/(R[kΩ])

Values for simulation with CLS52 at 25 °C (77 °F):

Simulation resistance R	Default cell constant k	Conductivity reading
5.9 Ω	5.9 cm^{-1}	1000 mS/cm
10 Ω	5.9 cm^{-1}	590 mS/cm
29.5 Ω	5.9 cm^{-1}	200 mS/cm
100 Ω	5.9 cm^{-1}	59 mS/cm
295 Ω	5.9 cm^{-1}	20 mS/cm
2.95 kΩ	5.9 cm^{-1}	2 mS/cm
29.5 kΩ	5.9 cm^{-1}	200 µS/cm

Conductivity simulation:

Pull a cable through the sensor opening and then connect it to a decade resistor, for instance.

Temperature sensor simulation

The temperature sensor of the inductive conductivity sensor is connected to terminals 11, 12 and 13 on the device irrespective of whether this is a compact device or a remote device version.

For the simulation, the temperature sensor is disconnected from the sensor and an equivalent resistor is connected instead. This resistor must also be connected using a three-wire arrangement, i.e. connection to terminals 11 and 12 and a jumper between terminal 12 and 13.

The table shows some resistance values for temperature simulation:

Temperature	Resistance value
- 20 °C (-4 °F)	92.13 Ω
-10 °C (14 °F)	96.07 Ω
0 °C (32 °F)	100 Ω
10 °C (50 °F)	103.9 Ω
20 °C (68 °F)	107.79 Ω
25 °C (77 °F)	109.73 Ω
50 °C (122 °F)	119.40 Ω
80 °C (176 °F)	130.89 Ω
100 °C (212 °F)	138.5 Ω
150 °C (302 °F)	157.32 Ω
200 °C (392 °F)	175.84 Ω

11 Repair

11.1 General notes

The repair and conversion concept provides for the following:
- The product has a modular design
- Spare parts are grouped into kits which include the associated kit instructions
- Only use original spare parts from the manufacturer
- Repairs are carried out by the manufacturer's Service Department or by trained users
- Certified devices can only be converted to other certified device versions by the manufacturer's Service Department or at the factory
- Observe applicable standards, national regulations, Ex documentation (XA) and certificates

1. Carry out the repair according to the kit instructions.
2. Document the repair and conversion and enter, or have entered, in the Life Cycle Management tool (W@M).

11.2 Spare parts

Device spare parts that are currently available for delivery can be found on the website:

https://portal.endress.com/webapp/SparePartFinder

▶ Quote the serial number of the device when ordering spare parts.

11.3 Return

The product must be returned if repairs or a factory calibration are required, or if the wrong product was ordered or delivered. As an ISO-certified company and also due to legal regulations, Endress+Hauser is obliged to follow certain procedures when handling any returned products that have been in contact with medium.

To ensure the swift, safe and professional return of the device:

▶ Refer to the website www.endress.com/support/return-material for information on the procedure and conditions for returning devices.

11.4 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.

12 Accessories

12.1 Cable extension

Measuring cable CLK6
- Extension cable for inductive conductivity sensors, for extension via VBM junction box
- Sold by the meter, order number: 71183688

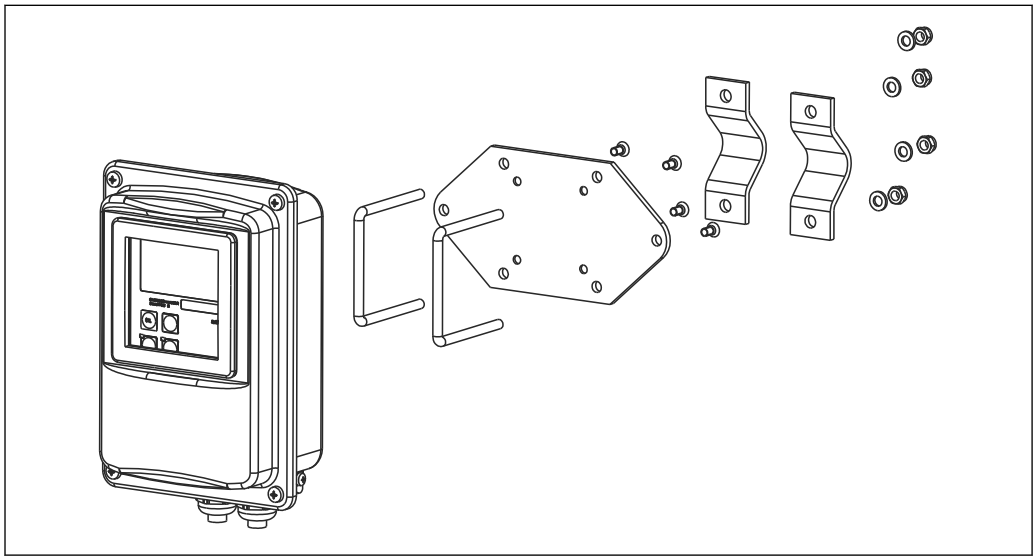
VBM
- Junction box for cable extension
- 10 terminal strips
- Cable entries: 2 x Pg 13.5 or 2 x NPT ½"
- Material: aluminum
- Degree of protection: IP 65
- Order numbers
  - Cable entries Pg 13.5 : 50003987
  - Cable entries NPT ½": 51500177

Depending on the ambient conditions, the inserted desiccant pouch must be checked and replaced at regular intervals to prevent incorrect measurements resulting from moisture bridges in the measuring line.

Desiccant pouch
- Desiccant pouch with color indicator for VBM junction box
- Order No. 50000671

12.2 Post mounting kit

Post mounting kit
- Mounting kit for securing the Smartec CLD132/CLD134 on horizontal and vertical pipes (max. Ø 60 mm (2.36"))
- Material: stainless steel 1.4301 (AISI 304)
- Order No. 50062121



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37 *Mounting kit for mounting the CLD132/CLD134 remote version on a post (base plate is included in the scope of delivery for the transmitter)*

12.3 Software upgrade

Function upgrade
- Remote parameter set configuration (measuring range switching, MRS) and determination of temperature coefficient;
- Order No. 51501643
- The serial number of the device must be specified when ordering.

12.4 Calibration solutions

Conductivity calibration solutions CLY11
Precision solutions referenced to SRM (Standard Reference Material) by NIST for qualified calibration of conductivity measuring systems in accordance with ISO 9000
CLY11-B, 149.6 µS/cm (reference temperature 25 °C (77 °F)), 500 ml (16.9 fl.oz)
Order No. 50081903

Technical Information TI00162C

13 Technical data

13.1 Input

Measured variable	▪ Conductivity ▪ Concentration ▪ Temperature	
Measuring range	Conductivity:	Recommended range: 100 µS/cm to 2000 mS/cm (uncompensated)
	Concentration:	
	NaOH:	0 to 15 %
	HNO_3:	0 to 25 %
	H_2SO_4:	0 to 30 %
	H_3PO_4:	0 to 15 %
	User 1 (to 4):	(4 tables available in versions with additional "remote parameter set configuration" function)
	Temperature:	−35 to +250 °C (-31 to +482 °F)
Temperature measurement	Pt 1000	
Sensor cable	Max. cable length of 55 m (180 ft.) with CLK5 cable (remote version)	
Binary inputs 1 and 2	Voltage	10 to 50 V
	Current consumption	Max. 10 mA at 50 V

13.2 Output

Output signal	Conductivity, concentration: Temperature (optional second current output)	0 / 4 to 20 mA, galvanically isolated
Signal on alarm	2.4 or 22 mA in the event of an error	
Load	Max. 500 Ω	
Transmission range	Conductivity	Configurable
	Temperature	Configurable
Signal resolution	Max. 700 digits/mA	
Separation voltage	Max. 350 V_{RMS} / 500 V DC	
Minimum spread of output signal	Conductivity	
	Measured value 0 to 19.99 µS/cm	2 µS/cm

	Measured value 20 to 199.9 µS/cm	20 µS/cm
	Measured value 200 to 1999 µS/cm	200 µS/cm
	Measured value 0 to 19.99 mS/cm	2 mS/cm
	Measured value 20 to 200 mS/cm	20 mS/cm
	Measured value 200 to 2000 mS/cm	200 mS/cm
	Concentration	No minimum spread
	Temperature	15 °C (27 °F)
Overvoltage protection	According to EN 61000-4-5:1995	
Auxiliary voltage output	Output voltage	15 V ± 0.6 V
	Output current	Max. 10 mA
Contact outputs	Switching current with ohmic load (cos φ = 1)	Max. 2 A
	Switching current with inductive load (cos φ = 0.4)	Max. 2 A
	Switching voltage	Max. 250 V AC, 30 V DC
	Switching power with ohmic load (cos φ = 1)	Max. 500 VA AC, 60 W DC
	Switching power with inductive load (cos φ = 0.4)	Max. 500 VA AC
Limit switch	Pickup/dropout delay (for versions with remote parameter set configuration)	0 to 2000 s
Alarm	Function (switchable):	Latching/momentary contact
	Alarm delay:	0 to 2000 s (min)

13.3 Power supply

Supply voltage	Depending on order version: ▪ 100/115/230 V AC +10/-15 %, 48 to 62 Hz ▪ 24 V AC/DC +20/-15 %	
Power consumption	Max. 7.5 VA	
Mains fuse	Fine-wire fuse, semi-delay 250 V/3.15 A	
Cable cross-section	Cable length ≤ 10 m (33 ft)	At least 3 x 0.75 mm² (≙ 18 AWG)
	Cable length > 10 ≤ 20 m (> 33 ≤ 66 ft)	At least 3 x 1.5 mm² (≙ 24 AWG)

13.4 Performance characteristics

Measured value resolution	Temperature:	0.1 °C

Response time	Conductivity:	t_{95} < 1.5 s
	Temperature:	t90 < 5 s For versions with stainless steel socket (CLD132-******** 1/2) t90 < 3.5 min For versions with fully sheathed Pt 100 (CLD132-********6/7)
Measured error of sensor [1]	Conductivity:	± (0.5 % of reading + 10 µS/cm) after calibration (plus uncertainty of the conductivity of the calibration solution)
	Temperature:	Pt 1000 Class A according to IEC 60751
Measured error of transmitter [2]	Conductivity:	
	- Display:	Max. 0.5 % of measured value ± 4 digits
	- Conductivity signal output:	Max. 0.75 % of current output range
	Temperature:	
	- Display:	Max. 0.6 % of measuring range
	- Temperature signal output:	Max. 0.75 % of current output range
Repeatability [3]	Conductivity:	Max. 0.2 % of measured value ± 2 digits
Cell constant	5.9 cm^{-1}	
Measuring frequency (oscillator)	2 kHz	
Temperature compensation	Range	−10 to +150 °C (+14 to +302 °F)
	Types of compensation	▪ None ▪ Linear with user-configurable temperature coefficient ▪ A user-programmable coefficient table (four tables in versions with remote parameter set configuration) ▪ NaCl in accordance with IEC 60746-3
	Minimum distance for table:	1 K
Reference temperature	25 °C (77 °F)	
Temperature offset	Adjustable, ± 5 °C, for adjusting the temperature display	

1) In accordance with DIN IEC 746 Part 1, at rated operating conditions
2) In accordance with DIN IEC 746 Part 1, at rated operating conditions
3) In accordance with DIN IEC 746 Part 1, at rated operating conditions

13.5 Environment

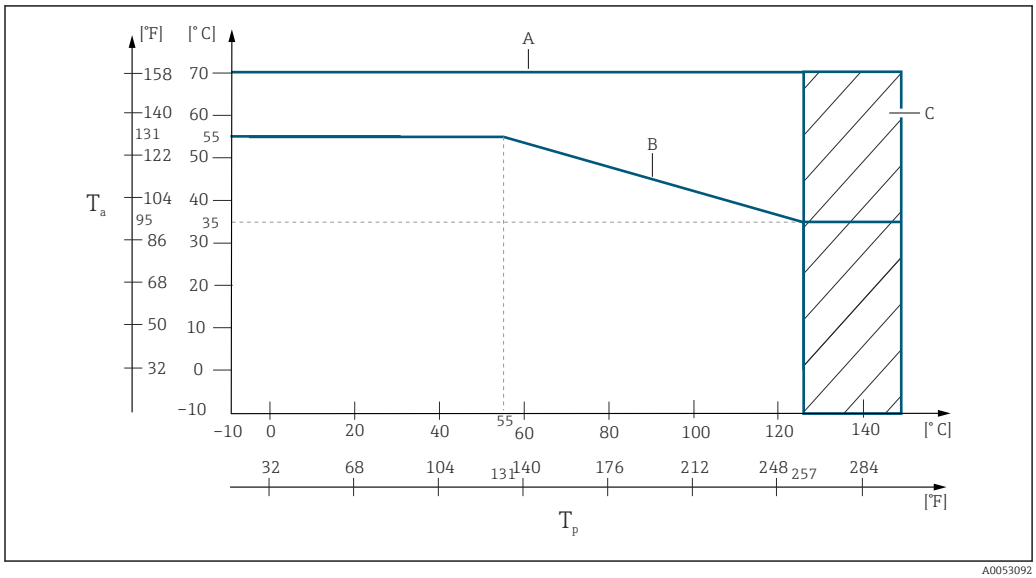
Ambient temperature	Compact version or electronics housing: Sensor (remote version):	0 to +55 °C (32 to +131 °F) -20 to +60 °C (-4 to +140 °F)
Ambient temperature limits	−10 to +70 °C (14 to +158 °F) (remote version) and separate transmitter −10 … +55 °C (14 … +131 °F) (compact version/electronics housing [4]) See also graphic for "Permitted temperature ranges of Smartec Smartec CLD132".	
Storage temperature	-25 to +70 °C (-13 to +158 °F)	
Electromagnetic compatibility	Interference emission and interference immunity as per EN 61326-1:2006, EN 61326-2-3:2006	
Degree of protection	IP67/Type 4	
Relative humidity	10 to 95 %, non-condensing	
Vibration resistance as per IEC 60770-1 and IEC 61298-3	Oscillation frequency: Deflection (peak value): Acceleration (peak value):	10 to 500 Hz 0.15 mm 19.6 m/s² (64.3 ft/s²)
Display window shock resistance	9 J	

13.6 Process

Process temperature	CLS52 sensor with:	
	Remote version:	max. 125 °C (257 °F) at 70 °C (158 °F) ambient temperature
	Compact version:	max. 55 °C (131 °F) at 55 °C (131 °F) ambient temperature
Sterilization	CLS52 sensor with:	
	Remote version:	140 °C (284 °F) at 70 °C (158 °F) ambient temperature, 4 bar (58 psi), abs, max. 30 min
	Compact version:	140 °C (284 °F) at 35 °C (95 °F) ambient temperature, 4 bar (58 psi), abs, max. 30 min
Absolute process pressure	16 bar (232.1 psi), abs at 90 °C (194 °F) No vacuum on versions with stainless steel socket (CLD132-******** 1 and CLD132-******** 2)	

4) → 78

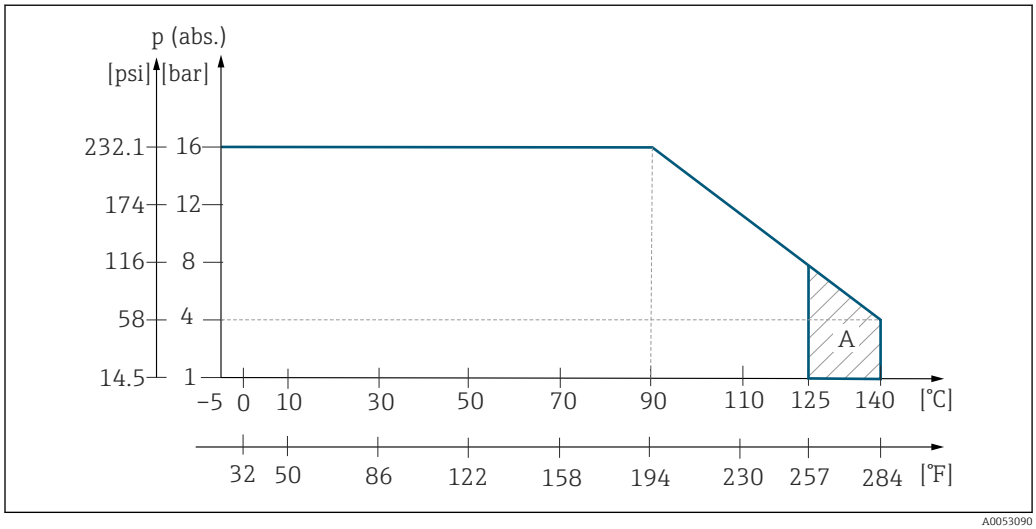
Permitted temperature ranges



38 *Permitted temperature ranges*

T_a *Ambient temperature*
T_p *Medium temperature*
A Sensor for remote version
B Compact version
C Temporarily for sterilization (< 60 min)

Pressure-temperature ratings of sensor



39 *Pressure-temperature ratings of CLS52 sensor*

A Temporarily for sterilization (max. < 30 minutes)

13.7 Flow velocity

Max. 5 m/s (16.4 ft/s) for low-viscosity media in DN65 pipes

13.8 Mechanical construction

Dimensions

Remote version with mounting plate: L x B x D: 225 x 142 x 109 mm (8.86 x 5.59 x 4.29 ")

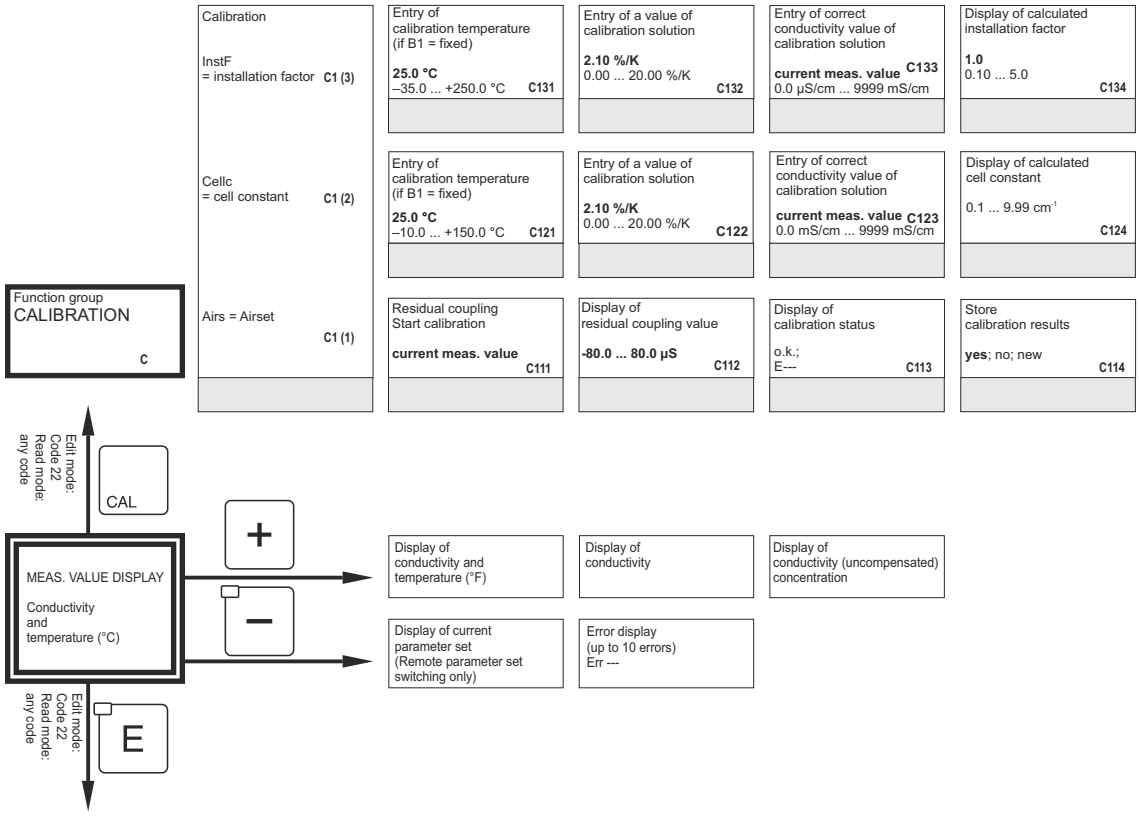
Compact device:

	Version MV1, CS1, GE1, SMS:	L x B x D: 225 x 142 x 242 mm (8.86 x 5.59 x 9.53 ")
	Version VA1, AP1:	L x B x D: 225 x 142 x 180 mm (8.86 x 5.59 x 7.09 ")
Weight	Remote version:	
	Transmitter:	approx. 2.5 kg (5.5 lb.)
	Sensor:	Depending on version 0.3 to 0.5 kg (0.66 to 1.1 lb.)
	Compact version with sensor:	approx. 3 kg (6.6 lb.)
Materials of sensor (in contact with medium)	In contact with medium:	Sensor: PEEK-GF20 Varivent flange, APF flange ▪ Flange: stainless steel 1.4435 (AISI 316L) ▪ Seal: EPDM Metal temperature sensor socket ▪ Socket: stainless steel 1.4435 (AISI 316 L) ▪ Seal: Chemraz®
Materials of transmitter	Housing:	Stainless steel 1.4301 (AISI 304)
	Front window:	Polycarbonate

Chemical resistance of the sensor

Medium	Concentration	PEEK	PFA	CHEMRAZ	VITON
Sodium hydroxide solution NaOH	0 to 50 %	20 to 100 °C (68 to 212 °F)	20 to 50 °C (68 to 122 °F)	0 to 150 °C (32 to 302 °F)	Not suitable
Nitric acid HNO_3	0 to 10 %	20 to 100 °C (68 to 212 °F)	20 to 80 °C (68 to 176 °F)	0 to 150 °C (32 to 302 °F)	0 to 120 °C (32 to 248 °F)
	0 to 40 %	20 °C (68 °F)	20 to 60 °C (68 to 140 °F)	0 to 150 °C (32 to 302 °F)	0 to 120 °C (32 to 248 °F)
Phosphoric acid H_3PO_4	0 to 80 %	20 to 100 °C (68 to 212 °F)	20 to 60 °C (68 to 140 °F)	0 to 150 °C (32 to 302 °F)	0 to 120 °C (32 to 248 °F)
Sulfuric acid H_2SO_4	0 to 2.5 %	20 to 80 °C (68 to 176 °F)	20 to 100 °C (68 to 212 °F)	0 to 150 °C (32 to 302 °F)	0 to 120 °C (32 to 248 °F)
	0 to 30 %	20 °C (68 °F)	20 to 100 °C (68 to 212 °F)	0 to 150 °C (32 to 302 °F)	0 to 120 °C (32 to 248 °F)
Hydrochloric acid HCl	0 to 5 %	20 to 100 °C (68 to 212 °F)	20 to 80 °C (68 to 176 °F)	0 to 150 °C (32 to 302 °F)	0 to 120 °C (32 to 248 °F)
	0 to 10 %	20 to 100 °C (68 to 212 °F)	20 to 80 °C (68 to 176 °F)	0 to 150 °C (32 to 302 °F)	0 to 120 °C (32 to 248 °F)

14 Appendix



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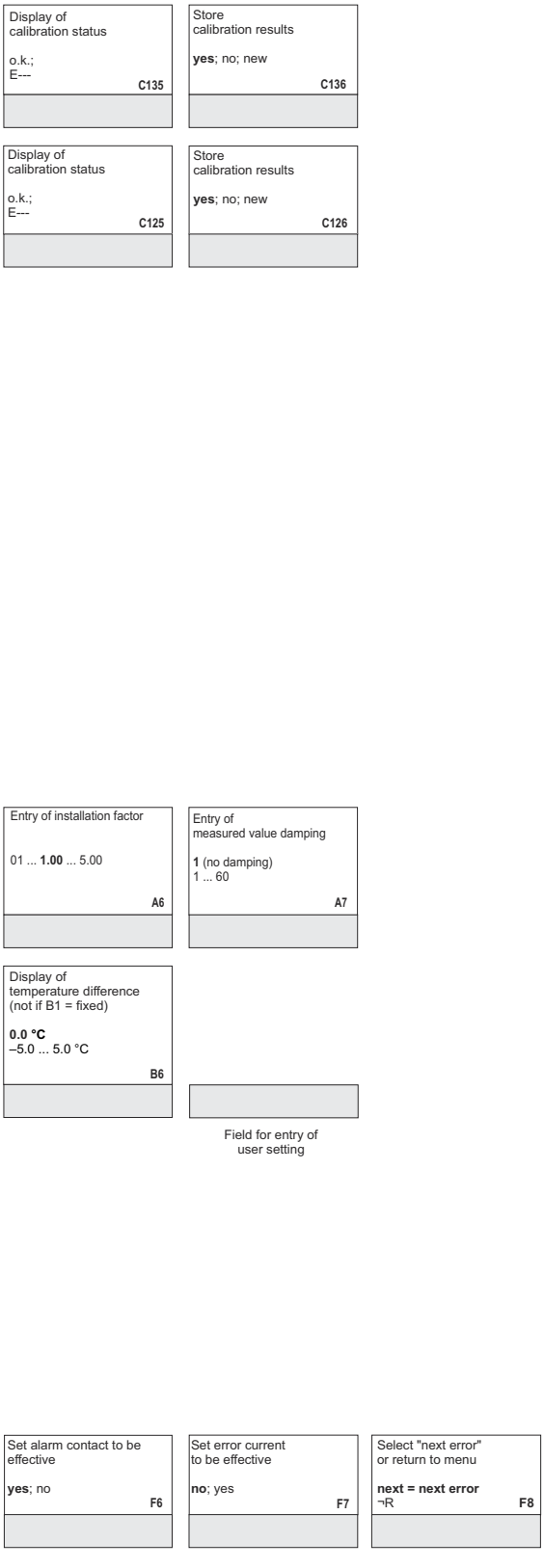
Display of calibration status
o.k.;
E---
C135
Store calibration results
yes; no; new
C136
Display of calibration status
o.k.;
E---
C125
Store calibration results
yes; no; new
C126
Entry of installation factor
01 ... 1.00 ... 5.00
A6
Entry of measured value damping
1 (no damping)
1 ... 60
A7
Display of temperature difference (not if B1 = fixed)
0.0 °C
–5.0 ... 5.0 °C
B6
Field for entry of user setting
Set alarm contact to be effective
yes; no
F6
Set error current to be effective
no; yes
F7
Select "next error" or return to menu
next = next error
¬R
F8

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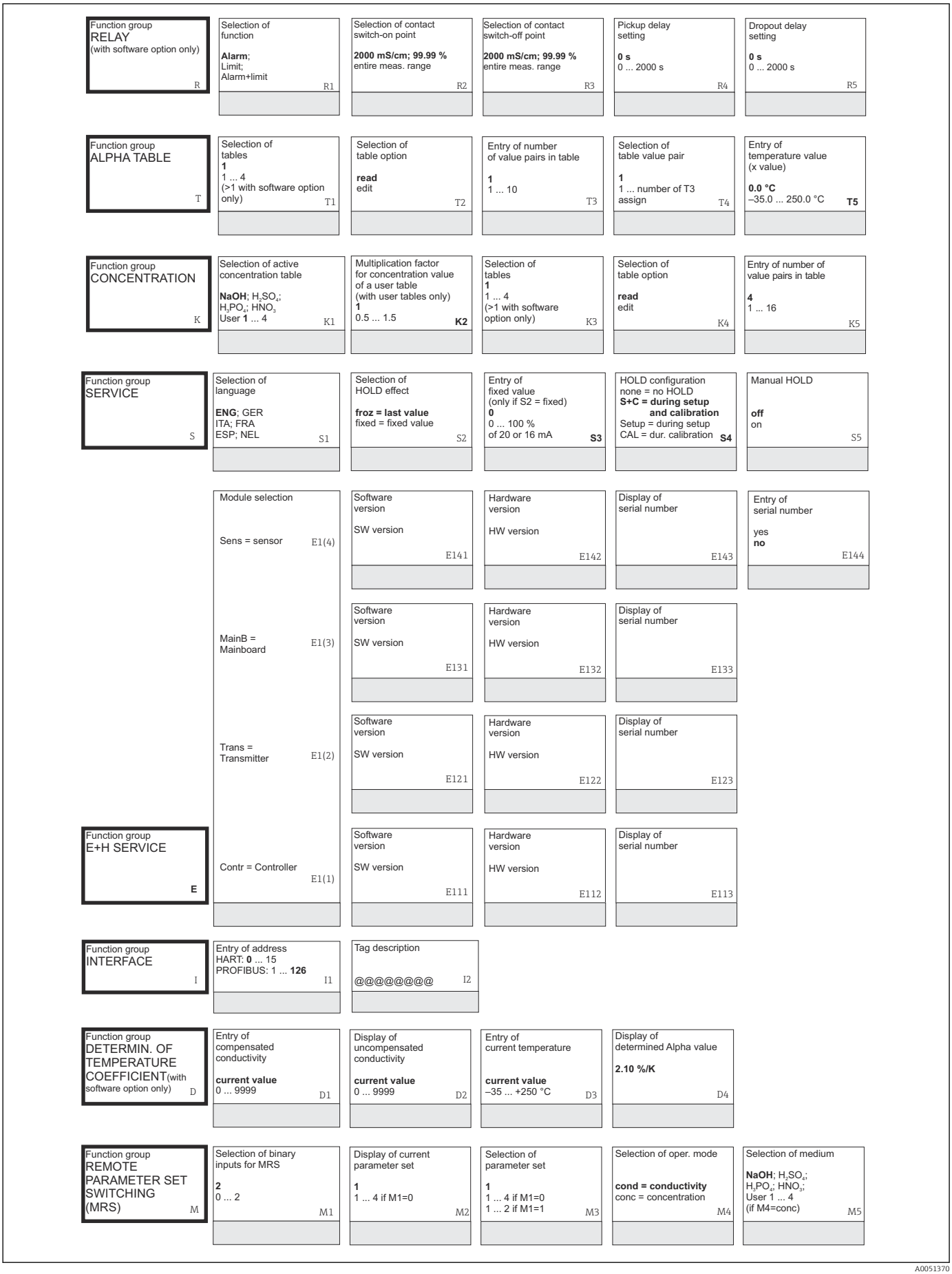
Function group RELAY (with software option only) R
Selection of function **Alarm**; Limit; Alarm+limit R1
Selection of contact switch-on point **2000 mS/cm; 99.99 %** entire meas. range R2
Selection of contact switch-off point **2000 mS/cm; 99.99 %** entire meas. range R3
Pickup delay setting **0 s** 0 ... 2000 s R4
Dropout delay setting **0 s** 0 ... 2000 s R5
Function group ALPHA TABLE T
Selection of tables **1** 1 ... 4 (>1 with software option only) T1
Selection of table option **read** edit T2
Entry of number of value pairs in table **1** 1 ... 10 T3
Selection of table value pair **1** 1 ... number of T3 assign T4
Entry of temperature value (x value) **0.0 °C** –35.0 ... 250.0 °C **T5**
Function group CONCENTRATION K
Selection of active concentration table **NaOH**; H_2SO_4; H_3PO_4; HNO_3 User **1** ... 4 K1
Multiplication factor for concentration value of a user table (with user tables only) **1** 0.5 ... 1.5 **K2**
Selection of tables **1** 1 ... 4 (>1 with software option only) K3
Selection of table option **read** edit K4
Entry of number of value pairs in table **4** 1 ... 16 K5
Function group SERVICE S
Selection of language **ENG**; GER ITA; FRA ESP; NEL S1
Selection of HOLD effect **froz = last value** fixed = fixed value S2
Entry of fixed value (only if S2 = fixed) **0** 0 ... 100 % of 20 or 16 mA **S3**
HOLD configuration none = no HOLD **S+C = during setup and calibration** Setup = during setup CAL = dur. calibration **S4**
Manual HOLD **off** on S5
Module selection
Sens = sensor E1(4)
Software version SW version E141
Hardware version HW version E142
Display of serial number E143
Entry of serial number yes **no** E144
MainB = Mainboard E1(3)
Software version SW version E131
Hardware version HW version E132
Display of serial number E133
Trans = Transmitter E1(2)
Software version SW version E121
Hardware version HW version E122
Display of serial number E123
Function group E+H SERVICE **E**
Contr = Controller E1(1)
Software version SW version E111
Hardware version HW version E112
Display of serial number E113
Function group INTERFACE I
Entry of address HART: **0** ... 15 PROFIBUS: 1 ... **126** I1
Tag description @@@@@@@@ I2
Function group DETERMIN. OF TEMPERATURE COEFFICIENT (with software option only) D
Entry of compensated conductivity **current value** 0 ... 9999 D1
Display of uncompensated conductivity **current value** 0 ... 9999 D2
Entry of current temperature **current value** –35 ... +250 °C D3
Display of determined Alpha value **2.10 %/K** D4
Function group REMOTE PARAMETER SET SWITCHING (MRS) M
Selection of binary inputs for MRS **2** 0 ... 2 M1
Display of current parameter set **1** 1 ... 4 if M1=0 M2
Selection of parameter set **1** 1 ... 4 if M1=0 1 ... 2 if M1=1 M3
Selection of oper. mode **cond = conductivity** conc = concentration M4
Selection of medium **NaOH**; H_2SO_4; H_3PO_4; HNO_3; User 1 ... 4 (if M4=conc) M5

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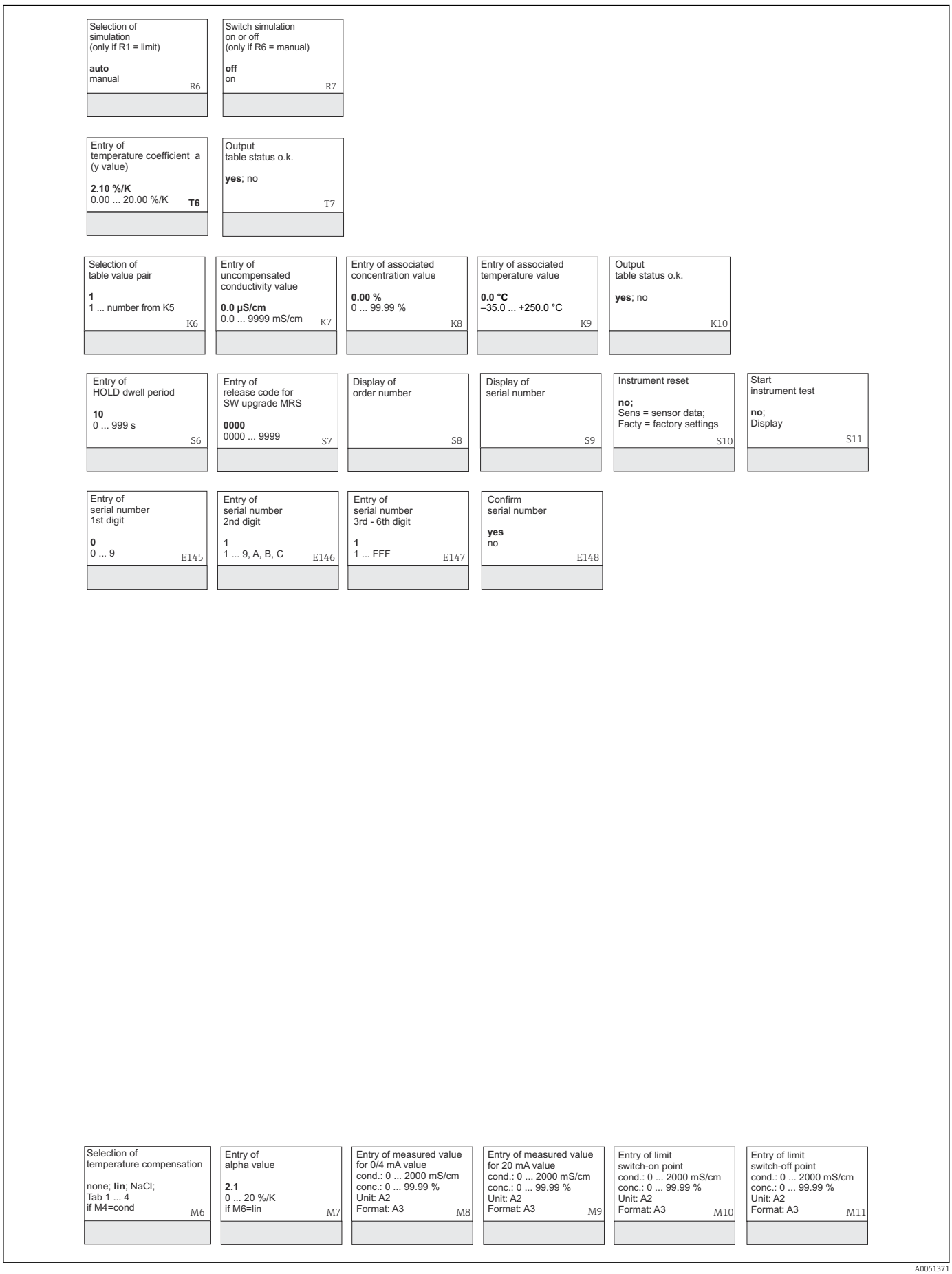
Selection of simulation (only if R1 = limit)
auto
manual
R6
Switch simulation on or off (only if R6 = manual)
off
on
R7
Entry of temperature coefficient a (y value)
2.10 %/K
0.00 ... 20.00 %/K
T6
Output table status o.k.
yes; no
T7
Selection of table value pair
1
1 ... number from K5
K6
Entry of uncompensated conductivity value
0.0 µS/cm
0.0 ... 9999 mS/cm
K7
Entry of associated concentration value
0.00 %
0 ... 99.99 %
K8
Entry of associated temperature value
0.0 °C
–35.0 ... +250.0 °C
K9
Output table status o.k.
yes; no
K10
Entry of HOLD dwell period
10
0 ... 999 s
S6
Entry of release code for SW upgrade MRS
0000
0000 ... 9999
S7
Display of order number
S8
Display of serial number
S9
Instrument reset
no;
Sens = sensor data;
Facty = factory settings
S10
Start instrument test
no;
Display
S11
Entry of serial number 1st digit
0
0 ... 9
E145
Entry of serial number 2nd digit
1
1 ... 9, A, B, C
E146
Entry of serial number 3rd - 6th digit
1
1 ... FFF
E147
Confirm serial number
yes
no
E148
Selection of temperature compensation
none; **lin**; NaCl;
Tab 1 ... 4
if M4=cond
M6
Entry of alpha value
2.1
0 ... 20 %/K
if M6=lin
M7
Entry of measured value for 0/4 mA value
cond.: 0 ... 2000 mS/cm
conc.: 0 ... 99.99 %
Unit: A2
Format: A3
M8
Entry of measured value for 20 mA value
cond.: 0 ... 2000 mS/cm
conc.: 0 ... 99.99 %
Unit: A2
Format: A3
M9
Entry of limit switch-on point
cond.: 0 ... 2000 mS/cm
conc.: 0 ... 99.99 %
Unit: A2
Format: A3
M10
Entry of limit switch-off point
cond.: 0 ... 2000 mS/cm
conc.: 0 ... 99.99 %
Unit: A2
Format: A3
M11

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