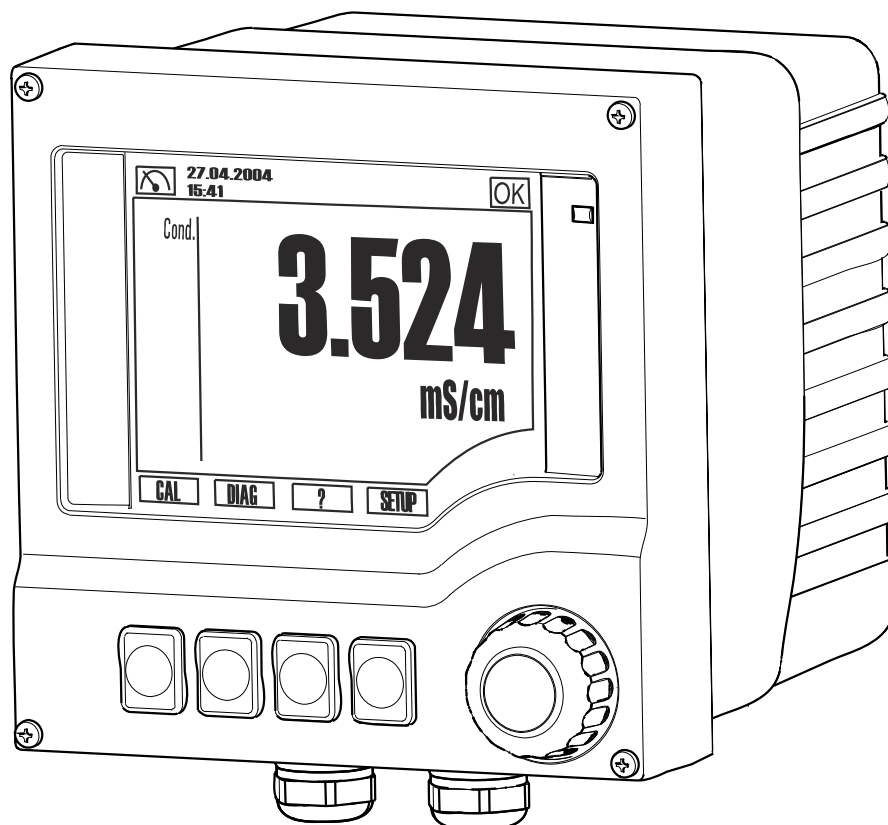


## Operating Instructions Transmitter H220X COND

Two-wire transmitter for conductivity measured  
conductively (analog sensors)

### Part 2



Ref. No. 243081-12



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# 1 Calibration and adjustment

## 1.1 Definitions

**Calibration** (as per DIN 1319):

A calibration is defined as a set of operations that establish the relationship between the measured value or expected value of the output variable and the related true or correct value of the measured variable (input variable) for a measuring system under specified conditions. A calibration does not alter the performance of the measuring device.

### **Adjustment**

An adjustment corrects the value displayed by a measuring device, in other words the measured/displayed value (the actual value) is corrected so that the reading agrees with the correct, set value.

The value determined during calibration is used to calculate the correct measured value and saved in the sensor.

## 1.2 Notes on the calibration

The following rules apply for all parameters:

- Calibrate in a way that reflects conditions in the process.
  - If the process medium is constantly moving, also move the calibration solution accordingly (e.g. use a magnetic stirrer if calibrating in the laboratory).
  - If your medium is relatively stationary, calibrate in solutions that are also stationary.
- Make sure that the samples are homogeneous for reference measurements, sample calibration etc.
- Use the same menu settings as those in the process to perform the calibration.

## 1.3 Types of calibration

The following types of calibration are possible:

- Cell constant with calibration solution
- Temperature adjustment via reference value, two-point calibration or table

## 1.4 Current values

The menu is only designed to give you an overview of the current calibration data. You cannot make any settings or execute any actions here.

## 1.5 Cell constant

### 1.5.1 Calibrating the cell constant

You enter a reference value for the conductivity with this type of calibration. In addition, you specify how the system should compensate for the influence of temperature. In the result, the device calculates a new cell constant for the sensor.

1. Go to the "CAL/Cell constant" menu.
2. Work your way through the menu functions that follow.
3. Start the calibration.
4. Follow the instructions.
5. Decide whether to use the calibration data captured, or to abort or repeat the calibration.

After calibration, the transmitter automatically switches back to the measuring mode and your measuring point is now ready for operation.

## 1.6 Temperature

### Temperature adjustment mode and special points to note

- 1-point (offset)
    - You adjust the medium temperature currently measured by the temperature sensor with the value from an external measurement.
    - The transmitter calculates the new temperature offset and displays it.
  - 2-point (offset/slope)
    - You need two media of different temperatures. You have already determined the temperatures with an external measurement.
    - During the calibration, immerse the sensor in each of the media and enter the reference temperatures.
    - The transmitter determines new values for the offset and slope.
  - Table (offset/slope)
    - You specify two value pairs for the temperatures measured by the temperature sensor and those determined with an external measurement.
    - If you select "Save table", the validity of the table is checked and the transmitter determines new values for the offset and slope.
- i** The device always waits 1 minute for a stable temperature value. If this time limit is exceeded, the device automatically aborts the calibration. Use the "Table" option in situations where you need to wait longer for a stable value.

### Temperature adjustment

1. Go to the "CAL/Temperature" menu.
  - ↳ The current offset and - in the case of "2 point" or "table" - also the slope are displayed. Furthermore, you can also choose the mode of the calibration/adjustment.
2. Decide which mode you want to use.
3. Start the calibration.
4. Follow the instructions.

5. Decide whether to use the calibration data captured, or to abort or repeat the calibration.

After calibration, the transmitter automatically switches back to the measuring mode and your measuring point is now ready for operation.

## 2 Diagnostics, troubleshooting

In the DIAG menu you will find information about the device state, in particular detailed error and maintenance messages.

In addition to this, there are various service functions available<sup>1)</sup>.

### 2.1 General troubleshooting

#### 2.1.1 Troubleshooting

The transmitter continuously monitors its own functions.

If an error detected by the device occurs, the red alarm LED lights up and the error number with the related error message appears on the display.

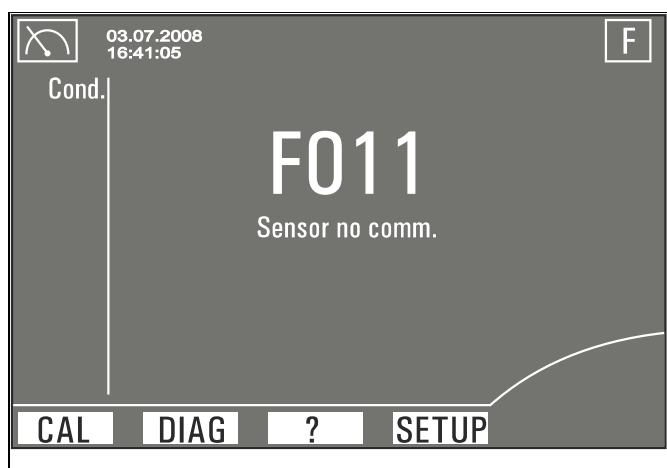


Fig. 1: Error messages (example)

#### Troubleshooting instructions

A diagnostics message is shown on the display, measured values are implausible or you discover an error.

1. See the Diagnostics menu (DIAG/Errors / Messages) for details on the diagnostics message.
2. Search for the diagnostic message under "Diagnostics information on the local display" (→ [10](#)) in this manual. Use the message number as the search criterion. Ignore the letters indicating the Namur error category.
  - ↳ Follow the troubleshooting instructions provided in the last column of the error tables.
3. In the event of implausible measured values, a malfunctioning local display or other errors, refer to "Process errors without messages" (→ [8](#)) or "Device-specific errors" (→ [9](#)).
  - ↳ Follow the recommended measures.

1) Depending on the device version

4. Contact the Service Department if you cannot rectify the error yourself. Only cite the error number.

### 2.1.2 Process errors without messages

Problem	Possible cause	Tests and/or remedial measures
Display values deviate from reference measurement	Incorrect calibration	Repeat the calibration. Where necessary, check and repeat the calibration with the reference device.
	Sensor fouled	Clean the sensor.
	Temperature measurement	Check the temperature measured values of both devices.
	Temperature compensation	Check the settings for temperature compensation and adjustment for both devices.
Display values deviate from reference measurement	Polarization error	Use suitable sensor: <ul style="list-style-type: none"> <li>▪ Larger cell constant</li> <li>▪ Graphite instead of stainless steel (note stability)</li> </ul>
Implausible measured values: <ul style="list-style-type: none"> <li>– Measured value constantly 000</li> <li>– Measured value too low</li> <li>– Measured value too high</li> <li>– Measured value frozen</li> </ul>	Short/moisture in sensor	Check sensor.
	Short-circuit in cable or socket	Check cable and socket.
	Disconnection in sensor	Check sensor.
	Disconnection in cable or socket	Check cable and socket.
	Incorrect cell constant setting	Check cell constant.
	Incorrect output assignment	Check assignment of measured value to current signal.
	Output function incorrect	Check preselection (0-20/4-20 mA) and curve shape (linear/table).
	Air pockets in assembly	Check assembly and orientation.
	Ground connection at or in device	Measure in isolated vessel.
	CPU module failure	Check with new module.
Device has impermissible operating status (no reaction to keys being pressed)	Switch device off and then on again.	
Incorrect temperature value	Temperature sensor wired incorrectly	Check connections using wiring diagram; three-wire connection always necessary.
	Measuring cable defective	Check cables for interruptions, short-circuit, shunt.
	Incorrect sensor type configured	Set correct temperature sensor type.



Problem	Possible cause	Tests and/or remedial measures
Measured value in process incorrect	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.
	Bubbles in medium	Suppress formation of bubbles by: <ul style="list-style-type: none"> <li>- Using gas bubble trap</li> <li>- Creating counterpressure (orifice plate)</li> <li>- Measuring in bypass</li> </ul>
	Flow too high (can result in bubble formation)	Reduce flow rate or select less turbulent mounting location.
	Voltage potential in medium (only for conductive)	Ground medium close to sensor.
	Sensor fouling or buildup on sensor	Clean sensor (see "Cleaning the conductivity sensors" section).
Measured value fluctuations	Interference on signal output cable	Check cable routing, route cable separately if necessary.
	Interference potential in medium	Eliminate source of interference or ground medium as close as possible to sensor.
Measured value fluctuations	Interference on measuring cable	Connect cable shield as per wiring diagram.
No current output signal	Cable disconnected or short-circuited	Disconnect cable and measure directly at device.
	Output defective	See "Device-specific errors" section.
Fixed current output signal	Current simulation active	Switch off simulation.
Incorrect current output signal	Total load in current loop too high	Measure the voltage directly at the device and compare to diagrams of the power supply and signal voltage (→ Technical data, Part 1).
	EMC (interference coupling)	Check wiring. Determine the reason for the EMC and eliminate it.

### 2.1.3 Device-specific errors

Problem	Possible cause	Tests and/or remedial measures
Dark display	No supply voltage	Check if supply voltage applied.
	CPU defective	Replace CPU, make sure correct version is used.


Problem	Possible cause	Tests and/or remedial measures
Values appear on display but: – Display does not change and / or – Device cannot be operated	Module not wired correctly	Check modules and wiring.
	Impermissible operating system condition	Switch device off and then on again.
Implausible measured values	Sensor module defective	First perform tests and take measures as outlined in "Process-specific errors" section Test the measuring inputs: – Connect a resistor instead of conductivity sensor – Tables on conductivity and temperature simulation are provided on the Internet
Current output, current value incorrect	Incorrect adjustment	Check with current simulation switched on, connect mA meter directly to current output .
	Load too large	
	Shunt / short to ground in current loop	
No current output signal	CPU defective	Check with current simulation switched on, connect mA meter directly to current output .

## 2.2 Diagnostic information on local display

The table of diagnostics messages is sorted by the message number. This number cannot be changed. The "Cat." column contains the error category which is assigned at the factory . Document all the changes you make for your measuring point in the diagnose list (→ SETUP/Sensor/Sensor diagnostics/Diagnostics list or SETUP/General settings/Device diagnostics/Diagnostics list).

No.	Display text	Cat.	Tests and/or remedial measures
003	Temp. sensor failure	F	– Check wiring
004	Scanning sensor	C	Establishing a connection to the sensor
010	Sensor initialization	C	Wait for the initialization to finish.
011	Sensor no communication	F	– Data processing interrupted due to user interaction with DAT module (F011) – Check the measuring chain with a new sensor – Check the settings for the sensor type used.
012	Sensor failure	F	
013	Wrong sensor type	F	
014	Invalid sensor data	C	
104	Sensor supply bad	F	– Sensor operating voltage fluctuating – Check connection – Replace sensor cable or sensor

No.	Display text	Cat.	Tests and/or remedial measures
119	Temp offset lower limit	F	<ul style="list-style-type: none"> <li>- Check the temperature sensor of the sensor</li> <li>- Clean the sensor and recalibrate</li> <li>- Replace sensor</li> </ul>
120	Temp offset lower limit	F	
127	Invalid TAG group	F	Use a sensor with a suitable sensor designation or sensor group.
128	Invalid TAG	F	
129	Sensor change aborted	C	Restart the sensor change
130	Calibration active	C	Wait for the calibration to finish.
131	PV not stable	M	<ul style="list-style-type: none"> <li>- Sensor too old</li> <li>- Cable or connector defective</li> </ul>
132	Temperature not stable	M	
133	Polarization warning	M	
203	Wrong transmitter type	F	Use a sensor module that suits the software. (Software version 10... for pH, 13... for conductivity, 20... for oxygen)
215	Simulation active	C	Active corresponding to your settings
218	Current output not available	F	Contact the Service Team!
310	Temp. slope alarm	M	Minimum or maximum slope reached Reason: sensor old or defective <ul style="list-style-type: none"> <li>- Check the sensor and replace if necessary</li> <li>- Repeat temperature calibration</li> </ul>
311	Temp. slope alarm	M	
316	Cell const. not calibrated	M	No calibration data available, factory settings are used <ul style="list-style-type: none"> <li>- Check the calibration information of the sensor</li> <li>- Calibrating the cell constant</li> </ul>
317	Temp. not calibrated	M	No calibration data available, factory settings are used <ul style="list-style-type: none"> <li>- Check the calibration information of the sensor</li> <li>- Calibrate the temperature</li> </ul>
322	Meas. value out of range	S	Process limit value undershot alarm Possible reasons: <ul style="list-style-type: none"> <li>- Sensor in air</li> <li>- Air cushion in assembly</li> <li>- Sensor defective</li> <li>- Increase the process value</li> <li>- Check the measuring system</li> <li>- Change sensor type</li> </ul>
325	Sensor value out of range	S	Conductivity outside measuring range Possible reason: using sensor with incorrect cell constant <ul style="list-style-type: none"> <li>- Use a sensor with a suitable cell constant</li> </ul>
326	Internal sensor conn. broken	S	Replace sensor
380	Comm. module defect	F	
381	Comm. module incomp	F	

No.	Display text	Cat.	Tests and/or remedial measures
404	Lower limit current output	S	<ul style="list-style-type: none"> <li>- Measured value outside the specified current range</li> <li>- Check plausibility</li> <li>- Adapt the current output limits (Setup/current output.../Low value (4mA) or Upper value (20mA))</li> </ul>
405	Upper limit current output	S	
406	SETUP active	C	End parameter entry
407	DIAG active	C	End query of device and sensor information
408	Calibration aborted	M	Renew calibration solution, repeat calibration
501	Device open	M	Close the housing and tighten the screws.
513	Device alarm ([%V%S])	F	Contact the Service Team! Quote the error number and the text displayed. ([%V%S]) here stands for the text actually displayed.
514	Device warning ([%V%S])	M	
530	[%V%S] : 20 % remain <sup>1)</sup>	S	The ring memory of the logbook is almost full.
531	[%V%S] : full	S	The ring memory of the logbook is full. From now on, new events will overwrite the oldest entries.
532	Calibration timer expired	M	The counter for the Cal Timer has reached its limit. Perform a calibration. This resets the counter.
810	PV upper limit alarm	F	<ul style="list-style-type: none"> <li>- Sensor in air</li> <li>- Air cushion in assembly</li> <li>- Check the measuring chain</li> </ul> PV = primary value (main value)
811	PV lower limit alarm	F	
812	Temperature out of range	F	
840	PV upper limit warning	M	<ul style="list-style-type: none"> <li>- Sensor in air</li> <li>- Air cushion in assembly</li> <li>- Check the measuring chain</li> </ul>
841	PV lower limit warning	M	
950	Conc. temp lower limit	M	<ul style="list-style-type: none"> <li>- Check your process conditions.</li> <li>- Adjust the measuring range if necessary.</li> </ul> <p> These messages only apply to the concentration tables saved at the factory. These messages do not appear if you use user-defined tables.</p>
951	Conc. temp upper limit	M	
952	Conc. kappa lower limit	M	
953	Conc. kappa upper limit	M	
954	Conc. lower limit	M	
955	Conc. upper limit	M	
956	Cond temp lower limit	M	
957	Cond temp upper limit	M	
958	Cond kappa lower limit	M	
959	Cond kappa upper limit	M	
960	Cond kappa comp lower limit	M	
961	Cond kappa comp upper limit	M	

1) Variable text [%V%S]: the relevant logbook is named.


## 2.3 Adapting the diagnostic information

### 2.3.1 Classification of diagnostics messages

More detailed information on the current errors displayed is provided in the "DIAG/Errors / Messages" menu. The red LED flashes if a diagnostic message assigned to error category F has occurred. Furthermore, the error category of every diagnostic message is indicated in the status bar of the display by the appropriate error letter.

In accordance with Namur specification NE 107, the diagnostics messages are characterized by:

- Message number
- Error category (letter in front of the message number)
  - **F** = Failure. A malfunction has been detected.  
The cause of the malfunction is to be found in the measuring point.
  - **C** = Function check, no error  
Maintenance work is being performed on the device. Wait until the work has been completed.
  - **S** = Out of specification. The measuring point is being operated outside specifications.  
Operation is still possible. However, you run the risk of increased wear, shorter operating life or lower accuracy levels. The cause of the problem is to be found outside the measuring point.
  - **M** = Maintenance required. Action must be taken as soon as possible  
The device stills measures correctly. Immediate measures must not be taken. However, proper maintenance efforts would prevent a possible malfunction in the future.
- Message text

 If you contact the Service Department, please cite the message number only. Since you can individually change the assignment of an error to an error category, the Service Department cannot use this information.

### 2.3.2 Adapting the diagnostic information

All the diagnostics messages are assigned to specific error categories at the factory. Since other settings might be preferred depending on the application, error categories and the effect errors have on the measuring point can be configured individually. Furthermore, every diagnostic message can be disabled.

#### Example

The device displays diagnostic message 011 "Sensor no communication". You want to change this message so that no error is shown on the display, for example.

1. Go to SETUP/Sensor conductivity/Sensor diagnostics/Diagnostics list or SETUP/General settings/Device diagnostics/Diagnostics list
  - ↳ The list of all the diagnostic messages is displayed. Here it does not matter which of the two paths you used to open the list. The list is the same either way.

2. Select diagnostic message 011 and press the navigator button.
  - ↳ The details on the diagnostic message and the current message category are displayed.
3. Select the category and decide whether to change the category or deactivate the message.
4. Deactivate the message, for example (Disabled) and press "OK" to confirm your change.
  - ↳ The message without the letter of the Namur category is displayed in the diagnostic list.  
The message is deactivated.

Proceed in a similar fashion if you want to change the category. You then see the change directly in the list.

## 2.4 Pending diagnostic messages

The Diagnostics menu contains all the information on the device status. Furthermore, various service functions are available.


The following messages are directly displayed every time you enter the menu:

- "Most important msg."  
Diagnostic message recorded with the highest (most critical) Namur category
- "Past message"  
Diagnostic message whose cause was the most recent to be remedied.

## 2.5 Diagnostic list

All the diagnostic messages currently pending are listed under DIAG/Errors / Messages. The Namur category along with the number of the diagnostic message and a message description are displayed.

## 2.6 Logbooks

 The logbook memories are "ring memories". They are filled with data while storage space is available. As soon as the memory is full, each new entry overwrites the oldest entry in the memory.

To ensure data are recorded in the logbooks, you must activate the function in the **SETUP/General settings/Logbooks** menu.

Logbooks cannot be saved to external memories or transferred to other transmitters.

The logbook entries are in chronological order. The most recent entry always appears at the top of the list.

The following logbooks are available:

- Calibration logbook
  - Log of calibrations and adjustments
  - It is possible to call up the following details on every entry: time stamp, calibration method and sensor type used
  - Max. 15 entries

- 
- Event logbook
    - Log of the warnings and error messages
    - It is possible to call up the following details on every entry: time stamp, event (diagnostic message number), description, device status and event state
    - Max. 50 entries
  - Parameter logbook
    - Log of changes in the configuration
    - Every modified setting in the SETUP menu is recorded and displayed.
    - Max. 50 entries
  - User logbook
    - Log of logins and logouts
    - Each login and logout is recorded and displayed with a time stamp and the user name.
    - The data are only recorded if user administration is enabled.
    - Max. 50 entries
  - Audit trail
    - Chronological log of all logbook entries without the data logbook but with the device history (see DIAG/Device information)
    - Here, you can navigate to each individual logbook entry, regardless of the type of logbook, and display the details.
    - Max. 200 entries

You can also define and activate a data logbook:

- SETUP/General settings/Logbooks/Data logbook
- The data logbook consists of the recorded measured values in the scan rate you defined including the associated time stamp.
- Max. 500 entries

## 2.7 Simulation, Resetting the measuring device

### 2.7.1 Simulation

You can output a simulated current value at the current output for test purposes.

The symbol for the simulation appears in the status bar of the display when the function is switched on: SIMU

**Path: DIAG/Service/Simulation**

Function	Display	Info
Current output 1		
Simulation	Options <ul style="list-style-type: none"> <li>▪ on</li> <li>▪ off</li> </ul> <b>Factory setting</b> off	<ul style="list-style-type: none"> <li>▪ <b>on:</b> The simulation value is output at current output 1. The simulation value continues to be output even if you exit the DIAG menu. If you want to switch back to having the system output the measured value, you have to set the "Simulation" to "Off".</li> <li>▪ <b>off:</b> The measured value, and not the simulation value, is output at current output 1.</li> </ul>
Simulation value	3.60 to 21.50 mA <b>Factory setting</b> 10.00 mA	
Current output 2		
Simulation	Options <ul style="list-style-type: none"> <li>▪ on</li> <li>▪ off</li> </ul> <b>Factory setting</b> off	<ul style="list-style-type: none"> <li>▪ <b>on:</b> The simulation value is output at current output 2. The simulation value continues to be output even if you exit the DIAG menu. If you want to switch back to having the system output the measured value, you have to set the "Simulation" to "Off".</li> <li>▪ <b>off:</b> The measured value, and not the simulation value, is output at current output 2.</li> </ul>
Simulation value	3.60 to 21.50 mA <b>Factory setting</b> 10.00 mA	

**2.7.2 Reset and factory settings**

Each of the following functions causes the device to be restarted.

**NOTICE****Factory default or customer factory default**

All user-specific changes in the configuration are lost

- ▶ Make a backup of your configuration on an optional CopyDAT (CY42-C1).
- ▶ Only select "Factory default" or "Customer factory default" if you do not need the modified settings with user-specific changes or have saved them beforehand.

**Path: DIAG / Service**

Function	Display	Info
Device restart	Options <ul style="list-style-type: none"> <li>▪ Abort action</li> <li>▪ Device restart</li> </ul> <b>Factory setting</b> Abort action	Restart the device and keep all the settings



Path: DIAG / Service

Function	Display	Info
Factory default	Options <ul style="list-style-type: none"> <li>▪ Abort action</li> <li>▪ Factory default</li> </ul> <b>Factory setting</b> Abort action	The device is restarted and all the customer-specific settings are reset to the factory default values.
Cust. fact. default	Options <ul style="list-style-type: none"> <li>▪ Abort action</li> <li>▪ Cust. fact. default</li> </ul> <b>Factory setting</b> Abort action	The device is restarted and all the settings are reset to the original, <b>optionally</b> ordered settings

## 2.8 Sensor status

The device displays the cell constant and the related quality, i.e. to what extent it deviates from the ideal value.

You also see the sensor operating time.

From the information displayed, you can see whether and when you must schedule maintenance measures for the sensor, whether the sensor has to be calibrated shortly or whether you will have to replace the sensor soon.

You can display the values graphically (as a bar graph) or numerically (selection using soft keys).



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Abb. 2: Graphic display of the sensor status (example)

- 1 Cell constant: value is within an acceptable range
- 2 Operating time: specified duration exceeded: error is displayed

**i** You can set warning and alarm limits in the "SETUP/Sensor conductivity/Sensor diagnostics" menu.

## 2.9 Output state

The current value and the output variable are displayed for each current output.

You can select the output variable to be displayed in the "SETUP/Current output" menu.

**i** The current output range is displayed for information purposes only. It is fixed at 4 to 20 mA.

## 2.10 Device information

Information in the following categories is displayed:

- Identification  
Information on the device identifier, e.g. serial number, order code, device version and bus address
- CPU  
Identification of the installed CPU module, e.g. serial number, order code, hardware and firmware versions
- Sensor module  
Identification of the installed sensor module, e.g. serial number, order code, hardware and firmware version
- Current output  
Identification of the current output, e.g. serial number, order code, hardware and firmware version
- Display  
Identification of the installed display module, e.g. serial number, order code, hardware and firmware version
- Device history  
"Hardware logbook"  
All the hardware and software changes made to the device can be read out with a time stamp and with detailed information on every entry.
  - Max. 10 entries concerning changes to the software version
  - Max. 25 entries concerning changes to the hardware, e.g. sensor change, module replacement etc.

## 3 Maintenance

Only clean the front of the housing with commercially available cleaning agents.

The front is resistant to the following as per DIN 42 115:

- Ethanol (short periods)
- Diluted acids (max. 2% HCl)
- Diluted bases (max. 3% NaOH)
- Soap-based household cleaners

### **NOTICE**

#### **Prohibited cleaning agents**

Danger of damaging the housing surface or housing sealing.

- ▶ Never use concentrated mineral acids or bases for cleaning purposes.
- ▶ Never use organic cleaners such as acetone, benzyl alcohol, methanol, methylene chloride, xylene or concentrated glycerol cleaner.
- ▶ Never use high-pressure steam for cleaning purposes.

### 3.1 Maintenance of certified devices

Please note the following:

- Ex-certified devices may only be altered, maintained or repaired by qualified personnel or by the Service Team of the manufacturer.
- Make sure applicable standards, national Ex-area regulations and the safety instructions in the Operating Instructions and certificates are observed.
- Only use genuine spare parts from the manufacturer.
- When ordering spare parts, note the device designation on the nameplate. Parts can only be replaced by like parts.
- Only the manufacturer's Service Team may convert a certified device to another certified version.
- Document every repair and every conversion.

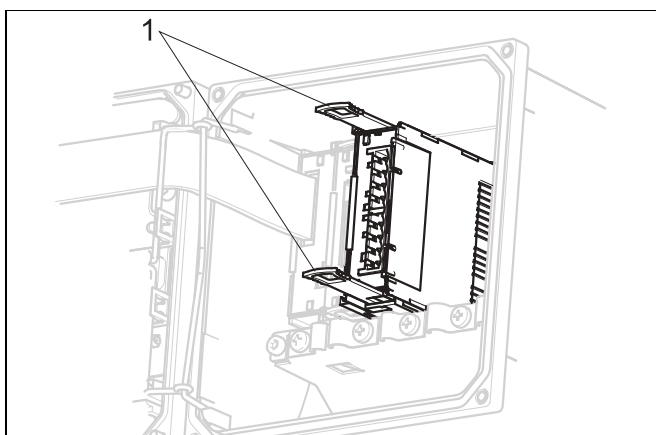
## 4 Repair

### 4.1 Spare parts

Contact your local sales center.

### 4.2 Replacing modules

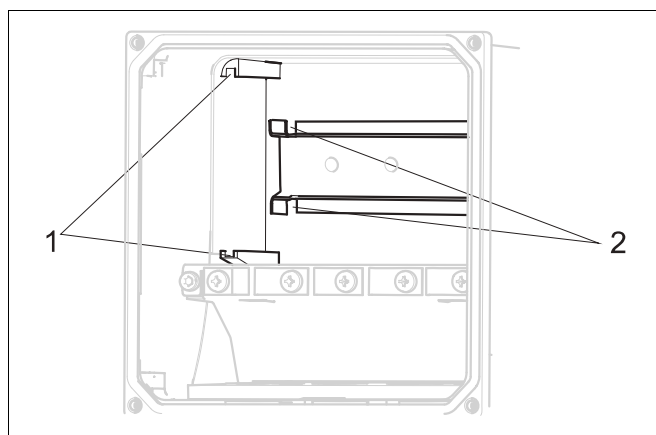
You change modules if you must replace defective modules or if you want to change the hardware configuration of your device.



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Fig. 3: Removing module

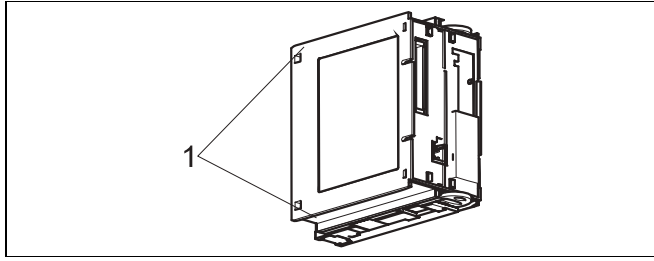
1 Removal aids



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Fig. 4: Housing guides

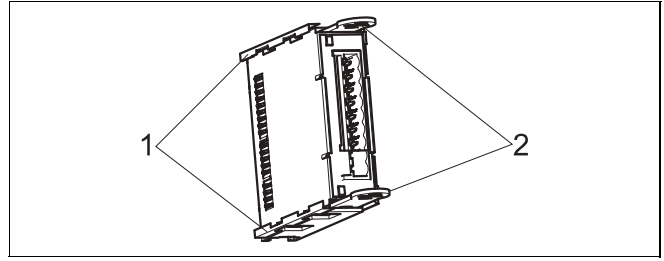
1 Guides on housing wall  
2 Guides in DIN rail



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Fig. 5: Module, left side (cable connections = front)





- 1 Guides (CPU module) to fit into the guides in housing



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Fig. 6: Module, right side (cable connection = front)

- 1 Guides (input module) to fit into the right-hand guides in the CPU module
- 2 Removal aids

1. Disconnect the transmitter from the power supply and open the housing.
2. Remove the cable connections from the module you want to replace.
3. Pull out the two removal aids on the module until the stop (→  3).
  - ↳ The module can now be easily removed from the DIN rail.
4. Slide the new module into the guides (→  4, →  5, →  6).
5. Push the two removal aids on the module in the direction of the DIN rail until the stop. This locks the module onto the DIN rail.
6. Connect the cables in accordance with the wiring diagram (see "Wiring").
7. Connect the sensor, close the housing, and check that the entire measuring system is working correctly.

### 4.3 Return

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

### 4.4 Disposal

The device contains electronic components and must therefore be disposed of in accordance with regulations on the disposal of electronic waste. Please observe local regulations.

## 5 Accessories

Contact your local sales center.

## 6 Technical data

### 6.1 Input

#### 6.1.1 Measured variables

→ Documentation of the connected sensor

#### 6.1.2 Measuring range

→ Documentation of the connected sensor

#### 6.1.3 Cable specification

Two-electrode sensor 10 $\mu\text{S}\cdot\text{k}$ to 20 $\text{mS}\cdot\text{k}$ / 0.1 $\text{M}\Omega/\text{k}$ to 50 $\Omega/\text{k}$ 5 $\mu\text{S}\cdot\text{k}$ to 20 $\text{mS}\cdot\text{k}$ / 0.2 $\text{M}\Omega/\text{k}$ to 50 $\Omega/\text{k}$ 0.1 $\mu\text{S}\cdot\text{k}$ to 20 $\text{mS}\cdot\text{k}$ / 20 $\text{M}\Omega/\text{k}$ to 50 $\Omega/\text{k}$	Max. cable length 100 m (330 ft) Max. cable length 50 m (160 ft) Max. cable length 15 m (50 ft)
Four-electrode sensor 10 $\mu\text{S}\cdot\text{k}$ to 1.5 $\text{S}\cdot\text{k}$ 0.1 $\mu\text{S}\cdot\text{k}$ to 20 $\text{mS}\cdot\text{k}$	Max. cable length 100 m (330 ft) Max. cable length 15 m (50 ft)

#### 6.1.4 Ex specification

Intrinsically safe sensor circuit with type of protection: Ex ia IIC	
Max. output voltage $U_o$	10.08 V
Max. loop current $I_o$	23 mA
Max. output performance $P_o$	57 mW
Max. outer inductance $L_o$	300 $\mu\text{H}$
Max. outer capacitance $C_o$	50 nF

### 6.2 Output

#### 6.2.1 Output signal

2x 4 to 20 mA, passive, potentially isolated from the sensor circuit and from one another

#### 6.2.2 Signal on alarm

3.6 to 21.5 mA

### 6.2.3 Load

Max. load with supply voltage of 24 V: 500  $\Omega$

Max. load with supply voltage of 30 V: 750  $\Omega$

### 6.2.4 Ex specification

### 6.2.5 Current output, passive

#### Span

3.6 to 21.5 mA

#### Signal characteristics

Linear / table

#### Cable specification

Cable type: shielded cable,  $\varnothing$  2.5 mm (14 AWG)

## 6.3 Electrical connection

### 6.3.1 Supply voltage and signal voltage

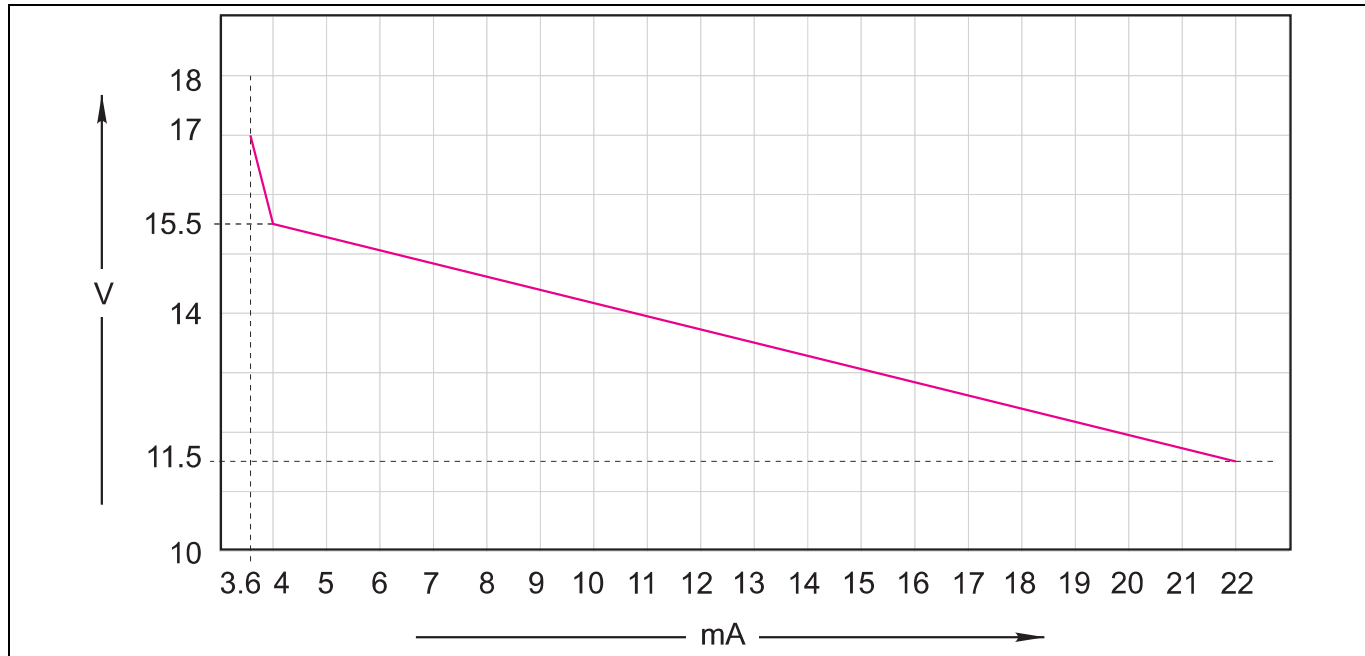


Fig. 7: Minimum supply voltage at the transmitter depending on the output current

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### 6.3.2 Certified cable glands

Cable gland	Clamping area, permitted cable diameter
M16 x 1.5 mm	3 to 6 mm (0.12 to 0.24")
M20 x 1.5 mm	5 to 9 mm (0.20 to 0.35")
M20 x 1.5 mm	6 to 12 mm (0.24 to 0.47")
NPT 3/8"	3 to 6 mm (0.12 to 0.24")
NPT 1/2"	5 to 9 mm (0.20 to 0.35")
NPT 1/2"	6 to 12 mm (0.24 to 0.47")
G3/8	3 to 6 mm (0.12 to 0.24")
G1/2	5 to 9 mm (0.20 to 0.35")
G1/2	9 to 12 mm (0.35 to 0.47")
Dummy plug M16	-
Dummy plug M20	-

#### NOTICE

##### Housing not sealed correctly, lack of strain relief

Dust can enter, cables can become loose, IP protection no longer guaranteed

- ▶ Make sure that cable glands cannot become loose and that the seals are installed close to the housing.
- ▶ Once you have routed the cables through the glands, tighten the cable glands and the associated nuts with a torque of 2 Nm to ensure the cables are secure.
- ▶ Pay attention to strain relief for the cables. Route the cables so that they are securely in place.
- ▶ Make sure that the cable entries and glands are leak-tight.

### 6.3.3 Cable cross-section

Max. cable cross-section: 2.5 mm<sup>2</sup> (h 14 AWG), GND 4 mm<sup>2</sup> (h 12 AWG)

## 6.4 Performance characteristics

### 6.4.1 Reference temperature

Standard 25 °C (77 °F)

Adjustable from -5 to 100 °C (23 to 212 °F)

### 6.4.2 Current output response time

$t_{90}$  = max. 500 ms for an increase from 4 to 20 mA

### 6.4.3 Measured value resolution

→ Documentation of the connected sensor

### 6.4.4 Maximum measured error

→ Documentation of the connected sensor

Current outputs, additional 25  $\mu$ A

### 6.4.5 Tolerance of current outputs

Current outputs, additional 25  $\mu$ A

### 6.4.6 Repeatability

→ Documentation of the connected sensor

### 6.4.7 Temperature compensation

Types of compensation	Range
None	
Linear	$\alpha = 0.00$ to $20.00 \text{ \%K}^{-1}$
NaCl to IEC 746-3	0 to 100 °C (32 to 212 °F)
Natural waters to IEC 7888	0 to 35 °C (32 to 95 °F)
Ultrapure water NaCl	0 to 100 °C (32 to 212 °F)
Ultrapure water HCl (also for NH <sub>3</sub> )	0 to 60 °C (32 to 140 °F)
4 user-definable tables	

### 6.4.8 Temperature adjustment

Temperature offset	-5 to +5 °C (23 to 41 °F)
Temperature increase	0.9 to 1.1

## 6.5 Environment

### 6.5.1 Ambient temperature range

-20 to 50 °C (T6)

-20 to 55 °C (T4)

### 6.5.2 Storage temperature

-40 to 80 °C (-40 to 175 °F)



### 6.5.3 Electromagnetic compatibility

Interference emission and interference immunity to EN 61326-1: 2006, Category B (residential environments)

### 6.5.4 Degree of protection

IP66 / IP 67 / NEMA 4X

### 6.5.5 Relative humidity

10 to 95%, not condensing

### 6.5.6 Pollution degree

The product is suitable for pollution degree 3.

## 6.6 Mechanical construction

### 6.6.1 Weight

1.5 kg (3.3 lbs)

### 6.6.2 Material

Housing	PC-FR (polycarbonate, flame-retardant)
Housing seals	Foamed silicone, EPDM
Module housing	PC (polycarbonate)
Soft keys,	TPE
Cable mounting rail	Stainless steel 1.4301 (AISI 304)
Display panel	PC-FR (polycarbonate, flame-retardant)
Cable glands	PA (polyamide) V0 as per UL94
Dummy plugs M16 and M20	PA (polyamide) V0 as per UL94

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