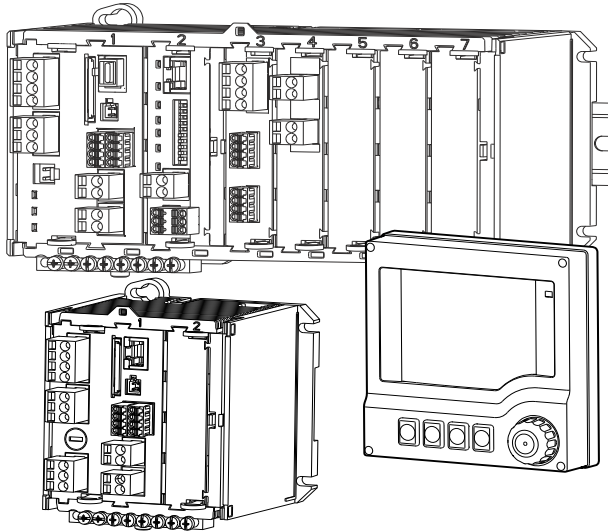


Operating Instructions

Liquiline

CM442R/CM444R/CM448R

Universal four-wire multichannel controller for
control cabinet installation
Maintenance & diagnostics



About this manual

This manual describes all the tasks you must perform for maintenance, diagnostics and repair.

A description of the following is provided here:

- General troubleshooting
- Overview of the diagnostic messages
- Description of the information in the "Diagnostics" menu
 - Diagnostics list
 - Logbooks
 - System information
 - Sensor information
 - Systemtest/Reset
- Maintenance
- Spare parts and accessories

This manual does not include the following:

For a description of the following menus, refer to the listed manuals.

- Display/Operation
 - > Operating Instructions BA01225C "Commissioning"
- Basic setup
 - > Operating Instructions BA01225C "Commissioning"
- Setup/General settings
 - > Operating Instructions BA00450C "Operation & settings"
- Inputs
 - > Operating Instructions BA00450C "Operation & settings"
- Outputs
 - > Operating Instructions BA00450C "Operation & settings"
- Additional functions
 - > Operating Instructions BA00450C "Operation & settings"
- Calibration
 - > Operating Instructions BA00451C "Calibration"
- Expert
 - > Internal Service Manual

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

1 Diagnostics and troubleshooting

The color of the display background changes to red if a diagnostics message for error category "F" occurs.

1.1 General troubleshooting

1.1.1 Troubleshooting

A diagnostic message appears on the display via the fieldbus indicating that the measured values are not plausible, or you identify a fault.

1. See the Diagnostics menu for the details on the diagnostic message.
 - ↳ Follow the instructions to rectify the problem.
2. If this does not help: Search for the diagnostic message under "Overview of diagnostic information" (→  16) in this manual. Use the message number as a search criterion. Ignore the letters indicating the Namur error category.
 - ↳ Follow the troubleshooting instructions provided in the last column of the error tables.
3. If the measured values are implausible, the onsite display is faulty or you encounter other problems, search for the faults under "Process errors without messages" (→  4) or "Device-specific errors" (→  12).
 - ↳ Follow the recommended measures.
4. Contact the Service Department if you cannot rectify the error yourself. Only cite the error number.

1.1.2 Process errors without messages

pH/ORP measurement

| Problem | Possible cause | Tests and/or remedial measures |
|---|------------------------------------|---|
| Display deviates 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. |
| Measuring chain zero-point cannot be adjusted | Contaminated reference system | Test with new sensor |
| | Junction clogged | Clean or grind junction |
| | Asymmetric sensor voltage too high | Clean junction or test with another sensor |

| Problem | Possible cause | Tests and/or remedial measures |
|---|--|--|
| No change or subtle change in display | <ul style="list-style-type: none"> - Sensor fouled - Sensor old - Sensor defective (reference lead) | Clean the sensor. |
| | Reference has low level of KCl | Check KCl supply: 0.8 bar (12 psi) over medium pressure |
| Measuring chain slope: <ul style="list-style-type: none"> - Cannot be adjusted - To low - No slope | Device input defective | Check device directly. |
| | <ul style="list-style-type: none"> - Sensor old - Hair-line crack in the glass membrane | Renew sensor. |
| Constant, incorrect measured value | Sensor does not immerse properly or protection cap not removed | Check installation position, remove protection cap. |
| | Air pockets in assembly | Check assembly and orientation. |
| | Ground fault at or in device | Perform test measurement in isolated vessel, with buffer solution if applicable. |
| | Hair-line crack in the glass membrane | Renew sensor. |
| | Device in impermissible operating condition (does not respond when key pressed) | Switch off device and switch it on again. |
| Incorrect temperature value | Sensor defective | Replace sensor |
| Fluctuations in measured value | 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. |
| 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 load and reduce it to the permitted value if necessary (--> Technical data, Operating Instructions "Commissioning"). |
| | EMC (interference coupling) | Check wiring. Identify and eliminate cause of interference. |

Conductivity measurement

| Problem | Possible cause | Tests and/or remedial measures |
|--|---|---|
| Display deviates 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 deviates from reference measurement | Polarization fields | Use suitable sensor: <ul style="list-style-type: none"> ▪ Larger cell constant ▪ Graphite instead of stainless steel (observe material resistance properties) |
| Implausible measured values: <ul style="list-style-type: none"> – 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. |
| | 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. |
| | Air pockets in assembly | Check assembly and orientation. |
| | Ground fault at or in device | Measure in isolated vessel. |
| Device in impermissible operating condition (does not respond when key pressed) | Switch off device and switch it on again. | |
| Incorrect temperature value | Sensor defective | Replace sensor |

| 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"> - Gas bubble trap - Creating counterpressure (orifice plate) - Measurement in bypass |
| | Flow rate too high (can lead to 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). |
| Fluctuations in measured value | 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. |
| | 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 load and reduce it to the permitted value if necessary (--> Technical data, Operating Instructions "Commissioning"). |
| | EMC (interference coupling) | Check wiring. Identify and eliminate cause of interference. |

Oxygen measurement

| Problem | Possible cause | Tests and/or remedial measures |
|-----------------------|------------------------------|--|
| Display value - - - - | Sensor defective | Test with new sensor |
| | Sensor cable disconnected | Check cable or cable extension. |
| | Incorrect sensor connection | Check the connection at the input module (--> BA "Commissioning", "Wiring" section). |
| | Electronics module defective | Replace the module. |

| Problem | Possible cause | Tests and/or remedial measures |
|---------------------------------------|--|---|
| No change or subtle change in display | <ul style="list-style-type: none"> - Sensor fouled - Sensor old (membrane) | <ul style="list-style-type: none"> ▪ Clean the sensor. ▪ If necessary: <ul style="list-style-type: none"> - Change electrolyte, change membrane cap (amperometric sensor) - Change fluorescence cap (optical sensor) |
| Constant, incorrect measured value | Device in impermissible operating condition (does not respond when key pressed) | Switch off device and switch it on again. |
| Measured value too low | Membrane fouled | Clean or replace cap |
| | Electrolyte exhausted or contaminated | Change electrolyte |
| | Anode coating worn | Repolarize sensor |
| | Black anode coating | Regenerate sensor in factory |
| Measured value too high | Air pocket under membrane | Clean sensor, optimize installation where necessary |
| | Polarization not complete | Wait until polarization time elapses (--> Technical data in sensor operating manual) |
| Implausible measured value | Incorrect temperature measurement | Check/correct value. |
| | Incorrect altitude setting | Incorrect calibration Reset and repeat calibration. |
| | Incorrect air pressure | |
| Incorrect temperature value | Incorrect sensor connection | Check the connection at the input module (--> BA "Commissioning", "Wiring" section). |
| | Temperature sensor defective | Replace sensor |
| Fluctuations in measured value | 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. |
| 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 load and reduce it to the permitted value if necessary. |
| | EMC (interference coupling) | Disconnect both output cables and measure directly at device. |

Chlorine measurement

| Problem | Possible cause | Tests and/or remedial measures |
|---|---|--|
| Display value - - - - | Sensor defective | Test with new sensor |
| | Sensor cable disconnected | Check cable or cable extension. |
| | Incorrect sensor connection | Check the connection at the input module (--> BA "Commissioning", "Wiring" section). |
| | Electronics module defective | Replace the module. |
| Slope too low | Sensor was in chlorine-free water or in air. | Short conditioning over (not in!) chlorine bleach, wait for adjustment time in water to elapse before calibration. |
| Values do not match the DPD control measurement | Measurement is performed without pH compensation while DPD measurement is always buffered to pH 6.3. | Measure the chlorine value with pH compensation |
| DPD measured value far too high | Organic chlorination agents (possibly also only used temporarily or for shock chlorination). In this instance, no correlation between actual free available chlorine, DPD measurement and amperometric measurement. DPD value up to 5 times too high. | Use free (gaseous) chlorine or chlorine from inorganic chlorine compounds. |
| Chlorine value too high | Membrane defective | Replace membrane cap |
| | Polarization not complete | Wait for the polarization time to elapse |
| | Alien oxidizing agents | Analyze medium |
| | Shunt in chlorine sensor | Replace sensor |
| Chlorine value too low | Measuring chamber not closed | Refill and screw closed carefully |
| | Air bubble outside in front of membrane | Remove air bubble, select a better installation position if possible. |
| | Air bubble inside membrane | Refill and screw closed so that it is air-free |
| No change or subtle change in display | Sensor fouled | Clean sensor |
| | Sensor old | Replace sensor |
| | Sensor defective (ref. lead) | Replace sensor |
| Constant, incorrect measured value | Sensor does not immerse properly or protection cap not removed | Check installation position, remove protection cap |
| | Air pockets in assembly | Check assembly and orientation |
| No current output signal | Cable disconnected or short-circuited | Disconnect cable and measure directly at device. |
| | Output defective | See "Device-specific errors" section. |

| Problem | Possible cause | Tests and/or remedial measures |
|---------------------------------|-------------------------------------|--|
| Fixed current output signal | Current simulation active | Switch off simulation. |
| Incorrect current output signal | Total load in current loop too high | Measure the load and reduce it to the permitted value if necessary (--> Technical data, Operating Instructions "Commissioning"). |
| | EMC (interference coupling) | Check wiring. Identify and eliminate cause of interference. |

Measurement with ion-selective sensors

| Problem | Possible cause | Tests and/or remedial measures |
|---|--|--|
| Temperature value always 20 °C or incorrect | <ul style="list-style-type: none"> - Temperature sensor not connected or connected incorrectly - Temperature sensor defective - Cable to temperature sensor defective | <ul style="list-style-type: none"> - Check temperature sensor and replace where necessary - Replace the cable |
| Display values deviate from reference measurement | Incorrect calibration | Repeat the calibration. Where necessary, check and repeat the calibration with the reference device. |
| | Electrode connected to the wrong slot | Compare terminal assignment to setting on transmitter |
| | Electrodes fouled | Clean the electrodes. |
| | Incorrect temperature measurement | Check the temperature measured values of both devices. |
| | Temperature compensation | Check the settings for temperature compensation and adjustment for both devices. |
| | pH compensation (only for ammonium), pH measurement | Check the settings and the pH measurement if necessary. |
| No change or subtle change in display | <ul style="list-style-type: none"> - Electrodes fouled - Electrodes too old - Electrodes defective | <ul style="list-style-type: none"> - Clean the electrodes - Replace membrane cap and electrolyte - Replace the electrodes |
| Measured value drift | Reference of pH electrode defective | Replace the pH electrode |
| | Contamination of reference electrode or ion-selective electrodes | Application problem |
| Constant, incorrect measured value | Sensor does not immerse properly or protection cap of the pH electrode not removed | Check installation position, remove protection cap. |
| | Air bubble in the electrode between membrane and inner terminal leads | Tap the electrolyte in the electrode towards the membrane |
| | Membrane cap or electrode defective | Replace the membrane cap or electrode. |

| Problem | Possible cause | Tests and/or remedial measures |
|--|--|---|
| Measuring chain zero-point not stable and cannot be adjusted | Sensor does not immerse properly or protection cap of the pH electrode not removed | Check installation position, remove protection cap. |
| | Air bubble in the electrode between membrane and inner terminal leads | Tap the electrolyte in the electrode towards the membrane |
| | Membrane cap or electrode defective | Replace the membrane cap or electrode. |
| | Electrodes contaminated | Test with new electrodes |
| | Reference of pH electrode used | Replace the pH electrode |
| | Electrode connected to the wrong slot | Compare terminal assignment to setting on transmitter |
| Display fluctuates greatly | Air bubbles in the electrodes | Tap the electrolyte in the electrode towards the membrane |
| Fluctuations in measured value | 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. |
| 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 load and reduce it to the permitted value if necessary (-> Technical data, Part 1). |

Turbidity, SAC and nitrate measurement

| Problem | Possible cause | Tests and/or remedial measures |
|---------------------------------------|---|---|
| Display value - - - - | Sensor defective | Test with new sensor |
| | Sensor cable disconnected | Check cable or cable extension. |
| | Incorrect sensor connection | Check the connection at the input module (-> BA "Commissioning", "Wiring" section). |
| | Electronics module defective | Replace the module. |
| No change or subtle change in display | Sensor fouled | Clean the sensor. |
| Constant, incorrect measured value | Device in impermissible operating condition (does not respond when key pressed) | Switch off device and switch it on again. |

| Problem | Possible cause | Tests and/or remedial measures |
|---|---|--|
| Implausible measured value | Sensor not calibrated or incorrectly calibrated | Calibration with original sample might be necessary for concentration or solids content. |
| | Sensor fouled | Clean sensor |
| | Sensor installed in "dead zone" or air pocket in assembly or flange | Check installation position, move sensor to area that receives good flow. Pay attention when mounting in horizontal pipes |
| | Incorrect sensor orientation | Align sensor: <ul style="list-style-type: none"> ■ Normal media: Direct flow to measuring window ■ For high solids content: Align measuring window at angle of 90° to flow |
| Incorrect temperature value | Incorrect sensor connection | Check the connection at the input module (--> BA "Commissioning", "Wiring" section). |
| | Temperature sensor defective | Replace sensor |
| Fluctuations in measured value | Interference on signal output cable | Check cable routing, route cable separately if necessary. |
| | Irregular flow / turbulence / air bubbles / large solid particles | Select a better mounting location or reduce turbulence, use a large measured value damping factor if necessary Set gas bubble threshold to 100 % |
| 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 load and reduce it to the permitted value if necessary. |
| | EMC (interference coupling) | Disconnect both output cables and measure directly at device. |
| Value switches to zero and back to measured value | Air bubbles | Do not mount sensor above aeration discs |

1.1.3 Device-specific errors

| Problem | Possible cause | Tests and/or remedial measures |
|---|---|---|
| Dark display (only with optional display) | No supply voltage | Check if supply voltage applied. |
| | Display connector incorrectly connected | Check. Must be inserted into RJ45 socket on basic module. |
| | Basic module defective | Replace basic module |

| 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 off device and switch it on again. |
| Implausible measured values | Inputs defective | First perform tests and take measures as outlined in "Process-specific errors" section Measuring input test: – Connect the Memocheck Sim CYP03D to the input and use this to test its function. |
| Current output, incorrect current value | Incorrect adjustment | Check with integrated current simulation, connect mA meter directly to current output. |
| | Load too large | |
| | Shunt / short to ground in current loop | |
| No current output signal | Basic module defective | Check with integrated current simulation, connect mA meter directly to current output. |

1.2 Diagnostic information on onsite display (optional)

Up-to-date diagnostic events are displayed along with their status category, diagnostic code and short text. Clicking on the Navigator lets you retrieve more information and tips on remedial measures.

1.3 Diagnostic information via web browser

The same information as for the onsite display is available via the web server.

1.4 Diagnostic information via fieldbus

Diagnostic events, status signals and more information are transmitted according to the definitions and technical capability of the respective fieldbus systems


1.5 Adjusting diagnostic information

1.5.1 Classification of diagnostics messages

More detailed information on the current diagnostics messages displayed is provided in the DIAG/Diagnostics list menu.

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
 - **M** = (Maintenance required) Action should be taken as soon as possible
 - **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 its specification
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.
- 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.

1.5.2 Adjusting diagnostic behavior

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 diagnostics message can be disabled.

Example

The controller returns diagnostics message 531 "Logbook full". You want to change this message so that an error is not indicated on the display for example.

1. Go to:
 - Menu/Setup/General settings/Extended setup/Diagnostics/Device behavior
for device-specific diagnostics messages (as in this example)
 - Menu/Setup/Inputs/<sensor type>/Extended setup/Diagnostics settings/Diag.
behavior
for sensor-specific diagnostics messages.
2. Select the diagnostics message and press the navigator button.
3. Decide:
 - a. Should the message be deactivated?
 - b. Do you want to change the error category?
 - c. Should an error current be output?
 - d. Do you want to trigger a cleaning program?
4. Deactivate the message, for example (Diagnostics message to "Off").

Possible settings

The list of diagnostic messages displayed depends on the path selected. There are device-specific messages, and messages that depend on what sensor is connected.

Path: ... /Extended setup/Diagnostics settings/Diag. behavior

| Function | Options | Info |
|-----------------------------|---|--|
| List of diagnostic messages | | Select the message to be changed. Only then can you make the settings for this message. |
| Diag. code | Read only | |
| Diagnostic message | Options <ul style="list-style-type: none"> ▪ On ▪ Off Factory setting Depends on the message | You can deactivate or reactivate a diagnostics message here. Deactivating means: <ul style="list-style-type: none"> ▪ No error message in the measuring mode ▪ No error current at the current output |
| Error current | Options <ul style="list-style-type: none"> ▪ On ▪ Off Factory setting Depends on the message | Decide whether an error current should be output at the current output if the diagnostic message display is activated. |
| Status signal | Options <ul style="list-style-type: none"> ▪ Maintenance (M) ▪ Out of specification (S) ▪ Function check (C) ▪ Failure (F) Factory setting Depends on the message | The messages are divided into different error categories in accordance with NAMUR NE 107. Decide whether you want to change a status signal assignment for your application. |
| Diag. output | Options <ul style="list-style-type: none"> ▪ None Factory setting None | Before you can assign the message to an output, you must first configure a relay output to "Diagnostics" (Menu/Setup/Outputs, assign the "Diagnostics" function and set the Operating mode to "as assigned"). |
| Cleaning program | Options <ul style="list-style-type: none"> ▪ None ▪ Cleaning 1 ▪ Cleaning 2 ▪ Cleaning 3 ▪ Cleaning 4 Factory setting None | Decide whether the diagnostic message should trigger a cleaning program. You can define the cleaning programs under: Menu/Setup/Additional functions/Cleaning. |
| Detail information | Read only | Here you can find more information on the diagnostic message and instructions on how to resolve the problem. |

1.6 Overview of diagnostic information

1.6.1 Device-specific, general diagnostics messages

| No. | Message | Factory settings | | | Tests or remedial measures |
|-----|------------------|------------------|--------------|---------------|---|
| | | Cat. | Diag. on/off | Error current | |
| 202 | Selftest active | F | On | Off | Wait for self-test to be finished |
| 216 | Hold active | C | On | Off | Output values and status of the channel are on hold |
| 241 | Device error | F | On | On | Internal device error 1. Update the software 2. Contact the Service Department 3. Replace the backplane (Service) |
| 242 | Software incomp. | F | On | On | |
| 243 | Device error | F | On | On | |
| 261 | Electr. module | F | On | On | Electronics module defective 1. Replace the module 2. Contact the Service Department |
| 263 | Electr. module | F | On | On | Wrong kind of electronics module 1. Replace the module 2. Contact the Service Department |
| 284 | Firmware update | M | On | Off | Update completed successfully |
| 285 | Update error | F | On | On | Firmware update failed 1. Repeat update 2. SD card error --> use another card 3. Incorrect firmware --> repeat with suitable firmware 4. Contact the Service Department |
| 302 | Battery low | M | On | Off | Buffer battery of real time clock is low The date and time are lost if the power is interrupted. --> Contact the Service Department (battery replacement) |
| 304 | Module data | F | On | On | At least 1 module has incorrect configuration data 1. Check the system information 2. Contact the Service Department |
| 305 | Power consum. | F | On | On | Total power consumption too high 1. Check installation 2. Remove sensors/modules |
| 306 | Software error | F | On | On | Internal firmware error --> Contact the Service Department |
| 370 | Intern. Voltage | F | On | On | Internal voltage outside the valid range --> Check supply voltage |
| 373 | Electr. temp. | M | On | Off | High electronics temperature --> Check ambient temperature and energy consumption |

| No. | Message | Factory settings | | | Tests or remedial measures |
|-----|------------------|------------------|--------------|---------------|---|
| | | Cat. | Diag. on/off | Error current | |
| 374 | Sensor check | F | On | Off | No measurement signal from sensor -> Check the sensor connection -> Check sensor, replace if necessary |
| 401 | Reset to default | F | On | On | Factory reset is performed |
| 406 | Param. active | C | Off | Off | --> Wait for configuration to be finished |
| 407 | Diag. active | C | Off | Off | --> Wait for maintenance to be finished |
| 412 | Writing backup | F | On | Off | --> Wait for the write process to be finished |
| 413 | Reading backup | F | On | Off | --> Wait |
| 460 | Curr. under-run | S | On | Off | Reasons |
| 461 | Current exceeded | S | On | Off | <ul style="list-style-type: none"> ■ Sensor in air ■ Air pockets in assembly ■ Sensor fouled ■ Incorrect flow to sensor Measures <ol style="list-style-type: none"> 1. Check sensor installation 2. Clean sensor 3. Adjust assignment of current outputs |
| 462 | Output Deviation | S | On | Off | When the current output is read back, the value deviates from the target value displayed. Possible reasons: Current load outside specification, short-circuit or open current loop, module defective <ol style="list-style-type: none"> 1. Check installation of current loop 2. Check module 3. Contact the Service Department |
| 502 | No text catalog | F | On | On | --> Contact the Service Department |
| 503 | Language change | M | On | Off | Language change failed --> Contact the Service Department |
| 530 | Logbook at 80% | M | On | Off | <ol style="list-style-type: none"> 1. Save the logbook to the SD card and then delete the logbook in the device 2. Set memory to ring memory 3. Deactivate logbook |
| 531 | Logbook full | M | On | Off | |
| 532 | License error | M | On | Off | --> Contact the Service Department |
| 540 | Parameter save | M | On | Off | Configuration saving has failed, --> repeat |
| 541 | Parameter load | M | On | Off | Configuration successfully loaded |
| 542 | Parameter load | M | On | Off | Configuration loading has failed, --> repeat |
| 543 | Parameter load | M | On | Off | Configuration loading aborted |
| 544 | Parameter reset | M | On | Off | Factory default successful |
| 910 | Limit switch | S | On | Off | Limit switch activated |

| No. | Message | Factory settings | | | Tests or remedial measures |
|-----|-----------------------------|------------------|--------------|---------------|---|
| | | Cat. | Diag. on/off | Error current | |
| 921 | Pump bracket | F | On | On | The pump bracket is detected as open. <ul style="list-style-type: none"> ■ Pump bracket open ■ Reed contact defective -> Close the pump bracket -> Contact the Service Department |
| 969 | Modbus Watchdog | S | Off | Off | The device did not receive a Modbus telegram from the master within the specified time. The status of modbus process values received is set to invalid. |
| 970 | Input Overload | S | On | On | Current input overloaded The current input is switched off from 23 mA due to overload and reactivated automatically when a normal load is present. |
| 971 | Input low | S | On | On | Current input too low At 4 to 20 mA, the input current is less than the lower error current -> Check the input for short-circuits. |
| 972 | Input > 20 mA | S | On | On | Current output range exceeded |
| 973 | Input < 4 mA | S | On | On | Current output range undershot |
| 974 | Diag. confirmed | C | Off | Off | User has acknowledged the message displayed in the measuring screen. |
| 975 | Device reset | C | Off | Off | Device reset |
| 976 | PFM value high | S | On | Off | Pulse frequency modulation: output signal exceeded/undershot. Measured value outside the specified range. Reasons: sensor in air, air pockets in assembly, incorrect flow to sensor, sensor fouled 1. Clean sensor 2. Check plausibility 3. Adjust the PFM configuration. |
| 977 | PFM value low | S | On | Off | |
| 990 | Deviation limit | F | On | On | Redundancy: limit value of percentage deviation exceeded |
| 991 | CO ₂ conc. range | F | On | On | CO ₂ concentration (degassed conductivity) outside the measuring range |
| 992 | pH calc range | F | On | On | pH calculation outside the measuring range |
| 993 | rH calc range | F | On | On | rH calculation outside the measuring range |
| 994 | Dual cond range | F | On | On | Dual conductivity outside the measuring range |

1.6.2 Sensor-specific diagnostics messages

Abbreviations used for sensor types

- P ... pH/ORP (general)
 - P (glass) ... glass electrode
 - P (ISFET) ... ISFET sensor
- C ... Conductivity (general)
 - C (cond.) ... Conductive sensor
 - C (ind.) ... Inductive sensor
- O ... Oxygen (general)
 - O (opt.) ... Optical sensor
 - O (amp.) ... Amperometric sensor
- N ... Nitrate
- T ... Turbidity and solids
- S ... SAC
- U ... Interface
- I ... ISE
- Cl ... Chlorine

| No. | Message | Factory settings | | | Sensor type | Tests or remedial measures |
|-----|------------------|------------------|-------|---------------|----------------|--|
| | | Cat. | Diag. | Error current | | |
| 002 | Sensor unknown | F | On | On | All | Replace sensor |
| 004 | Sensor problem | F | On | On | All | |
| 005 | Sensor data | F | On | On | All | Sensor data invalid <ol style="list-style-type: none"> 1. Check the firmware compatibility for the sensor and transmitter, load suitable firmware if necessary 2. Reset the sensor to factory setting, disconnect the sensor and reconnect it 3. Update the transmitter date 4. Replace sensor |
| 010 | Sensor scanning | F | Off | On | All | Wait for initialization to be finished |
| 012 | Writing data | F | On | On | All | Could not write sensor data <ol style="list-style-type: none"> 1. Repeat write process 2. Replace sensor |
| 013 | Sensor type | F | On | On | All | Replace sensor, making sure correct sensor type is used |
| 018 | Sensor not ready | F | On | On | All | Sensor communication blocked <ol style="list-style-type: none"> 1. Sensor fails tag check. Replace. 2. Internal software error. Contact Service Department |
| 022 | Temp. sensor | F | On | On | P, C, O, I, Cl | Temperature sensor defective Replace sensor |

| No. | Message | Factory settings | | | Sensor type | Tests or remedial measures |
|-----|------------------|------------------|-------|---------------|----------------|--|
| | | Cat. | Diag. | Error current | | |
| 061 | Sensor electr. | F | On | On | All | Sensor electronics defective Replace sensor |
| 062 | Sensor connect. | F | On | On | All | 1. Check sensor connection 2. Contact the Service Department |
| 081 | Initialization | F | On | On | All | Wait for initialization to be finished |
| 100 | Sensor comm. | F | On | On | All | Sensor not communicating 1. Check sensor connection 2. Check sensor plug 3. Contact the Service Department |
| 101 | Sensor incompat. | F | On | On | All | 1. Update the sensor firmware 2. Replace sensor 3. Contact the Service Department |
| 102 | Calib. Timer | M | On | Off | All | Calibration interval elapsed. Measurement can still take place. Calibrate sensor |
| 103 | Calib. timer | M | On | Off | All | Calibration interval will elapse soon. Measurement can still take place. Calibrate sensor |
| 104 | Calib. validity | M | On | Off | All | Validity of last calibration expired. Measurement can still take place. Calibrate sensor |
| 105 | Calib. validity | M | On | Off | All | Validity of last calibration will expire soon. Measurement can still take place. Calibrate sensor |
| 106 | Sensor TAG | F | On | On | All | Sensor has invalid tag or tag group 1. Replace sensor 2. Use new sensor with identical design 3. Deactivate tag check |
| 107 | Calib. active | C | On | Off | P, C, O, I, Cl | Wait for calibration to be finished |
| 108 | Sterilization | M | On | Off | P, C, O | Specified number of sterilizations will soon be reached. Measurement can still take place. Replace sensor |
| 109 | Sterilizat. cap | M | On | Off | O (amp.) | Specified number of sterilizations for the cap is reached. Measurement can still take place. Replace membrane cap |
| 110 | Channel init. | F | On | On | All | Initialization of channel failed, operation is not possible --> Contact the Service Department |

| No. | Message | Factory settings | | | Sensor type | Tests or remedial measures |
|-----|------------------|------------------|-------|---------------|---------------------|--|
| | | Cat. | Diag. | Error current | | |
| 114 | Temp.offset high | M | On | Off | All except U | Calibration alarm: Limit values for temperature offset exceeded 1. Check temperature sensor 2. Replace sensor |
| 115 | Temp. offset low | M | On | Off | All except U | |
| 116 | Temp. slope high | M | On | Off | All except U | Calibration alarm: Limit values for temperature slope exceeded Sensor old or defective 1. Repeat calibration 2. Replace sensor |
| 117 | Temp. slope low | M | On | Off | All except U | |
| 118 | Sensor glass | F | On | On | P (glass) | Glass breakage warning, impedance of pH glass too low Measuring can continue until the alarm (118) occurs. 1. Inspect sensor for hair-line cracks and breakage 2. Check medium temperature 3. Replace sensor |
| 119 | Sensor check | M | On | Off | P (glass) | |
| 120 | Sensor reference | F | On | On | P (glass) | Reference warning, impedance of reference too low Measuring can continue until the alarm (120) occurs 1. Check reference for clogging/contamination 2. Clean reference/junction 3. Replace sensor |
| 121 | Sensor reference | M | On | Off | P (glass) | |
| 122 | Sensor glass | F | On | On | P (glass) | Impedance limit values exceeded/undershot Measuring can continue until the alarm (122, 124) occurs. 1. Inspect sensor for hair-line cracks and breakage 2. Check limit values and change where necessary 3. Replace sensor |
| 123 | Sensor glass | M | On | On | P (glass) | |
| 124 | Sensor glass | M | On | Off | P (glass) | |
| 125 | Sensor glass | F | On | On | P (glass) | |
| 126 | Sensor check | M | On | Off | P (glass) | Sensor condition check (SCC), poor sensor condition Glass membrane fouled or dry, junction blocked 1. Clean sensor, regenerate 2. Replace sensor |
| 127 | Sensor check | M | On | Off | P (glass) | Sensor condition check (SCC), adequate sensor condition |
| 128 | Sensor leakage | F | On | On | P (ISFET), O (amp.) | ISFET leak current alarm Defective due to gate abrasion or damage Replace sensor |

| No. | Message | Factory settings | | | Sensor type | Tests or remedial measures |
|-----|------------------|------------------|-------|---------------|------------------------|--|
| | | Cat. | Diag. | Error current | | |
| 129 | Sensor leakage | F | On | Off | P (ISFET), O (amp.) | ISFET leak current warning Measuring can continue until the alarm occurs |
| 130 | Sensor supply | F | On | On | P, O, I, Cl | Poor sensor power supply 1. Check sensor connection 2. Replace sensor |
| 131 | Sensor calib. | M | On | Off | O (opt.) | Limit values for sensor relaxation time (fluorescence decay time) exceeded/undershot Reasons: high oxygen content, incorrect calibration 1. Repeat calibration 2. Replace sensor cap 3. Replace sensor |
| 132 | Sensor calib. | M | On | Off | O (opt.) | |
| 133 | Sensor signal | F | On | On | O (opt.) | No signal (fluorescence decay) 1. Replace sensor cap 2. Contact the Service Department |
| 134 | Sensor signal | M | On | Off | O (opt.) | Low signal amplitude. Measurement can still take place. 1. Replace sensor cap 2. Contact the Service Department |
| 135 | Sensor temp. | S | On | On | O | Temperature outside specification 1. Check process 2. Check installation |
| 136 | Sensor temp. | S | On | On | O | |
| 137 | Sensor LED | F | On | On | O (opt.) | Sensor LED: no voltage Contact the Service Department |
| 138 | Sensor LED | F | On | On | O (opt.) | Sensor LED: no power Contact the Service Department |
| 140 | Sensor check | F | On | On | O | Sensor range errors Contact the Service Department |
| 141 | Polarization | F | On | On | C (cond.) | Polarization warning The measured value is distorted at high conductivity levels. Use a sensor with a larger cell constant |
| 142 | Sensor signal | F | On | On | C | No conductivity displayed Reasons: sensor in air, sensor defective 1. Check installation 2. Replace sensor |
| 143 | Sensor check | F | On | Off | C | Sensor self-test error 1. Replace sensor 2. Contact the Service Department |
| 144 | Cond. out of rng | S | Off | On | C | Conductivity outside the measuring range Use a sensor with a suitable cell constant |

| No. | Message | Factory settings | | | Sensor type | Tests or remedial measures |
|-----|------------------|------------------|-------|---------------|-------------|---|
| | | Cat. | Diag. | Error current | | |
| 146 | Sensor temp. | S | Off | Off | C, N, T, S | Temperature outside specification 1. Check temperature 2. Check measuring chain 3. Replace sensor type |
| 147 | Sensor check | F | On | On | C (ind.) | Coil transmission current too high Reasons: transmission coil short-circuit, inductance too low 1. Replace sensor 2. Contact the Service Department |
| 148 | Sensor check | F | On | On | C (ind.) | Coil transmission current too low Reasons: transmission coil interrupted, inductance too high 1. Replace sensor 2. Contact the Service Department |
| 149 | Sensor LED | F | On | On | T | Sensor LED error 1. Replace sensor 2. Contact the Service Department |
| 151 | Sensor buildup | F | On | On | T | Coating, high amount of fouling 1. Clean sensor 2. Replace sensor 3. Contact the Service Department |
| 152 | Sensor data | M | Off | Off | C (ind.) | No calibration data Perform air set calibration |
| 153 | Sensor failure | F | On | On | N, T, S | Sensor strobe lamp defective Reasons: deterioration, end of operating life, mechanical interference/vibration 1. Replace sensor 2. Contact the Service Department |
| 154 | Sensor data | M | Off | Off | C | Factory calibration is used Perform calibration |
| 155 | Sensor failure | F | On | On | N, T, S | Sensor defective Error with analog evaluation 1. Replace sensor 2. Contact the Service Department |
| 156 | organ. pollution | M | On | On | N, T, S | Excessive organic fouling Reasons: sensor fouling, high organic content, incorrect orientation 1. Clean sensor 2. Install automatic cleaning 3. Check application |
| 157 | Filter change | M | On | Off | N, S | Optical filter must be replaced Reasons: long period of operation, moisture in sensor 1. Replace sensor 2. Contact the Service Department |

| No. | Message | Factory settings | | | Sensor type | Tests or remedial measures |
|---|----------------|------------------|-------|---------------|-------------|---|
| | | Cat. | Diag. | Error current | | |
| 158 | Sensor check | F | On | On | N, T, S | Invalid measured value 1. Check sensor power supply 2. Restart device 3. Contact the Service Department |
| 159 | Sensor check | F | On | On | N, T, S | Uncertain measured value Reasons: sensor fouling, incorrect application 1. Clean sensor 2. Check application |
| 160 | Sensor data | F | On | On | N, T, S, Cl | No calibration data Reasons: data deleted 1. Select other data record 2. Use factory calibration 3. Contact the Service Department |
| 161 | Filter change | F | On | Off | N, T, S | Filter change necessary Reasons: long period of operation, moisture in sensor 1. Replace sensor 2. Contact the Service Department |
| 162 | Install.factor | M | On | Off | C (ind.) | Installation factor exceeded/undershot, alarm Reason: distance between wall and sensor too small (< 15 mm) 1. Check pipe diameter 2. Clean sensor 3. Calibrate sensor |
| 163 | Install.factor | M | On | Off | C (ind.) | |
| 164 | Sensor data | M | Off | Off | C | No temperature calibration data Factory calibration is used 1. Check process 2. Check sensor, replace if necessary |
| 168 | Polarization | S | On | Off | C (cond.) | Polarization warning The measured value is distorted at high conductivity levels. Use a sensor with a larger cell constant |
| 169 - 170: Warning issued by hours of operation monitoring system. Measurement can still take place. 1. Replace sensor 2. Adjust monitoring limit 3. Deactivate monitoring | | | | | | |
| 169 | Operating time | M | On | Off | S | Operating hours, conc. > 200 mg/l |
| 170 | Operating time | M | On | Off | S | Operating hours, conc. < 50 mg/l |
| 171 | Lamp change | M | On | Off | N, T, S | Need to change lamp 1. Replace sensor 2. Contact the Service Department |
| 172 | Echo lost | F | On | On | U | Echo signal lost |

| No. | Message | Factory settings | | | Sensor type | Tests or remedial measures |
|--|-----------------|------------------|-------|---------------|-------------|--|
| | | Cat. | Diag. | Error current | | |
| 173 | Sludge level | F | On | On | U | Incorrect interface measurement Replace sensor |
| 174 | Turbid. failure | F | On | On | U | Incorrect turbidity measurement. Replace sensor |
| 175 | Wiper failure | F | On | On | U | Wiper not working. Clean or replace sensor. |
| 176 - 199: Warning issued by hours of operation monitoring system. Measurement can still take place. | | | | | | |
| 1. Replace sensor | | | | | | |
| 2. Adjust monitoring limit | | | | | | |
| 3. UDeactivate monitoring | | | | | | |
| 176 | Operating time | M | On | Off | Cl | Operating hours > 100 nA |
| 177 | Operating time | M | On | Off | Cl | Operating hours > 20 nA |
| 178 | Operating time | M | On | Off | Cl | Operating hours > 15 °C |
| 179 | Operating time | M | On | Off | P | Operating hours > 300 mV |
| 180 | Operating time | M | On | Off | P | Operating hours < -300 mV |
| 181 | Operating time | M | On | Off | O (opt.) | Operating hours < 25 µS |
| 182 | Operating time | M | On | Off | O (opt.) | Operating hours > 40 µS |
| 183 | Operating time | M | On | Off | O (amp.) | Operating hours > 10 nA (COS51D) |
| 184 | Operating time | M | On | Off | O (amp.) | Operating hours > 30 nA (COS22D) |
| 185 | Operating time | M | On | Off | O (amp.) | Operating hours > 40 nA (COS51D) |
| 186 | Operating time | M | On | Off | O (amp.) | Operating hours > 160 nA (COS22D) |
| 187 | Operating time | M | On | Off | C | Operating hours > 80 °C, 100 nS/cm |
| 188 | Operating time | M | On | Off | C, O | Operating hours < 5 °C |
| 189 | Operating time | M | On | Off | O | Operating hours > 5 °C |
| 190 | Operating time | M | On | Off | O | Operating hours > 25 °C |
| 191 | Operating time | M | On | Off | O, I, Cl | Operating hours > 30 °C |
| 192 | Operating time | M | On | Off | O, I | Operating hours > 40 °C |
| 193 | Operating time | M | On | Off | P, C, O | Operating hours > 80 °C |
| 194 | Operating time | M | On | Off | P | Operating hours > 100 °C |
| 195 | Operating time | M | On | Off | C | Operating hours > 120 °C |
| 196 | Operating time | M | On | Off | C | Operating hours > 125 °C |
| 197 | Operating time | M | On | Off | C | Operating hours > 140 °C |

| No. | Message | Factory settings | | | Sensor type | Tests or remedial measures |
|--|----------------|------------------|-------|---------------|----------------|---|
| | | Cat. | Diag. | Error current | | |
| 198 | Operating time | M | On | Off | C | Operating hours > 150 °C |
| 199 | Operating time | M | On | Off | All except U | Total operating hours |
| 215 | Simul. active | C | On | Off | All | Simulation active End simulation by changing to measuring mode |
| 408 | Calib. aborted | M | Off | Off | P, C, O, I, Cl | Calibration aborted |
| 500 | Sensor calib. | M | On | Off | All | Calibration aborted, main measured value fluctuates Reasons: sensor too old, sensor occasionally dry, calibration value not constant 1. Check sensor 2. Check calibration solution |
| 501 | Sensor calib. | M | On | Off | All except U | Calibration aborted, temperature measured value fluctuates Reasons: Sensor too old, sensor occasionally dry, temperature of calibration solution not constant 1. Check sensor 2. Regulate calibration solution temperature |
| 505 - 522: Limit values of calibration monitoring system exceeded/undershot. Measuring can continue if a warning is issued. Possible reasons: sensor old or defective, reference blocked, calibration solution too old or contaminated 1. Check sensor, replace if necessary 2. Check calibration solution, replace if necessary 3. Repeat calibration | | | | | | |
| 505 | Sensor calib. | M | On | Off | P, O, I, Cl | Max. zero point warning |
| 507 | Sensor calib. | M | On | Off | P, O, I, Cl | Min. zero point warning |
| 509 | Sensor calib. | M | On | Off | P, O, I, Cl | Min. slope warning |
| 511 | Sensor calib. | M | On | Off | P, O, I, Cl | Max. slope warning |
| 513 | Zero Warn | M | On | Off | O (amp.), Cl | Zero point warning |
| 515 | Sensor calib. | M | On | Off | P (ISFET) | Max. operating point warning |
| 517 | Sensor calib. | M | On | Off | P (ISFET) | Min. operating point warning |
| 518 | Sensor calib. | M | On | Off | P, O, I, Cl | Delta slope warning |
| 520 | Sensor calib. | M | On | Off | P, O, I, Cl | Delta zero point warning |
| 522 | Sensor calib. | M | On | Off | P (ISFET) | Delta operating point warning |

| No. | Message | Factory settings | | | Sensor type | Tests or remedial measures |
|-----|------------------|------------------|-------|---------------|--------------|---|
| | | Cat. | Diag. | Error current | | |
| 523 | Sensor calib. | M | On | On | C | Invalid cell constant, max./min. value or lower/upper warning value reached 1. Calibrate sensor 2. Replace sensor |
| 524 | Sensor calib. | M | On | On | C | |
| 526 | Sensor calib. | M | On | Off | C | |
| 528 | Sensor calib. | M | On | Off | C | |
| 534 | Sensor calib. | M | On | Off | Cl | Set limit for electrolyte consumption is reached Measurement can still take place. 1. Replace the electrolyte 2. Clear the electrolyte consumption counter |
| 535 | Sensor check | M | On | Off | O (amp.), Cl | Specified number of cap calibrations is reached Measurement can still take place. Replace sensor cap |
| 550 | Process temp. | S | On | On | C | Process temperature above/below concentration table - Process value outside specification - Incomplete table --> Extend table |
| 551 | Process temp. | S | On | On | C | |
| 552 | Process conduc. | S | On | On | C | Process conductivity above/below concentration table - Process value outside specification - Incomplete table --> Extend table |
| 553 | Process conduc. | S | On | On | C | |
| 554 | Process conc. | S | On | On | C | Process concentration above/below concentration table - Process value outside specification - Incomplete table --> Extend table |
| 555 | Process concent. | S | On | On | C | |
| 556 | Process temp. | S | On | On | C | Process temperature above/below compensation table - Process value outside specification - Incomplete table --> Extend table |
| 557 | Process temp. | S | On | On | C | |
| 558 | Process conduc. | S | On | On | C | Process compensation above/below compensation table - Process value outside specification - Incomplete table --> Extend table |
| 559 | Process conduc. | S | On | On | C | |

| No. | Message | Factory settings | | | Sensor type | Tests or remedial measures |
|-----|------------------|------------------|-------|---------------|-------------|---|
| | | Cat. | Diag. | Error current | | |
| 560 | Proc.cond.comp | S | On | On | C | Conductivity compensation above/below compensation table – Process value outside specification – Incomplete table --> Extend table |
| 561 | Proc.cond.comp | S | On | On | C | |
| 720 | Membrane change | M | On | Off | I | Replacement of the membrane cap necessary 1. Replace membrane cap 2. Reset the timer |
| 722 | Sensor reference | F | On | On | P | Alarm: Reference membrane impedance too low. 1. Check sensor, replace if necessary 2. Check and correct the reference limit value |
| 723 | Sensor reference | M | On | Off | I | Warning: Reference membrane impedance too low. Measurement can continue until the alarm. 1. Check sensor, replace if necessary 2. Check and correct the reference limit value |
| 724 | Sensor reference | F | On | On | I | Alarm: Reference membrane impedance too high. 1. Check sensor, replace if necessary 2. Check and correct the reference limit value |
| 725 | Sensor reference | M | On | Off | I | Alarm: Reference membrane impedance too high. Measurement can continue until the alarm. 1. Check sensor, replace if necessary 2. Check and correct the reference limit value |
| 771 | Lamp change | F | On | Off | N, T, S | Lamp change alarm ■ Configured operating hours have been reached -> Replace the lamp -> Contact the Service Department |
| 841 | Operating range | S | Off | Off | All | Process value outside operational range 1. Check application 2. Check sensor |
| 842 | Process value | S | Off | Off | P | Process limit value exceeded/undershot Reasons: sensor in air, air pockets in assembly, incorrect flow to sensor, sensor defective 1. Change process value 2. Check measuring chain 3. Change sensor type |
| 843 | Process value | S | Off | Off | P | |

| No. | Message | Factory settings | | | Sensor type | Tests or remedial measures |
|-----|------------------|------------------|-------|---------------|--------------|---|
| | | Cat. | Diag. | Error current | | |
| 844 | Process value | S | Off | Off | N, T, S | Measured value outside specified range Reasons: sensor in air, air pockets in assembly, incorrect flow to sensor, sensor defective 1. Increase process value 2. Check measuring chain 3. Change sensor type |
| 904 | Process check | F | On | On | All | Stagnating measuring signal Reasons: sensor in air, sensor fouling, incorrect flow to sensor, sensor defective 1. Check measuring chain 2. Check sensor 3. Restart device |
| 914 | USP/ EP alarm | M | On | Off | C | USP limit values exceeded Check process |
| 915 | USP / EP warning | M | On | Off | C | |
| 934 | Process temp. | S | Off | Off | All except U | Process temperature high 1. Do not increase temperature 2. Check measuring chain 3. Change sensor type |
| 935 | Process temp. | S | Off | Off | All except U | Process temperature low 1. Do not reduce temperature 2. Check measuring chain 3. Change sensor type |
| 942 | Process value | S | Off | Off | All except U | Process value high 1. Do not increase process value 2. Check measuring chain 3. Change sensor type |
| 943 | Process value | S | Off | Off | All except U | Process value low 1. Do not decrease process value 2. Check measuring chain 3. Change sensor type |
| 944 | Sensor range | S | On | Off | S | Measurement at the margin of sensor's dynamic range. Reasons: Changes in the process to a higher or lower measuring range. 1. Check application 2. Use sensor suited to the measuring range of the application |
| 983 | Sensor ISE check | F | On | On | I | Electrode or membrane defective 1. Check electrode, replace if necessary 2. Check membrane cap, replace if necessary |
| 984 | Process temp. | S | On | On | I | Temperature outside specification 1. Check process temperature 2. Check measuring chain |

| No. | Message | Factory settings | | | Sensor type | Tests or remedial measures |
|-----|------------------|------------------|-------|---------------|-------------|---|
| | | Cat. | Diag. | Error current | | |
| 985 | Sensor Interface | F | On | On | I | Sensor interface error 1. Check plug 2. Check cable, replace if necessary |
| 987 | Calib. req. | M | On | On | I | Electrode change --> Calibration required |

1.6.3 Configuration options for troubleshooting

The table **only** lists the diagnostics messages that depend on your settings in the menu. The path where you can change the settings is specified in the table. The sensor type is also indicated in the path if the message **only** applies to one type of sensor. All other settings affect several sensor types.

| No. | Path to software function |
|-----|--|
| 102 | Menu/Setup/Inputs/Extended setup/Calib. settings/Calibration timer |
| 103 | Menu/Setup/Inputs/Extended setup/Calib. settings/Calibration timer/Calibration timer |
| 104 | Menu/Setup/Inputs/Extended setup/Calib. settings/Calib. expiration date/Alarm limit |
| 105 | Menu/Setup/Inputs/Extended setup/Calib. settings/Calib. expiration date/Warning limit |
| 108 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Sterilizations/Warning limit |
| 109 | Menu/Setup/Inputs/Oxygen (amp.)/Extended setup/Diagnostics settings/Number of cap sterilizations/Warning limit |
| 122 | Menu/Setup/Inputs/pH Glass/Extended setup/Diagnostics settings/Glass impedance (SCS)/Lower alarm limit |
| 123 | Menu/Setup/Inputs/pH Glass/Extended setup/Diagnostics settings/Glass impedance (SCS)/Lower warning limit |
| 124 | Menu/Setup/Inputs/pH Glass/Extended setup/Diagnostics settings/Glass impedance (SCS)/Upper alarm limit |
| 125 | Menu/Setup/Inputs/pH Glass/Extended setup/Diagnostics settings/Glass impedance (SCS)/Upper warning limit |
| 126 | Menu/Setup/Inputs/pH Glass/Extended setup/Diagnostics settings/Sensor Condition Check |
| 127 | Menu/Setup/Inputs/pH Glass/Extended setup/Diagnostics settings/Sensor Condition Check |
| 145 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Delta slope/Alarm limit |
| 157 | Menu/Setup/Inputs/Nitrate/Extended setup/Diagnostics settings/Limits operating hours/Filter change |
| 168 | Menu/Setup/Inputs/Cond c/Extended setup/Polarization detected |
| 169 | Menu/Setup/Inputs/SAC/Extended setup/Diagnostics settings/Limits operating hours/Operation > 200 mg/l |
| 170 | Menu/Setup/Inputs/SAC/Extended setup/Diagnostics settings/Limits operating hours/Operation < 50 mg/l |
| 176 | Menu/Setup/Inputs/Chlorine/Extended setup/Diagnostics settings/Limits operating hours |

| No. | Path to software function |
|-----|---|
| 178 | Menu/Setup/Inputs/Oxygen (amp.)/Extended setup/Diagnostics settings/Number of cap sterilizations/Alarm limit |
| 179 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Limits operating hours/Operation > 300 mV |
| 180 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Limits operating hours/Operation < -300 mV |
| 181 | Menu/Setup/Inputs/Extended setup/Oxygen (opt.)/Diagnostics settings/Limits operating hours/Operation < 25 µs |
| 182 | Menu/Setup/Inputs/Oxygen (opt.)/Extended setup/Diagnostics settings/Limits operating hours/Operation > 40 µs |
| 183 | Menu/Setup/Inputs/Oxygen (amp.)/Extended setup/Diagnostics settings/Limits operating hours/Operation > 15 nA |
| 184 | Operating time |
| 185 | Menu/Setup/Inputs/Oxygen (amp.)/Extended setup/Diagnostics settings/Limits operating hours/Operation > 50 nA |
| 186 | Operating time |
| 187 | Menu/Setup/Inputs/Cond c/Extended setup/Diagnostics settings/Limits operating hours/Operation > 80°C < 100nS/cm |
| 188 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Limits operating hours/Operation < 5°C |
| 190 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Limits operating hours/Operation > 25°C |
| 192 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Limits operating hours/Operation > 40°C |
| 193 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Limits operating hours/Operation > 80°C |
| 194 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Limits operating hours/Operation > 100°C |
| 195 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Limits operating hours/Operation > 120°C |
| 196 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Limits operating hours/Operation > 125°C |
| 197 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Limits operating hours/Operation > 140°C |
| 198 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Limits operating hours/Operation > 150°C |
| 199 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Limits operating hours/Operating time |
| 505 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Zero point/Upper warning limit |
| 507 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Zero point/Lower warning limit |
| 509 | Menu/Setup/Inputs/Oxygen (amp.)/Extended setup/Diagnostics settings/Slope/Lower warning limit |
| 511 | Menu/Setup/Inputs/Oxygen (amp.)/Extended setup/Diagnostics settings/Slope/Upper warning limit |
| 513 | Menu/Setup/Inputs/Oxygen (amp.)/Extended setup/Diagnostics settings/Zero point/Warning limit |
| 515 | Menu/Setup/Inputs/pH ISFET/Extended setup/Diagnostics settings/Operating point/Upper warning limit |
| 517 | Menu/Setup/Inputs/pH ISFET/Extended setup/Diagnostics settings/Operating point/Lower warning limit |
| 518 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Delta slope/Warning limit |

| No. | Path to software function |
|-----|--|
| 520 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Delta zero point/Warning limit |
| 522 | Menu/Setup/Inputs/pH ISFET/Extended setup/Diagnostics settings/Delta operating point/Warning limit |
| 842 | Menu/Setup/Inputs/Redox/Extended setup/Diagnostics settings/Redox-Meas value/Upper alarm limit |
| 843 | Menu/Setup/Inputs/Redox/Extended setup/Diagnostics settings/Redox-Meas value/Lower alarm limit |
| 904 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Process Check System |
| 934 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Limits operating hours |
| 935 | Menu/Setup/Inputs/Extended setup/Diagnostics settings/Limits operating hours |
| 942 | Menu/Setup/Inputs/Redox/Extended setup/Diagnostics settings/Redox-Meas value/Upper warning limit |
| 943 | Menu/Setup/Inputs/Redox/Extended setup/Diagnostics settings/Redox-Meas value/Lower warning limit |

1.7 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 message"
Diagnostics message recorded with the highest criticality level
- "Past message"
Diagnostic message whose cause is no longer present.

All the other functions in the Diagnostics menu are described in the following chapters.

1.8 Diagnostics list

All the current diagnostics messages are listed here.

A time stamp is available for each message. Furthermore, the configuration and the description of the message are displayed, as saved in "Menu/Setup/General settings/Diagnostics/Device behavior".

1.9 Event logbook

1.9.1 Available logbooks

Types of logbooks

- Logbooks physically available (all apart from the overall logbook)
- Database view of all logbooks (=overall logbook)

| Logbook | Visible in | Max. entries | Can be disabled ¹⁾ | Logbook can be deleted | Entries can be deleted | Can be exported |
|--------------------------|--|--------------|-------------------------------|------------------------|------------------------|-----------------|
| Overall logbook | All events | 1000 | Yes | No | Yes | No |
| Diagnostics logbook | Diagnostic events | 250 | (Yes) | No | Yes | Yes |
| Calibration logbook | Calibration events | 75 | (Yes) | No | Yes | Yes |
| Operation logbook | Configuration events | 250 | (Yes) | No | Yes | Yes |
| Version logbook | All events | 50 | No | No | No | Yes |
| Hardware version logbook | All events | 125 | No | No | No | Yes |
| Data logbook | Data logbooks | 150,000 | Yes | Yes | Yes | Yes |
| Debugging logbook | Only accessible with the special activation code (Service) | 1000 | Yes | No | Yes | Yes |

1) Data in brackets means this depends on the overall logbook

1.9.2 Menu Logbooks

Diagnostics/Logbooks


| Function | Options | Info |
|----------------------|---|---|
| ▶ All events | | Chronological list of all the logbook entries, with information on the type of event. |
| ▶ Show | Events are displayed | Select a particular event to display more detailed information. |
| ▶ Go to date | User input <ul style="list-style-type: none"> ■ Go to date ■ Time | Use this function to go directly to a specific time in the list. In this way, you avoid having to scroll through all the information. The complete list is always visible, however. |
| ▶ Calibration events | | Chronological list of the calibration events. |
| ▶ Show | Events are displayed | Select a particular event to display more detailed information. |

Diagnostics/Logbooks

| Function | Options | Info |
|------------------------|---|---|
| ▶ Go to date | User input <ul style="list-style-type: none"> ▪ Go to date ▪ Time | Use this function to go directly to a specific time in the list. In this way, you avoid having to scroll through all the information. The complete list is always visible, however. |
| ▷ Delete all entries | Action | You can delete all the calibration logbook entries here. |
| ▶ Configuration events | | Chronological list of the configuration events. |
| ▶ Show | Events are displayed | Select a particular event to display more detailed information. |
| ▶ Go to date | User input <ul style="list-style-type: none"> ▪ Go to date ▪ Time | Use this function to go directly to a specific time in the list. In this way, you avoid having to scroll through all the information. The complete list is always visible, however. |
| ▷ Delete all entries | Action | You can use this to delete all the operation logbook entries. |
| ▶ Diagnostic events | | Chronological list of the diagnostics events. |
| ▶ Show | Events are displayed | Select a particular event to display more detailed information. |
| ▶ Go to date | User input <ul style="list-style-type: none"> ▪ Go to date ▪ Time | Use this function to go directly to a specific time in the list. In this way, you avoid having to scroll through all the information. The complete list is always visible, however. |
| ▷ Delete all entries | Action | You can use this to delete all the diagnostics logbook entries. |

You can view your data logbook entries graphically on the display ("Show plot").

You can also adapt the display to suit your individual requirements:

- If you press the navigator button in the graphic display, you are given additional options such as the zoom function and x/y movement of the graph.
- Furthermore, you can also define a cursor. If you select this option, you can move along the graph with the navigator and view the logbook entry (data stamp/measured value) in text form for every point in the graph.
- Simultaneous display of two logbooks ("Select 2nd plot" and "Show plot"), →  1:
 - A small cross marks the currently selected graph for which the zoom can be changed or a cursor used, for example.
 - In the context menu (press the navigator button), you can select the other graph. You can then apply the zoom function, a movement or a cursor to this graph.
 - Using the context menu, you can also select both graphs simultaneously. This enables you, for example, to use the zoom function on both graphs simultaneously.

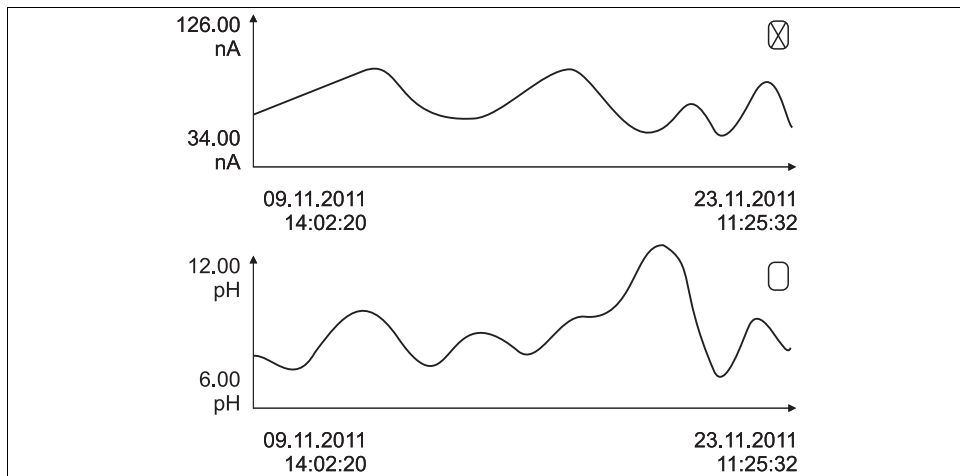



Fig. 1: Simultaneous display of two graphs, the upper one is "selected"

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Diagnostics/Logbooks

| Function | Options | Info |
|-------------------------------|--|---|
| ▶ Data logbooks | | Chronological list of the data logbook entries. |
| Data logbook 1 <Logbook name> | | This submenu is available for each data logbook that you have set up and activated. |
| Source of data | Read only | Input or mathematical function is displayed. |
| Measured value | Read only | Measured value being recorded is displayed. |
| Log time left | Read only | Display of days, hours and minutes until logbook is full. Please note the instructions regarding the selection of the storage type in the General settings/Logbooks menu (--> BA "Operation and settings"). |
| ▶ Show | Events are displayed | Select a particular event to display more detailed information. |
| ▶ Show plot | Graphic display of the logbook entries | The entries are displayed according to your settings in the General settings/Logbooks menu. |
| Select 2nd plot | Selecting another data logbook | You can view a second logbook at the same time as the current one. |
| ▶ Go to date | User input <ul style="list-style-type: none"> ▪ Go to date ▪ Time | Use this function to go directly to a specific time in the list. In this way, you avoid having to scroll through all the information. The complete list is always visible, however. |
| ▷ Delete all entries | Action | You can use this to delete all data logbook entries. |

Diagnostics/Logbooks

| Function | Options | Info |
|---|--|---|
| ▶ Save logbooks | | |
| File format | Options <ul style="list-style-type: none"> ▪ CSV ▪ FDM | Save the logbook in the preferred file format. You can then open the CSV file you saved on the PC in MS Excel, for example, and process it further ¹⁾ . You can import the FDM files into Fieldcare and archive them so they are tamper-proof. |
| <ul style="list-style-type: none"> ▷ All data logbooks ▷ Data logbook 1 to n ▷ All event logbooks ▷ Calibration logbook ▷ Diagnostic logbook ▷ Configuration logbook ▷ HW version logbook ▷ Version logbook | The action commences as soon as the option is selected | Use this function to save the logbook to an SD card. <ul style="list-style-type: none"> ▶ Insert the SD card into the device card reader and select the logbook to be saved. |
|  The file name is made up of the "Logbook ident" (Menu/Setup/General settings/Logbooks), an abbreviation for the particular logbook and a time stamp | | |

1) CSV files use international number formats and separators. Therefore they must be imported into MS Excel as external data with the correct format settings. If you double-click the file to open it, the data are only displayed correctly if MS Excel is installed with the US country setting.

1.10 Simulation

You can simulate values at inputs and outputs for testing purposes:

- Current values at current outputs
- Measured values at inputs

Diagnostics/Simulation

| Function | Options | Info |
|----------------------|---|---|
| ▶ Current output:x:y | | |
| Simulation | Options <ul style="list-style-type: none"> ▪ On ▪ Off Factory setting Off | If you simulate the value at the current output, this is indicated on the display by a simulation icon in front of the current value. |
| Current | 2.4 to 23.0 mA Factory setting 4 mA | Set the desired simulation value. |

Diagnostics/Simulation


| Function | Options | Info |
|------------------------------|---|---|
| ▶ Alarm relay ▶ Relay x:y | | Simulation of a relay state This menu appears once for each relay. |
| Simulation | Options <ul style="list-style-type: none"> ▪ On ▪ Off Factory setting Off | If you simulate the relay state, this is indicated on the display by a simulation icon in front of the relay display. |
| State | Options <ul style="list-style-type: none"> ▪ Low ▪ High Factory setting Low | Set the desired state. The relay switches in accordance with your setting when you switch on the simulation. The display shows "On" (= "Low") or "Off" (= "High") for the simulated relay state. |
| ▶ Meas. inputs | | Simulation of a measured value This menu appears once for each measuring input. |
| ▶ Channel : parameter | | |
| Sim. main value | Options <ul style="list-style-type: none"> ▪ On ▪ Off Factory setting Off | If you simulate the measured value, this is indicated on the display by a simulation icon in front of the measured value. |
| Main value | Depends on the sensor Factory setting Depends on the sensor | Set the desired simulation value. |
| Sim. temperature | Options <ul style="list-style-type: none"> ▪ On ▪ Off Factory setting Off | If you simulate the temperature measured value, this is indicated on the display by a simulation icon in front of the temperature. |
| Temperature | -50.0 to +250.0 °C (-58.0 to 482.0 °F) Factory setting 20.0 °C (68.0 °F) | Set the desired simulation value. |

1.11 Reset measuring instrument

Diagnostics/Systemtest/Reset

| Function | Options | Info |
|----------------|---|-----------------------------------|
| ▷ Device reset | Options <ul style="list-style-type: none"> ▪ OK ▪ ESC | Restart and keep all the settings |


Diagnostics/Systemtest/Reset

| Function | Options | Info |
|-------------------|---|---|
| ▷ Factory default | Options <ul style="list-style-type: none"> ▪ OK ▪ ESC | Restart with factory settings Settings that have not been saved are lost. |
| ▶ Power supply | Read only <ul style="list-style-type: none"> ▪ Digital Supply 1: 1.2V ▪ Digital Supply 2: 3.3V ▪ Analog Supply: 12.5V ▪ Sensor Supply: 24V ▪ Temperature | Detailed list of power supply to instrument.  The actual values can vary without a malfunction being present. |

1.12 Device information

1.12.1 System information

Diagnostics/System information

| Function | Options | Info |
|--|--|--|
| Device tag | Read only | Individual device tag, --> "General settings" |
| Order code | Read only | You can order identical hardware with this code. This code changes on account of changes to the hardware and you can enter the new code you received from the manufacturer here ¹⁾ .  To find out what device version you have, enter the order code in the search screen at the following address: www.products.endress.com/order-ident |
| Orig. order code ext. | Read only | Complete order code for the original device, resulting from the product structure. |
| Current order code ext. | Free text | Current code, taking into account changes to the hardware. You must enter this yourself. |
| Serial number | Read only | The serial number allows you to access device data and documentation on the Internet: www.products.endress.com/device-viewer |
| Software version | Read only | Current version |
| ▶ System modules | | |
| Depends on the electronics module available, e.g.: Base | Read only <ul style="list-style-type: none"> ▪ Description ▪ Serial number ▪ Order code ▪ Hardware version ▪ Software version | This information is provided for every electronics module available. Specify the serial numbers and order codes when servicing, for example. |

Diagnostics/System information

| Function | Options | Info |
|----------------------------------|--|--|
| ▶ Sensors | | |
| Depends on the sensors connected | Read only <ul style="list-style-type: none"> ▪ Description ▪ Serial number ▪ Order code ▪ Hardware version ▪ Software version | This information is provided for every sensor available. Specify the serial numbers and order codes when servicing, for example. |

1) Provided you give the manufacturer all the information about changes to the hardware.

1.12.2 Sensor information

Select the channel you want from the list of channels.

Information in the following categories is displayed:

- Extreme values
Extreme conditions to which the sensor was previously exposed, e.g. min./max. temperatures¹⁾
- Operating time
Operating time of the sensor under defined extreme conditions
- Calibration information
Calibration data of the last calibration
- Sensor specifications
Measuring range limits for main measured value and temperature
- General information
Sensor identification information

The specific data that are displayed depends on what sensor is connected.

1.13 Firmware history

| Date | Version | Changes to software | Documentation: edition |
|---------|----------|---------------------|--|
| 07/2013 | 01.04.00 | Original firmware | BA01225C/07/EN/01.13 BA01227C/07/EN/01.13 BA00450C/07/EN/17.13 BA00451C/07/EN/16.13 BA00486C/07/EN/02.13 |

1) Not available for all sensor types.

2 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.
- ▶ De-energize the device before opening it.
- ▶ Power can be supplied to switching contacts from separate circuits. De-energize these circuits before working on the terminals.

NOTICE

Electrostatic discharge (ESD)

Risk of damage to 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, use only genuine spare parts. With genuine parts, the function, accuracy and reliability are also ensured after maintenance work.


2.1 Calibration

Sensors with Memosens protocol are calibrated at the factory.

Users must decide whether the process conditions present require calibration during initial commissioning.

Additional calibration is not required in many standard applications.

Calibrate the sensors at sensible intervals depending on the process.

 All information on calibration is provided in BA00451C "Calibration".

2.2 Cleaning

2.2.1 External display (in installed state)

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**

Damage to the housing surface or housing seal

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

2.2.2 Digital sensors**⚠ CAUTION****The cleaning system is not switched off during calibration or maintenance activities**

Risk of injury due to medium or cleaning agent

- ▶ If a cleaning system is connected, switch it off before removing a sensor from the medium.
 - ▶ If you are not switching off the cleaning system because you wish to test the cleaning function, wear protective clothing, goggles and gloves or take other appropriate measures.
1. If an error occurs or the maintenance schedule stipulates that the sensor has to be replaced, use a new sensor or a sensor that has been precalibrated in the laboratory. A sensor is calibrated in the laboratory under optimum external conditions, thereby ensuring better quality of measurement.
 2. Remove the sensor to be serviced and install the new sensor.
 3. You must perform calibration if you use a sensor that is not precalibrated.
 4. The sensor data are automatically accepted by the transmitter. A release code is not required.
 5. Measurement is resumed.
 6. Take the used sensor back to the laboratory. In the laboratory you can get the sensor ready for reuse while ensuring the availability of the measuring point.
 - Clean the sensor. For this purpose, use the cleaning agent specified in the sensor manual.
 - Inspect the sensor for cracks or other damage.
 - If no damage is found, regenerate the sensor. Where necessary, store the sensor in a regeneration solution (--> sensor manual).
 - Recalibrate the sensor for reuse.

2.2.3 Assemblies

Refer to the assembly operating manual for information on servicing and troubleshooting the assembly. The assembly operating manual describes the procedure for mounting and disassembling the assembly, replacing the sensors and seals, and contains information on the material resistance properties, as well as spare parts and accessories.

3 Repair

3.1 Spare parts

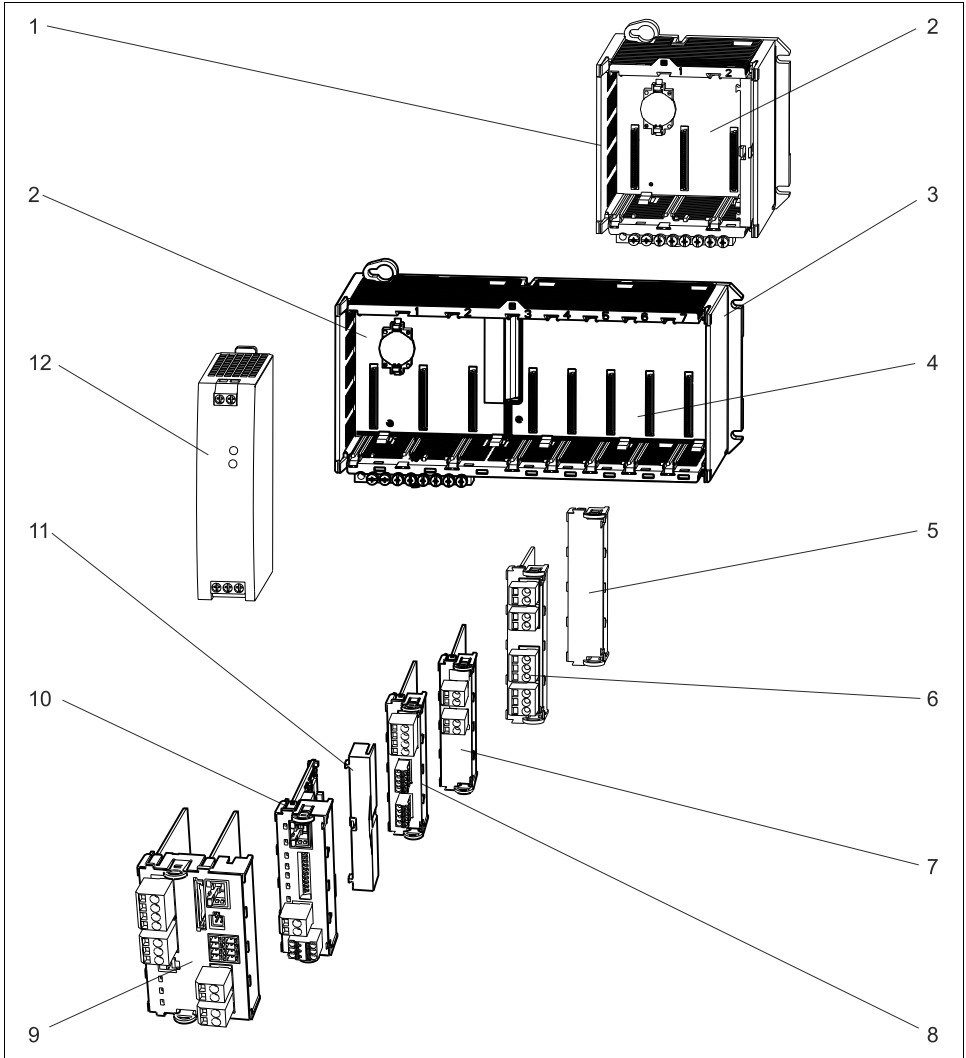


Fig. 2: Spare parts: You can find the names of spare parts and their order numbers in the following table.

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NOTICE**Damaged cable resulting from careless maintenance or repair work**

- ▶ Take care when replacing defective cables, particularly if pulling them out of a cable duct
- ▶ Use a junction box preferably, which then constitutes a stationary connection to the cabinet.

| Item | Kit CM44x | Order number |
|-------|---|--------------|
| 1 | Kit CM442R <ul style="list-style-type: none"> ▪ Control cabinet installation housing, complete | 71222273 |
| 2 | Kit CM44x/CM44xR: electronics module backplane <ul style="list-style-type: none"> ▪ Backplane complete ▪ To be replaced only by Endress+Hauser Service | 71101457 |
| 3 | Kit CM444R/448R <ul style="list-style-type: none"> ▪ Control cabinet installation housing, complete | 71222276 |
| 4 | Kit CM44x/CM44xR: electronics module extension backplane <ul style="list-style-type: none"> ▪ Extension backplane complete ▪ To be replaced only by Endress+Hauser Service | 71141366 |
| 5, 11 | Kit CM44xR <ul style="list-style-type: none"> ▪ Set of covers for protection against contact | 71222282 |
| 9 | Kit CM442: basic module BASE-L 24V AC/DC <ul style="list-style-type: none"> ▪ Basic module 24V AC/DC complete ▪ End cover (item 8) ▪ Instructions for spare parts kit CM44x | 71100607 |
| | Kit CM442: basic module BASE-H 230V AC <ul style="list-style-type: none"> ▪ Basic module 230V AC, complete ▪ End cover (item 8) ▪ Instructions for spare parts kit CM44x | 71100611 |
| | Kit CM444/CM448: basic module BASE-E <ul style="list-style-type: none"> ▪ Basic module, complete ▪ End cover (item 8) ▪ Connecting cable for connecting to a EPS-H or EPS-L power unit ▪ Instructions for spare parts kit CM44x | 71141336 |
| | Kit CM44x: terminal set, basic module | 71107452 |

| Item | Kit CM44x | Order number |
|-------------|---|--|
| 6, 7, 8, 10 | Kit CM44x/CM44xR: extension module AOR (2 relays + 2 current outputs) <ul style="list-style-type: none"> ▪ Extension module AOR, complete ▪ Instructions for spare parts kit CM44x | 71111053 |
| | Kit CM44x/CM44xR: terminal set, extension module AOR | 71107453 |
| | Kit CM44x/CM44xR: extension module 2R (2 relays) <ul style="list-style-type: none"> ▪ Extension module 2R complete ▪ Instructions for spare parts kit CM44x | 71125375 |
| | Kit CM44x/CM44xR: extension module 4R (4 relays) <ul style="list-style-type: none"> ▪ Extension module 4R complete ▪ Instructions for spare parts kit CM44x | 71125376 |
| | Kit CM44x/CM44xR: terminal set, extension module 2R, 4R | 71155581 |
| | Kit CM44x/CM44xR: extension module 2AO (2 x 0/4 to 20 mA) <ul style="list-style-type: none"> ▪ Extension module 2AO complete ▪ Instructions for spare parts kit CM44x | 71135632 |
| | Kit CM44x/CM44xR: extension module 4AO (4 x 0/4 to 20 mA) <ul style="list-style-type: none"> ▪ Extension module 4AO complete ▪ Instructions for spare parts kit CM44x | 71135633 |
| | Kit CM44x/CM44xR: terminal set, extension module 2AO, 4AO | 71155582 |
| | Kit CM44x/CM44xR: extension module DIO (each with 2 x digital input, digital output) <ul style="list-style-type: none"> ▪ Extension module DIO complete ▪ Instructions for spare parts kit CM44x/CM44xR | 71135638 |
| | Kit CM44x/CM44xR: terminal set, extension module DIO | 71219784 |
| | Kit CM44x/CM44xR: extension module 2DS (2 x digital sensor) <ul style="list-style-type: none"> ▪ Extension module 2DS complete ▪ Instructions for spare parts kit CM44x | 71135631 |
| | Kit CM44x/CM44xR: extension module 2AI (2 x analog input 0/4 to 20 mA) <ul style="list-style-type: none"> ▪ Extension module 2AI complete ▪ Instructions for spare parts kit CM44x | 71135639 |
| | Kit CM44x/CM44xR: extension module 485 (Ethernet configuration) <ul style="list-style-type: none"> ▪ Extension module 485 complete ▪ With activation code extendable to PROFIBUS DP or Modbus RS 485 or Modbus TCP ▪ Instructions for spare parts kit CM44x | 71135634 |
| | Kit CM44x/CM44xR: terminal set, extension module 2AI, 485 | 71155583 |
| 12 | Kit CM444R/8R: DIN rail power unit <ul style="list-style-type: none"> ▪ DIN rail power unit 110 to 230 VAC ▪ DIN rail power unit 24 VDC | <ul style="list-style-type: none"> ▪ 71222277 ▪ 71222279 |

3.2 Return

The product has to be returned in the event of repair, factory calibration, incorrect delivery or incorrect ordering. As an ISO-certified company and due to legal regulations, Endress+Hauser is obligated to use particular handling techniques for all returned products that have come into contact with a medium.

In order to ensure a reliable, proper and quick return:

Learn about the methods and basic conditions at the Internet site

www.services.endress.com/return-material

3.3 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.



The battery located on the backplane must be disposed of in accordance with local battery disposal regulations.

4 Accessories



The most important accessories available at the time this document went to print are listed below. Contact your service representative or Sales Center for accessories that are not listed here.

4.1 Measuring cable

Memosens data cable CYK10

- For digital sensors with Memosens technology
 - pH, redox, oxygen (amperometric), chlorine, conductivity (conductive)
- Order as per product structure (--> Online Configurator, www.products.endress.com/cyk10)
- Technical Information TI00118C/07/EN

Memosens data cable CYK11

- Extension cable for digital sensors with Memosens protocol
- Order as per product structure (--> Online Configurator, www.products.endress.com/cyk11)

Measuring cable CYK81

- Unterminated cable for extending sensor cables (e.g. Memosens)
- 2 x 2 cores, twisted with shielding and PVC sheath (2 x 2 x 0.5 mm² + shielding)
- Material sold by the meter, Order No.: 51502543

4.2 Sensors

4.2.1 Glass electrodes

Orbisint CPS11D

- pH sensor with Memosens technology
- Dirt-resistant PTFE diaphragm
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps11d)
- Technical Information TI00028C/07/EN

Memosens CPS31D

- pH sensor with Memosens technology
- Gel-filled reference system with ceramic diaphragm
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps31d)
- Technical Information TI00030C/07/EN

Ceraliquid CPS41D

- pH sensor with Memosens technology
- Ceramic diaphragm and KCl liquid electrolyte
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps41d)
- Technical Information TI00079C/07/EN

Ceragel CPS71D

- pH sensor with Memosens technology
- Twin-chamber reference system and integrated bridge electrolyte
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps71d)
- Technical Information TI00245C/07/EN

Orbipore CPS91D

- pH sensor with Memosens technology
- Open aperture junction for media with high potential for fouling
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps91d)
- Technical Information TI00375C/07/EN

Orbipac CPF81D

- pH compact sensor for installation or immersion operation in industrial water and wastewater
- Order as per product structure (--> Online Configurator, www.products.endress.com/cpf81d)
- Technical Information TI191C/07/EN

4.2.2 Enamel pH electrodes

Ceramax CPS341D

- pH electrode with pH-sensitive enamel
- For the toughest requirements in terms of precision, pressure, temperature, sterility and operating life
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps341d)
- Technical Information TI468C/07/EN

4.2.3 ORP sensors

Orbisint CPS12D

- ORP sensor with Memosens technology
- Dirt-resistant PTFE diaphragm;
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps12d)
- Technical Information TI367C/07/EN

Ceraliquid CPS42D

- ORP sensor with Memosens technology
- Ceramic diaphragm and KCl liquid electrolyte
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps42d)
- Technical Information TI373C/07/EN

Ceragel CPS72D

- ORP sensor with Memosens technology
- Twin-chamber reference system and integrated bridge electrolyte
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps72d)
- Technical Information TI374C/07/EN

Orbipac CPF82D

- Redox compact sensor for installation or immersion operation in industrial water and wastewater
- Order as per product structure (--> Online Configurator, www.products.endress.com/cpf82d)
- Technical Information TI191C/07/EN

Orbipore CPS92D

- ORP sensor with Memosens technology
- Open aperture junction for media with high potential for fouling
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps92d)
- Technical Information TI435C/07/EN

4.2.4 pH-ISFET sensors

Tophit CPS471D

- Sterilizable and autoclavable ISFET sensor with Memosens technology
- For food and pharmaceutical industry, process engineering, water treatment and biotechnology
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps471d)
- Technical Information TI283C/07/EN

Tophit CPS441D

- Sterilizable ISFET sensor with Memosens technology
- For low-conductivity media, with liquid KCl electrolyte
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps441d)
- Technical Information TI352C/07/EN

Tophit CPS491D

- ISFET sensor with Memosens technology
- Open aperture diaphragm for media with high potential for fouling
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps491d)
- Technical Information TI377C/07/EN

4.2.5 Combined pH/ORP sensors

Memosens CPS16D

- Combined pH/ORP sensor for process technology, with dirt-resistant PTFE diaphragm
- With Memosens technology
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps16d)
- Technical Information TI00503C/07/EN

Memosens CPS76D

- Combined pH/ORP sensor for process technology, hygiene and sterile applications
- With Memosens technology
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps76d)
- Technical Information TI00506C/07/EN

Memosens CPS96D

- Combined pH/ORP sensor for chemical processes
- With poison-resistant reference with ion trap
- With Memosens technology
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps96d)
- Technical Information TI00507C/07/EN

4.2.6 Inductive conductivity sensors

Indumax CLS50D

- Inductive conductivity sensor with very good resistance properties for standard, Ex and high-temperature applications
- Memosens protocol
- Order as per product structure (--> Online Configurator, www.products.endress.com/cls50d)
- Technical Information TI182C/07/EN

4.2.7 Conductive conductivity sensors

Condumax CLS15D

- Conductive conductivity sensor for pure water, ultrapure water and Ex applications
- Order as per product structure (--> Online Configurator, www.products.endress.com/cls15d)
- Technical Information TI109C/07/EN

Condumax CLS16D

- Hygienic, conductive conductivity sensor for pure water, ultrapure water and EX applications
- With EHEDG and 3A approval
- Order as per product structure (--> Online Configurator, www.products.endress.com/cls16d)
- Technical Information TI227C/07/EN

Condumax CLS21D

- Two-electrode sensor in plug-in head and fixed cable version
- Order as per product structure (--> Online Configurator, www.products.endress.com/cls21d)
- Technical Information TI085C/07/EN

4.2.8 Oxygen sensors

Oxymax COS51D

- Amperometric sensor for dissolved oxygen, with Memosens technology
- Order as per product structure (--> Online Configurator, www.products.endress.com/cos51d)
- Technical Information TI413C/07/EN

Oxymax COS61D

- Optical oxygen sensor for drinking water and industrial water measurement
- Measuring principle: quenching
- Memosens protocol
- Material: stainless steel 1.4571 (AISI 316Ti)
- Order as per product structure (--> Online Configurator, www.products.endress.com/cos61d)
- Technical Information TI387C/07/EN

Oxymax COS22D

- Sterilizable sensor for dissolved oxygen
- Order as per product structure (--> Online Configurator, www.products.endress.com/cos22d)
- Technical Information TI446C/07/EN

4.2.9 Chlorine sensors

CCS142D

- Membrane-covered amperometric sensor for free chlorine
- Memosens technology
- Measuring range 0.01 to 20 mg/l
- Order as per product structure (--> Online Configurator, www.products.endress.com/ccs142d)
- Technical Information TI419C/07/EN

4.2.10 Ion-selective sensors

ISEmax CAS40D

- Ion-selective sensors
- Order as per product structure (--> Online Configurator, www.products.endress.com/cas40d)
- Technical Information TI491C/07/EN

4.2.11 Turbidity sensors

Turbimax CUS51D

- For nephelometric turbidity and solids measurement in wastewater
- 4-beam alternating light method based on scattered light
- With Memosens protocol
- Order as per product structure (--> Online Configurator, www.products.endress.com/cus51d)
- Technical Information TI461C/07/EN

4.2.12 SAC and nitrate sensors

Viomax CAS51D

- SAC and nitrate measurement in drinking water and wastewater
- With Memosens protocol
- Order as per product structure (--> Online Configurator, www.products.endress.com/cas51d)
- Technical Information TI459C/07/EN

4.2.13 Interface measurement

Turbimax CUS71D

- Immersion sensor for interface measurement
- Ultrasonic interface sensor
- Order as per product structure (--> Online Configurator, www.products.endress.com/cus71d)
- Technical Information TI490C/07/EN

4.3 Additional functionality

4.3.1 Hardware extension modules

Kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48: extension module AOR

- 2 x relay, 2 x analog output 0/4 to 20 mA
- Order No. 71111053

Kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48: extension module 2R

- 2 x relay
- Order No. 71125375

Kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48: extension module 4R

- 4 x relay
- Order No. 71125376

Kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48: extension module 2AO

- 2 x analog output 0/4 to 20 mA
- Order No. 71135632

Kit CM444/CM448/CM444R/CM448R/CSF48: extension module 4AO

- 4 x analog output 0/4 to 20 mA
- Order No. 71135633

Kit CM444/CM448/CM444R/CM448R/CSF48: extension module 2DS

- 2 x digital sensor, Memosens
- Order No. 71135631


Kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48: extension module 2AI

- 2 x analog input 0/4 to 20 mA
- Order No. 71135639

Kit CM444/CM448/CM442R/CM444R/CM448R/CSF48: extension module DIO

- 2 x digital input
- 2 x digital output
- Auxiliary voltage supply for digital output
- Order no. 71135638

Kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48: extension module 485

- Ethernet configuration
- Can be extended to PROFIBUS DP or Modbus RS485 or Modbus TCP. This requires an additional activation code which can be ordered separately (→  52).
- Order No. 71135634

Upgrade kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48

- Extension module 485
- PROFIBUS DP (+ Ethernet configuration)
- Order No. 71140888

Upgrade kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48

- Extension module 485
- Modbus RS485 (+ Ethernet configuration)
- Order No. 71140889

Upgrade kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48

- Extension module 485
- Modbus TCP (+ Ethernet configuration)
- Order No. 71140890

4.3.2 Firmware and activation codes

SD card with Liquiline firmware

- Industrial Flash Drive, 1 GB
- Order No. 71127100

Activation code for digital HART communication

- Order No. 71128428

Activation code for PROFIBUS DP

- Order No. 71135635

Activation code for Modbus RS485

- Order No. 71135636

Activation code for Modbus TCP

- Order No. 71135637

Kit CM442R: Activation code for 2nd digital sensor input

- Order No. 71114663

Kit CM444R/CM448R: Upgrade code for 2 x 0/4 to 20 mA for BASE-E

- Order No. 71140891

Activation code for feedforward control

- Order no. 71211288

Activation code for measuring range switch

- Order no. 71211289

4.4 Software

Memobase Plus CYP71D

- PC software for supporting laboratory calibration
- Visualization and documentation of sensor management
- Database storage of sensor calibrations
- Order as per product structure, www.products.endress.com/cyp71d
- Technical Information TI00502C/07/EN

MS30 Field Data Manager software

- PC software for centralized data management
- Visualization of measurement series and logbook events
- SQL database for secure storage
- Order No. 71129799

4.5 Other accessories

4.5.1 External display

Graphic display

- For installation in door or casing of control cabinet
- Order No. 71185295

Service display

- Portable, for commissioning
- Order No. 71185296

4.5.2 SD card

SD card

- Industrial Flash Drive, 1 GB
- Order No. 71110815

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