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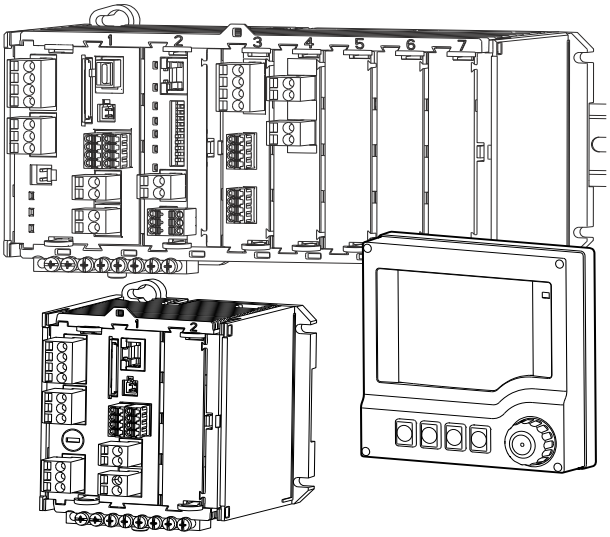
Operating Instructions
Liquiline CM442R/CM444R/CM448R

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



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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 InstructionsBA00450C "Operation & settings"
- Inputs
  --> Operating InstructionsBA00450C "Operation & settings"
- Outputs
  --> Operating InstructionsBA00450C "Operation & settings"
- Additional functions
  --> Operating InstructionsBA00450C "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 displayor 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	– 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: – Cannot be adjusted – To low – No slope	Device input defective	Check device directly.
	– 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: ▪ Larger cell constant ▪ Graphite instead of stainless steel (observe material resistance properties)
Implausible measured values: – 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: – 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	– Sensor fouled – Sensor old (membrane)	▪ Clean the sensor. ▪ If necessary: – 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	– Temperature sensor not connected or connected incorrectly – Temperature sensor defective – Cable to temperature sensor defective	– 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	– Electrodes fouled – Electrodes too old – Electrodes defective	– 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: ▪ 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 ▪ On ▪ Off **Factory setting** Depends on the message	You can deactivate or reactivate a diagnostics message here. Deactivating means: ▪ No error message in the measuring mode ▪ No error current at the current output
Error current	Options ▪ 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 ▪ 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 ▪ 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 ▪ 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 ▪ Sensor in air ▪ Air pockets in assembly ▪ Sensor fouled ▪ Incorrect flow to sensor Measures 1. Check sensor installation 2. Clean sensor 3. Adjust assignment of current outputs
461	Current exceeded	S	On	Off	
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 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	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. ▪ 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	CO2 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 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 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 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. ÜDeactivate 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. ÜDeactivate 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 detetected
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 ▪ 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 ▪ 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 ▪ 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 ▪ 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.

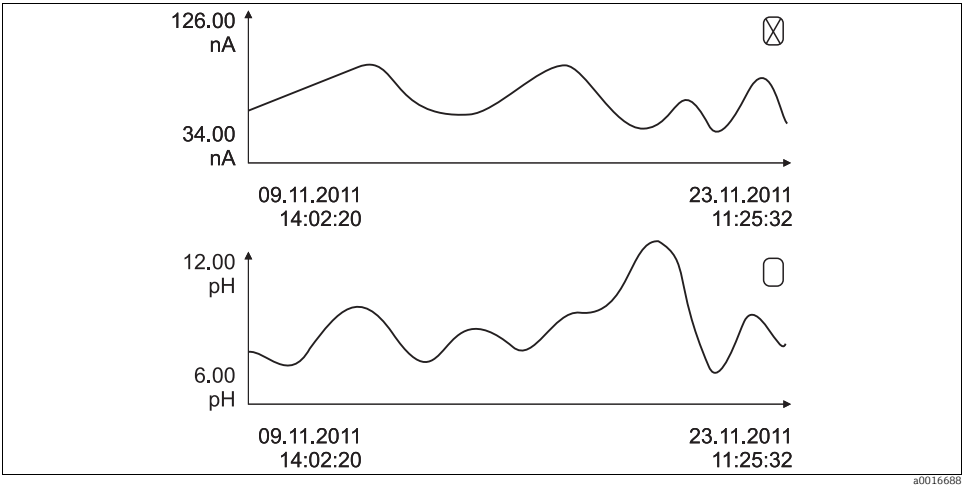

Fig. 1: Simultaneous display of two graphs, the upper one is "selected"

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 ▪ 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 ▪ 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.
▷ 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. ▶ 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 outputx:y		Simulation of an output current This menu appears once for each current output.
Simulation	Options ▪ 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 ▪ 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 ▪ 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 ▪ 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 ▪ 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 ▪ OK ▪ ESC	Restart and keep all the settings

Diagnostics/Systemtest/Reset

Function	Options	Info
▷ Factory default	Options ▪ OK ▪ ESC	Restart with factory settings Settings that have not been saved are lost.
▶ Power supply	Read only ▪ 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, enterthe 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 ▪ 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 ▪ 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. temperatures[1)]
- 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

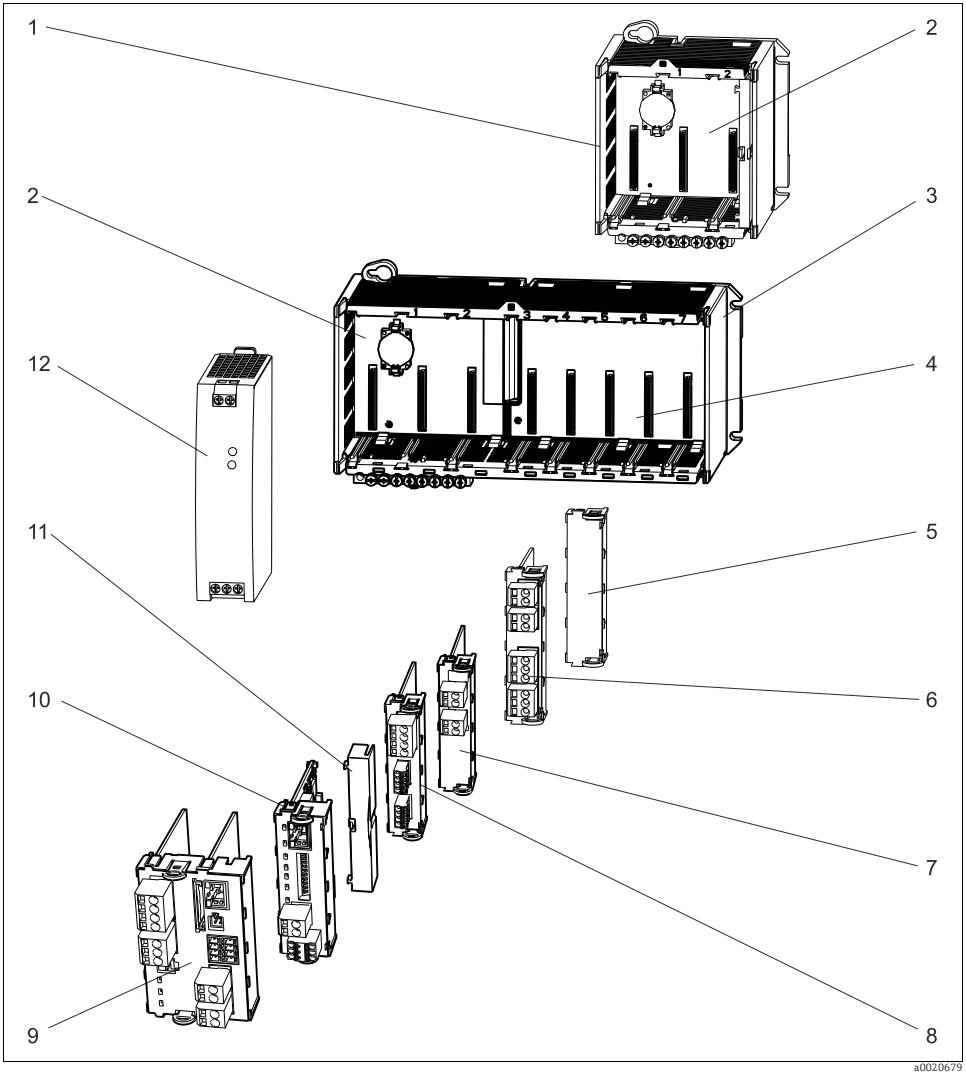

Fig. 2: Spare parts: You can find the names of spare parts and their order numbers in the following table.

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 ▪ Control cabinet installation housing, complete	71222273
2	Kit CM44x/CM44xR: electronics module backplane ▪ Backplane complete ▪ **To be replaced only by Endress+Hauser Service**	71101457
3	Kit CM444R/448R ▪ Control cabinet installation housing, complete	71222276
4	Kit CM44x/CM44xR: electronics module extension backplane ▪ Extension backplane complete ▪ **To be replaced only by Endress+Hauser Service**	71141366
5, 11	Kit CM44xR ▪ Set of covers for protection against contact	71222282
9	Kit CM442: basic module BASE-L 24V AC/DC ▪ 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 ▪ Basic module 230V AC, complete ▪ End cover (item 8) ▪ Instructions for spare parts kit CM44x	71100611
	Kit CM444/CM448: basic module BASE-E ▪ 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) ▪ 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) ▪ Extension module 2R complete ▪ Instructions for spare parts kit CM44x	71125375
	Kit CM44x/CM44xR: extension module 4R (4 relays) ▪ 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) ▪ Extension module 2AO complete ▪ Instructions for spare parts kit CM44x	71135632
	Kit CM44x/CM44xR: extension module 4AO (4 x 0/4 to 20 mA) ▪ 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) ▪ 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) ▪ 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) ▪ Extension module 2AI complete ▪ Instructions for spare parts kit CM44x	71135639
	Kit CM44x/CM44xR: extension module 485 (Ethernet configuration) ▪ 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 ▪ DIN rail power unit 110 to 230 VAC ▪ DIN rail power unit 24 VDC	▪ 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 mm^2 + 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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