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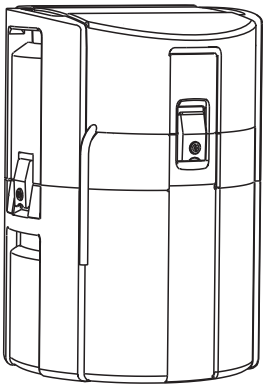
Operating Instructions
Liquiport 2010 CSP44

Automatic sampler for liquid media
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 diagnostic messages
- Description of the information in the "Diagnostics" menu
  - Diagnostics list
  - Logbooks
  - System information
  - Output status
  - Systemtest/Reset
  - Sensor change
  - Manual hold
  - Term information
  - Simulation
  - Sensor information
- Cleaning and maintenance
- Accessories and spare parts

This manual does not include the following:
- Setup/General settings
  --> Operating Instructions BA00465C "Commissioning"
- Display/Operation
  --> Operating Instructions BA00465C "Commissioning"
- Inputs
  --> Operating Instructions BA00492C "Operation & settings"
- Outputs
  --> Operating Instructions BA00492C "Operation & settings"
- Sampling programs
  --> Operating Instructions BA00492C "Operation & settings"
- Additional functions
  --> Operating Instructions BA00492C "Operation & settings"
- Data management
  --> Operating Instructions BA00492C "Operation & settings"
- Calibration
  --> Operating Instructions BA00493C "Calibration"
- Expert
  --> Internal Service Manual

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1 Diagnostics and troubleshooting

The sampler continuously monitors its own functions.
The color of the display background changes to red if a diagnostics message for error category "F" occurs.
The LED beside the display flashes red if a diagnostics message for error category "M" occurs.

1.1 General troubleshooting

1.1.1 Troubleshooting

A diagnostic message appears on the display, measured values are not plausible or you encounter a problem.

1. See the Diagnostics menu for 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" () 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 under "Process errors without messages" (→ 🖹 4) or "Device-specific errors" (→ 🖹 10).
   ↳ 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 values deviate from reference measurement	Incorrect calibration	Repeat the calibration. Where necessary, check and repeat the calibration with the reference device.
	Sensor fouled	Clean the sensor.
	Temperature measurement	Check the temperature measured values of both devices.
	Temperature compensation	Check the settings for temperature compensation and adjustment for both devices.

Problem	Possible cause	Tests and/or remedial measures
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
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 failure	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 shortcircuited	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, BA "Commissioning").
	EMC (interference coupling)	Check wiring. Identify and eliminate cause of interference.

Conductivity measurement

Problem	Possible cause	Tests and/or remedial measures
Display values deviate from reference measurement	Incorrect calibration	Repeat the calibration. Where necessary, check and repeat the calibration with the reference device.
	Sensor fouled	Clean the sensor.
	Temperature measurement	Check the temperature measured values of both devices.
	Temperature compensation	Check the settings for temperature compensation and adjustment for both devices.
Display values deviate from reference measurement	Polarization 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 failure	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 shortcircuited	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, BA "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 failure	Test with new sensor
	Sensor cable disconnected	Check cable or cable extension.
	Incorrect sensor connection	Check the connection at 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 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 shortcircuited	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.

Turbidity and nitrate measurement

Problem	Possible cause	Tests and/or remedial measures
Display value - - - -	Sensor failure	Test with new sensor
	Sensor cable disconnected	Check cable or cable extension.
	Incorrect sensor connection	Check the connection at 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.
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 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 shortcircuited	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
The device cannot be switched on/display remains dark	No supply voltage	Check if voltage supplied
	Basic module defective	Replace basic module
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
Control signals are not accepted or outputs do not switch	Incorrect program setting	Check program setting
	Incorrect wiring	Check wiring
	Electronics failure	Replace basic module
Sample not representative	Siphon in sampling hose	Check sampling hose
	Connection not air-tight/sampling hose taking in air	– Check tubes/connections – Check the sampling hose is routed correctly
	Bottles not being filled correctly	– Incorrect distribution selected in the controls – Calibrate the distribution arm
	Distribution arm does not move	– Incorrect distribution selected in the controls – Check distribution arm connection – Distributor defective, replace distributor or – Have repaired by E+H Service
	Incorrect bottle filled	– Incorrect distribution selected in the controls
	Wrong pump tube	Only use genuine pump tube
	Faulty sensory mechanism	Replace sensory mechanism (contact E+H Service)
No sampling	Connection leaking	Check tubes/connections for leaks
	Sampling hose taking in air	Check the sampling hose is routed correctly
	Wrong pump tube	Only use genuine pump tube
	Faulty sensory mechanism	Replace sensory mechanism (contact E+H Service)
Implausible measured values (only for version with sensors with the Memosens protocol)	Inputs defective	First perform tests and take measures as outlined in "Process-specific errors" section Measuring input test: – Connect a resistor instead of the conductivity sensor
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	

Problem	Possible cause	Tests and/or remedial measures
No current output signal	Basic module defective	Check with integrated current simulation, connect mA meter directly to current output.

1.2 Diagnostic information on local display

Up-to-date diagnostic events are displayed along with their status category, diagnostic code and short text. By clicking the navigator, you can call up additional information and tips on remedial measures.

1.3 Adjusting diagnostic information

1.3.1 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.
    The cause of the malfunction is to be found in the sampling point/measuring point. Any controller connected should be set to manual mode.
  - **M** = Maintenance required. Action should be taken as soon as possible.
    The device still measures/takes a sample correctly. Immediate measures must not be taken. However, proper maintenance efforts would prevent a possible malfunction in the future.
  - **C** = Function check, (no error)
    Maintenance work is being performed on the device. Wait until the work has been completed.
  - **S** = Out of specification. The measuring point is being operated outside specifications. Operation is still possible. However, you run the risk of increased wear, shorter operating life or lower accuracy levels. The cause of the problem is to be found outside the measuring point.
- 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.

1.3.2 Adjusting the device 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").

Configuration options

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 (optional)

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

Path: ... /Extended setup/Diagnostics settings/Diag. behavior (optional)

Function	Options	Info
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. If general device errors occur, the error current is output at all the current outputs. In the case of channel-specific errors, the error current is only output at the particular current output.
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. --> BA00470C "Maintenance & diagnostics" Decide whether you want to change a status signal assignment for your application.
Diag. output	Options ▪ None ▪ Binary output **Factory setting** None	You can use this function to select an output to which the diagnostic message should be assigned. For sensors with the Memosens protocol: You first have to configure a relay output for "Diagnostics" (Menu/Setup/Outputs, assign "Diagnostics" function and set Operating mode to "as assigned") before being able to assign the message to an output. --> BA00492C "Operation & settings"
Cleaning program(optional)	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.

1.4 Overview of diagnostic information

1.4.1 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
262	Module connect.	F	On	On	Electronics module not communicating 1. Check cable connection, replace if necessary 2. Check the power supply of the sampling control module 3. 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

No.	Message	Factory settings			Tests or remedial measures
		Cat.	Diag. on/off	Error current	
311	Temp. sensor	F	On	On	Temperature sensor PT2 in sample compartment is defective. ▪ Sample temperature measurement not possible ▪ A sampling program will not be canceled -> Replace sensor
314	No sample flow	F	On	On	Negative pressure cannot be created in the peristaltic pump. -> Check pump tube for leaks -> Immerse suction line in medium
322	Read sub-program	F	On	On	Selected subprogram cannot be read from the program memory --> Create new subprogram
323	Write sub-prg.	F	On	On	Subprogram created cannot be saved -> Hardware error -> Contact the Service Department
324	Delete sub-prg.	F	On	On	Selected subprogram cannot be deleted from the program memory -> Reset the software
325	Readsub-prg.list	F	On	On	Subprogram list cannot be read from the program memory -> Reset the software
328	Distribution arm	F	On	On	Distribution arm zero point not found during test run -> Perform distribution arm test under Diagnostics/System test/Distribution arm -> Contact the Service Department
331	Peristaltic pump	F	On	On	▪ Peristaltic pump defective ▪ Motor cable broken -> Contact the Service Department
332	Peristaltic pump	F	On	On	Control of peristaltic pump defective --> Contact the Service Department
333	Pressure sensor	F	On	On	Medium detection not possible No sampling possible. ▪ Suction line not drained before sampling ▪ Pressure sensor defective -> Check suction line, where necessary purge it using the pump test under Diagnostics/System test/Pump test -> Contact the Service Department

No.	Message	Factory settings			Tests or remedial measures
		Cat.	Diag. on/off	Error current	
337	Pump tubing	M	On	Off	Pump tube operating time reached shortly Display under Diagnostics/Runtime info/Tubing age -> Schedule replacement -> After replacement, reset the operating time under Diagnostics/Runtime info
338	Pump tubing	M	On	Off	Pump tube operating time reached Display under Diagnostics/Runtime info/Tubing age -> Change the pump tubing ->After replacement, reset the operating time under Diagnostics/Runtime info
343	Power supply	M	On	Off	Power supply failure
344	Program pause	C	On	Off	Sampling program paused
345	Time changeover	M	On	Off	Daylight saving time/winter time setting Normal time (winter time) active.
346	Time changeover	M	On	Off	Daylight saving time/winter time setting Daylight saving time active
347	Sample confirm.	F	On	On	Sampling command has not been processed -> Check internal cable to 1IF -> Reset the software
348	Read program	F	On	On	Selected program cannot be read from the program memory --> Create new program
349	Write program	F	On	On	Program created cannot be saved Hardware error has occurred --> Contact the Service Department
351	Delete prog.	F	On	On	Selected program cannot be deleted from the program memory --> Reset the software
352	Read Prog.list	F	On	On	Program list cannot be read from the program memory --> Perform device reset under Diagnostics/System test/Reset/Device reset
353	Overfill check	F	On	Off	Total capacity of bottle reached ▪ No further sampling to current bottle is triggered -> Adjust the sampling program under Program selection if desired
354	Bottle check	F	On	Off	No empty bottles available for current program ▪ No further sampling -> Check the program settings under Program selection

No.	Message	Factory settings			Tests or remedial measures
		Cat.	Diag. on/off	Error current	
355	Start time over	M	On	Off	Start time entered is in the past ▪ Enter a new start time
356	Overfill check	F	On	Off	The total sample volume does not fit in the sample bottle -> Change the sample volume
357	Sampling faulted	M	On	Off	▪ Sample discarded ▪ There are too many sampling requests pending -> Adjust the sampling program under Program selection
358	Configuration	F	On	On	Program configuration does not match the current device configuration -> Adjust the configuration
359	Emptying error	F	On	On	▪ Error when draining ▪ Draining and sampling program cancelled -> Check connection to FMSY1 module -> Check 4R module, replace if necessary -> Restart the software under Setup/Diagnostics/System test/Restart
366	Module connect.	F	On	On	No communication with actuator module -> Check internal connecting cable to module 1IF
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
374	Sensor check	F	On	Off	No measurement signal from sensor -> Check sensor connection -> Check sensor, replace if necessary
375	No 4R module	F	On	On	No connection to 4R module -> Check 4R module, replace if necessary -> Restart the software under Setup/Diagnostics/System test/Restart
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

No.	Message	Factory settings			Tests or remedial measures
		Cat.	Diag. on/off	Error current	
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
729	Filter candle	M	On	Off	▪ Filter cartridge change necessary ▪ The limit value for operating hours has been exceeded -> Replace the filter cartridge for the sample preparation system and reset the operating hours counter in the Diagnostics menu

No.	Message	Factory settings			Tests or remedial measures
		Cat.	Diag. on/off	Error current	
730	Clean. solution	M	On	Off	▪ Warning for level of cleaning solution for sample preparation system ▪ Depending on the cleaning duration, the cleaning interval and external events, the remaining quantity is sufficient for a few hours or days -> Top up cleaning solution for sample preparation system -> Check level switch for cleaning solution
910	Limit switch	S	On	Off	Limit switch activated
921	Pump bracket	F	On	On	The pump bracket is detected as open. ▪ Pump bracket open ▪ Reed contact defective -> Close 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 menu.
975	Device reset	C	Off	Off	Device Reset
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

1.4.2 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
- 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	Invalid sensor data 1. Check the firmware compatibility for the sensor and transmitter, load suitable firmware if necessary 2. Reset sensor to factory setting, disconnect sensor and connect it again 3. Update 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
061	Sensor electr.	F	On	On	All	Sensor electronics defective Replace sensor

No.	Message	Factory settings			Sensor type	Tests or remedial measures
		Cat.	Diag.	Error current		
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 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
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	

No.	Message	Factory settings			Sensor type	Tests or remedial measures
		Cat.	Diag.	Error current		
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
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

No.	Message	Factory settings			Sensor type	Tests or remedial measures
		Cat.	Diag.	Error current		
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
146	Sensor temp.	S	Off	Off	C, N, T, S	Temperature outside specification 1. Check temperature 2. Check measuring chain 3. Replace sensor type

No.	Message	Factory settings			Sensor type	Tests or remedial measures
		Cat.	Diag.	Error current		
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 failure 1. Replace sensor 2. Contact the Service Department
151	Sensor buildup	F	On	On	T	Buildup, high level of contamination 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 failure 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
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

No.	Message	Factory settings			Sensor type	Tests or remedial measures
		Cat.	Diag.	Error current		
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
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.

No.	Message	Factory settings			Sensor type	Tests or remedial measures
		Cat.	Diag.	Error current		
176 - 199: Warning issued by hours of operation monitoring system. Measurement can still take place. 1. Replace sensor 2. Adjust monitoring limit 3. Deactivate 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
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

No.	Message	Factory settings			Sensor type	Tests or remedial measures
		Cat.	Diag.	Error current		
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
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	

No.	Message	Factory settings			Sensor type	Tests or remedial measures
		Cat.	Diag.	Error current		
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	
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	Membrane cap replacement necessary 1. Replace membrane cap 2. Reset timer

No.	Message	Factory settings			Sensor type	Tests or remedial measures
		Cat.	Diag.	Error current		
722	Sensor reference	F	On	On	P	Alarm: impedance of reference membrane too low. 1. Check sensor, replace if necessary 2. Check and correct reference limit value
723	Sensor reference	M	On	Off	I	Warning: impedance of reference membrane too low. Measurement can continue until the alarm level. 1. Check sensor, replace if necessary 2. Check and correct reference limit value
724	Sensor reference	F	On	On	I	Alarm: impedance of reference membrane too high. 1. Check sensor, replace if necessary 2. Check and correct reference limit value
725	Sensor reference	M	On	Off	I	Warning: impedance of reference membrane too high. Measurement can continue until the alarm level. 1. Check sensor, replace if necessary 2. Check and correct reference limit value
771	Lamp change	F	On	Off	N, T, S	Lamp change alarm ▪ Configured operating time has been reached -> Replace 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	
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

No.	Message	Factory settings			Sensor type	Tests or remedial measures
		Cat.	Diag.	Error current		
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
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

1.4.3 Configuration options for troubleshooting (for version with sensors with the Memosens protocol)

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
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

No.	Path to software function
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
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

1.5 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.

Diagnostics messages associated with sampling are deleted under the following conditions:
- Diagnostics messages caused by sampling are deleted automatically with the next successful sampling.
- Diagnostics messages caused by the level of medium in the bottle are deleted the next time the bottle is changed.

1.6 Diagnostic list

All the current diagnostics messages are listed here.
A time stamp is available for each message. Furthermore, the system also displays the configuration and description of the message as saved in "Menu/Setup/General settings/Diagnostics/Device behavior".
For this purpose, select the appropriate message and press the navigator.

1.7 Logbooks

1.7.1 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
Program logbook	Program logbook	5000	Yes	No	Yes	Yes
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

1.7.2 Logbooks menu

Diagnostics/Logbooks

Function	Options	Info
▶ Program logbook		Chronological list of the programming 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.
▶ Show summary of current program	Read only	The bottle statistics for the sampler are displayed. The statistics are displayed for each individual bottle when the program is started. Further information is provided in the "Bottle statistics" section.

Diagnostics/Logbooks

Function	Options	Info
▶ Summary of inputs	Read only	The counters configured for the analog and binary input are displayed. Max. 8 lines
▷ Delete all entries	Action	You can delete all the program logbook entries here.
▶ 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.
▶ 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 delete all the operation logbook entries here.
▶ 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 delete all the diagnostics logbook entries here.

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.
  - You can select the other graph in the context menu (by pressing the navigator button), and 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 allows you to use the zoom function simultaneously on both graphs, for example.

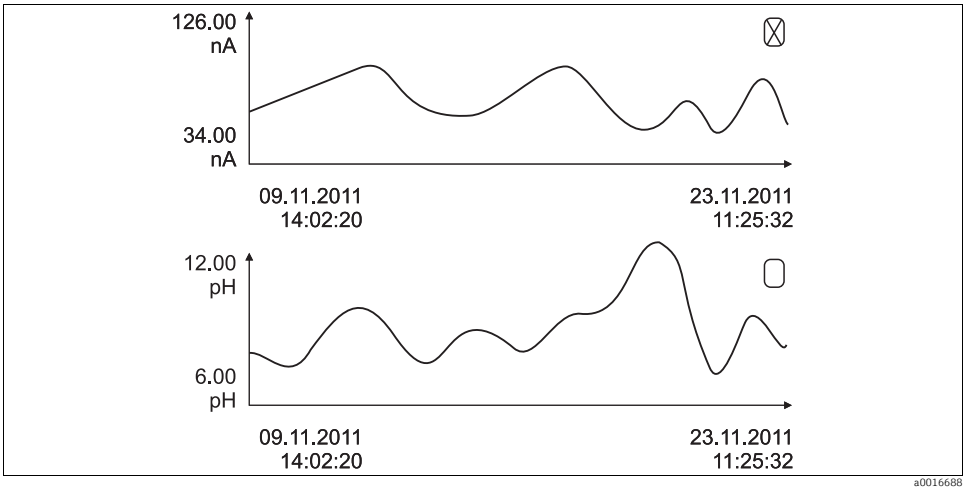


Fig. 1: Two graphs displayed simultaneously. The top graph is "selected".

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	Displays the input or the mathematical function
Measured value	Read only	Displays the measured value that is recorded
Log time left	Read only	Displays the days, hours and minutes until the logbook is full. Please note the instructions regarding the selection of the memory 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	Choice of another data logbook	You can view a second logbook at the same time as the current logbook.
▶ 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 data logbook entries here.
▶ Save logbooks		
File format	Options ▪ CSV ▪ FDM	Save the logbook in the preferred file format. You can then open the file you saved (.csv) on the PC and process it in MS-Excel for example.[1)]. You can import the FDM files into Fieldcare and archive them so they are tamper-proof.
▷ Program logbook ▷ All data logbooks ▷ Data logbook 1...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	Save the logbook in the preferred file format. You can then open the CSV file you saved on the PC and process it in MS-Excel for example. You can import the FDM files into Fieldcare and archive them so they are tamper-proof.

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.

1.7.3 Program logbook

The following table shows an overview of the exported program logbook and explains the most important terms in the program logbook.

Entry	Example	Info
Timestamp	05.05.2010 12:40	Time stamp - the start time in the case of sampling
Event	BasicPrgStart	**Power on** --> Time the device was started **Power failure** --> Time the power failed (to the minute) **BasicPrgStart, StdPrgStart** --> Time the program was started **BasicSampling, StdSampling** --> Entry made during sampling **PrgPartStart, PrgPartStop** --> Time a subprogram is enabled and disabled **PrgStop** --> Time the program was ended
Name	Program1	In the case of **BasicPrgStart, StdPrgStart, BasicSampling** or **PrgStop** --> the name of the program appears In the case of **StdSampling, PrgPartStart** or **PrgPartStop** --> the name of the subprogram appears
Bottle configuration	12x+6x PE/glass plate distribution	The selected bottle configuration is displayed
Left bottle volume	1000	The bottle volume is displayed --> "Right bottle volume" remains empty for bottle configurations with different volumes
Right bottle volume	3000	
Sampling mode	Time-paced CTCV	**Time-paced CTCV** --> in proportion to time **Flow-paced VTCV** --> in proportion to volume **Time/flow-paced CTVV** --> in proportion to flow **Single sample** --> single sample **Sample table** --> single sample --> the sampling mode is displayed
Sampling interval/unit	10 min	--> The interval and unit are displayed
Samples/bottle	4	**With bottle change** --> Number of samples per bottle
Bottles/sample	0	Multiple bottles
Sampling volume/unit	100 ml	Sample volume when sampling

Entry	Example	Info
Start mode	Immediate	Field only populated for **PrgPartStart, BasicPrgStart** and **StdPrgStart:** --> The program start setting is displayed - **Immediate** --> immediately - **Date/time** --> after date/time - **Volume** --> with a volume - **Event** --> when an event occurs - **Interval** --> after an interval - **Individual dates** --> individual timetable - **Multiple date** --> multiple dates
Start date	05.05.2010	Field only populated if **Start mode = Date/Time:** --> The start date is displayed
Stop mode	Program end	The program stop setting is displayed - **Program end** --> when the program ends - **Continuous** --> continuous operation - **Bottles full** --> when bottles are full - **Date/time** --> after date/time - **Event** --> when an event occurs
Stop date	06.05.2010	Field only populated if **Program end = Date/Time:** --> The time the program was stopped is displayed
Start flow sum/unit	100 m^3	Field only populated if **Start mode = Volume:** --> The starting volume is displayed
Bottle number	1	Field only populated in the case of **BasicSampling** or **StdSampling:** --> The bottle which was filled with the sample is displayed
Sample nbr	2	Number of samples transferred to the current bottle
Sampling result	Sampling Ok	**Sampling Ok** --> sampling ok **Sampling nOk** --> sampling failed --> For detailed diagnostics messages, see the diagnostics logbook
Running sample number	1	Running sample number in the current program
Flow sum since last sampling	1	For **flow-paced** and **time/flow-paced** sampling: --> Flow since the last sampling For all other types of sampling: --> Display: 0

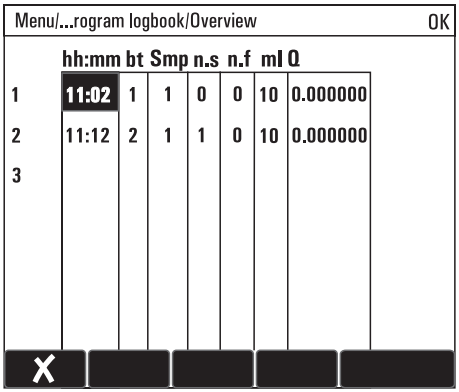
1.7.4 Bottle statistics

In "Menu/Diagnostics/Logbooks/Logbook program", select the "Show summary of current program" item to display the bottle statistics for the sampler. The statistics are displayed for each individual bottle when the program is started. This gives you detailed feedback on the last sampling operations.

The statistics are deleted when the following event occurs:
- Program is started

The statistics are selectively overwritten when the following event occurs:
- When the 1st bottle is reached in situations where "Continuous operation" is configured as the end of the program in the program settings.

The statistics are displayed as follows:



Column	Display	Info
1	**hh:mm**	The time the first sample was transferred to the bottle is displayed.
2	**bt**	The bottle number is displayed.
3	**Smp**	Displays how often sampling was triggered per bottle.
4	**n.s.**	Indicates the number of times a sample was not taken even though sampling was triggered. This can occur if the maximum permissible fill volume for the bottle has been reached but the system is still supposed to transfer samples to the bottle. The "Overfill sensor" message is displayed while the program is active.
5	**n.f.**	The value indicates how often sampling was canceled since the system was unable to take in any medium, or enough medium, into the dosing chamber to cover the LF1 probe.
6	**ml**	The sampling volume collected per bottle is displayed.
7	**Q**	The total flow for every bottle is displayed (if connected).

1.8 Device information

1.8.1 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.	Customized text	Current code, taking into account changes to the hardware. You must enter this code 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
Sw version FMSY1	Read only	Current version
FMSY1-proj. version	Read only	Current version
ENP version	Read only	Version of the electronic nameplate
▶ 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.
▶ 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.

1.8.2 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 has been exposed up to now, e.g. min./max. temperatures[1)]
- Operating time
  Sensor operation under 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.

1.9 Resetting the measuring device

Diagnostics/Systemtest/Reset

Function	Options	Info
Power supply	Read only	The current supply voltage is displayed.
▶ Manual sampling		
Bottle configuration	Read only	
Bottle volume	Read only	
Distributor position	Options ▪ Bottle 1 ...	Select which bottle should be filled with the sample.
Sample volume	10 to 10000 ml **Factory setting** 100 ml	You can change the sample volume.
▷ Start sampling	Action	
▶ Peristaltic pump		
▷ Pump purge	Action	
Pump purge, to stop press ESC	Read only	
Current pump run time	Read only	

1) Not available for all sensor types.

Diagnostics/Systemtest/Reset

Function	Options	Info
Power supply	Read only	The current supply voltage is displayed. With AC power supply: 24 V ±0.5 V With DC power supply: 22 to 28 V
Motor current	Read only	The current consumption of the pump is displayed.
Vacuum	Read only	The vacuum is an indicator of the suction height. -> 100 mbar is equivalent to a suction height of approx. 1 m.
Medium detected	Read only	Yes: the medium was detected No: no medium was detected
▷ Pump suction	Action	
Pump suction, to stop press ESC	Read only	
Current pump run time	Read only	
Power supply	Read only	The current supply voltage is displayed. With AC power supply: 24 V ±0.5 V With DC power supply: 22 to 28 V
Motor current	Read only	The current consumption of the pump is displayed.
Vacuum	Read only	The vacuum is an indicator of the suction height. -> 100 mbar is equivalent to a suction height of approx. 1 m.
Medium detected	Read only	Yes: the medium was detected No: no medium was detected
▷ Distribution arm	Action	Only for bottle configurations with more than one bottle.
Test distribution arm	Read only	When the menu item is activated, the distribution arm undergoes a test run. Afterwards, the system moves to each position in succession and the position is displayed. In the case of plate distribution, the arm moves left and right to ensure the bottles are numbered consecutively. Calibrate the distribution arm if the arm is not positioned precisely over the bottles.
Position	Read only	
▷ Device reset	Options ▪ OK ▪ ESC	Restart and keep all the settings
▷ 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 having occurred.

1.10 Runtime info

The following information is displayed:
- **Operating hours device:**
  Displays the total operating hours of the device in days, hours and minutes
- **Sample totalizer** :
  Number of all samples taken and sample errors
- **Pump tube life** :
  Displays how old the tube is in days, hours and minutes
  This counter must be reset when a tube is replaced.

Set the specific counter reading to zero with "Reset".

1.11 Status of inputs/outputs

Path:Display/Operation/Measurement

The following measured values are listed (read only):
- Binary inputs
  Current function state: on or off
- Current inputs
  Actual current values of all the current inputs available
- Binary outputs
  Current function state: on or off
- Temperature sensors
  Current value is displayed:
- Current outputs (for version with sensors with the Memosens protocol)
  Actual current values of the current outputs

1.12 Sensor replacement (for version with sensors with the Memosens protocol)

Diagnostics/Sensor change

Function	Options	Info
List of channels	Options ▪ On ▪ Off **Factory setting** Off	If you set the function to "On", the measured value at the current output is set to hold. In this way you avoid an error being reported at the process control system if the sensor is replaced on site. You can set the hold individually for every Memosens channel. Alternatively, you can set all the Memosens channels simultaneously to hold, or cancel the hold. Once you have replaced the sensor, you have to disable the hold at the same point.
▷ All channels sensor change on	Action	
▷ All channels sensor change off	Action	

1.13 Manual hold (for version with sensors with the Memosens protocol)

Diagnostics/Manual hold

Function	Options	Info
List of channels	Options ▪ On ▪ Off **Factory setting** Off	If you set the function to "On", the measured value at the current output is set to hold. You can set the hold individually for every Memosens channel. Alternatively, you can set all the Memosens channels simultaneously to hold, or cancel the hold. Once you have completed the maintenance task, you have to disable the hold at the same point.
▷ All channels manual hold on	Action	
▷ All channels manual hold off	Action	

1.14 Firmware history

Date	Version	Changes to software	Documentation: edition
04/2013	01.04.00	Extension ▪ Conductivity: – Measuring range switch – Temperature compensation ISO 7888 at 20 °C ▪ Keylock with password protection ▪ pH: – Icon for manual and automatic temperature compensation (ATC/MTC+MED) – Monitoring of the upper and lower limit of the glass SCS value can be switched on/off independently of each another ▪ ISE – Simultaneous calibration of two parameters – User-defined electrode type – Raw measured values can be selected for current output – Timer for membrane replacement ▪ Logbooks remain intact after the firmware update Improvement ▪ Offset icon only for pH or ORP ▪ Turbidity: autorranging can be switched off ▪ Export Print (xml): export file revised and style sheet added for better legibility. ▪ Overview of input with counter function ▪ Input menu accessible via program creation ▪ External signal for basic programs ▪ Quick programming via start screen	BA00465C/07/EN/15.13 BA00470C/07/EN/15.13 BA00492C/07/EN/15.13 BA00493C/07/EN/15.13 SD01068C/07/EN/01.12
07/2012	01.03	Extension ▪ USP/EP (United States Pharmacopeia and European Pharmacopeia) and TDS (Total Dissolved Solids) for conductivity Improvement ▪ Adapted factory settings ▪ SAC: Factory calibration in the field incl. filter operating time reset and lamp change ▪ ISFET leak current visible in measuring screen ▪ Multiselect for limit switch and cleaning cycles	BA00465C/07/EN/14.12 BA00470C/07/EN/14.12 BA00492C/07/EN/14.12 BA00493C/07/EN/14.12
04/2011	01.02	Extension ▪ Support for additional sensors: – Chlorine – ISE – SAC – Interface ▪ Mathematics functions Improvement ▪ Modified software structures ▪ Adapted factory settings ▪ User-defined measuring screens	BA465C/07/EN/13.11 BA470C/07/EN/13.11 BA492C/07/EN/13.11 BA493C/07/EN/13.11
06/2010	01.00	Original software	BA465C/07/EN/06.10 BA470C/07/EN/06.10 BA464C/07/EN/04.10 BA467C/07/EN/04.10

2 Maintenance

⚠ WARNING

Process pressure and temperature, contamination, electrical voltage

Risk of serious or fatal injury

- ▶ De-energize the device and disconnect the battery connection.
- ▶ If a sensor has to be removed during maintenance work, avoid hazards posed by pressure, temperature and contamination.

NOTICE

Electrostatic discharge (ESD)

Risk of damaging the electronic components

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

2.1 Recommended maintenance

Maintenance work has to be carried out at regular intervals to ensure the efficient operation of the sampler.

The maintenance work comprises:

- Replacing the wear parts
- Cleaning the device

The cleaning intervals depend heavily on:

- The medium
- The ambient conditions of the sampler (dust etc.)
- The programming intervals

For this reason, adapt the cleaning intervals to your specific requirements but always ensure that these cleaning tasks are performed regularly.

Replacing wear parts

Wear parts are replaced by Endress+Hauser Service at one- and two-year intervals. Please contact your local sales center in this regard.

Endress+Hauser offers its customers a maintenance contract. With a maintenance contract, you can increase your level of operational safety and relieve your operating staff of some of their workload. Ask your Endress+Hauser Service Organization for detailed information on maintenance contracts.

2.2 Replacing the pump tube

⚠ CAUTION

Danger of injury due to rotating parts

- ▶ Take the sampler out of service before opening the peristaltic pump.
- ▶ Safeguard the sampler against accidental operation while working on the open peristaltic pump.

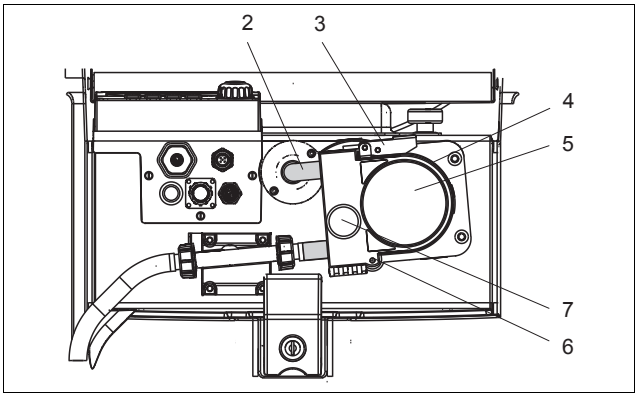
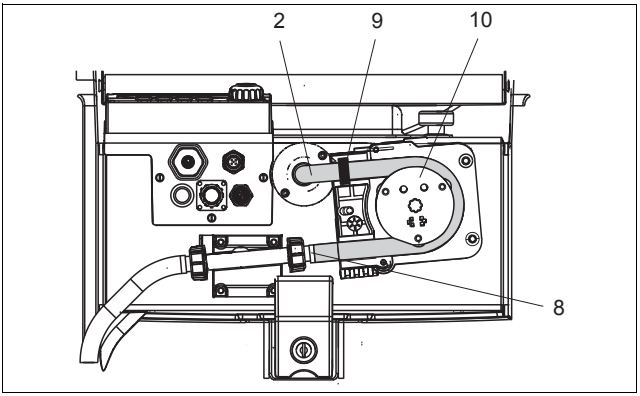


Fig. 2: Opening the peristaltic pump

2 Pump tube
3 Fastening clip
4 Pump bracket
5 Pump head cover
6 Positioning pin
7 Knurled head screw

Open the peristaltic pump as follows:

1. Take the sampler out of service by pausing a program that is currently running.
2. Open the fastening clip (item 3) and push the pump bracket (item 4) upwards.
3. Remove the knurled head screw (item 7) and open the pump head cover (item 5) downwards.



2 *Pump tube*
8 *Clamp*
9 *Marking ring*
10 *Roller*

Fig. 3: Replacing the pump tube

1. Remove the clamp (item 8) and remove the pump tube (item 2) from the pump.
2. Remove any silicone deposits on the roller (item 10) and the flexible pump bracket.
3. Make sure the roller turns smoothly and evenly.
4. Apply some lubricant to the roller.
5. Secure the new pump tube to the pressure sensor with the clamp (item 8).
6. Guide the pump tube around the roller and insert the marking ring into the groove (item 9).
7. Close the pump head cover and screw it tight. Close the pump bracket.
8. Under Menu/Diagnostics/Term information/Pump tube life reset the tube life to zero by selecting "Reset".

Calibrate the sample volume each time you replace a pump tube.
--> See Operating Instructions BA00493C "Calibration".

NOTICE

Incorrect sample volume

▶ Only reset the tube life counter to zero once you have successfully replaced the pump tube in order to avoid incorrect dosing of the medium.

2.3 Cleaning

2.3.1 Housing

Clean the housing with commercially available cleaning agents.

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.

2.3.2 Wetted parts

Peristaltic pump

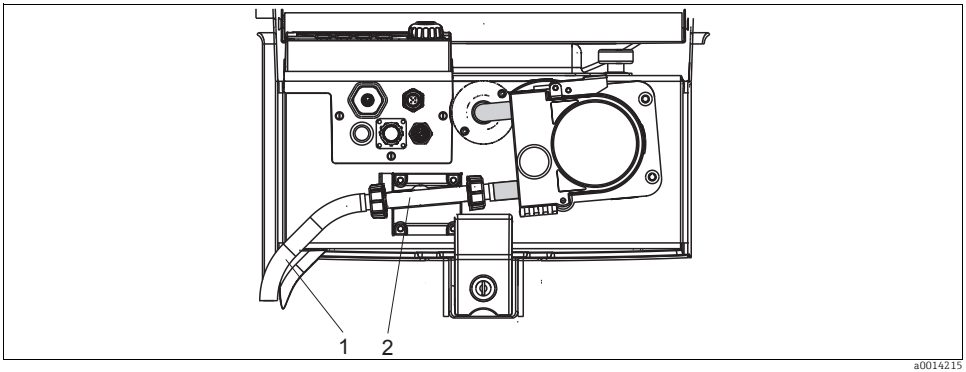


Fig. 4: Peristaltic pump

1 Suction line
2 Liquid detector

Clean the wetted parts as follows:

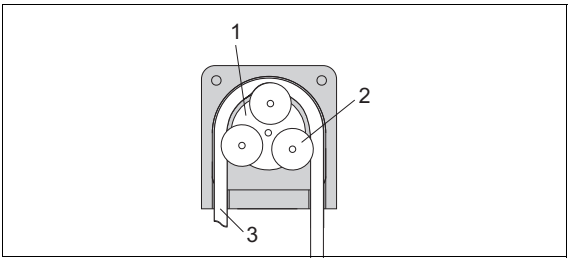
1. Connect a container containing clear water to the suction line (item 1).
2. Remove the bottles from the sample compartment.
3. Rinse the wetted parts with clear water by taking a manual sample or by performing a pump test (under Menu/Diagnostics/Systemtest/Reset/Peristaltic pump -> Pump purge/Pump suction).
4. Release the couplings to the left and right of the pressure sensor (item 2). Clean the tube piece carefully with a bottle brush.
5. Reconnect the sample supply to the tube connection and put the bottles back in the sample compartment.

Interior of peristaltic pump

⚠ WARNING

Danger of injury due to rotating parts

- ▶ Take the sampler out of service before opening the peristaltic pump.
- ▶ Safeguard the sampler against accidental operation while working on the open peristaltic pump.



1 Pump rotor
2 Roller
3 Pump tube

Fig. 5: Interior view of the peristaltic pump

1. Take the sampler out of service by pausing a program that is currently running.
2. Open the peristaltic pump as described in the "Replacing the pump tube" section.
3. Remove the pump tube.
4. Remove any silicone deposits on the roller and the flexible pump bracket.
5. Make sure the roller turns smoothly and evenly.

Cleaning the distribution arm

Make sure the distribution arm is seated correctly! The distribution arm must be locked as otherwise the rotation movement could be blocked or the system might no longer approach the bottles correctly.

Clean the distribution arm as follows:

1. Separate the upper from the lower compartment of the unit by opening the lockable latches at the side. Turn the top device section 90°.
2. Screw off the distribution arm.
3. Clean these parts with water or soapsuds. Use a bottle brush if necessary.
4. Reinstall the cleaned distribution arm.

2.3.3 Sample compartment

The sample compartment has a fully integrated plastic inner lining.

Clean the sample compartment as follows:
1. Remove the bottles.
2. Spray-clean the sample compartment with a water hose.

You can wash the PE and glass bottles in a dishwasher at 60 °C.

2.3.4 Digital sensors (for version with sensors with the Memosens protocol)

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.

2.3.5 Assemblies (for version with sensors with the Memosens protocol)

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 on spare parts and accessories.

2.4 Replacing the storage batteries

First remove the cover of the battery compartment to replace the batteries.

⚠ WARNING

Device is energized

Improper connection can cause injury or death.

▶ If a power supply unit or a charger is connected, disconnect it from the mains.

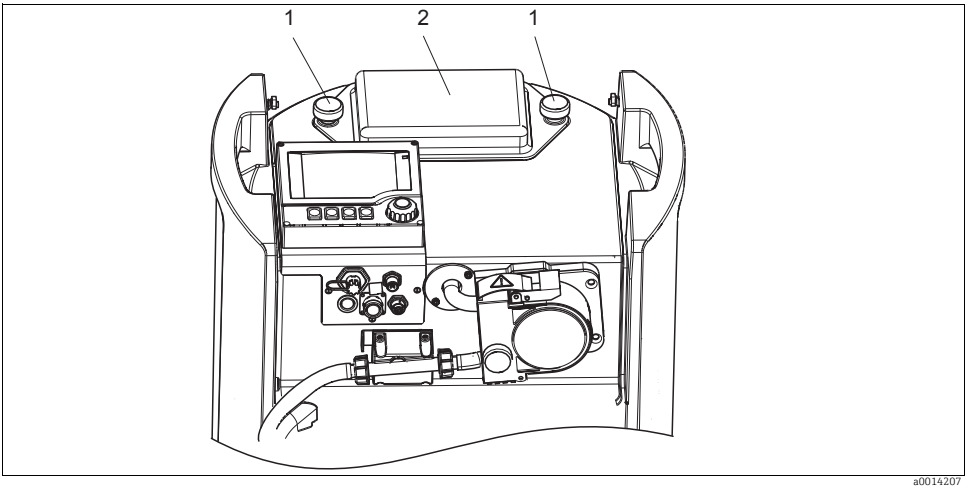


Fig. 6: Cover of battery compartment

1 Fixing screws
2 Cover of battery compartment

1. Release the screws (item 1).
2. Remove the cover of the battery compartment (item 2).
3. Remove the old batteries and disconnect them.
4. Connect the new batteries. Make sure the polarity is correct.
5. Place the new batteries into the battery compartment and replace the battery compartment cover.

Batteries must be replaced every 3 years by the following type of battery: Panasonic LC-R127R2PG1.

2.5 Calibration

Distribution arm
The position of the distribution arm is set at the factory.

Sample volume
The sample volume of the peristaltic pump is also calibrated at the factory.

For version with sensors with the Memosens protocol:
Users must decide whether the process conditions present require calibration during initial commissioning.
Additional calibration is not required in many standard applications.
Sensors with Memosens protocol are calibrated at the factory.
Calibrate the sensors at sensible intervals depending on the process.

All information on calibration is provided in BA00493C "Calibration".

2.6 Simulation

You can simulate values at inputs and outputs for testing purposes:
- Current values at current outputs
- Measured values at inputs

Only current values are simulated. It is not possible to use the simulation function to calculate the totalized value for the flow or rainfall.

The inputs and outputs must be activated in the Setup menu prior to simulation.

Diagnostics/Simulation

Function	Options	Info
▶ Current output x: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.

3 Repair

3.1 Spare parts

Contact your Endress+Hauser Service if you have any questions regarding spare parts.

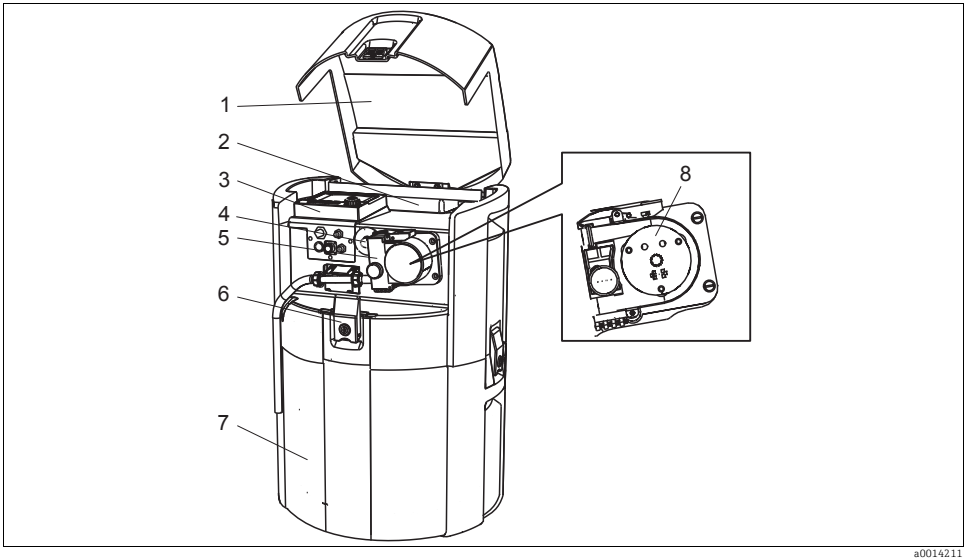


Fig. 7: Spare parts

Item No.	Designation and contents	Order number Spare parts kit
1	Lid for housing upper complete	71119023
2	Rechargeable battery pack	71119018
3	Housing cover with display CM44	71119035
4	Pump tubing, 2 pcs.	71114701
	Pump tubing, 25 pcs.	71114702
5	Peristaltic pump: pump housing	71119029
6	Lockable latch with keys	71119017
	Keys	71119017
7	Housing base	71119022
8	Peristaltic pump: pump head	71119008

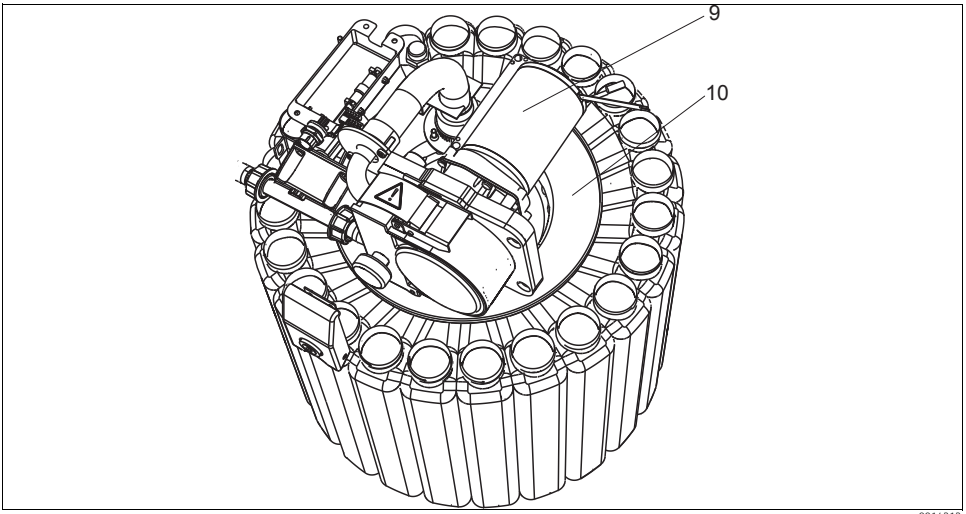


Fig. 8: Spare parts

Item No.	Designation and contents	Order number Spare parts kit
9	Peristaltic pump: pump motor	71119030
10	Downholder complete	71119013
	Distribution arm	71119007
	Distribution arm	71119025
	Seal set for peristaltic pump: O-ring ID=12.42 W=1.78 OD=15.98 EPDM, 2 pcs O-ring ID=20.92 W=2.62 OD=25.53 EPDM, 2 pcs O-ring ID=13.00 W=4.00 OD=21.00 NBR, 1 pc	71110928

3.2 Return

The sampler is repaired on site.
Contact your Endress+Hauser Service Department.

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 comply with local regulations and guidelines.

You can return the 12V storage batteries for disposal.

4 Accessories

The most important accessories available at the time this document went to print are listed below.
Contact your Service Department or sales center for accessories that are not listed here.

4.1 Accessories for Liquiport 2010 CSP44

	Base, complemented
71111864	CSP44 base + 1 x 20 liter (5.28 US gal.), PE
71111866	CSP44 base + 12 x 2 liter (0.53 US gal.), PE
71111867	CSP44 base + 12 x 0.7 liter (0.18 US gal.), glass
71111868	CSP44 base + 24 x 1 liter (0.26 US gal.), PE
71111870	CSP44 base + 12 x 1 liter (0.26 US gal.) + 6 x 2 liter (0.53 US gal.), PE
	Bottles + caps
71112221	20 liter (5.28 US gal.) PE + cap, 1 pc.
71111178	2 liter (0.53 US gal.) PE wedge shaped bottle + cap, 12 pcs.
71111176	1 liter (0.26 US gal.) PE wedge shaped bottle + cap, 24 pcs.
71111874	0.7 liter (0.18 US gal.) glass + cap, 12 pcs.
	Accessories base
71111878	Kit CSP44 base cover, transporting
71111880	Kit CSP44 freezer cartridge
	Suction line
71111233	Suction line ID 10 mm (3/8"), reinforced fabric, PVC, clear, length 10 m (33 ft), suction head V4A
71111234	Suction line ID 10 mm (3/8"), EPDM, black, length 10 m (33 ft), suction head V4A
71111482	... m; suction line coil ID 10 mm (3/8"), PVC
71111484	... m; suction line coil ID 10 mm (3/8"), EPDM
71111184	Strainer V4A 316(x) for ID 10 mm (3/8"), 1 pc.
	Tubing customized
71114701	Pump tubing, 2 pcs.
71114702	Pump tubing, 25 pcs.
	Installation
71111881	CSP44 suspension kit, for use in 500 to 600 mm diameter manhole
	Power supply
71111872	Lead-acid battery 24 V DC
71111882	Kit CSP44 charger adapter cable, battery for power unit
71111883	Kit CSP44 power unit/charger for indoor use, 100 to 120/200 to 240 V AC ±10 %, 50/60 Hz
71111884	Kit CSP44 power unit/charger for outdoor use, IP 65, 100 to 120/200 to 240 V AC ±10 %, 50/60 Hz
	Communication; software
51516983	Commubox FXA291 + FieldCare Device Setup
71129799	Field Data Manager software; 1 license
	Retrofit kits
71111879	Kit CSP44 retrofit distribution system (distribution arm, distribution drive)

4.2 Measuring cable

Memosens data cable CYK10
- For digital sensors with Memosens technology:
  pH, ORP, oxygen (amperometric), chlorine, conductivity (conductive)
- Order as per product structure (--> Online Configurator, www.products.endress.com/cyk10)

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

4.3 Sensors

You can only connect sensors with M12 plug.

4.3.1 Glass electrodes

Orbisint CPS11D
- pH sensor with Memosens technology
- Dirt-repellent PTFE junction
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps11d)
- Technical Information TI028C/07/EN

Ceraliquid CPS41D
- pH sensor with Memosens technology
- Ceramic junction and KCl liquid electrolyte
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps41d)
- Technical Information TI079C/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 TI245C/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 TI375C/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

4.3.2 Pfaudler sensors

Ceramax CPS341D
- Electrode with pH sensitive enamel
- Meets highest demands of measuring accuracy, pressure, temperature, sterility and durability
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps341d)
- Technical Information TI468C/07/EN

4.3.3 ORP sensors

Orbisint CPS12D
- ORP sensor with Memosens technology
- Dirt-repellent PTFE junction;
- 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 junction 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
- ORP 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

4.3.4 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 junction for media with high potential for fouling
- Order as per product structure (--> Online Configurator, www.products.endress.com/cps491d)
- Technical Information TI377C/07/EN

4.3.5 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

4.3.6 Conductive conductivity sensors

Condumax CLS15D
- Conductive conductivity sensor for pure water, ultrapure water and applications in hazardous areas
- Order as per product structure (--> Online Configurator, www.products.endress.com/cls15d)
- Technical Information TI109C/07/EN

Condumax H CLS16D
- Hygienic, conductive conductivity sensor for pure water, ultrapure water and applications in hazardous areas
- With EHEDG and 3A approval
- Order depending on version, see Technical Information TI227C/07/en

Condumax W CLS21D
- ▶ Two-electrode sensor in plug-in head and fixed cable version
- ▶ Order as per product structure, see Technical Information TI085C/07/en

4.3.7 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

4.3.8 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

4.3.9 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

4.3.10 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

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