Operating Instructions

Multi-Channel Measuring and Control System DULCOMARIN® II Disinfection Controller DXCa

Part 2, Operation

Please carefully read these operating instructions before use! · Do not discard!
The operator shall be liable for any damage caused by installation or operating errors!

Part No. 986436 **ProMinent Dosiertechnik GmbH · 69123 Heidelberg · Germany** BA DC 051 12/08 GB

These operating resp. supplementary instructions apply only in conjunction with the following ticked operating resp. supplementary instructions:

- ☑ Operating Instructions Multi-Channel Measuring and Control System DULCOMARIN® II Swimming Pool Controller and Disinfection Controller DXCa Part 1: Mounting and Installation
- ☐ Operating Instructions Multi-Channel Measuring and Control System DULCOMARIN® II Swimming Pool Controller DXCa Part 2: Operation
- ☐ Operating Instructions Multi-Channel Measuring and Control System DULCOMARIN® II Disinfection Controller DXCa Part 2: Operation
- ☑ Supplementary Instructions DULCOMARIN® II Videographic Recorder Operation
- ☑ Supplementary Instructions DULCOMARIN® II, M Module (Measurement Module for pH, Redox/ORP, Temperature) DXMaM Operation
- ☐ Supplementary Instructions DULCOMARIN® II, M Module (Measurement Module for pH, Redox/ORP, Temperature) DXMaM Connection
- ☐ Supplementary Instructions DULCOMARIN® II, A Module (Actuator Module, Pumps and Standard Signal Outputs mA) DXMaA
- ☐ Supplementary Instructions DULCOMARIN® II, N Module (Power Supply Module without Relays) DXMaN
- ☐ Supplementary Instructions DULCOMARIN® II, P Module (Power Supply Module with Relays) DXMaP
- ☑ Supplementary Instructions DULCOMARIN® II, I Module (Current Input Module, Standard Signal Inputs mA) DXMaI

Imprint:
Operating instructions
Multi-Channel Measuring and Control System
DULCOMARIN® II Disinfection Controller DXCa,
Part 2, Operation

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General User Information

Please read through the following user guidelines! Familiarity with these points ensures optimum use of the operating instructions.

Key points in the text are indicated as follows:

- enumerated points

▶ hints

Working guidelines:

NOTE

Notes are intended to make your work easier.

and safety guidelines:

CAUTION

Characterizes a possibly hazardous situation.
There is a danger of slight or minor injury if these notes are disregarded!

IMPORTANT

Characterizes a possibly hazardous situation.

There is a danger of damage to property if these notes are disregarded!

1 About this Controller

The provision of perfect drinking water poses a central, global challenge. The natural water supplies, which can be used as drinking water without any further treatment, are negligible. We have made it our task to treat the existing water supplies with suitable processes such that drinking water of best quality is produced. In this respect, we can rely on a comprehensive portfolio of all important technologies for the measurement of important parameters, such as pH value, chlorine or chlorine dioxide concentration, and the treatment of drinking water.

The DULCOMARIN® II Disinfection Controller is a measuring and control unit designed for the specific demands in drinking water treatment.
It can be combined with various measuring and actuator modules and thus ensures a very flexible use.
With the DULCOMARIN® II Disinfection Controller, ProMinent is the first supplier offering a standard bus system for networking the sensors and actuators with the control unit in drinking water treatment.
The device is equipped with the standardised bus system CANopen®. This is a system that already has a well-proven record of success in a variety of applications including elevators, motor vehicles, ships, medical equipment as well as building installations and rail vehicles.
All applications require a fast and extremely reliable transmission medium.
A further advantage is that all modules are based on the plug & play principle.
A flexible system that, corresponding to specific requirements, can be configured as a compact or decentral modular system while being fully prepared for future applications.

The DULCOMARIN® II Disinfection Controller can process the measured values of up to 16 drinking water lines.

The I module permits the connection of up to 3 (external) sensors with mA signals, e.g. for flow rate, turbidity and UV intensity, for each drinking water line.

Depending on the measured parameters, metering pumps, chlorine gas metering units or chlorine gas generation plants can be directly controlled.
The flow rate signal can be used as disturbance for the controlled measured variables.

The following sensors are available for the measurement of the following measured variables in drinking water: pH value, free chlorine, total available chlorine, chlorine dioxide, chlorite, ozone, fluoride, and ammonia/ammonium.
The measured values for chlorine, fluoride and ammonia/ammonium are pH-compensated.
The DULCOMARIN® II Disinfection Controller has an integrated data logger and optionally an embedded Web server and OPC server which permit the transmission of the measured values and messages to a control desk via LAN/Ethernet.

2 Safety Chapter

2.1 Proper Use

The DULCOMARIN® II Disinfection Controller is exclusively designed for:

- **Measuring and controlling of the pH value or the ORP**
- **Measuring and controlling of the chlorine concentration**
- **Measuring and controlling of the chlorine dioxide concentration**
- **Measuring of the temperature**
- **Measuring of the fluoride concentration**
- **Measuring of ammonia and ammonium concentration**
- **Measuring of the flow rate**
- **Displaying of the measuring values**
- **Creating of output signals**

The DULCOMARIN® II Disinfection Controller is only destined for applications in water treatment! All other uses or modifications may only be performed after written agreement with ProMinent Dosiertechnik GmbH, Heidelberg!

- **Without protective cabinet, the controller may not be used for applications in the open!**

In the following, some facts are pointed out which are not expected because of the new technology!

IMPORTANT

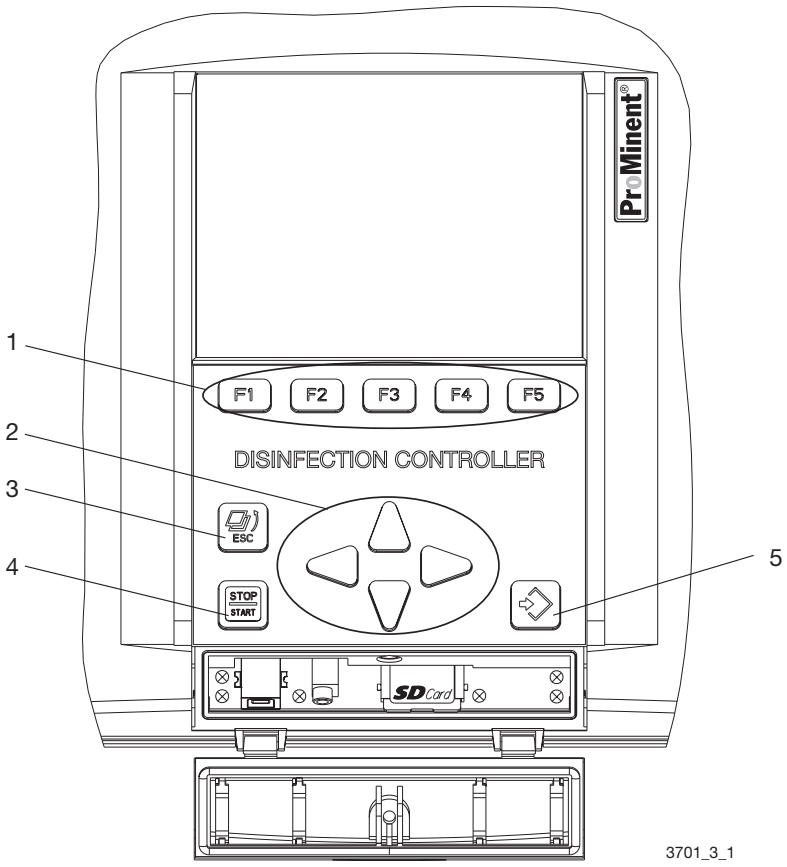
- ***If a module has been assigned to a pool, it cannot be simply exchanged with another module! CAN sensors for chlorine are also modules!***
  The central unit is not able to detect for which pool a module is meant; furthermore, problems regarding the node IDs of the modules are created.
  If a module is to be replaced with another module, it has to be expressly assigned to a pool "0" before removing it from the CAN bus train (see chap. 8 "Complex Activities").
  If a new module is to be looped in a CAN bus train, it has to be expressly assigned to a pool (see chap. 8 "Complex Activities")!
- ***Never alter the submenus UPDATE or BUS if you have not received proper training!***
  The software of the DULCOMARIN® II might be erased and the entire controller might fail!

NOTE

If a limit value criterion for chlorine was violated, the left LED at the chlorine sensor is flashing in red!

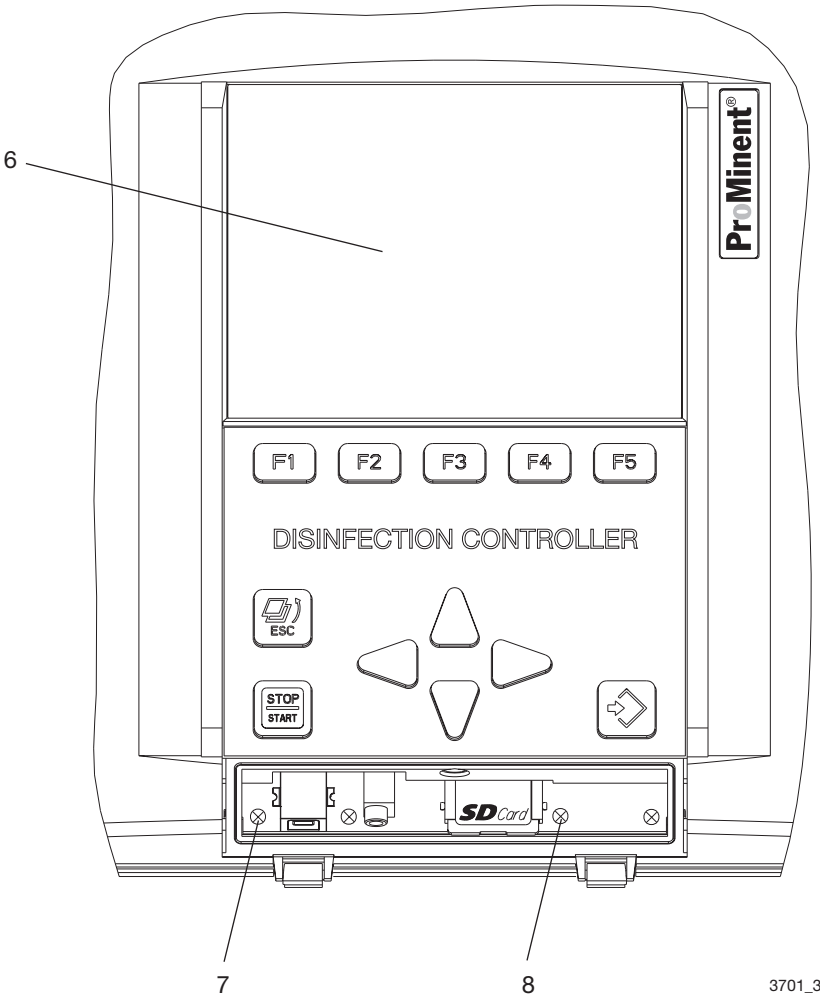
3 Controls

Fig. 1: The keys



1 Function keys, variable assignment
2 Arrow keys
3 ESC key
4 Start/stop key
5 ENTER key

Fig. 2:
The displays



6 LCD screen
7 NetDevice LED
8 CAN 1 LED

3.1 Function of the Keys

(navigation in the operating menu)

The **ENTER key** is used to:

- go from menu option to menu option in the operating menu - into the operating menu.
- access a selection in the index cards of a menu option and confirm a change.

The **ESC key** is used to:

- go from menu option to menu option in the operating menu - from the operating menu.

NOTE

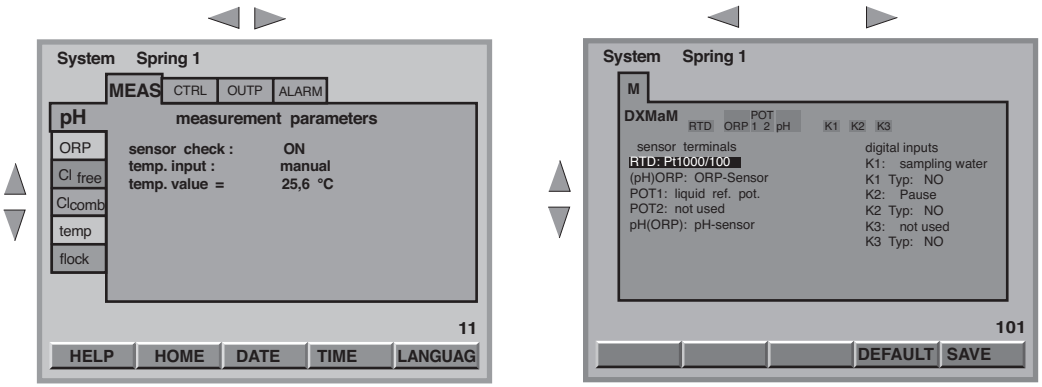
To return from any menu option of the operating menu to the permanent display, press the ESC key repeatedly until the permanent display appears.

It is also possible to wait until the DULCOMARIN® II automatically returns to the permanent display step by step.

The **arrow keys UP, DOWN, LEFT, RIGHT** are used to:

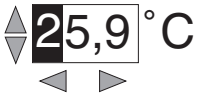
- toggle between the index cards of a menu option in a certain menu option.
- to toggle between the selections of an index card.

Fig. 3: Toggle between index cards - selection of an index card



The numerical value or variable displayed in a selection can be changed with the arrow keys UP, DOWN. With the arrow keys LEFT, RIGHT, the decimal point to be changed can be selected for a numerical value.

Fig. 4: Changing of numerical value



The variably assigned **function keys F1 through F5** are used to select the menus or functions displayed above in the display as keys (e.g. menus (CONFIG(uration), PASS(word), HELP or the function SAVE).

IMPORTANT

The numerical values or variables can only be saved in the index cards using the function SAVE.

Individual numerical values such as e.g. in PASSW, TIME or DATE are saved by pressing the ENTER key.

Fig. 5: Example for the allocation of function keys

The **START/STOP key** is used to start or stop overall controlling or dosing. In this case, the permanent display and the main center menu option show “Dosing ON” or “Dosing OFF”.

3.2 Access Code (Password)

The access to the controller can be extended level by level by adjusting the access code correspondingly. Upon delivery, the controller DULCOMARIN® II has the access codes according to the following table.

The 3 different levels permit the following:

Level	0 (Anybody)	1 (User)	2 (Installer)	3 (Service)	4 (Supervisor)	5 (ProMinent)
Password (Default)	0000	1111	2222	3333	4444	Confidential
Viewing	X	X	X			
Calibrating	X	X	X			
Parameterising			X	X	X	X
Configuring			X	X	X	X
Calibrating Cl NP			X	X	X	X
Configuring bus				X	X	X
Updating all modules				X	X	X
Updating individual modules					X	X
Updating central unit						X

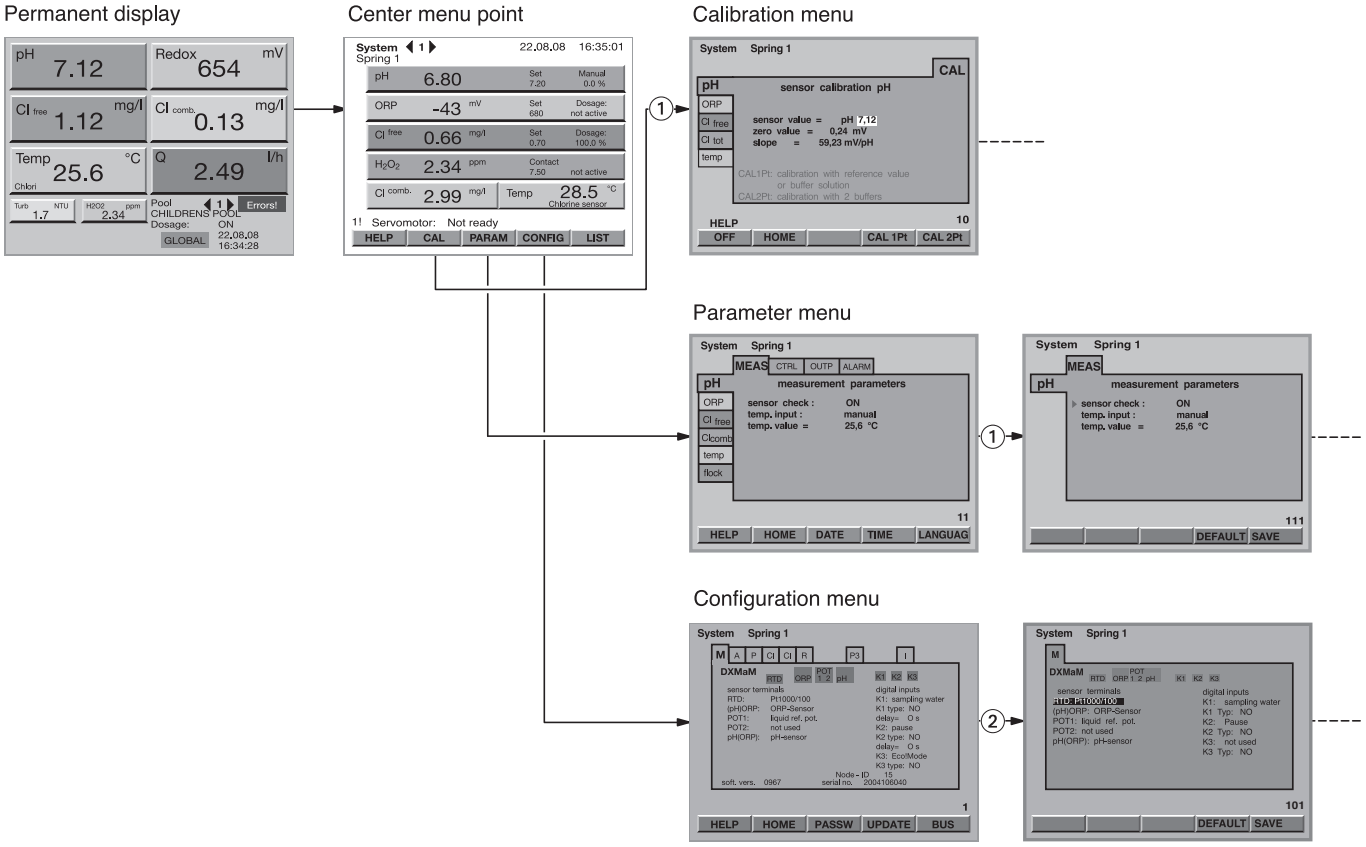
IMPORTANT

- ***Replace the access code ex works by your own code!***
  Otherwise the following menus are not sufficiently protected!
- ***When returning to the permanent display, the DULCOMARIN® II automatically resets to level "0" for "anybody".***
- ***If the level is to be set to "0", press the key sequence: F4 (CONFIG), F2 (OPTION), F5 (RESTART) from the center menu option – the module recognition function is started manually.***

NOTE

If the password has been set to "0000" for level 1 (users), it is possible to freely calibrate in the levels 0 and 1.

Fig. 6:
Menus protected by access codes



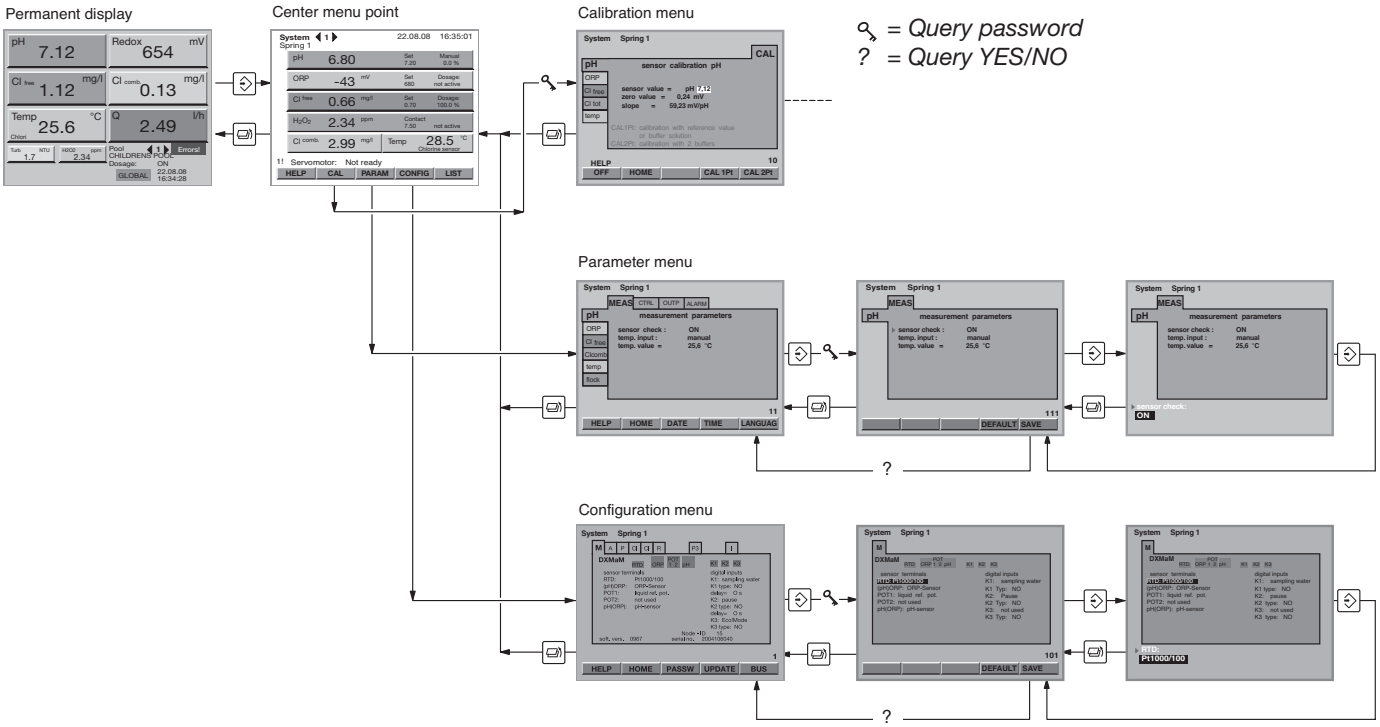
Language

The language can be set in the submenu LANGUAGE.
Press the function key F5 (PASSW) in the parameter menu.

4 Layout of the Operating Menu

4.1 General Layout

Fig. 7:
General layout of the operating menu

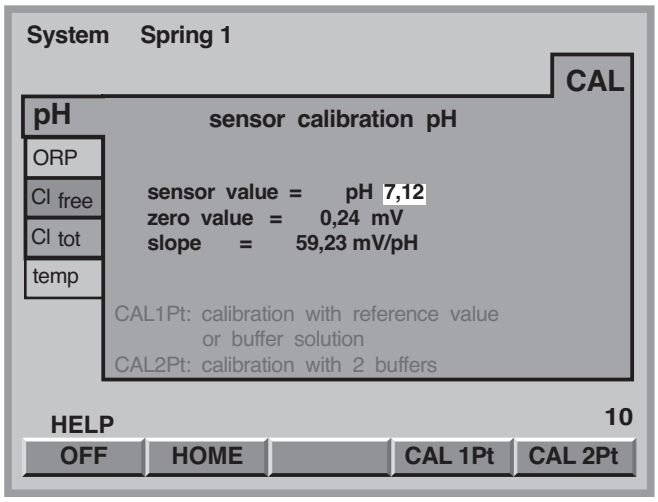


From the permanent display it is possible to go to the **center menu option**. At this option, the operating menu branches into:

- **Calibration menu**
- **Parameter menu**
- **Configuration menu**

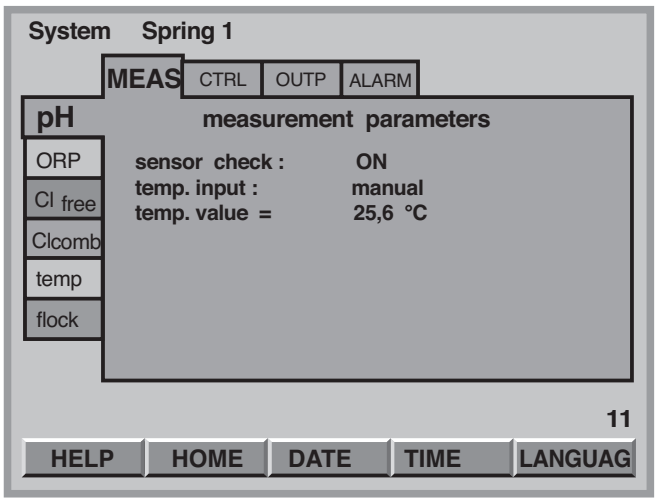
4.2 Menus Under Center Menu Option

Fig. 8:
First menu option of the calibration menu



The **calibration menu** for all measured variables can be accessed in the center menu option by pressing the function key F2 (CAL).

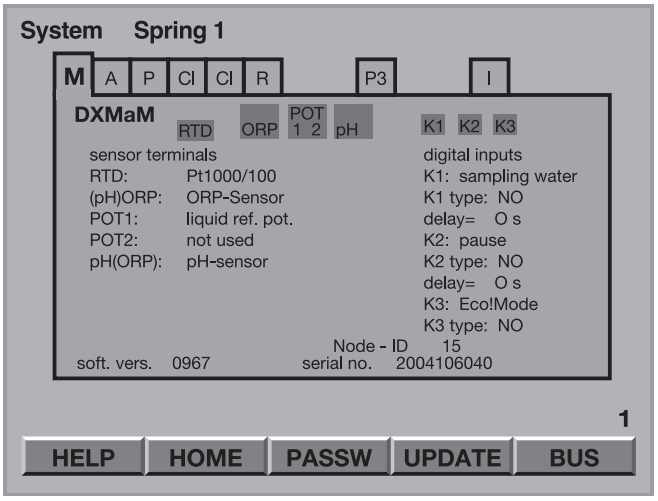
Fig. 9:
First menu option of the parameter menu



The **parameter menu** is designed like a card box (with horizontal and vertical tabs):

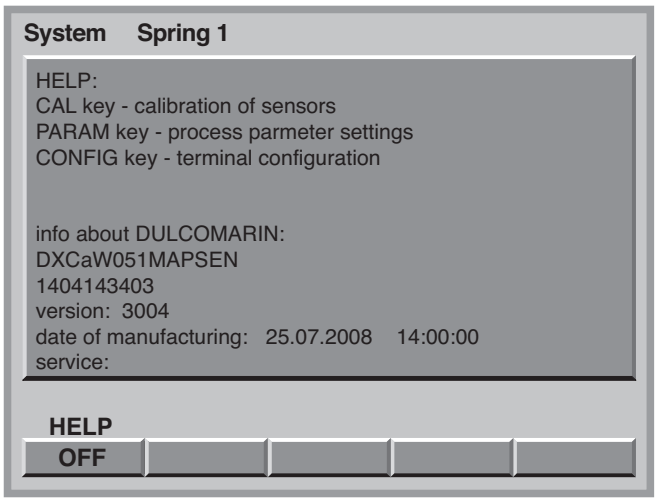
- the vertical tabs are the measured variables (pH, ORP, ...)
- the horizontal tabs contain the groups of parameters (e.g. measurement, controlling, mA outputs, alarm)

Fig. 10:
First menu option of the configuration menu



The layout of the **Configuration menu** represents the existing hardware modules. For each module, an index card is created which also shows the connections.

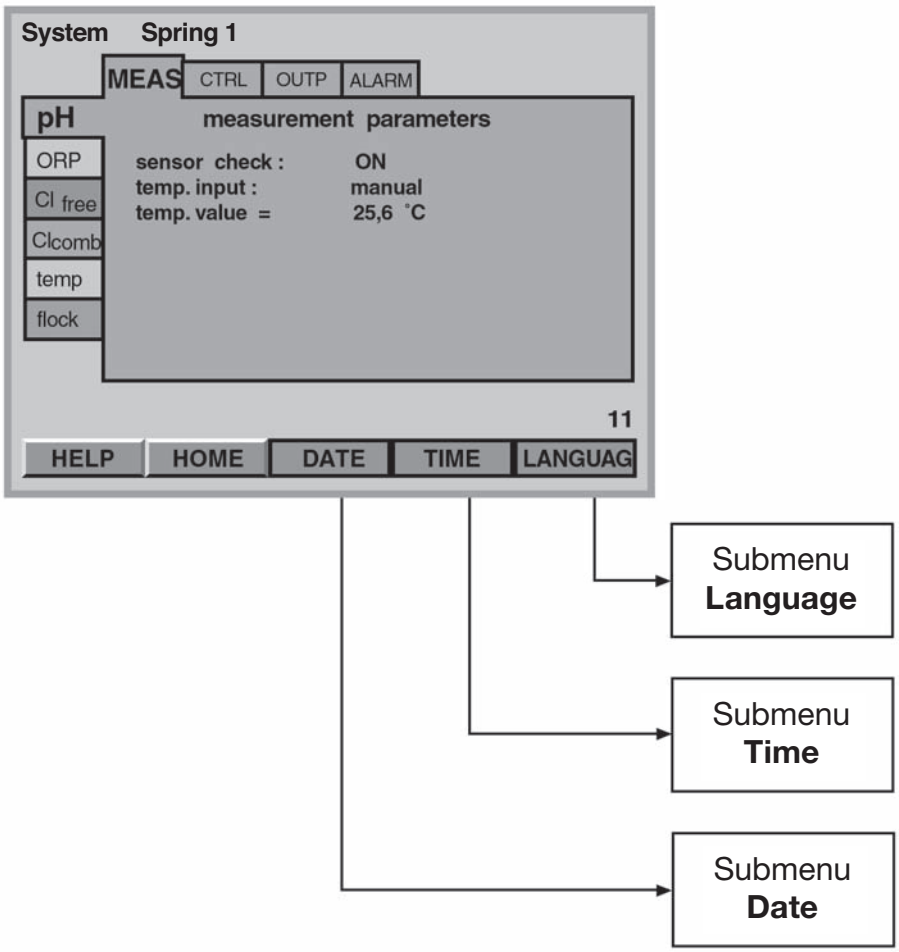
Fig. 11:
Example for a help display



The **Help function** can be called with F1 if HELP is displayed above F1 in the menu option. When called from the center menu option, the Help in addition displays the software version of the central unit and the production date.
In the calibration menu, common help texts for all menu options of the calibration menu can be activated and deactivated in the index cards by pressing F1 (HELP).

4.3 Submenus of Parameter Menu

Fig. 12: Access to the submenus DATE, TIME and LANGUAGE via the first menu option of the parameter menu



The submenus **DATE**, **TIME**, and **LANGUAGE** can be accessed through the parameter menu or the configuration menu by pressing the function keys.

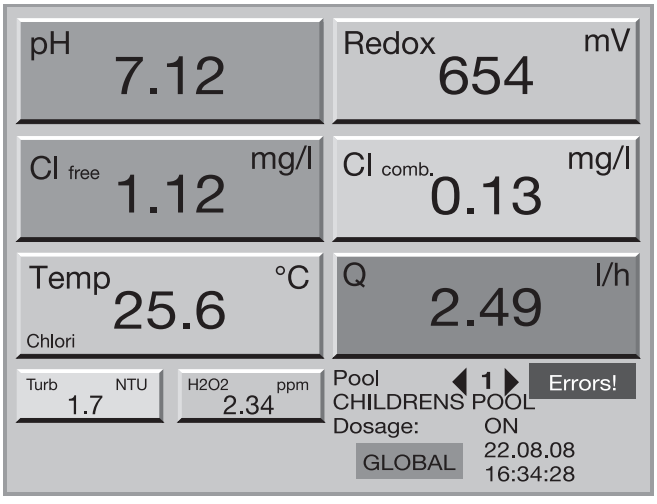
The submenus **PASSW** and **BUS** can be accessed through the configuration menu by pressing the function keys (for BUS see chap. 8 “Complex Activities”).

IMPORTANT

The DULCOMARIN® II does not automatically set to summer time!

4.4 Permanent Display

Fig. 13: The permanent display for all measured variables measured



The permanent display shows all existing measuring values of the sample water of a pool. If a limit value was exceeded or undershot, a red or blue angle is displayed besides the measuring value and the measuring value is also shown in the corresponding colour.

If a sensor-related error occurs or if the calibration is faulty, an error message is displayed besides the field of the relevant measured variable.
In the field at the right bottom, the permanent display shows the pool number and the pool name. Date and time are also shown there.
The display also shows whether dosing was activated or deactivated by pressing the start/stop key. (dosing “ON” or “OFF”; (unlike the individual dosing in the center menu option)).
An overview of the measured values and the setpoints of all basins is displayed after F4 **(GLOBAL)** is pressed, if several basins were configured.

IMPORTANT

The DULCOMARIN® II calculates the displayed values for combined chlorine as difference of the measuring values of the chlorine sensors for free chlorine and total chlorine!

NOTE

- ***A fixed colour is assigned to each measured variable (e.g. pH = orange, redox/ORP = yellow, ...).***
- ***To return from any menu option of the operating menu to the permanent display, press the ESC key repeatedly until the permanent display appears.***

  It is also possible to wait until the DULCOMARIN® II automatically returns to the permanent display step by step.

4.5 Center Menu Option

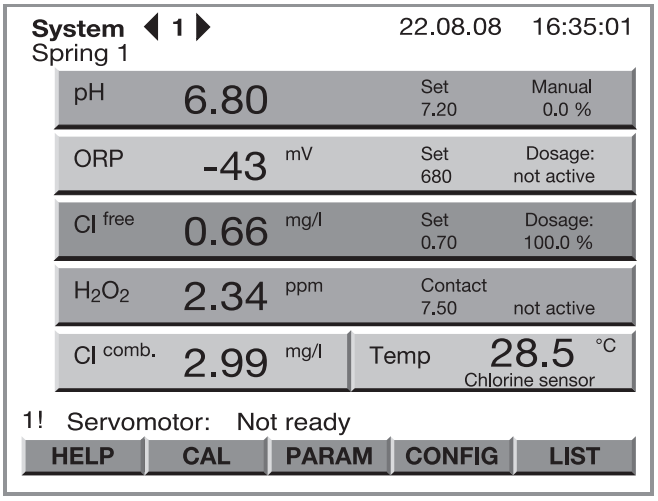


Fig. 14: The center menu option for all measured measured variables

The central menu option typically shows the same data as the permanent display.
In addition, it may also show the setpoints and the switching point for combined chlorine or temperature.
If a measured variable is controlled, the coloured bar extends across the entire display.
If a measured variable is only displayed, its bar only extends across half the display.
If not all measured variables can be shown on the display but are to be visible, it can be checked whether there are measured variables which are not connected with each other. In this case, a set of measured variables can be separated and may be assigned to a second, virtual basin. These two basins are declared as subsystems and should be best identified immediately, but e.g. differentiated by the name affixes “_A” and “_B”.

Unlike the permanent display, the center menu option for the individual measured variables of a pool shows whether dosing is set to “off” or “on” (see chap. 6.3. “Controlling”). It then shows the value of the control variable. If dosing was set to “off”, it cannot be activated via the START/STOP key.
It is only for several basins that the DULCOMARIN® shows the basin number.

The center menu option shows the error messages below the fields for the measured variables. If more than one error message is given, the function **LIST** is displayed after acknowledgement of an alarm by pressing F5: pressing F5 displays a list of the errors.

Here it is possible to change over to the archive of previous error messages with F5 **(ARCHIVE)** provided an SD card is installed.

The following data can be shown for each event:

Block 1: Number, date, time, OCCUR/CLEARED *
Block 2: Node ID, pool number, serial number
Block 3: Error message

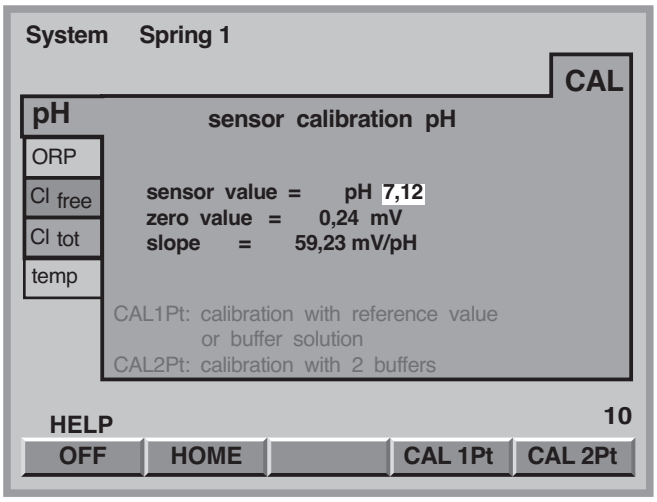
* Designates whether the fault occured or disappeared at this time.

These data are stored in the file “eventlog.txt” on the SD card. This file can be viewed with a text processing program on a PC (maximise window for better overview).

From the center menu option, the operating menu branches into the setting menus

- Calibration
- Parameter settings
- Configuration

5 Calibration



During the calibration, the DULCOMARIN® II sets the command outputs to “0”. Exception: if a base load or manual control variable was set, these are maintained during the calibration. The standard signal outputs mA (see chapter 7.2 “Module DXMaA”) are frozen.

After a successful calibration, all error examinations relating to the measuring value are started again. The DULCOMARIN® II stores the determined data for zero point and slope.

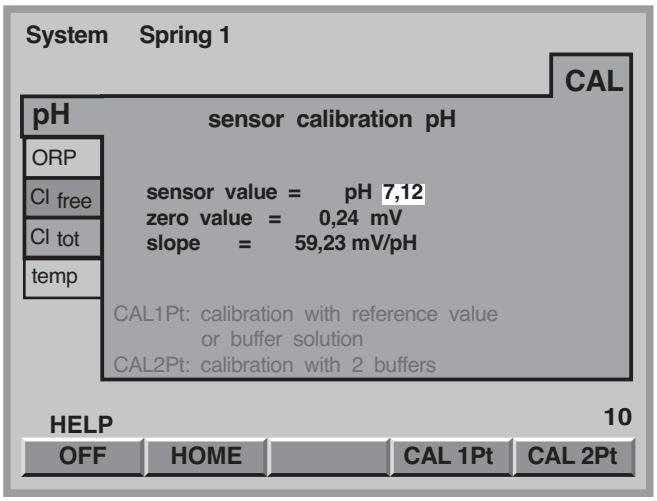
Start of calibration (for all measured variables):

- ▶ Close the sample water (acknowledge possible alarm pressing the ENTER key).
- ▶ Press F2 (CAL) in the center menu option to access the calibration menu.
- ▶ Enter the access code with the arrow keys UP and DOWN, LEFT and RIGHT and press the ENTER key.
- ▶ Select the index card with the desired measured variable (arrow keys).

NOTE

Help texts can be activated or deactivated by pressing F1 (Help).

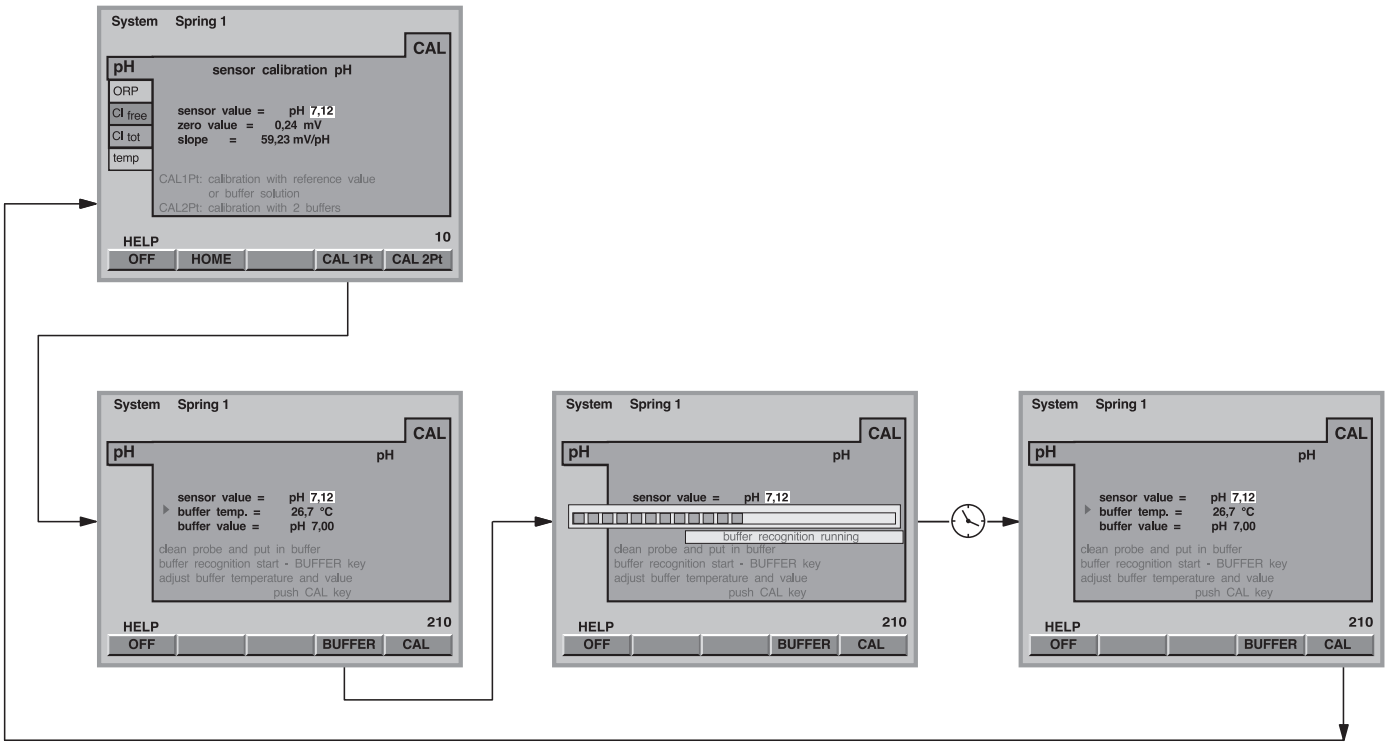
5.1 Measured Variable pH



NOTE

Reject used quality buffers!

1-Point Calibration

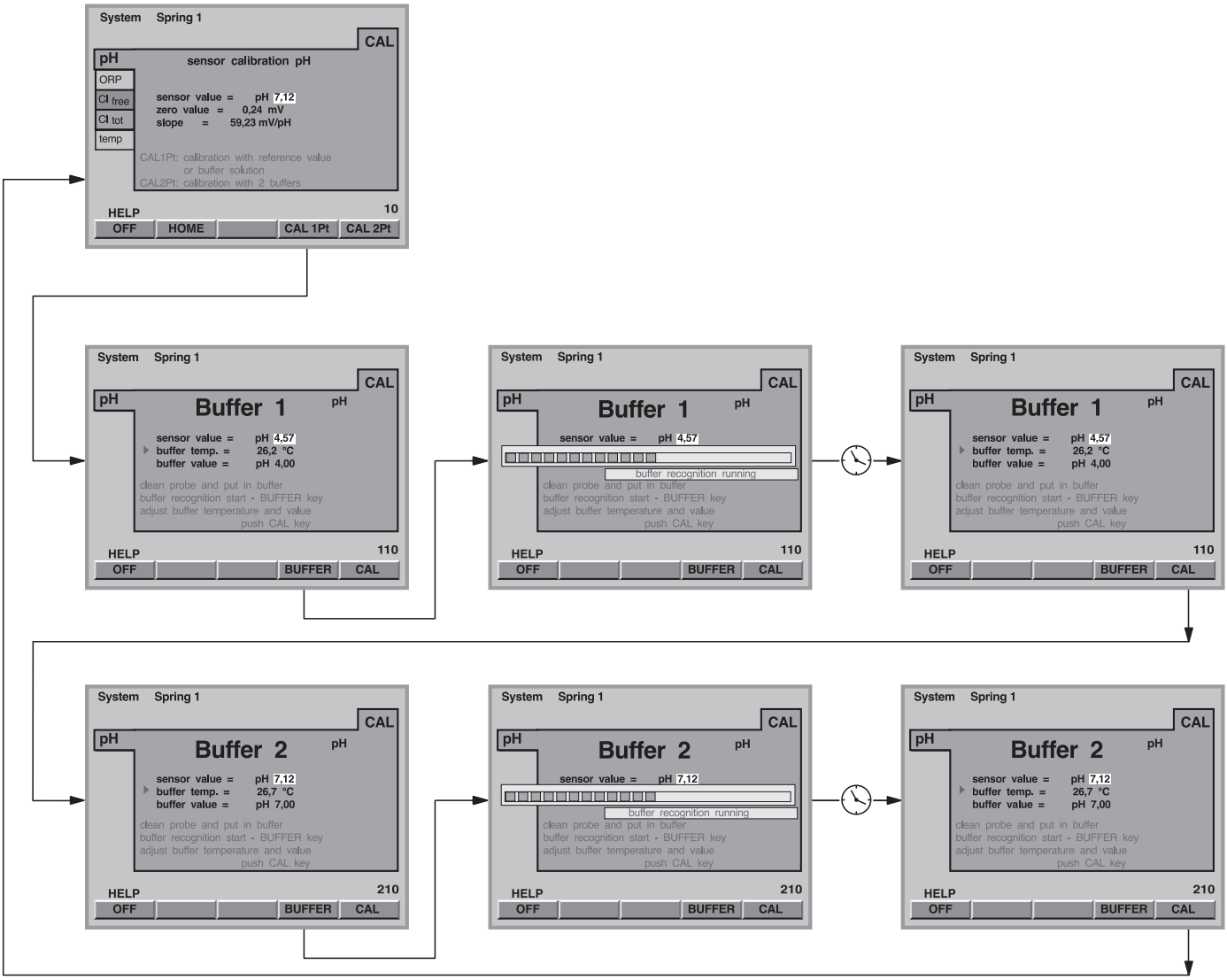


The DULCOMARIN® II calibrates:

- the zero point if the buffer value ranges between 6.8 pH and 7.5 pH.
- the slope, if the buffer value is lower than 6.8 pH or higher than 7.5 pH.

▶ Close the sample water (acknowledge possible alarm pressing the ENTER key).
▶ Disconnect the coaxial cable from the pH sensor
▶ Remove the pH sensor (sample water closed?)
▶ Rinse the pH sensor with distilled water
▶ Carefully dab dry the pH sensor using a fine cloth (fat-free, lint-free)
▶ Re-connect the coaxial cable to the pH sensor
▶ Press F4 (CAL 1Pt) to select a 1-point calibration
▶ Dip the pH sensor into quality buffer (e.g. pH 7) and stir a bit
▶ If measuring with an equipotential bonding pin, dip it also in quality buffer
▶ In the index card, select the buffer temperature (arrow keys) and press the ENTER key
▶ Enter the “buffer temperature” (arrow keys) and press the ENTER key
▶ Press F4 (buffer) (buffer detection) - the progress display and “buffer recognition running” are displayed
▶ Press the ESC key to access the calibration mode again
▶ Press F5 (CAL) to complete the calibration process and to save the values
▶ If no other calibrations are to be performed, press the ESC key to return to the permanent display (all menus are then again protected by the access code) or to the center menu option
▶ Disconnect the coaxial cable from the pH sensor
▶ Install the pH sensor again at the in-line probe (tighten fingertight but nevertheless watertight)
▶ Re-connect the coaxial cable to the pH sensor
▶ Re-install the equipotential bonding pin
▶ Open the shut-off valve for the sample water

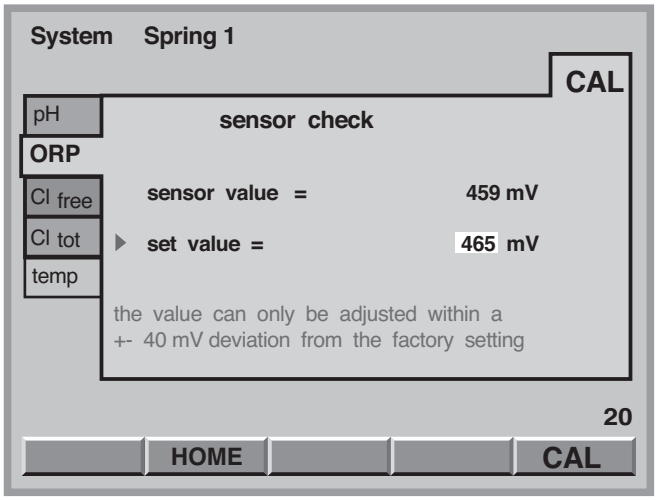
2-Point Calibration



- ▶ Close the sample water (acknowledge possible alarm pressing the ENTER key).
- ▶ Disconnect the coaxial cable from the pH sensor
- ▶ Remove the pH sensor (sample water closed?)
- ▶ Rinse the pH sensor with distilled water
- ▶ Carefully dab dry the pH sensor using a fine cloth (fat-free, lint-free)
- ▶ Re-connect the coaxial cable to the pH sensor
- ▶ Press F5 (CAL 2Pt) to select a 2-point calibration
- ▶ Dip the pH sensor into quality buffer pH 7 and stir a bit
- ▶ If measuring with an equipotential bonding pin, dip it also in quality buffer
- ▶ In the index card (key word “buffer 1” or display no. -110), select the buffer temperature (arrow keys) and press the ENTER key
- ▶ Enter the “buffer temperature” (arrow keys) and press the ENTER key
- ▶ Press F4 (buffer) (buffer detection) - the progress display and “buffer recognition running” are displayed
- ▶ Press the ESC key to access the calibration mode again
- ▶ Press the function key F5 (CAL) to continue with the calibration process
- ▶ Rinse the pH sensor, dab it dry carefully, dip into quality buffer pH 4 and stir a bit
- ▶ If measuring with an equipotential bonding pin, dip it also in quality buffer

- ▶ In the index card (key word “buffer 2” or display no. 210) now displayed, select the buffer temperature (arrow keys) and press the ENTER key
- ▶ Enter the “buffer temperature” (arrow keys) and press the ENTER key
- ▶ Press F4 (buffer) (buffer detection) - the progress display and “buffer recognition running” are displayed
- ▶ Press the ESC key to access the calibration mode again
- ▶ Press F5 (CAL) to complete the calibration process and to save the values. “Calibration OK” is displayed on successful calibration
- ▶ If no other calibrations are to be performed, press the ESC key to return to the permanent display (all menus are then again protected by the access code) or to the center menu option
- ▶ Disconnect the coaxial cable from the pH sensor
- ▶ Install the pH sensor again at the in-line probe (tighten fingertight but nevertheless watertight)
- ▶ Re-connect the coaxial cable to the pH sensor
- ▶ Re-install the equipotential bonding pin
- ▶ Open again the shut-off valves for the sample water - first outlet, then inlet

5.2 Measured Variable Redox/ORP



NOTE

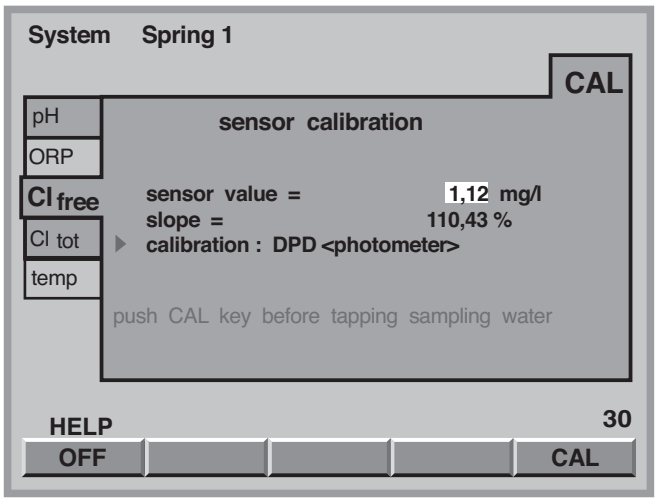
- ***The measuring value redox/ORP can only be set as a default within a range between ±40 mV around the test value.***
- ***Reject used quality buffers!***

- ▶ Select the index card “ORP” “Set value” (arrow keys) and press the ENTER key.
- ▶ Close the sample water (acknowledge possible alarm pressing the ENTER key).
- ▶ Disconnect the coaxial cable from the redox/ORP sensor.
- ▶ Remove the redox/ORP sensor (sample water closed?)
- ▶ Rinse the redox/ORP sensor with distilled water
- ▶ Carefully dab dry the redox/ORP sensor using a fine cloth (fat-free, lint-free)
- ▶ Re-connect the coaxial cable to the redox/ORP sensor
- ▶ Dip the redox/ORP sensor into quality buffer (e.g. 465 mV)
- ▶ If measuring with an equipotential bonding pin, dip it also in quality buffer.
- ▶ After the “sensor value” has stabilised, compare it to the mV value on the bottle of the quality buffer. The value may not deviate more than ±40 mV from the buffer value

Do not press F5 (SAVE)!

- ▶ If no other calibrations are to be performed, press the ESC key to return to the permanent display (all menus are then again protected by the password) or to the center menu option
- ▶ Disconnect the coaxial cable from the redox/ORP sensor
- ▶ Install the redox/ORP sensor again at the in-line probe (tighten fingertight but nevertheless watertight)
- ▶ Re-connect the coaxial cable to the redox/ORP sensor
- ▶ Re-install the equipotential bonding pin
- ▶ Open again the shut-off valves for the sample water - first outlet, then inlet

5.3 Measured Value Free Chlorine



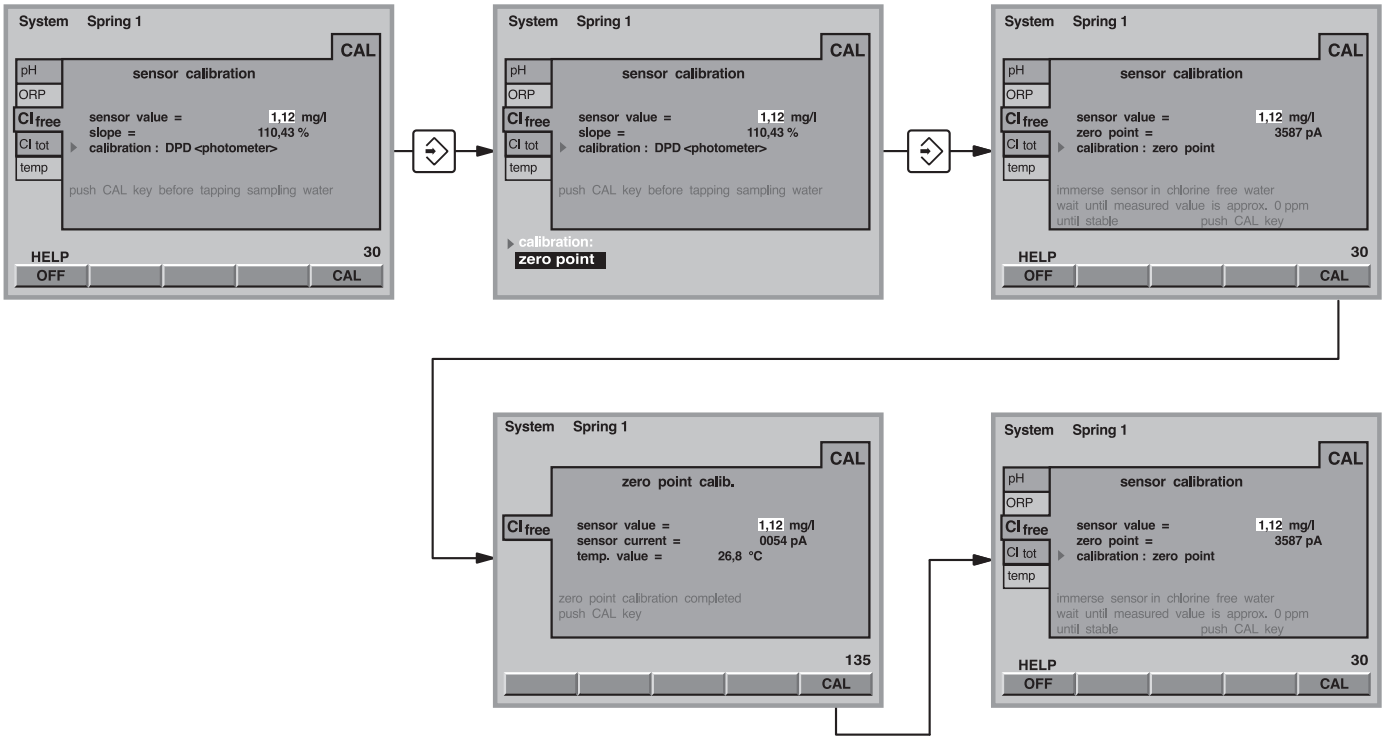
IMPORTANT

- ***Please also read the operating instructions for chlorine sensor and in-line probe!***
- ***A differential chlorine may only be set up in connection with a calibrated pH sensor!***
- ***If calibration was carried out with pH correction, the measurement may only be carried out with pH correction! If calibration was carried out without pH correction, the measurement may only be carried out without pH correction!***
- ***A slope calibration must be carried out after having replaced a diaphragm cap or electrolyte!***
- ***For a perfect functioning of the sensor, the slope calibration must be repeated in regular intervals! For swimming pools and potable water, a calibration of the sensor every 3-4 weeks is sufficient.***
- ***Take care not to dose incorrectly which might cause air bubbles in the sample water! Air bubbles sticking to the diaphragm of the sensor might cause a low measuring value and thus might result in overdosing.***
- ***Observe the valid national regulations for calibration intervals!***

Prerequisites

- constant flow at the in-line probe – minimum 40 l/h
- the sensor has been run in

a) Calibrate zero point



IMPORTANT

- ***The sensor must have run in!***
- ***Only perform a zero offset if you:***
  - ***use the sensor at the lower measuring range limit!***
  - ***intend to measure combined chlorine (differential chlorine measurement).***

▶ Select the index card “Cl free” - “Sensor calibration” (arrow keys) and press the ENTER key.

▶ Select “zero point” (arrow keys) and press the ENTER key.

▶ Shut-off the sample water – first inlet, then outlet.

▶ Remove the sensor.
Do not disconnect the CAN cable from the sensor CLE!

▶ Rinse the sensor with chlorine-free water.

▶ Dip the sensor CLE into a bucket with clean, chlorine-free tap water (or in carbonic acid-free mineral water or distilled water. Check the tap water for chlorine with measuring tool). The chlorine-free water must have the same temperature as the pool water.

▶ Stir carefully with the sensor until the “measured value sensor” has been stable for 5 min. and remains close to zero.

▶ Then press F5 (CAL).

▶ Press F5 (CAL) to complete the calibration process and to save the values - “Calibration completed” is displayed.

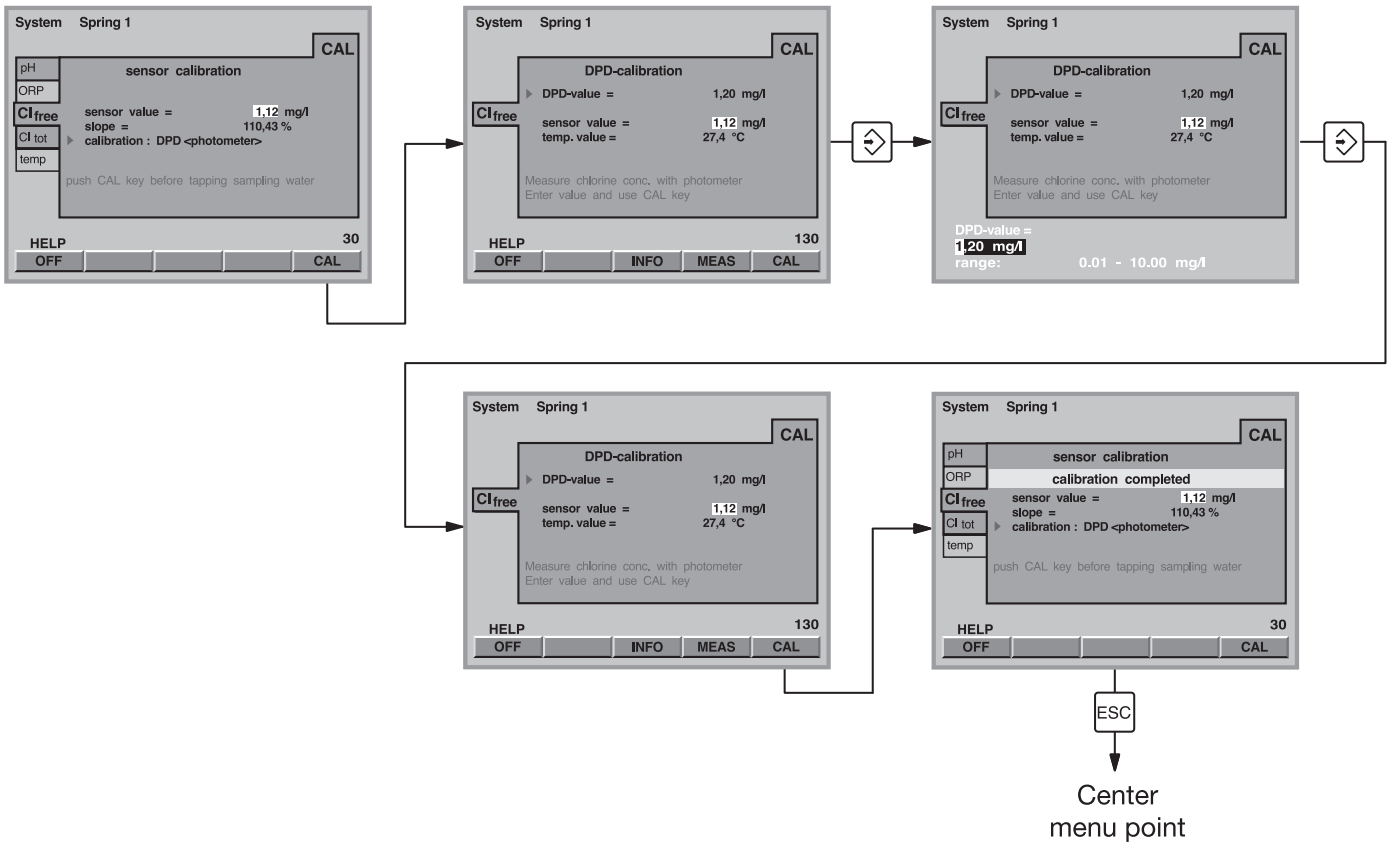
▶ Install the chlorine sensor again at the in-line probe

▶ Re-open the shut-off valves for the sample water. First the outlet, then the inlet.
Before calibrating the slope, wait until the measured value is stable (wait for at least 15 min.).

CAUTION

The slope must now be calibrated.

b) Calibrate slope



IMPORTANT

Chlorine must be present in the sample water all the time (approx. 0.5 mg/l)! Otherwise, the measuring system cannot be calibrated.

- ▶ Select the index card “Cl free” “Sensor calibration” (arrow keys) and press the ENTER key
- ▶ Select “DPD (Photometer)” (arrow keys) and press the ENTER key
- ▶ After the “sensor value” has stabilised, press F5 (CAL)
- ▶ Directly after, take a sample water sample at the in-line probe
- ▶ Directly after this step, determine the chlorine content of the sample water using a photometer and a suitable measuring tool (e.g. DPD 1 for free chlorine (chlorine sensor CLE))
- ▶ Immediately enter the chlorine content (arrow keys) and press the ENTER key
- ▶ Press F5 (CAL) to complete the calibration process and to save the values. “Calibration completed” is displayed.
- ▶ If total chlorine is to be determined, too, calibrate this measured variable also with the same sample (next chapter)
- ▶ If no other calibrations are to be performed, press the ESC key to return to the permanent display (all menus are then again protected by the password) or to the center menu option

Repeat the calibration the next day!

NOTE

Only for customer service: By pressing F4 (MEAS), the pH value, the sensor current, and the temperature at the time of pressing the key can be displayed.

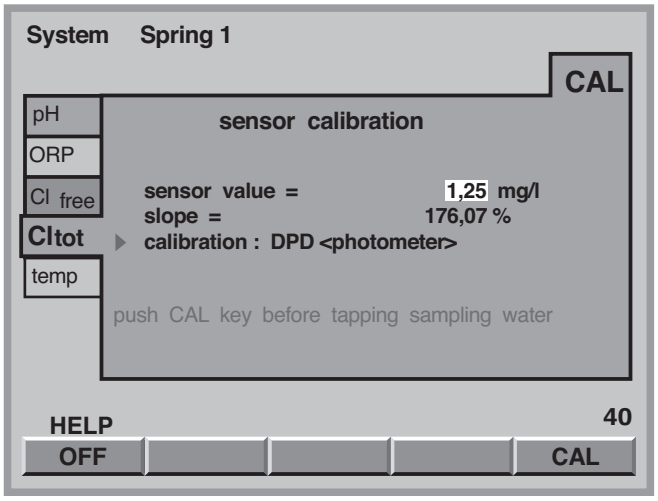
- ***If an error message is displayed during the calibration of a chlorine sensor, access more detailed data by pressing F3 INFO. These data are also of help when talking with the technical service.***

If, after the running-in period of the measuring cells (approx. 2-6 h for CLE 3.1 and CTE/CGE, approx. 2 h for CLE 3), DULCOMARIN® II shows a measured value that is much too low or cannot be calibrated (there should be approx. 1 mg/l free chlorine in the pool, the pH value should be 7.2 and the sample water and circulating pump must be running), double the running-in period or extend it until the next morning.

If the measuring cell can then still not be calibrated, contact ProMinent Customer Support (see back cover for telephone numbers). Have following data at hand:

- DPD1 value (free chlorine)
- DPD3 value (total chlorine)
- Primary sensor current in pA (with F4 MEASURE under steepness calibration menu)
- pH value
- Redox value (if ORP measurement is available)
- Pool size in cubic metres

5.4 Measured Value Total Chlorine



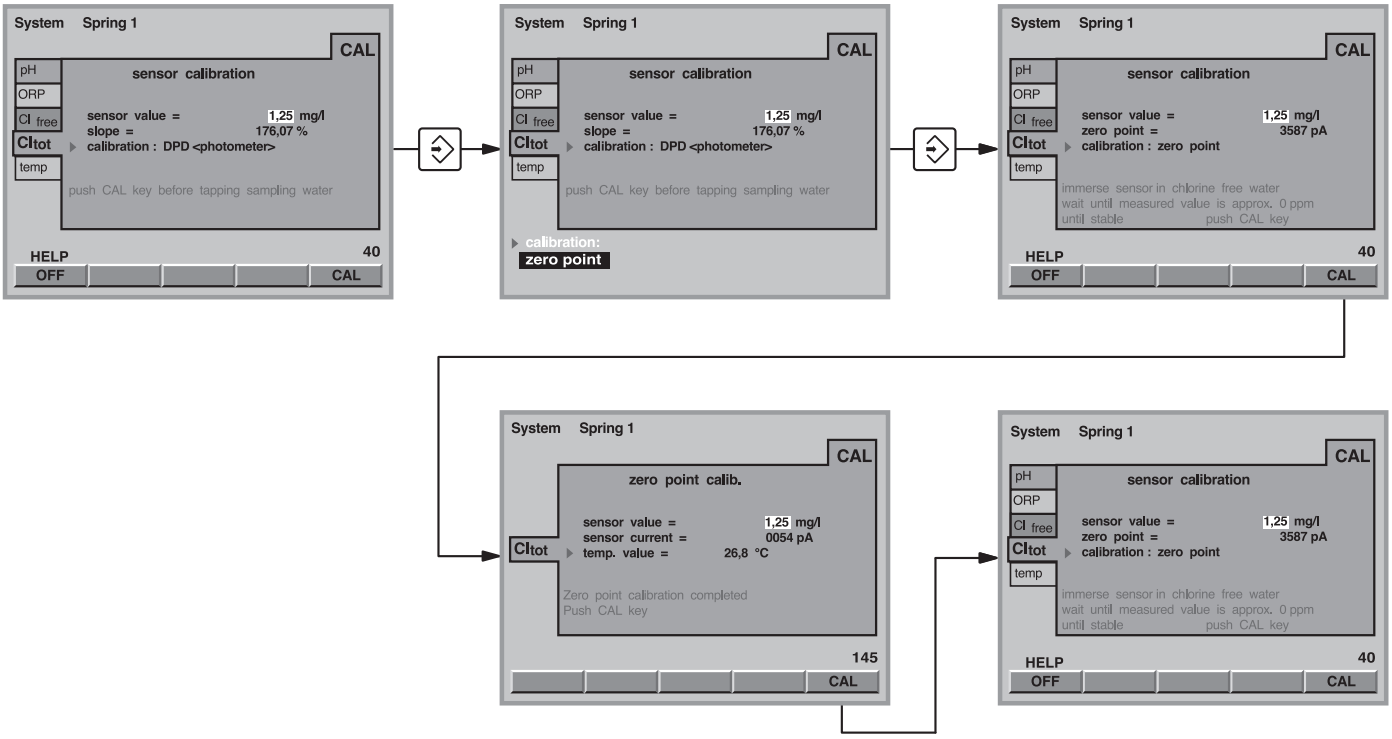
IMPORTANT

- ***In this step, the chlorine sensor CTE for total chlorine is calibrated!***
- ***The DULCOMARIN® II calculates the displayed values for combined chlorine as difference of the measuring values of the chlorine sensors for free chlorine and total chlorine!***
- ***For the purposes of the differential measurement, the chlorine sensor for free chlorine must be the sensor CLE 3.1!***
- ***Please also read the operating instructions for chlorine sensor and in-line probe!***
- ***A differential chlorine may only be set up in connection with a calibrated pH sensor!***
- ***If calibration was carried out with pH correction, the measurement may only be carried out with pH correction! If calibration was carried out without pH correction, the measurement may only be carried out without pH correction!***
- ***A slope calibration must be carried out after having replaced a diaphragm cap or electrolyte!***
- ***For a perfect functioning of the sensor, the slope calibration must be repeated in regular intervals! For swimming pools and potable water, a calibration of the sensor every 3-4 weeks is sufficient.***
- ***Take care not to dose incorrectly which might cause air bubbles in the sample water! Air bubbles sticking to the diaphragm of the sensor might cause a low measuring value and thus might result in overdosing.***
- ***Observe the valid national regulations for calibration intervals!***

Prerequisites

- constant flow at the in-line probe – minimum 40 l/h
- the sensor has been run in
- a sensor CLE 3.1 for free chlorine must be installed in the system (basin, filtration circuit, …)

a) Calibrate zero point



IMPORTANT

- ***The sensor must have run in!***
- ***Only perform a zero offset if you:***
  - ***use the sensor at the lower measuring range limit!***
  - ***intend to measure combined chlorine (differential chlorine measurement).***

▶ Select the index card “Cl comb.” “Sensor calibration” (arrow keys) and press the ENTER key

▶ Select “zero point” (arrow keys) and press the ENTER key
Do not remove the CAN cable from the sensor CTE

▶ Shut-off the sample water – first inlet, then outlet.

▶ Remove the sensor.

▶ Rinse the sensor with chlorine-free water.

▶ Dip the sensor CTE into a bucket with clean, chlorine-free tap water (or in carbonic acid-free mineral water or distilled water. Check the tap water for chlorine with measuring tool). The chlorine-free water must have the same temperature as the pool water

▶ Stir carefully with the sensor until the “measured value sensor” has been stable for 5 min. and remains close to zero.

▶ Then press F5 (CAL)

▶ Press F5 (CAL) to complete the calibration process and to save the values
“Calibration completed” is displayed

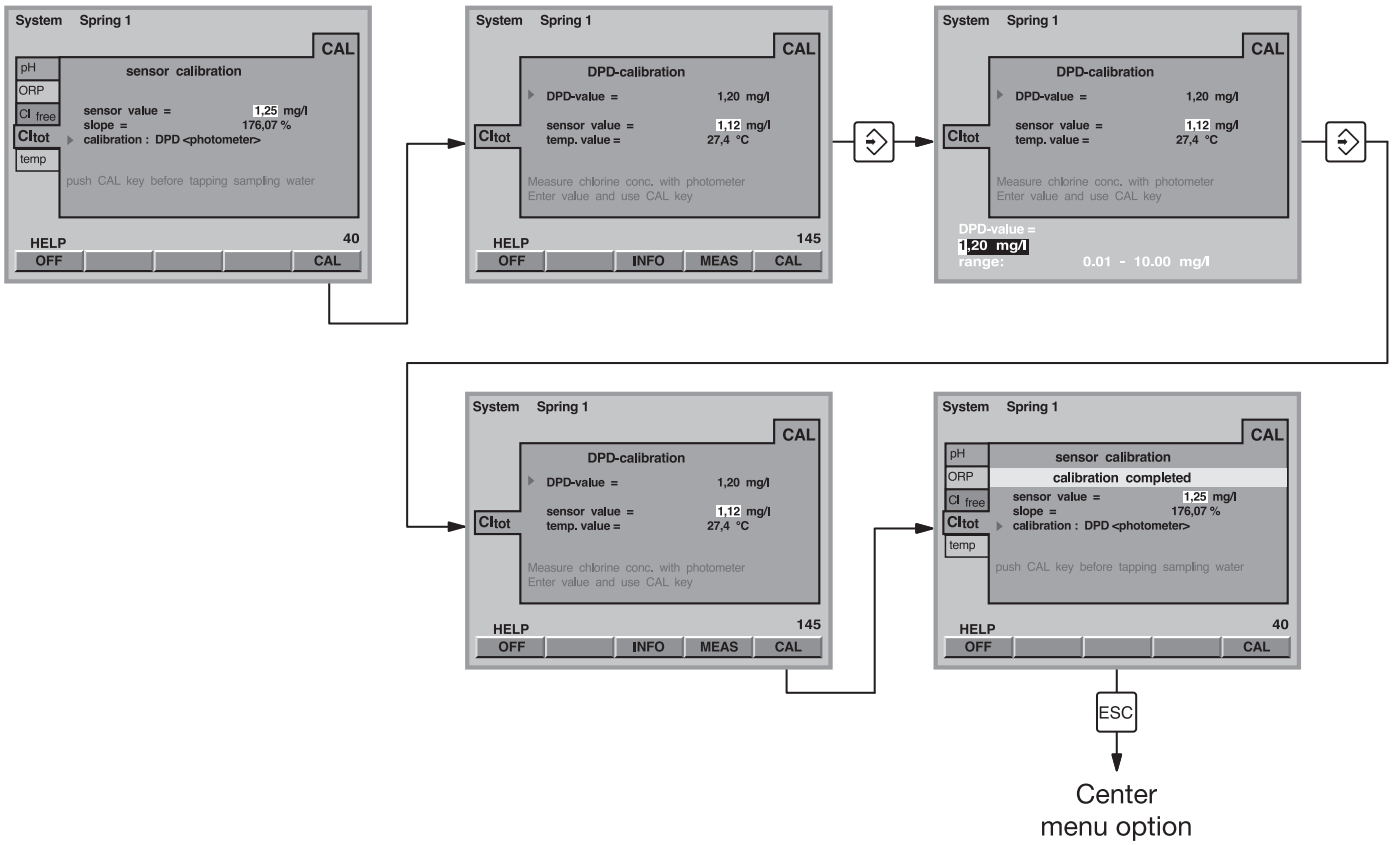
▶ Install the sensor again at the in-line probe

▶ Re-open the shut-off valves for the sample water. First the outlet, then the inlet.
Before calibrating the slope, wait until the measured value is stable (wait for at least 15 min.).

CAUTION

The slope must now be calibrated:

b) Calibrate slope



IMPORTANT

Chlorine must be present in the sample water all the time (approx. 0.5 mg/l)! Otherwise, the measuring system cannot be calibrated.

- ▶ Select the index card “Cl comb.” “Sensor calibration” (arrow keys) and press the ENTER key
- ▶ Select “DPD (Photometer)” (arrow keys) and press the ENTER key
- ▶ After the “sensor value” has stabilised, press F5 (CAL)
- ▶ Directly after, take a sample water sample at the in-line probe
- ▶ Directly after this step, determine the chlorine content of the sample water using a photometer and a suitable measuring tool (e.g. DPD 3 for total chlorine (sensor CTE))
- ▶ Immediately enter the chlorine content (arrow keys) and press the ENTER key
- ▶ Press F5 (CAL) to complete the calibration process and to save the values. “Calibration completed” is displayed
- ▶ If no other calibrations are to be performed, press the ESC key to return to the permanent display (all menus are then again protected by the password) or to the center menu option

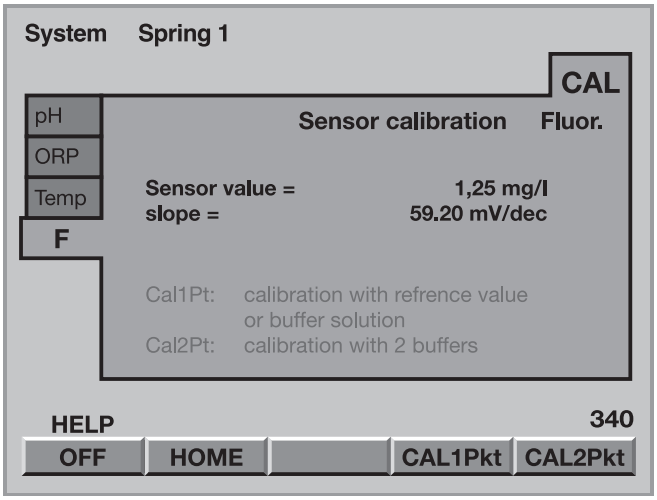
Repeat the calibration the next day!

NOTE

Only for customer service: By pressing F4 (MEAS), the pH value, the sensor current, and the temperature at the time of pressing the key can be displayed.

- ***If an error message is displayed during the calibration of a chlorine sensor, access more detailed data by pressing F3 INFO. These data are also of help when talking with the technical service.***

5.5 Measured Variable Fluoride (F^-)



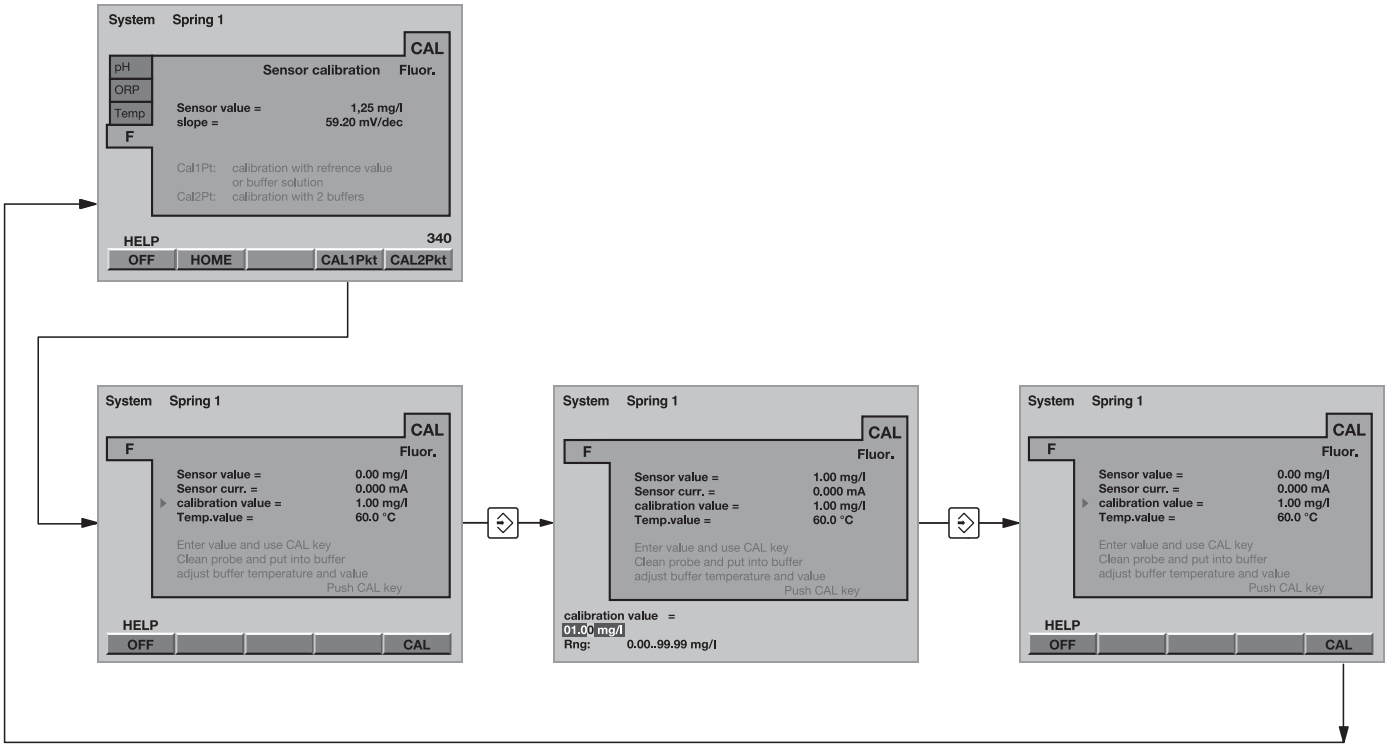
CAUTION

- ***Please also read the operating instructions for sensor, in-line probe and the "Operating instructions fluoride measurement on panel"!***
- ***For a perfect functioning of the sensor, the sensor has to be inspected and calibrated, if required, in regular intervals!***
- ***Take care not to meter incorrectly which might cause air bubbles in the sample water! Air bubbles sticking to the solid state diaphragm of the sensor might cause a too low measuring value and thus might result in overmetering.***
- ***A 2-point calibration has to be performed during the first commissioning!***
- ***Observe the valid national regulations for calibration intervals!***

Prerequisites

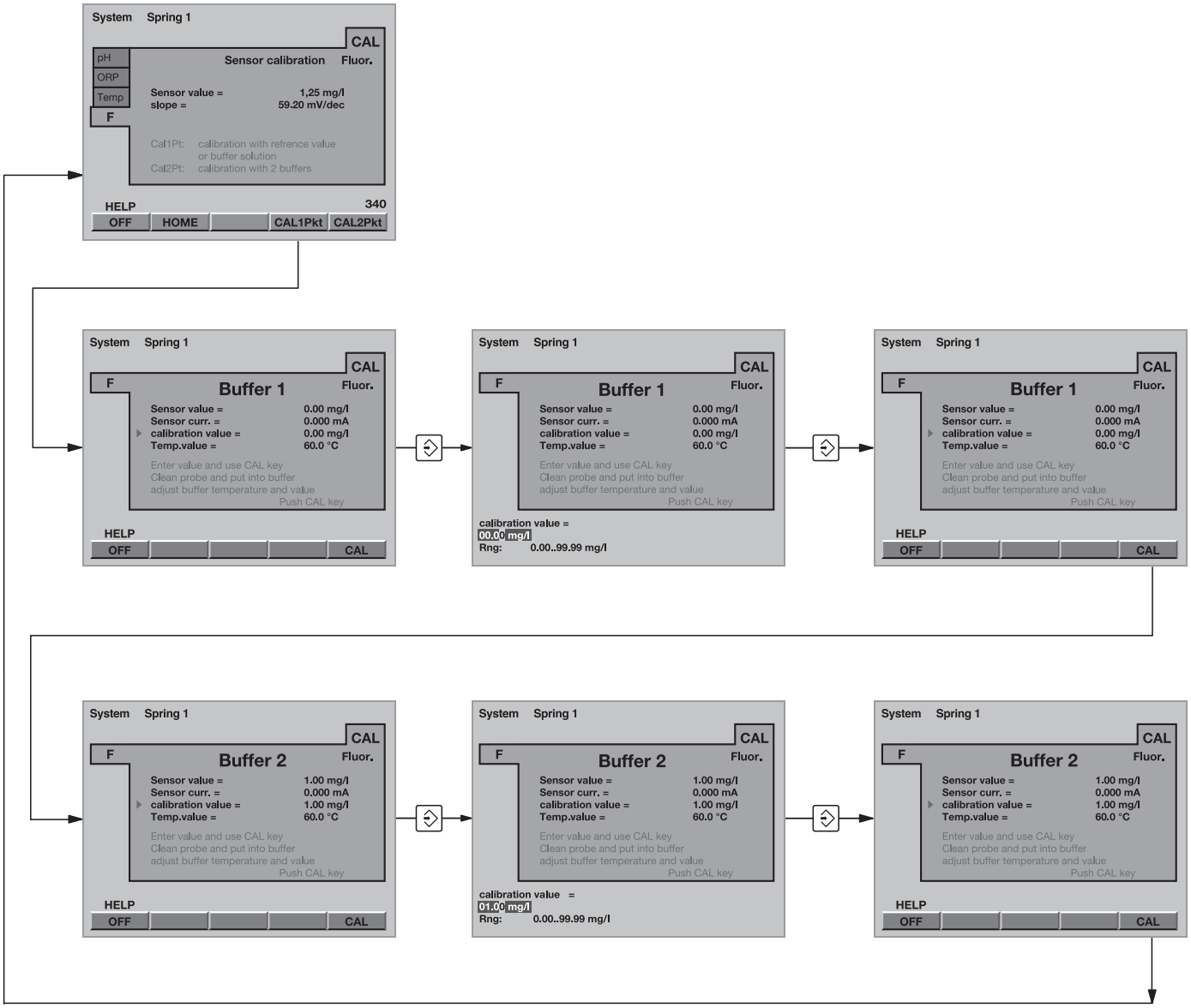
- the sensor has been run-in (min. 1 h)

5.5.1 1-Point Calibration
(via photometer)



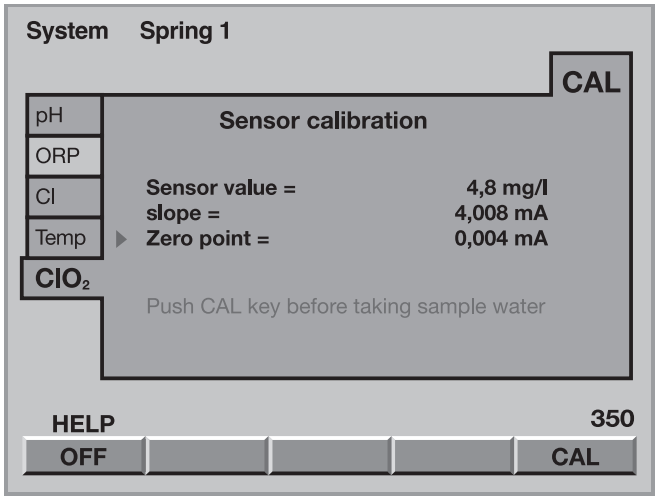
- ▶ For calibration, take a water sample from the sampling cock.
- ▶ Measure the water sample in accordance with the instructions of the photometer manufacturer.
- ▶ Then switch to the calibration menu using F2 CAL.
- ▶ Select the index card “F¯“ (arrow keys) and press F4 CAL 1PT.
- ▶ If the temperature of the water is not correct, select “Temp.value” (arrow keys) and press the ENTER key.
- ▶ Enter the value of the measured temperature of the water (arrow keys) and press the ENTER key.
- ▶ Select “Calibration value” (arrow keys) and press the ENTER key.
- ▶ Enter the fluoride concentration measured with the photometer (arrow keys) and press the ENTER key.
- ▶ Then press F5 CAL.
- ▶ If no other calibrations are to be performed, press the ESC key to return to the permanent display (all menus are then again protected by the password) or to the central menu option.

5.5.2 2-Point Calibration



Please use the detailed “Operating instructions fluoride measurement on panel” to perform the 2-point calibration!

5.6 Measured Variable Chlorine Dioxide (ClO_2)



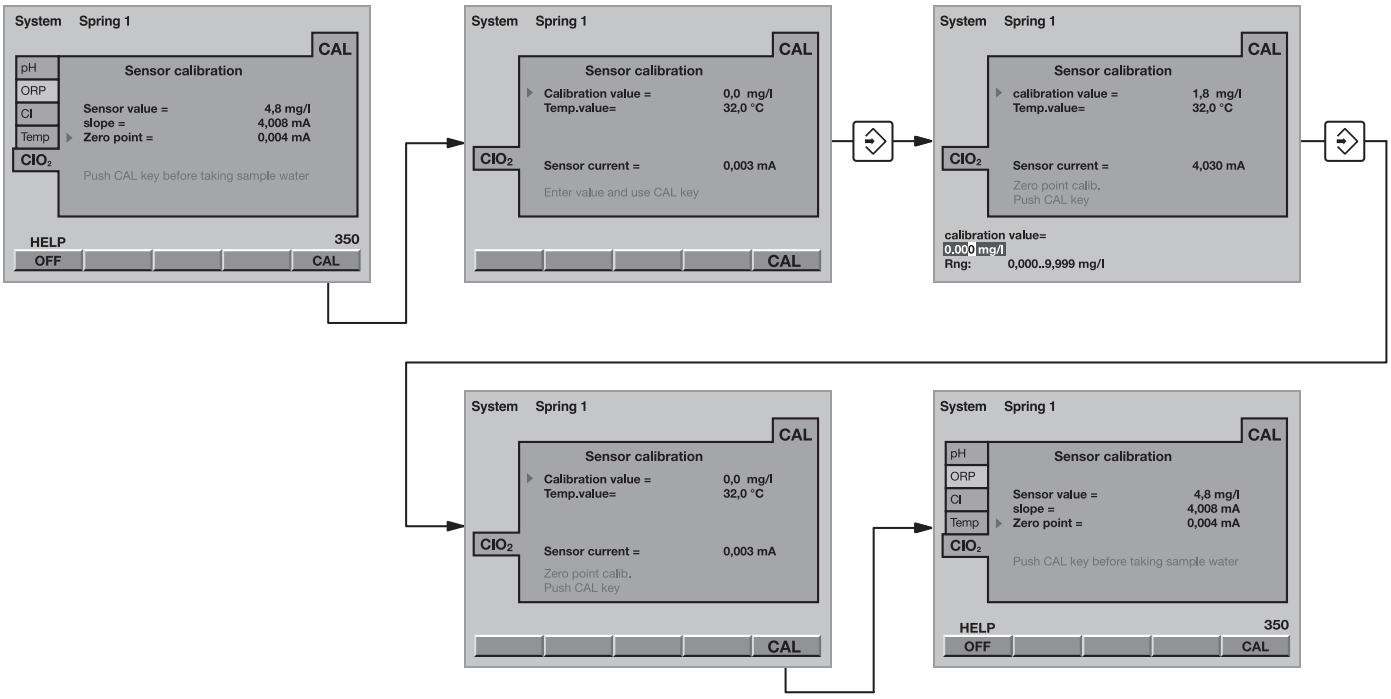
CAUTION

- ***Please also read the operating instructions for chlorine sensor and in-line probe!***
- ***A slope calibration must be carried out after having replaced a diaphragm cap or electrolyte!***
- ***For a perfect functioning of the sensor, the slope calibration must be repeated in regular intervals!***
- ***Take care not to meter incorrectly which might cause air bubbles in the sample water! Air bubbles sticking to the diaphragm of the sensor might cause a too low measuring value and thus might result in overmetering.***
- ***Observe the valid national regulations for calibration intervals!***

Prerequisites

- constant flow at the in-line probe – at least 20 l/h
- constant temperature of the sample water
- identical temperatures of sample water and sensor (wait for approx. 15 min.)
- the sensor has been run in

a) Calibrate zero point



CAUTION

- ***The sensor must have run in!***
- ***Only perform a zero offset if you:***
  - ***use the sensor at the lower measuring range limit!***
  - ***use the 0.5 ppm type!***

▶ Select the index card "ClO_2" "Sensor calibration" (arrow keys), press F5 CAL and then the ENTER key.

▶ Enter the value 0.00 mg/l in "DPD value" and press the ENTER key – the index card now shows "Zero point calibration".

▶ Shut-off the sample water – first inlet, then outlet.

▶ Remove the sensor.

▶ Rinse the sensor with chlorine-free water.

▶ Dip the sensor CDE in a bucket with non-carbonated mineral water or distilled water. This water must have the same temperature as the sample water.

▶ Stir carefully with the sensor until the "Sensor value" has been stable for 5 min. and remains close to zero.

▶ Then press F5 CAL.

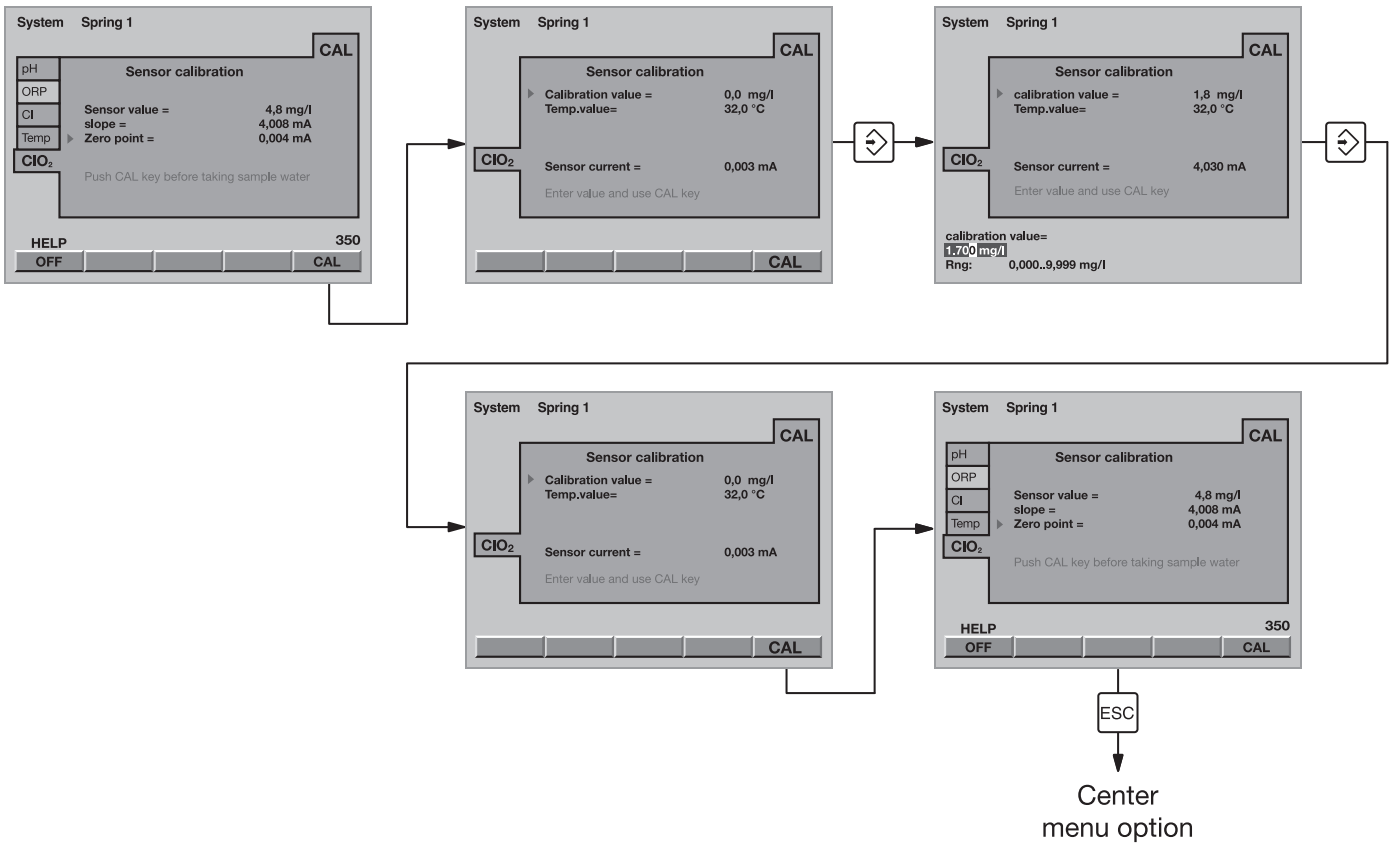
▶ Re-install the sensor at the in-line probe (see operating instructions for in-line probe).

▶ Open the shut-off valves for the sample water again. First the outlet, then the inlet.

CAUTION

Now, the slope has to be calibrated:

b) Calibrate slope



CAUTION

- ***Before calibrating the slope, wait until the measured value is stable (wait for at least 15 min.).***
- ***Chlorine dioxide must be present in the sample water all the time (approx. 0.5 mg/l)! Otherwise, the measuring system cannot be calibrated.***
- ***Please check the calibration using DPD after 24 h after initial commissioning!***

▶ Select the index card "ClO_2" "Sensor calibration" (arrow keys).

▶ After the "Sensor value" has stabilised, press F5 CAL.

▶ Directly after, take a sample water sample at the in-line probe.

▶ Immediately after this step, determine the chlorine dioxide content of the sample water using a photometer and a suitable measuring tool (e.g. DPD)

▶ Immediately enter the chlorine dioxide content (arrow keys) and press F5 CAL.

▶ If no other calibrations are to be performed, press the ESC key to return to the permanent display (all menus are then again protected by the password) or to the central menu option.

NOTE

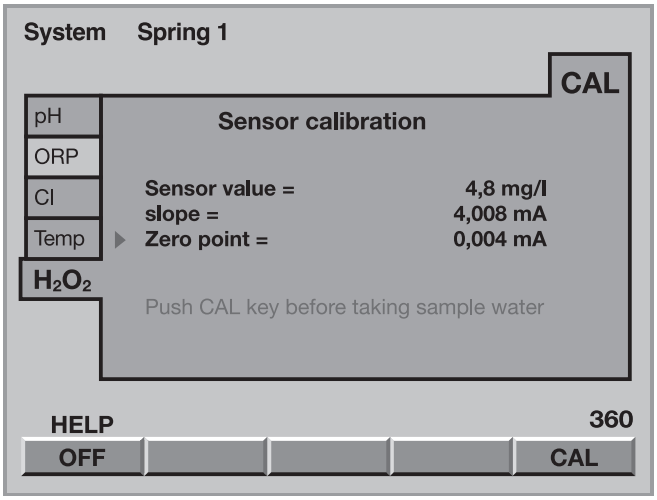
Calibration at increased temperature
Because in contrast to chlorine, chlorine dioxide is only physically solved in water, it quickly outgasses from the medium at increased temperatures (> 30 °C). The DPD measurement must thus be performed quickly.

After sample-taking, the reagents should be added within 1 minute. In this case, the red dye is to be directly generated at the sampling site by addition reagents and then the measurement is to be performed in the laboratory as quickly as possible.

If the DULCOMARIN® II indicates a clearly insufficient measured value or cannot be calibrated after the running-in period of the sensors (for CDE approx. 2-6 h), double the running-in period or extend it to the next morning.

If the sensor can then still not be calibrated, contact the ProMinent customer service (telephone numbers are stated on the back cover page).

5.7 Measured Variable Hydrogen Peroxide (H_2O_2)



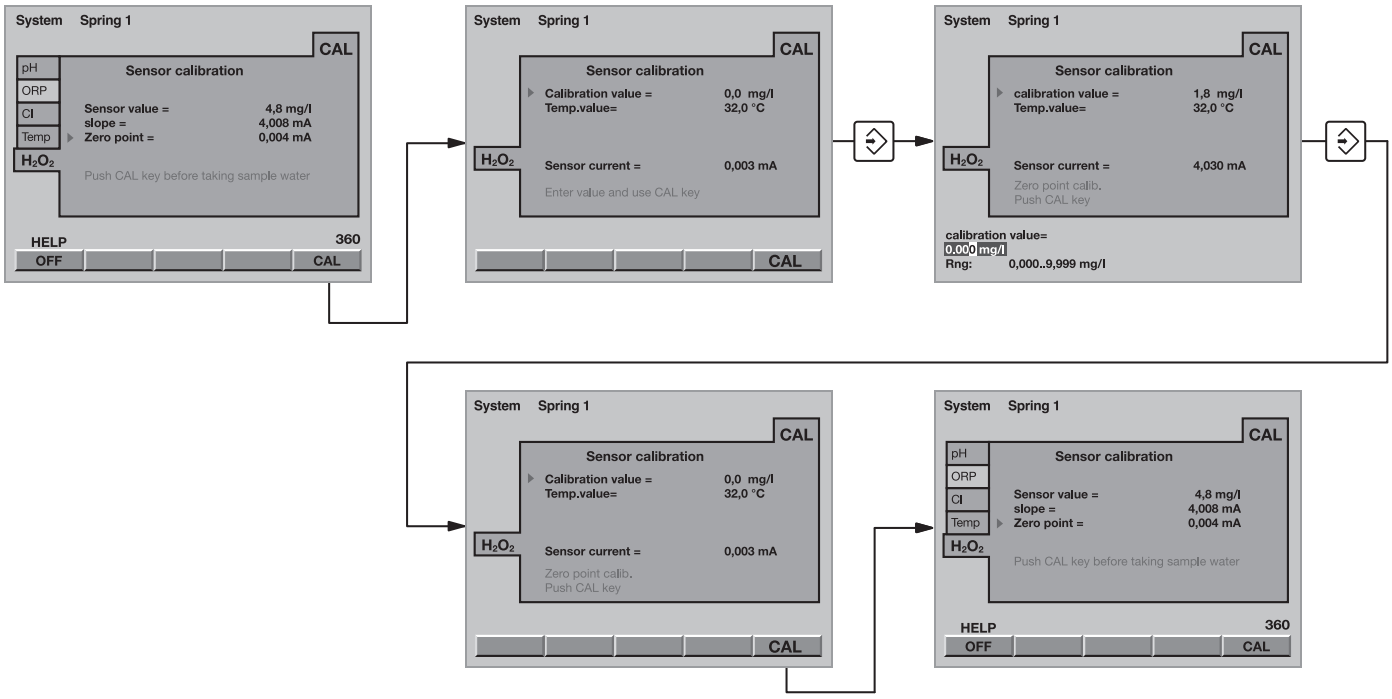
CAUTION

- ***Please also read the operating instructions for chlorine sensor and in-line probe!***
- ***A slope calibration must be carried out after having replaced a diaphragm cap or electrolyte!***
- ***For a perfect functioning of the sensor, the slope calibration must be repeated in regular intervals!***
- ***Observe the valid national regulations for calibration intervals!***

Prerequisites

- the H_2O_2 concentration of the sample water is sufficiently stable at the same time (observe the response time of the sensor of 8 min!)
- constant, permissible flow at the in-line probe – see operating instructions sensor, “Technical data”
- identical temperatures of sample water and sensor (wait for approx. 15 min.)
- the sensor has been run in

a) Calibrate zero point



CAUTION

- ***The sensor must have run in!***
- ***Only perform a zero offset if you:***
  - use the sensor at the lower measuring range limit!

▶ Select the index card "H_2O_2" "Sensor calibration" (arrow keys), press F5 CAL and then the ENTER key.

▶ Enter the value 0.00 mg/l in "DPD value" and press the ENTER key – the index card now shows "Zero point calibration".

▶ Shut-off the sample water – first inlet, then outlet.

▶ Remove the sensor.

▶ Rinse the sensor with H_2O_2-free water.

▶ Dip the sensor PER in a bucket with non-carbonated mineral water or distilled water. This water must have the same temperature as the sample water.

▶ Stir carefully with the sensor until the "Sensor value" has been stable for 5 min. and remains close to zero.

▶ Then press F5 CAL.

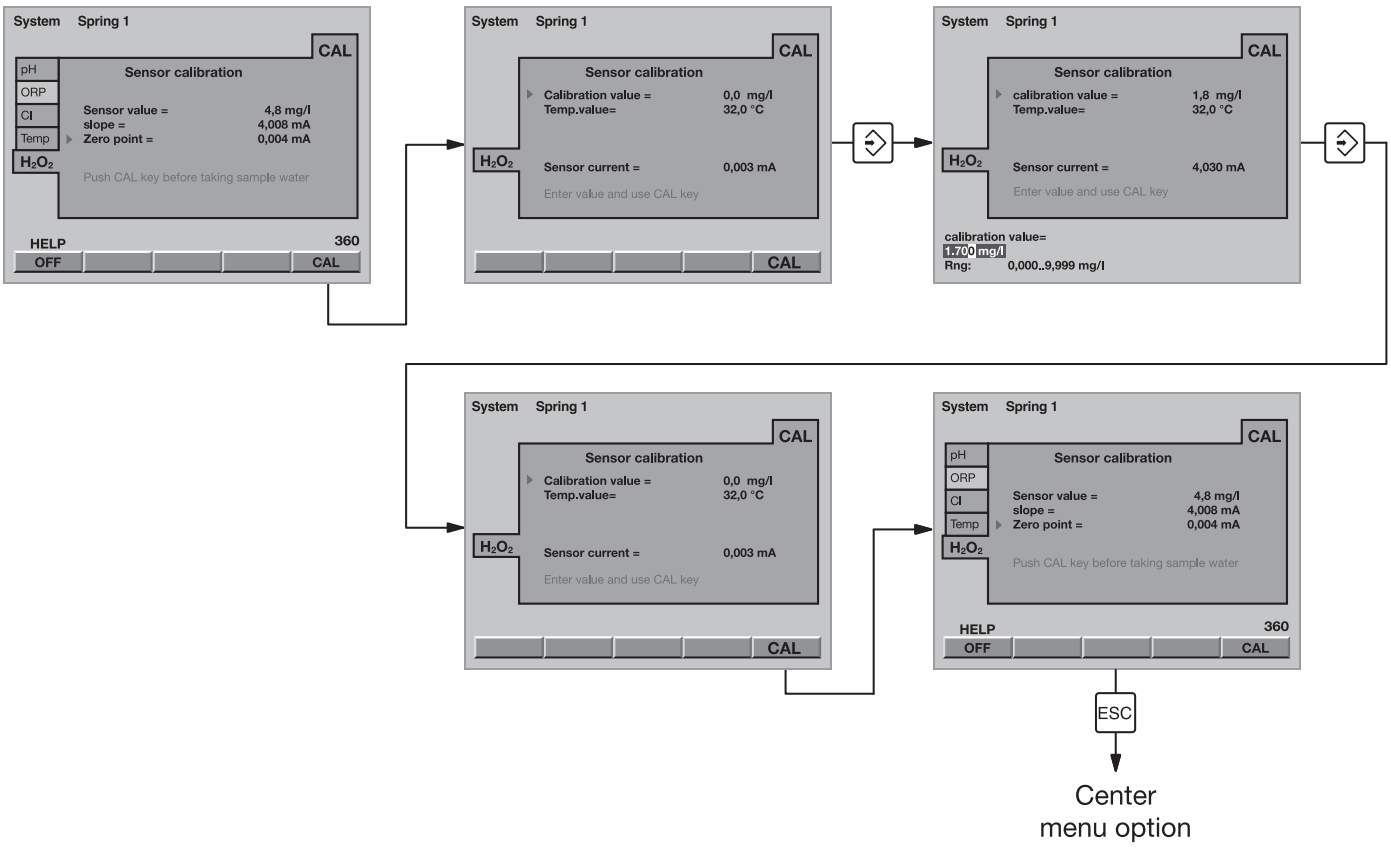
▶ Re-install the sensor at the in-line probe (see operating instructions for in-line probe).

▶ Open the shut-off valves for the sample water again. First the outlet, then the inlet.

CAUTION

Now, the slope has to be calibrated:

b) Calibrate slope



CAUTION

- ***Before calibrating the slope, wait until the measured value is stable (wait for at least 15 min.).***
- ***Please check the calibration using DPD after 24 h after initial commissioning!***
- ***Repeat the calibration, if the H_2O_2 concentration deviates more than 15 % from the reference value.***

▶ Select the index card "H_2O_2" "Sensor calibration" (arrow keys).

▶ After the "Sensor value" has stabilised, press F5 CAL.

▶ Directly after, take a sample water sample at the in-line probe.

▶ Immediately after this step, determine the H_2O_2 content of the sample water using a photometer and a suitable measuring tool (e.g. DPD)

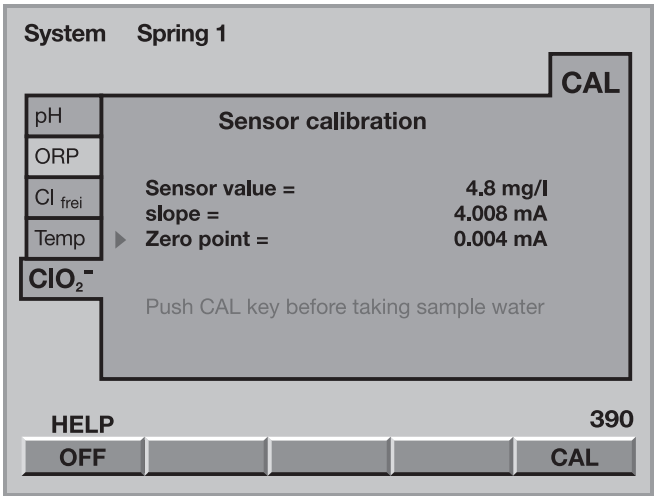
▶ Immediately enter the H_2O_2 content (arrow keys) and press F5 CAL.

▶ If no other calibrations are to be performed, press the ESC key to return to the permanent display (all menus are then again protected by the password) or to the central menu option.

If the DULCOMARIN® II indicates a clearly insufficient measured value or cannot be calibrated after the running-in period of the sensors (for PER approx. 6-12 h), double the running-in period or extend it to the next morning.

If the sensor can then still not be calibrated, contact the ProMinent customer service (telephone numbers are stated on the back cover page).

5.8 Measured Variable Chlorite (ClO_2^-)



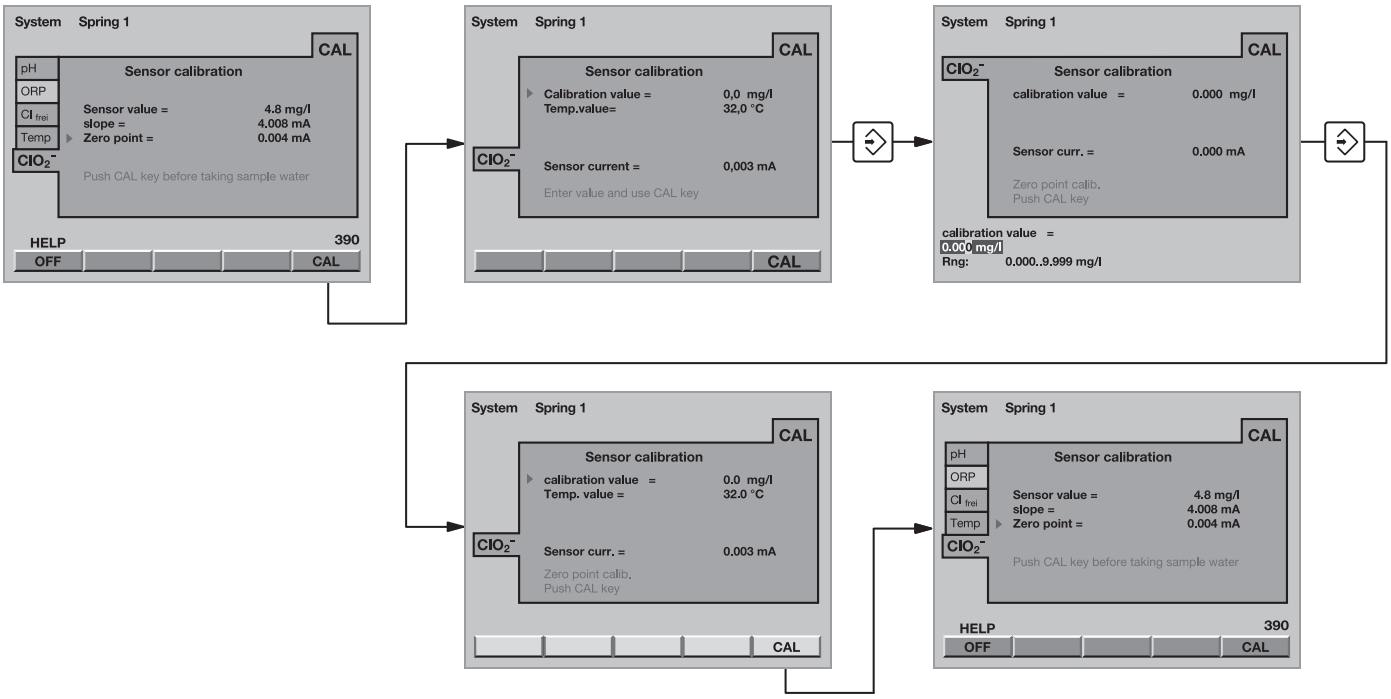
CAUTION

- ***Please also read the operating instructions for chlorine sensor and in-line probe!***
- ***A slope calibration must be carried out after having replaced a diaphragm cap or electrolyte!***
- ***For a perfect functioning of the sensor, the slope calibration must be repeated in regular intervals!***
- ***Take care not to meter incorrectly which might cause air bubbles in the sample water! Air bubbles sticking to the diaphragm of the sensor might cause a too low measuring value and thus might result in overmetering.***
- ***Observe the valid national regulations for calibration intervals!***

Prerequisites

- constant flow at the in-line probe – at least 20 l/h
- constant temperature of the sample water
- identical temperatures of sample water and sensor (wait for approx. 15 min.)
- the sensor has been run in
- constant pH value in the permitted range (pH 6.5 – 9.5)

a) Calibrate zero point



CAUTION

- ***The sensor must have run in!***
- ***Only perform a zero offset if you:***
  - use the sensor at the lower measuring range limit!

▶ Select the index card “ClO_2^-” “Sensor calibration” (arrow keys), press F5 CAL and then the ENTER key.

▶ Enter the value 0.00 mg/l in “DPD value” and press the ENTER key – the index card now shows “Zero point calibration”.

▶ Shut-off the sample water – first inlet, then outlet.

▶ Remove the sensor.

▶ Rinse the sensor with chlorine-free water.

▶ Dip the sensor CLT in a bucket with non-carbonated mineral water or distilled water. This water must have the same temperature as the sample water.

▶ Stir carefully with the sensor until the “Sensor value” has been stable for 5 min. and remains close to zero.

▶ Then press F5 CAL.

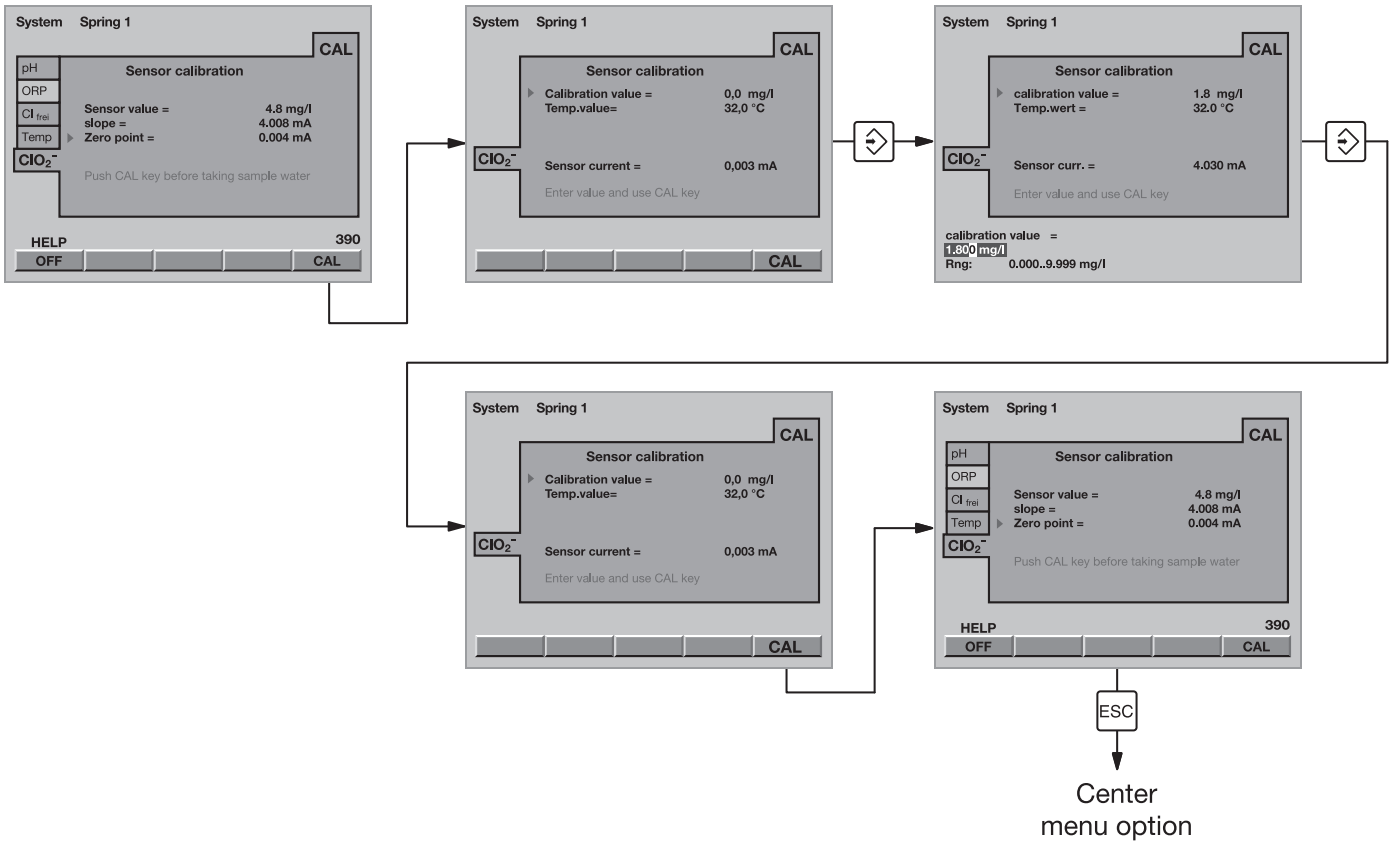
▶ Re-install the sensor at the in-line probe (see operating instructions for in-line probe).

▶ Open the shut-off valves for the sample water again. First the outlet, then the inlet.

CAUTION

Now, the slope has to be calibrated:

b) Calibrate slope



CAUTION

- ***Before calibrating the slope, wait until the measured value is stable (wait for at least 15 min.).***
- ***Chlorite must be present in the sample water all the time (approx. 0.5 mg/l)! Otherwise, the measuring system cannot be calibrated.***
- ***Please check the calibration using DPD after 24 h after initial commissioning!***

▶ Select the index card "ClO_2^-" "Sensor calibration" (arrow keys).

▶ After the "Sensor value" has stabilised, press F5 CAL.

▶ Directly after, take a sample water sample at the in-line probe.

▶ Immediately after this step, determine the chlorite content of the sample water using a photometer and a suitable measuring tool (e.g. DPD)

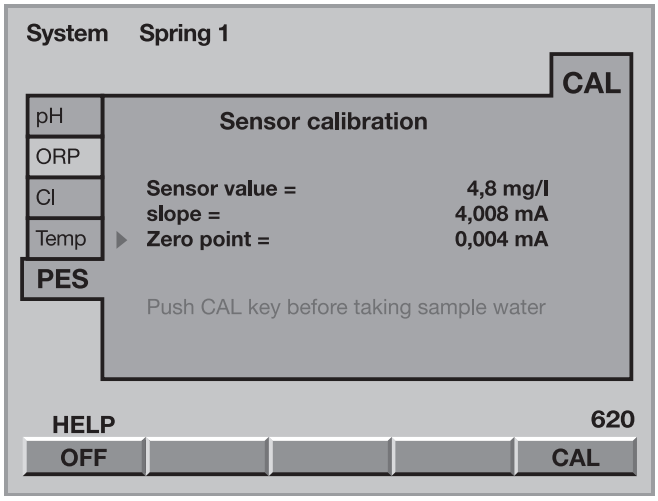
▶ Immediately enter the chlorine content (arrow keys) and press F5 CAL.

▶ If no other calibrations are to be performed, press the ESC key to return to the permanent display (all menus are then again protected by the password) or to the central menu option.

If the DULCOMARIN® II indicates a clearly insufficient measured value or cannot be calibrated after the running-in period of the sensors (for CLT approx. 2-6 h), double the running-in period or extend it to the next morning.

If the sensor can then still not be calibrated, contact the ProMinent customer service (telephone numbers are stated on the back cover page).

5.9 Measured Variable Peracetic Acid (PES)



CAUTION

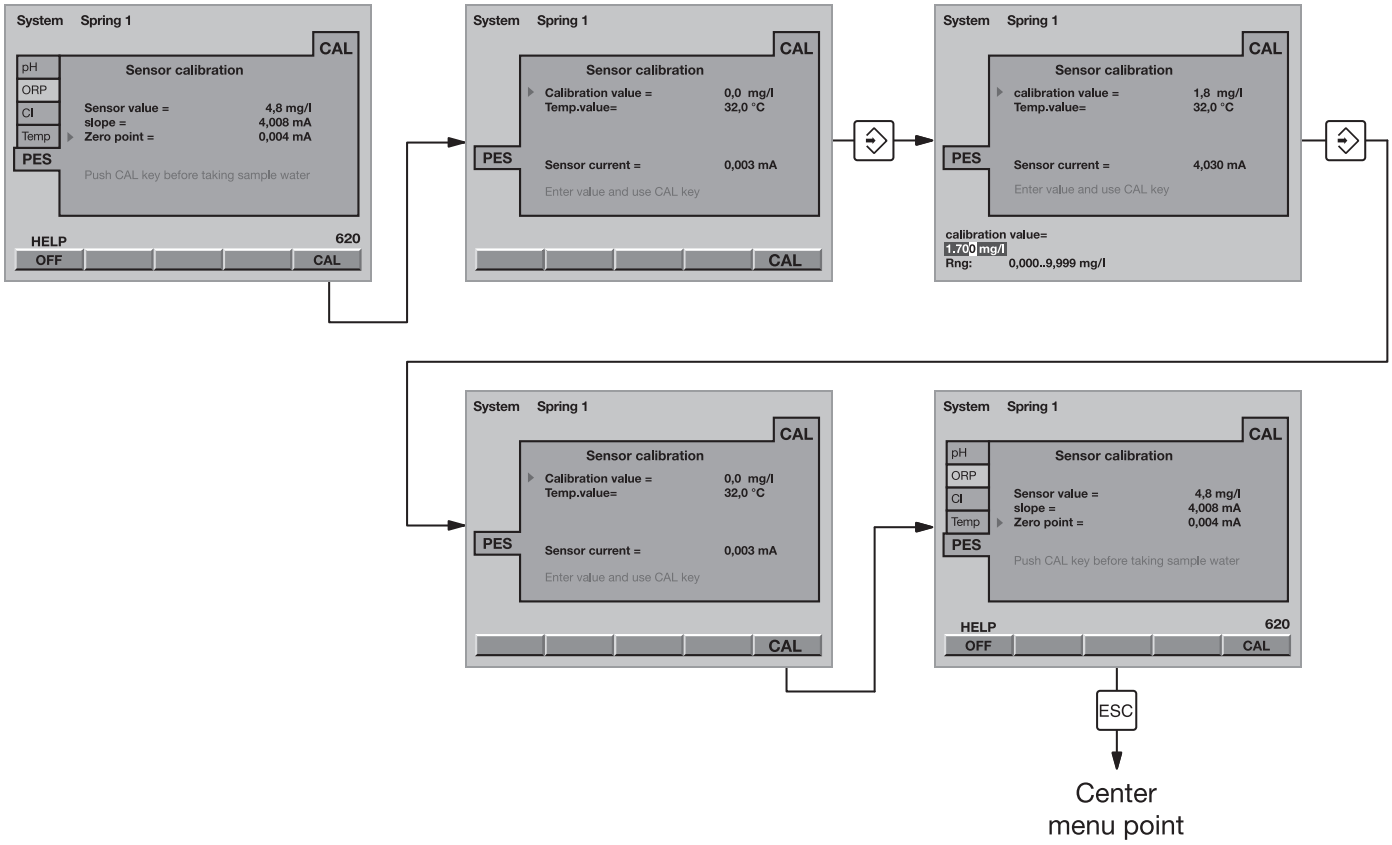
- ***Please also read the operating instructions for chlorine sensor and in-line probe!***
- ***A slope calibration must be carried out after having replaced a diaphragm cap or electrolyte!***
- ***For a perfect functioning of the sensor, the slope calibration must be repeated in regular intervals!***
- ***Take care not to meter incorrectly which might cause air bubbles in the sample water! Air bubbles sticking to the diaphragm of the sensor might cause a too low measuring value and thus might result in overmetering.***
- ***Observe the valid national regulations for calibration intervals!***

Prerequisites

- constant flow at the in-line probe – at least 20 l/h
- identical temperatures of sample water and sensor (wait for approx. 15 min.)
- the sensor has been run in

A zero point calibration is not required.

b) Calibrate slope



CAUTION

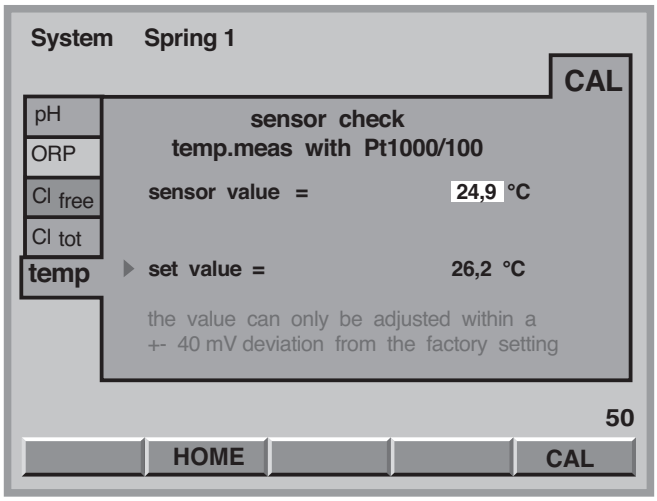
- ***Please check the calibration after 24 h after initial commissioning!***
- ***Repeat the calibration, if the PES concentration deviates more than 15 % from the reference value.***

- ▶ Select the index card “PER” “Sensor calibration” (arrow keys).
- ▶ After the “Sensor value” has stabilised, press F5 CAL.
- ▶ Shut-off the sample water – first inlet, then outlet.
- ▶ Fill a standard solution with known PES concentration, e.g. into the cup of the in-line probe DLG III.
- ▶ Mix the cup content with a magnetic stir bar.
- ▶ Dip the sensor into the cup until the measured value remains stable (15 min). Immediately enter the peracetic acid content (arrow keys) and press F5 CAL.
- ▶ Open the shut-off valves for the sample water again. First the outlet, then the inlet.
- ▶ If no other calibrations are to be performed, press the ESC key to return to the permanent display (all menus are then again protected by the password) or to the central menu option.

If the DULCOMARIN® II indicates a clearly insufficient measured value or cannot be calibrated after the running-in period of the sensors (for PAA approx. 1-2 h), double the running-in period or extend it to the next morning.

If the sensor can then still not be calibrated, contact the ProMinent customer service (telephone numbers are stated on the back cover page).

5.10 Measured Variable Temperature



NOTE

- ***An external temperature sensor should only be calibrated if:***
  - ***use the temperature measurement of chlorine sensors***
  - ***you have a temperature sensor of type PT100***
  - ***you have a precise reference measuring instrument***
- ***Do not exchange the temperature sensor during calibration!***
- ***The measuring value temperature can only be set as default within a range of ±4 °C around the calibration value.***

▶ Take a sample water sample of at least 250 ml

▶ Dip in the external temperature sensor PT100 of the DULCOMARIN® II and the sensor of the reference measuring instrument at the same time

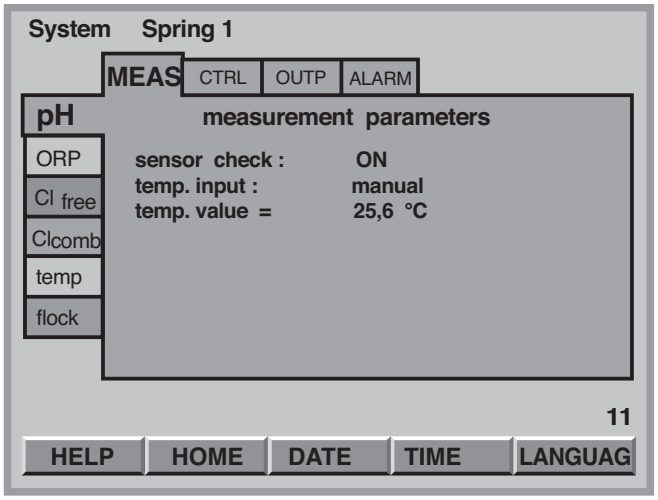
▶ After the “sensor value” has stabilised, press the ENTER key

▶ Enter the value of the reference measuring instrument in “Set value” (arrow keys) and press the ENTER key

▶ Press F5 (SAVE) to complete the calibration process and to save the values

▶ If no other calibrations are to be performed, press the ESC key to return to the permanent display (all menus are then again protected by the password) or to the center menu option

6 Parameter Settings



This chapter describes the menu options for the parameter groups:

- **Measurement**
- **Controlling**
- **mA output**
- **Alarm**
- **Eco!Mode**

for the individual measured variables of the DULCOMARIN® II and the flocculant.

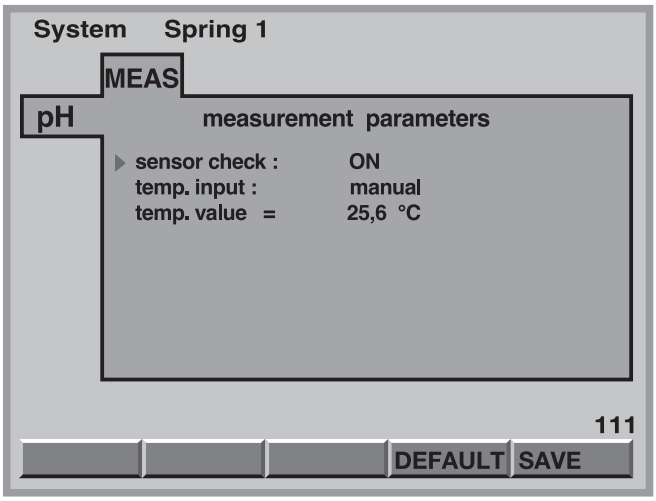
6.1 All Parameters

Exiting an index card of the parameter setting menu:

- without saving: press the ESC key repeatedly until the DULCOMARIN® II has returned to the permanent display (all menus are then again protected by the access code)
- with saving: Press F5 if SAVE is displayed above.
  Confirm the query “Save?” with the ENTER key.
  If no other parameters are to be set, press the ESC key to return to the permanent display (all menus are then again protected by the access code) or to the center menu option
- The default values can be called in the second menu option for the current index file by pressing F4 (DEFAULT)

6.2 Measurement

6.2.1 pH



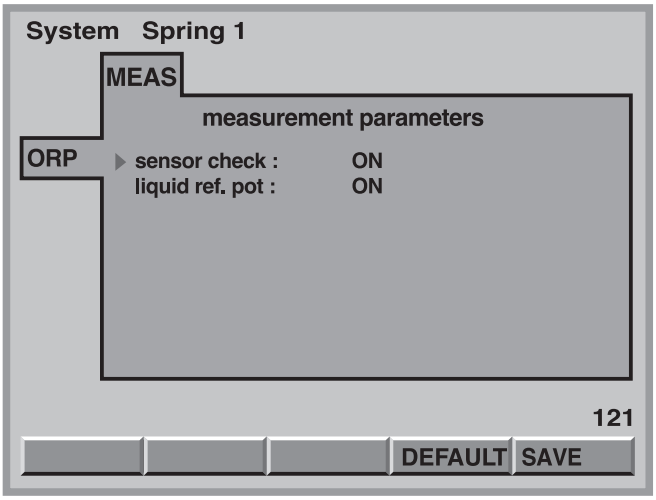
Adjustable variables	Increments	Remarks
Sensor check	Off	
	On	
Liquid ref. pot.	Off	Only displayed with equipotential bonding pin
	On	Equipotential bonding pin must be connected
Temp. input.	PT1000 (100)	Chlorine sensor or separate temperature sensor
	Input	
Temp. value	0.0 ... 99.9 °C	With “Temp. input.” “manual”

Sensor monitoring

Select “on” or “off” in “sensor check” to activate or deactivate the pH sensor monitoring.

During activated sensor monitoring, the resistance value of the pH sensor is measured.
If the resistance value falls below 2 MΩ for more than 1 minute during operation, the error message “pH sensor faulty!” is displayed in the main menu option. If the resistance value exceeds 200 MΩ and if the measuring signal varies heavily, the error message “pH input faulty!” is displayed.

6.2.2 Redox/ORP



Adjustable variables	Increments	Remarks
Sensor check	Off	
	On	
Liquid ref. pot.	Off	Only displayed with equipotential bonding pin
	On	Equipotential bonding pin must be connected

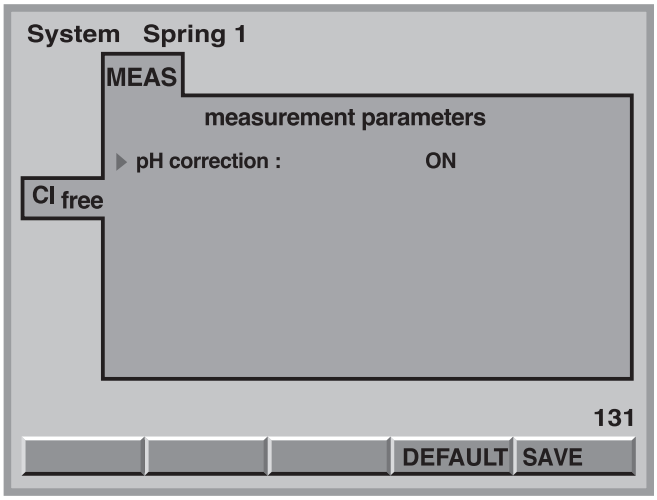
Sensor monitoring

Select “on” or “off” in “sensor check” to activate or deactivate the redox/ORP sensor monitoring.

During activated sensor monitoring, the resistance value of the redox/ORP sensor is measured.

If the resistance value falls below 2 MΩ for more than 1 minute during operation, the error message “ORP sensor faulty!” is displayed in the main menu option. If the resistance value exceeds 200 MΩ and if the measuring signal varies heavily, the error message “ORP input faulty!” is displayed.

6.2.3 Chlorine, Free

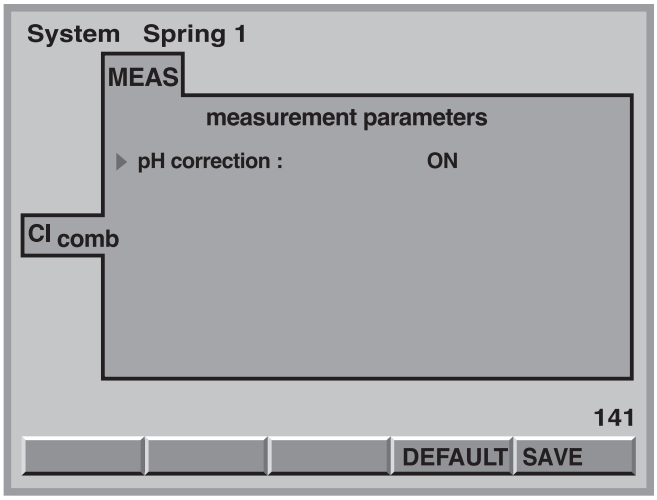


Adjustable variables	Increments	Remarks
pH correction	On	The controller can display a pH-corrected value for free chlorine
	Off	

IMPORTANT

If calibration was carried out with pH correction, the measurement may only be carried out with pH correction! If calibration was carried out without pH correction, the measurement may only be carried out without pH correction!

6.2.4 Chlorine, Combined

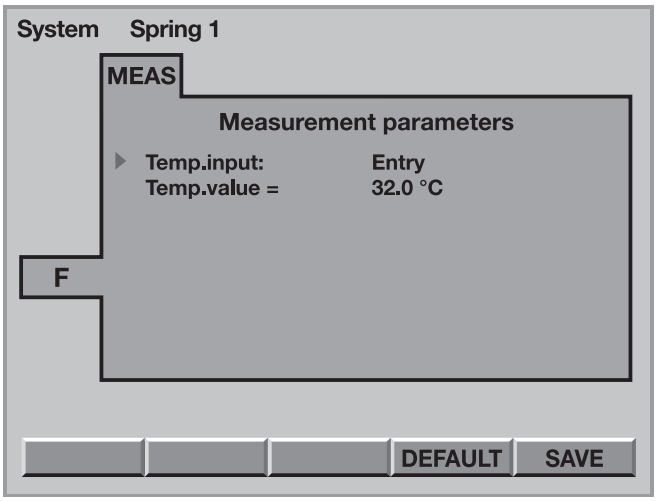


Adjustable variables	Increments	Remarks
pH correction	On	The controller can display a pH-corrected value for combined chlorine
	Off	

IMPORTANT

- ***If calibration was carried out with pH correction, the measurement may only be carried out with pH correction! If calibration was carried out without pH correction, the measurement may only be carried out without pH correction!***
- ***The DULCOMARIN® II calculates the displayed values for combined chlorine as difference of the measuring values of the chlorine sensors for free chlorine and total chlorine (CLE and CTE)!***

6.2.5 Fluoride (F^-)

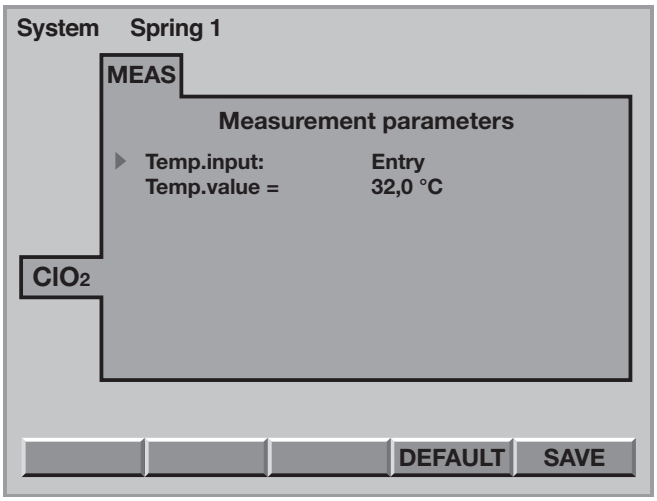


Only available if the terminal “I out 2” of the I modules was configured for the measured variable “F^-“.

Adjustable variables	Increment	Remarks
Temp. detect.	Off	
	Input	
	Sensor *	
Temp. value	0,0 ... 99.9 °C	With “Temp. detect.” “input”

* Only available if the terminal “I out 3” of the I module was configured for the measured variable “Temperature“.

6.2.6 ClO_2

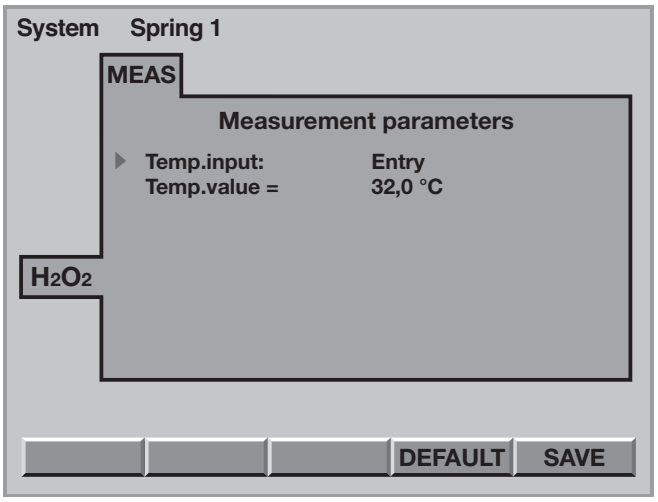


Only available if the terminal “I out 2” of the I module was configured for the measured variable “ClO_2“ and no chlorine sensor is connected.

Adjustable variables	Increment	Remarks
Temp. detect.	Off	
	Input	
	Sensor *	
Temp. value	0,0 ... 99.9 °C	With “Temp. detect.” “input”

* Only available if the terminal “I out 3” of the I module was configured for the measured variable “Temperature“.

6.2.7 H_2O_2



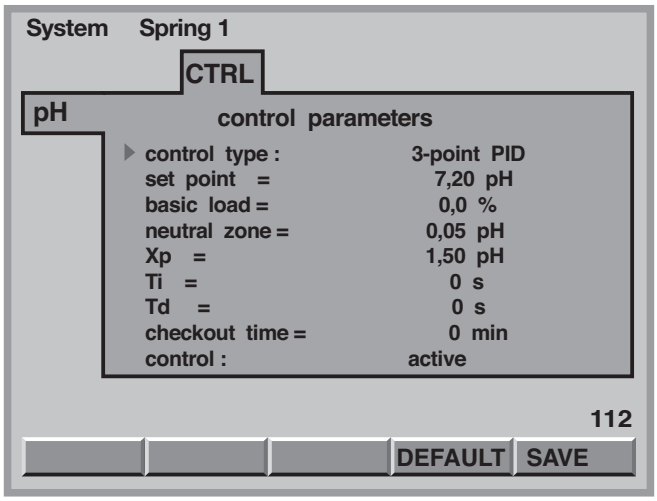
Only available if the terminal “I out 2” of the I module was configured for the measured variable “H_2O_2“ and no chlorine sensor is connected.

Adjustable variables	Increment	Remarks
Temp. detect.	Off	
	Input	
	Sensor *	
Temp. value	0,0 ... 99.9 °C	With “Temp. detect.” “input”

* Only available if the terminal “I out 3” of the I module was configured for the measured variable “Temperature“.

6.3 Controlling

6.3.1 pH



Adjustable variables	Increments	Remarks
Control type	Manual	
	PID 1 point	See fig. 15
	PID 2 point	See fig. 16
	P 2 point	
	P 1 point	
Setpoint	0.00 ... 12.00 pH	
Basic load	-100.0 ... 100.0 %	
Neutral zone	0.00 ... 1.00 pH	See fig. 15
xp *	0.01 ... 70.00 pH	
Ti	0 ... 9,999 s	With “Control type” “PID”
Td	0 ... 2,500 s	With “Control type” “PID”
Control direction	Act. pH lowering	Acid, one-way control
	Act. pH raising	Alkali,one-way control
Checkout time	0 ... 999 min	Not with “Control type” “manual”
Disturbance feedforward	Inactive	
	Mult.	Multiplicative disturbance of “I out 1“
Man. dosing	-100.0 ... 100.0 %	With “Control type” “manual”
Control	Active	Control loop can be deactivated independent of Start/stop key. Start/stop key stops all control loops.
	Inactive	

* Definition xp see Glossary

IMPORTANT

Check always whether the prerequisites for the settings in “Control” or “Control direction” were actually given in the configuration menu!

NOTE

We recommend keeping the pH value at 7.2 because chlorine shows good disinfection effects in this range. In addition, skin tolerability is good at this pH value.

Fig. 15: Figure of control type PID two-way, without and with neutral zone

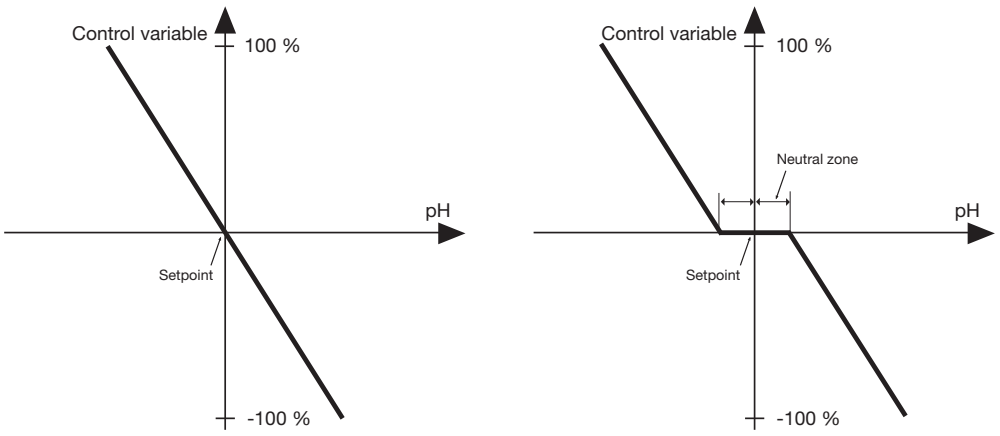
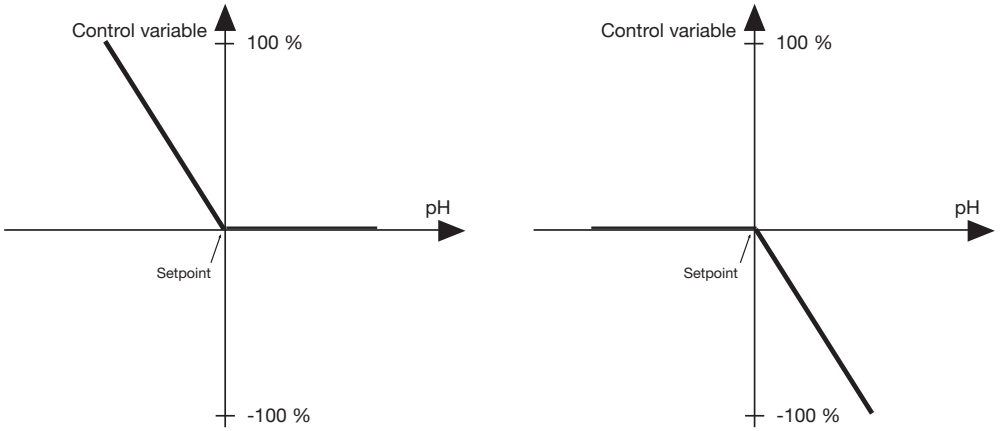
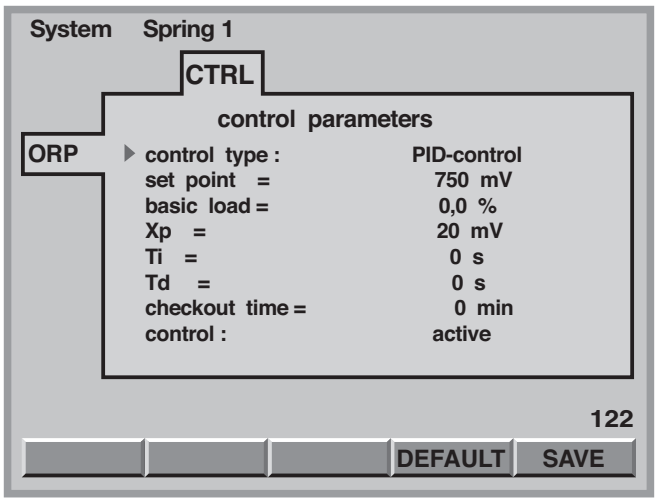


Fig. 16: Figure of control type PID 1 point, direction acid and direction alcaline



6.3.2 Redox/ORP

(Not, if chlorine is controlled)



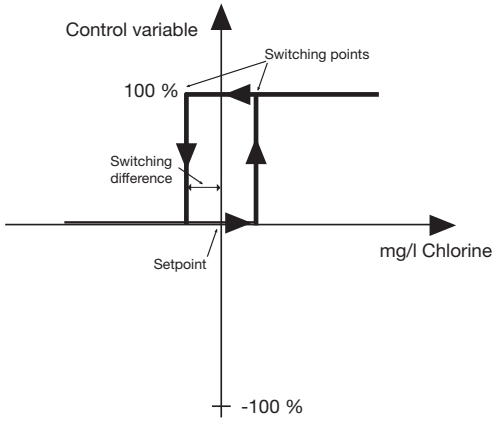
Adjustable variables	Increments	Remarks
Control type	PID controller	
	P controller	
	2-pt contact	See fig. 17
	Manual	
Setpoint	700 ... 850 mV	
Basic load	0.0 ... 100.0 %	
xp *	1 ... 1,000 mV	
Ti	0 ... 9,999 s	With “Control type” “PID”
Td	0 ... 2,500 s	With “Control type” “PID”
Switching interval	0 ... 50 mV	
MIN ON time	0 ... 6,000 s	
MIN OFF time	0 ... 6,000 s	
Checkout time	0 ... 999 min	Not with “Control type” “manual”
Control	Active	Control loop can be deactivated independent of Start/stop key. Start/stop key stops all control loops.
	Inactive	

* Definition xp see Glossary

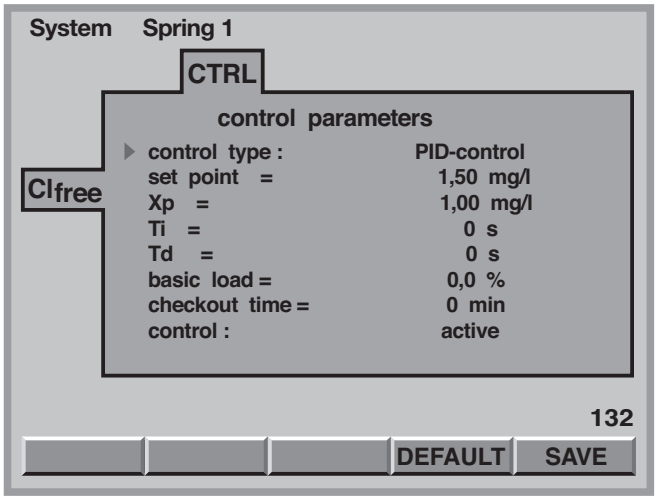
IMPORTANT

Check always whether the prerequisites for the settings in “Control” or “Control direction” were actually given in the configuration menu!

Fig. 17: Figure of control type 2-point contact



6.3.3 Chlorine, Free



Adjustable variables	Increments	Remarks
Control type	PID controller	
	P controller	
	2-pt contact	See fig. 18
	Manual	
Setpoint	0.00 ... 20.00 mg/l	
Basic load	0.0 ... 100.0 %	
xp *	0.10 ... 99.99 mg/l	
Ti	0 ... 9,999 s	With “Control type” “PID”
Td	0 ... 2,500 s	With “Control type” “PID”
Switching interval	0.00 ... 0.50 mg/l	
MIN ON time	0 ... 6,000 s	
MIN OFF time	0 ... 6,000 s	
Checkout time	0 ... 999 min	Not with “Control type” “manual”
Control	Active	Control loop can be deactivated independent of Start/stop key. Start/stop key stops all control loops.
	Inactive	

* Definition xp see Glossary.

IMPORTANT

Check always whether the prerequisites for the settings in “Control” or “Control direction” were actually given in the configuration menu!

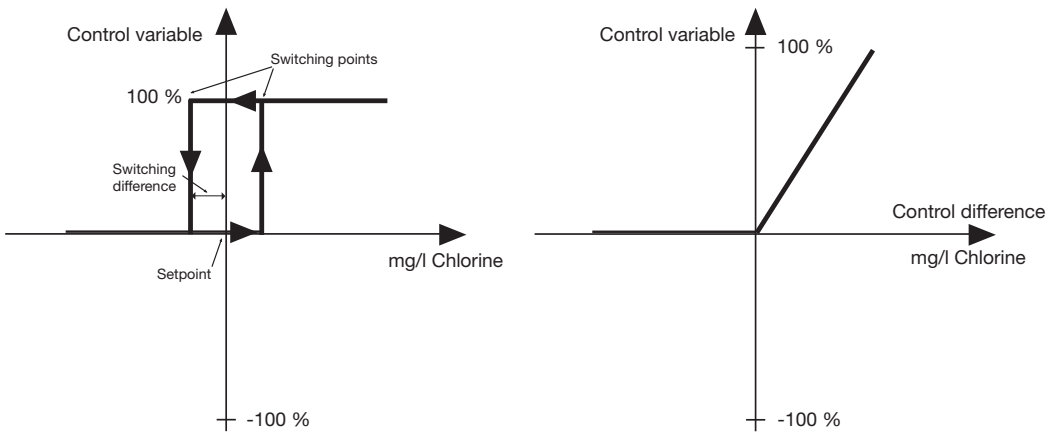
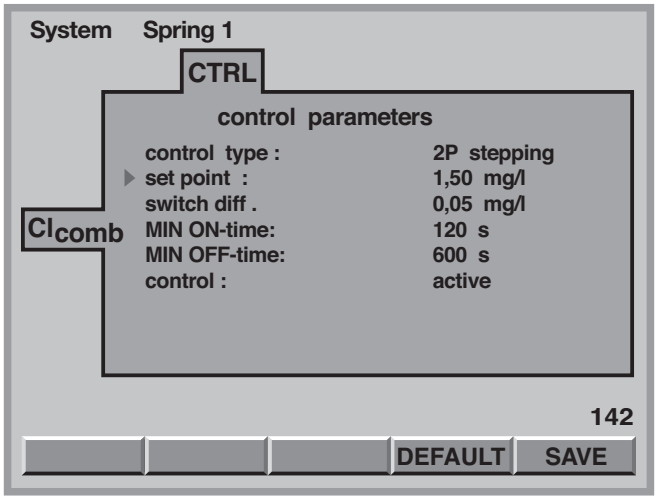


Fig. 18: Figure of control type 2-point contact and PID controller for chlorine

6.3.4 Chlorine, Combined



Adjustable variables	Increments	Remarks
Switching point	0.00 ... 20.00 mg/l	Above the switching point, relay P4 can switch an UV plant
Switching diff.	0.00 ... 0.50 mg/l	
MIN ON time	0 ... 9,999 s	
MIN OFF time	0 ... 9,999 s	
Control	Active	Control loop can be deactivated independent of Start/stop key. Start/stop key stops all control loops.
	Inactive	

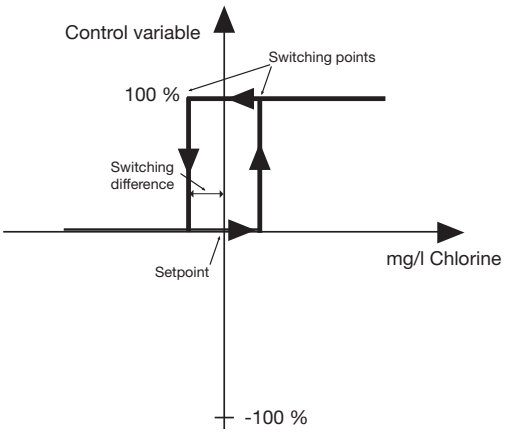
Only “Control type” “2-pt contact” possible.

IMPORTANT

- ***For the entries to be effective, a power relay must be configured!***
- ***The control Cl comb. serves minimising the combined chlorine, e.g. through a UV plant.***

For explanations see “limit value” in the glossary at the end of the operating instructions.
(The “switching point” corresponds to a “max. limit”.)

Fig. 19: Figure of control type 2-point contact



6.3.5 Temperature

Adjustable variable	Range	Remarks
Switching point	0.0 ... 40.0 °C	Comparable to target value. Relay P4 can switch a hot water solenoid valve of a heat exchanger.
Switching interval	0.0 ... 1.5 °C	Corresponds to a hysteresis
MIN ON time	0 ... 9,999 s	Minimum time the actuator must be switched on for increasing temperature to be detected.
MIN OFF time	0 ... 9,999 s	Limits the switching frequency of the actuator.
Control	Inactive	Control circuit can be switched off independent of the Start/Stop button. Start/Stop button stops all control circuits.
	Active	

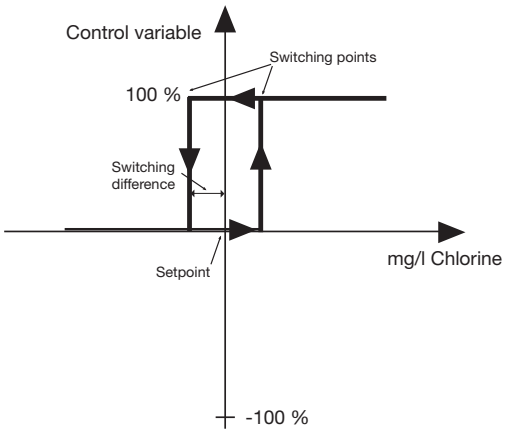
Only control type “2-pt. contact” possible.

IMPORTANT

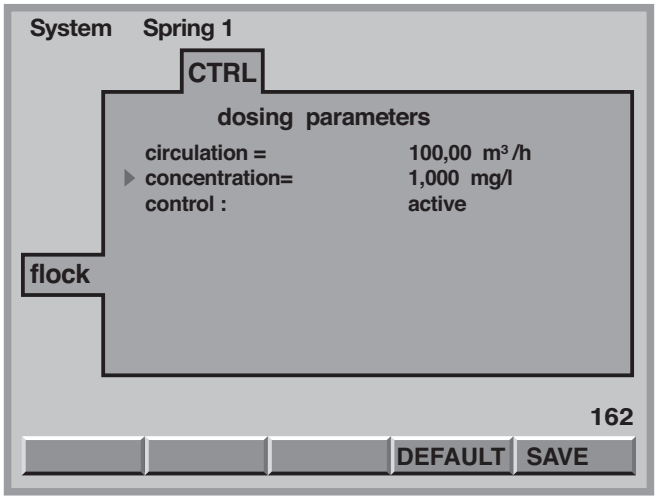
A power relay must be configured for all entries to be effective!

For explanations, see “Limit value” in index of technical terms at the end of the operating instructions (the “switching point” corresponds to a “max. limit”).

Fig. 20: Figure of control type 2-point contact



6.3.6 Flocculants



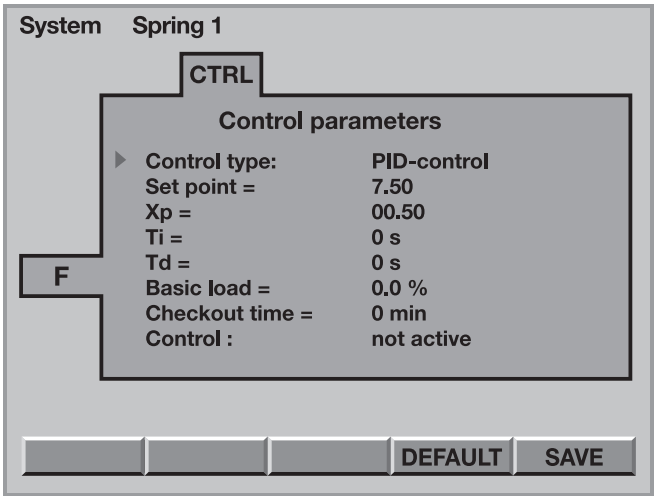
Adjustable variables	Increments	Remarks
Circulation	0.0 ... 500.0 m³/h	
Concentration	0.1 ... 9.9 mg/l	Desired concentration of flocculants
Control	Active	Control loop can be deactivated independent of Start/stop key. Start/stop key stops all control loops.
	Inactive	

Pump capacity

If a flocculant pump is configured, after saving under “pump output” DULCOMARIN® II will show its metering capacity (calculated from “circulation” and “concentration” realised through stroke rate) as a percentage referred to the “max. output”.

Under “max. output” DULCOMARIN® II shows the maximum calculated metering capacity for the pump type at the set stroke length, 100 % stroke rate and 1.5 bar backpressure (identical to “output” in index card P1, P2 or P3 under the configuration menu).

6.3.7 Fluoride (F^-)



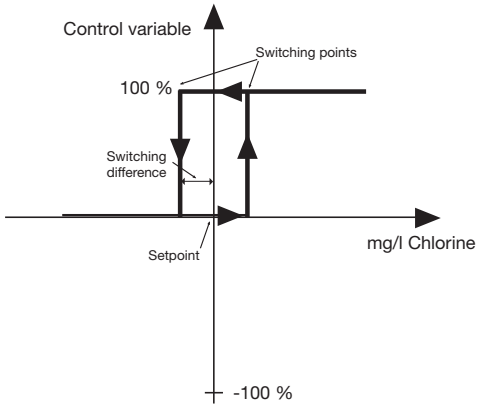
Adjustable variables	Increment	Remarks
Control type	PID controller	
	P controller	
	2-pt contact	See fig. 21
	Manual	
Setpoint	0,00 ... 9.99 ppm	
Basic load	0,0 ... 100,0 %	
xp *	1 ... 1,000 ppm	
Tn	0 ... 9,999 s	With “Controlling” “PID”
Tv	0 ... 2500 s	With “Controlling” “PID”
Switching interval	0 ... 50 ppm	
Min. switch-on time	0 ... 6,000 s	
Min. switch-off time	0 ... 6,000 s	
Control time	0 ... 999 min	Not with “Controlling” “manual”
Disturbance feedforward	Inactive	
	Mult.	Multiplicative disturbance of “I out 1”
	Add.	Additive disturbance of “I out 1”
Controlling	On	Controlling only with metering pumps with CANopen bus. Control loop can be deactivated independent of Start / stop key. Start / stop key stops all control loops in the selected system.
	Off	

* Definition xp see Glossary.

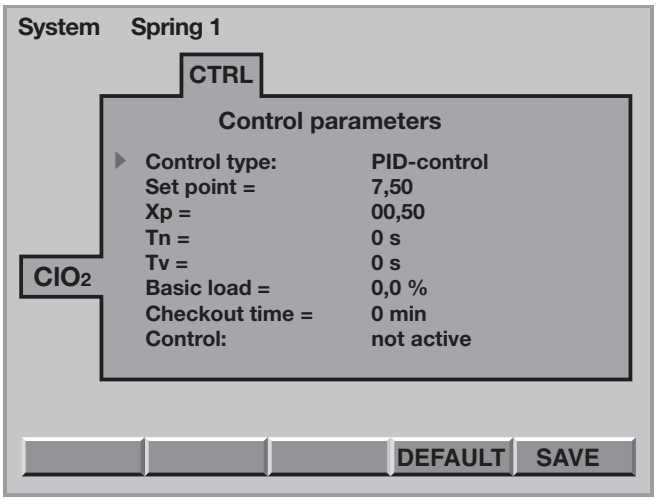
CAUTION

Check always whether the prerequisites for the settings in “Controlling” or “Control direction” were actually given in the configuration menu!

Fig. 21: Figure of control type 2-point contact



6.3.8 Chlorine Dioxide (ClO_2)



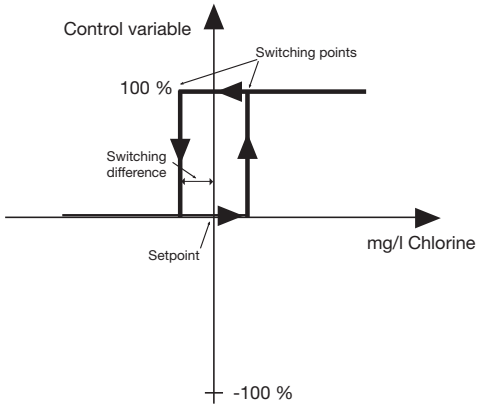
Adjustable variables	Increment	Remarks
Control type	PID controller	
	P controller	
	2-pt contact	See fig. 22
	Manual	
Setpoint	0,00 ... 9.99 ppm	
Basic load	0,0 ... 100,0 %	
xp *	1 ... 1,000 ppm	
Tn	0 ... 9,999 s	With “Controlling” “PID”
Tv	0 ... 2500 s	With “Controlling” “PID”
Switching interval	0 ... 50 ppm	
Min. switch-on time	0 ... 6,000 s	
Min. switch-off time	0 ... 6,000 s	
Control time	0 ... 999 min	Not with “Controlling” “manual”
Disturbance feedforward	Inactive	
	Mult.	Multiplicative disturbance of “I out 1“
	Add.	Additive disturbance of “I out 1“
Controlling	On	Controlling only with metering pumps with CANopen bus. Control loop can be deactivated independent of Start / stop key. Start / stop key stops all control loops in the selected system.
	Off	

* Definition xp see Glossary.

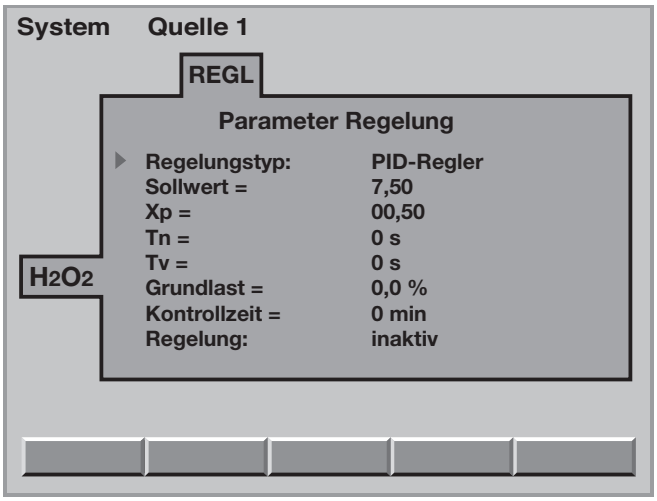
CAUTION

Check always whether the prerequisites for the settings in “Controlling” or “Control direction” were actually given in the configuration menu!

Fig. 22: Figure of control type 2-point contact



6.3.9 Hydrogen Peroxide (H_2O_2)



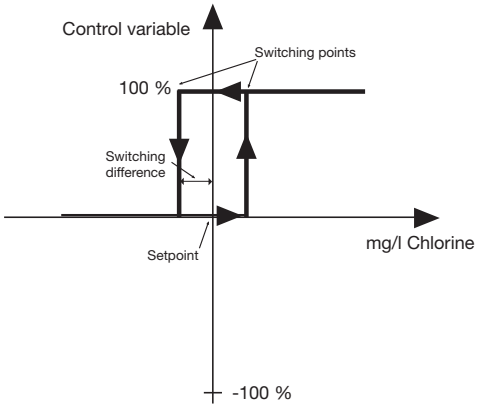
Adjustable variables	Increment	Remarks
Control type	PID controller	
	P controller	
	2-pt contact	See fig. 23
	Manual	
Setpoint	0,00 ... 9.99 ppm	
Basic load	0,0 ... 100,0 %	
xp *	1 ... 1,000 ppm	
Tn	0 ... 9999 s	With “Controlling” “PID”
Tv	0 ... 2500 s	With “Controlling” “PID”
Switching interval	0 ... 50 ppm	
Min. switch-on time	0 ... 6,000 s	
Min. switch-off time	0 ... 6,000 s	
Control time	0 ... 999 min	Not with “Controlling” “manual”
Disturbance feedforward	Inactive	
	Mult.	Multiplicative disturbance of “I out 1“
	Add.	Additive disturbance of “I out 1“
Controlling	On	Controlling only with metering pumps with CANopen bus. Control loop can be deactivated independent of Start / stop key. Start / stop key stops all control loops in the selected system.
	Off	

* Definition xp see Glossary.

CAUTION

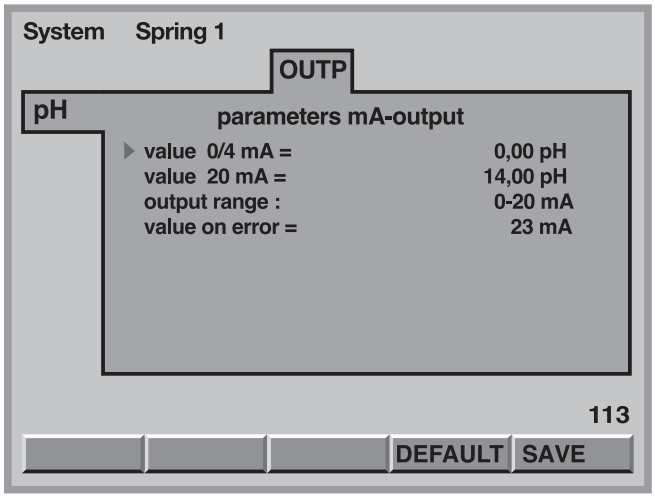
Check always whether the prerequisites for the settings in “Controlling” or “Control direction” were actually given in the configuration menu!

Fig. 23: Figure of control type 2-point contact



6.4 mA Output

All measured variables

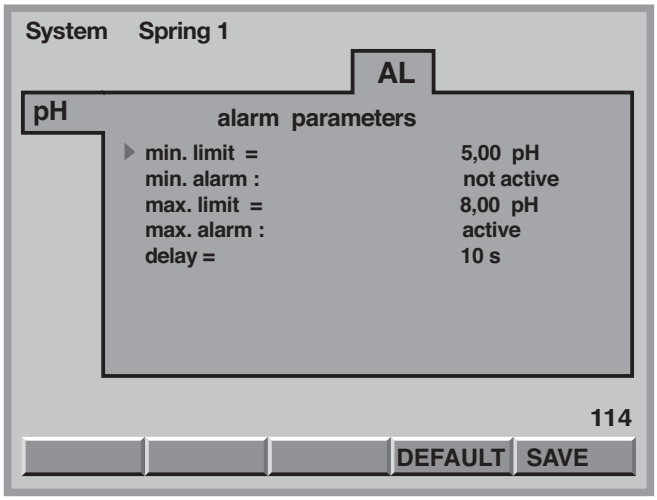


Adjustable variables	Increments	Remarks
Value 0/4 mA	0.00 ... xx.xx Y *	mA value depending on “output”
Value 20 mA	0.00 ... xx.xx Y *	
Output range	0-20 mA	Not with “Iout” “not used” (see configuration)
	4-20 mA	
Value if error	23 mA OFF 3.7 mA 22 mA	Not with “Iout” “not used” (see configuration)

* “xx.xx Y” is the value and the unit of measurement of a measured variable of this controller.

6.5 Alarm

All measured variables

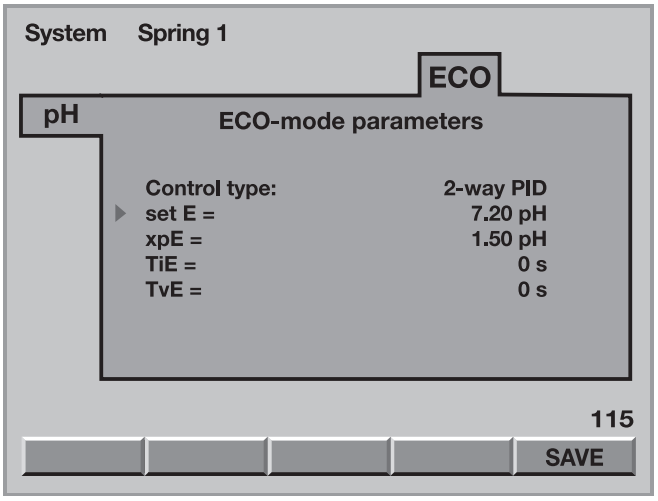


Adjustable variables	Increments	Remarks
Min. limit	0.00 ... xx.xx Y *	
Min. alarm	Not active	Only error message for error
	Active	Error message, alarm horn, relay for error. Must be acknowledged.
Max. limit	0.00 ... xx.xx Y *	
Max. alarm	Not active	Only error message for error
	Active	Error message, alarm horn, relay for error. Must be acknowledged.
Delay	0 ... 3,600 s	

* “xx.xx Y” is the value and the unit of measurement of a measured variable of this controller.

Influence on controlling see table 2.

6.6 Eco!Mode



In Eco!Mode, a second parameter set for controlling can be switched to active temporarily in order to save energy. This can e.g. be done together with reducing the circulation rate. As soon as a contact at the contact input K3 of the M module switches, the Eco!Mode becomes active or inactive. The Eco!Mode is available for all measured variables of the M module, if controlled:

- pH
- ORP
- Chlorine, free
- Chlorine, combined
- Temperature
- Flocculants

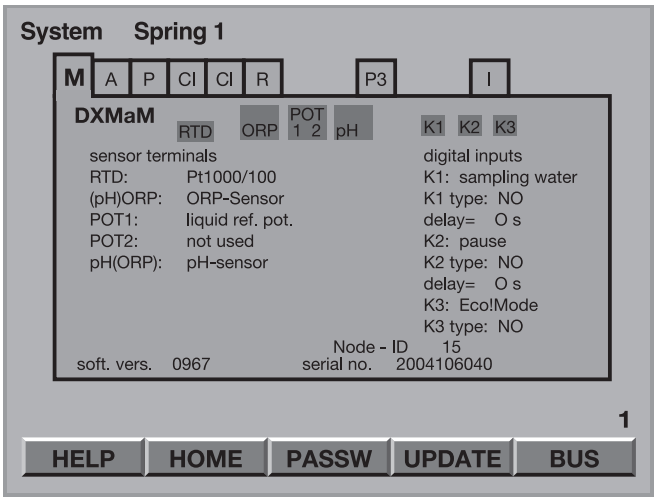
As soon as the second parameter set is activated, the central menu option shows a green identifier ‘ECO’.

To activate Eco!Mode, set connection K3 to Eco!Mode in the index card DXMaM under the configuration menu.

CAUTION

See section 6.3 “Controlling” for more detailed information on the set variables!

7 Configuration



The index cards of the individual CAN modules display the version of the module software at the left bottom and the allocated CAN node number (node ID) and the serial number (R. no. on the rating plate of the module) at the right bottom.

IMPORTANT

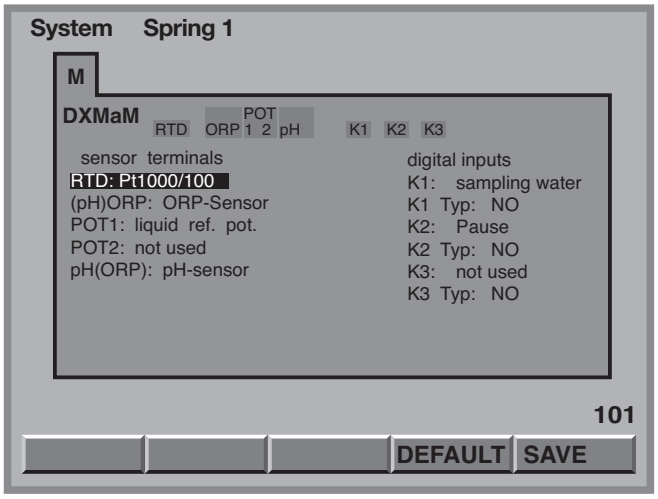
- ***The CAN sensors and the CAN pumps, too, are modules!***
- ***Terminals which are not assigned must be configured as “not assigned”!***

NOTE

As a reminder, each index card displays the arrangement of the module’s terminals at the top with a coloured background.

7.1 Module DXMaM

M Module (measurement module)



Sensor connections:

Terminals/adjustable variables	Increments	Remarks
RTD (temperature)	PT1000/100	PT1000/PT100 (self-detection) if no chlorine sensor used
	Not used	Free
(pH) ORP	Redox/ORP sensor	
	Not used	Free
POT1	Liquid ref. pot.*	To “(pH) ORP” (ORP = Redox)
	Not used	Free
POT2	Liquid ref. pot.*	To “pH (ORP)” (ORP = Redox)
	Not used	Free
pH (ORP)	pH sensor	
	Not used	Free

* for equipotential bonding pin. Do not connect to ground! No jumper required.

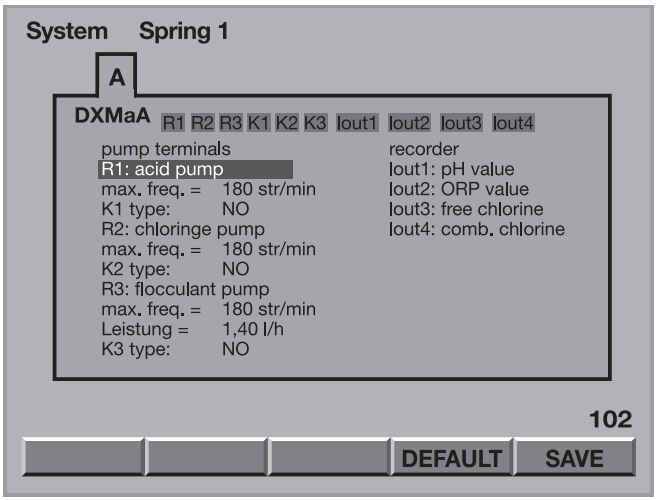
Switch inputs:

Terminals/adjustable variables	Increments	Remarks
K1	Sample flow	Sample water monitoring
K1 type	NC	
	NO	
Delay (contact)	0 ... 3,600 s	
K2	Pause control	
	Not used	Free
K2 type	NC	
	NO	
Delay (contact)	0 ... 3,600 s	
K3	Eco!Mode	Second set of parameters for all controlled variables
	Not used	Free
K3 type	NC	
	NO	

K1 - K3 are switch inputs of the M module DXMaM (the A module DXMaA shows the same designations!).

7.2 Module DXMaA

A Module (actuator module)



Pump connections:

Terminals/adjustable variables	Increments	Remarks
R1	Acid pump	For external input acid pump
	Alcaline pump	For external input alkali pump
	Not used	Free
max. freq.	0 ... 500 strokes	Only when pump selected
K1 type	NO	Only when pump selected
	NC	Only when pump selected
	Not used	Free
R2	Chlorine pump	For external input Sodium hypochlorite pump
	Acid pump	For external input acid pump
	ORP pump	For external input
	Not used	Free
max. freq.	0 ... 500 strokes	Only when pump selected
K2 type	NO	Only when pump selected
	NC	Only when pump selected
	Not used	Free
R3	Flocculation pump	For external input Flocculant pump
	Chlorine pump	For external input Sodium hypochlorite pump
	ORP pump	For external input
	Not used	Free
max. freq.	0 ... 500 strokes	Only when pump selected
Capacity	0.10 ... 18.00 l/h	Only when pump selected
K3 type	NO	Only when pump selected
	NC	Only when pump selected

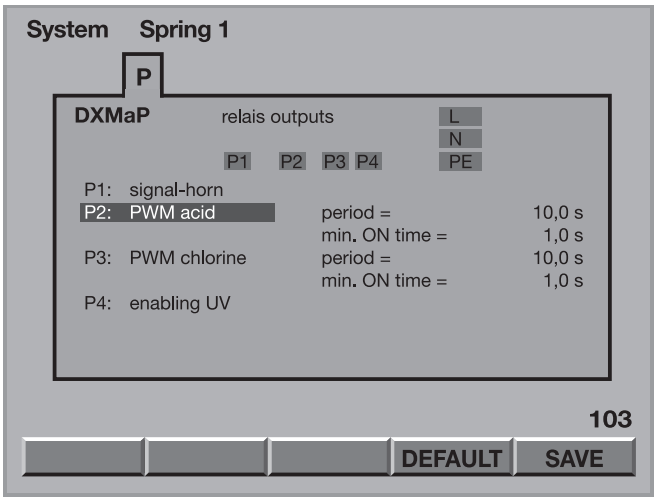
R1 - R3 are frequency outputs; K1 - K3 are switch inputs.
K1 - K3 are switch inputs of the A module DXMaA (the M module DXMaM shows the same designations!).

Outputs 0/4-20mA (standard signal outputs):

Terminals/adjustable variables	Increments	Remarks
Iout1	pH value	For recorder
	pH lower dosing	Control variable
	pH lift dosing	Control variable
	Cl dosing	Control variable
	Flocc. dosing	Control variable
	Control. out ORP	Control variable
	Not used	Free
Iout2	ORP value	For recorder
	pH lower dosing	Control variable
	pH lift dosing	Control variable
	Cl dosing	Control variable
	Flocc. dosing	Control variable
	Control. out ORP	Control variable
	Not used	Free
Iout3	Free chlorine	For recorder
	pH lower dosing	Control variable
	pH lift dosing	Control variable
	Cl dosing	Control variable
	Flocc. dosing	Control variable
	Control. out ORP	Control variable
	Not used	Free
Iout4	Comb. chlorine	For recorder ”value comb. chlorine” is the difference between the measuring values of CLE and CTE
	pH lower dosing	Control variable
	pH lift dosing	Control variable
	Cl dosing	Control variable
	Flocc. dosing	Control variable
	Control. out ORP	Control variable
	Temperature value	For recorder value temperature is received from the chlorine sensor or PT1000/PT100
	Not used	Free

7.3 Module DXMaP

P Module (power supply module)



Relay outputs:

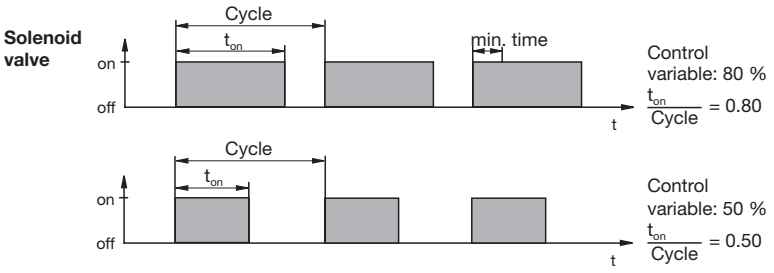
Terminals/adjustable variables	Increments	Remarks
P1	Signal-horn	
P2	PWM acid	Solenoid valve or switch-on of pump (acid)
	PWM alcaline	Solenoid valve or switch-on of pump (alkali)
	Not used	Free
P3	PWM alcaline	Solenoid valve or switch-on of pump (alkali)
	PWM chlorine	Solenoid valve or switch-on of pump (sodium hypochlorite pump)
	PWM ORP	Solenoid valve or switch-on of pump
	PWM acid	Solenoid valve or switch-on of pump (acid)
	Not used	Free
P4	UV enable	Releases locking mechanism
	PWM chlorine	Solenoid valve or switch-on of pump (sodium hypochlorite pump)
	PWM ORP	Solenoid valve or switch-on of pump
	Heating enable	
	Not used	Free
Period	0.0...999.0 s	
MIN ON time	0.0...500.0 s	

When controlling solenoid valves (PWM = pulse width modulation), the cycle times are to be observed.

NOTE

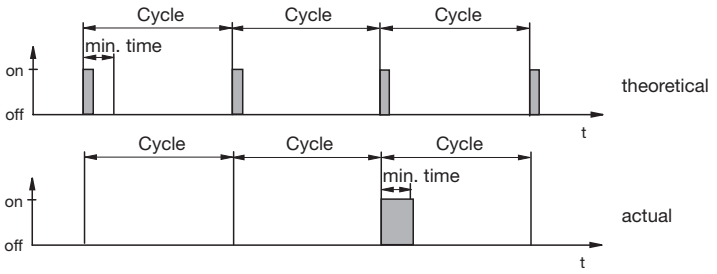
The power relays P1 (alarm) of all P modules always make and break simultaneously.

Solenoid valve relay



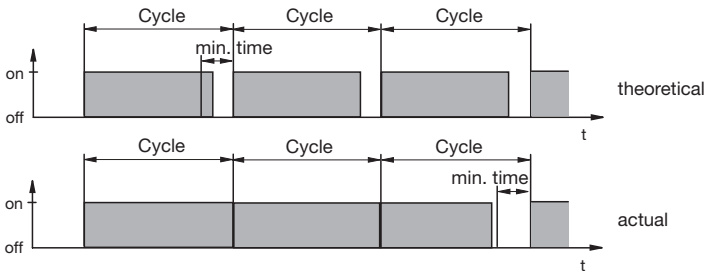
The operating intervals of the DULCOMARIN® II (solenoid valve) depend on the control variable and on “min. time” (smallest permissible operating time of the connected device).
The control variable determines the ratio t_{on}/cycle and thus the switching times (see fig. above).
“min. time” affects the switching times in two situations:

a) theoretical switching time < min. time:



The DULCOMARIN® II does not switch on for several cycles until the sum of the theoretical switching times exceeds “min. time”. Then, the controller switches on for the duration of the sum of times.

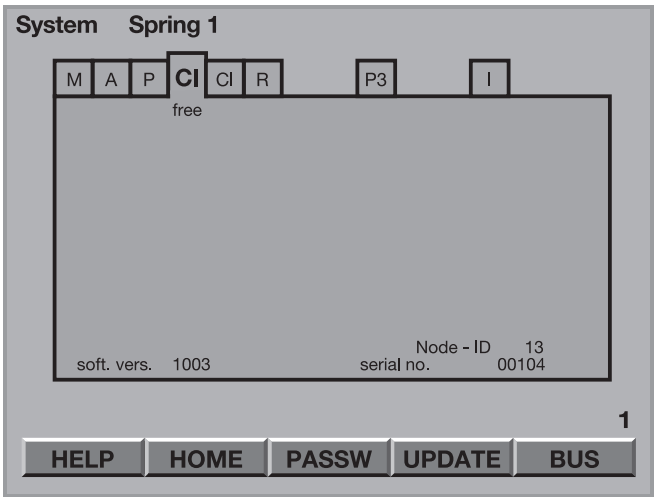
b) theoretical switching time > (cycle - min. time) and calculated switching time < cycle



The DULCOMARIN® II does not switch off for several cycles until the differences between the cycle and the theoretical switching time exceeds “min. time”.

7.4 Module Cl Free

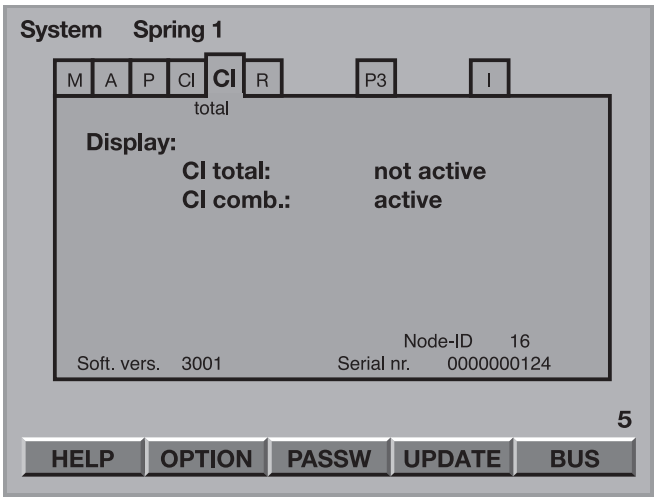
Measuring Sensor CLE



The index card only displays the software version, the CAN node number (node ID) and the serial number (R. no. on the rating plate of the module) because the CAN connection of the chlorine sensor does not require any calibration.

7.5 Module Cl Total

Measuring Sensor CTE



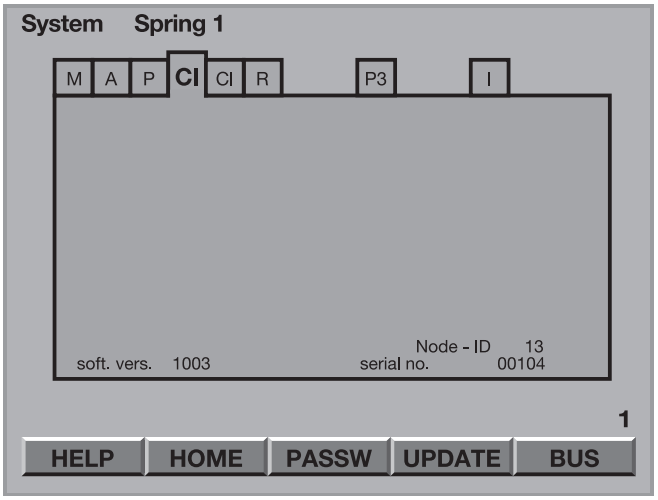
The index card shows only the version of the software, the CAN node number (node ID) and the serial number (R no. on the rating plate of the module).

It is also possible to specify in “Display” which chlorine concentration is to be shown by the DULCOMARIN® II.

Adjustable value	Increment	Remarks
Cl total	Inactive	
	Active	
Chlorine combined	Active	
	Inactive	

7.6 Module Cl

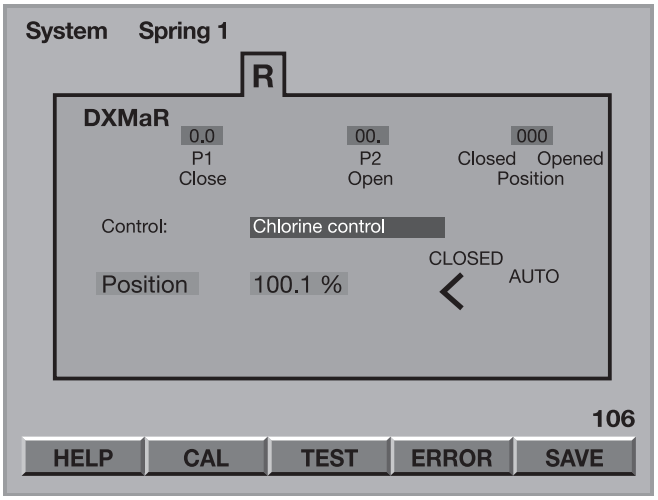
Measuring Sensor CGE



The index card only displays the software version, the CAN node number (node ID) and the serial number (R. no. on the rating plate of the module) because the CAN connection of the chlorine sensor does not require any calibration.

7.7 R Module (Actuator Module for Chlorine Gas Metering Unit)

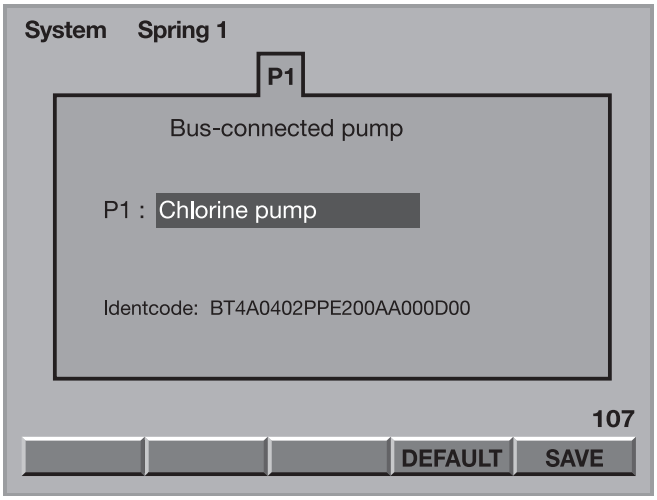
DXMaR Module



Adjustable variable	Range	Remarks
Control	Chlorine control	
	ORP control	

7.8 P1 Module (Metering Pumps Module)

CAN-Beta®



Pump use

Adjustable variable	Range	Remarks
P1	Acid pump	For acid
	Chlorine pump	
	Flocculation pump	
	Alkaline pump	For alkaline solution
	ORP pump	
	Pump standby chlorine	Only with I module and chlorine sensor
	Pump NH_4OH	Only with I module and chlorine sensor
	Pump F^-	Only if set at I module
	Pump ClO_2	Only if set at I module, without chlorine sensor
	Pump H_2O_2	Only if set at I module, without chlorine sensor
	Free	

An index card: P1, P2 or P3 appears for each pump connected to the CAN bus.

The index card also shows the current values for the following variables:

Variable	Range	Remarks
Pump capacity	0...100 %	Display of the current, relative pump capacity
Stroke length	0 ... 100 %	The metering accuracy decreases below 30 %
Level	> 10 %	Level OK
	< 10 %	Prepare tank change
	Tank empty	Change tank
Output		Maximum calculated metering capacity for the pump type at the set stroke length, 100 % stroke rate and 1.5 bar backpressure
Pump status	OFF	Beta multifunction switch set to STOP
	ON	Beta multifunction switch not set to STOP
	Bus	Beta multifunction switch set to BUS
	Manual	Beta multifunction switch not set to BUS
	Calibrate pump!	
	Calibration OK!	

Even in systems with only one pool, CAN pumps must be allocated to this pool (see chapter 8 “Complex Activities“). The metering rate curves for each stroke length at a constant backpressure of 1.5 bar are stored in each Beta/4-CANopen.
DULCOMARIN® II will trigger an alarm and a message will appear in the display if the stroke length of Beta changes by more than ±10 %. The pump, however, continues to operate.
The message disappears after saving the settings (calibration) and DULCOMARIN® II adapts the pump output corresponding to the new metering rate curve.

Pump standby chlorine

The Disinfection controller can control up to 4 metering pumps with CAN bus.
It is possible to configure a metering pump for chlorine as standby pump to supplement the main chlorine pump.
In this case, the screen recorder must be activated and a SD card must be inserted because the recorder saves the operating modes in the event file on the SD card (see Supplementary instructions for screen recorder).

The following causes effect switching to the standby pump:

- failure of the main chlorine pump
- chemicals supply of the main chlorine pump is empty
- The main pump was set to “Stop” at the multifunctional switch.

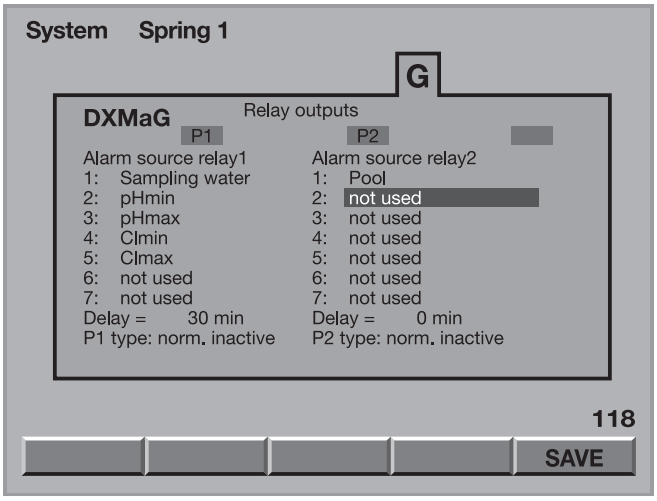
A power failure or disconnection of the bus connection to the main pump, however, does not result in any switching to the standby pump.

Pump NH_4OH

If CAN pumps are configured for chlorine control, a pump for chloramination can also be configured via “PumpNH_4OH”. The pump then meters an ammonium solution parallel to the chlorine solution. To obtain the correct stoichiometry, the concentration of the ammonium solution and the stroke length of the ammonium pump must be adjusted to the chlorine concentration in the treated water.

7.9 G Module (Limit Value Module)

DXMaG Module

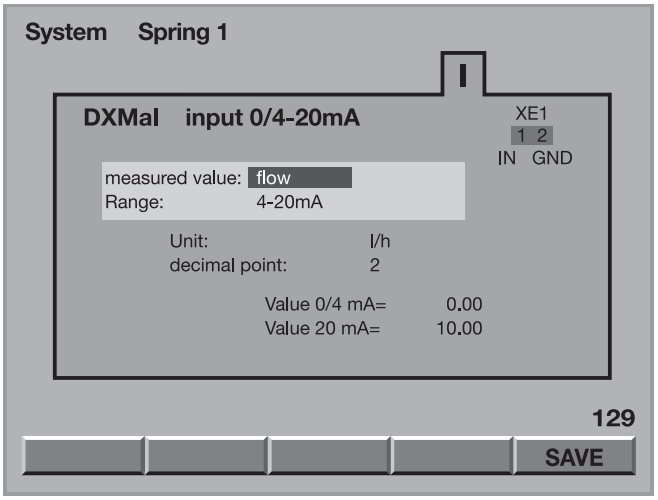


Variable	Range	Remarks
Alarm sources	Pool	All alarm sources can be selected with “Pool”. Only alarm source 1.
	Sample water	Sample water monitoring
	pH min	
	pH max	
	Cl min	
	Cl max	
	Free	
Delay (error)	0 ... 999 min	
P1 Type	Normally inactive (NO)	Power relay P1 of all
	Normally active (NC)	P modules
P2 Type	Normally inactive (NO)	Power relay P2 of all
	Normally active (NC)	P modules

Up to 7 alarm sources per power relay can be selected (the alarm sources are then OR operations).

7.10 I Module (Current Input Module)

Module DXMaI



Adjustable variables	Increment	Remarks
Measured variable	Sample water	Only at K1
	Pause	Only at K2
	Flow rate Q	Only at “I out 1”; can be used as disturbance for measured variables at “I out 2”
	Turbidity	Only at “I out 1” or “I out 3”
	Conductivity	Only at “I out 2”
	F^-	Only at “I out 2”
	O_2	Only at “I out 2”
	ClO_2	Only at “I out 2”
	ClO_2^-	Only at “I out 2” or “I out 3”
	H_2O_2	Only at “I out 2”
	UV	Only at “I out 3”
	Temp.	Only at “I out 3”
	PES	Only at “I out 3”; peracetic acid
Range	0-20 mA	
	4-20 mA	

Unit/adjustable variables	Increment	Remarks
Flow rate Q	m^3/h	
	l/h	
Turbidity	NTU	
	FNU	
	FTU	
	FAU	
	EBC	
Conductivity	µS/cm	
	mS/cm	
	S/cm	
UV	W/m^2	
	mW/cm^2	
Others	mg/l	For F^-, O_2, ClO_2, ClO_2^-, H_2O_2, PES
	ppm	

Adjustable variables	Increment	Remarks	
		Value range for 0/4 mA	Value range for 20 mA
Decimal places	0	0...9000	0...9,999
	1	0...900,0	0...999.9
	2	0...90,00	0...99.99
	3	0...9,000	0...9,999

Adjustable variables	Increment	Remarks
Value 0/4 mA	0...9999	For 0 decimal place
	0...999,9	For 1 decimal places
	0...99,99	For 2 decimal places
	0...9,999	For 3 decimal places
Value 20 mA	0...9999	For 0 decimal places
	0...999,9	For 1 decimal place
	0...99,99	For 2 decimal places
	0...9,999	For 3 decimal places

Setting of measured variables

Measured variables

With the I module, the signals of sensors or units can be processed which supply a mA standard signal for the following measured variables:

Measured variable	Sensor or unit
Fluoride (F^-)	Measuring transducer 4-20 mA FP V1
Dissolved oxygen (O_2)	DULCOMETER® controller type D1C for dissolved oxygen
Chlorine dioxide (ClO_2)	Amperometric DULCOTEST® sensor
Chlorite (ClO_2^-)	Amperometric DULCOTEST® sensor
Ammonia (NH_2)	Measuring transducer 4-20 mA A V1
Hydrogen peroxide (H_2O_2)	Amperometric DULCOTEST® sensor
Peracetic acid (PES)	Amperometric DULCOTEST® sensor
Conductive conductivity	Measuring transducer DMT conductivity
Temperature	Measuring transducer 4-20 mA PT 100 V1
Flow	Matching third-party unit
UV intensity (UV)	Matching third-party unit
Turbidity	Matching third-party unit

Displays and limit values

The signals are displayed and can be monitored via the limit values (PARAM – AL).

Temperature compensation

For fluoride, a temperature compensation can be selected in PARAM - MEAS. To achieve this, a temperature sensor must be connected to the input “I out 3”.

Configuration

All measured variables, which can be selected here, are shown in 3 lines which can be selected using the arrow keys.
The sensors for the measured variables in line 1 must be connected to the terminal XE1, the sensors for the measured variables in line 2 to the terminal XE2 … .

Configuration of a sensor or unit:

- ▶ Select the correct line for the terminal (arrow keys UP/DOWN; for KE1 - line 1,...) and press the ENTER key – a screen to select the measured variable is displayed.
- ▶ Press the ENTER key.
- ▶ Select the correct measured variable and press the ENTER key.
- ▶ Confirm the setting by pressing the key F5 ACC – a scroll bar is displayed.

The defaults for the new measured variable are now loaded. Changing of certain parameters of the configuration, if required:

- ▶ Select the correct range of the standard signal in “Range”.
- ▶ Press the RIGHT key to select the next parameter block.
- ▶ Set the correct unit in “Units”.
- ▶ Select the desired number of decimal places after the comma to be shown in “Decimal places”.
- ▶ Press the RIGHT key to select the next parameter block.
- ▶ Select the correct zero value of the measured variable in “0/4 mA“.
- ▶ Select the correct maximum value of the measured variable in “20 mA“.
- ▶ Safe all settings by pressing F5 SAVE.
- ▶ In the following dialogue box, press the ENTER key for "Yes".
- ▶ Check whether parameters have to be adjusted in the PARAM menu, such as e.g. alarms or temperature compensation.
- ▶ A new measured variable for concentration has now to be calibrated.

8 Complex Activities

CAUTION

When performing these activities, always allow a few seconds to elapse between the last message or the last progress bar and the next activity.

NOTE

Modules can be logged on and off, but not temporarily, via the bus menu (the central unit does not store all data that are required for seamlessly restarting operation of the module).

8.1 Logging Modules On and Off

1. To add a module to the CAN configuration of the DULCOMARIN® II or a module that was deleted from the last configuration (see below):
   (The central unit does not yet have data relating to the module.)

▶ Add the module to the CAN-bus line – the message “Configuration service started – LSS node detected …” appears in the central menu option.

▶ See 3.

2. To disconnect a module temporarily without interim use of the CAN bus line at its basin:

   (The central unit stores all data that are required for seamlessly resuming operation of the module.)

▶ Disconnect the module from the CAN-bus line – the message “Module disconnected! Press ENTER” appears in the central menu.

▶ Press the ENTER key – the menu “Logged off modules” is displayed.

▶ Press F4 (SAVE); the module remains saved in the CAN configuration.
The message "Reconfiguration complete. Press ESC” is displayed.

▶ Press the ESC key to go to the central menu
(The overview at the beginning of the BUS submenu in the configuration menu shows that the module is “not connected”)
See next section for further procedure.

3. To reconnect a module which was temporarily disconnected without interim use of the CAN bus line (see paragraph above) to the CAN bus line at the old basin:

   (The central unit again activates all data that are required for seamlessly resuming operation of the module.)

▶ Connect the module to the CAN bus line – the message “Automatic configuration started – LSS node detected …” with progress bar is displayed in the central menu option and then “Automatic configuration complete – press ESC”.

▶ Press the ESC key - the permanent display with the message “Module registered! Press ENTER” is shown.

▶ Press the ENTER key – the central menu option with the message “Module registered! Press ENTER” is shown.

▶ Press the ENTER key – the menu “Registered modules detected” is displayed.

▶ Press F4 (ACC) for the module to function again at the CAN bus as saved in the CAN configuration - first a progress bar is shown and then the message "Reconfiguration complete. Press ESC”.

▶ Press the ESC key to go to the central menu

4. To finally disconnect a module from its pool or the DULCOMARIN® II or to use it at another pool or another DULCOMARIN® II:
   (The central unit deletes all data in connection with this module.)

▶ Disconnect the module from the CAN-bus line – the message “Module disconnected! Press ENTER” appears in the central menu.

▶ Press ENTER followed by F2 (DELETE) to delete the module from the CAN configuration.

▶ Press the ESC key to go to the central menu
(The overview at the beginning of the BUS submenu in the configuration menu shows that the module is set to “not connected”)

▶ Add the module in the same way as a new module to the CAN configuration of the DULCOMARIN® II – see 1.

8.2 Placing Pump CAN-Beta into Operation

CAUTION

To avoid problems, follow these instructions precisely!

Preparation

▶ If not yet done, start up the central unit.

▶ Set the stroke length to 95 % or as required at the pump.

▶ Check that the multifunction switch is set to BUS.

▶ Connect the pump to the CAN bus and only then connect to the supply voltage – the display of the central unit shows the message “Automatic configuration in progress – LSS node detected ” with progress bar and then “Automatic configuration complete – press ESC”.

▶ Press the ESC key - the permanent display with the message “New module reported! Press ENTER” is shown.

▶ Press the ENTER key – the central menu option with the message “New module reported! Press ENTER” is shown.

▶ Press the ENTER key – the menu “New module detected” is displayed.

Assignment to a system (basin, filtration circuit …)

▶ Select “System” with the arrow keys and press the ENTER key.

▶ Enter the desired system number with the arrow keys and press the ENTER key.

Assignment of pump number

▶ Select “No.” with the arrow keys and press the ENTER key.

▶ Enter the desired number for the pump (P1 … P4) with the arrow keys and press the ENTER key.

Saving of the configuration

▶ Press F4 (ACC) to save the CAN configuration - first a progress bar is shown and then the message "Reconfiguration complete. Press ESC”.

Allocate purpose

▶ In the central menu option press this key sequence to assign the pump to an application purpose: F4 (CONFIG), LEFT/RIGHT (index card P1 or P2 …), ENTER, arrow keys (password for level 3), 2x ENTER, arrow keys (application pump), ENTER, F5 (SAVE), ENTER, a progress bar is displayed, if “Pump Flocculation” was selected as application purpose.

▶ Then press ESC key.

“Calibrate” pump

▶ Press the following key sequence to “calibrate” the pump: F3 (PARAM), arrow keys (index card FLOCCULATION CONTROLLER):

▶ Even if the message “Pump capacity changed. Press ENTER and SAVE” does not appear, press the following key sequence: ENTER, F5 (SAVE), ENTER – progress bars appear.

▶ Then press ESC key 2x.

8.3 Placing R Module into Operation

CAUTION

Shut down chlorine gas metering while placing into operation (motive water pump, gas)! Otherwise chlorine gas could escape into the swimming pool area!

▶ If you wish to change the measured variable to be controlled (chlorine or ORP), do it now.

Test connection to R module

CAUTION

The test can be terminated at any time with F2 (STOP) – the chlorine gas metering unit then closes.

▶ Press the F4 key (TEST) – the TEST menu appears.

▶ As a test, manually actuate the chlorine gas metering unit with the keys F3 (CLOSED) and F4 (OPEN).

▶ Press F5 (QUIT) to exit the menu.

Calibrate R module

CAUTION

- ***The calibration procedure can be terminated at any time with F4 (STOP) – the chlorine gas metering unit then closes.***

NOTE

- ***The index card shows the current opening angle of the valve at all times (= position in %, low number = valve relatively closed, high number = valve relatively open).***

▶ Press the keys F2 (CAL) and F2 (START) one after the other.
The message “Calibration running” appears in the display.
Initially, DULCOMARIN® II closes the chlorine gas metering unit.
It then performs two calibration runs (open and close) (DULCOMARIN® II waits for a short time in each end position in order to evaluate the constancy of the potentiometer signal).
The message “Calibration finished” appears when the calibration procedure has finished and “Press QUIT”.

▶ Press F5 (QUIT) to exit the calibration menu.
After pressing F5 (SAVE) and the ENTER key, DULCOMARIN® II opens the chlorine gas metering unit corresponding to the current control variable.

8.4 Updating Software

Request the adequate update instructions for the present update from ProMinent Dosiertechnik GmbH.

9 Troubleshooting

IMPORTANT

The number before the error message shows the pool number of the relevant pool for the Dulco-Net.

Error messages	Response of DULCOMARIN® II and remedies
Sample water error	Dosing at base load, measuring values incorrect, check sample water throughput
pH sensor defective	Dosing at base load, measuring values incorrect, replace sensor
pH value too low	Dosing at base load, look for causes if required, switch to manual dosing
pH value too high	Dosing at base load, look for causes if required, switch to manual dosing
pH input hot-wired	Dosing at base load, measuring values incorrect, look for cause (incorrect connection)
pH not connected	Dosing at base load, measuring values incorrect, look for cause (incorrect connection)
pH error pump	Check tank, check pump, bleed air, measuring value OK
pH tank empty	Replace tank, bleed air, measuring value OK
ORP sensor defective	Measuring value incorrect, dosing at base load (if redox/ORP control active)
ORP value too low	Measuring value incorrect, dosing at base load (if redox/ORP control active)
ORP value too high	Measuring value incorrect, dosing at base load (if redox/ORP control active)
ORP input hot-wired	Measuring value incorrect, dosing at base load (if redox/ORP control active)
ORP not connected	Measuring value incorrect, dosing at base load (if redox/ORP control active)
Chlorine free CLE sensor defective	Measuring value incorrect, replace sensor
Chlorine free CLE - value too low	Dosing at base load, look for causes if required, switch to manual dosing
Chlorine free CLE - value too high	Dosing at base load, look for causes if required, switch to manual dosing
Chlorine free CLE not connected	Connect sensor
Chlorine free CLE - correction value temp. missing	Dosing at base load, measuring values incorrect, replace sensor
Chlorine free CLE - correction value pH missing	No pH sensor, switch pH correction to manual
Chlorine error pump	Check tank, check pump, bleed air, measuring value OK
Chlorine tank empty	Replace tank, bleed air, measuring value OK
Chlorine free CTE sensor defective	Measuring value incorrect, replace sensor
Combined chlorine value too low	Recalibrate chlorine sensors
Combined chlorine value too high	Addition of fresh water required
Chlorine total CTE - correction value temp. missing	Measuring value incorrect, replace sensor
Chlorine total CTE - correction value pH missing	No pH sensor, switch pH correction to manual
Chlorine total CTE sensor not connected	Connect sensor
Temperature sensor defective	Measuring value incorrect, replace PT1000(100)
Temperature value too low	Look for cause

Temperature value too high	Look for cause
Temperature input hot-wired	Measuring values incorrect, look for cause (incorrect connection)
Temperature not connected	Measuring values incorrect, look for cause (incorrect connection)
Error pump flocculants	Check tank, check pump, bleed air
Flocculant tank empty	Replace tank; bleed air
Module DXMaM bus error	Contact customer service
Module DXMaA bus error	Contact customer service
Module DXMaP bus error	Contact customer service
Chlorine free CLE - probe bus error	Contact customer service
Chlorine total CLE - probe bus error	Contact customer service
Actuator motor not ready	Basic load? See Table 3 “Specific faults …” for further procedure

Tab. 1: Error messages center menu option and remedies

Error messages	Response of DULCOMARIN® and remedy
Sensor error	Identify causes, if required replace sensor
Calibrate sensor	Calibrate sensor

Tab. 2: Error messages in the fields for measured variable and remedy

NOTE

- ***By pressing F4 (MEAS), the pH value, the sensor current, and the temperature at the time of pressing the key can be displayed.***
- ***If an error message is displayed during the calibration of a chlorine sensor, access more detailed data by pressing F3 INFO.***
  These data are also of help when talking with the technical service.

Rectifying servomotor fault

▶ If the error message “servomotor: Not ready” appears in the display, press F4 (ERROR) in the index card “R module” – the index card “Operating error” appears.

▶ Note down the specific error message relating to the actuator motor.

▶ Rectify the fault corresponding to the table 3.

▶ Press F2 (RESET) to exit the menu and acknowledge the fault.

NOTE

In preparation for a call to ProMinent Service, write down the calibration values of the actuator motor: Press F1 (HELP) in the index card “R module” – the table with the calibration values appears.

Error message	Cause	Remedy
Upper calibration point exceeded	Upper cam switch did not trip	Check mechanism in chlorine gas metering unit
Lower calibration point exceeded	Lower cam switch did not trip	Check mechanism in chlorine gas metering unit
Potentiometer not connected	No position feedback to R module	Check that wiring of potentiometer in the chlorine gas metering unit and wiring in the R module is connected correctly
Wrong direction of rotation	Direction of rotation of actuator motor does not agree with direction of rotation of potentiometer	Check that wiring of potentiometer and of relay actuation in the chlorine gas metering unit and wiring in the R module is connected correctly

Position not reached	Actuator motor does not reach the calculated position	Interruption in voltage supply, check wiring, excessive play in mechanism
Communication timeout	R module does not respond within the permitted time window	Check BUS connection, M module
Heartbeat timeout	Module not connected correctly	Check BUS wiring
Lower stop too low	Cam switch did not trip	Check mechanism, secure cam
Upper stop too high	Cam switch did not trip	Check mechanism, secure cam
Differences in calibration runs	There are runtime differences between the two calibration runs	Check mechanism, replace if necessary
Motor too fast	Jump in potentiometer or mechanism	Replace potentiometer or mechanism

Table 3: Specific actuator motor faults of index card “Operating faults”

Dosing	START/ STOP key	Parameter menu Controlling: OFF	Sample water error	Pause contact	Meas. value error	Display	Dosing	Remarks
Controller						Dosing ***60 %***	Control variable	
	X					Dosing **OFF**	0 %	For all measured variables of the displayed pool
		X				Dosing **OFF**	0 %	For one measured variable
			X			Dosing **OFF** Error message	0 %	
				X		Dosing **Pause**	0 %	
					X	Dosing ***10 %***	Base load	Adjustable (see chapter 6.3)
Manual						Man. dosing ***20 %***	Set value	Adjustable (see chapter 6.3)
	X					Man. dosing **OFF**	0 %	For all measured variables of the displayed pool
		X				Man. dosing **OFF**	0 %	For one measured variable
			X			Man. dosing **OFF** Error message	0 %	
				X		Man. dosing **Pause**	0 %	
					X	Man. dosing ***20 %***	Set value	Adjustable (see chapter 6.3)

Tab. 4: Dosing characteristics at various controller modes

Left LED
(Device LED)

Colour	Flash code	Cause	Result	Remedies
Red	Illuminated	Any	Warnings or acknowledged error messages	Remedy error (see tab. 1)
Red	Flashing	Unacknowledged error messages	Alarm	Acknowledge alarm, remedy error (see there)
Green	Illuminated	No device defect present	Standard operation DULCOMARIN® II	-

Right LED
(CAN-open LED)

Colour	Flash code	Cause	Result	Remedies
Green	Illuminated	Bus status OPERATIONAL	Standard operation bus	-
Green	Flashing	Bus status PRE-OPERATIONAL	Presently no measuring value communication	Wait briefly

Ignore the flash codes for approx. 2 min. (acknowledge any alarm, if any) after connecting the DULCOMARIN® II.

If the LEDs repeatedly start to send one and the same sequence of flash codes, the bus has to supply too many devices.
In this case, loop a (further) N or P module into the bus (see part 1 of the operating instructions).

In case of all other flash codes, contact the customer service!

Tab. 5: Flash code for LEDs DULCOMARIN® II (central unit DXCa)

Left LED
(Device LED)

Colour	Flash code	Cause	Result	Remedies
Red	Illuminated	Electronics error	Sensor faulty	Return chlorine sensor or contact customer service
Red	Flashing*	Start-up phase	No measuring value communication	Wait briefly
Red	Simple Flashing**	Calibration incorrect	Measuring value incorrect	Re-calibrate
Red	Double Flashing***	0 ppm > measuring value > 10 ppm	Measuring value too high / too low	Check chlorine content of sample water
		Measuring value ≠ limit value	Violation of limit value	Clarify cause; if required, re-set values
		No correction value pH transmitted	Correction value pH missing	Check parameters and configuration. Check pH sensor
Green	Illuminated	No device defect present	Standard operation Sensor	-
-	Dark	No supply voltage	Sensor not functioning	Check cable connections

Right LED
(CAN-open LED)

Colour	Flash code	Cause	Result	Remedies
Red	Any	Bus error	No measuring value communication	Contact customer service
Green	Illuminated	Bus status OPERATIONAL	Standard operation bus	-
Green	Flashing	Bus status PRE-OPERATIONAL	Presently no measuring value communication	Wait briefly

Ignore the flash codes for approx. 2 min. (acknowledge any alarm, if any) after connecting the chlorine sensor.

If the LEDs repeatedly start to send one and the same sequence of flash codes, the bus has to supply too many devices.
In this case, loop a (further) N or P module into the bus (see part 1 of the operating instructions DULCOMARIN® II).

In case of all other flash codes, contact the customer service!

Tab. 6: Flash code for LEDs CAN chlorine sensors (DXUa)

LEDs of Power Supply Modules

The two light emitting diodes LED 1 and LED 2 (last figure in chapter 8 “Terminal Connection Diagram” of supplementary instructions for power supply modules) indicate the load of the 24 V voltage supply for the CAN-bus.

Operating status	LED 1 (H2, current)	LED 2 (H3, voltage)	Current	Remarks
Normal	OFF	Green	< 1.1 A	Everything OK
Limit load	Red	OFF	> 1.1 A	Loop in a further power supply module
Overload/short-circuit	Red, flashing	OFF	> 1.35 A	Check wiring

Table 7: Flash code LEDs, power supply module monitoring DULCOMARIN® II (N and P module)

10 Glossary

pH Value

The pH value is the measure for the concentration (activity) of hydrogen ions or more simply: a measure for the acid or alkali character of water.

In swimming pool water treatment, the pH value is of significant importance. It affects:

- **the disinfection effect: the disinfection effect of chlorine decreases with increasing pH value**
- **the flocculation: for each flocculant there is only one pH range where the agent shows optimum effect**
- **the corrosivity: the aggressiveness of water increases with decreasing pH value. Metallic materials are attacked.**
- **the skin tolerability: the acid protection layer of human skin has a pH of 5.5. Excessive pH values of the pool water attack the acid protection layer and result in skin irritations.**

A pH value which is too low promotes the formation of tri-chloramine. This results in eye irritations (reddened, burning eyes) and irritations of mucous membranes (e.g. coughing).

For the above mentioned reasons, the pH values in swimming pools in general should range between 6.5 and 7.6 (optimum: pH optimum of the used flocculant). In a private pool, where in general no flocculant is used, the pH value should range between 7 and 7.2

On the other hand, the pH measurement is affected by the following factors:

- **the chlorination: all chlorine products result in a change of pH value**
- **the water flow: carbonic acid (CO_2) exhaled from the pool water leads to an increase of the pH value. This effect can be increased by an unfavourable water flow or by air jets, water mushrooms or similar.**

For the above mentioned reasons, it is necessary to constantly measure and control the pH value.

Redox/ORP

The redox/ORP depends on the sum of the substances present in the water having a reducing and oxidising effect. It is a measure for the disinfection power in the water. The higher the concentration of the oxidising substances, the higher the value of the redox/ORP (oxidation = disinfection).

In the swimming pool, the hypochlorous acid is the determining oxidising substance. The contaminating substances have a reducing effect.

pH value and temperature have the following effect on the redox/ORP value when the water is chlorinated:

increasing pH value --> decreasing redox/ORP

increasing temperature --> increasing redox/ORP

A stable pH value is of particular importance!

There exists no clear relationship between the concentration of the disinfectant and the redox/ORP. An redox/ORP of 750 mV guarantees that the introduced microorganisms are either destroyed or inactivated within a few seconds. At an ORP of less than 600 mV, the disinfection time may range between a few minutes and several hours.

Calibration (Sensor Calibration)

All pH electrodes, too, deviate from the theoretical values. Thus, a calibration (sensor calibration of zero point and slope) must be performed at the transducer.

In case of a one-point calibration this is done with a quality buffer solution of pH 7. This means that only the zero point is calibrated.

In case of a 2-point calibration, a second value is to be selected for slope calibration: e.g. pH 4 or pH 10. The second value depends on the actual measuring range (alkaline or acid).

In swimming pool applications, it is sufficient only to calibrate the zero point (at pH 7) and to check the sensor function with a buffer solution of pH 4 or pH 10. Since the measurement is done around the zero point, a moderate slope error is negligible.

The slope of the measuring sensor changes due to ageing and contamination.

Zero Point

The zero point describes e.g. the voltage a pH sensor gives off at a pH value of 7. The zero point of the pH sensor changes due to ageing and contamination.

The zero point of pH sensors is theoretically 0 mV. In practice, a zero point between -30 mV and +30 mV is still acceptable in practice. New electrodes have a zero point deviation of max. ±30 mV.

Slope / Sensitivity

This value is e.g. stated in mV/pH at 25 °C.

Controlled Variable (Measuring Value, Actual Value)

The controlled variable is the variable to be measured or detected (e.g. pH value, ORP value).

Setpoint

The setpoint is the value to be permanently maintained stable throughout the processing by controlling.

xp Value

The xp value affects the proportional control behaviour. In case of a deviation of +1.4 pH , a xp of 1.4 pH e.g. leads to a control variable of -100 %, or a deviation of -1.4 pH leads to a control variable of +100 %. Thus, if a deviation in the magnitude of xp occurs, a control variable of 100 % results.

Disturbance

The control can process a signal of a flow measurement at the analogue input “I out 1” of the DXMaI module as disturbance for the controlled measured variables of the I module.
This disturbance influences the controller output calculated by the controller depending on this external signal.

Depending on the type of the influence on the controlled output, the following is differentiated:

- multiplicative disturbance (flow-proportional influence)
- additive disturbance (controller output-dependent influence)

IMPORTANT

During “Commissioning”, the zero point signal of the flow meter must be checked without flow (must be ≥ 0).

Multiplicative Disturbance

This type of disturbance processing is used e.g. for continuous neutralisation.
The “controlled output” first “determined” by the controller is influenced multiplicatively by a factor F.
The factor ranges between 0 ≤ F ≤ 1 (0 ≙ 0 %, 1 ≙ 100 %). The controller output may thus be 100 % max.

$$\text{Controller output to actuator [\%]} = \frac{\text{determined controller output [\%] * current disturbance [mA]}}{\text{Rated value disturbance [mA]}}$$

A “current disturbance” larger than or equal to the “Rated value disturbance” has no influence on the controller output (see examples 2 and 3 in the table).

Examples:

Designation	Unit	1.	2.	3.	4.
Determined controller output	%	50	50	50	0
Current disturbance (for 0-20 mA)	mA	5	10	20	15
Rated value disturbance	mA	10	10	10	10
Factor F	-	0.5 (50 %)	1 (100 %)	1 (100 %)	1 (100 %)
Final controller output	%	25	50	50	0

Caption:

The determined controller output is the controller output the controller would deliver without disturbance. The rated value disturbance limits the used range.

Example:

A flow meter is e.g. used which is able to detect a maximum flow of Q = 250 m^3/h. The analogue output of the flow meter delivers a signal corresponding to 4 mA = 0 m^3/h, 20 mA = 250 m^3/h. The flow, which is achieved in the application as a maximum, however, is only 125 m^3/h. If the standard signal output signal of the flow meter is now not adjusted to the 4…20 mA range of the D1C (is possible with most flow meters), the standard signal at 125 m^3/h is only 12 mA. This value is then to be entered in the menu “Set disturbance?” in “Rated value disturbance”.

The disturbance is the present analogue current which is supplied by the flow meter. The final controller output is signalled to the actuator.

CAUTION

The multiplicative disturbance is not to be used for the permanent deactivation of the controller output! Please use the pause function for deactivation.

Additive Disturbance

The additive disturbance feedforward is suitable for metering tasks where the metering amount primarily depends on the disturbance (e.g. flow) and only requires little correction. This type of disturbance processing is used e.g. for chlorination of water with almost constant chlorine consumption.

A base load metering depending on the disturbance is added to or subtracted from the “controller output” first “determined” by the controller. The controller output may be 100% max.

$$\text{Controller output to actuator [\%]} = \frac{\text{determined controller output [\%]} + \text{max. additive controller output [\%]} * \text{current disturbance [mA]}}{\text{Rated value disturbance [mA]}}$$

Examples:

Designation	Unit	1.	2.	3.	4.	5.	6.
Determined controller output	%	40	90	50	50	50	0
Current disturbance (for 0-20 mA)	mA	5	5	2	10	20	5
Rated value disturbance	mA	10	10	10	10	0	10
Max. add. controller output	%	100	-100	200	200	200	100
Final controller output	%	90	40	90	100	50	50

Caption:

The maximum additive disturbance specifies which disturbance is to be added at a maximum (given current disturbance = rated value disturbance).
For further captions, see “Multiplicative disturbance”.

CAUTION

If no current disturbance exists (flow = 0) but a determined C of the PID controller, then the final controller output equals the determined controller output of the PID controller.

If a current disturbance exists (flow > 0) and the determined controller output of the PID controller is "0", then the final controller output equals the 2nd term of the above equation:

$$\frac{\text{max. additive controller output} * \text{current disturbance}}{\text{Rated value controller output}}$$

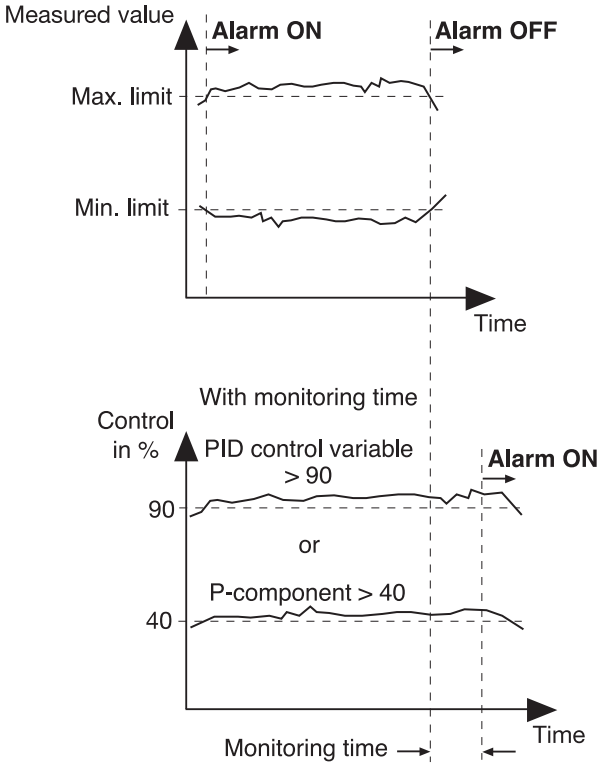
Control Variable

The control variable is the output (e.g. frequency, mA signal) transmitted e.g. by the controller to the actuator of a metering pump to reach the setpoint again (at control variable 100 %, the pump functions at full capacity).

Limit Values

"min. limit" means that the limit value criterion is violated in case of undershoot.

"max. limit" means that the limit value criterion is violated in case of overshoot.



Monitoring Time

CAUTION

Do not confuse the "monitoring time control" function with the "monitoring time measured value" of the DULCOMETER® D1C!

The "monitoring time control" function provides a protection facility to avoid overmetering. After the monitoring time has elapsed, the function switches the corresponding control circuit to 0 % metering and triggers an error message when:

- Pure P control: the P component of the control variable is greater than 40 %
- PID control: the PID control variable Y is greater than 90 %

Press the Start/Stop button twice to restart the corresponding control circuit and to remove the error message for the control circuit.

Determining the monitoring time

Precondition:

The system has reached the target values for chlorine concentration (0.45 mg/l) as well as the pH value.

- ▶ Stop the control system with the Start/Stop button.
- ▶ Wait until the chlorine concentration has dropped to 0.1 mg/l.
- ▶ Restart the control system with the Start/Stop button.
- ▶ Stop the time until the target value is reached again.
- ▶ Enter this time multiplied by 1.5 as the monitoring time for the chlorine concentration.
- ▶ Provided the pump variables were selected correctly, this monitoring time can also be entered for the pH value.

Delay (Error)

After a limit value infringement, the limit value relay of the G module will not switch before the delay set here has elapsed. This delay ensures that a short-term limit value infringement will not trigger an error message.

Delay (Contact)

As soon as a contact is connected externally to a contact input K of the M module, DULCOMARIN® II sets the outputs to “0” for as long as this contact is connected and for a subsequent delay period (contact) (provided it is set).
DULCOMARIN® II suppresses the fault processing procedure for as long as the contact is closed. As soon as the contact is opened, DULCOMARIN® II assumes the troubleshooting procedure – once the delay (contact) has elapsed (if set).
After the contact opens, the outputs remain set to “0” for the duration of the delay (contact).
The delay (contact) must be set such that, for example, sample water with the current process concentration flows up to the sensor within this time.
The delay (contact) for “Pause control” has a higher priority than the delay (contact) for “Sample water”.
The outputs 0/4-20 mA (standard signal outputs) for measured value or correction value are not affected by this function.

Delay (Alarm Limits)

Following an infringement of the alarm threshold, DULCOMARIN® II will not trigger an error message before the delay set here has elapsed. This function is intended to ensure a short-term infringement of the alarm threshold will not trigger an error message.

Controlling

The controller DULCOMARIN® II can be used either as P, PI or PID controller. This depends on the setting of the control parameters.

The control variable is calculated once per second.

This controller cannot be used in control circuits which require a rapid compensation of control deviations (smaller than approx. 30 seconds).

The control function (output of a control variable) can be deactivated via the control input Pause.

The calculation of the control variable starts again with expiry of the pause.

Abbreviations of control measures:

x: control variable, actual value (e.g. pH value)
K_{PR}: proportional coefficient
x_p: 100 %/K_{PR} (inverse proportional coefficient)
X_{max}: maximum actual value of the controller (e.g. pH 14)
y: control variable (e.g. pulse frequency to pump)
Y_h: control range (e.g. 180 pulses/min)
y_p: control variable of the P controller [%]
w: Reference variable or setpoint (e.g. pH 7.2)
e: control deviation, e = w-x
x_w: control deviation, x_w = x-w
T_i: reset time of the I controller [s]
T_d: rate time of the D controller [s]

Controller equations:

Standard

A measuring value is compared with a setpoint. In case of a controller deviation (difference of setpoint minus actual value), a control variable is calculated which counteracts the controller deviation.

The following controller types exist:

P controller: Is used for controlled systems which have an integrating effect (e.g. batch neutralisation).

PI controller: Can be used for non-integrating controlled systems (e.g. continuous neutralisation).

PID controller:

Is used for controlled systems where peaks occur which have to be compensated.

With dead zone

In case of a dead zone control (neutral zone controlling), two setpoints must be specified. If the measuring value is within the dead zone, no control variable is issued.

Setpoint 2 must be larger than setpoint 1!

Manual

IMPORTANT

The controller does not exist this operating mode automatically.
The operating mode 'Manual' may only be used for commissioning and for test purposes.

There is no controlling.
A control variable is specified manually:
Control variable: 0...+100 % (command output raising active)
Control variable: -100...0 % (command output lowering active)

This function serves the examination of actuators.

Additive base load
A base load is added to the present control variable.
By applying an additive base load, e.g. a constant gradient can be compensated for.

Y_{Tot} = Yp + 15 % (additive base load = 15 %)

Example 1 (one-sided control):
Y_{Tot} = 85 % + 15 %
Y_{Tot} = 100 %

Example 2 (two-sided control):
Y_{Tot} = -75 % + 15 %
Y_{Tot} = -60 %

Eco!Mode

In Eco!Mode, a second parameter set for controlling can be switched to active temporarily in order to save energy. This can e.g. be done together with reducing the circulation rate. As soon as a contact at the contact input K3 of the M module switches, the Eco!Mode becomes active or inactive. The Eco!Mode is available for all measured variables of the M module, in controlled:

- pH
- ORP
- Chlorine, free
- Chlorine, combined
- Temperature
- Flocculants

As soon as the second parameter set is activated, the central menu option shows a green identifier ‘ECO’.

Pause

Upon closing of a pause contact, the DULCOMARIN® II sets the command outputs to “0” as long as the pause contact remains closed. The DXC calculates the P ratio in the background while the pause contact remains closed.

Access Code (Password)

The access to the controller can be extended level by level by adjusting the access code correspondingly. Upon delivery, the controller DULCOMARIN® II has the access codes according to the table in chapter 3.2

Technical changes reserved.

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