Preliminary

Operating Instructions

DULCOMARIN® II Pool Controller DXCa

Part 2: Operation

DXCa_Titel

These operating instructions apply only in conjunction with the "Operating Instructions DULCOMARIN® II Pool Controller, Part 1: Mounting and Installation"!

Please carefully read these operating instructions before use! · Do not discard!
Damages due to improper operation will invalidate the warranty!

Part No. 986902 **ProMinent Dosiertechnik GmbH · 69123 Heidelberg · Germany** BA DC 027 05/05 GB

Imprint:
Operating instructions
DULCOMARIN® II Pool Controller
Part 2: Operation

ProMinent Dosiertechnik GmbH
Im Schuhmachergewann 5-11
69123 Heidelberg
Germany

Phone: +49 6221 842-0
Fax: +49 6221 842-419

info@prominent.com
www.prominent.com

Printed in Germany

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 Safety chapter

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

IMPORTANT

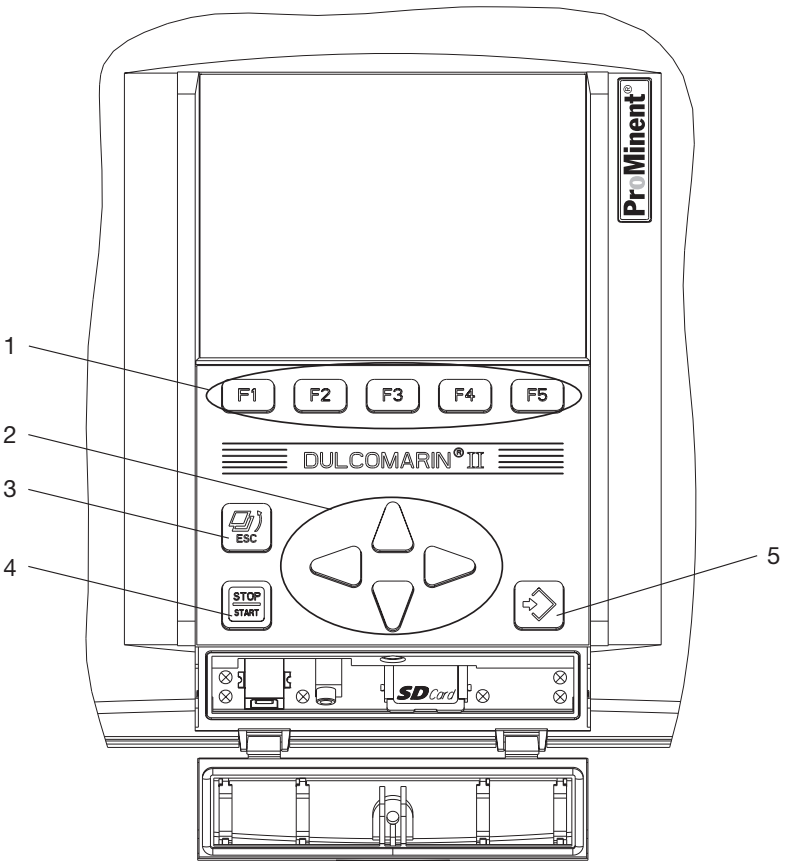
- ***If a module has been assigned to a pool, it cannot be simply exchanged with another module! CAN sensors for chlorine are also modules!***
  The central unit is not able to detect for which pool a module is meant; furthermore, problems regarding the node IDs of the modules are created.
  If a module 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. 7 "Bus configuration").
  If a new module is to be looped in a CAN bus train, it has to be expressly assigned to a pool (see chap. 7 "Bus configuration").!
- ***Never alter the sub-menus 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 criteria for chlorine was violated, the left LED at the chlorine sensor is blinking in red!

2 Controls

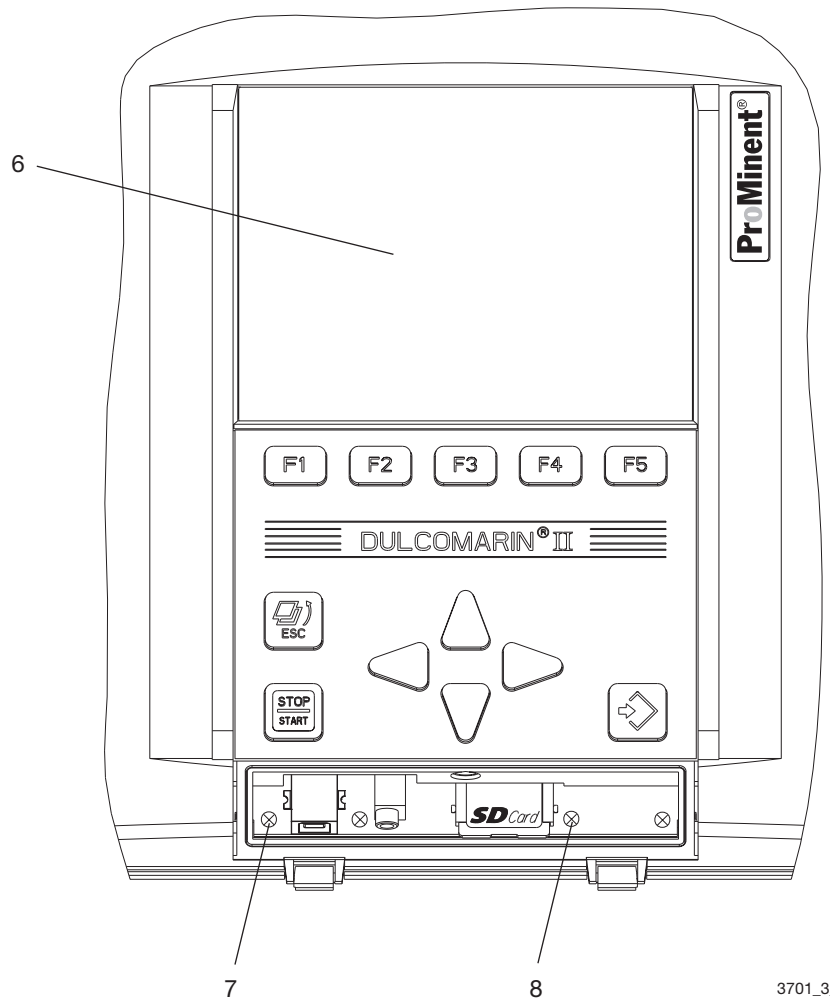
Fig. 1: The keys



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

3701_3_1

Fig. 2:
The displays



6 LCD screen
7 NetDevice LED
8 CAN 1 LED

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

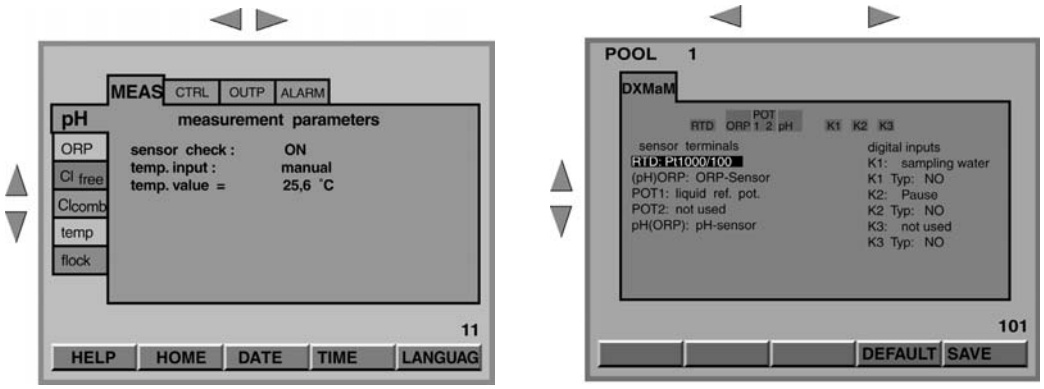
To return from any menu option of the operating menu to the permanent display, press the ESC key repeatedly until the permanent display appears.

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:

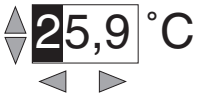
- toggle between the index cards of a menu option in a certain menu option.
- to toggle between the selections of an index card.

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



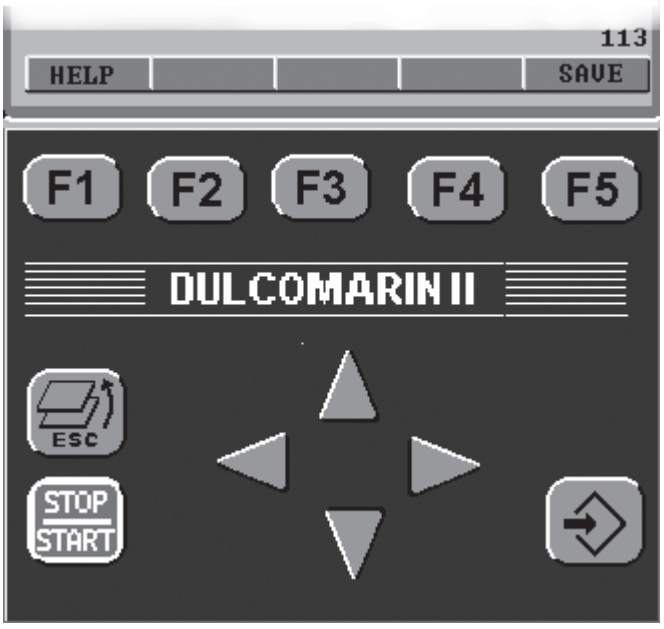
The variably assigned **function keys F1 through F5** are used to select the menus or functions displayed above in the display as keys (e.g. menus (CONFIG(uration), PASS(word), HELP or the function SAVE).

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 menu option show “Dosing ON” or “Dosing OFF”.

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 (fitter)
Password (default)	0000	1111	2222
View	X	X	X
Calibrate		X	X
Parameter settings, configuration, and calibration of chlorine sensors			X

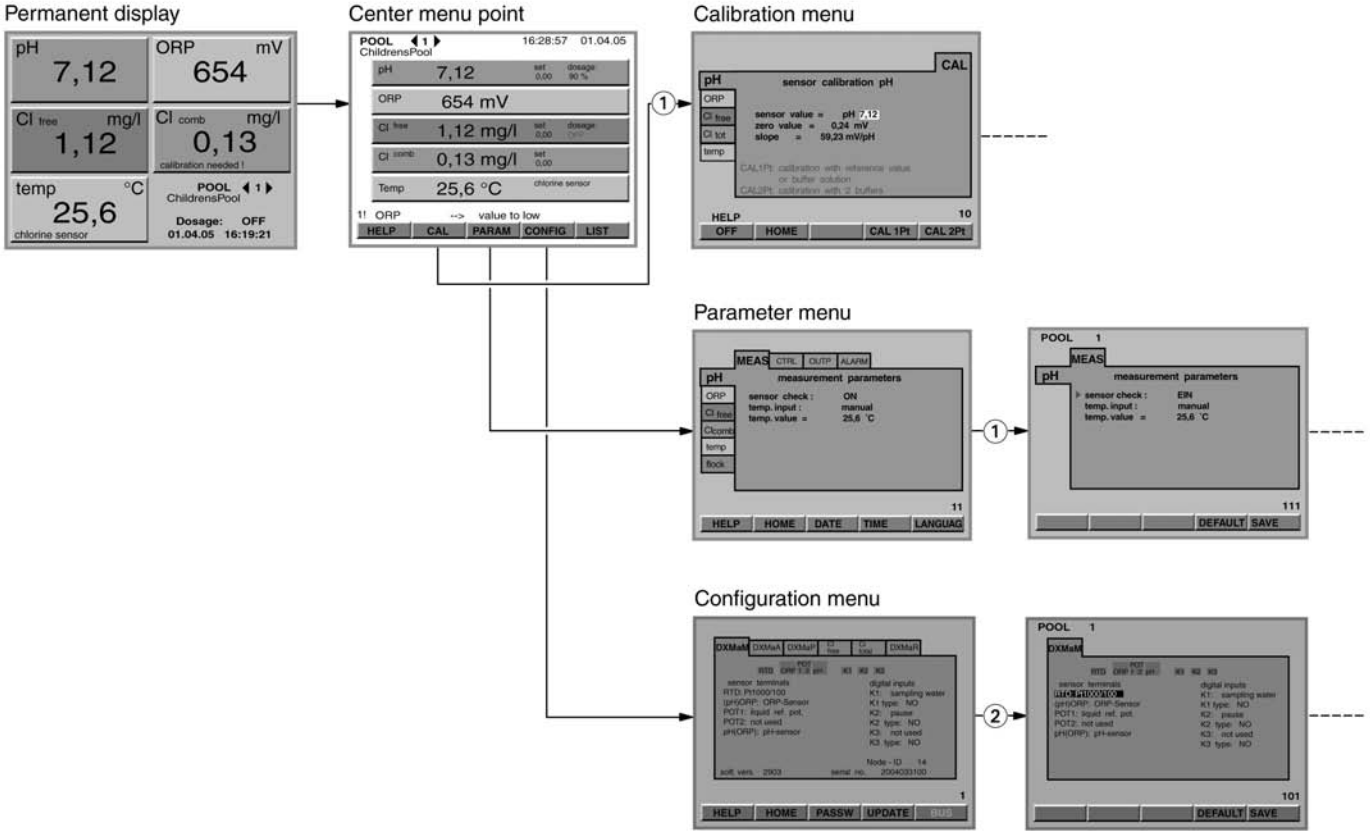
IMPORTANT

- ***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".***

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

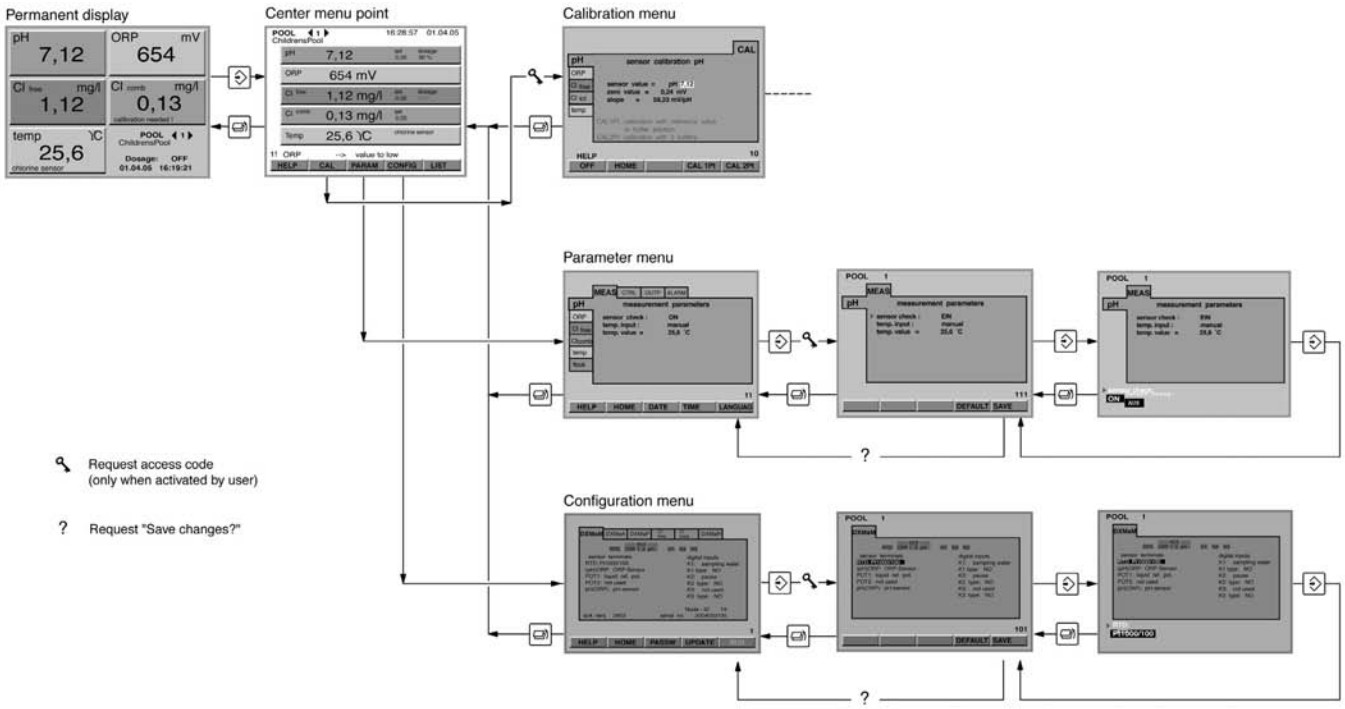


Language

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

3 Layout of the operating menu

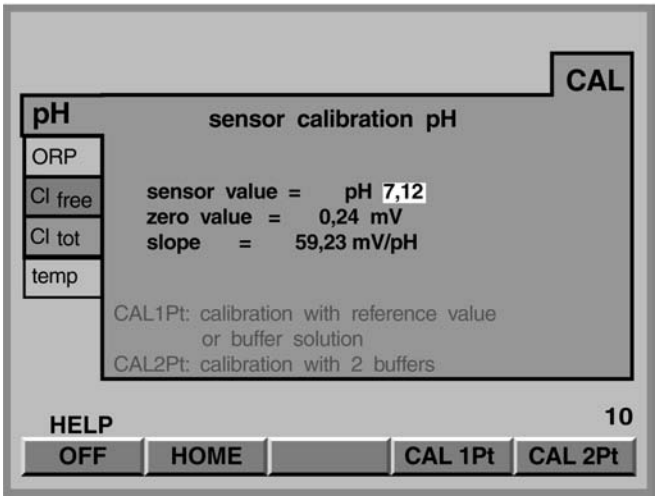
Fig. 7:
General layout
of the operating menu



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

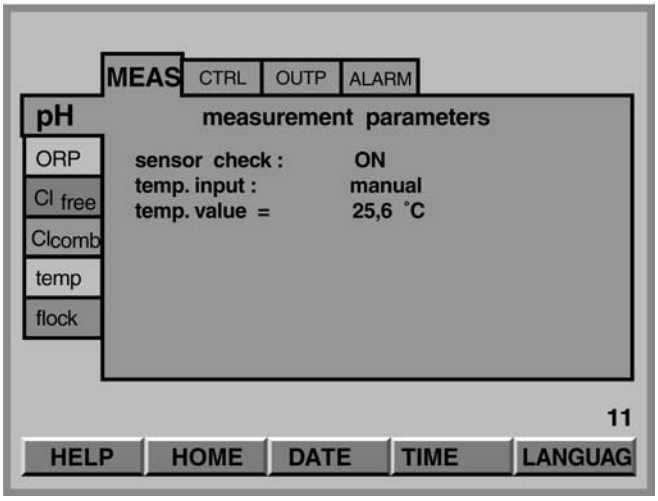
- **Calibration menu**
- **Parameter setting menu**
- **Configuration menu**

Fig. 8:
First menu option
of the calibration menu



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

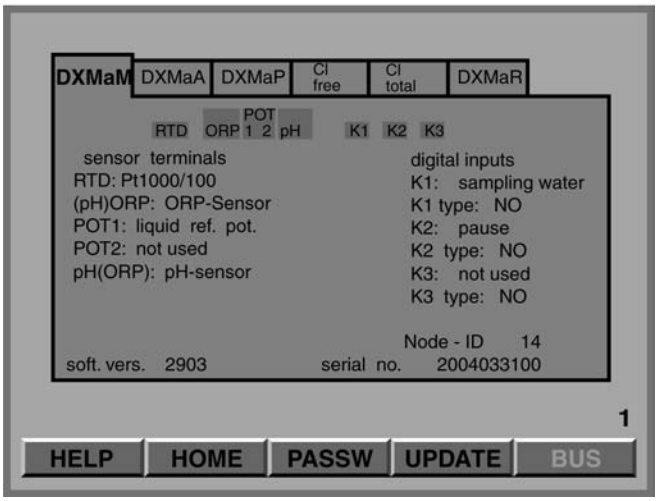
Fig. 9:
First menu option of the parameter setting menu



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

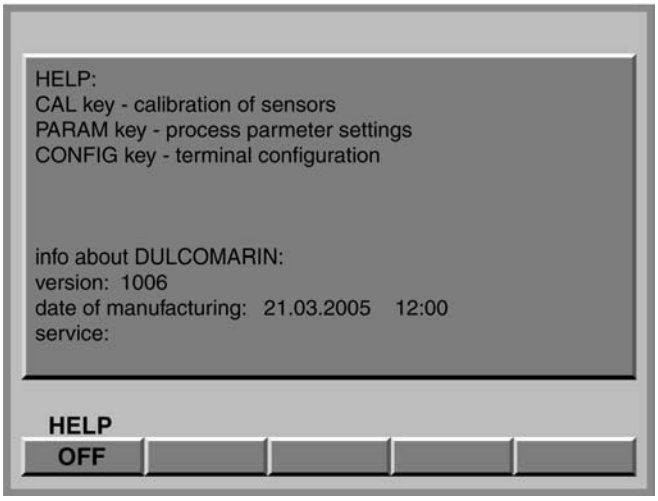
- the vertical tabs are the measured variables (pH, ORP, ...)
- the horizontal tabs contain the groups of parameters (e.g. measurement, controlling, mA outputs, alarm)

Fig. 10:
First menu option of the configuration menu



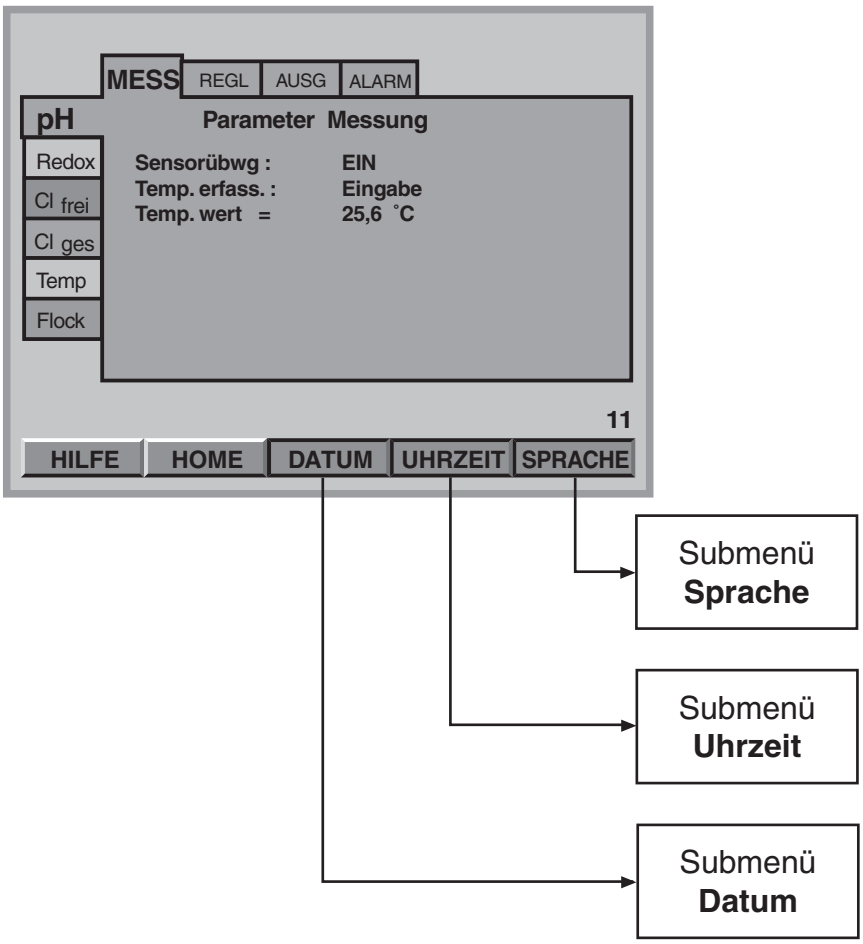
The layout of the **Configuration menu** represents the existing hardware modules. For each module, an index card is created which also shows the connections.

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 main 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).

Fig. 12:
Access to the sub-menus DATE, TIME and LANGUAGE via the first menu option of the parameter setting menu



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

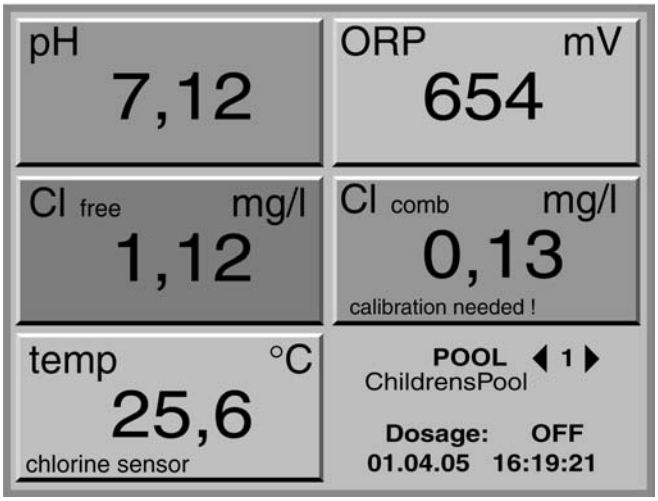
The sub-menus **PASSW** and **BUS** can be accessed through the configuration menu by pressing the function keys (for BUS see chap. 7 “Bus configuration”).

IMPORTANT

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

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 central menu option)).

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.

Main menu option

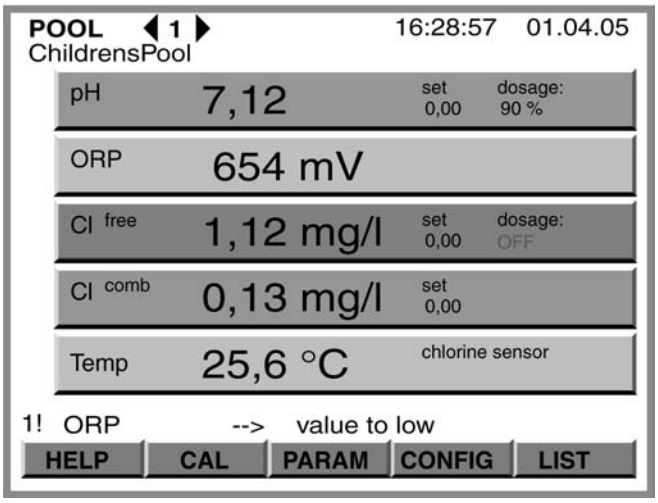


Fig. 14: The main menu option for all measured measured variables

The main menu option shows the same data as the permanent display.

In addition, it may show the setpoints and the switching point for combined chlorine.

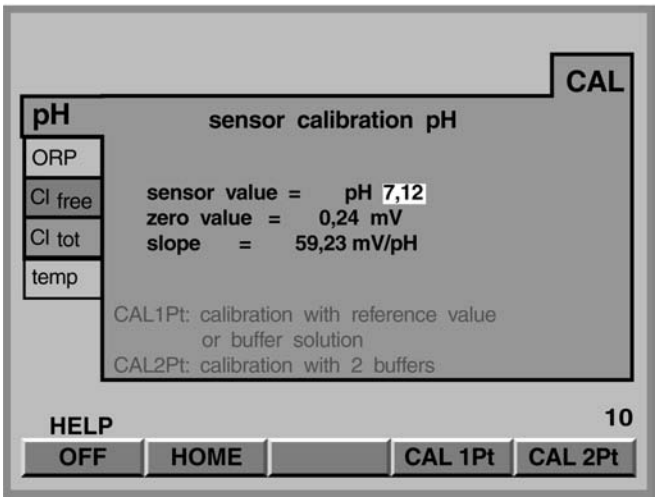
Unlike the permanent display, the central menu option for the individual measured variables of a pool shows whether dosing is set to “off” or “on” (see chap. 5.3. “Controlling”). It then shows the value of the controller output. If dosing was set to “off”, it cannot be activated via the START/STOP key.
Only the Dulco-Net version shows the pool number.

The main 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.

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

- Calibration
- Parameter settings
- Configuration

4 Calibration



During the calibration, the DULCOMARIN® II sets the command outputs to “0”. Exception: if a base load or manual controller output was set, these are maintained during the calibration. The standard signal outputs mA (see chapter 6.2 “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.

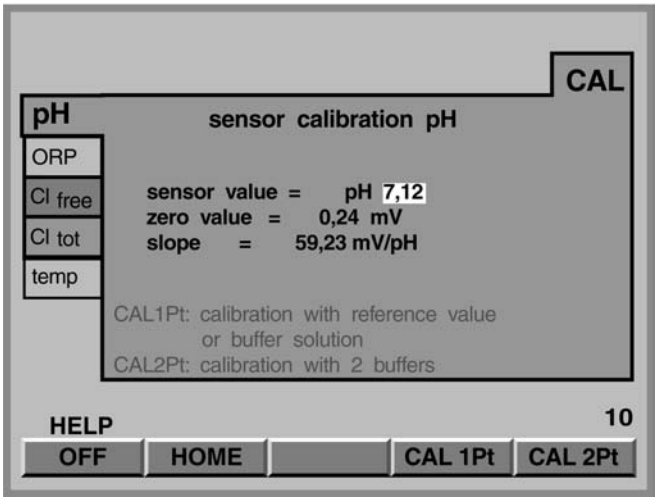
Start of calibration (for all measured variables):

- ▶ Close the sample water (acknowledge possible alarm pressing the ENTER key).
- ▶ Press F2 (CAL) in the main 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).

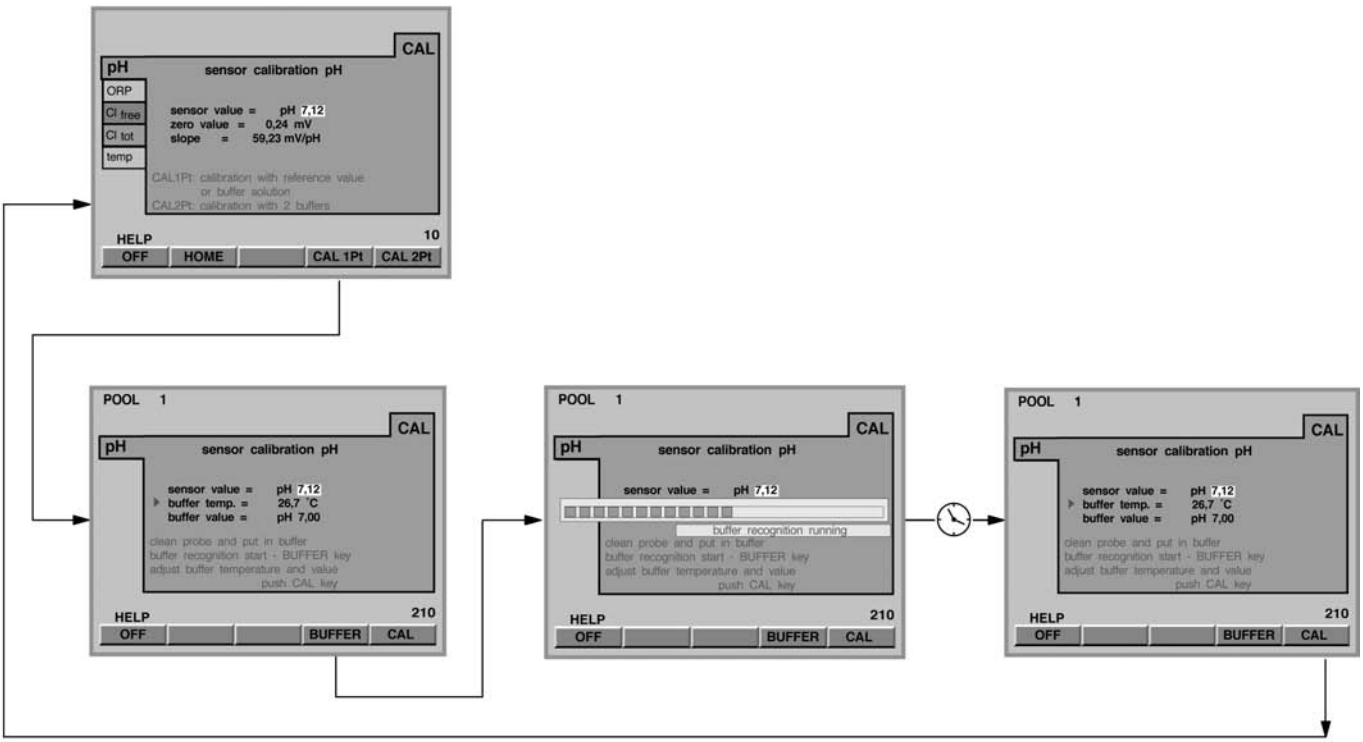
4.1 Measured variable pH



NOTE

Reject used quality buffers!

1-point calibration

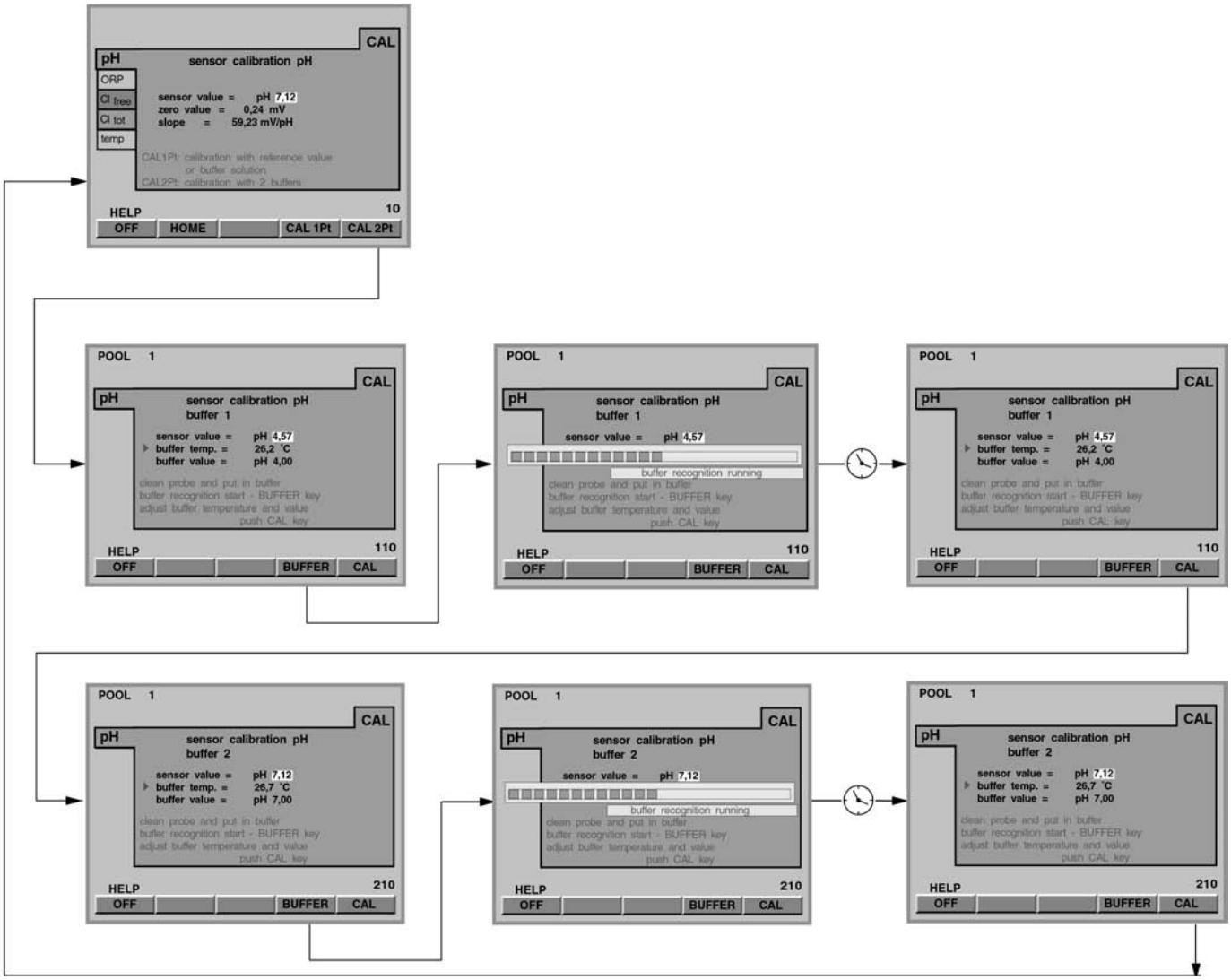


The DULCOMARIN® II calibrates:

- 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.

- ▶ 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 main 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

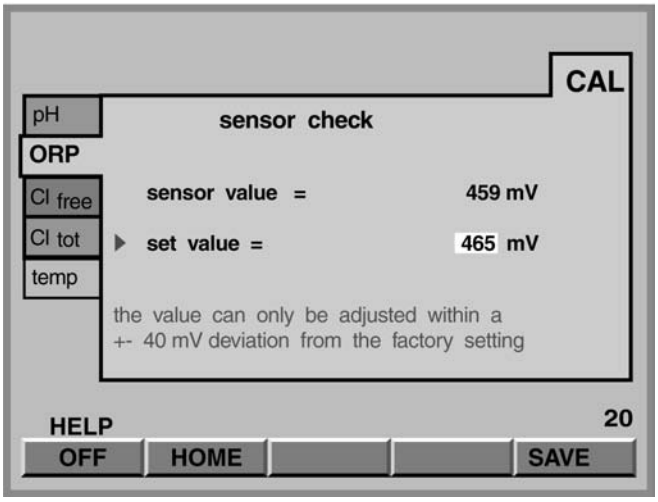
2-point calibration



- ▶ 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 main 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

4.2 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” “Sensor setting” (arrow keys) and press 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 main menu option

▶ Disconnect the coaxial cable from the redox/ORP sensor

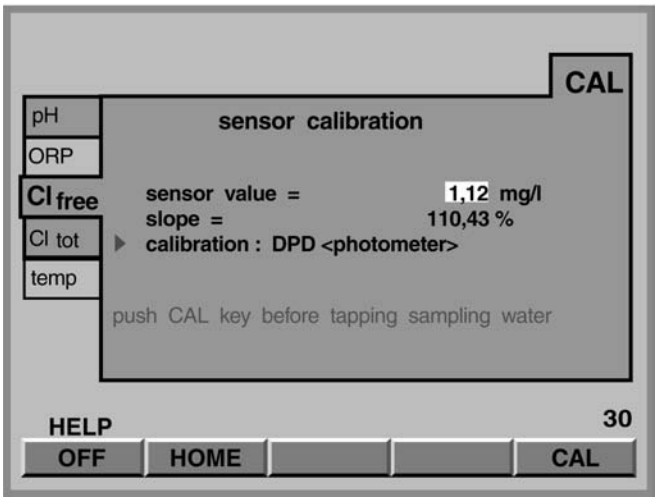
▶ Install the redox/ORP sensor again at the in-line probe (tighten fingertight but nevertheless watertight)

▶ 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

4.3 Measured value free chlorine



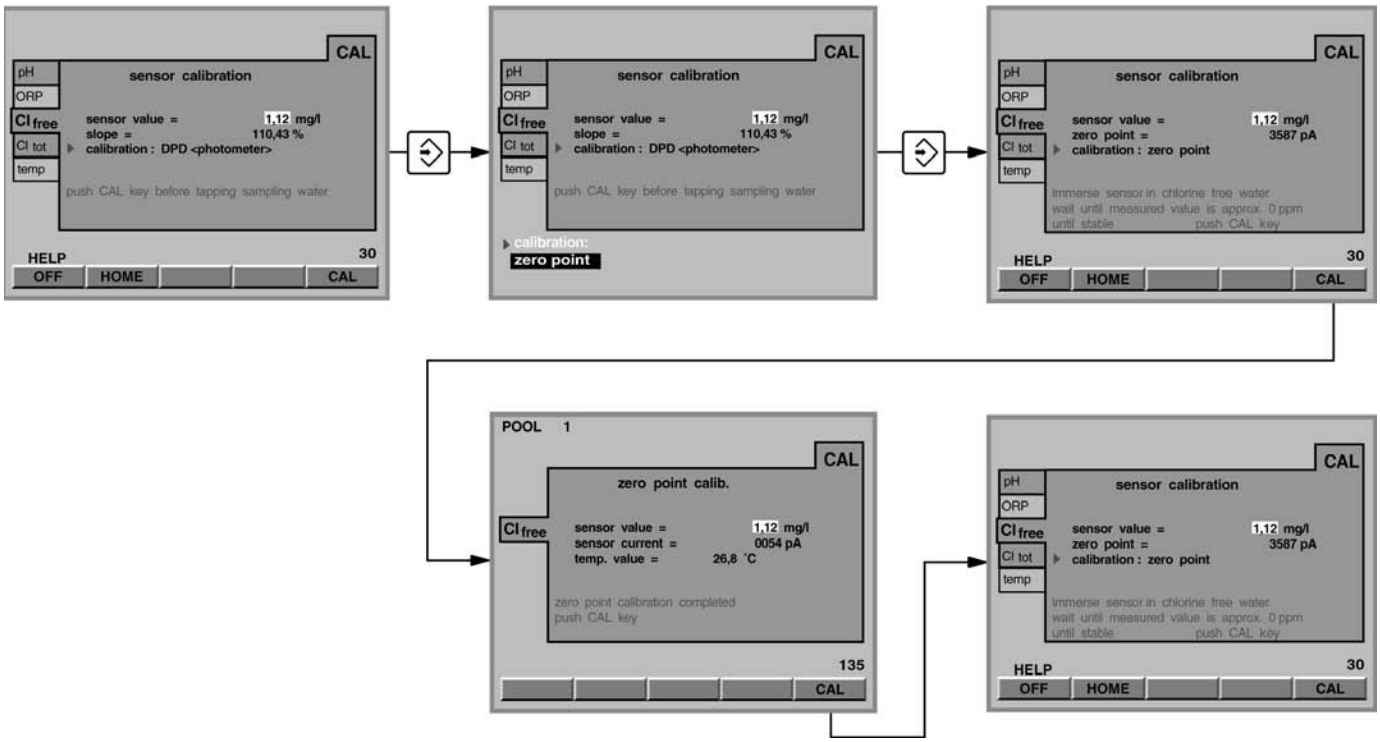
IMPORTANT

- ***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
- 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

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.

▶ Remove the chlorine sensor (sample water closed?)
Do not disconnect the CAN cable from the chlorine sensor CLE!

▶ Dip the chlorine 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 with the chlorine sensor until the “measuring value sensor” has been stable for 5 min. and remains close to zero.

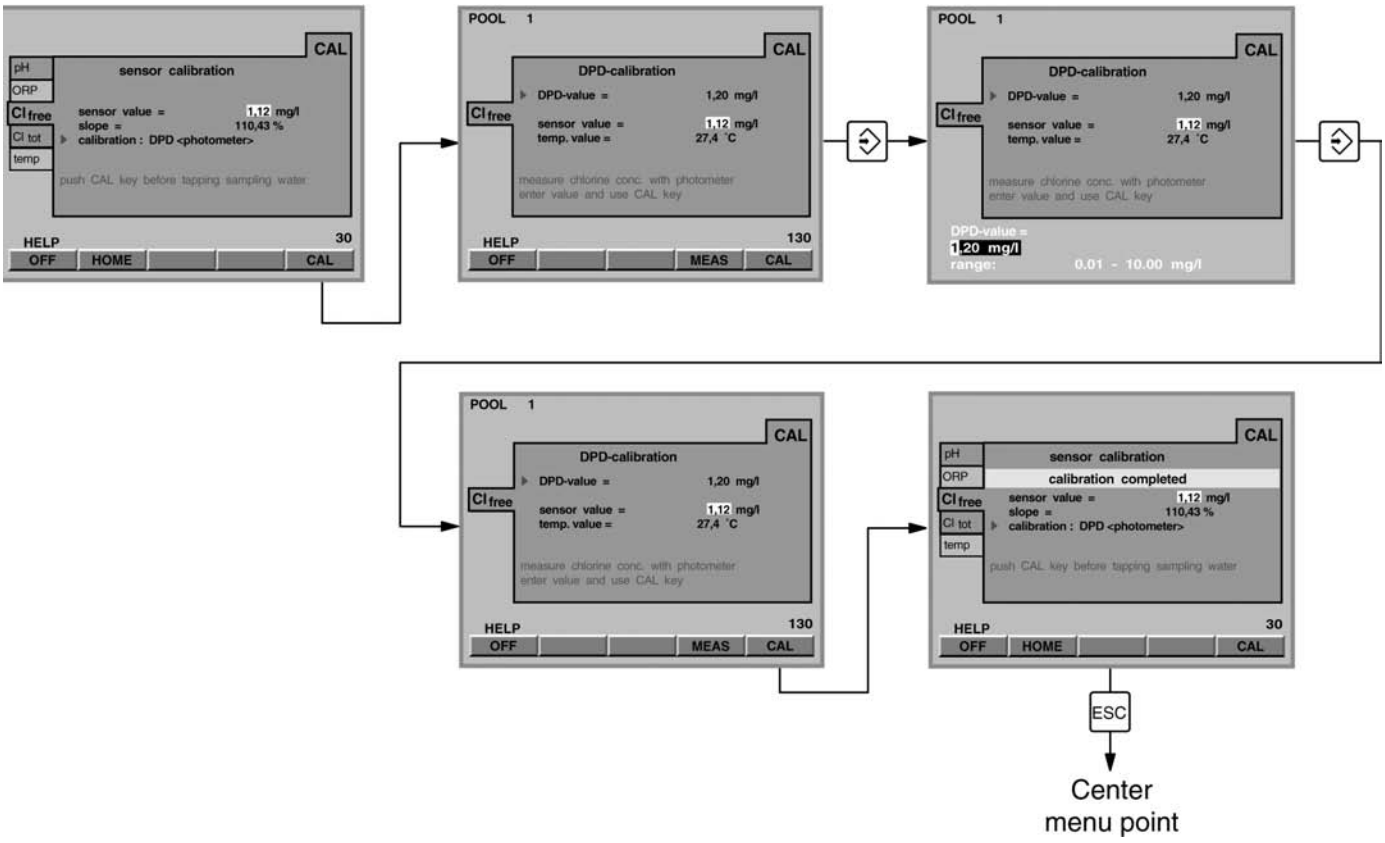
▶ Then press F5 (CAL).

▶ 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

Continue with “Calibrate slope”:

b) Calibrate slope



IMPORTANT

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

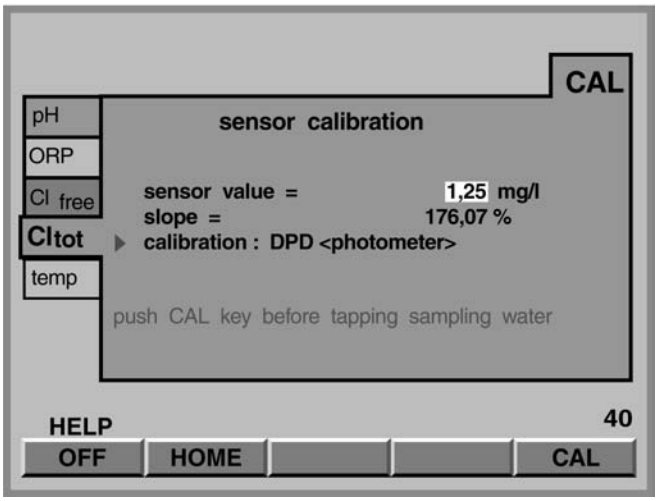
- ▶ Select the index card “Cl free” “Sensor calibration” (arrow keys) and press the ENTER key
- ▶ Select “DPD (Photometer)” (arrow keys) and press the ENTER key
- ▶ After the “sensor value” has stabilised, press F5 (CAL)
- ▶ Directly after, take a sample water sample at the in-line probe
- ▶ Directly 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 main menu option
- ▶ Open again the shut-off valves for the sample water - first outlet, then inlet

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.

4.4 Measured value total chlorine



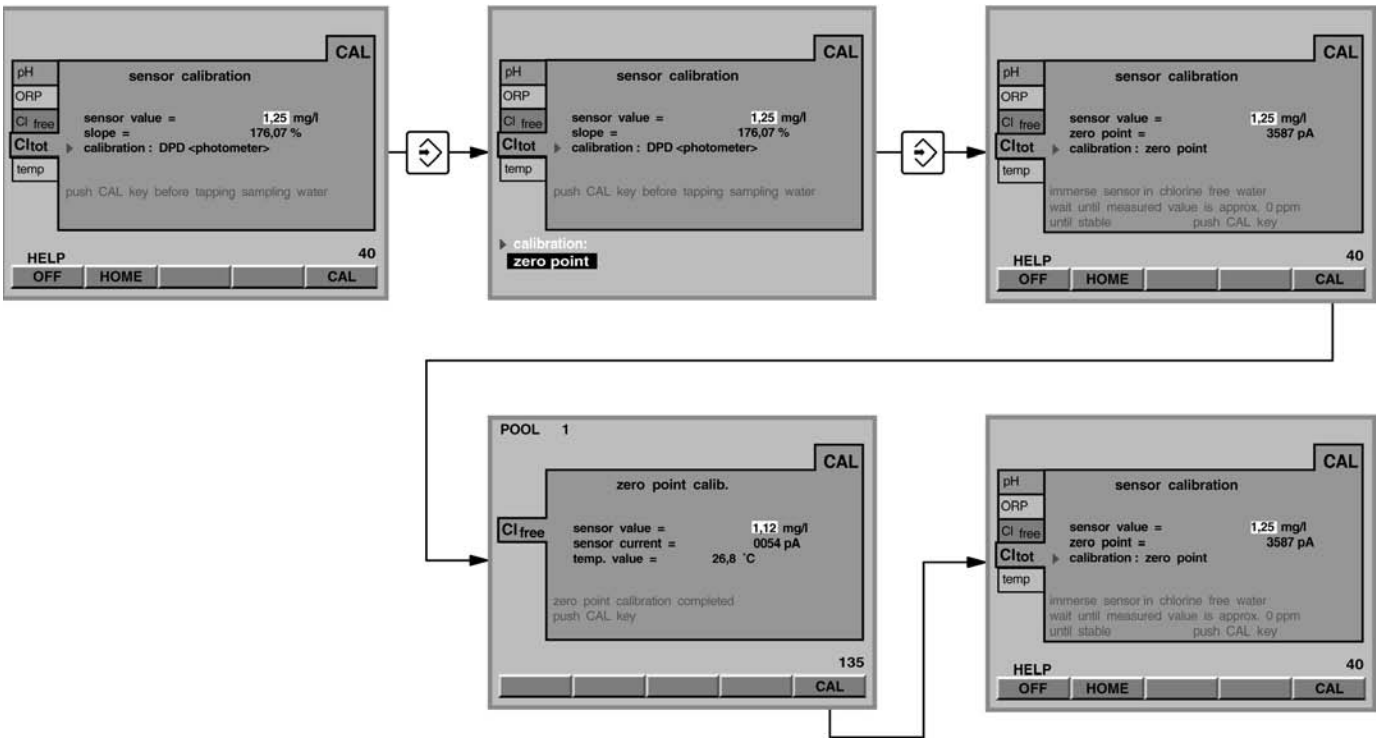
IMPORTANT

- ***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 (see chap. 15 “Techn. Specifications”)
- 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

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

▶ Remove the sensor (sample water closed?)
Do not remove the CAN cable from the sensor CTE

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

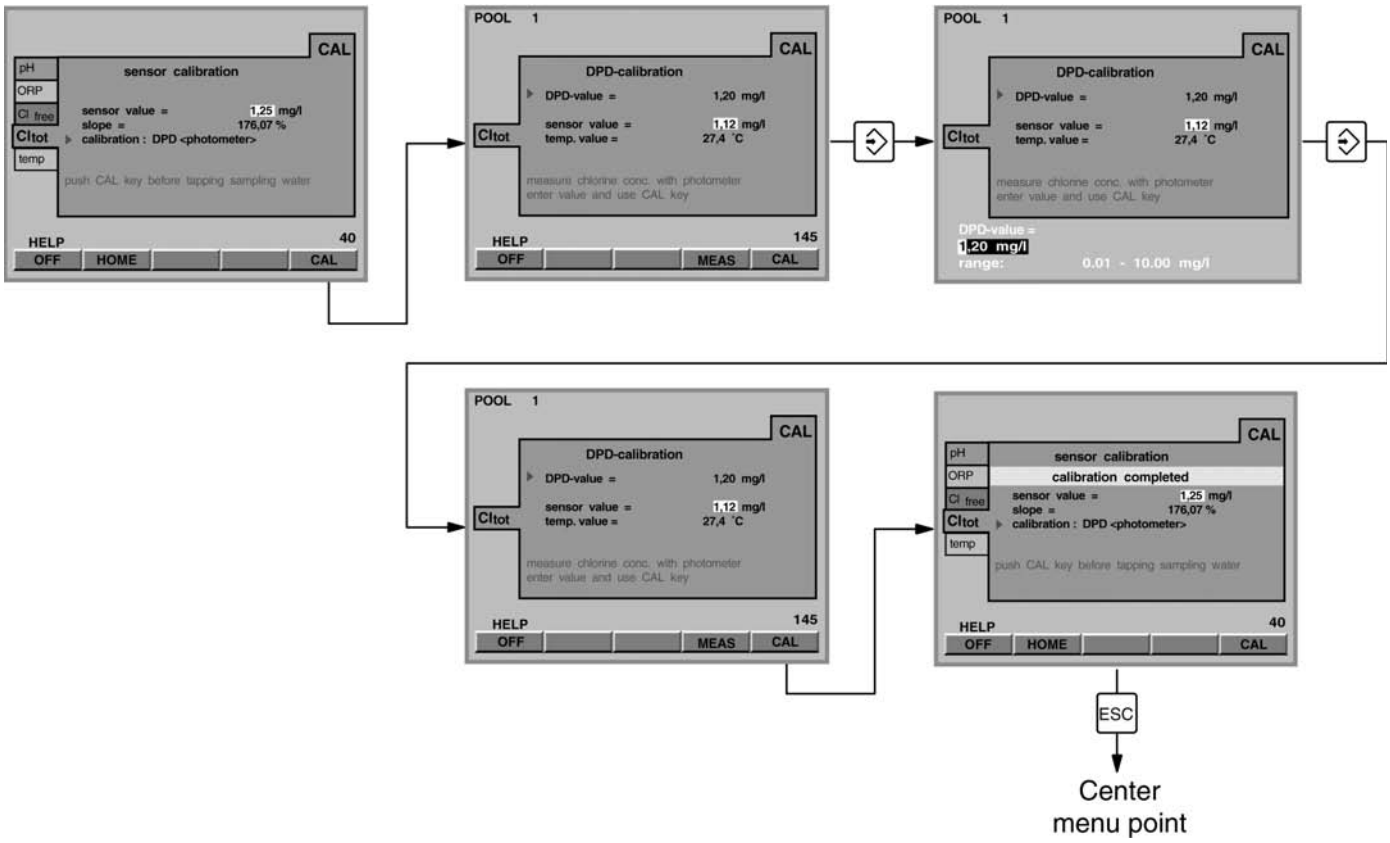
▶ Then press F5 (CAL)

▶ 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

Continue with “Calibrate slope”:

b) Calibrate slope



IMPORTANT

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

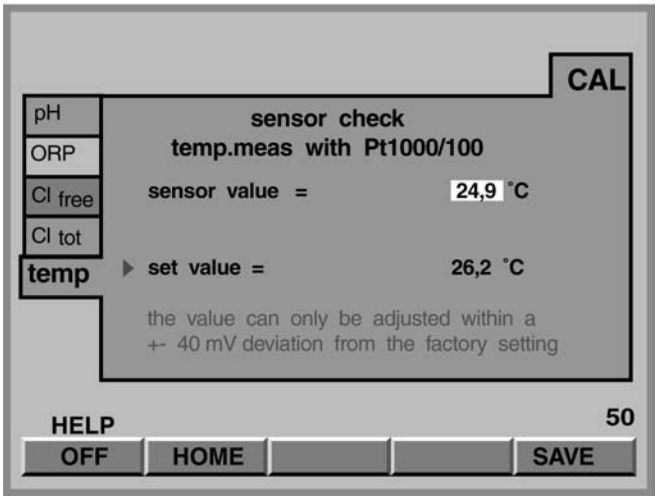
- ▶ Select the index card “Cl comb.” “Sensor calibration” (arrow keys) and press the ENTER key
- ▶ Select “DPD (Photometer)” (arrow keys) and press the ENTER key
- ▶ After the “sensor value” has stabilised, press F5 (CAL)
- ▶ Directly after, take a sample water sample at the in-line probe
- ▶ Directly 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 main menu option
- ▶ Open again the shut-off valves for the sample water - first outlet, then inlet

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.

4.5 Measured variable temperature



NOTE

- ***The temperature sensors of the chlorine sensors require no calibration (this index card is not displayed for chlorine sensors).***
- ***An external temperature sensor should only be calibrated if:***
  - ***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

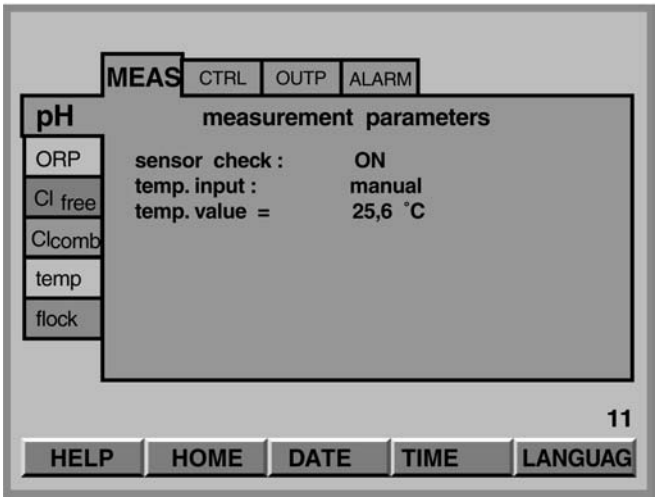
▶ After the “measured value” has stabilised, press the ENTER key

▶ 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 main menu option

5 Parameter settings



This chapter describes the menu options for the parameter groups:

- **Measurement**
- **Controlling**
- **mA output**
- **Alarm**

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

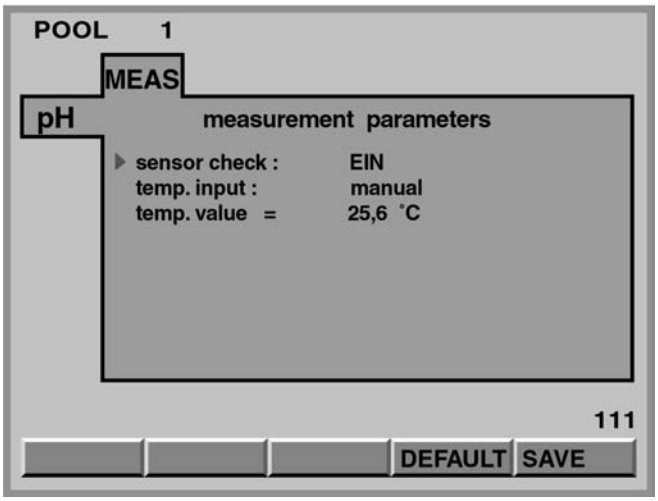
5.1 All parameters

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 main menu option
- The default values can be called in the second menu option for the current index file by pressing F4 (DEFAULT)

5.2 Measurement

5.2.1 pH



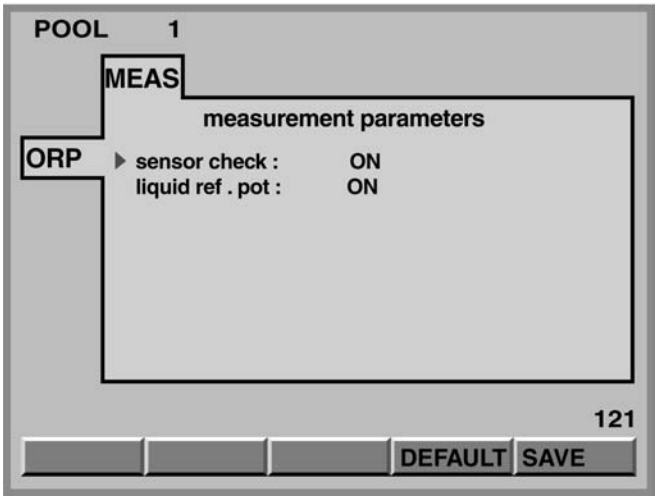
Adjustable variables	Increments	Remarks
probe check	off	
	on	
Liquid pot.	off	only displayed with equipotential bonding pin
	on	equipotential bonding pin must be connected
Temp. input.	Pt1000 (100)	Chlorine sensor or separate temperature sensor
	input	
Temp. value	0.0 ... 99.9 °C	with “Temp. input.” “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 MOhm 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 MOhm and if the measuring signal varies heavily, the error message “pH input faulty!” is displayed.

5.2.2 Redox/ORP



Adjustable variables	Increments	Remarks
Sensor monit	off	
	on	
Liquid pot.	off	only displayed with equipotential bonding pin
	on	equipotential bonding pin must be connected

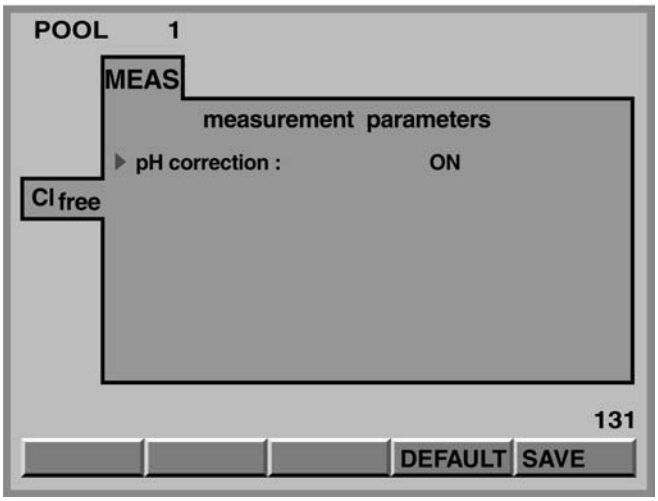
Sensor monitoring

Select “on” or “off” in “probe 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 MOhm 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 MOhm and if the measuring signal varies heavily, the error message “ORP input faulty!” is displayed.

5.2.3 Chlorine, free

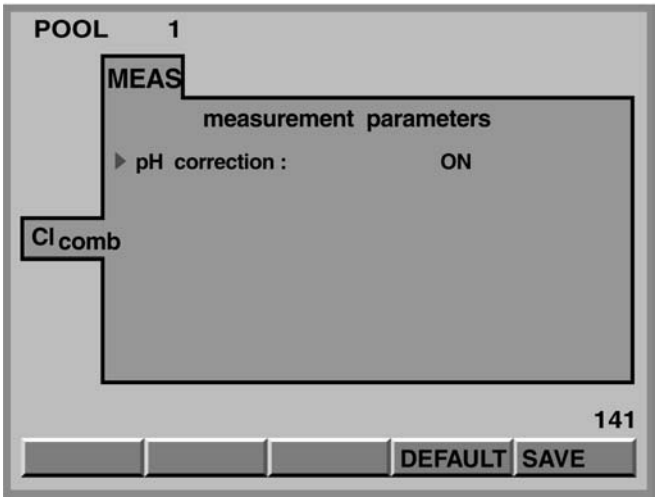


Adjustable variables	Increments	Remarks
pH correction	on	The controller can display a pH-corrected value for free chlorine
	off	

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!

5.2.4 Chlorine, combined



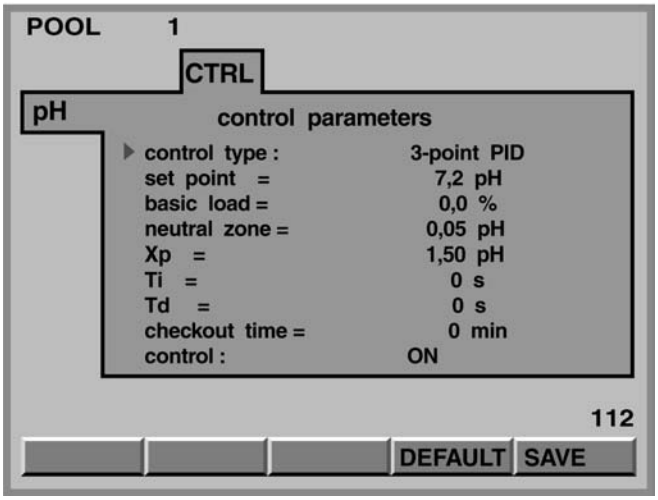
Adjustable variables	Increments	Remarks
pH correction	on	The controller can display a pH-corrected value for combined chlorine
	off	

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)!***

5.3 Controlling

5.3.1 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	6.00 ... 8.00 pH	
Base load	0.0 ... 100.0 %	
Neutral zone	0.00 ... 1.00 pH	see fig. 15
xp *	0.01 ... 70.00 pH	
Ti	0 ... 9999 s	with “Control type” “PID”
Td	0 ... 2500 s	with “Control type” “PID”
Control direction	Act. pH lowering	acid
	Act. pH raising	alkali
Control time	0 ... 999 s	not with “Control type” “manual”
Man. dosing	-100.0 ... 100.0 %	with “Control type” “manual”
Control	on	Control loop can be deactivated independent of Start/stop key. Start/stop key stops all control loops.
	off	

* Definition xp see Glossary

IMPORTANT

Check always whether the prerequisites for the settings in “Controlling” 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

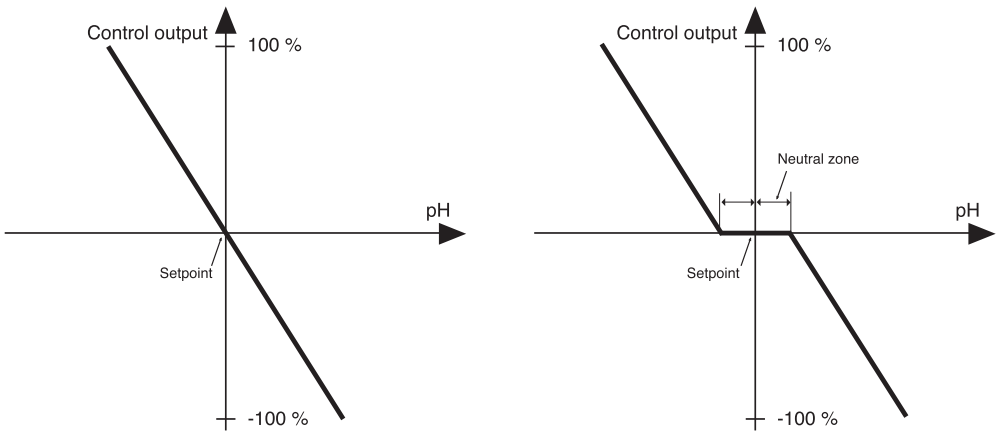
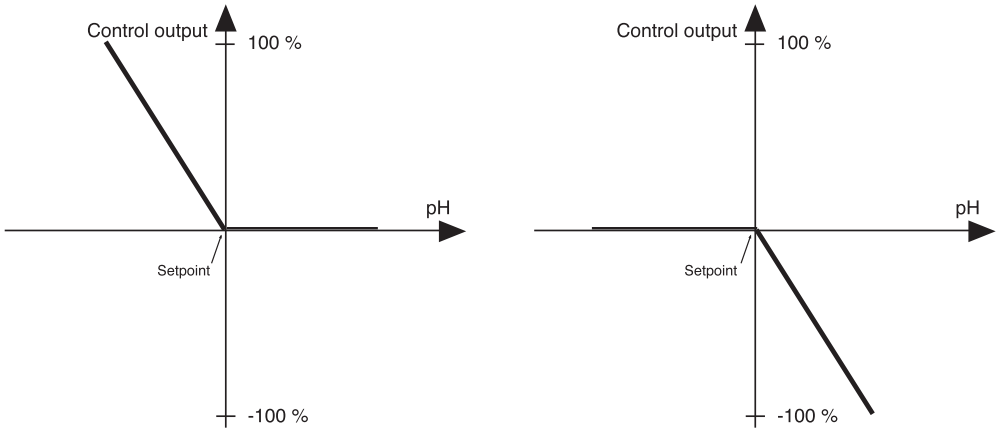
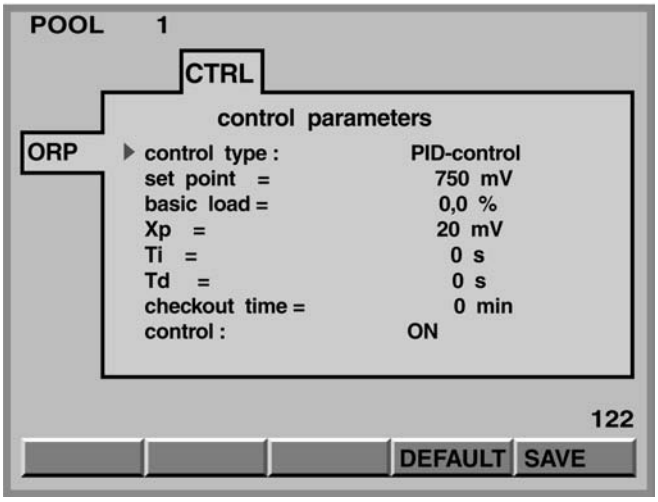


Fig. 16: Figure of control type PID 1 point, direction acid and direction alcaline



5.3.2 Redox/ORP

(Not, if chlorine is controlled)



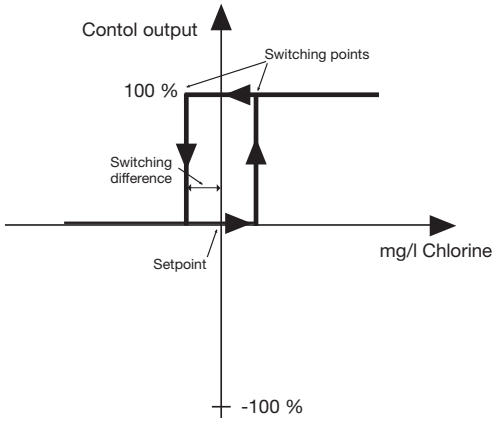
Adjustable variables	Increments	Remarks
Control type	PID controller	
	P controller	
	2-pt contact	see fig. 17
	manual	
Setpoint	700 ... 850 mV	
Base load	0.0 ... 100.0 %	
xp *	1 ... 1000 mV	
Ti	0 ... 9999 s	with “Control type” “PID”
Td	0 ... 2500 s	with “Control type” “PID”
Switching interval	0 ... 50 mV	
On-state interval	0 ... 6000 s	
Turn-off interval	0 ... 6000 s	
Control time	0 ... 999 s	not with “Control type” “manual”
Controlling	on	Control loop can be deactivated independent of Start/stop key. Start/stop key stops all control loops.
	off	

* Definition xp see Glossary

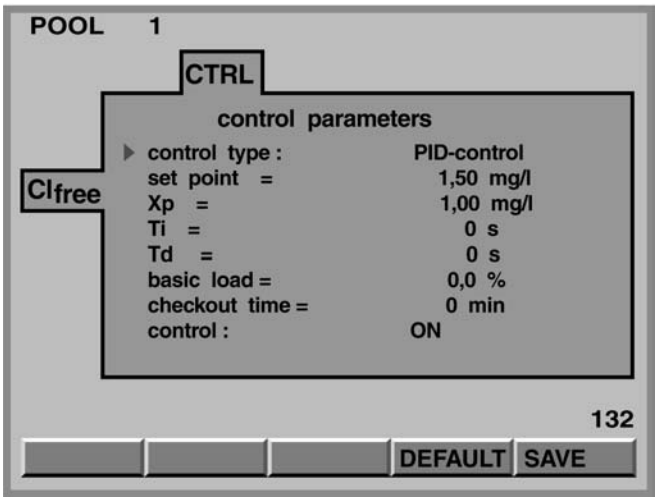
IMPORTANT

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

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



5.3.3 Chlorine, free



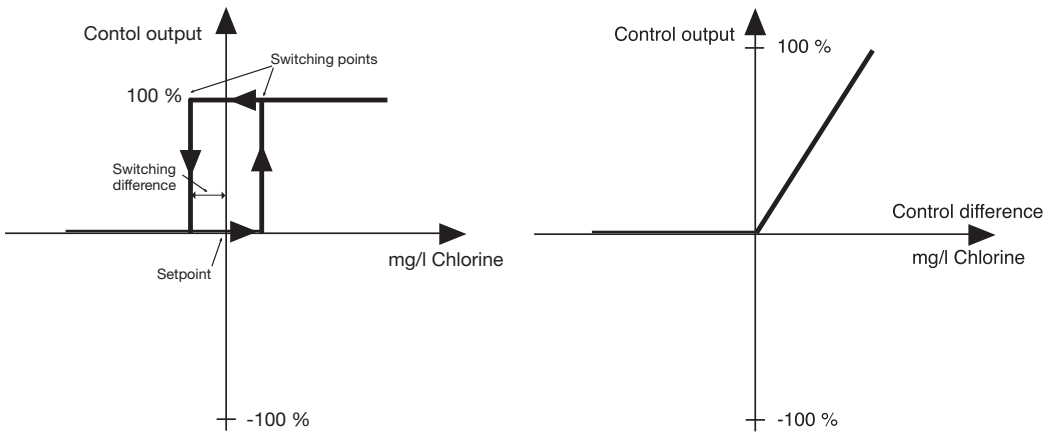
Adjustable variables	Increments	Remarks
Control type	PID controller	
	P controller	
	2-pt contact	see fig. 18
	manual	
Setpoint	0.00 ... 3.00 mg/l	
Base load	0.0 ... 100.0 %	
xp *	0.10 ... 9.99 mg/l	
Ti	0 ... 9999 s	with “Control type” “PID”
Td	0 ... 9999 s	with “Control type” “PID”
Switching interval	0.00 ... 0.50 mg/l	
On-state interval	0 ... 6000 s	
Turn-off interval	0 ... 6000 s	
Control time	0 ... 999 s	not with “Control type” “manual”
Controlling	off	Control loop can be deactivated independent of Start/stop key. Start/stop key stops all control loops.
	on	

* Definition xp see Glossary.

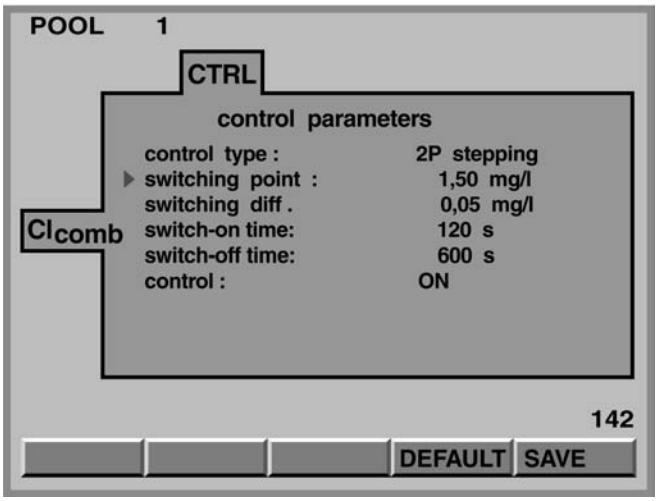
IMPORTANT

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

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



5.3.4 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 difference	0.00 ... 0.50 mg/l	
On-state interval	0 ... 9999 s	
Turn-off interval	0 ... 9999 s	
Control	off	Control loop can be deactivated independent of Start/stop key. Start/stop key stops all control loops.

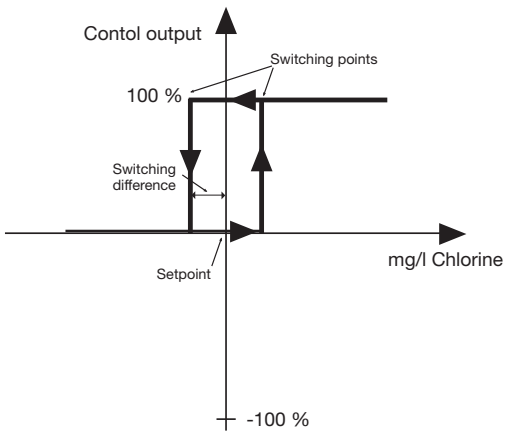
Only “Control type” “2-pt contact” possible.

IMPORTANT

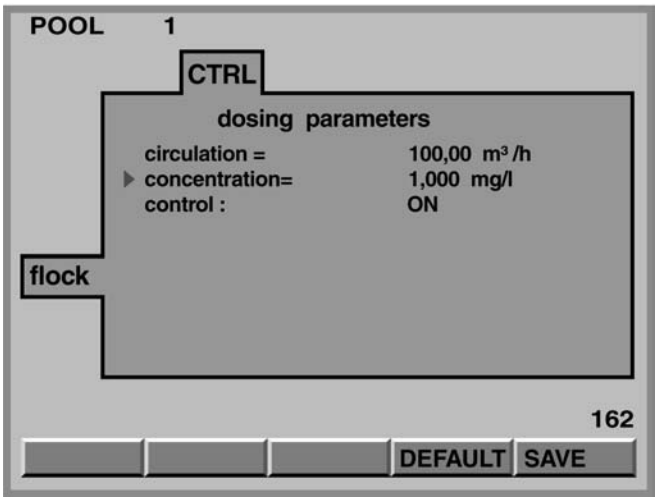
- ***For the entries to be effective, a power relay must be configured!***
- ***The control Cl comb. serves minimizing the combined chlorine, e.g. through a UV plant.***

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-pt contact



5.3.5 Flocculants



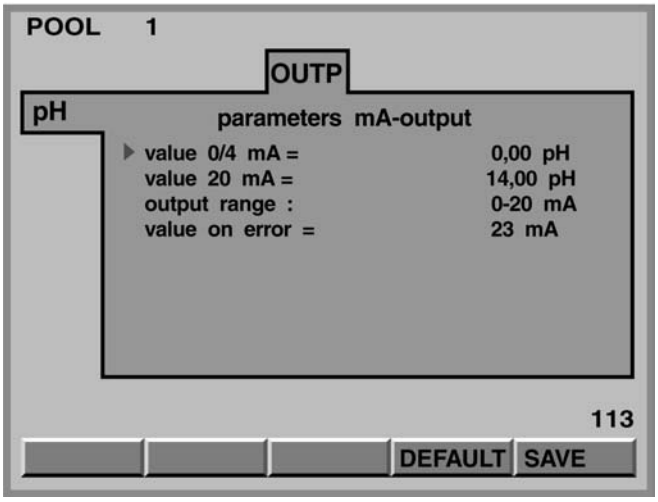
Adjustable variables	Increments	Remarks
Flow	10.0 ... 500.0 m³/h	
Concentration	0.1 ... 3.0 mg/l	Desired concentration of flocculants
Control	off	Control loop can be deactivated independent of Start/stop key. Start/stop key stops all control loops.
	on	

Pump capacity

If a flocculant pump is configured, the DULCOMARIN® II shows its pump capacity in “Pump capacity” after saving and in “Control flocculant pump” the setpoint which is required to obtain the desired concentration of flocculants.

5.4 mA output

All measured variables

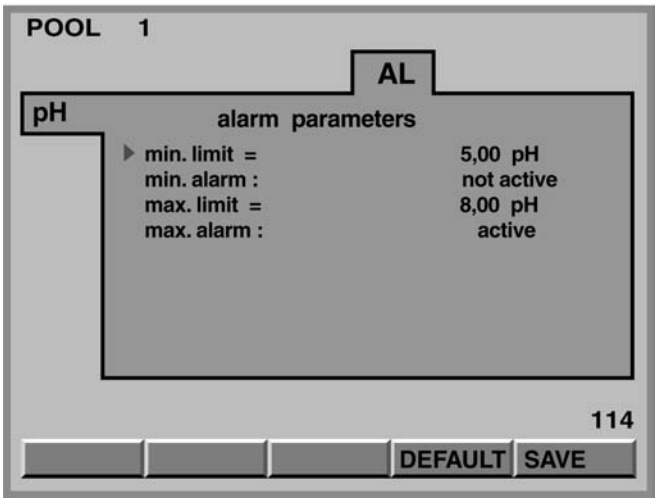


Adjustable variables	Increments	Remarks
Value 0/4 mA	0.00 ... xx.xx Y *	mA value depending on “output”
Value 20 mA	0.00 ... xx.xx Y *	
Output	0-20 mA	Not with “Iout” “not used” (see configuration)
	4-20 mA	
Value if error	23 mA AUS 3.7 mA 22 mA	Not with “Iout” “not used” (see configuration)

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

5.5 Alarm

All measured variables

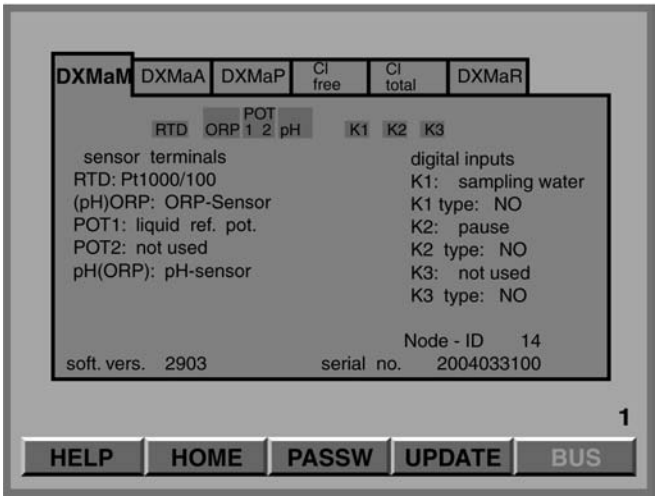


Adjustable variables	Increments	Remarks
Min. limit	0.00 ... xx.xx Y *	
Min. alarm	not active	Only error message for error
	active	Error message, alarm horn, relay for error. Must be acknowledged.
Max. limit	0.00 ... xx.xx Y *	
Max. alarm	not active	Only error message for error
	active	Error message, alarm horn, relay for error. Must be acknowledged.

* “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 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

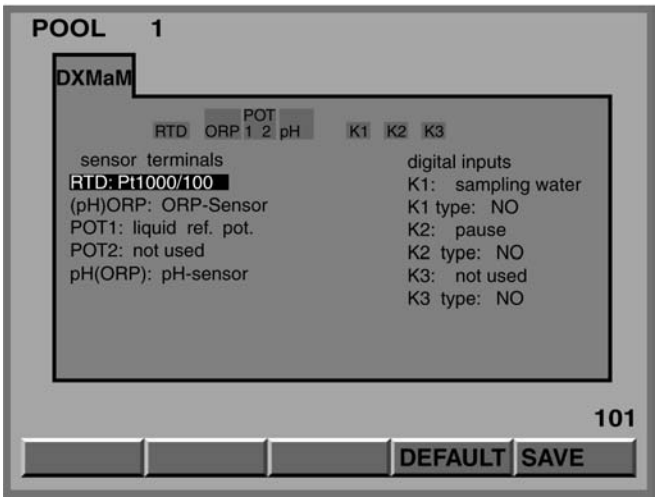
- ***The CAN sensors and the CAN pumps, too, are modules!***
- ***Terminals which are not assigned must be configured as “not assigned”!***

NOTE

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

6.1 Module DXMaM

M-Module (Sensor 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 pot.*	to “(pH) ORP” (ORP = Redox)
	not used	free
POT2	Liquid 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.

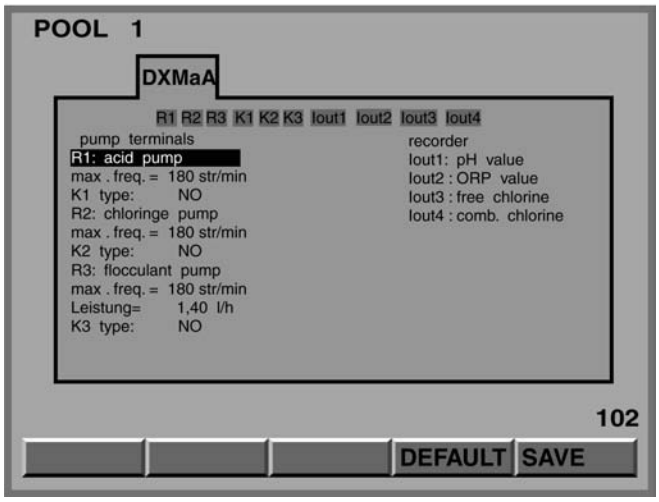
Switch inputs:

Terminals/adjustable variables	Increments	Remarks
K1	sample flow	sample water monitoring
K1 type	NC	
	NO	
K2	pause control	
	not used	free
K2 type	NC	
	NO	
K3	–	
	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!).

6.2 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. frequency	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. frequency	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. frequency	0 ... 500 strokes	Only when pump selected
Capacity	0,50 ... 18.00 l/h	Only when pump selected
K3 type	NO	Only when pump selected
	NC	Only when pump selected
	not used	free

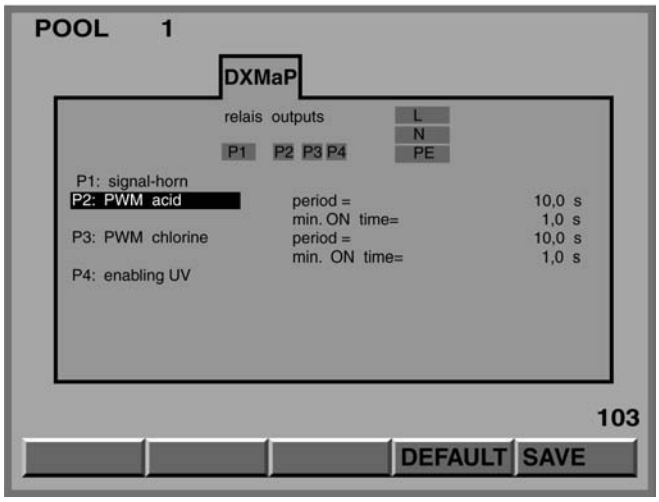
R1 - R3 are frequency outputs; K1 - K3 are switch inputs.
K1 - K3 are switch inputs of the A-Module DXMaA (the M-Module DXMaM shows the same designations!).

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

Terminals/adjustable variables	Increments	Remarks
Iout1	pH Value	for recorder
	pH lower dosing	Controller output
	pH lift dosing	Controller output
	Cl dosing	Controller output
	flocc. dosing	Controller output
	not used	free
Iout2	ORP value	for recorder
	acid metering	Controller output
	alcaline metering	Controller output
	cl. metering	Controller output
	flocc. metering	Controller output
	not used	free
Iout3	free Chlorine	for recorder
	acid metering	Controller output
	alcaline metering	Controller output
	cl. metering	Controller output
	flocc. metering	Controller output
	not used	free
Iout4	comb. chlorine	for recorder ”value comb. chlorine” is the difference between the measuring values of CLE and CTE
	acid metering	Controller output
	alcaline metering	Controller output
	cl. metering	Controller output
	flocc. metering	Controller output
	temperature	for recorder value temperature is received from the chlorine sensor or Pt1000/Pt100
	not used	free

6.3 Module DXMaP

P-Module (Power module)



Relay outputs:

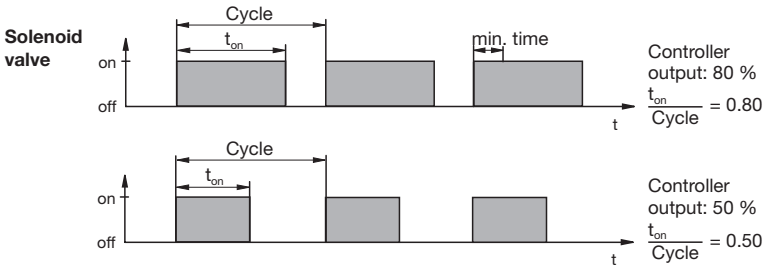
Terminals/adjustable variables	Increments	Remarks
P1	Signal-horn	
P2	PWM acid	Solenoid valve or switch-on of pump (acid)
	PWM alcaline	Solenoid valve or switch-on of pump (alkali)
	not used	free
P3	PWM chlorine	Solenoid valve or switch-on of pump (sodium hypochlorite pump)
	PWM ORP	Solenoid valve or switch-on of pump
	PWM acid	Solenoid valve or switch-on of pump (acid)
	not used	free
P4	UV plant	releases locking mechanism
	not used	free
Cycle time	0.0...999.0 s	
min. on-state interval	0.0...500.0 s	

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

NOTE

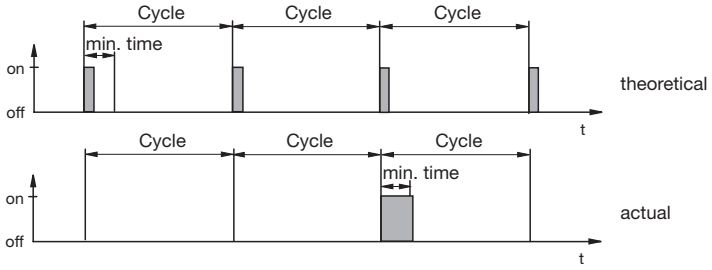
The power relays P1 (alarm) of all P-Modules always make and break simultaneously.

Solenoid valve relay



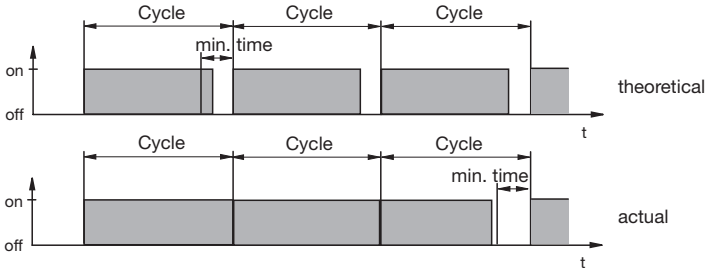
The operating intervals of the DULCOMARIN® II (solenoid valve) depend on the controller output and from “min. time” (smallest permissible operating time of the connected device).
The controller output determines the ratio t_{on}/cycle and thus the switching times (see fig. above).
“min. time” affects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

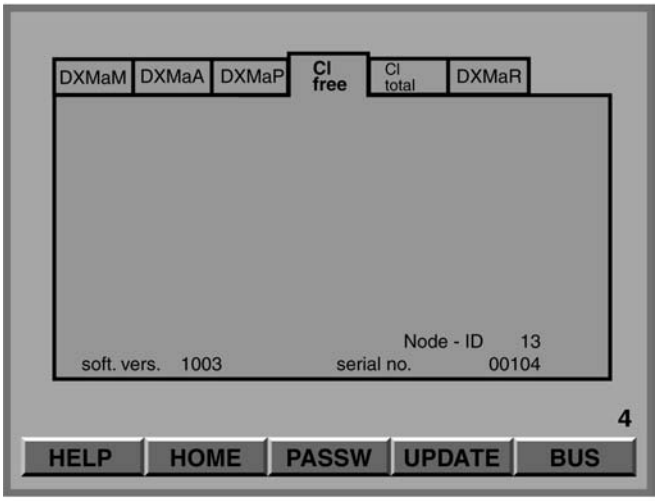
b) theoretical switching time > (cycle - min. time) and calculated switching time < cycle



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

6.4 Module Cl, free

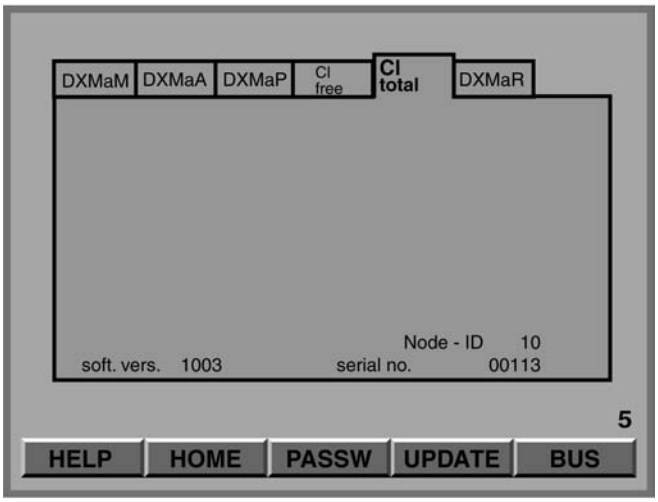
Chlorine sensor CLE



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.

6.5 Module Cl, total

Chlorine sensor CTE



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 Bus configuration

In this sub-menu, the assignment of the modules to a certain central unit can be influenced (central unit: main control in the cover of the DXC).
What has to be done and how depends on the version of the DULCOMARIN® II.

CAUTION

If central units have to be replaced or exchanged, please contact ProMinent Dosiertechnik GmbH, Heidelberg, for advise! Otherwise, there will be the risk of skin irritations for swimmers in the pool!

7.1 Compact version

Configurations in the sub-menu BUS must only be performed if modules are to be replaced. In this case, the relevant module first has to be signed off, i.e. has to be assigned to the virtual pool “0”:

IMPORTANT

- ***Consider possible effects on the entire system!***
- ***Identical new module types may never be connected simultaneously to the central unit because in this case detection via the semi-automatic module detection will no longer function.***

  In this case, commissioning can only be completed by the ProMinent service.
- ***CAN chlorine sensors, too, are modules.***
- ***N-Modules are not signed off.***
- ***P-Modules can be signed off without any problems - their voltage supply continues to function also without any CAN communication.***
- ***Note the parameters and the configuration of the relevant module.***

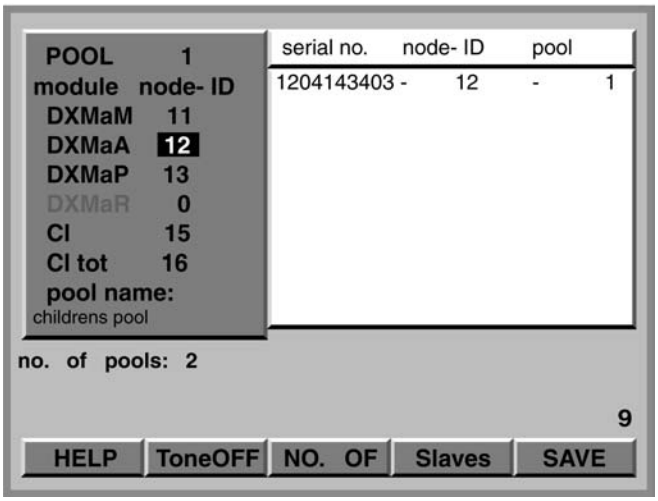


Fig. 15: Menu option “Pool” of the sub-menu BUS

▶ Open the sub-menu BUS in the configuration menu (see also “Operating Instructions DULCOMARIN® II, Pool Controller, Part 2: Operation”).

▶ Press F5 (CHANGE) in the displayed list of the assigned modules.

NOTE

The DULCOMARIN® II sorts the modules in the menu option "Pool" of the sub-menu BUS (see fig. 15) as follows:

If in the left field a module type has been pre-selected, the menu option displays in the right field the data of the module of this type (if the module has been detected by the central unit). The data are sorted according to node IDs.

The menu option "Pool" also displays in the left field the relevant node ID behind the designation of the module type (if the module has been assigned to the central unit).

- ▶ In the menu option "Pool" (see fig. 15) select (arrow keys) the module type from which a module is to be signed off in the next step in the left field - the right field has to show its serial number, a node ID assigned by the DULCOMARIN® II, and the pool number
- ▶ Press the ENTER key and set the stated node ID to "000" (arrow keys) in the black entry field, bottom
- ▶ Press the ENTER key - the node ID of the module in the left field besides the designation of the module type is now "0"
- ▶ Press F5 (SAVE) - a scroll bar is displayed. In the right field, the number of the pool is "0"
- ▶ Then press the ESC key - the list of the modules is displayed. The module is now "not connected"
- ▶ Press the ESC key again - the configuration menu is displayed

If a new module is connected now, a scroll bar is displayed - the module was detected by the central unit and was automatically assigned.

CAUTION

Check whether all calibrations, the parameters, and the configurations are ok! Otherwise, there will be the risk of skin irritations for swimmers in the pool!

7.2 DULCO-Net version

IMPORTANT

For the commissioning, we urgently recommend to use the additionally available commissioning instructions for the DULCOMARIN® II DULCO-Net!

Assignment of DULCOMARIN® II modules

IMPORTANT

- ***Consider possible effects on the entire system!***
- ***Identical new module types may never be connected simultaneously to the central unit because in this case detection via the semi-automatic module detection will no longer function.***

  In this case, commissioning can only be completed by the ProMinent service.
- ***CAN chlorine sensors, too, are modules.***
- ***N-Modules are not assigned.***

NOTE

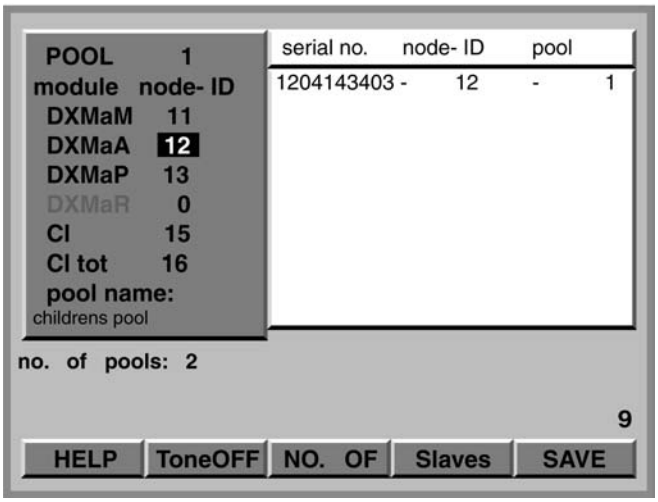
To ensure better overview, only connect and assign modules through the CAN bus to the central unit pool after pool.

Otherwise you may expend a lot of time!

Prerequisites

- The new modules of the DULCOMARIN® II DULCO-Net are mounted.
- The CAN bus cables are routed. The new modules, however, are not yet connected to these cables. With regard to the large DXC housings pay attention to any inside internal modules (do not connect any identical new module types simultaneously!).
- Voltage is only supplied to the power modules (N-Module and P-Module - not to the other devices connected to the DULCOMARIN® II DULCO-Net such as motor actuators or pumps) and the central unit is powered up.
- If the number of pools has increased, this was newly determined (e.g. from 6 to 7 pools).
- A new number was determined for the new pools (e.g. the number 7. “0” is reserved.).
- If required, pool names were determined.

Fig. 16: Menu option “Pool” of the sub-menu BUS



▶ Open the sub-menu BUS in the configuration menu (see also “Operating Instructions DULCOMARIN® II, Pool Controller, Part 2: Operation”).

▶ Press F5 (CHANGE) in the displayed list of the assigned modules.

▶ If the number of pools has increased: First press F3 (NUMBER) in the menu option displayed (see fig. 16) and then press the ENTER key.

▶ Enter the newly determined pool number (arrow keys) in the black entry field, bottom, and press the ENTER key.

▶ Connect the new module to the CAN bus - a scroll bar is displayed.

▶ Select the selection “Pool” (arrow keys) in the left upper field and press the ENTER key.

▶ Enter the number of the new pool in the black entry field, bottom, and press the ENTER key. (If the number of pools has increased and it is desired: Select the selection “Pool name” (arrow keys) and press the ENTER key.
Use the arrow keys to enter the characters of the desired pool name in the black entry field, bottom, and press the ENTER key.)

NOTE

The DULCOMARIN® II sorts the modules in the menu option “Pool” of the sub-menu BUS as follows: (see fig. 16):

If in the left field a module type has been pre-selected, the menu option displays in the right field the data of the module of this type (if the module has been detected by the central unit). The data are sorted according to node IDs.

The menu option “Pool” also displays in the left field the relevant node ID behind the designation of the module type (if the module has been assigned to the central unit).

- ▶ Select the module type of the new module (arrow keys) in the left field - the right field has to show its serial number, a node ID assigned by the DULCOMARIN® II, and a preliminary, virtual pool number “0”.
  If this is not the case, disconnect the module briefly from the CAN bus. Then, the DULCOMARIN® II must detect it and the data must be displayed.
- ▶ In order to assign the module from the right field to the selected pool, press the ENTER key and enter (arrow keys) its node ID from the right field into the black entry field, bottom.
- ▶ Press the ENTER key - the node ID of the module is now displayed in the left field besides the designation of the module type.
- ▶ Press F5 (SAVE) - a scroll bar is displayed.
- ▶ Connect the next module to the CAN bus - a scroll bar is displayed.
- ▶ Repeat the above described steps until all planned modules are connected and initialised (pay attention to internal modules!).
- ▶ Press F5 (SAVE) - a scroll bar is displayed.
- ▶ Then press the ESC key - the list of the modules for the last selected pool is displayed. Another pool can be selected by pressing the LEFT or RIGHT keys.
- ▶ Press the ESC key again - the configuration menu is displayed.

CAUTION

Check whether all calibrations, the parameters, and the configurations are ok! Otherwise, there will be the risk of skin irritations for swimmers in the pool!

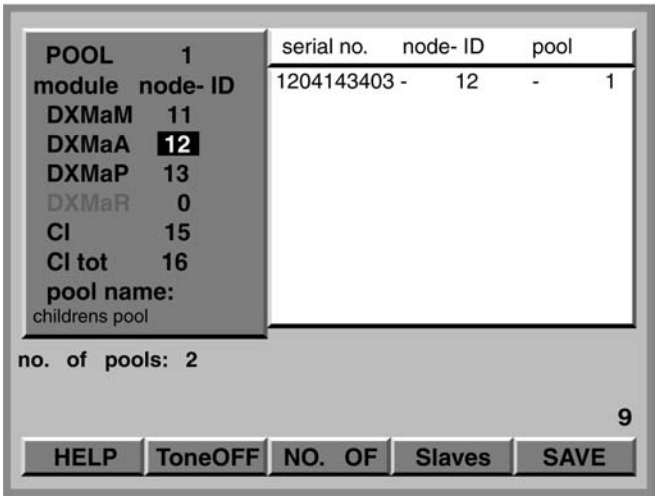
Sign off of DULCOMARIN® II modules

If a module is to be replaced or assigned to a different pool, the assigned module first has to be signed off, i.e. it has to be assigned to the virtual pool “0”:

IMPORTANT

- ***Consider possible effects on the entire system!***
- ***Identical new module types may never be connected simultaneously to the central unit because in this case detection via the semi-automatic module detection will no longer function.***
  In this case, commissioning can only be completed by the ProMinent service.
- ***CAN chlorine sensors, too, are modules.***
- ***N-Modules are not signed off.***
- ***P-Modules can be signed off without any problems - their voltage supply continues to function also without any CAN communication.***
- ***When replacing a module: Note the parameters and the configuration of the relevant module.***

Fig. 17:
Menu option “Pool”
of the sub-menu BUS



- ▶ Open the sub-menu BUS in the configuration menu (see also “Operating Instructions DULCOMARIN® II, Pool Controller, Part 2: Operation”).
- ▶ Press F5 (CHANGE) in the displayed list of the assigned modules.
- ▶ Select the selection “Pool” (arrow keys) in the left upper field and press the ENTER key.
- ▶ Enter the number of the module’s pool in the entry field.

NOTE

The DULCOMARIN® II sorts the modules in the menu option “Pool” of the sub-menu BUS as follows: (see fig. 17):

If in the left field a module type has been pre-selected, the menu option displays in the right field the data of the module of this type (if the module has been detected by the central unit). The data are sorted according to node IDs.

The menu option “Pool” also displays in the left field the relevant node ID behind the designation of the module type (if the module has been assigned to the central unit).

- ▶ Select (arrow keys) the module type from which a module is to be signed off in the next step in the left field - the right field has to show its serial number, a node ID assigned by the DULCOMARIN® II, and the pool number.
- ▶ Press the ENTER key and set the stated node ID to “000” (arrow keys) in the black entry field, bottom.
- ▶ Press the ENTER key - the node ID of the module in the left field besides the designation of the module type is now “0”.
- ▶ Press F5 (SAVE) - a scroll bar is displayed. In the right field, the number of the pool is “0”.
- ▶ Repeat the above described steps until all planned modules are signed off.
- ▶ Press F5 (SAVE) - a scroll bar is displayed.
- ▶ Then press the ESC key - the list of the modules for the last selected pool is displayed. The module is now “not connected”.
  Another pool can be selected by pressing the LEFT or RIGHT keys.
- ▶ Press the ESC key again - the configuration menu is displayed.

8 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

Tab. 1: Error messages central 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

Dosing	**START/ STOP key**	**Parameter menu Controlling: OFF**	**Sample water error**	**Pause contact**	**Meas. value error**	**Display**	**Dosing**	**Remarks**
Controller						dosing ***60%***	Controller output	
	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 5.3)
manual						man. dosing ***20%***	set value	adjustable (see chapter 5.3)
	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 5.3)

Tab. 3: 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	un-acknowledged 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. 3: 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. 4: Flash code for LEDs CAN chlorine sensors (DXUa)

9 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 result 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 aging 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 aging 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 controller output of -100%, or a deviation of -1.4 pH leads to a controller output of +100%. Thus, if a deviation in the magnitude of xp occurs, a controller output of 100% results.

Controller output

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

Control time

The DULCOMARIN® offers protection against overdosing. If the controller output of the P controller ranges between -10 % and +10 % for the duration of the control time, dosing is stopped. If a base load has been set, it will be switched. A corresponding error message “Overshoot Control Time Controller Output” is displayed.

Sensor monitoring

If the resistance value falls below 2 MOhm for more than 1 minute during operation, the error message “pH sensor faulty!” is displayed in the permanent display. If the resistance value exceeds 200 MOhm and if the measuring signal varies heavily, the error message “pH input faulty!” is displayed.

Controlling

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

The controller output 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 controller output) can be deactivated via the control input Pause.

The calculation of the controller output starts again with expiry of the pause.

Abbreviations of control measures:

x: controller output, 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: controller output (e.g. pulse frequency to pump)
Y_h: control range (e.g. 180 pulses/min.)
y_p: controller output 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 controller output 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 controller output 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 controller output is specified manually:
Controller output: 0...+100 % (command output raising active)
Controller output: -100...0 % (command output lowering active)

This function serves the examination of actuators.

Additive base load
A base load is added to the present controller output.
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 %

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.

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 2.

Technical changes reserved.

ProMinent Dosiertechnik GmbH
Im Schuhmachergewann 5-11
69123 Heidelberg
Germany

Phone: +49 6221 842-0
Fax: +49 6221 842-419

info@prominent.com
www.prominent.com