

User manual

for 127110 PM5 Total Chlorine Kit

Total Chlorine measuring system for Analyt & PoolManager® PRO



Compatible with

Analyt

PoolManager® PRO

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1 Identification of safety information

Please refer to the information concerning the identification of safety information in your PoolManager® or Analyt user manual.

2 General safety information



HAZARD!

Please follow the general safety information in your PoolManager® or Analyt user manual carefully.

3 User qualification

Please refer to the different user qualifications as defined in your PoolManager® or Analyt user manual.

4 Required PoolManager® Software Version



NOTE

Required PoolManager® software version for the Total Chlorine Measuring System

In order to use the Total Chlorine Measuring System in a PoolManager® PRO or Analyt controller, at least the following software version (or later) must be installed on the controller:

v150810-M1 (5.9.5)

If necessary, please perform a software update with a USB memory stick, as described in the PoolManager® manual.

5 Overview

The Total Chlorine Measuring System is an add-on to the BAYROL PoolManager® PRO and Analyt controllers. It measures the total chlorine (Cl_{tot}) in addition to the standard free chlorine measurement. A membrane covered total chlorine sensor is used for the measurement.

The Total Chlorine Measuring System may not be used with organic combined chlorine (e.g., trichlorisocyanuric acid).

The Total Chlorine Measuring System includes a plug-in interface module called PM5-mA-IN2 which provides two current signal inputs 4-20 mA.

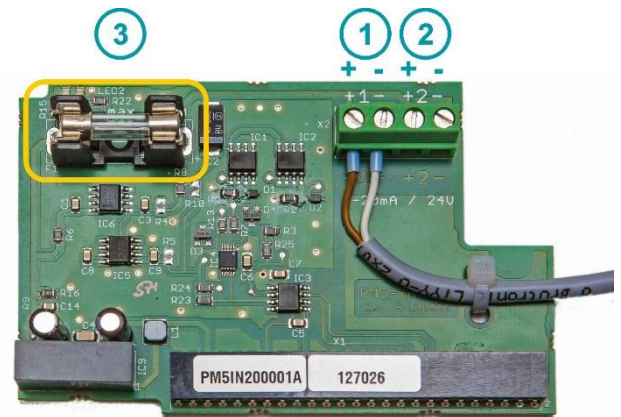
6 Combined Chlorine

- The combined chlorine which can be displayed in the Home menu in addition to the total chlorine is not measured directly but calculated according to the following formula:
Combined Chlorine = Total Chlorine - Free Chlorine
- This difference between the total chlorine and free chlorine measurement readings may be very small (even down to zero). This can result in a relatively high inaccuracy of the calculated combined chlorine value, if the total chlorine and free chlorine measurements do not work very accurately.
- An acceptable accuracy of the calculated combined chlorine can only be expected if free chlorine and total chlorine measurements are both well calibrated and stable. Regular calibration of both measurements is an absolute prerequisite for this. Calibrations on a weekly basis are strongly recommended!

7 Technical Data

Total chlorine (Cl _{tot}) measuring range	typical	0..5 mg/l
	min.	0..2,5 mg/l
	max.	0..5,5 mg/l
Total chlorine (Cl _{tot}) sensor sensitivity (slope), calculated during calibration	typical	3,2 mA/mg/l
	min.	2,9 mA/mg/l
	max.	6,4 mA/mg/l
Electrical interface	Current output 4-20 mA (4 mA = 0 mg/l), galvanic isolation	

7.1 PM5-mA-IN2 plug-in Module (2 current inputs 4-20mA)



- (1) Connection terminal for the first 4-20 mA current input. Connect the total chlorine sensor here. Take care of + and – connections.
- (2) Connection terminal for the second 4-20 mA current input. Reserved for future application.
- (3) Melting fuse 50 mA slow

8 Installation

8.1 Installation into the circulation system



IMPORTANT NOTICE

Ensure that connections are sealed tightly for all hose and assembly connections.
No liability for any potential leakage!

The sensor should be operated unpressurized if possible with free discharge of the measuring water. If that is not possible, the sensor can also be operated at a constant pressure of up to 1 bar (p_{rel}) or 2 bar (p_{abs}).

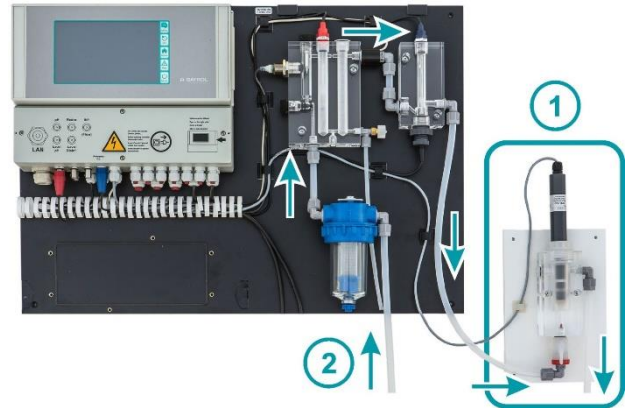
Pressure fluctuations must be prevented!



Total chlorine (Cl_{tot}) measuring cell

- 1 Total chlorine sensor
- 2 Cable gland (for connection cable)
- 3 Measuring water inlet
- 4 Measuring water outlet

The total chlorine measuring cell can be integrated into the measuring water circuit as shown on the following figure:



Analyt / PoolManager® Pro with additional total chlorine (Cl_{tot}) measuring cell

- 1 Total chlorine measuring cell (sensor and flow assembly)
- 2 Flow of measuring water

8.2 Sensor Set Up





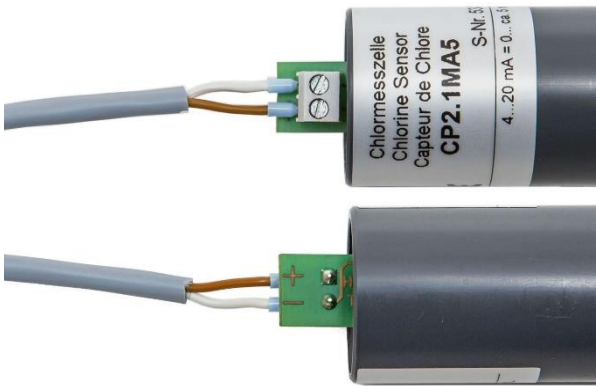


8.2.1 Fill in Electrolytic Gel

 <p>The image shows three items: a white bottle of electrolytic gel labeled 'ECP1.3IGEL', a grey membrane cap, and a black total chlorine sensor. Each item is marked with a circled number: 1 for the bottle, 2 for the cap, and 3 for the sensor.</p>	<p>(1) Bottle with electrolytic gel (2) Membrane cap (must be filled with electrolytic gel) (3) Total chlorine sensor. Do not touch the electrode finger and keep it clean!</p>
 <p>A hand is shown squeezing the electrolytic gel from the bottle into the membrane cap. To the right, the filled membrane cap is shown inserted into the sensor's body.</p>	<p>Fill the membrane cap completely with electrolytic gel.</p>
 <p>Three sequential images show the filled membrane cap being screwed onto the sensor. The first image shows the cap being aligned with the sensor's threads, the second shows it being partially tightened, and the third shows it fully secured.</p>	<p>Screw the filled membrane cap onto the total chlorine sensor (firmly but not violently).</p>
 <p>A hand is shown using a white paper tissue to gently wipe the electrode finger of the sensor.</p>	<p>Clean the sensor with a soft paper tissue.</p>
 <p>The sensor is held under a running faucet in a sink, with water being used to rinse the electrode finger.</p>	<p>Remove the remaining electrolytic gel with water.</p>

8.2.2 Installation of the Sensor into the Measuring Cell

	<p>Check the correct position and order of the seal rings. The black plastic ring is open on one side and must be placed in the groove on the sensor.</p>
	<p>Push the sensor carefully into the flow assembly. There must be a 1.5 to 2 cm gap between the tip of the sensor and the bottom of the flow assembly.</p>
	<p>Fix the plastic screw ring (firmly but not violently).</p>

8.2.3 Cable connection

	<p>white = - (minus)</p> <p>brown = + (plus)</p>
	<p>Unscrew the grey upper cap from the sensor and also unscrew the black cable gland.</p>
	<p>Insert the cable through the black cable gland first and then through the upper cap of the sensor.</p>
	<p>Insert the two cables into the connection terminals and fix them with a small screwdriver. Check, if the cables are properly fixed.</p>
	<p>Check the correct positions of + (plus / brown cable) and - (minus / white cable).</p>
	<p>Tighten the grey cap of the sensor.</p>
	<p>Tighten the black cable gland.</p>

8.3 Controller setup

This chapter describes the installation of the PM5-SA4 plug-in module inside the PoolManager® controller and the cable connections.



Required user qualification:
ELECTRICAL SPECIALIST

Electrical connection may only be performed by an ELECTRICAL SPECIALIST as defined in the chapter *User qualification* of your PoolManager® or Analyt user manual.

8.3.1 Opening the casing



HAZARD DUE TO VOLTAGE!

Inside the controller you may get in touch with dangerous electrical voltages.

Potential consequence: Death or the gravest degree of injury.

Disconnect the controller from mains power supply before opening the casing and, in particular, the lid of the connection terminal box.



IMPORTANT NOTICE!

Open on the right

Never open the casing on the left side, as damage may otherwise occur. Always open on the right side!

(1) Firmly press the hinge on the right side out and to the right.



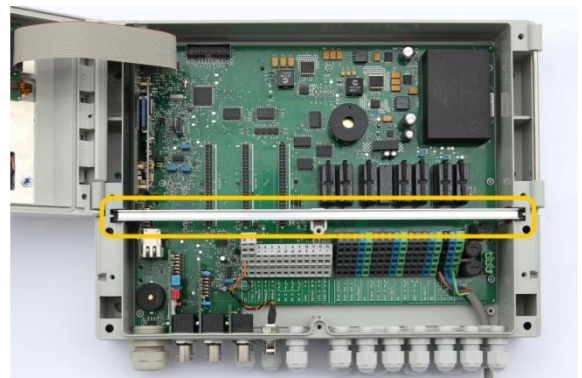
(2) Remove the cover plate and unhook the hinge on the bottom.



(3) Swing the casing cover open to the left.

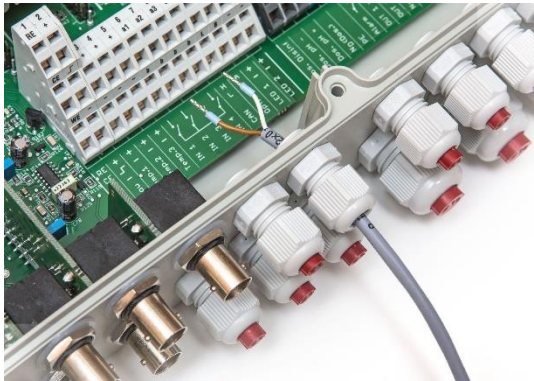


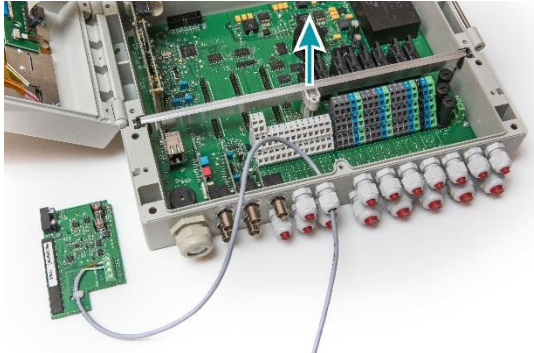


(4) Unbolt the four screws of the lid of the connection terminal box and remove the lid. Take out the aluminium rail afterwards.

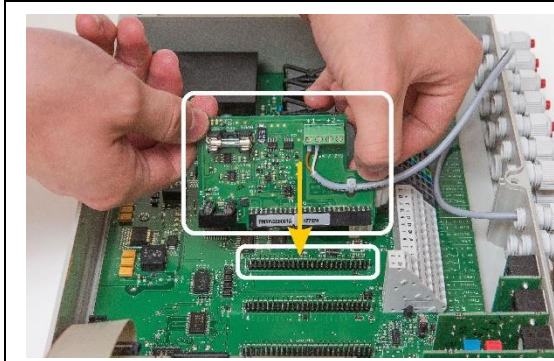


(5) To close the casing, reverse this procedure.

8.3.2 Cable Connection to the PM5-mA-IN2 Plug-in Module

 A close-up photograph of a green printed circuit board (PCB) showing several white cable glands. One grey cable is already inserted into one of the glands. The PCB has various components and labels visible.	<p>Remove the cap from one of the cable glands of your PoolManager® PRO or Analyt controller and insert the connection cable through the cable gland.</p>
 A photograph of the PM5-mA-IN2 plug-in module. It is a green PCB with various electronic components. Two cables, one brown and one white, are inserted into the connection terminals. The module is labeled "PM5IN200001A 127026".	<p>Insert the two cables into the connection terminals of the PM5-mA-IN2 plug-in module and fix them with a small screwdriver. Check, if the cables are properly fixed.</p> <p>brown = + (plus) white = - (minus)</p>
 A photograph of the PM5-mA-IN2 plug-in module, similar to the previous one. A yellow circle highlights a grey cable tie (cable binder) that is used to secure the grey cable to the PCB. The module is labeled "PM5IN200001A 127026".	<p>Use a cable tie (cable binder) to fix the grey cable firmly on the PCB (printed circuit board) of the PM5-mA-IN2 plug-in module. The cable tie is important for strain relief.</p>
 A photograph showing the PM5-mA-IN2 plug-in module being inserted into a larger device. A blue arrow points to an aluminum rail that is being removed from the device. The module is labeled "PM5IN200001A 127026".	<p>Remove the aluminium rail.</p>

8.3.3 Installation of the PM5-mA-IN2 Plug-in Module



Move the PM5-mA-IN2 plug-in module to the correct position and insert it carefully into the plug-in connector 3 (on the right).



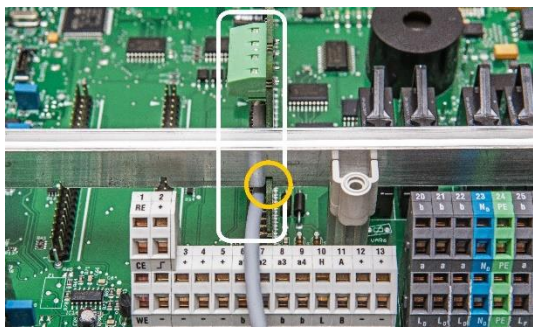
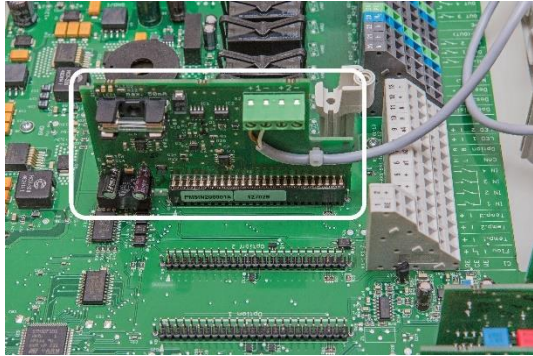
HAZARD!

Improper positioning

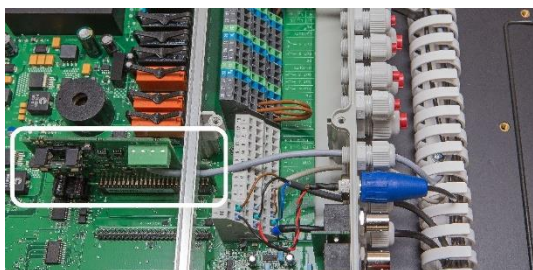
Improper (inaccurate) positioning of the plug-in module and applying too strong forces may bent or even break the contact pins of the plug-in connector.

Potential consequence: Irreparable damage of the plug-in connector, need for factory repair service.

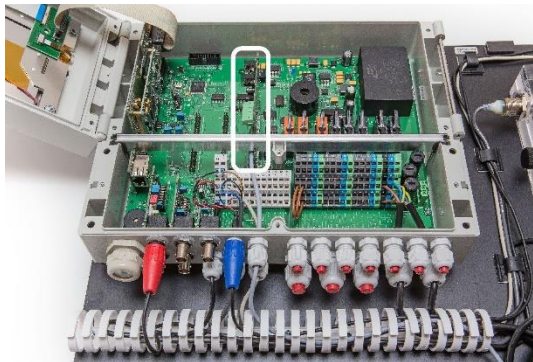
Take care for the correct and accurate position of the plug-in module and do not apply too strong forces.



Now insert the aluminium rail at its original position. Take care that the PM5-mA-IN2 plug-in module is exactly located in the corresponding slot of the aluminium rail as shown on the photo.



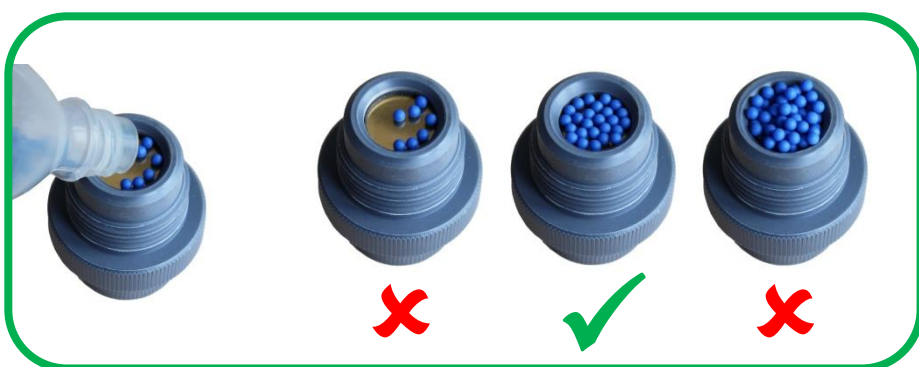
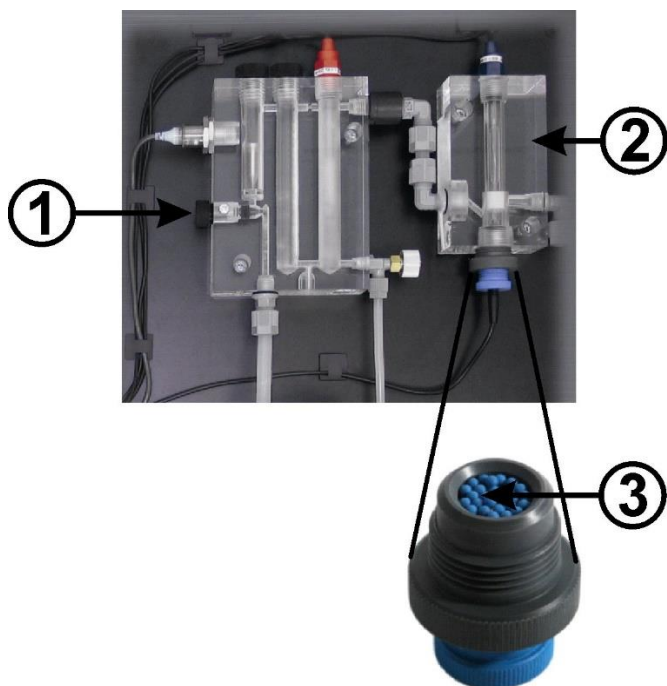
These photos show the correct position of the PM5-mA-IN2 plug-in module and the cable after installation.



9 Start of operation

When all measuring water connections and electrical connections are completed, turn on the measuring water.

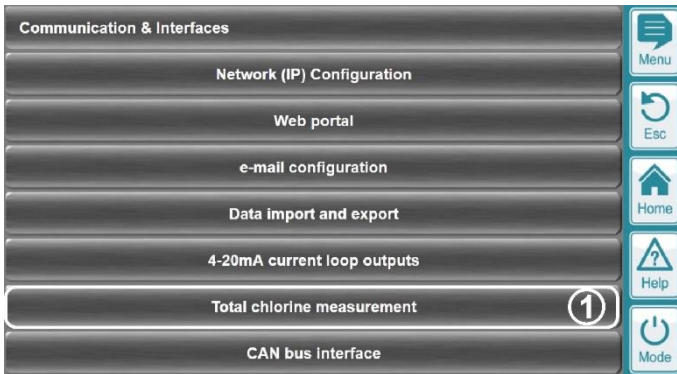
- Make sure that none of the measuring water connections leaks
- Use the flow adjustment (1) at the standard measuring cell to adjust the flow of measuring water. The flow is correct, if the blue cleaning pearls (3) in the standard free chlorine measuring cell (2) rotate consistently and do not (or only rarely) jump up.



10 Menus for Total Chlorine Measurement

10.1 Total Chlorine Measurement configuration menu

The total chlorine calibration parameters can be viewed and checked as follows:



- (1) The "Total Chlorine Measurement" menu is a sub-menu of the "Communication & Interfaces" menu.

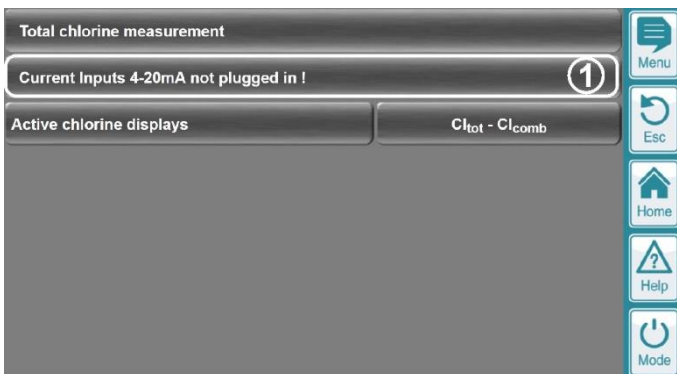


- (1) You can select up to two chlorine displays for the Home menu (besides the main free chlorine display):

- Cl_{act} : Active chlorine – Proportion of the free chlorine which is active for disinfection depending on the pH value / dissociation curve
- Cl_{tot} : Total chlorine – Total chlorine measured by the Total Chlorine Measuring System
- Cl_{comb} : Combined chlorine – Calculated as the difference between the measured total chlorine and the measured free chlorine

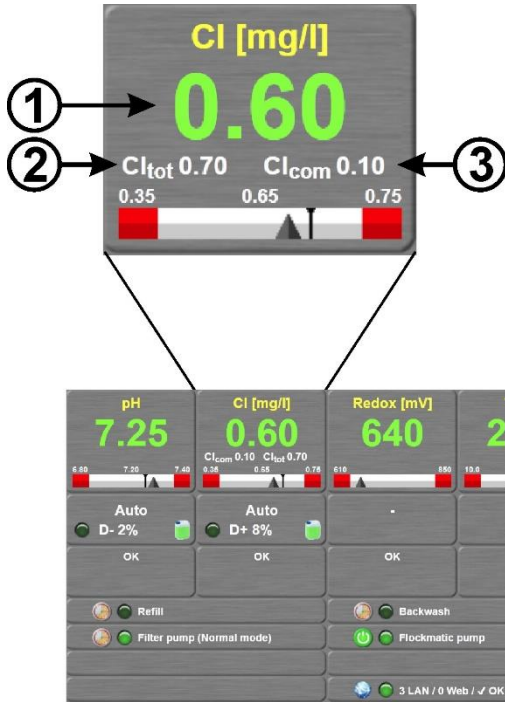


Up to two chlorine displays can be activated for the Home menu (highlighted button = display activated)



- (1) If the PM5-mA-IN2 plug-in module is not or not correctly plugged in, a text line indicates that the module is not available. The text line disappears when the PM5-mA-IN2 plug-in module is correctly plugged in.

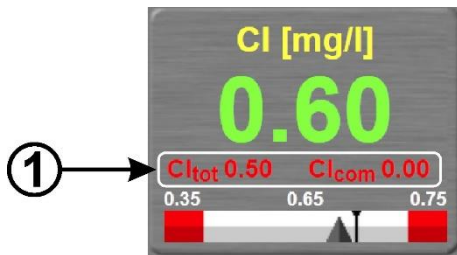
10.2 Home Menu



- (1) Free chlorine
(measured with the standard BAYROL open potentiostatic cell)
- (2) Total chlorine (Cl_{tot})
(measured with the membrane covered total chlorine cell)
- (3) Combined chlorine (Cl_{com})
(calculated as the difference between the measured total chlorine and free chlorine values)

Note

The displayed chlorine values depend on the setting “Active chlorine displays” in the menu “Total chlorine measurement”, see above.



- (1) The total chlorine value can never be lower than the free chlorine.

If the total chlorine measurement is lower than the free chlorine measurement, the colour of the total chlorine and combined chlorine displays switches to red to indicate the implausible measurement readings.

In this case, please check the measuring systems and perform re-calibrations of both, free chlorine and total chlorine.

10.3 Total Chlorine Calibration

This chapter describes the calibration of the Total Chlorine Measuring System.

10.3.1 Initial Calibration

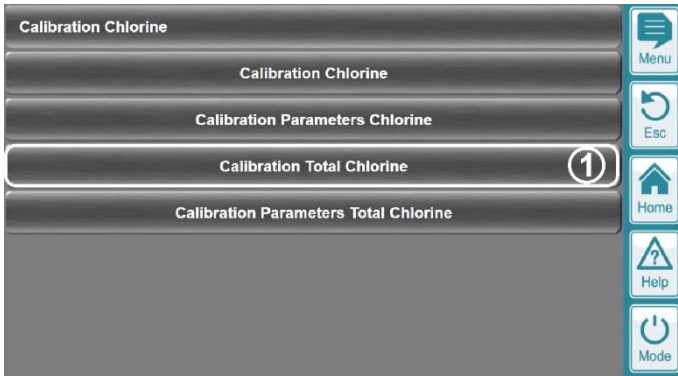
- After installation, an initial calibration is absolutely required in order to guarantee correct and accurate total chlorine readings.
- It is recommended to wait for at least 24 hours before the first calibration after commissioning in order to give the sensor time to stabilize.

10.3.2 Regular Calibration

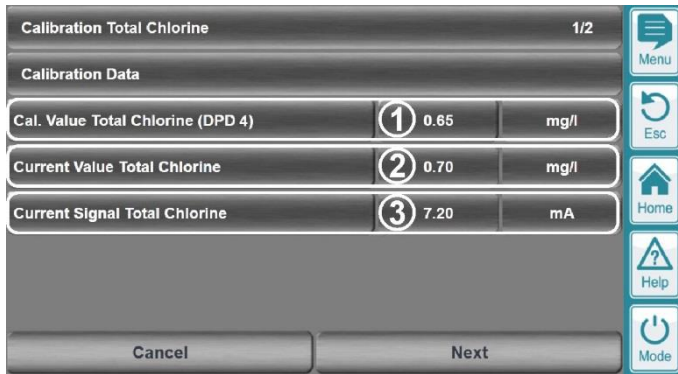
- To guarantee a good quality of the free chlorine and total chlorine measurements, regular calibrations at least once a week are recommended.



- (1) Select “Calibration Chlorine”



- (1) Select "Calibration Total Chlorine"



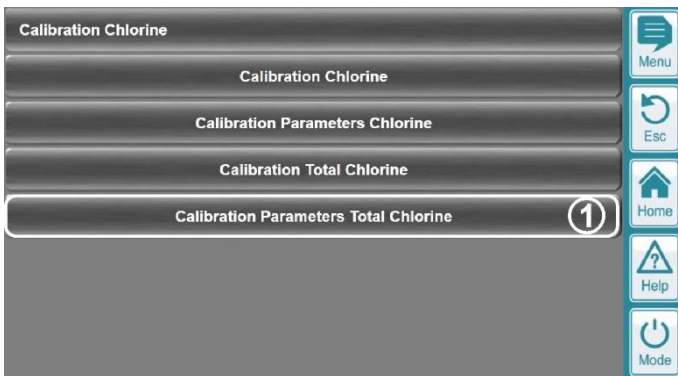
- Step 1/2
- (1) Enter the total chlorine value measured with DPD4 (DPD1 + DPD 3) by photometer
 - (2) Current total chlorine reading. This is based on the previous calibration and may be inaccurate or wrong. It may be used as a rough orientation.
 - (3) Electrical current signal from the total chlorine cell (typically 4mA + 3,2 mA/mg/l)



- Step 2/2
- (1) Slope (sensitivity) of the total chlorine cell in [mA/mg/l]. The slope is calculated during calibration. A typical value is 3,2 mA/mg/l.
 - (2) Offset (zero shift). This is always 0 for total chlorine measurement.
 - (3) Current total chlorine reading. This is now based on the new calibration and should be correct (according to the DPD4 (DPD1 + DPD3) reading).

10.4 Total Chlorine Calibration Parameters

The total chlorine calibration parameters can be viewed and checked as follows:



- (1) Select "Calibration Parameters Total Chlorine"



- (1) Slope (sensitivity) of the total chlorine cell in [mA/mg/l]. The slope is calculated during calibration. A typical value is 3,2 mA/mg/l.
- (2) Offset (zero shift). This is always 0 for total chlorine measurement.
- (3) Current total chlorine reading. This is based on the last calibration. If it is wrong or inaccurate, a new calibration should be done.

11 Handling of the Total Chlorine Cell



IMPORTANT NOTICE!

Read the manual "Operating Instruction TARAline CP2 / CP3" carefully and follow all instructions.

This is the user manual for the total chlorine cell which gives important advices for the handling of the cell.

Not following these instructions may result in malfunction or damage of the total chlorine cell and in the loss of warranty.

- After start of operation, the total chlorine measuring cell may need several hours until the measuring signal stabilizes. It is recommended to wait at least 24 hours before the first calibration is done.
- To guarantee a good quality of the total chlorine measurement the system must run 24 hours a day.
- When the measuring water is turned off for more than a few minutes and then turned on again it may take several hours until the total chlorine measuring signal stabilizes again.
- If the PoolManager® / Analyt is switched off or not connected to total chlorine measuring cell while the measuring water is running, it may take several hours until the total chlorine measuring signal stabilizes again, when the PoolManager® / Analyt is powered on or reconnected. The PoolManager® / Analyt should therefore not be disconnected or powered off while the measuring water is running.
- Do not touch the electrode finger (inside the membrane cap) and keep it clean!
- Do not remove the coating on the electrode finger!
- The total chlorine sensor is only suitable for water with drinking water quality.
- A special electrolytic gel (ECP2S/GEL) must be used, if the sensor is used in salt water / seawater.
- It is recommended to renew the electrolytic gel inside the membrane cap of the total chlorine sensor every 3 to 6 months.
- It is recommended to renew the membrane cap of the total chlorine sensor once a year.



When unscrewing the membrane cap:

Do not forget to lift up the hose ring covering the vent to allow air flowing into the membrane cap. Otherwise, the membrane will be destroyed because of the vacuum building up in the membrane cap.

12 Technical Data

Measure	Total chlorine
Membrane type	Hydrophilic membrane
Operating temperature	+5 to +45 °C
Temperature compensation	Automatic (integrated temperature sensor)
Pressure resistance	p _{abs.} : max. 2 bar p _{rel.} : max. 1 bar No pressure fluctuations are admissible when operating under pressure. Unpressurized operation is recommended (atmospheric pressure)
Flow rate	Approx. 30 l/h
pH-range	pH 4 – pH 10, the pH dependency is reduced (linear decrease of about 5% per pH unit)
Settling time	Approx. 2 h at initialization
Response time t ₉₀	Approx. 2 min.
Zero point adjustment	Not required
Cross sensitivity / disruptive substances	Chlorine dioxide not permitted Ozone is disruptive
Storage	Sensor: Frost-free, dry and without electrolyte, can be stored for an unlimited time at +5 to +45 °C Membrane cap: Used membrane caps cannot be stored Electrolyte: !!In the original bottle and protected against sunlight at +5 to +25 °C
Maintenance	Check the measurement signal regularly, at least once a week. Do a re-calibration of both, free chlorine and total chlorine, if necessary. <ul style="list-style-type: none"> • Replace the membrane cap once a year (subject to water quality). • Change the electrolyte: every 3 to 6 months.

13 Spare Parts

Ref.	Article
100623	CABLE SUPPORT BLACK PM5
112277	MOUNTING BRACKET D10 R/ 0.25 IN 90°
112278	MOUNTING BRACKET D10 R/ 0.25 IN 90° (with rabbet for O-Ring)
116004	PLATE PVC 240x160x10 MM
124105	O-RING 12x3 VITON
127111	DOSA FLOW - FLOW ASSEMBLY, DF01, LC-H Acryl, (1 x 1 1/4" IG)
127112	SONDE TOTAL CHLORINE CP2 1MA5
127113	MEMBRANE SONDE TOTAL CHLORINE CP2 1MA5
127114	ELECTROLYTE FLUID
127115	CABLE UNITRONIC LIYY 2X0,14
127117	BALL D=6,5MM POM
127118	SEALING RING 12,0 * 6,0x2MM VITON
127119	KIT SCREWING 1 1/4" MEASURING CHAMBER CP2. 1MA5
127026	PM5 PLUG-IN MODULE PM5-MA-IN2
186054	HOSE PE 10X8X1MM (LPDE)