Balance Tank Control

Version 1.2

GB

User manual

Art.-No. 127130 - Balance Tank Control (BTC)

Compatible with

PoolManager®
PoolManager® PRO
Analyt

BAYROL TECHNIK

Table of Contents

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 Balance Tank Control

In order to use the Balance Tank Control in a PoolManager®, PoolManager® PRO or Analyt controller, the following software version or a later one must be installed on the controller:

v211115-M1 (7.7.0)

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

5 Important advices

HAZARD!

Severe malfunctions of the Balance Tank Control may occur, if the system is not properly set up and fully tested after installation and configuration.

Potential consequence: Malfunction of the system, material damage, water damage

Configure and check all settings of the Balance Tank Control carefully, in particular the activation levels of the three functions replenishment, dry-run protection and overflow protection. Test all functions carefully as described in this section “Commissioning and test” before you start regular operation.

NOTE

Filter pump control must be in Auto mode

Dry-run protection stops the filter pump while overflow protection forces the filter pump on. The filter pump must run in Auto mode, if these functions are used. If the filter pump is manually set to off or to a fixed speed, dry-run protection and overflow protection will have no effect.

NOTE

No replenishment during overflow protection

If overflow protection is active, replenishment will be blocked. Usually, overflow protection and replenishment will not be active at the same time, because the activation level for overflow protection is above the levels for replenishment.

6 Overview

The Balance Tank Control is an add-on to the BAYROL PoolManager®, PoolManager® PRO and Analyt controllers. It measures the water level in the balance tank in centimetres. A very robust hydrostatic sensor (pressure sensor) made of titanium is used for the measurement. The sensor provides a 4-20 mA signal.

Based on the measured water level, the Balance Tank Control controls the following functions:

Water replenishment

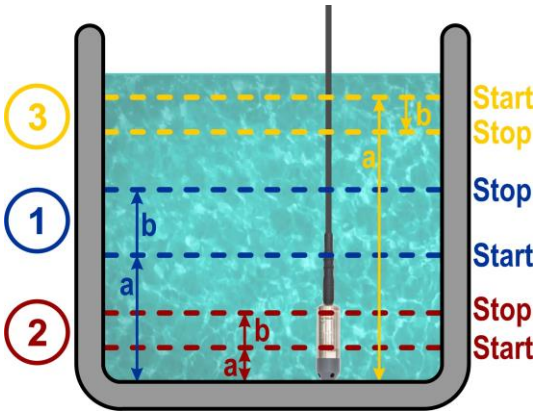
- Activates a switch output of the controller, if the water level drops below a programmable limit

Dry-run protection

- Forces a safety stop of the filter pump, if water level drops below a programmable limit

Overflow protection

- Forces activation of the filter pump, if the water level rises above a programmable limit



1	**Water replenishment**
1a	Menu setting “Start replenishment if level **below**”
1b	Menu setting “Stop replenishment if level **rises** by”

2	**Dry-run protection**
2a	Menu setting “Start dry-run protection if level **below**”
2b	Menu setting “Stop dry-run protection if level **rises** by”

3	**Overflow protection**
3a	Menu setting “Start overflow protection if level **above**”
3b	Menu setting “Stop overflow protection if level **drops** by”

7 Scope of Delivery

ID	Component	
1		Titanium level probe with protective plastic cap 5 m cable length
2		Cable clamp Used to fix sensor in the balance tank
3		Cable gland with kink protection Alternative to fix sensor in the balance tank
4		Terminal box with pressure compensation
5		Connection cable from the terminal box to the PoolManager® 5 m cable length
6		Plug-in module “PM5-mA-IN2” 2x 4-20 mA current input
7		BAYROL user manual for level control kit
8		Level probe user manual (DE / EN / FR)
10		USB stick with latest PoolManager® software

8 Functions

This chapter provides a more detailed description of the Balance Tank Control functions.

8.1 Water replenishment

- Activates a selectable switch output (“OUT”), if the water level drops below a limit, which is programmable in the menu.
- Usually, this output is used to activate a fresh water magnet valve.
- Once the function has been activated, the water level must rise again before the function is stopped. It can be programmed in the menu, by how many centimetres the water level must rise to stop replenishment again.

8.1.1 Safety stop function

- There is an optional safety stop function.
- If activated, this function stops water replenishment after a programmable maximum time, even if the water level has not risen as expected.
- This may happen in case of leakages or technical issues.
- A safety stop is signalled by an alarm message. The alarm message must be manually quit to continue water replenishment.

8.1.2 Block dosing during replenishment

- Depending on the installation, pH and disinfection measurements may be affected by water replenishment and the readings may be incorrect. This may result in inappropriate dosing.
- To prevent this, it is possible to block dosing for pH and disinfection during replenishment.
- It is also possible to extend the blocking by a time lag after a replenishment. This allows for the pH and disinfection measurements to stabilize, before dosing restarts.
- The lag time is programmable in the menu.

8.2 Dry-run protection

- Forces a safety stop of the filter pump, if the water level drops below a limit, which is programmable in the menu.
- Once the function has been activated, the water level must rise again before the function is stopped. It can be programmed in the menu, by how many centimetres the water level must rise to stop dry-run protection again.

8.3 Overflow protection

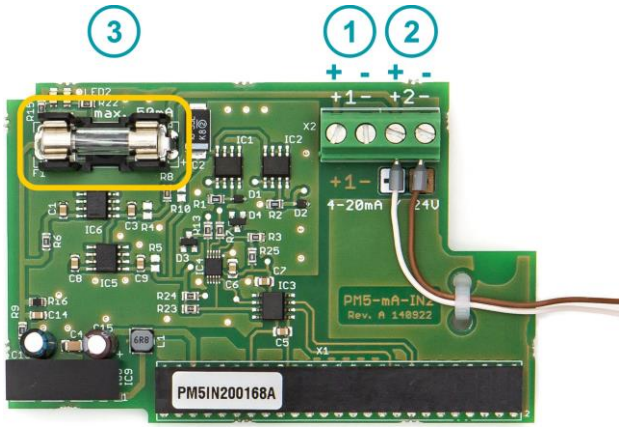
- Forces activation of the filter pump, if the water level rises above a limit, which is programmable in the menu.
- Once the function has been activated, the water level must drop again before the function is stopped. It can be programmed in the menu, by how many centimetres the water level must drop to stop overflow protection again.
- If a variable speed filter pump is used, the pump speed during overflow protection can be selected in the menu.

8.4 Calibration of the level probe

- The level probe can be calibrated to reach the maximum precision for level measurement.
- The current water level in the balance tank must be measured manually. The result of the manual measurement is entered in the menu as reference value for the calibration.
- Calibration adjusts the reading from the level probe to match the manual measurement.
- The offset (zero shift) of the level probe is usually close to zero and does not need to be adjusted. Nevertheless, it is possible to adjust the offset manually in the “Calibration parameters” menu.

- To read and adjust the zero signal from the level probe, the probe must be taken completely out of the water. If the displayed water level in this situation is different from zero, the parameter “Level probe offset” can be manually adjusted to get a reading of zero.

9 PM5-mA-IN2 plug-in module (2 current inputs 4-20 mA)



(1) Connection terminal for the first 4-20 mA current input.
This input is reserved for total chlorine measurement and possible future applications.

(2) Connection terminal for the second 4-20 mA current input.

Connect the level probe connection cable here.

Take care of + and – connections
according to the white and brown colour code.

(3) Melting fuse 5x20 mm / 50 mA slow

10 Commissioning and test

The following chapters describe the installation and the menu configuration of the Balance Tank Control.

After installation, a complete test of all functions is mandatory.

HAZARD!

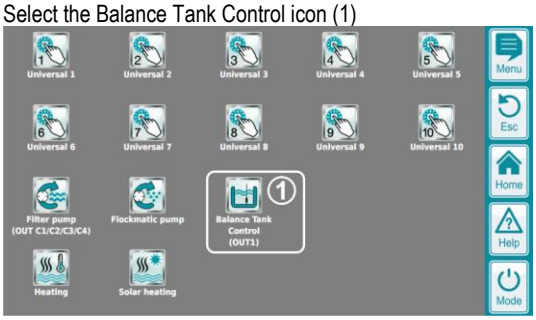
Severe malfunctions of the Balance Tank Control may occur, if the system is not fully tested after installation and configuration.

Potential consequence: Malfunction of the system, material damage, water damage

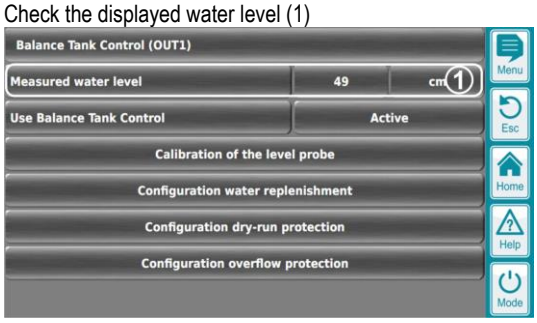
Test all functions of the Balance Tank Control carefully as described in this section before you start regular operation.

10.1 Verify measurement

- Power the controller
- Go to the “Add-on functions” icon menu
- Select the Balance Tank Control icon (1)



- Check the displayed water level (1)



- Move the level probe up and down in the balance tank and check, if the displayed “Measured water level” is correct and reacts on the movement of the level probe.
- If the displayed “Measured water level” is not accurate, you should do a “Calibration of the level probe”.
- If you don’t get correct measurement readings, please check the installation again.

10.2 Check water replenishment function

- Install, configure and activate the water replenishment function as described in the sections below.
- Reduce the water level in the balance tank or move the level probe up to get a water level measurement, which is below the activation level for water replenishment.
- Check, if water replenishment is started and works as expected.
- Increase the water level in the balance tank or move the level probe down to stop replenishment.
- Check, if water replenishment is stopped as expected.

10.3 Check dry-run protection function

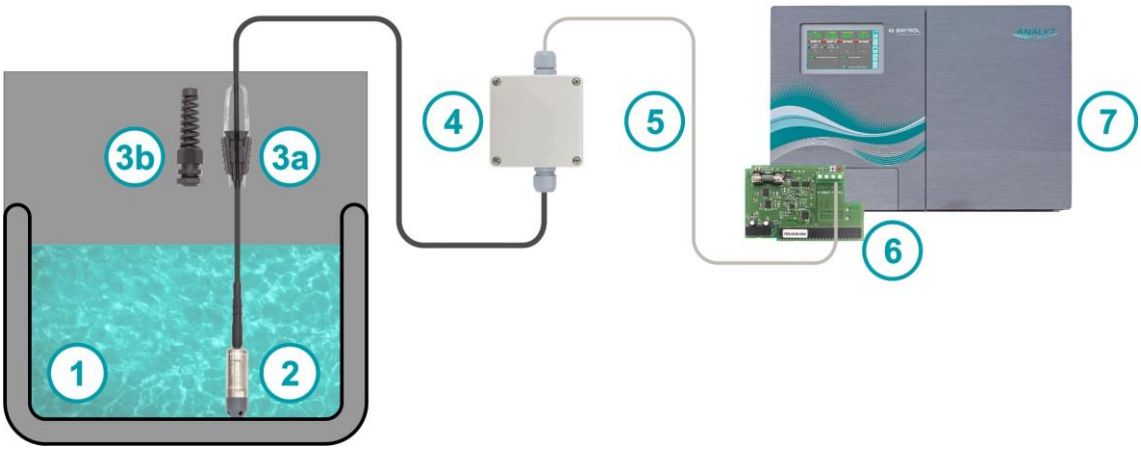
- Install, configure and activate the dry-run protection function as described in the sections below.
- Reduce the water level in the balance tank or move the level probe up to get a water level measurement, which is below the activation level for dry-run protection.
- Check, if dry-run protection is started and forces the filter pump to stop as expected.
- Increase the water level in the balance tank or move the level probe down to stop dry-run protection.
- Check, if dry-run protection is stopped as expected.

10.4 Check overflow protection function

- Install, configure and activate the overflow protection function as described in the sections below.
- Increase the water level in the balance tank or move the level probe down to get a water level measurement, which is above the activation level for overflow protection.
- Check, if overflow protection is started and forces the filter pump to run in the selected speed as expected.
- Reduce the water level in the balance tank or move the level probe up to stop overflow protection.
- Check, if overflow protection is stopped as expected.

11 Installation

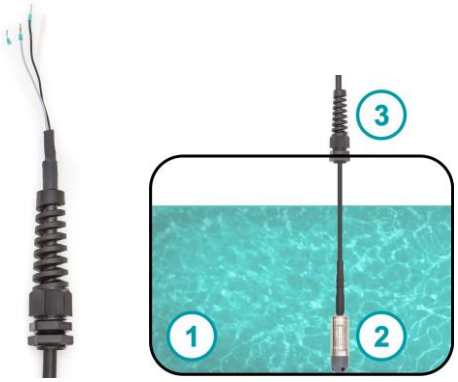
11.1 System overview



1	Balance tank
2	Level probe Must be installed with its head touching the bottom of the balance tank
3a	Cable clamp Can be used to fix the sensor cable on a wall or ceiling
3b	Cable gland with kink protection Can be used to fix the sensor cable in closed plastic balance tanks
4	Connection box Connects the 5 m sensor cable to a more flexible cable, which is connected to the controller
5	Connection cable Thin and flexible cable for the connection between the connection box and the controller
6	PM5-mA-IN2 plug-in module Plugged into the controller to provide a 4-20 mA input for the level probe
7	PoolManager® / PoolManager® PRO / Analyt controller

11.2 Installation of the level probe

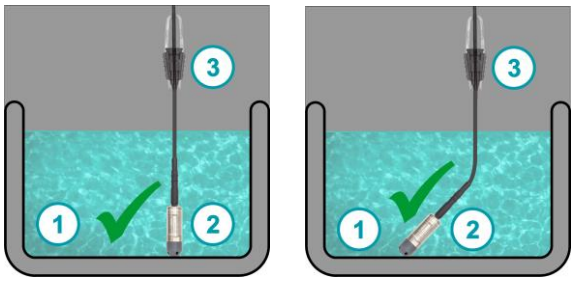
	The level probe has a 5 m cable with 3 wires inside: • 2 wires for the 4-20 mA measuring signal • 1 wire for the connection with protective earth (PE)
	There are two options included to fix the sensor cable. **Option 1: Cable clamp** • The cable clamp can be mounted on a wall or ceiling. Use a screw or hook to fix it. • Place the sensor cable between the two black plastic brackets and push the brackets down firmly to fix the cable.



Option 2: Cable gland with kink protection

- The cable gland can be used for covered plastic balance tanks.
- Drill a hole on the upper side or cover of the plastic tank.
  - Drill diameter ∅ 20 mm
  - Max. material thickness approx. 5 mm
- Fix the cable gland with the nut.
- Lead the sensor cable through the cable gland and the kink protection carefully.
- Fasten the cable gland firmly to fix the sensor cable in the correct position.

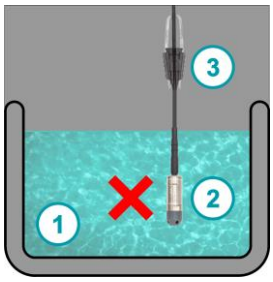
(1) Balance tank (plastic tank)
(2) Level probe at the bottom of the tank
(3) Cable gland with kink protection mounted on the upper side of the tank



Correct positioning of the level probe:

- The head of the sensor must touch the bottom of the balance tank

(1) Balance tank
(2) Level probe at the bottom of the tank
(3) Cable clamp to fix the sensor

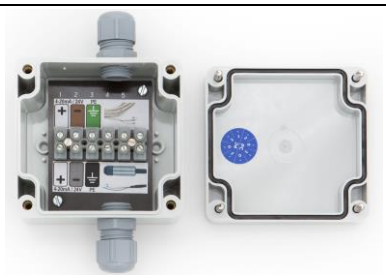


Incorrect positioning of the level probe:

- The head of the sensor does not touch the bottom of the balance tank

(1) Balance tank
(2) Level probe (does not touch the bottom of the tank)
(3) Cable clamp to fix the sensor

11.3 Connection box



- The connection box is used to interface from the sensor cable to the more flexible connection cable
- The connection box can be mounted on a wall with screws
- There are labels with colour codes for the connections of the sensor cable and the connection cable
  - White / grey / black for the sensor cable
  - White / brown / green for the connection cable

- Lead the sensor cable and the connection cable through the cable glands as shown in the picture
  - Use the end of the connection cable with the short wire ends as shown in the picture
- Fasten the cable glands firmly to fix the cables and ensure protection against water and dust
- Connect all wires to the connection terminals and make sure that they are well fixed
- Close the lid of the connection box

11.4 Controller setup

This chapter describes the installation of the PM5-mA-IN2 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.

11.4.1 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.

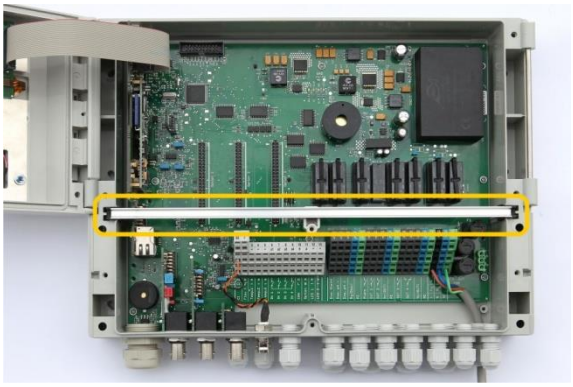
IMPORTANT NOTICE!
Open on the right
Never open the casing on the left side, as damage may otherwise occur. Always open on the right side!

(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.

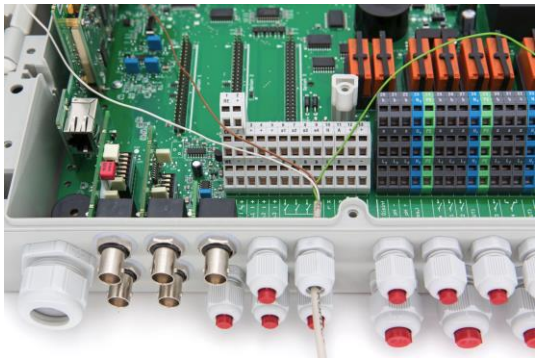
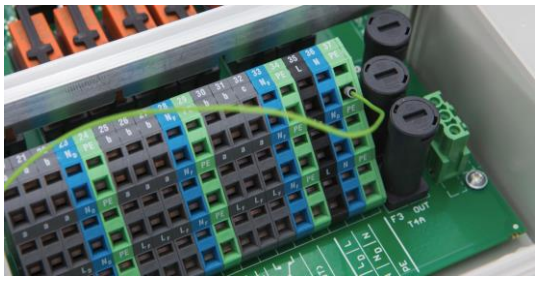
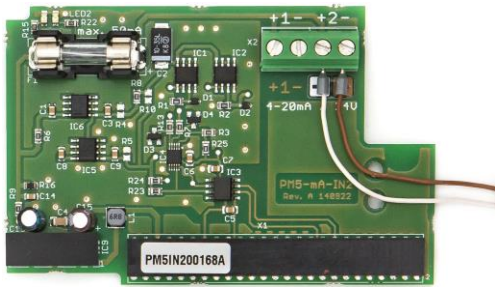
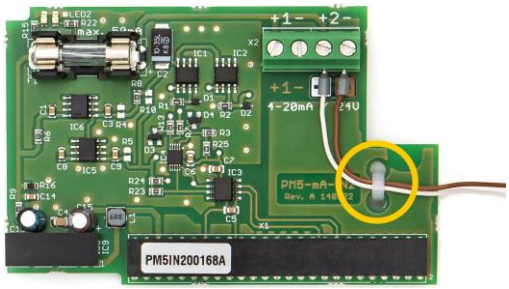
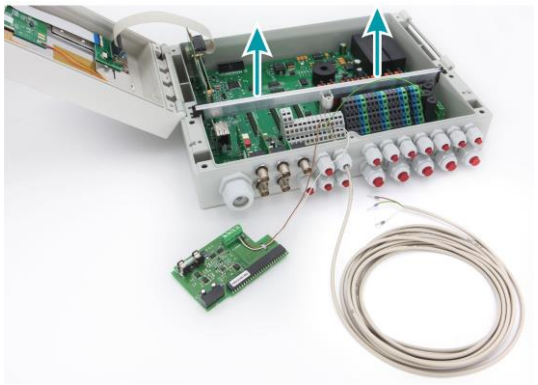
(3) Swing the casing cover open to the left.

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

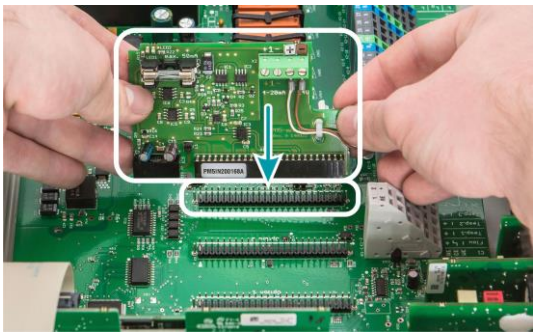


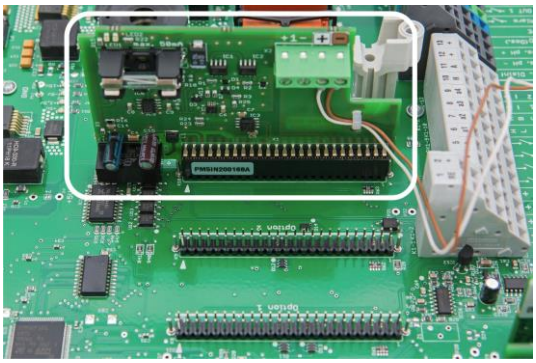
(5) To close the casing, reverse this procedure.

11.4.2 Cable Connection to the PM5-mA-IN2 Plug-in module

	Remove the cap from one of the smaller cable glands in the upper row of your PoolManager®, PoolManager® PRO or Analyt controller and lead the connection cable through the cable gland.
	Connect the green PE (protective earth) wire to one of the green PE terminals of the controller. You can use any of the green PE terminals.
	Insert the two white and brown wires 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. Take care of the white and brown colour code label below the terminal:  white = + (plus) brown = - (minus)
	Use a cable tie (cable binder) to fix the wires firmly on the PCB (printed circuit board) of the PM5-mA-IN2 plug-in module. The cable tie is important for strain relief. You need to fasten it very firmly in order to fix the thin wires.
	Remove the aluminium rail.

11.4.3 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).

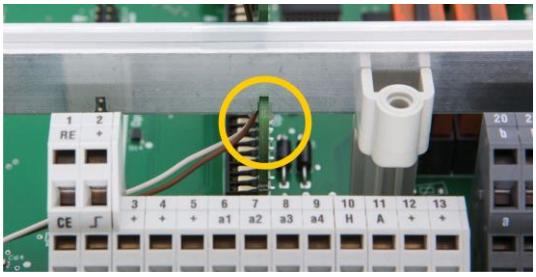
HAZARD!

Improper positioning

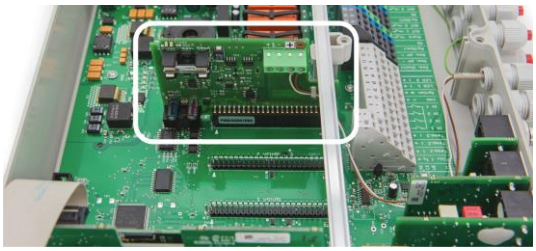
Improper (inaccurate) positioning of the plug-in module and applying too strong forces may bent or even break the contact pins of the plug-in connector.

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 picture.



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

12 Balance Tank Control menus

12.1 Help button

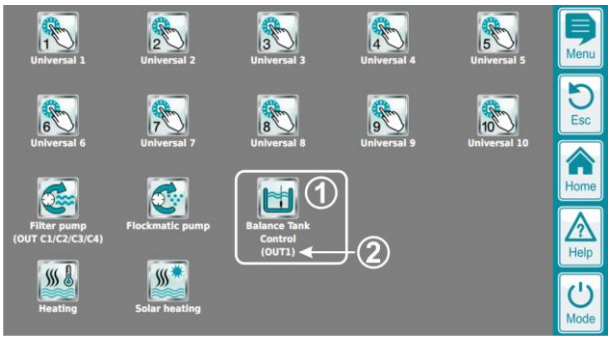
Please use the Help button 

to get context sensitive help information for menus and parameters on the device.

Help information for a parameter within a menu will also be displayed, if you click on the name of the parameter.

12.2 Balance Tank Control Main menu

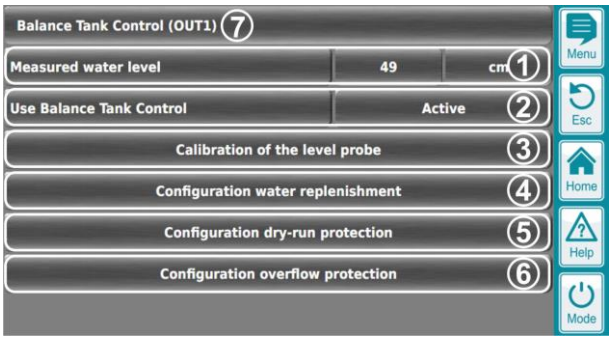
The Balance Tank Control has its own icon in the “Add-on functions” icon menu.



Add-on functions icon menu

(1) Balance Tank Control icon

(2) Indication of the switch output assigned for water replenishment



Balance Tank Control main menu

(1) Current water level measurement in centimetres.
Please do a calibration, if the displayed water level is not correct.

(2) Activate or deactivate Balance Tank Control
(activates or deactivates all 3 functions:
Water replenishment, dry-run protection and overflow protection)

(3) Calibration menu (check calibration parameters or recalibrate the level probe)

(4) Configuration menu for the water replenishment function

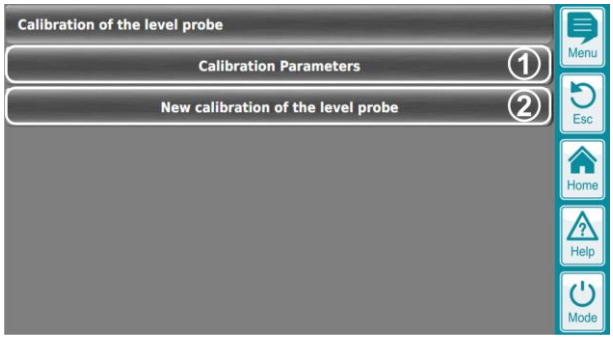
(5) Configuration menu for dry-run protection

(6) Configuration menu for overflow protection

(7) Switch output assigned for water replenishment

12.3 Calibration of the level probe

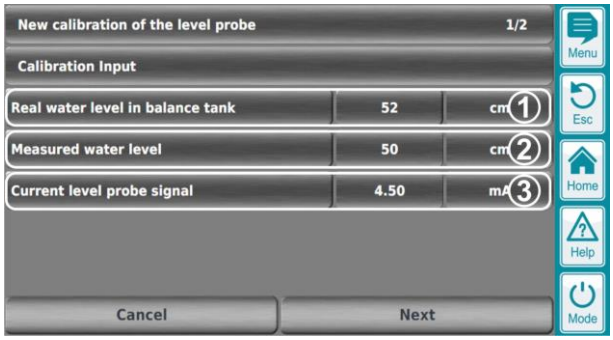
This chapter describes the calibration of the level probe. Make sure that the level probe is properly installed with its head touching the bottom of the balance tank.



Calibration main menu

(1) View the calibration parameters.
Includes the option to adjust the level probe offset (zero shift).

(2) Calibration of the level probe based on a manual reference measurement of the water level in the balance tank

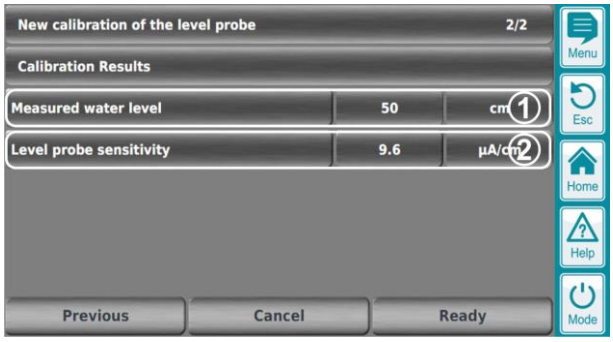


New calibration of the level probe (step 1/2: Calibration Input)

(1) Measure the current water level in the balance tank in centimetres (from the bottom) and enter the result here.

(2) Current level probe measurement. This will be adjusted to match the entered reference measurement.

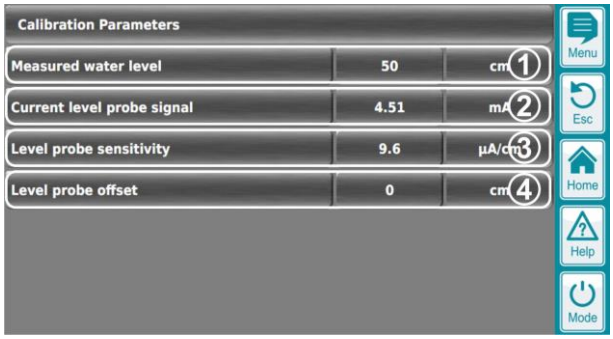
(3) Electrical current signal 4-20 mA from the level probe (typically 4 mA + 0,01 mA/cm)



New calibration of the level probe (step 2/2: Calibration Results)

(1) Current level probe measurement. This should now match the entered reference measurement. Deviations of up to 3 cm may occur and are acceptable.

(2) Level probe sensitivity calculated during calibration.
The sensitivity should be in the range from 8 to 12 µA/cm. If it is outside this range, please check your reference measurement and the proper installation of the level probe at the bottom of the balance tank.



Calibration Parameters menu

(1) Current level probe measurement.

(2) Electrical current signal 4-20 mA from the level probe (typically 4 mA + 0,01 mA/cm)

(3) Level probe sensitivity calculated during calibration.
The sensitivity should be in the range from 8 to 12 µA/cm. If it is outside this range, please check your reference measurement and the proper installation of the level probe at the bottom of the balance tank.

(4) Level probe offset (zero shift).
See instructions below for adjustment.

Adjustment of the level probe offset (zero shift)

Usually, the level probe offset (zero shift) is close to zero and does not need to be adjusted. Nevertheless, it is possible to adjust it to get the best possible accuracy for the water level measurement.

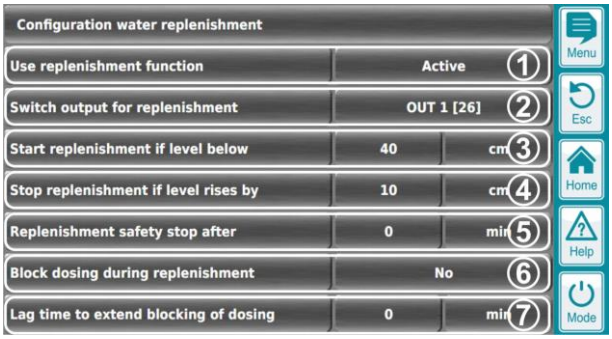
Please proceed as follows:

- Take the level probe completely out of the water
- Read the "Measured water level" display
- Enter the negative "Measured water level" as “Level probe offset”

Example

- Measured water level = 2 cm
- Level probe offset: Enter -2 cm

12.4 Configuration Menus for the individual functions



Configuration water replenishment

(1) Activate or deactivate the water replenishment function.
The function will only be active, if the global setting “Use Balance Tank Control” is also set to “active”

(2) Select a switch output used for water replenishment. Usually, a fresh water magnet valve is connected to this output. Refer to your PoolManager® or Analyt controller manual for the electrical installation.

(3) Water replenishment will be activated, if the measured water level drops below the limit entered here.

(4) Once water replenishment has been started, the water level must first rise, before the function is stopped again. Here you define by how many centimetres the water level must rise to stop replenishment.

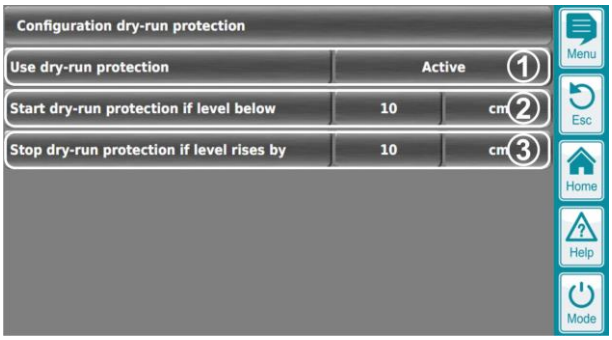
(5) You can set this parameter to activate a safety stop of water replenishment if the water level has not risen to the expected level after the given time. This may happen for example, if there is a leakage, which prevents the water level to rise. In this case, water replenishment will be stopped and an alarm will be signalled. The alarm must be manually quit to restart water replenishment.

Set to zero to deactivate the safety stop function.

(6) In some installations, water replenishment may have an effect on the measurement readings for pH and disinfection. The readings may not be correct during replenishment and this may result in inadequate dosing. To prevent this, you can activate this setting to block dosing during replenishment.

(7) The blocking of dosing during water replenishment can be extended after replenishment, if you set the desired lag time here. This is useful, if it takes some time after replenishment until the measurement readings of pH and disinfection get back to their correct and stable values.

Set to zero, if you do not want to extend the blocking of dosing.

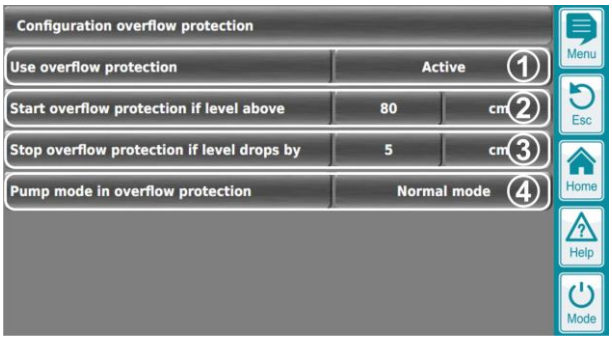


Configuration dry-run protection

(1) Activate or deactivate the dry-run protection function.
The function will only be active, if the global setting “Use Balance Tank Control” is also set to “active”

(2) Dry-run protection will be activated, if the measured water level drops below the limit entered here.

(3) Once dry-run protection has been started, the water level must first rise, before the function is stopped again. Here you define by how many centimetres the water level must rise to stop dry-run protection.



Configuration overflow protection

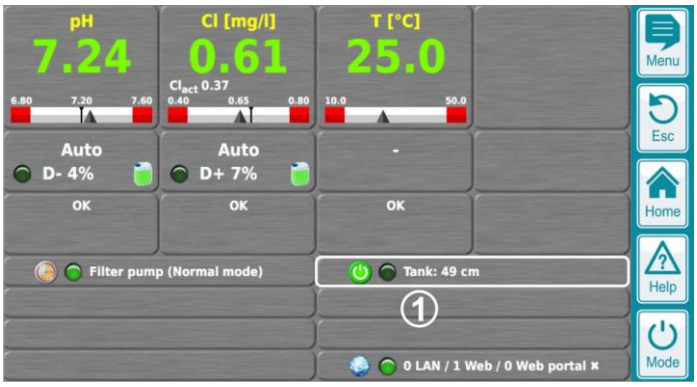
(1) Activate or deactivate the overflow protection function.
The function will only be active, if the global setting “Use Balance Tank Control” is also set to “active”

(2) Overflow protection will be activated, if the measured water level rises above the limit entered here.

(3) Once overflow protection has been started, the water level must first drop, before the function is stopped again. Here you define by how many centimetres the water level must drop to stop overflow protection.

(4) If you use a variable speed filter pump, you can select the pump speed during overflow protection.

12.5 Home Menu



(1) Display of the Balance Tank Control in the Home menu (“Tank:”)

- Display of the current water level measurement in centimetres
- Status button (see explanations below)
- Status LED (see explanations below)

	Balance Tank Control not displayed: Balance Tank Control is only displayed in the Home menu, if the function has been activated in the menu.
Tank: 50 cm	**Status button green / status LED off:** Balance Tank Control is activated in the menu, but currently none of the 3 functions is active (replenishment, dry-run protection, overflow protection)
Tank: 30 cm (refill)	**Status button green / status LED green / text “(refill)”:** Water replenishment is active
Tank: 29 cm (refill)	**Status button green / status LED yellow / text “(refill)”:** Water replenishment is active and blocks dosing. This is the case, if the setting “Block dosing during replenishment” is active in the menu.
Tank: 50 cm (lag time)	**Status button green / status LED off / text “(lag time)”:** Blocking of dosing is continued for the entered lag time after a replenishment.
Tank: 30 cm (stopped)	**Status button grey / status LED red / text “(stopped)”:** Replenishment has been stopped because the maximum allowed time has been exceeded (safety stop). The corresponding message in the “Alarm overview” must be quit to continue replenishment.
Filter pump (dry-run) Tank: 5 cm (refill)	**Status button green / status LED green / text “(refill)”, Filter pump LED red / text “(dry-run)”** Water replenishment and dry-run protection are both active. Dry-run protection forces the filter pump to stop.
Filter pump (dry-run) Tank: 5 cm (dry-run)	**Status button green / status LED red / text “(dry-run)”, Filter pump LED red / text “(dry-run)”** Dry-run protection is active and forces the filter pump to stop. Water replenishment is *not* active.
Filter pump (Normal mode) Tank: 90 cm (overflow)	**Status button green / status LED yellow / text “(overflow)”, Filter pump LED yellow** Overflow protection is active and forces the filter pump to run.

13 Technical Data

Level probe	
Probe material	Titanium with plastic protective cap
Type of measurement	Relative hydrostatic measurement with integrated pressure equalization hose
Measurement range	0 to 1,6 bar relative pressure
Measuring signal	4 - 20 mA, 2-wire
Sensitivity	typ. 10 µA/cm
Power supply	24 V DC (from PM5-mA-IN2 plug-in module via 4-20 mA current loop)
Step response time	2 ms
Operating temperature range	0 to 50 °C The level probe must not freeze in the medium!
Storage temperature range	-20 to +70 °C, dry
Dimensions	Probe length 79,6 mm Probe diameter 26,3 mm
Level probe cable	
Cable length	5 m
Cable diameter	8,4 mm
Cable material	FEP
Bending radius	Moving: min. 140 mm Fixed: min. 70 mm
Calibration	
Sensitivity (slope)	1-point calibration based on a manual reference measurement of the water level in the balance tank
Offset (zero shift)	Manual adjustment in the “Calibration Parameters” menu.
Accuracy (calibrated)	±3 cm
Connection box	
Dimensions	81 x 83 x 55 mm (125 x 83 x 55 mm incl. cable glands) Length of cable glands 22 mm
Connection cable	
Cable type	3x 0,14 mm²
Cable diameter	3,5 mm
Material	PVC mix
PM5 mA-IN2 plug-in module	
Inputs	2x input 4 – 20 mA
Power supply for sensor	24 V DC via 4-20 mA current loop
Fuse	5 x 20 mm / 50 mA slow

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