Pump Controller Type ABS
PC 111/211

81300096G (08/2023)

en

Installation and User Guide

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ABOUT THIS GUIDE, AUDIENCE AND CONCEPTS

This guide describes the pump control units PC 111/211. The only difference between the two pump controllers is that PC 111 is intended for one pump whereas PC 211 can control two pumps.

Prerequisites

This guide assumes that you already are acquainted with those pumps you are set out to control and the sensors connected to PC 111/211.

The pump controller can either use an analogue level-sensor, which measures the water level in the pit, for precise control over start and stop levels, or it can use simple float switches placed at start and stop levels. It is also possible to use only a start float, and let the pump(s) stop after a certain time or when the measured phase angle of the motor current has changed a certain amount (indicating that the pump is running dry).

An analogue level-sensor has the advantage over float switches that it is more robust (can not get stuck or be mechanically jammed), is more accurate, and is more flexible (you can easily change the start and stop levels). Also, you can get a reading of the water level in the pit.

Float switches can be used in addition to an analogue level-sensor, as a backup, and as an additional alarm input.

You need to know if the pump(s) should be exercised in case of long idle periods. If the installation has two pumps, you need to know if the pumps should alternate.

Reading guide

For installation, read Chapter 1 *Installation*. Before you make any settings, or use the pump controller, read Chapter 2 *Overview of functions and usage*; it describes the general functionality and the meaning and usage of the controls on the panel. Finally, make sure that all settings according to Chapter 3 *Menus: status and settings* are suitable for your application.

Glossary and conventions

Text in blue indicates a hypertext link. If you read this document on a computer, you can click on the item, which will take you to the link destination.

Pump exercising: Long idle periods in a corrosive contaminated environment are not good for pumps. As a countermeasure, they can be “exercised” at regular intervals, which will reduce corrosion and other detrimental effects.

Cos φ: Cosine of the phase angle φ between the motor current and the voltage.

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1 INSTALLATION

1.1 *Mount the controller*

Mount the controller on a 35 mm DIN rail. The physical dimensions of the controller is:118 x 128 x 72 mm (H x W x D); depth from the panel surface is 55 mm. It easily snaps onto the rail, but to remove it you may need to pull/bend the tab at the side, using a screwdriver.

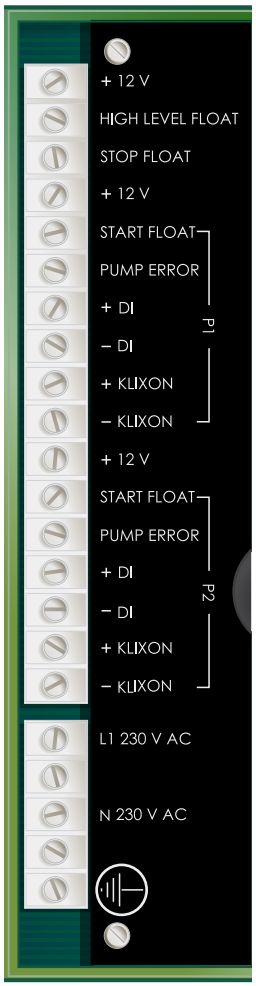
1.2 *Connect the controller*

Connect the controller according to Table 1-1 and Table 1-2. For the leakage monitors, we recommend a separate reference wire from each pump chassis to the *leak. ref* terminal; this will provide the best protection against magnetic induced ground currents. A simplified scheme may work in installations with small magnetic disturbances: in this case, you can use a common reference wire for both leakage monitors, provided that it is also connected to the earth/ground terminal on the pump controller.

Table 1-1. *Terminals at the bottom side*

Usage/Description
+ 12 V for float switches
High-level float (for alarm). Normally open
Low-level (stop) float [i]
+ 12 V for float switches and pump error switch
Start-float for pump 1. Normally open
From switch/monitor for motor error [ii]
Leakage monitor for pump 1 Connect *LEAK. REF* to pump chassis
Temperature monitor [iii] for pump 1 *TEMP. COM.* is common with 0 V
+ 12 V for float switches and pump error switch
Start-float for pump 2. Normally open
From switch/monitor for motor error [ii]
Leakage monitor for pump 2 Connect *LEAK. REF* to pump chassis
Temperature monitor [iii] for pump 2 *TEMP. COM.* is common with 0 V
L1 (live, ***must*** be L1 in Figure 1-1) 230 V AC power
N (neutral) 230 V AC power
Earth/ground

Only PC 211



i. Can be configured for normally open/closed.

ii. For instance an external motor protector or a manual switch. Connect the switch to + 12V. Active signal (on) blocks the pump and issues an alarm.

iii. For instance a PTC thermistor, such as Klixon, or a thermal switch.

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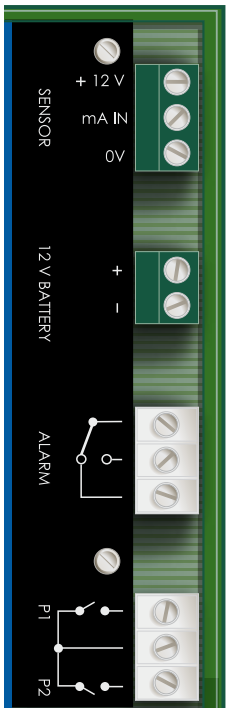
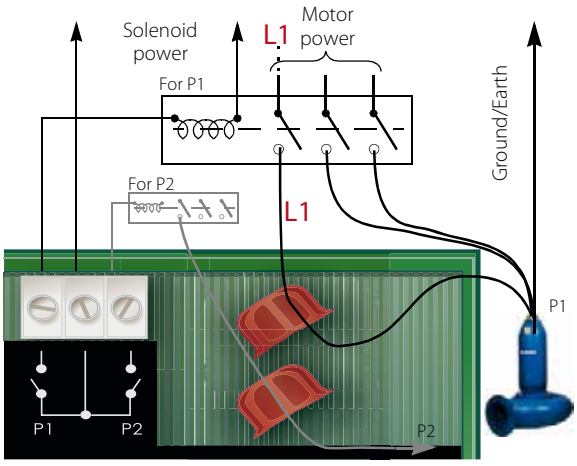


Table 1-2. *Terminals at the top side*

Usage/Description
For power supply to an analogue level-sensor
Analogue level-sensor input, 4–20 mA [i]
0 V reference for an analogue level-sensor
Lead-acid battery for backup. Charger is included in PC 111/211.
Relay for alarm. (Max 250 VAC, 4 A, 100 VA resistive load)
Normally open
Normally closed
Relay for start/stop of Pump 1
(Max 250 VAC, 4 A, 100 VA resistive load)
Relay for start/stop of Pump 2, or starting capacitor in PC 111 [ii]

i. Senses current in the range 4–20 mA.
ii. In PC 111, the function of the relay is to temporarily connect a starting capacitor to a single-phase motor (P1) during startup.

PC 111/211 has a current transformer for each pump, where the pump is connected so that one conductor is passed through the transformer. This makes it possible to not only measure the current consumption, but also the phase angle (cos φ) of the current. The controller can use these values and function also as a motor protector. Therefore, if you intend to use this functionality (either the current consumption measurement or the motor protector feature), connect each pump according to the following figure:



Note that L1 must be the same phase that is connected to PC 111/211 in Table1-1.

Figure 1-1 To exploit the feature of PC 111/211 to measure current and phase angle, connect each pump, using an external relay, according to the figure. Correct measurement of the phase angle for a 3-phase pump requires that the L1 wire is the same phase as the L1 wire connected to PC 111/211 according to Table 1-1.

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2 OVERVIEW OF FUNCTIONS AND USAGE

PC 111 and PC 211 are control units for one and two pumps respectively. These units have the same functionality in terms of their capability to control pumps and manage alarms — the only difference is that PC 211 is intended for two pumps whereas PC 111 is intended for one pump.

Figure 2-1 shows the panel of the pump controller. The main view of the two-row display dynamically shows the pit status (the level in the pit or the status of start floats) and if there are any alarms. The unit will always revert to this view after 10 minutes of inactivity in any other view.

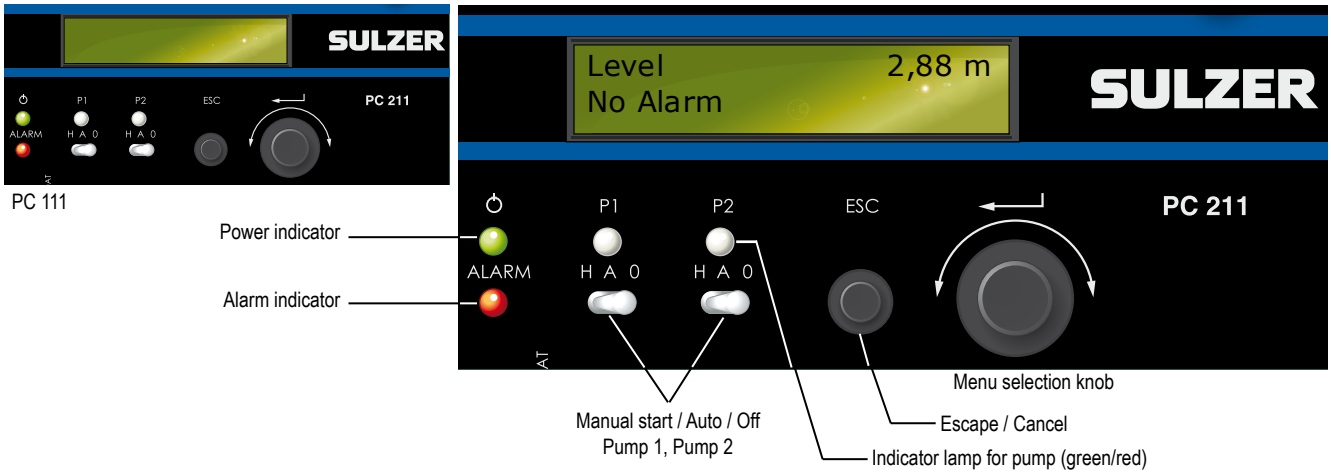

Figure 2-1 For each pump (P1 and P2), there is an indicator lamp showing whether the pump is running or not, and below that, a switch that controls whether the pump is in Auto mode (A), is turned off (0), or you attempt to start it manually (H).
A green lamp at the very left indicates that the unit is powered. The red alarm indicator will blink whenever there is an unacknowledged alarm. When the alarm is acknowledged, the light turns steady red and remains so until the cause disappears.
The ESC button will cancel or reset the current menu operation, or take you to the main view.
The menu selection knob has two functions: by rotating it in either direction, you scroll and select menu items; by pressing it, you enter into a menu, confirm a choice/operation, or acknowledge an alarm.

Power and alarm indicator

The two leftmost indicator lamps show:

- A green light indicates that the unit is powered.
- The red alarm indicator blinks whenever there is an unacknowledged alarm, and the display tells you the type of the alarm. When the alarm is acknowledged, the light turns steady red and remains so until the cause disappears.

Pump switches

PC 211 has two switches, PC 111 has one switch, with which you can manually start or stop the pump(s). It is a 3-way switch with the following functions:

- The leftmost position (H) is a momentary state, which will attempt to start the pump, overriding the pump controller.
- The middle state (A) sets the pump in Auto, which means that the pump controller is controlling the pump.
- The rightmost state (0) turns the pump off (disables it).

Pump indicator lamps

Above each switch, an indicator lamp shows:

- A green light indicates that the pump is running.
- A blinking green light indicates: attempting to start the pump.
- A red light indicates pump failure.

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Escape/Cancel The ESC button will cancel or reset the current menu operation, or take you to the main view.

The menu selection knob The menu selection knob has two functions:

- By rotating the knob in either direction, you do one of the following:
  - Scroll through menu items.
  - Change the value of a menu item (the value is either a number or an item in a list of alternatives; to confirm/save the change, press the knob).
- By pressing the knob, you do one of the following:
  - Enter into a menu.
    (You will then see a blinking cursor where a value can be changed.)
  - Confirm/save/perform a choice or an operation.
  - Acknowledge an alarm.

When the display shows that there is an unacknowledged alarm, press the knob to bring up a prompt to acknowledge the alarm, and if you press the knob once more, it acknowledges the alarm.

When the display shows that there is an active alarm, press the knob to bring up a list of details about the alarms; rotate the knob to scroll the list. Press ESC to go back to the main view.

How to adjust the contrast To adjust the contrast of the display, press the ESC button and rotate the knob.

How to enter values Rotate the knob to the desired value. (A value is either a number or an item in a list of alternatives.)

Battery backup PC 111/211 includes a charger for a lead-acid battery backup. During battery operation (no 230 V power), the pump relays are always off. The power indicator will remain on, and the alarm indicator will be on. The alarm relay will function according to the setting in Table 3-2 (Func Alarm Relay).

3 MENUS: STATUS AND SETTINGS

This chapter describes all settings that need to be properly set before the pump controller is used. How to use the menu selection knob to enter and save values is described in Chapter 2 Overview of functions and usage.

3.1 *Select language*

1. Rotate the menu selection knob anticlockwise one step (or until you see the menu item Select Language).
2. Press the knob.
3. Scroll to the desired language by rotating the knob.
4. Press the knob to save the choice.

3.2 *Menus: status information and all settings*

The first 7 clockwise items are only intended to show the current status. Table 3-1 shows these items. The other menu items are settings you can make. Table 3-2 shows all those items.

The menu system adapts dynamically to show only those items that currently are “usable”; for instance, if Sensor Type is set to Start/Stop float rather than Analogue, you will not see the menu items for setting start and stop levels. Likewise, the menu on PC 111 will not show items related to pump 2.

Table 3-1. *Menu items that show current status, sorted clockwise*

Menu item	Value
Pit status	The main view, which shows the pit status (the level in the pit or the status of start floats) and alarm status.
Current P1	The electric current and its phase angle.
Cosine φ P1	
Current P2	
Cosine φ P2	
Run. Time P1	The accumulated running time of the pump. (This value can be edited.)
Run. Time P2	
No. Starts P1	The accumulated number of times the pump has started. (This value can be edited.)
No. Starts P2	

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Table 3-2. *Settings, sorted clockwise (Sheet 1 of 2)*

	Menu item	Value	Comment
	Sensor Type	{Analog, Start/stop float	Choose method of level control: an analogue level-sensor or start/stop floats.
	Scaling 100%=	Value in m/ft/bar	*This section is for an analogue level-sensor.* For Unit, select the unit you will use for scaling. (For ft, you get foot with decimals, not foot/inch.)
	Scaling 0%=	Value in m/ft/bar	
	Unit	{m, ft, bar}	
	Filter	Seconds	
	High-Level Alarm	Chosen unit	
	Low-Level Alarm	Chosen unit	
	Start Level P1	Chosen unit	
	Stop Level P1	Chosen unit	
	Start Level P2	Chosen unit	
	Stop Level P2	Chosen unit	
	Start Criteria	{1 float + time, 2 start floats}	*Start criteria using floats with PC 211.* Unless Start Criteria is 2 start floats, the second pump will start Time to Start seconds after the (single) float is triggered.
	Time to Start	Seconds	
	Stop Criteria	{Stop float, Time, Delta cos φ}	*Stop criteria using floats.* If Stop Criteria is Time, a single pump will stop Time to Stop seconds after the start float releases, whereas two running pumps will stop after half that time. If Stop Criteria is Delta cos φ, the pump(s) will stop when cosine of the phase angle φ has changed Delta cos φ. See note[i] for details.
	Stop Float NO/NC	{Normally open, Normally closed}	
	Time to Stop	Seconds	
	Delta cos φ	Value 0 –1	
	Alternation	{Off, Both stopped, Each pump stop}	Unless Off, it will switch to the other pump, either after each pump stop, or after both pumps have stopped.
Only PC 111	Start Cap. Time	Seconds	The time during which the relay P2 is activated after start of pump P1. Used to temporarily connect a starting capacitor to a single-phase motor during startup. Default is 1.2 seconds.
	Start Delay	Seconds	To suppress spikes and noise, triggered thresholds from sensors can be required to persist for a certain time before a state change is accepted.
	Stop Delay	Seconds	
P1	Curr. Sensor P1	{On, Off}	PC 111/211 has a current transformer for each pump, see footnote[ii]. If no conductor is passed through the transformer, set Curr. Sensor to Off! Note: It is important to set Nominal Curr. to the reading you get in normal conditions! If left at zero, it disables all pump blockings and alarms related to current or phase loss. In the group Dry Run Detect, menu item Low Current or Delta cos φ will only appear if it has been selected as the method for Dry Run Detect,. Set a value that indicates that the pump is running dry. If Low Current is selected, the pump will be blocked when the current is < Low Current. If Delta cos φ is selected, the pump will be blocked when cos φ changes more than Delta cos φ. If Dry Run Reset is > 0, the alarm will be reset (and the pump deblocked) after that time.
P1	Motor Prot. P1	{On, Off}	
P1	Nominal Curr. P1	Amperes	
P1	Dry Run Det. P1	{Off, Low current, Delta cos φ}	
P1	Low Current P1	Amperes	
P1	Delta cos φ P1	Value 0 –1	
P2	Curr. Sensor P2	{On, Off}	
P2	Motor Prot. P2	{On, Off}	
P2	Nominal Curr. P2	Amperes	
P2	Dry Run Det. P2	{Off, Low current, Delta cos φ}	
P2	Low Current P2	Amperes	
P2	Delta cos φ P2	Value 0 –1	
	Dry Run Reset	Minutes	
	Curr Alarm-Delay	Seconds	

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Table 3-2. *Settings, sorted clockwise (Sheet 2 of 2)*

Menu item	Value	Comment
P1 Backup Start	{On, Off}	If set to On, and the high-level float turns on, the pump(s) will run for a period of Backup Run Time after the float has turned off.
P2 Backup Start	{On, Off}	
Backup Run Time	Seconds	
Exercise P1	{On, Off}	Can "exercise" the pumps if they have been standing still for Max Still Time. If the current level is below the stop level/stop float, the pump(s) will run for Exercise Time, otherwise, the pump(s) will run until stop level/stop float is reached.
Exercise P2	{On, Off}	
Exercise Time	Seconds	
Max Still Time	Hours	
Leakage Mon. P1	{Off, Normal, Block pump}	Leakage monitor. With Normal, an alarm will be issued when the leakage monitor conducts, but the pump will not be blocked.
Leakage Mon. P2	{Off, Normal, Block pump}	
Temp. Monitor P1	{Off, Man reset, Auto reset}	Temperature monitor, usually a PTC element. When the temperature exceeds the element's threshold, the pump will be blocked. With Auto reset, the alarm (and blocked state) will be reset when the temperature goes down again. With Man reset, it must be manually reset.
Temp. Monitor P2	{Off, Man reset, Auto reset}	
Buzzer	{On, Off}	If On, and there is an unacknowledged alarm, a buzzer will sound for Max Buzzer Time or until acknowledged. If Max Buzzer Time is zero, there is no maximum time.
Max Buzzer Time	Minutes	
Backlight Time	Minutes	A value of zero means that the backlight will always be on.
Func Alarm Relay	{Buzzer, Active alarm}	If set to Buzzer, the relay will follow the buzzer timer or until acknowledged. If set to Active alarm, it will be active as long as there is an active alarm.
Password	{On, Off}	If the setting is changed, you must enter the current password. The default password is 2.
Change Password	Integer	If you have forgotten the password, contact the distributer to unlock the controller.
PC 111/211 Ver	Version	
Select Language	Select a language	

i. Cos φ is measured about 5 seconds after the pump has started. If either Stop Criteria or Dry Run Detect is set to Delta cos φ, then the measured value, subtracted by the chosen Delta cos φ, is the threshold that will stop the pump. If both functions are active, please set Delta cos φ for the Stop Criteria lower than Delta cos φ for the Dry Run Detect — the pump will then stop without Dry Run Detect issuing an alarm.

ii. The pump should be connected so that one conductor is passed through the current transformer. This enables the controller to monitor the current and issue an alarm if a measurement indicates that the pump is running dry. In addition, the controller can function as a motor protector that complies with the standard for Class 10 protectors — the time to block the motor depends on how much the current exceeds Nominal Curr. It can also measure the phase angle (cos φ).

4 TECHNICAL DATA AND EMC COMPATIBILITY

4.1 *Technical data*

Ambient operating temperature:	–20 to +50 °C
Ambient storage temperature:	–30 to +80 °C
Mounting:	DIN rail 35 mm
Humidity:	0–95 % RH non-condensing
Dimensions:	H x W x D 118 x 128 x 72 mm Depth is 55 from panel surface
Power supply:	230V AC (210-250 V)
Power consumption:	< 30 mA 230 V AC, <120 mA 12 V DC
Max load on relays:	250 VAC, 4 A, 100 VA resistive load
Non-analogue input voltage:	5–34 V DC
Non-analogue input resistance:	5 kohm
Analogue sensor:	4–20 mA
Analogue input resistance:	110 ohm
Temperature sensor:	PTC, limit: >3 kohm
Leakage sensor:	Limit: <50 kohm
Analogue input resolution:	12 bits
Maximum length of I/O cables:	30 meters
Charge current for battery:	Max 80 mA, 13.7 V DC
Weight	0.45 kg

4.2 *Electromagnetic compatibility*

Description	Standard	Class	Level	Remarks	Criteria [i]
Electrostatic discharge immunity (ESD)	EN 61000-4-2	4	15 kV	Air discharge	A
		4	8 kV	Contact discharge	A
Fast transient/burst immunity	EN 61000-4-4	4	4 kV		A
Surge immunity 1.2/50 µs. See note [ii]	EN 61000-4-5	4	4 kV CMV		A
		4	2 kV NMV		A
Immunity to conducted disturbances, induced by RF fields	EN 61000-4-6	3	10 V	150 kHz – 80 MHz	A
Immunity to radiated RF fields	EN 61000-4-3	3	10 V/m	80 MHz – 1 GHz	A
Immunity to short interruptions and voltage variations	EN 61000-4-11				A

i. Performance criteria A = Normal performance within the specification limits.
Performance criteria B = Temporary degradation or loss of function or performance that is self-recoverable.

ii. Maximum length of I/O cables is 30 meters.

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