

Sema Ltd.

Water Pump Controllers

11kw and above

V 2.6.4



WPC 11+

This manual applies to all Sema Water Pump Controllers above 7.5Kw

Sema Part Numbers

WPC3-11 11 Kw 400 Vac three phase controller c/w transducer

WPC3-15 15 Kw 400 Vac three phase controller c/w transducer

WPC3-22 22 Kw 400 Vac three phase controller c/w transducer

The three sizes listed above are ex -stock. Larger sizes are ordered to suit. There are three delivery options with the larger sizes 5 week (standard) 3 week and 1 week.

The part number for larger sized controllers is WPC3– followed by the size of the drive in Kw. E.g. WPC3-45

Contact details

Sema Ltd

P.O. Box 374 Pukekohe 2340 New Zealand

www.sema.co.nz

info@sema.co.nz

+64 9 3580800

+64 9 3580700

Fax +64 9 8010031

Contact Maurice Coates on +64 27 9396240

maurice.coates@sema.co.nz

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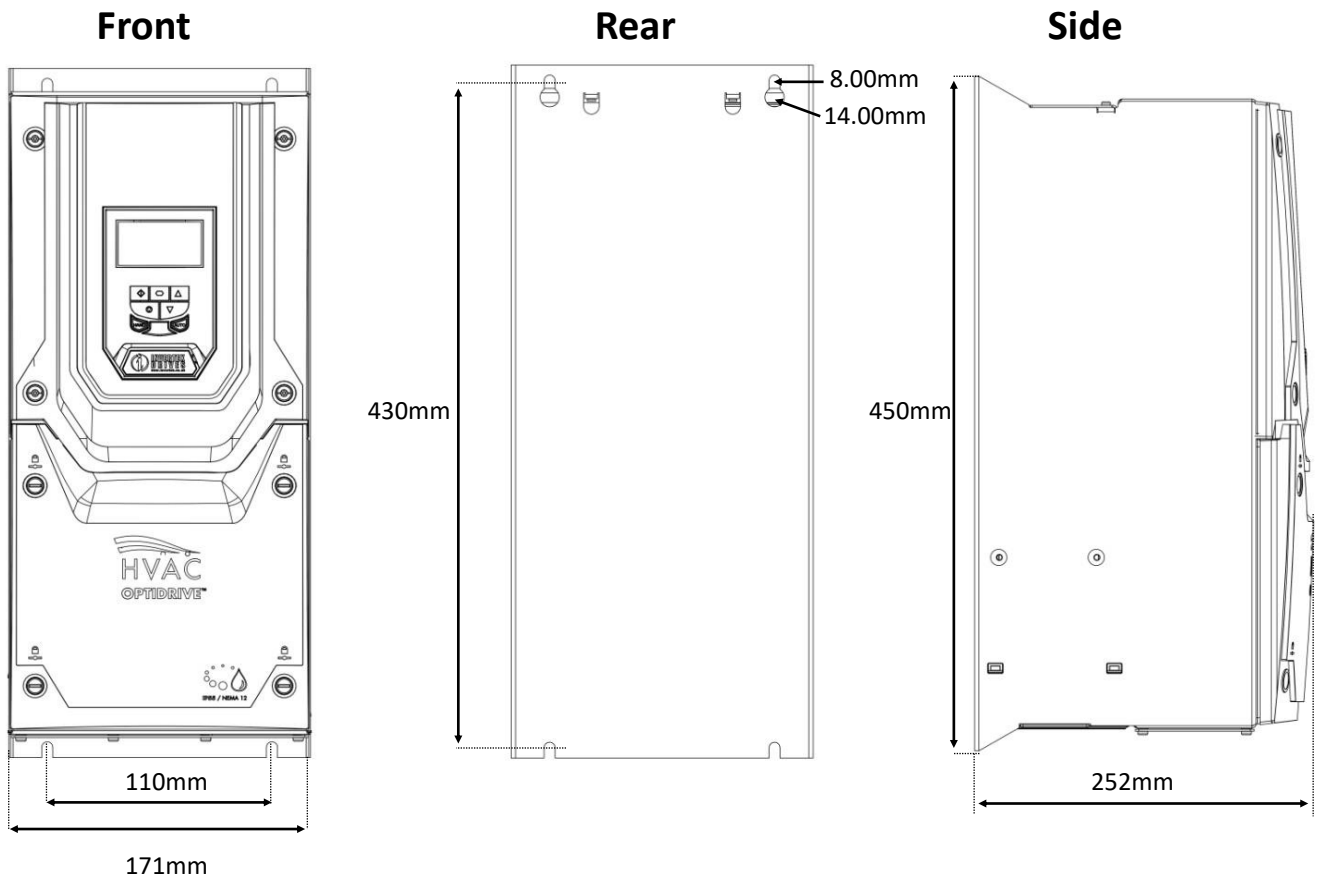
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Installing

Mounting

The 11, 15 and 22Kw drives share the same dimensions:

Please ask Sema for details on the larger units:



The controller must be mounted vertically with sufficient clearance above and below the drive to allow air to circulate freely.

The operating temperature range is -10°C to 40°C .

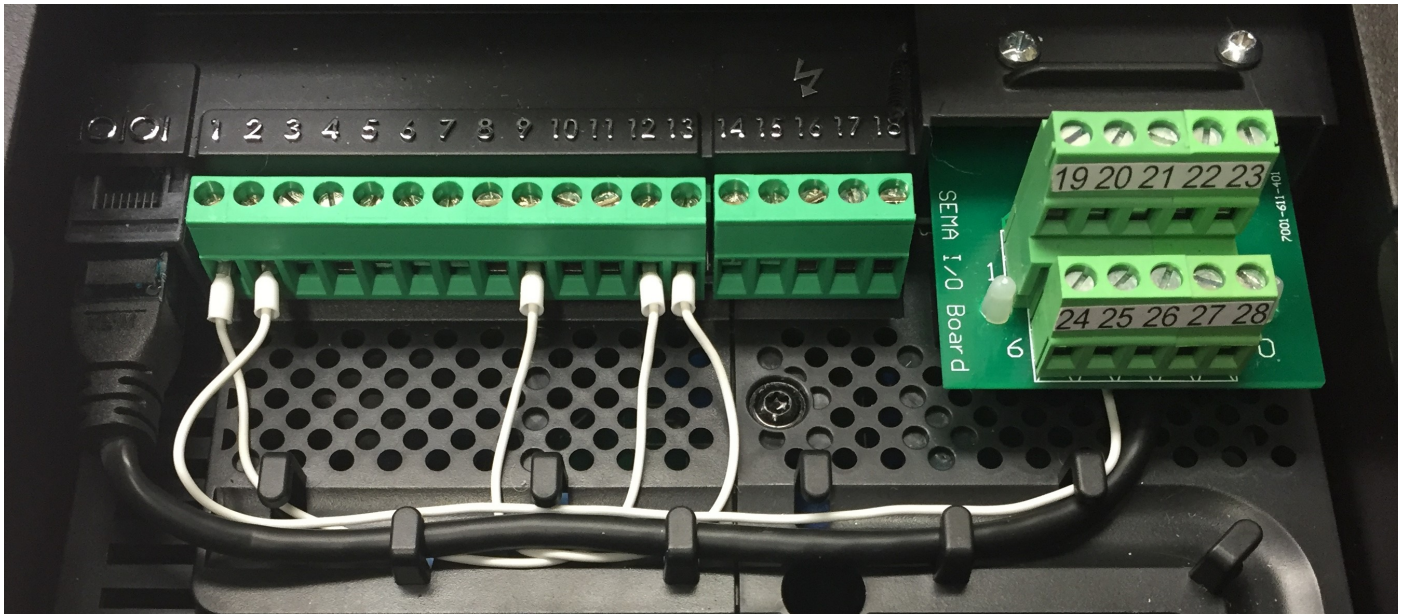
Wiring

All wiring must be performed by a suitably qualified person who is familiar with, and ensures compliance with, the appropriate Electrical Wiring Regulations.

There is no need to use screened mains cabling.

EMC screened cable must be used to connect the controller and motor. An EMC gland must be fitted to the motor and the preinstalled EMC Gland must be used in the controller.

All wiring that exits the controller including low voltage control cabling must be screened.



The picture above shows the control terminals of the WPC. Please note that, on some models, terminals 19 to 28 are not installed as they have no function. See [page 8](#). The wiring and links shown in the picture are installed by Sema and are necessary for the correct functioning of the controller. Please do not remove or alter any of these.

While there are other optional components which may be wired to these terminals (see [page 8](#)) the only additional piece of wiring which is essential to make the unit operate is from the transducer. Connect this as follows:

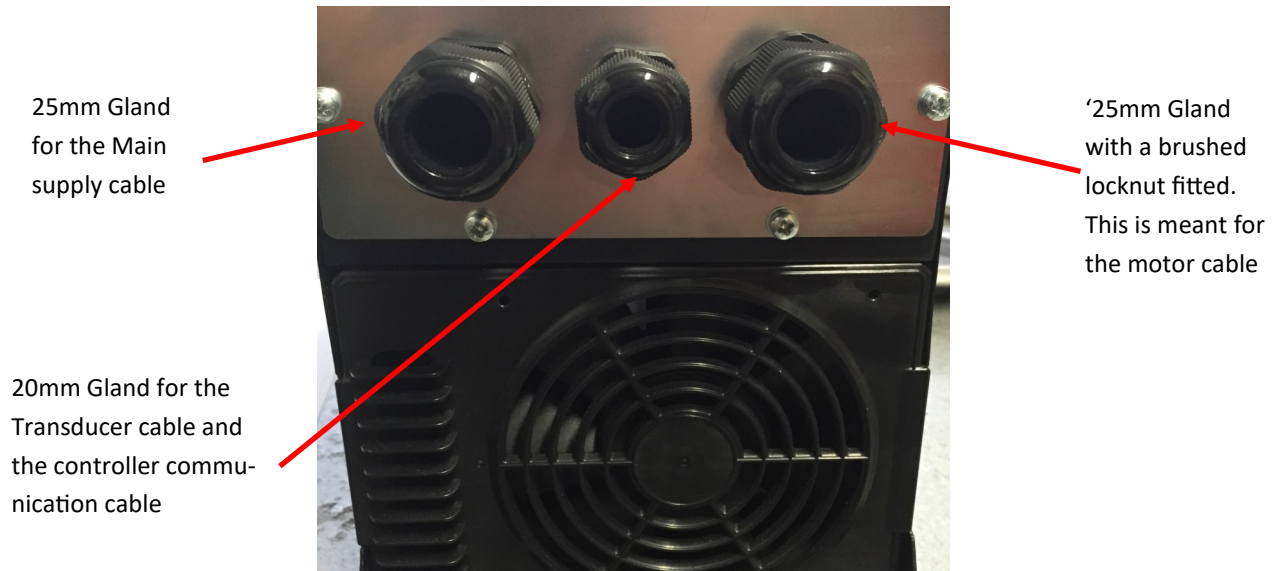
RED wire to terminal 1.

BLACK (in some cables this may be blue) wire to terminal 6.

Green/Yellow striped (in some cables this may have a clear covering) wire to terminal 7 or 9



Three Glands are fitted to the bottom of the VSD.



The motor gland has a brushed locknut fitted to it (see below). Sometimes well intentioned installers remove this gland and locknut and replace it with an EMC gland. Please note that the brushed locknut has an equal or greater performance to an EMC gland and that there is nothing to be gained by replacing it. To terminate the screen of the motor cable to the brushed locknut simply strip back enough of the plastic sheath so that the screen can contact the brush before inserting the cable through the gland. This will make an extremely effective EMC earthing connection and also maintain the units waterproofing rating through the use of an IP68 gland.

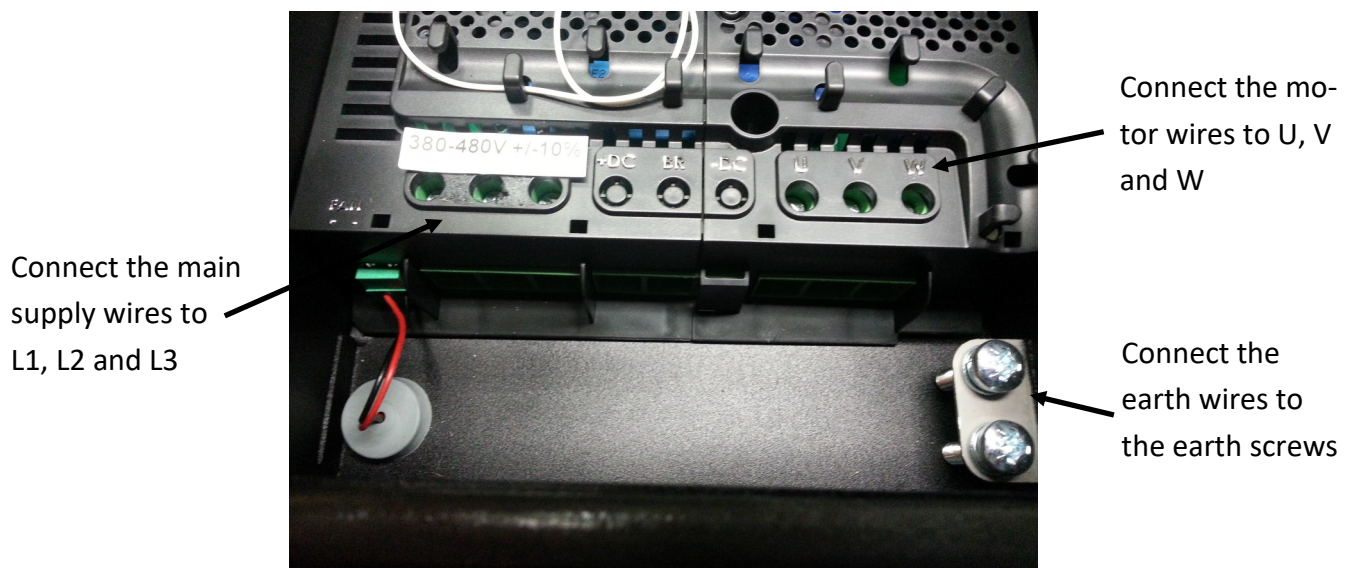


Emergency Mode: If the Transducer fails the WPC will stop. This is done to prevent possible over pressurising of the system. Because a Transducer isn't a device which is readily available in all parts of the world an Emergency Mode has been provided to enable the unit to run from a pressure switch.

To activate Emergency Mode:

1. Turn off the power and wait until the screen is dark .
2. Connect a Pressure Switch between terminals 1 & 2 (It doesn't matter whether you leave the pre-installed white wire in terminal 2 or not.)
3. Turn on the power and the unit will now detect the Pressure Switch, it will respond by activating its emergency mode and act as an on/off controller in response to the input from the pressure switch.

Power and Motor Connections



To reverse the direction of rotation of the motor change over any two of the three motor wires (U,V and W)

Description of control terminals

Terminal	Signal	Description
1	+24VDC	The RED Wire from the transducer is connected here. The Commons for the OPTIONAL emergency pressure switch (terminal 2) , the OPTIONAL pressure selector switch (terminal 3) and the OPTIONAL remote interlock are connected here.
2	EMERGENCY PRESSURE SWITCH	This terminal is used by the Sema controller as a safety shut down. Do not disconnect the pre-installed wire unless the transducer has failed and you wish to connect a Pressure switch to run the WPC in emergency mode. In this case the pressure switch is connected between terminals 1 and 2. The pre-installed wire can then either be removed or left in place.
3	Pressure selector switch	When this input is off Desired Pressure 1 is used, when it is on Desired Pressure 2 is used.
4	External Interlock	As supplied by Sema there is a link between terminal 1 and terminal 4. Optional remote interlocks can be installed in place of this link. When the connection between terminal 1 and terminal 4 is open the WPC will stop.
5	No user connection	This terminal is not used by the Sema controller. Do not connect.
6	4 to 20 ma analogue	The BLACK (please note that, in some cables, this wire may be BLUE) transducer
7	0V	The Yellow/Green or CLEAR transducer wire is connected here. This is the screen.
8	No User connection	
9	0V	
10	No User connection	
11	No User connection	
12	No User connection	
13	No User connection	
14	Relay 1 Common	Relay 1 turns on when the controller has a fault
15	Relay 1 N.O.	
16	Relay 1 N.C	
17	Relay 2 Common	Relay 2 turns on when the unit is running
18	Relay 2 N.O.	

Setting up and Operation

Using the keypad



Description:

- ♦ **ESC** The escape key functions in the same manner as the escape key on a computer it allows you to exit without saving parameters and also allows you to go back a step when going through the initial setup routine.
- ♦ **UP ARROW** Increases the digit immediately above the cursor when entering parameter values and scrolls through a menu list.
- ♦ **ENTER** Accepts and saves a value which has been entered. ***Press and hold for 3 seconds to access the Function menu from the main running screen.***
- ♦ **MAN** Short for Manual, holding this button down will gradually accelerate the pump to full speed
- ♦ **LEFT ARROW** Moves the cursor one position to the left when entering parameter values.
- ♦ **DOWN ARROW** Decreases the digit immediately above the cursor when entering parameter values and scrolls through a menu list.
- ♦ **RIGHT ARROW** Moves the cursor one position to the Right when entering parameter values.
- ♦ **ON OFF** Press once to turn the controller off, press again to turn the controller on. **After power up the controller will always start in the 'on' state.**

Hint: When entering numbers use the left and right arrow keys to move the cursor and the up and down arrow keys to change the number above the cursor.

Initial Set Up

A few seconds after powering the unit up for the first time, or after re-initialising it, the screen below will be displayed.



The only valid key which can be pressed is the ENTER key and the only way of stopping this screen from appearing is to complete the setup routine.

Please note that, if you make a mistake and enter the wrong value in one of the steps, the ESC key can be used to go back a step. You can go back as many steps as you like even right to the start of the setup routine if necessary.

The settings that you enter are only saved after you complete the last step so, providing you haven't completed the final step, you can always start setup again by turning off the power and then powering up again.

The controller can also be re-initialised. See the 'Changing Parameters' section for instructions on how to do this.

There are 11 steps in the setup routine and they are as follows:-

1. **ENTER THE MOTORS NAMEPLATE VOLTAGE:** Use the arrow keys to alter the value.
2. **ENTER THE MOTORS NAMEPLATE CURRENT:** Use the arrow keys to alter the value.
3. **ENTER THE MOTORS NAMEPLATE RPM:** Use the arrow keys to alter the value.
4. **ENTER THE MOTORS MAXIMUM SPEED:** Here you can enter the maximum operating RPM of the motor. This figure may be adjusted up to double the motors rated nameplate RPM but please note that very few pumps can be operated at this sort of speed. If you are in doubt about the maximum speed that your pump can be operated at then please set this figure to the same value as the Motors Rated Nameplate speed. Note that this is the value that appears by default.
5. **ENTER THE MOTORS MINIMUM SPEED:** This figure is also determined by the minimum speed that your pump can successfully run at. If you are in doubt then the default figure can safely be used.
6. **MOTOR DIRECTION CHECK:** Pressing the up arrow will cause the motor to run at low speed for a couple of seconds so that you can check that the direction of rotation is correct. If it isn't then turn off the power and, after the controller screen goes completely dark, remove the controller terminal cover and swap any two wires connected to U,V and W. Once this is done turn the power on again and you will be brought back to this step, all of your previous programming will have been saved. Confirm that the direction is now correct and then press ENTER to continue.

7. First Set-Point. Enter the pressure (in Bar) that you would like the system to operate at when the input connected to terminal 3 is OFF.

8. Second Set-Point. Enter the pressure (in Bar) that you would like the system to operate at when the input connected to terminal 3 is ON.

9. ENTER THE MAXIMUM ALLOWED RUN TIME. Enter the maximum time (in HOURS) that the controller is allowed to run continuously for before it will shut down and display an error. Setting this to 0 disables this function.

10. LoP (Loss of Prime). This step is for checking the current that the motor draws when the pump is not pumping water, you can run the pump by pressing and holding the MAN key. This figure can then be used in the next step as the Loss of Prime level for the motor . To obtain this figure either run the pump empty or block off its outlet so that it is not pumping water. Note that, if the feed to the pressure vessel cannot be shut off, then the pump must be run until the pressure vessel is completely up to pressure. You will be able to tell when this has happened as the motor current will stop reducing.

11. LoP Current Level. Enter the figure that was obtained in step 10. To turn off the LoP function set this figure to zero.

This completes setup, the controller is now fully configured and customised for this installation Please read the following sections which describe the running screen and how to alter parameters on a controller which has already been configured.

Running



MODE Five different modes may be displayed here:

1. **RUNNING** This is the normal mode which will be displayed when the pump is running. It also displays how long the unit has been running continuously for.
2. **READY TO RUN** If there is no demand for water the unit will stop the pump motor and display this message. This indicates that it is healthy and will start as soon as there is a demand for water
3. **STOPPED** The ON/OFF button has been pressed and the unit will not run. (Press the button again to put the unit in Run mode).
4. **MANUAL** The Manual Push Button is being held down.
5. **EMERGENCY MODE.** At power up the unit detected that there was a pressure switch connected between terminals 1 and 2. It has put itself into emergency mode and will turn on and off with the pressure switch. *See Page 7 for a more detailed explanation of "Emergency Mode".*

Changing Parameters:

To access the parameters (also called functions) menu press and HOLD the ENTER key for between 2 and 3 seconds.

There are seven parameters which can be altered without entering a password. These non password protected parameters may all be altered with or without the motor running.

Non Password Protected Parameters:

0.) Password Enter the password here which unlocks the protected parameters (14 to 19) **The password is 00004**

1.) Minimum Speed The minimum speed of the pump can be adjusted here.

2.) Maximum Speed The maximum speed of the pump can be adjusted here.

3.) Desired Pressure 1 This is the pressure set-point when the input to terminal 3 is OFF

4.) Desired Pressure 2 This is the pressure set-point when the input to terminal 3 is ON

5.) Maximum Run Time. This is the time in hours that the pump is permitted to run continuously for. If it is exceeded the pump will be stopped and an error message displayed. Set it to 0 to disable this function.

Password Protected Parameters:

Once the password has been entered correctly in Parameter 0 the password protected functions 14 to 19 become visible. Some of them require the pump to be stopped before they can be adjusted, if you try to adjust one of these with the pump running you will be asked to stop it before proceeding

Leaving the parameter menu resets the password.

13.) RIPPLE OVERSHOOT. If the control method is set to Ripple Control in function 14 the amount of ripple overshoot can be entered here.

14.) Control Method. By default this is set to 'Ripple Control' a Sema Ltd., invention which introduces a small pressure ripple into the pressure set-point and measures the time that it takes for the pressure to drop to determine if there is sufficient demand for water for the pump to be kept running. If you would like to operate the pump conventionally (without the ripple) then change this mode to 'Conventional'.

15.) Pressure Averaging. By default the WPC performs a rolling average of multiple readings from the pressure transducer over a 2 second period to determine the water pressure. This is to make the reading more stable and reduce the influence of air bubbles in the water stream. If this is considered undesirable it can be turned off here.

16.) Control Loop Delay. The WPC waits for this length of time after starting before it tries to control the pressure. This is to give it a few seconds of 'settling time' at minimum speed. This time may be adjusted here or even set to 0 if this is considered desirable.

17.) Lop (Loss of Prime) Current. This is set to the current that the motor draws when the pump is not pumping (i.e. when it is running dry) If the motor current is at or below this figure for more than 10 seconds the pump will be stopped and an error message displayed.

18.) Motor Current Adjust the motor current here if necessary to avoid nuisance tripping.

19.) Re-Initialise If the controller is moved to a new pump shed or a new pump is installed on the same controller

FAULTS

If a fault occurs that stops the controller running the backlight on the screen will flash rapidly and the fault description and fault number will be displayed. Please write down this number as it will provide Sema Ltd., with important information about the cause of the fault.

If a fault occurs turn off the power, wait until the controller screen is completely dark and then turn the power back on again. If the fault is still present then contact your Dealer or Sema Ltd.

Possible Faults:

Short Circuit. Check the motor cable and the motor for electrical faults

Motor Overloaded. Check that the pump isn't jammed. Attempt a reset by turning the power off and back on again. When the motor starts observe its running current (middle figure on the main running screen) and ensure that it is less than the nameplate current.

Over Voltage. Contact your power company. This will damage the controller if it's allowed to continue.

Under Voltage. The controller cannot run because there is insufficient power. Contact your power company.

Too Hot. The controller is overheated. Check that the cooling fins are not blocked and that the air temperature is not above 40 degrees Celsius.

Too Cold. The controller must be above -10 degrees Celsius before it will start. If the air temperature is less than this then gently warm the controller until it is able to start, once it has started it should generate enough internal heat to keep running.

Maximum Run Time Exceeded. The pump has run continuously for more than the maximum allowed run time. Usually this is caused by a water leak. Pushing the on/off button restarts the pump and resets the timer.

LoP (Loss of Prime or Pump Running Dry). Make sure that the pump has water available. Press the On/Off button to restart the pump.

External Cut-out Tripped. One or more of the external cut-outs connected between terminals 1 and 4 has tripped. Typically these will be things like a low water level sensor or a pump thermal trip.

Transducer Fault. Either the Transducer is faulty or there is a fault in the Transducer wiring (Might pay to check the plug on the transducer to make sure that it's properly plugged in!). If you can't rectify the problem then you can run the controller in 'Emergency Mode' from a pressure switch. See below:

Emergency Mode: If the Transducer fails the WPC will stop. This is done to prevent possible over pressurising of the system. Because a Transducer isn't a device which is readily available in all parts of the world an Emergency Mode has been provided to enable the unit to run from a pressure switch.

To activate Emergency Mode:

1. Turn off the power and wait until the screen is dark .
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WVMPC

Name² (of New Zealand manufacturer or importer):

Telephone: +64 9 358 0800

New Zealand Company No. (if applicable): 4305878

Email Address:

Contact Address:

P.O.Box 374
Pukekohe
Auckland 2340

MPC1 Single Phase milk pump controller 2.2kw
MPC3 Three Phase milk pump controller 2.2kw
WPC1 Single Phase Water Pump Controller 2.2Kw
WPC3 Three Phase Water Pump Controller all models
VPC Vacuum pump controller all models

With cited standard(s), as listed⁴:

Standard number and issue year: As/Nzs 3100:2001

Edition / Amendment status: 1

Standard title:

General requirements for electrical equipment

Standard number and issue year:

Edition / Amendment status:

Standard title:

AS/NZS ZZ modified Yes ☐ No ☐ N/A ☐AS/NZS ZZ modified Yes ☐ No ☐ N/A ☐OR Complies with the Conformity Cooperation Agreement⁵ Yes ☐ No ☐

Name(s):		Address(es):
Name(s):		Address(es):

Standard(s) or document(s) used, to show how compliance with cited standard is achieved:

Declaration of Conformity from Invertek Drives Ltd

Report Certification or Document
reference N°(s):

1.03

Issue dates(s):

Q1/10/2007

Reference to any management quality system involved: **ISO 9001**

Additional information⁶:Name and position as authorized by the issuer⁷:

Maurice Coates (Director)

Issuer Identification (as affixed to the article):

Sema Ltd.

Signature:

M. J. Coates

Date:

26/12/2013

NOTES