

Sema Ltd.

VPC3-11 Plus Mk2 User Manual

For Mk2 Vacuum Pump Controllers 11Kw and above.

V2.8.0



This manual applies to the 15 and 22kw Vacuum Pump Controllers

Sema Part Numbers

VPC3-11 11 Kw 400 Vac three phase controller c/w transducer and controller

VPC3-15 15 Kw 400 Vac three phase controller c/w transducer and controller

VPC3-22 22 Kw 400 Vac three phase controller c/w transducer and controller

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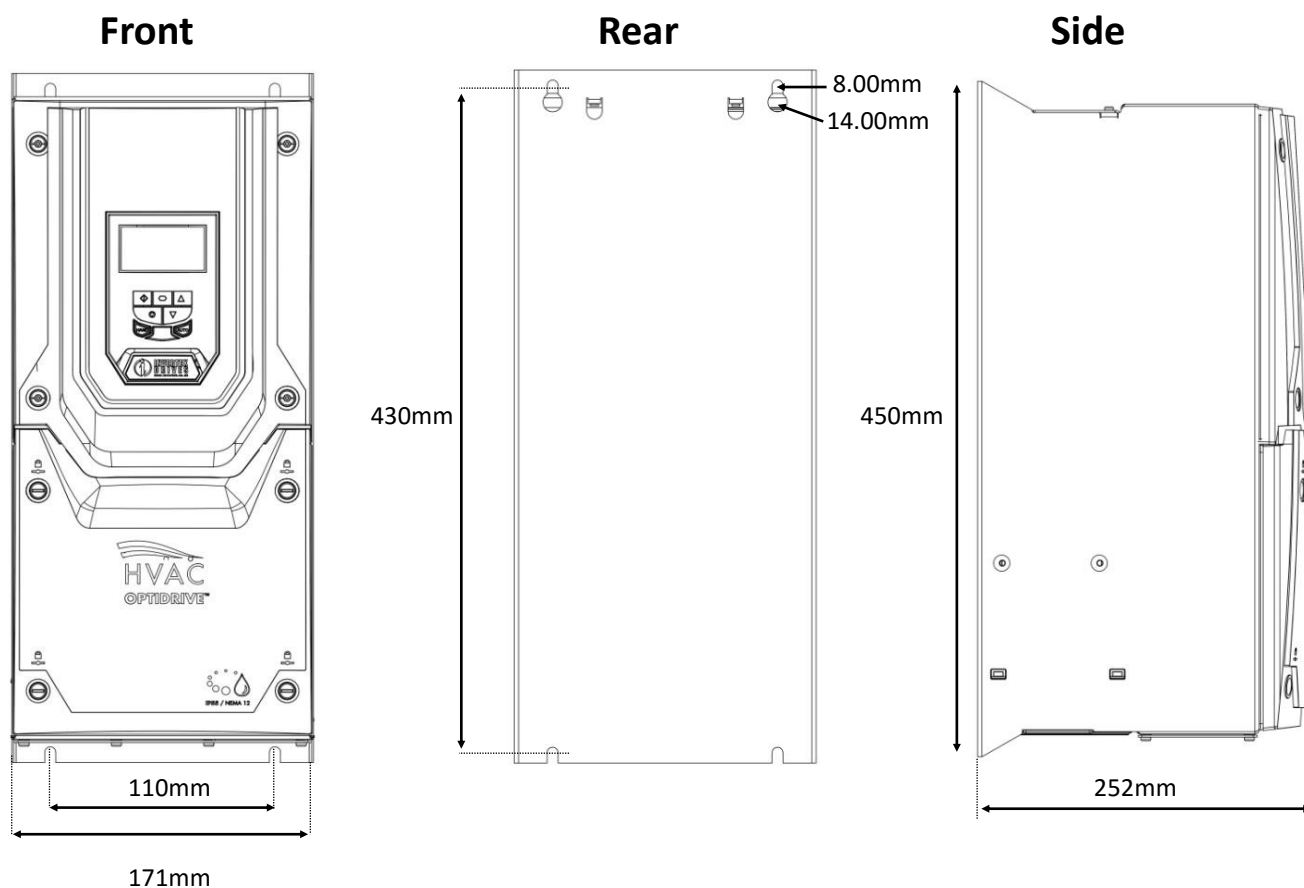
Plant Check?

Please read the instructions on page 7

Installing

Mounting

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



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 .

Mount the transducer in the vacuum line as near as is practical to the claws.

The transducer should be mounted vertically at least 1M from any bends, air bleeds or regulators.

Try to avoid placing the transducer close to any heat sources, in particular it should not be mounted within 1 meter of a steel roof.



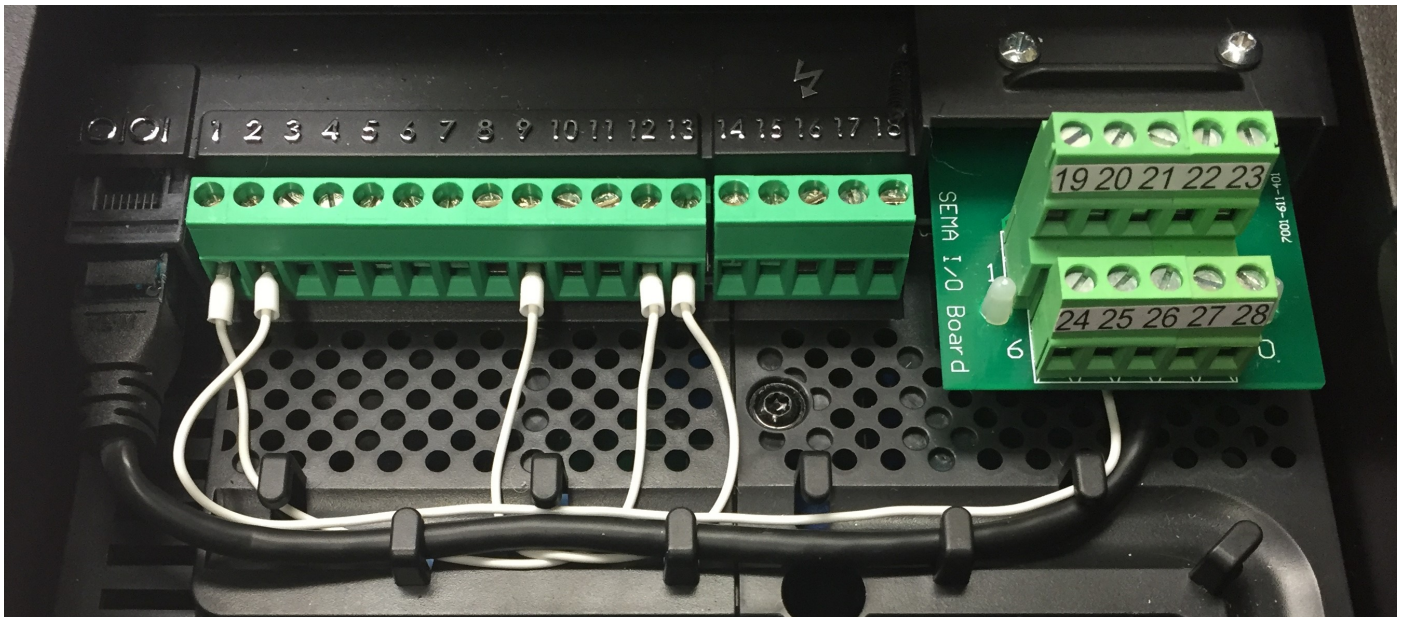
Wiring

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 VPC. The terminals are numbered from 1 to 28 and their functions are shown on [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:

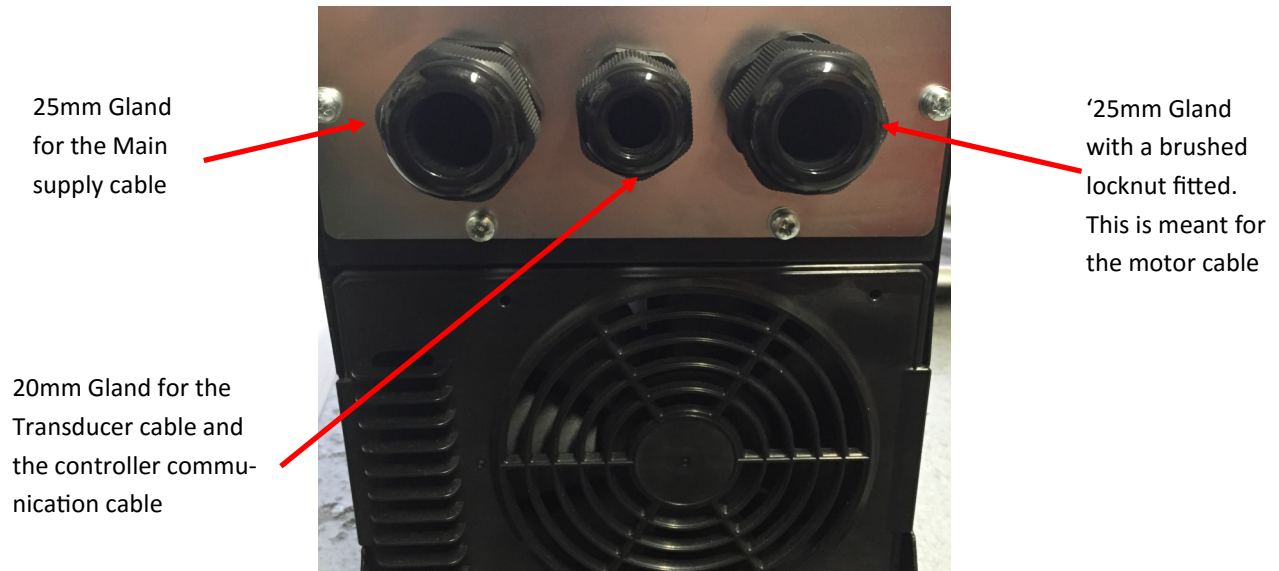
RED wire to terminal 1.

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



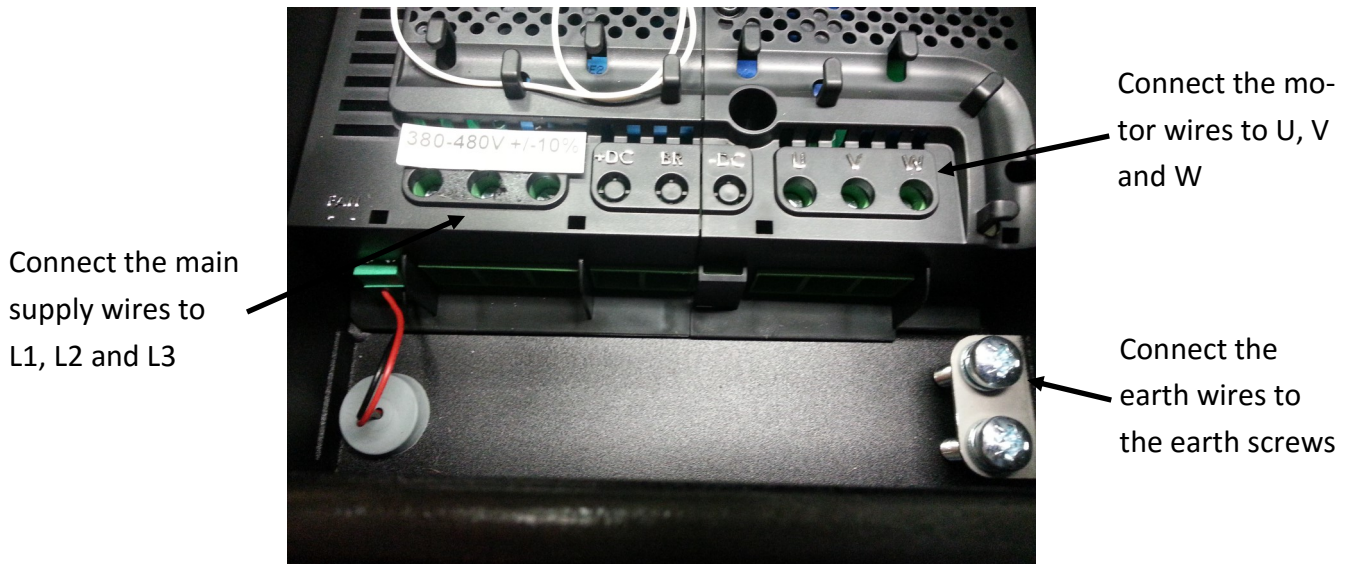
Three Glands are fitted to the bottom of the VSD.



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.



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)

Ensure that the motor is connected in either Star or Delta as is appropriate to the voltage of the controller. Typically a single phase 230Vac controller will require the motor to be connected in Delta and a three phase 400Vac controller will require that the motor is connected in Star. There are exceptions to this with some motors supplied from overseas so please check the motors nameplate.

Recommended Practices

To lessen the risk of the unit being damaged by lightning strikes when it is not in use Sema recommends that the power be turned off at the completion of milking.

Please be aware that, if you do not have the optional remote run/stop switch fitted and stop the unit using the button on the controller then, after a power outage, the unit will start as soon as power is applied. For this reason, if you elect not to turn off the power when the unit is not in use, you **MUST** fit a remote run/stop switch or else the unit will start automatically if the power goes off and then comes back on again.

Herd Test or Plant Check

Pushing the MAN button on the keypad will put the unit into wash mode. In wash mode it will accelerate slowly to full speed and stay there. Pushing the button again will put the unit back in milk mode. The unit will automatically power up in milk mode. If a remote milk/wash switch is fitted this can also be used to put the unit into wash mode.

Terminal Number	Signal	<u>Control Terminal Description</u>
1	+24VDC	The RED wire from the transducer is connected here
2	Controller	The white wire from the controller communications cable is connected here
3	No user connection	
4	No user connection	
5	No user connection	
6	4 to 20 ma analogue	The BLACK (In some cables this may be Blue) transducer wire is connected here
7	0V	The CLEAR (In some cables this may be a green and yellow stripe) 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 can be programmed to operate a switchable bleed solenoid
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.	
19	No User connection	
20	0V	
21	+24VDC	The commons for the Optional remote run and remote wash switches should be connected here.
22	0V	
23	No User connection	
24	No User connection	
25	No User connection	
26	No User connection	
27	Remote Run Switch	The Remote Run switch should be connected here.
28	Remote Wash Switch	The Remote Wash switch should be connected here

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. This toggles between Milk and (optionally Herd Test mode and) Wash modes. ***In wash mode the vacuum pump runs at full speed. Use this mode for plant checks.***
- ♦ **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 20 steps in the setup routine and they are as follows:-

1. **SELECT THE TYPE OF Shed:** use the up and down arrows to cycle through the available options, press the ENTER key to accept.
2. **ENTER THE NUMBER OF SETS OF CLAWS:** Use the arrow keys to alter the value. *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.*
3. **SELECT THE TYPE OF PUMP:** use the up and down arrows to cycle through the available options, press the ENTER key to accept.
4. **SELECT THE TYPE OF TRANSDUCER:** The default setting of "Sema Type 1" will almost always be correct but the unit can also use other types of transducer including the Delaval/John Brooks transducer. Contact Sema for advice if you are using something other than a Sema type 1 transducer.
5. **ENTER THE MOTORS NAMEPLATE VOLTAGE:** Use the arrow keys to alter the value.
6. **ENTER THE MOTORS NAMEPLATE CURRENT:** Use the arrow keys to alter the value.
7. **ENTER THE MOTORS NAMEPLATE RPM:** Use the arrow keys to alter the value. *(Hint: If this is a belt*

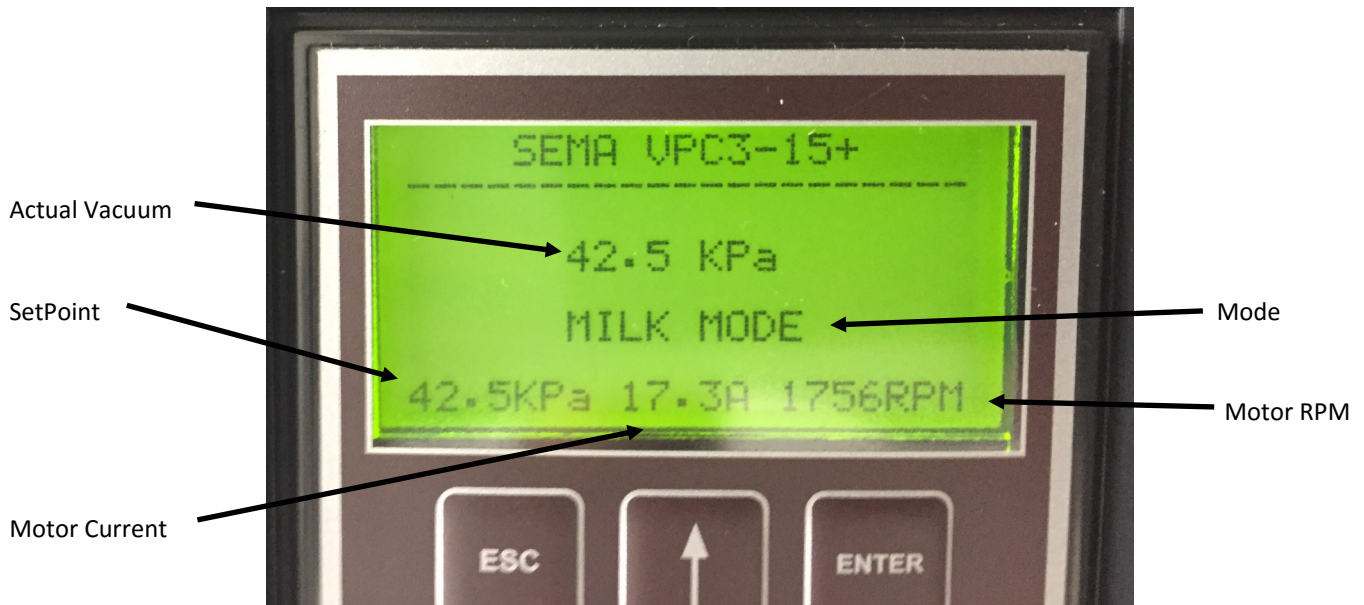
driven pump you can enter the speed of the pump here and then your maximum and minimum speeds will automatically refer to the pump and not the motor speeds)

8. **CONFIGURE RELAY 1:** Relay 1 can be configured to operate a switched bleed solenoid. This is a specialised setting and should not be used if you are unsure of its meaning.
9. **RELAY 1 TURN ON RPM:** This will only display if you have configured relay 1 to operate a bleed solenoid
10. **RELAY 1 TURN OFF RPM:** This will only display if you have configured relay 1 to operate a bleed solenoid
11. **ENTER THE MOTORS MAXIMUM SPEED:** Here you can enter the maximum operating RPM of the motor. This figure may be adjusted up to 20% more than the motors rated nameplate RPM. 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.
12. **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.
13. **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.
14. **ACCELERATION TIME:** This is the time that the motor will take to accelerate from a standstill or when switching between milk and wash modes. It does not apply when the VPC is controlling the vacuum.
15. **DECELERATION TIME:** This is the time that the motor will take to decelerate to standstill or when switching between milk and wash modes. It does not apply when the VPC is controlling the vacuum.
16. **VACUUM SETPOINT:** This is the vacuum level (in Kpa) that you would like the VPC to control to.
17. **DOES THIS SYSTEM USE AN AIR BLEED:** If you answer yes to this then the setup routine will be modified to guide you through the appropriate settings when using an optional air bleed.
18. **ADJUST THE REGULATOR:** Set the mechanical regulator to the vacuum level requested by the VPC.
19. **ADJUST THE AIR BLEED:** Wait a few seconds for the vacuum to stabilise and then follow the on screen instructions for setting the air bleed. *This step is skipped if you have selected no air bleed in step 17.*
20. **DOES THIS SYTEM USE A REMOTE ON/OFF SWITCH:** If you have fitted the optional remote switch answer yes, otherwise answer no.

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

Running

The Running Screen:



MODE Five different modes may be displayed here:

1. **MILK MODE** This is the normal mode which is displayed while the unit is running
2. **HERD TEST MODE** If password protected parameter number 9 (Herd Test Type) is set to anything other than "off" then pressing the manual key will switch between Milk, Herd Test and Wash modes. Herd test settings can be adjusted in functions 9 and 10.
3. **WASH MODE** This indicates that the pump will run at full speed
3. **LOCAL STOP** The on/off button on the front of the unit has been pressed. Press it again to start the unit.
4. **REMOTE STOP** The optional remote run switch is turned off.

Changing Parameters:

To access the parameters (also called functions) menu press and HOLD the ENTER key for between 2 and 3 seconds. (A screen will be displayed telling you to remove your finger after this time)

There are six parameters which can be altered or accessed without entering a password.

Non Password Protected Parameters:

0.) Password Enter the password here which unlocks the protected parameters **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.) Vacuum Setpoint Enter the desired vacuum level here

4.) ACCEL TIME This is the time that the motor will take to accelerate from a standstill or when switching between milk and wash modes. It does not apply when the VPC is controlling the vacuum.

5.) DECEL TIME This is the time that the motor will take to decelerate to a standstill or when switching between milk and wash modes. It does not apply when the VPC is controlling the vacuum.

6.) FAULT HISTORY The fault codes for the last 4 faults that the unit experienced are displayed here. Contact Sema for an explanation of the codes.

Password Protected Parameters:

Once the password has been entered correctly in Parameter 0 the password protected functions become visible. Most of these functions require the pump to be stopped before they are adjusted.

Leaving the parameter menu resets the password.

9.) HERD TEST TYPE. Valid options are : "OFF" herd test mode will be turned off and will not be displayed when the "MAN" button is pressed; "KPA ABOVE MILK LEVEL" the herd test vacuum level can be set to be a fixed number of KPa above the milking vacuum level; "FIXED SETPOINT" herd test vacuum level will be set to a defined vacuum level.

10.) HERD TEST LEVEL. Depending on the setting of function 9 this setting will either control how many kpa above milking vacuum the herd test is or be the vacuum setting at which herd test is performed.

11.) PROPORTIONAL GAIN The proportional gain of the control loop can be adjusted here

11.) PROPORTIONAL GAIN The proportional gain of the control loop can be adjusted here

12.) INTEGRAL TIME The integral time of the control loop can be adjusted here

13.) FAST ACCEL TIME The acceleration time that the drive uses when it is near the set-point is adjusted here

14.) FAST DECEL TIME The deceleration time that the drive uses when it is near the set-point is adjusted here

15.) BLEED SOLENOID ON The optional bleed solenoid turn on RPM can be adjusted here

16.) BLEED SOLENOID OFF The optional bleed solenoid turn off RPM can be adjusted here

17.) TRANSDUCER OFFSET The transducer can be trimmed so that the vacuum reading agrees with the set-point.

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 shed or a major change is made to the shed that it is installed in (i.e. a new pump is put in or extra sets of claws are added) then the controller should be re-initialised and the setup routine re done. Follow the prompts on the screen to achieve this.

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.

Transducer Error. The controller is not receiving the correct signal from the vacuum transducer. The most likely cause of this is a wiring fault. The controller may be run in **Emergency Mode** to enable milking to be completed.

EMERGENCY MODE

If the controller senses that the transducer is faulty it will not allow the pump to run. This is done for safety reasons to prevent the possibility of milking taking place with excessively high vacuum levels.

To run the pump when it displays a Transducer fault perform the following actions.

1. Turn off the power and wait until the controller screen is completely dark.
2. Ensure that no livestock is still attached to the milking claws.
3. Simultaneously hold down the ON/OFF and MAN keys while turning the power on to the controller.
4. Release these keys and press ENTER when you are prompted to do so. This will run the pump at full speed.
5. BEFORE attempting to milk re-adjust the regulator to give the desired milking vacuum.

The unit can be run in Emergency Mode indefinitely without any ill effects providing that the regulator is set correctly. Once the problem with the transducer is fixed the VPC will require you to perform another setup before it will run normally again.

SUPPLIER DECLARATION OF CONFORMITY (SDoC)
In accordance with ISO/IEC 17050-1:2004

SDoC Identification Number¹: **WVMPC**

Issuer details

Name² (of New Zealand manufacturer or importer): Sema Ltd. Telephone: +64 9 358 0800 New Zealand Company No. (if applicable): 4305878 Email Address: info@sema.co.nz	Contact Address: P.O.Box 374 Pukekohe Auckland 2340
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Medium Risk Article – Details³ (Product name, type, rating, brand, model, batch numbers, and serial numbers, as applicable):

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

The Medium Risk Article listed above, fully complies:

With cited standard(s), as listed⁴:	
Standard number and issue year: As/Nzs 3100:2001	Standard number and issue year:
Edition / Amendment status: 1	Edition / Amendment status:
Standard title: General requirements for electrical equipment	Standard title:
AS/NZS ZZ modified Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	AS/NZS ZZ modified Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
OR Complies with the Conformity Cooperation Agreement⁵ Yes <input type="checkbox"/> No <input type="checkbox"/>	

Names and addresses of any testing organisation or body

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

Reference to relevant test reports/certification and the issue date that show how compliance is achieved

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 date(s): 01/10/2007
Reference to any management quality system involved: ISO 9001		
Additional information⁶:		

Declaration (signed for and on behalf of)

Name and position as authorized by the issuer⁷: Maurice Coates (Director) Issuer identification (as affixed to the article): Sema Ltd.	Signature:  Date: 26/12/2013
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NOTES