

Sema Ltd.

VPC 7.5Kw and Below

V 1.3.0



This manual applies to the 4.0 and 7.5kw Vacuum Pump Controllers

Sema Part Numbers

VPC3-4.0 4 Kw 400 Vac three phase controller c/w transducer

VPC3-7.5 7.5 Kw 400 Vac three phase controller c/w transducer

VPS3-4.0 4 Kw 400 Vac three phase slave unit (Requires a Master)

VPS3-7.5 4 Kw 400 Vac three phase slave unit (Requires a Master)

Contact details

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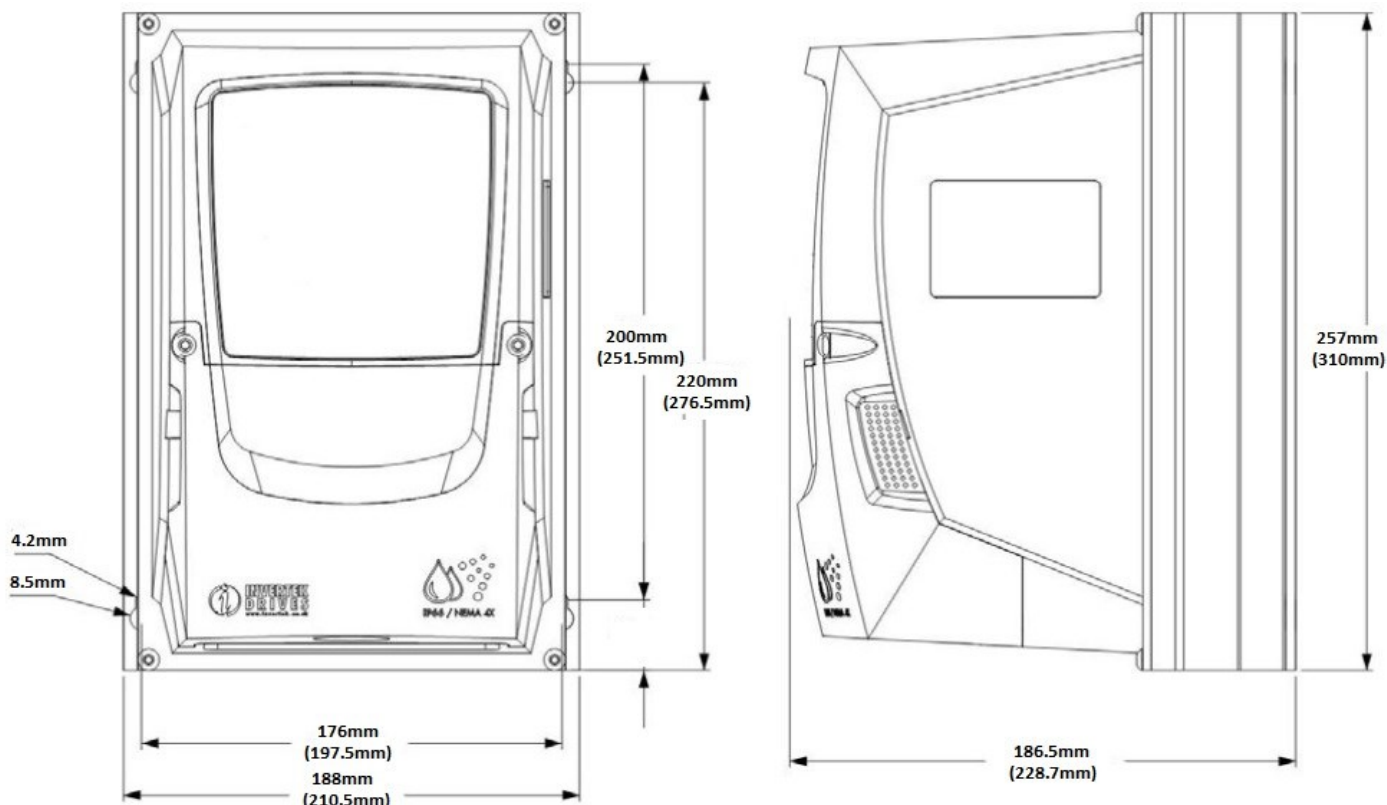
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Installing

Mounting



N.B. Dimensions outside of brackets refer to the 4.0kw units those enclosed in brackets refer to the 7.5kw units. If there are no brackets then the dimension is the same for both models.

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

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.

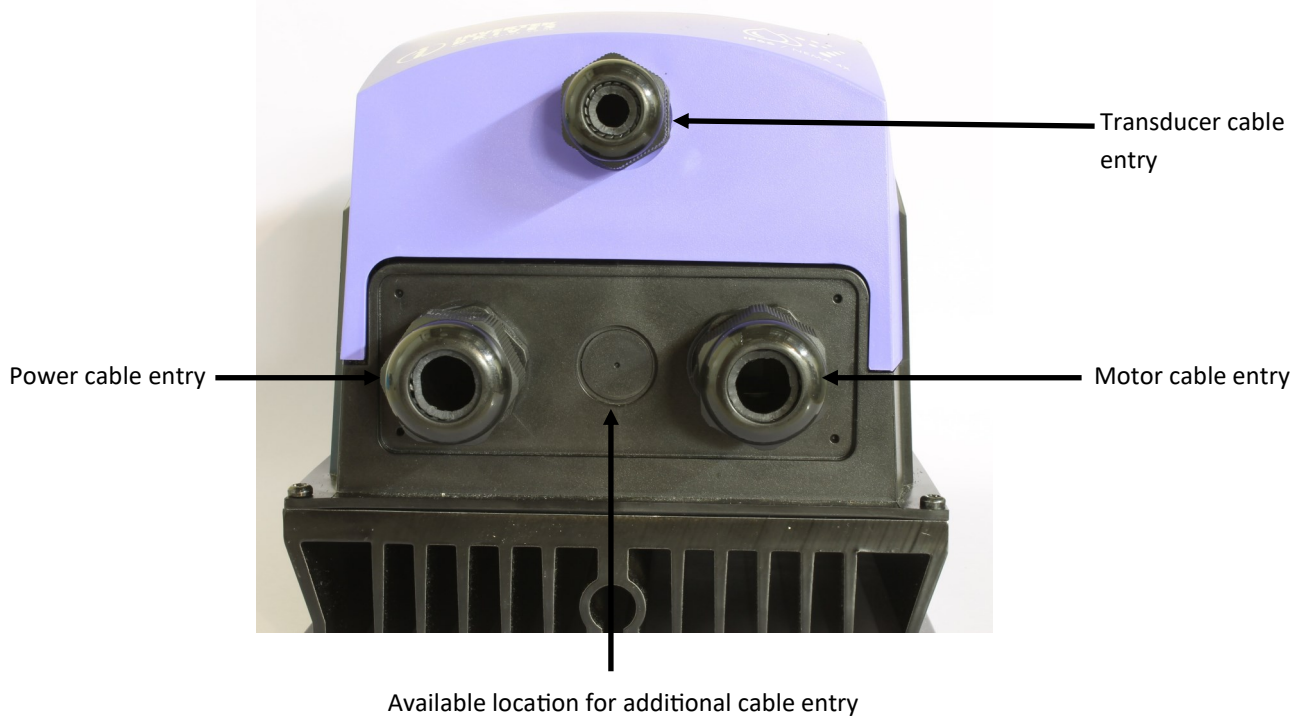
For 4.0kw units use a 15 or 16 Amp 'C' curve MCB and size the mains cabling appropriately for the length of the run.

For 7.5kw units use a 25 Amp 'C' curve MCB and size the mains cabling appropriately for the length of the run.

EMC screened cable must be used to connect the controller and motor. An EMC gland must be fitted to the motor and the pre-installed EMC clamp must be used in the controller.

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

As supplied the controller is fitted with 3 glands.



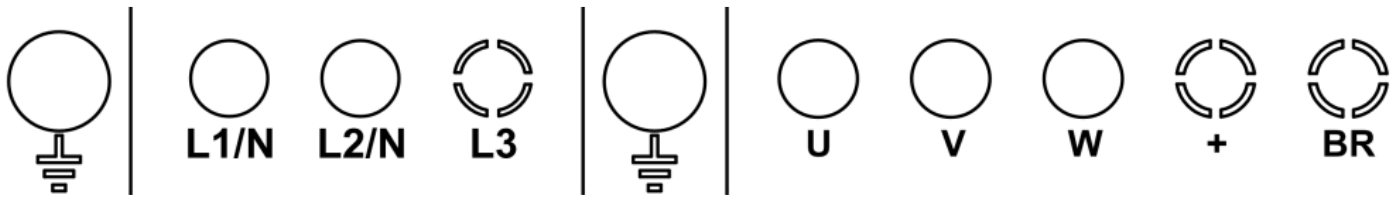
Please note that Sema Ltd has no objection to the glands being replaced with a flexible conduit fitting or any other fitting that the installing electrician would like to use provided that the fitting has an IP rating of at least IP66. **Water damage caused by inadequate sealing in this area is not covered under warranty.** If you are in doubt that a cable has a large enough cross section to seal in the gland please use a good quality silicon sealant to ensure water tightness.

The Right Hand cable gland has a brushed locknut fitted. To terminate the motor cable screen bare back approximately 15—20mm of the screen so that it makes contact with the brass brush inside the locknut.

Please note that the brushed locknut performs as well, if not better, than an EMC/VSD gland and has the added benefit of allowing an IP68 gland to be used. **There is absolutely no benefit to be gained by replacing this fitting with an EMC gland.**



Controller, Power and Motor, Terminal Markings



Always connect the main power and motor cable earths to the terminals marked as earth.

For controllers with a single phase supply connect the Phase to L1 and the Neutral to L2.

For controllers with a three phase supply connect the incoming three phases to L1, L2 and L3.

Connect the three motor wires to U,V and W.

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

Do not make any connection to + or BR.

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.

Control Terminal Connections



The transducer is connected as shown. If you are not going to use any remote switches then this is the only connection that needs to be made to the control terminals. Note that the screen (Which is the green and yellow striped wire) can be connected to either terminal 7 or 9.

Description of control terminals

Terminal Number	Signal	Description
1	+24 VDC	The RED wire from the transducer is connected here
2	No user connection	This terminal is used by the Sema controller as a safety shut down. Do not disconnect the pre-installed wire and do not make any other connections here
3	No user connection	This terminal is not used by the Sema controller. Do not connect.
4	No user connection	This terminal is not used by the Sema controller. Do not connect.
5	No user connection	This terminal is not used by the Sema controller. Do not connect.
6	4 to 20ma Analogue	The BLACK transducer wire is connected here
7	0V	The Green/Yellow wire from the transducer can be connected here or to terminal 9
8	No user connection	This terminal is not used by the Sema controller. Do not connect.
9	0V	As both the 0V terminals are connected to ground any control cable screen may be connected to either 0V terminal
10	Relay	This relay closes whenever the motor is running.
11	Relay	Contact 250VAC, 6A/ 30VDC, 5A
12	+24 VDC	This terminal is linked internally to terminal 1 and shares the same 24VDC supply
13	RUN	Connect an optional Run input between +24VDC (terminals 1 or 12) and here
14	WASH	Connect an optional Wash input between +24VDC (terminals 1 or 12) and here

The screen can go into either terminal 7 or 9. The transducer screen is the green/yellow wire. The colours of the ferrules are irrelevant.

Setting up and Operation

Using the keypad



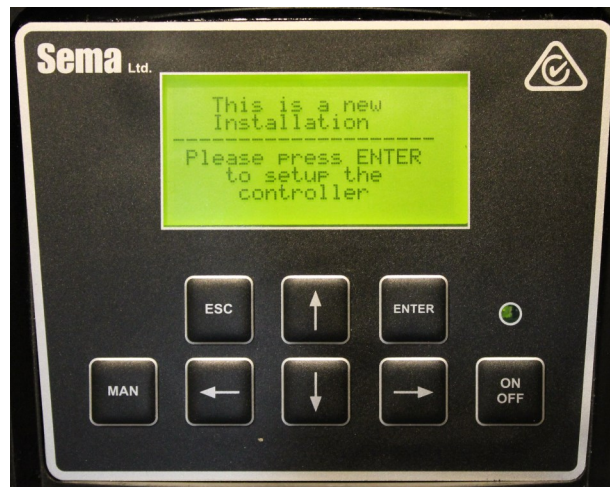
Description:

- ♦ **STATUS LIGHT** This is a high intensity L.E.D . designed to be as visible as possible. It is on when the Motor is running and off when it is stopped.
- ♦ **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 toggle between Milk 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 15 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. **ENTER THE MOTORS NAMEPLATE VOLTAGE:** Use the arrow keys to alter the value.
5. **ENTER THE MOTORS NAMEPLATE CURRENT:** Use the arrow keys to alter the value.
6. **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)*
7. **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.

8. **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.

9. **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.

10. **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.

11. **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.

10. **ENTER MAXIMUM MILK LEVEL:** In this step the maximum milk level that was created in step 9 is displayed and can be altered if desired.

11. **VACUUM SETPOINT:** This is the vacuum level (in Kpa) that you would like the VPC to control to.

12. **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.

13. **ADJUST THE REGULATOR:** Set the mechanical regulator to the vacuum level requested by the VPC.

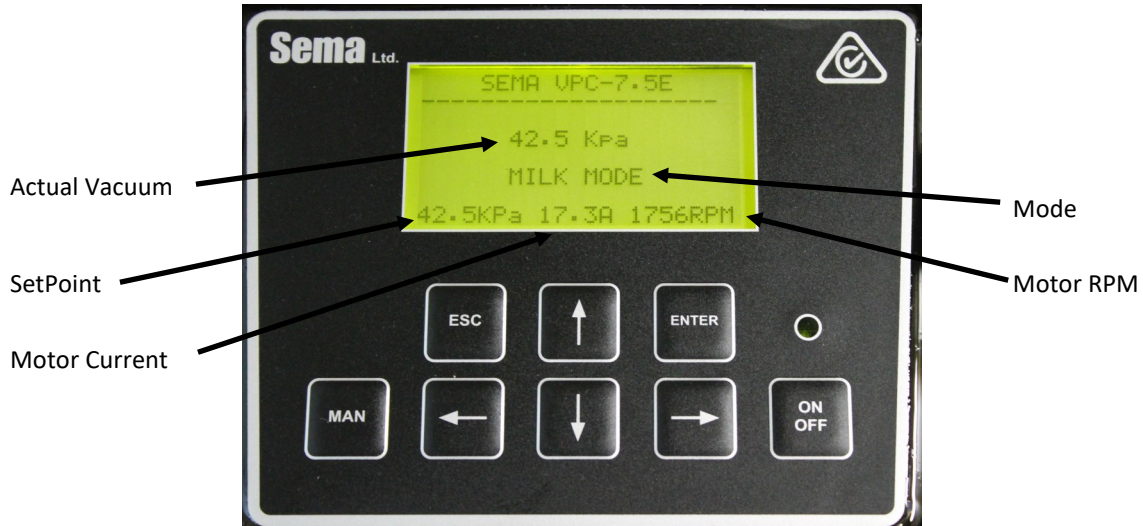
14. **ADJUST THE AIR BLEED:** Wait a few seconds for the vacuum to stabilise and then follow the on screen instructions for setting the air bleed. *This step is skipped if you have selected no air bleed in step 12.*

15. **DOES THIS SYSTEM USE A REMOTE ON/OFF SWITCH:** If you have fitted the optional remote Junction Box 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 Four different modes may be displayed here:

1. **MILK MODE** This is the normal mode which is displayed while the unit is running
2. **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 junction box is installed and the 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 **five** parameters which can be altered 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.

Password Protected Parameters:

Once the password has been entered correctly in Parameter 0 the password protected functions 18 and 19 become visible. Both of these functions require the pump to be stopped before they are adjusted.

Leaving the parameter menu resets the password.

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

Name ² (of New Zealand manufacturer or importer): Sema Ltd.	Contact Address: P.O.Box 374 Pukekohe Auckland 2340
Telephone: +64 9 358 0800	
New Zealand Company No. (if applicable): 4305878	
Email Address: info@sema.co.nz	

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 listed ⁴ :	
Standard number and issue year: As/Nzs 3100:2001	Standard number and issue year: <input type="text"/>
Edition / Amendment status: 1	Edition / Amendment status: <input type="text"/>
Standard title: General requirements for electrical equipment	Standard title: <input type="text"/>
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 Agreement ⁵ Yes <input type="checkbox"/> No <input type="checkbox"/>	

Names and addresses of any testing organisation or body

Name(s): <input type="text"/>	Address(es): <input type="text"/>
Name(s): <input type="text"/>	Address(es): <input type="text"/>

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 information ⁶ : <input type="text"/>		

Declaration (signed for and on behalf of)

Name and position as authorized by the issuer ⁷ : Maurice Coates (Director)	Signature: 
Issuer Identification (as affixed to the article): Sema Ltd.	Date: 26/12/2013

EMC Compliance

The current range of Sema product is based on the Invertek Drives range of variable speed drives. Units of 7.5kw and below use the E3 series of drives and units above 7.5kw use the P2 series.

Manuals and compliance information for these drives can be found at www.sema.co.nz or scan the QR codes below to be taken straight to the relevant document.

For information on how to perform a CE EMC compliant installation please view or download the appropriate Invertek manual and look in its index for the page labelled "**EMC Compliant Installation**".

Invertek E3 Conformity Certificate



Invertek E3 Manual



Invertek P2 Conformity Certificate



Invertek P2 Manual



