

Sema Ltd.

Milk Pump Controller

In Stainless Steel Cabinet

V 2.10.0 SS



MPC SS

All standard Sema Milk Pump Controllers can control a pump of up to 2.2Kw.

Larger sizes of up to 7.5Kw can be manufactured to order.

Sema Part Number Builder

We now have too many different models of milk pump controller to list them all separately. Instead please use our part number builder to work out the part number of your controller. If an option is present on your controller simply add it in the order given below. Examples are given at the bottom of the page

<u>Code</u>	<u>Description</u>
MPC	All Sema Milk Pump Controller part numbers start with this
1	Single phase input 3 phase output. 230Vac
3	Three phase input 3 phase output. 400Vac
-SS	Stainless steel cabinet model
-XD	Extreme Duty unit. Over engineered to cope with extremes of power or environment
-AT	Auxiliary terminals added. These let an external switch select the operating mode.
-4.0	This model will run pumps of up to 4.0kw (Note: we do not make an XD variant in this size)
-Probe	A 3 digit number giving the float level probe length in mm. Options are 410,500 or 585mm

Examples:

<u>Part Number</u>	<u>Description</u>
MPC3	Three Phase 400V controller without a probe
MPC3-410	As above but with a 410mm probe and gland
MPC3-SS-500	As above but in a SS box with a 500mm probe and gland
MPC3-XD-585	3 phase 400v extreme duty model with 585mm probe and gland
MPC3-SS-XD-AT-410	The works! Read the code descriptions above. To calculate the features.

All parts are available separately, please contact Sema for a price list.

Contact details

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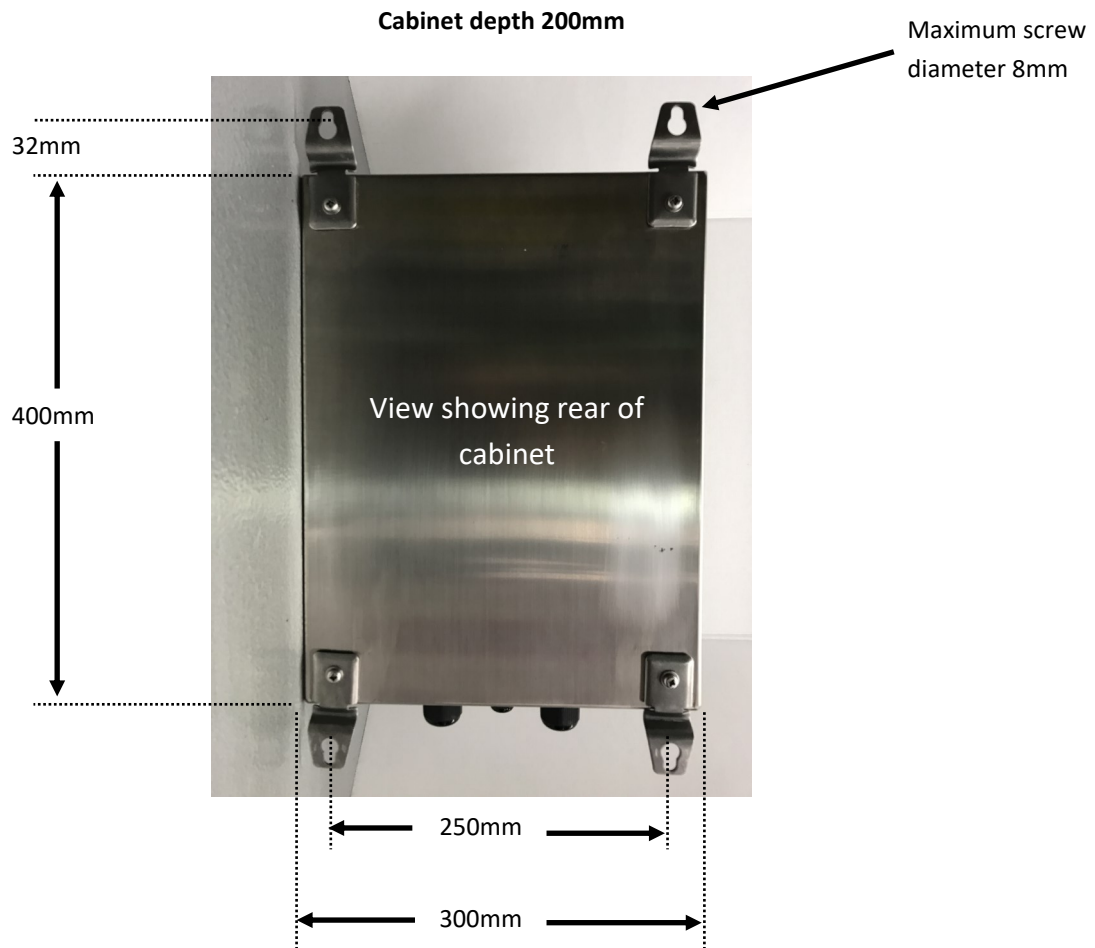
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Installing

Mounting



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

Although not essential it is good practise to mount the cabinet to a steel bracket which is welded to the steelwork of the milking shed. This aids in creating a good earth bond and minimising electrical emissions.

Wiring

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

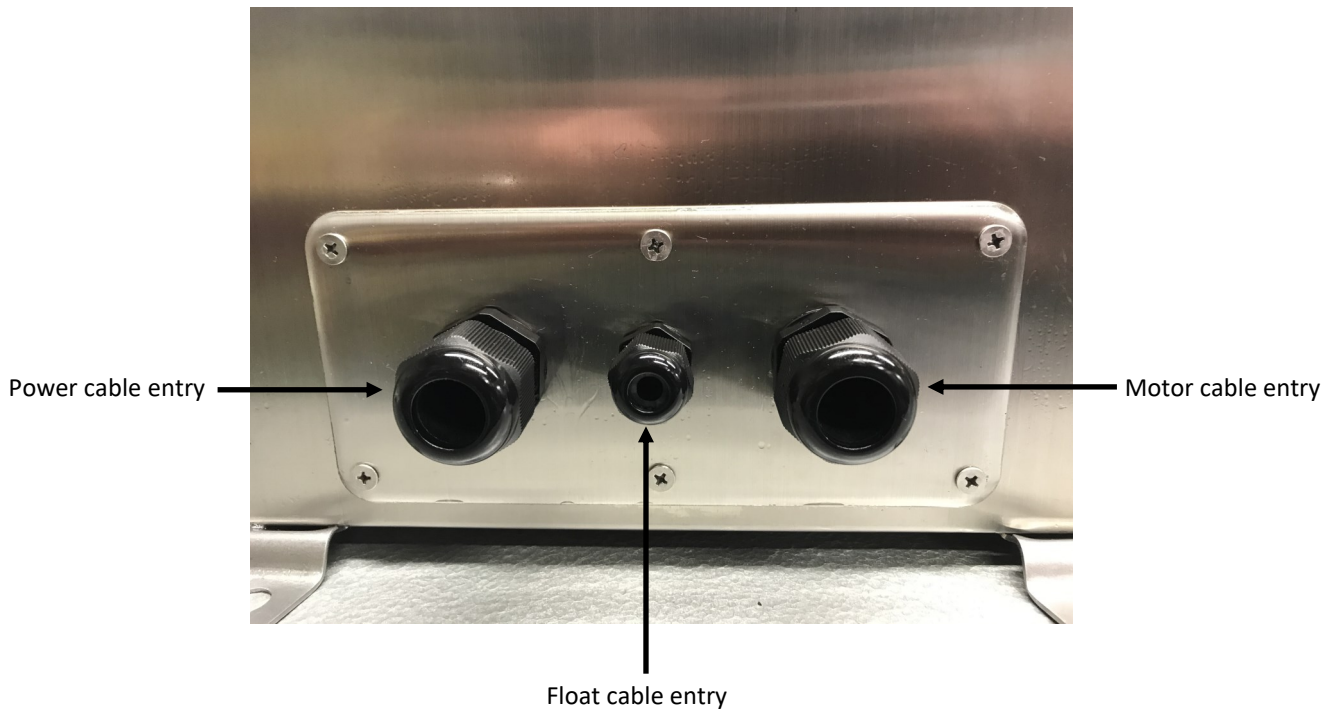
For single phase 230 Vac 2.2kw units use a 32 Amp 'C' curve MCB and size the mains cabling appropriately for the length of the run.

For three phase 400 Vac 2.2kw units use a 10 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 Brushed locknut or other approved device must be used in the controller.

All wiring that exits the controller, including low voltage control cabling must be screened, as the 0v control supply is internally earthed in the controller either terminal 7 or 9 may be used to terminate any screens on control cabling.

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.**



Power supply connections



Motor connections

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.

Note that there is already an earth wire in the top earth terminal, this is for earthing the cabinet and should stay in the terminal along with the power supply earth.

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.



On the underside of the drive are 11 terminals. The table on the following page shows what can be connected to these. The only thing that always needs to be connected in order for the controller to work is the Probe. The connections for it are shown above.

Description of control terminals (Terminals 12 to 14 are an optional extra)

Terminal Number		Signal	Description
1		+24 VDC	The Commons for the OPTIONAL remote WASH and MANUAL switches are 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		Wash Switch	The optional remote wash switch is connected here
4		Remote Manual	The optional remote manual switch (called pump-out or purge by other manufacturers) is connected here
5		+ 10VDC	The GREEN float level probe wire is connected here
6		0 to 10V Analogue	The BROWN float level probe wire is connected here
7		0V	The WHITE float level probe wire is connected here and the screen, which has a black ferrule fitted to it, may be connected here or to terminal 9.
8		Optional Slave Drive Connection.	Used when connecting a slave drive to the MPC. Instructions will be included with the Slave drive
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. It may be used to turn on the plate cooler water supply or for any other purpose. Contact 250VAC, 6A/ 30VDC, 5A
11		Relay	
Optional Terminals	12	+24 VDC	This terminal is linked internally to terminal 1 and shares the same 24VDC supply
	13	Froth Fighter Mode	Turning this input on will activate froth fighter mode
	14	Eco Flow Mode	Turning this input on will activate Eco-Flow mode

Using an existing Float with the Sema MPC

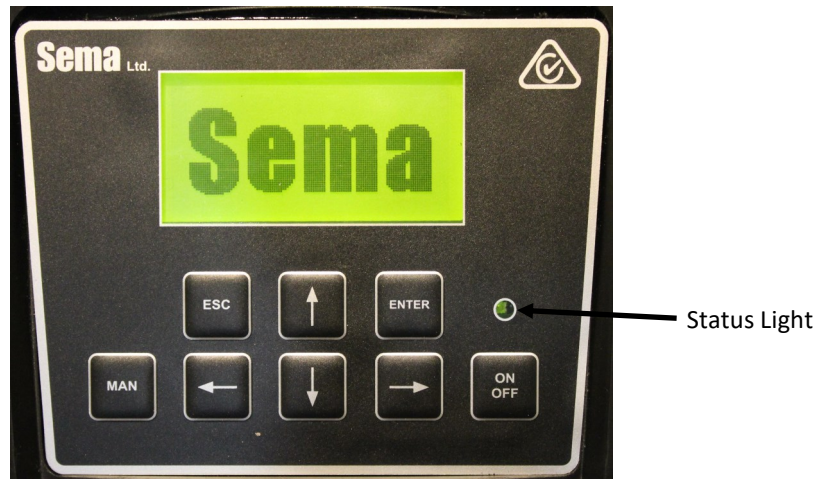
The Sema controller is compatible with all of the John Brooks Ltd and Delaval analogue float level probes. If you would like to re-use one of these probes then connect it as follows:-

If it is an older float level probe there will be two cables coming from it. There is no need to connect the cable that has two wires, it is not required by the Sema Controller. In the cable with three wires connect the **green** wire to terminal 5, **brown** to 6 and **white** to 7. The screens can go into either terminal 7 or 9.

If it is a newer probe it will have a single cable with 5 wires. There is no need to connect the yellow and grey wires, the remaining three wires and the screen can be connected as described above.

Setting up and Operation

Using the keypad



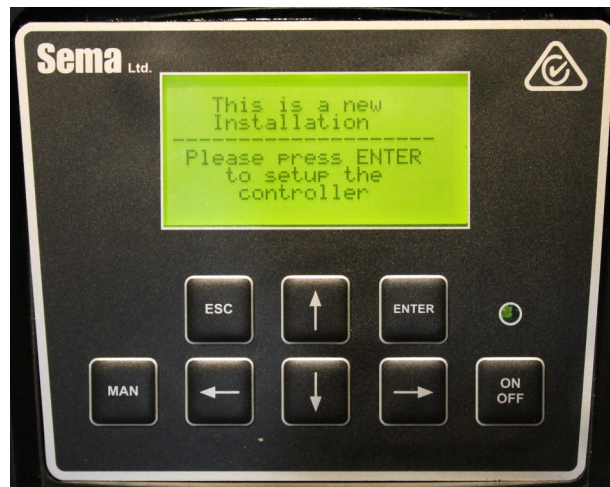
Description:

- ♦ **STATUS LIGHT** This is a high intensity L.E.D . designed to be as visible as possible e.g. from the end of the pit on a bright summers day. The status light has 3 possible states:-
 1. **OFF** The controller will not start when the milk level rises. It is either turned off or has a fault
 2. **FLASHING** The controller is not running but has no faults and will start as soon as the milk level rises.
 3. **ON** The controller is running.
- ♦ **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 will run the pump manually for as long as it is pressed. Other manufacturers call this 'Pump Out'.
- ♦ **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 22 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 KILOWATT RATING:** In previous versions the motors nameplate current used to be entered here. This is no longer necessary, instead simply enter the motors kilowatt rating exactly as it appears on the nameplate and the software will make all the other settings for you
6. **ENTER THE MOTORS NAMEPLATE RPM:** Use the arrow keys to alter the value.
7. **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.

8. **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.
9. **MAXIMUM LEVEL SETTING:** This is an automated setting. Reach into the can and raise the float to where you would like the maximum milk level to be. The controller will remember the highest position that the float reached. If, for some reason you are unable to perform this setting by raising the float don't worry as this figure can be entered manually in the next step
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. **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.
12. **SELECT THE OPERATION MODE:** There are three choices, the default is 'Conventional' ,in this mode the MPC behaves exactly like any other conventional variable speed milk pump controller. The second choice is Eco-Flow. Eco-Flow is a software algorithm (fancy name for a formula)which strives to keep the flow of milk through the heat exchanger as low and slow as possible in order to allow the heat exchanger to extract as much heat as possible from the milk. This results in a lower milk delivery temperature to the Vat which saves costs in running refrigeration plant and also reduces the bacteria count in the vat. Eco-Flow achieves this lower flow rate by allowing the level of milk in the can to vary within quite wide limits. If the shed has a large receiving can and **does** not have a frothing issue then Eco-Flow should work very well if however the plant has a small can or suffers from frothing then do not attempt to use Eco Flow. The third mode is Froth Fighter, this mode tries to keep the can empty while, at the same time, only running the pump as fast as it needs to. This mode is highly recommended for sheds that have frothing issues.. The operation mode can be changed at any time after setup is completed, see the section on changing parameters for instructions on how to change it.
13. **ENTER PUMP OUT TIME:** This figure sets the time (in seconds) that the controller will continue to run for after the float is at the bottom. This is to allow milk below the level of the float to be pumped out of the can. Be careful not to set an excessively long time as this can cause the pump to run dry. The default of 15 seconds is usually a good choice for most plants.
14. **ENTER THE EMPTY CAN INTERVAL:** Because of the way that the Eco-Flow mode works it is not uncommon for the receiving can to never empty itself. In some plants this is undesirable as it can lead to excessive froth formation. To combat this a time, in minutes, can be entered after which the controller will automatically pump the can dry. If the can empties naturally before this time expires then the timer is reset so it is really the MAXIMUM time that is allowed to elapse between the can being emptied. Setting this figure to 0 will disable this feature.
15. **SELECT WHEN RELAY OPERATES:** This setting allows you to select when the relay, which is connected between terminals 10 and 11, turns on. Available options are: **Milk Mode Only, Wash Mode Only, In any Mode.**
16. **SELECT WHETHER THE RELAY TURNS ON WITH THE PUMP.** This allows you to select whether the relay is on all the time or only turns on when the pump runs.
17. **RELAY OFF DELAY.** A time, in seconds, can be entered here as a delay before the programmable relay turns off

(useful for keeping plate cooler pumps running for a while after the milk pump turns off.) Maximum is 600 seconds or 10 minutes.

18. **DO YOU WANT TO HAVE SEPARATE SETTINGS FOR WASH MODE:** If you answer yes to this then parameters 12,13 and 14 become visible. These allow you to enter different Minimum and Maximum Speeds and a separate Maximum Level. These settings will take effect when wash mode is activated by turning on Input 2 (Terminal 3). Answering no will cause these parameters to be skipped.

19. **MAXIMUM WASH SPEED:** The maximum motor speed that will apply when the unit is in wash mode.

20. **MINIMUM WASH SPEED:** The minimum motor speed that will apply when the unit is in wash mode.

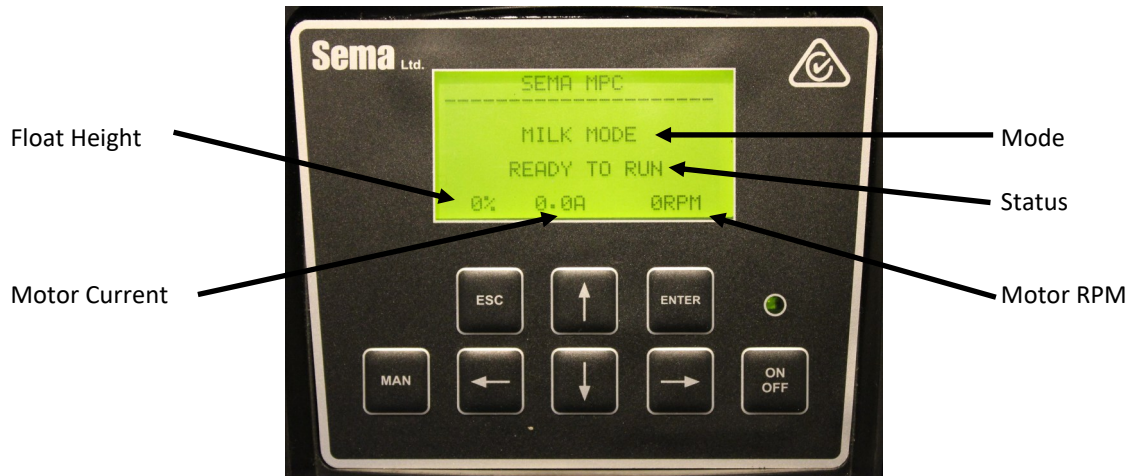
21. **MAXIMUM WASH LEVEL:** The maximum liquid level that applies when the unit is in wash mode.

22. **ENTER WASH PUMP OUT TIME:** When in wash mode this figure sets the time (in seconds) that the controller will continue to run for after the float is at the bottom. This is to allow milk below the level of the float to be pumped out of the can. Be careful not to set an excessively long time as this can cause the pump to run dry. The default of 15 seconds is usually a good choice for most plants.

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 Three 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 will only appear if an optional WBX (Wash Box) has been connected and the switch is in the wash position or if the optional Remote wash switch has been connected to terminal 3 and is turned on.
3. **MANUAL** This indicates that either the MAN pushbutton is being pressed or the remote Manual Switch is being operated.

STATUS Three different status's may be displayed here:

1. **READY TO RUN** This means that the unit has no faults and will run as soon as the float rises.
2. **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).
3. **RUNNING** The unit is running normally.

Changing Parameters:

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

There are **ELEVEN** 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. There are two valid passwords that can be entered here:

The first is the low security password that unlocks parameters 17 to 19 **The password for this is 00004**

The second password gives access to all of the parameters **The password for this is 00040**

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.) Maximum Milk Level The maximum milk level can be adjusted here.

4.) Operation Mode This may be changed between 'Eco-Flow', 'Conventional' and 'Froth Fighter'. See the description of these modes on page 10. Note that if you switch back to 'Eco_Flow' while the pump is running it will take a few minutes for it to adjust itself and start running correctly.

5.) Pump Out Time This may be adjusted between 0 (which is equivalent to Off) and 240 seconds

6.) Empty Can Interval This may be adjusted between 0 (Off) and 60 minutes.

7.) Minimum Wash Speed The minimum speed of the pump when the unit is in wash mode can be adjusted here.

8.) Maximum Wash Speed The maximum speed of the pump when the unit is in wash mode can be adjusted here.

9.) Maximum Wash Level The maximum liquid level in wash mode can be adjusted here.

10.) Wash Pump Out Time This may be adjusted between 0 (which is equivalent to Off) and 240 seconds

11.) Relay Mode Determines if the relay is on in Milk, Wash or in either mode and determines if the relay comes on when the pump starts or is on all the time.

12.) Relay off delay. This delays the turning off of the relay for the number of seconds that are entered here.

13.) Pump Out Speed. The choices are 'Automatic', which means that the speed will keep increasing as long as the button is held down, or 'Maximum' which means that pump-out will occur at the current maximum speed.

Password Protected Parameters:

Once the password has been entered correctly in Parameter 0 the password protected functions 17, 18 and 19 become visible. Functions 18 and 19 require the pump to be stopped before they are adjusted.

Leaving the parameter menu resets the password.

17.) MOTOR NOISE. The amount of electrical noise (this sounds like a high pitched ringing noise) that the motor produces can be adjusted here. By default this is set to the quietest setting.

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.

Please note that adjusting Minimum Speed, Maximum Speed, Maximum Milk Level or Pump-Out Time in the non password protected parameters will overwrite the values for all of the modes in the parameters below. i.e. the settings in the non password protected parameters are GLOBAL.

40.) ECO Minimum Speed The minimum speed of the pump when running in Eco mode can be adjusted here.

41.) ECO Maximum Speed The maximum speed of the pump when running in Eco mode can be adjusted here.

42.) ECO Maximum Milk Level The maximum milk level when running in Eco mode can be adjusted here.

43.) ECO Pump Out Time This is the pump out time when running in Eco Mode

44.) Conventional Minimum Speed The minimum speed of the pump when running in Conventional mode can be adjusted here.

45.) Conventional Maximum Speed The maximum speed of the pump when running in Conventional mode can be adjusted here.

46.) Conventional Maximum Milk Level The maximum milk level when running in Conventional mode can be adjusted here.

47.) Conventional Pump Out Time This is the pump out time when running in Conventional Mode

48.) Froth Fighter Minimum Speed The minimum speed of the pump when running in Froth Fighter mode can be adjusted here.

49.) Froth Fighter Maximum Speed The maximum speed of the pump when running in Froth Fighter mode can be adjusted here.

50.) Froth Fighter Pump Out Time This is the pump out time when running in Froth Fighter Mode

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.

SUPPLIER DECLARATION OF CONFORMITY (SDoC)

In accordance with ISO/IEC 17050-1:2004

SDoC Identification Number¹: Sema Pump Controllers

Issuer details

Name² (of New Zealand manufacturer or importer):

Sema Ltd.

Telephone:

+64 9 3580800

New Zealand Company No. (if applicable):

4305878

Email Address:

info@sema.co.nz

Contact Address:

P.O.Box 374
Pukekohe
Auckland 2340

Medium Risk Article – Details³ (Product name, type, rating, brand, model, batch numbers, and serial numbers, as applicable):

This document covers all Sema product which is based upon the 'Invertek' brand of Variable Speed Drives.

Namely:

MPC, WPC, VPC, EPC, FPC and DPC. It also covers any Invertek drives that are used as slaves to any of the products mentioned above or that are used as stand-alone VSD's.

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 ☐

No ☐

N/A ☐

AS/NZS ZZ modified

Yes ☐

No ☐

N/A ☐

OR Complies with the Conformity Cooperation Agreement⁵

Yes ☐

No ☐

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:

Declarations of Conformity from Invertek Drives Ltd

Extensive compliance and conformity documentation is available from Invertek Drives limited.

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:

14/September/2014

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



Write details of shed here

Function No.	Description	Value
	Motors Kilowatt Rating	
	Motors Nameplate R.P.M.	
1	Minimum Speed	
2	Maximum Speed	
3	Maximum Milk Level	
4	Operation Mode	
5	Pump Out Time	
6	Empty Can Interval	
7	Minimum Wash Speed	
8	Maximum Wash Speed	
9	Maximum Wash Level	
10	Wash Pump Out Time	
11	Relay Mode	
12	Relay Off Delay	
13	Pump Out Speed	
17	Motor Noise	
18	Motor Current	
40	ECO MODE Minimum Speed	
41	ECO MODE Maximum Speed	
42	ECO MODE Maximum Milk Level	
43	ECO MODE Pump Out Time	
44	CONVENTIONAL MODE Minimum Speed	
45	CONVENTIONAL MODE Maximum Speed	
46	CONVENTIONAL MODE Maximum Milk Level	
47	CONVENTIONAL MODE Pump Out Time	
48	FROTH FIGHTER MODE Minimum Speed	
49	FROTH FIGHTER MODE Maximum Speed	
50	FROTH FIGHTER MODE Pump Out Time	

