



# ANE Pump Station (Electric) Operations and Maintenance Manual



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## 1 INTRODUCTION

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These manual details the operations of the ANE emulsion pump. The pictures in this manual may vary from your equipment and the options fitted to your pump. For any further information please contact Multitorque directly.

**DANGER**

Before removing any guards or working on the equipment ensure the equipment has been isolated from all potential energy sources.

**DANGER**

While the electrical systems have water ingress protection at no times should the electrical system be washed or sprayed with water or other liquids under pressure.

## 2 OVERVIEW

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The ANE pump is mains powered the pump can be isolated by the isolator on the control panel this will isolate the electric pump motor and the external temperature and pressure sensors although these sensors are low voltage (24V).

1. Customer Mains Supply
2. Electrical Control Panel
3. Pump Motor and Pump
4. Pressure Sensor
5. Temperature Sensor
6. Flow Sensor
7. Speed Sensor

**IMPORTANT** When operating the pump, it is important that the valves and hoses connected to the pump are connected correctly before the pump is operated.

A touch screen and PLC form the second part of the control system and monitor product temperature, product pump pressure and product flow this system will also shut the pump down if abnormal condition are detected.

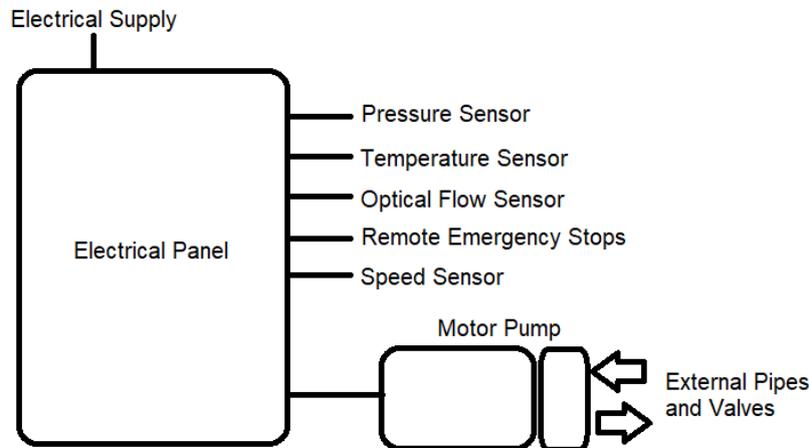


Figure 1 System Components

The control system has the following features;

- Start Stop from the Touch Screen and the wireless remote
- Increase Decrease Speed from the touch screen and the wireless remote
- Revers JOG at half speed for max 10 seconds from HMI and wireless remote
- Shut down if no flow is detected after set period
- Shut down if minimum pressure is not reached within set period
- Shut down if high temperature is detected
- Shut down if high pressure is detected
- Dead man warning after pump has been running 5 minutes
- Dead man shutdown if Dead Man timer has not been reset within 6 minutes.
- The pump will also shutdown on low voltage, vfd drive fault, overload and emergency stop.
- Pump displays the volume of material pumped in Tonnes and allows calibration
- The control system shows motor current and total run hours.
- The control system also provides a history of pump alarms and can be used to schedule pump services.

In addition to the electrical control the pump system has burst disks located in the pump delivery and suction lines these disks are designed to rupture if extreme pressure conditions are detected. The electrical controls are designed to operate before the rupture disks.



## 2.1 PASSWORD AND SECURITY LEVELS

The control system has 2 levels of security each require a different numerical password ;

General Access is provided to the Home Screen, History Screen, Help Screen

Level 1 – provides access to the Calibration used to claibrate the flow or loading rate.

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Level 2 – allows adjustment within limits of the alarm and trip levels, date and time changes.

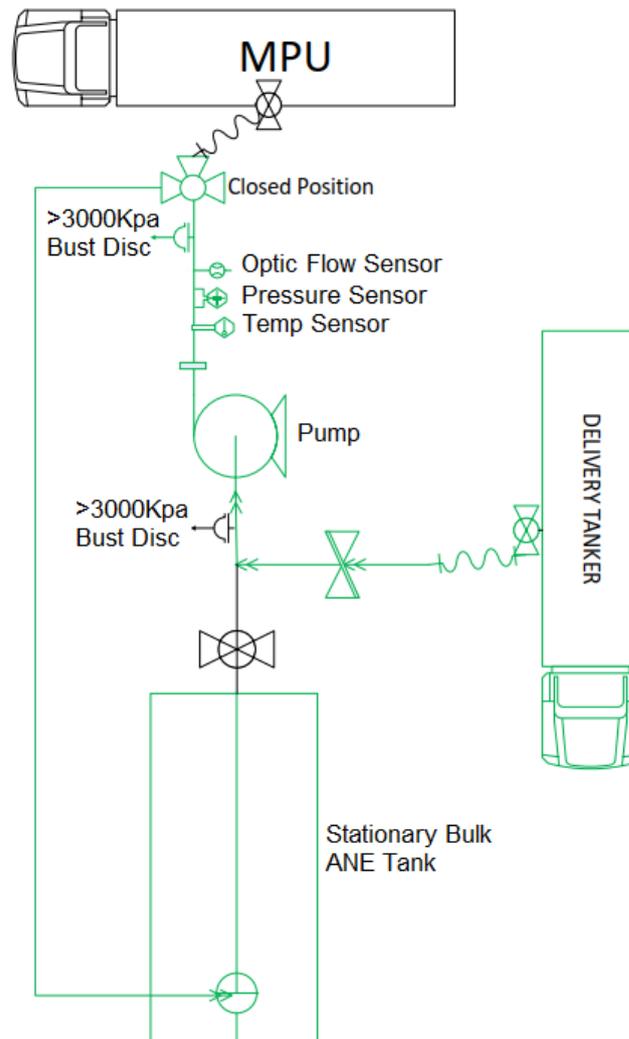
Level 3 – Factory Use Only

## 3 PUMP SYSTEM VALVES AND PIPING

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The piping and valving associated with the pumping system allows for a variety of pumping functions to be performed.

1. The pump can be used to unload a delivery tanker and load the contents into either the stationary bulk ANE tank or a Mobile Processing Unit (MPU).
2. The pump can be used to pump from the stationary bulk ANE tank to a Mobile Processing Unit or other suitable container.
3. The pump can be used to recirculate the product pumping from the stationary bulk ANE tank through the pump and back into the stationary bulk ANE tank



Operators should ensure valves are in the correct position for the pumping operation being undertaken.

Care should be taken with the ends of the flexible hoses to maintain them clean and free from dirt and other foreign materials that could damage the pump or other system components.



## 4 TOUCH SCREEN – THE HUMAN MACHINE INTERFACE (HMI)

The screen provides the operator interface to control and monitor the pump when initially powered up the Home screen will automatically load (Note a screen saver will blank the screen, touching the screen once will wake the screen up).

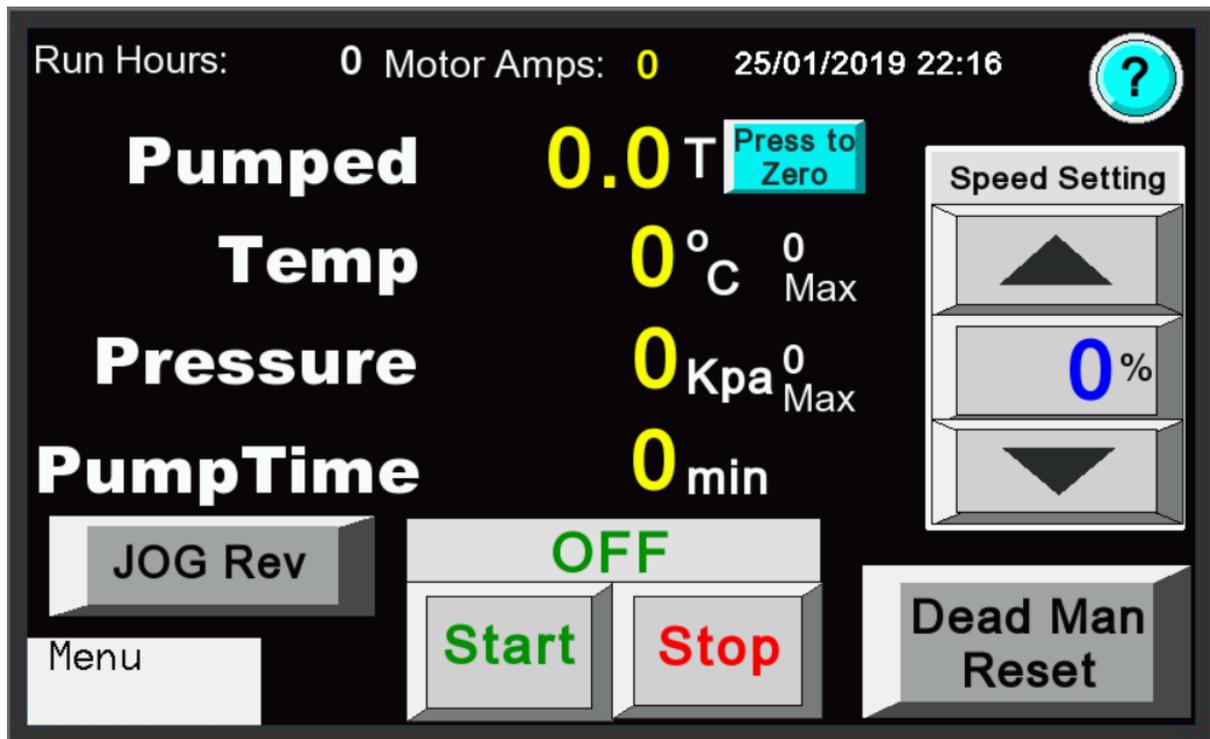
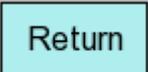
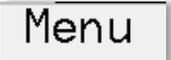
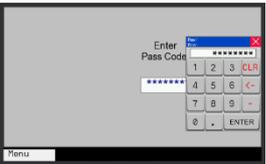


Figure 2 Home Screen - No Alarm Condition

The home screen is the normal operating screen and where the pump can be controlled as well as providing the operator with information on the status of the pump. When an alarm condition occurs or the pump shuts down the home screen will display additional information and provide reset buttons. The following figure shows the additional information that can be displayed in alarm condition.

### 4.1 TOUCH SCREEN - COMMON FEATURES



	<p>If displayed on a screen this button if pushed will bring up a help page.</p>
	<p>If displayed on a screen this will return to the previous screen.</p>
	<p>This is displayed on the bottom left on every screen and if pushed brings up a menu of further options.</p>
	<p>The Set Up Mode button will only display if the user has logged in with the correct user code it allows access to trip values and settings.</p> <p>This screen allows the manual control of the pump and allows forward and reverse changes</p> <p>The data log screen shows details of how often the pump has tripped. The pressure mode is optional if displayed the pressure mode will allow the pumping constant preset pressure.</p> <p>The log in screen allows users to input their password which will allow access to additional set up and maintenance screens.</p>
	<p>When the log in button is pushed the operator will be asked to "Enter Pass Code" when the operator taps or touches the passcode the numeric operator keypad is displayed allowing the operator to input their pass code.</p>
	<p>The numeric key pad is used to input the pass codes and is used for the operator to program various parameters.</p> <p>When entering parameters often there is a limit to what can be entered. The limit is displayed in the top left corner of the key pad (Max: and Min:) a value outside the Min and Max value cannot be entered and will bring up an error. This is the allowable min and max withing the PLC operation.</p> <p>After keying in the desired figure press enter to store the data. If the number is accepted the number keypad will close.</p>
	<p>The login screen allows the entry of the security PIN code, touching the pin code area will bring up the number entry keypad. Enter the security PIN once this has been done access to the "Set Up Mode" will be available on the quick menu tab.</p>
	<p>Most screens will have buttons that can be pushed/touched that either start, stop, reset or allow the operator to input settings.</p>

**Contacts:**



In each mode the Unit has built in protection like;

- ✓ Motor over current protection
- ✓ Dry run protection
- ✓ Delivery pressure sensor that offers over pressure protection and low flow protection
- ✓ Vacuum sensor detecting excess vacuum.

When a trip condition occurs the operator will need to acknowledge and reset the condition.

Following is what each of the trip conditions look like. These will only appear when a trip condition is present these will not be visible during normal operating conditions.



Figure 4 Trip Condition

The trip condition can usually be reset by pressing or touching the reset button, in some cases if the trip event has occurred and been reset too many times a supervisor must login and go to the **"Set up Mode"** and reset the trip event (This has been done to prevent equipment damage from excessive restarts & trips).



Figure 5 VF Comms Fail

The HMI Touch screen, Programmable Logic Controller and VF drive rely on being able to communicate with each other. If a coms failure occurs and the Programmable Controller can no longer communicate the pump will shutdown or trip on overcurrent protection. One of the most common reasons for communication failiure is the "Emergency Stop Button" has been pushed in which case the power to the VF drive and motor will be off.



## 4.2 TOUCH SCREEN - HOME PAGE

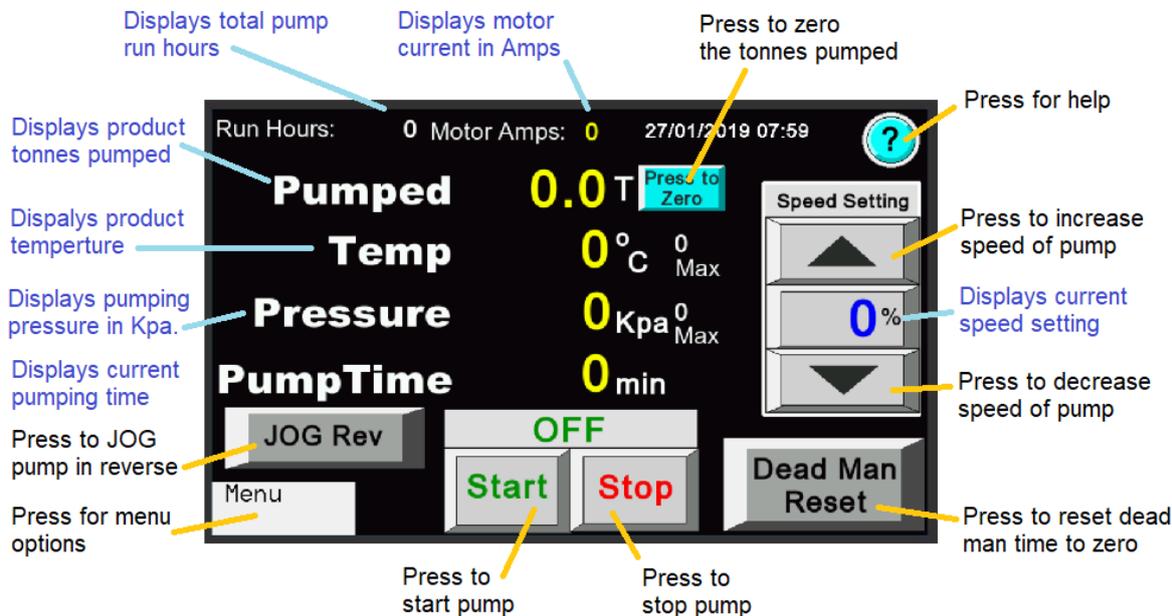


Figure 6 Home Page Explanation No Alarms

The home page is the page displayed after the power is turned onto the system. The page is used to monitor and control the pump during normal operations. Figure 6 details the buttons that can be used to control the pump and provides a description of each button.

The start button will only operate if there are no alarm conditions there are several alarm conditions that will stop the pump and prevent the pump from starting. When an alarm condition occurs it will also display on the home page, most alarm conditions can be reset by pressing the alarm reset button only if the alarm condition is no longer present (ie, the temperature or pressure is again normal). Figure 7 shows the alarm conditions that could appear on the home page during a system fault.

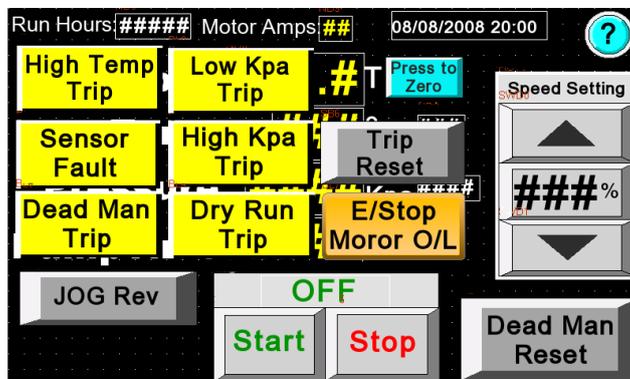


Figure 7 Home Page with Alarms

**Contacts:**



The alarm conditions and trip reset button will only display if in alarm condition exists. The trip reset button will only reset an alarm condition if the condition has returned to normal.

### 4.3 TOUCH SCREEN - CALIBRATION PAGE

The calibration allows the pump flow rate to be recalibrated, the flow rate is calculated from the number of pump revolutions. Both the progressive cavity and Napco style gear pumps are positive displacement pumps and typically pump a set volume of product per revolution. Any changes in product density will affect the flow (as it is shown as weight rather than volume). The calculated flow can also be affected by pump pressure and the condition of the pump. The following screen allows the pump to be calibrated.

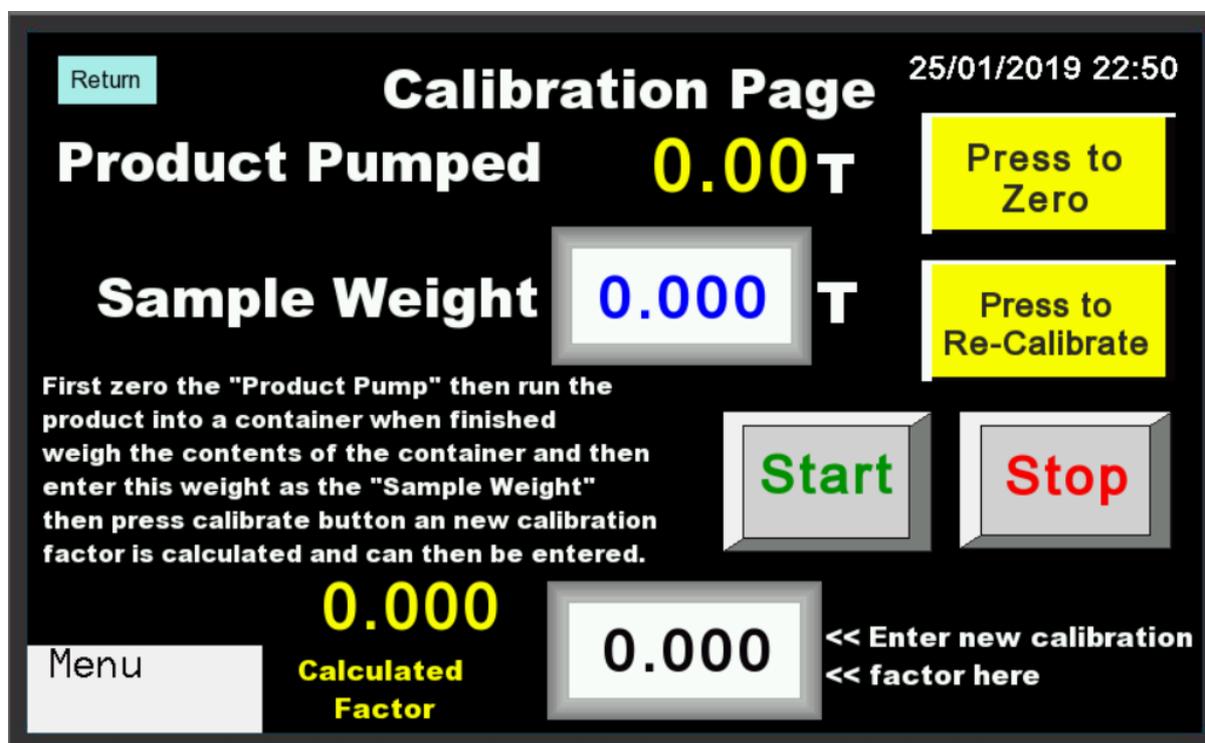


Figure 6 Calibration Screen

To carry out a calibration the pump needs to be set up to pump product into a container so that the pumped product can be weighed and entered into the calibration process. Following are the calibration steps.

Zero the product pumped by pressing **Press to Zero**

Ensure the pump is hoses and piped correctly to pump the product into the hopper or tanker that is going to be weighed. You need to weigh the hopper or tanker before you pump so that you have an empty or tare weight for the hopper or tanker. When ready run the pump, the larger the sample the better the calibration try and use a sample weight of at least 1 Tonne. Stop the pump when you have the required sample.



Weigh the sample, deduct the empty or pre pump weight so that you have the weight of the product that was pumped. This needs to be entered into the sample weight in Tonnes.

After you have entered the sample weight press "Press to Re-calibrate" calibrate button.

After the re-calibrate button has been pressed the control system calculates a new scale factor this is shown in yellow. The new scale factor needs to be reentered into the system.

Once this has been done the product pumped Tonnes should be the same or within 50Kg of the sample weight.



#### 4.4 TOUCH SCREEN - DATA LOGS

This screen provides the user with historical machine data and can help with trouble shooting.

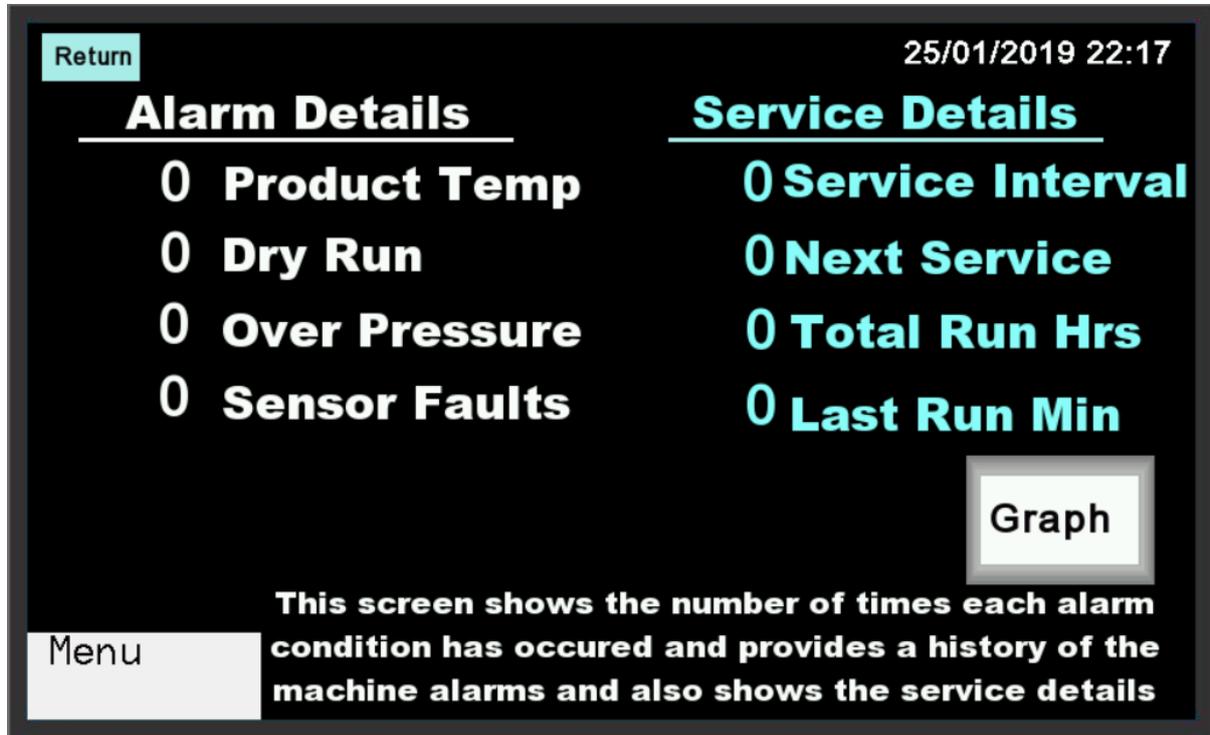


Figure 7 Data Logs

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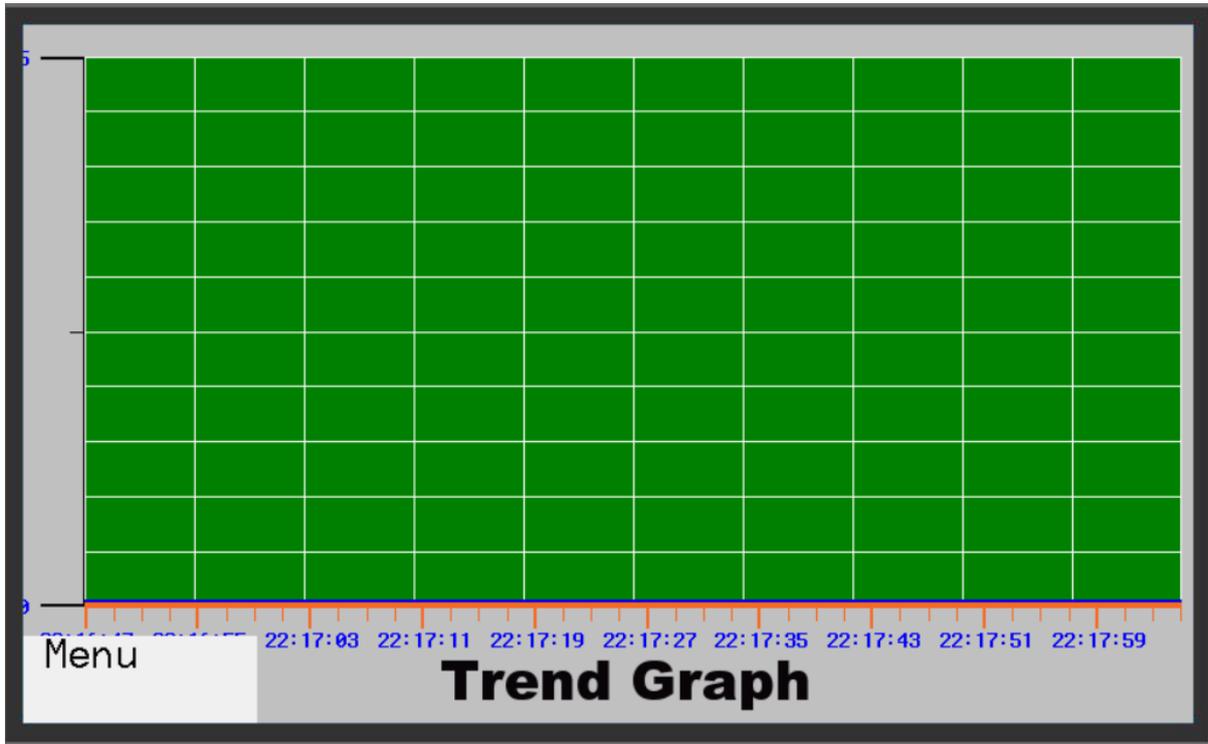


Figure 8 Trend Graph

The trend graph shows the pump pressure over the past 30 minutes

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#### 4.5 TOUCH SCREEN - SET UP PAGE

The “Set Up Mode” screen is only accessible by password and allows a supervisor to set key parameters and access maintenance screens.

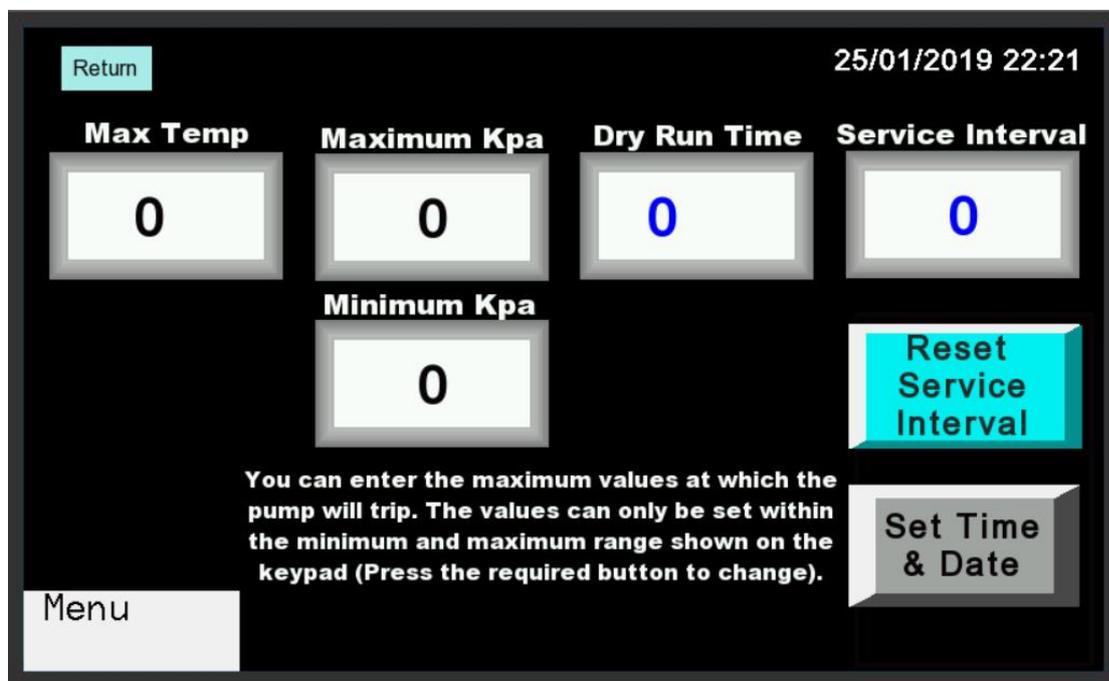


Figure 9 Set Up Mode Screen

Parameter	Range
Maximum Product Temperature– A temperature sensor in the pipe work is used to monitor product temperature. This button allows the user to set the maximum product temperature at which the pump will trip and shutdown.	50-85 Deg C
Maximum Kpa- The maximum pressure the pump will trip at can be set by the user.	500 to 1,500 Kpa
Minimum Kpa – The minimum pressure the pump needs to generate before the dry run time expires.	50 to 100 Kpa
Maximum Dry Time – An optical flow sensor is fitted in the pump to detect product flow and or minimum product pressure. This protects the pump from dry run situations. The dry run time is the maximum time the pump can run dry before the pump will trip and shutdown.	1 to 15 seconds
Service Interval Hr – The user can set the number of hours between services. When the machine hours equal or exceeds the service interval a warning will appear on the HMI screen home and calibrate page. An overdue service is a warning and will not stop the pump from being used. Setting the service interval to 0 will turn of the service warning function	0 to 1,000 0 will turn off the service warning function.

“SET TIME” allows the time and date to be set.

“RESET SERVICE INTERVAL” allows user to reset or complete a service

**Contacts:**



Touch Screen - Time and Date



The time and date can be adjusted by tapping our touch screen either the time or the date and then entering the new or correct time and date. The system will hold the correct time or date for up to 2 years without power.

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## 5 MAINTENANCE

The pumping system combines electrical and mechanical systems and it is important that work performed on these systems is carried out by suitably qualified people and that prior to any work commencing they isolate and make safe the equipment they are intending to work on.

### 5.1 RECOMMENDED MAINTENANCE SCHEDULE

Frequency	Task Description
Before Each Use	Before operating the pump check the pump pipework ensure the valves are set to allow the pump to operate correctly. If the valving and pipework are set incorrectly the pump could be pumping or sucking against a closed valve this could create a dangerous situation.
Daily	<ul style="list-style-type: none"> <li>➤ Inspect guards to ensure they are in place</li> <li>➤ Inspect pipe work and valves for any signs of leakage or spills</li> <li>➤ When pump is running look for any signs of loose flanges, bolts &amp; guards</li> <li>➤ When pump is running check pump pressures and temperatures are as expected.</li> </ul>
3 Monthly or as required	<ul style="list-style-type: none"> <li>➤ Carry out the daily inspection</li> <li>➤ Calibrate the product flow (see calibration section of this manual)</li> </ul>
Annually or as required by explosive industry standards	<ul style="list-style-type: none"> <li>➤ Carry out the daily and monthly inspections.</li> <li>➤ Ensure system is isolated when removing and replacing components</li> <li>➤ Disconnect the analogue sensors by unplugging the sensor ensure the control system detects the sensor has been disconnected and is a trip condition do this for both sensors.</li> <li>➤ Test each emergency stop button to ensure it operates the control system.</li> <li>➤ In the touch screen set up page lower the dry run trip time to the lowest value. Then if possible, run the pump without product to determine if the dry run trips. Alternatively test the optical flow sensor by removing the sensor from pipe and plugging the sensor port so the pump can be run check the pump trip on dry run.</li> <li>➤ Check the pressure sensor for calibration.</li> <li>➤ Grease the Napco pump.</li> <li>➤ Remove any bust disks and inspect and remove any crystallisation that may have built up around the bust disk re-fit after cleaning.</li> </ul>



## 5.2 RECOMMENDED MAINTENANCE MANUALS

Electrical Control System	Manufactured by Multitorque Industries Pty Ltd, Refer to this manual for operation and specific parts. All maintenance works should be carried out in accordance with AS3000 and by suitably qualified personnel.
Product Pump	Manufactured by Napco.
Electric Drive Motor	The electric motor conforms to ISO standards and may be of various manufactures, refer to manufacturers for parts and maintenance manuals.
VF Drive	manufacturer – Vacon 10x

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## 6 TROUBLE SHOOTING

Overload E/Stop Trip Condition	There is no reset for this condition check the emergency stop buttons on the system. There will be at least one emergency stop button on every system but some systems may have more than one emergency stop button.  If the emergency stop buttons are not operated, then the pump motor may have tripped on electrical overload. This will require resetting inside the electrical control panel and should be done by a suitably qualified person.
VF Drive Alarm	The HMI touch screen will display if a fault occurs with the VF drive. The VF drive will also display a fault code and if the fault can be reset allow the fault to be reset on the VF drive. If the fault cannot be reset, you may need to call a qualified electrician (VF Drive Manual Details below).
Burst Disk	If the burst disk is located on the pressure or discharge side of the pump the pump should have tripped on high pressure before a burst disc failure. Check the pressure sensor is working and is calibrated before restarting the pump.

### 6.1 ELECTRICAL SCHEMATIC DIAGRAM

#### Electrical Parts

Control Cabinet Complete	
HMI Screen	
VF Drive	
Pressure Sensor	
Temperature Sensor	
Optical Flow Sensor	
Speed Sensor	

#### Pump Parts

Couplings	
Flanges	
Repair kit excl gears	
Gear set	

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Pipework and Valves

Thru bore stainless steel valve	
Burst disc 300 Psi	
Camlocks	
Suction hose	

## 7 SPECIFICATIONS

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Supply Voltage:	380-440V 3 phase 50 Hz AC
Supply Current:	18 Amps full load
Supply Fault Current:	
Pump Flow Rate:	30 000l/hr
Pump Maximum Pressure:	10bar
Pump Skid (Motor and Pump) weight:	480 Kg
Pump Motor:	7.5Kw 4 pole 380/440VAC

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