Medical Vacuum Plant – HTM2022 & HTM02-01
Plant Systems
Operation and Maintenance Manual
Published by Pneumatech Medical Gas Solutions

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Important
Personnel must make themselves familiar with the contents of this manual and the function of the unit before installing, operating or maintaining any Medical Vacuum Plant

Information contained in this manual is correct at the date of publication. The policy of Pneumatech Medical Gas Solutions is one of continuous product improvement. Pneumatech Medical Gas Solutions reserves the right to make changes that may affect instructions in this manual without prior notice.

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Any complaints about the products or services provided by Pneumatech Medical Gas Solutions, please give as much of the following information as possible:
Product Part Number
Lot/ Batch Number
Approximate date of purchase
Apparent fault.

Complaints
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complaints@p-mgs.com
Introduction

This manual contains information needed to install, operate and maintain the Pneumatech Medical Gas Solutions (Pneumatech MGS) vacuum plant.

The contents of this manual are intended to be read and used by suitably qualified personnel.

**AC input power connection**

Electrical supply requirements vary with different pump models.
Incoming wiring must include neutral and earth.

**WARNINGS, CAUTIONS and NOTES**

The following Warnings, Cautions, and Notes must be read and understood before using the Vacuum Plant.

**Warnings!**

Warnings tell you about dangerous conditions that could lead to death or serious injury to the user that can occur if you do not obey all of the instructions in this manual.

**WARNING!** Read through this entire instruction manual before using or showing others how to use this equipment. As with all medical equipment, attempting to use this device without a thorough understanding of its operation may result in patient or user injury.

**WARNING!** Wear protective gloves when handling oily components.

**WARNING!** The interlock isolator on the Pump Starter Panel must be isolated (switched off) and locked in the off position before accessing pump electrical compartments or mechanical drives.

**WARNING!** Wear protective gloves when handling vacuum pump internal components. Components upstream of and including the aftercooler may reach temperatures of over 100°C during operation.

**WARNING!** Do not attempt to modify this device in any way not strictly described within this manual.

**WARNING!** Medical vacuum plant must be protected from access by unauthorised personnel.

**WARNING!** Ear defenders (hearing protection) maybe needed, especially during maintenance if acoustic enclosures are removed.

**WARNING!** The surfaces of the pumps and components connected to them reach high temperatures when operating for long periods.

**WARNING!** Pump starter panels are supplied with dangerous voltages. The mains supply must be isolated (switched off) and locked in the off position before attempting to access live components in the pump starter panel.

**WARNING!** Wear protective gloves when handling oily components.
Cautions!
Cautions tell you about dangerous conditions that can occur and cause damage to the equipment if you do not obey all of the instructions in this manual.

CAUTION! Use of sub-standard or inappropriate parts and materials may damage the product and invalidate the warranty. Only use genuine Pneumatech Medical Gas Solutions spare parts.
CAUTION! Be careful not to over-torque face seal fittings.
CAUTION! Only use leak detection fluids that are compatible with the materials being tested.
CAUTION! Always wash leak detection fluids off with clean water immediately after use.
CAUTION! The control system contains static sensitive electronic components; do not touch without appropriate precautions. Always wear an anti-static wrist strap when touching printed circuit board assemblies. Failure to do so may result in irreparable damage to electronic components and will invalidate the warranty.
CAUTION! Do not stand on a vacuum pump or bacteria filter assembly.
CAUTION! Always open valves slowly.
CAUTION! Before starting any motor check the pump oil level. Refer to the manufacturers specific instructions provided with the pump.
CAUTION! Do not cover or occlude fan ventilation ports.

Notes:
1. All information, specifications and illustrations within this manual are those in effect at the time of printing.
2. The manufacturer reserves the right to change or make improvements without notice and without incurring any obligation to make changes or add improvements to products previously provided.
3. Spectrographic oil analysis is recommended to monitor lubrication efficiency and to extend the life of oil-lubricated rotating machinery.

Abbreviations used
The following abbreviations are used in this manual:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGS</td>
<td>Medical Gas Solutions</td>
</tr>
<tr>
<td>kPa</td>
<td>Kilopascal</td>
</tr>
<tr>
<td>R.H.</td>
<td>Relative Humidity</td>
</tr>
<tr>
<td>IP4X</td>
<td>Ingress protection Class (for indoor installation only)</td>
</tr>
<tr>
<td>DIN</td>
<td>Deutsches Institut für Normung</td>
</tr>
<tr>
<td>HTM</td>
<td>Health Technical Memorandum</td>
</tr>
<tr>
<td>LED</td>
<td>Light Emitting Diode</td>
</tr>
<tr>
<td>CAN</td>
<td>Controller Area Network</td>
</tr>
<tr>
<td>LAN</td>
<td>Local Area Network</td>
</tr>
<tr>
<td>EFL</td>
<td>Emergency Forced Local</td>
</tr>
<tr>
<td>°C</td>
<td>Degrees Celsius</td>
</tr>
<tr>
<td>ARAF</td>
<td>Auto Restart After power Failure</td>
</tr>
<tr>
<td>h</td>
<td>Hour</td>
</tr>
<tr>
<td>IO</td>
<td>Input/Output</td>
</tr>
<tr>
<td>AC</td>
<td>Alternating Current</td>
</tr>
<tr>
<td>V</td>
<td>Volts</td>
</tr>
<tr>
<td>Hz</td>
<td>Hertz</td>
</tr>
</tbody>
</table>
Scope of this manual
This manual describes the Operation Service, Repair and Testing of the Pneumatech MGS Medical Vacuum Plant.

Pneumatech Medical Gas Solutions service contact
In the event of any queries or problems that cannot be resolved using information in this manual, please call:

44 (0) 1235 463051

Quote if possible, the:
- Product part number
- Lot/ Batch number
- Approximate date of purchase
- Apparent fault
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Safety, Storage and Handling

Storage
Pneumatech Medical Gas Solutions Medical Vacuum Plant can be safely handled and stored under normal working and environmental conditions.

Adverse environmental conditions and harsh abrasives or chemicals may cause damage to the unit.

All products are separately packaged and stored under controlled conditions.

Identification
The Pneumatech MGS Medical Vacuum Plant is identified by the machine number, printed onto a label located to the side of the control box (see Figure 1-1) and details:

- Model number
- Reference number
- Serial number
- Pump/pump supply voltage and frequency

![Identification label](image)

Figure 1; Identification label

Environmental Conditions
Pneumatech MGS Medical Vacuum Plant can be safely handled and stored under normal working and environmental conditions.
Adverse environmental conditions and harsh abrasives or chemicals may cause damage to the unit.
1 Introduction

1.1 Intended Use

The Pneumatech MGS Medical Vacuum Plant provides a proven and reliable means of generating vacuum in hospitals. The Vacuum Plant is manufactured and tested in accordance with current British Standards and can consist of up to five identical vacuum pumps, one or more vacuum vessels, and duplex bacterial filters. A fully automated electronic control system, with manual override, minimises energy consumption and vacuum pump wear. The configuration of the plant, which includes all interconnecting pipe work and wiring, is totally flexible and can be arranged to suit restricted plant rooms or those with difficult access.

Features:
- High quality, quiet and reliable rotary vane vacuum pumps.
- Automatic control system ensures economical operation, no day to day input required.
- Monitoring includes 'plant to alarm interface and indicator'.
- Multi-purpose test point fitted adjacent to plant/ pipeline interface.
- Plant can be customised to suit individual installation.
- Quick and simple installation.
## 2 Technical Specification

Table 2-1: Technical Specification

<table>
<thead>
<tr>
<th>Product name</th>
<th>Physical Characteristics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>Varies with model</td>
</tr>
<tr>
<td>Width</td>
<td>Varies with model</td>
</tr>
<tr>
<td>Depth</td>
<td>Varies with model</td>
</tr>
<tr>
<td>Weight</td>
<td>Varies with model</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental Transport, Storage and Operating Conditions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature transport/ storage</td>
</tr>
<tr>
<td>Operating Temperature</td>
</tr>
<tr>
<td>Operating conditions: Ventilation should be provided to ensure that the plant room temperature does not exceed ambient temperature by more than 10°C.</td>
</tr>
<tr>
<td>Humidity</td>
</tr>
</tbody>
</table>

### Electrical Specification

<table>
<thead>
<tr>
<th>Panel Electrical supply</th>
<th>Varies with model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Electrical supply</td>
<td>Varies with model</td>
</tr>
<tr>
<td>Protection against electric shock</td>
<td>Class 1 (requires protective earth)</td>
</tr>
<tr>
<td>Mode of operation</td>
<td>Continuous (may be left on indefinitely)</td>
</tr>
<tr>
<td>Ingress Protection Class</td>
<td>IP4X – for indoor installation only</td>
</tr>
<tr>
<td>Degree of mobility</td>
<td>Permanently installed</td>
</tr>
</tbody>
</table>

### Performance:

| Volumetric Flow Rate | Varies with model |

### Regulatory Classification:

<table>
<thead>
<tr>
<th>GMDN Code (Term)</th>
<th>36271 (Medical gas and vacuum supply systems)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC MDD Classification</td>
<td>Class IIb</td>
</tr>
<tr>
<td>GHTF Classification</td>
<td>Class C</td>
</tr>
</tbody>
</table>
3 User Responsibility

This device has been built to conform to the specification and operating procedures stated in this manual and/or accompanying labels and notices when checked, operated, maintained and serviced in accordance with these instructions. To ensure the safety of this device, it must be checked and serviced to at least the minimum standards laid out in this manual. A defective or suspected defective product must not be used under any circumstances.

The user must accept responsibility for any malfunction which results from non-compliance with the servicing requirements detailed in this manual. Additionally, the user must accept responsibility for any malfunction which may result from misuse of any kind, or non-compliance with other requirements detailed in this manual.

Worn, broken, distorted, contaminated or missing components must be replaced immediately. Should such a replacement repair be necessary, it is recommended that a request for service advice be made to the nearest Pneumatech Medical Gas Solutions Service Centre.

This device and any of its constituent parts must be repaired only in accordance with written instructions issued by Pneumatech MGS and must not be altered or modified in any way without the written approval of Pneumatech MGS.

The user of this equipment shall have the sole responsibility for any malfunction which results from improper use, maintenance, repair, damage or alteration by anyone other than Pneumatech MGS or their appointed agents.

4 Description of Symbols

**WARNING!** Indicates a potentially hazardous situation which, if not avoided, could result in personal injury to the user or others.

**CAUTION!** Indicates a potentially hazardous situation which, if not avoided, could result in damage to the device or property.

**Note:** Emphasises points to achieve more convenient or efficient use of the device.

Warning! Motor starts automatically

Warning! Surfaces may be hot and should not be touched

Warning! Dangerous voltage

Warning! Beware of sudden loud noises

Static sensitive components: take appropriate precautions

Wear ear defenders

Wear eye protection

Wear hand protection

Protective earth connection

Ambient pressure range

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Page 12   Medical Vacuum Plant
Ambient humidity range

Ambient temperature range

Consult accompanying documents

Service due date

The CE mark demonstrates that the product conforms to the requirements in the European Council Directive 93/42/EEC concerning medical devices. The number 0088 identifies the notifying body under which the Quality Systems operated within Pneumatech MGS.

Consult accompanying documents

Connection for the live conductor on permanently installed equipment

Connection for the neutral conductor on permanently installed equipment

Connection for the earth conductor on permanently installed equipment
5 Technical information

Figure 5-1; Quadruplex Vacuum Plant system diagram

5.1 Major components

Each Pneumatech Medical Vacuum Plant consists of:

1. HTM 2022 - Two or more vacuum pumps, up to a maximum of six, any of which can be selected as Duty pump.
2. HTM 02-01 - Three or more vacuum pumps, up to a maximum of six, any of which can be selected as Duty pump.
3. Pump monitors which indicate the status of their respective vacuum pumps.
4. Vacuum vessel(s) with manual drain and isolation valves.
5. A filter frame with two filter sub-assemblies, each including:
   b. Bacterial filter assemblies.
   c. Plant Control Unit.
   d. Plant to alarm interface.

5.1.1 Vacuum pumps

- Direct driven, air cooled, oil flooded, rotary vane vacuum pumps are provided as standard.
- The pumps are continuously rated and cannot be overloaded by continuous operation at high vacuum.
- Each pump includes an inlet filter and a non-return valve is provided at the inlet port to protect the vacuum vessels and piped distribution system from inadvertent pressurization.
- A condensate trap is fitted at each exhaust port. Except when mounted directly to the vacuum vessels each pump is individually mounted on a pump base for maximum flexibility of the plant layout.
5.1.2 Vacuum vessel

One or more vacuum vessels are supplied, manufactured in accordance with BS5169:1992 or BS EN 286-1:1998 and tested to PD5500. Each vessel is provided with a manual drain.

5.1.3 Duplex Filter Assembly

- The filter module has duplex bacterial filters, with manual isolating valves to enable the selection of Duty and Standby.
- Bacterial filter elements guarantee bacterial removal to 0.005% when tested to BS3928 at full design flow.
- Each filter is complete with a sterilisable drain flask with isolating valve, and a differential pressure gauge to indicate when the element needs replacing.
6 Installation

Pneumatech MGS Medical Vacuum Plant should only be installed, commissioned, and maintained by technicians who are suitably trained with piped medical gas systems, and who are fully conversant with the contract specifications and safety procedures.

Note: It is essential the installation of the plant is in accordance with the requirements of HTM 2022 and HTM 02-01, (as applicable) and must include an alarm system which has been proven and certified prior to the plant being accepted for use.

6.1 Environmental Conditions - Installation

WARNING! Keep all components dry and clean during storage and installation.
WARNING! Pneumatech Medical Gas Solutions vacuum plant can be safely handled and stored under normal working and environmental conditions.
Adverse environmental conditions and harsh abrasives or chemicals may cause damage to the unit.
WARNING! Ventilation should be provided to ensure that the plant room temperature does not exceed ambient temperature by more than 10°C.

6.2 Component check

Inspect all components as they are unpacked.
All plants have a plant rating label, affixed to the side of the Plant Control Unit indicating product description, output, part number and batch number, fitted to the Plant Control Unit.
Vessel rating labels are attached to the vacuum vessel(s).

6.3 Installation

1. Pneumatech MGS Medical Vacuum Plant should be installed within a plant room that provides adequate ventilation with an ambient temperature between +10°C and +40°C.

2. Ventilation should be provided to ensure that the plant room temperature does not exceed an ambient temperature by more than 10°C.

Note: 75% of all energy consumed is dissipated into the plant room.

3. There should be at least 500 mm between plant components and any walls or other obstructions.
7 Commissioning

Commissioning is carried out in full:
- After initial installation.
- After a major component change, and
- As part of a planned preventative maintenance programme.

The object of commissioning is to ensure that all components are serviceable. Personnel carrying out the following commissioning procedure must be qualified and fully conversant with the information contained in this manual.

7.1 Pre-test checks

7.1.1 Leak Test

Pressure for leak testing purposes must not exceed 7 bar, and should only be applied with the drain valve and drain flask removed.

As supplied, the plant operates under vacuum conditions. It is not possible to create a hazardous situation by drawing a vacuum on the vessel. Any positive pressure in the system should be considered hazardous.

7.1.2 Pre-start-up Tests

1. Check that all pipes are connected, all unions made and that the plant is mechanically secure.
2. Check that all electrical connections are in place and that they have been correctly made.
3. Check that the pumps have been filled with the correct level of lubricant.
4. Check that the isolating valves between the pumps and the vessels are open.
5. Check that the sensing line between the control panel and the plant/pipeline interface is connected.
### 7.1.3 Vacuum Pump Testing

1. Switch on the main isolator to pump No.1.
2. Check the rotation and switch off the isolator.
3. Repeat this procedure for the other pump(s).
4. If the rotation of any of the pumps is incorrect, isolate the supply and reverse L1 (red) and L3 (blue) phase wires at the pump connection box.

### 7.1.4 Commissioning HTM02-01 Medical Vacuum Plant

#### 7.1.5 Triplex Pump System

Triplex systems have one Duty, one Standby and one Reserve pump. The location of Duty, Standby and Reserve pumps is rotated automatically to ensure equal usage of all pumps. Each pump is sized to provide the full system design flow.

1. Switch on all isolators and allow the pumps to evacuate the vessel to the Duty cut-out of 650 mmHg.
2. Identify the Duty pump and vent the vessels, via one manual drain until the Duty pump starts.
3. Isolate the Duty pump and continue to vent the vessels until the Standby pump starts.
4. Isolate the Standby pump and continue to vent the vessels until the Reserve pump starts.
If the above procedure is completed satisfactorily, the pump controls are operating correctly and the vacuum pump operation is proved.

Select the RESET display on each pump controller and all fault conditions should be cancelled.

7.1.6 Quadruplex Pump System

Quadruplex systems have two Duty, one Standby, and one Reserve pump.
The location of Duty, Standby and Reserve pumps is rotated automatically to ensure equal usage of all pumps.
Each pump is sized to provide 50% of the system design flow.
1. Switch on all isolators and allow the pumps to evacuate the vessels to the Duty cut-out of 650 mmHg.
2. Identify the Duty pumps and vent the vessels, via one manual drain, until the Duty pumps start (there will be a delay between the two pumps starting to prevent overloading of the electrical supply).
3. Isolate the Duty pumps and continue to vent the vessels until the Standby pump starts.
4. Isolate the Standby pump and continue to vent the vessels until the Reserve pump starts.

If the above procedure is completed satisfactorily the pump controls are operating correctly and the vacuum pump operation is proved.
Select the RESET display on each pump controller and all fault conditions should be cancelled.

7.1.7 Pentaplex Pump System

Pentaplex systems have three Duty, one Standby, and one Reserve pump.
The location of Duty, Standby and Reserve pumps is rotated automatically to ensure equal usage of all pumps.
Each pump is sized to provide 33% of the system design flow.
1. Switch on all the isolators and allow the pumps to evacuate the vessels to the Duty cut-out of 650 mmHg.
2. Identify the Duty pumps and vent the vessels, via one manual drain, until the Duty pumps start.
   Note: There will be a delay between each of the pumps starting to prevent overloading of the electrical supply.
3. Isolate the Duty pumps and continue to vent the vessels until the Standby pump starts.
4. Isolate the Standby pump and continue to vent the vessels until the Reserve pump starts.

If the above procedure is completed satisfactorily the pump controls are operating correctly and the vacuum pump operation is proved.
Select the RESET display on each pump controller and all fault conditions should be cancelled.

Note: Refer to section 7.2 to complete commissioning of HTM 02-01 Vacuum Plant.

7.1.8 Commissioning HTM2022 Medical Vacuum Plant

7.1.9 Initial Starting – Vacuum Pumps

a) Check that the isolating valves between the vacuum pumps and the vacuum receiver are open. Check the sensing line between the control panel and outgoing pipeline has been re-fitted following pressure testing.
b) Switch on the main isolator to the vacuum pump No.1. Check the rotation and then switch off the isolator.
c) Switch on the main isolator to the vacuum pump No. 2. There is a time delay before No. 2 will start, to prevent simultaneous starting, following power failure (approximately 5 seconds). Check the rotation then switch off the isolator.
d) If the rotation of any pump is incorrect, isolate the plant at the distribution boards. Get a qualified electrician to check the phases are connected in the correct sequence. If necessary change L1 (red) and L3 (blue).

7.1.10 Proving the Vacuum Pumps

a) Once correct rotation has been achieved, switch on both isolators and allow the pumps to evacuate the reservoir to duty cut-out of 650mm/Hg.
b) Ensure No. 1 is selected as duty and vent the reservoir through the manual drain until No. 1 vacuum pump starts.
c) Isolate No. 1 vacuum pump and vent the reservoir and check No. 2 runs as standby.
d) Select No. 2 as duty and with both isolators on, vent the reservoir until No. 2 starts.
e) Isolate No. 2 vacuum pump and vent the reservoir and check No. 1 runs as standby.
f) Repeat steps a) to e) for pumps 3, 4 and 5 if applicable.

Assuming steps a) to e) can be achieved the vacuum pumps are now proved. To reset the alarms see Alarm Pressure Switch Adjustment, 7.3.

Note:

a) Vacuum pressure switch settings will vary due to small changes in barometric pressure and ambient temperatures.
b) Vacuum pumps have a minimum run time of 30 seconds.

7.1.11 Proving the Alarm Circuits

From the previous commissioning instructions the operator will have become familiar with the plant operation.

To Prove the Interface Indicator Conditions:
The interface indicator is located on the plant control unit.

Plant Fault
a) Check the indicator shows ‘Normal’
b) Isolate either or both pumps ‘Plant Fault’
c) Reinstate power and press reset to return ‘Normal’

Plant Emergency
a) Check the indicator shows ‘Normal’
b) Valve off both pumps and drop vacuum to Receiver, pressure 450mm/Hg ‘Plant Emergency’
c) Reinstate power and check interfaces return to ‘Normal’

Pressure Fault Pipeline
a) Check the indicator shows ‘Normal’
b) Reduce the vacuum in the line.
c) Reinstate line pressure and check interface returns to ‘Normal’

7.2 Proving the Alarm Interface Indicator Conditions

The alarm INTERFACE INDICATOR is located on the Plant Control Unit.
8 Operating Instructions

8.1 Introduction

As mentioned in chapter Plant description, both a pump controller per pump is foreseen and a central controller which centrally receives information from the pump controllers and sends commands to those pump controllers. The pump controllers are PureLogic® controllers with text display, while the central controller is a PureLogic® Graphic+

Together they form the control system for the medical vacuum plant, performing following functions:
1. Overall plant control and indication
2. Individual pump starting and stopping
3. Plant status monitoring and indication
4. Alarm status signalling

First the individual pump controllers will be explained. In the default situation they are controlled by the central controller, explained in section Central controller - Interface icons and menu structure.

8.2 Pump controller

8.2.1 Interface, icons and menu structure
### Table 8-1: PureLogic® Pump Controller

<table>
<thead>
<tr>
<th>Item</th>
<th>Designation</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Display</td>
<td>Shows icons and operating conditioning.</td>
</tr>
<tr>
<td>2</td>
<td>Warning LED</td>
<td>Is lit when warning is triggered.</td>
</tr>
<tr>
<td>3</td>
<td>Service LED</td>
<td>Is lit when a service is needed.</td>
</tr>
<tr>
<td>4</td>
<td>Operation LED</td>
<td>Is lit when the central controller is automatically controlling the pumps and dryers (sequencing is turned on).</td>
</tr>
<tr>
<td>5</td>
<td>Voltage LED</td>
<td>Indicates the voltage is turned on.</td>
</tr>
<tr>
<td>6</td>
<td>Enter button</td>
<td>Confirm action.</td>
</tr>
<tr>
<td>7</td>
<td>Escape button</td>
<td>Go to the previous screen or end current action.</td>
</tr>
<tr>
<td>8</td>
<td>Analogue Ammeter</td>
<td>Indicates the actual current (amps) of the pump.</td>
</tr>
<tr>
<td>9</td>
<td>LAN on/off switch</td>
<td>Determines if the pump is to be controlled manually or automatically.</td>
</tr>
<tr>
<td>10</td>
<td>Inter-locking isolator</td>
<td>Must be turned to the off position in order to open the cubicle door.</td>
</tr>
<tr>
<td>11</td>
<td>Stop button</td>
<td>Not used.</td>
</tr>
<tr>
<td>12</td>
<td>Start button</td>
<td>Not used.</td>
</tr>
<tr>
<td>13</td>
<td>Cubicle lock</td>
<td>Can be opened with a key to open the cubicle.</td>
</tr>
<tr>
<td>14</td>
<td>Scroll buttons</td>
<td>Use these buttons to scroll through the menu.</td>
</tr>
<tr>
<td>15</td>
<td>Purelogic® Graphic Controller</td>
<td>Intelligent central controller which sequences pumps and controls the dryer</td>
</tr>
</tbody>
</table>

![Figure 8-2; PureLogic® Pump Controller Icons](image-url)
<table>
<thead>
<tr>
<th>Item</th>
<th>Icon</th>
<th>Appearance</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><img src="image" alt="Blinking FTGOL fault" /></td>
<td>Blinking</td>
<td>FTGOL fault (the pump failed to go on load)</td>
</tr>
<tr>
<td>2</td>
<td><img src="image" alt="Rotating Running" /></td>
<td>Rotating</td>
<td>Running</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Steady Stopped" /></td>
<td>Steady</td>
<td>Stopped</td>
</tr>
<tr>
<td>3</td>
<td><img src="image" alt="Steady Under LAN control" /></td>
<td>Steady</td>
<td>Under LAN control</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Blinking Forced local mode" /></td>
<td>Blinking</td>
<td>Forced local mode</td>
</tr>
<tr>
<td>4</td>
<td><img src="image" alt="Pump cool down, to prevent too many motor starts per hour (maximum is 20 starts/hour)" /></td>
<td>Blinking</td>
<td>Pump cool down, to prevent too many motor starts per hour (maximum is 20 starts/hour)</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Value must be multiplied by 10 to get the actual value" /></td>
<td>When shown, value must be multiplied by 10 to get the actual value</td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Value must be multiplied by 100 to get the actual value" /></td>
<td>When shown, value must be multiplied by 100 to get the actual value</td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Value must be multiplied by 1000 to get the actual value" /></td>
<td>When shown, value must be multiplied by 1000 to get the actual value</td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Hours" /></td>
<td>Hours</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><img src="image" alt="Temperature indication (degrees C)" /></td>
<td>Temperature indication (degrees C)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Temperature indication (degrees F)" /></td>
<td>Temperature indication (degrees F)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td><img src="image" alt="MPa (pressure unit)" /></td>
<td>MPa (pressure unit)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Psi (pressure unit)" /></td>
<td>Psi (pressure unit)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Bar (pressure unit)" /></td>
<td>Bar (pressure unit)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td><img src="image" alt="Blinking Oil level switch (option): indicated the oil level is too low" /></td>
<td>Blinking</td>
<td>Oil level switch (option): indicated the oil level is too low</td>
</tr>
<tr>
<td>8</td>
<td><img src="image" alt="Steady Number of motor starts" /></td>
<td>Steady</td>
<td>Number of motor starts</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Blinking Motor overload" /></td>
<td>Blinking</td>
<td>Motor overload</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Emergency Stop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Service required</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Blinking Emergency Forced Local mode (triggered by local pressure)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Steady Automatic restart after voltage failure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Sensor error</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 8.2.2 Scrolling through all screens

**Controller panel**

Scroll buttons are used to scroll through all screens. The screens are divided into register screens, measured data screens, digital input screens (numbered as <d. In>, <d. 1>, ...), parameter screens (numbered as <P. 1>, <P. 2>, ...), and test screens (numbered as <t. 1>,...). During scrolling, the numbers of the screens appear in a consecutive order. For most screens, the unit of measurement and the related pictograph are shown together with the screen number.

**Figure 8-4; Example (operating hours)**
The screen shows the screen number `<d. 1>`, the unit used `<hrs>` and the related icon (operation). Press Enter key to call up the number of operating hours.

### Overview of the screens

Table 8-3: PureLogic® Pump controller – screen overview

<table>
<thead>
<tr>
<th>Digital input screens</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;d. In&gt;</code></td>
<td>Status of the digital inputs</td>
</tr>
<tr>
<td><code>&lt;d. 1&gt;</code></td>
<td>Running hours (hrs or x1000 hrs)</td>
</tr>
<tr>
<td><code>&lt;d. 2&gt;</code></td>
<td>Motor starts (x1 or x1000)</td>
</tr>
<tr>
<td><code>&lt;d. 3&gt;</code></td>
<td>Module hours (hrs or x1000 hrs)</td>
</tr>
<tr>
<td><code>&lt;d. 4&gt;</code></td>
<td>Service timer reading (hrs or x1000 hrs)</td>
</tr>
<tr>
<td><code>&lt;d. 5&gt;</code></td>
<td>Actual program version</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter screens</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;P. 1&gt;</code></td>
<td>Selection between Local, remote or LAN control (parameter not active)</td>
</tr>
<tr>
<td><code>&lt;P. 2&gt;</code></td>
<td>Setting a node ID for CAN control (CAN address)</td>
</tr>
<tr>
<td><code>&lt;P. 3&gt;</code></td>
<td>Settings for IP, gateway and Subnet mask</td>
</tr>
<tr>
<td><code>&lt;P. 4&gt;</code></td>
<td>Pressure band settings (parameter not active)</td>
</tr>
<tr>
<td><code>&lt;P. 5&gt;</code></td>
<td>Modifying the service timer</td>
</tr>
<tr>
<td><code>&lt;P. 6&gt;</code></td>
<td>Setting of unit for temperature (parameter not active)</td>
</tr>
<tr>
<td><code>&lt;P. 7&gt;</code></td>
<td>Setting of unit for pressure</td>
</tr>
<tr>
<td><code>&lt;P. 8&gt;</code></td>
<td>Setting for function: Automatic restart after voltage failure</td>
</tr>
<tr>
<td><code>&lt;P. 9&gt;</code></td>
<td>Selection between Y-D or DOL starting (parameter not active)</td>
</tr>
<tr>
<td><code>&lt;P. 10&gt;</code></td>
<td>Setting of minimum stop time</td>
</tr>
<tr>
<td><code>&lt;P. 11&gt;</code></td>
<td>Setting a password</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test screens</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;t. 1&gt;</code></td>
<td>Display test</td>
</tr>
<tr>
<td><code>&lt;t. 2&gt;</code></td>
<td>Jog function</td>
</tr>
</tbody>
</table>
Figure 8-5; PureLogic® Pump Controller – Menu flow
### 8.2.3 Pump controller operation

**LAN/local control, automatic/manual operation**

With the Local/LAN switch (9), the user can put the pump either in LAN control or in Local control. By default, the pumps should be in LAN control since this ensures the most efficient operation. The controller maintains the pressure between programmable limits by running or stopping the pumps.

When in LAN mode, these commands are relayed by the central controller. When in Local mode, these commands are based on the pressure measured by the transducer located at the inlet of the corresponding pump, see diagram: Plant description.

For maintenance reasons or in case of problems, it is advised to put the pump in Local control. By default, a plant fault alarm is triggered when a pump is set to Local. To prevent this fault from appearing during maintenance, isolate this pump in the central controller software (see Central controller operation). After having switched to Local control (switch 9), stop the pump by pushing the Stop button (11) and proceed by switching off the isolating switch (10).

To reinstate a pump, re-integrate it in the software, turn the isolating switch to On and put the Local/LAN switch to LAN.

In LAN control, the pump is in automatic operation by default. In Local control, operation depends whether the On or Off button is pressed on the controller (11 or 12). When the On button is pressed, the pump becomes active and starts running immediately.
pressed, operation is automatic (based on the pump’s local pressure sensor). When the Off button is active, the pump will not run, unless the JOG function is activated (see Scrolling through all screens). In JOG mode, the pump runs continuously until cancel is pressed. The JOG function is only available in Local Off mode.

Table 8-5: Pump controller – LAN/local switch

<table>
<thead>
<tr>
<th>Position of switch (9)</th>
<th>Position of switch (9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAN control</td>
<td>Local control</td>
</tr>
</tbody>
</table>

**Automatic operation**
- Pump is automatically started or stopped, based on central controller algorithm.
- Start button (12): Pump is automatically started or stopped, based on local pressure sensor.

**Manual operation**
- Not possible
- Stop button (11): No JOG: pump is stopped. JOG: pump runs continuously.

**Pressure display**
The default starting display shows the pressure that is read out from the pump’s pressure sensor, regardless whether the pump is running or not.

By scrolling down, the user can read out the running hours, motor starts, module hours, service hours, ... in the corresponding submenus (see section Scrolling through all screens). One by one, the other relevant submenus will be explained hereunder.

**Viewing the input status**
Entering submenu <d. In>, one can easily verify the status of the input signals (e.g. for troubleshooting). Four digits are displayed, each representing a specific input:
- First digit: Status of the motor overload protection. 1 = OK, 0 = Overload tripped.
- Second digit: Status of the Local/LAN switch. 1 = LAN mode, 0 = Local mode.
- Third digit: Status of the FTGOL switch (see Interface icons and menu structure and Plant fault). 1 = vacuum not detected, 0 = vacuum detected.

Example: for a pump that isn’t running, the following status corresponds to the fact that all inputs are normal: 1111. When a pump is running, this should change to 1110.

**Resetting service running hours**
When a maintenance interval is expired, the blue service LED is lit (item (3) in section Interface icons and menu structure).

To reset the service timer after carrying out the required maintenance (see Oil, oil filter and oil separator change), scroll to the service submenu <d. 4> and press Enter.
The number of running hours since the last service is shown. Press Enter (enter your password if it is set) and press Enter again to confirm. The service interval defined in <P. 5> will be subtracted, the blue LED will go out and the service warning will disappear.

**CAN settings**

Submenu <P. 2> can be used to change the CAN address and to turn CAN Off or On. Normally these settings are set correctly during production and should not be changed. The CAN address is unique per pump and defines the cut-in and delay value in Local mode. The CAN address should correspond to the figure indicated on the label on the pump cubicle. CAN should be put to Off prior to change the CAN address. Do not forget to put CAN to On after the CAN address has been set.

**IP settings**

When scrolling down further to submenu <P. 3>, the IP submenu is accessible. When the user wants to connect to this controller directly through LAN/IP, the settings can be modified according to the following diagram.
Changing the temperature unit
Scrolling down further till <P. 6> shows the submenu where the temperature unit can be modified. The actually used unit is shown. Possible settings are <˚C> and <˚F>.
To change:
• Press Enter button (6) (unit blinks) and use the Scroll buttons (14) to select another unit.
• Press Enter button (6) to program the new unit or press Escape button (7) to return to the parameter screen without changes.

Changing the pressure unit
Scrolling down further till <P. 7> shows the submenu where the pressure unit can be modified:
Automatic restart after voltage failure
Submenu «P. B» makes it possible to (de)activate the Automatic Restart After Voltage Failure (ArAF) function on the level of the local controller.
When ArAF is On, a pump in Local mode will restart when the power is reinstated within the selected time frame if it was running before the voltage was interrupted.
To prevent a pump from restarting unwillingly after voltage failure, the following procedure can be followed to disable ArAF:
Password

Submenu <P. 11> makes it possible to set a password to protect important settings such as service timer and control mode settings.

Attention: Lost passwords cannot be recovered. Save the password carefully

The following procedure makes it possible to set a password:
Figure 8-12: Pump controller – Password
8.3 Central controller (PureLogic®)

8.3.1 Interface, icons and menu structure

![Figure 8-13: PureLogic® Central Controller](image)

<table>
<thead>
<tr>
<th>Item</th>
<th>Designation</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Display</td>
<td>Shows icons and operating conditioning.</td>
</tr>
<tr>
<td>2</td>
<td>Warning LED</td>
<td>Is lit when warning is triggered.</td>
</tr>
<tr>
<td>3</td>
<td>Service LED</td>
<td>Is lit when a service is needed.</td>
</tr>
<tr>
<td>4</td>
<td>Operation LED</td>
<td>Is lit when pump is automatically started and stopped.</td>
</tr>
<tr>
<td>5</td>
<td>Voltage LED</td>
<td>Indicates the voltage is turned on.</td>
</tr>
<tr>
<td>6</td>
<td>Enter button</td>
<td>Confirm action.</td>
</tr>
<tr>
<td>7</td>
<td>Escape button</td>
<td>Go to the previous screen or end current action.</td>
</tr>
<tr>
<td>8</td>
<td>Stop buttons</td>
<td>This button stops the pump when in Local mode.</td>
</tr>
<tr>
<td>9</td>
<td>Start button</td>
<td>This button puts the pump in automatic operation when in Local mode. The operation LED (4) lights up and the pump controller is operative.</td>
</tr>
<tr>
<td>10</td>
<td>Cubicle lock</td>
<td>Can be opened with a key to open the cubicle.</td>
</tr>
<tr>
<td>11</td>
<td>Scroll buttons</td>
<td>Use these buttons to scroll through the menu.</td>
</tr>
<tr>
<td>12</td>
<td>Purelogic® Graphic Controller</td>
<td>Intelligent central controller which sequences pumps and controls the vacuum plant system.</td>
</tr>
</tbody>
</table>
Select one of the main tabs (Menu - Details or Views) by using the arrow keys (11) followed by pressing the enter key (6). Now it is possible to select one of the submenus by using the arrow keys (11) and again pushing Enter (6). If you want to revert from a submenu to the main screen, push the Escape button (7).

- Starting screen (ECO_1): shows the inlet net pressure and the status of the plant.
- Main menu (ECO_2): gives access to the different sub-menus (see Central controller operation).
- Pump overview screen (ECO_3): shows an overview of the plant pumps with their status.
- Command screen (ECO_4): Enables the user to start the central controller or force the pumps into local mode.
- View screen (ECO_5): enables the user to view the plant information as a graph, as a 2 line input or as a 4 line input.

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Description</th>
<th>Ref.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Normal</td>
<td>6</td>
<td>Pumps</td>
</tr>
<tr>
<td>2</td>
<td>Net pressure</td>
<td>7</td>
<td>Commands</td>
</tr>
<tr>
<td>3</td>
<td>Menu</td>
<td>8</td>
<td>ECO local</td>
</tr>
<tr>
<td>4</td>
<td>Detail</td>
<td>9</td>
<td>Reset</td>
</tr>
<tr>
<td>5</td>
<td>Views</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 8-8: PureLogic® Central Controller – Pump

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idle pump</td>
<td>The pump is idle and ready to be called. The bar graph is blank.</td>
</tr>
<tr>
<td>Lead pump</td>
<td>The central controller has assigned this pump to the next one to run. This is indicated by a full line underneath the blank bar graph.</td>
</tr>
<tr>
<td>Called pump</td>
<td>This pump is running. The bar graph is coloured.</td>
</tr>
<tr>
<td>Called pump, last one called</td>
<td>This pump has last started to run. This is indicated by a dotted line underneath the coloured bar graph.</td>
</tr>
</tbody>
</table>

### Table 8-9: Central controller – Fault icons (more details in section Plant fault)

<table>
<thead>
<tr>
<th>Icon</th>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No valid pump</td>
<td>A pump controller is expected at this CAN address.</td>
<td></td>
</tr>
<tr>
<td>No communication</td>
<td>No reply from the connected pump controller within a pre-defined time.</td>
<td></td>
</tr>
<tr>
<td>Blinking network icon</td>
<td>The pump is running in Emergency Forced Local (EFL).</td>
<td></td>
</tr>
<tr>
<td>No answer</td>
<td>Connected pump controller is not responding correctly to the commands (e.g. no reaction on a run command).</td>
<td></td>
</tr>
<tr>
<td>Not available</td>
<td>The pump is stopped and is counting out the Minimum Stop Time to prevent too many motor starts per hour. During this time the pump is not</td>
<td></td>
</tr>
</tbody>
</table>
### Pump status

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump shutdown</td>
<td>Pump is in Shutdown condition.</td>
</tr>
<tr>
<td>Failed to go on load</td>
<td>The pressure switch at the pump outlet detects vacuum when it should not.</td>
</tr>
<tr>
<td>Overload</td>
<td>The motor draws too much current and the overload has isolated the pump.</td>
</tr>
<tr>
<td>Sensor error</td>
<td>In case the pump controller shows the text Err on the display of the pump controller together with this icon on the central controller, the pump has a sensor error.</td>
</tr>
<tr>
<td>Local mode</td>
<td>The pump has either been manually set to Local, was forced to Local from an ECO command or was forced to Local by the Emergency Forced Local backup system.</td>
</tr>
<tr>
<td>Service required</td>
<td>The pump’s running hours have surpassed the predefined interval and maintenance must be carried out.</td>
</tr>
<tr>
<td>Isolated</td>
<td>User has isolated this pump controller. It will not transmit faults or alarms.</td>
</tr>
</tbody>
</table>

### 8.3.2 Central controller operation

**Gaining full access to all menus**

To access certain menus like the Settings, ECO, Test and Commands menu, the access key needs to be given.

In the Menu screen, navigate to the Settings icon indicated below, enter the following submenu and insert the code `<2801>`, using the scroll buttons.

![Figure 8-15; Central controller – entering password](image)

After entering the access code, the user has full access. When no key is pressed during several minutes, full access disappears and needs to be re-entered if required.

**Testing the alarms**

Before starting the machine, the alarms can be tested. The 3 alarms will automatically cycle for 3 seconds without actual faults. This can be done to test the transmission to the control room alarm display. Navigate to the following submenu and press Enter.
When the test icon is greyed out, the plant needs to be stopped first. Refer to the following paragraphs to stop the ECO system.

**Setting CAN**

These settings are set ex factory and need not to be changed. However, to verify, the following steps can be followed after entering the Settings submenu and then selecting Network (full access needs to be obtained, see above):

- The CAN address should be set to 30 and CAN should be set On.
- Communication profile should be set to Mk4.

**Setting ECO**

After commissioning the plant (see Starting the plant), the ECO control system must be started. During production, the system should have been set correctly in the software. To verify, the following procedure can be followed (full access needs to be obtained, see above):

**Setting the pressure unit**

In the Settings, General submenu (full access needed, see above), navigate to Pressure Unit and select the desired pressure unit.
**Automatic restart**

In the Settings submenu, the submenu of ArAF (Automatic Restart After voltage Failure) is accessible (full access needed, see above). Ex factory, it should be set to Infinite. Contact Pneumatech MGS if it is believed these settings should be changed.

**Other settings**

The following settings can be found under the ECO > Master submenu. In normal circumstances they should not be changed. Please contact Pneumatech MGS.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Min. setting</th>
<th>Factory setting</th>
<th>Max. setting</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure band X High</td>
<td>To program the maximum setting for pressure band X</td>
<td>0</td>
<td>-0.670</td>
<td>-0.869</td>
<td>bar</td>
</tr>
<tr>
<td>Pressure band X Low</td>
<td>To program the minimum setting for pressure band X</td>
<td>-0.671</td>
<td>-0.870</td>
<td>-1.500</td>
<td>bar</td>
</tr>
<tr>
<td>Pressure band in use</td>
<td>To select between pressure band 1 and 2</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Digital Pressure band selection</td>
<td>Enables to change the pressure band in use via digital input</td>
<td>-</td>
<td>Off</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Scheme in use</td>
<td>To define which scheme is in use (see slave parameter scheme x priority)</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Digital Scheme selection</td>
<td>Enables to change the digital scheme in use via digital input</td>
<td>-</td>
<td>Off</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Forced time</td>
<td>To program the interval at which, if activated by “System Forced”, the central</td>
<td>1</td>
<td>2</td>
<td>60</td>
<td>hrs</td>
</tr>
<tr>
<td>Setting</td>
<td>Value</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-----------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote to Local time</td>
<td>2 20 600 sec</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start/load time</td>
<td>2 3 600 sec</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unload time</td>
<td>2 3 600 sec</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delta time</td>
<td>10 168 872 hrs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>- On -</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System Forced function</td>
<td>- On -</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auto restart</td>
<td>Infinite</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum power down time</td>
<td>15 20 3600 sec</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequence method</td>
<td>Equal wear -</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation mode</td>
<td>Local control -</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group sequence X</td>
<td>- - - -</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manual Sequence Shift Up Delay</td>
<td>2 0 600 sec</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manual Sequence Shift Down Delay</td>
<td>2 0 600 sec</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The following settings can be found under the ECO > Slave X submenu.

In normal circumstances they should not be changed. Please contact Pneumatech MGS.
Table 8-11: Central controller – ECO slave settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Min. setting</th>
<th>Factory setting</th>
<th>Max. setting</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scheme X priority</td>
<td>To put this pump in a certain priority queue, based on the scheme selected (see master parameter “Scheme In Use”)</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Start/load reaction time</td>
<td>To program the time interval in which the start command from the central controller should result in the pump running</td>
<td>1</td>
<td>40</td>
<td>300</td>
<td>sec</td>
</tr>
<tr>
<td>Stop reaction time</td>
<td>To program the time interval in which the stop command from the central controller should result in the pump stopping</td>
<td>1</td>
<td>60</td>
<td>300</td>
<td>sec</td>
</tr>
<tr>
<td>Running hours</td>
<td>To adjust running hours for pump X to influence the even wear control algorithm</td>
<td>0</td>
<td>X</td>
<td>500000</td>
<td>hrs</td>
</tr>
<tr>
<td>Mode</td>
<td>See below</td>
<td>-</td>
<td>Integrated</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Manual sequence group</td>
<td>Only when Manual sequence is active. Defines to which manual sequence group this slave belongs.</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>-</td>
</tr>
</tbody>
</table>

Starting
To start the system, after having completed the CAN and ECO setup described above, carry out the following steps:

1. Turn the pumps’ main switch to On and the Local/LAN switch to LAN. The Emergency Forced Local warning (see Interface icons and menu structure) and red LED is present on the display since the pressure is above -590 mbar(e). Once the pressure is below -590 mbar (on the display of the pump controller), the Escape button must be pressed on the pump controller (see Interface icons and menu structure) which will make the warning to disappear and the red LED to go out.

2. Start the ECO system (full access mode, see above).
Navigate to the Start button and press Enter. A spinning circle on the display should appear to indicate that the ECO system is operating.

**Stopping and resetting**

To stop a certain pump, see section Pump controller operation. To force all pumps local, go to the commands screen and select the Local button.
The spinning circle symbol will disappear, indicating that the ECO is not active (controlling the pumps) any more. The pumps are now in Forced Local Mode, even though their Local/LAN switch may still be in LAN position. This allows the operator to do maintenance or troubleshooting on the central controller while vacuum is guaranteed by the local pumps.

To reset, after having pressed Local, turn off the ECO (see above), then select On again. Then proceed to paragraph Starting to start the central controller, putting it in charge of the pumps again. Alternatively, switch CAN Off and On.

Isolating a pump controller

To carry out maintenance on a pump without transmitting alarms, select the ECO submenu from the main menu (requires full access, see above). Browse to the pump that needs to be isolated and press Enter. In the following selection menu, navigate to Mode and select Isolated.

Important: after maintenance, this same process shall be followed to select the mode to Integrated again.

Event history

When an alarm is triggered, the full situation (inputs, outputs, time stamp) is logged into the event history. The event history keeps track of the last 30 events.

To take a look, follow the following steps:
**Viewing information about the central controller**
Through the following submenu, information regarding MAC address, software, IP settings, etc. can be viewed.

**Viewing the amount of module hours**
Through the Counters submenu, the amount of hours that the central controller was powered can be viewed.

**Viewing the input & output status**
The direct inputs of the central controller are the pressures measured upstream (net) and downstream (pump) of the bacterial filters, and consequently the difference thereof (Delta P). The outputs are the alarms or normal status that are transmitted potential free to the hospital control room. “Closed” corresponds to “active”. Through the following procedure, the inputs and outputs...
of the central controller can be viewed in real time. The configuration of the potential free contact is dual. As such, there is for instance Plant Fault and 2nd Plant Fault. One set of alarms is intended for the BMS (Building Management System), the other set is provided with additional resistors and intended to connect to the Zeus 15 Central Alarm System. Consult the service diagram for the correct configuration.

Web browser
Carry out the following steps to set a custom IP address, gateway and subnet mask. After connecting an ethernet cable between your network and the controller, the plant can be monitored online when browsing to the set IP address.
Protections menu
When there is a problem with one of the direct inputs (see previous paragraph), the red warning LED or blue service LED will be lit. When no problem is visible on the pump overview screen (see Interface icons and menu structure), the Protections submenu must be consulted. For faults, the warning disappears when the problem is remedied. The following situations are important (the fault is indicated in yellow):

Net pressure warning: When the limit is exceeded or no readout is obtained (indicated by stars ***), a problem with the sensor, cable or connections occurred. Taking into account the maintenance warnings (see Maintenance warnings), check the sensor, the cable and the connections for proper connection and correct wiring according to the service diagram. The fault should be physically remedied (spare parts can be ordered, consult the spare part list), whereby the yellow warning LED will automatically reset.

No valid pressure control: When the net pressure sensor is unavailable, the central controller has no pressure feedback and cannot control the pumps. Therefore it sends the pump controllers in Forced Local mode until the problem is remedied.
8.3.3 Service menu

Menu icon, Service

![Service menu icon](image)

**Function**

To reset the service plans which are carried out.
- To check when the next service plans are to be carried out.
- To find out which service plans were carried out in the past.
- To modify the programmed service intervals.
- To enable or disable the digital outputs for Plant Faults
- To activate or deactivate a plant fault when the backup pump is integrated.

To access certain service menus and functions, the access key needs to be entered. See section Central controller operation, paragraph Gaining full access to all menus how to navigate to the Access Key menu.
Figure 8-29; Service menu – Service menu overview

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Menu</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>Service</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>Service plan</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Service maintenance</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>Overview</td>
<td></td>
</tr>
</tbody>
</table>

Overview
Example for Service Plan A:
The figure at the left represents the programmed service interval. For Service Plan A, the programmed number of running hours is 2000 hours. The figure at right side of the green status bar is the number of hours to go till the next service intervention. In the example above, the vacuum plant was just started up, which means it still has 1985 running hours to go before the next service intervention needs to be carried out.

Service Plan
The interval can be changed and adapted to local conditions / requirements
Next Service Plan
Visualization when the next service intervention needs to be planned.

In the example above, the A Service level is programmed at 2000 running hours, of which 15 hours have passed.

History
The History screen shows a list of all service actions done in the past, sorted by date. The date at the top is the most recent service action. To see the details of a completed service action (e.g., Service level or Running hours), use the Scroll keys to select the desired action and press the Enter key.
Service maintenance

<table>
<thead>
<tr>
<th></th>
<th>Service maintenance</th>
<th></th>
<th>Service functions</th>
<th></th>
<th>Backup unit in operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Service maintenance</td>
<td>6</td>
<td>Are you sure?</td>
<td>7</td>
<td>Backup unit in operation</td>
</tr>
<tr>
<td>2</td>
<td>Service function</td>
<td>8</td>
<td>Deactivate</td>
<td>9</td>
<td>Activate</td>
</tr>
<tr>
<td>3</td>
<td>Disable plant fault output</td>
<td>4</td>
<td>Not activated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Backup unit in operation</td>
<td>9</td>
<td>Activate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

_Disable Plant Fault Output_
- “No” (default): any Plant Fault will also activate the Digital Output signals.
- “Yes”: the Plant Fault is only visible on the display. The Digital Outputs are not activated anymore.

Take utmost care when selecting this option!

_Backup Unit in Operation_
- “Activated” (default): When all pumps including the backup pump are called this will illuminate the red LED and generate a Plant Fault.
- “Not Activated”: No red LED neither Plant Fault is generated when the backup pump is called to assist when high air demand is requested.
8.4 Controller alarms and faults

8.4.1 Controller alarms and faults

Different alarms can be transmitted to the hospital control room by means of digital outputs. The configuration of the potential free contacts is dual. As such there is for instance “Plant Fault” and “2nd Plant Fault”. One set of alarms is intended for BMS (Building Management System), the other set is provided with additional resistors and intended to connect to Zeus 15 Central Alarm System. Consult the Service Diagram for the correct configuration.

When an alarm is shown on the central controller, the pump controller and/or the hospital’s control room, the necessary actions must be undertaken to investigate and remedy as soon as possible. There are three different alarm levels. A single alarm or a combination of alarms is possible. Per alarm, the possible originating faults are described along with their remedies. When trying to remedy problems, always take into account the maintenance warnings (see Maintenance warnings).

When no alarm is active, the normal status is shown in green colour on the display.

8.4.2 Plant fault

Description
A fault has occurred which potentially leads to the system performing suboptimal, and if left unattended could result in the loss of vacuum.

![Figure 8-34; Controller alarms and faults – Plant fault](image)

Causes and remedies
First, all pump controllers must be checked for the presence of red LED’s being lit (unless if causes 1 or 2 apply, see below). Navigate to the pump overview screen to ensure no warning icons (see Interface icons and menu structure) are present on any of the pump bars.

When no red LED is lit on one or more pump controllers and no warning icon is present on the pump status bars of the central controller, it is possible there was an unexpectedly high air demand which is larger than the design flow. In such case, all vacuum pumps - including the backup pump - will be called to assist in order to cope with the high air demand. If this situation prevails, the red LED on the central controller is lit. The red LED will be extinguished as soon as vacuum equals the value under Pressure band 1 High (default is -870 mbar(e)) is reached and the backup pump is stopped.

In case it is not desired that a Plant Fault is generated when the backup pump is called at high air demands, there is the option to deactivate this function in the submenu Service Maintenance. Put Backup unit in Operation to “Not Activated” and no red LED neither Plant Fault will be shown on the central controller.

It is also possible to suppress the relay output for Plant fault on the IO2 module. This can be done by putting Disable Plant Fault Output to “Yes” in the submenu Service Maintenance. In this case the red LED and Plant Fault is shown on the central controller but there will be no Digital output to BMS (Building Management System) nor Zeus 15. Take care with this option because selecting “Yes” for “Disable Plant Fault Output” will be valid for any Plant Fault which might prevail.
If a red LED is lit on a pump controller, the corresponding problem should occur both on the pump overview screen and on the main display of the pump controller, where it should appear as a blinking icon (see Interface icons and menu structure):

1. **a. Slave switched to Local:**

   Check if the Emergency Forced Local symbol and red LED are present on the pump controller (see Interface icons and menu structure).

   If so, a fault may have occurred whereby the system itself did not sustain the vacuum at the required minimum.

   Emergency Forced Local will start every pump (that is not in Local Stopped status) automatically based on only one input: the pump's local pressure transducer sensing a pressure less deep than -590 mbar(e). Please contact your customer contact.

   Once the cause is fixed, and pressure is deeper than -590 mbar(e), the user can only reset the warning by pressing the Escape button, otherwise the pump will run infinitely in this safety mode. If the Local/LAN switch is set to Local and there is no reason for it, please switch it back to LAN control. This is not a fault as such but constitutes a situation which is sub-optimal (the central controller can't control the pump to ensure even wear or respond to the demand based on pressure difference per unit of time).

   **b. No answer:**

   Interrelated with the previous fault, sometimes the Emergency Forced Local fault can cause the central controller (Purelogic) not to find the pump controller.

   After resetting the Emergency Forced Local as described above, also the following procedure must be carried out (full access needs to be obtained, see Central controller operation): go to submenu Commands and press Reset.

   ![Image](image.png)

   **Figure 8-35: Controller alarms and faults – Pumps commands**

2. **No Communication:**

   Either the controller has no electrical supply or there is a CAN network error.

   Taking into account the precautions of chapter Maintenance warnings, check that the controller is adequately electrically supplied and fix if necessary. If supply is adequate, check the software CAN settings in both the pump controllers and the central controller (see previous chapters).

   Verify that the CAN cables at the backside of the cubicles are correctly connected to the other cubicles. If so, open the cubicle and verify that the CAN cable is correctly connected between the cubicle back plate and the controller. If that is the case, open the CAN connectors and verify that the wires are correctly connected. Contact Pneumatech MGS for further investigation.
After fixing the problem, the status should automatically reset. If it doesn’t, press “Local” in the commands screen of the central controller and select ECO “Off” in the ECO menu (see Central controller operation). Then select On again and press Start in the commands menu. Alternatively, in the CAN menu, press CAN Off and On.

3. Sensor error:
A problem with the pump’s local pressure sensor, cable or connections has occurred or the pressure is out of range (e.g. -1,1 bar). Unless if the pump is in Local Off mode, this error will always start the pump (Emergency Forced Local mode).

Taking into account the precautions of chapter Maintenance warnings, check the sensor, the cable and the connections for proper connection and correct wiring according to the service diagram. The fault should be physically remedied (spare parts can be ordered, consult the spare parts list), whereby the alarm will automatically reset. If however the pressure is believed to be out of range (pump runs in Emergency Forced Local mode and plant inlet is closed or no vacuum demand), this error will reset automatically once the pressure is in range again.

4. Failed To Go On Load (FTGOL):
Two situations can be discerned:

a. When the fault appears when the pump is running, two causes can lead to this fault:
   • The switch, cable or connections lead to a short circuit. Taking into account the precautions of chapter Maintenance warnings, check the sensor, the cable and the connections for proper connection and correct wiring according to the service diagram. The fault should be physically remedied (spare parts can be ordered, consult the spare parts list), whereby the alarm will automatically reset.
   • The pump does not succeed in producing a vacuum deeper than -380 mbar(e) (-285 mmHg) within 10 seconds after the pump has been called (asked to run by the controller). This means that the pump is most likely defect. Check that the pump is rotating when called. If not, verify the electrical connections to the pump. If the pump does rotate, flow demand may exceed the plant flow capacity, there may be a leak or a blockage.

b. When the fault appears when the pump isn’t running, following causes are possible:
   • The switch, cable or connections are broken or loose. Check the sensor, the cable and the connections for proper connection and correct wiring according to the service diagram. The fault should be physically remedied (spare parts can be ordered, consult the spare parts list), whereby the alarm will automatically reset.
   • The non-return valve, installed upstream of the FTGOL (Failed To Go On Load) switch and pump inlet, is locked in open position. This could lead to oil being sucked out from the pump into the piping and must be attended to as soon as possible. Order a non-return valve service kit (consult the spare parts list) and proceed to replacing the non-return valve according to chapter Non-return valve and inlet screen replacement.

Table 8-12: Plant fault

<table>
<thead>
<tr>
<th>&lt;&lt;0&gt;&gt; signal received from FTGOL switch</th>
<th>Pump is called</th>
<th>Pump is not called</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK</td>
<td>PLANT FAULT ALARM</td>
<td></td>
</tr>
<tr>
<td>- switch, cable or connections disconnected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- non-return valve locked open</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>&lt;&lt;1&gt;&gt; signal received from FTGOL switch</th>
<th>Pump is called</th>
<th>Pump is not called</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLANT FAULT ALARM</td>
<td>OK</td>
<td></td>
</tr>
<tr>
<td>- switch, cable or connections short-circuited</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- pump defect</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. Motor tripped:
The motor draws more current (for several seconds) than the value set in the overload protection. This fault will always stop the pump and hence requires immediate attention.

Taking into account the precautions of chapter Maintenance warnings, open the corresponding cubicle and verify if the overload setting is according to the recommendation of chapter Fuse values.
If so, verify that the supply matches the required voltage +/-10%. A voltage dip or current surge may have occurred. If the supply is adequate, verify that all connections between cubicle and motor are in order and attached correctly (see service diagram).
If so, verify that the pump is maintained as required by chapter Checks and intervals in terms of e.g. oil and filter replacements and inspect the pump for any defaults or blockages.
If no cause can be established, please contact Pneumatech MGS.

After fixing the problem, press the Reset button on the overload protection inside the cubicle (see picture), close the cubicle and switch On the isolating switch. Press the Escape button (see Interface icons and menu structure to clear the display. Verify that the pump runs without problems for 10 minutes at least (e.g. by testing with JOG function, see Pump controller operation).

8.4.3 Plant Emergency
Description
The net pressure exceeds -600 mbar(e) (-450 mmHg). Evidently, this situation must be attended to as soon as possible.

Figure 8-36: Controller alarms and faults – Plant Emergency
Causes and remedies
The flow demand in vacuum can not be sustained. One of the following causes could lead to this alarm:

1. The plant is not properly sized to meet the flow demand. Conduct a flow test and consult Pneumatech MGS.
2. A ball valve is not in the correct position. Check all valve positions (see section Setting the pneumatic system).
3. One or more pumps are not performing to their full capacity. Check that maintenance is carried out as required according to section Checks and intervals and that the drawn current on the amp meter (see section Interface icons and menu structure) corresponds to the values found in section Fuse values and as written in the logbook during commissioning.
4. The pressure drop over the bacterial filters exceeds 100 mbar. Carry out maintenance (see section Bacterial filter replacement).
5. A leak or rupture is present in the piping, hoses, vessels, filters or pumps. Investigate the plant for leaks.
   When a leak or rupture is found in a section which can be isolated from the main flow, remedy the problem after isolating the section (for spare parts, consult the spare part list).
   When the leak or rupture is situated in the main flow pipeline of the plant and cannot be isolated, please contact Pneumatech MGS.
6. The piping, hoses or inlets of the pumps are blocked. When a blockage is found in a section which can be isolated from the main flow, remedy the problem after isolating the section (for spare parts, consult the spare part list).
   When the blockage is situated in the main flow pipeline of the plant and cannot be isolated, please contact Pneumatech MGS.
7. A non-return valve of a pump (situated upstream of the FTGOL switch) is locked in closed position. Pump by pump, verify if there is an impact on the pressure between the pump running and not running (Contact Pneumatech MGS).
   If there is no impact, order a non-return valve service kit (consult the spare parts list) and proceed to replacing the non-return valve according to section Non-return valve and inlet screen replacement.

8.4.4 Pressure fault

Description
The net pressure exceeds -480 mbar(e) (-360 mmHg).
Evidently, this situation requires immediate attention.

Causes and remedies
This situation is the escalation of the Plant emergency alarm above, and the same causes and remedies apply.
8.5 Web server

All Purelogic® controllers have a built-in web server that allows direct connection to the company network or to a dedicated PC via a local area network (LAN). This allows to consult certain data and settings via a PC instead of via the display of the controller.

Getting started
Make sure you are logged in as administrator.

- Use the internal network card from your computer or a USB to LAN adapter (see picture below).

![Web server – USB to LAN adapter](image)

*Figure 8-38; Web server – USB to LAN adapter*

- Use a UTP cable (CAT 5e) to connect to the controller (see picture below).

![Web server – UTP cable (CAT 5e)](image)

*Figure 8-39; Web server – UTP cable (CAT 5e)*

Configuration of the network card

- Go to My Network places (1).
Figure 8-40; Web server – My Network places

- Click on View Network connections (1).

Figure 8-41; Web server – View network connections

- Select the Local Area connection (1), which is connected to the controller
- Click with the right button and select properties (1).

- Use the checkbox Internet Protocol (TCP/IP) (1) (see picture). To avoid conflicts, de-select other properties if they are selected. After selecting TCP/IP, click on the Properties button (2) to change the settings.

Figure 8-42; Web server – Local area connection

Figure 8-43; Web server – Properties

Figure 8-44; Web server – Internet protocol
• Use the following settings:
  • IP Address 192.168.100.200
  • Subnetmask 255.255.255.0
Click OK and close network connections.

**Configuration of the web server**

**Configure the web interface**

The internal web server is designed and tested for Microsoft® Internet Explorer 6, 7 and 8. Other web browsers like Opera and Firefox do not support this internal web server. When using Opera or Firefox, a redirect page opens. Click on the hyperlink to connect to the download server from Microsoft® to download the latest version of Internet Explorer, and install this software.

**When using Internet Explorer:**
Open Internet Explorer and click on Tools - Internet options (2).

- Click on the Connections tab (1) and then click on the LAN settings button (2).

*Figure 8-45; Web server – Internet explorer*
In the Proxy server Group box, click on the Advanced button (1).

*Figure 8-46; Web server – Internet explorer*
• In the Exceptions Group box, enter the IP address of your controller. Multiple IP addresses can be given but they must be separated with semicolons (;).
Example: Suppose that you already added two IP addresses (192.168.100.1 and 192.168.100.2). Now you add 192.168.100.100 and separate the 3 IP addresses by putting semicolons between them (1) (see picture).
Click OK (2) to close the window.
**Viewing the controller data**

Open your browser and type the IP address of the controller you want to view in your browser (in this example http://192.168.100.100). The interface opens:
Navigation and options

- The banner shows the compressor type and the language selector. In this example, three languages are installed on the controller.

![Language selection](image)

*Figure 8-50: Web server – Language selection*

- On the left side of the interface you can find the navigation menu (see picture below). If a license for ESI is foreseen, the menu contains 3 buttons.
- Compressor: shows all compressor settings.
- ESI: shows the ESI status (if a license is provided).
- Preferences: allows to change temperature and pressure unit.

![Navigation menu](image)

*Figure 8-51: Web server – Preferences*

Compressor settings

All compressor settings can be hidden or shown. Put a mark for each setting. Only the machine status is fixed and can not be removed from the main screen.

Analog inputs

(The units of measure can be changed in the preference button from the navigation menu).

<table>
<thead>
<tr>
<th>Analog inputs</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dryer Inlet</td>
<td>2.6 bar</td>
</tr>
<tr>
<td>Medical Pressure</td>
<td>2.5 bar</td>
</tr>
<tr>
<td>Atmospheric Dewpoint</td>
<td>-42.7 °C</td>
</tr>
</tbody>
</table>

*Figure 8-52: Web server – Analog inputs*

Counters

Counters give an overview of all actual counters from controller and compressor.
Info status
Machine status is always shown on the web interface.

![Digital Inputs](image)

**Digital Inputs**
Gives an overview of all Digital inputs and status.

![Digital Outputs](image)

**Digital outputs**
Shows a list of all digital outputs and their status.

Special protections
Give an overview of all special protections of the compressor.
Figure 8-57; Web server – Special protections

Service plan
Shows all levels of the service plan and status. This screen only shows the running hours. It is also possible to show the actual status of the service interval.

Figure 8-58; Web server – Service plan
9 Maintenance

9.1 Introduction

Pneumatech MGS Medical Vacuum plants are designed to operate with the minimum of maintenance, however regular routine minor maintenance operations are recommended to prove the system integrity.

Maintenance operations are carried out in accordance with the planned preventative maintenance contract purchased by the customer.

Maintenance engineers must fully understand the Medical Vacuum Plant and must be conversant with the information contained in this manual.

Service and Maintenance is limited to replacement of worn or damaged components.

Warning! Use of sub-standard or inappropriate parts and materials may damage the vacuum plant and invalidate the warranty. Only use genuine Pneumatech Medical Gas Solutions spare parts.

Warning! Obtain a work permit before commencing any work on medical gas equipment.

9.2 Tools and equipment

No special tools are required, however all common hand tools used must be clean, completely free of oil and grease and checked for serviceability before commencing maintenance procedures.

All necessary spare parts must be obtained before commencing work.

9.3 Routine inspection, Checks and maintenance

9.3.1 Cleaning

The use of abrasive or solvent based cleaning solutions is not recommended.

Cleaning external surfaces - use a damp cloth only. Mild soap solution may be used but detergent/surfactant solutions are not recommended.

9.3.2 Minimum requirements

Minimum requirements for routine inspections, checks and maintenance are given in Table 9-1 and must be observed in full to ensure continued safe operation of the system.

9.3.3 Weekly

1. Check the pump oil levels.
2. Manually drain condensate from vacuum reservoir vessels via manual drains provided.
3. Visually inspect the plant.

9.3.4 Monthly

1. Check filter drain flasks for liquid build-up.
2. Exhaust the drain flasks of liquid build-up.

9.3.5 Six-monthly

1. Check operation of plant and make adjustments as necessary.
2. Check all electrical connections.
9.3.6 Annually

2. Change the oil in each pump.
3. Re-commission the plant to check the performance of each pump and the correct operation of the plant.

Table 9-1; Inspection and Maintenance Schedule

<table>
<thead>
<tr>
<th></th>
<th>5 Yearly</th>
<th>Annually</th>
<th>Quarterly</th>
<th>Weekly</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actions</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>Inspection, Checks and Tests:</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suitability of location</td>
<td>✷</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate access for maintenance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate room ventilation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planned Preventative Maintenance:</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Complete Commissioning Procedure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9.4 Servicing the bacterial filters

**WARNING!** Biohazard: take all necessary precautions to avoid injury.

9.4.1 Sterilise the Drain Trap

Refer to Figure 9-1.
1. Close the drain flask isolation valve (1).
2. Slacken the drain flask (2) to allow atmospheric pressure to be restored in the flask.
3. Unscrew the drain flask and dispose of the liquid safely, in accordance with local regulations.
4. Steam sterilize for 20 minutes at 32 psi at 134°C (+4°C / -0°C).
5. Screw the flask (2) onto the collar, ensuring that the O-ring is compressed to form a seal.
6. Open the drain flask isolation valve (1).

9.4.2 Renew the Filter Element

Refer to Figure 9-2.

1. Open the isolation valves on the Standby filter line and allow pressure to equalise.
2. Close the isolation valves on either side of the filter to be serviced.
3. With the drain flask isolation valve open, slacken the drain valve (1) to vent the filter housing and flask.
4. Close the drain flask isolation valve (1).
5. Unscrew the drain flask (2) and dispose of any liquid safely in accordance with local regulations.
6. Fill the drain flask with sterilizing agent, e.g. Formalin.
7. Refit the drain flask, open the isolating valve (1) and allow vapour from the sterilizing agent to permeate the filter housing for 24 hours.
8. Remove the drain flask (2) and vent the filter housing taking suitable precautions for Formalin vapour.
9. Remove the filter bowl (3) exposing the interior of the vessel and the lower end of the element (4). Take care to retain the O-ring (5).
10. Unscrew the element retaining nut and draw the element down and out.
11. Dispose of the used element, observing local regulations (bio-hazard).
12. Position the new element, taking care that the O-ring is in position at the element neck and that the outer foam sock is undamaged.
13. Screw on the element retaining nut, with the O-ring positioned in the retaining nut groove. **DO NOT OVERTIGHTEN.**
14. Refit the filter bowl, ensuring that the O-ring is in correctly positioned. Tighten systematically.
15. Refit the drain flask and open the drain flask isolation valve (1).

**Warning!** The used vacuum filter cartridge might contain hazardous components or bacteria. Biohazard regulations have to be taken into account when servicing the vacuum filter. **Warning!** Always wear protective gloves when servicing the filters.
NOTES:

[A] Maximum fuses with regard to short circuit protection of starter.
Cable section might impose fuses of smaller value.

[B] Note: CAN connector 1627 0165 06 need to be connected to CAN2

Marking of connectors:

2X27

2X33

2X31

2X21
Figure 9-4; DOL Vacuum Pump Controller – Wiring Diagram
<table>
<thead>
<tr>
<th>LOCATION</th>
<th>TAGNAME</th>
<th>PAGE</th>
<th>DESCRIPTION</th>
<th>FUNCTION</th>
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<tbody>
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<td>CANOPY</td>
<td>M1</td>
<td>02</td>
<td>PUMP MOTOR</td>
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</tr>
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<td>CANOPY</td>
<td>P1</td>
<td>05</td>
<td>PRESSURE SWITCH</td>
<td>FAILED TO OPEN VALVE</td>
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<tr>
<td>CANOPY</td>
<td>VSG1</td>
<td>05</td>
<td>VACUUM TRANSDUCER</td>
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<td>RECIRCULATION PUMP</td>
<td>SARELOGIC STANDARD</td>
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</tr>
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</tr>
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<td>LOCAL PLAN</td>
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</table>
Figure 9-5: YD Vacuum Pump Controller – Wiring diagram
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<th>PAGE</th>
<th>DESCRIPTION</th>
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<td>03</td>
<td>FUSE</td>
<td>CONTROL CIRCUIT</td>
</tr>
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<td>P4</td>
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<td>CONTROL PANEL</td>
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<td>G3</td>
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<td></td>
</tr>
</tbody>
</table>
10 Recommended Spares

For all Service Spares enquiries, contact the Pneumatech MGS Spares Department, giving as much of the following information as possible:
Product Part Number:
Lot / Batch Number:
Approximate date of purchase:

This information can be found on the plant rating label which is affixed to the Plant Control Unit.

Spares Department:
T: 44 (0) 1235 463053
F: 44 (0) 1235 463011

spares@p-mgs.com