

BeaconMedaes

Medical Vacuum Supply System (Floor Mounted)



Instruction book

4233500233.03

BeaconMedaes

Medical Vacuum Supply System (Floor Mounted)

Instruction book

Original instructions

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Issue Record

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Introduction

This manual contains information needed to install, operate, and maintain the BeaconMedaes floor mounted 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.

Safety, Storage and Handling Storage

BeaconMedaes Floor Mounted 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 BeaconMedaes Floor Mounted 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

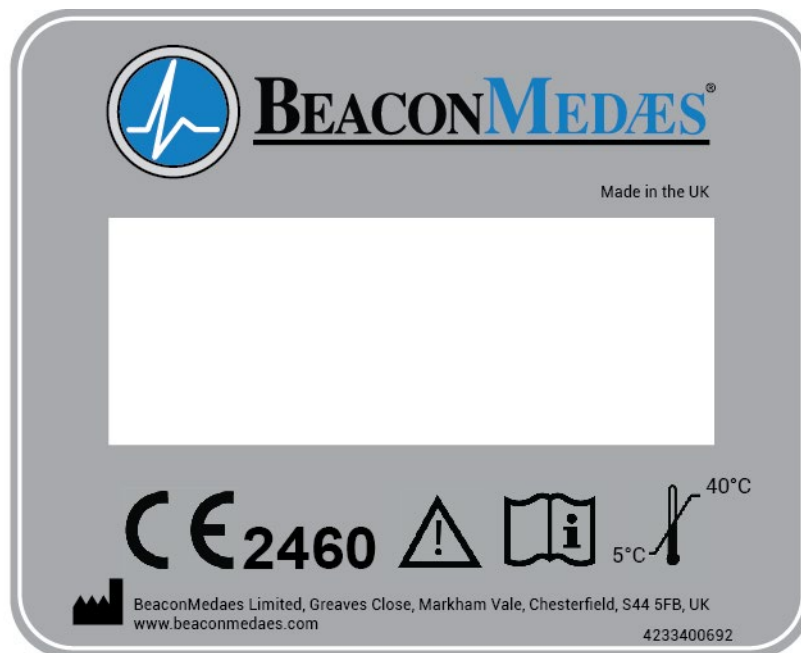


Figure 1; Identification label

0 WARNINGS, CAUTIONS and NOTES

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

0.1 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.

1. Read through these entire instructions 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
2. Electrical system should only be worked on by a competently trained electrician who is familiar with local wiring regulations. Verify zero voltage using appropriate testing equipment before commencing work on the electrical system.

Isolation process:

- a Switch off the isolator.
- b Apply lock-off devices and warning tags.
- c Verify zero voltage using appropriate testing equipment.

Only after confirming safe isolation, maintenance may begin

3. Do not attempt to modify this device in any way not strictly described within this manual.
4. Obtain a work permit before commencing any work on a medical gas installation.
5. No attempt should be made to use this product with a gas service or at a pressure other than as identified.
6. Do not use this product if it appears damaged in any way.
7. This equipment should only be installed, commissioned, operated and maintained by technicians who are suitably trained with medical gas systems, such as Competent or Authorised Persons as defined in UK Department of Health Technical Memorandum No. 02-01 (HTM 02-01).
8. Vacuum system components should be treated as a bio-hazard and handled and decontaminated accordingly if microbially contaminated
9. Vacuum pump surfaces may be hot and should not be touched
10. Isolate to the pipeline during brazing of the connection line.
11. Check the gas pipeline labelling matches the device before connecting to the pipeline
12. Portable and mobile RF communications equipment can affect the mVAC. They should be used no closer to any part of the mVAC, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter (See EN 60601)
13. The mVAC is intended for use in the electromagnetic environment specified below. The customer or user should assure that it is used in such an environment.
14. Filter elements cannot be cleaned or reused. Dispose of in accordance with hospital procedures for contaminated waste

0.2 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.

1. Use of sub-standard or inappropriate parts and materials may damage the product and invalidate the warranty. Only use genuine BeaconMedaes spare parts.
2. Leak detection fluids contain surface active agents (surfactants) that can damage plastic components under stress. Only use leak detection fluids that are compatible with the materials being tested.
3. Do not mix oil and fully clean any remaining oil during service.
4. Always wash leak detection fluids off with clean water immediately after use.

0.3 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.

0.4 Abbreviations used

The following abbreviations are used in this manual:

Abbreviation	Full name
MGS	Medical Gas Solutions
kPA	Kilopascal
R.H.	Relative Humidity
IP4X	Ingress protection Class (for indoor installation only)
DIN	Deutsch's Institute für Norming
HTM	Health Technical Memorandum
LED	Light Emitting Diode
CAN	Controller Area Network
LAN	Local Area Network
EFL	Emergency Forced Local
°C	Degrees Celsius
ARAF	Auto Restart After Power Failure
h	Hour
IO	Input/Output
AC	Alternating Current
V	Volts
Hz	Hertz

0.5 Scope of this manual

This manual describes the Operation Service, Repair and Testing of the BeaconMedaes Floor Mounted Medical Vacuum Plant.

0.6 BeaconMedaes service contact

In the event of any queries or problems that cannot be resolved using information in this manual, please call:

44 (0) 1246 474242

Quote if possible, the:

- Product part number
- Lot/ Batch number
- Approximate date of purchase
- Apparent fault

Contents

Instruction book	3
Copyright notice	3
Issue Record.....	4
Introduction	5
Safety, Storage and Handling Storage	5
Identification	5
0 WARNINGS, CAUTIONS and NOTES	6
0.1 Warnings!	6
0.2 Cautions!	6
0.3 Notes:	6
0.4 Abbreviations used	7
0.5 Scope of this manual.....	8
0.6 BeaconMedaes service contact.....	8
1 General Information	12
1.1 Device Description	12
1.2 ISO/HTM Statement	15
1.3 Device Limitation	15
1.4 Anticipated lifetime	15
1.5 Dismantling and disposal	15
2 Technical Specification	17
3 User Responsibility	18
4 Description of Symbols	18
5 Technical information	20
5.1 Major components	20
5.1.1 Vacuum pumps	20
5.1.2 Vacuum vessel.....	21
5.1.3 Duplex Filter Assembly.....	21
6 Installation	22
6.1 Component check	22
6.2 Installation conditions.....	22
7 Commissioning	23
7.1 Pre-test checks.....	23
7.1.1 Leak Test	23
7.1.2 Pre-start-up Tests	23
7.1.3 Vacuum Pump Testing	24
7.1.4 Commissioning HTM02-01 Medical Vacuum Plant	24
7.1.5 Triplex Pump System.....	24
7.1.6 Quadruplex Pump System.....	25
7.1.7 Pentaplex Pump System	25
7.1.8 Commissioning HTM2022 Medical Vacuum Plant.....	26
7.1.9 Initial Starting – Vacuum Pumps.....	26

7.1.10 Proving the Vacuum Pumps	26
7.1.11 Proving the Alarm Circuits	26
7.2 Proving the Alarm Interface Indicator Conditions	27
8 Operating Instructions	28
8.1 Introduction	28
8.2 Pump controller	29
8.2.1 Interface, icons and menu structure	29
8.2.2 Scrolling through all screens	32
8.2.3 Pump controller operation	35
8.3 Central controller (PureLogic®)	43
8.3.1 Interface, icons and menu structure	43
8.3.2 Central controller operation	47
8.3.3 Service menu	58
8.4 Controller alarms and faults	62
8.4.1 Controller alarms and faults	62
8.4.2 Plant fault	62
8.4.3 Plant Emergency	66
8.4.4 Pressure fault	67
8.5 Web server	67
9 Maintenance	77
9.1 Introduction	77
9.2 Tools and equipment	77
9.3 Routine inspection, Checks and maintenance	77
9.3.1 Cleaning	77
9.3.2 Minimum requirements	77
9.3.3 Weekly	77
9.3.4 Monthly	77
9.3.5 Six-monthly	77
9.3.6 Annually	78
9.4 Servicing the bacterial filters	78
9.4.1 Sterilise the Drain Trap	78
9.4.2 Renew the Filter Element	79
9.5 Wiring diagrams	80
10 Recommended Spares	80
11 Reporting Serious Incidents	80
12 Online access:	81

Figures

Figure 1; Identification label	5
Figure 1-1; Medical Vacuum Plant (Modular) – General view	13
Figure 5-1; Quadruplex Vacuum Plant system diagram	20
Figure 7-1; Pump Control Panel	24

Figure 8-1; PureLogic® Pump Controller	29
Figure 8-2; PureLogic® Pump Controller Icons.....	30
Figure 8-3; Pump Controller Panel.....	32
Figure 8-4; Example (operating hours).....	33
Figure 8-5; PureLogic® Pump Controller – Menu flow	34
Figure 8-6; Pump Controller.....	35
Figure 8-7; Example of running hours on display since last service.....	37
Figure 8-8; Pump controller – CAN settings.....	38
Figure 8-9; Pump controller – IP settings	39
Figure 8-10; Pump controller – Changing the pressure unit	40
Figure 8-11; Pump controller – ARAF.....	41
Figure 8-12; Pump controller – Password.....	42
Figure 8-13; PureLogic® Central Controller.....	43
Figure 8-14; Central controller – Main Menu flowchart (full access situation).....	44
Figure 8-15; Central controller – entering password.....	47
Figure 8-16; Central controller – testing the alarms	47
Figure 8-17; Central controller – CAN settings	48
Figure 8-18; Central controller – setting up the ECO	49
Figure 8-19; Central Controller – Starting the ECO	52
Figure 8-20; Central controller – ECO Local	53
Figure 8-21; Central Controller – Isolating a pump.....	54
Figure 8-22; Central Controller – Event history	55
Figure 8-23; Central controller – Information.....	55
Figure 8-24; Central controller – Counters.....	55
Figure 8-25; Central controller – Inputs and outputs	56
Figure 8-26; Central controller – Ethernet.....	57
Figure 8-27; Central controller – Protections.....	58
Figure 8-28; Service menu – service icon	58
Figure 8-29; Service menu – Service menu overview	59
Figure 8-30; Service menu – Service plan.....	60
Figure 8-31; Service menu – Next service	60
Figure 8-32; Service menu – History	61
Figure 8-33; Service menu – Service maintenance	61
Figure 8-34; Controller alarms and faults – Plant fault	62
Figure 8-35; Controller alarms and faults – Pumps commands	64
Figure 8-36; Controller alarms and faults – Plant Emergency.....	66
Figure 8-37; Controller alarms and faults – Pressure Fault	67
Figure 8-38; Web server – USB to LAN adapter.....	68
Figure 8-39; Web server – UTP cable (CAT 5e).....	68
Figure 8-40; Web server – My Network places	68
Figure 8-41; Web server – View network connections.....	69
Figure 8-42; Web server – Local area connection	69
Figure 8-43; Web server – Properties	70
Figure 8-44; Web server – Internet protocol.....	70
Figure 8-45; Web server – Internet explorer.....	71
Figure 8-46; Web server – Internet explorer.....	71
Figure 8-47; Web server – Internet explorer.....	72
Figure 8-48; Web server – Proxy settings.....	73
Figure 8-49; Web server – Web interface	73
Figure 8-50; Web server – Language selection.....	74

Figure 8-51; Web server – Preferences.....	74
Figure 8-52; Web server – Analog inputs	74
Figure 8-53; Web server – Counters.....	75
Figure 8-54; Web server – Info status	75
Figure 8-55; Web server – Digital inputs	75
Figure 8-56; Web server – Digital outputs.....	75
Figure 8-57; Web server – Special protections	76
Figure 8-58; Web server – Service plan	76
Figure 9-1; Servicing the bacterial filters – drain tap	79
Figure 9-2; Servicing the bacterial filters – filter element renewal	79

Tables

Table 2-1; Technical Specification	15
Table 3-1; Technical Specification	17
Table 8-1; PureLogic® Pump Controller	29
Table 8-2; PureLogic® Pump Controller Icons	31
Table 8-3; PureLogic® Pump controller – screen overview.....	33
Table 8-4; PureLogic® Pump Controller – menu flow.....	34
Table 8-5; Pump controller – LAN/local switch.....	36
Table 8-6; PureLogic® Central Controller	43
Table 8-7; Central controller – Main Menu flowchart (full access situation)	44
Table 8-8; PureLogic® Central Controller – Pump.....	45
Table 8-9; Central controller – Fault icons (more details in section Plant fault).	45
Table 8-10; Central controller – other settings.....	49
Table 8-11; Central controller – ECO slave settings.....	51
Table 8-12; Plant fault.....	65
Table 9-1; Inspection and Maintenance Schedule	78

1 General Information

1.1 Device Description

The device shall operate in a manner that complies to both HTM 02-01 and ISO 7396-1 requirements.

This device is defined within ISO 7396-1 as one or more source of supply which assists with maintaining continuity of supply to the medical vacuum pipeline.

Intended Use of the Device

The device is intended to work in conjunction with other devices within the medical gas pipeline system (MGPS) to assist with maintaining continuity of medical vacuum supply throughout the hospital to local connection points for eventual removal of fluids from the human body.

The device controls the vacuum pressure within the specification as required by the MGPS. In all cases other devices outside of this scope are connected downstream of the MGPS are required

to control the final vacuum pressure and flow requirements for safe supply from the patient. Therefore, this device is not intended to control supply parameter hazards directly to the patient, only to the MGPS.

The BeaconMedaes Floor Mounted 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 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.

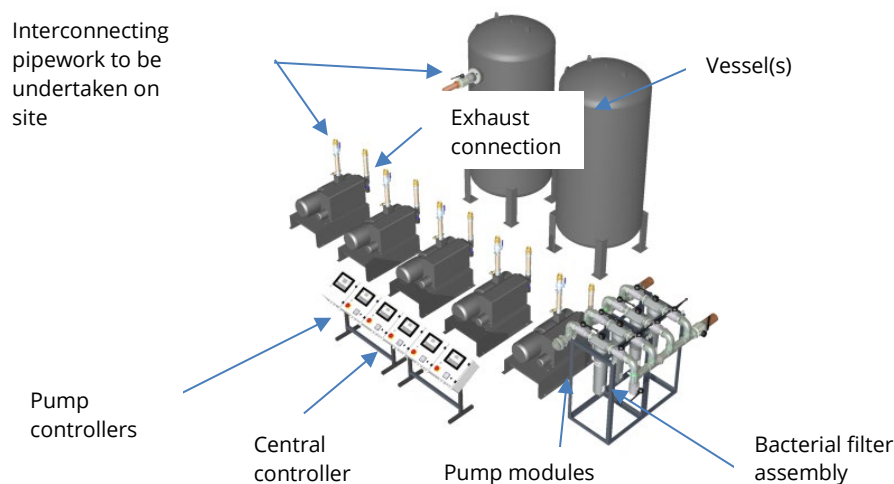


Figure 1-1; Medical Vacuum Plant (Modular) – General view

Intended Patient Population

The device is intended to be used in conjunction with other medical vacuum pipeline equipment in hospitals and have no direct contact with patients. Medical Vacuum Pipeline Systems supply vacuum to medical equipment which can be used across any populations & all age groups.

Intended Use Profile

Medical Vacuum Supply System is intended for use by appropriately qualified and trained personnel only who have undergone relevant 'HTM 02-01 Authorised Person' (AP) training regarding the safe use of medical gas supply systems.

The device should only be installed, commissioned, operated, and maintained by technicians who are suitably trained with medical gas systems, such as Competent or Authorised Persons as defined in UK Department of Health Technical Memorandum No. 02-01 (HTM 02-01 Part B: Operational Management). The device is intended for use by appropriately qualified technical personnel only. This condition is emphasised in the IFUs.

Reference: HTM 02-01 Medical gas pipeline systems – Part B: Operational Management

Authorised Person (MGPS)

4.21 The Authorised Person (MGPS) is defined as that person designated by the Executive Manager to be responsible for the day-to-day management of the MGPS at a particular site or sites. This includes the issue of permits in accordance with the permit-to-work procedure. The principal responsibilities of the Authorised Person (MGPS) in respect of the permit-to-work procedure are set out in paragraph 6.91. The Authorised Person (MGPS) also has specific duties with regard to VIE installations (see Appendix E).

Competent Person (MGPS)

4.40 The Competent Person (MGPS) is the person who carries out the installation and/or maintenance work on the MGPS. A list of his/her responsibilities and duties is set out in paragraph 6.92. The Competent Person (MGPS) should have received appropriate training and should be on a list of Competent Persons (MGPS). In the case of directly employed labour, this list should be held by the Authorised Person (MGPS); in the case of contracted labour, it should be held by the contractor's Authorised Person (MGPS) or project manager.

Indications

Medical Vacuum Supply System is used as part of medical vacuum pipeline systems where an uninterrupted supply of medical vacuum is required. The medical device works in conjunction with other medical devices for the immediate and reliable delivery of medical vacuum to terminal units used for removal of body liquids in healthcare facilities. In all cases there are medical devices installed between this device and the patient that controls the flow and vacuum to safe levels to the patient. This device therefore only delivers medical vacuum within specification to the medical gas pipeline system, not directly to the patient.

Contraindications

If the device sustains any damage or malfunctioning, the assembly or faulty part should be replaced completely. This ensures all damaged components are replaced. Contraindications for use, warnings and precautions related to the safe use of the devices are detailed in the IFU supplied with the devices. These sections shall be read by the intended user before installing the device and starting to use it.

Environmental Conditions

BeaconMedaes Medical Vacuum Supply System 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. Environmental Transport and Storage Conditions

All products are separately packaged and stored in controlled conditions.

Minimum storage temperature: 0°C

Maximum storage temperature: +40°C

Environmental Operating Conditions

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

Minimum working temperature: +5°C

Maximum working temperature: +40°C

Environmental Protection

Discard the unit and/or components in any standard refuse facility. The unit does not contain and hazardous substances.

1.2 ISO/HTM Statement

The source of supply is defined differently for HTM02-01, HTM2022 and ISO medical vacuum systems. When used as a main supply manifold, the source of supply is defined as below:

Table 2-1; ISO/HTM Statement

Standard	Primary Source	Secondary source	Reserve source
HTM02-01	Duty pump/s system	2 x Standby pump system	Portable suction equipment
HTM2022	Duty compressor/s	1 x standby compressors	Portable suction equipment
ISO	Duty pump/s system	1st standby pump system	2nd standby pump system Maybe automatic or manual start.

1.3 Device Limitation

This medical vacuum system is intended solely for clinical suction use in fixed indoor healthcare installations compliant with HTM 02-01 and ISO 7396-1. It must only be used for medical vacuum (negative pressure) applications and not with flammable, toxic, or pressurized gases. Only authorized personnel may install or service the system. Unauthorized modifications, non-approved accessories, or use outside validated environmental and electrical conditions are not permitted. This system is not a substitute for emergency portable suction devices.

1.4 Anticipated lifetime

The anticipated lifetime of vacuum system is 10 years from the date of installation, assuming proper maintenance, service and environmental conditions are met. This estimate is based on product design, historical performance, and internal technical assessments.

1.5 Dismantling and disposal

The procedure to dismantle and dispose of the vacuum plant is as follows:

1. Switch off all isolating switches and the main power supply switches.
2. Clean drains and filters as described in sections [Bacterial filter replacement](#) and [Drain flask change](#).
3. Close the inlet connection point valve and open one of the drain valves without drain flask slowly to bring the pressure inside the pipes to atmospheric

pressure.

4. Disconnect all electric cables and dismount the cubicles.
5. Drain all oil from the vacuum pumps and remove the oil filters.
6. Separate all materials and components to be treated as special waste from the pump.
7. Dispose of the oil and contaminated items (piping, filters, .) in compliance with the applicable regulations.
8. Dispose of electric components according to the applicable regulations.
9. Dispose of any other uncontaminated material as scrap metal.

2 Technical Specification

Table 3-1; Technical Specification

Product name	
Physical Characteristics:	
Height	Varies with model
Width	Varies with model
Depth	Varies with model
Weight	Varies with model
Environmental Transport, Storage and Operating Conditions:	
Humidity	0 to 95% R.H. non-condensing
Storage Temperature Limit	0 to +40°C
Operating Temperature Limit	+5 to +40°C
Electrical Specification	
Panel Electrical supply	Varies with model
Pump Electrical supply	Varies with model
Protection against electric shock	Class 1 (requires protective earth)
Mode of operation	Continuous (may be left on indefinitely)
Ingress Protection Class	IP4X – for indoor installation only
Degree of mobility	Permanently installed
Performance:	
Volumetric Flow Rate	Varies with model

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 BeaconMedaes Service Centre.

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

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 BeaconMedaes or their appointed agents.

4 Description of Symbols

Symbols	Title	Symbols	Title
	Manufacturer		Protect from heat and radioactive sources
	Date of manufacture		Keep dry
	Authorized representative in the European Union		Temperature limit
	Batch code		Humidity limitation
	Catalogue Number		Atmospheric pressure limitation
	Serial number		Caution

	Unique Device Identifier		Upper limit of temperature
	Do not use if package is damaged and consult instructions for use		Biological risks
	Keep away from sunlight		Consult instructions for use or consult electronic instructions for use
	Lower limit of temperature		Medical device
	Do not dispose of in general waste		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
L	Connection for the live conductor on permanently installed equipment	N	Connection for the neutral conductor on permanently installed equipment
E	Connection for the earth conductor on permanently installed equipment		

5 Technical information

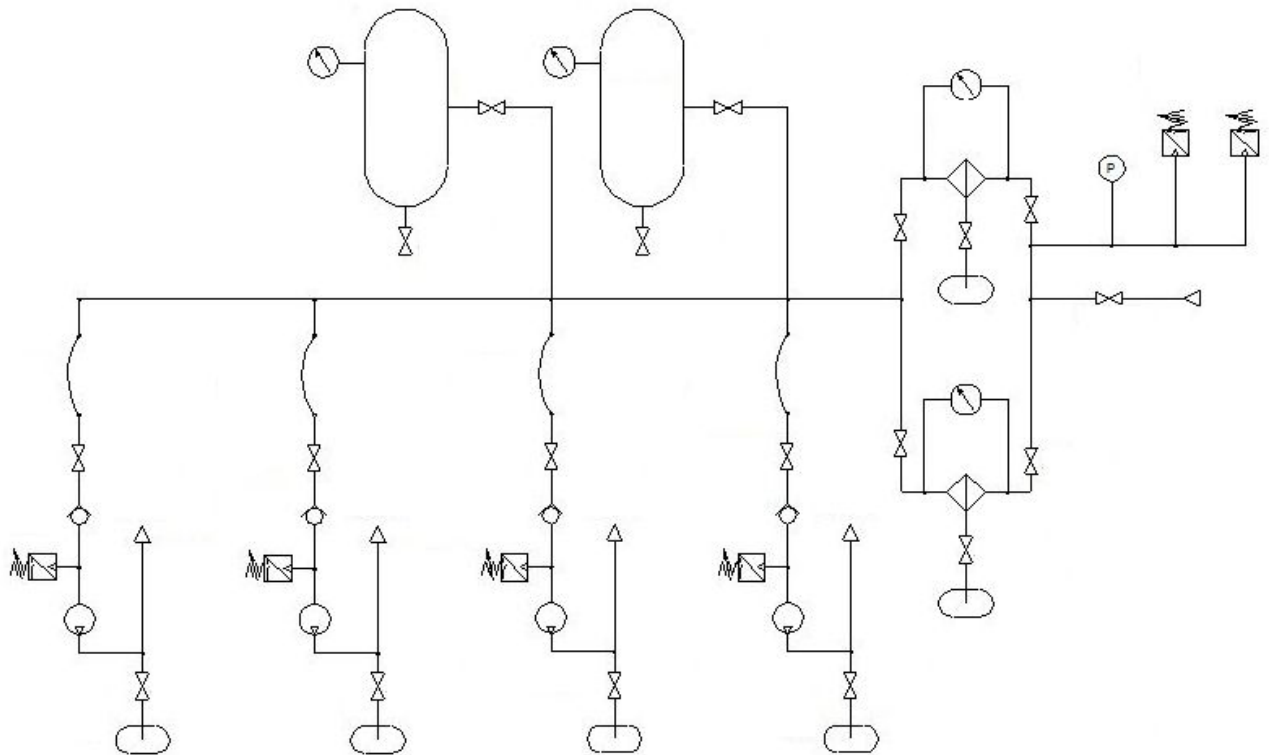


Figure 5-1; Quadruplex Vacuum Plant system diagram

5.1 Major components

Each BeaconMedaes 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:
 - a. Manual isolating valves.
 - 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 sterilizable drain flask with isolating valve, and a differential pressure gauge to indicate when the element needs replacing.

6 Installation

BeaconMedaes Floor Mounted 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 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).

6.2 Installation conditions

1. BeaconMedaes Floor Mounted Medical Vacuum Plant should be installed within a plant room that provides adequate ventilation with an ambient temperature between 0°C and +40°C.

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

2. 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

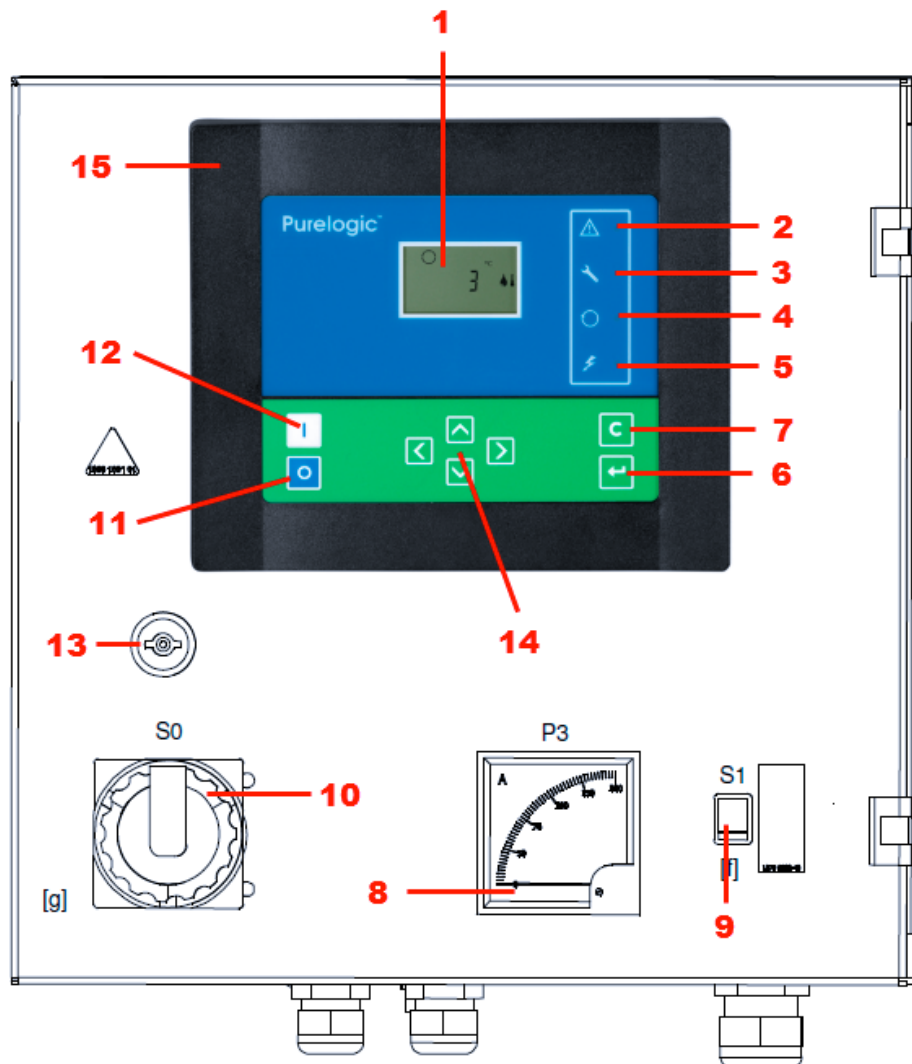


Figure 7-1; Pump Control Panel

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

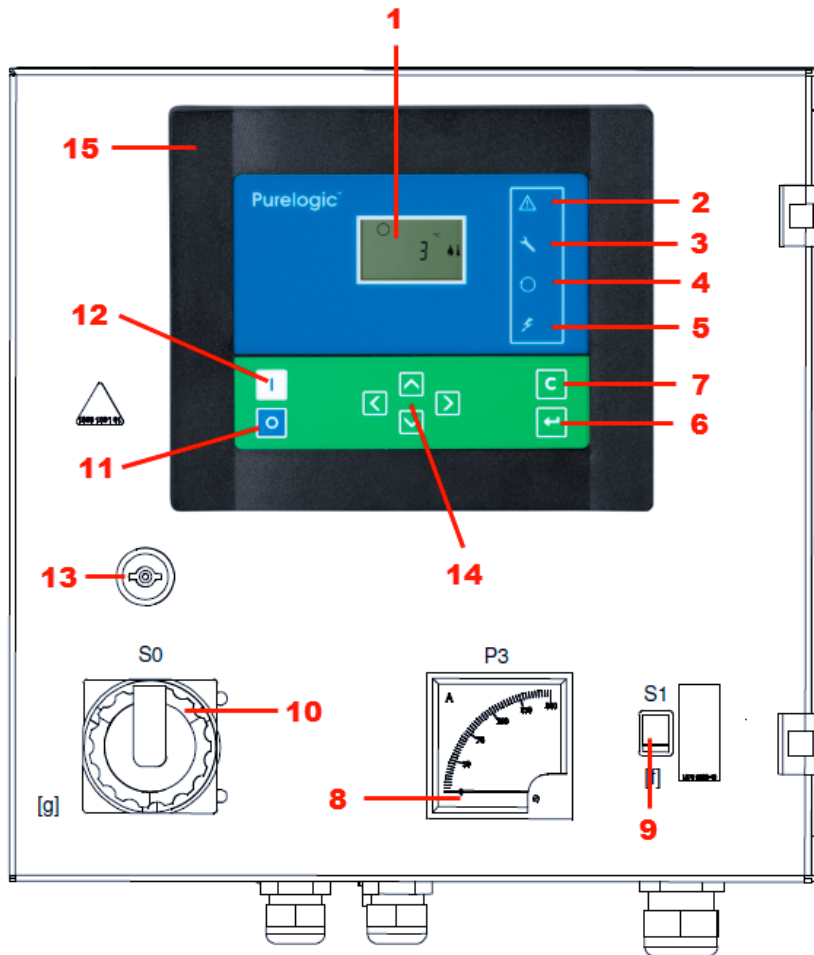


Figure 8-1; PureLogic® Pump Controller

Table 8-1; PureLogic® Pump Controller

Item	Designation	Function
1	Display	Shows icons and operating conditioning.
2	Warning LED	Is lit when warning is triggered.
3	Service LED	Is lit when a service is needed.
4	Operation LED	Is lit when the central controller is automatically controlling the pumps and dryers (sequencing is turned on).
5	Voltage LED	Indicates the voltage is turned on.
6	Enter button	Confirm action.
7	Escape button	Go to the previous screen or end current action.
8	Analogue Ammeter	Indicates the actual current (amps) of the pump.
9	LAN on/off switch	Determines if the pump is to be controlled manually or automatically.

10	Inter-locking isolator	Must be turned to the off position in order to open the cubicle door.
11	Stop button	Not used.
12	Start button	Not used.
13	Cubicle lock	Can be opened with a key to open the cubicle.
14	Scroll buttons	Use these buttons to scroll through the menu.
15	Purelogic® Graphic Controller	Intelligent central controller which sequences pumps and controls the dryer.

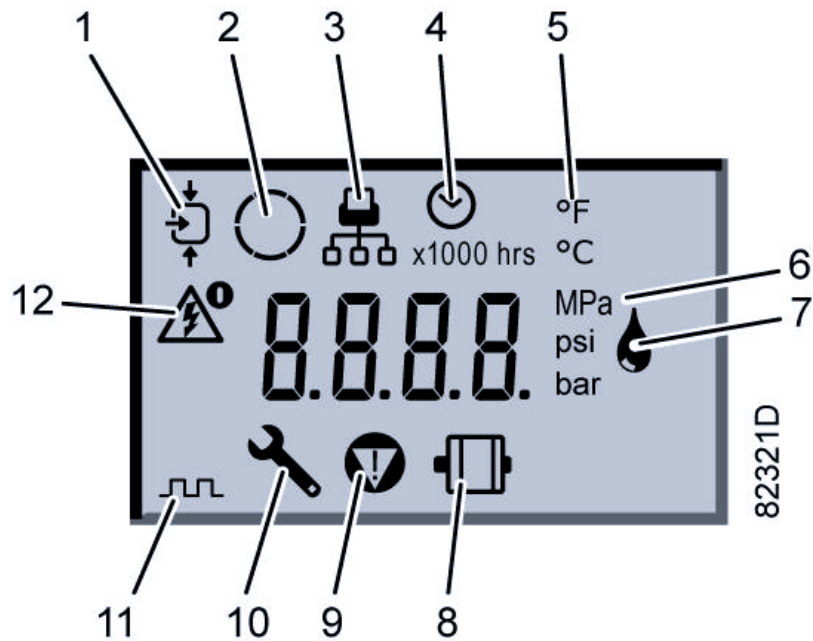
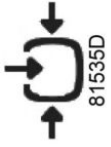















Figure 8-2; PureLogic® Pump Controller Icons

Table 8-2; PureLogic® Pump Controller Icons

Item	Icon	Appearance	Description
1	 81535D	Blinking	FTGOL fault (the pump failed to go on load)
2	 81532D	Rotating	Running
	 81532D	Steady	Stopped
3	 81537D	Steady	Under LAN control
	 81537D	Blinking	Forced local mode
4	 81539D		Pump cool down, to prevent too many motor starts per hour (maximum is 20 starts/hour)
	x10 81112D		When shown, value must be multiplied by 10 to get the actual value
	x100 81111D		When shown, value must be multiplied by 100 to get the actual value
	x1000 81110D		When shown, value must be multiplied by 1000 to get the actual value
	hrs 81109D		Hours
5	°C 81108D		Temperature indication (degrees C)
	°F 81107D		Temperature indication (degrees F)
6	MPa 81116D		MPa (pressure unit)
	psi 81115D		Psi (pressure unit)
	bar 81114D		Bar (pressure unit)
7	 83223D	Blinking	Oil level switch (option): indicated the oil level is too low
8	 81542D	Steady	Number of motor starts

	 81542D	Blinking	Motor overload
9	 81540D		Emergency Stop
10	 81541D		Service required
11	 82320D	Blinking	Emergency Forced Local mode (triggered by local pressure)
12	 81538D	Steady	Automatic restart after voltage failure
13	 81982D		Sensor error

8.2.2 Scrolling through all screens

Controller panel

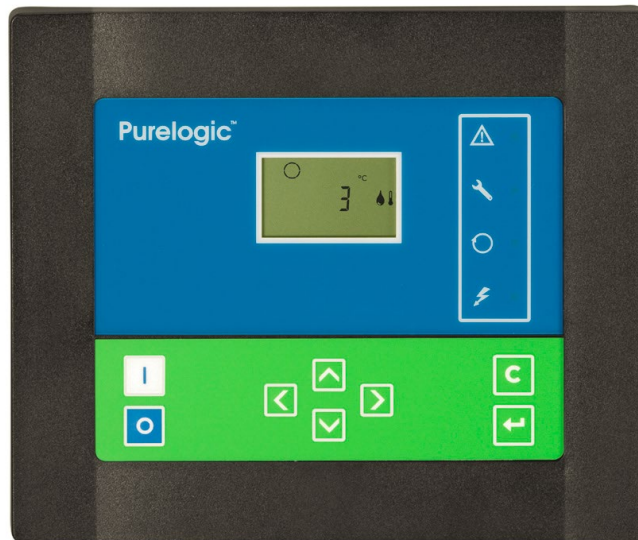


Figure 8-3; Pump Controller Panel

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.

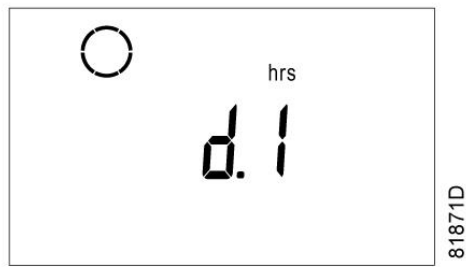


Figure 8-4; Example (operating hours)

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

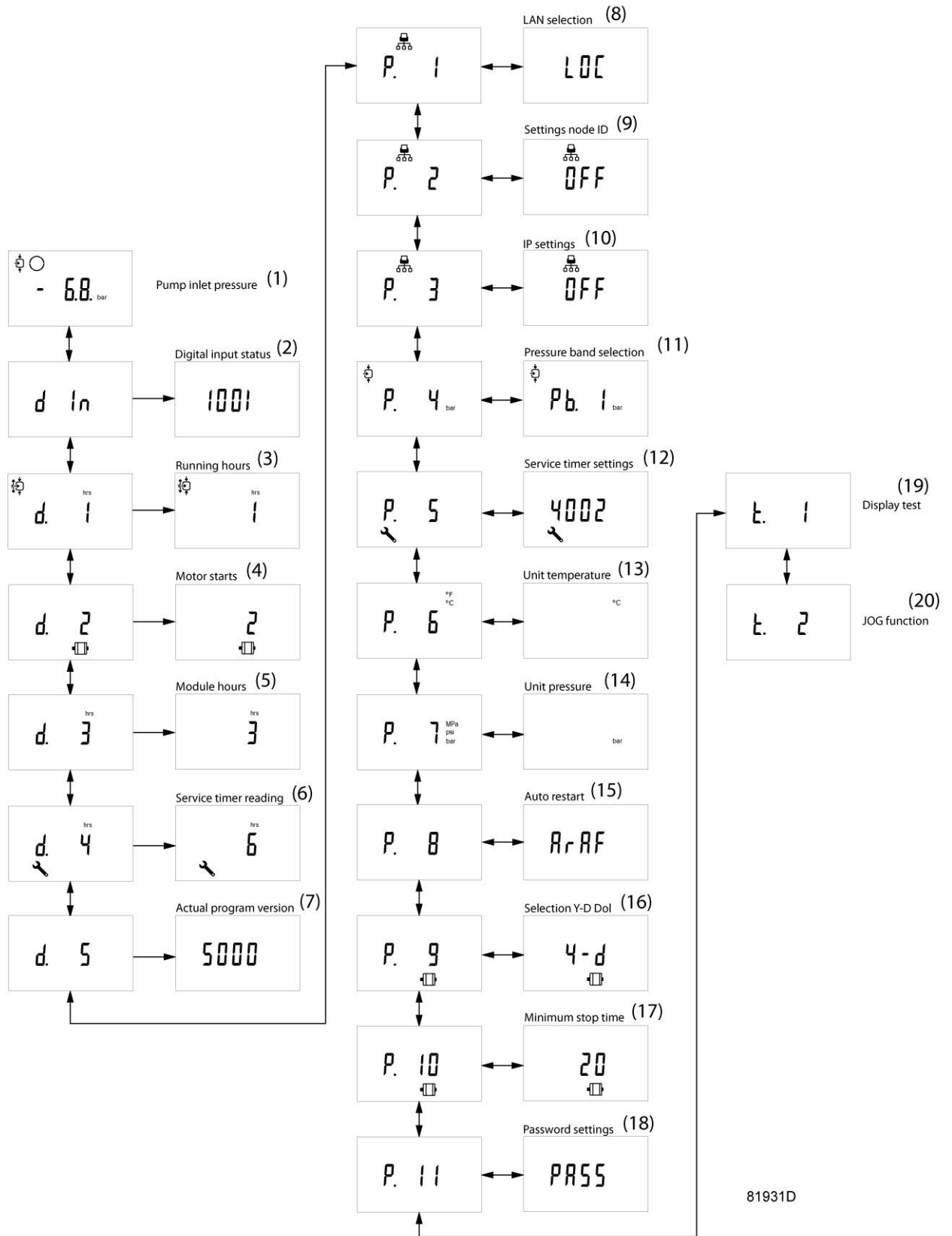
Table 8-3; PureLogic® Pump controller – screen overview

Digital input screens	Designation
<d. In>	Status of the digital inputs
<d. 1>	Running hours (hrs or x1000 hrs)
<d. 2>	Motor starts (x1 or x1000)
<d. 3>	Module hours (hrs or x1000 hrs)
<d. 4>	Service timer reading (hrs or x1000 hrs)
<d. 5>	Actual program version

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

Test screens	Designation
<t. 1>	Display test
<t. 2>	Jog function

Menu flow



81931D

Figure 8-5; PureLogic® Pump Controller – Menu flow

Table 8-4; PureLogic® Pump Controller – menu flow

Ref.	Description	Ref.	Description
1	Pump inlet pressure	11	Pressure band selection
2	Digital input status	12	Service timer settings
3	Running hours	13	Unit temperature
4	Motor starts	14	Unit pressure
5	Module hours	15	Auto restart function
6	Service timer reading	16	Selection Y-D DOL
7	Actual program version	17	Minimum stop time
8	LAN selection	18	Password settings
9	Settings node ID	19	Display test
10	IP settings	20	Jog function

8.2.3 Pump controller operation

LAN/local control, automatic/manual operation

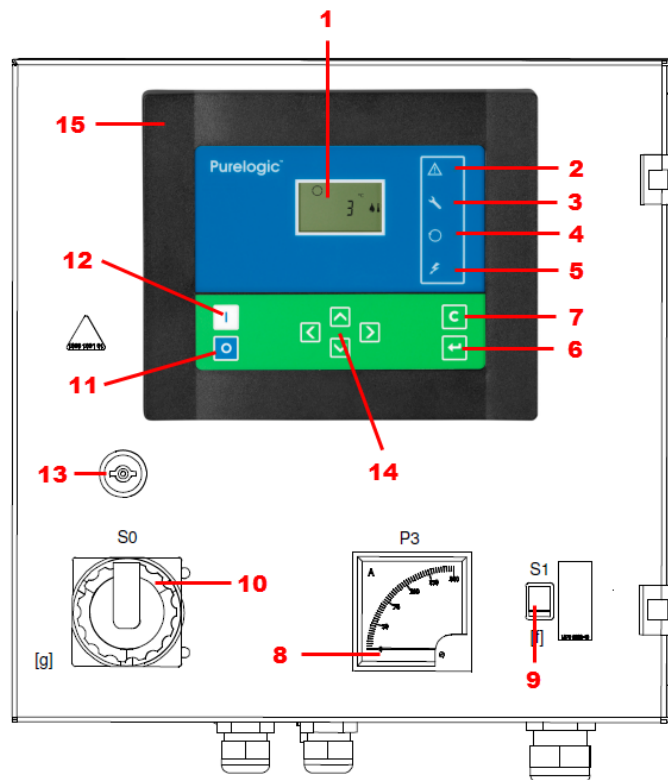


Figure 8-6; Pump Controller

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, 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

	Position of switch (9)  LAN control	Position of switch (9)  Local control	
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 that 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.



Figure 8-7; Example of running hours on display since last service

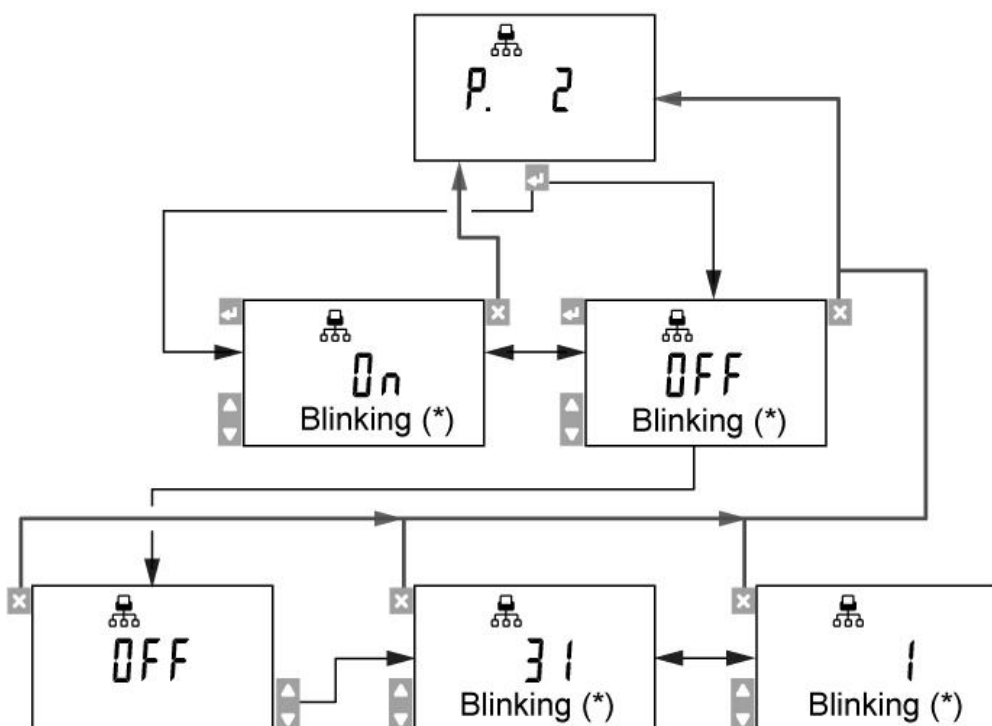
The number of running hours since the last service is shown. Press Enter (enter your password if it is set) and press Enter again to confirm. The service interval defined in <P. 5> will be subtracted, the blue LED will go out and the service warning will disappear.

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.

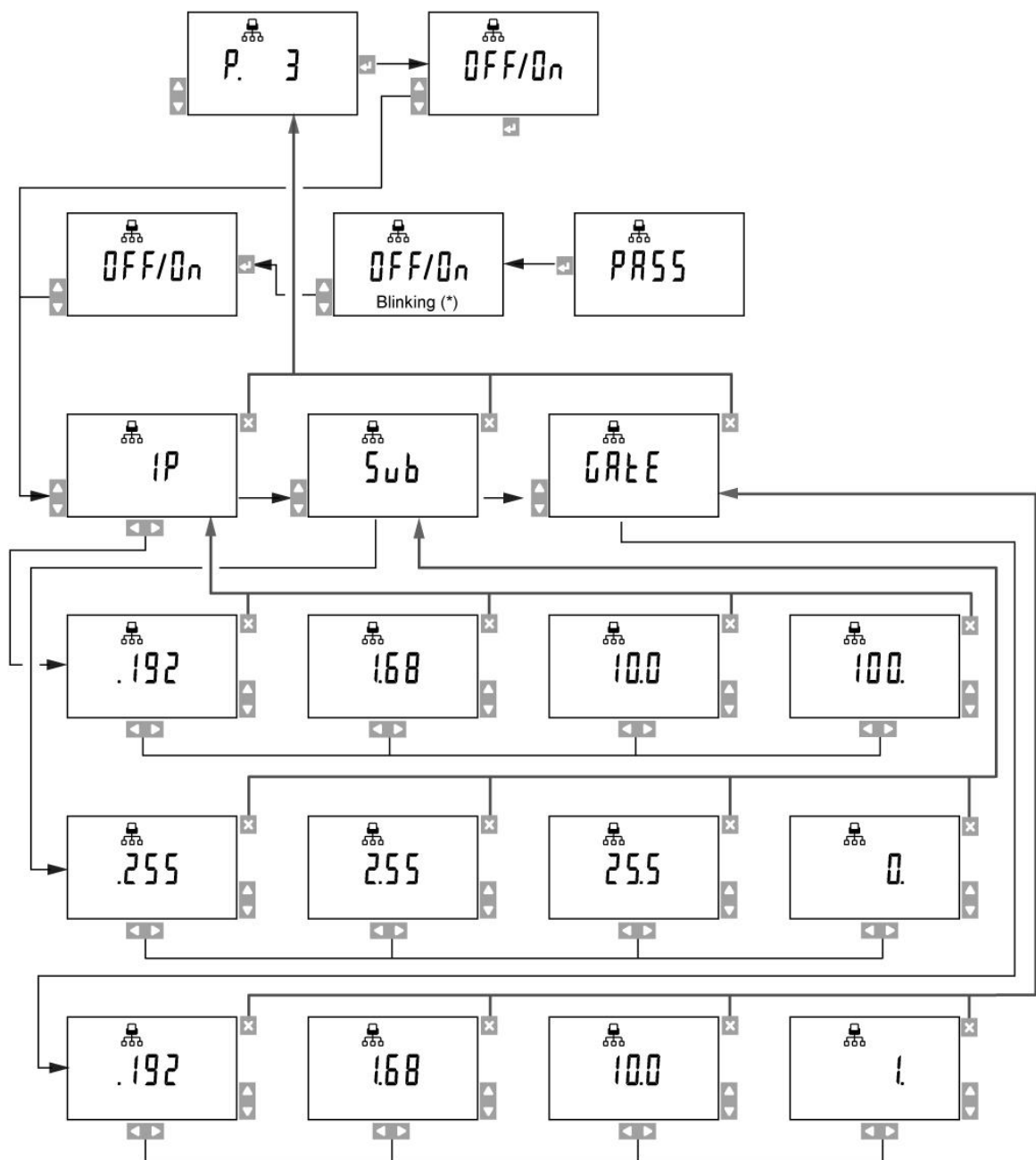


81936D

Figure 8-8; Pump controller – CAN settings

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.



81937D

Figure 8-9; Pump controller – IP settings

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:

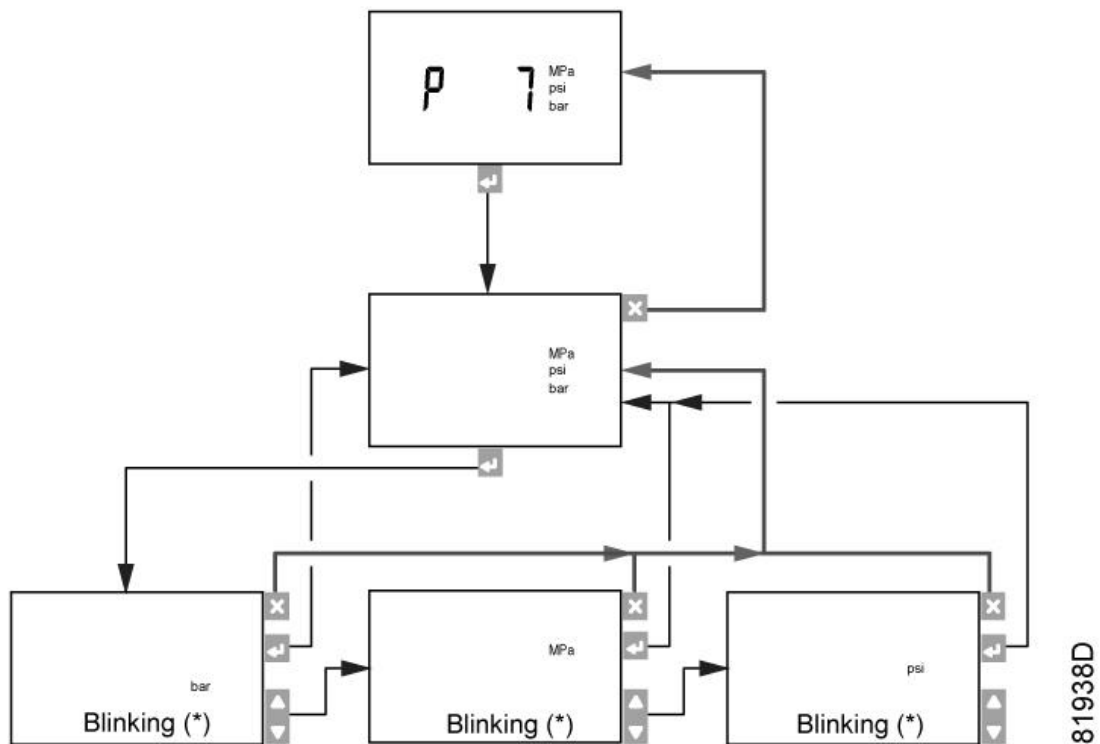


Figure 8-10; Pump controller – Changing the pressure unit

Automatic restart after voltage failure

Submenu <P. 8> 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:

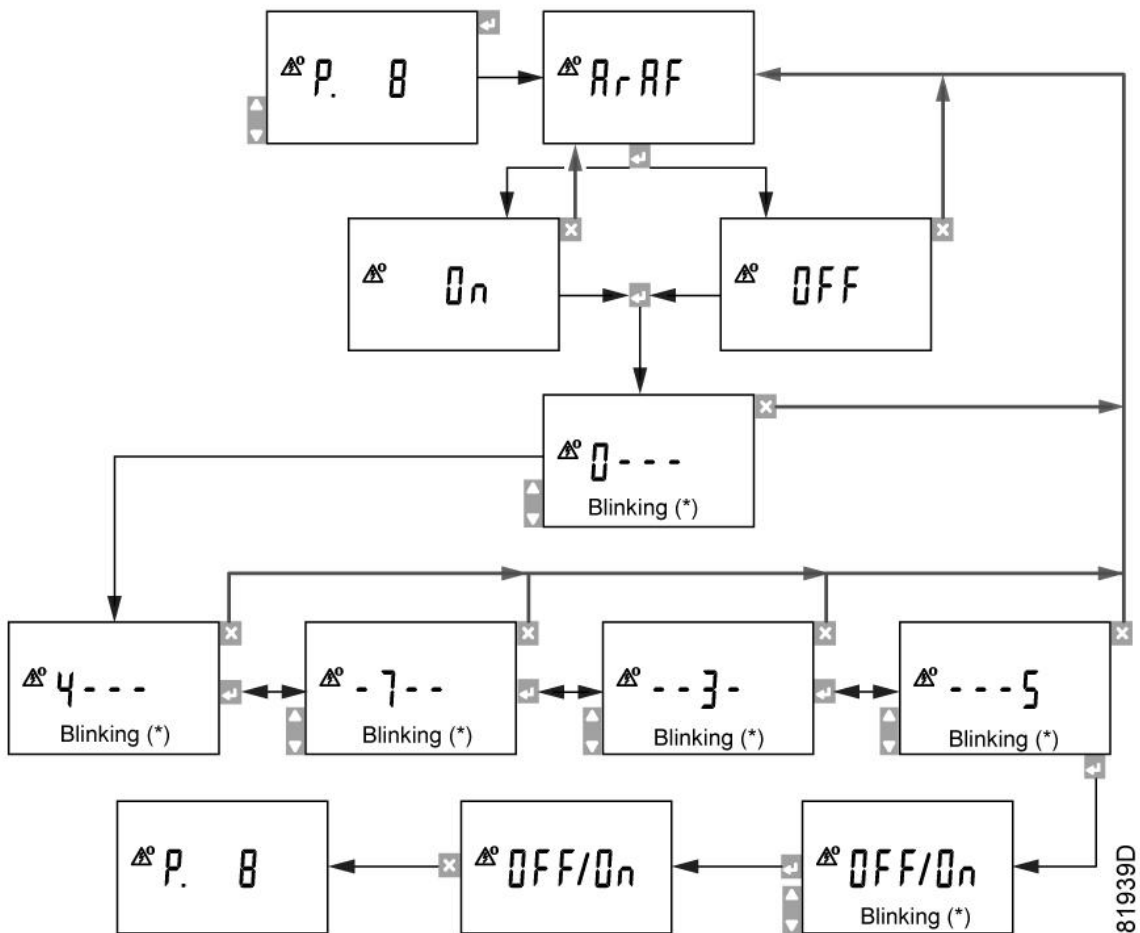



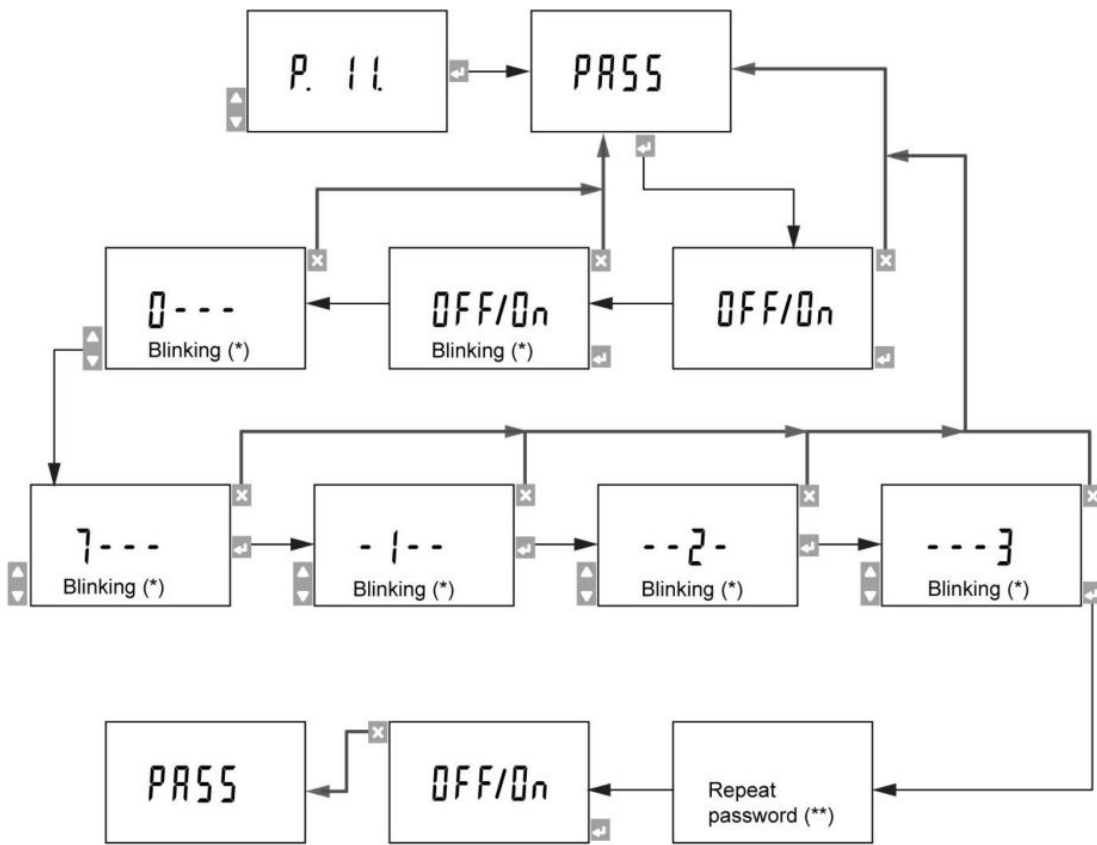
Figure 8-11; Pump controller - ARAF

Password

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

	<p>Attention: Lost passwords can not be recovered. Save the password carefully</p>
---	--

The following procedure makes it possible to set a password:



81940D

Figure 8-12; Pump controller - Password

8.3 Central controller (PureLogic®)

8.3.1 Interface, icons and menu structure

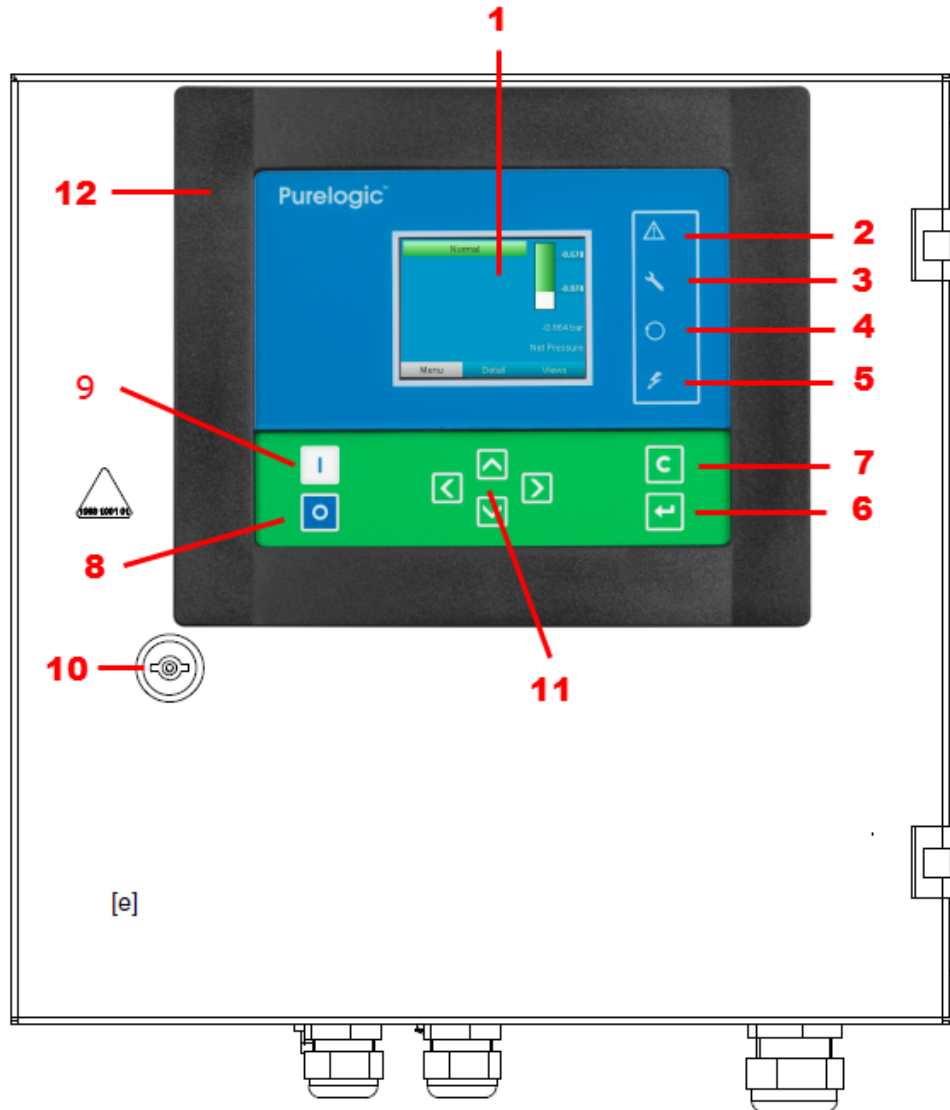


Figure 8-13; PureLogic® Central Controller

Table 8-6; PureLogic® Central Controller

Item	Designation	Function
1	Display	Shows icons and operating conditioning.
2	Warning LED	Is lit when warning is triggered.
3	Service LED	Is lit when a service is needed.
4	Operation LED	Is lit when pump is automatically started and stopped.
5	Voltage LED	Indicates the voltage is turned on.
6	Enter button	Confirm action.
7	Escape button	Go to the previous screen or end current action.
8	Stop buttons	This button stops the pump when in Local mode.

9	Start button	This button puts the pump in automatic operation when in Local mode. The operation LED (4) lights up and the pump controller is operative.
10	Cubicle lock	Can be opened with a key to open the cubicle.
11	Scroll buttons	Use these buttons to scroll through the menu.
12	Purelogic® Graphic Controller	Intelligent central controller which sequences pumps and controls the vacuum plant system.

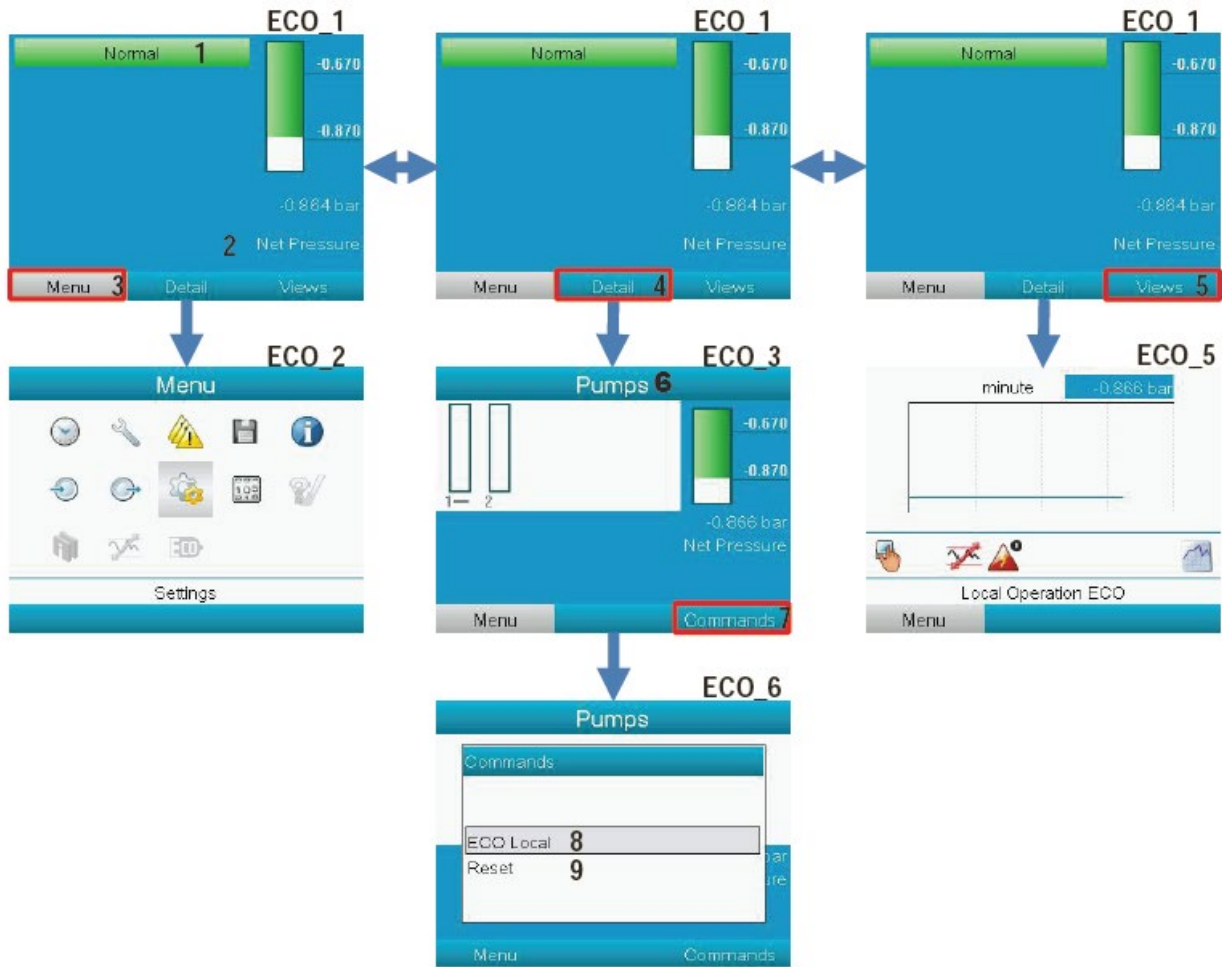


Figure 8-14; Central controller – Main Menu flowchart (full access situation)

Table 8-7; Central controller – Main Menu flowchart (full access situation)

Ref.	Description	Ref.	Description
1	Normal	6	Pumps
2	Net pressure	7	Commands
3	Menu	8	ECO local
4	Detail	9	Reset
5	Views		

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 8-8; PureLogic® Central Controller – Pump








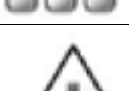




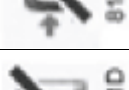
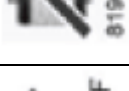


Bar Graph	Status	Description
	Idle pump	The pump is idle and ready to be called. The bar graph is blank.
	Lead pump	The central controller has assigned this pump to the next one to run. This is indicated by a full line underneath the blank bar graph.
	Called pump	This pump is running. The bar graph is coloured.
	Called pump, last one called	This pump has last started to run. This is indicated by a dotted line underneath the coloured bar graph.

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

Icon	Status	Description
	No valid pump	A pump controller is expected at this CAN address.
	No communication	No reply from the connected pump controller within a pre-defined time.
	Blinking network icon	The pump is running in Emergency Forced Local (EFL).
	No answer	Connected pump controller is not responding correctly to the commands (e.g. no reaction on a run command).
	Not available	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 available to the Purelogic® control algorithm (maximum 20 motor starts /hour).
	Pump shutdown	Pump is in Shutdown condition.
	Failed to go on load	The pressure switch at the pump outlet detects vacuum when it should not.
	Overload	The motor draws too much current and the overload has isolated the pump.
	Sensor error	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.
	Local mode	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.
	Service required	The pump's running hours have surpassed the predefined interval and maintenance must be carried out.
	Isolated	User has isolated this pump controller. It will not transmit faults or alarms.

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

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.



Figure 8-16; Central controller – testing the alarms

1	Menu
2	Test

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.



Figure 8-17; Central controller – CAN settings

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.

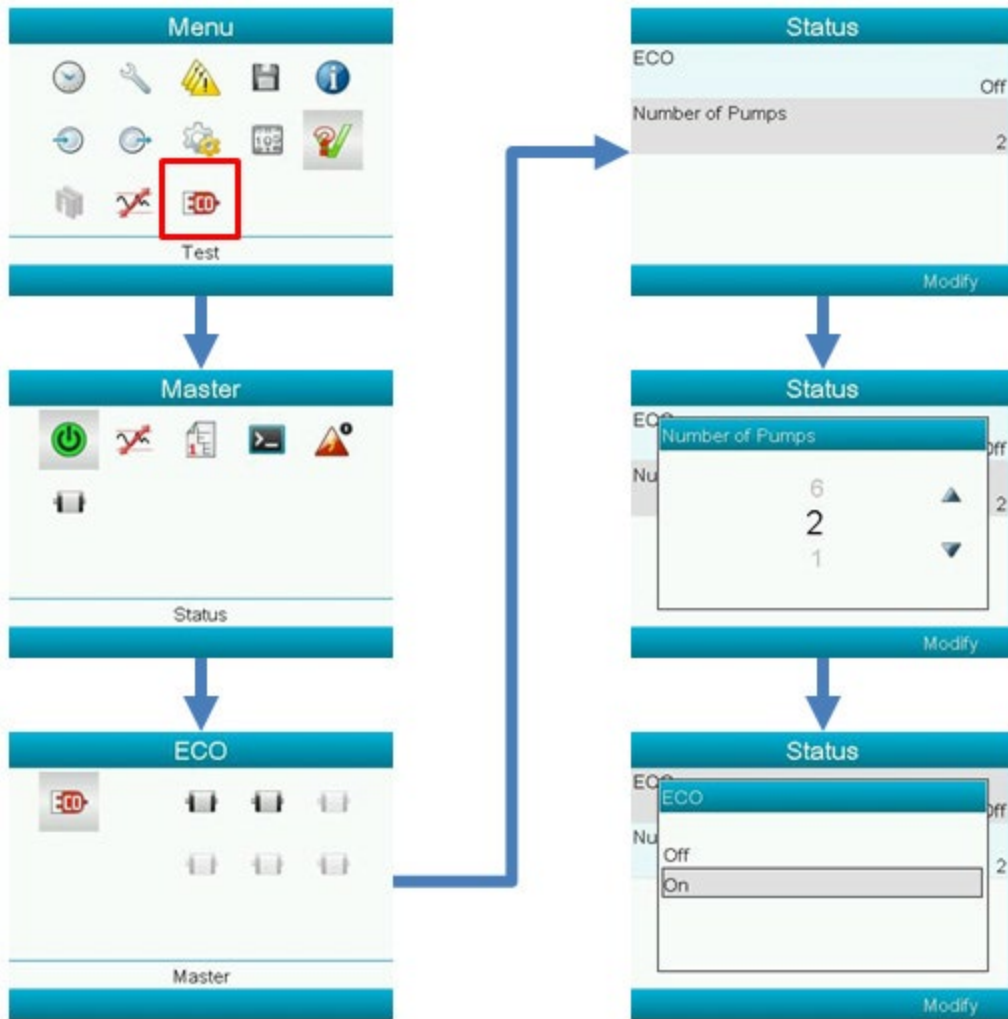


Figure 8-18; Central controller – setting up the ECO

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 BeaconMedaes 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 Beacon.

Table 8-10; Central controller – other settings

Parameter	Function	Min. setting	Factory setting	Max. setting	Unit
Pressure band X High	To program the maximum setting for pressure band X	0	-0.670	-0.869	bar
Pressure band X Low	To program the minimum setting for pressure band X	-0.671	-0.870	-1.500	bar
Pressure band in use	To select between pressure band 1 and 2	-	1	-	-

Digital Pressure band selection	Enables to change the pressure band in use via digital input	-	Off	-	-
Scheme in use	To define which scheme is in use (see slave parameter scheme x priority)	-	1	-	-
Digital Scheme selection	Enables to change the digital scheme in use via digital input	-	Off	-	-
Forced time	To program the interval at which, if activated by "System Forced", the central controller starts a new pump in case no sequence change has occurred during the interval	1	2	60	hrs
Remote to Local time	To program the time interval between LAN and Local commands from central to pump controllers	2	20	600	sec
Start/load time	To program the time interval between the different start commands from central to pump controllers	2	3	600	sec
Unload time	To program the time interval between different stop commands from central to pump controllers	2	3	600	sec
Delta time	To program the difference in running hours to allow the central controller to decide starting another pump	10	168	672	hrs
Local	If activated, a local command is possible from the commands screen	-	On	-	-
System Forced function	To allow the central controller to force another sequencing by starting a new pump at the interval programmed in "Forced Time"	-	On	-	-
Auto restart	When power recovers within this time, the automatic restart function will be performed. If power recovers beyond this time, no automatic restart will be executed.		Infinite		
Maximum power down time	If ArAF is set to "Active" (e.g. instead of "Infinite"), then the system will only restart automatically within this power down time.	15	20	3600	sec
Sequence method	Equal wear or manual sequence	-	Equal wear	-	-
Operation mode	Change controller to be Local, Remote or LAN controlled	-	Local control	-	-
Group sequence X	Only when manual sequence is active. Set up manual sequence.	-	-	-	-
Manual Sequence Shift Up Delay	Only when Manual sequence is active. Time how long it will take to shift the sequence one up.	2	0	600	sec

Manual Sequence Shift Down Delay	Only when Manual sequence is active. Time how long it will take to shift the sequence one down.	2	0	600	sec
----------------------------------	---	---	---	-----	-----

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

In normal circumstances they should not be changed. Please contact BeaconMedaes.

Table 8-11; Central controller – ECO slave settings

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

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).

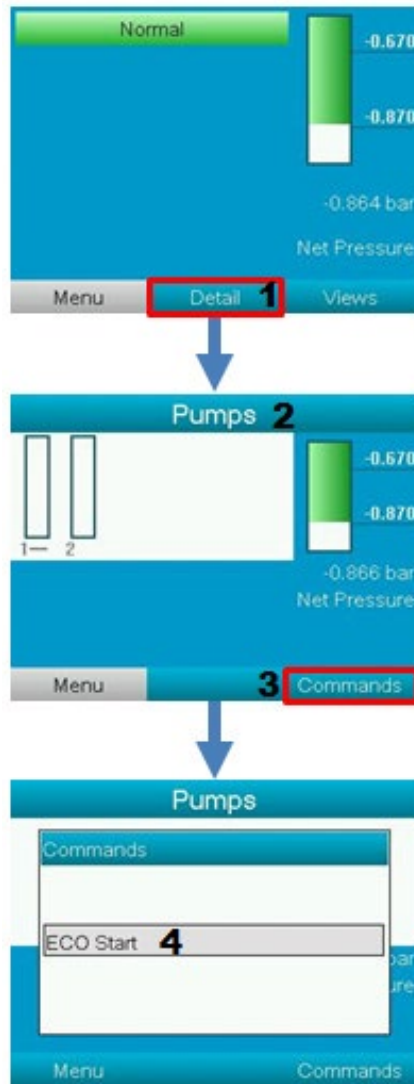


Figure 8-19; Central Controller – Starting the ECO

1	Details	3	Commands
2	Pumps	4	ECO Start

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.

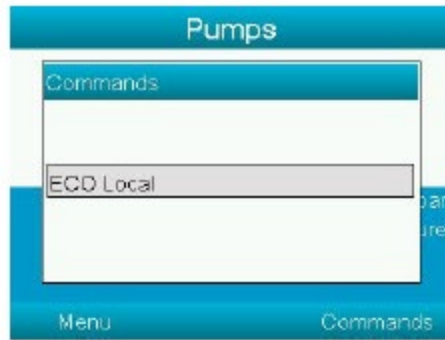


Figure 8-20; Central controller – ECO Local

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.

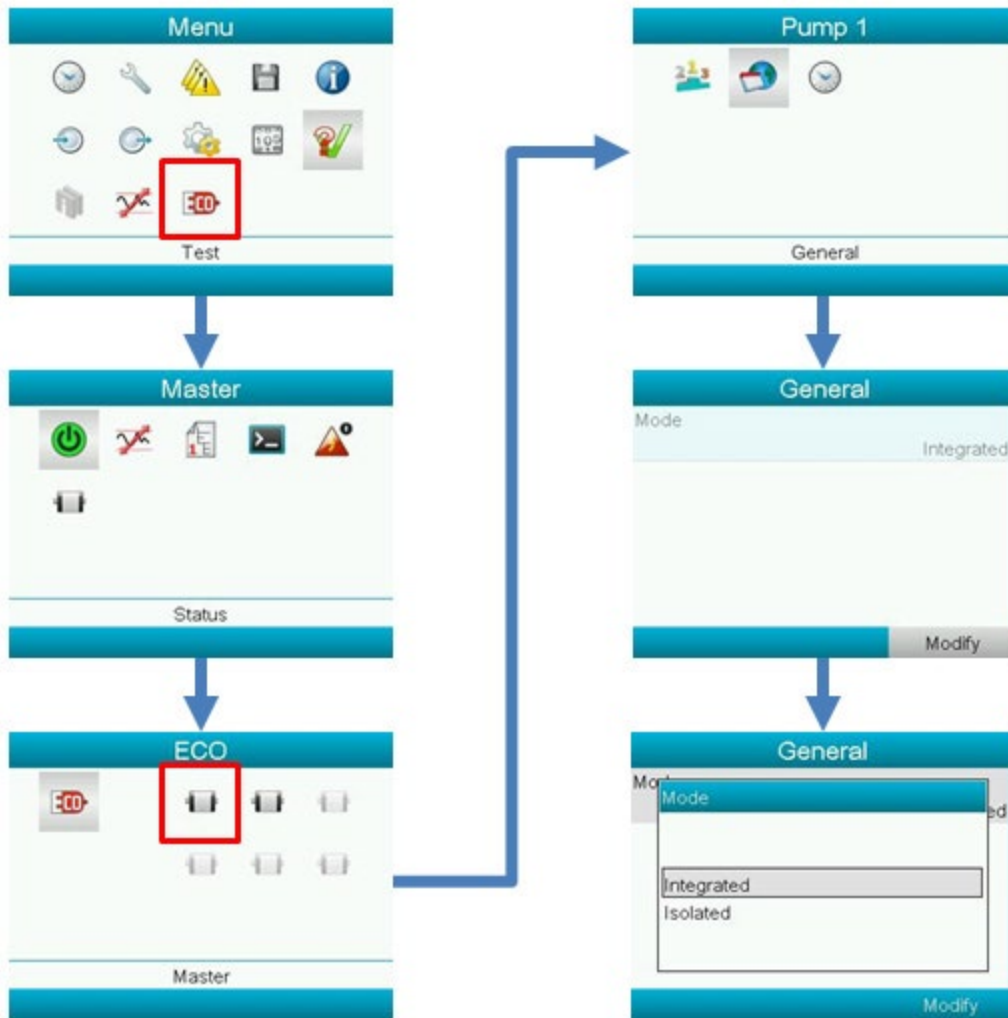


Figure 8-21; Central Controller – Isolating a pump

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:

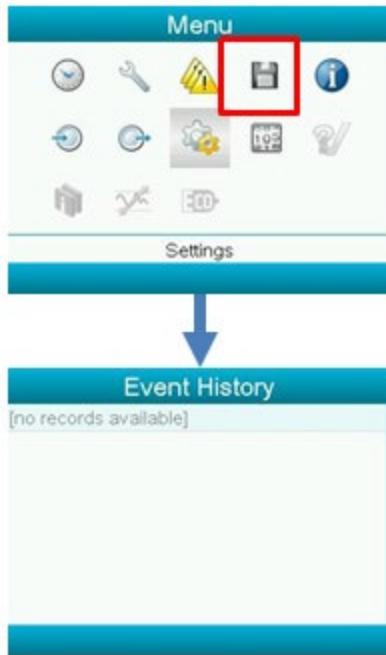


Figure 8-22; Central Controller – Event history

Viewing information about the central controller

Through the following submenu, information regarding MAC address, software, IP settings, etc. can be viewed.

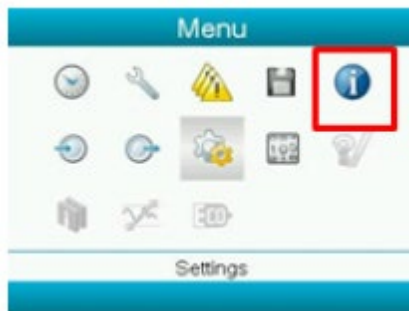


Figure 8-23; Central controller – Information

Viewing the amount of module hours

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



Figure 8-24; Central controller – Counters

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.

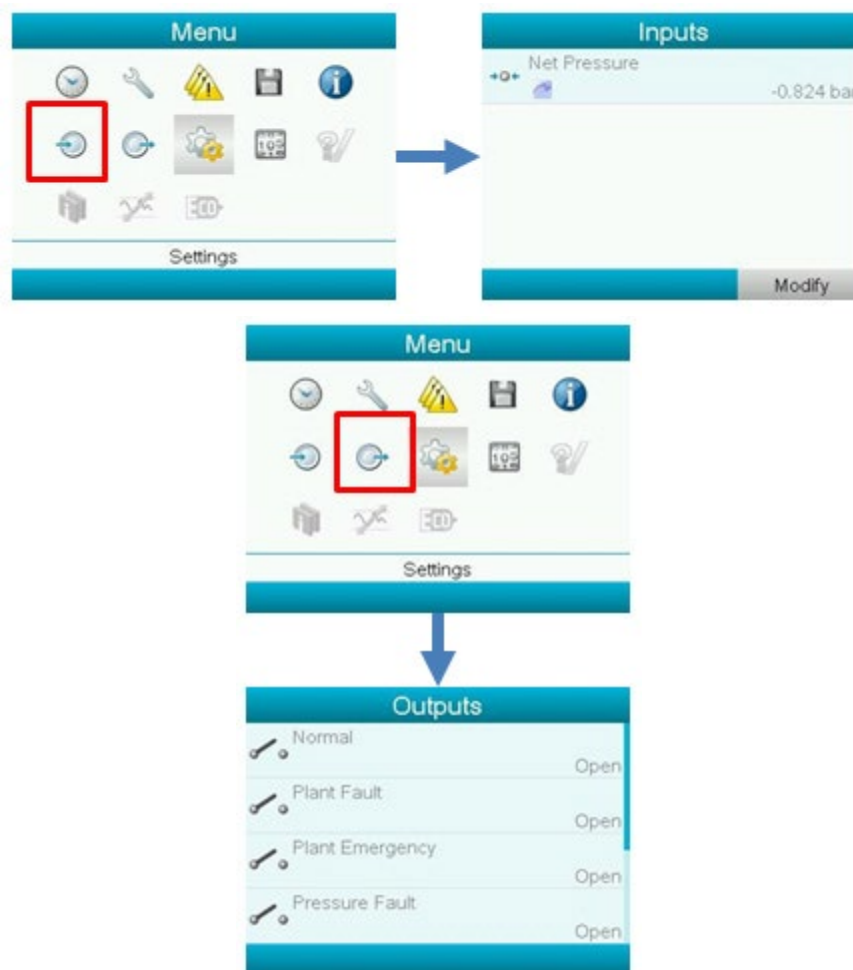


Figure 8-25; Central controller – Inputs and outputs

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 on line when browsing to the set IP address.

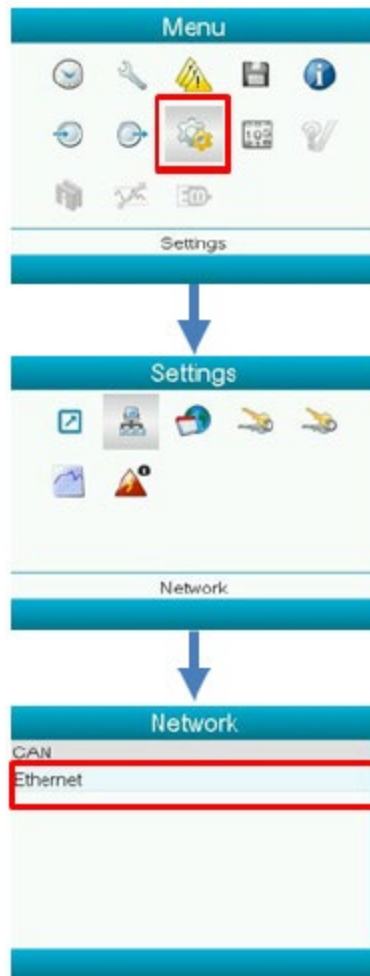


Figure 8-26; Central controller – Ethernet

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 can not control the pumps. Therefore it sends the pump controllers in Forced Local mode until the problem is remedied.

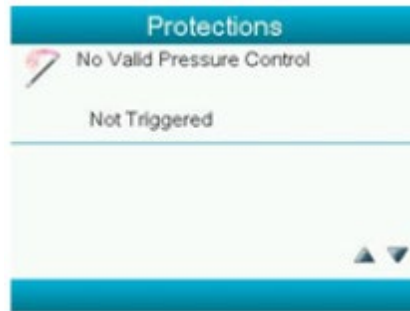


Figure 8-27; Central controller – Protections

8.3.3 Service menu

Menu icon, Service



Figure 8-28; Service menu – service icon

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.

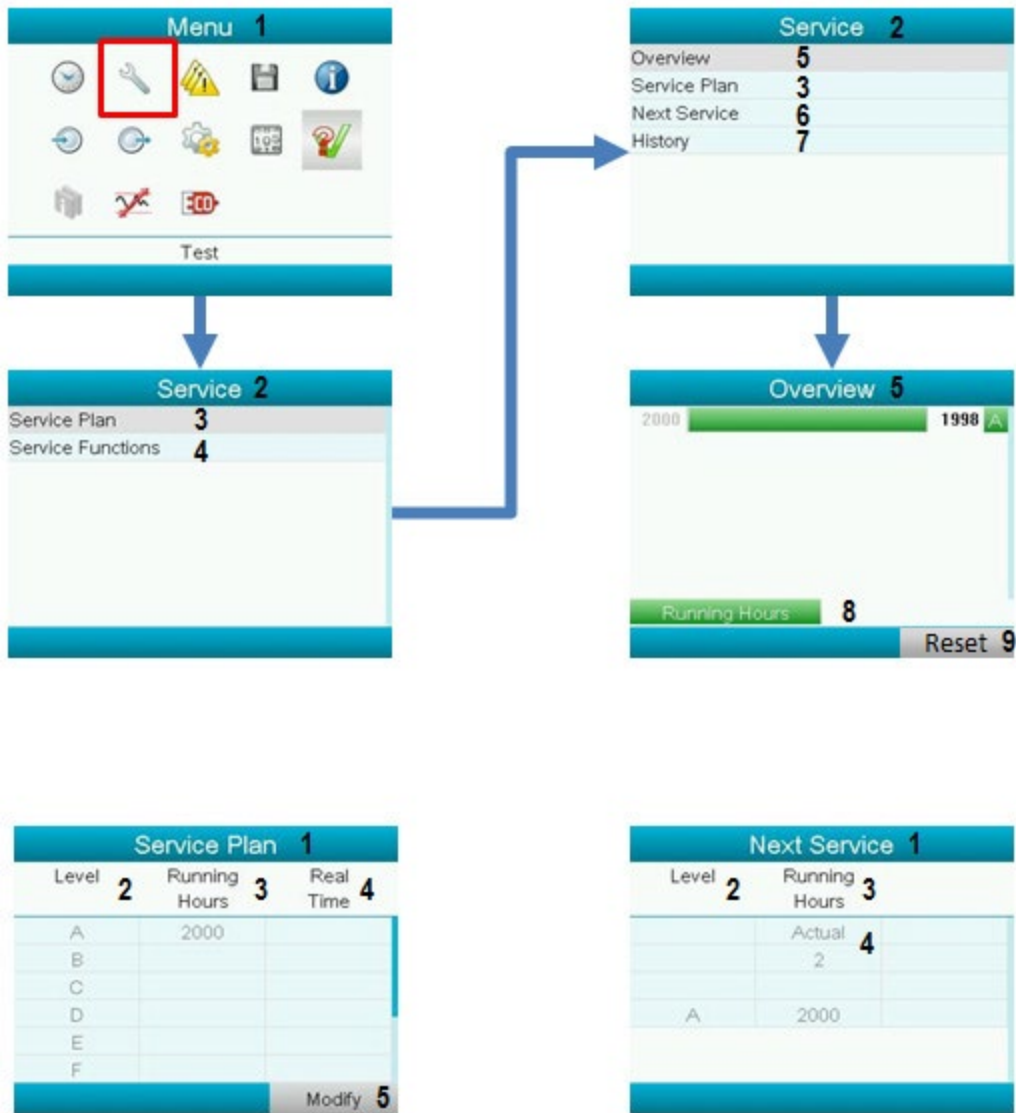


Figure 8-29; Service menu – Service menu overview

1	Menu	6	Next service
2	Service	7	History
3	Service plan	8	Running hours
4	Service maintenance	9	Reset
5	Overview		

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

Service Plan 1		
Level 2	Running Hours 3	Real Time 4
A	2000	
B		
C		
D		
E		
F		
		Modify 5

Figure 8-30; Service menu – Service plan

1	Service plan
2	Level
3	Running hours
4	Real time hours
5	Modify

Next Service Plan

Visualization when the next service intervention needs to be planned.

Next Service 1		
Level 2	Running Hours 3	Actual 4
		2
A	2000	

Figure 8-31; Service menu – Next service

1	Next service
2	Level
3	Running hours
4	Actual

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.



Figure 8-32; Service menu - History

Service maintenance

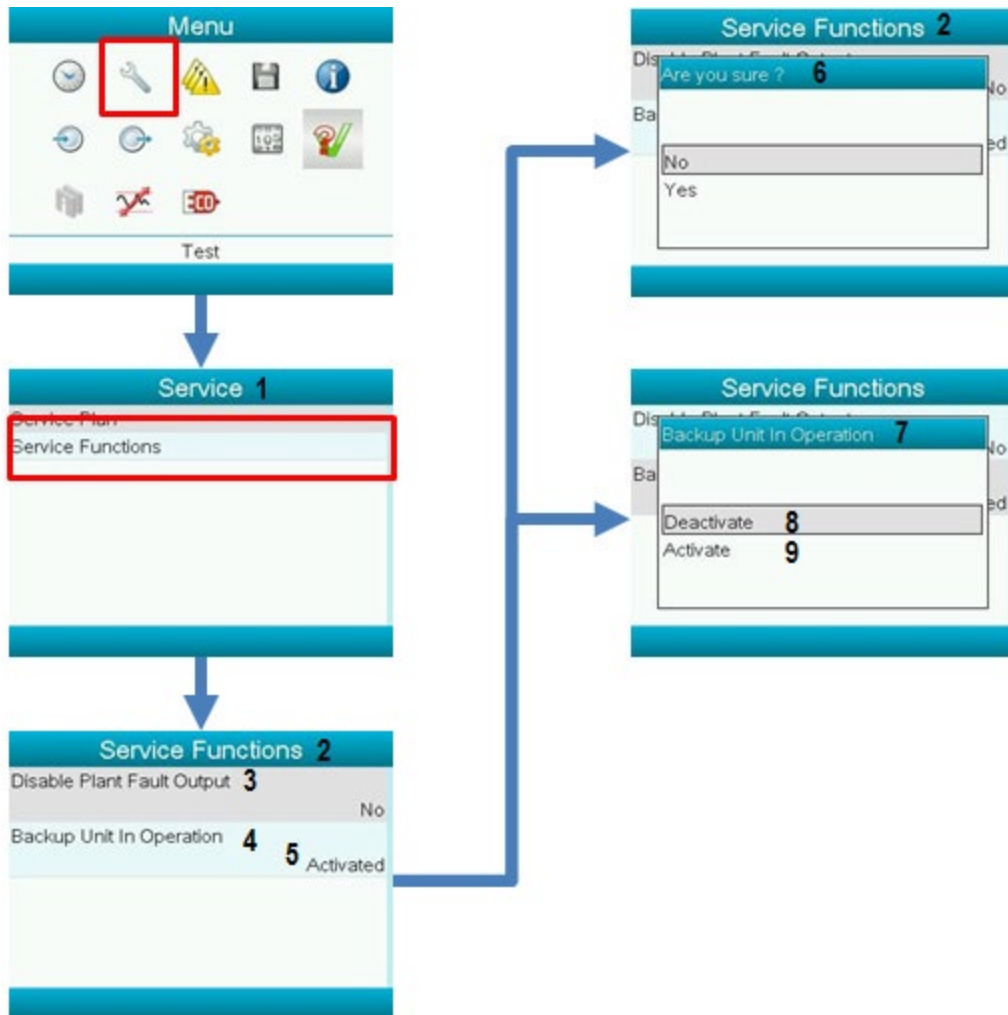


Figure 8-33; Service menu - Service maintenance

1	Service maintenance	6	Are you sure?
2	Service function	7	Backup unit in operation
3	Disable plant fault output	8	Deactivate
4	Backup unit in operation	9	Activate

5	Not activated		
---	---------------	--	--

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

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.

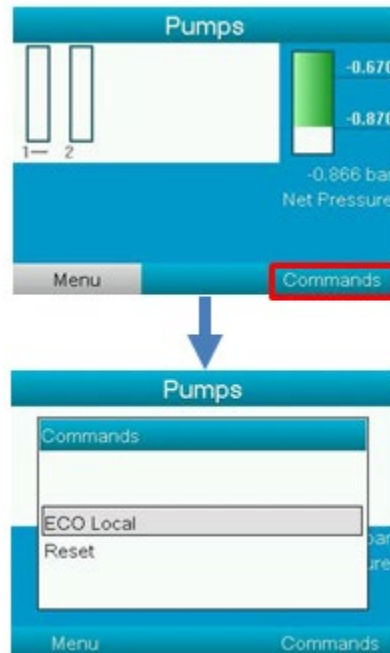


Figure 8-35; Controller alarms and faults – Pumps commands

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 BeaconMedaes 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

	Pump is called	Pump is not called
<<0>> signal received from FTGOL switch	OK	PLANT FAULT ALARM - switch, cable or connections disconnected - non-return valve locked open
<<1>> signal received from FTGOL switch	PLANT FAULT ALARM - switch, cable or connections short-circuited - pump defect	OK

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 BeaconMedaes.

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.

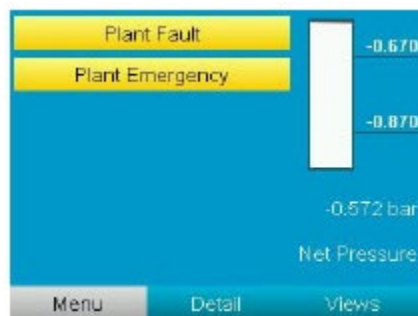


Figure 8-36; Controller alarms and faults – Plant Emergency

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 BeaconMedaes.
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 BeaconMedaes.

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 BeaconMedaes.

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 BeaconMedaes).
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.

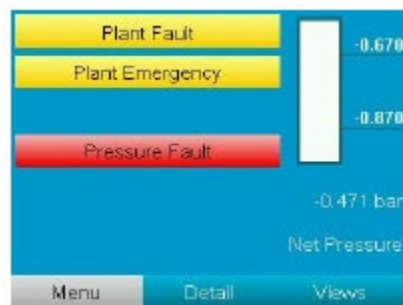


Figure 8-37; Controller alarms and faults – Pressure Fault

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).



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

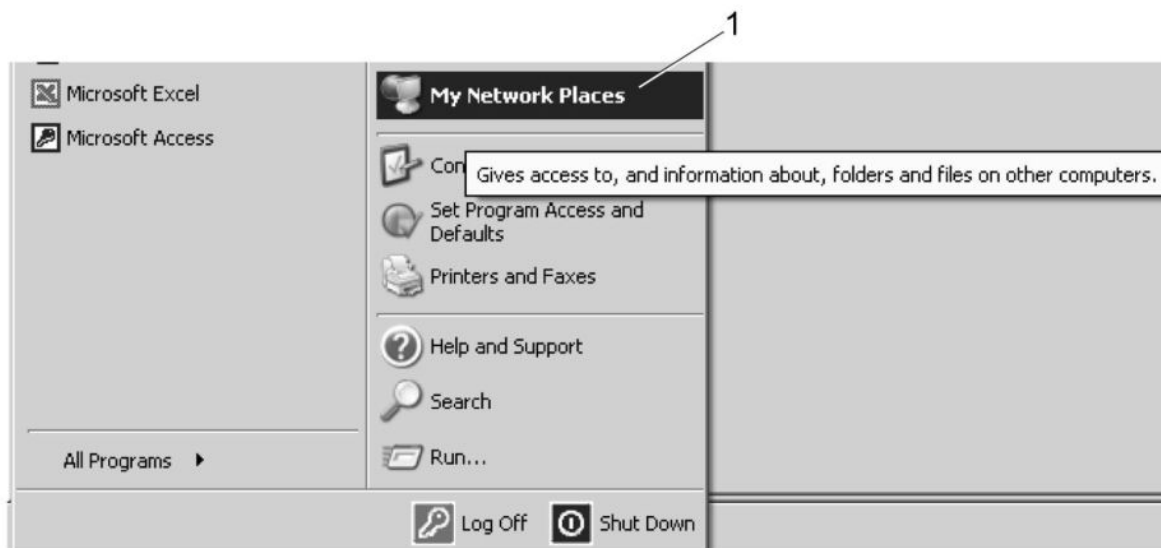
- Use a UTP cable (CAT 5e) to connect to the controller (see picture below).



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

Configuration of the network card

- Go to My Network places (1).



81509D

Figure 8-40; Web server – My Network places

- Click on View Network connections (1).

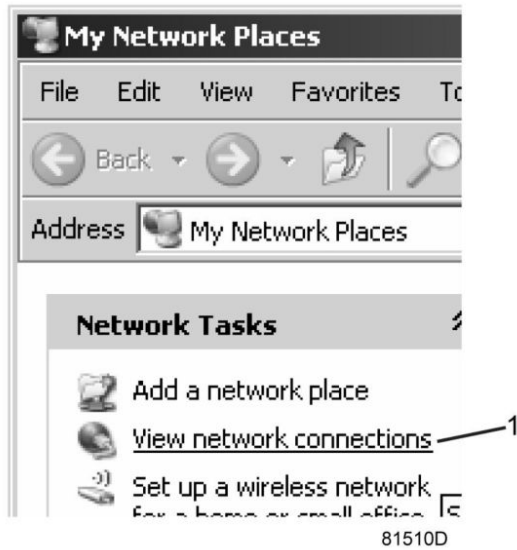


Figure 8-41; Web server – View network connections

- Select the Local Area connection (1), which is connected to the controller

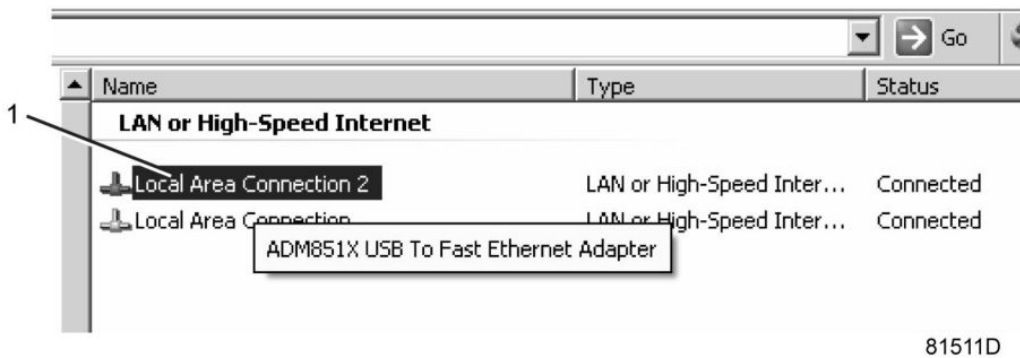


Figure 8-42; Web server – Local area connection

- Click with the right button and select properties (1)

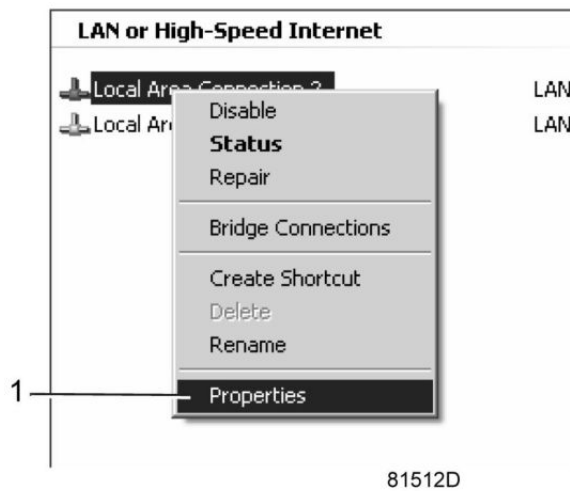


Figure 8-43; Web server – Properties

- 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.

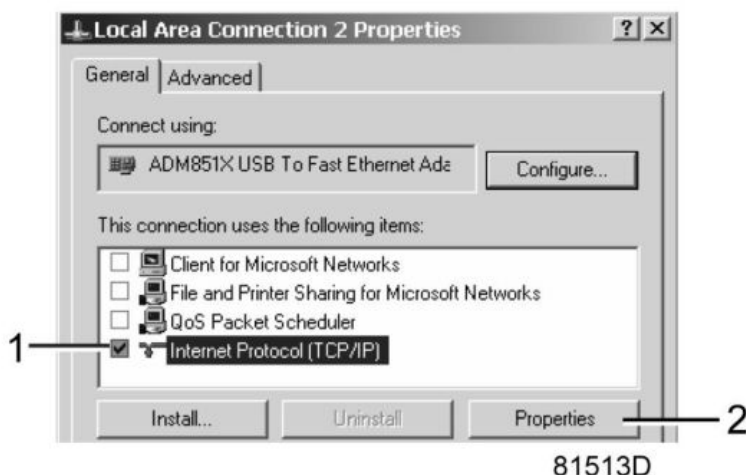



Figure 8-44; Web server – Internet protocol

- Use the following settings:
- IP Address 192.168.100.200
- Subnetmask 255.255.255.0

Click OK and close network connections.

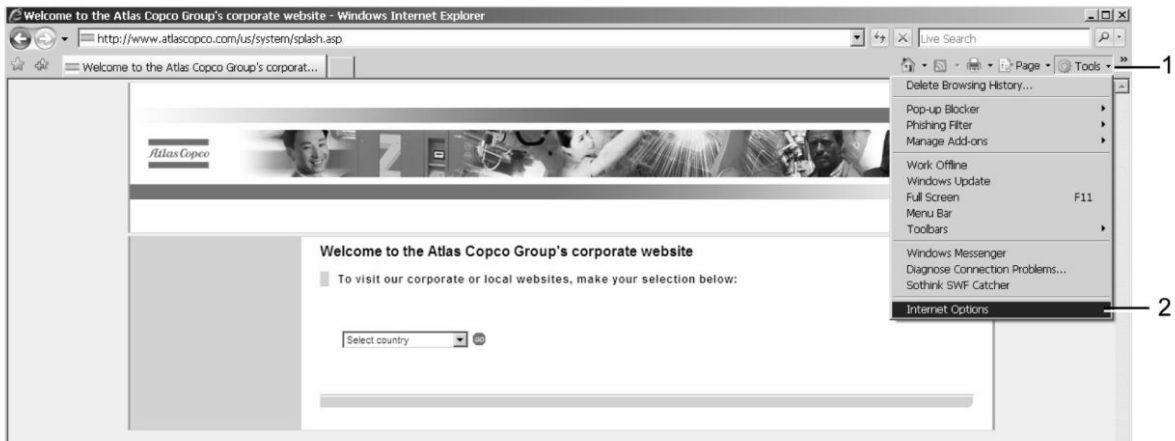
Configuration of the web server

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.
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When using Internet Explorer:

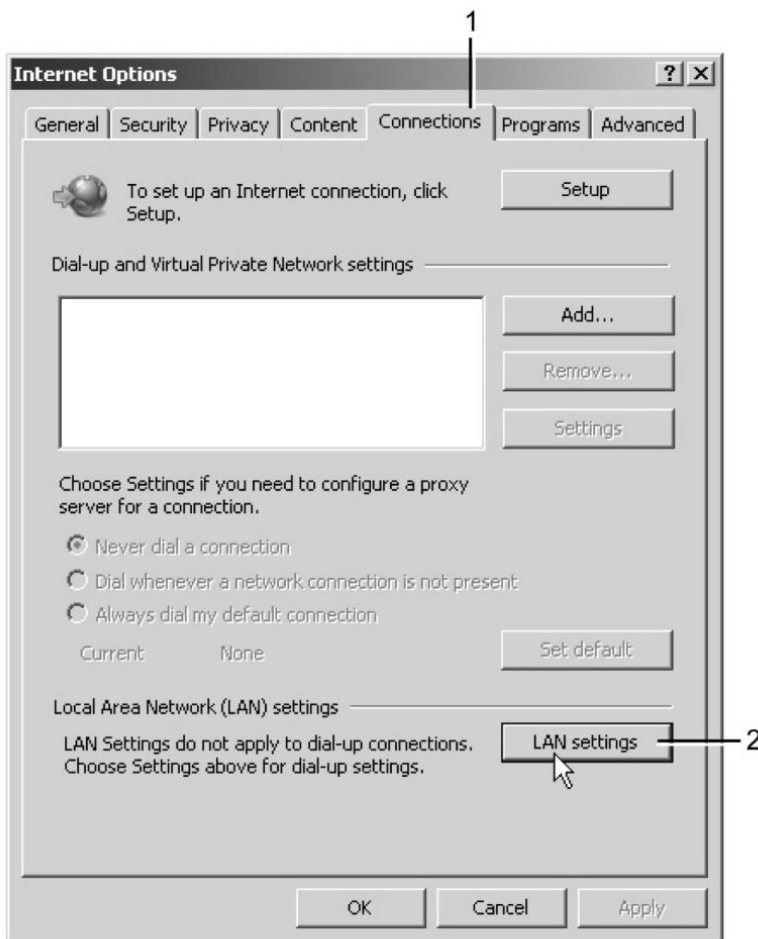
Open Internet Explorer and click on Tools - Internet options (2).



81516D

Figure 8-45; Web server – Internet explorer

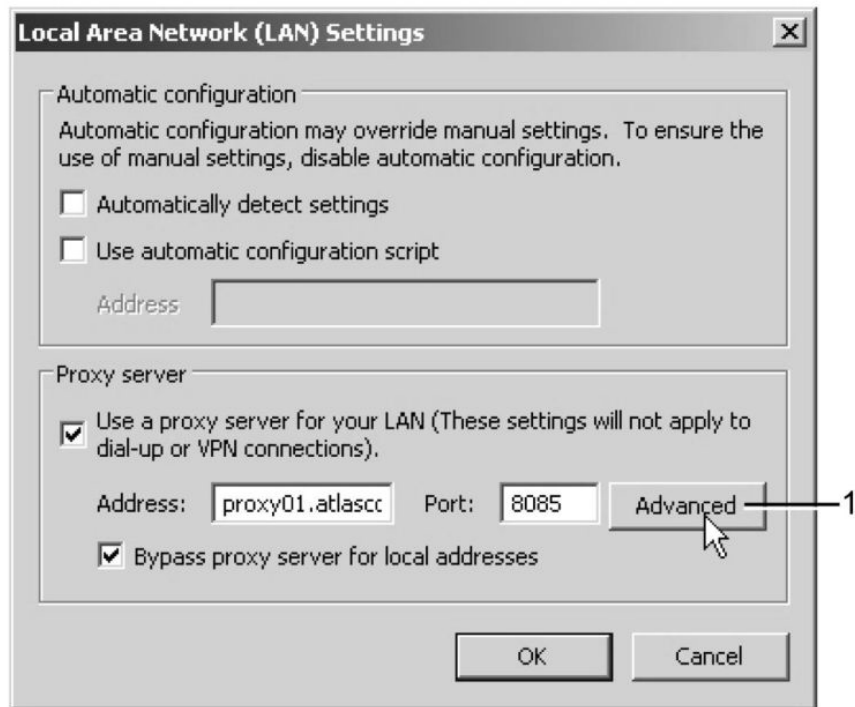
- Click on the Connections tab (1) and then click on the LAN settings button (2).



81517D

Figure 8-46; Web server – Internet explorer

- In the Proxy server Group box, click on the Advanced button (1).



81518D

Figure 8-47; 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.

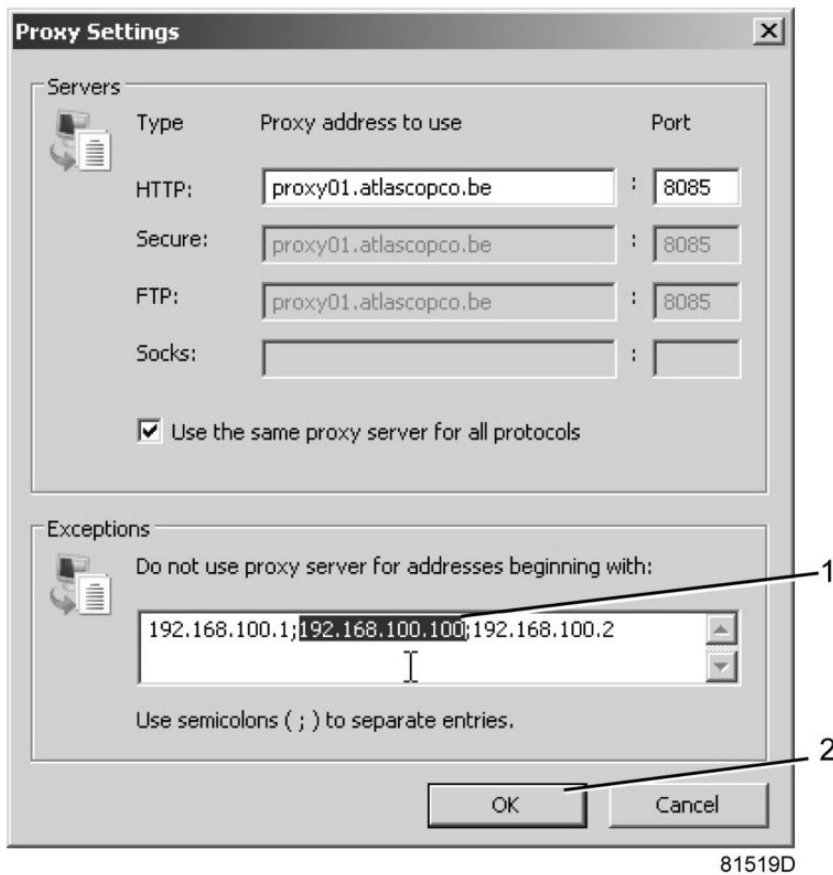


Figure 8-48; Web server – Proxy settings

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:

Serial Number: GCFB01268

ES_PAM

Language: English

Analog Inputs Counters Digital Inputs Digital Outputs

Special Protections

Analog Inputs	Value
Dryer Inlet	2.6 bar
Medical Pressure	2.5 bar
Atmospheric Dewpoint	-42.7 °C

Counters	Value
Module Hours	9 hrs
Running Hours	0 hrs

Info	Local Operation ECO
Machine Status	
Digital Inputs	Value
Reserve Manifold Low Pressure	Closed
Digital Outputs	Value
Plant Fault	Open
Plant Emergency	Open
Reserve Fault	Closed
Pressure Fault	Open
2nd Plant Fault	Open
2nd Plant Emergency	Open
2nd Reserve Fault	Closed
2nd Pressure Fault	Open
Special Protections	
No Valid Pressure Control	OK
Plant Emergency	Warning
Pressure Fault	Warning
Plant Fault	Warning
Reserve Fault	OK
Expansion Module Communication	OK
Normal	OK
Dryer Dewpoint Protection	Warning
Backup unit in operation	Warning
Medical Pressure Too High	OK
Medical Pressure Too Low	Warning

Page displayed at 16:08:15 21/05/2014 v2.2.0.1

Figure 8-49; Web server – Web interface

Navigation and options

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

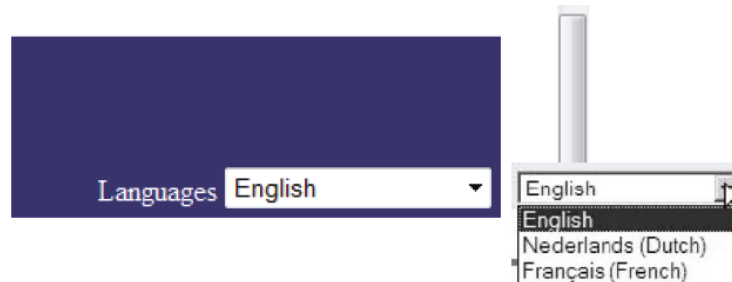


Figure 8-50; Web server – Language selection

- 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.
- Es: shows the ESi status (if a license is provided).
- Preferences: allows to change temperature and pressure unit.



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).

<input checked="" type="checkbox"/> Analog Inputs	<input checked="" type="checkbox"/> Counters
<input checked="" type="checkbox"/> Special Protections	

Analog Inputs	Value
Dryer Inlet	2.6 bar
Medical Pressure	2.5 bar
Atmospheric Dewpoint	-42.7 °C

Figure 8-52; Web server – Analog inputs

Counters

Counters give an overview of all actual counters from controller and compressor.

Counters

Counters	Value
Module Hours	9 hrs
Running Hours	0 hrs

Figure 8-53; Web server – Counters

Info status

Machine status is always shown on the web interface.

Info	
Machine Status	Local Operation ECO

Figure 8-54; Web server – Info status

Digital inputs

Gives an overview of all Digital inputs and status.

Digital Inputs

Digital Inputs	Value
Reserve Manifold Low Pressure	Closed

Figure 8-55; Web server – Digital inputs

Digital outputs

Shows a list of all digital outputs and their status.

Digital Outputs

Digital Outputs	Value
Plant Fault	Open
Plant Emergency	Open
Reserve Fault	Closed
Pressure Fault	Open
2nd Plant Fault	Open
2nd Plant Emergency	Open
2nd Reserve Fault	Closed
2nd Pressure Fault	Open

Figure 8-56; Web server – Digital outputs

Special protections

Give an overview of all special protections of the compressor.

Special Protections	
No Valid Pressure Control	OK
Plant Emergency	Warning
Pressure Fault	Warning
Plant Fault	Warning
Reserve Fault	OK
Expansion Module Communication	OK
Normal	Warning
Dryer Dewpoint Protection	Warning
Backup unit in operation	Warning
Medical Pressure Too High	OK
Medical Pressure Too Low	Warning

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.

<input checked="" type="checkbox"/> Service Plan	Service Plan	Level	Running Hours
	Running Hours	A	3971
	Running Hours	B	3971
	Running Hours	C	7971
	Running Hours	D	23971

81529D

Figure 8-58; Web server – Service plan

9 Maintenance

9.1 Introduction

BeaconMedaes Floor Mounted 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.

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 filters drain flasks for liquid build-up.
2. Exhaust the drain flasks of liquid build-up.

9.3.5 Six-monthly

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

9.3.6 Annually

1. Change bacterial filter elements.
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

Actions	Inspection, Checks and Tests:						
	Suitability of location		◆				
	Adequate access for maintenance		◆				
	Adequate room ventilation		◆				
	Ambient temperature			◆			
	Planned Preventative Maintenance:				◆		
	Complete Commissioning Procedure						◆
Commissioning		◆	◆	◆	◆		◆
Daily							
Weekly							
Quarterly			◆		◆		
Annually			◆			◆	◆
5 Yearly				◆			◆

9.4 Servicing the bacterial filters

9.4.1 Sterilise the Drain Trap

Refer to Figure 9-1.

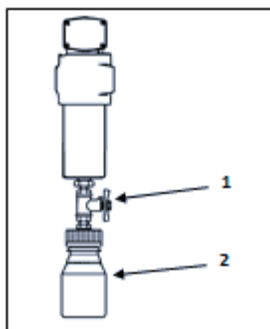


Figure 9-1; Servicing the bacterial filters – drain tap

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 sterilizes 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.

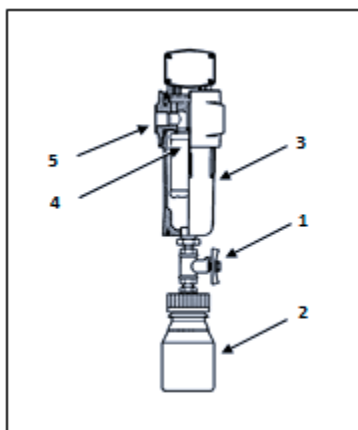


Figure 9-2; Servicing the bacterial filters – filter element renewal

1. Open the isolation valves on the Standby filter line and allow pressure to equalize.
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 vapor 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 vapor.

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).

9.5 Wiring diagrams

9827 8487 00 – ES-PVM
9827 8488 00 – Pump DOL

10 Recommended Spares

For all Service Spares enquiries, contact the BeaconMedaes Spares Department, giving as much of the following information as possible:

Product Part Number:

Lot / Batch Number:

Approximate date of purchase:

Spares Department:

T: 44 (0) 1246 474242

11 Reporting Serious Incidents

In accordance with Regulation (EU) 2017/745 (MDR), a notice to the user and/or patient that any serious incident that has occurred in relation to the device should be reported to the manufacturer and the competent authority of the Member State in which the user and/or patient is established.

A serious incident is defined as any incident that directly or indirectly led, might have led, or might lead to:

- the death of a patient, user, or other person,
- the temporary or permanent serious deterioration of a patient's, users, or other person's state of health,
- a serious public health threat.

These events may occur during device use, due to device failure, malfunction, labeling error, or IFU omission.

User Responsibilities

The user or healthcare professional should report any suspected serious incident without delay. (Immediately, but no later than 2 calendar days after the manufacturer becomes aware of the threat.)

If a serious incident is suspected, users must:

- Immediately discontinue use of the device, if safe to do so
- Retain the device (if possible) for investigation
- Notify the manufacturer without delay using the contact information below
- Report the event to the local competent authority of their country as required

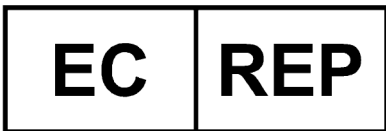
Contact Information for Reporting Serious Incidents

- **Manufacturer:** www.beaconmedaes.com
- **Support Email:** BMCS@beaconmedaes.com
- **Phone:** 01246 474242
- **Authorized Representative (EU):** Atlas Copco Airpower n.v. Boomsesteenweg 957 2610 Wilrijk-Belgium
- **Competent Authority:** https://health.ec.europa.eu/md_authorities

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12 Online access:

IFUs are available in digital format on the BeaconMedaes BeaconMedaes official website [HTM/ISO products \(beaconmedaes.com\)](http://HTM/ISO_products(beaconmedaes.com)), where the latest versions can be accessed and downloaded. For previous versions, end users may contact us via the "Request Information" section on the website.



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