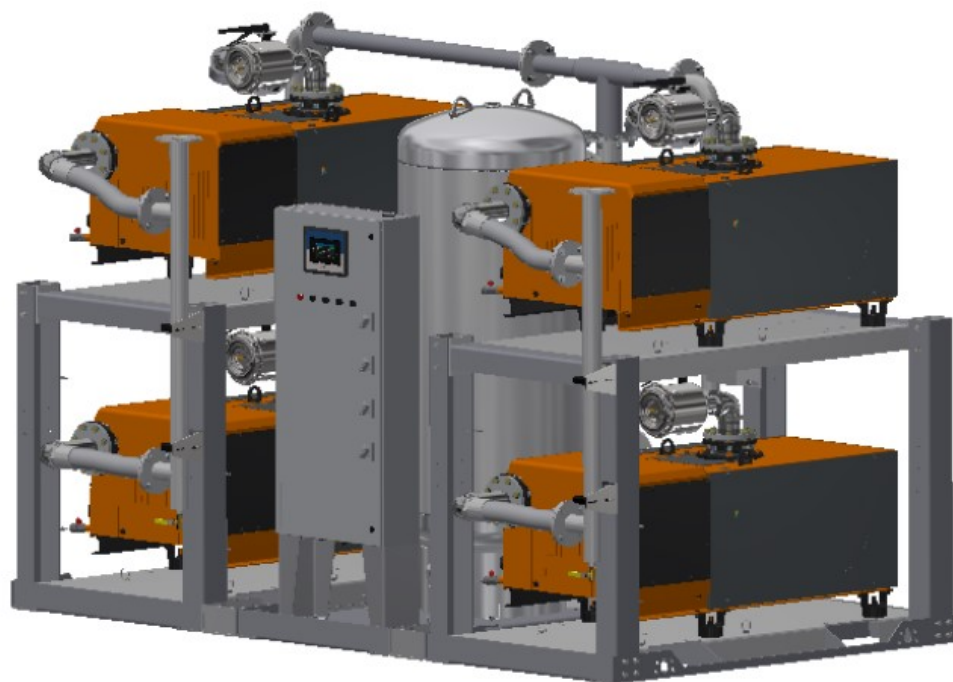


Installation, Operation and Maintenance Instructions



Lubricated Rotary Vane Medical Vacuum System

Part number 4109 9902 34

Revision 02

October 16, 2023



BEACONMEDÆS®



Installation, Operation and Maintenance Manual

7.5 - 25 Hp Medical Lubricated Rotary Vane Vacuum System

(Not intended for use on dedicated WAGD applications as per NFPA 99 - 2005 edition)

This unit is purchased from: _____

Date purchased: _____

Model number: _____

Serial number: _____

Option(s) included: _____

Any information, service or spare parts requests should include the machine serial number and be directed to:

BeaconMedæS

No.45 Ximei Road, Xinwu District, Wuxi City, Jiangsu Province 214111, China

Atlas Copco (Wuxi) Compressor Co., Ltd

Telephone: 400-616-9018

BeaconMedæS reserves the right to make changes and improvements to update products sold previously without notice or obligation.

Part number 4109 9902 34

October 16, 2023

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Safety Precautions

The operator should carefully read the entire contents of this manual before installing, wiring, starting, operating, adjusting and maintaining the system.

The operator is expected to use common-sense safety precautions, good workmanship practices and follow any related local safety precautions.

In addition:

- **Before starting any installation or maintenance procedures, disconnect all power to the package.**
- All electrical procedures must be in compliance with all national, state, and local codes and requirements.
- A certified electrician should connect all wiring.
- Refer to the electrical wiring diagram provided with the unit before starting any installation or maintenance work.
- Release all vacuum from the affected components before removing, loosening, or servicing any covers, guards, fittings, connections, or other devices.
- Notify appropriate hospital personnel if repairs or maintenance will affect available vacuum levels.
- Prior to using the LifeLine® Lubricated Rotary Vane Medical Vacuum System, the medical facility must have a Certifier perform all installation tests as specified in NFPA 99. The medical facility is also responsible for ensuring that the medical vacuum meets the minimum requirements for medical vacuum as specified in NFPA 99.
- This is a high speed, rotating piece of machinery. Do not attempt to service any part while machine is in operation.
- To prevent automatic starting, disconnect all electrical power before performing any maintenance functions.
- Do not operate unit without guards, shields or screens in place.
- Make sure that all loose articles, packing material, and tools are clear of the package.

- Check all safety devices periodically for proper operation.
- Electrical service must be the same as specified on the control panel nameplate or damage to the equipment may occur.
- Vibration during shipment can loosen electrical terminals, fuse inserts, and mechanical connections. Tighten all electrical connections prior to energizing the control panel.

1.0 Electromagnetic Immunity

Note: This section applicable to Lubricated Rotary Vane Medical Vacuum Systems with the TotalAlert Embedded electronic control system.

EN 61000-6-2

Medical Electrical Equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in this manual.

Portable and mobile RF communications equipment can affect Medical Electrical Equipment.

The use of accessories, transducers, and cables other than those specified by the manufacturer, may result in decreased immunity of the TotalAlert Embedded control system.

The TotalAlert Embedded control system should not be used adjacent to other equipment. If adjacent use is necessary, the TotalAlert Embedded control system should be observed to verify normal operation in the configuration in which it will be used.

1.0 Electromagnetic Immunity

EN 61000-6-2 (Cont.)

Guidance and manufacturer's declaration - electromagnetic immunity			
The TotalAlert Embedded control system is intended for use in the electromagnetic environment specified below. The customer or the user of the TotalAlert Embedded control system should assure that it is used in such an environment.			
Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Electrostatic Discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete, metal or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/ output lines	±2 kV for power supply lines ±1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment
Voltage dips, short Interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5 % U_T (>95 % dip in U_T) for 0,5 cycle <40 % U_T (>60 % dip in U_T) for 5 cycles <70 % U_T (>30 % dip in U_T) for 25 cycles <5 % U_T (>95 % dip in U_T) for 5 sec	<5 % U_T (>95 % dip in U_T) for 0,5 cycle <40 % U_T (>60 % dip in U_T) for 5 cycles <70 % U_T (>30 % dip in U_T) for 25 cycles <5 % U_T (>95 % dip in U_T) for 5 sec	Mains power quality should be that of a typical commercial or hospital environment. If the user of the TotalAlert Embedded control system requires continued operation during powermains interruptions, it is recommended that the system be installed on an emergency power service.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE: U_T is the a.c. mains voltage prior to application of the test level.			

1.0 Electromagnetic Immunity

EN 61000-6-2 (Cont.)

Guidance and manufacturer's declaration - electromagnetic immunity			
The TotalAlert Embedded control system is intended for use in the electromagnetic environment specified below. The customer or the user of the TotalAlert Embedded control system should assure that it is used in such an environment.			
Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the TotalAlert Embedded control system, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = 1,2\sqrt{P}$ $d = 1,2\sqrt{P} \quad 80 \text{ MHz to } 800 \text{ MHz}$ $d = 2,3\sqrt{P} \quad 800 \text{ MHz to } 2,5 \text{ GHz}$ where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,^a should be less than the compliance level in each frequency range.^b Interference may occur in the vicinity of equipment marked with the following symbol: 
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2,5 GHz	3 V/m	
NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies. NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			
^a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the TotalAlert Embedded control system is used exceeds the applicable RF compliance level above, the TotalAlert Embedded control system should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the TotalAlert Embedded control system. ^b Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.			

2.0 Installation

2.1 Inspection Upon Receiving

The condition of the **LifeLine®** Lubricated Rotary Vane Medical Vacuum System should be carefully inspected upon delivery. Any indication of damage by the carrier should be noted on the delivery receipt, especially if the system will not be immediately uncrated and installed. **BeaconMedaes** ships all systems F.O.B. factory; therefore, damage is the responsibility of the carrier, and all claims must be made with them. Lubricated Vane systems may remain in their shipping containers until ready for installation. If **LifeLine®** Lubricated Vane systems are to be stored prior to installation, they must be protected from the elements to prevent rust and deterioration.

DO NOT REMOVE the protective covers from the inlet and discharge connection ports of the unit until they are ready for connecting to the hospital's pipeline distribution system.

2.2 Handling

WARNING:
USE APPROPRIATE LOAD RATED LIFTING EQUIPMENT AND OBSERVE SAFE LIFTING PROCEDURES DURING ALL MOVES.

The vacuum package can be moved with either a forklift or dollies. Keep all packing in place during installation to minimize damage. Walk along the route the unit must travel and note dimensions of doorways and low ceilings. Most **LifeLine®** Lubricated Vane systems are designed to go through 36" doorways (15 Hp through 25 Hp systems have bases that measure 43").

Most Single Point Connection systems can be separated to fit through 36" doorways (15 Hp through 25 Hp skid bases measure 43"). If separating bases, carefully label all removed

electrical connections for easier re-assembly at the final destination.

Modular systems are shipped as separate units to facilitate a variety of installations. Most modular and tank mount units are designed to fit through a standard 36" doorway, though some receiver modules may need to be tipped slightly (15 Hp through 25 Hp skid bases measure 43"). Some interconnecting piping and wiring between modules may be necessary on modular systems only.

Refer to the diagrams supplied with your system for dimensional, wiring and installation information.

Place units to ensure high visibility of indicators and gauges and for performing maintenance on the system. Refer to your installation diagram. If you do not have one, please contact **BeaconMedaes Technical Support** at 400-616-9018.

2.3 Location

The **LifeLine®** Lubricated Rotary Vane Medical Vacuum system should be installed indoors in a clean, well-ventilated environment. Areas of excessive dust, dirt or other air-borne particulate should be avoided.

Certain considerations should be given to the placement of the system. The package may be installed in a location that is flat, level, and will support its weight. Clearance between the unit and adjacent walls should be no less than 24" to ensure sufficient airflow for cooling. There should be a minimum of three feet of clearance in front of the control panel for safe operation and maintenance. A vertical distance of 24" is required above the modules for ventilation and maintenance.

2.0 Installation

No special foundation is required. However, all units must be securely bolted using all mounting holes provided. If a raised concrete pad is used, the module bases must not overhang the concrete base. A method to drain away moisture is necessary.

Adequate ventilation is required. The pumps are air-cooled. Therefore, it is very important that the ambient temperature should be between 40°F and 105°F (if the maximum ambient exceeds 105°F, contact factory for special instructions). The system should be located as close as possible to the point of usage to prevent excessive loss of operating vacuum due to pressure drop.

When selecting the location for the system, remember to keep in mind the requirements for service, such as cleaning, changing filters, and changing oil.

2.4 Locations Above Sea Level

All vacuum pumps above sea level have reduced flow and should be de-rated. After determining the correct flow needed for the medical vacuum system, multiply this number by the adjustment factor located in Table 2.1. After determining the new flow required, use this number to size the medical vacuum system.

Table 2.1 Altitude Adjustment Factor

Altitude (ft)	Normal Barometric Pressure (inches HG)	Multiplier Used for Required SCFM
0	29.92	1.00
500	29.39	1.02
1,000	28.86	1.04
1,500	28.33	1.06
2,000	27.82	1.08
2,500	27.32	1.10
3,000	26.82	1.12
3,500	26.33	1.14

4,000	25.84	1.16
5,000	24.90	1.20
6,000	23.98	1.25
7,000	23.09	1.30
8,000	22.23	1.35
9,000	21.39	1.40
10,000	20.58	1.45

2.5 Electrical Requirements

WARNING:

USE APPROPRIATE LOAD RATED LIFTING EQUIPMENT AND OBSERVE SAFE LIFTING PROCEDURES DURING ALL MOVES.

Refer to the electrical diagram provided with the unit before starting any installation or maintenance work.

Do not operate vacuum pump on a voltage other than the voltage specified on the control panel nameplate.

All customer wiring should be in compliance with the National Electrical Code and any other applicable state or local codes.

Refer to the wiring diagram(s) that came with the vacuum pump system for pertinent wiring connections.

Electrical power for the medical system must be supplied from the emergency life support circuit.

Check the control voltage, phase, and amp ratings before starting the electrical installation, and make sure the voltage supplied by the hospital is the same. The wire size should be able to handle peak motor amp load of all operating units. Refer to the vacuum pump system full load amperes on the wiring diagram.

2.0 Installation

Check all electrical connections within the vacuum system that may have loosened during shipment.

Qualified electricians only should make power connections to the control panel and any interconnecting wiring. The control panel has openings for electrical and alarm/data connections. **Do not drill additional holes in the control panel as this may void the system warranty.** See Figure 2.1 for opening locations.

2.6 Intake Piping

Before connecting any piping, the plastic thread protector installed in the connection port must be removed. We recommend that the main vacuum line to the receiver should not be reduced below that provided on the receiver. Long piping runs may need to be increased in size to minimize pressure drop. Improper line sizing may result in a loss of capacity. Ideally, piping should be constructed using long radius elbows and a minimum number of turns.

All secondary lines should be taken from the top or side of the main line to prevent any accumulated moisture from draining towards the pumps. All lines should slope away from the pumps. Any low points in the piping should be equipped with pipe drains to remove accumulated moisture.

All intake vacuum lines must be piped in accordance with NFPA 99. All pipe must be either seamless copper tubing or other corrosion-resistant metallic tubing, as detailed in NFPA 99.

2.7 Exhaust Piping

The exhaust line must be piped outside of the building in accordance with NFPA 99. To ensure that no restriction of airflow will occur, size the piping according to Table 2.2. All pipe must be either seamless copper tubing or other corrosion-resistant metallic tubing as detailed in NFPA 99. A flexible connector must be installed on each exhaust port of the vacuum pump before connecting to the main exhaust line leading outdoors. Additionally, a drip leg must be installed at each exhaust port connection to allow for the draining of any accumulated moisture (Refer to the installation schematics for more details). The outside pipe must be turned down and screened to prevent contamination.

2.0 Installation

WARNING:

THE VACUUM EXHAUST VENT MUST BE LOCATED AWAY FROM MEDICAL AIR INTAKES, DOORS, AND OPENINGS IN THE BUILDINGS TO MINIMIZE POSSIBLE CONTAMINATION TO THE FACILITY, IN ACCORDANCE WITH NFPA 99.

Table 2.2 Exhaust Pipe Length

	LifeLine Units	Pump Connection	System Exhaust Pipe Length (ft) - See Notes											
			25	50	75	100	150	200	250	300	350	400	450	500
DUPLEX	7.5 Hp	2	3	3	3	3	3	3	3	3	3	3	4	4
	15 Hp	3	3	3	4	4	4	4	4	4	4	4	4	5
	18 Hp	3	4	4	4	4	4	4	4	5	5	5	5	5
	25 Hp	3	4	4	4	4	4	5	5	5	5	5	5	5
TRIPLEX	7.5 Hp	2	3	3	3	3	3	4	4	4	4	4	4	4
	15 Hp	3	5	5	5	5	5	5	5	5	6	6	6	6
	18 Hp	3	6	6	6	6	6	6	6	6	6	6	6	6
	25 Hp	3	6	6	6	6	6	6	6	6	8	8	8	8
QUADRUPLE	7.5 Hp	2	3	3	3	3	4	4	4	4	4	4	5	5
	15 Hp	3	5	5	5	5	5	5	5	5	6	6	6	6
	20 Hp	3	6	6	6	6	6	6	6	6	6	6	6	6
	25 Hp	3	6	6	6	6	6	6	6	6	8	8	8	8

Notes:

1. All pipe sizes are based on the following: copper pipe (Type L), 14.7 psia.
2. The minimum pipe size must be maintained for the total length of the exhaust pipe. Use next larger size pipe in the event the minimum size is not available.
3. When determining the total pipe length, add all the straight lengths of pipe together in addition to the number of elbows times the effective pipe length for that pipe size. (See the following table and example.)

2.0 Installation

Table 2.3 Pipe Length for 90° Elbow

Effective Pipe Length Equivalent to each 90 degree Elbow										
Pipe Size (in.)	1.25	1.50	2.00	2.50	3.00	3.50	4.00	5.00	6.00	8.00
Eff. Pipe Length (ft)	3.4	4.0	4.9	6.4	7.9	9.4	10.0	11.9	13.2	14.5

Example:

Select the pipe size for a Triplex 7.5 HP with 130 feet of straight pipe and six elbows:

- Select the pipe size of 3" diameter for 130 feet of straight pipe.
- Determine the eff. pipe length for an elbow of 3" dia. (EPL= 7.9 ft / elbow).
- Calculate the SYSTEM PIPE LENGTH {SPL (3.0" D) = 130 + (6 x 7.9) = 177.4 ft}
- Check this SYSTEM PIPE LENGTH to see if it exceeds the minimum pipe size. In this case it does, select the next larger pipe size from the table (D = 4").
- To double-check the pipe size, recalculate the SPL with the new diameter. SPL (D = 4") = 130 + (6 x 10.0) = 190 ft. This is in the allowable range.

3.0 Start Up – Total Alert Embedded Controls

Note: This section applicable to Lubricated Rotary Vane Medical Vacuum Systems with the TotalAlert Embedded electronic control system.

3.1 Prestart-up

The contractor should notify **BeaconMedæx** two weeks prior to start-up date to schedule an appointment for an authorized technician to review the installation prior to start-up.

CAUTION: Failure to install the unit properly and have an authorized technician from **BeaconMedæx** start-up the system can void the manufacturer's warranties.

WARNING:

Prior to putting the LifeLine® Lubricated Rotary Vane Medical Vacuum system into use, the medical facility must have a Certifier perform all installation tests as specified in NFPA 99/ GB 50751-2012. The medical facility is also responsible for ensuring that the Medical Vacuum meets the minimum requirements for Medical Vacuum as specified in NFPA 99/ GB 50751-2012.

Prestart-up and start-up procedures should be performed for a new installation or when major maintenance has been performed.

WARNING:

Have more than one person on hand during prestart-up and start-up procedures to ensure safety and to facilitate certain checks.

The main power source to the control panel should be OFF for the duration of the visual inspection.

Ensure that the equipment is installed on a solid level surface. Walk around the system to ensure that there is enough clearance on all sides to perform operational checks/actions and

maintenance. The temperature of the area containing the modules should be approximately 70°F (21.1°C) with a minimum ambient temperature of 40°F (4.4°C) and a maximum ambient temperature of 105°F (40°C).

- Check the intake piping for proper size and connection to the vacuum modules.
- Check all piping system joints that might have come loose during shipment and installation to ensure they are tight.
- Check the air receiver, controls, and pumps for damage.
- Check the drain valve on the air receiver.
- Check all valves for full open and full close travel. Ensure that the system's valves are positioned for proper operation. (Refer to labeling on valve handles)
- Remove all packing material from the unit.
- Check the electrical connections to the control cabinet.
- Verify electrical service. Before starting the system, check to see that voltage, amperage, and wire size are appropriate.

CAUTION: Electrical service must be as specified or damage to equipment may occur.

WARNING:

To prevent electrical shock, ensure that ALL electrical power to the system is OFF, including the disconnect switches and Automatic-Off-Manual touch screens on the control panel. The facility's supply circuit breaker should also be locked out.

- Open the electrical cabinet by loosening the fasteners on the front.

CAUTION: Vibration during shipment and installation can loosen electrical terminals, fuse inserts, and mechanical connections. Tighten as necessary.

3.0 Start Up

- Check the electrical cabinet for any broken components.
- Check that all motor starter connections are tight and that there are no loose objects such as terminal lugs, screws, nuts, etc., in the cabinet.

3.2 Initial Start-up

CAUTION: Complete the prestart-up procedure before continuing with the initial start-up procedure

WARNING:

To prevent electrical shock, ensure that ALL electrical power to the system is OFF, including the disconnect switches. The facility's supply circuit breaker should also be locked out.

3.2.1 Lubrication

The pumps are oil lubricated. The lubricating oil can be put into the pump at the oil filler port of the oil separator housing, observing the "MAX" and "MIN" position at the oil level sight glass. (For recommended oil type, refer to Section 6.1.) After filling, make sure the oil filler port is closed.

3.2.2 Pump Rotation

Check all voltages supplied to the **Lifeline®** system to ensure they are the required value and phases needed by the control panel.

Apply power to the system and turn the disconnect switches to "On".

Prior to actual operation, the pumps must be checked for correct rotation.

Inside the control cabinet, switch one of the unit printed circuit boards from the manual override "Off" position to the bottom position, the default

"Automatic" mode. Make sure the Pump Mode on the Unit touchscreens are in the Off position.

Check for correct direction of rotation of each pump by pressing the "Rotation" button on touchscreen display (found in the Service section of the Unit touchscreens) and observing rotation. The Pump Mode for each compressor must be in the Off Position for the Rotation to function.

3.3 Initial Operation

Start each pump by pressing "Automatic" on the touchscreen.

WARNING:

Pumps that have reached operating temperature may have a high surface temperature on the top of the exhaust muffler.

DO NOT TOUCH!

Run the pump for two minutes in the correct rotation. Stop the pump and top off the oil level utilizing the oil filler port to the correct level as shown in the sight glass. **DO NOT OPEN THE FILLER PORT WHILE THE PUMP IS RUNNING.**

After testing each pump, if everything appears normal, put each pump into the "Automatic" mode and allow each pump to run until vacuum builds. Check for any leaks in the piping. Repair leaks, if needed

4.0 MK5s

Elektronikon™ MK5s Touch controller



Introduction

The Elektronikon™ controller has following functions

- Controlling the compressor
- Protecting the compressor
- Monitoring components subject to service
- Automatic restart after voltage failure (ARAVF)

Automatic control of the compressor

The controller maintains the net pressure between programmable limits by automatically loading and unloading the compressor (fixed speed compressors) or by adapting the motor speed (compressors with frequency converter). A number of programmable settings, e.g. the unloading and loading pressures (for fixed speed compressors), the setpoint (for compressors with frequency converter), the minimum stop time and the maximum number of motor starts and several other parameters are taken into account.

The controller stops the compressor whenever possible to reduce the power consumption and restarts it automatically when the net pressure decreases. If the expected unloading period is too short, the compressor is kept running to prevent too short standstill periods.

Warning

If one of the measurements exceeds the programmed shutdown warning level, a message

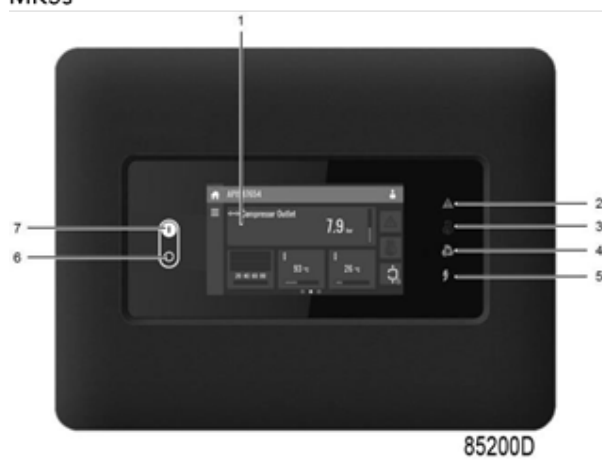
will appear on the display and the general alarm LED will light up to warn the operator before the shutdown level is reached.

Service Warning

A number of service operations are grouped (called Service Plans). Each Service Plan has a programmed time interval. If the service timer exceeds a programmed value, this will be indicated on the display to warn the operator to carry out the service actions belonging to that Service Plan.

4.1 Control Panel

MK5s



MK5s Parts and functions

Reference	Designation	Function
1	Touchscreen	Shows the compressor operating condition and a number of icons to navigate through the menu. The screen can be operated by touch.
2	Warning sign	Flashes in case of a shutdown, is lit in case of a warning condition.
3	Service sign	Is lit when service is needed.
4	Operation sign	Is lit when the compressor is running in automatic operation.
5	Voltage sign	Indicates that the voltage is switched on.
6	Stop button	This button stops the compressor.
7	Start button	This button starts the compressor. The operation sign (4) lights up. The controller is operative.

4.0 MK5s

4.2 Menu

Menu icons

Menu	Icon	Menu	Icon	Menu	Icon
Data	 85233D	Status	 85238D		
		Inputs	 85240D		
		Outputs	 85241D		
		Counters	 85242D		
Service	 85234D	Service		Overview	 85252D
				Service Plan	 85253D
				Service History	 85254D
		Service functions	 85244D		
		Clean Screen			
Week Timer	 85235D			Week	
				Remaining Running Time	
Event History	 85236D	Saved Data	 85245D		

Menu	Icon	Menu	Icon	Menu	Icon
Machine Settings	 85237D	Alarms	 85239D		
		Regulation	 85240D		
		Control Parameters	 85241D		
		Aux. Equipment Parameters	 85242D	Internal SmartBox	 85256D
Controller Settings	 85238D	Network Settings	 85246D	Ethernet Settings	 85257D
				CAN Settings	 85258D
		Localisation	 85247D	Language	 85259D
				Date/Time	 85260D
				Units	 85261D
		User Password	 85248D		
		Help	 85249D		
		Information	 85250D		

4.0 MK5s

Status icons

Icon	Description
 85262D	Motor Stopped
 85263D	Motor Stopped Wait
 85264D	Running Unloaded
 85266D	Manual Unload
 85267D	Runing Unloaded Wait
 85268D	Running Loaded
 85269D	Failed to Load
 85270D	Running Loaded Wait
 85271D	Manual Stop
 85272D	Machine Control Mode, Local
 85273D	Machine Control Mode, Remote
 85274D	Machine Control Mode, LAN
 85275D	Automatic Restart After Voltage Failure

System icons

Icon	Description
 85276D	Basic User
 85277D	Advanced User
 85278D	Atlas Copco Service
 85279D	Antenna 25%
 85280D	Antenna 50%
 85281D	Antenna 75%
 85282D	Antenna 100%
 85283D	Change between screens (indication)
 85286D	Element
 85288D	Menu
 85290D	Reset

Input icons

Icon	Description
 85296D	Pressure
 85297D	Temperature
 85298D	Special Protection
 85299D	Open
 85300D	Closed



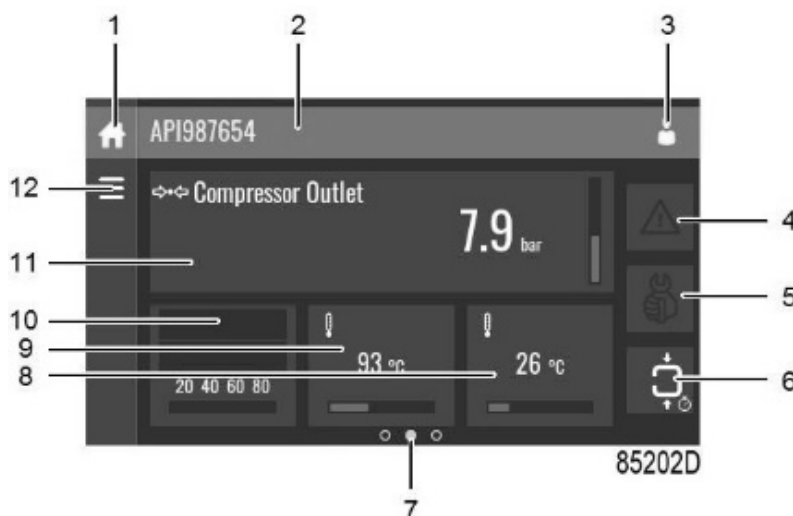
This chapter gives a general survey of available icons. Not all icons mentioned in this chapter are applicable to every machine.

4.0 MK5s

4.3 Main Screen

Function

The Main screen is the screen that is shown automatically when the voltage is switched on. It is switched off automatically after a few minutes when there is no touch input.

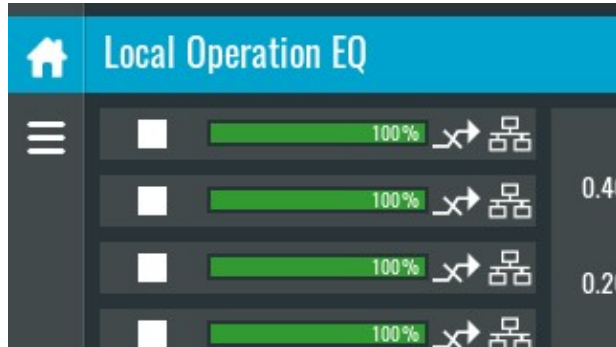


Description

Reference	Designation	Function
1	Home button	The home button is always shown and can be tapped to return to the main screen.
2	Screen information	On the main screen, the screen information bar shows the serial number of the machine. When scrolling through menus, the name of the current menu is shown.
3	Access level button	The access level button is always shown and can be tapped to change the current user access level.
4	Alarm button	The alarm button can be tapped to show the current alarms. If an alarm occurs, the icon on the button will be red.
5	Service button	The service button can be tapped to show the service information.
6	Compressor status	This icon shows the current compressor status.
7	Page indicator	Indicates which page you currently see. The middle indication is the main screen, left is the menu screen and at the right the quick access screen. Swipe left or right to go to another screen.
8, 9, 10, 11	These fields can contain a history chart, an input or a counter value, depending on the type of the machine.	Tap the field to view the type of measurement. This will be shown in the screen information bar. Examples of inputs: - Ambient temp - Compressor outlet - Dryer dewpoint Examples of counters: - Running hours - Load relay - Loaded hours
12	Menu button	The menu button is always shown and can be tapped to go to the menu.

4.0 MK5s

Description



85204D

Reference	Designation	Description
(1)	Data menu	The data menu contains the Compressor status, information about the Inputs, Outputs and Counters. The Auxiliary equipment can also be viewed through this menu.
(2)	Service menu	The service menu contains the Service information. The 'Clean screen' function can be used to clean the touchscreen.
(3)	Week timer menu	Multiple Week timers and a Remaining running time can be set through this menu.
(4)	Event history menu	In case of an alarm, the compressor Status information is saved and can be viewed through this menu.
(5)	Machine settings menu	Alarms settings, Regulation settings and Control parameters can be changed through this menu. Auxiliary equipment parameters can also be changed.

(6)	Controller settings menu	Network settings, Localisation settings and a User password can be set through this menu. There is also a Help page available and the Controller information can be shown.
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Data menu

Function

This screen is used to display the following submenus:

- Status
- Inputs
- Outputs
- Counters
- Aux.Equipment

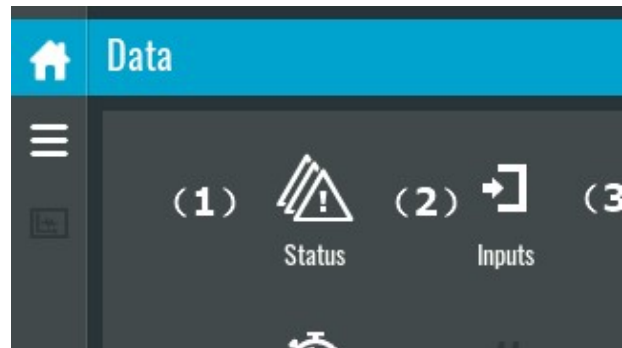
These submenus can be entered by tapping the icons.

Procedure

To enter the Data menu screen:

- Tap the Menu button
- Tap the Data icon

Description

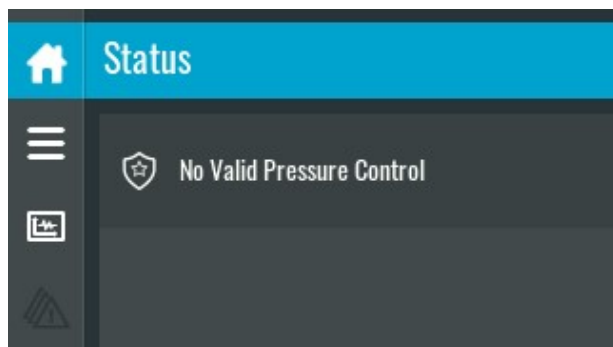


Reference	Designation
(1)	Status menu
(2)	Inputs menu
(3)	Outputs menu
(4)	Counters menu

4.0 MK5s

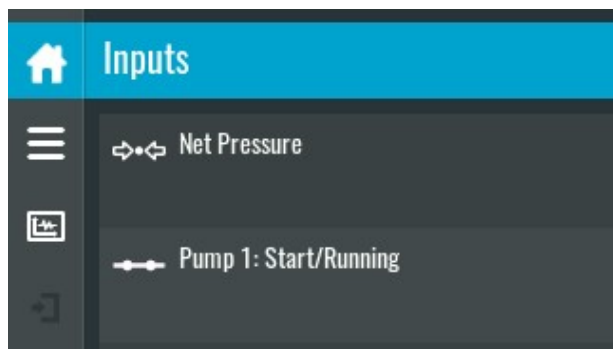
Status menu

Tap the Status icon to enter the status menu. This menu shows the current compressor status.



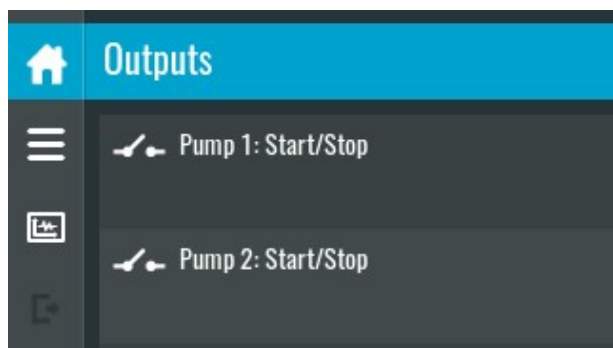
Inputs menu

Tap the Inputs icon to enter the inputs menu. This menu shows information about all the inputs.



Outputs menu

Tap the Outputs icon to enter the outputs menu. This menu shows information about all the outputs.



	Voltage-free outputs may only be used to control or monitor functional systems. They should NOT be used to control, switch or interrupt safety related circuits. Check the maximum allowed load on the label.
	Stop the compressor and switch off the supply before connecting external equipment. Check the Safety precautions.

Counters menu

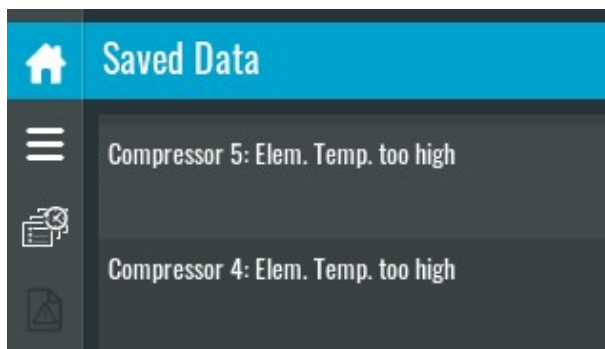
Tap the Counters icon to enter the counters menu.

This menu shows an overview of all actual hours and counters of the compressor and controller.



Saved data

Tap the Saved data icon to enter the saved data menu.:



4.0 MK5s

Machine settings menu

Function

This screen is used to display the following submenus:

- Alarms
- Regulation
- Control Parameters

Only visible if the machine has adaptable parameters.

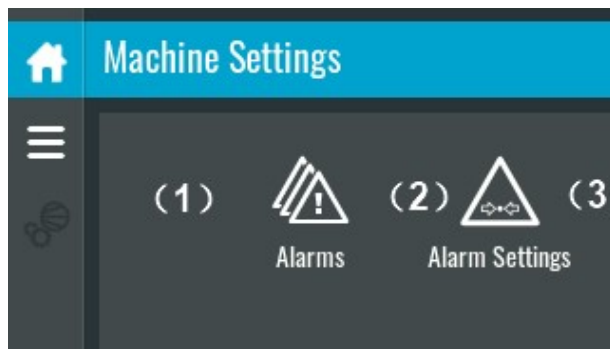
These submenus can be entered by tapping the icons.

Procedure

To enter the Machine settings menu screen:

- Tap the Menu button
- Tap the Machine Settings icon

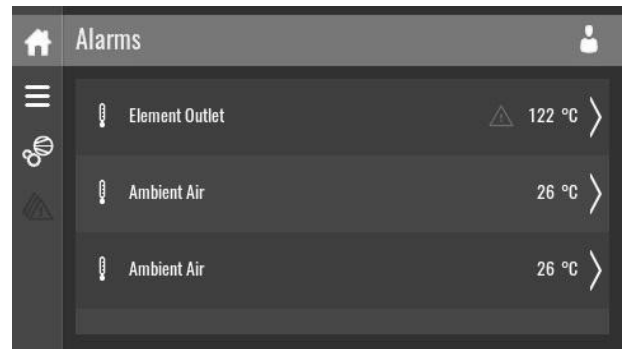
Description



Reference	Designation
(1)	Alarms menu
(2)	Regulation menu
(3)	Control Parameters menu

Alarms menu

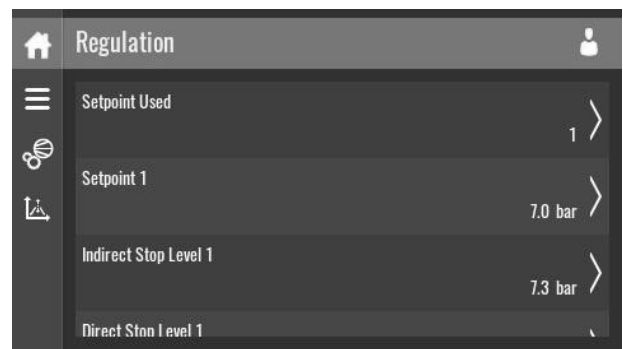
Tap the Alarms icon to enter the alarms menu.



85217D

Regulation menu

Tap the Regulation icon to enter the regulation menu.



85218D

Setpoints or pressure bands can be modified through this menu.

5.0 General Operation - TotalAlert Embedded Controls

Note: This section applicable to Lubricated Rotary Vane Medical Vacuum Systems with the TotalAlert Embedded electronic control system.

WARNING:

NEVER RUN THE PUMP WITHOUT LUBRICATING OIL!

5.1 Electrical Control Panel

The LifeLine multiplex control system has a touch screen control, automatic lead/lag sequencing, external operators with circuit breaker disconnects, full voltage motor starters, overload protection, control circuit, and automatic-off-manual selector for each vacuum pump. Automatic alternation of all vacuum pumps is based on first-on/first-off principle with provisions for simultaneous operation if required. Automatic activation of reserve unit, if required, will activate an audible alarm as well as a visual alarm on the control panel. The control panel displays service alert, run hours for each vacuum pump, system status, system vacuum level, and high discharge air temperature.

During normal operation, all pumps should be in the “Automatic” position so that the control system can effectively run the system. The control system monitors the system vacuum level, starts and stops the pumps depending on changing vacuum level conditions and minimum run time values, and automatically alternates the lead position between units.

On the **initial** system start-up, when the system vacuum level is below the set point of the vacuum transducer, pump 1 will start immediately. Another pump starts after a programmed time delay. The time delay prevents high inrush current after a power failure or emergency power switch over. During this initial system start-up, the lag alarm may come on at this point and is normal. It can be reset once the system reaches its normal

operating vacuum and the lag pump times out and stops.

In a typical **duplex** system, one pump will be able to handle the system load. The control system will signal the lead pump to start when the vacuum transducer senses the vacuum level below its set point. If one pump can carry the load, then the vacuum level will rise and maintain the vacuum level setting. At this point, if the minimum run timer for that pump has been satisfied, the control system will turn off the lead pump. If the minimum run timer for that pump has not been satisfied, the lead pump will continue to run until the timer expires. When the system vacuum drops below the vacuum level setting, the control system will automatically sequence the lead role to the other pump and will start it. This is also known as “first on/first off” instead of the more traditional “last on/first off”.

With the “first on/first off” sequencing technique, starts and stops on the pump are minimized. If the lead pump runs continuously in lead for more than the minimum run time, the control system will automatically sequence the pump attempting to evenly distribute the run time among all available pumps. If during operation, the second pump is required to come on in addition to the lead pump, the control system will turn on the “Lag Alarm”

In a **triplex** or **quadruplex** system, the operation is very similar to the duplex operation described above with the following differences. With a triplex or a quadruplex system, the lag unit running alarm may not necessarily correspond to the third or fourth pump coming on. To determine when the control system turns on the lag alarm, it counts the number of units in the “Automatic” position and makes a decision based on the vacuum transducer signal. A lag alarm occurs when the last available pump (in automatic) starts.

5.0 General Operation - TotalAlert Embedded Controls

5.1.1 Run Timer

All LifeLine lubricated vacuum systems incorporate run timers to minimize the starts and stops on the vacuum pumps. After the pump has stopped, its runtime will be adjusted based on how long the lead pump is off.

5.2 Tank Drains

The standard tank drain consists of a manually operated ball valve.

To drain the liquid from the tank, open the tank bypass valve and close the tank isolation valves. Then open the vent and drain valves. When draining is complete, close the vent and drain valves first, then open the tank isolation valves and close the tank bypass valve.

5.3 Emergency Shutdown / Alarms

The following conditions may arise during operation.

5.3.1 Unit Shutdown / Alarms

Motor Overload Shutdown - This will shut down the pump in question and will not re-start the pump until the reset button on the starter is reset (See “Motor breakers trip” in the Trouble Shooting Section 6). Press the alarm silence button on the main display screen to silence the alarm. After the starter is reset, push the “Reset” button on the Unit Shutdown screen. On the Unit main screen, put the pump into “Automatic” mode to make the pump available for operation.

High Discharge Exhaust Temperature Shutdown

This will shut down the vacuum pump in question and not re-start the pump until the condition is corrected, the “Reset” button is pushed on the Unit Shutdown screen and the “Automatic” button is pressed on the Unit main screen. Before allowing the unit to re-start, the condition should

be checked (see “Pump overheats” in the Trouble Shooting Section 6.0). Even after resetting the alarm and putting the vacuum unit in “Automatic” mode, the unit may not re-start, depending on system sequencing and system pressure.

High Discharge Exhaust Temperature Alarm

This will not shut down the pump in question but instead is a warning that a shutdown is likely to occur. The condition should be checked immediately (see “Pump overheats” in the Trouble Shooting Section 6.0) to avoid a pump shutdown.

Control Circuit Alarm - This will not shut down the pump in question but instead is a notification that there is a loss of communication between printed circuit boards within the control panel.

5.3.2 System Alarms

Lag Unit Running Alarm - This alarm will activate if the last available vacuum pump comes on. Press the alarm silence button on the main display screen to silence the alarm. If a lag condition remains, the “Red” indicating light on the Main screen will remain on. Once the lag condition is corrected, press the reset button to turn off alarm light on display screen.

In the case of a duplex system, it will activate when the second vacuum pump turns on based on the signal from the vacuum transducer. In the case of a multiplex system, the lag alarm will activate when the last available unit is required to come on. For example, in a quadruplex system, if all four pumps are set to “Automatic”, then the lag alarm will trigger when the fourth unit comes on. If on the same system, three (3) of the four pumps are set to “Automatic” and the other to “Off” or “Manual”, then the lag alarm will activate when the third unit comes on. In the event the lag alarm is persistent, check to see if any leaks or valves are open downstream or reduce the system load.

5.0 General Operation - TotalAlert Embedded Controls

Please note that the lag alarm may not be reset if the lag pump is still running. This can happen due to the run timer not having expired, but the lag vacuum level itself may be above the alarm setting.

The Lag Alarm will activate if the vacuum transducer signal circuit is lost or the transducer malfunctions.

Press the alarm silence button on the main display screen to silence the alarm (see Troubleshooting Section 6). The vacuum level reading on the main display will read "ERR" when this alarm occurs. The vacuum system will continue to run off the backup vacuum switch.

6.0 Trouble Shooting

Problem	Possible Causes	Solution
Power failure	Main fuse blown Fuse blown in control circuit	Replace fuse Replace fuse
Unit lacks sufficient vacuum or lag alarm has occurred	System may not be vacuum tight.	Check hose/pipe and connections for possible leaks.
	The oil tank may be low/empty of oil.	Immediately shut off the pump, drain the remaining oil from the tank and replenish with new fresh oil.
	The oil tank has contaminated oil or was filled with the incorrect type of oil.	Make sure the pump has reached its operating temperature before shutting down and replace with fresh new oil. Refer to section 7.2 for the correct oil type.
	Clogged inlet filter Inlet check valve plate assembly may be worn or damaged due to process contamination.	Clean filter. Disassemble valve plate assembly, clean, replace worn or damaged parts and reassemble.
	Leaking oil lines on the pump could introduce an atmospheric pressure bleed spoiling the vacuum.	Check all oil lines for leakage. Replace or tighten as required. Make sure to use the same size and type of line when replacing.
	The exhaust oil filter may be clogged.	Measure the amount of pressure between the exhaust side of the pump cylinder and the exhaust oil separator(s). The separator element(s) must be replaced if this pressure is near 0.7 bar or greater (approximately 10 psig).
	Insufficient pump speed (RPM)	Check voltage and amperage to motor. Inspect motor and coupling halves. Check that the pump shaft turns freely.
	Defective gaskets	Inspect gaskets for breakage or disintegration. Replace if necessary.
Unit lacks sufficient vacuum	Line losses too high	Piping diameter too small- replace with larger diameter. Check for clogged filter elements - replace if necessary.
	Unit is operating at an elevated altitude	Contact the factory for assistance. Performance may be reduced when operating above sea level (see Section 2.4).
	Exhaust valve may not be properly seated or stuck open.	Contact the factory for assistance. Have pump model and serial number available.
	Shaft seal may be leaking.	
	Radial clearance between rotor and cylinder may need adjustment.	
	Internal parts may be damaged or worn.	Contact the factory for assistance. Have pump model and serial number available.
	Transducer fault with lag alarm.	
		Replace Transducer (TAE controls only).

6.0 Trouble Shooting

Problem	Possible Causes	Solution
Motor breakers trip	Defective motor	Test motor and replace if necessary.
	Low motor voltage	Check at motor terminals. Contact electric service provider.
	Ambient temperature too high	Reduce ambient temperature.
	Stuck rotor	Disassemble pump to determine reason. Replace all necessary parts.
	Clogged exhaust oil separator(s) - back pressure too high	Replace separator(s).
Unit runs rough and cannot be rotated manually	Broken rotor vane	Disassemble unit and replace vane. Check cylinder for wear.
	Worn coupling disc	Remove motor and inspect rubber coupling disc and pins. Replace, if necessary, and realign.
	Seized bearings	Remove end shields and inspect cylinder. Replace if necessary. Re-shim bearings to maintain proper clearance.
	Locked rotor	Remove end shields and inspect cylinder. Remove contamination.
Pump overheats	Cooling ducts blocked	Clean cooling ducts.
	Cooling fan broken	Replace fan.
Smoke/Oil Mist (emitted) from exhaust (port)	Pump is overfilled with oil.	Adjust oil level to proper setting as recommended in Section 3.2.
	Exhaust filters not correctly seated or installed	Check filters
	Pump is operated at vacuum levels outside the recommended range on a continuous basis.	Consult factory for assistance.
Runs excessively hot	Pump does not have adequate ventilation for cool operation.	If pump is installed in an enclosure, make sure re-circulation of hot exhaust cooling air is avoided and pump receives enough fresh cooling air. Do not block cooling air entrance to pump. Do not allow the pump to become covered with dirt, dust or process material. This will act as an insulator which may severely damage the pump.
	Pump is operated at vacuum levels outside the recommended range on a continuous basis.	Consult factory for assistance.

6.0 Trouble Shooting

Problem	Possible Causes	Solution
Runs excessively hot	The oil tank may be low/empty of oil, has contaminated oil or was filled with an incorrect type of oil.	If the oil level is found to be low, immediately shut off the pump, drain the remaining oil from the tank and replenish with new fresh oil. If an incorrect oil type or contamination is found, make sure the pump has reached its operating temperature before replacing with new fresh oil. Refer to Section 7.2 for the correct type of oil.
Excessive noise level	The coupling rubbers may be worn.	Call the factory for replacements.
	Worn bearings	Call the factory for replacements.
Pump has seized	Pump may have been operated without enough oil.	Call the factory for assistance. Have pump model and serial number available. NOTE: If liquid is found to have been ingested or if process vapor is condensing inside the pump, protective measures must be taken. Install trap or filter device on inlet of pump to remove the contaminate from the air stream.
	Liquid may have been ingested into pump.	
	Process vapor may have condensed inside pump.	
Pump has seized	Pump may have been operated in the wrong direction for an extended period of time.	Call the factory for assistance. Have pump model and serial number available.
Pump motor draws high amperage or pump starts but labors	Pump is operating in the wrong direction.	Make sure pump is operating in the proper direction. See rotation arrow on the pump.
	Ambient temperature may be too low for the recommended oil.	Multi-weight non-detergent oil may be required. Contact the factory for assistance.
	The exhaust oil filter may be clogged.	This can be checked by measuring the amount of pressure between the exhaust side of the pump cylinder and the exhaust oil separator(s). The separator element(s) must be replaced if this pressure is near 0.7 bar or greater (approximately 10 psig).
	Make sure the pump is not overfilled with oil or that the wrong type of oil has been used.	Adjust oil level to proper setting or replace oil with the correct type. Refer to Section 7.2 for the correct oil type.
	The wiring connection in the electrical circuit may have become loose.	Check all connections and tighten or replace as required.

6.0 Trouble Shooting

Problem	Possible Causes	Solution
Pump motor draws high amperage or pump starts but labors	Make sure the electrical circuit is properly sized to handle load.	Wiring sized too small will create a voltage drop large enough to produce over amperage of motor. Check line voltage for unusually low supply voltage.
	Motor damage may have occurred.	Consult a qualified electrician for further diagnosis.
	A bearing may be worn.	Call the factory for replacement. Please have the pump model and serial number available.
	Process vapor may be condensing inside pump.	Stop pump, change oil and install protective devices on inlet of pump to prevent recurrence.

7.0 Maintenance

7.1 General Maintenance

WARNING:
ISOLATE POWER BEFORE STARTING ANY MAINTENANCE PROCEDURES, TO PREVENT ELECTRICAL SHOCK OR ACCIDENTAL STARTING OF EQUIPMENT

WARNING:
Pumps that have reached normal operating temperature may have a high surface temperature.
Do not perform any maintenance until after a sufficient cool down period

Never perform any maintenance functions while the unit is in operation.

Table 7.1 Maintenance Schedule

Operation	Duty*
Check oil level & condition.(See note below)	24 h
Clean dirt trap at pump inlet	Monthly
Clean anti suck back valve at pump inlet.	Yearly
Change oil, oil filter (if installed) & exhaust filter	
Lubricating oil/Oil filter	4000 h/1 year
Exhaust filter	Oil mist appear/1 year
Clean the pump, the radiator and the motor fan guard	1000 h
Pump overhaul(Please contact BeaconMedaes)	10000 h
Check belt condition (MVS 630A)	Every 2000 h or 6 months

* 4000 running hours or 1 year or whatever comes first.Notes:Running hour is the compressor unit running hours.

7.0 Maintenance

Maintain the pump regularly to achieve the best operating results. Maintenance intervals will depend on the pump's use and ambient conditions. Each pump in the LifeLine system is a lubricated rotary vane vacuum pump.

Do not run pumps without lubricating oil.

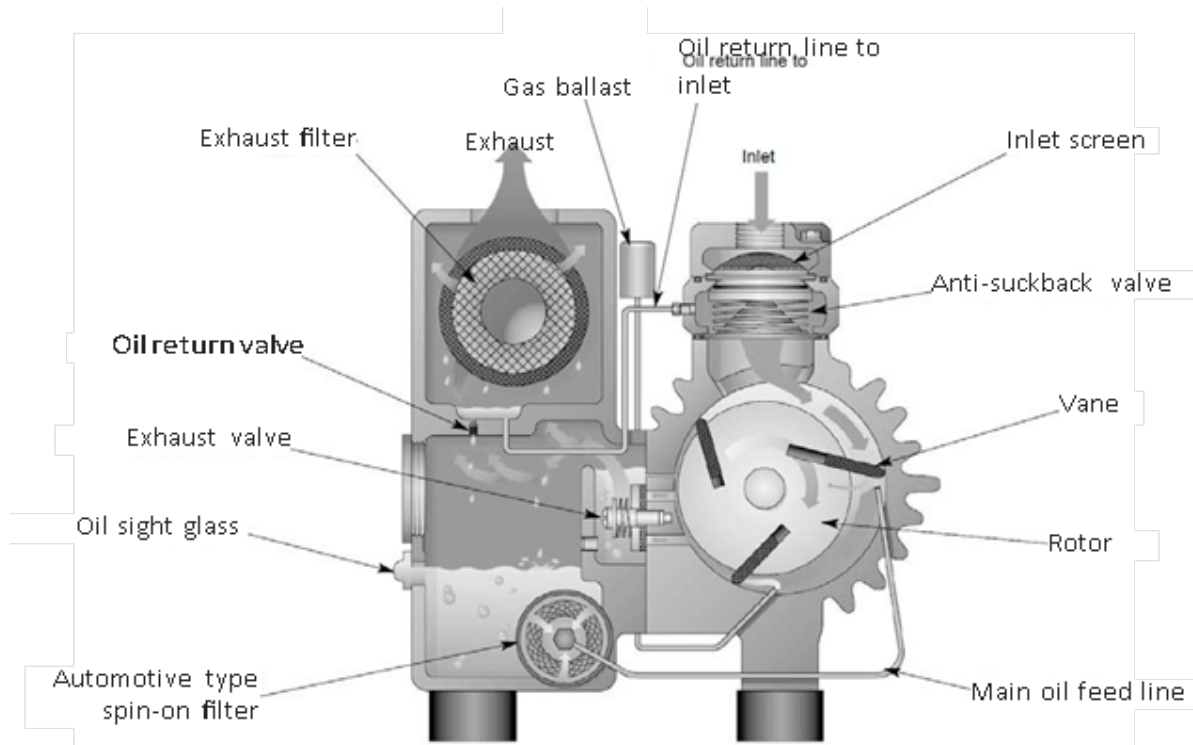


Figure 7.1 Vacuum Pump

7.2 Oil

7.2.1 Oil Type

Non-detergent oil should be used. Do not use detergent motor oil as additives in detergent will plug exhaust filter elements and shorten their life.

It is recommended that BeaconMedaes oil be used to receive the best performance from your vacuum equipment. BeaconMedaes oil is a high quality vacuum oil which will give longer running time between oil changes, will provide better

lubrication at high operating temperatures, and will prolong the life of the exhaust filter elements.

NOTE: It is important to completely drain oil from the pump, if changing brands.

7.0 Maintenance

7.2.2 Oil Level

WARNING:

Do not add oil while the pump is running since hot oil vapor may escape through the oil fill port.

WARNING:

Insufficient oil quantity in the pump has the potential, under certain conditions, to lead to self-ignition of the remaining oil in the pump..

Check the oil level daily by observing the built-in sight glass. Each pump requires the proper oil to operate correctly (see Section 7.2.1 for the correct oil types). The oil should be changed every 2000 hours of operation. The oil will need to be changed more frequently when operating at ambient temperatures above 105°F.

Oil level readings should be done only when the pump is turned off. Oil can be added to the oil fill port if the pump is shut off and the circulating oil has sufficient time to return to the oil sump.

The oil might appear foamy, which is a normal phenomenon with aerated oil.

The technical data in Table 7.2 gives the approximate quantities of oil required for each pump. The oil capacity chart should only be used as a guide, since oil capacity may be slightly lower, depending on whether the pump was filled previously, and whether all components such as oil filter, oil lines, etc. were allowed to completely drain. Use only the sight glass reading for proper level. **Never overfill.**

To change the oil, the pump must be switched off and ventilated to reach atmospheric pressure. Open the oil drain valve and drain the oil. When the oil stops draining, close the drain valve.

Start the pump again for a few seconds. Stop the pump once again, and then reopen the drain valve and discharge any remaining oil. Close the drain valve.

CAUTION: Oil filters and used oil must be disposed of corresponding with the relevant health, safety and environmental laws.

After changing the oil filter (see Section 7.2.3), fill the pump with the recommended vacuum oil through the oil filling port, observing “MAX” and “MIN” position on the oil level sight glass.

7.2.3 Automotive-Type Oil Filter

The pump is equipped with an automotive-type oil filter. (See Figure 7.1 for location.)

Replace the oil filter when changing the oil. After draining the oil, remove the oil filter and replace it with a new one using a BeaconMedæx oil filter. Make sure to tighten the filter securely against the aluminum sealing surface so that leaks will not occur.

7.3 Drip Leg and Filters

7.3.1 Exhaust Drip Leg Valve

Each pump should have a drip leg at the exhaust port on the pump. This valve should be checked daily at first, then depending on the moisture accumulated, could be checked less frequently.

7.3.2 Inlet Filter

Each pump is equipped with an inlet filter. The filter cartridge should be checked on a monthly basis and cleaned as required. The filter cartridge should be changed annually.

7.0 Maintenance

To clean the inlet filter, unsnap the lid clamps and lift off the filter lid. Remove cartridge, being careful not to knock any foreign particles present inside the canister into the pump section. Clean foreign particles from the canister with an air hose, and carefully back flush the filter cartridge with shop air. If the filter cartridge has been subjected to moisture or is extremely dirty, it may need replacement.

7.3.3 Exhaust Filter

Exhaust filters should be checked monthly. A pressure gauge is supplied as part of the oil fill plug. This gauge has a green field and a red field. A pressure within the green field indicates normal pressure. Any pressure in the red field (for a continuous period of time) requires an immediate change of the exhaust filter(s). Annually, or as necessary, replace the exhaust filter elements.

7.4 Bearings

7.4.1 Greasing the Motor Bearings

If greasing the motor becomes necessary, wipe the fittings completely clean and use clean equipment. More bearing failures are caused by dirt introduced by greasing than from insufficient grease. Be careful not to over-grease the motor. If this occurs, the excess grease will spill out of the motor and drip onto the vacuum pump.

Use good quality rust inhibited polyurea-based grease, such as Chevron SRI. Motors that do not have re-greasing capabilities (no grease fittings) are factory lubricated for normal bearing life.

7.5 General inspections

7.5.1 Monthly Inspections

A general inspection should be performed on a regular basis (monthly) for safety items. Items to inspect include all wiring, flex hoses, and other items. If a damaged item is viewed, call your local BeaconMedæx service technician for a thorough inspection and report of findings.

7.5.2 Every Six Months

A thorough inspection of the vacuum pump cooling air intake and discharge grating should be performed at least every six months or more frequently if conditions require. If a dust/dirt buildup is visible, clean the grating to remove the buildup. Excess dust/dirt buildup in these areas will prevent air from cooling the vacuum pump, affecting performance of the vacuum system.

7.5.3 Oil Leak

If upon inspection of the vacuum system, a noticeable amount of oil is seen on the base of the system or on the floor around the system, immediate action is required to prevent the possibility of injury. Using an oil absorbent or like product, absorb the oil on the base frame or floor to remove the potential of slipping. Call your local BeaconMedæx service technician for a thorough inspection of the vacuum pumps.

8.0 Replacement / Maintenance Parts

Any information, service or spare parts requests should include the machine serial number and be directed to:

BeaconMedæS

Floor 12, Building 36, No.1888, New Jinqiao Road,
Shanghai

Postcode: 201206

Telephone: 400-616-9018

9.0 Maintenance Record

Model Number _____

Model Number _____

Model Number _____

Date of Service								
Hours								
Load								
Ambient Temp.								
Vacuum Level								
Inlet Filters								
Inlet Screen								
Oil Change								
Oil Filter								
Motor Bearings								
Coupling Inserts								
Exhaust Filters								
Relief Valves								
Misc.								
Serviced By								

9.0 Maintenance Record

Model Number _____

Model Number _____

Model Number _____

Date of Service								
Hours								
Load								
Ambient Temp.								
Vacuum Level								
Inlet Filters								
Inlet Screen								
Oil Change								
Oil Filter								
Motor Bearings								
Coupling Inserts								
Exhaust Filters								
Relief Valves								
Misc.								
Serviced By								

Appendix A: Overcurrent settings

Frequency(Hz)	Voltage(V)	Settings (A)			
		5.5KW 7.5HP	9.2KW 15HP	11KW 18HP	15KW 25HP
50	380	12.7	22.1	28.2	32.1



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