Installation, Operation and Maintenance Instructions

Oil-Sealed Rotary Screw Vacuum Pumps Manual

Part Number 6996025301_A

MSV007, MSV010, MSV015, MSV020

Friday, April 15, 2022

BeaconMedæs®

Part of the Atlas Copco Group

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Product warranty and limit of liability are dealt with in our standard terms and conditions of sale or negotiated contract under which this document is supplied.

You must use this product as described in this manual. Read the manual before you install, operate, or maintain the product.

Contents

List of Figures

1. Safety and compliance

1.1. Definition of Warnings and Cautions

NOTICE:

For safe operation from the start, read these instructions carefully before you install or commission the equipment and keep them safe for future use.

Read all the safety instructions in this section and the rest of this manual carefully and make sure that you obey these instructions. The equipment must only be operated and maintained by trained personnel in the proper condition and as described in this instruction manual.

Obey local and state requirements and regulations. If you have any questions about safety, operation or maintenance of the device, please contact our nearest subsidiary.

Important safety information is highlighted as warning and caution instructions. Obey these instructions.

WARNING:

If you do not obey a warning, there is a risk of injury or death. Different symbols are used according to the type of hazard.

CAUTION:

If you do not obey a caution, there is a risk of minor injury, damage to equipment, related equipment or process.

NOTICE:

Information about properties or instructions for an action which, if ignored, will cause damage to the equipment.

We reserve the right to change the design and the stated data. The illustrations are not binding.

Keep the instructions for future use.

1.2. General safety precautions

WARNING: AUTOMATIC RESTART

Risk of injury and damage to equipment. If the pump has an automatic restart function and it is set to on, the pump will restart automatically when the power is restored after the power interruption.

CAUTION: RADIO INTERFERENCE

Risk of injury. In a domestic environment, the pump can cause radio interference which requires supplementary mitigation measures.

- Obey the work safety requirements and regulations.
- Obey all the local site safety and operating procedures.
- If any of the statements do not match with the applicable legislation, the stricter of the two statements takes priority.
- The personnel responsible for the installation, operation, maintenance and repair work must be trained and approved by us.
- The pump is designed for handling atmospheric air only. Other gases, vapours or fumes must not be exposed to the pump intake or processed by the pump.
- Before you do the maintenance, repair, adjustment or other non-routine checks, refer to Preventive maintenance schedule on page 52.
- For units that have a supply from a frequency converter, wait for 10 minutes after disconnection before you start the electrical work.
- Do not rely on the indicator lamps or electrical door locks. Before you do maintenance work, disconnect and check for electrical safety with a measuring device.
- Do not touch the pump intake when the pump is in operation.
- Keep the pump in safe operating condition. Replace parts and accessories that are not safe for operation.
- Do not walk or stand on the pump or on its components.

Note:

1. These precautions apply to a pump that processes or uses air or inert gas. When the pump is used with other gases, it is necessary to use more safety precautions.

2. Some precautions are general and are applicable for all types of pumps and equipment. Some of the statements, might not apply to your pump.

3. If the installation, operation, maintenance, and repair is done without our prior written approval, or if the pump is not installed in accordance with our recommendations, we will not accept liability or warranty claims in accordance with the standard terms and conditions.

1.3. Safety precautions during installation

1. When you lift the pump, make sure that:
   - you use the correct lifting equipment and you obey the local safety regulations
   - you tighten all the loose and movable parts before you lift the pump
   - no personnel are in the risk zone below the lifted load
   - the speed of the lifting equipment is in safety limits
   - personnel wear safety helmets in the area of overhead or lifting equipment.
2. The pump is made to be installed and used inside. If the pump is installed outside, contact us.
3. Install the pump in an area with cool and clean air.
4. Do not cause an air inlet blockage.
5. Refer to Technical data on page 27 for liquid handling capacity.
6. Remove the blanking flanges, plugs, caps and desiccant bags before you connect the pipes.
7. The vacuum connection and discharge pipes must be of correct size and applicable for the working pressures and temperatures.
8. Do not use frayed, damaged or worn hoses.
9. Distribution pipes and connections must be of correct size and applicable for the working pressures.
10. The inlet air must have no flammable fumes, vapours or particles (for example, paint solvents can cause internal fire or explosions).
11. The external force on the inlet and outlet connection is 10 kg. Make sure that there is no strain on the pipe connections. Supports must not be installed to the external body (canopy) of the pump.
12. If a remote control is installed, the pump must have the sign that follows: "Danger: The machine is remotely controlled and can start without a warning." The operator must make sure that the machine is stopped and depressurised, the electrical isolation switch is open and the electrical isolation switch is locked with a temporary warning attached before maintenance and repairs. Persons that use a remote controlled machine must obey the necessary precautions. When you operate the machine you must make sure that no one is working on the machine.
13. Air-cooled pump must be installed in such a way that an adequate flow of the cooling air is available. Make sure that the exhausted air does not recirculate to the pump air inlet or cooling air inlet.
14. The electrical connections must be same as the applicable codes. Make sure that the machines are grounded and protected against short circuits by fuses in all phases. Install a power isolation switch near the pump. You must be able to lock the power isolation switch.
15. The pumps with an automatic start/stop system or an Automatic Restart After Voltage Failure (ARAVF) function must have the sign: "This pump can start without warning" attached near to the instrument panel.
16. Do not remove or adjust the safety devices, guards or insulation installed on the pump.

17. There are pipes and parts with temperatures more than 70 ˚C (158 ˚F). Install insulation or guards to prevent contact with hot surfaces. All pipes and parts with high temperatures must be clearly marked.
18. If the ground is not flat or it has slope, contact the manufacturer.
19. Pump outlet air contains traces of oil mist. Make sure that the pump is compatible with the working environment.
20. If a pump is installed in a system with inlet gas-stream temperatures more than the maximum temperature permitted, contact us. The installation must be approved by us before the pump is started.

1.4. Safety precautions during operation

1. Do not touch pipes or pump components during operation.
2. Use the correct type and size of hose end - fittings and connections. Make sure that the hose is depressurised before you disconnect it.
3. Persons that use a remote-controlled machine must obey the necessary precautions. Before you operate the machine you must make sure that no one is working on the machine. If a remote control is installed, the pump must have the sign that follows:

   "Danger: The machine is remotely controlled and can start without warning."
4. Do not operate the pump:
   - near flammable or toxic fumes, vapours or particles
   - outside the specified limit ratings.
5. Make sure that all bodywork doors are closed during the operation of the pump. The doors can be opened for short periods (for example, routine service operation). Persons must wear ear protection when the doors are open. For pumps without external bodywork, ear protection must be worn near the pump.
6. Persons must wear ear protection when the sound pressure level is equal to or higher than 80 dB(A).
7. At regular intervals make sure that:
   - the guards are correctly installed
   - the guards are in the correct position
   - the hoses and pipes inside the pump are in serviceable condition
   - there are no leaks
   - the fasteners are tight
   - the electrical leads are serviceable
   - safety valves and other pressure relief devices are not clogged
   - the inlet valve and the air net components (for example, pipes, couplings, manifolds and valves) are in serviceable condition
   - electrical cabinet air cooling filters are not clogged.
8. If warm cooling air coming out from the pumps is used in air heating systems (for example, to warm up a workroom), take precautions against air pollution and possible contamination of the breathing air.

9. Do not remove or adjust:
   - the sound-damping material
   - the safety devices
   - the guards
   - the insulation installed on the pump.
10. The oil separator tank can be slightly pressurised. Do not open the oil filler or drain plugs, when the pump is in operation. Do not keep the oil filler or drain plugs open when the pump is in operation.
11. Do not use the pump as a compressor.
12. Do not operate the pump without installing the air intake filter.

1.5. Safety precautions during maintenance or repair

1. Use the correct safety equipment (for example, safety glasses, gloves, safety shoes).
2. Use the correct tools for maintenance and repair.
3. Use only genuine spare parts.
4. Do not start maintenance until the pump is cool.
5. Attach a warning sign "Work in progress, do not start" next to the pump before you start the maintenance or repair.
6. Persons that use a remote-controlled machine must obey the necessary precautions. Before you operate the machine you must make sure that no one is working on the machine. Attach a sign next to the remote start equipment as follows:

   "Danger: The machine is remotely controlled and can start without warning."
7. Before components are removed from the pump, make sure that:
   - the pump is isolated from all sources of under and overpressure
   - the pump is at atmospheric pressure.
8. Do not use flammable solvents or carbon tetrachloride to clean the parts. Obey the safety precautions for toxic vapours of cleaning liquids.
9. During maintenance and repair:
   a. clean the pump carefully with a clean cloth
   b. install protective covers on the parts and openings of the pump.
10. Do not weld or do any operation involving heat near the oil system. Oil tanks must be completely purged (for example, by steam cleaning) before you do such operations. Do not weld or modify the pressure vessels.
11. If there is an indication or suspicion that an internal part of a pump is overheated:
    a. stop the pump
    b. do not open the inspection covers until enough cooling time is completed to prevent the risk of spontaneous ignition of the oil vapour.
12. Do not use a light source with an open flame to examine the inside of the pump.
13. Make sure that no tools, parts or other items are left in or on the pump.
14. Be careful when you handle the regulating and safety devices. Make sure that they operate correctly. For safety, do not disconnect the regulating and safety devices.

15. Before you use the machine after maintenance or overhaul make sure that:
    - the operating pressures, temperatures and time settings are correct
    - the control and shutdown devices are installed, and they operate correctly
    - the coupling guard of the pump drive-shaft is installed.
16. Every time the separator element is renewed, examine the discharge and the inside of the oil separator vessel for carbon deposits. If there is excessive carbon deposits, remove the carbon deposits.
17. Install protection to the motor, electrical and regulating components to prevent damage from moisture when the pump is cleaned (for example, steam cleaning).
18. Make sure that the sound-damping material and vibration dampers of the pump (for example, the sound-damping material on the body and in the air inlet and outlet systems) are in serviceable condition. Replace all damaged material with genuine material from the manufacturer.
19. Do not use caustic solvents which can damage the materials of the air net (for example, polycarbonate bowls).
20. Faults or wearing of seals can cause leakage of oil lubricant. Prevent the dispersion in soil and pollution of the other materials.

2. General description

2.1. Vacuum and flow rate

A vacuum is a pressure in a system that is less than the ambient atmospheric pressure. It can be shown in absolute terms or in effective gauge terms:

- mbar(a) - the absolute pressure shows how much the pressure is above the absolute zero vacuum.
- (minus) mbar(e) - the effective or gauge pressure shows how much the pressure is below the local atmospheric pressure.

Flow rate definitions

The two ways to show the flow rate in a vacuum are:

1. The displacement or volumetric flow rate (Am^3/hr)
2. Throughput or mass flow rate

Displacement/volumetric flow rate

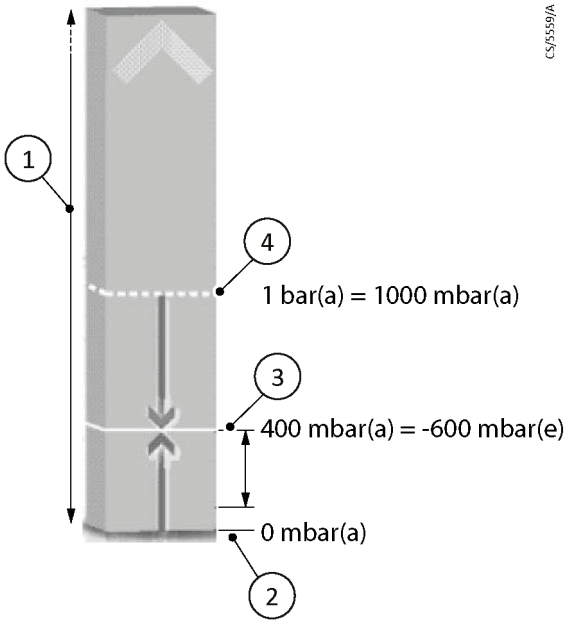
For the relevant pressure range, when the pump operates at quasi constant motor speed (rotations per minute) and since the compression chambers have fixed dimensions, the same volume of air is pumped from inlet to outlet with decrease in pressure level. Over the relevant pressure range, this makes the volumetric flow rate quasi independent of the vacuum level. It is the expression of the flow rate inside the piping at the governing vacuum level (Am^3/hr) and is always higher than the throughput or mass flow rate.

Throughput or mass flow rate

If the volumetric flow does not change with the decrease in pressure level, the number of molecules in the volume of air can change. The deeper the vacuum, the less number of molecules in the same volume of air.

The mass flow rate will decrease with a decrease in (absolute) pressure. A flow rate must be shown at a specified vacuum level when you use throughput or mass flow rate.

Figure 1 Vacuum and flow rate



1. *Pressure*
2. *Absolute vacuum*
3. *Typical pump range (400 mbar(a) to 10 mbar(a))*
4. *Atmospheric pressure*

Atmospheric pressure at sea level is approximately 1 bar(a) or 1000 mbar(a). The typical working range for the pumps is 400 mbar(a) to 10 mbar(a) (-600 mbar(e) to -990 mbar(e)).

It is important to understand the type of reference to select a correct pressure gauge to measure the vacuum. Note that the distinction does not matter for a pressure difference (delta P, example, pressure loss), since it is always the result of subtracting two pressures (as absolute or effective pressures).

Our pump uses volumetric flow rate to denote the performance.

2.2. Introduction

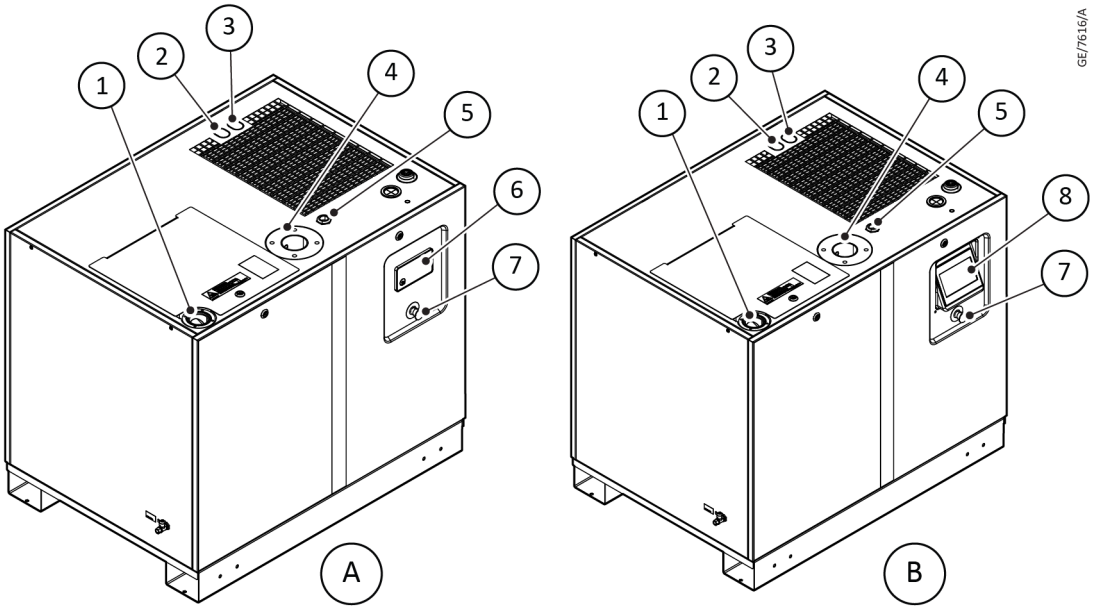
The pumps are single-stage, oil-sealed screw pumps driven by an electric motor. The pumps are controlled by an electronic controller.

The controller is attached to the front door. An electric cabinet is installed behind the front door. The electric cabinet contains fuses, transformers, relays, etc.

The pumps use Variable Speed Drive (VSD) technology. The VSD technology helps to automatically adjust the motor speed as necessary.

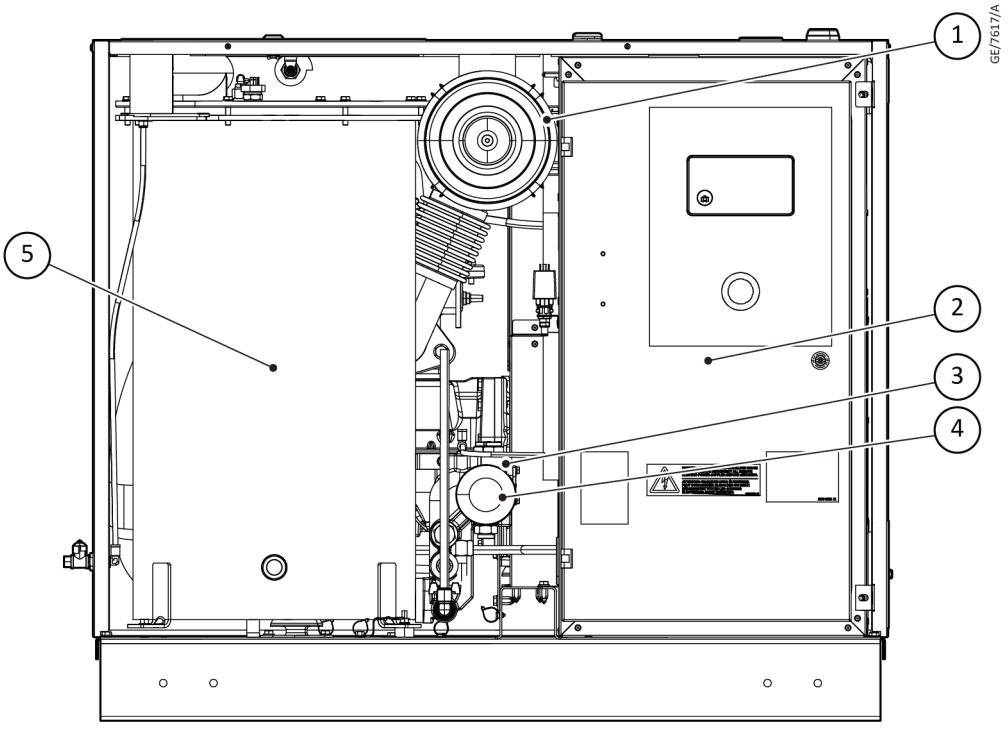
The pumps are available as air-cooled version. The pumps have a sound-insulated canopy.

Figure 2 General view



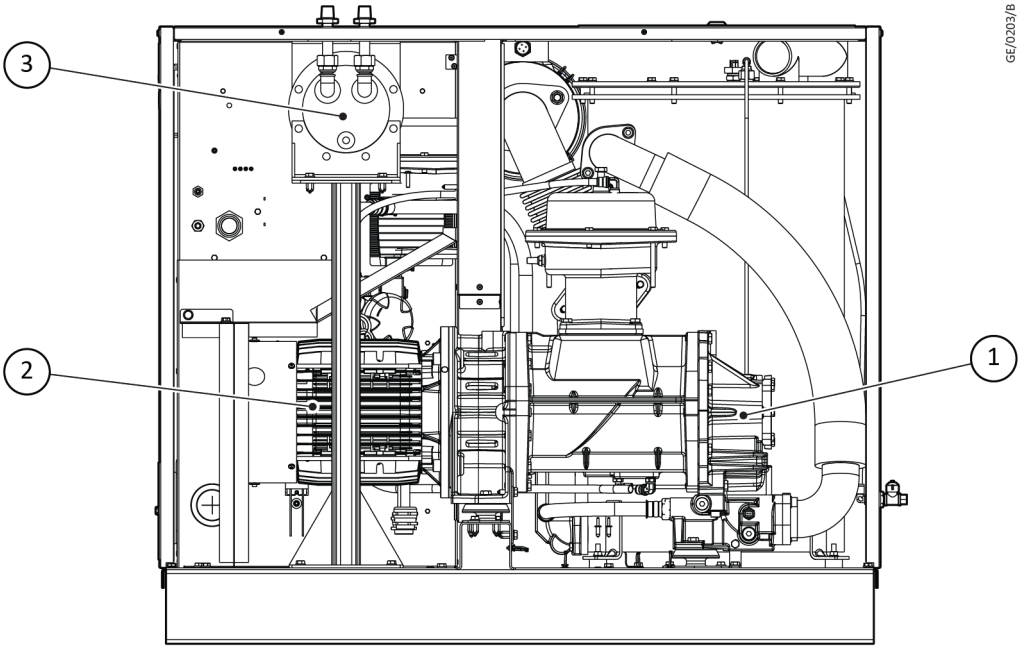
1. *Discharge connection*
2. *Cooling water out*
3. *Cooling water in*
4. *Air intake*
5. *Cable entry*
6. *Front panel*
7. *Emergency stop button*
8. *HMI*

Figure 3 Front view



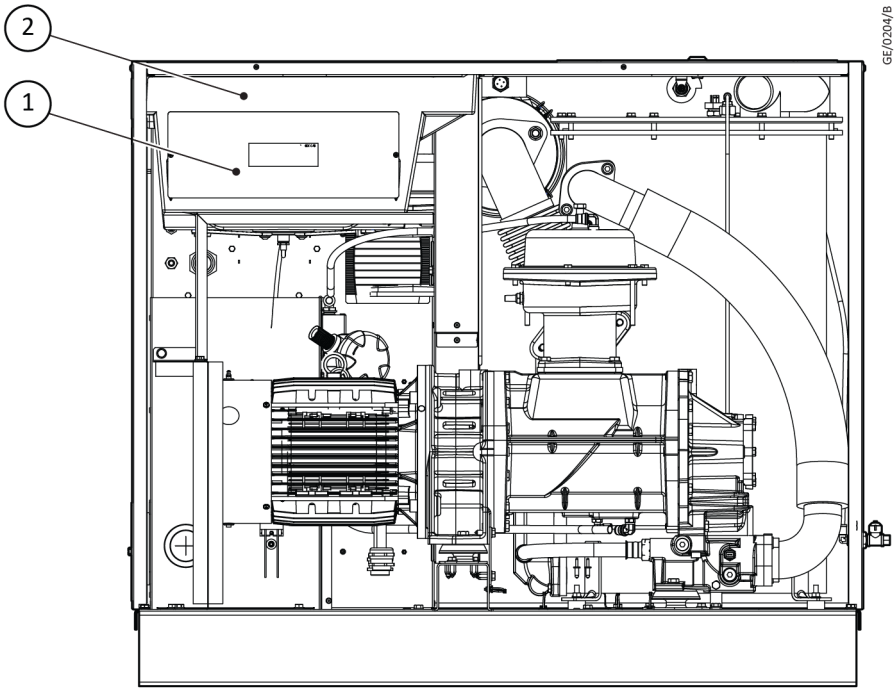
1. *Air intake filter*
2. *Electric cabinet*
3. *Thermostatic bypass valve*
4. *Oil filter*
5. *Oil separator tank*

Figure 4 Rear view - Water cooled



1. *Element*
2. *Drive motor*
3. *Water/oil cooler*

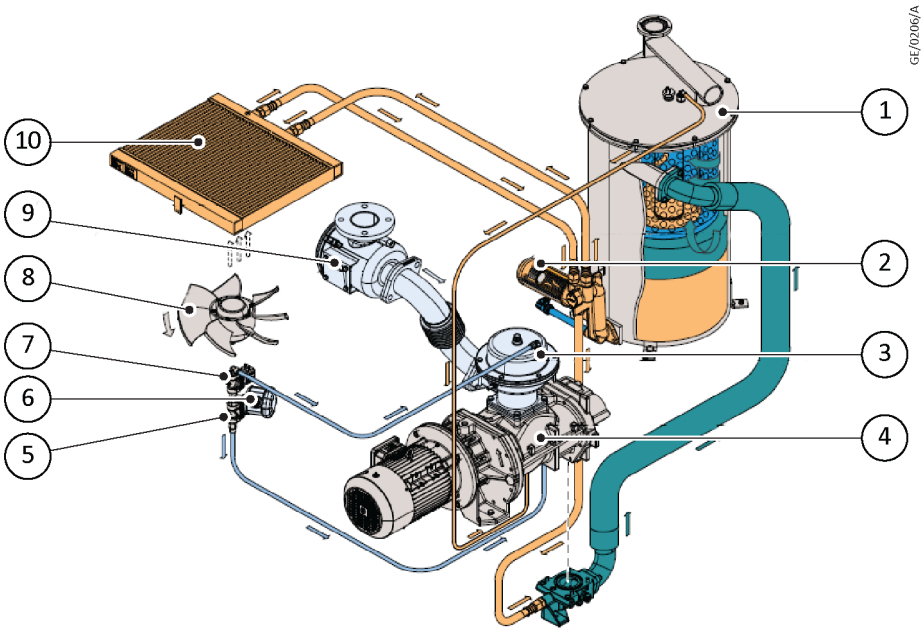
Figure 5 Rear view - Air cooled



1. *Cooling fan*
2. *Air/oil cooler*

2.3. Flow diagram

Figure 6 Flow diagram of air cooled version



A. Process pressure
B. Air atmospheric pressure
C. Air/Oil mixture
D. Oil

1. *Oil mist separator*
2. *Oil filter*
3. *Vacuum control valve*
4. *Screw element*
5. *Solenoid valve*
6. *Air filter*
7. *Solenoid valve*
8. *Fan*
9. *Inlet filter*
10. *Oil cooler*

Air flow

Air comes in through the air intake filter and the control valve and is displaced by the pump element. A mixture of air and oil flows into the oil separator tank. After passing the air/oil separator filter, clean air, conditioned to a few parts per million, is released through the outlet.

Oil system

The oil separator tank removes most of the oil from the air/oil mixture by the centrifugal action. The oil separator removes the remaining oil. The oil collects in the lower part of the oil separator tank.

The oil system has a thermostatic bypass valve. When the oil temperature is less than 83 °C (181 °F) (87 °C (189 °F) for optional high-water handling capacity versions), the bypass valve stops the oil supply from the oil cooler.

The air pressure pushes the oil from the oil separator tank through the oil filter. The oil cooler is bypassed. When the oil temperature increases up to 83 °C (181 °F) (87 °C (189 °F) for the optional high-water handling capacity versions), the thermostatic bypass valve starts the supply from the oil cooler. At approximately 95 °C (203 °F) (104 °C (219 °F) for the optional high-water handling capacity versions), all the oil flows through the oil cooler. The filtered oil flows into the pump element.

Cooling

The cooling system has an oil cooler.

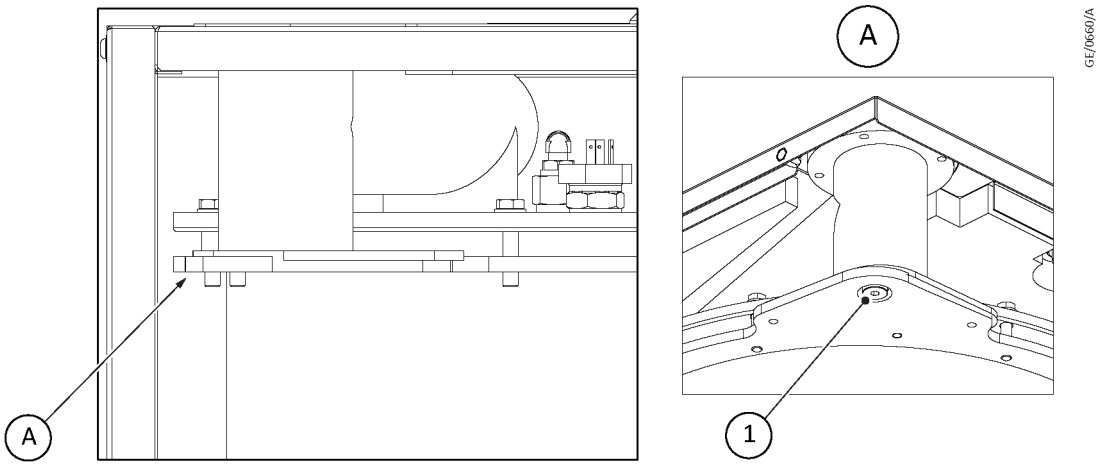
The fan blows air over the coolers. The fan is set to on or off, depending on the operating conditions, as per the specific algorithm.

2.4. Condensate system

When discharge pipes are used, water in the discharge air can condense in the pipes. This water is collected in the collector of the outlet pipe where a drain point is available.

Initially the drain point is sealed with a threaded plug, but can be exchanged by a G1/4" connector with tube to drain the condensate. Preventing condensate collection in the oil separator will extend oil life. Refer local regulations which are applicable for water drainage.

Figure 7 Condensate system



1. *Drain point*

2.5. Regulating system

If the vacuum process demand is less than the throughput of the pump, the vacuum pressure decreases. When the pressure is lower than the set-point (necessary vacuum pressure), the regulator decreases the motor speed.

If the vacuum pressure decreases and the motor operates at minimum speed, the regulator stops the motor. When the motor is stopped automatically and the vacuum pressure reaches the set-point, the regulator starts the motor again.

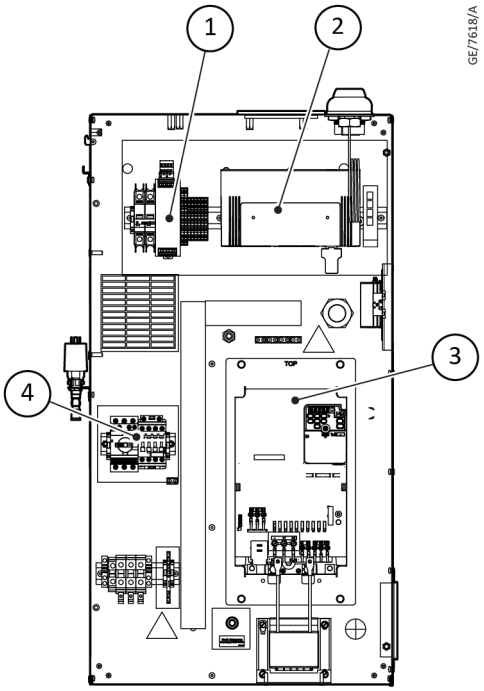
Quick version

The regulation system of the quick version can handle fast cycling duties. When the vacuum pressure reaches the set-point, the regulator will keep the motor operating at increased speed for an adjustable time before the regulator decreases the motor speed.

2.6. Electrical system

Electric components

Figure 8 Electrical cabinet (typical example)



1. *Power supply unit*
2. *Controller*
3. *Frequency converter (U1)*
4. *Circuit breaker (Q15)*

Electrical diagrams

You can find the electrical diagram in the electric cabinet.

3. Beacon Medaes Controller

3.1. Introducing the controller

The controller starts and stops the pump, adjusts the pressure setpoints, and monitors alerts. You can also collect data and analyse pump performance to improve processes and lower your operating costs.

3.1.1. Accessing User Interface

You can access the controller from any device connected to the same network (Windows PC, smartphone, tablet, laptop,...)

A Discovery app is available to locate the controller connected to the local network with the help of the IP address.

To access the controller

Note:

Your computer must not be connected to another network when you access the controller.

1. Click the browser's address bar.
2. Type the IP address, 192.168.202.10 and press Enter.

   Note:

   When you access the UI, you may get a message "Your connection is not private". Click on Advanced and Proceed to (IP address) 192.168.202.10.

3. To change the display language
   a. Click on the Flag icon.
   b. Select the language of your choice.

   The notifications are displayed along with the Bell icon.
4. To Sign-in
   a. Click on Sign in button
   b. Type Username and Password.
   c. Click Sign in.
   d. Use your login credentials or the credentials available on the sticker found on the machine.

Troubleshooting Windows connection problems

If you cannot access the IP address, 192.168.202.10 in your web browser,

1. Press the "Windows" button on the keyboard.
2. Search "View network connections".
3. Right click on Ethernet or Adapter (depending on the ethernet connection).

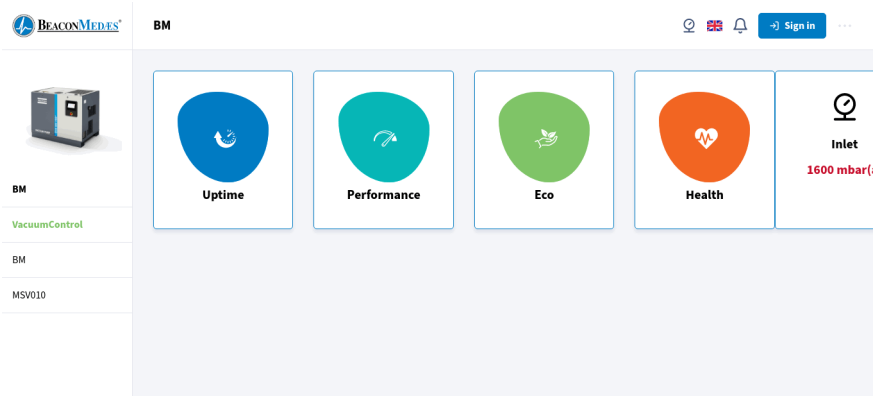
4. Click Properties > Internet protocol version 4 (TCP/IPv4) > Properties > Use following IP address.
5. Enter IP address as 192.168.202.9.

Note:

The IP address placed in IPv4 needs to be different from the IP entered in the web browser, for example enter IP address as 192.168.202.9.

6. Click on Subnet mask and 255.255.255.0 number must appear.
7. Click OK.

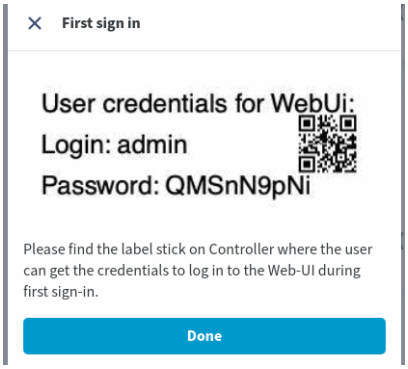
Try to connect through your web browser again.



Entering login credentials

To use first time sign-in

1. Click First sign-in tab First sign in page displays



2. Type Username
3. Type Password
4. Click OK

You can change login credentials after your first login.

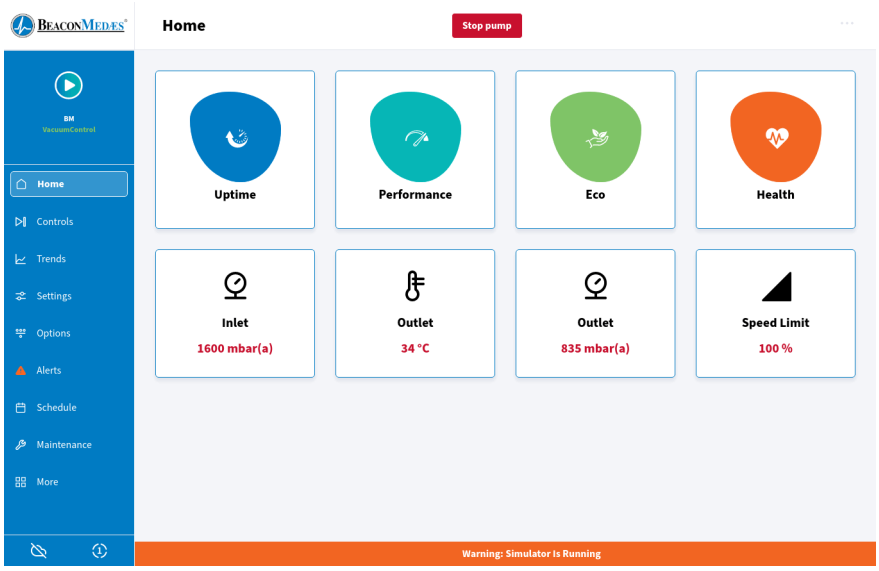
Entering new password

If you forgot your Username and Password

1. Go to the Forgot Password tab.
2. Enter the details from the controller hardware label.

Viewing controller home page

The default home page displays after the first login.



The home page is divided into four segments

Section	Functions
Navigation bar	You can see key parts of controller such as ▪ Home ▪ Controls ▪ Trends ▪ Settings ▪ Schedule ▪ Maintenance ▪ Alarms ▪ More
KPI functionalities	You can see pump parameters such as Uptime, Performance, Eco and Health.
Pump sensor values	You can see pump sensor values.
KPI insight card	You can see KPI functionalities.

3.1.2. Using Discovery application for finding the pump

To find the pump through the Discovery application

1. Navigate to the App store or Google play store of your mobile device.
2. Search the IP discovery application.
3. Download the IP discovery application.

Note:

Make sure that the network connection is same for the controller and search engine. To do so, check the connection from controller to the customer end connection.

4. Open the application window.
5. Click on the pump card to display the network IP address.

3.1.3. List of abbreviations

Table 1 Abbreviations

UI	User Interface
HMI	Human Machine Interface
IP address	Internet Protocol address
DNS	Domain Name System
DHCP	Dynamic Host Configuration Protocol
mDNS	Multicast DNS
M2M	Machine to Machine
MQTT	Message Queuing Telemetry Transport

3.2. Configuring the controller

Configure the controller for your situation and usage.

3.2.1. Connecting the pump to the local LAN network

Note:

Connect the controllers directly to the company network through the X11 port on the rear of the controller with Ethernet cables.

To connect to the controller

1. Navigate to the IP address in a web browser.
   If you do not have the IP address, use X10 access (OP0020).
2. Click Sign in.
3. Enter login credentials to access the home page.
4. Click More > Preferences > Connectivity > LAN.
5. Check and confirm with the IT department, if the DHCP has been set automatically.

- If the DHCP is set automatically, the connection is complete.
- If the DHCP is not set automatically, connect the ethernet manually

Note:

If the DHCP is enabled, the connection details will be selected automatically. If it is not displayed, enter the details manually.

a. Click Edit.
b. Deactivate DHCP.
c. Enter the connection details manually.
d. Click Save.
e. Activate Proxy if you have to add the Proxy IP address.

3.2.2. Setting the preferred language

To set your desired language

1. Click More.
2. Navigate to Preferences > General > Language.
3. Select the preferred language.

3.2.3. Setting the physical units

To set the physical parameters units

1. Click More.
2. Navigate to Preferences > General > Units.
3. Modify the units for different parameters as per your requirement

3.2.4. Setting the date and time

To set the date and time

1. Click More.
2. Navigate to Preferences > General > Date and time.
3. Modify the time zone, date and time, format of date and time as per requirement.

3.2.5. Creating user profile for customer

Note:

You must create an admin profile for the user (tier level 1). The admin can use his access to create different user profiles for their use.

To create the user profile

1. Click More > Manage users > Add user.
2. Enter the user details.
3. Click Save user.

3.2.6. Setting the HMS WiFi bolt

Connecting WiFi to the company network

Note:

The controllers can be connected directly to the company network through the X11 port using the Client mode of the WiFi bolt.

To connect the controller to the WiFi connection

1. Navigate to the IP address in a web browser.
2. Click Sign in.
3. Enter your credentials to access the home screen.
4. Click More > Preferences > Accessories > WiFi bolt.
5. Configure the WiFi bolt
    a. Enable the WiFi bolt.
    b. Make sure that the WiFi bolt is connected.
    c. Press the Refresh button (visible only when the WiFi bolt is not connected).
    d. Select Client mode.
    e. Click Scan to see the access points.

f. Select the WiFi access point to connect.
g. Select the Authentication mode.
h. Enter Password.
i. Click Connect.

6. Repeat the process for all the devices that you want to connect to the customer network through WiFi.

Creating a separate local network with WiFi bolts

Note:

If you do not want a direct connection between the controller and your network, create a separate local network by an access point.

The controllers can connect directly to the customer network through the X11 port using the Client mode of the WiFi bolt.

To create a separate local network with WiFi bolts

1. Connect the WiFi bolt to the pump.
2. Navigate to IP address in a web browser.
3. Click Sign in.
4. Type your credentials to access the home page.
5. Click More > Preferences > Accessories > WiFi bolt.
6. Configure the WiFi bolt
   a. Enable the WiFi bolt.
   b. Check that the WiFi bolt is connected.
   c. Press the Refresh button (visible only when the WiFi bolt is not connected).
   d. Change connection mode to Access Point.
   e. Create the access point by typing the name (SSID).
   f. Set Password if required.
   g. Set the Authentication mode to WPA2.

Connecting to a local network with WiFi bolts

To connect to a separate local network with WiFi bolts

1. Navigate to the IP address in a web browser.
2. Click Sign in.
3. Use your credentials to access the home screen.
4. Click More > Preferences > Accessories > WiFi bolt.
5. Configure the WiFi bolt
   a. Enable the WiFi bolt.
   b. Make sure that the WiFi bolt is connected. If not, press the Refresh button (visible only when the WiFi bolt is not connected).
   c. Change connection mode to Client.
   d. Click Scan to see the access points.
   e. Select the WiFi access point to connect.

f. Select the Authentication mode.
g. Enter Password.
h. Click Connect.

6. Repeat the process for all the devices that you want to connect to the customer network through WiFi.

3.2.7. Changing display settings

To change the display settings

1. Click More.
2. Navigate to Preferences > Accessories > HMI menu.
3. Modify the brightness, zoom and colour palette of the HMI as per your requirement.

3.2.8. Backup and restore parameter setting

This feature enables the user to backup and restore the parameters saved in the settings.

To backup the parameter values:

1. Navigate to Settings.
2. Click top right icon.
3. Click Backup locally.

To restore the parameter settings:

1. Navigate to Settings.
2. Click top right icon.
3. Click restore parameters from file.
4. Upload the backup file from your location and upload.

3.2.9. Updating the software

To update the software offline and online

Updating the software offline

Update the software offline by manually updating .tar file from the controller.

1. Click More.
2. Navigate to Preferences > Software update.
3. Click Manual upload on the top right corner.
4. Go to Instruction window, drag-drop the .tar file in the instruction window. (Make sure that the file name is correct.)
5. Click Upload file > Install update > Done.

Updating the software online

Update the software online by updating automatically from the controller.

Note:

Make sure to stop the pump before you do the software update.

1. Click Download update file which has been received from the cloud.
2. Click Install update > Done.

Troubleshooting software update failure

There is a chance of failure when updating the software. To fix the failure issue

1. Click View log.
2. Click Failed updates.
3. Check more information on failed updates.
4. Click Download log.
5. Restart the controller.
6. Repeat the software update.
7. If the problem persists
   - Click on Download log.
   - Send the log file and the software update file (if available) through TechConnect to the second level support.

3.2.10. Allowing remote assistance (optional)

Note:

You can access the controller through TeamViewer. This feature is available on request. Contact us for details.

To access the TeamViewer support for remote assistance

1. Click More.
2. Navigate to Support.
3. Click TeamViewer.

4. Technical data

4.1. Reference condition and limitations

Table 2 Reference conditions

Parameter	Unit	Value
Relative humidity	%	0
Air inlet temperature	°C	20
	°F	68
Exhaust back pressure	mbar(g)	0
	psig	0
Ambient barometric pressure	mbar(a)	1013
	psia	14.7

Table 3 Limitations

Parameter	Unit	Value
Minimum ambient temperature	°C	0
	°F	32
Maximum ambient temperature (3 ph)	°C	46
	°F	115
Maximum ambient temperature (1 ph)	°C	32
	°F	90
Minimum permitted inlet temperature	°C	-10
	°F	14
Maximum permitted inlet temperature	°C	70
	°F	158
Maximum (absolute) inlet pressure	mbar(a)	1050
	psia	15.2
Maximum vessel pressure	mbar(a)	1500
	psia	21.8

4.1.1. Vacuum pump data

Reference condition

Note:

The data given is to be used with the reference conditions, refer to Reference condition and limitations on page 27.

Table 4 Common pump data

Parameter	Unit	Value
Number of compression stages		1
Ultimate pressure	mbar(a)	0.35
	Torr	0.4
Maximum exhaust back pressure	mbar(g)	100
	psig	1.45
Temperature of the air leaving the discharge (approximate)	°C	83
	°F	181

The pump is developed to work constantly at inlet pressures from ultimate vacuum up to atmospheric pressure. The maximum allowed inlet pressure is 200 mbar(g). In case of even higher inlet pressure, please contact your pump manufacturer.

Table 5 MSV007

Parameter	Unit	Standard	With high water handling capacity
Nominal motor power	kW	7.5	7.5
	HP	10	10
Maximum motor shaft speed	rpm	3500	3500
Minimum motor shaft speed	rpm	600	600
Oil capacity	L	16	16
	US GAL	4.2	4.2
	Imp. GAL	3.5	3.5
	cu. ft.	0.57	0.57
Sound pressure level (according to ISO 2151 (2004))	dB(A)	65 (±3)	65 (±3)
Temperature of the air leaving the discharge (approximately)	°C	80	87
	°F	176	188.6

Table 6 MSV010

Parameter	Unit	Standard	With high water handling capacity
Nominal motor power	kW	7.5	7.5
	HP	10	10
Maximum motor shaft speed	rpm	4500	4500
Minimum motor shaft speed	rpm	600	600
Oil capacity	L	16	16
	US GAL	4.2	4.2
	Imp. GAL	3.5	3.5
	cu. ft.	0.57	0.57

Parameter	Unit	Standard	With high water handling capacity
Sound pressure level (according to ISO 2151 (2004))	dB(A)	68 (±3)	68 (±3)
Temperature of the air leaving the discharge (approximately)	°C	80	87
	°F	176	188.6

Table 7 MSV015

Parameter	Unit	Standard	With high water handling capacity
Nominal motor power	kW	11	11
	HP	15	15
Maximum motor shaft speed	rpm	6000	6000
Minimum motor shaft speed	rpm	600	600
Oil capacity	L	16	16
	US GAL	4.2	4.2
	Imp. GAL	3.5	3.5
	cu. ft.	0.57	0.57
Sound pressure level (according to ISO 2151 (2004))	dB(A)	73 (±3)	73 (±3)
Temperature of the air leaving the discharge (approximately)	°C	80	87
	°F	176	188.6

Table 8 MSV020

Parameter	Unit	Standard	With high water handling capacity
Nominal motor power	kW	15	15
	HP	20	20
Maximum motor shaft speed	rpm	7000	7000
Minimum motor shaft speed	rpm	600	600
Oil capacity	L	16	16
	US GAL	4.2	4.2
	Imp. GAL	3.5	3.5
	cu. ft.	0.57	0.57
Sound pressure level (according to ISO 2151 (2004))	dB(A)	76 (±3)	76 (±3)
Temperature of the air leaving the discharge (approximately)	°C	80	87
	°F	176	188.6

4.2. Reading on display

Note:

The readings given are correct for the conditions given in Reference condition and limitations on page 27.

Reference	Readings
Vacuum pressure	Depends on the set-point (necessary net pressure)
Element outlet temperature	Approximately 83 °C (181 °F) (ambient temperature 20 °C + 63 °C)
Discharge pressure	Approximately 1020 mbar(a)

4.3. Electrical cable size

CAUTION: ELECTRICAL CABLE SIZE

Risk of injury and damage to equipment. Do a check of the fuse size and the calculated cable size. If necessary, decrease the fuse size or increase the cable size. The cable length must not be more than the maximum limit given in IEC 60204.

Note:

- The voltage on the pump terminals (3 ph) must not deviate more than 10% of the nominal voltage. The voltage on the pump terminals (1 ph) must not deviate more than 5% of the nominal voltage.

- It is recommended to keep the voltage drop over the supply cables at nominal current below 5% of the nominal voltage (IEC 60204-1).

- If cables are grouped together with other power cables, it can be necessary to use cables of a larger size than those calculated for the standard operating conditions.

- Use the original cable entry. Refer to .

- To keep the IP protection degree of the electric cubicle and to protect its components from dust from the environment, it is mandatory to use a correct cable gland when you connect the supply cable to the pump.

- Local regulations remain applicable if they are stricter than the values given in the manual.

Leakage breaker (optional)

If a leakage breaker is necessary for installation, use an all current sensitive leakage breaker, RCM or RCD Type B (refer to IEC/EN 60755). Make sure that the leakage breaker has a sufficient trip level.

Table 9 Currents and fuses (IEC and UL/cUL approval)

Pump specification					Itot		Imax under voltage	
					Primary	Secondary	Primary	Secondary
Pump	Voltage (V)	Frequency (Hz)	Secondary voltage auto transform	Approval	Itot (A)			
MSV007-MSV010	380	60	-	IEC/CSA/ UL	18.4	-	20.4	-
	400	50	-		17.4	-	19.4	-
	460	60	-		15.2	-	16.9	-
	200	50	400		34.9	17.4	38.8	19.4
	230	60	460		30.3	15.2	33.7	16.9
	500	50	400		14.0	17.4	15.5	19.4
	575	60	460		12.1	15.2	13.5	16.9
MSV015	380	60	-		25.2	-	28.0	-
	400	50	-		23.9	-	26.6	-
	460	60	-		20.8	-	23.1	-
	200	50	400		47.8	23.9	53.2	26.6
	230	60	460		41.6	20.8	46.2	23.1
	500	50	400		19.1	23.9	21.3	26.6
	575	60	460		16.6	20.8	18.5	23.1
MSV020	380	60	-		35.8	-	39.8	-
	400	50	-		34.0	-	37.8	-
	460	60	-		29.6	-	32.9	-
	200	50	400		64.7	32.3	71.8	35.9
	230	60	460		56.2	28.1	62.5	31.2

Pump specification					Itot		Imax under voltage	
					Primary	Secondary	Primary	Secondary
Pump	Voltage	Frequency	Secondary voltage auto transform	Approval	Itot			
	(V)	(Hz)			(A)			
	500	50	400		25.9	32.3	28.7	35.9
	575	60	460		22.5	28.1	25.0	31.2

Pump			Maximum fuse pack		Supply cables	
	Voltage	Frequency	IEC class gL/gC	UL class K5 CSA HRC from ii	Wire ends	Recommended cable size
	(V)	(Hz)	(A)	(A)		(mm^2 (P/FF))
MSV007-MSV010	380	60	20	20	End sockets	4
	400	50	20	20		4
	460	60	20	20		4
	200	50	40	40		16
	230	60	35	35		10
	500	50	15	15		2.5
	575	60	15	15		2.5
MSV015	380	60	32	30		6
	400	50	32	30		6
	460	60	25	25		6
	200	50	63	60		25
	230	60	50	50		16
	500	50	25	25		4
	575	60	20	20		4
MSV020	380	60	40	40		10
	400	50	40	40		10

Technical data

Pump			Maximum fuse pack		Supply cables	
	Voltage	Frequency	IEC class gL/gC	UL class K5 CSA HRC from ii	Wire ends	Recommended cable size
	(V)	(Hz)	(A)	(A)		(mm^2 (P/FF))
	460	60	35	35		10
	200	50	80	80		35
	230	60	80	70		25
	500	50	32	30		10
	575	60	32	30		6

Note:

I: current in the supply lines at maximum load and nominal voltage.

Setting for circuit breakers:

Q1 - 1 A

Q15 - 0.6 A

Fuse calculations for IEC:

For the IEC fuse calculations refer to 60364-4-43 electrical installations of buildings, part 4: protection for safety- section 43: protection against over current. Fuse sizes are calculated to give the necessary protection to the cable against short circuits.

Fuse calculations for cUL and UL:

The given fuse size is the maximum fuse size to protect the motor against short circuit. For cUL fuse HRC form II (200-230, 500-575 V)/class T (380-460 V), for UL fuse class K5 (200-230, 500-575 V)/class T (380-460 V).

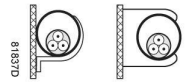
Earthing

The earthing cable connected to the pump should be minimum as per the EN 60204-1 section 828.

Cable sizing according IEC

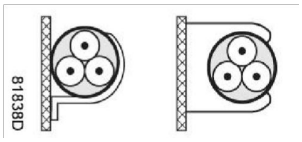
The tables show the current carrying capacities of cables for three commonly used installation methods, calculated as per the standard 60364-5-52 - electrical installations of buildings part 5 - selection and erection equipment and section 52 - current carrying capacities in wiring systems.

The permitted currents are valid for PVC insulated cables with three loaded copper conductors (maximum conductor temperature 70 °C).

	Installation method B2 as per table B.52.1. Multi-core cable in conduit on a wooden wall.

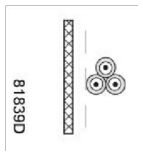
Maximum permitted current in function of the ambient temperature for installation method B2.

	Ambient temperature				
Cable section	**30 °C**	**40 °C**	**45 °C**	**50 °C**	**55 °C**
4 mm^2	< 27 A	< 23 A	< 21 A	< 19 A	< 16 A
6 mm^2	< 34 A	< 30 A	< 27 A	< 24 A	< 21 A
10 mm^2	< 46 A	< 40 A	< 36 A	< 33 A	< 28 A
16 mm^2	< 62 A	< 54 A	< 49 A	< 44 A	< 38 A
25 mm^2	< 80 A	< 70 A	< 63 A	< 57 A	< 49 A
35 mm^2	< 99 A	< 86 A	< 78 A	< 70 A	< 60 A
50 mm^2	< 118 A	< 103 A	< 93 A	< 84 A	< 72 A
70 mm^2	< 149 A	< 130 A	< 118 A	< 106 A	< 91 A
95 mm^2	< 179 A	< 156 A	< 141 A	< 127 A	< 109 A
120 mm^2	< 206 A	< 179 A	< 163 A	< 146 A	< 126 A

	Installation method C as per table B.52.1. Single-core or multi-core cable on a wooden wall.

Maximum permitted current in function of the ambient temperature for installation method C.

	Ambient temperature				
Cable section	**30 °C**	**40 °C**	**45 °C**	**50 °C**	**55 °C**
4 mm^2	< 32 A	< 28 A	< 25 A	< 23 A	< 20 A
6 mm^2	< 41 A	< 36 A	< 32 A	< 29 A	< 25 A
10 mm^2	< 57 A	< 50 A	< 45 A	< 40 A	< 35 A
16 mm^2	< 76 A	< 66 A	< 60 A	< 54 A	< 46 A
25 mm^2	< 96 A	< 84 A	< 76 A	< 68 A	< 59 A
35 mm^2	< 119 A	< 104 A	< 94 A	< 84 A	< 73 A
50 mm^2	< 144 A	< 125 A	< 114 A	< 102 A	< 88 A
70 mm^2	< 184 A	< 160 A	< 145 A	< 131 A	< 112 A
95 mm^2	< 223 A	< 194 A	< 176 A	< 158 A	< 136 A
120 mm^2	< 259 A	< 225 A	< 205 A	< 184 A	< 158 A

	Installation method F as per table B.52.1. Single-core cables, touching in free air clearance to wall not less than one cable diameter.

Maximum permitted current in function of the ambient temperature for installation method F.

	Ambient temperature				
Cable section	**30 °C**	**40 °C**	**45 °C**	**50 °C**	**55 °C**
25 mm^2	< 110 A	< 96 A	< 87 A	< 78 A	< 67 A
35 mm^2	< 137 A	< 119 A	< 108 A	< 97 A	< 84 A
50 mm^2	< 167 A	< 145 A	< 132 A	< 119 A	< 102 A
70 mm^2	< 216 A	< 188 A	< 171 A	< 153 A	< 132 A
95 mm^2	< 264 A	< 230 A	< 209 A	< 187 A	< 161 A
120 mm^2	< 308 A	< 268 A	< 243 A	< 219 A	< 188 A

Calculation method for IEC:

- Single supply cables (3 phases + PE - configuration (1)):
  - Add 10% to the total pump current (Itot from the tables)
  - Install the specified fuse on each cable.
- Parallel supply cable (2 x 3 phases + PE - configuration (2)):

- Add 10% to the total pump current (Itot from the tables) and divide by 2
- Multiply the ampacity of the cables with 0.8 (refer to table A.52.17 (52-E1))
- Install fuses of half the size of the recommended maximum fuse size on each cable.

- When using 2 x 3 phases + PE as in (3):
  - Add 10% to the total pump current (Itot from the tables) and divide by √3
  - Multiply the ampacity of the cables with 0.8 (refer to table A.52.17 (52-E1))
  - Fuse size: the recommended maximum fuse size divided by √3 on each cable.
- Size of the PE cable:
  - For supply cables up to 35 mm²: same size as supply cables
  - For supply cables larger than 35 mm²: half the size of the supply wires
  - Always check the voltage drop over the cable (less than 5% of the nominal voltage is recommended).
  - Example: Itot= 89 A, maximum ambient temperature is 45 °C, recommended fuse = 100 A
- Single supply cables (3 phases + PE - configuration (1)):
  - I = 89 A + 10% = 89 x 1.1 = 97.9 A
  - The table for B2 and ambient temperature = 45 °C permits a maximum current of 93 A for a 50 mm² cable. For a cable of 70 mm², the maximum permitted current is 118 A, which is sufficient. Use a 3 x 70 mm² + 35 mm² cable.

If method C is used, 50 mm² is sufficient. (35 mm² for method F) =>cable 3 x 50 mm² + 25 mm².

- Parallel supply cable (2 x 3 phases + PE - configuration (2)):
  - I = (89 A + 10%)/2 = (89 x 1.1)/2 = 49 A
  - For a cable of 25 mm², B2 at 45 °C, the maximum current is 63 A x 0.8 = 50.4 A. So, 2 parallel cables of 3 x 25 mm² + 25 mm² are sufficient.
  - Install 50 A fuses on each cable instead of 100 A.

Cable sizing according UL/cUL

Calculation method according UL 508A, table 28.1 column 5: permitted ampacities of insulated copper conductors (75 °C (167 °F)).

Maximum permitted current in function of the wire size

AWG or kcmil	Maximum current
10	< 30 A
8	< 50 A
6	< 65 A
4	< 85 A
3	< 100 A
2	< 115 A
1	< 130 A
1/0	< 150 A

AWG or kcmil	Maximum current
2/0	< 175 A
3/0	< 200 A

Calculation method for UL:

- Single supply cables (3 phases + 1 PE - configuration (1)):
  - Add 25% to the total current from the tables (refer to UL 508A 28.3.2: “Capacity shall have 125% of the full load current”)
  - Install the specified maximum fuse on each cable.
- Parallel supply cable (2 x 3 phases + 2 PE - configuration (2)):
  - Add 25% to the total current from the tables and divide by 2
  - Multiply the capacity of the cables with 0.8 (refer to UL 508A table 28.1 continued)
  - Install fuses of half the size of the recommended maximum fuse size on each cable.
- When using 2 x 3 phase + 2 PE as in (3):
  - Add 25% to the total current from the tables and divide by √3
  - Multiply the capacity of the cables with 0.8 (refer to UL 508A table 28.1 continued)
  - Fuse size: the recommended maximum fuse size divided by √3 on each cable.
- Size of the PE cable:
  - For supply cables up to AWG8: use same size as the supply cables
  - For supply cables larger than AWG8: use maximum permitted capacity.

< 100 A	use AWG8
< 200 A	use AWG6
< 300 A	use AWG4

Always check the voltage drop over the cable (less than 5% of the nominal voltage is recommended).

Example of supply cable calculation: Itot= 128 A, maximum ambient temperature is 45 °C, recommended fuse = 150 A.

- Single supply cables (3 phases + 1 PE - configuration (1)):
  - I = 128 A + 25% = 128 x 1.25 = 160 A
  - For AWG2/0, the maximum current is 175 A, which is sufficient => use AWG2/0
  - Install the specified maximum fuse (150 A) on each cable.
- Parallel supply cable (2 x 3 phases + 2 PE - configuration (2)):
  - I = (128 A + 25%)/2 = (128 x 1.25)/2 = 80 A
  - For an AWG4, the maximum current is 85 A x 0.8 = 68 A, which is not sufficient. For an AWG3, the maximum current is 100 x 0.8 = 80 A. So, 2 parallel cables of 3 x AWG3 + 2 x AWG8 are sufficient.
  - Install 80 A fuses on each cable.

5. Instructions for use

5.1. Air/oil separator vessel

CAUTION: PRESSURISED AIR

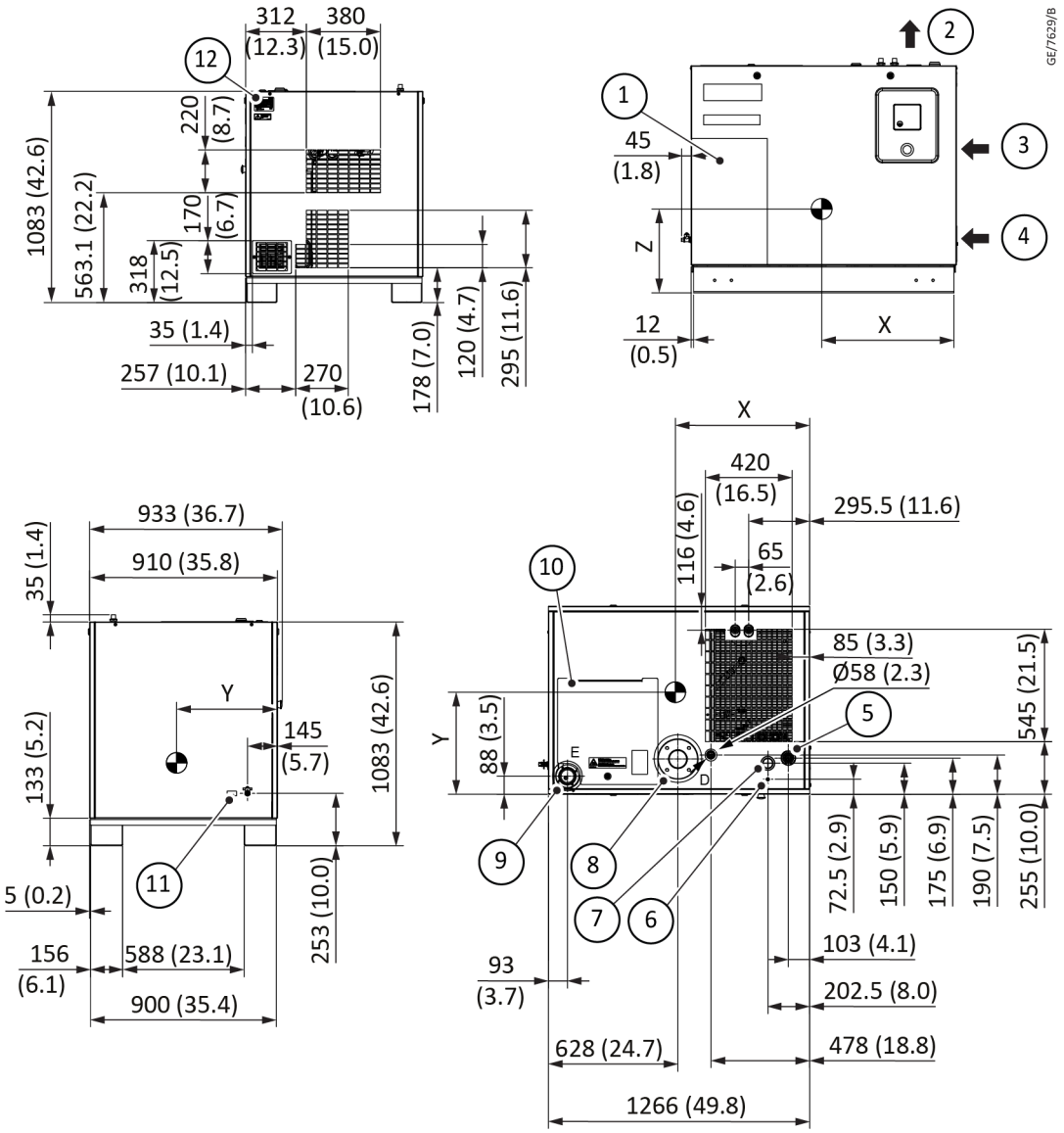
Risk of injury and damage to the equipment. The vessel can contain pressurised air, this can be dangerous if the equipment is misused.

- The vessel must only be used as an air/oil separator.
- The vessel must be operated at less than 0.5 bar(g).
- Do not make changes to the vessel by welding, drilling or by other mechanical methods without the written permission of the manufacturer.
- Only use oil as specified by the manufacturer.
- The vessel is guaranteed to operate for more than 20 years.
- The vessel needs a yearly visual inspection.

6. Installation

6.1. Dimension drawing

Figure 9 Dimension drawing



1. *Service panel*
2. *Hot air outlet area of cubicle/motor*
3. *Cooling air inlet area of cooler*
4. *Cooling air inlet area of cubicle/motor*
5. *WIFI Bolt(optional)*
6. *Antenna*
7. *Customer controller connections*
8. *Air inlet*
9. *Air outlet*
10. *Service panel*
11. *Condensate drain*
12. *Data plate*

Table 10 Centre of gravity and weight

Type	Centre of gravity*			Weight#
	Length-A mm (inch)	Width-B mm (inch)	Height-C mm (inch)	Kg (lbs)
MSV007	642 (25.2)	498 (19.6)	400 (15.7)	500 (1102)
MSV010				500 (1102)
MSV015				510 (1124)
MSV020				520 (1146)

* Centre of gravity: ± 50 mm or ± 2.0 inches

* Dimensions: ± 10 mm or ± 0.3 inches

Weight (oil included): ± 20 kg or ± 44 lbs

6.2. Installation proposal

Install the pump on a level surface that is clean, vibration free, well ventilated, has sufficient lighting and supports the weight of the pump. The complete length of the frame base must be supported. Add a shim where it is necessary. Do not use wood.

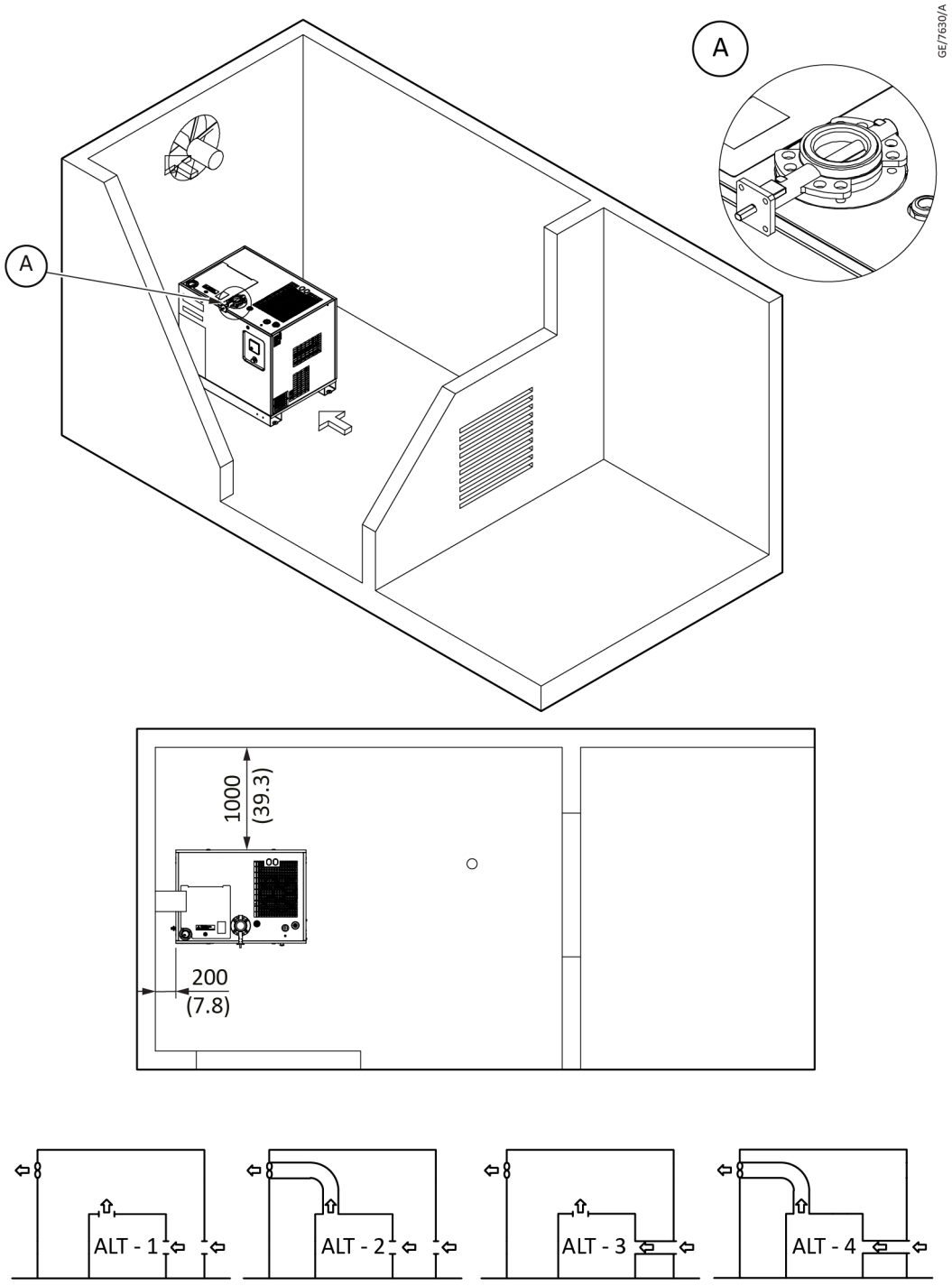
Make sure that the ambient temperature is not more than the temperatures given in the specifications.

All models are intended for indoor installation.

Do not locate the pump where the hot exhaust air from other pumps or heat generating equipment can be drawn into the pump. Never prevent the flow of exhaust air from the fluid cooler.

Release the hot exhaust air outside to prevent the high ambient conditions in the room.

Figure 10 Installation proposal



A. Isolation valve

Note:

A sufficient space is necessary (1 m of clearance on all sides and top of the pump) for the safe and correct installation, daily inspection and maintenance.

6.3. Piping

The vacuum distribution and piping system, including the pump and all related components, must be designed in accordance with generally accepted engineering practises. For example, inlet pipe work should slope away from the pump.

Incorrectly designed distribution systems can cause the damage to the pump. Exhaust pipes should be installed in such a way that they do not create additional back pressure on the pump.

The exhaust pipes should be installed sloping away from the pump.

A drip leg with a drain point provision is given in the pump to prevent the condensate to go back into the fluid reservoir.

Take precautions to prevent the installation of the pipes in a strain with the pump.

Use sufficient pipe diameter for the vacuum network. The combination of restrictive pipe diameter and long pipes can create a pressure drop. For the single pump installation, keep the diameter of the pump inlet as far into the process as possible.

We recommend to install an isolation valve at the inlet of the pump to isolate the pump from vacuum distribution and piping system before you do the maintenance.

The discharge air can have temperature up to 120 °C (248 °F), make sure that the pipes can take this temperature.

The pump has an inlet filter. But depending on the application, an additional inlet filtration upfront the pump can be required.

6.4. Ventilation

Install the inlet grids and the ventilation fan to prevent the recirculation of the cooling air to the inlet grating of the pump. The air velocity to the grids must not be more than 5 m/s.

The maximum air temperature at the intake opening for 3 ph is 46 °C (115 °F) and for 1 ph is 32 °C (90 °F), (minimum 0 °C / 32 °F).

The ventilation alternative 1 and 3:
The necessary ventilation to limit the pump room temperature is calculated from:

$Qv = SF * Pnom / (1.21 * dT)$

Where,

Qv = necessary cooling air flow (m^3/s)

SF= Service factor of motor

Pnom = Nominal motor power of the pump (kW)

dT= Temperature increase in the pump room (°C)

Ventilation alternative 2 and 4:
The fan capacity should match the pump-fan capacity at a pressure head equal to the pressure drop caused by cooling air ducts.

Maximum permitted pressure drop in ducting before or after the pump = 10 Pa.

Refer to instruction 9820726229 for inlet and outlet related options.

Outdoor/altitude operation

The pumps are designed according to the IP2X classification. The electrical cabinet and motor are designed according to the IP54 classification. If the pump is installed outdoors, special precautions must be taken. Contact us.

The pumps can only be used in temperatures above 0 °C (+32 °F). If frost occurs, take applicable protective steps to prevent damage to the pump and its ancillary equipment. In this case, contact us.

If it is necessary to operate the pump at more than 1000 m (3300 ft), contact us.

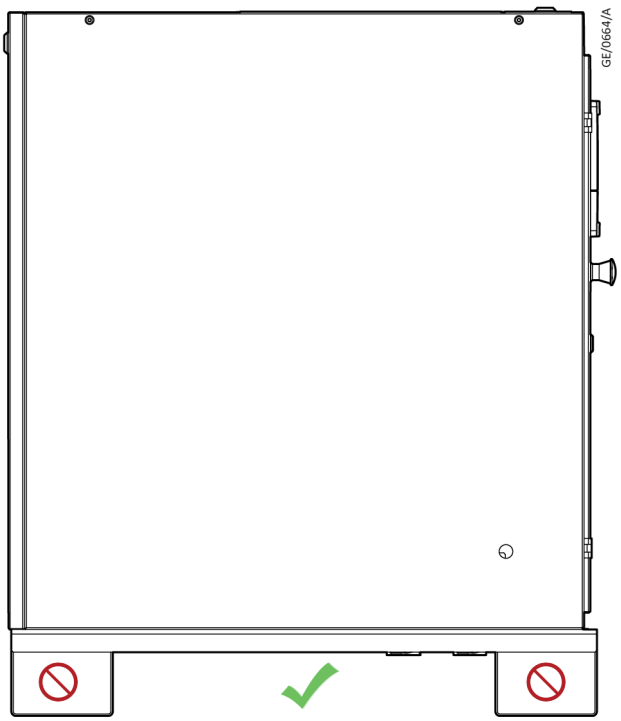
6.5. Position the pump

WARNING: HEAVY OBJECT

Risk of injury and damage to the equipment. Do not lift the pump if the external body (canopy) parts or lifting supports are not fully installed. When the pump is being lifted, do not stand below the load or do maintenance.

- Use correct lifting equipment (fork-lift truck or pallet truck) to move the pump on its pallet, near to the installation area.
- The pumps can be moved by a lift truck using the slots in the frame.
- Lift the pump vertically.
- Carefully lift the pump without twisting.
- Before lifting, install the transport securing bolts.
- Make sure that the forks extend to the other side of the frame.
- The pumps can also be lifted after you insert beams in the slots.
- Make sure that the beams do not slide and extend uniformly from the frame.
- Hold the chains parallel to the bodywork by the chain spreaders to prevent damage to the pump.

Figure 11 Lifting slots



6.6. Acclimatization

CAUTION: MOISTURE FORMATION

Risk of damage to equipment. To prevent moisture that can damage the electrical components, make sure that a minimum of 2 hours of acclimatization is done before you start the pump.

When you move the pump to the installation room, condensation can occur on some components. Make sure that the pump is left idle for minimum 2 hours to adjust in the installation room condition.

6.7. Electrical connections

CAUTION: NETWORK CONNECTIONS

Risk of injury. Take special safety precautions when you use the machines controlled by a frequency converter. The safety precautions depend on the type of network used (TN, TT, IT system). Contact us for information.

Most pumps are designed for use in TT/TN networks and are intended for an industrial environment where the electrical supply is separated from the residential/ commercial supply network.

To use the pump in light industrial, commercial or residential environments with a shared supply network, or in an IT network, extra precautions are necessary. Contact us for information.

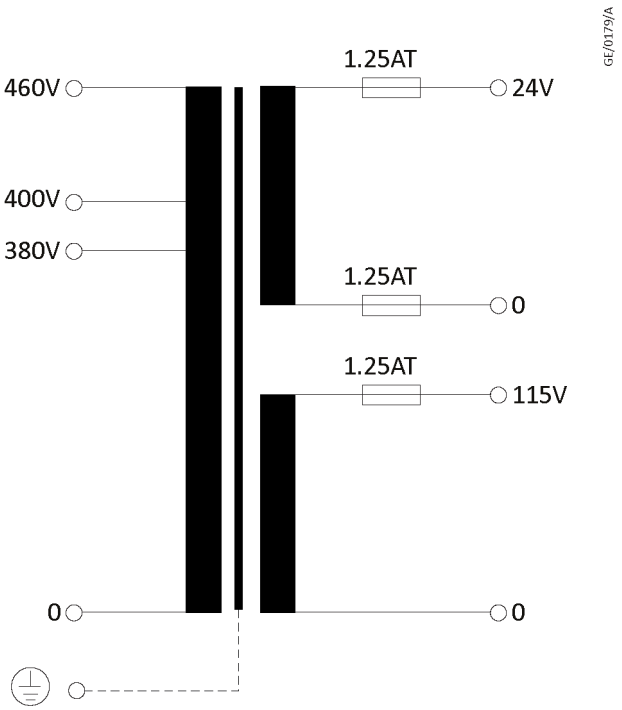
Note:

You can find the correct position for the electrical connection on the dimension drawings.

A correct cable gland must be used when the supply cable is connected to the pump. This will give the necessary protection to the electrical cubicle and its components from dust.

1. Install an isolating switch.
2. Check that the motor cables and wires in the electric cabinet are connected to their terminals.
3. Check the fuses. Refer to Electrical cable size on page 30.
4. Connect the power supply cables to the terminals (1, 3 and 5).
5. Connect the earth conductor to the earth bolt.

380 V or 460 V supply



Install the transformer bridge on the primary winding side of the transformer, installed in the electrical cubicle, as shown on the transformer (also shown here) for the applicable supply voltage. Initially, the pumps have 400 V supply voltage setting.

Pump control modes

Refer to Control mode selection.

The control modes that follows can be selected:

- Local control: The pump accepts the command signals from the control panel. It also accepts the start and stop command signals from the Clock function, if programmed and set to on.
- Remote control: The pump accepts the command signals from the external switches (remote control). It also accepts the command signals from the emergency stop, start and stop command signals from the clock function.
- LAN control: The pump is controlled through a local network. Contact us.

Note:

Modifications must be approved by us.

Stop the pump and switch off the voltage before external equipment is connected.

Only potential-free contacts are permitted.

Pump status indication

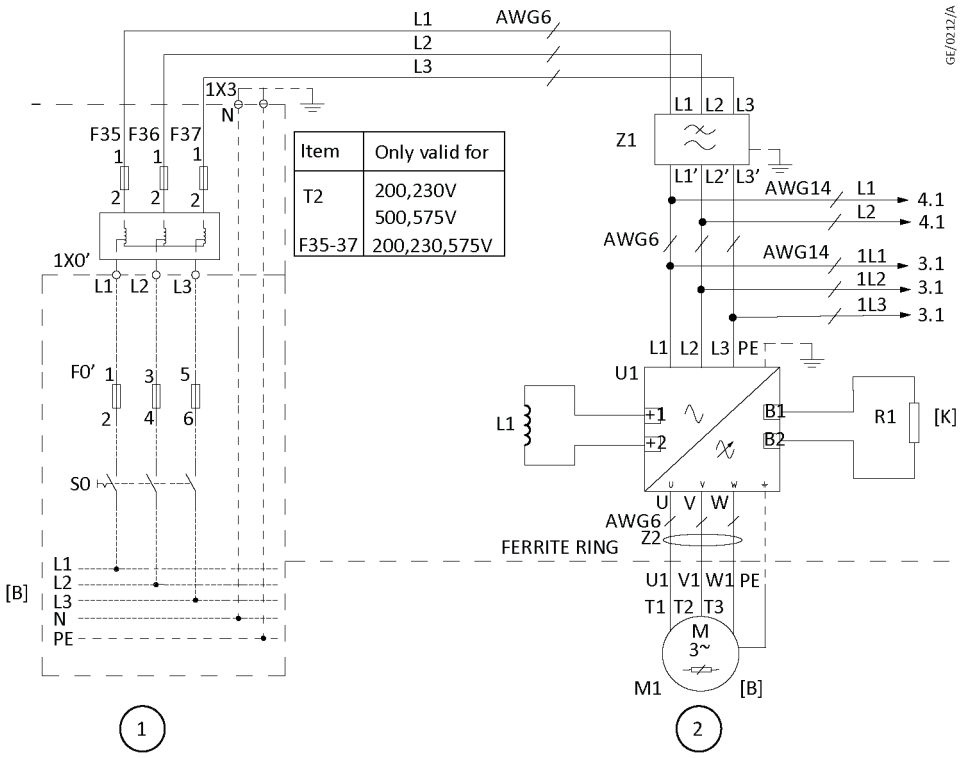
The controller has a potential-free auxiliary NO contacts (NO = normally open) (K07, K08 and K09) for the remote indication of:

- Manual or automatic operation (K07)
- Warning condition (K08)
- Shutdown condition (K09)

Maximum contact load: 10 A / 250 V a.c.

Stop the pump and set the voltage to off before you connect the external equipment. Contact us.

Figure 12 Service diagram

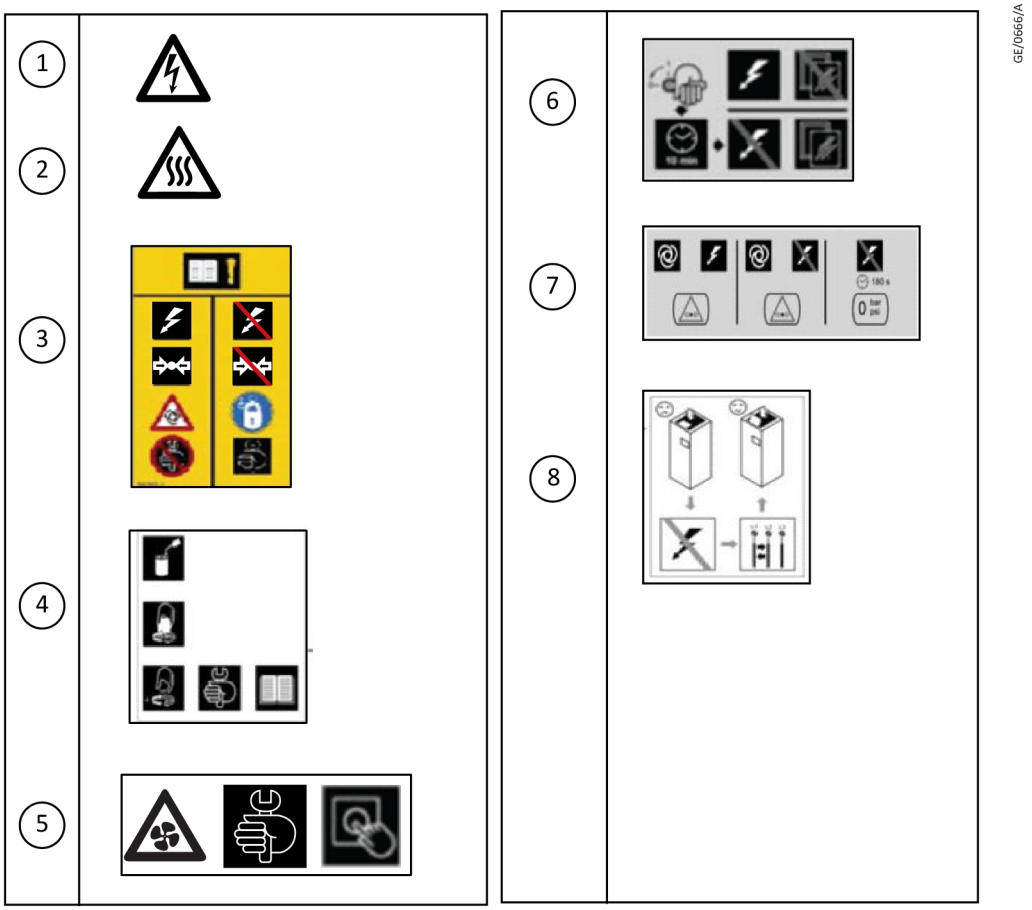


1. *Customer's installation*
2. *Pump motor*

You can find the electrical diagram in the electric cabinet.

6.8. Pictographs

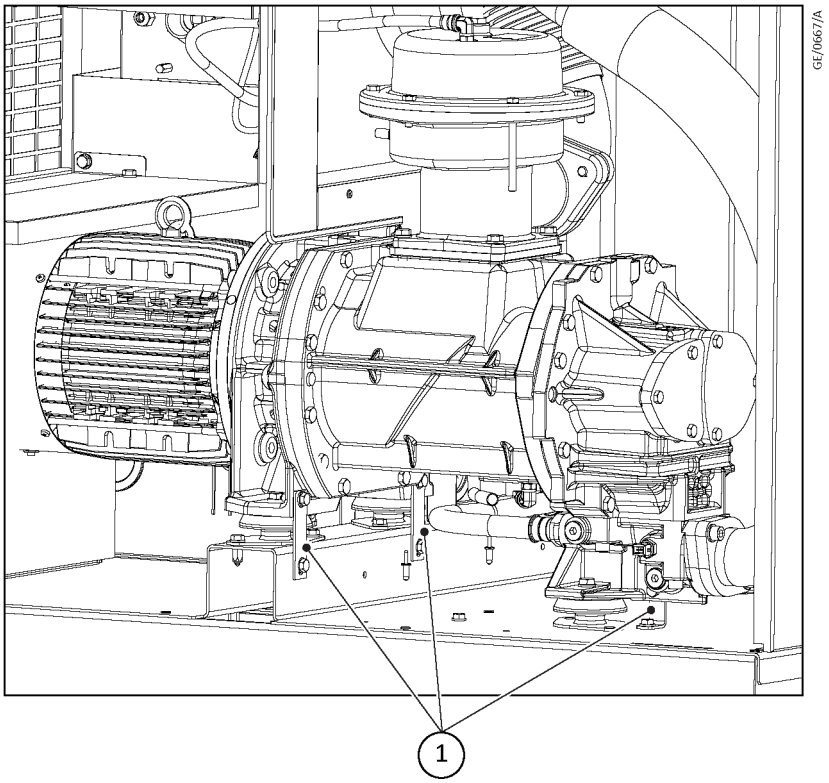
Figure 13 Pictographs



1. *Warning, voltage*
2. *Warning, hot surface*
3. *Set the voltage to off and depressurise the pump before you start the maintenance or repair.*
4. *Lightly apply oil to the gasket of the oil filter, install it and tighten by hand (approximately half a turn)*
5. *Stop the pump before the coolers are cleaned.*
6. *Set the voltage to off and wait for 10 minutes before the maintenance is started.*
7. *Pump remains pressurised for 180 seconds after you switch off the voltage.*
8. *If the rotation direction is wrong, open the isolating switch in the voltage supply line and reverse the two incoming electric lines.*

7. Operation

Figure 14 Initial start-up

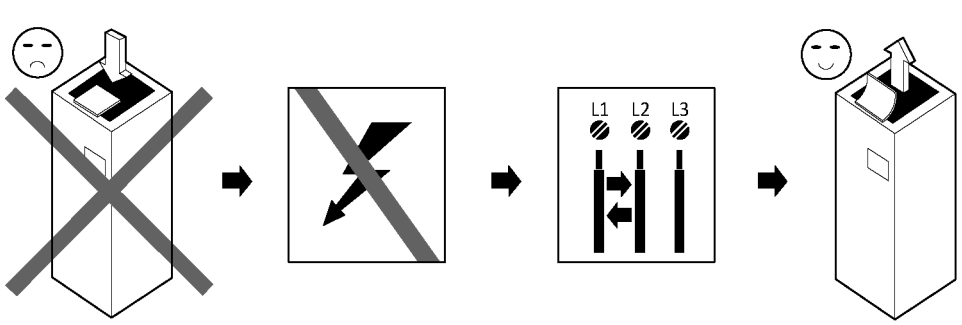


1. *Transport spacers*

7.1. Initial start-up

1. The operator must obey all relevant safety precautions.
2. Remove the external body (canopy) panels to get access to the internal components.
3. Remove the red transport spacers and the related bolts below the element, coupling housing and oil separator tank.
4. Make sure that the electrical connections correspond to the local codes and that all wires are clamped tight to their terminals.
5. The installation must be earthed and protected against short circuits by fuses of the inert type in all phases. Install an isolating switch near the pump.
6. If electrical connections of motor, fan or converter have been disconnected, always check the rotation direction.
7. Check that the process lines are of correct size to prevent high pressure drop and for cleanliness to protect the pump. Also check for leaks.
8. Make sure that the pump outlet is not blocked.
9. Install the inlet isolation valve. Refer to Installation on page 39 for the position of the valve.
10. Close the valve.
11. Connect the inlet pipework to the valve.
12. Check the oil level. The oil level must reach the top of the oil sight glass.

13. If necessary, fill the oil through the oil filler plug.
14. Make sure that no dirt enters the oil system.
15. Provide labels, warnings as follows:
    - The pump can automatically restart after a voltage failure (if ARAVF is activated, contact us).
    - The pump is automatically controlled and can be automatically restarted.
    - The pump can be remotely controlled.



16. Check the programmed settings.
17. Close the isolation valve.
18. Start and operate the pump for a few minutes. Check that the pump operates normally.
    - To check the rotation direction of the motor, examine the direction of the motor fan.
    - Check the rotation of the fan for air cooler (when applicable).
19. Open the inlet isolation valve.

7.2. Start the pump

To start the pump do the steps that follow:

1. Set the electrical supply to on.
2. Make sure that the voltage on LED illuminates.
3. Push the start button on the control panel. The pump operates and the automatic operation LED illuminates.
4. Open the inlet isolation valve.

7.3. During operation

WARNING: OPERATION SAFETY

Risk of injury or damage to equipment. Do not operate the pump with the enclosure panels removed.

Note:

When the automatic operation LED is on, the pump can start automatically.

When the automatic operation LED is on, the controller controls the pump, for example, to load, stop and restart the motors.

Regularly check the oil level during the operation.

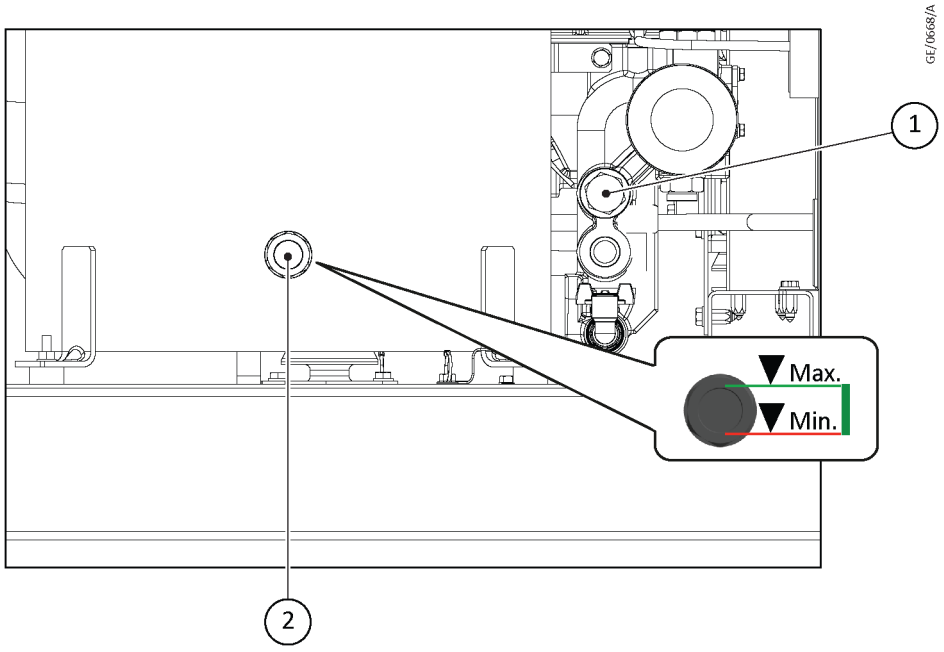
A few minutes after the pump is stopped the oil level should touch the top of the oil sight glass.

If the oil level is too low:

1. Wait until the pump has vented.
2. Push the emergency stop button to prevent the pump from starting unexpectedly.
3. Close the inlet isolation valve.
4. Remove the oil filler plug.
5. Add oil until the oil level touches the top of the oil sight glass.
6. Install and tighten the plug.
7. Unlock the emergency stop button.
8. Select the STOP icon on the display and push reset before you restart.

Check the display

- Regularly check the display for readings and messages.
- The display shows the vacuum pressure of the pump, and the different icons show the status of the pump.
- If the alarm LED is lit or flashes, correct the fault.
- The display will show a service message:
  - If a service plan interval is exceeded, or
  - If a service level for a monitored component has been exceeded.
- Do the service actions of the shown plan or replace the component and reset the timer.



1. *Oil filler plug*
2. *Oil sight glass*

7.4. Stop the pump

To shutdown the pump do the steps that follow:

1. Push the stop button. The automatic operation LED flashes and the pump stops.
2. To stop the pump if there is an emergency, push the emergency stop button. An alarm LED flashes.
3. Correct the problem.
4. Pull the button to unlock it.
5. Use the Scroll keys to move the cursor to the Stop icon.
6. Push the Enter key.
7. Push Reset icon.
8. Close the air inlet valve.
9. Set the voltage to off.

Note:

Do not use the emergency stop button to stop the pump unless there is an emergency.

7.5. Taking out of operation

1. Set the electrical supply to off.
2. Shut off and vent the system connected to the pump.
3. To vent the system connected to the pump, open the plug given on the lid of the air inlet filter.
4. Isolate the pump from the vacuum system.
5. Drain the oil.

8. Maintenance

8.1. Preventive maintenance schedule

WARNING: MAINTENANCE SAFETY

Risk of injury or damage to equipment. The operator must obey the safety precautions. Only approved personnel trained by us is permitted to do the maintenance.

WARNING: HIGH VOLTAGE CAPACITOR

Risk of injury or damage to equipment. Dangerous high voltage remains on the capacitors of the start and the speed regulation unit for some minutes after the current supply is off. Wait for minimum 10 minutes before you start the electrical repairs.

Before the maintenance, repair or adjustments, do the steps as follows:

1. Stop the pump.
2. Close the air inlet valve.
3. Push the emergency stop button.
4. Set the current supply to off.
5. Open the plug and make sure that the pump is open to the air.
6. Make sure that the pump system is at atmospheric pressure level.
7. Lockout - Tagout (LOTO): Open the power isolation switch and lock it with a personal lock. Tag the power isolation switch with the name of the service technician.
8. Make sure that the power supply is set to off and disconnected.

Warranty - Product liability

Use only approved parts. The damage or malfunction caused by the use of the parts that are not approved is not covered in the warranty or product liability.

Service kits

To do an overhaul or a preventive maintenance, service kits are available. Refer to Service kits on page 62.

Service contracts

We offer different types of service contracts, to relieve you of all preventive maintenance work. Contact our customer centre.

General

Replace the O-rings and washers that are removed during servicing.

Intervals

- Our local customer centre can overrule the maintenance schedule, specially the service intervals, depend on the environmental and working conditions of the pump.
- Include the shorter interval checks and the longer interval checks.
- The service plans are shown for the pump with the controller.
- Each plan has a programmed time interval in the plan for the service actions.
- When you reach the interval, a message is shown on the screen that shows which service plans are permitted.
- After servicing, reset the intervals.

Depending on the process and the machine room specifications, the pump conditions are defined as normal, medium or harsh for your application. These pump conditions have a dedicated service requirements and they are dependent on the used oil type. For more information and service plan, contact your pump manufacturer to guarantee your warranty or product liability coverage in line with the used oil of your pump manufacturer.

Table: Preventive maintenance schedule shows the intervals for a normal application with synthetic oil, the service visits are programmed in the controller.

Table 11 Preventive maintenance schedule

Action	Type		
	Normal	**Medium**	**Harsh**
Check the oil level and condition	Daily	Daily	Daily
Drain outlet collector			
Check readings on the display			
Remove the air filter elements and inspect	Monthly	Monthly	Weekly
Replace damaged or heavily contaminated elements			
Check for possible air and oil leakages			
Check coolers, clean if necessary	3-Monthly	3-Monthly	3-Monthly
Check the filter elements of the electric cabinet. Replace if necessary			
Check the silencer of the vacuum control valve, clean if necessary			

Action	Type		
	Normal	Medium	Harsh
Replace the air filter elements	4000 hours*	2000 hours*	1000 hours*
Clean the scavenge line and blow out the restriction nozzle			
Clean the coolers			
Check the pressure and temperature readings			
Check the operation of the cooling fans of the converter and clean heat sink			
Check the vacuum control solenoid valve and the gas ballast solenoid valve			
Check and clean the cooling fan assembly			
Regreasing of motor bearings			
Change the synthetic oil**	8000 hours†	6000 hours†	4000 hours†
Change the oil filter (for synthetic oil)			
Replace the oil separator elements			
Replace the filter element of electric cabinet			
Replace the thermostatic valve			
Test the pressure switch			
Carry out a LED/display test			
Motor overhaul	24000 hours	24000 hours	24000 hours
Replace membrane of vacuum control valve			
Change lip seal assembly			
Replace the tubes			
Element overhaul for the synthetic oil‡			
Working pressure, P ≥ 300 mbar(a)	96000 hours	72000 hours	64000 hours
Working pressure, P ≥ 200 mbar(a)	72000 hours	60000 hours	48000 hours
Working pressure, P < 200 mbar(a)	64000 hours	48000 hours	36000 hours

* Or yearly, whichever comes first.

† Or every 2 years, whichever comes first.

** In medium and harsh applications, an optional 500 hours oil sample is recommended.

‡ Based on the oil temperature of 90 °C. For more information contact us. For high water handling capability option, always use synthetic oil and harsh service intervals.

The given service exchange intervals are correct for the standard operating conditions (refer to Reference condition and limitations on page 27) and nominal operating pressure (refer to Vacuum pump data on page 27).

Shorter service exchange interval can be necessary for:

- exposure of the pump to external pollutants
- operation at high humidity with low duty cycles
- operation at higher temperatures.

Contact us if in doubt.

Note:

The pumps with optional high water handling capability (humid version) are recommended to use with our vacuum synthetic fluid only.

8.2. Oil specification

Note:

Do not mix lubricants of different brands or types as they can possibly not be compatible and the oil mix will have inferior properties. A label, showing the type of oil filled ex-factory, is given on the air receiver/oil tank.

We recommend to use genuine vacuum lubricants supplied by manufacturer. They are the result of years of field experience and research. Refer to Preventive maintenance schedule on page 52 for the applicable replacement intervals. Refer to spare parts list for the part number information.

Vacuum fluid basic

The vacuum fluid basic is a mineral fluid specially developed lubricant for use in single stage oil-sealed screw pumps. Its specific composition keeps the pump in excellent condition. The vacuum mineral fluid can be used for the pumps that operates at the ambient temperatures between 0 °C (32 °F) and 40 °C (104 °F). If the pump regularly operates in the ambient temperatures above 35 °C (95 °F), the oil lifetime decreases significantly. In such case, use our vacuum synthetic fluid for a longer interval for oil exchange.

If the pump regularly operates in the ambient temperatures more than 35 °C (95 °F), the oil lifetime decreases.

Vacuum fluid premium and ultra

The vacuum fluid premium and ultra are high quality synthetic lubricant for oil-sealed screw pumps which keeps the pump in excellent condition. Because of its excellent oxidation stability, vacuum synthetic fluid can be used for the pumps that operates at the ambient temperatures between 0 °C (32 °F) and 46 °C (115 °F).

If the pump regularly operates in the ambient temperatures more than 40 °C (104 °F), the oil lifetime decreases.

Vacuum fluid FG (food grade)

The vacuum fluid FG is a special oil, delivered as an option.

The vacuum fluid FG is a unique high-quality synthetic lubricant, specially created for oil-sealed screw pumps for the food industry. This lubricant keeps the pump in excellent condition. The vacuum food grade fluid can be used for the pumps that operates at the ambient temperatures between 0 °C (32 °F) and 40 °C (104 °F).

If the pumps regularly operates in the ambient temperatures more than 35 °C (95 °F), the oil lifetime decreases.

Note:

For oil lifetime, refer to Preventive maintenance schedule on page 52.

8.3. Drive motor

Bearing maintenance

Recommended grease:

Use 2901033813 Amber

Variant	Quantity
MSV007	6.9 g (0.24 oz) per bearing
MSV010	7.2 g (0.25 oz) per bearing
MSV015	
MSV020	

Note:

Only use the amount of grease specified.

Do not mix the greases of different brands or types.

8.4. Air filter

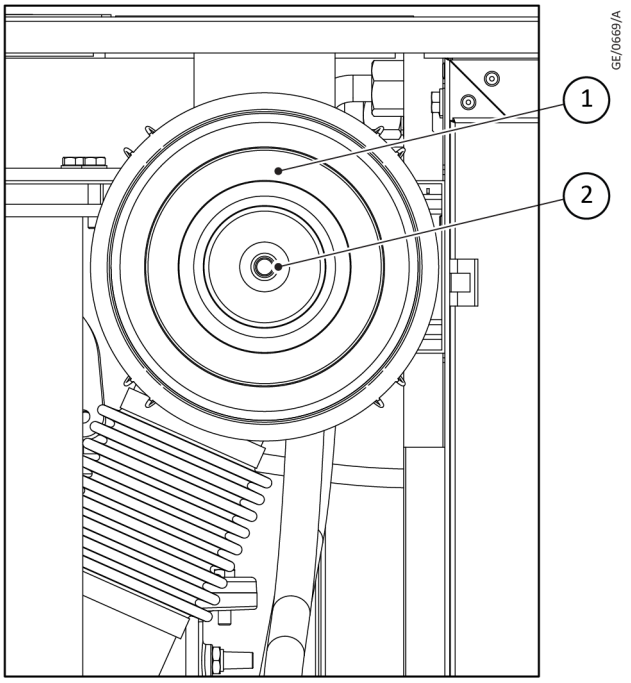
Refer to Figure: Air filter. To change the air filter, do the steps that follows:

1. Stop the pump.
2. Set the voltage to off.
3. Vent the pump by opening the plug on the lid of the air inlet filter.
4. Remove the cover of the air filter.
5. Remove the filter element.
6. Install the new filter element.
7. Install the cover of the air filter.
8. Set the air filter service warning again.

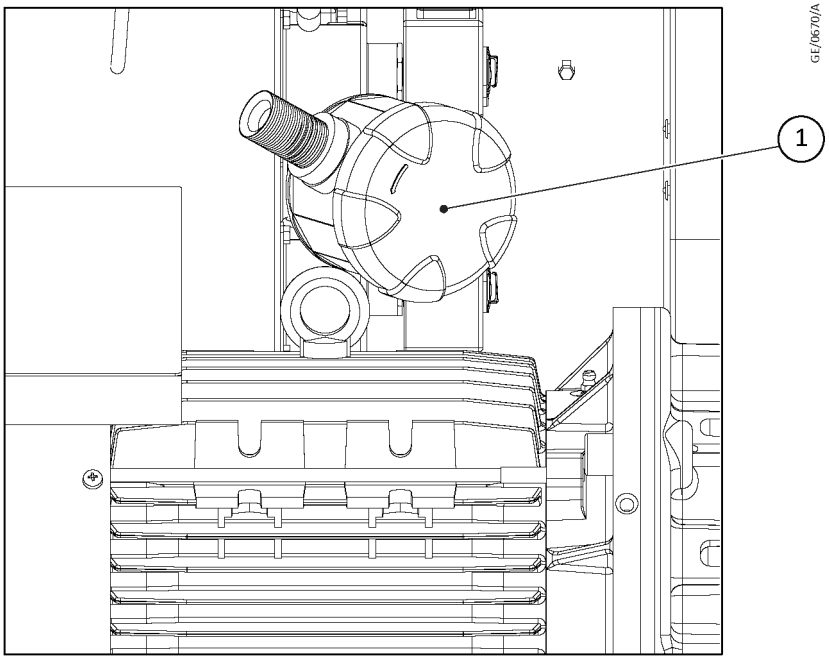
Note:

When you install the air filter element, make sure that the seal is in good condition.

Figure 15 Air filter



1. *Air filter* 2. *Plug*



1. *Air filter*

8.5. Oil and oil filter change

WARNING: OIL CONTAMINATION

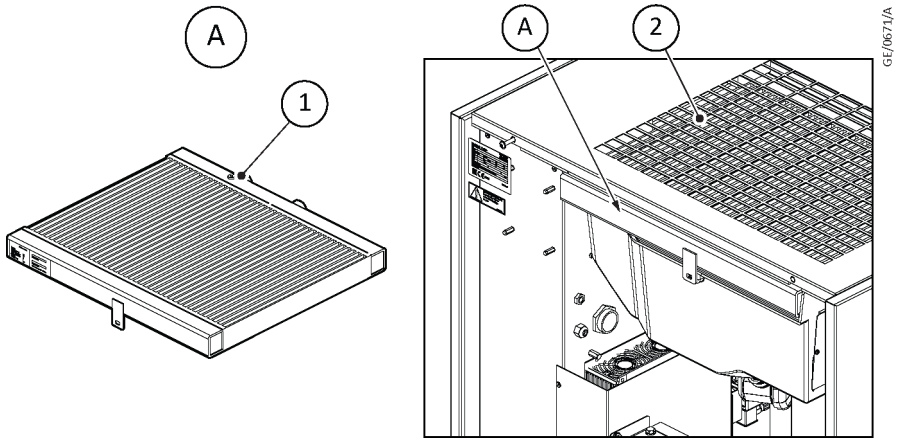
Risk of damage to equipment. Always drain the pump oil at all drain points. Used oil that is not drained from the pump can contaminate the oil system and can decrease the lifetime of the new oil.

Note:

Do not mix lubricants of different brands or types as they can possibly not be compatible and the oil mix will have inferior properties. A label, showing the type of oil filled ex-factory, is given on the air receiver/oil tank.

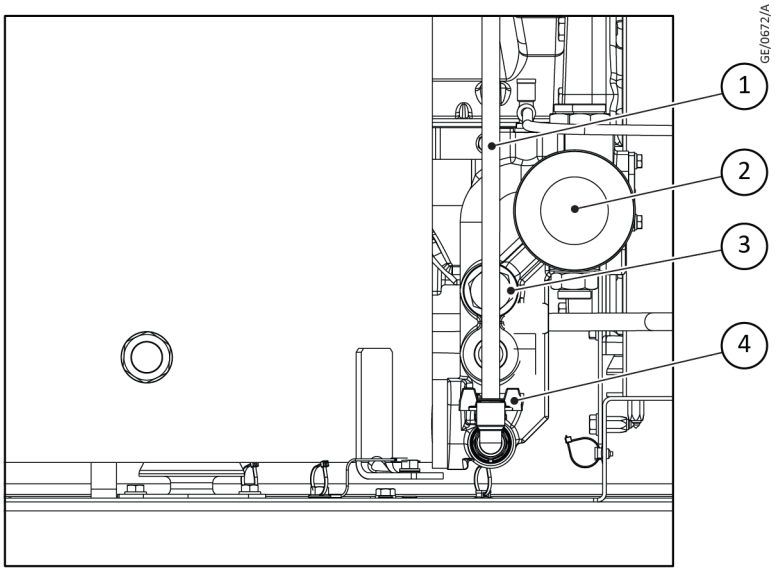
To replace the oil and oil filter, do the steps that follows:

1. Operate the pump until warm and stop the pump.
2. Close the air inlet valve.
3. Set the voltage to off.
4. Vent the pump by opening the plug on the cover of the air inlet filter.
5. Remove the vent plug of the oil cooler.



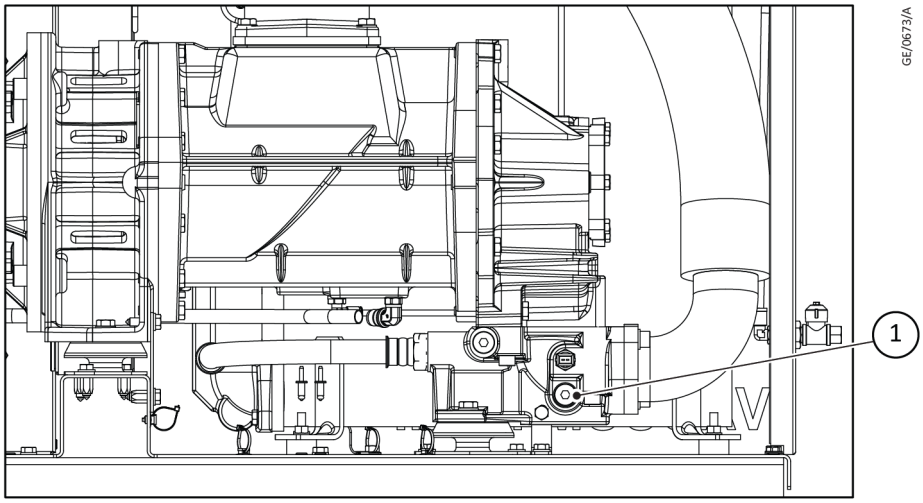
1. Vent plug
2. Oil cooler

6. Open the oil drain valves. Hold the oil drain hose downward to drain the oil.



1. Oil drain hose
2. Oil filter
3. Filler plug
4. Oil drain valve

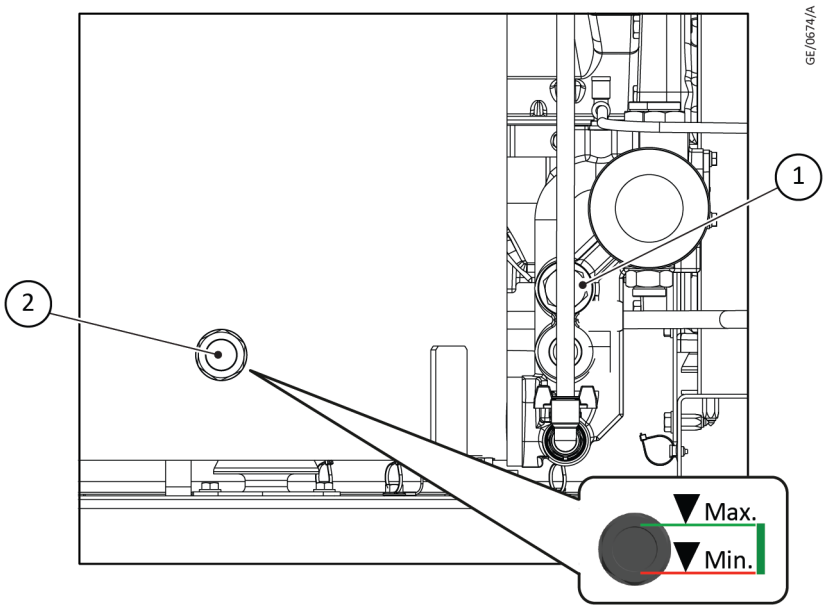
7. Collect the oil in a collector and deliver it to the local collection service.
8. Install the vent plugs after the oil is drained.
9. Close the oil drain valves.
10. Clean the seat on the manifold.
11. Lubricate the gasket of the new oil filters.
12. Install the gasket of the new oil filters. Tighten them firmly by hand.



1. Drain plug

13. Remove the drain plug in the outlet element housing and drain the oil from the pump element and outlet housing.
14. Collect the oil in a collector and deliver it to the local collection service.
15. Install the vent plugs after the oil is drained.
16. Remove the filler plug.

17. Fill the oil separator vessel with oil until the level reaches the top of the oil sight glass.



1. Oil filler plug
2. Oil sight glass

18. Make sure that no dirt enters into the system.
19. Install the filler plug.
20. Operate the pump for a few minutes.
21. Stop the pump.
22. Close the air inlet valve.
23. Set the voltage to off.
24. Wait for a few moments for the pump to vent the vessel.
25. Turn the oil filler plug by one turn to remove the remaining pressure in the pump.
26. Fill the oil separator tank with oil until the level reaches the top of the oil sight glass. Refer to Operation on page 48 and During operation on page 50.
27. Install the filler plug.
28. When the oil level is too low, go back to step 16.

8.6. Coolers

CAUTION: LOOSE PARTS

Risk of damage to equipment. Remove the loose parts that are used as a cover after the maintenance on the fan and on the coolers.

Note:

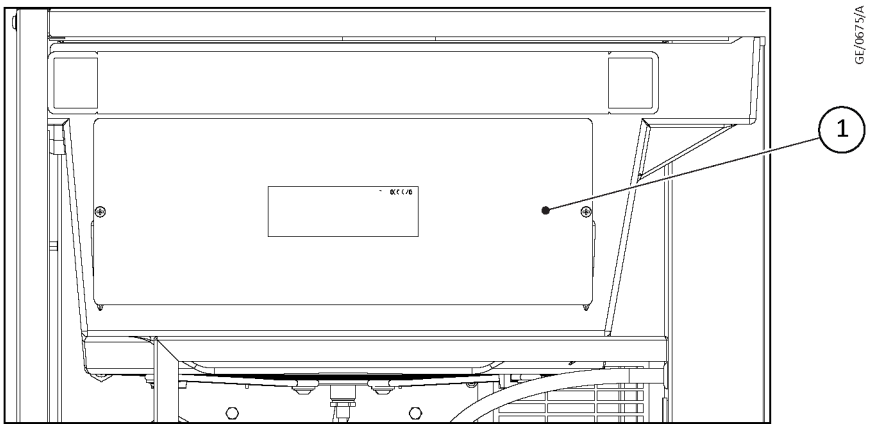
Keep the coolers clean to maintain their efficiency.

To replace the cooler, do the steps that follow:

1. Stop the pump.
2. Set the air inlet valve to off.

3. Set the voltage to off.
4. Cover all the parts under the coolers.
5. Remove the service plate at the fan compartment.
6. Remove the dirt from the coolers with a fibre brush. Brush in the direction of the cooling fins.
7. Clean with an air jet in the reverse direction to normal flow.
8. If it is necessary to wash the coolers with a cleaning agent, contact us.
9. Install the service plate at the fan compartment.

Figure 16 Coolers



1. *Service plate*

8.7. Oil separator change

CAUTION: INSTALLATION SAFETY

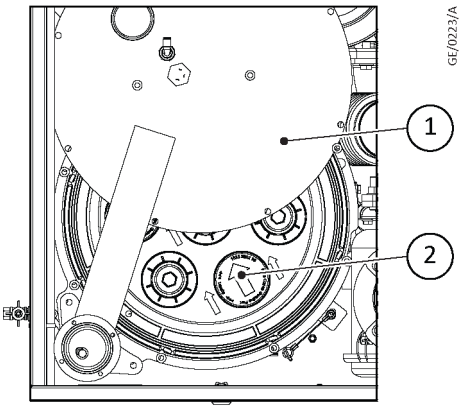
Risk of injury or damage to equipment. Make sure all separator elements are installed in the correct position. An arrow is given on the cover of the separator elements and at the bottom of the shield. All arrows must point in the same direction after the installation.

To remove the oil separator:

1. Stop the pump.
2. Close the isolation valve.
3. Set the voltage to off.
4. Wait for a few moments for the pump to vent the vessel.
5. Open the service panels.
6. Remove the bolts of the cover of the oil separator tank.
7. Slide the cover of the oil separator tank to the rear side.
8. Remove the oil separator elements by turning one quarter counter-clockwise.
9. Clean the seat on the shield.
10. Lubricate the gasket of the new oil separator using the pump oil.
11. Install the gasket of the new oil separator and tighten them firmly by hand.
12. Slide the cover of the oil separator tank back in the position. Make sure not to squeeze the O-ring.

13. Install the bolts.

Figure 17 Oil separator change



1. *Oil separator tank cover*
2. *Oil separator elements*

8.8. Pressure switch

CAUTION: PRESSURE SWITCH

Risk of damage to equipment. Adjustments are not permitted. Do not operate the pump without the pressure switch.

Note:

The pressure switch test can only be done by the authorised personnel and is protected by a security code.

If the pressure switch does not open at the set pressure of 1500 mbar (a), replace the pressure switch.

8.9. Service kits

For overhaul and for the preventive maintenance, a wide range of service kits are available. The service kits have the necessary parts to service the components of the pump and offer the benefits of our genuine parts with a low maintenance budget.

A full range of tested lubricants are available to keep the pump serviceable and in a good condition.

Refer to the spare parts list for the part numbers.

9. Fault finding

WARNING: HIGH VOLTAGE

Risk of injury or damage to equipment. Wait for 10 minutes before you start electrical repairs as dangerous high voltage remains on the capacitors of the start and speed regulation unit for several minutes after you set the voltage to off.

Before you do maintenance, repair work or adjustment, stop the pump. Close the isolation valve and wait for 3 minutes.

The operator must obey all relevant safety precautions.

Push the emergency stop button and set the voltage to off.

Vent the pump by opening the plug on the cover of the air inlet filter. For location of components, refer to:

Installation on page 39

Operation on page 48

Maintenance on page 52

Open and lock the isolating switch.

Lock the air inlet valve during the maintenance and repair.

Table 12 Error codes

Error code	Fault	Remedy
LLP-Interface.PROCESS.0x00000101	Emergency stop	Release Emergency stop button and reset the alarm
LLP-Interface.PROCESS.0x00000102	High element outlet temperature failure	Check remedy on user interface
LLP-Interface.PROCESS.0x00000103	High element outlet temperature warning	Check remedy on user interface
LLP-Interface.PROCESS.0x00000104	Inlet pressure sensor failure	Check remedy on user interface
LLP-Interface.PROCESS.0x00000105	Inlet pressure sensor warning	Check remedy on user interface
LLP-Interface.PROCESS.0x00000106	AI_E4_0_20mA failure	Check remedy on user interface
LLP-Interface.PROCESS.0x00000107	AI_E4_0_20mA warning	Check remedy on user interface
LLP-Interface.PROCESS.0x00000108	High outlet pressure failure	Check remedy on user interface
LLP-Interface.PROCESS.0x00000109	Fan circuit breaker warning	Check remedy on user interface
LLP-Interface.PROCESS.0x00000110	Lower pump performance because of high motor current	Check remedy on user interface

Error code	Fault	Remedy
LLP-Interface.PROCESS.0x00000113	Outlet pressure sensor warning	Check remedy on user interface
LLP-Interface.PROCESS.0x00000114	Outlet side is under vacuum	Check remedy on user interface
LLP-Interface.PROCESS.0x00000117	Accurate pressure sensor warning	Check remedy on user interface
LLP-Interface.PROCESS.0x00000120	Advanced pump down optimization option active	No action needed
LLP-Interface.PROCESS.0x00000122	AI_E2_0_20mA failure	Check remedy on user interface
LLP-Interface.PROCESS.0x00000123	AI_E2_0_20mA warning	Check remedy on user interface
LLP-Interface.PROCESS.0x00000124	External DI failure	Check remedy on user interface
LLP-Interface.PROCESS.0x00000125	High outlet pressure warning	Check remedy on user interface
LLP-Interface.SYSTEM.0x00000001	Initialisation of hardware failed	Contact us
LLP-Interface.SYSTEM.0x00000002	Invalid state machine	Contact us
LLP-Interface.SYSTEM.0x00000003	Response was skipped as there was not enough free space in output buffer	Contact us
LLP-Interface.SYSTEM.0x00000004	Failed to read frame data (type:, requestId:, dataSize:)	Contact us
LLP-Interface.SYSTEM.0x00000005	Frame checksum mismatch (type:, requestId:, dataSize:, frameChecksum:, calculatedChecksum:)	Contact us
LLP-Interface.SYSTEM.0x00000006	Component with idx not found!	Contact us
LLP-Interface.SYSTEM.0x00000007	Property idx not found in component idx	Contact us
LLP-Interface.SYSTEM.0x00000008	Unknown property type:	Contact us
LLP-Interface.SYSTEM.0x00000009	"Start/Stop" button pressed	Message for system monitoring
LLP-Interface.SYSTEM.0x0000000a	"Switch mode" button pressed	Message for system monitoring
LLP-Interface.SYSTEM.0x0000000b	"Switch control location" button pressed	Message for system monitoring
LLP-Interface.SYSTEM.0x0000000c	"Reset failure" button pressed	Message for system monitoring
LLP-Interface.SYSTEM.0x0000000d	Unknown command source:	Contact us

Error code	Fault	Remedy
LLP-Interface.SYS-TEM.0x0000000e	Modbus not ready	Contact us
LLP-Interface.SYS-TEM.0x0000000f	Component does not define properly	Contact us
LLP-Interface.SYS-TEM.0x00000010	Failed to read from EEPROM	Contact us
LLP-Interface.SYS-TEM.0x00000011	Failed to write to EEPROM	Contact us
LLP-Interface.SYS-TEM.0x00000012	Service will be needed soon	Contact us
LLP-Interface.SYS-TEM.0x00000013	Service is needed	Contact us
LLP-Interface.SYS-TEM.0x00000014	The system requires more storage blocks than available. Not all settings will be saved	Contact us
LLP-Interface.SYS-TEM.0x00000015	The system requires more storage space than available. Not all settings will be saved	Contact us
LLP-Interface.SYS-TEM.0x00000016	Firmware upgrade has been initiated. The controller will reboot in 1 s time.	Contact us
LLP-Interface.SYS-TEM.0x00000017	EEPROM size is too small to hold all storage data. Storage has been disabled	Contact us
LLP-Interface.SYS-TEM.0x00000018	EEPROM cache size is too small to hold all storage data. Storage has been disabled	Contact us
LLP-Interface.SYS-TEM.0x00000019	State machine changed from a to b after x seconds	Message for system monitoring
LLP-Interface.SYS-TEM.0x0000001a	EEPROM has been rebuilt	Contact us
LLP-Interface.SYS-TEM.0x0000001b	Factory reset - restored default controller settings	Adapt settings when defaults does not fit your process requirements
LLP-Interface.SYS-TEM.0x0000001c	SYSTEM MISCONFIGURED State machine disabled	Perform factory reset. Contact us when issue reoccurs
LLP-Interface.SYS-TEM.0x0000001d	No communication with HLP	Contact us
LLP-Interface.SYS-TEM.0x0000001e	Found blocks with duplicated name hashes, so not all values will be properly restored	Contact us
LLP-Interface.SYS-TEM.0x0000001f	Mode limit reached, so modes have been ignored	Remove modes before creating new ones

Error code	Fault	Remedy
LLP-Interface.SYS-TEM.0x00000020	Mode property limit for mode reached, so properties have been ignored	Remove settings in modes before adding new ones
LLP-Interface.SYS-TEM.0x00000021	System age has been reset. All system age related coun-ters have been reset	Contact us
LLP-Inter-face.dOut_E1.0x10a9b800	Active function code {U16:0} is not in range	Contact us
LLP-Inter-face.dOut_E1.0x10a9b801	Reached limit of available function codes	Contact us
LLP-Interface.relay7.0x10a9b800	Active function code {U16:0} is not in range	Contact us
LLP-Interface.relay7.0x10a9b801	Reached limit of available function codes	Contact us
LLP-Inter-face.dOut_I2.0x10a9b800	Active function code {U16:0} is not in range	Contact us
LLP-Inter-face.dOut_I2.0x10a9b801	Reached limit of available function codes	Contact us
LLP-Inter-face.dOut_E2.0x10a9b800	Active function code {U16:0} is not in range	Contact us
LLP-Inter-face.dOut_E2.0x10a9b801	Reached limit of available function codes	Contact us
LLP-Inter-face.dOut_E3.0x10a9b800	Active function code {U16:0} is not in range	Contact us
LLP-Inter-face.dOut_E3.0x10a9b801	Reached limit of available function codes	Contact us
LLP-Inter-face.dOut_I1.0x10a9b800	Active function code {U16:0} is not in range	Contact us
LLP-Inter-face.dOut_I1.0x10a9b801	Reached limit of available function codes	Contact us
LLP-Inter-face.dOut_I3.0x10a9b800	Active function code {U16:0} is not in range	Contact us
LLP-Inter-face.dOut_I3.0x10a9b801	Reached limit of available function codes	Contact us
LLP-Interface.mainInvert-er.0xa9025a00	Slave Id {U8:0} is wrong	Contact us
LLP-Interface.mainInvert-er.0xa9025a01	Modbus error {X32:0}	Contact us
LLP-Interface.mainInvert-er.0xa9025a02	RampUp speed is not in range	Contact us
LLP-Interface.mainInvert-er.0xa9025a03	RampDown speed is not in range	Contact us
LLP-Interface.mainInvert-er.0xa9025a04	RampUp minimum speed is greater than maximum	Contact us
LLP-Interface.mainInvert-er.0xa9025a05	RampDown minimum speed is greater than maximum	Contact us

Error code	Fault	Remedy
LLP-Interface.mainInverter.0xa9025a06	Communication between controller and Yaskawa is broken	▪ Check communication cable and reboot ▪ Contact us when it reoccurs
LLP-Interface.mainInverter.0xa9025a07	DC Bus Undervoltage	▪ Check supply voltage ▪ Check input wiring ▪ Check EMC filter
LLP-Interface.mainInverter.0xa9025a08	DC Bus Overvoltage	▪ Check supply voltage ▪ Check input wiring ▪ Check EMC filter
LLP-Interface.mainInverter.0xa9025a09	Heatsink Overheat	Check input wiring
LLP-Interface.mainInverter.0xa9025a0a	Drive Overheat Warning	Check EMC filter
LLP-Interface.mainInverter.0xa9025a0b	Overtorque 1	▪ Check inlet valve ▪ Check back pressure oil separator vessel ▪ Check drive train ▪ Check oil injection
LLP-Interface.mainInverter.0xa9025a0c	Overtorque 2	▪ Check inlet valve ▪ Check back pressure oil separator vessel ▪ Check drive train ▪ Check oil injection
LLP-Interface.mainInverter.0xa9025a0d	FWD/REV Run Command Input Error	
LLP-Interface.mainInverter.0xa9025a0e	Baseblock	Contact us
LLP-Interface.mainInverter.0xa9025a0f	External Fault (terminal S3)	Check control wiring
LLP-Interface.mainInverter.0xa9025a10	External Fault (terminal S4)	Check control wiring
LLP-Interface.mainInverter.0xa9025a11	External Fault (terminal S5)	Check control wiring
LLP-Interface.mainInverter.0xa9025a12	External Fault (terminal S6)	Check control wiring
LLP-Interface.mainInverter.0xa9025a13	External Fault (terminal S7)	Check control wiring
LLP-Interface.mainInverter.0xa9025a14	External Fault (terminal S8)	Check control wiring
LLP-Interface.mainInverter.0xa9025a15	Internal Fan Fault	Contact us
LLP-Interface.mainInverter.0xa9025a16	Overspeed	Contact us
LLP-Interface.mainInverter.0xa9025a17	Speed Deviation	Contact us

Error code	Fault	Remedy
LLP-Interface.mainInverter.0xa9025a18	PG Disconnect	Contact us
LLP-Interface.mainInverter.0xa9025a19	MEMOBUS/Modbus Communication Err	Contact us
LLP-Interface.mainInverter.0xa9025a1a	Option Communication Error	Contact us
LLP-Interface.mainInverter.0xa9025a1b	Serial Comm Transmission Error	Contact us
LLP-Interface.mainInverter.0xa9025a1c	Motor Overload	▪ Check inlet valve ▪ Check back pressure oil separator vessel ▪ Check drive train ▪ Check oil injection
LLP-Interface.mainInverter.0xa9025a1d	Drive Overloaded	▪ Check inlet valve ▪ Check back pressure oil separator vessel ▪ Check drive train ▪ Check oil injection
LLP-Interface.mainInverter.0xa9025a1e	Option Card External Fault	Contact us
LLP-Interface.mainInverter.0xa9025a1f	Motor Switch during Run	Contact us
LLP-Interface.mainInverter.0xa9025a20	Serial Comm Transmission Error	Contact us
LLP-Interface.mainInverter.0xa9025a21	Undertorque Detection 1	Contact us
LLP-Interface.mainInverter.0xa9025a22	Undertorque Detection 2	Contact us
LLP-Interface.mainInverter.0xa9025a23	MEMOBUS/Modbus Comm Test Mode Err	Contact us
LLP-Interface.mainInverter.0xa9025a24	External 24 V Power Supply Depletion	Contact us
LLP-Interface.mainInverter.0xa9025a25	Motor Overheat (PTC)	▪ Check wiring to motor ▪ Check ambient temperatures ▪ Check cooling unit ▪ Check inlet valve ▪ Check back pressure oil separator vessel
LLP-Interface.mainInverter.0xa9025a26	PID Feedback Loss	Contact us
LLP-Interface.mainInverter.0xa9025a27	Excessive PID Feedback	Contact us
LLP-Interface.mainInverter.0xa9025a28	Drive Disabled	Contact us

Error code	Fault	Remedy
LLP-Interface.mainInverter.0xa9025a29	PG Hardware Fault	Contact us
LLP-Interface.mainInverter.0xa9025a2a	MECHATROLINK Watchdog Timer Err	Contact us
LLP-Interface.mainInverter.0xa9025a2b	Station Address Setting Error (CC-Link, CANopen, MECHATROLINK)	Contact us
LLP-Interface.mainInverter.0xa9025a2c	MECHATROLINK CommCycleSettingErr	Contact us
LLP-Interface.mainInverter.0xa9025a2d	Current Alarm	Contact us
LLP-Interface.mainInverter.0xa9025a2e	Cooling Fan Maintenance Time	Contact us
LLP-Interface.mainInverter.0xa9025a2f	Capacitor Maintenance Time	Contact us
LLP-Interface.mainInverter.0xa9025a30	External Fault (terminal S1)	Contact us
LLP-Interface.mainInverter.0xa9025a31	External Fault (terminal S2)	Contact us
LLP-Interface.mainInverter.0xa9025a32	Safe Disable Signal Input	Check emergency stop, pressure switch and temperature switch
LLP-Interface.mainInverter.0xa9025a33	Safe Disable Signal Input	Check emergency stop, pressure switch and temperature switch
LLP-Interface.mainInverter.0xa9025a34	Mechanical Weakening Detection 1	Contact us
LLP-Interface.mainInverter.0xa9025a35	Mechanical Weakening Detection 2	Contact us
LLP-Interface.mainInverter.0xa9025a36	IGBT Maintenance Time (90%)	Contact us
LLP-Interface.mainInverter.0xa9025a37	Soft Charge Bypass Relay Maintenance Time	Contact us
LLP-Interface.mainInverter.0xa9025a38	IGBT Maintenance Time (50%)	Contact us
LLP-Interface.mainInverter.0xa9025a39	BrakingTransistor Overload Fault	Contact us
LLP-Interface.mainInverter.0xa9025a3a	DriveWorksEZ Fault	Contact us
LLP-Interface.mainInverter.0xa9025a3b	DriveWorksEZ Alarm 2	Contact us
LLP-Interface.mainInverter.0xa9025a3c	DriveWorksEZ Alarm 3	Contact us
LLP-Interface.mainInverter.0xa9025a3d	External Power 24 V Supply	Contact us

Error code	Fault	Remedy
LLP-Interface.mainInverter.0xa9025a3e	Log Communication Fault	Contact us
LLP-Interface.mainInverter.0xa9025a3f	Keypad Battery Voltage Low	Contact us
LLP-Interface.mainInverter.0xa9025a40	Unknown device warning {X16:0}	Contact us
LLP-Interface.mainInverter.0xa9025a41	Unknown device failure {X16:0}	Contact us
LLP-Interface.mainInverter.0xa9025a42	Read error {X32:0}:{X8:0}	Contact us
LLP-Interface.mainInverter.0xa9025a43	Write error {X32:0}:{X8:0}	Contact us
LLP-Interface.mainInverter.0xa9025a44	DC Bus Undervoltage	▪ Check supply voltage ▪ Check input wiring ▪ Check EMC filter
LLP-Interface.mainInverter.0xa9025a45	Control Power Supply Voltage Fault	▪ Check supply voltage ▪ Check input wiring ▪ Check EMC filter
LLP-Interface.mainInverter.0xa9025a46		
LLP-Interface.mainInverter.0xa9025a47	Out Short Circuit or IGBT Fault	▪ Check wiring to motor ▪ Check for short-circuits ▪ Check inlet valve ▪ Check back pressure oil separator vessel ▪ Check oil injection
LLP-Interface.mainInverter.0xa9025a48	Ground Fault	▪ Check wiring to motor ▪ Check for short-circuits ▪ Check inlet valve ▪ Check back pressure oil separator vessel ▪ Check oil injection
LLP-Interface.mainInverter.0xa9025a49	Overcurrent	▪ Check wiring to motor ▪ Check for short-circuits ▪ Check inlet valve ▪ Check back pressure oil separator vessel ▪ Check oil injection
LLP-Interface.mainInverter.0xa9025a4a		
LLP-Interface.mainInverter.0xa9025a4b	Heatsink Overheat	▪ Check ambient temperatures ▪ Check cooling unit/ inverter ▪ Check heatsink inverter

Error code	Fault	Remedy
LLP-Interface.mainInverter.0xa9025a4c	Heatsink Overheat	▪ Check ambient temperatures ▪ Check cooling unit/ inverter ▪ Check heatsink inverter
LLP-Interface.mainInverter.0xa9025a4d	Motor Overload	▪ Check inlet valve ▪ Check back pressure oil separator vessel ▪ Check drive train ▪ Check oil injection
LLP-Interface.mainInverter.0xa9025a4e	Drive Overloaded	▪ Check inlet valve ▪ Check back pressure oil separator vessel ▪ Check drive train ▪ Check oil injection
LLP-Interface.mainInverter.0xa9025a4f	Overtorque Detection 1	▪ Check inlet valve ▪ Check back pressure oil separator vessel ▪ Check drive train ▪ Check oil injection
LLP-Interface.mainInverter.0xa9025a50	Overtorque Detection 2	▪ Check inlet valve ▪ Check back pressure oil separator vessel ▪ Check drive train ▪ Check oil injection
LLP-Interface.mainInverter.0xa9025a51	Dynamic Braking Transistor	Contact us
LLP-Interface.mainInverter.0xa9025a52	Braking Resistor Overheat	Contact us
LLP-Interface.mainInverter.0xa9025a53	External Fault (terminal S3)	Contact us
LLP-Interface.mainInverter.0xa9025a54	External Fault (terminal S4)	Contact us
LLP-Interface.mainInverter.0xa9025a55	External Fault (terminal S5)	Contact us
LLP-Interface.mainInverter.0xa9025a56	External Fault (terminal S6)	Contact us
LLP-Interface.mainInverter.0xa9025a57	External Fault (terminal S7)	Contact us
LLP-Interface.mainInverter.0xa9025a58	External Fault (terminal S8)	Contact us
LLP-Interface.mainInverter.0xa9025a59	Internal Fan Fault	Contact us
LLP-Interface.mainInverter.0xa9025a5a	Overspeed	Contact us

Error code	Fault	Remedy
LLP-Interface.mainInverter.0xa9025a5b	Speed Deviation	Contact us
LLP-Interface.mainInverter.0xa9025a5c	PG Disconnect	Contact us
LLP-Interface.mainInverter.0xa9025a5d	Input Phase Loss	▪ Check supply voltage ▪ Check input wiring ▪ Check EMC filter
LLP-Interface.mainInverter.0xa9025a5e	Output Phase Loss	Check wiring to motor
LLP-Interface.mainInverter.0xa9025a5f	Motor Overheat Alarm (PTC Input)	▪ Check wiring to motor ▪ Check ambient temperatures ▪ Check cooling unit ▪ Check inlet valve ▪ Check back pressure oil separator vessel
LLP-Interface.mainInverter.0xa9025a60	Keypad Connection Fault	
LLP-Interface.mainInverter.0xa9025a61	EEPROM Write Error	
LLP-Interface.mainInverter.0xa9025a62	Motor Overheat Fault (PTC Input)	▪ Check wiring to motor ▪ Check ambient temperatures ▪ Check cooling unit ▪ Check inlet valve ▪ Check back pressure oil separator vessel
LLP-Interface.mainInverter.0xa9025a63	MEMOBUS/Modbus Communication Fault	Contact us
LLP-Interface.mainInverter.0xa9025a64	Option Communication Error	Contact us
LLP-Interface.mainInverter.0xa9025a65	Control Fault	Contact us
LLP-Interface.mainInverter.0xa9025a66	Zero Servo Fault	Contact us
LLP-Interface.mainInverter.0xa9025a67	Option Card External Fault	Contact us
LLP-Interface.mainInverter.0xa9025a68	PID Feedback Loss	Contact us
LLP-Interface.mainInverter.0xa9025a69	Undertorque Detection 1	Contact us
LLP-Interface.mainInverter.0xa9025a6a	Undertorque Detection 2	Contact us
LLP-Interface.mainInverter.0xa9025a6b	High Slip Braking oL	Contact us

Error code	Fault	Remedy
LLP-Interface.mainInverter.0xa9025a6c	Fx Fault [Hardware Fault	Contact us
LLP-Interface.mainInverter.0xa9025a6d	Z Pulse Fault	Contact us
LLP-Interface.mainInverter.0xa9025a6e	Z Pulse Noise Fault Detection	Contact us
LLP-Interface.mainInverter.0xa9025a6f	Inversion Detection	Contact us
LLP-Interface.mainInverter.0xa9025a70	Inversion Prevention Detection	Contact us
LLP-Interface.mainInverter.0xa9025a71	Output Current Imbalance	Contact us
LLP-Interface.mainInverter.0xa9025a72	Pull-Out Detection	Contact us
LLP-Interface.mainInverter.0xa9025a73	PG Hardware Fault	Contact us
LLP-Interface.mainInverter.0xa9025a74	MECHATROLINK Watchdog Timer Err	Contact us
LLP-Interface.mainInverter.0xa9025a75	Too Many Speed Search Restarts	Contact us
LLP-Interface.mainInverter.0xa9025a76	Excessive PID Feedback	Contact us
LLP-Interface.mainInverter.0xa9025a77	External Fault (terminal S1)	Contact us
LLP-Interface.mainInverter.0xa9025a78	External Fault (terminal S2)	Contact us
LLP-Interface.mainInverter.0xa9025a79	Mechanical Weakening Detection 1	Contact us
LLP-Interface.mainInverter.0xa9025a7a	Mechanical Weakening Detection 2	Contact us
LLP-Interface.mainInverter.0xa9025a7b	Current Offset Fault	Contact us
LLP-Interface.mainInverter.0xa9025a7c	DriveWorksEZ Fault	Contact us
LLP-Interface.mainInverter.0xa9025a7d	EEPROM Memory DWEZ Data Error	Contact us
LLP-Interface.mainInverter.0xa9025a7e	DriveWorksEZ Fault 2	Contact us
LLP-Interface.mainInverter.0xa9025a7f	DriveWorksEZ Fault 3	Contact us
LLP-Interface.mainInverter.0xa9025a80	Braking Resistor Fault	Contact us
LLP-Interface.mainInverter.0xa9025a81	Braking Transistor Overload Fault	Contact us

Error code	Fault	Remedy
LLP-Interface.mainInverter.0xa9025a82	LSo Fault	Contact us
LLP-Interface.mainInverter.0xa9025a83	Node Setup Error	Contact us
LLP-Interface.mainInverter.0xa9025a84	Polarity Judge Timeout	Contact us
LLP-Interface.mainInverter.0xa9025a85	Output Phase Loss 3	Contact us
LLP-Interface.mainInverter.0xa9025a86	Current Imbalance	Contact us
LLP-Interface.mainInverter.0xa9025a87	Gate Drive Board Power Supply Voltage Low	Contact us
LLP-Interface.mainInverter.0xa9025a88	A/D Conversion Failure	Contact us
LLP-Interface.mainInverter.0xa9025a89	PWM Motor Failure	Contact us
LLP-Interface.mainInverter.0xa9025a8a	Control Circuit Error	▪ Check supply voltage ▪ Check input wiring ▪ Check EMC filter
LLP-Interface.mainInverter.0xa9025a8b	Terminal Board Connection Error	Contact us
LLP-Interface.mainInverter.0xa9025a8c	EEPROM Serial Communications Error	Contact us
LLP-Interface.mainInverter.0xa9025a8d	RAM Fault	Contact us
LLP-Interface.mainInverter.0xa9025a8e	FLASH Memory Fault	Contact us
LLP-Interface.mainInverter.0xa9025a8f	Watchdog Circuit Exception	Contact us
LLP-Interface.mainInverter.0xa9025a90	Control Circuit Fault	▪ Check supply voltage ▪ Check input wiring ▪ Check EMC filter
LLP-Interface.mainInverter.0xa9025a91	Clock Fault	Contact us
LLP-Interface.mainInverter.0xa9025a92	Timing Fault	Contact us
LLP-Interface.mainInverter.0xa9025a93	Control Circuit Fault	▪ Check supply voltage ▪ Check input wiring ▪ Check EMC filter
LLP-Interface.mainInverter.0xa9025a94	Control Circuit Fault	▪ Check supply voltage ▪ Check input wiring ▪ Check EMC filter
LLP-Interface.mainInverter.0xa9025a95	Hardware Fault (at power ON)	Check EMC filter
LLP-Interface.mainInverter.0xa9025a96	Hardware Fault (after communication startup)	Contact us

Error code	Fault	Remedy
LLP-Interface.mainInverter.0xa9025a97	A/D Conversion Failure	Contact us
LLP-Interface.mainInverter.0xa9025a98	PWM Feedback Fault	Contact us
LLP-Interface.mainInverter.0xa9025a99	Drive Capacity Signal Fault	Contact us
LLP-Interface.mainInverter.0xa9025a9a	Terminal Board not Connected	Contact us
LLP-Interface.mainInverter.0xa9025a9b	ASIC BB Circuit Error	Contact us
LLP-Interface.mainInverter.0xa9025a9c	ASIC PWM Setting Register Error	Contact us
LLP-Interface.mainInverter.0xa9025a9d	ASIC PWM Pattern Error	Contact us
LLP-Interface.mainInverter.0xa9025a9e	ASIC On-delay Error	Contact us
LLP-Interface.mainInverter.0xa9025a9f	ASIC BB ON Error	Contact us
LLP-Interface.mainInverter.0xa9025aa0	ASIC Code Error	Contact us
LLP-Interface.mainInverter.0xa9025aa1	ASIC Start-up Error	Contact us
LLP-Interface.mainInverter.0xa9025aa2	Watchdog Circuit Exception Circuit Fault	Contact us
LLP-Interface.mainInverter.0xa9025aa3	ASIC Power, Clock Error	Contact us
LLP-Interface.mainInverter.0xa9025aa4	External A/D Conversion Failure	Contact us
LLP-Interface.mainInverter.0xa9025aa5	ASIC Reception Error	Contact us
LLP-Interface.mainInverter.0xa9025aa6	ASIC Reception Error	Contact us
LLP-Interface.mainInverter.0xa9025aa7	EEPROM Motor Failure	Contact us
LLP-Interface.mainInverter.0xa9025aa8	Control Circuit Error	▪ Check supply voltage ▪ Check input wiring ▪ Check EMC filter
LLP-Interface.mainInverter.0xa9025aa9	Control Circuit Error	▪ Check supply voltage ▪ Check input wiring ▪ Check EMC filter
LLP-Interface.mainInverter.0xa9025aaa	Control Circuit Error	▪ Check supply voltage ▪ Check input wiring ▪ Check EMC filter
LLP-Interface.mainInverter.0xa9025aab	Control Circuit Error	▪ Check supply voltage ▪ Check input wiring ▪ Check EMC filter

Error code	Fault	Remedy
LLP-Interface.mainInverter.0xa9025aac	Control Circuit Error	▪ Check supply voltage ▪ Check input wiring ▪ Check EMC filter
LLP-Interface.mainInverter.0xa9025aad	Control Circuit Error	▪ Check supply voltage ▪ Check input wiring ▪ Check EMC filter
LLP-Interface.mainInverter.0xa9025aae	Not supported	Contact us
LLP-Interface.mainInverter.0xa9025aaf	Connection Error	Contact us
LLP-Interface.mainInverter.0xa9025ab0	A/D Conversion Error	Contact us
LLP-Interface.mainInverter.0xa9025ab1	Option Response Error	Contact us
LLP-Interface.mainInverter.0xa9025ab2	RAM Fault	Contact us
LLP-Interface.mainInverter.0xa9025ab3	Option Operation Mode Fault (SLMOD)	Contact us
LLP-Interface.mainInverter.0xa9025ab4	CRC Error (Drive receive)	Contact us
LLP-Interface.mainInverter.0xa9025ab5	Frame Error (Drive receive)	Contact us
LLP-Interface.mainInverter.0xa9025ab6	Abort Error (Drive receive)	Contact us
LLP-Interface.mainInverter.0xa9025ab7	CRC Error (Option receive)	Contact us
LLP-Interface.mainInverter.0xa9025ab8	Frame Error (option receive)	Contact us
LLP-Interface.mainInverter.0xa9025ab9	Abort Error (option receive)	Contact us
LLP-Interface.mainInverter.0xa9025aba	Comm. ID Error	Contact us
LLP-Interface.mainInverter.0xa9025abb	Model Code Error	Contact us
LLP-Interface.mainInverter.0xa9025abc	Checksum Error	Contact us
LLP-Interface.mainInverter.0xa9025abd	Comm. option timeout waiting for response	Contact us
LLP-Interface.mainInverter.0xa9025abe	MEMOBUS/Modbus communications timeout	Contact us
LLP-Interface.mainInverter.0xa9025abf	Drive timeout waiting for response	Contact us
LLP-Interface.mainInverter.0xa9025ac0	CI Check Error	Contact us
LLP-Interface.mainInverter.0xa9025ac1	Drive timeout waiting for response	Contact us

Error code	Fault	Remedy
LLP-Interface.mainInverter.0xa9025ac2	Control Command Selection Error	Contact us
LLP-Interface.mainInverter.0xa9025ac3	Drive timeout waiting for response	Contact us
LLP-Interface.mainInverter.0xa9025ac4	Control Response Selection 1 Error	Contact us
LLP-Interface.mainInverter.0xa9025ac5	Drive timeout waiting for response	Contact us
LLP-Interface.mainInverter.0xa9025ac6	Control Response Selection 2 Error	Contact us
LLP-Interface.mainInverter.0xa9025ac7	Drive timeout waiting for response	Contact us
LLP-Interface.mainInverter.0xa9025ac8	Not supported	Contact us
LLP-Interface.mainInverter.0xa9025ac9	Connection Error	Contact us
LLP-Interface.mainInverter.0xa9025aca	Duplicate Options	Contact us
LLP-Interface.mainInverter.0xa9025acb	A/D Conversion Error	Contact us
LLP-Interface.mainInverter.0xa9025acc	Option Response Error	Contact us
LLP-Interface.mainInverter.0xa9025acd	RAM Fault	Contact us
LLP-Interface.mainInverter.0xa9025ace	Option Operation Mode Fault (SLMOD)	Contact us
LLP-Interface.mainInverter.0xa9025acf	CRC Error (Drive receive)	Contact us
LLP-Interface.mainInverter.0xa9025ad0	Frame Error (Drive receive)	Contact us
LLP-Interface.mainInverter.0xa9025ad1	Abort Error (Drive receive)	Contact us
LLP-Interface.mainInverter.0xa9025ad2	CRC Error (Option receive)	Contact us
LLP-Interface.mainInverter.0xa9025ad3	Frame Error (Option receive)	Contact us
LLP-Interface.mainInverter.0xa9025ad4	Abort Error (Option receive)	Contact us
LLP-Interface.mainInverter.0xa9025ad5	Comm. ID Error	Contact us
LLP-Interface.mainInverter.0xa9025ad6	Model Code Error	Contact us
LLP-Interface.mainInverter.0xa9025ad7	Checksum Error	Contact us

Error code	Fault	Remedy
LLP-Interface.mainInverter.0xa9025ad8	Comm. option timeout waiting for response	Contact us
LLP-Interface.mainInverter.0xa9025ad9	MEMOBUS/Modbus communications timeout	Contact us
LLP-Interface.mainInverter.0xa9025ada	Drive timeout waiting for response	Contact us
LLP-Interface.mainInverter.0xa9025adb	CI Check Error	Contact us
LLP-Interface.mainInverter.0xa9025adc	Drive timeout waiting for response	Contact us
LLP-Interface.mainInverter.0xa9025add	Control Command Selection Error	Contact us
LLP-Interface.mainInverter.0xa9025ade	Drive timeout waiting for response	Contact us
LLP-Interface.mainInverter.0xa9025adf	Control Response Selection 1 Error	Contact us
LLP-Interface.mainInverter.0xa9025ae0	Drive timeout waiting for response	Contact us
LLP-Interface.mainInverter.0xa9025ae1	Control Response Selection 2 Error	Contact us
LLP-Interface.mainInverter.0xa9025ae2	Drive timeout waiting for response	Contact us
LLP-Interface.mainInverter.0xa9025ae3	Not supported	Contact us
LLP-Interface.mainInverter.0xa9025ae4	Connection Error	Contact us
LLP-Interface.mainInverter.0xa9025ae5	Duplicate Options	Contact us
LLP-Interface.mainInverter.0xa9025ae6	A/D Conversion Error	Contact us
LLP-Interface.mainInverter.0xa9025ae7	Option Response Error	Contact us
LLP-Interface.mainInverter.0xa9025ae8	RAM Fault	Contact us
LLP-Interface.mainInverter.0xa9025ae9	Option Operation Mode Fault (SLMOD)	Contact us
LLP-Interface.mainInverter.0xa9025aea	CRC Error (Drive receive)	Contact us
LLP-Interface.mainInverter.0xa9025aeb	Frame Error (Drive receive)	Contact us
LLP-Interface.mainInverter.0xa9025aec	Abort Error (Drive receive)	Contact us
LLP-Interface.mainInverter.0xa9025aed	CRC Error (Option receive)	Contact us

Error code	Fault	Remedy
LLP-Interface.mainInverter.0xa9025aee	Frame Error (option receive)	Contact us
LLP-Interface.mainInverter.0xa9025aef	Abort Error (Option receive)	Contact us
LLP-Interface.mainInverter.0xa9025af0	Encoder Option AD Conversion Error	Contact us
LLP-Interface.mainInverter.0xa9025af1	Encoder Option Analog Circuit Error	Contact us
LLP-Interface.mainInverter.0xa9025af2	Encoder Communication Timeout	Contact us
LLP-Interface.mainInverter.0xa9025af3	Encoder Communication Data Error	Contact us
LLP-Interface.mainInverter.0xa9025af4	Encoder Error	Contact us
LLP-Interface.mainInverter.0xa9025af5	Resolver Error	Contact us
LLP-Interface.mainInverter.0xa9025af6	Safety Circuit Fault	Check emergency switch, pressure switch and temperature switch
LLP-Interface.mainInverter.0xa9025af7	Drive Cooling Fan Failure	Contact us
LLP-Interface.mainInverter.0xa9025af8	Reached limit of custom parameters	Contact us
LLP-Interface.mainInverter.0xa9025af9	Failed to write parameter {X16:0} with error {X8:0}!	Contact us
LLP-Interface.pressureSpeedDerating.0x238a4f00	Range must be positive value	Contact us
LLP-Interface.performanceDataEstimator.0x199d2c00	Data pressure/speed/flow/power not valid	Contact us
LLP-Interface.currentSpeedDerating.0x2ab81d00	Range must be positive value	Contact us
LLP-Interface.pressurePID.0xe09dd600	PID proportional ({F:0}) must be valid	Contact us
LLP-Interface.pressurePID.0xe09dd601	PID integral ({F:0}) must be valid	Contact us
LLP-Interface.pressurePID.0xe09dd602	PID derivative ({F:0}) must be valid	Contact us
LLP-Interface.pressurePID.0xe09dd603	Deadband ({F:0}) must be valid	Contact us
LLP-Interface.postPurge.0xf4402900	Reference minimum speed must not be bigger than maximum speed	Contact us
LLP-Interface.gasballastControl.0x10a9b800	Active function code {U16:0} is not in range	Contact us
LLP-Interface.gasballastControl.0x10a9b801	Reached limit of available function codes	Contact us

Error code	Fault	Remedy
LLP-Interface.remoteStart-Stop.0x10a9b800	Active function code {U16:0} is not in range	Contact us
LLP-Interface.remoteStart-Stop.0x10a9b801	Reached limit of available function codes	Contact us
LLP-Interface.digitalSetpointSelection.0x10a9b800	Active function code {U16:0} is not in range	Contact us
LLP-Interface.digitalSetpointSelection.0x10a9b801	Reached limit of available function codes	Contact us
LLP-Interface.remoteManualPurge.0x10a9b800	Active function code {U16:0} is not in range	Contact us
LLP-Interface.remoteManualPurge.0x10a9b801	Reached limit of available function codes	Contact us
LLP-Interface.ifAbovePressureSetpoint.0x10a9b800	Active function code {U16:0} is not in range	Contact us
LLP-Interface.ifAbovePressureSetpoint.0x10a9b801	Reached limit of available function codes	Contact us
LLP-Interface.remoteMaxSpeed.0x10a9b800	Active function code {U16:0} is not in range	Contact us
LLP-Interface.remoteMaxSpeed.0x10a9b801	Reached limit of available function codes	Contact us
LLP-Interface.prePurge.0x37293800	Reference temperature values must be sorted	Contact us
LLP-Interface.speedLimit.0xeb9f2600	Reference pressure values must be sorted in ascending order	Contact us
LLP-Interface.speedLimit.0xeb9f2601	Reference point ({U8:0}) minimum speed must not be bigger than maximum speed	Contact us
LLP-Interface.fanControl.0x415df200	Off Threshold larger than On Threshold	Contact us
LLP-Interface.temperatureSpeedDerating.0x1936b600	Range must be positive value	Contact us
LLP-Interface.outletPressureAI.0xc2b53400	Reading pin failed, hw code: {X32:0}	Contact us
LLP-Interface.outletPressureAI.0xc2b53401	Analog Input Pin must be valid	Contact us
LLP-Interface.outletPressureAI.0xc2b53402	Sample count is out of range ({U16:0})	Contact us
LLP-Interface.outletPressureAI.0xc2b53403	Minimum source is out of range ({F:0})	Contact us
LLP-Interface.outletPressureAI.0xc2b53404	Maximum source is out of range ({F:0})	Contact us
LLP-Interface.outletPressureAI.0xc2b53405	Minimum source minimum is greater than maximum	Contact us
LLP-Interface.outletPressureAI.0xc2b53406	Maximum source minimum is greater than maximum	Contact us

Error code	Fault	Remedy
LLP-Interface.outletPressur-eAI.0xc2b53407	Minimum source is greater than maximum source	Contact us
LLP-Interface.outletPressur-eAI.0xc2b53408	Source range does not fit into hardware pin range	Contact us
LLP-Interface.outletPressur-eAI.0xc2b53409	Read value ({F:0}) does not fit into source range	Contact us
LLP-Interface.inletPressur-eAI.0xc2b53400	Reading pin failed, hw code: {X32:0}	Contact us
LLP-Interface.inletPressur-eAI.0xc2b53401	Analog Input Pin must be valid	Contact us
LLP-Interface.inletPressur-eAI.0xc2b53402	Sample count is out of range ({U16:0})	Contact us
LLP-Interface.inletPressur-eAI.0xc2b53403	Minimum source is out of range ({F:0})	Contact us
LLP-Interface.inletPressur-eAI.0xc2b53404	Maximum source is out of range ({F:0})	Contact us
LLP-Interface.inletPressur-eAI.0xc2b53405	Minimum source minimum is greater than maximum	Contact us
LLP-Interface.inletPressur-eAI.0xc2b53406	Maximum source minimum is greater than maximum	Contact us
LLP-Interface.inletPressur-eAI.0xc2b53407	Minimum source is greater than maximum source	Contact us
LLP-Interface.inletPressur-eAI.0xc2b53408	Source range does not fit into hardware pin range	Contact us
LLP-Interface.inletPressur-eAI.0xc2b53409	Read value ({F:0}) does not fit into source range	Contact us
LLP-Interface.outletTempera-ture.0x9dd99000	Reading temperature pin failed, hw code: {X32:0}	Contact us
LLP-Interface.outletTempera-ture.0x9dd99001	Sample count is out of range ({U16:0})	Contact us
LLP-Interface.outletTempera-ture.0x9dd99002	Minimum temperature is out of range ({F:0})	Contact us
LLP-Interface.outletTempera-ture.0x9dd99003	Maximum temperature is out of range ({F:0})	Contact us
LLP-Interface.outletTempera-ture.0x9dd99004	Minimum temperature mini-mum is greater than maxi-mum	Contact us
LLP-Interface.outletTempera-ture.0x9dd99005	Maximum temperature mini-mum is greater than maxi-mum	Contact us
LLP-Interface.outletTempera-ture.0x9dd99006	Minimum temperature mini-mum ({F:0}) has been trim-med to supported range ({F:4}).	Contact us
LLP-Interface.outletTempera-ture.0x9dd99007	Maximum temperature maxi-mum ({F:0}) has been trim-	Contact us

Error code	Fault	Remedy
	med to supported range ({F:4}).	
LLP-Interface.outletTempera-ture.0x9dd99008	Minimum temperature is greater than maximum tem-perature.	Contact us
LLP-Interface.ain_E2.0xfa2eb500	Active function code is not in range	Contact us
LLP-Interface.ain_E4.0xfa2eb500	Active function code is not in range	Contact us
LLP-Interface.ain_E2.0xc2b53400	Reading pin failed, hw code: {X32:0}	Contact us
LLP-Interface.ain_E2.0xc2b53401	Analog Input Pin must be valid	Contact us
LLP-Interface.ain_E2.0xc2b53402	Sample count is out of range ({U16:0})	Contact us
LLP-Interface.ain_E2.0xc2b53403	Minimum source is out of range ({F:0})	Contact us
LLP-Interface.ain_E2.0xc2b53404	Maximum source is out of range ({F:0})	Contact us
LLP-Interface.ain_E2.0xc2b53405	Minimum source minimum is greater than maximum	Contact us
LLP-Interface.ain_E2.0xc2b53406	Maximum source min is greater than maximum	Contact us
LLP-Interface.ain_E2.0xc2b53407	Minimum source is greater than maximum source	Contact us
LLP-Interface.ain_E2.0xc2b53408	Source range does not fit into hardware pin range	Contact us
LLP-Interface.ain_E2.0xc2b53409	Read value ({F:0}) does not fit into source range	Contact us
LLP-Interface.ain_E4.0xc2b53400	Reading pin failed, hw code: {X32:0}	Contact us
LLP-Interface.ain_E4.0xc2b53401	Analog Input Pin must be valid	Contact us
LLP-Interface.ain_E4.0xc2b53402	Sample count is out of range ({U16:0})	Contact us
LLP-Interface.ain_E4.0xc2b53403	Minimum source is out of range ({F:0})	Contact us
LLP-Interface.ain_E4.0xc2b53404	Maximum source is out of range ({F:0})	Contact us
LLP-Interface.ain_E4.0xc2b53405	Minimum source min is greater than max	Contact us
LLP-Interface.ain_E4.0xc2b53406	Maximum source min is greater than max	Contact us
LLP-Interface.ain_E4.0xc2b53407	Minimum source is greater than maximum source	Contact us

Error code	Fault	Remedy
LLP-Interface.ain_E4.0xc2b53408	Source range does not fit into hardware pin range	Contact us
LLP-Interface.ain_E4.0xc2b53409	Read value ({F:0}) does not fit into source range	Contact us
LLP-Interface.eD-IN_E1.0x372d0800	Active function code is not in range	Contact us
LLP-Interface.eD-IN_E2.0x372d0800	Active function code is not in range	Contact us

10. Storage

CAUTION: STORAGE SAFETY

Risk of injury or damage to equipment. If the pump is going to be stored without operating from time to time, protective steps must be taken. Contact your supplier.

Operate the pump regularly (for example, twice a week until warm).

11. Disposal

DIRECTIVE 2012/19/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on waste electrical and electronic equipment (WEEE)

This equipment comes under the provisions of the European Directive 2012/19/EU on waste electrical and electronic appliances (WEEE) and cannot be disposed as unsorted waste.

The equipment is labelled in accordance with the European Directive 2012/19/EU with the crossed-out wheelie bin symbol.

At the end of life-time of the electric and electronic equipment (EEE) it must be taken to separate collection.

For more information contact your local waste authority, customer centre or the distributor.

Note:

Obey all the local and national safety and environmental regulations when you discard service liquid and all other used materials (for example, dirty rags and machine parts).

12. Service

12.1. Return the equipment or components for service

Before you send your equipment to us for service or for any other reason, you must send us a completed Declaration of Contamination of Vacuum Equipment and Components – Form HS2. The HS2 form tells us if any substances found in the equipment are hazardous, which is important for the safety of our employees and all other people involved in the service of your equipment. The hazard information also lets us select the correct procedures to service your equipment.

We provide instructions for completing the form in the Declaration of Contamination of Vacuum equipment and Components – Procedure HS1.

If you are returning a vacuum pump, note the following:

- If a pump is configured to suit the application, make a record of the configuration before returning the pump. All replacement pumps will be supplied with default factory settings.
- Do not return a pump with accessories fitted. Remove all accessories and retain them for future use.
- The instruction in the returns procedure to drain all fluids does not apply to the lubricant in pump oil reservoirs.

Download the latest documents from https://www.beaconmedaes.com/, follow the procedure in HS1, fill in the electronic HS2 form, print it, sign it, and return the signed copy to us.

NOTICE:

If we do not receive a completed HS2 form, your equipment cannot be serviced.

13. Guidelines for inspection

On the Declaration of Conformity/Declaration by the manufacturer, the harmonised and other standards that have been used for the design are shown or referred to.

The Declaration of Conformity/Declaration by the manufacturer is part of the documentation that is supplied with the pump.

Local legal requirements, use outside the limits and conditions as specified by the manufacturer can require other inspection periods as mentioned on the declaration.