Leybold

SOGEVAC SV55BI² / SV70BI² Single-stage, Oil-Sealed Rotary Vane Pump

Instruction manual

Operating instructions 301256888_002_C0

Part Numbers

SV55BI ²
103300xxVxx

SV70BI ²
103300xxVxx

Original instructions

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We accept no liability for loss of profit, loss of market or any other indirect or consequential loss whatsoever.

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. For manual enquiries, email *documentation@leybold.com*.

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1 Safety and compliance

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 instruction manual is an important safety document that we often deliver digitally. It is your responsibility to keep the instruction manual available and visible while working with the equipment. Please download the digital version of the instruction manual for use on your device or print it if a device will not be available.

1.1 Definition of Warnings and Cautions

Important safety information is highlighted as warning and caution instructions which are defined as follows. Different symbols are used according to the type of hazard.

WARNING:

If you do not obey a warning, there is a risk of injury or death.

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.

1.2 Trained personnel

For the operation of this equipment “trained personnel” are:

- skilled workers with knowledge in the fields of mechanics, electrical engineering, pollution abatement and vacuum technology and
- personnel specially trained for the operation of vacuum pumps

Safety and compliance

1.3 Safety symbols

The safety symbols on the products show the areas where care and attention is necessary.

The safety symbols that we use on the product or in the product documentation have the following meanings:

	**Warning/Caution** Risk of injury and/or damage to equipment. An appropriate safety instruction must be followed or a potential hazard exists.
	**Warning - Automatic start up** Risk of injury. The equipment can be started remotely and without warning.
	**Warning - Corrosive substances** Risk of injury or damage to equipment. Identifies the presence of corrosive gases, liquids or materials.
	**Warning - Dangerous voltage** Risk of injury. Identifies possible sources of hazardous electrical shock.
	**Warning - Environmental hazard** Risk of damage to the environment. Identifies the presence of toxic or damaging gases, liquids or materials.
	**Warning - Flammable material** Risk of fire. Identifies possible sources of flammable gases, liquids or materials.
	**Warning - Hot surfaces** Risk of injury. Identifies a surface capable of inflicting burns through contact.
	Warning - Overhead or Suspended load Do not stand below the suspended load.
	**Warning - Noise hazard** Risk of injury. Identifies a possible source of noise above the recommended safe level.
	**Warning - Overpressure** Risk of increased pressure beyond permissible limit.
	**Warning - Risk of explosion** Risk of injury or damage to equipment. Identifies a situation that could result in an explosion.

	**Warning - Toxic material** Risk of injury or damage to the environment. Identifies a source of toxic gases, liquid or material.
	**Warning - Trip hazard** Risk of injury. Identifies spilled liquids, trailing cords, pipes and other low-lying objects that may result in slipping, tripping or falling.
	**Warning - Use protective equipment** Risk of injury. Use appropriate Personal Protective Equipment (PPE) when performing the task.

2 Important safety information

2.1 Mechanical hazards

CAUTION: MECHANICAL HAZARDS

Never expose part of the body to the vacuum. There is a danger of injury. Never operate the pump with an open and thus accessible inlet. Vacuum connections as well as oil filling and oil draining openings must not be opened during operation of the pump.

1. The vacuum pumps have been manufactured according to the latest technical standards and safety regulations. If not installed properly or not used as directed, dangerous situations or damages could occur.
2. It is mandatory that these operating instructions be read and understood prior to vacuum pump installation and start-up.
3. The pump complies to the standard EN 61010-1.

2.2 Electrical hazards

CAUTION: ELECTRICAL HAZARDS

Risk of damage to equipment. The electrical connection must only be provided by a trained person. Please observe the national regulations in the country of use.

1. Disconnect the unit from the power supply before you start any work on the pump.
2. High electric voltages. When touching parts at high electric voltages, there is the risk of suffering severe injuries by an electric shock! Covers marked with this symbol must only be opened by trained electricians after having reliably de-energised (lockout/tagout) the equipment.
3. Always operate the pump with a properly connected protective earth conductor and make sure that the motor and frequency converter connection box are closed.
4. Use only our frequency converter for the pumps equipped with one.
5. After having made changes to the wiring, check the motor's direction of rotation.
6. Lay the connecting lines so that these cannot be damaged. Protect the lines against humidity and contact with fluids.
7. Avoid thermally stressing the lines by unfavourable laying. Provide strain relief for the connecting lines so that the plugs and the line connectors are not subjected to excessively high mechanical stresses.
8. Lay the electric feed lines so that there is no risk of tripping over these.
9. Observe all safety regulations.

2.3 Thermal hazards

CAUTION: HOT SURFACE

Risk of burn injury. During operation the pump is hot and some surfaces can reach a temperature higher than 85°C (185°F). Switch off the pump and let it cool down before any intervention or take appropriate precautions. It is recommended to use an oil casing or pump touching protection at high ambient temperatures. Make sure that you wear protective gloves before you touch any part during or just after the pump operation.

CAUTION: THERMAL HAZARDS

When operating pump is hot and some surfaces could reach a temperature higher than 80°C (176°F). There is a risk of burn by touching.

1. All work on a pump which is still warm from operation should be done only whilst wearing protective gloves.
2. Handle the pump only while vented and after having let it cool down.
3. Never remove the oil-fill or oil-drain plugs while the pump is running. There exists the risk of suffering burns. Always wear protective gloves and protective goggles also for protection against the oil.

2.4 Hazards caused by materials and substances

WARNING: TOXIC MATERIALS AND SUBSTANCES

SOGEVAC® pumps are not designed:

- for pumping of aggressive, corrosive, flammable or explosive gases or gases mixtures;

- for pumping of oxygen or other highly reactive gases with a greater concentration than atmospheric concentration (>23.5%);

- for working in flammable or explosive environment.

For all these cases, special materials must be used. In case of doubt, please contact us.

See also the limits of use indicated in the CE declaration of conformity.

Depending on the process involved, dangerous substances and oil may escape from the pump. Take the necessary safety precautions.

Take adequate safety precautions prior to opening the intake or exhaust port. Take appropriate precautions to make sure that the pump cannot start.

If the pump has pumped hazardous gases it will be absolutely necessary to determine the nature of the hazard involved and take the appropriate safety precautions.

Observe the instructions concerning environment protection when discarding used oil or exhaust filters.

Observe all safety regulations.

1. Follow the instructions for environment protection when you dispose of the used oil or exhaust filters.

2. Some pumps use perfluoropolyether (PFPE) as a lubricant. When handling (PFPE) you should observe the following: During thermal decomposition at temperatures over 290 °C toxic and corrosive gases are released. When handling PFPE keep it away from open fires. Do not smoke with PFPE on your fingers.
3. Touch the inner sections of the pumps only while wearing clean gloves and use a clean tool. Do the necessary work in clean and dry rooms.

2.5 Risk of pump damage

CAUTION: PUMP DAMAGE

Liquid and solid particles must not enter the pump. Install the adequate filters, separators and/or condensers. In case of doubt consult us.

The intake line of the pump must never be connected to a device with over atmospheric pressure. Design the exhaust line so that no pressure higher than 1.15 bar absolute (0.15 bar relative) can occur. Do not work with closed or restricted pump exhaust.

The maximum exhaust pressure must neither exceed 1.15 bar absolute (0.15 bar relative) nor fall under atmosphere pressure minus 15 mbar.

Operating of the pump without oil or operating with incorrect direction of rotation can destroy the pump or lead to oil backstreaming.

Never use discarded seals. Always assemble using new seals.

The pump must be packaged in such a way that it will not be damaged during shipping, and so that no harmful substances can escape from the package.

1. As a touching protection, you can use the Noise enclosure for SV40 BI + 65 BI frequency converter P/N 960331NENC. The noise enclosure is an accessory not included in the pump delivery.
2. Do not allow the ingestion of any objects (screws, welding beads, nuts, washers, pieces of wire, fittings etc.) through the intake port of the pump.
3. Objects falling into the pump can cause severe damage.
4. Pump must not be operated above 3000 m sea level.

3 Description

The pumps are designed for pumping of inert gases in the range of rough vacuum, between atmospheric pressure and ultimate pressure of the pump.

When removing condensable vapours, periodic opening of the gas ballast valve is required.

3.1 Principle of operation

The pumps are single-stage oil-sealed rotary vane vacuum pumps. The rotor, having three slots in which the vanes are sliding, is eccentrically installed in a pump cylinder (stator).

The vanes separate the interior space into 3 chambers. The volume of these chambers varies with the rotation of the rotor.

The gas sucked into the inlet chamber is compressed and then pushed out at the exhaust valve.

The oil injected in the inlet chamber guarantees the air-tightness, the lubrication and cooling of the pump. It is dragged off by the compressed gases and roughly separated by gravity when entering in the oil sump. A fine separation is then operated in the exhaust filter. An internal transfer pushes the collected oil back into the vacuum generator, the transfer is operated by a float valve to avoid atmospheric air coming from the oil casing to the inlet of the pump when no oil is present in the recovery system.

The oil circulation functions by differential pressures.

The pumps are equipped with a gas ballast valve for pumping condensable vapours.

The anti-suckback valve at the inlet flange avoids oil coming back into the inlet line when the pump is stopped. This is valid for working pressures below 100 mbar and under the condition that the valve is kept clean and in good condition. The anti-suckback valve is not a safety valve. If oil back flowing is to be avoided by all means, it is necessary to mount a separate safety valve on the pump inlet.

All variants are equipped with a frequency converter giving a constant pumping speed independently of the mains frequency and regulating the pump power consumption. At high inlet pressures, the pump speed is decreased.

The pump speed can be reduced to 900 rpm (idle mode) to reduce the power consumption w/o loss of end pressure on some pump variants. In this idle mode, the pump inlet pressure must remain below 10 mbar.

Note:

This equipment has been tested and found to comply with the limits for a Class B, group 1 digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Description

This product has been tested to the requirements of CAN/CSA-C22.2 No. 61010-1, third edition, including Amendment 1, or a later version of the same standard incorporating the same level of testing requirements.

4 Technical data

Table 1. Technical data - SV55BI2

Parameter	Unit	SV55BI [2]	
		50 Hz	60 Hz
Effective pumping speed at 2 mbar	$m^3 h^{-1}$	≥ 36	
Ultimate total pressure without gas ballast*	mbar	≤ 0.2	
Ultimate total pressure without gas ballast (PFPE variants)*	mbar	≤ 0.3	
Ultimate total pressure with standard gas ballast*	mbar	≤ 1.0	
Ambient temperature	-	18 - 40 °C	
Inlet gas temperature	-	≤ 40°C	
Water vapour tolerance with standard gas ballast*	mbar	10	
Water vapour tolerance with standard gas ballast	$kg.h^{-1}$	0.34	
Noise level #	dB (A)	≤ 58	
Motor voltage 1 ph	V	200 - 240 V ± 10 %	
Power consumption at 10 mbar, w/o gas ballast	kW	≤ 0.75	
Type of protection	-	IP20	
Rated rotational speed	min^{-1}	900 to 1650	
Net weight (with oil filling)	kg	30	
Oil capacity	l	1	
Intake connection	-	25 or 40 KF	
Exhaust connection	-	P/N dependent	

** to DIN 28400 and following numbers.*

 # operated at 2.5 mbar, free-field measurement at a distance of 1 m.

These values are valid for the standard variants and with the use of the recommended oils according to *Lubricants* on page 17.

Technical data

Table 2. Technical data - SV70BI2

Parameter	Unit	SV70BI [2]	
		50 Hz	60 Hz
Effective pumping speed at 2 mbar	$m^3 h^{-1}$	≥ 50	
Ultimate total pressure without gas ballast*	mbar	≤ 0.2	
Ultimate total pressure with standard gas ballast*	mbar	≤ 1.0	
Ambient temperature	-	18 - 40 °C	
Inlet gas temperature	-	≤ 40°C	
Water vapour tolerance with standard gas ballast*	mbar	10	
Water vapour tolerance with standard gas ballast	$kg.h^{-1}$	0.42	
Noise level #	dB (A)	≤ 59	
Motor voltage 1 ph	V	200 - 240 V ± 10 %	
Power consumption at 10 mbar, w/o gas ballast	kW	≤ 0.75	
Type of protection	-	IP20	
Rated rotational speed	min^{-1}	900 to 1650	
Net weight (with oil filling)	kg	31	
Oil capacity	l	1	
Intake connection	-	40 KF	
Exhaust connection	-	P/N dependent	

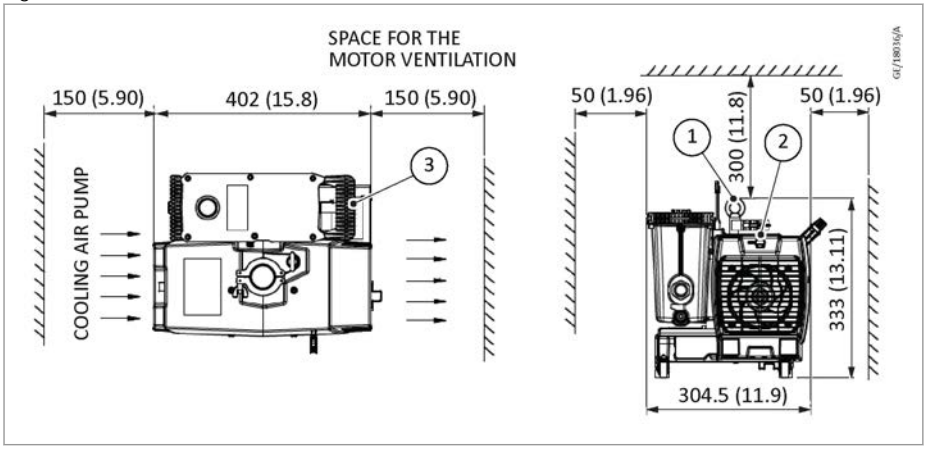
** to DIN 28400 and following numbers.*

 # operated at 2.5 mbar, free-field measurement at a distance of 1 m.

These values are valid for the standard variants and with the use of the recommended oils according to *Lubricants* on page 17.

4.1 Dimension drawings

Figure 1. SV55/70 BI2 Dimensions



1. *Lifting lug*
2. *Gas ballast*
3. *Exhaust port*

4.2 Lubricants

These pumps should be run with vacuum pump oils with a viscosity according to ISO category VG32. Use only the oil indicated on the nameplate and pump. In case other oils are used, we rejects all responsibility should if any problem occurs.

Oil	Conditioning	Reference
PFPE LVO 420	1 l	L42001
Synthetic LVO 702	1 l	L70201

Table 3 Accessory list

P/N	Pump	Power cable	Power cable P/N	Control cable	Control cable P/N	Oil cans
10330040V01	SV55 BI²	No	-	No	-	-
10330040V02	SV55 BI²	NEMA6-15P C19 P/N 140305GUS	-	No	-	-
10330040V03	SV55 BI²	NEMA6-15P C19 P/N 140305GUS	-	No	-	-
10330040V04	SV55 BI²	P/N 140305GCN China	-	No	-	-
10330040V05	SV55 BI²	No	-	CONTROL CABLE SUBD9 MALE - DIN5 PTS P/N 140305GCN1	-	-
10330040V06	SV55 BI²	No	-	No	-	-
10330040V07	SV55 BI²	C14-C19 P/N 140305GC14	-	CONTROL CABLE SUBD9 MALE - DIN3 PTS 6558650	-	-
10330040V08	SV55 BI²	C14-C19 P/N 140305GC14	-	No	-	-

Technical data

P/N	Pump	Power cable	Power cable P/N	Control cable	Control cable P/N	Oil cans
10330040V09	SV55 BI²	C14-C19 P/N 140305GC14	-	No	-	1x1 l
10330040V10	SV55 BI²	P/N 140305GCN China	-	No	-	-
10330065V01	SV70 BI²	NEMA6-15P C19 P/N 140305GUS	-	No	-	-
10330065V02	SV70 BI²	P/N 140305GCN China	-	No	-	-
10330065V03	SV70 BI²	cable shoes P/N 140305GCS	-	No	-	-
10330065V04	SV70 BI²	No	-	Dsub9 male/ male adapter P/N 140305GM9	-	1x1 l
10330065V05	SV70 BI²	No	-	No	-	-
10330065V06	SV70 BI²	No	-	No	-	-
10330065V07	SV70 BI²	No	-	No	-	-

Table 4. Available power cables

Part number	Plug supply side	Length (m)
140305GUS	NEMA 6-15P 250 V	1.8
161810EU	Euro / Schuko 16 A	1.8
161810UK	UK plug 13 A	1.8
E6500825	C20	2.5
E6505883	IEC 309 16 A	5
140305GC14	C14	2.5
140305GCN	China	3
140305GCS	Cable shoes 5 mm	2.8

5 Transportation

The vacuum pumps pass a rigorous operating test in our factory and are packaged to avoid transport damages.

Please check packaging on delivery for transport damages.

The outer package bears a shock indicator, turning red at 50 g. Should the shock indicator have reacted, a transportation damage may have occurred and the freight forwarder must be advised.

Packing materials should be disposed off according to environmental laws or re-cycled. These operating instructions are part of the consignment.

The connection ports are blanked off by plastic protective caps, membranes or self-adhesives. Take these caps or self-adhesives away before turning on the pump.

5.1 Mounting orientation

Refer to required space on drawings in *Dimension drawings* on page 17.

Check the pump for the presence of any oil leaks, because there is the danger that someone may slip on the oil which has leaked from the pump.

Pumps which have been filled with oil must only be moved in the upright position (horizontally). Otherwise oil may escape. The angle of slope may not be over 10° maximum. Avoid any other orientations while moving the pump.

Only use the lifting lugs which are provided on the pump to lift the pump with the specified lifting devices.

Make sure that these have been installed safety. Use suitable lifting equipment. Make sure that all safety regulations are observed.

Use only lifting devices appropriated to the pump weight. Check name plate. Do not use other pump elements than the lifting lugs or oil casing handles as handles.

5.2 Unpacking

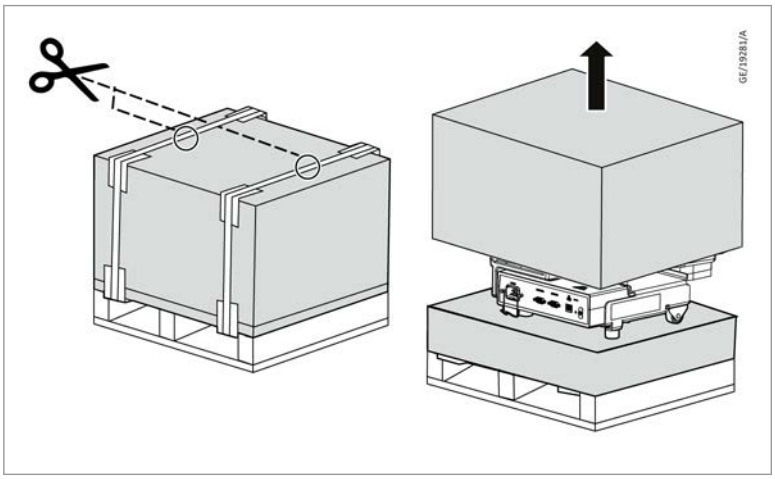
WARNING: OPERATION SAFETY

Risk of injury or damage to equipment. Do not use the pump if it is damaged. Failure to do so can result in injury or damage to equipment.

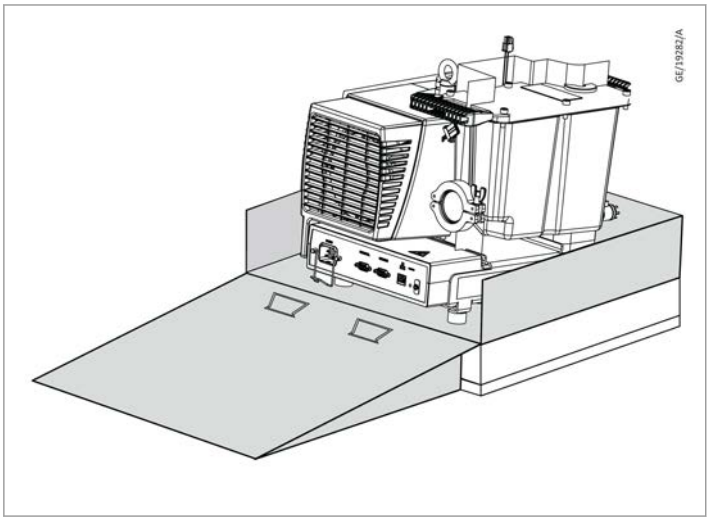
1. Make sure that you wear safety gloves and safety shoes when unpacking the pump from the wooden pallet.
2. Use scissors or a knife to cut and remove packaging straps. Remove the cardboard box.

Transportation

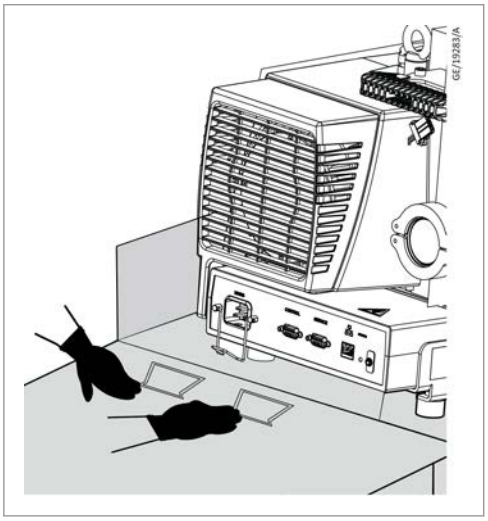
3. Remove the upper wedge.



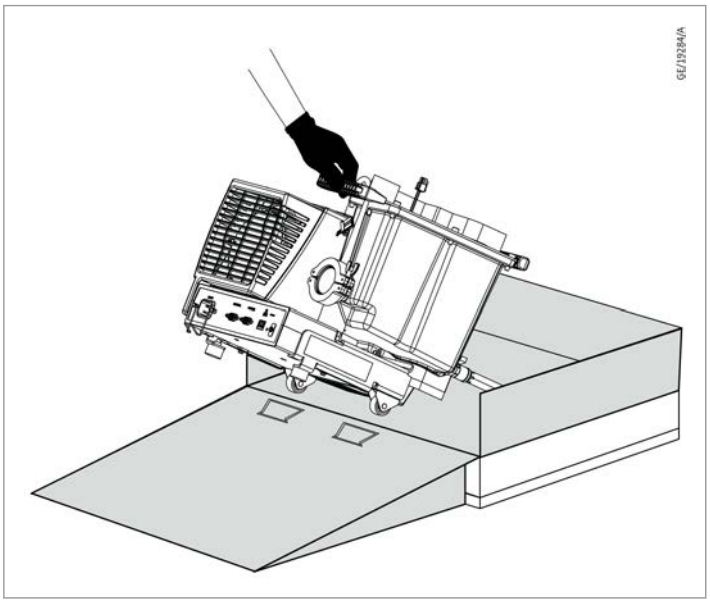
4. Unfold the ramp.



5. Assemble the ramp on bottom wedge.



6. Use the oil casing handles to move the pump around. Do not use the power card to pull the pump.



7. The pump is equipped with two casters. Make sure that you wear personal protective equipment when you operate the pump castors.

6 Installation

CAUTION:INSTALLATION HAZARDS

It is essential to observe the following instructions step by step to make sure safe start-up. Start-up may only be conducted by trained specialists.

The standard pump is not suitable for installation in explosion hazard areas ATEX. Please contact us, if you are planning such an application. Before installing the pump you must reliably disconnect it from the electrical power supply and prevent the pump form running up inadvertently.

Observe all safety regulations.

The pumps have the LVO 702 / 420 oil filled in.

The pump must be set up or mounted horizontally on a flat surface. Special mounting is not required.

The pump must be levelled within a tolerance of ± 2 degrees.

The oil level cannot be read properly if the pump is tilted and lubrication may be affected.

The pump is to be installed such that the oil level sight-glass can be both easily read and so that it will not be broken.

The following ambient operating environment must be observed:

- Pollution degree 2
- Ambient temperature must be between 18°C (64°F) and 40°C (104°F).
- Ambient pressure = Atmospheric pressure.
- Relative humidity ≤ 95 % without condensation.

To avoid over-heating of the pump, an undisturbed fresh airflow to the pump is necessary.

To ensure adequate cooling of the pump, leave enough space at the air intake and exhaust points, and for access and maintenance. Make sure to keep the fans, hoods, air intake of the motor clean.

Consider changes in ambient temperatures that might occur when air conditioning is turned down, such as nights and weekends.

The pump must be kept clean (no dust deposit).

Normal presence of transient over-voltages due to the power mains. The usual transient over-voltage level corresponds to the category II of the impulse withstand (over-voltage) of the IEC 60364-4-443.

6.1 Connection to the system

6.1.1 Intake side

See *Important safety information* on page 10.

- Pump should be connected to inlet line without any tension. Use flex lines at inlet and exhaust lines so that they can be easily removed for pump maintenance.

The pipes should cause no stresses on the pump's flanges.

Restriction of the pipes must be avoided in order not to decrease the pumping speed of the pump. The nominal diameter of the pipes has to be at least the same as the diameter of pump's inlet flange.

- When removing condensable vapours, a gas ballast valve must be opened periodically to avoid solvent build up in the oil.
- The maximum pressure at the inlet may not exceed atmospheric pressure (about 1013 mbar). Never operate the pump in the presence of over pressures at its intake.
- Type of materials used for mounting of piping should take care of pumped gases. It is the same for its tightness.

The cross-section of the intake line should be at least the same as the one for the intake port. If the intake line is too narrow, it reduces the pumping speed. The intake must be installed in such a way to avoid condensates flowing into the pump.

- Additional air flow may be needed during ballast, as this increases pump temperature.

6.1.2 Exhaust side

The pumps have integrated exhaust filters which, even at a high gas throughput, trap the oil mist and guarantee exhaust gas free of oil mist. If the exhaust filters are clogged, the bypass opens at 1.5 bar, (absolute pressure), and the filters are bypassed. As a result, the proportion of oil in the exhaust gas as well as the pump's oil consumption will rise. Installing new exhaust filters will correct this problem.

Check in the individual case whether a line is necessary and/or prescribed.

Volatile substances will pass through the filter. We recommend connecting an exhaust line; this is always necessary when the exhaust gases are dangerous.

It should be installed in a manner so that no condensate can enter the pump (siphon, slope).

The maximum exhaust pressure must neither exceed 1.15 bar absolute (0.15 bar relative), nor fall under atmosphere pressure minus 15 mbar.

Corresponding pressure regulating devices to be installed by the user.

The cross-section of the exhaust line should be at least the same as the pump's exhaust port. If the exhaust line is too narrow, overpressure or overheating may occur in the pump.

Never operate the pump with a blocked or restricted exhaust line.

No valve or non return valve devices should be installed in the exhaust line of the pump.

Before start-up, ensure that any blinds or similar shut-off devices in the exhaust line on the pressure side are opened and that the exhaust line is not obstructed. Exhaust pipe material must be resistant to pumped gases.

6.2 Electrical connections

Supply voltage (Vac rms)	Phase	Frequency (Hz)	Input current (A rms)
200 -240 +/-10%	Single	50 or 60	16.0

It is essential to observe the following instructions step by step to ensure safe start-up. Start-up may only be conducted by trained specialists.

IEC and local electrical regulations must be followed.

The standard pump is not suitable for installation in explosion hazard ATEX areas. Please contact us, if you are planning such an application. Before installing the pump you must reliably disconnect it from the electrical power supply and prevent the pump form running up inadvertently.

Observe all safety regulations.

Should the pump be connected to a standard wall socket, it must be checked that a building protection rated 16 A is installed (fuse or breaker) to protect the power cable. The frequency converter itself is self-protecting.

Power cable must be installed in such a way that it is not in contact with hot surfaces exceeding 60°C.

Even if the pump is not operating, live voltage is present in the frequency converter.

Voltage and frequency mentioned on the pump nameplate must agree with the supply voltage.

The control cable must be at least distant by 10 cm to the mains cable and crossings shall be at 90°.

Pump control and power supply connection:

See *Ordering information* on page 50 for the power supply and interface type on the pump.

The power socket and cord are disconnection elements which must remain accessible to the users.

In de-energized condition, plug the mains cable to the pump. Then connect the mains cable to the wall socket or instrument power supply.

6.3 Fill the oil

The pump is delivered filled with oil.

To fill in the oil:

- Unscrew the oil fill plug
- Fill the oil until the oil level reaches the top of the oil sight glass.

Note:
1L oil is needed for the SV55-70BI².

- Tighten the fill plug to 4 Nm.

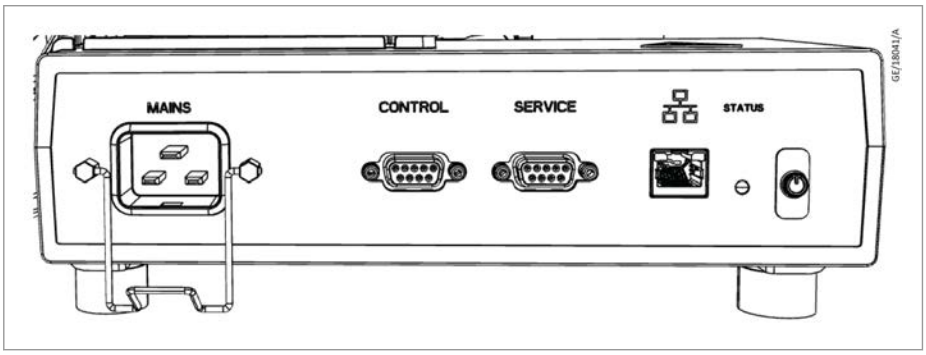
6.4 Start up

Always verify proper oil level before operating the pump.

Connect a C19 power cable into the C20 socket.

Provide electrical overload protection according to EN61010-1 (Lab circuit breaker Curve B).

7 Operation



Part number	Sub-D type	Control	On/Off switch
10330040V01	9 Female	Manual CMD On Off switch	Enabled
10330040V02	9 Female	RS485	Enabled
10330040V03	9 Female	RS485	Enabled
10330040V04	9 Female	Manual CMD On Off switch	Enabled
10330040V05	9 Female	DI CMD DRY Pins 9 and 8	Disabled
10330040V06	9 Female	DI CMD 24 V d.c. 24 V d.c. (Pin 8) and 0 V (Pin 7)	Disabled
10330040V07	9 Female	DI CMD 24 V d.c. 24 V d.c. (Pin 8) and 0 V (Pin 7)	Disabled
10330040V08	9 Female	Manual CMD On Off switch	Enabled
10330040V09	9 Female	Manual CMD On Off switch	Enabled
10330040V10	9 Female	Manual CMD On Off switch	Enabled
10330065V01	9 Female	RS485	Enabled
10330065V02	9 Female	RS485	Enabled
10330065V03	9 Female	DI CMD DRY Pins 9 and 8	Disabled
10330065V04	9 Female	DI CMD DRY Pins 9 and 8	Disabled

Part number	Sub-D type	Control	On/Off switch
10330065V05	9 Female	DI CMD DRY Pins 9 and 8	Disabled
10330065V06	9 Female	DI CMD DRY Pins 9 and 8	Disabled
10330065V07	9 Female	DI CMD DRY Pins 9 and 8	Disabled

On/OFF switch enabled or Manual CMD On/Off switch

- To start the pump press on the pump switch.
- This initiates a motor or frequency converter initialisation and starts the pump fan. The pump starts afterwards within approximately 10 seconds

DI CMD 24 V d.c., 24 V d.c. (Pin 8) and 0 V (Pin 7)

- A 24 V signal on corresponding pins will initiate a motor or frequency converter initialisation and starts the pump fan. The pump starts afterwards within approximately 10 seconds

DI CMD DRY pins 9 and 8

- Connecting above pins will initiate a motor or frequency converter initialisation and starts the pump fan. The pump starts afterwards within approximately 10 seconds.

RS485

- Pump controlled through RS485 Modbus RTU, refer to *Pump control with D-sub 9 port CONTROL: RS485 modbus communication* on page 32.

During pump down (maximum 50 L) the pump noise level can be louder while above 20 mbar. This is normal. During pump down, the pump rotational speed automatically regulates not to exceed 12 A line current. At operating pressure (between ultimate and 10 mbar), the pump noise will stabilise during the first minutes of operation while the pump warms up.

The noise level with PFPE fluid can be slightly louder than with synthetic long life oil LVO702.

Take note of warning labels on the pump.

Pump reference	Startup behaviour
10330040V04 10330040V05 10330065V03 10330065V04 10330065V05 10330065V06 10330065V07 10330040V06 10330040V07 10330040V10	To start the pump short pin 2 and 4 of CONTROL port. This initiates a motor / frequency converter initialisation and starts the pump fan. The pump starts afterwards within approximately 10 seconds.

Operation indoor only without condensation.

Operation

7.1 Pumping of non-condensable gases

If the pump system contains mainly non condensable gases, the pump should be operated without gas ballast.

If the composition of the gases to be pumped is not known and if condensation in the pump cannot be ruled out, run the pump with gas ballast valve open in accordance with Pumping of condensable gases and vapours.

7.2 Shutdown

The intake port of the pumps contains an anti-suckback valve which closes the intake port when the pump is switched off, thus maintaining the vacuum in the connected apparatus and preventing oil from being sucked back into the apparatus. The valve's functioning is not impaired by gas ballast operation.

If the pump has to be shutdown, drain the oil flush out the pump with fresh oil and fill in the required amount of clean oil (refer to *Check the oil* on page 39). Close the connection ports. Special preservation or flushing oils do not need to be used.

Note:
When the pump has been switched off due to over heating, initiated by the motor or its temperature detector, the pump must be cooled down to the ambient temperature, and must only be switched on again manually after having eliminated the cause.

In order to prevent the pump from running up unexpectedly after a mains power failure, the pump must be integrated in to the control system in such a way that the pump can only be started by a manually operated switch. This applies equally to emergency cut-off switches.

Close the gas ballast.

The pump doesn't restart automatically after a power shut down, except if the command given by digital input is maintained.

7.3 Condition of use

These pumps are intended to be used on clean processes, at low inlet pressure, for example, for backing turbomolecular pumps (TMP) in Analytical or Research and Development applications like mass spectrometers, electronic microscopes, coating installations, etc.

In normal operation, these pumps operated below 10 mbar inlet pressure or at ultimate pressure with open gas ballast (for pumps having a gas ballast). Continuous duty is possible up to 10 mbar.

In the below listed abnormal conditions (but not limited to) the pump may stop due to overheating of the power electronics or motor.

- Continuous operation at high inlet pressure
- Restricted, clogged or blocked exhaust filter or exhaust line
- Out of tolerance supply voltage
- Unsuitable, polluted or too old oil
- Too low oil level
- Too high ambient temperature
- Clogged fan hoods or impeded fresh air circulation.

The pump has been designed and tested to work in a normal EMC environment in according to IEC 61326-1 Table 1.

7.4 Pumping of condensable gases and vapours

With the gas ballast valve open and at operating temperature, the pumps can pump pure water vapour up to the values indicated in the Technical Data.

The gas ballast valve is opened by a screwdriver. The running noise of the pump is slightly louder if the gas ballast valve is open. Before pumping vapours make sure that the pump has warmed up for approximately 30 min. with closed intake line and with open gas ballast valve.

Note:

Do not open the pump to condensable vapours until it has warmed to operating temperature ; pumping process gas with a cold pump results in vapours condensing in the oil.

One sign of condensation of vapours in the pump is a rise of the oil level during operation of the pump.

Note:

When vapours are pumped, the pump must not be switched off immediately after completion of the process because the condensate dissolved in the pump oil may cause changes or corrosion. To prevent this, the pump must continue to operate with open gas ballast valve and closed intake port until the oil is free of condensate. We recommend operating the pump in this mode for at least 30 min. after completion of the process.

In cycle operation, the pump should not be switched off between the cycles but should continue to run with gas ballast valve open and intake port closed (if possible via a valve). Power consumption is minimal when the pump is operating at ultimate pressure.

Once all vapours have been pumped off from a process (for example, during drying), the gas ballast valve can be closed in order to improve the ultimate pressure.

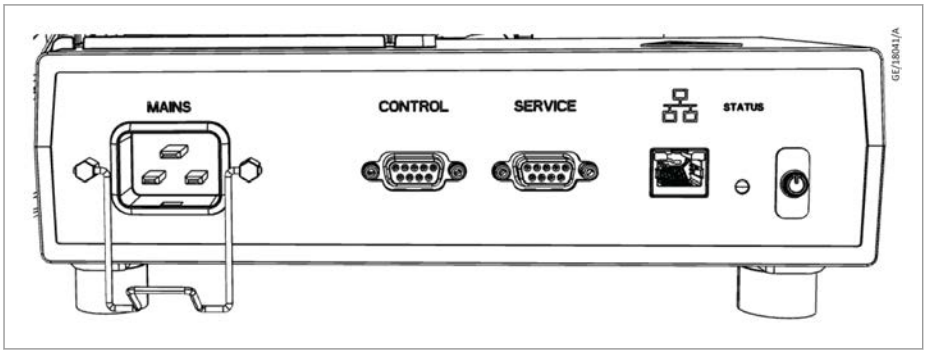
7.5 Taking out of use

Please contact us for all relation question about the disposal of spares, consumables or the entire pump.

Local contact information available at *Worldwide locations* on our website.

7.6 Control panel interface

7.6.1 Overview



Socket ID	Behaviour	Use	Comment
MAINS	IEC C20	Power supply	L/N interchangeable
CONTROL	D-SUB9, female screw UNC 4-40	To startup the pump To adjust pumping speed	-
SERVICE	D-SUB9, female screw UNC 4-40	Field service only	-
LAN	RJ45 female	GENIUS Instant Insights™	Cloud telemetry
STATUS	Multicolor LED	Give pump status	-
Push button	One state push button	Start-up the pump	Activated in standard only for specific pump reference

LED state	Pump state	Meaning
Off	Pump not powered	
Green, blinking	Pump is stopped	No error/warning active Waiting startup command
Green, solid	Pump motor running	No error/warning active Normal state
Yellow, blinking	Pump is stopped	Warning active
Yellow, solid	Pump is running	Warning active
Red, blinking	Pump is stopped	Error active
Red, solid	Pump is stopped	Internal error detected
Blue, blinking	Firmware update in progress.	-
Blue, solid	Firmware recovery mode. For development purposes only.	-
Green / Yellow / Red alternating with Blue blinking	Firmware update available on GENIUS Instant Insights™ platform	-

7.6.2 Pump control with D-sub 9 port CONTROL: Digital inputs variants

Pin description :

Remark 1: choice is given to use pin 9 or pin 2 for 24 V d.c. supply.

Remark 2: external supply can be used by using grounding to pin 3 or 7. Customer responsibility to put the correct current protection.

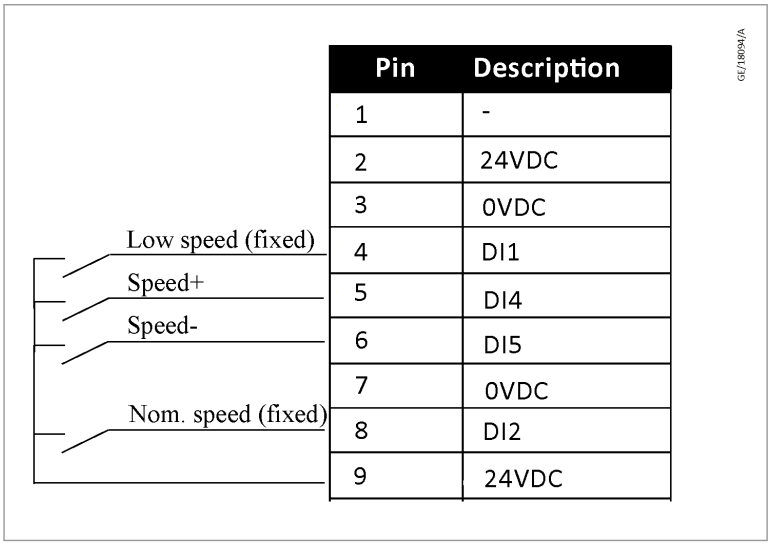


Table 5. CONTROL port datasheet

Description	Min	Nominal	Max	Unit
Supply voltage (pin 2or9 and 3and7)	22.8	24	25.2	V
Supply current	-	-	40	mA
DI voltage range	0	-	32	V
DI low level	-	-	4	V
DI high level	10	-	-	V
Sourcing/sinking current	-	-	1	mA

Table 6 Operation combination table

DI5 Speed-	DI4 Speed+	DI2 Nominal speed	DI1 Low speed	SPEED_SET	Remark
0	0	0	0	0	Standby mode, green LED blinking
0	0	0	1	LOW SPEED	Identified as SPEED_2 Default : 900rpm
0	0	1	0	NOMINAL SPEED	Identified as SPEED_1 Default : 1500rpm
0	0	1	1	HIGH SPEED	Identified as SPEED_3 Default : 1650rpm
0	1	0	0	0	No action
0	1	0	1	LOW SPEED+INCRE-MENT	Speed increment+ from LOW SPEED (10rpm every 100ms)

DI5 Speed-	DI4 Speed+	DI2 Nominal speed	DI1 Low speed	SPEED_SET	Remark
0	1	1	0	NOMINALSPEED+INCREMENT	Speed increment+ from NOMINAL SPEED (SPEED_2) (10rpm every 100ms)
0	1	1	1	HIGH SPEED+INCREMENT	Speed increment+ from HIGH SPEED (SPEED_3) (10rpm every 100ms)
1	0	0	0	0	No action
1	0	0	1	LOW SPEED-DECREMENT	Speed decrement- from LOW SPEED (10rpm every 100ms)
1	0	1	0	NOMINAL SPEED-DECREMENT	Speed decrement- from NOMINAL SPEED (10rpm every 100ms)
1	0	1	1	HIGH SPEED-DECREMENT	Speed decrement- from HIGH SPEED (10rpm every 100ms)
1	1	1	1	HIGH SPEED	Identified as SPEED_3 Default : 1650rpm

NOTE:

SPEED changed into SPEED1/SPEED2/SPEED3 by SPEED+/SPEED- command are memorised after power down (that means a new startup with SPEED1/ SPEED2/SPEED3 selection keep the previous speed adjustment.

7.6.3 Pump control with D-sub 9 port CONTROL: RS485 modbus communication

Pin description:

Pin	Description
1	-
2	-
3	RS485#1 - DATA A
4	-
5	RS485#1 - 0V
6	-
7	RS485#1 - DATA B
8	-
9	-

Note:

The RS485 termination required at bus ends needs to be implemented in the cable connected to the RS485 interface.

7.7 MODBUS RTU Protocol

The MODBUS RTU Protocol specifies the serial communications interface for the pumps. The serial communications interface is defined as follows:

- Half-duplex, RS-485, physical layer
- MODBUS RTU standard/open protocol

Throughout this section, all MODBUS addresses and values are specified using the C notation for hexadecimal (0x).

Table 7 Default comms configuration

Configuration Description	MODBUS Address	MODBUS Data	Description
Slave Address	0x7200	0x0011	Slave Address = 11
RS-485 Baud Rate	0x7201	0x0002	2= 19200 Bits per second
Protocol	0x7202	0x0000	0=RTU, 8 bits, no parity, 2 stop bits Does not take effect until Power On Reset or validation command set to 1.
Validation command	0x7203	0x0001	Write 1 to immediately apply RS485#1 settings without Power On Reset.

Note :

The pumps support only the MODBUS RTU mode.
Slave Address configurable from 1 to 254.

The pump MODBUS is following rules from the MODBUS over serial line specification and implementation guide V1.02 (Modbus.org).

Table 8. Supported Modbus Function Codes:

Function Code	Name
03 (0x03)	Read holding registers
04 (0x04)	Read input registers
06 (0x06)	Write single register
16 (0x10)	Write multiple registers
23 (0x17)	Read/Write multiple registers

7.7.1 Pump control with LAN port : MODBUS TCP/IP

The pump MODBUS TCP/IP is following rules from the MODBUS Messaging on TCP/IP Implementation Guide V1.0b (Modbus.org).

Table 9 Default comms configuration

Configuration Description	MODBUS Address	MODBUS Data	Description
LAN_LOCAL_IP_ADDRESS	0x03F2 u8[4]	192.168.0.10	Slave Address = 11
LAN_SUBNET_MASK	0x03F4 u8[4]	255.255.255.0	-
LAN_DEFAULT_GATEWAY	0x03F6 u8[4]	192.168.0.1	0=RTU, 8 bits, no parity, 2 stop bits Does not take effect until Power On Reset or validation command set to 1.
Validation command	0x03F8	0x0001	Write 1 to immediately apply LAN settings without Power On Reset.

7.7.2 Operation by modbus communication (RS485 or TCP/IP)

start command and speed set: ensure that SPEED_DI=0 (address 0x3EC, u8) and enter target speed =1500 rpm into SPEED_SET (address 0x3EB, u16)

To stop SPEED_SET=0

Note 1: the push button mounted on the pump is inhibited in case of taking the control from the communication.

Note 2: after power cycle SPEED_SET go back to 0.

7.7.3 Modbus registers table

Number (HEX)	Name	Access	Register Count	C Data type	Default	Min	Max	Unit	Description
3E8	SPEED_1	R/W	1	u16	1500	SPEED_LOW_LIMIT	SPEED_HIGH_LIMIT	RPM	Predefined motor speed setpoint used with Digital input
3E9	SPEED_2	R/W	1	u16	900	SPEED_LOW_LIMIT	SPEED_HIGH_LIMIT	RPM	Predefined motor speed setpoint used with Digital input
3EA	SPEED_3	R/W	1	u16	1650	SPEED_LOW_LIMIT	SPEED_HIGH_LIMIT	RPM	Predefined motor speed setpoint used with Digital input
3EB	SPEED_SET	R or R/W	1	u16	0	SPEED_LOW_LIMIT	SPEED_HIGH_LIMIT	RPM	Current motor speed setpoint. If the user selects a predefined motor speed setpoint with digital input, then current value of SPEED_1, SPEED_2 or SPEED_3 is written into SPEED_SET. Read-only if SPEED_DI=1.
3EC	SPEED_DI	R/W	1	u8	1	0	1	-	If 0, Modbus drives the setpoint and all Digital Inputs are disabled. If 1, Digital Inputs drive the setpoint (SPEED_SET becomes read-only).
70A	MAIN_counter_hours	R/M	2	u32	0	0	4294967295	hours	Cumulative time during pump running (hours component).
70C	MAIN_counter_minutes	R/M	1	u8	0	0	59	minutes	Cumulative time during pump running (minutes component).
70D	MAIN_counter_seconds	R/M	1	u8	0	0	59	seconds	Cumulative time FSM spends iduring pump running (seconds component).
2100	ERR_CURRENT	R	2	u32	0	0	4294967295	-	Error code of active error.
2102	ERR_OLD1	R	2	u32	0	0	4294967295	-	Error code of last error that occurred.
2104	ERR_OLD2	R	2	u32	0	0	4294967295	-	Error code of 2nd to last error that occurred
2106	ERR_OLD3	R	2	u32	0	0	4294967295	-	Error code of 3rd to last error that occurred
2108	ERR_OLD4	R	2	u32	0	0	4294967295	-	Error code of 4th to last error that occurred

Number (HEX)	Name	Access	Register Count	C Data type	Default	Min	Max	Unit	Description
210A	ERR_OLD5	R	2	u32	0	0	4294967295	-	Error code of 5th to last error that occurred.
210C	ERR_OLD6	R	2	u32	0	0	4294967295	-	Error code of 6th to last error that occurred
210E	ERR_OLD7	R	2	u32	0	0	4294967295	-	Error code of 7th to last error that occurred.
2110	ERR_OLD8	R	2	u32	0	0	4294967295	-	Error code of 8th to last error that occurred.
2112	ERR_OLD9	R	2	u32	0	0	4294967295	-	Error code of 9th to last error that occurred
2114	ERR_OLD10	R	2	u32	0	0	4294967295	-	Error code of 10th to last error that occurred.
2116	WARN_CURRENT	R	2	u32	0	0	4294967295	-	Error codes of active warnings.
2118	WARN_OLD1	R	2	u32	0	0	4294967295	-	Error code of last warning that occurred.
211A	WARN_OLD2	R	2	u32	0	0	4294967295	-	Error code of 2nd to last warning that occurred.
211C	WARN_OLD3	R	2	u32	0	0	4294967295	-	Error code of 3rd to last warning that occurred.
211E	WARN_OLD4	R	2	u32	0	0	4294967295	-	Error code of 4th to last warning that occurred.
2120	WARN_OLD5	R	2	u32	0	0	4294967295	-	Error code of 5th to last warning that occurred.
2122	WARN_OLD6	R	2	u32	0	0	4294967295	-	Error code of 6th to last warning that occurred.
2124	WARN_OLD7	R	2	u32	0	0	4294967295	-	Error code of 7th to last warning that occurred.
2126	WARN_OLD8	R	2	u32	0	0	4294967295	-	Error code of 8th to last warning that occurred.
2128	WARN_OLD9	R	2	u32	0	0	4294967295	-	Error code of 9th to last warning that occurred.
212A	WARN_OLD10	R	2	u32	0	0	4294967295	-	Error code of 10th to last warning that occurred.
2136	CTTR3_TEMP_VAL	R	1	s16	0	-32768	32767	0.1 °C	Pump current temperature.

Number (HEX)	Name	Access	Register Count	C Data type	Default	Min	Max	Unit	Description
2137	Motor_Speed	R	1	u16	0	0	65535	RPM	Current motor speed.
213A	Motor_current	R	1	u16	0	0	65535	mA	Current motor output current.
213D	Drive_PCB_temperature	R	1	s16	0	-32768	32767	0.1 °C	Current temperature of the drive.
213E	Supply_Voltage	R	1	u16	0	0	65535	V	Measured AC supply voltage
213F	Energy_Transferred	R/M	2	u32	0	0	4294967295	kWh	Total energy transferred to motor by GENESIS FC (estimate).
2143	Output_power	R	1	u16	0	0	65535	W	Current output electrical power of drive (estimate)
2144	DC_bus_voltage	R	1	u16	0	0	65535	V	Current DC bus voltage
8101	ERROR_CLEAR	W	1	u8	0	0	1	-	Write 1 to clear current errors.

7.7.4 Error and warning registers handling and diagnosis

Table below summarize the error code or warning code found into registers mentioned as ERR_CURRENT, ERR_OLD1,… ERR_OLD10 and WARN_CURRENT, WARN_OLD1 - WARN_OLD10.

0x00000002	ERR_OVER_VOLTAGE_DC	Critical error Warning	DC voltage too high
0x00000004	ERR_UNDER_VOLTAGE_DC	Critical error Warning	DC voltage too low
0x00000008	ERR_OVER_VOLTAGE_AC	Critical error Warning	AC voltage too high
0x00000010	ERR_UNDER_VOLTAGE_AC	Critical error Warning	AC voltage too low
0x00000020	ERR_IGBT_OVER_HEAT	Critical error Warning	IGBT temperature too high
0x00000040	ERR_PFC_OVER_HEAT	Critical error Warning	PFC temperature too high
0x00000080	ERR_PCB_OVER_HEAT	Critical error Warning	PCB temperature too high
0x00000100	ERR_PUMP_OVER_HEAT	Critical error Warning	Pump (CTTR3) temperature too high
0x00000200	ERR_MOTOR_OVER_HEAT	Critical error	Motor (PT) temperature too high
0x00000400	ERR_OVERLOAD	Critical error	I^2T trip triggered by prolonged motor overload
0x00000800	ERR_U_PHASE	Critical error	Inconsistent motor current on phase U
0x00001000	ERR_V_PHASE	Critical error	Inconsistent motor current on phase V
0x00002000	ERR_W_PHASE	Critical error	Inconsistent motor current on phase W
0x00004000	ERR_24V_FAILURE	Critical error	Cannot deliver correct supply voltage to CTTR1/CTTR2/CITF
0x00008000	ERR_CTTR3_CONNECTION	Critical error	Invalid measurement from pump temperature sensor (not connected or shorted)
0x00010000	ERR_INTERNAL_ERROR	Critical error	Internal error in FC or CITF
0x00020000	ERR_START_UP	Critical error	Maximum number of motor start-up attempts exceeded
0x00040000	ERR_HARSH_CONDITIONS_TIMEOUT	Critical error	Motor control FSM ran in HARSH CONDITIONS RUN for too long
0x00080000	ERR_PLL_Phase Lock Loss	Critical error	Phase lock loss during the running state

Note:

Multiple errors/warning management : registers will concatenate multiple errors appeared in the same time.

8 Maintenance

8.1 Safety information

Observe all safety regulations.

All work must be done by suitably trained personnel. Maintenance or repairs carried out incorrectly will affect the life and performance of the pump and may cause problems when filling warranty claims.

Never mount used seals; always mount new seals.

8.2 Maintenance Intervals

The intervals stated in the maintenance schedule are approximate values for normal pump operation. Unfavourable ambient conditions and/or aggressive media may significantly reduce the maintenance intervals.

Maintenance job	Frequency	Section
Check the oil level	Daily	A
Oil changes operation	Annually Longer with LVO702	B
Exhaust filter replacement	Annually Longer with LVO702	C
Gas ballast valve	Monthly checking	D
Anti-suck back valve checking	Annually	E
Front and rear cover cleaning	Annually	F

To simplify the maintenance work we recommend to combine several jobs. Maintenance works must be carried out with proper tools and in an adequate workspace/bench equipped with sufficient lighting.

Use only spare and consumables supplied by us.

An overhaul is recommended every 3 years.

After maintenance operations, make sure the device is in a safe condition before putting back into operation.

8.3 Maintenance work

8.3.1 Check the oil

Oil level

The oil level shall be checked daily and must be, while the pump is at standstill, close to the MAX marks. Should the oil level be below the MIN mark switch off the pump, check it (see chapter 4) and add the required amount of oil.

Oil level may drop when pump is operating due to oil distribution in the pump.

Maintenance

Oil change

Oil must be changed typically after the first year of service. Further oil changes must be done typically annually. If there is considerable pollution, it could be necessary to change the oil more frequently.

Oil changing must be done with a switched off and still warm pump. Open the oil drain valve and let the used oil run out into an appropriate container.

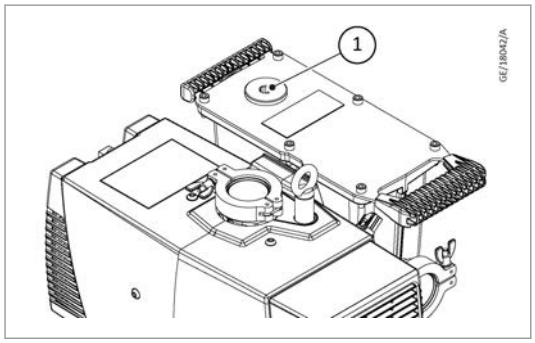
Close the drain valve when the oil stops flowing out.

Additional warning note: more frequent oil changes may be necessary if the ambient temperature is above 30 °C.

Before refastening the oil drain plug, inspect the O-ring and verify that it is free of particulate and is seated properly. Replace if necessary.

The pump should be "flushed" if there is considerable pollution.

To flush the pump, fill clean oil up to the minimum level, screw the oil filling plug at 4Nm, let the pump run for a few minutes and drain the oil. Install a full charge of oil.



1. *Tightening torque 4 Nm*

When disposing of used oil, please observe the relevant environmental regulations.

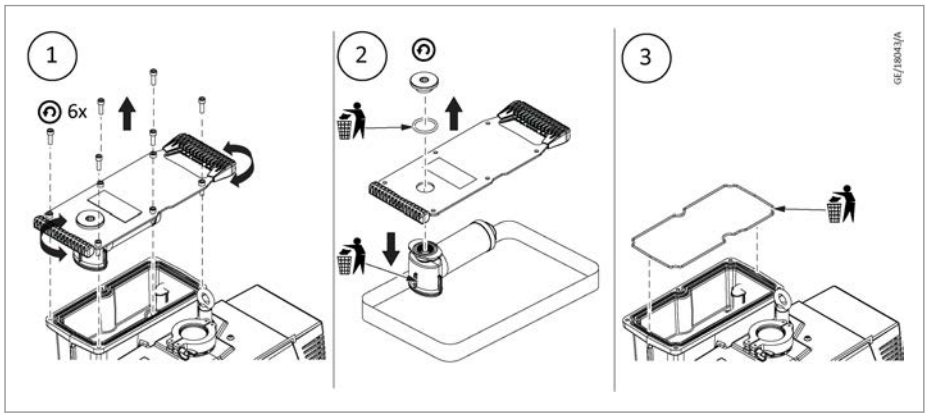
Replacing the exhaust filters

CAUTION: HOT OIL

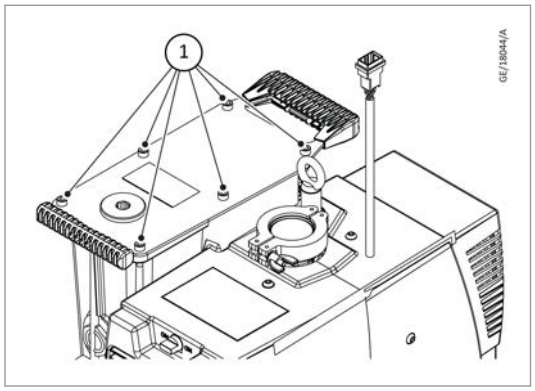
Risk of burns. Take appropriate precautions about hot oil as there is risk of burning by touching.

Oil mist escaping from the exhaust during operation indicates that the filter is probably clogged. Increased energy intake by the motor could also be the result of a soiled exhaust filter.

- Switch off the pump.
- Unscrew the oil casing cover, take out the filter from the oil casing cover and replace it.



- Also, check the O-ring of the oil casing cover and change it if necessary. The O-ring is part of the maintenance kit.
- Attach the oil casing cover to the pump, tightening torque 9.5 Nm.



1. Screw

Gas ballast valve cleaning

Contact us.

Clean the gas ballast valve, the seat. Reassemble in the reverse sequence.

Check and clean if necessary inlet of gas ballast

Anti-suck back valve checking

The anti-suck back valve should be checked at the same time as the inlet flange, be cleaned with an appropriate solvent.

Also check, if there is no damage on the sealing part of the valve.

Front and rear cover cleaning

Clogging of the covers may lead to overheating of the motor, the frequency converter and the pump. Remove the front and rear cover and clean them with blast air.

Clean carefully the fan with a soft brush

Before starting the pump again, be sure that covers have been reassembled.

9 Fault finding

Table 10. Fault finding

Fault	Pump does not start
Cause	**Pump is connected incorrectly**
Remedy	Connect the pump correctly.
Cause	**Motor protection switch incorrectly set**
Remedy	Change the fuse.
Cause	**Operating voltage does not match motor**
Remedy	Replace the motor.
Cause	**Motor is malfunctioning**
Remedy	Replace the motor.
Cause	**Oil temperature is below 12 °C (54 °F)**
Remedy	Heat the pump and pump oil or use different oil.
Cause	**Oil is too viscous**
Remedy	Use appropriate oil grade.
Cause	**Exhaust filter/exhaust line is clogged**
Remedy	Replace the filter or clean the exhaust line.

Fault	Pump does not reach ultimate pressure
Cause	**External leak**
Remedy	Repair the pump.
Cause	**Anti-suckback valve is malfunctioning**
Remedy	Repair the valve.

Cause	**Inadequate lubrication due to: unsuitable or contaminated oil**
Remedy	Change the oil (degas it, if necessary).
Cause	**Inadequate lubrication due to: clogged oil filter**
Remedy	Replace the oil filter.
Cause	**Inadequate lubrication due to: clogged oil lines**
Remedy	Clean the oil casing.
Cause	**Vacuum lines are dirty**
Remedy	Clean vacuum lines.
Cause	**Pump is too small**
Remedy	Check the process date; replace the pump, if necessary.

Fault	**Pumping speed is too slow**
Cause	**Dirt trap in the intake port is clogged**
Remedy	Clean the dirt trap; Precaution : Install a dust filter in intake line.
Cause	**Exhaust filter is clogged**
Remedy	Install new filter elements.
Cause	**Connecting lines are too narrow or too long**
Remedy	Use adequately wide and short connecting lines.

Fault	**After switching off pump under vacuum, pressure in system rises too fast**
Cause	**System has a leak**
Remedy	Check the system.
Cause	**Anti-suckback is malfunctioning**
Remedy	Repair the valve.

Fault	**Pump gets too hot**
Cause	**Cooling air supply is obstructed**
Remedy	Set pump up correctly.
Cause	**Cooler is dirty**
Remedy	Clean the cooler.
Cause	**Ambient temperature is too high**
Remedy	Set pump up correctly.
Cause	**Process gas is too hot**
Remedy	Change the process.

Fault finding

Cause	**Oil level is too low**
Remedy	Add oil to reach the correct oil level.
Cause	**Oil is unsuitable**
Remedy	Change the oil.
Cause	**Oil cycle is obstructed**
Remedy	Clean or repair the oil lines.
Cause	**Exhaust filter/exhaust line is obstructed**
Remedy	Replace the exhaust filter, clean the exhaust line.
Cause	**Pump module is no longer usable**
Remedy	Replace the pump module.

Fault	Oil in intake line or in vacuum vessel
Cause	**Oil comes from the vacuum system**
Remedy	Check the vacuum system.
Cause	**Anti-suckback valve is obstructed**
Remedy	Clean or repair the valve.
Cause	**Sealing surfaces of anti-suckback valve are damaged or dirty**
Remedy	Clean or repair the intake port and valve.
Cause	**Oil level is too high**
Remedy	Drain the excess oil.

Fault	Pump's oil consumption too high, oil mist at exhaust
Cause	**Exhaust filters are clogged or damaged**
Remedy	Replace the filter.
Cause	**Nozzle of float valve is clogged**
Remedy	Check the valve, clean the nozzle.
Cause	**Oil level is too high**
Remedy	Drain the excess oil.

Fault	Oil is turbid
Cause	**Condensation**
Remedy	Degas the oil or change the oil and clean the pump. Precaution: Open the gas ballast valve or insert a condensate trap. Clean the gas ballast intake filter.

Fault	Pump is excessively noisy
Cause	**Oil level is very low (oil is no longer visible)**
Remedy	Add oil.
Cause	**Oil filter is clogged**
Remedy	Change the oil and filter.
Cause	**Large vacuum leak in system**
Remedy	Repair vacuum leak.

10 Storage

Before stocking the pump for a long time put it back in its original condition (blank off inlet and exhaust ports with the shipping seals, drain the oil) and store the pump in a dry place at room temperature in its original packaging. Storage temperature is -15°C to +50°C. Relative humidity < 95, non condensing.

Until the pump is put back into service again, the pump should be stored in a dry place, preferably at room temperature (20°C - 168°F). Before taking the pump out of service, it should be properly disconnected from the vacuum system, purged with dry nitrogen and the oil should be exchanged too. The gas ballast must be closed and if the pump is to be shelved for a longer period of time it should be sealed in a plastic bag together with a desiccant (Silicagel).

If the pump has been shelved for over one year, standard maintenance must be done and the oil must be exchanged too before the pump is put in to service once more.

We recommend that you contact our service.

11 Service

11.1 Return the equipment or components for service

Before you send your equipment to us for service or for any other reason, you must complete a Declaration of Contamination Form. The 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.

If you are returning equipment note the following:

- If the equipment is configured to suit the application, make a record of the configuration before returning it. All replacement equipment will be supplied with default factory settings.
- Do not return equipment 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 *leybold.com/en/downloads/download-documents/declaration-of-contamination/*, 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 form, your equipment cannot be serviced.

12 Spare parts

To guarantee the safe operation of the vacuum pump, only original spare parts and accessories should be used. When ordering spare parts and accessories, always state the pump type and serial number. You can find the part numbers in the spare parts list. Consumables and main spare parts kits for pumps are usually available on stock at our service centres. The list of the maintenance kits is given here.

Part number	Description
EK103355M	Minor Maintenance Kit SV55-70 BI²
EK10335501	Major Maintenance Kit SV55 BI² DSS
EK103355P1	Major Maintenance Kit SV55 BI² PTFE
EK10337001	Major Maintenance Kit SV70 BI² DSS
GK103355DSS1	DSS Shaft Seal + Bushing kit - V55 BI²
GK103355PTFE1	PTFE Shaft Seal + Bushing kit - V55 BI²
GK103370DSS1	DSS Shaft seal + Bushing kit - V70 BI²

We recommend to use these kits which have been defined to allow an optimal maintenance or repair. Individual spare parts may need longer delivery time. For all maintenance works, use only genuine parts. If non genuine parts are used during warranty period, we reserve the right to reject any claim.

13 Accessories

13.1 Accessories

Specification	Part number
Noise enclosure	960331NENC

Accessories

13.2 Ordering information

P/N	Pump	GB	Inlet	Exhaust	Oil	Shaft seal	Sub-D type	Control	Socket	On/Off switch	Current overload
10330040V01	SV55 BI²	Y1	40 KF	40 KF	LVO702	FKM DSS	9 Female	Manual CMD On Off switch	C20	Enabled	Fuses x 2 10A T
10330040V02	SV55 BI²	Y1	25 KF	25 KF	LVO702	FKM DSS	9 Female	RS485	C20	Enabled	Fuses x 2 10A T
10330040V03	SV55 BI²	Y1	25 KF	25 KF	PFPE LVO420	PTFE	9 Female	RS485	C20	Enabled	Fuses x 2 10A T
10330040V04	SV55 BI²	Y1	25 KF	1/2" Barbed hose fitting	LVO702	FKM DSS	9 Female	Manual CMD On Off switch	C20	Enabled	Fuses x 2 10A T
10330040V05	SV55 BI²	Y1	25 KF	1/2" Barbed hose fitting	LVO702	FKM DSS	9 Female	DI CMD DRY pins 9 and 8	C20	Disabled	Fuses x 2 10A T
10330040V06	SV55 BI²	Y1	40 KF	1/2" Barbed hose fitting	PFPE LVO420	PTFE	9 Female	DI CMD 24 V DC 24 V DC (Pin 8) and 0 V (Pin 7)	C20	Disabled	Fuses x 2 10A T
10330040V07	SV55 BI²	Y1	25 KF	w/o G 3/8	LVO702	FKM DSS	9 Female	DI CMD 24 V DC 24 V DC (Pin 8) and 0 V (Pin 7)	C20	Disabled	Fuses x 2 10A T
10330040V08	SV55 BI²	Y1	40 KF	1/2" Barbed hose fitting	PFPE LVO420	PTFE	9 Female	Manual CMD On Off switch	C20	Enabled	Fuses x 2 10A T

Accessories

P/N	Pump	GB	Inlet	Exhaust	Oil	Shaft seal	Sub-D type	Control	Socket	On/Off switch	Current overload
10330040V09	SV55 BI²	Y1	40 KF	1/2" Barbed hose fitting	LVO702	FKM DSS	9 Female	Manual CMD On Off switch	C20	Enabled	Fuses x 2 10A T
10330040V10	SV55 BI²	Y1	40 KF	1/2" Barbed hose fitting	LVO702	FKM DSS	9 Female	Manual CMD On Off switch	C20	Enabled	Fuses x 2 10A T
10330065V01	SV70 BI²	Y1	40 KF	40 KF	LVO702	Dynamic	9 Female	RS485	C20	Enabled	Fuses x 2 10A T
10330065V02	SV70 BI²	Y1	40 KF	1/2" barbed	LVO702	Dynamic	9 Female	RS485	C20	Enabled	Fuses x 2 10A T
10330065V03	SV70 BI²	Y1	40 KF	15 mm straight	LVO702	Dynamic	9 Female	DI CMD DRY Pins 9 and 8	C20	Disabled	Fuses x 2 10A T
10330065V04	SV70 BI²	Y1	40 KF	1/2" barbed	LVO702	Dynamic	9 Female	DI CMD DRY Pins 9 and 8	C20	Disabled	Fuses x 2 10A T
10330065V05	SV70 BI²	Y1	40 KF	1/2" barbed	LVO702	Dynamic	9 Female	DI CMD DRY Pins 9 and 8	C20	Disabled	Fuses x 2 10A T
10330065V06	SV70 BI²	Y1	40 KF	1/2" barbed	LVO702	Dynamic	9 Female	DI CMD DRY Pins 9 and 8	C20	Disabled	Fuses x 2 10A T
10330065V07	SV70 BI²	Y1	40 KF	1/2" barbed	LVO702	Dynamic	9 Female	DI CMD DRY Pins 9 and 8	C20	Disabled	Fuses x 2 10A T

P20050188A

EU Declaration of Conformity

This declaration of conformity is issued under the sole responsibility of the manufacturer:

Leybold GmbH
Bonner Strasse 498
D-50968 Köln
Germany

Documentation Officer
T: +49(0) 221 347 0
documentation@leybold.com

The product specified and listed below:

- Product: SOGEVAC, Single Stage Rotary Vane pumps,
  with motor and frequency converter
- Models: SV55/70BI²
- Pump family codes: *SV55 BI² 10330040Vxx*
  SV70 BI² 10330065Vxx
  (xx are chronologically numbered customer variants)

Is in conformity with the relevant Union harmonisation legislation:

2006/42/EC	Machinery directive *Note: The safety objectives of the Low Voltage Directive 2014/35/EU were complied with in accordance with Annex 1 No. 1.5.1 of this directive.*
2014/30/EU	Electromagnetic compatibility (EMC) directive
2011/65/EU	Restriction of certain hazardous substances (RoHS) directive as amended by Delegated Directive (EU) 2015/863

Based on the relevant requirements of harmonised standards:

EN 1012-2:1996 +A1:2009	Compressors and vacuum pumps. Safety requirements. Vacuum pumps
EN 61010-1:2010 +A1:2019	Safety requirements for electrical equipment for measurement, control and laboratory use. General requirements.
EN IEC 61326-1:2021	Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements. Class B Emissions
EN IEC 61000-6-2:2019	Electromagnetic Compatibility (EMC) - Part 6-2: Immunity standard for industrial environments
EN IEC 61000-6-3:2021	Electromagnetic Compatibility (EMC) - Part 6-3: Emission standard for equipment in residential environments

This declaration, based on the requirements of the listed Directives and EN ISO/IEC 17050-1, covers all product serial numbers from this date on: *2025-01-20*

You must retain the signed legal declaration for future reference
This declaration becomes invalid if modifications are made to the product without prior agreement.

Andries DE
VP Engineering
Industrial Vacuum Division

François BOUILLOT
General Manager Leybold Valence

This product has been manufactured under a quality management system certified to ISO 9001:2015

Declaration of Conformity

Leybold GmbH
Bonner Strasse 498
D-50968 Köln
Germany

Documentation Officer
Innovation Drive
Burgess Hill
West Sussex
RH15 9TW
documentation@leybold.com

This declaration of conformity is issued under the sole responsibility of the manufacturer.

- Product: SOGEVAC, Single Stage Rotary Vane pumps,
  with motor and frequency converter
- Models: SV55/70BI²
- Pump family codes: *SV55 BI² 10330040Vxx*
  SV70 BI² 10330065Vxx
  (xx are chronologically numbered customer variants)

The object of the declaration described above is in conformity with relevant statutory requirements:

Supply of Machinery (Safety) Regulations 2008 *The objectives of the Electrical Equipment (Safety) Regulations 2016 are governed by Annex 1 1.5.1 of this regulation.*

Electrical Equipment (Safety) Regulations 2016

Electromagnetic Compatibility Regulations 2016
Class B Emissions, Basic Immunity

Batteries and Accumulators (Placing on the Market) Regulations 2008

Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Relevant designated standards or technical specifications are as follows:

EN 1012-2:1996 +A1:2009	Compressors and vacuum pumps. Safety requirements. Vacuum pumps
EN 61010-1:2010 +A1:2019	Safety requirements for electrical equipment for measurement, control and laboratory use. General requirements.
EN IEC 61326-1:2021	Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements. Class B Emissions
EN IEC 61000-6-2:2019	Electromagnetic Compatibility (EMC) - Part 6-2: Immunity standard for industrial environments
EN IEC 61000-6-3:2021	Electromagnetic Compatibility (EMC) - Part 6-3: Emission standard for equipment in residential environments

This declaration, based on the requirements of the listed Statutory Instruments and EN ISO/IEC 17050-1, covers all product serial numbers from this date on: *2025-01-20*

You must retain the signed legal declaration for future reference
This declaration becomes invalid if modifications are made to the product without prior agreement.

Signed for and on behalf of Leybold GmbH

Andries DE BOCK
VP Engineering
Industrial Vacuum Division

François BOUILLOT
General Manager Leybold Valence

ADDITIONAL LEGISLATION AND COMPLIANCE INFORMATION (EU/UK)

RoHS (EU, UK): Material Exemption Information

This product is compliant with the following Exemptions
Annex III:

- 6(a) **Lead** as an alloying element in steel for machining purposes and in galvanised steel containing up to 0.35 % lead by weight
- 6(b) **Lead** as an alloying element in aluminium containing up to 0.4% by weight
- 6(c) Copper alloy containing up to 4% **lead** by weight

REACH (EU, UK)

This product is a complex article which is not designed for intentional substance release. To the best of our knowledge the materials used comply with the requirements of REACH. The product manual provides information and instruction to ensure the safe storage, use, maintenance and disposal of the product including any substance based requirements.

Article 33.1 Declaration (EU, UK)

This product contains Candidate List Substances of Very High Concern above 0.1%ww by article as clarified under the 2015 European Court of Justice ruling in case C-106/14.

- Lead (Pb)
  This substance is present in certain steel / aluminium / brass / electrical or electronic components.

WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (EU,UK)

This product must be disposed of in accordance with the requirements of the WEEE Directive.

COMPLIANCE INFORMATION – INCORPORATED PRODUCTS AND ASSEMBLIES

Motors	Regulation (EU) No 2019/1781 electric motors and variable speed drives *Based on the requirements of harmonised standard:* EN 60204-1:2018;EN 60320-1:2015; EN 60999-1:2000;EN 60352-2:2006; EN 61010-1:2010

ADDITIONAL APPLICABLE REQUIREMENTS

The product is in scope for and complies with the requirements of the following:

Product is certified to EN 61010-1:2010 +A1:2019	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements cTUVus certification CU 72405912.01

材料成分声明
China Material Content Declaration

	有害物质 Hazardous Substances					
部件名称 Part name 	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr VI)	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
铸铝及铝合金制品 Aluminium alloys	X	0	0	0	0	0
钢合金制品 Steel alloys	X	0	0	0	0	0
印刷电路组件 (PCA) Printed Circuit Assembly (PCA)	X	0	0	0	0	0
电机（泵和机械增压泵） Motors (pump and mechanical booster)	X	0	0	0	0	0
电子元件和控件 Electronics and Controls	X	0	0	0	0	0

O: 表示该有害物质在该部件的所有均质材料中的含量低于 GB/T 26572 标准规定的限量要求。
O: Indicates that the hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572.

X: 表示该有害物质在该部件的至少一种均质材料中的含量超出 GB/T26572 标准规定的限量要求。
X: Indicates that the hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T26572.

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Leybold

Pioneering products. Passionately applied.

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