Leybold

LEYVAC

LV 80, LV 140

Dry Compressing Vacuum Pumps

Operating Instructions 300407956_002_C5

Part Numbers

115080V15 / 30

115140V15 / 30 / 40

Contents

Contents

Original installation and operating instructions.

Safety Information

NOTE

Obligation to Provide Information

Before installing and commissioning the pump, carefully read these Operating Instructions and follow the information so as to ensure optimum and safe working right from the start.

The Leybold **LEYVAC** has been designed for safe and efficient operation when used properly and in accordance with these Operating Instructions. It is the responsibility of the user to carefully read and strictly observe all safety precautions described in this section and throughout the Operating Instructions. The pump **must only be operated in the proper condition and under the conditions described in the Operating Instructions**. It must be operated and maintaine d by trained personnel only. Consult local, state, and national agencies regarding specific requirements and regulations. Address any further safety, operation and/or maintenance questions to our nearest office.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE is used to notify users of installation, operation, programming or maintenance information that is important, but not hazard related.

We reserve the right to alter the design or any data given in these Operating Instructions. The illustrations are not binding.

Retain the Operating Instructions for further use.

0 Important Safety Information

Explanation of Warning Symbols

<table>
<tr><td></td><td colspan="2">⚠ WARNING</td></tr>
<tr><td>  </td><td>Toxic gases</td><td rowspan="4">The pump must be leaktight. When the pump has been used to pump hazardous gases before, introduce appropriate safety precautions before opening it. Before opening the pump, purge it for a longer period of time with an inert gas. If necessary, wear gloves, breathing protection or protection clothing.</td></tr>
<tr><td>  </td><td>Danger of explosion</td></tr>
<tr><td>  </td><td>Fire danger</td></tr>
<tr><td>  </td><td>Reactive or corrosive media</td></tr>
<tr><td>  </td><td>Contaminated parts</td><td></td></tr>
<tr><td>  </td><td colspan="2">Hazardous Voltage
Disconnect power before opening.
Contact causes electrical shock.
High Leakage Current
Earth connection essential before connecting supply.
Electrical Hazards
Danger of residual voltage for up to 5 min after disconnecting power supply. Connect and disconnect the mains plug only in deenergized condition.</td></tr>
<tr><td>  </td><td colspan="2">Hot Surface
Do not touch.
Allow this area to cool before servicing.
Burn hazard
Hot Surface inside. Do not touch, wear protective equipment.</td></tr>
</table>

Safety Information

	⚠ CAUTION
	**Purge gas** Check compatibility with applications **Overpressure in the discharge line** Components can be thrown in all directions. The pressure in the discharge line must not exceed atmospheric pressure by 300 mbar max. The discharge line must not be blocked or restricted.
	**Pumps with wheels** must only be placed and moved on levelled horizontal surfaces!
	**Vacuum** Avoid exposing any part of the human body to the vacuum.
	**Machinery starts automatically** Connect the pump so that it not will restart automatically after a mains power failure, once the power returns.
	**Overhead load** Transport the pump only secured with a forklift. Only qualified personnel are allowed to unload and lift the pump. When elevating the pump, no personnel should be under the object.

0.1 Mechanical Hazards

WARNING

1 In order to avoid the destruction of systems and injury to operating personnel we urgently recommend to observe the information and installation information provided in these Operating Instructions.

2 Avoid exposing any part of the human body to the vacuum.

3 Do not operate the pump with an opened intake port. There exists the risk of suffering injury.

4 The pump is intended for generating a vacuum only. If an **overpressure** can occur in the pump and the system then they must be protected against such an overpressure by an overpressure safety valve, for example.

5 The maximum permissible discharge pressure for the LEYVAC is 1.3 bar abs.

We recommend to operate the pump with a silencer or a connected discharge line. The pressure in the discharge line must not exceed atmospheric pressure by 300 mbar max.

Make sure that the gas flow at the discharge is not blocked or restricted in any way, even when the pumped out gases need to be collected or contained.

No shutoff devices are required in the discharge line for pump operation. If shutoff devices are installed, open them before starting the pump.

In the case of processes involving much condensate, we recommend the installation of a condensate separator in the discharge line.

6 Protect the purge gas supply so that in the event of a malfunction or power interruption no overpressure can occur within the pump system.

7 We recommend to design the discharge line in consideration of a possible overpressure of 5 bar. In the event of a malfunction, such a pressure can occur briefly.

8 For **transporting** the pump use only suitable transport means.

When selecting the lifting and transport means take note of the total weight before transporting the pump.

Only the qualified personnel are allowed to unload and lift the pump. When elevating the pump, no personnel should be under the object.

As standard the pump has been equipped with a single crane eye. When transporting the pump with a forklift or similar, ensure that the pump has been secured on the forks or on a suitable pallet. Alternatively use two nylon slings as hoisting devices.

Be careful not to overturn the pump when pushing or pulling the pump sideways.

9 Select the location where the pump is installed so that all controls can be easily accessed. Place the pump only on a floor which is level. It can topple when it is tilted by more than 10° with respect to the verti-cal axis.

For pumps on castors only
Because of the fitted castors, the pump must only be placed on a level floor capable of supporting the pump's weight, as otherwise there exists the risk of the pump rolling away. Moreover, the pump may only be moved on a level floor! Moving the pump along sloping paths or ramps is prohibited! The pump must only be transported with a forklift or a crane! At the installation location, screw down the adjustable feet.

10 Before beginning with any maintenance and servicing work always ensure that **no gas can flow backwards** through the pump since then the rotors might turn against the normal direction of rotation. For this reason vent the vacuum chamber to the discharge pressure level or ensure through suitable valves that the vacuum chamber and the lines are reliably separated from the pump. When connecting several pump systems, pressure differences between inlet and discharge can give rise to uncontrolled turning of the pump's shafts.

11 During operation, the cooling water circuit must not be shut off. A cooling water discharge which has been blocked can cause the formation of gas bubbles and result in excessively high pressures.

12 Lay electric feed and cooling water lines so that there is no risk of **tripping** over these.

13 When changing the oil remove any escaped oil as otherwise there is the risk of slipping.

14 Before doing installation work on the pump system make sure that no vacuum is present in the pump and that all media connections have been depressurised.

15 Before disassembling any cooling water lines, leave the pump to cool down, shut off the feed line.

0.2 Electrical Hazards

WARNING

1 The electrical connection must only be provided by a trained person. Observe the national regulations in the country of use like EN 50110-1 for Europe, for example.

2 Potentially lethal voltages are present at the mains connections. Before beginning with any maintenance or service work on the pump, disconnect the pump from all power supplies (lockout/tagout).

3 Install a device for a safe disconnection from the power supply.

4 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 deenergised (lockout/tagout) the equipment.

5 Always operate the pump with a properly connected protective earth conductor and make sure that the motor casing is closed.

6 The pump must only be operated at the frequency specified for the motor.

7 After having connected the motor and each time after having made changes to the wiring, check the motor's direction of rotation.
A wrong direction of rotation can cause a pressure buildup on the intake side. Moreover, the pump may suffer severe damage.

8 Install a suitable motor protection for the electric motor before starting up for the first time. Note the information in these Operating Instructions and on the nameplate.

9 Before starting, check to ensure that the junction box is undamaged, run a visual inspection on on the seals.

10 Install add-on parts (pressure switches, for example) without any mechanical tensions and protect these against being damaged by impacts, for example.

11 Lay the connecting lines so that these cannot be damaged. Protect the lines against humidity and contact with water. Avoid thermally stressing the lines by unfavourable laying. Comply with the required standards when designing and laying the electrical connections.

12 Provide strain relief for the connecting lines so that the plugs and the line connectors are not subjected to excessively high mechanical stresses.

13 Lay electric feed lines so that there is no risk of **tripping** over these.

14 The pump must be integrated in the system control arrangement so that it can not run-up automatically after it has been shut down due to overtemperature. This applies equally to emergency shut-down arrangements. After having determined the fault cause, the pump should be switched on manually again.

0.3 Thermal Hazards

CAUTION

1 Under certain ambient conditions parts of the the pump may attain temperatures over 80 °C. There then exists the risk of suffering burns. Note the danger symbols on the pump and in the case of a hot pump wear the required protection equipment. 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 Before disassembling any cooling water lines, leave the pump to cool down, shut off the feed line.

4 When uninstalling the cooling water lines, take note of splashing water. Heated water can cause burns.

5 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.

6 Operating the pump with less than the specified amount of cooling water will result in excessively high surface temperatures. Moreover, there exists the risk of suffering burns.

0.4 Hazards Caused by Materials and Substances

WARNING

1 The vacuum line must be leaktight. **Hazardous process gases** may escape or the pumped gases can react with air or atmospheric humidity. After installation of the pump and after servicing work on the vacuum system, a leak search will always be necessary.

When pumping toxic, corrosive and reactive gases we recommend a leak search on a regular basis. Leaks in the pump cannot be ruled out under all circumstances. When pumping hazardous gases, the operator must ensure that that leaks at the pump will not be a hazard.

2 Before commissioning the pump, make sure that the media which are to be pumped are compatible with each other so as to avoid hazardous situations.

All relevant safety standards and regulations must be observed.

3 If required additional monitoring of the purge gas quantities is necessary from the side of the operator when a well-defined and ensured dilution is necessary from the side of the process.

The type of protection depends on the specific process and needs to be assessed by of the customer.

4 The cooling water from the return is not of drinking water quality and should not be used for this purpose.

After having operated the pump, the cooling water lines may suffer from microbiological contamination. Take appropriate safety precautions.

5 Before operating the pump with a gas ballast or a purge gas check the compatibility of the gas with the pumped media so as to avoid dangerous conditions during operation.

6 Secure the purge gas supply so that in the event of a malfunction no overpressure can occur in the system.

7 When the pump has been used to pump hazardous gases before, introduce appropriate safety precautions before opening the intake or the discharge connections. Before opening the pump, purge it for a longer period of time with an inert gas. If necessary, wear gloves, breathing protection or protection clothing and work under a fume hood. Firmly seal off the pump. When shipping the decontaminated pump for servicing please also indicate the type of hazard. For this see Section 5.1 Service at Leybold.

8 Leybold is not in a position to perform servicing (repairs) and waste disposal of radioactively contaminated pumps. Both needs to be ensured from the side of the user.

9 When disposing of the pump, used lubricants and used oil filters observe the applicable environment regulations.

10 When pumping hazardous gases you must assume the presence of hazardous residues in the pump.

11 If the pump has been contaminated by the process or through environmental influences, it must be decontaminated professionally.

Contaminated parts can be detrimental to health and the environment. Before beginning with any repair and maintenance work inform yourself about any possible contamination. When handling contaminated parts observe the pertinent regulations and comply with the necessary protection measures.

When shipping contaminated pumps which require approval by the authorities, note the applicable regulations regarding packaging and shipping.

12 Some pumps use perfluoropolyether **(PFPE)** as 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 way from open fires. Do not smoke with PFPE on your fingers.
Touch the inner sections of the pumps only while wearing clean gloves, and use clean tools;
do the necessary work in clean and dry rooms;
after having removed the pump from its packaging, start it up as quickly as possible;
as cleaning agents solvents based on hydrofluorether compounds may be used.

13 Fluoropolymers are used as sealants (FKM) and as lubricants (PFPE) in the pumps. In case the pump suffers a severe mechanical failure, or is misused, or was exposed in a fire, the possibility of hazardous substances being released owing to their thermal decomposition cannot be excluded. Do not touch or inhale these thermal breakdown products of fluorinated materials.

0.5 Ignition Risk

WARNING

The standard version of the pump **must not** be used to pump potentially flammable atmospheres and is **not** suited for operation in explosion hazard areas. Contact us before planning to use the pump under such circumstances.

0.6 Noise Hazard

CAUTION

The noise level of the pump during ultimate pressure operation with silencer or connected discharge line corresponds to the values stated in the Technical Data. In other operating modes and with other equipment, higher values must be expected. Make sure that suitable protection measures are taken to protect your hearing.
We recommend to wear hearing protectors (earmuffs), if local noise levels exceed mandatory limits.

0.7 Dangers in Connection with safety-related Measures and Precautions

CAUTION

Take note of the warning information on the casing surface. If this warning information was removed, covered or obstructed, then provide corresponding additional warning information.

0.8 Danger of Pump Damage

NOTICE

1 Select an installation site for the pump so that all controls are easily accessible.

2 The pumps are supplied filled with PFPE (LVO 410) or synthetic oil (LVO 210). For this reason they should, while being transported or shipped, not be subjected to tilting by more than 10° with respect to the horizontal axis. Store the pumps only horizontally standing on their feet.

3 When pumping dust containing media, install a dust filter in the pro-cess gas flow upstream with respect to the pump.

4 When connecting the pump, provide a suitable valve on the intake side for the purpose of shutting off the intake line so as to prevent the pump from turning backwards in the event of a power failure. Otherwise the pump may suffer damage or oil may contaminate the pump chamber.

5 Lines and other vacuum connections should be clean and free of oil. Special attention must be paid here when oil-sealed pumps have been used on the vacuum side. Check the conditions before initial commissioning. In the case of deviations, the pump can suffer contamination with oil residues.

6 The pressure within a pump which has been switched off will increase to ambient pressure within a few seconds. In such a case the pump is vented through the discharge. We recommend to fit a **nonreturn discharge valve.**

7 The **discharge line** should be laid so that it slopes down and away from the pump so as to prevent condensed vapours from backstreaming into the pump.

8 In the case of wet processes we recommend the installation of **liquid separators,** upstream and downstream of the pump so as to avoid the influx of liquid into the pump.

9 During installation work on the intake and discharge lines do not subject flanges to any stresses. Check the rubber elements of the pump's feet as

to any deformation.

10 Before pumping **condensable vapours** the pump should be at operating temperature. If a gas ballast is present, then it should be opened. The pump will attain its operating temperature approximately 120 minutes after having started the pump. During this warm-up phase, the pump should be left separated from the process by a valve in the intake line, for example.

11 If condensable vapours have been pumped, the pump should before switching off be purged with an inert gas or air (depending on the specific application). This process should also be run before cleaning the pump chamber.

12 For shutting down the pump let the pump operate idle for at least 30 minutes. Disconnect the pump from the mains power. Place desiccant into the intake flange and into the discharge flange and blank off the flanges with a piece of foil.
When storing the pump for a longer period of time, drain out the oil first. Package the pump airtight in polyethylene foil.

13 Improper maintenance or repair work can have an influence on the service life and the performance of the pump and will void any warranty claims.

14 Maximum **cooling water pressure:** 7 bar. When exceeded, there is the risk of leaks.

Pressures given in bar or mbar are absolute values. If exceptionally a gauge pressure is meant, a “g” is added (bar(g)).

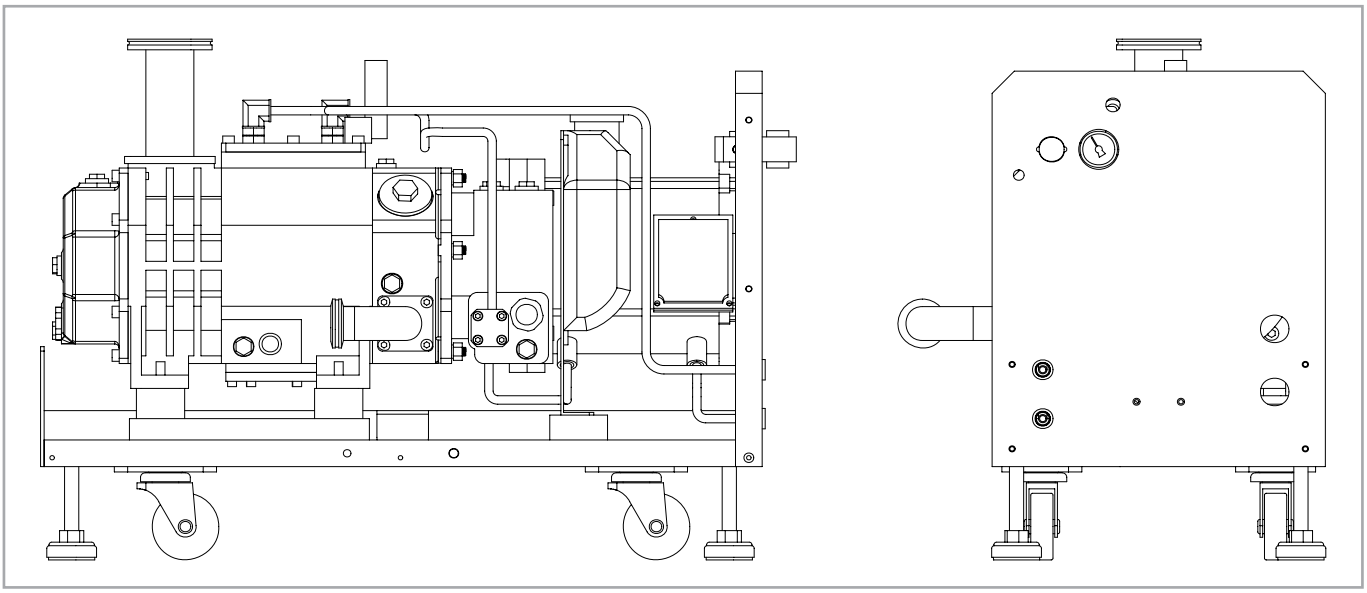


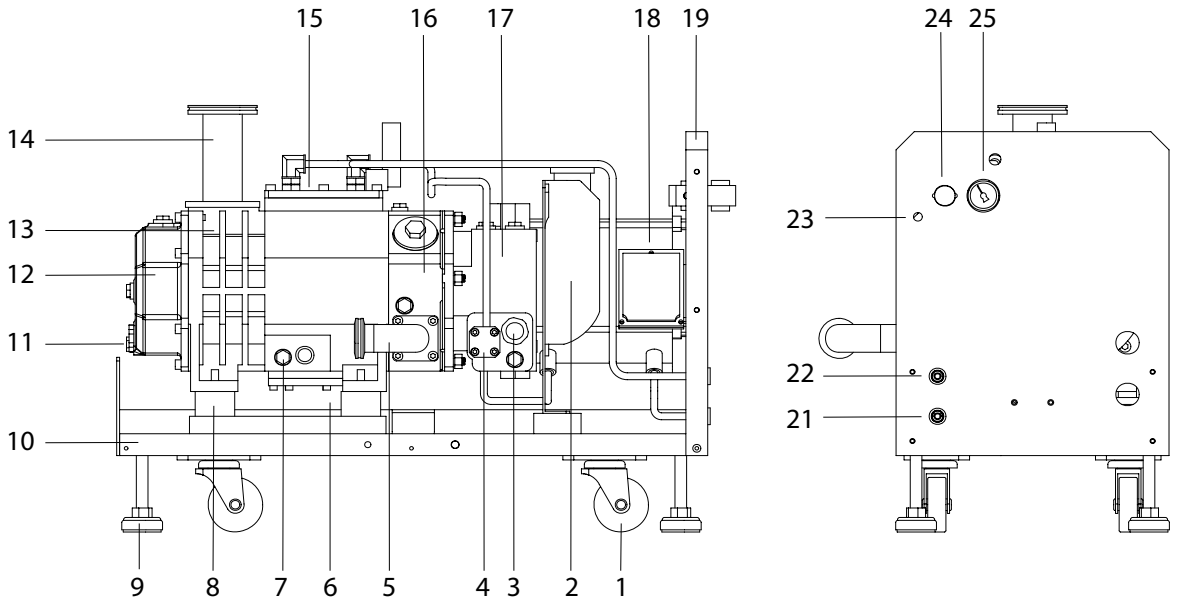
Fig. 1.1 LEYVAC LV 80; LEYVAC LV 140

1 Description

1.1 Pump Module

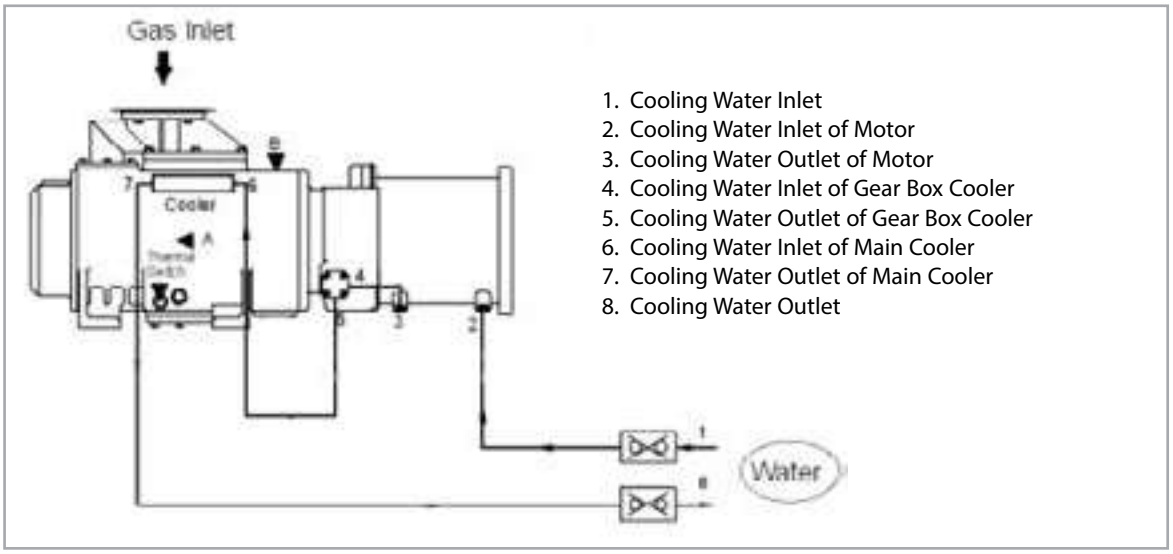
Members of the LEYVAC vacuum pump family are of the dry compressing single stage screw vacuum pump type. All LV models are positive displacement rotary pumps. During operating, the pump rotors are not in contact to each other; therefore, there is no need of grease for lubricating or for sealing the vacuum chamber. Thus, concerns in respect to oil dust backflows are not applicable.

The pumps are water cooled and they are lubricated with PFPE (LVO 410) or synthetic oil (LVO 210). Their purge gas system is equipped with a 24V-operated magnetic valve for both rotor purge and shaft seal purge, with an additional manually operated valve fitted to the rotor purge line. There are two different model types to be distinguished: The uncovered LEYVACs and C-Type pumps with a cover installed.



1. Castor
2. Expansion Vessel
3. Oil Level Indicator
4. Gear Box Cooler
5. Pump Outlet (Side)
6. Cooler
7. Casing Temperature Sensor
8. Shock-absorping Pad
9. Height-adjustment Foot
10. Pump Frame
11. Oil Level Indicator
12. Oil Box
13. Casing
14. Pump Inlet
15. Main Cooler
16. High Pressure Side Plate
17. Gear Box
18. Motor
19. Front Panel
21. Cooling Water Inlet
22. Cooling Water Outlet
23. N_2 Gas Inlet
24. N_2 Pressure Regulator
25. N_2 Pressure Gauge

Fig. 1.2 LEYVAC LV 80 Pump Configuration; LEYVAC LV 140



1. Cooling Water Inlet
2. Cooling Water Inlet of Motor
3. Cooling Water Outlet of Motor
4. Cooling Water Inlet of Gear Box Cooler
5. Cooling Water Outlet of Gear Box Cooler
6. Cooling Water Inlet of Main Cooler
7. Cooling Water Outlet of Main Cooler
8. Cooling Water Outlet

Fig. 1.3 Cooling Water System

Cooling Water System

Fig. 1.3 shows the flow path entering at water inlet 1, cooling down the motor (2 -> 3), the gear box (4 -> 5), the casing and the high pressure side plate. Then it enters the main cooler (6 -> 7). After passing the main cooler at 7 the cooling water exits at outlet 8. Casing and high pressure side plate are both cooled down by the coolant in the water jacket (indirect cooling).

There is another line between main cooler and expansion vessel, to resupply the coolant. The expansion vessel has another pipe to balance its pressure.

There are thermal switches on motor and casing to protect the pump.

NOTICE

Connect the thermal switches of motor and casing to the protection circuit of your equipment, or it might cause pump damage.

Purge Gas System

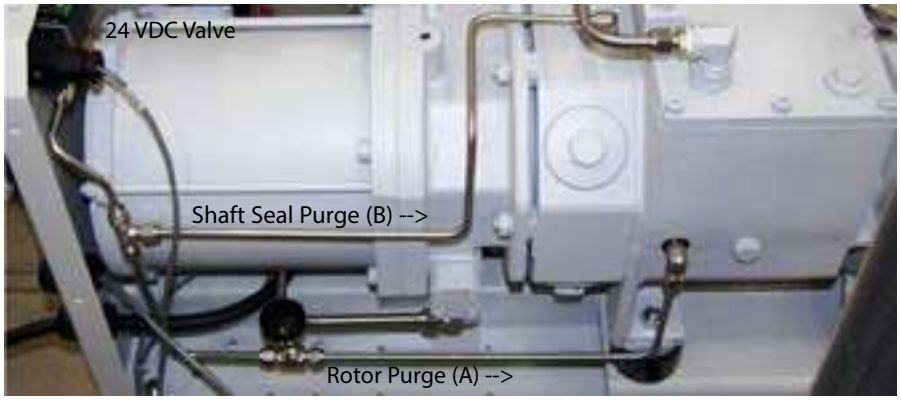


Fig. 1.4a Purge Gas System

NOTICE

Operate the pump with purge gas at all times.

The pressurized purge gas comes into the pump via the inlet. Adjust the regulation pressure (by pressure regulator) to the specified value, and supply the correct amount of purge gas to the pump. The pressure is shown at the pressure gauge. The purge gas piping can be divided into two sets of pipe lines.

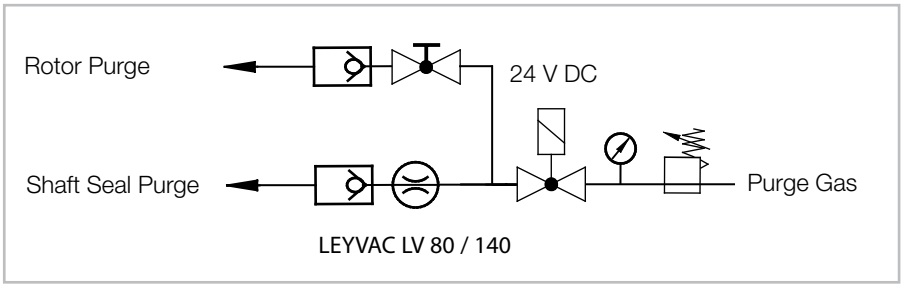


Fig. 1.4b Purge Gas System (schematic)

Gas line (rotor purge): The main purpose is to decrease the partial pressure of the process gas in the pump, to reduce corrosion due to process gas, and to retard the accumulation of reaction byproducts. The amount of purge gas can be adjusted by the flow regulator, and the non-return valve can prevent the process gases from getting into the purge gas pipe line.

Gas line (shaft seal purge): The main purpose is to prevent process gas from entering the gear box through the high pressure side plate. The purge gas will come into the rotating shaft in the high pressure side plate through the non-return valve.

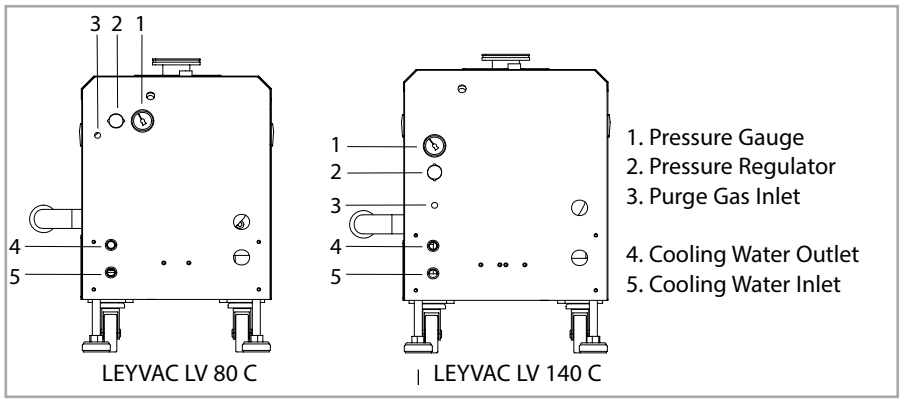


Fig. 1.5 Front Panel Layouts

Front Panel

The connectors for cooling water (outlet over inlet) are RC3/8"; the connector for the purge gas inlet is Swagelok 1/4". The maximum pressure for the purge gas regulator is 2 bar (0.2 MPa), and the pressure is indicated at the pressure gauge. Refer to the Technical Data Section for adjusting process-dependent purge gas pressures.

Description

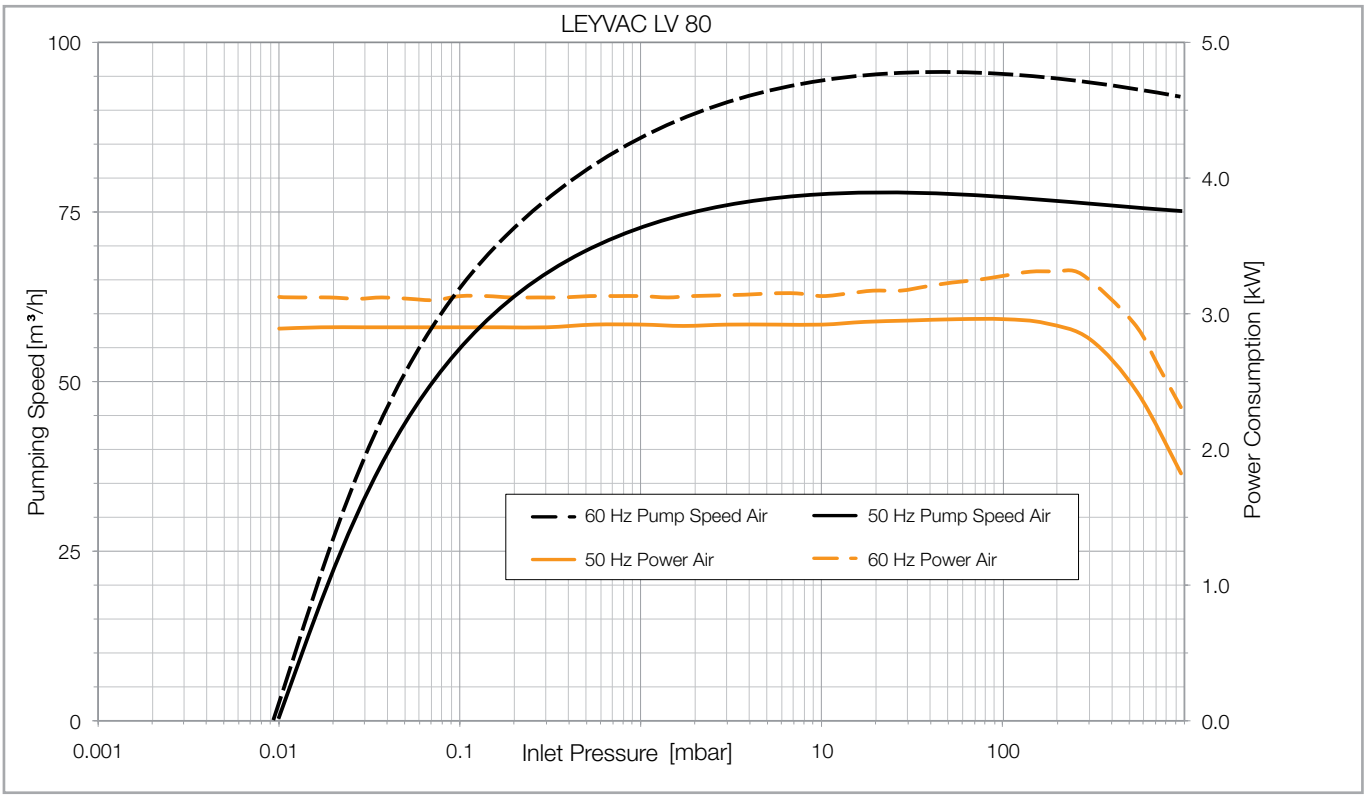


Fig. 1.6 Pumping Speed Curves for LEYVAC LV 80

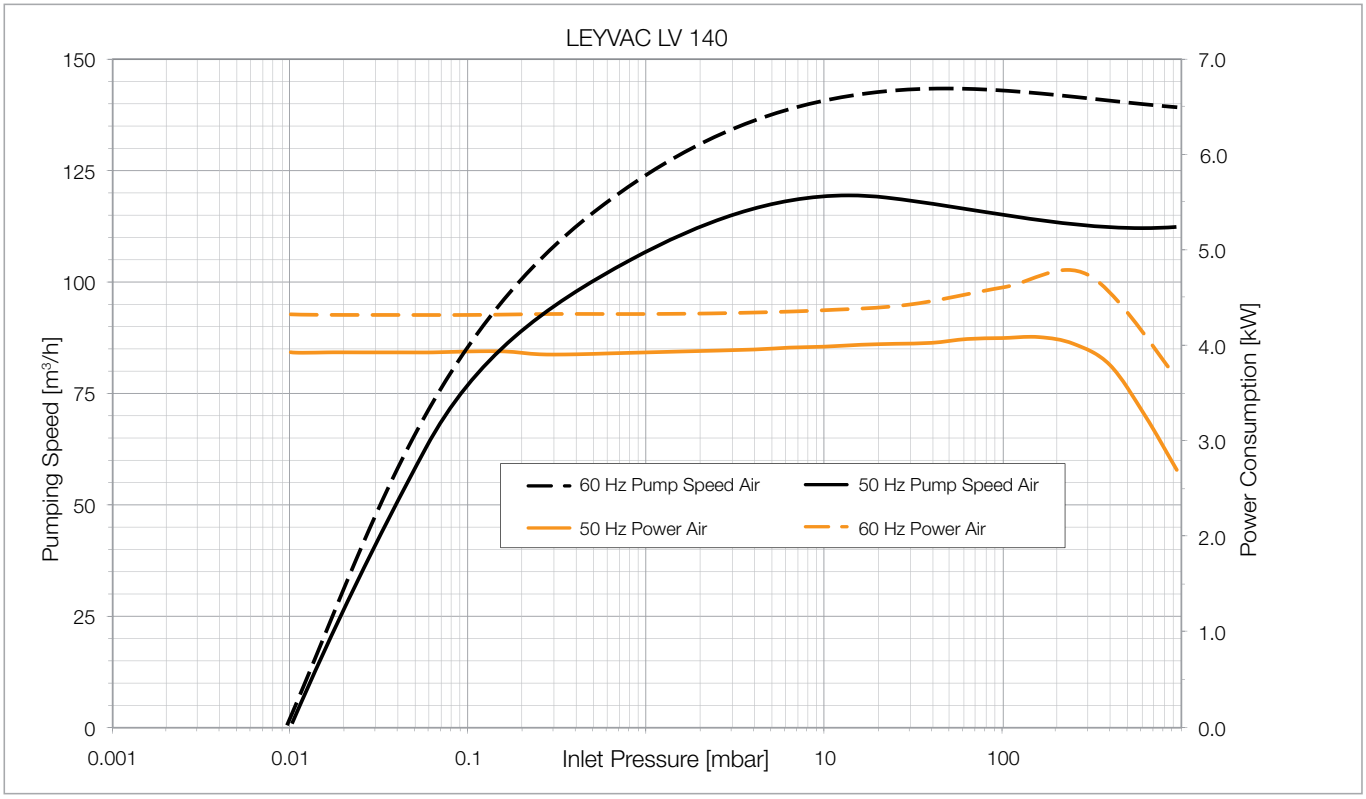


Fig. 1.7 Pumping Speed Curves for LEYVAC LV 140

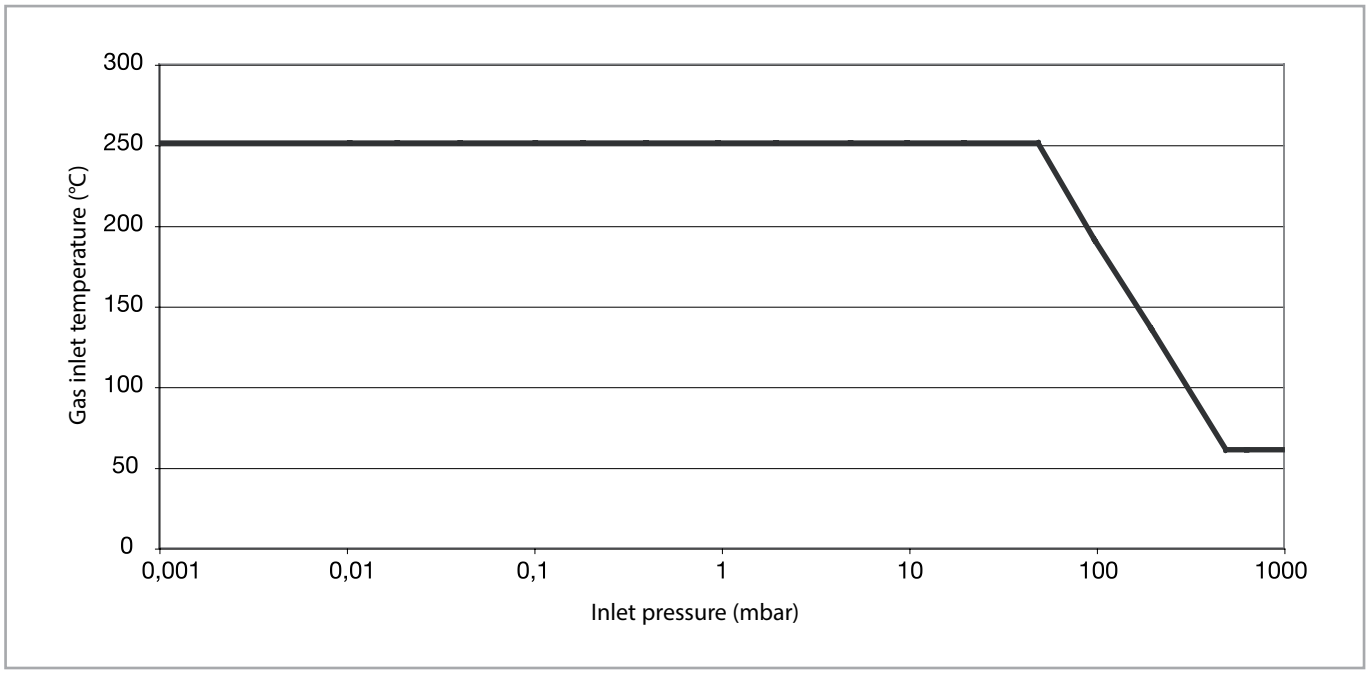


Fig. 1.8 Permissible gas inlet temperature as function of the inlet pressure

1.2 Supplied Equipment

Check if all the parts attached are complete. When there is any damage, or when components are missing, contact us immediately. All LEYBOLD vacuum pumps are equipped with:

- Operating Instructions
- Purge Gas Swagelok Connector
- Lubricants (already filled in)

Description

1.3 Technical Data

LEYVAC LV		80	140	Tolerance
Maximum pumping speed (50 / 60 Hz) (w/o gas ballast)		80 / 96 m^3/h	125 / 145 m^3/h	±10 %
Ultimate partial pressure		1 x 10^{-2} mbar		
Max. perm. inlet pressure		1050 mbar		
Max. perm. discharge pressure (absolute)		1300 mbar		
Integral leak rate		1 x 10^{-5} mbarl/s		
Water vapour tolerance w/gas ballast 80 slm 50 / 60 Hz		20 / 30 mbar	125 / 160 mbar	
Water vapour capacity w/ gas ballast 80 slm 50 / 60 Hz		1.24 / 2.3 kg/h	11.5 / 18 kg/h	
Perm. ambient temperature		+5 to +45 °C		
Storage temperature		-10 to +60 °C		
Noise level with silencer, at ultimate pressure (acc. to DIN EN ISO 2151)		< 75 dB(A)		
Noise level with rigid exhaust pipe, at ultimate pressure (acc. to DIN EN ISO 2151)		< 65 dB(A)		
Relative atmospheric humidity		< 95% RH non-condensing		
Installation location		up to 2,500 m		
Cooling		Water / Glycol		
Mains voltage (50 Hz)		Δ200 - 220 V (Standard- & C-Version, only) / Y380 - 420 V		±10 %
Mains voltage (60 Hz)		Δ200 - 220 V (Standard- & C-Version, only) / Y440 - 460 V		±10 %
Frequency		50 / 60 Hz		
Phases		3-ph		
Rated power at 50 / 60 Hz		3.7 kW	5.5 kW	
Rated current at 50 Hz	Δ200 - 220 V	14.5 - 13.2 A	21.2 - 19.3 A	
	Y380 - 420 V	7.6 - 6.9 A	11.2 - 10.1 A	
Rated current at 60 Hz	Δ200 - 220 V	14.5 - 13.2 A	20.7 - 18.9 A	
	Y440 - 460 V	6.6 - 6.3 A	9.4 - 9.0 A	
Power consumption at ultimate pressure (50 / 60 Hz)		2.7 / 2.9 kW	3.6 / 4.0 kW	
Power factor cos φ (400 V; 50 / 60 Hz)		0.87 / 0.89	0.85 / 0.88	
Max. permissible speed		4,200 rpm		
Min. permissible speed		1,200 rpm		
IP Code		IP 54		
Lubricant filling		LVO 410	LVO 410 / LVO 210	
Total lubricant quantity (low pressure side / high pressure side)		0.8 l (0.2 / 0.6 l)		
Intake flange		DN 63 ISO-K		
Discharge flange		DN 40 KF		
Materials (components in contact with gas in the pump chamber)		grey cast iron / steel / stainless steel / FPM		
Weight, approx. (C & CC)		227 kg 242 kg / 248 kg	273 kg 290 kg / 296 kg	
Dimensions in mm (L x W x H)		814×375×550	895×400×567	
Water				
Water connection		RC 3/8"		

LEYVAC LV	80	140	Tolerance
Water temperature	+15 – 30 °C		
Maximum supply pressure	2 – 7 bar (g)		
Nominal flow	5 – 10 Nl/m		
15 – 19 °C	5 Nl/m		
20 – 24 °C	7 Nl/m		
25 – 30 °C	10 Nl/m		
Materials in the cooling circuit of the pump	copper, stainless steel, brass		
Purge gas			
Allowed purge gas	N_2 / Ar / dry clean air		
Connection	Swagelok 1/4"		
Rotor purge gas flow			
shaft seal	7 Nl / min		
rotor purge	0 – 100 Nl / min		
Permissible purge gas supply pressure	4 – 8 bar (g) (0.4 – 0.8 MPa (g))		
Permissible purge gas setting pressure	1.5 – 2 bar (g) (0.15 – 0.2 MPa (g))		
Optional Gas ballast (manual or electrical)			
Flow (normally ambient air)	80 Nl / min		

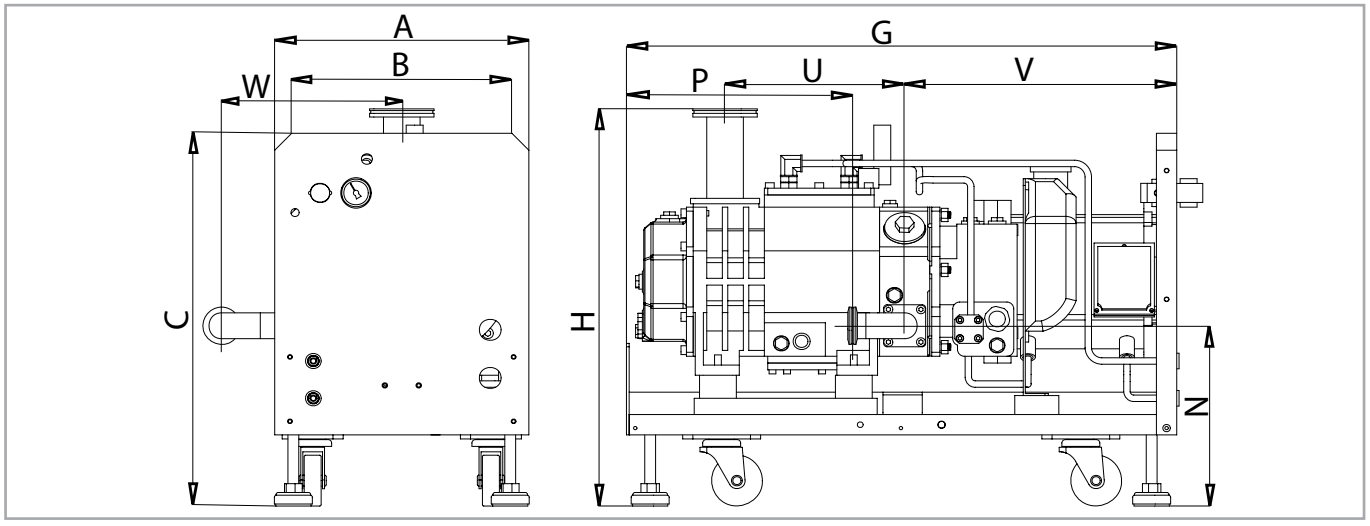


Fig. 1.9 Dimensional Drawings

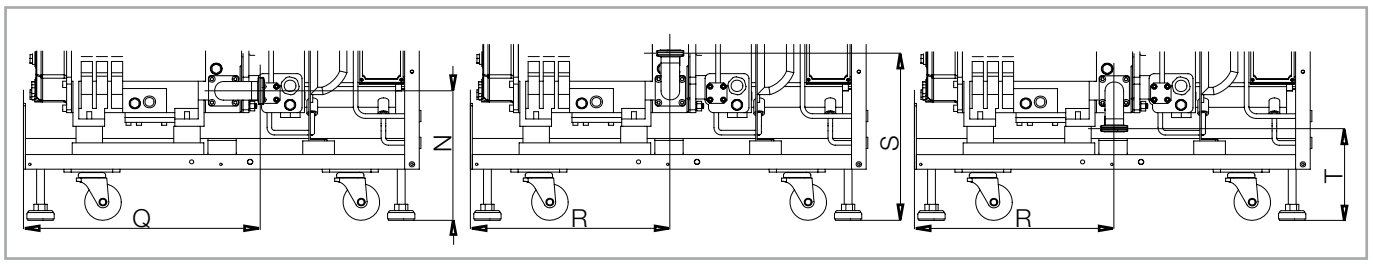


Fig. 1.10 Dimensions and Exhaust Arrangements

Modell	A	B	C	G (CC-type)	H	N	P	Q	R	S	T	U	V	W
LV 80	375	320	550	814 (984)	576	266	335	485	410	341	191	265	402	266
LV 140	400	350	567	895 (1065)	597	257	364	514	439	332	182	297	453	285

Dimensions in mm

1.4 Ordering Information

Part numbers for pumps

LV 80	115080V15
LV 80 C	115080V30
LV 140	115140V15
LV 140 C	115140V30
LV 140 C (LVO 210)	115140V40

Accessories

Check valve ball type	115005A01
Check valve spring loaded (for noise reduction)	115005A02
RUVAC Adapter for Wx(U)501 and WH700 onto LV 80 / LV 140	115005A03
RUVAC Adapter Disc for WX1001 onto LV 140	115005A04*
Exhaust Pressure Sensor LV 80	115005A10
Gas Ballast Kit manual	115005A12
Gas Ballast Kit 24V	115005A13
Purge Gas-Kit	EK110003350
Standard Silencer (w/built-in check valve for noise reduction)	115005A20
High Efficiency Silencer	115005A21
Serviceable Silencer	115005A22
Drainable Silencer (w/built-in check valve for noise reduction)	115005A23
Drainable Elbow for Silencer	115005A26
Inlet screen LV 80 / LV 140	115005A28
Earthquake ground fixation LV 80 / LV 140	115005A29
LEYBONOL LVO 210 (synthetic oil) 1 litre	L21001
LEYBONOL LVO 210 (synthetic oil) 5 litres	L21005
LEYBONOL LVO 410 (PFPE) 1 litre	L41001

* 115005A03 additionally required

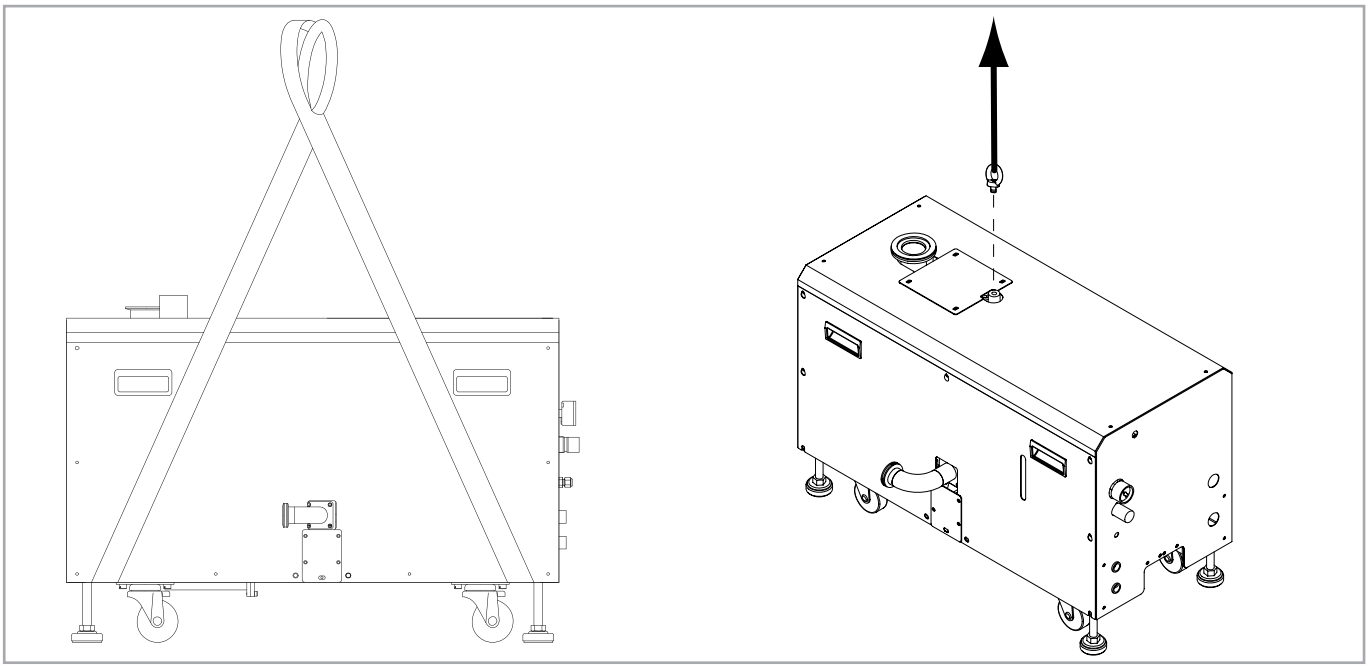


Fig. 2.1 Hoisting the Pump

Lifting via Crane Eye

2 Transport and Storage

Check the specification on the nameplate of the pump and confirm that pump supplied agrees with your purchase.

Observe safety notes 0.1.8 and 0.1.9.

All LEYVAC LVs are equipped with a single crane eye. The pump may be lifted with a forklift. Alternatively use two nylon slings as hoisting devices with a length of 3 m, a width of 50 mm, and a tensile load of min. 2 tons.

Before hoisting, check if the slings are in the position between castors and adjustment feet (cf. Fig. 2.1), to ensure the pump will not slide off. The slings's eyes must be centre top during hoisting, to avoid a tending to one side. The tension for the slings should be equal at the both sides.

The pumps are supplied filled with PFPE or synthetic oil. For this reason they should, while being transported or shipped, not be subjected to tilting by more than 10° with respect to the horizontal axis. Store the pumps only horizontally standing on their feet.

WARNING

Transport and Storage

Pumps with castors

Due to the castors which have been fitted, the LEYVAC must only be installed on a level surface capable of carrying the weight of the pump as otherwise there exists the danger of the pump rolling away. The pump must also only be moved on level surfaces.

Moving the pump on slopes or ramps is not allowed!

The pump must only be transported using a crane.

At the installation site, use all four adjustable feet for aligning thereby securing the unit from rolling away and thus taking away the load from the castors.

Storage

Store the pumps only horizontally standing on their feet.

When storing the pump for a longer period of time (> 2 weeks) the flanges should be sealed off with a piece of foil. Place a bag with desiccant in the pump chamber, if required. Before operating the pump once more do not forget to remove this bag first.

Due to the PFPE filling pumps should be sealed off in a gas-tight manner and vented with nitrogen.

NOTICE

The cooling jacket is filled with a water glycol mixture, which is cold resistant up to -10 °C.

If there is the danger of frost, the cooling water for the external water circuit must be drained, see Section 4.4 Removing from Service

Temperature	-10 to +60 °C
Coolant mixture	30% glycol
Storage site	dry
Maximum atmospheric humidity	< 95 %, non-condensing

3 Installation

3.1 Ambient Requirements and Placement

The pump is designed for operation in buildings with a good ventilation. It must not be installed in sites which are highly-polluted, very humid, full of corrosive gases, and metal dust. The pump must not be exposed to direct sunlight or water.

For maintenance purposes the clearance on top and around the pump must be at least 900 mm.

The ambient temperature for the pump should not exceed 45 °C. The installing site should not be near boilers or any other equipment that would be heat-radiating.

Ensure a good ventilation and heat dissipation with the pump installed indoors; therefore the location for the vacuum pump should be considered cautiously.

For a convenient installation, four mobile support units, each consisting of a castor and a height-adjustment foot, are attached at the frame of the pump. Before moving the pump, make sure to check the four adjustment feet are already at their highest positions.

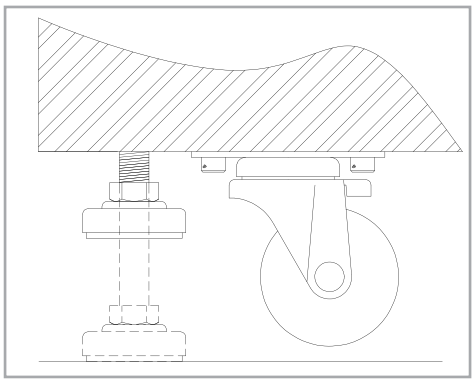


Fig. 3.1 Adjusting Castors

The pump should be installed on a floor which can stand the weight of the pump. A shock-absorbing pad should be used between the frame of the pump and the floor for a better ground holding and less impact to avoid vibration.

Place the pump system on a flat and level surface. For proper securing against rolling away, use all four adjustable feet for aligning thus taking away the load from the castors.

Adjust the adjustment feet on the pump frame until the moveable wheels are 3-5 mm off the ground; then tighten the M16 nuts to fix the pump.

Remove covers and blank flanges on the pump only before fitting the pump so that the assembly work can be performed under the cleanest conditions.

The pumps are supplied filled with PFPE (LVO 410) or synthetic oil (LVO 210). Nothing will have to be refilled. Check the oil levels through all oil level glasses. If one of the oil levels is found to be incorrect, please contact us.

The oil levels of both, the gear box and the low pressure side, should be between 1/2 - 2/3 of the oil level glass. If the level is below 1/2, lubricant should be added. See the Maintenance section for further information.

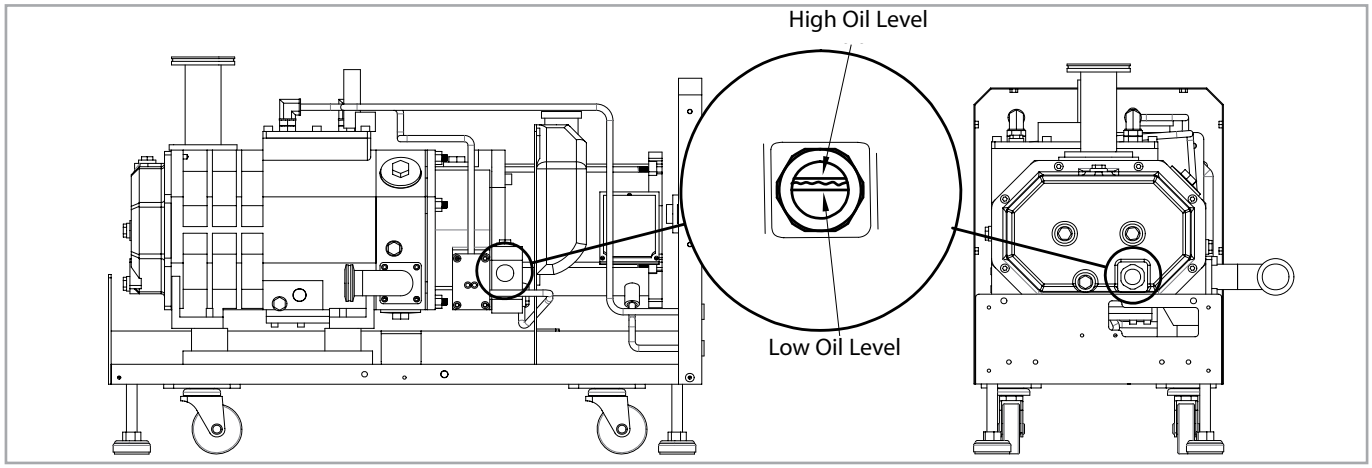


Fig. 3.2 Oil Level Indicators

3.2 Conforming Use

The LEYVAC dry pumps have been developed to meet the demanding requirements for process pumping solutions in the Coating, Flat panel, Process and Solar industries.

Basically, all LEYVAC pumps are leaktight and may for this reason be utilised for pumping toxic and potentially flammable gases outside their ignition range. For such applications, note the safety information given in Section 0.4. When using the pumps in connection with oxidising or corrosive gases, check media compatibility first. Media compatibility and the therefrom resulting hazards of each substance used and also of each substance mixture need to be reassessed on a case-by-case basis.

When planning to pump hazardous substances always consult Leybold first.

3.2.1 Non-conforming Use

Non-conforming use for the pump are among others:

- Operation with limit parameters which are not programmed by Leybold, particularly the maximum speed.
- Pumping of gases and vapours for which the materials of the pump are not suited, consult Leybold. For a list of materials in contact with the process gases, see Section 1.3 Technical Data.
- Pumping of substances and mixtures (gases, liquids and solids) which are rated as being explosive.
- Pumping of condensable vapours without adequately controlling the temperature of the pump. Upon compression in the pump, these vapours may condense or form deposits, consult Leybold.

- Pumping of dusts and solids without suitable screens and filters, consult Leybold.
- Pumping of liquids
- Pumping of ignitable gas mixtures
- Pumping of process gases which form hard or sticky deposits which may cause the pump to seize.
- The use of pump and frequency converter in the explosion hazard areas
- Non-compliance with the described maintenance and service intervals.
- Use in systems and pump systems in which the exhaust pressure may increase over 1.3 bar abs.
- Operation with an inadequately affixed pump.
- Operation at impermissibly high gas temperatures
- Use in systems where pump, frequency converter and cables are subjected to impact stresses.
- Operation on movable systems or system components (locks or mobile pump systems).
- Use of pump, fitted ad-on components, drive electronics, flanges and cables to climb onto the system.
- Removing, covering or obstructing warning notices.
- Operation outside of buildings.
- Standstill or storing of pump and drive electronics without suitable sealing and drying. When stored in a humid atmosphere corrosion can occur.
- Conversions, manipulations and maintenance work by persons not authorised by Leybold.
- Accessories which have not been specified by Leybold may only be used after approval by Leybold.

The non-conforming use of pump and accessories may result in severe injury or damage to the components.

WARNING

3.3 Connecting the Intake and Exhaust Lines

3.3.1 Intake Lines

Pay attention to the following rules when connecting the vacuum pump and the vacuum system:

For the lowest vacuum and the best pumping speed, we suggest to use the shortest pipe, the least elbow, if possible, with the biggest diameter to reduce the pipe line loss.

The intake lines must be clean. Connect the intake line to the pump. We recommend using bellows on the top of the pump for vibration absorption.

Support the intake lines.

WARNING

Align the bellows. Do not overstress the bellows. Too much stress on the bellows will cause them to drop out untimely and thus leading to leaks in the system.

Check for leaks after installing the pump. A leak may lead to a dangerous discharge of hazardous substances or to unpredictable reactions with air admitted into the pump.

When choosing and installing the vacuum pumps for harsh processes or for processes of special applications, like harsh furnace process, toxic or explosive gas process, please check in advance with the engineers of Leybold; when necessary, we suggest installing a trap at the pump inlet or outlet port to prevent any safety accidents.

NOTICE

Ensure that no items like welding beads, bolts, nuts, washers, pieces of wire, for example, enter into the inlet.

3.3.2 Exhaust Lines

Connect the exhaust line to the pump system's exhaust connection. Use bellows to eliminate tension and vibration in the line. If applicable the exhaust ellbow can be detached and turned in 90° angels for an exhaust transport according to customer-specific needs (cf. Fig. 1.9). In this case ensure to retighten the 4 bolts, and to conduct a leak tightness check on the exhaust.

The exhaust line should have the same or larger diameter than the exhaust flange (DN 40 KF) and 2.0 mm min. thickness. The exhaust line must be able to withstand 1.3 bar and 150 °C.

NOTICE

Observe the following when connecting the pump and the exhaust system:

When there is high pressure from the exhaust system, check whether the silencer of the vacuum pump and the exhaust pipes for the facilities are blocked or not.

When using explosive, corrosive or toxic gas for the process, the pump exhaust system must not contact the atmosphere.

The supports must be installed under the exhaust pipe line to avoid any leakage caused by shear strength at the connecting parts of the pipe lines.

A leak check will surely be performed after the installation of the vacuum pump or when finding any leakage. When proceeding with the leak check for the vacuum pump or the vacuum system, please pay attention to check any emission of gas (moisture, residual of organic solvent) which will cause virtual leaks of the vacuum system. The recommended maximum leak rate value for a purge gas leakage test or other ways of test is $1x10^{-5}$ mbarl/s.

WARNING

Observe Safety Information 0.1.6 to 0.1.8.

Check leak tightness of the exhaust lines on a regular basis!
Observe Safety Information 0.4.

Keep the exhaust line free of deposits. If the exhaust flow becomes restricted, deposits could collect in the LEYVACs.

Connect the exhaust line to an abatement system with sufficient throughput, if required by the process. The LEYVAC pumps will not be switched off automatically, when the abatement system is too small and there is an overpressure. As prevention an optional pressure sensor may be installed; in this case provide an adequate electrical connection; cf. Section 3.7.3.

In order to prevent deposits in the exhaust lines it may be necessary to heat the exhaust lines.

Run the exhaust line only by way of a fixed installation to the outside and/or connected to a silencer.

3.4 Connecting Cooling Water

CAUTION

Observe Safety Information 0.3.3 to 0.3.6.
Never stop supplying cooling water during the pump operation, otherwise, the components of the pump will over-heat and can damage the pump.

According to the directions of water inlet and outlet from the pump, connect the male and female quick joints to the front panel.

Ensure that the cooling water discharge is not constricted in any way.

Supply the cooling water and check for any leakage from the joints and the pipe lines.

Do not connect pump cooling water loops in series. Select piping to ensure sufficient and adequate flow through each pump in accordance with the technical data.

The temperature of the discharged cooling water must not exceed 55 °C as otherwise the lines will tend to calcify.

If work on the water cooling system becomes necessary and in the case of a longer standstill or transportation, completely drain out all cooling water and completely dry the lines (with nitrogen, for example).

Block or label the area of the cooling water and exhaust lines to prevent tripping.

3.4.1 Water Quality

In order to ensure long trouble-free operation the cooling water must not contain any oils, greases and suspended solids. Moreover, we recommend compliance with the following limit values:

Appearance	Clear, free of oils and greases
Suspended matter	< 250 mg/l
Particle size	< 150 µm
Electrical conductivity	< 700 µS/cm
pH value	7.0 to 9.0
Total hardness (total alkaline earths)	< 8 °dGH
Aggressive carbon dioxide	None, not detectable
Chloride	< 100 mg/l
Sulfate	< 150 mg/l
Nitrate	≤ 50 mg/l
Iron	< 0.2 mg/l
Manganese	< 0.1 mg/l
Ammonium	< 1.0 mg/l
Free chlorine	< 0.2 mg/l

8 °dH (degrees German hardness) = 1.4mmol/l
= 10 °e (degrees English hardness)
= 14 °f (degrees French hardness)

If there is the danger of frost, you may use a water glycol mixture of up to 30 %.

When using DS water/deionised water (softened or fully desalinated water) check whether cooling system, water and materials used are suitable. For this please consult us.

3.5 Purge Gas Piping

The inlet port for the purge gas is a Swagelok 1/4" stainless connector. Allowed purge gases are N_2, Ar, or dry clean air. The pressure of the purge gas can be adjusted by the pressure regulator to a suitable pressure, and the range is 1.5 to 2 bar (g) (0.15 – 0.2 MPa (g)).

As Leybold vacuum pumps can be used for a variety of processes the amount of sediments thus produced will also be different. In order to reduce corrosion due to process gas and retard the accumulation of reaction byproducts, adjust the purge gas pressure and flow to the appropriate values. Please refer to the information given in Section 1.3 Technical Data.

Ensure that the purge gas flow is not obstructed.

The purge gas supply should not be shut off while the pump system is operating, above all especially not during shutdown and venting operations.

As the pumps are equipped with a 24V-operated magnetic valve in the purge gas system, provide an adequate electrical connection. Ensure with switching off the pump that the magnetic valve will be closed.

Overview of Rotor Purge Gas Throughput

Refer to the following table for the relationship between pressure regulator turns and purge gas throughput (cf. Fig. 1.4):

	at End Pressure
Knob turns	0.15 MPa
0	0
0.5	16
1	37
1.5	59
2	84
2.5	95
3	100

(all values in slm; ±3 slm)

Fig. 3.3 Thermal switch positions

3.6 Electrical Connection

WARNING

Observe Safety Information 0.2.

Customers must make sure that the grounding wire is connected, and the grounding function meets the electric rules (cf. Fig. 3.4a).

Check if the voltage of the power supply is correct; and the rated current of the NFB (No Fuse Breaker) at the customer's site meets the values in the table listed below.

With all types of LV pumps, too, a short-circuit protection must be installed at the connection side.

Refer to the national and local electrical regulations, and decide the proper specification for the wire and NFB to ensure the safety of electricity usage.

	Δ200 – 220V			Y380 – 460V (50/60 Hz)		
	Main fuse	Cable Size (mm^2)	Relay (A)	Main fuse	Cable Size (mm^2)	Relay (A)
LV 80	20A	4	16	15A	2.5	10
LV 140	30A	6	24	20A	4	15

Recommended rated current of main fuse and cable sizes

The voltage for the power supply should be kept within ±10% of the rating voltage.

Fig. 3.4 Electrical connections: PE grounding, Thermal switch (motor) and PT 1000, motor wiring

3.6.1 Standard and C-Type Pumps

Figure 3.4 (RHS) shows the mains connecting methods for different voltages. The terminal is designed for voltage ranges of 200 – 220V (cf. upper array), or 380 – 420V (50 Hz) and 420 – 460V (60 Hz) (cf. lower array).

The LEYVAC has **no** switching devices of its own. Install an adequate motor protection switch for the equipment. The pumps are equipped with two thermal switches for motor and casing protection, and a Pt1000 sensing device for measuring the motor's temperature (cf. Fig. 3.3).

NOTICE

The motor must only be operated with an overprotection circuitry in place.

Connect the factory-integrated Pt 1000 temperature sensor, and the thermal switch of the casing (SW85) to the protection circuit of the equipment, to prevent pump damage.

The Pt1000 serves the purpose of thermally monitoring the water-cooled motor. It is recommended to set a warning and a shut down at temperatures of 85 °C and 100 °C, respectiviely, to protect the pump in case of unsufficient cooling water qualities or flow rates.

Refer to the table below for the trigger temperatures.

Electric Device (cable)	Status	Action Temperatures	Reset Temperatures
Motor Thermal Switch (black)	NC	90 °C	50 – 60 °C
Casing Thermal Switch (white)	NC	85 °C	45 – 65 °C

Installation

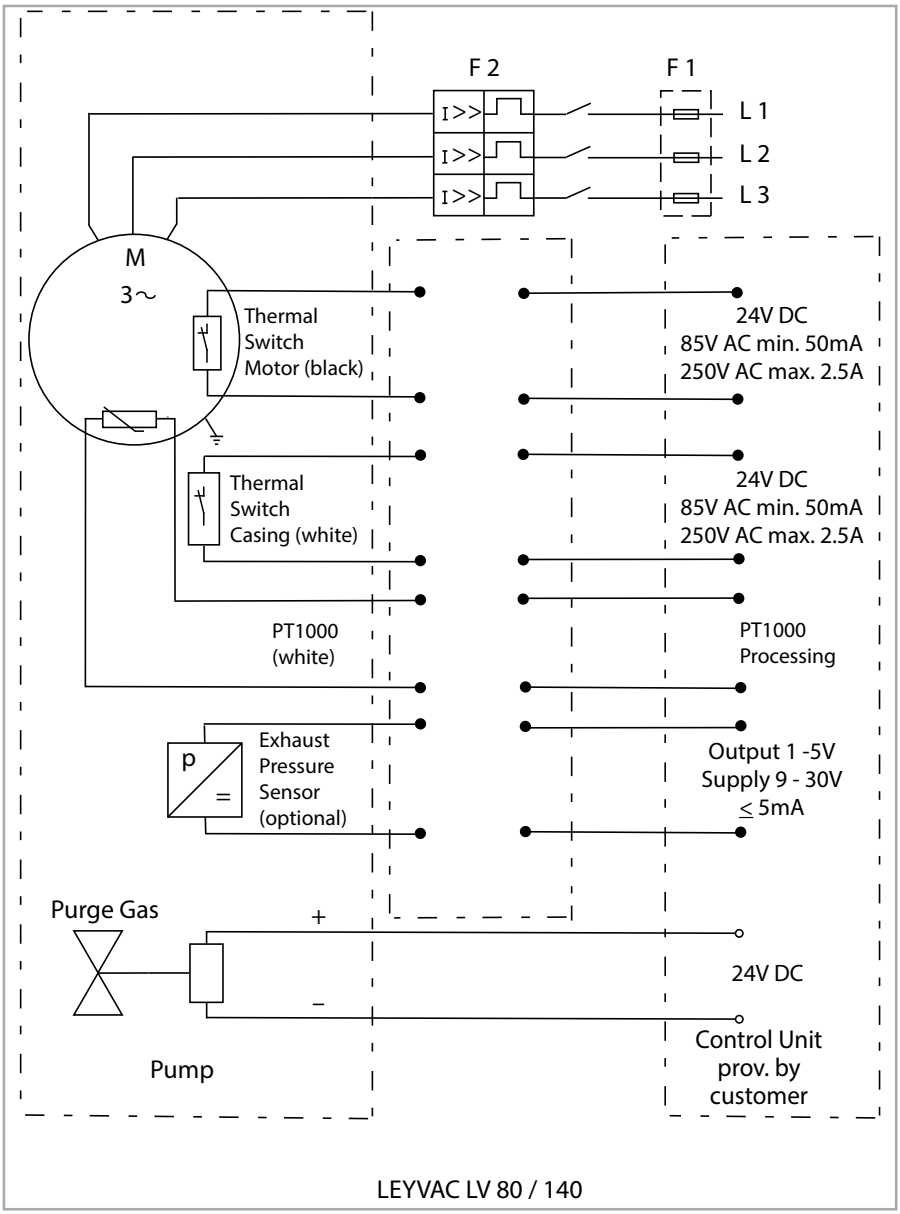


Fig. 3.5 Main and Control Circuit Wiring (without frequency converter)

3.6.2 Checking the Direction of Rotation

The rotational direction is correct, when there is pressure at the exhaust and the attached plastic cap fixed to the exhaust is blown off, after the pump has been test-switched on.

3.6.3 Connecting an external Frequency Converter

Observe Safety Information 0.2.

Take note of the information provided in the manufacturer's Operating Instructions enclosed with the frequency converter Read these Operating Instructions and make yourself comfortable with the contents before installing and operating the frequency converter or before doing maintenance work on it. The frequency converter must be installed in agreement with the information given in these Operating Instructions and in agreement with the locally applicable regulations. Non-compliance with the safety information can result in severe or even deadly injuries or may damage the products or facilities and systems operated in connection with the product.

WARNING

Enclosed with the frequency converters delivered by Leybold is a copy of the instructions for commisioning the Yaskawa V1000. This frequency converter shows an integrated mains filter and perfectly matches the pump.

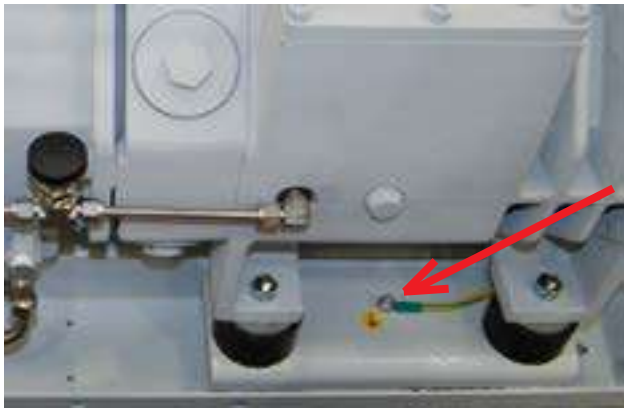
- Connect the pump to the correct mains voltage through the connections in the junction box (cf. Fig. 3.3).
- Do not connect the electric control circuitry to the power circuitry of the frequency converter.
- Use fuses recommended in Main Circuit only, cf. the section Technical Data.

Connect and evaluate both thermal switches to ensure that the pump is shut down as soon as one of the monitoring facilities responds:

- Connect the casing's thermal switch (nc; trigger 85°C) and
- the motor's thermal switch (nc; trigger 90°C).

Shielded types of cable must be used for the motor power supply line.

The max. length for the cable between external frequency converter and motor is 30 m.



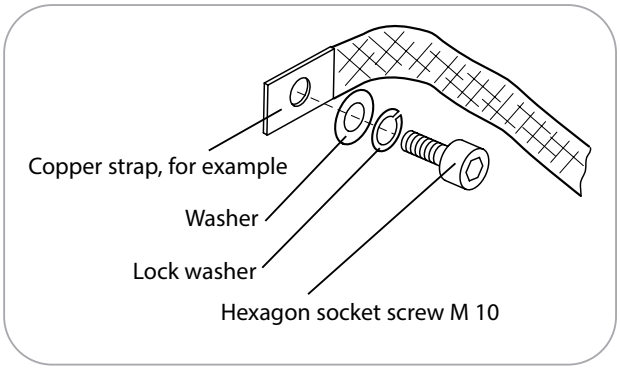


Fig. 3.6 Establishing the potential equalisation at the pump casing

In the case of FC operation considerable electromagnetic interference occurs. Here the limits specified in the pertinent standards and guidelines need to be complied with under all circumstances by the installer. In order to reduce the level of electromagnetic interference, shielded motor cables, shielded cable feedthroughs, mains filters and EMC compliant ground connections are required between frequency converter and pump.

It is necessary to examine the thermal switch.

In order to protect the pump, current limits in the frequency converter as a function of the frequency must be taken into account.

	LV 80		LV 140	
to	400V	200V	400V	200V
36Hz	8,3A	16,6A	13A	20,0A
80Hz	7,0A	14,0A	13A	19,6A

Permissible frequencies range

The permissible frequencies range for LEYVAC pumps is between 20 Hz to max. 70 Hz.

Establishing Potential Equalisation

NOTICE

In the case of operation with a frequency converter and ground leakagecurrents of over 3.5 mA, the protective ground conductor must have across-section of the least 10 mm^2. Or a further protective ground conductor having at least the same cross-section as the connection cable must be provided.

A M10 thread is provided at the motor casing for connecting the external potential equalisation cable.

The potential equalisation conductor must be connected as depicted in Fig. 3.6.

After connecting the motor and every time you alter the wiring, check the direction of rotation (cf. Section 3.6.2 for more information).

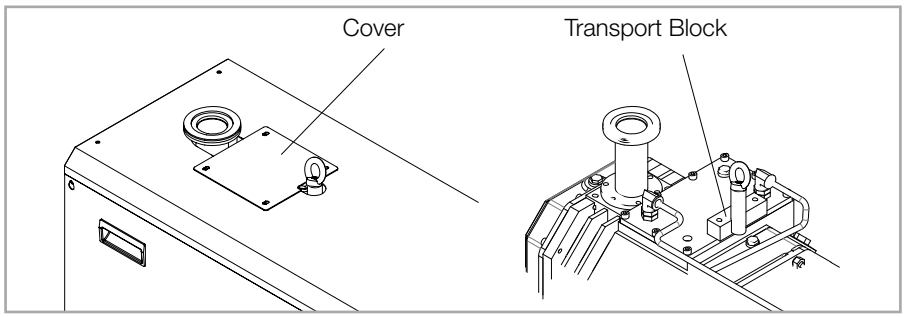


Fig. 3.7 Preps for Mounting a RUVAC

3.7 Mounting Accessories

C- type pumps only show a detachable cover on the housing lid. For mounting a RUVAC remove this cover first, and then the lid. With this modification the transport block **does not** have to be removed.

Fig. 3.8 RUVAC Adapter for Wx(U) 501 and WH 700 similar

3.7.1 Roots Pump Adapter

The adapter serves as a connecting component when fitting a RUVAC onto the LV models. The use of other pump types or other connection components is not permissible. The adapter for the RUVAC weighs approximately 6 kg.

Before the adapter can be mounted the stainless steel pump inlet must be removed. Keep this gasket and the 4 screws for re-use. The RUVAC adapter comes with 4 substitute screws; the RUVAC comes completely with bolts, washers, nuts and gasket.

Fig. 3.9 LEYVAC with RUVAC WH 700 on top

Installation

NOTICE

Make sure that no items like welding beads, screws, nuts, washers, small pieces of wire, for example, enter through the inlet into the pump. Carefully handle the sealing surfaces and keep them clean.

We recommend that two fitters fit the adapter.

The Roots vacuum pump must only be fitted as depicted. Other orientations are **not** allowed as otherwise stability is endangered.

Supplied Equipment

- Adapter
- 4 hexagon socket screws M 8x25
- O-ring 80x5, 4 stud bolts M 12x50, 8 washers A 13, 8 nuts M 12 (for fastening the RUVAC)

Mounting the adapter on the LEYVAC

C pumps: Firstly remove the cover and the housing lid.

When fitting the adapter onto the LEYVAC, ensure that the O-ring will not slip.

Place the O-ring on the inlet of the LEYVAC and bolt the adapter onto the pump, tightening torque 50 ± 5 Nm.

C pumps: Re-fit the housing lid, **before** mounting the RUVAC.

Mounting the RUVAC

When fitting the RUVAC onto the adapter, ensure that the gasket will not slip.

Place the O-ring in the adapter groove and attach the RUVAC to the adapter, Push the studs through the flanges and secure both ends with the nuts, tightening torque 50 ± 5 Nm.

After fitting the adapter, we recommend conducting a leak search. For commissioning the pump combination please note the information given in the Operating Instruction for the RUVAC.

3.7.2 Non-return Valve and Silencers

The non-return valve is a fitting for shutting off which is attached to the exhaust flange for the LEYVAC. It prevents gas from flowing back into the pump.

If the pump is to be connected directly to the exhaust piping, we recommend the use of a spring-loaded valve which can be mounted in either direction.

For extremely dusty processes, we recommend the use of a self-cleaning ball-type valve. This must **only** be mounted vertically.

The standard silencer comes with a built-in non-return valve which operates both vertically and horizontally.

For processes involving much condensate there are two options for fitting the silencer. All silencers may be fitted vertically **only** in combination with a drainable elbow (cf. Section 1.4).
With a horizontal version the supplied elbow can be used; in this case the serviceable silencer **must** be attached, to ensure that the ball valve is the lowest point of the exhaust system.

Fig. 3.10 LEYVAC 80 with optional exhaust pressure sensor

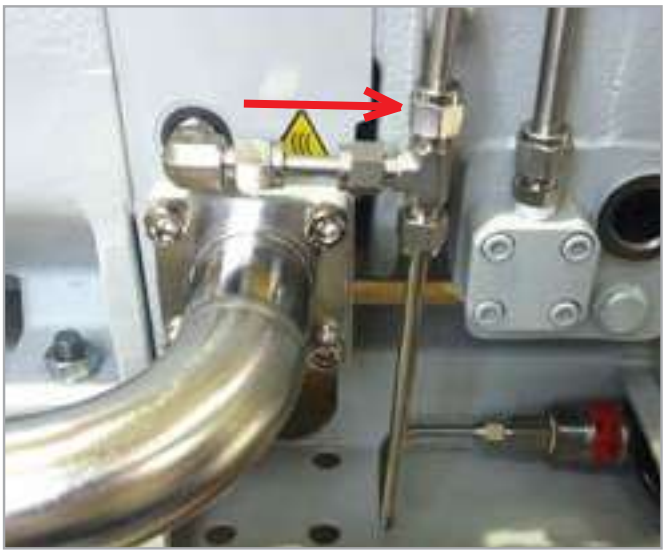


Fig. 3.11 Position of the orifice plate to be inserted

3.7.3 Exhaust Pressure Sensor (option)

An exhaust pressure sensor may be installed optionally above the elbow. This sensor is purge gas protected; the connection is provided by the customer. At a pressure of 0 bar (g) the output voltage is 1 VDC; with a pressure of 1 bar (g) it is 5 VDC. For more information on connecting the sensor refer to the manufacturer's specs. The pump must be turned off with an exhaust pressure of 0.3 bar (g).

WARNING

Before starting any installation work on the pump, shut down the system and leave it to cool down.
In particular observe Safety Information 0.3 and 0.4.
Retrofitting must only be carried out by duly trained personnel. The electrical connection must only be provided by a trained person.

The conversion kit consists of the exhaust pressure sensor as well as all necessary pipes, T-pieces, and fittings.

Only C pumps: Remove the top and side covers.

Remove the plug above the elbow and screw in the corresponding threaded connector of the exhaust pressure sensor kit. Use Loctite 542 to ensure for leak tightness. At the upper tee remove the blank flange from the shaft seal purge gas pipe. Connect all pipes and tees as shown above. Make sure to insert the orifice plate into the riser of the lower tee.

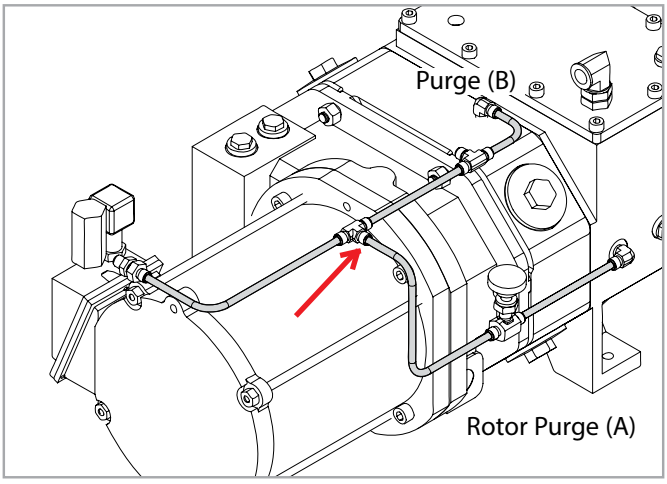


Fig. 3.12 Purge gas lines


Fig. 3.13 LEYVAC with gas ballast kit installed (24 V)

Provide an adequate electrical connection for the sensor; refer to the wiring schematics in the Section "Checking the Direction of Rotation".

Systematically check for leaks after the installation, and before starting the pump system.

Only C- type: Conduct a leak test **before** re-fitting the covers.

3.7.4 Gas Ballast Kit (option)

As options, LEYVACs can be retrofitted with an electrically (24 VDC) or a manually operated gas ballast system. These conversion kits modify the conventional rotor purge gas line (A). Via these systems ambient air as the gas ballast can be supplied at a fairly high throughput of up to 80 Nl/m. The 24 VDC valve is nc.

The gas ballast conversion kit contains all of the necessary modification parts.

Only C pumps: Remove the side cover.

Conversion to manually operated system

Remove the purge gas pipe between the lower T-piece connection and the manual valve. Blank-flange (included) the T-piece (cf. arrow in Fig. 3.12).

Conversion to 24 VDC system

Remove the purge gas line (A) between the lower T-piece connection and the threaded connector at the purge gas entry (rotor). Blank-flange (included) the T-piece, to ensure for a continuous purge gas flow to the shaft (line B).

Install the gas ballast kit, as depicted. Use Loctite 542 to ensure for leak tightness.

Provide an adequate electrical connection for the valve (cf. to the wiring schematics).

Check the compatibility with the media being pumped.

Systematically check for leaks after the installation, and before starting the pump system.

Only C : Conduct a leak test **before** re-fitting the cover.

Check the gas ballast filter contamination on a regular basis.

4 Operation

NOTICE

Observe Safety Information 0.6.

4.1 Before Starting

Proceed with the following items before connecting the vacuum pump with the power cable.

- Check if the vacuum pump is in its position, and the adjustment feet are fixed.
- Turn on the cooling water flow, and check piping for water leaks.
- Operate the pump with purge gas at all times.
  For purge gas operations:
  Check that the pressure regulator on the front panel is closed, i.e. the pressure adjustment knob is fully counterclockwise. Turn on purge gas supply. Adjust the pressure slowly to 1.5 bar (0.15 MPa), then lock the knob. The manometer might be damaged while the purge gas supply pressure is too large.
- Check the exhaust piping. If there is any valve closed on the exhaust piping, open it.
- Check that the 24V valve is opened before starting to ensure a shaft seal purge flow.
- Check that the manual rotor purge is opened or closed, depending on the requirements of your applicaiton.
- Check if the inlet port of the pump and the vacuum system are connected properly.
- Check the connection between the thermal switches of motor and casing to the protection circuit of the whole equipment.
- Check that the voltage of the power supply is correct; turn on power.

4.1.1 Pumping of monoatomic Gas

Due to the higher adiabatic exponent K with monoatomic gases (e.g. argon) and resulting higher compression temperatures please consult with the corresponding customer service before pumping these gases to evaluate your application.

4.2 Stop Pump

When operation is finished switch off the pump. Proceed as follows:

Isolate the pump from the chamber but keep it running.

In order to prevent any corrosive gases or byproducts inside the pump, do not stop the pump until after at least 30 minutes after stopping the flow of process gases.

Switch off the pump.

In order to prevent any residual process gas inside the pump, purge with N_2 gas for at least one hour after the pump stops.

Low purge gas flow during shut-off may damage the pump.

The pump must only be vented such that **atmospheric pressure is never exceeded**.

If the pump has previously pumped hazardous gases observe Safety Information in Section 0.4.

In order to prevent a scald accident, it is strictly forbidden to touch the pump body, the exhaust piping and the hot N_2 piping before they are cold down completely.

Keep cooling the pump with the cooling water for at least ten minutes; after that, stop supplying the cooling water, to prevent condensation on the surface.

WARNING

4.3 Venting

Open the vacuum system only in completely vented state and only as short as possible. Otherwise humidity will collect on the inner surfaces. This will then, during subsequent evacuation, result in significantly longer pumpdown times until attaining the desired ultimate pressure.

If during longer downtimes the system shall remain conditioned for a rapid pumpdown, we recommend to vent the system with dry nitrogen to atmospheric pressure and maintain it in this condition without opening it.

Process pump recovery after pump failure

In the event of a process pump stopping during a process step there is risk that the pump could contain hazardous materials, the following procedure should be followed in order to minimise the risk to people and property.

WARNING

If the pump has previously pumped hazardous gases observe Safety Information in Section 0.4.

- Interlock the process valve to close when the process pump stops.
- Vent the system with dry purge gas to atmospheric pressure.
- Shut off the purge.
- Disconnect the pump exhaust and fit a metal ISO / NW blanking plate.
- Disconnect the pump inlet and fit a metal ISO / NW blanking plate.
- Disconnect the purge gas supply and seal.
- The pump can now be removed to a workshop for decontamination and repair.

4.4 Removing from Service

Shut off and vent the pump system as described above.

Clean the pump system of any substances which may lead to corrosion. (e.g. by extended purge).

Flood it with nitrogen or dry purge gas, add desiccant and seal it.

Drain cooling water

Remove the cooling water from the pump system.

Remove the cooling water hoses from the pump and drain the cooling water. Blow out the cooling water coils with compressed air or Nitrogen (**max. 4 bar**). Blow into the cooling water inlet port only.

Drain lubricant

Drain the lubricant (PFPE or synthetic oil) out of the pump (cf. Fig. 5.1).

WARNING

If the lubricant is drained out of pumps which have already been operated on the process, then it may have suffered contamination. You must determine the nature of the hazard and take the appropriate safety precautions before draining the lubricant. Precautions can include the use of appropriate personal protective equipment (PPE) such as gloves, respirator and/or protective clothing, working under an exhaust hood, etc. Comply with all safety regulations.
Label the lubricant containers according to the type of contamination.

Loosen the drain plug somewhat, hold drain through and bucket against the pump. Unscrew the drain plug. Tools and bucket must be clean so as not to further contaminate the lubricant.

Screw the drain plug with the sealing ring back in, wipe off any dripped lubricant from the casing.

5 Maintenance

5.1 Return the equipment or components for service

Contamination

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.

Form

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.leybold.com/en/download-center/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 HS2 form, your equipment cannot be serviced.

5.2 Maintenance Intervals

See the table for the recommended maintenance intervals for the pumps. Periodic and proper maintenance will keep the pump in a normal working condition, and helps avoiding pump breakdowns and failures. Maintenance intervals are process-dependent. In clean processes, you may increase the maintenance intervals; in harsh processes, you may have to decrease them.

We recommend a service contract with Leybold.

We recommend to inspect the pump system and all components after approximately 6 months under the process conditions. The inspection of the components shall let corrosion attacks become apparent at an early stage and indicate possible deposits of process dust. Depending on the findings, changed

maintenance and replacement intervals can become necessary for specific compnents.

Service work	Interval
Coolant level in the expansion vessel	Monthly
Oil level check	Monthly
PFPE level and colour	Monthly
Gas ballast filter	Yearly
N_2 pressure regulator	Yearly
N_2 flow regulator	Yearly
Vacuum pump bearings	5 years
Vacuum pump impeller seals	5 years
LVO 210 change (synthetic oil)	Yearly
PFPE change (with clean / medium application)	5 years
Water glycol mixture	5 years

This maintenance plan is a recommendation, adjust it according to your working conditions. With harsh processes intervals should be reduced.

General Notes on Maintenance

Any maintenance work must be performed by qualified personnel. The personnel must be familiar with the safety rules related to the pump, and must use the suitable tools to dismantle and clean the contaminated parts.

WARNING

In order to prevent any danger, don't move or disassemble the pump before it has stopped completely; switch off the power supply to the pump before you start maintenance work.

The pump casing, the exhaust piping and the heating piping are extremely hot during operation and remain hot for some time after stopping. Keep the personnel and flammable substances away from the hot area.

Purge the pump with sufficient N_2 gas, at least one hour, before removing and cleaning the vacuum lines and exhaust piping.

There might be toxic gases or materials remain in the pump, check that there is nothing remaining before the disassembly.

Don't reuse any o-ring. Be careful to cleaning all flange surfaces and check they are undamaged. Check for gas leaks after installing and maintaining the piping.

With improper use, malfunctions or exposure to fire the pump may have overheated. Do not touch or inhale thermal breakdown products of fluorinated materials which are present if the pump has been subject to

temperatures of 260 °C and above. These breakdown products are very dangerous. Fluorinated materials in the pump may include oils, greases and seals.

Disposal of process byproducts, lubricating oil, vacuum grease and other wastes must be in strict accordance with all local and national environmental and safety regulations. For further info see Section 7 Waste Disposal.

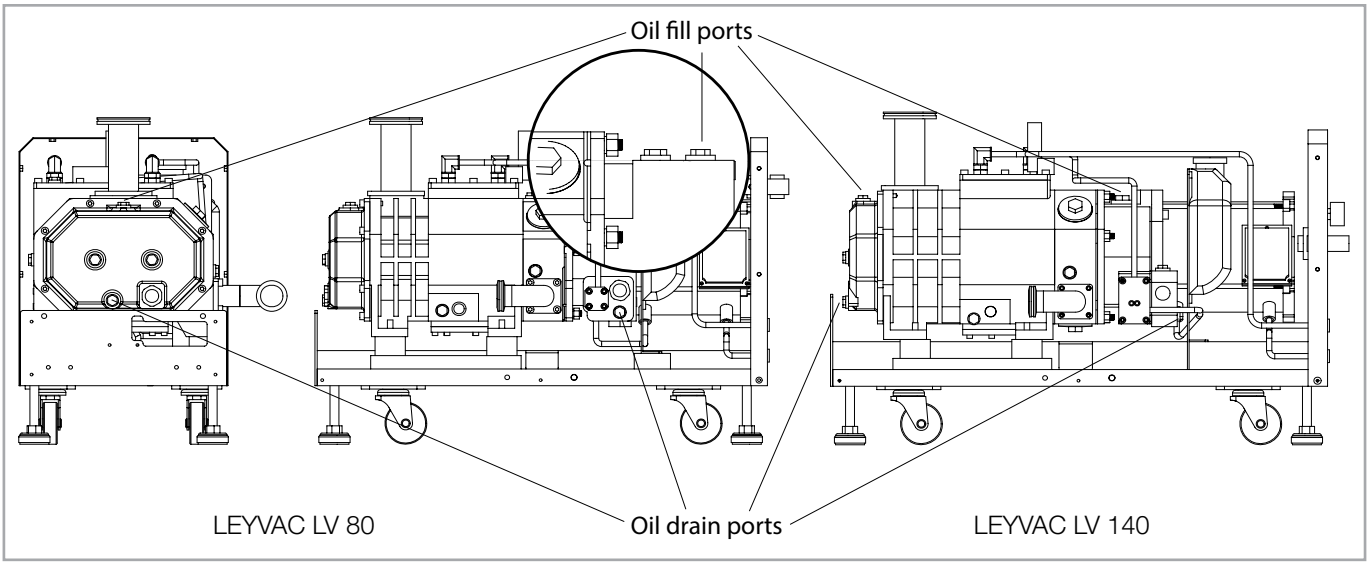


Fig. 5.1 Positions of Oil Ports for Exchanging Lubricants

5.3 Exchanging the Lubricant

Notice safety information 0.3 to 0.5.

The oil-fill port must be sealed air-tight. In the presence of a vacuum, the entry of air may cause oil-containing gas to enter the pumping chamber via the impeller seals.

When using PFPE as intended, PFPE is not subject to ageing. It must only be changed if it is contaminated by the process gas. It can only be determined individually when PFPE is so contaminated that it must be changed.

Change the lubricant more frequently when pumping corrosive vapours or large amounts of dust or when cycling frequently from atmospheric to working pressure.

CAUTION

Before removing the oil-drain or oil-fill plug always **switch off the pump first** and vent to atmospheric pressure.
When the pump has become warm during operation the casing and the oil temperature may exceed 80 °C.
Leave the pump to cool down. Always wear protective gloves also to protect

WARNING

yourself against aggressive residues in the lubricant.

The lubricating oil for the vacuum pump is fluorinated lubricant oil (LVO 410) or synthetic oil (LVO 210). Another kind of oil can not be used or replaced; otherwise, it will cause a major damage of the vacuum pump. When replacing the oil, the used oil inside the pump must be drained out completely; otherwise, it will reduce the lifetime of the new oil. The procedures to replace the oil are listed as follows:

- Dismantle the oil fill plug at the oil inlet hole.
- Dismantle the drain plug at the oil outlet hole; drain out the oil of the oil box, or make use of a proper pump to draw out the used oil.
- Replace all the O-rings. Check the drain plug is tightened. Wipe off any oil residues from the casing.
- Fill in new oil at a pump temperature of 15 °C to 25 °C.
- Make sure to use the right kind of oil and according to Leybold's suggestion. Only use Leybold authorized vacuum oil and re-supply the new oil.
- Clean the oil-fill port, reinstall and tighten the plug using a gasket which is in perfect condition. Wipe off any oil residues from the casing.

Observe the correct oil fill levels for the shutdown (standing still) pump.

NOTICE

The oil levels of both, the gear box and the low pressure side, should be between 1/2 – 2/3 of the oil level glass height. If the level drops below 1/2, lubricant should be added (cf. Fig. 3.2).
If the oil level is too low, the bearings and gearwheels are not lubricated adequately; if it is too high, oil may enter the pumping chamber.
Mineral oils, synthetic oils and PFPE do not mix.

Please consult us if you intend to run the pump with other oils or special lubricants.

The waste oil must be disposed by a professional and qualified waste disposal dealer, container with PFPE has to be labelled as such. For further info see Section 7 Waste Disposal.

5.4 Exhaust Piping Connector

A regular leakage check should be performed over all the connecting parts of the piping. It should be included of checking any crack on the pipes. Washers, O-rings and pipes should be replaced according to their condition. All parts should be tightened again or re-sealing if necessary.

5.5 Pump Inlet Flange

Dismantle the pump inlet flange regularly for cleaning the dirt on the mesh and change with a new O-ring.

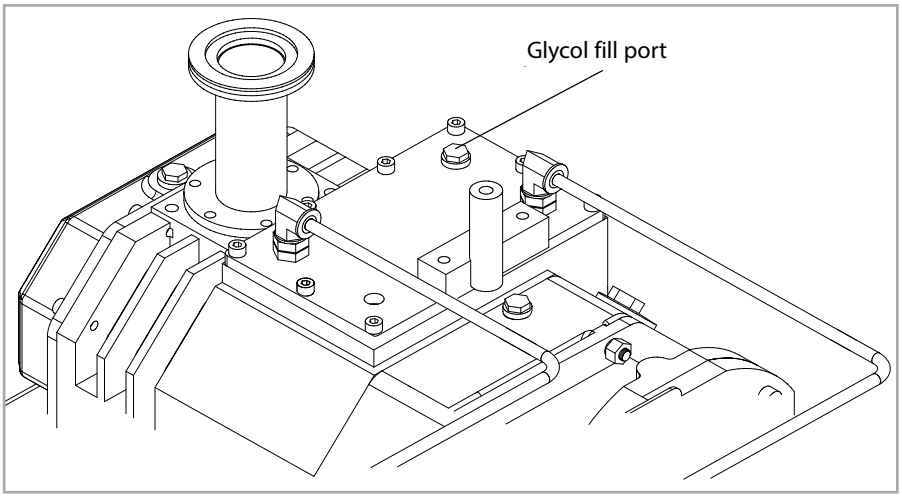


Fig. 5.2 Fill port for the main cooling circuit

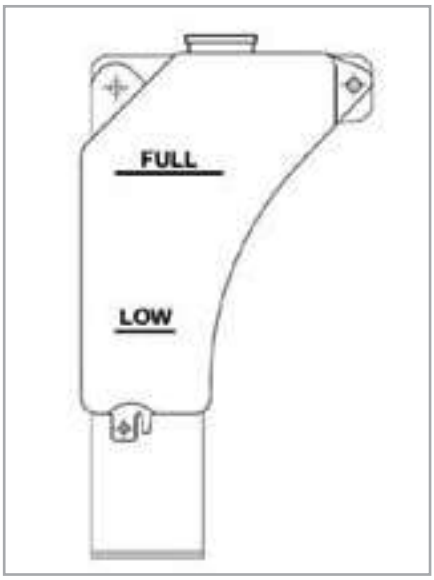


Fig. 5.3 Expension Vessel

5.6 Purge Gas Pressure and Flow Regulator

Check and test regularly that the function of the N_2 pressure regulator and the N_2 flow regulator are normal. When the pump is running, supply the N_2 gas and regulate the flow to check the N_2 mass flow works in normal condition.

Check the gas ballast filter contamination in regards to the ambient air on a regular basis, and replace the filter insert as appropiate.

5.7 Cooling Water Piping

After operating for a period of time, the cooling water piping might encounter the problem of a poor cooling effect because of the dirt adhering to the piping. It will cause the pump casing temperature to rise. A regular cleaning job is necessary, and the clean frequency is dependent on the quality of the water. The cooling tower and the filter should also be cleaned often. If the piping has already been adhered with the dirt, the piping should be cleaned with a cleaner or be replaced.

5.8 Coolant Level

Check the coolant level in the expansion vessel regularly. If the coolant is insufficient, re-supply the water-glycol-mixture and keep the level between FULL and LOW. If the level is really low, additionally fill in coolant directly into the main cooling circuit (cf. Fig. 5.2). The capacity of the main cooling circuit and the expansion vessel is approx. 5 litres.

6 Troubleshooting

6.1 Pump Malfunctions

Malfunction	Likely cause	Remedy
Current is too high	Exhaust pressure rises.	Check exhaust piping and silencer.
	Pump with noise, and rotors are in contact.	Replace or overhaul pump.
	Power supply failure.	Check power supply.
Motor temp. high (90 °C)	Insufficient cooling.	Check water flow and temperature.
	Motor failure.	Replace the motor.
Casing temp. high (85 °C)	Insufficient cooling.	Check water flow and temperature.
	Insufficient coolant in the water jacket.	Refill the coolant.
	Byproduct is clogged.	Replace or overhaul pump.
Water flow is too low	Water piping leaks.	Check the fittings.
	Differential pressure is too small	Check the inlet and outlet pressure of water piping.
	Water piping is clogged.	Clean or replace piping.
	Outlet / inlet is reverse.	Connect correctly.

6.2 Malfunctions with Frequency Converter Operations (option)

Faults and alarms indicate problems in the frequency converter or in the pump.

An alarm (warning) is indicated by a code on the data display and the flashing ALM LED. The frequency converter output is not necessarily switched off.

A fault is indicated by a code on the data display and the ALM LED is on. The frequency converter output is always switched off immediately and the motor coast to stop.

To remove an alarm or reset a fault, trace the cause, remove it and reset the frequency converter by pushing the Reset key on the operator or cycling the power supply.

This lists up the most important alarms and faults only.

Error message	Brief Description	AL	FLT	Possible cause	Corrective Action
bb	Base Block	■		The software base block function is assigned to one of the digital inputs and the input is off. The frequency converter does not accept Run commands.	Check the digital inputs function selection. Provide link between SC and S6.
CF	Control Fault			The torque limit was reached during deceleration for longer than 3 sec. when in Open Loop Vector control • The load inertia is too big. • The torque limit is too low. • The motor parameters are wrong.	Check the load. Set the torque limit to the most appropriate setting (L7-01 through L7-04). Check the motor parameters.
CPF02 to CPF24	Control Circuit Fault		■	There is a problem in the frequency converter's control circuit.	Cycle the frequency converter power supply. Initialize the frequency converter. Replace the frequency converter if the fault occurs again.
CPF25	Control Circuit Fault		■	There is no terminal board connected to the control board.	Check if the terminal board is installed properly. Uninstall and Reapply the terminal board. Change the frequency converter.
Cr5r	Cannot Reset	■		Fault reset was input when a Run command was active.	Turn off the Run command and reset the frequency converter.
EF	Option External Fault	■	■	An external fault was tripped by the upper controller via an option card.	Remove the fault cause, reset the fault and restart the frequency converter. Check the upper controller program.
EF	External Fault	■		A forward and reverse command were input simultaneously for longer than 500 ms. This alarm stops a running motor.	Check the sequence and make sure that the forward and reverse input are not set at the same time.
EF1 to EF6	External Faults	■	■	An external fault was triggered by an external device via one of the digital inputs S1 to S6. EF2: Temperatur limiter (casing rotor) exceeds fault threshold. EF3: Temperature limiter (motor) exceeds fault threshold. The digital inputs are set up incorrectly.	Find out why the device tripped the EF. Remove the cause and reset the fault. Check water cooling. Check motor load, reduce if required, check water cooling. Check the functions assigned to the digital inputs.
GF	Ground Fault		■	Ground leakage current has exceeded 50% of the frequency converters rated output current. Cable or motor insulation is broken. Excessive stray capacitance at frequency converter output.	Check the output wiring and the motor for short circuits or broken insulation. Replace any broken parts. Reduce the carrier frequency.

Troubleshooting

Error message	Brief Description	AL	FLT	Possible cause	Corrective Action
PF	Output Phase Loss		■	Output cable is disconnected or the motor winding is damaged. Loose wires at the frequency converter output. Motor is too small (less than 5% of frequency converter current).	Check the motor wiring. Make sure all terminal screws in the frequency converter and motor are properly tightened. Check the motor and frequency converter capacity.
oC	Overcurrent		■	Short circuit or ground fault on the frequency converter output side The load is too heavy. The accel./decel. times are too short. Wrong motor data or V/f pattern settings. A magnetic contactor was switched at the output.	Check the output wiring and the motor for short circuits or broken insulation. Replace the broken parts. Check the machine for damages (gears, etc.) and repair any broken parts. Check the frequency converter parameter settings. Check the output contactor sequence.
oH or oH1	Heatsink Overheat	■	■	Surrounding temperature is too high. The cooling fan has stopped. The heatsink is dirty. The airflow to the heatsink is restricted.	Check the surrounding temperature and install cooling devices if necessary. Check the frequency converter cooling fan. Clean the heatsink. Check the airflow around the heatsink.
oL1	Motor Overload		■	The motor load is too heavy. The motor is operated at low speed with heavy load. Cycle times of accel./ decel. are too short. Incorrect motor rated current has been set.	Reduce the motor load. Use a motor with external cooling and set the correct motor in parameter L1-01 Check the sequence. Check the rated current setting.
oL2	Drive Overload		■	The load is too heavy. Too much torque at low speed.	Check the load. The overload capability is reduced at low speeds. Reduce the load or increase the frequency converter size.

7 Waste Disposal

Contamination

The equipment may have been contaminated by the process or by environmental influences. In this case the equipment must be decontaminated in accordance with the relevant regulations. We offer this service at fixed prices. Further details are available on request.

WARNING

Contaminated parts can be detrimental to health and environment.
Before beginning with any work, first find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

Separate clean components according to their materials, and dispose of these accordingly. We offer this service. Further details are available on request.

When sending us any equipment, observe the regulations given in Section 5.1 Leybold service.

Disposal of Waste Oil

Owners of waste oil are entirely self-responsible for proper disposal of this waste.

Waste oil from vacuum pumps must not be mixed with other substances or materials.

Waste oil from vacuum pumps (Leybold oils which are based on mineral oils) which are subject to normal wear and which are contaminated due to the influence of oxygen in the air, high temperatures or mechanical wear must be disposed of through the locally available waste oil disposal system.

Waste oil from vacuum pumps which is contaminated with other substances must be marked and stored in such a way that the type of contamination is apparent. This waste must be disposed of as special waste.

European, national and regional regulations concerning waste disposal need to be observed. Waste must only be transported and disposed of by an approved waste disposal vendor.

PFPE from vacuum pumps may be regenerated, if required, and provided the quantities are large enough. For this, please contact us for assistance.

Waste Disposal

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P20050070A

EU Declaration of Conformity

Leybold GmbH
Bonner Strasse 498
D-50968 Koln
Germany

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

The product specified and listed below

Product Designation	Designation Type	Part Numbers
Screw Vacuum Pump LEYVAC	LEYVAC LV 80, LEYVAC LV 80C, LEYVAC LV 80CC, LEYVAC LV 140, LEYVAC LV 140C, LEYVAC LV 140CC, LEYVAC LV 250, LEYVAC LV 250C, LEYVAC LV 250 CC	115080Vxy,115140Vxy,115250Vxy Where xy=(15,20,30,35,40,45)

Is in conformity with the relevant requirements of European CE legislation:

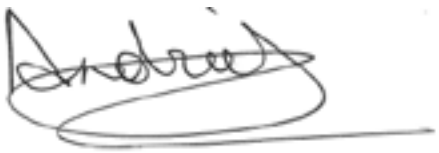
2006/42/EC	Machinery directive *Note: The safety objectives of the Low Voltage Directive 2014/35/EU were complied with in accordance with Annex 1 No. 1.5.1 of this directive.*
2014/30/EU	Electromagnetic compatibility (EMC) directive
2011/65/EU	Restriction of certain hazardous substances (RoHS) directive 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 60204-1:2018	Safety of machinery. Electrical equipment of machines. General requirements
EN 61000-6-2:2005	Electromagnetic Compatibility (EMC) - Part 6-2: Generic Industrial Immunity Standard
EN 61000-6-4:2007	Electromagnetic Compatibility (EMC) - Part 6-4: Generic Industrial Emission Standard

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: *2022-01-11*

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 Bock – Vice President Engineering
Industrial Vacuum Division, Cologne

Axel Guddas – General Manager
Product Company Cologne

P20050070A

Declaration of Conformity

Leybold GmbH
Bonner Strasse 498
D-50968 Koln
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 Designation	Designation Type	Part Numbers
Screw Vacuum Pump LEYVAC	LEYVAC LV 80, LEYVAC LV 80C, LEYVAC LV 80CC, LEYVAC LV 140, LEYVAC LV 140C, LEYVAC LV 140CC, LEYVAC LV 250, LEYVAC LV 250C, LEYVAC LV 250 CC	115080Vxy,115140Vxy,115250Vxy Where xy=(15,20,30,35,40,45)

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.

Electromagnetic Compatibility Regulations 2016

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 60204-1:2018	Safety of machinery. Electrical equipment of machines. General requirements
EN 61000-6-2:2005	Electromagnetic Compatibility (EMC) - Part 6-2: Generic Industrial Immunity Standard
EN 61000-6-4:2007	Electromagnetic Compatibility (EMC) - Part 6-4: Generic Industrial Emission Standard

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: *2022-01-11*

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 – Vice President Engineering
Industrial Vacuum Division, Cologne

Axel Guddas – General Manager
Product Company Cologne

ADDITIONAL LEGISLATION AND COMPLIANCE INFORMATION

EMC (EU, UK): Class A/B Industrial equipment

Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

RoHS (EU, UK): Material Exemption Information

This product is compliant with the following Exemptions
Annex III:

- 6(b) **Lead** as an alloying element in aluminium containing up to 0.4% 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.

Additional Applicable Requirements

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

2012/19/EU	Directive on waste electrical and electronic equipment (WEEE)

Product is certified to:	Certificate No:
UL 1004-1:2012 R8.18	US 72192862
CSA C22.2 No 100-14	CA 72192863

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	O	O	O	O	O

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.

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

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Leybold

Pioneering products. Passionately applied.

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