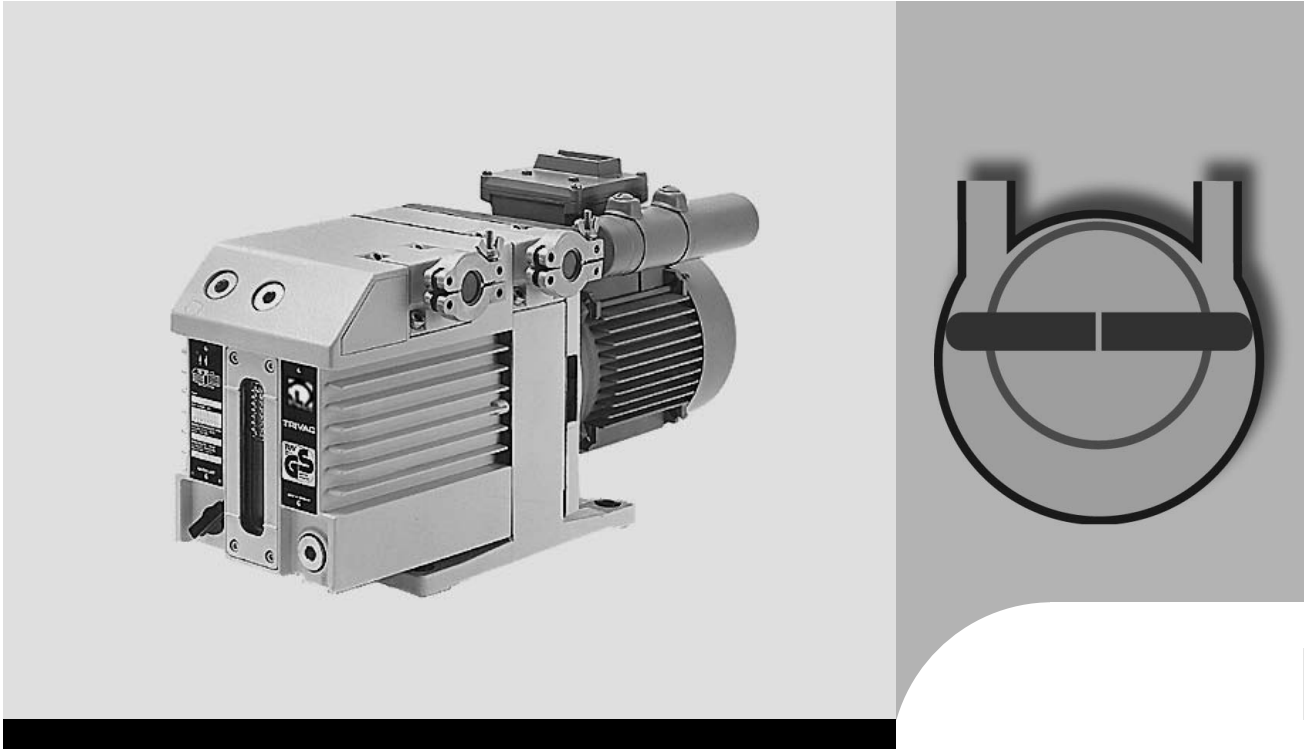


# OPERATING INSTRUCTIONS

GA01201\_1002



## **TRIVAC® B** **D 4 B / D 8 B** Rotary Vane Vacuum Pump

**Cat. No.**

113 08/17

140 081/082

 **Leybold**  
vacuum

# Contents

Section	Page
<b>Important Safety Information</b> .....	<b>6</b>
<b>1 Description</b> .....	<b>8</b>
1.1 Function .....	9
1.2 Supplied Equipment .....	11
1.3 Accessories .....	12
1.4 Technical Data .....	13
1.4.1 Motor Related Data .....	13
<b>2 Transportation</b> .....	<b>14</b>
<b>3 Installation</b> .....	<b>15</b>
3.1 Placement .....	15
3.2 Connection to the System .....	16
3.3 Electrical Connections .....	17
3.4 Areas of Application .....	17
<b>4 Operation</b> .....	<b>18</b>
4.1 Start-up .....	18
4.2 Operation .....	18
4.2.1 Pumping of Non-Condensable Gases .....	18
4.2.2 Pumping of Condensable Gases and Vapours .....	19
4.2.3 Operating Temperature .....	19
4.3 Shutdown .....	20
4.3.1 Shutdown through Monitoring Components .....	20
4.3.2 Failure of the Control System or the Mains Power .....	20

<b>Section</b>	<b>Page</b>
<b>5 Maintenance</b> .....	<b>21</b>
5.1 Checking the Oil Level .....	22
5.1.1 Checking the Condition of N 62 or HE 200 Oil .....	22
5.2 Oil Change .....	23
5.3 Cleaning the Inlet Screen .....	24
5.4 Removing and Fitting the Internal Demister .....	24
5.5 Disassembly and Reassembly of the Electric Motor .....	26
5.6 Replacing the Shaft Seal .....	27
5.7 Removing and Remounting the Pump Module .....	28
5.7.1 Removing the Pump Module .....	29
5.7.2 Remounting the Pump Module .....	29
5.8 Service by Leybold .....	30
5.8.1 Waste Disposal of Used Pump Materials .....	30
5.9 Storing the Pump .....	31
5.10 Maintenance Plan .....	32
<b>6 Troubleshooting</b> .....	<b>33</b>
<b>7 Spare Parts</b> .....	<b>34</b>
<b>EEC Declaration of Conformity</b> .....	<b>35</b>
<b>EEC Manufacturer's Declaration</b> .....	<b>36</b>
<b>Declaration of Contamination</b> .....	<b>37</b>

### **Leybold Service**

If a pump is returned to Leybold indicate whether the pump is free of substances damaging to health or whether it is contaminated.

If it is contaminated also indicate the nature of the hazard. Leybold must return any pumps without a "Declaration of Contamination" to the sender's address.

### **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.

**Figures** The references to diagrams, e.g. (1/2) consist of the Fig. No. and the Item No. in that order.

---

We reserve the right to modify the design and the specified data. The illustrations are not binding.

The vacuum pumps from the TRIVAC B system from Leybold ensure when properly used and when observing the information provided in these Operating Instructions, safe and reliable operation. Please read all safety related notes provided in this section and the remaining part of the Operating Instructions with care and ensure compliance. **The pump must only be operated and maintained by trained staff while in the proper state and as described in these Operating Instructions.** Please also note local and government requirements and regulations. Should you have any questions relating to safety, operation or maintenance of the equipment, please get in touch with your nearest Leybold Vacuum office.



The icon indicates procedures that must be strictly observed to prevent hazards to persons.

**Warning**



This special icon warns about dangers caused by high electric voltages. Touching parts at a high voltage can result in immediate death. Covers which are marked with this icon must only be removed by trained electricians after having reliably disconnected the electric power source.

**Warning**



Indicates procedures that must strictly be observed to prevent damage to, or destruction of the equipment.

**Caution**

Emphasises additional application information and other useful information provided within these Operating Instructions.

**Note**

# Important Safety Information

**Warning**  
Non-compliance with the following precautions can result in severe injury!



**Warning**



- Before beginning with any maintenance or service work on the TRIVAC B, disconnect the pump from all power supplies.
- Do not operate the pump with any of the covers removed. Serious injury may result.
- If exhaust gases must be collected or contained, do not allow the exhaust line to become pressurised.
- Make sure that the gas flow from the exhaust port is not blocked or restricted in any way.
- The standard version of the TRIVAC B is not suited for operation in explosion hazard areas. For this purpose there are special TRIVAC B Atex Pumps. Contact us before planning to use the pump under such circumstances.
- Before starting up for the first time, the motor circuit must be equipped with a suitable protective motor switch. Please take note of the information in these Operating Instructions or on the electric motor (wiring diagram).
- The TRIVAC B is **not suited** for pumping of:
  - combustile and explosive gases and vapours
  - radioactive and toxic substances
  - pyrophorous substances
- Avoid exposing any part of the human body to the vacuum.
- Never operate the TRIVAC B without a connected intake line or blank flange at the intake port.
- The location at which the TRIVAC B (including its accessories) is being operated should be such that angles over 10° from the vertical are avoided.
- The location of the TRIVAC B should be such that all controls are easily accessible.
- Under certain ambient conditions the TRIVAC B may attain a temperature of over 70 °C (158 °F). There then exists the danger of receiving burns. Note the symbols on the pump pointing to the hazards, and in the case of a hot pump wear the required protective clothing.
- The noise level of the TRIVAC B is between 52 and 62 dB(A). Introduce suitable hearing protection.
- Before pumping oxygen (or other highly reactive gases) at concentrations exceeding the concentration in the atmosphere (> 21 % for oxygen) it will be necessary to use a special pump. Such a pump will have to be modified and degreased, and an inert special lubricant (like PFPE) must be used.
- Before commissioning the TRIVAC B, 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.

- It is recommended to always operate the TRIVAC B with a suitable exhaust line which is properly connected. It must slope down and away from the pump.
- When moving the TRIVAC B always use the allowed means only. The pump is equipped as standard with a handle.
- Do not allow the ingestion of small objects (screws, nuts, washers, pieces of wire, etc.) through the inlet port. For this reason always use the inlet screen which is supplied as standard.
- Do **not** use the pump for applications that produce abrasive or adhesive powders or condensable vapours that can leave adhesive or high viscosity deposits. When planning to pump vapours other than water vapour please contact our sales or service department for advice.
- This pump is suited for pumping water vapour within the specified water vapour tolerance limits.
- Avoid vapours that can condense into liquids when being compressed inside the pump, if these substances exceed the vapour tolerance of the pump.
- Before pumping vapours the TRIVAC B should have attained its operating temperature. This will be the case approximately 30 minutes after having started the pump. During this warming up phase, the pump should be separated from the process, by a blocking valve in the intake line, for example.
- In the case of wet processes we recommend the installation of liquid separators upstream and downstream of the pump as well as the use of the gas ballast.
- The exhaust line should be laid so that it slopes down and away from the pump so as to prevent condensate from back-streaming into the pump.
- The entry of particles and fluids must be avoided under all circumstances.
- Reactive or aggressive substances in the pump chamber may impair the operating oil or modify it. In addition, such substances may be incompatible with the materials of the pump (Viton, grey cast iron, aluminium, steel, resins, glass etc.).
- Corrosion, deposits and cracking of oil within the pump are not allowed.
- Normal amounts of humidity within the range of the pump's water vapour tolerance will not significantly affect pump performance when the gas ballast is active.

**In the case of custom pumps (with a part number deviating from that stated in the EC Declaration of Conformity) please note the information provided in the supplementary sheet.**

**Caution**  
**Non-compliance with the following precautions can cause damage to the pump!**

**This information serves the purpose of making optimum use of the pump!**

**Caution**

## Description

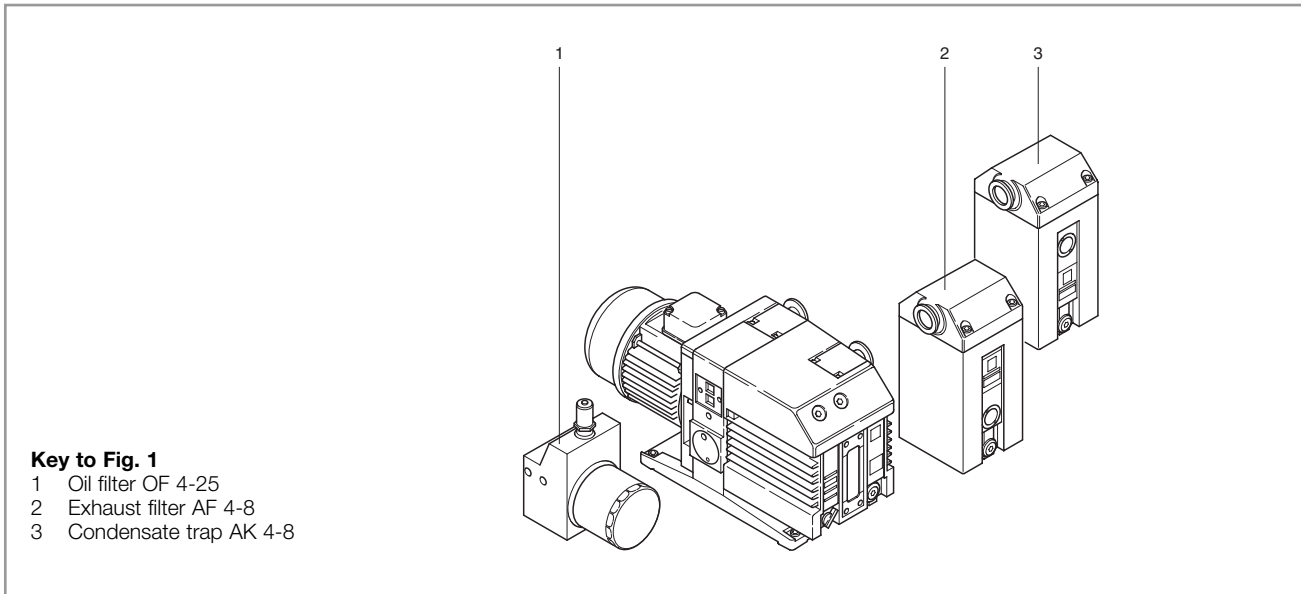


Fig. 1 TRIVAC B with accessories

# 1 Description

TRIVAC B pumps are oil-sealed rotary vane pumps. The TRIVAC D 4 B and D 8 B are dual-stage pumps. The number in the type designation (4 or 8) indicates the pumping speed in  $\text{m}^3 \cdot \text{h}^{-1}$ .

TRIVAC B pumps are capable of pumping gases and vapours and evacuating vessels or vacuum systems down into with the medium vacuum range. The standard versions of the pump are not suited for pumping of oxygen exceeding the concentration as found in the atmosphere, and are also not suited for pumping of hazardous gases or extremely aggressive or corrosive media.

The drive motor of the TRIVAC B is directly flanged to the pump at the coupling housing. The pump and motor shafts are directly connected by a flexible coupling. The bearing points of the pump module are force lubricated sliding bearings. All controls as well as the oil-level glass and the nameplate are arranged on the front. All connections are to be found at the sides of the pump. The oil-level glass is provided with prisms for better observation of the oil level.

The pump module consists of assembly parts which are pin-fitted so as to allow easy disassembly and reassembly. The pump module can be easily removed without special tools.



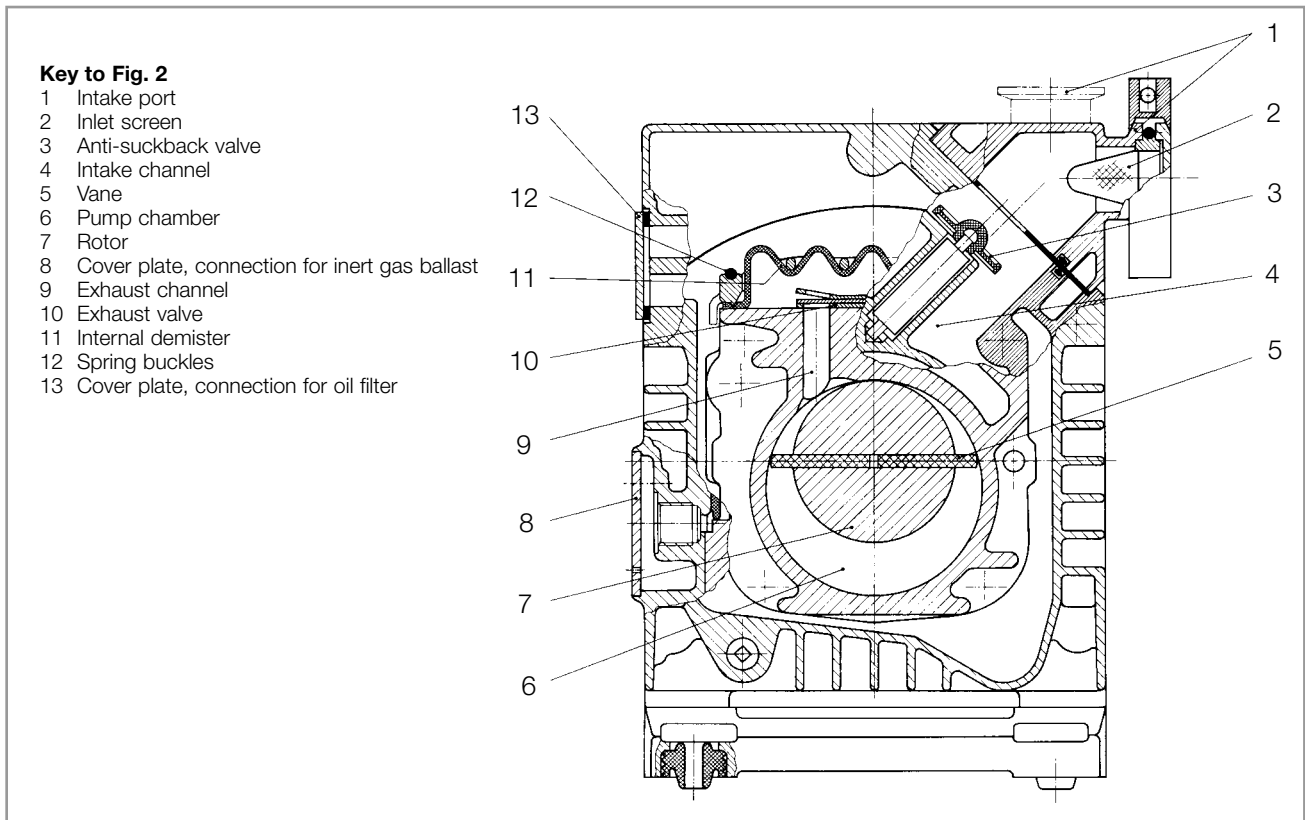


Fig. 2 Sectional drawing of the TRIVAC B

## 1.1 Function

The rotor (2/7), mounted eccentrically in the pump chamber (2/6), has two radially sliding vanes (2/5) which divide the pump chamber into several compartments. The volume of each compartment changes periodically with the rotation of the rotor.

As a result, gas is sucked in at the intake port (2/1). The gas passes through the inlet screen (2/2), flows past the open anti-suckback valve (2/3) and then enters the pump chamber (2/6). In the pump chamber, the gas is passed on and compressed, after the inlet aperture is closed by the vane.

The oil injected into the pump chamber is used for sealing and lubricating. The slap noise of the oil in the pump which usually occurs when attaining the ultimate pressure is prevented by admitting a very small amount of air into the pump chamber.

The compressed gas in the pump chamber is ejected through the exhaust valve (2/10). The oil entrained in the gas is coarsely trapped in the internal demister (2/11); there the oil is also freed of mechanical impurities. The gas leaves the TRIVAC B through the exhaust port.

During compression, a controlled amount of air - the so-called gas ballast - can be allowed to enter the pump chamber by opening the gas ballast valve (position I). The gas ballast stops condensation of vapours in the pump chamber up to the limit of water vapour tolerance as specified in the technical data for the pump.

### Operating Principle

### Oil filter

### Operating with gas ballast

## Description

The gas ballast valve is opened (position I) and closed (position 0) by turning the gas ballast knob (7/5) on the front.

### Lubrication system

To enable the TRIVAC B to be used at intake pressures as high as 1,000 mbar, a special lubricating system was developed featuring force-lubrication of the sliding bearings.

An oil pump (3/6) pumps the oil from the oil reservoir (3/5) into a pressure-lubrication system which supplies oil to all bearing points (3/2). From there the oil enters the pump chamber area (2/6) of the vacuum pump.

The oil pump is fitted in the front end plate on the coupling side of the pump module. The oil suction line is placed low, resulting in a large usable oil reservoir.

### Seperation of oil and gas

The oil is separated from the gas in the TRIVAC B in two steps as described above. First, small droplets are coalesced into large drops in the internal demister (2/11) fitted above the exhaust valve (2/10). Then, the large drops fall into the oil reservoir as the exhaust gas is diverted by the inner walls of the oil case. Thus a low loss of oil is obtained. This and the large usable oil reservoir ensure long intervals between oil changes even at high intake pressures.

### Anti-suckback valve

The vacuum is maintained by the TRIVAC B by an integrated hydropneumatic anti-suckback valve (2/3) which is controlled via the oil pressure.

During operation of the TRIVAC B the control piston (4/3) remains sealed against a spring (4/2) by the oil pressure. The valve disc (4/6) of the anti-suckback valve is held at the lower position by its own weight (valve open). When the pump stops (because it has been switched off or because of a failure), the oil pressure drops and the spring (4/2) presses the control piston (4/3) up. Thus a connection is provided between the oil case or the oil reservoir (4/1) and the piston (4/4) of the anti-suckback valve. Due to the pressure difference between the oil case and the intake port the oil presses the piston (4/4) up and the valve plate (4/6) against the valve seat (4/5). The quantity of oil in the oil reservoir (4/1) prevents the entry of air into the intake port (2/1) at the beginning of this process.

After the oil has flowed out from the reservoir and when the valve plate rests on the valve seat, air follows in, which vents the pump chamber and forces the valve disc (4/6) against its seat. This effectively prevents backstreaming of oil. The anti-suckback valve (2/3) operates independently of the operating mode of the pump, i.e. also with gas ballast.

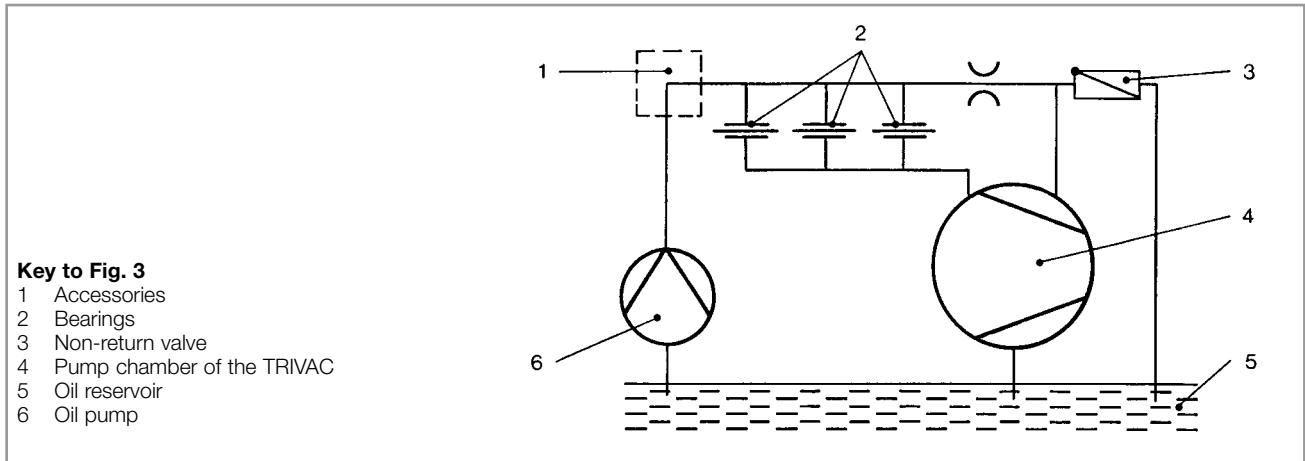


Fig. 3 Schematic of the lubricating system

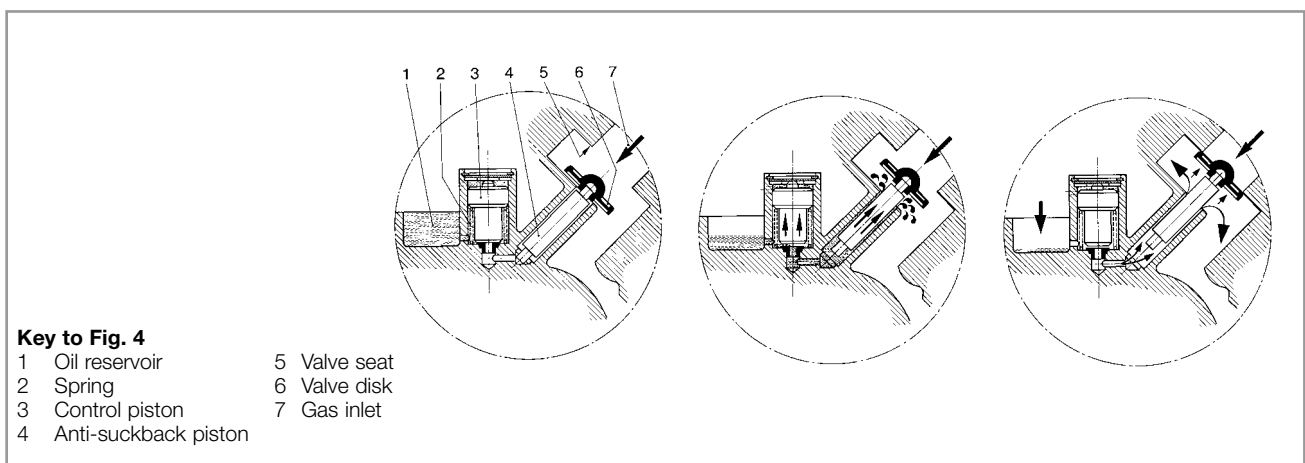


Fig. 4 Hydropneumatic anti-suckback valve

## 1.2 Supplied Equipment

The equipment supplied with the TRIVAC-B pump includes:

Pump with motor, including initial filling of N 62 or HE-200 oil.

1 centering ring,

1 centering ring with dirt trap,

2 clamping rings DN 25 KF.

As protection during shipment, the connection ports are each blanked off by rubber diaphragms and supporting rings.

TRIVAC-B pumps with single-phase AC motor are supplied ready to operate with switch, built-in thermal motor protection switch.

**A mains cable must be ordered additionally:**

- |                        |                             |
|------------------------|-----------------------------|
| ■ 100 V - 120 V (NEMA) | <b>Cat.-No.: 200 81 090</b> |
| ■ 200 V - 240 V (NEMA) | <b>Cat.-No.: 200 81 141</b> |
| ■ 200 V - 240 V (EURO) | <b>Cat.-No.: 200 81 091</b> |

**Note**

### 1.3 Accessories

	<b>Cat.-No.</b>
Seperator AK 4-8, DN 16 KF	188 06
Exhaust filter AF 4-8, DN 16 KF	189 06
Drain trap for Seperator, exhaust-filter, oil drain of the pump, vacuum tight	190 90
oil tight	190 91
Exhaust filter with lubricant return AR 4-8, DN 16 KF	189 20
Dust filter FS 2-4	186 05
Fine vacuum adsorption trap FA 2-4 (with zeolithe)	187 05
adsorption trap (with aluminium oxide)	854 14
adsorption trap (with cryo insert)	854 17
Cold trap TK 4-8	188 20
Oil filter OF 4-25	101 91
Chemical filter CF 4-25	101 96
Adapter für gas ballast port M 16 x 1,5 - DN 16 KF	168 40
M 16 x 1,5 - $\frac{3}{8}$ inch NPT	99 175 011
<b>Oil N 62</b>	
1l	177 01
5l	177 02
20 l	177 03
(order from Leybold, Cologne)	
<b>Oil HE-200</b>	
1 qt	98 198 006
12 qt case	98 198 049
1 gal	98 198 007
5 gal	98 198 008
(order from LHVP, Export Pa., USA)	

The oil grades N 62 and HE-200 are interchangeable. Special oils upon request.

**Caution** Only use the kind of oil specified by Leybold. Alternative types of oil are specified upon request.

## 1.4 Technical Data

		TRIVAC D 4 B two-stage	TRIVAC D 8 B two-stage
Nominal pumping speed <sup>1)</sup>	m <sup>3</sup> · h <sup>-1</sup>	4.8	9.7
Pumping speed <sup>1)</sup>	m <sup>3</sup> · h <sup>-1</sup>	4.2	8.5
Ultimate partial pressure without gas ballast <sup>1)</sup>	mbar		10 <sup>-4</sup>
Ultimate total pressure without gas ballast <sup>1)</sup>	mbar		< 2 · 10 <sup>-3</sup>
Ultimate total pressure with gas ballast <sup>1)</sup>	mbar		< 5 · 10 <sup>-3</sup>
Water vapor tolerance <sup>1)</sup>	mbar	30	25
Water vapor capacity	gm · h <sup>-1</sup>	93	157
Oil filling, min./max.	l	0.3 / 0.8	0.3 / 0.9
Noise level * to DIN 45 635, (without/with gas ballast)	dB (A)		50 - 52
Admissible ambient temperature	°C		12 - 40
Motor rating *	W		370
Nominal speed *	min <sup>-1</sup>		1500
Type of protection	IP		54
Weight *	kg	18.7	21.2
Connections, intake and exhaust side	DN		16 KF

<sup>1)</sup>To DIN 28 400 and subsequent numbers

\*)Length, weight, motor rating, nominal speed and noise levels for the pumps with AC motor, 230 V, 50 Hz, only.

**Note** We can only guarantee that the pump will meet its specifications when using the type of lubricant which has been specified by us.

### 1.4.1 Motor Related Data

D 4 B			D 8 B			Motor connections voltage, frequency	Motor power	Rated current	Speed	P/N motor
Cat. No.	l (mm)	W (kg)	Cat. No.	l (mm)	W (kg)					
113 07	223	10.6	113 17	248	12.8	ohne Motor	-	-	-	-
140 081	455	19.1	140 082	480	21.1	1~ 100 V-120 V, 50 Hz/60 Hz* 200 V-240 V, 50 Hz/60 Hz*	570 W/660 W	7.7/5.6 A 4.0/2.8 A	1420/1690	10000 2292

\*)a mains cable must be ordered additionally:

- 100 V - 120 V (NEMA) **Cat.-No.: 200 81 090**
- 200 V - 240 V (NEMA) **Cat.-No.: 200 81 141**
- 200 V - 240 V (EURO) **Cat.-No.: 200 81 091**

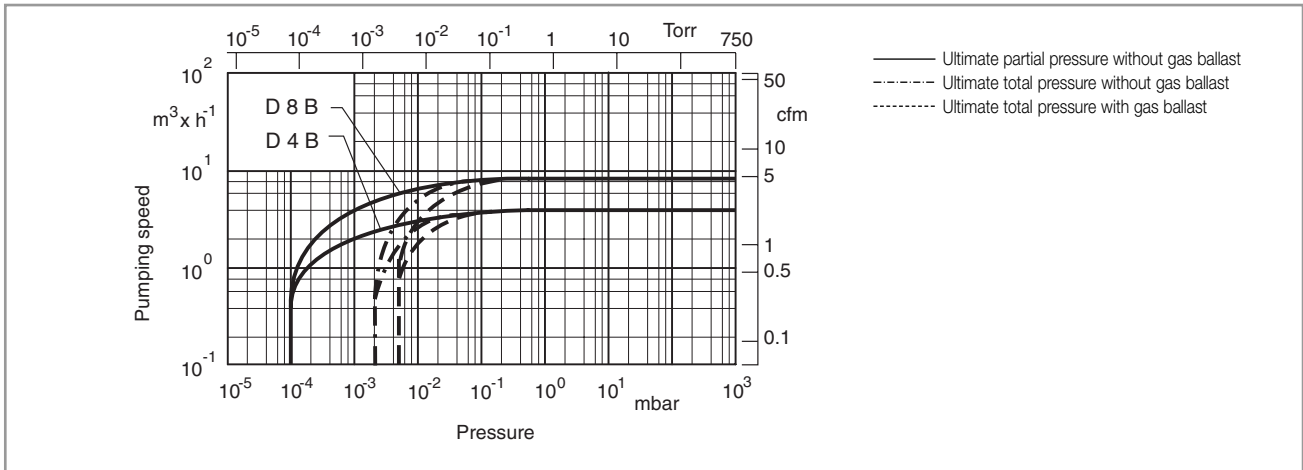


Fig. 5 Pumping speed characteristics of the TRIVAC D 4 B and TRIVAC D 8 B, 50 Hz operation, SI units

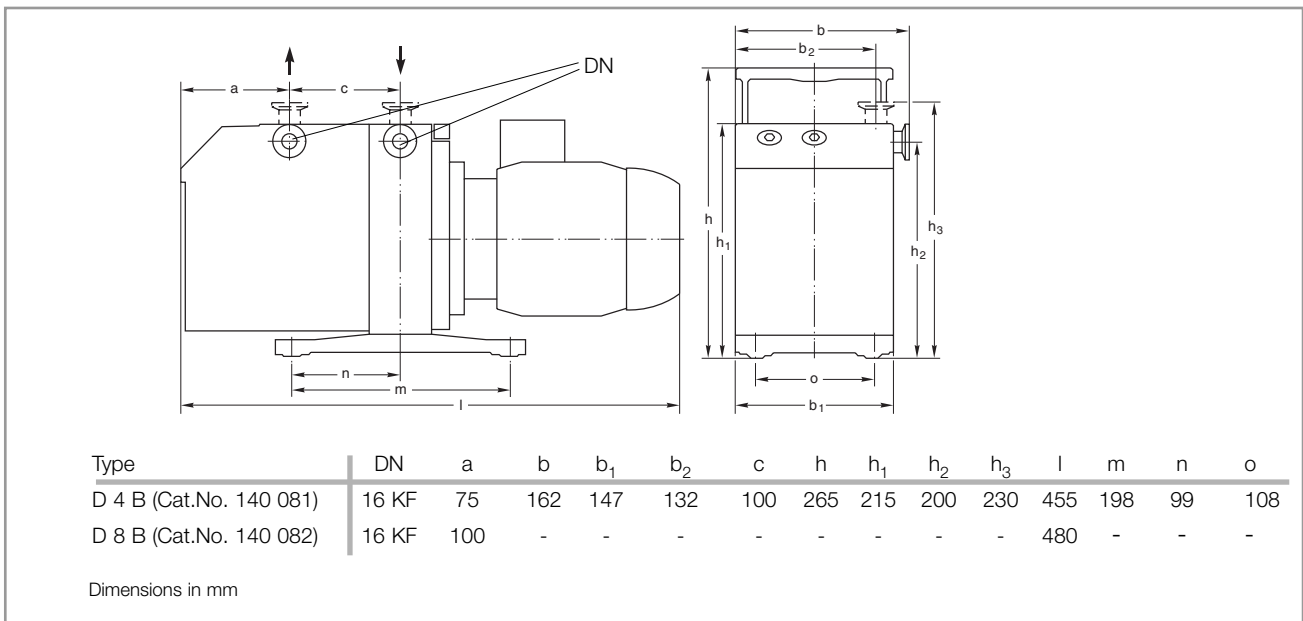


Fig. 6 Dimensional drawing for the TRIVAC rotary vane pumps (Dimensions a, l, b to b2 and h1 are approximate)

## 2 Transportation and Storage

### Caution

- Pumps which are filled with operating agents must only be moved while standing upright. Otherwise oil may escape. Avoid any other orientations during transport.

### Warning



- Check the pump for the presence of any oil leaks, since there exists the danger that someone may slip on spilt oil.
- When lifting the pump you must make use of the crane eyes provided on the pump for this purpose; also use the recommended type of lifting device.

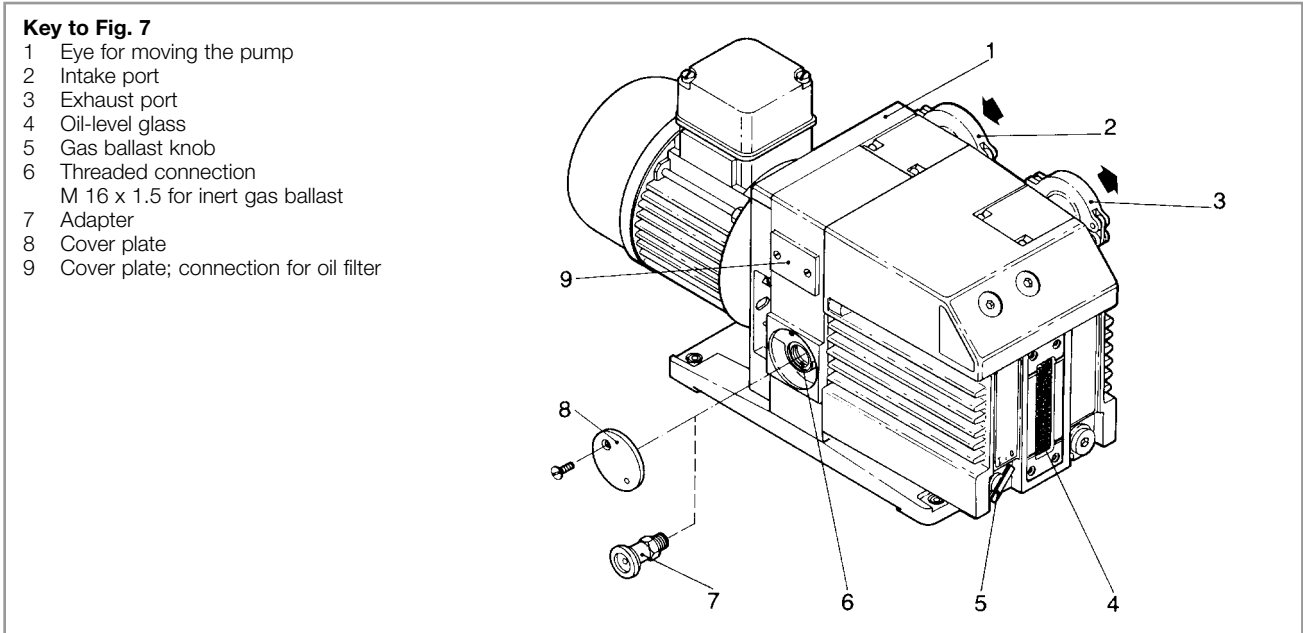


Fig. 7 Connections and controls

## 3 Installation

### 3.1 Placement

The standard pump is **not** suited for installation in the explosion hazard areas. When planning such an application please contact us first.

**Warning**



The TRIVAC B pump can be set up on a flat, horizontal surface. Rubber feet under the coupling housing ensure that the pump can not slip.

If you wish firmly install the pump in place, insert bolts through bore holes in the rubber feet.

Max. tilt for the pump (without further attachment) with possibly fitted standard accessories is 10° from the vertical.

**Caution**

The rubber feet act as vibration absorbers. They must therefore not be compressed by screws.

When installing the TRIVAC B pump, make sure that the connections and controls are readily accessible.

The site chosen should allow adequate air circulation to cool the pump (keep front and rear unobstructed).

The ambient temperature should not exceed +40 °C (104 °F) and not drop below +12 °C (55 °F) (see Section 4.2.3).

The max. amount of heat given off approximately corresponds to the rated motor power.

### 3.2 Connection to the System

Before connecting the TRIVAC B, remove the shipping seals from the connection flanges (7/2) and (7/3).

#### Caution

Retain the shipping seals in case you need to store the pump in the future.

The pump is shipped with intake and exhaust flanges mounted for horizontal connection of the connecting lines. You can easily convert the ports for vertical connection by removing the four capscrews, rotating the flanges as required, and reinstalling the capscrews.

Connect the intake and exhaust lines with a centering ring and a clamping ring each. Use the centering ring with dirt trap for the intake port.

Connect the intake and exhaust line using anti-vibration bellows, without placing any strain on the pump.

The intake line must be clean. Deposits in the intake line may outgas and adversely affect the vacuum. The connecting flanges must be clean and undamaged.

The maximum throughput of the pump is equivalent to the pumping speed of the pump (see Section 1.4).

#### Caution

The cross-section of the intake and exhaust lines should be at least the same size as the connection ports of the pump. If the intake line is too narrow, it reduces the pumping speed. If the exhaust line is too narrow, overpressures may occur in the pump; this might damage the shaft seals and cause oil leaks. The maximum pressure in the oil case must not exceed 1.5 bar (absolute).

When pumping vapours, it is advisable to install condensate traps on the intake and exhaust sides.

Install the exhaust line with a downward slope (lower than the pump) so as to prevent condensate from flowing back into the pump. If this is not possible, insert a condensate trap.

The exhaust gases from the vacuum pump must be safely led away and subjected to post-treatment as required. In order to reduce the emission of oil vapours we recommend the installation of an additional exhaust filter (Leybold accessory).

Depending on the type of application or the kind of pumped media, the corresponding regulations and information sheets must be observed.

The pumps may be operated with an inert gas ballast via a connection which is provided for this purpose. The cover plate (7/8) can be removed to gain access to this M 16 x 1.5 threaded port (7/6). Matching connectors are available (see Section 1.3).

Inlet pressure for the gas ballast should be about 1000 mbar (absolute) and sufficient quantities of gas must be available (about  $\frac{1}{10}$  of the pumping speed).

#### Warning



Never operate the pump with a sealed exhaust line. There is the danger of injury.

Before starting any work on the pump, the personnel must be informed about possible dangers first. All safety regulations must be observed.



### 3.3 Electrical Connections

Before wiring the motor or altering the wiring, ensure that mains supply for the pump is off and that it can not be applied inadvertently.

In order to prevent the pump from running up unexpectedly after a mains power failure, the pump must be integrated in the control system in such a way that the pump can only be switched on again manually. This applies equally to emergency cut-out arrangements.

The connections must only be provided by a trained electrician or must be supervised by a trained electrician working in accordance with the currently valid IEC (International), EN (European) or national guidelines.

Observe all safety regulations.

TRIVAC B pumps are available with a single-phase motor.

With a single-phase AC motor the pumps may be connected directly to the mains via the mains cord and the mains plug.

Fusing must always be done in accordance with the national and local regulations for single phase mains (in Germany 16 amps, for example).

The direction of rotation need not be checked as it is fixed.

The motor is protected against overloading by a thermal overload switch with automatic resetting.

If the thermal overload protector shuts off the pump, the motor will restart itself as soon as it cools. That's why the mains plug should be disconnected from the mains before starting with any work on the pump.

#### Warning



#### Warning



### 3.4 Areas of Application

Before pumping oxygen (or other highly reactive gases) at concentrations exceeding the concentration in the atmosphere (> 21 % for oxygen) it will be necessary to use a special pump. Such a pump will have to be modified and degreased, and an inert special lubricant (like PFPE) must be used.

The TRIVAC B is **not suited** for pumping of:

- ignitable and explosive gases or vapours
- oxidants
- pyrophorous gases.

The pumps are not suited for pumping of liquids or media which carry large quantities of dust. Corresponding protection devices need to be provided.

The standard pump is not suited for pumping of hazardous gases or vapours.

Our technical sales department is available for further advice in these matters.

#### Warning



#### Caution

#### Warning



## 4 Operation

### 4.1 Start-up

Each time before starting up check the oil level.

On initial start-up, after prolonged idle periods or after an oil change, the specified ultimate pressure cannot be attained until the oil is degassed. This can be done by running the pump for approx. 30 min. with the intake line closed and the gas ballast valve (7/5) open.

**Warning**



Before starting the pump ensure that the pump and the fitted accessories meet the requirements of your application and that safe operation can be guaranteed.

Avoid exposure of any part of the body to the vacuum. There is the danger of injury. Never operate the pump with an open intake port. Vacuum connections as well as oil-fill and oil-drain openings must never be opened during operation.

The safety regulations which apply to the application in each case must be observed. This applies to installation, operation and during maintenance (service) as well as waste disposal and transportation.

### 4.2 Operation

TRIVAC B pumps can pump condensable gases and vapours, provided that the gas ballast valve (7/5) is open and the pump has attained its operating temperature.

#### 4.2.1 Pumping of Non-Condensable Gases and Vapours

If the process contains mainly permanent gases, the TRIVAC B may be operated without gas ballast (position 0), provided that the saturation vapour pressure at operating temperature is not exceeded during compression.

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 the gas ballast valve open in accordance with Section 4.2.2.

### 4.2.2 Pumping of Condensable Gases and Vapours

With the gas ballast valve open (position I) and at operating temperature, TRIVAC B pumps can pump pure water vapour up to the water vapour tolerance specified by the technical data. If the vapour pressure increases above the permissible level, the water vapour will condense in the oil of the pump.

When pumping vapours ensure that the gas ballast valve is open and that the pump has been warmed up for approximately 30 minutes with the intake line closed.

Vapour phases may only be pumped up to the permissible limit after the pump has attained its operating temperature.

During pumping, vapours may dissolve in the oil. This changes the oil properties and thus there is a risk of corrosion in the pump. Therefore, don't switch off the pump immediately after completion of the process. Instead, allow the pump to continue operating with the gas ballast valve open and the intake line closed until the oil is free of condensed vapours. We strongly recommend operating the TRIVAC B in this mode for about 30 minutes after completion of the process.

In cyclic operation, the TRIVAC B should not be switched off during the intervals between the individual working phases (power consumption is minimal when the pump is operating at ultimate pressure), but should continue to run with gas ballast valve open and intake port closed (if possible via a valve).

Once all vapours have been pumped off from a process (e.g. during drying), the gas ballast valve can be closed to improve the attainable ultimate pressure.

### 4.2.3 Operating Temperature

Proper operation of the TRIVAC B is ensured in the ambient temperature range between 12 °C to 40 °C (55 °F to 104 °F).

At operating temperature, the surface temperature of the oil case may lie between 40 °C and over 70 °C (104 °F and 156 °F), depending on the load.

The surface temperature of the TRIVAC B pumps may rise above 70 °C.

There is the danger of receiving burns.

#### Caution

#### Warning



## 4.3 Shutdown

Under normal circumstances, all that you need do is to electrically switch off the TRIVAC B.

No further actions will be required.

When pumping condensable media let the pump continue to operate with the gas ballast valve open and the intake line closed before switching off (see Section 4.2.2).

When pumping aggressive or corrosive media, let the pump continue to operate even during long non-working intervals (e.g. overnight) with the intake line closed and the gas ballast valve open. This avoids corrosion during idle periods.

If the TRIVAC B is to be shutdown for an extended period after pumping aggressive or corrosive media or if the pump has to be stored, proceed as follows:

**Warning**



When having pumped harmful substances, take adequate safety precautions.

Our technical sales department is available for further advice in these matters.

Drain the oil (see Section 5.2).

Add clean oil until the oil-level is at the „min“ mark (see Section 5.2) and let the pump operate for some time.

Then drain the oil and add clean oil until the oil level is at the „max“ mark (see Section 5.2).

Seal the connection ports. Special conservation or anti-corrosion oils aren't necessary.

**Caution**

Please also take note of the information given in Section 5.9 (Storing the Pump).

### 4.3.1 Shutdown through Monitoring Components

**Warning**



When the pump has been switched off due to overheating sensed by the motor coil protector or other monitoring components at the pump (e. g. thermal sensor), the pump must only be started manually after the pump has cooled down to the ambient temperature and after having removed the cause first.

### 4.3.2 Controller/Mains Power Failure

**Warning**



In order to prevent the pump from running up unexpectedly after a mains power failure, the pump must be integrated in the control system in such a way that the pump can only be switched on again manually. This applies equally to emergency cut-out arrangements.

## 5 Maintenance

Disconnect the electrical connections before disassembling the pump. Make absolutely sure that the pump cannot be accidentally started.

If the pump has pumped harmful substances, contrary to what has been stated in Section 3.4, ascertain the nature of hazard and take adequate safety measures.

Observe all safety regulations.

### Warning



Whenever you send a pump to Leybold, indicate whether the pump is contaminated or is free of substances which could pose a health hazard. If it is contaminated, specify exactly which substances are involved. You must use the form we have prepared for this purpose; we will forward the form on request.

A copy of the form is printed at the end of these operating instructions: „Declaration of contamination of vacuum equipment and components“. Another suitable form is available from the Leybold homepage: <http://www.leybold.com> under the headline “Support & Download”.

Attach the form to the pump or enclose it with the pump. Do not put the form in the polyethylen bag together with the pump.

This statement detailing the contamination is required to satisfy legal requirements and for the protection of our employees.

Pumps which are not accompanied by a contamination statement will be returned to the sender.

When disposing of used oil, you must observe the applicable environmental regulations.

### Contamination

### Form

### Caution

Due to the design concept, TRIVAC B pumps require very little maintenance when operated under normal conditions. The work required is described in the sections below. In addition to this, a maintenance plan is provided in Section 5.10.

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

LEYBOLD offers practical courses on the maintenance, repair, and testing of TRIVAC B pumps. Further details are available from LEYBOLD on request.

If the TRIVAC B is used in ambient air which is much contaminated, make sure that the air circulation and the gas ballast valve are not adversely affected.

Please take the spare parts numbers from the enclosed spare parts list.

In case of special designs and variants please always indicate the special, variant and serial number.

### Caution

### Caution

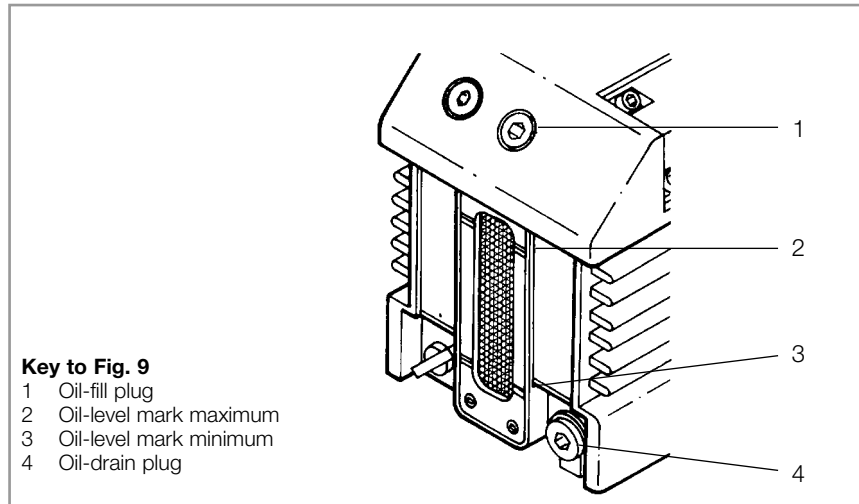


Fig. 9 Oil change

## 5.1 Checking the Oil Level

During operation of the TRIVAC B the oil level must always remain between marks (9/2) and (9/3) on the oil-level glass. The amount of oil must be checked and topped up as required.

**Caution** Fill in oil only after the pump has been switched off.

### 5.1.1 Checking the Condition of N 62 or HE 200 Oil

The ageing process for the standard operating fluid N 62 respectively HE 200 (see Section 1.2) will depend very much on the area of application for the pump.

#### a) Visual check

Normally the oil is clear and transparent. If the oil darkens, it should be changed.

#### b) Chemical check

The neutralisation number of N 62 oil is determined according to DIN 51558. If it exceeds 2, the oil should be changed.

#### c) Viscosity check

If the viscosity of N 62 at 25 °C exceeds a level of 240 mPas (20 % higher than the viscosity of fresh oil) an oil change is recommended.

If gases or liquids dissolved in the oil result in a deterioration of the ultimate pressure, the oil can be degassed by allowing the pump to run for approx. 30 min. with the intake port closed and the gas ballast valve open.

When wanting to check the oil, switch off the pump first and drain out from the warm pump the required amount of oil through the oil drain (9/4) into a beaker or similar.

**Caution** Please note the safety information given in Section 5.2

## 5.2 Oil Change

Before pumping oxygen (or other highly reactive gases) at concentrations exceeding the concentration in the atmosphere (> 21 % for oxygen) it will be necessary to use a special pump. Such a pump will have to be modified and degreased, and an inert special lubricant (like PFPE) must be used.

Hazardous substances may escape from the pump and the oil. Take adequate safety precautions. For example wear gloves, face protection or breathing protection.

### Observe all safety regulations.

For proper operation of the pump, it is essential that the pump has an adequate supply of the correct and clean oil at all times.

The oil must be changed when it looks dirty or if it appears chemically or mechanically worn out (see Section 5.1.1).

The oil should be changed after the first 100 operating hours and then at least every 2,000 to 3,000 operating hours or after one year. At high intake pressures and intake temperatures and/or when pumping contaminated gases, the oil will have to be changed much more frequently.

Further oil changes should be made before and after long-term storage of the pump.

If the oil becomes contaminated too quickly, install a dust filter and/or oil filter (see Section 1.3).

Contact us for more information in this matter.

Only change the oil after the pump has been switched off and while the pump is still warm.

### Required tool: Allen key 8 mm.

Remove the oil-drain plug (9/4) and let the used oil drain into a suitable container. When the flow of oil slows down, screw the oil-drain plug back in, briefly switch on the pump (max. 10 s) and then switch it off again. Remove the oil-drain plug once more and drain out the remaining oil.

Screw the oil-drain plug back in (check the gasket and reinstall a new one if necessary).

Remove the oil-fill plug (9/1) and fill in with fresh oil.

Screw the oil-fill plug (9/1) back in.

If there is the danger that the operating agent may present a hazard in any way due to decomposition of the oil, or because of the media which have been pumped, you must determine the kind of hazard and ensure that all necessary safety precautions are taken.

Torque for the oil-fill plug (9/1): **10 Nm**  
Gasket: P/N: 239 55 165

Torque for the oil-drain plug (9/4): **10 Nm**  
Gasket: P/N.: 239 55 165

We can only guarantee that the pump operates as specified by the technical data if the lubricants recommended by us are used.

### Warning



### Caution

### Warning



### Torques

### Caution

### 5.3 Cleaning the Inlet Screen

A wire-mesh sieve is located in the intake port of the pump to act as a dirt trap for coarse particles. It should be kept clean to avoid a reduction of the pumping speed.

For this purpose, remove the inlet screen (2/2) from the intake port and rinse it in a suitable vessel with solvent. Then thoroughly dry it with compressed air. If the inlet screen is defective, replace it with a new one.

**Caution** The cleaning intervals depend on the application. If the pump is exposed to large amounts of abrasive materials, a dust filter should be fitted into the intake line.

### 5.4 Removing and Fitting the Internal Demister

**Required tools:** Allen keys SW 5 and SW 8.

**Required spare parts:**

Allen keys 5 mm and 8 mm.

The internal demister is spring-mounted in a frame. When it is clogged, it rises periodically to reduce the pressure difference created.

The resultant noise at high intake pressures indicates that the internal demister is dirty.

Periodically clean or replace the internal demister; the maintenance interval depends on the application. Use a suitable solvent for cleaning.

Shutdown the pump and drain the oil (see Section 5.2).

Pull the handle upward.

Remove the **four recessed** screws (10/5) on the oil case (10/1). Don't remove the non-recessed screws; they hold the motor flange in place.

Pull the oil case forward off the pump.

Remove the gasket (10/7).

Press the spring buckles (10/2) sideways away from the frame (10/4). Lift off the frame (10/4) and remove the internal demister (10/3).

Clean all parts and check that they are in perfect condition; if not, replace them with new parts.

Reassemble in the reverse order.

**Caution** Torque for the screws (10/5) is 5 Nm.



**Key to Fig. 10**

- 1 Oil case
- 2 Spring buckles
- 3 Demister
- 4 Frame for demister
- 5 Hex. socket screws (4 pcs.)
- 6 Slencing nozzle
- 7 Gasket

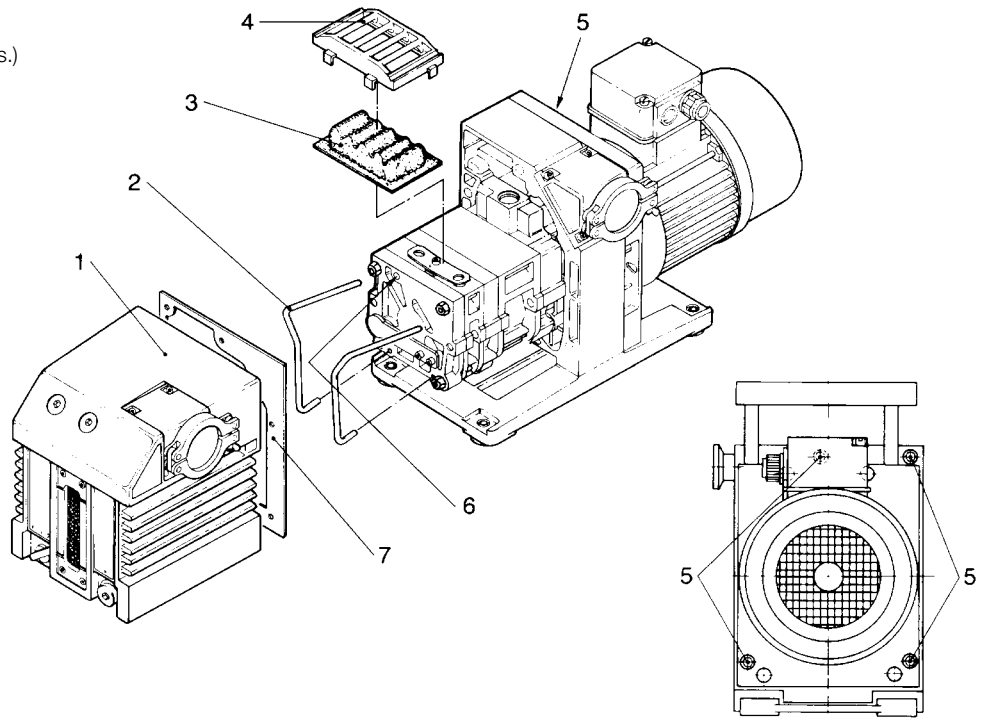


Fig. 10 Removal and fitting of the internal demister

**Key to Fig. 11**

- 1 Gasket
- 2 Handle
- 3 Coupling
- 4 Threaded pin
- 5 Only for USA motors: adapter flange
- 6 Electric motor
- 7 Hex. socket screws
- 8 Intermediate flange
- 9 Hex. socket screw

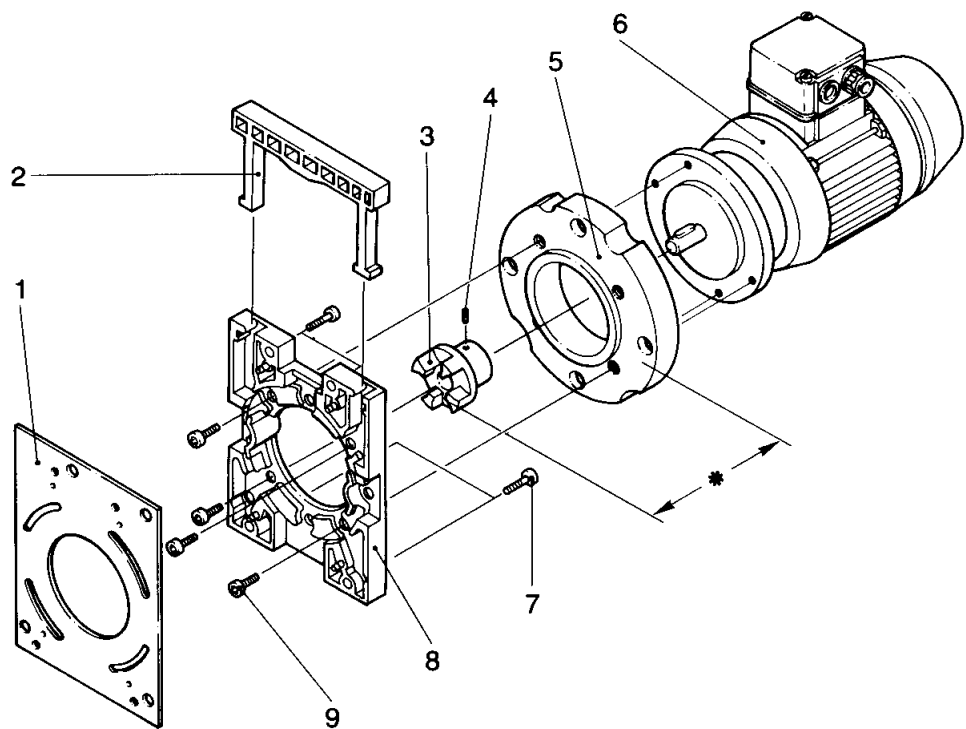


Fig. 11 Disassembly and reassembly of the electric motor

## 5.5 Disassembly and Reassembly of the Electric Motor



**Warning**

Before starting work, always disconnect the motor from the mains. Pull the mains plug.

**Required tools:**

Allan keys size 2,5, size 3 size 5 and size 6. Possibly a puller for the coupling.

Place the pump on its front side.

Unscrew the four **non-recessed** hex. socket screws (11/7).

Remove the intermediate flange (11/8) together with the electric motor (11/6).

Remove the gasket (11/1).

Remove the handle (11/2).

Loosen the threaded pin (11/4) and pull the coupling (11/3) with the blade wheel off the motor shaft.

Unscrew the hex. socket screws (11/9).

Remove the electric motor (11/6) (and the adapter flange (11/5) in the case of the USA motors).

Clean all parts and check that they are in perfect condition; if not, replace them with new parts.

Reassemble in the reverse order.

**Caution**

In the case of 60 Hz motors (USA versions) with adapter flange the coupling must not be pushed on to the shaft right up to the stop. On the other hand if it is not pushed on far enough the pump module may be damaged during operation. Push the coupling on in such a way that the distance between the front end of the coupling (11/3) and front side of the adapter flange (11/5) amounts to  $41.3 \pm 0.8$  mm ( $1 \frac{5}{8} \pm \frac{1}{32}$  inch) (see Fig. 11). The adapter flange (11/5) is screwed to the motor flange with four additional screws.

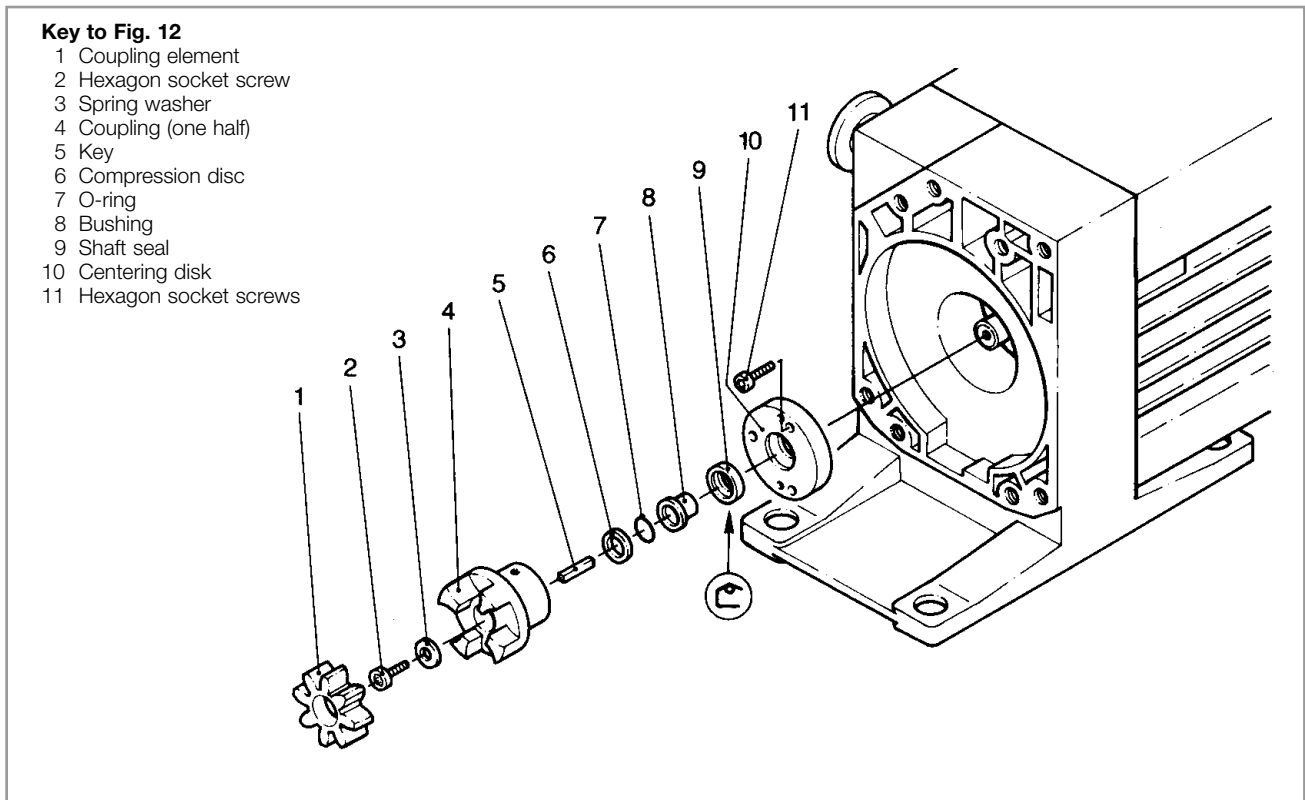


Fig. 12 Exchanging the shaft seal

## 5.6 Replacing the Shaft Seal

### Required tools:

Allen keys 3 mm, 5 mm, 8 mm, flat-nose pliers, plastic hammer, shaft seal driver, possibly puller for coupling.

The TRIVAC 4/8 B has two shaft seals; the outer one is subject to greater wear. Oil marks under the coupling housing are signs of a damaged outer shaft seal.

The outer shaft seal (12/9) can be replaced without removing or disassembling the pump module.

Shutdown the pump.

Drain the oil (see Section 5.2) or place the pump on its front side.

Unscrew the four non-recessed hex. socket screws (11/7) and remove the motor (11/6) together with the intermediate flange (11/8).

Remove the gasket (11/1).

Remove the coupling element (12/1).

Remove the hex. socket screw (12/2) and the spring washer (12/3).

Pull off the coupling (12/4).

Remove the key (12/5).

Pull off the compression disc (12/6) and the O-ring (12/7).

Unscrew the hex. socket screws (12/11) and pull off the centering disk (12/10) together with the bushing (12/8).

If the centering disk is stuck, screw the capscrews (12/11) into the jack-screw holes in the centering disk.

Pull the bushing out from the centering disc and force the shaft seal (12/9) out of the centering disk.

**Caution** We recommend the use of a new shaft seal, an O-ring and bushing for reassembly. Before insertion, moisten the new shaft seal slightly with a little vacuum pump oil.

Using a suitable plastic or aluminium cylinder (shaft seal driver) and a plastic hammer, force the shaft seal (12/9) carefully and without bending it into the centering disk (for position of shaft seal, see Fig. 12).

If you do not have a shaft seal driver, place the shaft seal on the opening in centering disk and carefully force it in with light blows of the plastic hammer. The shaft seal must not be bent.

Carefully push the bushing (12/8) into the shaft seal.

Push the centering disk (12/10) with the shaft seal and bushing onto the shaft and up against the end plate; fasten it with the hex. socket screws (12/11).

Push the O-ring (12/7) and the compression disc (12/6) onto the shaft.

Insert the key (12/5).

Mount the pump-half of the coupling (12/4) on the shaft.

Install the spring washer (12/3) and tighten the hex. screw (12/2).

Insert the coupling element (12/1) into the coupling and mount the motor (see Section 5.5).

## 5.7 Removing and Remounting the Pump Module

### Required tools:

Allen keys 3 mm, 5 mm, 8 mm, box wrench 10 mm, possibly pliers.

### 5.7.1 Removing the Pump Module

Drain the oil and remove the oil case (see Section 5.4).

Unscrew the hex. nuts (13/1).

Pull the entire pump module (13/2) forward off the tie rods (13/6).

**Caution** When doing so, ensure that the individual pin-fitted parts are not loosened. Further disassembly of the pump module should only be carried out by a trained service engineer.

Remove the gasket (13/4).

Remove the coupling element (13/5).

**Caution** After removing the protective shipping materials, handle the new pump module with care.

Before installing a new pump module, remove the four tie rods from the new module and insert them in the old one for protection during shipment.

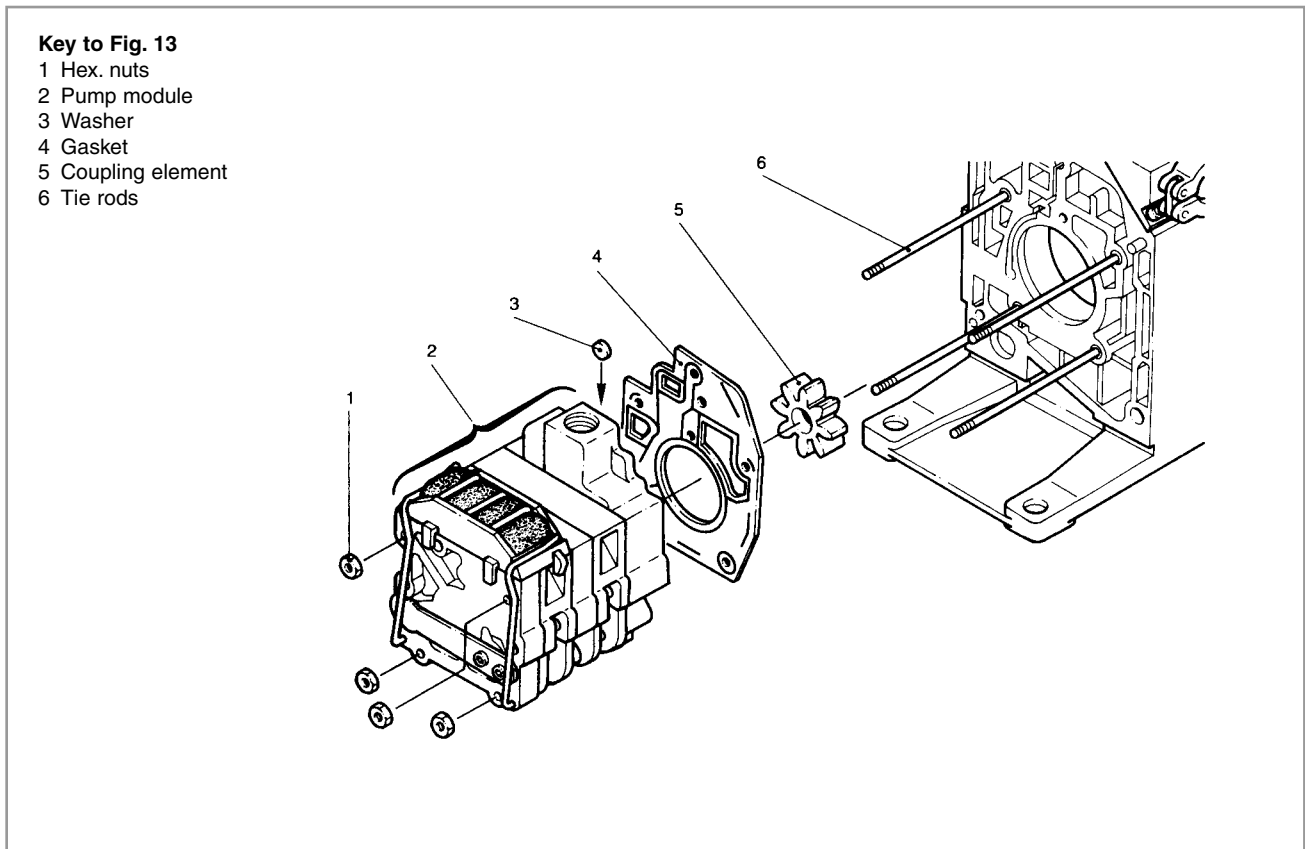


Fig. 13 Removing and Remounting the Pump Module

### 5.7.2 Remounting the Pump Module

When installing a new pump module, it is also advisable to use a new gasket (13/4).

Check the coupling element (13/5) for damage; if necessary, install a new one.

Use the tie rods supplied with the new pump module only if the old ones are damaged. To do so, unscrew the old tie rods with lock nuts, and screw in the new ones. With the aid of the lock nuts, tighten the tie rods. Then remove the lock nuts.

Before mounting the pump module, make sure that sealing disc (13/3) fits correctly in its bore.

Push the gasket (13/4) onto the tie rods (13/6), push the coupling element (13/5) onto one coupling half.

Push the entire pump module (new or repaired) onto the tie rods.

Screw on the hex. nuts (13/1) and carefully cross-tighten them (torque 7,5 Nm).

**Caution**

Mount the oil case together with the gasket (see Section 5.4).

Fill in oil.

### 5.8 Service by Leybold

**Contamination** Whenever you send a pump to Leybold, indicate whether the pump is contaminated or is free of substances which could pose a health hazard. If it is contaminated, specify exactly which substances are involved. You must use the form we have prepared for this purpose; we will forward the form on request.

**Form** A copy of the form is printed at the end of these operating instructions: „Declaration of contamination of vacuum equipment and components“. Another suitable form is available from the Leybold homepage: <http://www.leybold.com> under the headline “Support & Download”.

Attach the form to the pump or enclose it with the pump.

This statement detailing the contamination is required to satisfy legal requirements and for the protection of our employees.

Pumps which are not accompanied by a contamination statement will be returned to the sender.

**Warning**



The pump must be packed in such a way, that it will not be damaged during shipping and so that any contaminants are not released from the package.

#### 5.8.1 Waste Disposal of Used Pump Materials

The corresponding environmental and safety regulations apply. This applies equally to used filters and filter elements (oil filter, exhaust filter and dust filter).

**Warning**



In the case of hazardous substances determine the kind of hazard first and observe the applicable safety regulations. If the potential hazard still persists, the pump must be decontaminated before starting with any maintenance work. For professional decontamination we recommend our Leybold service.

Never exchange the oil or the filters while the pump is still warm. Let the pump cool down to uncritical temperatures first. You must wear suitable protective clothing.

## 5.9 Storing the Pump

Before putting a pump into operation once more it should be stored in a dry place preferably at room temperature (20 °C). Before the pump is shelved it must be properly disconnected from the vacuum system, purged with dry nitrogen and the oil should be changed too.

The inlets and outlets of the pump must be sealed with the shipping seals which are provided upon delivery.

The gas ballast switch must be set to the „0“ position and if the pump is to be shelved for a longer period of time it should be sealed in a PE bag containing some desiccant (silica gel).

When a pump is put into operation after it has been shelved for over one year, standard maintenance should be run on the pump and the oil should also be exchanged (see Section 5.2). We recommend that you contact the Leybold Service.

### Caution

## 5.10 Maintenance Plan (Recommendation)

No.	Rotary vane pump TRIVAC D 4 B TRIVAC D 8 B	Measurement/test quantity Operating/auxiliary materials	Interval						Remarks
			VE	VP	t	6m	a	n-a	
								Refer also to the Operating Instructions Section: individual components.	
1	Operate the pump for at least 0.8 h with gas ballast.				x			Condensed water is thus removed from the oil.	
2	Check the oil level, if required change the oil.	Oil: N 62 or special- and alternative oils (see Section 1.3)	x		x			Refill: Only after the pump has been switched off.	
3	Check the quality of the oil, change the oil if required.	visually  chemically  mechanically	x		x			<p><b>Visually:</b> normally light and transparent, oil change is required when discolorations increase.</p> <p><b>Chemically:</b> to DIN 51558, when the neutralisation number exceeds 2; then an oil change will be required.</p> <p><b>Mechanically:</b> when dynamic viscosity at 25 °C exceeds 240 mPas; then an oil change will be required. Disposal of waste oil: see Section: 5.8.1</p>	
4	Clean the inlet screen in the intake port, change it as required.	Suitable cleaning agent and compressed air.				x		<p>■ Clean inlet screen with a cleaning agent and blow it out with compressed air under a suction hood.</p> <p>■ Replace the defective inlet screen. Use a cleaning agent which complies with the national/international specifications.</p> <p><b>Observe the safety regulations when using cleaning agents.</b></p>	
5	Clean the internal demister, change it as required.	Suitable cleaning agent.					x	<p>Already clean before the maintenance interval has elapsed when the noise level increases.</p> <p>■ Clean internal demister with cleaning agent ■ Replace the defective internal demister ■ Dispose of the defective internal demister as special waste. Cleaning agent according to national/international specifications.</p> <p><b>Observe the safety regulations when using cleaning agents.</b></p>	
6	Check the edges of the teeth on the coupling element for any damages, change the coupling element as required.						x		
7	Change the oil -  and  clean the oil level glass.	Oil: N 62 or special- and alternative oils  Suitable cleaning agent and compressed air.					x	<p>Oil change: ■ First oil change after 100 operating hours. ■ Pump switched off and cold. Exchange the oil while the pump is cold so as to avoid releasing adsorbed gases.</p> <p>Clean the oil level glass with a cleaning agent and blow it out with compressed air under a suction hood.</p> <p><b>Use cleaning agents only corresponding to the national/international specifications. Observe the safety regulations when using cleaning agents</b> <b>Quantity of oil:</b> see Section 1.4 <b>Oil disposal:</b> see Section 5.8.1.</p>	
8	Check the fan of the pump and motor as well as the cooling fins on the motor for deposits and clean as required.	Brush and industrial vacuum cleaner.					x	<p>Already clean before the maintenance interval has elapsed when the pump or the motor gets too warm.</p> <p><b>Caution:</b> switch off the pump and ensure that it cannot run inadvertently (disconnect from the mains).</p>	

**Key to maintenance plan**

- VE = Maintenance before switching on the system
- VP = Maintenance before starting production
- t = Daily maintenance
- 6m = Six monthly maintenance
- a = Annual maintenance
- n-a = Maintenance every n years

We recommend that you service the pump every two years covering the following:

- Cleaning
- Checking the individual components
- Exchange of all seals
- Functional check

This check should be run by the Leybold Service.



## 6 Troubleshooting

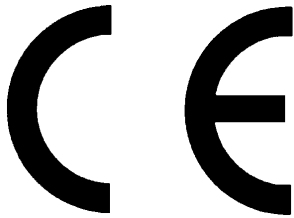
Fault	Possible cause	Remedy	Repair
Pump does not start.	Wiring is malfunctioning.	Check and repair wiring.	-
	Motor protection switch incorrectly set (three-phase motors only).	Set motor protection switch properly.	3.3
	Operating voltage does not match motor.		4.2
	Motor is malfunctioning.	Replace the motor.	4.2
	Oil temperature is below 12 °C.	Heat the pump and pump oil or use a different oil.	4.2.3/5.2
	Oil is too thick.	Change the oil.	5.2
	Exhaust filter/exhaust line is clogged. Pump is seized up (sign: pump is jammed).	Replace the filter or clean the exhaust line. Repair the pump.	- Service
Pump does not reach ultimate pressure.	Measuring technique or gauge is unsuitable.	Use correct measuring technique and gauge. Measure the pressure directly at the pump's intake port.	-
	External leak <sup>1)</sup> .	Repair the pump.	Service
	Anti-suckback valve is malfunctioning.	Repair the valve.	Service
	Exhaust valve is malfunctioning.	Repair the valve.	Service
	Oil is unsuitable.	Change the oil (degas it, if necessary).	5.2
	Vacuum lines are dirty.	Clean the vacuum lines.	-
	Pump is too small.	Check the process data, replace the pump, if necessary.	-
Pumping speed is too low.	Inlet screen in the intake port is clogged.	Clean the inlet screen. Precaution: install a dust filter in the intake line.	5.3
	Exhaust filter is clogged.	Install new filter element.	-
	Connecting lines are too narrow or too long.	Use adequately wide and short connecting lines.	3.2
After switching off the pump under vacuum, pressure in the system rises too fast.	System has a leak.	Check the system.	-
	Anti-suckback valve is malfunctioning.	Repair the valve.	Service
Pump gets hotter than usually observed.	Cooling air supply is obstructed.	Set pump up correctly.	3.1
	Ambient temperature is too high.	Set pump up correctly.	3.1/4.2.3
	Process gas is too hot.	Change the process.	-
	Oil level is too low.	Add oil.	5.1
	Oil is unsuitable.	Change the oil.	5.2
	Oil cycle is obstructed.	Clean or repair the oil lines and channels.	Service
	Exhaust filter/exhaust line is obstructed.	Replace the exhaust filter, clean the exhaust line.	-
	Exhaust valve is malfunctioning. Pump module is worn out. Deviating mains voltage.	Repair the valve. Replace the pump module. Check the motor voltage and check available mains voltage.	Service 5.7
Oil in the intake line or in the vacuum vessel.	Oil comes from the vacuum system.	Check the vacuum system.	-
	Anti-suckback valve is blocked.	Clean or repair the anti-suckback valve.	Service
	Sealing surfaces of the anti-suckback valve are damaged or dirty.	Clean or repair intake and anti-suckback valve	Service
	Oil level is too high.	Drain out excess oil.	5.1
Oil is turbid.	Condensation.	Degas the oil or change the oil and clean the pump. Precaution: open the gas ballast valve or fit separator.	4.2.2/5.2
Pump is excessively noisy.	Oil level is much too low (oil level is no longer visible).	Add oil.	5.1/5.2
	Silencing nozzle is clogged.	Clean the silencing nozzle or replace it.	Fig. 10
	Intake pressure is too high.	Lower the intake pressure.	-
	Internal demister is clogged.	Clean or replace demister.	5.4
	Coupling element is worn.	Install new coupling element.	5.5/5.6
	Vanes or bearings are damaged.	Repair pump.	Service
Pump shuts down after a few minutes with very high motor temperature or with a very high current uptake (> 15 A).	Relay does not switch off the start-up capacitor (voltage too low).	Let the motor cool down (for at least 10 minutes). Ensure correct power supply voltage (218-242 V).	

\* Repair information: Refer to the stated section in these Operating Instructions.

<sup>1)</sup> Bubble test: The warm pump with degassed oil is running without gas ballast and the intake is blanked off. The exhaust line is led into a vessel with water. If an evenly spaced line of bubbles appears then the pump has an external leak.

## 7 Spare Parts

The spare parts for your vacuum pump are listed in the spare parts list enclosed with the product.



# EEC-Declaration of Conformity

We - LEYBOLD Vacuum GmbH - here with declare that the products defined below meet the basic requirements regarding safety and health of the relevant EC directives by design, type and versions which are brought into circulation by us.

In case of any product changes made without our approval, this declaration will be void.

**Designation of the products:** Rotary vane vacuum pump - **dual stage**

**Types:** TRIVAC D 4 / D 8 B

**Cat. No.:** 140 081; 140 082

## The products conform to the following directives:

- EC Directive on Machinery (98/37/EG)
- EC Directive on Low-Voltages (73/23)+(93/68/EG)
- EC EMC Directive (89/336/EG)/(91/263/EG)/(92/31/EWG)/(93/68/EG)

## Applied harmonised standards:

- EN 1012 - 2                      1996
- EN 60204 - 1                    1997
- EN 60034 - 1/A1/A2/A11      2002

Cologne, 01.07.2005

Marcus Eisenhuth  
Member of the Management Board  
Head of Product Development

Cologne, 01.07.2005

Wolfgang Giebmanns  
Head of Design  
Forevacuum Pump Design

**Leybold Vacuum GmbH**  
Bonner Straße 498  
D-50968 Cologne  
Tel.: ++49 (0)221 347-0  
Fax: ++49 (0)221 347-1250  
documentation@leybold.com

[www.leybold.com](http://www.leybold.com)

# EEC Manufacturers Declaration

in the sense of the Directive on Machinery 92/37/EG, Annex IIb

We – Leybold Vacuum GmbH – herewith declare that operation of the incomplete machine defined below, is not permissible until it has been determined that the machine into which this incomplete machine is to be installed, meets the regulations of the EEC Directive on Machinery.

**Designation of the Products:** Rotary vane pump - dual stage

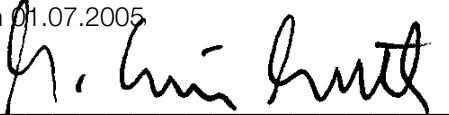
**Types:** TRIVAC D 4 B without Motor / D 8 B without Motor

**Cat. - Nos.:** 113 07; 113 17

**Applied harmonized Standards:**

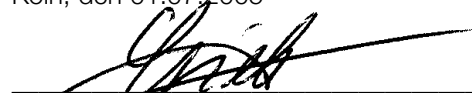
■ EN 1012 - 2 1996

Köln, den 01.07.2005



Marcus Eisenhuth  
Mitglied der Geschäftsführung  
Leiter Produktentwicklung

Köln, den 01.07.2005



Wolfgang Diebmans  
Konstruktionsleiter  
Konstruktion Vorvakuum-Pumpen

 **Leybold**  
vacuum

**Leybold Vacuum GmbH**  
Bonner Straße 498  
50968 Köln  
Tel.: ++49 (0)221 347-0  
Fax: ++49 (0)221 347-1250  
documentation@leybold.com

[www.leybold.com](http://www.leybold.com)

## Declaration of Contamination of Compressors, Vacuum Pumps and Components

The repair and / or servicing of compressors, vacuum pumps and components will be carried out only if a correctly completed declaration has been submitted. **Non-completion will result in delay.** The manufacturer can refuse to accept any equipment without a declaration.

**A separate declaration has to be completed for every single component.**

This declaration may be completed and signed only by authorised and qualified staff.

Customer/Dep./Institute: _____ Address _____ Person to contact: _____ Phone: _____ Fax: _____ Order number of customer: _____	<b>Reason for returning <input checked="" type="checkbox"/> applicable please mark</b> <input type="checkbox"/> repair <input type="checkbox"/> chargeable <input type="checkbox"/> warranty <input type="checkbox"/> replacement <input type="checkbox"/> chargeable <input type="checkbox"/> warranty <input type="checkbox"/> DKD-calibration <input type="checkbox"/> Factory calibration <b>Returning of goods because of following reason:</b> <input type="checkbox"/> rent/loan <input type="checkbox"/> for credit <input type="checkbox"/> against exchange <input type="checkbox"/> exchange already received/arranged
---	---

<b>A. Description of the equipment (machine or component)</b>	Ancillary equipment
Type: _____	_____
Part number: _____	_____
Serial number: _____	_____
Type of oil used: _____	_____

<b>B. Condition of the equipment</b>					
	No	Yes	No	<b>Contamination:</b>	No
1. Has the equipment been used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	toxic	<input type="checkbox"/>
2. Drained (Product/service fluid)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	corrosive	<input type="checkbox"/>
3. All openings sealed airtight	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	microbiological	<input type="checkbox"/>
4. Purged	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	explosive	<input type="checkbox"/>
If yes which cleaning agent:				radioactive	<input type="checkbox"/>
and which method of cleaning:				other harmful substances	<input type="checkbox"/>
					<input type="checkbox"/>

<b>C. Description of processed substances (Please fill in absolutely)</b>			
1. What substances have come into contact with the equipment:			
Trade name and / or chemical term of service fluids and substances processed, properties of the substances; According to safety data sheet (e.g. toxic, inflammable, corrosive, radioactive)			
Trade name:	Chemical name:	Residues:	
a) _____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	
b) _____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	
c) _____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	
d) _____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No	
2. Are these substances harmful?	Yes	No	
	<input type="checkbox"/>	<input type="checkbox"/>	
3. Dangerous decomposition products when thermally loaded	Yes	No	
Which:	<input type="checkbox"/>	<input type="checkbox"/>	

**Components contaminated by microbiological, explosive or radioactive products will not be accepted without written evidence of decontamination.**

### D. Legally binding declaration

**I / we hereby declare that the information supplied on this form is accurate and sufficient to judge any contamination level.**

Name of authorised person (block letters): \_\_\_\_\_

Date \_\_\_\_\_ Signature of authorised person \_\_\_\_\_

Company stamp

# Sales and Service Net Worldwide

## Germany

**Leybold Vacuum GmbH**  
Bonner Strasse 498  
D-50968 Cologne  
Phone: +49-221-347 1234  
Fax: +49-221-347 1245  
sales@leybold.com

**Leybold Vacuum GmbH**  
**Sales Area North/East**  
Branch office Berlin  
Buschkrugallee 33  
1. Obergeschoss  
D-12359 Berlin  
Phone: +49-30-435 609 0  
Fax: +49-30-435 609 10  
sales.berlin@leybold.com

**Leybold Vacuum GmbH**  
**Sales Area South/Southwest**  
Branch office Munic  
Karl-Hammerschmidt-Strasse 38  
D-85609 Aschheim/Dornach  
Phone: +49-89-357 33 90  
Fax: +49-89-357 33 933  
sales.muenchen@leybold.com  
service.muenchen@leybold.com

**Leybold Vacuum GmbH**  
**Sales Area West**  
Branch office Cologne  
Emil-Hoffmann-Straße 43  
D-50996 Cologne-Suerth  
Phone: +49-221-347 1270  
Fax: +49-221-347 1291  
sales.koeln@leybold.com

**Leybold Vacuum GmbH**  
**Service Center**  
Emil-Hoffmann-Straße 43  
D-50996 Cologne-Suerth  
Phone: +49-221-347 1439  
Fax: +49-221-347 1945  
service@leybold.com

**Leybold Vacuum GmbH**  
**Mobile after sales service**  
Emil-Hoffmann-Straße 43  
D-50996 Cologne-Suerth  
Phone: +49-221-347 1765  
Fax: +49-221-347 1944  
kundendienst@leybold.com

**Leybold Vacuum**  
**Dresden GmbH**  
Zur Wetterwarte 50, Haus 304  
D-01109 Dresden  
Service:  
Phone: +49-351-88 55 00  
Fax: +49-351-88 55 041  
info@leybold-dresden.de  
www.leybold-dresden.de

## Europe

Belgium  
**Leybold Vacuum Nederland B.V.**  
**Belgisch bijkantoor**  
Leuvensesteenweg 542-9A  
B-1930 Zaventem  
Sales:  
Phone: +32-2-711 00 83  
Fax: +32-2-720 83 38  
sales.belgium@leybold.com  
Service:  
Phone: +32-2-711 00 82  
Fax: +32-2-720 83 38  
service.belgium@leybold.com

France  
**Leybold Vacuum France S.A.**  
7, Avenue du Québec  
Z.A. de Courtaboeuf, B.P. 42  
F-91942 Courtaboeuf Cedex  
Sales and Service:  
Phone: +33-1-69 82 48 00  
Fax: +33-1-69 07 57 38  
sales.france@leybold.com

**Leybold Vacuum France S.A.**  
**Valence Factory**  
640, Rue A. Bergès - B.P. 107  
F-26501 Bourg-lès-Valence Cedex  
Phone: +33-4-75 82 33 00  
Fax: +33-4-75 82 92 69  
marketing.valence@leybold.fr

Great Britain  
**Leybold Vacuum UK Ltd.**  
Waterside Way, Plough Lane  
GB-London SW17 0HB  
Sales:  
Phone: +44-20-8971 7000  
Fax: +44-20-8971 7001  
sales@leybold.com  
Service:  
Phone: +44-20-8971 7030  
Fax: +44-20-8971 7003  
service@leybold.com

Italy  
**Leybold Vacuum Italia S.p.A.**  
8, Via Trasimeno  
I-20128 Milano  
Sales:  
Phone: +39-02-27 22 31  
Fax: +39-02-27 20 96 41  
sales@leybold.it  
Service:  
Phone: +39-02-27 22 31  
Fax: +39-02-27 20 96 41  
service@leybold.it

Field Service Base  
Z.I.Le Capanne  
I-05021 Acquasparta (TR)  
Phone: +39-0744-93 03 93  
Fax: +39-0744-94 42 87  
service@leybold.it

Netherlands  
**Leybold Vacuum Nederland B.V.**  
Computerweg 7  
NL-3542 DP Utrecht  
Sales and Service:  
Phone: +31-346-58 39 99  
Fax: +31-346-58 39 90  
sales.netherlands@leybold.com  
service.netherlands@leybold.com

Spain  
**Leybold Vacuum España S.A.**  
C/. Huelva, 7  
E-08940 Cornellà de Llobregat  
(Barcelona)  
Sales:  
Phone: +34-93-666 46 16  
Fax: +34-93-666 43 70  
sales.spain@leybold.com  
Service:  
Phone: +34-93-666 49 51  
Fax: +34-93-685 40 10

Sweden  
**Leybold Vacuum Scandinavia AB**  
Box 9084  
SE-40092 Göteborg  
Sales and Service:  
Phone: +46-31-68 84 70  
Fax: +46-31-68 39 39  
info@leybold.se  
Visiting/delivery address:  
Datavägen 57B  
SE-43632 Askim

Switzerland  
**Leybold Vacuum Schweiz AG**  
Leutschenbachstrasse 55  
CH-8050 Zürich  
Sales:  
Phone: +41-1-308 40 50  
Fax: +41-1-302 43 73  
sales@leybold.ch  
Service:  
Phone: +41-1-308 40 62  
Fax: +41-1-308 40 60

## America

USA  
**Leybold Vacuum USA Inc.**  
5700 Mellon Road  
Export, PA 15632  
info@leyboldvacuum.com  
Sales:  
Eastern & Central time zones  
Phone: +1-724-327-5700  
Fax: +1-724-733-1217  
Pacific, Mountain,  
Alaskan & Hawaiian time zones  
Phone: +1-480-752-9191  
Fax: +1-480-752-9494  
Service:  
Phone: +1-724-327-5700  
Fax: +1-724-733-3799

**Leybold Vacuum GmbH**  
Bonner Straße 498 (Bayenthal)  
50968 Köln  
Tel.: ++49 (0)221 347-0  
Fax: ++49 (0)221 347-1250  
e-mail: documentation@leybold.com

## Asia

P.R. China  
**Leybold Vacuum (Tianjin)**  
**International Trade Co., Ltd.**  
Beichen Economic  
Development Area (BEDA),  
No. 8 Western Shuangchen Road  
Tianjin 300400, China  
Sales and Service:  
Phone: +86-22-2697 0808  
Fax: +86-22-2697 4061  
Fax: +86-22-2697 2017  
leybold@leybold.com.cn

**Leybold Vacuum (Tianjin)**  
**Equipment Manufacturing Co., Ltd.**  
Beichen Economic  
Development Area (BEDA),  
No. 8 Western Shuangchen Road  
Tianjin 300400, China  
Phone: +86-22-2697 0808  
Fax: +86-22-2697 4061  
Fax: +86-22-2697 2017  
leybold@leybold.com.cn

**Leybold Vacuum (Tianjin)**  
**International Trade Co., Ltd.**  
Beijing Branch:  
1-908, Beijing Landmark Towers  
8 North Dongsanhuan Road  
Chaoyang District  
Beijing 100004, China  
Sales and Service:  
Phone: +86-10-6590-7607  
Fax: +86-10-6590-7622

**Leybold Vacuum (Tianjin)**  
**International Trade Co., Ltd.**  
Shanghai Branch:  
Add: No. 33, 76 Futedong San  
Rd., Waigaoqiao FTZ,  
Shanghai 200131, China  
Sales and Service:  
Phone: +86-21-5064-4666  
Fax: +86-21-5064-4668  
leybold\_sh@leybold.com.cn

**Leybold Vacuum (Tianjin)**  
Guangzhou Branch:  
Add: G/F,#301 Building,  
110 Dongguangzhuang Rd.  
Guangzhou 510610, China  
Sales:  
Phone: +86-20-8723-7873  
Phone: +86-20-8723-7597  
Fax: +86-20-8723-7875  
leybold\_gz@leybold.com.cn

India  
**Leybold Vacuum India Pvt Ltd.**  
A-215 Road No. 30  
MIDC Wagle Industrial Estate  
Thane(W) - 400 604 Maharashtra  
India  
Sales and Service:  
Phone: +91-22-2581 2929  
Fax: +91-22-2581 2626  
ivt2004@yahoo.com

Japan  
**Leybold Vacuum**  
**Japan Co., Ltd.**  
Head Office  
Tobu A.K. Bldg. 4th Floor  
23-3, Shin-Yokohama  
3-chome  
Kohoku-ku, Yokohama-shi  
Kanagawa-ken 222-0033  
Sales:  
Phone: +81-45-4713330  
Fax: +81-45-4713323

**Leybold Vacuum**  
**Japan Co., Ltd.**  
Osaka Branch Office  
MURATA Bldg. 7F  
2-7-53, Nihi-Miyahara  
Yodogawa-ku  
Osaka-shi 532-0004  
Sales:  
Phone: +81-6-6393-5211  
Fax: +81-6-6393-5215

**Leybold Vacuum**  
**Japan Co., Ltd.**  
Tsukuba Technical S.C.  
Tsukuba Minami Daiichi  
Kogyo Danchi  
21, Kasumi-no-Sato,  
Ami-machi, Inashiki-gun  
Ibaraki-ken, 300-0315  
Service:  
Phone: +81-298-89-2841  
Fax: +81-298-89-2838

Korea  
**Leybold Vacuum Korea Ltd.**  
#761-4, Yulkeum-ri,  
SungHwan-eup, Cheonan-City  
Choongchung-Namdo,  
330-807, Korea  
Sales:  
Phone: +82-41-580-4420  
Fax: +82-41-588-3737  
Service:  
Phone: +82-41-580-4415  
Fax: +82-41-588-3737

Singapore  
**Leybold Vacuum**  
**Singapore Pte Ltd.**  
No.1, International  
Business Park,  
B1-20B, The Synergy  
Singapore 609917  
Sales and Service:  
Phone: +65-66652910  
Fax: +65-65668202  
vacuum@leyboldvac.com.sg

Taiwan  
**Leybold Vacuum Taiwan Ltd.**  
No 416-1, Sec. 3  
Chung-Hsin Rd., Chu-Tung  
Hsin-Chu, Taiwan, R.O.C.  
Sales and Service:  
Phone: +886-3-5833988  
Fax: +886-3-5833999

## Hotline

**Sales: +49-221-347 1234**  
**Service: +49-221-347 1765**

sales@leybold.com  
service@leybold.com

**Leybold Vacuum USA Inc.**  
5700 Mellon Road  
Export, PA. 15632-8900  
Tel.: 724-327-5700  
Fax: 724-325-3577  
e-mail: info@leyboldvacuum.com