

oerlikon
leybold vacuum

TURBOVAC

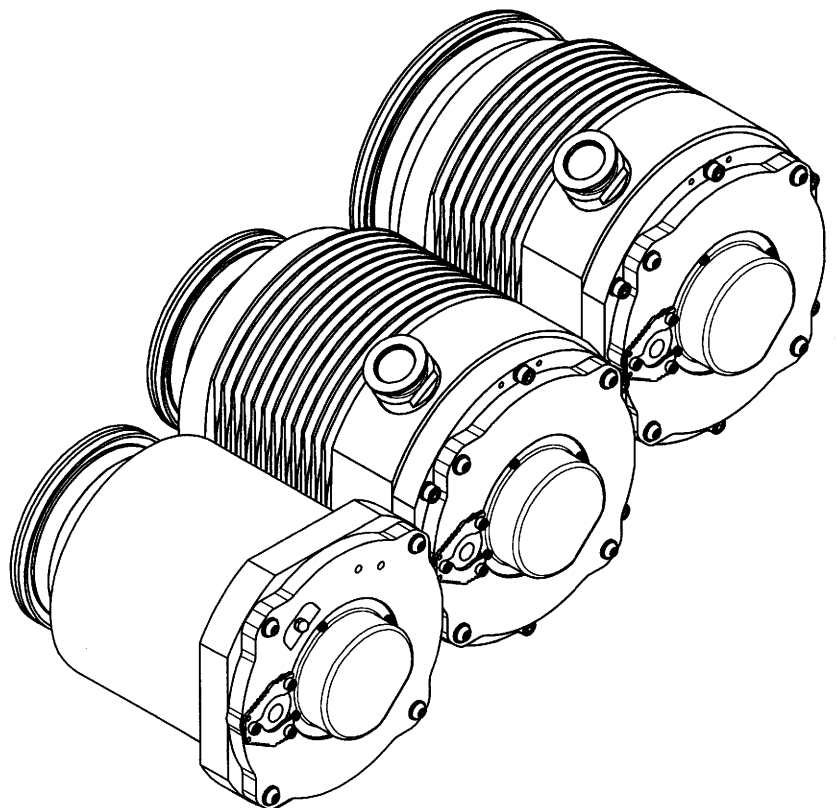
TW 400, TW 400/25

Wide-Range Turbomolecular Pumps
with External Frequency Converter

Incorporation Declaration & Operating Instructions
300407961_002_A1

Part Nos.

800160V0030 /31 /34 /35



Safety Information

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 Oerlikon Leybold Vacuum **TURBOVAC** 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 maintained 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.

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

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

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

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.

Original installation and operating instructions.

NOTICE



DANGER



WARNING



CAUTION



NOTICE



0.2 Electrical hazards

- 1 The electrical connection must only be provided by a trained person. Please observe the national regulations in the country of use like EN 50110-1 for Europe, for example.
- 2 The frequency converter must only be connected to power supplies which meet the requirements for functional extra-low voltages with positive isolation in accordance with IEC 60364-4-41 (or local regulations) (PELV).
- 3 Lethal voltages are present at the mains connections. Before starting with any maintenance and service work, de-energise (lockout/tagout) the product first.
- 4 Unplug any connectors only when the mains voltage is switched off and the pump does no longer turn.
- 5 Unauthorized device conversion and modifications are prohibited for safety reasons.
- 6 Hazardous voltages are present within the frequency converter. When coming into contact with these, death or severe injury can result. After the pump has arrived at standstill, disconnect the frequency converter from the mains power and prevent it against being switched on inadvertently (lockout/tagout) before opening it. Basically there is no reason why the frequency converter should be opened. There are no user serviceable parts inside.
- 7 When the connector cable is attached, the outputs at the frequency converter are not free of voltage.
- 8 Lay connecting lines so that they cannot be damaged. Protect the lines against humidity and contact with water. Avoid any heat stress on the line due to unfavourable laying conditions.
- 9 Suitably support the connecting lines so that the pumps are not exposed to any major mechanical stress.
- 10 Do not expose pump, frequency converter and the connections to dripping water. Note the information on the IP type of protection.
- 11 When storing pump, frequency converter and connecting lines in a humid atmosphere, these can suffer corrosion. Corrosion gives rise to conductive deposits which in turn can cause short-circuits and reduce the insulation levels of electrical components
- 12 Transport pump, frequency converter and connecting cables only in their original packaging so as to avoid any mechanical damage which in turn may reduce air gaps and creepage distances.
- 13 When applying external voltages above 42 V to the connection terminals, observe the applicable VDE safety regulations!
- 14 Make the electrical connections only after pump and accessories (e.g. air cooler) have been installed mechanically.

DANGER



0.5 Danger of ignition

- 1 During operation the pressure inside the turbomolecular pump is so low that there is no danger of ignition (at pressures below about 100 mbar). A hazardous condition will be created if flammable mixtures enter the hot pump at pressures above 100 mbar. During operation the pump can reach temperatures as high as 120°C internally, and at parts of the outside surfaces 80 °C. Sparks could occur in case of damage to the pump and these could ignite explosive mixtures. Also note the safety information provided by the gas supplier.

CAUTION



0.6 Dangers in connection with safety-related measures and precautions

- 1 The frequency converter is not equipped with its own emergency shut down switch. Such a facility needs to be provided from the side of the system.

CAUTION



0.7 Risk of damaging the pump

- 1 Never touch the rotor. Touching the rotor may cause injury and damage the rotor bearing.
- 2 Foreign objects which enter the pump through the intake would cause serious damage to the rotor. That's why we recommend installing an inlet screen. Damages caused during operation without the inlet screen are excluded from warranty.
- 3 Ensure correct polarity when connecting the TURBO.DRIVE. A wrong polarity may cause an internal fuse to blow. The fuse can only be changed by Oerlikon Leybold Vacuum Service.
- 4 The interface connectors have UNC 4-40 threads. Do not use connectors with M3 threads.
- 5 Disconnect and connect the cable connections only while the pump is turning no longer (green status LED off) **and** with the mains power switched off (yellow power LED off). Otherwise there is the risk of damaging the frequency converter.
- 6 Exposure of the pump to accelerating forces must be avoided or reduced to such an extent that the rotor unit will not be excited by vibrations. In the case of critical applications you must consult our Applications Dept. first.

NOTICE



1.2 Standard equipment

The pumps are shipped sealed in a PE bag with a desiccant to absorb moisture. The maximum useful life of the desiccant is one year.

- Plastic covers for the high-vacuum (and interstage) flange
- Centering ring DN 16 KF, FPM sealing ring, clamping yoke for the forevacuum connector
- 1 Fitting for purge gas connection M5, Part. No. 6512686, for tube with outer diameter x wall thickness 4.3x3

PE = Polyethylene

FPM = Fluororubber, resistant to temperatures up to 150°C (302 °F)

1.3 Technical data

TURBOVAC		TW 400	TW 400	TW 400/25	TW 400/25
High-vacuum connection	DN	100 ISO-K	160 ISO-K	100 ISO-K	160 ISO-K
Interstage connection	DN	—	—	25 KF	25 KF
Max. pumping speed HV port for	l·s ⁻¹				
N ₂		270	350	270	350
Ar		250	330	250	330
He		340	390	340	390
H ₂		260	290	260	290
Max. pumping speed interstage port for N ₂	l·s ⁻¹	—	—	25	25
Gas throughput	mbar · l · s ⁻¹				
N ₂			> 5		
Ar			> 3,5		
He			> 5		
H ₂			> 5		
Compression ratio					
N ₂			1·10 ¹¹		
Ar			1·10 ¹¹		
He			2·10 ⁷		
H ₂			3·10 ⁹		
Max. permissible forevacuum pressure	mbar		8		
Recommended frequency converter			TURBO.DRIVE 400		
Operating speed	r.p.m.		48,000		
Run-up time, approx.	min		8		
Forevacuum connection	DN		16 KF		
Weight, approx.	kg		7,5		
Type of protection	IP		20		
Purge gas and venting connection		M5	M5	—	—
Max. purge gas flow	mbar·l·s ⁻¹	0.4	0.4	—	—
Cooling water connections (optional)		for hose 8 mm outer dia.	for hose 8 mm outer dia.	—	—
Ambient temperature during operation	°C		+ 15 - + 40		
storage	°C		- 15 - + 70 °C		
Max. rel. air humidity			approx. 95% ¹⁾ (non-condensing)		

1) More details in Applied technical standard IEC 721-3-3
3K3/3Z1/3B1/3C1/3S2/3M1

Description

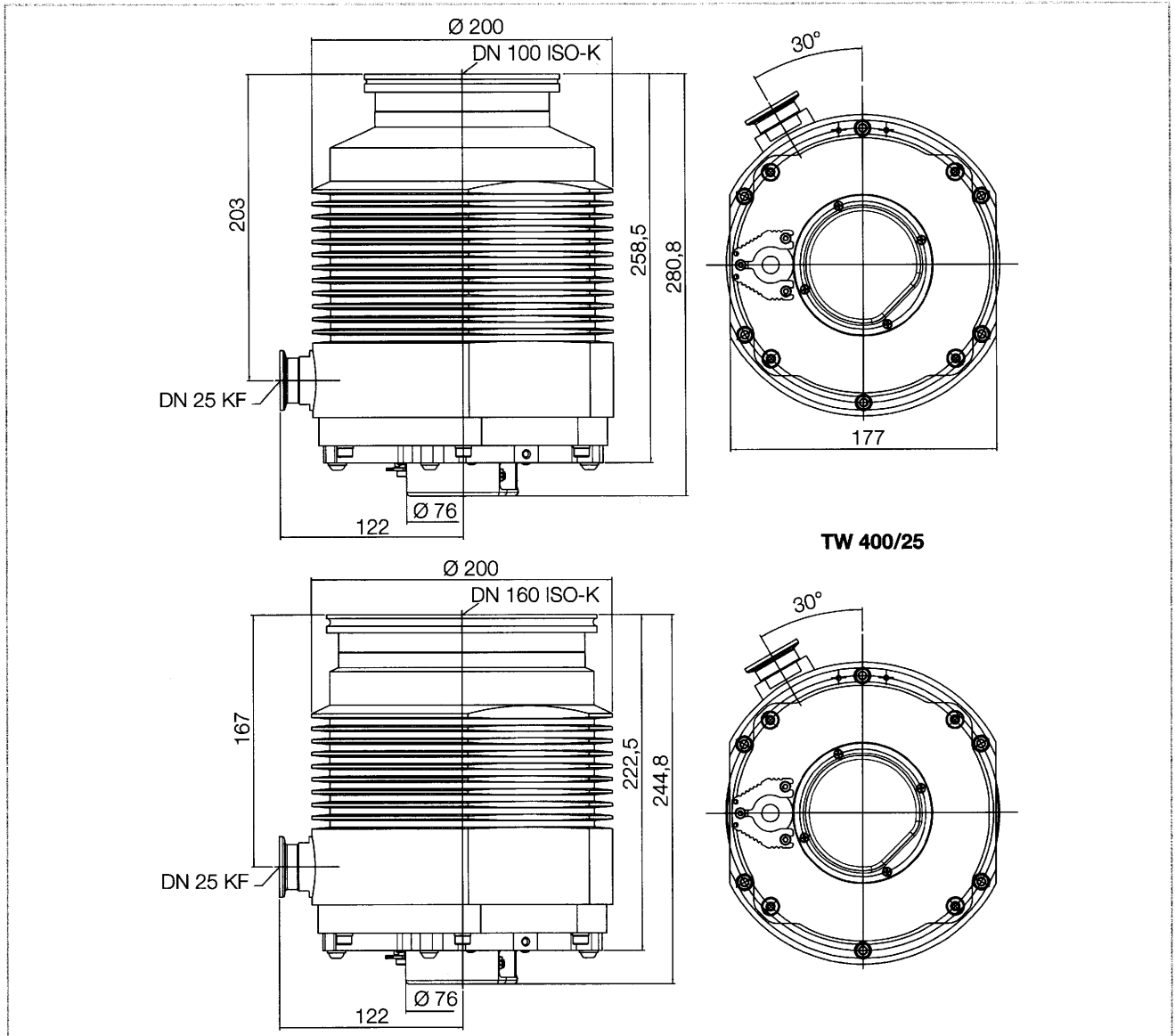


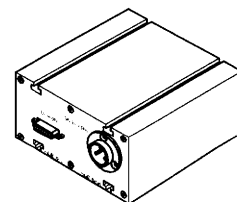
Fig. 1.2 Dimensional drawings , dimensions in mm

1.5 Accessories

Part number

Frequency converter

TURBO.DRIVE 400	
with RS 232 C interface	800073V0002
with RS 485 C interface	800073V0003
with Profibus interface	800073V0004
with USB interface	800073V0008
with RS 485 C interface and reverse feed inhibitor	800073V0009



Transport and storing

2 Transport and storing

Remove the equipment from the transportation box and keep the packaging. Make sure that the product has not been damaged during transportation. If this unit is damaged contact your carrier and inform Oerlikon Leybold Vacuum if necessary. For storage of the product, use the packaging provided.

Be careful not to damage the sockets and connections during transportation

Do not stand below the pump while connecting or removing the turbomolecular pump.

The turbomolecular pump is shipped in a sealed PE bag with desiccant. Do not open the sealed package until immediately before installing.

Do not remove the covers and blanking flanges until you are ready to make the connections, to ensure that the turbomolecular pump is installed under the cleanest possible conditions.

Turbomolecular pumps which were not operated for a period of over 12 months should be returned to us. For more information on this please contact your local sales partner.

Do not store pump and accessories in a moist atmosphere so as to prevent these items from suffering corrosion.

NOTICE



WARNING



- Operation without having flanged the pump to the system or without having connected it to a suitable backing pump.
- Operation with additional heat sources involving thermal radiation, thermal conduction via the high vacuum or the forevacuum flange, strong magnetic fields or very hot process gases, for example.
- Use in systems in which impact stress and vibrations or periodically occurring forces affect pump, frequency converter and cables.
- Operation on moving system or system components (locks or movable pump systems, for example).
- Operation at vibration absorbers and vacuum components (gate valves, valves) which are not capable of sustaining the specified deceleration torque should the pump rotor seize.
- Stepping on pump, add-on parts, drive electronics, flanges and cables to climb onto the system.
- Fitting of add-on parts to the forevacuum flange which cause an inadmissible high load.
- Removing, covering or obstructing warning notices.
- Standstill or storing of pump and drive electronics without suitable sealing-off and drying. Storing in a humid atmosphere can cause corrosion.
- Conversions, manipulations and maintenance work by personnel not authorised by Oerlikon Leybold Vacuum.

Any non-conforming utilisation of pump, frequency converter and accessories can result in severe injury and cause damage to components.

3.2 Operating environment

The maximum permissible ambient temperature is 45 °C (113 °F). Do not expose the pump or the frequency converter to dripping or spraying water.

If the pump is used within a magnetic field, the magnetic induction at the surface of the pump housing may not exceed:

B = 5 mT if impinging radially and

B = 15 mT if impinging axially.

Install shielding equipment as appropriate if these values are exceeded.

The standard pump version without frequency converter is resistant to radiation up to 10³ Gy.

Places of installation up to 1000 m above sea level (3300 ft) are possible without restrictions. At altitudes over 1000 m heat dissipation by the ambient air is impaired. Please consult us.

The frequency converter must not be operated in explosive gas atmospheres.

1 mT (milliTesla) = 10 G (Gauß)

1 Gy (Gray) = 100 rad

WARNING



Ambient temperature

Magnetic field

Radiation

Places of installation

3.3 Attach the pump to the vacuum chamber

Never touch the rotor. Touching the rotor may cause injury and damage the rotor bearing.

The high-vacuum flange must be solidly mounted to the vacuum chamber. Observe Safety Information 0.1.6.

Remove the transport seal from the intake flange and remove the desiccant. Pay attention to maximum cleanliness when connecting.

If the pump should suddenly seize, an ensuing deceleration torque of up to 3200 Nm will have to be absorbed by the system.

In most applications the pump is flanged to the high-vacuum flange at the apparatus. The pump can be mounted and operated in any desired attitude. No support is required.

Use exclusively flange connecting components and fittings which have been manufactured in accordance with DIN 28404, ISO 1609 (ISO-K flange connections) or ISO 3669 (CF flange connections).

The flange material to which the pump is bolted, must have at operating temperature a minimum strength specification of 150 N/mm².

Operation with vibration absorber

The pump is precision balanced and is generally operated without a resonance damper. To decouple extremely sensitive equipment and to prevent transfer of external vibrations to the pump a special resonance damper is available for mounting at the high-vacuum flange.

In this case mount the turbomolecular pump separately. A vibration absorber cannot reliably sustain the high deceleration torque in case of a rotor seizure.

If additional mounting is not possible, then the pump must be protected by a suitable shield during operation.

If several turbomolecular pumps are installed to the vacuum chamber of the same system, there is the risk of interference (vibration interference between the pumps). If such a risk exists please contact Oerlikon Leybold Vacuum Application Support.

The standard mounting arrangement for the pump is adequate to ensure earthquake protection. If required mount the system to the floor or the walls.

Install an inlet screen

Foreign objects which enter the pump through the intake would cause serious damage to the rotor. That's why we recommend installing an inlet screen. Damages caused during operation without the inlet screen are excluded from warranty.

NOTICE



WARNING



Torque when the rotor seizes

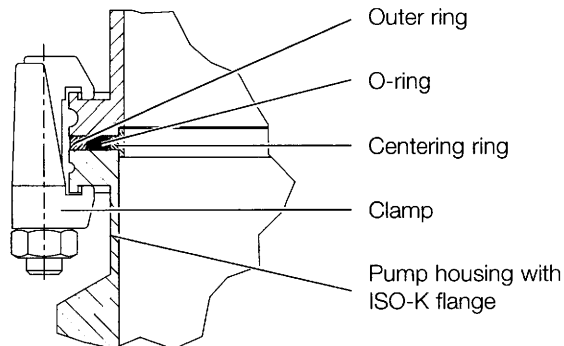
Vibration influence

Earthquake protection

NOTICE



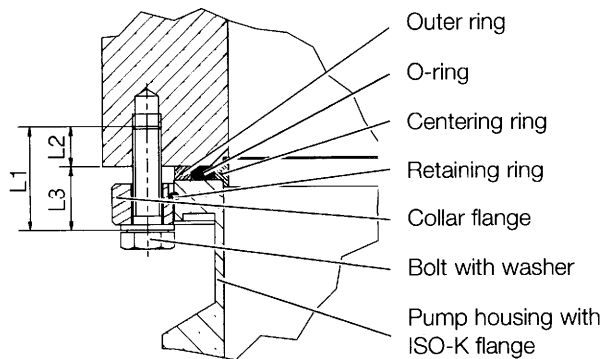
ISO-K flange at ISO-K flange



Pump/flange	DN 100 ISO-K	DN 160 ISO-K
Number of clamps	6x M10	6x M10
Minimum clamp strength, yield strength	> 450 N/mm ²	
Fastening torque	20 ⁺³ Nm	

The fastening torque levels apply to lubricated threads.

ISO-K flange at ISO-F flange with collar flange



Pump/flange	DN 100 ISO-K	DN 160 ISO-K
Number of clamps	8 x M8	8 x M10
Minimum bolt strength, yield strength	> 450 N/mm ²	> 600 N/mm ²
Minimum screw in depth L2		
for steel	12 mm	13 mm
for aluminium	16 mm	18 mm
L3	18.5 mm	23 mm
Recommended bolts, ISO 4014		
for steel flanges	M8x30	M10x40
for alum. flanges	M8x35	M10x45
Bolt quality	8.8 or	8.8 or
stainless steel bolts	A2(A4)-70	A2(A4)-80
Fastening torque	20 ⁺³ Nm	35 ⁺⁵ Nm

Fig. 3.3 Mounting high vacuum flange ISO-K.

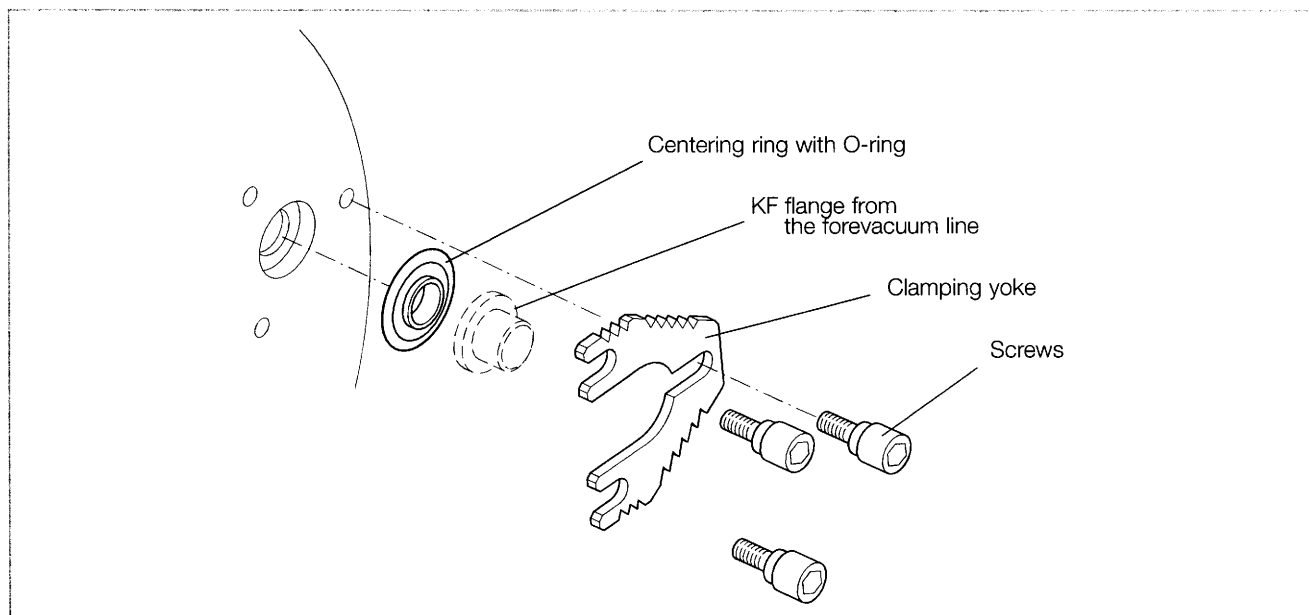


Fig. 3.5 Connecting the forevacuum line

3.4 Forevacuum connection

The high vacuum pressure level which can be achieved is a function of the volume of gas flow Q to be pumped and the forevacuum pressure.

Connect the clean forevacuum line. The connection must be clean and undamaged. The cross section of this line must be so wide that safe operation of the pump can be ensured.

The forevacuum line must be tight. Hazardous gases can escape at leaks or the gases being pumped can react with air or humidity. Observe Safety Information 0.4.4.

Fig. 3.10 is a schematic diagram of a pump system incorporating a turbomolecular pump and a TRIVAC forevacuum pump with an anti-suckback valve.

A separate safety valve must be provided for oil-sealed forevacuum pumps without an anti-suckback valve. The safety valve prevents oil flowing back from the forevacuum pump into the turbomolecular pump when the system is not running.

To ensure that the forevacuum space at the turbomolecular pump is kept largely free of oil vapors during operation, as well, we recommend installing an adsorption trap in the forevacuum line. Alternatively purge the forevacuum line with inert gas. In this case the pressure in the forevacuum line must be over 10^{-2} mbar.

Provide a roughing line to achieve the shortest cycle times.

Ensure that the pump is sufficiently isolated against vibrations generated by the forevacuum pump.

No forces from the piping system may be allowed to affect the turbomolecular pump. Support the piping correspondingly or decouple through flexible joints.

DANGER



Safety valve

Adsorption trap

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 °dH
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.

Connecting the cooling water

Screw the water cooling under the pump and connect hoses.

Adjust the cooling water temperature so that the formation of condensate is avoided.

When switching the cooling water supply on and off by means of an electrically actuated valve, connect the valve so that it will be switched on and off together with the pump.

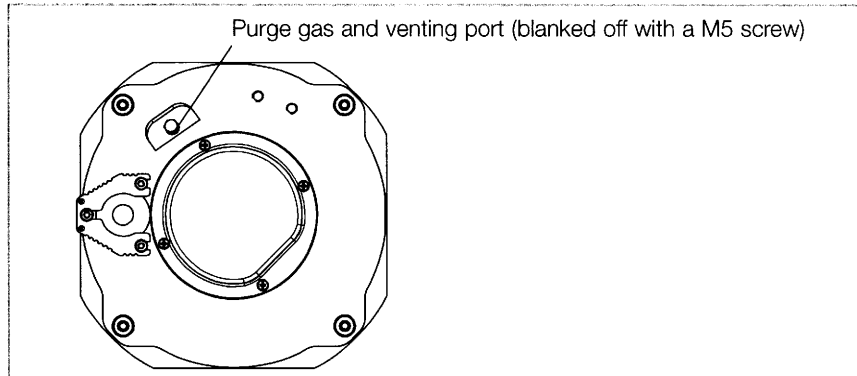


Fig. 3.9 Purge gas port on TW 400

3.6 Connect purge gas or a venting valve

The TW 400 has a purge gas and venting port. A hose coupling is provided. A purge gas and venting valve or a power failure venting valve or a venting valve may be either connected. Depending on the valve possibly adapters have to be used.

The power failure venting valve or venting valve vents the pump and the forevacuum line when the pump is switched off and thus keeps oil vapor from diffusing back from the forevacuum line.

A choke nozzle in the vent port ensures that the pump is not vented too fast.

When having to decide which gases need or not need to be pumped with purge gas we are available to provide assistance.

Refer to Section 4.1 for suited gases.

When operating the pump with purge gas, the pump needs to be vented via the purge gas valve after having shut down the pump, see Section 4.5.

Consider the additional purge gas flow when selecting a suitable backing pump.

We recommend a purge gas flow of 0.4 mbar·l/s (24 sccm) with Nitrogen.

The pressure in the pump must not exceed 1400 mbar (0.4 bar overpressure). Observe Safety Information 0.1.2 to 0.1.5.

WARNING



3.7 Connect the frequency converter

Refer to the Operating Instructions for the TURBO. DRIVE 400 and, if required, for the serial interfaces.

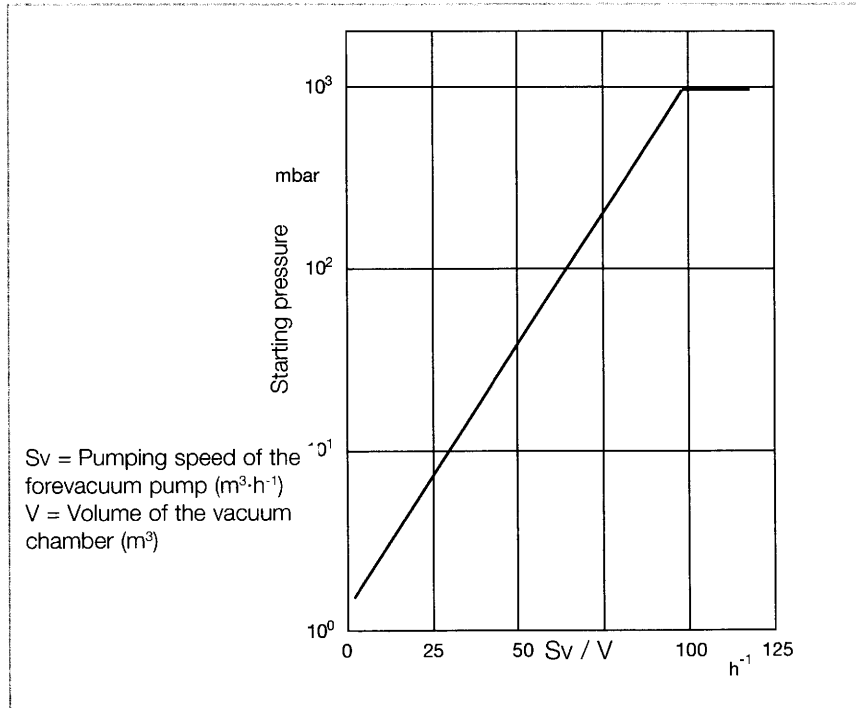


Fig. 4.1 Determining the starting pressure of a turbomolecular pump when evacuating large volumes

4.3 Switching on

Switch on the 24 V DC power supply. The yellow LED at the frequency converter lights up.

The maximum starting pressure for the turbomolecular pump can be read from the graph in Fig. 4.1.

Switch on the turbomolecular pump at the frequency converter

- via pins 7 and 8 of the socket REMOTE (X1) (For example via a remote control or with the aid of the plug with integrated ON/OFF switch.
- by a start command via the interface.
- For the power supply units offered or recommended by Oerlikon Leybold Vacuum: If the contacts 7 and 8 at the REMOTE (X1) connector are closed the pump starts automatically when the DC voltage is switched on (provided parameter 12 is set to 0).

The turbomolecular pump accelerates. The green LED flashes. When the pump reaches normal operation the green LED lights up permanently.

Avoid the influences of shock and vibration when the pump is running.

Exposure of the pump to accelerating forces must be avoided or reduced to such an extent that the rotor unit will not be excited by vibrations. In the case of critical applications you must consult our Applications Dept. first.

After a mains power failure the pump can run up automatically once more.

Starting pressure

NOTICE



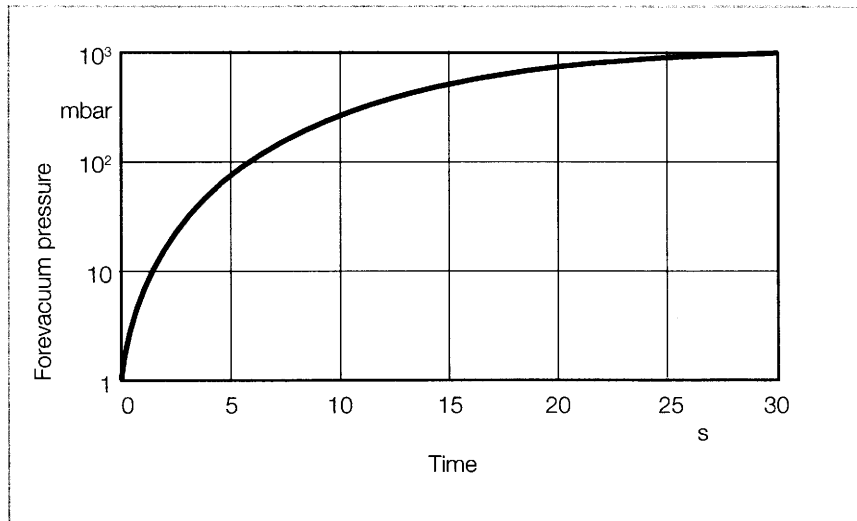


Fig. 4.2 Maximum rise in pressure

4.5 Venting

Refer to Section 4.1 for suited gases.

Venting Methods

There are three different methods of venting the turbomolecular pump.

In the case processes requiring a purge gas, the pump must be vented via the **purge gas and venting valve** when shutting the pump down.

When additionally venting the vacuum chamber, the venting function of the purge gas and venting valve must be opened before opening the chamber valve. This will ensure the presence of a higher pressure in the area of the ball bearings compared to the remaining vacuum area. This will prevent particles, dust or aggressive gases from being forced through the bearings into the not yet vented motor chamber of the pump.

Cautious venting of the pump is possible from the **high vacuum side**, since here the bearing forces will be lowest. When doing so, no free jet of gas must be allowed to form on the rotor so as to avoid exposing the rotor to additional forces.

When venting the pump through its **foreline connection**, neither oil nor particles may be entrained in the gas flow from the forevacuum side into the pump.

Speed of the Pressure Rise

All turbomolecular pumps may be vented at full speed. However, the pressure must not increase faster than specified through the pressure rise curve.

The pump must be vented significantly slower when there is the risk of particles entering into the pump from the process. During venting, the flow must be of the laminar type in both the vacuum chamber and the turbomolecular pump.

The pump must not be vented to pressures above atmospheric pressure.

Speed
Pressure rise curve

Particles

5 Maintenance

We recommend an exchange of the rotor unit after 80,000 operating hours at the latest.

Such maintenance work can only be done by the Oerlikon Leybold Vacuum Service. If required contact the Oerlikon Leybold Vacuum service center nearest to your location. You can find the address on our internet page www.oerlikon.com.

At high pump loads - for example during cyclic operation, at high gas throughputs or at high ambient temperatures - the aforementioned maintenance work should be carried forward. Please consult Oerlikon Leybold Vacuum for recommendations.

Observe Safety information 0.1.6.

Depending on the degree of contamination of the purge gas used the filter will clog and will have to be exchanged (our experience indicates that this will become necessary after 1 to 6 months).

When an adsorption trap is used, regenerate or renew the adsorption agent regularly; refer to the operating instructions provided with the trap.

5.1 Cleaning

If required clean the turbomolecular pump of dust with a dry cloth.

Cleaning the frequency converter internally

The converter essentially requires no servicing since it contains no components which could be adjusted.

Depending on the installation particulars and the ambient conditions, the converter may collect grime (dust, moisture) on the inside. Such contamination can lead to malfunctions, overheating or short circuits and will have to be avoided to the maximum extent possible. The Oerlikon Leybold Vacuum Service Department can clean the converter. We recommend adhering to a cleaning interval of about five years.

5.2 Oerlikon Leybold Vacuum Service

Whenever you send us in equipment, indicate whether the equipment 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.

A copy of the form has been reproduced at the end of these Operating Instructions: "Declaration of Contamination for Compressors, Vacuum Pumps and Components". Another suitable form is available from www.oerlikon.com/leyboldvacuum → Documents → Download Documents.

Attach the form to each pump.

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

Rotor exchange

WARNING



Purge gas filter

Adsorption trap

Contamination

Form

Troubleshooting

Error code	Designation	Meaning	Possible Cause	Remedy	Shut-down
1	Overspeed warning	The actual frequency exceeds the setpoint by over 10 Hz.	Frequency converter defective	Contact Oerlikon Leybold Vacuum Service.	no
2	Pass through time error	The pump has not reached the minimum speed after the maximum run-up time has elapsed.	Forevacuum pressure too high. Gas flow too high Rotor blocked	Check the ultimate pressure of the backing pump and install a bigger backing pump if req. Seal leak, check process Check if the rotor turns freely. Contact Oerlikon Leybold Vacuum Service if the rotor is damaged or blocked.	yes
3	not used				
4	Short circuit error				yes
5	Converter temperature error	Overtemperature at the power output stage or within the frequency converter	Ambient temperature too high Poor cooling	Ensure max. ambient temperature of 45°C Improve cooling	yes
6	Run-up time error	The pump has not reached the normal operating frequency after the maximum run-up time.	Forevacuum pressure too high. Gas flow too high	Check the ultimate pressure of the backing pump and install a bigger backing pump if req. Seal leak, check process	yes
7	Motor temperature error	The motor temperature has exceeded the shut-down threshold.	Forevacuum pressure too high. Gas flow too high Fan defective Water cooling switched off	Check the ultimate pressure of the backing pump and install a bigger backing pump if req. Seal leak, check process Replace fan Switch on water cooling	yes
8	Pump error	Pump couldn't be identified or no pump is connected	Pump not connected correctly to frequency converter Frequency converter software not current, Hardware defective	Check connection between pump and frequency converter Contact Oerlikon Leybold Vacuum Service Contact Oerlikon Leybold Vacuum Service	yes

Troubleshooting

Error code	Error	Possible Cause	Remedy	Shut-down
—	Yellow power LED is not on	No DC power DC power miswired Frequency converter defective	Check cables and power supply Ensure correct polarity of the DC cable. Replace frequency converter. The following may damage the freq. converter: - Disconnection of the DC cable while the pump was still rotating - Non-compliance with the note related to connecting several pump to a single power supply.	—
div.	Red LED flashes	Warning message. See Operating Instructions of the frequency converter for the possible reasons of the warning.	The pump can continue to run, as long as operation limits are only exceeded for a short time. In case of longer exceeding send pump and frequency converter to the OLV service.	no
—	Turbomolecular pump does not start, ERROR LED does not light.	Interface protocol error No communication via the serial interface. REMOTE connector (X1) connected wrongly. REMOTE and SERVICE connectors mixed up. Wrong Profibus address set.	Use USS protocol. Connect bus as shown in the Operating Instructions of the frequency converter. Connect as shown in the Operating Instructions of the frequency converter. Connect correctly. Set address between 0 and 126.	—
—	Turbomolecular pump produces loud running noises and vibrations.	Rotor out of balance Bearing defective	Balance the rotor Replace the bearing	no
—	Turbomolecular pump does not reach ultimate pressure.	Measurement instrument defective Measurement sensors soiled Leaks at the equipment, lines or the pump Pump soiled Forevacuum pump provides insufficient pumping speed or ultimate pressure which is too high. Frequency parameters programmed wrongly	Inspect the measurement sensor Clean or replace the sensors Check for leaks Clean the pump Check the ultimate pressure of the forevacuum pump and install a higher-capacity vacuum pump if necessary Check parameters.	no
—	Running pump can not be stopped via X1	Pump has been started via the serial interface, the interface controls the pump	Disconnect the DC supply or connect serial interface and stop via bus	no

EC- Declaration of Incorporation of Partly Completed Machinery

The manufacturer **Oerlikon Leybold Vacuum GmbH**
Bonner Straße 498, 50968 KÖLN, GERMANY

Declare that the partly completed machines specified and listed below:

Product designation: **Turbomolecular pump**

Type designation: **Catalogue No.:**

TURBOVAC TW220/150 S
TURBOVAC TW220/150/15 S
TURBOVAC TW250/200/40 S
TURBOVAC TW400/300/25 S(-PP)
TURBOVAC TW400/300
TURBOVAC TW400
TURBOVAC TWaaa/bbb/cc 11430, 800160V00xx

Comply with the following fundamental requirements of the **EC Machinery Directive (2006/42/EG)**:
Annex I, Paragraph 1.1.2, 1.1.3, 1.1.5, 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.7, 1.5.1, 1.5.2, 1.5.4, 1.5.5, 1.5.8,
1.5.9, 1.5.11, 1.5.13, 1.6.1, 1.6.2, 1.7.1, 1.7.3, 1.7.4, 1.7.4.1 und 1.7.4.2

The safety objectives of the Low Voltage Directive 2006/95/EC, have been complied with as regards
the electrical dangers, in accordance with Annex 1 No. 1.5.1 of the Machinery Directive 2006/42/EC.

The following harmonized standard has been applied:

EN 1012-2:1996 +A1:2009 Compressors and vacuum pumps - Safety requirements
Part 2: Vacuum pumps

The incomplete machine may only be put into operation after it has been determinate that the machine
into which the incomplete machine shall be installed complies with the regulations laid down in the EC
Machinery Directive (2006/42/EG).

The manufacturer commits himself to make the specials documentation on the incomplete machine
electronically available to national authorities upon request.

The special engineering documentation belonging to the machine was compiled in accordance with
Annex VII Part B.

Documentation officer:
E-Mail: documentation.vacuum@oerlikon.com

Herbert Etges
Tel.: +49(0)221 347-0
Fax: + 49(0)221 347 1250

Cologne, 2013-12-18


Dr. Monika Mattern-Klosson
Head of Product Development

Cologne, 2013-12-18


Harald Udelhoven
Head of Quality Management

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 each single component.

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

Customer/Dep./Institute : _____ Address : _____ _____ Person to contact: _____ Phone : _____ Fax: _____ End user : _____	Reason for return: <input checked="" type="checkbox"/> applicable please mark Repair: <input type="checkbox"/> chargeable <input type="checkbox"/> warranty Exchange: <input type="checkbox"/> chargeable <input type="checkbox"/> warranty <input type="checkbox"/> Exchange already arranged / received Return only: <input type="checkbox"/> rent <input type="checkbox"/> loan <input type="checkbox"/> for credit Calibration: <input type="checkbox"/> DKD <input type="checkbox"/> Factory-calibr. <input type="checkbox"/> Quality test certificate DIN 55350-18-4.2.1																																							
A. Description of the product: _____ Failure description: _____ Material description : _____ Catalog number: _____ Additional parts: _____ Serial number: _____ Application-Tool: _____ Type of oil (ForeVacuum-Pumps) : _____ Application- Process: _____																																								
B. Condition of the equipment <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:60%;"></th> <th style="width:10%; text-align: center;">No¹⁾</th> <th style="width:10%; text-align: center;">Yes</th> <th style="width:10%; text-align: center;">No</th> <th style="width:10%;"></th> <th style="width:10%;"></th> </tr> </thead> <tbody> <tr> <td>1. Has the equipment been used</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;">→</td> <td rowspan="4" style="vertical-align: top;"> Contamination : toxic <input type="checkbox"/> <input type="checkbox"/> corrosive <input type="checkbox"/> <input type="checkbox"/> flammable <input type="checkbox"/> <input type="checkbox"/> explosive ²⁾ <input type="checkbox"/> <input type="checkbox"/> radioactive ²⁾ <input type="checkbox"/> <input type="checkbox"/> microbiological ²⁾ <input type="checkbox"/> <input type="checkbox"/> other harmful substances <input type="checkbox"/> <input type="checkbox"/> </td> </tr> <tr> <td>2. Drained (Product/service fluid)</td> <td style="text-align: center;">↓</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>3. All openings sealed airtight</td> <td style="text-align: center;">↓</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>4. Purged</td> <td style="text-align: center;">↓</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td colspan="5"> If yes, which cleaning agent and which method of cleaning _____ _____ </td> <td style="vertical-align: top;"> No¹⁾ <input type="checkbox"/> Yes <input type="checkbox"/> </td> </tr> <tr> <td colspan="5"> ¹⁾ If answered with "No", go to D. ← </td> <td style="vertical-align: top;"> ↓ </td> </tr> </tbody> </table>			No ¹⁾	Yes	No			1. Has the equipment been used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	→	Contamination : toxic <input type="checkbox"/> <input type="checkbox"/> corrosive <input type="checkbox"/> <input type="checkbox"/> flammable <input type="checkbox"/> <input type="checkbox"/> explosive ²⁾ <input type="checkbox"/> <input type="checkbox"/> radioactive ²⁾ <input type="checkbox"/> <input type="checkbox"/> microbiological ²⁾ <input type="checkbox"/> <input type="checkbox"/> other harmful substances <input type="checkbox"/> <input type="checkbox"/>	2. Drained (Product/service fluid)	↓	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3. All openings sealed airtight	↓	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4. Purged	↓	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If yes, which cleaning agent and which method of cleaning _____ _____					No ¹⁾ <input type="checkbox"/> Yes <input type="checkbox"/>	¹⁾ If answered with "No", go to D. ←					↓
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C. Description of processed substances (Please fill in absolutely) 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) <table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width:5%; text-align: center;">X</td> <td style="width:40%;">Tradename:</td> <td style="width:55%;">Chemical name:</td> </tr> <tr> <td></td> <td>a)</td> <td></td> </tr> <tr> <td></td> <td>b)</td> <td></td> </tr> <tr> <td></td> <td>c)</td> <td></td> </tr> <tr> <td></td> <td>d)</td> <td></td> </tr> </table>		X	Tradename:	Chemical name:		a)			b)			c)			d)																									
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2. Are these substances harmful ? <input type="checkbox"/> No <input type="checkbox"/> Yes 3. Dangerous decomposition products when heated ? <input type="checkbox"/> No <input type="checkbox"/> Yes If yes, which ? _____ ←																																								
²⁾ Components contaminated by microbiological, explosive or radioactive products/substances 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 authorized person (block letters) : _____

_____ Date

_____ signature of authorized person

firm stamp