



TURBOLAB Core

Operating instructions 300972222_002_C0

Copyright notice

©Leybold GmbH. All rights reserved.

Associated publications

Publication title	Publication number
DIVAC 1.4 HV3	300313759
TURBOVAC 90/250 i	300554863

Trademark credit

Leybold and the Leybold logo are trademarks of Leybold GmbH, Bonner Strasse 498, D-50968 Cologne.

Disclaimer

The content of this manual may change from time to time without notice. We accept no liability for any errors that may appear in this manual nor do we make any expressed or implied warranties regarding the content. As far as practical we have ensured that the products have been designed and constructed to be safe and without risks when properly installed and used in accordance with their operating instructions.

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

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

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

Contents

1 Safety and compliance.	6
1.1 Definition of Warnings and Cautions.	6
1.2 Safety symbols.	7
1.3 Important safety information	7
1.3.1 Mechanical hazards	7
1.3.2 Electrical hazard.	8
1.3.3 Hazards caused by materials and substances	8
1.3.4 Danger of damages to the pump system	8
2 General description.	10
2.1 Overview.	10
2.2 Variants.	10
3 Technical data.	11
3.1 Operating and storage conditions.	11
3.2 Mechanical data.	11
3.3 Pump performance data.	12
3.4 Venting gas specification and vent control data.	13
3.5 Electrical connections.	13
4 Transportation.	14
5 Installation.	15
5.1 Conforming use.	15
5.1.1 Ambient conditions	15
5.2 Prepare the system for installation.	15
5.3 Installation safety.	15
5.4 Locate the pumping system.	16
5.5 Connect to the vacuum system.	16
5.6 Connect to the exhaust extraction system.	17
5.7 Connect the electrical supply.	17
5.8 Configure the pumping system.	18
5.9 Turbo pump delay.	18
5.10 Connect a vacuum gauge.	18
6 Operation.	19
6.1 Control panel description.	19

Contents

6.2 Turbo screen.	20
6.3 Gauge screen.	21
6.4 Vent valve screen.	21
6.5 Turbo setpoint screen.	22
6.6 Calibrate gauge screen.	22
6.7 Units screen.	23
6.8 Electrical supply failure.	23
7 Maintenance.	24
7.1 General maintenance.	24
7.2 Cleaning.	24
8 Fault finding.	26
8.1 Error numbers.	26
9 Storage.	28
10 Disposal.	29
11 Service.	30
11.1 Return the equipment or components for service	30
12 Accessories.	31
Legal declarations.	32

List of Figures

Figure 1. General view of the pumping system.....	10
Figure 2. Dimensions drawing.....	12
Figure 3. Front panel display.....	19
Figure 4. Rear panel.....	19

Safety and compliance

1 Safety and compliance

1.1 Definition of Warnings and Cautions

NOTICE:

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



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

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

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



WARNING:

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



CAUTION:

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



NOTICE:

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

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








Keep the instructions for future use.

Safety and compliance

1.2 Safety symbols

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

The safety symbols that follow are used on the product or in the product documentation.

	Warning/Caution An appropriate safety instruction must be followed or caution to a potential hazard exists.
	Warning - Dangerous voltage Identifies possible hazards from dangerous voltages.
	Warning - Heavy object Identifies a possible hazard from a heavy object.
	Warning - Hot surfaces Identifies a potential hazard from a hot surface.
	Warning - Moving parts present Identifies parts that move. You must let the parts that turn stop before you remove the electrical power.
	Warning - Risk of explosion There is a risk of explosion when you do the task.
	Warning - Use protective equipment Use appropriate protective equipment for the task.

1.3 Important safety information

1.3.1 Mechanical hazards

1. Avoid exposing any part of the human body to the vacuum.
2. The pressure in the pump system must not exceed atmospheric pressure.
3. The pump system is intended for generating a vacuum only. If there is a risk of an overpressure within the system and the pump, then it must be protected. Install an overpressure safety valve (for example).
4. The maximum pressure on the inlet side must not exceed atmospheric pressure (approximately 1013 mbar).
5. Make sure that the exhaust of the backing pump is not blocked in any way and the pressure in the exhaust line must not exceed atmospheric pressure.
6. After the Plexiglas panel is removed, do not reach into the turbomolecular pump since there is the risk of suffering injury at sharp edges.
7. Operate the pump system only after it is connected to the corresponding piping.

Safety and compliance

8. The turbomolecular pump must, when removed from the pump system, always be firmly attached to a vacuum chamber. If the mounting is not sturdy enough, pump blockage could cause the pump to break loose. The internal pump components can be thrown in all directions. Never operate the pump (in bench testing, for example) without proper flanging to the vacuum chamber.
9. The construction on the TURBOLAB must not weigh more than 25 kg. In case of greater weight, confirm the load capacity of different TURBOLAB versions.
10. The pump system must only be detached from the vacuum chamber and moved only after it stops completely.
11. For the TURBOLAB 90 and 250 models, the safety strap must be mounted around the pump.

1.3.2 Electrical hazard

1. The system must be connected to a power supply with the specifications stated on the nameplate.
2. Do not open the switch-box and do not remove any covers from the electrical equipment.
3. Do not disconnect any earth connections.

1.3.3 Hazards caused by materials and substances

1. The product in its standard version is not suited for operation in explosion hazard areas.
2. The product is not suited for pumping of
 - combustible and explosive gases and vapour
 - radioactive and toxic gases and vapour
 - pyrophorous substances
 - oxygen which exceeds the concentration in the atmosphere (> 21%).
3. When you use an oil lubricated backing pumps, there is the risk of escaping oil mist. Use a suitable exhaust filter or an exhaust line. Refer to [Accessories](#) on page 31.
4. If the system has previously pumped hazardous gases, take appropriate safety measures before you open the intake or exhaust ports. Use gloves, a breathing mask or protective clothing and work under a fume hood.

1.3.4 Danger of damages to the pump system

1. The pump system is not suited for pumping of liquids or of dusty, aggressive or corrosive media.
2. The pump system must only be detached from the vacuum chamber and moved only after it stops completely.
3. 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 us.
4. The pump must only be opened by authorised personnel.

Safety and compliance

5. Make sure that no items like bolts, nuts, washers, pieces of wire, for example, enter into the inlet of the pump. Foreign objects which enter into the pump will generally cause severe damage. Damage caused by the intake of foreign objects is not covered by our warranty.
6. The equipment must not be exposed to drip or spray water.
7. Set the device up securely at its place of operation, so that it will not fall or tip over in the event of any incident.

General description

2 General description

For the general description of the major components used on the TURBOLAB Core, refer to the individual instruction manual.

Product	Publication number
DIVAC 1.4 HV3	300313759
TURBOVAC 90/250 i	300554863

2.1 Overview

The TURBOLAB Core is a small, compact and fully automatic pumping system which is suitable for a wide range of vacuum applications.

The system can be supplied with a combination as follows:

- a DIVAC 1.4 HV3 oil-free diaphragm pump with a TURBOVAC 250i turbomolecular pump

The system is controlled by an easy to use touch pad control module. A single gauge input included can be connected to a range of our active gauges allowing for pressure measurement and/or control management of the turbomolecular pump.

The compact size of the TURBOLAB Core is ideal for use on bench tops or suitable mobile platforms. The open system configuration allows easy maintenance of the main pump components.

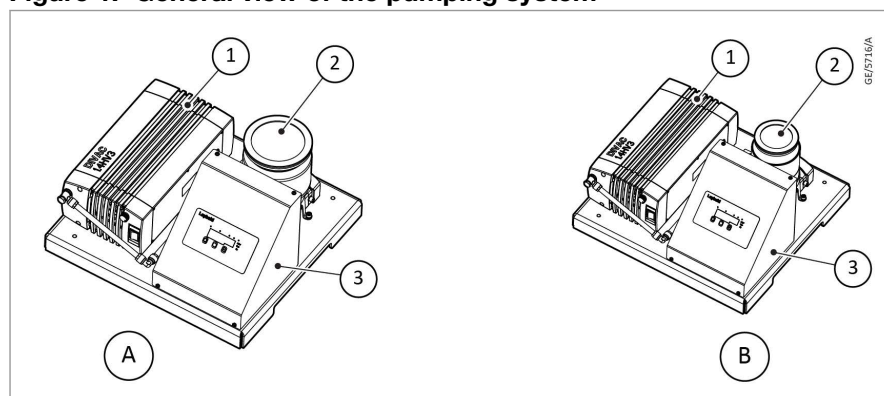
2.2 Variants

Table 1 TURBOLAB Core variants

TURBOLAB Core	Operating voltage	Catalogue number*
TV90i DN 63 ISO-K with DIVAC 1.4	90 - 264 V a.c.	501591V00000500
TV90i DN 63 CF with DIVAC 1.4	90 - 264 V a.c.	501591V01000500
TV90i DN 40 KF with DIVAC 1.4	90 - 264 V a.c.	501591V02000500
TV250i DN 100 ISO-K with DIVAC 1.4	90 - 264 V a.c.	501591V08000500
TV250i DN 100 CF with DIVAC 1.4	90 - 264 V a.c.	501591V09000500

*Mains cable is not part of the TURBOLAB Core Catalogue Number

Figure 1. General view of the pumping system



A. TV250i with DIVAC 1.4

B. TV90i with DIVAC 1.4

1. Backing pump

2. Turbomolecular inlet

3. TURBOLAB Core control unit

3 Technical data

Note:

The operating, storage conditions and performance of the pumping system may depend on the type of backing pump used. Refer to the technical data in the appropriate supplementary publications as listed in [General description](#) on page 10.

3.1 Operating and storage conditions

Table 2 Operating and storage conditions

Parameter	Value	Units
Supply voltage		
▪ TURBOLAB Core	100 - 240	V a.c.
Power consumption	250	W
Ambient temperature		
▪ Operation	12 - 40	°C
▪ Storage	-15 - 70	°C
Relative humidity (not condensing)	80	%
Degree of pollution	II	

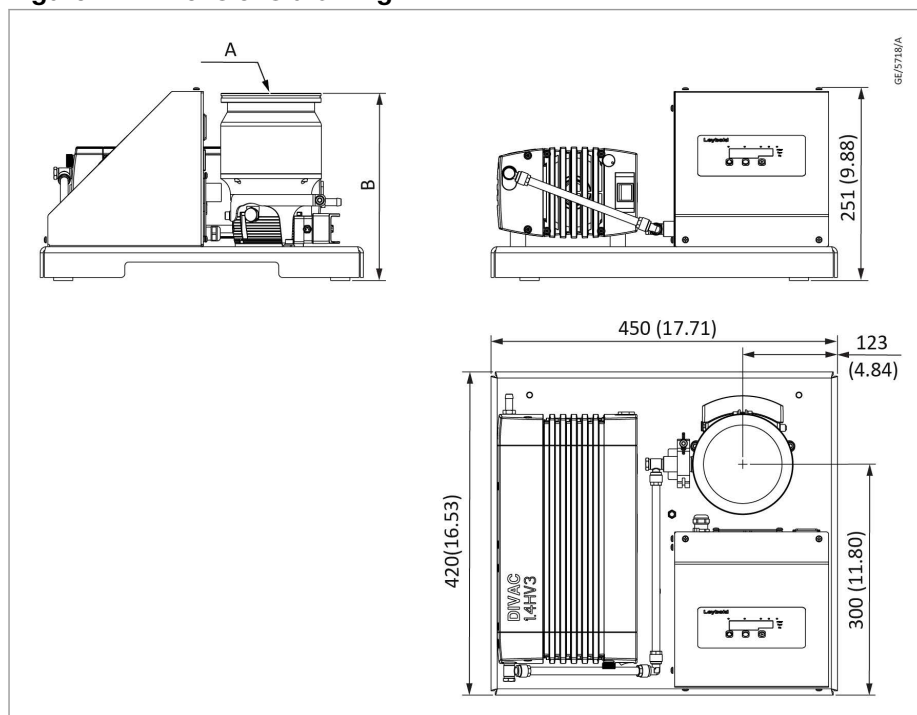
3.2 Mechanical data

Table 3 Mechanical data

Parameter	Data
Dimensions	Refer to Figure: Dimensions drawing .
Degree of protection (to IEC34-5:1981)	IP20
Weight	23 kg - 27 kg

Technical data

Figure 2. Dimensions drawing



All measurements indicated are shown in mm (inches)

Dimension	TURBOLAB Core 90			TURBOLAB Core 250	
	DN 40 KF	DN 63 ISO-K	DN 63 CF	DN 100 ISO-K	DN 100 CF
A					
B	249.5 mm (9.82 inch)	230.5 mm (9.07 inch)	248 mm (9.76 inch)	243.5 mm (9.58 inch)	252.5 mm (9.94 inch)

3.3 Pump performance data

Table 4 Pump performance data

Parameter	TURBOVAC 90i	TURBOVAC 250i
Pumping speed*		
▪ Nitrogen	38 ls ⁻¹	225 ls ⁻¹
▪ Argon	36 ls ⁻¹	210 ls ⁻¹
▪ Helium	39 ls ⁻¹	250 ls ⁻¹
▪ Hydrogen	31 ls ⁻¹	210 ls ⁻¹
Compression ratio*		
▪ Nitrogen	1 x 10 ¹¹ ls ⁻¹	1 x 10 ¹¹ ls ⁻¹
▪ Argon	1 x 10 ⁶ ls ⁻¹	1 x 10 ⁶ ls ⁻¹
▪ Helium	1 x 10 ⁸ ls ⁻¹	1 x 10 ⁸ ls ⁻¹
▪ Hydrogen	5 x 10 ⁷ ls ⁻¹	2 x 10 ⁷ ls ⁻¹

* Contact us when you use Argon or other "heavy" gases as process gas.

Technical data

3.4 Venting gas specification and vent control data

Although the pump may be vented to atmosphere, high relative humidity of the air may greatly increase the subsequent pump down time. To reduce pump down times the pump should be vented with dry, clean gases.

Refer to the TURBOVAC i pump instruction manual (300554863) for the vent valve connection.

3.5 Electrical connections

Table 5 Electrical connections

Parameter	Value
Electrical supply	
▪ Inlet plug type	IEC60320
▪ Integral fuse rating	10 A Type T, 20 mm
Backing pump	
▪ Outlet socket type	IEC60320
Turbomolecular pump	
▪ Connector type	RS485 Communication 9 Pin D-Sub
▪ Power supply	24 V d.c. power supply ODU Connector
Active gauge	
▪ Connector type	RJ45 8-way
▪ Power supply	24 V d.c. nominal

Transportation

4 Transportation

You must follow the safety instructions when the pump is moved from one location to another.

- Hold the pump only at its base panel when you carry or lift the pump system. To move the pump over long distances, use the crane eye.
- Pump systems on castors may also be rolled on level and smooth surfaces. Lock the front castors after the pump system is moved to its desired position .
- The pump system may be tilted by 10 degree maximum.
- Make sure to protect your hand and feet when the pump system is lifted and moved. There is a risk of pinching.
- Do not stand under the suspended pump system while it is being moved.
- Do not use the piping or other components to lift or move the pump system.
- 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.

5 Installation

5.1 Conforming use

The turbomolecular pump systems TURBOLAB are turnkey vacuum units for pumping vacuum vessels to pressures in the high-vacuum range.

The standard versions are not suitable for pumping dusty, aggressive or corrosive media. Contact us for details.

Refer to the information on conforming utilization given for the individual pumps and components.

5.1.1 Ambient conditions

- The magnetic field and the radiation at the pump system must not be too strong. Refer to the Operating Instructions of the turbomolecular pump.
- The ambient temperature must be between 12 °C and 35 °C.
- 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. Consult us for details.
- The pump system must not be operated in explosive gas atmospheres. The standard version of the product is not suited for operation in explosion hazard areas.
- The pump system must only be used in indoor rooms. Protect the pump system and the connecting lines against splash water and condensing water.

5.2 Prepare the system for installation

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 us if necessary.

To move the pump system to desired location, refer to [Transportation](#) on page 14.

5.3 Installation safety

- Carry or lift the pump system only by lifting it at the frame.
- Install the pump system on a level, smooth surface, which is sufficiently large.
- The high-vacuum connection must be as close as possible to the vacuum vessel.
- Install the pump system such that a clearance of at least 10 cm on each side of the pump system for ventilation.
- The noise level when the pumps are running is below 70 dB(A). No acoustic insulation is required.
- The area around the controls (on/off switches, for example) must remain freely accessible.
- Move the pump system only after it is switched off and the turbo pump and backing pump come to a complete stop.
- Operate the pump after it is fastened securely on the TURBOLAB by the safety strap.

Installation

5.4 Locate the pumping system



WARNING: HEAVY OBJECT

Risk of injury or damage to equipment. Heavy objects can cause muscle strain or back injury. The mass of the pumping system will differ depending on the model supplied. Make sure that 2 person lift the pump together. Do not use crane to lift the pumping system.



CAUTION: OVERHEATING

Risk of damage to equipment. When locating the pumping system, care should be taken not to restrict the ventilation grid located under the base of the system. Failing to observe this may result in overheating of the turbomolecular pump.

The turbo pump used on the pumping system stores a large amount of kinetic energy when it is running at full speed. In the unlikely event of a malfunction (rotor seizure), the stored energy could cause a slight movement of the pumping system platform. If the pumping system is operating on a bench top:

Position the pumping system at least 10 to 15 cm away from the edge of the bench top and adjacent devices.

5.5 Connect to the vacuum system



WARNING: POWER SUPPLY TO PUMP

Risk of injury or damage to equipment. Connect the turbo pump inlet to the vacuum system before applying power to the pumping system. This will ensure that the pump cannot operate accidentally causing injury.



WARNING: TOPPLE HAZARD

Risk of injury or damage to equipment. If installing the vacuum system directly onto the pumping system, the weight of the system must be no more than 10 kg and the center of gravity must be positioned laterally within the bounds of the base plate. If this is not the case, the vacuum system must be supported to ensure that the pumping system does not topple.

1. The turbo pump can be securely fixed to the vacuum system via the inlet flange. Make sure that the pump inlet and all components fitted to the pump inlet are clean and dust-free. If the pump inlet is not kept clean, the pump down time may be increased.
2. Make sure to maintain maximum cleanliness when you do the connection.
3. The TURBOVAC generates little noise or vibration. The pump system must not be influenced by vibration from other machinery.
4. Make sure to install an inlet screen to protect from foreign objects entering the pump via the high vacuum connection. They can cause serious damage to the rotor.
5. The TURBOVAC 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.

Table 6 Fastening torque for high vacuum flange connection

Connection	Pump	Number	Torque
Clamps ISO-K	TURBOVAC 90i/250i	4 x M10	20 Nm
Bolts for collar flange ISO-K	TURBOVAC 90i	4 x M8	20 Nm
Bolts for collar flange ISO-K	TURBOVAC 250i	8 x M8	20 Nm
Bolts for CF flange	TURBOVAC 90i	8 x M8	15 Nm
Bolts for CF flange	TURBOVAC 250i	16 x M8	15 Nm

5.6 Connect to the exhaust extraction system



WARNING: DANGEROUS GASES

Risk of injury or damage to equipment. Vent dangerous gases and gas mixtures safely. Do not expose people to these gases. If pumping hazardous gases or vapour, observe the safety recommendations of the supplier of the gas/vapour.

We recommend to connect the exhaust of the backing pump to an exhaust line to prevent process gases or oil mists from being distributed within the room. This applies in particular when the exhaust filter is not connected. If you do not connect an exhaust line, we recommend to install an exhaust filter in the case of oil-sealed vacuum pumps.

The cross-section of the exhaust line must at least match the inside diameter of the connections. Smaller cross sections may cause an undesirable overpressure within the system.

Do not start up the system with a constricted or blocked exhaust. Make sure that any valves or blocking devices in the exhaust line are open. Clogged exhaust lines will reduce the available pumping speed, increase temperature and cause overloading of the pump motors or a dangerous overpressure within the system. There is the risk of bursting.

The exhaust lines must be laid so that they drop down and away thereby preventing condensate from flowing back into the pumps.

It is the responsibility of the operator to ensure that all safety instructions are followed when toxic substances or gases are used.

5.7 Connect the electrical supply



WARNING: ELECTRICAL INSTALLATION SAFETY

Risk of injury or damage to equipment. Ensure that the electrical installation of the pump conforms with all local and national safety requirements. It must be connected to a suitably fused and protected electrical supply with a suitable earth point.



CAUTION: ELECTRICAL INSTALLATION SAFETY

Risk of damage to equipment. Always make the electrical connections to the pumping system after the equipment has been installed on the vacuum system. Always disconnect the electrical supply from the pumping system before removing the equipment from the vacuum system.

Check that the electrical supply is suitable for this equipment. Refer to [Table: Operating and storage conditions](#) for the electrical requirements for this equipment.

Installation

Make the electrical connection to the pumping system using a cable fitted with an IEC60320 connector.

A range of suitable cables is available from the supplier.

5.8 Configure the pumping system

As supplied from the factory, the pumping system will control the system as follows:

If system start is selected:

- The backing pump will turn on.
- The turbomolecular pump will start accelerating up to full rotational speed.

If system off is selected:

- The backing pump will turn off when the turbomolecular pump has decelerate to 10%.
- The turbomolecular pump drive will turn off and the pump will start to decelerate.

5.9 Turbo pump delay

The pumping system can be configured to delay the turbo pump after the backing pump has started.

Refer to [Turbo setpoint screen](#) on page 22. The delay is helpful to prevent the turbomolecular pump from accelerating under high pressure for a prolonged period if the volume being pumped is greater than 2 liters.

5.10 Connect a vacuum gauge

A single compatible active gauge can be fitted to the pumping system.

Fit the gauge using an our active gauge cable into the gauge connector located on the back of the controller housing. For active gauge control and set up refer to [Gauge screen](#) on page 21.

The following are our active gauges which are suitable for use with the pumping system:

- PTR90N
- TTR91R
- TTR101
- DU 200
- DU 201
- DU 2000
- DU 2001

6 Operation



WARNING: ROTATING PARTS

Risk of injury or damage to equipment. Do not attempt to move the pumping system while the turbo pump is rotating. Doing so may cause severe damage to the pump and could cause injury.



CAUTION: OPERATIONAL SAFETY

Risk of damage to equipment. To familiarise yourself with the vacuum pumps installed on the pumping system, it is advisable to read the relevant instruction manuals refer to [General description](#) on page 10.

6.1 Control panel description

Figure 3. Front panel display

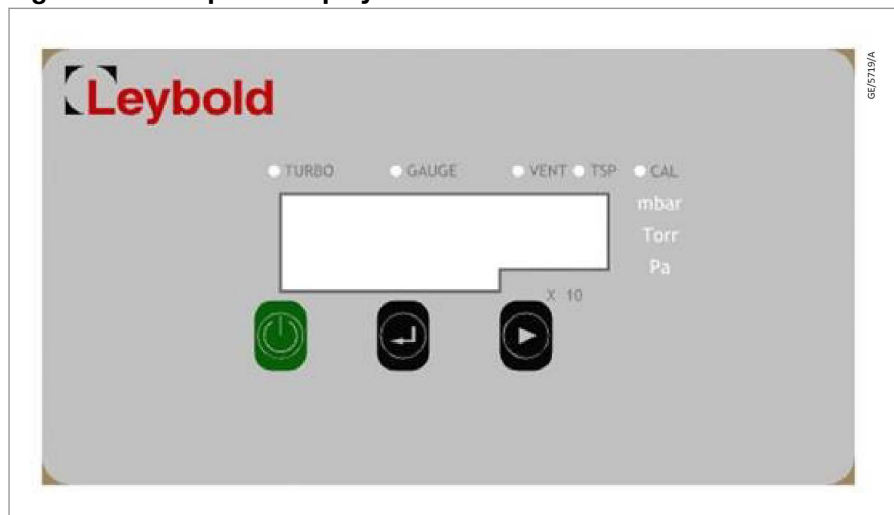
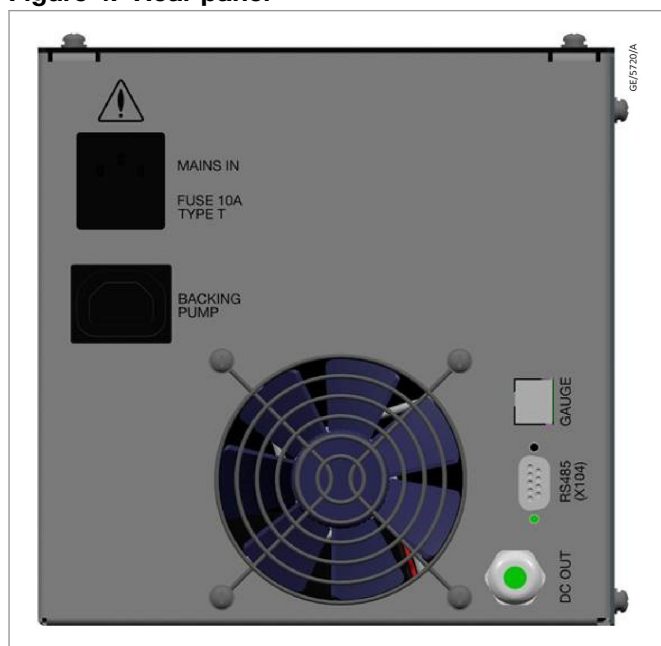


Figure 4. Rear panel



Operation

Table 7 Front panel symbols and their functions

Key pad symbol	Name	Function
1	START/STOP	Turns the pumps on and off. Returns to turbo menu screen.
2	ENTER	Selects or confirms current menu option. Controls active gauges.
3	NEXT	Moves to next menu. Scrolls through menu options.

The LEDs along the top of the pumping system display indicate which menu screen is currently being shown on the numeric display. To move to the next menu item press the NEXT key and to return to the turbo menu screen press the START/STOP key. The available items are listed in order in [Table: Menu items](#).

Table 8 Menu items

Turbo screen
Gauge screen
Vent valve screen
Turbo setpoint (TSP) screen
Calibrate gauge screen
Units screen

6.2 Turbo screen

When the turbo screen is selected, the turbo LED is lit and the speed of the turbomolecular pump is displayed in percentage of full speed.

If no turbo pump is connected the display shows "---".

Start the pump with the turbo screen

When you push the START/STOP key, both the turbo and backing pumps start. The display shows the turbo pump is accelerating by flashing the top left portion of the percentage sign. When the turbo pump reaches normal speed (> 90%) the percentage sign stops flashing and remains steady.

If a Turbo Set-Point (TSP) has been set, only the backing pump starts when you push the START/STOP key. The TSP LED flashes until the setpoint has been reached. Once the setpoint has been reached the turbo pump starts and the TSP LED turns OFF. If no turbo setpoint has been set, the TSP LED remains OFF.

Stop the pump with the turbo screen

1. To stop the pumps press the START/STOP key, the display will show "Stop" for three seconds.
2. Press the ENTER key within that time to stop the pumps. If the ENTER key has not been pressed, or the START/STOP or NEXT keys are pressed, the display shows the turbo pump speed and the pumps remain running.

When the turbo pump is decelerating the bottom right portion of the percentage sign flashes until the pump has completely stopped.

Table 9 Turbo screen key actions

Keys	Short press	Long press
START	START the turbo, or initialise turbo STOP sequence, or cancel turbo STOP, or force turbo STOP when in error	-
ENTER	Acknowledge turbo STOP	-
NEXT	Go to gauge screen, or cancel turbo STOP	Scroll through menu screens

6.3 Gauge screen

When the gauge screen is selected, the gauge LED is lit and the gauge pressure reading is displayed in the selected units.

If no gauge is connected the display shows "---".

Connect a gauge

When a gauge is first connected the display shows "ID" followed by a number to identify the new gauge.

If the gauge type is not supported the display shows "???". When no gauge is connected the display shows "---".

6.4 Vent valve screen

When a valve is connected to the 24 V d.c. output of the turbo pump, the operation of the valve is controlled by the turbo pump and can be adjusted through the valve screen. When the vent valve screen is selected, the vent LED is lit and the current vent valve control setting is displayed. Default is turbo pump is turning.

1. Select the appropriate setting.
2. To change the vent valve setting press the ENTER key, then use the NEXT key to choose between the options.
3. Press the ENTER key again to confirm the selection.

Options	
5	Pump in normal operation
7	Pump is turning
19	Always on
25	Power failure venting
26	Pump has start command
36	Venting valve ("frequency dependent")
41	Combination of power failure venting and frequency dependent venting

For detailed information refer to the turbomolecular pump interface manual 300450826

Table 10 Vent valve screen key actions

Keys	Short press	Long press
START	Go to turbo screen	-
ENTER	Enter edit mode, or confirm selection	-

Operation

Keys	Short press	Long press
NEXT	Next valve option, or go to TSP control screen	Scroll through vent options in edit mode or scroll through menu screens

6.5 Turbo setpoint screen

The turbo setpoint screen is used to configure the start delay of the turbo pump.

When the turbo setpoint screen is selected, the TSP LED is lit and the current setpoint is displayed. The default is "OFF". The turbo setpoint menu is not available if the turbo pump is running or the selected units are volts.

1. To change the turbo setpoint press the ENTER key, then use the NEXT key to choose between off, time delay and pressure setpoint.
2. Press the ENTER key again to confirm the selection.
3. When time delay is selected the display will show the delay time in seconds. The default time is 120 seconds. This means that the turbo pump will start after a delay of 120 seconds from when the START key is pressed. To change the value of the delay time press and hold the ENTER key to start number entry mode.
4. If an active gauge is connected to the system the pressure setpoint can be used to start the turbo pump once the pressure has fallen below the setpoint value. When pressure is selected the display shows the setpoint pressure. The default pressure is 5.00 mbar shown as an exponential. To change the pressure setpoint, press and hold the ENTER key to start number entry mode.

Note:

If the turbo setpoint is set to pressure but a gauge is not connected the turbo pump will not start.

Table 11 Turbo setpoint screen key actions

Keys	Short press	Long press
START	Go to turbo screen	-
ENTER	Enter edit mode, or confirm selection	Enter number entry mode
NEXT	Next TSP option, next number or go to gauge calibration screen	Scroll through TSP options in edit mode, scroll through numbers in number entry or scroll through menu screens

6.6 Calibrate gauge screen

When the calibrate gauge screen is selected, the gauge LED and the CAL LED are lit together. The numeric display is blank. The calibrate gauge menu is not available for gauges which do not support calibration.

When the ENTER key is pressed the action depends on gauge type:

WRG or APGX: The calibration command is sent to the gauge and the display shows "CALd" for 3 seconds.

ASG: The calibration functions as a zero offset adjustment. The pressure currently displayed is saved as the zero offset and is subtracted from all future readings. The display shows "CALd" for 3 seconds to confirm the action. The offset adjustment can be cancelled by pressing the ENTER key

again. The display shows "OFF" for 3 seconds to confirm that the offset adjustment has been removed.

Table 12 Calibrate gauge screen key actions

Keys	Short press	Long press
START	Go to turbo screen	-
ENTER	Calibrate gauge	-
NEXT	Go to units screen	Scroll through menu screens

6.7 Units screen

When the units screen is selected, the menu LEDs are unlit and the currently selected units LED is lit. The numeric display is blank.

To change the units press the ENTER key and use the NEXT key to choose between mbar, Torr, Pa and voltage. Press the ENTER key again to confirm the selection. Note that when voltage is selected the display shows " 0.000".

When the units are changed, the setpoint values will be converted to the new units. For example, if a setpoint threshold is entered as 1.0×10^{-3} mbar and the units are changed to Torr, then the value will be displayed as 7.5×10^{-4} Torr.

6.8 Electrical supply failure



WARNING: IMPELLER SPIN

Risk of injury or death. If the power supply fails when the pump is running, the impeller could continue to spin for approximately 10 minutes. The control circuit may not give any indication that the impeller is still running.

If the electrical supply to the pumping system fails when the turbo pump is rotating, the motor of the turbo pump is used as a generator. The regenerated power is used to maintain the control system and the display. The regenerated power is not used to maintain the pumping system control system or the display.

When power to the control system is lost, no indication will be given about pump rotational speed, yet the impeller may still be turning.

The system will not restart when the power is reinstated.

Maintenance

7 Maintenance

7.1 General maintenance



CAUTION: HAZARDOUS WORKING CONDITIONS

Risk of injury or damage to the equipment. Make sure that the pump system and the mains plug is set to off before you do the maintenance work.

Rotor exchange

We recommend an exchange of the rotor unit after 80000 operating hours.

The maintenance must be done by us. If required contact the service center nearest to your location.

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. Consult us for recommendations.

Purge gas filter

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).

Adsorption trap

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

Backing pump

For maintenance work on the backing pump, refer to the information given in the corresponding Operating Instructions.

7.2 Cleaning

Remove dust on the surfaces with a moist piece of cloth only to prevent sparks.

Cleaning the frequency converter internally

The frequency converter is basically maintenance free as it does not contain any adjustable components.

Depending on the installation and ambient conditions, the frequency converter can suffer from the internal contamination (dust, humidity). Such contamination can result in malfunctions, overheating or short circuits and must be avoided as far as possible. We can clean the frequency converter and recommend a cleaning intervals of approximately 5 years.

Cleaning the TURBOVAC internally

Contamination inside the TURBOVAC is indicated by a deterioration in performance, that is, an increasing decline in working pressure.

Maintenance

If there is only slight contamination, such as a coating on the TURBOVAC interior surfaces due to exposure to the atmosphere over an extended period of time, the flange heater can be used for cleaning.

The ultimate pressure must be monitored while baking out under vacuum. When making the initial examination of the pump, mount blank flanges to eliminate any possibility of leaks and desorption in the vacuum chamber.

The pump must be disassembled if there is more extensive contamination. Contact us for more details.

Fault finding

8 Fault finding

Fault The pumping system has failed to start

Cause **The electrical supply fuse has blown**

Remedy Contact us.

Cause **The operating voltage is incorrect**

Remedy Check the voltage supply matches the pumping system voltage requirements. Refer to the electrical rating label located at the rear of the pumping system.

Fault Ultimate pressure cannot be reached

Cause **Pressure is limited by water vapour**

Remedy Bake the chamber or run the system for a duration until the vacuum improves.

Cause **The vacuum gauges are contaminated**

Remedy Clean or replace the vacuum gauges.

Cause **Pumping speed is insufficient due to poor conductance between the pump and the gauge or the chamber is too large**

Remedy Increase the conductance or reduce the volume.

Cause **The high vacuum area of the system is contaminated**

Remedy Clean the high vacuum system.

Cause **Check the rest of the system for leaks and contamination**

Remedy If found, repair the leaks and clean the contamination.

Cause **The inlet pressure is poor**

Remedy If inlet pressure is poor, check the turbo pump for contamination and refer to the Troubleshooting section of the turbo pump manual.

Leak test the pump. If the leak rate is greater than 1×10^{-7} mbar l s⁻¹ (1×10^{-5} Pa l s⁻¹), contact us or the supplier.

Fault The turbo pump is very noisy or there is excessive vibration or both

Cause **The turbo pump is noisy or vibrates during operation**

Remedy Refer to the Troubleshooting section of the turbo pump manual. See [General description](#) on page 10.

8.1 Error numbers

If an error is detected by the controller the display will show "Err" followed by a number.

Refer to for a description of the error together with likely causes and suggested remedies.

Fault finding

Table 13 Error numbers

Error Number	Meaning	Possible cause/remedy
Controller errors		
1	EEPROM error	The internal EEPROM checksum has failed. All user settings will revert to the factory default.
2	ID reference error	The reference used for identifying gauges is incorrect. Please remove all connected gauges, turn the electrical supply off and on, and wait for 30 seconds before reconnecting the gauges.
Pump errors		
41	Turbo pump fault	Inspect the LEDs on the turbo pump module for status information. For more detailed fault codes, use LeyAssist to read out the Error Memory of the Turbo pump.

Storage

9 Storage

You must follow the safety instructions before you store the pump.

- For storage of the product, use the packaging provided.
- The pump system must only be detached from the vacuum chamber and moved, provided the pump has been allowed to run down completely and is at a full standstill.
- Store the system only after it has been vented with dry air or nitrogen. Place dry cartridges into the flanges and seal the system.
- Store it at a dry place at -20 to 60 °C and at 95% maximum air humidity, non-condensing.

Use the following procedure to store the pumping system.

1. Shut down the pumping system as described in [Stop the pump with the turbo screen](#).
2. Isolate the pumping system from the electrical supply and disconnect it from the vacuum system.
3. Place protective covers over the inlet and outlet flanges.
4. For the fastest pump down after the pumping system is reinstalled, seal the turbomolecular pump inside a plastic bag together with a suitable desiccant.

10 Disposal

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

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

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

When sending us any equipment, refer to Leybold Service.

Service

11 Service

11.1 Return the equipment or components for service

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

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

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

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

Download the latest documents from leybold.com/en/downloads/download-documents/declaration-of-contamination/, follow the procedure in HS1, fill in the electronic HS2 form, print it, sign it, and return the signed copy to us.



NOTICE:

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

Accessories

12 Accessories

Table 14 Accessories

For TURBOVAC i	Catalogue number
Y cable TURBOVAC i, M8	800110V0020
Venting valve, 24 V d.c., G 1/8"	800120V0012
Power failure venting valve 24 V d.c., G 1/8"	800120V0022
Purge gas valve, 24 V d.c., G 1/8", 24 sccm	800120V0013
Purge gas throttle, G 1/8", 24 sccm	800120V0014
Air filter for TMP, G 1/8"	800110V0022

Table 15 Mains Cable

Accessories	Catalogue number
with Euro-Plug, 3 m	800102V0002
with UK-Plug, 3 m	800102V0003
with US-Plug, 3 m	800102V1002

EU Declaration of Conformity

**Leybold GmbH**

Bonner Strasse 498
D-50968 Koln
Germany

Documentation Officer

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

The product specified and listed below

- TURBOLAB Core Pump Station
- TURBOVAC 90i AND TURBOVAC 250i Turbomolecular pump in combination with DIVAC 1.4 backing pump and Controller box unit

Type Designation	Part Number
TURBOLAB Core TV90i/63ISO-K/1.4	501591V00000500
TURBOLAB Core TV90i/63CF/1.4	501591V01000500
TURBOLAB Core TV90i/40KF/1.4	501591V02000500
TURBOLAB Core TV250i/100ISO-K/1.4	501591V08000500
TURBOLAB Core TV250i/100CF/1.4	501591V09000500

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

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

Based on the relevant requirements of harmonised standards:

EN 1012-2:1996 +A1:2009	Compressors and vacuum pumps. Safety requirements. Vacuum pumps
EN 61010-1:2010/A1:2019	Safety requirements for electrical equipment for measurement, control and laboratory use. General requirements
EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements

This declaration, based on the requirements of the listed Directives and EN ISO/IEC 17050-1, covers all product serial numbers from this date on: 2021-09-27

You must retain the signed legal declaration for future reference

This declaration becomes invalid if modifications are made to the product without prior agreement.



Ian Keech – VP Engineering, Scientific Vacuum Division
Burgess Hill



Axel Guddas – General Manager
Product Company Cologne

Declaration of Conformity

Leybold GmbH

Bonner Strasse 498
D-50968 Koln
Germany

Documentation Officer

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

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

Type Designation	Part Number
TURBOLAB Core TV90i/63ISO-K/1.4	501591V00000500
TURBOLAB Core TV90i/63CF/1.4	501591V01000500
TURBOLAB Core TV90i/40KF/1.4	501591V02000500
TURBOLAB Core TV250i/100ISO-K/1.4	501591V08000500
TURBOLAB Core TV250i/100CF/1.4	501591V09000500

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

Supply of Machinery (Safety) Regulations 2008

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

Electromagnetic Compatibility Regulations 2016

Class B Emissions, Industrial Immunity

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

Relevant designated standards or technical specifications are as follows:

EN 1012-2:1996 +A1:2009	Compressors and vacuum pumps. Safety requirements. Vacuum pumps
EN 61010-1:2010/A1:2019	Safety requirements for electrical equipment for measurement, control and laboratory use. General requirements
EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements

This declaration, based on the requirements of the listed Statutory Instruments and EN ISO/IEC 17050-1, covers all product serial numbers from this date on: *2021-09-27*

You must retain the signed legal declaration for future reference

This declaration becomes invalid if modifications are made to the product without prior agreement.

Signed for and on behalf of Leybold GmbH



Ian Keech – VP Engineering, Scientific Vacuum Division
Burgess Hill



Axel Guddas – General Manager
Product Company Cologne

ADDITIONAL LEGISLATION AND COMPLIANCE INFORMATION

EMC (EU, UK): Class B Industrial equipment

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

RoHS (EU, UK): Material Exemption Information

This product is compliant with the following Exemptions

Annex III:

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

REACH (EU, UK)

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

Article 33.1 Declaration (EU, UK)

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

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

Additional Applicable Requirements


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

2012/19/EU

Directive on waste electrical and electronic equipment (WEEE)

材料成分声明

China Material Content Declaration

部件名称 Part name 	有害物质 Hazardous Substances					
	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr VI)	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
铸铝及铝合金制品 Aluminium alloys	X	O	O	O	O	O
钢合金制品 Steel alloys	X	O	O	O	O	O
铜接头 Brass connectors	X	O	O	O	O	O
<p>O: 表示该有害物质在该部件的所有均质材料中的含量低于 GB/T 26572 标准规定的限量要求。 O: Indicates that the hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572.</p> <p>X: 表示该有害物质在该部件的至少一种均质材料中的含量超出 GB/T26572 标准规定的限量要求。 X: Indicates that the hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T26572.</p>						

This page has been intentionally left blank.



Pioneering products. Passionately applied.

Leybold GmbH
Bonner Strasse 498
50968 Cologne
GERMANY
+49-(0)221-347-0
info@leybold.com
www.leybold.com