

ECODRY plus

Multi-stage Roots vacuum pump

Operating Instructions 300758785_002_C1

Part Nos.

161040V21

161040V22

161065V21

161065V22



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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 Leybold **ECODRY plus** 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. Moreover, observe the information in all additionally supplied Operating Instructions for switches or valves, for example. 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.

NOTICE



DANGER



WARNING



CAUTION



NOTICE



Safety Information

0 Important Safety Information

WARNING



0.1 Mechanical Hazards

- 1 Avoid exposing any part of the human body to the vacuum.
- 2 Select a secure place for the appliance (level surface).
- 3 The discharge port of the pump must not be blocked or constricted. Never operate the pump with a seal-off stopper in place blanking off the exhaust port. Operate the pump only with a connected vacuum system to the intake flange.
- 4 With a closed exhaust pipe, the pump can generate up to 5 bar pressure (absolute) on the exhaust. The exhaust pipes should be laid out according.
- 5 Condensates from the pump can collect inside or at the exhaust, escape and spill onto the floor, when operating the pump without an exhaust line or during transport with an exhaust being not blanked off. In this case there exists the risk of slipping.
- 6 Due to its weight the pump must only be lifted by duly trained and qualified persons.

DANGER



0.2 Electrical hazards

- 1 Housing parts must not be opened.
- 2 Connect the appliance only to a properly and professionally installed mains outlet socket with protective earth connection.
- 3 Note the information on the IP type of protection.

CAUTION



0.3 Thermal Hazards

- 1 At the crane eye, the intake flange and the exhaust flange, the pump may attain temperatures over 80 °C. There is the risk of suffering burns. Note the danger symbols on the pump itself.

DANGER



0.4 Hazards Caused by Materials and Substances

- 1 Fluoropolymers are used as sealants (FKM) and as lubricants (PFPE) in the pumps. In case the pump suffers a severe mechanical failure, it cannot be ruled out that toxic and/or corrosive substances may be released due to thermal decomposition. Do not open the pump module, and close off the inlet and exhaust flanges using blank flanges.
- 2 Before commissioning the pump, make sure that the media which are to be pumped are compatible with each other so as to avoid hazardous situations. Observe the instructions for proper and improper use of the pump in Section 3.2.
- 3 When pumping hazardous gases we recommend a leak search on a regular basis. Leaks in the pump cannot be ruled out under all circumstances. When pumping hazardous gases, the operator must ensure that that leaks at the pump will not be a hazard. When pumping toxic gases replace the gas ballast switch with a plug screw or connect a gas supply to the gas ballast.

Safety Information

- 4 If required additional monitoring of the gas ballast quantities is necessary from the side of the operator when a well-defined and ensured dilution is necessary from the side of the process. The type of protection depends on the specific process and needs to be assessed by of the customer.
- 5 When the pump has been used to pump hazardous gases, introduce appropriate safety precautions before opening the intake or the discharge connections. Before opening the pump, purge it for a longer period of time with an inert gas. If necessary, wear suitable personal protection equipment like gloves, breathing protection and protection clothing, for example (see Material Safety Data Sheets for the substances in use, the chemical reactions and the by-products). Close off the pump's inlet and exhaust flanges using blank flanges.
- 6 When disposing of the pump, observe the applicable environment regulations.

0.5 Noise Hazard

- 1 The noise level of the pump during ultimate pressure operation corresponds to the values stated in the technical data. In other operating modes and depending on the connected vacuum system, higher values can be expected. Make sure that suitable protection measures are taken to protect your hearing.

CAUTION



Description

1 Description

The ECODRY plus is an eight-stage Roots pump. It is of the dry compressing type and capable of evacuating chambers down to the medium vacuum range.

The pump is connected to a single-phase supply using a mains power cable and is powered via a built-in electronic drive unit. It is air-cooled. Bearings and gears are lubricated using PFPE. The pump is therefore maintenance-free from the customer's perspective.

1.1 Supplied Equipment

The pump is delivered ready for use, except from a power cable. Inlet and exhaust flanges are closed. The scope of delivery includes:

- 2 centering rings, 2 clamping rings, 2 blank flanges for the inlet and exhaust flanges
- D-sub 9-pin jumper for manual operation of the pump.

1.2 Technical Data

ECODRY plus	40	65	Tolerance
Maximum pumping speed without gas ballast	40 m ³ /h	55 m ³ /h	± 5 %
Ultimate partial pressure without gas ballast	< 0.03 mbar		
Ultimate partial pressure with gas ballast	< 0.1 mbar		
Maximum permissible inlet pressure	1050 mbar*		
Max. perm. discharge pressure (relative to ambient)	200 mbar		
Leak rate	< 10 ⁻⁵ mbar·l/s		
Water vapour tolerance with gas ballast	20 mbar	20 mbar	
Water vapour capacity with gas ballast	300 g/h	500 g/h	
Permissible ambient temperature	+5 to +40 °C		
Storage temperature	-20 to +60 °C		
Typical noise level without silencer, at ultimate pressure (acc. to DIN EN ISO 2151)	< 52 dB(A)		
Relative ambient atmospheric humidity	95%, non-condensing		
Max. installation height	up to 3000 m (NHN)*		
Cooling	Air		
Leakage current in accordance with IEC 61010-1	< 3.5 mA		
Max. contamination grade acc. to IEC 61010-1	2		
Speed	12 600 RPM		
Protection class	IP 42		
Intake flange	DN 25 ISO-KF	DN 40 ISO-KF	
Discharge flange	DN 16 ISO-KF		
Weight, approx.	43 kg		± 1 kg

* For installation heights above 2000 m, an inlet pressure of 50 mbar should not be permanently exceeded.

1.2.1 Electrical Data

ECODRY plus	120 V	200-240 V	Tolerance
Rated voltage	120 V	200-240 V	± 10 %
Frequency	60 Hz	50/60 Hz	± 5 %
Network type	TN		
Phases	1-ph		
Rated current	15 A	10 A	
Rated power	1200 VA		
Mains fusing / characteristic	15 A / slow blow	16 A / slow blow	
Mains connection	C 20 acc. to IEC 60320		

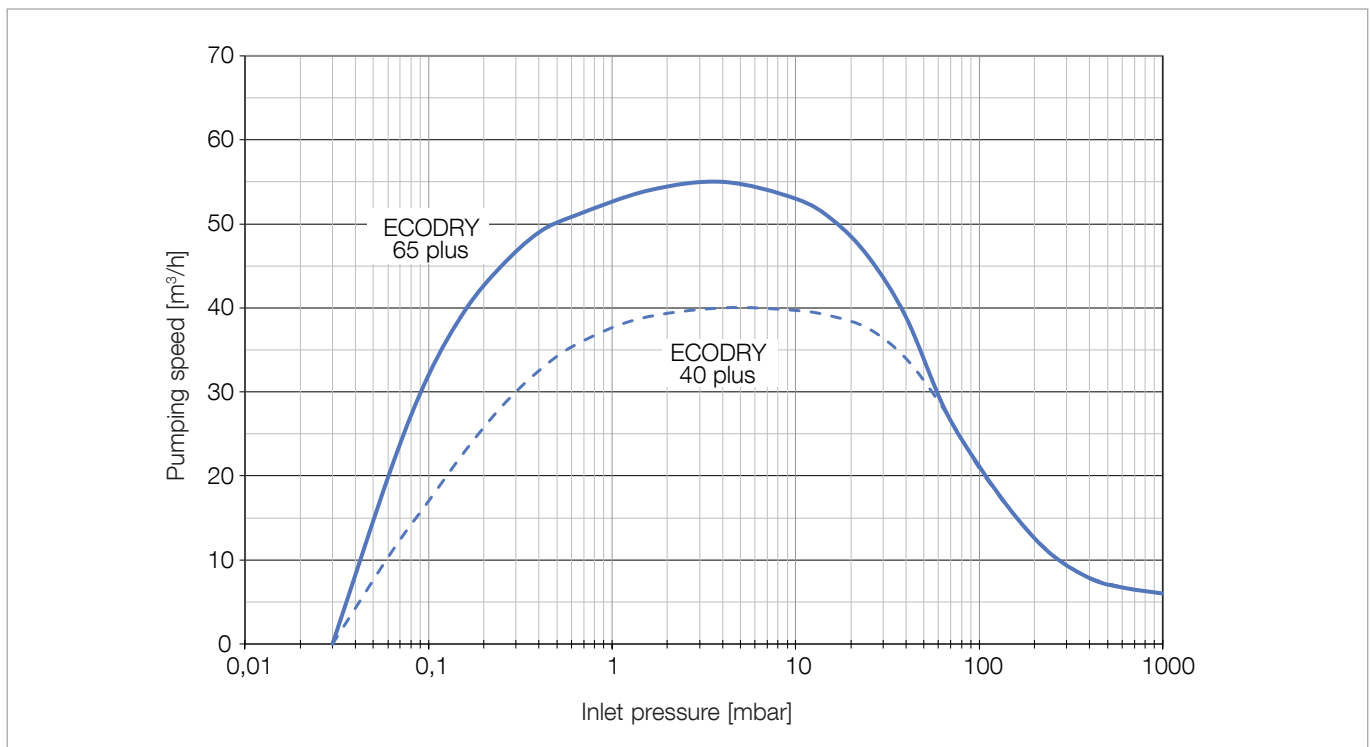


Fig. 1.1 Typical pumping speed curves

Description

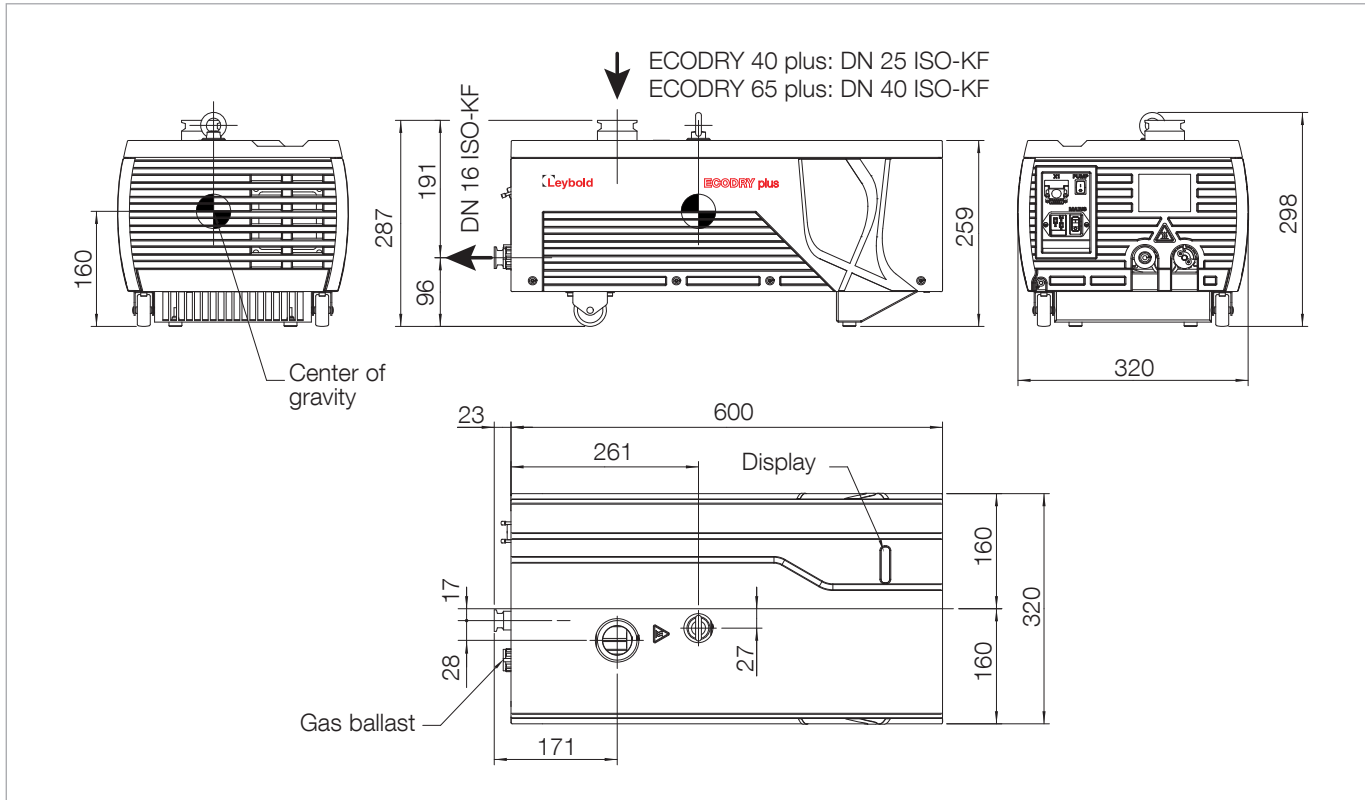


Fig. 1.2 Dimensional drawing, dimensions in mm

1.3 Ordering Data

	Part No.
ECODRY 40 plus (120 V)	161040V21
ECODRY 65 plus (120 V)	161065V21
ECODRY 40 plus (200-240 V)	161040V22
ECODRY 65 plus (200-240 V)	161065V22

1.4 Accessories

Inlet screen	
DN 40 ISO-KF	E41 170 121
DN 25 ISO-KF	E41 170 206
<hr/>	
Mains cables	
EU (CEE 7/7 - C19, 2.0 m)	161810 EU
UK (BS 1363 - C19, 2.0 m)	161810 UK
US cables	
US 120 V (NEMA 5-15P - C19, 2 m)	141103US
US 200-240 V (NEMA 5-15P - C19, 2.5 m)	161810US
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Blank flange, aluminium	
DN 16 ISO-KF	184 46
DN 25 ISO-KF	184 47
DN 40 ISO-KF	184 48
<hr/>	
Centering ring, aluminium, FPM	
DN 16 ISO-KF	182 06
DN 25 ISO-KF	182 07
DN 40 ISO-KF	182 08
<hr/>	
Clamping ring, aluminium	
DN 16 ISO-KF	183 41
DN 25 ISO-KF	183 42
DN 40 ISO-KF	183 43
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Casing assembly mounting kit	161 831 A
<hr/>	
Plug screw gas ballast	161 832 A
<hr/>	
Purge gas adapter	161 833 A
<hr/>	
DN 16 ISO-KF/12 mm hose adapter for exhaust flange	182 90
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RS485/USB connecting cable for X104 interface, 1.8 m	161 820 USB
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LEYASSIST software	230 439 V01
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Replacement control interface jumper X1	161 823 A
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Transport and Storage

2 Transport and Storage

For transportation lift the pump at the crane eye or safely secured on a suitable pallet.

The pump must not be tilted more than 30 degrees during transport.

For transports over short distances slightly lift the pump at the front side and move it to the desired location.

Storage

Store the pumps only horizontally standing on their feet and castors.

The pump has been blanked off with blank flanges. Open the pump only immediately before installing it.

Until putting the pump into service, store the pump in a dry place preferably at room temperature blanked off with the supplied blank flanges.

The pump must be stored at the most for one year only. Longer storing without turning the rotors will damage the bearings. Therefore, if you are storing the pump for longer periods, it should be run once a year for at least 45 minutes and then returned to storage, as described in the following sections. (The intake flange can stay sealed during this brief operation, the exhaust flange must be opened.)

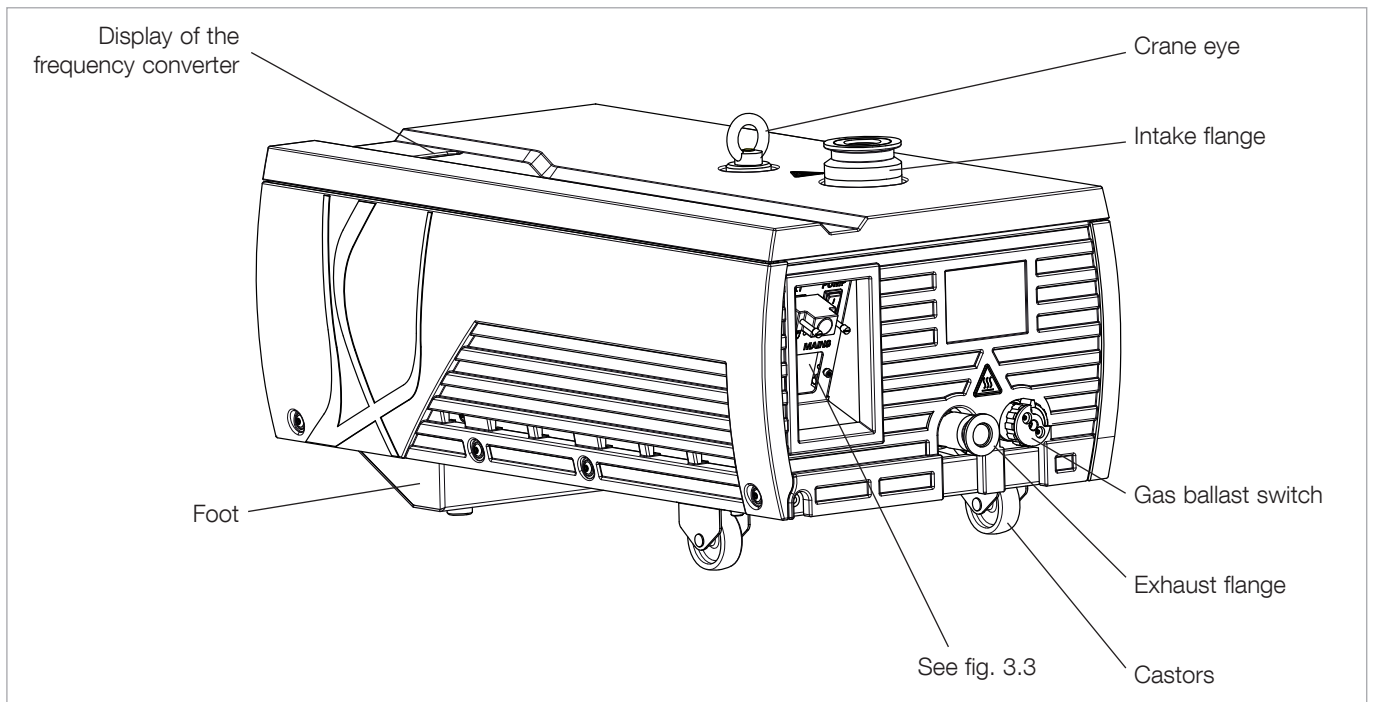


Fig. 3.1 Connections and controls

3 Installation

3.1 Placement

Place the pump on a straight and level surface (max. tilt of 2°).

To ensure sufficient cooling of the pump, the fan openings of the pump must not be obstructed, see fig. 3.2.

3.2 Conforming Use

The ECODRY plus has been designed to produce a vacuum. It is capable of pumping clean, dry gases, which are free of particles, like air, nitrogen, oxygen $\leq 21\%$, argon with inlet pressure < 100 mbar and helium. Moreover, it is capable of evacuating vessels of vacuum systems down to the medium vacuum range.

The pump is suited for deployment as a backing pump for turbomolecular pumps.

Organic solvents may only be pumped in traces/at low concentrations (consult Leybold first) outside the flammability range. The pump is suited for pumping water vapour within the limits given in the technical data.

Installation

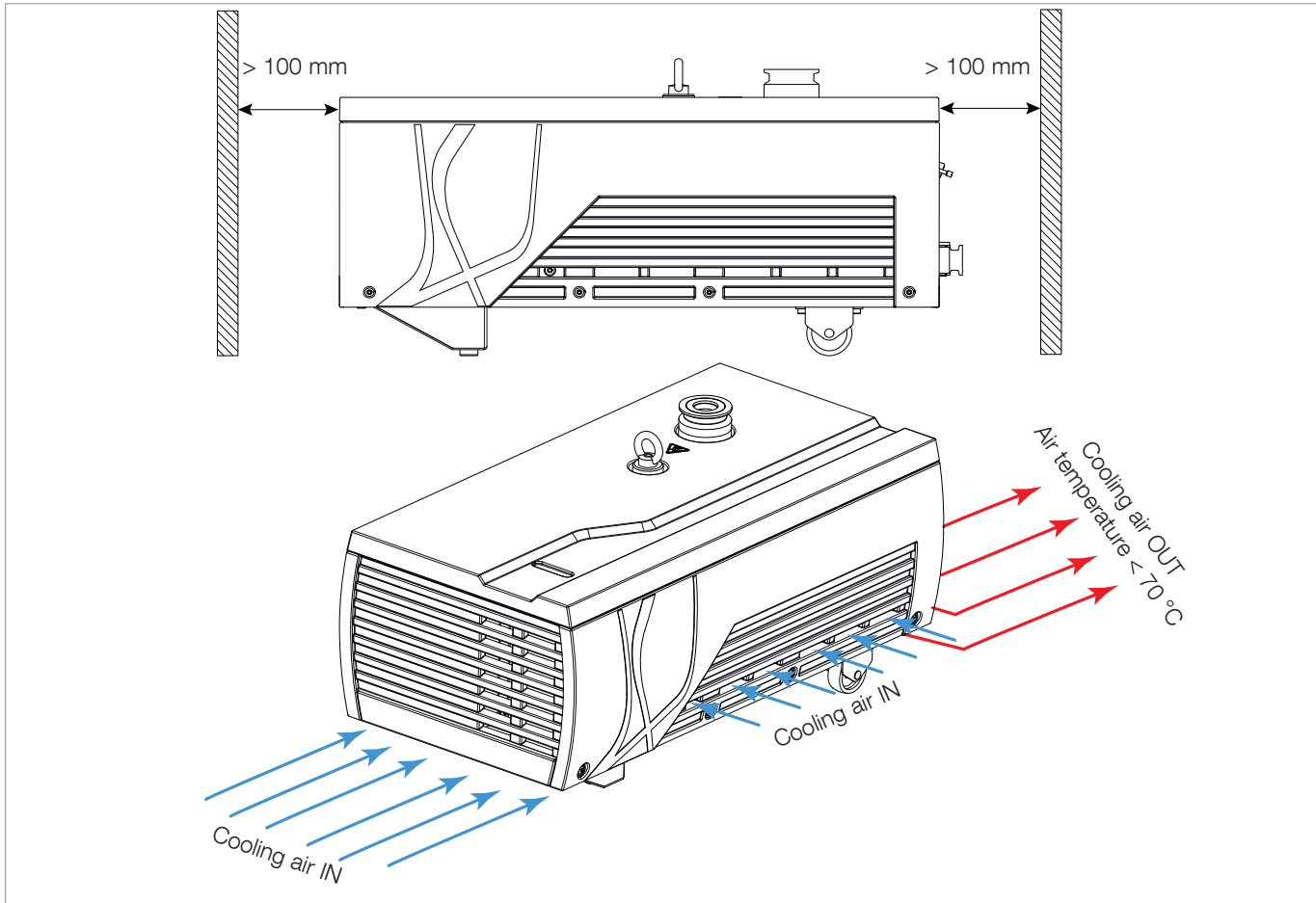


Fig. 3.2 Cooling air flow

3.2.1 Non-conforming Use

DANGER



The ECODRY plus is not suited for use in short cycle pump processes with high repetition rates (pick-and-place, loadlock, for example).

The ECODRY plus is not suited for pumping of:

- Radioactive substances
- Explosive substances
- Ignitable gas mixtures
- Pyrophorous gases
- Liquids
- Media condensing in the pump
- Solids/dusts
- Oxidative substances with the exception of $\leq 21\%$ oxygen in the air
- Toxic gases belonging to GHS category I and II*

Pumping of the following gases is only permissible after having consulted Leybold first:

- corrosive gases
- toxic gases belonging to GHS category II and IV*

*Globally Harmonized System of Classification, Labelling and Packaging of Chemicals

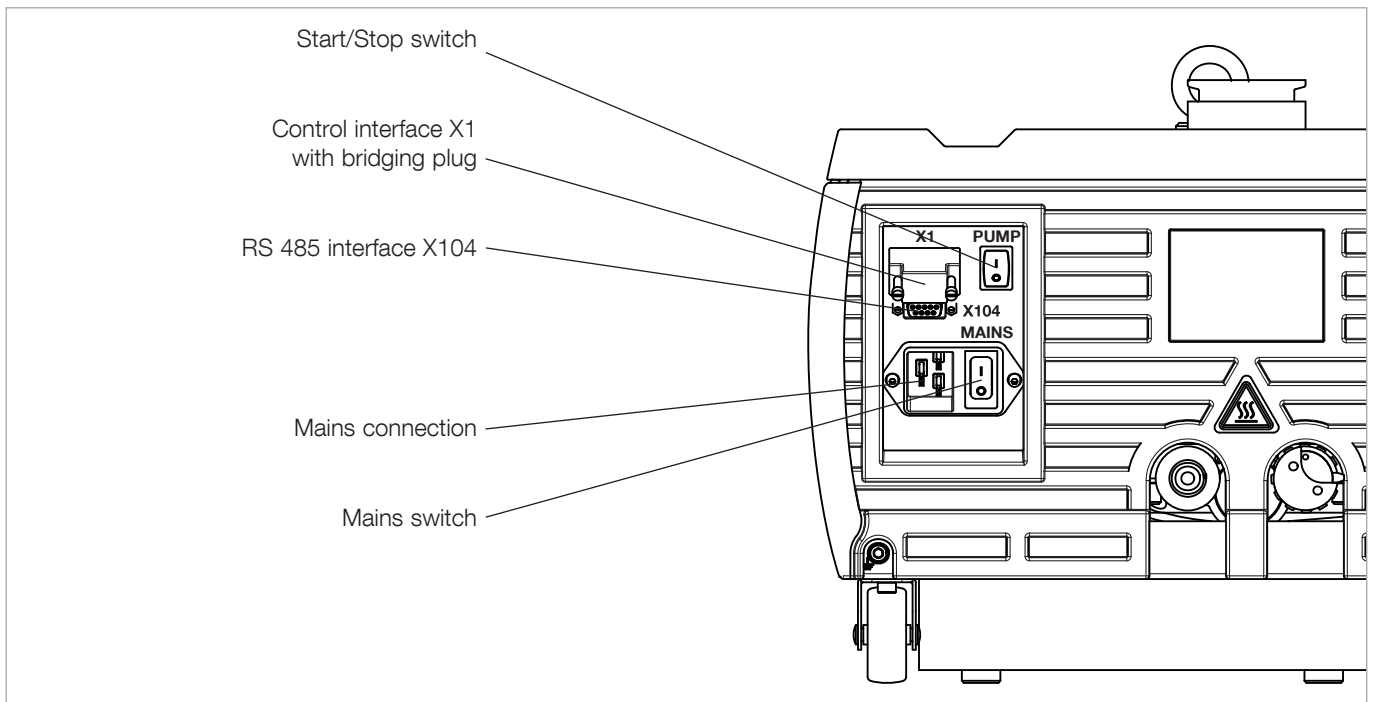


Fig. 3.3 Connections and controls

When pumping toxic gases replace the gas ballast switch with a plug screw or connect a gas supply to the gas ballast.

3.3 Connecting the Pump

Remove the blank flanges. We recommend that you retain the blank flanges for decommissioning of the pump.

During installation work on the intake and discharge lines do not subject flanges to any stresses.

Intake side

At the intake side, connect a hose to the vacuum chamber. Do not damage the sealing surfaces of the connecting flanges.

Do not allow the ingestion of any objects (screws, welding beads, nuts, washers, pieces of wire, etc.) through the intake port of the pump.

NOTICE



The intake line must be clean. Deposits in the intake line can degas and impair the vacuum. The connecting flanges must be clean and undamaged.

Installation

DANGER**Exhaust line**

Connect the exhaust line with a hose to the pump, or when operating the pump without a connected exhaust line, operate the pump only in a well ventilated room. The operator must check, whether the pumped gases will lead to safety risks on the environment if the pump is operated without an exhaust line (i.e. risk of suffocation, risk of slipping due to condensing vapours, etc.).

The cross-section of the exhaust line must at least match the inside diameter of the connections.

CAUTION

Smaller cross sections may cause an undesirable overpressure within the system. Do not start up the pump with a constricted or blocked exhaust. Ensure 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 motor or a dangerous overpressure within the system. There is the risk of bursting. The pump can generate pressures up to 5 bar (abs.) at the exhaust, when the discharge line is shut.

When pumping vapours we recommend connecting a condensate separator at the exhaust.

The exhaust lines should be laid so that they drop down and away thereby preventing condensate from flowing back into the pump. We recommend a slope $> 3^\circ$.

Connect the exhaust line to an abatement system with sufficient throughput, if required by the process.

DANGER

If within the system toxic substances or gases are being used, then the operator will be responsible for ensuring that the corresponding safety precautions are introduced!

**3.4 Electrical Connection**

Read the data on the device nameplate carefully before connecting to mains voltage. Plug in the power connector.

The pump is only intended for a TN systems network. For other types of networks please contact Leybold.

When using a residual current device (RCD) install type B or type F.

The plug is equipped with a cable pull-out protection. When plugging in the mains plug, the pull-out protection mechanism engages. To pull out, press finger on the yellow release lever, which will release the locking mechanism again.

If required, connect the X1 control interface or the X104 RS 485 interface (see Section 4.2).

4 Operation

The ECODRY plus can be operated either manually or via an interface.

Switch the pump only on provided an exhaust line has been connected. The exhaust of the pump must not be blocked or constricted. Never operate the pump with the seal-off stoppers in place blanking off the exhaust port.

4.1 Manual Operation

For manual operation, connect the jumper supplied with the unit to the X1 interface.

Switch the pump on at the MAINS switch and wait for approximately two seconds while the pump initialises. Now the pump can be started using the start/stop switch (PUMP).

Following start-up, the pump requires a few seconds in order to reach its rated frequency.

In this mode, the X104 interface can only be used for reading off operating parameters.

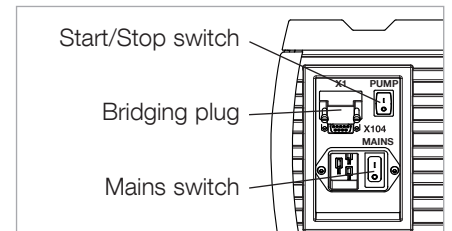
4.2 Interfaces

4.2.1 X1 Control Interface

The pump can be incorporated within a plant control system by means of the X1 control interface. To do this, set the start/stop (PUMP) switch to "1". The ECODRY plus can be started remotely by closing the pin 8 contact to pin 9 on the X1 interface. Opening the contact stops the unit.

In this mode, the X104 interface can only be used for reading off operational parameters.

WARNING



Operation

Table: Pin assignment X1

Customer plug (provided with pump) SUB-D 9 (female)		ECODRY plus X1 SUB-D 9 (male)			
Description	Pin	Pin	Description	Limits	Function
	1	1	Analog Frequency Monitor output	0 ... +10 Vdc (2 mA)	Analog signal proportional to current rotation frequency (10 V = 210 Hz)
	2	2	Digital Input / Low speed	low active input (ref. to Digital Common)	Bridge to pin 4 for lower speed (170 Hz), open for full speed (210 Hz)
	3	3	Voltage supply for analog input	+10.5 V (max. 16 mA)	Voltage supply for analog input A1
	4	4	Digital Common		
	5	5	Digital Output (Pump Status)	Optocoupler output open collector (supply by single resistor, max. current 10 mA) (low active ref. to optocoupler ground)	On: Frequency setting reached Off: Frequency setting not reached
Jumper Pin 6 / Pin 7: speed control deactivated	6	6	Analog Input (Speed Control)	0 ... +10 V (20 kOhm)	Optional input, deactivated by default*. Contact Leybold for further information.
	7	7	Analog Common		
Jumper Pin 9 / Pin 8: Run Switch active	8	8	Digital Common		
	9	9	Digital Input / RUN	low active input related to digital common	Bridge to pin 8 for RUN, open for STOP
Housing		Housing	Pump housing, PE		

* When speed control is activated, operation is only possible if a voltage is applied between pins 6 and 7. 10 V correspond to maximum speed.



NOTICE: Do not apply external voltage to the digital input terminals because the internal optocouplers can be damaged.

Do not exceed the stated voltage and current limits.

4.2.2 X104 Serial RS-485 Interface

Alternatively, the X104 RS 485 interface can be used to operate the pump, giving access to additional operational parameters for the frequency converter.

The operating parameters can be accessed via MODBUS protocol or via the LEYASSIST software (see Section 1.4. Accessories).

The following connection parameters are used for communication:

Protocol	Modbus RTU
Baud rate	9600 bps
Data length	8 bit
Parity	No parity
Stop bit	1 bit
Address	1

Modbus Register List

Description	Read/Write	Modbus Register	Settings	
Run Command	Write	2000H	Bit 1~0	01B: Stop 10B: Run
			Bit 5~4	Always set to: 01B: FWD
			Bit 14~13	Run command source: 00B: No function 01B: Digital keypad 10B: Operated by 00-21 Setting 11B: Change operation source
			All other bits set to zero.	
Frequency Command (Hz)	Read	2102H		
Frequency Command (Hz)	Write	0400H		
Output Frequency (Hz)	Read	2103H		
Output Current (A)	Read	2104H		
Output Voltage (V)	Read	2106H		
DC Bus Voltage (V)	Read	2105H		
Output Power (kW)	Read	210FH		
Drive Status	Read	2101H	Bit 1~0	AC motor status: 00B: Drive stops 01B: Drive decelerating 10B: Drive standby 11B: Drive operating
Source of operation command	Write	0015H	1: External terminals 2: RS485 Communication	
Error code	Read	2100H	Error codes listed in section „Troubleshooting“	
Reset	Write	2002H	Set Bit 1 to 1 for Reset	

Operation

Description	Read/ Write	Modbus Register	Settings
Temperature of drive power module (°C)	Read	220EH	
Accumulated Run time (minutes)	Read	051FH	
Accumulated Run time (days)	Read	0520H	
Software revision/version	Read	0006H	

Table: Pin assignment serial interface X104

Customer plug SUB-D 9 (male)		ECODRY plus Serial Interface X104 SUB-D 9 (female)		
Description	Pin	Pin	Description	Comment
	1	1	Not connected	
Bridge to Pin 3 for termination	2	2	Termination	
Bridge to Pin 2 for termination	3	3	Termination	
	4	4	Not connected	
GND	5	5	Ground (GND)	
	6	6	Internally bridged w/ Pin 8	
Tx/Rx+	7	7	Receive + (Tx/Rx+)	Bridged internally to Pin 9
Tx/Rx-	8	8	Send - (Tx/Rx-)	Bridged internally to Pin 6
	9	9	Internally bridged w/ Pin 7	
Shield	Housing	Housing	Grounded	

4.2.3 Frequency converter display

After switching on the FC, the display will show the output frequency in Hz with a preceding „H“.

E.g.: the pump motor runs at 60 Hz



There are several LEDs to indicate the different pump's states:

STOP LED	Flashing: Drive is in a warning mode. On: Drive is in an error mode and the pump is being stopped.
REV LED	On: Motor runs reverse Off: Motor rotates forward
FWD LED	On: Pump is ready or is running. Off: Drive is in initialisation mode.
RUN LED	Output frequency is shown in the display.. On: Drive is running.

Approx. 1,000 hours before reaching the recommended service interval, the display will show the warning message „SEr“ and the remaining time indicated by a „d“ (for days).

The displays change constantly every 3 seconds:



If the recommended service interval is exceeded, the display toggles between showing the frequency and the warning message „SEr“.

The displays change constantly every 3 seconds:



Operation

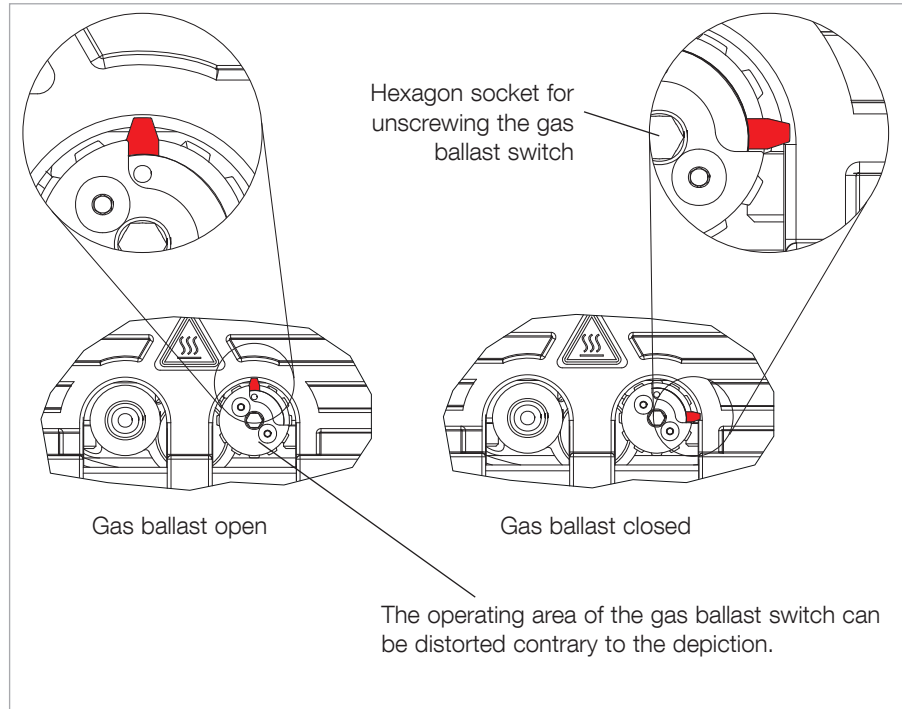


Fig. 3.4 Gas ballast switch

4.3 Gas Ballast

If the process contains mainly permanent gases, the ECODRY plus may be operated without gas ballast.

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

Pumping of Condensable Gases and Vapours

If the gas ballast valve is open when the temperature is at operating level, the ECODRY plus can pump water vapour within the limits specified in the technical data. If the vapour pressure rises above the permitted water vapour tolerance, the gasses condense to vapour in the pump. This can lead to corrosion and thus damage to the pump.

Before pumping out vapours, open the gas ballast valve and warm up the pump for around 30 minutes with the inlet line closed.

Running under gas ballast has a detrimental effect on the ultimate pressure which can be achieved.

After a pumpdown cycle leave the pump to operate for at least 30 minutes approx. with the gas ballast open and the intake line closed until it is dry again.

With the gas ballast valve opened the vacuum vessel will be vented in the event of a power failure.

Swapping out the gas ballast switch

The gas ballast switch can be swapped for a solenoid valve or a purge gas connector.

To do this, unscrew the gas ballast switch from the pump using a 6 mm Allen key.

Then, screw in a suitable solenoid valve or purge gas connector with a quarter-inch thread. Max torque = 8 Nm.

Following assembly, check for leaks in the pump in order to ensure optimum vacuum performance.

When connecting a gas supply to the gas ballast, reduce the pressure to 0.5 bar(g).

NOTICE



4.4 Switching off / Decommissioning

Switching off

Stop the pump using the start/stop switch or via an interface. If the pump is to be disconnected from the supply voltage, switch off the mains switch.

If the gas ballast valve is closed, rapid ventilation of the attached vacuum vessel and damage to any turbomolecular pump which may be attached are prevented by means of a check valve.

Decommissioning

If the pump is to be decommissioned for an extended period of time, the pump should first be run dry and then evacuated.

The pump should then be switched off and removed from the system.

DANGER



When the pump has been used to pump hazardous gases, introduce appropriate safety precautions before opening the intake or the discharge connections.

Close off the inlet aperture using the blank flange supplied with the unit.

Leave the outlet flange open or, if necessary, connect it to a suitable exhaust system.

Start the pump and, with the gas ballast switch open, let it run for at least 30 minutes.

Thereafter, close the gas ballast switch and run the pump for a further 5 minutes.

Then, stop the pump and leave it connected to the power supply for another few minutes to cool down (the ventilator continues to run).

Next, close off the pump's outlet aperture using the blank flange supplied with the unit, switch of the MAINS switch and remove the mains plug.

5 Servicing

The pump is maintenance-free. We recommend that a precautionary service (an overhaul at the Leybold Service Centre) be carried out after 35,000 hours of operation or after five years of service life at the latest, whichever occurs sooner. The pump is fitted with a counter for this purpose, which shows the remaining number of days of operation until the next recommended service on the pump's display. For a long pump life we recommend regular service by Leybold.

The recommended service intervals refer to continuous operation with inlet pressures below 50 mbar and the pumping of non-condensable gases. In case of frequent operation above 50 mbar, frequent pumping cycles or when pumping condensing gases, we recommend shortening the service intervals. Please contact Leybold.

1000 hours before reaching the recommended service interval, the display will show the message \overline{SEr} alternating with the down-counting hours remaining and the current speed. If the recommended service interval is exceeded, the message toggles between \overline{SEr} and the current speed.

Within the pumps, fluoropolymers are used as a sealant (FKM) and as a lubricant (PFPE). In case the pump suffers severe mechanical damage, it cannot be ruled out that toxic and/or corrosive substances may be released due to thermal decomposition. Do not open the pump module, and close off the inlet and exhaust flanges using blank flanges.

The pump is equipped with EMC devices on the input side. Observe this during device tests/commissioning.

5.1 Leybold 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.leybold.com -> Downloads -> 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.

We must return to the sender any equipment which is not accompanied by a contamination statement.

DANGER



Troubleshooting

6 Troubleshooting

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

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

A fault is indicated by a code on the display and the permanently lighting STOP LED. The frequency converter output is always switched off immediately and the pump coast to stop.

To reset an alarm or an error, first find the cause for it. Remedy it and then switch the Start/Stop switch to Stop. Then switch the mains switch off.

Wait for a few seconds until the display goes out and then switch the mains switch on again, and thereafter switch the Start/Stop switch to Start.

This lists up the most important alarms and faults only. For further error messages please contact the Leybold service.

Troubleshooting

Malfunction	Error message	Error code (MODBUS)	Brief Description	Likely cause	Remedy
End pressure will not be reached.	-		-	Gas ballast valve open	Close gas ballast valve, if possible.
				Leakage in the system	Check for leak.
				Gas ballast valve defective	Check for leak. Replace gas ballast valve – please send us your enquiry.
				Outlet blocked	Ensure the pump outlet is clear.
				Unacceptably high back pressure in outlet	Ensure that outlet pressure does not exceed 1200 mbar.
				Pump does not run at the rated rotational speed of 210 Hz.	Set target speed of 210 Hz (using X104 RS-485 interface). Contact Leybold Service.
Error message in the display	<i>SEr</i>		Service Alarm	Pump service countdown has expired.	Pump service required.
	<i>ocA</i>	1	Overcurrent	Short circuit or earthing fault on the output side of the frequency converter	Contact Leybold Service.
	<i>ocd</i>	2			
	<i>ocn</i>	3			
Pump is extremely loud.	-		-	Bearing defective	Contact Leybold Service.
Pump switches off	<i>aH 1</i>	16	Heatsink Overheat	Ambient temperature too high	Set the pump up at a suitable location with a lower ambient temperature.
	<i>aH 3</i>	24		Cooling air supply or discharge impeded	Ensure sufficient cooling air supply or discharge.
			Ventilator defective	Contact Leybold Service.	
			Pump cooling fins blocked by dirt	Contact Leybold Service.	
			Gas temperature too high	Check the system.	
Pump switches off	<i>aL</i>	21	Motor Overload	Bearing defective	Contact Leybold Service.
	<i>EaL 1</i>	22		Foreign bodies, particles or process deposits are blocking the rotor.	Contact Leybold Service.
Pump switches off	<i>Lun</i>	13	DC Under-voltage	The voltage on the DC bus fell for longer than two seconds. (The power supply dropped or is too weak.)	Check the power supply. Ensure that the power supply is sufficiently strong. Remove the pump from the mains supply for at least 10 seconds and restart.

Troubleshooting

Malfunction	Error message	Error code (MODBUS)	Brief Description	Likely cause	Remedy
Pump does not start.	-		-	No mains voltage present	Check mains power supply. Set the mains switch on the pump to 1.
				Mains cable defective or not correctly inserted	Check the pump's power supply.
				If operating using the start-stop switch: the plug supplied is not connected to the X1 control interface, or pins 8 and 9 are not bridged.	Connect the plug supplied, with a bridge between pins 8 and 9, to the X1 control interface.
				If operating using the X1 control interface: start-stop button is not set to "start".	Set start-stop switch to "start".
				Drive defective	Contact Leybold Service.
Pump does not start.	<i>LUS</i>	14	DC Under-voltage or Controller Under-voltage"	Input voltage too low	Compare the voltage range on the pump's nameplate with the available mains voltage, and connect the pump to a power supply at the correct voltage.
Pump does not start or switches off.	<i>LUS</i>	14	Controller Under-voltage	Voltage too low for controlling the frequency converter	Disconnect the pump from the mains for at least 10 seconds and restart.
Pump does not start or switches off.	<i>LUS</i>	14	DC Charge Circuit Fault	Charging circuit for DC bus is defective.	Disconnect the pump from the mains for at least 10 seconds and restart.
Pump does not start or switches off.	<i>oud</i> <i>oun</i>	8	DC Over-voltage	DC bus voltage was too high.	Compare the voltage range on the pump's nameplate with the available mains voltage, and connect the pump to a power supply at the correct voltage.
		9		The rundown time is too short. Unstable motor controller Input voltage is too high.	
Pump does not reach nominal speed 210 Hz	-		-	Inlet pressure > 50 mbar	Close the pump inlet and check the rotational speed on the display.
				Outlet blocked	Ensure the pump outlet is clear.
				Unacceptably high back pressure in outlet	Ensure that outlet pressure does not exceed 1200 mbar.
Others					Contact Leybold Service.

7 Waste Disposal

The pump 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 pumps according to their materials, and dispose of these accordingly. We offer this service. Further details are available on request.

When sending us a pump, observe the regulations given in the Section “Leybold Service”.

WARNING



8 Certificates

The ECODRY have been tested by the TÜV Rheinland of North America according to the requirements of

- IEC 61010-1:2010 (Third Edition)
- UL 61010-1:2012
CAN/CSA-C22.2

The TÜV Rheinland of North America is a “Nationally Recognized Testing Laboratory” (**NRTL**) for the USA and Canada.



C

U S

EU Declaration of Conformity

(Translation of original Declaration of Conformity)

The manufacturer: Leybold GmbH
Bonner Strasse 498
D-50968 Köln
Germany

herewith declares that the products specified and listed below which we have placed on the market, comply with the applicable EU Directives. This declaration becomes invalid if modifications are made to the product without agreement of Leybold GmbH.

Product designation: Multi-stage Roots vacuum pump
Type designation: ECODRY 40 plus ECODRY 65 plus
Part numbers: 161040YXX 161065YXX
XX = 00..99; Y = S,V

The products comply with the following Directives:

Machinery Directive (2006/42/EC)

The safety objectives of the Low Voltage Directive 2014/35/EU are complied with in accordance with Appendix 1 No. 1.5.1 of Machinery Directive 2006/42/EC.

Electromagnetic Compatibility (2014/30/EU)

Directive RoHS (2011/65/EU)

The following harmonized standards have been applied:

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

EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use — Part 1: General requirements


EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use — EMC requirements — Part 1: General requirements
Emissions: Group 1, Class B
Immunity: Industrial electromagnetic environment


EN 50581:2012 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Documentation officer: Leybold GmbH, Bonner Straße 498, D-50968 Köln
Herbert Etges
T: +49(0)221 347 0
F: +49(0)221 347 1250
documentation@leybold.com

Cologne, May 11, 2018

Cologne, May 11, 2018


i.V. Dr. Thomas Dreifert
Head of Engineering
Cologne Product Company


i.V. Martin Laerbusch
Head of Production Systems
Cologne Product Company

Document No.: 300579067-002-A5

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 Leybold 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:40%;"></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:20%;"></th> <th style="width:10%; text-align: center;">No¹⁾</th> <th style="width:10%; text-align: center;">Yes</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>toxic</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>2. Drained (Product/service fluid)</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></td> <td>corrosive</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;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> <td>flammable</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;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> <td>explosive ²⁾</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td colspan="4">If yes, which cleaning agent</td> <td></td> <td>radioactive ²⁾</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td colspan="4">and which method of cleaning</td> <td></td> <td>microbiological ²⁾</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td colspan="4">¹⁾ If answered with "No", go to D. ←</td> <td></td> <td>other harmful substances</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>			No ¹⁾	Yes	No		No ¹⁾	Yes	1. Has the equipment been used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	→	toxic	<input type="checkbox"/>	<input type="checkbox"/>	2. Drained (Product/service fluid)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		corrosive	<input type="checkbox"/>	<input type="checkbox"/>	3. All openings sealed airtight	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		flammable	<input type="checkbox"/>	<input type="checkbox"/>	4. Purged	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		explosive ²⁾	<input type="checkbox"/>	<input type="checkbox"/>	If yes, which cleaning agent					radioactive ²⁾	<input type="checkbox"/>	<input type="checkbox"/>	and which method of cleaning					microbiological ²⁾	<input type="checkbox"/>	<input type="checkbox"/>	¹⁾ If answered with "No", go to D. ←					other harmful substances	<input type="checkbox"/>	<input type="checkbox"/>
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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



Pioneering products. Passionately applied.

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