



ECODRY plus / ECODRY He plus Multi-stage Roots vacuum pump

Instruction manual

Operating instructions 300758785_002_C3

Part numbers

161040V21

161040V22

161065V21

161065V22

161065V31

161065V32



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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. For manual enquiries, email documentation@leybold.com.

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1 Safety and compliance

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 instruction manual is an important safety document that we often deliver digitally. It is your responsibility to keep the instruction manual available and visible while working with the equipment. Please download the digital version of the instruction manual for use on your device or print it if a device will not be available.

1.1 Definition of Warnings and Cautions

Important safety information is highlighted as warning and caution instructions which are defined as follows. Different symbols are used according to the type of hazard.

WARNING:

If you do not obey a warning, there is a risk of injury or death.

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.

1.2 Trained personnel

For the operation of this equipment “trained personnel” are:

- skilled workers with knowledge in the fields of mechanics, electrical engineering, pollution abatement and vacuum technology and
- personnel specially trained for the operation of vacuum pumps

Safety and compliance

1.3 Safety symbols

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

The safety symbols that we use on the product or in the product documentation have the following meanings:

	Warning/Caution Risk of injury and/or damage to equipment. An appropriate safety instruction must be followed or a potential hazard exists.
	Warning - Corrosive substances Risk of injury or damage to equipment. Identifies the presence of corrosive gases, liquids or materials.
	Warning - Dangerous voltage Risk of injury. Identifies possible sources of hazardous electrical shock.
	Warning - Flammable material Risk of fire. Identifies possible sources of flammable gases, liquids or materials.
	Warning - Hot surfaces Risk of injury. Identifies a surface capable of inflicting burns through contact.
	Warning - Pressurised Risk of injury or damage to equipment. Identifies equipment containing pressurised gases or liquids.
	Warning - Risk of explosion Risk of injury or damage to equipment. Identifies a situation that could result in an explosion.
	Warning - Toxic material Risk of injury or damage to the environment. Identifies a source of toxic gases, liquid or material.
	Warning - Vacuum hazard Risk of injury. Identifies the source of a dangerous vacuum.
	Mandatory action symbol Failure to comply with this action may result in injury or damage to equipment.
	Warning - Use protective equipment Risk of injury. Use appropriate Personal Protective Equipment (PPE) when performing the task.

Important Safety Information

2 Important Safety Information



NOTICE: 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.

Retain the Operating Instructions for further use.

2.1 Mechanical Hazards



WARNING: VACUUM

Risk of injury. Avoid exposing any part of the human body to the vacuum.

-
1. Select a secure place for the appliance (level surface).
 2. 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.
 3. 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.
 4. 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.
 5. Due to its weight the pump must only be lifted by duly trained and qualified persons.

Important Safety Information

2.2 Electrical hazards

WARNING: HAZARDOUS VOLTAGE

Risk of injury or damage to the equipment.

The protection of the device could be compromised if it is used in a different manner than specified by the manufacturer.

Housing parts must not be opened.

Note the information on the IP type of protection.

Connect the appliance only to a properly and professionally installed mains outlet socket with protective earth connection.

The pump must be operated with a disconnecting device which must be always accessible. The mains connector can be used as the disconnecting device.

The power cord must not show any visible damage.

Do not use extensions or adapters that are not explicitly approved for this device.

Replace the power cord only with a manufacturer-approved replacement part. For approved power cords refer to [Accessories](#) on page 29.



2.3 Thermal Hazards

WARNING: HOT SURFACE

Risk of injury. 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.



2.4 Hazards Caused by Materials and Substances

WARNING: TOXIC MATEREIAL

Risk of injury or damage to the environment. Identifies a source of toxic gases, liquid or material.



WARNING: CORROSIVE SUBSTANCES

Risk of injury or damage to equipment. Identifies the presence of corrosive gases, liquids or materials.



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 [Conforming Use](#) on page 17.

Important Safety Information

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 a purge valve with external gas supply.
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.

2.5 Noise Hazard



WARNING: NOISE HAZARD

Risk of injury. 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

Description

3 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.

Compared to the ECODRY plus, the ECODRY He plus pump offers enhanced leak tightness, making it particularly suitable for Helium 3 and 4 gas recovery and recirculation. It reaches a maximum Helium pumping speed of up to 52 m³/h.

For the same application with other gases such as SF₆, please contact your Applications Support Team. The ECODRY He plus does not have a gas ballast valve and as such it is not suitable to pump condensable vapours. The dimensions and power ratings of both the ECODRY plus and ECODRY He plus variants are identical.

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.

3.1 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 bridge connector for manual operation of the pump.

Table 1. Ordering Data

Description	Part No.
ECODRY 40 plus (100-120 V)	161040V21
ECODRY 40 plus (200-240 V)	161040V22
ECODRY 65 plus (100-120 V)	161065V21
ECODRY 65 plus (200-240 V)	161065V22
ECODRY 65 He plus (100-120 V)	161065V31
ECODRY 65 He plus (200-240 V)	161065V32

4 Technical data

Table 2 Technical data

Pump	ECODRY plus		ECODRY He plus	Tolerance
	40	65	65	
Maximum air pumping speed without gas ballast	40 m ³ /h	55 m ³ /h	55 m ³ /h	± 5 %
Ultimate pressure without gas ballast	< 0.03 mbar			-
Ultimate pressure with gas ballast	< 0.1 mbar		n/a	-
Maximum permissible inlet pressure	1050 mbar*			-
Maximum permissible discharge pressure (relative to ambient)	200 mbar			-
Standard Helium leak rate according ISO 20485, test procedure A.3 (local)	< 10 ⁻⁵ mbar·l/s		n/a	
Standard Helium leak rate according ISO 20485, test procedure A.1 (total)	n/a		< 5·10 ⁻⁸ mbar·l/s	
Water vapour tolerance with gas ballast	20 mbar	20 mbar	n/a	-
Water vapour capacity with gas ballast	300 g/h	500 g/h	n/a	-
Permissible ambient temperature	+5 to +40 °C			-
Storage temperature	-20 to +60 °C			-
Typical noise level without silencer, at ultimate pressure (according to DIN EN ISO 2151)	< 52 dB(A)			-
Relative ambient atmospheric humidity	95%, non-condensing			-
Maximum installation height	up to 3000 m (NHN)*			-
Cooling	Air			-
Leakage current in accordance with IEC 61010-1	< 3.5 mA			-
Contamination level according to IEC 61010	2			-
Overvoltage category according to IEC 61010	II			-
Speed	12600 RPM			-
Protection class	IP 42			-
Intake flange	DN 25	DN 40	DN 40	-
Discharge flange	DN 16			-
Weight, approximately	43 kg			± 1 kg

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

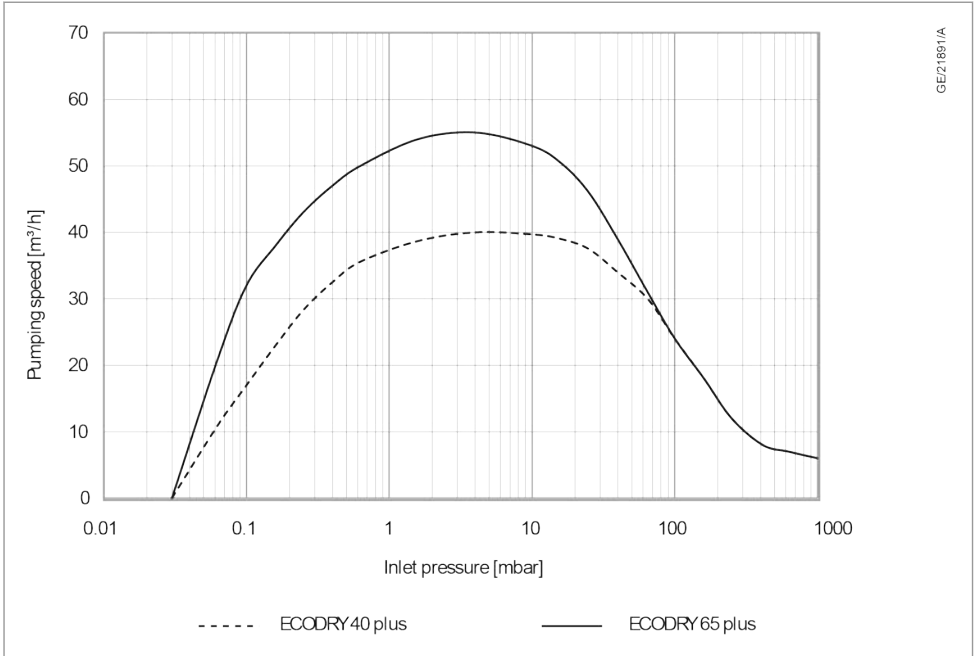
Technical data

4.1 Electrical Data

Table 3. Electrical Data

Description	100-120 V	200-240 V	Tolerance
Rated voltage	100-120 V	200-240 V	± 10 %
Frequency	50/60 Hz	50/60 Hz	± 5 %
Network type	TN		-
Phases	1-ph		-
Rated current	15 A	10 A	-
Rated power	1200 W		-
Mains fusing / characteristic	15 A / slow blow	15 A / slow blow	-
Mains connection	C 20 acc. to IEC 60320		-

Figure 1. Typical pumping speed curves - Air



Technical data

Figure 2. Typical pumping speed curve - Helium

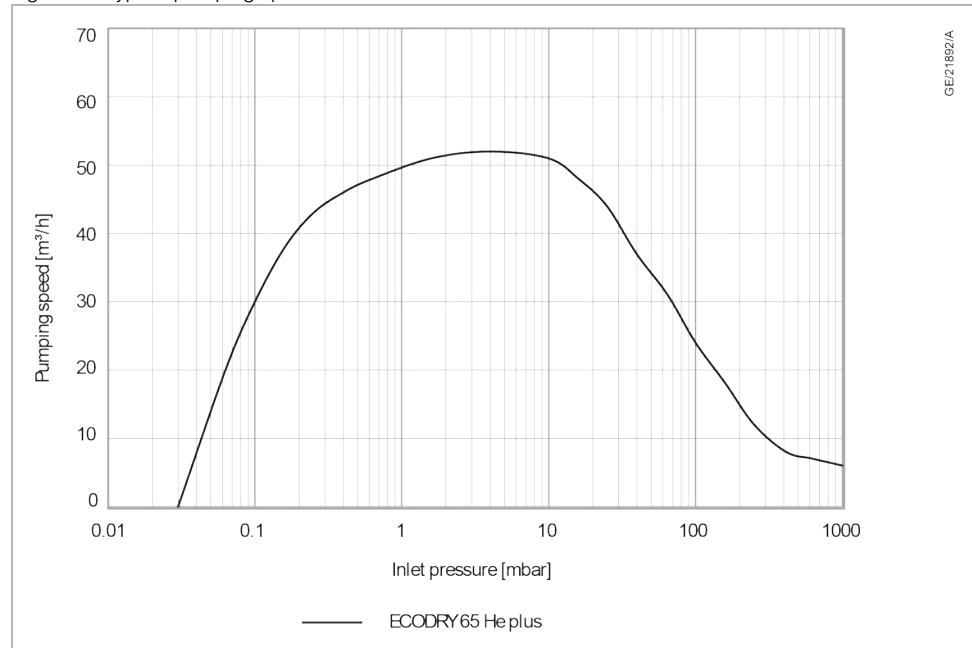
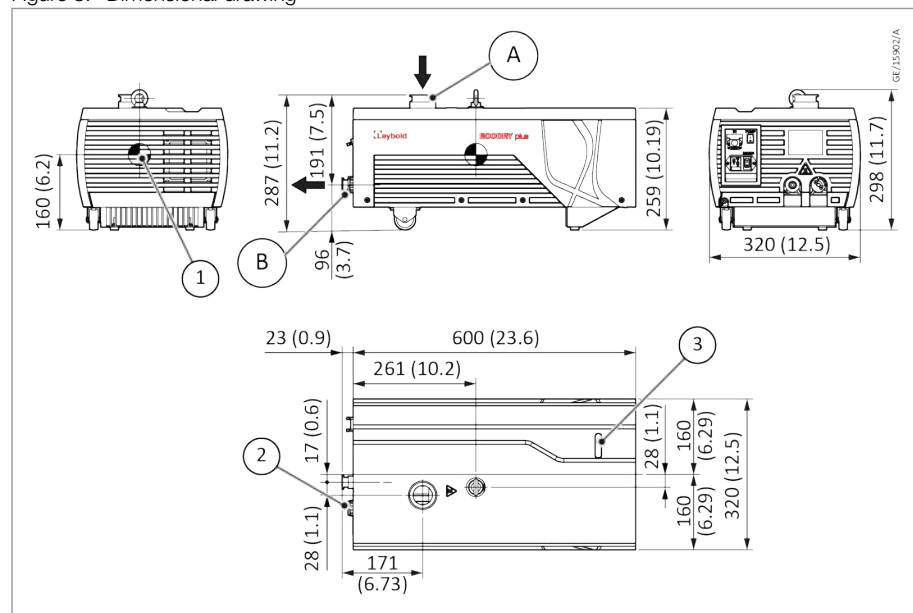


Figure 3. Dimensional drawing



Dimensions are in mm (inch)

- A. ECODRY 40 plus DN 25 ISO KF
ECODRY 65 plus / ECODRY 65 He plus: DN 40 ISO KF
- B. DN 16 ISO KF
- 1. Center of gravity
- 2. Gas ballast (ECODRY plus only)
- 3. Display

Transport

5 Transport

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

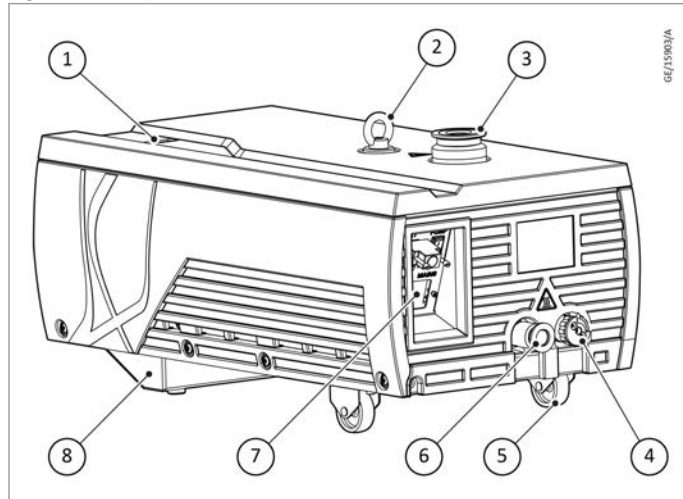
The pump must not be tilted more than 30 degrees during transport.

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

6 Installation

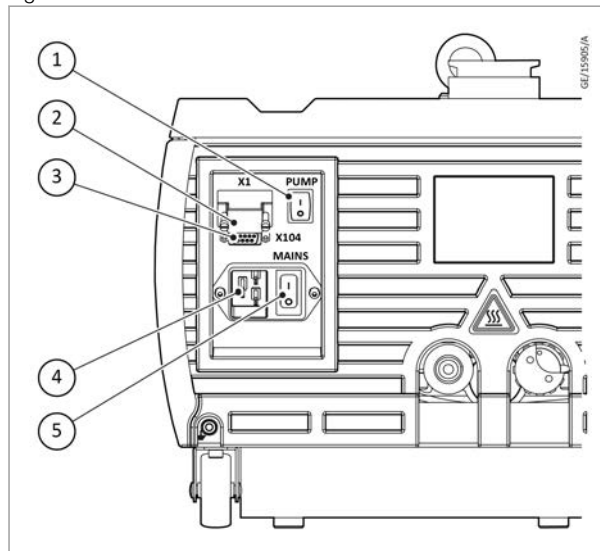
6.1 Overview

Figure 4. Pump overview



- | | |
|---------------------------------------|--|
| 1. Display of the frequency converter | 2. Crane eye |
| 3. Inlet flange | 4. Gas ballast switch (ECODRY plus only) |
| 5. Castors | 6. Exhaust flange |
| 7. Connections and control | 8. Foot |

Figure 5. Connections and control



- | | |
|--------------------------|--|
| 1. Start/Stop switch | 2. Control interface X1 with bridging plug |
| 3. RS 485 interface X104 | 4. Mains connection |
| 5. Mains switch | |

6.2 Conforming Use

The pump 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,

Installation

it is capable of evacuating vessels of vacuum systems down to the medium vacuum range.

The pumps must only be operated indoors.

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 us first) outside the flammability range. The pump is suited for pumping water vapour within the limits given in the technical data.

6.3 Non-conforming Use



WARNING: INSTALLATION SAFETY

Risk of injury or damage to the equipment. Read the safety instructions correctly.

The ECODRY He plus is not suited to operate with condensing gases as the pump is not equipped with a gas ballast valve.

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

The pump 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 us first:

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

When pumping toxic gases replace the gas ballast switch with a plug screw or a purge valve with external gas supply.

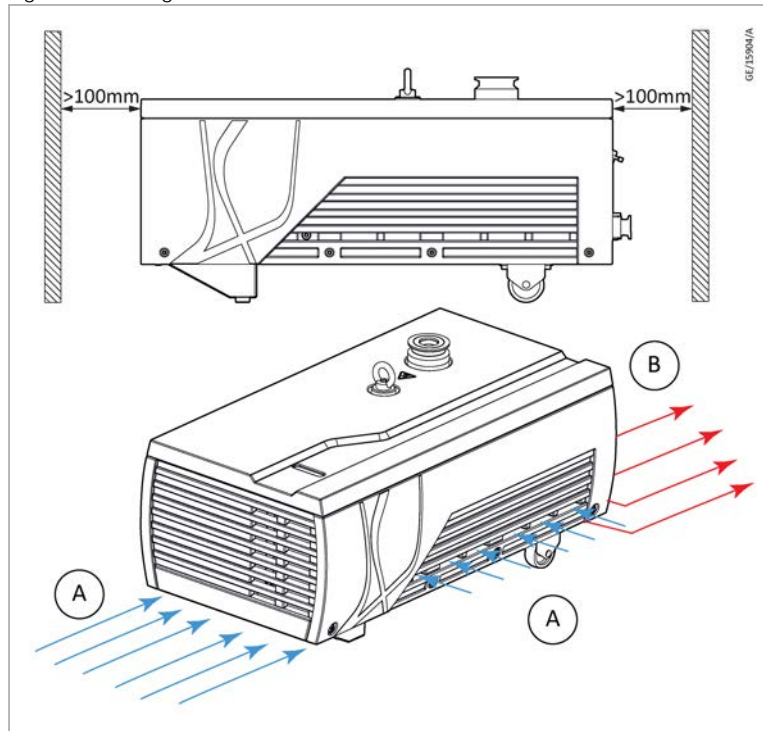
**Globally harmonized system of classification, labelling and packaging of chemicals.*

6.4 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, refer to [Figure: Cooling airflow](#) on page 19

Figure 6. Cooling airflow



Dimensions are in mm

A. Cooling air IN

B. Cooling air OUT (Air temperature < 70 °C)

6.5 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



NOTICE:

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

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

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

Exhaust line



CAUTION: OVERPRESSURE

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.

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.

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.



WARNING: TOXIC SUBSTANCE

Risk of injury. 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.

6.6 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 us.

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 (refer to [Interfaces](#) on page 22).

Figure 7. Electrical Connection



7 Operation



WARNING: EXHAUST CONNECTION

Risk of injury or damage to the equipment. 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.

The pump can be operated either manually or via an interface.

7.1 Manual Operation

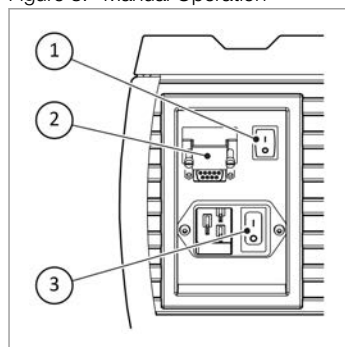
For manual operation, connect the jumper supplied with the unit to the X1 interface.

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.

Figure 8. Manual Operation



- 1. Start/Stop switch
- 3. Mains switch

- 2. Bridge connector

7.2 Interfaces

7.2.1 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 pump 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.

Table 4 Table: Pin assignment X1

Bridge connector (provided with pump) SUB-D 9 (female)		Pump Interface Connector 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 us 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.

7.2.2 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 (refer to [Accessories](#) on page 29).

The following connection parameters are used for communication:

Operation

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

Table 5 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	
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 6 Pin assignment serial interface X104

Customer plug SUB-D 9 (male)		Pump Serial Interface Connector 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	

7.2.3 Frequency converter display

After switching on the FC, the display will show the output frequency in Hz with a preceeding "H".



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

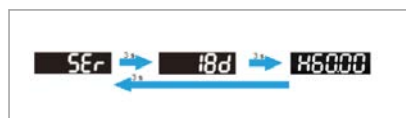


There are several LEDs to indicate the different pump's states:

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).

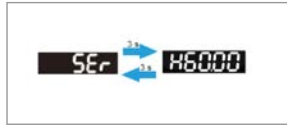
The displays change constantly every 3 seconds:



Operation

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:



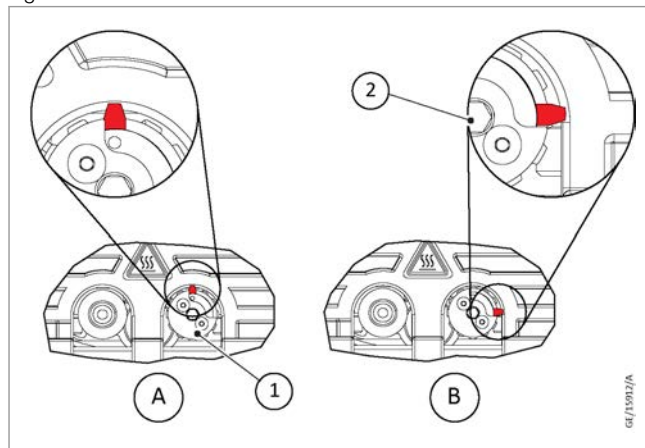
7.3 Gas Ballast (ECODRY plus only)

The pump is equipped with a gas ballast valve that can be opened and closed as shown in [Figure 9](#) on page 26 below.

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.

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

Figure 9. Gas ballast switch



A. Gas ballast open

B. Gas ballast closed

1. The operating area of the gas ballast switch can be distorted contrary to the depiction.

2. Hexagon socket for unscrewing the gas ballast switch

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.

Note

The ECODRY He plus must not be operated with condensing gases as the pump is not equipped with a gas ballast valve.

**NOTICE:**

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 = 6 ± 0.6 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)

Operation

7.4 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



WARNING: HAZARDOUS MATERIAL

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

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.

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 off the MAINS switch and remove the mains plug.

8 Accessories

Table 7. Accessories

Description	Part no.
Mains cables ▪ EU (CEE 7/7 - C19, 2.0 m) ▪ UK (BS 1363 - C19, 2.0 m) ▪ US 100-120 V (NEMA 5-15P - C19, 2.0 m) ▪ US 200-240 V (NEMA 5-15P - C19, 2.5 m) ▪ CN /AU (AS 3112 - C19, 2.0 m)	161 810 EU 161 810 UK 141 103 US 161 810 US 161 810 CN
Inlet screen ▪ DN 40 ISO-KF ▪ DN 25 ISO-KF	E41 170 121 E41 170 206
Casing assembly mounting kit	161 831 A
RS485/USB connecting cable for X104 interface, 1.8 m	161 820 USB
Replacement control interface jumper X1	161 823 A
LEYASSIST software	https://leyassist.leybold.com/
Accessories suitable for ECODRY plus only:	
Plug screw gas ballast	161 832 A
Purge gas adapter	161 833 A
DN16 ISO-KF - 12 mm hose adapter for exhaust flange	182 90

Fault finding

9 Fault finding

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 our service.

Fault finding

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 Unacceptably high back pressure in outlet.	Ensure the pump outlet is clear. 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 our Service.
Error message in the display.	SEr		Service Alarm	Pump service countdown has expired.	Pump service required.
	ocA ocd ocn	1 2 3	Overcurrent	Short circuit or earthing fault on the output side of the frequency converter.	Contact Our Service.
Pump is extremely loud.	–		–	Bearing defective.	Contact Our Service.
Pump switches off.	oH 1 oH 3	16 24	Heatsink Overheat	Ambient temperature too high.	Set the pump up at a suitable location with a lower ambient temperature.
				Cooling air supply or discharge impeded.	Ensure sufficient cooling air supply or discharge.
				Ventilator defective.	Contact Our Service.
				Pump cooling fins blocked by dirt.	Contact Our Service.
				Gas temperature too high.	Check the system.

Fault finding

Malfunction	Error message	Error code (MODBUS)	Brief Description	Likely cause	Remedy
Pump switches off.	oL EoL 1	21 22	Motor Overload	Bearing defective.	Contact Our Service.
				Foreign bodies, particles or process deposits are blocking the rotor.	Contact Our Service.
Pump switches off.	Lun	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.

Fault finding

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 Our Service.

Fault finding

Malfunction	Error message	Error code (MODBUS)	Brief Description	Likely cause	Remedy
Pump does not start.	LuS	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.	LuS	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.	LuS	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.	oud oun	8 9	DC Over- voltage	DC bus voltage was too high. The run-down time is too short. Unstable motor controller. Input voltage is 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.

Fault finding

Malfunction	Error message	Error code (MODBUS)	Brief Description	Likely cause	Remedy
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 Unacceptably high back pressure in outlet.	Ensure the pump outlet is clear. Ensure that outlet pressure does not exceed 1200 mbar.
Others					Contact Our Service.

Storage

10 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.)

11 Disposal



WARNING: CONTAMINATION HAZARD

Risk of injury. 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.

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.

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 [Maintenance and service](#) on page 38.

Maintenance and service

12 Maintenance and service



WARNING: CORROSIVE SUBSTANCES

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.

12.1 Cleaning

If required clean the housing of the pump. Remove dust with a dry cloth and ensure ventilation slots (air in and outlet) are not clogged.

12.2 Service

The pump is maintenance-free. We recommend that a precautionary service (an overhaul at the Our 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 us.

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 us.

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

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

12.3 Return the equipment or components for service

Before you send your equipment to us for service or for any other reason, you must complete a Declaration of Contamination Form. The 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.

If you are returning equipment note the following:

- If the equipment is configured to suit the application, make a record of the configuration before returning it. All replacement equipment will be supplied with default factory settings.
- Do not return equipment 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.

Maintenance and service

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 form, your equipment cannot be serviced.

Certificates

13 Certificates

The ECODRY plus and ECODRY He plus 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.



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EU Declaration of Conformity

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

Leybold GmbH
Bonner Strasse 498
D-50968 Köln
Germany

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

The product specified and listed below:

- **Product:** *Multi-stage roots vacuum pump*
- **Models:** *ECODRY 40 plus* *ECODRY 65 plus* *ECODRY 65 He plus*
- **Part numbers:** *161040VXX* *161065VXX* *161065V3X*
XX = 00..29; 40..99 *XX = 00..29; 40..99* *X = 0..9*

Is in conformity with the relevant Union harmonisation 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 A 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 IEC 61326-1:2021 | Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements |
| EN IEC 63000:2018 | Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances |

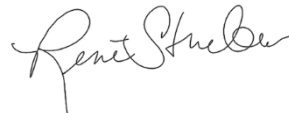
This declaration, based on the requirements of the listed Directives and EN ISO/IEC 17050-1, covers all product serial numbers from this date on: **2025-09-15**

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 Vacuum Division
Burgess Hill



René Rose Stueber – General Manager
Product Company Cologne

ADDITIONAL LEGISLATION AND COMPLIANCE INFORMATION (EU/UK)

EMC (EU, UK): 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 (UKCA equivalent given in brackets).

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 (Table 1-12)
- 6(b) **Lead** as an alloying element in aluminium containing up to 0.4% by weight (Table 1-15)
- 6(c) Copper alloy containing up to 4% **lead** by weight (Table 1-18)

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.

WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (EU, UK)

This product must be disposed of in accordance with the requirements of the WEEE Directive.

ADDITIONAL APPLICABLE REQUIREMENTS

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

Product is certified to CSA-C22.2 No.61010-1-12	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements
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Product is certified to UL61010-1 3 rd Edition	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements
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cTUVus Certificate No.	CU 72302300
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The product is certified by TÜV Rheinland of North America which is a “Nationally
Recognized Testing Laboratory” (NRTL) for USA and Canada.

TSCA PBTs	Regulation of Persistent, Bioaccumulative, and Toxic Chemicals under TSCA Section 6(h) The product does not knowingly or intentionally contain substances in contravention with the above requirements.
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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)	邻苯二甲酸二丁酯 Dibutyl phthalate (DBP)	邻苯二甲酸丁基苄酯 Benzyl butyl phthalate (BBP)	邻苯二甲酸双(2-乙基己基)酯 Bis(2-ethylhexyl) phthalate (DEHP)	邻苯二甲酸二异丁酯 Diisobutyl phthalate (DIBP)
铸铝及铝合金制品 Aluminium alloys	X	O	O	O	O	O	O	O	O	O
钢合金制品 Steel alloys	X	O	O	O	O	O	O	O	O	O
铜管管件 Brass pipe fitting	X	O	O	O	O	O	O	O	O	O
O: 表示该有害物质在该部件的所有均质材料中的含量低于 GB/T 26572 标准规定的限量要求。 O: Indicates that the hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572. X: 表示该有害物质在该部件的至少一种均质材料中的含量超出 GB/T26572 标准规定的限量要求。 X: Indicates that the hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T26572.										

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Pioneering products. Passionately applied.

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