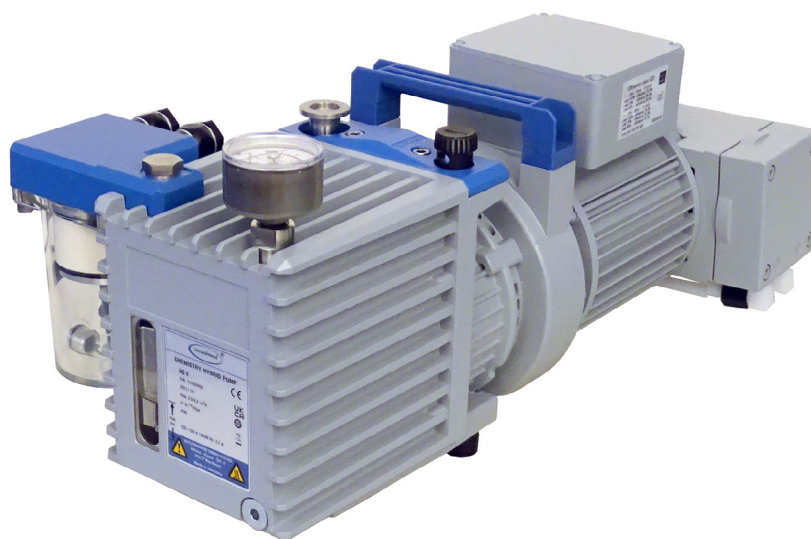


CHEMISTRY-HYBRID-PUMP

RC 6



Instructions for use



Original instructions Keep for further use!

This manual is only to be used and distributed in its complete and original form. It is strictly the user's responsibility to carefully check the validity of this manual with respect to the product.

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*Thank you for purchasing this product from **VACUUBRAND GMBH + CO KG**. You have chosen a modern and technically high quality product.*

TABLE OF CONTENTS

1	Introduction	5
1.1	User information	5
1.2	About this document.	6
1.2.1	Manual structure	6
1.2.2	Display conventions	7
1.2.3	Symbols and icons	8
1.2.4	Handling instructions (action steps).	9
1.2.5	Abbreviations	10
1.2.6	Term definitions.	10
2	Safety information	11
2.1	Usage.	11
2.1.1	Intended use	11
2.1.2	Intended use	11
2.1.3	Improper use.	12
2.1.4	Foreseeable misuse.	13
2.2	Obligations	14
2.2.1	Operator obligations	14
2.2.2	Personnel obligations	14
2.3	Target group description.	14
2.4	General safety information	16
2.4.1	Safety precautions	16
2.4.2	Protective clothing.	16
2.4.3	Laboratory and working materials.	17
2.4.4	Chemical compatibility of materials.	19
2.4.5	Eliminate sources of danger	20
2.5	Motor protection	24
2.6	Disposal	25
3	Product description	27
3.1	Basic configuration of a Chemistry-HYBRID-Pump	28
3.2	Components RC 6	29
3.2.1	Manometer	29
3.2.2	Oil mist separator	30
3.3	Chemistry-HYBRID-Pumps.	31
3.4	Optional accessories	32
3.5	Application example	34
4	Installation and connection	35
4.1	Transport	35
4.2	Set up the vacuum pump	36
4.3	Initial operation – Pouring in pump oil.	38

4.4	Connection	41
4.4.1	Vacuum connection (IN)	41
4.4.2	Outlet connection (OUT)	43
4.4.3	Electrical connection	44
5	Commissioning (operation)	47
5.1	Switch on	47
5.2	Operation	47
5.2.1	Operation with gas ballast	50
5.2.2	Condensate in catchpots	53
5.3	Switch off	54
5.4	Shutdown (storage)	55
6	Troubleshooting	57
6.1	Technical support	57
6.2	Error – Cause – Remedy	58
7	Cleaning and maintenance	63
7.1	Information on maintenance work	64
7.2	Cleaning	67
7.3	Oil change	68
7.4	Replacing diaphragms and valves	73
7.5	Replacing the filter element	80
7.6	Inspecting the safety pop valve	82
7.7	Replacing the device fuses	83
8	Appendix	85
8.1	Technical data	85
8.2	Rating plate	88
8.3	Wetted materials	88
8.4	Ordering information	89
8.5	Service	91
8.6	Index	92
8.7	EC Declaration of conformity	94
8.8	UKCA Declaration of conformity	95

1 Introduction

This manual is part of your product. The manual applies to all versions of the vacuum pump and is intended in particular for laboratory staff.

1.1 User information

Safety

Instructions for use
and safety

- Read this manual thoroughly and completely before using the product.
- Keep this manual in an easily accessible location.
- Correct use of the product is essential for safe operation. Comply with all safety information provided!
- In addition to this manual, adhere to the accident prevention regulations and industrial safety regulations applicable in the country of use.

General

General information

- If passing the product on to a third party, also give them this manual.
- The illustrations in this manual are only intended to facilitate comprehension.
- We reserve the right to make technical changes in the course of continuous product improvement.
- For easier readability, the general term *vacuum pump* is used as an equivalent to and instead of the product name *Chemistry-HYBRID-Pump RC 6*.

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copyright law

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Contact

Contact us

- If your manual is incomplete, you can request a replacement. Alternatively, you can use our download portal: www.vacuubrand.com
- You are welcome to contact us at any time in writing or by telephone if you would like more information, have questions about our products or wish to share feedback with us.
- When contacting our Service Department, please have the serial number and product type at hand → *see **Rating plate on the product***.

1.2 About this document

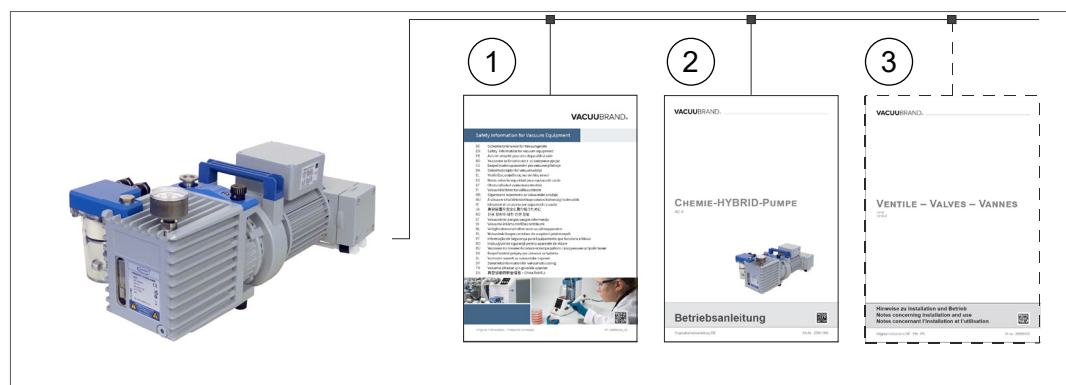
1.2.1 Manual structure

Specific information

The manual has a modular structure with separate instruction modules for the vacuum pump and any accessories.

Instruction modules

Vacuum pump and modular instruction manuals



Description

- 1 Safety information for vacuum equipment
- 2 Description: Vacuum pump – connection, operation, service
- 3 Optional description: Accessories

1.2.2 Display conventions

Warning levels

Presentation
conventions

	DANGER Indicates an imminent hazardous situation. Disregarding the situation could result in extremely serious injury or death. ⇒ Take appropriate action to avoid dangerous situations!
	WARNING Warns of a potentially hazardous situation. Disregarding the situation could result in serious injury or death. ⇒ Take appropriate action to avoid dangerous situations!
	CAUTION Indicates a potentially hazardous situation. Disregarding the situation could result in minor injury or damage to property. ⇒ Take appropriate action to avoid dangerous situations!
NOTE Indicates a potentially harmful situation. Disregarding the situation could result in damage to property.	

Additional notes

IMPORTANT!

- ⇒ Information or specific recommendation which must be observed.
- ⇒ Important information for trouble-free operation of your product.



- ⇒ Helpful tips + tricks
- ⇒ Additional information

1.2.3 Symbols and icons

This manual uses symbols and icons. Safety symbols indicate specific risks associated with handling the product. Symbols and icons are designed to help you identify risks more easily.

Sicherheitssymbole

Explanation
of safety symbols



Hazardous substance – hazards to human health.



General prohibition sign.



General warning symbol.



Warning: hot surface.



Danger: electricity.



General mandatory sign.



Disconnect power plug.



Wear chemical-resistant protective gloves.



Wear protective goggles.

Additional symbols and icons

Additional
symbols



Refers to content in this manual.



Refers to content in other supplementary documents.



Electric/electronic devices must not be disposed of in domestic waste at the end of their service life.



Ensure sufficient air circulation.



Flow arrow
Inlet

1.2.4 Handling instructions (action steps)

Instructions (single step)

Action steps as text ⇒ Perform the step described.

☒ Result of action

Instructions (multiple steps)

1. First step

2. Next step

☒ Result of action

Instructions (shown graphically)

Schematic diagram
Action steps as
graphics



1. First step



2. Next step

☒ Result of action

⇒ Perform the steps in the order described.

1.2.5 Abbreviations

Used Abbreviations

DN	Nominal diameter
FFKM	Perfluoro elastomer
FKM	Fluoroelastomer
IN	Inlet, vacuum connection
KF	Small flange
max.	Maximum
min.	Minimum
NBR	Nitrile butadiene rubber
OUT	Outlet
PBT	Polybutylene terephthalate
PEEK	Polyether ether ketone
PFA	Perfluoroalkoxy
PMP	Polymethylpentene
PPS	Polyphenylene sulfide
PTFE	Polytetrafluoroethylene
PVC	Polyvinyl chloride
Resp	Responsible
RMA no.	Return Merchandise Authorization number

1.2.6 Term definitions

Product-specific terms

Chemistry-HYBRID-Pump	Combination of an oil-sealed, two-stage rotary vane pump and a series-connected chemistry diaphragm pump for optimized corrosion resistance.
Fine vacuum	Pressure range in vacuum technology, from: 1 mbar – 0.001 mbar (0.75 Torr – 0.00075 Torr)
Rough vacuum	Pressure range in vacuum technology, from: atmospheric pressure – 1 mbar (atmospheric pressure – 0.75 Torr)
VACUU·VIEW extended	External vacuum sensor with VACUU·BUS port, 1100 – 0.001 mbar. ► with own plug-in power supply

2 Safety information

The information in this chapter must be observed by everyone who works with the product described here.

The safety information is valid for the entire life cycle of the product.

2.1 Usage

Only use the product if it is in perfect working condition.

Only use the product with oil filling.

2.1.1 Intended use

2.1.2 Intended use

Intended use

The **RC 6** is a combination of an oil-sealed rotary vane pump and a chemistry diaphragm pump for improved corrosion resistance for the fine vacuum range in the laboratory. The diaphragm pump permanently evacuates the oil reservoir of the rotary vane pump, freeing it from corrosive gases and vapors. The vacuum pump may only be used indoors in a dry, non-explosive atmosphere..

Intended use also includes:



- observing the information in the document **Safety information for vacuum equipment**,



- observing the manual,
- complying with all notes on correct vacuum and electrical connections, → see *chapter: 4.4 Connection on page 41*,
- observing the manual of connected components,
- operating the vacuum pump only within its limitation of use, → see *chapter Observe limitation of use on page 37*,
- ensuring adequate ventilation, especially if installing the vacuum pump in a cabinet or a housing, and installing an external automatic ventilation system if necessary,
- observing the maximum permitted gas temperature at the inlet,
- regularly inspecting the vacuum pump according to its operating conditions and have this carried out by qualified personnel,
- regularly replacing wear parts,

- using the vacuum pump and all system parts only for generation of vacuum in vessels designed for that purpose,
- using only original **VACUUBRAND** parts and original or approved accessories or spare parts. The CE mark may be voided if not using original manufacturer's spare parts.

Any other use is considered improper use.

2.1.3 Improper use

Improper
use

Incorrect use or any application which does not correspond to the technical data may result in injury or damage to property.

Improper use includes:

- using the product contrary to its intended use,
- using the product in non-commercial environments, unless the necessary protective measures and precautions have been taken by the company,
- operation under inadmissible environmental and operating conditions,
- operation despite obvious errors, damage, or defective safety devices,
- operation without oil filling,
- unauthorized extensions, conversions, or repairs, in particular when these impair safety,
- the use of unauthorized accessories or spare parts,
- usage despite incomplete assembly,
- operation by insufficiently trained or qualified personnel,
- switching on/off with tools or one's foot,
- operation with sharp-edged objects,
- pulling plug-in connections on the cable out of the socket,
- extracting or conveying solids, dusts, or liquids.

2.1.4 Foreseeable misuse

Misuse In addition to improper use, there are types of use which are prohibited when handling the product:

Prohibited types of use include, in particular:



- use on humans or animals,
- use on equipment and vessels which are not vacuum proof,
- installation and operation in potentially explosive atmospheres,
- pumping of potentially explosive atmospheres,
- use in mines or underground,
- pumping oxidizing and pyrophoric substances, liquids or solids,
- pumping hot, unstable, or explosive media,
- pumping self inflammable substances,
- pumping substances which are inflammable without air,
- pumping substances which may react explosively under impact and/or elevated temperature without an air supply,
- pumping substances which may form deposits inside the vacuum pump,
- pumping liquids,
- unauthorized modifications,
- switching on/off with tools or one's foot,
- operation with sharp-edged objects,
- using the product to generate pressure,
- operation with closed pump outlet,
- fully exposing the product to the vacuum, immersing it in liquids, exposing it to water spray or steam jets.

IMPORTANT!

No foreign bodies, hot gases or flames from the application must be allowed to enter the equipment.

→ see chapter: *8.1 Technical data on page 85.*

2.2 Obligations

2.2.1 Operator obligations

Operator obligations The owner defines the responsibilities and ensures that only trained personnel or specialists work on the product. This applies in particular to connection work and troubleshooting.

Users must have the appropriate qualifications for the listed activities, see ***Responsibility matrix***. In particular work on electrical equipment must be performed only by qualified electricians.

2.2.2 Personnel obligations

Personnel obligations In the case of activities which require protective clothing, personal protective equipment as specified by the operator is to be worn.

If the product is not in proper working order, it must be prevented from being accidentally switched back on.

- ⇒ Always be conscious of safety and work in a safe manner.
- ⇒ Observe instructions issued by the operator, and national regulations on accident prevention and industrial safety.



The way individuals act can help to prevent accidents at work.

2.3 Target group description

Target groups The manual must be read and observed by every person who is tasked with the activities described below.

Qualification description

Personnel qualification

Operator	Laboratory staff, such as chemists, laboratory technicians
Specialist	Person with professional qualification in mechanics, electrical equipment or laboratory devices
Responsible specialist	Specialist with additional specialist, departmental or area responsibility

Responsibility matrix

Responsibility matrix

Activity	Operator	Specialist	Responsible specialist
Transport	x	x	x
Installation	x	x	x
Commissioning	x	x	x
Operation	x	x	x
Drain catchpot	x	x	x
Oil change		x	x
Maintenance		x	x
Replacing the device fuses		x	x
Repair ¹		x	x
Repair order			x
External cleaning	x	x	x
Shutdown		x	x
Decontamination ²		x	x

¹ see also homepage:

VACUUBRAND > Support > [Repair instructions](#)

² Or have decontamination carried out by a qualified service provider.

2.4 General safety information

Quality standard and safety

Products from **VACUUBRAND GMBH + CO KG** are subject to stringent quality testing with regard to safety and operation. Each product undergoes a comprehensive test program prior to delivery.

2.4.1 Safety precautions

Safety precautions

- ⇒ Observe the instructions for all actions as specified in this manual.
- ⇒ Use your product only if you have understood its function and this manual.
- ⇒ Replace defective parts immediately, e.g., a broken power cord, or faulty hoses.
- ⇒ Use only original accessories and components which are designed for the vacuum technology, such as a vacuum hose, vacuum valve, etc.
- ⇒ When handling contaminated parts, follow the relevant regulations and protective measures; this also applies to equipment sent in for repair.

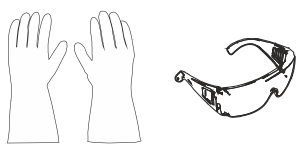
Prior to returning any product to our Service Department for repair, contamination from hazardous substances needs to be excluded.

IMPORTANT!

- ⇒ Therefore, send us the carefully completed and signed [Health and Safety Clearance](#) certificate before sending your product for repair.
-

2.4.2 Protective clothing

Protective clothing



No special protective clothing is required to operate the vacuum pump. Observe instructions issued by the operator for your workplace.

During cleaning, we recommend wearing chemical-resistant protective gloves, protective clothing, and protective goggles.

IMPORTANT!

- ⇒ When handling chemicals and pump oils, wear your personal protective equipment.
-

2.4.3 Laboratory and working materials



DANGER

Hazardous substances could be discharged at the outlet.

The discharge from the pump invariably contains the pumped gases or vapors. During pump down, hazardous, chemically aggressive, or toxic substances at the outlet can get into the ambient air.

- ⇒ Observe the relevant safety regulations for safe handling of hazardous substances.
- ⇒ Please note that residual process media may pose a danger to people and the environment.
- ⇒ Use appropriate accessories to protect personnel, environment, and the vacuum pump:
Mount and use suitable separators, cold traps, filters, or fume hood devices.

- ⇒ In case of a leak in the manifold or at the shaft seal of the rotary vane pump, or in case of a diaphragm crack of the diaphragm pump, pumped substances might be released into the environment or into the pump housing or motor.
Prevent the release of hazardous, toxic, explosive, corrosive fluids, gases, or vapors or those that are harmful to health or the environment, or of oil vapors, for example through suitable laboratory facilities with a fume hood and ventilation control.

	DANGER
	Occurrence of explosive mixtures in the vacuum pump or at the outlet. Mechanically generated sparks (e. g., in case of a diaphragm failure), hot surfaces, or static electricity may ignite explosive mixtures. ⇒ Prevent any formation of explosive mixtures in the pump or at the outlet of the pump. ⇒ Avoid explosive conditions when compressing explosible and flammable substances or mixtures. ⇒ Connect inert gas for gas ballast or venting. ⇒ Attention: The gas ballast of the diaphragm pump is permanently active. ⇒ Drain appropriately or otherwise remove any potentially explosive mixtures at the outlet of the pump. ⇒ Dilute any potentially explosive mixtures at the outlet of the pump to non-explosive concentrations.

- ⇒ Comply with applicable regulations when disposing of chemicals. Take into consideration that chemicals may be contaminated.
- ⇒ Wear your personal protective equipment and take precautions to avoid contact with the skin, inhalation, and possible irritations.

Hazards due to different substances

Pumping different
substances

Pumping different substances or media can cause the substances to react with one another.

- ⇒ Be aware of interactions and possible chemical reactions of the pumped media.
- ⇒ Purge the vacuum pump with ambient air or inert gas before changing the medium to be pumped. Thereby you will pump residues out of the vacuum pump and reduce the possibility of reactions of the pumped substances with each other and with the pump's materials.

2.4.4 Chemical compatibility of materials

	CAUTION
	Deposits and condensate inside the vacuum pump. Deposits and condensate in the pump may lead to increased temperatures even to the point of exceeding the maximum permitted temperatures. Deposits may cause seizing of the pump unit. ⇒ Check the inlet and outlet of the vacuum pump for deposits. ⇒ Check the oil condition. ⇒ Inspect the pump unit of the rotary vane pump and the pump chamber of the diaphragm pump regularly, if there is a danger of forming deposits inside the vacuum pump. Clean the pump unit and the pump chamber if necessary.

Working materials which get into the vacuum pump with the gas flow can damage the vacuum pump. Substances can be deposited in the vacuum pump.

Compatibility of the vacuum pump with pumped substances

- ⇒ Check the compatibility of the pumped substances with the wetted materials of the vacuum pump
→ *see chapter: 8.3 Wetted materials on page 88.*
- ⇒ Install a cold trap in front of the vacuum pump if pumping aggressive or corrosive gases or vapors, or if the thermodynamic conditions of the application are such that vapors could condense in the rotary vane pump.
- ⇒ In case, install an in-line valve or a shut-off valve in the inlet line to isolate your application from the vacuum pump until the pump has reached its operating temperature.

2.4.5 Eliminate sources of danger

Connect the tubing correctly

Avoid overpressure

No inadmissible pressure must be created at the vacuum pump outlet, → *see chapter 8.1 Technical data on page 85.*

- ⇒ Always ensure that the outlet line is clear and has no back pressure. The outlet must not be blocked, to ensure that gases can exit freely.
- ⇒ Prevent uncontrolled overpressure (e.g., due to a locked or blocked piping system, condensate, or clogged outlet line).
- ⇒ Do not operate the pump with closed outlet. Closing the outlet during operation may cause damage to pump or components next in line.
- ⇒ Due to the high compression ratio, the pump may generate overpressure at the outlet. Check pressure compatibility with system components (e. g., exhaust pipeline) at the pump outlet.
- ⇒ At the gas connections, the connections for the inlet and outlet must not be mixed up.
- ⇒ Hose connections at the vacuum pump inlet and outlet must always be gas tight.
- ⇒ Observe the maximum pressures at the inlet and outlet of the vacuum pump, as specified in chapter **8.1 Technical data on page 85.**
- ⇒ The system to be evacuated as well as all hose connections must be mechanically stable.
- ⇒ Attach hoses to hose nozzles so that they do not come loose unintentionally.

Usage of pump oil

Usage of pump oil The rotary vane pump is oil-sealed.



WARNING

Oil vapors at the outlet of the vacuum pump.

Even if the pumped medium is only air or a pure gas, the discharge from rotary vane pumps will contain small quantities of oil vapor and petroleum fractions. These substances are particularly contaminating in closed spaces or in case of insufficient ventilation.

- ⇒ Ensure that the pump location is well ventilated.
- ⇒ Do not inhale oil vapors.
- ⇒ Connect a gas-tight exhaust line at the pump outlet. Always vent exhaust gases appropriately, e. g., into a fume hood.
- ⇒ Prevent any dangerous reactions with oil or oil vapors and the formation of impermissible or dangerous emissions.

- ⇒ Comply with all relevant statutory requirements and regulations concerning the handling, storage and disposal of oil.
- ⇒ Do not allow oils to enter the drainage system or other bodies of water.
- ⇒ Do not spill oil. Clean up spilled oil immediately. Spillage can cause accidents (slip hazard)!
- ⇒ Operate the vacuum pump only with oil filling.
- ⇒ The vacuum pump is supplied without oil filling. Before starting the pump for the first time, pour in the supplied pump oil, → see *chapter: 4.3 Initial operation – Pouring in pump oil on page 38*.
- ⇒ Check the oil level through the sight glass every time before starting the vacuum pump.
- ⇒ Check the pump's oil level and the condition of the oil on a regular basis, → see *chapter: Oil level check on page 48*.
- ⇒ Use only oil of the recommended type. Other oils or operating fluids may cause damage of the pump or danger.
- ⇒ Wear your personal protective equipment when working with pump oils to avoid contact with the skin and possible irritations.



Prevent condensate return

Condensate in the outlet line

Condensate in the outlet line can damage the vacuum pump. Condensate must not flow back into the outlet or vacuum pump through the hose line. Liquid must not accumulate inside the outlet line.

⇒ Preferably route the outlet line with a fall from the outlet, i.e., running downward so that no backup forms.

Prevent foreign bodies inside the pump

Foreign bodies

Particles, liquids, and dust must not enter the vacuum pump.

⇒ Do not pump any substances which could form deposits inside the vacuum pump.

⇒ Install suitable filters upstream of the inlet. Suitable filters are chemically resistant, clog-proof and have a reliable flow rate, for example.

⇒ Replace porous vacuum hoses without delay.

Hazards during venting

Hazards during venting

If the manual gas ballast valve of the rotary vane pump is open, a power failure or switching off the pump may cause accidental ventilation of the pump or the vacuum system.

⇒ Install a solenoid operated gas ballast valve to avoid accidental ventilation.

Dangers due to automatic restart

Dangers due to automatic restart of the vacuum pump

The vacuum pump restarts automatically when the power supply is switched off and then back on, e.g.:

- after a power failure,
- after switching the vacuum pump off and on,
- after disconnecting and reconnecting the power plug.

An ongoing process starts automatically when the power supply is disconnected and reconnected.

⇒ Ensure that the automatic restart of the process does not pose any danger to persons or equipment.

⇒ Take appropriate safety precautions (e.g., shut-off valve, relay switch, protection against restart) if an automatic restart of the vacuum pump can lead to a dangerous situation.

Hazards due to residual energy

Hazards due to residual energy

After the vacuum pump has been switched off and disconnected from the power supply, there may still be dangers due to residual energy:

- Thermal energy: engine waste heat, compression heat.
- Electrical energy: Motor capacitors have a discharge time of up to 5 seconds.

Please note the following before performing actions:

- ⇒ Let the vacuum pump cool down
- ⇒ Wait until the capacitors have discharged.

Hazards due to hot surfaces or overheating

Hot surfaces, overheating

	CAUTION
	Risk of burns from hot surfaces In case of failure the pump surface can heat up to temperatures above 221 °F (105 °C). ⇒ Provide a suitable contact guard to protect yourself from accidental contact with hot surfaces. ⇒ Wear adequate personal protective equipment, if necessary. ⇒ Ensure the cooling-down of the vacuum pump prior to any further work.
	CAUTION
	Risk of burns from hot surfaces Depending on operation conditions and ambient conditions dangers due to hot surfaces may arise. ⇒ Avoid direct contact with the surface or wear heat-resistant safety gloves if contact cannot be excluded. ⇒ Provide contact protection if the surface temperature should be elevated on a regular basis.

The vacuum pump can be damaged due to overheating. Possible causes include insufficient air supply to the fan, failure to maintain minimum distances, ambient temperature outside the specified operating conditions.

- ⇒ When installing the product, ensure that there is a minimum distance of 5 cm between the vacuum pump and adjacent parts (such as the housing, walls, etc.).
- ⇒ Ensure that there is always sufficient air supply to the fan, especially if installing the vacuum pump in a cabinet or a housing. Install an external automatic ventilation system if necessary.
- ⇒ Check the fan regularly for dirt.
- ⇒ Clean soiled fan guard grills.
- ⇒ Clean the vacuum pump regularly from external soiling and deposits to avoid an increase of the pump's operating temperature, → *see chapter: 7.2 Cleaning on page 67.*
- ⇒ Avoid excessive heat input due to hot process gases.
- ⇒ Observe the maximum admissible media temperature
→ *see chapter: 8.1 Technical data on page 85.*

Keep signs legible

Labels and signs

Keep any signs affixed to the product in an easily readable condition:

- ⇒ Labels
- ⇒ Rating plates

2.5 Motor protection

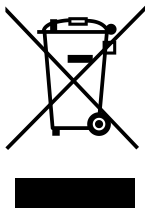
Overheating protection

The pump motor is equipped with a self-hold thermal cutout in the winding as overload protection. In case of excess temperature the vacuum pump switches off.

	CAUTION Impaired lock of the thermal cutout in case of supply voltage below 115 VAC. In case of supply voltage below 115 V, the lock of the thermal cutout might be impaired. The pump may re-start on its own after sufficient cooling down. ⇒ In case of excess temperature, switch off the vacuum pump or disconnect the pump from the power source to avoid an automatic restart.
---	---

If the vacuum pump is switched off due to these safety precautions, the error must be cleared manually: Unplug vacuum pump from power supply → eliminate cause of error → allow the vacuum pump to cool down sufficiently → switch the vacuum pump back on.

2.6 Disposal



NOTE

Electronic devices must not be disposed of in domestic waste at the end of their service life.

Used electronic devices contain harmful substances that can cause damage to the environment or human health. Disused electrical devices also contain valuable raw materials, which can be recovered for reuse if the device is disposed of correctly within the recycling process.

End users are legally obliged to take used electric and electronic devices to a licensed collection point.

- ⇒ Correctly dispose of all electronic scrap and electronic components at the end of their service life.
- ⇒ Observe the national regulations regarding disposal and environmental protection.

3 Product description

Product description The ***Chemistry-HYBRID-Pump RC 6*** is a four-stage vacuum pump consisting of an oil-sealed, two-stage rotary vane pump with a series-connected two-stage diaphragm pump. The two units are mounted on a common shaft and are connected directly to the drive motor. The dry-running compressor-type diaphragm pump evacuates the headspace of the oil reservoir of the rotary vane pump, thus considerably increasing the latter's maximum vapor inlet pressure and chemical resistance.

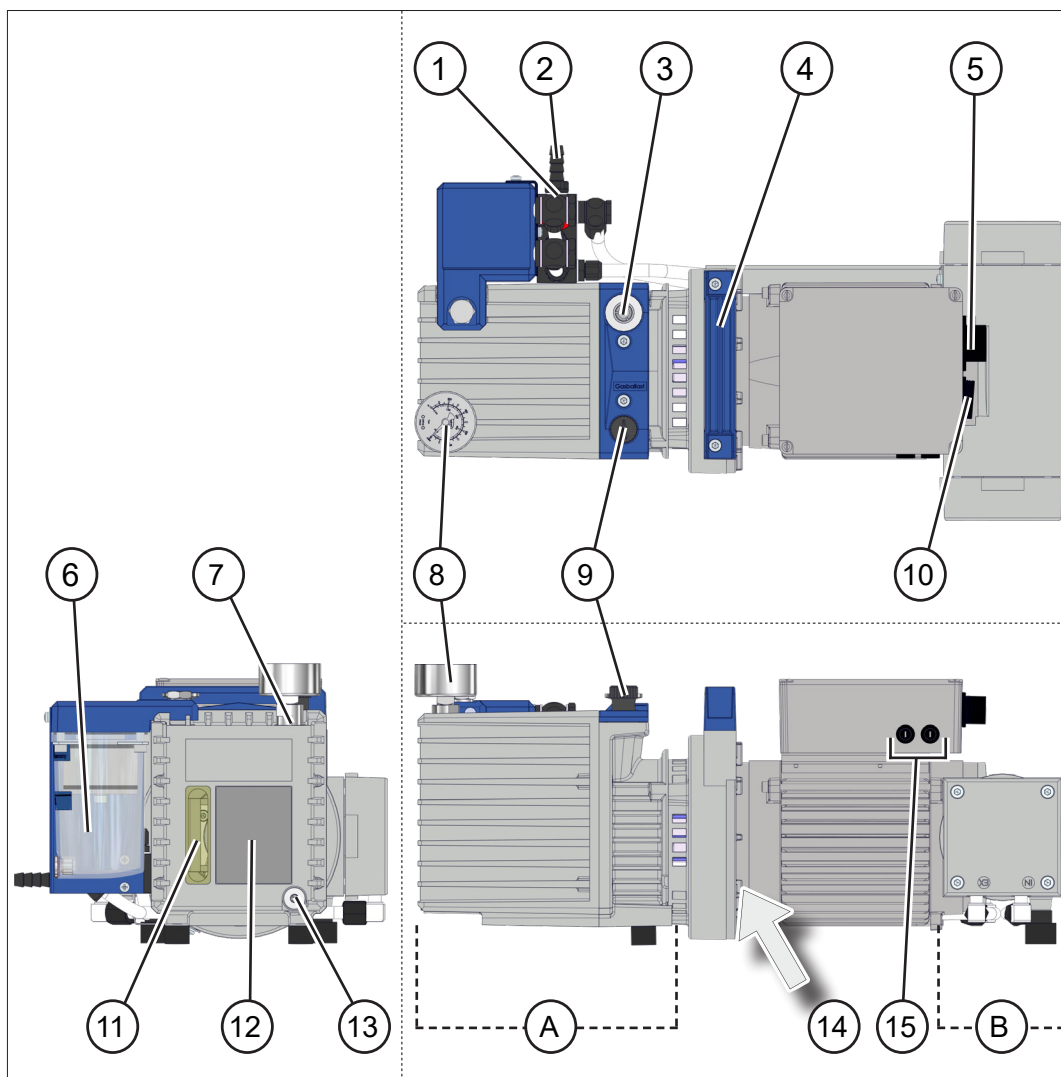
With the gas ballast valve closed, the rotary vane pump shuts off vacuum tight. This, in turn, prolongs the intervals between oil changes and improves corrosion resistance. The oil system incorporates an oil pump; this forced-lubrication system ensures an adequate supply of oil to the pump unit even at high inlet pressures. A mechanical retaining valve in the oil system prevents oil suck-back into the vacuum system.

The oil mist filter of the rotary vane pump removes 99 % of the oil mist. If an exhaust waste vapor condenser is fitted (available on request), the vapors handled by the pump can be condensed to a large extent and either be recycled or disposed of in accordance with regulations.

3.1 Basic configuration of a Chemistry-HYBRID-Pump

Views and basic configuration

Views and basic configuration



Description

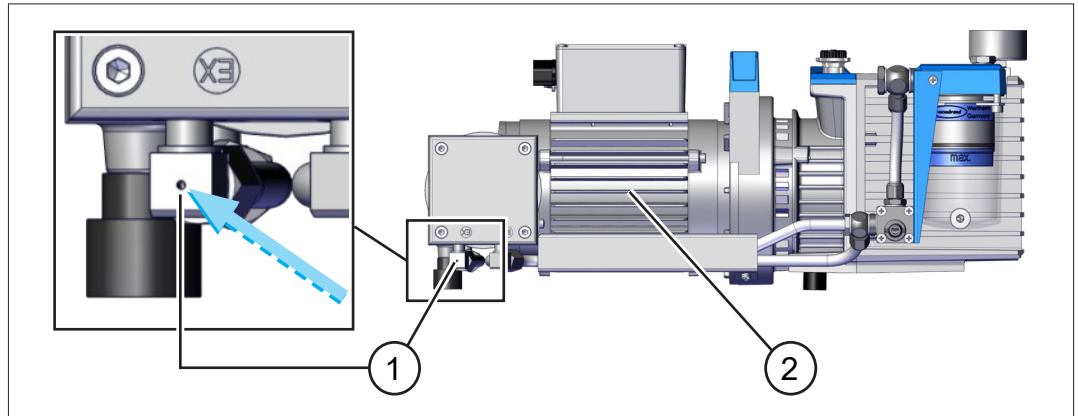
- | | |
|----|---|
| 1 | Outlet (OUT) |
| 2 | Safety pop valve inside the distributor block (at outlet) |
| 3 | Inlet (IN), vacuum connection |
| 4 | Handle |
| 5 | Power connection |
| 6 | Oil mist separator |
| 7 | Oil inlet |
| 8 | Manometer for oil reservoir pressure control |
| 9 | Manual gas ballast valve |
| 10 | ON/OFF switch |
| 11 | Sight glass for oil level |
| 12 | Rating plate with min. / max. mark for oil level |
| 13 | Oil drain plug / Oil outlet |
| 14 | Fan / ventilation slots |
| 15 | Device fuse – only 100 – 120 V version |

- A** Rotary vane pump
- B** Chemistry diaphragm pump

Permanent gas ballast

Permanent gas
ballast of diaphragm
pump

The gas ballast of the diaphragm pump is permanently active.



Description

- 1** Permanent gas ballast of the diaphragm pump
- 2** Vacuum pump

3.2 Components RC 6

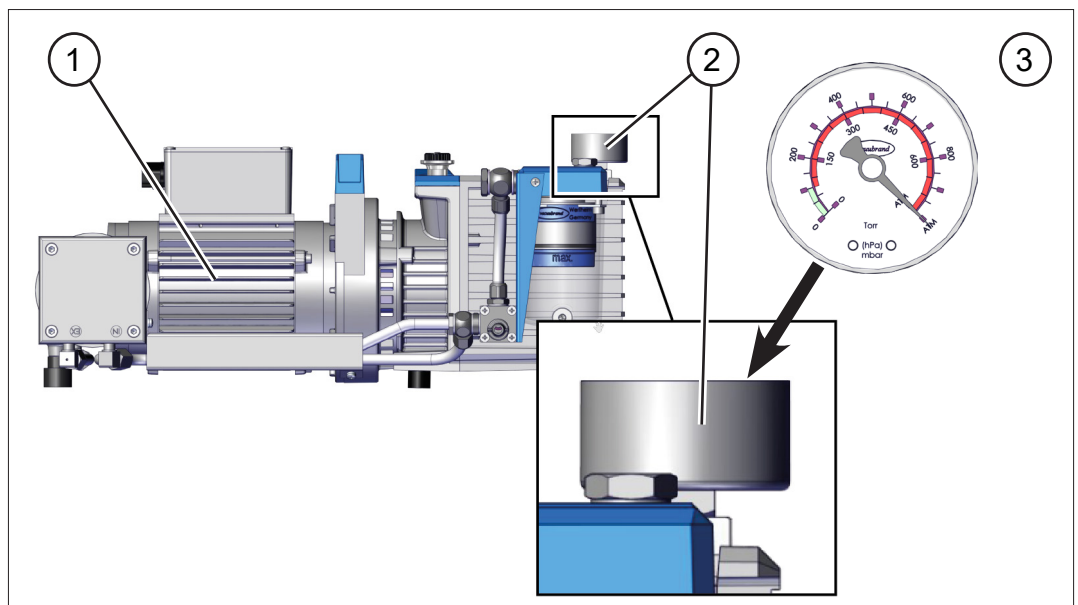
3.2.1 Manometer

Pressure display oil
reservoir
Oil inlet plug

The manometer indicates the pressure inside the oil reservoir of the rotary vane pump. Moreover, the oil inlet is closed by the manometer's thread.

Pressure display oil reservoir

Detailed view
manometer



Description

- | |
|-----------------------------|
| 1 Vacuum pump |
| 2 Manometer |
| 3 Manometer dial (top view) |

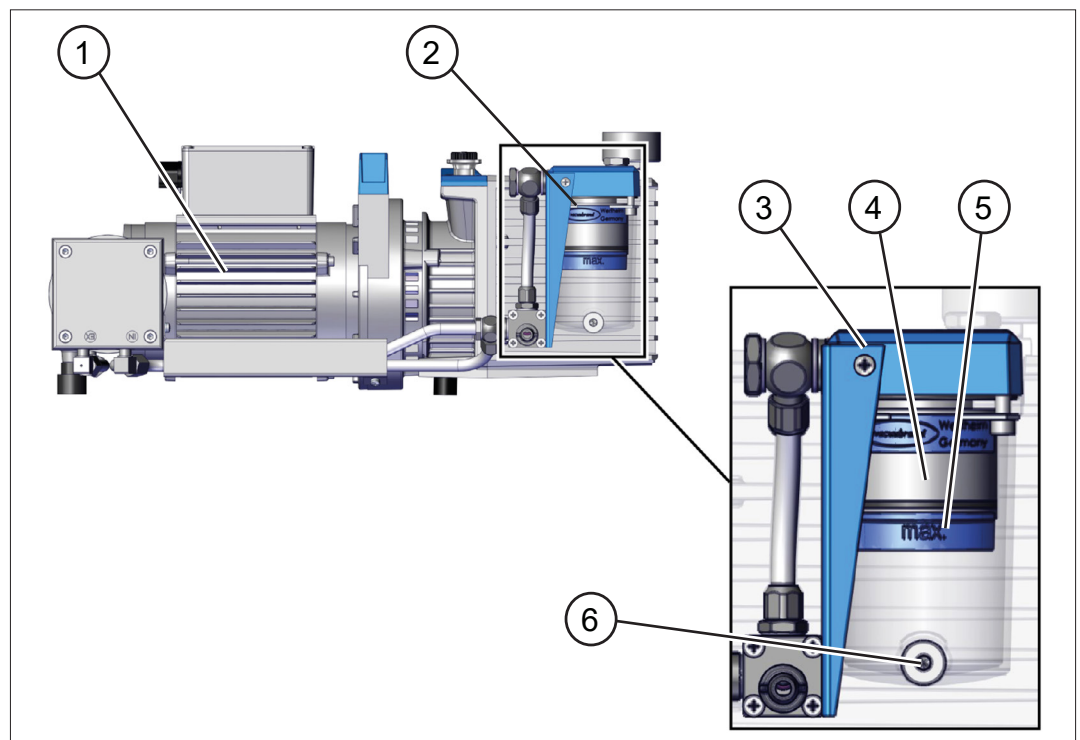
3.2.2 Oil mist separator

Oil mist separator at outlet

The vacuum pump is filled with oil. The oil mist separator at the outlet of the rotary vane pump removes 99 % of the oil mist. The max. mark indicates the maximum permissible filling level in the catchpot. Drain the catchpot using the drain plug.

Oil mist separator

Detailed view oil mist separator



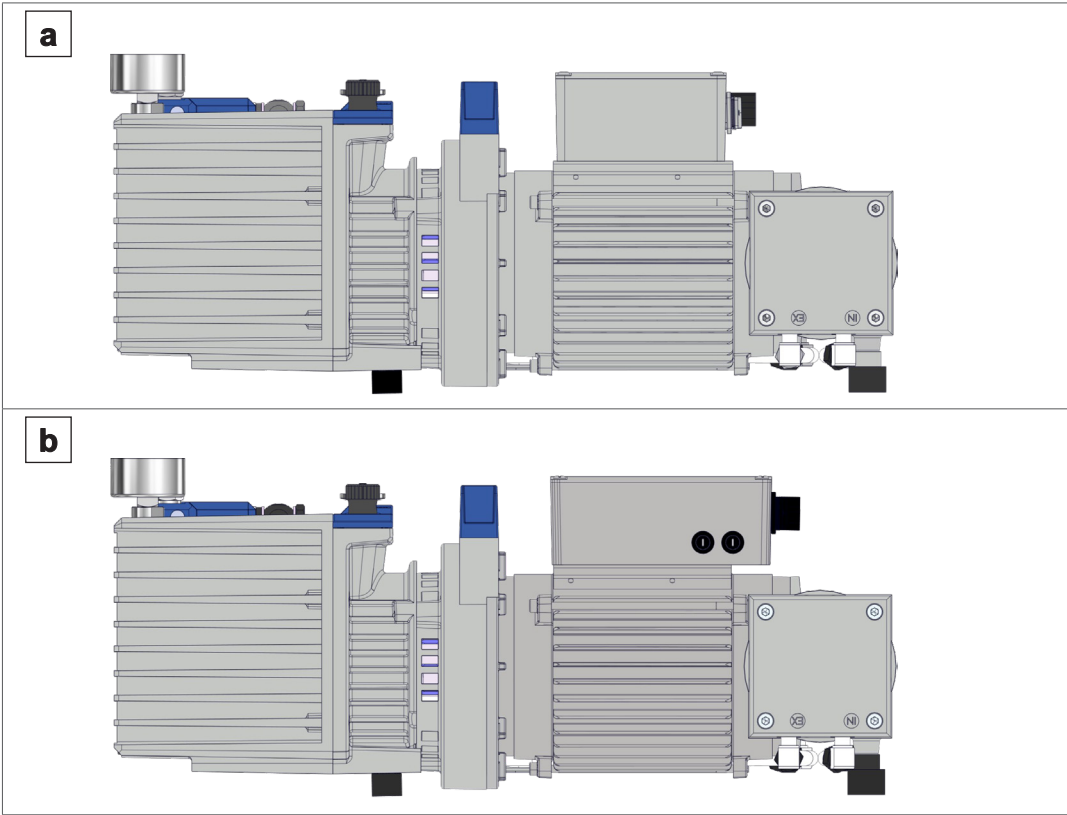
Description

- | |
|---------------------------|
| 1 Vacuum pump |
| 2 Oil mist separator |
| 3 Holder |
| 4 Filter element |
| 5 Catchpot with mark max. |
| 6 Drain plug |

3.3 Chemistry-HYBRID-Pumps

Voltage versions

Overview
Chemistry-HYBRID-
Pumps



Description

Chemistry-HYBRID-Pump	Voltage version
a RC 6	230 V
b RC 6	100 – 120 V

3.4 Optional accessories

Optional accessories
for the vacuum
pump

Separator, vacuum valves, and a solenoid operated gas ballast valve are available as separate accessories to be mounted at the vacuum pump, → *see also chapter: 8.4 Ordering information on page 89.*

Separator AK

The separator AK at the inlet retains droplets and particles and protects the recipient against back flow of pump oil. The separator is mounted directly on the inlet port.

Shut-off valve

Ball valve VKE for connection via small flange KF DN 16

Vacuum valve

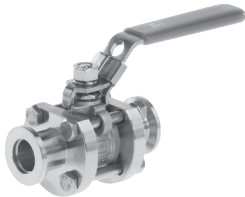
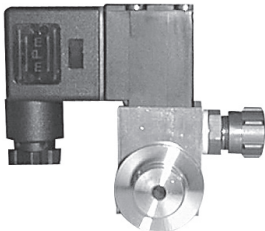
In-line butterfly-type valve (VS) for connection via small flange KF DN 16.

Solenoid operated gas ballast valve VB M-B

The solenoid operated gas ballast valve with hose nipple for connection of inert gas controls the gas ballast and replaces the manual gas ballast valve. The valve operates in conjunction with the VACUU·SELECT vacuum controller or the vacuum gauge DCP 3000. The valve is mounted via adapter directly on the manual gas ballast.

Overview of vacuum pump accessories

Overview vacuum pump accessories

a 	b 
c 	d 

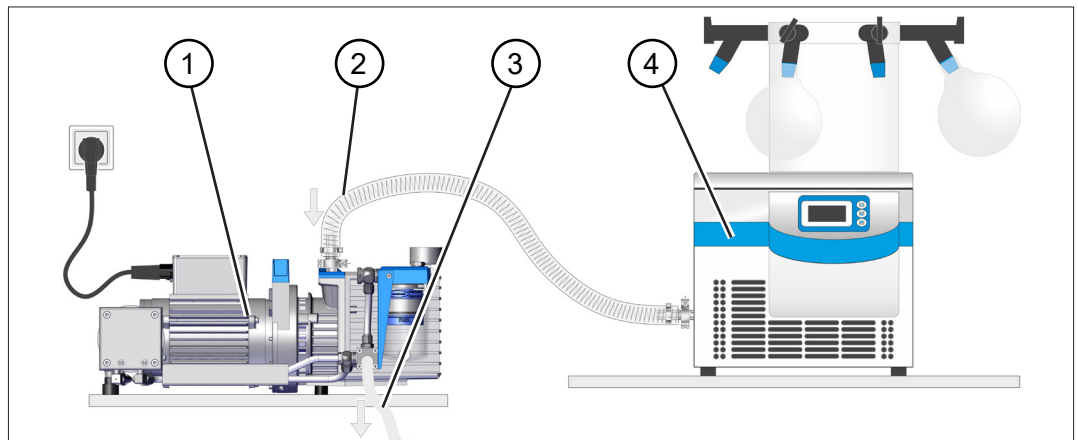
Description

a	Separator AK
b	Shut-off valve VKE
c	Butterfly valve VS
d	Solenoid operated gas ballast valve

3.5 Application example

Freeze drying

→ Example
Freeze drying



Description

- | | |
|---|---|
| 1 | Vacuum pump RC 6 |
| 2 | Inlet line |
| 3 | Outlet line (diverted into a fume hood) |
| 4 | Example of use: Lab freeze dryer |

4 Installation and connection

4.1 Transport

Products from **VACUUBRAND** are packed in sturdy, recyclable packaging.



The original packaging is accurately matched to your product for safe transport.

If possible, please keep the original packaging, e.g., for returning the product for repair.

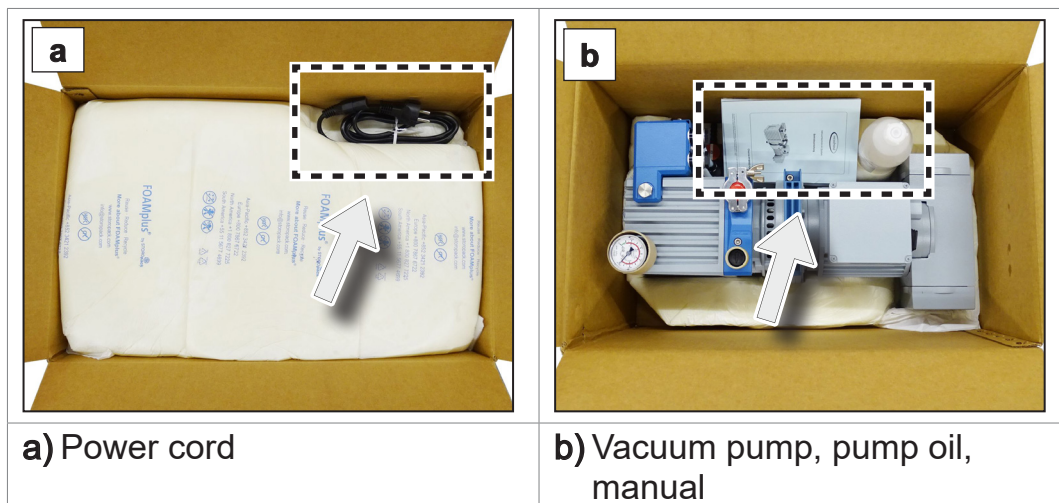
Goods receipt

Check the shipment for transport damage and completeness.

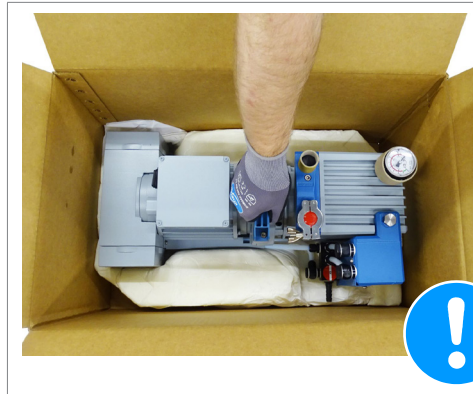
⇒ Immediately report any transport damage in writing to the supplier.

Unpacking

→ Example
Vacuum pump in
original packaging



⇒ Remove the upper part of the foam packaging.



- ⇒ Note that the **weight of the vacuum pump is approx. 55 lbs. (25 kg).**
- ⇒ Carefully lift the vacuum pump out of the packaging using the handle. We recommend using a lifting aid.

- ⇒ Retain the transport caps for future use.
- ⇒ Use the handle to transport the vacuum pump.
- ⇒ The vacuum pump is delivered without oil filling. Before starting the vacuum pump for the first time, pour pump oil into the oil reservoir of the rotary vane pump, → see *chapter: 4.3 Initial operation – Pouring in pump oil on page 38.*

4.2 Set up the vacuum pump

NOTE

Condensate can damage the vacuum pump.

A large temperature difference between the storage location and the installation location can cause condensation.

- ⇒ After goods receipt or storage, allow your product to acclimatize before initial use. The acclimatization can take several hours.

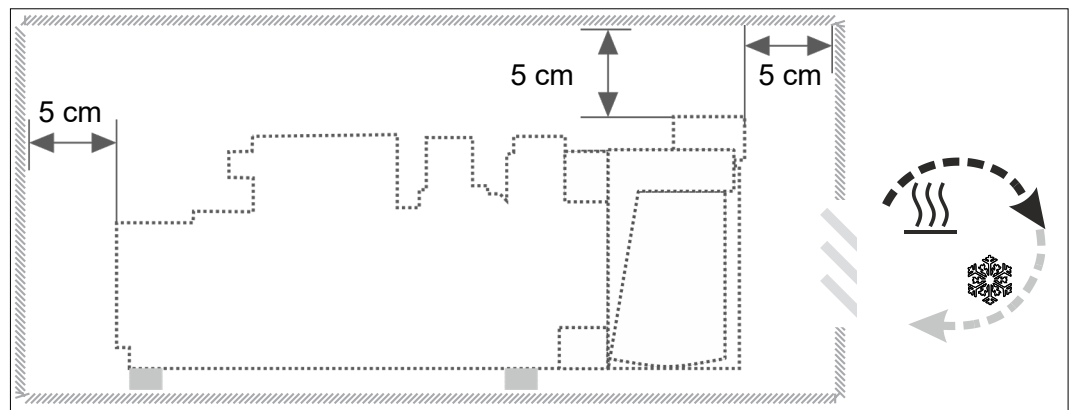
Check installation conditions

Check installation conditions

- The product is acclimatized.
- The ambient conditions are within the limitation of use, → see *chapter: Observe limitation of use on page 37.*
- The ambient temperature should be at least 54 °F (+12 °C). Otherwise the pump may not start because of the high oil viscosity at low temperature.
- The vacuum pump must have a stable and secure base without additional mechanical contact apart from the pump feet.

→ Example
Sketch of
minimum distances
in lab furniture

Set up the vacuum pump



IMPORTANT!

- ⇒ Place the vacuum pump on a stable, non-vibrating, level surface.
- ⇒ When installing in lab furniture, maintain a minimum distance of 5 cm (2 in) to adjacent objects or surfaces.
- ⇒ The product must be positioned so that the on/off switch and the power plug can be reached and are accessible. For this purpose a minimum distance of 12 cm (5 in) to adjacent objects or surfaces must be kept at one side of the pump. The on/off switch is at the rear of the terminal box.
- ⇒ Prevent heat accumulation and ensure sufficient air circulation, especially in closed housings.

Observe limitation of use

Observe limitation of
use

Limitation of use		(US)
Operating ambient temperature	12 – 40 °C	54 – 104 °F
Max. altitude	2000 m above sea level	6500 ft above sea level
Minimum distance to adjacent parts	5 cm (12 cm)	2 in (5 in)
Relative humidity	30 – 85 %, non-condensing	
Pollution degree	2	
Protection class	IP 40	
Prevent condensation or external contamination from dust, liquids, and corrosive gases.		

IMPORTANT!

- ⇒ Note the IP protection class. IP protection is only guaranteed if the product is appropriately mounted and connected.
- ⇒ When connecting, observe the information on the rating plate and the chapter **8.1 Technical data on page 85**.

4.3 Initial operation – Pouring in pump oil

Pouring in pump oil

NOTE

Operating the vacuum pump without oil filling damages the vacuum pump.

- ⇒ The vacuum pump is delivered without oil filling. This is in order to ensure that oil cannot make its way from the rotary vane pump into the housing of the oil mist filter during transport.
- ⇒ Before starting the vacuum pump for the first time, pour pump oil into the oil reservoir of the rotary vane pump. 0.5 l (0.53 quarts) of B-oil for rotary vane pumps are supplied with the vacuum pump for this purpose.

Pouring in the pump oil



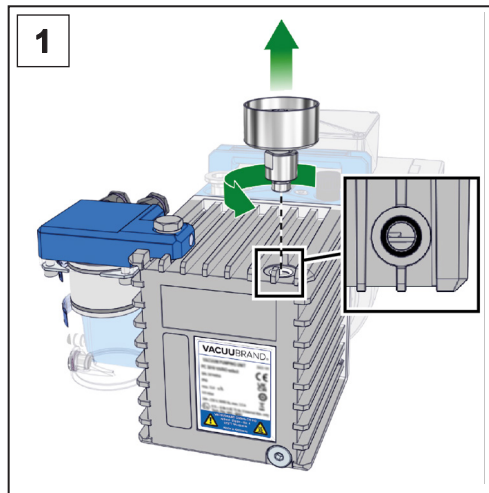
CAUTION

Possible damage due to pump oil.

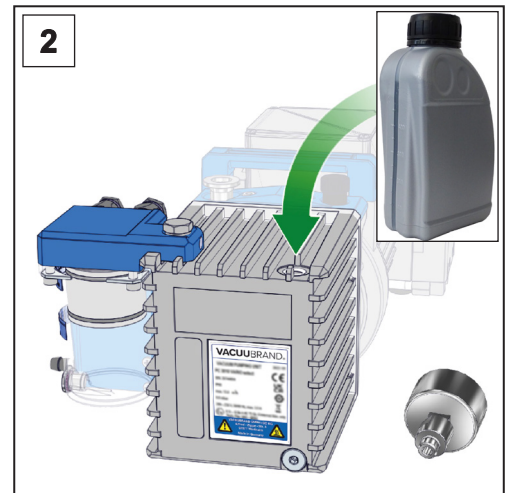
Pump oil may damage personnel and environment.

- ⇒ Avoid skin contact.
- ⇒ Avoid inhalation of vapors.
- ⇒ Wear your personal protective equipment.
- ⇒ Comply with all relevant statutory requirements and regulations concerning the handling, storage and disposal of oil.
- ⇒ Oil may drip. Use a suitable pad.

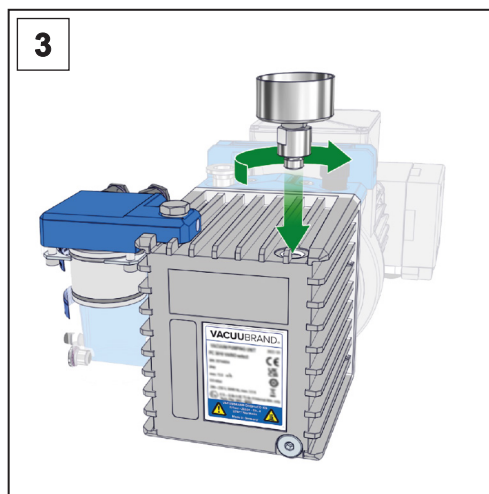




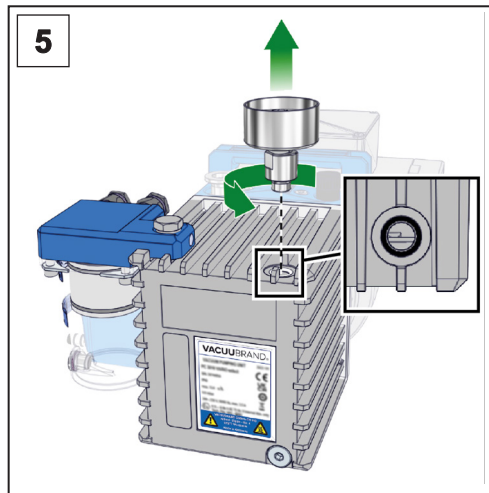
1. Unscrew the manometer at its adapter from the oil reservoir of the rotary vane pump; open-ended wrench width 17 mm. Do not turn the manometer itself as leaks might be caused! Pay attention to the O-ring.



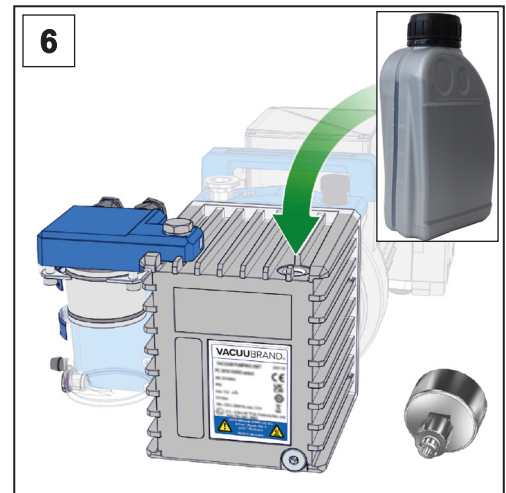
2. Pour only approx. 350 ml (0.37 quarts) of pump oil into the pump, bringing the oil level roughly to the "min." mark. Observe the oil level through the sight glass in doing so.



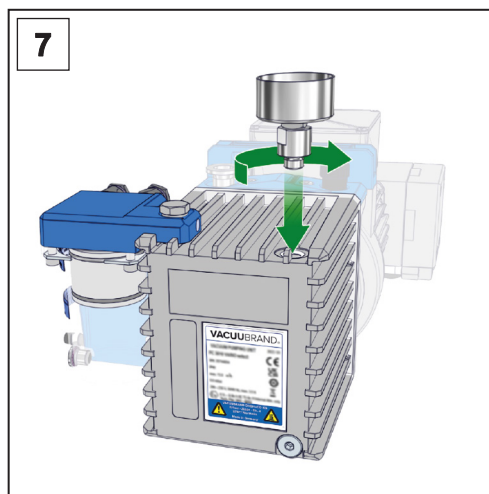
3. Screw the manometer with its adapter into the oil reservoir of the rotary vane pump; open-ended wrench width 17 mm. Do not turn the manometer itself as leaks might be caused! Pay attention to the O-ring.
4. With inlet line closed, operate the vacuum pump for approx. 5 – 10 minutes.
Note: Because new oil contains gas, a considerable degree of foaming can occur during the first pumping down with new oil, and oil could penetrate the oil separator.



5. Unscrew the manometer at its adapter from the oil reservoir of the rotary vane pump; open-ended wrench width 17 mm. Do not turn the manometer itself as leaks might be caused! Pay attention to the O-ring.



6. Add approx. 100 ml (0.11 quarts) of pump oil. Observe the oil level through the sight glass in doing so. The oil level must be between the marks "min." and "max." on the rating plate. Do not overfill.



7. Screw the manometer with its adapter into the oil reservoir of the rotary vane pump; open-ended wrench width 17 mm. Do not turn the manometer itself as leaks might be caused! Pay attention to the O-ring.

☒ Pump oil filled in.

⇒ When transporting a vacuum pump containing oil, do not tilt the pump to an angle that would allow oil to make its way from the oil reservoir into the filter element of the oil mist separator.

4.4 Connection

The vacuum pumps have a vacuum connection and an outlet connection. Connect your vacuum pump as described below.

- ⇒ Ensure that you do not mix up the inlet and outlet ports of the vacuum pump. Confusing inlet and outlet will cause overpressure in the connected apparatus.
- ⇒ After assembly, check the whole system for leaks.

4.4.1 Vacuum connection (IN)

- ⇒ Connect the vacuum port of your application to the inlet of the vacuum pump.

Vacuum connection
(IN)



CAUTION

Flexible vacuum hoses can contract during evacuation.

Connected components that are not secured can cause injury or damage due to the jerky movement (shrinkage) of a flexible vacuum hose. The vacuum hose can come loose.

- ⇒ Secure the vacuum hose to the connections.
- ⇒ Secure connected components.
- ⇒ Take the maximum shrinkage into account when sizing the flexible vacuum hose.

NOTE

Foreign bodies in the inlet line can damage the vacuum pump.

- ⇒ Prevent particles and contaminants from being aspirated or being able to flow back.
- ⇒ If necessary, install suitable filters upstream of the vacuum pump to avoid the aspiration of particles and dust. Ensure that the filters are chemically resistant, clog-proof and have a reliable flow rate, appropriate for your application.

IMPORTANT!

- ⇒ Do not use rigid pipelines. Rigid pipelines can transmit mechanical load between the vacuum pump and the application.
- ⇒ Use elastic hoses or flexible elements to avoid mechanical load due to rigid pipelines.
- ⇒ Use a sufficiently stable vacuum hose that is designed for the required vacuum range.
- ⇒ Keep the vacuum hose as short as possible.
- ⇒ Connect a vacuum hose with as large as possible cross-section.
- ⇒ The connection between vacuum hose and the vacuum pump must be gas-tight.
- ⇒ Avoid kinks in the vacuum hose.

Connect the vacuum hose

Connect the vacuum hose at the inlet

1. Remove the blind flange on the inlet flange.
 - ⇒ Connect a vacuum hose with small flange KF DN 16 to the inlet flange, ensuring the connection is gas-tight.
 - ⇒ Alternatively, you can use an adapter from small flange KF DN 16 to hose nozzle and attach a vacuum hose to it. Secure hose connections on hose nozzles, e.g., with a hose clip.
 - ⇒ If necessary, install an in-line valve or shut-off valve in the inlet line to isolate your application from the vacuum pump to allow the pump to warm up or to clean the pump after use before it is switched off.
- ☒ Vacuum hose connected.



- Observe the following points for optimum results:
- ⇒ Keep the vacuum line as short as you can with as large a cross-section as possible.

4.4.2 Outlet connection (OUT)

Outlet connection
(OUT)

- ⇒ Remove the red protection cap on the outlet of the vacuum pump.
- ⇒ Connect a gas-tight exhaust line at the pump outlet if necessary. The outlet (hose nozzle) is marked "OUT".
- ⇒ Always vent exhaust gases appropriately, e. g., into a fume hood.



WARNING

Overpressure at the outlet of the vacuum pump.

Due to the high compression ratio, the vacuum pump may generate overpressure at the outlet.

- ⇒ The outlet line (exhaust gas, gas outlet) must always be clear and non-pressurized.
- ⇒ Never block the gas outlet. Do not kink the outlet line.
- ⇒ Use an outlet line with sufficient cross-section. The cross-section of the outlet line must be at least the size of the pump's exhaust connection.

Connect the outlet line

Connect the outlet
line to the outlet

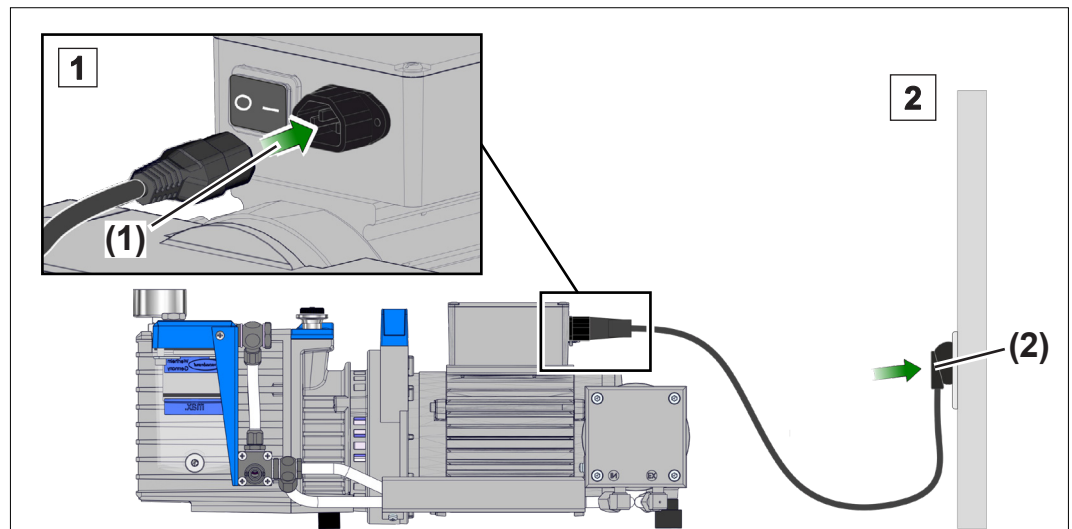
1. Remove the red protection cap on the outlet of the vacuum pump.
 2. Attach the outlet line to the hose nozzle DN 10.
 3. Secure hose connections on hose nozzles, e.g., with a hose clip.
- ⇒ Route the outlet line with a fall from the outlet, i.e., running downward so that no backup forms.
 - ☑ Outlet line connected.

4.4.3 Electrical connection

- ⇒ Check the power source and the pump's rating plate to be sure that the power source and the equipment match in voltage, phase, and frequency.

Connect the vacuum pump electrically

→ Example
Electrical connection
of vacuum pump



1. Plug connector **(1)** of the power cord into the power connection of the vacuum pump.
2. Plug power plug **(2)** into the power outlet.
 - ☑ Vacuum pump electrically connected.

IMPORTANT!

- ⇒ Only use a power cord which is undamaged and meeting the regulations.
- ⇒ Plug the power plug only into a properly grounded power outlet.
- ⇒ Lay the power cord such that it cannot be damaged by sharp edges, chemicals, or hot surfaces.
- ⇒ Keep the electrical power cord away from hot surfaces.
- ⇒ Keep the electrical power cord away from heated surfaces.
- ⇒ The power plug serves as a disconnecting device from the electrical supply voltage. The product must be installed in such a way that the power plug is easily reached and accessible at all times to disconnect the product from the mains supply.

Mains connection

The vacuum pump is delivered ready for use with the appropriate power plug.

IMPORTANT!

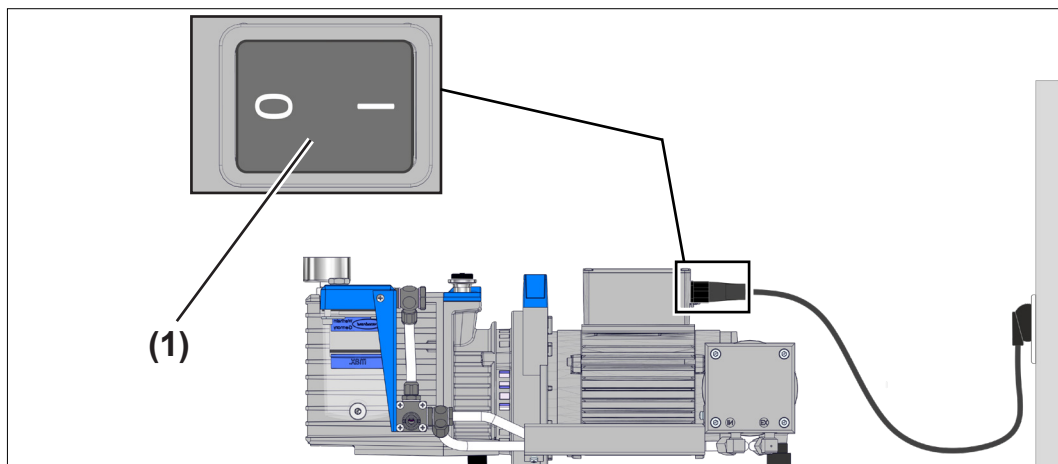
- ⇒ Use the power plug which fits your power supply.
 - ⇒ Do not use multiple sockets connected in series as power connection.
-

5 Commissioning (operation)

5.1 Switch on

Switch on the vacuum pump

Switch on the vacuum pump



⇒ Switch rocker switch (1) on – switch position I.

5.2 Operation

Warm-up (warm-up time)

- ⇒ The warm-up time enables the vacuum pump to reach full operating capacity. A warm up period of typically 30 minutes is required to ensure that the rated ultimate vacuum and pumping speed and the full vapor pumping rate and chemical resistance are attained.
- ⇒ If necessary, install an in-line solenoid valve or shut-off valve in the inlet line to isolate your application from the vacuum pump to allow the pump to warm up.

Operating conditions

Inlet pressure,
outlet pressure

- ⇒ Pumping down can be started at any pressure at the inlet below atmospheric pressure
- ⇒ Do not start the pump, if the pressure at the outlet port exceeds 16.0 psi (1.1 bar) absolute.
- ⇒ Continuous operation is possible at any inlet pressure below atmospheric pressure.

- ⇒ Avoid overpressure of more than 17.5 psi absolute (1.2 bar absolute) in the event that inert gas is connected to the pump, to the gas ballast or to a venting valve.
- ⇒ The attainable ultimate vacuum is limited by the properties of the vacuum vessel (leak-tightness, cleanliness and degassing of the inner surfaces), degassing of substances used and the condition of the pump oil (cleanliness, content of hydrocarbons with higher partial pressures).

Operation with condensable vapors

Condensable vapors

- ⇒ Allow the pump to attain its operating temperature before pumping condensable vapors. Keep the vapor inlet pressure below the permitted maximum.
- ⇒ Open the manual gas ballast valve in case of pumping significant amounts of vapor, → *see chapter: 5.2.1 Operation with gas ballast on page 50.*

Oil level check

Check oil level

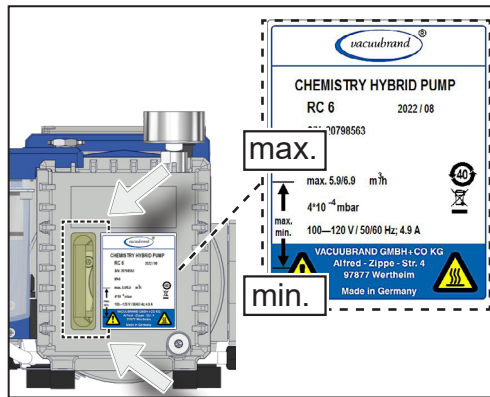
NOTE

A too low oil level during operation may damage the vacuum pump.

- ⇒ Check the oil level of the vacuum pump every time before starting the pump.
- ⇒ Check the oil level of the vacuum pump at least once a week.
- ⇒ Check the oil level more frequently if high amounts of gas or vapor are pumped or if operating the vacuum pump with open gas ballast valve.
- ⇒ Oil consumption will increase at inlet pressures above 75 Torr (100 mbar). In that case check the oil level more frequently.
- ⇒ Adjust the oil level, if necessary, → *see chapter: 7.3 Oil change on page 68.*

Check oil level

- ⇒ Check the oil level through the oil level sight glass of the vacuum pump.



- ⇒ The oil level must be between the marks "min." and "max." on the rating plate.
- ⇒ Adjust the oil level, if necessary, → see chapter: **7.3 Oil change on page 68.**

Pay attention to pumped media



CAUTION

Possible damage due to aggressive or corrosive media.

Aggressive or corrosive gases or vapors can damage personnel, environment or the vacuum pump.

- ⇒ Use appropriate accessories to protect personnel, environment, and the vacuum pump.
- ⇒ Use accessories such as cold trap, separator, oil separator, or shut-off valves, → see *chapter: 8.4 Ordering information on page 89.*

Manometer for monitoring the pressure in the oil reservoir

HYBRID principle

The HYBRID principle relies on the pumped vapors being prevented from condensing inside the oil reservoir of the rotary vane pump. Therefore the pressure inside the oil reservoir has to be lower than the vapor pressure of the pumped media at the oil's temperature of approx. 140 °F (60 °C). The manometer indicates the pressure inside the oil reservoir.

Increased pressure
inside the oil
reservoir

NOTE

An increased pressure in the oil reservoir reduces the chemical resistance of the vacuum pump and results in faster aging of the oil.

If during the process the manometer needle is clearly in the red zone, it is necessary to reduce the inlet pressure.

- ⇒ Reduce the amount of pumped vapors or solvents.
- ⇒ Install a cold trap in front of the vacuum pump.
- ⇒ If no pressure reduction in the oil reservoir can be achieved even with the vacuum chamber being absolutely leak tight, this points to a potential failure of the diaphragm pump (e.g., a diaphragm crack).

Any drop in the diaphragm pump's pumping speed produces a pressure increase in the oil reservoir. Although this does not have a direct effect on the pumping speed and on the ultimate vacuum attainable by the HYBRID pump, it does have a considerable effect on the aging of the oil and the HYBRID pump's chemical resistance.

Check of operability
of diaphragm pump

Check the operability of the diaphragm pump in case of a permanently increased pressure in the oil reservoir:

- ⇒ Measure the pressure in the oil reservoir with a more precise manometer, e. g., with a DVR 2pro. If the pressure in the oil reservoir with inlet port and gas ballast valve closed is higher than 19 Torr (25 mbar), check the diaphragm pump and replace the diaphragms if necessary, → *see chapter: 7.4 Replacing diaphragms and valves on page 73.*

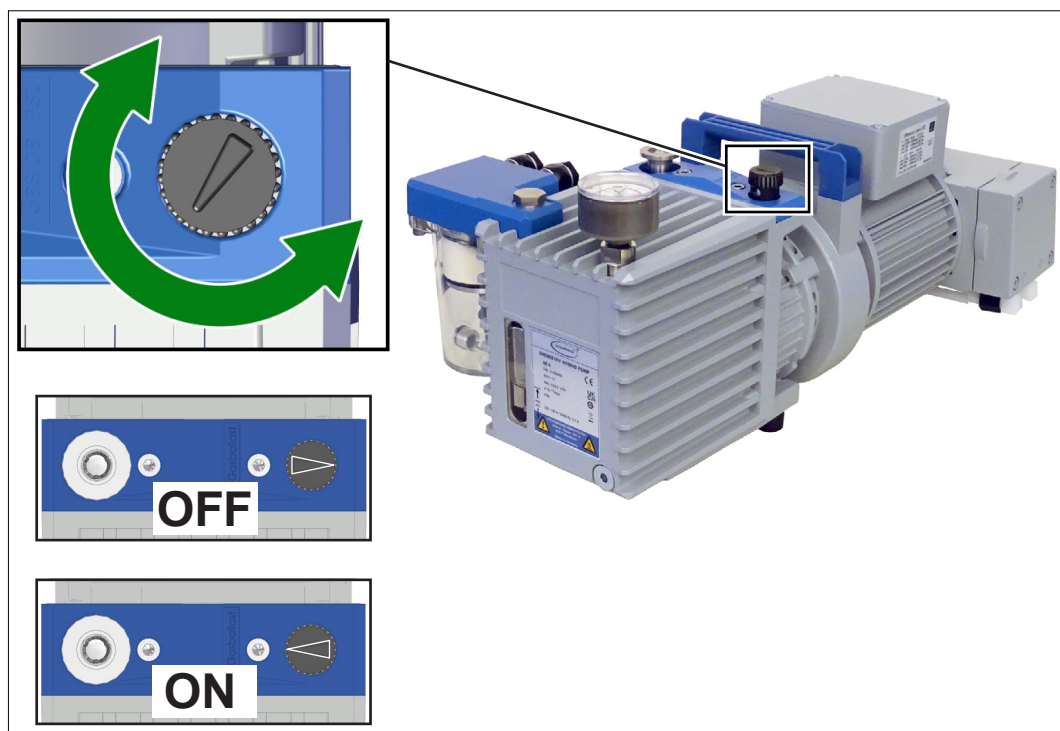
5.2.1 Operation with gas ballast

Gas ballast

The supply of gas ballast reduces the condensation of pumped substances (e. g., water vapor, solvents) inside the pump or decontaminates the pump oil from volatile substances. With gas ballast valve open, the ultimate vacuum will be slightly reduced.

	DANGER
	Explosion risk due to air as gas ballast. By using air as a gas ballast, a small amount of oxygen enters the inside of the vacuum pump. Depending on the process, a potentially explosive mixture can form due to oxygen in the air, or other dangerous situations can occur, if the pumped media react with the oxygen. ⇒ Make sure that air/gas intake through the gas ballast valve can never lead to hazardous, explosive or otherwise dangerous mixtures. ⇒ In the presence of flammable substances and for processes in which a potentially explosive mixture can occur, use only inert gas as a gas ballast, e. g., nitrogen (max. 1.2 bar/900 Torr absolute). ⇒ If in doubt, always use inert gas for gas ballast.
	CAUTION
	Possible damage due to accidental venting in case of open gas ballast valve. If the manual gas ballast valve of the rotary vane pump is open, a power failure or switching off the pump may cause accidental ventilation of the pump or the vacuum system. ⇒ Take appropriate safety measures, if accidental ventilation constitutes a potential source of danger, e. g., install a solenoid operated gas ballast valve.

Open / close the gas ballast valve



Open / close the gas ballast valve

- ⇒ Turn the black gas ballast cap in any direction to open or close the gas ballast valve.
The manual gas ballast valve is open if the arrow on the gas ballast cap is pointing towards labeling "Gasballast", i. e., towards the inlet of the vacuum pump.
- ⇒ Evacuate condensable vapors, e. g., water vapor, solvents, etc., only once the vacuum pump has reached its operating temperature and with the gas ballast valve open.
- ⇒ Do not pump vapor before the pump has reached its operating temperature. In case, install an in-line valve in the inlet line of the vacuum pump and open it only approx. 30 minutes after the pump has been started.
- ⇒ Operate the vacuum pump without gas ballast only in case of a clean vacuum system or when no condensable vapors can occur.
- ⇒ Check the maximum vapor inlet pressure. The pump can operate continuously at any pressure lower than the maximum specified inlet pressure for vapor.
- ⇒ Avoid sudden vapor surges when evacuating commences. In case, use a flow-control valve in the inlet line and open the valve only gradually.
- ⇒ To connect inert gas as gas ballast, remove the black gas ballast cap and install a gas ballast adapter instead.
→ see chapter:: 8.4 Ordering information on page 89.

5.2.2 Condensate in catchpots

Operating the pump with condensates in the catchpots

Condensates in optional catchpots

⇒ Observe the condensate levels in the catchpots of the separator at the inlet (optional) and of the oil mist filter.

- The condensate level in the optional separator at the inlet must always be kept below the bottom of the separator tube.
- The condensate level in the oil mist filter must always be kept below the bottom edge of the filter.
- In case of a clogged filter, oil mist might be visible in the oil filter housing, or the filter might be discolored or exhibit deposits on the inside. Replace the filter element of the oil mist filter if it is clogged. Disassemble the oil mist filter to replace the filter element. Under certain circumstances, clogged filter elements can be cleaned using suitable solvents. However, it is safer to use a new filter element, → *see chapter: 7.5 Replacing the filter element on page 80.*

Drain condensate

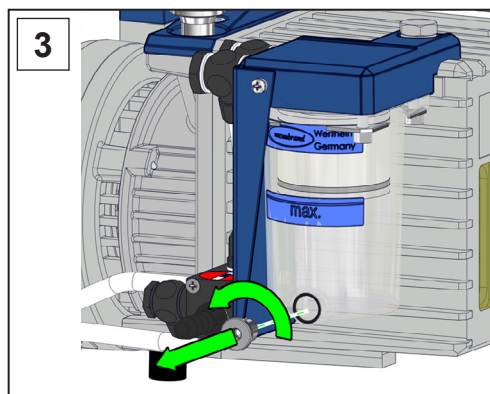
Drain condensate



Drain the catchpots in time.

⇒ Wear your personal protective equipment.

1. Switch off the vacuum pump.
2. Ventilate the vacuum pump.



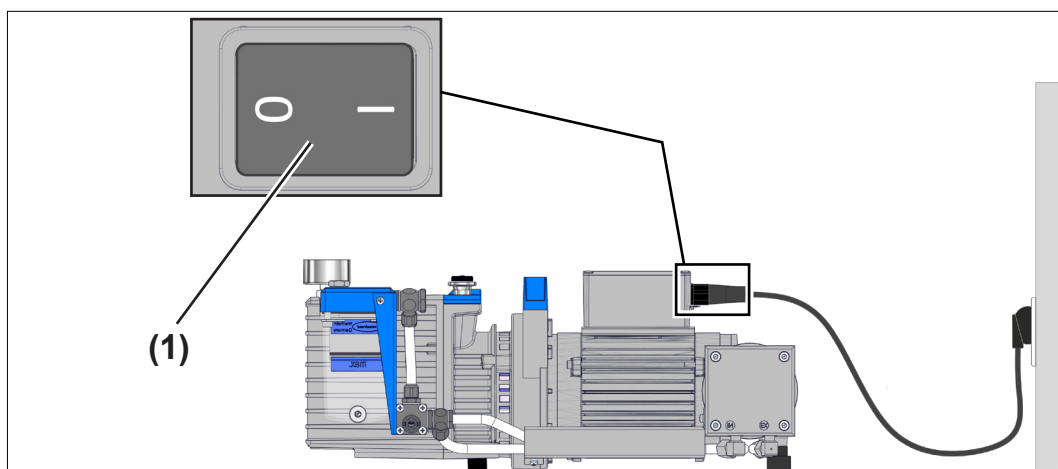
3. Open the drain screw of the transparent catchpot and drain the condensate; Allen key size 6. Pay attention to the O-ring.
 4. Comply with regulations when disposing of condensates and chemicals thereby taking contaminations due to pumped substances into account.
 5. Screw in the drain screw again; Allen key size 6.
- ⇒ Do not reuse separated oil if it is contaminated or discolored.
- ☒ Condensate drained.

5.3 Switch off

Switch off the vacuum pump

Switch off the vacuum pump

1. Stop the process.
2. In case, close the in-line valve in the inlet line of the vacuum pump.
3. Allow the vacuum pump to continue running for approx. 30 minutes with open gas ballast valve if the vacuum pump has been exposed to condensate.
4. Allow the vacuum pump to continue running for approx. 30 minutes with closed gas ballast valve.



5. Switch off rocker switch **(1)** – switch position **0**.
☒ Vacuum pump switched off.
6. Disconnect the vacuum pump from the apparatus.
7. Check the vacuum pump for possible damage and contamination.

5.4 Shutdown (storage)

Take the vacuum pump out of operation

Shutdown

1. Carry out the steps for switch off, → *see chapter: 5.3 Switch off on page 54.*
2. Drain the condensate from the catchpots of the separator at the inlet (optional) and of the oil mist filter.
3. Flush the pump with dry nitrogen.
Connect dry nitrogen (max. 1,2 bar / 900 Torr absolute) to the pump inlet or to the gas ballast and operate the pump briefly (for approximately 1 minute)
4. Carry out oil change to protect the pump, → *see chapter: 7.3 Oil change on page 68.*
5. Fill the vacuum pump completely with new oil (more than mark "max.") for corrosion protection.
Attention: Before restarting the pump, drain oil to the maximum oil level mark "max.".
6. Close the manual gas ballast valve.
7. Clean the vacuum pump in the event of external contamination.
8. Close the vacuum pump's inlet and outlet, e.g., with the transport caps.
9. Package the vacuum pump such that it is protected from dust; enclose desiccants if necessary.
10. Store the vacuum pump in a cool, dry location.
☒ Vacuum pump out of operation.

IMPORTANT!

If damaged parts are stored for operational reasons, these should be clearly identified as **not ready for use**.

Carry out oil change and, if necessary, maintenance prior to use if the pump has been stored for longer than one year.

6 Troubleshooting

6.1 Technical support

Technical support ⇒ To identify errors and potential remedies, please refer to the troubleshooting table
Error – Cause – Remedy.

For technical assistance or errors for which you require additional support, please contact your local distributor or our [Service Department](#)¹.



Only operate the product if it is in perfect working condition.

- ⇒ Perform the recommended service activities, → see ***chapter: 7.1 Information on maintenance work on page 64***, and ensure that the product is in good working order.
- ⇒ Send defective products to our Service Department or your local distributor for repair!

¹ -> Phone: +49 9342 808-5660, fax: +49 9342 808-5555, service@vacuubrand.com

6.2 Error – Cause – Remedy

Error – Cause –
Remedy

Error	► Possible cause	✓ Remedy	Personnel
Pump does not start.	► Electrical power cord not plugged in.	✓ Plug in power cord.	Operator
	► Supply voltage does not correspond with the pump.	✓ Connect pump to a suitable supply voltage.	Operator
	► Electrical supply failure.	✓ Check fuse.	Specialist
	► Device fuse defective (only version with 100 – 120 V motor).	✓ Replace device fuse.	Specialist
	► Oil temperature below 54 °F (+12 °C).	✓ Operate the pump in suitable ambient conditions.	Operator
	► Pump unit of rotary vane pump contaminated.	✓ Perform maintenance or clean the pump unit.	Resp. specialist
	► Motor thermally overloaded.	✓ Switch off pump, allow motor to cool down, provide sufficient ventilation.	Specialist
	► Overpressure in outlet line.	✓ Open outlet line.	Operator
	► Oil mist filter clogged/overfilled, filter element in contact with oil.	✓ Drain oil mist filter, replace filter element if necessary.	Specialist
	► Oscillating starting behavior of the pump.	✓ Normal behavior, no fault in case of a cold pump.	
	► Pump seized.	✓ See below.	

Error – Cause –
Remedy

Error	► Possible cause	✓ Remedy	Personnel
Pump does not achieve its ultimate vacuum or usual pumping speed.	► Measuring procedure or vacuum gauge not suitable.	✓ Choose a suitable measuring procedure or vacuum gauge.	Operator
	► Inlet blocked.	✓ Ensure that the inlet line does not become blocked.	Operator
	► Centering ring not correctly positioned.	✓ Check small flange connections.	Operator
	► Long, narrow vacuum line.	✓ Use lines with larger cross-section.	Operator
	► Leak in the pipeline or vacuum system.	✓ Check pump directly - connect vacuum gauge directly at pump inlet. Check pipeline and vacuum system.	Operator
	► Not enough oil.	✓ Top up oil to correct level.	Specialist
	► Oil contaminated (also with solvents).	✓ Change oil and flush with oil.	Specialist
	► Wrong type of oil used.	✓ Change oil and flush with oil.	Specialist
	► Outgassing substances or vapor generated in the process.	✓ Check process parameters.	Operator
	► Pump has not yet reached its operating temperature.	✓ Allow the pump to reach its operating temperature.	Operator
	► None of the above mentioned causes.	✓ Send in vacuum pump.	Resp. specialist

Error – Cause –
Remedy

Error	Possible cause	✓ Remedy	Personnel
Pump too noisy or strange noise.	▶ Too much oil.	✓ Lower oil level to mark "max.".	Specialist
	▶ Motor thermally overloaded.	✓ Switch off pump, allow motor to cool down, identify cause of failure. Provide sufficient ventilation.	Specialist
	▶ Diaphragm of diaphragm pump damaged.	✓ Replace diaphragm.	Specialist
	▶ Pump seized.	✓ See below.	
	▶ Overpressure in outlet line.	✓ Open outlet line	Operator
	▶ None of the above mentioned causes.	✓ Send in vacuum pump.	Resp. specialist
Oil in the inlet line.	▶ Back diffusion (small amount of oil, oil film).	✓ Install a sorption trap or a separator, if necessary.	Specialist
	▶ Back streaming (large amount of oil).	✓ Send in vacuum pump.	Resp. specialist
Oil leakage.	▶ Oil spilled.	✓ Absorb the oil and dispose of according to regulations.	Specialist
	▶ None of the above mentioned causes.	✓ Send in vacuum pump.	Resp. specialist
High oil consumption.	▶ High inlet pressure.	✓ Normal. Top up oil whenever necessary. Check oil mist filter.	Specialist
	▶ Operation with gas ballast.	✓ Top up oil whenever necessary. Check oil mist filter.	Specialist
	▶ Oil level too high.	✓ Lower oil level to mark "max.".	Specialist
Fast aging of the oil.	▶ Pumping aggressive gases.	✓ Use suitable oil.	Specialist
	▶ Condensation in the pump.	✓ Use separator or cold trap.	Specialist
	▶ Oil mist filter defective.	✓ Replace filter. Check safety pop valve.	Specialist
	▶ Diaphragm pump does not reach its pumping speed.	✓ Perform maintenance of diaphragm pump.	Specialist

Error – Cause –
Remedy

Error	► Possible cause	✓ Remedy	Personnel
Pump seized.	► Ambient temperature too high (> 104 °F (40°C)).	✓ Provide sufficient ventilation.	Operator
	► None of the above mentioned causes.	✓ Send in vacuum pump.	Resp. specialist

7 Cleaning and maintenance

	WARNUNG
	Danger due to electrical voltage. ⇒ Switch the product off before cleaning or maintenance work. ⇒ Unplug the power plug from the socket and afterwards wait 5 seconds for the capacitors to discharge.
	Risk from contaminated parts. Pumping hazardous media can result in hazardous substances adhering to internal parts of the pump. ⇒ Wear your personal protective equipment, e.g., protective gloves, eye protection and, if necessary, respiratory protection. ⇒ Clean or decontaminate the vacuum pump, if necessary. If necessary have decontamination carried out by an external service provider. ⇒ Take safety precautions according to your instructions for handling hazardous substances. ⇒ Avoid the release of pollutants.

NOTE

Damage possible if work is performed incorrectly.

- ⇒ Have maintenance work performed by a trained specialist or at least by a trained person.
- ⇒ Recommendation: Before carrying out maintenance work for the first time, please read through all the instructions to get an overview of the required service work.
- ⇒ A service manual (available in English and German only) with exploded view drawings, spare parts list and directions for repair is available on request. The service manual is intended for trained service people only.

7.1 Information on maintenance work

Motor bearings have a typical durability of 40000 operating hours. Motor capacitors have a typical durability in the range of 10000 to 40000 operating hours depending strongly on operation conditions including ambient temperature, humidity or load.

The valves and diaphragms of the diaphragm pump are wear parts. In normal use, the lifetime of the diaphragms and valves is typically 15,000 operating hours.

IMPORTANT!

⇒ Work on the terminal box must be carried out by a qualified electrician.

Check motor capacitors



WARNING

Overaged motor capacitors may get hot, melt or emit a darting flame.

An overaged capacitor may get hot or even melt. Rarely it may emit a darting flame which could be dangerous for personnel and equipment in the vicinity.

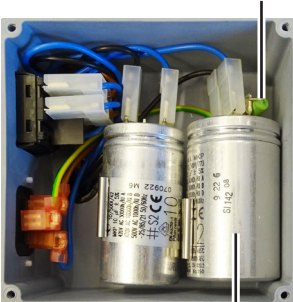
- ⇒ Check the capacitors in the terminal box of the vacuum pump regularly.
- ⇒ Measure the capacitance of the capacitors and estimate their operating hours.
- Note:** Pumps Rx 6 and Rx 9 have a start capacitor with discharge resistor. Depending on the measuring device, the discharge resistor can lead to incorrect capacitance measurements.
- ⇒ Replace overaged capacitors.

NOTE

If the motor is blocked, the discharge resistor on the start capacitor can become so hot that the insulation of wires in direct contact may melt. This may cause a short circuit and trip the fuse.

- ⇒ When working in the terminal box, lay the strands so that they cannot come into direct contact with the discharge resistor.

Discharge resistor



Start capacitor

Recommended maintenance activities

Maintenance intervals

Maintenance intervals	
▶ Clean surfaces	if required
▶ Clean fan grill	if required
▶ Oil change	if required
▶ Replace filter element in oil mist filter	in case of clogged or discolored filter element
▶ Replace diaphragms and valves	after 15000 operating hours, in case of increased pressure in the oil reservoir or in case of increased operation noise
▶ Check safety pop valve	in case of fast aging oil
▶ Replace motor capacitors	after 10000 – 40000 operating hours or in case of decreasing capacity

Maintenance intervals depend on the individual application:

- In case, check and clean the pump heads of the diaphragm pump on a regular basis,
- perform maintenance work more frequently, if corrosive gases or vapors are being pumped in particular.

Wear parts have to be replaced regularly. Regular maintenance will improve the lifetime of the vacuum pump and also protect both users and the environment.

Check the diaphragm pump's operability

Operability check of the diaphragm pump

The operability of the diaphragm pump can be checked by measuring the pressure in the oil reservoir. Replace diaphragms and valves if one of the following cases applies:

- The manometer needle of the manometer indicating the pressure in the oil reservoir is clearly in the red zone.
- The pressure in the oil reservoir is above 19 Torr (25 mbar) while operating the pump with closed inlet and closed gas ballast valve of the rotary vane pump.

Use a correctly calibrated vacuum gauge to measure the pressure in the oil reservoir (e. g., DVR 2pro):

1. Unscrew the manometer at its adapter from the oil reservoir of the rotary vane pump; open-ended wrench width 17 mm. Do not turn the manometer itself as leaks might be caused! Pay attention to the O-ring. → see also section: *Pouring in the pump oil on page 38.*



2. Unscrew the hose nozzle from the outlet.
 3. Install the hose nozzle at the oil inlet. Make sure the O-ring is seated correctly.
 4. Connect a suitable vacuum gauge to the hose nozzle and measure the pressure while operating the pump with closed inlet and closed gas ballast valve of the rotary vane pump.
 5. Remove the hose nozzle from the oil inlet.
 6. Reinstall the hose nozzle at the outlet.
 7. Screw the manometer with its adapter into the oil reservoir of the rotary vane pump; open-ended wrench width 17 mm. Do not turn the manometer itself as leaks might be caused! Pay attention to the O-ring.
- ☒ Operability of diaphragm pump has been checked.

Recommended aids

→ Example
Recommended aids



No	Item
1	Diaphragm key, width 66 mm (Replacing diaphragms)
2	Allen key size 5 (Replacing diaphragms and valves; replacing filter element) Allen key size 6 (Oil change; draining condensate)
3	Open-ended wrench, width 14/17 mm (Replacing diaphragms and valves) Open-ended wrench, width 17 mm (Oil change)

- | | |
|---|--|
| 4 | Phillips screwdriver size 2 (Replacing diaphragms and valves; checking the safety pop valve) |
| 5 | Slotted screwdriver (replacing the device fuse) |
| 6 | Torque wrench, adjustable (Replacing diaphragms and valves) |
| 7 | Funnel (oil change) |
| 8 | Receptacle for oil (oil change) |

IMPORTANT!

⇒ Always wear your personal protective equipment when performing activities which may bring you into contact with hazardous substances.

Order information of spare parts and aids: → *see chapter: Spare parts / aids on page 89.*

7.2 Cleaning

This chapter does not contain descriptions for decontamination of the product. This chapter describes simple measures for cleaning and care.

⇒ Switch off vacuum pump before cleaning.

Clean surfaces



⇒ Clean dirty surfaces with a clean, slightly damp cloth. We recommend using water or mild soapy water to moisten the cloth.

Clean fan grille

⇒ Clean dirty fan grilles, for example with a vacuum cleaner.

7.3 Oil change

Oil change



DANGER

Contamination of vacuum pump and pump oil with dangerous substances

The vacuum pump and the pump oil might be contaminated with noxious or otherwise dangerous substances and chemicals that have been pumped during operation.

- ⇒ Decontaminate or clean the vacuum pump before coming in contact.
- ⇒ Wear your personal protective equipment.
- ⇒ Avoid skin contact with contaminated parts and inhalation of vapors.



CAUTION

Possible damage due to lubricants, pump fluids, and solvents.

Lubricants (e. g., pump oil), pump fluids, and solvents may damage personnel and environment.

- ⇒ Avoid skin contact.
- ⇒ Avoid inhalation of vapors.
- ⇒ Wear your personal protective equipment.
- ⇒ Comply with all relevant statutory requirements and regulations concerning the handling, storage and disposal of oil.
- ⇒ Take into account possible contaminations with pumped media when disposing of used oil.
- ⇒ Oil may drip. Use a suitable pad.
- ⇒ Use suitable receptacle when draining the pump oil.



CAUTION

Risk of scalding due to hot oil.

The pump oil inside the oil reservoir of the vacuum pump heats up due to operation.

- ⇒ Wear your personal protective equipment.
- ⇒ Avoid direct contact with the oil.

Pump oil ages. Carry out an oil change, if one of the following points applies:

- the pump oil is of darker color compared to new oil,
- the pump oil is considerably discolored compared to new oil,
- the pump oil has a strange odor,
- there are particles in the oil.

Oil change interval

The oil change interval depends on of the individual application:

- Check oil level every time before starting the pump.
- Under normal operating conditions we recommend a yearly oil change.
- Especially if corrosive gases or vapors have been pumped, it may be appropriate to check the oil frequently and according to the users' experience and to carry out an oil change, if necessary.

If the oil contains only small quantities of water/solvent, the oil can be cleaned to a certain extent by operating the vacuum pump for 1 to 2 hours with the inlet line closed and the gas ballast valve of the rotary vane pump open.

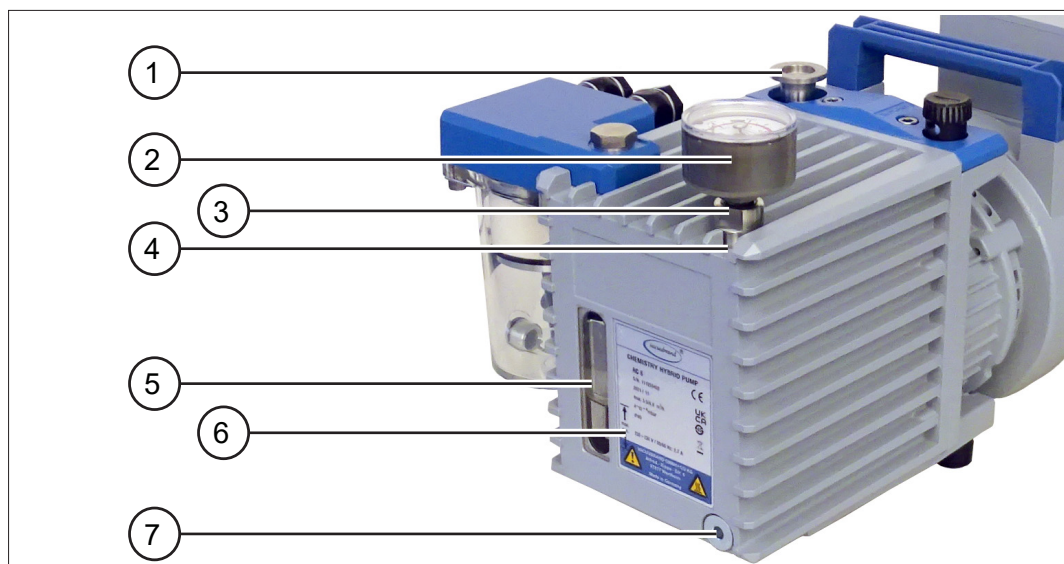
Oil change procedure

Oil change procedure

⇒ We recommend a temperature of the vacuum pump in the range from 12 to 40 °C (54 to 104 °F) for the oil change procedure. The viscosity of a cold pump's oil is increased making the oil change more difficult.



1. Switch off the pump and unplug the power plug from the socket. Ensure that the pump cannot be operated accidentally if parts of the pump are disassembled.
2. Disconnect the vacuum pump from the apparatus.



3. Ventilate the pump:
Unscrew the manometer (2) at its adapter (3) from the oil reservoir of the rotary vane pump to ventilate the oil reservoir; open-ended wrench width 17 mm. Do not turn the manometer itself as leaks might be caused! Pay attention to the O-ring.
→ see also chapter: **4.3 Initial operation – Pouring in pump oil on page 38.**
4. Allow the pump to cool down, if necessary.
5. Place a suitable receptacle beneath the oil outlet (8). In case, use a funnel.
6. Remove the oil drain plug (7) below the rating plate, paying attention to the O-ring; Allen key size 6.
7. Tilt the pump slightly and catch the oil in the receptacle.
8. Screw in oil drain plug (7) with O-ring; Allen key size 6.
9. Screw the manometer (2) with its adapter (3) into the oil reservoir of the rotary vane pump; open-ended wrench width 17 mm. Do not turn the manometer itself as leaks might be caused! Pay attention to the O-ring.
10. Pour in approx. 0.05 quarts (50 ml) of fresh oil through the pump inlet (1). In case, use a funnel and remove any assembled separators (optional) at the inlet beforehand.
11. Operate the pump briefly (for approximately 1 minute).
12. Drain flushing oil and repeat flushing procedure, if necessary, until all contaminations are flushed out.
13. Unscrew the manometer (2) at its adapter (3) from the oil reservoir of the rotary vane pump to ventilate the oil reservoir; open-ended wrench width 17 mm. Do not turn the

manometer itself as leaks might be caused! Pay attention to the O-ring.

14. Pour at first only approx. 350 ml (0.37 quarts) of fresh oil through the oil inlet (4) into the pump, bringing the oil level roughly to the "min." mark (6). In case, use a funnel. In doing so, observe the oil level through the sight glass (5).
15. Screw the manometer (2) with its adapter (3) into the oil reservoir of the rotary vane pump; open-ended wrench width 17 mm. Do not turn the manometer itself as leaks might be caused! Pay attention to the O-ring.
16. Operate the vacuum pump with closed inlet for approx. 5 – 10 minutes.
Note: Because new oil contains gas, a considerable degree of foaming can occur during the first pumping down with new oil, and oil could penetrate the oil separator.
17. Unscrew the manometer (2) at its adapter (3) from the oil reservoir of the rotary vane pump to ventilate the oil reservoir; open-ended wrench width 17 mm. Do not turn the manometer itself as leaks might be caused! Pay attention to the O-ring.
18. Pour another approx. 100 ml (0.11 quarts) of fresh oil through the oil inlet (4) into the pump. In case, use a funnel. Observe the oil level through the sight glass (5). The oil level has to be between the marks "min." and "max." (6) on the rating plate. Do not overfill!
19. Screw the manometer (2) with its adapter (3) into the oil reservoir of the rotary vane pump; open-ended wrench width 17 mm. Do not turn the manometer itself as leaks might be caused! Pay attention to the O-ring.

☒ Oil change accomplished.

Notes on the pump oil

Pump oil The **standard oil** for rotary vane pumps is the **B-oil for rotary vane pumps**. This is a mineral oil, which is used for the first filling of the pump.

The advantages of the B-oil are:

- flat viscosity curve,
- low vapor pressure,
- good chemical resistance,
- extended stability when pumping oxidants, acid or basic vapors compared to conventional mineral oils.



The oil degasses and foams at low pressures. This is a welcome condition which helps to protect the pump unit against corrosion and to prolong the working life of the oil.

- ⇒ The quantity, condition and quality of the pump oil have a decisive effect on the pump's performance and dependability.
- ⇒ It may not be possible to reach the specified ultimate vacuum if an oil other than B-oil for rotary vane pumps is used. Similarly, failure to use the recommended oil may impair cold-start performance and pump lubrication!

Certain pumped media may attack the standard oil in the pump. It is at the users' responsibility to check if the materials of the wetted parts are resistant against the pumped substances. This is also mandatory for the pump oil.

7.4 Replacing diaphragms and valves

Replacing
diaphragms and
valves

When replacing diaphragms and valves, the diaphragms and valves in both pump heads of the diaphragm pump are replaced.



DANGER



Contamination of vacuum pump with dangerous substances

The vacuum pump might be contaminated with noxious or otherwise dangerous substances and chemicals that have been pumped during operation.

- ⇒ Decontaminate or clean the vacuum pump before coming in contact.
- ⇒ Wear your personal protective equipment.
- ⇒ Avoid skin contact with contaminated parts.



Prepare the replacement of diaphragms and valves



1. Switch off the pump and unplug the power plug from the socket. Afterwards wait 5 seconds for the capacitors to discharge. Ensure that the pump cannot be operated accidentally if parts of the pump are disassembled.
2. Disconnect the vacuum pump from the apparatus.
3. Ventilate the pump:
Unscrew the manometer (2) at its adapter (3) from the oil reservoir of the rotary vane pump to ventilate the oil reservoir; open-ended wrench width 17 mm. Do not turn the manometer itself as leaks might be caused! Pay attention to the O-ring.
→ *see also chapter: 4.3 Initial operation – Pouring in pump oil on page 38.*
4. Allow the pump to cool down, if necessary.
5. Drain the condensate from the catchpot of the oil mist filter; Allen key size 6, → *see chapter: Drain condensate on page 53.* By draining the condensate you prevent leaking of condensate from the catchpot of the oil mist filter.
6. Drain the oil to prevent oil from making its way into the oil mist filter or into the manometer, → *see chapter: 7.3 Oil change on page 68.* Refill the pump with oil before restarting the pump.
7. For maintenance, lay the pump on its side with the pump head of the diaphragm pump to be maintained at the top. Support the pump appropriately. Prevent any damage to the

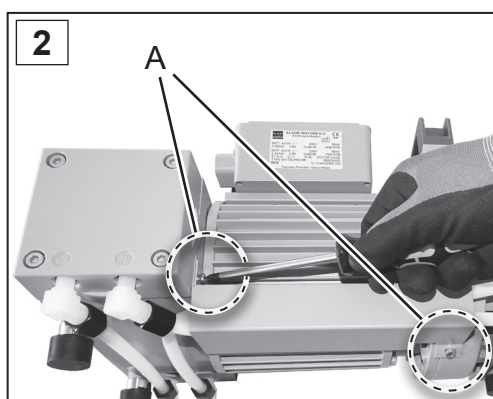
oil mist filter or to the manometer. Do not use the oil mist filter to prop up the pump.

Clean and check the pump heads

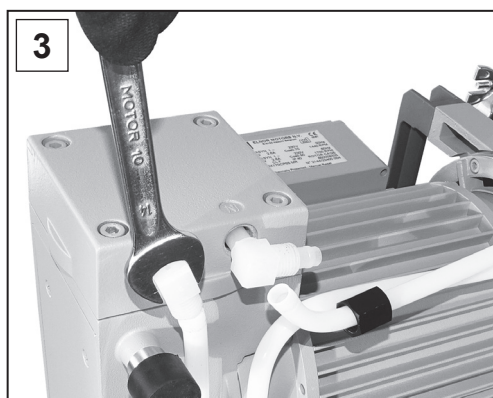
Clean and check the pump heads



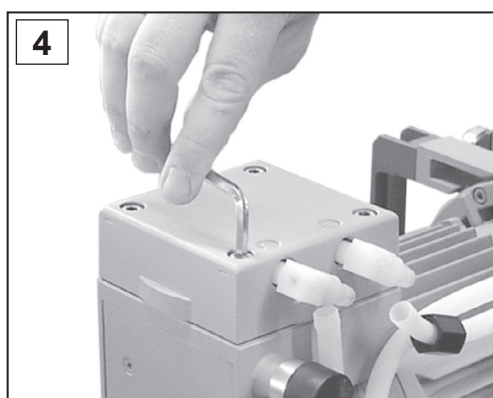
1. Loosen the union nuts at the pump heads; open-ended wrench width 17 mm.



2. Loosen the two screws (A); Phillips screwdriver size 2. Pay attention to lock washers. Remove the cover plate.



3. Turn the elbow fittings a quarter of a turn each to detach the hoses from the fittings; open-ended wrench width 14 mm. Do not remove the elbow fittings from the pump head. During reassembly a leak may result.

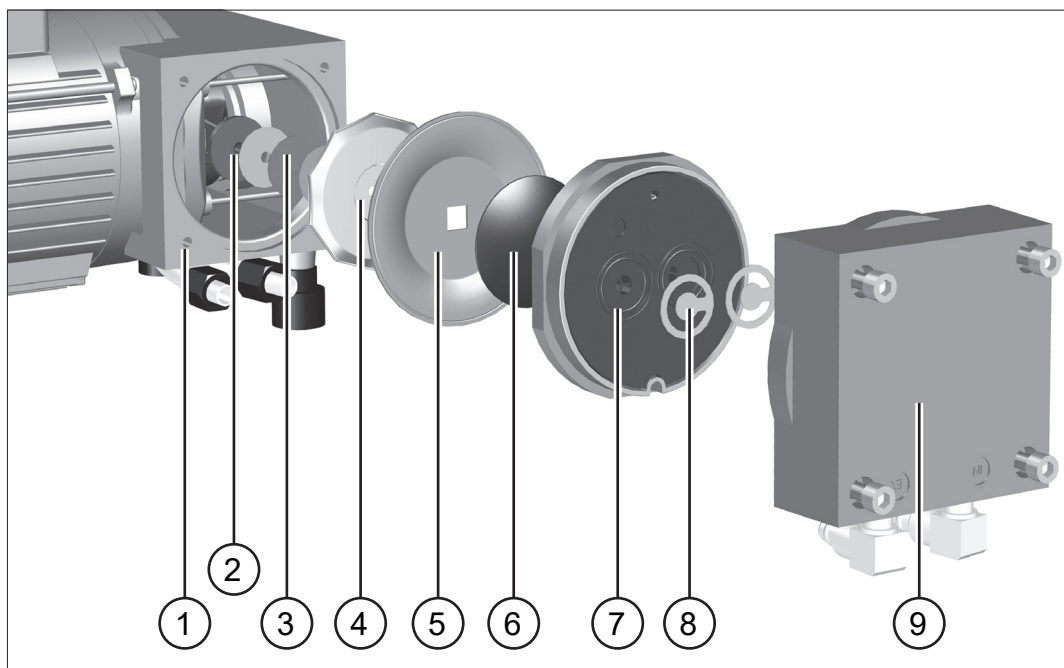


4. Unscrew the four Allen screws at the pump head; Allen key size 5.

5. Remove the housing cover with housing cover insert together with the head cover and the valves. Never remove parts by using a pointed or sharp-edged tool (e.g., screwdriver). Instead, carefully use a mallet or compressed air.
6. Remove the head cover carefully from the housing cover with housing cover insert.
7. Note the position and orientation of the valves and remove them.
8. Check the valves for damage and replace the valves, if necessary.
9. Check the diaphragm for damage and replace the diaphragm, if necessary.

Exploded view of pump head

Exploded view of
pump head

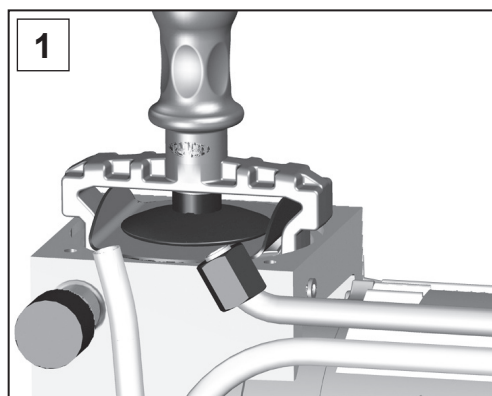


Description

No.	Component
1	Housing
2	Connecting rod
3	Washer
4	Diaphragm support disc
5	Diaphragm
6	Diaphragm clamping disc with square head screw
7	Head cover
8	Valve
9	Housing cover with housing cover insert

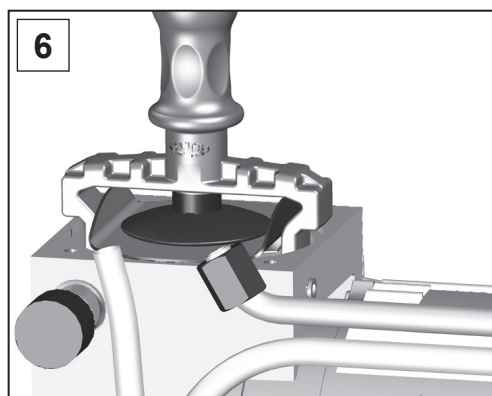
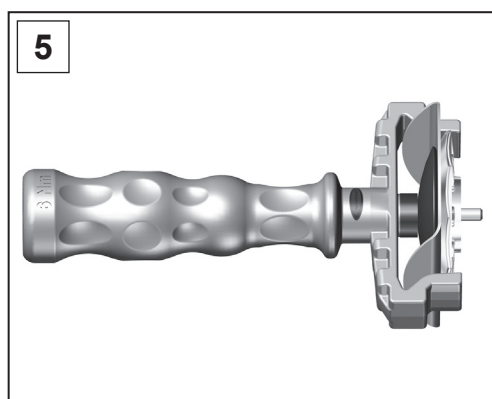
Replace the diaphragm

Replacing the
diaphragm



1. Lift diaphragm carefully side-wise. Never use a pointed or sharp-edged tool to lift the diaphragm. Use the diaphragm key to grip the diaphragm support disc below the diaphragm. Loosen the diaphragm support disc with the diaphragm key and unscrew the diaphragm support disc together with the diaphragm and the diaphragm clamping disc.

2. Check for possible washers between the diaphragm support disc and the connecting rod. Keep the washers from different pump heads separate. Reassemble the same washers in their original number later on.
3. Separate the diaphragm from the diaphragm support disc. If the old diaphragm is difficult to separate from the diaphragm support disc, use naphtha or petroleum ether to separate.
4. Position the new diaphragm between the diaphragm clamping disc with square head screw and the diaphragm support disc. Position diaphragm with its pale side towards the diaphragm clamping disc.
Make sure that the square head screw of the diaphragm clamping disc is correctly seated in the guide hole of the diaphragm support disc.

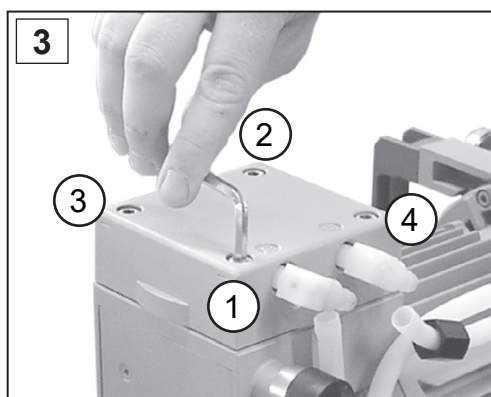
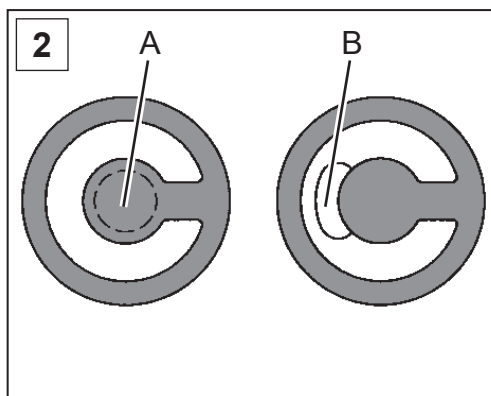
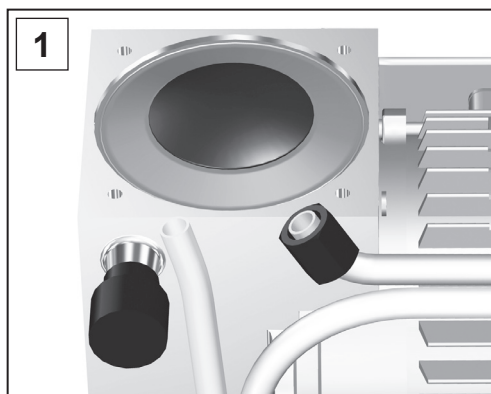


5. Lift the diaphragm at the side. Place the diaphragm carefully together with the diaphragm clamping disc and the diaphragm support disc in the diaphragm key. Avoid damage of the diaphragm. Do not excessively bend the diaphragm.
6. Pay attention to possibly existing washers. Reassemble the same washers in their original number between the connecting rod and the diaphragm support disc. Screw the diaphragm clamping disc, the diaphragm, the diaphragm support disc and possible washers to the connecting rod.

- ⇒ In case, use a torque wrench. Optimum torque for the diaphragm support disc: **6 Nm (4.4 ft.lb.)**. You can attach the torque wrench to the diaphragm key (hexagonal bolt 6 mm wide). Never use the diaphragm key with any additional tools like tongs or Allen keys without appropriate torque limitation.
- ⇒ Too few washers: Pump will not attain its vacuum specification.
Too many washers: Diaphragm clamping disc will hit the head cover, noisy operation.

Assemble the pump heads

Assembling the pump heads



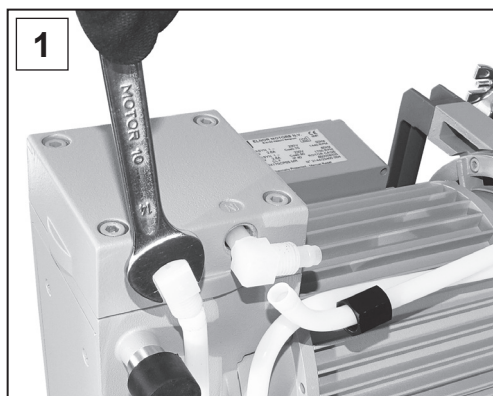
1. Bring the diaphragm into a position, in which it is in contact with the housing and centered with respect to the bore. Thus the diaphragm will be clamped uniformly between the housing and the head cover when assembling the pump head.

2. Assemble the head cover, the valves, the inner part of the housing cover and the housing cover to one unit. Make sure that the **valves are correctly positioned** on the head cover: Outlet side: round centered opening (A) under the valve; Inlet side: kidney-shaped opening (B) beside the valve.

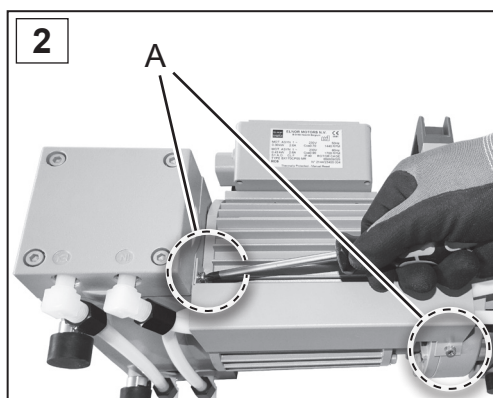
3. Place the unit consisting of housing cover and head cover onto the housing. Screw in the four Allen head screws at the housing cover; Allen key size 5. Tighten the four Allen head screws at first slightly and diagonally (e. g. in sequence ①, ②, ③, ④), then tighten the screws with a torque wrench; **torque 12 Nm (8.9 ft.lbf)**. Do not overtighten.

Assemble the connecting hose

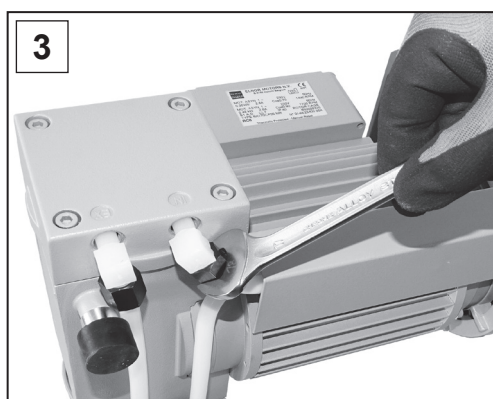
Assembling the connecting hose



1. Slip the hose connector of each fitting into the hose by turning the fitting a quarter of a turn; open-ended wrench width 14 mm.



2. Assemble the over plate. Screw in both screws (A); Phillips screwdriver size 2. Pay attention to lock washers.



3. Tighten the union nuts at first by hand. Then tighten the union nuts one full turn using the open-ended wrench; open-ended wrench width 17 mm.

⇒ Maintain the second pump head on the opposite side in the same way.

☒ Diaphragms and valves replaced.

NOTE

Operating the vacuum pump without oil filling damages the vacuum pump.

⇒ Before starting the vacuum pump again, pour pump oil into the oil reservoir of the rotary vane pump., → see chapter: 4.3 *Initial operation – Pouring in pump oil on page 38.*

⇒ Check the diaphragm pump's operability, → *see chapter: Check the diaphragm pump's operability on page 65.*

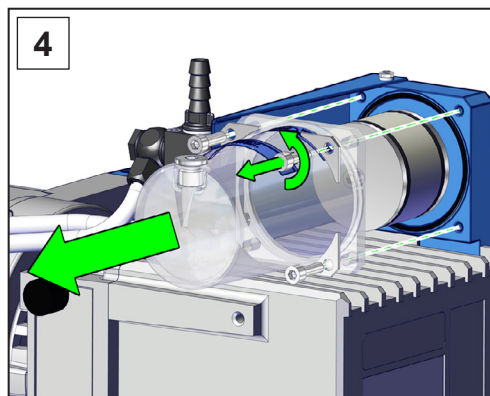
If the vacuum pump does not achieve the specified ultimate vacuum:

- Await the break-in period of the vacuum pump. Whenever the diaphragms and valves have been replaced, a break-in period of several hours is required before the vacuum pump achieves its ultimate vacuum.
- In case of an unusual noise, switch off the vacuum pump immediately and check clamping disc positions.
- Check the fittings of the connecting hoses at the pump heads and the pump heads as such anew, if the ultimate vacuum is far-off from the specified ultimate vacuum, and if this does not change after the break-in period.

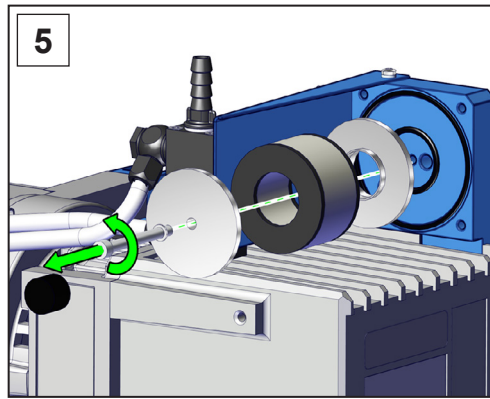
7.5 Replacing the filter element

Replacing the filter element in the oil mist filter

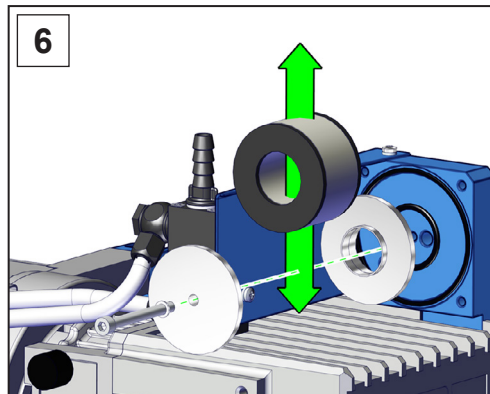
1. Drain the condensate from the catchpot of the oil mist filter; Allen key size 6, → *see chapter: Drain condensate on page 53.*
2. Lay the pump on its side with the oil mist filter at the top. Support the pump appropriately. Prevent any damage to the oil mist filter or to the manometer. Do not use the oil mist filter to prop up the pump.
3. Drain the oil to prevent oil from making its way into the oil mist filter or into the manometer, → *see chapter: 7.3 Oil change on page 68.* Refill the pump with oil before restarting the pump.



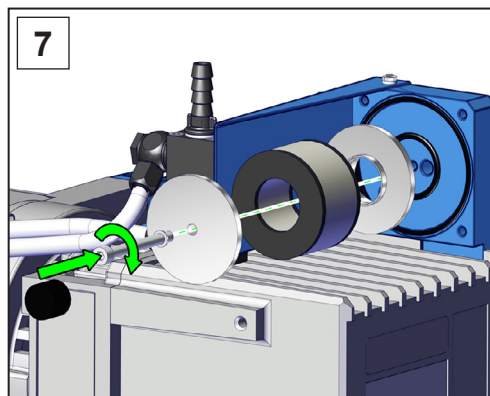
4. Loosen the four Allen head screws; Allen key size 5. Remove the catchpot. Pay attention to the sealing ring.



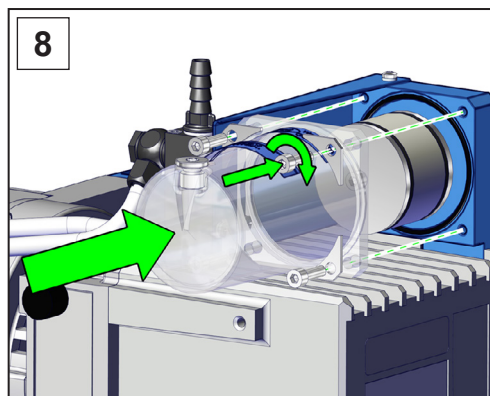
5. Loosen the Allen head screw in the center of the bottom filter thrust plate; Allen key size 5. Remove both filter thrust plates, the filter element and the O-ring.



6. Clean or replace the filter element. Dispose of the filter element in accordance with regulations, thereby taking into account possible contaminations with pumped substances.



7. Position the filter element between the two filter thrust plates. Screw on the filter element and both filter thrust plates with the Allen head screw; Allen key size 5. Make sure that the O-ring is correctly seated.



8. Screw on the catchpot with four Allen head screws; Allen key size 5. Make sure that the sealing ring is correctly seated.

☑ Filter element replaced.

NOTE

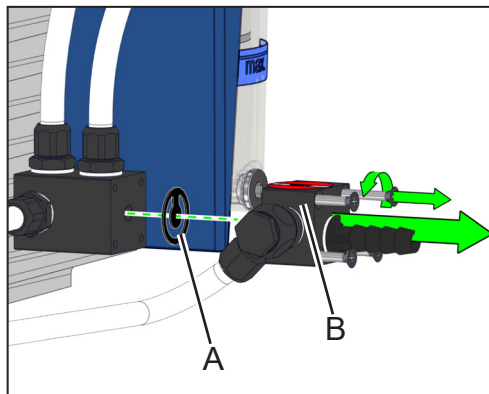
Operating the vacuum pump without oil filling damages the vacuum pump.

⇒ Before starting the vacuum pump again, pour pump oil into the oil reservoir of the rotary vane pump., → *see chapter: 4.3 Initial operation – Pouring in pump oil on page 38.*

7.6 Inspecting the safety pop valve

Inspecting the safety pop valve

1. Drain the oil to prevent oil from making its way into the oil mist filter or into the manometer, → *see chapter: 7.3 Oil change on page 68.* Refill the pump with oil before restarting the pump.
2. Lay the pump on its side with the oil mist filter at the top. Support the pump appropriately. Prevent any damage to the oil mist filter or to the manometer. Do not use the oil mist filter to prop up the pump.



3. Remove the four countersunk screws at the distributor block (B); Phillips screwdriver size 2.
 4. Lift off the distributor block. Note the valve's position (A).
 5. Inspect the valve and replace the valve if damaged.
 6. Position the valve and screw on the distributor block with the four screws; Phillips screwdriver size 2.
- ☒ Safety pop valve inspected.

NOTE

Operating the vacuum pump without oil filling damages the vacuum pump.

⇒ Before starting the vacuum pump again, pour pump oil into the oil reservoir of the rotary vane pump., → *see chapter: 4.3 Initial operation – Pouring in pump oil on page 38.*

7.7 Replacing the device fuses

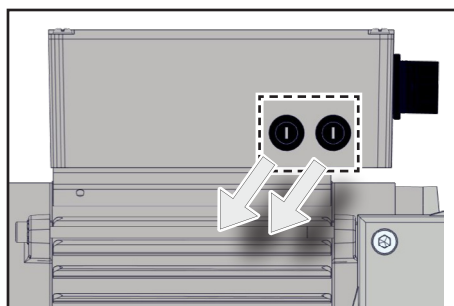
The vacuum pump in 120 V – version has two device fuses. The vacuum pump in 230 V – version has no device fuse. The device fuses are located laterally at the terminal box.

Type: 250 VAC / 10 AT – 5x20.

	DANGER
	Danger due to electrical voltage. The vacuum pump has two fuses (double pole / neutral fusing) and might be energized, even when one fuse has blown or has been removed. ⇒ Switch off the vacuum pump. ⇒ Unplug the power plug from the socket, before unscrewing the fuse holder

Replacing the device fuse

Replacing the device fuse



1. Identify and eliminate the cause of failure before switching on the pump again.
 2. Unscrew the fuse holder at the terminal box of the pump using a slotted screwdriver.
 3. Replace the defective fuse by a fuse of the same type → see chapter: → see chapter: **8.1 Technical data on page 85**.
 4. Reassemble the holder with fuse to the pump; slotted screwdriver.
- ☒ Device fuse replaced.

8 Appendix

8.1 Technical data

Technical data

Ambient conditions

		(US)
Max. ambient temperature during operation	12 – 40 °C	54 – 104 °F
Storage/transport temperature	-10 – 60 °C	14 – 140 °F
Max. altitude	2000 m above sea level	6562 ft above sea level
Relative humidity	30 – 85 %, non-condensing	
Pollution degree	2	
Protection class (IEC 60529)	IP 40	

Operating conditions

		(US)
Maximum admissible media temperature (gas), non-explosive atmospheres:		
Short term (< 5 minutes), Inlet pressure < 100 mbar/75 Torr (low gas load)	-10 – 80 °C	14 – 176 °F
Continuous operation, inlet pressure < 100 mbar/75 Torr (low gas load)	0 – 60 °C	32 – 140 °F
Continuous operation, inlet pressure > 100 mbar/75 Torr (high gas load)	10 – 40 °C	50 – 104 °F

Connections

Vacuum connection IN (inlet)	Small flange KF DN 16 ¹
Exhaust connection OUT (outlet)	Hose nozzle DN 10 mm
Cold-device plug	+ power connection CEE, CH, CN, UK, IN, US

¹ Pumps 22614824 and 22614825: Additional adapter small flange KF DN 16 to hose nozzle DN 19 mm (material: aluminum) and adapter small flange KF DN 16 to hose nozzle 1/2" (material: PP)

Technical data

Electrical dataObserve
specifications of
rating plate

Voltage version 230 V	
Overvoltage category	II
Motor protection	Self-hold thermal cutout, manual reset ²
Rated voltage	230 V ±10 %
Power frequency	50 / 60 Hz
No-load speed	1500 / 1800 min ⁻¹
Rated motor power ³	0.3 kW
Rated current	2.6 / 2.6 A (50 / 60 Hz)

Observe
specifications of
rating plate

Voltage version 100 – 120 V		(US)
Overvoltage category	II	
Motor protection	Self-hold thermal cutout, manual reset ²	
Rated voltage	100 – 120 V ±10 %	
Power frequency	50 / 60 Hz	
No-load speed	1500 / 1800 min ⁻¹	1500 / 1800 rpm
Device fuse, slow blow fuse	2 x 10 AT 250 VAC, 5 x 20 mm	breaking capacity: 1000 A at 250 VAC
Rated motor power ³	0.3 kW	0.40 hp
Rated current	4.3 / 4.9 A (50 / 60 Hz)	
Starting current, typical	25 A for 100 ms	

² In case of supply voltage below 115 V, the lock of the cutout might be restricted.

³ Visit our website for information on the subject **Regulation on ecodesign for electric motors (EU) 2019/1781, 2021/341**: <https://www.vacuubrand.com/ie2>

Mechanical data

		(US)
Dimensions (L x W x H), approx.	526 mm x 302 mm x 226 mm	20.7 in x 11.9 in x 8.9 in
Weight with oil filling, approx.	25.0 kg	55.1 lbs.

Technical data

Vacuum data

		(US)
Maximum pumping speed 50 / 60 Hz	5.9 / 6.9 m³/h	3.5 / 4.1 cfm
Ultimate partial pressure without gas ballast ⁴	4*10 ⁻⁴ mbar	3*10 ⁻⁴ Torr
Ultimate total pressure without gas ballast ⁵	2*10 ⁻³ mbar	1.5*10 ⁻³ Torr
Ultimate total pressure with gas ballast	1*10 ⁻² mbar	0.75*10 ⁻² Torr
Max. permissible inlet pressure, absolute	1.1 bar	16 psi
Max. permissible outlet pressure, absolute	1.1 bar	16 psi
Max. permissible pressure difference between inlet and outlet	1.1 bar	16 psi
Max. permissible pressure at gas ballast valve, absolute	1.2 bar	17.5 psi

4 Partial pressure of permanent gases measured at pump inlet.

5 The total pressure is higher than the partial pressure because the former includes the vapor pressure of the pump oil and other condensable vapors (e.g., water); the condition of the oil (cleanliness, content of hydrocarbons with higher partial pressures) is crucial for this value.

Other specifications

		(US)
Water vapor tolerance ⁶	>> 40 mbar	>> 30 Torr
Recommended oil	B-oil for rotary vane pumps	
Oil capacity min. / max.	340 / 500 ml	0.36 / 0.53 quarts
Total pressure in oil reservoir ⁷	18 mbar	13.5 Torr
Oil temperature ⁸ (under typical operating conditions) approx.	60 °C	140 °F
A-weighted emission sound pressure level ⁹ (uncertainty K _{pA} : 3 dB(A))	50 dB(A)	

6 The maximum inlet pressure for water vapor, or rather the maximum inlet pressure for vapor, cannot be specified in accordance with ISO 21360-2 because it cannot be determined for the HYBRID pump in accordance with this standard. Because the diaphragm pump reduces the pressure in the oil-sealed part of the RC 6, however, the water vapor tolerance is considerably higher than that of a conventional oil-sealed rotary-vane pump.

7 With inlet sealed and without gas ballast

8 Oil temperature and pressure in the oil reservoir are the relevant parameters for maximum vapor inlet pressure and chemical resistance.

9 Measurement according to EN ISO 2151:2009 and EN ISO 3744:1995 at 230 V / 50 Hz and ultimate vacuum with exhaust tube at outlet.

8.2 Rating plate

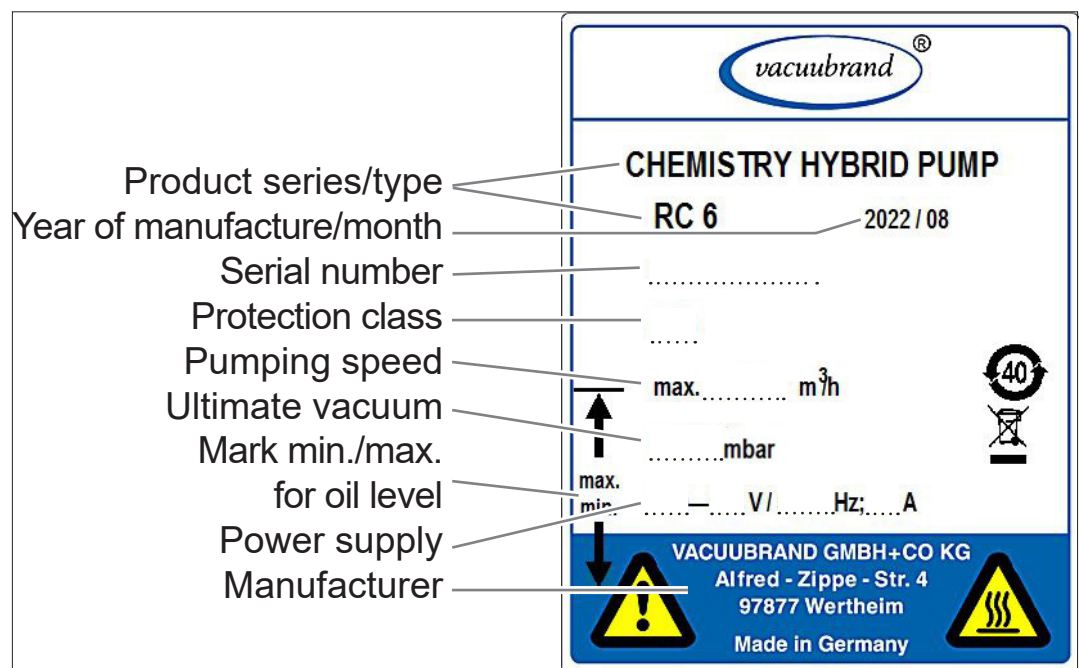
Data from rating plate



- ⇒ In the event of an error, make a note of the type and serial number on the rating plate.
- ⇒ When contacting our Service Department, please provide the type and serial number from the rating plate. This will allow us to provide you with specific support and advice for your device.

Vacuum pump rating plate

→ Example
Vacuum pump rating plate



8.3 Wetted materials

Wetted materials

Components	Wetted materials
Metal parts ¹	aluminum alloy, stainless steel, gray cast iron, steel (partly plasma nitrated), nickel-plated, zincked
Plastic materials	epoxy resin, FFKM, FPM, NBR, PBT, PEEK, PFA, PMP, PPS glass-fiber reinforced, PTFE, PVC

¹ The vacuum pump RC 6 doesn't contain any nonferrous heavy metal.

8.4 Ordering information

Spare parts / aids

Ordering information
for spare parts / aids

	Order no.
Diaphragm (Replacing diaphragms and valves)	20639786
Valve (Replacing diaphragms and valves)	20638440
Diaphragm key SW 66 (Replacing diaphragms and valves)	20636554
Vacuum gauge DVR 2pro (Operability check of the diaphragm pump)	20682906
B-oil for rotary vane pumps, 1 liter (oil change)	20687010
Filter element FO DN 10 (Replacing the filter element in the oil mist filter)	20640187
Safety pop valve (valve in distributor block at the outlet)	20638836
Maintenance kit for pump unit RC 6 (rotary vane pump and diaphragm pump)	20649990

Accessories

Ordering information
for accessories

	Order no.
Separator AK at the inlet	20698006
Butterfly valve VS 16C	20665007
Shut-off valve, ball valve VKE 16; KF DN 16	20675504
Gas ballast adapter, connection KF DN 16, stainless steel	20636193
Solenoid operated gas ballast valve VB M-B KF DN 16	20674217
Vacuum gauge DCP 3000 with gauge head VSP 3000 (Pirani); 1100 – 0,001 mbar, 100 – 230 V / 50 – 60 Hz	20683190
Vacuum gauge VACUU·VIEW extended, 1*10 ³ – 1*10 ⁻³ mbar, 100 – 230 V / 50 – 60 Hz	20683210
Small flange with hoe nipple for hose DN 19, aluminum; KF DN 16	20662531
Vacuum hose (rubber, DN 20)	20686005
PTFE vacuum hose (antistatic), with stainless steel small flanges. PTFE hose with smooth inner side*. KF DN 16, 500 mm	20686030
PTFE vacuum hose (antistatic), with stainless steel small flanges. PTFE hose with smooth inner side*. KF DN 16, 1000 mm	20686031
PTFE vacuum hose (antistatic), with stainless steel small flanges. PTFE hose with smooth inner side*. KF DN 25, 500 mm	20686032
PTFE vacuum hose (antistatic), with stainless steel small flanges. PTFE hose with smooth inner side*. KF DN 25, 1000 mm	20686033

Power cord	CEE	20612058
	CH	20676021
	CN	20635997
	IN	20635365
	UK	20676020
	US	20612065

** For increased chemical resistance, reduced deposits, and high conductance.*

Pump oil

Ordering information
for pump oil

	Order no.
B-oil for rotary vane pumps, 1 liter	20687010
B-oil for rotary vane pumps, 5 liter	20687011
B-oil for rotary vane pumps, 20 liter	20687012
B-oil for rotary vane pumps, 200 liter	20687013

Safety information
on pump oil



The safety information on the pump oil is available for download at <https://www.vacuubrand.com/safety-information>.

Sources of supply

Purchase original accessories and original spare parts from a subsidiary of **VACUUBRAND GMBH + CO KG** or your local distributor or from the [VACUUBRAND Online-Shop](#).

International
sales offices and
distribution



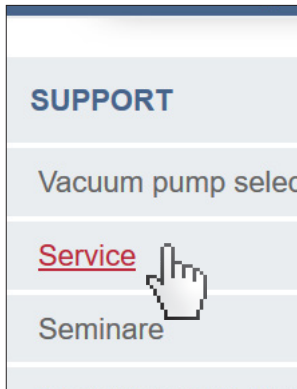
Information about our complete product range is available in the current [product catalog](#).

⇒ Your local distributor or VACUUBRAND GMBH + CO KG [sales office](#) is available to assist you with orders, questions on vacuum control and optimal accessories.

8.5 Service

Take advantage of the comprehensive range of services available from **VACUUBRAND GMBH + CO K**

Service offer and service range



Services in detail

- product consultation and practical solutions,
 - fast delivery of spare parts and accessories,
 - professional maintenance,
 - immediate repairs processing,
 - on-site service (on request),
 - with [Health and Safety Clearance](#): return, disposal
- ⇒ Visit our website for further information www.vacuubrand.com.

Service handling

⇒ Follow these headings: VACUUBRAND > Support > [Service](#)

Meet terms of service



Reduce downtime, speed up processing. Please have the required data and documents at hand when contacting our Service Department.

- ▶ Your order can be quickly and easily processed.
- ▶ Hazards can be prevented.
- ▶ A brief description and/or photos will help locate the source of the error.

8.6 Index

Index	A	Inlet pressure	47
	Abbreviations	Inspecting the safety pop valve	82
	Accessories	Instruction module	6
	Action steps	Instructions	9
	Additional symbols	Intended use	11
	Ambient conditions	L	
	Application example	Labels and signs	24
	Assembling the connecting hose	Limitation of use	37
	Assembling the pump heads	M	
	Automatic restart	Maintain minimum distance	24
	Avoid overpressure	Maintenance intervals	65
	B	Mandatory sign	8
	Basic configuration	Manual structure	6
	B-oil for rotary vane pumps	Mechanical data	86
	C	Minimum distances	37
	Check motor capacitors	Misuse	13
	Check oil level	O	
	Clean and check the pump heads ...	Oil change	68
	Cleaning and maintenance	Oil change interval	69
	Condensable vapors	Oil change procedure	69
	Condensate	Oil level	48
	Condensates	Oil mist separator at outlet	30
	Connections	Operability check	65
	Copyright	Operating conditions	47, 85
	D	Operating steps as graphics	9
	Display of operating steps	Operator obligations	14
	Disposal	Ordering information	
	Distribution	for accessories	89
	Drain condensate	Ordering information for pump oil	90
	E	Ordering information	
	EC Declaration of conformity	for spare parts / aids	89
	Electrical connection	Other specifications	87
	Electrical data	Outlet connection	43
	Eliminate sources of danger	Outlet line	43
	Error – Cause – Remedy	Outlet pressure	47
	Explanation of safety symbols	Overheating	23
	Exploded view of pump head	Overheating protection	24
	F	Overview	
	Foreign bodies	Chemistry-HYBRID-Pumps	31
	G	P	
	Gas ballast	Permanenter Gasballast	29
	Gas ballast valve	Personnel obligations	14
	Goods receipt	Personnel qualification	14
	H	Pouring in pump oil	38
	Hot surfaces	Pouring in the pump oil	38
	HYBRID principle	Power connection	85
	I	Power cord	44
	Icons	Presentation conventions	7
	Improper use	Pressure display oil reservoir	29
	Increased pressure	Prevent condensate return	22
	inside the oil reservoir	Product description	27
	50	Product-specific terms	10
		Prohibition sign	8

Index	Protective clothing	16
	Pump oil	21, 72
Q		
	Qualification description	14
	Quality standard	16
R		
	Replacing diaphragms and valves ...	73
	Replacing the device fuse	83
	Replacing the diaphragm	76
	Replacing the filter element in the oil mist filter	80
	Residual energy	23
	Responsibility matrix	15
S		
	Safety information	11
	Safety information on pump oil	90
	Safety precautions	16
	Separator AK	32
	Service handling	91
	Service range	91
	Shutdown	55
	Sources of supply	90
	Switch off	54
	Switch on	47
	Symbols	8
T		
	Target groups	14
	Technical data	85
	Technical support	57
	Term definitions	10
	Troubleshooting	57
U		
	UKCA Declaration of Conformity	95
	Unpacking	35
	User information	5
V		
	Vacuum connection (IN)	41
	Vacuum pump rating plate	88
	Vakuumdaten	87
	Views	28
W		
	Warm-up times	47
	Warning symbol	8
	Wetted materials	88

8.7 EC Declaration of conformity

EC Declaration of
conformity

EG-Konformitätserklärung für Maschinen EC Declaration of Conformity of the Machinery Déclaration CE de conformité des machines



Hersteller / Manufacturer / Fabricant:

VACUUBRAND GMBH + CO KG · Alfred-Zippe-Str. 4 · 97877 Wertheim · Germany

Hiermit erklärt der Hersteller, dass das Gerät konform ist mit den Bestimmungen der Richtlinien:

Hereby the manufacturer declares that the device is in conformity with the directives:

Par la présente, le fabricant déclare, que le dispositif est conforme aux directives:

- 2006/42/EG
- 2011/65/EU, 2015/863

Chemie-HYBRID-Pumpe / Chemistry-HYBRID-pump / Pompe HYBRIDE chimie:

Typ / Type / Type: **RC 6**

Artikelnummer / Order number / Numéro d'article: **20798560, 20798561, 20798562, 20798566, 22614824**

Seriennummer / Serial number / Numéro de série: Siehe Typenschild / See rating plate / Voir plaque signalétique

Angewandte harmonisierte Normen / Harmonized standards applied / Normes harmonisées utilisées:

EN ISO 12100:2010 (ISO 12100:2010), EN 1012-2:1996 + A1:2009, EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
(IEC 61010-1:2010 + COR:2011 + A1:2016, modifiziert / modified / modifié + A1:2016/COR1:2019)

EN IEC 63000:2018 (IEC 63000:2016)

Bevollmächtigter für die Zusammenstellung der technischen Unterlagen / Person authorised to compile the technical file / Personne autorisée à constituer le dossier technique:

Dr. Constantin Schöler · VACUUBRAND GMBH + CO KG · Germany

Ort, Datum / place, date / lieu, date: Wertheim, 07.12.2023

(Dr. Constantin Schöler)

Geschäftsführer / Managing Director / Gérant

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Web: www.vacuubrand.com

VACUUBRAND®

8.8 UKCA Declaration of conformity

UKCA Declaration of
Conformity

Declaration of Conformity



Manufacturer:

VACUUBRAND GMBH + CO KG · Alfred-Zippe-Str. 4 · 97877 Wertheim · Germany

Hereby the manufacturer declares that the device is in conformity with the directives:

- Supply of Machinery (Safety) Regulations 2008
(S.I. 2008 No. 1597, as amended by S.I. 2019 No. 696)
- The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (S.I. 2012 No. 3032)

Chemistry-HYBRID-pump

Type: **RC 6**

Order number: **20798560, 20798561, 20798562, 20798566, 22614824**

Serial number: See rating plate

Designated standards applied:

EN ISO 12100:2010, EN 1012-2:1996+A1:2009, EN 61010-1:2010+A1:2019, EN 61010-1:2010/A1:2019/AC:2019-04
EN IEC 63000:2018

Person authorised to compile the technical file:

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Place, date: Wertheim, 07.12.2023

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Managing Director

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(Jens Kaibel)

Technical Director

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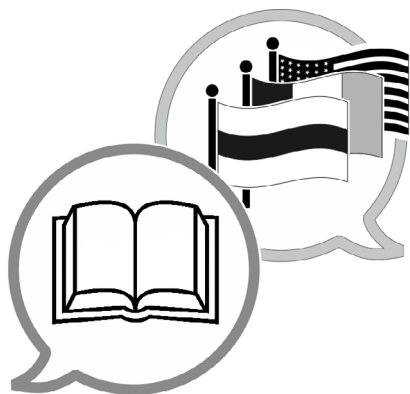
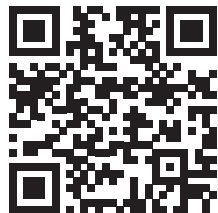
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