



Technology for vacuum systems

CHEMISTRY PUMPING UNIT SERIES

- PC 3001 VARIO select*
- PC 3001 VARIO select TE*
- PC 3001 VARIO select IK*
- PC 3001 VARIO select EKP*



Instructions for use



**Original instructions
Retain for future 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.*

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1 About this document

This is part of the product you have purchased.

This manual, in conjunction with the **VACUU-SELECT®** manual, applies to all versions of the pumping unit and is intended in particular for laboratory staff.

1.1 User information

Safety

Instructions for use
and safety

- Read this thoroughly before using the product.
- Keep this in a readily accessible location.
- Correct use of the product is essential for safe operation. Comply with all safety information provided!
- In addition to the information in this , adhere to the health and safety regulations applicable in the country of use.

General

General information

- If passing the product on to a third party, also give them this .
- 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.
- To improve readability, the general term is used as an equivalent to and instead of the product name .

Copyright

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Contact

Contact us

- If your 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 the rating plate on the product.

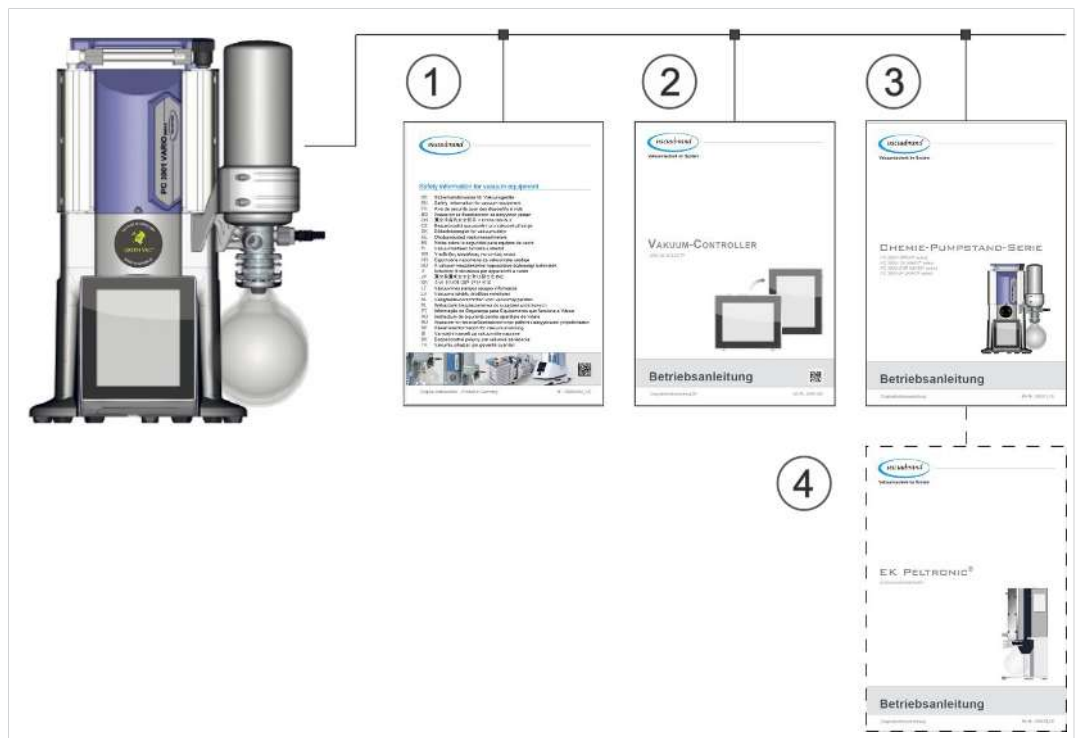
1.2 Manual structure

Breakdown of instructions

The manual has a modular structure with separate individual instruction modules for the pumping unit, controller, and any accessories.

Instruction modules

Pumping unit series and modular manuals




Description


- 1 Safety information for vacuum equipment
- 2 Description: Vacuum controller — control and operation
- 3 Description: Pumping unit – connection, operation, maintenance, mechanics
- 4 Optional description: Accessories


1.3 Display conventions

Warning levels

Display of warning levels

	DANGER
	<p>Warns of an imminent hazard.</p> <p>Disregarding the situation could result in extremely serious injury or death.</p> <ul style="list-style-type: none"> ➤ Take appropriate action to avoid dangerous situations!


	WARNING
	<p>Warns of a potentially hazardous situation.</p> <p>Disregarding the situation could result in serious injury or death.</p> <ul style="list-style-type: none"> ➤ Take appropriate action to avoid dangerous situations!

	CAUTION
	<p>Indicates a potentially hazardous situation.</p> <p>Disregarding the situation could result in minor injury or damage to property.</p> <ul style="list-style-type: none"> ➤ Take appropriate action to avoid dangerous situations!

NOTICE	
<p>Indicates a potentially harmful situation.</p> <p>Disregarding the situation could result in damage to property.</p>	

Additional notes

Display of information and tips







	<p>General information about:</p> <ul style="list-style-type: none"> ⇒ Tips and tricks ⇒ Helpful functions or actions
---	--

1.4 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.









Safety symbols

Explanation of safety symbols

	General danger sign.		Danger: electricity.
	Danger: hot surface.		Danger: potentially explosive material.
	Electrostatically sensitive components ESD.		
	General, mandatory sign.		Disconnect power plug.

Additional symbols and icons

Additional symbols

	Positive example – Do this! Result – OK		Negative example – Don't do this!
	Refers to content in this .		Refers to content of additional documents.
	Ensure sufficient air circulation.		
	Electric/electronic devices and batteries must not be disposed of in the domestic waste at the end of their service life.		
	Flow arrow, inlet – vacuum connection		
	Flow arrow, outlet – -exhaust gas		

1.5 Instructions

Instruction (single step)

- Instructions ⇒ Perform the step described.
 Result of action

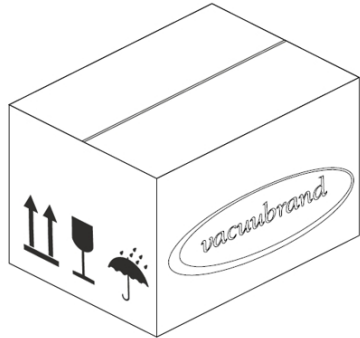
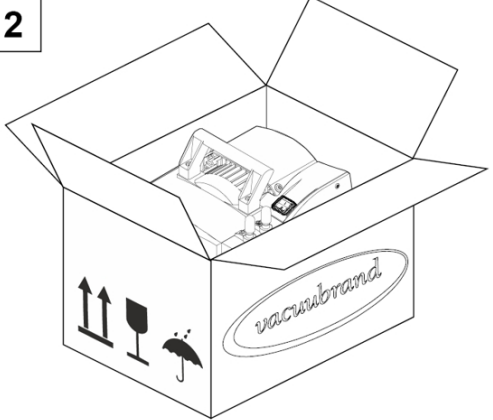
Instruction (multiple steps)

1. First step
2. Next step
 Result of action

Carry out instructions requiring multiple steps in the order described.

Instruction (graphic description)


-> Example
 Schematic diagram
 operating steps
 shown in pictures

<div data-bbox="435 931 504 999">1</div> 	<div data-bbox="978 931 1046 999">2</div> 
<p>1. First step.</p>	<p>2. Next step. <input checked="" type="checkbox"/> Intermediate result or result of step</p>

1.6 Abbreviations

Abbreviations used

>/	not greater than
abs.	Absolute
AK	Separator flask
ATM	Atmospheric pressure (bar graph, program)
di	Interior diameter
DN	Nominal diameter
EK	Vapor condenser
EKP	Peltronic® or EK- Peltronic® vapor condenser

EX ¹	Outlet (exhaust, exit), exhaust gas connection
	ATEX equipment labeling
FKM	Fluoroelastomer
---	---
GB	Gas ballast
---	---
---	Size
IK	Inlet condenser
IN ¹	Inlet, vacuum connection
KF	Small flange
max.	Maximum value
min.	Minimum value
without EK	Without vapor condenser
PA	Polyamide
PBT	Polybutylene terephthalate
PC ...	Chemistry pumping unit with type identification number
PE	Polyethylene
RMA no.	Return Merchandise Authorization number
---	---
SW	Wrench size (tool)
TE	Dry ice condenser
Resp.	Responsible
e.g.	For example

¹ Labeling on vacuum pump or component, see also product specific abbreviations under: → **Chemistry pumping unit series on page 23**

1.7 Term definitions

Product specific terms

Separator flask	Glass flask/separator mounted at the inlet or outlet.
Vapor condenser ²	Cooling condenser with receiving flask mounted at the outlet (pressure side).
Fine vacuum	Pressure measuring range in vacuum technology, from: 1 mbar–0.001 mbar (0.75 Torr–0.00075 Torr)
Rough vacuum	Pressure measuring range in vacuum technology, from: atmospheric pressure–1 mbar (atmospheric pressure–0.75 Torr)
Inlet condenser ²	Cooling condenser with receiving flask mounted at the inlet (vacuum side).
PC 3001 VARIO select	Vacuum pumping unit with variable speed motor for precise vacuum control with VACUU·SELECT® controller and VACUU·SELECT® sensor.
Peltronic®	Electronic chiller with Peltier elements mounted at the outlet (pressure side); condenses solvent vapors without external coolant.
Dry ice condenser ²	Cooling condenser mounted at the outlet (pressure side) with receiving flask and dry ice as coolant.
VACUU·BUS®	Bus system from VACUUBRAND for communication of peripheral devices with VACUU·BUS®-enabled gauges and controllers.
VACUU·BUS® address	Address which enables the VACUU·BUS® client to be unambiguously assigned within the bus system, e.g., for connecting multiple sensors with the same measuring range.
VACUU·BUS® client	Peripheral device or component with VACUU·BUS® port which is integrated in the bus system, e.g., sensors, valves, level indicators, etc.
VACUU·BUS® connector	4-pin round connector for the bus system from VACUUBRAND.
VACUU·BUS® configuration	Assigning a different VACUU·BUS® address to a VACUU·BUS® component using a gauge or controller.
VACUU·SELECT®	Vacuum controller, controller with touchscreen; consisting of operating panel and vacuum sensor.
VACUU·SELECT® sensor	Vacuum sensor with integral venting valve.
VARIO® drive	Speed control for vacuum pump; the motor runs only as fast as necessary to meet demand.

² only suitable for vapor condensation.

2 Safety information

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

The safety information applies to the entire life cycle of the equipment.

2.1 Usage

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

2.1.1 Intended use

Intended use

A chemistry pumping unit of product series PC 3001 VARIO select is a vacuum system consisting of a vacuum pump, controller, vacuum sensor and separator for generating and controlling a rough vacuum in designated systems.

Attached chillers (vapor condenser, inlet condenser, dry ice chiller, Peltronic® vapor condenser), including separators and flasks, are exclusively intended for vapor condensation.

Examples of use: evacuating distillation instruments, particularly rotary evaporators.

The vacuum system 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,
- observing the manual of connected components,
- observing the inspection and maintenance intervals and having maintenance performed by appropriately qualified personnel,
- using only approved accessories or spare parts.

Any other use is considered improper use.

2.1.2 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,
- operation under inadmissible environmental and operating conditions,
- operation despite obvious errors or defective safety devices,
- unauthorized extensions or conversions, in particular when these impair safety,
- usage despite incomplete assembly,
- operation with sharp-edged objects,
- pulling plug-in connections on the cable out of the socket,
- aspirating, conveying, or compressing solids or fluids.

2.1.3 Foreseeable misuse

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

Prohibited types of use include, in particular:

- use on humans or animals,
- installation and operation in potentially explosive atmospheres,
- use in mines or underground,
- using the product to generate pressure,
- fully exposing vacuum equipment to the vacuum,
- immersing vacuum equipment in liquids, or exposing it to water spray or steam jets,
- pumping oxidizing and pyrophoric substances, liquids or solids,
- pumping hot, unstable, or explosive media,
- pumping substances which may react explosively under impact and/or elevated temperature without an air supply.

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

2.2 Obligations

Operator obligations

Operator obligations

The owner defines the responsibilities and ensures that only trained personnel or specialists work on the vacuum system. This applies in particular to connection, installation and maintenance work and troubleshooting.

Users in the areas of competence set out in the → **Target group description on page 14** must possess the relevant qualifications for the activities listed. In particular work on electrical equipment must be performed only by qualified electricians.

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 vacuum system 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.

Personnel qualification

Qualification description

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
Installation	x	x	x
Commissioning	x	x	x
Network integration			x
Operation	x	x	x
Error report	x	x	x
Remedy	(x)	x	x
Maintenance		x	x
Repair ³		x	x
Repair order			x
Cleaning, simple	x	x	x
Empty the separator	x	x	x
Shutdown	x	x	x
Decontamination ⁴		x	x

2.4 General safety information

Quality standards 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.

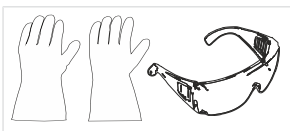
Observe the instructions for all actions as specified in this manual.

2.5 Protective clothing

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

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

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



³ see also Homepage: [VACUUBRAND > Support > Instructions for repair](#)

⁴ Alternatively, arrange for decontamination by a qualified service provider.

2.6 Safety precautions

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

NOTICE! Prior to returning any product to our Service Department for repair, contamination from hazardous substances needs to be excluded. Therefore, send us the carefully completed and signed [Health and Safety Clearance](#) certificate before sending your product for repair.

2.7 Laboratory and working materials



DANGER

Hazardous substances could be discharged at the outlet.

During aspiration, hazardous, 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.
- Install and use suitable separators, filters or extraction devices.

Hazards due to different substances

Pumping different substances

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

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

Possible protective measures

Protective measures, depending on application

- ⇒ Purge the vacuum pump with inert gas or air before changing the medium to be pumped.
- ⇒ Use inert gas to dilute critical mixtures.
- ⇒ Prevent the release of hazardous, toxic, explosive, corrosive fluids, gases or vapors or those that are harmful to health or the environment, for example, through suitable laboratory facilities with a fume hood and ventilation control.
- ⇒ Protect the inside of the vacuum pump from deposits or moisture, e. g, through the provision of a gas ballast.
- ⇒ Be aware of interactions and possible chemical reactions of the pumped media.
- ⇒ Check the compatibility of the pumped substances with the wetted materials of the pumping unit.
- ⇒ Contact us if you have concerns about using your vacuum pump with certain working materials or media.

Prevent foreign bodies inside the pump

Observe vacuum pump design

- Particles, liquids and dust must not get inside the vacuum pump.
- ⇒ Do not pump any substances which could form deposits inside the vacuum pump.
 - ⇒ Install suitable separators and/or filters upstream of the inlet. Suitable filters are chemical-resistant, clog-proof and have a reliable flow rate, for example.
 - ⇒ Replace porous vacuum hoses without delay.

2.8 Possible sources of danger

Take mechanical stability into account

Note mechanical load capacity

The high compression ratio of the pump may result in a higher pressure at the outlet than the mechanical stability of the system allows.

- ⇒ Always ensure that the outlet line is clear and non-pressurized. 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.
- ⇒ At the gas connections, the connections for the inlet IN and outlet EX must not be mixed up.

- ⇒ Be aware of the max. pressures at the inlet and outlet of the pump as well as the max. admissible differential pressure between the inlet and outlet, according to the *technical data*.
- ⇒ The system to be evacuated as well as all hose connections must be mechanically stable.
- ⇒ Fix coolant hoses to the hose nozzles such that they cannot inadvertently become loose.

Prevent condensate return

Prevent backup in the outlet line

Condensate can damage the pump head. Condensate must not flow back into the outlet and pump head through the hose line. Liquid must not accumulate inside the exhaust gas hose.

- ⇒ Avoid condensate return by using a separator. Condensate must not enter the inside of the housing via the hose lines.
- ⇒ Preferably route the exhaust gas hose with a fall from the outlet, i.e., running downward so that no backup can form.
- ⇒ Incorrect measurements due to a blocked vacuum line, e.g., condensate in the vacuum line, can distort the measurements taken by the vacuum sensor.
- ⇒ Avoid overpressure in the suction line (>/ 1060 mbar [>/ 795 Torr]).

Hazards during venting

Observe hazards during venting

Depending on the application, explosive mixtures can form or other hazardous situations can arise in systems.

Hazards due to residual energy

Possible 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: motor waste heat, hot surface, compression heat.
- Electrical energy: the installed capacitors have a discharge time of up to 3 minutes.

Before any action:

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

Hazards due to hot surfaces or overheating

Surface temperatures

The surface of vacuum pumps can reach temperatures $> 70\text{ °C}$ during operation, in particular when pumping out heated media.

- ⇒ Avoid direct contact with the surface.
- ⇒ Use protection against accidental contact if the surface temperature is regularly elevated.
- ⇒ Allow the vacuum pump to cool down before performing maintenance work.

Overheating

The vacuum pump can be damaged due to overheating. Possible causes include insufficient air supply to the fan and/or failure to maintain minimum distances.

- ⇒ When installing the device, ensure that there is a minimum distance of 5 cm between the fan and adjacent parts (such as the housing, walls, etc.).
- ⇒ Always ensure a sufficient air supply; if applicable, provide external forced ventilation.
- ⇒ Place the device on a stable surface. A soft surface such as a foam rubber sound absorber can impair and block the air supply.
- ⇒ Clean polluted ventilation slots.
- ⇒ Remove the cover used as transport protection from the device before operating it.
- ⇒ Avoid excessive heat input due to hot process gases.
- ⇒ Observe the maximum permissible media temperature according to the *technical data*.

Correct handling of coolants and cryogenic substances

Hazards when handling cryogenic substances

Cryogenic substances can cause frostbite (cold burns) on contact with skin.

- ⇒ Observe the applicable regulations regarding handling of cryogenic substances.
- ⇒ Use only approved transport containers.
- ⇒ Take the appropriate safety precautions when handling cryogenic coolants, e.g., dry ice.
- ⇒ Do not use damaged components.
- ⇒ Wear your personal protective equipment when handling hazardous substances.
- ⇒ Ensure your workplace is ventilated.

Dry ice must not be used in gas-tight containers. Do not secure the cover on the dry ice condenser. Pressure equalization between coolant and the atmosphere must be ensured at all times.

Keep signs legible

Labels and signs

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

- ⇒ Connection labels
- ⇒ Warning and information signs
- ⇒ Motor data and rating plates

2.9 Motor protection

Overheating protection, blockage protection

The pump motor has a temperature sensor on the circuit board as overload protection. In the event of excessive temperature or if the motor is blocked, the vacuum pump switches off.

Procedure for switching back on

If the vacuum pump is switched off due to these safety precautions, the error must be cleared manually: Disconnect pumping unit from power supply -> Eliminate cause of error -> Restart pumping unit.

2.10 ATEX equipment category

Installation and potentially explosive atmospheres



Installation and operation in areas where potentially explosive atmospheres can develop to a hazardous degree is not permitted.

The user is responsible for assessing the risks posed by the equipment in such a way that any safety measures necessary for installation and safe operation can be implemented.

ATEX approval only applies to the internal, wetted parts of the of the device, not to its surroundings.

ATEX equipment labeling

ATEX equipment category



Vacuum equipment labeled with Ex has ATEX approval in line with the ATEX marking on the rating plate.

Operation is only permitted when in perfect working condition.

The product is designed for a low level of mechanical stress and must be installed in such a way that it cannot sustain mechanical damage from outside.

ATEX equipment category and peripheral devices

The ATEX equipment category of the device is dependent on the connected components and peripheral devices. Components and peripheral devices need to have the same or higher ATEX approval.

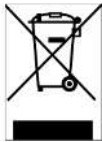
Prevent ignition sources

The use of venting valves is only permitted if this would not normally, or only rarely, cause explosive mixtures in the interior of the device, or do so only for a short time.

⇒ If necessary vent with inert gas.

Information on the ATEX equipment category is also available online at: [Information-ATEX](#)

2.11 Disposal



NOTICE

Incorrect disposal of electronic components can damage the environment.

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.

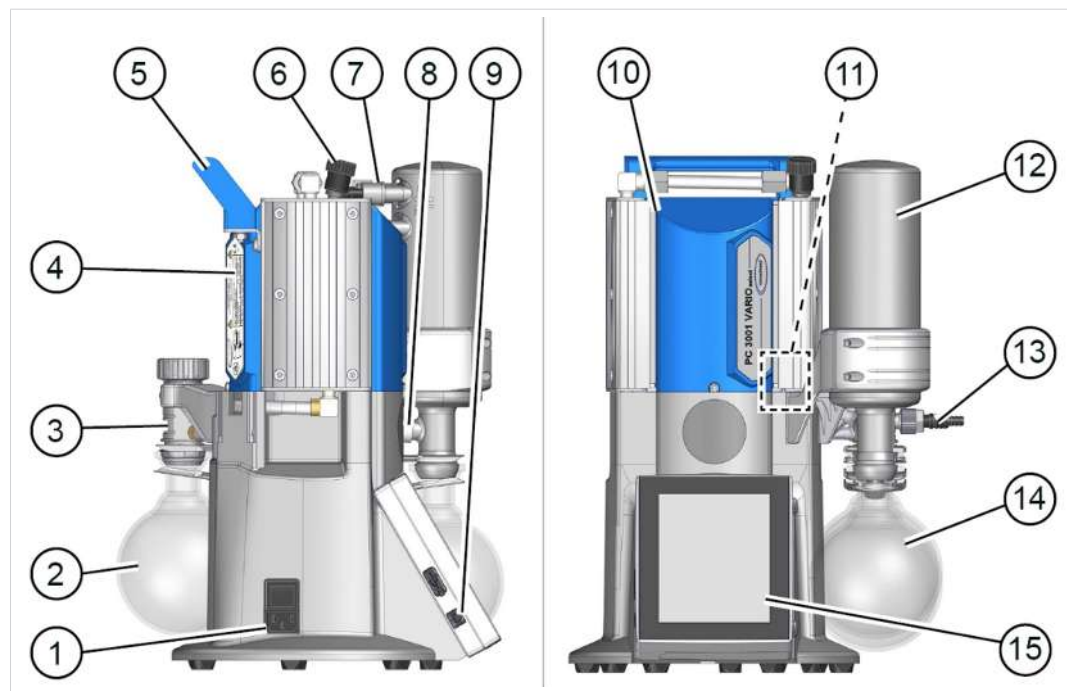
- ⇒ Correctly dispose of electronic scrap and electronic components at the end of their service life.
- ⇒ Observe the national regulations regarding disposal and environmental protection.

3 Product description

Pumping units of the PC 3001 VARIO select series essentially consist of a diaphragm pump controlled by VARIO drive, a VACUU·SELECT® type vacuum controller and a chiller with separator. There are different versions of chiller. The difference lies in how the chillers operate.

3.1 Schematic design of pumping unit series

View and schematic design
PC 3001 VARIO select

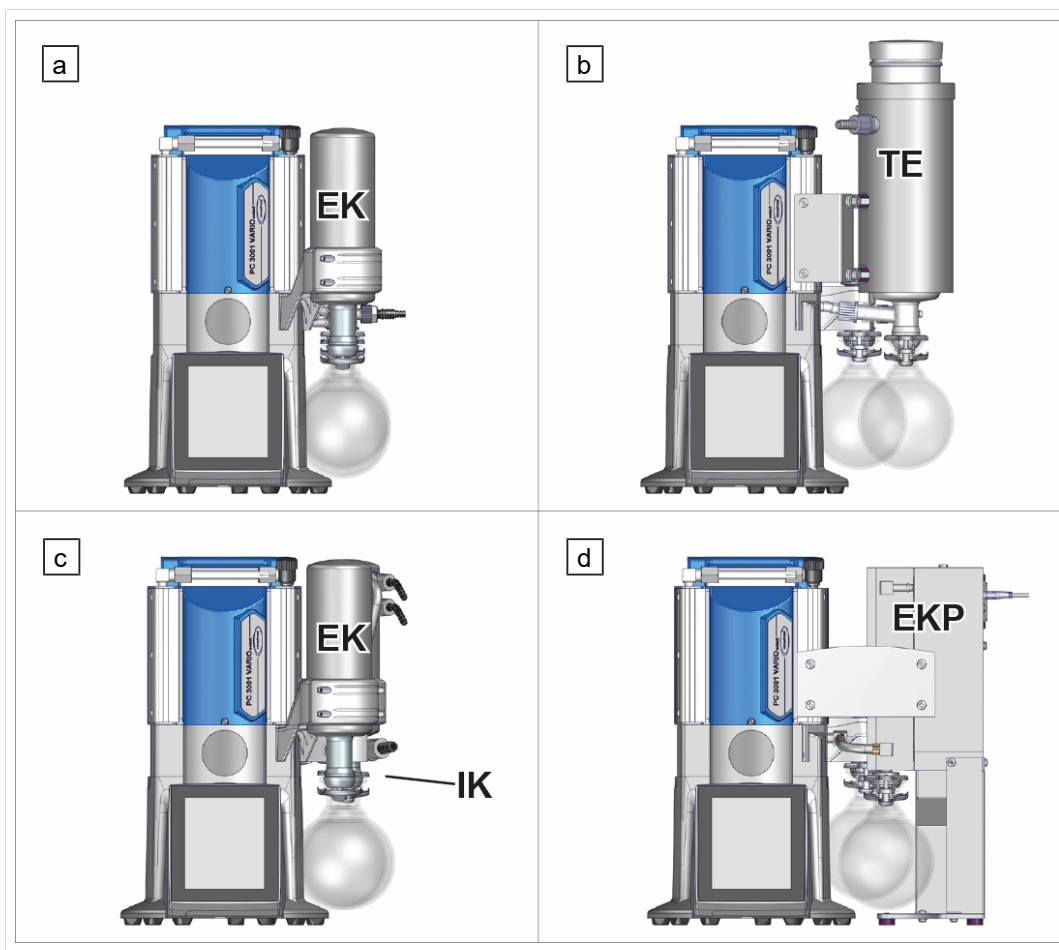


Description

- 1 Pumping unit power supply with ON/OFF switch (rocker switch)
- 2 Separator flask AK, round bottom flask at inlet
- 3 Distributor head
- 4 Rating plate
- 5 Handle
- 6 Gas ballast valve
- 7 Connections on EK: outlet, coolant
- 8 Pressure relief valve
- 9 VACUU·SELECT® controller ON/OFF button
- 10 Chemistry diaphragm pump
- 11 VACUU·SELECT® sensor, mounted in the pumping unit housing
- 12 Vapor condenser EK
- 13 Vacuum inlet, at rear round bottom flask
- 14 Round bottom flask at the outlet
- 15 VACUU·SELECT® operating panel, removable

3.2 Chemistry pumping unit series

Overview of chemistry pumping units



Description

Chemistry pumping unit	AK	IK	EK	TE	EKP
a PC 3001 VARIO select	•		•		
b PC 3001 VARIO select TE	•			•	
c PC 3001 VARIO select IK		•	•		
d PC 3001 VARIO select EKP	•				•

Product-specific abbreviations

Product-specific abbreviations

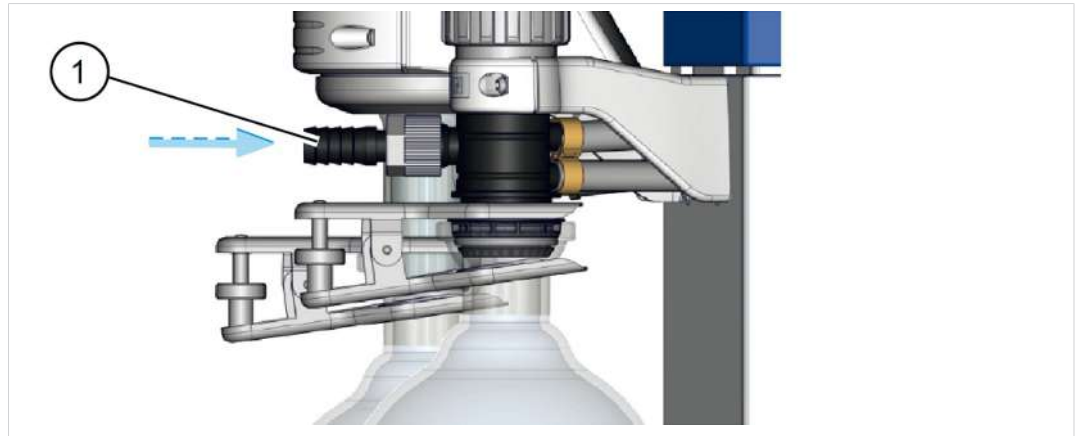
AK	Separator flask, mounted at the inlet or outlet
EK	Vapor condenser, mounted at the outlet
EKP	Peltronic® vapor condenser, mounted at the outlet
IK	Inlet condenser, mounted at the inlet
without EK	Without vapor condenser
PC	Chemistry pumping unit with type identification number
TE	Dry ice condenser, dry ice chiller

3.3 Condensers and chillers

3.3.1 Separator/condenser at the inlet

Connection at the separator flask

Connections on the AK

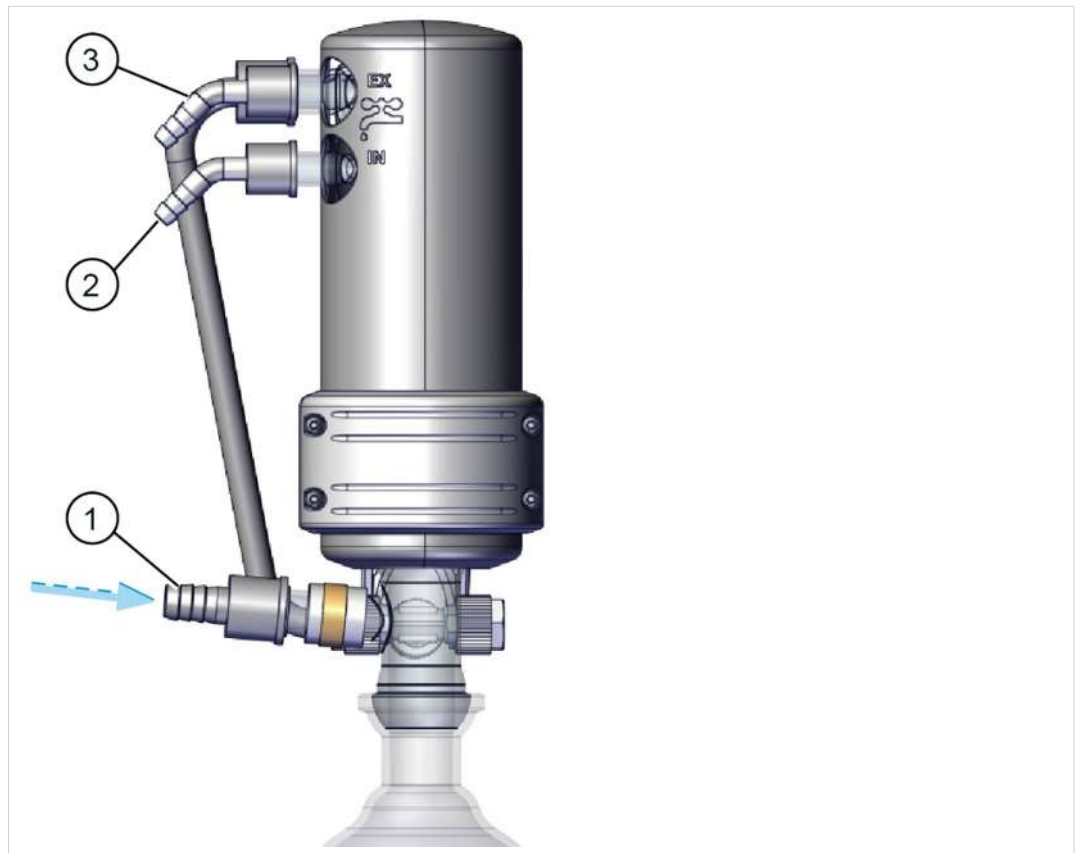


Description

1 Inlet connection vacuum IN

Connection and coolant on the inlet condenser

Connections on the IK



Description

1 Inlet connection vacuum IN

2 Inlet connection coolant IN, e.g., water

3 Coolant outlet connection EX

3.3.2 Condenser at the outlet

Connection and coolant on the vapor condenser

Connections on the EK

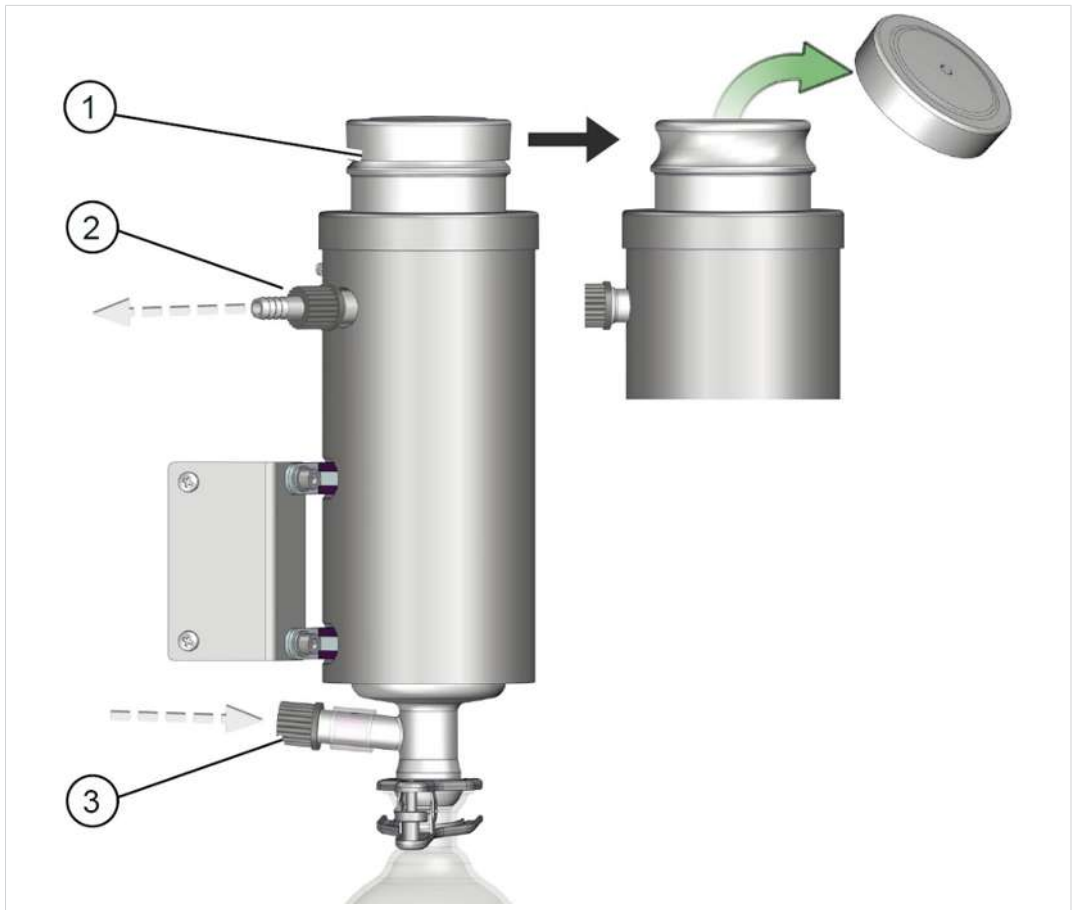


Description

- 1 Coolant outlet connection EX
- 2 Inlet connection coolant IN, e.g., water
- 3 Outlet connection EX

Connection and coolant on the dry ice condenser

Connections on the TE
PC 3001 VARIO
select TE

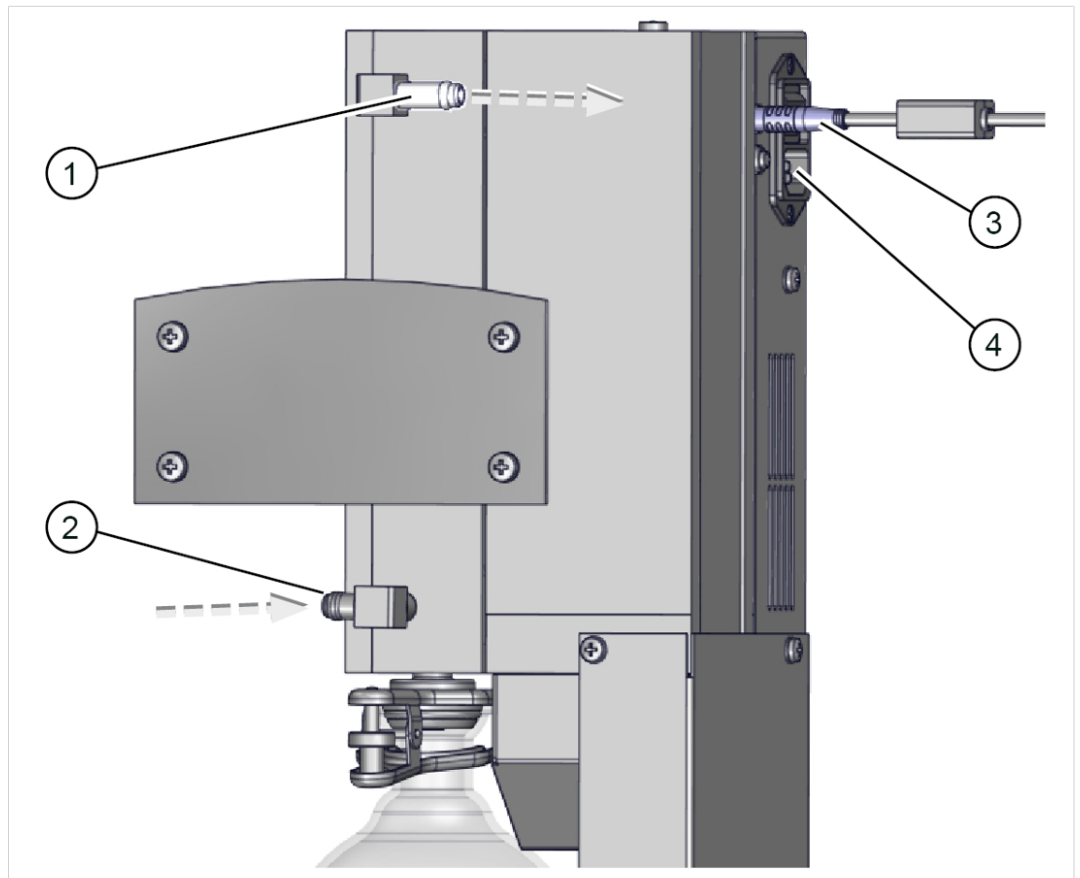


Description

- 1 Opening for refrigerant mixture, e.g., dry ice mixture, coolant insert removable for emptying, secured with bayonet fastener
- 2 Outlet connection EX
- 3 Vacuum pump connection

Connections at the Peltronic® vapor condenser

Connections on the
EKP



- 1 Outlet connection EX
- 2 Vacuum pump connection
- 3 VACUU·BUS® port
- 4 Power supply with ON/OFF switch

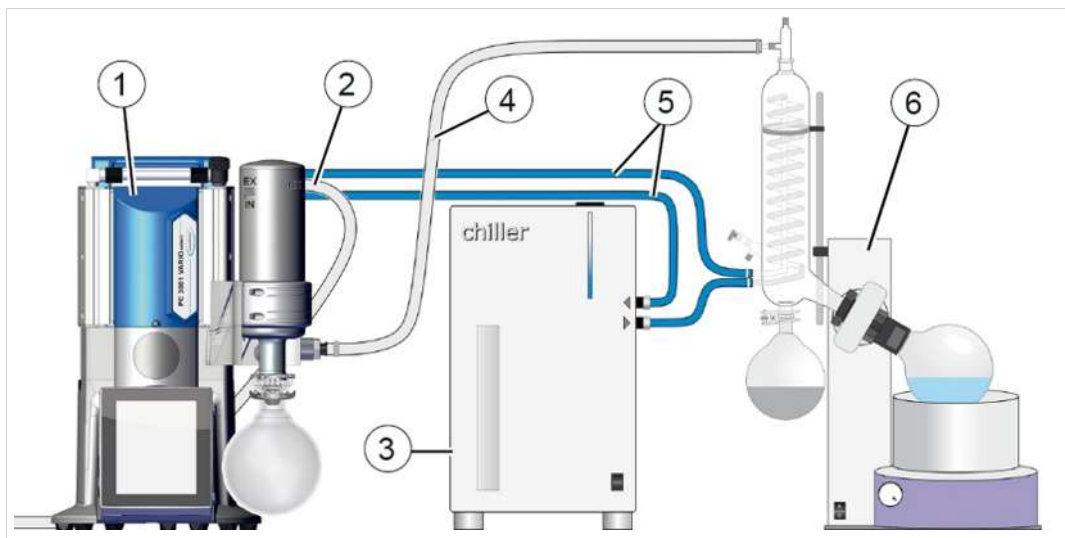


⇒ For detailed information and descriptions of the Peltronic® vapor condenser
-> see [EK Peltronic](#) manual.

3.4 Sample application

Evaporation

-> Example
Rotary evaporation

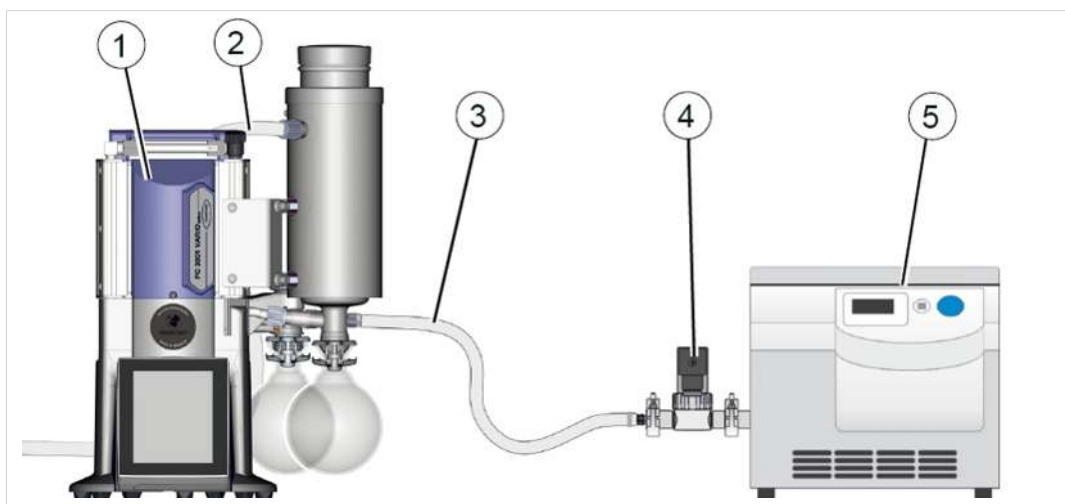


Description

- 1 **PC 3001 VARIO select** vacuum pumping unit
- 2 Exhaust gas hose (diverted into a fume hood)
- 3 Chiller
- 4 Vacuum hose
- 5 Coolant hoses (connected in series)
- 6 Example: rotary evaporator

Vacuum concentrator

-> Example
Vacuum concentra-
tor



Description

- 1 **PC 3001 VARIO select TE** vacuum pumping unit
- 2 Exhaust gas hose (diverted into a fume hood)
- 3 Vacuum hose
- 4 Vacuum valve: shut-off valve
- 5 Example: Vacuum concentrator

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.

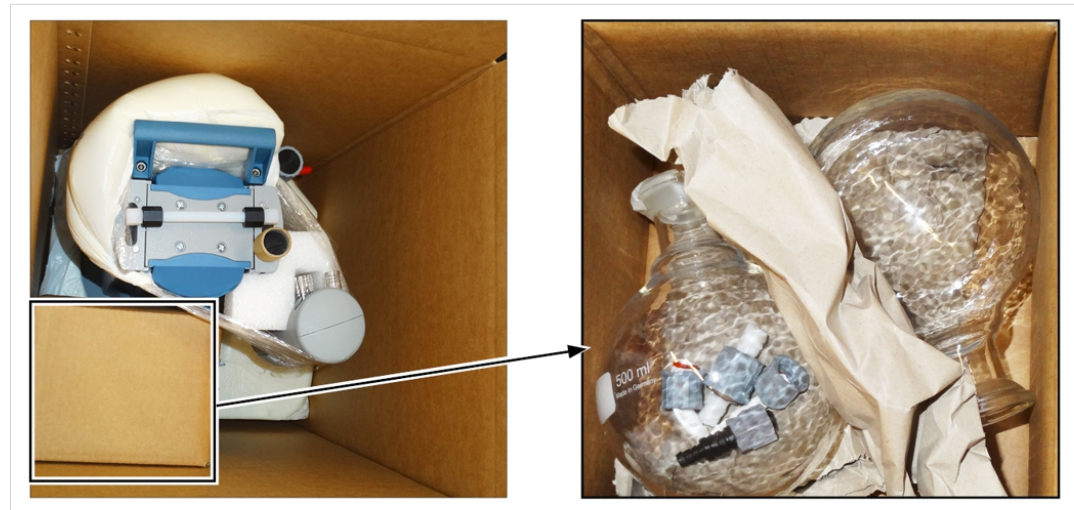
Goods receipt

- ⇒ Check the shipment for transport damage and completeness.
- ⇒ Immediately report any transport damage in writing to the supplier.

Unpacking

-> Example
Pumping unit in
original packaging

Glass flask in en-
closed box



1. Only lift the device by the designated handles or grip recesses.
2. Remove the connections, such as hose nozzles and screw connections, from the glass flask.
3. Compare the scope of delivery with the delivery note.

4.2 Installation

NOTICE

Condensate can damage the electronics.

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

⇒ After goods receipt or storage, allow your vacuum device to acclimatize for at least 3-4 hours before initial use.

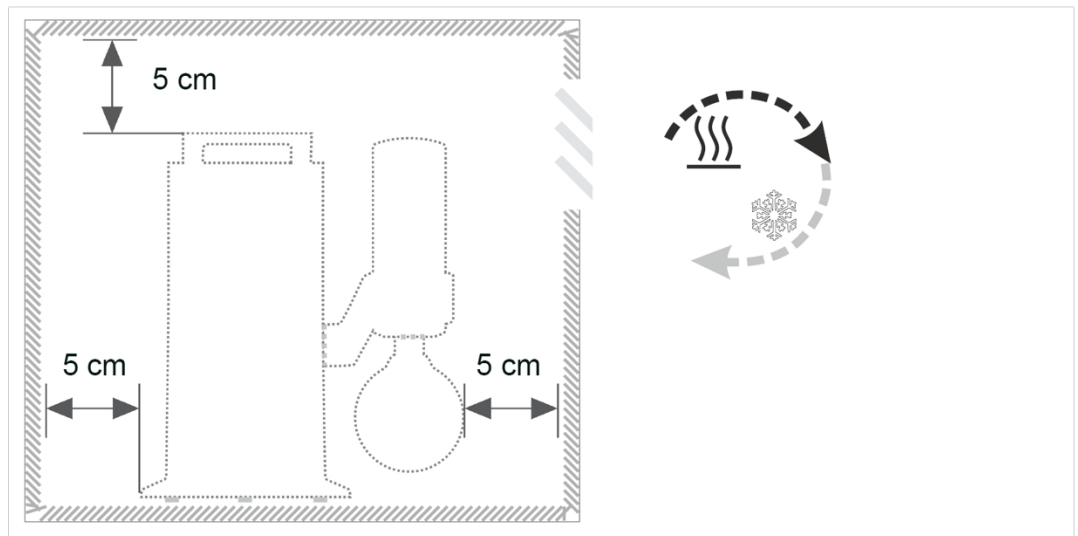
Check installation conditions

Calibrate for installation conditions

- The device is acclimatized.
- Ambient conditions have been observed and are within the limitation of use.
- The pump must have a stable and secure base without additional mechanical contact apart from the pump feet.

Vacuum pump installation

-> Example
Drawing showing minimum distances in the laboratory furniture



- ⇒ 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.
- ⇒ Prevent heat accumulation and ensure sufficient air circulation, especially in closed housings.

Observe limitation of use

Ambient conditions


Ambient conditions		(US)
Ambient temperature	10–40 °C	50-104°F
Altitude, max.	2000 m above sea level	6562 ft above sea level
Relative humidity	30–85 %, non condensing	
Pollution degree	2	
Impact energy	5 J	
Protection class (IEC 60529)	IP 20	
Type of protection(UL 50E)	Type 1	
Prevent condensation or contamination from dust, liquids, or corrosive gases.		

- ⇒ Note the IP protection class. IP protection is only guaranteed if the device is appropriately mounted and connected.
- ⇒ When connecting devices, always observe the information on the rating plate and in the technical data chapter.

4.3 Connection

All condensers in the pumping unit series have a vacuum connection and an outlet connection. The connection is very similar. Connect your pumping unit as described in the examples below.

4.3.1 Vacuum connection (IN)

	CAUTION
<p>Flexible vacuum hoses can contract during evacuation.</p> <p>Connected components that are not secured can cause injury or damage due to jerky movement (shrinkage) of the flexible vacuum hose. The vacuum hose can come loose.</p> <ul style="list-style-type: none"> ➤ Secure the vacuum hose to the connections. ➤ Secure connected components. ➤ Take the maximum shrinkage, i.e., contraction, into account when sizing the flexible vacuum hose. 	

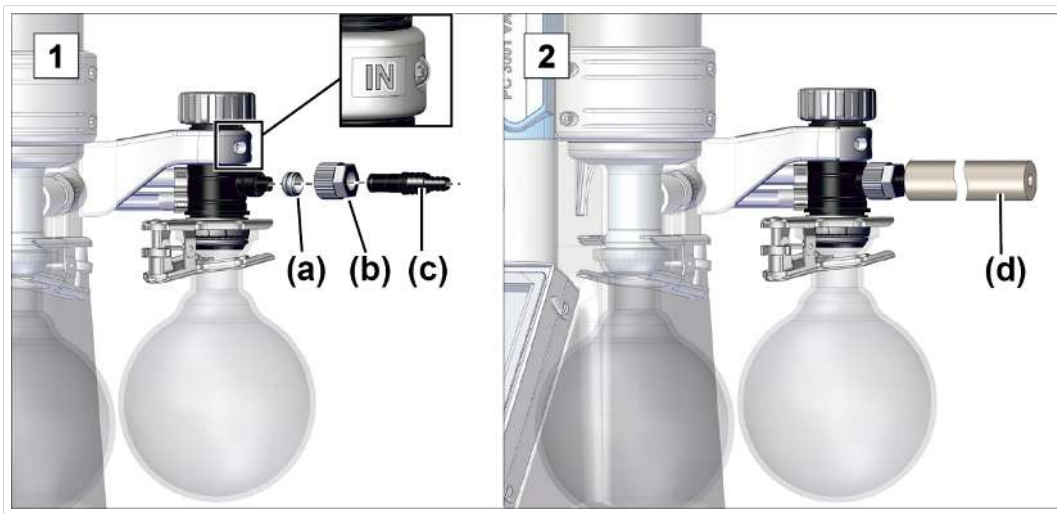
NOTICE

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

⇒ Prevent particles, liquids or contaminants from being aspirated or being able to flow back.

Connect the vacuum hose

-> Example
Vacuum connection
at the inlet IN



1. Connect sealing ring **(a)**, union nut **(b)** and hose nozzle **(c)** as shown.
2. Push vacuum hose **(d)** from the equipment onto the hose nozzle and secure the vacuum hose, for example, with a hose clip.



Observe the following to achieve the optimum vacuum for your application:

- ⇒ Keep the vacuum line as short as you can with as large a cross-section as possible.
- ⇒ Use a sufficiently stable vacuum hose that is designed for the required vacuum range.
- ⇒ Make sure the connection of hose lines is gas-tight.

4.3.2 Exhaust gas connection (EX)



WARNING

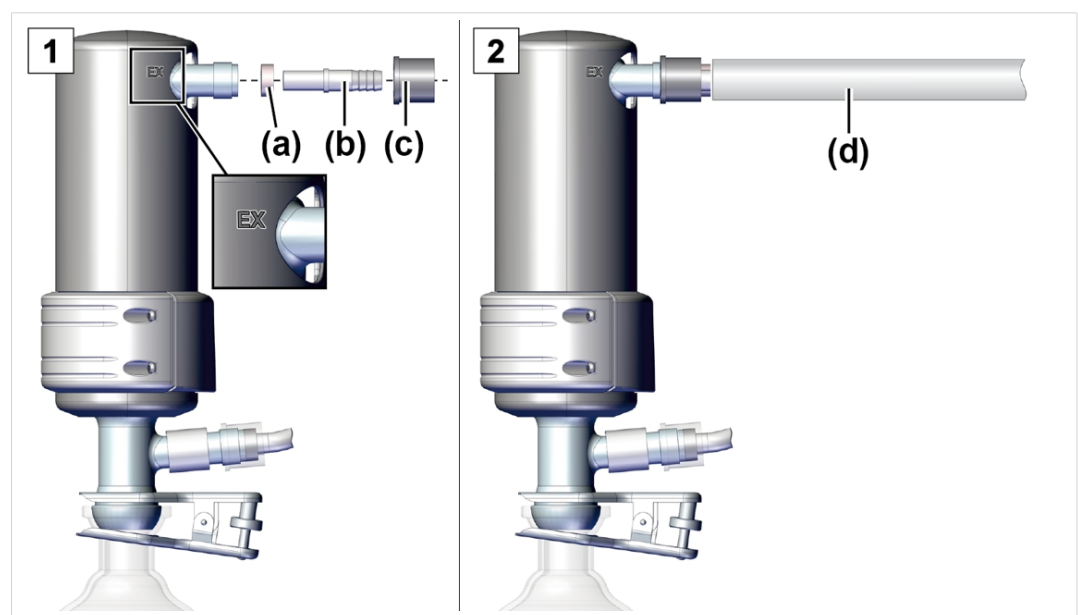
Risk of bursting due to overpressure inside the outlet line.

Inadmissibly high pressure in the outlet line can cause the vacuum pump to burst or damage seals.

- The outlet line (outlet, gas outlet) must always be clear and non-pressurized.
- Always route the exhaust gas hose with a fall or take measures to prevent condensate return into the vacuum pump.
- Observe the maximum admissible pressures and pressure differences.

Connect the exhaust gas hose

-> Example
Exhaust gas connection at outlet EX



1. Connect rubber sealing ring **(a)**, hose nozzle **(b)** and union nut **(c)** as shown and screw them onto the connection.
2. Push exhaust gas hose **(d)** onto the hose nozzle and, if necessary, lay the hose in a fume hood. Secure the exhaust gas hose if required, e.g., with a hose clip.

4.3.3 Coolant connection at the condenser

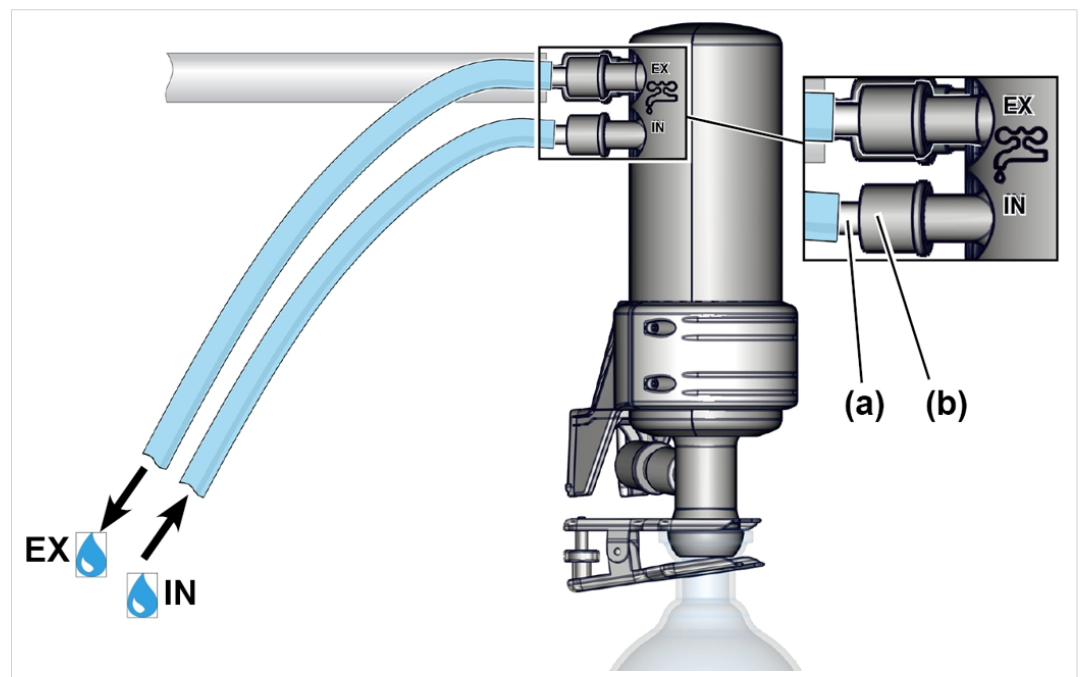
Coolant connection
IN = feed line
EX = outlet

A vapor condenser (EK) has a connection for coolant. For example, water or liquid in a chiller circuit is suitable for cooling.

- In a closed, in-house coolant circuit, the pressure should be limited to 3 bar (44 psi).
- A coolant valve may only be installed in the feed line; the coolant drain must be clear and non-pressurized.

Connect the coolant ⁵

-> Example
Coolant connection
at the EK or IK



1. Fasten both hose nozzles **(a)** with union nuts **(b)** on the condenser as shown.
2. Fasten the hoses for the coolant on the condenser as shown in the diagram:
IN = inlet
EX = outlet
3. Secure the hoses, e.g., with hose clips.

⁵ Also applies to the inlet condenser IK

4.3.4 Dry ice condenser

NOTICE

Damage to the dry ice condenser due to cryogenic substances.

- ⇒ Carry out a visual inspection prior to each use. Glass surfaces must be free from damage, ruptures, cracks and scratches.
- ⇒ Only loosely lay on the cover of the dry ice condenser, thus ensuring pressure equalization between the coolant and the atmosphere.
- ⇒ The coolant can escape from the chiller unexpectedly, e.g., in case of high gas volume.

Cooling with dry ice condenser

Cooling with refrigerant mixtures

The dry ice condenser does not have a coolant connection. For cooling, the dry ice chiller is filled with a refrigerant mixture. These refrigerant mixtures consist of cold to cryogenic media and a liquid for better cooling transfer.

Details refrigerant mixture

-> Example
Refrigerant mixtures

Refrigerant mixtures		
Ethanol/dry ice mixture		
Water/ice mixture		
Brine/ice mixture		
Admissible cooling temperatures		(US)
cold	-18 – -5 °C	-0.4 – 23 °F
very cold	-30 – -18 °C	-22 – -0.4 °F
cryogenic	below -30 °C	less than -22 °F
lowest	-80 °C	-112 °F

Fill the dry ice condenser



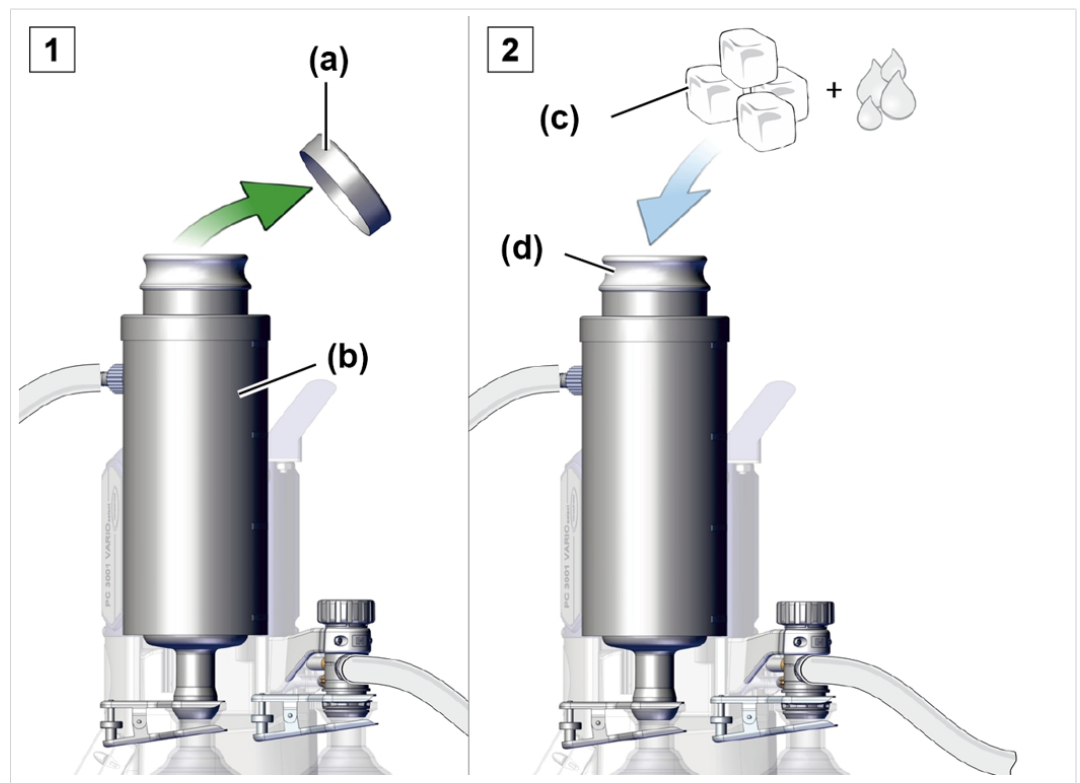
CAUTION

Risk of injury when handling cryogenic coolants.

Cryogenic substances can cause frostbite, or 'cold burns', on contact with skin.

- Avoid skin contact and always wear your personal protective equipment, e.g., thermal protective gloves, protective goggles, when handling cryogenic substances.

-> Example
Fill the dry ice condenser with refrigerant mixture

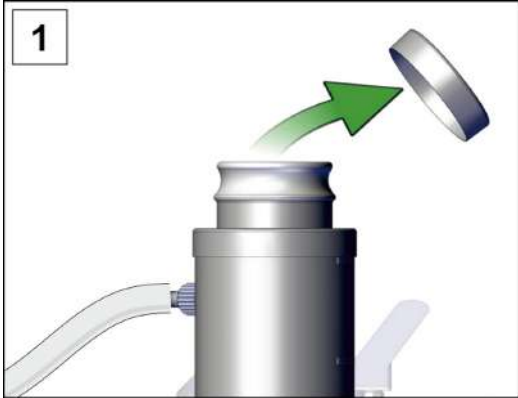





1. Remove cover **(a)** from dry ice chiller **(b)**.
2. Use your preferred refrigerant mixture **(c)** to fill container **(d)**.
 - Do not overfill the container.
3. Then replace the cover on the dry ice chiller.
 - Only ever lay the cover on loosely, do not secure it.
 - Regularly check the coolant level in the chiller during operation.

Empty the dry ice condenser TE

Before refilling the dry ice condenser with coolant, it may need to be emptied first. Remove the chiller insert (bayonet fastener) and empty it.

-> Example
Chiller insert (bayonet fastener)

	
<p>1. Remove the cover from the chiller.</p>	<p>2. Rotate the chiller insert – bayonet fastener.</p>
	
<p>3. Pull out the chiller insert.</p>	<p>4. Empty the liquid.</p>
<p>5. Refit the empty chiller insert in the dry ice condenser in reverse order.</p>	

4.3.5 Venting connection



DANGER

Risk of explosion by venting with air.

Depending on the application, venting can cause explosive mixtures to form or other hazardous situations to arise.

- Never vent processes with air which could form an explosive mixture.
- In the case of flammable substances, use only inert gas for venting, e.g., nitrogen (max. 1.2 bar/900 Torr abs.).

Vent with ambient air⁶

Position of sensor + venting valve sectional diagram



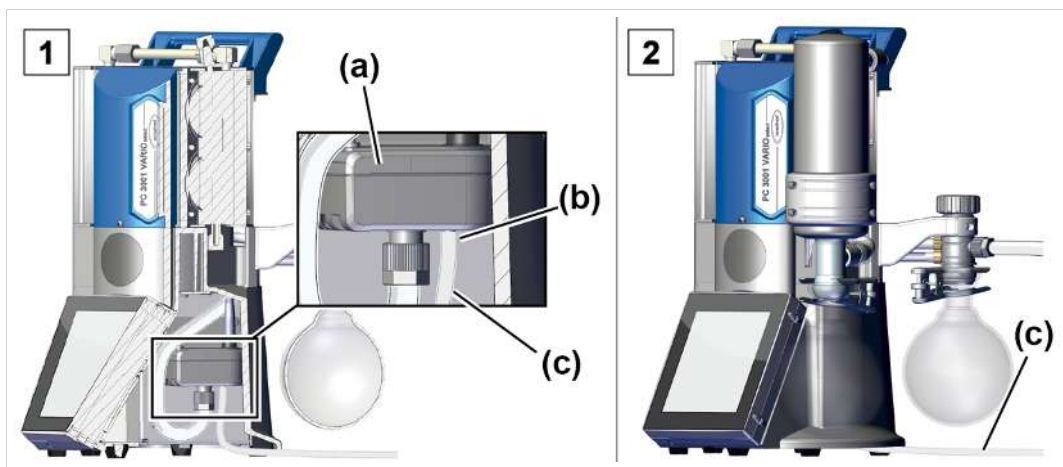
For venting with ambient air, nothing needs to be connected to venting valve **(b)** of sensor **(a)**.

⁶ Only applicable to sensors with an integrated venting valve.

Vent with inert gas – connect venting valve⁷

Required connection material: Hose for hose nozzle (\varnothing 4–5 mm), e.g., silicone tube 3/6 mm.

Position of sensor + inert gas venting valve (sectional diagram)



1. Slightly tilt the pumping unit to one side and push hose (c) onto the connection of venting valve (b).
2. Route the hose underneath the pumping unit to the outside and connect the inert gas (max. 1.2 bar/900 Torr, abs.).

⁷ Avoid overpressure.

4.3.6 Gas ballast (GB)

Use ambient air as gas ballast



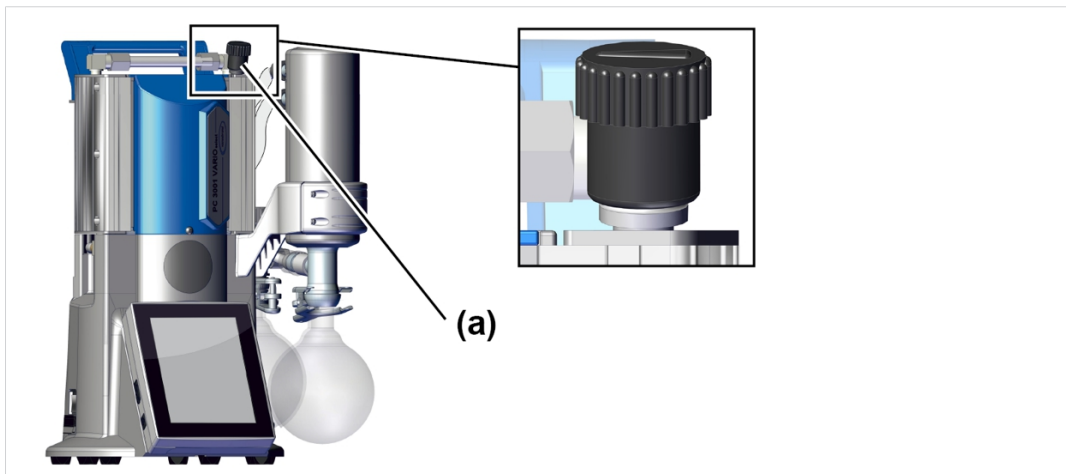
DANGER

Risk of explosion from air as gas ballast.

By using air as gas ballast, small amounts of oxygen get inside the vacuum pump. Depending on the process, the oxygen in the air can form an explosive mixture or other dangerous situations can arise.

- In the case of ignitable substances and for processes in which an explosive mixture can arise, only use inert gas as gas ballast, e.g. nitrogen (max. 1.2 bar / 900 Torr abs.).

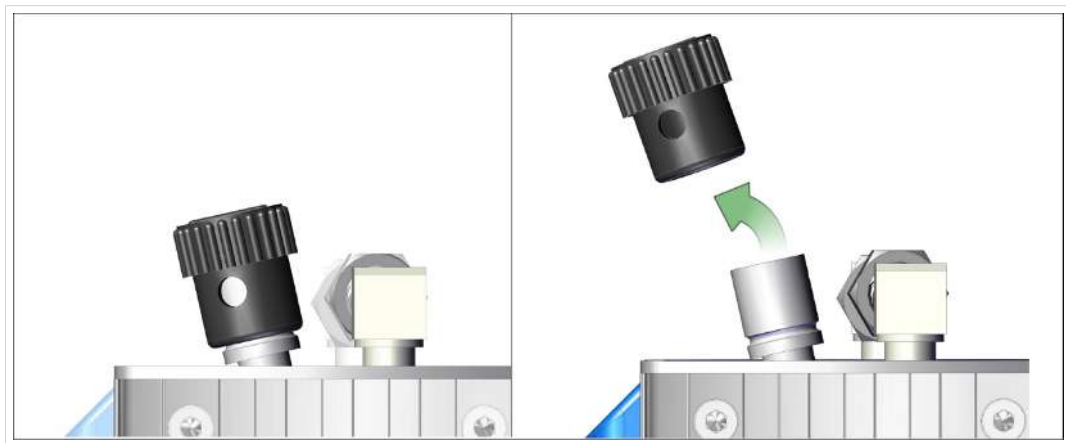
Gas ballast valve position



If ambient air is to be used as gas ballast, nothing needs to be connected at the pumping unit; gas ballast valve (a); see also chapter: → *Operation with gas ballast on page 46*

Use of inert gas as gas ballast – OPTION

Prepare the inert gas connection (GB)



- ⇒ Remove the black gas ballast cap and connect a gas ballast adapter in its place.

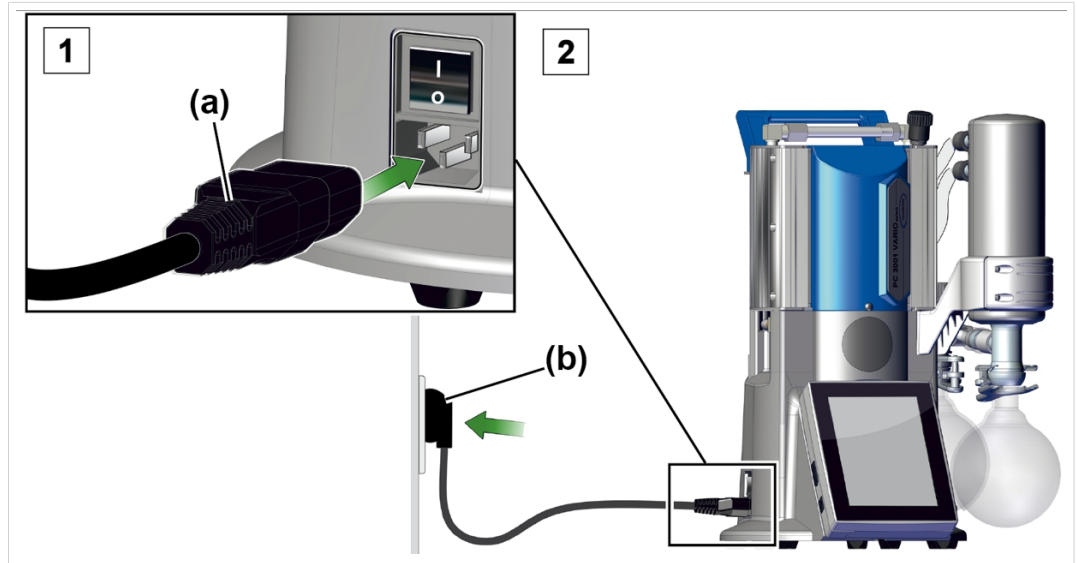


Connection options and adapter for hose nozzle or small flange are available on request.

4.4 Electrical connection

Pumping unit electrical connection

-> Example
Pumping unit electrical connection

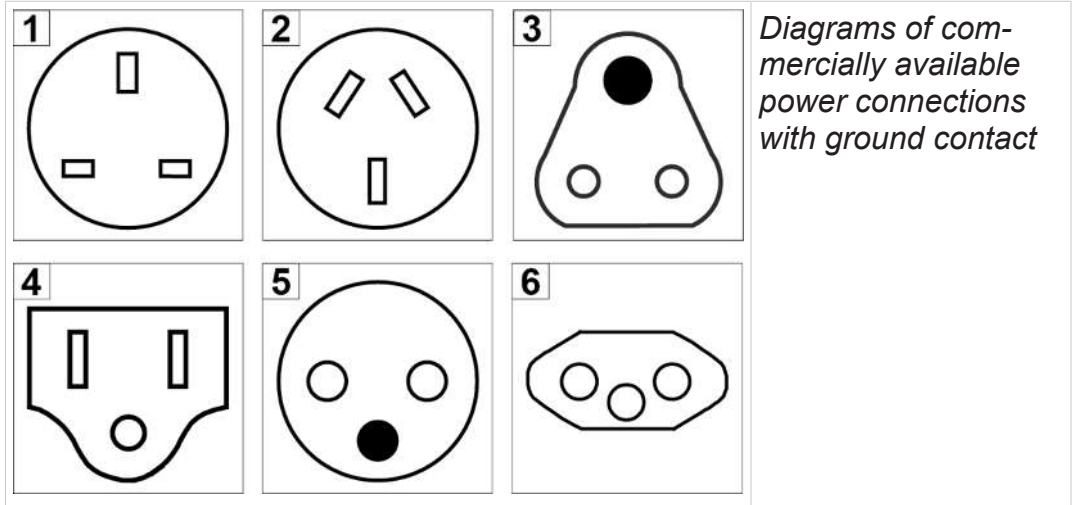


1. Plug connector **(a)** of the power cord into the power connection of the vacuum pump.
2. Plug power plug **(b)** into the power outlet.
 - Pumping unit connected electrically.

NOTICE! Lay the power cord such that it cannot be damaged by sharp edges, chemicals, or hot surfaces.

Power connections with country code

-> Example
Power plug types



Diagrams of commercially available power connections with ground contact

1 UK	2 CN	3 IND
4 US	5 CEE	6 CH

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

NOTICE!

- ⇒ Use the power plug which fits your power connection.
- ⇒ Do not use multiple sockets connected in series as the power connection.
- ⇒ The power plug also serves as a disconnecter. Install the unit so that the plug can be easily disconnected from it.

5 Commissioning (operation)

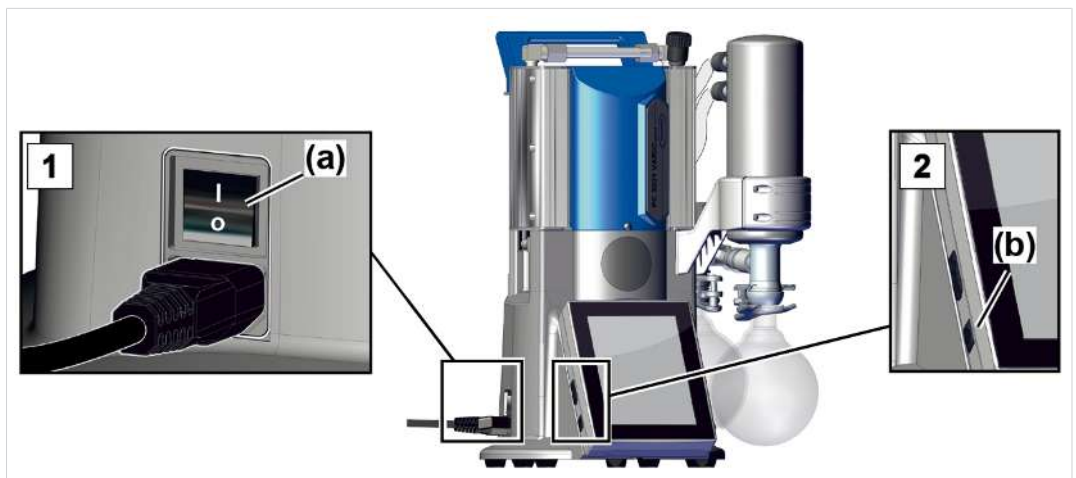
Apart from the chapters Switch on and Switch off, this manual describes the mechanics of a pumping unit in the PC 3001 VARIO select series.

Operation of the installed vacuum controller⁸ and its functions are described in the separate **VACUU-SELECT**[®] manual.

5.1 Switch on

Switch on pumping unit

Switch on



1. Switch rocker switch **(a)** on – switch position I.
2. Press ON/OFF button **(b)** on the controller.
 - The start screen is displayed.
 - After approx. 30 seconds, the process screen with the operating elements appears on the controller display.

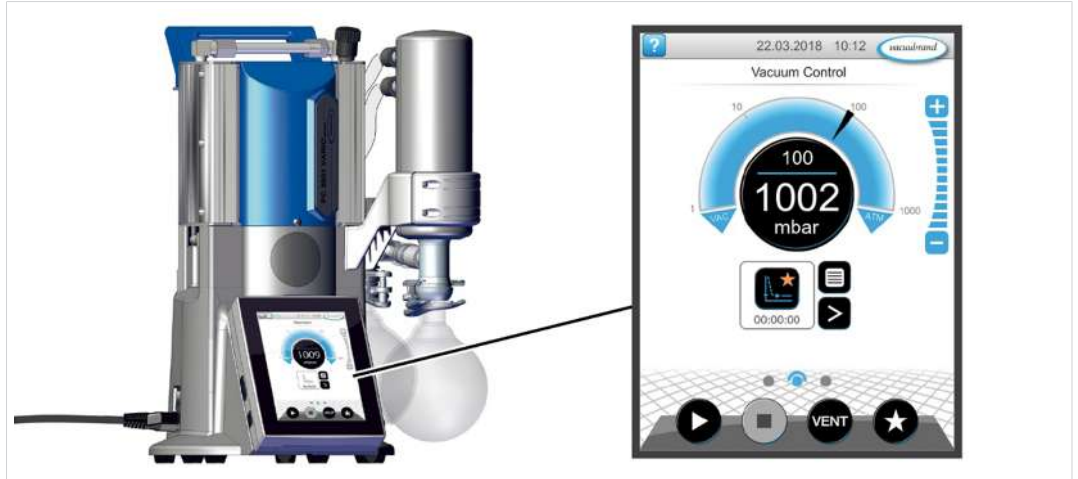
⁸ WEB: [VACUUBRAND/Products/Gauges and controllers/Vacuum control](http://VACUUBRAND/Products/Gauges%20and%20controllers/Vacuum%20control)

5.2 Operation

5.2.1 User interface

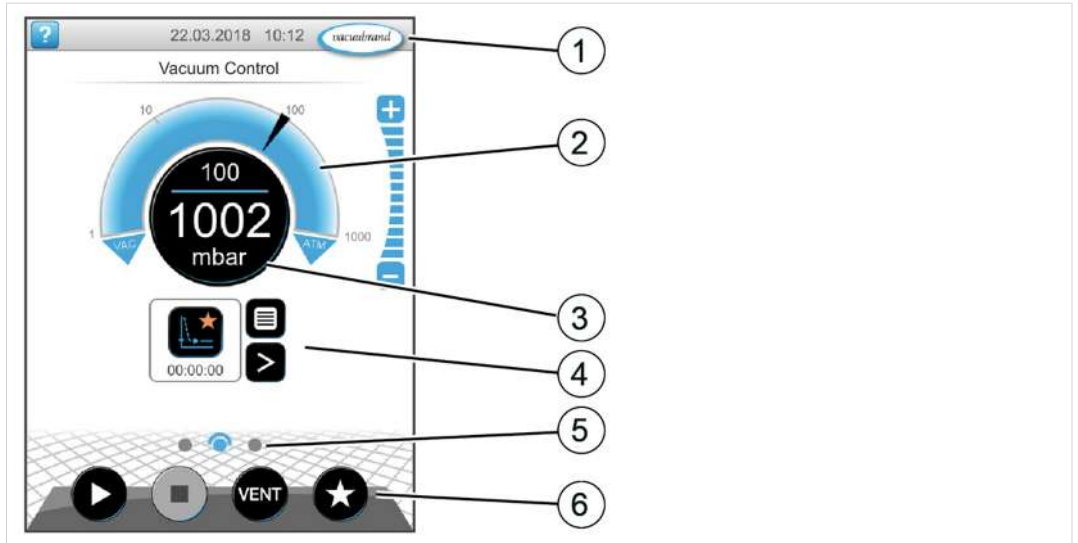
User interface

VACUU-SELECT®
with process screen



Process screen










Pressure display for
a process



- 1 Status bar
- 2 Analogue pressure display – pressure curve
- 3 Digital pressure display – pressure value (target value, actual value, pressure unit)
- 4 Process screen with context features
- 5 Screen navigation
- 6 Operating elements for control

Operating elements

Operating elements
Vacuum controller

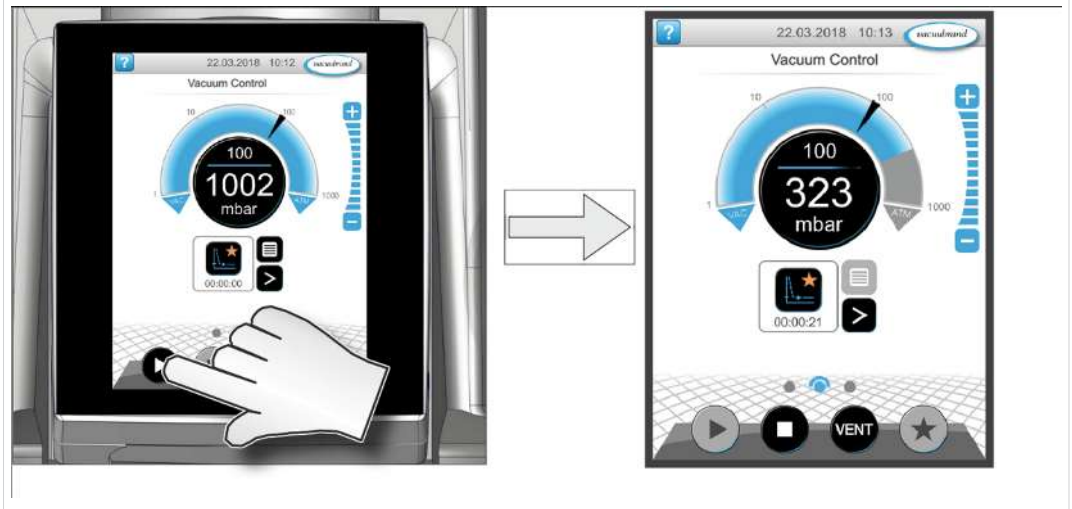
Button	Function
 	Start Start application – only available on the process screen.
 	Stop Stop application – always possible.
	VENT⁹ – Vent the system (option) Press button < 2 sec = vent briefly; control continues.
 	Press button > 2 sec = vent to atmospheric pressure; vacuum pump is stopped. Press button during venting = venting is stopped.
 	Favorites View Favorites menu.

⁹ The VENT button is only displayed when a venting valve is connected or activated.

5.2.2 Operation

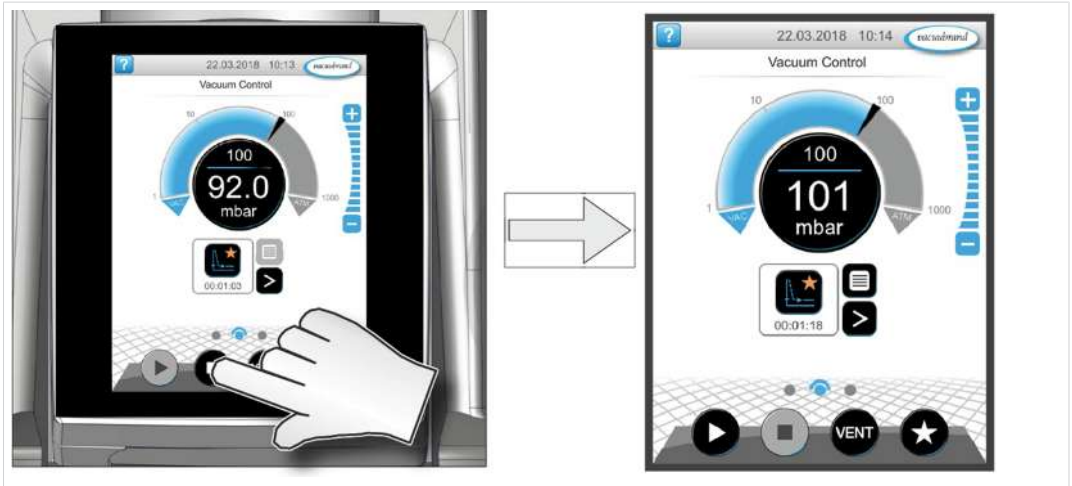
Start the vacuum controller

Start



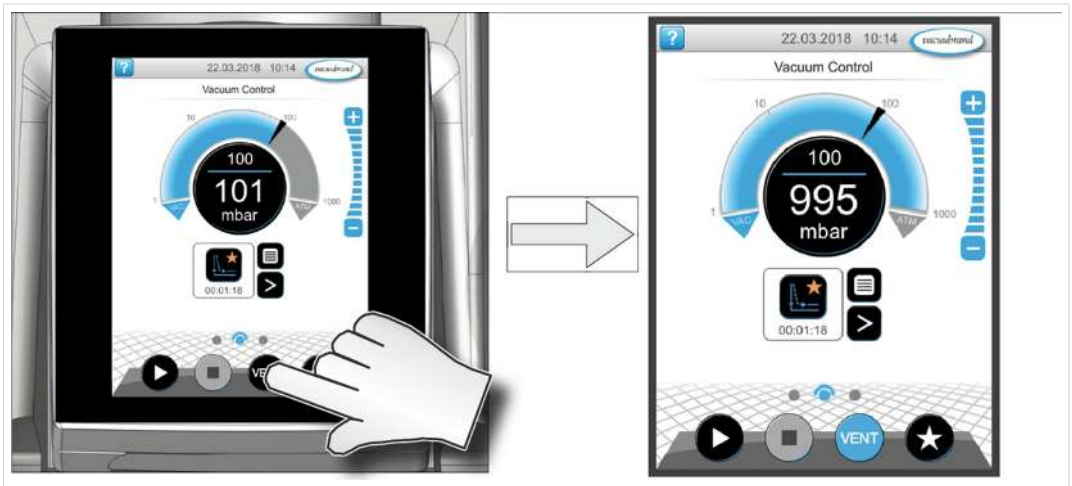
Stop the vacuum controller

Stop



Vent

Vent

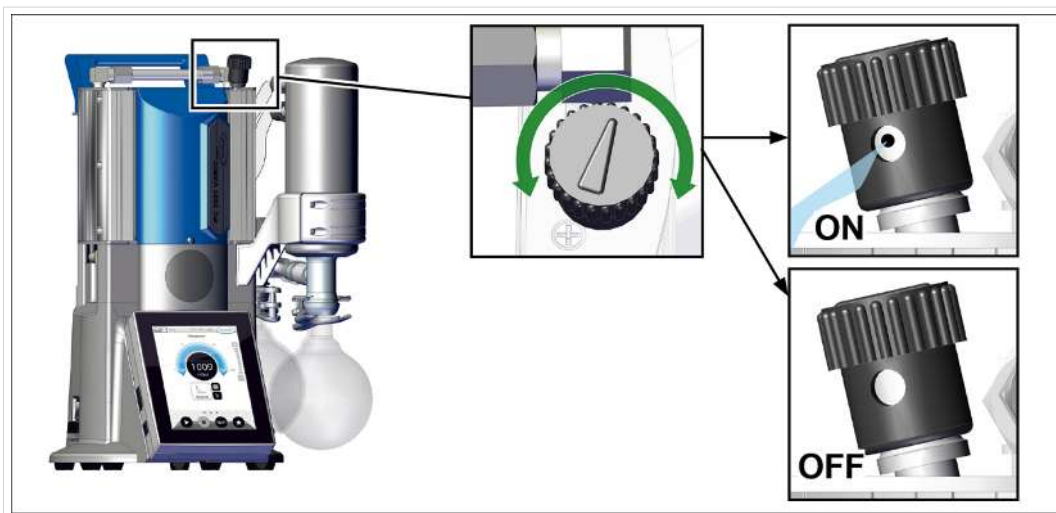


5.2.3 Operation with gas ballast

Description The provision of gas ballast (= addition of gas) ensures that vapors do not condense inside the vacuum pump but are instead ejected from the pump. This makes it possible to pump larger amounts of condensable vapors, and also prolongs the service life. The ultimate vacuum with gas ballast is slightly higher.

Open/close the gas ballast valve

Operate the gas ballast valve



- ⇒ Turn the black gas ballast cap in any direction to open or close the gas ballast valve.
- ⇒ Evacuate condensable vapors, e.g., water vapor, solvents, etc. preferably only with the vacuum pump at operating temperature and with the gas ballast valve open.
- ⇒ If necessary, connect inert gas as a gas ballast to prevent the formation of explosive mixtures.
- ⇒ Observe the admissible pressure at the gas ballast connection, max. 1.2 bar/900 Torr abs.



If the gas volume in the vacuum pump is low, a gas ballast can be eliminated in these cases to increase the solvent recovery rate.

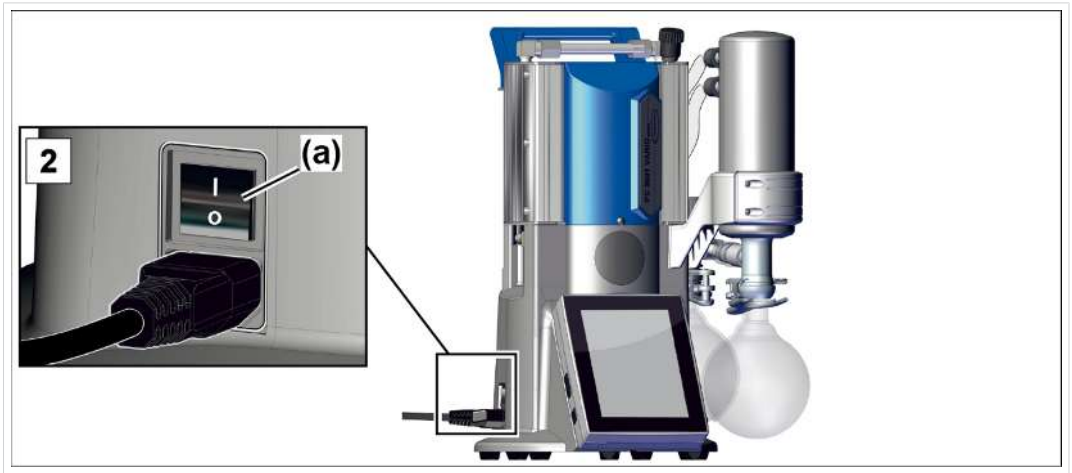
5.3 Shutdown (switch off)

Shut down the pumping unit

Switch off pumping unit

1. Stop the process and let the pumping unit run on for about 30 minutes, with open gas ballast or open inlet (IN).
 - Condensate and media residues will be flushed out of the vacuum pump.

NOTICE! Prevent deposits and rinse condensate out of the pump.



2. Switch off rocker switch **(a)** – switch position 0.
 - Pumping unit switched off.
3. Unplug the power plug.
4. Disconnect the pumping unit from the apparatus.
5. Empty the glass flasks.
6. Check the pumping unit for dirt and damage.

5.4 Storage

Store the pumping unit

1. Clean the pumping unit if required.
2. Recommendation: Perform preventative maintenance before storing the pumping unit. This is especially important if it ran more than 15,000 operating hours.
3. Close the suction and outlet lines, e.g., with the transport caps.
4. Package the pumping unit such that it is protected from dust, enclose desiccant if necessary.
5. Store the pumping unit in a cool, dry location.

NOTICE! If damaged parts are stored for operational reasons, these should be clearly identified as not operational.

6 Troubleshooting

6.1 Technical support

For troubleshooting, refer to table → **Error – Cause – Remedy on page 49.**

For technical assistance or in the event of an error, please contact our [Service](#) department.



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

- ⇒ Observe the recommended maintenance intervals to ensure a fully functional system.
- ⇒ Send defective devices to our service department or your local distributor for repair.

6.2 Error – Cause – Remedy

Error	Cause	Remedy	Personnel
Readings deviate from the reference standard	Vacuum sensor dirty. Moisture in the sensor. Sensor defective. Sensor measures incorrectly.	Clean sensor measuring chamber. Allow sensor measuring chamber to dry, e.g., by pumping down. Calibrate sensor with reference gauge. Replace defective components.	Specialist
Sensor does not pass on measured value	No voltage applied. VACUU·BUS plug-in connection or cables defective or not connected.	Check VACUU·BUS plug-in connection and cables to the controller.	Operator
Sensor does not pass on measured value	Sensor defective.	Replace defective components.	Specialist
Venting valve does not operate	No voltage applied. VACUU·BUS plug-in connection or cables defective or not connected. Venting valve dirty.	Check VACUU·BUS plug-in connection and cables to the controller. Clean venting valve. If necessary, use a different, external venting valve.	Operator

Error	Cause	Remedy	Personnel
Venting valve does not operate	Venting valve in sensor defective.	Replace defective components.	Specialist
Vacuum pump does not start	Pumping unit switched off. Power plug not correctly plugged in or pulled out. VACUU·BUS plug-in connection or cables defective or not connected. Overpressure in outlet line.	Switch on Pumping unit. Check power connection and cable. Check VACUU·BUS plug-in connection and cables to the controller. Open outlet line. Ensure clear passage.	Operator
Vacuum pump stopped Vacuum pump does not start	Motor overloaded. Motor overheated. Thermal protection triggered.	Check coolant connection. Ensure supply of coolant. Allow the motor to cool down. Clear error manually: -> Disconnect pumping unit from power supply -> Eliminate cause of error -> Restart pumping unit	Specialist
No or very little suction power	Leak in the suction line or apparatus. Condensate collection flask not mounted correctly. Condensate inside the vacuum pump. Gas ballast open Gas ballast cap porous or no longer present.	Check suction line and apparatus for leaks. Check condensate collection flask and mount correctly. Check equipment for leaks. Allow vacuum pump to run for a few minutes with the suction nozzle open. Close the gas ballast Check gas ballast cap. Replace defective components.	Operator

Error	Cause	Remedy	Personnel
No or very little suction power	Deposits inside the vacuum pump. Diaphragms or valves defective. High level of vapor generated in the process.	Clean and check pump heads. Replace diaphragms and valves. Check process parameter.	Specialist
No or very little suction power	Vacuum line too long.	Use vacuum lines with larger cross-section.	Resp. specialist
No display	Pumping unit switched off. Power plug not correctly plugged in or pulled out. VACUU·BUS plug-in connection or cables defective or not connected. Controller switched off or defective.	Switch on Pumping unit. Check power connection and cable. Check VACUU·BUS plug-in connection and cables to the controller. Replace defective components.	Operator
Condenser (chiller) defective	Mechanically damaged.	Send in.	Resp. specialist
Loud operating noises	No hose installed.	Check hose and install it correctly.	Operator
Loud operating noises	Outlet line open. Glass flask on EK missing. Torn diaphragm or loose diaphragm clamping disc. Ball bearing defective.	Check outlet line connections. Connect outlet line to an extraction system or fume hood. Mount the glass flask Service the vacuum pump and replace defective parts or send in the device.	Specialist

7 Cleaning and maintenance



WARNING

Danger due to electrical voltage.

- Switch the device off before cleaning or maintenance work.
- Unplug the power plug from the socket.



Risk from contaminated parts.

Pumping hazardous media can result in hazardous substances adhering to internal parts of the pump.

If this is the case for you:

- ⇒ Wear your personal protective equipment, e.g., protective gloves, eye protection and, if necessary, respiratory protection.
- ⇒ Decontaminate the vacuum pump before opening it. If necessary have decontamination carried out by an external service provider.
- ⇒ Take safety precautions according to the instructions you have received on handling hazardous substances.

NOTICE

Damage possible if work is performed incorrectly.

- ⇒ Let a trained specialist or at least an instructed person carry out Maintenance work.
- ⇒ Before carrying out Maintenance for the first time, please read through all the instructions to get an overview of the required service work.

7.1 Information on service work

Recommended maintenance intervals ¹⁰

Maintenance intervals

Maintenance intervals	As required	15,000 h
Replace diaphragms		x
Replace valves		x
Clean or replace molded PTFE hose	x	
Replace pressure relief valve on EK	x	
Cleaning the pumping unit	x	

Recommended aids

-> Example
Recommended aids
for cleaning and
maintenance



Description

No.	Item
1	Round bottom flask stand
2	Glass pipette
3	Protective gloves
4	Chemical-resistant vessel + funnel

¹⁰ Recommended maintenance interval according to operating hours and under normal operating conditions; depending on the environment and area of application, we advise performing cleaning and maintenance as needed.

Tools needed for maintenance

-> Example Tools



Description

No.	Tool	Size
1	Flat-head screwdriver To open hose clips	Size 1
2	Torx screwdriver Screw fittings, counterhold EK or IK	TX10
3	Open-end wrench M14 union nut Rotate angled screw fitting	SW17 SW14
4	Phillips screwdriver Screw fittings, holder TE or EKP	Size 2
5	Flat nose pliers To secure the hose clips	
6	Hex key Screw fittings, handle Screw fittings, housing cover Screws, sensor	Size 5 Size 4 Size 3
7	Service kit PC 3001 #20696828 Diaphragm wrench Diaphragms Valves	SW46

7.2 Cleaning

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

⇒ Before cleaning, switch off the pumping unit.

7.2.1 Housing surface

Clean the surfaces

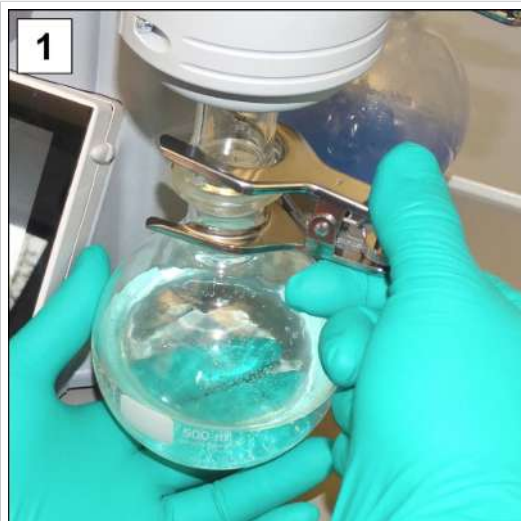


Clean dirty surfaces with a clean, slightly damp cloth. We recommend using water or mild soapy water to moisten the cloth.

7.2.2 Empty the glass flask

Remove and empty the glass flask

-> Example
Empty the glass
flask



1. Open the joint clamp and remove the glass flask.

2. Empty the glass flask into a suitable container, e.g., chemical-resistant drum.

3. Secure the glass flask (separator) to the condenser again using the joint clamp.



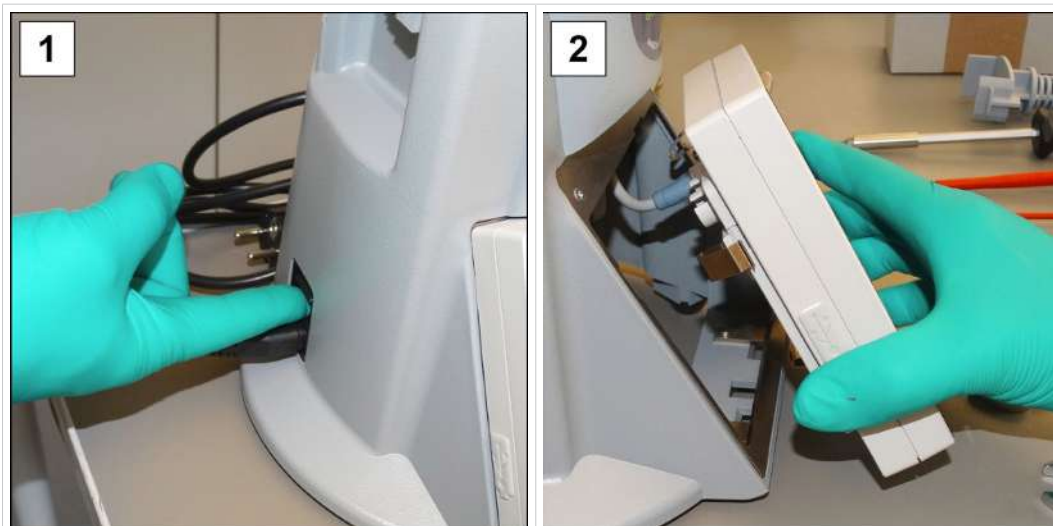
Depending on the application, the liquid collected can either be retreated or professionally disposed of.

7.2.3 Clean the sensor and venting valve

In case of incorrect measurements or malfunctions that indicate contamination of the sensor and/or venting valve, we recommend cleaning the sensor and the venting valve. Cleaning is also recommended prior to re-calibration.

Remove the sensor

-> Example
Remove the sensor



1. Switch the pumping unit off and unplug the power plug.

2. Remove the vacuum controller from the housing and disconnect any connected VACUU·BUS connectors.

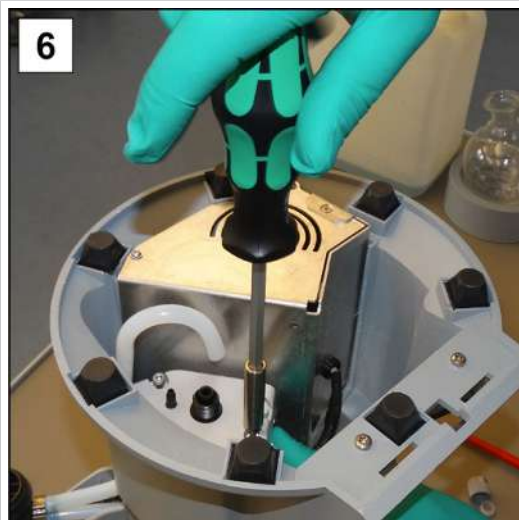
3. Remove the glass flasks and place them on suitable stands.



4. Close the hose nozzle of the chiller and carefully turn the pumping unit upside down.

5. Open the union nut on the sensor, open-end wrench SW17, and pull off the molded hose.

-> Example
Remove the sensor



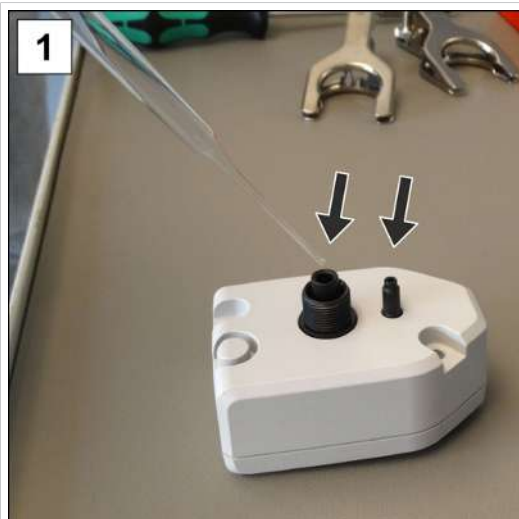
6. Undo the screws, hex key size 3



7. Disconnect the VACUU·BUS connector at the bottom and remove the sensor.

Clean the sensor

-> Example
Clean the measurement chamber and the venting valve



1. Use a pipette to fill a small amount of solvent, e.g., benzene, into the openings.



2. Leave the solvent to act for a few minutes before pouring it off.

3. Repeat until the solvent is free from contaminants.

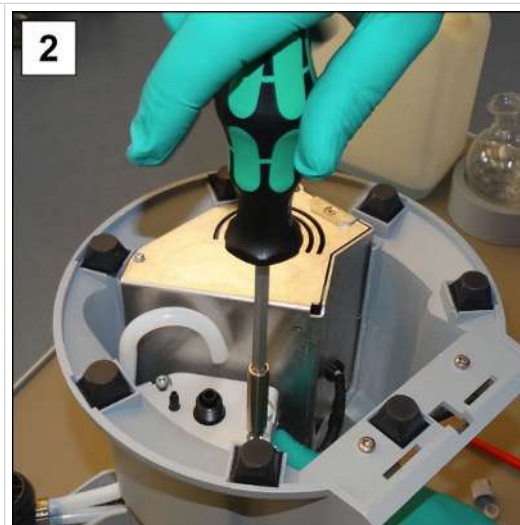
4. Let the interior of the sensor air dry or dry under vacuum.

Install the sensor

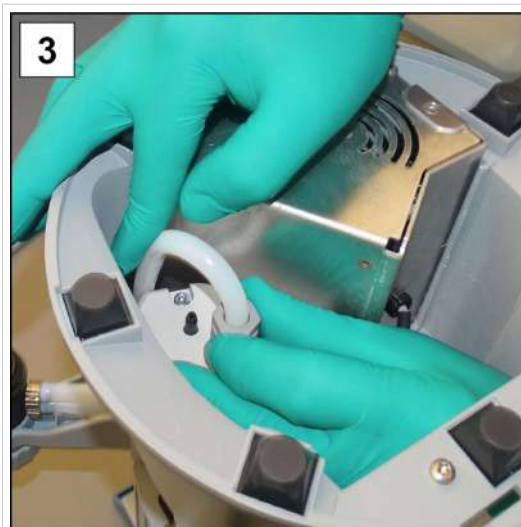
-> Example
Fit the sensor



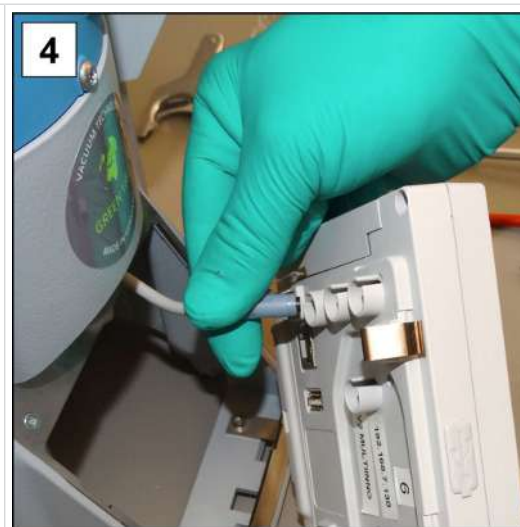
1. Connect the VACUU·BUS connector and place the sensor on the holder.



2. Insert the screws and screw them in until they are finger-tight, hex key size 3.



3. Push the molded hose onto the connection and screw on the union nut until it is finger-tight; open-end wrench SW17.



4. Turn the pumping unit right side up and connect the cables: VACUU·BUS, power plug.

5. Secure the glass flasks with the joint clamp.

6. Switch on the pumping unit and the vacuum controller.

NOTICE! Re-calibrate the sensor if incorrect values are displayed -> see vacuum controller manual.

7.2.4 Clean or replace PTFE hoses

Maintenance provides the opportunity to check the components of the pumping unit, including the hoses.

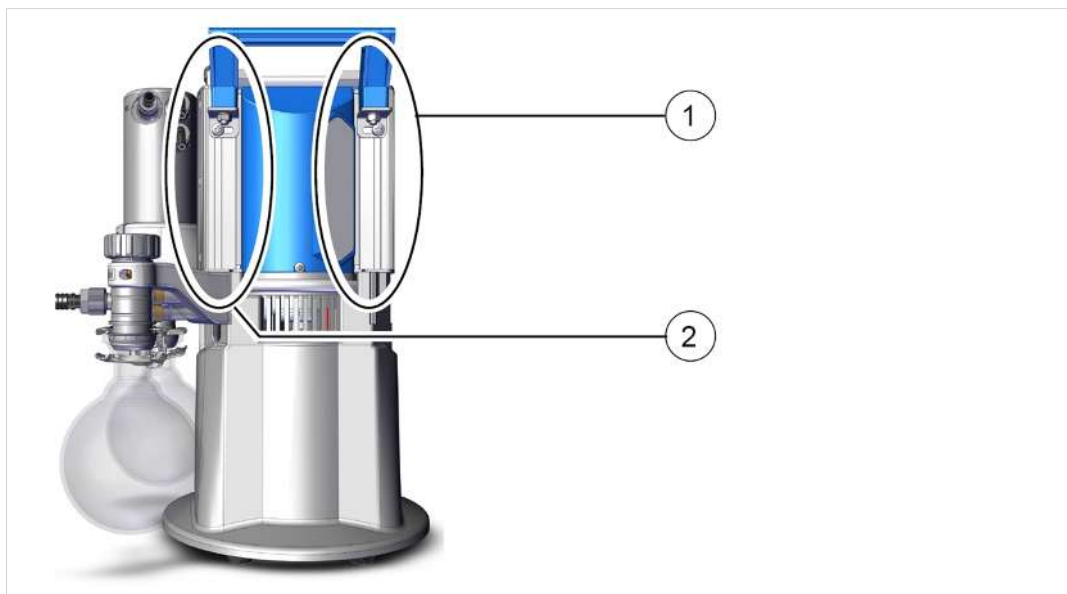
- ⇒ Clean the inside of very dirty molded hoses, e.g., using a pipe cleaner or similar.
- ⇒ Replace brittle and defective molded hoses.

7.3 Vacuum pump maintenance

7.3.1 Maintenance items

Positions to be maintained

-> Example
Pump head maintenance



Description

Maintenance items

- 1 Housing cover, power supply side
- 2 Housing cover with gas ballast

- ⇒ Perform maintenance on the pump heads one after the other.
- ⇒ Always replace all diaphragms and valves of the pump heads as described in the graphic description for pump head **(1)**.

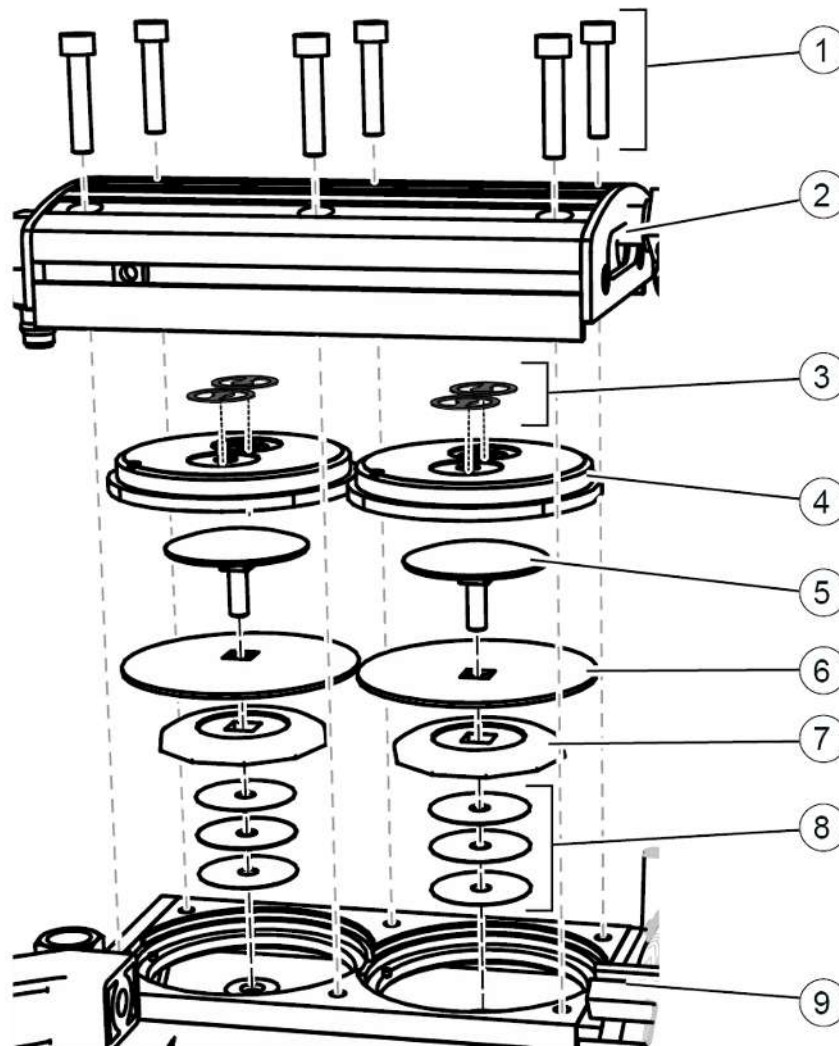


Straightforward maintenance due to split work steps.

- ⇒ On one pump head pair, first replace the diaphragms.
- ⇒ Then change the inlet/outlet valves.
- ⇒ Then repeat these steps for the next pump head.

Exploded drawing of pump head (example)

-> Example
Exploded drawing
of pump head



Description

Valve maintenance

- 1 Screw fittings
- 2 Housing cover
- 3 Valves

Diaphragm maintenance

- 4 Head cover
- 5 Diaphragm clamping disc with square head screw
- 6 Diaphragms
- 7 Diaphragm support disc
- 8 Spacer discs, max. 4
- 9 Pumping unit

7.3.2 Change the diaphragms and valves

Preparation

-> Example
Prepare for maintenance



1. Switch the pumping unit off and unplug the power plug.



2. Remove the glass flasks and connected hoses (coolant, vacuum).

-> Example
Remove the EK (IK)



3. Unscrew the screws from the counterhold; Torx screwdriver TX10.



4. Remove the counterhold and set it aside with the screws.

-> Example
Remove the EK (IK)



5. Unscrew the union nut and pull off the molded hose.

6. Remove the chiller.



7. Set the chiller down securely so that no liquid can escape.

Remove the TE or EKP

-> Example
Remove the dry ice condenser (TE) or Peltronic vapor condenser (EKP)



⇒ Unscrew the 2 screws; Phillips screwdriver size 2.



The chillers TE and EKP are secured with retaining plates.

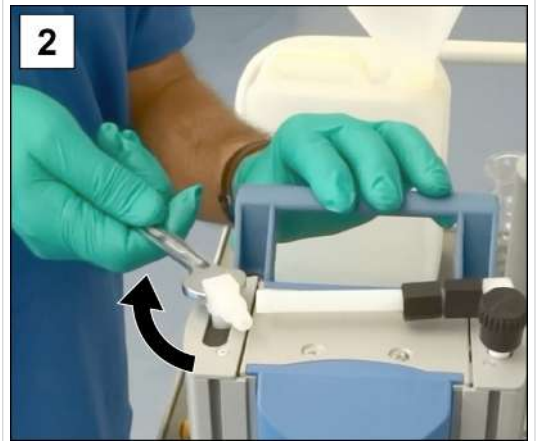
⇒ On these chillers, only loosen the screws in the retaining plates on the pumping unit.

Disassemble the device and housing sections

-> Example
Remove the housing sections on the left



1. Loosen the union nut; open-end wrench SW17.



2. Rotate the angled screw fitting to one side by a quarter turn; open-end wrench SW14.



3. Loosen the screw fitting on the handle; hex key size 5.



4. Carefully lay the pumping unit on its side.



5. Open the hose clip; flat-head screwdriver size 1.

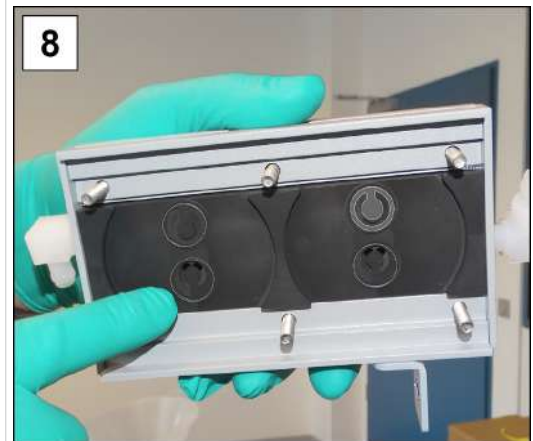


6. Unscrew the screw fittings; hex key size 4.

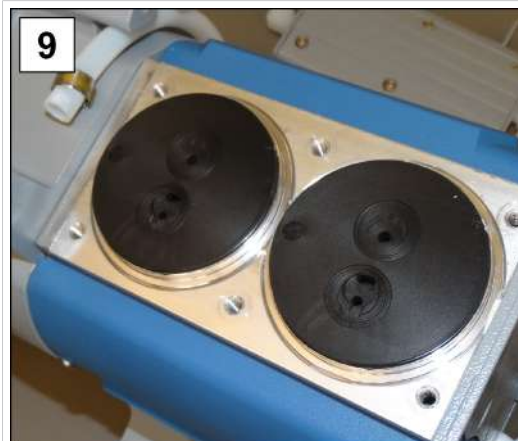
-> Example
Remove the housing sections on the left



7. Lift off the housing cover and pull off the molded hose.



8. Check for adhered valves and place the housing cover with the screw fittings to one side.



9. Make a note of the position of the head covers.

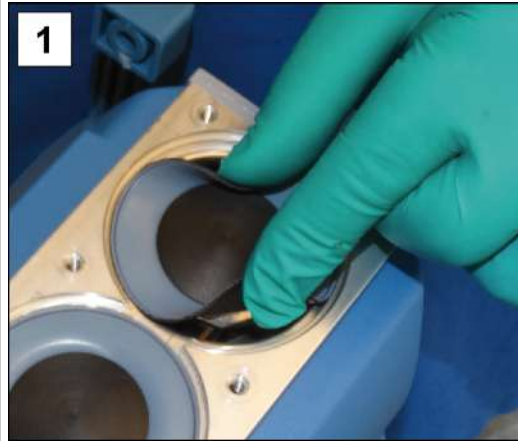


10. Remove the head covers.

NOTICE! Valves must be correctly positioned, otherwise the vacuum pump will not generate a vacuum.

Replace diaphragms

-> Example
Diaphragm replacement



1. Fold the diaphragm up at the sides.



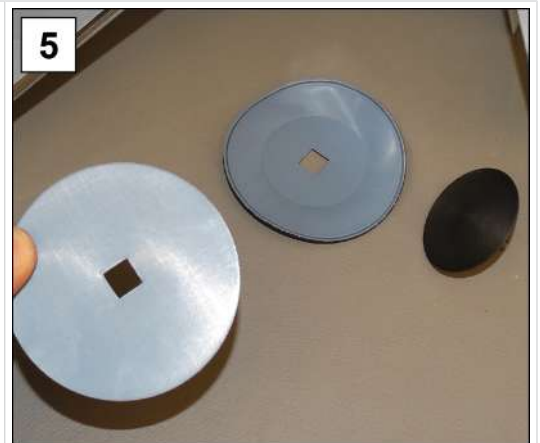
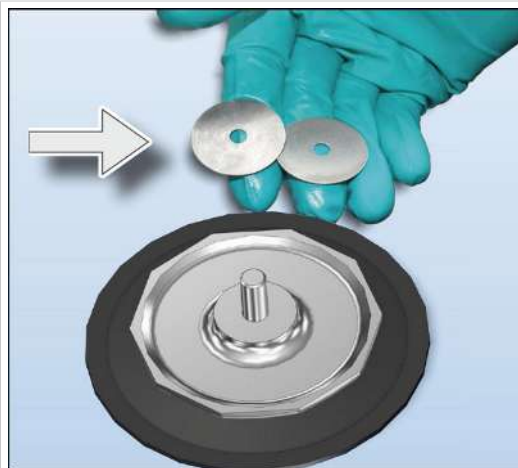
2. Carefully position the diaphragm wrench on the diaphragm support disc.



3. Use the secured diaphragm wrench to unscrew the assembly.

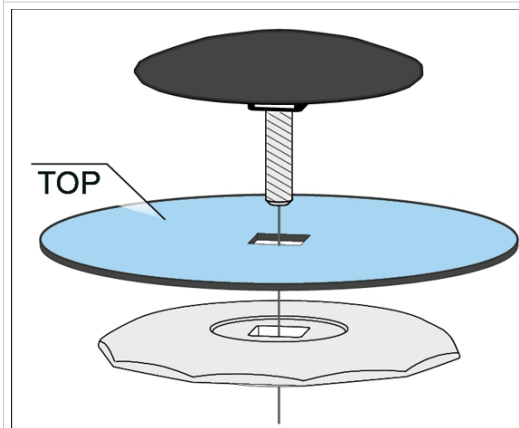


4. Lift the diaphragm, along with all the parts, out of the vacuum pump.



- Never drop spacer discs into the aluminum housing.
- Check for any spacer discs adhering to the connecting rod.
- Keep the spacer discs. It is essential to reinsert the same number of spacer discs.

5. Disassemble the assembly and take a new diaphragm; service kit MD 1C.



- Ensure that the diaphragm is inserted correctly, with the coated, light-colored side facing upwards.
- Pay special attention to correct positioning on the square head.



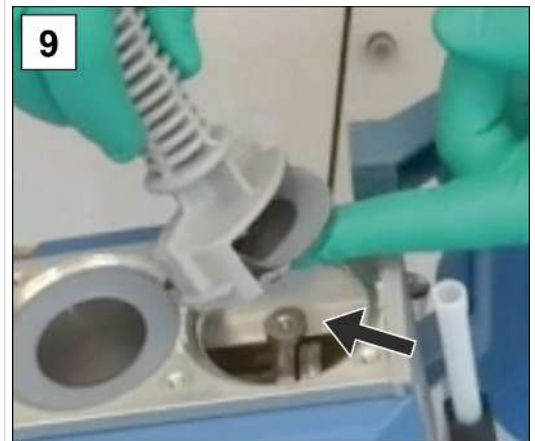
6. Assemble the diaphragm assembly and ensure its correct positioning on the square head.



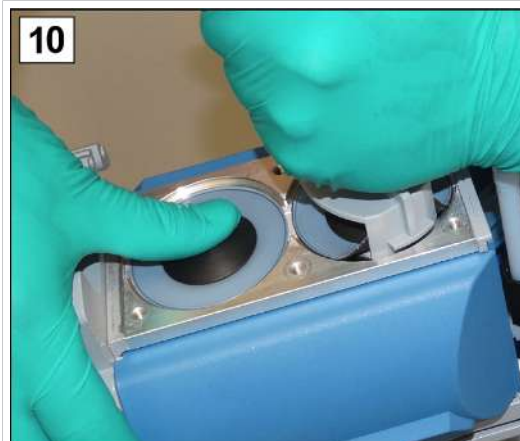
7. Use the correct number of spacer discs.



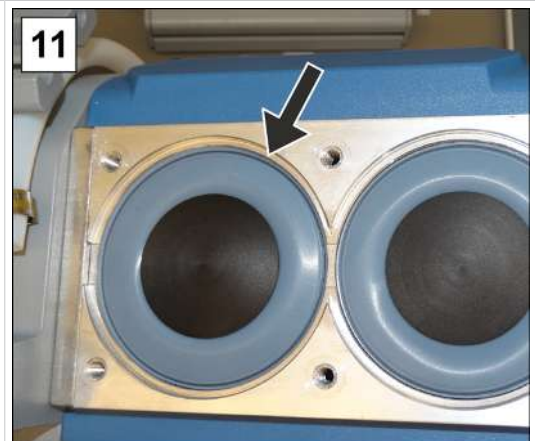
8. Secure the diaphragm assembly inside the diaphragm wrench.



9. Hold the spacer discs firmly and place the assembly on the connecting rod thread.



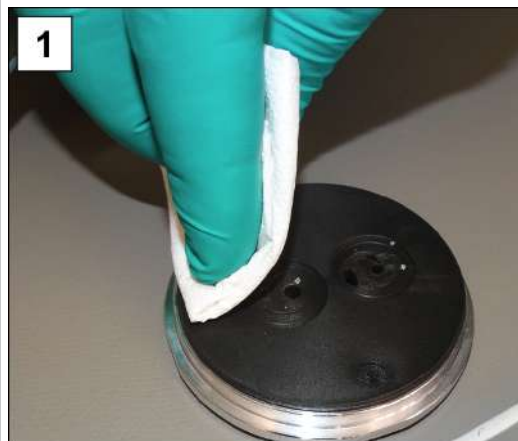
10. Tighten the assembly until finger-tight, using the diaphragm wrench.



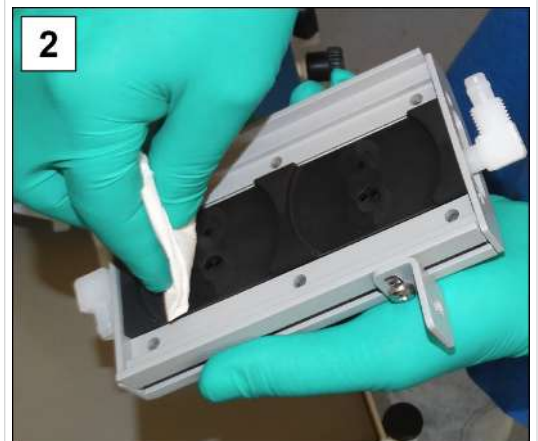
11. Repeat for the second diaphragm.

Change valves

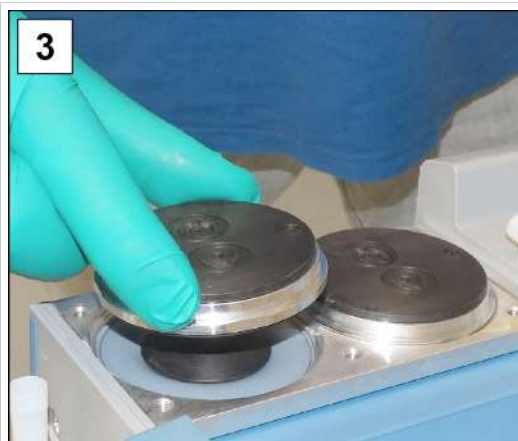
-> Example
Valve replacement



1. Carefully clean dirty head covers and



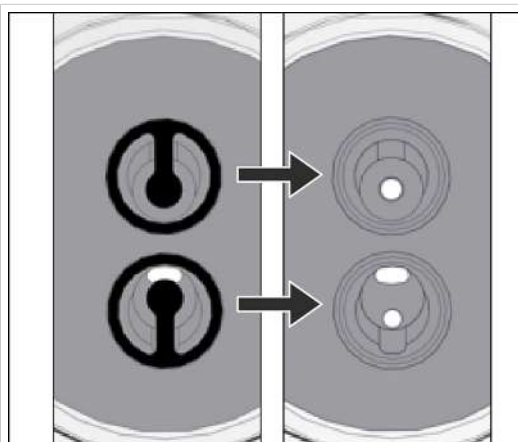
2. housing covers with a cloth.



3. Place both head covers in the correct position.



4. Position the new valves and align them; service kit MD 1C.



Plan view cutout: Correct positioning of valves.



5. Once all valves are positioned correctly, initially insert the molded hose.

-> Example
Valve replacement



6. Position the housing cover so that it is level and screw in the screw fittings; hex key size 4, tightening torque 6 Nm.

Assemble the device and housing sections

Before restarting the pumping unit, all previously removed parts of the device and housing must be fixed back in place.

-> Example
Mount the device
and housing sections



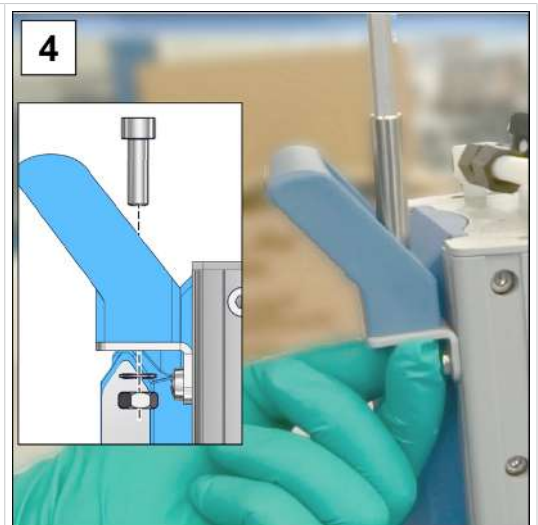
1. Set the pumping unit upright.



2. Rotate the angled screw fitting back into the molded hose by a quarter turn.



3. Screw on the union nut until it is finger-tight; open-end wrench SW17.



4. Secure the handle; hex key size 5.



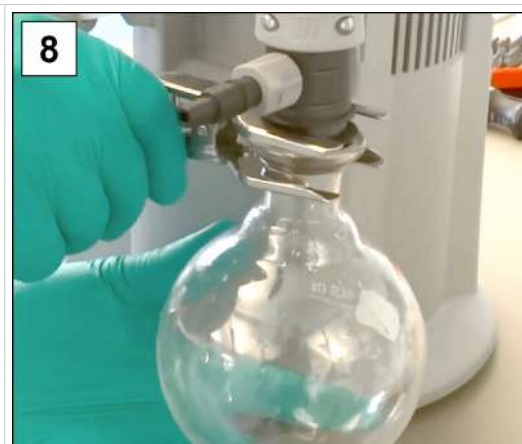
5. Secure open hose clips using flat nose pliers.



6. Push on the molded hose and screw on the union nut until it is finger-tight.



7. Secure the counter holder; Torx screwdriver TX10. For EKP or TE, please screw on the retaining plate; Phillips screwdriver size 2.



8. Secure the glass flasks with the joint clamp.

Diaphragm and valve replacement, next pump head

-> Example
Second pump head
maintenance



1. Turn the the pumping unit to the other side.
2. Repeat the above steps for diaphragm and valve replacement.

If maintenance work has been completed in full:

- ⇒ Connect the hoses for operation.
- ⇒ Connect the pumping unit to the power supply.
- Pumping unit is ready to be returned to use.
- Without reconnection -> Pumping unit is prepared for storage.

8 Appendix

8.1 Technical data

Product designation


Product names

Chemistry pumping unit series

PC 3001 VARIO select	PC 3001 VARIO select
PC 3001 VARIO select TE	PC 3001 VARIO select TE

Technical data

Technical data

Ambient conditions		(US)
Ambient temperature	10–40 °C	50-104°F
Altitude, max.	2000 m above sea level	6562 ft above sea level
Relative humidity	30–85 %, non condensing	
Pollution degree	2	
Impact energy	5 J	
Protection class (IEC 60529)	IP 20	
Type of protection(UL 50E)	Type 1	
Prevent condensation or contamination from dust, liquids, or corrosive gases.		
Operating conditions		(US)
Working temperature	10-40 °C	50-104 °F
Storage/transport temperature	-10-60 °C	14-140 °F
Maximum admissible media temperature (gas), non-explosive atmosphere:		
Short term	80 °C	176 °F
Continuous operation	45 °C	113 °F
ATEX conformity	II 3/- G IIC T3 X internal atm. only	
Maximum admissible media temperature (gas),  atmosphere:		
Short term	40 °C	104 °F
Continuous operation	40 °C	104 °F
Connections		
Vacuum, inlet IN	Hose nozzle DN 6/10	
Gas ballast GB	Gas ballast valve, manual	

Inert gas adapter – OPTION	Small flange GB NT KF DN 16 Hose nozzle GB NT DN 6/10	
Venting valve (venting with inert gas) – OPTION	Silicone rubber hose 3/6	
Coolant EK (+IK)	2x (+2x) hose nozzles DN 6/8	
Exhaust gas, outlet EX	Hose nozzle DN 8/10	
Cold connector	+ power connection CEE, CH, CN, UK, IN, US	
Plug-in connector	VACUU·BUS®	
Electrical data		
Nominal voltage	100-230 VAC ±10 %	
Mains frequency	50/60 Hz	
Overvoltage category	II	
Rated current at 50 Hz	1,6-0,7 A	
Power, max.	0,16 kW	
Interface	VACUU·BUS®	
Power cord	2 m	
Device fuse circuit board	1x 1,1 AT (VACUU·BUS) 1x 7 AF	
Vacuum data		
		(US)
Inlet pressure/ outlet pressure/ differential pressure, abs.	1.1 bar	825 Torr
Pressure at gas connections, absolute max.	1.2 bar	900 Torr
Sensor	integrated	integrated
Measuring principle	Ceramic diaphragm (aluminum oxide), capacitive, gas type independent, absolute pressure	
Accuracy of measurement	< ±1 mbar/hPa/Torr, ±1 digit (after calibration, constant temperature)	
Upper measurement limit	1080 mbar	810 Torr
Lower measurement limit	0.1 mbar	0.1 Torr
Temperature coefficient	< 0.15 mbar/K	0.11 Torr/K
Max. pumping speed	2.0 m ³ /h	1.18 cfm
Ultimate vacuum, abs.	2.0 mbar	1.5 Torr
Ultimate vacuum with GB, abs.	4 mbar	3 Torr
Number of cylinders/stages	4/3	

Weights* and dimensions (l x w x h)		(US)
PC 3001 VARIO select	303 mm x 306 mm x 400 mm	12.05 in x 11.93 in x 15.75 in
Weight*	8,2 kg	18.08 lb
PC 3001 VARIO select TE	300 mm x 341 mm x 493 mm	11.81 in x 13.43 in x 19.41 in
Weight*	8,7 kg	19.18 lb
PC 3001 VARIO select IK	309 mm x 312 mm x 400 mm	12.17 in x 12.28 in x 15.75 in
Weight*	8,8 kg	19.4 lb
PC 3001 VARIO select EKP	300 mm x 370 mm x 400 mm	11.81 in x 14.57 in x 15.75 in
Weight*	11,8 kg	26.01 lb
* without cable		

Other information

Sensor type	VACUU·SELECT Sensor
Controller	VACUU·SELECT
Volume of separator flask	500 ml each
Sound pressure level at 1500 rpm/62 % (VARIO)	42 dBA ±3

8.2 Wetted materials

Wetted materials

Component	Wetted materials
Pump	
Housing cover	PTFE
Head cover	ETFE carbon fiber reinforced
Diaphragm clamping disc	ETFE carbon fiber reinforced
Diaphragms	PTFE
Valves	FFKM
Pumping unit	
Inlet	PPS (IK: PP)
Outlet	PET (PC 3001 without EK: Carbon fiber reinforced PTFE)
Hoses	PTFE
Hose fitting	ETFE, ECTFE
O-ring on separator	Fluoroelastomer
Pressure relief valve at the vapor condenser	Silicone rubber, PTFE film

Distributor head (inlet)	PPS glass fiber reinforced, PP (blind plate)
Condenser IK, EK, TE	Borosilicate glass
Round bottom flask	Borosilicate glass
Peltronic vapor condenser	ETFE, ECTFE, PP, PA
Silencer	PBT, PVF, rubber
VACUU·SELECT Sensor	
Vacuum sensor	Aluminum oxide ceramic, goldplated
Measurement chamber	PPS
Small flange OPTION	PP
Sealing ring at the sensor	Chemical-resistant fluoroelastomer
Hose nozzle	PP
Venting valve seal	FFKM

8.3 Rating plate

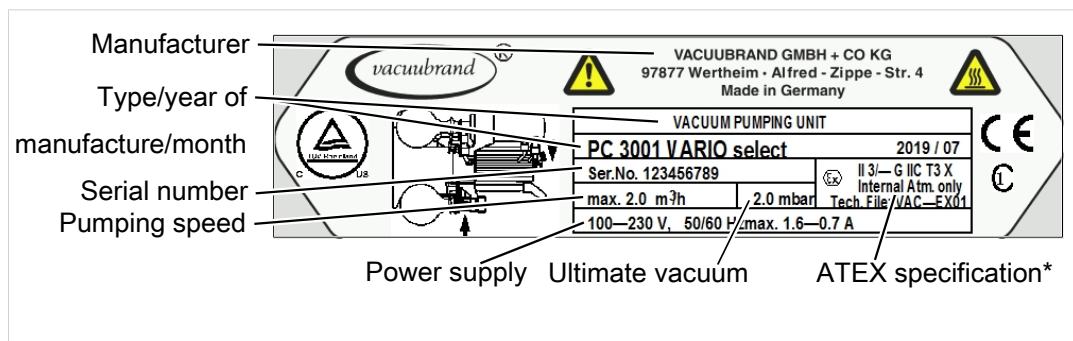
Details on rating plate



- ⇒ 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.

Pumping unit rating plate, general

-> Example Rating plate detail



The diagram shows a detailed view of the rating plate for a VACUUBRAND PC 3001 VARIO select vacuum pumping unit. The plate includes the following information:

- Manufacturer:** VACUUBRAND GMBH + CO KG, 97877 Wertheim · Alfred - Zippe - Str. 4, Made in Germany.
- Type/year of manufacture/month:** VACUUM PUMPING UNIT, PC 3001 VARIO select, 2019 / 07.
- Serial number:** Ser.No. 123456789.
- Pumping speed:** max. 2.0 m³/h, 2.0 mbar.
- Power supply:** 100-230 V, 50/60 Hz, max. 1.6-0.7 A.
- ATEX specification*:** II 3/- G IIC T3 X, Internal Atm. only, Tech. File/VAC-EX01.

* Indicating documentation, group and category, marking G (gas), type of protection, explosion group, temperature class (see also: Approval for ATEX equipment category).

8.4 Ordering information

Ordering information for pumping units

Chemistry pumping unit series	*Order no.
PC 3001 VARIO select	2070020x
PC 3001 VARIO select TE	2070022x
PC 3001 VARIO select IK	2070026x
PC 3001 VARIO select EKP	2070024x

* Order no. depends on power cord CEE, CH, UK, US, CN, IN

Ordering information for accessories

Accessories	Order no.
Vacuum hose DN 6 mm (l = 1000 mm)	20686000
Vacuum hose DN 8 mm (l = 1000 mm)	20686001
Coolant valve VKW-B	20674220
Venting valve VBM-B	20674217
Level sensor	20699908
VACUU·SELECT Sensor	20612881
VSK 3000	20640530
DAkKS calibration with first delivery	20900214
DAkKS recalibration	20900215

Ordering information for spare parts

Spare parts	Order no.
Hose nozzle 6 rounded	20639948
Hose nozzle DN 6/10	20636635
Small flange KF DN 16	20635008
Extension cable VACUU·BUS, 0.5 m	20612875
Extension cable VACUU·BUS, 2 m	20612552
Extension cable VACUU·BUS, 10 m	22618493
Joint clamp VA KS35/25	20637627
Glass flask/round bottom flask 500 ml	20638497
PA knurled nut M14x1 (union nut)	20637657
PA locking ring D10 (seal)	20637658
Vapor condenser EK, complete	20699922
Dry ice condenser TE	upon request
Inlet condenser IK	20636256
Peltronic® vapor condenser EKP	20636298
Anti-rotation protection D17x17.5	20635113
Gas ballast cap	20639223
Power cord	CEE
	20612058

CH	20676021
CN	20635997
IN	20635365
UK	20612065
CEE	20612058



⇒ VACUUBRAND > Support > Instructions for repair > [Chemistry pumping units](#).

Sources of supply

International sales offices and distribution

Purchase original accessories and original spare parts from a subsidiary of VACUUBRAND GMBH + CO KG or your local distributor.



⇒ Information about our complete product range is available in the current product catalog.

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

8.5 Service information

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

Services in detail

Service offer and service range

- Product consultation and practical solutions
- Fast delivery of spare parts and accessories
- Professional maintenance
- Immediate repairs processing
- On-site service (on request)
- Calibration (DAkkS-accredited)
- With Health and Safety Clearance form: return, disposal

Visit our website for further information: www.vacuubrand.com.

Service handling

Follow these headings: VACUUBRAND > Support > [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, photos or diagnostic data will help locate the source of the error.

8.6 EU Declaration of Conformity

**EU-Konformitätserklärung
EC Declaration of Conformity
Déclaration CE de conformité**



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 (M-RL), 2014/30/EU (EMV-RL), 2014/34/EU (ATEX-RL),
2011/65/EU, 2015/863 (RoHS-2)

Chemie-Pumpstand-Serie / Chemistry pumping unit series / Groupe de pompage *chimie*
Typ / Type / Type: **PC 3001 VARIO select, PC 3001 TE VARIO select,
PC 3001 EKP VARIO select, PC 3001 IK VARIO select**

Artikelnummer / Order number / Numéro d'article: **20700205, 20700225, 20700245,
20700265**

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

Angewandte harmonisierte Normen / Harmonized standards applied / Normes har-
monisées utilisées: DIN EN ISO 12100:2011, DIN EN 1012-2:2011, IEC 61010-
1:2010 (Ed. 3), DIN EN 61010-1:2011, DIN EN 61326-1:2013, DIN EN 1127-1:2011,
DIN EN ISO 80079-36:2016, DIN EN IEC 63000:2019

Bevollmächtigter für die Zusammenstellung der technischen Unterlagen / Person
authorised to compile the technical file / Personne autorisée à constituer le dossier
technique: Dr. F. Gitmans · VACUUBRAND GMBH + CO KG · Germany

Ort, Datum / place, date / lieu, date: Wertheim, 10.07.2020



(Dr. F. Gitmans)

*Geschäftsführer / Managing Director /
Gérant*

i. A.



(Dr. A. Wollschläger)

*Regulatory Affairs Manager / Directrice
des affaires réglementaires*

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Alfred-Zippe-Str. 4
97877 Wertheim

Tel.: +49 9342 808-0

Fax: +49 9342 808-5555

E-Mail: info@vacuubrand.com

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