vacuubrand

Technology for Vacuum Systems

CHEMISTRY PUMPING UNIT SERIES

PC 3010 VARIO select
PC 3016 VARIO select
PC 3012 VARIO select
PC 3012 VARIO select EKP

Instructions for use

Original instructions EN

OI no.: 20901118

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

This manual is part of your product. The 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 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

- For easier readability, the general term *pumping unit* is used as an equivalent to and instead of the product name *PC 301x VARIO select chemistry pumping unit*.
- 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.

Copyright

Copyright © and copyright law

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

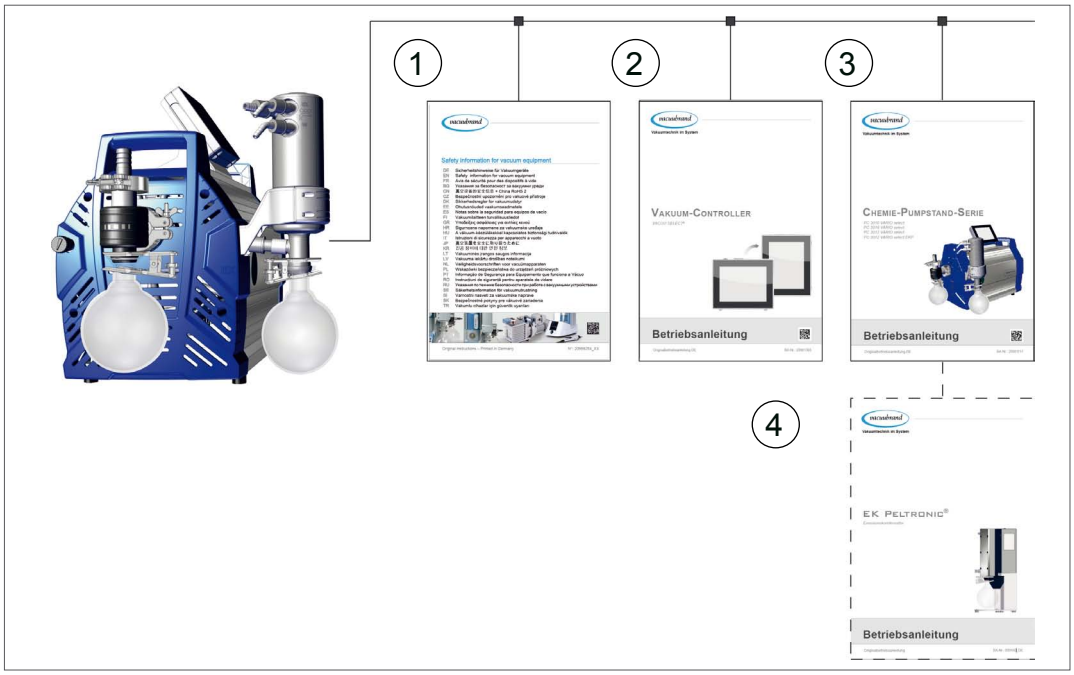
1.2.1 Manual structure

Modular instructions for use

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

Instruction modules

Pumping unit series and instructions for use



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

1.2.2 Display conventions

Warning levels

Display 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.

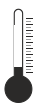
Safety symbols

Explanation of safety symbols

	Hazardous substance – hazards to human health.		General prohibition sign.
	General warning symbol.		Warning: risk of explosion.
	Danger: electricity.		Warning: hot surface.
	General mandatory sign.		Disconnect power plug.
	Wear chemical-resistant protective gloves.		Wear protective goggles.
	Read the repair instructions.		

Additional symbols and icons

Additional symbols

	Positive example – **Do this!** Result – **OK**		Negative example – **Don't do this!**
	Refers to content in this manual.		Refers to content in other supplementary documents.
	Installation at temperatures < 40 °C.		Ensure sufficient air circulation.
	Flow arrow Inlet – vacuum connection		Flow arrow Outlet – exhaust gas

1.2.4 Handling instructions (action steps)

Display of operating steps

Instructions (single step)

⇨ Perform the step described.

☑ Result of action

Instructions (multiple steps)

1. First step
2. Next step

☑ Result of action

Perform the steps in the order described.

1.2.5 Abbreviations

Abbreviations

abs.	Absolute
AK	Separator flask
ATM	Atmospheric pressure (bar graph, program)
d_i (di)	Interior diameter
DN	Nominal diameter
EK	Vapor condenser
EKP	Peltronic® vapor condenser or EK-Peltronic®
EX*	Outlet (exhaust, exit), exhaust gas connection
⟨Ex⟩	ATEX equipment labeling
FKM	Fluoroelastomer
GB	Gas ballast
IK	Inlet condenser
IN*	Inlet, vacuum connection
KF	Small flange
max.	Maximum value
min.	Minimum value
without EK	Without vapor condenser
PA	Polyamide
PBT	Polybutylene terephthalate
PC	Pumping unit chemistry with series identification number
PE	Polyethylene
RMA no.	Return Merchandise Authorization number
SW	Wrench size (tool)

Abbreviations

TE	Dry ice condenser
resp.	Responsible
e. g.	For example

** Labeling on the vacuum pump or component*

→ *see also* ***Product-specific abbreviations on page 25***

1.2.6 Term definitions

Product-specific terms

Separator flask	Glass flask/separator mounted at the inlet or outlet.
Vapor condenser*	Cooling condenser with receiving flask mounted at the outlet (pressure side).
PC 301x VARIO select	Vacuum pumping unit with variable speed motor for precise vacuum control including **VACUU·SELECT®** controller and **VACUU·SELECT® Sensor**.
Peltronic®	Electronic chiller with Peltier elements mounted at the outlet; condenses solvent vapors without external coolant.
VACUU·BUS®	Bus system from **VACUUBRAND** for communication between peripheral devices with **VACUU·BUS®**-enabled gauges and controllers. The maximum admissible cable length is 30 m.
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·LAN®	Local area vacuum network.
VACUU·SELECT®	Vacuum controller, controller with touchscreen; consisting of operating panel and vacuum sensor.

Product-specific terms

VACUU·SELECT® Sensor	External vacuum sensor ▸ for **VACUU·SELECT®** *or* ▸ separately as an independent vacuum sensor.
VARIO® drive	Speed control for vacuum pump; the motor runs only as fast as necessary to meet demand.

** 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 is valid for the entire life cycle of the product.

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 from the *PC 301x VARIO select* product series is a vacuum system consisting of a variable speed vacuum pump, controller, sensor and separators, for the creation and control of rough vacuum in designated systems, e. g., evacuating distillation equipment, as a vacuum dryer or systems with VACUU·LAN local area vacuum network, etc.

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

The vacuum system may only be used indoors in a 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,
- 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 faults 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

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

Foreseeable misuse

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,

Foreseeable misuse

- 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.

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

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 vacuum system. This applies in particular to connection, assembly and maintenance work, and troubleshooting.

Users in the areas of competence in the *Responsibility matrix* must possess the relevant qualifications for the activities listed. 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 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	Similar to a specialist, with additional specialist responsibility, or responsibility for a department or division

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[1]		x	x
Repair order			x
Cleaning, simple	x	x	x
Empty the separator	x	x	x
Shutdown	x	x	x
Decontamination[2]		x	x

1 *See also our website:*
VACUUBRAND > Support > Instructions for repair

2 *Alternatively, arrange for decontamination by a qualified service provider*

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.

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

IMPORTANT!

⇨ When handling chemicals, wear your personal protective equipment.

2.4.2 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 cable, 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.

IMPORTANT!

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

⇨ Fill out the Health and Safety Clearance form in full and confirm with your signature.

2.4.3 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.

⇨ Mount and use suitable separators, filters or fume hood 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, depending on the 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.

2.4.4 Eliminate 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 *8.1.1 Technical data on page 79*.
- ⇨ 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 *EX* or 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 forms.

Prevent incorrect measurements

Incorrect measurements due to a blocked vacuum line, e. g., condensate in the vacuum line, can distort the measurements taken by the vacuum sensor.

⇨ Prevent overpressure > 1060 mbar (795 Torr) inside the suction line.

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 chemically resistant, clog-proof and have a reliable flow rate, for example.

⇨ Replace porous vacuum hoses without delay.

Hazards during venting

Hazards when 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 at the plug-in power supply due to residual energy:

- Thermal energy: Motor waste heat, hot surfaces, compression heat.

⇨ Allow the vacuum pump to cool down.

- Electrical energy: The capacitors on the electronic assembly have a discharge time of up to 3 minutes.

⇨ Wait until the capacitors have discharged.

Risk of burns due to hot surfaces or overheating

Surface temperatures

The surface of the vacuum pump can reach operating temperatures > **70 °C**, in particular when pumping 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 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 foam rubber as a sound absorber can impair and block the air supply.

⇨ Clean polluted ventilation slots.

⇨ Remove covers from the device before operating it.

⇨ Avoid excessive heat input due to hot process gases.

⇨ Observe the maximum admissible media temperature
→ *see chapter: 8.1.1 Technical data on page 79*.

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

2.5 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 vacuum pump back on

If the vacuum pump is switched off due to these safety precautions, the error must be cleared manually: Unplug pumping unit from power supply -> eliminate cause of error -> switch pumping unit back on.

2.6 ATEX equipment category

Installation and potentially explosive atmospheres

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

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.

- ⇨ Only use the product if it is in perfect working condition.
- ⇨ The devices are designed for a low level of mechanical stress and must be installed in such a way that they cannot sustain mechanical damage from the outside.

ATEX equipment category and peripheral devices

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

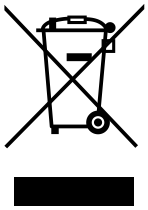
Prevent ignition sources

The use of venting valves is only permitted if this would not normally, or only rarely, cause explosive mixtures within 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 on our website at: www.vacuubrand.com/.../Information-ATEX

2.7 Disposal



NOTE

Risk of environmental damage due to incorrect disposal of the product.

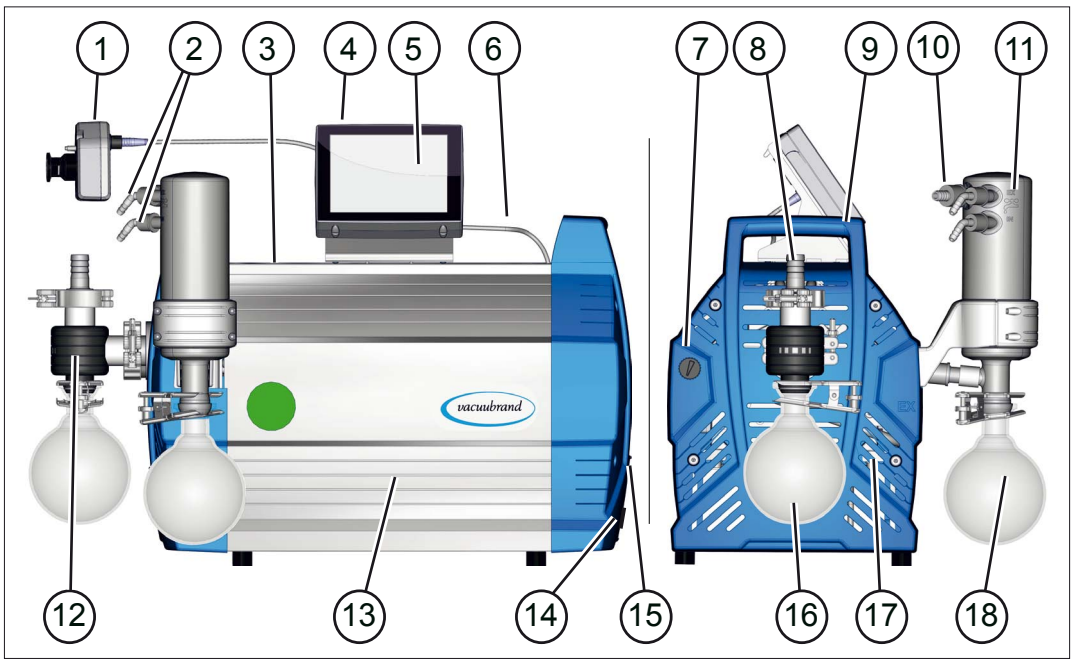
- ⇨ Do not dispose of the product with household waste! Electronic components are subject to hazardous waste treatment and must only be disposed of by certified specialists.
- ⇨ Observe the national regulations for safe disposal and environmental protection.
- ⇨ Detailed information on the respective regulations can be obtained from your local administrative authority.

3 Product description

Pumping units in the PC 301x VARIO select series essentially consist of a diaphragm pump with VARIO® drive, a VACUU·SELECT® vacuum controller, and a chiller with separator. The chiller can take various forms, depending on how it operates.

3.1 PC 3012 VARIO select (schematic design)

→ Example PC 3012 VARIO select side and front view



Meaning

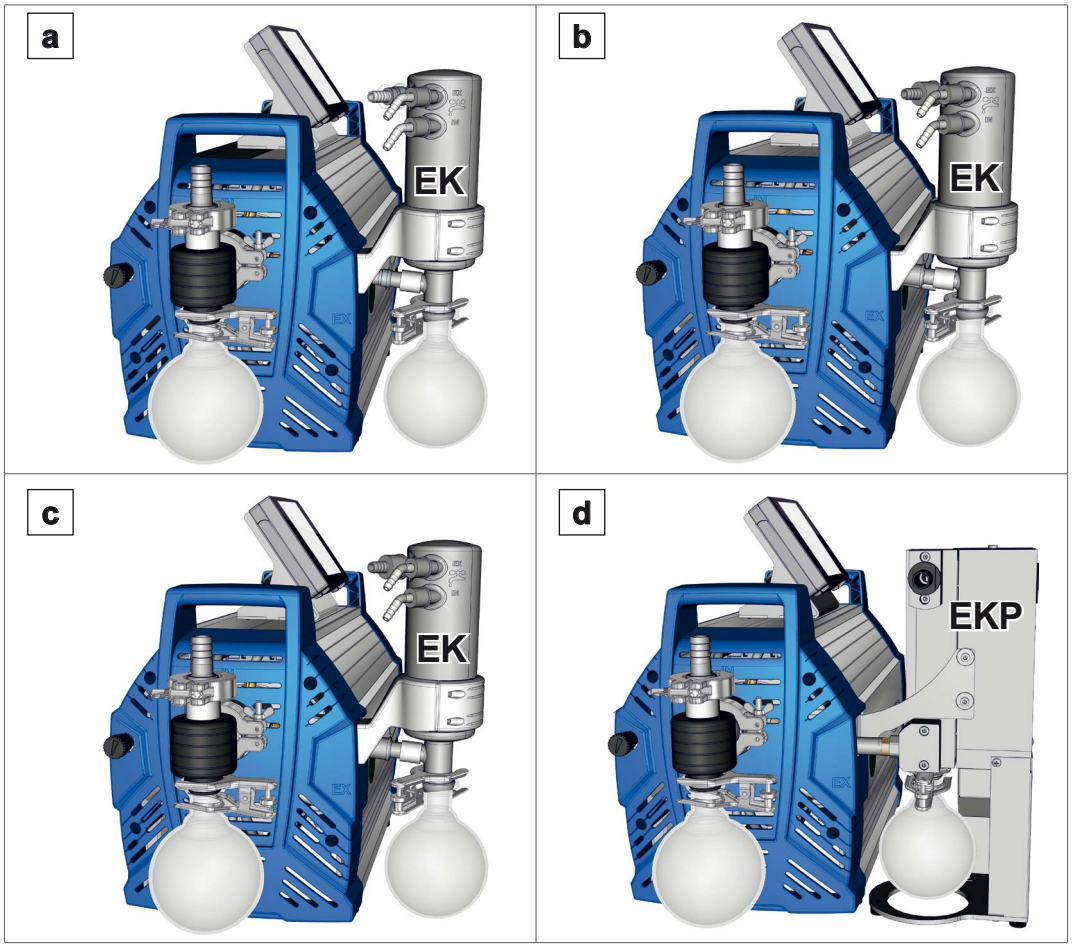
1	VACUU·SELECT® Sensor, to be mounted externally on suction line
2	Coolant connections
3	Chemistry diaphragm pump
4	Vacuum controller ON/OFF button
5	VACUU·SELECT® operating panel
6	VACUU·SELECT® VACUU·BUS cable (power supply + control cable)
7	Gas ballast valve
8	Vacuum connection – inlet IN
9	Handles (2x)
10	Outlet connection – outlet EX
11	Vapor condenser EK
12	Separator flask
13	Side panel, cover
14	Power connection, ON/OFF button (rocker switch)
15	Rating plate

16	Round bottom flask at the inlet
17	Housing section with handle, front
18	Round bottom flask at the outlet

3.2 Chemistry pumping unit series

Overview of PC 301x VARIO select chemistry pumping units

Overview of chemistry pumping units



Meaning

Chemistry pumping unit	Pump head	Stages	AK	EK	EKP
a PC 3010 VARIO select	**8**	**4**	●	●	
b PC 3016 VARIO select	**8**	**1**	●	●	
c PC 3012 VARIO select	**8**	**3**	●	●	
d PC 3012 VARIO select EKP	**8**	**3**	●		●

Product-specific abbreviations

Product-specific abbreviations

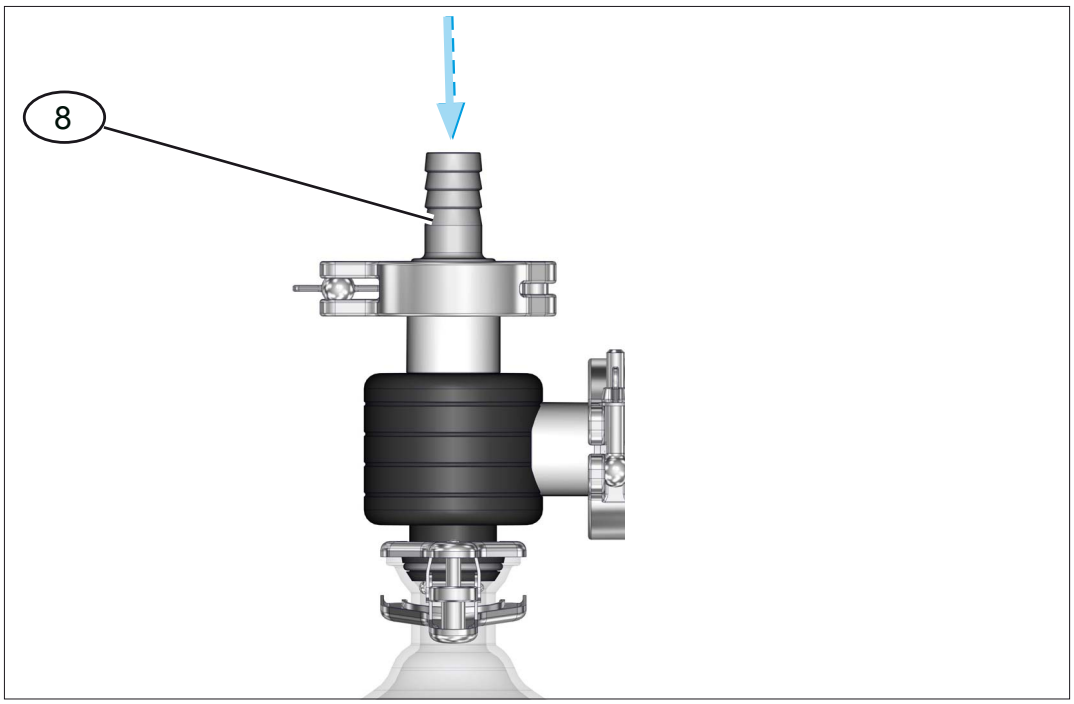
AK	Separator flask, mounted at the inlet or outlet
EK	Vapor condenser, mounted at the outlet
EKP	Peltronic® vapor condenser, mounted at the outlet
PC	Chemistry pumping unit with type identification number

3.3 Condensers and chillers

3.3.1 Separator/condenser at the inlet

Connection to separator flask

Connections at the separator flask



Meaning

8	Inlet connection vacuum IN

3.3.2 Condenser at the outlet

Connection and coolant at the vapor condenser

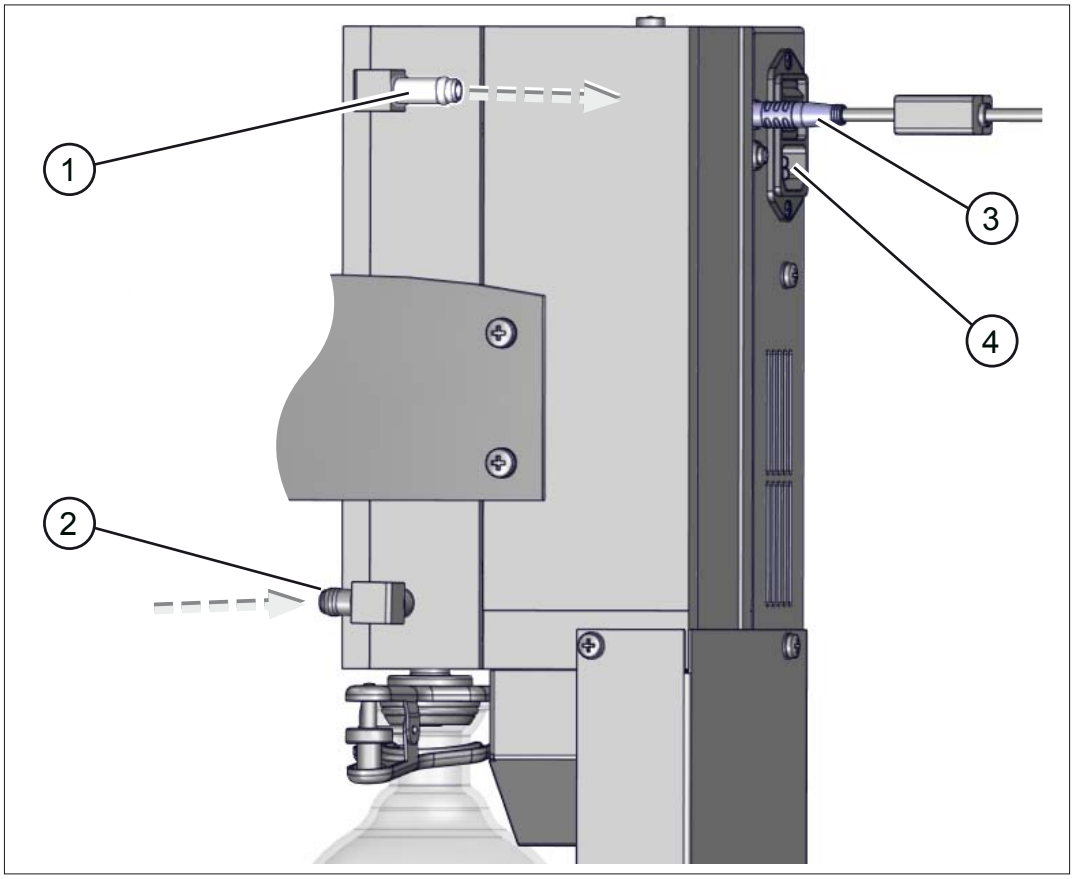
Connections on the EK

Meaning

2.1	Coolant outlet connection EX
2.2	Coolant inlet connection IN, e. g., water
10	Outlet connection EX

Connections at the Peltronic® vapor condenser

Connections on the EKP



Meaning

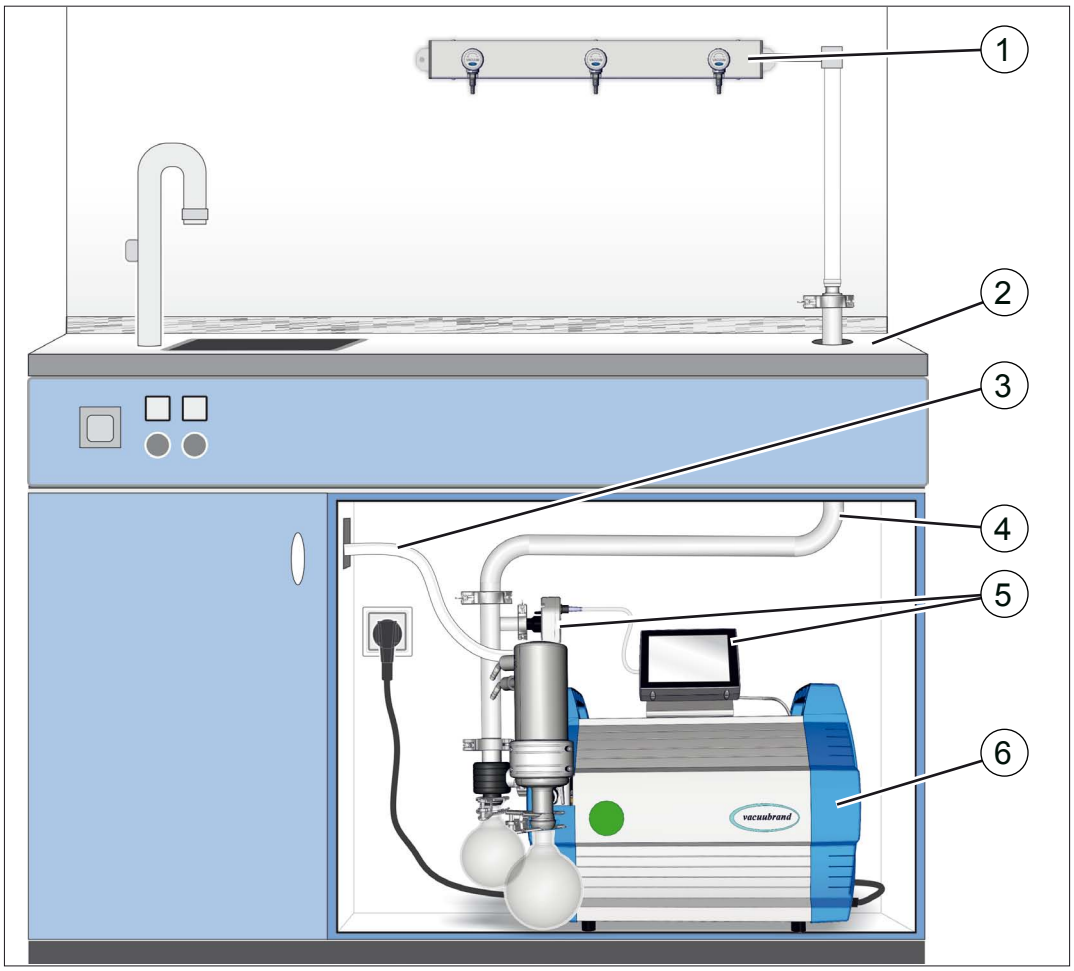
1	Outlet connection EX
2	Vacuum pump connection
3	VACUU·BUS® port
4	Power supply with ON/OFF button

For detailed information and descriptions of the Peltronic® vapor condenser, → *see manual #20901074.*

3.4 Example

Local area vacuum network

→ Example
Local area vacuum network



Meaning

1	Example: VACUU·LAN®, local area vacuum network with three valve modules
2	Lab furniture
3	Outlet hose (diverted into a fume hood)
4	Vacuum tubing
5	**VACUU·SELECT** operating panel + **VACUU·SELECT Sensor**
6	**PC 3012 VARIO select** vacuum pumping unit

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.

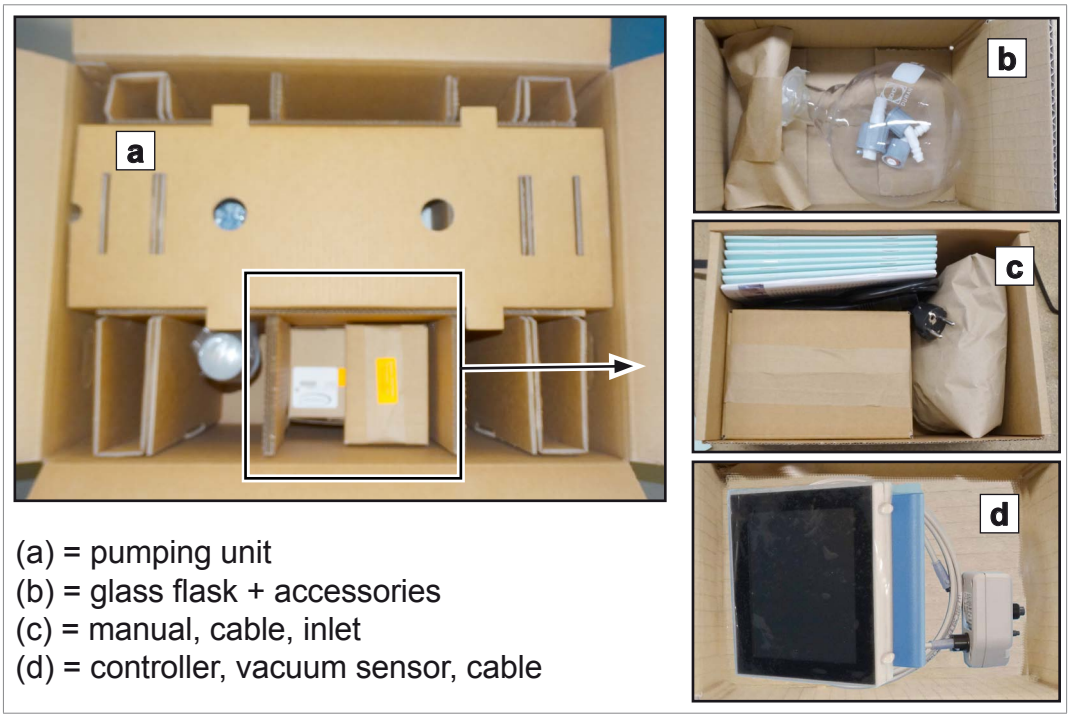
Goods receipt

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 with enclosed packages



(a) = pumping unit
(b) = glass flask + accessories
(c) = manual, cable, inlet
(d) = controller, vacuum sensor, cable

⇨ Remove all enclosed packages from their original packaging and unpack them.

⇨ Compare the scope of delivery with the delivery note.

⇨ Please note that a **pumping unit can weigh approx. 30-34 kg**. We recommend using a lifting aid.

⇨ Lift the unit out of the packaging by the side handles.

4.2 Installation

NOTE

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

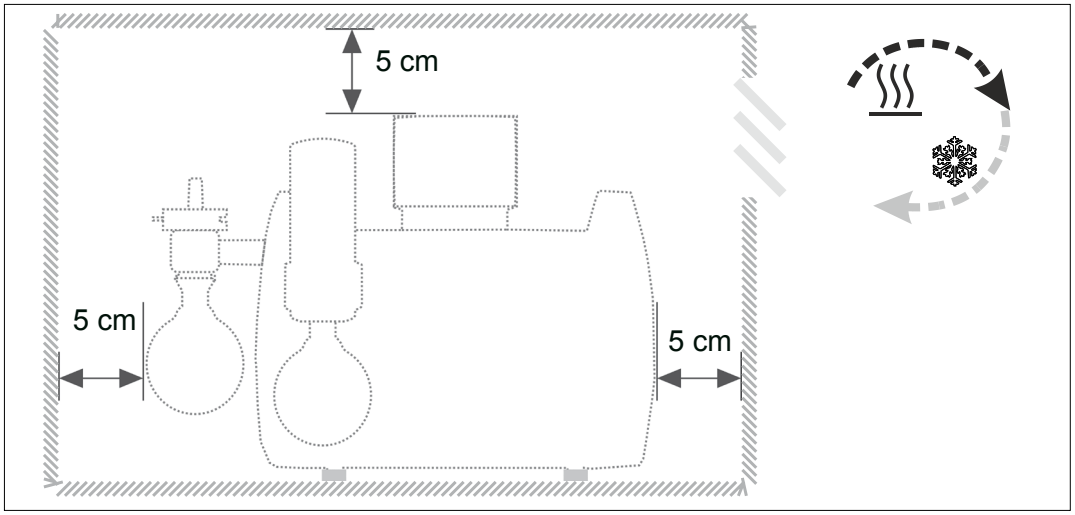
Check installation conditions

- 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.

Installing the vacuum pump

⇨ Place the vacuum pump on a stable, non-vibrating, level surface.

→ Example
Sketch of minimum distances in lab furniture



IMPORTANT!

⇨ 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

Observe limitation of use

Limitation of use		(US)
Ambient temperature	10–40 °C	50-104 °F
Max. altitude	2000 m above sea level	6562 ft above sea level
Minimum distance to adjacent parts	5 cm	2 in
Coolant circuit, max. pressure	3 bar	44 psi
Relative humidity	30-85 %, non-condensing	
Protection class	IP 40/IK 08	
Prevent condensation or contamination from dust, liquids, or corrosive gases.		

IMPORTANT!

⇨ Note the IP protection class. IP protection is only guaranteed if the device is appropriately mounted and connected.

⇨ For connection also note the rating plate data and chapter *8.1.1 Technical data on page 79.*

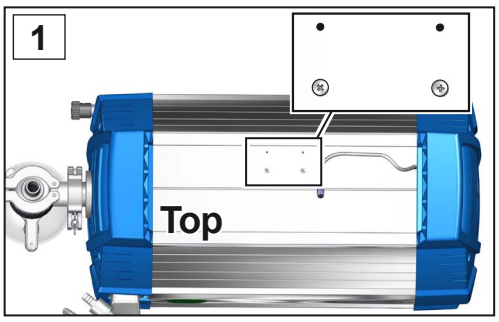
4.3 Controller base

The base, controller, screw fittings and vacuum sensor are enclosed separately. Before installation, the base can be mounted on the pumping unit and the controller clipped into place.

Alternatively, the controller can be clipped into a recess in the lab furniture.

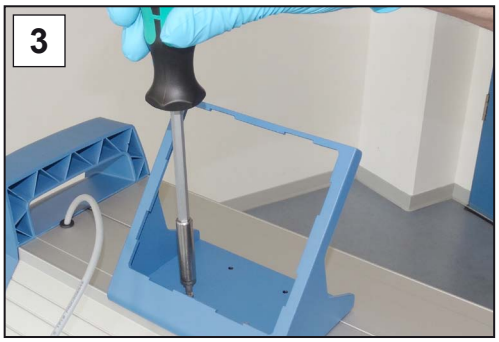
Mount the base

Mount the base to the pumping unit (option)



1. Unscrew the screw fittings from the pumping unit; Phillips screwdriver size 1.

2. Position the base on the pumping unit.



3. Wind in the screw fittings with the base.

4. Clip the controller into the base.

5. Plug the VACUU·BUS cable into the power connection on the back of the controller.

6. Also plug in the VACUU·BUS cables from peripheral devices. Use Y adapters if there are not enough connections.

4.4 Connection

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

4.4.1 Vacuum connection (IN)

CAUTION

Flexible vacuum hoses can contract during evacuation.

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.

- ⇨ 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 suction line can damage the vacuum pump.

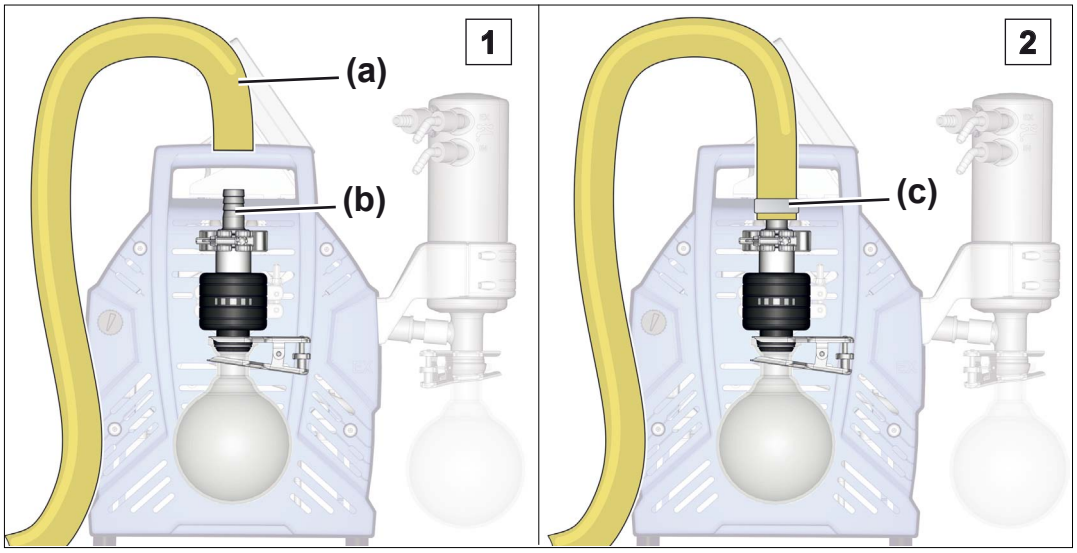
⇨ Prevent particles, liquids or contaminants from being aspirated or being able to flow back.

IMPORTANT!

- ⇨ Use a sufficiently stable vacuum hose that is designed for the required vacuum range.
- ⇨ Keep hose lines as short as possible.
- ⇨ The connection between hose lines and the vacuum pump must be gas-tight.
- ⇨ Avoid kinks in the vacuum hose.

Connect the vacuum hose

→ Example
Vacuum connection at the inlet



1. Take a vacuum hose **(a)** that fits on hose nozzle SW15 **(b)**.
2. Push vacuum hose **(a)** from the apparatus onto the hose nozzle and secure the vacuum hose, for example with a hose clip **(c)**.

Observe the following points for optimum results:

⇨ Keep the vacuum line as short as you can with as large a cross-section as possible.

⇨ Alternatively, you can connect a metal hose with small flange KF25 directly → see accessories in *8.2 Ordering information on page 84*.

4.4.2 Outlet connection (EX)

WARNING

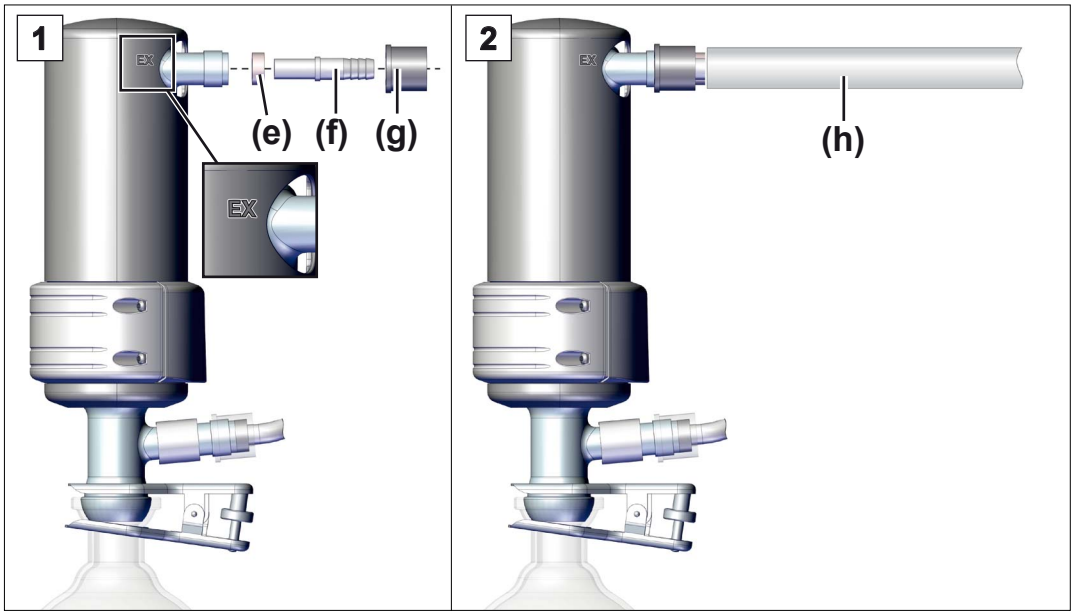
Risk of bursting due to overpressure inside the outlet line.

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

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

Connect the exhaust gas hose

→ Example
Exhaust gas connection at the outlet EX



1. Connect rubber sealing ring **(e)**, hose nozzle **(f),** and union nut **(g)** as shown, and screw onto the connection.
2. Slide outlet hose **(h)** onto the hose nozzle and route the hose into a fume hood if necessary. If necessary fix the outlet hose, e. g., with a hose clip.

4.4.3 Coolant connection at the condenser

Coolant connection
IN = feed line
EX = outlet

A vapor condenser EK has a connection for coolant. Water or the liquid from a chiller, for example, are suitable coolants.

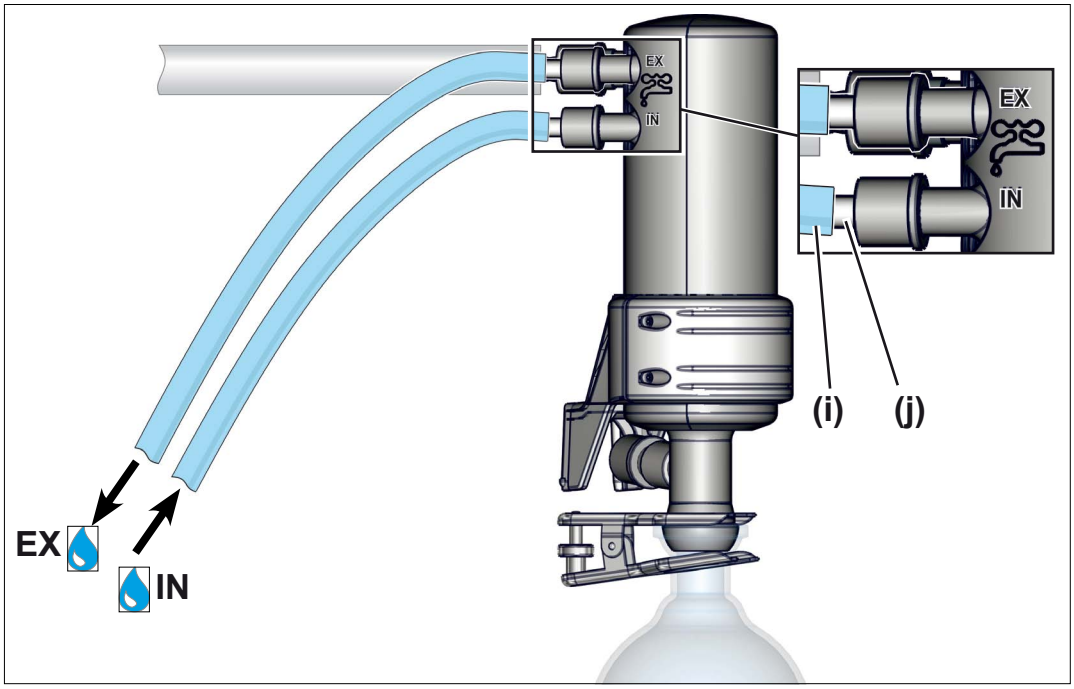
IMPORTANT!

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 coolant

→ Example
Coolant connection on the EK or IK



1. Fix both hose nozzles **(i)** to the condenser as shown using union nuts **(j)**.
2. Fix the hoses for the coolant on the condenser as shown: IN = feed line, EX = outlet.
3. Secure the hoses, e. g., with hose clips.

4.4.4 Venting connection (option)

DANGER

Risk of explosion by venting with air.

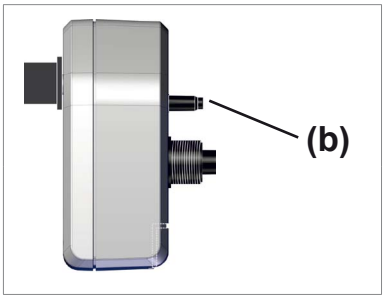
Depending on the application, venting can cause explosive mixtures to form or other hazardous situations to arise.

⇨ 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.).

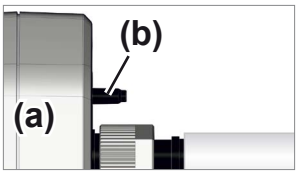
The pumping unit and controller have *no* direct ventilation connection. You can connect different venting valves, e. g., the supplied **VACUU·SELECT® Sensor**.

VACUU·SELECT® Sensor with venting valve



The ventilation connection **(b)** for a **VACUU·SELECT® Sensor** is described below.

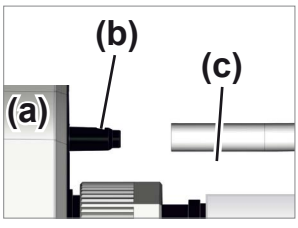
Alternatively you can use a larger valve, e. g., a **VB M-B** (#20674217) for faster venting.



Vent with ambient air[1]

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

Vent with inert gas – connect venting valve[1]



Required connection material: Hose for hose nozzle, e. g., silicone tube 4/5 mm

⇨ Attach hose **(c)** to the connection of venting valve **(b)** and connect inert gas (max. 1.2 bar/900 Torr, abs.).

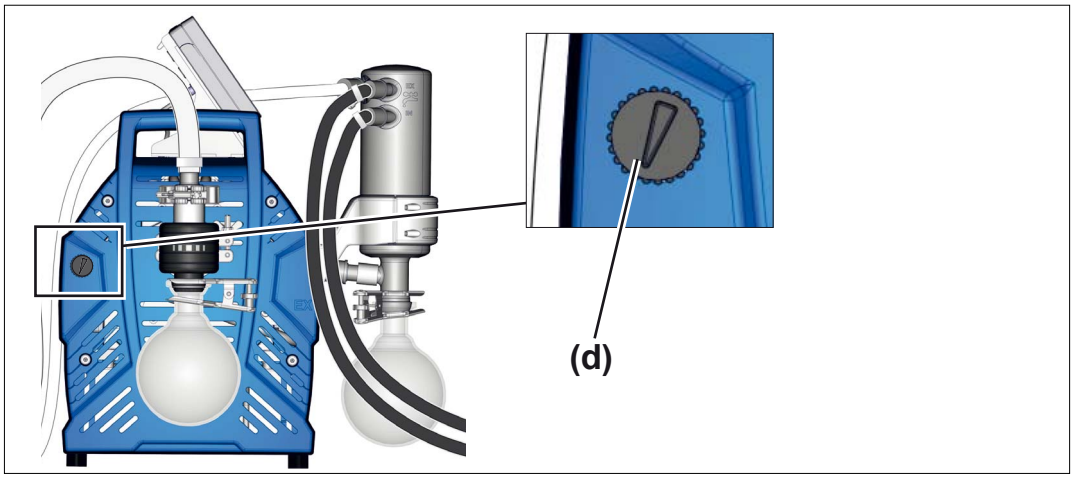
☑ Venting valve with hose for venting with inert gas[2].

1 *Not applicable to sensors without an integrated venting valve.*
2 *Avoid overpressure.*

4.4.5 Gas ballast (GB)

Use of ambient air as gas ballast

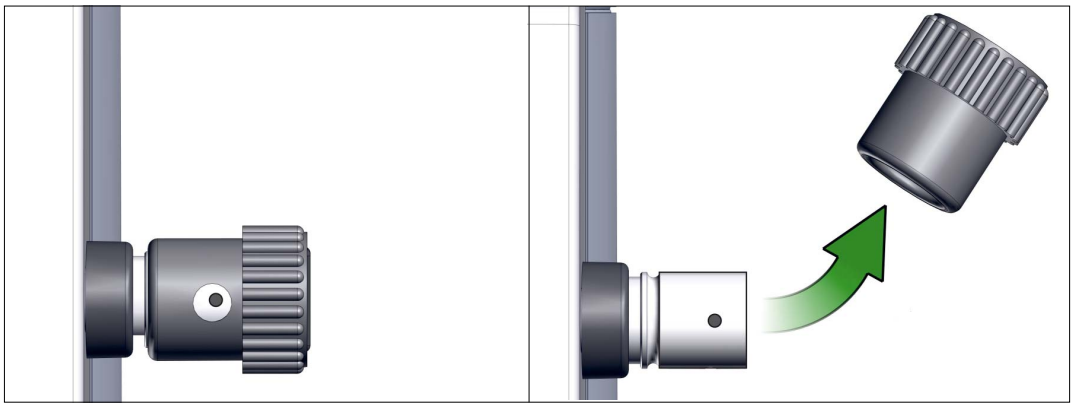
→ Example
Position of gas ballast valve



If ambient air is to be used as gas ballast, nothing needs to be connected at the pumping unit; gas ballast valve **(d)**.
→ *see also chapter 5.2.2 Operation with gas ballast on page 44*

Use of inert gas as gas ballast – OPTION

Prepare inert gas connection (GB)



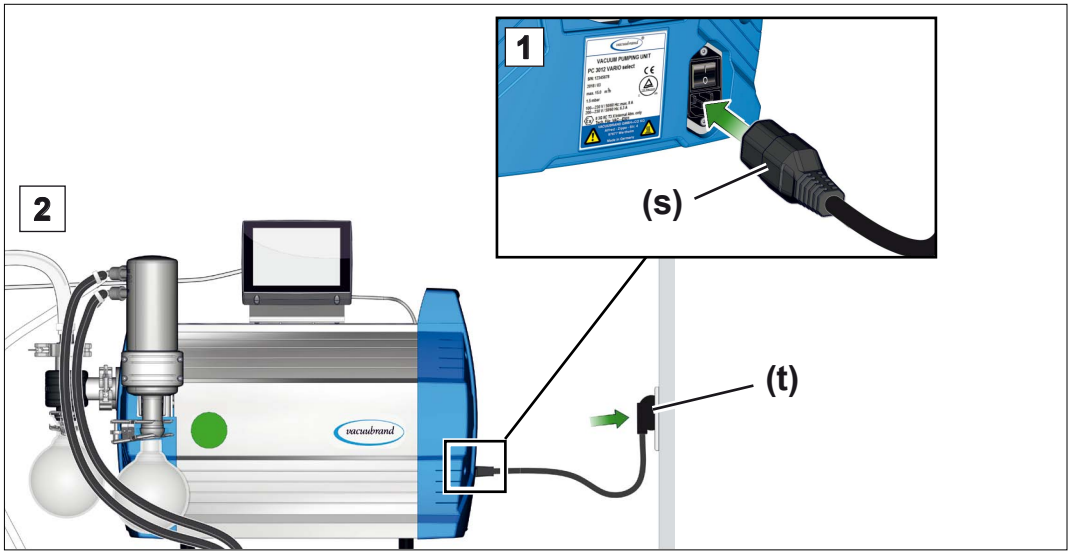
⇨ Remove the black gas ballast cap and connect a gas ballast adapter in its place.

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

4.4.6 Electrical connection

Pumping unit electrical connection

→ Example
Electrical connection for pumping unit



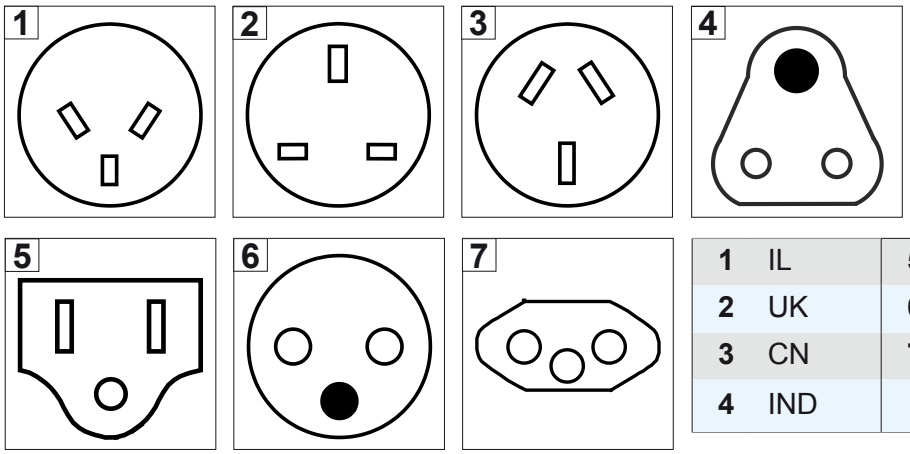
1. Plug the connector **(s)** on the power cable into the power connection of the vacuum pump.
2. Plug power plug **(t)** into the power outlet.
   ☑ Pumping unit connected electrically.

IMPORTANT!

⇨ Lay the power cable such that it cannot be damaged by sharp edges, chemicals, or hot surfaces.

Power connections with country code

Diagrams of standard power connections with grounding contact



1	IL	5	US
2	UK	6	CEE
3	CN	7	CH
4	IND		

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 the power connection.

5 Commissioning (operation)

5.1 Switch on

Switch on pumping unit

Switch on pumping unit

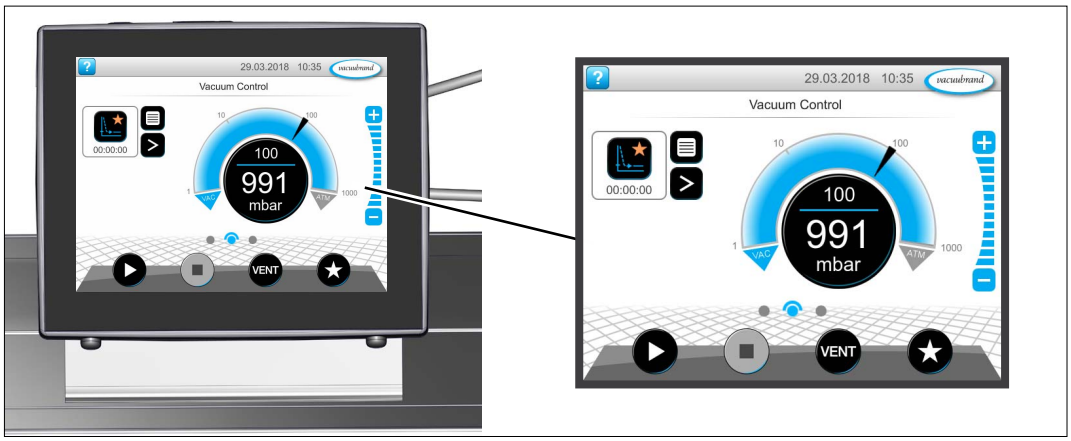
1. Switch rocker switch **(a)** on – switch position **I**.
2. Press ON/OFF button **(b)** on the controller.
   - ☑ The start screen is displayed.
   - ☑ After approx. 30 seconds, the process screen with the operating elements appears on the controller display.

5.2 Operation

Operation with vacuum controller

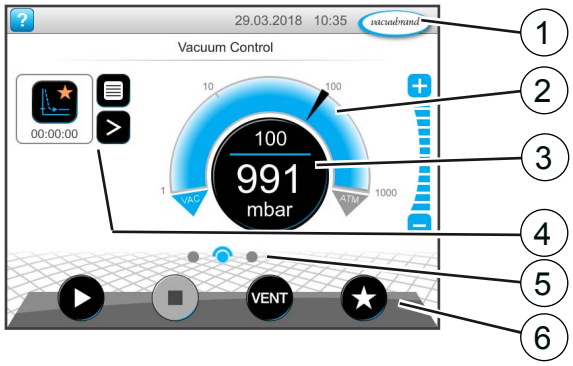
Apart from the chapters Switch on and Switch off, this manual describes the mechanical structure of a pumping unit in the **PC 301x VARIO select** series.

Operation of the installed vacuum controller and its functions are described in the separate **VACUU·SELECT** manual.



Process screen

Vacuum controller process screen



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

Vacuum controller operating elements

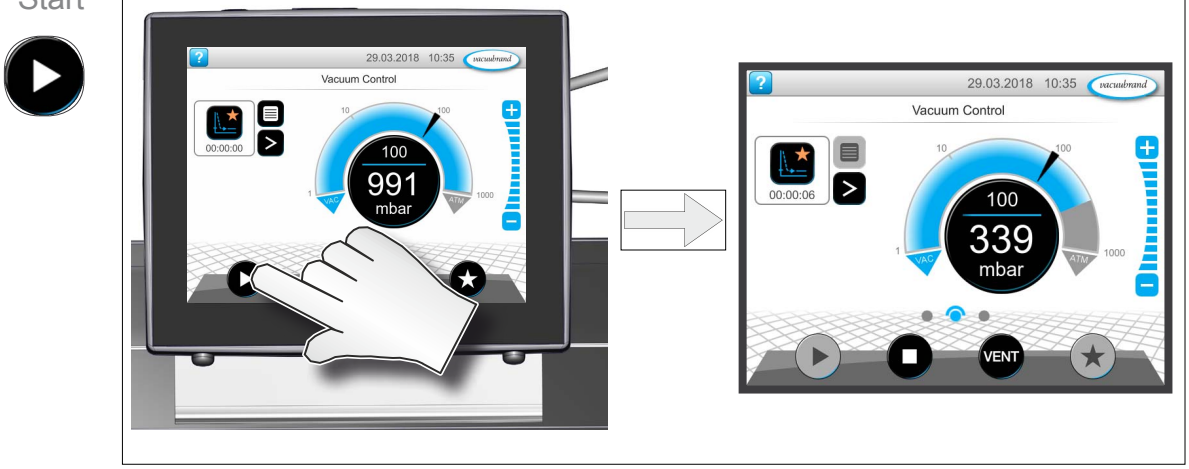
Button		Function
Active	Locked	
		***Start*** ▸ Start application – only available on the process screen.
		***Stop*** ▸ Stop application – always possible.
 *		***VENT*** – vent the system (option) ▸ Press button < 2 sec = vent briefly; control continues.
 * 		▸ Press button > 2 sec = vent to atmospheric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

** Button is only displayed if venting valve is connected or activated.*

5.2.1 Operation (→ *see description of controller)*

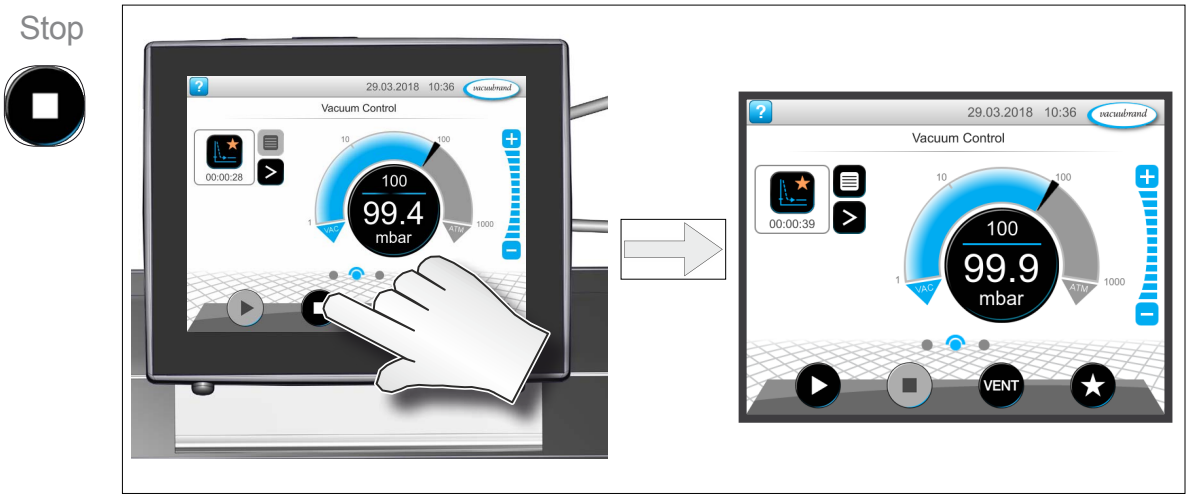
Start the vacuum controller

Start



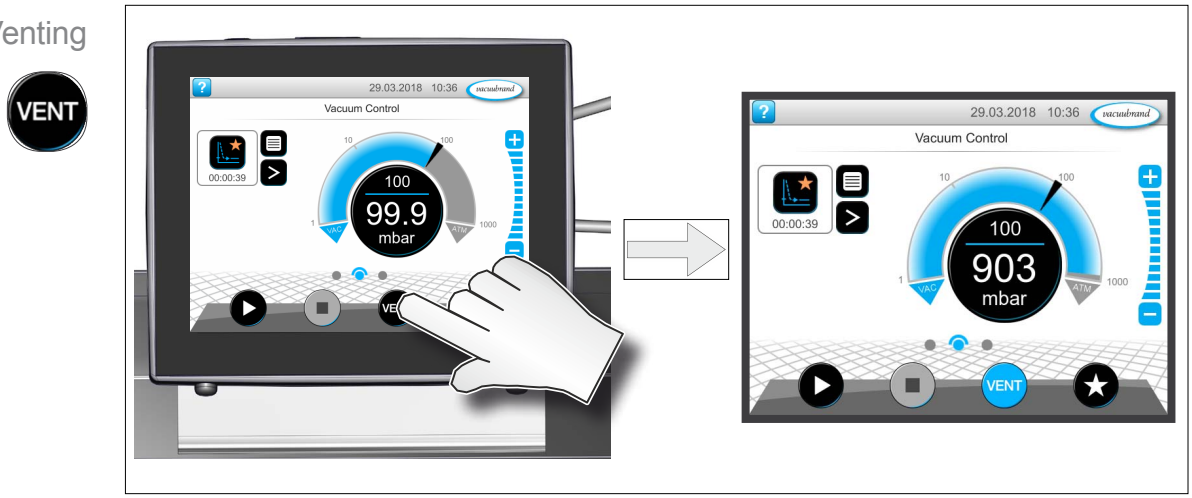
Stop the vacuum controller

Stop



Venting

Venting



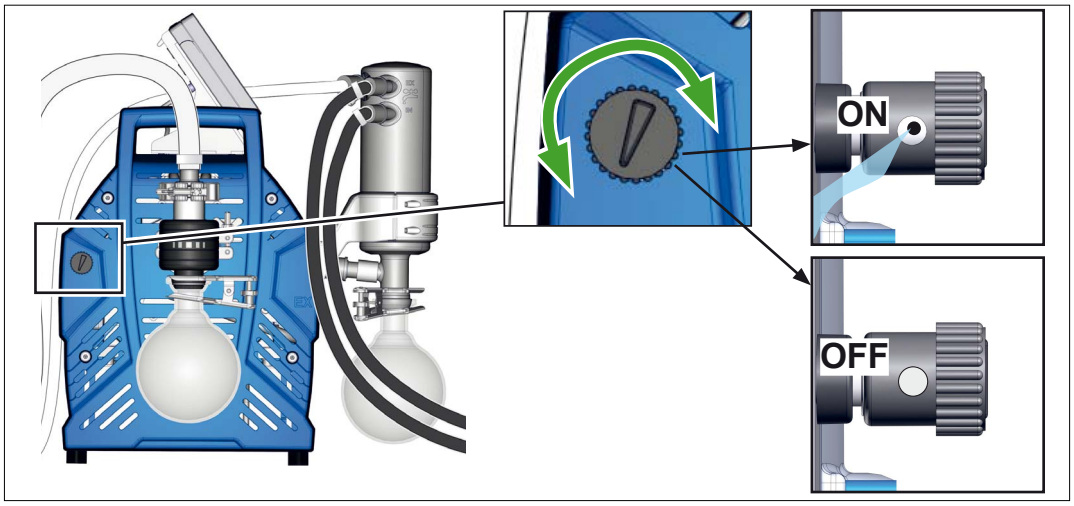
5.2.2 Operation with gas ballast

Meaning

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

→ Example
Operate 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.

IMPORTANT!

⇨ 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.

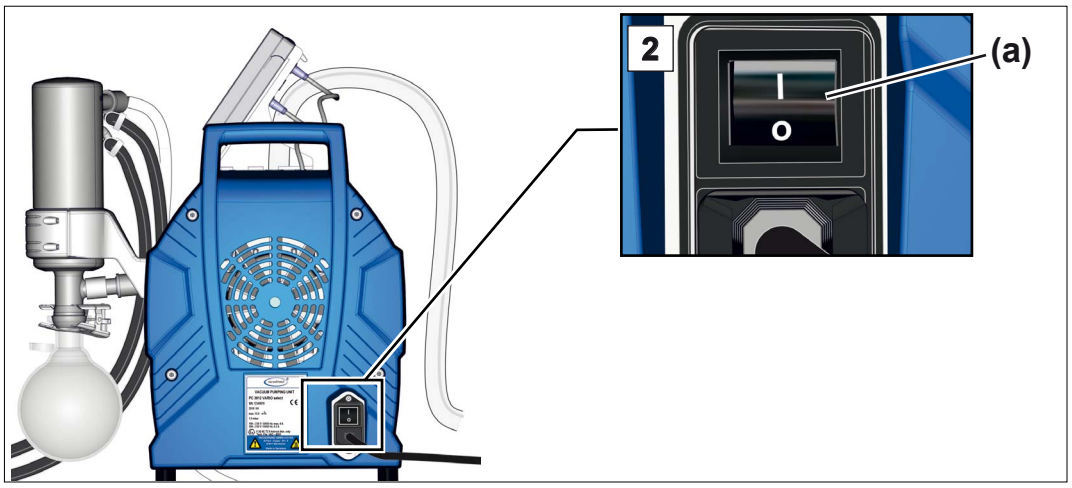
5.3 Shutdown (switch off)

Take the pumping unit out of operation

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.
   ☑ Condensate and media residues will be flushed out of the vacuum pump.

IMPORTANT! ⇨ Prevent deposits and rinse condensate out of the pump.



2. Switch rocker switch **(a)** off – switch position **O**.
   ☑ Pumping unit switched off.
3. Disconnect the pumping unit from the apparatus.
4. Empty the glass flasks.
5. Check the pumping unit for dirt and damage.

5.4 Storage

Store the pumping unit

1. Clean the pumping unit if dirty.
2. Recommendation: Perform preventive 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 desiccants if necessary.
5. Store the vacuum pumping unit in a cool, dry location.

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

6 Troubleshooting

6.1 Technical support

⇨ To identify errors and potential remedies, please refer to the troubleshooting table *Error – Cause – Remedy*.

Technical support

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.

⇨ 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

Error	▸ Possible 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. ✓ 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 defective.	✓ Replace defective components.	Specialist

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

Error – Cause – Remedy

Error	▸ Possible cause	✓ Remedy	Personnel
Venting valve does not operate	▸ No voltage applied. ▸ VACUU·BUS plug-in connection or cables defective or not connected. ▸ Venting valve dirty. ▸ Venting valve in sensor defective.	✓ Check VACUU·BUS plug-in connection and cables to the controller. ✓ Clean venting valve. ✓ If necessary, use another external venting valve.	Specialist
Vacuum pump does not start	▸ Overpressure in the outlet line. ▸ Condensation in the vacuum pump.	✓ Open the outlet line. ✓ Ensure clear passage.	Operator
	▸ Pumping unit switched off. ▸ Power plug not correctly plugged in or pulled out. ▸ VACUU·BUS plug-in connection or cables defective or not connected.	✓ Switch pumping unit on using rocker switch. ✓ Check power supply and cable. ✓ Check VACUU·BUS plug-in connection and cables to the controller.	Operator
	▸ Motor overloaded. ▸ Thermal protection triggered.	✓ Allow the motor to cool down. ✓ Clear error manually: → Unplug pumping unit from the power supply → Eliminate cause of error → Switch pumping unit back on	Specialist
No or very little suction power	▸ Leak in the suction line or apparatus. ▸ Separator flask not mounted correctly.	✓ Check suction line and apparatus for leaks. ✓ Check the separator flask and mount correctly.	Operator
	▸ Vacuum line too long or cross-section too small.	✓ Use a shorter vacuum line with a larger cross-section.	Resp. specialist

Error – Cause – Remedy

Error	▸ Possible cause	✓ Remedy	Personnel
	▸ Condensate inside the vacuum pump.	✓ Allow vacuum pump to run for a few minutes with the suction nozzle open.	Operator
	▸ Deposits inside the vacuum pump.	✓ Clean and check pump heads.	Specialist
	▸ Diaphragms or valves defective.	✓ Replace diaphragms and valves.	Specialist
	▸ High level of vapor generated in the process.	✓ Check process parameter.	Specialist
	▸ Gas ballast open	✓ Close the gas ballast	Operator
	▸ Gas ballast cap porous or no longer present.	✓ Check gas ballast cap. ✓ Replace defective components.	Operator
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 pumping unit on using rocker switch. ✓ Switch on controller. ✓ Check power supply and cable. ✓ Check VACUU·BUS plug-in connection and cables to the controller. ✓ Replace defective components.	Operator
Loud operating noises	▸ No hose installed.	✓ Check hose and install it correctly.	Operator

Error – Cause – Remedy

Error	▸ Possible cause	✓ Remedy	Personnel
Loud operating noises	▸ Ball bearing defective. ▸ Open outlet line. ▸ Glass flask on EK missing.	✓ Service the vacuum pump and replace defective parts or send in the device. ✓ Check outlet line connections. ✓ Connect the outlet line to an extraction system or fume hood. ✓ Assemble glass flask.	Specialist
Condenser (chiller) defective	▸ Mechanically damaged.	✓ Send in.	Resp. 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.

⇨ 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 your instructions for handling hazardous substances.

NOTE

Damage possible if work is performed incorrectly.

⇨ Have maintenance work performed by a trained professional or at least by a trained person.

⇨ Recommendation: 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

Maintenance intervals*	If required	15,000 h
Replace diaphragms		x
Replace valves		x
Replace O-rings		x
Clean or replace molded PTFE hose	x	
Replace pressure relief valve on EK	x	
Cleaning pumping unit	x	

** 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.*

Recommended aids

→ Example Recommended aids for cleaning and maintenance

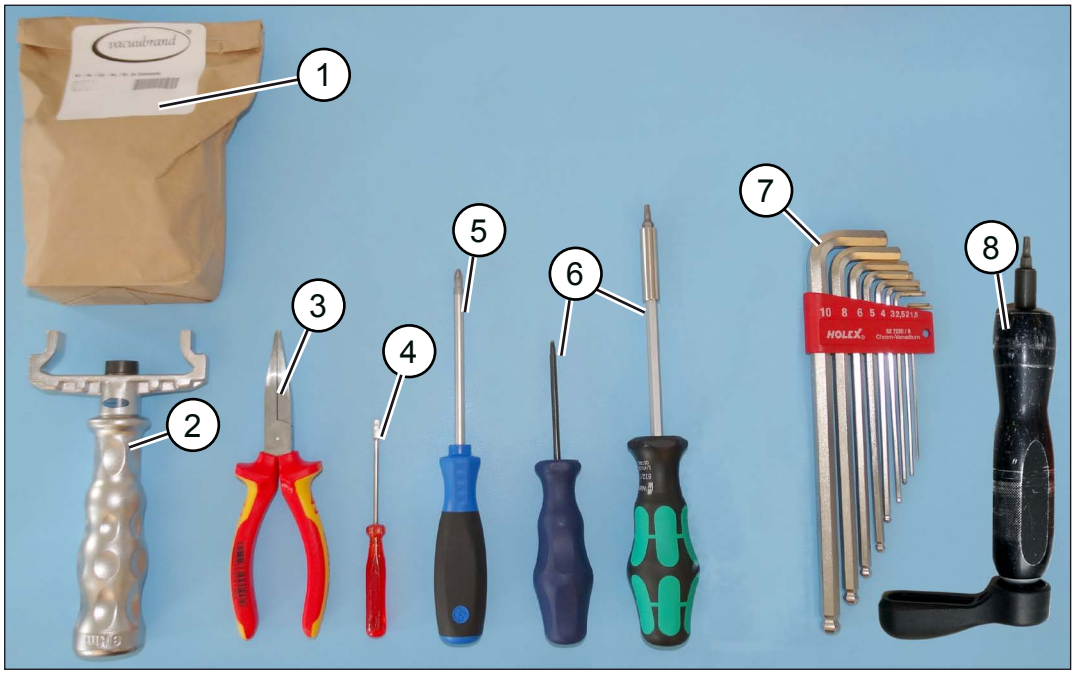
No.	Item
1	Round bottom flask stand
2	Protective gloves
3	Chemically-resistant vessel + funnel

IMPORTANT!

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

Tools needed for maintenance

→ Example Tools



No.	Tool	Size
1	**Service kit**	
	Service kit PC 3010, PC 3012 #20696839	1x
	or	
	Service kit PC 3016 #20696867	2x
2	**Diaphragm wrench #20636554**	SW66
3	**Flat nose pliers**	
	To secure the hose clips	
4	**Flat-head screwdriver**	
	To open hose clips	Size 1
5	**Phillips screwdriver**	
	Screw fittings, controller base	Size 1
6	**Torx screwdriver**	
	Screw fittings, counterhold EK	TX10
	Loosen/secure clamping claws	TX20*
7	**Hex key**	
	Screw fittings, side panels	Size 5
	Screw fittings, head cover	Size 5
	Screw fittings, hold EKP or EK	Size 4
	Screw fittings, housing sections with handle	Size 4
	Loosen/secure side panel retaining plates	Size 4
8	**Torque wrench, adjustable 2–10 Nm**	

** In the example here with bit support*

7.2 Cleaning

IMPORTANT! 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 Pumping unit

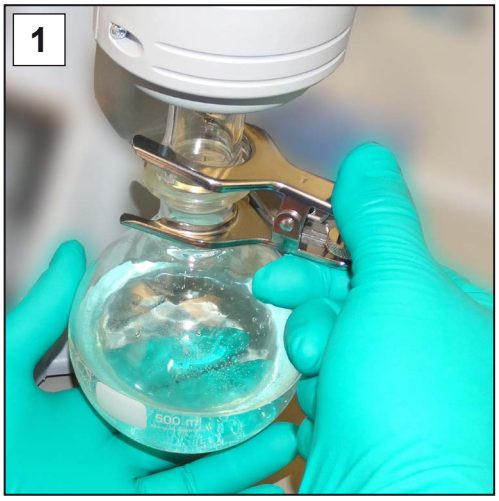
Clean the surfaces

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

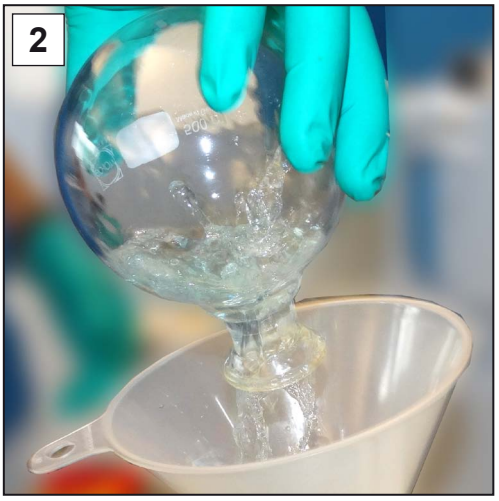
7.2.2 Empty the glass flask

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 canister.

3. Then secure the glass flask 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 or replace molded 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.

7.2.4 Clean or replace the controller

During maintenance, the controller can be disconnected and removed.

Clean the surfaces

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

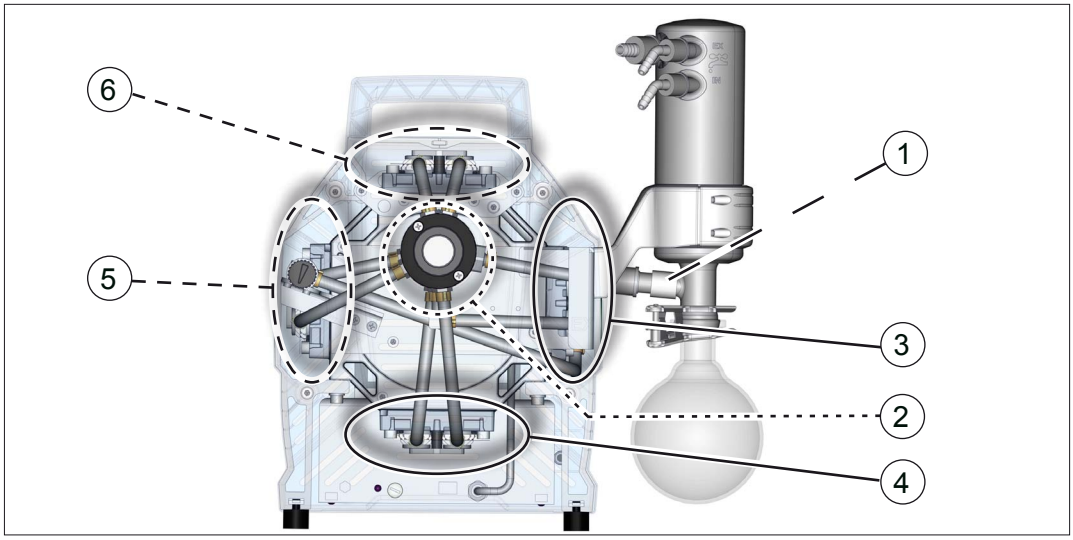
⇨ Reattach the controller after maintenance work has been completed.

7.3 Vacuum pump maintenance

7.3.1 Maintenance items

Items that require maintenance

→ Example
Pumping unit, front, semi-transparent view



Meaning

Maintenance items and sequence	
1	EK pressure relief valve in silicone #20638821
2	Suction/pressure distributor *(behind separator flask)*
3	Right pump head pair
4	Bottom pump head pair
5	Left pump head pair
6	Top pump head pair

Straightforward maintenance due to split work steps. Observe the recommended sequence of maintenance steps according to the table:

- ⇨ On removal, check the pressure relief valve on the EK.
- ⇨ Next, replace the O-ring and pressure relief valve in the suction/pressure distributor.
- ⇨ On one pump head pair, first replace the diaphragms.
- ⇨ Then change the inlet/outlet valves.
- ⇨ Repeat these steps on the next pump head pair.

7.3.2 Preparation

Disassemble the controller and base
→ see also chapter: *4.3 Controller base on page 32*

Disassemble the device and housing sections

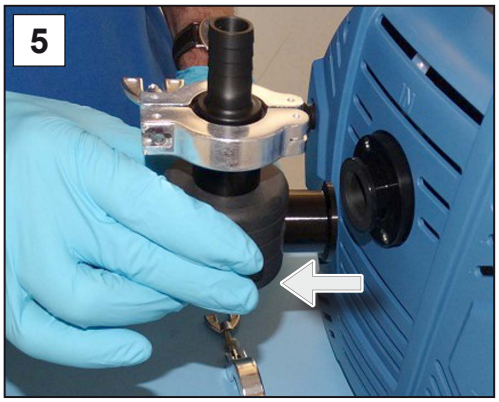
Disassemble the attachments

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

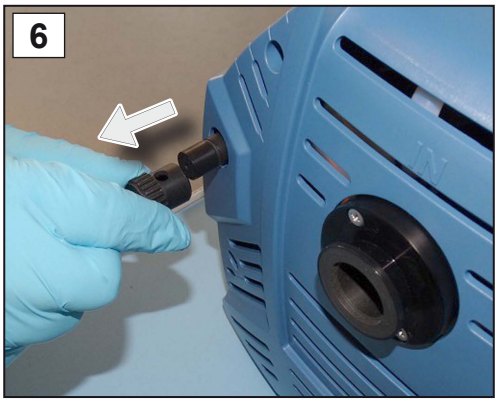
2. Remove the glass flask from the inlet IN.

3. Remove the glass flask from the EK as well as the connected hoses.

4. Open the clamping ring of the separator flask.



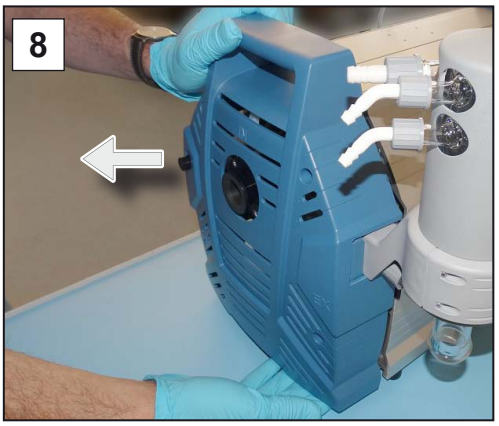
5. Remove the separator flask and put the components aside.



6. Remove the cap from the gas ballast.

Disassemble the housing sections

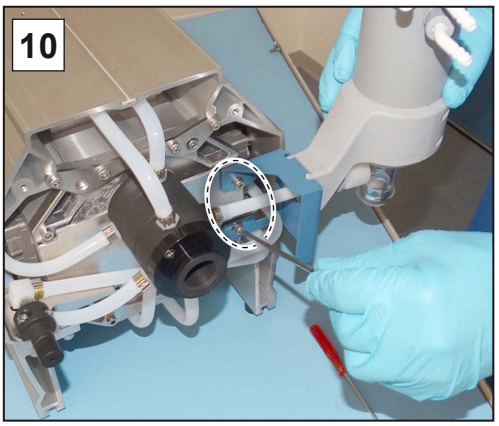
7. Unscrew the 4 screws from the front housing section; hex key size 4.



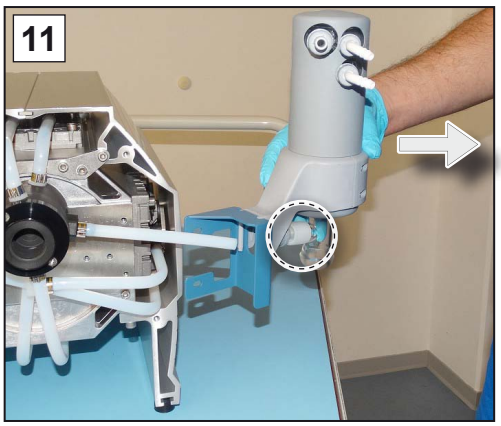
8. Remove the housing section and set it aside.

Disassemble the EK

9. Undo the union nut on the EK feed line.



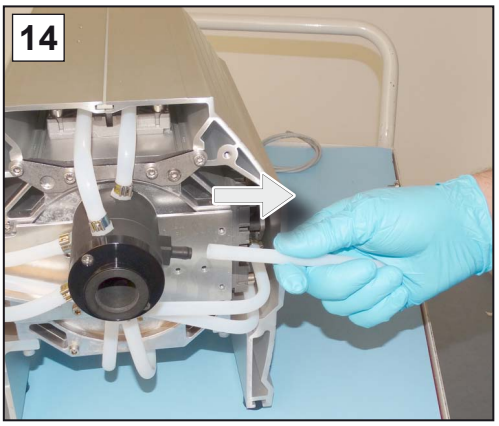
10. Unscrew the 2 screws in the EK holder; hex key size 4.



11. Pull the EK and its holder from the molded hose. You can then check the EK pressure relief valve and replace it if damaged.

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

13. Open the hose clip on the molded hose leading to the EK; flat-head screwdriver size 1.

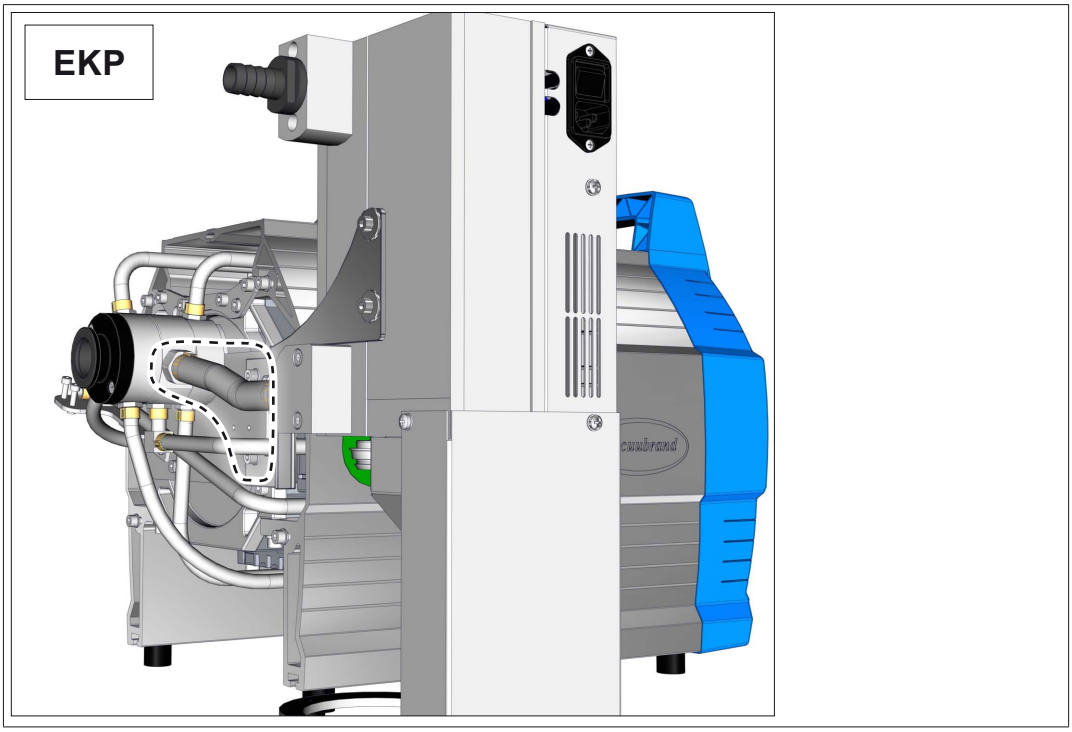


14. Pull off the molded hose.

The EKP chiller is fixed with a retaining plate.

⇨ With this chiller, loosen the screws in the retaining plates on the pumping unit.

Disassemble the EKP



⇨ Unscrew the 2 screws; hex key size 4.

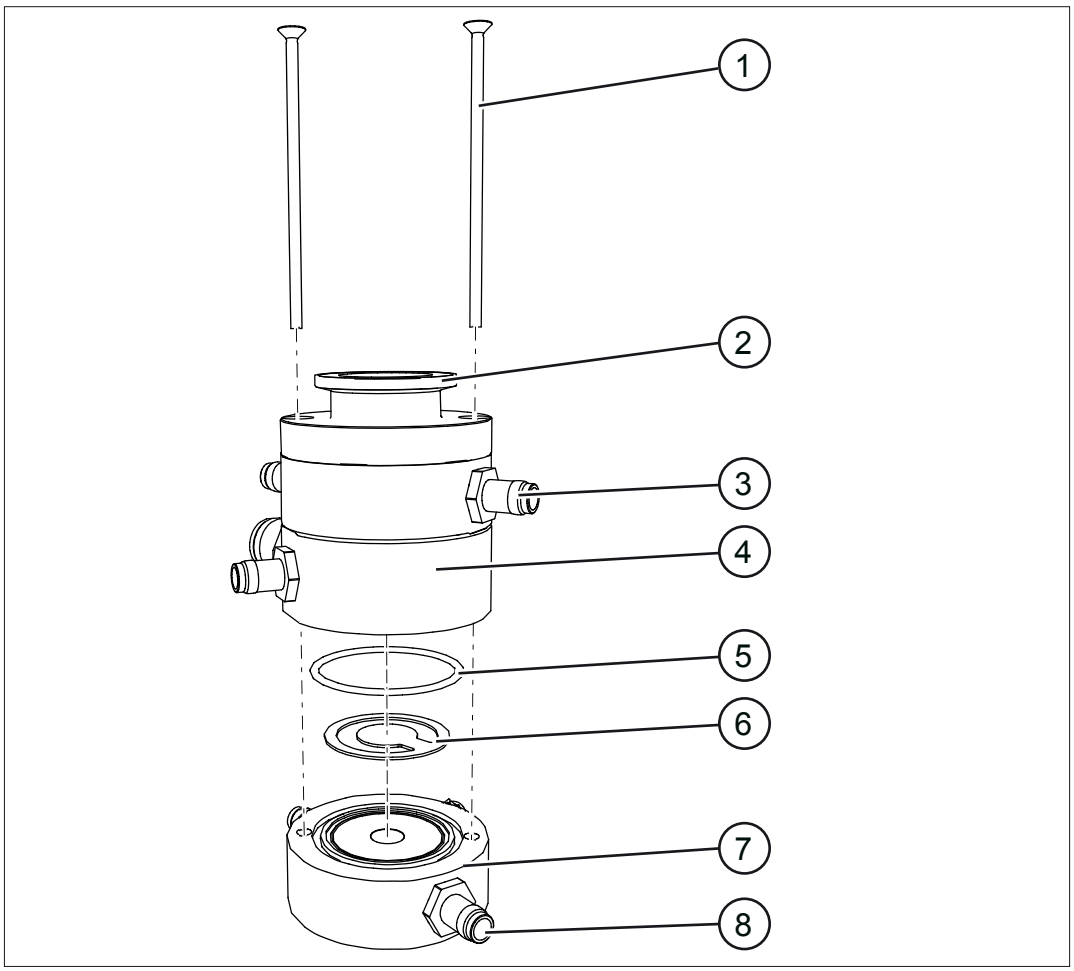
⇨ Loosen the corresponding hose clip and pull the molded hose from the inlet.

7.3.3 Suction/pressure distributor maintenance

This description only applies to the following pumping units: PC 3010 and PC 3012.

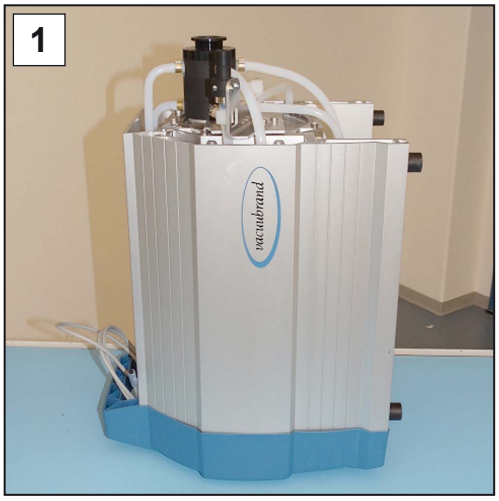
Exploded drawing of suction/pressure distributor (example)

→ Example
Pressure relief valve

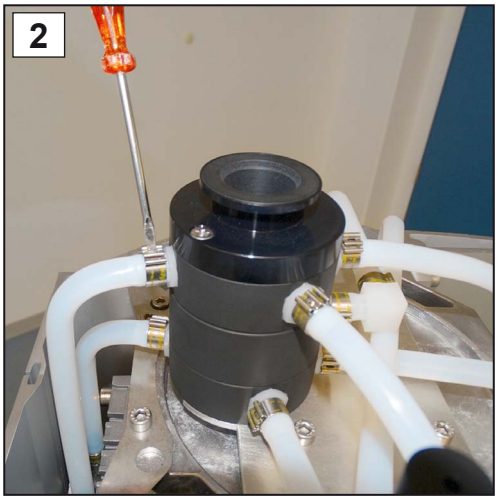


Pressure relief valve + O-ring maintenance	
1	Countersunk screw M4x80
2	Connection DN 25
3	Hose nozzle
4	Suction distributor
5	O-ring 40 x 2
6	Pressure relief valve D37
7	Pressure distributor
8	Hose nozzle

Replace pressure relief valve + O-ring

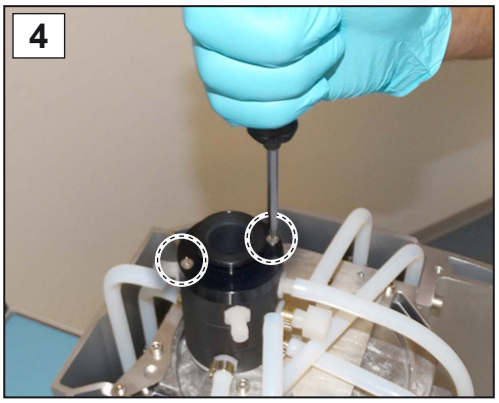


1. Place the vacuum pump on a clean, stable surface as shown.



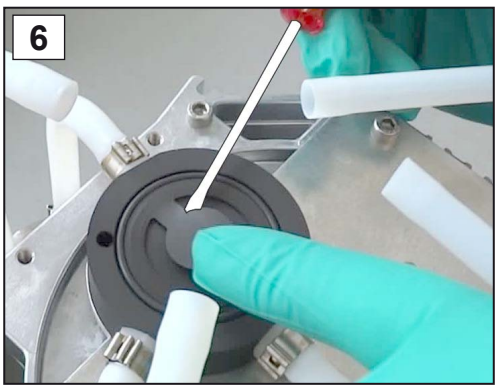
2. Only open the hose clips above the pressure distributor; flat-head screwdriver size 1.

3. Remove the molded hoses one by one from the hose nozzles.

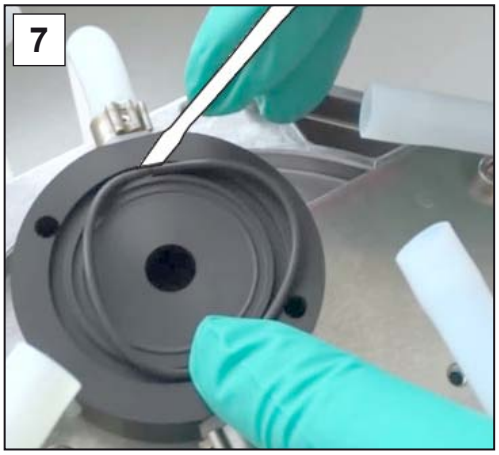


4. Unscrew the screw fittings. Phillips screwdriver size 2.

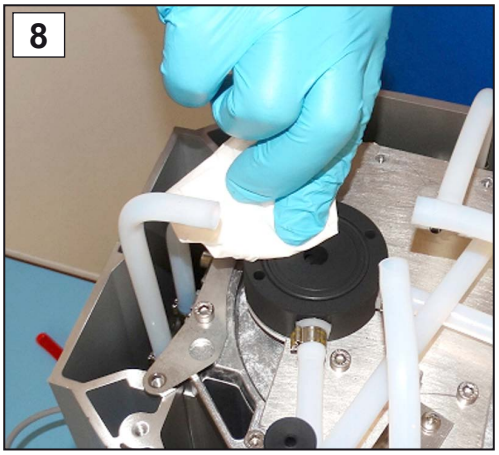
5. Remove the suction distributor with the screws and put it aside.



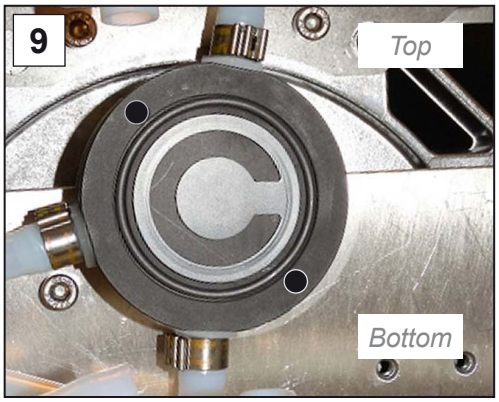
6. Carefully remove the used pressure relief valve, e. g., with a sturdy plastic rod or a narrow flat-head screwdriver.



7. Replace the used O-ring.



8. Clean the pressure distributor if necessary.



9. Place the new pressure relief valve on the clean surface. Ensure the pressure relief valve is positioned correctly on the pressure distributor.

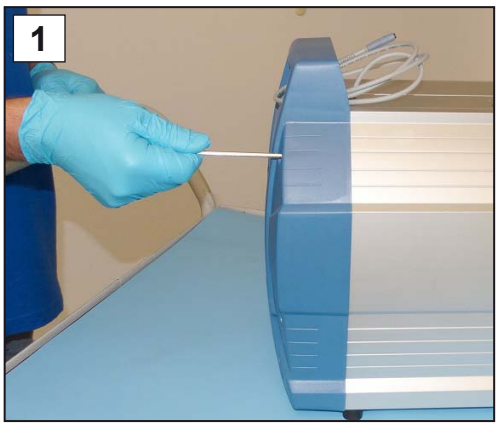
10. Position the suction distributor with screws and wind in the screw fittings until hand-tight; Phillips screwdriver size 2.

11. Push the molded hoses back into place on the hose nozzles.

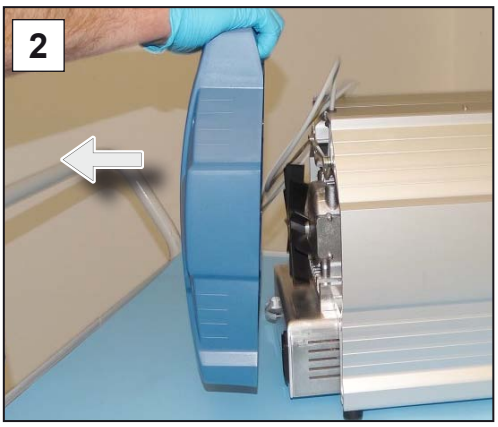
12. Secure the hose clips on the hose nozzles, e. g., with flat nose pliers.

7.3.4 Change the diaphragms and valves

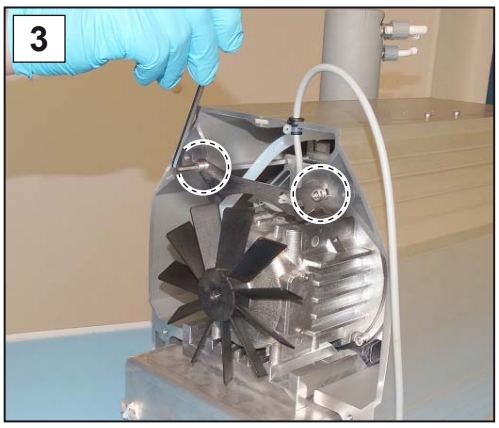
Disassemble the next housing sections



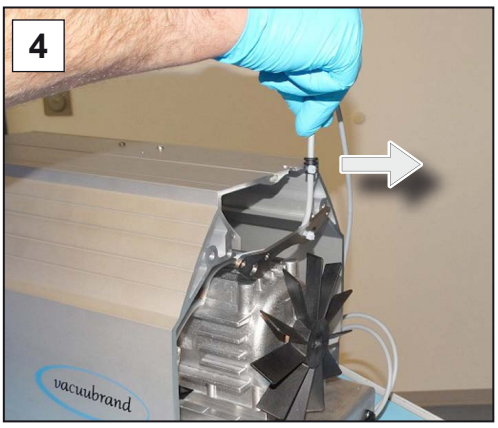
1. Unscrew the 4 screws from the rear housing section; hex key size 4.



2. Remove the housing section and set it aside.

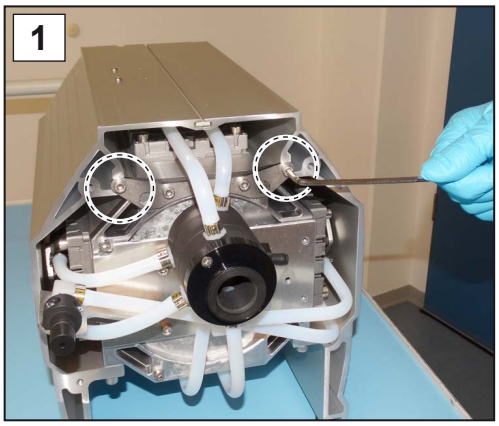


3. Unscrew the screws from the side panel retaining plate; hex key size 4.



4. Route the cable out of the recess.

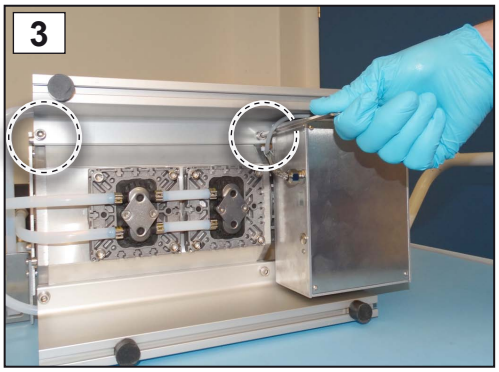
Remove the side panel



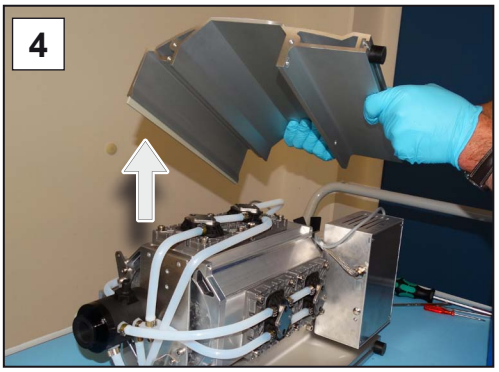
1. Unscrew the 2 outer screws from the retaining plate; hex key size 4.

2. Place the pump carefully on its side.

Remove the right side panel



3. Unscrew the screw fittings from the side panel; hex key size 5.



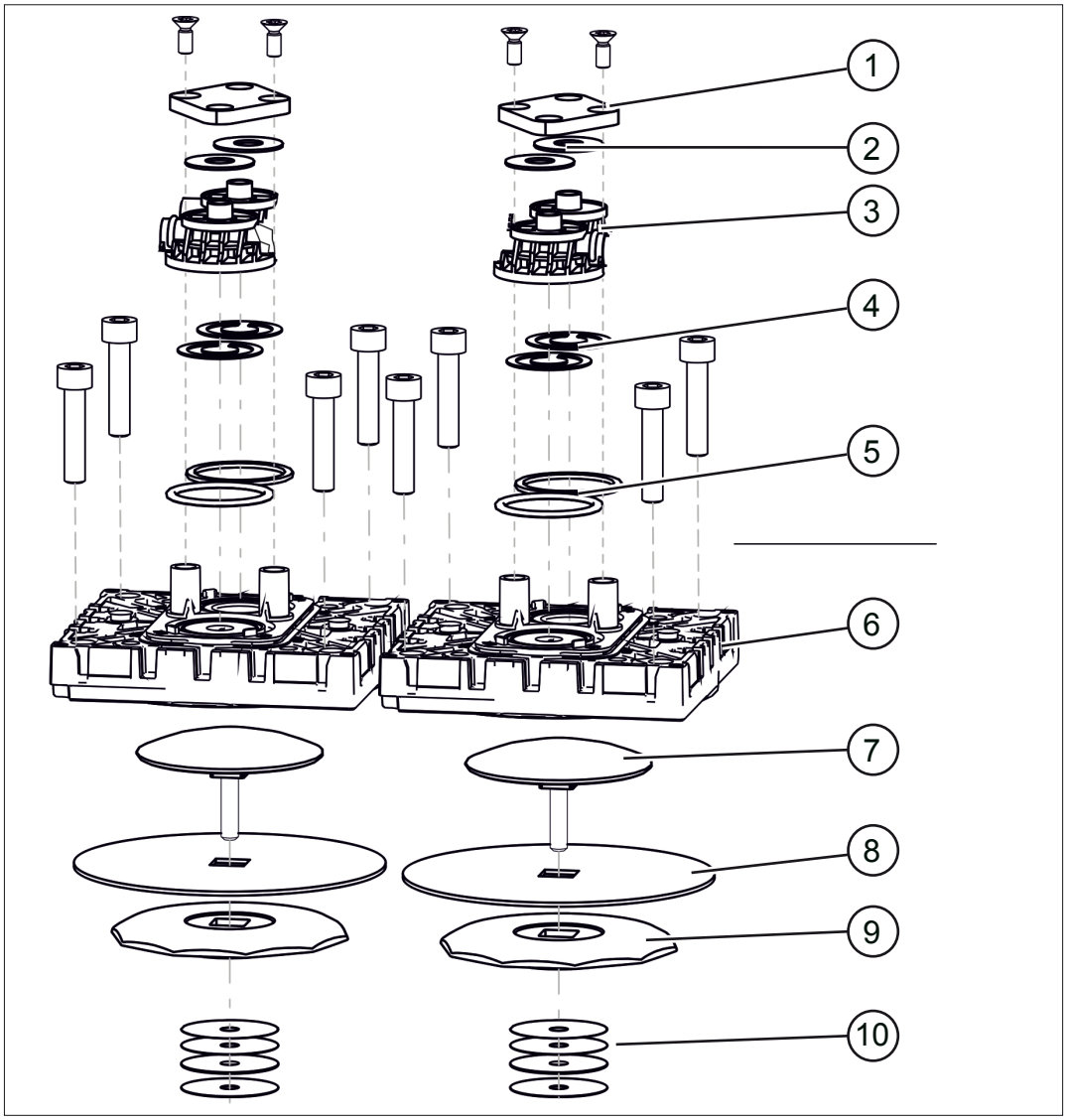
4. Lift the side panel off the pump. The lower side panel remains attached for now to provide stabilization.

IMPORTANT!

⇨ Service the pump head pairs one after the other.

⇨ Always change the diaphragms and valves completely in the pump heads.

Exploded drawing of pump head (example)

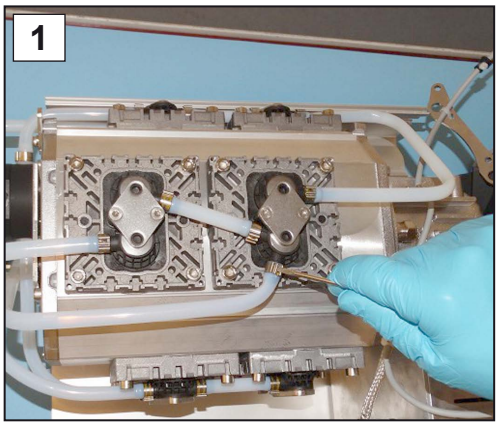


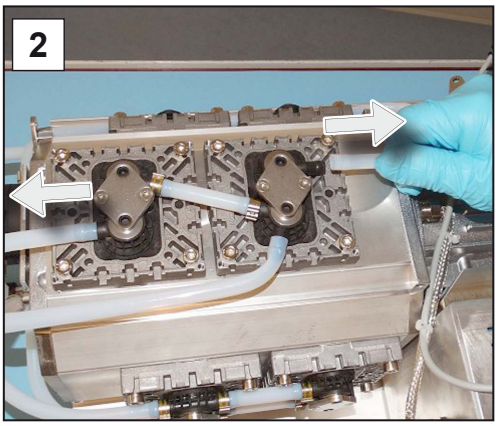
Valve maintenance	
1	Clamping claw + screw fittings
2	Disc springs
3	Valve terminals
4	Valves
5	O-ring size 26 x 2

Diaphragm maintenance	
6	Head cover + screw fittings
7	Diaphragm clamping disc with square head screw
8	Diaphragms
9	Diaphragm support disc
10	Spacer discs, max. 4 per pump head

Right pump head pair

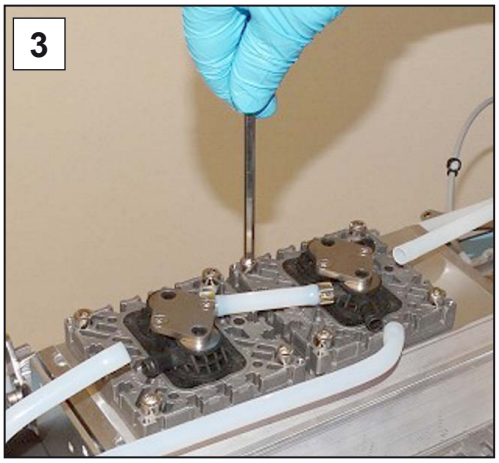
→ Example Right pump head pair

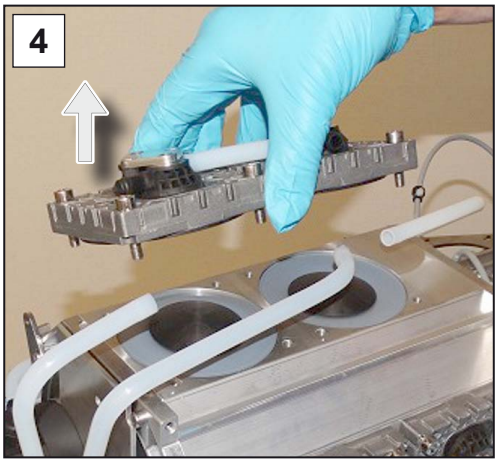




1. Open the hose clips on the outer hoses. Flat-head screwdriver size 1.

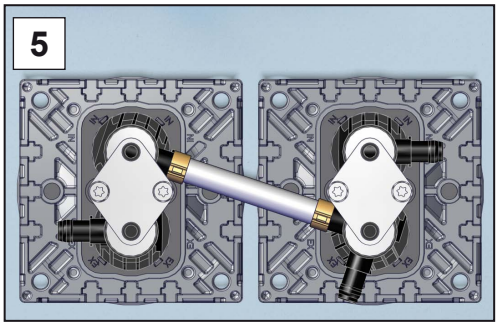
2. Pull off the molded hoses.





3. Unscrew the socket head screws from the head covers. Hex key size 5.

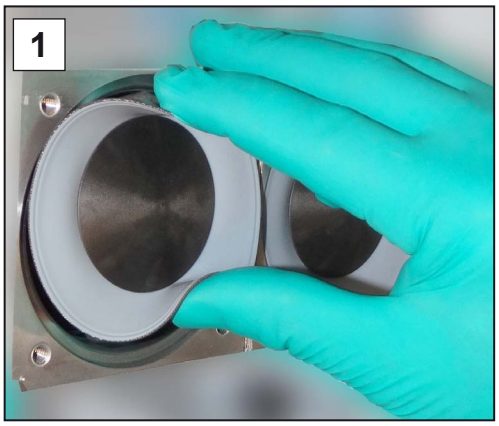
4. Remove the pump head pair with the screw fittings.



5. Set the pump head pair aside.

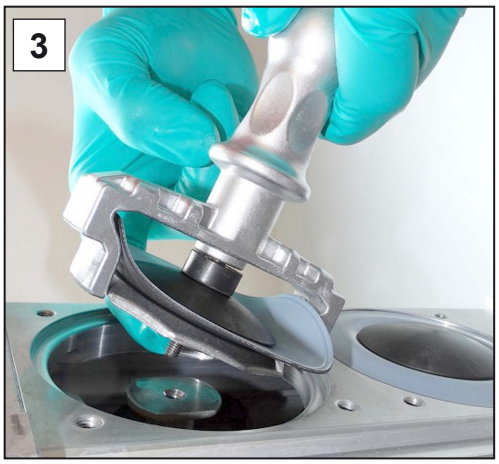
Replace the diaphragms

→ Example Diaphragm replacement

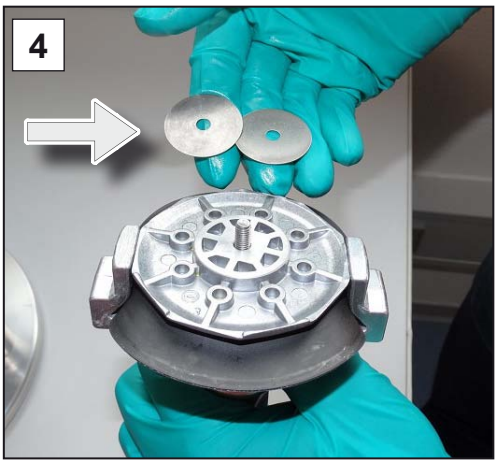


1. Lift the diaphragm upwards on either side.

2. Carefully position the diaphragm wrench on the diaphragm support disc and unscrew the assembly with the diaphragm wrench attached.



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



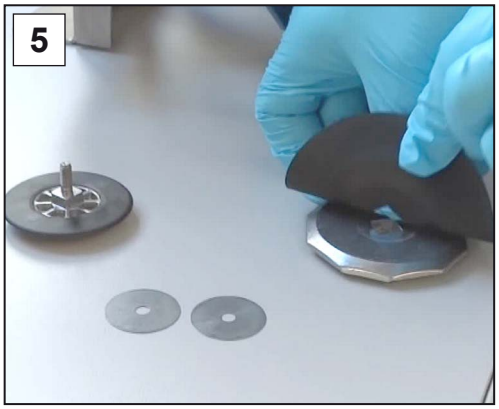
4. If the spacer discs adhere to the connecting rod, remove them carefully.

IMPORTANT!

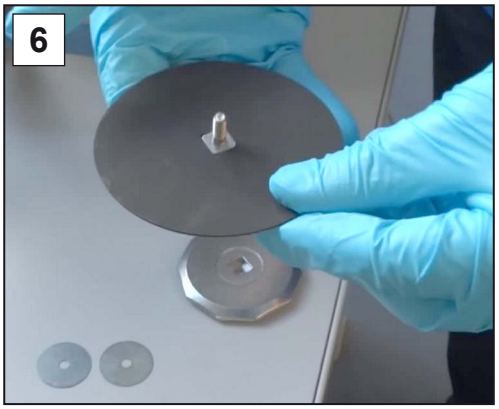
⇨ Never drop spacer discs into the aluminum housing.

⇨ Keep the spacer discs. It is essential to reinsert the same number of spacer discs.

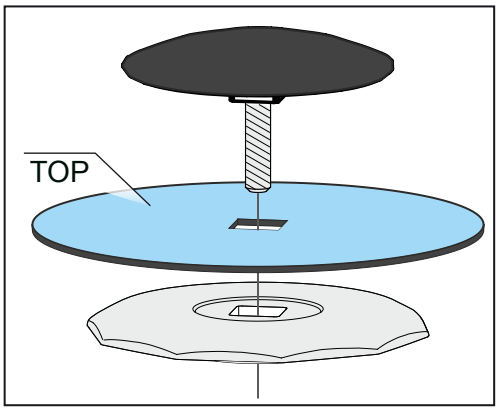
→ Example
Diaphragm replacement



5. Pull out the diaphragm clamping disc and remove the used diaphragm.



6. Place the new diaphragm over the square head of the clamping disc.

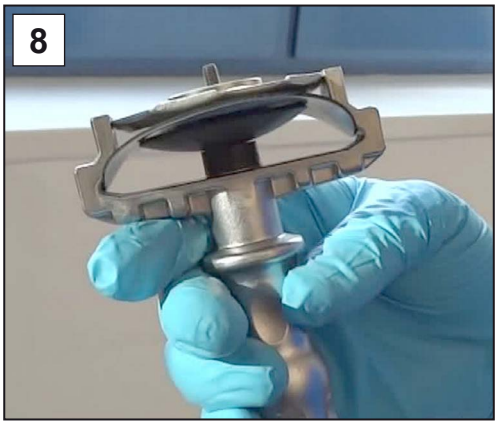


IMPORTANT!

⇨ Ensure that the diaphragm is inserted correctly, with the coated, light-colored side facing upwards.

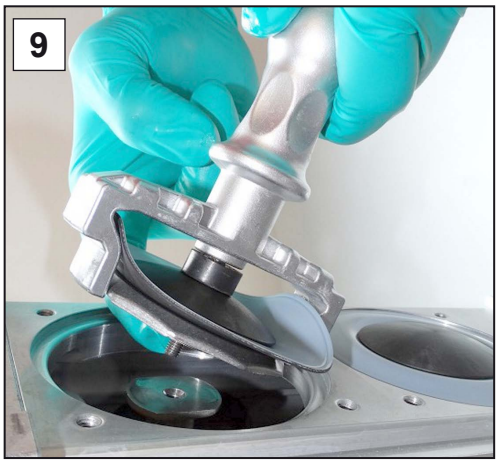
⇨ Pay special attention to correct positioning on the square head.

7. Place all spacer discs on the thread pin.



8. Secure the diaphragm assembly inside the diaphragm wrench.

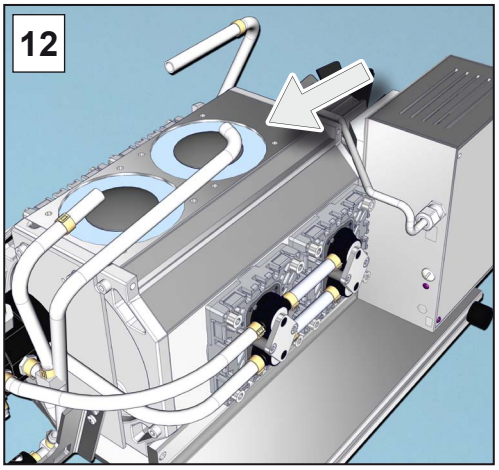
→ Example
Valve replacement



9. Hold the spacer discs firmly and place all the components carefully on the connecting rod thread.

10. Initially tighten the assembly with the diaphragm wrench by hand.

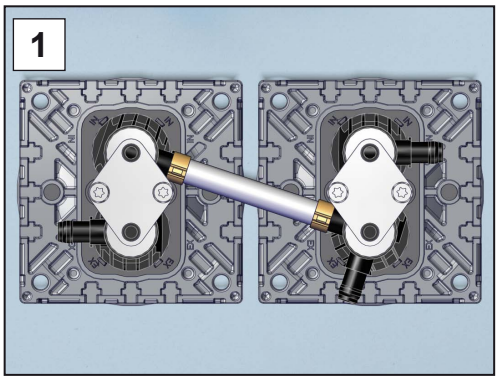
11. Then position a torque wrench with socket head bit on the diaphragm wrench and tighten the assembly to 6 Nm.



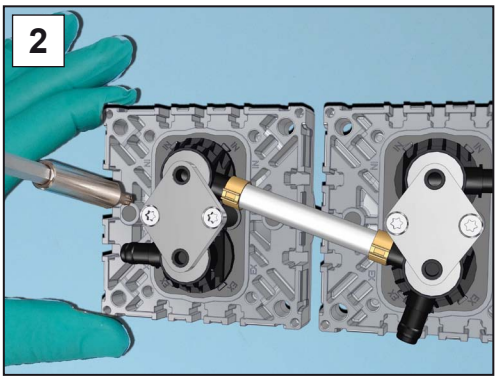
12. Repeat steps 1-11 for changing the next diaphragm.

→ Example
Valve replacement

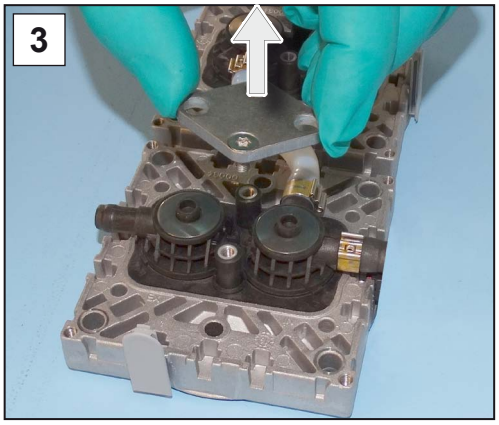
Replace the valves



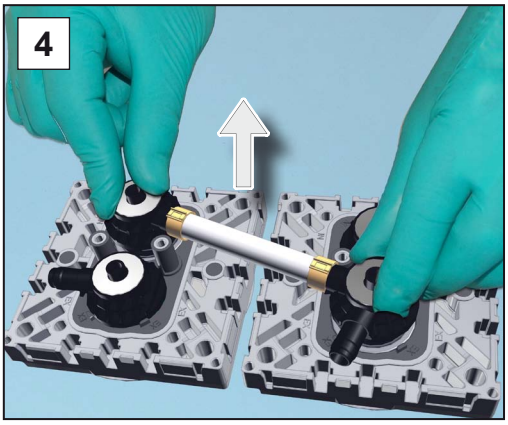
1. Take the pump head pair which you had set aside.



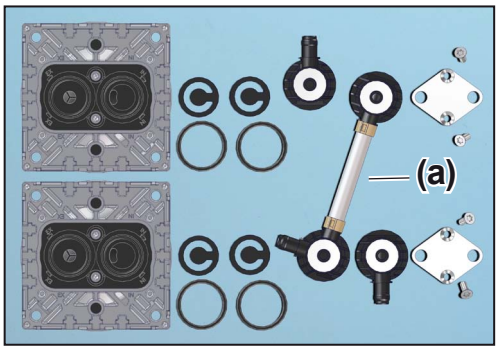
2. Unscrew the Torx screws. Torx screwdriver Tx20



3. Remove the clamping claws from the valve terminals.



4. Remove the valve terminals with the disc springs.



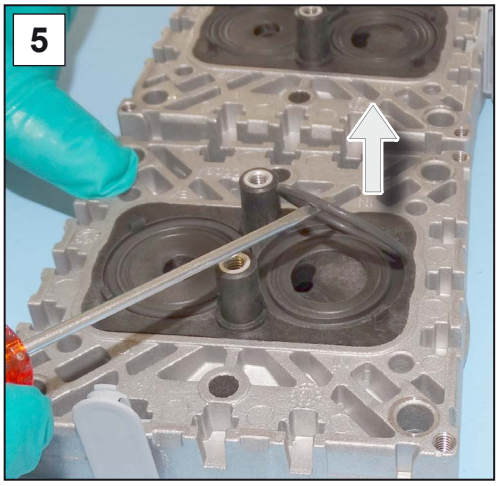
Example – view from above:
Valve terminals, valves, O-rings, molded hose of a pump head pair.

NOTE

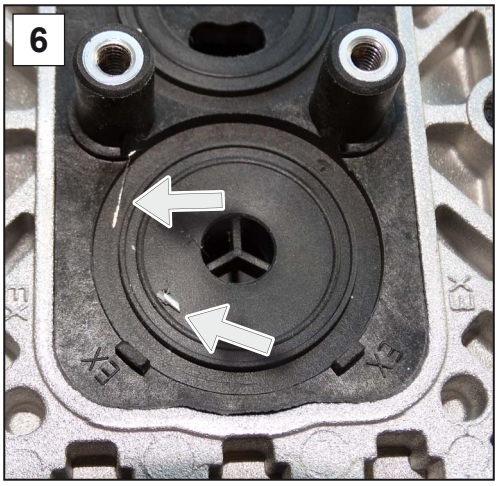
⇨ The number and wiring of molded hoses **(a)** depends on the position of the pump head pair. Pump head pairs must not be interchanged.

⇨ Valves can adhere to the underside of a valve terminal.

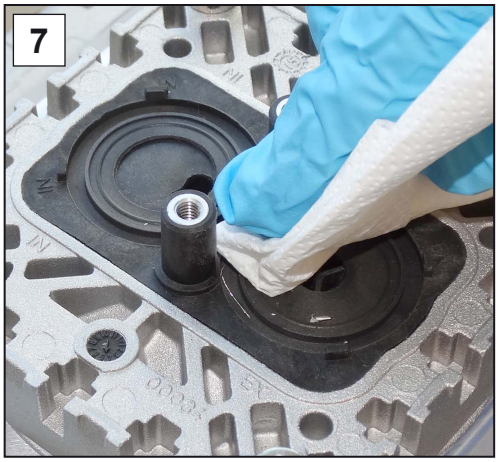
⇨ Depending on the pump type, the valve material is either PTFE (white) or FFKM (black).



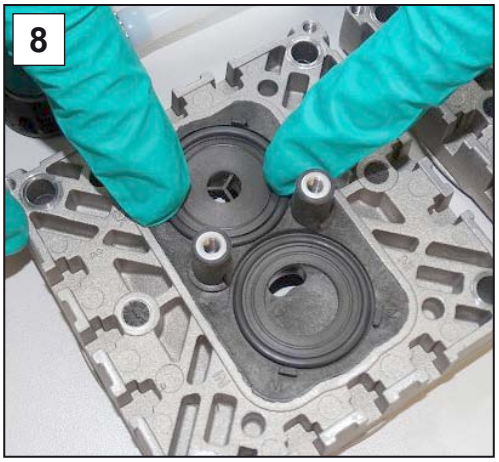
5. Carefully remove the used O-rings and valves.



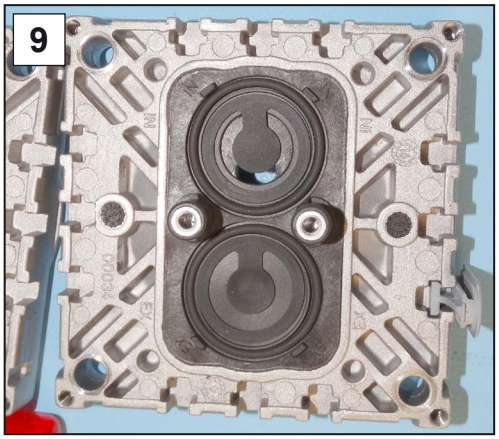
6. Check the surfaces for dirt.



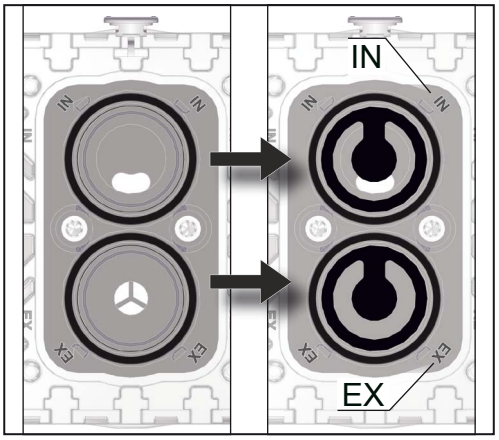
7. Clean dirty surfaces carefully.



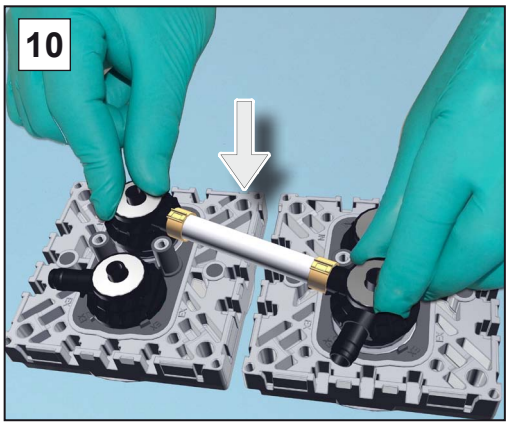
8. Insert the new sealing rings into the grooves.



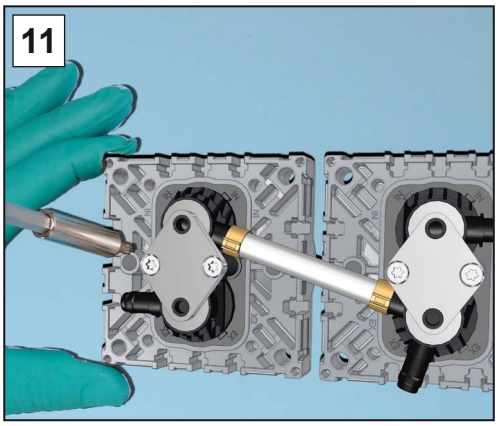
9. Place the new valves on top and align them.



Cutout view from above: correct valve positioning. IN = inlet
EX = exhaust (outlet)

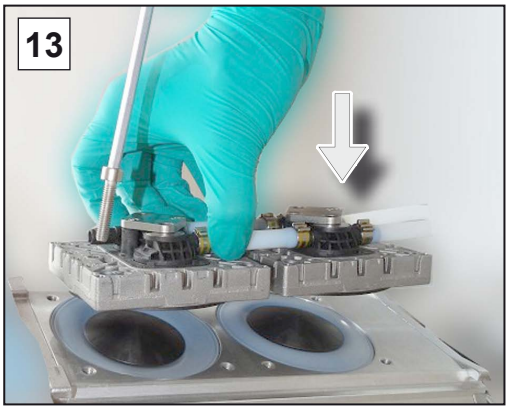


10. Place both valve terminals with the disc springs on the pump heads.

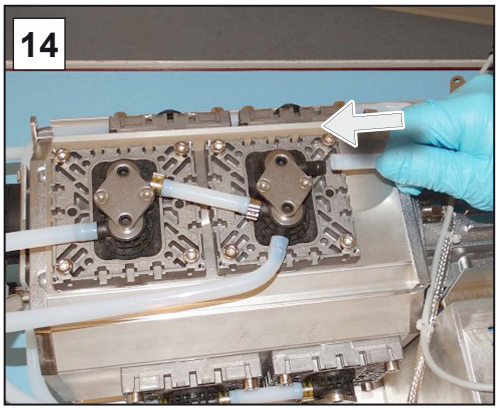


11. Place the clamping claws on the valve terminals and tighten the screw fittings first by hand, then with a torque wrench to 3 Nm.

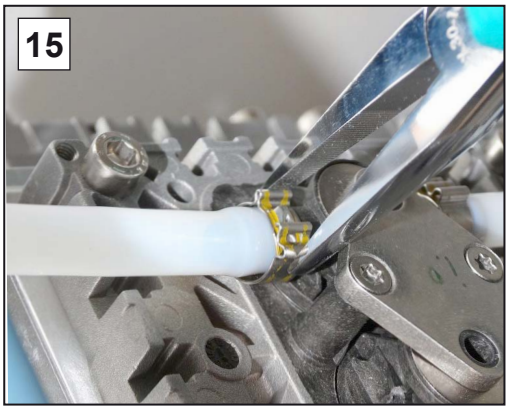
12. Carefully press the diaphragms centrally into the housing opening, ensuring they are flush with it.



13. Hold the pump head pair at the vacuum pump and wind in the screw fittings; hex key size 5.



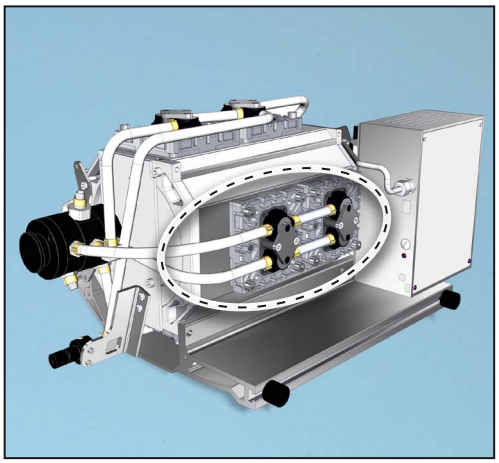
14. Slide the molded hoses back onto the hose nozzles.



15. Secure the hose clips on the hose nozzles, e. g., with flat nose pliers.

Bottom pump head pair

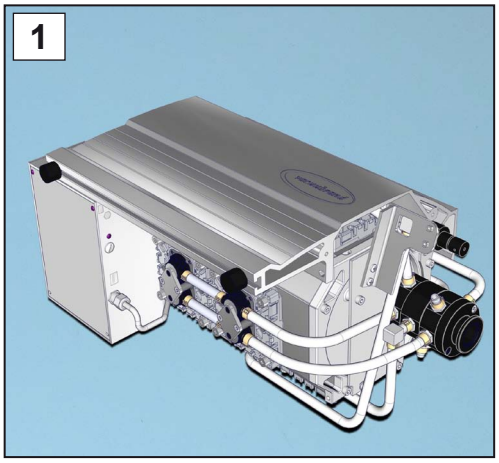
Service the bottom pump head pair



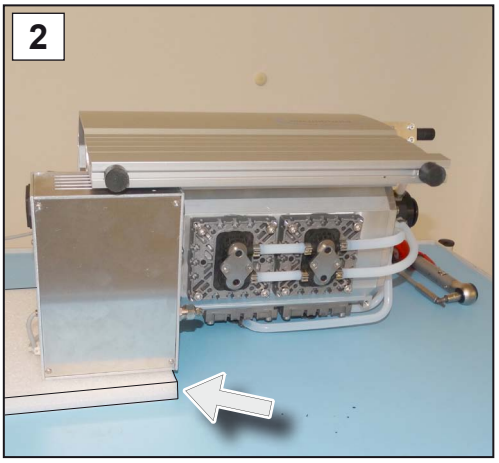
⇨ Follow the same procedure to change the diaphragms and valves as for the *Right pump head pair, on pages 66 to 72* .

Left and top pump head pair

Service the left and top pump head pair

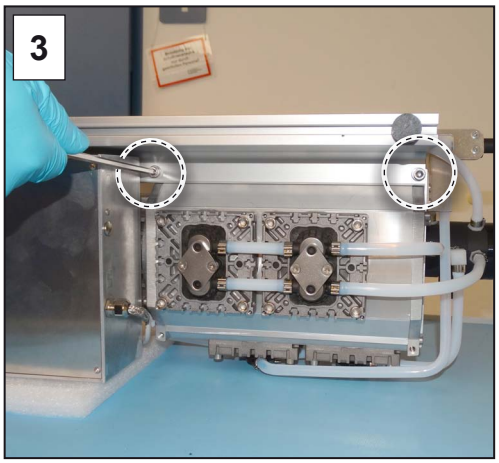


1. Turn the pumping unit with the side panel upwards.

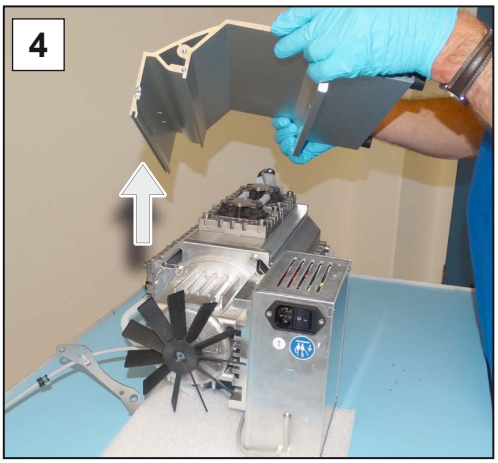


2. Support the pumping unit, e. g., with rigid foam below the housing of the frequency converter.

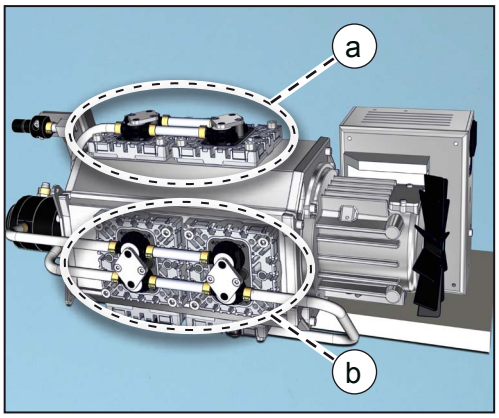
Remove the left side panel



3. Unscrew the screw fittings from the side panel; hex key size 5.



4. Lift the side panel off the pump.



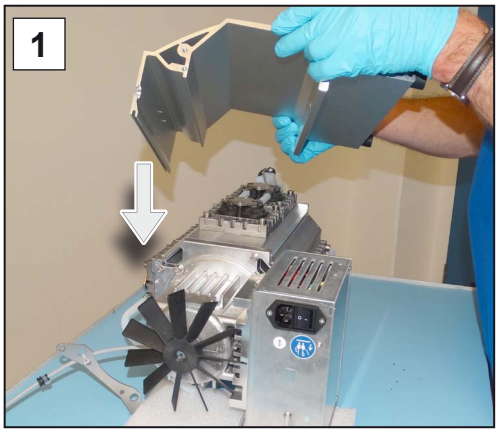
a	Left pump head pair
b	Top pump head pair

5. Follow the same procedure to change the diaphragms and valves as for the *Right pump head pair, on pages 66 to 72* .

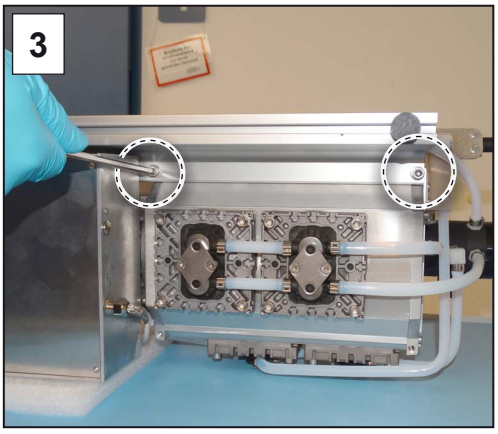
Assemble the device and housing sections

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

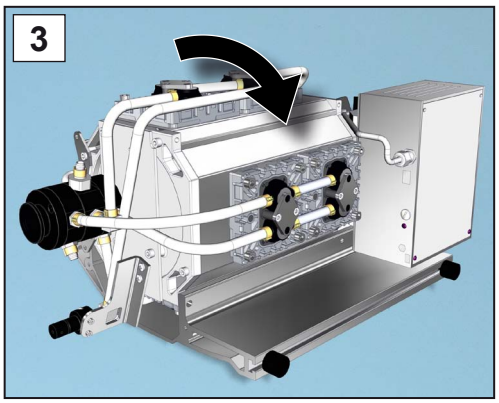
Mount the side panel



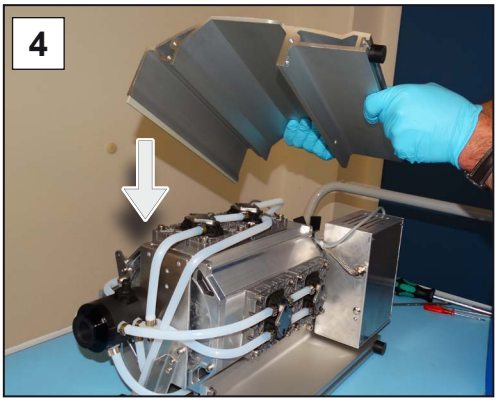
1. Replace the side panel on the pump.



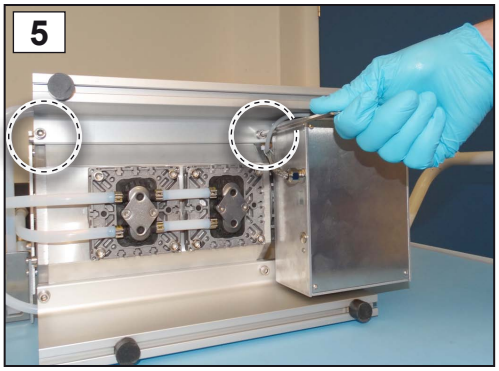
2. Wind the screw fittings into the side panel; hex key size 5.



3. Turn the pumping unit upwards and ensure it is positioned securely.

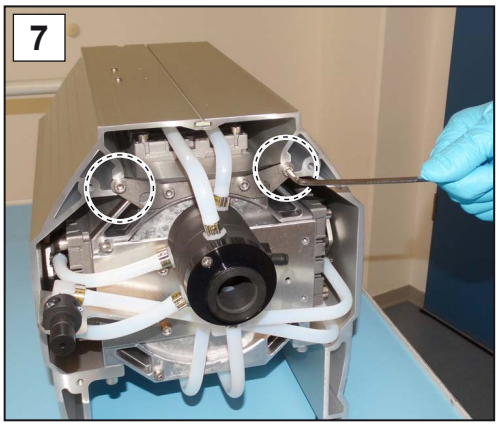


4. Replace the side panel on the pump.

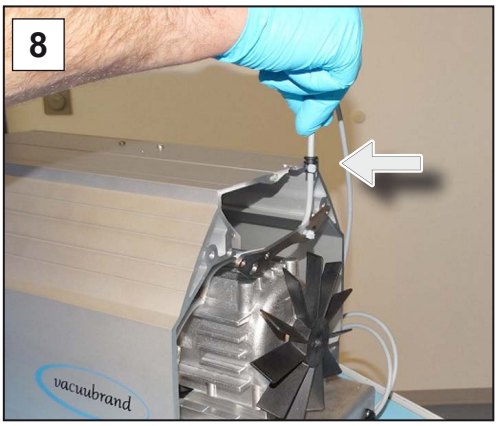


5. Wind the screw fittings into the side panel; hex key size 5.

6. Stand the pump on its rubber feet.

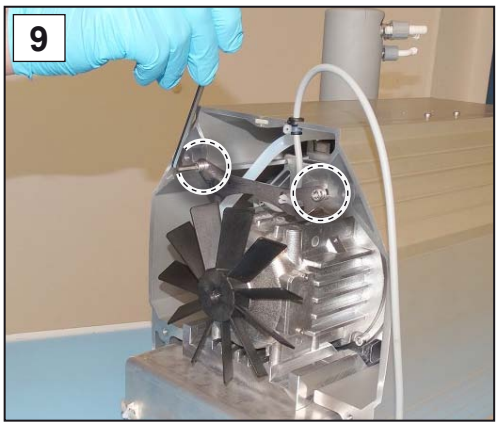


7. Wind in the 2 outer screws of the retaining plate; hex key size 4.

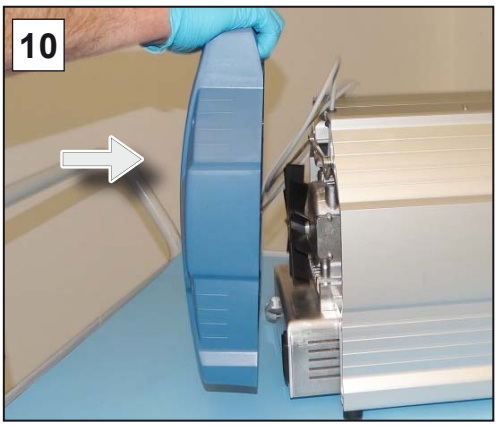


8. Secure the cable in the rear recess.

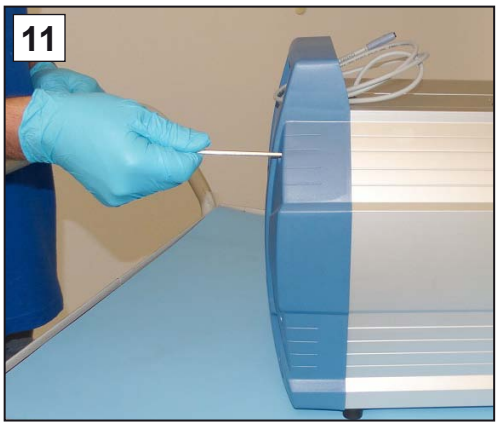
Mount the rear housing cover



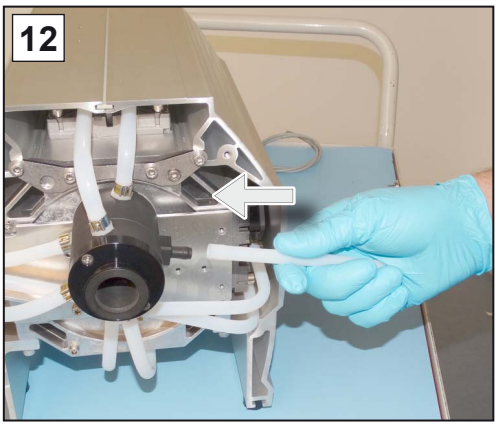
9. Wind in the screws of the side panel retaining plate; hex key size 4.



10. Replace the rear housing section.

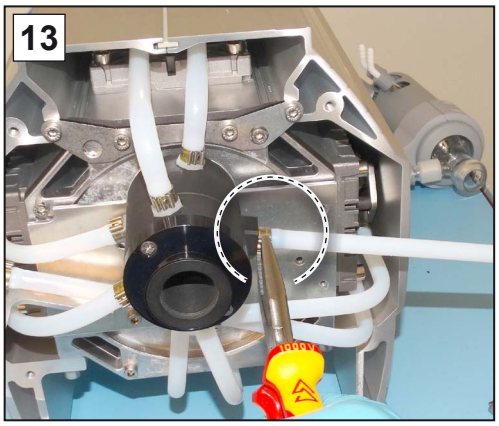


11. Wind in the screws of the housing section; hex key size 4.

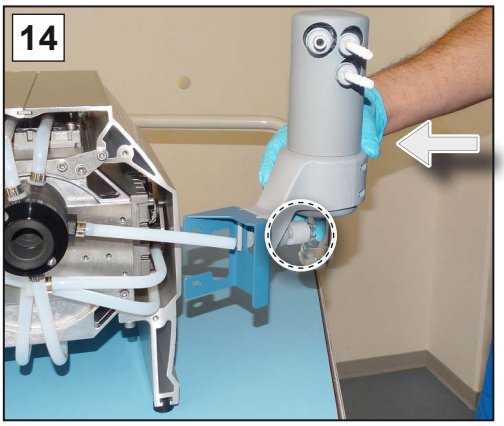


12. Push the molded hose for the EK into place.

Assemble the EK

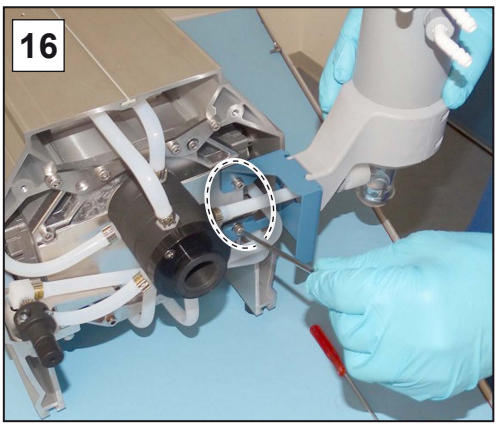


13. Secure the hose clip, e. g., with flat nose pliers.



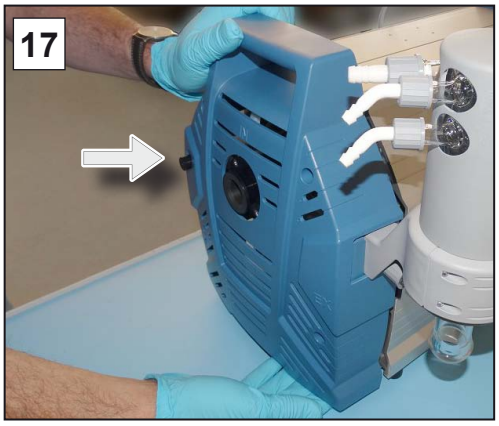
14. Slide the EK and its holder onto the molded hose.

15. Secure the union nut on the EK feed line.

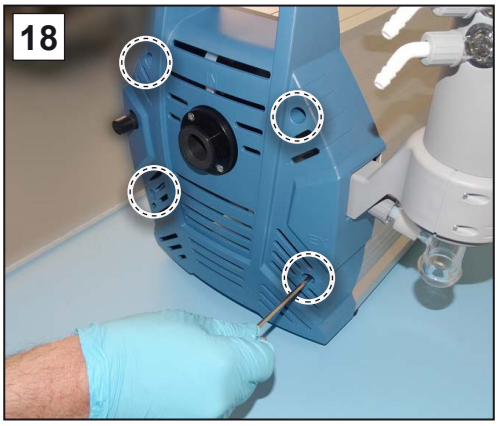


16. Wind in the 2 screws of the EK holder; hex key size 4.

Mount the front housing cover

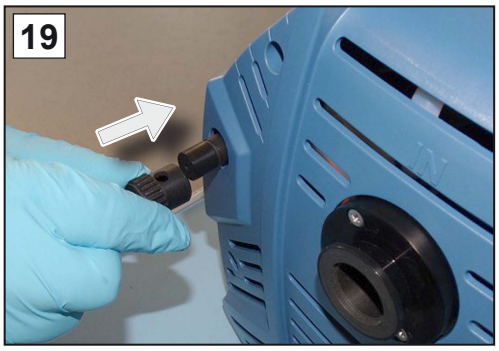


17. Replace the front housing section.



18. Wind in the screws of the housing section; hex key size 4.

Assemble attachments



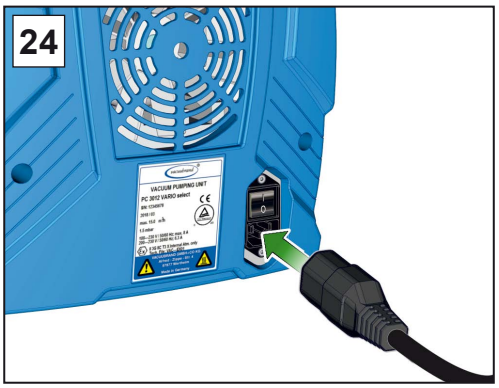
19. Place the cap on the gas ballast.

20. Secure the separator flask with the clamping ring.

21. Secure the glass flask to the inlet IN.

22. Secure the glass flask to the EK.

23. Secure the controller on the pumping unit and connect all cables.



24. Plug in the power plug.

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.

If not reconnected:

☑ Pumping unit is ready for storage.

8 Appendix

8.1 Technical information

Chemistry pumping unit series	
PC 3010 VARIO select	**PC 3016 VARIO select**
PC 3012 VARIO select	**PC 3012 VARIO select EKP**

8.1.1 Technical data

Technical data

Ambient conditions		(US)
Ambient temperature, max.	10–40 °C	50-104 °F
Working temperature	10-40 °C	50-104 °F
Storage/transport temperature	-10-60 °C	14-140 °F
Max. altitude	3000 m above sea level	9840 ft above sea level
Relative humidity	30-85 %, non-condensing	
Protection class	IP 40 / IK 08	

Operating conditions		(US)
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), Ex atmosphere:		
Short term	40 °C	104 °F
Continuous operation	40 °C	104 °F

Connections	
Vacuum, inlet	Small flange KF DN 25 / hose nozzle SW15
Gas ballast GB Inert gas adapter – OPTION	Gas ballast valve, manual Small flange GB NT KF DN 16 Hose nozzle GB NT DN 6/10
Venting valve (venting with inert gas) – OPTION	Silicone rubber hose 4/5
Coolant EK (+IK)	2x (+2x) hose nozzles DN 6/8
Exhaust gas, outlet EX	Hose nozzle DN 8/10
Cold device plug	+ power supply CEE, CH, CN, UK, IN, US
Plug-in connector	VACUU·BUS®

Technical data

Electrical data		(US)
Nominal voltage	200-230 VAC	100-120 VAC
Nominal frequency	50 Hz/ 60 Hz	50 Hz/ 60 Hz
Nominal current	6.3 A	8 A
Power, max.	1 kW	
Interface	VACUU·BUS®	
Power cable	2 m	

Vacuum data		(US)
PC 3010		
Max. pump rate	13 m^3/h	
Ultimate vacuum, abs.	0.6 mbar	0.45 Torr
Ultimate vacuum with GB, abs.	1.2 mbar	0.9 Torr
Number of cylinders/stages	8/4	
PC 3012		
Max. pump rate	15 m^3/h	
Ultimate vacuum, abs.	1.5 mbar	1.1 Torr
Ultimate vacuum with GB, abs.	3 mbar	2.2 Torr
Number of cylinders/stages	8/3	
PC 3016		
Max. pump rate	20 m^3/h	
Ultimate vacuum, abs.	70 mbar	53 Torr
Ultimate vacuum with GB, abs.	100 mbar	75 Torr
Number of cylinders/stages	8/1	

Max. Inlet pressure, abs.	1.1 bar	825 Torr
Max. Outlet pressure, abs.	1.1 bar	825 Torr
Max. Differential pressure, abs.	1.1 bar	825 Torr
Max. Max. pressure at gas connections, abs.	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 adjustment, constant temperature)	
Upper measurement limit	1060 mbar	795 Torr
Lower measurement limit	0.1 mbar	0.1 Torr
Temperature coefficient	< 0.07 mbar/hPa/K	0.05 Torr/K

Weights* and dimensions (l x w x h)		(US)
PC 3010 VARIO select	616 mm x 387 mm x 450 mm	24.25 in x 15.24 in x 17.72 in
Weight*	27 kg	59.5 lb
PC 3016 VARIO select	616 mm x 387 mm x 450 mm	24.25 in x 15.24 in x 17.72 in
Weight*	27 kg	59.5 lb
PC 3012 VARIO select	616 mm x 387 mm x 450 mm	24.25 in x 15.24 in x 17.72 in
Weight*	27 kg	59.5 lb
PC 3012 VARIO select EKP	616 mm x 435 mm x 450 mm	24.25 in x 17.3 in x 17.72 in
Weight*	33.6 kg	74 lb

** Excl. 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)	47 dBA

8.1.2 Wetted materials

Wetted materials

Component	Wetted materials
Pump	
Head cover	ETFE carbon fiber reinforced
Diaphragm clamping disc	ETFE carbon fiber reinforced
Diaphragms	PTFE
Valves PC 3010, PC 3012	FFKM
Valves PC 3016	PTFE
O-rings	FKM
Valve terminals	ECTFE, carbon fiber reinforced
Hose fittings	ETFE/ECTFE
Pumping unit	
Inlet	PP, PE
Outlet	PET
Hoses	PTFE
O-ring on separator	Fluoroelastomer, NBR
Pressure relief valve at EK	Silicone rubber, PTFE film
Condenser EK	Borosilicate glass
Round bottom flask	Borosilicate glass
Peltronic vapor condenser	PFA, PP, PA
VACUU·SELECT Sensor	
Vacuum sensor	Aluminum oxide ceramic, gold-coated
Measurement chamber	PPS
Small flange	PP
Sealing ring at the sensor	Chemically resistant fluoroelastomer
Hose nozzle	PP
Venting valve seal	FFKM

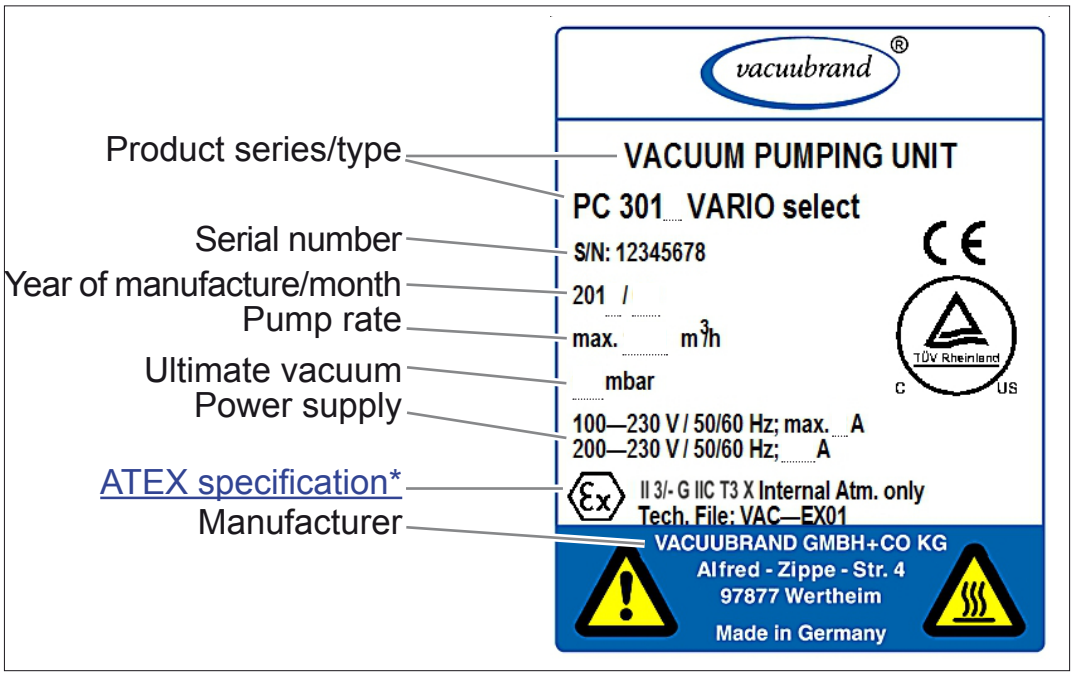
8.1.3 Rating plate

Data 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
Cut-out showing rating plate



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

8.2 Ordering information

Ordering information for pumping unit series

Chemistry pumping unit series	Order no.*
PC 3010 VARIO select	207448xx
PC 3012 VARIO select	207438xx
PC 3012 VARIO select EKP	20743875
PC 3016 VARIO select	207418xx

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

Ordering information for accessories

Accessories	Order no.
PTFE hose KF DN 25 (l = 1000 mm)	20686033
Centering and sealing ring KF DN 25 C Al/FEP	20635722
Coolant valve VKW-B	20674220
Venting valve VBM-B	20674217
Level sensor	20699908
VACUU·SELECT Sensor with venting valve	20700020
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 KF DN 25/SW 15		20662808
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
Peltronic® vapor condenser EKP		20636298
Anti-rotation protection D17x17.5		20635113
Gas ballast cap		20639223
Service kit PC 3010, PC 3012		20696839
Service kit PC 3016, 2x		20696867
EK pressure relief valve		20638821
Power cable	CEE	20612058
	CH	20676021
	CN	20635997
	IND	20635365
	UK	20612065

⇨ A full list of spare parts available can be found under → 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 GMBH + CO KG** sales office is available to assist you with orders, questions on vacuum control and optimal accessories.

8.3 Service

Service offer and service range

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

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)
- Calibration (DAkkS-accredited)
- With Health and Safety Clearance form: return, disposal.

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

Service handling

Meet the terms of service

1. Contact your local distributor or our Service Department.
2. Request an RMA no. for your order.
3. Clean the product thoroughly or if necessary, decontaminate it professionally.
4. Fill out the Health and Safety Clearance form in full.

Return (reshipment)

5. Return your product, including:
   - RMA no. and description of the error
   - Repair or service order
   - Health and Safety Clearance form
   - Attach everything to the outside of the package

⇨ 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.

8.4 Index

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8.5 EU Declaration of Conformity

EU-Konformitätserklärung
EC Declaration of Conformity
Déclaration CE de conformité

CE

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 (RoHS-2)

Chemie-Pumpstand-Serie / Chemistry pumping unit series / Groupe de pompage ***chimie***
Typ / Type / Type: **PC 3010 VARIO select, PC 3016 VARIO select, PC 3012 VARIO select, PC 3012 EKP VARIO select**

Artikelnummer / Order number / Numéro d'article: **20744850, 20741850, 20743850, 20743875**
Seriennummer / Serial number / Numéro de série: Siehe Typenschild / See rating plate / Voir plaque signalétique

Angewandte harmonisierte Normen / Harmonized standards applied / Normes harmonisées 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 50581:2013

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

Ort, Datum / place, date / lieu, date: Wertheim, 07.09.2018

(Dr. F. Gitmans)	ppa. (Dr. J. Dirscherl)
Geschäftsführer / Managing Director / Gérant	*Technischer Leiter / Technical Director / Directeur technique*

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E-Mail: info@vacuubrand.com
Web: www.vacuubrand.com

vacuubrand

Technology for Vacuum Systems

Version: 20901118_EN_PC301x_VARIO_sel_Serie_V1.1_070918

Manufacturer:
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