

# Operating Manual

Translation of the original operating manual

## VAP 5 Vacuum Pumps For vacuum drying oven VDL

Model	Voltage	Equipment	Art. no.
VAP 5 vacuum pump	230 V	4 heads	5013-0220
VAP 5 vacuum pump	120 V	4 heads	5013-0221

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**Dear customer,**




For the correct operation of the vacuum pump, it is important that you read this operating manual completely and carefully and observe all instructions as indicated. Failure to read, understand and follow the instructions may result in personal injury. It can also lead to damage to the device and/or poor equipment performance..

## 1. Operating manual and classification

### 1.1 Operating manual

This operating manual is part of the components of delivery. Always keep it handy for reference in the vicinity of the device. If selling the device, hand over the operating manual to the purchaser. This product must not be distributed without the operating manual.

To avoid injuries and property damage observe the safety instructions of the operating manual. Failure to follow instructions and safety precautions can lead to significant risks and to the loss of explosion protection. Users/personnel must read and understand these operating instruction in full prior to starting work.

 	<div style="background-color: red; color: white; text-align: center; padding: 5px;">  <b>DANGER</b> </div> <p><b>Explosion hazard due to failure to observe the instructions and safety precautions. Serious injuries and device damage. Risk of death.</b></p> <ul style="list-style-type: none"> <li>➤ Observe the safety instructions in this Operating Manual.</li> <li>➤ Follow the operating procedures in this Operating Manual.</li> <li>➤ Carefully read the complete operating instructions of the device prior to installing and using the device.</li> <li>➤ Keep the operating manual for future reference.</li> </ul>
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Make sure that all persons who use the device and its associated work equipment have read and understood the Operating Manual.

This Operating Manual is supplemented and updated as needed. Always use the most recent version of the Operating Manual. When in doubt, call the BINDER Service Hotline for information on the up-to-dateness and validity of this Operating Manual.

## 1.2 Legal considerations

This operating manual is for informational purposes only. It contains information for correct and safe installing, start-up, operation, decommissioning, cleaning and maintenance of the product. The content of this operating manual takes into account the applicable regulatory requirements and the latest technology.

The operator is responsible for ensuring proper use of vacuum apparatus / vacuum systems. The device may only be used if it is in perfect technical condition.

Understanding and observing the instructions in this operating manual are prerequisites for hazard-free use and safety during operation and maintenance. Images are to provide basic understanding. They may deviate from the actual version of the device. The actual scope of delivery can, due to optional or special design, or due to recent technical changes, deviate from the information and illustrations in these instructions this operating manual. In no event shall BINDER be held liable for any damages, direct or incidental arising out of or related to the use of this manual.

This operating manual cannot cover all conceivable applications. If you would like additional information, or if special problems arise that are not sufficiently addressed in this manual, please ask your dealer or contact us directly, e.g. by phone at the number located on page one of this manual.

Furthermore, we emphasize that the contents of this operating manual are not part of an earlier or existing agreement, description, or legal relationship, nor do they modify such a relationship. All obligations on the part of BINDER derive from the respective purchase contract, which also contains the entire and exclusively valid statement of warranty administration and the general terms and conditions, as well as the legal regulations valid at the time the contract is concluded. The statements in this manual neither augment nor restrict the contractual warranty provisions.

Furthermore, relevant national and international regulations on occupational safety apply. The operator must know, comply with, and implement these requirements. In particular, this includes the provisions of ATEX Operational Directive 1999/92/EC ("ATEX 137") (implemented for Germany in the Industrial Safety Regulation (BetrSichV) and the Ordinance on Hazardous Substances (GefStoffV)). The operator is responsible for choosing suitable work equipment for the areas classified as explosion hazards and for installing and operating equipment in accordance with respective requirements.

### **Limitation of liability**

BINDER GmbH is not liable for any damage arising from the following causes:

- Non-observance of Instruction Manual
- Improper use
- Improper installation, setup, maintenance, repair
- Inspections not being performed (testing before initial commissioning, recurring tests, testing before recommissioning)
- Negligence or willful intent
- Incorrect response to malfunctions
- Assignment of improperly or insufficiently trained personnel
- Technical changes and modifications made by the operator and not approved by the manufacturer
- Use of non-approved accessories and replacement parts

We reserve the right to technical changes as part of improvements to operating characteristics and further development.

Have repairs performed only by experts authorized by BINDER. Repaired devices must comply with the quality standard specified by BINDER. In particular, carry out an inspection before recommissioning after maintenance or repairs. These can only be performed by the manufacturer or specially trained personnel (in Germany: Qualified Persons per BetrSichVO).


### 1.3 Structure of the safety and warning notices


In this operating manual, the following safety definitions and symbols indicate dangerous situations following the harmonization of ISO 3864-2 and ANSI Z535.6.

#### 1.3.1 Warning levels

Depending on the probability of serious consequences, potential dangers are identified with a signal word, the corresponding safety color, and if appropriate, the safety alert symbol.

	<b>DANGER</b>
Indicates an imminently hazardous situation that, if not avoided, will result in death or serious (irreversible) injury.	

	<b>WARNING</b>
Indicates a potentially hazardous situation which, if not avoided, could result in death or serious (irreversible) injury.	

	<b>CAUTION</b>
Indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor (reversible) injury.	

<b>NOTICE</b>	
Indicates a potentially hazardous situation, which, if not avoided, may result in damage to the product and/or its functions or to property in its proximity.	

#### 1.3.2 Representation of safety and warning notices

Pictogram	WARNING LEVEL
<b>Type / cause of hazard.</b>	
<b>Possible consequences.</b>	
Ø Instruction how to avoid the hazard: prohibition	
➤ Instruction how to avoid the hazard: mandatory action	

Observe all other notes and information not necessarily emphasized in the same way, in order to avoid disruptions that could result in direct or indirect injury or property damage.

#### 1.3.3 Safety alert symbol



Use of the safety alert symbol indicates a **risk of injury**

Observe all measures that are marked with the safety alert symbol in order to avoid death or injury.


























### 1.3.4 Explosion protection symbol







Use of the explosion protection symbol warns against **explosion hazards**.

Observe all measures in this operating manual to avoid the formation of explosive atmosphere as well as explosions.

### 1.3.5 Pictograms in this manual


Warning signs			
			
Danger of injury	Electrical hazard	Hot surface	Explosive atmosphere
			
Stability hazard	Lifting hazard	Inhalation hazard	Suffocation hazard
			
Harmful substances	Biohazard	Risk of corrosion and / or chemical burns	Pollution Hazard
			
Cutting injuries	Low temperature warning	Toxic substances warning	
Mandatory action signs			
			
Mandatory regulation	Read operating instructions	Disconnect the power plug	Release before maintenance or repairs
			
Wear protective gloves	Wear eye protectors	Wear ESD shoes (antistatic shoes)	Ground before use
			
Environment protection	Wipe with damp cloth only		



Prohibition signs			
	Prohibited		Do NOT touch
			Do NOT spray with water
	Information to be observed in order to ensure optimum function of the product.		

## 1.4 Localization / position of safety labels on the device

The following labels are located on the pump housing:

Safety labels (warning signs)	
	Hot surface

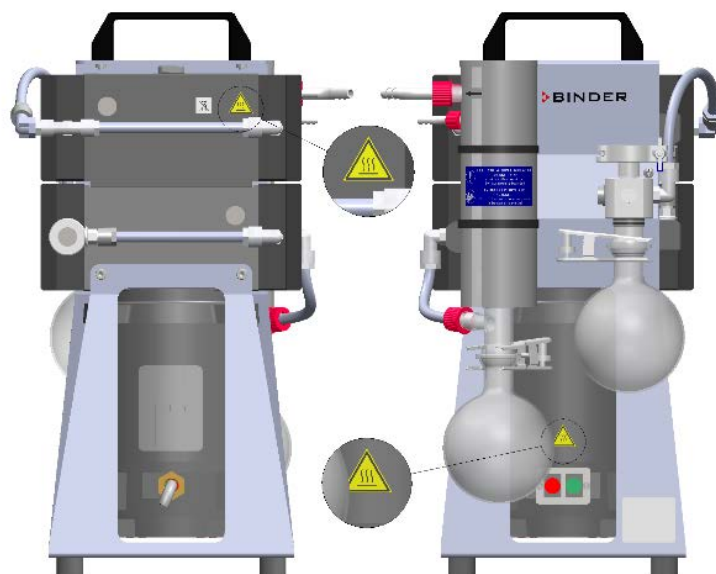



Figure 1: Position of the safety labels on the device

	Keep safety labels complete and legible.
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Replace safety labels that are no longer legible. Contact BINDER service for these replacements.

## 1.5 Type plates and classifications

There are three type plates / four classification labels on the device in the following positions:

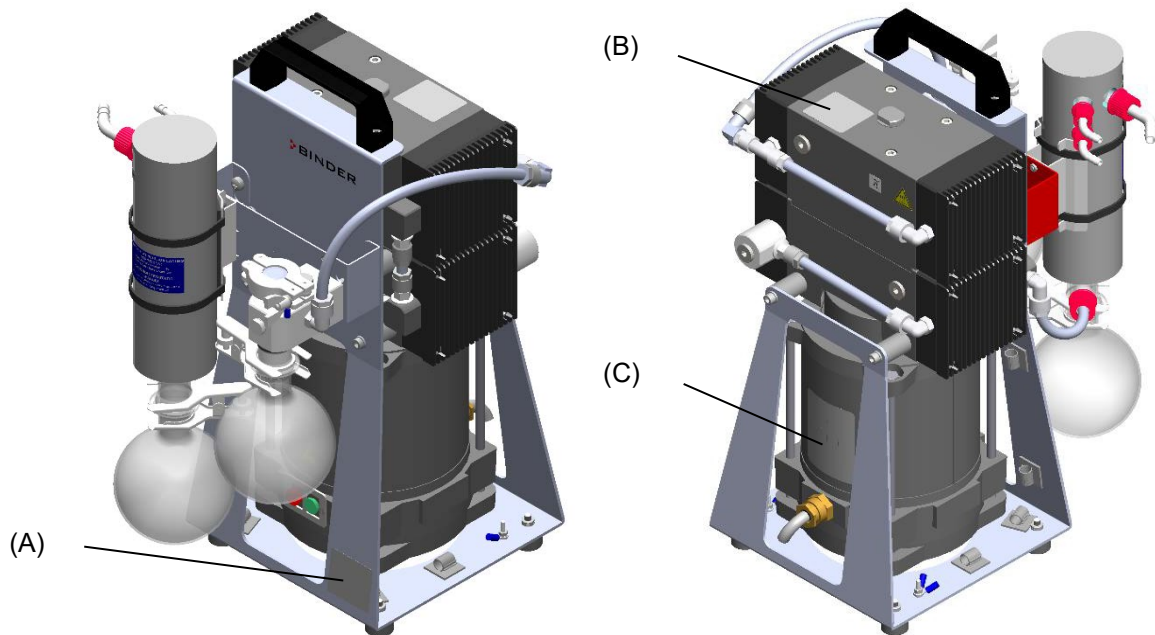
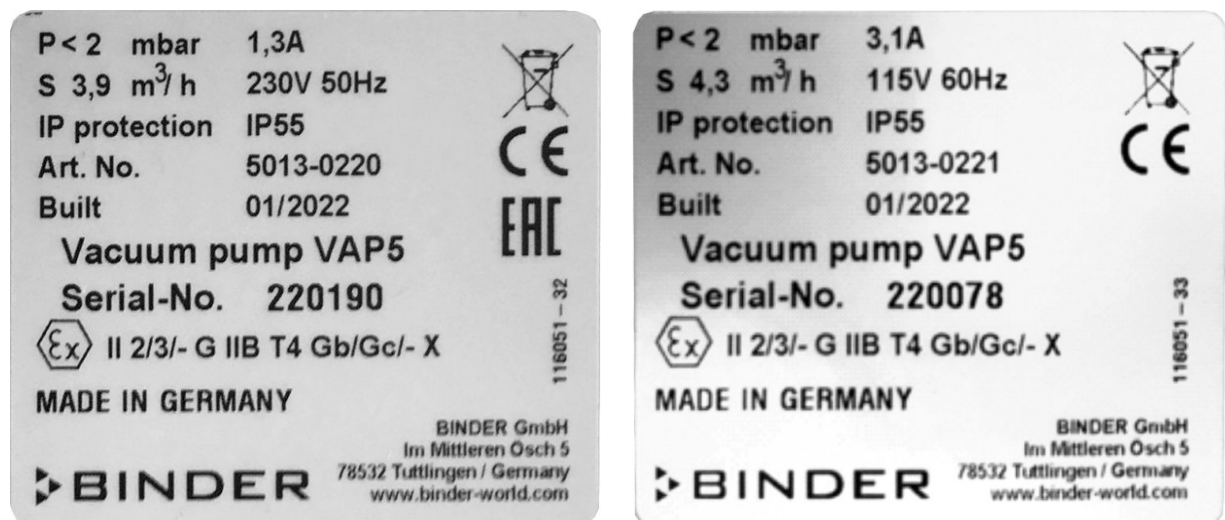


Figure 2: Type plate positions

- (A) Entire device (assembly)
- (B) Pump unit
- (C) Motor

### 1.5.1 Type plate of the entire device VAP 5




230V





115V

Figure 3: Type plate of the entire device VAP 5 (assembly)

## Indications of the type plate of the entire device VAP 5

Indication		Information
BINDER		Manufacturer: BINDER GmbH
Vacuum pump		Device name: Vacuum pump
VAP 5		Model designation
Serial-No.		Serial no
 II 2/3/- G IIB T4 Gb/Gc/- X		Ex classification according to ATEX Directive 2014/34/EU
P < 2 mbar		Final pressure
S 3,9 m³/h S 4,3 m³/h		Suction capacity (230V model: 3,9 m³/h; 115 V model: 4,3 m³/h)
1,3 A 3,1 A		Rated current (230V-Modell: 1,3 A; 115 V-Modell: 3,1 A)
230 V 50 Hz 115 V 60 Hz		Nominal voltage +/- 10% at the indicated power frequency
IP protection	IP55	IP type of protection acc. to standard EN 60529
Art. No.	5013-0220 5013-0221	Art. No. of the device
Built	01/2022	Year and month of construction of the device (example)
Serial No.	202299	Serial no. of the device (example)

## Symbols on the type plate

Symbol	Valid for	Information
	All models	CE conformity marking
	All models	Electrical and electronic equipment manufactured / placed on the market in the EU after 13 August 2005 and to be disposed of in a separate collection according to Directive 2012/19/EU on waste electrical and electronic equipment (WEEE).
	All models	Explosion protection symbol. Ex classification acc. to ATEX Directive 2014/34/EU
	Not for UL models	The device is certified according to Customs Union Technical Regulation (CU TR) for the Eurasian Economic Union (Russia, Belarus, Armenia, Kazakhstan Kyrgyzstan).

### 1.5.2 Type plate of the electric motor

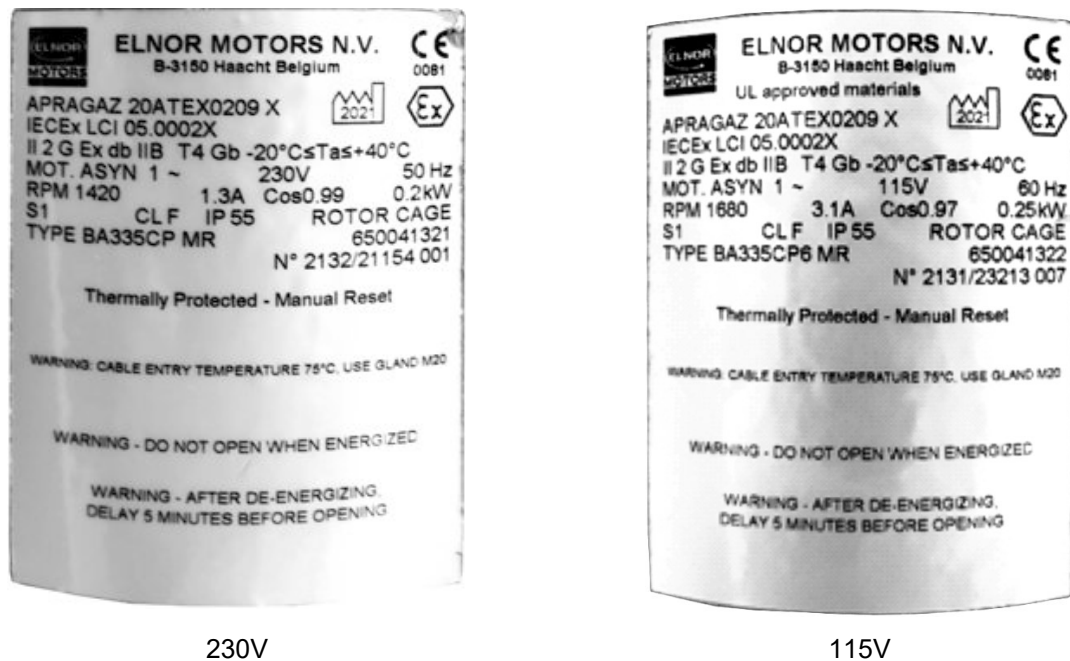


Figure 4: Type plate of the electric motor

### 1.5.3 Type plate of the mechanical pump unit

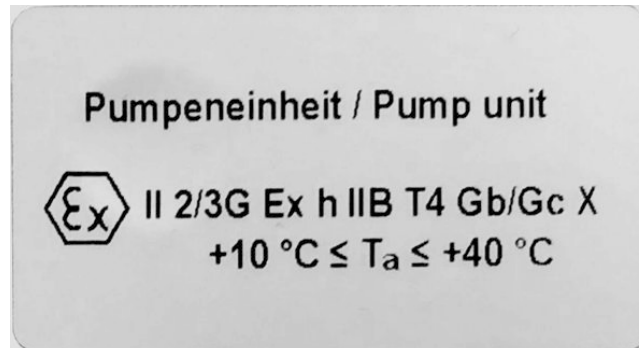


Figure 5: Type plate of the mechanical pump unit

### 1.5.4 Classification on the cable gland

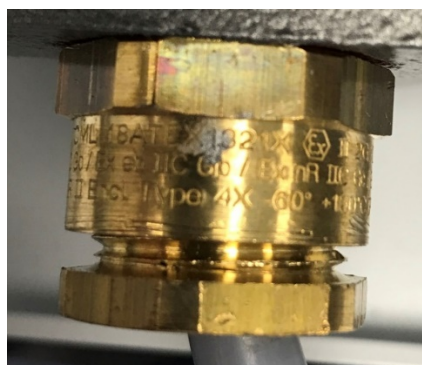


Figure 6: Cable gland with Ex classification

## 1.6 Ex classification of the device and immediate surroundings

### 1.6.1 Classification of the assembly “VAP 5 vacuum pump”



The designations “device” and “vacuum pump” in this operating manual describe the entire assembly of the VAP 5 vacuum pump, consisting of the integrated pump unit, electric motor, attachments such as emission condenser, separator and condensate catchpot, connection cable, power plug, housing, and various other parts.

The VAP 5 vacuum pump is an assembly in the sense of ATEX Directive 2014/34/EU with the following Ex classification:



**II 2/3/- G IIB T4 Gb/Gc/- X** in accordance with DIN IEC 60079-46.

X: The special conditions are included in the documentation of this whole assembly group

#### Explanation:

II	Use of the device above ground
2	Equipment category 2 per ATEX Directive 2014/34/EU Suitability for areas in which explosive atmospheres may occur occasionally. Interior of the pump unit (fluid pumping area), tubing / line to the vacuum drying oven, outside area of the pump unit (drive chamber) <b>with</b> inert gas purging
3	Equipment category 3 per ATEX Directive 2014/34/EU Suitability for areas in which explosive atmospheres may occur, on a rare and temporary basis: The entire device, with the exception of the device power plug, is designed in Device category 3 in relation to the environment Area at the installation site of the vacuum pump, interior of the optional pump module, outside area of the pump unit (drive chamber) without inert gas purging.
-	No equipment category per ATEX Directive 2014/34/EU Device power plug (unprotected device area). The device power plug is unprotected. The electrical connection must therefore be established outside a zone. See images of the areas in chap. 3.4.
G	Substance group G per ATEX Directive 2014/34/EU Gas: Do not introduce combustible dust into the device or allow combustible dusts to be present in the vicinity of the device.
IIB	Equipment subgroup IIB Substances falling under Gas group / Explosion group IIA or IIB are permitted. Substances falling under Gas group / Explosion group IIC are not permitted.
T4	Temperature class of the interior: T3 acc. to IEC 60079-0 Materials of temperature classes T4, T5, and T6 are not permitted. Only materials whose auto-ignition temperature exceeds 200 °C / 392 °F may be aspirated.
Gb	Equipment protection level (EPL) Gb acc. to EN IEC 60079-0 / EN ISO 80079-36 Suitability for areas in which explosive atmospheres may occur occasionally. Interior of the pump unit (fluid pumping area), tubing / line to the vacuum drying oven, outside area of the pump unit (drive chamber) <b>with</b> inert gas purging
Gc	Equipment protection level (EPL) Gc acc. to EN IEC 60079-0 / EN ISO 80079-36 Suitability for areas in which explosive atmospheres may occur on a rare and temporary basis (fault): Outside area of the pump unit (drive chamber) without inert gas purging




-	No equipment protection level (EPL) acc. to EN IEC 60079-0 / EN ISO 80079-36 Device power plug (unprotected device area)
X	<p>Specific operating conditions:</p> <ul style="list-style-type: none"> <li>• Technical ventilation required during operation and when emptying the condensate catchpot (chap. 5.2)</li> <li>• Operation only allowed with equipotential bonding measures between parts of the pump and with the system / installation surface (chap. 5.3)</li> <li>• The pneumatic installation must prevent any backflow of fluid after shutting down the device</li> <li>• Electrostatic charges must be prevented. Do not clean with dry cloths - Use only humid cloths to wipe the device. The personal protective equipment (PPE) of the operating personnel must be implemented ESD protected, i.e. against electrostatic discharge. No processes that generate electrostatic charge, are permitted in the installation area of the device.</li> <li>• Only suitable gaseous media may be pumped. The device must be used in accordance with its intended use (chap. 2.2)</li> <li>• It must not be operated without its attachments.</li> <li>• Regular inspections and maintenance work must be carried out</li> <li>• Ambient temperature during operation: +18 °C up to +32 °C (permissible temperature range Ta outside)</li> </ul>






The operator is responsible for ensuring that the specific conditions of use are complied with and that the device is used in accordance with its classification labelling.

### 1.6.2 Parts of the assembly “VAP 5 vacuum pump”

The “VAP 5 vacuum pump” assembly includes the following parts in the sense of the ATEX directive 2014/34/EU:

Component with a classification	Classification
<p><b>Mechanical pump</b> Non-electrical device, Ignition protection Ex h</p>	<p> II 2/3 G Ex h IIB T4 Gb/Gc X +10 °C ≤ Ta ≤ +40 °C</p>
<p>Interior of the pump unit (fluid pumping area), outside area of the pump unit (drive chamber) <b>with</b> inert gas purging:</p> <ul style="list-style-type: none"> <li>• Equipment category 2 per ATEX Directive 2014/34/EU</li> <li>• Equipment protection level (EPL) Gb acc. to EN IEC 60079-0 / EN ISO 80079-36</li> <li>• Suitability for areas in which explosive atmospheres may occur occasionally.</li> </ul> <p> II 2G Ex h IIB T4 Gb X</p>	
<p>Outside area of the pump unit (drive chamber) without inert gas purging:</p> <ul style="list-style-type: none"> <li>• Equipment category 3 per ATEX Directive 2014/34/EU</li> <li>• Equipment protection level (EPL) Gc acc. to EN IEC 60079-0 / EN ISO 80079-36</li> <li>• Suitability for areas in which explosive atmospheres may occur on a rare and temporary basis (fault)</li> </ul> <p> II 3G Ex h IIB T4 Gc X</p>	



Component with a classification	Classification
<b>Electric motor</b> Electric device <ul style="list-style-type: none"> <li>Ignition protection: Pressure-resistant casing "d" per EN IEC 60079-1, Equipment protection level: high protection "db", suitable for placement in Zone 1 or 2</li> <li>Equipment category 2 per ATEX Directive 2014/34/EU</li> <li>Equipment protection level (EPL) Gb acc. to EN IEC 60079-0 / EN ISO 80079-36</li> <li>Suitability for areas in which explosive atmospheres may occur occasionally.</li> </ul>	 II 2 G Ex db IIB T4 Gb -20 °C ≤ Ta ≤ +40 °C
<b>Cable gland</b> Electric device <ul style="list-style-type: none"> <li>Equipment category 2 per ATEX Directive 2014/34/EU</li> <li>Equipment protection level (EPL) Gb acc. to EN IEC 60079-0 / EN ISO 80079-36</li> <li>Suitability for areas in which explosive atmospheres may occur occasionally.</li> <li>Ignition protection: Pressure-resistant casing "d" per EN IEC 60079-1, Equipment protection level: high protection "db", suitable for placement in Zone 1 or 2</li> </ul>  II 2G 1D Ex db IIC Gb [...]	CMP UK 20S A2F M20 CML 18ATEX1321X  II 2G 1D CE 2776 IECEX CML 18 0179X Ex db IIC Gb / Ex eb IIC Gb / Ex nR IIC Gc / Ex ta IIIC Da CSA E X d IIC, Ex e II Ex nR II E?? Type 4X -60° +130°C IP66 / 67 / 68

Other parts
<b>Power supply connector</b> No equipment category per ATEX Directive 2014/34/EU, No classification, unprotected Connection outside of a zone required
<b>Emission condenser</b>
<b>Coupling</b> Non-electrical device
<b>Cable</b> with a length of 3m acc. to DIN EN 60079-14
<b>Glass attachments:</b> condensate catchpot and separator

## 2. Safety

### 2.1 Personnel Qualification

The operator must ensure that the personnel are properly trained and that all necessary protective measures are complied with.

	 <b>GEFAHR</b>
	<p><b>Hazards during activities by untrained personnel.</b>  <b>Serious injuries and device damage. Risk of death.</b></p> <p>➤ Follow the instructions on personnel qualification in this operating manual.</p>

## Overview of responsibilities

The **operator** (responsible representative for processes) is responsible for risk assessment, explosion protection concept, zone classification, instruction of employees, creation of operating and work instructions, provision of protective equipment, responsibility for tests and maintenance, etc. (see chap. 2.7).

The **device is to be used** by laboratory personnel who have been trained for this purpose and are familiar with all safety measures for working with equipment in accordance with ATEX Directive 2014/37/EU, are aware of and bear in mind the particular hazards, and have understood the functionalities and operating instructions for the device. Follow the country-specific regulations on the minimum age of laboratory personnel (in Germany: 14 years).

**Installation, testing, commissioning, fault analysis, operator maintenance work** (membrane replacement) is to be carried out by qualified personnel with additional skills in explosion protection (ATEX), who are familiar with the assembly, commissioning and operation of the device. Qualified personnel are persons whose professional education, knowledge, experience and knowledge of relevant standards allow them to assess, carry out, and identify any potential hazards in the work assigned to them. This includes persons with professional qualifications, such as mechanics, electricians and laboratory managers. They must also have been trained and instructed, and be authorized, to work on the device. This includes basic knowledge of explosion protection (ATEX training), instruction of the operator based on the risk assessment (chap. 2.7.2) and knowledge of the operator's operating instructions.

**Repairs** may only be carried out by the manufacturer or service providers authorized by the manufacturer.

## Tabular overview of responsibilities for working on the device

Action to take	Trained laboratory personnel	Qualified personnel with additional skills in explosion protection	Manufacturer or service provider authorized by the manufacturer
Transport, storage, setting up	x	x	x
Installation: Vacuum connection Refrigerant connection Inert gas connection Achieving equipotential bonding Electrical connection		x	x
Commissioning	x	x	x
Operation	x	x	x
Removing and emptying the condensate catchpots	x	x	x
Daily inspection	x	x	x
Regular inspection	x	x	x
Testing before commissioning		x	x
Testing after maintenance / repair		x	x
Cleaning	x	x	x
Decontamination of the external surfaces of the pump and the glass attachments	x	x	x
Decontamination after use of hazardous substances		X (depending on the application)	X



Action to take	Trained laboratory personnel	Qualified personnel with additional skills in explosion protection	Manufacturer or service provider authorized by the manufacturer
Maintenance work to be carried out by operator (membrane replacement)		x	x
Analyze malfunctions	x	x	x
Eliminate malfunctions	x	x	x
Damage report, Contamination clearance certificate		x	x
Disposal		x	x

## 2.2 Intended use



Following the instructions in this operating manual and conducting regular maintenance work (chap. 11) are part of the intended use.

Any use of the products that does not comply with the requirements specified in this Operating Manual shall be considered improper use.

All applications must be within the specification (see Technical data, chap. 13.1 and indications on the type plate, chap. 1.5).

**Other applications than those described in this chapter are not approved.**

Use of the device that does NOT correspond to its intended use is considered **improper use**.



**DANGER**

**Risk of explosion due to improper use of the device**

**Serious injury or death from burns and / or explosion pressure.**

- Ensure the device is operated in accordance with the intended use.
- Only operate the device according to its EX classification.
- Follow the relevant statutory regulations.

### Use

The VAP 5 vacuum pump is suitable for conveying gaseous media.

The diaphragm pumps are intended for:

- Creating vacuum
- Use in physical and chemical laboratories in trade or industry

Use for vacuum filtration, vacuum distillation and vacuum drying as well as other applications in vacuum technology

### Area of application

The VAP 5 vacuum pump is used to extract gaseous media, in particular from the BINDER VDL vacuum drying ovens. It is suitable for pumping flammable solvents up to an ignition temperature of 200 °C as well as non-flammable solvents.

The solvent contained in the aspirated medium must not be able to form an explosive mixture with air under normal conditions. The ignition of an explosive atmosphere is prevented by various safety measures.

The pump is suitable for laboratory and industrial use in rough vacuum workspaces and is designed for continuous operation.

The device must be connected in accordance with the statutory requirements and operated in compliance with the technical data and specifications on the type plate.

- extracting, conveying and compressing harmless gases and vapors.
- extracting, conveying and compressing of explosive atmospheres consisting of air and combustible gases, vapors and mists in any mixing ratio according to the EX classification of the device.

#### Requirements for the aspirated atmosphere

Only substances with an auto-ignition temperature that is higher than 200 °C / 392 °F may be aspirated. The devices are not suitable to aspirate substances with an auto-ignition temperature below 200 °C / 392 °F. Substances falling under Gas group / Explosion group IIC are not permitted (e.g. carbon disulfide, acetylene, hydrogen. Substances falling under groups II A and II B may be aspirated.

The temperature class of the interior according to IEC 60079-0 is T3. The auto-ignition temperature is determined from the safety specifications of the solvent used. In the case of solvent mixtures, the solvent with the lowest auto-ignition temperature as this is critical.

According to IEC 60079-0 the VAP 5 vacuum pump is NOT intended for the temperature classes T4, T5 and T6. Insert only substances with an auto-ignition temperature that is higher than 200 °C / 392 °F.

The description of explosion protection on the type plate of the assembly determines the classification




The VAP 5 vacuum pump is NOT suitable for substances, which tend towards exothermal decomposition, or for materials that come under the legal definition of explosives. Such substances must not be aspirated. Dangerous chemical reactions must not occur. Exothermal reactions must definitely be excluded. Familiarize yourself with the physical and chemical properties of the aspirated material, as well as the contained moisture constituent and its behavior with changes in pressure. Familiarize yourself with any potential health risks caused by aspirated material, the contained moisture constituent or by reaction products. Take adequate measures to exclude such risks prior to putting the device into operation.

Aspirated gases and vapors shall not contain any corrosive ingredients that may damage the machine components. Such ingredients include in particular acids and halides. Any corrosive damage caused by such ingredients is excluded from liability by BINDER GmbH.



The VAP 5 vacuum pump is NOT suitable for use in conjunction with explosive dust atmospheres or hybrid mixtures. Combustible dust are generally not permitted

The temperature of the aspirated gases and vapors must not exceed the permissible gas inlet temperature of max. 40 °C / 104 °F when entering the pump.


The pump is not suitable for aspirating liquids.

 	<div style="background-color: red; color: white; text-align: center; padding: 5px;">  <b>DANGER</b> </div> <p><b>Explosion or implosion hazard and danger of poisoning through the aspiration of unsuitable gases and vapors.</b></p> <p><b>Poisoning. Serious injury or death from burns and / or explosion pressure.</b></p> <ul style="list-style-type: none"> <li>⊘ Do NOT aspirate any substance with an auto-ignition temperature below 200 °C / 392 °F.</li> <li>⊘ Do NOT aspirate any combustible dust.</li> <li>⊘ Do NOT aspirate any substance, which tend to exothermic decomposition.</li> <li>⊘ Do NOT aspirate any substance, which fall under the explosives law</li> <li>⊘ With a set-point temperature above 40 °C / 104 °F, take appropriate measures to cool down the aspirated vapor before its entry to the vacuum pump</li> </ul>
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The aspiration of gases and vapors must NOT result in the release of toxic gases. Contamination of the device by toxic, infectious or radioactive substances must be prevented

 	<div style="background-color: orange; text-align: center; padding: 5px;"><b>! WARNING</b></div> <p><b>Danger of intoxication and infection through contamination of the device with toxic, infectious or radioactive substances.</b></p> <p><b>Damages to health.</b></p> <ul style="list-style-type: none"> <li>➤ Make sure that NO toxic, infectious or radioactive substances can be aspirated.</li> <li>➤ Take suitable protective measures when introducing and removing accidentally aspirated toxic, infectious or radioactive material.</li> </ul>
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Solid particles in the aspirated medium impair the pumping action and can damage the pump.

	<div style="background-color: #00a0e3; color: white; text-align: center; padding: 5px;"><b>NOTICE</b></div> <p><b>Danger of mechanical damage and malfunctions due to the suction of solid particles.</b></p> <p><b>Damage to the device.</b></p> <ul style="list-style-type: none"> <li>➤ Prevent solid particles from entering the pump.</li> </ul>
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In case of foreseeable use of the device there is no risk for the user through the integration of the device into systems or by special environmental or operating conditions in the sense of EN 61010-1:2010. For this, the intended use of the device and all its connections must be observed.

## Medical devices

The devices are not classified as medical devices as defined by Regulation (EU) 2017/745.

## Personnel Requirements

Only trained personnel with knowledge of the Operating Manual can set up and install the device, start it up, operate, clean, and take it out of operation. Service and repairs call for further technical requirements (e.g. electrical know-how),.

Only trained personnel with knowledge of explosion protection and knowledge of the Operating Manual can set up and install the device, start it up, operate, clean, and take it out of operation. Service and repairs call for further technical requirements (e.g. electrical know-how). Follow the requirements for PPE (ESD protection), see chap. 2.1.

## Installation site requirements

The devices are designed for setting up inside a building (indoor use).

Provide active extraction (technical ventilation according to country-specific regulations – TRBS 2152 Part 2 for Germany) on the installation site. It must cover the entire installation area of the vacuum pump. Suction must be active during the entire operation of the device and when handling the condensate catchpot of the pump. Suction must be conducted into an explosion-proof area.

The requirements described in the Operating Manual for installation site and ambient conditions (chap. 5) must be met. In particular, the operator's protective measures with regard to equipotential bonding and zone classification must be observed.

The device is not intended for installation in a Zone 0 or 1. The device is not to be installed and operated in areas that occasionally or frequently / permanently have potential explosive atmospheres. The EX labelling must be observed, see chap. 1.6.

The device plug (power plug) is not explosion-proof. The electrical connection must therefore be located outside a zone.

### **Requirements for the operator**

Based on his risk assessment, the operator must draw up an explosion protection plan, classify zones and define and implement tests and protective measures. Please refer to chap. 2.7.

Connected devices must be operated within the scope of their specification and in compliance with their operating instructions

Only spare parts and accessories approved by the manufacturer may be used

The device may only be operated in perfect technical condition and with complete documentation. Applications that are contrary to the intended use must be prevented by the operator.

## **2.3 Foreseeable Misuse**

Other applications than those described in chap. 2.1 are not approved. These are considered improper use.

This expressly includes the following misuses (the list is not exhaustive), which pose risks despite the inherently safe construction and existing technical safety equipment:

- Non-observance of the Operating Manual
- Non-observance of information and warnings on the device
- Installation, startup, operation, maintenance and repair by untrained, unqualified, insufficiently qualified, or unauthorized personnel
- Unattended operation in critical applications
- Operating the device with tools or other prohibited objects.
- Suction of impermissible, liquid or particulate media, aspiration of materials excluded or not permitted by this Operating Manual.
- Missed or delayed maintenance and testing
- Non-observance of traces of wear and tear
- Installation, testing, service or repair in the presence of solvents
- Manipulation of the device, such as improper attachments or modifications.
- Installation of replacement parts and use of accessories and operating resources not specified and authorized by the manufacturer
- Installation, startup, operation, maintenance or repair of the device in absence of a risk assessment and operating instructions from the operator
- Installation, startup, operation, maintenance or repair of the device with inadequate or non-existent protective measures.
- Bypassing or changing protective systems, operation of the device without the designated protective systems
- Non-observance of messages regarding cleaning and disinfection of the device.
- Wiping the device with a dry cloth, generating static charge
- Spilling water or cleaning agent on the device, water penetrating into the device during operation, cleaning or maintenance.
- Cleaning activity while the device is turned on.
- Operation of the device with a damaged housing or damaged power cord
- Continued operation of the device during an obvious malfunction
- Insertion of objects, particularly metallic objects, in louvers or other openings or slots on the device
- Human error (e.g. insufficient experience, qualification, stress, exhaustion, laziness)

- Non-compliance with statutory regulations

To prevent these and other risks from incorrect operation, the operator shall issue operating instructions. The operator is also recommended to create Standard Operating Procedures (SOPs).

## **2.4 Residual Risks**

The unavoidable design features of a device, as well as its proper field of application, can also pose risks for the user, even during correct operation. These residual risks include hazards which, despite the inherently safe design, existing technical protective equipment, safety precautions and supplementary protective measures, cannot be ruled out.

Messages on the device and in the Operating Manual warn of residual risks. The consequences of these residual risks and the measures required to prevent them are listed in the Operating Manual. Moreover, the operator must take measures to minimize hazards from unavoidable residual risks. This includes, in particular the Operator measures described in chap. 2.7. Residual hazards are to be taken into account by the operator in their risk assessment. This includes, in particular, issuing operating instructions.

The following list summarizes the hazards against which this Operating Manual and the Service Manual warn, and specifies protective measures at the appropriate spots (list is not exhaustive):

### **Unpacking, transport, installation**

- Sliding or tilting the device
- Setup of the device in unauthorized areas
- Connecting the power plug in unauthorized areas
- Installation of a damaged device / a device with damaged power cord
- Inappropriate site of installation
- Missing protective conductor connection
- Missing or improperly executed equipotential bonding
- Missing or improperly designed technical ventilation in the installation area

### **Normal operation**

- Assembly errors
- Lack of electrical testing before initial commissioning or recommissioning
- Insufficient or missing technical ventilation (extraction) at the installation area
- Contact with hot surfaces on the motor housing
- Emission of non-ionizing radiation from electrical operating resources
- Use of inert gas in higher concentration (optional)
- Contact with live parts in normal state
- Operation without supervision

### **Cleaning and Decontamination**

- Explosive atmosphere during cleaning and decontamination
- Electrostatic charges
- Penetration of water into the device
- Inappropriate cleaning and decontamination agents

### **Malfunction and Damage**

- Continued operation of the device during an obvious malfunction or outage of the pump motor
- Contact with live parts during error status
- Operation of a device with damaged power cord

### **Maintenance**

- Maintenance work on live parts.
- Explosive atmosphere during maintenance
- Execution of maintenance work by untrained/insufficiently qualified personnel
- Electrical safety analysis during annual maintenance not performed
- Verification of explosion protection during annual maintenance not performed
- Incorrect and incomplete grounding before recommissioning

### **Troubleshooting and repair**

- Trouble-shooting of live parts without specified safety measures
- Absence of a plausibility check to rule out erroneous inscription of electrical components
- Performance of repair work by untrained/insufficiently qualified personnel
- Inappropriate repairs which do not meet the quality standard specified by BINDER
- Use of replacement parts other than BINDER original replacement parts
- Electrical safety analysis not performed after repairs
- Verification of explosion protection not performed after repairs

## **2.5 Operating instructions**

Depending on the application and location of the device, the operator of the device must provide the relevant information for safe operation of the device in a set of operating instructions.



Keep these operating instructions with the device at all times in a place where they are clearly visible. They must be comprehensible and written in the language of the employees.

Operating personnel must follow the applicable operating instructions of the operator as well as the national regulations for accident prevention, safety and occupational safety.

## **2.6 Safety regulations**

### **2.6.1 General information**

The following safety regulations must be read and understood by all users of the device. They must be fully familiar with the operating instructions. The applicable operating instructions of the operator as well as the local and national regulations for accident prevention, safety and occupational safety must be followed. Note the personnel requirements (chap. 2.1).

The operator must ensure safe operation and, if necessary, take measures to protect the user. Ensure that all relevant national and international regulations are complied with prior to commissioning the device. Within the European Union, devices that will be operated in potentially explosive areas have to meet the requirements of ATEX Directive 2014/34/EU. With regard to operating the vacuum pump and to the installation location, please observe the relevant national regulations (for Germany in particular: DGUV guidelines 213-850 on safe working in laboratories, issued by the employers' liability insurance association; Industrial Safety Regulation (BetrSichV); Ordinance on Hazardous Substances (GefStoffV); Technical Regulations on Industrial Safety and Health (TRBS 1201 Part 1).

The central element of the Industrial Safety Regulation is the **risk assessment** performed by competent personnel which enables an employer to evaluate risks that may arise before using work equipment and to derive necessary and suitable tests and measures. The **explosion protection plan** to be created by the operator represents the entirety of the technical and organizational measures for explosion protection determined and specified on the basis of the risk assessment. For measures by the operator please refer to chap. 2.7.



For the safety of the users, the operator must define and ensure the protective measures. Failure to do so may result in a health hazard for the users.

All protective measures must have the highest priority in order to ensure the life and health of persons are protected. In the event of potential safety hazards, these must be assessed and measures must be taken to avert them.

BINDER GmbH is responsible for the safety features of the device only, provided skilled electricians or qualified personnel authorized by BINDER perform all maintenance and repair, and if components relating to device safety are replaced in the event of failure with original spare parts.

Operate the device using only original BINDER accessories or accessories / components from third-party suppliers authorized by BINDER. The user is responsible for any risk arising from using unauthorized accessories

For safe operation, the safety requirements of the operating instructions must be observed in full.

The device may only be used if it is in perfect technical condition.

## 2.6.2 Safety instructions on installation

### 2.6.2.1 Measures against overheating

The device heats up due to the motor (passive cooling) as well as the temperature of the medium to be pumped and compression heat. Therefore, ensure that the installation site is well ventilated.



#### NOTICE

**Danger of overheating due to lack of ventilation.**

**Damage to the device.**



- Ø Do NOT install the device in unventilated recesses.
- Ensure sufficient ventilation for dispersal of the heat.

### 2.6.2.2 No installation in potentially explosive areas of Zone 1 or 0


The device may only be used according to its Ex classification. The operator is responsible for evaluating the EX zone classification and defining the device requirements



Even when the equipment is used properly, there exists a residual risk of explosion that cannot be excluded, particularly in relation to the environment of the device. To minimize this risk, strictly observe the legal regulations about how to select an appropriate location. Do not install and operate the device in occasionally or continuously / for long periods / frequently potentially explosive areas.



	 <b>DANGER</b>
	<p><b>Explosion hazard due to combustible dusts or explosive mixtures in the vicinity of the equipment.</b></p> <p><b>Serious injury or death from burns and / or explosion pressure.</b></p> <ul style="list-style-type: none"> <li>➤ Only operate the device according to its EX classification.</li> <li>⊘ Do NOT operate the device in occasionally or continuously / for long periods / frequently potentially explosive areas. It is not intended for installation in a zone 1 or 0.</li> <li>➤ KEEP combustible dusts AWAY from the equipment</li> <li>➤ Make sure that air-solvent mixtures are NOT occasionally or continuously / for long periods / frequently in the vicinity of the equipment.</li> <li>➤ Reliably prevent spreading of an explosive atmosphere to unprotected areas (power plug, chap. 3.4).</li> <li>➤ Strictly observe the relevant legal regulations about how to select an appropriate location.</li> </ul>

When setting up the VAP 5 vacuum pump in the optional pump module:

	<p>Avoid the solvent accumulation in the optional pump module as this would cause the vacuum module to become an occasionally or continuously / for long periods / frequently potentially explosive area (Zone 0 or 1).</p>
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	 <b>DANGER</b>
	<p><b>Explosion hazard by operating the device with substances containing solvents that can form an explosive mixture with air.</b></p> <p><b>Serious injury or death from burns and / or explosion pressure or by poisoning.</b></p> <ul style="list-style-type: none"> <li>➤ Observe the following measures for operation with substances containing solvents that can form an explosive mixture with air.</li> <li>➤ Make sure that only solvents with an auto-ignition temperature below 200 °C / 392 °F will be aspirated. In the case of solvent mixtures, use the auto-ignition temperature of the material with the lowest auto-ignition temperature.</li> <li>➤ Ensure that the technical ventilation of the installation site is active, in particular when emptying the condensate catchpot of the vacuum pump.</li> <li>➤ When using the pump module, connect an extraction system to the provided exhaust port as described in the mounting instructions of the pump module (Art. no. 7001-0401).</li> </ul>

### 2.6.2.3 Technical ventilation (extraction)

The operator shall provide active extraction (technical ventilation according to country-specific regulations (TRBS 2152 Part 2 for Germany) before commissioning the pump and handling the pump. Extraction must include the entire installation area of the vacuum pump and further system parts like the vacuum drying oven and pump module. Handling the pump must always take place under technical ventilation.




This will prevent spreading of an explosive atmosphere to unprotected areas (power plug of the vacuum pump) outside the defined areas.



	 <b>DANGER</b>
	<p><b>Explosion hazard due to the spread of an explosive atmosphere to unprotected areas of the pump (power plug) or the vacuum drying oven and ignition due to electric sparking or hot surfaces.</b></p> <p><b>Serious injury or death from burns and / or explosion pressure or by poisoning.</b></p> <ul style="list-style-type: none"> <li>➤ Provide active suction (technical ventilation according to country-specific regulations (TRBS 2152 Part 2 for Germany) prior to commissioning the vacuum pump</li> <li>➤ Extraction must include the entire installation area of the vacuum pump and further system parts like the vacuum drying oven and pump module.</li> <li>➤ When using the pump module, connect an extraction system to the provided exhaust port as described in the mounting instructions of the pump module (Art. no. 7001-0401).</li> </ul>

#### 2.6.2.4 Equipotential bonding according to the grounding concept

The walkable installation and operating surface of the devices must be conductive. This installation and operating surface must be connected to the vacuum pump and other system parts like the vacuum drying oven and pump module according to the grounding concept (chap. 6.5). Cyclic measurements of the equipotential bonding are required.

 	 <b>DANGER</b>
	<p><b>Explosion hazard by electric sparking due to missing or improperly implemented equipotential bonding.</b></p> <p><b>Serious injury or death from burns and / or explosion pressure or by poisoning.</b></p> <ul style="list-style-type: none"> <li>➤ Connect all equipment elements in the installation and operating area (VDL vacuum drying oven / pump module / vacuum pump) with the conductive surface and/or with each other. Proceed according to the grounding concept (chap. 6.5).</li> <li>➤ Measure the equipotential bonding prior to commissioning the equipment.</li> <li>➤ Provide cyclic measurements of the equipotential bonding.</li> </ul>

#### 2.6.2.5 Accessibility to the disconnection from the power supply



To completely separate the VAP 5 vacuum pump from the power supply, you can disconnect it from the power supply turning off the main power switch (7). Install the device in a way that the main power switch (red off switch) is easily accessible and can be easily reached in case of a danger. (Chap. 5.6, 8.3).



In addition, you can disconnect the power plug. A customer's emergency stop switch or a comparable power disconnecter can also be used in case of a danger.

The device's power plug is unprotected. The electrical connection must therefore be established outside a zone.

## 2.6.3 Safety instructions on operating the vacuum pump

### 2.6.3.1 Measures against hazards caused by voltage



	 <b>DANGER</b>
	<p><b>Electrical hazard by touching live device parts.</b>  <b>Deadly electric shock.</b></p> <ul style="list-style-type: none"> <li>➤ Make sure that the vacuum pump has been professionally connected (chap. 6.6)</li> <li>Ø Do NOT open the vacuum pump.</li> <li>Ø Do NOT put ANY objects, especially no metallic objects) into slots or openings of the device</li> <li>Ø Do NOT operate the device when the housing is damaged.</li> <li>Ø Do NOT operate the device when housing parts are missing.</li> <li>Ø Do NOT operate the device when the power cable is damaged.</li> <li>➤ If there is an obvious malfunction, disconnect the device from the power supply.</li> </ul>

	 <b>DANGER</b>
	<p><b>Electrical hazard by water entering the device.</b>  <b>Deadly electric shock.</b></p> <ul style="list-style-type: none"> <li>Ø The device must NOT become wet during operation, cleaning, or maintenance.</li> <li>Ø Do NOT install the device in damp areas or in puddles.</li> <li>Ø Set up the device in a splash-proof manner.</li> </ul>

The devices were produced in accordance with VDE regulations and were routinely tested in accordance to VDE 0411-1 (IEC 61010-1). There is no risk to the user from temporary voltage surges.

### 2.6.3.2 Measures against hazards caused by hot surfaces

During and after operation, high temperatures occur on the motor housing and the surrounding areas. In normal operation, the motor housing can reach a surface temperature of approx. 90 °C. Contact may cause burns.

	 <b>CAUTION</b>
	<p><b>Danger of burning when touching the hot inner surfaces during operation.</b>  <b>Burns.</b></p> <ul style="list-style-type: none"> <li>Ø Do NOT touch the motor housing and surrounding areas during and after operation.</li> <li>➤ Do NOT touch the motor housing and surrounding areas when operating the main power switch.</li> </ul>

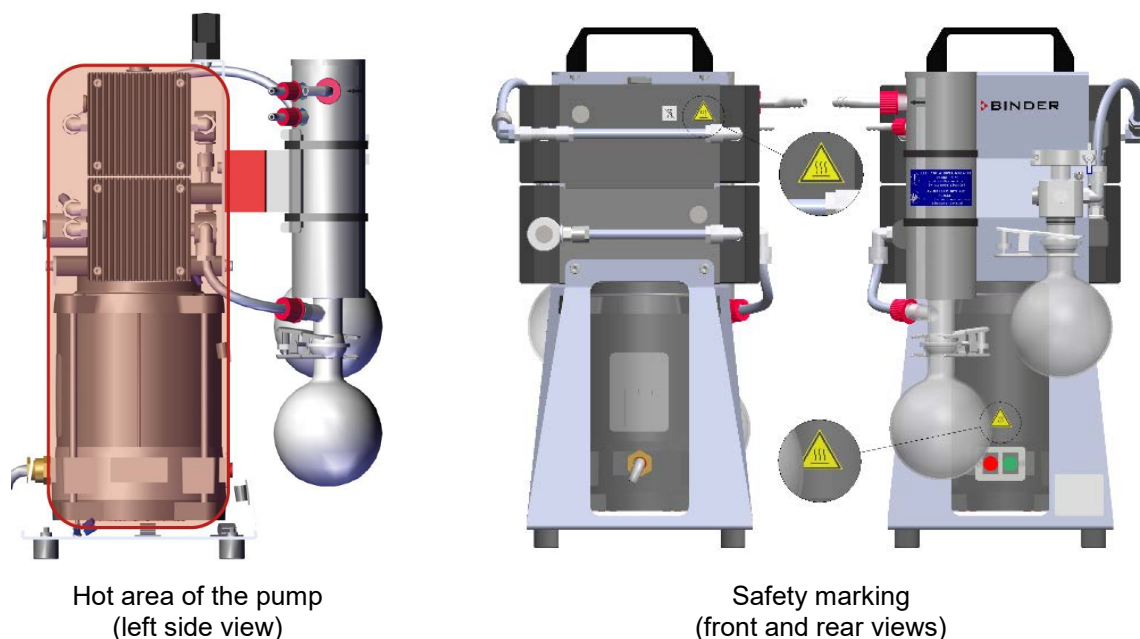





Figure 7: Hot areas and marking on the VAP 5 vacuum pump

### 2.6.3.3 Measures against hazards from cold surfaces



When used with very cold coolant, surfaces such as those on the user's supply and discharge lines can reach very low temperatures and cause cold burns.

 	<div style="background-color: yellow; text-align: center; padding: 5px;">  <b>CAUTION</b> </div> <p><b>Danger of injury by freezing on when touching cold device parts during operation.</b>  <b>Local frostbite</b></p> <ul style="list-style-type: none"> <li>⊘ Do NOT directly touch the user's supply and discharge lines for the refrigerant during operation.</li> <li>➤ Wear protective gloves, if appropriate.</li> </ul>
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### 2.6.3.4 Observe the maximum gas suction temperature

**The VAP 5 vacuum pump is designed for a gas inlet temperature of 40 °C / 104 °F max. Do NOT exceed this temperature.**


The temperature of the gases and vapors aspirated must not exceed the allowable suction temperature of 40 °C when entering the pump. If the gas suction temperature is too high, the temperature of the solvent and the ignition temperature of the solvent may be exceeded due to compression in the pump and subsequent heating. If the ignition temperature of a solvent contained in the medium is exceeded, there is an acute risk of fire and explosion.

	<div style="background-color: red; text-align: center; padding: 5px;">  <b>DANGER</b> </div> <p><b>Fire and explosion hazard due to exceeding the solvent's auto-ignition temperature by exceeding the gas inlet temperature.</b>  <b>Damage to the vacuum pump. Serious injury or death from burns and / or explosion pressure.</b></p> <ul style="list-style-type: none"> <li>➤ Make sure that the temperature of the aspired media does NOT exceed 40 °C / 104 °F.</li> <li>➤ With a higher inlet temperature above 40 °C / 104 °F, take appropriate measures to cool down the aspired vapor before its entry to the vacuum pump.</li> <li>➤ Ensure adequate ventilation around the device.</li> </ul>
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### 2.6.3.5 Measures against condensation by pumping vapors

Condensation may form in the pump's pumping area in vapor applications. If required by the application, a condenser must be installed upstream to protect the pump. The operator must define how it is to be used. Condensation can significantly reduce the service life of the components, especially the membranes.

A device at operating temperature reduces condensation in the pumping area. Using the gas ballast (chap. 6.4.2) can prevent the formation of condensation within the pump.




	<b>NOTICE</b>
	<p><b>Risk of reducing the service life of components due to condensation in the pump discharge area.</b></p> <p><b>Damage to the vacuum pump.</b></p> <ul style="list-style-type: none"> <li>➤ Make sure that the maintenance intervals for membrane replacement are adapted to the application.</li> <li>➤ If necessary, install a condenser upstream to prevent condensation in the pump discharge area</li> <li>➤ Use the gas ballast with applications with vapors.</li> <li>➤ Make sure that the device is at operating temperature before starting applications.</li> </ul>


In applications that can reduce the service life of the membranes, it is possible to purge the drive chamber with inert gas. When using the purge, the inert gas prevents the formation of an explosive atmosphere in the drive chamber in the event of a fault (membrane rupture). It is recommended to always use the drive chamber purge system.

	 <b>DANGER</b>
	<p><b>Explosion hazard due to entry of explosive atmosphere into the drive chamber in the event of membrane rupture</b></p> <p><b>Serious injury or death from burns and / or explosion pressure.</b></p> <ul style="list-style-type: none"> <li>➤ Make sure that the maintenance intervals for membrane replacement are adapted to the application.</li> <li>➤ Make sure that the membrane is always replaced promptly and correctly.</li> <li>➤ If necessary, purge the drive chamber with inert gas (recommended).</li> </ul>

### 2.6.3.6 Ventilation precautions

Sudden aeration can cause the vacuum pump to burst. Splinters can seriously injure the user.

 	 <b>WARNING</b>
	<p><b>Risk of injury due to Bursting due to sudden aeration.</b></p> <p><b>Injuries.</b></p> <ul style="list-style-type: none"> <li>➤ Check the pressure before disconnecting the pneumatic connections</li> <li>➤ Only use the vacuum-proof and shatter-proof glass apparatus supplied.</li> </ul>

	<p>Even when the pump is switched off, there may still be a vacuum!</p>
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## 2.6.4 Safety instructions on inert gas supply

When operating the vacuum pump with inert gas correctly follow the technical ventilation measures according to the local and national regulations relevant for your country (for Germany: DGUV guidelines 213-850 on safe working in laboratories, issued by the employers' liability insurance association).



Do not start up the vacuum pump without active technical ventilation.

During operation with inert gas the device is supplied with an oxygen displacing gas (e.g. N<sub>2</sub>). The gas escaping from the system must therefore be extracted from the installation area using a suitable extraction system.

Inert gases in high concentrations are hazardous to health. They are colorless and almost odorless and therefore practically imperceptible. Inhalation of inert gases can cause drowsiness up to respiratory arrest. When the O<sub>2</sub> content of the air decreases below 18%, there is risk of death from lack of oxygen. Any gas that might escape has to be led out via good room ventilation or a suitable exhaust system.



**DANGER**

**Suffocation hazard due to high concentration of inert gas.**

**Death by suffocation.**

- Ø Do NOT set up the device in non-ventilated recesses.
- Make sure that technical ventilation measures are active.
- Respect the relevant regulations for handling inert gases.
- When decommissioning the vacuum pump, shut off the inert gas supply.

## 2.6.5 Safety instructions on the aspirated media

Familiarize yourself with any potential health risks caused by aspirated gases and vapors. Take adequate measures to exclude such risks prior to putting the device into operation.

This device is not suitable to aspirate substances with an auto-ignition temperature below 200 °C / 392 °F. Substances falling under explosion group / gas group IIC are not permitted (e.g. carbon disulfide, hydrogen). Combustible dusts are generally not permitted, neither in the vicinity nor as aspirated media.



**DANGER**

**Explosion hazard due to unsuitable aspirated media.**

**Serious injury or death from burns and / or explosion pressure.**

- Ø Do NOT aspirate any substance with an auto-ignition temperature below 200 °C / 392 °F
- Ø Do NOT aspirate combustible dusts.
- Ø Do NOT aspirate any substance which tends towards exothermal decomposition.
- Ø Do NOT aspirate any substance which comes under the explosive substance law.
- Ø Do NOT aspirate any substance which could lead to release of toxic gases.

Familiarize yourself with the physical and chemical properties of the aspirated media, as well as the contained moisture constituent and its behavior with changes in pressure. No dangerous chemical reactions must occur during the drying process.




**DANGER**



**Fire and explosion hazard caused by chemical reactions with changes in pressure.**


**Serious injury or death from burns and / or explosion pressure.**

- Make sure that no dangerous chemical reactions of the aspirated media can occur in the vacuum pump.


	Familiarize yourself with any potential health risks caused by the charging material, the contained moisture constituent or by reaction products that may arise during the drying process. Take adequate measures to exclude such risks prior to putting the vacuum pump into operation
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Hazardous substances in the medium to be pumped can endanger the health of persons. Contamination of the device by toxic, infectious or radioactive substances must be prevented.

	<div style="background-color: orange; text-align: center; padding: 5px;">  <b>WARNING</b> </div> <p><b>Danger of intoxication and infection through contamination of the device with toxic, infectious or radioactive substances.</b></p> <p><b>Damages to health.</b></p> <ul style="list-style-type: none"> <li>➤ Protect the interior of the device from contamination by toxic, infectious or radioactive material.</li> <li>➤ Take appropriate protective measures when introducing and removing toxic, infectious or radioactive material.</li> <li>➤ Follow the safety instructions and warnings for handling hazardous substances and the safety data sheets of the manufacturers of hazardous substances.</li> <li>➤ Ensure that NO toxic or polluting substances can escape from the pump</li> </ul>
---	---

	Hazardous substances should be separated before entering the pump in accordance with the technical possibilities.
---	---

## 2.7 Operator responsibility, documentation, and measures

	This is NOT an exhaustive list of the required measures and documents! Follow applicable national and international regulations.
---	--

The device is intended for commercial use. The operator must know, comply with, and implement the relevant regulations on occupational safety. In particular, this includes the conditions of the Industrial Safety Regulation 1999/92/EC (Title: Improvement of the Health Protection and Safety of Workers Who May Be Endangered by Explosive Atmospheres). Known as ATEX 137, this directive was implemented in Germany through the Industrial Safety Regulation (BetrSichV) and the Ordinance on Hazardous Substances (GefStoffV).

### 2.7.1 Risk assessment / explosion protection document

First, a **risk assessment** is carried out to determine the hazards that are present where the device is used due to the working conditions. When documenting the risk assessment, the operator must provide specific evidence of the hazards posed by explosive mixtures in the **explosion protection document**.

When creating the explosion protection document, follow applicable national regulations (for Germany: Industrial Safety Regulation (BetrSichV); Ordinance on Hazardous Substances (GefStoffV)).

In particular, the explosion protection document must indicate

- Determination and evaluation of explosion hazards
- Explosion protection plan

The explosion protection plan to be created by the operator represents the entirety of the technical and organizational measures for explosion protection determined and specified on the basis of the risk assessment. These measures should prevent the formation of hazardous explosive mixtures or to limit or prevent their ignition. They should also minimize the spread of an explosion and its effects. (ATEX operator directive 1999/92/EG)

The explosion protection document serves to document the results of the risk assessment in accordance with § 6 Para. 9 GefStoffV (for Germany).

- Classification as explosion protection zones
- Explosion protection measures
- Cooperation with various companies
- Test findings on explosion protection and technical protection measures

### 2.7.2 Employee training and protocols

The operator must ensure that all employees have read and understood the Operating Manual.

Before employees use the vacuum pump for the first time, the operator must provide them with sufficient and suitable information on the hazards presented and measures to be taken in a form and language that is understandable.

This includes the information resulting from the risk assessment:

- Hazards when using the vacuum pump, in particular fire and explosion hazards, functioning of protective devices
- Required protective measures and code of conduct
- Necessity of wearing personal protective equipment, which must be implemented ESD protected, i.e., against electrostatic discharge.
- Procedure for cleaning and repair work
- Measures for operational interruptions, accidents, and first aid for emergencies

The operator must clearly define the responsibilities for installation, operation, troubleshooting, maintenance, and cleaning. It must be ensured that untrained personnel have no access to the device and related work equipment and systems.

The operator must instruct employees with regard to their activity before they begin using the vacuum pump. Following this, further instruction must be provided at regular intervals, at least once per year. The date of each instruction and the names of the instructed persons must be recorded in writing.

It is essential for safe and secure operation of the device that the user be familiar with the safety plan from the manufacturer and the explosion protection plan from the operator.

Do not work on the device or in its surroundings, under any circumstances, after consuming alcohol, drugs, and certain medications which may impair the ability to perceive, assess, and react.

### 2.7.3 Operating instructions issued by the operator

The measures to avoid hazards resulting from the risk assessment (Chap. 2.7.1) are to be specified as **Operating instructions**. Before employees use the vacuum drying oven and related work equipment for the first time, the operator must specify instructions for safe use in one or more operating instructions. These must comply with regulatory requirements and be verified regularly to ensure that they are up to date.

When creating the operating instructions, follow applicable national regulations (for Germany: Industrial Safety Regulation (BetrSichV); Ordinance on Hazardous Substances (GefStoffV)).



Keep these operating instructions with the device at all times in a place where they are clearly visible. They must be comprehensible and written in the language of the employees.



#### 2.7.4 Personal protective equipment



The operator must provide the operating personnel with the necessary protective equipment.

The personal protective equipment (PPE) of the operating personnel must be implemented ESD protected, i.e. against electrostatic discharge.

When using gloves make sure that they are conductive. The same applies for shoes and other elements that can lead to electrostatic charges.

For applications and activities that require this,

use suitable personal protective equipment (PPE). The operator must specify the type and manner of protective equipment.

	<div style="background-color: yellow; padding: 5px; text-align: center;">  <b>CAUTION</b> </div> <p><b>Risk of injury due to work without or with insufficient personal protective equipment. Injuries</b></p> <p>➤ Use personal protective equipment which is suitable for the respective type of work</p>
---	--

#### 2.7.5 Standard Operating Procedures (SOP)

Creating **Standard Operating Procedures (SOP)** is recommended. In particular, this should prevent the **Residual Risks due to incorrect operation** specified in chap. 2.4

When creating Standard Operating Procedures, take into account the information and instructions in this Operating Manual. The risks result from the risk assessment to be undertaken by the operator (chap. 2.7.1). The measures must be determined by the operator of the device based on the risks determined and the respective conditions at the installation site.

#### 2.7.6 Testing and maintenance

The operator must ensure that the device is always in a technically functional state.

Observe the maintenance intervals specified by the manufacturer. If there is above-average strain, the intervals must be shortened accordingly.

The operator must regularly verify that the safety-related devices are functioning correctly.

Document tests with results and measures that were potentially initiated, as well as maintenance and repairs, in a system book.

For testing before commissioning please refer to chap. 7

For recurring tests and maintenance please refer to chap. 7.5, 7.6, 11.3.

#### 2.7.7 Operation log

For safety reasons, keeping an operation log which documents each individual drying process is recommended

The following contents should be entered and recorded:

- Solvent type
- Solvent auto-ignition temperature; in the case of solvent mixtures: solvent with the lowest Auto-ignition temperature
- Drying temperature
- Date
- Signature



### 3. Device description

#### 3.1 Device overview

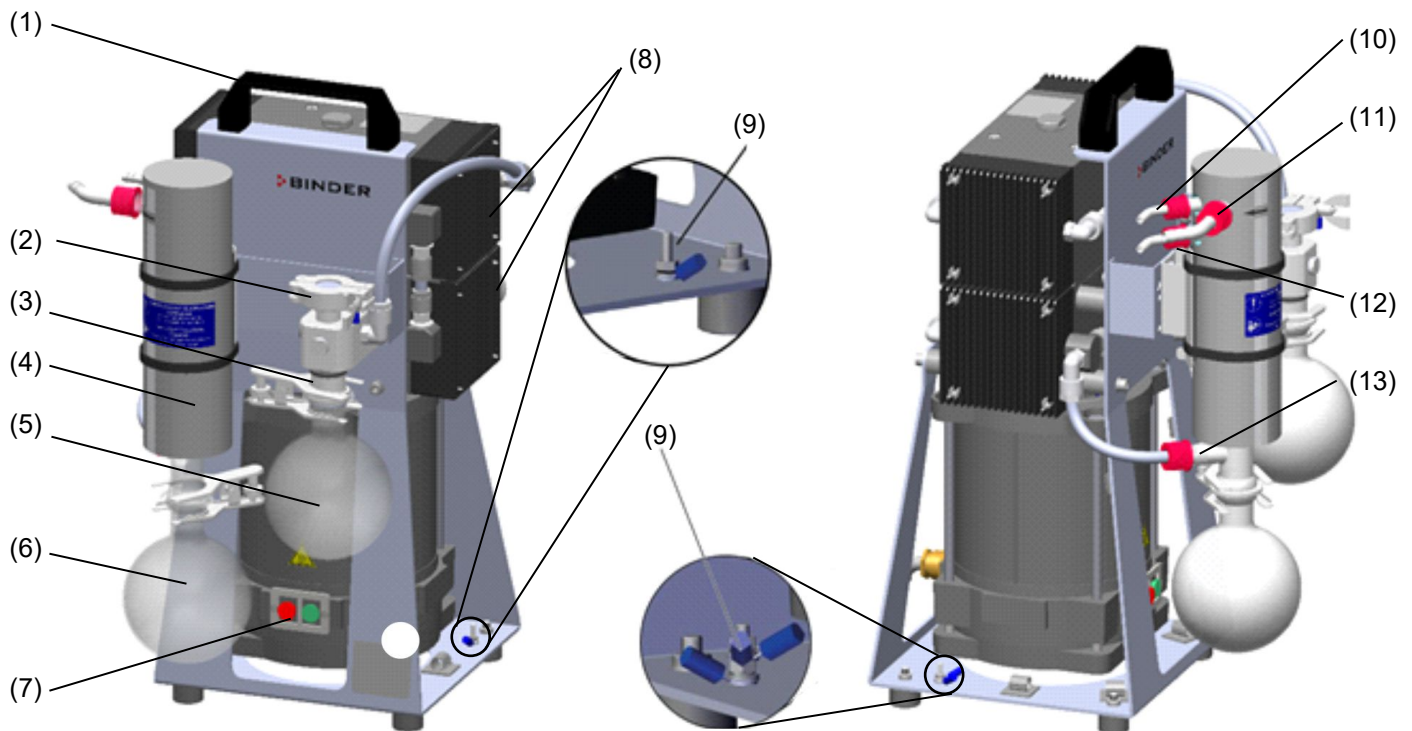


Figure 8: VAP 5 vacuum pump, front (Illustration without equipotential bonding cable)

- (1) Carrying handle
- (2) Pneumatic inlet connection (suction side)
- (3) Conical joint clip
- (4) Emission condenser
- (5) Separator (suction side)
- (6) Condensate catchpot (pressure side)
- (7) On/Off switch (main switch) On switch "green" / Off switch "red"
- (8) Pump unit (4 heads)
- (9) Grounding connections on the pump housing (device delivered with three equipotential bonding cables connected)
- (10) Coolant condenser outlet
- (11) Pneumatic outlet connection (pressure side)
- (12) Coolant condenser inlet
- (13) Safety valve for emission condenser, outlet
- (14) Power plug



All pneumatic connections incl. inlet (suction side) and outlet (pressure side) must always be free of deposits.

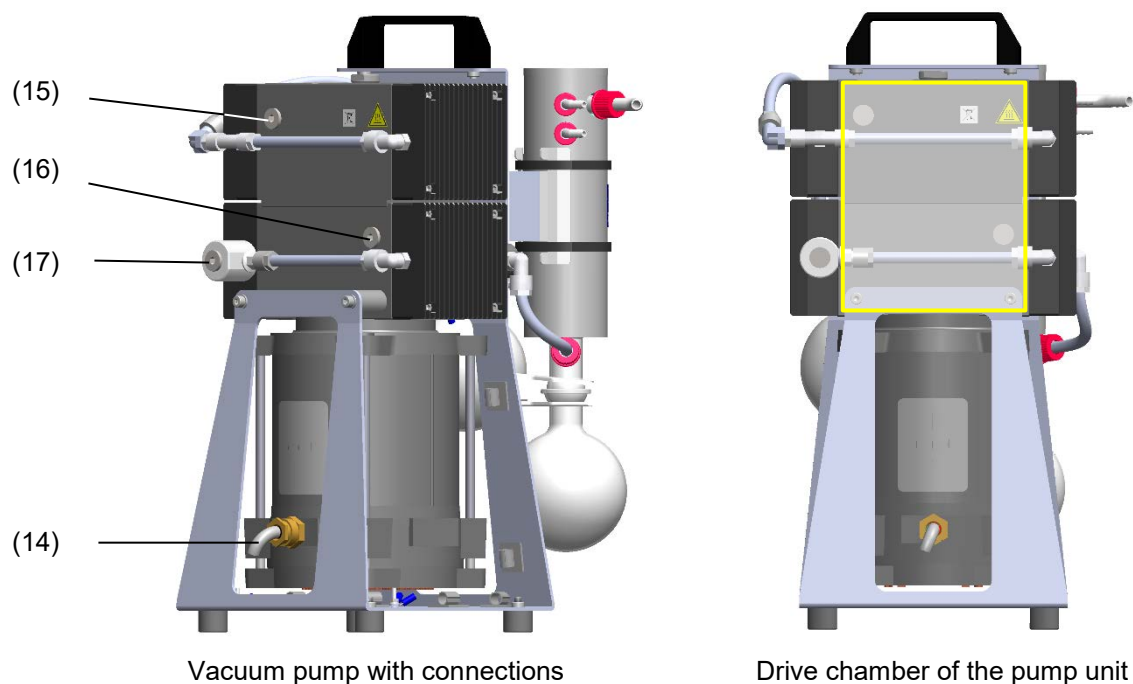


Figure 9: VAP 5 vacuum pump, rear (Illustration without equipotential bonding cable)

- (14) Power cord
- (15) Inert gas connection outlet\* for purging the drive chamber(chap. 6.4.1)
- (16) Inert gas connection inlet\* for purging the drive chamber(chap. 6.4.1)
- (17) Gas ballast inert gas connection(chap. 6.4.2)

\* when delivered closed with screw plugs

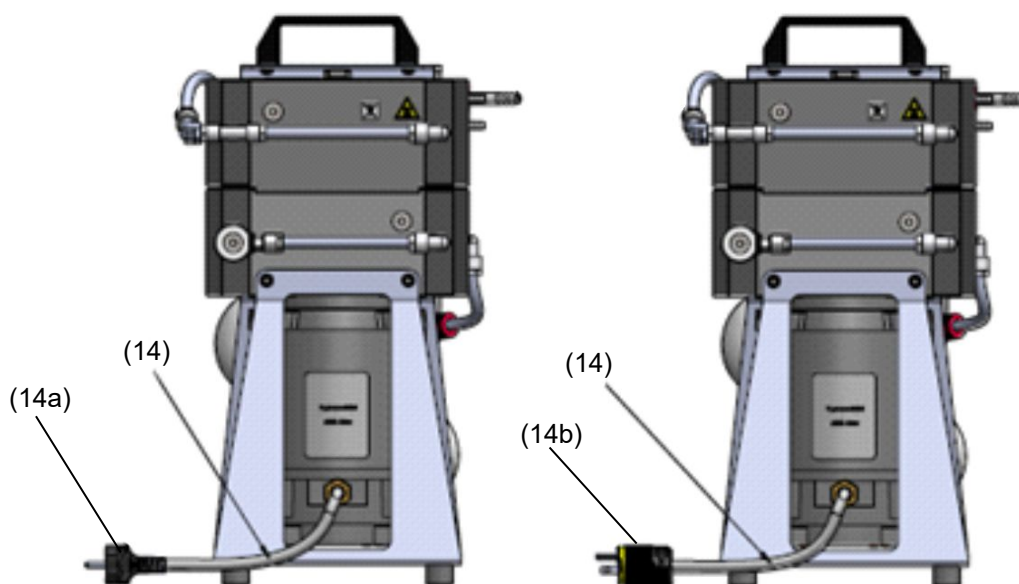


Figure 10: VAP 5 vacuum pump, rear with power connection

- (14) Power connection cable 3m
- (14a) Power plug type CEE 7/7
- (14b) Power plug type NEMA 5-15 P

## 3.2 Description and equipment

The VAP 5 vacuum pump is an explosion-proof chemical membrane pump, pre-assembled with separator, condensate catchpot and emission condenser, suitable for flammable solvents.

It is available in two versions

- 230 V, 50/60 Hz (Art. no. 5013-0220)
- 120 V, 60 Hz (Art. no. 5013-0221)

The VAP 5 vacuum pump is ideal for operation with BINDER VDL vacuum drying ovens. A connection kit is provided for connection to the VDL vacuum drying oven (Art. no. 8012–2029).

### Application area

The VAP 5 vacuum pump serves to aspirate solvents from the BINDER VDL vacuum drying ovens. It is suitable for the suction, pumping and compression of gaseous media (gases and vapors), in particular explosive atmospheres consisting of air and combustible gases, vapors and mists in any mixing ratio.

The pump is suitable for laboratory and industrial use in rough vacuum workspaces. It enables effective and rapid drying of even higher boiling solvents thanks to a high pump volume of 3.9 m<sup>3</sup>/h (230 V) or 3.9 m<sup>3</sup>/h (115 V) and a high ultimate vacuum of 2 mbar. Gases are aspirated, compressed and ejected via the vacuum membrane pump. Condensate-forming media are separated via the glass attachments. The materials used make the pump resistant to a wide range of chemicals.

The VAP 5 vacuum pump must be connected in accordance with the statutory requirements and operated in compliance with the technical data and the intended use. It may be installed and operated in explosion hazardous areas as specified in chap. 3.4.

The VAP 5 vacuum pump is delivered with operating mode S1 (continuous operation with constant load). When operated with the VDL vacuum drying oven, the pump works in continuous operation. The pressure control of the VDL vacuum drying oven controls a valve to the connected vacuum pump and so the set vacuum is reached.

All operating elements of the pump are easy and comfortable to use thanks to their clear arrangement. Major features are easy cleaning of all device parts and easy connection as well as low-noise operation.

The production underlies an internal monitoring according to ATEX Directive 2014/34/EU appendix VIII.

### Ex-classification

The device is equipped with measures for explosion protection.

The Ex-classification of the VAP 5 vacuum pump (assembly) acc. to ATEX Directive 2014/34/EU is:

 **II 2/3/- G IIB T4 Gb/Gc/- X**

The description of explosion protection on the type plate of the entire device determines the classification.

Detailed information on the Ex classification of the assembly and the individual components can be found in chap. 1.6.

The maximum permitted aspiration temperature is 40 °C.

### Temperature class

The temperature class of the interior of the pump (fluid discharge area) acc. to EN 60079-0 is T4. The temperature class of the entire device (assembly) equals the temperature class of the interior.

### Installation site

The VAP 5 vacuum pump may be installed in areas in which explosive atmospheres may occur on a rare and temporary basis. The entire device with the exception of the power plug is classified in category 3 in relation to the environment. The device plug (power plug) is unprotected, therefore the electrical connection must be established outside a zone.

## Construction

The vertically mounted vacuum diaphragm pump consists of a pump unit with four pump heads and a drive with explosion-proof motor, as well as mechanical drive elements. There are also glass attachments.

The **system boundary** divides the device into the following areas:

- Inside: Internal area of the pump unit (fluid pumping area)
- Outside: Outside area of the pump unit (drive chamber) and exterior of the overall unit

## Material

The housing made of steel FR235SRJR / KF12.03 (material no. 1.0038) and RAL 7035 powder-coated. All corners and edges are completely coated.

For the materials of pump parts in contact with the medium see chap. 13.3.

## Glass attachments :separator and condensate catchpot

The separator upstream on the inlet side serves to protect the membrane pump. Condensate and liquid media are collected in the condensate catchpot.

## Emission condenser

The emission condenser is used to condense residual vapors out of the pumped medium and separate them.

## Connections

The pump is fitted with connections for an inert gas purge of the drive chamber and for the gas ballast. There are also connections for coolant. The vacuum connection is made via a flexible metal hose. The power cable has an unprotected safety plug. Two grounding connections (9) are provided to ensure equipotential bonding between the pump parts and with the system. The device is delivered with three equipotential bonding cables connected for equipotential bonding between the pump parts.

## 3.3 Manufacturer's safety plan: Protective measures and equipment

The operator of the device must observe the local and national regulations and take precautions to prevent accidents.

The following measures were taken on the manufacturer's side in order to prevent ignition and explosions.

### Motor thermal protection

The device heats up due to the motor (passive cooling) as well as the temperature of the medium to be pumped and compression heat. It has a resettable thermal protection switch on the motor. This self-retaining bimetal switch disconnects the entire unit from the power supply in the event of overheating.

### Inert gas connections for drive chamber purging (optional protective measure)

Purging the drive chamber of the pump unit with inert gas can prevent the formation of an explosive atmosphere in the drive chamber in the event of a fault (membrane rupture).

Without inert gas purging, the drive chamber is classified as equipment category 3, and with inert gas purging as equipment category 2.

### Inert gas connection for gas ballast (optional protective measure)

Purging of the suction chamber (fluid pumping area within the pump unit) is always required when pumping vapors. Use of the gas ballast can prevent the formation of condensation within the pump.

### Safety valve

There is a safety valve (13) on the gas inlet of the emission condenser. If the pressure side is closed by deposits, the safety valve opens due to the overpressure. The medium is thereby released from the device.



Check the valve seals at regular intervals.

### **Prevention of electrostatic charges / grounding concept**

All parts of the vacuum pump are at a common potential. For this purpose, they are connected ex works with three equipotential bonding cables (chap. 6.5.1)

In addition, the housing must be connected to the equipotential bonding of the system via a grounding connection (chap. 6.5.2).

The device has a cold-device plug with a protective contact. An electrical connection with protective conductor (operating mode S1: suitable for continuous operation) must be provided (chap. 6.6).

The establishment of equipotential bonding of the system in accordance with the manufacturer's grounding concept is mandatory.



You can find a detailed grounding concept for the VDL, the pump module, the VAP 5 vacuum pump and installation and loading area is provided in the operating manual of the VDL vacuum drying oven, chap. 6.8.

All components of the system are prepared for grounding. Then all conductive parts in the system have the same electrical potential

Any clothing, shoes and gloves of the operating personnel must be implemented ESD protected, i.e. against electrostatic discharge.

When installed and operated as intended, there will be equipotential bonding when operating the pump and when emptying the condensate catchpot, and there is no risk of charges that are hazardous to operation. Spark formation is prevented.

### **Mandatory extraction in the installation are of the vacuum pump / the system**

The entire system must be set up with active suction. The operator is responsible for correct installation. He must ensure active suction during operation and when emptying the condensate catchpot of the pump

When using the optional pump module, an extraction system provided by the customer must be connected to the port of the pump module. This keeps the concentration in the pump module low.

### **Construction of the pump module (option)**

The condensate collecting tray provided in the pump module prevents condensate leakage.

### **Further measures to prevent accidents**

- **Indications on the type plate of the assembly**

For Ex classification, temperature classes and electrical data, please refer to the operating manual chap. 1.5.1.

- **Operating manual**

An operating manual is available for each device.

- **Non-ionizing radiation**

Non-ionizing radiation is not intentionally produced, but released only for technical reasons by electrical equipment (e.g. electric motors, power cables, solenoids). The machine has no permanent magnets. If persons with active implants (e.g. pacemakers, defibrillators) keep a safe distance (distance of field source to implant) of 30 cm, an influence of these implants can be excluded with high probability.

- **Protection against touchable surfaces**

Tested according to EN ISO 13732-1:2008.

- **Floors**

See operating manual chap. 5 for correct installation.

- **Cleaning**

See operating manual chap. 9.2.

- **Maintenance**

For maintenance instructions for the user, please refer to operating manual chap. 11

### 3.4 Area classification, information for the zone classification



The operator is to classify the zones.

#### 3.4.1 Area classification inside the VAP 5 vacuum pump

The **inner area of the pump unit** comprises the pumping area of the aspirated medium

It is designed in equipment category 2 and is therefore suitable for the occasional occurrence of an explosive atmosphere.

The **outside area of the pump unit** includes the immediate vicinity of the pump unit and the drive chamber of the pump.

For the surroundings of the vacuum pump see chap. 3.4.2.

The pump drive chamber can be purged by the customer with inert gas. This affects the equipment category:

- **Pump drive chamber without inert gas purging:** Equipment category 3 and therefore suitable for areas in which explosive atmospheres may occur infrequently and for a short period only (fault)
- **Pump drive chamber with inert gas purging:** Equipment category 2 and therefore suitable for occasional occurrence of explosive atmospheres.

If the drive chamber is classified as category 2, the system must include monitoring of the inert gas supply. It is the responsibility of the operator to ensure and monitor purging.

#### 3.4.2 Area classification in the surroundings of the VAP 5 vacuum pump

The VAP 5 vacuum pump, with the exception of the power plug, is classified in category 3 in relation to the environment. It may be installed in areas in which explosive atmospheres may occur on a rare and temporary basis.

The **device plug (power plug)** is unprotected (not explosion protected). Therefore, the electrical connection must be established outside a zone.

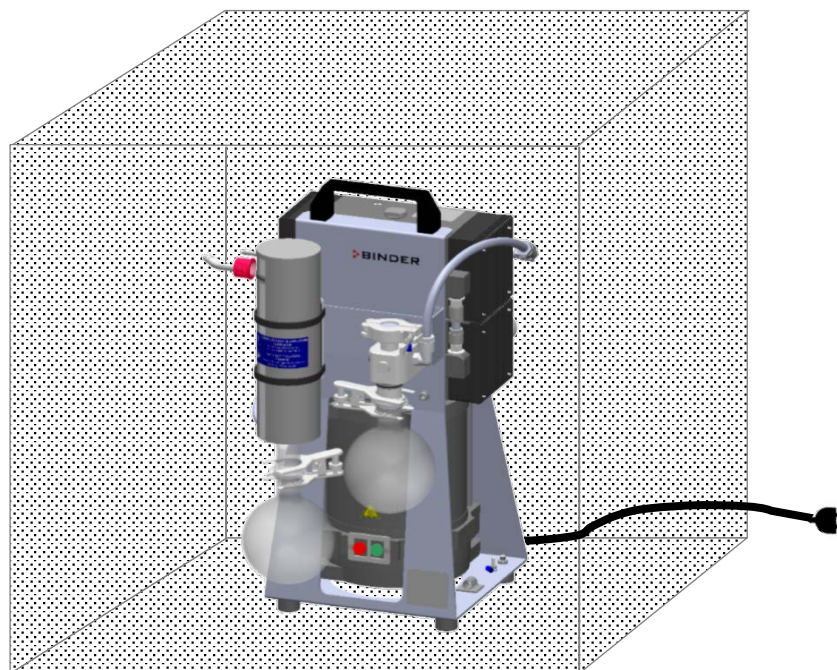



Figure 11: Area classification in the surroundings of the vacuum pump (schematic representation)



Occurrence of an explosive atmosphere:

 **On a rare and temporary basis:** surroundings of VDL and vacuum pump, interior of the pump module

The creation of a zone outside the defined areas must be reliably prevented.

 **Never** (unprotected areas): Connection location of the power plug.

The spread of an explosive atmosphere to unprotected device parts must be reliably prevented.

### 3.4.3 Area classification in the surroundings of the VAP 5 vacuum pump when setting it up in the pump module (optional)

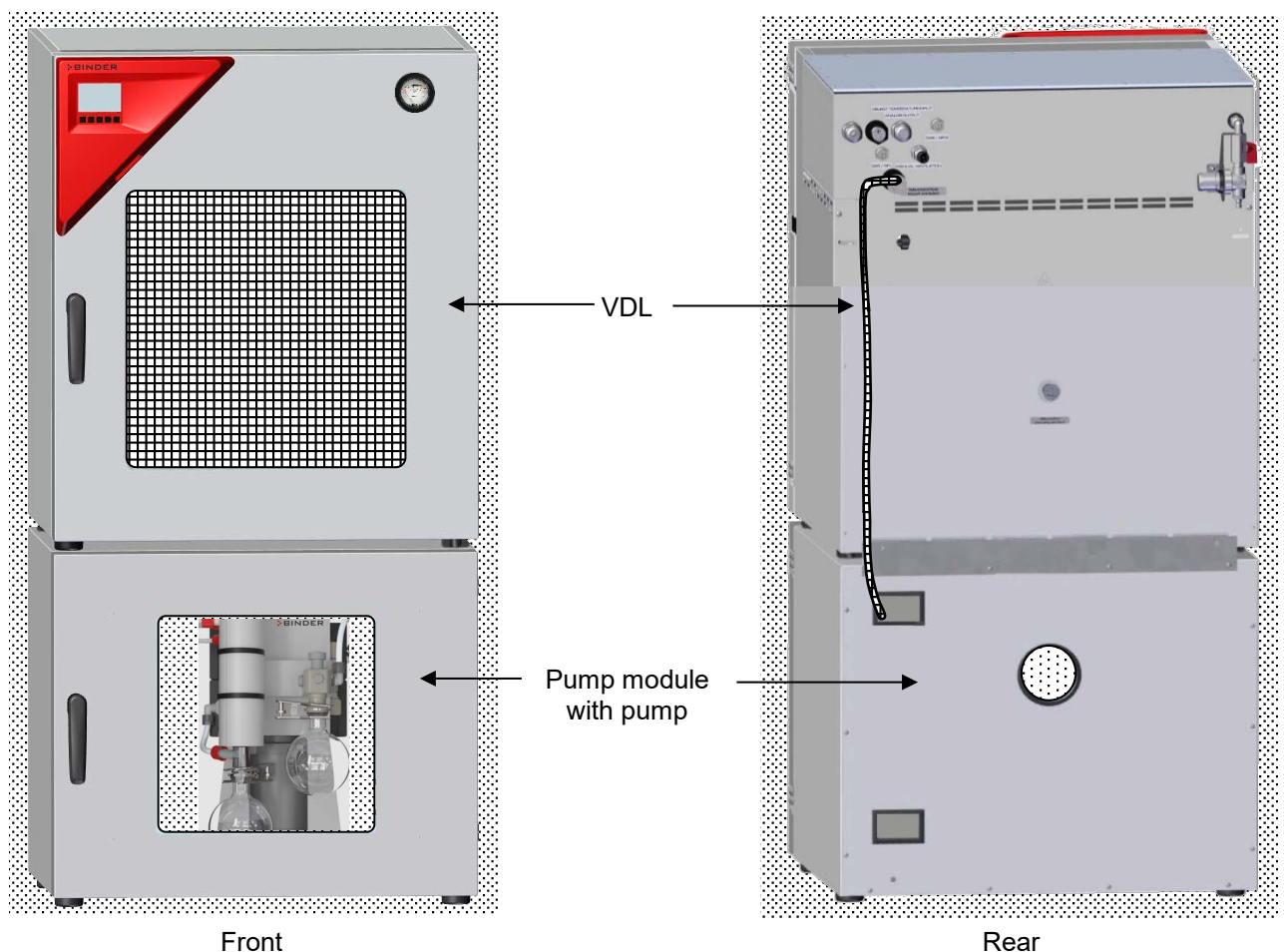




Figure 12: Area classification in the surroundings of the device during operation, installation in the pump module (power cables and plugs not shown)

Occurrence of an explosive atmosphere:

 **Occasionally:** VDL inner chamber, line to the vacuum pump, interior of the pump unit, pump drive chamber with inert gas purging

The creation of a zone outside the defined areas must be reliably prevented.

 **On a rare and temporary basis:** surroundings of VDL and vacuum pump, interior of the pump module, pump drive chamber without inert gas purging

The creation of a zone outside the defined areas must be reliably prevented.

 **Never** (unprotected areas): Connection location of the power plug.

The spread of an explosive atmosphere to unprotected device parts must be reliably prevented.

## 4. Completeness of delivery, transportation, storage, and installation

### 4.1 Scope of delivery

VAP 5 vacuum pump, with pump unit, housing, motor, and glass attachments

- Pump connection with small flange DN 16 (nominal width)
- 2 glass flasks (separator and condensate catchpot),
- 2 fork clamps (conical ground clamps) for the condensate catchpot and separator
- Pneumatic connection (PTFE tube (Polytetrafluorethylene) with 2 angle adjustment pin)
- Emission condenser with insulation, with 2 fastening straps
- Hose shaft DN 8 (nominal width)
- Grounding kit: 2x washer, 1x spring washer, 1x nut each for M4
- Power cable with power plug
- Operating manual

Inert gas connections for drive chamber purging and gas ballast:

- 3 x hose shaft (stainless steel) DN 8
- 12x2 O-ring EPDM (ethylene propylene diene rubber)



ATEX connection kit (option, Art. no. 8012-2029)





- Metal hose (stainless steel) 1.5 m, small flange DN 16
- Seal (stainless steel / FKMO-ring), small flange DN 16
- Clamping ring, small flange DN 10/16 for connection to VDL



In the complete sets consisting of pump, pump module, and connection kit, the connection kit article no. 8012-2029 is already included.

### 4.2 Unpacking, and checking the equipment

Carefully unpack the vacuum pump VAP 5 vacuum pump.

  	<div style="background-color: yellow; text-align: center; padding: 5px;">  <b>CAUTION</b> </div> <p><b>of injury and damages by lifting heavy loads and by sliding or tilting of the pump due to improper lifting</b></p> <p><b>Injuries, damage to the device.</b></p> <ul style="list-style-type: none"> <li>⊘ Do NOT lift the device from connections or glass attachments.</li> <li>⊘ Do not use any technical aids to lift the device.</li> <li>➤ Use 2 people to lift the pump out of the box.</li> <li>➤ Lift the pump by the carrying handle and metal housing parts or the pump unit</li> </ul>
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After unpacking, please check the device and its optional accessories, if any, based on the delivery receipt ...

- for compliance with the provisions of the supply contract (type, connected loads, etc.)
- for completeness of delivery



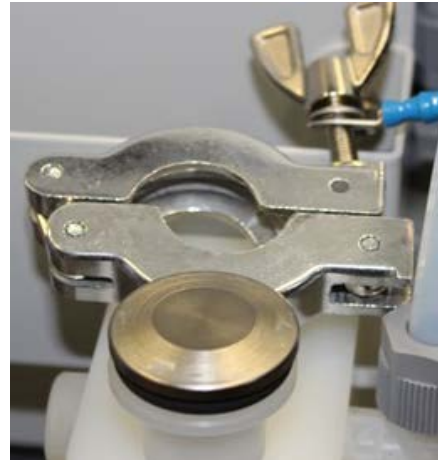
- for transportation damage. Inform the carrier immediately if transportation damage has occurred.

Please remove any transportation protection devices and adhesives in/on the device and on the doors and remove the operating manuals and accessory equipment.

The connection of the pneumatic inlet (suction side) small flange DN 16 is supplied closed with a blind cap and secured with a clamping ring. The pressure side / emission condenser connection is open.



Connection with clamping ring and blind cap  
(delivery condition)



Connection with blind cap after removal  
of the clamping ring

Figure 13: Connection of pneumatic inlet (suction side) in delivery condition

To connect the vacuum hose, you must remove the blind cap from the pneumatic inlet connection (chap. 6.2). Keep it for longer periods of non-use, storage or transport of the pump.



Figure 14: Blind cap and seal with inner centering ring

If you need to return the device, please use the original packing and observe the guidelines for safe lifting and transportation (chap. 4.3). For disposal of the transport packing, see chap. 12.1.



The device must be checked for explosion safety and electrical safety in order to rule out possible transport damage.

#### Note on second-hand devices (Ex-Demo-devices):

Second-hand devices are devices that were used for a short time for tests or exhibitions. They are thoroughly tested before resale. BINDER ensures that the devices is technically sound and will work flawlessly.

Second-hand devices are marked with a sticker as such. Please remove the sticker before commissioning the device.

### 4.3 Guidelines for safe transportation

After operation, please observe the guidelines for temporarily decommissioning (chap. 12.2). You can order transport packing for shipping purposes from BINDER service.

For transport, close the pneumatic inlet connection with the corresponding blind cap with seal supplied (chap. 4.2). If it is no longer present, another suitable protection can be used.

## Ambient conditions

- Permissible ambient temperature range during transport: +5 °C up to +40 °C.
- Permissible ambient humidity during transport: < 90% r.F., non-condensing

## 4.4 Storage

Intermediate storage of the device is possible in a closed and dry room. After operation please observe the guidelines for temporary decommissioning (chap. 12.2).

For storage, close the pneumatic inlet connection with the corresponding blind cap with seal supplied (chap. 4.2). If it is no longer present, another suitable protection can be used.

## Ambient conditions

- Permissible ambient temperature range during storage: +5 °C up to +40 °C.
- Permissible ambient humidity during storage: < 90% r.F., non-condensing

When after storage in a cold location you transfer the device to its warmer installation site, condensation may form. Before start-up, wait at least one hour until the device has attained ambient temperature and is completely dry

## 5. Location of installation and ambient conditions

### 5.1 General requirements for installation


Observe all safety and warning information.

Set up the VAP 5 vacuum pump oven on a flat, even and non-flammable surface, free from vibration, in a well-ventilated, dry location and align it using a spirit level or laser. The site of installation must be capable of supporting the device's weight (see technical data, chap. 13.1). The devices are designed for setting up inside a building (indoor use). Provide active extraction (technical ventilation, chap. 5.2).

Place the pump in a vibration-free position. External mechanical stresses and vibrations must not be transferred to the device

Minimum distances: To cool the pump, maintain a clearance of at least 20 mm to neighboring parts or the walls of the pump module .

Ventilated environment for heat dissipation during normal operation: Set up the VAP 5 vacuum pump at a well-ventilated place.

	<b>NOTICE</b>
	<p><b>Danger of overheating due to lack of ventilation.</b>  <b>Damage to the device.</b></p> <ul style="list-style-type: none"> <li>⊘ Do NOT install the device in unventilated recesses.</li> <li>➤ Ensure sufficient ventilation for dispersal of the heat.</li> <li>➤ Observe the prescribed minimum distances when installing the device.</li> </ul>

### 5.2 Extraction (technical ventilation)

Provide active extraction at the location of installation. The extraction shall be provided as technical ventilation according to country-specific regulations (TRBS 2152 Part 2 for Germany). It must include the entire installation area of the device.

When using the optional pump module, an extraction system to be provided by the client must be connected to the socket of the pump module .

In normal operation, the extraction affects in particular the installation area of the device for the spatial limitation and reduction of any possible explosive atmosphere. Also, in the event of a fault (e.g. if the filled condensate catchpot of the pump falls down), it causes spatial limitation and reduction of any possible explosive atmosphere.

Extraction must be active during the entire operation of the device and when handling the condensate catchpot of the pump. Extraction must lead into an explosion-proof area.

D The operator must ensure active extraction before starting up the device. Extraction must be provided during the entire operation of the device as well as when handling the condensate catchpot of the pump. This ensures that solvent vapors never reach unprotected areas or accumulate in an impermissible manner.

If the technical ventilation fails, the power to the VAP 5 vacuum pump must be switched off. It must be ensured that the device can be switched off by the operator using an explosion-protected device: Turn off the pump at the main power switch (7) (red switch), pull out the power plug or operate e.g., a customer's explosion-protected emergency stop switch.

### 5.3 Information on equipotential bonding

The accessible installation and operating surface of the devices must be electrically conductive. This installation and operating surface must be connected to the VAP 5 vacuum pump and other equipment (e.g. pump module, VDL vacuum drying oven) according to the grounding concept. Provide cyclic measurements.

For the grounding concept see chap. 6.5.

Upon entering the installation area, note that there may be a potential equalization. The personal protective equipment (PPE) of the operating personnel must be implemented ESD protected, i.e. against electrostatic discharge.

### 5.4 Ambient conditions



- Permissible ambient temperature during operation: +10 °C up to +40 °C.
- Permissible ambient humidity during operation: 70 % r.h. max., non-condensing
- Installation height: max. 2000 m / 6562 ft above sea level.
- There must be no conductive dust in the environment, as per the design of the device in accordance with pollution degree 2 (IEC 61010-1).

### 5.5 Permissible areas / zones in the installation area


- The **VAP 5 vacuum pump** may be installed in areas in which explosive atmospheres may occur on a rare and temporary basis. The entire device with the exception of the power plug is classified in category 3 in relation to the environment.
- The device plug (power plug) is unprotected. Therefore, the electrical connection must be established outside a zone.

The VAP 5 vacuum pump is not intended for installation in a Zone 1 or 0. It must not be installed or operated in an occasionally or continuously / for long periods / frequently potentially explosive area. Measures must be taken to prevent the spread of explosive atmospheres to unprotected areas. Spreading of an explosive atmosphere to the unprotected areas must be reliably prevented. Observe the information on zone classification (chap. 3.4).

Observe the instructions on extraction (technical ventilation, chap. 5.2). When installed as intended, there is no Zone 1 or 0 in the vicinity of the device.

	 <b>DANGER</b>
	<p><b>Explosion hazard by penetration of an explosive atmosphere to unprotected areas. Serious injury or death from burns and / or explosion pressure.</b></p> <ul style="list-style-type: none"> <li>Ø Do NOT operate the device in occasionally or continuously / for long periods / frequently potentially explosive areas. It is not intended for installation in a zone 1 or 0</li> <li>➤ Make sure that there are NO combustible dusts in the vicinity of the device</li> <li>➤ Make sure that air-solvent mixtures are NOT occasionally or continuously / for long periods / frequently in the vicinity of the device.</li> <li>➤ Strictly observe the relevant legal regulations about how to select an appropriate location.</li> </ul>

The operator is responsible for the correct installation of the VAP 5 vacuum pump (zone classification). Sufficient extraction (technical ventilation, chap. 5.2) also in the event of an error (e.g. damage / overfilling the condensate catchpot of the pump, or spilling or dropping containers or material to be loaded with solvents) must be provided.

	<p>Follow country-specific regulations for explosion protection.</p>
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With the optional pump module, the VAP 5 vacuum pump will be delivered in a separate box and must be fitted into the module and connected at the place of installation (chap. 6).



## 5.6 Accessibility of the main power switch / emergency stop

The main power switch (7) is located on the front of the vacuum pump.


To completely separate the VAP 5 vacuum pump from the power supply, you can turn off the main power switch (7). Install the device in a way that the main power switch is easily accessible and can be easily used in case of danger.

In addition you can disconnect the power plug. It is also possible to use a customer's explosion-protected emergency stop switch or a comparable power disconnecter.

The device plug (power plug) is unprotected (not explosion protected). It must therefore be connected outside the installation area of the device so that it can be pulled safely in the event of a fault.

	 <b>DANGER</b>
	<p><b>Explosion hazard due to sparking when disconnecting an improper electrical connection. Serious injury or death from burns and / or explosion pressure</b></p> <ul style="list-style-type: none"> <li>➤ Make sure that the electrical connection is located outside a zone.</li> <li>➤ In hazardous situations, disconnect the device from the power supply by pressing the main switch (7).</li> <li>➤ Connect the plug outside the installation area of the pump. Take into account the information on zone classification.</li> </ul>

## 5.7 Fire extinguisher

	<p>During operation a fire extinguisher must be available.</p>
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## 5.8 Lightning protection device

The building in which the VAP 5 vacuum pump is installed must have a lightning protection system. All internal connections in the operator's building must contain lightning protection in accordance with EN/IEC 62305-3.

Lightning protection measures must be taken in order to prevent melting and spraying effects. The operator's zone classification shall be used to plan lightning protection measures. The lightning discharge paths must be designed so that heat or ignitable / spray sparks cannot become the ignition source for an explosive atmosphere.

## 6. Installation and connections

### 6.1 Installation in the pump module (optional)

Place the vacuum pump in the pump module.

To establish a conductive connection between the vacuum pump and the pump module a grounding cable is supplied, which is already fixed at the pump module. Connect it to the pump using the supplied parts (grounding kit, chap. 6.5.2).



The mounting instructions Art. no. 7001-0401 supplied with the pump module offers detailed information on the pump module installation.



**DANGER**

**Explosion hazard due to electric sparking due to missing or improperly implemented equipotential bonding.**

**Serious injury or death from burns and / or explosion pressure.**

- Connect all elements in the installation and loading area (VDL / pump module / pump) with the conductive surface and/or with each other. Proceed according to the grounding plan in chap. 6.5
- installation of the pump module proceed acc. to the mounting instructions of the pump module (Art. no. 7001-0401).

### 6.2 Vacuum connection



The ATEX Connection kit (option, Art. no. 8012-2029) is required to establish the vacuum connection to the VDL.

The connection of the pneumatic inlet (suction side) small flange DN 16 is supplied closed with a blind cap and secured with a clamping ring.

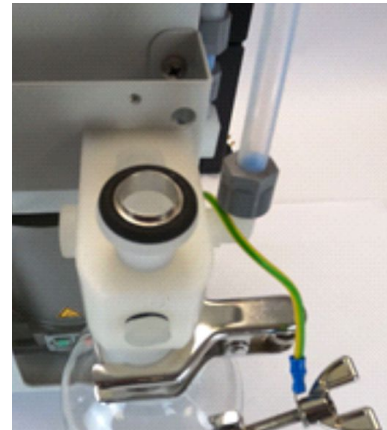
Loosen the wing screw and remove the clamping ring.

Do NOT remove the grounding cable!

Remove and retain the blind cap. The seal remains on the connection.



Connection with clamping ring and blind cap  
(delivery condition)



Connection with seal after removal  
of the clamping ring and the blind cap

Figure 15: Pneumatic inlet connection, preparation

The ATEX connection kit contains a flexible metal hose made of stainless steel, small flange DN 16.

For installation in the pump module: Feed the hose through the hose passage at the rear of the pump module.

Place the hose on the sealing ring at the pneumatic inlet connection and secure the connection again with the clamping ring.






Attaching the vacuum hose



Vacuum pump with hose connected

Figure 16: Connection of the vacuum hose to the pneumatic inlet connection


The pneumatic connection must be carried out correctly so that no leaks occur.

 	<div style="background-color: red; color: white; padding: 5px; text-align: center;">  <b>DANGER</b> </div> <p><b>Explosion hazard due to electric sparking due to missing or improperly implemented equipotential bonding.</b></p> <p><b>Serious injury or death from burns and / or explosion pressure.</b></p> <ul style="list-style-type: none"> <li>➤ Ensure that the grounding cable remains fitted to the vacuum connection.</li> <li>➤ Check that the grounding cable is firmly attached after connection</li> </ul>
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Do NOT exceed the following pressures:

- Maximum permissible inlet pressure at the pneumatic inlet (suction side): 1 bar.
- Maximum permissible generated overpressure at the pneumatic outlet connection (pressure side): 1 bar

	<b>NOTICE</b>
	<p><b>Danger of damage due to exceeding the maximum permitted pressure.</b></p> <p><b>Damage to the device.</b></p> <ul style="list-style-type: none"> <li>Ø Make sure that the maximum permissible pressure of 1 bar at the pneumatic inlet is NOT exceeded.</li> <li>Ø Make sure that the overpressure generated at the pneumatic outlet connection (pressure side) does NOT exceed 1 bar.</li> </ul>

### 6.3 Coolant connection

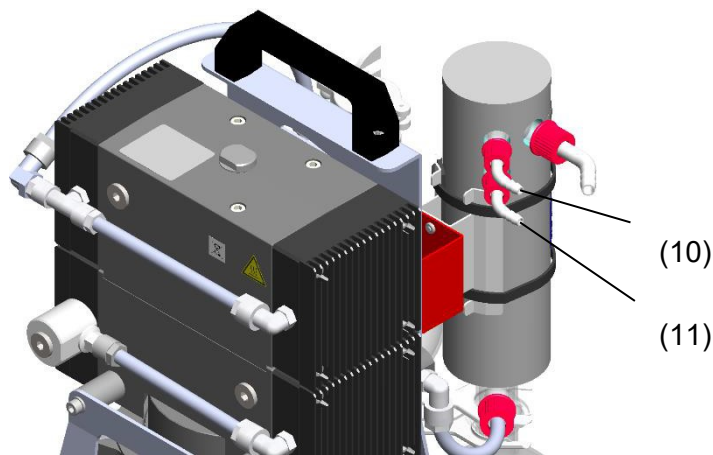


Figure 17: Coolant inlet and outlet (rear view)

- (10) Coolant condenser outlet, with hose shaft GL 14
- (11) Coolant condenser inlet, with hose shaft GL 14 overall length??

#### Procedure:

Connect the coolant supply to the inlet (11). Connect the drain to the outlet (10).

### 6.4 Inert gas connections (optional)

The pump is fitted with inert gas connections for drive chamber purge and gas ballast. The required connection parts (hose shafts and O-rings) are included in the scope of delivery. Both connections are independent of each other and can also be established individually.





An inert gas connection for the pump drive chamber must be independent of an inert gas connection for gas ballast. Serial connection is not allowed.

When using inert gas, follow the technical ventilation measures according to the local and national regulations relevant for your country (for Germany: DGUV guidelines 213-850 on safe working in laboratories, issued by the employers' liability insurance association).


The inert gas must be particle-free and dry (e.g. nitrogen N<sub>2</sub>).


When operating with inert gas, the device is supplied with an oxygen displacing gas, e.g., N<sub>2</sub>. Inert gases in high concentrations are hazardous to health. They are colorless and almost odorless and therefore practically imperceptible. Inhalation of inert gases can cause drowsiness up to respiratory arrest. When the O<sub>2</sub> content of the air decreases below 18%, there is risk of death from lack of oxygen.

Any gas that might escape has to be led out via good room ventilation or a suitable exhaust system.

	 <b>DANGER</b>
	<p><b>Risk of suffocation by inert gas in a high concentration.</b>  <b>Death by suffocation.</b></p> <ul style="list-style-type: none"> <li>➤ Ensure that technical ventilation measures are activated.</li> <li>➤ Respect the relevant regulations for handling inert gases.</li> <li>➤ When decommissioning the vacuum pump, turn off the inert gas supply.</li> </ul>

The inert gas must be connected to the respective inert gas connection (16) or (17) via a pressure reducer to be installed by the customer.

	<p>The max. connection pressure of the inert gas is 1100-1150 mbar overpressure to ambient pressure.</p>
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	<b>NOTICE</b>
	<p><b>Risk of damage due to excessively high connection pressure of the inert gas.</b>  <b>Damage to the device.</b></p> <p>Ø DO NOT exceed the maximum connection pressure of the inert gas of 1100–1150 mbar overpressure to ambient pressure..</p>

#### 6.4.1 Inert gas connections for purging the drive chamber

Purging the drive chamber with inert gas is an optional protective measure. Purging the drive chamber of the pump unit with inert gas can prevent the formation of an explosive atmosphere in the drive chamber in the event of a fault (membrane rupture). This is particularly useful in applications that can reduce the service life of the membranes. It is recommended to always use the drive chamber purge system.

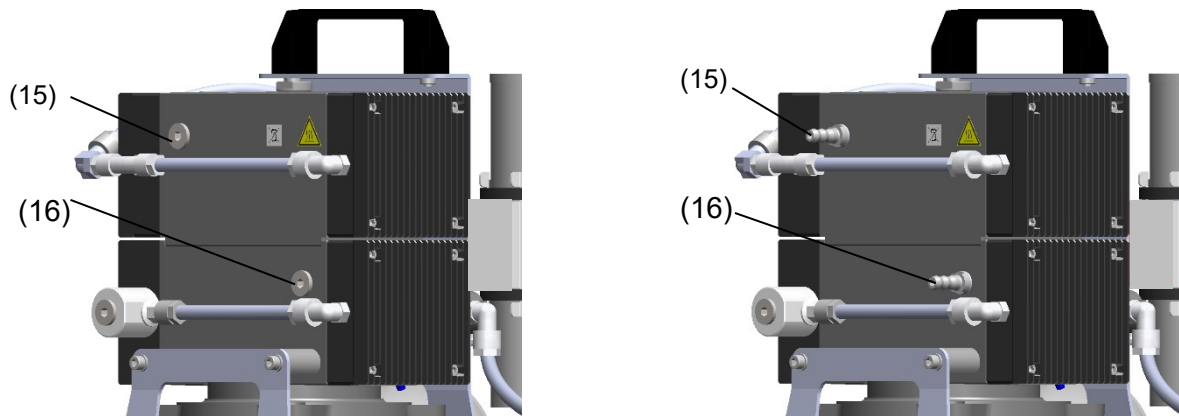
Inert gas purging affects the equipment category of the drive chamber:

- **Pump drive chamber without inert gas purging:** Equipment category 3 and therefore suitable for areas in which explosive atmospheres may occur infrequently and for a short period only (fault)
- **Pump drive chamber with inert gas purging:** Equipment category 2 and therefore suitable for occasional occurrence of explosive atmospheres.

	<p>If the drive chamber is classified as category 2, the system must include monitoring of the inert gas supply. It is the responsibility of the operator to ensure and monitor purging.</p>
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The inert gas is fed in at the inert gas connection inlet (16) of the drive chamber and is discharged via the inert gas connection outlet (15) of the drive chamber.





Delivered with screw plugs

Installed hose shafts

Figure 18: Inert gas connections for purging the drive chamber

- (15) Inert gas connection outlet for purging the drive chamber and volume flow monitoring
- (16) Inert gas connection inlet for purging the drive chamber

Both connections are supplied closed with screw plugs.

The connection must always be established on both terminals (15) and (16). Operation with one or both open inert gas connections is not permitted.



When the inert gas connections for drive chamber purging are not in use, they must ALWAYS be closed with the screw plugs. Operation with open inert gas connections for drive chamber purging is NOT permitted.

#### Connection:

- Remove and retain screw plugs with seal from connections (15) and (16)
- Screw the supplied hose shafts DN 8 with seal into both connections in a gas-tight manner.
- Plug the hose of the inert gas supply into the inert gas connection inlet (16)
- Plug the hose for discharging the inert gas into the inert gas connection outlet (15)
- Secure each of the attached hoses with a hose clamp
- Place the hose for discharging the inert gas in such a way that escaping inert gas is safely discharged, e.g. by means of a suitable connection to an extraction system.

#### Volume flow monitoring:

Use suitable measuring equipment to monitor the volume flow at the inert gas connection outlet (15) of the drive chamber. A change in the inert gas flow rate may indicate a membrane rupture (fault). In this case, the aspirated medium can enter the drive chamber and the environment and cause an explosive atmosphere. In the event of a fault, the application must be stopped immediately and safety must be restored (chap. 11.5).



**DANGER**

**Explosion hazard due to the occurrence of an explosive atmosphere in the event of a membrane rupture.**

**Serious injury or death from burns and / or explosion pressure.**

- Make sure that flow monitoring is active at the inert gas connection outlet (15) of the drive chamber.
- If the flow rate changes, switch off the pump immediately.
- Determine the cause and rectify it.

## 6.4.2 Gas ballast inert gas connection

Use of the gas ballast can prevent the formation of condensation within the pump. Use the gas ballast with applications with vapors.

Depending on the environment of the pump and the type of materials aspirated, the inert gas connection for gas ballast offers the option of inerting only the suction chamber and subsequently the atmosphere on the outlet side condensate catchpot without having to inert and thus monitor the drive chamber at the same time. Of course, the inert gas connections for drive chamber purging and gas ballast can also be used in parallel.

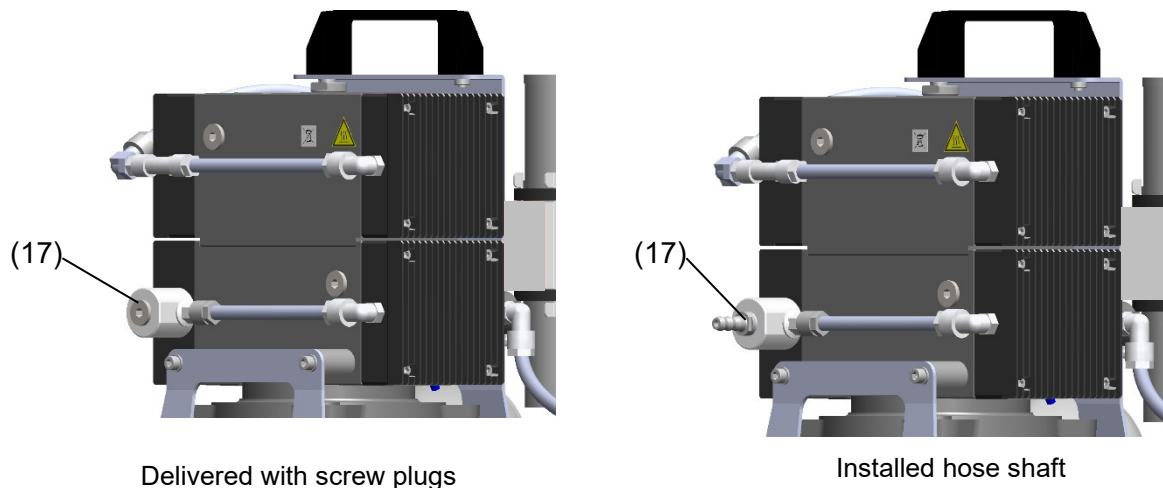


Figure 19: Gas ballast inert gas connections

(17) Gas ballast inert gas connection

The connection is supplied closed with a screw plug.



When not in use, the inert gas connection for gas ballast must ALWAYS be closed with the screw plug. Operation with open inert gas connection for gas ballast is NOT permitted.

Operation with an open inert gas connection for gas ballast could result in the suction of ambient air and create an explosive atmosphere. Therefore, the gas ballast must only be operated with inert gas. When not in use, the inert gas connection for gas ballast must be closed with the screw plug.



**DANGER**

**Explosion hazard due to suction of ambient air when operating with an open inert gas connection for gas ballast.**

**Serious injury or death from burns and / or explosion pressure.**

➤ Ensure that the gas ballast inert gas connection (17) is closed with the screw plug when not in use.

### Connection:

- Remove and retain the screw plug and seal from the connector (17).
- Screw in the supplied hose shaft DN 8 with seal in a gas-tight manner.
- Attach the inert gas supply hose
- Secure the attached hoses with a hose clamp

## 6.5 Achieving equipotential bonding / grounding concept

For systems in potentially explosive areas, equipotential bonding acc. to IEC 60079-14 is required. All electrically conductive parts must be connected to the equipotential bonding system. Connections to the equipotential bonding system must be secured against automatic loosening.

Equipotential bonding is achieved in the following ways (grounding concept):

- Equipotential bonding of components within the pump(chap. 6.5.1)
- Equipotential bonding of the pump via the power connection. This equipotential bonding via the ground conductor of the power connection must be ensured before commissioning (chap. 6.6).
- Equipotential bonding with the system(chap. 6.5.2)
- The personal protective equipment (PPE) of the operating personnel must be implemented ESD protected, i.e. against electrostatic discharge. This includes gloves.

There are two grounding connections (9) on the pump housing for attaching the equipotential bonding cables.

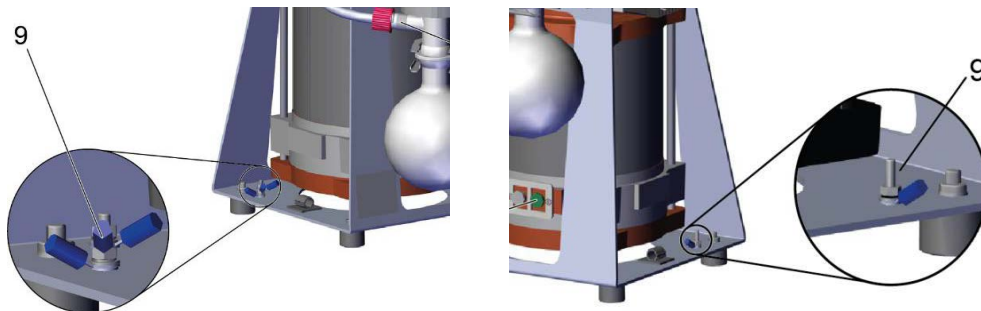
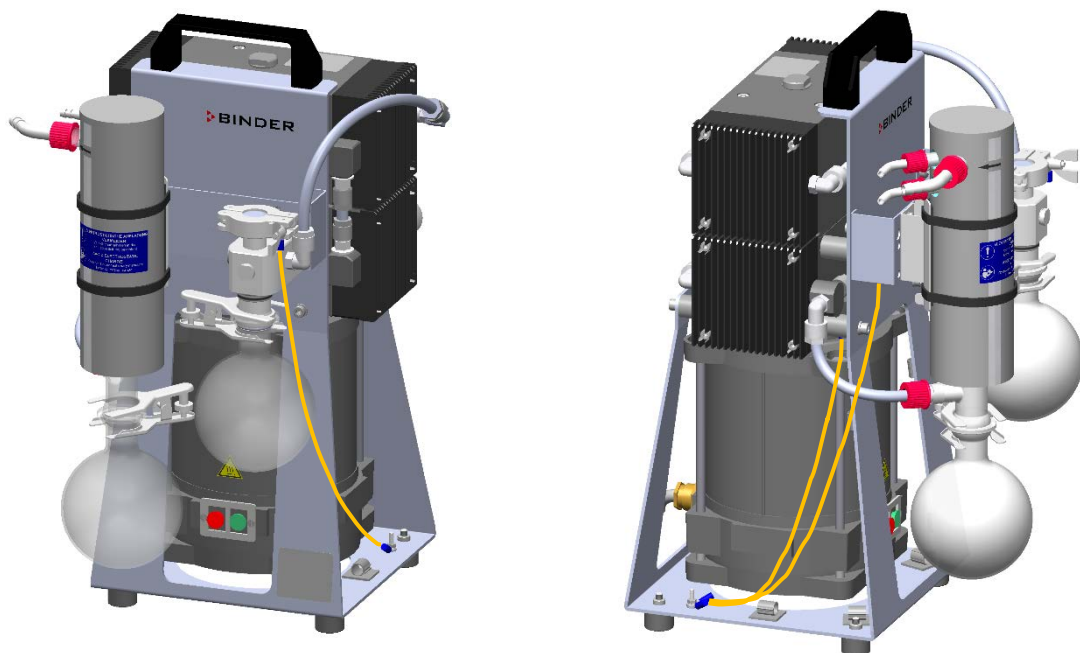


Figure 20: Grounding connections (9) on the pump housing

### 6.5.1 Equipotential bonding of the components within the pump (delivery condition)



Equipotential bonding to metal clamp (small flange clamp) on pneumatic inlet (suction side)

Equipotential bonding to the carrier of the glass attachments and to the housing of the pump unit

Figure 21: Equipotential bonding cable on the pump (symbolic illustration)

Three equipotential bonding cables are already connected to the two grounding connections (9) on the pump housing in delivery condition, one leading to the metal clamp (clamp KF) at the pneumatic inlet, one to the carrier of the glass attachments, which ensures the grounding of the metal clamps holding the glass attachments, and one is fastened to the housing of the pump unit.



Do NOT disconnect or remove these equipotential bonding cables.  
Only the grounding connection on the pump unit is temporarily removed during maintenance work and must then be restored accordingly, see chap. 11.4.3.

### 6.5.2 Connection to the equipotential bonding of the system (by the customer)

Equipotential bonding must always be made via external grounding connections, so that no potential can be introduced in the event of a short circuit.



Following the installation of the vacuum pump and having implemented all the measures described to achieve equipotential bonding, we recommend performing a protective conductor measurement before commissioning

The pump is connected to the equipotential bonding of the system, i.e. to the pump module or directly to the conductive surface of the installation site and thus integrated into the grounding concept of the system (see VDL operating manual chap. 6.8).

Grounding, i.e. achieving equipotential bonding is required as solvent vapors may be present during loading and / or unloading. Also, when removing the filled condensate catchpot from the pump, solvents may accidentally be spilled. Therefore, the accessible surface of the installation area must be conductive, there must be technical ventilation, and all equipment (VDL / pump module / vacuum pump must be connected to the conductive surface or to each other according to the grounding concept.



When using the optional pump module, to establish a conductive connection between the vacuum pump and the pump module a grounding cable is supplied, which is already fixed at the pump module

#### Attaching the equipotential bonding cable for connection to the conductive surface of the installation site or to the pump module:

Use one of the two grounding connections (9) on the pump housing. These grounding connections provide additional space for attaching a customer-supplied equipotential bonding cable to connect to the equipotential bonding of the equipment.

Do not loosen or remove any of the existing grounding connections!

The fastening material is enclosed with the unit as a grounding kit (chap. 4.1).

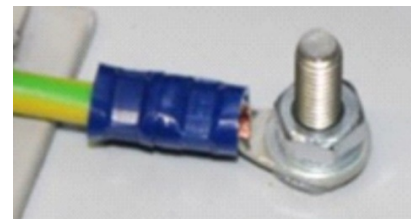


Figure 22: Grounding connection (9) (delivery condition) for attachment of an equipotential bonding cable

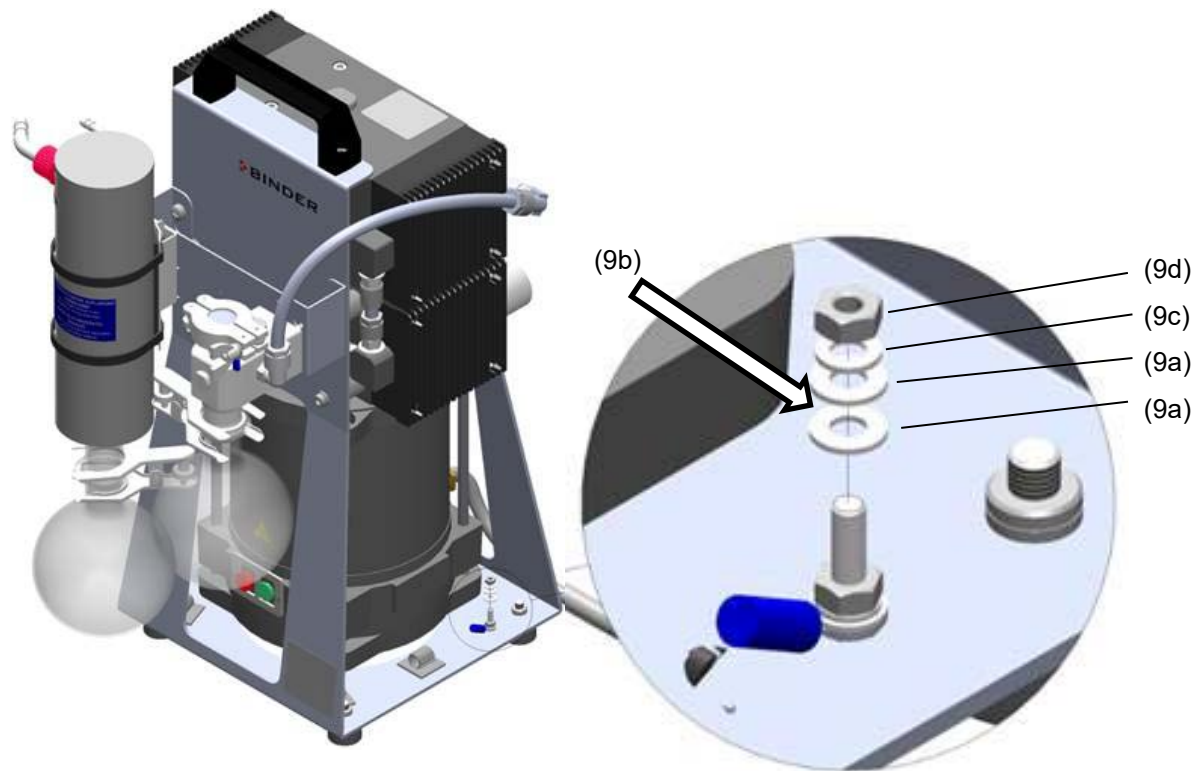


Figure 23: Grounding connection (9) with grounding kit for attachment of an equipotential bonding cable

Attach the parts of the supplied grounding kit and the lug of the equipotential bonding cable to the grounding connection (9) above the existing connection.

Order (from bottom to top): washer (9a) > lug of the equipotential bonding cable (9b) > washer (9a) > spring washer (9c) > nut (9d)



**DANGER**


**Explosion hazard due to electric sparking due to missing or improperly implemented equipotential bonding.**

**Serious injury or death from burns and / or explosion pressure.**

- Connect the vacuum pump to the pump module or with the conductive surface. Proceed according to the grounding concept for the system.
- For installation of the vacuum pump inside the pump module, proceed acc. to the mounting instructions of the pump module (Art. no. 7001-0401)
- Before commissioning, measure the equipotential bonding after first setting up the vacuum pump and implementing all described measures for establishing the equipotential bonding
- Provide cyclic measurements of the equipotential bonding.
- Always wear ESD-protected safety clothing when operating the device.

## 6.6 Electrical connection

The electrical connection must be established outside a zone. The device plug (power plug) is unprotected (not explosion protected).



	 <b>DANGER</b>
	<p><b>Explosion hazard by connecting the power plug within a zone.</b>  <b>Serious injury or death from burns and / or explosion pressure.</b></p> <p>➤ Make sure that the electrical connection is located outside a zone.</p>

The pumps are supplied ready for connection. They come with a fixed power connection cable of at least 3m in length and a shockproof plug.


Model type	Power plug of the power cable	Nominal voltage +/- 10% at the indicated power frequency	Current type
VAP 5 vacuum pump 230 V	Grounded plug CEE 7/7	230 V at 50 Hz	1N~
VAP 5 vacuum pump 120 V	NEMA 5-15P	115 V at 60 Hz	1N~

Observe the following when connecting to the power supply:

- The device plug (power plug) is not explosion-proof. It must therefore be connected outside the installation area of the device so that it can be pulled safely in the event of a fault.
- The domestic socket must also provide a protective conductor. Make sure that the connection of the protective conductor of the domestic installations to the device's protective conductor meets the latest technology (ground conductor acc. to IEC 60364-4-41). The ground conductor must not have any interruptions. The protective conductors of the socket and plug must be compatible!

	 <b>DANGER</b>
	<p><b>Electrical hazard due to lack of a protective conductor.</b>  <b>Deadly electric shock.</b></p> <p>➤ Make sure that the power plug and power socket match and that the protective electrical conductors of the device and domestic installation are securely connected.</p>



- Only use original connection cables from BINDER according to the above specification.
- Prior to connection and start-up, check the power supply voltage. Compare the values to the specified data located on the type plate of the vacuum pump, chap. 1.5.1.

	<b>NOTICE</b>
	<p><b>Danger of incorrect power supply voltage due to improper connection.</b>  <b>Damage to the equipment.</b></p> <p>➤ Check the power supply voltage before connection and start-up.          ➤ Compare the power supply voltage with the data indicated on the type plate.</p>

- When connecting, please observe the regulations specified by the local electricity supply company as well as the local or national electrical regulations (VDE directives for Germany).
- Observe a sufficient current protection according to the number of devices that you want to operate. We recommend the use of a residual current circuit breaker.



- Do not shorten the power cord.
- Make sure that the connection cable is not damaged.

	 <b>DANGER</b>
	<p><b>Electrical hazard due to shock after damage to the pump due to pulling on the electrical connection cable during transport.</b></p> <p><b>Damage to the pump. Deadly electric shock.</b></p> <ul style="list-style-type: none"> <li>➤ After transport, check the electrical power cable at the installation site to make sure that it is connected correctly and securely.</li> <li>⊘ Do NOT operate the device if the power cable is damaged.</li> </ul>

- Pollution degree (acc. to IEC 61010-1): 2
- Over-voltage category (acc. to IEC 61010-1): II

See also electrical data (chap.13.1).



To completely separate the VAP 5 vacuum pump from the power supply, you can disconnect it from the power supply turning off the main power switch (7). Install the device in a way that the main power switch (red off switch) is easily accessible and can be easily reached in case of a danger. (Chap. 5.6, 8.3).

In addition, you can disconnect the power plug. A customer's emergency stop switch or a comparable power disconnecter can also be used in case of a danger.

Please observe the national and local regulations applicable to your country.

#### Remark when operating the device with a power frequency of 60 Hz:

When connected to a power supply 1N~ with a frequency of 60 Hz, a leakage current of more than 3.5 mA is possible. If grounding through the power cable is insufficient or missing, the leakage current may flow through the user's body. Correct installation of the professional grade power socket provided by the user safely avoids this. Before connecting the device to the socket, please check its grounding contact type plug for appropriate construction and whether it is undamaged.

	 <b>DANGER</b>
	<p><b>Electrical hazard by high leakage current.</b></p> <p><b>Deadly electric shock.</b></p> <ul style="list-style-type: none"> <li>➤ Earth connection is essential before connecting supply. Check socket before inserting plug.</li> </ul>

## 7. Explosion safety tests

This chapter provides instructions for the user to ensure the safety of the system and to meet applicable regulations. Proper operation is only ensured after the test has been carried out and any necessary measures implemented.

Follow the provisions on testing explosion protection according to country-specific regulations (for Germany in particular TRBS 1201 Part 1; this substantiates the requirements of the Industrial Safety Regulation (BetrSichV) 2015) within the scope of its application.

### 7.1 Scope of the functional test

The test represents the entirety of all work equipment relevant to explosion protection. This includes the VAP 5 vacuum pump, the VDL vacuum drying oven, the optional pump module, extraction devices, and ventilation systems, gas warning devices, inerting devices including connection elements as well as the installation area with effective devices for equipotential bonding and any other building components that may be relevant to explosion protection (non-exhaustive list).



- Before commissioning and after changes requiring review, perform a comprehensive inspection of the system in its entirety.
- Systems must be checked in their entirety at least every 6 years.
- Tests can also be carried out by an approved monitoring body or by personnel qualified for testing. Observe relevant regulations for the qualification requirement.
- Devices, protective systems, safety, control and regulating devices according to Directive 2014/34/EU, connection devices, and interactions with other parts of the system must continue to be checked at least every three years. Tests of ventilation systems, gas warning and inerting devices must be performed at least once per year in the future.
- It may be possible to skip recurring tests, e.g. of devices, protective systems, etc., as well as ventilation systems, gas warning and inerting devices, if a **maintenance plan** is provided. The full inspection of the entire system remains unaffected.

## 7.2 Explosion protection plan

The explosion protection plan to be created by the operator represents the entirety of the technical and organizational measures for explosion protection determined and specified on the basis of the risk assessment. Please refer to ATEX Operational Directive 1999/92/EC. The explosion protection document serves to document the results of the risk assessment in accordance with § 6 Para. 9 GefStoffV (for Germany).

## 7.3 Objective of testing

Determine the suitability and functionality of safety-related measures. When testing the explosion safety of the system, evaluate the explosion protection plan and compare the target state derived from it with the actual state of the system (according to available test records):

- Assess the completeness and plausibility of safety-related documents (such as the explosion protection document, installation plans, zone plans, safety-related figures)
- Determine whether the system has been set up in accordance with national regulation (GefStoffV for Germany) and is safe for use with regard to explosion protection
- Technical measures are suitable and functional for explosion protection,
- Technical organizational measures necessary for explosion protection are suitable
- The deadline for the next recurring test was correctly set in accordance with national regulations (in accordance with § 3 Para. 6 BetrSichV for Germany).

### Performing tests

The tests can be divided into the verification of the documentation and a technical examination.

## 7.4 Testing before initial commissioning



Proceed according to country-specific regulations (for Germany in particular: TRBS 1201 Part 1; BetrSichV).

Before the initial commissioning of the Ex system, perform the explosion safety test. It serves to determine the explosion safety of the system, including the work equipment and the working environment and is based on the explosion protection plan from the employer in accordance with the specifications in the explosion protection document and its implementation in the Ex system. Equivalent test results according to other legal regulations can be considered. It is also permissible to refer to tests that have already been carried out.

### Scope of the test

- Testing the plausibility of the explosion protection plan and measures
- Verifying the implementation of measures
- Checking the deadlines for the recurring tests
- Verifying the maintenance plan

For the tests of technical ventilation systems, gas warning devices, inerting devices, devices, protective systems or safety, control or regulating devices, and other technical devices for explosion protection, the following applies:

Test content that has been checked and documented as part of conformity assessment procedures do not need to be checked again. Verify the plausibility and completeness of documents.

The following points must generally be verified:

- Technical ventilation systems, gas warning devices, inerting devices with regard to their suitability, their functionality, their interconnections, their installation conditions, their proper condition, and their installation / assembly
- Devices, protective systems, or safety, control, or regulating devices within the meaning of Directive 2014/34/EU on explosion protection with regard to their proper condition, their suitability, their interconnections, their installation conditions, and their installation / assembly
- Safety, control, or regulating devices with relevance for explosion protection, which can also be located outside the potentially explosive atmospheres, to determine whether ventilation systems, gas warning devices, inerting devices ensure the proper exclusion of ignition sources and functionality.
- Ex devices in the sense of TRGS 725, whether they ensure the necessary functional reliability of the measures.
- Connection elements and other technical devices (such as lightning protection, requirements for floors) with regard to their condition, their interconnections, and their installation / assembly for explosion safety (e.g. type of installation, insulation resistance of electrical cables and lines)
- Take into account the significant interactions of devices, protective systems, safety, control, or regulating devices and their connecting elements – with each other and with other system parts. This includes, for example, testing the equipotential bonding, the involvement of pipes in equipotential bonding, overvoltage protection, and lightning protection, alignment of units (e.g. pump – coupling – motor).

## 7.5 Inspection after changes requiring review

There is a need for a change requiring review if the explosive safety of the explosive system is affected by the change. Changes requiring review are evaluated in accordance with applicable national regulations (for Germany in particular: TRBS 1123). Checks after a change requiring review may be limited to the changes made. Verify whether the system in the potentially explosive area has been changed in accordance with this regulation and is working properly. See the requirements in chap. 7.4.

## 7.6 Recurring tests for the explosive safety of the system

**Objective of testing:** The recurring tests serve to maintain the explosive safety of the Ex system. Among other things, the actual state of the system is compared

## 8. Commissioning

Prior to commissioning the vacuum pump make sure that all relevant national and international regulations are observed. Within the European Union, devices that will be operated in potentially explosive areas have to meet the requirements of ATEX Directive 2014/34/EU



Note the following points before starting up the device:

- The walkable installation and operating surface of the device must be conductive. This installation and operating surface must be connected to the vacuum pump according to the grounding concept. Cyclic measurements of the equipotential bonding are required
- Provide technical ventilation in the area of the vacuum pump, particularly in the areas of the condensate catchpot (when emptying it) and the exhaust air of the vacuum pump
- The personal protective equipment (PPE) of the operating personnel must be implemented ESD protected, i.e. against electrostatic discharge.
- Only trained personnel with password authorization may work on the VAP 5 vacuum pump.
- All required tests must be carried out.



When after storage in a cold location you transfer the device to its warmer installation site, condensation may form. Before start-up, wait at least one hour until the device has attained ambient temperature and is completely dry

### 8.1 Requirements for safe commissioning

Prior to turning on the device, the following points must certainly be met:

- Installation of the device (chap. 6) performed in compliance with the installation guidelines and ambient conditions (chap. 5)
  - Vacuum connection (chap. 6.2)
  - If required: Coolant connection (chap. 6.3), coolant supply established
  - If required: Inert gas connection for purging the drive chamber (chap. 6.4, 6.4.1)
  - If required: Inert gas connection for gas ballast(chap. 6.4, 6.4.2)
  - Equipotential bonding established according to the grounding concept (chap. 6.5)
  - Power connection established (chap. 6.6)
- Observing all safety instructions
- Technical ventilation activated
- If inert gas connection(s) shall be used: Inert gas connection established, volume flow / inert gas pressure set (chap. 6.4.1)

### 8.2 Tests / inspections

**Upon initial commissioning:**

- Test before initial commissioning performed and passed (chap. 7.4)

**Upon recommissioning after maintenance / repairs / changes requiring review:**

- Test performed and passed (Chap. 7.5)

**Upon each commissioning:**

- Checking all connections as described in chap. 6.
- Check the attachments for integrity

- Check all electrical and pneumatic connections for secure fit
- Check whether the pneumatic connection is free of deposits (visual check)

#### After switching on:

- Check the operating behavior, e. g. unusual running noise.
- Check the tightness of the pneumatic connections and operating equipment.



The final pressure must be reached. Otherwise, it must be assumed that the device does not have the necessary tightness.

### 8.3 Turning on and off, emergency stop

#### Turning on

Turn on the VAP 5 vacuum pump at the main power switch (7) by pressing the green button (7).

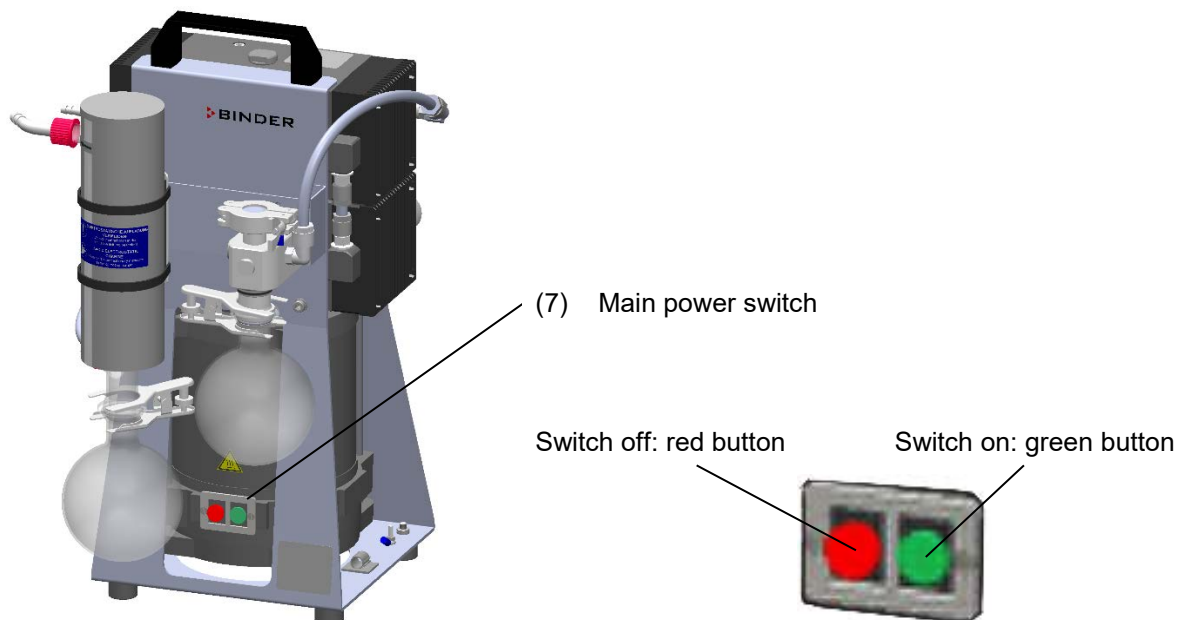


Figure 24: Position of the main switch on the front of the pump and detailed view

#### Turning off / emergency stop

To completely separate the VAP 5 vacuum pump from the power supply, you can turn off the main power switch (7). In addition, you can disconnect the power plug. It is also possible to use a customer's explosion-protected emergency stop switch or a comparable power disconnecter in case of an emergency.



When de-energized, the motor stops and all valves are closed.

## 9. Operation

With regard to operating the VAP 5 vacuum pump and further elements of the system, please observe the relevant local and national regulations (for Germany in particular: DGUV guidelines 213-850 on safe working in laboratories, issued by the employers' liability insurance association; Industrial Safety Regulation (BetrSichV); Ordinance on Hazardous Substances (GefStoffV); Technical Regulations on Industrial Safety and Health (TRBS 1201 Part 1).



Do not start up the device without technical ventilation (chap. 5.2).

Turn on the vacuum pump by its main power switch (7) (chap. 8.3)

When operating with the VDL vacuum drying oven the vacuum pump runs in continuous operation. The VAP 5 vacuum pump is delivered with operating mode S1 (continuous operation with constant load).

The VDL vacuum drying oven controls the connected pump and thus reaches the vacuum set at the VDL.

The temperature of the gases and vapors aspirated must not exceed the allowable suction temperature of 40 °C when entering the pump. If the gas inlet temperature is too high and then becomes even warmer by compression in the pump, the resulting temperature (of the gas-solvent mixture inside the pump) could exceed the solvent's temperature class and auto-ignition temperature.



### DANGER

**Fire and explosion hazard due to exceeding the solvent's auto-ignition temperature by exceeding the gas inlet temperature.**

**Damage to the vacuum pump. Serious injury or death from burns and / or explosion pressure.**

- Do NOT exceed the set-point temperature 40 °C / 104 °F.
- With a set-point temperature above 40 °C / 104 °F, take appropriate measures to cool down the sucked-in gas before its entry to the vacuum pump.

### 9.1 Daily inspection

- Check the vacuum pump daily for unusual running noise and heat development on the pump surface.
- Check the electrical and vacuum connections every day.
- Check the filling level of the condensate catchpot every day and empty it as soon as necessary.
- Check daily whether the final pressure is reached. Otherwise, it must be assumed that the device does not have the necessary tightness.

### 9.2 Removing and emptying the condensate catchpot







Do not remove the full condensate catchpot of the pump without technical ventilation.

At the end of the process, the accumulated medium can mix with ambient air in the condensate catchpot (6) and form an explosive atmosphere. Explosions can cause serious injury or death

When connecting various vacuum applications to the device, the collected media may mix. The media mixtures must not endanger persons, the environment and/or equipment.

Check the level regularly. Empty the condensate catchpot at the latest when it is 75 % full. Safe emptying must be guaranteed.

 	<div style="text-align: center; background-color: red; color: white; padding: 5px;">  <b>DANGER</b> </div> <p><b>Explosion hazard due to the formation of an explosive atmosphere in the condensate catchpot.</b></p> <p><b>Serious injury or death from burns and / or explosion pressure.</b></p> <ul style="list-style-type: none"> <li>➤ Monitor the filling level of the condensate catchpot and empty it in good time.</li> <li>➤ Ensure that no hazardous mixtures are created by mixing media from different applications.</li> <li>➤ Empty the condensate catchpot regularly and at the end of the process.</li> <li>➤ Wear protective gloves when emptying the piston to avoid contact with hazardous substances. Gloves must be ESD-protected.</li> <li>➤ Make sure that the technical ventilation is active and that the extraction system is active when installing in the pump module.</li> <li>➤ Ensure equipotential bonding. Use ESD-protected personal protective equipment (PPE)</li> </ul>
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	<p>When using the optional inert gas purge on the gas ballast, the formation of an explosive atmosphere on the outlet side condensate catchpot during operation can be avoided.</p>
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The time interval and the procedure for emptying must be determined by the operator. Safe emptying must be ensured.

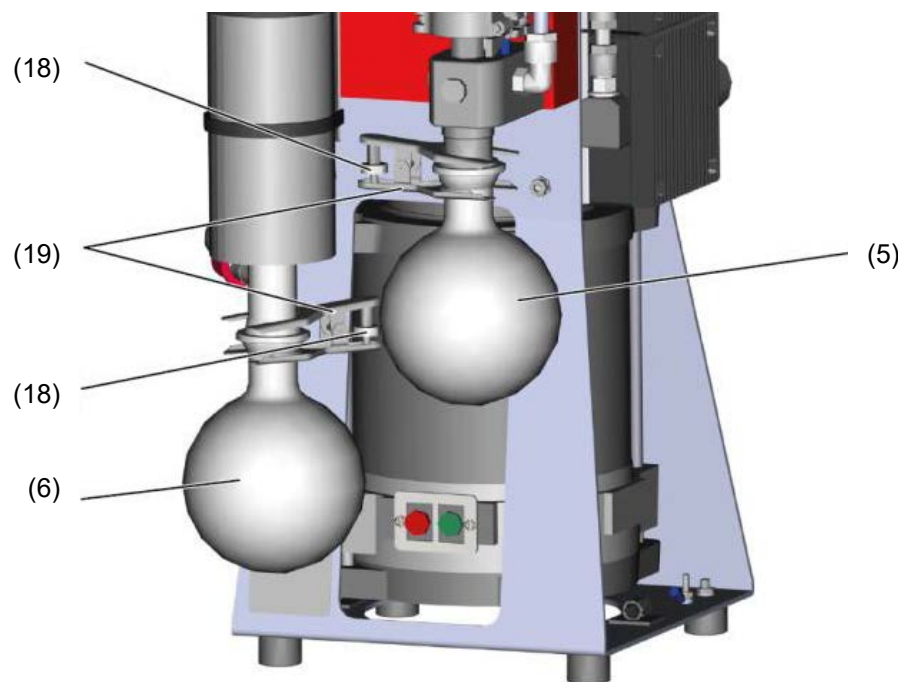


Figure 25: Removing the condensate catchpot (6)

- (5) Separator (suction side)
- (6) Condensate catchpot (pressure side)
- (18) Knurled screws
- (19) Conical joint clips

### Removal procedure:

- Hold on to the condensate catchpot (6).
- Unscrew the knurled screw (18)
- Loosen the conical ground clamp (19)
- Remove the condensate catchpot

When removing it, be careful not to spill the contents of the condensate catchpot. Wear protective clothing and gloves if handling the condensed materials requires it.

It is not normally necessary to empty the separator (5) when using the pump with the VDL. This may be necessary for other uses of the pump, such as when it is connected to a rotary evaporator, where a fault can result in a boiling delay and liquid enters the separator via the suction line.

### Fastening after emptying:

Fastening is performed in reverse order. After emptying, plug the condensate catchpot back in and fix it with the fork clamp (conical ground clamp). Use the knurled screw to tighten the fork clamp until the end stop.

	<b>NOTICE</b>
	<p><b>Danger of spilling the condensate catchpot if it is too full.</b></p> <p><b>Damage of the device.</b></p> <ul style="list-style-type: none"> <li>➤ Always empty the condensate catchpot in time.</li> <li>➤ Wear protective clothing and gloves if required for handling the condensed substances.</li> </ul>





Note: To empty and reinstall the separator (5), proceed accordingly.

The attachments must always be used. NEVER operate the vacuum pump without attachments.

## 10. Cleaning and decontamination




Clean the device after each use to avoid potential corrosion damage by ingredients of the aspirated material.




Prior to renewed startup, allow the device to completely dry after all cleaning and decontamination measures.

  	 <b>DANGER</b>
	<p><b>Electrical hazard by water entering the device.</b></p> <p><b>Deadly electric shock.</b></p> <ul style="list-style-type: none"> <li>➤ Make sure that the device will not become wet during cleaning or decontamination.</li> <li>⊘ Do NOT spill water or cleaning agents over the device.</li> <li>⊘ Do NOT put ANY cleaning aids (cloth or brush) into slots or openings on the device.</li> <li>➤ Make sure that no water will enter into slots or openings on the device.</li> <li>➤ Before cleaning, disconnect the power plug. Let the device cool down to ambient temperature.</li> <li>➤ Completely dry the device before turning it on again.</li> </ul>


Avoid electrostatic charges.




 	<div style="background-color: red; color: white; text-align: center; padding: 5px;">  <b>DANGER</b> </div> <p><b>Explosion hazard due to electrostatic charge when rubbing with a dry cloth.</b>  <b>Serious injury or death from burns and / or explosion pressure.</b></p> <ul style="list-style-type: none"> <li>➤ Use only damp cloth when wiping the device. You may use water and the specified cleaning agents.</li> <li>⊘ NEVER wipe the device with a dry cloth.</li> <li>⊘ Ensure equipotential bonding. Use ESD-protected personal protective equipment (PPE).</li> </ul>
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 	<div style="background-color: orange; color: black; text-align: center; padding: 5px;">  <b>WARNING</b> </div> <p><b>Danger of intoxication and infection through contamination of the device with toxic, infectious or radioactive substances.</b>  <b>Damages to health.</b></p> <ul style="list-style-type: none"> <li>➤ Make sure that NO toxic, infectious or radioactive substances has been aspirated.</li> <li>➤ Take suitable protective measures when removing accidentally aspirated toxic, infectious or radioactive material and in the event of any required decontamination of wetted pump components.</li> </ul>
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## 10.1 Cleaning

	<p>Always keep the device clean. Thoroughly remove residues of media.</p>
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	<p>Avoid electrostatic charges. Use only damp cloth when wiping the device. Avoid rubbing with non-conductive materials.</p>
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### Procedure:


- Disconnect the device from the power supply before cleaning and disconnect the power plug.
- Wipe the surfaces with a moistened towel.
- For surface protection, perform cleaning as quickly as possible.
- Clean wetted parts (connections, valves, sensors) at regular intervals according to level of soiling with a suitable solvent (e.g. acetone)
- After cleaning completely remove cleaning agents from the surfaces with a moistened towel.
- Let the device dry completely before recommissioning.


### Suitable cleaning agents:


Exterior surfaces, motor housing	Standard commercial cleaning detergents free from acid or halides. Alcohol-based solutions.
Hoses, condensate catchpot, separator	Standard commercial cleaning detergents free from acid or halides. We recommend using the neutral cleaning agent Art. No. 1002-0016.
Valves, pump head, Form diaphragm	Acetone with a soft rag


Do not use cleaning agents that may cause a hazard due to reaction with components of the device or the aspirated material. If there is doubt regarding the suitability of cleaning products, please contact BINDER service.

	<p>We recommend using the neutral cleaning agent Art. No. Art. 1002-0016 for a thorough cleaning.</p> <p>Any corrosive damage that may arise following use of other cleaning agents is excluded from liability by BINDER GmbH.</p> <p>Any corrosive damage caused by a lack of cleaning, is excluded from liability by BINDER GmbH.</p>
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	<p style="text-align: center;"><b>NOTICE</b></p> <p><b>Danger of corrosion by using unsuitable cleaners.</b></p> <p><b>Damage to the device.</b></p> <ul style="list-style-type: none"> <li>Ø Do NOT use acidic or chlorine cleaning detergents.</li> <li>Ø Do NOT use a neutral cleaning agent on other kind of surfaces.</li> </ul>
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	<p>Soapsuds may contain chlorides and must therefore NOT be used for cleaning. We recommend only using the cleaning agents specified in the operating instructions.</p>
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	<p>With every cleaning method, always use adequate personal safety controls. Do NOT use compressed air to clean pump parts, which come in contact with the medium.</p>
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	<p>The neutral cleaning agent may cause health problems in contact with skin and if ingested. Follow the operating instructions and safety hints labeled on the bottle of the neutral cleaning agent.</p>
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Recommended precautions: To protect the eyes use sealed protective goggles. Suitable protective gloves with full contact: butyl or nitrile rubber, penetration time >480 minutes.

    	<p style="text-align: center;"> <b>CAUTION</b></p> <p><b>Danger of chemical burns due to contact with skin or ingestion of the neutral cleaning agent.</b></p> <p><b>Skin and eye damage. Environmental damage.</b></p> <ul style="list-style-type: none"> <li>Ø Do NOT empty the neutral cleaning agent into drains.</li> <li>Ø Do not ingest the neutral cleaning agent. Keep it away from food and beverages.</li> <li>➤ Wear protective gloves and goggles.</li> <li>➤ Avoid skin contact with the neutral cleaning agent.</li> </ul>
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## 10.2 Decontamination / chemical disinfection

The operator must ensure that proper decontamination is performed in case a contamination of the device by hazardous substances has occurred.


### 10.2.1 Decontamination of the external surfaces of the pump and the glass attachments


Disconnect the device from the power supply prior to chemical decontamination. Disconnect the power plug.

Do not use decontamination agents that may cause a hazard due to reaction with components of the device or the aspired material. If there is doubt regarding the suitability of cleaning products, please contact BINDER service.

Suitable disinfectants:


- Standard commercial surface disinfectants free from acid or halides.
- Alcohol based solutions.

	<p>For chemical disinfection, we recommend using the disinfectant spray Art. No. 1002-0022. Any corrosive damage that may arise following use of other disinfectants is excluded from liability by BINDER GmbH.</p>
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	<p>With every decontamination method, always use adequate personal safety controls.</p>
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In case of contamination of the interior by biologically or chemically hazardous material, spray the device with an appropriate disinfectant. Before start-up, the device must be absolutely dry and ventilated, as explosive gases may form during the decontamination process.

You can sterilize the condensate catchpot and separator in a sterilizer or autoclave.

	<p>In case of eye contact, the disinfectant spray may cause eye damage due to chemical burns. Follow the operating instructions and safety hints labeled on the bottle of the disinfectant spray.</p>
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Recommended precautions: To protect the eyes use sealed protective goggles.

	<table border="1"> <tr> <td>  </td> <td> <b>CAUTION</b> </td> </tr> <tr> <td colspan="2"> <p><b>Danger of chemical burns through eye contact with the disinfectant spray.</b></p> <p><b>Eye damage. Environmental damage.</b></p> <ul style="list-style-type: none"> <li>Ø Do NOT empty the disinfectant spray into drains.</li> <li>➤ Wear protective goggles.</li> </ul> </td> </tr> </table>		<b>CAUTION</b>	<p><b>Danger of chemical burns through eye contact with the disinfectant spray.</b></p> <p><b>Eye damage. Environmental damage.</b></p> <ul style="list-style-type: none"> <li>Ø Do NOT empty the disinfectant spray into drains.</li> <li>➤ Wear protective goggles.</li> </ul>	
	<b>CAUTION</b>				
<p><b>Danger of chemical burns through eye contact with the disinfectant spray.</b></p> <p><b>Eye damage. Environmental damage.</b></p> <ul style="list-style-type: none"> <li>Ø Do NOT empty the disinfectant spray into drains.</li> <li>➤ Wear protective goggles.</li> </ul>					

	<p>After using the disinfectant spray, allow the device to dry thoroughly, and aerate it sufficiently.</p>
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### 10.2.2 Pump suction chamber decontamination

Decontamination of the interior of the pump / wetted parts after the use of hazardous substances can only be carried out by the manufacturer or by qualified and authorized service providers.

Make sure that the completed contamination clearance certificate (chap. 16) is present.

## 11. Maintenance and service, troubleshooting, maintenance by the operator, repair, testing

### 11.1 General information, personnel qualifications



For operation, please perform a daily inspection of the pump and connections (chap. 9.1 11.3.1).

- **Regular inspection, maintenance intervals**

Please refer to chap. 11.3

- **Simple troubleshooting**

Chap. 11.3.3. describes troubleshooting by operating personnel. It does not require technical intervention into the device, nor disassembly of device parts

For personnel requirements please refer to chap. 2.1.

- **Detailed troubleshooting**

If errors cannot be identified with simple troubleshooting, further troubleshooting must be performed by BINDER Service or by BINDER qualified service partners or technicians.

- **Maintenance by the operator**

For the replacement of form diaphragm and valves, please refer to chap. 11.4.

The operator must create an application-related maintenance plan and define maintenance intervals.

Maintenance works may only be carried out by qualified personnel or specially trained users (see overview of responsibilities in chap. 2.1). The operator is responsible for ensuring that the work is carried out properly.

Following maintenance after maintenance, the unit must be **tested** prior to resuming operation. An electrical test and an explosion protection test are required.

- **Repair by the manufacturer**

Repair of the device must only be performed by BINDER Service or by BINDER qualified service partners or technicians.

Procedure for returning the device to BINDER GmbH, see chap. 11.7

After maintenance, the device must be **tested** prior to resuming operation. An electrical test and an explosion protection test are required.

- **Electrical testing**

To prevent the risk of electrical shock from the electrical equipment of the device, an annual repeat inspection as well as a test prior to initial startup and prior to resuming operation after maintenance or repair, are required. This test must meet the requirements of the competent public authorities. We recommend testing under EN 50678:2020 / EN 50699:2020 by BINDER Service or by BINDER qualified service partners or technicians.



- **Test for explosion protection**





Testing before initial commissioning and before restarting after maintenance or repair as well as repeat tests according to the explosion protection concept created by the operator is required.



Observe the relevant legal regulations for the qualification of the examiner. In Germany, the explosion protection test may only be carried out by a **qualified person recognized by a state authority** or by the **manufacturer** (BINDER Service).


Follow the provisions on testing explosion protection according to EN 60079-17:2014 / IEC 60079-17:2013 and the relevant country-specific regulations (for Germany in particular TRBS 1201 Part 1; this substantiates the requirements of the Industrial Safety Regulation (BetrSichV) 2015) within the scope of its application).



## 11.2 Safety instructions

	<div style="background-color: red; color: white; text-align: center; padding: 5px;">  <b>DANGER</b> </div> <p><b>Fire and explosion hazard due to explosive atmosphere during maintenance and service, troubleshooting, repair, and testing.</b></p> <p><b>Serious injury or death from burns and / or explosion pressure.</b></p> <ul style="list-style-type: none"> <li>➤ Before performing troubleshooting, maintenance or repair work, make sure that there is no explosive atmosphere in the installation area of the device and inside the device</li> <li>⊘ Do NOT perform any maintenance, repair or tests on the device in potentially explosive areas.</li> <li>➤ Conduct the explosion protection test when performing the annual maintenance and after repair.</li> <li>⊘ Do NOT put the device into operation if it did not pass the explosion protection test.</li> <li>➤ Before commissioning, ensure that the system is correctly and completely grounded.</li> </ul>
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  	<div style="background-color: red; color: white; text-align: center; padding: 5px;">  <b>DANGER</b> </div> <p><b>Electrical hazard during live maintenance work.</b></p> <p><b>Deadly electric shock.</b></p> <ul style="list-style-type: none"> <li>⊘ The device must NOT become wet during operation or maintenance works.</li> <li>⊘ Do NOT remove the fixing sheet panel of the motor housing.</li> <li>➤ Disconnect the device before conducting maintenance work. Pull the power plug.</li> <li>➤ Take all precautionary measures that a device which is disconnected from the power supply will not be inadvertently connected to the power supply.</li> <li>➤ Only open the device when the power plug is disconnected.</li> <li>⊘ Make sure that general maintenance work will be conducted by licensed electricians with additional skills in explosion protection (ATEX) or experts authorized by BINDER.</li> </ul>
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	<div style="background-color: red; color: white; text-align: center; padding: 5px;">  <b>DANGER</b> </div> <p><b>Electrical hazard due to high voltage after improper repairs.</b></p> <p><b>Deadly electric shock.</b></p> <ul style="list-style-type: none"> <li>➤ Make sure to perform the electrical safety test during annual maintenance and after any repairs.</li> <li>⊘ Do NOT put the device into operation if it did not pass the electrical safety test.</li> <li>➤ Have potential causes for errors checked and eliminated by servicing technicians.</li> <li>➤ Make sure that general maintenance work will be conducted by licensed electricians with additional skills in explosion protection (ATEX) or experts authorized by BINDER.</li> </ul>
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	<p>The warranty becomes void if maintenance work is conducted by non-authorized personnel.</p>
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	 <b>CAUTION</b>
	<p><b>Danger of burning by touching hot device parts.</b>  <b>Burns.</b></p> <ul style="list-style-type: none"> <li>➤ Allow the device to cool down to hand temperature before carrying out maintenance work / operator maintenance.</li> </ul>

Wear appropriate personal protective equipment (PPE) for applications and activities that require it. The operator must specify the type of protective equipment.

 	 <b>CAUTION</b>
	<p><b>Risk of injury when working without or with insufficient personal protective equipment.</b>  <b>Injuries.</b></p> <ul style="list-style-type: none"> <li>➤ Use the personal protective equipment PPE which is suitable for the respective type of work</li> </ul>

Contamination of the device by toxic, infectious or radioactive substances must be prevented.


Components in contact with the medium can be contaminated by accidentally aspirated hazardous substances (toxic, infectious, or radioactive material). They must be decontaminated before further operation, maintenance and service, troubleshooting, repair, or tests. If appropriate, further protective measures must be taken. The operator must ensure decontamination and protective measures.

 	 <b>WARNING</b>
	<p><b>Danger of intoxication and infection through contamination of the device with toxic, infectious or radioactive substances.</b>  <b>Damages to health.</b></p> <ul style="list-style-type: none"> <li>➤ During the use, the device may be contaminated with toxic or harmful substances</li> <li>➤ Prior to any service tasks a person in charge shall clean the device.</li> <li>➤ Do NOT service or repair a device with sticking toxic or harmful substances</li> </ul>

## 11.3 Regular inspection, maintenance intervals

### 11.3.1 Daily inspection by the operator

For operation, please perform a daily inspection of the pump and connections (chap. 9.1).

	<p>For safe operation of the device, the operator must draw up an application-related maintenance/inspection plan and ensure that the maintenance cycles are adhered to.</p>
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### 11.3.2 Regular inspection

- Check the system regularly for leaks: The specified final pressure must be reached, see chap. 13.1.
- Check the pneumatic connection, especially the outlet, for free passage (visual inspection): Blocked lines at the outlet or inlet can cause malfunctions and damage. All connections must be free of deposits.
- If necessary, replace the seals (usually together with membrane replacement, chap. 11.4)
- Check all connections for tightness
- Check the glass apparatus for integrity
- Check the device for functionality and deviations, e.g. abnormal operating noise
- Clean the device regularly (chap. 10.1)

### 11.3.3 Maintenance intervals

Ensure regular maintenance work is performed at least once a year and that the legal requirements are met regarding the qualifications of service personnel, scope of testing and documentation.

The technical ventilation (extraction) in the installation area of the device must also be monitored in accordance with relevant standards and regulations (for Germany: TRBS2152 Part 2).



For safe operation of the device, the operator must draw up an application-related maintenance/inspection plan and ensure that the maintenance cycles are adhered to.

The membrane must be changed once a year or when the maximum permissible operating time of 8,000 operating hours has been reached (chap. 11.4). There is a complete maintenance kit for this purpose.

The operator must monitor this.


In applications with media that reduce the service life of materials, the maximum permissible runtime cannot be ensured. The operator must draw up a separate application-related maintenance/inspection plan and define the maintenance intervals.

### 11.4 Maintenance by the operator: Replacing of the form diaphragms

	 <b>DANGER</b>
	<p><b>Fire and explosion hazard due to explosive atmosphere during maintenance tasks. Serious injury or death from burns and / or explosion pressure.</b></p> <ul style="list-style-type: none"> <li>➤ Before performing maintenance work, make sure that there is no explosive atmosphere in the installation area of the device or inside the device</li> <li>➤ After replacing the membrane, carry out the explosion protection test.</li> <li>⊘ Do NOT put the device into operation if it did not pass the explosion protection test.</li> <li>➤ Before commissioning, ensure that the system is correctly and completely grounded.</li> </ul>

#### Permitted scope of work for maintenance work by the operator:


- Loosening and removing hose connections.
- Opening and removing the heat dissipater / pump heads.
- Inspection of the suction chambers, form diaphragms, and valves.
- Cleaning the interior of the pump in the event of deposits.
- Replacing of the form diaphragms, valves and seals.
- Restoration of safe operating condition (assembly, installation, equipotential bonding, tests).

	<p>Only carry out the work described here that is permissible for the operator. All other maintenance or service work may only be carried out by the manufacturer or authorized specialist personnel.</p>
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## Maintenance intervals





The membrane must be replaced annually or after 8,000 operating hours (max. permissible runtime). The operator must monitor this. Depending on the application process, this change can also be defined at an earlier point in time.

	<p>In applications with media that reduce the service life of materials, the maximum permissible runtime cannot be ensured</p> <p>It is the responsibility of the operator to create an application-related maintenance/inspection plan and to define the maintenance intervals.</p>
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Spare parts:	<ul style="list-style-type: none"> <li>• Service Kit, complete: O-rings, valves, form diaphragms</li> </ul> <p>Art. no. 8500-0160</p>
Necessary tools and material	<ul style="list-style-type: none"> <li>• Allen wrench, size 4 mm</li> <li>• Allen wrench, size 5 mm</li> <li>• Open end wrench, wrench size 17</li> <li>• Acetone</li> <li>• Soft cleaning rag</li> </ul>

Switch off the unit and disconnect it from the power supply. Remove all connections.

Follow all safety instructions, in particular in chap. 11.2.

  	 <b>DANGER</b>
	<p><b>Electrical hazard during live maintenance work.</b></p> <p><b>Deadly electric shock.</b></p> <ul style="list-style-type: none"> <li>➤ Before conducting maintenance work, turn off the device at the main power switch (7) and disconnect the power plug.</li> <li>➤ Take all precautionary measures that a device which is disconnected from the power supply will not be inadvertently connected to the power supply</li> </ul>

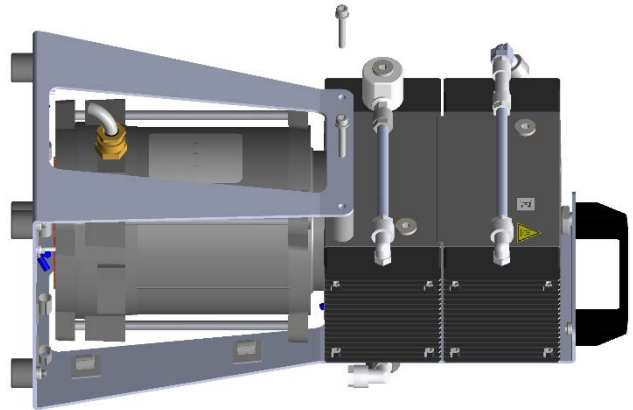
### 11.4.1 Removing the pump unit from the housing

Before removing the pump unit from the housing, first remove the glass attachments and empty the separator and condensate catchpot (chap. 9.2).

Then proceed as described:

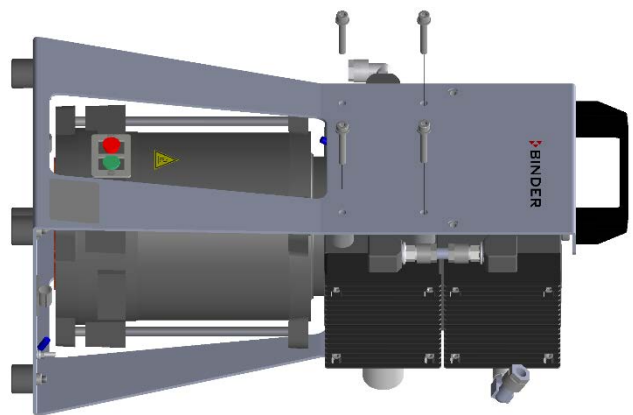
- Disconnect the power supply and secure it against being switched on again.
- Loosen and remove the pneumatic connection to the pump
- Place the device in a way that the back side is facing up

Loosen the screws (2x) on the pump housing on the rear and remove both spacers and screws.



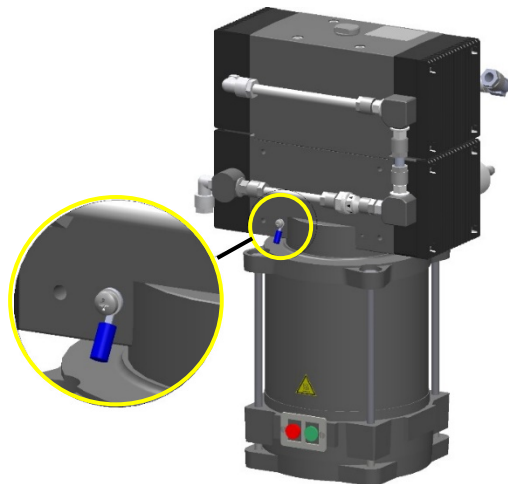
- Position the device so that the front faces upwards

Loosen the screws (4x) on the pump housing on the front and remove the four spacers and screws.



- Remove the pump unit from the housing
- Disconnect the equipotential bonding at the pump unit

Pump unit with motor removed,  
front view  
(equipotential bonding cable is not shown)



### 11.4.2 Removing the equipotential bonding cable

Remove the equipotential bonding cable connector on the pump unit.

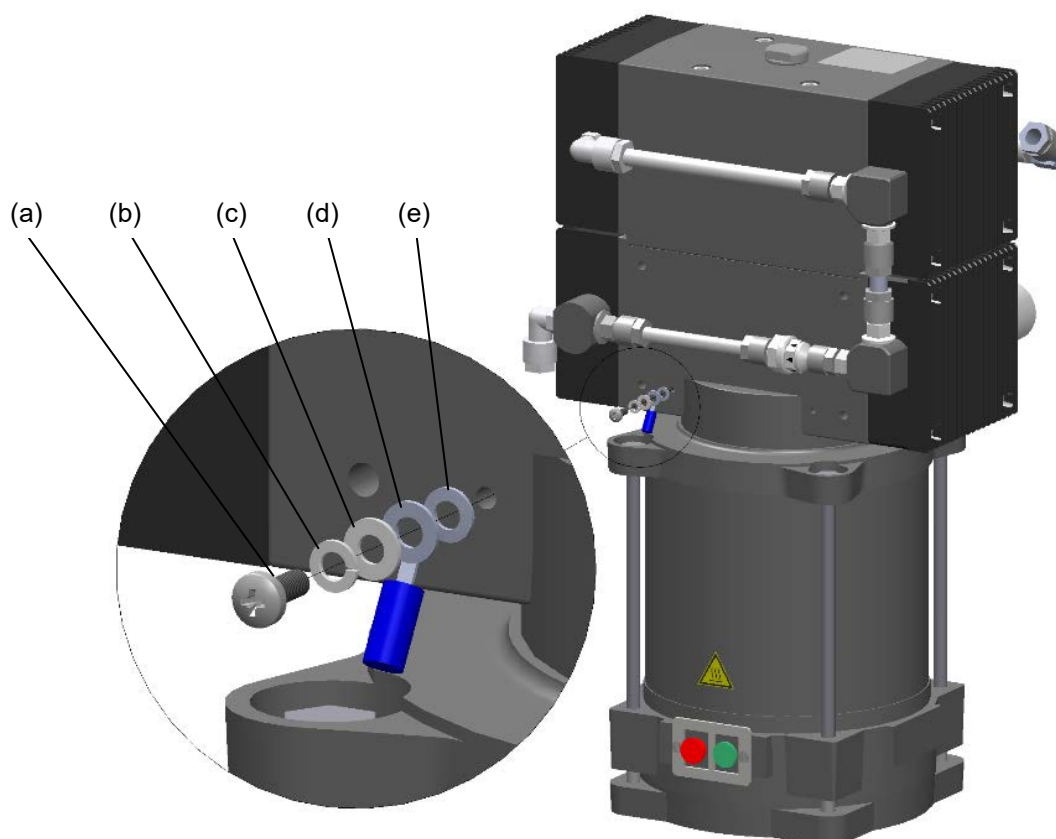


Figure 26: Illustration of grounding connection on the pump unit

- (a) Screw
- (b) Spring washer
- (c) Washer
- (d) Equipotential bonding cable lug
- (e) Contact disc



After completing the work, the equipotential bonding must be restored in the order shown.

### 11.4.3 Replacing the service kit (form diaphragm, valves and o rings)

Before changing the maintenance kit, the following steps must be carried out:

Removing the glass attachments and emptying the separator and condensate catchpot (chap. 9.2).

- Disconnect the power supply and secure against reconnection
- The pump unit must be removed from the carrier (chap. 11.4.1)

Then proceed as follows:

- Position the pump heads horizontally upwards
- Open the compression fittings (l) of the hoses on the pump unit with an open end wrench size SW 17.
- Loosen the cylinder screws (k) with an Allen wrench size SW 4
- Remove the heat dissipater (o)
- Pull the valve inserts (j) out of the pump head (h). The valve inserts contain an M5 threaded hole for removal.
- Remove the valves (m) and the o-rings (i)
- Take off the pump head (h)
- Loosen the form diaphragm (g) by turning it counter-clockwise
- Clean the pump head (h) with a soft cleaning rag and acetone



NEVER use compressed air to clean these parts as they may be chemically contaminated.

- Check whether you can easily rotate the drive.

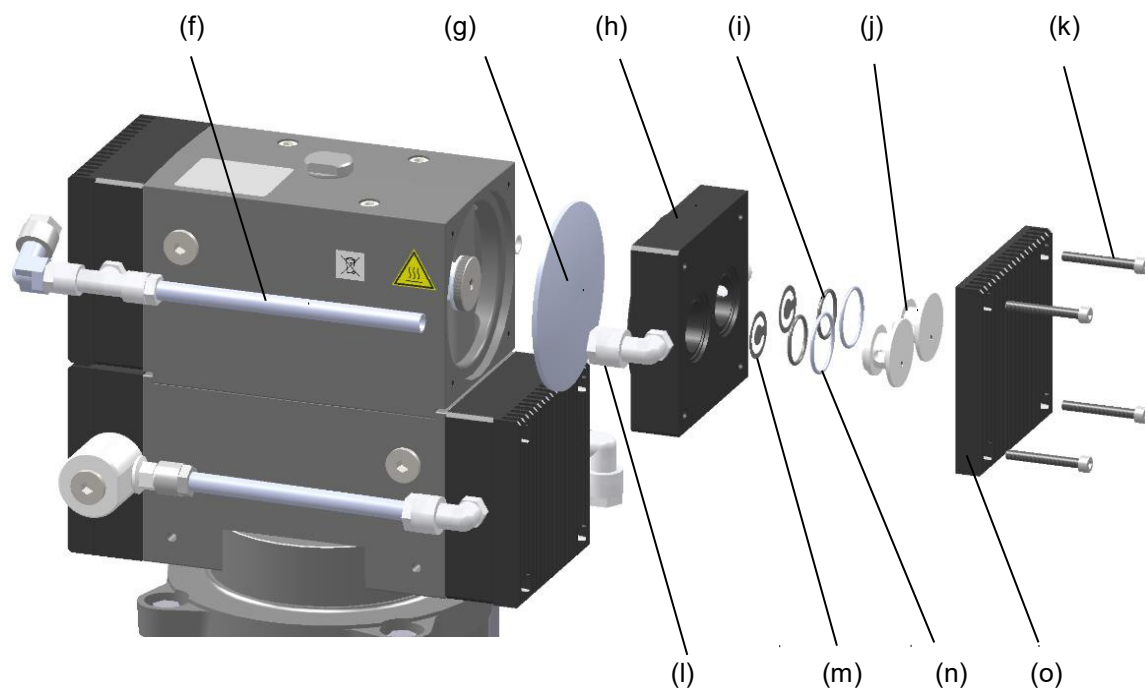


Figure 27: Disassembly and assembly of the pump unit

(f)	Pneumatic connection	(k)	Cylinder screws
(g)	Form diaphragm	(l)	Compression fittings
(h)	Pump head	(m)	Valves
(i)	O-rings (22 x 2)	(n)	O-rings (28 x 2)
(j)	Valve inserts	(o)	Heat dissipater

Proceed as follows to assemble:

- Place the pump in a way that the form diaphragm (g) is horizontal to the top
- Screw the form diaphragm (g) finger tight
- Bring the connecting rod and the form diaphragm (g) into the middle position
- Put on the pump head (hc). To do this, position the hose connection in the compression fitting.
- Insert the O-rings (i)
- Insert the valves (m).

Pay attention to full-surface contact of the valves.

Do not insert the ridge side towards the sealing surface.



Ensure that the valves are inserted correctly, otherwise leaks may occur.

- Insert the valve inserts (j)
- Put on the heat dissipater (o)
- Screw on and tighten the four cylinder screws (k) symmetrically with a torque of 3 to 4 Nm  
Mount the screws with screw locks, e.g. LOCTITE 243
- Tighten the compression fitting (l).



### NOTICE

**Danger of leaks due to improper assembly.**

**Final pressure is not reached.**

➤ Make sure that the components are correctly inserted.

## 11.4.4 Reinserting the pump unit into the housing

- Insert the pump unit into the housing.
- Position the device so that the front faces upwards  
Insert the spacers and screws  
Mount the screws (4x) on the pump housing on the front
- Position the device so that the rear side is facing upwards  
Insert the spacers and screws  
Mount the screws (2x) on the pump housing on the rear
- Connect the pneumatic connection to the pump (inlet/outlet). Screw the compression fittings of the pneumatic connection tight.
- Restore the equipotential bonding on the pump, see chap. 11.4.2



### DANGER

**Explosion hazard by electric sparking due to missing or improperly implemented equipotential bonding.**

**Serious injury or death from burns and / or explosion pressure.**

➤ Before commissioning, ensure that all equipotential bonding cables are connected and that all measures for equipotential bonding are observed.

### 11.4.5 Function test

- Connect a vacuum measuring device to the suction connection of the pump and measure the final pressure. If it functions properly, this must correspond to the technical data after a maximum of one minute. If the final pressure is not reached in this time, it must be assumed that the device does not have the necessary tightness.
- Do not start an application process until the necessary tightness of the device has been ensured. For further procedure, see chap. 11.5.
- The pump must not generate any abnormal noises or vibration.

Immediately shut down the device, if it is not working properly.

## 11.5 Simple troubleshooting

Defects and shortcomings can compromise the operational safety of the device and can lead to risks and damage to equipment and persons. If there is a technical fault or shortcoming, take the device out of operation and inform BINDER Service. If you are not sure whether there is a technical fault, proceed according to the following list. If you cannot clearly identify an error or there is a technical fault, please contact BINDER Service.



Only qualified service personnel authorized by BINDER must perform repair. Repaired devices must comply with the BINDER quality standards and pass the required tests.

### Resetting the thermal switch

The VAP 5 vacuum pump is equipped with a fitted with a thermal protection switch on the motor. This self-retaining bimetal switch disconnects the entire unit from the power supply in the event of overheating.

After the unit has cooled down, you can reset the thermal protection switch.

Procedure:

- Turn off the VAP 5 vacuum pump at the main power switch
- Allow the motor to cool down completely
- Only then turn on the VAP 5 vacuum pump again at the main power switch.



Do not reset the thermal protection switch until the fault has been analyzed. If the fuse trips again, contact BINDER Service.

Fault description	Possible cause	Required measures
<b>General</b>		
Vacuum pump does not start.	Device turned off	Turn on the device on the main power switch
	No power supply.	Check connection to power supply
	Wrong operating voltage.	Check whether the correct voltage is present at the socket (chap. 6.6).
	Thermal switch on the motor has responded	Reset the thermal switch: Turn off the device at the main power switch. Let the device cool down and turn it on again. If the thermal switch responds again, contact BINDER-Service.
	Pump unit drive blocked	Replace diaphragm (chap. 11.4).
	Motor defective.	Contact BINDER service.
	Pump unit drive defective.	
	Power cable broken or brittle	Contact BINDER service to have the cable replaced.
<b>Vacuum</b>		
Vacuum pump generates no or insufficient vacuum	Pneumatic connections / connections leaking. Connected apparatus and/or connection elements leaking.	Determine and seal the leak, if necessary replace seals and / or hoses
	Vacuum pump leaky	Check and seal the hose connections between the pump heads and screw connections and replace the hoses and / or screw connections if necessary.
	Pump head leaky (even after diaphragm replacement)	Contact BINDER Service for repair or replacement.
	Form diaphragm defective	Replace diaphragm (see chap. 11.4).
	Valves defective	Replace valves (see chap. 11.4).
	Vacuum pump soiled	General maintenance and cleaning
	Valves soiled	Clean valves from condensates and impurities
Running noise	Vacuum pump soiled	General maintenance and cleaning
<b>Inert gas purging of the drive chamber</b>		
Change in the volume flow at the inert gas connection outlet (15) of the drive chamber.	Connected apparatus and/or inert gas connection leaking.	Determine and seal the leak, if necessary replace seals and / or hoses
	Pump unit, pneumatic connection / screw fittings leaky.	Check and seal the hose connections between the pump heads and screw connections and replace the hoses and / or screw connections if necessary.
	Pump head leaky (even after diaphragm replacement)	Contact BINDER Service for repair or replacement.
	Form diaphragm defective	Replace diaphragm (see chap. 11.4).



## 11.6 BINDER Service contact data

We recommend taking out a maintenance agreement. Please consult BINDER Service.

BINDER telephone hotline:	+49 (0) 7462 2005 555
BINDER fax hotline:	+49 (0) 7462 2005 93555
BINDER e-mail hotline:	customerservice@binder-world.com
BINDER service hotline USA:	+1 866 885 9794 or +1 631 224 4340 x3 (toll-free in the USA)
BINDER service hotline Asia Pacific:	+852 390 705 04 or +852 390 705 03
BINDER service hotline Russia and CIS	+7 495 988 15 16
BINDER Internet website	<a href="http://www.binder-world.com">http://www.binder-world.com</a>
BINDER address	BINDER GmbH, post office box 102, D-78502 Tuttlingen

International customers, please contact your local BINDER distributor.

## 11.7 Sending a device back to BINDER GmbH

you return a BINDER product to us for repair or any other reason, we will only accept the product upon presentation of an **authorization number** (RMA number) that has previously been issued to you. An authorization number will be issued after receiving your complaint either in writing or by telephone **prior** to your sending the BINDER product back to us. The authorization number will be issued following receipt of the information below:

- BINDER product type and serial number
- Date of purchase
- Name and address of the dealer from which you bought the BINDER product
- Exact description of the defect or fault
- Complete address, contact person and availability of that person
- Exact location of the BINDER product in your facility
- Completed damage report (chap. 15)
- Completed contamination clearance certificate (chap. 16) must be faxed in advance

The authorization number must be applied to the packaging in such a way that it can be easily recognized or be recorded clearly in the delivery documents.



For security reasons we cannot accept a device delivery if it does not carry an authorization number.

Return address: BINDER GmbH, Abteilung Service, Gänsäcker 16, 78502 Tuttlingen, Germany

## 12. Disposal

### 12.1 Disposal of the transport packing



The wrapping (single material packaging) consists of the following materials:

Packing element	Material	Disposal
Wrapping film	PE	Plastic recycling
Cardboard sheets	Cardboard	Paper recycling
Staples	Steel	Metal recycling
Package tape	PVC	Plastic recycling
Foamed plastic stuffing	PE foam	Plastic recycling
Straps to fix packing	PP	Plastic recycling
Bag for operating manual	PE foil	Plastic recycling
Insulating air cushion foil (packing of optional accessories)	PE foil	Plastic recycling

If recycling is not possible, all packing parts can also be disposed of with normal waste.

## 12.2 Decommissioning

- Turn off the device at the main power switch (h) and disconnect it from the power supply (pull the power plug).
- Turn off the inert gas supply.

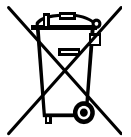
	<div style="background-color: red; color: white; padding: 5px; text-align: center;">  <b>DANGER</b> </div> <p><b>Risk of suffocation by inert gas in a high concentration.</b>  <b>Death by suffocation.</b></p> <ul style="list-style-type: none"> <li>➤ Respect the relevant regulations for handling inert gases.</li> <li>➤ When decommissioning the vacuum pump, turn off the inert gas supply.</li> </ul>
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- Empty the separator and the condensate catchpot.
- Remove the hose connections.
- Temporal decommissioning: See indications for appropriate storage, chap. 4.4.
- Final decommissioning: Dispose of the device as described in chap. 12.3 to 12.5.


## 12.3 Disposal of the device in the Federal Republic of Germany

According to Annex I of Directive 2012/19/EU of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE), BINDER devices are classified as “monitoring and control instruments” (category 9) only intended for professional use”. They must not be disposed of at public collecting points.


The devices bear the symbol for the marking of electrical and electronic equipment manufactured / placed on the market in the EC after 13 August 2005 and be disposed of in separate collection according to Directive 2012/19/EU on waste electrical and electronic equipment (WEEE) and German national law for electrical and electronic equipment (Elektro- und Elektronikgerätegesetz, ElektroG). WEEE marking: crossed-out wheeled bin with solid bar under. A significant part of the materials must be recycled in order to protect the environment.





At the end of the device's service life, have the device disposed of according to the German national law for electrical and electronic equipment (Elektro- und Elektronikgerätegesetz, ElektroG from 20 October 2015, BGBl. I p. 1739) or contact BINDER service who will organize taking back and disposal of the device according to the German national law for electrical and electronic equipment (Elektro- und Elektronikgerätegesetz, ElektroG from 20 October 2015, BGBl. I p. 1739).

	<div style="background-color: #00a0e3; color: white; padding: 5px; text-align: center;"> <b>NOTICE</b> </div> <p><b>Danger of violation against existing law if not disposed of properly.</b>  <b>Failure to comply with applicable law.</b></p> <ul style="list-style-type: none"> <li>Ø Do NOT dispose of BINDER devices at public collecting points.</li> <li>➤ Have the device disposed of professionally at a recycling company which is certified according to the German national law for electrical and electronic equipment (Elektro- und Elektronikgerätegesetz, ElektroG from 20 October 2015, BGBl. I p. 1739).</li> <li style="text-align: center;">or</li> <li>➤ Instruct BINDER Service to dispose of the device. The general terms of payment and delivery of BINDER GmbH apply, which were valid at the time of purchasing the device.</li> </ul>
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Certified companies disassemble waste (used) BINDER equipment in primary substances for recycling according to Directive 2012/19/EU. The devices must be free from toxic, infectious or radioactive substances in order to eliminate any health hazards to the employees of the recycling companies.

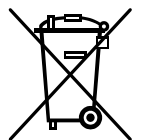
	<p>Prior to handing the device over to a recycling company, it is the user's responsibility that it is free from toxic, infectious or radioactive substances.</p> <ul style="list-style-type: none"> <li>• Prior to disposal, clean all introduced or residual toxic substances from the device.</li> <li>• Prior to disposal, disinfect the device from all sources of infection. Be aware that sources of infection may also be located outside the interior.</li> <li>• If you cannot safely remove all toxic substances and sources of infection from the device, dispose of it as "special" waste according to national law.</li> <li>• Fill out the contamination clearance certificate (chap. 16) and enclose it with the device.</li> </ul>
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	<div style="background-color: orange; text-align: center; padding: 5px;">  <b>WARNING</b> </div> <p><b>Danger of intoxication and infection through contamination of the device with toxic, infectious or radioactive substances.</b></p> <p><b>Damages to health.</b></p> <ul style="list-style-type: none"> <li>Ø NEVER take a device contaminated with toxic substances or sources of infection for recycling according to Directive 2012/19/EU.</li> <li>➤ Prior to disposal, remove all toxic substances and sources of infection from the device.</li> <li>➤ A device from which all toxic substances or sources of infection cannot be safely removed must be considered as "special" waste according to national law. Dispose of it accordingly.</li> </ul>
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## 12.4 Disposal of the device in the member states of the EU except for the Federal Republic of Germany


According to Annex I of Directive 2012/19/EU of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE), BINDER devices are classified as "monitoring and control instruments" (category 9) only intended for professional use". They must not be disposed of at public collecting points.

The devices bear the symbol for the marking of electrical and electronic equipment manufactured / placed on the market in the EC after 13 August 2005 and be disposed of in separate collection according to the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE). WEEE marking: crossed-out wheeled bin with solid bar under.







At the end of the device's service life, notify the distributor who sold you the device, who will take back and dispose of the device according to the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE).





	<div style="background-color: #00a0e3; color: white; text-align: center; padding: 5px;"> <b>NOTICE</b> </div> <p><b>Danger of violation against existing law if not disposed of properly.</b></p> <p><b>Failure to comply with applicable law.</b></p> <ul style="list-style-type: none"> <li>Ø Do NOT dispose of BINDER devices at public collecting points.</li> <li>➤ Have the device disposed of professionally at a recycling company that is certified according to conversion of the Directive 2012/19/EU into national law.</li> <li style="text-align: center;"><i>or</i></li> <li>➤ Instruct the distributor who sold you the device to dispose of it. The agreements apply that were agreed with the distributor when purchasing the device (e.g. his general terms of payment and delivery).</li> <li>➤ If your distributor is not able to take back and dispose of the device, please contact BINDER service.</li> </ul>
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Certified companies disassemble waste (used) BINDER equipment in primary substances for recycling according to Directive 2012/19/EU. The devices must be free from toxic, infectious or radioactive substances in order to eliminate any health hazards to the employees of the recycling companies.

	<p>Prior to handing the device over to a recycling company, it is the user's responsibility that it is free from toxic, infectious or radioactive substances.</p> <ul style="list-style-type: none"> <li>• Prior to disposal, clean all introduced or residual toxic substances from the device.</li> <li>• Prior to disposal, disinfect the device from all sources of infection. Be aware that sources of infection may also be located outside the interior.</li> <li>• If you cannot safely remove all sources of infection and toxic substances from the device, dispose of it as "special" waste according to national law.</li> <li>• Fill out the contamination clearance certificate (chap. 16) and enclose it with the device.</li> </ul>
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 	<div style="background-color: orange; text-align: center; padding: 5px;">  <b>WARNING</b> </div> <p><b>Danger of intoxication and infection through contamination of the device with toxic, infectious or radioactive substances.</b></p> <p><b>Damages to health.</b></p> <ul style="list-style-type: none"> <li>Ø NEVER take a device contaminated with toxic substances or sources of infection for recycling according to Directive 2012/19/EU.</li> <li>➤ Prior to disposal, remove all toxic substances and sources of infection from the device.</li> <li>➤ A device from which all toxic substances or sources of infection cannot be safely removed must be considered as "special" waste according to national law. Dispose of it accordingly.</li> </ul>
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## 12.5 Disposal of the device in non-member states of the EU

 	<div style="background-color: #00a0e3; color: white; text-align: center; padding: 5px;"> <b>NOTICE</b> </div> <p><b>Danger of violation against existing law if not disposed of properly.</b></p> <p><b>Failure to comply with applicable law. Alteration of the environment.</b></p> <ul style="list-style-type: none"> <li>➤ For final decommissioning and disposal of the vacuum drying oven, please contact BINDER Service.</li> <li>➤ Follow the statutory regulations for appropriate, environmentally friendly disposal.</li> </ul>
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## 13. Technical description

### 13.1 Connections

Connection type	Version
Pneumatic inlet (suction side)	DN 16 small flange incl. 1/4" thread
Pneumatic outlet (pressure side)	Hose shaft GL 18 (inner diameter 10 mm)
Coolant inlet/outlet	Hose shaft GL 14 (inner diameter 8 mm)
Drive chamber purging inlet/outlet (Scope of delivery for inert gas connection)	Hose shaft DN 8 (inner diameter 8 mm)
Gas ballast (Scope of delivery for inert gas connection)	Hose shaft DN 8 (inner diameter 8 mm)

## 13.2 VAP 5 Technical data

Device type			230 V model	120 V model
<b>Dimensions</b>				
Height		mm	530 ± 10	530 ± 10
Width		mm	330 ± 10	330 ± 10
Depth		mm	360 ± 10	360 ± 10
Weight (unpackaged)		kg	28,2	28,2
<b>Performance data</b>				
Suction capacity acc. to ISO 21360-1 at 1000 mbar	at 50 Hz	m <sup>3</sup> / h	3,9	---
	at 60 Hz	m <sup>3</sup> / h	---	4,3
Ultimate pressure (base pressure) acc. to ISO 21360-1	without gas ballast	mbar	≤ 2	≤ 2
	with gas ballast	mbar	≤ 3	≤ 3
Max. inlet/outlet pressure		mbar	1100	1100
Noise level		dB (A)	53	53
<b>Ambient conditions</b>				
Ambient temperature range for operation	outside (T <sub>a</sub> )	°C	+10 to +40	+10 to +40
Max. medium temperature		°C	+40	+40
Max. refrigerant temperature		°C	+12	+12
Ambient temperature range for storage		°C	+ 5 to + 40	+ 5 to + 40
Max. ambient humidity for storage		% r.F.	< 90	< 90
Operating fluid coolant equipment min. max:		°C	0 – + 15	
Max. operating altitude above sea level		m	2000	2000
<b>Operation with inert gas (optional)</b>				
Inert gas quantity (tolerance)	+/- 10%	L / h	60	60
Inert gas pressure (absolute, i.e. relative overpressure to ambient pressure)		mbar	1100 – 1150	1100 – 1150
<b>Electrical data</b>				
IP protection degree acc. to EN 60529		IP	55	55
Nominal power	at 50 Hz	V AC	230	---
	at 60 Hz	V AC	---	115
Nominal current	at 50 Hz	A	1,30	---
	at 60 Hz	A	---	3,1

All technical data is specified for devices with standard equipment at an ambient temperature of 22 +/- 3 °C / 71.6 +/- 5.4 °F and a power supply voltage fluctuation of +/-10%. Technical data is determined in accordance to the relevant standards.

**All indications are average values, typical for devices produced in series. We reserve the right to change technical specifications at any time.**

## 13.3 Circuit of the pump heads

- Three-stage circuit (T)
- Two pump heads are connected in parallel, the other two are connected in series.

### 13.4 Materials of pump parts in contact with the medium



The operator must ensure that the application of the pumped solvents with the installed materials is not critical.

Component	Material
Vacuum pump <ul style="list-style-type: none"> <li>- Pump heads</li> <li>- Form diaphragm</li> <li>- Valves</li> <li>- Gaskets</li> </ul>	<ul style="list-style-type: none"> <li>- PTFE (Polytetrafluorethylene)</li> <li>- PTFE coating on elastomer</li> <li>- PEEK (Polyetheretherketone)</li> <li>- EPDM (ethylene propylene diene rubber)</li> </ul>
Pneumatic connections <ul style="list-style-type: none"> <li>- Vacuum hoses</li> <li>- Screwings</li> <li>- Gaskets, O-ring</li> </ul>	<ul style="list-style-type: none"> <li>- PTFE (Polytetrafluorethylene)</li> <li>- PVDF (Polyvinylidenfluoride)</li> <li>- EPDM (ethylene propylene diene rubber)</li> </ul>
Condensate catchpot / Emission condenser <ul style="list-style-type: none"> <li>- Separator, condensate catchpot</li> <li>- Hose shaft</li> <li>- Connection block incl. hose shaft</li> </ul>	<ul style="list-style-type: none"> <li>- Glass (vacuum proof)</li> <li>- PTFE (Polytetrafluorethylene)</li> <li>- PVDF (Polyvinylidenfluoride)</li> </ul>

### 13.5 Accessories and spare parts



BINDER GmbH is responsible for the safety features of the device only, provided skilled electricians with additional skills in explosion protection or qualified personnel authorized by BINDER perform all maintenance and repair, and if components relating to device safety are replaced in the event of failure with original spare parts. The user is responsible for any risks arising from using unauthorized accessories/components.

Failure to follow these instructions can result in loss of explosion protection.

Description	Art. no.
ATEX Connection kit for vacuum drying oven VDL, consisting of: <ul style="list-style-type: none"> <li>• Metal hose (stainless steel), small flange DN 16</li> <li>• Seal (stainless steel /FKM O-ring), small flange DN 16</li> <li>• Clamping ring, small flange DN 10/16</li> </ul>	8012-2029
VAP 5 Service Kit for maintenance, complete, consisting of: 2 x form diaphragm 2 x valve 2 x O-ring ø 22 x 2 2 x O-ring ø 28 x 2	8500-0160
Emission condenser	
Separator / condensate catchpot Conical ground clamp, stainless steel, conical joint 35 Round-bottomed flask 500 ml conical joint 35	

For information on components not listed here, please contact BINDER Service.

### 13.6 Diagrams of suction pressure / suction capacity

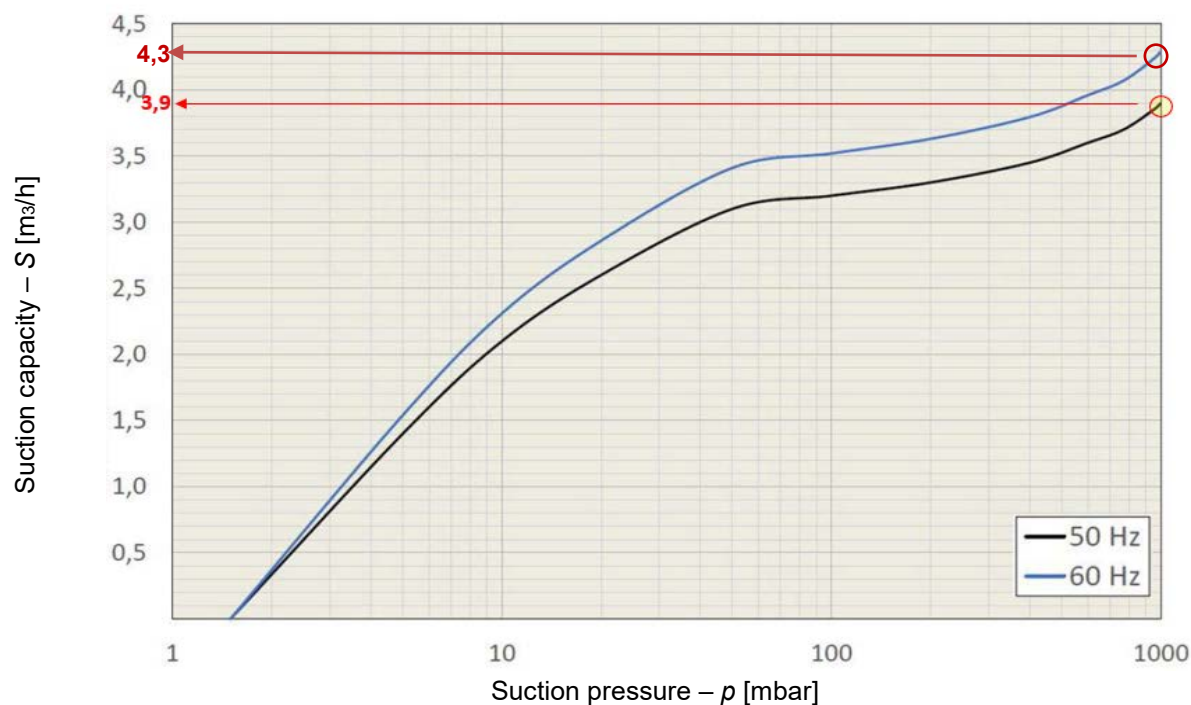


Figure 28: Characteristic suction capacity  $S(p)$  of the VAP 5 vacuum pumps

### 13.7 Dimensions

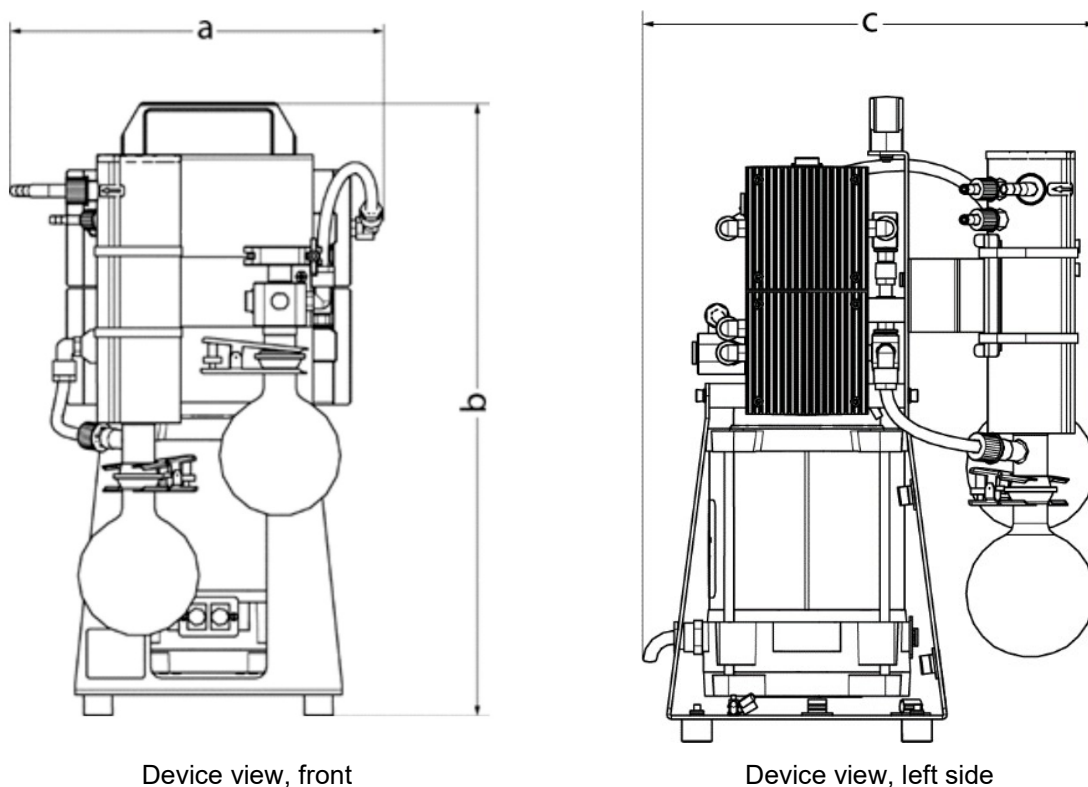


Figure 29: VAP 5 dimensions

a	Height	mm	$330 \pm 10$
b	Width	mm	$530 \pm 10$
c	Depth	mm	$360 \pm 10$



## 14. Certificates and declarations of conformity

### 14.1 EU Declaration of conformity



**CE** EU-Konformitätserklärung / EU Declaration of Conformity / Déclaration de conformité  
UE / Declaración de conformidad UE / Dichiarazione di conformità UE / Декларация  
соответствия EU

Hersteller / Manufacturer / Fabricant / Fabricante / Fabbricante / Производитель	BINDER GmbH
Anschrift / Address / Adresse / Dirección / Indirizzo / Адрес	Im Mittleren Ösch 5, 78532 Tuttlingen, Germany
Produkt / Product / Produit / Producto / Prodotto / Продукт	Vakuumpumpen Vacuum pumps Pompes à vide Bombas de vacío Pompe per vuoto Вакуумные насосы
Typenbezeichnung / Type / Type / Tipo / Tipo / Тип	VAP 5
Art. No. / Art. no. / Réf. / Art. N° / Art. n. / № apr.	5013-0220, 5013-0221

Die oben beschriebenen Maschinen sind konform mit folgenden EG/EU-Richtlinien (gemäß Veröffentlichung im Amtsblatt der europäischen Kommission):

The machines described above are in conformity with the following EC/EU Directives (as published in the Official Journal of the European Union):

Les machines décrites ci-dessus sont conformes aux directives CE/UE suivantes (selon leur publication dans le Journal officiel de l'Union européenne):

La máquina descrita arriba cumple con las siguientes directivas de la CE/UE (publicados en el Diario oficial de la Unión Europea):

Le macchine sopra descritte sono conforme alle seguenti direttive CE/UE (secondo la pubblicazione nella Gazzetta ufficiale della Commissione europea):

Машина, указанная выше, полностью соответствует следующим регламентам ЕС/ЕУ (опубликованным в Официальном журнале Европейского Содружества):

- **2006/42/EC**  
Maschinenrichtlinie 2006/42/EG / Machinery directive 2006/42/EC / Directive Machines 2006/42/EC / Directiva 2006/42/CE (Máquinas) / Direttiva macchine 2006/42/CE / Директива о машинах 2006/42/EC
- **2014/34/EU**  
ATEX-Richtlinie 2014/34/EU / ATEX Directive 2014/34/EU / Directive ATEX 2014/34/UE / Directiva ATEX 2014/34/UE / Direttiva ATEX 94/9/UE / Директива ATEX 2014/34/EU
- **2014/30/EU**  
EMV-Richtlinie 2014/30/EU / EMC Directive 2014/30/EU / Directive CEM 2014/30/UE / Directiva CEM 2014/30/UE / Direttiva EMC 2014/30/UE / Директива ЭМС 2014/30/EU
- **2011/65/EU**  
RoHS-Richtlinien 2011/65/EU / RoHS Directive 2011/65/EU / Directive RoHS 2011/65/UE / Directiva RoHS 2011/65/UE / Direttiva RoHS 2011/65/UE / Директива RoHS 2011/65/EU

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BINDER GmbH Postfach 102 D-78502 Tuttlingen Anschrift: BINDER GmbH Im Mittleren Ösch 5 D-78532 Tuttlingen  
Kontakt: Telefon: +49 (0) 74 62 / 20 05 – 0 | Telefax: +49 (0) 74 62 / 20 05 – 100 | info@binder-world.com | www.binder-world.com  
Geschäftsführung: Dipl.-Ing. Peter M. Binder | Amtsgericht Stuttgart, HRB 727150 | Sitz der Gesellschaft: Tuttlingen  
Bankverbindung: Kreissparkasse Tuttlingen IBAN-Code: DE05643 500700 000002266 | SWIFT-Code: SOLA DE 31TUT  
Deutsche Bank Tuttlingen IBAN-Code: DE56653 70075 0213870900 | SWIFT-Code: DEUT DE 33653  
Altgeräte-Entsorgung gemäß WEEE-Reg.-Nr. DE 37004983

Die oben beschriebenen Maschinen entsprechen aufgrund ihrer Konzipierung und Bauart sowie in der von uns in Verkehr gebrachten Ausführung den einschlägigen grundlegenden Sicherheits- und Gesundheitsanforderungen der genannten EG/EU-Richtlinien.

The machines described above are conform to the mentioned EC/EU directives in regard to the relevant safety and health demands due to their conception and style of construction as well as to the version put onto market by us.

Les machines décrites ci-dessus correspondent aux demandes de sécurité et de santé des directives citées de la CE/UE due à leur conception et construction et dans la réalisation mise sur le marché par nous.

Las máquinas descritas arriba se corresponden con los requisitos básicos pertinentes de seguridad y salud de las citadas directivas de la CE/UE debido a su concepción y fabricación, así como a la realización llevada a cabo por nosotros.

Le macchine sopra descritte sono conforme ai requisiti essenziali di sanità e sicurezza pertinenti delle summenzionate direttive CE/UE in termini di progettazione, tipo di costruzione ed esecuzione messa da noi in circolazione.

Машины описано выше, соответствует указанным директивам ЕС/EU в отношении требований соответствующей безопасности и здоровья по концепции и конструкции так же как и версия, применяемая нами на рынке.

Die oben beschriebenen Maschinen tragen entsprechend die Kennzeichnung CE.

The machines described above, corresponding to this, bear the CE-mark.

Les machines décrits ci-dessus, en correspondance, portent l'indication CE.

Las máquinas descritas arriba, en conformidad, llevan la indicación CE.

Le macchine sopra descritte sono contrassegnate dal marchio CE.

Машины описано выше, в соответствии с изложенным выше маркированы знаком CE.

Die oben beschriebenen Maschinen sind konform mit folgenden harmonisierten Normen:

The machines described above are in conformity with the following harmonized standards:

Les machines décrits ci-dessus sont conformes aux normes harmonisées suivantes:

Las máquinas descritas arriba cumplen con las siguientes normas:

Le macchine sopra descritte sono conforme alle seguenti normative armonizzate:

Машины описано выше, полностью соответствуют следующим стандартам:

Sicherheit / Safety / Sécurité / Seguridad / Sicurezza / Нормативы по безопасности
<ul style="list-style-type: none"><li>• EN ISO 12100:2010 + Corr. 1:2011</li><li>• EN 1012-2:1996+ A1: 2009</li></ul>
EMV / EMC / CEM / CEM / EMC / ЭМС
<ul style="list-style-type: none"><li>• EN 61000-6-2:2019</li><li>• EN 61000-6-3:2007 + A1:2011</li></ul>

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RoHS
<ul style="list-style-type: none"> <li>• <b>EN IEC 63000:2018</b></li> </ul>
Explosionsschutz / Explosion protection / Protection contre les explosions / Protección contra explosiones / Protezione contro le esplosioni / Взрывозащита
<ul style="list-style-type: none"> <li>• <b>EN 1127-1:2019</b></li> <li>• <b>EN 80079-36:2016</b></li> <li>• <b>EN 80079-37:2016</b></li> </ul>

Die Ex-Klassifikation des Gesamtgerätes (Baugruppe) nach ATEX Richtlinie 2014/34/EU ist :

The Ex classification of the entire unit (assembly) according to ATEX Directive 2014/34/EU is :

La classification Ex de l'appareil entier (assemblage) selon la Directive 2014/34/UE ATEX est :

La clasificación Ex del dispositivo completo (ensamblaje) según la Directiva 2014/34/UE es:

La classificazione Ex dello spazio interno dell'intero apparecchio (assemblaggio) secondo la direttiva ATEX 2014/34/UE è:

Классификация Ex внутренней всей камеры (сборка) в соответствии с Директивой ATEX 2014/34/EU

 II 2/3/- G IIB T3 Gb/Gc/- X

78532 Tuttlingen, 28.02.2022

BINDER GmbH



P. Wimmer

Vice President

Vice President

Vice président

Vicepresidente

vicepresidente

Вице-президент



J. Bollaender

Leiter F & E

Director R & D

Chef de service R&D

Responsable I & D

Direttore R & D

Глава департамента R&D


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The pumps / components are shipped in accordance with the legal requirements. Hereby we order the repair.

Legally binding declaration: We declare that the statements here are correct and complete.	
Name: _____	Position: _____
Company: _____	Department: _____
Address: _____	Contact (phone, fax, E-mail): _____
Signature: _____	Date: _____
Company stamp:	

	<p>A repair can only be carried out if a fully completed damage report and a fully completed contamination clearance certificate are available.</p> <p>Otherwise, work may be delayed. Our general terms and conditions of delivery and payment apply.</p>
---	--

**Notes/additions**


## 16. Contamination clearance certificate

### 16.1 For devices located outside the USA and Canada

#### Declaration regarding safety and health

Erklärung zur Sicherheit and gesundheitlichen Unbedenklichkeit

The German Ordinance on Hazardous Substances (GefStoFV), and the regulations regarding safety at the workplace, require that this form be filled out for all products that are returned to us, so that the safety and the health of our employees can be guaranteed.

Die Sicherheit und Gesundheit unserer Mitarbeiter, die Gefahrstoffverordnung GefStoFV und die Vorschriften zur Sicherheit am Arbeitsplatz machen es erforderlich, dass dieses Formblatt für alle Produkte, die an uns zurückgeschickt wird.



Note: A repair is not possible without a completely filled out form.  
Ohne Vorliegen des vollständig ausgefüllten Formblattes ist eine Reparatur nicht möglich.

- A completely filled out form must be transmitted via Fax (+49 (0) 7462 2005 93555) or by letter in advance, so that this information is available before the equipment/component part arrives. A second copy of this form must accompany the equipment/component part. In addition, the carrier should be informed.

Eine vollständig ausgefüllte Kopie dieses Formblattes soll per Telefax (Nr. +49 (0) 7462 2005 93555) oder Brief vorab an uns gesandt werden, so dass die Information vorliegt, bevor das Gerät/Bauteil eintrifft. Eine weitere Kopie soll dem Gerät/Bauteil beigelegt sein. Ggf. ist auch die Spedition zu informieren.

- Incomplete information or non-conformity with this procedure will inevitably lead to substantial delays in processing. Please understand the reason for this measure, which lies outside our area of influence and will help us to speed up this procedure.

Unvollständige Angaben oder Nichteinhalten dieses Ablaufs führen zwangsläufig zu beträchtlichen Verzögerungen in der Abwicklung. Bitte haben Sie Verständnis für Maßnahmen, die außerhalb unserer Einflussmöglichkeiten liegen und helfen Sie mit, den Ablauf beschleunigen.

- Please print and fill out this form completely.**

Bitte unbedingt vollständig ausfüllen!

Note: All questions must be answered or the applicable information checked. If a field is not filled in, contamination is automatically assumed and the necessary measures shall be taken at your expense.

1.	<b>Device/ component part / type::</b>		
2.	Serial no.:		
3.	Details about utilized substances / biological substances / or process-related reaction products which came into contact with the unit / components		
3.1	Commercial name / Product name / Manufacturer	Chemical name	Danger class
a)			
b)			
c)			
3.2	Safety measures required for handling these substances:		
a)			
b)			
c)			

3.3	Measures to be taken in case of personnel contact or release into the atmosphere
a)	
b)	
c)	
3.4	Other important information that must be taken into account
a)	
b)	
c)	
4.	Declaration on the risk of these substances (please checkmark the applicable items):
<input type="checkbox"/>	4.1 For nontoxic, non-radioactive, biologically harmless materials
We hereby guarantee that the above-mentioned unit / component part...	
<input type="checkbox"/>	Has not been exposed to or contains any toxic or otherwise hazardous substances
<input type="checkbox"/>	That eventually generated reaction products are non-toxic and also do not represent a hazard
<input type="checkbox"/>	Eventual residues of hazardous substances have been removed
<input type="checkbox"/>	4.2 For toxic, radioactive, biologically harmful or hazardous substances, or any other hazardous materials
We hereby guarantee that ...	
<input type="checkbox"/>	The hazardous substances, which have come into contact with the above-mentioned equipment / component part, have been completely listed under item 3.1 and that all information in this regard is complete
<input type="checkbox"/>	That the unit /component part has not been in contact with radioactivity
5.	Kind of transport / transporter
Transport by (means and name of transport company, etc.):	
Date of dispatch to BINDER GmbH:	
We hereby declare that the following measures have been taken:	
<input type="checkbox"/>	Hazardous substances were removed from the unit including component parts, so that no hazard exists for any person in the handling or repair of these items
<input type="checkbox"/>	The unit was securely packaged and properly identified. The unit / components are shipped in accordance with the legal requirements
<input type="checkbox"/>	Information about the hazardousness of the shipment (if required) has been provided to the transporter.
We hereby commit ourselves and guarantee that we will indemnify BINDER GmbH for all damages that are a consequence of incomplete or incorrect information provided by us, and that we will exempt BINDER GmbH from eventual damage claims by third parties.	
We are aware that, in accordance with Article 823 of the German Civil Code (BGB), we are directly liable with regard to third parties, in this instance especially the employees of BINDER GmbH, who have been entrusted with the handling / repair of the unit / component.	



Legally binding declaration: We declare that the statements here are correct and complete.

Name:

Position:

Company:

Department:

Address:

Contact (phone,  
fax, E-mail):

Signature:

Date:

Company stamp:



Equipment that is returned to the factory for repair must be accompanied by a completely filled out contamination clearance certificate. For service and maintenance on site, such a contamination clearance certificate must be submitted to the service technician before the start of any work. No repair or maintenance of the equipment is possible, without a properly filled out contamination clearance certificate.

#### Notes/additions


## 16.2 For devices in the USA and Canada

### Product Return Authorization Request

Please complete this form and the Customer Decontamination Declaration (next 2 pages) and attach the required pictures. E-mail to: IDL\_SalesOrderProcessing\_USA@binder-world.com

After we have received and reviewed the complete information we will decide on the issue of a RMA number. Please be aware that size specifications, voltage specifications as well as performance specifications are available on the internet at [www.binder-world.us](http://www.binder-world.us) at any time.

Take notice of shipping laws and regulations.

	Please fill:	
Reason for return request	<input type="radio"/> Duplicate order	
	<input type="radio"/> Duplicate shipment	
	<input type="radio"/> Demo	<i>Page one completed by sales</i>
	<input type="radio"/> Power Plug / Voltage	115V / 230 V / 208 V / 240V
	<input type="radio"/> Size does not fit space	
	<input type="radio"/> Transport Damage	Shock watch tripped? (pictures)
	<input type="radio"/> Other (specify below)	
	_____	
Is there a replacement PO?	<input type="radio"/> Yes <input type="radio"/> No	
<i>If yes -&gt; PO #</i>		
<i>If yes -&gt; Date PO placed</i>		
Purchase order number		
BINDER model number		
BINDER serial number		
Date device was received		
Was the device unboxed?	<input type="radio"/> Yes <input type="radio"/> No	
Was the device plugged in?	<input type="radio"/> Yes <input type="radio"/> No	
Was the device in operation?	<input type="radio"/> Yes <input type="radio"/> No	
<i>Pictures of device attached?</i>	<input type="radio"/> Yes <input type="radio"/> No	Pictures have to be attached!
<i>Pictures of Packaging attached?</i>	<input type="radio"/> Yes <input type="radio"/> No	

	Customer Contact Information	Distributor Contact Information
Name		
Company		
Address		
Phone		
E-mail		

## Customer (End User) Decontamination Declaration

### Health and Hazard Safety declaration

To protect the health of our employees and the safety at the workplace, we require that this form is completed by the user for all products and parts that are returned to us. (Distributors or Service Organizations cannot sign this form)



NO RMA number will be issued without a completed form. Products or parts returned to our NY warehouse without a RMA number will be refused at the dock.

A second copy of the completed form must be attached to the outside of the shipping box.

<b>1.</b>	<b>Device/ component part / type:</b>
<b>2.</b>	<b>Serial No.</b>
<b>3.</b>	<b>List any exposure to hazardous liquids, gasses or substances and radioactive material</b>
<b>3.1</b>	<b>List with MSDS sheets attached where available or needed (if there is not enough space available below, please attach a page):</b>
a)	_____
b)	_____
c)	_____
<b>3.2</b>	<b>Safety measures required for handling the list under 3.1</b>
a)	_____
b)	_____
c)	_____
<b>3.3</b>	<b>Measures to be taken in case of skin contact or release into the atmosphere:</b>
a)	_____
b)	_____
c)	_____
d)	_____
<b>3.4</b>	<b>Other important information that must be considered:</b>
a)	_____
b)	_____
c)	_____

**4. Declaration of Decontamination**

**For toxic, radioactive, biologically and chemically harmful or hazardous substances, or any other hazardous materials.**

**We hereby guarantee that**

- 4.1 Any hazardous substances, which have come into contact with the above-mentioned equipment / component part, have been completely listed under item 3.1 and that all information in this regard is complete.
- 4.2 That the device /component part has not been in contact with radioactivity
- 4.3 Any Hazardous substances were removed from the device / component part, so that no hazard exists for a persons in the shipping, handling or repair of these returned device
- 4.4 The device was securely packaged in the original undamaged packaging and properly identified on the outside of the packaging material with the device designation, the RMA number and a copy of this declaration.
- 4.5 Shipping laws and regulations have not been violated.

**I hereby commit and guarantee that we will indemnify BINDER Inc. for all damages that are a consequence of incomplete or incorrect information provided by us, and that we will indemnify and hold harmless BINDER Inc. from eventual damage claims by third parties.**

Name: \_\_\_\_\_

Position: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

Phone #: \_\_\_\_\_

Email: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_



Equipment returned to the NY warehouse for repair must be accompanied by a completed customer decontamination declaration. For service and maintenance works on site, such a customer decontamination declaration must be submitted to the service technician before the start of work. No repair or maintenance of the equipment is possible without a completed form.

