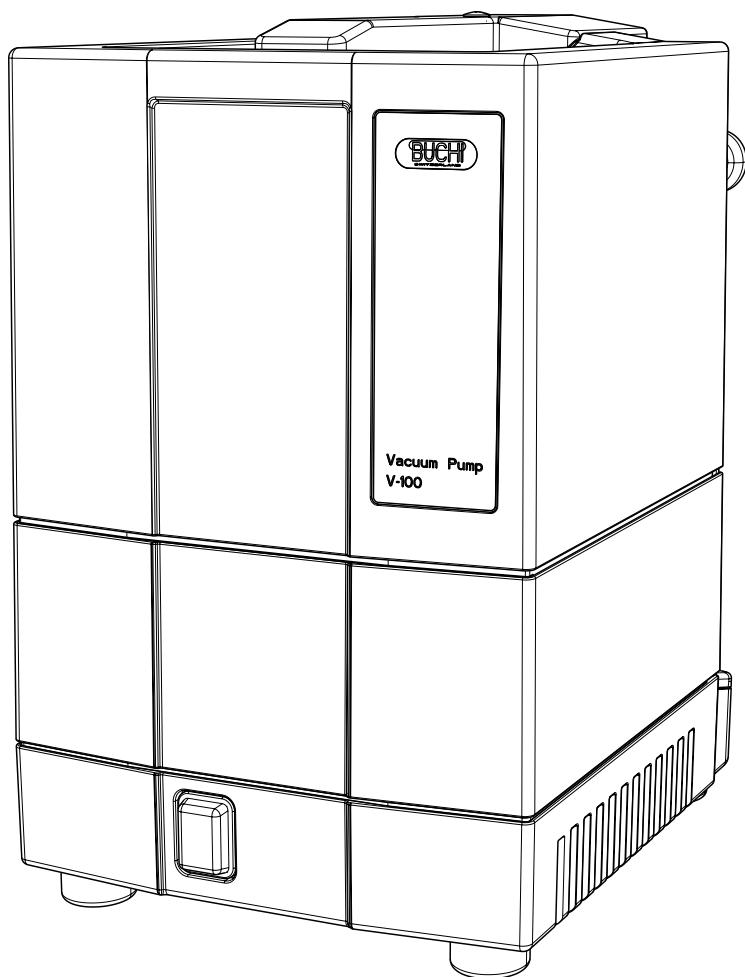




Vacuum Pump V-100

Operation Manual



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1 About this document

These operating instructions describe the Vacuum Pump V-100 at the time supplied. They are an integral part of the product and contain important information that is necessary for safe operation and maintenance.

These operating instructions apply to all variants of the Vacuum Pump V-100 and are intended primarily for laboratory staff.

- ▶ To ensure safe and trouble-free operation, read these operating instructions before starting up the device and follow the guidance they contain.
- ▶ Keep the operating instructions somewhere near to the device.
- ▶ Pass on the operating instructions to any subsequent owner or user.

BÜCHI Labortechnik AG accepts no liability whatsoever for any faults or damage that result from the failure to follow these operating instructions.

- ▶ If you still have any questions after reading these operating instructions, please contact BÜCHI Labortechnik AG Customer Service. Contact details for your local agents can be found on the back cover of these operating instructions or on the Internet at <http://www.buchi.com>.

1.1 Warning notices in this document

Warning notices warn you of dangers that can occur when handling the device. There are four danger levels, each identifiable by the signal word used.

| Signal word | Meaning |
|-------------|---|
| DANGER | Indicates a danger with a high level of risk which could result in death or serious injury if not prevented. |
| WARNING | Indicates a danger with a medium level of risk which could result in death or serious injury if not prevented. |
| CAUTION | Indicates a danger with a low level of risk which could result in minor or medium-severity injury if not prevented. |
| NOTICE | Indicates a danger that could result in damage to property. |

1.2 Symbols

The following symbols may be displayed in this instruction manual or on the device:

1.2.1 Warning symbols

| Symbol | Meaning | Symbol | Meaning |
|---|------------------------------|--|----------------------------------|
|  | General warning |  | Corrosive substance |
|  | Dangerous electrical voltage |  | Flammable substance |
|  | Biological hazard |  | Potentially explosive atmosphere |
|  | Breakable items |  | Dangerous gases |

| Symbol | Meaning | Symbol | Meaning |
|---|---------------------|--|---------------------------------------|
|  | Hot surface |  | Health-harming or irritant substances |
|  | Risk of hand injury |  | Strong magnetism |

1.2.2 Mandatory directive symbols

| Symbol | Meaning | Symbol | Meaning |
|---|------------------------|--|--|
|  | Wear safety goggles |  | Wear protective clothing |
|  | Wear protective gloves |  | Heavy load, do not lift without assistance |

1.2.3 Other symbols



NOTE

This symbol draws attention to useful and important information.

- This character draws attention to a requirement that must be met before the instructions below are carried out.
- This character indicates an instruction that must be carried out by the user.
- This character indicates the result of a correctly carried out instruction.

1.3 Available languages

These operating instructions were originally produced in German and have been translated into several other languages. The translations are available on the enclosed CD or can be obtained as a PDF file via <http://www.buchi.com>.

1.4 Trademarks

Product names and registered or unregistered trademarks that are used in this instruction manual are used only for identification and remain the property of the owner in each case.

For example, Rotavapor® is a registered trademark of BÜCHI Labortechnik AG.

2 Safety

2.1 Intended use

The Vacuum Pump V-100 has been designed and built as an item of laboratory equipment. Its intended use is the evacuation of laboratory apparatus. This is done by means of a PTFE-membrane pump – with or without regulation by a vacuum controller.

PTFE-membrane pumps are used primarily for the following applications:

- Evacuating distillation apparatus, in particular rotary evaporators (Rotavapor®)
- Vacuum filtration
- Vacuum-drying cabinets
- Drying kilns

2.2 Use other than that intended

Use of any kind other than that referred to and any application that does not comply with the technical specifications constitutes use other than that intended. The operator alone is liable for any damage brought about by use of the device in a manner other than that intended.

In particular, the following applications are not permissible:

- Use in areas which require explosion-safe apparatus.
- Pumping of liquids and solid particles.
- Processing samples which could be caused to explode or ignite by impact, friction, heat or sparks (e.g. explosives).
- Use for analysis (e.g. Kjeldahl).
- Generation of positive pressure (pressurizing a system).
- Operation at ambient temperatures >40 °C.

2.3 Staff qualification

Unqualified persons are unable to identify risks and are therefore exposed to greater dangers.

The device may only be operated by suitably qualified laboratory staff.

These operating instructions are aimed at the following target groups:

Users

Users are persons that meet the following criteria:

- They have been instructed in the use of the device.
- They are familiar with the contents of these operating instructions and the applicable safety regulations and apply them.
- They are able on the basis of their training or professional experience to assess the risks associated with the use of the device.

Operator

The operator (generally the laboratory manager) is responsible for the following aspects:

- The device must be correctly installed, commissioned, operated and serviced.
- Only suitably qualified staff may be assigned the task of performing the operations described in these operating instructions.
- The staff must comply with the locally applicable requirements and regulations for safe and hazard-conscious working practices.
- Safety-related incidents that occur while using the device should be reported to the manufacturer (quality@buchi.com).

BUCHI service technicians

Service technicians authorized by BUCHI have attended special training courses and are authorized by BÜCHI Labortechnik AG to carry out special servicing and repair measures.

2.4 Residual risks

The device has been developed and manufactured using the latest technological advances. Nevertheless, risks to persons, property or the environment can arise if the device is used incorrectly.

Appropriate warnings in this manual serve to alert the user to these residual dangers.

2.4.1 Dangerous vapors

Distillation can produce dangerous vapors that are capable of causing life-threatening toxic effects.

- ▶ Do not inhale any vapors produced during distillation.
- ▶ Ensure that vapors are removed immediately by a suitable fume hood.
- ▶ Only use the device in well ventilated areas.
- ▶ If vapors escape from joints or connections, check the seals concerned and replace them if necessary.
- ▶ Do not distill any unknown fluids.
- ▶ Observe the safety data sheets for all fluids used.

2.4.2 Faults during operation

If a device is damaged, sharp edges or exposed electrical wires can cause injuries.

- ▶ Regularly check device for visible damage.
- ▶ If faults occur, switch off the device immediately, unplug the power cord and inform the operator.
- ▶ Do not continue to use devices that are damaged.

2.5 Personal protective equipment

Depending on the application, hazards due to heat and/or corrosive chemicals may arise.

- ▶ Always wear appropriate personal protective equipment such as safety goggles, protective clothing and gloves.
- ▶ Make sure that the personal protective equipment meets the requirements of the safety data sheets for all chemicals used.

2.6 Modifications

Unauthorized modifications may impair safety and lead to accidents.

- Use only genuine BÜCHI accessories, spare parts and consumables.
- Technical modifications to the device or accessories should only be carried out with the prior written approval of BÜCHI Labortechnik AG and only by authorized BÜCHI technicians.

BÜCHI accepts no liability whatsoever for damage arising as a result of unauthorized modifications.

3 Product description

3.1 Description of function

The Vacuum Pump V-100 is intended for evacuating laboratory apparatus to a terminal vacuum of 10 mbar (± 2 mbar).

Once switched on, the V-100 runs in continuous mode unless it is connected to the Interface I-100 unit. In unregulated continuous mode, the pump runs at a maximum speed of 1280 rpm and generates a terminal vacuum of 10 mbar (± 2 mbar). The time required for evacuation depends on the size (volume) of the vessel.

After 1 hour of operation, the V-100 switches automatically to ECO mode. In ECO mode, the V-100 runs at 70 % capacity but still generates the same terminal vacuum of 10 mbar (± 2 mbar).

The pump can be operated either as a standalone device or combined with optional accessories (see Chapter 3.3 "Specifications supplied", page 14).

3.2 Configuration

3.2.1 Front view

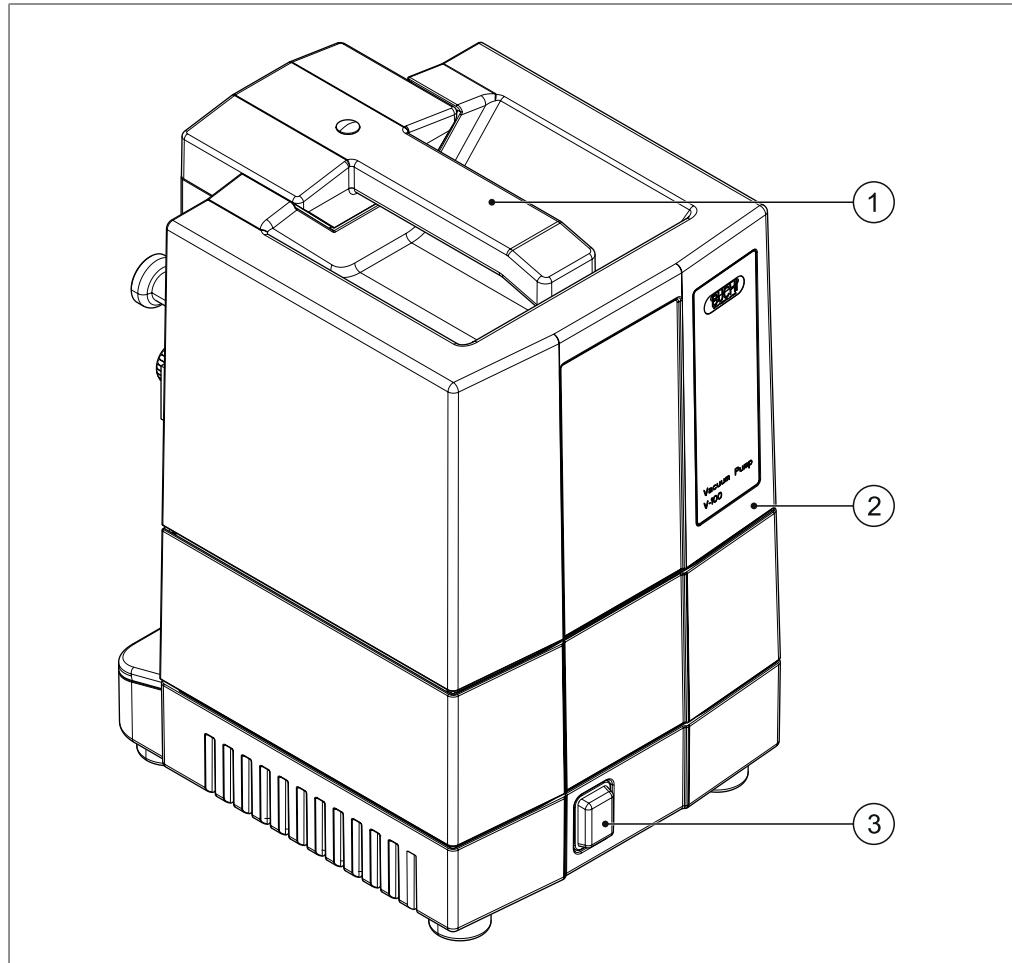


Fig. 1: Design of V-100

- 1 Carrying handle
- 2 Pump top cover
- 3 On/Off master switch

3.2.2 Rear view

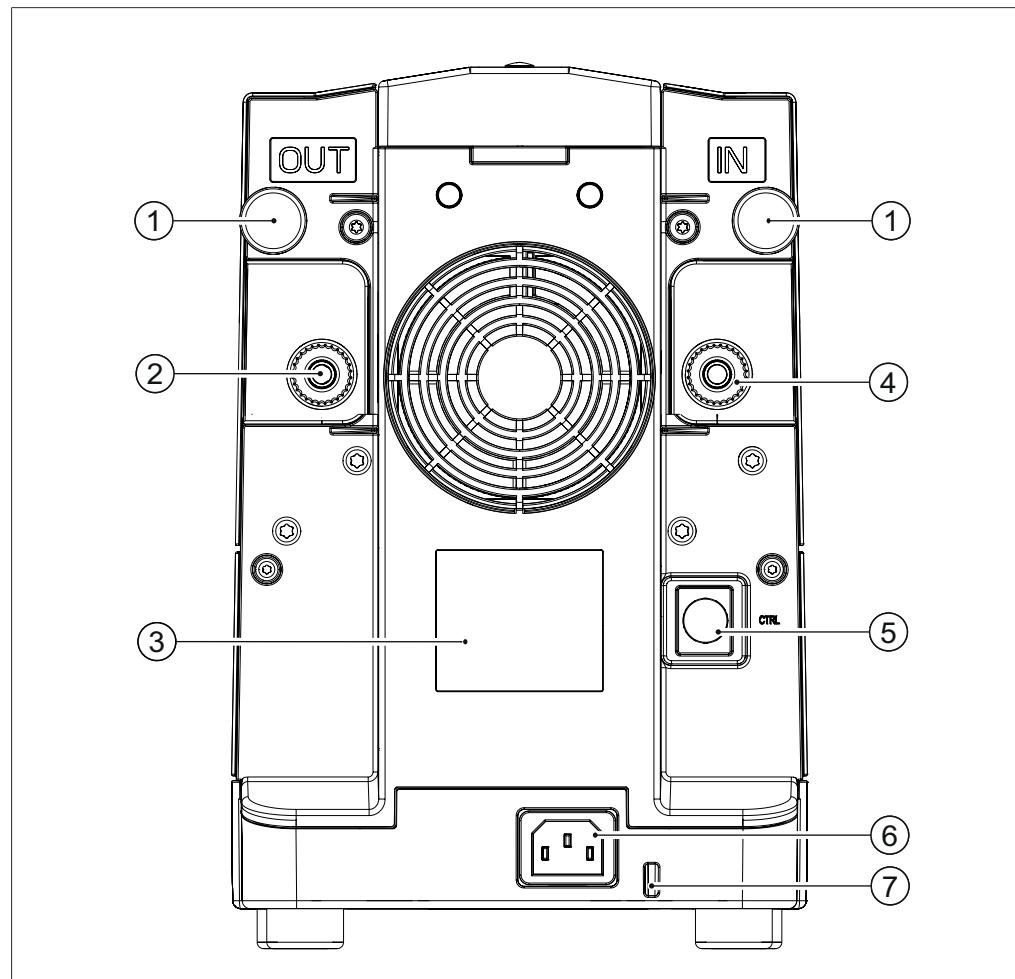


Fig. 2: Rear view of V-100

| | |
|-----------------------|--|
| 1 Knurled-head screws | 4 Pump intake (vacuum) |
| 2 Pump outlet | 5 Mini-DIN connection |
| 3 Type plate | 6 Power supply connection |
| | 7 Lashing eye (for securing against earthquakes) |

3.2.3 Internal view

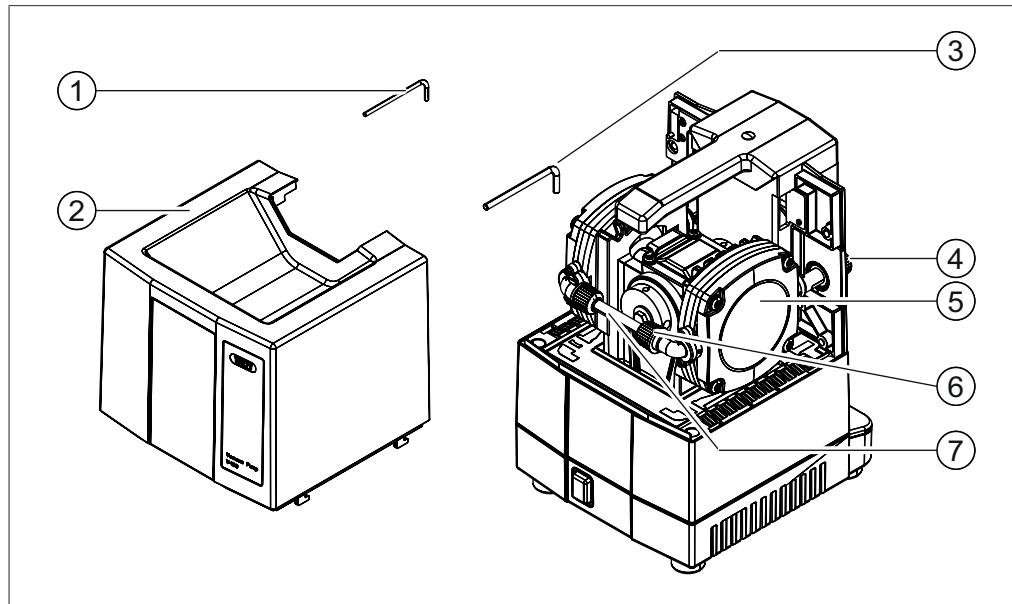


Fig. 3: Internal view of V-100 showing pump head and pump-head connection piece

| | |
|-------------------|------------------------------|
| 1 Torx key (TX10) | 3 Torx key (TX25) |
| 2 Pump top cover | 4 Pump outlet |
| | 5 Pump-head metal cover |
| | 6 GL14 cap nut |
| | 7 Pump-head connection piece |

3.2.4 Typical application

The V-100 is used for evacuating laboratory apparatus such as tubes, flasks and other apparatus.

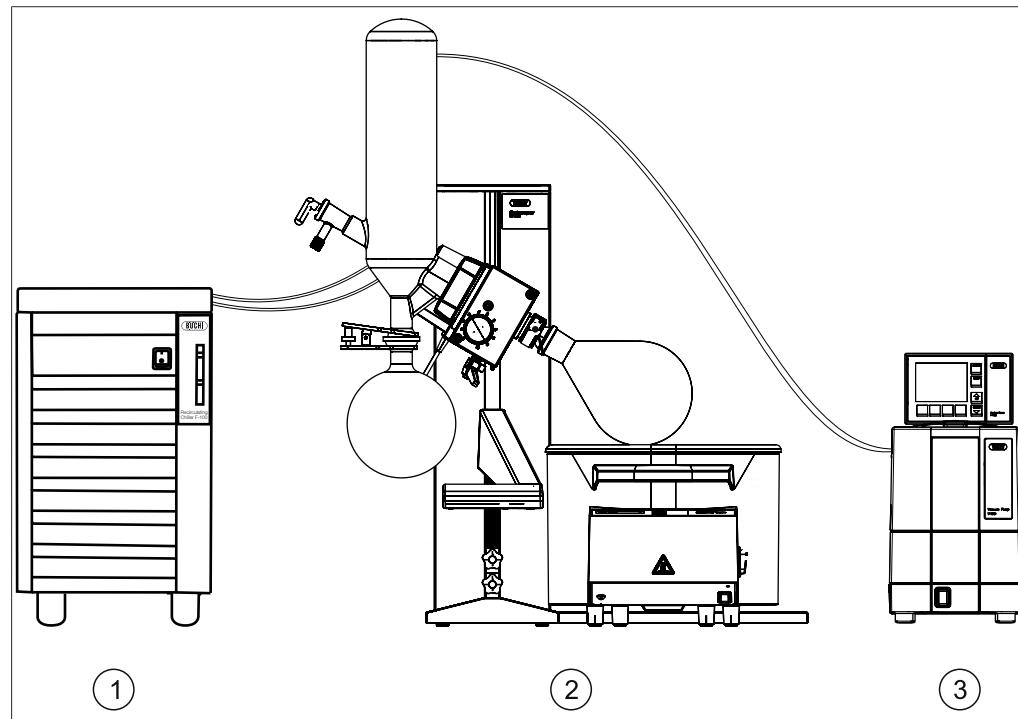


Fig. 4: Typical application for the V-100 in a laboratory

- 1 Recirculating Chiller F-100
- 2 Rotavapor R-100
- 3 Vacuum Pump V-100 with Interface I-100

Evacuation changes the physical and chemical properties of materials. The V-100 is ideally suited to connection to a Rotavapor R-100 in combination with a Recirculating Chiller F-1xx. With that combination of apparatus controlled by a controller such as the Interface I-100, ideal distillation configurations for all commonly used solvents can be created.

3.2.5 Type plate

The type plate is on the rear of the Vacuum Pump V-100.

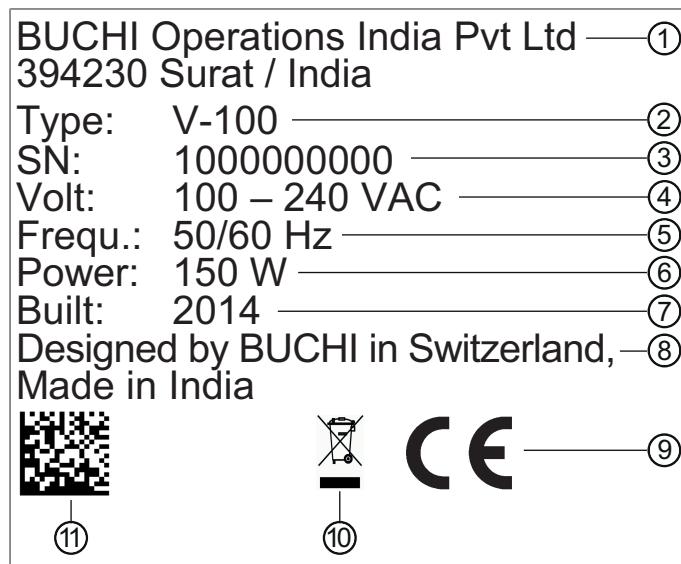


Fig. 5: Type plate (example)

| | |
|----------------------------|--|
| 1 Company name and address | 7 Year of manufacture |
| 2 Device name | 8 Country of manufacture |
| 3 Serial number | 9 Approvals |
| 4 Input voltage | 10 Symbol for "Do not dispose of as household waste" |
| 5 Frequency | 11 Product code |
| 6 Maximum power rating | |

3.3 Specifications supplied

| V-100 | |
|--------------------------|---|
| Vacuum Pump V-100 | 1 |
| Vacuum tubing (2 m) | 1 |
| Power supply cable | 1 |
| Silencer | 1 |
| Tubing connections (set) | 1 |
| Interface I-100 | * |
| Woulff bottle | * |
| Condensation unit | * |
| Communication cables | * |

* As per order code

3.4 Technical data

3.4.1 Vacuum Pump V-100

| | |
|-------------------------------|--|
| Dimensions (W x H x D) | 180 x 275 x 210 mm |
| Weight | 5.6 kg |
| Power supply voltage | 100 – 240 V, 50/60 Hz |
| Power consumption | 150 W |
| Power consumption in ECO mode | 70 W |
| Terminal vacuum (absolute) | 10 mbar (\pm 2 mbar) |
| Pump capacity | 1.5 m ³ /h |
| Vacuum connection | GL-14 |
| Motor | Brushless DC motor |
| Rotation speed | 1280 rpm max. |
| Rotation speed in ECO mode | 70 % of max. capacity |
| Noise level | 32 to 57 dBA 57 dBA: with 100% load |
| Overvoltage category | II |
| Pollution degree | 2 |
| Enclosure rating | IP 20 |
| Certificates | CE |

3.4.2 Ambient conditions

| | |
|-------------------------------|---|
| Max. altitude above sea level | 2000 m |
| Ambient temperature | 5 - 40 °C |
| Maximum relative humidity | 80 % for temperatures up to 31 °C decreasing linearly to 50 % at 40 °C |

The Vacuum Pump V-100 may only be used in indoor areas.

3.4.3 Materials

| Component | Material |
|----------------------------|-------------------------|
| Pump heads | PPS |
| Drive unit body | Aluminium |
| Housing | PBT |
| Membranes | PTFE/rubber |
| Valve plate | PEEK |
| Valve head | PEEK |
| Pump-head connection piece | FEP |
| Vacuum tubing | Silicone/natural rubber |
| Non-return valve O-rings | FFKM |

4 Transport and storage

4.1 Transport

NOTICE

Risk of breakage due to incorrect transportation

- ▶ Make sure that all parts of the device are safely packed in such a way as to prevent breakage, ideally in the original box.
- ▶ Avoid sharp movements during transit.

- ▶ After transportation, check the device for damage.
- ▶ Damage that has occurred in transit should be reported to the carrier.
- ▶ Keep packing for future transportation.

4.2 Storage

- ▶ Make sure that the ambient conditions are complied with (see Chapter 3.4 "Technical data", page 15).
- ▶ Wherever possible, store the device in its original packaging.
- ▶ After storage, check the device, all seals and tubing for damage and replace if necessary.

4.3 Removing transit fixings

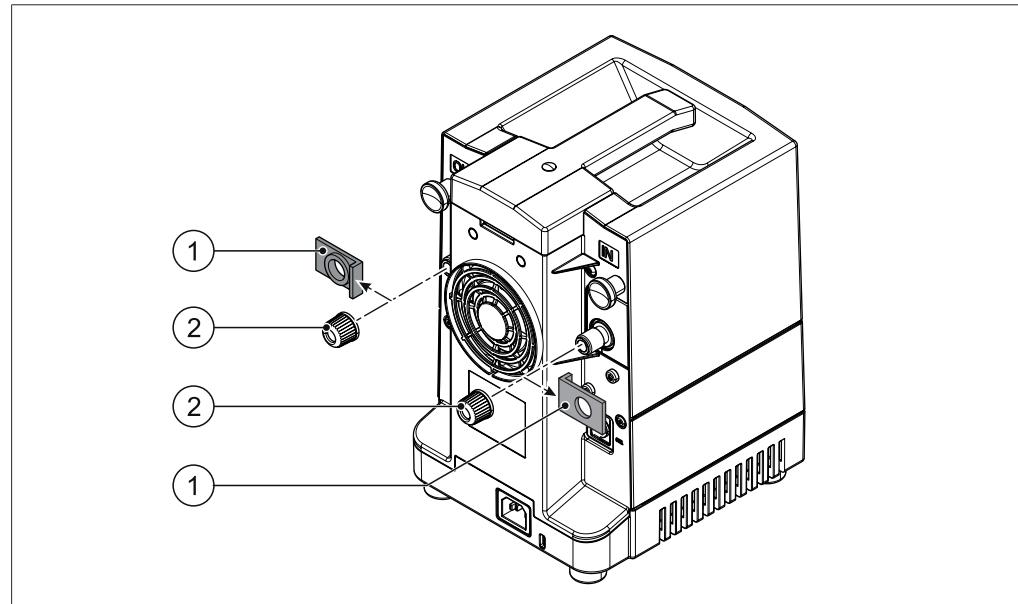


Fig. 6: Transit fixings on the rear of the Vacuum Pump V-100

1 Transit fixings

2 GL14 cap nuts

Before the V-100 is set up and put into service, the transit fixings (red) have to be removed.

- ▶ On the rear of the V-100, unscrew the GL14 cap nuts (2) from the pump intake and pump outlet.
- ▶ Pull off the red transit fixings (1).
- ▶ Screw the cap nuts back on.

5 Installation

5.1 Important considerations prior to commissioning



⚠ WARNING

Risk of irritation of mucous membranes and poisoning from inhalation of hazardous gases and vapors.

In the process of evacuation it is possible that hazardous substances may be pumped out at the same time and released into the atmosphere. In addition, it is possible for such substances to collect as condensation at leaking connections.

- ▶ Operate the pump inside a fume hood.
- ▶ Direct vapors from the pump outlet into the fume hood.
- ▶ If necessary, wear a face mask and safety goggles.
- ▶ If necessary, only handle pump and accessories with protective gloves.



⚠ WARNING

Risk of fire or explosion from flammable solvent vapors.

In the process of evacuation, it is possible for solvent vapors to get into the inside of the pump and catch fire or explode due to the electric current.

- ▶ Follow the guidance notes for the solvents used.
- ▶ Connect a Woulff bottle upstream of the pump intake.
- ▶ Operate the pump inside a fume hood.



⚠ CAUTION

Health risks when handling corrosive substances.

- ▶ When working with strong acids or caustic solutions, always wear personal protective equipment (safety goggles, protective clothing, protective gloves).

5.2 Installation site

- Before setting up the V-100 and putting it into service, remove the transit fixings (red) on the rear of the device (see Chapter 4.3 "Removing transit fixings", page 17).

NOTICE

Risk of property damage from falling equipment (e.g. in an earthquake)

- Secure the Vacuum Pump against falling by means of the lashing eye on the rear of the device (see Chapter 3.2.2 "Rear view", page 11).

The installation site must meet the following requirements:

- Firm and level surface: at least 200 mm x 300 mm (W x D)
- Height: at least 300 mm
- Set up inside a fume hood or feed the pump outlet into the fume hood
- Sufficient air supply to the pump cooler

The V-100 is intended for use in laboratory environments (see Chapter 3.4.2 "Ambient conditions", page 15).

5.3 Connecting laboratory equipment

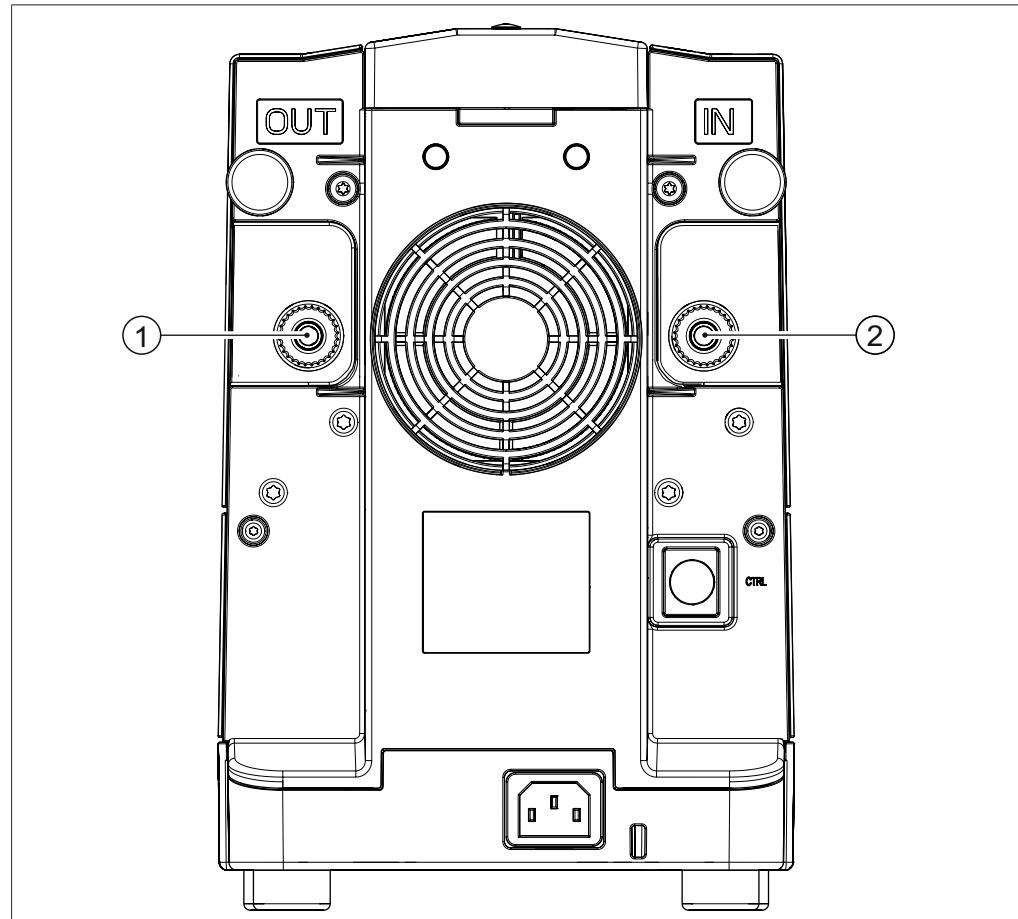


Fig. 7: Vacuum Pump (V-100) with transit fixings

1 Pump outlet

2 Pump intake (vacuum)

The V-100 is connected by a vacuum tubing to the laboratory apparatus to be evacuated. The vacuum tubing leads via a GL14 connection from the pump intake (2) to the outlet of the laboratory device concerned.

Precondition:

Transit fixings have been removed (see Chapter 4.3 "Removing transit fixings", page 17).

► Fit tubing to pump intake (2) using the GL14 cap nut.

If vapors are to be expected during evacuation, we recommend the following:

► Connect a Woulff bottle upstream of the pump intake (see Chapter 5.5 "Connecting a Woulff bottle", page 23).

► Connect the tubing to the Woulff bottle intake using a GL14 cap nut.

For details of connecting the V-100 to a rotary evaporator (e.g. Rotavapor® R-100) see the relevant section of the device's operating instructions.

For more information on the use of the V-100, see Chapter 3.2.4 "Typical application", page 13.

5.4 Connecting the silencer

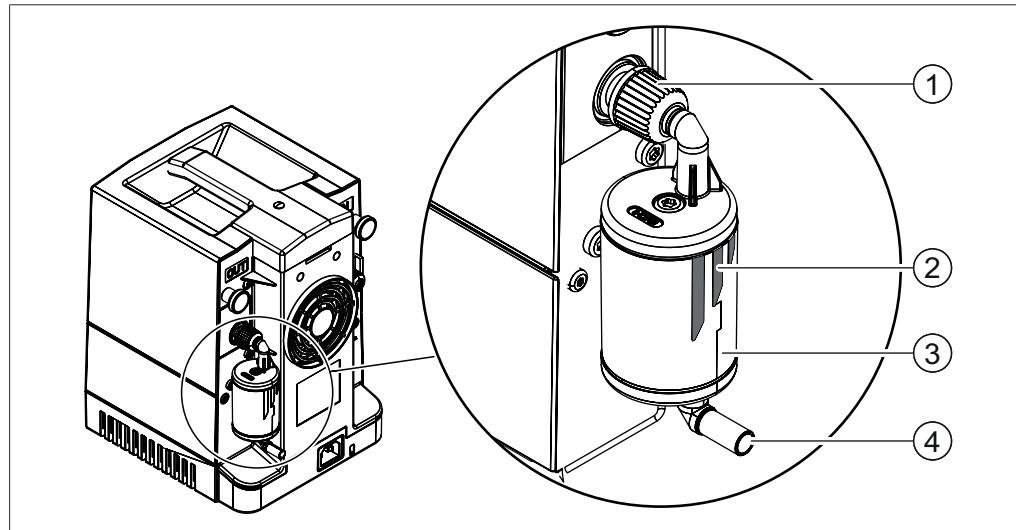


Fig. 8: Silencer on pump outlet of V-100

| | |
|-------------------------|-------------------|
| 1 GL14 cap nut | 3 Silencer |
| 2 Flow direction marker | 4 Silencer outlet |

The silencer can be connected directly to the pump or to the outlet of the secondary condenser.

Connecting silencer directly to V-100

- ▶ Fit the silencer (3) onto the pump outlet so that the flow direction marker (2) on the silencer points away from the pump.
- ▶ Slide forwards the GL14 cap nut (1) on the top connection of the silencer and screw it onto the GL14 thread of the pump outlet.

Connecting the silencer to the outlet of the secondary condenser

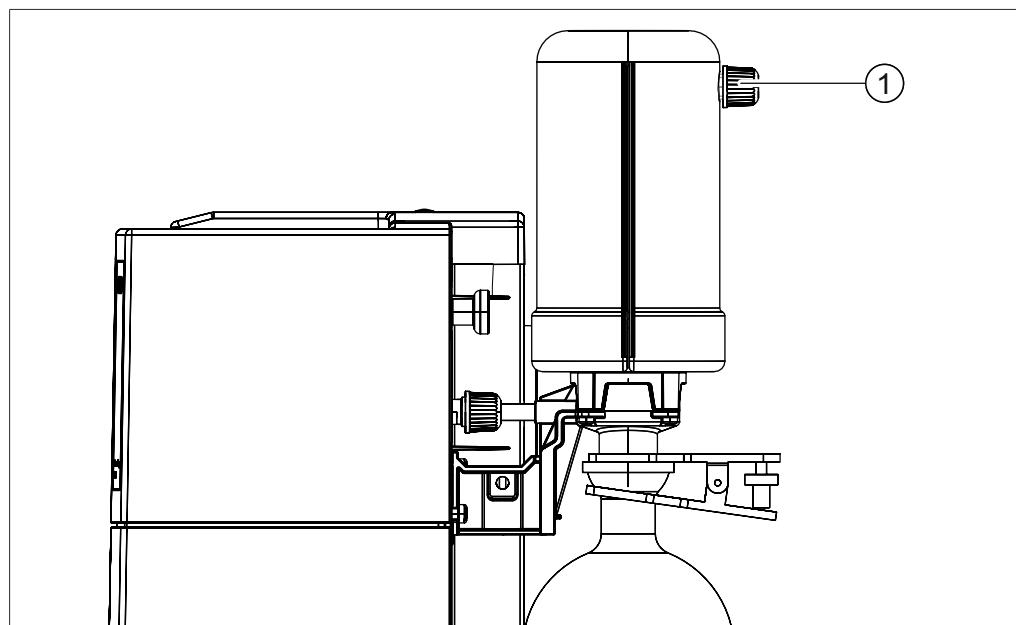


Fig. 9: Connection for the silencer

| |
|------------------------------|
| 1 Secondary condenser outlet |
|------------------------------|

- ▶ Position the silencer inlet on the secondary condenser outlet (1).

- ▶ Slide forwards the GL14 cap nut on the silencer inlet and screw it onto the thread of the condenser outlet.

5.5 Connecting a Woulff bottle

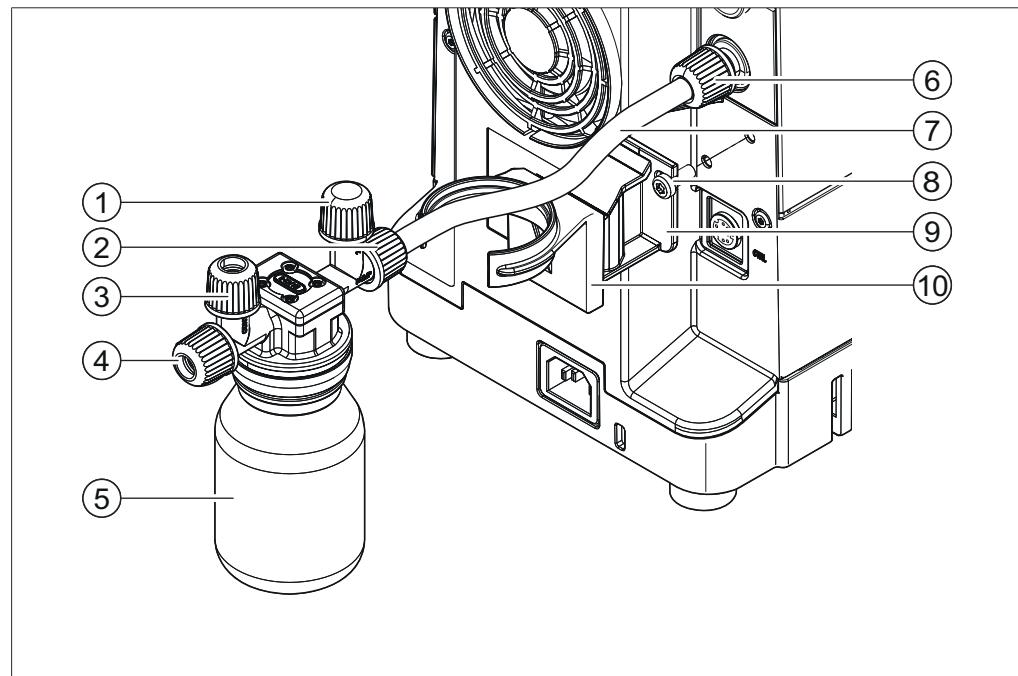


Fig. 10: Connecting a Woulff bottle to the V-100

| | |
|---|----------------------------|
| 1 GL14 cap nut | 6 Pump intake |
| 2 Woulff bottle outlet | 7 Connection piece |
| 3 Top outlet for connecting Interface I-100 | 8 Screw |
| 4 Woulff bottle inlet | 9 Mounting rail for holder |
| 5 Woulff bottle glass component | 10 Woulff bottle holder |

The Woulff bottle is connected to the pump intake on the rear of the V-100.

Tools required: Torx key (fitted in pump top cover)

- ▶ Fix the mounting rail (9) for the holder below the pump intake (6) using the screw (8).
- ▶ Fit the holder (10) onto the mounting rail.
- ▶ Unscrew the GL14 screw-cap from the pump intake (6).
- ▶ Fit the connection piece (7) from the outlet of the Woulff bottle onto the pump intake. Screw the GL14 cap nut (1) on the end of the tubing onto the pump intake thread.
- ▶ Press the Woulff bottle into the holder.

Connecting an Interface I-100 via a Woulff bottle

- ▶ If necessary connect the Woulff bottle to the Interface I-100 as follows: Fit the connection piece to the top outlet (3) of the Woulff bottle.
- ▶ For details of connecting the connection piece to the interface unit and the setup, also refer to the operating instructions for the I-100.

5.6 Connecting a secondary condenser

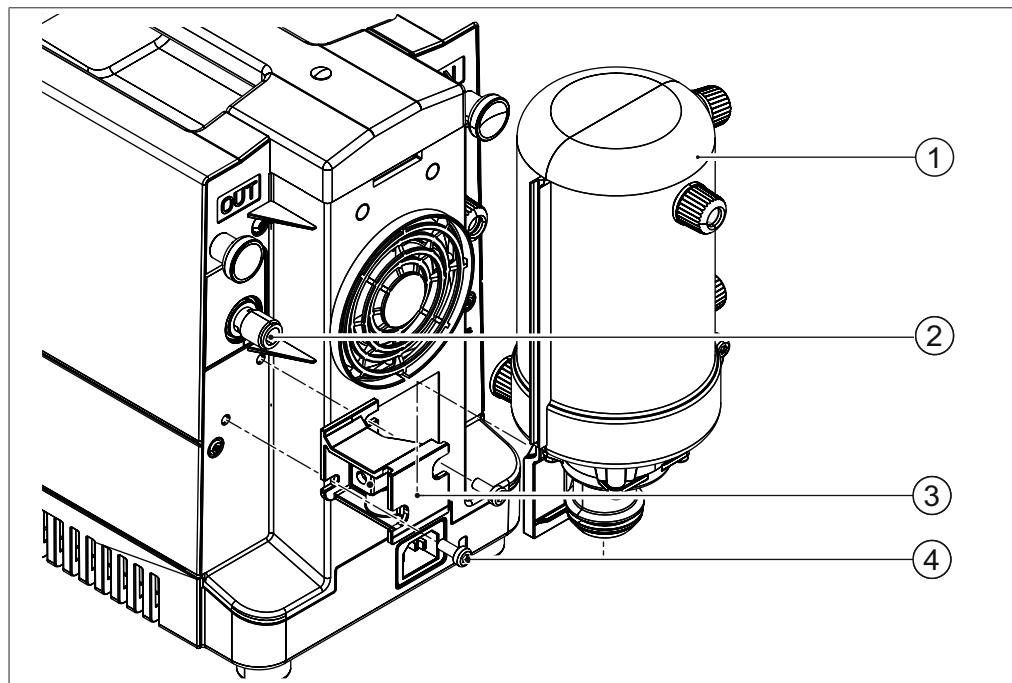


Fig. 11: Connecting secondary condenser to V-100

| | |
|-----------------------|----------|
| 1 Secondary condenser | 3 Holder |
| 2 Pump outlet | 4 Screw |



NOTE

Connecting a secondary condenser is advised particularly in cases where the pump outlet cannot be connected to a fume hood or the solvent concentration in the vapor is too high. The secondary condenser reduces the amount of vapor emitted.

The secondary condenser is connected directly to the pump outlet (2) on the rear of the V-100.

Fitting holder for secondary condenser

Tools required: Torx key (fitted in pump top cover – see Chapter 3.2.3 "Internal view", page 12).

- Position the holder (3) below the pump outlet (2) and fix to the pump housing by means of two screws (4).

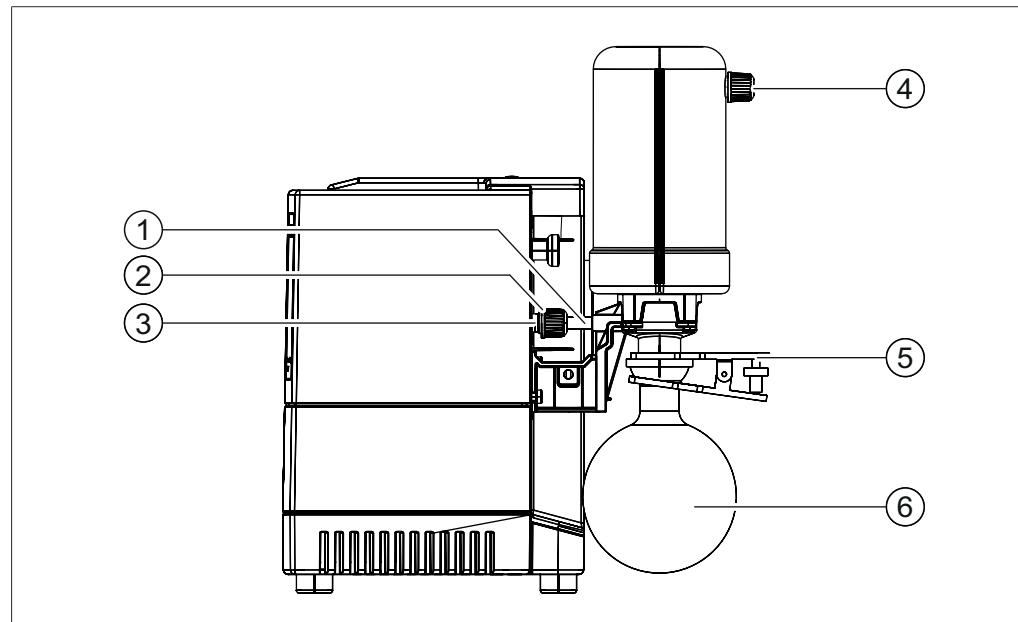
Fitting secondary condenser into the holder and connecting up

Fig. 12: V-100 with secondary condenser connected

| | |
|--------------------|------------------------------|
| 1 Connection piece | 4 Secondary condenser outlet |
| 2 GL14 cap nut | 5 Ball joint clamp |
| 3 Pump outlet | 6 Receiving flask |

- ▶ Push secondary condenser together with connection piece (1) and GL14 cap nut (2) fully home into holder from above.
- ▶ Fit the unattached end of the connection piece into the pump outlet (3).
- ▶ Screw the GL14 cap nut (2) on the connection piece onto the thread on the pump outlet.
- ▶ Fit receiving flask (6) underneath the secondary cooling cold trap and fix with ball joint clamp (5).

5.7 Connecting a secondary cooling cold trap

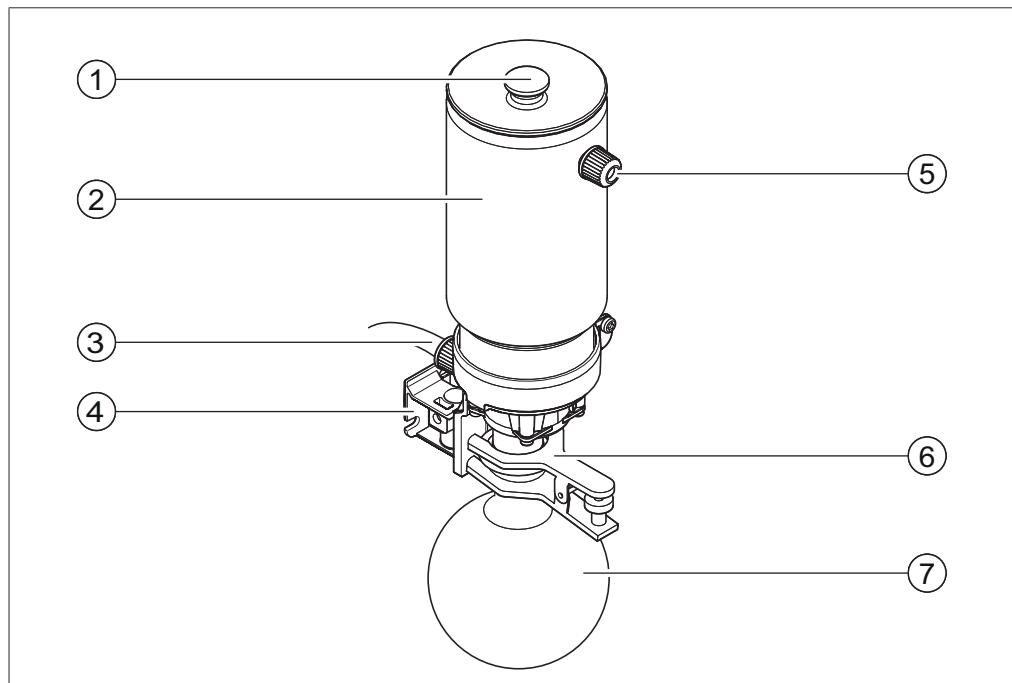


Fig. 13: Cold trap for V-100

| | |
|--|--------------------------------------|
| 1 Cover | 5 Secondary cooling cold trap outlet |
| 2 Secondary cooling cold trap | 6 Ball joint clamp |
| 3 Secondary cooling cold trap inlet with connecting tubing | 7 Receiving flask |
| 4 Holder for secondary cooling cold trap | |

Connecting a secondary cooling cold trap upstream of the pump outlet reduces the amount of residual vapor released into the atmosphere.

Fitting to pump outlet

Tools required: Torx key (fitted in pump top cover – see Chapter 3.2.3 "Internal view", page 12).

- ▶ Position the holder (4) for the secondary cooling cold trap below the pump outlet and fix it to the housing using two screws.
- ▶ Unscrew the GL14 cap nut from the pump outlet and slide it narrow-end first over the connecting tubing on the inlet (3) of the secondary cooling cold trap.
- ▶ Fit the unattached end of the connecting tubing (3) into the pump outlet.
- ▶ Screw the GL14 cap nut on the connecting tubing back onto the thread on the pump outlet.
- ▶ Push secondary cooling cold trap (2) fully home into holder.
- ▶ Fit receiving flask (7) into the bottom outlet of the secondary cooling cold trap and fix with the aid of a ball joint clamp (6).
- ▶ From the outlet (5) of the secondary cooling cold trap, feed another connecting tubing directly into a waste drum.

5.8 Electrical connections

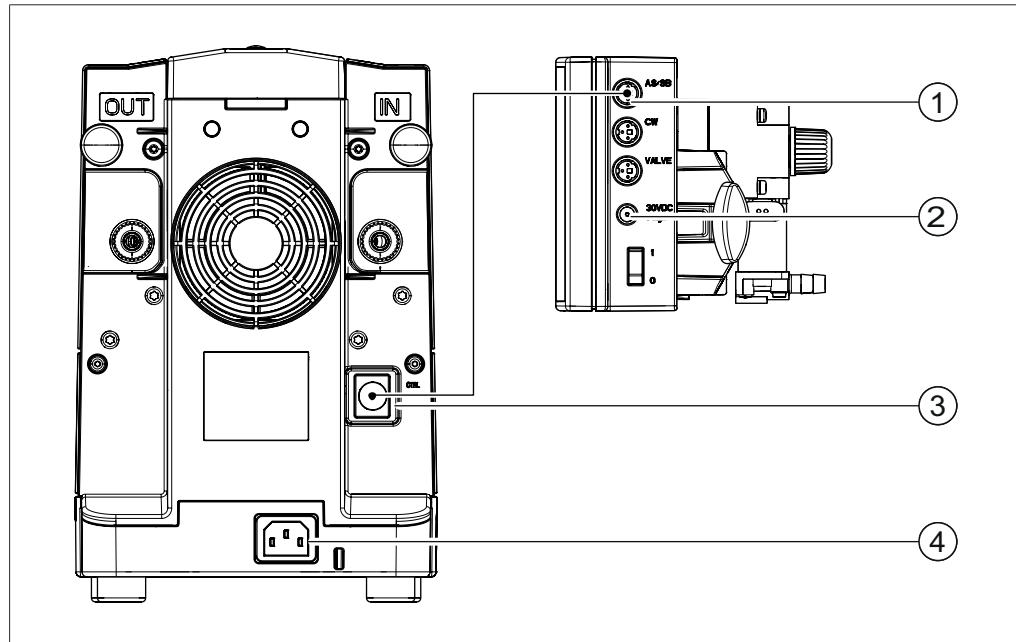


Fig. 14: Electrical connections on the V-100 (left) and the Interface I-100 (right)

| | |
|---|-------------------------------------|
| 1 Mini-DIN connection (Interface I-100) | 3 Mini-DIN connection (vacuum pump) |
| 2 Power supply for Interface I-100 | 4 Power supply for vacuum pump |

- ▶ Make sure that the available power supply matches the rating indicated on the type plate.
- ▶ Join the mini-DIN socket (1) of the V-100 to the mini-DIN socket (3) of the Interface I-100 with a communication cable.
- ▶ Plug the mains power cord supplied into the power supply socket (4) on the V-100.
- ▶ Plug the mains power cord into a grounded mains power socket.
- ▶ Connect the power adapter for the Interface I-100 to the socket (2) for the power supply.

5.9 Fitting and connecting the Interface I-100

5.9.1 Fitting an interface unit to the Vacuum Pump V-100

Fitting the holder

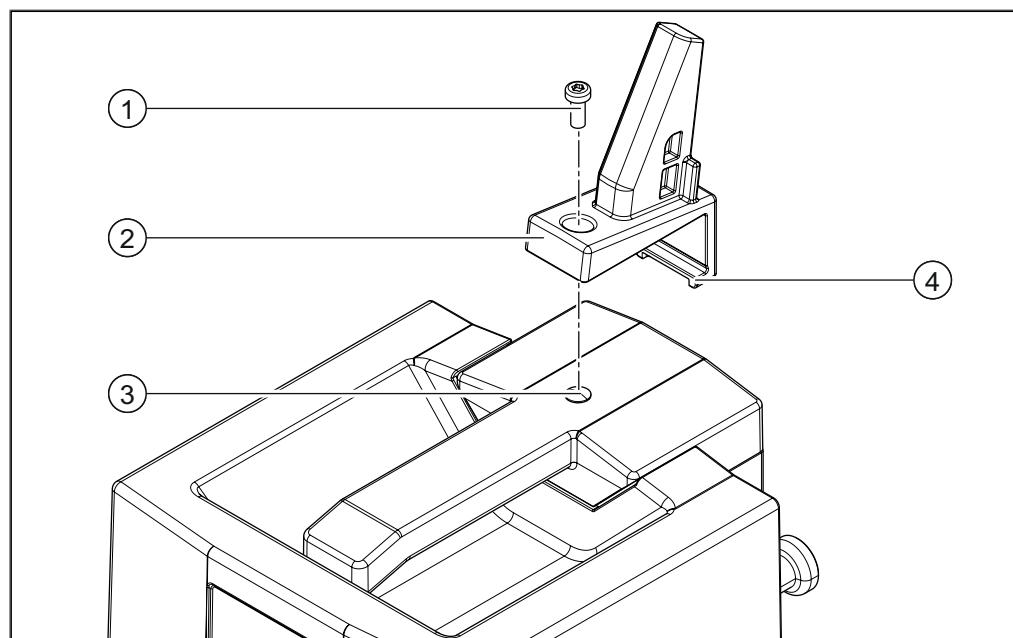


Fig. 15: Fitting the holder for the Interface I-100

| | |
|------------------------------|-------------------------------------|
| 1 Screw | 3 Rubber plug (in thread for screw) |
| 2 Holder for Interface I-100 | 4 Lower hinge of holder |

The Torx key required for fitting the holder is included in the specifications supplied.

- ▶ Remove rubber plug (3).
- ▶ Fit the holder (2) onto the pump top cover from behind and secure it with the screw (1).
- ▶ Make sure that the hinge (4) of the holder is engaged in the slot on the rear of the V-100.

Fitting the interface unit

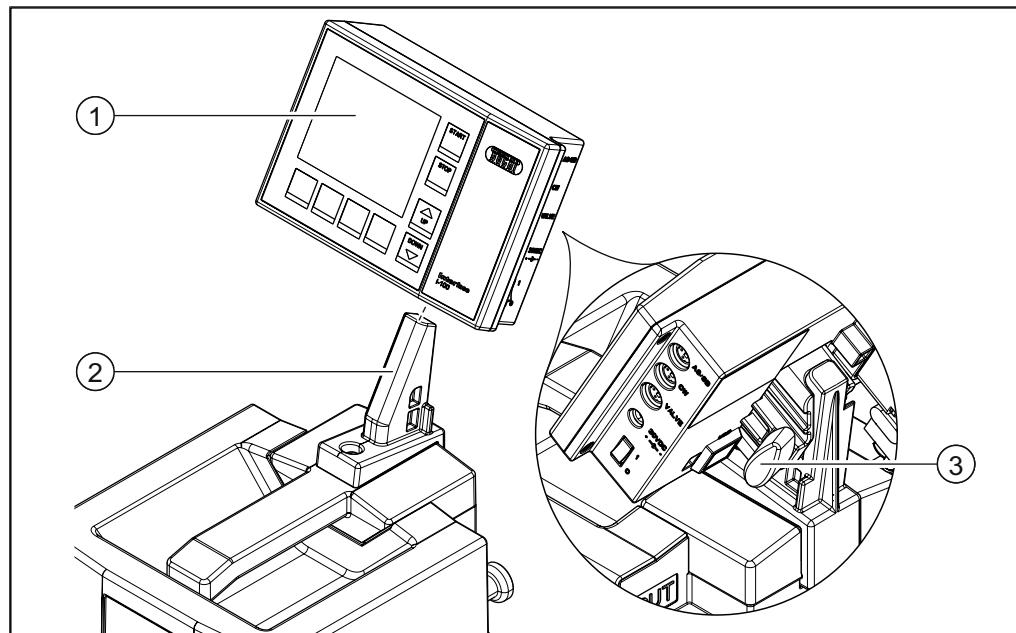


Fig. 16: Fitting the Interface I-100

1 Interface I-100

3 T-screw

2 Holder

- ▶ Fit the interface unit (1) onto the holder (2).
- ▶ Tighten the T-screw (3) on the back of the interface unit by turning it clockwise.

5.9.2 Connecting interface unit to Vacuum Pump V-100

The V-100 is connected to the Interface I-100 by means of a communication cable (mini-DIN socket on rear of vacuum pump – see illustration in Chapter 5.8 "Electrical connections", page 27) and a tubing (from top outlet of Woulff bottle – see illustration in Chapter 5.5 "Connecting a Woulff bottle", page 23). For more information on connecting the tubing and communication cable, refer to the section "Commissioning" in the operating instructions for the Interface I-100.

6 Operation

6.1 Operating V-100 with Interface I-100

The Vacuum Pump V-100 can be controlled by an Interface I-100. Control encompasses the following parameters and functions:

- Setting the required vacuum
- Timer

Details of controlling the V-100 and the other laboratory equipment involved in evacuation can be found in the operating instructions for the Interface I-100.

6.2 Operating V-100 without Interface I-100

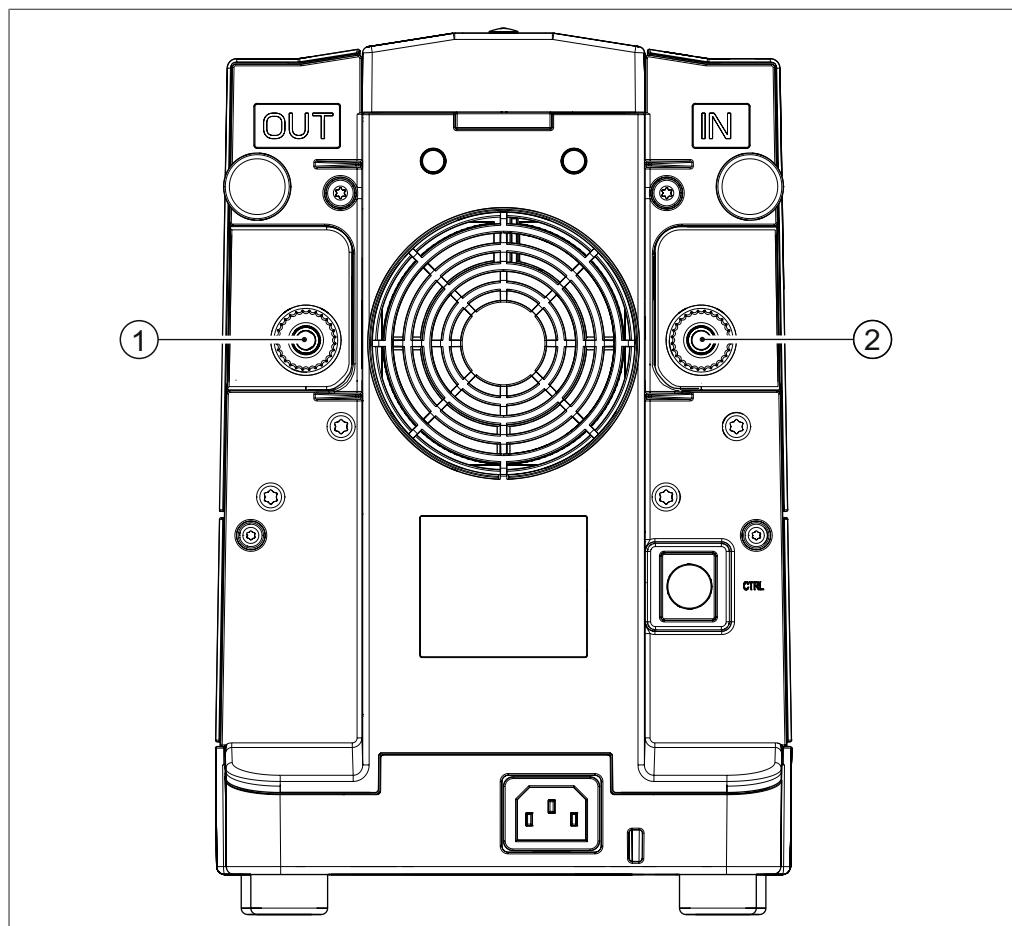


Fig. 17: V-100

1 Pump outlet

2 Pump intake (vacuum)

If not controlled by an Interface I-100, the vacuum pump runs in continuous mode and switches to ECO mode after one hour, see Chapter 3.1 "Description of function", page 10.

7 Cleaning and servicing



NOTE

Users may only carry out the servicing and cleaning operations described in this section.

Any servicing and repair work which involves opening up more than the pump top cover may only be carried out by authorized service technicians.

- ▶ Use only genuine BÜCHI consumables and spare parts in order to ensure correct operation of the device and preserve the warranty.
- ▶ Before carrying out any servicing work, switch off the device and disconnect it from the power cable.

7.1 Cleaning

7.1.1 Important considerations when cleaning



⚠ WARNING

Risk of fatal injury from electric shock.

If the pump is opened up while it is running there is a risk of dangerous electric shocks.

- ▶ Before carrying out any cleaning or servicing work, always shut down the device and disconnect the power cable.

7.1.2 Cleaning the pump

- ▶ Disconnect all connections to the device.
- ▶ Place a collecting vessel under the pump outlet.
- ▶ Switch on the Vacuum Pump V-100 and allow it to run.
- ▶ Spray ethanol into the pump intake.
- ▶ Hold your finger over the pump intake so that a vacuum is created for a short time.
- ▶ Remove your finger from the pump intake again.
- ▶ Allow the pump to run until there is no more liquid inside the pump heads.
- ▶ Repeat the procedure if necessary.
- ▶ Switch off the pump and reconnect the apparatus.

7.1.3 After working with strong acids

After distilling strong acids or corrosive solutions the pump should be flushed out in order to increase its service life.

- ▶ Detach tubing connections to other laboratory equipment.
- ▶ If present, remove Woulff bottle from pump intake and secondary condenser or cold trap from pump outlet and clean them.
- ▶ Place a bowl or glass collection vessel under the pump outlet.
- ▶ Switch on the pump and pour 5 to 10 mL of water into the pump intake.
- ▶ Test the pH level of the water collected at the pump outlet.
- ▶ Repeat the flushing process until the discharged water has a pH level of between 3 and 9.
- ▶ Allow the pump to run for two to three minutes to dry out.

7.1.4 Cleaning the housing

NOTICE

Risk of acid damage

The housing of the unit is made of plastic. Escaping acid may damage the material.

- Immediately remove any drops of acid with a damp cloth.

- Only use a damp cloth to clean the device.
- To clean the housing, only use ethanol or soapy water.

7.1.5 Cleaning glass components

The V-100 does not itself contain any glass components but the accessories (Woulff bottle, secondary cooling cold trap, secondary condenser) consist mainly of glass and must always be inspected and cleaned before and after use.

As the glass components are under vacuum when in use, they are subjected to high stress.

- Before use, check all glass components for cracks, chipping and any other damage.
- Replace any damaged glass components.
- Rinse out glass components with water and a conventional cleaning agent (e.g. mild soap and water solution).
- Wherever possible, clean glass components by hand.



NOTE

Feeding a thin copper wire into the cooling coil of the secondary condenser or cold trap reduces the amount of dirt deposited.

7.1.6 Cleaning tubing

After evacuation, there may still be residual fluid in the tubing from condensed vapors. The pump can largely dry itself out when running idle.

- Detach connections to other laboratory equipment and allow the pump to run in continuous mode.
- Switch off the pump after three to five minutes.

To clean the connecting tubing inside the pump between the two pump heads it is necessary to open up the pump as follows:

Precondition:

- Pump has been shut down.

- Remove the pump top cover and take out the pump tubing (see Chapter 7.2.5 "Replacing tubing", page 40).
- Rinse out the tubing with clean water. If necessary, remove residues inside the tubing with a copper wire.
- Refit the pump tubing (see Chapter 7.2.5 "Replacing tubing", page 40).
- Switch on the pump and allow it to run in continuous mode until the inside of the tubing is dried out.
- Refit the pump top cover.

7.1.7 Cleaning valve heads

Dirt contamination of the valve heads is evidenced by the V-100 failing to achieve the terminal vacuum of 10 mbar (± 2 mbar) even though components are intact and connections air-tight. To clean them, proceed as follows:

- ▶ Detach all connections (tubing and communication cable) from the pump.
- ▶ Place a collecting vessel under the pump outlet.
- ▶ Switch on the pump.
- ▶ Spray a small amount of acetone (approx. 10 mL) into the pump intake.
- ▶ Wait until the sound of the pump changes back to what it was before the acetone was injected.
- ▶ Repeat this procedure four times.
- ▶ Re-attach the connections to the pump and check whether the terminal vacuum is now achieved.

If the V-100 is still unable to achieve the required performance even after the valve heads have been cleaned, both pump heads must be dismantled and manually cleaned (see Chapter 7.2.2 "Dismantling and reassembling pump head", page 35).

7.1.8 Cleaning non-return valve

The V-100 operates with a total of four non-return valves. There is one valve with an O-ring in the connection on each of the two ports on each pump head. To clean the valves, the pump heads have to be dismantled as follows:

- ▶ Remove the pump top cover and dismantle the pump heads (see Chapter 7.2.2 "Dismantling and reassembling pump head", page 35).

7.1.9 Cleaning the membrane

After evacuation, there may still be residual fluid on the membrane from condensed vapors. The pump can largely dry itself out when running idle.

- ▶ Detach connections to other laboratory equipment and allow the pump to run in continuous mode.
- ▶ Switch off the pump after three to five minutes.

If the membrane is contaminated by residues, the pump heads must first be dismantled and the membranes then unscrewed and cleaned.

- ▶ Remove the pump top cover and remove the pump heads (see Chapter 7.2.2 "Dismantling and reassembling pump head", page 35).
- ▶ Unscrew the membranes (see Chapter 7.2.3 "Replacing the membrane", page 38).
- ▶ Wipe down membranes with a damp cloth.
- ▶ Refit the membranes (see Chapter 7.2.3 "Replacing the membrane", page 38).
- ▶ Refit the pump heads and pump top cover (see Chapter 7.2.2 "Dismantling and reassembling pump head", page 35).

7.2 Servicing

7.2.1 Notes on servicing



⚠ WARNING

Risk of fatal injury from electric shock.

If the pump is opened up while it is running there is a risk of dangerous electric shocks.

- ▶ Before carrying out any cleaning or servicing work, always shut down the device and disconnect the power cable.

NOTICE

Risk of pump damage and loss of warranty entitlement.

Unauthorized opening up of the lower part of the pump may permanently impair the function of the pump.

- Only allow authorized BUCHI service technicians to open up the lower part of the pump.

7.2.2 Dismantling and reassembling pump head

Removing pump top cover

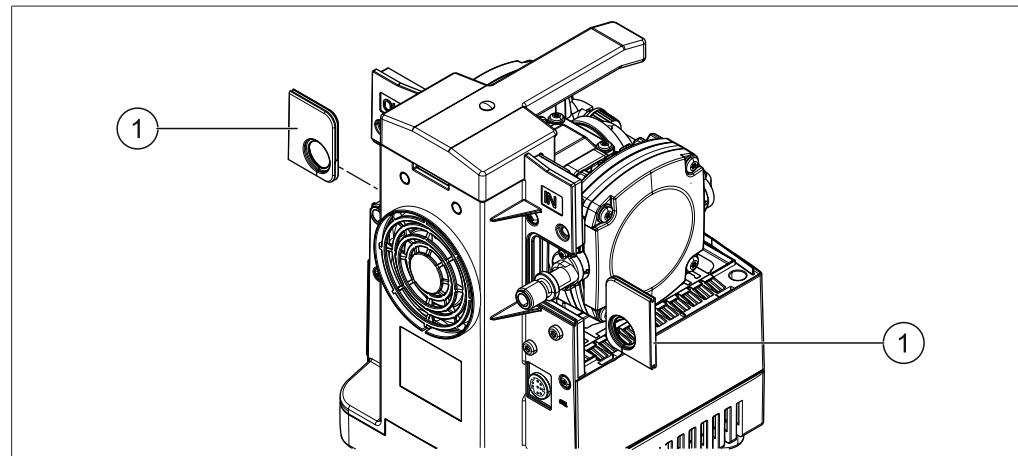


Fig. 18: V-100 with pump top section opened up

1 Rubber surrounds

Precondition:

Pump has been shut down.

- Unscrew the two knurled-head screws on the rear of the V-100 and remove the pump top cover.
- Remove the rubber surrounds (1) from the pump intake and pump outlet.

Removing pump-head connection piece

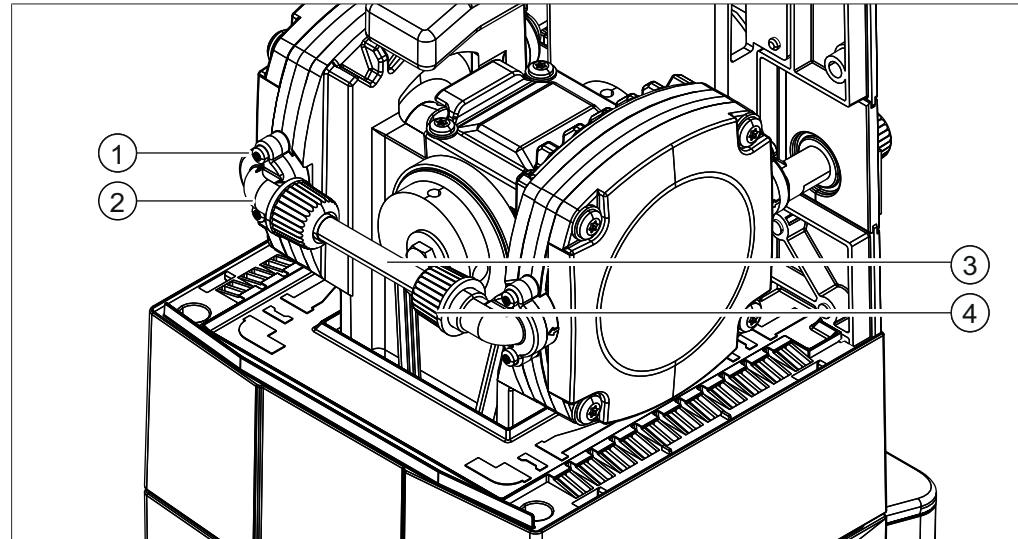


Fig. 19: Pump-head connection piece with union nuts between the two pump heads

1 Screw (elbow connection)

3 Pump-head connection piece

2 Elbow connection

4 GL14 cap nut

- Unscrew two screws (1) from each of the two pump heads, and remove the elbow connections (2) together with the pump-head connection piece (3) from the pump heads.
- Unscrew the GL14 cap nuts (3) from the elbow connections.
- Pull the GL14 cap nuts off the pump-head connection piece (4).

Removing the pump head

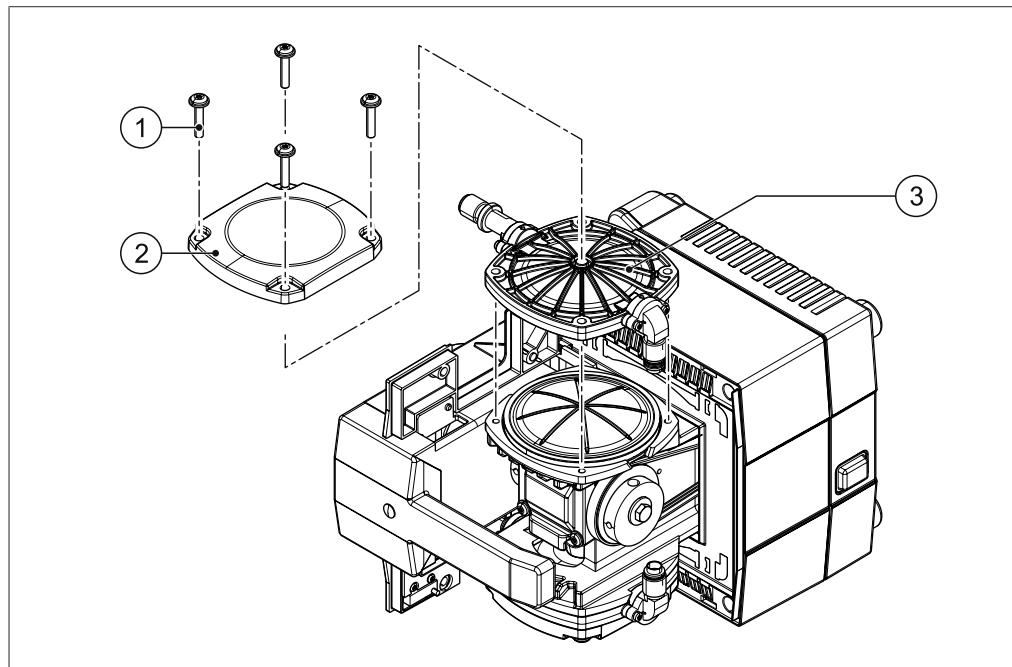


Fig. 20: Pump head opened up showing membrane underneath

1 Allen-head screws

3 Pump head

2 Metal cover

- Lie the pump on its side.
- Unscrew the four Allen-head screws (1) and remove the metal cover (2).
- Remove the pump head (3).

Dismantling the pump head

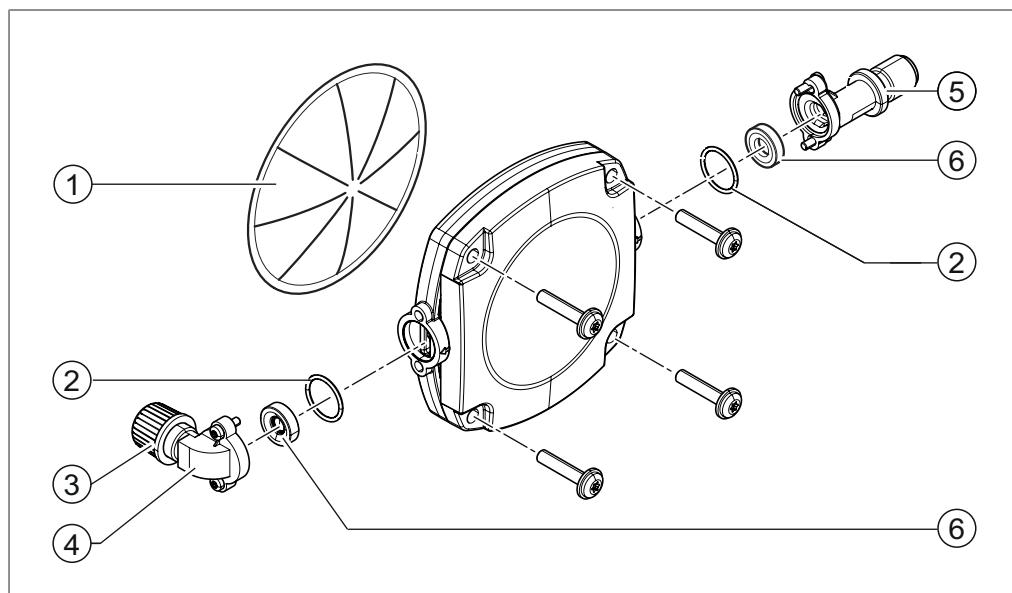


Fig. 21: View of completely dismantled pump head

1 Membrane

4 Elbow connection

2 O-rings

5 Straight connection

3 GL14 cap nut

6 Non-return valves

The pump head has two ports, attached to each of which is a connection (4, 5) with a non-return valve (6) and an O-ring (2). The straight connection (5) leads to the pump intake/pump outlet. The elbow connection (4) leads to the opposite pump head via the pump-head connection piece.

- ▶ Unscrew the fixing screws on the straight connections (5) and remove the connections.
- ▶ Remove the O-rings (2) from the connections.
- ▶ Remove the non-return valves (6) from the connections.

Reassembling and refitting the pump head

- ▶ Insert the non-return valves (6) and O-rings (2) inside the connections (4 and 5).
- ▶ Fit the straight connections (5) on the pump heads (the elbow connections are refitted later together with the pump-head connection piece).
- ▶ Position the pump head on the membrane and fix in place with the four Allen-head screws.
- ▶ Fit the elbow connections (4) together with the pump-head connection piece and the GL14 cap nuts between the two pump heads.
- ▶ Refit the rubber surrounds on the pump intake and pump outlet inside the housing.
- ▶ Refit the pump top cover and fix in place with the knurled-head screws.

7.2.3 Replacing the membrane

The membranes of the V-100 are located on the left and right behind the pump head.

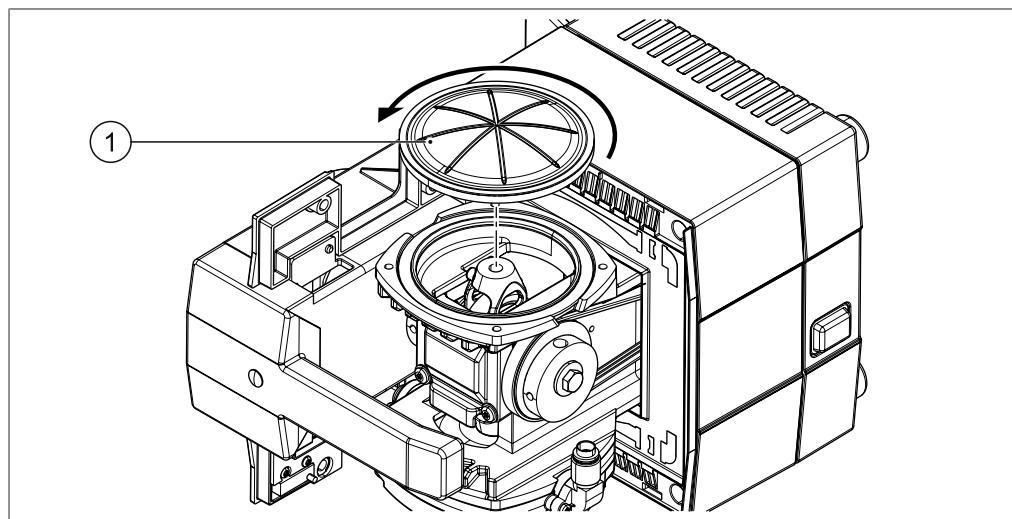


Fig. 22: Membrane

1 Membrane

To remove the membrane you require a clamp (see Chapter 10.2 "Spare parts and accessories", page 46).

Precondition:

Pump has been shut down.

- ▶ Remove the top cover of the V-100 and remove the pump head (see Chapter 7.2.2 "Dismantling and reassembling pump head", page 35).
- ▶ Grip membrane with clamp and turn counter-clockwise.
- ▶ Remove old membrane and insert new membrane.
- ▶ Tighten new membrane by turning clockwise with clamp.
- ▶ Refit the pump head and pump top cover (see Chapter 7.2.2 "Dismantling and reassembling pump head", page 35).

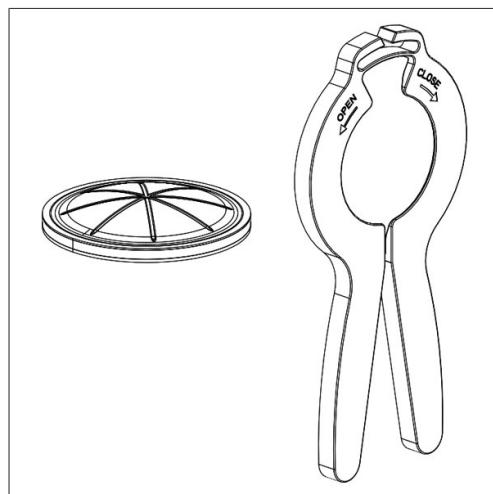


Fig. 23: Membrane and clamp

7.2.4 Replacing valve

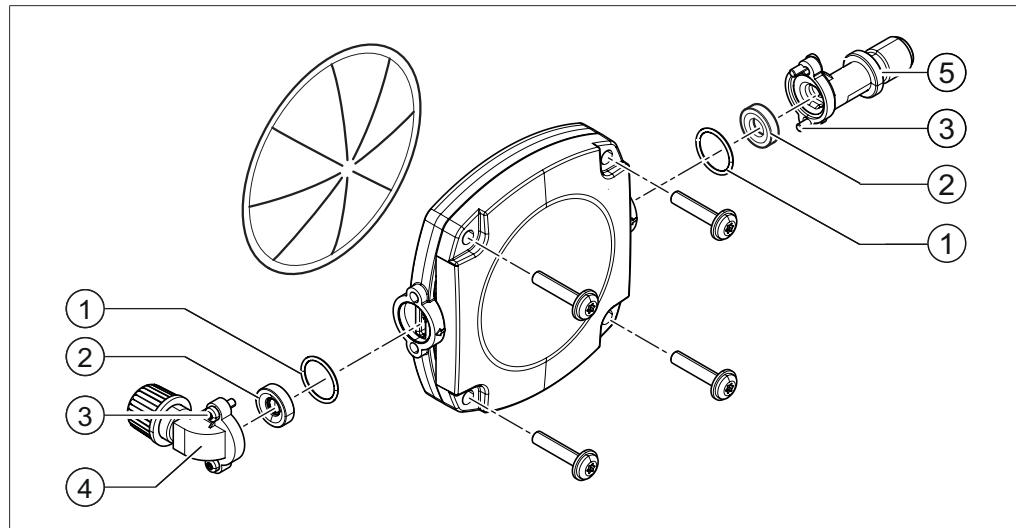


Fig. 24: Dismantling the pump head

- 1 O-rings
- 2 Non-return valves
- 3 Screws for connections

- 4 Elbow connection
- 5 Straight connection

- Remove the pump head (see Chapter 7.2.2 "Dismantling and reassembling pump head", page 35).
- Unscrew the screws (3) from the connections (4, 5).
- Remove the elbow connection and the straight connection from the pump head.
- Remove the O-rings (1) and the non-return valves (2) from inside the connections.
- Insert new O-rings and valves into the connections. **NOTICE! When inserting the non-return valves, pay attention to the airflow direction: the air enters on the funnel-shaped side of the non-return valve. See also the schematic diagram on the inside of the housing above the pump intake and pump outlet.**
- Refit the connections to the pump head.

7.2.5 Replacing tubing

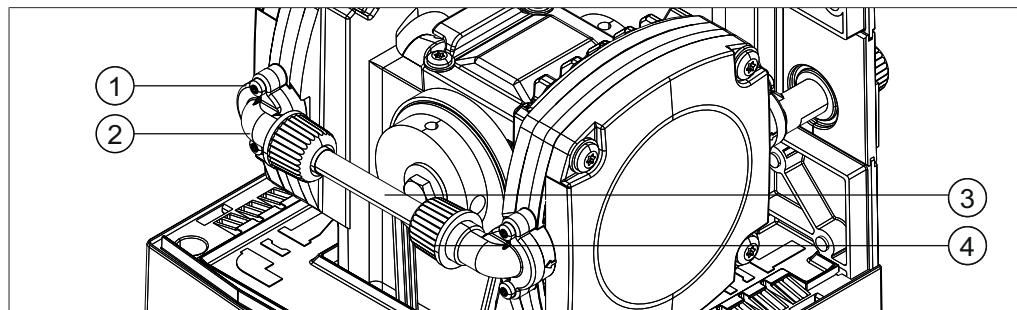


Fig. 25: Pump-head connection piece with GL-14 union nuts between the two pump heads

| | | | |
|---|------------------------|---|----------------------------|
| 1 | Screws for connections | 3 | Pump-head connection piece |
| 2 | Elbow connection | 4 | GL14 cap nut |

Precondition:

Pump has been shut down.

- ▶ Unscrew the two knurled-head screws and remove the pump top cover.
- ▶ Unscrew two screws (1) from each elbow connection (2).
- ▶ Remove the two elbow connections together with the pump-head connection piece (3) from the pump heads.
- ▶ Unscrew the GL14 cap nuts (4) on each end of the pump-head connection piece counter-clockwise and remove the connections (2).
- ▶ Pull the GL14 cap nuts off the pump-head connection piece.
- ▶ Feed a new pump-head connection piece through the union nuts.
- ▶ Screw the GL14 cap nuts onto the connections. Make sure that the FEP pipe seals under the GL14 cap nuts are in proper contact with the pump-head connection piece and are not damaged.
- ▶ Fit the connections together with the pump-head connection piece on the pump heads.
- ▶ Refit the pump top cover and fix in place.

8 Help with faults

8.1 Faults, possible causes and remedies

| Fault | Possible cause | Remedy |
|---|--|---|
| Device does not work. | Master switch is off. Device is not connected to a power supply. | ► Switch on master switch. ► Check power supply. |
| System is not air-tight and cannot achieve terminal vacuum. | Pipe clips not properly fitted or are damaged. Tubing leaking (and brittle) Membrane and/or valves dirty | ► Check pipe clips (see Chapter 7.2.5 "Replacing tubing", page 40). ► Replace tubing (see Chapter 7.2.5 "Replacing tubing", page 40). ► Clean or replace membrane and/or valves (see Chapter 7.2.3 "Replacing the membrane", page 38 and Chapter 7.2.4 "Replacing valve", page 39). |
| | Valve O-rings are leaking. | ► Replace O-rings (see Chapter 7.2.4 "Replacing valve", page 39). |
| Pump fails to start. | Switch on pump top cover not closing. | ► Check seating of pump top cover and correct if necessary. The cover is fixed by two knurled-head screws. |

8.2 Customer service

Repairs to the device may only be carried out by authorized service technicians. The service technicians have been comprehensively technically trained and are aware of the potential hazards that can arise from the device.

The addresses of the official BUCHI Customer Service offices can be found on the BUCHI website at: www.buchi.com. If you have any questions regarding technical issues or faults, please contact those offices.

Customer Services can offer you:

- supply of spare parts
- repairs
- technical advice

9 Taking out of service and disposal

9.1 Taking out of service

- ▶ Remove all tubing and communication cables from the device.
- ▶ Run the pump to dry out tubing and diaphragms inside the pump.
- ▶ Switch off the pump and disconnect it from the mains power supply.

9.2 Disposal

The operator is responsible for proper disposal of the Vacuum Pump.

- ▶ When disposing of equipment observe the local regulations and statutory requirements regarding waste disposal.

10 Appendix

10.1 Solvent table

| Solvent | Formula | Molar mass in g/mol | Evaporation energy in J/g | Boiling point in °C at 1013 mbar | Density in g/cm ³ | Vacuum in mbar for 40 °C boiling point |
|--|---|---------------------|---------------------------|----------------------------------|------------------------------|--|
| Acetone | CH ₃ H ₆ O | 58.1 | 553 | 56 | 0.790 | 556 |
| <i>n</i> -Amyl alcohol, <i>n</i> -pentanol | C ₅ H ₁₂ O | 88.1 | 595 | 37 | 0.814 | 11 |
| Benzene | C ₆ H ₆ | 78.1 | 548 | 80 | 0.877 | 236 |
| <i>n</i> -butanol | C ₄ H ₁₀ O | 74.1 | 620 | 118 | 0.810 | 25 |
| Tert butyl alcohol (2-methyl-2-propanol) | C ₄ H ₁₀ O | 74.1 | 590 | 82 | 0.789 | 130 |
| Chlorobenzene | C ₆ H ₅ Cl | 112.6 | 377 | 132 | 1.106 | 36 |
| Chloroform | CHCl ₃ | 119.4 | 264 | 62 | 1.483 | 474 |
| Cyclohexane | C ₆ H ₁₂ | 84.0 | 389 | 81 | 0.779 | 235 |
| Diethyl ether | C ₄ H ₁₀ O | 74.0 | 389 | 35 | 0.714 | 850 |
| 1,2-dichloroethane | C ₂ H ₄ Cl ₂ | 99.0 | 335 | 84 | 1.235 | 210 |
| <i>cis</i> -1,2-dichloroethylene | C ₂ H ₂ Cl ₂ | 97.0 | 322 | 60 | 1.284 | 479 |
| <i>trans</i> -1,2-dichloroethylene | C ₂ H ₂ Cl ₂ | 97.0 | 314 | 48 | 1.257 | 751 |
| Di-isopropyl ether | C ₆ H ₁₄ O | 102.0 | 318 | 68 | 0.724 | 375 |
| Dioxane | C ₄ H ₈ O ₂ | 88.1 | 406 | 101 | 1.034 | 107 |
| DMF (dimethylformamide) | C ₃ H ₇ NO | 73.1 | – | 153 | 0.949 | 11 |
| Acetic acid | C ₂ H ₄ O ₂ | 60.0 | 695 | 118 | 1.049 | 44 |
| Ethanol | C ₂ H ₆ O | 46.0 | 879 | 79 | 0.789 | 175 |
| Ethylacetate | C ₄ H ₈ O ₂ | 88.1 | 394 | 77 | 0.900 | 240 |
| Heptane | C ₇ H ₁₆ | 100.2 | 373 | 98 | 0.684 | 120 |
| Hexane | C ₆ H ₁₄ | 86.2 | 368 | 69 | 0.660 | 360 |
| Isopropylalcohol | C ₃ H ₈ O | 60.1 | 699 | 82 | 0.786 | 137 |
| Isoamylalcohol (3-methyl-1-butanol) | C ₅ H ₁₂ O | 88.1 | 595 | 129 | 0.809 | 14 |
| Methylethylketone | C ₄ H ₈ O | 72.1 | 473 | 80 | 0.805 | 243 |
| Methanol | CH ₄ O | 32.0 | 1227 | 65 | 0.791 | 337 |
| Methylene chloride, dichloromethane | CH ₂ Cl ₂ | 84.9 | 373 | 40 | 1.327 | 850 |
| Pentane | C ₅ H ₁₂ | 72.1 | 381 | 36 | 0.626 | 850 |
| <i>n</i> -propylalcohol | C ₃ H ₈ O | 60.1 | 787 | 97 | 0.804 | 67 |
| Pentachloroethane | C ₂ HCl ₅ | 202.3 | 201 | 162 | 1.680 | 13 |

| Solvent | Formula | Molar mass in g/mol | Evaporation energy in J/g | Boiling point in °C at 1013 mbar | Density in g/cm ³ | Vacuum in mbar for 40 °C boiling point |
|----------------------------|---|---------------------|---------------------------|----------------------------------|------------------------------|--|
| 1,1,2,2-tetra-chloroethane | C ₂ H ₂ Cl ₄ | 167.9 | 247 | 146 | 1.595 | 20 |
| Carbon tetrachloride | CCl ₄ | 153.8 | 226 | 77 | 1.594 | 271 |
| 1,1,1-trichloroethane | C ₂ H ₃ Cl ₃ | 133.4 | 251 | 74 | 1.339 | 300 |
| Tetrachloroethylene | C ₂ Cl ₄ | 165.8 | 234 | 121 | 1.623 | 53 |
| THF (tetrahydrofuran) | C ₄ H ₈ O | 72.1 | – | 67 | 0.889 | 374 |
| Toluene | C ₇ H ₈ | 92.2 | 427 | 111 | 0.867 | 77 |
| Trichloroethylene | C ₂ HCl ₃ | 131.3 | 264 | 87 | 1.464 | 183 |
| Water | H ₂ O | 18.0 | 2261 | 100 | 1.000 | 72 |
| Xylene (mixture) | C ₈ H ₁₀ | 106.2 | 389 | – | – | 25 |
| <i>o</i> -xylene | C ₈ H ₁₀ | 106.2 | – | 144 | 0.880 | – |
| <i>m</i> -xylene | C ₈ H ₁₀ | 106.2 | – | 139 | 0.864 | – |
| <i>p</i> -xylene | C ₈ H ₁₀ | 106.2 | – | 138 | 0.861 | – |

10.2 Spare parts and accessories

- Use only genuine BÜCHI consumables and spare parts in order to ensure correct, safe and reliable operation of the system.



NOTE

Any modifications of spare parts or assemblies are only allowed with the prior written permission of BÜCHI.

10.2.1 Accessories

Secondary condensers

Secondary condenser C. Cold trap, P+G, incl. holder 047190

Condenses vapor before getting into the pump. In use with ice or dry ice. Contents: 500 mL receiving flask, connection piece, holder for the vacuum pump

Secondary condenser V. Vertical condenser, incl. insulator, holder 047180

Condenses vapor before getting into the pump. Used with recirculating chiller or tap water. Contents: 500 mL receiving flask, connection piece, holder for the vacuum pump

Tubing

FEP, Ø6/8mm, transparent, per m 027900

Utilization: Vacuum, cooling media

Natural rubber, Ø6/16mm, red, per m 017622

Utilization: Vacuum

Nyflex, PVC-P, Ø8/14mm, transparent, per m 004113

Utilization: Vacuum, cooling media, feeding (industrial Rotavapor)

PTFE, Ø8/10mm, white, per m 027277

Utilization: Vacuum, feeding (industrial Rotavapor)

Silicone rubber, Ø6/9mm, transparent, per m 004133

Utilization: Cooling media

Communication cables

Mini-DIN, 0.6m 11060882

Connection between interface and vacuum pump

Mini-DIN, Y-shielded, 650mm 031920

Used when connecting vacuum pump with two vacuum controllers

Receiving flasks

Glass, BJ35/20, 250mL 000423

Glass, BJ35/20, 250mL, P+G 11060907

Glass, BJ35/20, 500mL 000424

Glass, BJ35/20, 500mL, P+G 025264

Further accessories

| | |
|---|--------|
| Manometer with needle valve. Incl. holder for pump, valve, vacuum gauge | 047291 |
| For manual vacuum adjustment | |
| Manometer with needle valve. Incl. valve, vacuum gauge, not incl. holder | 047391 |
| Valve unit. Incl. Woulff bottle, 125mL, P+G, holder | 047160 |
| The valve is only to use in combination with a vacuum controller/interface | |
| Woulff bottle. 125mL, P+G, incl. holder | 047170 |
| For trapping particles and droplets and for pressure equalization | |
| Woulff bottle. 3-neck, 800mL, P+G | 025519 |
| For trapping particles and droplets and for pressure equalization | |

10.2.2 Wear parts**Seals**

| | |
|--|--------|
| For cap nut, GL14, FEP | 038225 |
| Set. 10pcs, for hose barbs, GL14, EPDM, black | 040029 |
| Set. 10pcs, for hose barbs, GL14, FPM, green | 040040 |
| Set. 20pcs, for hose barbs, GL14, silicone, red | 040023 |

Hose barbs

| | |
|---|--------|
| Bent, GL14, incl. silicone seal | 018916 |
| Set. 3pcs, bent, GL14, silicone seal | 041987 |
| Content: Hose barbs, seals | |
| Set. 4pcs, bent, GL14, EPDM seal | 043129 |
| Content: Hose barbs, cap nuts, seals | |
| Set. 4pcs, bent, GL14, FEP seal | 040295 |
| Content: Hose barbs, cap nuts, seals | |
| Set. 4pcs, bent, GL14, silicone seal, incl. cap nut | 037287 |
| Content: Hose barbs, cap nuts, seals | |
| Set. 4pcs, bent, GL14, silicone seal, incl. cap nut | 043128 |
| Content: Hose barbs, cap nuts, seals | |
| Set. 4pcs, straight, GL14, EPDM seal | 040296 |
| Content: Hose barbs, cap nuts, seals | |
| Set. 4pcs, straight, GL14, silicone seal | 037642 |
| Content: Hose barbs, cap nuts, seals | |
| Set. 6pcs, bent (4), straight (2), GL14, silicone seal | 038000 |
| Content: Hose barbs, cap nuts, seals | |

Further wear parts

| | |
|--|----------|
| Membrane. For pump head, incl. clamp, support ring | 047153 |
| Membranes, set. 10pcs, for pump head, incl. clamp, support ring | 11055214 |
| O-ring. For secondary condenser, FKM/FEP, Ø28.2/2.6mm | 11057661 |
| O-rings, set. 4pcs, FFKM, Ø15.4/1.55mm, white | 11057136 |

| | |
|--|----------|
| Check valves, set. 4pcs, incl. O-ring | 047156 |
| Check valves, set. 4pcs, without O-rings | 11058389 |
| Screw caps, set. 5pcs, GL14 | 040624 |
| Cap nuts, set. 10pcs, screw cap with hole, GL14, incl. FEP seal | 041999 |
| Content: Hose barbs, cap nuts, seals | |
| Cap nuts, set. 10pcs, cap nuts with hole, GL14 | 041956 |

10.2.3 Spare parts

| | |
|---|----------|
| Connection piece. Straight, for pump head | 11061580 |
| Content: Connection straight, valve, O-ring, cap nut, GL14, FEP seal | |
| Connection piece. Bent, for pump head | 11061579 |
| Content: Connection bent, valve, O-ring, cap nut, GL14, FEP seal | |
| Lid. For cold trap, Ø68mm | 047193 |
| Insulator. For secondary condenser | 047183 |
| Prevents formation of condensed water | |
| Ball joint clamp. For BJ35/20 | 003275 |
| Secondary condenser V. Vertical condenser | 047181 |
| Condenses remaining vapors after the vacuum pump outlet. Used along with a recirculating chiller or tap water | |
| Secondary condenser V. Vertical condenser | 11061840 |
| Condenses remaining vapors after the vacuum pump outlet. Used along with a recirculating chiller or tap water | |
| Pump head. For Vacuum Pump V-100/V-700/V-710 | 11061578 |
| Pump head, set. For Vacuum Pump V-100 | 11061577 |
| Content: Pump head, set connection piece straight, set connection piece angled | |
| Silencer. Incl. cap nut, GL14, FEP seal | 047090 |
| For Vacuum Pump V-100 / V-700 or V-710 | |
| Tubing. Silicone rubber, Ø6/16, red, 2m | 040459 |
| Utilization: Vacuum | |
| Support secondary condenser V. Incl. holder, FEP seal, connection piece | 11055584 |
| Support condenser V/C. Holder | 047182 |
| Connection piece. PTFE, Ø6/8mm, 162mm | 047154 |
| Tubing between vacuum controller/interface and Woulff bottle | |
| Connection piece. PTFE, Ø6/8mm, 77mm | 047066 |
| Tubing between vacuum pump and Woulff bottle | |
| Packaging. V-100/V-700, with glass assembly | 045617 |
| Packaging. V-100/V-700, without glass assembly | 045616 |

10.3 List of abbreviations

| Abbreviation | Meaning |
|--------------|---|
| ADR | Accord européen relatif au transport international des marchandises dangereuses par route (European Agreement concerning the International Carriage of Dangerous Goods by Road) |
| DKD | Deutscher Kalibrierdienst (German Calibration Service) |
| EPDM | Ethylene propylene diene monomer |
| FEP | Fluorinated ethylene propylene |
| FFKM | Perfluoro-elastomer |
| FPM | Fluorinated propylene monomer |
| GGVE | Gefahrgutverordnung Eisenbahn (German Hazardous Goods Regulations for Railways) |
| GGVS | Gefahrgutverordnung Strasse (German Hazardous Goods Regulations for Road Transport) |
| PBT | Polybutylene terephthalate |
| PEEK | Polyetheretherketone |
| PP | Polypropylene |
| PTFE | Polytetrafluoroethylene |
| RID | Règlement concernant le transport international ferroviaire de marchandises dangereuses (Regulations concerning the International Carriage of Dangerous Goods by Rail) |

10.4 Health and safety approval

To guarantee the health and safety of our staff and to comply with the law and the regulations for handling hazardous materials, for the purposes of health and safety at work and safe disposal of waste, no products may be sent back to BÜCHI Labortechnik AG or repaired unless we have received the declaration below, completed and signed.

Products sent to us will not be accepted for repair or DKD calibration until we have received this declaration.

- ▶ Copy the form overleaf and complete it.
- ▶ Make sure that you know the full details of the substances with which the device has been in contact and the all questions have been answered fully and correctly.
- ▶ Send the completed form to us in advance by post or fax. The declaration must reach us before the device.
- ▶ Enclose a copy of the declaration with the device.
- ▶ If the product is contaminated, inform the carrier (in accordance with GGVE/ GGVS/RID/ADR).

If the declaration is missing or the procedure described is not followed, the repairs will be delayed. We ask for your understanding and cooperation with regard to these measures.

10.5 Health and safety

Declaration regarding the safety, hazards and safe disposal of waste

To guarantee the health and safety of our staff and to comply with the law and the regulations for handling hazardous materials, regarding health and safety at work, and to comply with safety regulations, health and safety requirements and requirements for safe disposal of waste such as chemical waste, chemical residues or solvents, the form below must be fully completed and signed whenever devices or faulty components are to be sent back to our factory.

Products or components will not be accepted if this declaration has not been provided.

| | | |
|---------------|--------|------------------|
| Device | Model: | Part/Device no.: |
|---------------|--------|------------------|

| | |
|--|---|
| Declaration for non-hazardous materials | We hereby assure that the products returned |
|--|---|

have not been used in the laboratory and are new.

have not been in contact with toxic, corrosive, biologically active, explosive, radioactive or other hazardous materials.

are not contaminated. The solvents or residues of the substances pumped have been removed.

| | |
|--|--|
| Declaration for hazardous materials | In respect of the products returned, we hereby assure that |
|--|--|

all substances (toxic, corrosive, biologically active, explosive, radioactive or otherwise hazardous) that have been pumped by the products or have otherwise been in contact with the products are listed below.

the products have been cleaned, decontaminated, sterilised inside and outside and all inlets and outlets are sealed.

List of hazardous materials that have been in contact with the products:

| Chemical, material | Hazard category |
|--------------------|-----------------|
| | |
| | |
| | |

| | |
|--------------------------|------------------------|
| Final declaration | We hereby declare that |
|--------------------------|------------------------|

- we are fully conversant with the substances that have been in contact with the products and have answered all questions correctly.
- we have taken all measures necessary to prevent potential hazards in respect of the products returned.

Company name or stamp:

Place, date:

Name (block letters), position
(block letters):

Signature:

BUCHI Affiliates:

Europe

| | | | |
|--|--|--|--|
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