LAB Online Exhibition

Operation Manual

knowledge

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Table of Contents

Please read these operating instructions carefully before using the **BÜCHI** Vac **V-511/512/513**. Keep these instructions in the proximity of the apparatus so that you can consult them immediately whenever necessary.

Chapter 2 contains important safety instructions. Read them carefully; they are essential for the safe operation of the apparatus.

en, Version D (28 pages)	**Order No.**
V-511 Operating Instructions	**96716**

1 Supplied Materials

Fig. 1: Vac V-511

1.1 Büchi Vac V-511

Description		Order No.
Büchi Vac V-511	230 V 50 Hz	**38658**
Büchi Vac V-511	120 V 50/60 Hz	**38660**
Büchi Vac V-511	100 V 50/60 Hz	**38661**

Contents of enclosed box:

2 m	Vacuum hose	**17622**
1	Collecting tank for additional condenser	**37949**
1	Power cable PNE, 1.5 m	
	Type CH	**10010**
	Type Shuko	**10016**
	Type GB	**17835**
	Type USA	**10020**
	Type AUS	**17836**
1	Operating instructions	
	German	**96715**
	English	**96716**
	French	**96717**
	Italian	**96718**
	Spanish	**96719**

Table 1: Contents of enclosed box Büchi Vac V-511

Fig. 2: Vac V-512

1.2 Büchi Vac V-512

Description			Order No.
Büchi Vac V-512	230 V	50 Hz	**38662**
Büchi Vac V-512	120 V	50/60 Hz	**38664**
Büchi Vac V-512	100 V	50/60 Hz	**38665**

Contents of enclosed box:

2 m	Vacuum hose	**17622**
1	Control cable V-800 to pump	**38010**
1	Power cable PNE, 1.5 m	
	Type CH	**10010**
	Type Shuko	**10016**
	Type GB	**17835**
	Type USA	**10020**
	Type AUS	**17836**
1	Operating instructions	
	German	**96715**
	English	**96716**
	French	**96717**
	Italian	**96718**
	Spanish	**96719**

Table 2: Contents of enclosed box Büchi Vac V-512

Fig. 3: Vac V-513

1.3 Büchi Vac V-513

Description		Order No.
Büchi Vac V-513	230 V 50 Hz	**38666**
Büchi Vac V-513	120 V 50/60 Hz	**38668**
Büchi Vac V-513	100 V 50/60 Hz	**38669**

Contents of enclosed box:

2 m	Vacuum hose	**17622**
1	Collecting tank for additional condenser	**37949**
1	Control cable V-800 to pump	**38010**
1	Power cable PNE 1.5 m	
	Type CH	**10010**
	Type Shuko	**10016**
	Type GB	**17835**
	Type USA	**10020**
	Type AUS	**17836**
1	Operating instructions	
	German	**96715**
	English	**96716**
	French	**96717**
	Italian	**96718**
	Spanish	**96719**

Table 3: Contents of enclosed box Büchi Vac V-513

2 Safety

The apparatus is built with state-of-the-art technology and according to recognized safety regulations.
Nevertheless, using this apparatus can lead to certain risks and dangers:

- If the apparatus is not used according to these instructions.
- If the apparatus is used by personnel who have not been properly trained.

2.1 Symbols

Stop
Information about risks which can lead to extensive property damage or to serious or life-threatening personal injury.

Warning
Information about risks which can lead to damage to one's health or to property damage.

Reference
Information which refers to technical requirements. Failure to heed these requirements can lead to malfunctions, poor economic performance, and production losses.

2.2 Requirements for the User

The apparatus may be used only by laboratory personnel or other persons who, due to their training or professional experience, are capable of recognizing possible dangers which might arise from the use of the apparatus.

Personnel who do not have this training or who are presently in training must be given careful and exact instruction. These operating instructions are intended for use as a basis for such instruction.

2.3 Proper Use

The apparatus was designed and built for laboratory use. Its proper use is the evacuation of laboratory vacuum apparatus to <10 mbar. This is done by means of a PTFE diaphragm pump, with or without regulation through one or more vacuum controllers.

Uses:

- Evacuation of distillation apparatus, in particular rotation evaporators
- Vacuum filtrations
- Vacuum drying cabinets
- Drying ovens

2.4 Improper Use

Any use of the apparatus other than those given above or any use of the apparatus which is not in accordance with the technical data shall be regarded as a misuse. The operator bears the sole responsibility for any and all damage which may result from such misuse. The apparatus is not suitable for pumping liquids or solid particles. The result of such a use would be the destruction of the pump or a loss in performance capability.

In particular, the apparatus must not be used in the following ways:

- Use of the apparatus in rooms which require ex-protected apparatus.
- Processing of samples which can explode or ignite due to a blow, friction, heat, or sparks (e.g., explosives, etc.).
- Use of the apparatus for digestions (e.g., Kjeldahl).
- Use of the pump to produce over-pressure.
- Operation of the apparatus in a surrounding temperature of <5° C, >40° C.
- The top of the apparatus must not be used as storage space.

2.5 General Risks

In general, risks can arise from:

- Glass parts which are not suitable for use under vacuum conditions.
- Solvents which can react with one another if they mix in the pump or in the additional condenser.
- Ignition sources in the immediate vicinity of the pump/pump system outlet.
- Flammable gases or solvent vapors in the immediate vicinity of the apparatus.
- Damaged glass equipment.
- Bent, leaking, or brittle hoses.

2.6 Safety Measures

Protective clothing such as **goggles** and **laboratory coats** must be worn during operation of the apparatus.

These operating instructions must be available at all times to operating personnel at the place of operation of the apparatus and should be regarded as an integral part of the Büchi Vac V-511-513. Instructions in other languages, which may be ordered separately, must also be kept with the apparatus.

Modifications

Modifications of the apparatus or of spare parts or of accessories as well as the use of spare parts or accessories other than those mentioned in these operating instructions is allowed only with the prior written permission of BÜCHI Labortechnik AG.

Responsibility of the Operator

The operator is responsible for the instruction of his personnel. Copies of these operating instructions in various languages can be ordered for this purpose.
The operator shall inform the manufacturer without delay of any safety-related events which might occur during operation of the apparatus.
Regional and local statutes and regulations must be observed.

It is forbidden for anyone other than authorized maintenance personnel to remove any parts not described in these operating instructions. Damaged glass equipment may not be used under vacuum conditions.

Touching any parts of the apparatus carrying electrical current can result in fatal injury!

2.7 Safety Features

Electronics

- The apparatus and the vacuum controller are equipped with fuses
- The motor is equipped with protection from overheating

Operation

- If the absolute pressure exceeds 1400 mbar, the built-in aeration valve on the Vacuum Controller V-800 opens automatically.

Glass

- Use of high-quality, inert borosilicate glass 3.3
- Screw-on hose connections to prevent glass breakage
- Plasticized separator on the valve unit

Protective Shield

The protective shield prevents injury to the operator from splinters in the event of glass breakage.

3 Function

3.1 General

The system V-511 consists of a PTFE diaphragm pump and an integrated additional condenser, without the Vacuum Controller V-800. This system runs in continuous operation with the main switch turned on.
The systems V-512 and V-513, with the integrated Vacuum Controller V-800, create and regulate a vacuum and maintain it at a constant level by automatically compensating for any loss of vacuum in the evacuated device and returning it to the selected set pressure. This is accomplished by turning the integrated PTFE diaphragm pump on and off directly.
The vacuum, which is selected according to the solvent (cf. Page 27), permits almost 100% condensation in the condenser of the distillation apparatus. The result is a massive reduction in solvent emissions. The integrated additional condenser assures that any solvent vapors which might have been suctioned off will be condensed out to the physical limit following the pump.
In addition, the cooling water can be controlled during distillation. This can be handled by the cooling water valve, which is available as an option. Up to 95% of the water can be saved with this device.

Additional functions are
- Automatic performance of distillations until dry, if this is physically possible without a loss of solvents (→ redistillation!)
- Automatic continued distillation until completion of a distillation which has been started manually (e.g., with a mixture of problematic solvent mixtures)

Fig. 4: Vac V-511

Büchi Vac V-511

① Additional condenser
② Collecting tank
③ Main switch

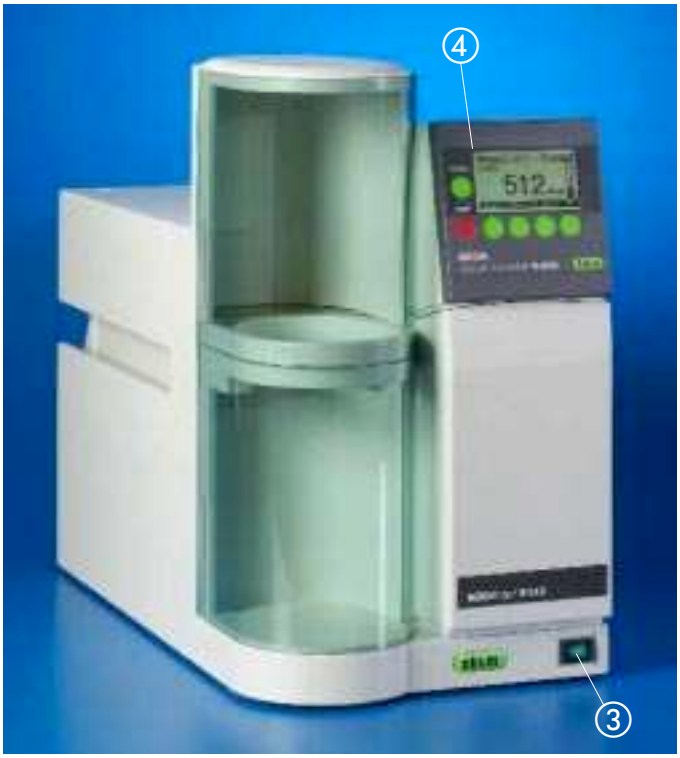


Fig. 5: Vac V-512

Büchi Vac V-512

③ Main switch
④ Vacuum Controller V-800

Fig. 6: Vac V-513

Büchi Vac V-513

① Additional condenser
② Collecting tank
③ Main switch
④ Vacuum Controller V-800

4 Beginning Operation

4.1 General

Please check all parts for damage when unpacking. It is important that any transport damage be discovered when the parts are unpacked. If necessary, a record of the condition of the parts should be made immediately (report to postal service, railway service, or shipping company).

Keep the original packaging for the event of a later transport.

4.1.1 Placement

The apparatus must be set up on a stable, clean, and level surface. The surrounding temperature may not exceed 40° C. Proper air circulation is necessary.

The apparatus must be placed at a minimum of 20 cm from walls and other objects in order to prevent damage. Containers, chemicals, or other apparatus may not be placed behind the pump.

4.1.2 Electrical Connections

Ensure that the electric current available from the location's outlets is the same voltage as that indicated by the label on the apparatus. The apparatus must always be connected to a grounded outlet. External couplings and extension cords must have a protective conductor (3-pin couplings, cables, or plug and socket connections). There must be no break in any part of the protective conductor. This will avoid risks resulting from internal defects.

Connect the pump to the power source with the enclosed cable.

4.1.3 Hose Connections

- Please be sure that none of the hoses are bent closed (bends, the apparatus is resting on the hose).
- Replace brittle hoses.
- The hoses should be secured with standard hose clamps or cable binders for safety. The hoses in the apparatus itself have already been secured by the factory.
- The apparatus must never be put into operation without an exhaust hose. The exhaust hose must not be pointed towards hot objects or towards objects which produce sparks. The exhaust hose must end in a fume hood so that none of the vapors from the solvents can be released in the room.

4.2 Installation

4.2.1 Glass Parts

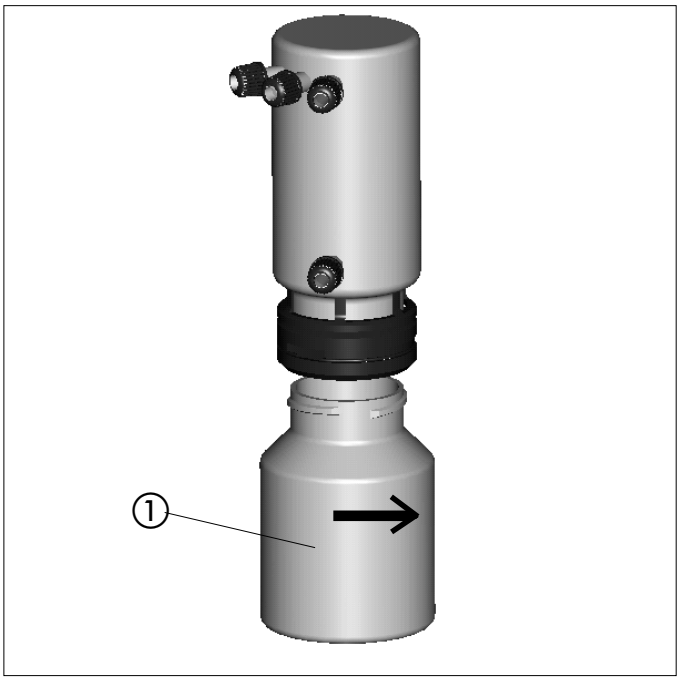


Fig. 7: Collecting tank

Collecting tank

Screw on the collecting tank ① securely by turning it clockwise a quarter-turn.

The vacuum system must never be operated without a collecting tank as solvent vapors could otherwise collect in the apparatus.

4.2.2 Connections

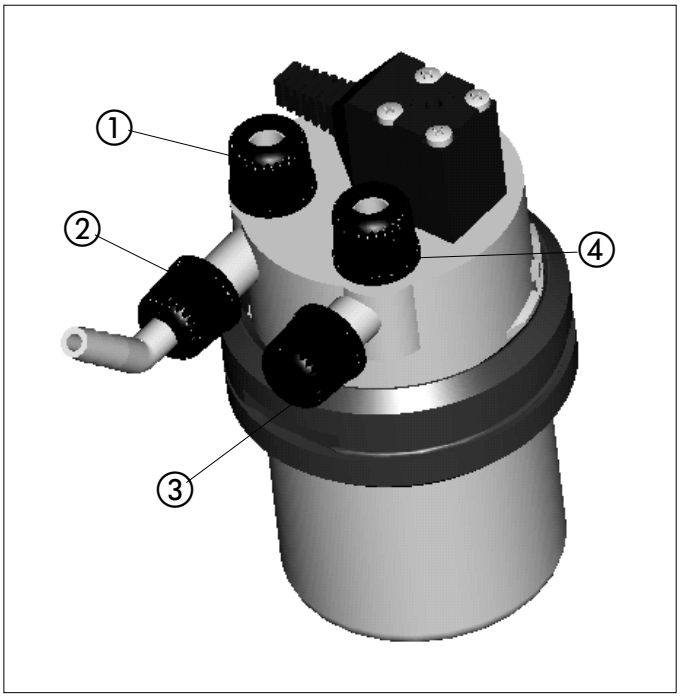


Fig. 8: Valve unit

Connections to the valve unit

① Vacuum Controller V-800
② Rotavapor
③ Second valve unit (cf. Page 15)
④ Pump

Connections to a Rotavapor

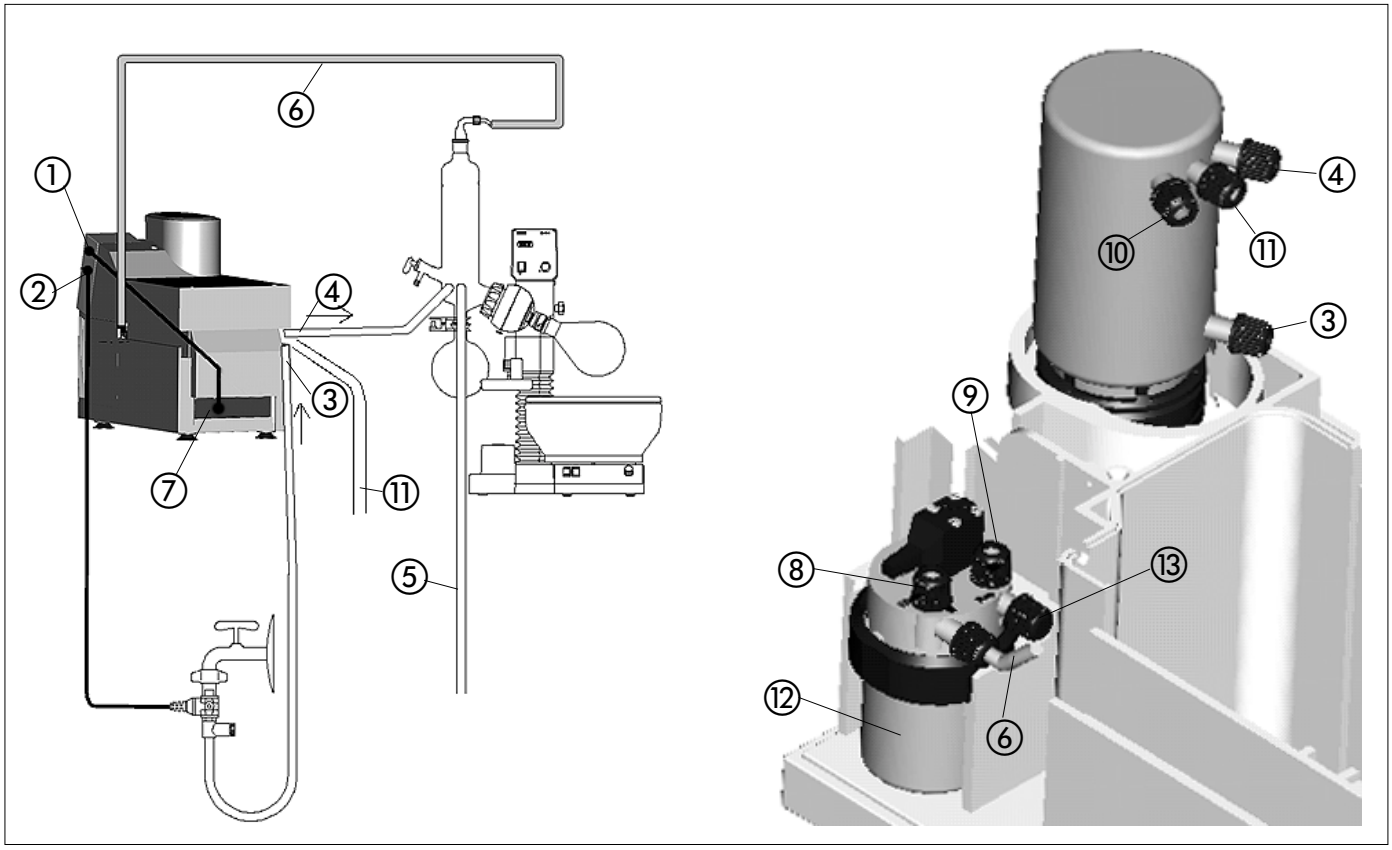


Fig. 9: Installation diagram 1

① Control cable V-800 to pump
② Cooling water valve on the "CW" connection
③ Cooling water inlet (CW in)
④ Cooling water outlet to Rotavapor (CW out)
⑤ Cooling water outlet from Rotavapor
⑥ Vacuum hose to Rotavapor (red hose)
⑦ Power cable socket
⑧ Hose connection to V-800
⑨ Hose connection to pump
⑩ Connection to pump outlet
⑪ Exhaust hose ∅14mm
⑫ Woulff-bottle
⑬ Connection to further user (cf. Page 15)

The inert gas ventilation of the Rotavapor is handled by the Vacuum Controller (cf. Page 20).

During operation, the valve unit is in a vacuum. Please inspect glass parts for splinters or cracks.

Connection to a second Rotavapor

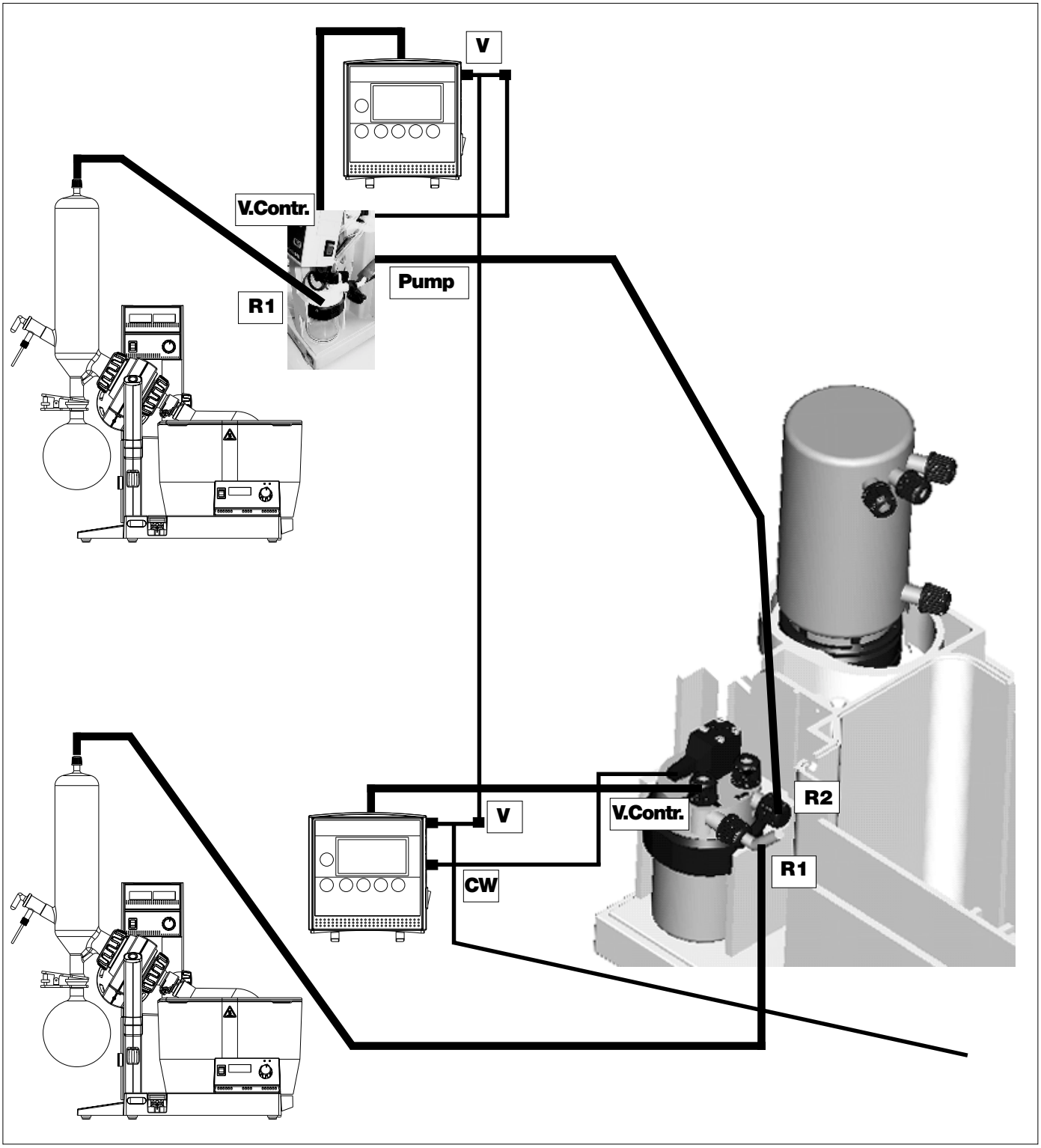


Fig. 10: Installation diagram 2

— Electrical connections

▬ Vacuum hoses

5 Operation

Please be sure that the apparatus has been properly installed according to the instructions in Chapter 4, Beginning Operation.

5.1 Vacuum Systems

Fig. 11: Front of Vac V-513

① Main switch vacuum system
② Vacuum Controller V-800 (only for V-512 and V-513)
③ Additional condenser (only for V-511 and V-513)

Fig. 12: Vac V-513 from the side

④ Valve unit (only for V-512 and V-513)
⑤ Main switch V-800

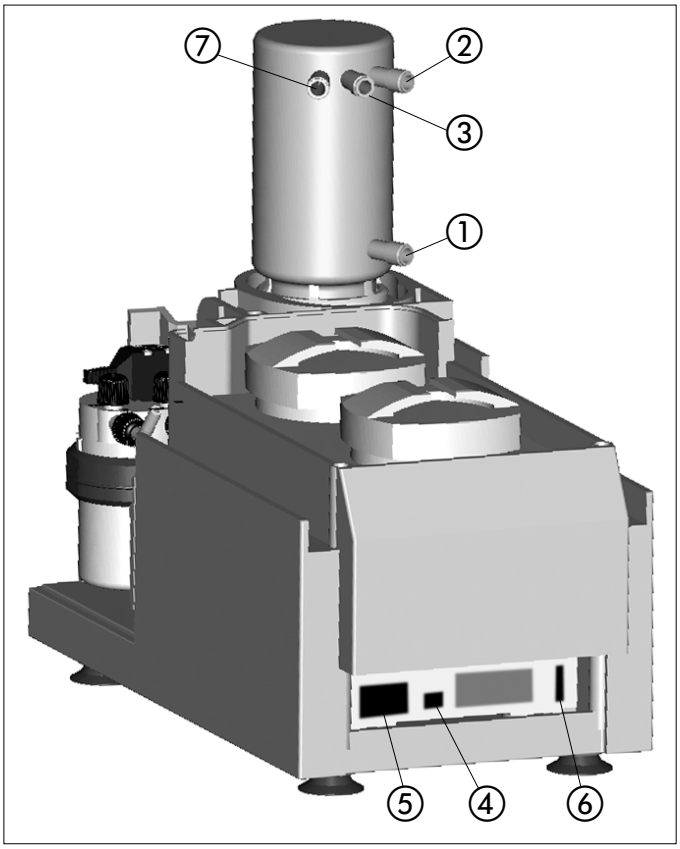


Fig. 13: Back of Vac V-513

① Cooling water inlet
② Cooling water outlet
③ Exhaust hose
④ Control connection
⑤ Power connection
⑥ Allen wrench
⑦ Connection to pump outlet

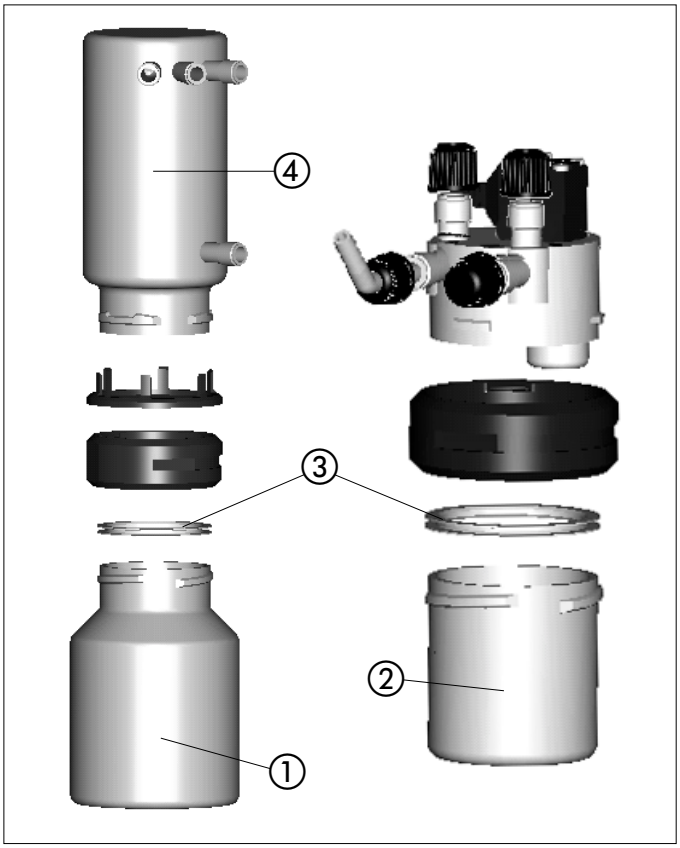


Fig. 14: Back of Vac V-513

Removing valve unit, collecting tank and condenser

Turn off the apparatus before beginning work.

The collecting tank and the Woulff-bottle should be checked regularly for possible contents. If any substances have been collected in these containers, they must be emptied. To do this, the valve unit must be removed from its holder. The collecting tank or Woulff-bottle can then be removed by twisting it counterclockwise a quarter-turn. This is also a good opportunity to check the gasket for damage. The top of the housing must be unscrewed if the condenser must be removed. The condenser can then also be removed by turning it clockwise a quarter-turn. However, the hoses must first be disconnected from the condenser.

① Collecting tank
② Woulff-bottle
③ Gasket
④ Condenser

5.2 Troubleshooting

Problem	Possible Cause	Correction
No display on Vacuum Controller	Apparatus is not connected	Turn on all power switches Check all power connections Check fuse on V-800
Frequent operation of the valve and the pump	The system has a leak	Check all possible places for leaks (hoses and connections)
	The selected hysteresis is too low	Set hysteresis at a higher value (if the final vacuum is higher than 700 mbar, set for automatic hysteresis)
Valve does not operate	Valve does not close	Separating membrane is defect Valve cable is not connected (Connection "V" on V-800)
No vacuum	Incorrect hose connections	Cf. Chapter 4.2, Installation
	Incorrect cable connections	Cf. Chapter 4.2, Installation
Vacuum is not achieved	Solvent residue in system	Empty valve unit and, after drying, replace it. Start the pump with an open vacuum hose and allow it to run for 1-2 minutes. Any remaining vapors will be blown out.
	Valve plate in the pump is dirty	Clean or replace the valve plate. Cf. Chapter 6.2
	Pump membrane is defective	Replace the membrane
Vacuum not achieved in the second Rotavapor	Backstroke valve has a leak	Clean the backstroke valve

Table 4: Troubleshooting

Error messages on Vacuum Controller:

Error—0 Error—1 Error—2	Automatic temperature sensor defective	Call customer service
Error—3	Pressure sensor defective	Call customer service
Error—4 Error—5	Software error	Call customer service
Error—6	Hardware error	Call customer service
Error—7	Pressure sensor is not calibrated	Call customer service
Error—8	Pressure has increased above 1400	Avoid excess pressure in the system
Error—9	Leak rate is too high	Evacuate apparatus dry Leak rate < 5mbar/min.
	Pump is too weak	To less water pressure in the water jet pump Clogged water jet pump Defective pump Configure apparatus (see 4.6)
	Back evaporation	Empty receiving flask
Error-10	Hardware error	Call customer service

Table 5: Error messages on Vacuum Controller

6 Maintenance

6.1 Cleaning

Valve head

Fig. 15: Cleaning Valve head

If the end vacuum of the pump can not be reached the problem is often caused by stuck valve plates. To clean them do the following steps:

1) remove all of the connections to the pump and the sound absorber
2) switch the pump on
3) inject a small amount of about max. 10 ml at one time of acetone at the inlet side of the pump and wait till the pump makes the same sound as before injecting the solvent. The injection should only be done with safety washing bottles as seen on the picture.
4) Repeat point 3) four to five times
5) Leave the pump running for about 2 minutes and check then if the end vacuum can be reached.
6) If the end vacuum can not be reached after this cleaning procedure, repeat it again before going on with Chapter 6.2.

Housing

Before cleaning, please disconnect the apparatus from the power source.

The housing is made of plastic. Drops of acid must be wiped away immediately with a damp cloth. Using organic solutions for cleaning (exception: ethanol) can cause damage and is not allowed.

Glass parts can be rinsed out with standard cleaning agents (e.g., mild soap solutions). After they have been cleaned and dried thoroughly, they must be examined visually for splintered places or cracks. As the valve unit is in a vacuum during operation, this examination must be carried out conscientiously.

Hoses and gaskets must also be examined visually; if cracks have developed or if they have become brittle, they must be replaced with suitable new hoses.

Büchi offers sets of spare parts which make it easier for the user to obtain spare parts.The necessary articles can be found in Chapter 8.1, Spare Parts.

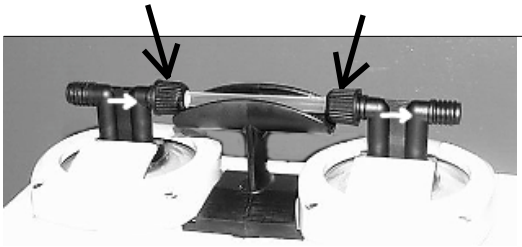
6.2 Removal and Assembly of the Pump Heads, Valve Heads and Diaphragms

Under conditions of normal usage, the diaphragms and the valve plates will rarely require replacement.
If the benchmarks of the function checkup (6.1) are not met, the pump heads, diaphragms, and valve heads should be cleaned.

If the pump's performance does not improve, the valve heads (38025) and possibly the diaphragms must be replaced (Spare Parts Set 38120).

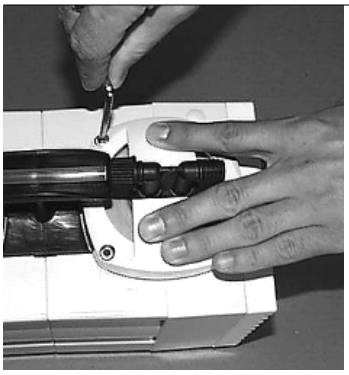
Attention: Before replacing the diaphragms, please disconnect the apparatus from the power source.

The parts of the pump head are delicate. Pay close attention to ensure that the glass head, the valve head, and the diaphragms are not subjected to mechanical damage. Before assembly, the parts must be examined for nicks, chips, or deformation.



Removal and cleaning of valve head

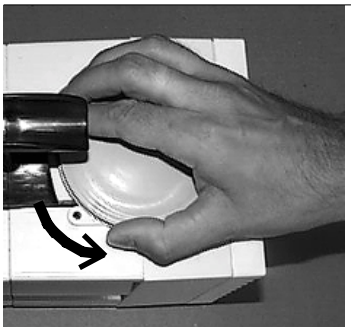
1. Release both of the black hose couplings GL-14 between the pump heads.



2. Using the allen wrench provided, loosen crosswise with a quarter-turn each and remove the 4 screws on the valve head top.
3. Carefully remove the valve head top with the valve head and glass head.
4. Place the entire part on a soft surface. The glass head can now be removed by applying light pressure to the valve head.

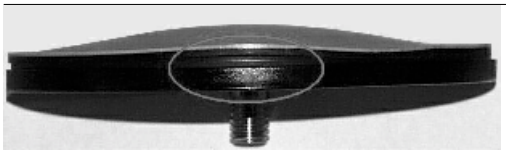
The valve head, glass head, and diaphragms can now be cleaned with a suitable cleansing agent (e.g., acetone), or defective parts can be replaced. The valves of the valve head can be cleaned by putting the whole valve head into an acetone bath. If they are still contaminated, use an ultrasonic bath.

Avoid hitting the sides and edges of the glass head. A glass head which has been dropped may not suffer any apparent damage, but could break if used again!



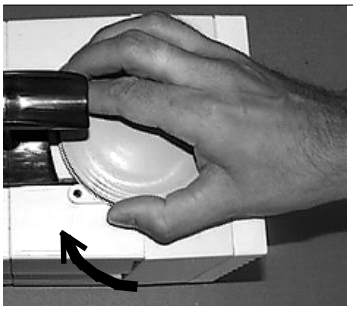
Removal of the diaphragms

Only remove the diaphragms if they are broken or can not be cleaned in a mounted way. They can be released by turning them counterclockwise.



Replacement of the diaphragms

Before you replace the diaphragm make sure, that the diaphragm holder fits tight on the lower side of the diaphragm. There must be **no gap** between holder and diaphragm



The diaphragm and the diaphragm holder can then carefully be screwed on and tightened by hand with the same force as your have needed to detache it before! Check again if there is **no gap** between diaphragm and holder after replacing the diaphragm.

Replacement of the pump head and assembling

1. Before replacing the valve head check if the valves are not stuck together by holding the head between two fingers. You should hear a soft clicking while shaking it carefully.

2. Place the valve head into the valve head top. Check if the rubber sealing is symmetrical placed in the metal part of the valve head top. Then snap the glass head into the top so that the knobs on the glass head fit into the spaces on the valve head. Place the assembled pump head on the diaphragms.

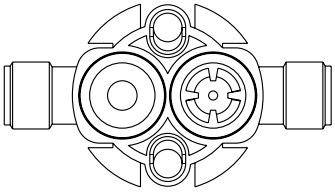
Pay careful attention to the arrows on the upper part of the valve heads. They **must** point in the **same direction** on both pump heads.

3. Place the setting gauge side number 1 between the metal top and thread and screw the first screw (a) in so that the setting gauge can be removed without force. After the first screw do the same procedure with the screw (b) and then with the screw (c) and last but not least again with the screw (d) (Crosswise).

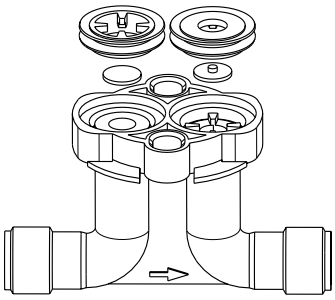
4. If all screws are on the level 1 change to the side 2 of the setting gauge. Place this side between metal top and thread and screw the first screw (a) one quarter-turn in. After this change the setting gauge to screw (b) and screw this one also a quarter-turn in. Go on with the screw (c) and (d) in the same way and repeat this procedure till you can't remove the setting gauge without force. Loosen the screw a little bit to take out the setting gauge and leave the screw on this position.

Hold the short red part of the allen wrench to tighten the screws, which will provide for the correct tightness.
You should only use screws with a blue spot on the thread. The blue spot is a Tufloc coating which prevents the screw from loosening during operation or transportation of the pump. If you are using a new screw it could be possible that you need a slightly higher force to screw this in. This doesn't matter and doesn't influence the result of your work.

5. Now connect the connecting hose, tighten the hose connections, and then assemble the second pump head the same way as the first one.



6. If the vacuum is not achieved, it may be necessary to replace or clean the valve head seals. To do this, remove the valve heads as indicated in 6.2. 1-4.



Carefully take the white sealing rings out of the retainer using the valve reed and place them in an ultrasonic bath (if possible).

Refit the cleaned individual parts or replacement parts as shown in the diagram.

6.3 Function control

A functional control should be carried out at least once a year as follows:

Pump:
The suction time for a dry volume of 3 litres at 20 mbar should not take longer than 60 seconds.

The functional control should also include a regular inspection of hoses for any brittle areas and leaks.

If the pump does not perform to specification, the pump, diaphragms and valve heads must be cleaned and replaced, if necessary.

6.4 Customer Service

Work on or in the apparatus may be carried out only by authorized service personnel. These are people with sound technical vocational training and knowledge of the risks which result when safety measures are disregarded. BÜCHI customer service offices have service manuals specific to the various apparatus; these manuals can be obtained only by authorized personnel.

The addresses of the official BÜCHI customer service offices are listed on the last cover page of these operating instructions. If malfunctions arise or if you have technical questions or problems in operating the apparatus, please turn to these offices.

BÜCHI's customer service provides the following services:
- Spare parts service
- Repair service
- Maintenance service
- Technical consulting.

6.5. Working with strong acids / bases on Büchi VAC V-500 – 513

If strong acids or bases are removed with a Vacuum pump, protecting clothing such as goggles and laboratory coats must be worn during operation of the device.

If strong acids or bases are distillated we highly recommend to rinse the pump after the application to increase the lifetime of the instrument.

That means 5-10 ml of water should be sucked in trough the pump inlet and collected directly after the pump outlet. This process should be repeated as long as the pH of the liquids coming out of the pump outlet, is between 3-9.

After that the pump is been dried, by sucking air through the pump for 2-3 min.

7 Shutting Down

Before the apparatus can be moved, the power cable must be disconnected and all hoses taken off.

7.1 Storage/Transport

Clean the apparatus thoroughly (see 6.1). Any chemicals remaining in the apparatus must be removed completely and the glass parts must be washed. Return the apparatus to the original packaging for storage and transport.

7.2 Disposal

Chapter 9, Appendix, contains a list of the materials used in manufacturing the apparatus so that it can be disposed of in accordance with environmental regulations. This ensures that the various parts can be separated and recycled properly. Please observe the valid regional and local statutes in disposing of the apparatus.

8 Spare parts and Accessories

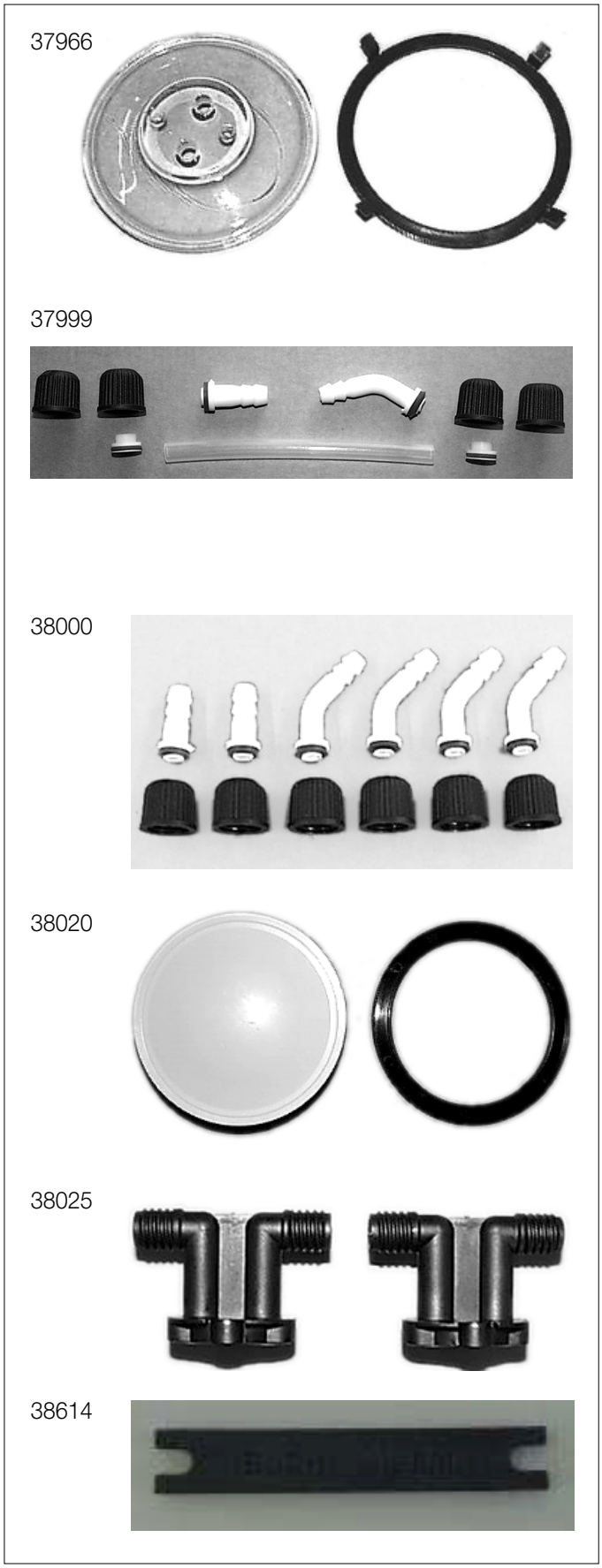


Fig. 16: Spare parts 1

Only original spare parts and accessories from BÜCHI guarantee that the apparatus will function properly and safely. Spare parts and accessories from other manufacturers may be used only with the express permission of BÜCHI AG. General safety regulations and Chapter 6 must be observed when assembling or dismantling the apparatus. Before putting the apparatus into operation, please check that it is fully functional as described in Chapter 6.1. Production according to this manual is forbidden. The copyright is owned by the firm Büchi Labortechnik AG.

8.1 Spare parts

1	Spare parts set with 2 valve heads and 2 diaphragms	**38120**
1	Glass head set (with 1 glass head)	**37966**
1	Valve head set (with 2 valve heads)	**38025**
1	Diaphragm set (with 1 diaphragm)	**38020**
1	GL-14 screw set (with PTFE hose, 4GL-14)	**37999**
1	Set hose connections (4 x bent / 2 x straight / 6 x screw caps)	**38000**
1	Control cable Vacuum Controller V-800 to V-500, or B-721 to 721	**38010**
1	Secondary condenser	**37775**
1	Holder for secondary condenser and collecting tank	**38086**
1	Collecting tank for secondary condenser	**37949**
1	Spring lock washer	**37872**
1	Gasket for secondary condenser or valve unit	**37873**
1	Collecting beaker for valve unit	**38005**
1	Signal cable for KNF vacuum controller	**38015**
1	Signal cable for Vacuubrand vacuum controller	**38014**
1	Sound absorber	**37947**
1	Rubber vacuum hose, 2 m	**17622**
1	PVC vacuum hose, 2 m	**04113**
1	Cooling water hose, 2 m	**04133**
1	Stand with holder for valve unit/ secondary condenser	**38021**
1	Valve unit complete	**37968**
1	Cable set for combination with Rotavapor R-134/144 or B-168	**31466**
1	Cooling water valve	**31356**
1	Thermostatic jacket for secondary condenser	**37616**
1	Installation tool	**38614**
1	Set of valve reeds	**41977**

Table 6: Spare parts

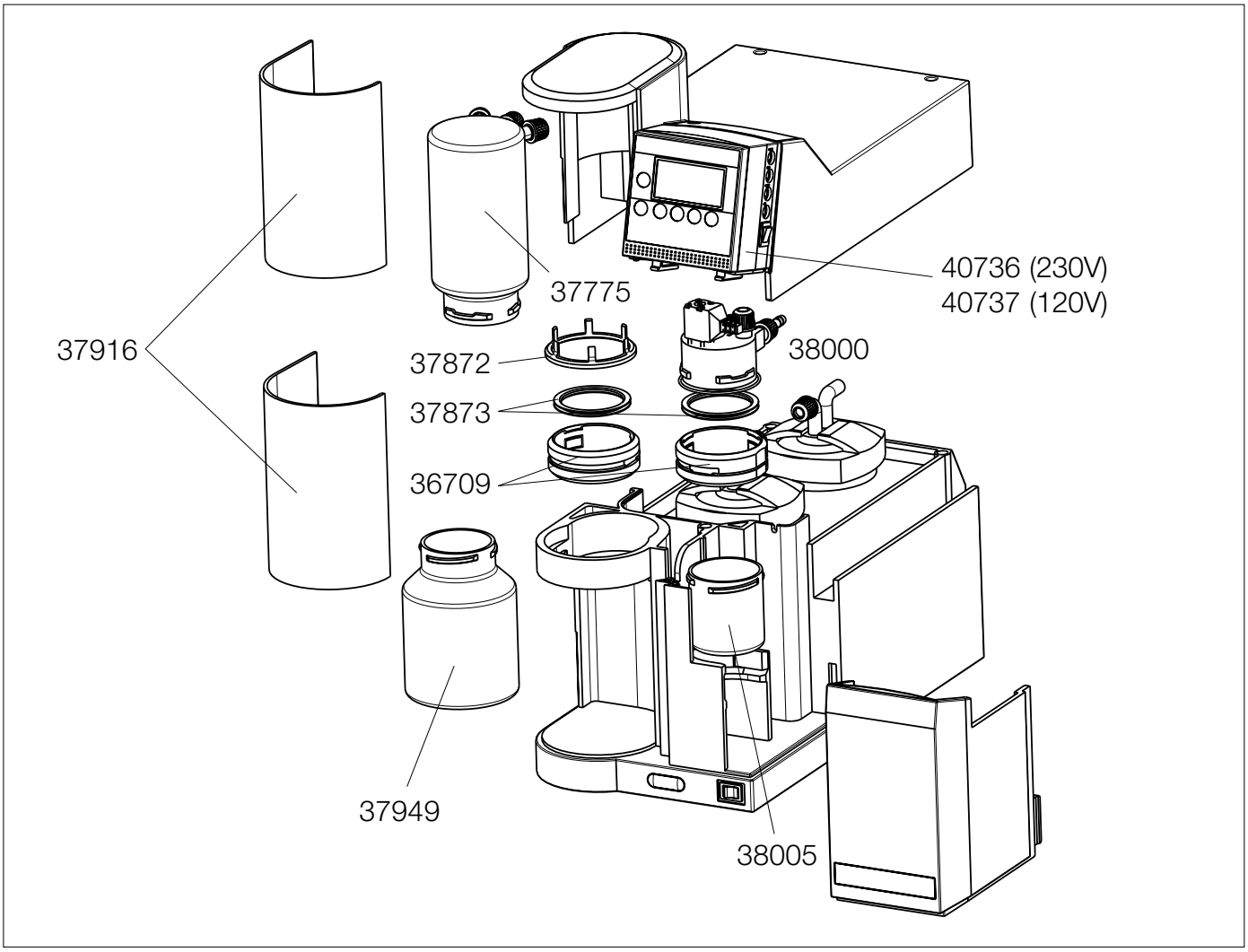


Fig. 17: Spare parts 2

8.2 Accessories

	Description	Order No.
1	Adapter cable for Vacuubrand Vacuum Controller CVC2	**38014**
1	Adapter cable for MLT (PVK) Vacuum Controller Type 610 and 650	**38015**
1	Cooling water valve	**31356**
	Vacuum hose (rubber), 1 m	**17622**
1	Vacuum hose (PVC), 1 m	**04113**
1	Cooling water hose, 1 m	**04133**
1	Valve unit for R-134/144, compl. (including cable)	**37968**
1	Adapter cable for R-134/144 or B-168	**31465**

Table 7: Accessories

9 Appendix

9.1 Technical data

Device Measurements (width x depth x height)	230 x 470 x 393 mm	
Weight	14-17 kg	
Voltage	230 V	50 Hz
	120 V	50/60 Hz
	100 V	50/60 Hz
Power input	V-511:	240 W
	V-512:	260 W
	V-513:	260 W
Overvoltage category	II	
Support	T400mAL 250V	
Surrounding temperature	5…40° C	
Relative humidity	max. 80%	
Degree of contamination	2	
Final vacuum possible	< 10 mbar	
Pumping volume	1.6 m^3/h	
Display	Digital, 1-1400 mbar (1-1050 Torr)	
Regulated range	1 mbar/Torr – atmospheric pressure	
Accuracy, absolute	± 5 mbar (typically 2 mbar)	

Table 8: Technical data

9.2 Materials used

Description	Materials	Material code
Pump heads	Glass	3.3 borosilicate
Condenser	Glass	3.3 borosilicate
Collecting tank	Glass	3.3 borosilicate
Woulff-bottle	Glass	3.3 borosilicate
System housing		PUR
Pump housing	Aluminum	Al
Pump cover		PBT
Diaphragms		PTFE/Rubber
Valve plates		PEEK
Valve head		PEEK
Housing	Grillamid	PA
Pressure sensor	Ceramic	
Foil	Polyester	PES
Printed board	Fiberglass reinforced epoxy resin	
Cable	Polyvinyl chloride	PVC
Vacuum hoses		PTFE/Rubber
Cooling water hose	Silicon	SI
Exhaust hose	Silicon	SI
Gasket rings, valves		ETFE
Diaphragms, valve unit	Perfluorelastomer	
Gasket additional condenser/valve unit		PTFE/Viton

Table 9: Materials

9.3 FCC requirements (for USA and Canada)

English:

This equipment has been tested and found to comply with the limits for a Class A digital device, pusuant to both Part 15 of the FCC Rules and the radio interference regulations of the Canadian Department of Communications. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is like to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Français:

Cet appareil a été testé et s'est avéré conforme aux limites prévues pour les appareils numériques de classe A et à la partie 15 des règlementation FCC à la règlementation des radio-interférences du Canadian Department of communications. Ces limites sont destinées à fournir une protection odéquate contre les interférences nétastes lorsque l'appareil est utilisé dans un environnement commercial.
Cet appareil génère, utilise et peut radier une énergie à fréquence radioélectrique, il est en outre susceptible d'engendrer des interferences avec les communications radio, s'il n'est pas installé et utilisé conformément aux instructions du mode d'emploi. L'utilisation de cet appareil dans les zones résidentielles peut causer des interférences nèfastes, auquel cas l'exploitant sera amené à prendre les dispositions utiles pour polier aux interférences à ses propres frais.

9.4 Declaration of confirmity

We **BÜCHI** Labortechnik AG
Postfach, CH-9230 Flawil
Switzerland

do hereby declare on our responsibility that the product:
BÜCHI VAC **V-511** / **V-512** / **V-513**

which is the object of this certification, is in accordance with the following norms:

EN 61010-1:1993 (~ IEC 1010-1, VDE 0411-1)
Safety regulations for electrical measuring, control, regulation, and laboratory apparatus: general requirements

EN 55011:1991/B (~ VDE 0875/B, VDE 0871/B)
Limits and measuring procedures for interference from industrial, scientific, and medical high-frequency apparatus

EN 61000-3-2: 1995/1996
Limits for harmonic current emissions

EN 61000-3-3: 1995
Limitation of voltage fluctuations and flicker

In accordance with the regulations of the EU guidelines
73/23/EWG (electrical operating equipment/low-voltage guidelines)
89/336/EWG (electromagnetic compatibility)

Flawil, 05th march 2001

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Switzerland