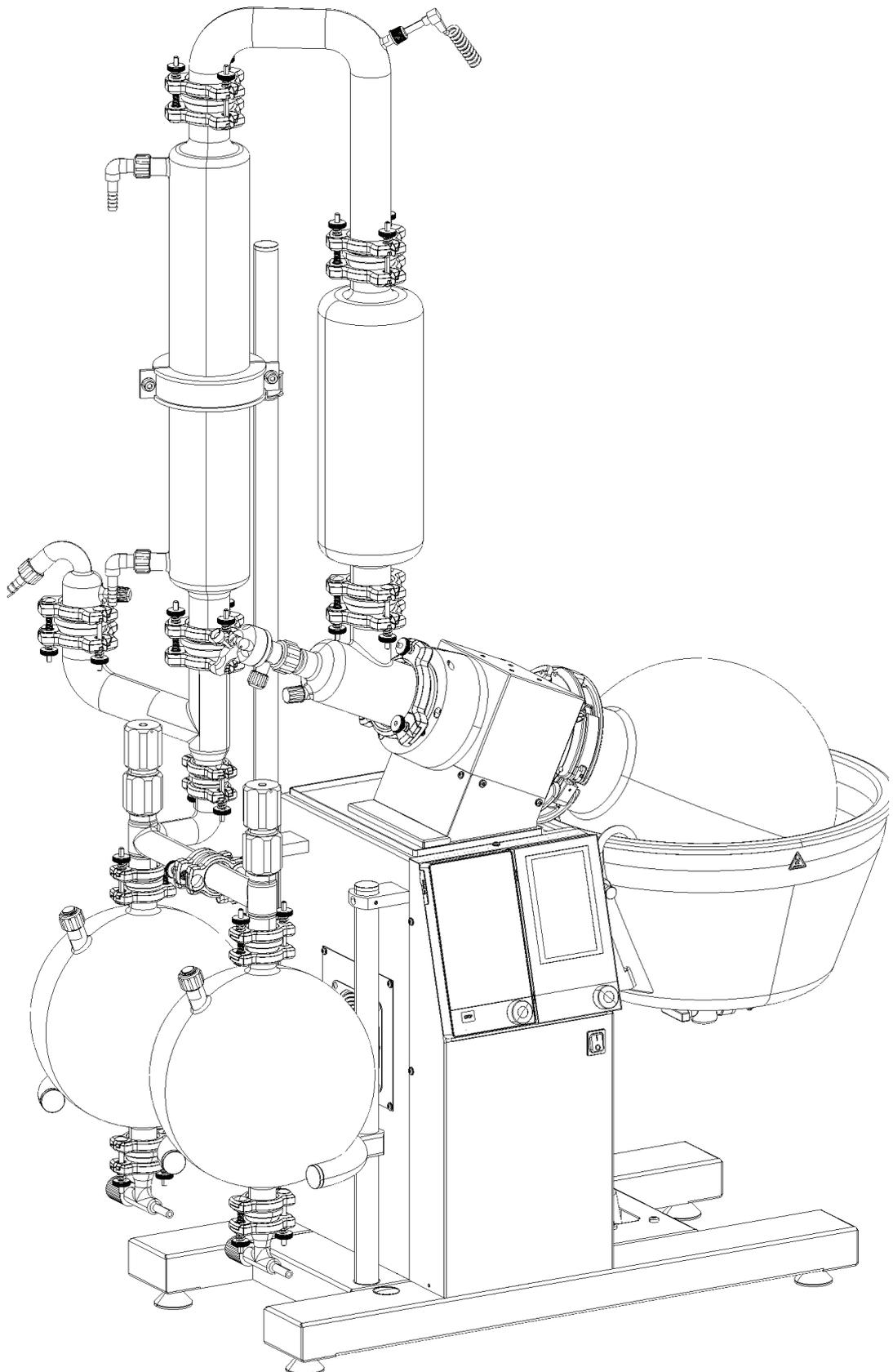




Rotavapor® R-220 Pro

Operation Manual



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BUCHI reserves the right to make changes to the manual as deemed necessary in the light of experience; especially in respect to structure, illustrations and technical detail.

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1 About this manual

This manual describes the Rotavapor® R-220 Pro and provides all information required for its safe operation and to maintain it in good working order.

It is addressed to laboratory personnel and operators in particular.

Read this manual carefully before installing and running your system and note the safety precautions in chapter 2 in particular. Store the manual in the immediate vicinity of the instrument, so that it can be consulted at any time.

No technical modifications may be made to the instrument without the prior written agreement of BÜCHI. Unauthorized modifications may affect the system safety or result in accidents. Technical data are subject to change without notice.

NOTE

The symbols pertaining to safety (WARNINGS and ATTENTIONS) are explained in chapter 2.

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- Rotavapor® is a registered trademark of BÜCHI Labortechnik AG

The English manual is the original language version and serves as basis for all translations into other languages. If you need another language version of this manual, you can download available versions at www.buchi.com.

2 Safety

This chapter highlights out the safety concept of the instrument and contains general rules of behavior and warnings from direct and indirect hazards concerning the use of the product. For the users' safety, all safety instructions and safety messages in the individual chapters shall be strictly observed and followed. Therefore, the manual must always be available to all persons performing the tasks described herein.

2.1 User qualification

The instrument may only be used by laboratory personnel and other persons who on account of training and professional experience know of the potential dangers that can develop when operating the instrument.

Untrained personnel, or persons who are currently being trained, require careful supervision by a qualified person. The present Operation Manual serves as a basis for training.

2.2 Proper use

The rotary evaporator has been designed for use in technical laboratories and in production. It is authorized for use in applications that work with the evaporation and condensation of solvents.

- Evaporation of solvents and suspensions
- Synthesis and cleaning of refined chemicals
- Reactions under reflux
- Recycling and concentration of solvents
- Re-crystallization
- Drying of powders and granulates

2.3 Improper use

Applications not mentioned in section 2.2 are considered to be improper. Applications which do not comply with the technical data (see section 3 of this manual) are also considered to be improper.

The operator bears the sole risk for any damages or hazards caused by improper use!

The following uses are expressly forbidden:

- Use of the instrument in explosive environments
- The production and processing of materials that can cause spontaneous reactions (e.g. explosives; metal hydrides or solvents that can form peroxides)
- Processing with explosive gas mixtures
- Working without the evaporating flask being immersed in the water bath (risk of breakage)
- The drying of hard, brittle materials (e.g., stones, soil samples) that might cause damage to the receiving flask
- Shock-cooling of the evaporating flask and other glass parts
- Installation or use of the instrument in rooms, which require ex-protected instruments
- For safety reasons, only original spare parts must be used
- Using the flask handler installed on the heating bath to lift or lower an evaporating flask

2.4 Safety warnings and safety signals used in this manual

DANGER, WARNING, CAUTION and NOTICE are standardized signal words for identifying levels of hazard seriousness of risks related to personal injury and property damage. All signal words, which are related to personal injury are accompanied by the general safety sign.

For your safety it is important to read and fully understand the below table with the different signal words and their definitions!

Sign	Signal word	Definition	Risk level
	DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.	★★★★
	WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.	★★★☆☆
	CAUTION	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.	★★☆☆☆
no	NOTICE	Indicates possible property damage, but no practices related to personal injury.	★☆☆☆☆ (property damage only)

Supplementary safety information symbols may be placed in a rectangular panel on the left to the signal word and the supplementary text (see below example).

Space for supplementary safety information symbols.	 SIGNAL WORD
	Supplementary text, describing the kind and level of hazard / risk seriousness. <ul style="list-style-type: none"> List of measures to avoid the herein described hazard or hazardous situation.

Table of supplementary safety information symbols

The below reference list incorporates all safety information symbols used in this manual and their meaning.

Symbol	Meaning
	General warning
	Electrical hazard

	<p>Explosive gases, explosive environment</p>
	<p>Harmful to life-forms</p>
	<p>Hot item, hot surface</p>
	<p>Device damage</p>
	<p>Inhalation of substances</p>
	<p>Explosive substances</p>
	<p>Flammable substances</p>
	<p>Fragile items / content</p>
	<p>Warning, heavy item</p>
	<p>Environmental pollution hazard</p>
	<p>Do not dispose of in household trash</p>

	Use of water is mandatory (non-standard symbol)
	Wear protective mask
	Wear laboratory coat
	Wear protective goggles
	Wear protective gloves
	Heavy weight, lifting requires more than one person

Additional user information

Paragraphs starting with NOTE transport helpful information for working with the device/ software or its supplementaries. NOTES are not related to any kind of hazard or damage (see example below).

NOTE

Useful tips for the easy operation of the instrument/ software.

2.5 Product safety

Safety warnings in this manual (as described in section 2.4) serve to make the user alert and to avoid hazardous situations emanating from residual dangers by giving appropriate counter measures. However, risks to users, property and the environment can arise when the instrument is damaged, used carelessly or improperly.

2.5.1 General hazards

The following safety messages show hazards of general kind which may occur when handling the instrument. The user shall observe all listed counter measures in order to achieve and maintain the lowest possible level of hazard.

Additional warning messages can be found whenever actions and situations described in this manual are related to situational hazards.

	<p>! WARNING</p> <p>Death or serious poisoning by inhalation of hazardous heating bath liquids.</p> <ul style="list-style-type: none"> • Do not inhale fumes from the heating bath • Keep the heating bath temperature as low as reasonably practicable • Obtain the material safety data sheets of all used liquids • Wear appropriate personal protective equipment • Do not use liquids of unknown composition • Directly withdraw released fumes and gaseous substances by sufficient ventilation • Only operate the instrument in ventilated environments
	<p>! WARNING</p> <p>Death or serious injuries by formation of explosive atmospheres inside the instrument.</p> <ul style="list-style-type: none"> • Directly withdraw released fumes and gaseous substances by sufficient ventilation at filling • Before operation, check all gas connections for correct installation • Establish inert system atmosphere before processing substances that can form explosive or reactive gases or powders • Check for proper earth connection to lead off electrostatic charges
	<p>! WARNING</p> <p>Death or serious injuries by use in explosive environments.</p> <ul style="list-style-type: none"> • Do not operate the instrument in explosive environments • Do not operate the instrument with explosive gas mixtures • Directly withdraw released gases and gaseous substances by sufficient ventilation
	<p>! CAUTION</p> <p>Risk of minor or moderate burns when handling hot parts.</p> <ul style="list-style-type: none"> • Do not touch hot parts or surfaces • Drive down the heating bath after distillation • Let the evaporating flask cool down for some minutes after use

	<p style="text-align: center;">NOTICE</p> <p>Risk of instrument short-circuits and damage by liquids.</p> <ul style="list-style-type: none"> • Do not spill liquids over the instrument or its component parts • Wipe off any liquids instantly • Ensure a safe positioning of the evaporating flask for storage • Do not move the instrument when it is loaded with liquid • Keep external vibrations away from the instrument
	<p style="text-align: center;">NOTICE</p> <p>Risk of instrument damage by internal overpressure.</p> <ul style="list-style-type: none"> • External supply pressure must meet the system specifications • Exchange clogged filters immediately • Dispose of filter immediately
	<p style="text-align: center;">NOTICE</p> <p>Risk of instrument damage by wrong mains supply.</p> <ul style="list-style-type: none"> • External mains supply must meet the voltage given on the type plate • Check for sufficient grounding • Disconnect power supply before removing cover • Cover my only be opened by instructed persons.
	<p style="text-align: center;">NOTICE</p> <p>Risk of glass breakage by excessive strains.</p> <ul style="list-style-type: none"> • Mount all glassware parts without strains • Check glassware for proper fixing regularly and readjust fixing points if necessary • Do not use defective glassware

2.5.2 Warning labels on housing

The following warning sticker(s) can be found on the housing or assemblies of the Rotavapor®:

Symbol	Meaning	Location
	Hot item, hot surface	Sticker is located on top of the housing and at the racks
	Fill in H ₂ O as heating medium only!	Sticker is located on top of the heating distributor box at the heating bath

2.5.3 Personal safety measures

Always wear personal protective equipment such as protective eye goggles, protective clothing and gloves when working with the instrument. Wear inhalation protection when working with hazardous solvents and all kind of respirable material or material of unknown composition.

	<p>! WARNING</p> <p>Death or serious poisoning by contact or incorporation of harmful media at use.</p> <ul style="list-style-type: none"> • Before operation, inspect seals, tubes and hoses for good condition • Exchange worn out or defective parts immediately • Before operation, check the instrument for correct assembly and proper seal • Only operate the instrument in ventilated environments • Directly withdraw released gases and gaseous substances by sufficient ventilation • Wear safety goggles • Wear safety gloves • Wear a suitable protective mask • Wear a laboratory coat • Obtain all additional requirements listed in the supplementary data sheets of the media in use
	<p>! CAUTION</p> <p>Risk of injury by drawing in of hair and clothing by the rotary drive.</p> <ul style="list-style-type: none"> • Wear work overalls or protective clothing • Do not wear loose or baggy items of clothing such as scarves or neck-ties • Tie up long hair • Do not wear jewelry such as necklaces or bracelets • At high speeds and/or high temperatures, use the optional safety guard or a similar protective arrangement.

2.5.4 Built-in safety elements and measures

Heating bath

- Overheating protection circuit
- Selectable max. temperature setpoint of the heating bath
- Dry-run protection against insufficient heating liquid level
- Automatic temperature control of heater
- Automatic heating bath lowering via built-in, rechargeable battery in certain error situations

Electrostatic charges

- Internal grounding to lead-off electrostatic charges

Air/gas

- Automatic pressure relief when system pressure exceeds system specifications
- Automatic aeration in case of power interruption

Glass

- High temperature resistance and high transparency borosilicate glass
- Plastic+Glas coating as effective splinter protection in the event of an implosion (except evaporating flask)

2.6 General safety rules

Responsibility of the operator

The head of the laboratory is responsible for training his/her personnel.

The operator shall inform the manufacturer without delay of any safety-related incidents which might occur during operation of the instrument. Legal regulations, such as local, state and federal laws applying to the instrument must be strictly followed.

Duty of maintenance and care

The operator is responsible for the proper condition of the instrument at use and that maintenance, service and repair jobs are performed with care and on schedule by authorized personnel only.

Spare parts to be used

Use only genuine consumables and spare parts for maintenance and repair to assure good system performance and to maintain the safety level. Any modifications to the spare parts used are only allowed with the prior written permission of the manufacturer.

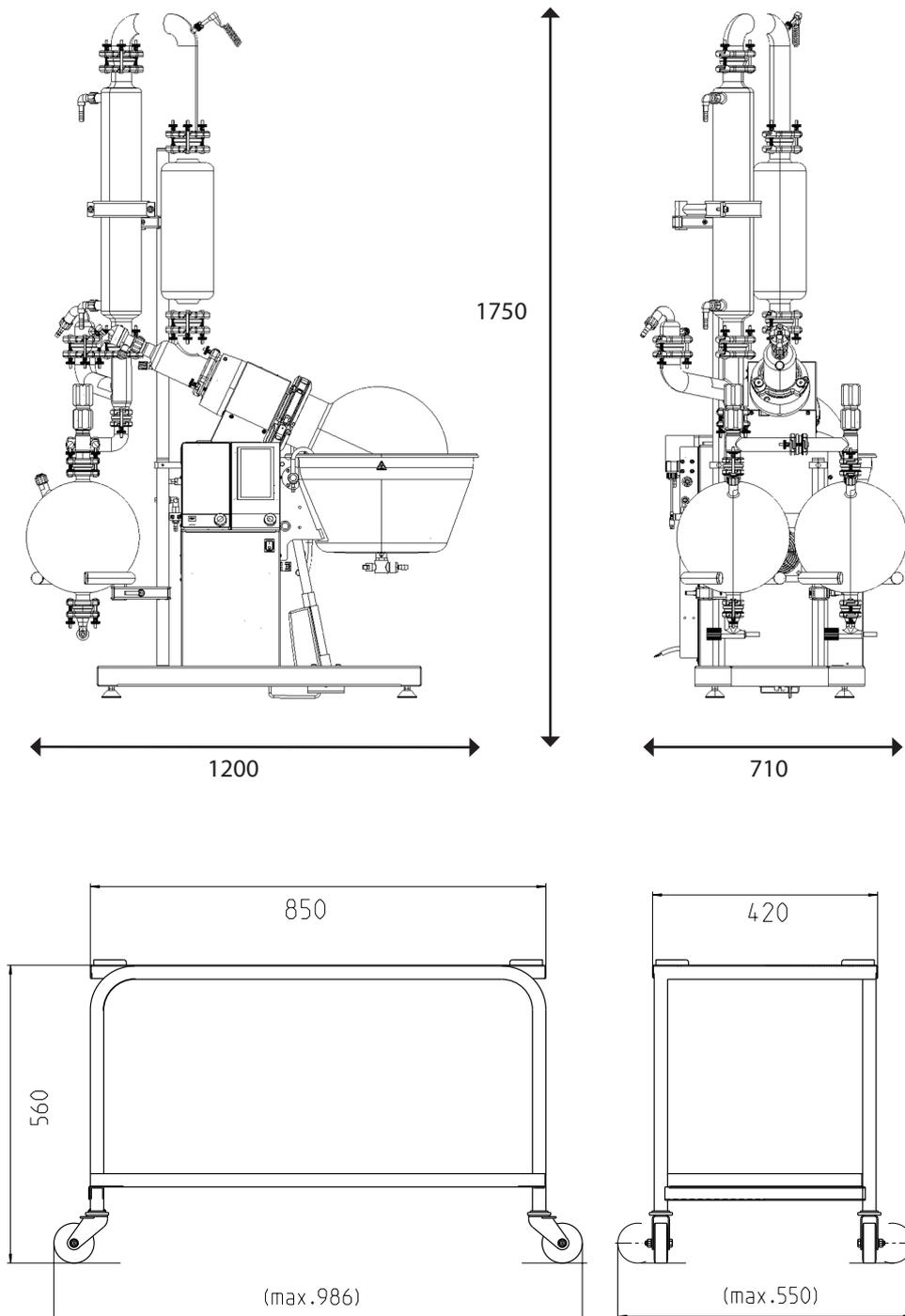
Modifications

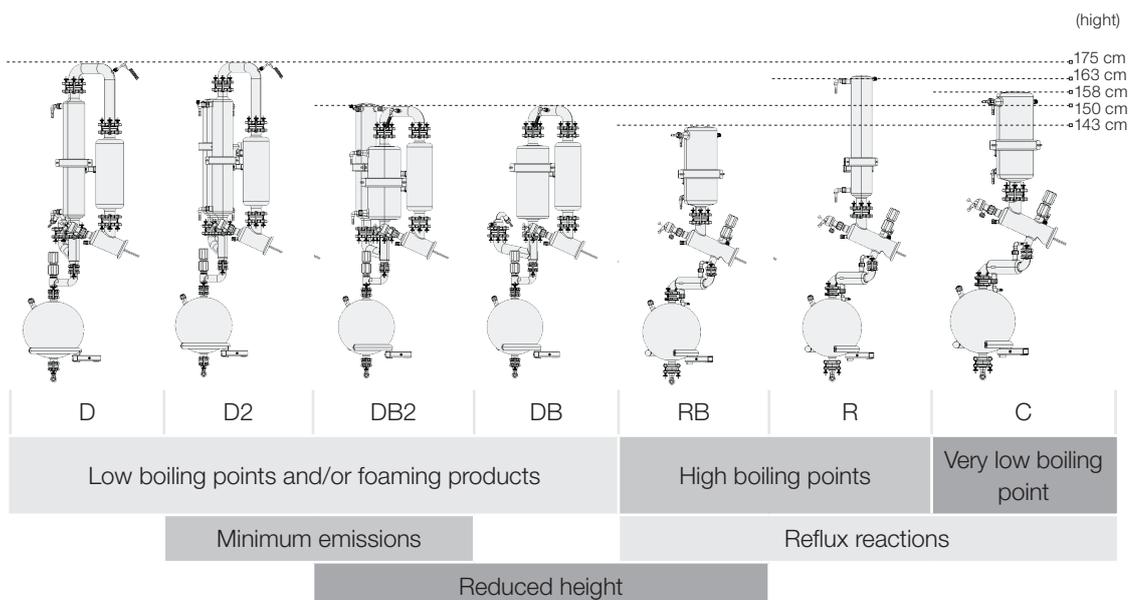
Modifications to the instrument are only permitted after prior consultation with and with the written approval of the manufacturer. Modifications and upgrades shall only be carried out by an authorized BUCHI technical engineer. The manufacturer will decline any claim resulting from unauthorized modifications.

3 Technical data

This chapter introduces the reader to the instrument and its specifications. It contains an overview of available glassware configurations, technical data, requirements and performance data.

3.1 Available system configurations and dimensions





3.1.1 Typical example applications and accessories

Application	Glassware setup	Recommended accessories
Purification of ethanol	D	
Concentration of foam producing materials	D	Foam sensor
Gentle processing of heat sensitive materials	D2 at low temperatures or C	CW probe
Concentration of large volumes	All	Inlet valve
Recrystallization	R	
Drying	R	Vapor duct with frit

NOTE

For large scale continuous evaporation BUCHI offers the R-220 Pro in continuous version with a highly automated refill and product receiving process.

3.2 Technical data

	R-220 Pro	R-220 Pro Essential	R-220 Pro Continuous	R-220 Pro High Performance
Dimensions (W x D x H)	1200 x 710 x 1750 mm	1100 x 560 x 1700 mm	1200 x 600 x 1750 mm	1200 x 710 x 1800 mm
Weight	100 kg	85 kg	100 kg	110 kg
Connection voltage	200 VAC (1Ph, N, G) ± 10 % 220 - 240 VAC (1Ph, N, G) ± 10 % 400 VAC (3Ph, N, G) ± 10 %	200 VAC (1Ph, N, G) ± 10 % 220 - 240 VAC (1Ph, N, G) ± 10 % 400 VAC (3Ph, N, G) ± 10 %	200 VAC (1Ph, N, G) ± 10 % 220 - 240 VAC (1Ph, N, G) ± 10 % 400 VAC (3Ph, N, G) ± 10 %	- - 400 VAC (3Ph, N, G) ± 10 %
Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
Power consumption (3600 W heater)	5000 W	5000 W	5000 W	-
Power consumption (4200 W heater)	5500 W	-	5500 W	-
Power consumption (6300 W heater)	-	-	-	7500 W
Pollution degree	2	2	2	2
Overvoltage category	II	II	II	II
Approval (200 VAC Connection Voltage)	CE	CE	CE	CE
Approval (220 -240 VAC Connection Voltage)	CE UL / CSA	CE UL / CSA	CE -	CE -
Approval (400 VAC Connection Voltage)	CE UL / CSA	CE UL / CSA	CE -	CE -
Rotation Motor	1-phase 0.6 A at 50 Hz 10 Nm	1-phase 0.6 A at 50 Hz 10 Nm	1-phase 0.6 A at 50 Hz 10 Nm	1-phase 0.6 A at 50 Hz 10 Nm
Rotation controlling	Electronically	Electronically	Electronically	Electronically
Rotation speed	5 – 150 rpm	5 – 150 rpm	5 – 150 rpm	5 – 150 rpm
Rotation Accuracy	± 1 rpm at 5 rpm to ± 5 rpm at 150 rpm	± 1 rpm at 5 rpm to ± 5 rpm at 150 rpm	± 1 rpm at 5 rpm to ± 5 rpm at 150 rpm	± 1 rpm at 5 rpm to ± 5 rpm at 150 rpm
Cooling consumption (adjustable via integrated needle valve)	120 – 200 L/h	120 – 200 L/h	120 – 200 L/h	120 – 200 L/h
Cooling restriction abs. without pulsation	max. 2.7 bar	max. 2.7 bar	max. 2.7 bar	max. 2.7 bar
Heating bath medium (3600 W heater)	Water or oil	Water or oil	Water or oil	-

	R-220 Pro	R-220 Pro Essential	R-220 Pro Continuous	R-220 Pro High Performance
Heating bath medium (4200 W heater)	Water	-	Water	-
Heating bath medium (6300 W heater)	-	-	-	Water
Heating capacity (3600 W heater)	Ambient to 180 °C	Ambient to 180 °C	Ambient to 180 °C	-
Heating capacity (4200 W heater)	Ambient to 100 °C	-	Ambient to 100 °C	-
Heating capacity (6300 W heater)	-	-	-	Ambient to 100 °C
Heating bath accuracy	± 2 °C	± 2 °C	± 2 °C	± 2 °C

Ambient conditions

For indoor use only.

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

Safety

Safety coated glassware	Yes, except the evaporating flask
Over temperature protection of the bath	<ul style="list-style-type: none"> · Separate monitoring circuit with manual reset · Error if temperature is 15 °C above set value
Rotation	<ul style="list-style-type: none"> · Soft start · Stop in case of blocked rotation
At any Error	<ul style="list-style-type: none"> · Bath lowering, heater off, rotation off · Type of error showed on display · Reset with main switch

Display	
Bath temperature	1 °C steps
Cooling temperature (option)	1 °C steps
Vapor temperature	1 °C steps
Set rotation speed	1 rpm steps
Set bath temperature	1 °C steps
Actual vacuum	1 mbar steps
Set vacuum	1 mbar steps
Materials	
Housing	Stainless steel 1.4301 (AISI 304)
Gear head	Aluminum cast (3.2373)
Paint	Powder coated with Epoxy (EPX)
Bath pan	Stainless steel 1.4404 (AISI 316 L)
Heating element	Stainless steel 1.4404 (AISI 316 L)
Glass	Borosilicate 3.3
In contact with product	FDA compliant materials
Leakage of the complete system	<1 mbar/min
Sensors	
Vapor temperature	PT-1000, 2 wire
Bath temperature	PT-1000, 2 wire
Speed sensor	Hall-sensor
Vacuum	Ceramic, capacitive

4 Description of function

This chapter explains the basic working principle of the Rotavapor® R-220 Pro. It also shows how the instrument is structured and provides a general functional description of its assemblies.

4.1 Functional principle of a Rotavapor® evaporation

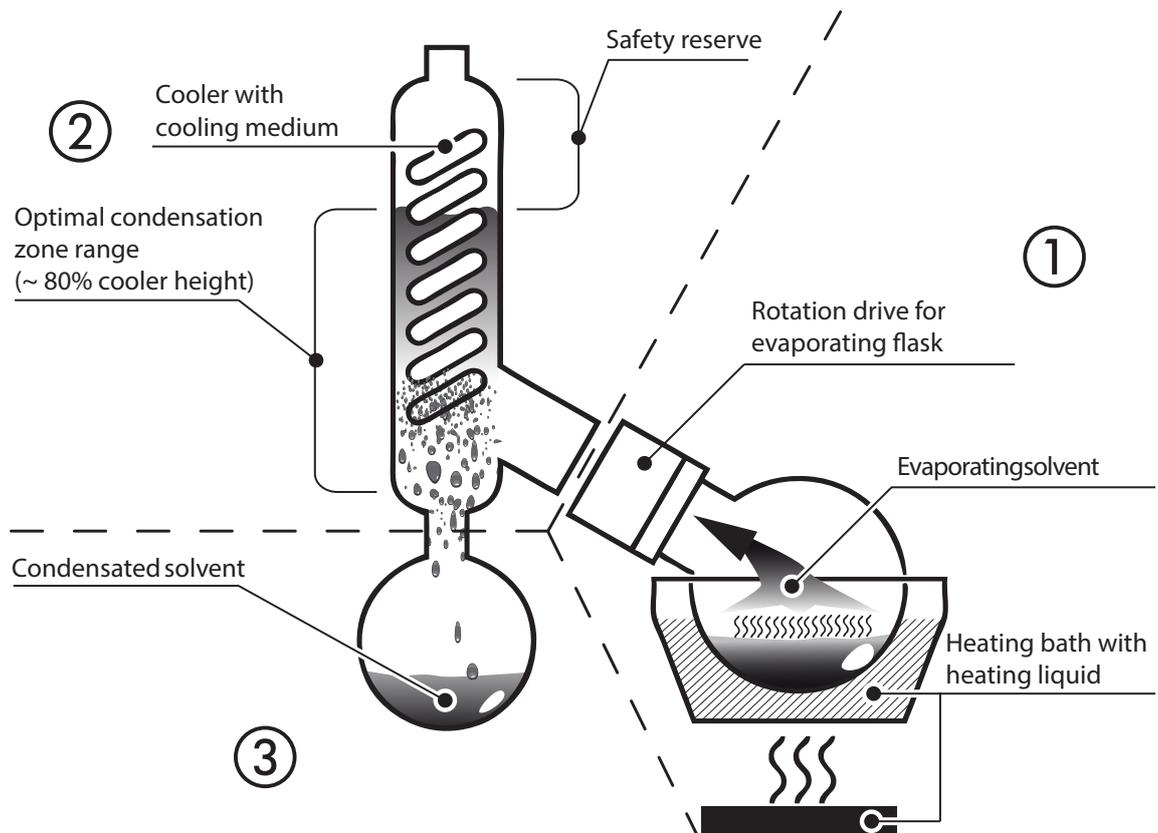
The Rotavapor® R-220 Pro offers efficient, time saving single-stage distillations for small and medium stage productional applications. The process is based on the evaporation and condensation of solvents or drying of powders and pasty materials in a rotating evaporating flask .

Standard vacuum applications

Due to its sophisticated seal system a highly stable vacuum level can be reached in combination with a vacuum controller and a vacuum pump. The vacuum also eliminates unwanted or hazardous emissions of vapors during the process and serves as an important safety feature. The low pressure decreases the boiling point of the medium inside the Rotavapor®. This allows to treat the product gently at even higher evaporation performance compared to environmental pressure operation.

Special applications

- In combination with the dry ice condenser (configuration 'C') distillations at lowest temperatures can be achieved
- For the oxydation of sensitive products, the processing can take place under inert gas conditions



① Evaporation area

The solvent is heated by means of a heating bath. The turbulent mixing inside the rotating evaporating flask results in an increased evaporation rate.

The drive unit offers a wide range of rotational speeds to perfectly match different evaporation tasks. It also leads to an even mixing of the sample, thus preventing stationary overheating in the flask. When drying powders or pasty materials, the rotation ensures smooth and thorough drying.

② Cooling area

The solvent vapor quickly enters the condenser. Here, the energy in the solvent vapor is transferred to the cooling medium (mostly water), so that the solvent condenses.

③ Receiving flask

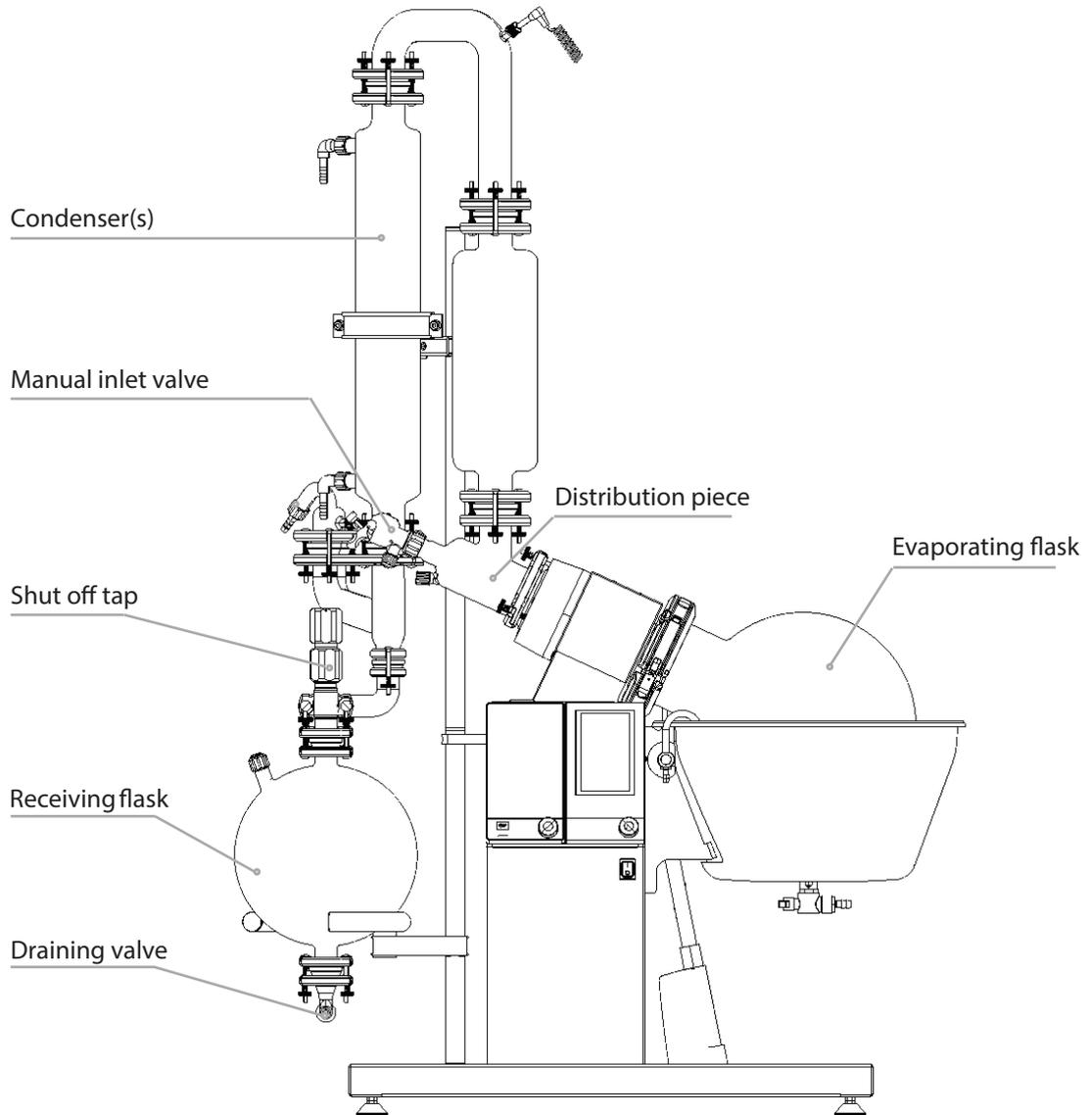
The receiving flask collects the condensed solvent.

NOTE

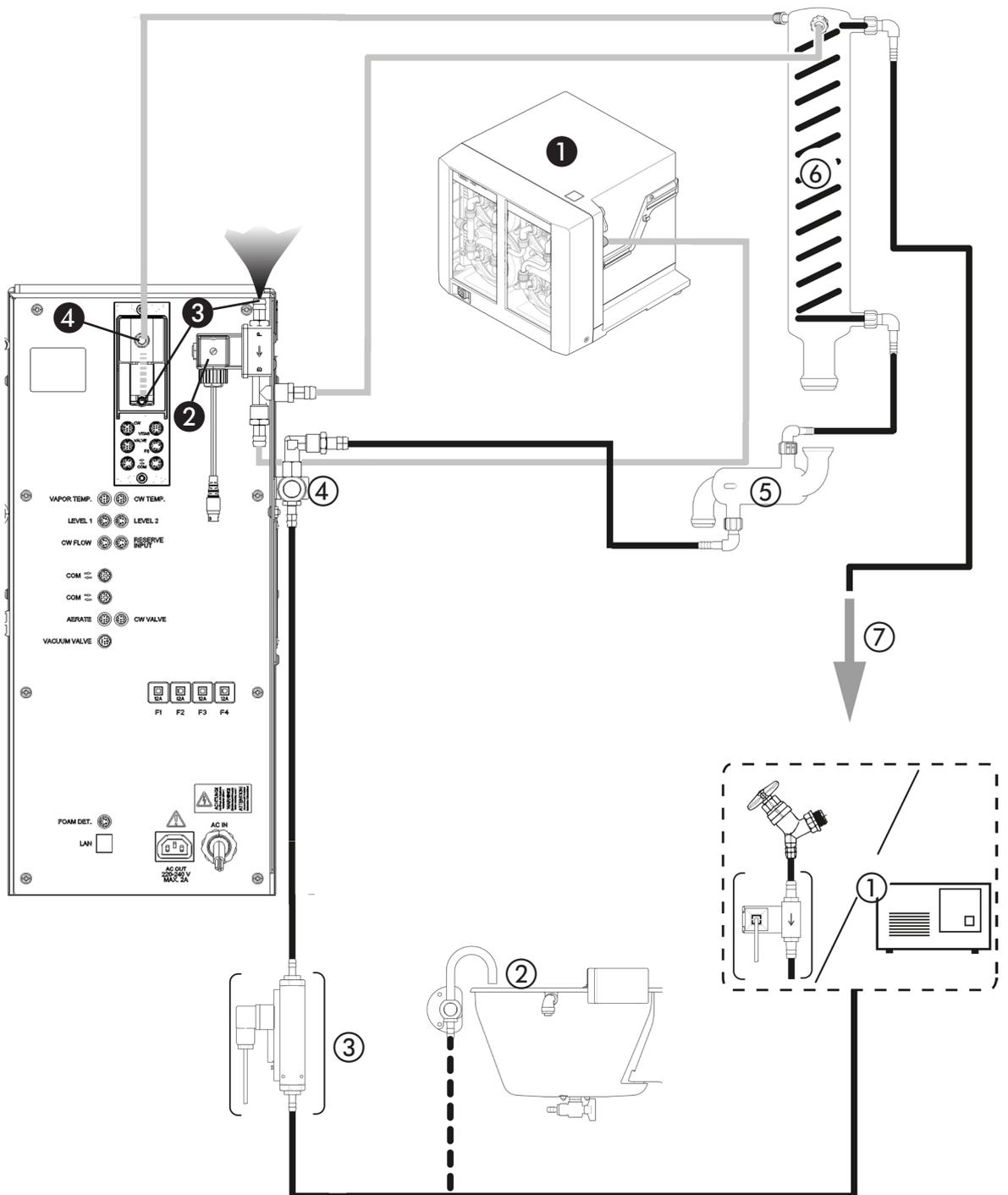
For information about optimum distillation conditions see section 6, Operation.

4.2 Rotavapor® front-side

Various glassware configurations are available for the Rotavapor® R-220 Pro.



4.3 Tubing scheme



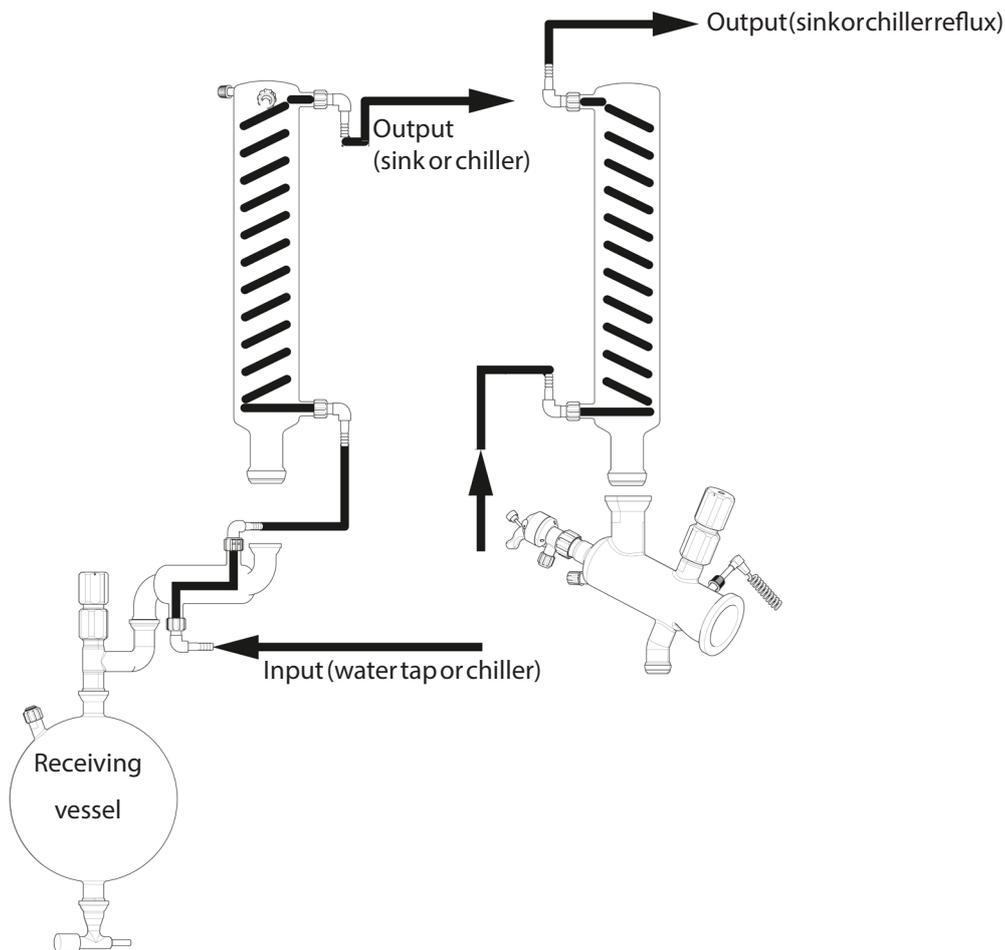
Vacuum / gas circuit		
①	Vacuum pump (recommended type: Vacuum Pump V-600)	For most applications a vacuum is used to significantly reduce the boiling point of the liquid content inside the evaporating flask.
② + ③	Aeration / inert gas inlet at the Vacubox	<p>The aeration valves at the optional vacuum controller and the aeration valve of the Rotavapor® are used to aerate the Rotavapor®.</p> <p>Under inert conditions, both aeration inlets must be connected to an inert gas source with regulated output pressure equal to ambient air pressure!</p>
④	Vacuum sensor tube at vacuum controller	If a Vacuum Interface I-300 Pro is installed, a tube connection must be established to detect the vacuum level inside the glassware.
Cooling medium circuit		
①	Chiller or cooling water tap (optional with cooling water valve)	<p>When a chiller is used, up to 300 liters of mains water can be saved a day during operation. In addition, higher process safety and lower solvent emissions due to the constant, low cooling temperature can be achieved.</p> <p>The cooling water valve can also significantly reduce cooling water consumption by cutting off the water supply when no cooling is necessary.</p>
②	Replenishment water tap	For safety reasons the replenishment water tap must not be connected when a heating medium different to water is used!
③	Water flow sensor	Detects cooling water flow when installed.
④	Flow reducing valve	The valve can be used to reduce the cooling water flow to achieve the best cooling to water consumption ratio.
⑤	Condensate cooler	This cooler inhibits evaporation from the receiving flask. It is part of some glassware configurations.
⑥	Cooler(s)	Depending on the type of glassware configuration, one or more coolers can be connected in serial.
⑦	Cooling water output to sink / return loop to chiller	The warmed cooling water can be disposed of into a sink or reused in a closed cooling cycle when a chiller is used.

4.3.1 Cooling water routing

General memory aid for cooling water routing

Independent of the number of coolers, the water inlet has to be connected in ascending order starting with the cooler closest to the receiving vessel. The water output is always the upper connector!

Example:



The drawing shows the cooling water routing for a setup of three coolers. Other arrangements with single or double cooler setup can be connected accordingly.

	 DANGER
	<p>Death or serious burns by deflagration of hot heating bath liquids.</p> <ul style="list-style-type: none"> • Secure all cooling water hoses against slip off with hose clamps

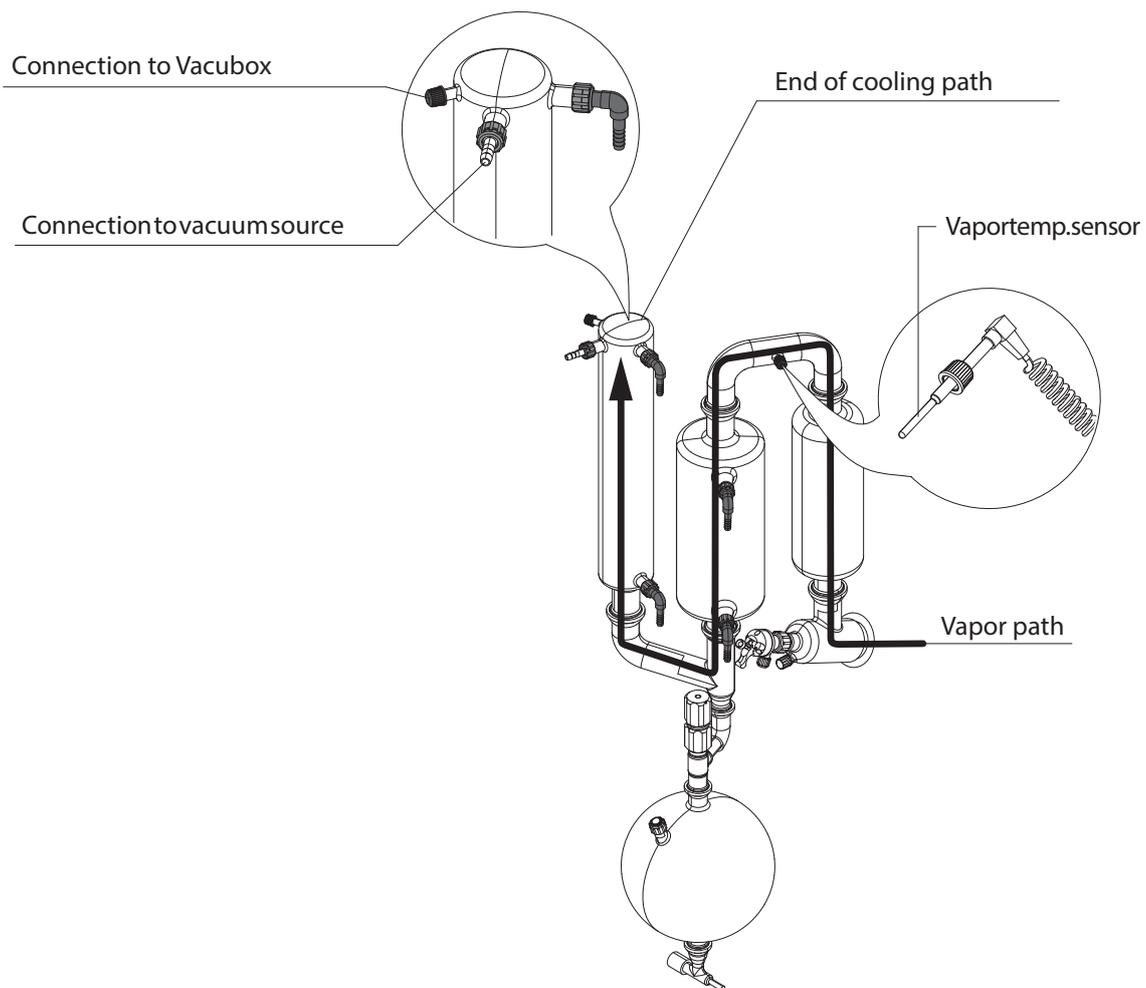
NOTE

The vapor temperature sensor always has to be installed before the vapor inlet of the first condenser.

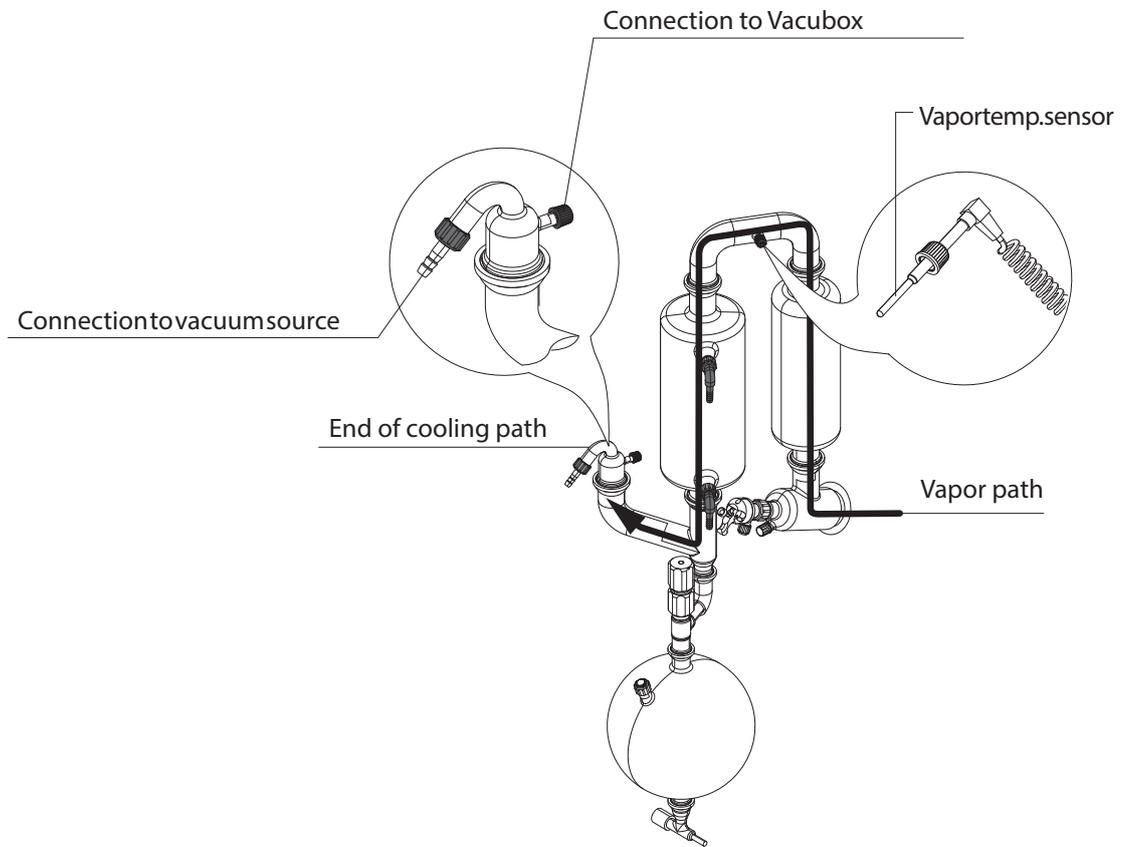
4.3.2 Vacuum routing

General memory aid for vacuum routing

Independent of the installed glassware setup the vacuum pump has to be connected at the end of the cooling path. Depending on the used setup this can either be subsequently at or after the last condenser.

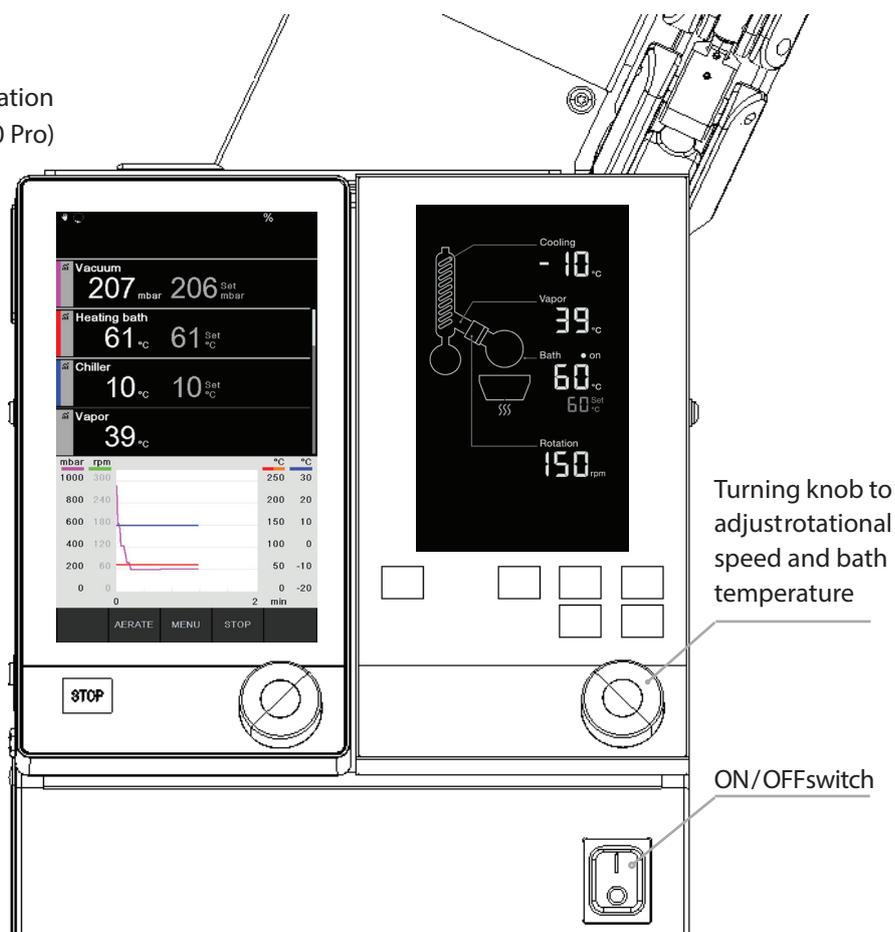
Example 1:

Example 2:



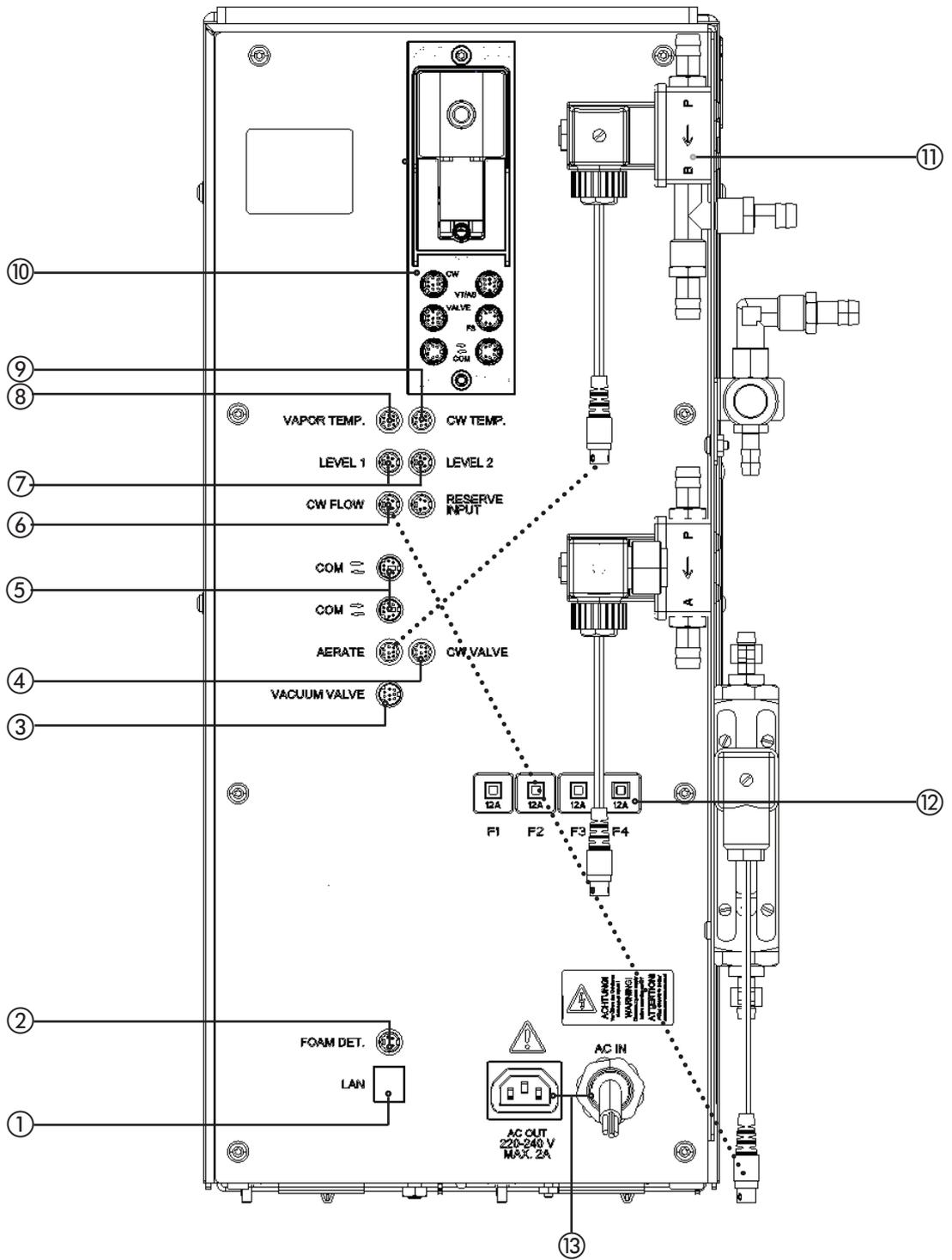
4.4 User interface front-side

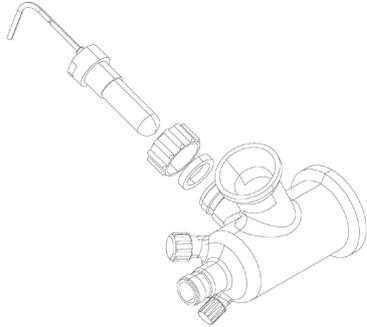
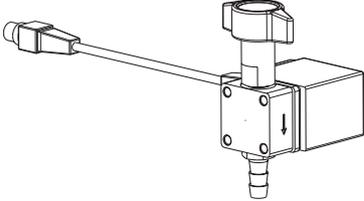
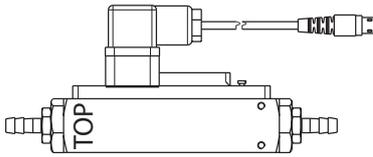
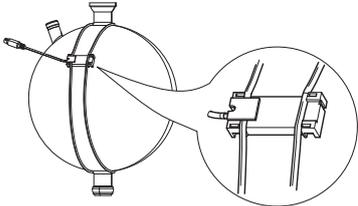
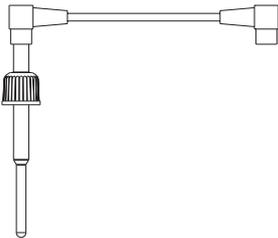
Interface I-300 Pro
(see separate Operation
Manual of the I-300 Pro)

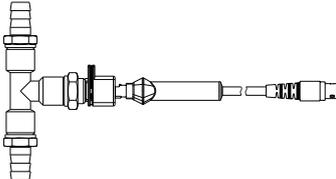
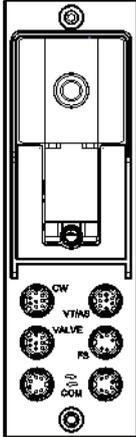
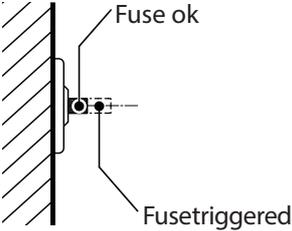
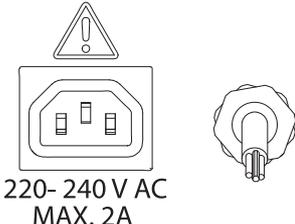


Button	Functionality
	Set the bath temperature, change value with the turning knob
	<u>Heater:</u> Switches the heating bath ON/OFF <u>Rotation:</u> Switches the rotation drive ON/OFF
	Opens the aeration valve at the Rotavapor® rear-side
	Functionality changes on the basis of the corresponding button description on the display
	Functionality changes on the basis of the corresponding button description on the display

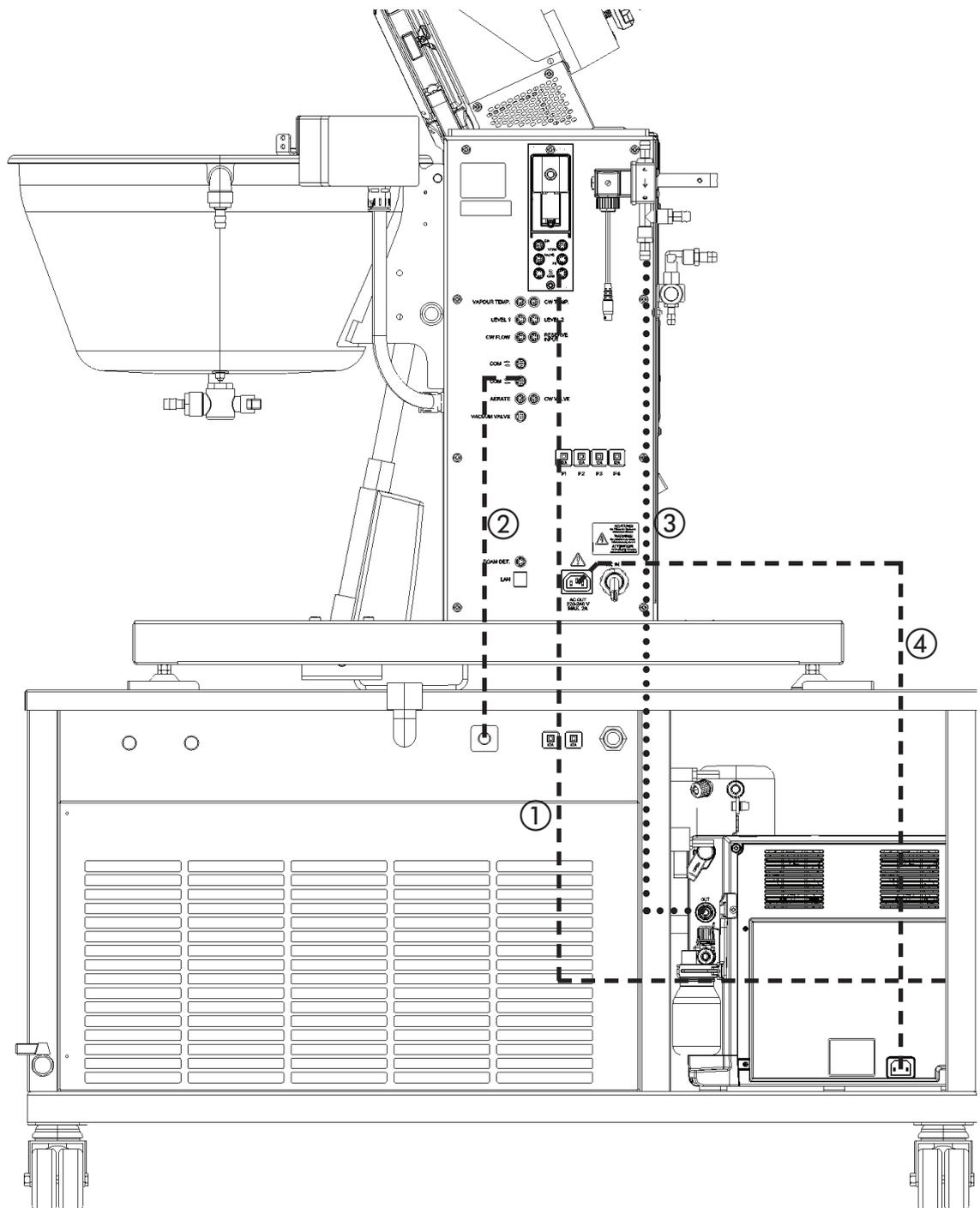
4.5 Connection field at the rear-side



Position	Drawing	Description
①		LAN Interface RJ-45
②		The optional foam detector is located before the expansion vessel. In case of foam detection its signal opens the aeration valve for an instant. This aeration pulse causes the foam to collapse. For installation a special distribution piece is needed!
③	See master drawing for appearance and mounting position	The optional vacuum valve must be installed in case a 3rd party vacuum pump is used. It is a safety device to control the vacuum level.
④		The optional cooling water valve interrupts the water flow in order to effectively reduce the water consumption. It must be installed in serial after the cooling water source.
⑤	See Operation Manual of the connected device(s)!	BUCHICOM bus sockets with power over bus connector. Suitable BUCHI devices: Vacuum pump, vacuum controller, chiller
⑥		Cooling water flow sensor (optional).
⑦		Up to two optional level sensors can be connected - one per receiving flask. Once the liquid level inside the receiving flask reaches the sensor, the alarm output will be triggered.
⑧		Vapor temperature sensor, measures the entry temperature of the vapor before the condenser.

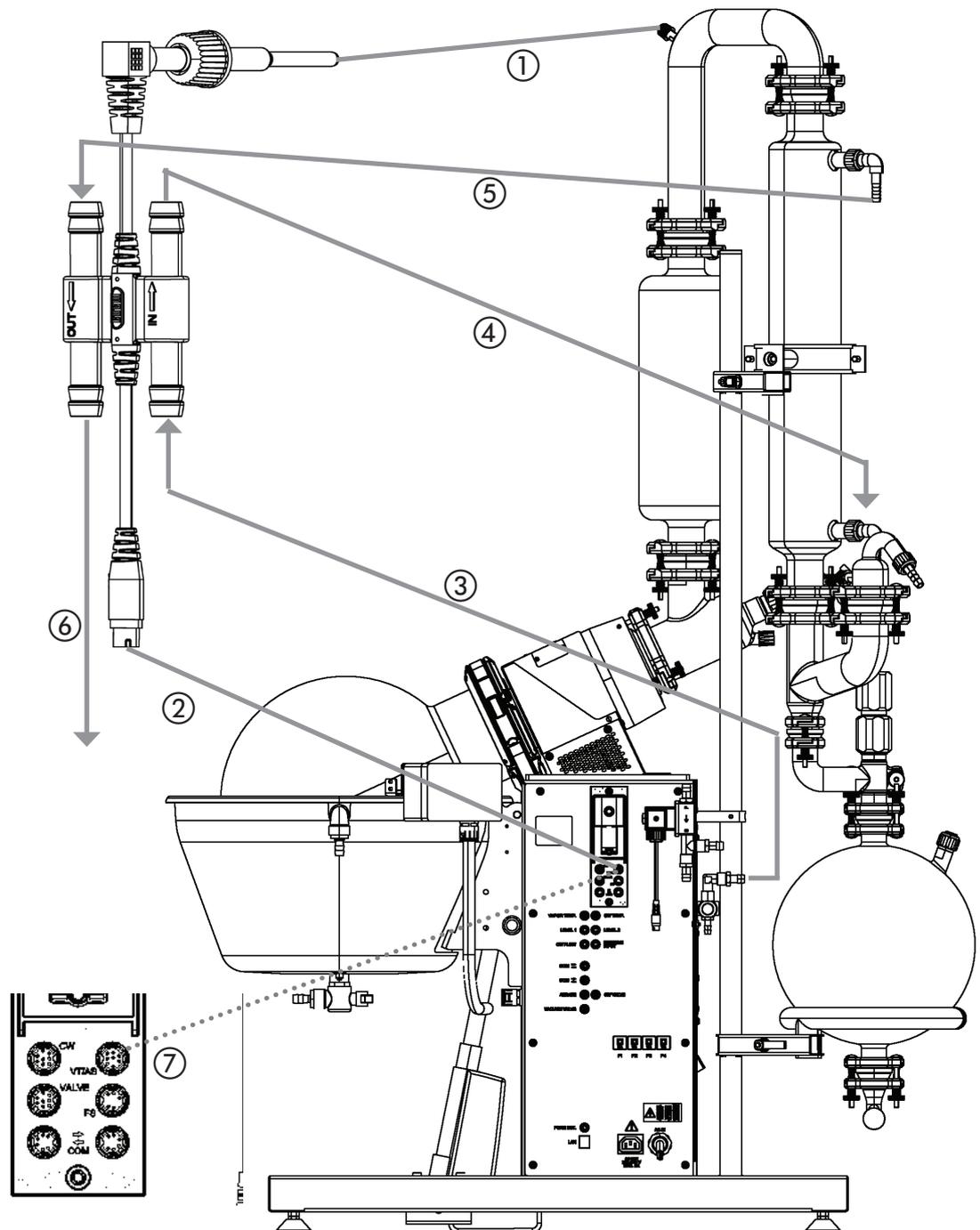
Position	Drawing	Description
⑨		<p>Cooling water temperature sensor. Must be looped-in between cooling water source outlet and cooler/cooler assembly of the Rotavapor®.</p>
⑩		<p>Vacubox. For a detailed description see I-300 Pro operation manual.</p>
⑪	<p>See master drawing for appearance and mounting position.</p>	<p>Aerate valve (parallel to controller aeration valve)</p>
⑫		<p>Resettable fuses. Gently push them back into prestressed position when fuses are activated.</p>
⑬	 <p>220- 240 V AC MAX. 2A</p>	<p>Mains input cable to supply the Rotavapor®. Output socket to supply vacuum pump. Mind the voltage and maximal output current, when installing a vacuum pump! The combination of Rotavapor® and vacuum pump must not violate the local electrical safety regulations. Contact an electrician before connecting any device.</p>

4.6 Connection of the Rotavapor® R-220 Pro to the Recirculating Chiller F-325 and the Vacuum Pump V-600



- ① Communication link between Rotavapor® R-220 Pro and Recirculating Chiller F-325.
- ② Communication link between Rotavapor® R-220 Pro and Vacuum Pump V-600.
- ③ Vacuum tubing between Rotavapor® R-220 Pro and Vacuum Pump V-600.
- ④ Jumper cord, power supply of the Vacuum Pump V-600 via Rotavapor® R-220 Pro.

4.7 Placement of the automatic sensor



- ① Location of the temperature sensor
- ② Connection of the automatic sensor to the VacuBox (connection port: VT/AS).
- ③ Cooling water inlet into the automatic sensor (connection port: IN).
- ④ Cooling water flow from the automatic sensor to the condenser
- ⑤ Cooling water flow from the condenser to the automatic sensor (connection port: OUT)
- ⑥ Cooling water outlet at the sensor
- ⑦ Close up of the connection port VT/AS

5 Putting into operation

This chapter describes how the instrument has to be installed. It also gives instructions for the initial startup.

NOTE

Inspect the instrument for damages during unpacking. If necessary, prepare a status report immediately to inform the postal company, railway company or transportation company. Keep the original packaging for future transportation.

5.1 Installation site

Put the instrument on a stable, horizontal surface. Consider the maximum product dimensions and weight. Obtain the environmental conditions as described in section 3.2, technical data. Installation on the dedicated mobile trolley (order no. 041257) or the BUCHI Recirculating Chiller F-325 is also possible.

Installation prerequisites:

- Do not place any objects on top or below the instrument or parts of it.
- The instrument must be installed with 10–15 cm clearance to any other objects or walls to allow sufficient cooling.
- Do not store containers, chemicals or other items behind the instrument.
- When working with hazardous solvents or media, install the instrument inside a fume hood.
- When using the Recirculating Chiller F-325, place the Rotavapor® R-220 Pro within the markings on top of the device.

	<p>! WARNING</p> <p>Death or serious injuries by use in explosive environments.</p> <ul style="list-style-type: none"> • Do not operate the instrument in explosive environments • Do not operate the instrument with explosive gas mixtures • Before operation, check all gas connections for correct installation • Directly withdraw released gases and gaseous substances by sufficient ventilation
	<p>! CAUTION</p> <p>Risk of minor or moderate injury by heavy weight of the instrument.</p> <ul style="list-style-type: none"> • Consult a second person to transport the instrument • Do not drop the instrument • Place the instrument on a stable, even and vibration-free surface • Keep limbs out of crushing zone

	NOTICE
	<p>Risk of instrument damage by liquids or mechanical shocks.</p> <ul style="list-style-type: none"> • Do not spill liquids over the instrument or its components • Do not move the instrument when it is loaded with sample liquid • Do not drop the instrument or its components • Keep external vibrations away from the instrument • Safely attach the instrument to the bench in earthquake prone regions • Do not operate the instrument without the protection cover installed at the front

NOTE

Secure the instrument against tilting and unintentional moving in earthquake prone regions.

5.2 Electrical connections

The Rotavapor® is aimed to be installed stationary and is not equipped with a power plug. The electrical installation must be performed by an electrician or equivalent specialist in any case. After the installation procedure an electrical safety test must be performed to verify a safe system condition such as sufficient grounding.

- In case the instrument is installed stationary (without power plug) an emergency power-off device must be installed in the vicinity of the Rotavapor® with free access granted.

Demands on the mains circuit

The mains circuit must

- provide the voltage that is given on the type plate of the instrument.
- be able to handle the load of the connected instruments.
- be equipped with adequate fusage and electrical safety measures, in particular proper grounding.

For details about the installation requirements, see "Installation Instruction R-220 Pro" document.

See also technical data (section 3.2) of all components regarding the different minimum system requirements!

NOTE

- Additional electrical safety measures such as residual current breakers may be necessary to meet local laws and regulations!
- External power switches (e.g. emergency stop switches) must meet IEC 60947-1 and IEC 60947-3 requirements. Such devices must be clearly labeled and accessible at any time.
- External connections and extension lines must be provided with a grounded conductor lead (3-pole couplings, cord or plug equipment). All used power cords must meet the input power requirements.

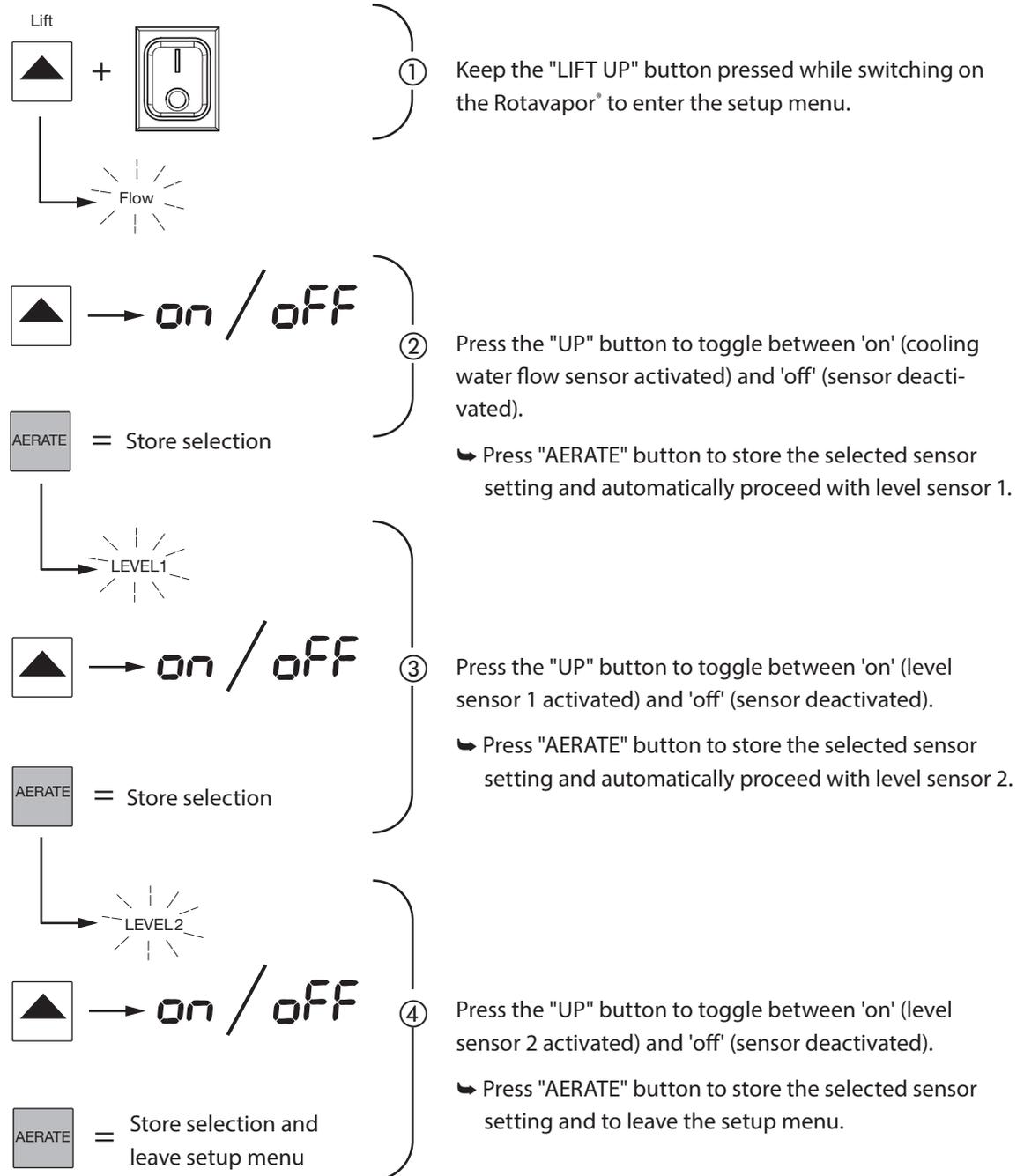
	WARNING
	<p>Death or serious burns by electric current at installation.</p> <ul style="list-style-type: none"> • The instrument must be installed by an electrician or equivalent specialist • After installation, the instrument must be tested for electrical safety

	NOTICE
 	<p>Risk of instrument damage by wrong mains supply.</p> <ul style="list-style-type: none">• External mains supply must meet the voltage given on the type plate• Check for sufficient grounding

5.3 Sensor setup and adjustments

Sensor setup menu

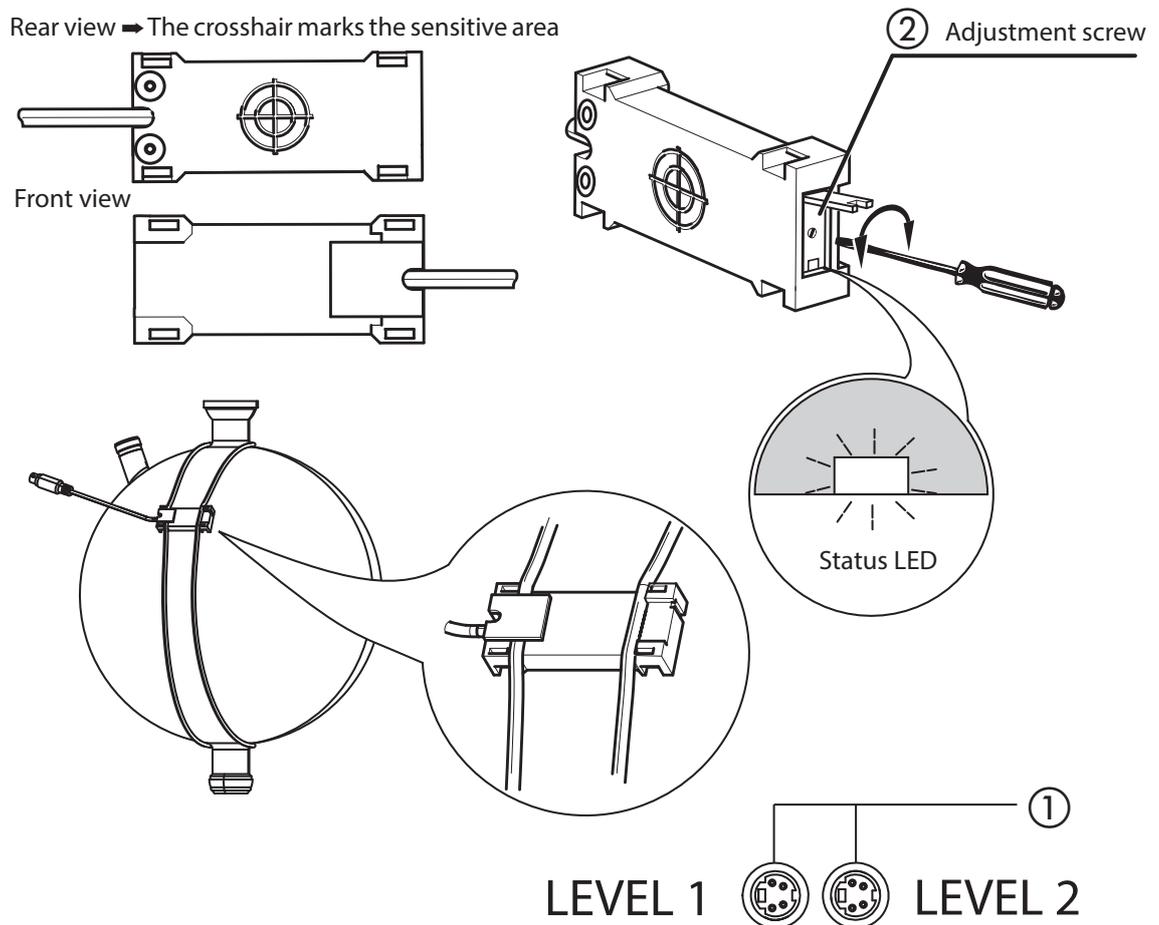
These instructions are valid for the setup menu of the cooling water sensor and level sensors connected at the rear connection field.



5.3.1 Level sensors

Description of function:

The capacitive level sensors are recommended for setups with two receiving flasks to achieve uninterrupted evaporation over a longer period and for larger product volumes. The sensitivity of the capacitive level sensors must be adjusted to safely detect the liquid level between different products.

Installation instructions:

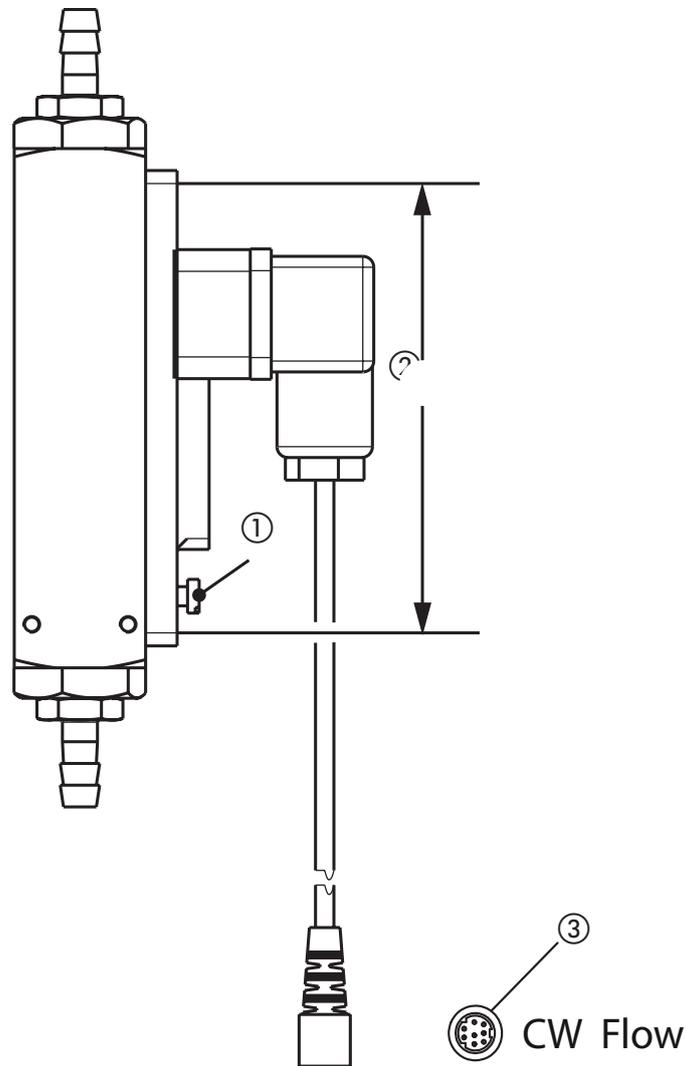
- Mount the sensor at the vessel and connect it at the rear-side connection panel ①.
- Fill in some solvent.
- Shift the sensor until it is located below the liquid level.
 - ↳ The red LED at the sensor should now be off.
- If the sensor does not safely detect the liquid:
 - ↳ Use a small screwdriver to set the sensitivity (with the small adjustment screw) ② of the sensor.

NOTE

- The sensor detects a liquid when the red LED is off. The message "Level 1" or "Level 2" is displayed on the Rotavapor® display, depending on the tested sensor loop.

5.3.2 Cooling water flow sensor

The switching threshold of the flow sensor can be adjusted by shifting the sensor element up and down.



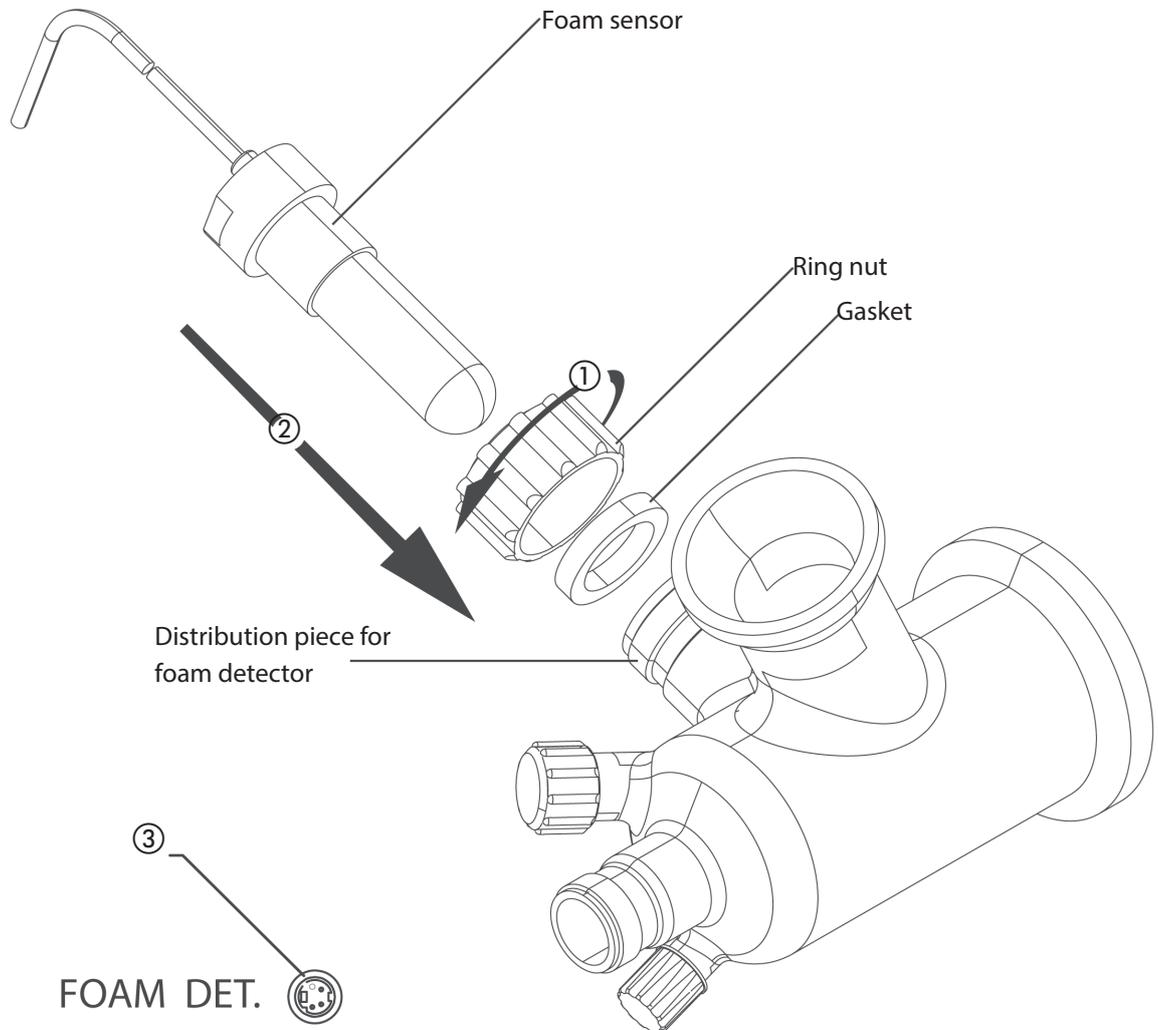
Adjustment instructions

- Make sure the flow sensor is installed in an upright position! Loosen the locking screw ①.
 - Switch on the Rotavapor® and shift the sensor far downwards. The display must not show a flow sensor error in this position.
 - Subsequently shift the sensor upwards until it generates a flow sensor error on the display (E12, "FLOW"). To avoid unintentional switching, lift the sensor 2-3 more millimeters and tighten the locking screw to fix the sensor position.
- ➔ Turn on the cooling water. The error should now disappear.

5.3.3 Foam sensor

Description of function:

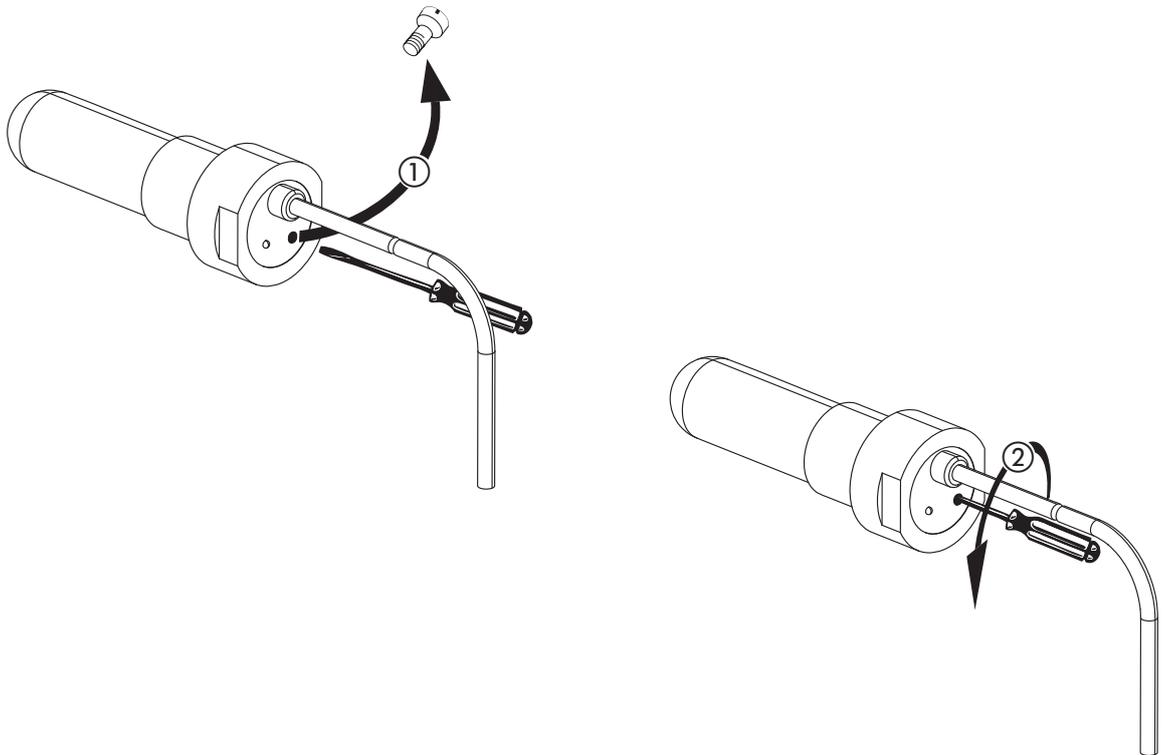
A foam sensor is highly recommended whenever heavily foaming products are in use. When foam formation is detected by the sensor, the aeration valve of the Rotavapor® will be opened for an instant, causing the foam to collapse.

Installation instructions:

Put the gasket into the ring nut ① and pre-mount it at the distribution piece. Subsequently insert the foam sensor ② and fasten the ring nut to tighten the connection. Insert the sensor plug at the "FOAM DET." socket ③.

Adjustment instructions

- Make sure the foam sensor is installed correctly. Remove the white plastic screw ① to get access to the sensor adjustment screw.
- Allow sufficient foam formation.
- As soon as the foam touches the sensor housing, the LED at the sensor must switch active, causing the aeration valve to open for an instant. The valve makes a noticeable *click* sound!
 - ↳ If the sensor does not detect the foam use a small flat head screw driver to adjust the sensitivity of the sensor.
- ➔ Check, if the LED switches off as soon as the foam collapses. If not, slightly decrease the sensitivity and start a new adjustment cycle.



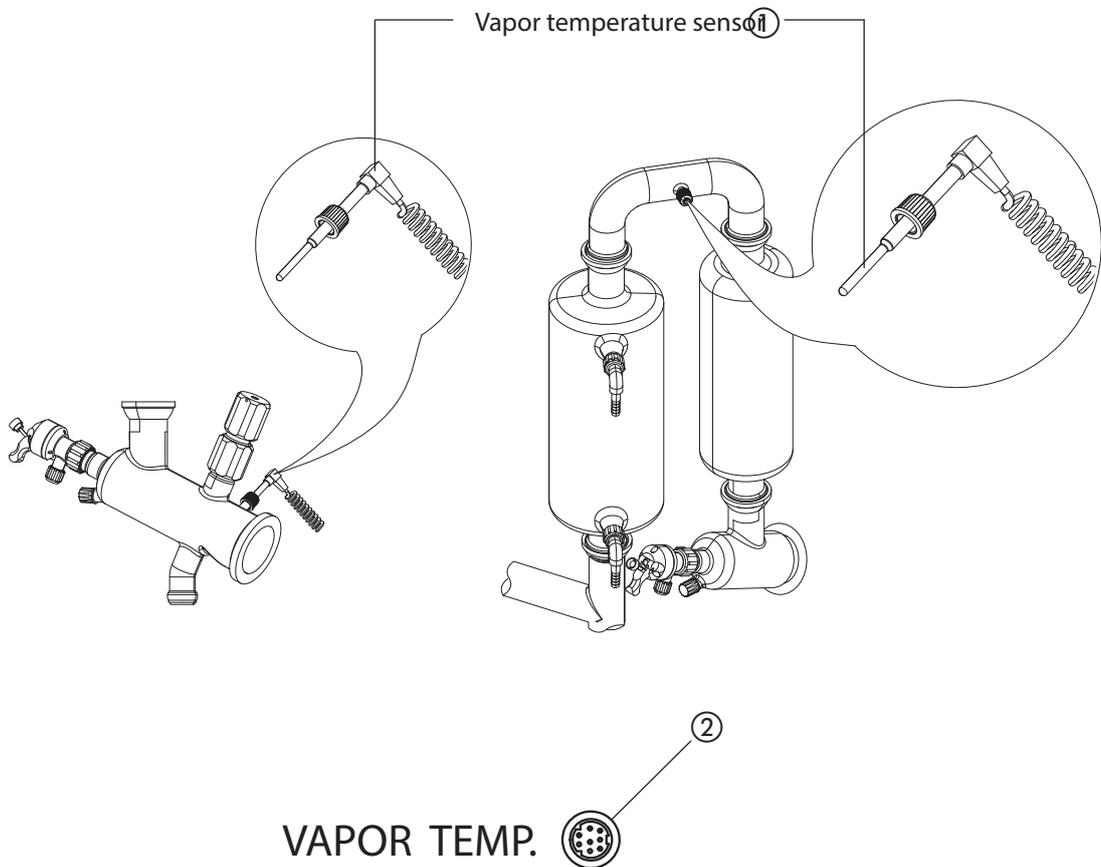
NOTE

The foam sensor can only be used at decending glassware setups!

5.3.4 Vapor temperature sensor

Description of function:

Enables the vapor temperature reading at the Rotavapor® display.

Installation instructions:

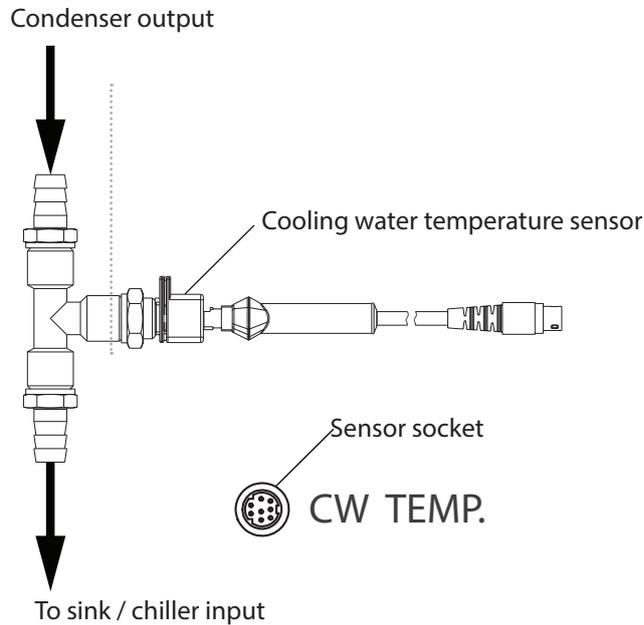
Turn the ring nut ① of the sensor to fasten and tighten the temperature sensor. Insert the sensor plug at the "VAPOR TEMP." socket ②.

Bath lights flash
alternately

5.3.5 Cooling water temperature sensor

Description of function:

Enables the cooling water temperature reading at the Rotavapor® display.

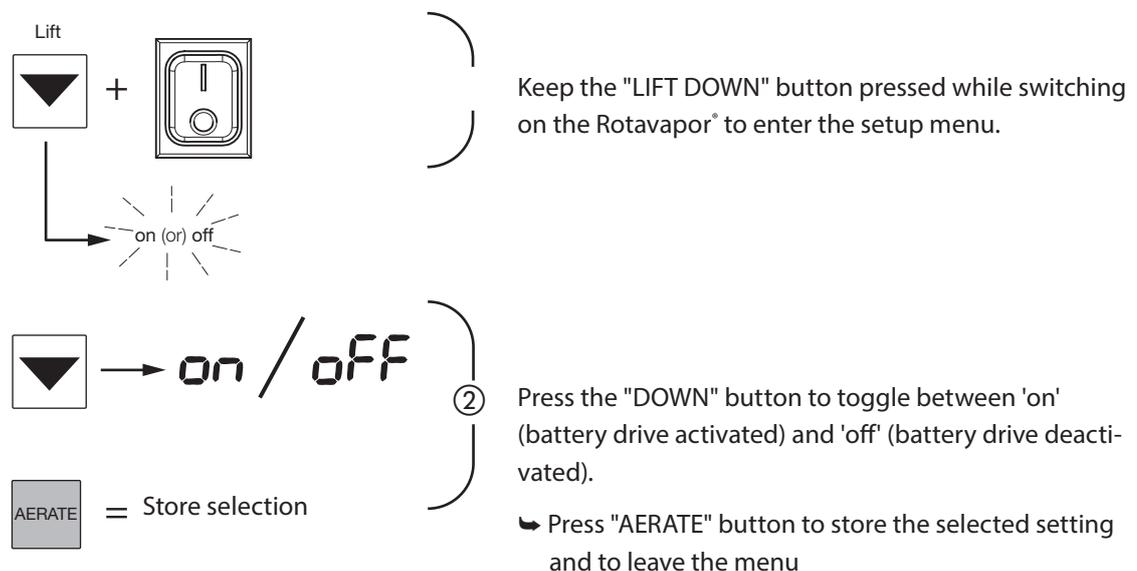


Installation instructions:

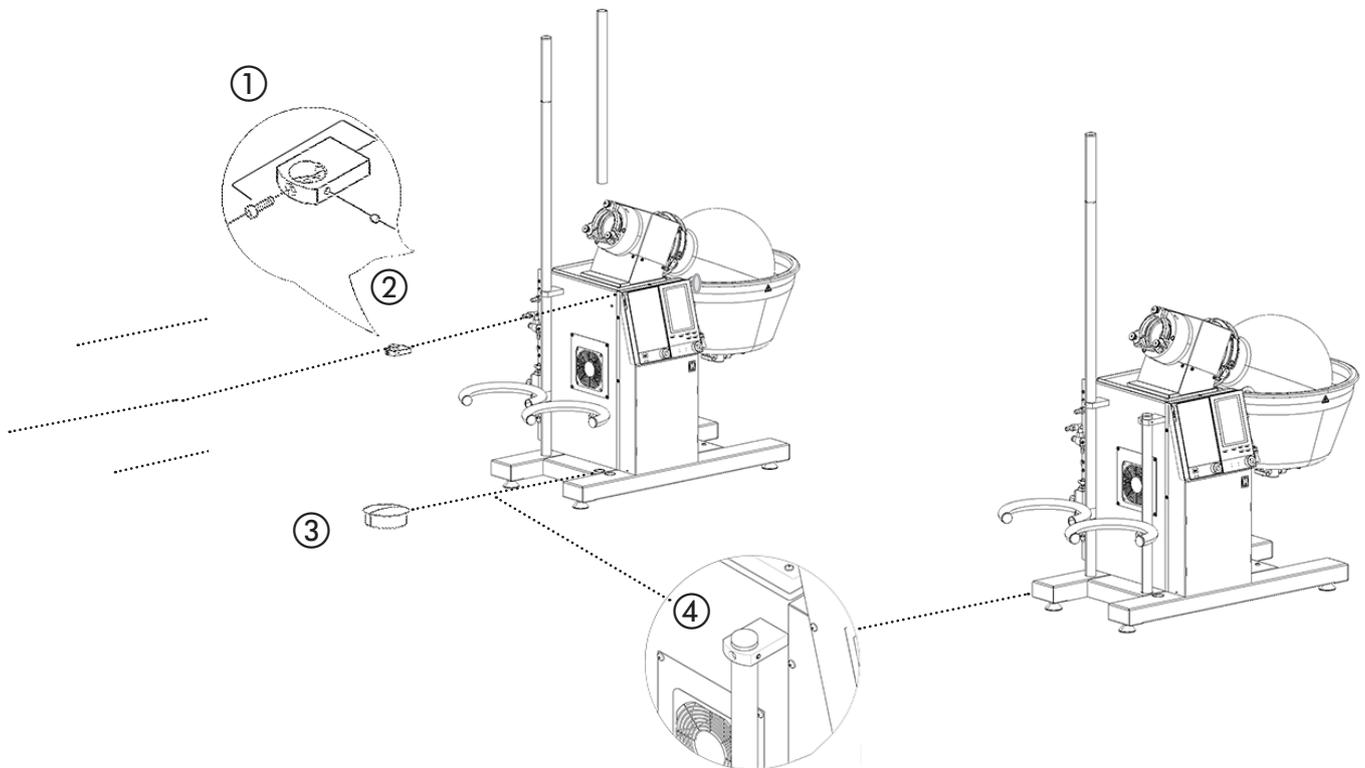
Use hose clamps to install the sensor at the hosing between condenser output and sink or chiller input. The sensor has no preferred flow direction.

5.4 Battery driven lift function at power failure

In case of a power failure, the internal battery of the Rotavapor® lowers the bath. This action interrupts the heat transfer towards the product and stops the evaporation.

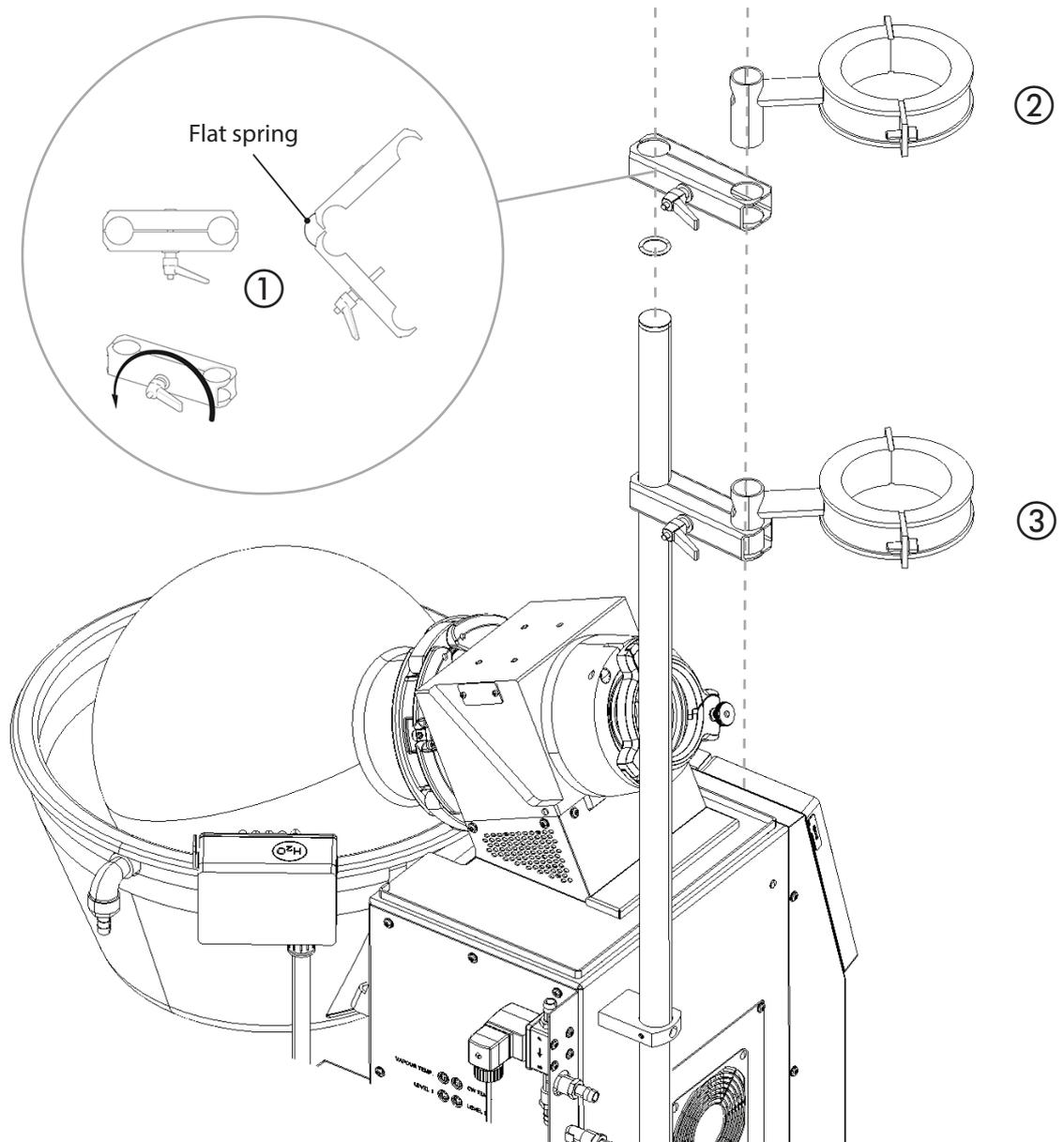


5.5 Setting up the support rod(s)



- ① Install the retaining bracket at the housing. Fasten the Torx screw with included tool.
- ② Premount the headless screw with a few turns at the side thread of the bracket.
- ③ Remove the blind plug from the blind hole at the foot of the Rotavapor®. Insert the short rod from above through the retaining bracket into the blind hole.
- ④ Tighten the headless screw at the retaining bracket to safely fixate the rod. Now, the receiving flask holder(s) can be installed.

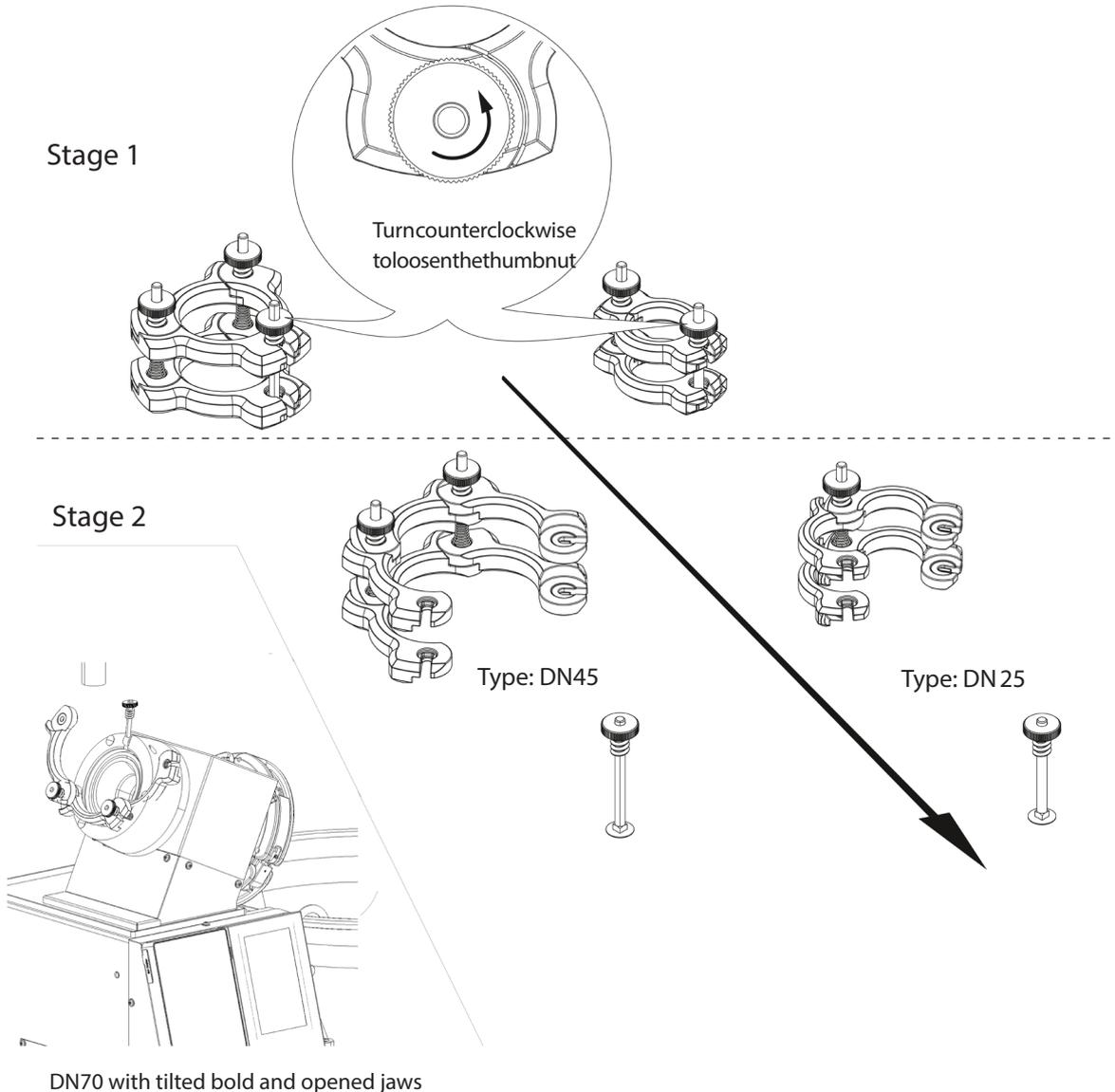
5.6 Condenser clamps



- ① Turn the lever counterclockwise to loosen / open the clamp. It is not necessary to completely open the clamp!
- ② Pull the support o-ring onto the rod. Shift the opened clamp with the flat spring side onto the rod until it touches the o-ring. The clamp weight is now supported by the o-ring.
- ③ Insert the condenser with the mounted holder (here illustrated without condenser!) into the free end of the clamp. Turn the fixation screw clockwise to fixate the condenser in its position.

5.7 EasyClamps

EasyClamps can be found at glassware connections. EasyClamps can be cleaned assembled or disassembled in an ultrasonic bath, e.g. with a soapy detergent if cleaning is necessary.



Stage 1

- In this stage an EasyClamp can be carefully adjusted with even clamping pressure for proper seal. Do not overtighten the thumb nuts!

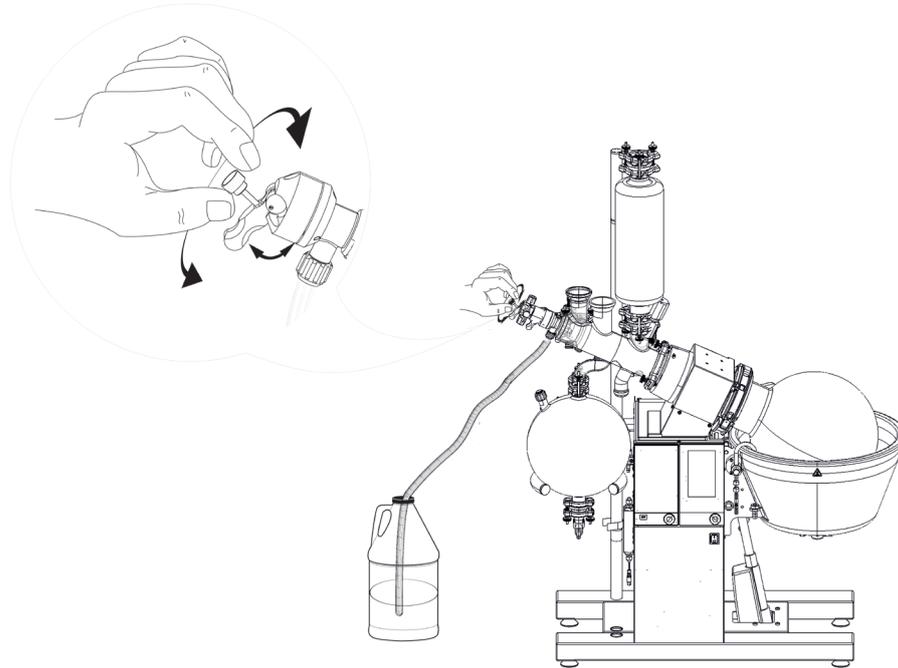
Stage 2

- Every EasyClamp is equipped with a special bold, which can either be shifted out (DN25 / DN45) or tilted (DN70, at the gearbox).
- To unlock an EasyClamp (e.g. to remove or exchange a glasspart) the special bold must be loosened only that much, that it can be removed or tilted. It is not necessary to completely remove the fixing nut of any screw!
- With the bold removed or tilted (DN70 only), the EasyClamp jaws can be opened to free the glassparts. Support the released glasspart(s) by hand!

To mount an EasyClamp proceed in reverse order.

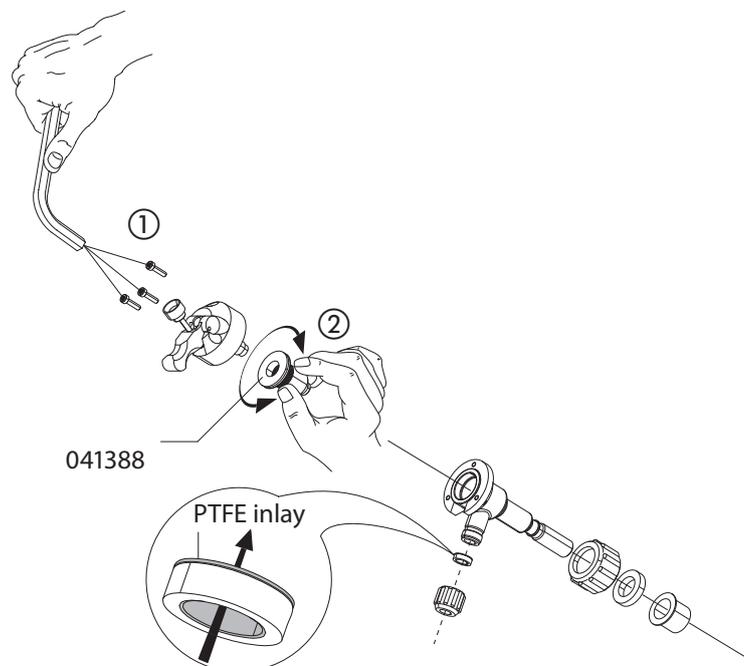
5.8 Inlet valve

The inlet valve allows continuous feeding and manual aeration (e.g. at foam formation) of the evaporating flask. The feeding throughput is manually adjustable via the thumbscrew.



NOTE

The PTFE seal element inside the valve is a standard spare part and can be exchanged easily according to the drawing below.



- ① Remove the three allen key screws and pull off the valve head.
- ② The white PTFE seal element (order no. 041388) is equipped with a thread and can be exchanged easily. Turn counterclockwise to remove the element.

5.9 Glassware and configurations

All original glassware parts and accessories are of superior quality. However, glassware is generally fragile and must be handled with appropriate care to achieve a long lifetime and safe use. Every glassware part must be inspected visually prior to use to ensure safe and proper functionality.

Visually inspect glassware for:

- Cracks and splinters
- Scratches and blunt spots
- Proper condition of safety coating "Plastic+Glas"

	 CAUTION
	<ul style="list-style-type: none"> • Risk of minor or moderate cuts when handling damaged glass parts. <ul style="list-style-type: none"> • Handle glass parts with care • Visually inspect every glass part before mounting • Exchange damaged glass parts immediately • Do not touch cracks or bits of broken glass with bare hands

NOTE

- Clean all glass parts before mounting to avoid cross contamination.
- "Plastic+Glas" coating is not dishwasher proof! Clean coated parts manually with a soft cleaning detergent.

All sealings in contact with the product have a PTFE surface and can be disinfected in an ultrasonic bath with a corresponding disinfection medium. At reinstallation, mind hygienic handling!

NOTE

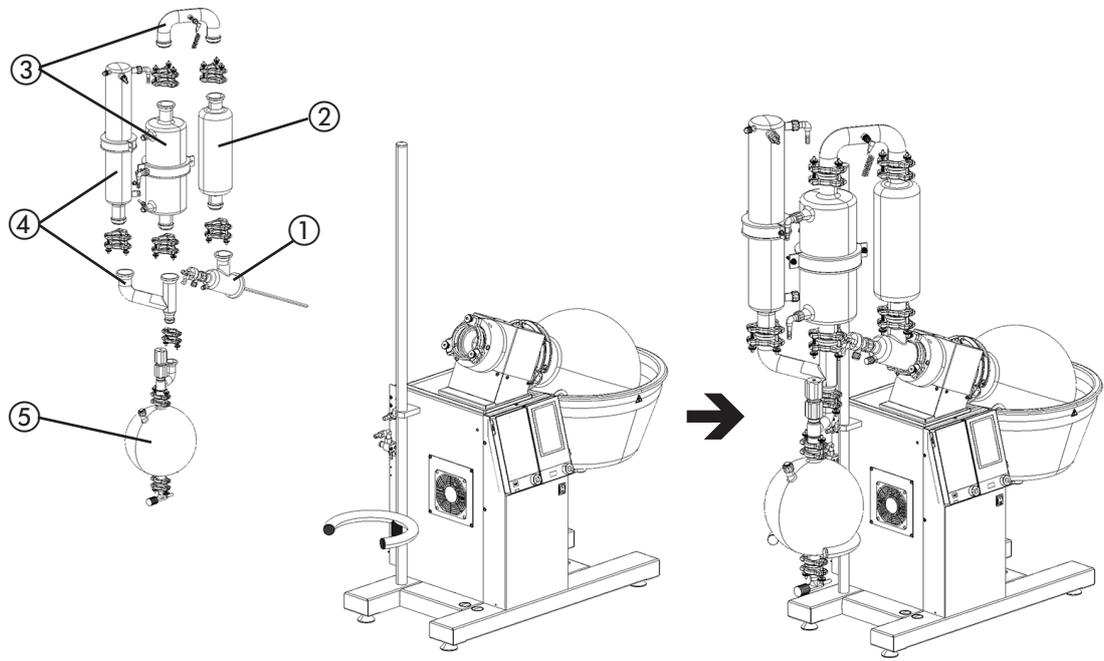
Do not bring the seals in contact with lubricants or other harmful substances!

After cleaning, the system must be assembled to run a disinfection cycle, see below.

5.10 General installation instructions for glassware

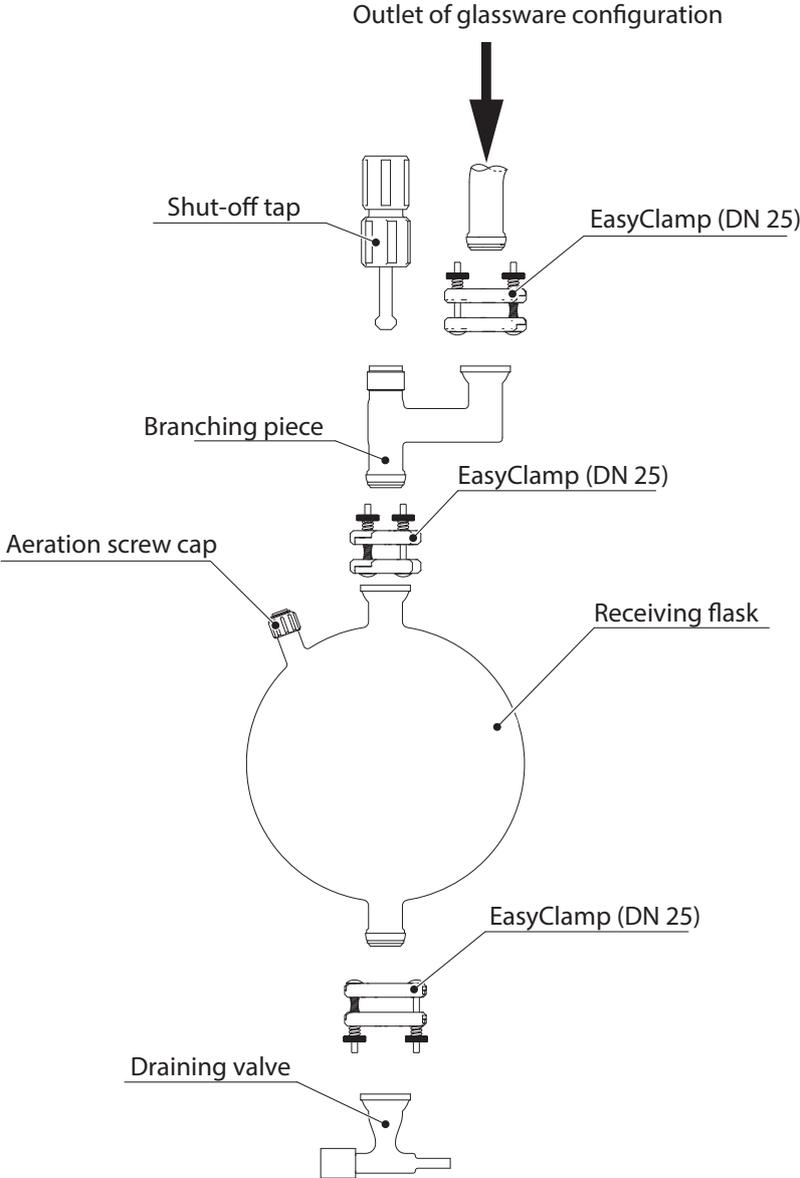
Small tolerances of glassware parts are conditional of manufacturing. Thus, it is necessary to individually adjust fixtures and holders at installation to avoid stress at the components.

It is recommended to install a glassware setup starting with the distribution piece at the gearbox. All other parts will subsequently be aligned towards the Rotavapor® via the distribution piece. The drawing below shows an example installation of a complex setup. For other setups proceed adaptive (e.g. leave parts / steps out).



- ① Start with the distribution piece and mount it at the gearbox.
- ② Proceed with the expansion vessel. Mind upright installation!
- ③
 - Use the u-shaped bridge tube to roughly align the first condenser to the expansion vessel.
 - Fix the u-tube at the expansion vessel and subsequently bring in the condenser.
 - Fasten the condenser. Fix the tube to the condenser.
- ④
 - Use the y-shaped bridge tube to roughly align the outlet of the second condenser to the first condenser from below.
 - Fix the y-piece at the first condenser outlet.
 - Subsequently bring in the second condenser, fasten it and fix the y-piece.
- ⑤ Align the receiving flask to the y-piece and fasten the clamp.

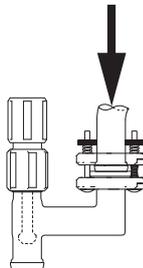
5.11 Single receiver



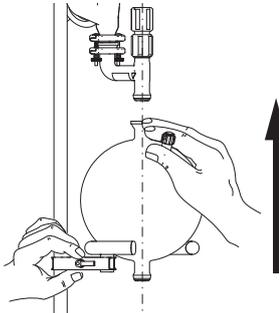
Preparational steps:

- Install the appropriate glassware configuration between the gearbox and the branching piece
- Install the support ring at the support rod on a low position
- Install the shut-off tap at the branching piece

Main installation:

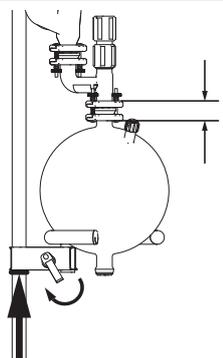


Connect the ball joint of the branching piece to the glassware configuration outlet. Fixate the joint with an EasyClamp (DN 25).



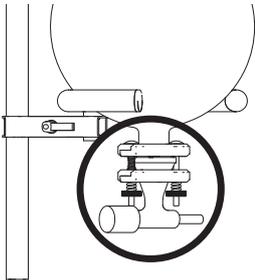
Place the receiving flask on the support ring.

- ↳ Keep the receiving flask upright with one hand.
- ↳ Adjust the support ring until the ball joint between the receiving flask and the y-piece is seated without tension.



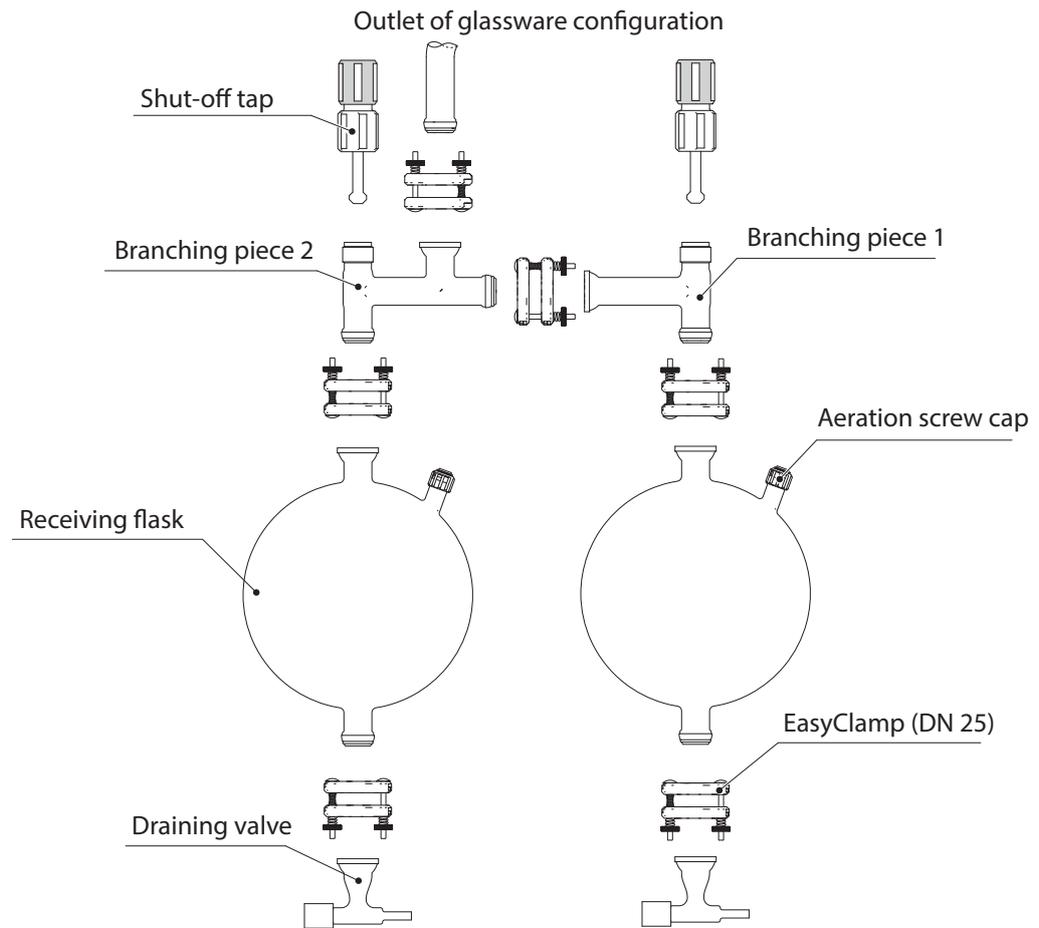
Fixate the support ring in this position. Shift the anti-slip-ring to bring it into contact with the retaining bracket.

- ↳ Fixate the joint towards the y-piece with an EasyClamp (DN 25).



Install the draining valve with an EasyClamp (DN 25).

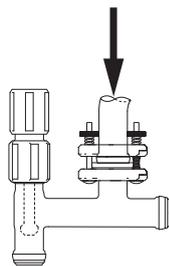
Dual receiver



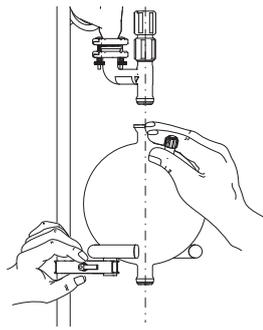
Preparational steps:

- Install the appropriate glassware configuration between the gearbox and the 'branching piece 2'
- Install the support ring at the support rod on a low position
- Install the shut-off taps at the branching pieces

Main installation:

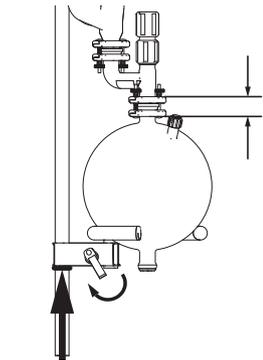


Connect the ball joint of the branching piece to the glassware configuration outlet. Fixate the joint with an EasyClamp (DN 25).



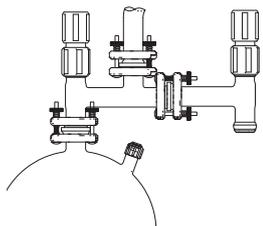
Place the first receiving flask on the support ring.

- ↳ Keep the receiving flask upright with one hand.
- ➔ Adjust the support ring until the ball joint between the receiving flask and the branching piece is seated without tension.



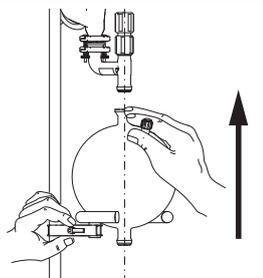
Fixate the support ring in this position. Shift the anti-slip ring to bring it into contact with the retaining bracket.

- ➔ Fixate the joint towards the 'branching piece 2' with an EasyClamp (DN 25).



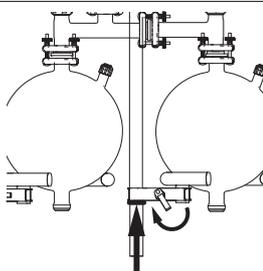
Connect 'branching piece 1' (T shaped) with 'branching piece 2'.

- ↳ Adjust the joint with a small downward gradient towards the connector of the second receiving flask.
- ➔ Fixate the joint with an EasyClamp (DN 25).



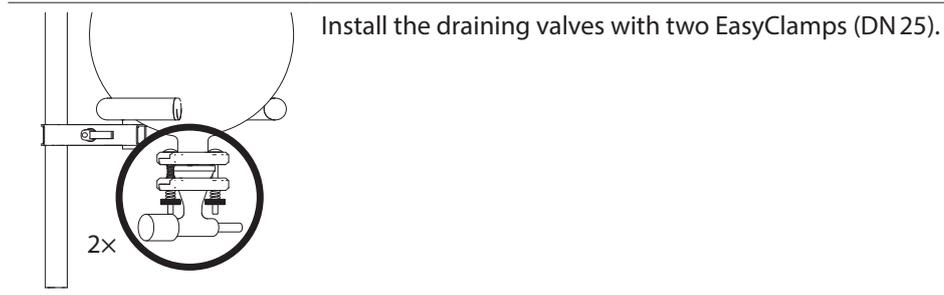
Place the second receiving flask on the support ring.

- ↳ Keep the receiving flask upright with one hand.
- ➔ Adjust the support ring until the ball joint between the receiving flask and the branching piece is seated without tension.



Fixate the support ring in this position and position the anti-slip ring in contact with the clamp.

- ➔ Fixate the joint towards the 'branching piece 2' with an EasyClamp (DN 25).



5.12 Heating bath filling level

The optimal filling level of the heating transfer medium in the bath ensures maximum evaporation performance and safe handling. Depending on the evaporating flask size, the level has to be adjusted.

Filling procedure

- Mount the evaporating flask and drive up the bath.
- Select heating transfer medium according to the target temperature. Mind the limitations for the different heating types!
- With the bath in highest position, fill in heating transfer medium.

The filling level should be a fingerbreadth below the level drain output with the evaporating flask immersed. During rotation of the evaporating flask at target speed, no heating transfer medium should spill or splash.

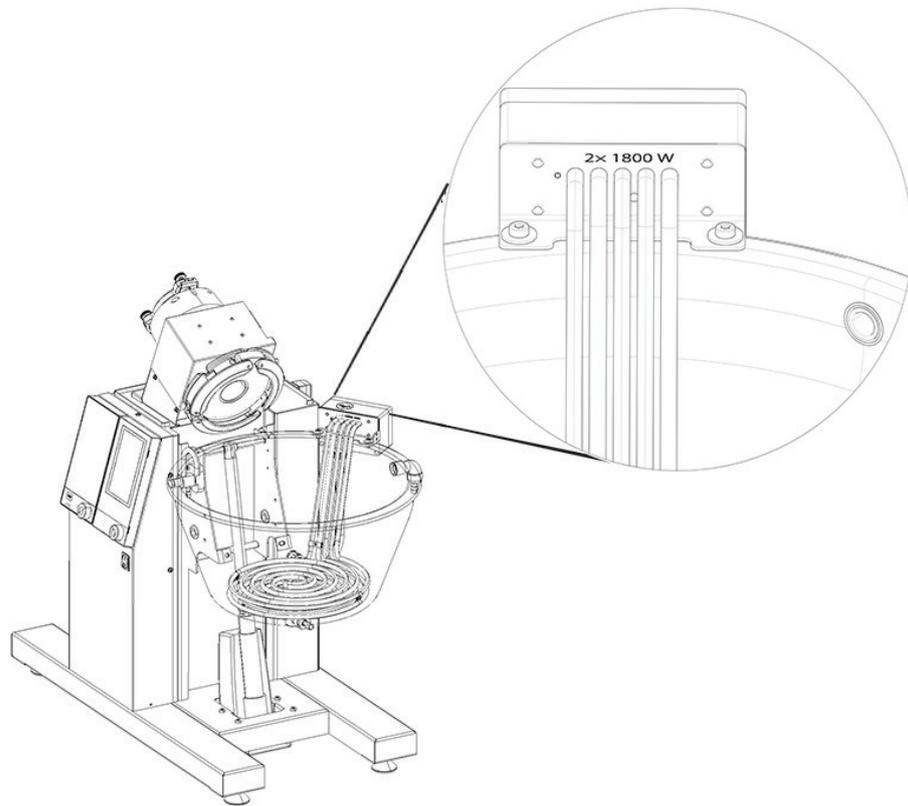
	 CAUTION
	<p>Risk of minor or moderate injuries by hot surfaces at the draining tap and level drain output.</p> <ul style="list-style-type: none"> • Let the bath cool down below 40°C before touching these items

NOTE

If the drain is not connected to a sink, install the drain cap to seal the heating bath.

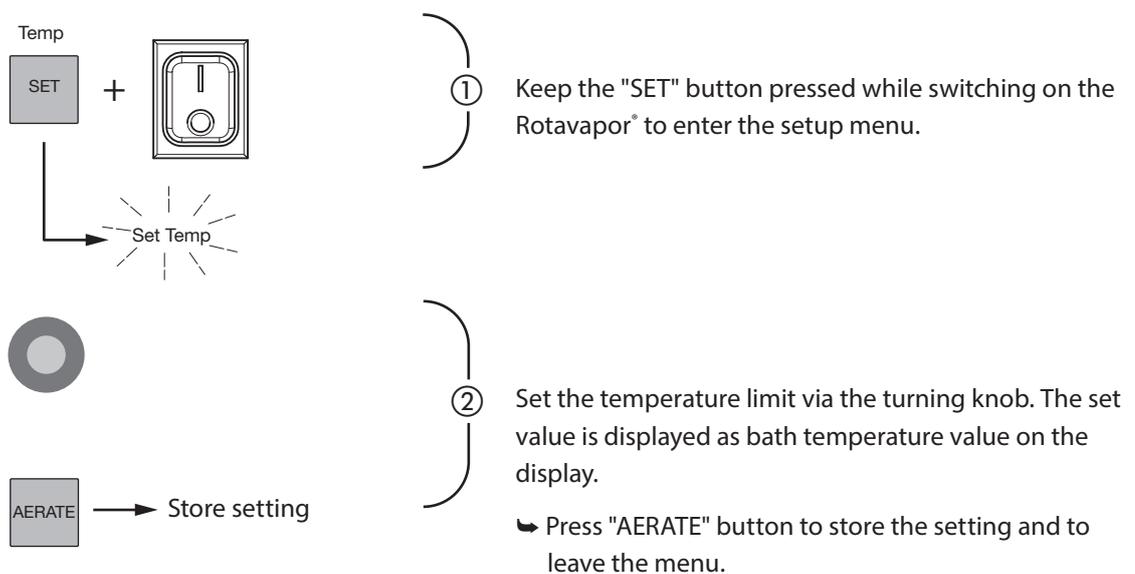
5.13 Heating bath setup for 2×1800W heating element

The heating element holder is labelled with the heating power data. The heating bath of the 2×1800 W version can be filled with different kinds of liquid heating transfer medium. Depending on the maximum heating bath temperature for the target application, a suitable medium must be used.



How to set the maximum setpoint temperature

Limiting the maximal temperature set-point to a value below 180°C can help to eliminate processing errors, e.g. when working with heat-sensitive substances.



Basic heating transfer medium requirements

- Do not use media which are corrosive against the heating bath and its subcomponents or the evaporating flask. E.g. add a sufficient amount of borax when deionized water is used!
- The medium must be liquid at room temperature.
- Do not mix liquids of unknown composition!

	 DANGER
	<p>Death or serious burns by use with highly flammable substances in the heating bath.</p> <ul style="list-style-type: none"> • Do not use heating transfer medium with a flash point below 200 °C • At liquid exchange, the heating bath must be clean and dry

	 DANGER
	<p>Death or serious burns by deflagration of hot heating bath liquids.</p> <ul style="list-style-type: none"> • Do not mix or add water to other heating transfer media with a higher boiling point • The replenishment valve must not be connected to a water source when another heating transfer medium than water is used

NOTE

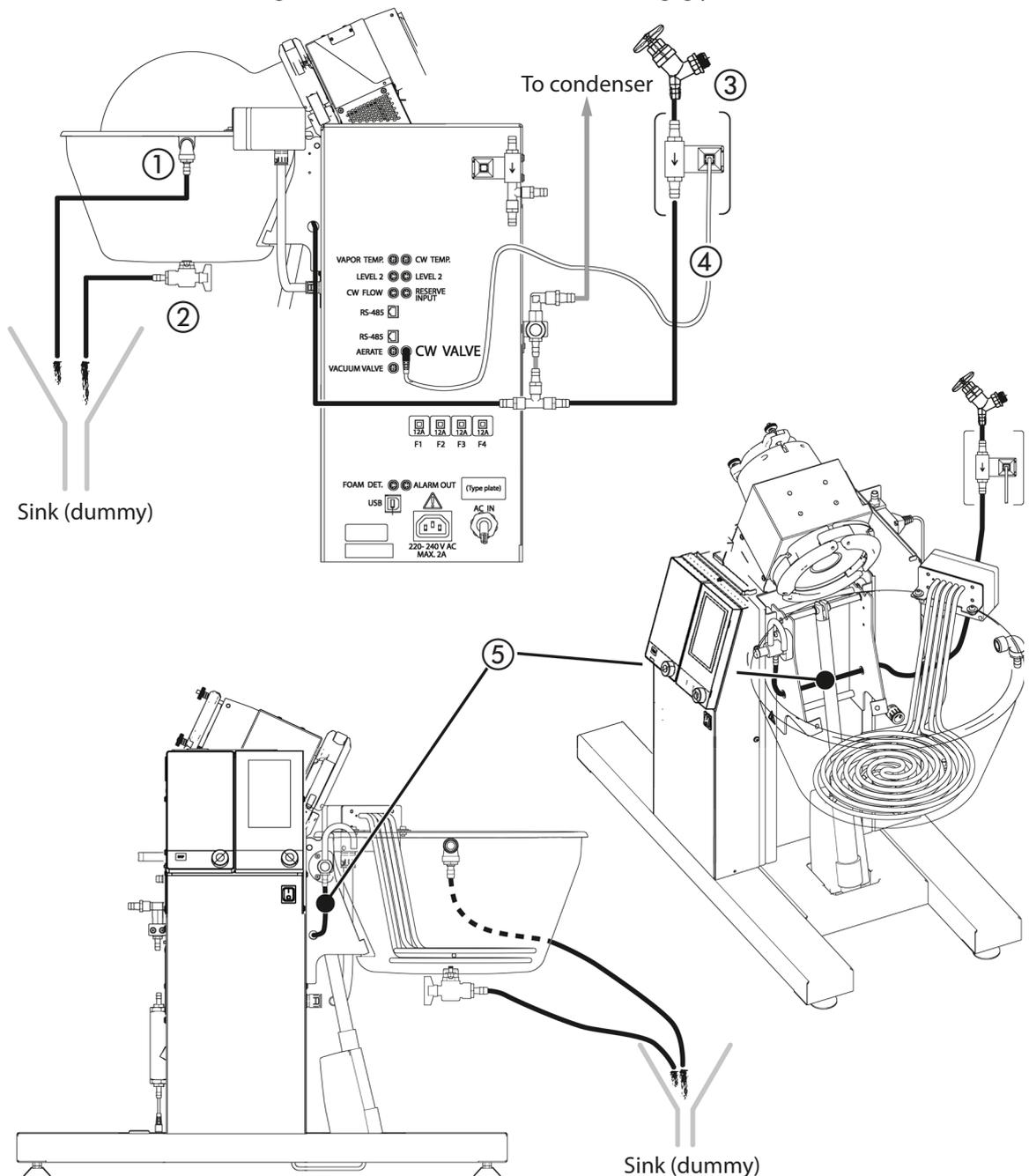
- Do not switch on the heating when the heating transfer medium level is insufficiently low for evaporation tasks.
- Drain and clean the bath regularly to maintain the system in good working order.
- Ambient humidity can diffuse into the heating medium and condensed water can gather at the bottom when the bath has not been used over a longer period. To drive out unwanted water let the evaporating flask rotate and heat up the bath above 100 °C for some minutes.

5.13.1 Water as heating transfer medium

With the heating bath in lowest position, install the level drain output tube with a level difference of > 5 cm towards the sink to ensure safe draining. Fixate all tube connections with hose clamps!

	<p>NOTICE</p> <p>Risk of damage caused by heating transfer mediums.</p> <ul style="list-style-type: none"> • Do not fill the heating bath to overflow • Do not leave the system unattended when replenishment is active • Check the level drain for proper drainage function in lowest heating bath position
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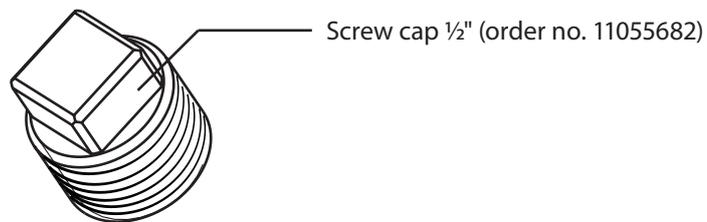

Do NOT connect the replenishment tap to a water source in case a heating transfer medium different to water (e.g. glycerin) is used!

- ① Level drain with Ø 12 mm hose connector, let into sink.
- ② Draining tap with Ø 12 mm hose connector, let into sink.
- ③ Heating and cooling water source. If a water tap is used, the optional cooling water shut-off tap is recommended.
- ④ Control cable to cooling water valve connection at the Rotavapor® connection panel (rear side).
- ⑤ Routing of the cooling water supply tube:
 - ↳ Route the tube through the free tube holes at the bath lift side plates, make sure the tube cannot be kinked or damaged by the lift mechanic!
 - ↳ Connect the tube to the replenishment needle valve tap. Use a hose clamp to safely install the tube.

5.13.2 Heating transfer media with high boiling point

The use of commercially available, nontoxic medium is highly recommended. However, all supplementary data sheets of the used liquids must be obtained!



- When using liquids with high boiling points the replenishment tap must not (!) be connected to a water source for safety reasons.
- The level drain must be closed with the original screw cap.
- The filling level should be a fingerbreadth below the level drain output with the evaporating flask immersed.

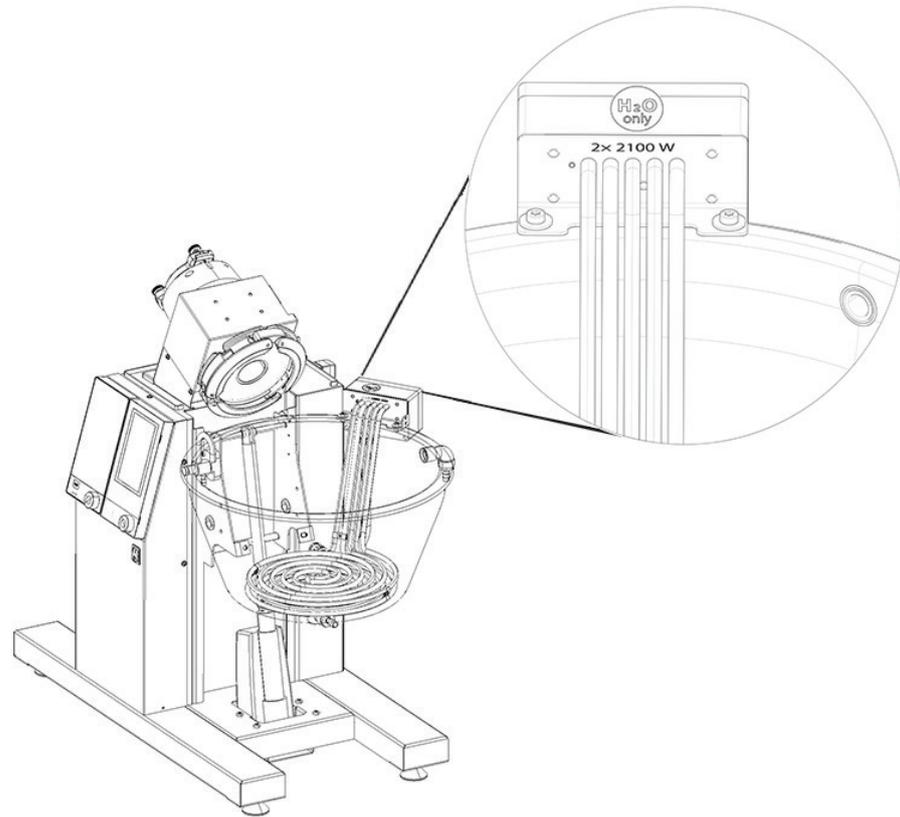
NOTICE	
	<p>Risk of damage caused by heating transfer mediums.</p> <ul style="list-style-type: none"> • Do not fill the heating bath to overflow • Seal drain with screw cap

NOTE

Use PTFE seal tape for a tight installation of the screw cap!

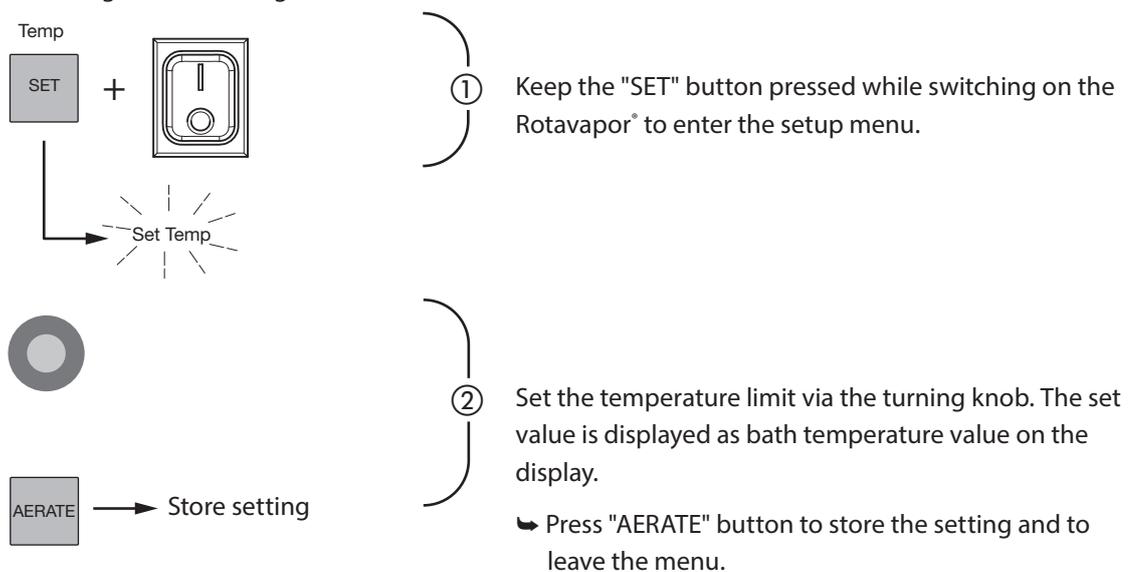
5.14 Heating bath setup for 4.2 and 6.3 kW heating element

The heating element holder is labelled with the heating power data. For the 4.2 and 6.3 kW versions only water must be used as heating transfer medium. Because of the enormous heat input there is a risk of smoke formation and fire when using other heating transfer media than water!



How to set the maximum setpoint temperature

Limiting the maximal temperature set-point to a value below 100 °C can help to eliminate processing errors, e.g. when working with heat-sensitive substances.



Basic heating transfer medium requirements

Do not use water which is corrosive against the heating bath and its subcomponents or the evaporating flask. E.g. add a sufficient amount of borax when deionized water is used!

	<p>! DANGER</p> <p>Risk of fire by use of flammable heating transfer media.</p> <ul style="list-style-type: none">• Use only water as heating transfer medium• The heating bath must be cleaned regularly
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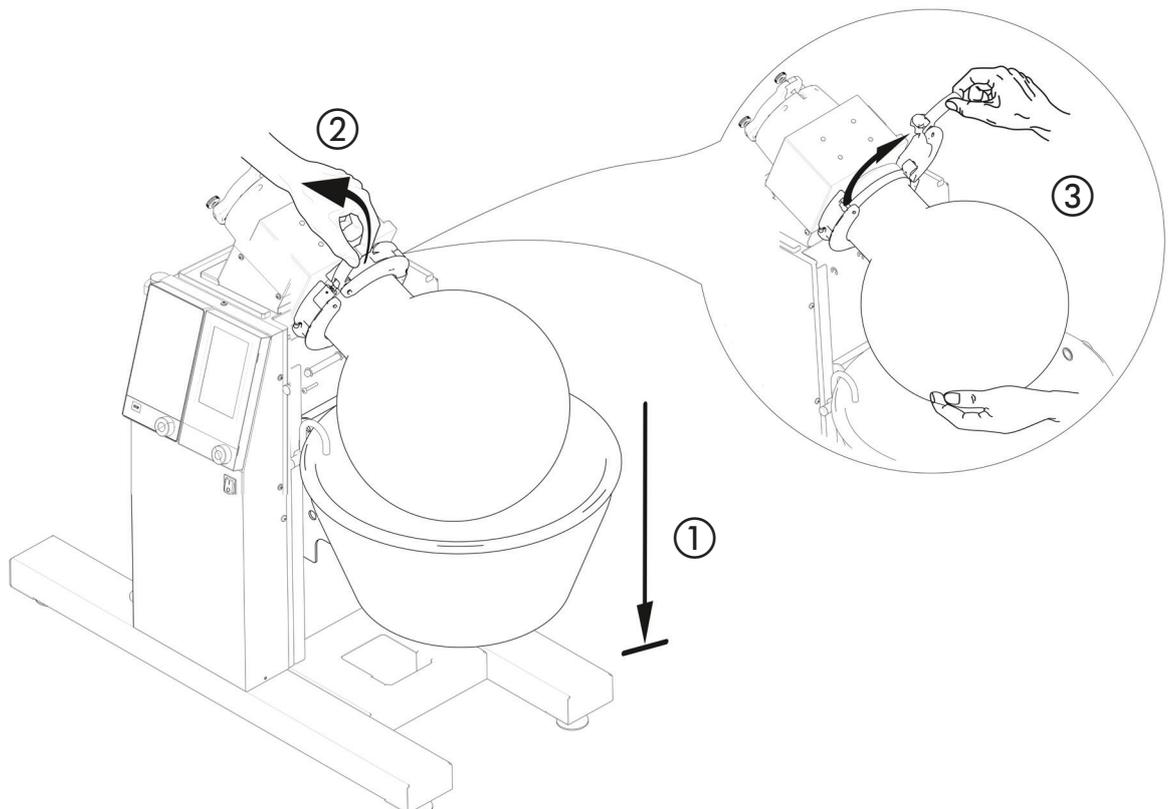
NOTE

- Do not switch on the heating when the heating transfer medium level is insufficiently low for evaporation tasks.
- Drain and clean the bath regularly to maintain the system in good working order.

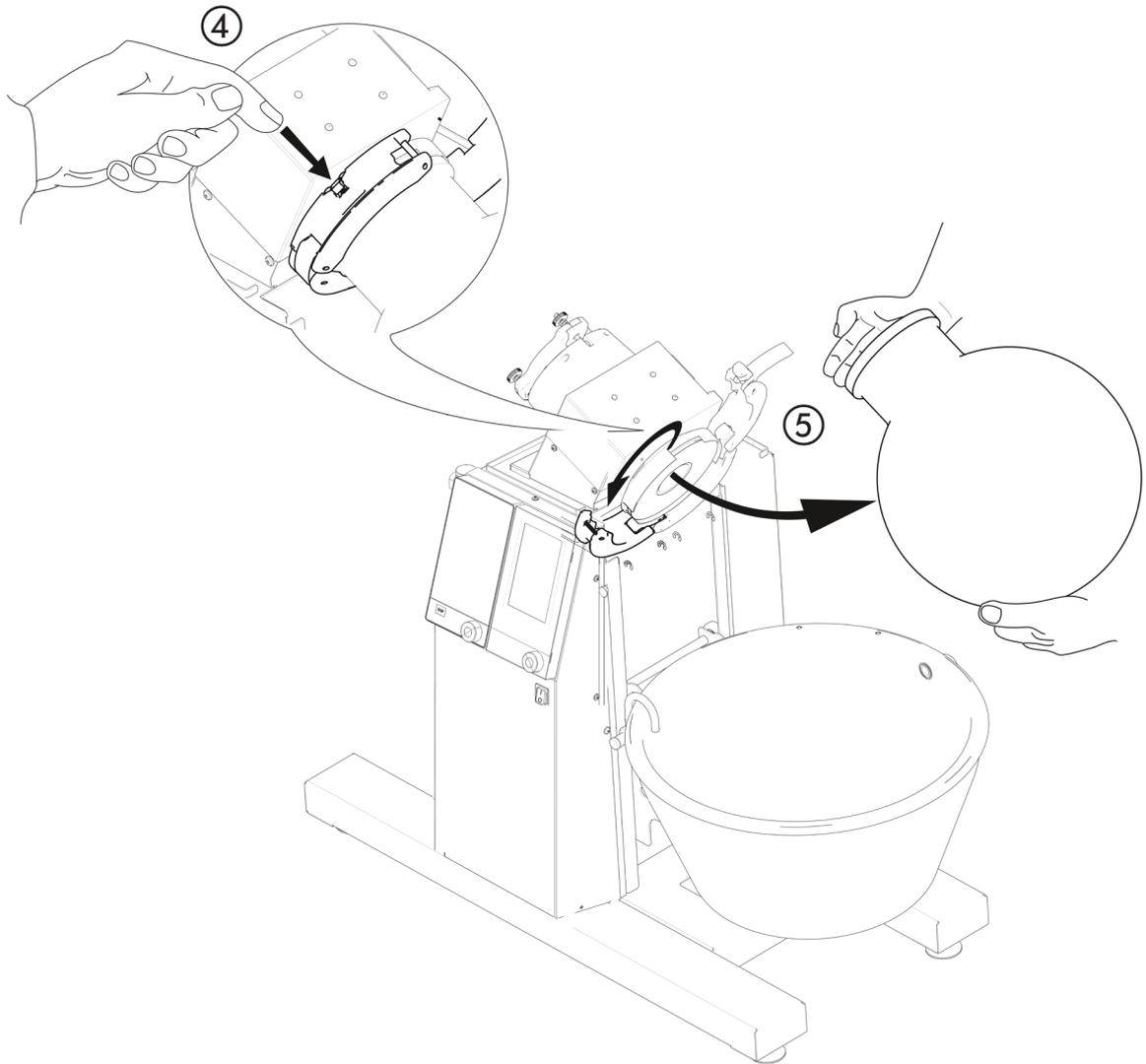
5.15 Attaching and removing evaporating flasks

Evaporating flasks are available in different types and sizes to meet all kinds of application requirements. However, the maximal load on the rotational flange must not exceed 20 kg!

	<p>! CAUTION</p> <p>Risk of minor or moderate injury by heavy weight of the evaporating flask.</p> <ul style="list-style-type: none"> • Clean and dry the exterior of the flask before installation and removal • Lift the flask carefully and avoid overexertion • Do not drop the flask • Savely support the flask at handling • Savely store the flask onto a matching flask ring or holder • Keep limbs out of crushing zone
	<p>! WARNING</p> <p>Risk of serious burns by hot heating bath content.</p> <ul style="list-style-type: none"> • Do not drop any parts into the heating bath • Wear protective clothes against hot liquid spills



- ① Drive down the heating bath.
- ② Support the evaporating flask by hand or with the optional 'Manual flask handler' (order no. 41400). Lift the lever of the snap flange. See also section 5.16 for correct adjustment of the lever tension!
- ③ Swivel out the right half of the snap flange.



- ④ Push down the unlock rocker at the left half of the snap flange.
- ⑤ Open the snap flange completely and carefully take away the evaporating flask.

Using the flask handler

The handler can increase the level of safety when placed on top of the heating bath at flask exchange. However, the flask handler is not suitable as an installation support! The lift mechanism does not stop automatically when the evaporating flask has reached its individual installation height!

Using the flask handler installed on the heating bath to lift or lower the evaporating flask can be dangerous for the operator and can cause device damages.



WARNING

Serious injuries by flying pieces of broken glass.

- Do not use the bath lift to install or deinstall the evaporating flask
- Do not operate the lift with the flask handler installed

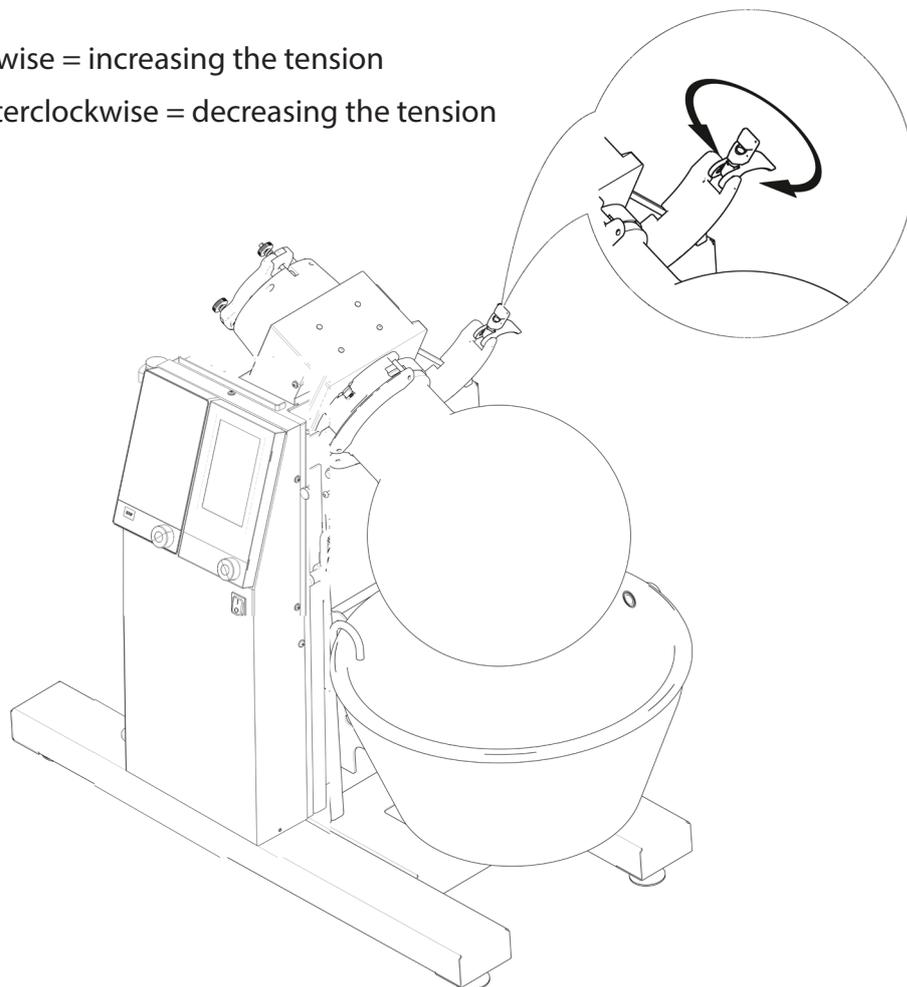
	<p style="text-align: center;">NOTICE</p> <p>Risk of instrument damage by wrong mains supply.</p> <ul style="list-style-type: none"> • External mains supply must meet the voltage given on the type plate • Check for sufficient grounding
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5.16 Adjusting the snap flange

System tightness is essential when working with a Rotavapor®. Thus, the snap flange assembly should be checked at every evaporating flask installation. This is necessary since every glassware has its unique fitting accuracy.

Clockwise = increasing the tension

Counterclockwise = decreasing the tension



- When passing the top dead center of the closing mechanism a clear resistance must be felt.
- Moving the lever must never require excessive force!
- ➔ If the required lever force is too weak the flange may not be tight and will wear out the PTFE seal. In this case, increase the tension of the closure.
- ➔ If the required lever force is too high (e.g. the lever can not be shifted over the top dead center) reduce the tension of the closure.

After readjustment, perform a vacuum test-run without heating bath and sample medium.

NOTE

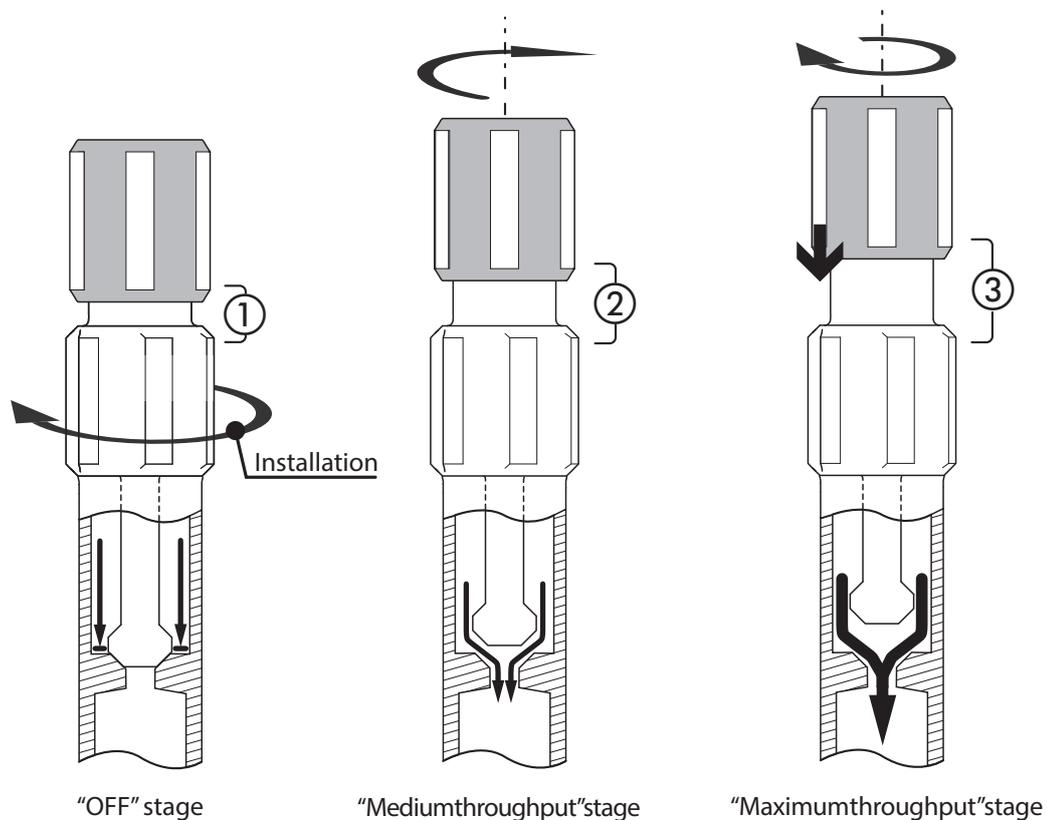
Perform the adjustment in single-turn steps only. Inbetween, check for proper tension with the empty evaporating flask.

5.17 Installation and usage of a shut-off tap

The shut-off tap provides a three stage valve mechanism with a spring-loaded seal stamp. This prestressing assures safe seal under normal conditions.

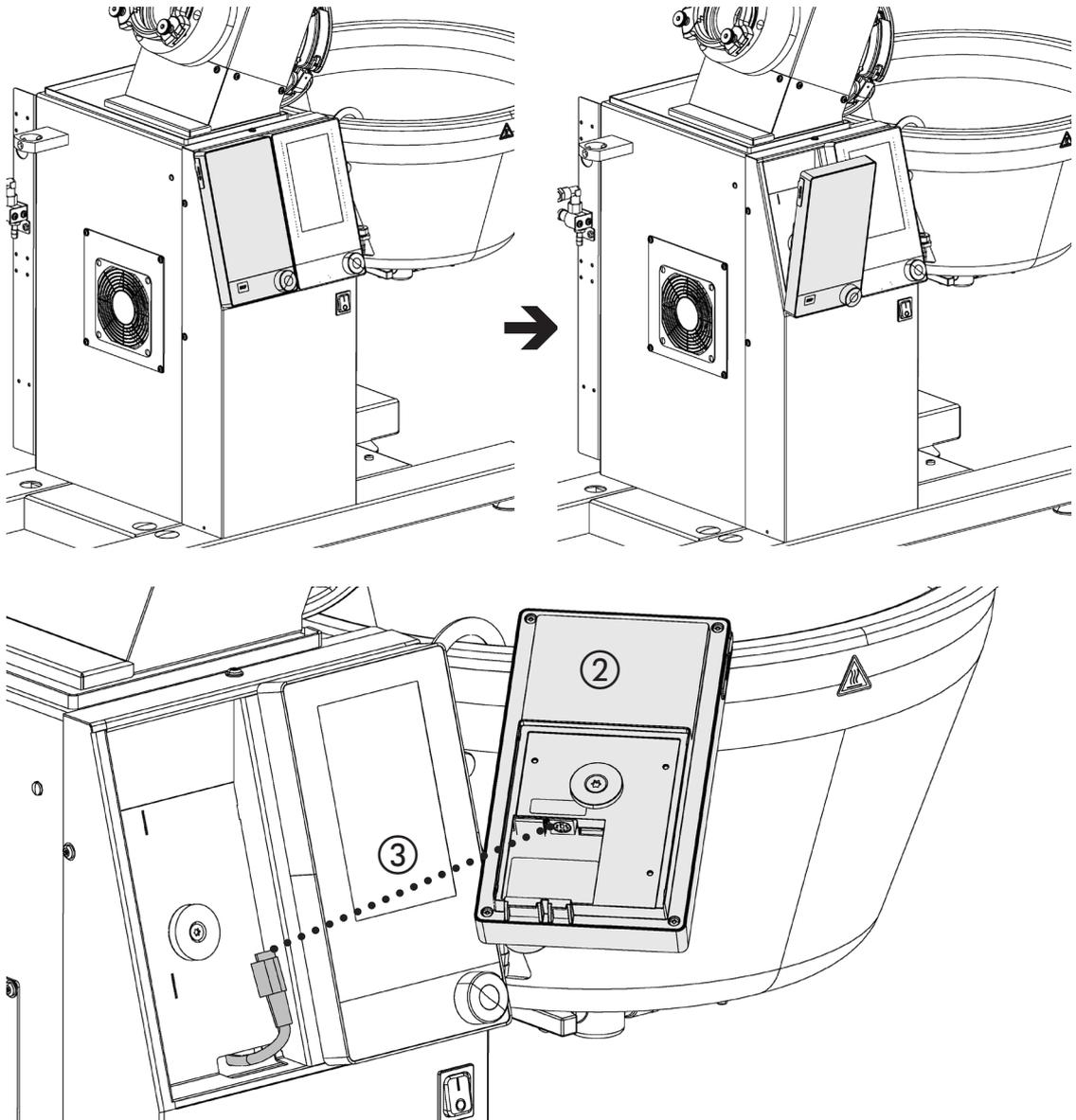
①

Turn the lower, white part clockwise to install the tap at the glassware thread. Mount it handtight only!



- ① In this position, the shut-off tap completely blocks the flow of the medium.
- ② Starting with the tap in "OFF" stage – turn the upper, black part clockwise to reach the "Medium throughput" stage. A noticeable drop in resistance can be felt between every stage.
- ③ Starting with the tap in "Medium throughput" stage – turn the upper, black part clockwise to reach the "Maximum throughput" stage.

5.18 Removing the interface for remote control



- Tilt the I-300 Pro display towards you ①.
- Remove the I-300 Pro display ② from the holder ③.
- You can fill the space with a blind cover (see chapter 10.5 "Optional equipment and upgrade parts")

For reinstallation proceed in reverse order.

NOTE

- More information about the operation and handling of the available controller models can be found in the respective operation manuals of the controllers.

	 CAUTION
	<p>Risk of injury when remote controlling Rotavapor® R-220 Pro without visual contact</p> <ul style="list-style-type: none">• Keep visual contact to the Rotavapor® R-220 Pro to ensure that no-one is attempting to operate the device while it is being remote controlled

5.19 Final installation check

After installation has been completed and before performing the first distillation make sure the installation has been carried out correctly:

- Inspect glassware visually for possible damage
- Inspect safe and correct routing of all cables and hoses
- Check that all connections (steam, water, vacuum) have been fixed properly
- Check all supply hoses for tightness
- If applicable: Check overall system vacuum tightness (see operation manual I-300 Pro)

6 Operation

This chapter gives examples of typical instrument applications and instructions on how to operate the instrument properly and safely. See also section 2.5 "Product safety" for general warnings.

NOTE

Operation of the interface is explained in the operation manual of the Interface I-300 Pro.

6.1 Evaporation in three steps

① Preparational steps

- System must be in good working order. See final installation check, section 5.19.
- Check level of heating transfer medium as described in section 5.13.
- Fill the evaporating flask with the product to maximally slightly below the half. Install the flask at the Rotavapor[®].

OR

Mount the flask and establish a weak vacuum e.g. 800 mbar. Feed the evaporating flask via the feeding-valve to maximally slightly below the neck of the flask.

- Close the splash protector if installed. Select the target heating bath temperature and start heating.

② Evaporation process

- Establish working pressure (see operation manual I-300 Pro).
- Lift up the heating bath completely. The evaporation will start shortly.
- With the heating bath at temperature start rotation and set rotational speed to the target value. At this time the cooling medium flow must be established!
- NOTE the condensation zone of the cooler during evaporation!
Optimal cooling to evaporation ratio for safe use is reached at approx. 75-80% condensation zone height at the first condenser. It is recommended to adjust the evaporation parameter to reach optimal condensation height e.g. to alter the cooling medium flow during operation.
- Foam formation under vacuum can be interrupted manually at any time during evaporation.

Press the 'Aerate' button in short steps to let the foam collapse

③ After evaporation

- In case the Rotavapor[®] is equipped with an Interface, pressing the 'Stop' button at the controller will automatically stop heating, rotation and vacuum. Aeration will be done via the aeration valve.

OR

Stop heating, stop rotation and drive down the heating bath manually. Depending on the device setup it might be necessary to switch off the vacuum source manually. Aerate the Rotavapor[®] and wait approx. 5 minutes before interrupting the cooling medium flow.

- Open the splash protector if installed.
- Unmount the evaporating flask.

NOTE

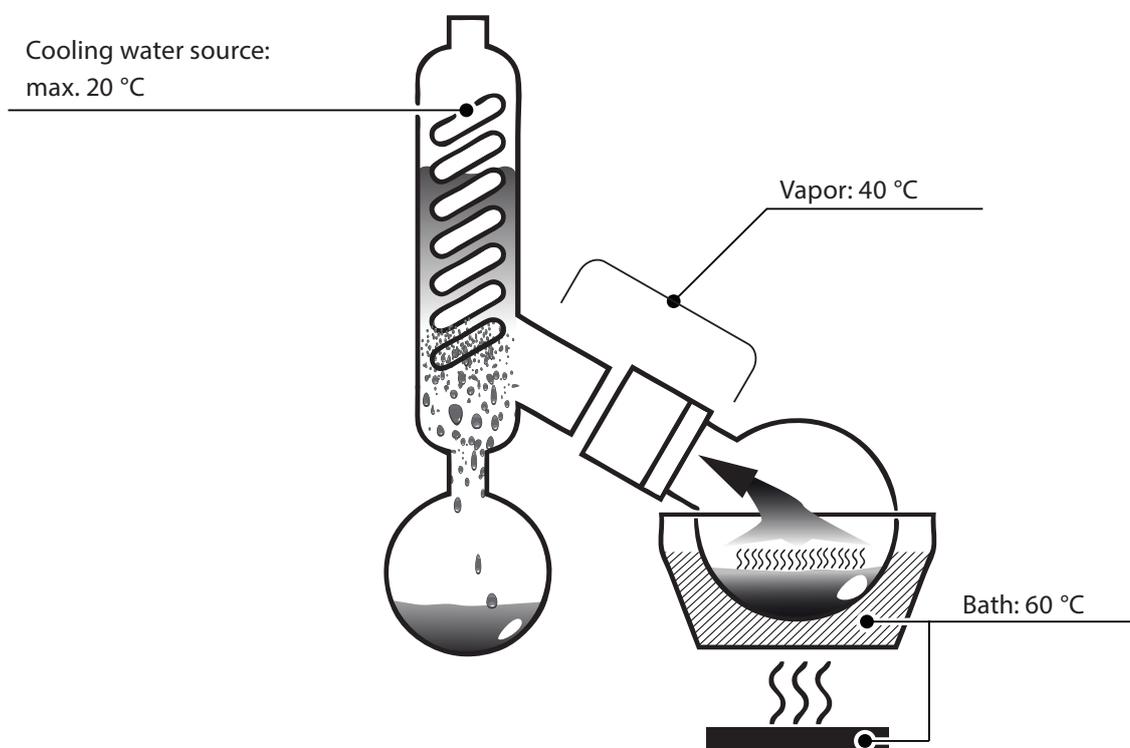
To remove solvent residues after evaporation remount the empty evaporating flask, close the system and evacuate the system to a very low pressure. Then aerate via the outlet of the receiving vessel and the filler-cock. Let the flask rotate to dry the seals at the gearbox thoroughly.

6.2 Optimal distillation conditions

To achieve optimal distillation conditions, all distillation energy supplied by the heating bath must be removed by the condenser. The physical cooling capacity of the condenser must not be exceeded in order to avoid steam emission by overpressure inside the assembly!

NOTE:

- A temperature gradient of 20 °C between 'heating bath → vapor' and 'vapor → cooling medium' is optimal for most distillation tasks. This rule can also be applied to other temperature ranges.
- During aeration (e.g. to suppress foam formation) the condensation height can decrease.
- Condensation over the complete condenser height is a sign for insufficient cooling capacity! Adjust the distillation parameters (e.g. lower the cooling medium temperature) to stabilize the condensation zone at approximately 2/3 to 3/4 during operation.



Typical distillation parameter settings:

- Set the bath temperature to 60 °C.
- Use cooling water / medium with less than 20 °C.
- Allow cooling water / medium to flow through the condenser at approximately 120—150 l/h.
- Adjust pressure parameter to reach a boiling point of ~40 °C for the used solvent. In most cases it is necessary to apply a vacuum! Information about the corresponding pressure for common solvents can be found in the following 'Solvent table'.

Advantages associated with bath temperatures of 60 °C:

- Water can be used as heating medium (cost efficient, good availability)
- Comparatively low consumption of heating energy compared to higher bath temperatures
- Gentle product treatment at moderate temperature
- Shorter cooling-off time for evaporating flask and heating medium

6.3 Solvent table

Solvent	Formula	Molarmass in g/mol	Evaporationenergy in J/g	Boilingpoint at1013mbar	Densityin g/cm ³	Vacuum in mbar for boilingpointat40 °C
Acetone	CH ₃ H ₆ O	58.1	553	56	0.790	556
n-amylalcohol, n-pentanol	C ₅ H ₁₂ O	88.1	595	137	0.814	11
Benzene	C ₆ H ₆	78.1	548	80	0.877	236
n-butanol	C ₄ H ₁₀ O	74.1	620	118	0.810	25
tert.butanol(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
Diethylether	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
1,2-dichloroethylene (cis)	C ₂ H ₂ Cl ₂	97.0	322	60	1.284	479
1,2-dichloroethylene (trans)	C ₂ H ₂ Cl ₂	97.0	314	48	1.257	751
Diisopropyl 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 (dimethyl-formamide)	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
Methylenechloride,dichloromethane	CH ₂ Cl ₂	84.9	373	40	1.327	850
Pentane	C ₅ H ₁₂	72.1	381	36	0.626	850
n-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
1,1,2,2-tetra-chloroethane	C ₂ H ₂ Cl ₄	167.9	247	146	1.595	20
Tetrachlorocarbon	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
Tetra-chloro-ethylene	C ₂ Cl ₄	165.8	234	121	1.623	53
THF (tetrahydrofurane)	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
o-xylene	C ₈ H ₁₀	106.2		144	0.880	
m-xylene	C ₈ H ₁₀	106.2		139	0.864	
p-xylene	C ₈ H ₁₀	106.2		138	0.861	

7 Maintenance and repairs

This chapter gives instructions on maintenance work to be performed in order to keep the instrument in a good and safe working condition. All maintenance and repair work requiring the opening or removal of the instrument housing must be carried out by trained personnel and only with the tools provided for this purpose.

NOTE

Use only genuine consumables and spare parts for any maintenance and repair work in order to assure warranty and continued system performance. Any modifications of the Rotavapor® R-220 Pro or parts of it need prior written permission of the manufacturer.

	<p>CAUTION</p> <p>Risk of minor or moderate cuts when handling damaged glass parts.</p> <ul style="list-style-type: none"> • Handle glass parts with care • Visually inspect every glass part for good condition before mounting • Exchange damaged glass parts immediately • Do not touch cracks or bits of broken glass with bare hands
	<p>NOTICE</p> <p>Risk of instrument damage by liquids and detergents.</p> <ul style="list-style-type: none"> • Empty the heating bath and all glass accessories prior to maintenance and repair action • Do not spill liquids over the instrument or parts of it • Wipe off any liquids instantly • For the housing, use ethanol or soapy water as detergent only

7.1 Customer service

Only authorized service personnel are allowed to perform repair work on the instrument. Authorization requires a comprehensive technical training and knowledge of possible dangers which might arise when working at the instrument. Such training and knowledge can only be provided by BUCHI.

Addresses of official BUCHI customer service offices are given on the BUCHI website under: www.buchi.com. If malfunctions occur on your instrument or you have technical questions or application problems, contact one of these offices.

The customer service offers the following:

- Spare part delivery
- Repairs
- Technical advice

7.2 Regular service and checks

To maintain the system in good working order the checks described in this section should be performed regularly. Defective or worn out parts must be exchanged directly to ensure safe use and optimal efficiency.

7.2.1 System tightness

To evaluate the system tightness, run the leakage test according to the I-300 Pro operation manual. A greater pressure rise indicates a leakage. In such a case, recheck all EasyClamp connections, seal rings and valves for proper seating.

7.2.2 Sealings and hoses

Check for wear and clean the vacuum seal at least every six months.
Check all other seals and hoses for wear at least yearly.

➔ Exchange seals with scratches or other harms directly.

NOTE

- To prevent damaging the seals never apply grease or touch them with sharp objects.
- To prolong the lifetime of the seals, rinse them routinely with water or ethanol to remove possible contamination with sample material.
- Dry the cleaned seals with a soft, lint-free cloth.
- PTFE seals need a 10 hours run-in period to reach their optimum tightness condition. This is normal for a PTFE seal.

7.2.3 Glassware and clamps

Clean all glass components after a distillation process to prevent cross-contamination.

- Inner surfaces
 - ➔ Cleaning can be done by distillation of ethanol or acetone (product residues must be soluble by the distilled cleaning agent).
- Outer surfaces
 - ➔ Cleaning of outer parts can be done manually with warm water and a commercial cleaning agent (e.g. mild soap solution).
- Smaller parts such as clamps can be cleaned in an ultrasonic bath.

➔ Visually check all glass components and clamps for damages subsequently.

NOTE

- It is recommended to decalcify the cooler spiral regularly to prevent calcification.
- Regularly flush the cooling spiral with cleaning detergent to remove algae.

7.2.4 Housing, heating bath, cables and accessories

Check the housing, cables and accessories for visible defects (cracks, kinks etc.). Clean housing parts regularly with a damp cloth. Soapy water can be used as cleaning agent.

Heating bath

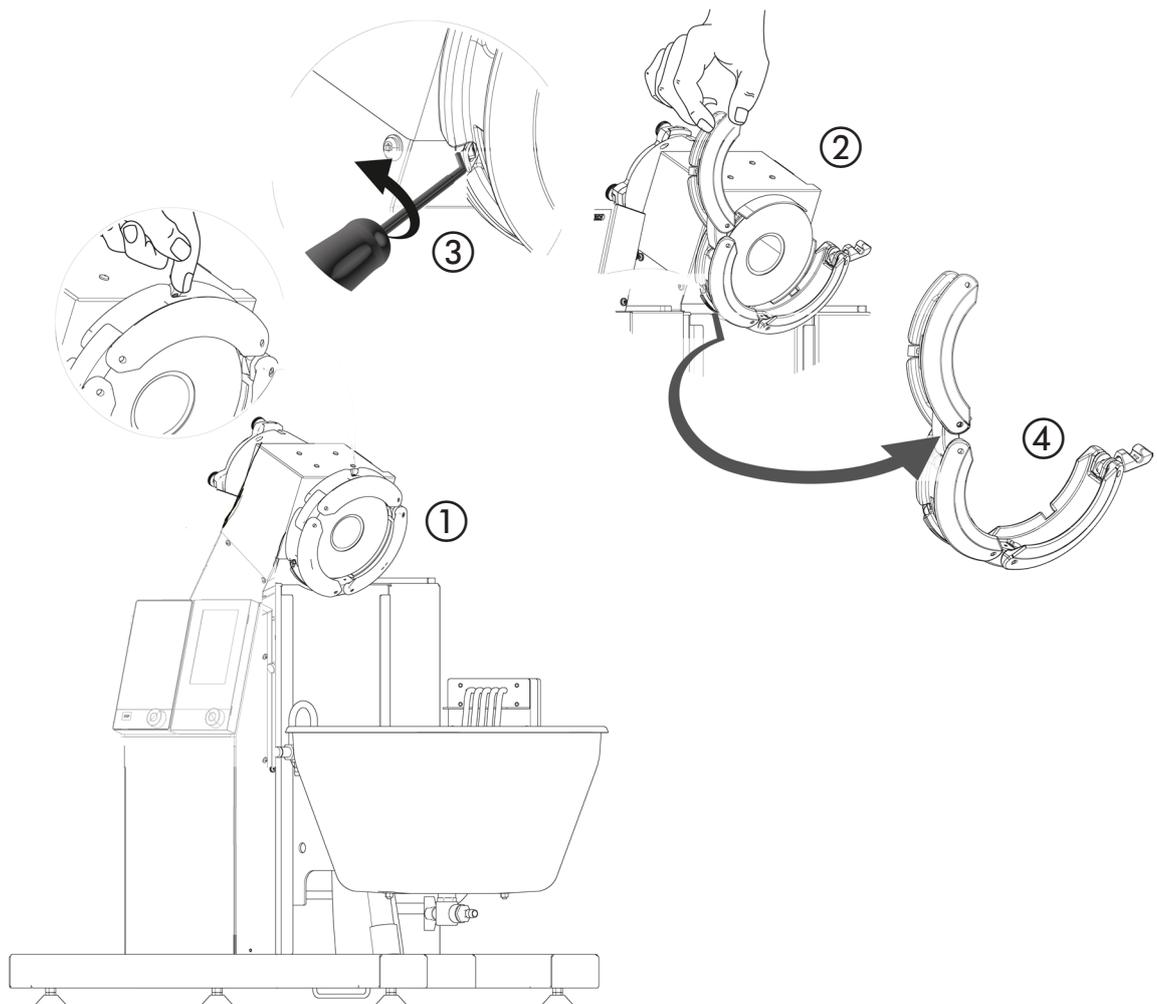
Use a commercially available decalcification agent to dissolve residues of calcium and other minerals in the bath. Subsequently rinse the bath thoroughly!

All housing parts must be completely dried before the system can be connected to mains again!

	<p>! WARNING</p>
	<p>Death or serious burns by electric current at cleaning.</p> <ul style="list-style-type: none"> • Switch off the instrument • Disconnect the power cord and prevent unintentional restart • Wait until the instrument is completely dry before reconnecting to mains

7.3 Snap flange coupling, flask seal and vapor duct

Removal/installation of the snap flange coupling



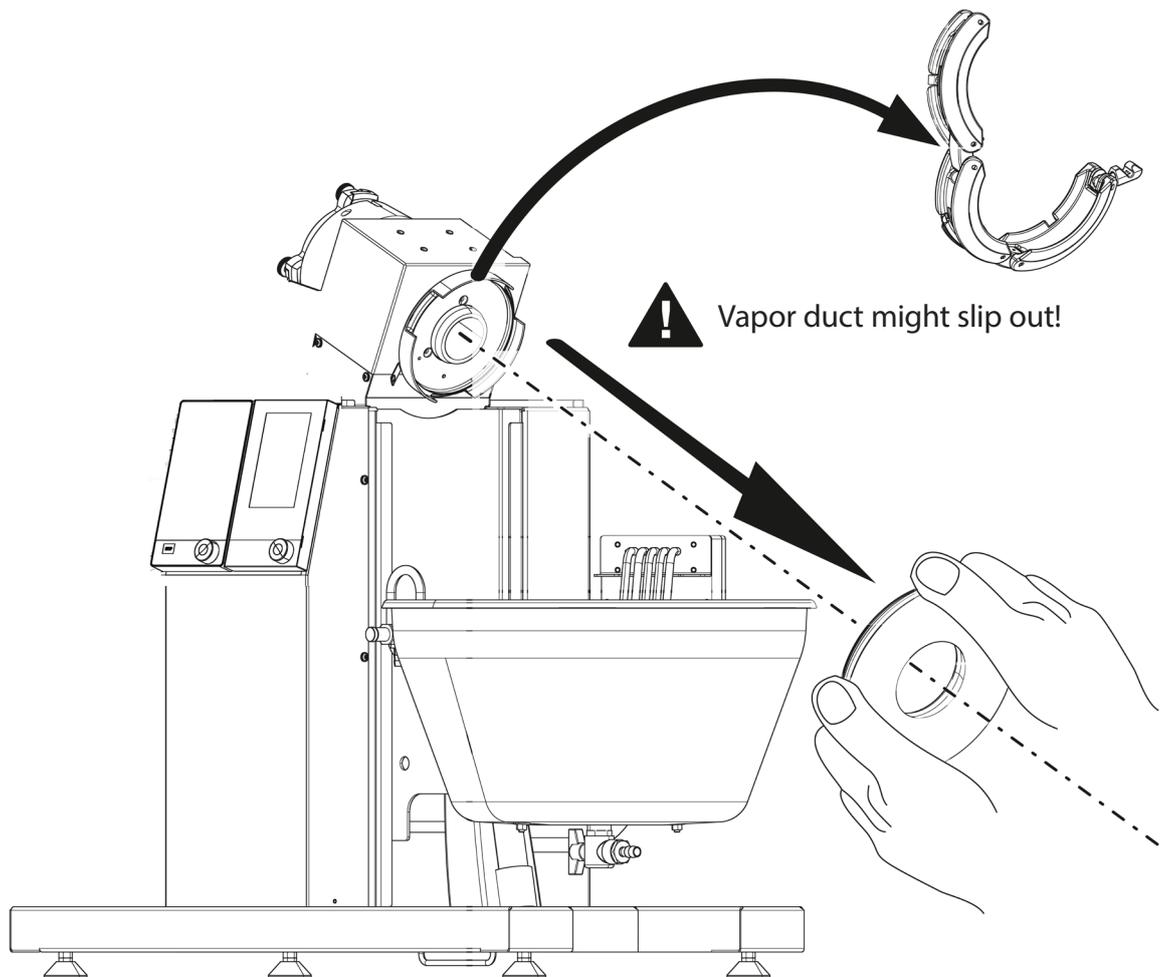
- ① Turn the snap flange coupling until the unlock rocker at the left half of the snap flange is in top position.
- ② Open both levers of the snap flange.

- ③ Use the seal tool (order no. 20075) to unlock the metal reed and free the snap flange.
- ④ Carefully pull off the snap flange from the metal reed locking.

For reinstallation plug the coupling back onto the flange. The metal reed snaps into locking position with a noticeable click sound.

➔ After installation, see also section 5.16 for correct adjustment of the lever tension!

Removal / installation of the flask seal



- ① Remove the snap flange coupling. Hook some fingers behind the seal at two of the three cut-outs.
- ② Carefully pull off the seal step by step. Change the position at the cut-outs from time to time to avoid canting of the seal plate! Make sure the vapor duct does not accidentally slip out when removing the seal plate.

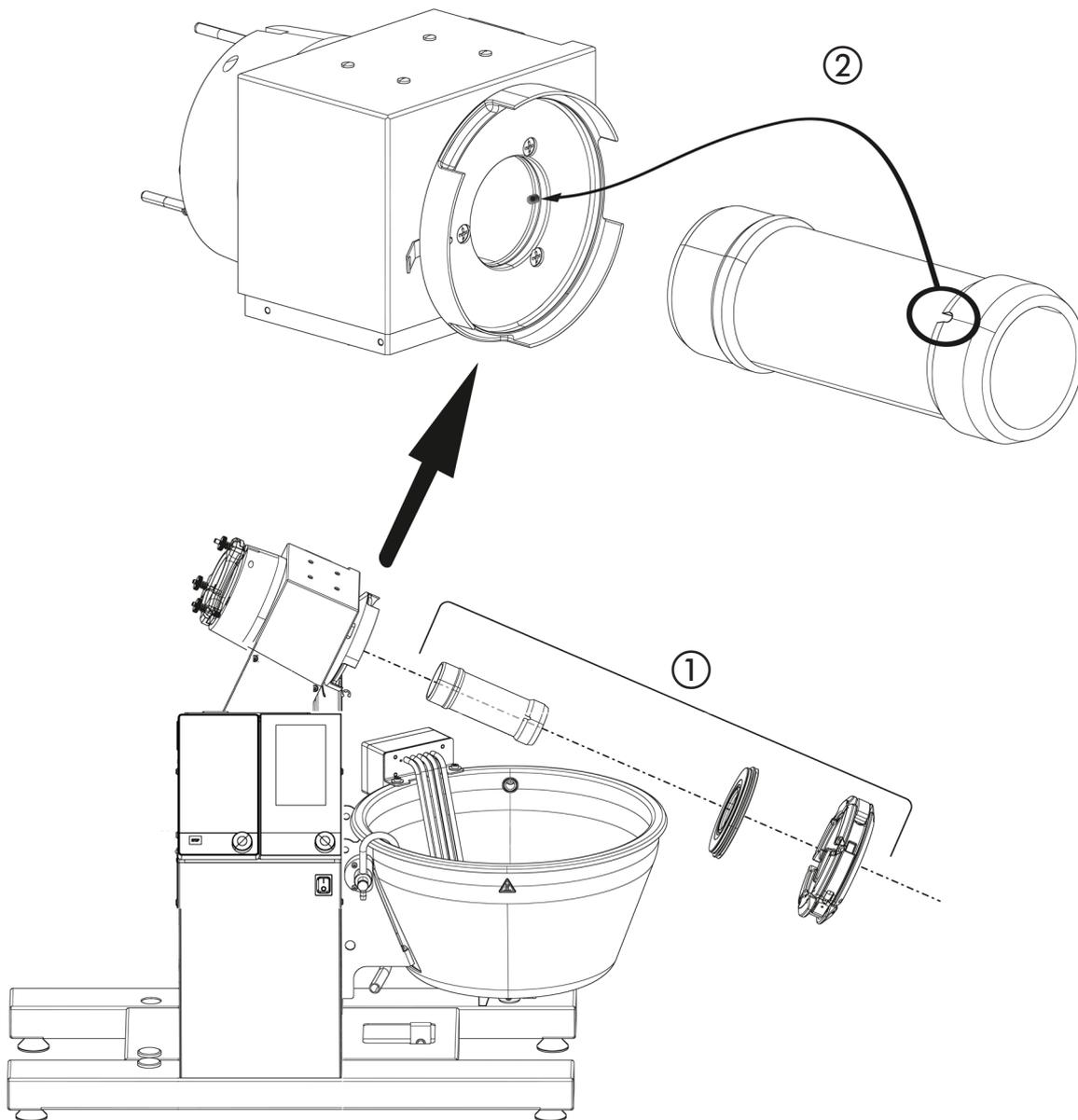
For reinstallation proceed in reverse order.

NOTE

Do not use metal tools or other utilities that might scratch or harm the metal flange or the seal plate!
Clean the seal face before reinstallation.

Removal/installation of the vapor duct

With the flask seal removed, the (glass) vapor duct can easily be pulled out. At reinstallation, the keyway at the vapor duct end must be aligned to the spring loaded notch at the gearbox to lock rotation between the drive and the duct.

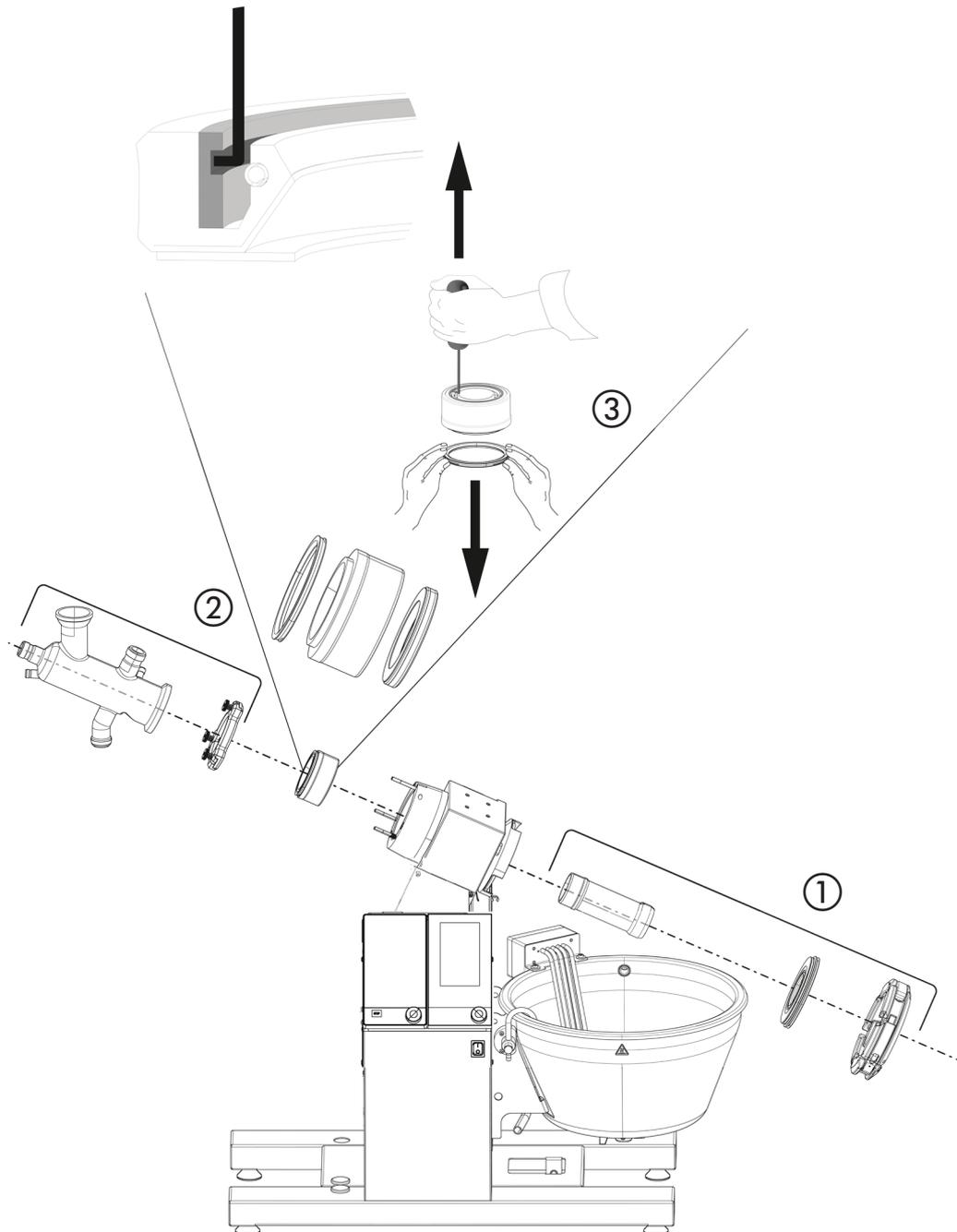


- ① Remove the snap flange coupling and the flask seal first. Pull out the vapor duct by hand.
- ② To install the vapor duct proceed in reverse order. Make sure the notch blocks rotational movement of the duct.

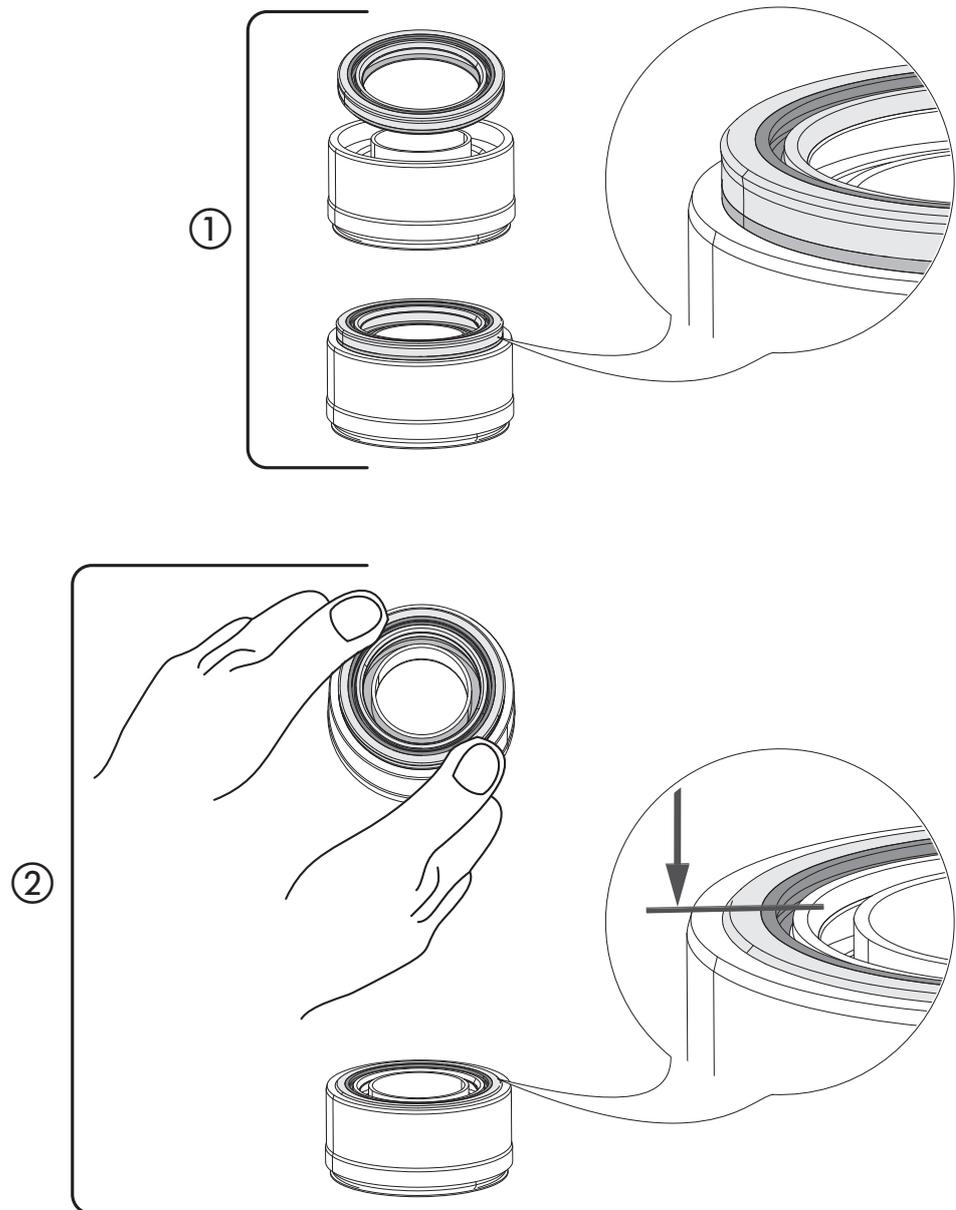
NOTE

Clean the vapor duct before reinstallation to ensure a clean seal face for good tightness!

7.4 Distribution head seal and vacuum seal

Removal of the seal holder

- ① Remove the snap flange coupling and the flask seal first. Pull out the vapor duct by hand.
- ② Loosen the EasyClamp (DN70) and take off the distribution head (glass part). Subsequently, completely remove the EasyClamp from the gearbox.
- ③ Pull out the seal holder by hand.
 - The distribution head seal can easily be pulled off by hand.
 - To remove the vacuum seal use the seal tool (order no. 020075). Hook it in under the ring-shaped metal insert (!) and pull out the seal from the seal holder. Perform this action in several minor steps and change the tool's position to avoid canting!

Installation of the seal unit

- ① Place the vacuum seal onto the seal holder with the ring-shaped metal insert facing upwards.
- ② Take the seal holder into both hands and gently push in the seal with both thumbs in several steps. Rotate the seal holder while doing this to avoid canting!

NOTE

Clean seal rings, seal holder and vapor duct before reinstallation to ensure a clean seal face for good tightness!

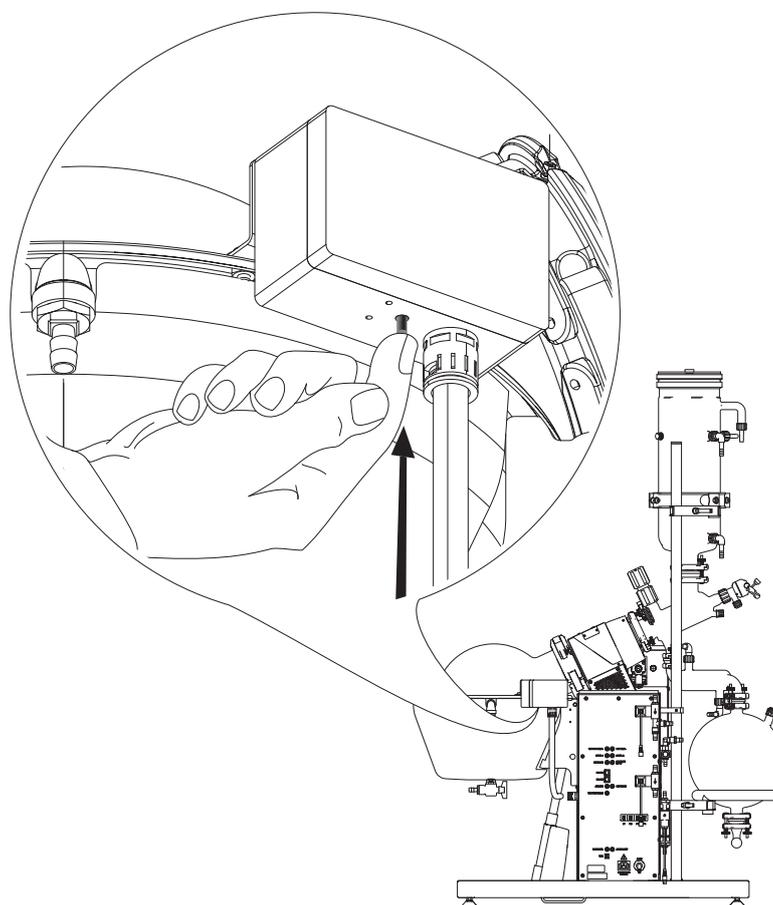
8 Troubleshooting

This chapter helps to resume operation after a problem has occurred with the instrument which does not require special technical training. It lists possible occurrences, their probable cause and suggests how to remedy the problem.

The troubleshooting table below lists possible malfunctions and errors of the instrument. The operator is enabled to correct some of those problems or errors by him/herself. For this, appropriate corrective measures are listed in the column "Remedy".

8.1 Resetting the over-temperature protection

For safety reasons (e.g. if no heating medium is in the bath) the over-temperature protection mechanically cuts off the heating current at temperatures above 205 °C. The overtemperature protection is located at the heating element distribution box.



- Switch off the Rotavapor® and wait some minutes for the heating elements to cool down after the mechanism has been activated.
- Check for correct level of the heating transfer medium and take corrective actions if necessary!
- Push in the reset button by hand.
- Switch on the Rotavapor® and perform a functional test of the heating.
 - ➔ If the overtemperature problem still exists call for service!

8.2 Error messages and their remedy

8.2.1 Error messages of the Interface I-300 Pro

For an explanation of the error messages of the Interface I-300 Pro, please refer to the Interface I-300 Pro operation manual.

8.2.1 Error messages of the Rotavapor®

The error messages are shown in the rotational speed display.



Errors which are not listed in the table are to be corrected by a BUCHI trained technician who has access to official service manuals. In this case, please refer to your local BUCHI customer service agent.

Errors and their remedy			
Error	Additional error indicator on display	Possible cause	Remedy
E01	Heating bath icon flashes.	Bath temp. sensor not connected or defective.	<ul style="list-style-type: none"> Switch off the unit. Wait for the bath to cool down a little before restart. <p>Call service if problem is persistent.</p>
E02	Heating bath icon flashes.	<p>The bath does not reach the intended maximum height.</p> <ul style="list-style-type: none"> Lift motor is defective or blocked. 	<ul style="list-style-type: none"> Press the "Aerate" button to confirm the error message. Switch off the unit. Check if lift is blocked. <p>Call service if problem is persistent.</p>
E03	Drive unit icon flashes.	<p>The rotary drive does not reach the set speed value.</p> <ul style="list-style-type: none"> Drive defective or blocked. 	<ul style="list-style-type: none"> Press the "Aerate" button to confirm the error message. Switch off the unit and check if drive is blocked, rotate evaporating flask manually. <p>Call service if problem is persistent.</p>
E04	n.a.	<p>Battery voltage too low.</p> <ul style="list-style-type: none"> PB battery weak or defective. 	<ul style="list-style-type: none"> Press the "Aerate" button to confirm the error message. Switch on the system overnight to allow recharging of the battery. <p>Call service if problem is persistent.</p>
E05	n.a.	Hardware malfunction.	<ul style="list-style-type: none"> Restart the unit. <p>Call service if problem is persistent.</p>
E06	n.a.	Shortcut at aeration valve.	<ul style="list-style-type: none"> Unplug valve and restart system for causal research. Exchange valve if defective or run evaporation with manual aeration. <p>Call service if problem is persistent.</p>
E07	n.a.	Shortcut at cooling water valve.	<ul style="list-style-type: none"> Unplug valve and restart system for causal research. Exchange valve if defective or run evaporation without cooling water valve. <p>Call service if problem is persistent.</p>

E08	n.a.	Shortcut at vacuum valve.	<ul style="list-style-type: none"> • Unplug valve and restart system for causal research. • Exchange valve if defective. <p>Call service if problem is persistent.</p>
Error	Addition error indicator on display	Possible cause	Remedy
E11	'SHIELD OPEN' message appears.	Shield not closed at the time of flask rotation start.	<ul style="list-style-type: none"> • Close bath shield. • Press the "Aerate" button to confirm the error message. <p>Call service if problem is persistent.</p>
E12	'FLOW' message appears.	Cooling medium flow insufficient.	<ul style="list-style-type: none"> • Increase cooling water flow and press the "Aerate" button to confirm the error message. • Adjust sensor. • Check cable and plug of the flow sensor. • Exchange sensor if defective or run evaporation without flow sensor. <p>Call service if problem is persistent.</p>
E13	'LEVEL 1' message appears.	Filling level reached.	<ul style="list-style-type: none"> • Empty receiving vessel 1 and press the "Aerate" button to confirm the error message. • Check cable and plug of the flow sensor. • Exchange sensor if defective or run evaporation with user controlled filling level. <p>Call service if problem is persistent.</p>

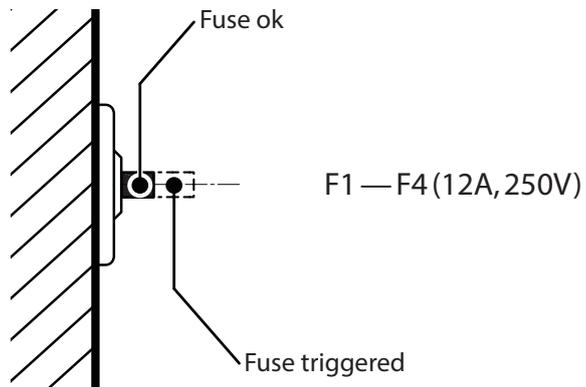
E14	'LEVEL2'messageappears.	Filling level reached.	<ul style="list-style-type: none"> • Emptyreceivingvessel2andpress the“Aerate”button to confirm the error message. • Check cable and plug of the flow sensor. • Exchangesensorifdefectiveorrunevaporation with user controlled filling level. <p>Call service if problem is persistent.</p>
E26	Heating bath icon flashes.	Bath temp. sensor shortcut.	<ul style="list-style-type: none"> • Restart the unit. <p>Call service if problem is persistent.</p>
Error	Additionerrorindicatorondisplay	Possible cause	Remedy
E27	Condenser icon flashes.	Vapor temp. sensor shortcut.	<ul style="list-style-type: none"> • Switch off the unit. Check sensor cable and plug. • Exchangesensorifdefectiveorrunevaporation without vapor temp. display. <p>Call service if problem is persistent.</p>
E28	Condenser icon flashes.	Cooling water temp. sensor shortcut.	<ul style="list-style-type: none"> • Switch off the unit. Check sensor cable and plug. • Exchangesensorifdefectiveorrunevaporationwithoutcoolingmedium temp. display. <p>Call service if problem is persistent.</p>
E31	Heating bath icon flashes.	<ul style="list-style-type: none"> • Heating bath runs dry. • Mechanical safety switch activated. 	<ul style="list-style-type: none"> • Switchofftheunit.Lettheheating cool down. • Refill heating transfer medium at least to minimum level. • Reset overtemp. safety switch according to section 8.1. <p>Call service if problem is persistent.</p>
E32	Heating bath icon flashes.	<ul style="list-style-type: none"> • Heating bath runs dry. • Temperature >200 °C. 	<ul style="list-style-type: none"> • Switchofftheunit.Lettheheating bath cool down below 180 °C. • Refill transfer medium at least to minimum level. <p>Call service if problem is persistent.</p>

E33	Heating bath icon flashes.	<ul style="list-style-type: none"> Actual to set value difference is higher than 15 °C. Electronic malfunction. 	<ul style="list-style-type: none"> Press "Aerate" button to confirm the error message. Check set value for plausibility (e.g. set value below room temperature). If necessary, wait for the heating bath to cool down sufficiently. <p>Call service if problem is persistent.</p>
E40	n.a.	Voltage drop or power outage.	<ul style="list-style-type: none"> Press "Aerate" button to confirm the error message. Check mains connection for sufficient power performance. Alternatively: Install uninterruptible power supply. <p>Call service if problem is persistent.</p>
Error	Addition error indicator on display	Possible cause	Remedy
E41	n.a.	<ul style="list-style-type: none"> Load limit exceeded by external electrical consumers (30V). Electronic malfunction. 	<ul style="list-style-type: none"> Unplug external consumers (e.g. valves and sensors) step-by-step. Restart system in-between for causal research. Exchange defective consumer. <p>Call service if problem is persistent.</p>
E42	n.a.	<ul style="list-style-type: none"> Load limit exceeded by external electrical consumers (24V). Electronic malfunction. 	<ul style="list-style-type: none"> Unplug external consumers (e.g. valves and sensors) step-by-step. Restart system in-between for causal research. Exchange defective consumer. <p>Call service if problem is persistent.</p>
E43	n.a.	Electronic malfunction.	<ul style="list-style-type: none"> Restart the unit. <p>Call service if problem is persistent.</p>

Other error situations

In case the temperature reading at the display for vapor or cooling water is missing, check the respective sensor cable and plug. Exchange a defective sensor and call service if the problem is persistent.

8.3 Resettable automatic system fuses



Resetting a system fuse

- Switch off the Rotapavor®
- Push in the fuse for reset
- Switch on the Rotapavor®

NOTE

Device fuses may be triggered occasionally due to voltage peaks under high system load. When fuses trigger frequently, inform your customer service! Do not try to repair the fuses!

9 Shutdown, storage, transport and disposal

This chapter instructs how to shut down and disposal of the instrument. Information about storage and shipping conditions can also be found here.

9.1 Storage and transport

Switch off the instrument and remove the power cord. To disassemble the Rotavapor® follow the installation instructions in section 5 in reverse order. Remove all liquids and other residues before packaging the instrument.

NOTE

It is recommended to ship the instrument and its accessories in original packing to reduce the risk of possible transport damages.

	<p>! WARNING</p> <p>Death or serious poisoning by contact or incorporation of harmful substances.</p> <ul style="list-style-type: none"> • Wear safety goggles • Wear safety gloves • Wear a suitable protective mask • Wear a laboratory coat • Clean the instrument and all accessories thoroughly to remove possibly dangerous substances • Do not clean dusty parts with compressed air • Store the instrument and its accessories at a dry place in its original packaging
	<p>! CAUTION</p> <p>Risk of minor or moderate injury by heavy weight of the instrument.</p> <ul style="list-style-type: none"> • Consult a second person to transport the instrument • Do not drop the instrument • Place the instrument on a stable, even and vibration-free surface • Keep limbs out of crushing zone

9.2 Disposal

For instrument disposal in an environmentally friendly manner, a list of materials is given in chapter 3.3. This helps to ensure that the components can be separated and recycled correctly by a specialist for disposal.

For disposal of liquids and consumables such as heating transfer media, see supplementary data sheets of these chemicals!

You have to follow valid regional and local laws concerning disposal. For help, please contact your local authorities!

NOTE

When returning the instrument to the manufacturer for repair work, please copy and complete the health and safety clearance form on the following page and enclose it with the instrument.

9.2.1 Lead-acid battery

The battery contains lead and sulfuric-acid. Both materials are toxic and thus harmful to life forms (see hazardous material classification entry in material list, section 3.3). The battery must be removed and recycled or discarded according to local regulations!

   	<p>! WARNING</p>
	<p>Risk of death or serious injuries by explosion, toxication and corrosion.</p> <ul style="list-style-type: none"> • Do not damage the battery • Do not burn or overheat the battery • Do not dispose of the battery with unsorted household waste

Health and Safety Clearance

Declaration concerning safety, potential hazards and safe disposal of waste.

For the safety and health of our staff, laws and regulations regarding the handling of dangerous goods, occupational health and safety regulations, safety at work laws and regulations regarding safe disposal of waste, e.g. chemical waste, chemical residue or solvent, require that this form must be duly completed and signed when equipment or defective parts were delivered to our premises.

Instruments or parts will not be accepted if this declaration is not present.

Equipment

Model:

Part/Instrument no.:

1.A Declaration for non dangerous goods

We assure that the returned equipment

- has not been used in the laboratory and is new
- was not in contact with toxic, corrosive, biologically active, explosive, radioactive or other dangerous matters.
- is free of contamination. The solvents or residues of pumped media have been drained.



1.B Declaration for dangerous goods

List of dangerous substances in contact with the equipment:

Chemical, substance	Danger classification

We assure for the returned equipment that

- all substances, toxic, corrosive, biologically active, explosive, radioactive or dangerous in any way which have pumped or been in contact with the equipment are listed above.
- the equipment has been cleaned, decontaminated, sterilized inside and outside and all inlet and outlet ports of the equipment have been sealed.

2. Final Declaration

We hereby declare that

- we know all about the substances which have been in contact with the equipment and all questions have been answered correctly
- we have taken all measures to prevent any potential risks with the delivered equipment.

Company name or stamp: _____

Place, date: _____

Name (print), job title (print): _____

Signature: _____

10 Spare parts

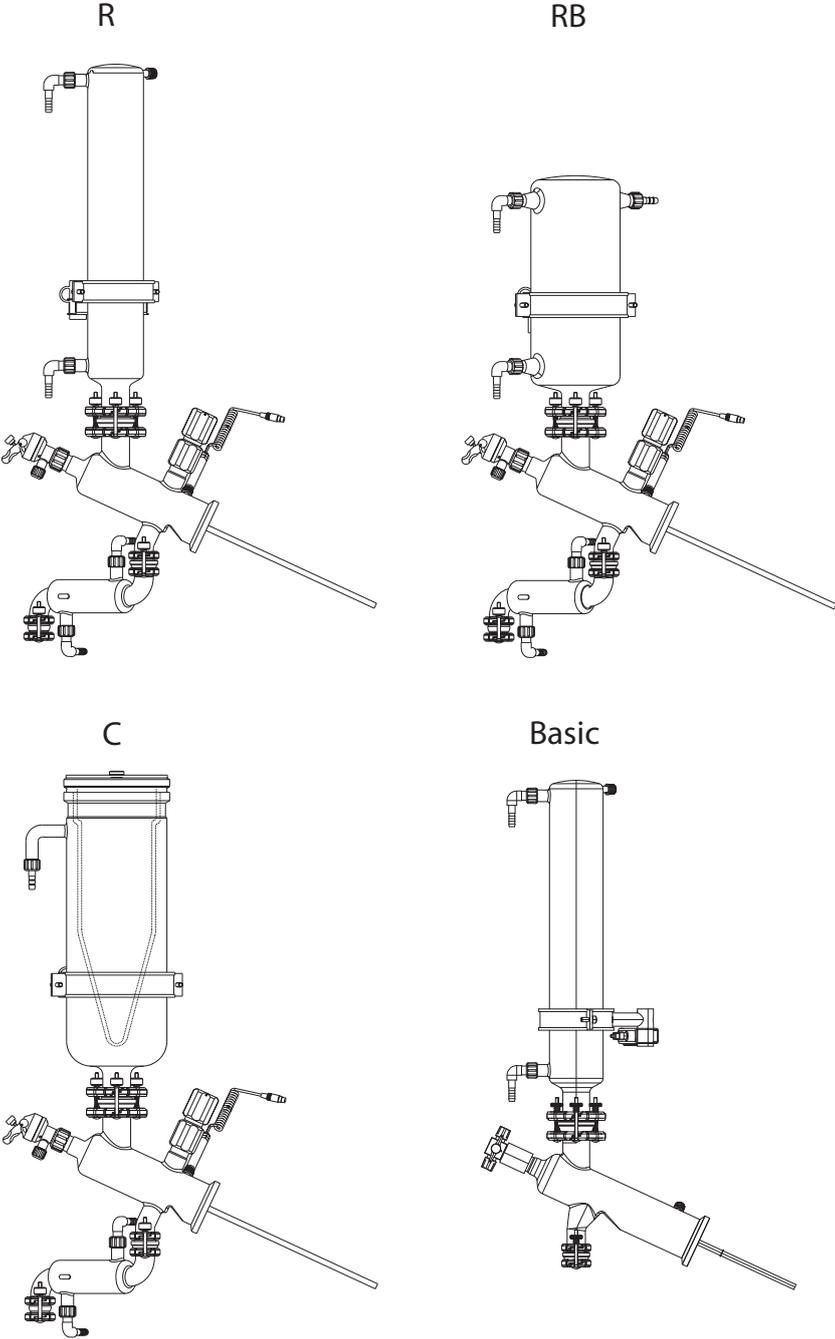
This chapter lists spare parts, accessories and options including their ordering information.

Only order spare parts and consumables from BUCHI to maintain the warranty status and to assure best performance and reliability of the system and affected components. Any modifications to the spare parts used are only allowed with the prior written permission of the manufacturer.

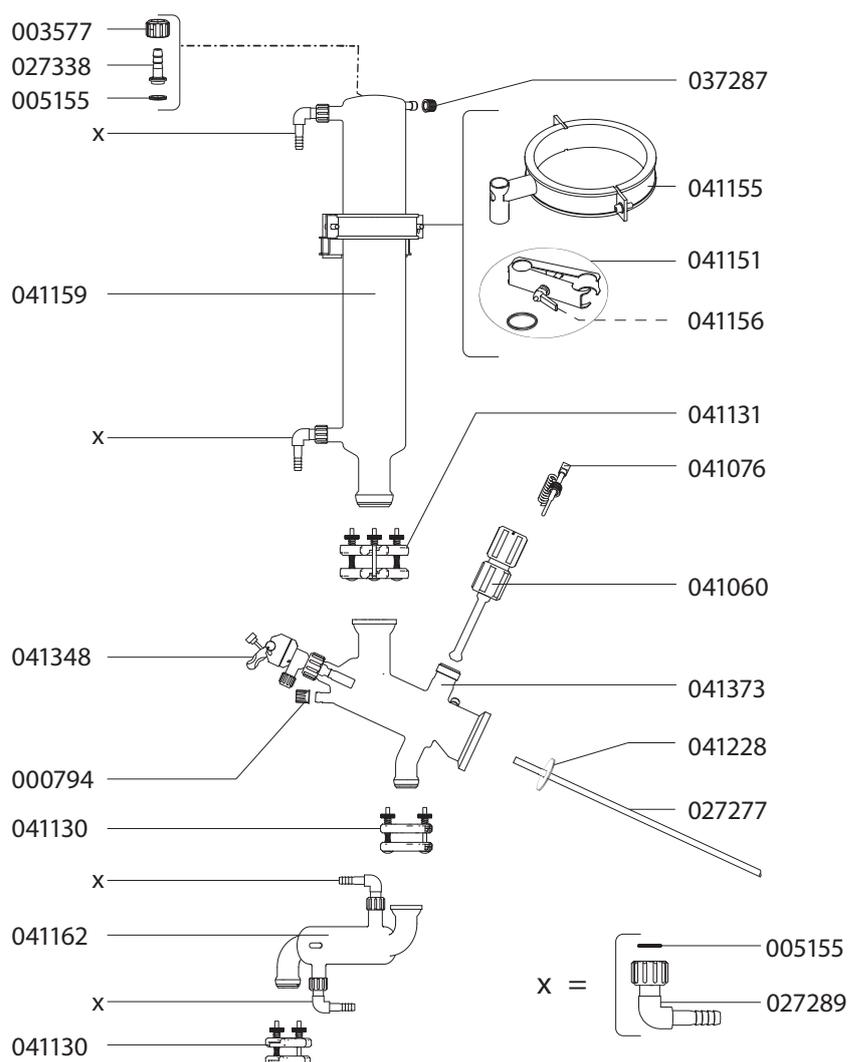
Always state the product designation, instrument serial and part numbers for warranty clearance when ordering spare parts!

10.1 Reflux glass configurations

Reflux configurations are available with three different types of coolers attached to a common base of distribution piece and condensate cooler.



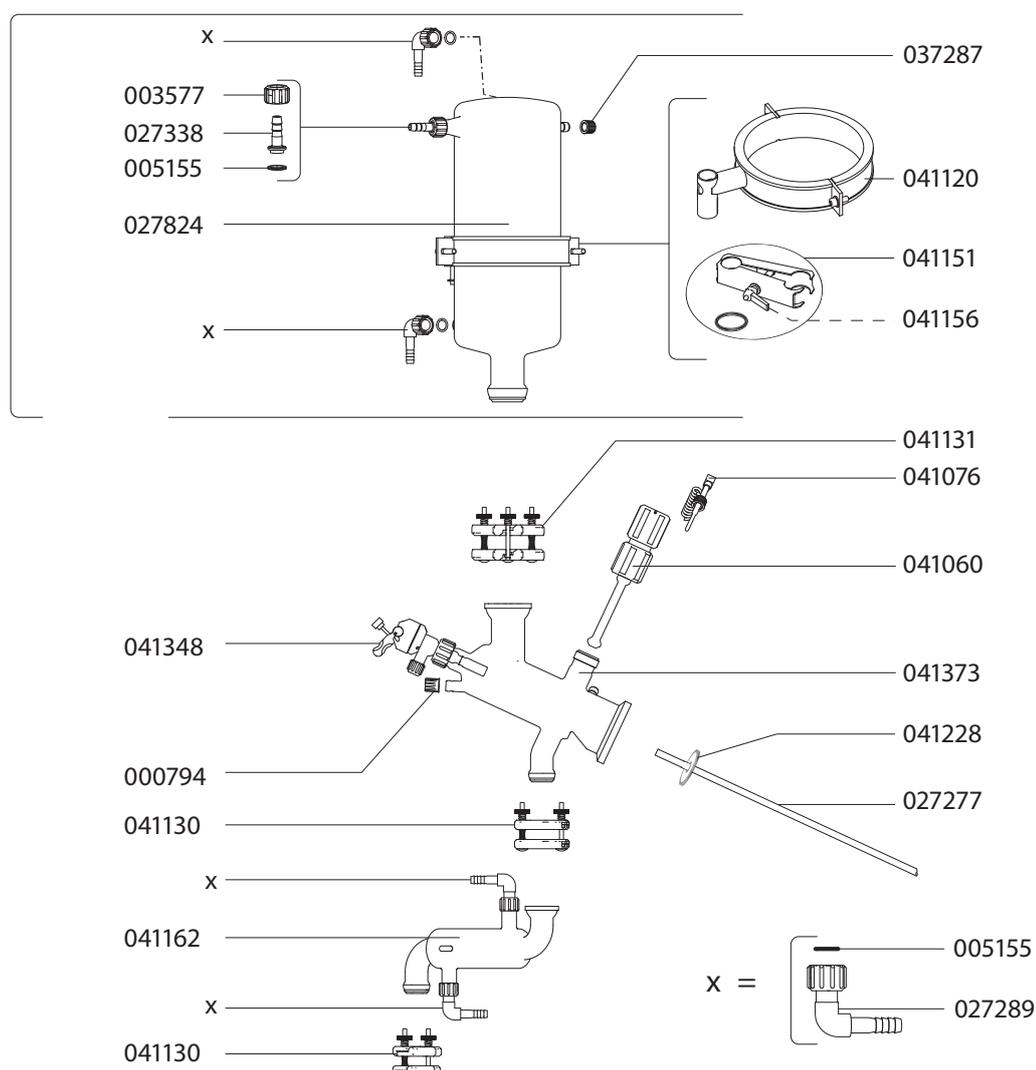
10.1.1 'R' configuration



List of articles

Order no.	Part name	Order no.	Part name
000794	Screw cap SVL 15	041131	EasyClamp DN 40, cpl.
003577	Screw cap SVL 22	041151	Pivoting clamp, cpl.
005155	O-ring	041155	Glass holder, cpl.
027277	PTFE hose, outer diam. 10.0x1.0	041156	Clamping lever
027289	Fitting SVL 22	041159	Cooler, 3-coil, closed Plg
027338	Hose nipple SVL 22	041162	Condensate cooler
037287	Hose nipple GL 14 (set of 4)	041228	Set PTFE-disks (set of 10)
041060	Shut-off tap, large, cpl.	041348	Inlet valve, cpl.
041076	Temperature sensor B, cpl.	041373	Distribution piece "R"
041130	EasyClamp DN 25, cpl.		

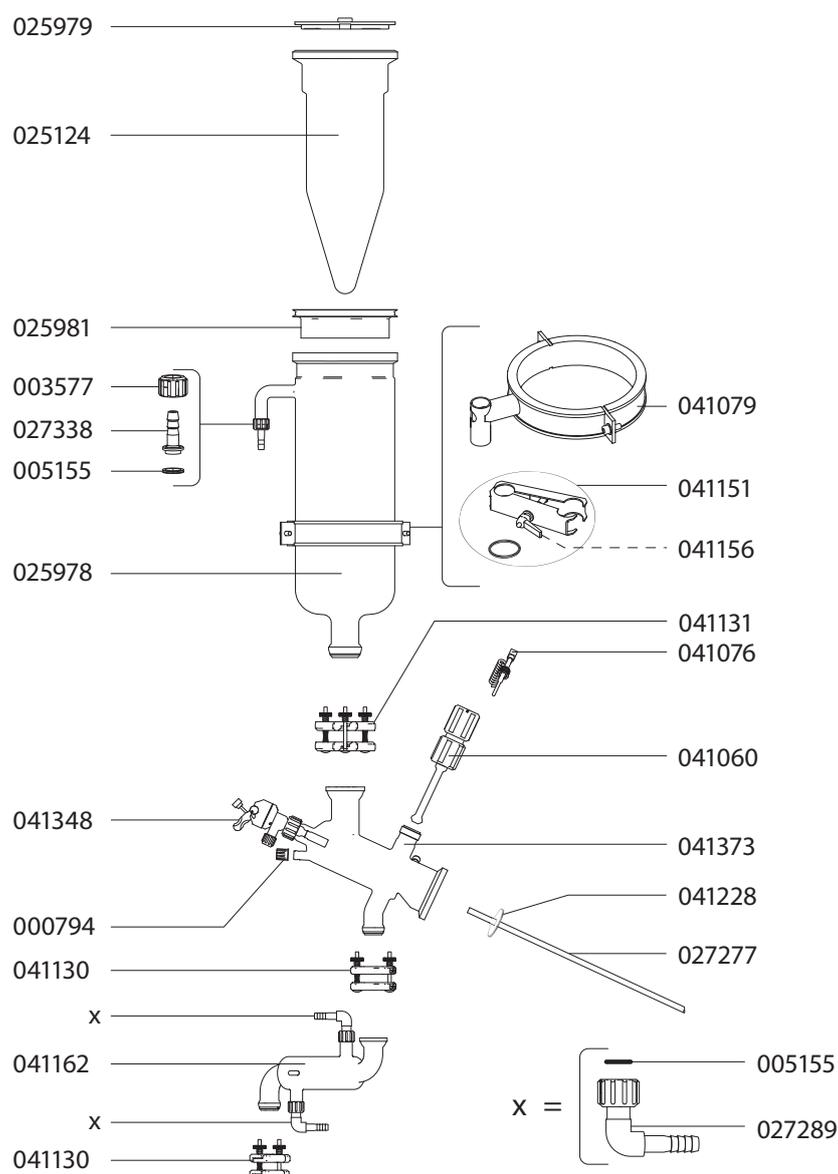
10.1.2 'RB' configuration



List of articles

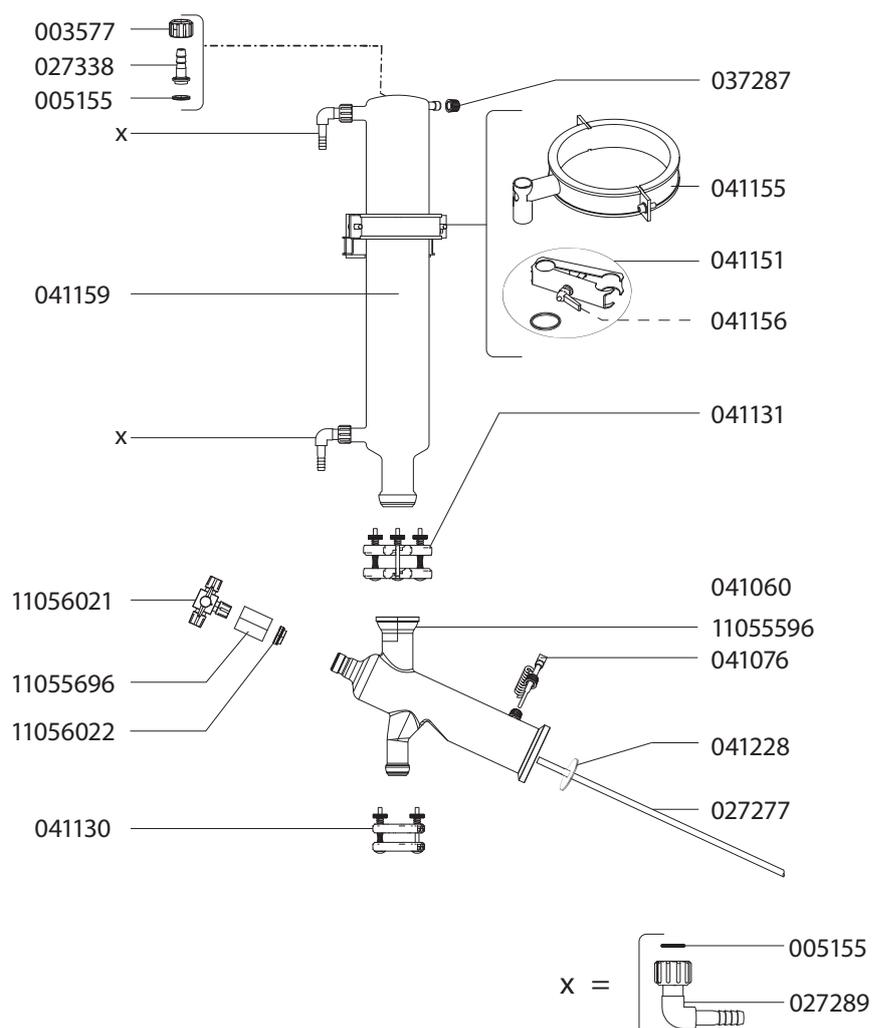
Order no.	Part name	Order no.	Part name
000794	Screw cap SVL 15	041120	Glass holder Bullfrog
003577	Screw cap SVL 22	041130	EasyClamp DN 25, cpl.
005155	O-ring	041131	EasyClamp DN 40, cpl.
027277	PTFE hose, outer diam. 10.0x1.0	041151	Pivoting clamp, cpl.
027289	Fitting SVL 22	041156	Clamping lever
027338	Hose nipple SVL 22	041162	Condensate cooler
027824	Bullfrog condenser	041228	Set PTFE-disks (set of 10)
037287	Hose nippel GL 14 cpl. (set of 4)	041348	Inlet valve, cpl.
041060	Shut-off tap, large, cpl.	041373	Distribution piece "R"
041076	Temperature sensor B, cpl.		

10.1.3 'C' configuration



List of articles			
Order no.	Part name	Order no.	Part name
000794	Screw cap SVL 15	041060	Shut-off tap, large, cpl.
003577	Screw cap SVL 22	041076	Temperature sensor B, cpl.
005155	O-ring	041079	Holder cold trap, cpl.
025124	Cold finger R-152	041130	EasyClamp DN 25, cpl.
025978	Cold trap	041131	EasyClamp DN 40, cpl.
025979	Cover R-152/R-220	041151	Pivoting clamp, cpl.
025981	Gasket cpl. R-152	041156	Clamping lever
027277	PTFE hose, outer diam. 10.0x1.0	041162	Condensate cooler
027289	Fitting SVL 22	041228	Set PTFE-disks (set of 10)
027338	Hose nipple SVL 22	041348	Inlet valve cpl.
037287	Hose nippel GL 14 cpl. (set of 4)	041373	Distribution piece "R"

10.1.4 'BASIC' configuration

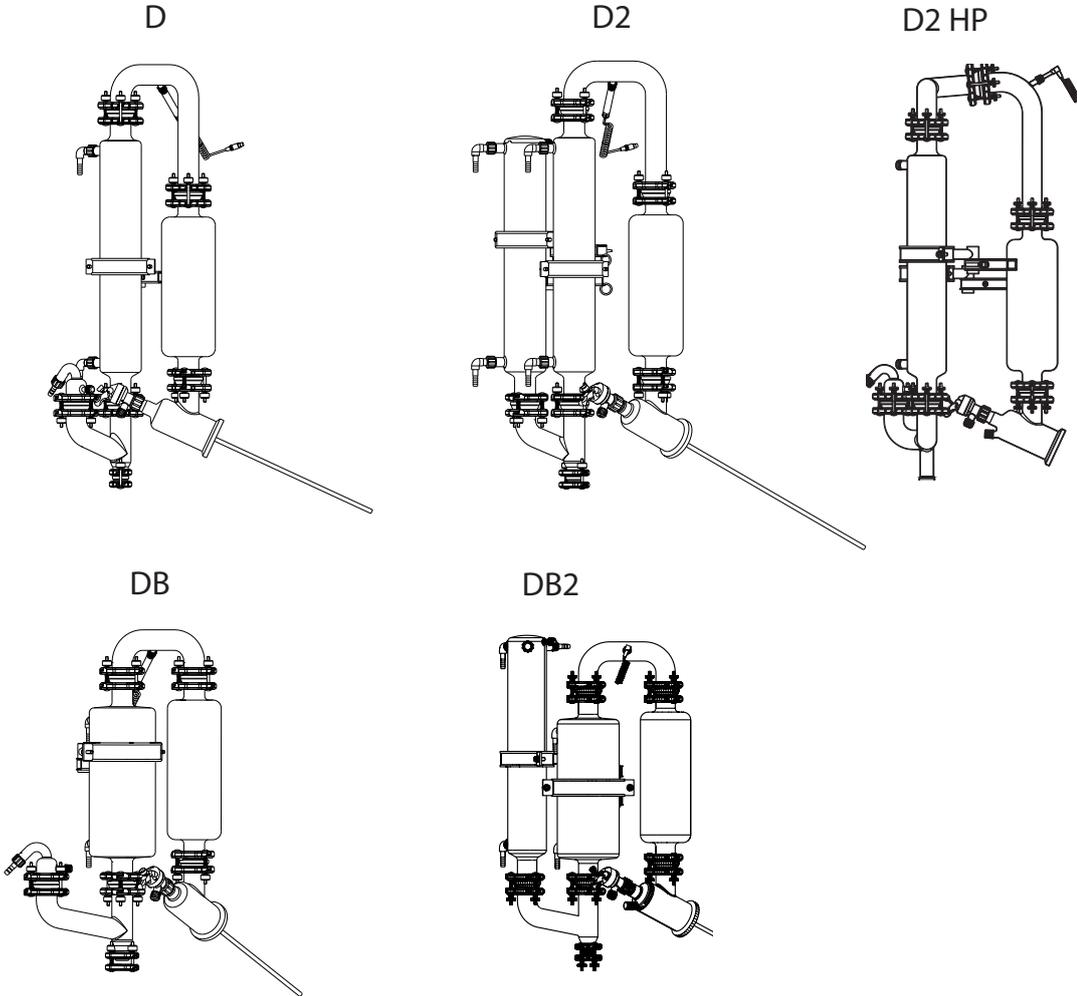


List of articles

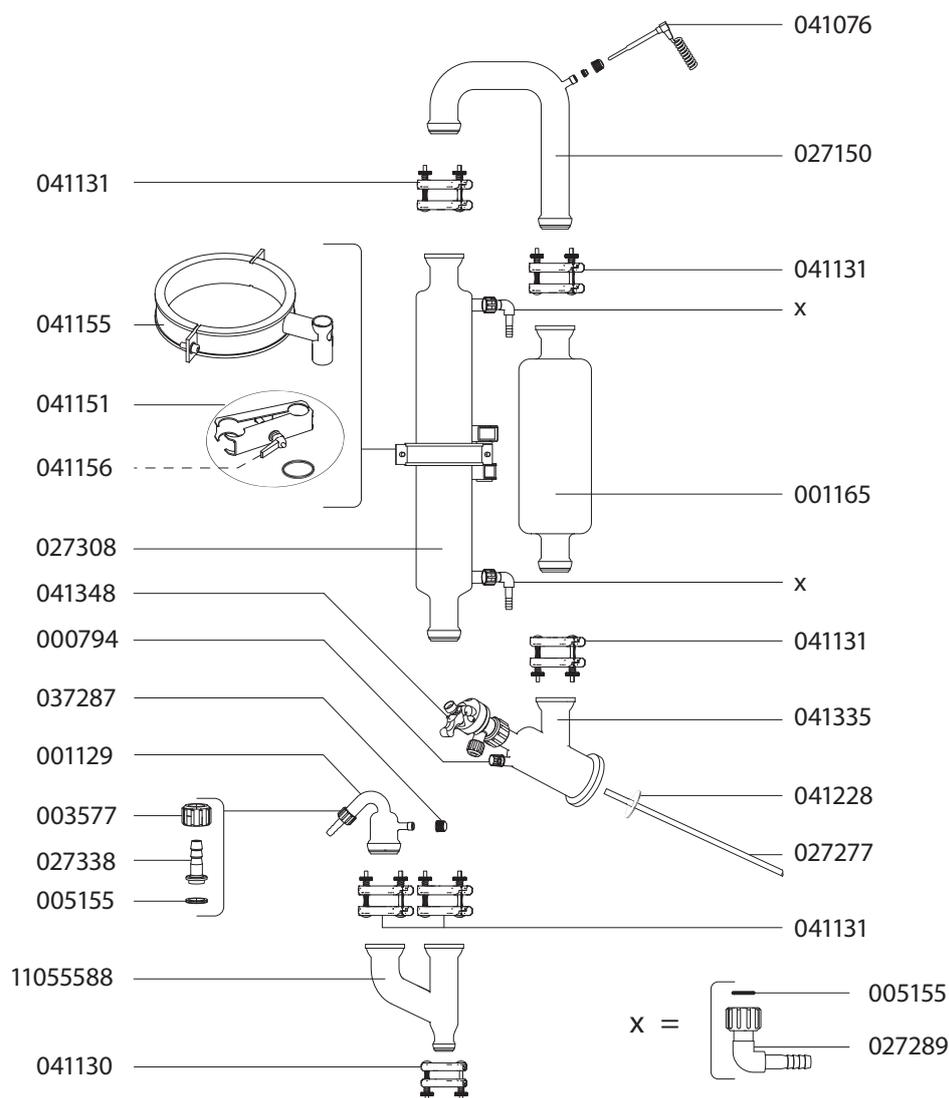
Order no.	Part name	Order no.	Part name
000794	Screw cap SVL 15	041131	EasyClamp DN 40, cpl.
003577	Screw cap SVL 22	041151	Pivoting clamp, cpl.
005155	O-ring	041155	Glass holder, cpl.
027277	PTFE hose, outer diam. 10.0x1.0	041156	Clamping lever
027289	Fitting SVL 22	041159	Cooler, 3-coil, closed Plg
027338	Hose nipple SVL 22	041228	Set PTFE-disks (set of 10)
037287	Hose nipple GL 14 (set of 4)	11055596	Distribution piece reflux "V PLG"
041060	Shut-off tap, large, cpl.	11055696	Cover SVL30
041076	Temperature sensor B, cpl.	11056021	3-way PTFE valve, cpl.
041130	EasyClamp DN 25, cpl.	11056022	SVL-Sealing

10.2 Decending glass configurations

Decending configurations are available with five different types of cooler setups attached to a common base of distribution piece and y-piece.

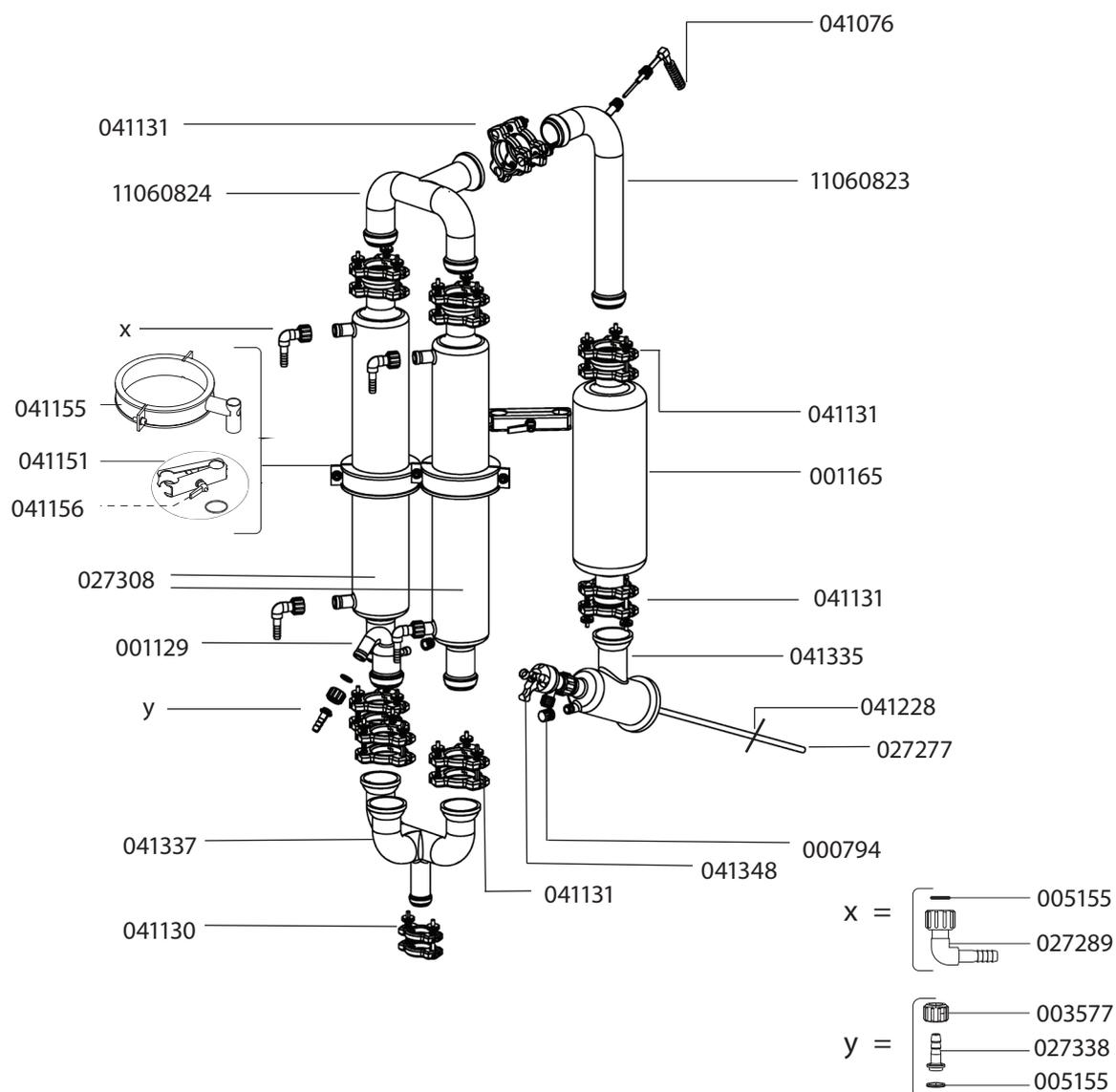


10.2.1 'D' configuration



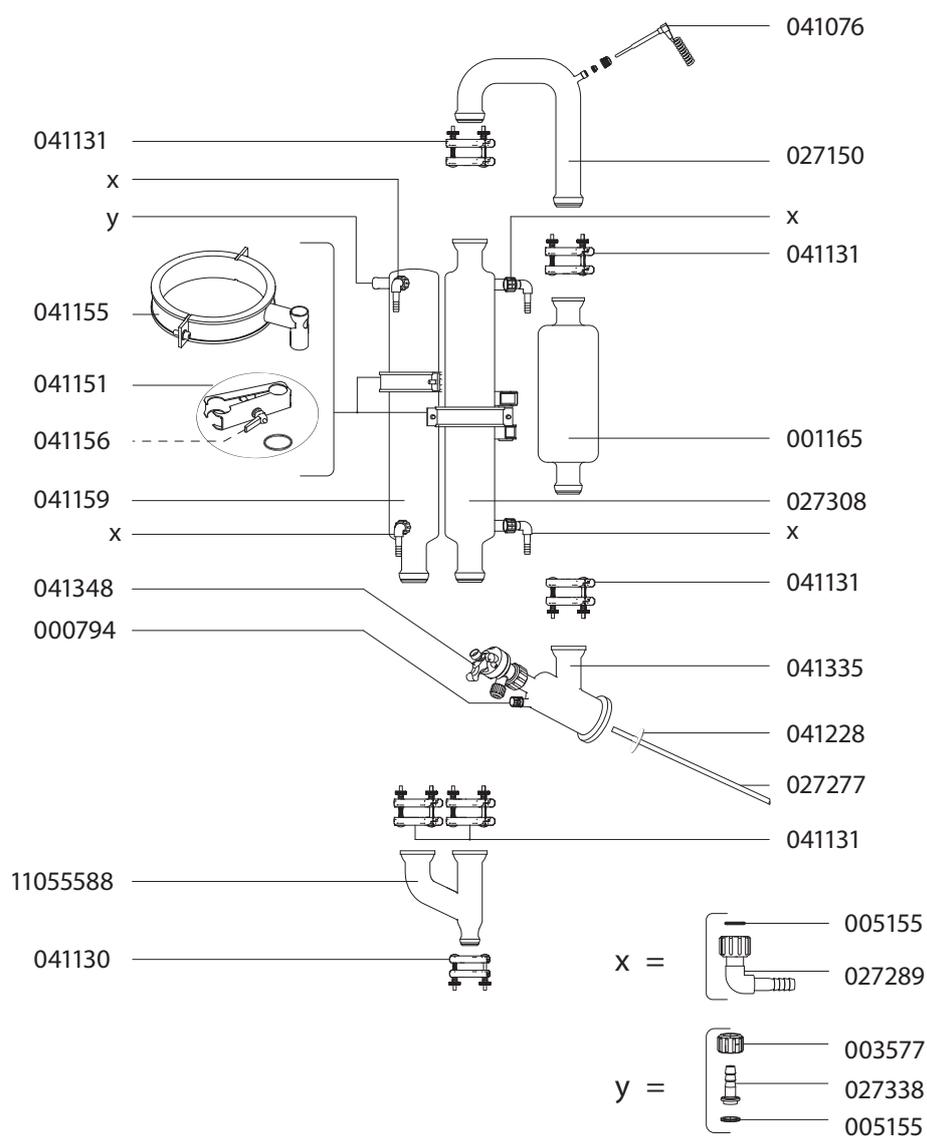
List of articles			
Order no.	Part name	Order no.	Part name
000794	Screw cap SVL 15	037287	Hose nipple GL 14 cpl. (set of 4)
001129	Vacuum-connection	041076	Temperature sensor B, cpl.
001165	Expansion vessel	041130	EasyClamp DN 25, cpl.
1105588	Y-connection receiver	041131	EasyClamp DN 40, cpl.
003577	Screw cap SVL 22	041151	Pivoting clamp, cpl.
005155	O-ring	041155	Glass holder, cpl.
027150	U-tube	041156	Clamping lever
027277	PTFE hose, outer diam. 10.0x1.0	041228	Set PTFE-disks (set of 10)
027289	Fitting SVL 22	041348	Inlet valve, cpl.
027308	3-spiral condenser	041335	Distribution piece descending
027338	Hose nipple SVL 22		

10.2.2 'D2 HP' configuration



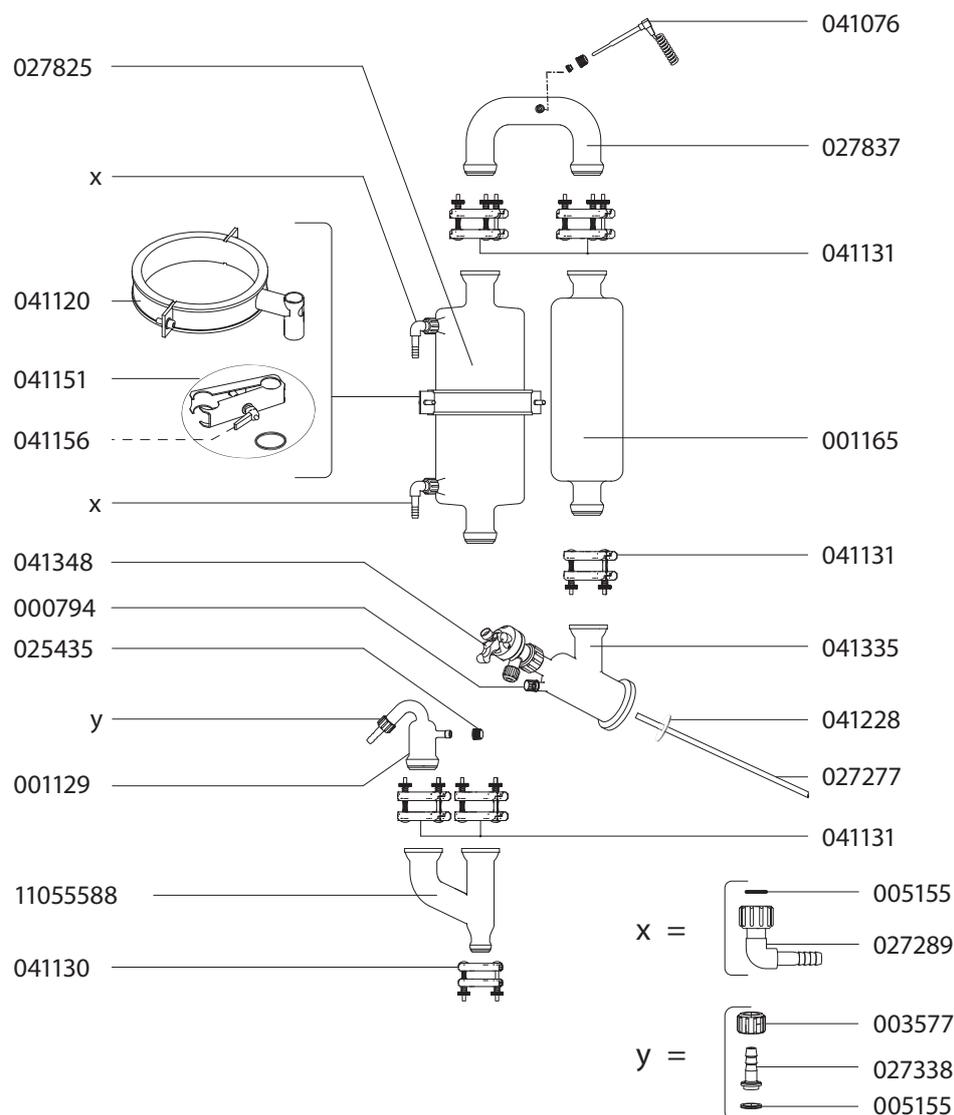
Artikelliste			
Bestell-Nr.	Bezeichnung	Bestell-Nr.	Bezeichnung
000794	Screw cap SVL15	041131	Easy Clamp DN40, cpl.
001129	Vacuum connection	041151	Pivoting clamp, cpl.
001165	Expansion vessel	041155	Glass holder, cpl.
003577	Screw cap SVL22	041156	Clamping lever
005155	O-ring	041228	Set PTFE disks (set of 10)
027277	PTFE hose, outer diam. 10,0x1,0	041335	Distribution piece descending
027289	Fitting SVL22	041337	Frame 3xDN40, 1xDN25
027308	3-spiral condenser	041348	Inlet valve, cpl.
027338	Hose nipple SVL22	11060823	Rising tube DN40 P+G
041076	Temperature sensor B, cpl.	11060824	Frame DN40 P+G
041130	EasyClamp DN25, kpl.		

10.2.3 'D2' configuration



List of articles			
Order no.	Part name	Order no.	Part name
000794	Screw cap SVL 15	041076	Temperature sensor B, cpl.
001165	Expansion vessel	041130	EasyClamp DN 25, cpl.
1105588	Y-connection receiver	041131	EasyClamp DN 40, cpl.
003577	Screw cap SVL 22	041151	Pivoting clamp, cpl.
005155	O-ring	041155	Glass holder, cpl.
027150	U-tube	041156	Clamping lever
027277	PTFE hose, outer diam. 10.0x1.0	041159	3-spiral condenser closed
027289	Fitting SVL 22	041228	Set PTFE-disks (set of 10)
027308	3-spiral condenser	041348	Inlet valve, cpl.
027338	Hose nipple SVL 22	041335	Distribution piece descending

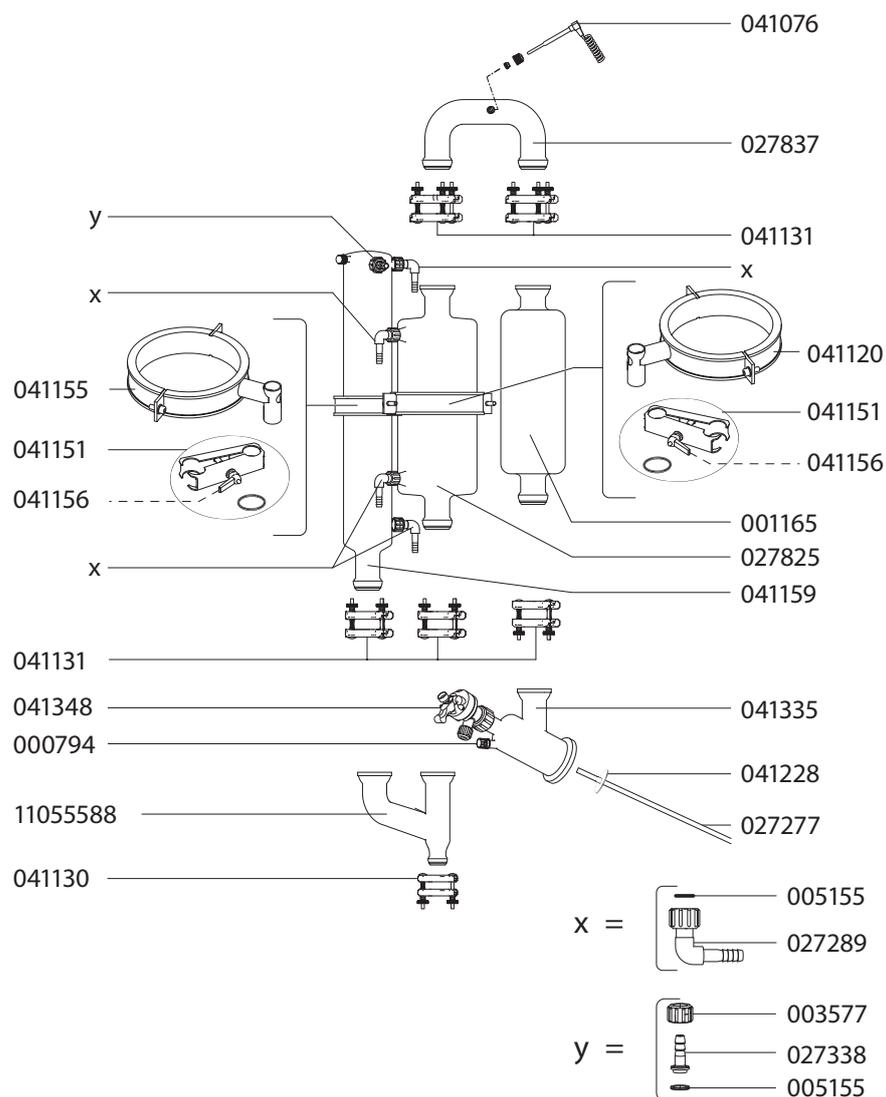
10.2.4 'DB' configuration



List of articles

Order no.	Part name	Order no.	Part name
000794	Screw cap SVL 15	027837	U-tube to Bullfrog plg
001129	Vacuum-connection	041076	Temperature sensor B, cpl.
001165	Expansion vessel	041120	Glass holder Bullfrog, cpl.
1105588	Y-connection receiver	041130	EasyClamp DN 25 cpl.
003577	Screw cap SVL 22	041131	EasyClamp DN 40 cpl.
005155	O-ring	041151	Pivoting clamp, cpl.
025435	Screw cap GL 14	041156	Clamping lever
027277	PTFE hose, outer diam. 10.0x1.0	041228	Set PTFE-disks (set of 10)
027289	Fitting SVL 22	041335	Distribution piece descending
027338	Hose nipple SVL 22	041348	Inlet valve cpl.
027825	Bullfrog 2 plg		

10.2.5 'DB2' configuration

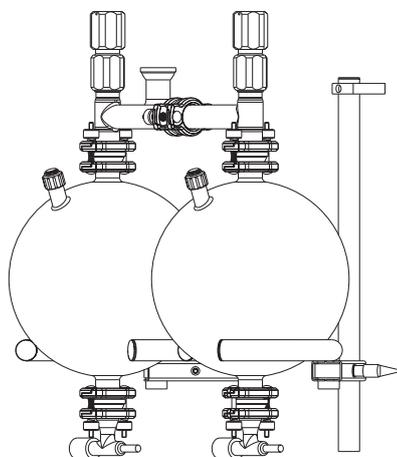


List of articles

Order no.	Part name	Order no.	Part name
000794	Screw cap SVL 15	041348	Inlet valve cpl.
027837	U-tube to Bullfrog plg	041120	Glass holder Bullfrog, cpl.
001165	Expansion vessel	041130	EasyClamp DN 25 cpl.
1105588	Y-connection receiver	041131	EasyClamp DN 40 cpl.
003577	Screw cap SVL 22	041151	Pivoting clamp, cpl.
005155	O-ring	041155	Glass holder, cpl.
027277	PTFE hose, outer diam. 10.0x1.0	041156	Clamping lever
027289	Fitting SVL 22	041159	3-spiral condenser closed
027338	Hose nipple SVL 22	041228	Set PTFE-disks (set of 10)
027825	Bullfrog 2 plg	041335	Distribution piece descending
041076	Temperature sensor B, cpl.		

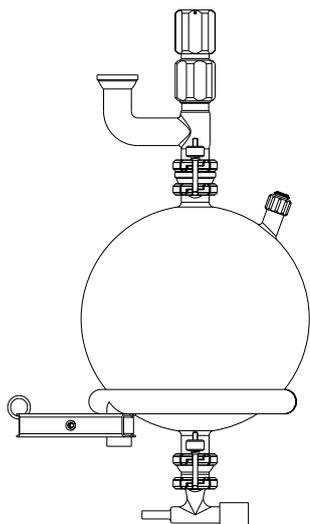
10.3 Receiving vessel parts

Interchangeable receiver (double)



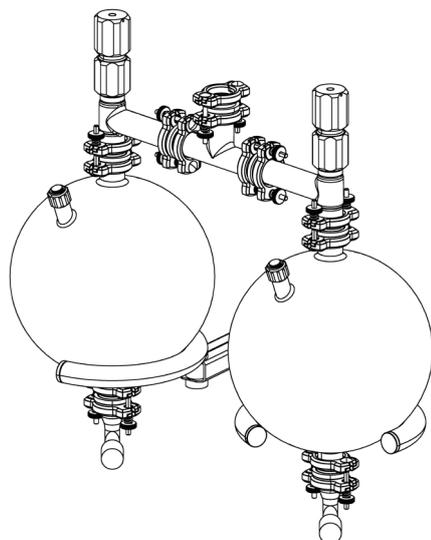
Part name	Order no.
Receiving flask 10 l plg	037569
Branching piece 1 plg	041048
Branching piece 2 plg for configuration R, RB and C	11055585
Branching piece 2 plg for configuration D, D2, DB and DB2	041049
Outlet valve, DN 25/2	041061
Shut-off tap, small, cpl.	041062
EasyClamp, DN 25	041130
Pivoting clamp, cpl.	041151
Base for flask	041252
Ventilation cap	046574

Interchangeable receiver



Part name	Order no.
Receiving flask 10 l plg	037569
Branching piece plg	041053
Outlet valve, DN 25/2	041061
Shut-off tap, small, cpl.	041062
EasyClamp, DN 25	041130
Pivoting clamp, cpl.	041151
Base for flask	041252
Ventilation cap	046574

Interchangeable receiver D2 HP



Part name	Order no.
Receiving flask 10 l plg	037569
Branching piece plg	041048
Outlet valve, DN25/2	041061
Shut-off tap, small, cpl.	041062
EasyClamp, DN25	041130
Pivoting clamp, cpl.	041151
Base for flask	041252
T-piece DN25	041445
Ventilation cap	046574

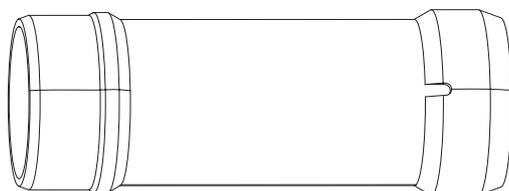
10.4 Miscellaneous parts



Part name	Order no.
Nylflex tubing, PVC, Ø 8.0 / 14 mm (per m)	004113
Syntheticrubbertubing, Ø9.5/16mm (per m)	11065051
Syntheticrubbertubing, Ø6.5/16mm (per m)	11063244
PVC tubing, Ø 10 / 14 mm (per m)	027146
PTFE tubing, Ø 10 / 12 mm (per m)	027277



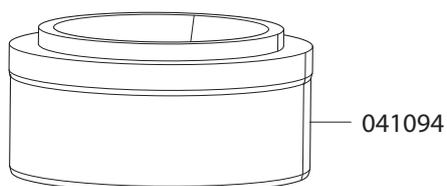
Seal tool	020075
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Vapor duct	041084
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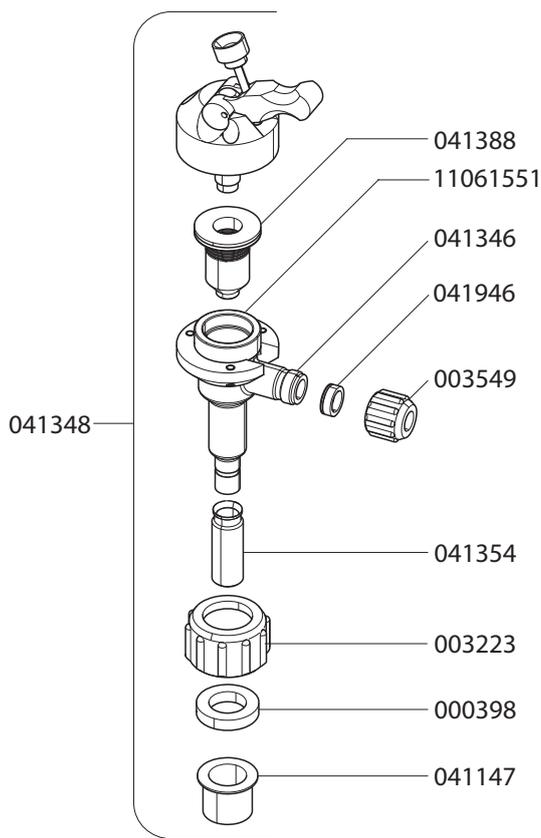
Set of distribution head seals (5 pcs.)	041231
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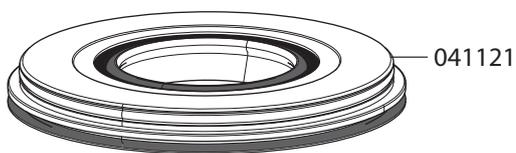
Seal holder	041094
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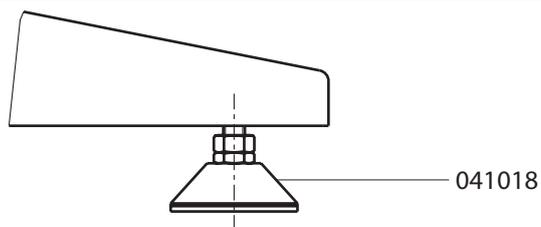
Vacuum seal	041095
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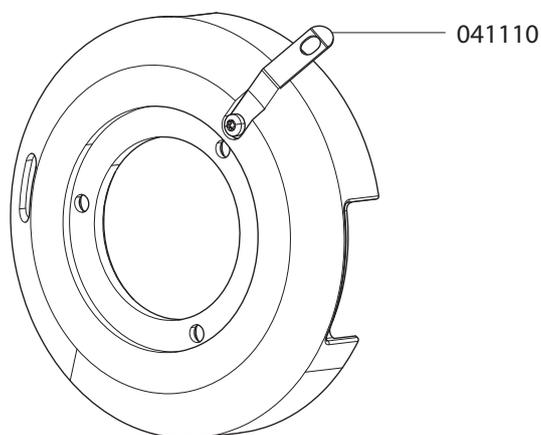
Inlet valve, cpl.	041348
PTFE bellow	041388
Glass body	041346
Set of 5 SVL 15 seals	041946
Screw cap SVL 15	003549
Connetion, PTFE	041354
Screw cap SVL 30	003223
Seal SVL 30x18	000398
Support ring inlet valve	041147
Flange ring	11061551



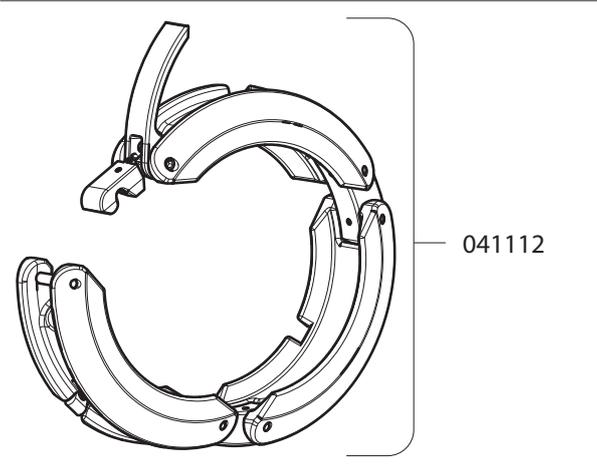
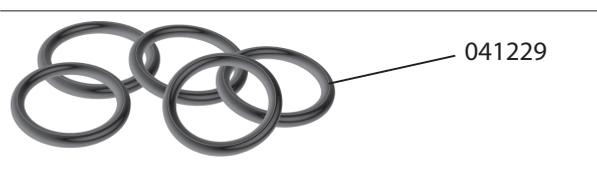
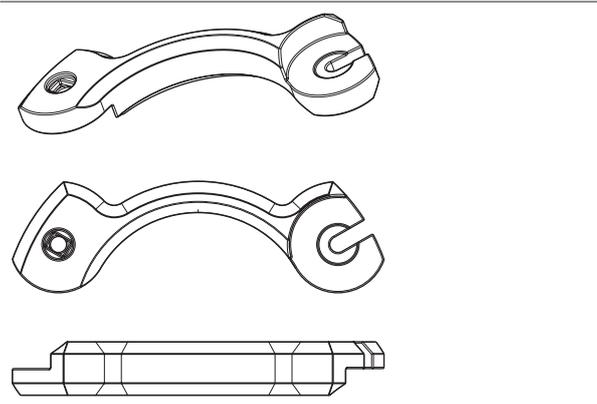
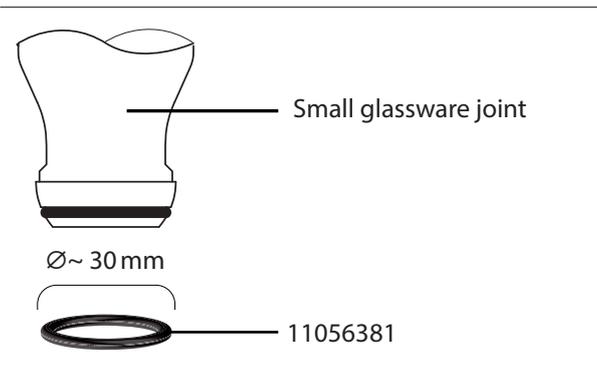
Evaporating flask seal, cpl.	041121
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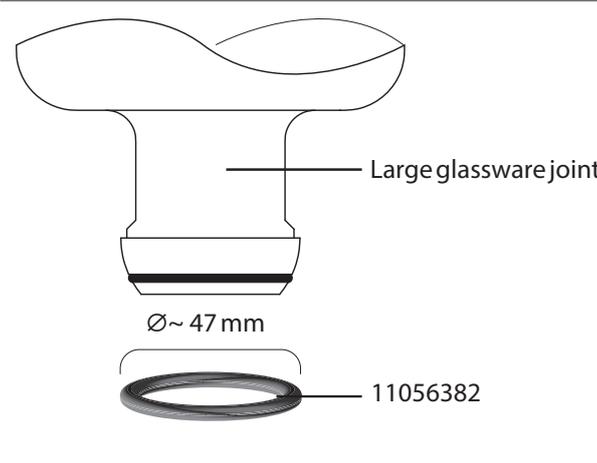
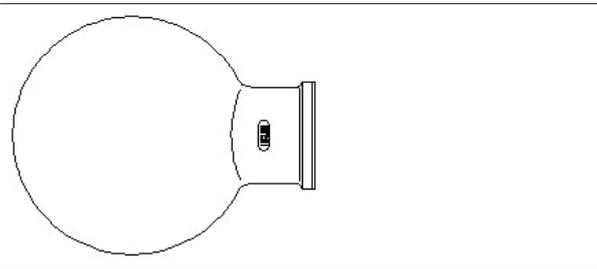
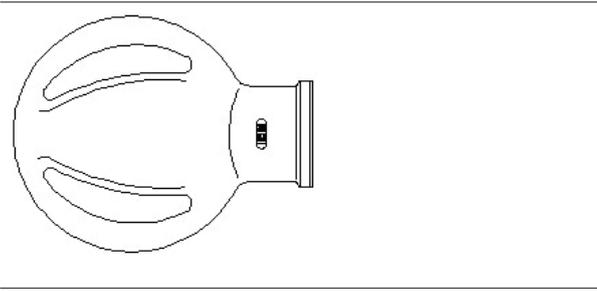


Part name	Order no.
Adjustable machine leg	041018



Metal reed (at gearbox flange)	041110
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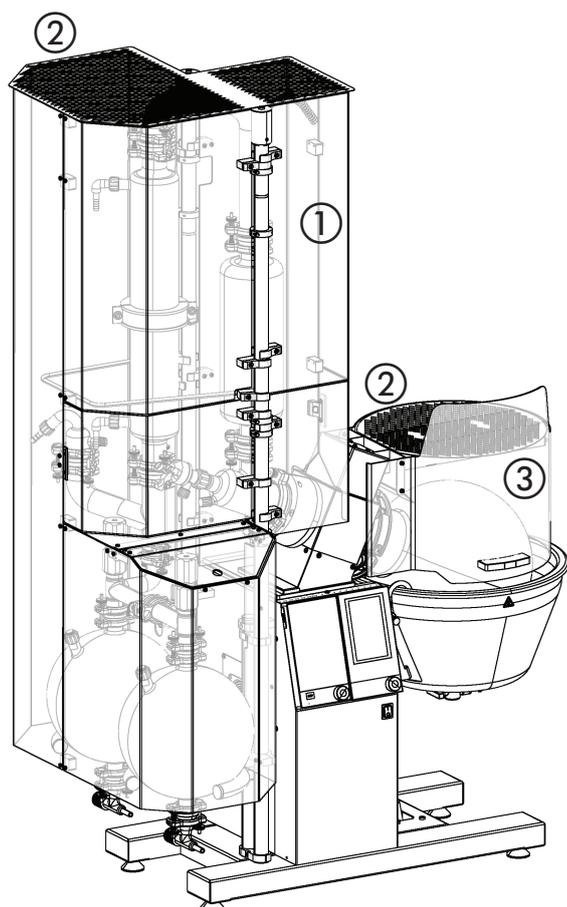
	<p>Snap flange coupling, cpl. 041112</p>
	<p>Set of 5x O-ring 64 x 5.0 041229</p>
	<p>EasyClamp element, DN 70 041135</p>
	<p>PTFE coated silicone gasket for DN 25 (set of 5) 11056381</p>

 <p>Large glassware joint</p> <p>Ø~47 mm</p> <p>11056382</p>	<p>PTFE coated silicone gasket for DN40 (set of 5)</p> <p>11056382</p>
	<p>6 L evaporating flask 027470</p> <p>10 L evaporating flask 027469</p> <p>20 L evaporating flask 027468</p> <p>10 L evaporating flask, amber 11069604</p> <p>20 L evaporating flask, amber 11069605</p>
	<p>This special flask is particularly suited for drying powdery substances or a homogeneous mixture of solid products. The baffles attached on the circumference of the flask ensure an intensive circulation of the contents inside the flask.</p> <p>10 L drying flask 028592</p> <p>20 L drying flask 028593</p>
	<p>Cover for evaporating flask, PE 11057349</p>

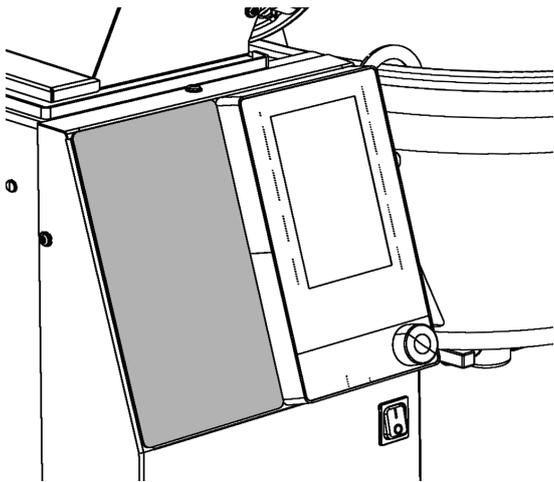
10.5 Optional equipment and upgrade parts

For more information about the following parts go to www.buchi.com or contact your local BUCHI representative.

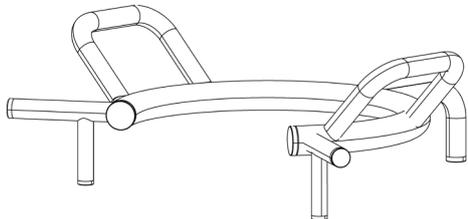
Optional parts



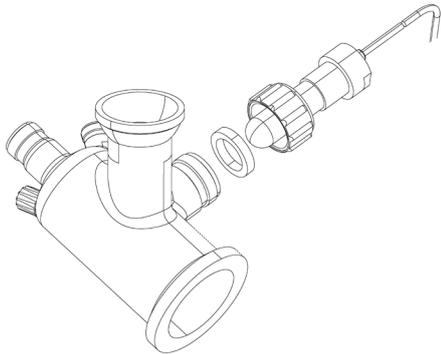
Part name	Order no.
Safety shield for D, D2, R and C for single receiving flask ①	11055796
Safety shield D, D2, R and C for dual receiving flask ①	11055797
Safety shield DB, DB2, RB for single receiving flask ①	11055798
Safety shield DB, DB2, RB for double receiving flask ①	11055799
Protective grid cpl. ② Protects the glass assembly and the bath against falling objects (only in conjunction with corresponding safety shield)	11056081
Bath shield cpl. ③	11055364
Trolley	041257



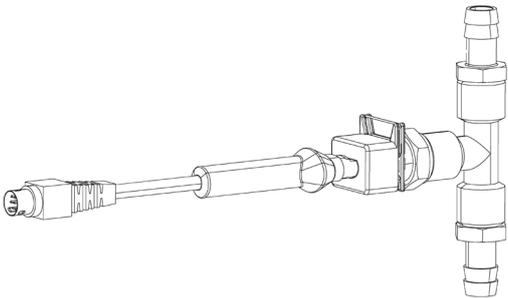
Blind cover for Interface I-300 Pro 11064152



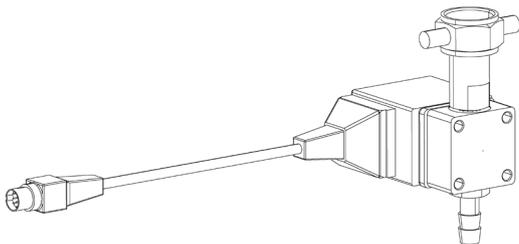
Manual flask handler 041400



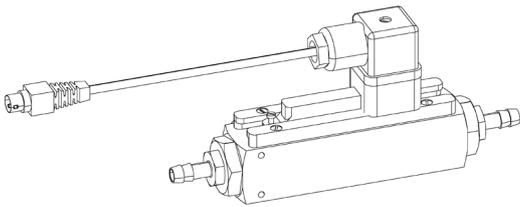
Foam detector 11056083



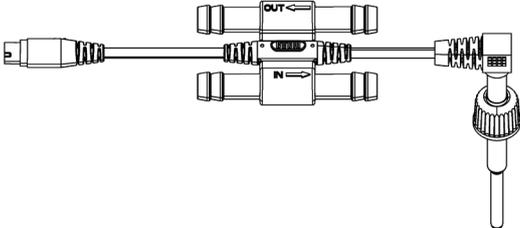
Cooling water temp. sensor 11055988



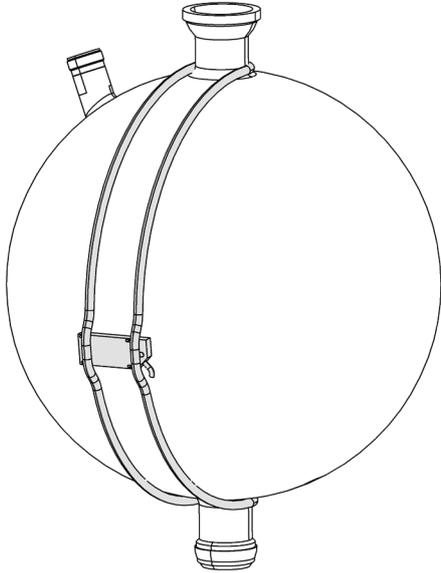
Cooling water valve 041191



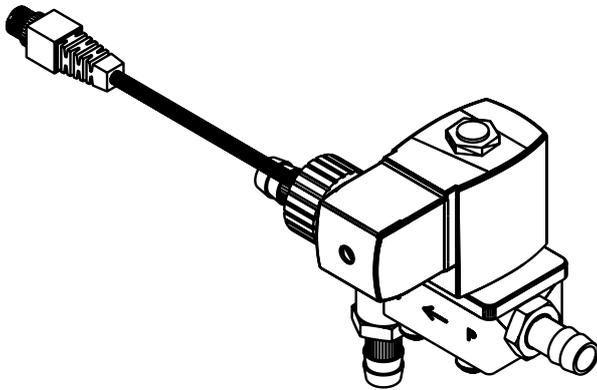
Cooling water flow sensor 11055971



Automatic sensor for R-220 Pro 11064486



Level sensor (pluggable) 11056192



Aeration valve 11055929

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