



Scrubber K-415

Operation Manual

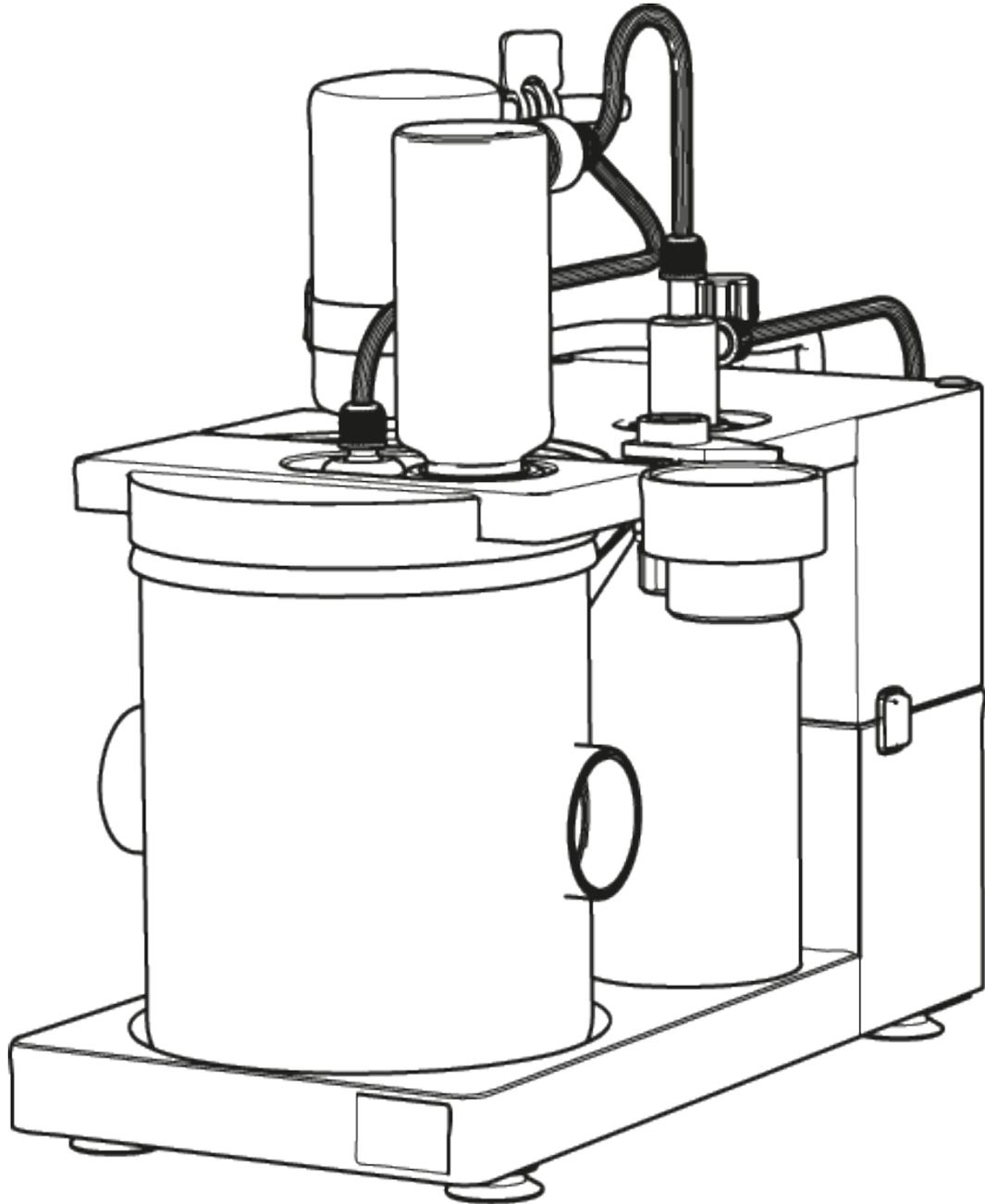


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Read this manual carefully before installing and running your system and note the safety precautions in chapter 2 in particular. Store the manual in the immediate vicinity of the instrument, so that it can be consulted at any time.

No technical modifications may be made to the instrument without the prior written agreement of BUCHI. Unauthorized modifications may affect the system safety or result in accidents.

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The English manual is the original language version and serves as basis for all translations into other languages. Other language versions can be downloaded at www.buchi.com.

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1 About this manual

This manual describes the Scrubber and provides all information required for its safe operation and to maintain it in good working order.

It is addressed to laboratory personnel in particular.

NOTE

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

1.1 Reference documents

For information on the digestion instrument, please refer to the corresponding manuals available in English, German, French, Italian and Spanish

- Digest System K-437, Operation Manual numbers 96760 - 96764
- Digest Automat K-438/432, Operation Manual numbers 96765 - 96769
- SpeedDigester K-425/K-436, Operation Manual numbers 11593346 - 15593350
- SpeedDigester K-439, Operation Manual numbers 15593351 - 15593355
- WetDigester B-440, Operation Manual numbers 096790 - 096794
- Kjeldigester K-446/K-449, Operation Manual numbers 11593546 - 11593552, 11593643

1.2 Abbreviations

CR: Chloroprene Rubber
EPDM: Ethylene Propylene Dimonomer
FEP: Fluorinated Ethylene Propylene
FPM: Fluoroelastomer
pa: per analysis
PA: Polyamides
PMMA: Polymethylmethacrylate
POM: Polyoxymethylene
PP: Polypropylene
PPS: Polyphenylenesulfide
PTFE: Polytetrafluoroethylene
PUR: Polyurethanes
P+G: Plastic & Glass
PA12: Polyamide 12

2 Safety

This chapter points out the safety concept of the instrument and contains general rules of behavior and warnings from hazards concerning the use of the product.

The safety of users and personnel can only be ensured if these safety instructions and the safety-related warnings in the individual chapters are 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 or professional experience have an overview of the dangers which can develop when operating the instrument.

Personnel without this training or persons who are currently being trained require careful instruction. The present Operation Manual serves as the basis for this.

2.2 Proper use

The instrument has been designed and built for laboratories. It serves for the neutralization and adsorption of gases that arise during chemical reactions and syntheses.

Only gases with known chemical composition may be drawn off.

2.3 Improper use

Applications not mentioned above are improper. Also, applications, which do not comply with the technical data, are considered improper. In particular no gases with unknown chemical composition may be drawn off.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

The operator bears the sole risk for any damages caused by such improper use.

The following uses are expressly forbidden:

- Use of the instrument in rooms which require ex-protected instruments.
- Use on samples, which can explode or inflame (example: explosives, etc.) due to shock, friction, heat or spark formation.
- Use in overpressure situations.
- Drawing off liquids.
- Drawing off solvents.
- Drawing off vapors of organic solvents.
- Use for cleaning of room air.

2.4 Safety warnings and safety signs 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 table below 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 example below).

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

Symbol	Meaning
	General warning
	Electrical hazard
	Harmful to life-forms
	Inhalation of substances

Symbol	Meaning
	Heavy weight, avoid overexertion
	Chemical burns by corrosives
	Fragile components
	Explosive gases, explosive environment
	Device damage
	Wear laboratory coat
	Wear protective goggles
	Wear protective gloves

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 following example).

NOTE

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

2.5 Product safety

The Scrubber K-415 has been designed and built in accordance with current state-of-the-art technology, at the time of development. Safety warnings in this manual (as described in section 2.4) serve to make the user alert to and 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

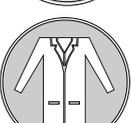
The following safety messages show hazards of general kind which may occur when handling the instrument. The user shall observe all listed counter measures in order to achieve and maintain the lowest possible level of hazard.

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

	<p>! DANGER</p> <p>Death or serious injuries by use in explosive environments.</p> <ul style="list-style-type: none"> • Do not store or operate the instrument in explosive environments • Remove all sources of flammable vapors • Do not store chemicals in the vicinity of the device
	<p>! CAUTION</p> <p>Risk of minor or moderate cuts by sharp edges.</p> <ul style="list-style-type: none"> • Do not touch defective or broken glassware with bare hands • Do not touch thin metal edges
	<p>NOTICE</p> <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 drop the instrument or its components • Keep external vibrations away from the instrument

2.5.2 Personal protective equipment

Always wear personal protective equipment such as protective eye goggles, protective clothing and gloves. The personal protective equipment must meet all requirements of all data sheets for the chemicals used. These instructions are an important part of the Scrubber K-415 and must be made available at all times to the operating personnel at the place where the equipment is deployed. This also applies to additional language versions of these instructions, which can be reordered separately.

   	! WARNING
<p>Serious chemical burns by corrosives.</p> <ul style="list-style-type: none"> • Observe all data sheets of the used chemicals • Handle corrosives in well ventilated environments only • Always wear protective goggles • Always wear protective gloves • Always wear protective clothes • Do not use damaged glassware 	

2.5.3 Built-in safety elements and measures

Neutralization vessel P+G coated

The protective P+G coating of the neutralization vessel protects operators from risks, caused by parts of broken glass.

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 or its accessories. Legal regulations, such as local, state and federal laws applying to the instrument or its accessories must be strictly followed.

Duty of maintenance and care

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

Spare parts to be used

Use only genuine consumables and spare parts for maintenance to assure good system performance, reliability and safety. Any modifications of spare parts or assemblies are only allowed with the prior written permission of the manufacturer.

Modifications

Modifications to the instrument are only permitted after prior consultation 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 specifications. It contains the scope of delivery, technical data, requirements and performance data.

3.1 Scope of delivery

Check the scope of delivery according to the order number.

NOTE

For detailed information on the listed products, see www.buchi.com or contact your local dealer.

3.1.1 DuoScrub



Table 3-1: DuoScrub K-415

Product	Order number
230 V / 50/60 Hz	114152320
120 V / 50/60 Hz	114151220
100 V / 50/60 Hz	114151020

3.1.2 TripleScrub



Table 3-2: TripleScrub K-415

Product	Order number
230 V / 50/60 Hz	114152330
120 V / 50/60 Hz	114151230
100 V / 50/60 Hz	114151030

Standard accessories

Silicone hose 6/9 3 m	048355
-----------------------	--------

3.1.3 TripleScrub^{ECO}



Table 3-3: TripleScrub^{ECO} K-415

Product	Order number
230 V / 50/60 Hz	114152331
120 V / 50/60 Hz	114151231
100 V / 50/60 Hz	114151031

Standard accessories

Hose for water control	11057146
Adapter with sieve for tap	11058398
Multi-tool	11058474
Silicone hose 6/9 3 m	048355
Connection cable to digester	030973

3.1.4 QuadScrub^{ECO}



Table 3-4: QuadScrub^{ECO} K-415

Product	Order number
230 V / 50/60 Hz	114152341
120 V / 50/60 Hz	114151241
100 V / 50/60 Hz	114151041

Standard accessories

Hose for water control	11057146
Adapter with sieve for tap	11058398
Multi-tool	11058474
Silicone hose 6/9 3 m	048355
Connection cable to digester	030973

3.1.5 Standard accessories for all scrubber models

Table 3-5: Standard accessories

Product	Order number
1 power cable	
Type CH	010010
Type Schuko / Japan	010016
Type GB	017835
Type USA	033763
Type AUS	017836
Operation Manual:	
English	11593505
German	11593506
French	11593507
Italian	11593508
Spanish	11593509
Chinese	11593510
Japanese	11593511

3.1.6 Optional upgrade sets

Table 3-6: Optional upgrade sets

Product	Order number
Condensation step	11058460
Reaction step	11058461
TKN set	11057333
Cooling water valve	11058462
Tray for adsorption storage	11057332
Connection cable to digester	030973
IQ/OQ Scrubber K-415	11058568
Repeating OQ Scrubber K-415	11058569

3.2 Technical data overview

Table 3-7: Technical data			
	Scrubber Unit K-415		
Dimensions (W x H x D) (completely equipped instrument)	DuoScrub	248 x 412 x 526 mm	
	TripleScrub	347 x 417 x 526 mm	
	TripleScrub ^{ECO}	347 x 417 x 543 mm	
	QuadScrub ^{ECO}	347 x 450 x 543 mm	
Weight	DuoScrub	10.1 kg	
	TripleScrub	11.2 kg	
	TripleScrub ^{ECO}	12.3 kg	
	QuadScrub ^{ECO}	12.9 kg	
Power system voltage / frequency /consumption / fuse	230 V ± 10 % / 50/60 Hz	140 W	T1A L 250 V
	120 V ± 10 % / 50/60 Hz	140 W	T2A L 250 V
	100 V ± 10 % / 50/60 Hz	140 W	T2A L 250 V
Installation site	For indoor use only		
Temperature	+ 5 °C to + 40 °C		
Altitude	up to 2000 m above sea level		
Humidity	maximum relative humidity 80 % for temperatures up to 31 °C, decreasing linearly to 50 % relative humidity at 40 °C		
Pump suction capacity (max.)	32 L/min (air)		
System suction capacity	adjustable approximately between 50 and 400 mbar below atmospheric pressure		
Overvoltage category	II		
Pollution degree	2		
Noise level	< 70 dB		

3.3 Materials and Approvals

Table 3-8: Materials and Approvals	
Component	Material designation
Housing	PUR
Minor hardware	PP, PA, POM
Lip gasket acid- / base-resistant	FPM, EPDM
Gasket	PTFE, CR
Cover of neutralization vessel	PMMA
Glass parts	Borosilicate 3.3, P+G plastic coated glass
Pump	PPS, CR, FPM
Hoses	CR, FEP
Cooling water control	brass, FKM (sealing)
Water hose (black)	Polychloroprene Rubber
Water hose (white)	brass, PA12
Approvals	CE, CSA

3.4 Recommended consumables

Table 3-9: Active charcoal for adsorption vessel

Product	Order number
Fluka, granules impregnated with potassium hydroxide for the chemisorption of acid vapors	Fluka 29238
Fluka, purum p.a. 4 - 8 mm	Fluka 05110
Merck, granulated	Merck 102518

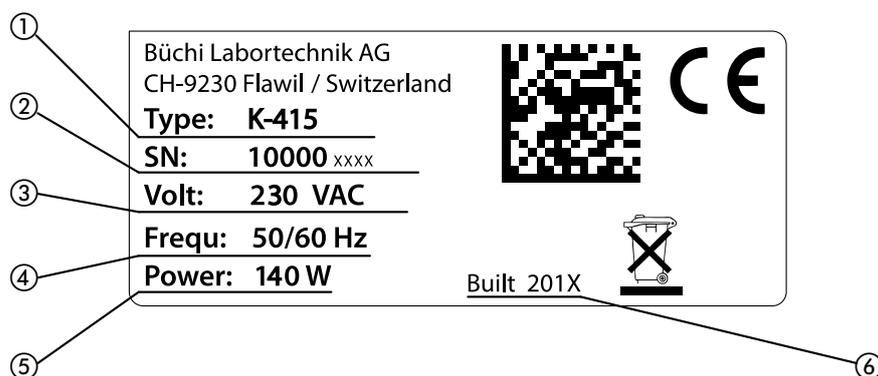
Table 3-10: Glasswool for adsorption vessel

Product	Order number
Glass wool	033701

Table 3-11: Color indicator for washing solution

Product	Order number
Bromothymol blue, Merck	Merck 3026

3.5 Information on type plate



- ① Instrument type code
- ② Serial number
- ③ Supply voltage range / type
- ④ Frequency of supply voltage
- ⑤ Nominal power rating
- ⑥ Year of manufacture

4 Description of function

This chapter explains the basic principle of the instrument, shows how it is structured and gives a functional description of the assemblies.

The pump draws off the gases and vapors produced in chemical reactions via a condenser providing a receiving vessel underneath. The suction performance of the pump can be regulated via a bypass valve on the rearside of the instrument.

The condensation stage is used as a preliminary extractor for vapors, water steam (to prevent warming or an increase in volume of the washing solution) and for the liquids carried along with them, thus extending the service life of the neutralization stage.

The acid or alkaline gases are washed and neutralized in the neutralization stage.

The next stage, the adsorption stage, holds back most of the undesired particles by means of granules of activated charcoal or a universal adsorption granulate. It also enables the aerosols to recondensate.

In the reaction stage that follows specific redox reactions are accomplished.

The used air is directly lead into an exhaust or into the open air through a silencer. The ^{ECO}-versions of the K-415 are equipped with a cooling water control unit that allows an automatic start and stop of the cooling water flow, triggered by the digester (or by the on/off switch of the K-415).

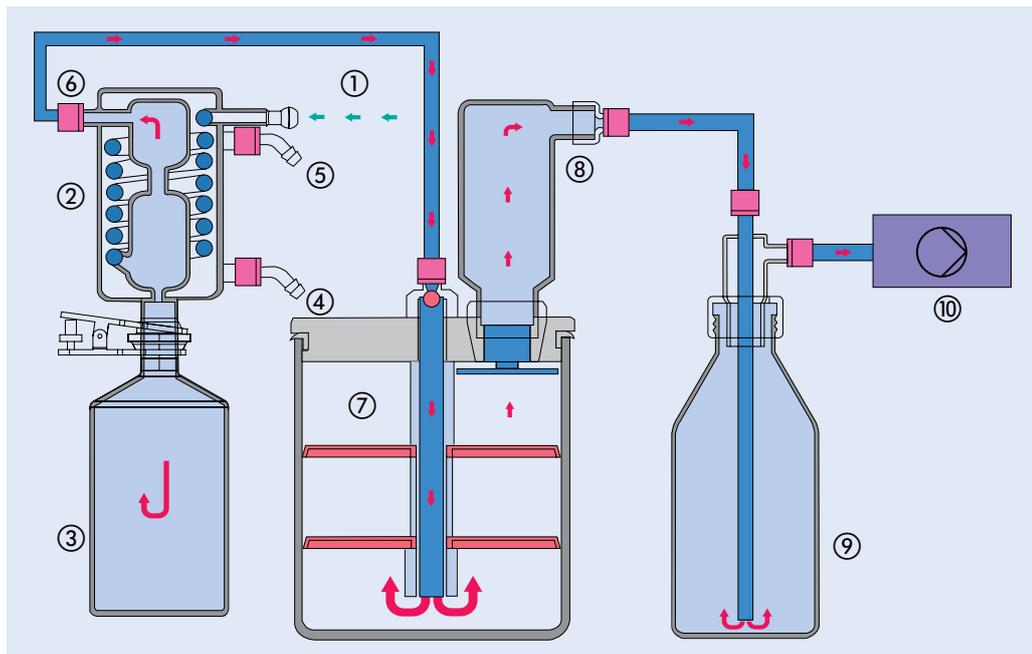
4.1 Functional principle of the Scrubber



- ① Receiving vessel
- ② Condenser
- ③ Reaction tubelet (Reaction stage)

- ④ Adsorption vessel
- ⑤ Neutralization vessel
- ⑥ Tray for adsorption vessel and tube connector

Fig. 4.1: Overview over the Scrubber



- | | |
|-------------------------------------|--|
| ① Fume inlet into condenser | ⑥ Fume outlet of condenser |
| ② Condenser | ⑦ Neutralization vessel with washing solution |
| ③ Receiving vessel | ⑧ Adsorption vessel (filled with activated charcoal) |
| ④ Cooling water inlet of condenser | ⑨ Reaction stage |
| ⑤ Cooling water outlet of condenser | ⑩ Fume exhaust pump |

Fig. 4.2: Functional principle of the Scrubber

Condensation stage

- Condensation of vapors
- Condensation of water steam (prevention of warming or an increase in volume of the washing solution)
- Condensation of the liquids carried along

Neutralization stage

- Neutralization of acid or alkaline gases

Adsorption stage

- Specific adsorptions and retention of particles (using granules of activated charcoal or a universal adsorption granulate)
- Recondensation of aerosols

Reaction stage

- Specific reactions (e.g., redox reactions)

4.2 Scrubber capacity

The suction capacity of the Scrubber K-415 is designed for digestion units with a maximum of 20 sample tubes.

Connection examples:

- Connection of up to two SpeedDigesters K-425 (6 places each)
- Connection of one SpeedDigester K-436 / K-439 (12 places)
- Connection of one WetDigester B-440
- Connection of one KjeldDigester K-446 / K-449 (20 places)

5 Putting into operation

This chapter describes how the instrument is installed and gives instructions on 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.

5.1 Installation site

	<p>! DANGER</p> <p>Death or serious injuries by use in explosive environments.</p> <ul style="list-style-type: none"> • Do not store or operate the instrument in explosive environments. • Remove all sources of flammable vapors. • Do not store chemicals in the vicinity of the device.
	<p>! CAUTION</p> <p>Risk of minor or moderate injury by heavy weight of the instrument.</p> <ul style="list-style-type: none"> • Lift the instrument carefully and avoid over exertion. • Do not drop the instrument or its transport box. • Place the instrument on a stable, even and vibration-free surface. • Keep limbs out of crushing zone.
	<p>! WARNING</p> <p>Serious chemical burns by corrosives.</p> <ul style="list-style-type: none"> • The instrument may only be operated within a fume hood. • Handle corrosives in well ventilated environments only. • Always wear protective goggles. • Always wear protective gloves. • Always wear protective clothes. • Do not use damaged glassware.

NOTE

Place the Scrubber K-415 on the left side of a digestion unit (e.g. SpeedDigester, Digest System K-437 or Digest Automat K-438/K-432). The Scrubber ventilation is located on the left side. In case the Scrubber is placed on the right side of another unit, cool air will hit the digestion sample and cool it down, so that no digestion can take place.

5.1.1 Anti-seismic-tie-down

For the use in earthquake-susceptible regions, the instrument can be equipped and secured with the anti-seismic-tie-down, contained in the standard delivery of the instrument.

The fixing device can be attached to the instrument from the bottom side of the instrument, close to the housing foot on the right rear side of the instrument.

- Slide the fixing bracket ① into the provided groove ② and fix it with the provided screw ③.
- The instrument can now be tied to the setup.

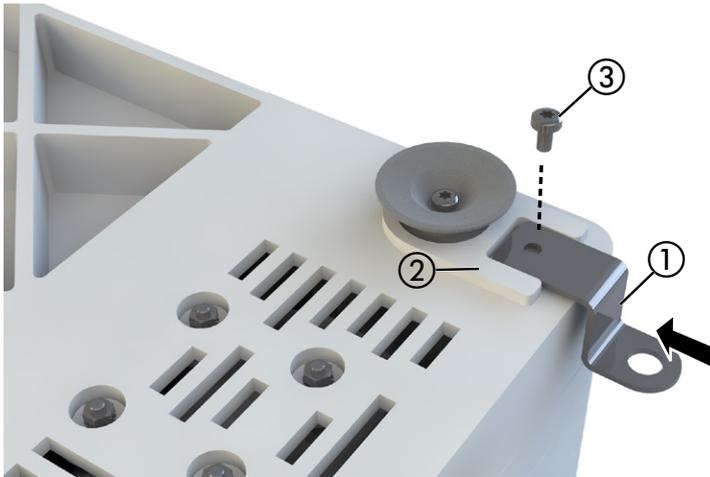


Fig. 5.1: Fixing the anti-seismic-tie-down

5.2 General installation procedure for all Scrubber models

To commission the Scrubber K-415, proceed as follows:

- Make sure that the silencer (① in figure 5.2) is filled with polyester fibres and install it:

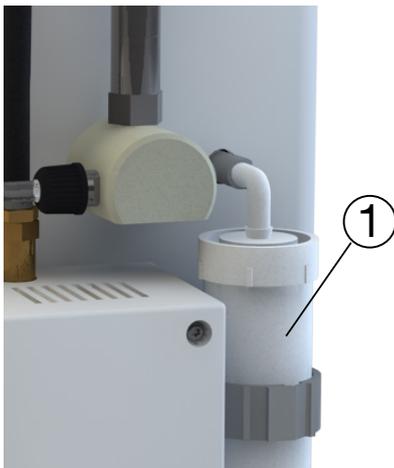


Fig. 5.2: The silencer on the rear side of the instrument

- Check the glass for flaws and cracks.
- Check the seals and gaskets (embrittlement, scratches). If they are not OK, take them out and replace them (see also chapter 7).
- Carefully insert the glass parts. Otherwise there is a risk of damaging the glassware.

- Attach the tray for adsorption storage (optional available for DuoScrub) to the housing: Slide the tray ① from the side into the groove in the housing ② and fix it by tightening the screw ③. After the tray has been attached to the housing of the scrubber, the adsorption vessel and the inlet tubing of the neutralization vessel can be stored in the tray, while the neutralization vessel is taken away from the instrument.

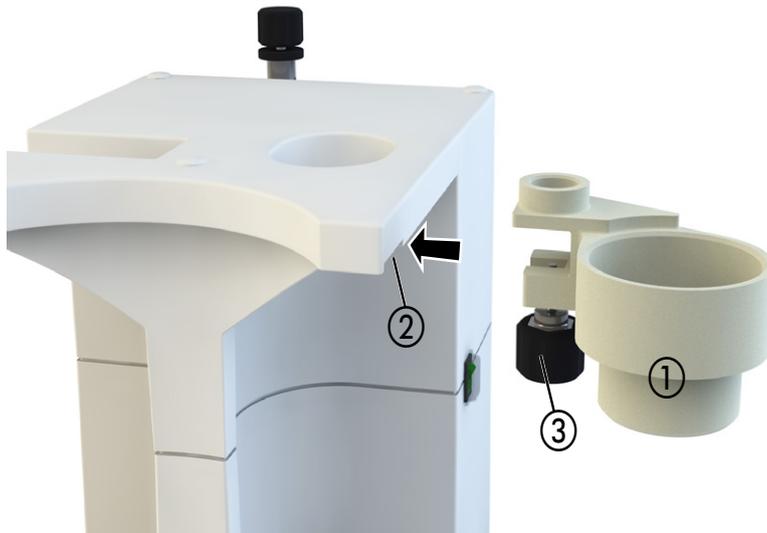


Fig. 5.3: Fixing the tray for adsorption storage



Fig. 5.4: Swiveling adsorption vessel and tubing to the tray

5.3 Equipping the Scrubber with the condenser unit

To prepare a Scrubber model for operation with a condenser, proceed as follows:

- Unless the carrier-plate ① for the condenser is not yet installed, slide it into the housing from the side and fix it with the two screws from below. The groove ② must point away from the opening in the housing (see figure 5.5).

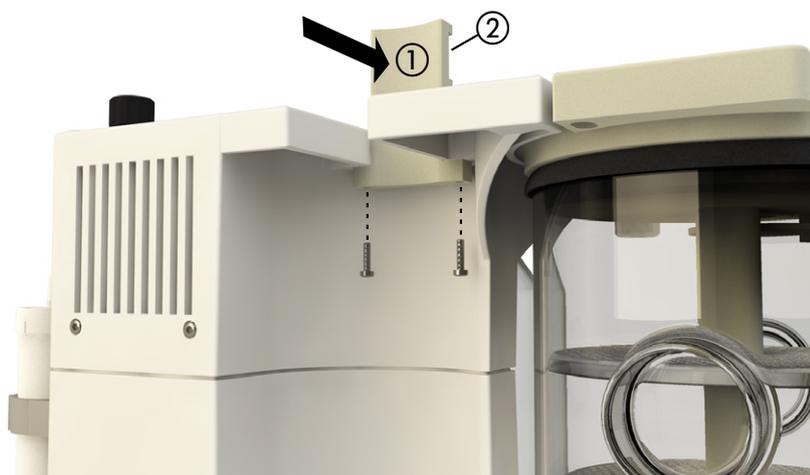


Fig. 5.5: Fixing the carrier plate

- Carefully slide the condenser from top into the opening in the housing and fix it on the carrier plate ① with the rubber strap ③. The rubber strap has to be passed through the groove on the back-side of the carrier plate to prevent it from sliding up or down and to guarantee a tight positioning of the condenser (see arrow in figure 5.6). Make sure the connections of the condenser are pointing backward.
- The receiving vessel ④ can be attached from below and secured with the catchpot clip ⑤.



Fig. 5.6: Fixing the condenser with the rubber strap

For the determination of the total Kjeldahl nitrogen (TKN) the optional TKN set can be used as an alter-

native to the receiving vessel. For details please refer to chapter 5.5.

The connections of the condenser can be seen from the following schema:

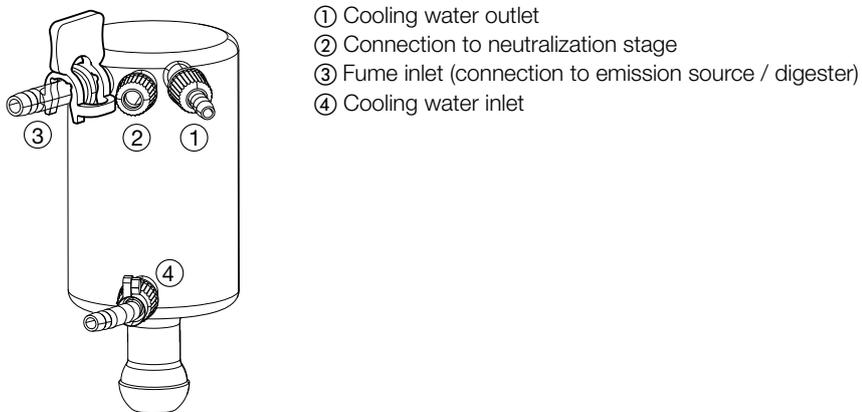


Fig. 5.7: Connections of the condenser

5.4 Installing the Reaction vessel

- Screw the screw cap ③ together with the gasket ring ② loosely onto the reaction vessel ①.
- Insert the introduction tube assembly ④. Tighten the screw cap ③.
- Insert the mounted reaction vessel ① from the side to the housing and place it in the groove ⑨ on the bottom of the housing (the introduction tube assembly ④ has to protrude from the round opening on top of the housing ⑩).
- Attach the provided tubing ⑦ and ⑧ using the provided screw caps ⑥ and gaskets ⑤ (GL 14). (See also chapter 5.7.4)
- (Dismount in the reversed order.)

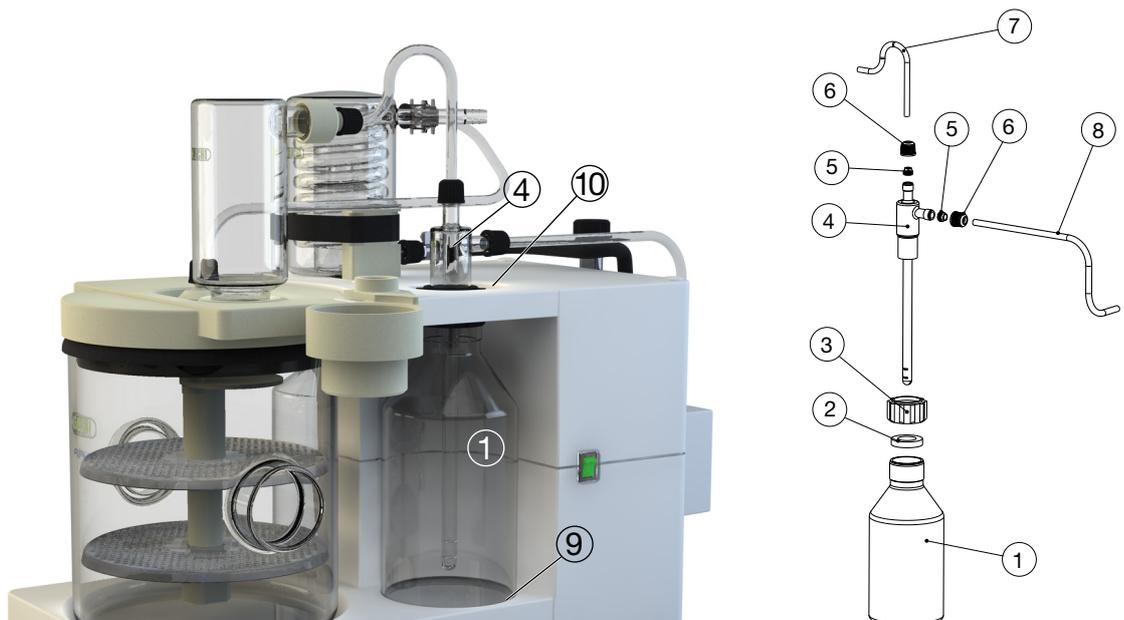


Fig. 5.8 Installing the Reaction vessel

5.5 Receiving vessel with outlet - Total Kjeldahl Nitrogen set (optional)

A receiving vessel with outlet ① is optionally available. It serves for the digestion of samples with a large water content. Using the drain cock ② it is possible to drain the collected volume of liquid during operation.

To install the optional TKN-set, proceed as follows:

- Attach the receiving vessel ① with outlet to the condenser from below and secure it with the catchpot clip ③.
- Attach the provided hose to the outlet of the cock and secure it with a hose clamp. Connect the other end of the hose to an appropriate collection tank or sink.



Fig. 5.9 Connecting the TKN set

NOTE

During manual operation of the K-415 the cock of the TKN receiving vessel has to be kept closed - otherwise the suction performance of the K-415 may not be sufficient to draw off all fumes produced by the digester. The cock shall only be opened for a very short time while the receiving vessel is discharged.

Manual operation:

1. Reduce the suction performance to a minimum.
2. Open the cock ② of the receiving vessel.
3. Wait until the receiving vessel is completely emptied, then close the cock again.
4. Set the suction performance back to the previously used level .

Automatic operation:

1. Place an additional bigger vessel with sufficient capacity to the floor.
2. Connect the tube from the TKN set to this vessel.
3. Tighten the connection between the tube and the vessel (otherwise the suction capacity of the scrubber will go down and will no longer be sufficient to draw off all fumes produced by the digester).
4. The cock ② of the receiving vessel a can now be left open permanently.

5.6 Connecting the cooling water control (ECO-versions only)

The ^{ECO}-versions of the Scrubber are equipped with a cooling water control ensuring the flow of the cooling water is switched on every time the K-415 is switched on by the digestion instrument and is turned off the same time, the digester is turned off. (Assumed the external cooling water source is always turned on).

The cooling water control ① can be found on the rear side of the instrument with cooling water inlet ② at the bottom and the cooling water outlet on top. The cooling water inlet can be horizontally swivelled around in a range of 180 degrees. This makes it possible to orient the inlet towards the available cooling water supply.

To swivel the cooling water inlet, proceed as follows:

- Loosen the nut on the bottom of the inlet ③, using the matching end of the provided Multi-tool ④.
- Swivel the inlet ② to the appropriate position.
- Tighten the nut ③ with the Multi-tool ④.

NOTE

After swivelling the cooling water inlet to the preferred position make sure the fixing nut ③ is tight and check all connections and tubing of the cooling water control for tightness.

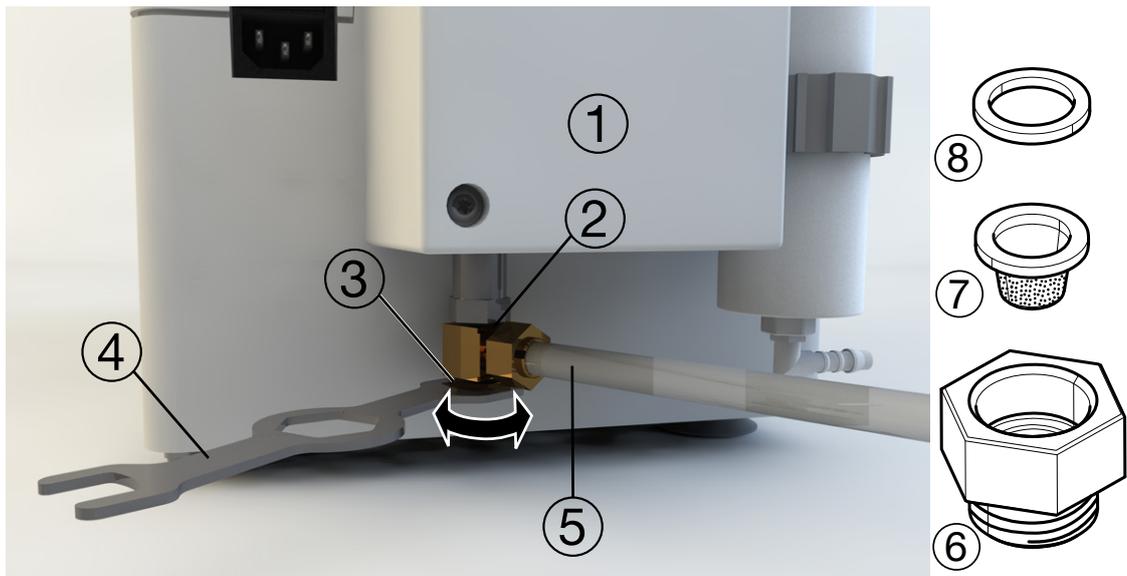


Fig. 5.10 Swivelling the cooling water inlet

- Connect the provided hose for the water control ⑤ on one side to the inlet ② of the cooling water control and tighten it with the matching end of the Multi-tool ④.
- Connect the provided adapter ⑥ with sieve ⑦ and sealing ⑧ to the water source and tighten it using the Multi-tool.
- Connect the other end of the hose to the adapter at the water source and tighten it.
- Check all connections for tightness before putting the instrument into operation.

5.7 Hose connections

NOTE

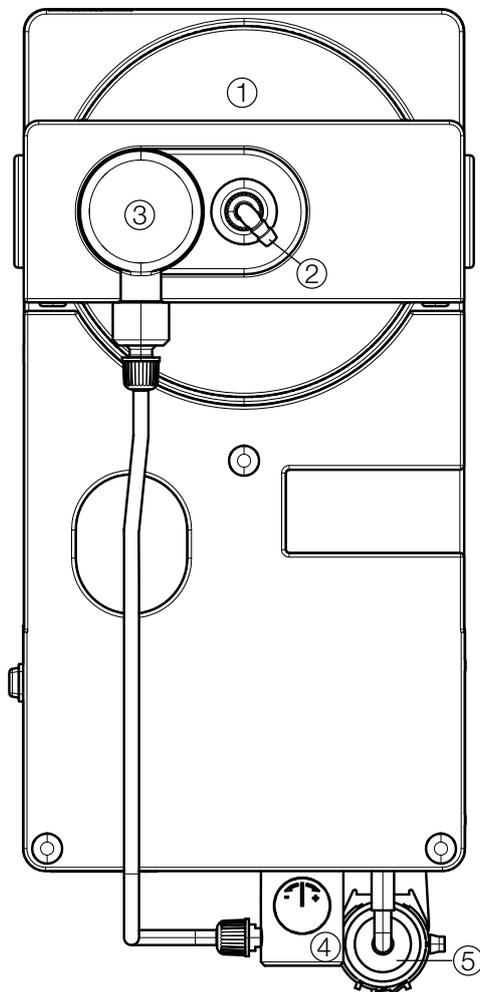
Use clips and cable ties where necessary to secure the hoses in place.

5.7.1 Hose connections of the DuoScrub

The DuoScrub consists of the neutralization and the adsorption vessel.

To establish the hose connections, proceed as follows:

- Connect the adsorption vessel ③ to the bypass valve ④ using the PTFE hose and secure it with the GL 14 hose connectors at both ends.
- Connect the emission source via a Woulff bottle to the neutralization vessel ② and secure all connections with hose clamps.



① Neutralization stage

② Inlet for fumes from the emission source

③ Adsorption vessel

④ Bypass valve

⑤ Silencer

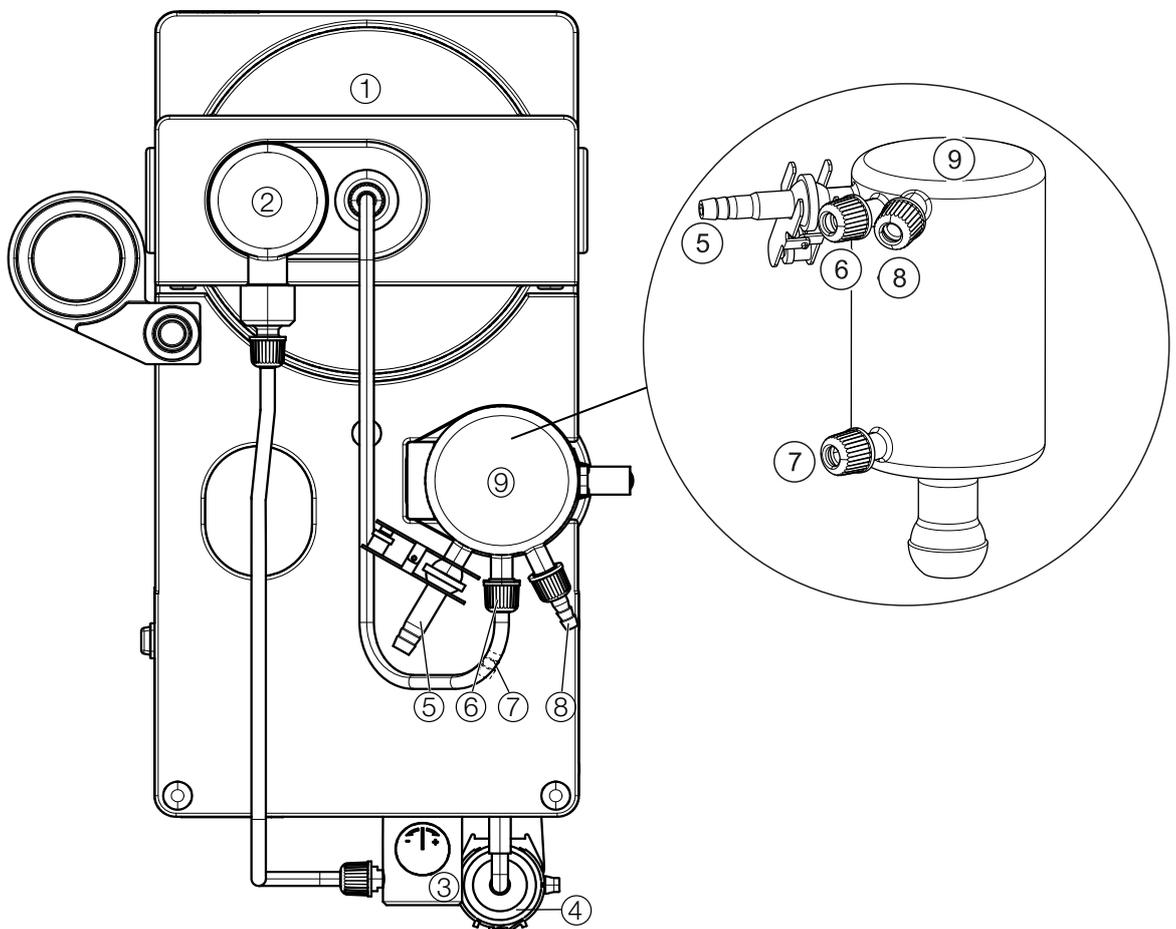
Fig. 5.11: Hose connections of the DuoScrub

5.7.2 Hose connections for the TripleScrub

The TripleScrub consists of the neutralization vessel, the adsorption vessel, and the condenser unit.

To establish the hose connections, proceed as follows:

- Put hose connectors GL 14 with seals on all PTFE hoses.
- Connect the emission source to the condenser inlet ⑤.
- Connect the condenser outlet ⑥ to the neutralization vessel ①.
- Connect the adsorption vessel ② to the bypass valve ③.
- Cut off a piece of the provided silicone hose and connect the cooling water source to the cooling water inlet of the condenser ⑦. Secure it with a hose clamp.
- Cut off a piece of the provided silicone hose and connect the cooling water outlet of the condenser ⑧ to the waste water system.



- ① Neutralization stage
- ② Adsorption vessel
- ③ Bypass valve
- ④ Silencer
- ⑤ Inlet for fumes from emission source

- ⑥ Outlet to neutralization vessel (top)
- ⑦ Cooling water inlet (bottom)
- ⑧ Cooling water outlet (top)
- ⑨ Condenser

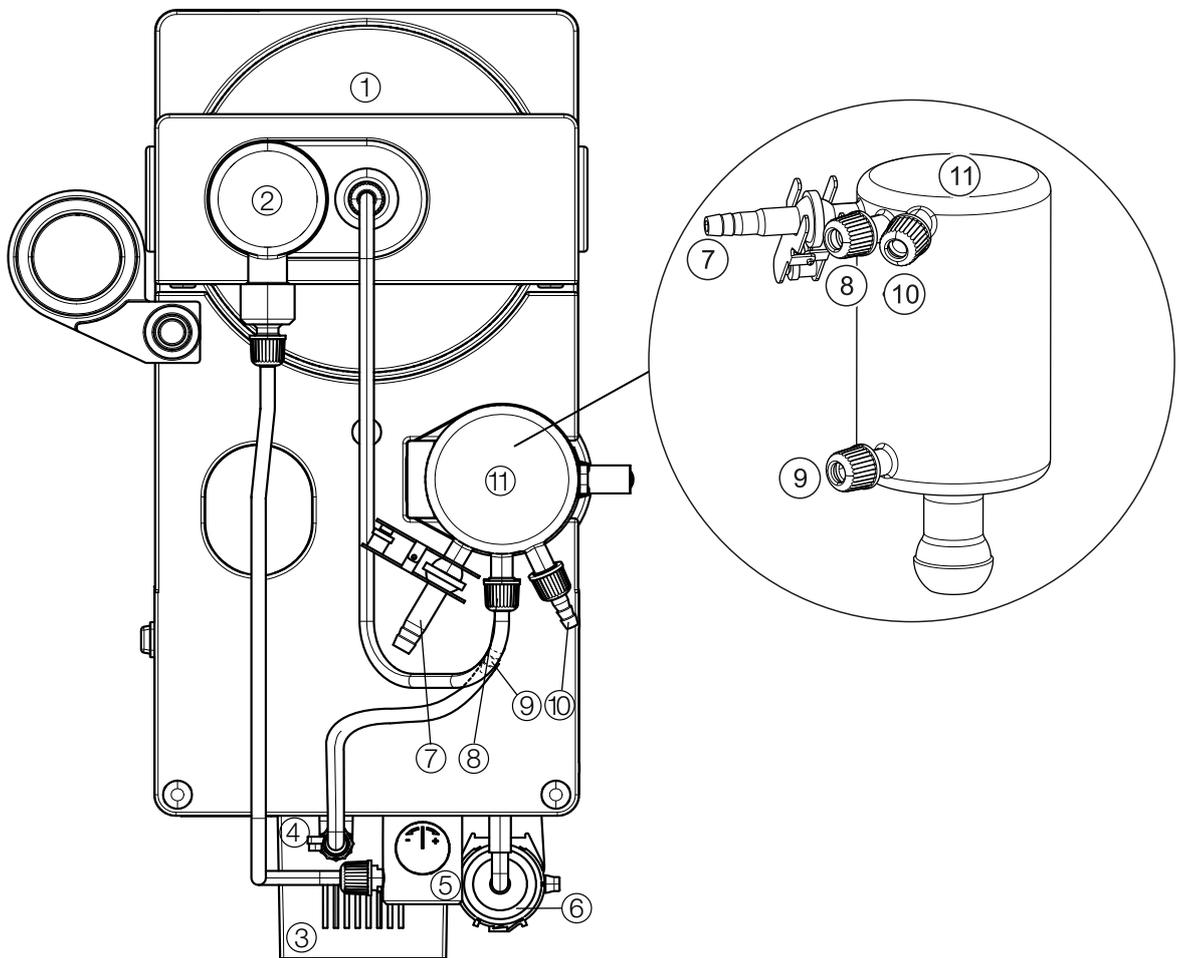
Fig. 5.12: Hose connections for the TripleScrub

5.7.3 Hose connections for the TripleScrub^{ECO}

The TripleScrub^{ECO} consists of the neutralization, the adsorption vessel, the condenser unit and the cooling water control.

To establish the hose connections, proceed as follows:

- Put hose connectors GL 14 with seals on all PTFE hoses.
- Connect the emission source to the condenser inlet ⑦.
- Connect the condenser outlet ⑧ to the neutralization vessel ①.
- Connect the adsorption vessel ② to the bypass valve ⑤.
- Connect your cooling water source to the cooling water tube of the water control ③ using the provided adapter with sieve and tighten it (see chapter 5.6).
- Cut off a piece of the provided silicone hose and connect the cooling water outlet ④ of the water control ③ to the cooling water inlet ⑨ of the condenser. Secure both connections with hose clamps.
- Cut off a piece of the provided silicone hose and connect the cooling water outlet ⑩ of the condenser ⑪ to the waste water system.



- ① Neutralization stage
- ② Adsorption vessel
- ③ Water control
- ④ Water control (outlet)
- ⑤ Bypass valve
- ⑥ Silencer

- ⑦ Inlet from emission source (digester)
- ⑧ Outlet to neutralization vessel (top)
- ⑨ Cooling water inlet (bottom)
- ⑩ Cooling water outlet (top)
- ⑪ Condenser

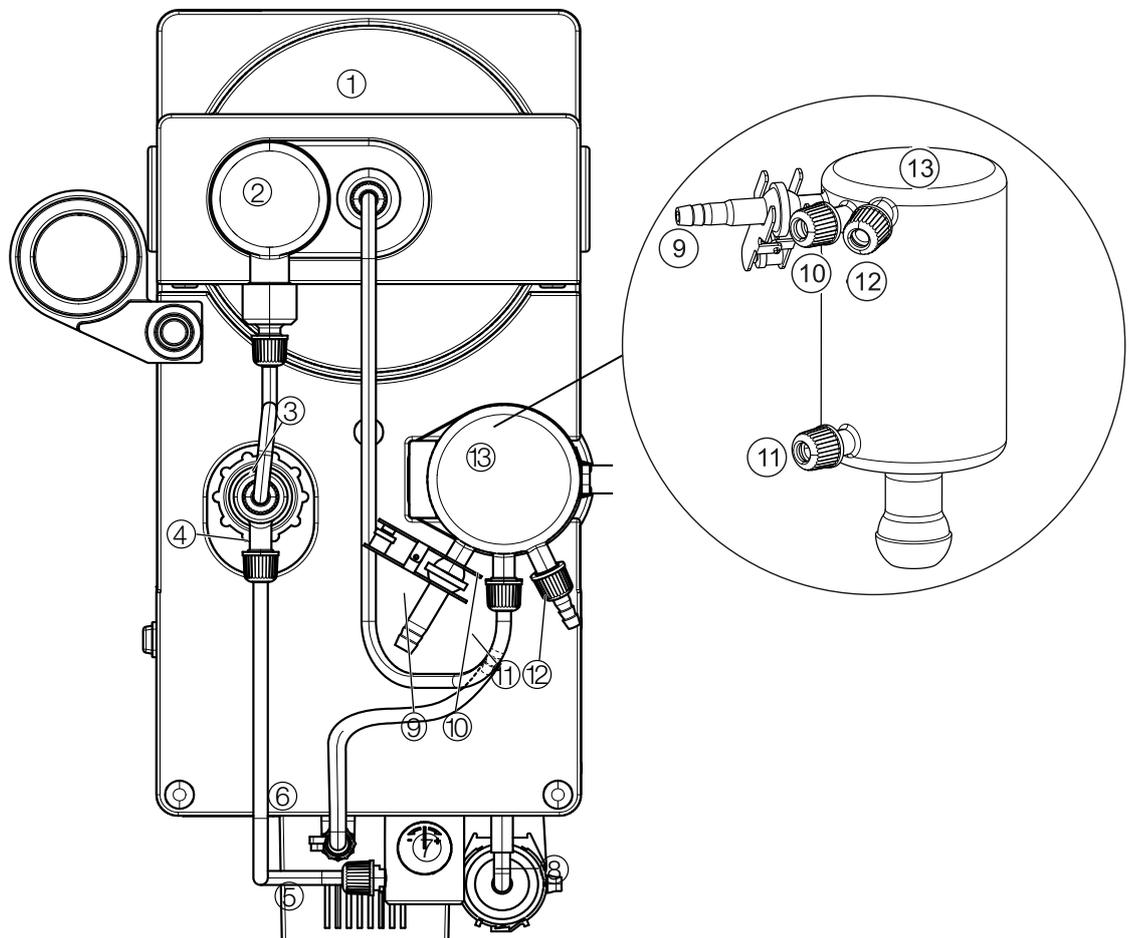
Fig. 5.13: Hose connections for the TripleScrub^{ECO}

5.7.4 Hose connections for the QuadScrub^{ECO}

The QuadScrub^{ECO} consists of the neutralization, the adsorption vessel, the condenser, the cooling water control and the reaction stage.

To establish the hose connections, proceed as follows:

- Put hose connectors GL 14 with seals on all PTFE hoses.
- Connect the emission source to the condenser inlet ⑨.
- Connect the condenser outlet ⑩ to the neutralization vessel ①.
- Connect the adsorption vessel ② to the top of the reaction tubelet ③.
- Connect the reaction tubelet (connection on the side ④) to the bypass valve ⑦.
- Connect your cooling water source to the cooling water tube of the water control ⑤ using the provided adapter with sieve and tighten it (see chapter 5.6).
- Cut off a piece of the provided silicone hose and connect the cooling water outlet ⑥ of the water control ⑤ to the cooling water inlet ⑪ of the condenser ⑬. Secure both connections with a hose clamp.
- Cut off a piece of the provided silicone hose and connect the cooling water outlet ⑫ of the condenser ⑬ to the waste water system.



- | | |
|-------------------------------|---|
| ① Neutralization stage | ⑧ Silencer |
| ② Adsorption vessel | ⑨ Inlet from emission source (digester) |
| ③ Reaction stage (upper port) | ⑩ Outlet to neutralization vessel (top) |
| ④ Reaction stage (side port) | ⑪ Cooling water inlet of condenser (bottom) |
| ⑤ Water control | ⑫ Cooling water outlet of condenser (top) |
| ⑥ Water control (outlet) | ⑬ Condenser |
| ⑦ Bypass valve | |

Fig. 5.14: Hose connections for QuadScrub^{ECO}

5.8 Electrical connections

	<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 proper grounding. • Exchange defective cabling instantly. • Make sure the used digester and the K-415 are suitable for the same power system (voltage and frequency) when both instruments share the same power source.
---	--

Connect the Scrubber K-415 to the mains with the power cord contained in the scope of delivery. To start the Scrubber automatically at the same time the digestion process starts, connect it to the SpeedDigester K-439, to a Digest System K-437 or to a Digest Automat K-438/K-432 with the optional connection cable.

NOTE

To cut the power in case of an emergency by unplugging, the instrument or any other item must not block the mains plug! In this case, the plug must be able to be pulled out instantly.

5.9 Preparing washing solutions

	<p style="text-align: center;">! WARNING</p> <p>Serious chemical burns by corrosives.</p> <ul style="list-style-type: none"> • Observe all data sheets of the used chemicals. • Handle corrosives in well ventilated environments only. • Always wear protective goggles. • Always wear protective gloves. • Always wear protective clothes. • Do not use damaged glassware.
---	---

5.9.1 Washing solutions for acidic vapors and gases

- Sodium hydroxide 8-10 %, max. 20 %
- Sodium carbonate
 - dissolve 600 g Na_2CO_3 in 3 L distilled warm water, or
 - dissolve 1.7 kg $\text{Na}_2\text{CO}_3 \cdot 10 \text{H}_2\text{O}$ in 3 L distilled warm water

Color indicator

A color indicator is added to the washing solution to assess its washing power visually as well.

We recommend to use a spatula tip of color indicator for 3 L of washing solution.

Bromothymol blue serves as a standard indicator. The transition area here is between pH 6.0 to 7.6.

Thus the fresh solution has a blue color while the neutralized or acidic solution has an orange yellowish color.

Depending on the application purpose, other suitable color indicators should be used.

5.9.2 Washing solutions for alkaline vapors and gases

- Hydrochloric acid, max. 15 %
- Sulphuric acid, max. 20 %

Depending on the area of application, it is recommended to use different washing solutions or concentrations. The Scrubber K-415 is supplied ex works with a base-resistant lip gasket.

NOTE

For operating with acid washing solutions, an acid-resistant lip gasket should be used.

Color indicators

Table 5-1: Indicators for washing solutions for alkaline vapors and gases

Name	Transition pH range	Color change
Bromocresol green	3.8 - 5.4	yellow to blue
Bromothymol blue	5.8 - 7.6	yellow to blue
Methylen red	4.4 - 6.2	yellow to red

5.10 Filling up the prepared washing solution

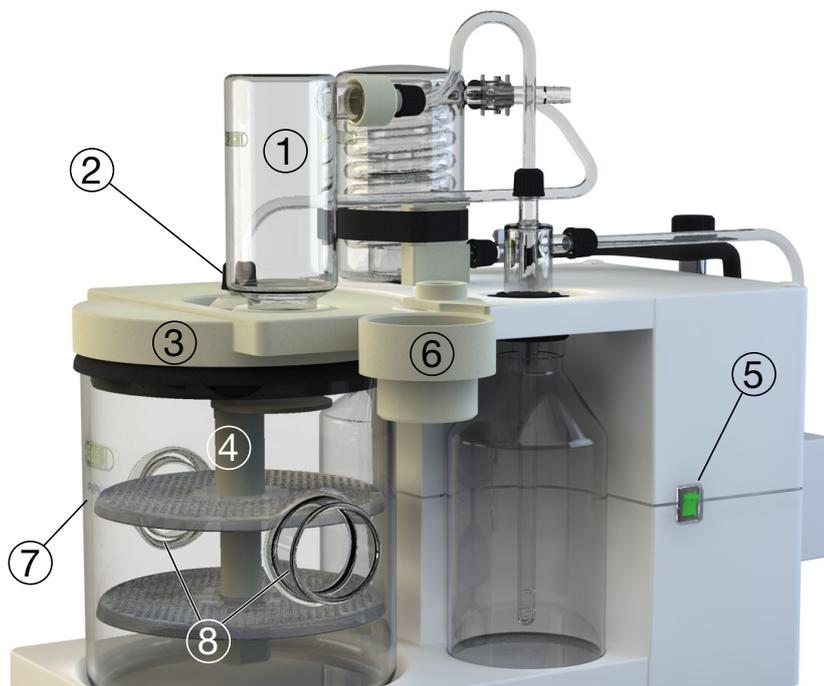
	! WARNING
	<p>Risk of serious chemical burns by corrosives.</p> <ul style="list-style-type: none"> • Always use the glass handles of the neutralization vessel to lift or carry it. • Never try to lift or carry the neutralization vessel while holding it on the cover of the neutralization vessel.

To fill up the washing solution, proceed as follows:

- Remove the adsorption vessel ① by gently pulling it upwards. (If available store it on the tray ⑥.)
- Loosen the hose connector GL 14 ② at the neutralization vessel and pull off the hose. (If available store it on the tray ⑥.)
- Take the neutralization vessel with the attached cover away from the instrument. Lift or carry the neutralization vessel solely by using the glass handles ⑧ of the vessel.
- Remove the cover of the neutralization vessel ③ together with the attached swirl discs ④.
- Carefully pour the prepared washing solution into the neutralization vessel and fill up to the blue wavy optimal filling mark ⑦.
- Reassemble the instrument in the reverse order.

NOTE

Make sure the cover is pressed firmly against the neutralization vessel to ensure tightness of the system!



- ① Adsorption vessel
- ② Nut GL 14
- ③ Cover with swirl discs
- ④ Washing insert

- ⑤ ON/OFF switch
- ⑥ tray
- ⑦ filling mark
- ⑧ glass handles

Fig. 5.15: Filling up the washing solution

NOTE

For information on how and when to exchange the washing solution, see chapter 7.6.

5.11 Preparation of the adsorption vessel

NOTE

When you carry out Kjeldahl digestions, the suction capacity might become too high. Therefore we recommend to fill activated charcoal into the adsorption vessel and to add glass wool at both ends. The glass wool prevents charcoal from being drawn into the vacuum pump. The activated charcoal should be grainy with a particle size of 2 to 6 mm.

	CAUTION
	<p>Risk of instrument damage and risk of serious chemical burns by corrosives.</p> <ul style="list-style-type: none">• Never use charcoal in the form of powder or with a particle size below 2 mm - otherwise the adsorption vessel will get clogged and as a result the pump will get damaged.



Fig. 5.16: Adsorption vessel with activated charcoal and glass wool

5.12 Filling the reaction stage

For digestions with aqua regia it becomes necessary to fill the reaction stage with around 350 mL of a saturated FeSO_4 solution (~27 g/100 mL) to dispose of the nitrous gases.

6 Operation

This chapter gives examples of typical instrument applications and instructions on how to operate the instrument properly and safely.

	 CAUTION
	<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 before mounting. • Exchange damaged glass parts immediately. • Do not touch cracks or bits of broken glass with bare hands.

ATTENTION

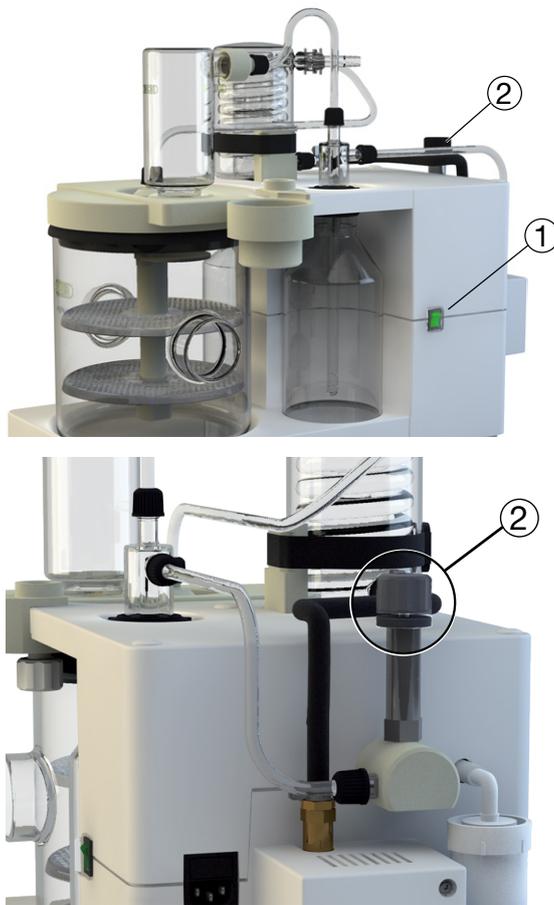
Switch on the K-415 before a connected instrument produces gases. Check the level of the liquid in the neutralization vessel before putting the scrubber into operation - the optimal liquid level can be checked against the blue filling mark (wave) on the neutralization vessel.

If the K-415 is controlled via a digester do not switch the K-415 off. If the K-415 is equipped with cooling water control (^{ECO}-versions) leave the external cooling water supply switched on as well.

6.1 Typical applications

Table 6-1: Typical applications			
Gases and vapors	Chemical formula	Neutralization (stage 2)	Specific reactions (stage 4)
Kjeldahl digestions	SO ₂ , H ₂ SO ₄	saturated soda / NaOH 8 - 10 % (max. 20 %)	
Sulfur dioxide	SO ₂	saturated soda / NaOH 8 - 10 % (max. 20 %)	
Sulfuryl chloride	SO ₂ Cl ₂	NaOH 8 - 10 % (max. 20 %)	
Hydrochloric or hydrobromic acids	HCl, HBr	NaOH 8 - 10 % (max. 20 %)	
Thionyl chloride	SOCl ₂	NaOH 8 - 10 % (max. 20 %)	
Cyanuric chloride	C ₃ N ₃ Cl ₃	NaOH 8 - 10 % (max. 20 %)	
Carbonic acid chloride	R-COCl	NaOH 8 - 10 % (max. 20 %)	
Ammonia	NH ₃	HCl max. 15 % / H ₂ SO ₄ max. 20 %	
Nitrous oxides (nitrous gases) Nitric acid / aqua regia	NO _x	NaOH 20 %	FeSO ₄ saturated
Chlorine, bromine, iodine	Cl ₂ , Br ₂ , J ₂	NaOH 8 - 10 % (max. 20 %)	FeSO ₄ saturated
Thiophenols	Ar-SH	NaOH 8 - 10 % (max. 20 %)	KMnO ₄ saturated
Thioalcohols, mercaptan	R-SH	NaOH / javelle water	KMnO ₄ saturated
Hydrogen sulphide	H ₂ S	NaOH 8 - 10 % (max. 20 %)	KMnO ₄ saturated
Carbon disulphide	CS ₂	NaOH 8 - 10 % (max. 20 %)	KMnO ₄ saturated

6.2 Operation



- Switch on the power switch ①.
- Make sure that the cooling water flow rate $>1.2 \text{ L/min}$ ($\leq 25 \text{ }^\circ\text{C}$) is pulse-free and does not exceed 2.7 bar.
- The *ECO*-models of the Scrubber K-415 come equipped with an automatic water-control. The automatic water control will start the flow of cooling water automatically once the instrument is switched on and stop it, when the instrument is switched off (this is also valid, if the K-415 is controlled via a digester).
- The suction performance can be regulated, using the bypass valve ②. To reduce the suction performance, turn the knob counter-clockwise. Turning the knob clockwise will close the valve and maximise the suction performance.

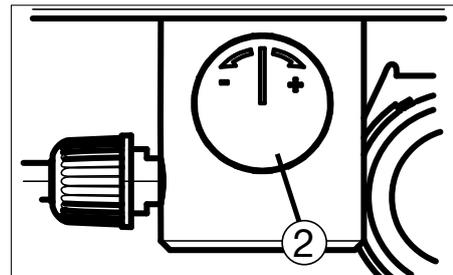


Fig. 6.1: Operation

NOTE

For most applications it is recommended to keep the bypass valve completely closed and to work with the maximum available suction performance.

In case you find out the suction performance is too high for your requirements (e.g. for small sample volumes or small numbers of samples) turn the knob counter-clockwise until the suction performance is reduced to an adequate proportion.

The bypass valve can be adjusted in the range of 100 to 400 mbar below atmospheric pressure.

7 Maintenance

This chapter gives instructions on all maintenance work to be performed in order to keep the instrument in good working condition.

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 Scrubber or parts of it need prior written permission of the manufacturer.

	<p>WARNING</p> <p>Death or serious burns by electric current.</p> <ul style="list-style-type: none"> • Switch off the instrument and disconnect the power cord before performing any maintenance work. • Do not spill liquids over the instrument or parts of it.
	<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 housing and instrument damage by liquids and detergents.</p> <ul style="list-style-type: none"> • Do not spill liquids over the instrument or parts of it. • Wipe off any liquids instantly. • Use ethanol or soapy water as detergent only.

Table 7-1: Service intervals

Part	Service intervals	See chapter
Housing	Check and clean once a week	7.1
Glass parts	Check and clean once a month (or if required)	7.2
Hoses /hose connectors	Check and clean once a week	7.3
Sealing system	Check and clean once a month (or if required), replace sealing once a year	7.4
Washing insert	Check from time to time	7.5
Washing solution	Check and replace in appropriate time	7.6
Charcoal in adsorption vessel	Replace if necessary	7.7
Pump	Flush once a week or after hard work	7.8
Hose water control / condenser	Check on a monthly base	7.9
Hose water control feed	Check sieve on a monthly base, check hose once a year	7.10
Rubber strap	check and replace if required	
Power supply fuses	Replace if necessary	7.11

Table 7-1: Service intervals

Part	Service intervals	See chapter
Silencer	Replace once a year	7.12
Functional test		7.13
Customer Service		7.14

7.1 Housing

Check the housing for defects (switches, plugs) and clean it once a week with a damp cloth.

7.2 Glass parts

Take out and clean the glass parts once a month or if required with commercially available cleaning agents or in an ultrasonic bath. After the glass parts have been cleaned and fully dried, check each part visually for cracks, scratches and for any parts or sections that might have splintered off. Take out and replace any damaged glass parts.

7.3 Hoses / hose connectors

Visually examine the hose connections regularly. When hoses become cracked and brittle, replace them with new hoses.

Grease all joints on the condenser side regularly to achieve optimum tightness of the system.

Flush out the hoses at least once a week with water or ethanol.

For the ^{ECO}-versions check the cooling water hose for tightness and clean the sieve of the adapter on a regular base.

7.4 Sealing system

ATTENTION

When removing and reinstalling the seals and gaskets, make sure not to damage them. Always move them perpendicularly to the axis of the glass parts and ensure no damage occurs to the sealing lip.

Never apply grease to the seals and never touch them with sharp objects, otherwise they will get damaged.

7.4.1 Cleaning the gaskets

To prolong the lifetime of the gaskets (lip-gasket, gasket ring), rinse them at least once a month or if required (e.g. when exchanging the washing solution) with water, especially if working with crystalline products. Afterwards, dry them with a soft cloth.

7.4.2 Replacing the seals / GL 14 connector

Seals are subject to wear and tear, thus you should check them regularly and replace them, if necessary, e.g. if the system becomes untight.

We recommend to replace the seals periodically as follows:

Table 7-2: Replacing seals and silencer unit

Position in Fig. 10.1	Order no.	Description	Replacing interval
8 + 7	040296	Set of seals / connectors (straight)	once a year
30 + 7	040295	Set of seals / connectors (bent)	once a year
28	037928	O-ring to adapter (37777)	once a year
13	003575	Gasket SVL 42 x 30 PTFE	once a year
17 + 7	041999	Lip gasket GL 14 (FEP)	once a year
23	037873	Seal for receiving vessel	once a year
32	037925	Gasket ring	once a year
3	037871	Silencer unit	once a year
41	003576	Gasket SVL 22 x 16 PTFE (with silicone bearing)	once a year
39	003575	Gasket SVL 42 x 30 PTFE	once a year

7.5 Washing insert

The washing insert must be cleaned from time to time and the lip gasket must be replaced when brittle.

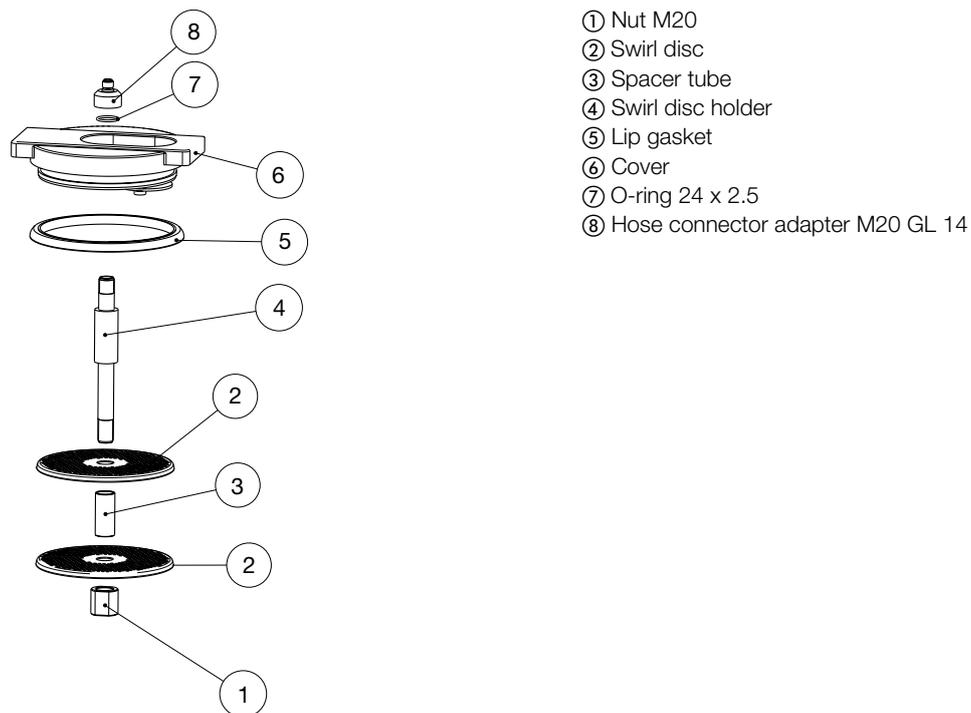


Fig. 7.1: Exploded view of the washing insert

To (re)assemble the washing insert, proceed as follows:

- Insert the lip gasket e into the cover of the neutralization vessel ⑥.
- Place the cover of the neutralization vessel ⑥ on the swirl disc holder ④.
- Screw on the adapter ⑧ with the O-ring ⑦ and tighten it.
- Insert the first swirl disc ②.
- Insert the spacer tube ③.
- Insert the second swirl disc ②.
- Screw the washing insert into the nut ①.
- Insert the complete washing insert into the neutralisation vessel.
- Press the cover ⑥ on the neutralization vessel and center the neutralization vessel.

7.6 Washing solution

Used washing solutions may impair the functionality of the Scrubber K-415 especially in the range of the neutralization point as a result of strong foaming. Changing the washing solution in appropriate time (when the color indicator undergoes a color change) keeps the adsorption stage and/or reaction stage from getting soiled and prevents the possibility of the pump getting damaged. For a description of how to prepare and fill up the washing solution, see chapters 5.9 and 5.10.

NOTE

Make sure to dispose of the used washing solution according to your laboratory guidelines.

7.7 Active charcoal

Exchange the active charcoal as soon as it clumps together or white crystals or other residues become visible.

7.8 Pump

Flush the pump once a week or after hard use.

To flush the pump, proceed as follows:

- Close the bypass valve ① completely (for maximum suction power).
- Disconnect the suction hose ④ from the absorption vessel and put it into a suitable vessel ③ with at least 500 mL of distilled water.
- Disconnect the silencer and remove it.

	NOTICE
	<p>Risk of a water leakage and power failure.</p> <ul style="list-style-type: none"> • Do not pull on the pump output hose.

- Place a suitable vessel ② on the pump output.
- Switch on the device and collect the waste water from the pump.
- Flush the pump until the collected waste water is clear

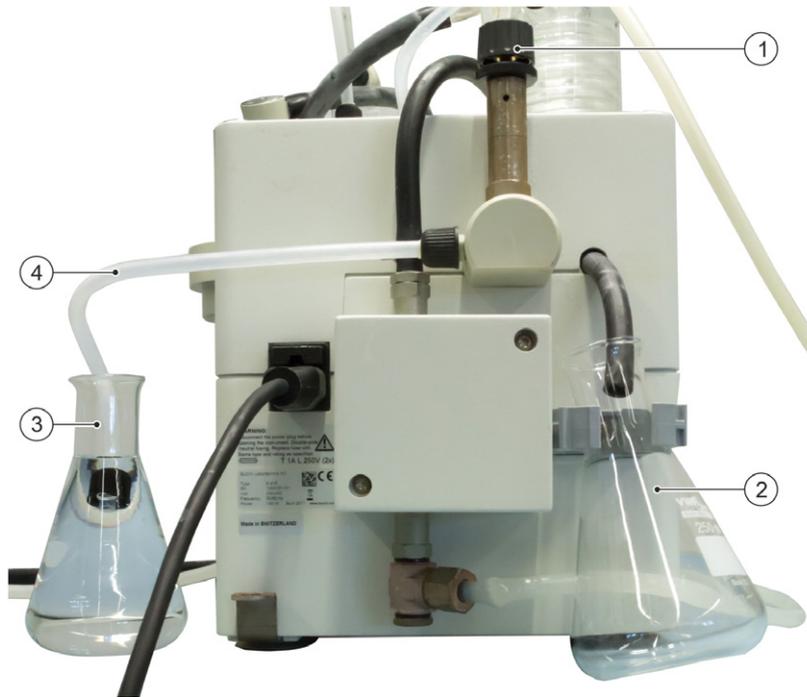


Fig. 7.2: Flushing the pump

7.9 Hose cooling control / condenser

Check the hose monthly and replace it as soon as it becomes porous.

7.10 Hose water control feed

- Check the sieve once a month for residues and clean it if necessary.
- Check the adapter, its sealings and the sieve on a yearly base and replace defective parts.

7.11 Power supply fuses

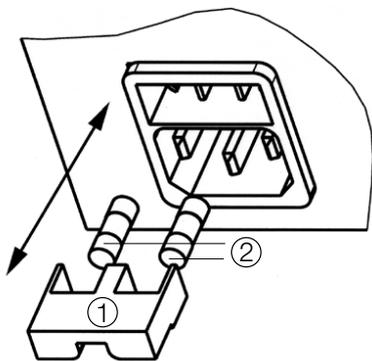


Fig. 7.3: Replacing the power supply fuses

To replace the power supply fuses, proceed as follows:

- Pull out the power supply cable.
- Remove the fuse holder ①.
- Replace the defective fuse with a new fuse ② of the same type:
 - 100 V: T2A L 250 V
 - 120 V: T2A L 250 V
 - 230 V: T1A L 250 V
- Put the fuse holder back.

7.12 Silencer

Replace the silencer once a year.

7.13 Functional test

A functional test to check whether the bypass valve functions properly and if the complete system of the K-415 is tight can be performed by your service technician. Please contact your BUCHI service center concerning this matter.

7.14 Customer service

Only authorised service personnel are allowed to perform repair work on the instrument. These persons have a comprehensive technical training and knowledge of possible dangers which might arise from the instrument.

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
- Troubleshooting
- Instrument qualification (IQ) and operative qualification (OQ)

8 Troubleshooting

This chapter helps to resume operation after a minor problem has occurred with the instrument. 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 "Corrective measure".

The elimination of more complicated malfunctions or errors is usually performed by a BUCHI technical engineer who has access to the official service manuals. In this case, please refer to your local BUCHI customer service agent.

8.1 Malfunctions and their remedy

Table 8-1: General malfunction and their remedy		
Malfunction	Possible cause	Corrective measure
K-415 does not work	No mains connection?	Check whether the instrument is connected to the mains.
	Fuses defective?	Replace the defective fuses.
	Mains switch defective?	Contact the BUCHI customer service.
	No digestion running while instrument is controlled by digester?	Wait for digestion to start.
Pump does not work	Wiring defective?	Contact the BUCHI customer service.
	Pump defective?	Contact the BUCHI customer service.
Cooling water not running	External cooling water source switched off?	Switch external cooling water source on.
Loss of cooling water	Untight hose connections?	Check hose connections and water control.
Fumes are not exhausted during digestion (Scrubber suction capacity too weak)	Suction system leaking?	Tighten the hose and glass connections .
	Hose bent or porous?	Check the hoses.
	Adsorption vessel clogged?	Check the adsorption vessel and the contained activated charcoal.
	Washing solution dirty?	Exchange the washing solution.
	Adsorbents clogged?	Renew the adsorbents.
	Pump dirty?	Clean the pump.
	Silencer unit clogged?	Replace the silencer unit.
	Overpressure valve dirty?	Contact the BUCHI customer service.
Fumes are exhausted too fast during digestion (Scrubber suction capacity too strong)	Cock of TKN receiving vessel open?	Close the cock.
	Wrong adjustment of bypass valve?	Readjust the bypass valve.
	Suction system clogged?	Check all stages and the connected digestion unit as well.
	Adsorbents clogged?	Exchange the adsorbents.
	Silencer unit defective?	Replace the silencer unit.
Unsufficient neutralization	Wrong adjustment of bypass valve?	Readjust the bypass valve.
	Bypass valve defective?	Contact the BUCHI customer service.
	Washing solution used up?	Exchange the washing solution.
	Swirl discs blocked?	Clean swirl discs and washing solution.

9 Shutdown, storage, transport and disposal

This chapter instructs how to shut down the instrument, how to pack it for storage or transport, and specifies the storage and shipping conditions.

	! WARNING
	<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 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

9.1 Storage and transport

Switch off the instrument and remove the power cord. To disassemble the Scrubber K-415 follow the installation instructions in section 5 in reverse order. Clean the instrument thoroughly! Remove all liquids and dusty residues before packaging the instrument.

9.2 Disposal

To dispose of the instrument in an environmentally friendly manner, a list of materials is given in chapter 3. This helps to ensure that the components are separated and recycled correctly. Please follow valid regional and local laws concerning disposal.

10 Spare parts

This chapter lists spare parts, accessories, and options including their ordering information. Order the spare parts from BUCHI. Always state the product designation and the part number when ordering spare parts. Use only genuine BUCHI consumables and genuine spare parts for maintenance and repair to assure good system performance and reliability. Any modifications to the spare parts used are only allowed with the prior written permission of the manufacturer.

10.1 Spare parts on the exploded instrument view

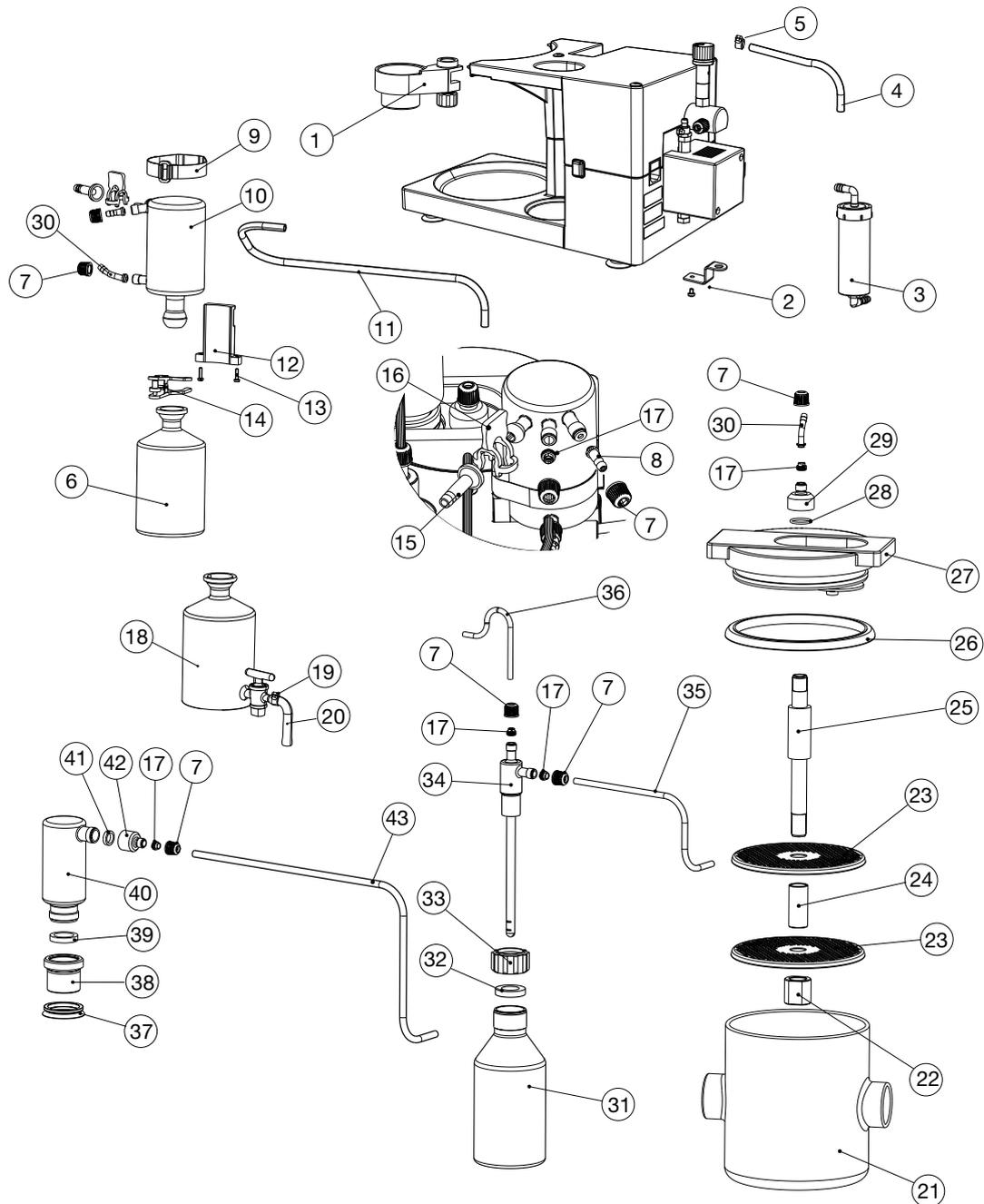


Fig. 10.1: Spare parts on the exploded instrument view

Table 10-1: Spare parts on the exploded instrument view

Position	Product	Order number	Position	Product	Order number
1	Tray for adsorption storage (with screw)	11057332	23	Swirl disc	037821
2	Anti-seismic-tie-down	-	24	Spacer tube	037852
3	Silencer unit (filled with polyester fibres)	11056985	25	Swirl disc holder	037851
4	Neoprene hose (8/2 x 250)	11056456	26	Lip gasket EPDM (resistant against bases) FPM (resistant against acids)	037874 038064
5	Hose clamp (10 - 16 mm)	043297	27	Cover of neutralization vessel	11057139
6	Receiving vessel	11057153	28	O-Ring 24 x 2.5 (with hose connector adapter)	037928
7	Screw cap GL 14 (Set of 10 pcs.)	041956	29	Hose connector adapter M20 GL 14	037777
8 + 7	Connector straight for GL 14 with FPM sealing (set of four, including screw caps)	040296	30 + 7	Connector bent for GL 14 (set of four, including screw caps)	040295
9	Rubber strap	11059813	31	Reaction vessel, 1.0 L	037797
10	Condenser S35	11057152	32	Gasket ring	037925
11	Hose condenser / washing solution (FEP)	11057155	33	Screw cap SVL 42	003551
12	Carrier plate for condenser	-	34	Introduction tube assembly	037778
13	Screws for carrier plate (M4x16)	-	35	Hose reaction / pump (FEP)	11057157
14	Catchpot clip S35	003275	36	Hose adsorption / reaction (FEP)	11057156
15	Hose connection S19 (ball joint)	11057159	37	Axial Gasket ring	049485
16	Ball joint clamp	11057149	38	Adapter piece for adsorption	11057147
17 + 7	Gasket FEP (GL 14) (set of 10, incl. screw caps)	041999	39	Gasket SVL 42 x 30 PTFE	003575
18	Receiving vessel with cock (TKN-set)	11056979	40	Adsorption vessel	037774
19	Hose clamp (10 - 16 mm)	043297	41	Gasket SVL 22 x 16 PTFE (with silicone bearing)	002070
20	Tube for TKN-set (1.5 m, 8/12)	020136	42	Adapter SVL 22 / GL 14	037972
21	Neutralization vessel (P+G)	11057138	43	Hose adsorption / pump	11057154
22	Nut M20	037855			

10.2 Miscellaneous

Table 10-2: Miscellaneous

Product	Order number
Set of sealings FPM (10 pieces)	040040
Set of screw caps GL 14 (10 pieces)	041956
Set of screw caps GL 14 and sealings FEP (10 pieces)	041999

11 Declarations and requirements

11.1 FCC requirements (for USA and Canada)

English:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to both Part 15 of the FCC Rules and the radio interference regulations of the Canadian Department of Communications. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Français:

Cet appareil a été testé et s'est avéré conforme aux limites prévues pour les appareils numériques de classe A et à la partie 15 des réglementations FCC ainsi qu'à la réglementation des interférences radio du Canadian Department of Communications. Ces limites sont destinées à fournir une protection adéquate contre les interférences néfastes lorsque l'appareil est utilisé dans un environnement commercial.

Cet appareil génère, utilise et peut irradier une énergie à fréquence radioélectrique, il est en outre susceptible d'engendrer des interférences avec les communications radio, s'il n'est pas installé et utilisé conformément aux instructions du mode d'emploi. L'utilisation de cet appareil dans les zones résidentielles peut causer des interférences néfastes, auquel cas l'exploitant sera amené à prendre les dispositions utiles pour palier aux interférences à ses propres frais.

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