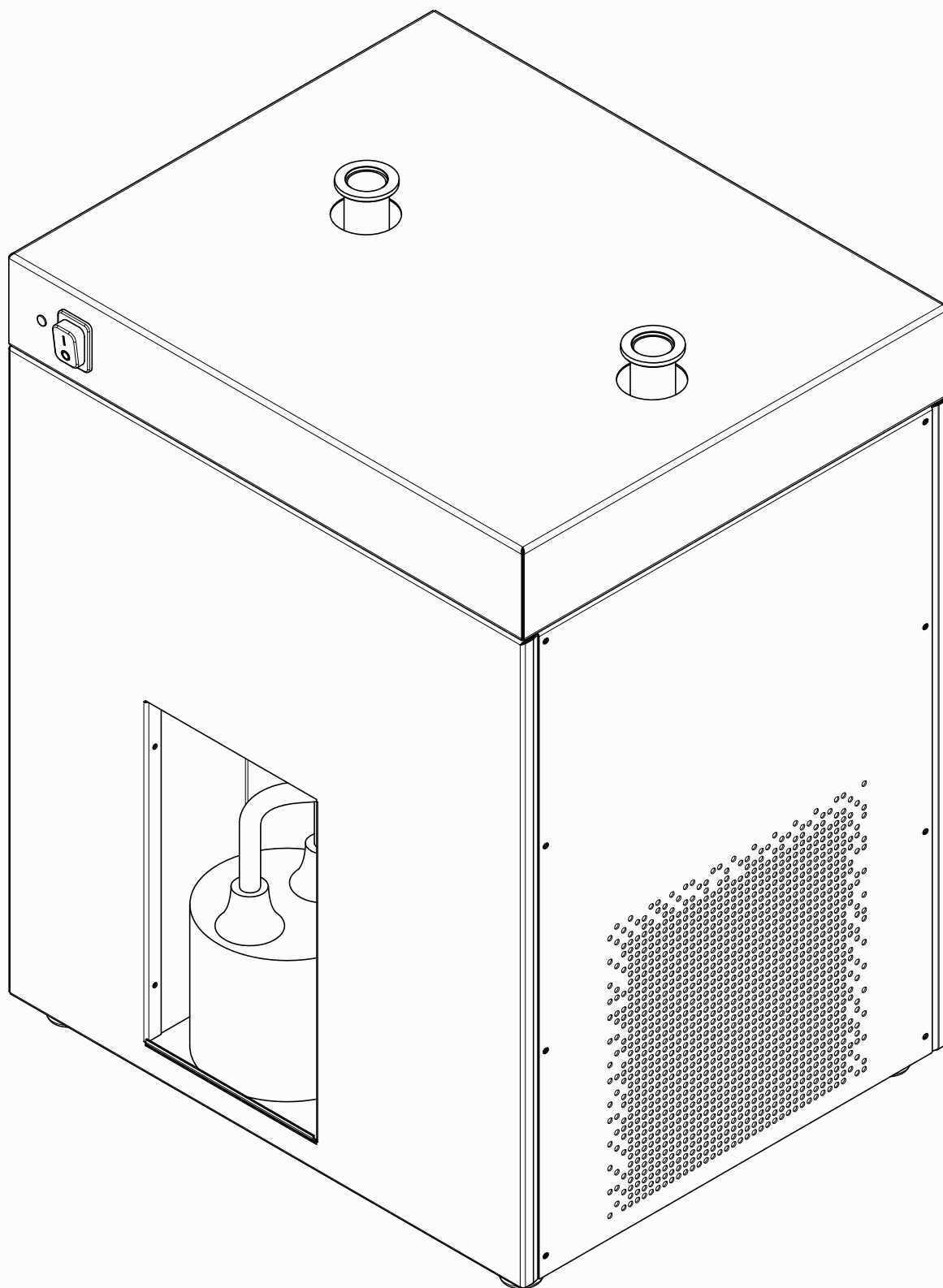




Operation Manual

Dehumidifier S-396 SE



Imprint

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1 About this document

This operation manual is applicable for all variants of the instrument.

Read this operation manual before operating the instrument and follow the instructions to ensure safe and trouble-free operation.

Keep this operation manual for later use and pass it on to any subsequent user or owner. BÜCHI Labortechnik AG accepts no liability for damage, faults and malfunctions resulting from not following this operation manual.

If you have any questions after reading this operation manual:

- Contact BÜCHI Labortechnik AG Customer Service.

<https://www.buchi.com/contact>

1.1 Mark-ups and symbols



NOTE

This symbol draws attention to useful and important information.

- ☑ This character draws attention to a requirement that must be met before the instructions below are carried out.

- This character indicates an instruction that must be carried out by the user.

- ⇒ This character indicates the result of a correctly carried out instruction.

Mark-up	Explanation
<i>Window</i>	Software Windows are marked-up like this.
<i>Tab</i>	Tabs are marked-up like this.
<i>Dialog</i>	Dialogs are marked-up like this.
<i>[Button]</i>	Buttons are marked-up like this.
<i>[Field names]</i>	Field names are marked-up like this.
<i>[Menu / Menu item]</i>	Menus or menu items are marked-up like this.
Status	Status is marked-up like this.
Signal	Signals are marked-up like this.

1.2 Trademarks

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

1.3 Connected instruments

In addition to this operation manual, follow the instructions and specifications in the documentation for the connected instruments.

2 Safety

2.1 Proper use

The instrument is designed and built for laboratories.

The instrument can be used for the following tasks:

- Condense organic solvent from the drying gas from BUCHI spray dryer.

2.2 Use other than that intended

The use of the instrument other than described in proper use and specified in technical data is use other than that intended.

The operator is responsible for damages or hazards that are caused by use other than that intended.

Especially the following uses are not permitted:

- Use of the instrument in areas which require explosion-safe instruments.
- Use the instrument with non-BUCHI instruments.
- Use of the instrument for processing substances outside of research and development.
- Use of the instrument with gases with unknown chemical composition.
- Use of the instrument with samples containing peroxides.
- Use of the instrument with samples that can form peroxides.
- Use of the instrument with samples which produce oxygen during the processing.
- Use of the instrument with toxic substances without appropriate safety measures.
- Use of the instrument with biohazardous materials such as viruses or bacteria.
- Use of the instrument with substances which might explode or ignite because of the processing.
- Use of the instrument with corrosive samples.

2.3 Staff qualification

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

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

These operating instructions are aimed at the following target groups:

Users

Users are persons that meet the following criteria:

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

Operator

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

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

BUCHI service technicians

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

2.4 Personal protective equipment

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

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

2.5 Warning notices in this document

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

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

2.6 Warning symbols

The following warning symbols are displayed in this operation manual or on the instrument.

Symbol	Meaning
	General warning
	Instrument damage
	Flammable substances

Location of the warning symbols on the instrument

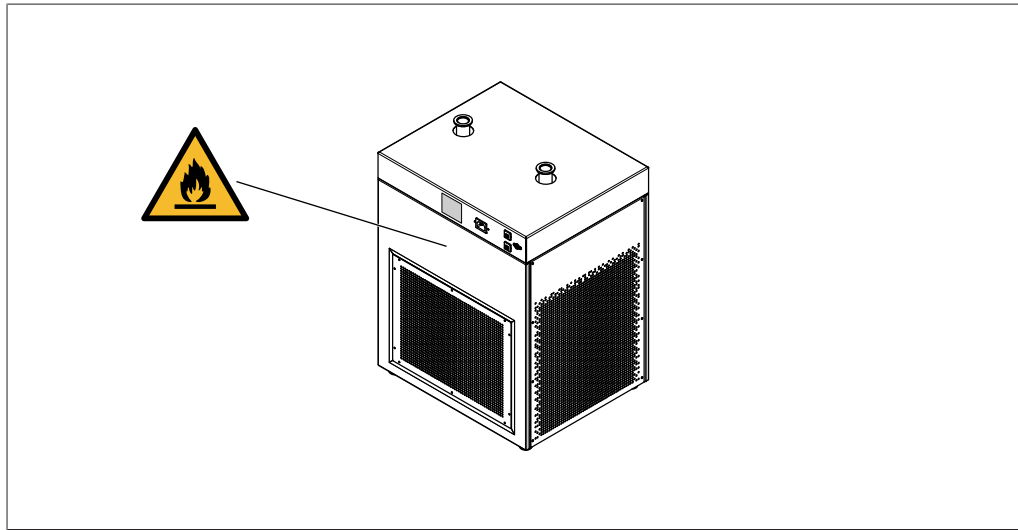


Fig. 1: Location of the warning symbols on the instrument

2.7 Residual risks

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

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

2.7.1 Malfunction of a connected instrument (option)

A malfunction on a connected instrument can cause poisoning or death.

- Make sure that the connected instrument is prepared and maintained according to the user documentation.

2.7.2 Incorrect spray drying mode installation

An incorrect spray drying mode installation can cause an instrument damage.

- Make sure that all instruments for a spray drying mode are installed in the correct order.

2.8 Modifications

Unauthorized modifications can affect safety and lead to accidents.

- Use only genuine BUCHI accessories, spare parts and consumables.
- Carry out technical changes only with prior written approval from BUCHI.
- Only allow changes to be made by BUCHI service technicians.

BUCHI accepts no liability for damage, faults and malfunctions resulting from unauthorized modifications.

3 Product description

3.1 Description of function

The Dehumidifier S-396 SE dries moisture (solvent) gases while maintaining constant and reproducible conditions. As the gas passes through the refrigerator, vapor condenses and is collected in a closed woulff bottle.

3.2 Configuration

3.2.1 Front view

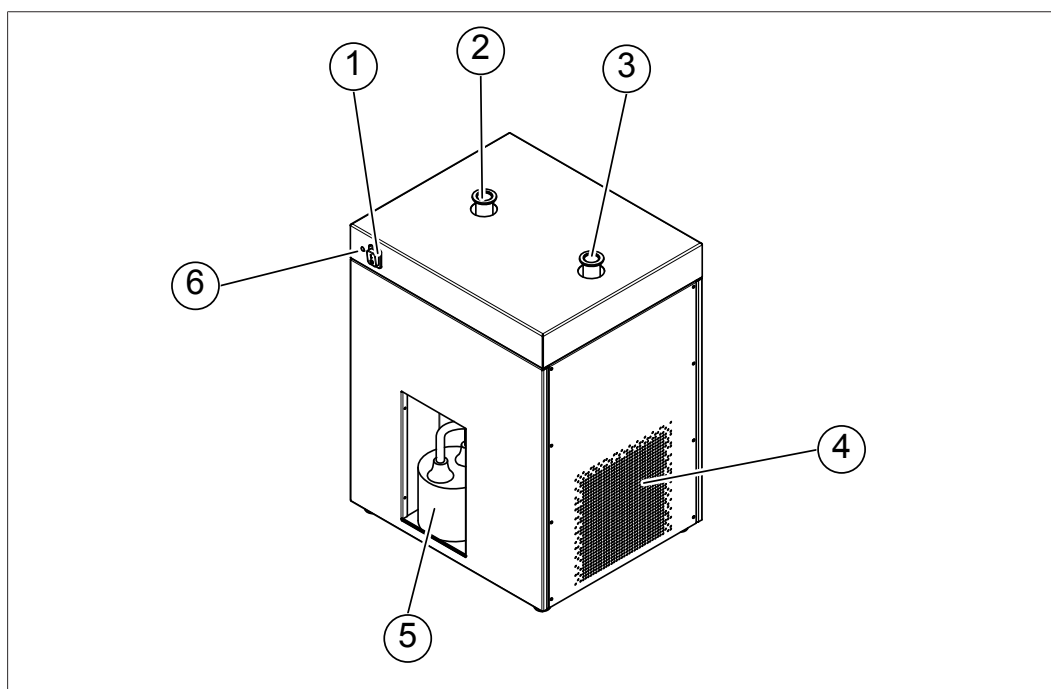


Fig. 2: Front view

- | | | | |
|---|------------------------|---|-------------------|
| 1 | On / Off master switch | 2 | Inlet |
| 3 | Outlet | 4 | Ventilation slots |
| 5 | Condensate vessel area | 6 | Status LED |

3.2.2 Rear view

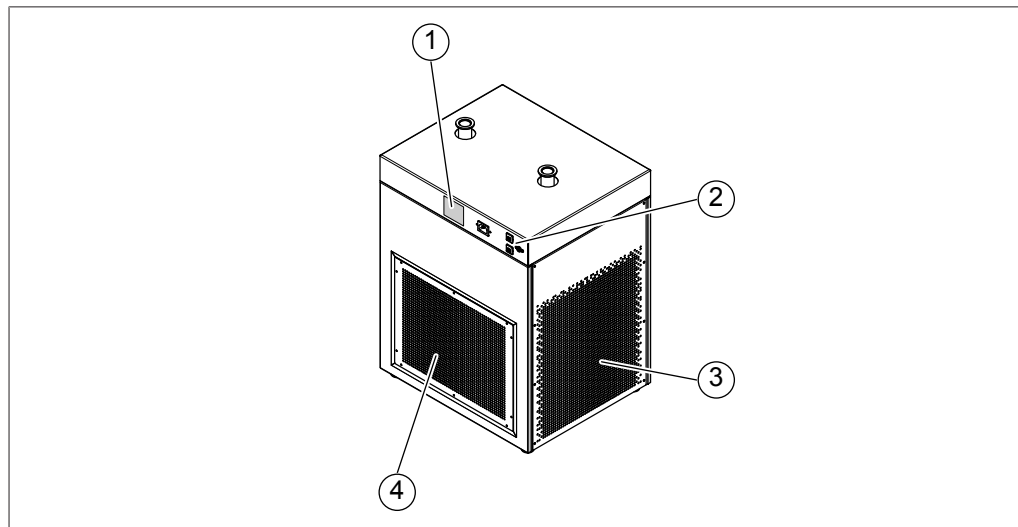


Fig. 3: Rear view

- | | |
|---|---|
| <p>1 Type plate
See Chapter 3.4 “Type plate”,
page 10.</p> <p>3 Ventilation slots</p> | <p>2 Connections
See Chapter 3.2.3 “Connections”,
page 10.</p> <p>4 Ventilation slots</p> |
|---|---|

3.2.3 Connections

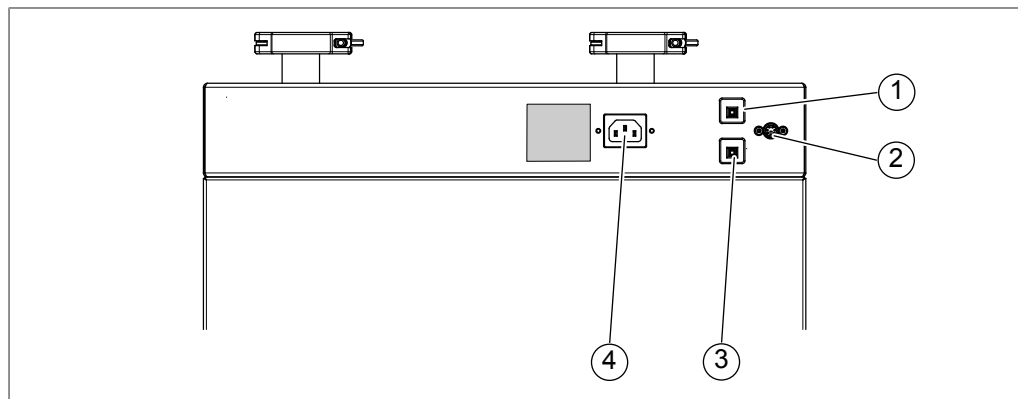


Fig. 4: Connections

- | | |
|-----------------------------|---|
| <p>1 Fuse</p> <p>3 Fuse</p> | <p>2 COM port (24 V, ≤ 1 A)
for maintenance purposes only</p> <p>4 Power supply</p> |
|-----------------------------|---|

3.3 Scope of delivery



NOTE

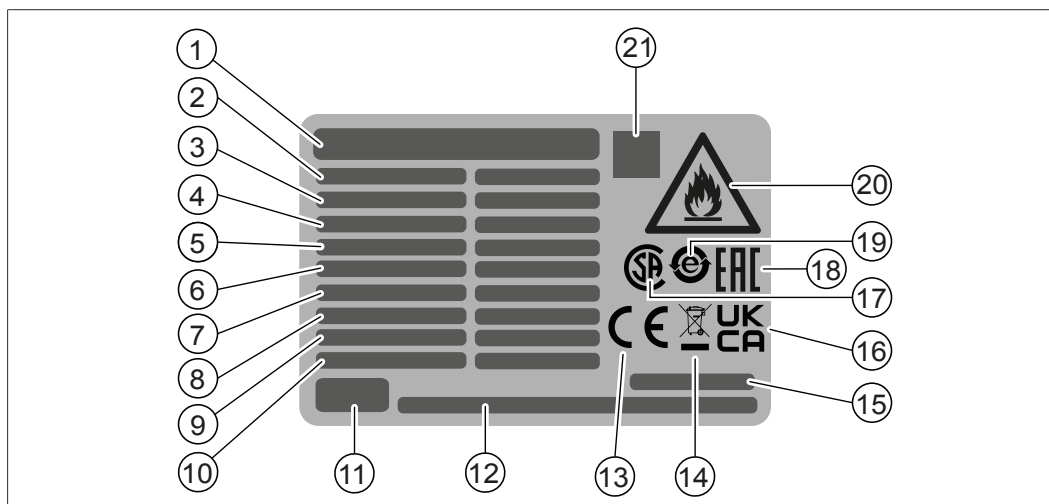
The scope of delivery depends on the configuration of the purchase order.

Accessories are delivered as per the purchase order, order confirmation, and delivery note.

3.4 Type plate

The type plate identifies the instrument. The following type plate is an example. For more details refer to the type plate on the instrument.

The type plate is located at the rear of the instrument.



- | | |
|--|---|
| 1 Instrument name | 2 Serial number |
| 3 Article number | 4 Refrigerant/-quantity |
| 5 Pressure high-side | 6 Pressure low-side |
| 7 Input voltage range | 8 Frequency |
| 9 Power consumption | 10 Production year |
| 11 Company logo | 12 Company name, address and website |
| 13 Symbol for "CE conformity" | 14 Symbol for "Do not dispose of as household waste" |
| 15 Product origin | 16 Symbol for "UK Conformity Assessed" |
| 17 Symbol for "CSA certified" | 18 Symbol for "Eurasian Conformity" |
| 19 Symbol for "electronics recycling" | 20 Warning symbol for flammable substance (refrigerant) |
| 21 QR-Code contains "Item number, Serial number" | |

3.5 Technical data

3.5.1 Dehumidifier S-396 SE

Specification	Dehumidifier S-396 SE
Dimensions (W x D x H)	450 x 373 x 609 mm
Weight	34.5 kg
Minimum clearance on all sides	200 mm
Power consumption	max. 500 VA
Frequency	50 / 60 Hz
Connection voltage	200–240 VAC $\pm 10\%$
Fuses	6 A
Overvoltage category	II
Pollution degree	II
Protection degree	IP20
Typical outlet temperature	5 °C
Rate of cooling	approx. 850 W at 5 °C outlet temperature
Refrigerant	R290

Specification	Dehumidifier S-396 SE
Refrigerant GWP	3
Filling amount of refrigerant	0.098 kg
Maximum allowable pressure (PS), low-pressure side	13.5 bar
Maximum allowable pressure (PS), high-pressure side	22 bar
Maximum allowable process gas pressure	±0.15 bar
Maximum inlet temperature	100 °C

3.5.2 Ambient conditions

For indoor use only.

Specification	Value
Max. altitude above sea level	2,000 m
Ambient and storage temperature	5–40 °C
Max. relative humidity	80% for temperatures up to 31 °C decreasing linearly to 50% relative humidity at 40 °C

3.5.3 Materials

Component	Materials of construction
Housing	St 1.4301 powder coated
Reservoir	St 1.4301 Silver solder Phosphor solder EPDM
Evaporator	Aluminum Copper
Connections	Stainless steel
Woulff bottle	Glass
Hoses	Silicone

3.5.4 Installation site

- The installation site has a firm, level surface.
- The installation site allows that the power supply can be disconnected at any time in an emergency.
- The installation site has enough space that cables / tubes can be routed safely.
- The installation site has no obstacles (e.g. water taps, drains, etc.).
- The installation site is not exposed to external thermal loads, such as direct solar radiation.
- The installation site meets the requirements for the connected devices. See related documentation.
- The installation site meets the specifications according to the technical data (e.g. weight, dimension, etc.). See Chapter 3.5 “Technical data”, page 11
- The installation site meets the requirements of the safety data sheets for all solvents and samples used.
- There is no loose paper or the like at the installation site that could be drawn in the ventilation.
- The installation site has an own mains outlet socket for the instrument.
- The electric installation meets the requirements. See Chapter 5 “Installation”, page 15 and Chapter 3.5 “Technical data”, page 11.

4 Transport and storage

4.1 Transport



NOTICE

Risk of breakage due to incorrect transportation

- ▶ Make sure that all parts of the instrument are safely packed in such a way as to prevent breakage, ideally in the original box.
 - ▶ Avoid sharp movements during transit.
-
- ▶ After transportation, check the instrument for damage.
 - ▶ Damage that has occurred in transit should be reported to the carrier.
 - ▶ Keep packing for future transportation.

4.2 Storage

- ▶ Make sure that the ambient conditions are complied with (see Chapter 3.5 “Technical data”, page 11).
- ▶ Wherever possible, store the instrument in its original packaging.
- ▶ After storage, check the instrument, all seals and tubing for damage and replace if necessary.

4.3 Lifting the instrument



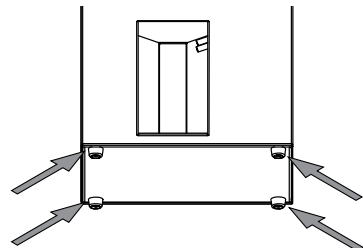
WARNING

Danger due to incorrect transportation

The possible consequences are crushing injuries, cuts and breakages.

- ▶ The instrument should be transported by two persons at the same time.
- ▶ Lift the instrument at the points indicated.

- ▶ Lift the instrument at the points indicated ((1) + (3) and (2) + (3)).



5 Installation

5.1 Before installation



NOTICE

Instrument damaged if switched on too early.

After transporting, wait twelve hours before switching on the instrument. The fluid in the cooling system requires twelve hours to collect in the refrigerant compressor.

5.2 Establishing electrical connections



NOTICE

Risk of instrument damage because of not suitable power supply cables.

Not suitable power supply cables can cause bad performance or an instrument damage

- Use only BUCHI power supply cables.



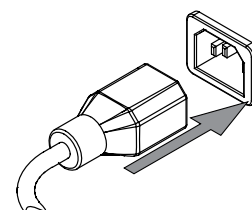
NOTICE

The power supply cable is for disconnecting the instrument.

- Easy access must be guarantee to the mains plug at all times.

Precondition:

- ☒ The electrical installation is as specified on the type plate.
 - ☒ The electrical installation is equipped with a proper grounding system.
 - ☒ The electrical installation is equipped with suitable fuses and electrical safety features.
 - ☒ The installation site is as specified in the technical data. See Chapter 3.5 "Technical data", page 11.
- Connect the power supply cable to the connection on the instrument. See Chapter 3.2 "Configuration", page 9.



- Connect the mains plug to an own mains outlet socket.

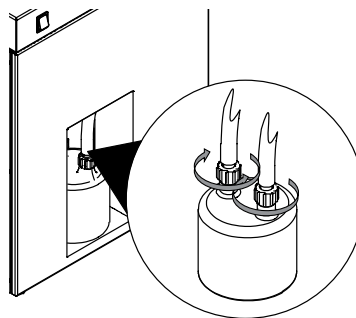
5.3 Installations for spray drying mode

For installations of different spray drying modes, please refer to the separate installation manuals.

- Dehumidifier S-396 SE for inlet air conditioning when spray drying in open loop mode
- Dehumidifier S-396 SE in combination with InertLoop S-395 when spraying in closed loop mode with the MiniSpayDryer S-300

5.4 Installing the woulff bottle

- Put the woulff bottle in the condensate vessel area.
- Attach the cap nuts to the bottle.



6 Operation

6.1 Starting the instrument

Hello



NOTE

During operation, check the woulff bottle's fill level regularly.

- ▶ Check that the fill level is below the connecting screws.
- ▶ Empty the woulff bottle regularly to prevent it from overflowing.

Precondition:

- ☒ All commissioning operations have been completed. See Chapter 5 "Installation", page 15.
- ☒ The woulffe bottle is empty. See Chapter 7.2 "Emptying the woulff bottle", page 18.
- ▶ Set the On/Off master switch to On.
 - ⇒ The compressor starts up.
 - ⇒ The outlet hoses cool down.

Status LED

After switching on the instrument, the status LED indicates the operating state.

LED signal	Description
Regular blinking	• The instrument is initializing. • The instrument is in conditioning mode for the cooling circuit.
Steady light	• The instrument is on (normal condition).
Three blinks followed by a pause (repeats)	• The instrument is in stop mode. • An error has occurred. See Chapter 8.1 "Troubleshooting", page 20.

6.2 Shutting down the instrument

- ▶ Set the On/Off master switch to Off.
- ▶ Empty the woulff bottle. See Chapter 7.2 "Emptying the woulff bottle", page 18.

7 Cleaning and servicing



NOTE

- Carry out only the service and cleaning operations described in this section.
- Do not carry out any servicing and cleaning operations that involve opening the housing.
- Use only genuine BUCHI spare parts in order to ensure correct operation and preserve the warranty.
- Carry out the service and cleaning operations described in this section to extend the lifetime of the instrument.

7.1 Regular maintenance work

Action	Daily	Weekly	Monthly	Additional information
7.2 Emptying the woulff bottle	1			Carry out this action before every instrument use and check regularly to prevent overflow.
7.3 Cleaning the housing		1		
7.4 Cleaning and servicing the warning and directive symbols		1		
7.5 Cleaning the ventilation slots			1	
7.6 Cleaning the instrument			1	In addition, carry out this cleaning process when changing the sample.

1 - Operator

7.2 Emptying the woulff bottle



NOTE

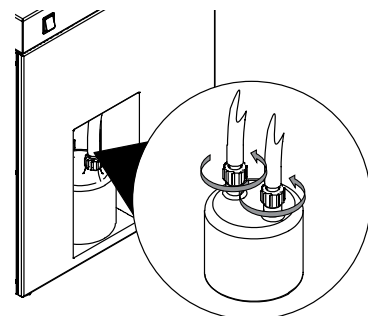
Installing is done in reverse sequence.



NOTE

During operation, check the woulff bottle's fill level regularly.

- Check that the fill level is below the connecting screws.
- Empty the woulff bottle regularly to prevent it from overflowing.
- Open the cap nuts.
- Remove the bottle.
- Empty the bottle in compliance with local regulations and legal requirements for waste disposal.



7.3 Cleaning the housing

- ▶ Wipe down the housing with a damp cloth.
- ▶ If heavily soiled, use ethanol or a mild detergent.

7.4 Cleaning and servicing the warning and directive symbols

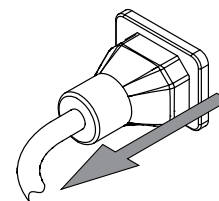
- ▶ Check that the warning symbols on the instrument are legible.
- ▶ If they are dirty, clean them with a damp cloth.

7.5 Cleaning the ventilation slots

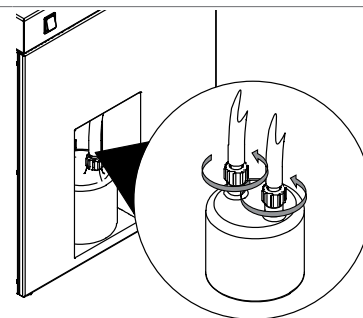
- ▶ Remove dust and foreign objects from the ventilation slots using compressed air or a vacuum cleaner.

7.6 Cleaning the instrument

- ▶ Disconnect the power cable.



- ▶ Remove the process gas tubes.
- ▶ Open the cap nuts.
- ▶ Remove the bottle.



- ▶ Put the condensate drain tubes in a bucket (min. 5 L)
- ▶ Seal the condensate drain tubes with a hose clamp.
- ▶ Fill about 5 liter non-corrosive cleaning liquid (e.g. ethanol) into the process gas tube connected to the connection marked *IN*.
- ▶ Wait 5 minutes.

NOTICE! Check the filling level of the bucket during the draining process. If necessary empty it.

- ▶ Drain the cleaning liquid through the condensate drain tubes.
- ▶ Repeat the cleaning procedure until the washing solution is free from particles or chemicals

8 Help with faults

8.1 Troubleshooting

Problem	Possible cause	Action
The On/Off master switch does not light up the status LED.	No electric connection or supply.	► Check the electric connection and/or power supply connection. ► Connect the instrument to the electric power supply. See Chapter 5 “Installation”, page 15. ► Switch on the On/Off master switch.
The compressor does not start up.	Broken compressor. Wrong connection voltage. Insufficient mains voltage. Triggered fuse. Unallowed condition of refrigeration system. Defective PCB controller.	► Contact BUCHI Customer Service.
The outlet hose does not get cold.	Compressor is broken. Wrong connection voltage.	► Contact BUCHI Customer Service.
The status LED indicates an error (three blinks followed by a pause, repeating).	Restart required.	► Switch off the On/Off master switch. ► Switch on the On/Off master switch again. ► If the status LED starts blinking in the error pattern again, switch off the On/Off master switch and wait for two hours. ► After two hours, switch on the On/Off master switch. ► If the error still persists, contact BUCHI Customer Service.

9 Taking out of service and disposal

9.1 Taking out of service

- ▶ Switch off the instrument and disconnect it from the mains power supply.
- ▶ Remove all tubing and communication cables from the instrument.

9.2 Disposal

The operator is responsible for proper disposal.

- ▶ When disposing the instrument, equipment or packaging, observe the local regulations and statutory requirements regarding waste disposal.
- ▶ When disposing, observe the disposal regulations of the materials used. For the used materials see Chapter 3.5 “Technical data”, page 11 or the material labeling on the parts.



NOTICE

Environmental hazard from flammable refrigerant

The refrigerant used to operate the instrument is flammable.

- ▶ Dispose the instrument properly, if necessary using a professional disposal service.

9.3 Returning the instrument

Before returning the instrument, contact the BÜCHI Labortechnik AG Service Department.

<https://www.buchi.com/contact>

10 Appendix

10.1 Spare parts and accessories

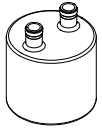
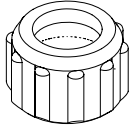
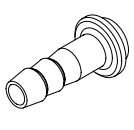
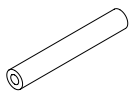
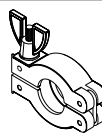
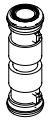
Use only genuine BUCHI consumables and spare parts in order to ensure correct, safe and reliable operation of the system.



NOTE

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

10.1.1 Spare parts and Accessories

	Order no.	Image
Woulff bottle	041875	
Cap nut SVL 22	003577	
Seal PTFE	005155	
PTFE hose connection SVL 22	027338	
Silicone hose 10x2.0x130 V0	11074029	
Vacuum clamp KF 25	11063662	
Tube Dehumidifier TPR conf.	11074039	



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