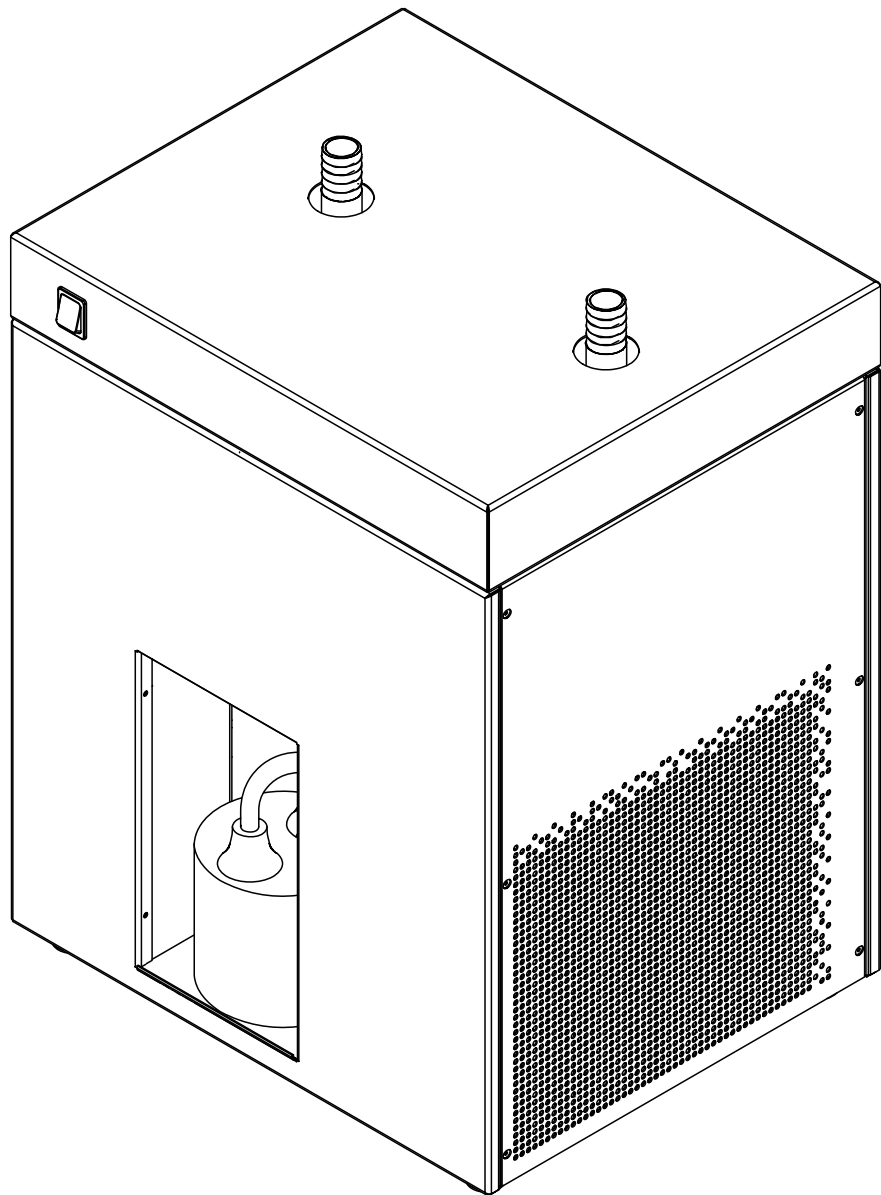




Dehumidifier S-396 Nano

Operation Manual



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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 water 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.

Specially 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 in closed mode without Inert Loop.
- 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 organic solvents (> 20 %) without Inert Loop.
- Use of the instrument with organic solvents (> 20 %) in open mode.
- 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 in closed mode.

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

Symbol	Meaning
	Instrument damage
	Health-harming or irritant substances

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 the 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 is an instrument which can dry gases at constant and reproducible humidity conditions. The humidity condensates while passing the refrigerator and is being collected in a closed condensate bottle.

3.2 Configuration

3.2.1 Front view

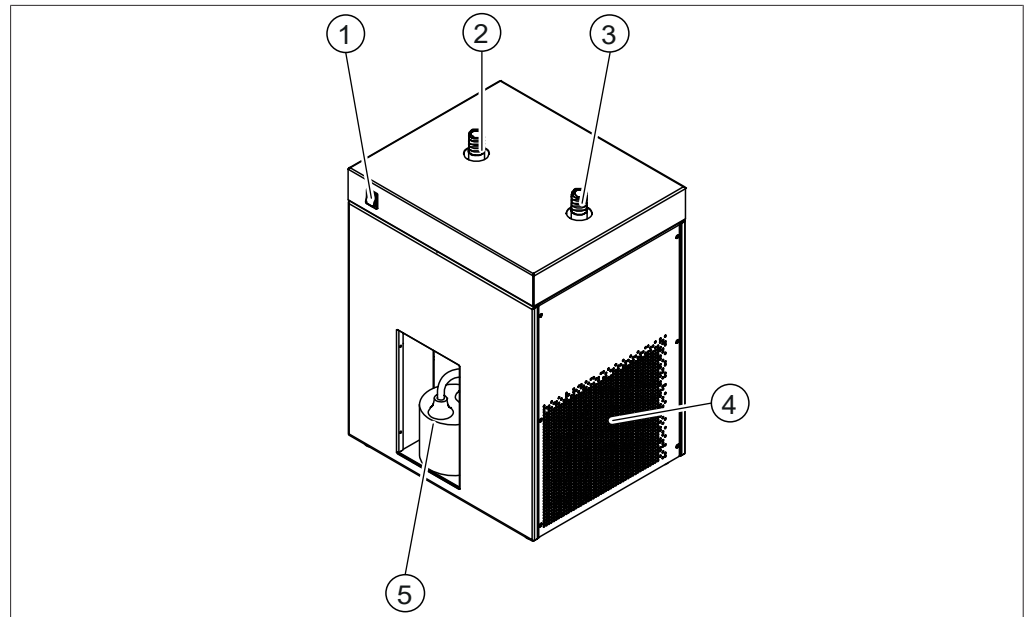


Fig. 1: Front view

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

3.2.2 Rear view

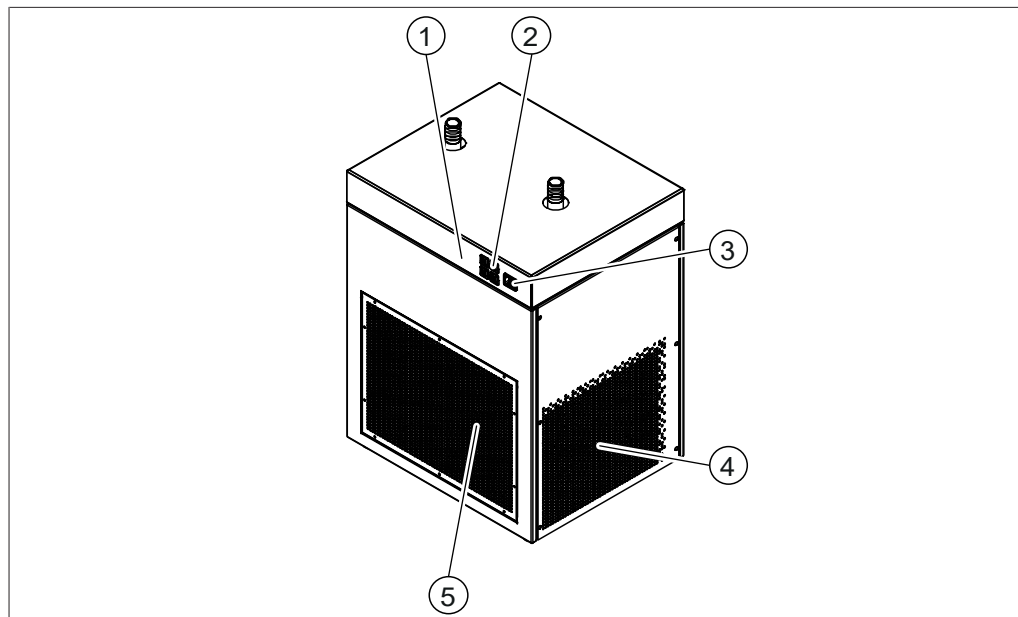


Fig. 2: Rear view

- | | | | |
|---|--|---|-------------------|
| 1 | Type plate
See Chapter 3.4 "Type plate",
page 10 | 2 | Fuses |
| 3 | Power supply | 4 | Ventilation slots |
| 5 | Ventilation slots | | |

3.3 Scope of delivery



NOTE

The scope of delivery depends of 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 type plate is located at the rear of the instrument. See Chapter 3.2.2 "Rear view", page 10

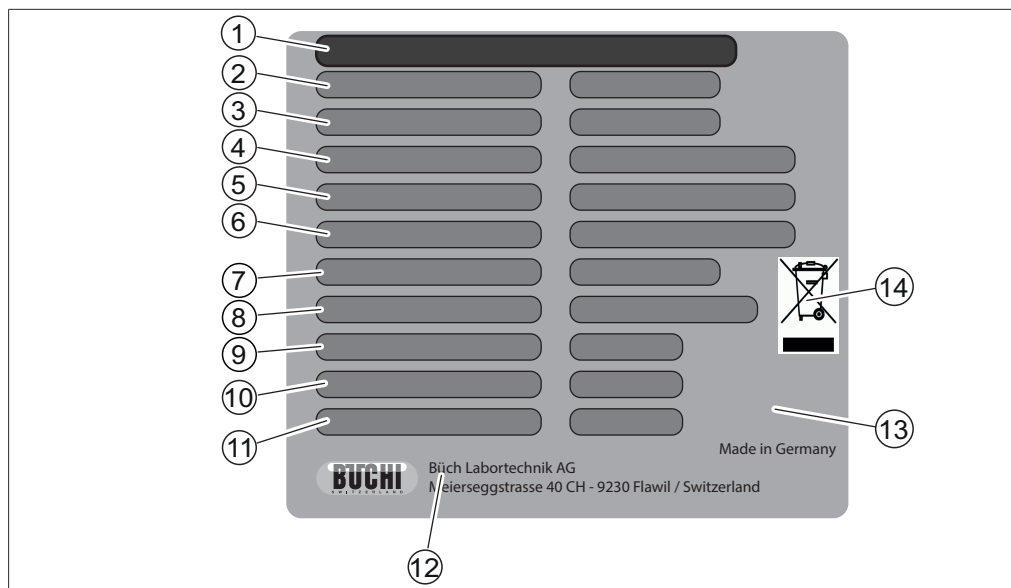


Fig. 3: Type plate

- | | |
|--|--|
| 1 Instrument name | 2 Serial number |
| 3 Article number | 4 Refrigerant details
Filling capacity |
| 5 Global warming potential | 6 Input voltage range
Frequency |
| 7 Power consumption maximum | 8 Fuse type |
| 9 High-pressure system design pressure | 10 Low-pressure system design pressure |
| 11 Year of manufacture | 12 Company name and address |
| 13 Approvals | 14 Symbol for "Do not dispose of as household waste" |

3.5 Technical data

3.5.1 Dehumidifier S-396 Nano

Specification	Dehumi difier S-396 nano 200 V	Dehumi difier S-396 nano 210 V	Dehumi difier S-396 nano 220 V	Dehumi difier S-396 nano 230 V	Dehumi difier S-396 nano 240 V
Dimensions (W x D x H)	450 x 373 x 609 mm	450 x 373 x 609 mm	450 x 373 x 609 mm	450 x 373 x 609 mm	450 x 373 x 609 mm
Weight	41 kg	41 kg	41 kg	41 kg	41 kg
Power consumption	max. 700 VA	max. 700 VA	max. 700 VA	max. 700 VA	max. 700 VA
Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
Connection voltage	200 VAC ± 10 %	210 VAC ± 10 %	220 VAC ± 10 %	230 VAC ± 10 %	240 VAC ± 10 %

Specification	Dehumidifier S-396 nano 200 V	Dehumidifier S-396 nano 210 V	Dehumidifier S-396 nano 220 V	Dehumidifier S-396 nano 230 V	Dehumidifier S-396 nano 240 V
Primary fuse	10 A	10 A	10 A	10 A	10 A
Secondary fuse	6 A	6 A	6 A	6 A	6 A
Oversvoltage category	II	II	II	II	II
Protection degree	I	I	I	I	I
Pollution degree	II	II	II	II	II
Min. outlet temperature	0 °C	0 °C	0 °C	0 °C	0 °C
Rate of cooling	340 W at 0 °C	340 W at 0 °C	340 W at 0 °C	340 W at 0 °C	340 W at 0 °C
Refrigerant	R513A	R513A	R513A	R513A	R513A
CO-equivalent	0.195 t	0.195 t	0.195 t	0.195 t	0.195 t
Filling amount of refrigerant	0.34 kg	0.34 kg	0.34 kg	0.34 kg	0.34 kg
Safety Group Refrigerants (ASHRAE)	A1 (lower toxicity, no flame propagation)	A1 (lower toxicity, no flame propagation)	A1 (lower toxicity, no flame propagation)	A1 (lower toxicity, no flame propagation)	A1 (lower toxicity, no flame propagation)
Maximum allowable pressure (PS) [Low pressure side]	12 bar	12 bar	12 bar	12 bar	12 bar
Maximum allowable pressure (PS) [High pressure side]	18 bar	18 bar	18 bar	18 bar	18 bar
Minimum clearance on all sides	200 mm	200 mm	200 mm	200 mm	200 mm

3.5.2 Ambient conditions

For indoor use only.

Max. altitude above sea level	2000 m
Ambient and storage temperature	5–40 °C
Maximum 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

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

4.2 Storage

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

4.3 Lifting the instrument



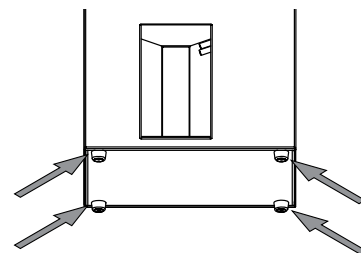
WARNING

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.



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

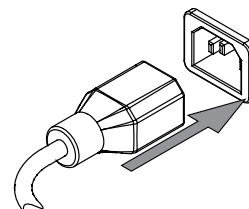
Risk of instrument damage because of not suitable power supply cables.

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

- ▶ Use only BUCHI power supply cables.

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.

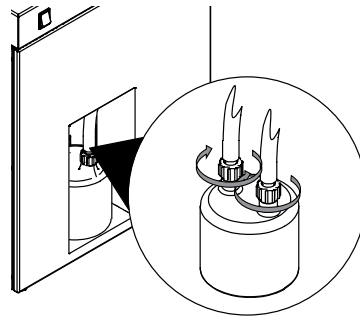
5.3 Installations for a spray drying mode

For installations for a spray drying mode, see separate installation manuals.

- "Nano Spray Dryer B-90 HP in closed mode"
- "Nano Spray Dryer B-90 HP in open mode with gas supply"
- "Nano Spray Dryer B-90 HP in open mode"

5.4 Installing the condensate vessel

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



6 Operation

6.1 Starting the instrument

Precondition:

- All commissioning operations have been completed. See Chapter 5 "Installation", page 15
- The condensate vessel is empty. See Chapter 7.2 "Empty the condensate vessel", page 18
- ▶ Set the On / off master switch to On.
 - ⇒ The compressor is starting up.
 - ⇒ The outlet hoses gets cold.

6.2 Shutting down the instrument

- ▶ Set the On / Off master switch to Off.
- ▶ Wait until the instrument is the same as the ambient temperature.
- ▶ Empty the condensate vessel. See Chapter 7.2 "Empty the condensate vessel", 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 Empty the condensate vessel	1			Carry out this action before every instrument use.
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

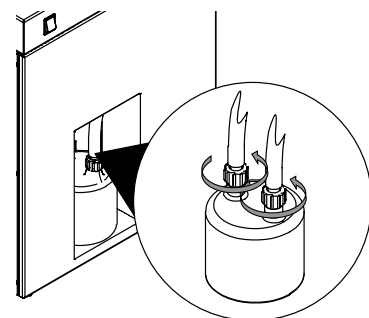
7.2 Empty the condensate vessel



NOTE

Installing is done in reverse sequence.

- ▶ 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

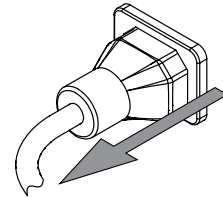
- ▶ Check that the warning symbols on the instrument are legible.
- ▶ If they are dirty, clean them.

7.5 Cleaning the ventilation slots

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

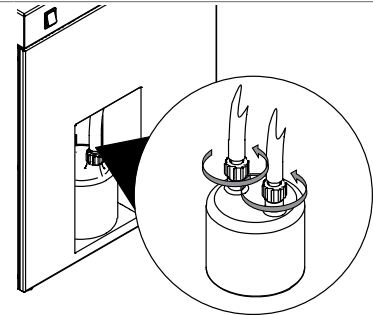
7.6 Cleaning the instrument

- ▶ 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 in about 5 liter 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.	No electric connection.	▶ Connect the instrument to the electric power supply. See Chapter 5 "Installation", page 15
The compressor does not start up.	Compressor is broken. Wrong connection voltage.	▶ Contact BUCHI Customer Service.
The outlet hose does not get cold	Compressor is broken. Wrong connection voltage.	▶ 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 of the instrument.

- ▶ When disposing of equipment observe the local regulations and statutory requirements regarding waste disposal.
- ▶ When disposing, observe the disposal regulations of the materials used. Materials used see Chapter 3.5 "Technical data", page 11.

9.3 Refrigerant



CAUTION

Potential environmental hazard.

The instrument uses refrigerant. See Chapter 3.5 "Technical data", page 11

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

9.4 Returning the instrument

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

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

We are represented by more than 100 distribution partners worldwide.
Find your local representative at:

www.buchi.com

Quality in your hands
