

Operation Manual





Imprint

Product Identification: Operation Manual (Original) Glass Oven G-300 11594666

Publication date: 03.2025

Version A

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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	
Window	Software Windows are marked-up like this.	
Tab	Tabs are marked-up like this.	
Dialog	Dialogs are marked-up like this.	
[Button]	Buttons are marked-up like this.	
[Field names]	Field names are marked-up like this.	
[Menu / Menu item]	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 Intended use

The instrument is designed as an item of laboratory equipment.

The instrument can be used in laboratories and production for the following tasks:

- Drying of solid substances
- Sublimation
- Distillation
- Freeze Drying

2.2 Use other than intended

Use of any kind other than that described in the section Chapter 2.1 "Intended use", page 7 and any application that does not comply with the technical specifications (see Chapter 3.5 "Technical data", page 15) constitutes use other than that intended.

In particular, the following applications are not permissible:

- Use of the instrument in an environment with a potential risk of explosion or areas which require explosion-safe apparatus
- Use of the instrument for processing substances in the food, animal feed or cosmetics industries
- Production and processing of substances that can lead to spontaneous reactions, e.g. explosives, metal hydrides or solvents that can form peroxides
- Working with explosive gas mixtures
- Drying hard, brittle substances (e.g. stone or soil samples) that could damage the instrument
- Shock-cooling of the glass components

Damage or hazards attributable to use of the product other than as intended are entirely at the risk of the user alone.

2.3 Staff qualification

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

The instrument must be operated by suitably qualified laboratory staff. These operating instructions are aimed at the following target groups:

Users

The 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 must 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
	Dangerous electrical voltage
	Hot surface



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 Faults during operation

If an instrument is damaged, sharp edges, glass splinters, moving parts or exposed electrical wires can cause injuries.

- ► Regularly check instruments for visible damage.
- If faults occur, switch off the instrument immediately, unplug the power cord and inform the operator.
- ▶ Do not continue to use instruments that are damaged.

2.7.2 Hot surfaces

The surfaces of the instrument can become hot. If touched they can cause skin burns.

- ▶ Do not touch hot surfaces or wear suitable protective gloves.
- Never cover the instrument with any object or towel.

2.7.3 Dangerous vapors

The use of the instrument can produce dangerous vapors that are capable of causing life-threatening toxic effects.

- ► Do not inhale any vapors produced during processing.
- Ensure that vapors are removed by a suitable fume hood.
- Only use the instrument in well ventilated areas.

- If vapors escape from connections, check the seals concerned and replace them if necessary.
- ▶ Do not process any unknown fluids.
- Observe the safety data sheets for all substances used.

2.7.4 Dangerous particles

The use of the instrument can produce dangerous particles that can cause lifethreatening toxic effects.

- ▶ Observe the safety data sheets for all substances used.
- Do not process any unknown substances.
- ► Do not inhale any particles produced during processing.
- ► Ensure that particles are removed by a suitable fume hood.
- Only use the instrument in well ventilated areas.
- If particles escape from connections, check the seals concerned and replace them if necessary.

2.7.5 Glass breakage

Broken glass can cause severe cuts.

Minor damage to the ground joints impairs the sealing effect and may therefore diminish suction capacity.

- Handle the glass components carefully and do not drop them.
- Always place the glassware in a suitable holder when they are not in use.
- Always visually inspect glass components for damage every time they are to be used.
- Do not continue to use glass components that are damaged.
- Always wear protective gloves when disposing of broken glass.

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 instrument is designed for drying, distilling, sublimating or freeze drying of small volume substances. The instrument can be equipped with any accessories for the required application.

The main unit consists of two borosilicate glass tubes, one inside the other. The inner glass tube is coated with a transparent semi-conductor coating used for heating. This design provides:

- Uniform heat distribution
- Rapid heating and cooling
- Sample monitoring

3.1.1 Applications

The instrument comes in two configurations, Drying and Kugelrohr. The configuration Drying can be used for drying, and—with the addition of the respective accessory—sublimation, and freeze drying. The configuration Kugelrohr comes with glassware to perform drying under rotation and distillation.



- 1 Drying
- 2 Freeze drying
- 3 Sublimation

- 4 Drying under rotation
- 5 Distillation

Configuration	Application	Description
Drying	Drying	To dry solid substances.
		This method heats a smaller volume than traditional dry- ing cabinets, saving energy and reducing drying time.
	Freeze drying	To gently dry substances while preserving product in- tegrity.
		First, the solution is frozen externally. Then the pressure is reduced to allow the ice to sublimate.
		To freeze dry with the G-300, order the freeze-drying accessory (see Chapter 11.1.1 "Accessories", page 54) additionally to the configuration Drying.
	Sublimation	To separate and purify products without the need for ad- ditional solvents.
		Sublimation is the process where a substance transi- tions directly from a solid to a gas without passing through the liquid phase. This is possible when a sub- stance is at a temperature and pressure below its triple point.
		To sublimate with the G-300, order the sublimation ac- cessory (see Chapter 11.1.1 "Accessories", page 54) additionally to the configuration Drying and reuse its stopcock.
Kugelrohr	Drying under rota- tion	To dry solid substances that form a hard layer on their surface.
		The Kugelrohr accessory allows for the rotation of flasks during drying, significantly reducing downtime. Use the included notched rotation drying flask for optimal results.
	Distillation	For simple and fractional distillation.
		Distillation with the Kugelrohr features a bulb-to-bulb method for vapor condensation outside the oven. The number of bulbs can be extended up to four to match the mixture's components. For low-boiling substances, a cooling tray can be filled with various cooling agents.

3.2 Configuration

3.2.1 Front view



- 1 Protection grid
- 3 Angle adjustment button
- 5 Main switch
- 7 Handhold for angle adjustment
- 9 Flange

- 2 Protection glass
- 4 Interface
- 6 Main unit
- 8 Heating glass
- 10 Knurled-head screw

3.2.2 Rear view



Main fuse

1 Support 2

3.2.3 Connections



4 Communication COM

3.3 Scope of delivery



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

NOTE

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 Company name and address
- 3 Serial number
- 5 Frequency
- 7 Year of manufacture
- 9 Symbol for "CE conformity"
- 11 Symbol for "electronics recycling"
- 13 QR-Code contains "Item number, Serial number"
- 15 Symbol for "CSA certified" (optional)

3.5 Technical data

3.5.1 Glass Oven G-300

2	Instrument name
2	Instrument name

- 4 Input voltage range
- 6 Power consumption maximum
- 8 Product origin
- 10 Symbol for "Do not dispose of as household waste"
- 12 Symbol for "UK Conformity Assessed"
- 14 Symbol for "Eurasian Conformity" (optional)

Specification	Glass Oven G-300 Drying	Glass Oven G-300 Kugelrohr
Dimensions ($W \times D \times H$)	400 mm × 180 mm × 295 mm	750 mm × 190 mm × 805 mm
Weight	6.0 kg	7.6 kg
Volume	up to 250 mL (sample vol.)	5–40 mL (flask size)
Adjustable angle	0-90°	0-90°
Rotation speed range	-	0–100 rpm
Connection voltage	100-240 VAC ±10%	100-240 VAC ±10%
Frequency	50 / 60 Hz	50 / 60 Hz
Power consumption	600 W	600 W
Fuse	3.15 AT	3.15 AT
Overvoltage category	II	II

Specification	Glass Oven G-300 Drying	Glass Oven G-300 Kugelrohr	
IP Code	IP20	IP20	
Pollution degree	2	2	
Minimum clearance on all sides	300 mm	300 mm	
Display type	3" Dark segment display	3" Dark segment display	
Temperature range	up to 300 °C	up to 300 °C	
Temperature precision	± 5 °C	± 5 °C	
Temperature adjustment accuracy	±1°C	±1°C	
Warm-up time (from 20 to 300 °C)	approx. 10 min	approx. 10 min	
Certificate	CB, CE, UL / CSA	CB, CE, UL / CSA	

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% rela- tive humidity at 40 °C

3.5.3 Materials

Component	Material
Heating glass	Borosilicate glass
Protection glass	Borosilicate glass
Cooling tray	Polyethylene, HD-PE
Heating fixture	Aluminum
Support	Aluminum
Drive unit housing	Polyacetal, POM
Flange	Aluminum
Main unit housing	Polyurethane, PUR

3.5.4 Installation site

The installation site must meet the following requirements:

- The installation site meets the safety requirements. See Chapter 2 "Safety", page 7
- The installation site meets the specifications according to the technical data (e.g. weight, dimension, minimum clearance on all sides, etc.). See Chapter 3.5 "Technical data", page 15.
- The installation site has a firm, level and nonslip surface.
- The installation site has no obstacles (e.g. water taps, drains, etc.).
- The installation site has an own mains outlet socket for the instrument.
- The installation site allows that the power supply can be disconnected at any time in case of an emergency.
- The installation site is not exposed to external thermal loads, such as direct solar radiation.
- The installation site has enough space that cables / tubes can be routed safely.
- The installation site meets the requirements for the connected devices. See related documentation.

4 Transport and storage

4.1 Transport



NOTICE

Risk of breakage due to incorrect transportation

- ▶ Make sure that the instrument is fully dismantled.
- Pack all instrument components properly to prevent breakage. Use the original packaging whenever possible.
- Avoid sharp movements during transit.
- ► After transporting, check the instrument and all glass components for damage.
- ► Damage that has occurred in transit should be reported to the carrier.
- ► Keep packaging for future transportation.

4.2 Storage

- Make sure that the ambient conditions are complied with (see Chapter 3.5 "Technical data", page 15).
- ▶ Wherever possible, store the instrument in its original packaging.
- After storage, check the instrument, all glass components, seals and tubing for damage and replace if necessary.

4.3 Lifting the instrument



NOTICE

Dragging the instrument can damage the feet of the instrument.

- ► Lift the instrument when positioning or re-locating.
- ▶ Lift the instrument at the points indicated.



5 Installation

5.1 Before installation



NOTICE

Instrument damage due to switching it on too early.

Switching on the instrument too early after transportation can cause damage.

► Climatize the instrument after transportation.

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 the disconnecting device.

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

Precondition:

- \square 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 15.
- Connect the power supply cable to the connection on the instrument. See Chapter 3.2 "Configuration", page 13.
- Connect the mains plug to an own mains outlet socket.



6 Interface

6.1 Configuration



- 1 Button **STOP**
- 3 Display

2 Button SET4 Navigation control

6.2 Display layout



- 1 Status bar
- 3 Timer
- 5 Rotation control (only when drive unit is connected)
- 2 Heating control
- 4 Temperature indicator
- 6 Error code

6.3 Display symbols

Symbol	Description
	BUCHI COM connected
থ্ট	Settings
₩	Cooling active
Set	Set value
Adjust	One point calibration value
8	Timer in hours to stop operation automatically
on	Heating ON
り	Rotation
G	Rotation with changing direction (drying mode)
Error	Error occurrence
rpm	Revolutions per minute
°C	Degree Celsius
°F	Degree Fahrenheit

6.4 Main functions

6.4.1 Start/Stop heating

- ▶ Push the *navigation control*.
- \Rightarrow Activates the heating.
- \Rightarrow Stops the heating.



6.4.2 Control rotation speed

- ► Turn the *navigation control*.
- \Rightarrow Changes the value.



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6.4.3 Stop the instrument

- ► Touch the **STOP** button.
 - Stops the instrument. (incl. instruments connected with BUCHI communication cable)

6.5 Settings

6.5.1 Operation settings

Navigation path



- ▶ Push the *SET* button.
- ⇒ Settings symbol appears.
- \Rightarrow Blinking value is active.



► Turn the *navigation control*.

\Rightarrow Changes the value.



 Touch the [SET] button to navigate through the settings.



- ▶ Push the *navigation control*.
- \Rightarrow Exits the settings.



6.6 Advanced settings

Navigation path	Symbol	Description
Rotation mode	ר, G	Changing between one-directional and alternating rotation (drying mode, 15 s interval).
Temperature unit	°C , °F	Changing temperature unit between °C and °F.
Heating temperature adjustment	Adjust	Setting an offset for the heating temperature cali- bration.

- ► Touch the SET button and the navigation control.
- \Rightarrow Settings symbol appears.
- \Rightarrow Blinking symbol or value is active.



- ► Turn the *navigation control*.
- \Rightarrow Changes the symbol or value.



Touch the SET button to navigate through the settings.



- ▶ Push the *navigation control*.
- \Rightarrow Exits the settings.



7 Operation

7.1 Switching the instrument on/off

Precondition:

 \boxdot The instrument is installed.

Push the main switch I to switch on the instrument.



Push the main switch O to switch off the instrument.



7.2 Operating with drying accessory

7.2.1 Filling the drying tube

Direct drying

Boats and metal dishes may be used with this method.

▶ Place the sample directly into the drying tube.



Indirect drying

For hygroscopic samples. Use a secondary container, which can be closed immediately after drying.

Precondition:

- \boxdot Heating glass is in vertical position.
- ▶ Fill the sample into a secondary container.

▶ Place the secondary container into the drying tube.



7.2.2 Adjusting the angle

- ► Hold handhold for angle adjustment.
- ▶ Push and hold the angle adjustment button.
- ► Tilt the heating glass to the preferred angle.



7.2.3 Positioning the drying tube

► Position the aluminum ring.







▶ Position the O-ring.



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▶ Remove the knurled-head screw.



► Insert the drying tube into the heating glass.

► Secure the drying tube with the knurled-head screw.



7.2.4 Preparing for drying

Precondition:

- \boxdot Sample is positioned into the drying tube.
- \boxdot The drying tube is installed.
- Fill the glass ball with a desiccant, if needed, for faster drying of samples containing water.



 Position the glass ball.
 Make sure the glass ball is facing downwards and the stopcock is in horizontal position.

Tighten the flange nut. Make sure that the spring clip in the flange nut lies around the neck of the glass ball.



- ▶ See Chapter 7.2.7 "Performing without vacuum", page 33.
- ▶ See Chapter 7.2.8 "Performing with vacuum", page 34.

7.2.5 Preparing for freeze-drying

The instrument can be converted into a freeze-dryer. By using a freeze-drying accessory, a condenser and a vacuum pump.

▶ Position the condenser on a laboratory stand.



Insert the T-piece between the condenser and the receiving flask.

► Secure with a ball joint clamp.



- ► Connect the vacuum hose from the vacuum pump to the condenser. *Pump and chiller serve as an example. Consider requirements of application. ► Connect the coolant hoses from the chiller to the condenser. ► Connect the vacuum tube from the T-piece to the glass oven. Precondition: \square The empty drying tube is installed. ► Fill the freeze-drying tube with the sample. ► Freeze the freeze-drying tube containing the sample. NOTICE! The frozen sample should have a thickness <1 cm, as drying time increases
 - thickness <1 cm, as drying time increases proportionally with layer thickness. To ensure a thin even layer, rotate the freezedrying tube in a cooling bath to freeze.

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 $\square \square$

▶ Remove the cap.

▶ Position the glass ball.



▶ Place the freeze-drying tube into the drying tube.



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Tighten the flange nut. Make sure that the spring clip in the flange nut lies around the neck of the glass ball.

Make sure the glass ball is facing downwards and

the stopcock is in horizontal position.

- Start the cooling. See additional manuals according to the instrument.
- ⇒ The chiller must be cooled down to operation temperature.
- Start the vacuum. See additional manuals according to the instrument.
- ► Set a vacuum pressure.
- \Rightarrow Vacuum is achieved.



► Open the stopcock for vacuum.



- ▶ Push the *navigation control* if heating is needed.
- ▶ Stop the process. See Chapter "Stop the process", page 34.
- Remove the accessory. See Chapter 7.2.9 "Removing the drying accessory", page 35.

7.2.6 Preparing for sublimation

► Move the stopcock, flange nut and the insert spring from the drying unit to the sublimation finger.



► Attach the coolant inlet.



► Attach the coolant outlet.



- Fill the drying tube with the sample. Boat or thin layer at bottom of the drying tube. (max. 10 g)
 See Chapter 7.2.1 "Filling the drying tube", page 25.
- ► Install the drying tube. See Chapter 7.2.3 "Positioning the drying tube", page 26.





Tighten the flange nut. Make sure that the spring clip in the flange nut lies around the neck of the glass ball.

Perform the vacuum process. See Chapter 7.2.8 "Performing with vacuum", page 34.

7.2.7 Performing without vacuum

Start the process

► Open the stopcock.

▶ Push the *navigation control*.

- \Rightarrow The instrument starts heating.
- ⇒ The temperature indicator is loading to the set temperature.

Stop the process

- ▶ Push the **STOP** button.
- ⇒ Instrument stops.



► Close the stopcock.



Remove the accessory. See Chapter 7.2.9 "Removing the drying accessory", page 35.

7.2.8 Performing with vacuum

Start the process

► Connect the vacuum hose from the vacuum pump.

► Open the stopcock for vacuum.

- Start the vacuum. See additional manuals according to the instrument.
- \Rightarrow Vacuum is achieved.
- ▶ Push the *navigation control*.
- \Rightarrow The instrument starts heating.
- ⇒ The temperature indicator is loading to the set temperature.

Stop the process

- ▶ Push the **STOP** button.
- ⇒ Instrument stops.











► Close the stopcock.



► Open the stopcock.



Remove the accessory. See Chapter 7.2.9 "Removing the drying accessory", page 35.

7.2.9 Removing the drying accessory



Risk of skin burns due to hot glassware.

- ► Let the glassware cool down.
- ► Wear suitable protective gloves.

Precondition:

 \boxdot Instrument is not running.

- ▶ Remove the glassware.
- ▶ Remove the knurled-head screw.



► Remove the drying tube.



▶ Remove the sample.

7.3 Operating with Kugelrohr accessory

7.3.1 Installing the drive unit

▶ Remove the knurled-head screw.







► Position the iris diaphragm.

 Secure the iris diaphragm with the knurled-head screw. Attach the stopper with the knurled-head screw to the drive unit.



► Insert the drive unit into the support.



► Attach the plugs to the drive unit.



Attach the stopcock to the drive unit. Make sure that the spring clip in the fixation nut lies around the neck of the glassware.



- ▶ Press the locking button.
- ► Unscrew the union nut.
- ▶ Remove the clamping cone.



- ► Take the vapor duct according to the used glassware.
- ► Insert the union nut.
- ► Insert the clamping cone.



Insert the vapor duct with the union nut and clamping cone into the drive unit.



▶ Press the locking button.



► Tighten the union nut.



Plug the cable from the drive unit into connection Drive/Adjust.

DRIVE ADJUST



7.3.2 Preparing for distillation



Risk of skin burns and serious eye injuries due to dry ice-solvent mixtures.

► Wear suitable protective equipment.



Risk of ignition.

▶ With dry ice-solvent mixtures in the cooling tray, always make sure there is dry ice in the solvent as long as the temperature of the glass oven is higher than 50 °C.



NOTICE

Risk of damages to the polyethylene cooling tray.

- ▶ Never use cooling mixtures containing chlorinated solvents.
- ► Avoid contact between the cooling tray and the metal flange.

Precondition:

 \boxdot The drive unit is installed.

► Fill the glassware with the sample.



► Attach the next glassware.



► Secure the glassware with the clip.

 \Rightarrow It is possible to attach 2–4 glass balls.



► Attach the glassware to the vapor duct.



► Secure the glassware with the clip.

insert the glassware.



- ► Attach the cooling tray to the instrument.
- Position the cooling tray to accommodate the respective flask. (lengthwise or crosswise)

▶ Move the drive unit closer to the instrument and

Fill the cooling tray with a cooling agent. NOTICE! The recommended cooling agent is tap water, ice-water, ice-salt mixture, dry ice or a dry ice-alcohol mixture.



- Leave the last glass ball outside of the heating glass. ³
- Close the iris diaphragm.
 NOTICE! The iris diaphragm should not be closed too tightly. Avoid contact with the glass.



According to the process:

- ► See Chapter 7.3.4 "Performing without vacuum", page 42.
- ► See Chapter 7.3.5 "Performing with vacuum", page 43.

7.3.3 Preparing for drying under rotation

Precondition:

- \boxdot The drive unit is installed.
- ► Fill the glassware with the sample.



► Attach the glassware to the vapor duct.



Move the drive unit closer to the instrument and insert the glassware.





 Close the iris diaphragm.
 NOTICE! The iris diaphragm should not be closed too tightly. Avoid contact with the glass.



According to the process:

- ▶ See Chapter 7.3.4 "Performing without vacuum", page 42.
- ▶ See Chapter 7.3.5 "Performing with vacuum", page 43.

7.3.4 Performing without vacuum

Start the process

▶ Open the stop cock.



Push the *navigation control*.
⇒ The instrument starts heating.
⇒ The temperature indicator is loading to the set temperature.
Turn the *navigation control* for slow rotation.
⇒ The glassware starts to rotate.
Set rotation speed according to flask size and fill level.
⇒ The process starts.

NOTICE! A higher rotation speed leads to a higher distillation rate.

Stop the process ► Push the STOP button. ⇒ Instrument stops. Solution S

Remove the accessory. See Chapter 7.3.6
 "Removing the Kugelrohr accessory", page 45

7.3.5 Performing with vacuum

Start the process

► Connect the vacuum hose from the vacuum pump.



► Open the stopcock for vacuum.



▶ Push the *navigation control*.

- \Rightarrow The instrument starts heating.
- ⇒ The temperature indicator is loading to the set temperature.

► Turn the *navigation control* for slow rotation.

- \Rightarrow The glassware starts to rotate.
- Set rotation speed according to flask size and fill level.
- \Rightarrow The process starts.

NOTICE! A higher rotation speed leads to a higher distillation rate.

- Start the vacuum. See additional manuals according to the instrument.
- \Rightarrow Vacuum is achieved.

Stop the process

- ▶ Push the *STOP* button.
- ⇒ Instrument stops.









► Close the stopcock.





► Open the stopcock.



Remove the accessory. See Chapter 7.3.6
 "Removing the Kugelrohr accessory", page 45

7.3.6 Removing the Kugelrohr accessory



Risk of skin burns due to hot glassware.

- ► Let the glassware cool down.
- ▶ Wear suitable protective gloves.

Precondition:

 \boxdot Instrument stopped.

▶ Open the iris diaphragm.



► Move the drive unit away from the instrument.



▶ Remove the clip.





▶ Remove the sample.

7.3.7 Removing the vapor duct

▶ Press the locking button.



0

► Unscrew the union nut.





7.3.8 Removing the drive unit

 Unplug the cable from the drive unit into connection Drive/Adjust.



▶ Remove the stopcock from the drive unit.













► Remove the iris diaphragm.



9

► Position the knurled-head screw.

8 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.

8.1 Maintenance work

Action		Weekly	کم عبر Additional information
8.2	Cleaning the housing	1	
8.3	Cleaning and servicing the warning and directive symbols	1	
8.6	Inspecting and cleaning the vapor duct	1	
8.4	Inspecting and replacing the seals		1 or when system is leaking
8.5	Inspecting and replacing the hoses		1 or when system is leaking

1 - Operator

8.2 Cleaning the housing

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

8.3 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.

8.4 Inspecting and replacing the seals

- ▶ Remove the seals and inspect them for damages and cracks.
- ▶ Rinse the intact seals with water or ethanol.
- ▶ Dry the seals with a soft cloth.
- ► Replace damaged seals.
- ► Check the corresponding glass contact faces for damages (e.g. wear marks).

8.5 Inspecting and replacing the hoses

- ▶ Inspect the hoses for damages and cracks.
- Replace damaged hoses.

8.6 Inspecting and cleaning the vapor duct

- ► Remove the vapor duct.
- See Chapter 7.3.7 "Removing the vapor duct", page 46.
- ► Visually inspect the vapor duct for damages, wear marks and residues.
- ► Clean the vapor duct with a paper towel and water or ethanol.

9 Help with faults

9.1 Troubleshooting

Problem	Possible cause	Action
Instrument is not working	No electrical connection	 Establish an electrical connection. See Chapter 5.2 "Establishing electrical connections", page 19.
	Main switch is off	► Switch on the main switch.
	Fuse is blown	 Replace the fuse. See Chapter 3.2.2 "Rear view", page 14. Contact BUCHI Customer Service.
Cooling medium is leaking	Tubes or hoses are brittle and leak- ing	Replace the tubing. See Chapter 8.5 "Inspecting and replacing the hoses", page 49.
	Cap nuts and seals are not correctly fitted or are damaged	 Replace the seals. See Chapter 8.4 "Inspecting and replacing the seals", page 49.
	Cooling connector is not tightened	► Check the cooling connection.
Desired vacuum level is not reached	System is leaking	 Service the vacuum pump. See BUCHI Operation Manual Vacuum Pump. Replace the tubing. See Chapter 8.5 "Inspecting and replacing the hoses", page 49. Replace the seals. See Chapter 8.4 "Inspecting and replacing the seals", page 49.
	Vacuum pump is not running	 Switch on the main switch of the vacuum pump. See Operation Manual Vacuum Pump.
	Vacuum pump too weak	 Use suitably dimensioned vacuum pump.

9.1.1 Error codes

Error code	Description	Action
E10	Temperature Sensor short cir-	Restart the instrument.
	cuit	\Rightarrow If the error code is still indicated.
		Contact BUCHI Customer Service.
E11	Temperature Sensor discon- nected	Check the connection.
		\Rightarrow If the error code is still indicated.
		Contact BUCHI Customer Service.
E12	Not heating	► Contact BUCHI Customer Service.
E13	Temperature increase too high	 Disconnect the power supply. Contact BUCHI Customer Service.
E14	Unexpected temperature in- crease	 Disconnect the power supply. Contact BUCHI Customer Service.

Error code	Description	Action
E15	Not calibrated	► Contact BUCHI Customer Service.
E20	Motor short circuit	Check the drive unit (cable).
		\Rightarrow If the error code is still indicated.
		Contact BUCHI Customer Service.
E21	Motor driver error	Restart the instrument.
		\Rightarrow If the error code is still indicated.
		Contact BUCHI Customer Service.
E94	Supply voltage too low	Check the power supply.
		\Rightarrow If the error code is still indicated.
		Contact BUCHI Customer Service.
E95	Pump driver error	Check the connection to the attached
		pump.
		Restart the instrument.
		\Rightarrow If the error code is still indicated.
		► Contact BUCHI Customer Service.
E96	Touch interface error	Restart the instrument.
		\Rightarrow If the error code is still indicated.
		Contact BUCHI Customer Service.
E97	EEPROM error	Restart the instrument.
		\Rightarrow If the error code is still indicated.
		Contact BUCHI Customer Service.
E98	Electronic error	Restart the instrument.
		\Rightarrow If the error code is still indicated.
		Contact BUCHI Customer Service.
E99	Initialization error	Restart the instrument.
		\Rightarrow If the error code is still indicated.
		Contact BUCHI Customer Service.

9.1.2 Customer service

Only authorized service personnel are allowed to perform repair work on the instrument which is not described in this manual. Authorization requires a comprehensive technical training and knowledge of possible dangers which might arise when working at the instrument. Such training and knowledge can only be provided by BUCHI.

The customer service and support offers the following support:

- Spare part delivery
- Repairs
- Technical advice

Addresses of official BUCHI customer service offices can be found on the BUCHI website.

www.buchi.com

10 Taking out of service and disposal

10.1 Taking out of service

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

10.2 Disposal

The operator is responsible for proper disposal of the instrument.

- ► When disposing the equipment 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 15 or the material labeling on the parts.

10.3 Returning the instrument

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

https://www.buchi.com/contact

11 Appendix

11.1 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.

11.1.1 Accessories

	Order no.	Image
Kugelrohr accessory	11082306	
Complete ball tube drive for converting to a ball tube distillation oven (Kugelrohr). Incl. cooling de- vice, drive unit, and suction angle.		O FE
Drying accessory	037010	
For converting to the drying model. For sample volumes up to 250 mL. Incl. drying tube, glass ball, stopcock, flange ring, spring, and O-ring		- Di-
Freeze drying accessory. Incl. glass tube, screw cap, O-ring	046710	
For freeze drying applications. Meant to be used with the drying accessory and either a condenser or cold trap.		
Sublimation accessory. Incl. sublimation finger	036766	
Meant to be used with the drying accessory.		200
Sublimation accessory. Incl. drying tube, glass tube, sublimation finger, stopcock, flange ring, O-ring	037133	
For conversion to the sublimation configuration		
Rotation drying flask. Glass, 30 mL, SJ14/23	037143	
Content: Drying flask, vapor duct, clip		
Ball tube. Glass, 10 mL (4 pcs), SJ14/23	037118	
Content: Ball tubes, vapor duct, clips		ODDO

	Order no.	Image
Ball tube. Glass, 20 mL (3 pcs), SJ14/23	037107	
Content: Ball tubes, vapor duct, clips		DaDaDa
Ball tube. Glass, 40 mL (2 pcs), SJ14/23	037117	
Content: Ball tubes, vapor duct, clips		()))))
End bulb spec. D 40mm	11061825	
Content: End ball tube		
Condenser V. Vertical condenser, 1500 cm ² , Safety Coating	046711	
For distillations and freeze drying application. Used with recirculating chiller or tap water. Con- tent: 250 mL receiving flask, ball joint clamp, vac- uum connection (Safety Coating).		
Condenser C. Cold trap, 500 cm ² , Safety Coating	046712	ு.
For freeze drying application and for distillations of low-boiling point solvents. Content: 250 mL receiv- ing flask, ball joint clamp, vacuum connection (Safety Coating).		
Cooling unit. Incl. cooling tray	11080855	
For substances with a low boiling point, to con- dense the vapor in the balls outside of the oven area. Cooling tray can be filled with e.g. ice water or dry ice.		
Communication cable, Mini-DIN, 0.6 m	11060882	and
Cable. Mini-DIN, 1.5 m	038010	
Connection between glass oven and vacuum pump that does not have a COM connection.		A Co

11.1.2 Wear parts

	Order no.	Image
O-ring. NBR, Ø 50.4 mm	002797	
For the drying accessory and the sublimation glass assembly.		

	Order no.	Image
Vacuum gasket. Shaft seal ring, NBR, Ø 10/24 mm Used in fixation nut to attach stopcock to Kugel- rohr drive unit (046765).	002862	
Vacuum gaskets, set. 5 pcs, shaft seal ring, NBR, Ø 10/24 mm	037288	
Hose barb, bent, GL 14, incl. silicone seal	018916	
Hose barbs, set. 4 pcs, bent GL 14, silicone seal Content: Hose barbs, cap nuts, seals	037287	
Cap nut GL14	033577	

Hoses

	Order no.	Image
Tubing, silicone, Ø 6/9 mm, transparent, per m	004133	
Use: Cooling media		
		0

11.1.3 Spare parts

Main unit

	Order no.	Image
Handhold for angle adjustment	046633	

	Order no.	Image
Fuses, set. 10 pcs.	019659	
T 3.15A H 250V (100−240 V), 20 mm, Ø5 mm		
Navigation control knob	11074581	
Knurled screw M5	046683	

Drying

	Order no.	Image
Glass ball Incl. cap nut GL14, Olive bent GL14 Si.	036765	
Drying tube 230 × 50 mm	002965	
Aluminum flange ring 68.5 × 29 mm	002970	
To attach drying tube to the instrument.		
Insert spring	000590	
Flange nut TR 68 × 3 mm	036848	
To attach glass ball to drying tube.		

	Order no.	Image
Flange nut set cpl. Incl. flange nut, insert spring, O-ring	037285	
Stop cock STJ18.8/26	037132	
Drying flask 5 mL 270 pcs.	003007	
Holder for flasks	003006	A Constant of the second secon
Holder with glass tubes cpl.	001981	
Incl. holder, 5 mL flask set. 270 pcs		Second Second

Freeze-drying

	Order no.	Image
O-ring D 30.00 × 4.00 EPDM 70ShA	037179	
Screw cap SVL 30	005223	

Kugelrohr

	Order no.	Image
Drive unit cpl.	11082309	~
Incl. motor unit, cap nut, clamping cone, guiding tubes, cable		
		5 D

	Order no.	Image
Cooling tray	11081778	
For substances with a low boiling point, to con- dense the vapor in the balls outside of the oven area. Cooling tray can be filled with e.g. icewater or dry ice.		
Cap nut. Ø 20/35 mm, black	036824	
Clamping cone	036770	
Suction angle cpl.	040461	
Incl. connection cock 3-Way GL14, nut, stop cock, gasket NBR, insert spring.		
Connection cock 3-Way GL14	036771	
Incl. cap nut GL14, Olive bent GL14 Si.		
Stop cock STJ18.8/26	037132	\sim
Insert spring	002859	
For suction angle cpl. (040461)		
Iris diafragm cpl.	046605	
Rotation drying tube 30 mL	036480	

	Order no.	Image
End bulb 10 mL	037101	
End bulb 20 mL	037104	
End bulb 40 mL	036478	
Bulb with 2 openings 10 mL	037102	
Bulb with 2 openings 20 mL	037106	
Bulb with 2 openings 40 mL	036479	
Vapor duct 14/23 For ball tubes.	037073	
Vapor duct 24/29 For rotation flask.	037125	OM
Set Clamp SJ14.5 (5pcs) Incl. clamps SJ14.5 (5 pcs).	040893	

	Order no.	Image
Set Ns-Clamps	037286	
Incl. clamps SJ14.5 (5 pcs), clamps SJ19 (5 pcs), clamps SJ24 (2 pcs).		PRC.
Clamp SJ24	037479	
Knurled screw M5	046683	

11.1.4 Consumables

	Order no.	Image
Lab grease. Glisseal 40 (30 g)	048197	
To grease joints in order to increase tightness of system.		



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