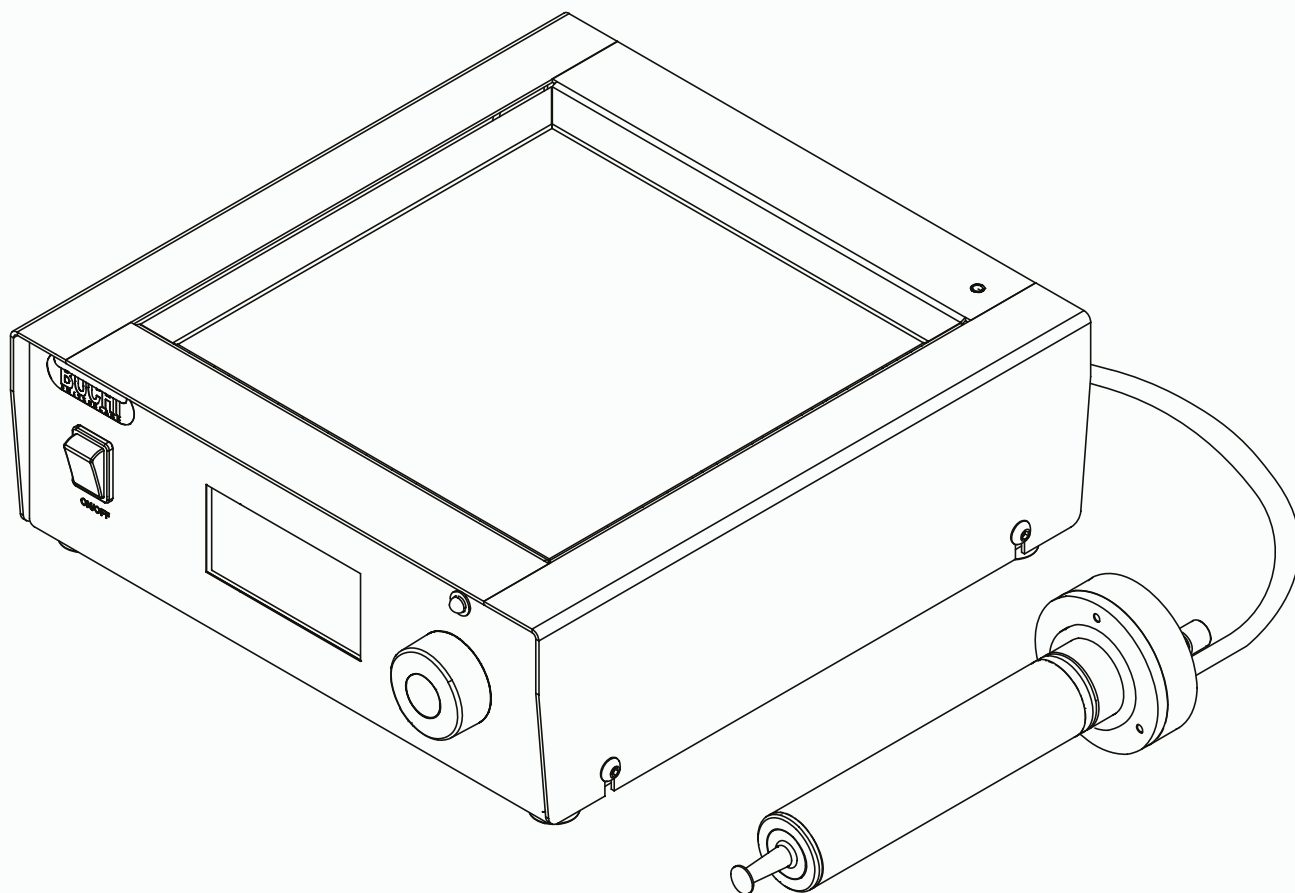




Operation Manual

Ultrasonic Package



Imprint

Product Identification:
Operation Manual (Original) Ultrasonic Package
11594107

Publication date: 08.2026

Version D

BÜCHI Labortechnik AG
Meierseggstrasse 40
CH-9230 Flawil
E-Mail: quality@buchi.com

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

This manual is copyrighted. Information from it may neither be reproduced, distributed, or used for competitive purposes, nor made available to third parties. The manufacture of any component with the aid of this manual without prior written agreement is also prohibited.

Table of contents

1	About this document	5
1.1	Mark-ups and symbols	5
1.2	Trademarks	5
1.3	Connected instruments	5
2	Safety	6
2.1	Proper use	6
2.2	Use other than that intended	6
2.3	Staff qualification	6
2.4	Personal protective equipment	7
2.5	Warning notices in this document	7
2.6	Warning symbols	7
2.7	Residual risks	8
	2.7.1 Faults during operation	8
	2.7.2 Dangerous vapors	8
2.8	Modifications	9
3	Product description	10
3.1	Description of function	10
3.2	Configuration	10
	3.2.1 Front view Ultrasonic Controller	10
	3.2.2 Rear view Ultrasonic Controller	11
	3.2.3 Ultrasonic Nozzle	12
3.3	Scope of delivery	12
3.4	Type Plate	12
3.5	Technical data	13
	3.5.1 Ultrasonic Controller	13
	3.5.2 Ultrasonic Nozzle	13
	3.5.3 Ambient conditions	14
	3.5.4 Materials	14
4	Transport and storage	15
4.1	Transport	15
4.2	Storage	15
5	Installation	16
5.1	Before installation	16
5.2	Installation site	16
5.3	Establishing electrical connections	16
5.4	Installing the Ultrasonic Controller	17
	5.4.1 Installing the Ultrasonic Controller (B-290)	17
	5.4.2 Installing the Ultrasonic Controller (S-300)	17
5.5	Installing the Ultrasonic Nozzle in open mode	17
	5.5.1 Installing the Ultrasonic Nozzle in open mode (B-290)	17
	5.5.2 Installing the Ultrasonic Nozzle in open mode (S-300)	19
5.6	Installing the Ultrasonic Nozzle in closed mode	21
	5.6.1 Installing the Ultrasonic Nozzle in closed mode (B-290)	21
	5.6.2 Installing the Ultrasonic Nozzle in closed mode (S-300)	25

6	Operation	28
6.1	Operating the display	28
6.1.1	Layout of the display	28
6.1.2	Entering settings	28
6.1.3	Selecting the operation mode	28
6.2	Finding the optimal spray cone	29
6.2.1	Finding the optimal spray cone (Power-leveling mode)	29
6.2.2	Finding the optimal spray cone (Load-leveling mode)	29
6.3	Carrying out a spray drying process in open mode.....	29
6.3.1	Tasks before starting spray drying in open mode.....	29
6.3.2	Preparing the instrument for open mode	29
6.3.3	Starting a spray drying process in open mode.....	30
6.3.4	Tasks during spray drying.....	30
6.3.5	Ending a spray drying process in open mode.....	30
6.3.6	Shutting down the instrument	31
6.4	Carrying out a spray drying process in closed mode	31
6.4.1	Tasks before starting spray drying in closed mode.....	31
6.4.2	Preparing the instrument for closed mode	31
6.4.3	Starting a spray drying process in closed mode	31
6.4.4	Tasks during spray drying.....	32
6.4.5	Ending a spray drying process in closed mode	32
6.4.6	Shutting down the instrument	32
7	Cleaning and servicing.....	33
7.1	Regular maintenance work	33
7.2	Cleaning the Ultrasonic Nozzle	33
8	Help with faults.....	35
8.1	Troubleshooting	35
8.1.1	Error messages.....	35
8.1.2	Customer service	35
8.2	No liquid delivery	35
8.3	Liquid emerges unatomized	35
9	Taking out of service and disposal	36
9.1	Taking out of service	36
9.2	Disposal	36
9.3	Returning the instrument.....	36
10	Appendix.....	37
10.1	Spare parts and accessories.....	37
10.1.1	Spare parts	37
10.1.2	Accessories.....	37

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 has been designed and built for laboratories.
- The Ultrasonic Nozzle together with the Ultrasonic Controller are designed for spray drying purposes using the BUCHI Mini Spray Dryer S-300 and its subsystems.
- The Ultrasonic Nozzle together with the Ultrasonic Controller are designed to atomize liquids with viscosities lower or equal to 50 cps.

2.2 Use other than that intended

Use of any kind other than that described in the section Proper use Chapter 2.1 "Proper use", page 6 and any application that does not comply with the technical specifications (see Chapter 3.5 "Technical data", page 13) constitutes use other than that intended.

In particular, the following applications are not permissible:

- Use of the instrument with non-BUCHI products nor with any other BUCHI model than the Mini Spray Dryer S-300.
- 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 outside of research and development.
- Use of the instrument for food, pharmacy and cosmetic products without appropriate cleaning.
- Use of the instrument without an appropriate leading away exhaust gas from the working area.
- Use of gases with unknown chemical composition.
- Use of the instrument with organic solvents (> 20 %) without safety lamella curtain and Inert Loop S-395.
- Use of the instrument with organic solvents (> 20 %) in open mode.
- Production and processing of substances that can lead to spontaneous reactions, such as explosives, metal hydrides or solvents 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 samples which can block the feed channel of the Ultrasonic Nozzle.
- Use of the instrument with substances which might explode or ignite due to the processing and the selected parameters.
- Use of the instrument with corrosive samples other than the Mini Spray Dryer S-300 Corrosive.
- 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 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@buchicom).

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
	Instrument damage
	Grounding

Location of the warning symbols on the instrument

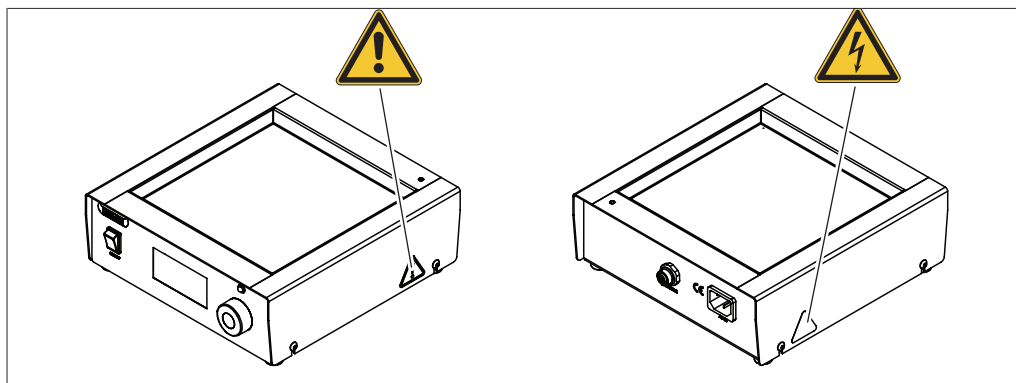


Fig. 1: Location of the warning symbols

2.7 Residual risks

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

2.8 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 Ultrasonic Nozzle with the Ultrasonic Controller are to be used as liquid atomizers in the spray drying process with the Mini Spray Dryer S-300 and its subsystems.

An ultrasonic atomizing nozzle vibrates at frequencies beyond human hearing (>20 kHz). The vibration on the atomizing surface of the nozzle produces a low velocity spray by breaking up a liquid feed into a spray of droplets. This phenomenon is the result of the decay of an unstable capillary wave that develops in the liquid. The spray velocity is typically low with 18–36 cm/s as compared to 10–20 m/s for pressure atomizing nozzles. The Ultrasonic Controller provides the high frequency electrical energy required to operate the Ultrasonic Nozzle.

Three modes are available:

Mode	Solvent composition
Open mode	up to 20% organic solvent
Closed mode with S-395 (Accessory inert gas adapter necessary)	between 90%–100% organic solvent
Closed mode with S-395 and S-396 (Accessory inert gas adapter necessary)	between 21%–90% organic solvent

3.2 Configuration

3.2.1 Front view Ultrasonic Controller

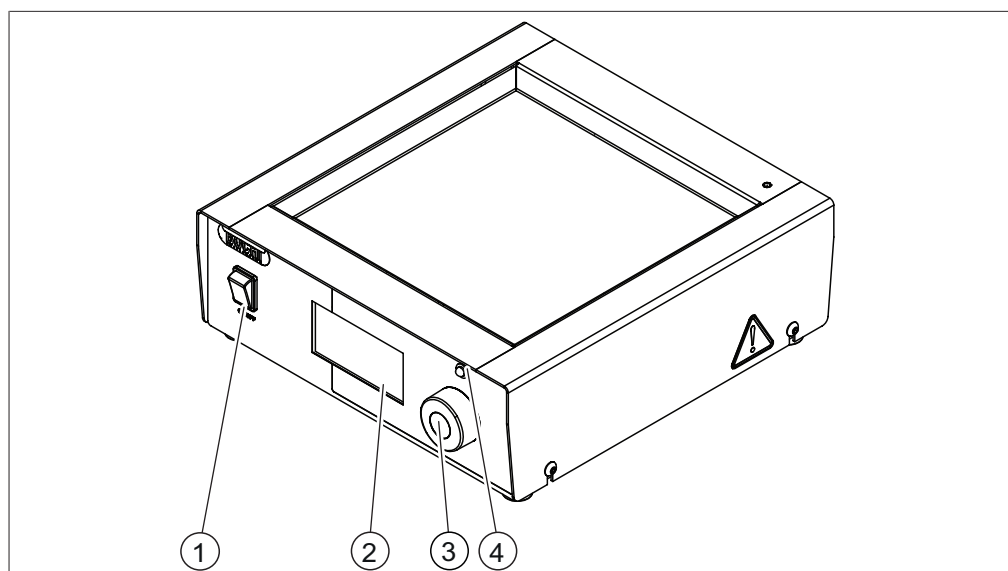


Fig. 2: Front view (Ultrasonic Controller)

- | | |
|-------------------------------|-----------|
| 1 On/Off master switch | 2 Display |
| 3 Navigation control | 4 LED |

3.2.2 Rear view Ultrasonic Controller

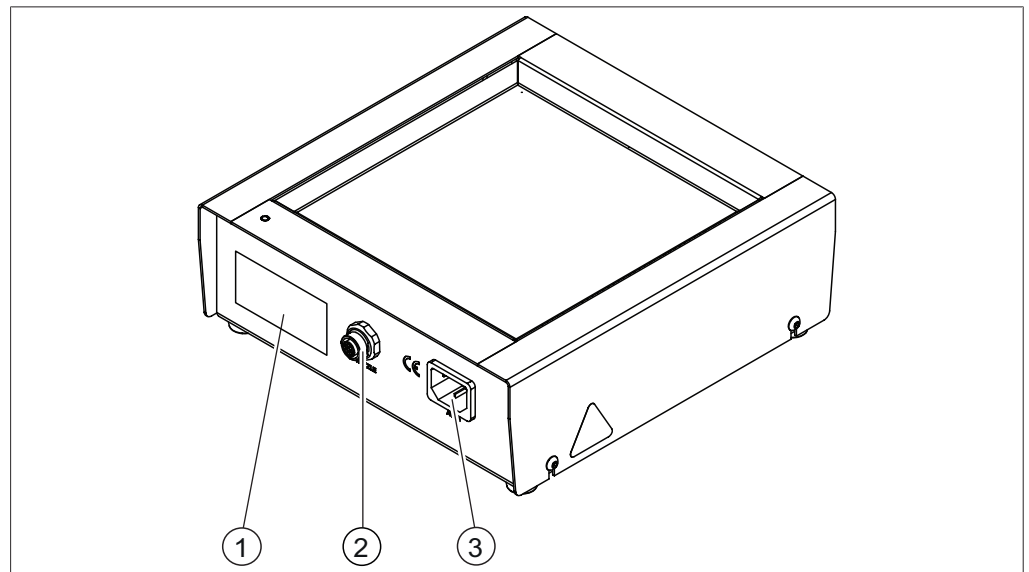


Fig. 3: Rear view (Ultrasonic Controller)

- | | | | |
|---|--------------------------------|---|-----------------------------|
| 1 | Type plate
See Type plates. | 2 | Connector Ultrasonic Nozzle |
| 3 | Power supply connection | | |

3.2.3 Ultrasonic Nozzle

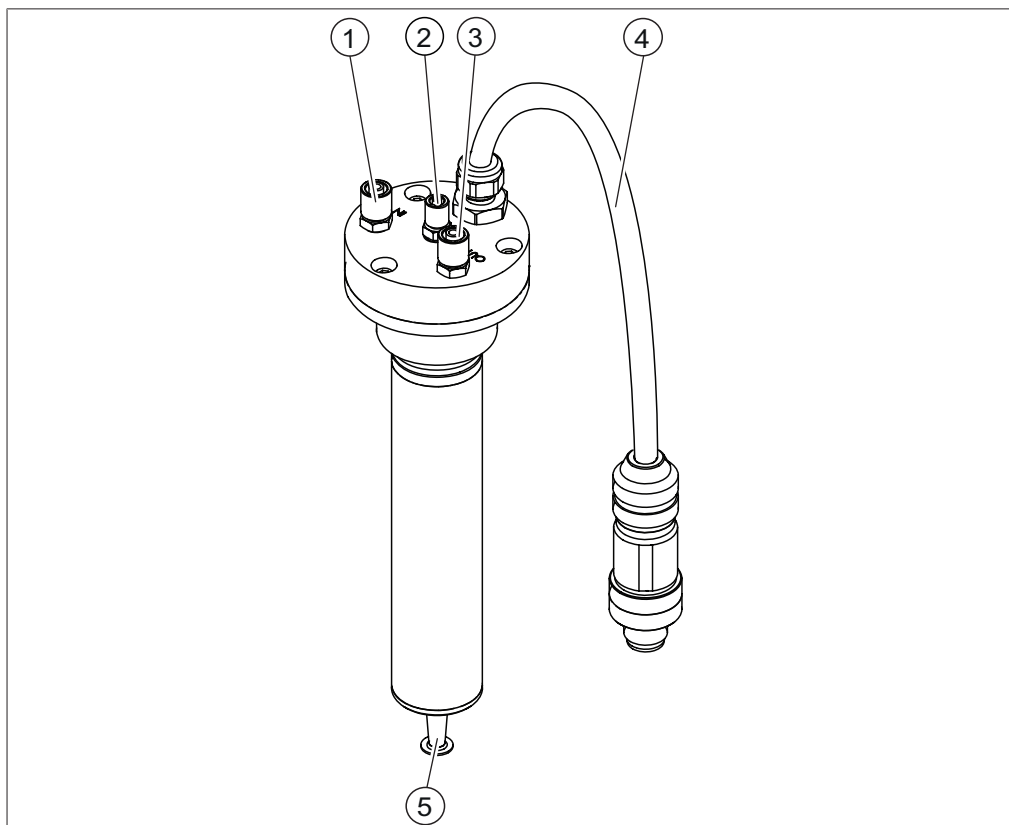


Fig. 4: Ultrasonic Nozzle

- | | | | |
|---|------------------------|---|---------------------|
| 1 | Cooling gas <i>IN</i> | 2 | Connector feed tube |
| 3 | Cooling gas <i>OUT</i> | 4 | Ultrasonic cable |
| 5 | Atomizing surface | | |

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 plates on the Ultrasonic Controller are located on the rear side.

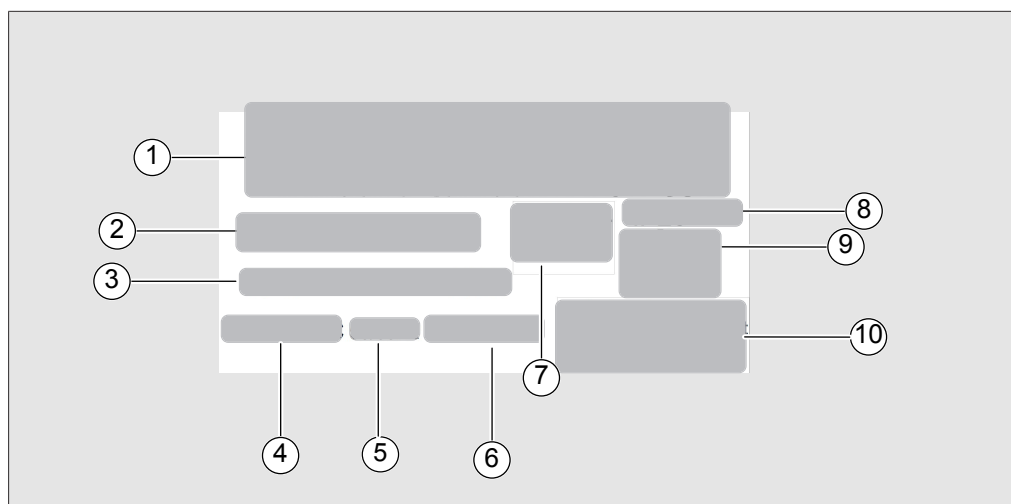


Fig. 5: Type Plate

- | | |
|------------------------------|--|
| 1 Company Name and Address | 2 Product Number |
| 3 Serial Number | 4 Input Voltage Range |
| 5 Frequency | 6 Maximum Power Consumption |
| 7 US Patent Number | 8 Degree of Protection |
| 9 cULus Listed Approval Mark | 10 Equipment Classification and UL File Number |

3.5 Technical data

3.5.1 Ultrasonic Controller

Specification	Value
Dimensions (W x D x H)	223 x 242 x 79 mm
Weight	1.8 kg
Connection voltage	100–240 VAC $\pm$ 10%
Frequency	50/60 Hz
Power consumption	max. 50 W
Maximum viscosity	70 cps
Minimum feed flow rate	1 mL/min
Maximum feed flow rate	9 mL/min
Mean particle diameter	80% (20–60 μ m)
Maximum cooling gas flow rate	200–800 L/h (at 5–7 bar)
Yield	Up to 85%, by default 40–70%
IP Class	20
Pollution degree	2
Overvoltage category	II

Occurring overvoltages do not influence the safety of the instrument.

3.5.2 Ultrasonic Nozzle

Specification	Value
Maximum operating temperature	100 °C
Dimensions (W x D x H)	51 x 51 x 190 mm

Specification	Value
Weight	0.54 kg
Connection voltage	23–25 VAC $\pm$ 5 %
Ultrasonic frequency	60 kHz
Power output	1–15 W

3.5.3 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

3.5.4 Materials

Component	Materials of construction
Ultrasonic Nozzle	Titanium
	Stainless steel
Housing	Painted aluminum (chassis)
	Painted steel (cover)

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 13).
- ▶ Wherever possible, store the device in its original packaging.
- ▶ After storage, check the device for damage and replace if necessary.

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 Installation site

- Place the Ultrasonic Controller on the product feed table of the Mini Spray Dryer S-300.



NOTE

Make sure that the power supply can be disconnected at any time in an emergency.

5.3 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.



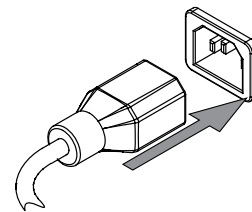
NOTICE

The power supply cable is for disconnecting the instrument.

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

Precondition:

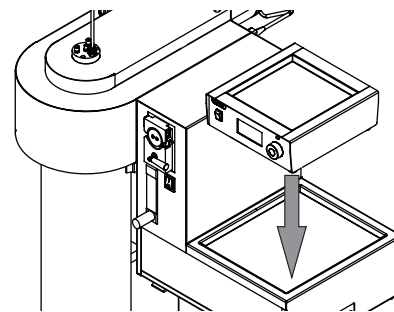
- ☒ The electrical installation is as specified on the type plate.
- ☒ The electrical installation is equipped with a proper grounding system.
- ☒ The electrical installation is equipped with suitable fuses and electrical safety features.
- ☒ The installation site is as specified in the technical data. See Chapter 3.5 "Technical data", page 13.
- Connect the power supply cable to the connection on the instrument. See Chapter 3.2 "Configuration", page 10.
- Connect the mains plug to an own mains outlet socket.



5.4 Installing the Ultrasonic Controller

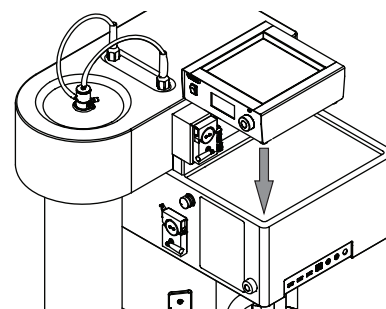
5.4.1 Installing the Ultrasonic Controller (B-290)

- ▶ Place the instrument on the product feed table of the Mini Spray Dryer B-290.



5.4.2 Installing the Ultrasonic Controller (S-300)

- ▶ Place the instrument on the product feed table of the Mini Spray Dryer S-300.



5.5 Installing the Ultrasonic Nozzle in open mode



⚠ WARNING

Incorrect cooling gas in open mode e.g. Nitrogen

Incorrect cooling gas can lead to unconsciousness, intoxication and other serious perils.

- ▶ Use compressed air.
- ▶ Other gases install the instrument in a fume hood.



NOTICE

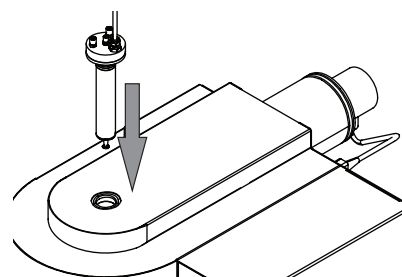
Water as cooling medium

Water as cooling medium can cause an instrument damage.

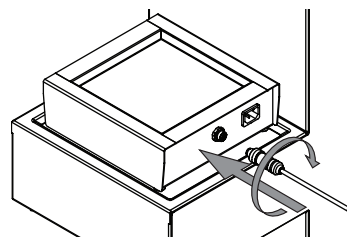
- ▶ Use compressed air.

5.5.1 Installing the Ultrasonic Nozzle in open mode (B-290)

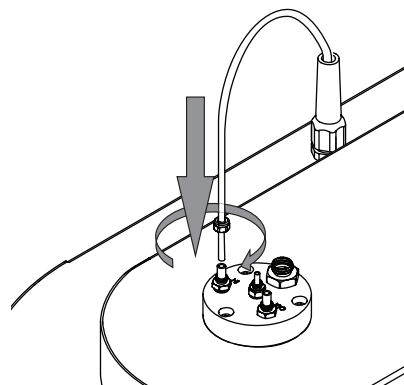
- ▶ Insert the Ultrasonic Nozzle into the heater element of the Mini Spray Dryer B-290.



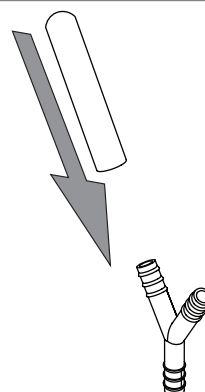
- ▶ Attach the Ultrasonic Nozzle with the Ultrasonic Nozzle cable on the Ultrasonic Controller.



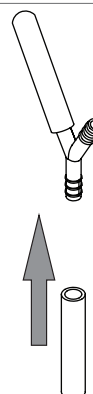
- ▶ Attach the cooling gas onto the connection marked *IN*.
- ▶ Attach the inlet tube in place with the union nut.



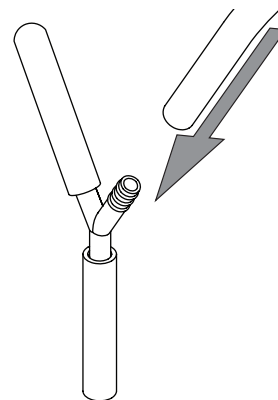
- ▶ Select a suitable type of supply hose. See resistance table of the *Operation Manual Mini Spray Dryer B-290*.
- ▶ Cut approx. 50 mm from the feeding tube.
- ▶ Attach the damper to the Y-piece.



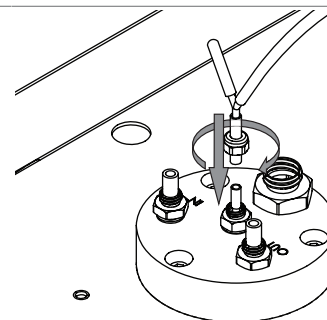
- ▶ Attach the tube piece to the Y-piece.



- Attach the feeding tube to the Y-piece.



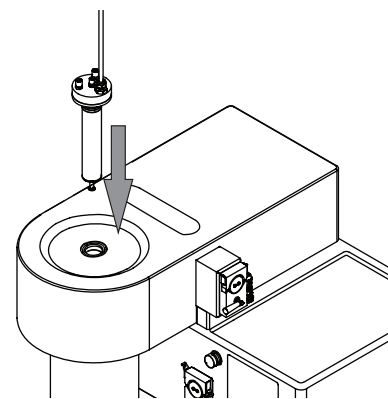
- Attach the assembled feeding tube to the nozzle.
- Attach the inlet tube in place with the union nut.



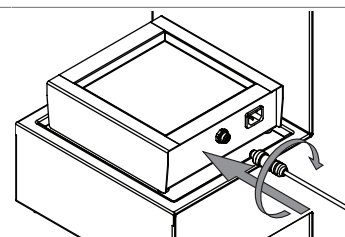
- Install the feed tube at the peristaltic pump. See *Operation Manual Mini Spray Dryer B-290*.
- Adjust the peristaltic pump bed. See *Operation Manual Mini Spray Dryer B-290*.

5.5.2 Installing the Ultrasonic Nozzle in open mode (S-300)

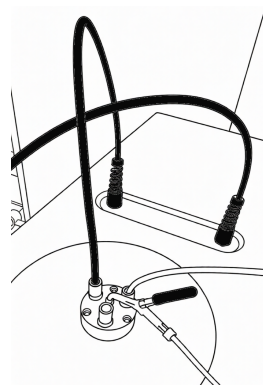
- Insert the Ultrasonic Nozzle into the heater element of the Mini Spray Dryer S-300.



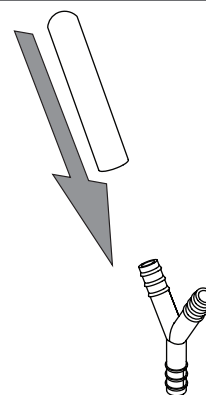
- Attach the Ultrasonic Nozzle with the Ultrasonic Nozzle cable on the Ultrasonic Controller.



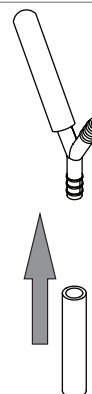
- ▶ Attach the cooling gas onto the connection marked *IN*.
- ▶ Attach the inlet tube in place with the union nut.



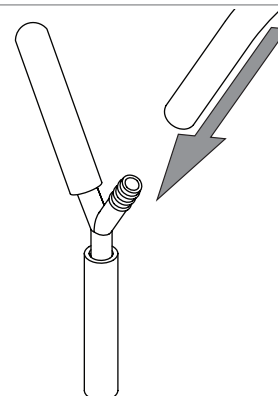
- ▶ Select a suitable type of supply hose. See resistance table of the *Operation Manual Mini Spray Dryer S-300*.
- ▶ Cut approx. 50 mm from the feeding tube.
- ▶ Attach the damper to the Y-piece.



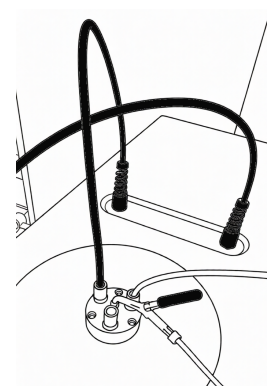
- ▶ Attach the tube piece to the Y-piece.



- ▶ Attach the feeding tube to the Y-piece.



- ▶ Attach the assembled feeding tube to the nozzle.
- ▶ Attach the inlet tube in place with the union nut.



- ▶ Install the feed tube at the peristaltic pump. See *Operation Manual Mini Spray Dryer S-300*.
- ▶ Adjust the peristaltic pump bed. See *Operation Manual Mini Spray Dryer S-300*.

5.6 Installing the Ultrasonic Nozzle in closed mode



DANGER

Incorrect cooling gas in closed mode e.g. compressed air

Incorrect cooling gas can lead to an potential explosive environment.

- ▶ Use inert gas.



NOTICE

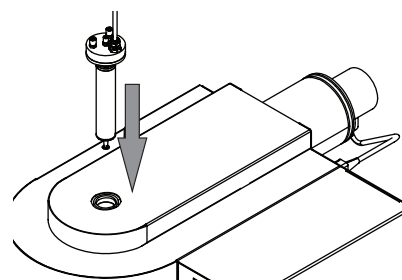
Water as cooling medium

Water as cooling medium can cause an instrument damage.

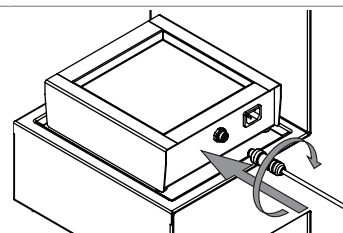
- ▶ Use compressed air.

5.6.1 Installing the Ultrasonic Nozzle in closed mode (B-290)

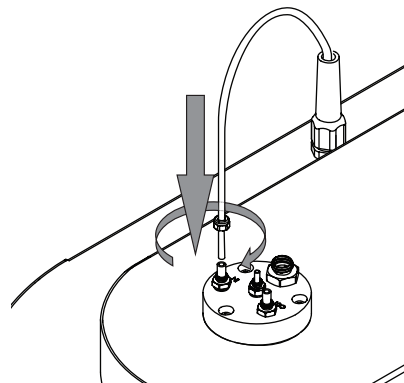
- ▶ Insert the Ultrasonic Nozzle into the heater element of the Mini Spray Dryer B-290.



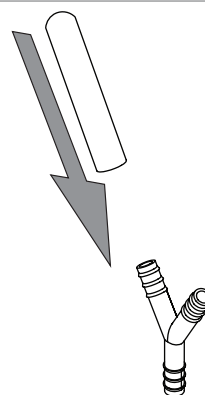
- ▶ Attach the Ultrasonic Nozzle with the Ultrasonic Nozzle cable on the Ultrasonic Controller.



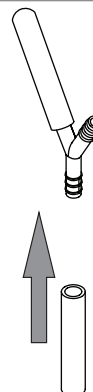
- ▶ Attach the cooling gas onto the connection marked *IN*.
- ▶ Attach the inlet tube in place with the union nut.



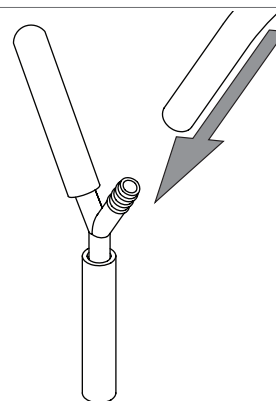
- ▶ Select a suitable type of supply hose. See resistance table of the *Operation Manual Mini Spray Dryer B-290*.
- ▶ Cut approx. 50 mm from the feeding tube.
- ▶ Attach the damper to the Y-piece.



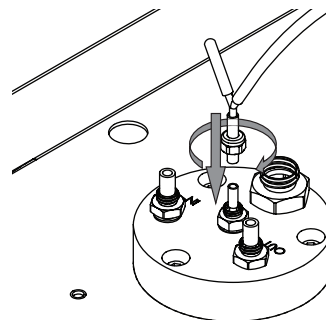
- ▶ Attach the tube piece to the Y-piece.



- ▶ Attach the feeding tube to the Y-piece.

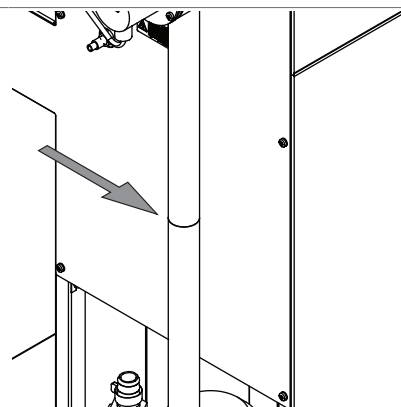


- ▶ Attach the assembled feeding tube to the nozzle.
- ▶ Attach the inlet tube in place with the union nut.

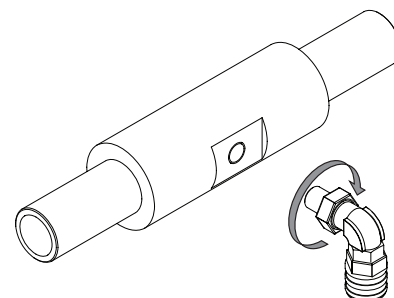


- ▶ Install the feed tube at the peristaltic pump. See *Operation Manual Mini Spray Dryer B-290*.
- ▶ Adjust the peristaltic pump bed. See *Operation Manual Mini Spray Dryer B-290*.

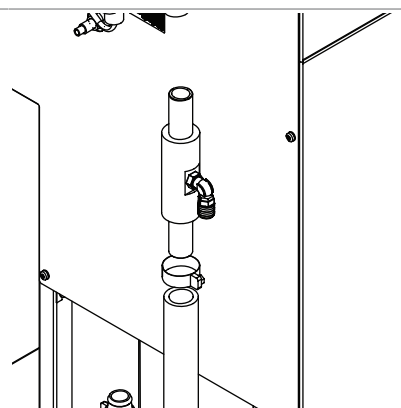
- ▶ Cut the drying gas hose 200 mm below the heater.



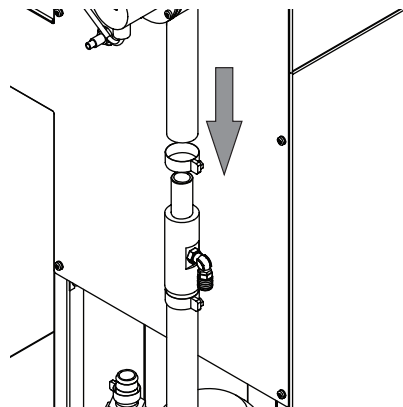
- ▶ Attach the hose connector to the inert gas adapter.



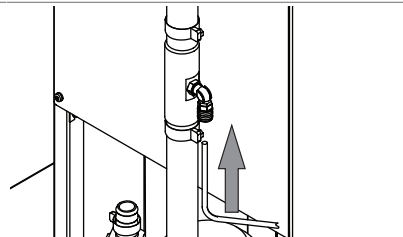
- ▶ Attach the inert gas connector to the hose.
- ▶ Attach the inert gas adapter in place with a hose clip.



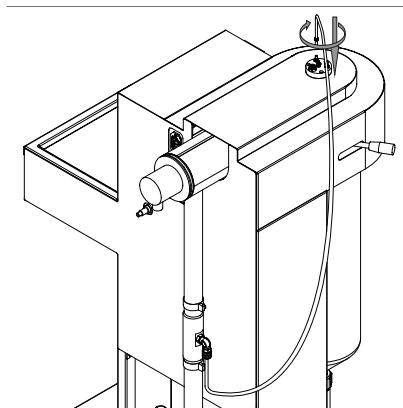
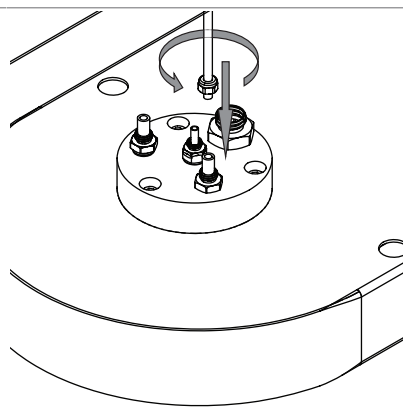
- Attach the drying gas hose to the inert gas adapter



- Attach the inert gas hose to the inert gas adapter.

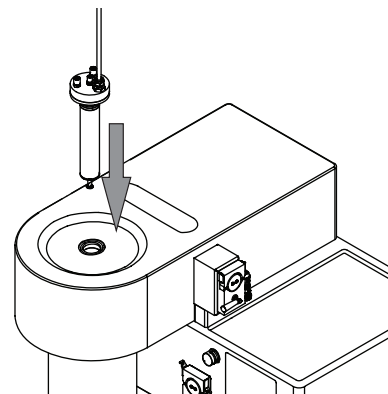


- Install the inert gas hose onto the connection marked *OUT*.
- Attach the inert gas hose in place with the union nut.

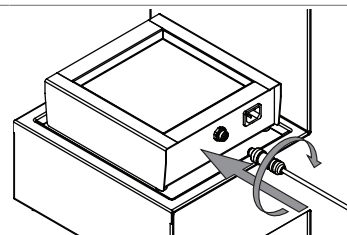


5.6.2 Installing the Ultrasonic Nozzle in closed mode (S-300)

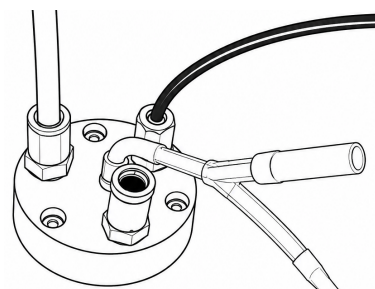
- ▶ Insert the Ultrasonic Nozzle into the heater element of the Mini Spray Dryer S-300.



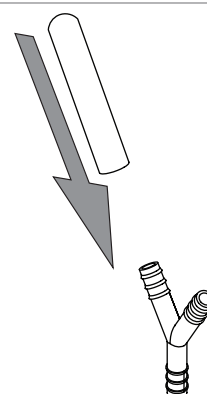
- ▶ Attach the Ultrasonic Nozzle with the Ultrasonic Nozzle cable on the Ultrasonic Controller.



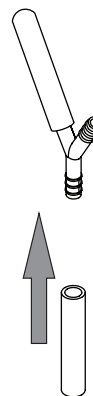
- ▶ Attach the cooling gas onto the connection marked *IN*.
- ▶ Attach the inlet tube in place with the union nut.



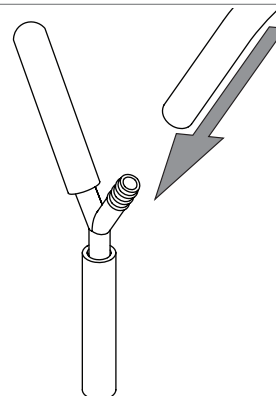
- ▶ Select a suitable type of supply hose. See resistance table of the *Operation Manual Mini Spray Dryer S-300*.
- ▶ Cut approx. 50 mm from the feeding tube.
- ▶ Attach the damper to the Y-piece.



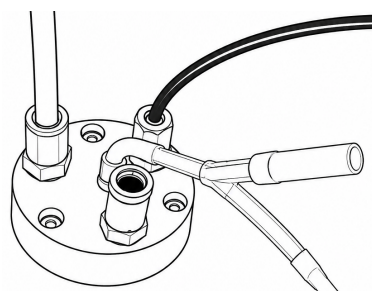
- Attach the tube piece to the Y-piece.



- Attach the feeding tube to the Y-piece.



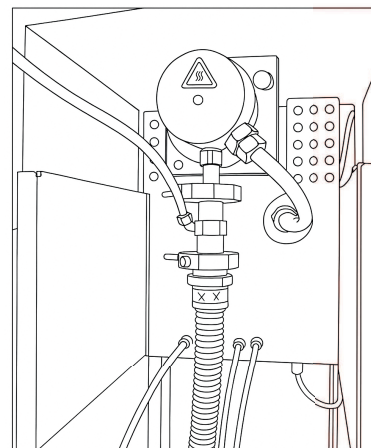
- Attach the assembled feeding tube to the nozzle.
- Attach the inlet tube in place with the union nut.



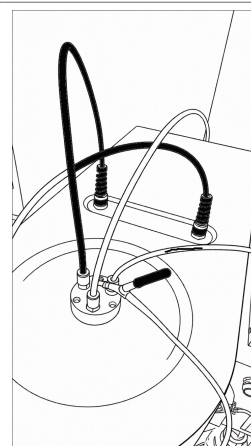
- Install the feed tube at the peristaltic pump. See *Operation Manual Mini Spray Dryer S-300*.
- Adjust the peristaltic pump bed. See *Operation Manual Mini Spray Dryer S-300*.
- Cut the drying gas hose 200 mm below the heater.
- Attach the hose connector to the inert gas adapter.



- ▶ Attach the inert gas connector to the hose.
- ▶ Attach the inert gas adapter in place with a hose clip.
- ▶ Attach the drying gas hose to the inert gas adapter
- ▶ Attach the inert gas hose to the inert gas adapter.



- ▶ Install the inert gas hose onto the connection marked *OUT*.
- ▶ Attach the inert gas hose in place with the union nut.



6 Operation

6.1 Operating the display

6.1.1 Layout of the display

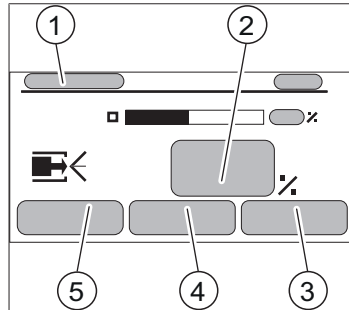


Fig. 6: Display

- | | | | |
|---|---------------------------|---|-------------------|
| 1 | Actual nozzle temperature | 2 | Set power / level |
| 3 | Info menu | 4 | Alarm screens |
| 5 | Setup menu | | |

6.1.2 Entering settings

- Use the navigation control to select the desired parameter.
- Press the navigation control to confirm the selection.

6.1.3 Selecting the operation mode

The instrument has two operation modes:

Mode	Explanation
Load-leveling mode	The Ultrasonic Controller compensates the load changes seen at the Ultrasonic Nozzle.
Power-leveling mode	The Ultrasonic Controller delivers a constant power to the Ultrasonic Nozzle.

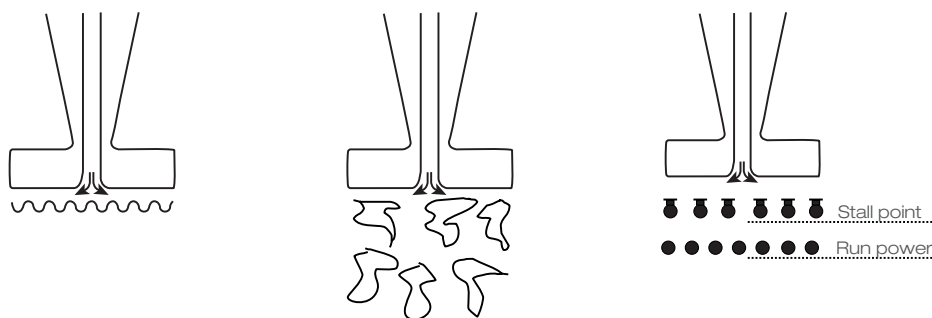
Proceedings:

Navigation path

→ Setup → Leveling

- Navigate to the submenu Leveling according the navigation path.
- Select the mode.
- Press the button **[Save]**.
- ⇒ The output leveling mode is set.

6.2 Finding the optimal spray cone



Low power

- No droplet production.

High power

- The liquid is being ripped apart.

Optimal power

- The liquid produces droplets

6.2.1 Finding the optimal spray cone (Power-leveling mode)

Precondition:

- ☒ Instrument is prepared for spraying.

- ▶ Turn the navigation control clockwise until the nozzle starts producing droplets.
- ▶ Turn the navigation control counter clockwise in 0.1 watt steps until the liquid starts to spit from the tip of the nozzle and / or flooding the tip.
 - ⇒ The stall point is found.
- ▶ Turn the navigation control 0.5 to 1.0 watt clockwise.
 - ⇒ The optimal spray cone is found.

6.2.2 Finding the optimal spray cone (Load-leveling mode)

Precondition:

- ☒ Instrument is prepared for spraying.

- ▶ Turn the navigation control clockwise until the nozzle starts producing droplets.
- ▶ Turn the navigation control counter clockwise in 1 % steps until the liquid starts to spit from the tip of the nozzle and / or flooding the tip.
 - ⇒ The stall point is found.
- ▶ Turn the navigation control 2 - 5 % clockwise.
 - ⇒ The optimal spray cone is found.

6.3 Carrying out a spray drying process in open mode

6.3.1 Tasks before starting spray drying in open mode

Precondition:

- ☒ The installation is complete. See Chapter 5.5 "Installing the Ultrasonic Nozzle in open mode", page 17.
- ▶ Prepare 50 mL pure solvent.
- ▶ Prepare the sample.
- ▶ Place sample and solvent on top of the Ultrasonic Controller.

6.3.2 Preparing the instrument for open mode

	Low drying temperature ca. 80 °C	High drying temperature ca. 220 °C
Time required:	approx. 15 min	approx. 30 min

- ▶ Switch the On/Off master switch of the Mini Spray Dryer S-300 to On.
 - ⇒ The instrument is starting up.
- ▶ Set the flow on the rotameter between 50 - 60 mm.
 - ⇒ The cooling gas cools the Ultrasonic Nozzle.
- ▶ Select the aspirator power.
- ▶ Tap the button main switch aspirator.
 - ⇒ Drying gas is flowing in the drying circuit.
- ▶ Select the inlet temperature.
- ▶ Tap the button main switch heater.
 - ⇒ The drying gas heats up.
- ▶ Wait until the system is in steady conditions.

6.3.3 Starting a spray drying process in open mode

Precondition:

- ☒ The instrument is prepared. See Chapter 6.3.2 “Preparing the instrument for open mode”, page 29
- ▶ Immerse the tube in the pure solvent.
- ▶ Set the peristaltic pump between 3 - 30 %.
- ▶ Tap the button main switch peristaltic pump.
 - ⇒ Pure solvent flows to the nozzle.
- ▶ Wait until the solvent reach the atomizing surface of the Ultrasonic Nozzle.
- ▶ Switch the On/Off master switch of the Ultrasonic Controller to On.
- ▶ Select the output leveling mode. See Chapter 6.1.3 “Selecting the operation mode”, page 28
 - ⇒ The Ultrasonic Nozzle vibrates at the set power level.
- ▶ Adjust the spray cone. See Chapter 6.2 “Finding the optimal spray cone”, page 29

6.3.4 Tasks during spray drying

Precondition:

- ☒ The instrument is in operating conditions. See Chapter 6.3.3 “Starting a spray drying process in open mode”, page 30
- ▶ Change the feed tube from the pure solvent to the sample.
 - ⇒ The sample flows though the feed tube to the nozzle.
- ▶ Turn the navigation control a small distance clockwise.
 - ⇒ Spray cone is established.

6.3.5 Ending a spray drying process in open mode

Precondition:

- ☒ The sample beaker is empty.
- ▶ Change the feed tube from the sample to the pure solvent.
- ▶ Decrease the pump rate.
- ▶ Wait 2 -3 minutes.
 - ⇒ The solvent flushes the remainings from the Ultrasonic Nozzle.
- ▶ Tap the button main switch peristaltic pump.
- ▶ Switch the On/Off master switch of the Ultrasonic Controller to Off.
- ▶ Tap the button main switch heater.
- ▶ Wait until the glassware cooled down.
- ▶ Tap the button main switch aspirator.
- ▶ Set the air flow on the rotameter to 0.
- ▶ Remove the product from the product collection vessel.

6.3.6 Shutting down the instrument

Precondition:

- ☑ The spray drying process is finished. See Chapter 6.3.5 “Ending a spray drying process in open mode”, page 30.
- ▶ Switch the On/Off master switch of the Mini Spray Dry S-300 to Off.
- ▶ Clean the Ultrasonic Nozzle. See Chapter 7 “Cleaning and servicing”, page 33.
- ▶ Clean the Mini Spray Dryer S-300. See *Operation Manual Mini Spray Dryer S-300*.

6.4 Carrying out a spray drying process in closed mode

There are two different modes closed mode:

- Closed mode with inert loop
- Closed mode with inert loop and dehumidifier

6.4.1 Tasks before starting spray drying in closed mode

Precondition:

- ☑ The installation is complete. See Chapter 5.6 “Installing the Ultrasonic Nozzle in closed mode”, page 21.
- ▶ Prepare 50 mL pure solvent.
- ▶ Prepare the sample.
- ▶ Place sample and solvent on top of the Ultrasonic Controller.

6.4.2 Preparing the instrument for closed mode

	Low drying temperature ca. 80 °C	High drying temperature ca. 220 °C
Time required:	approx. 15 min	approx. 30 min

- ▶ Switch the On/Off master switch of the Mini Spray Dryer S-300 to On.
 - ⇒ The instrument is starting up.
 - ⇒ The Inert Loop S-395 is starting up.
- ▶ Select the condenser temperature at the Inert Loop S-395.
- ▶ For closed mode with S-395 and S-396 switch the On/Off master switch of the Dehumidifier S-396 to On.
- ▶ Set the flow on the rotameter between 30 - 40 mm.
 - ⇒ The cooling gas cools the Ultrasonic Nozzle.
- ▶ Select the aspirator power.
- ▶ Tap the button main switch aspirator.
 - ⇒ Drying gas is flowing in the drying circuit.
- ▶ Wait until the oxygen level has reached < 6%.
- ▶ Wait until the signal lamp *OXYGEN HIGH* switch off.
- ▶ Wait until the signal lamp *PRESSURE LOW* switch off.
- ▶ Select the inlet temperature.
- ▶ Tap the button main switch heater.
 - ⇒ The drying gas heats up.
- ▶ Wait until the system is in steady conditions.

6.4.3 Starting a spray drying process in closed mode

Precondition:

- ☑ The instrument is prepared. See Chapter 6.4.2 “Preparing the instrument for closed mode”, page 31
- ▶ Immerse the tube in the pure solvent.

- ▶ Set the peristaltic pump between 3 - 30 %.
- ▶ Tap the button main switch peristaltic pump.
 - ⇒ Pure solvent flows to the Ultrasonic Nozzle.
- ▶ Wait until the solvent reach the atomizing surface of the Ultrasonic Nozzle.
- ▶ Switch the On/Off master switch of the Ultrasonic Controller to On.
- ▶ Select the output leveling mode. See Chapter 6.1.3 “Selecting the operation mode”, page 28
 - ⇒ The Ultrasonic Nozzle vibrates at the set power level.
- ▶ Adjust the spray cone. See Chapter 6.2 “Finding the optimal spray cone”, page 29

6.4.4 Tasks during spray drying

Precondition:

- ☒ The instrument is in operating conditions. See Chapter 6.3.3 “Starting a spray drying process in open mode”, page 30
- ▶ Change the feed tube from the pure solvent to the sample.
 - ⇒ The sample flows though the feed tube to the nozzle.
- ▶ Turn the navigation control a small distance clockwise.
 - ⇒ Spray cone is established.

6.4.5 Ending a spray drying process in closed mode

Precondition:

- ☒ The sample beaker is empty.
- ▶ Change the feed tube from the sample to the pure solvent.
- ▶ Decrease the pump rate.
- ▶ Wait 2 -3 minutes.
 - ⇒ The solvent flushes the remainings from the Ultrasonic Nozzle.
- ▶ Tap the button main switch peristaltic pump.
- ▶ Switch the On/Off master switch of the Ultrasonic Controller to Off.
- ▶ Tap the button main switch heater.
- ▶ Wait until the glassware cooled down.
- ▶ Tap the button main switch aspirator.
- ▶ Set the air flow on the rotameter to 0.
- ▶ Remove the product from the product collection vessel.

6.4.6 Shutting down the instrument

Precondition:

- ☒ The spray drying process is finished. See Chapter 6.3.5 “Ending a spray drying process in open mode”, page 30.
- ▶ Switch the On/Off master switch of the Mini Spray Dry S-300 to Off.
- ▶ For closed mode with S-395 and S-396 switch the On/Off master switch of the Dehumidifier S-396 to Off.
- ▶ Clean the Ultrasonic Nozzle. See Cleaning and servicing.
- ▶ Clean the Mini Spray Dryer S-300. See *Operation Manual S-300 Mini Spray Dryer*

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

Component	Action	Frequency
Housing	▶ Wipe down the housing with a damp cloth. ▶ If heavily soiled, use ethanol or a mild detergent.	Weekly
Warning symbols	▶ Check that the warning symbols on the instrument are legible. ▶ If they are dirty, clean them.	Weekly

7.2 Cleaning the Ultrasonic Nozzle



NOTICE

Sharp cleaning tools

Sharp cleaning tools can damage the surface.

- ▶ Do not use any sharp cleaning tools.

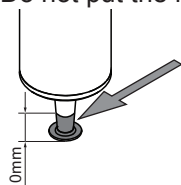


NOTICE

Ultrasonic bath

Cleaning the instrument in an ultrasonic bath cause damage.

- ▶ Do not put the nozzle tip more than 10 mm into the ultrasonic bath.



NOTICE

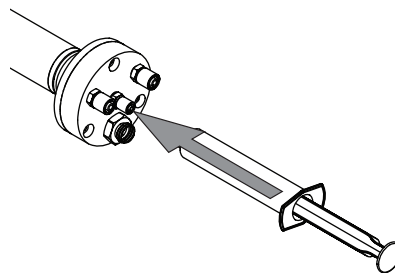
Liquids in cooling gas channels.

Liquids in cooling gas channels cause damage.

- ▶ Make sure that no liquids get into the cooling gas channels during the cleaning process.

Precondition:

- ☑ The Ultrasonic Nozzle is not installed.
- ▶ Connect a syringe with solvent to the feed tube connector.
- ▶ Press the solvent through the Ultrasonic Nozzle.
- ▶ Wipe down the surface of the Ultrasonic Nozzle with a damp cloth.



8 Help with faults

8.1 Troubleshooting

8.1.1 Error messages

Message	Explanation	Solution
Alarm	The nozzle is not connected	► Connect the nozzle
	The nozzle temperature is more than 100 °C	► Increase the cooling supply
LED lighting	The nozzle temperature is more than 100 °C	► Increase the cooling supply

8.1.2 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

8.2 No liquid delivery

- Check the condition of the tube used in the peristaltic pump.
 - ⇒ Replace a worn out tube.
- Adjust the peristaltic pump bed. See *Operation Manual Mini Spray Dryer S-300*

8.3 Liquid emerges unatomized

- Check if the maximum flow rate is within the rated nozzle capacity.
- Check if the feed viscosity and particle size of the slurry are within the specifications.
- Turn off the peristaltic pump.
- Switch the Ultrasonic Controller on/off for 5 times to get the liquid out of the Ultrasonic Nozzle, or use the damper by squeezing it.
- Adjust the spray cone. See Chapter 6.2 "Finding the optimal spray cone", page 29

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 cables from the device.

9.2 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 13 or the material labeling on the parts.

9.3 Returning the instrument

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

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

10 Appendix

10.1 Spare parts and accessories

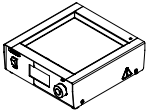
Use only genuine BUCHI consumables and spare parts in order to ensure correct, safe and reliable operation of the system.



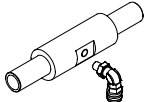
NOTE

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

10.1.1 Spare parts

	Order no.	Image
Silicon tube D2/4 (per m)	004138	
Y-piece	11060527	
Silicon cap	11060528	
Ultrasonic Controller	11069891	
Ultrasonic Nozzle with cable	11060053	

10.1.2 Accessories

	Order no.	Image
Inert gas adapter for B-290 US UL	11060492	
Inert gas adapter for S-300 US UL	11073782	



11594107 | D en

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

www.buchi.com

Quality in your hands