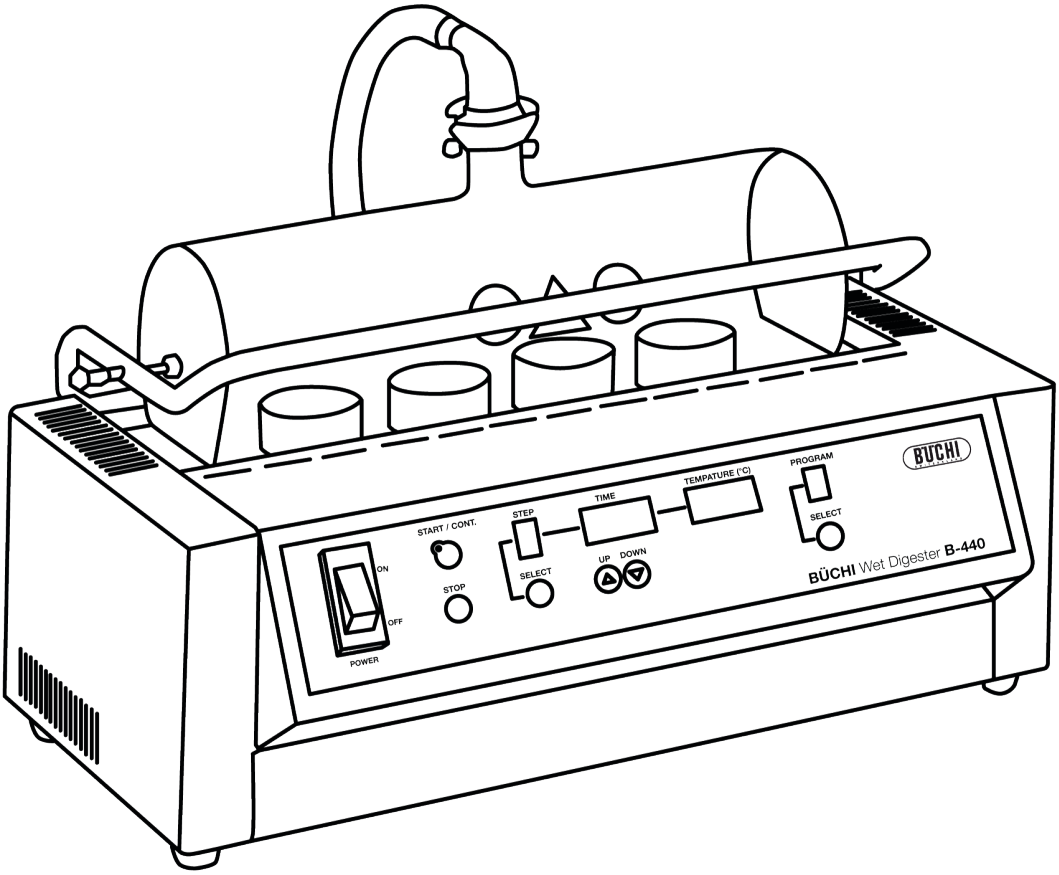
Wet Digester B-440
Operation Manual



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1 About this manual

This manual describes the Wet Digester B-440 and provides all information required for its safe operation and to maintain it in good working order.

It is addressed to laboratory personnel and operators in particular.

Read this manual carefully before installing and running your system and note the safety precautions in section 2 in particular. Store the manual in the immediate vicinity of the instrument, so that it can be consulted at any time.
No technical modifications may be made to the instrument without the prior written agreement of Buchi. Unauthorized modifications may affect the system safety or result in accidents. Technical data are subject to change without notice.

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

The English manual is the original language version and serves as basis for all translations into other languages. If you need another language version of this manual, you can download available versions at www.buchi.com.

2 Safety

This section introduces the safety concept of the instrument and contains general rules of behavior and warnings from direct and indirect hazards concerning the use of the product.
For the users safety, all safety instructions and safety messages in the individual sections shall be strictly observed and followed. Therefore, the manual must always be available to all persons performing any tasks described herein.

2.1 User qualification

The instrument may only be used by laboratory personnel and other persons who on account of training and professional experience know the potential dangers that can develop when operating the instrument.
Untrained personnel, or persons who are currently being trained, require careful supervision by a qualified person. This Operation Manual serves as a basis for training.

2.2 Proper use

The equipment is designed and built as laboratory equipment. It serves to heat up organic compounds with acids/peroxides for the wet digestion applications. It is also capable to perform dry ashing at high temperatures.

A Scrubber (e.g. Scrubber B-414) has to be connected to the glass hood to safely withdraw and neutralize fumes which will emerge during digestion. In any case, all exhausts and fumes leaving the system or assemblies such as the Scrubber have to be withdrawn instantly by a fume hood. This is mandatory to remove all possibly hazardous substances (e.g. acid fumes) from the working area. The ventilation system of the fume hood has to be equipped with safety measures such as outlet filters to avoid contamination of the environment.
When the Wet Digester B-440 is used in combination with other instruments (e.g. Scrubber and fume hood) all related manuals are to be fully observed.

2.3 Improper use

Any other use than the one stated above and any application that does not comply with the technical data is considered to be improper use. Improper use can cause hazardous situations for the operator and / or for the instrument and might cause consequential property damage.

The operator bears the sole risk for any damages or hazards caused by improper use!

In particular, the following uses shall not be permitted

- Installation or use of the instrument in rooms, which require ex-protected instruments.
- Use of samples which can explode or ignite due to shocks, friction, heat or sparks.
- The use of spare parts or accessories other than those mentioned in these operating instructions.
- The equipment may not be operated using combustible substances.

2.4 Safety warnings and safety signs used in this manual

DANGER, WARNING, CAUTION and NOTICE are standardized signal words for identifying levels of hazards and risks related to personal injury and property damage. All signal words, which are related to personal injury are accompanied by the general safety sign.

For your safety it is important to read and fully understand the table below with the different signal words and their definitions!

Sign	Signal word	Definition	Risk level
⚠	DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.	★★★★
⚠	WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.	★★★☆
⚠	CAUTION	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.	★★☆☆
no	NOTICE	Indicates possible property damage, but no practices related to personal injury.	★☆☆☆ (property damage only)

Supplementary safety information symbols may be placed in a rectangular panel on the left to the signal word and the supplementary text (see example below).

Space for supplementary safety information symbols.	⚠ SIGNAL WORD
	Supplementary text, describing the kind and level of hazard / risk seriousness. • List of measures to avoid the herein described, hazard or hazardous situation. • ... • ...

Table of supplementary safety information symbols

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

Symbol	Meaning
	General warning
	Electrical hazard
	Heavy weight, avoid over exertion
	Explosive gases, explosive environment

Symbol	Meaning
	Fire hazard
	Harmful to life-forms
	Hot item, hot surface
	Device damage
	Inhalation of substances
	Chemical burns by corrosives
	Fragile components
	Wear laboratory coat
	Wear protective goggles
	Wear protective gloves

Additional user information

Paragraphs starting with NOTE transport helpful information for working with the device / software or its supplementaries. NOTEs are not related to any kind of hazard or damage (see following example).

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

2.5 Product safety

The Wet Digester B-440 has been designed and built in accordance with current state-of-the-art technology, at the time of development. Safety warnings in this manual (as described in section 2.4) serve to make the user alert to and avoid hazardous situations emanating from residual dangers by giving appropriate counter measures.
However, risks to users, property and the environment can arise when the instrument is damaged, used carelessly or improperly.

2.5.1 General hazards

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

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

DANGER

Death or serious injuries by use in explosive environments.

- Do not store or operate the instrument in explosive environments
- Remove all sources of flammable vapors
- Do not store chemicals in the vicinity of the device
- Operate and maintain the device in a fume hood with sufficient ventilation to directly withdraw fumes

CAUTION

Risk of minor or moderate cuts by sharp edges.

- Do not touch defective or broken glassware with bare hands
- Do not touch thin metal edges

NOTICE

Risk of instrument damage by liquids or mechanical shocks.

- Do not spill liquids over the instrument or its components
- Do not move the instrument when it is loaded with sample material
- Do not drop the instrument or its components
- Keep external vibrations away from the instrument
- Do not operate the instrument without insulation panels and reflector

2.5.2 Warning labels on housing and assemblies

The following warning sticker(s) can be found on the housing or assemblies of the Wet Digester:

Symbol	Meaning	Location
	Do not touch hot item, hot surface!	Sticker / label, located at the glass hood
	Wear protective goggles	Sticker / label, located at the glass hood
	Wear protective gloves	Sticker / label, located at the glass hood

2.5.3 Personal protective equipment

Always wear personal protective equipment such as protective eye goggles, protective clothing and gloves. The personal protective equipment must meet all requirements of all data sheets for the chemicals used. These instructions are an important part of the Wet Digester B-440 and must be made available at all times to the operating personnel at the place where the equipment is deployed. This also applies to additional language versions of these instructions, which can be reordered separately.

WARNING

Serious chemical burns by corrosives.

- Observe all data sheets of the used chemicals
- Handle corrosives in well ventilated environments only
- Always wear protective goggles
- Always wear protective gloves
- Always wear protective clothes
- Do not use damaged glassware

2.5.4 Built-in safety elements and measures

Buchi glassware design

- All original Buchi digestion glassparts are made of high temperature and chemical resistant borosilicate glass.
- Acid fumes generated during digestion accumulate in the glass hood
- The fumes must be safely withdrawn from the glass hood by a Scrubber (e.g. Scrubber B-414) with sufficient suction flow.

Heater

The device is inherently safe due to its limited heating power. In case of a faulty heating circuit, the device cannot overheat.

2.6 General safety rules

Responsibility of the operator

The head of the laboratory is responsible for training his/her personnel.
The operator shall inform the manufacturer without delay of any safety-related incidents which might occur during operation of the instrument or its accessories. Legal regulations, such as local, state and federal laws applying to the instrument or its accessories must be strictly followed.

Duty of maintenance and care

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

Spare parts to be used

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

Modifications

Modifications to the instrument are only permitted after prior consultation and with the written approval of the manufacturer. Modifications and upgrades shall only be carried out by an authorized Buchi technical engineer. The manufacturer will decline any claim resulting from unauthorized modifications.

3 Technical data

This section introduces the reader to the Wet Digester and its specifications. It contains the technical data, requirements and performance data.

3.2 Technical data

Technical data	
Power consumption	max. 1200 W
Integrated power outlet socket for Srubber B-414	max. load 100 W
Temperature control range	0 – 600°C (working range starts at ambient temp.)
Connection voltage	220 – 240 VAC ± 10% (1P, N, G)
Input fuse (internal)	T 100mA L 250 V
Frequency	50 / 60 Hz
IP degree of protection (two digits)	IP 20 Explanation of protection level: 2 Protection provided by the enclosure against access to hazardous parts (e.g., electrical conductors, moving parts) and the ingress of solid foreign objects with a diameter of > 12,5 mm. 0 No protection of the equipment inside the enclosure against harmful ingress of water.
Overvoltage category	II
Environmental conditions:	
Pollution degree	2 (for indoor use only)
Temperature	5 – 40 °C
Altitude (above sea level)	up to 2000 m
Humidity (curve parameter)	Maximum relative humidity 80% up to 31 °C, then decreasing linearly to 50% relative humidity at 40 °C
Dimensions in mm (W × D × H)	470 × 290 × 370
Net weight	12 kg

NOTE
Technical data of accessory instruments can be found in the respective operation manual!

3.3 Materials used

Materials used			
Component	Material designation	Material code	Hazardous substances
Steel, powder-coated with polyester-epoxide	Housing	1.0330	—
Halogen bulb	Heating element		—
Aluminium	Reflector	AL	—
Borosilicate glass 3.3	All glass parts	DIN/ISO 3585	—
Vitrified ceramic	Plate		—

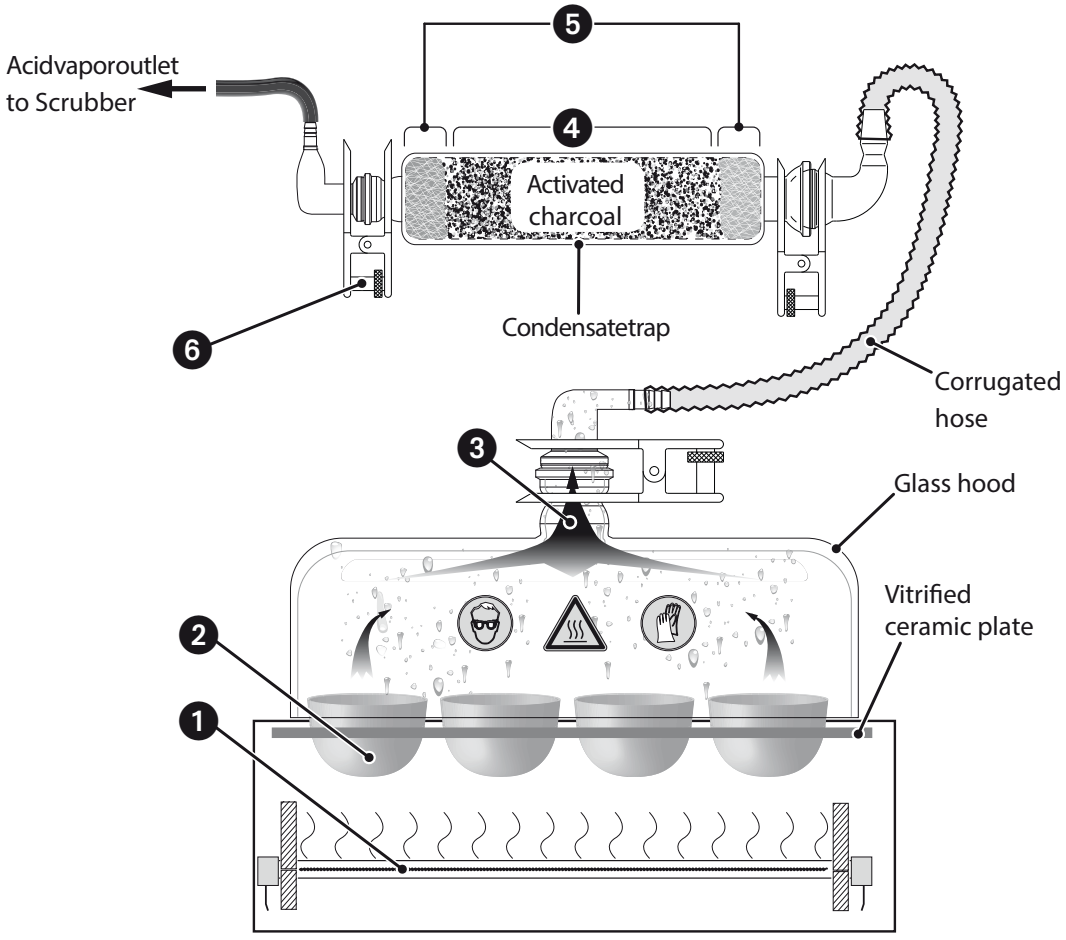
4 Description of function

This section explains the basic working principle of the Wet Digester B-440. It also shows how the instrument is structured and provides a general functional description of its assemblies.

4.1 Functional principle

The set-up with the optional condensate trap is suitable for all wet ashing operations (e.g. when using sulphuric acid). The ratio between the weight of the sample / acids and the temperature program must be selected in such a way that practically only gaseous products are produced by the reaction.

Digestion process overview



Processing steps:

- The infrared heating ❶ generates high temperatures (up to 600 °C) to heat up the crucibles.
- Inside the crucibles ❷ the digestion process of the sample material takes place.
- Hot fumes ❸ rise into the glass hood and are safely withdrawn by the suction flow of the Scrubber.
- The digestion fumes can be highly corrosive and hazardous to life forms! The optional condensate trap can be interconnected between the glass hood and the scrubber ❹ to neutralize most of the hazardous fumes in the first place.
- The activated charcoal must be kept in place within a sandwich layer of glass wool ❺ at each end of the condensate trap.
- Every glass-to-glass connection must be secured by a clip ❻!

5 Putting into operation

This section describes how the instrument has to be installed. It also gives instructions for the initial startup.

NOTE
Inspect the instrument for damage during unpacking. If necessary, prepare a status report immediately and inform customer and your local Buchi representative. Keep the original packaging for future transportation.

5.1 Installation site

Put the instrument into a fume hood onto a clean, stable and horizontal surface. Consider the maximum product dimensions and weight. Obtain the environmental conditions as described in section 3.2, technical data.

Installation prerequisites and installation steps:

- The fume hood must be equipped with a heat- and acid-resistant lining.
- Do not place any objects on top or below the instrument.
- The instrument must be installed with a safety clearance of not less than 30 cm to any other objects or walls to allow sufficient cooling.
- Do not place containers, chemicals or other items behind the instrument.
- When using a Scrubber B-414 it must be placed on the left side of the Wet digester B-440.

NOTE
- To cut the power in case of an emergency by unplugging, the instruments or any other items must not block the mains plug!
- Any cooling of the Wet Digester can disturb the digestion process. When switched 'On', the Scrubber B-414 cooling fan emits from the left side of the housing. Hence the Scrubber B-414 should not be installed on the right side of the Wet Digester.

DANGER

Death or serious injuries by use in explosive environments.

- Do not store or operate the instrument in explosive environments
- Remove all sources of flammable vapors
- Do not store chemicals in the vicinity of the device
- Install the device in a fume hood with sufficient ventilation to directly withdraw fumes

CAUTION

Risk of minor or moderate injury by heavy weight of the instrument.

- Lift the instrument carefully and avoid over exertion
- Do not drop the instrument or its transport box
- Place the instrument on a stable, even and vibration-free surface
- Keep limbs out of crushing zone

5.3 Electrical connections

After the installation procedure has been completed successfully, the power plug of the Wet Digester can be connected to mains. The jumper cord should only be used to supply a Scrubber B-414 in line to the Wet Digester.

The used mains circuit has to:

- provide the voltage that is given on the type plate of the instrument.
- be able to handle the load of the connected instruments.
- be equipped with adequat fuses and electrical safety measures, in particular proper grounding.

See also technical data of all components regarding the different minimum system requirements!

Notice

Risk of instrument damage by wrong mains supply.

- External mains supply must meet the voltage given on the type plate
- Check for proper grounding
- Exchange defective cabling instantly
- The max. load on the auxiliary power outlet socket must not exceed 100W!

NOTE

- Additional electrical safety measures such as residual current breakers may be necessary to meet local laws and regulations!
- External power switches (e.g. emergency stop switches) must meet IEC 60947-1 and IEC 60947-3 requirements. Such devices must be clearly labeled and accessible at any time.
- External connections and extension lines must be provided with a grounded conductor lead (3-pole couplings, cord or plug equipment). All used power cords must meet the input power requirements.

5.3.1 System behaviour at power outage

- An on-going process cycle will automatically be continued in the event of a power outage of < 3 minutes.
- A power outage of > 3 minutes will result in the process cycle being discontinued. The cycle must be restarted manually.

NOTE
In no case will the saved program data be lost.

6 Operation

This section gives examples of typical instrument applications and instructions on how to operate the instrument properly and safely. See also section 2.5 “Product safety” for general warnings.
The Wet Digester is also capable to perform ashing at high temperatures. However, wet digestions often require aggressive acids at high temperatures for processing which are hazardous to life forms. There is also a potential risk of fire when working with easily flammable substances in the Wet Digester.

WARNING

Death or serious burns by flammable sample materials.

- Do not overheat the sample materials
- Do not cover any part of the device during operation or when device is hot
- Ensure fire extinguishing material is appropriate for chemicals in use
- Avoid condensation of flammable substances at the glass hood

WARNING

Risk of fire and serious or moderate burns when touching hot housing parts.

- Always install upper and lower check plates at both sides of the heating chamber
- Use the handle to lift the glass hood
- Use a tongs to handle the crucibles
- Do not cover any part of the device during operation or when device it hot

CAUTION

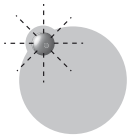
Risk of burns by hot machine parts and glassware.

- Do not touch hot parts or surfaces
- Let the system and inserted glassware cool down safely
- Do not move the instrument or parts of it when hot

6.1 Operating controls and housing

Front side

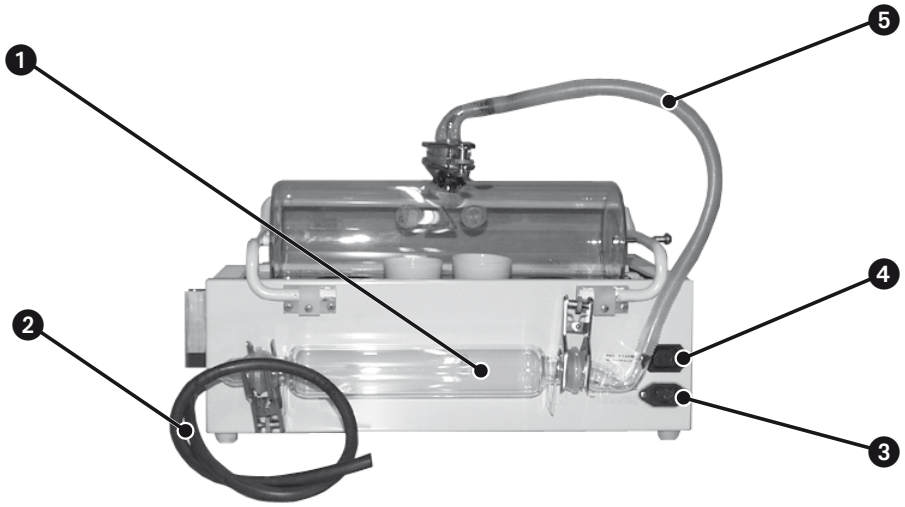
1. Glass hood (in closed condition)
2. On-/Off switch (lights green when instrument is switched on)
3. Operating panel with various parameter displays
4. Crucibles seated in vitrified ceramic plate
5. Handle to open and close the glass hood
6. Glass connector to condensation trap or Scrubber

Buttons	
Button	Functionality
START / CONT. 	Button to start or continue an active application. This button is equipped with a green indicator light!
STOP 	Stop button to pause or abort an active application.

Buttons cont.	
SELECT 	LEFT SELECT BUTTON: Activate and sequentially jump between displays. Activated displays will blink for 10 seconds until falling back into deselected status automatically.
SELECT 	RIGHT SELECT BUTTON: Select program 1 – 9.
UP 	Button to increase the value of an activated display.
DOWN 	Button to decrease the value of an activated display.

Displays	
Display	Indicated value and range
STEP 	Steps within a program.
TIME [min.] 	At programming: Duration of selected step (0 – 240 minutes). At active / paused application: Total time of all steps of the running application + blinking dot.
TEMPERATURE [°C] 	At programming: Temperature setpoint of selected step (0 °C – 600 °C). At active application: Actual temperature value of the running application (starting at ambient temperature).
PROGRAM 	At programming / at active application: Shows the currently selected program.

Rear side



1. Condensate trap, installed at the housing brackets
2. FPM / FKM hose to Scrubber
3. Mains power input socket
4. Mains power output socket to Scrubber (max. load 100W)
5. Corrugated hose (with hose clamps) between glass hood and condensate trap

6.2 Preparing for use

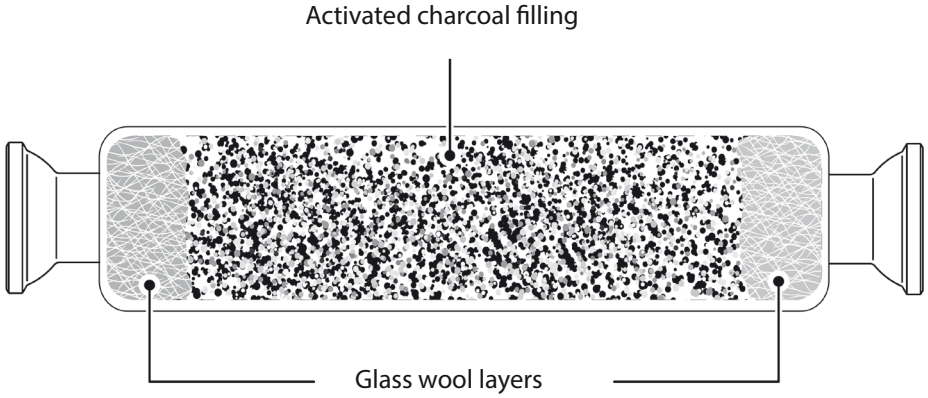
During the preparation process, handling with strong acid and other potentially dangerous substances will be inevitable. Thus, all steps must be performed under safe laboratory conditions!

Prerequisites

- All parts must be clean and free of damage.
- To achieve a reliable and reproducible digestion result, the quality of sample material and additives (e.g. acids) must be free of impurities and of adequate amount.

6.2.1 Filling of the condensate trap (optional)

Fill condensate trap with activated charcoal granules. Use glass wool as a barrier for the charcoal. To prevent the glass wool causing a blockage, the glass wool should only be inserted very loosely!



NOTE
Activated charcoal is available on the open market by various companies. A granule size of approx. 2.5 mm is convenient.

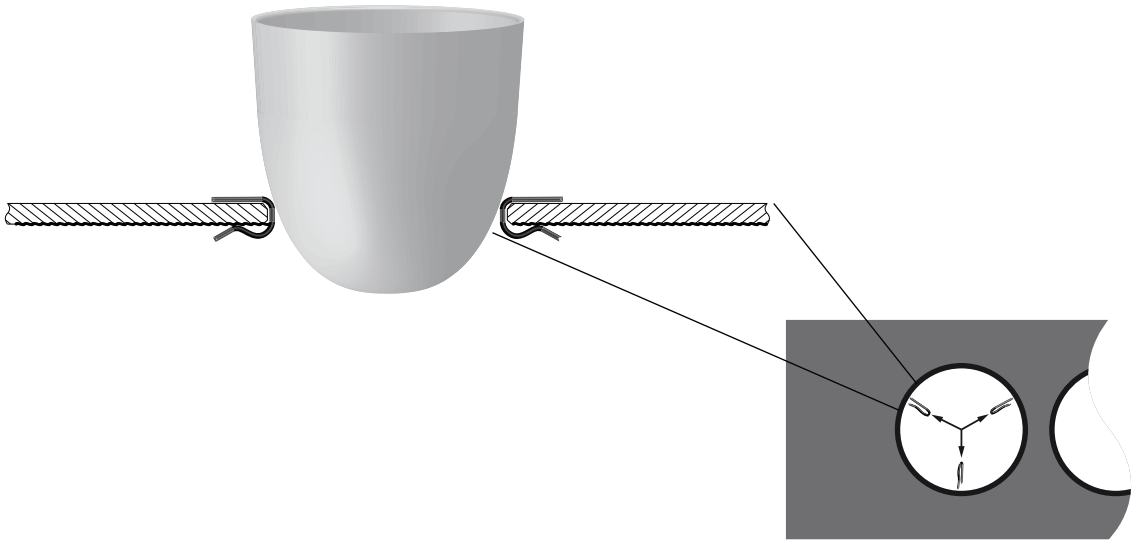
Installation of the condensate trap (optional)

Install both elbow connectors at the ends of the condensate trap. Join each connector with a clamp and place the trap with the tube connections upwards into the bracket at the rear side of the digester housing.

NOTE
When no condensate trap is needed, the Scrubber must be directly connected to the glass hood.

6.2.2 Installing the vitrified ceramic plate

- To prevent the crucibles from jamming, every aperture of the plate must be equipped with at least 2 spacing clips.
- Place the vitrified ceramic plate on the heating dish. Install the vitrified ceramic plate with the smooth surface facing upwards!



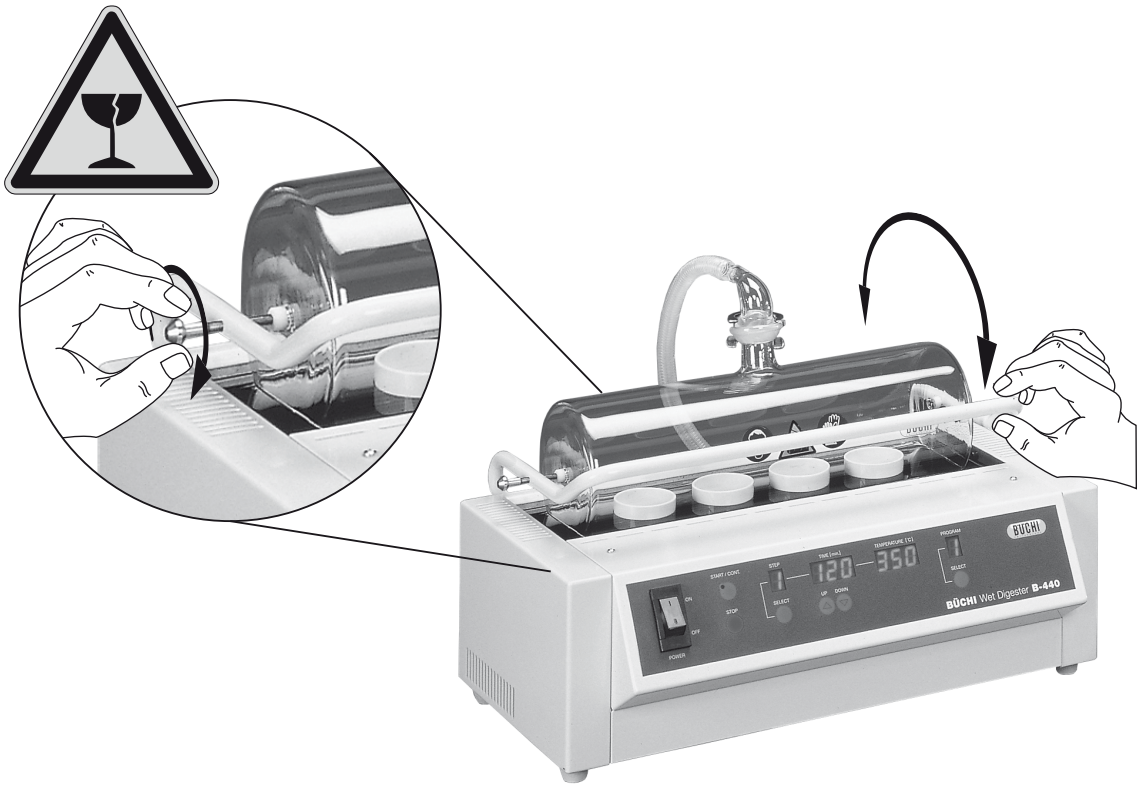
	NOTICE
	Risk of ceramic plate and crucible stress cracks by heat. • Mount at least two spacing clips at every aperture • Exchange corroded spacing clips • Do not use damaged parts

NOTE

A set of 3 spacing clips is optimal for perfect balance and positioning of the crucibles.

6.2.3 Installing the glass hood

Place the glass hood into the two retaining cams and fix it in place by means of the counterpin. Be careful not to overtighten and crack the glass hood!



Subsequently mount the elbow connector at the outlet of the glass hood and secure it with a clamp. Now the corrugated hose can be installed. Use hose clamps to secure the hose and check for proper seating!
Open and close the glass hood to verify proper functionality.

	**CAUTION** Risk of minor or moderate cuts when handling damaged glass parts. • Handle glass parts with care • Visually inspect every glass part before mounting • Do not operate with damaged parts • Do not touch cracks or bits of broken glass with bare hands

NOTE
Due to its corrugated surface the hose can accumulate condensated liquids (e.g. acid) after use. Always secure the hose with hose clamps! Mind operation instructions in the following sections for safe handling.
Inform service if the hinge of the glass hood handle does not provide sufficient friction to stabilize the glasshood when opened!

6.3 Setting up application parameters

Internal program storage

- The B-440 is capable of storing 9 application methods in its program storage.
- Each program has 5 steps with individual parameter pairs of time and temperature.

Parameter name	Range
Programs	1 – 9
Steps	1 – 5
Temperature	ambient – 600 °C
Time (per "STEP")	0 – 240 minutes

Setting up PROGRAMs and STEPs

- Switch "ON" the Wet Digester.
  ➥After the bootprocess (≈ 4 seconds) the instrument will be operational.
- Select a program via the right "SELECT" button (below "PROGRAM" display).
- Press the left "SELECT" button (below "STEP" display) repeatingly to switch through every "TIME" / "TEMP" parameter of each "STEP" in a loop.
  ➥The "STEP" display shows the selected step (1—5).
  ➥The corresponding "TIME" / "TEMP" display will flash for 10 seconds and switch to "STEP" level 1 without button action.
- To change either the heating time or temperature of a step, use the "UP" and "DOWN" buttons while the respective display flashes.
  ➥As soon as the display stops flashing, the value is being stored.

NOTE

- Some application methods do not require a full set of 5 steps. To disable a "STEP", set its "TIME " to 0.
- During a running application, programming is not possible.

6.4 How to perform a wet application

Digestion fumes can be hazardous and must be neutralized by a Scrubber or a condensate trap / Scrubber combination. Fumes which may escape during operation must be safely withdrawn by a fume hood! Wear personal protective equipment, see section 2.5 for general safety information!

⚠ WARNING

Death or serious poisoning by contact or incorporation of harmful substances and fumes at use.

- Before operation, check the instrument for correct assembling
- Rinse condensate trap, hoses and connectors before use
- Before operation inspect sealing surfaces and tubes for good condition and tightness
- Secure all hoses with hose clamps
- Exchange worn out or defective parts immediately
- Only operate the instrument in a fume hood
- Directly withdraw released gases and gaseous substances by a Scrubber
- Dispose of condensate in tubings and glassware safely after use
- Do not inhale digestion fumes

NOTE
Do not use coated tongs! Most coatings will melt at contact with hot crucibles! Close unused positions with empty crucibles for evenly heat distribution and to reach high temperatures!

Starting an application

- Activate the fume hood.
- Use the crucible tongs to insert the crucibles into the openings of the ceramic plate.
- Close the glass hood and check all suction hoses and connections for proper seating.
- Switch "ON" the Wet Digester.
  ➡ If connected to the rear side power socket of the Wet Digester, the Scrubber starts up simultaneously. If not, switch "OFF" the digester and check the power cord of the Scrubber. The power switch of the Scrubber must be in "ON" position!

  OR
- If the Scrubber is not connected to the power socket at the Wet Digester rear side, switch "ON" the Scrubber manually!
- Select a "PROGRAM". If necessary, adjust the digestion parameters (see section 6.3).
- Press the "START / CONT." button to start the digestion. A green light at the button indicates an active digestion.
  ➥The "STEP" display shows the actual step level.
  ➥The "TIME" display shows the actual digestion duration as a total of all programmed "STEP"- times in minutes. A flashing dot indicates the active countdown.
  ➥The "TEMP [°C]" display shows the actual digestion temperature.

Pausing or aborting an application

To pause an active application press the "STOP" button once. The countdown indicator in the "TIME" display and the green light of the "START / CONT." will flash simultaneously.

- Press the "START / CONT." button to continue the application process.
- Press the "STOP" button again to abort the application and to reset the timer countdown.

6.5 Finishing an application

Due to high process temperatures there is a risk of burns by hot surfaces. Do not touch any hot surface (e.g. glass hood, vitrified ceramic plate and crucibles) without appropriate safety measures!

If consistent with the application in process, it is recommended to let the Wet Digester and the samples cool down below 40 °C (safe temperature range) first.

The fume hood must be active to withdraw any fumes that might escape when opening the glass hood.

⚠ WARNING

Risk of dangerous or moderate burns when handling hot parts and sample tubes.

- Do not touch any hot parts
- Use the handle to lift the glass hood
- Use a tongs to handle the crucibles

After the application:

- Use the handle to safely lift the glass hood.
- Use the crucible tongs to remove the crucibles. The crucibles can be slippery! Ensure safe grip before taking out the crucible of the ceramic plate completely!
- Place hot crucibles on a acid- and fireproof surface only.
- Switch "OFF" the Wet Digester and the Scrubber.
- Clean all accessories that have been in use.
  ➥ Optional: Dispose of the filling of the condensate trap if the activated charcoal is exhausted (e.g. shows signs of a high moisture content).

⚠ Caution

Risk of moderate chemical burns by splashing acid or peroxide drops.

- Carefully unplug the suction hose connectors
- Wipe off any liquid drops from the suction hose(s) and the condensate trap
- Wear safety goggles
- Wear safety gloves

6.3 Optimization principle for ashing programs

The various molecule structures make it impossible to develop a general-purpose wet or dry ashing procedure for all substances. Each substance has its own ashing kinetics and therefore its own profile of the decomposition temperature.

Observe the following rules to optimize a wet ashing program

Added acids or peroxides at wet ashing tend to boil over at high start-up temperatures. Thus, carbonization often requires gradually heating stages.

- If the sample contains water, evaporate it during the first step by heating the sample at approx. 120°C for a sufficient time.
- After carbonization, the heating can be increased to up to 600 °C for ashing. Intermediate temperature steps might be necessary at different ashing-reaction stages.

Note

The temperature inside the crucible will be slightly lower than the selected heating temperature. The ΔT between heating and crucible depends on many factors such as wall thickness of the crucibles and the digesting samples.

NOTE

If the sample is heated to too high temperature too quickly, it may ignite or be propelled out of the crucible.

7 Maintenance and repairs

This section gives instructions on maintenance work to be performed in order to keep the instrument in a good and safe working condition. All maintenance and repair work requiring the opening or removal of the instrument housing must be carried out by trained service personnel and only with the tools provided for this purpose.

NOTE
Use only genuine consumables and spare parts for any maintenance and repair work in order to assure warranty and continued system performance. Any modifications of the Wet Digester or parts of it need prior written permission of the manufacturer.

WARNING

Death or serious burns by electric current.

- Switch off the instrument, disconnect the power cord and prevent unintentional restart before touching the heating elements
- Do not spill liquids over the device

CAUTION

Risk of minor or moderate cuts when handling damaged glass parts.

- Handle glass parts with care
- Visually inspect every glass part for good condition before mounting
- Do not operate with damaged parts
- Do not touch cracks or bits of broken glass with bare hands

NOTICE

Risk of housing and instrument damage by liquids and detergents.

- Do not spill liquids over the instrument or parts of it
- Wipe off any liquids instantly
- Use ethanol or soapy water as detergent
- For sticky residues, use thin acid for cleaning the inner surface of the hood

7.1 Customer service

Only authorized service personnel are allowed to open up the housing and /or 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.

Addresses of official Buchi customer service offices are given on the Buchi website under: www.buchi.com. If malfunctions occur on your instrument or you have technical questions or application problems, contact one of these offices.

The customer service offers the following:

- Spare part delivery
- Repairs
- Technical advice

7.2 General inspection and cleaning instructions

Check the housing for visible defects (switches, plugs, enclosure etc.) and clean it regularly under safe conditions with a damp cloth. Wipe off any splashes of aggressive chemicals immediately using a damp cloth in order to avoid any damage being caused to the plastic coating on the housing.

Cleaning under safe conditions

- Switch off the Wet Digester and unplug the power cord.
  ➡ Let the system cool down completely!
- Perform cleaning actions

After each use:

- Check the glass components for damage (e.g. stars, cracks or blind spots). Exchange defective parts immediately.
- Clean the glass hood and vitrified ceramic plate with water.
- Separate glassware joints from each other.
- Do not grease ground-glass joints under any circumstance.

WARNING

Death or serious burns by electric current at cleaning.

- Switch off the instrument
- Disconnect the power cord and prevent unintentional restart
- Wait until the instrument is completely dry before reconneting to mains

All parts must be completely dried before the system can be connected to mains again!

7.2.1 Additional cleaning instructions

Condensate trap

The activated charcoal does not have to be cleaned or changed until the glass wool at the inlet has clearly changed colour or has become sticky. However, it is generally sufficient just to change the dirty glass wool.

Extraction hose

The extraction hose(s) can be rinsed through with water or ethanol. Cleaning using an ultrasonic bath is also suitable.

Crucibles

Do not rapidly cool down hot crucibles or any other hot glass or ceramic parts e.g. with cold water. The resulting temperature shock might lead to tension and cracks in the material.

Glass components and sealing surfaces

Clean the glass components after each working process to prolong their lifetime. The glass assemblies can be taken out and cleaned manually with water and a commercial cleaning agent (e.g. mild

soap solution) or in an ultrasonic bath. Visibly check for damages at all the glass components and sealing surfaces subsequently.

NOTICE

Risk of sealing damage by lubricants or sharp objects.

- Do not lubricate sealings
- Do not bring sealings in contact with sharp objects
- Use ethanol or soapy water as detergent only

7.2.2 Liquid ingress into the instrument

In case of liquid ingress into the housing the instrument is not safe to use anymore. Follow the instructions below to limit possible damage and safely bring the instrument into operable condition again.

- Switch off the Wet Digester and unplug the power cord.
- Use a long forceps to dab liquid off the outer housing parts. Wear safety gloves!

➡ Let the system cool down completely!

- Use a long forceps to dab residual liquid off the heating chamber.
- Wear cut- and acid-safe gloves to wipe out the chamber with dry cloth.
- Use a long forceps to clean the chamber(s) with a wet damp cloth. Let the chamber dry subsequently!

➡ Call service! Do not reconnect the system to mains!

⚠ WARNING

Death or serious burns by electric current.

- Switch off the instrument
- Disconnect the power cord and prevent unintentional restart

All parts must be completely dried before the system can be checked by a service technician!
An electrical safety test and a functional test must be performed before the system can be used again.

7.5 Reflector exchange

Components may only be changed when the equipment has cooled down completely.
The equipment must be disconnected from all mains sources before any components are changed.
Electrical and electronic components may only be changed by appropriately qualified personnel.

Preparations

- Switch off the Wet Digester and unplug the power cord.

➡ Let the system cool down completely!

- Carefully remove the vitrified ceramic plate.
- Take out the upper check plates.

- Push a fixation clip to free one side of the heating element with one hand. At its ceramic insulation, carefully lift the heating element slightly (!) above the holder. The heating element must not collide with the ceramic tube of the temperature sensor!
- Repeat the previous action at the second holder to completely free the heating element.
- Carefully put the heating element out of the heating chamber. Mind the limitating cable length — do not pull with force! Do not touch the glass of the heating element!

Taking out the old reflector

- Squeeze the reflector sufficiently to pass the thin ceramic tube at the reflectors cut-out when removing it. Carefully avoid knocking or braking the sensor tube! Dispose of the reflector.
- Take out the lower check plates.
- Wear acid-safe gloves to wipe out the chamber with wet damp cloth.
- Reinstall the lower check plates.

Installing a new reflector

- Remove the protective foil of the new reflector. Be careful not to leave fingerprints on the reflective (inner) side!
- Align the cut out at the front side of the reflector to the temperature sensor tube. Keep the reflector rear side upright and slightly (!) sqeeze it to just pass the temperature sensor tube with the cut out. Do not overbend the reflectors material! The hold-down cams must securely keep the reflector in position.
- Reinstall the heating element. Take care with proper routing of the cables!
- Reinstall the upper check plates.

Check proper seating of all parts before reconnecting the device to mains!

WARNING

Risk of fire and dangerous or moderate burns when touching overheated housing parts.

- Always install upper and lower check plates at both sides of the heating chamber
- Use the handle to lift the glass hood
- Use a tongs to handle the crucibles
- Do not cover any part of the device during operation or when device it hot

NOTICE

Risk of heating element damage by lubricants, sharp objects and fingerprints.

- Do not put any lubricate on the heating element
- Do not let the heating element collide with other objects
- Do not touch the glass of the heating element, avoid fingerprints
- Wear protective gloves

8 Troubleshooting

This section helps to resume operation after a problem has occurred with the instrument which does not require special technical training. It lists possible occurrences, their probable causes and suggests how to remedy the problem.
The troubleshooting table below lists possible malfunctions and errors of the instrument. The operator is enabled to correct some of those problems or errors by him/herself. For this, appropriate corrective measures are listed in the column “Remedy”.

8.1 Malfunctions and their remedy

Malfunctions and their remedy

Malfunction	Possible cause	Remedy
Heating performance low	Blind reflector or worn out heating lamp (see section 8.1.1)	Exchange reflector or call service for bulb exchange
LED display does not illuminate	Onboard fuse or electronic malfunction	Call service for repair
Heating lamp does not warm up	Bulb faulty	Call service for exchange
E2, E4, E5, E6,E7, E8, E9	Electronic malfunction	Call service for repair

Malfunctions or errors which are not listed in the table are to be corrected by a Buchi trained technical engineer who has access to the official service manuals. In this case, please refer to your local Buchi customer service agent.

8.1.1 Heating performance test

Exchange the reflector if a temperature of 530 °C can no longer be achieved at the bottom inside the crucibles. To check this, a Tempilstick® with a melting point of 530 °C can be used.

NOTE
If the reflector exchange does not increase the system performance sufficiently, call service for a heating bulb exchange!

9 Shutdown, storage, transport and disposal

This section instructs how to shut down and to pack the instrument for storage or transport. Specifications for storage and shipping conditions can also be found listed here.

WARNING

Death or serious poisoning by contact or incorporation of harmful substances.

- Wear safety goggles
- Wear safety gloves
- Wear a laboratory coat
- Clean the instrument and all accessories thoroughly to remove possibly dangerous substances
- Do not clean dusty parts with compressed air
- Store the instrument and its accessories at a dry place in its original packaging

9.1 Storage and transport

Switch off the instrument and remove the power cord. To disassemble the Wet Digester B-440 follow the installation instructions in section 5 in reverse order. Clean the instrument thoroughly! Remove all liquids and dusty residues before packaging the instrument.

9.2 Disposal

For instrument disposal in an environmentally friendly manner, a list of materials is given in section 3.3. This helps to ensure that the components can be separated and recycled correctly by a specialist for disposal.
For disposal of liquids and consumables such as catalyst or acid, see data sheets of these chemicals!

You have to follow valid regional and local laws concerning disposal. For help, please contact your local authorities!

NOTE
When returning the instrument to the manufacturer for repair work, please copy and complete the health and safety clearance form on the following page and enclose it with the instrument.

Health and Safety Clearance

Declaration concerning safety, potential hazards and safe disposal of waste.

For the safety and health of our staff, laws and regulations regarding the handling of dangerous goods, occupational health and safety regulations, safety at work laws and regulations regarding safe disposal of waste (e.g. chemical waste, chemical residues or solvents) require that this form must be completed, signed and enclosed to every return shipment of equipment or defective parts.

Instruments or parts will not be accepted if this declaration is not present.

Equipment

Model: Part/Instrument no.:

1.A Declaration for non dangerous goods

We assure that the returned equipment:

☐ is unused and new.

☐ has not been exposed to toxic, corrosive, biologically active, explosive, radioactive or other dangerous matters. No hazard emanates from the device!

☐ is free of contamination (e.g.that chemicals, solvents or residues of pumped media have been drained prior to shipment). No hazard emanates from the device!

1.B Declaration for dangerous goods

Exhaustive list of dangerous substances the equipment has been exposed to:

Chemical, substance	Danger classification

We assure that:

☐ all hazardous substances (e.g. toxic, corrosive, biologically active, explosive, radioactive etc.) which have been processed or been in contact with the equipment are listed above.

☐ the equipment has been cleaned, decontaminated and is free of transmissible agents such as hazardous fungi, bacteria, viruses etc. If sterilization is applicable, all in- and outlets of the equipment have been properly sealed the process.

2. Final Declaration

We hereby declare that:

- we know all about the substances which have been in contact with the equipment and all questions have been answered correctly.
- we have taken all measures to prevent potential risks that might emanate from the delivered equipment.
- this document will be attached clearly visible and securely to the outside of the transport box.

Company name or stamp: _____

Place, date: _____

Name (print), job title (print): _____

Signature: _____

Health and Safety Clearance_20081110_KESS.doc_20081110 Version 1.0 Page 1/1

10 Spare parts

This section lists spare parts, accessories and options including their ordering information.
Only order spare parts and consumables from Buchi to maintain the warranty status and to assure best performance and reliability of the system and affected components. Any modifications to the spare parts used are only allowed with the prior written permission of the manufacturer.

Always state the product designation, instrument serial and part numbers for warranty clearance when ordering spare parts!

10.1 Scope of application and delivery

All system configurations come with a limited set of accessories as a starter kit. Within a system family, additionally available accessories (see table "Ceramic plates and crucibles") can be used to easily reconfigure your system.
The scope of delivery depends on the ordered system configuration and can be checked according to the individual delivery note and the listed order numbers.

Starter package

Content		
Item	Quantity/length	Order no.
Glass hood	1 ×	036081
Connection to glass hood	1 ×	036076
Condensation trap, cpl.	1 ×	036119
Viton tubes 12/8	1 m	020136
Corrugated hose	1 ×	026096
Crucible tongs	1 ×	034184
Fixation clips for glass connections	3 ×	003275
Spacer clips, bag (20 pcs.)	1 ×	026968
Glass wool	1 ×	033701
Mains cable	1 ×	Country-specific
Operating instructions	1 ×	Country-specific

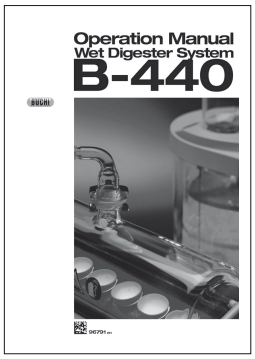
Ceramic plates and crucibles

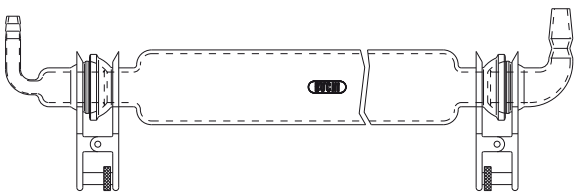
Vitrified ceramic plate						Ceramic crucibles		
Ordernumber	Sample positions		Opening sizes			Ensure number of sample positions matches order quantity		
	4	6	39 mm	48 mm	56 mm	20 ml	49 ml	90 ml
026661		●	●			026936		
036676	●			●			036675	
026663	●				●			026938

NOTE
Contact your local Buchi representative for customized vitrified ceramic plates to meet other crucible sizes than offered above.

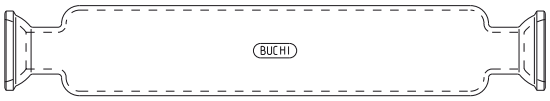
For additional information about the listed products, see www.buchi.com or contact your local dealer.

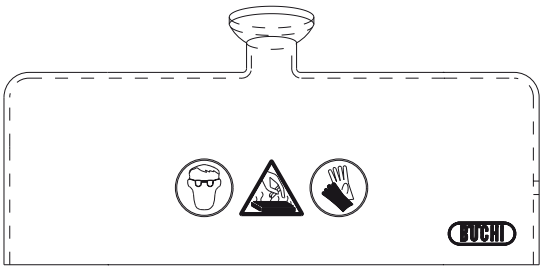
10.2 Spare parts, optional accessories and consumables

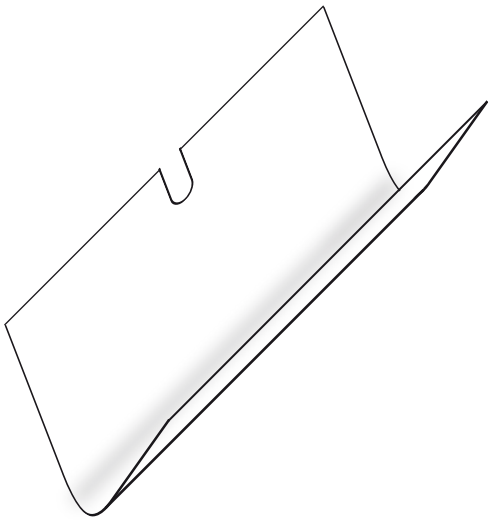


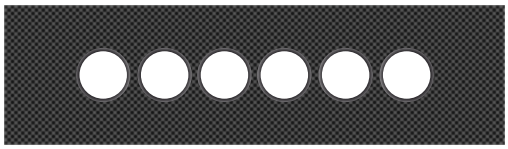


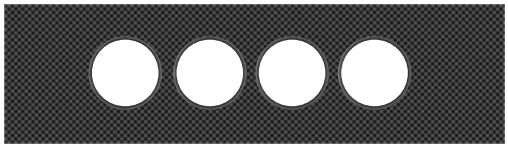
Spare parts	
Description	Order no.
Mains cable, CH-type	10021
Mains cable, DE-type	10029
Mains cable, GB-type	17833
Mains cable, US-type	33756
Mains cable, AU-type	17834
Operation Manual, German	096790
Operation Manual, English	096791
Operation Manual, French	096792
Operation Manual, Italian	096793
Operation Manual, Spanish	096794
Condensate trap cpl.	036119

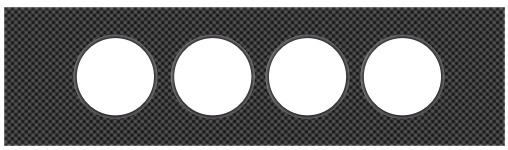








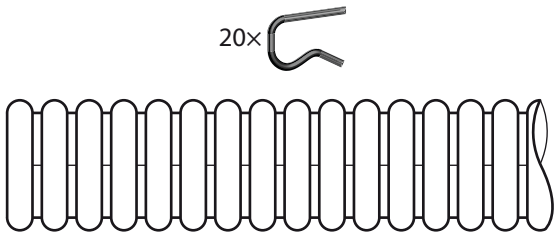


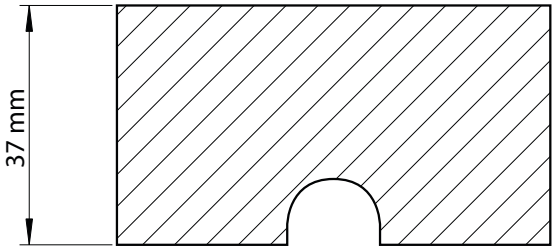


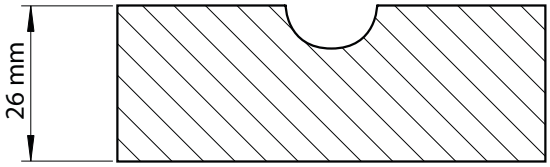
Spare parts	
Condensatetrap,tubewithoutconnectors	036080
Glass hood	036081
Reflector	026924
Vitrifiedceramicplate,39 mmopeningsize	026661
Vitrifiedceramicplate,48 mmopeningsize	036676
Vitrifiedceramicplate,56 mmopeningsize	026663

Other opening sizes can be requested!

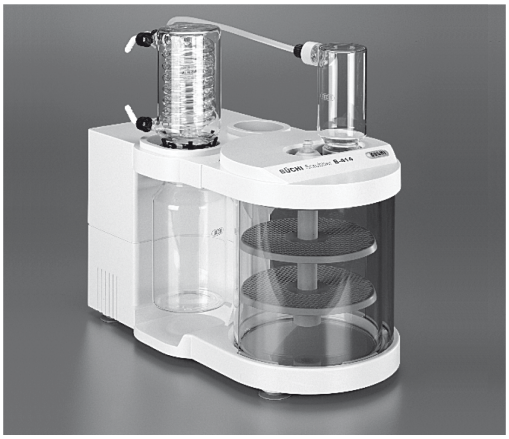
Crucible, 20 ml	026936
Crucible, 49 ml	036675
Crucible, 90 ml	026938







Spare parts	
Description	Order no.
Set of clips (20 pcs.)	026968
Corrugated hose with clamps, 380 mm	11056574
FPM, FKM hose, 1 m, 12/8″	020136
Upper check plate	026690
Lower check plate	026894



Optional parts	
Description	Order no.
Scrubber B-414 with condenser, 230V	037882
Scrubber B-414 with condenser, 120V	037883
Scrubber B-414 with condenser, 100V	037884
Condensatebottle4LforScrubberB-414	048668

11 Declarations and requirements

11.1 FCC requirements (for USA and Canada)

English:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to both Part 15 of the FCC Rules and the radio interference regulations of the Canadian Department of Communications. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Français:

Cet appareil a été testé et s'est avéré conforme aux limites prévues pour les appareils numériques de classe A et à la partie 15 des réglementations FCC ainsi qu'à la réglementation des interférences radio du Canadian Department of Communications. Ces limites sont destinées à fournir une protection adéquate contre les interférences néfastes lorsque l'appareil est utilisé dans un environnement commercial.
Cet appareil génère, utilise et peut irradier une énergie à fréquence radioélectrique, il est en outre susceptible d'engendrer des interférences avec les communications radio, s'il n'est pas installé et utilisé conformément aux instructions du mode d'emploi. L'utilisation de cet appareil dans les zones résidentielles peut causer des interférences néfastes, auquel cas l'exploitant sera amené à prendre les dispositions utiles pour palier aux interférences à ses propres frais.

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