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Operating Manual

Biometra Minigel-Twin
Polyacrylamide Gel Electrophoresis Device

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For a proper and safe use of this product follow the instructions. Keep the operating manual for future reference.

General Information http://www.analytik-jena.com

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Technical Documentation Analytik Jena GmbH+Co. KG

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Table of contents

1 Notes on this operating manual

Content

The operating manual describes the following device model:

- Biometra Minigel-Twin

In the rest of this text, this model is usually simply referred to as the **device**.

The device is intended to be operated by qualified specialist personnel under observance of the operating manual.

The operating manual provides information about the design and operation of the device and provides operating personnel with the necessary know-how for safe handling of the device and its components. Furthermore, the operating manual includes information on the maintenance and servicing of the device as well as information on potential causes of malfunctions and their correction.

Conventions

Instructions for actions occurring in chronological order are numbered and combined into action units.

Warnings are indicated by a warning triangle and a signal word. The type, source and consequences of the hazard are stated together with notes on preventing the hazard.

Elements of the control and analysis program are indicated as follows:

- Program terms are in bold (e.g., the **System** menu).
- Menu items are separated by vertical lines (e.g., **System** | **Device**).

Symbols and signal words used in this manual

The user manual uses the following symbols and signal words to indicate hazards or instructions. These warnings are always placed before an action.

WARNING

Indicates a potentially hazardous situation which can cause death or very serious (possibly permanent) injury.

CAUTION

Indicates a potentially hazardous situation which can cause slight or minor injuries.

NOTICE

Provides information on potential material or environmental damage.

2 Intended use

The Biometra Minigel-Twin is a vertical gel electrophoresis chamber for polyacrylamide gels (PAGE gel electrophoresis). The device can be used for electrophoretic separation of proteins and nucleic acids.

Electrophoresis can be carried out with 1 or 2 gels at the same time with the Biometra Minigel-Twin.

The chamber design enables electrophoresis with low buffer quantities.

3 Safety

For your own safety and to ensure error-free and safe operation of the device, please read this chapter carefully before commissioning.

Follow all safety instructions described in this manual.

3.1 Safety labeling on the device

Warning and mandatory action labels have been attached to the device and must always be observed. Damaged or missing warning and mandatory action labels can cause incorrect actions leading to personal injury or material damage.

- Do not remove the warning and mandatory action signs.
- Replace damaged signs.

The following warning and mandatory action signs are used:

Warning/mandatory sign	Meaning
	General warning sign, observe the operating manual!
	Danger of electric shock!
	Fragile device parts!

3.2 Requirements for the operating personnel

The device must only be operated by qualified specialist personnel instructed in the use of the device. The operating personnel must meet the following requirements:

- Operate the device only after instruction and training.
- Know and avoid dangers when working with the device.
- Wear personal protective equipment such as protective gloves, lab coat and safety goggles.
- Training by Analytik Jena is recommended.

The operator of the device is responsible for compliance with safety and occupational health regulations. The operator must meet the following requirements:

- Provide information about national regulations on work safety and accident prevention and observe them during operation of the device.
- Instruct the operating personnel in the safe operation of the device. In doing so, also convey the contents of the manuals for the device system.

3.3 Safety instructions for transport and commissioning

Transport

There is a risk of injury when lifting and carrying, especially from unsecured parts.

- Empty the device and secure all loose parts, e.g. with adhesive tape. Close the lid.
- Only transport the device in its original packaging. Insert all transport locks.

Ambient conditions during commissioning

The device is dangerous if it is installed in an unsuitable environment.

- Place the device on a dry, flat surface.

Electrical conditions

The device may be dangerous if the conditions for the electrical connection are not met.

- Only protection class 2 power supply devices are permitted for the electrophoresis systems. Observe the specifications in the operating manual of the power supply device used!
- Check the electrical requirements of the device before connecting it to a power supply device.
- Only use the supplied cables for connection to a power supply device.
- Observe the information on the electronics in the operating manual of the power supply device.
- Disconnect the cable connection between the device and the power supply device before storage.

If fluid is escaping the device due to a defect while it is on top of a power supply device, electrical shocks may ensue.

- Never place the device on top of a power supply device.

3.4 Safety instructions for operation

Electrical hazard

Lethal voltages may occur in the device.

- Before each start-up, make sure that the device and its safety devices are in proper working condition.
- In case of faulty electrical components, switch off the power supply device immediately, disconnect it from electrical power, and disconnect the connection between the device and the power supply device.
- Do not remove or bypass any protective devices such as the housing.
- Before opening the cover, switch off the power supply device and disconnect the power connection to the device.
- Do not use the device in environments with extreme humidity (>95 %), or in locations in which condensation occurs.

Hazard from substances

The device can be used to handle hazardous substances. The operator is responsible for the safe handling of these substances.

- If the device has been contaminated with hazardous substances, decontaminate it as described in the operating manual. Use other methods only after consultation with Analytik Jena.

3.5 Safety instructions for maintenance and cleaning

There is a risk of electric shock if contact is made with live components, which may lead to serious injury.

- Before maintenance and cleaning, switch off the power supply device and disconnect the power connection between the device and the power supply device. Only work on the electrically live device if the operating manual explicitly requires it.

Unauthorized servicing can lead to maladjustment or damage of the device and its system components.

- Only carry out the maintenance actions listed in the operating manual.
- Use only original spare parts, wear parts and consumables. These have been tested and ensure safe operation.
- After maintenance, ensure that all safety devices are fully functional again.
- Clean the device with a damp, non-dripping cloth. Do not use alcohol, organic solvents, abrasive cleaners or bleach.

3.6 Behavior during emergencies

In an emergency such as a laboratory fire, live devices put rescue personnel at risk.

- If possible, switch off the device and its components at the power switch and disconnect the power cable from the mains socket.

4 Design

Device components

The Biometra Minigel-Twin consists of a protective electrophoresis chamber with built-in buffer chambers the glass plate sandwiches are inserted in.

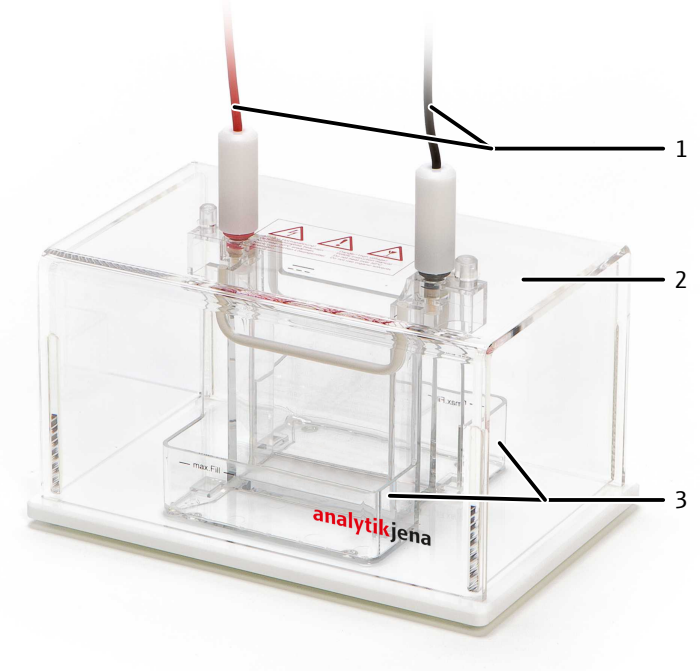


Fig. 1 Electrophoresis chamber design

1 Anode (red) and cathode (black)
2 Safety cover
3 Buffer chambers with buffer reservoirs and stand for glass plate sandwiches or dummy plates (not inserted here)

Accessories and spare parts

The following accessories and spare parts are available:

- Glass plates with fixed spacers, 1.0 mm
- Glass plates with fixed spacers, 0.6 mm
- Glass plates, cut out, straight cut
- Glass plates, cut out, angled cut
- Silicone seals, 1.0 mm
- Silicone seals, 0.6 mm
- Clips, 3 pcs.
- Combs with different numbers of teeth
- Gray seals for fixing to the top buffer chamber

Type plate

The type plate is located on the bottom of the device and includes the following information:

- Manufacturer and address
- Device type and model
- Year of manufacture
- Country of manufacture
- Electrical connection data
- Serial number
- Conformity and test sign
- Disposal instructions (Do not dispose of as domestic waste!)

5 Installation and commissioning

5.1 Installation requirements

Climate conditions

The requirements for the climate conditions at the installation location are set out in the specifications. If required, ensure that the room is temperature-controlled.

- This laboratory device is designed for inside use.
- Do not use the device in wet and damp environments. Keep the device surface clean and dry.
- Avoid direct sunlight and radiation from heaters onto the device. If necessary, provide air conditioning.
- Do not locate the device near sources of electromagnetic interference.
- Avoid mechanical shocks and vibrations.
- Do not use the device in explosion-hazard environments.
- The installation site must be free of drafts, dust and caustic fumes.
- Keep the ventilation slits free and do not obstruct them with other devices.
- Place the device on a stable surface.
- Make sure the system is level.
- Do not place the device on top of a power supply unit.

5.1.1 Spatial requirements

CAUTION

Risk of electrical shock

If the electrophoresis device is on top of a power supply device, buffer fluid escaping due to a defect can enter the power supply device and lead to electric shocks.

- Never place the electrophoresis device on top of a power supply device!

The spatial requirements of the device are 23.5 x 19.0 x 16.0 cm. Additional space is required next to the device for the power supply device.

5.1.2 Power supply

NOTICE

The electrophoresis chamber is designed for DC operation. Do not ground the electrophoresis chamber separately!

Independent of the specifications of the power supply devices used, the following maximum limit values apply for device use at typical run times of approx. 4–6 h (monitored):

Max. voltage (DC)	Max. current	Max. power	Max. temperature
400 V	50 mA (2 gels)	20 W	50 °C

5.2 Installation

NOTICE

Keep the original packaging

Transport damage can only be avoided if the device is transported in its original packaging.

- Keep the original packaging for transport, e.g., in case the device must be returned to the manufacturer for repair.

- Remove the device from the transport packaging. Wait until the device has reached room temperature before further installation.
- Verify that the delivery is complete. Check all components of the device for transport damage.
  - If the delivery is incomplete or transport damage has occurred, contact Analytik Jena.
  - In case of a return shipment, observe the information in the corresponding chapter of this operating manual.
- Set up the device on a flat dry surface near the power supply device. Do not place it on top of a power supply device!
  - ✓ The device is set up and can be used for electrophoresis.

6 Operation

6.1 Preparing electrophoresis

6.1.1 Required chemicals

WARNING

Danger to health due to acrylamide

Acrylamide is a neurotoxin.

- Always wear personal protective equipment when handling acrylamide!

Separation and collection gel

The following chemicals are required to produce the gels:

- Master solution of 30 % acrylamide and 0.8 % bis-acrylamide
- TRIS/HCl (1.88 M, pH 8.8)
- SDS (as 0.5 % solution)
- Ammonium persulfate solution (10 %)
- TEMED
- Bidistilled water

Electrophoresis buffer

The following chemicals are required for the electrophoresis buffer:

- TRIS base
- Glycine
- SDS (powdered)
- Demineralized water

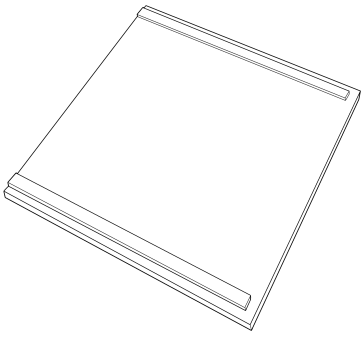
Sample buffer

For the sample buffer, which is used later, the following chemicals are required:

- TRIS/HCl (0.625 M, pH 8.8)
- SDS (powdered)
- Glycerin
- B-mercaptoethanol
- Bromophenol blue (1 % solution in ethanol)
- Bidistilled water

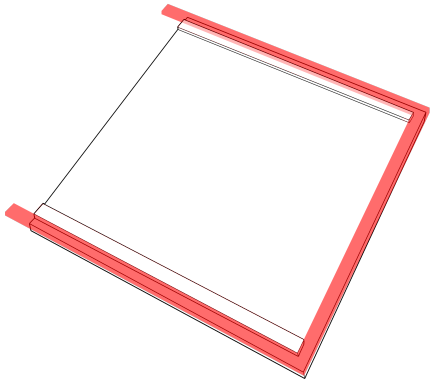
6.1.2 Assembling the glass plate sandwiches

Assembling a glass plate sandwich



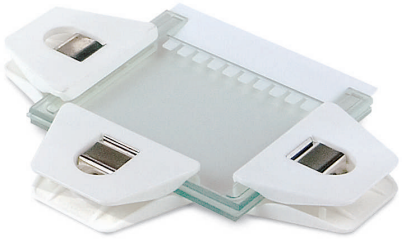
- ▸ Prepare a clean glass plate with fixed spacer.
- ▸ Clean the glass plate as required. No grease stains must be on the glass plates!

NOTICE! Do not use chromosulfuric acid to clean glass plates with adhesive spacers!



- Place a silicone seal at the outside of the spacers on the glass plate (silicone seal shown in red in the illustration).

NOTICE! For a tight seal, the silicone seal must be placed around the spacers and may not be jammed between the spacers.



- Place a cut-out glass plate on the prepared glass plate with spacers and silicone seal.
- Fix the place glass plate with clips. Place a clip on each side of the glass plate sandwich.
  - ✓ The glass plate sandwich is assembled.

6.1.3 Casting the separation gel

WARNING

Danger to health due to acrylamide

Acrylamide is a neurotoxin.

- Always wear personal protective equipment when handling acrylamide!

NOTICE

Prepare the ammonium persulfate solution fresh every day and keep it at 4 °C until use.

Creating the separation gel solution

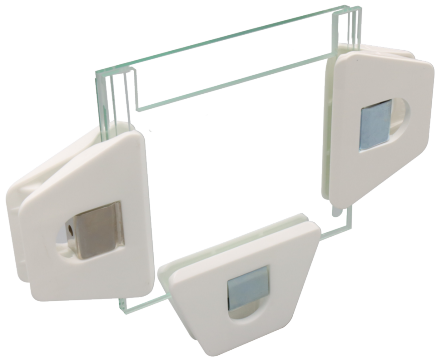
- Mix the separation gel in accordance with the following table:

Minigel-Twin (6 ml + 0.035 ml, for 1 gel with 1.0 mm spacers)	Acrylamide concentration				
	7.5 %	10.0 %	12.5 %	15.0 %	17.5 %
Master solution (30 % acrylamide, 0.8 % bisacrylamid)	1.5 ml	2.0 ml	2.5 ml	3.0 ml	3.5 ml
Tris/HCl (1.88 M, pH 8.8)	1.2 ml	1.2 ml	1.2 ml	1.2 ml	1.2 ml
SDS (0.5 %)	1.2 ml	1.2 ml	1.2 ml	1.2 ml	1.2 ml
Bidistilled water	2.1 ml	1.6 ml	1.1 ml	0.6 ml	0.1 ml
Only add the following components shortly before casting the gel					
Ammonium persulfate solution (10 %)	30 µl	30 µl	30 µl	30 µl	30 µl
TEMED	5 µl	5 µl	5 µl	5 µl	5 µl

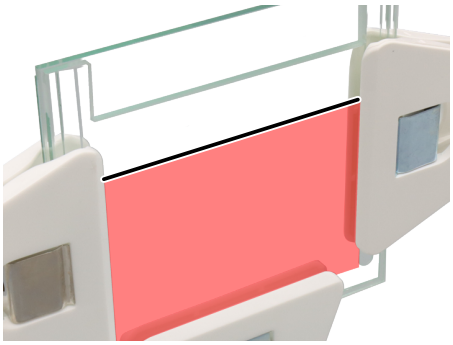
- Mix the separation gel solution well.
- Degas the separation gel solution as required.
  - ✓ The separation gel solution is created and can be poured into the glass plate sandwich.

Casting the separation gel solution

⇨ The glass plate sandwich is assembled and fastened with clips.



- Set the glass plate sandwich up on an even, level surface with the bottom clip.
- Degas the separation gel solution as required.
- Add TEMED and ammonium persulfate to the separation gel solution. For the TEMED and ammonium persulfate volumes, observe the information in the table further above.



- Pipette the separation gel solution into the opening between the two glass plates without bubbles. Pipette up to a height of 6 to 6.5 cm. (See image. Gel colored for better visibility.)
- Create a layer of bidistilled water above the separation gel solution.
- Allow the separation gel solution to polymerize for approx. 20–40 min. at room temperature.
  - ✓ A sharp dividing line has formed between the separation gel and the layer of water. The separation gel is fully polymerized.
- Remove the bidistilled water from the separation gel. Use filter paper to remove it.
  - ✓ The separation gel is ready for use. The collection gel can be created and poured.

6.1.4 Casting the collection gel

NOTICE

Create the collection gel solution immediately before use.

NOTICE

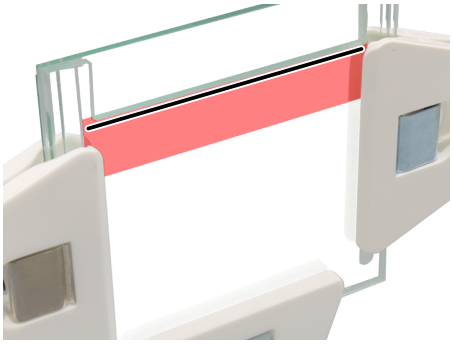
Prepare the ammonium persulfate solution fresh every day and keep it at 4 °C until use.

Creating the collection gel solution

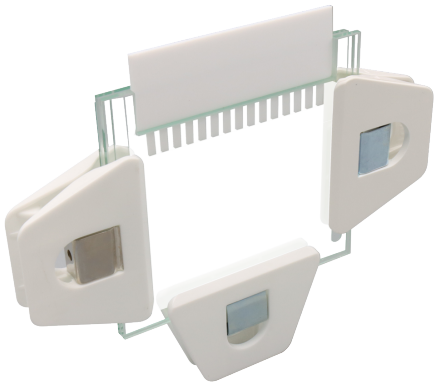
- Mix the collection gel solution in accordance with the following table:

Collection gel (5 %) (2 ml + 0.012 ml, for 1 gel with 1.0 mm spacers)	Volumes
Master solution (30 % acrylamide, 0.8 % bisacrylamid)	0.33 ml
Tris/HCl (1.88 M, pH 8.8)	0.4 ml
SDS (0.5 %)	0.4 ml
Bidistilled water	0.87 ml
TEMED	2 µl
Ammonium persulfate solution (10 %)	10 µl

Pouring the collection gel



- Pour the collection gel solution onto the polymerized separation gel up to the bottom edge of the recess.



- Select the suitable comb for the sample quantities to be applied and insert it in the collection gel solution.
- Allow the collection gel solution to polymerize for approx. 20–30 min. at room temperature.
  - ✓ The collection gel has been filled in. The glass plate sandwich can be installed or stored.

NOTICE! Leave the comb in the collection gel for now. The comb stabilizes the pockets forming in the gel until the samples are applied.

6.1.5 Creating the electrophoresis buffer

Prepare the electrophoresis buffer for filling the buffer reservoir.

You can create electrophoresis buffer in greater volumes and stores it in the dark at room temperature. The following table lists the components for 5 l electrophoresis buffer:

- Volume: 5 l
- pH: 8.3

Components	Amount
Tris base	15.1 g
Glycine	72.0 g
SDS	5.0 g
Demineralized water	5 l

6.1.6 Mounting the electrophoresis chamber

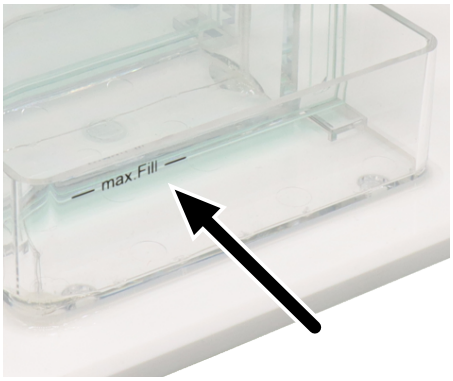
CAUTION

Risk of electrical shock

If the electrophoresis device is on top of a power supply device, buffer fluid escaping due to a defect can enter the power supply device and lead to electric shocks.

- Never place the electrophoresis device on top of a power supply device!

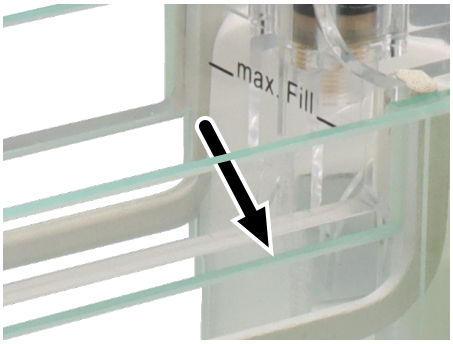
▸ Place the electrophoresis chamber on a dry, stable surface. Observe the requirements for the setup location in the corresponding chapter of this manual.



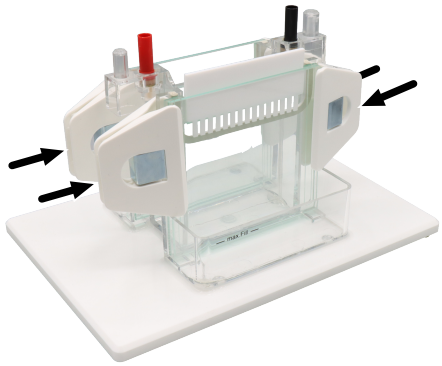
▸ Fill the bottom buffer reservoir of the electrophoresis chamber with electrophoresis buffer.

▸ Remove the clips and the silicone seal on a glass plate sandwich with filled gel.

▸ Check the glass plate sandwich for any bubbles in the gel. Air bubbles on the bottom of the gel can be removed quickly with a syringe with a bent needle.

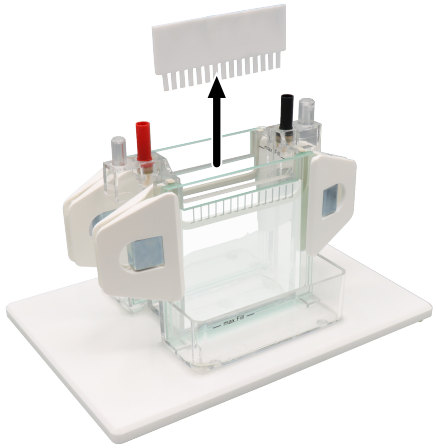


- Carefully insert the glass plate sandwich in the electrophoresis chamber. Ensure the proper direction during insertion: The cut-out plate must face the direction of the top buffer reservoir.



- Fasten the glass plate sandwich to the body of the electrophoresis chamber on both sides with clips.
- If required: Insert an additional glass plate sandwich in the same manner.

- Fill the top buffer reservoir with electrophoresis buffer. Observe the maximum filling height.



- Remove the combs from the glass plate sandwiches.
- The gel pockets are exposed.
- Wash the gel pockets. Carefully aspirate the buffer in the gel pockets with a syringe and discharge it again. Perform the washing process one or two times per gel pocket.
  - ✓ The electrophoresis chamber is mounted. The sample can be applied and electrophoresis can be carried out.

6.2 Preparing and applying samples

Preparing the samples

- Create the sample buffer. The following table indicates the components for an SDS sample buffer for SDS-PAGE gels under denaturing conditions:

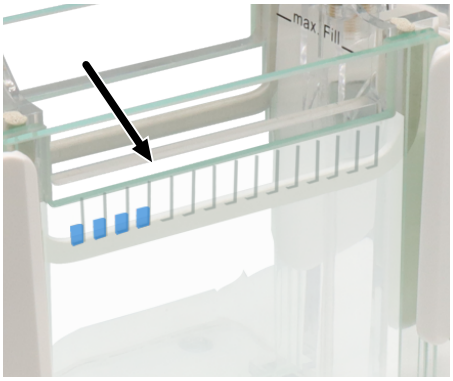
Component	Amount
Tris/HCl (0.625 M, pH 6.8)	2.0 ml
SDS	0.2 g
Glycerin	5.0 ml
B-mercaptoethanol	0.5 ml
Bromophenol blue (1 % solution in ethanol)	0.1 ml
Bidistilled water	2.4 ml

- Dissolve the sample in sample buffer. Mix the SDS sample buffer 1:1 with the sample.
- If necessary, heat the samples for 5 minutes in a boiling water bath.
  - ✓ The samples have dissolved and can be applied to the gel pockets of the collection gel.

Applying the samples

⇨ Th electrophoresis chamber is mounted and a glass plate sandwich is installed.

- If the samples were precipitated with trichloroacetic acid: Neutralize the dissolved samples before application with tris buffer.



- Put the dissolved and, if necessary, neutralized samples into the gel pockets of the collection gel one after another.
  - ✓ The samples have been applied. Electrophoresis can now be started.

6.3 Starting and ending electrophoresis

CAUTION

Danger due to electrical voltage

The device is connected to high voltage when switched on!

- Switch off the power supply device and disconnect the connection between the power supply device and the electrophoresis unit before opening the cover.

CAUTION

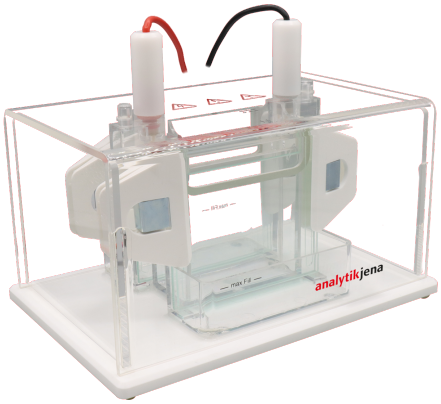
Danger due to hot device components and buffers

During electrophoresis, the electrophoresis chamber and the buffer can heat up.

- Proceed with caution when handling device components after electrophoresis.

Starting electrophoresis

Proceed as follows to start electrophoresis:



⇨ The samples have been applied.

- Apply the safety cover. Ensure the correct orientation of the cathode and anode during application. The cathode and anode are marked color-coded on the safety cover and on the electrophoresis module:
  - Anode (positive pole): Red
  - Cathode (negative pole): Black

- Connect the electrophoresis chamber to a power supply device. Observe the color-coding of the power supply device and the cables on the safety cover for connection.
- Set the current and voltage on the power supply device. The values to set depend on the gel the sample is in and can be found in the following table. First set the values for the position in the collection gel.

NOTICE! The position of the samples can be seen on the bromophenol blue line of the standard. Set the values corresponding to the table again as soon as the bromophenol blue line has reached the end of the collection gel layer.

Set the following conditions for 10 % separation gels with 1.0 mm spacers (typical run time of 4–6 h, monitored:

Position of the samples (can be seen at the bromophenol blue line of the standard)	Max. current (per gel)	Max. voltage
Collection gel	10 mA	400 V
Separation gel	25 mA	400 V

- If a power supply unit with a timer is used: Set the timer to the desired time.

✓ The power supply device is set. Electrophoresis is started.

Ending electrophoresis

⇨ The bromophenol blue line of the standard has reached the bottom end of the separation gel.

- Switch off the power supply device.
- Disconnect the connection to the power supply device.

✓ Electrophoresis is ended. The electrophoresis chamber can be opened.

6.4 After electrophoresis

After electrophoresis, you can make the sample on the gel visible or fix them with various methods, for example:

- Staining, e.g., using silver staining, ruthenium staining or a Coomassie Brilliant Blue solution
- Blotting
- Autoradiography

7 Maintenance and care

7.1 Cleaning

WARNING

Danger of electric shock

- Before all maintenance work, disconnect the device from the power supply device!

Observe the following when cleaning the device:

- Use a soft cloth dampened with water for cleaning.
- Do not use alcohols (e.g., methanol or ethanol) for cleaning!
- Do not use organic solvents (e.g., acetone) for cleaning!
- If required, a mild cleaning agent can be used.
- Do not heat the gel chamber above 50 °C!
- Do not use chromosulfuric acid for cleaning glass plates with adhesive spacers!
- Store the glass plates with adhesive spacers dry after cleaning. Do not store lying flat in liquid.

7.2 Maintenance for the gray seals

Greasing the seals	Greasing of the seals is generally not necessary!
Indication for replacement	Replace a seal if it has come out of the groove in the device body and has marks.
Inserting a new seal	Make sure not to stretch or squeeze the seal when inserting it into the groove. After insertion, cut the new seal with a sharp scalpel flush with the top side of the device body.

8 Returning the product

WARNING

Warning of biohazard

The device handles biological and biochemical substances that are potentially pathogenic.

- Wear personal protective equipment when handling these substances.
- Observe all instructions and specifications in the safety data sheets. Observe national regulations when handling these substances.
- Decontaminate and clean the device after use.

NOTICE

Risk of device damage due to unsuitable packaging material

- Only transport the device and its components in the original packaging.
- Empty the device completely and attach all transport locks before transporting the device.

- Clean all device components from biologically hazardous, chemical, and radioactive contamination.
- When registering the return, you will receive a decontamination declaration from customer service. Complete the declaration and attach the signed decontamination declaration to the outside of the shipment.
- Only use the original packaging for the shipment and insert the transport lock. If the original packaging is no longer available, please contact Analytik Jena or your local distributor.
- Attach the following warning label to the packaging:
  "**CAUTION! SENSITIVE ELECTRONIC DEVICE!**".
- Enclose a sheet with the following data:
  - Name and address of the sender
  - Name and telephone number of a contact for inquiries
  - A detailed description of the fault, the precise conditions and situations under which the fault occurs

9 Disposal

At the end of its service life, the device and its electronic components must be disposed of as electronic waste in accordance with the applicable regulations.

Acrylamide is a neurotoxin! Do not pour remaining acrylamide solution down the drain.

Polymerized acrylamide is non-toxic. The polymerized gel can be disposed of with normal waste.

10 Specifications

10.1 Technical data

General characteristics

Designation/type	Biometra Minigel-Twin
Dimensions (W x H x D)	23.5 x 19.0 x 16.0 cm
Weight	1.25 kg
Glass plate dimensions (W x H)	10.5 x 9.8 cm
Gel dimensions (W x H)	8.6 x 7.7 cm (T: 0.6 mm or 1.0 mm)
Buffer volume ■ Top reservoir ■ Bottom reservoir	 ■ 260 ml ■ 2x 90 ml
Max. number of gels	2

Electrical variables

Maximum current(per gel) ■ Collection gel ■ Separation gel	 ■ 10 mA ■ 25 mA
Maximum voltage	400 V (DC)
Maximum power	10 W

10.2 Ambient conditions

Work environment	Only designed for indoor use.
Temperature	4 to 40 °C
Humidity	Max. 80 % (≤ 31 °C), with linear decrease to 50 (at 40 °C)
Air pressure	75 to 106 kPa
Maximum altitude	2000 m above sea level

10.3 Standards and directives

Protection type	The housing is protection type IP 20.
Device safety	The device complies with the following safety standards ■ EN 61010-1
Guidelines for China	The device contains substances subject to regulation (according to the directive GB/T 26572-2011). Analytik Jena guarantees that, if the device is used as intended, these substances will not leak within the next 25 years and therefore will not pose a threat to the environment or health within this time period.
EU directives	The device meets the requirements of the Directive 2011/65/EU. The device is designed and tested in accordance with standards meeting the requirements of EU Directive 2014/35/EU. The device leaves the factory in a perfect condition with regard to safety. To maintain this condition and to ensure safe operation, the user must strictly observe the safety and operating instructions contained in this operating manual. For accessories delivered with the device and system components from other manufacturers, the information provided in their respective operating manuals has priority.

11 Revision overview

version	Effective date	Changes
A	10/2023	First version