miniOne® SYSTEMS

MiniOne® Electrophoresis System

Instruction Manual

CE marked

Cat#s M1000, M1010

Version 050919

Maximum Input Voltage 100–240 Volts

Safety

Always wear protective gloves and safety goggles in the laboratory. The MiniOne® Electrophoresis System is intended for educational use only. The MiniOne® 42V Power Supply is designed for use with the MiniOne Electrophoresis System only. Do not attempt to use the MiniOne 42V Power Supply with any other electric apparatus and do not attempt to use the MiniOne Electrophoresis System with any other power supply. The MiniOne Electrophoresis System and power supply should not be modified or altered in any way.

Embi Tec® is not responsible for any injury or damage caused by the use of this system for purposes other than for which it was intended or by modifications to the system not performed by Embi Tec.

***WARNING:** Death or injury may occur if any power supply other than the one provided by Embi Tec, which provides an output voltage of 42 V is used.

PLEASE USE WITH CAUTION.

Warranty

The MiniOne Electrophoresis System is warranted to be free of defects in materials and workmanship for a one year period from the date of purchase. If a defect is found during this warranty period, Embi Tec will replace the defective parts at no charge, provided the customer agrees to fill out the Return Authorization Form and the product is returned within the warranty period.

This warranty specifically excludes:

- Defects caused by improper operation
- Damage caused by improper handling or accidental misuse
- Damage caused by the use of organic solvents
- Common replacement parts including carbon electrodes and fuses
- Damage incurred during shipping

Please keep a record of the order information for future reference:

- Date of Purchase: _____
- Purchase Order Number: _____
- Date of Delivery: _____
- Invoice Number: _____

***WARNING:** If any power supply other than the one provided by Embi Tec, which provides an output voltage of 42 V is used, the unit is void of all warranty. The customer is responsible for any problems should they arise.

Table of Contents

General Information

The MiniOne® Electrophoresis System combines the electrophoresis gel tank, power supply, and light box into one single compact unit, offering students the opportunity to completely experience electrophoresis, from start to finish.

The System includes:

1. MiniOne® Gel Casting System
2. MiniOne® Gel Tank and Carriage with LEDs and controls
3. MiniOne® 42V Power Supply
4. MiniOne® Photo Hood

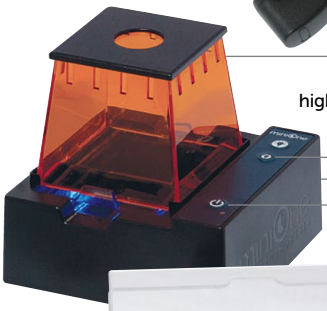
The MiniOne Gel Casting System includes a horizontal casting stand, which contains two individual compartments. The dual reversible comb allows students to make gels in an easy to load 6- or 9-well format.

The MiniOne Gel Tank accommodates one gel per run. With the light generated by high energy LEDs (emission wavelength 475 +/- 30 nm), run the gel and visualize it within the class period. It is effective for visualizing DNA stained with dyes that fluoresce in blue light, such as GelGreen™. Using this non-hazardous stain allows you to eliminate EtBr and UV light from the classroom environment.

This electrophoresis system comes with a one prong power supply that connects the carriage to the wall outlet. Running at 42 V, it is a safe, student-friendly voltage.

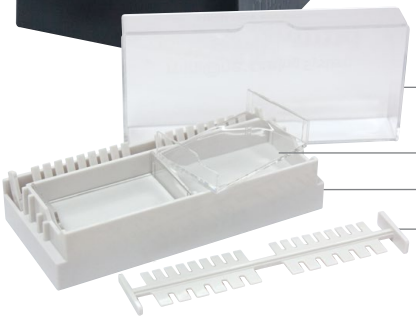
Packing List

MiniOne® 42V Power Supply (1)
100–240 V input
Fits into wall outlets to power the device



MiniOne® Photo Hood (1)
Amber filter to enhance DNA bands for real-time viewing and capturing gel image with a smart device

MiniOne® Carriage (1)
With blue LED illumination and magnet-activated safety switch. Place the gel tank inside to visualize gels and to power the electrodes. CE marked

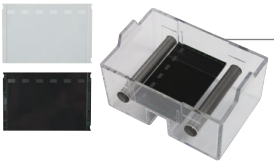


MiniOne® Casting Stand Cover (1)

MiniOne® Gel Trays (2)

MiniOne® Casting Stand (1)

MiniOne® Gel Comb (1)
6 and 9-wells, reversible,
for casting agarose gels



MiniOne® Gel Tank (1)
Black gel tray platform for running gels, visualizing DNA, grey gel tray platform for running gels, visualizing dyes
(Gel tray platforms may be packed with manual)

Validation Kit (1)
Two GreenGel™ cups, three DNA samples, and TBE buffer concentrate. A startup reagent kit lets you test run your new system
(1 pack per classroom package)

MiniOne® Micropipette (1)
2–20 µL adjustable volumes, for pipetting samples/sample transfer

System Specifications

General specifications

Maximum relative humidity	80%
Operating temperature range	4 to 40°C
Maximum altitude	Less than 2000 meters

MiniOne® Casting System

Casting stand	Molded PC, white
Dual reversible comb	Molded PC, white 6-well (max 24 µL), 9-well (max 18 µL)
Gel tray	Molded UVT acrylic, clear 6.3 (w) x 4.2 (l) cm
Casting stand cover	Molded PC, clear 6.1 (w) x 14.8 (l) x 2.5 (h) cm

MiniOne® Electrophoresis System

Gel tank	Molded PC, clear 6.8 (w) x 9.9 (l) x 4.8 (h) cm
Electrodes	Graphite
Carriage with LEDs and controls	Molded PC, black 13.4 (w) x 13.4 (l) x 6.0 (h) cm
Light source	Blue LED, 475 +/- 30 nm
LED life	50,000 hours
Photo hood	Molded acrylic, black and amber filter 8.9 (w) x 8.9 (l) x 7.6 (h) cm Amber photo lens, 2.7 cm (diameter)
Certification	CE

MiniOne® 42V Power Supply

Voltage output	42 V
Input voltage maximum	100–240 V, 50/60 Hz, 0.5 A
Dimensions	4.5 (w) x 7.0 (l) x 2.5 (h) cm
Certifications	CE FC cULus RoHS compliant

Assembly

1. Insert the clear gel tank into the carriage, such that the tank fits comfortably inside. The top edge of the tank should be level and the electrodes should touch the metal bumps on the carriage. If the tank is not level, the power connection will not be made.

2. With the provided power supply, plug one side into an outlet and the other side into the back of the carriage. Make sure the connector is pushed in all the way.

3. The top buttons control high and low intensity lights.

4. The power button controls power to the electrodes.

5. Before an experiment begins, make sure that the power button is OFF.

6. After all the DNA is loaded into wells and you are ready to start an experiment, place the photo hood on the carriage, then press the power button and a green LED will indicate that the power is ON.

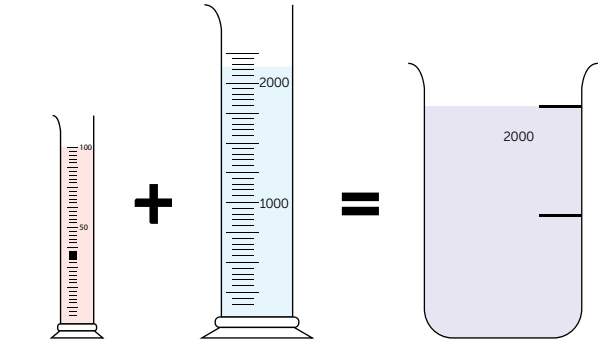
Note: The first time that you use the MiniOne® Electrophoresis System, you can use the validation kit to test run your new device.

Prepare Running Buffer

Dilute **1** part TBE Concentrate with **19** parts deionized or distilled water

Gather materials for diluting running buffer, including deionized or distilled water, Tris-Borate EDTA Buffer (TBE) Concentrate, a graduated cylinder and a container for mixing and storing the running buffer.

1. **To make 2000 mL of 1X running buffer (TBE),** mix 100 mL TBE Concentrate and 1900 mL deinonized or distilled water



TBE running buffer is stable stored at room temperature.

2. **To make various volumes of TBE running buffer use this formula:**

$$C_1 \times V_1 = C_2 \times V_2$$

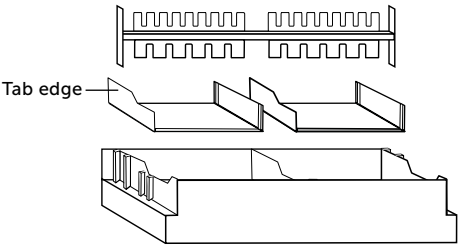
Where:
C_1 = Original TBE Concentrate
V_1 = Volume of the Original TBE Concentrate needed
C_2 = Final concentration
V_2 = Total final volume desired

Once you have calculated the volume of TBE Concentrate needed, SUBTRACT that amount from the total volume of TBE running buffer desired to find the volume of water needed.

We recommend diluting buffer in batches for accuracy.

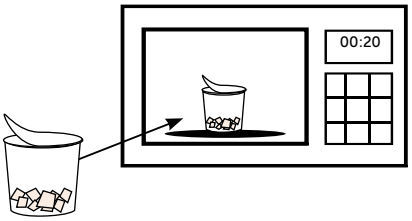
How to Cast a Gel

1. Place the MiniOne® Gel Casting Stand on a level surface and place gel trays in the two cavities. For proper tray orientation place the tab edge of the tray on the left side. Insert the comb into the slots at the top of the casting stand with the 6- or 9-well side facing down.

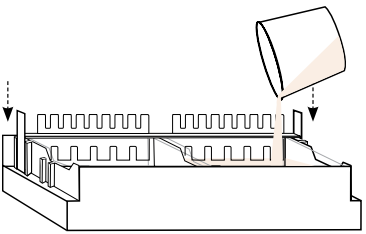


2. Partially peel back the film of a GreenGel™ cup and microwave for 20 seconds. Allow to cool for 15 seconds. **DO NOT microwave more than 5 gel cups at a time.**

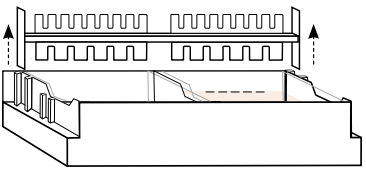
   ⚠**Safety requirement:** Adult supervision required if students are handling gel cups!

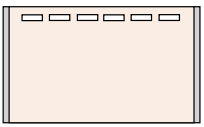


3. **One gel cup is for making one agarose gel!** Slowly pour the hot agarose solution into a gel tray. Make sure there are no air bubbles in the agarose solution. Let the agarose gel solidify for 10 minutes or until opaque**.** **DO NOT disturb the gel until time is up.**
   OR
   If you are making your own gels, use approximately 11 mL of your molten agarose per gel tray.



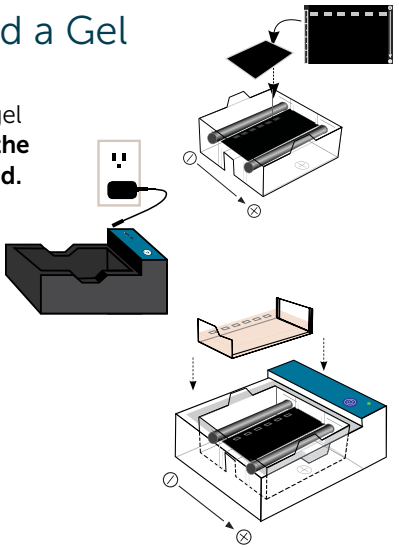
4. Carefully remove comb when gel is ready. Remove gel tray with solidified gel from casting stand and wipe off any excess agarose from the bottom of the tray.



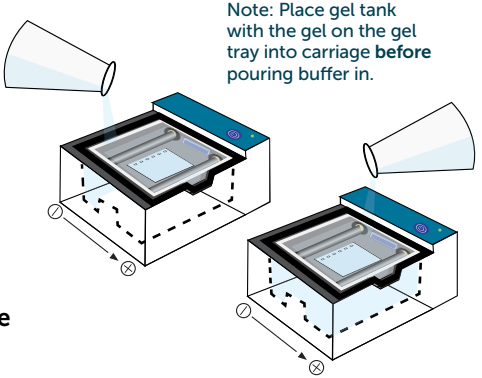


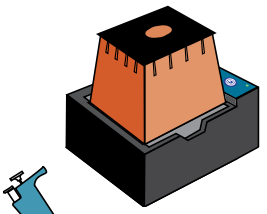
How to Load a Gel

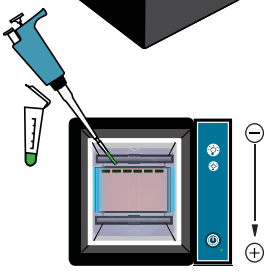
1. Ensure the black viewing platform is in the gel tank. **Make sure the wells are aligned with the marks on the platform on the negative end.**
2. Plug the power supply into the wall and carefully insert the other end into the back of the MiniOne® Carriage.
3. Place the gel tank into the carriage so the carbon electrodes are touching the gold rivets and the tank sits level with the carriage.
4. Place the gel tray with the gel into the gel tank. The gel tank should not have any buffer in it when putting the gel tray with gel into it.
5. Turn the low intensity blue LED on by pressing the ☼ button on the carriage.
6. Measure 135 mL of TBE running buffer and pour into **one side** of the gel tank. Watch the air push out between the gel tray and viewing platform. Once air has been removed from under the gel tray, pour remaining buffer into the **other side** of the gel tank.
7. Place photo hood on the carriage.
8. Press the power button which should now be a solid green light. If green light is **solid,** turn off the unit and proceed to loading gels. If the green light is **blinking,** see the Troubleshooting Guide.
9. Ensure the low intensity blue light is on. Load appropriate volume samples for your activity into each well. MiniLabs are designed to use 10 µL per well. Remember to change pipette tips for each sample. **Record the ID/ name of each sample corresponding to the correct well for ease of data analysis later.**



Note: Place gel tank with the gel on the gel tray into carriage **before** pouring buffer in.

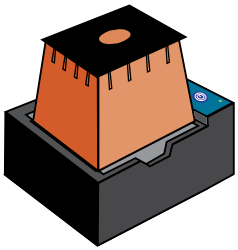






Run, Visualize, and Capture Gel Image

1. Once the gel is loaded, do not move it. Make sure the power supply is plugged in and place the photo hood on the carriage. Turn on the unit by pressing the ⏻ button. The green LED next to the button will turn on.

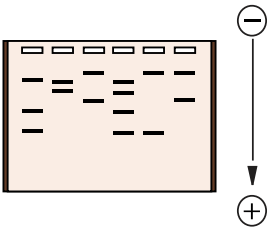


The green power LED will not turn on if:

- **The tank is not properly placed inside the carriage.**
- **There is no buffer in the tank.**
- **The buffer is too diluted.**
- **The photo hood is not on the carriage.**
- **There is too little running buffer.**
- **The power supply is not plugged in. Check by turning on the blue LEDs.**
- **If the green power LED is blinking, please refer to the troubleshooting steps on pages 13 and 14.**

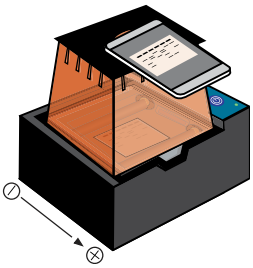
2. Have students periodically check the migration of the bands (~every five minutes).

3. Allow the gel to run **20 minutes** or until DNA separation is sufficient. Keep in mind small DNA samples run faster so it's important to periodically check where your bands are. After your run is complete, turn off the power by pressing the ⏻ button. Use the low intensity for viewing during the run. Light will weaken the fluorescent DNA signal.



4. Document your results.

Wipe off the condensation from the inside of the hood with a soft cloth if necessary, then place the hood back on the carriage. **Turn on** the high intensity light. Place your cell phone or camera directly on the photo hood to take a picture of the DNA. **DO NOT** zoom in as this will result in blurry pictures. (The photo hood is already at the optimal focal length for a smart device.



Clean Up

Note: All reagents in this lab can be disposed of as non-hazardous waste.

1. After collecting data and documenting results, remove the photo hood and unplug the power supply from the wall and from the back of the MiniOne® Carriage Remove the clear running tank from the carriage and remove the gel and tray from the running tank.

2. Pour the used running buffer down the drain or into a waste beaker. Throw the gel away AND SAVE THE GEL TRAYS. Rinse the clear plastic running tank, gel tray, comb, and casting system with DI or distilled water. Allow the tanks to fully air dry before storing.

3. Use a paper towel or Kimwipe™ to gently wipe the gold rivets in the carriage (where the electrodes connect) to ensure all moisture is removed. Wipe up any buffer that may have spilled into the black carriage. Follow any additional directions the instructor gives for clean up and storage.

Cleaning and Maintenance

- Never submerge the MiniOne® Carriage or MiniOne® 42V Power Supply in water.
- Always disconnect the power supply from the MiniOne Carriage before cleaning.
- The components of the MiniOne® Electrophoresis System are **NOT** compatible with organic solvents such as acetone or ethanol. Cleaning the system with organic solvents voids all warranties.
- Keep the MiniOne Carriage or power supply clean by wiping the outside surfaces with a paper towel.
- After removing the clear MiniOne® Gel Tank from the rest of the device, rinse with DI or distilled water. Flip the tank over and air dry before re-inserting it upside down into the carriage for storage.
- Clean the casting system components with warm water to remove any agarose pieces and then rinse with DI or distilled water. Air dry before storing away.
- **DO NOT** open the MiniOne Carriage or power supply. Warranty void if these parts have been opened.
- **Never submerge** micropipettes in water. The micropipette is **NOT** compatible with organic solvents such as acetone or ethanol. If needed, wipe the outside surfaces with a paper towel.

Frequently Asked Questions

1. Does it matter if some of the gel solution gets under the gel tray while casting the gel?

   No. A small amount of gel solution will flow underneath the tray; this will not affect gel performance. After the gel is solidified, just remove the thin layer of gel (with a tissue paper) before running the gel.

2. Sometimes I see an air bubble under the gel tray after I add running buffer. How can I get rid of it?

   To prevent any trapped air bubbles under the gel tray, pour 135 mL of running buffer slowly to one reservoir first, such that the buffer will gradually flow towards the other side and under the gel tray to push out all air bubbles.

3. How can I see the wells better when loading samples?

   You can turn on the low intensity light while loading. The light makes the gel blue, while the wells appear darker, allowing you to easily see the boundaries.

4. Why is electrophoresis taking longer than expected run time?

   Check to make sure that the running buffer was correctly diluted from TBE Concentrate to 1X running buffer. You need to add 19 volumes of DI water to every 1 volume of TBE Concentrate. Running buffer that is too dilute results in less salt ions and lower current levels; thus longer run times. If you add too much buffer into the tank to cover the gel, the run speed will also decrease. Be sure to add about 135 mL of 1X running buffer to fill both reservoirs and slightly cover the top of the gel.

5. I am having trouble focusing the camera during imaging. How can I take a clear picture?

   First, make sure the high intensity light is turned on. Then make sure to wipe off any condensation on the inside of the photo hood with a soft paper towel. Rest your smart device camera or digital camera lens, directly on the photo hood top. Focus on the DNA bands in the gel, then finally take an image. Do not zoom in.

NOTE: For more FAQs, visit www.theminione.com

Troubleshooting Blinking Green Power Light

Scenario A – Incorrect Assembly Sequence of MiniOne® Electrophoresis System

Problem: Green power light comes on immediately when power supply is plugged into a completed MiniOne Assembly without pressing the power button

Solution 1 – Press the blinking green light once. The light should stay steady, indicating that the unit is running and the buffer is at the correct concentration.

Solution 2 – Remove the photo hood, unplug the power cord from the MiniOne unit. In this order:

a) Replug the power cord

b) Replace the photo hood

c) Press the power button

The light should stay steady, indicating that the unit is running and the buffer is at the correct concentration.

See page 9 for correct assembly sequence of the unit. If the green light blinks after trying the above, the buffer concentration/volume should be evaluated.

Scenario B – Buffer Concentration is Too High, or Too Much Buffer Volume

Problem: Green power light blinks when power button is pressed

Solution 1 – Buffer concentration is too high. Check that the buffer stock was diluted correctly to 1X (see table on page 14).

Solution 2 – Too much buffer in the gel tank. In this order:

a) Remove buffer from the gel tank using a transfer pipet to get the buffer volume down to the buffer lines marked on the gel tank, or just enough so that the wells of the gel are covered by buffer.

b) Press the power button.

The light should stay steady, indicating that the unit is running and the buffer is at the correct concentration.

Do not fill gel tank with buffer before putting the gel tray with the gel into the tank. This can cause excess buffer volume, liquid to spill into the tank, or the gel to float.

Troubleshooting Blinking Green Power Light (cont'd)

Scenario C – Water in Gel Tank, or Insufficient Buffer Volume

Problem: Green power light flickers momentarily but does not stay on

Solution 1 – Buffer concentration is below 0.5X, or it is possibly just DI water. Check that the buffer stock was diluted correctly to 1X (see table below).

Solution 2 – No buffer or not enough buffer. In this order:

a) With the gel and gel tray assembly in place, fill the gel tank to the buffer fill line, but add enough so that the gel is completely submerged, or between 135 mL and 145 mL of buffer but no more than 145 mL. If you have already loaded your samples, do not pour buffer directly over wells of the gel.

b) Press the power button.

The light should stay steady, indicating that the unit is running and the buffer is at the correct concentration.

To make 1 liter of 1X running buffer

Concentration of Buffer Stock	Volume of Buffer Stock (mL)	Volume of DI H_2O* (mL)
5X	200 mL	800 mL
10X	100 mL	900 mL
20X	50 mL	950 mL
50X	20 mL	980 mL

*Only distilled or deionized water should be used

Additional MiniOne® Products

MiniOne® Equipment

Catalog #	Description
M1000	MiniOne® Electrophoresis System
M1010	MiniOne® Electrophoresis Classroom Package of 10 Systems
M2031	MiniOne® Microcentrifuge, Multi-Speed
M2032	MiniOne® Single Speed Microcentrifuge
M4000	MiniOne® PCR System
M5000	PrepOne™ Sapphire and Photo Hood

Micropipettes

Catalog #	Description
M2008	Variable Volume, 2–20 µL
M2010	Variable Volume, 20–200 µL
M2011	Variable Volume, 100–1000 µL
M2012	Variable Volume, 1–10 µL

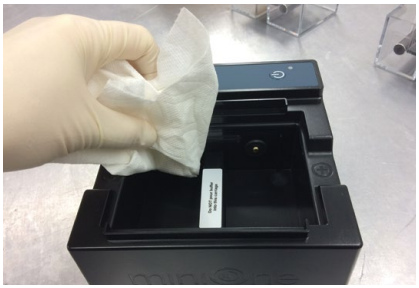
MiniLabs

Catalog #	Description	Shelf Life*
M3001	Electrophoresis 101 - The "fun"-damentals of electrophoresis (10 groups)	6 months
M3002	Agarose Gel Loading Practicing Kit - Master the skills to load a gel (20 groups)	6 months
M3003	PTC Genetics - Mendelian inheritance and taste blindness (10 groups)	6 months
M3004	DNA Fingerprinting - Help a whale calf find her father (10 groups)	6 months
M3005	CSI Forensics - Solve the crime using DNA and other evidence (10 groups)	6 months
M3006	Foodborne Outbreak Investigation - Can you link what the party goers ate to what made them sick? How did the food get contaminated? (10 groups)	6 months
M3007	Colorful Dye Electrophoresis - For middle school and beginning high school students (10 groups)	6 months
M3008	NGSS-Aligned Color Dyes and Gel Electrophoresis - A comprehensive 5E inquiry, week-long lesson plan (10 groups)	6 months
M3009	Candy Color Electrophoresis MiniLab - Explore the colors of candies with electrophoresis (10 groups)	6 months
M3010	Hunting the Inheritance of Huntington's Disease - In this MiniLab students construct a pedigree, determine the probability of inheritance of disease, and confirm genotype via gel electrophoresis (10 groups)	6 months
M6001	PCR 101 MiniLab and Gel Electrophoresis Combo (10 groups)	6 months
M6002	PCR 101 MiniLab: Amplification from the Lambda Phage Genome (10 groups)	6 months
M6005	PCR Cycle Number Analysis - Examine the effects of the number of PCR cycle on the total copies made (10 groups)	6 months
M6010	A Taste of Genetics - Collect, extract, amplify own DNA to determine PTC genotype using a restriction digest assay (10 groups)	6 months
M6050	Restriction Digest Basics - Predict and analyze pre-cut restriction digest DNA fragments (10 groups)	6 months
M6053	Restriction Analysis of DNA - AP level lab for predicting, digesting, and analyzing single and double stranded digests, and the use of controls (10 groups)	6 months

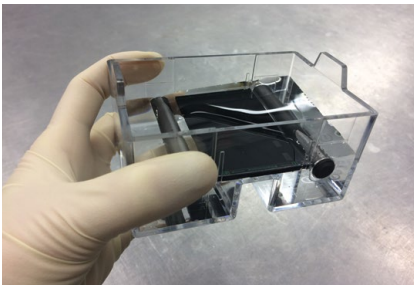
***When stored at recommended storage temperature**

Care of Your MiniOne® Electrophoresis System

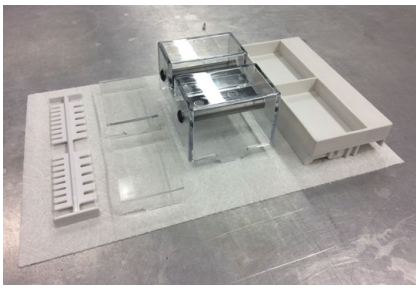
To ensure a long life for your MiniOne® Electrophoresis System follow these steps to clean, dry, and store. Graphite electrodes should be handled with care and rivets protected from rust.



1. Wipe up any moisture from the inside of the carriage and around the rivets as soon as you are done.



2. Rinse the tank, gel tray, and casting stand with deionized or distilled water. Wipe the outside of the gel tank, particularly around the grommets that connect to the rivets in the carriage.



3. Allow the tank, gel trays, and casting stand to dry upside down.

4. Store the tank upside down inside the carriage. This relieves pressure on the connectors.

theminione.com (858) 684-3190 info@theminione.com

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