Instruction Manual

Mini-Slab Size Electrophoresis System
with integrated power supply
WSE-1150
PageRun　Ace

5th Edition

May 10th, 2023

Made in Tokyo

SupportingLifeResearch

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Introduction

Thank you for purchasing ATTO Corporation's power supply Mini-Size electrophoresis system "WSE-1150 PageRun-Ace." This instruction manual (i.e. this document) is delivered to you together with the system so that you can make full use of the system.

Not only those of you who use this system for the first time, but also those who have used it before, should read this document carefully to understand the contents.

If you use this system for the first time, please read this document from the beginning in serial order.

In addition to how to use it, this document contains information related to maintenance, guarantee and services as well. Please keep it handy all the time to make its full use.

If you have any inquiries on your purchased product or the instruction manual, please feel free to contact us. (Please refer to the back cover.)

About this manual

Before using the product, please read this document carefully. After reading it, please be sure to keep it for your future reference. When you relocate this system, be sure to attach this document to it.

If there is any defect in this document such as misplaced or missing pages, or if this document is lost or tainted, we will replace it with a new one. Please take a moment to contact the distributor you purchased the product from or our company's customer service department (please refer to the back cover). At that time, please inform us of your product name and type. This document was created with our most careful attention; however, should you find any queries,

errors or omissions, please inform our company's customer service department (please refer to the back cover).

Safety precautions

To use this system safely, it is a must to operate it properly. Do not use this product until you read this document carefully and understand the content sufficiently. Precautions on usage and safety described in this document are applied to the use of this system only for the specified purpose of use. Do not use this system for any other purpose than described here, or do not use this system by any other method than described here. If you use this system for any other purpose or by any other method than described in this manual, you will be held responsible for all necessary safety measures as operator.

If you operate the system for the first time, you need to be given instructions from an experienced operator with proper knowledge, and to understand its principle and method. Not only people who operate the system for the first time but people who have ever used it after receiving professional education should keep this instruction manual handy to make its effective use. In order to prevent any electric shock caused by the electrophoresis system or any damage to the system, please understand and follow the correct operation method shown in this manual.

If you have questions or concern related to the principle of electrophoresis, maintenance or inspection, feel free to contact our company (please refer to the back cover).

Safety symbols

To use this system safely and maintain the safe status, the following symbols are indicated in the instruction manual and on the system's main unit. Please note the meaning of each symbol and observe each item.

Symbol	Description
⚠Danger	This symbol indicates emergent danger, such as death or heavy injury caused by ignoring the symbol and mishandling the system.
⚠Warning	This symbol indicates possibility of danger, such as death or injury, caused by ignoring the symbol and mishandling the system.
⚠Caution	This symbol indicates possible occurrence of physical damage caused by ignoring the symbol and mishandling the system.
	This symbol indicates prohibition.
	This symbol indicates an important matter.
	This symbol indicates a tip related to the operation.

Operation precautions

These are precautions for preventing fire, electric shock and other accident or failure. Read and understand the information well, and be sure to observe it.

⚠Danger

Power supply connection 	Do not use a deformed or corroded electrode terminal, AC adapter, power cable whose insulation coating is peeled off, or damaged power cable. Do not connect to this system any power supply other than the power supply attached to this system. Before operating this system, check and confirm that there is no damage to it. Otherwise, it may catch fire or cause electric shock due to loose connection. If there is any damage, stop using this system and contact our company (please refer to the back cover). After use, be sure to turn off the power switch and disconnect it from the outlet. When disconnecting AC adapter from the outlet, be sure to turn off the power switch, and then disconnect it by holding the AC adapter instead of pulling the cable.
No wet hand 	When handling this system, keep your hands dry. Do not touch AC adapter or connection terminal with wet hands. If you do, electric shock or failure may be caused. If the power supply part or AC adapter gets wet, do not use it. If you do, electric shock

	or failure may be caused. If wetted, stop using it and contact our company (please refer to the back cover).
Main Unit 	Do not put any foreign object into this system. If you do, electric shock or failure may be caused. If the external surface of this system gets wet, do not use it. If you do, electric shock or failure may be caused. When using it, wipe moisture off the surface and dry it.
Maintenance 	If an error occurs or if there seems to be an error or failure while this system is being used, stop using it immediately. If you find any defect at the time of inspection, do not use this system. If you do, electric shock or defect may be caused. While this system is in use, check if there is any error, such as abnormal sound or smoking, or and see if any liquid leakage by regular visual inspection. If you find an error, failure or defect, stop using it and contact our company (please refer to the back cover).
Reagent 	For the electrophoresis, deleterious substance, dangerous substance, or carcinogenic material may be used for preparation of buffer solution, staining or decoloring operation. Do not allow its direct contact to human body. If you do, fatal accident or body injury, like burn, may be caused. When using chemicals, protect your body with gloves and a mask. Carefully read and observe precautions on handling attached to the chemicals.

Caution

Installation 	Do not install the system on an unstable table, tilted place or a heavily vibrating place. Install it on an experimental table with horizontal, stable and solid surface. Otherwise, electric shock due to falling or liquid leakage may be caused. Do not put any object on this system. If you do, electric shock due to falling may be caused.
Main Unit 	This system is not of explosion-proof structure. Install it at the place where there is no exposure to fire or combustible gas. When taking this system out of a low-temperature room for use, take measures against dew condensation before moving it. If condensation is seen, dry it completely. Otherwise, electric shock or failure may be caused.
Transfer 	While this system is in operation, do not touch any parts other than operation panel, nor move it. Electric shock may be caused by leakage of Running buffer solution. Also, electric cords may get entangled and the system may fall. When moving this system, be sure to turn off the power switch and disconnect AC adapter, and then disconnect all wiring cables.
Maintenance	When you conduct maintenance or cleaning, be sure to turn off the switch of the power supply and disconnect all lead wires.

	To maintain good performance and safety of this product, please ask us for periodical maintenance, inspection and calibration (please refer to the back cover).
No disassembly 	Do not disassemble or modify this system. Do not remove the external cover. Interior adjustment or repair of this product should be made by our engineers. If adjustment or repair needs to be done, please ask us for it (please refer to the back cover). Our company will not accept any responsibility for any accident or failure caused by disassembly or modification done by yourself.
Sticker 	Do not peel off the warning stickers. They indicate a dangerous section of this system. If it is peeled off or cannot be read due to stain, please contact us (please refer to the back cover).

Warning

AC adapter 	Do not use the power supply part and AC adapter of this system for any other purpose than electrophoresis of this system. If you do, failure or accident may be caused. We will not accept responsibility for any accident or failure caused by using the power supply and AC adapter of this system for any other system than this system. If this system is used outside Japan, prepare the conversion adapter complying with the standards of the country where you use it. If a non-standard adapter is used, heat generation or ignition may occur. If you have any inquiries, please contact us or our sales agency (please refer to the back cover)

Information

Sticker 	The name plate sticker shows important information for maintenance and management of the product. Do not peel it off.

Notices

Application

This system is physical and chemical equipment for research. It is not medical equipment. Therefore, it cannot be used for medical practices, such as medical care-related judgment or treatment effect checking.

Export

Export of certain services or cargos is controlled by the foreign exchange law and the government decree or ministerial ordinance of foreign trade control law of Japan. This product is subject to such regulations.

Even if the product is not pertinent to the government decree, it is necessary to submit the document to the customs office to that effect. If the product is pertinent, it is necessary to obtain the export license from the Ministry of Economy, Trade and Industry and submit the license to the customs office.

When you export our company's product, please contact the distributor or our company's customer department in advance.

(Please refer to the back cover)

Trademarks / copyright

1. Overview

This chapter explains purpose and principle of this system.

1.1. Purpose

WSE-1150 PageRun-Ace is the system for carrying out electrophoresis of protein and nucleic acid using two sheets of plate-type polyacrylamide gel at the same time. WSE-1150M type PageRun-Ace carries out electrophoresis using gel prepared by Rapidus/dual-mini slab gel casting set (AE-6401). WSE-1150P type PageRun-Ace carries out electrophoresis using the precast gel polyacrylamide gel "(e-)PAGEL" (AE-6000 series).

1.2. Principle

This system distributes power from the dedicated electrophoresis power supply to the plate-type polyacrylamide gel set on the electrophoresis tank via buffer in both upper and lower tanks. A sample added to the sample groove at the upper edge of the gel moves to the opposite electrode of its charge when the power is distributed. The components within the sample are separated by difference of movement for a set period of time.

2. Inspection when unpacking the product

This chapter explains items to be checked when unpacking the product and configuration of equipment.

2.1. Inspection at the time of unpacking

When you receive the product, check if the main unit and the accessories are properly packed and there is no damage.

If you find any defect or damage, please contact the distributor you purchased the product from or our company immediately (please refer to the back cover).

Carry out the inspection at the time of unpacking within one week after you receive the product.

After one week elapses, damage or parts shortage may not be recovered.

2.2. Equipment configuration

This product consists of main unit and accessories.

Main unit

Product name: Mini-Slab Size electrophoresis System with integrated power supply, PageRun-Ace

Model: WSE-1150 P/M

Type	WSE-1150P	WSE-1150M

Main Unit	Core assembly	
	Lower tank	
	Dedicated electrophoresis power supply with safety cover	
	Plate holder for (e-)PAGEL	Plate holder for hand-cast gel

Accessories

Type	WSE-1150P	WSE-1150M
Dummy plate	dummy plate DP-5	dummy plate DP-7
AC adapter	1 piece	
Extension cable	1 piece	
Instruction manual	1 copy	

3. Name and function of each part

This chapter explains name and function of each part.

3.1. System configuration

(1) Main unit

Integrated power supply module with safety cover

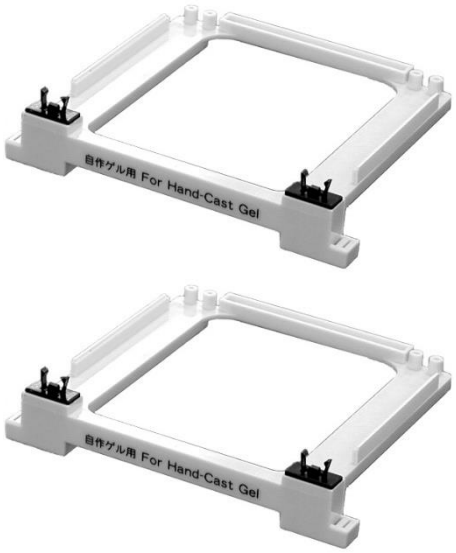
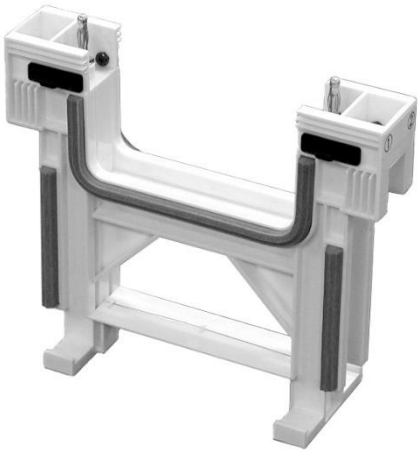


Plate holder



Core assembly

Dummy plate DP-5 or

Dummy plate DP-7

Lower tank

Integrated power supply module with safety cover

This power supply distributes power to the electrophoresis tank and controls it. The power is distributed for the time and under constant current conditions that are set on the operation panel. The power distribution is automatically stopped at the set time and the alarm is activated.

Core assembly

This part fixes the plate holder to which Glass plate is attached, and then becomes the upper tank to hold the upper buffer. An electrode is installed on it.

Lower tank

This tank holds the lower buffer and houses the upper tank.

Plate holder

This holder holds and fixes the preparation gel plate in the core assembly.

Dummy plate

When only one gel is migrated, this plate is installed on one plate holder and attached to the core assembly to hold the upper buffer.

(2) Accessories

AC adapter

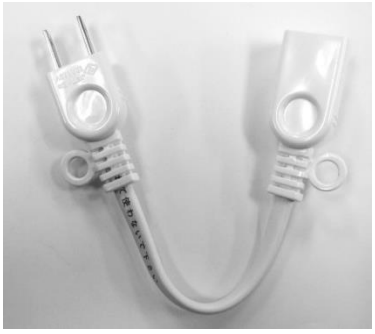
Extension cord

Instruction manual

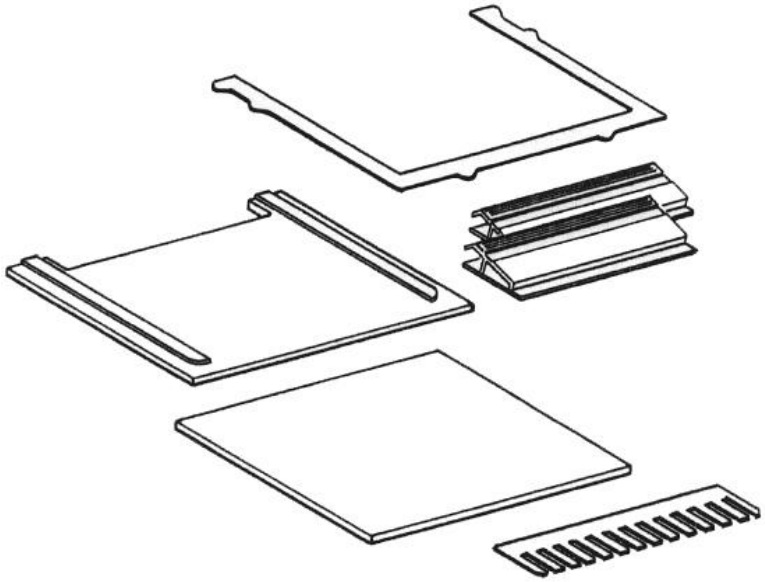
Hand-cast gel casting set

Accessory for WSE-1150MW type only

AC adapter



Extension cord



Hand-cast gel casting set

3.2. Main unit

(1) Integrated power supply module with safety cover

Explained here are names and functions of the dedicated electrophoresis power supply with safety cover.

(1)Operation panel

(2) Electrode connector

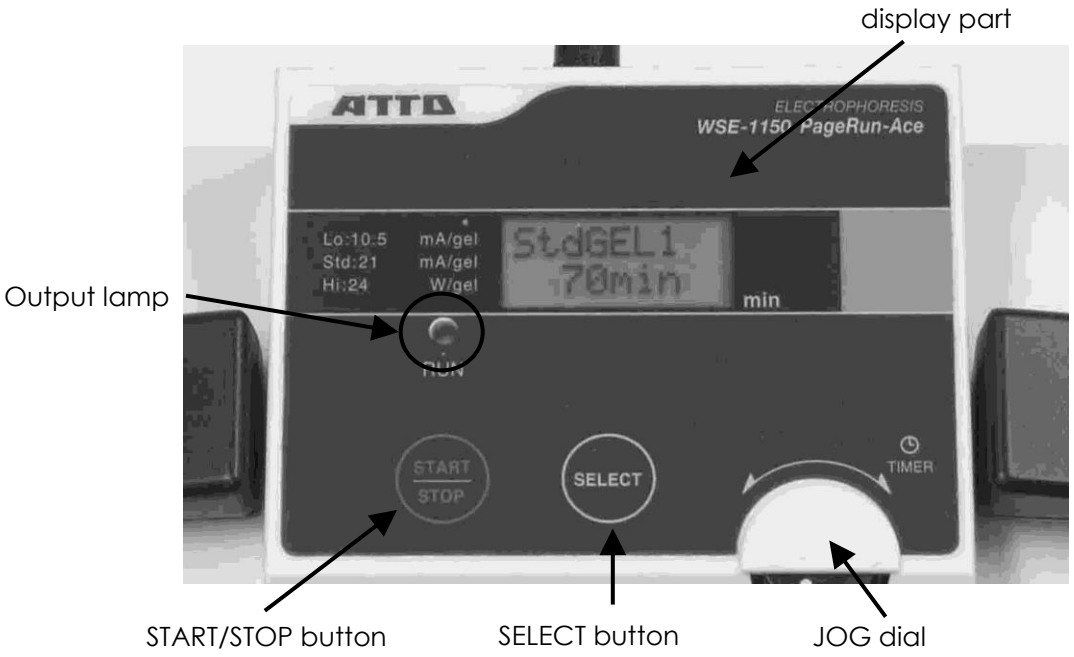
z

(3) Power switch

(4) Power supply jack

(1) Operation panel

On this panel, output mode selection, power distribution time setting, power distribution start/stop operation, and selection mode display, output status, remaining time are displayed.



START/STOP button

If you press the button, the power distribution is started. While the power is distributed, the output lamp (RUN) is lit. If you press the button once again, the power distribution stops.

SELECT button

This is to select the output mode. If you press the button, the output mode is changed. The output mode is explained on page 56.

JOG dial

This is to set the power distribution time. If you turn this dial to right or left, you can set distribution time on the display part. The range is from 1 to 250 min. If you set it to [0], the timer setting becomes off.

Output lamp

During electrophoresis output power distribution, the green lamp is on. At the time of short open error, it blinks quickly. In all other times, the lamp is off.

Display part

During the selected output mode, set distribution time and the power distribution, the remaining time is displayed as count down style. The upper side of display shows power distribution, and the lower side shows time. The unit is minute. When the power distribution is terminated, "End" is displayed. At the time of a short open error, "Err" or "Open Err" is displayed.

Memory function

Selected distribution time of each mode is memorized. Previous used mode and time are remained, and displayed this condition when it is switched on. With any operation like pushing SELECT button, the condition is memorized.

Output limit function

The voltage value that is electrophoresed with constant output power increases depending on variation of electrical resistivity occurring in the power distribution part (gel, buffer etc.). This apparatus limits at 400V as maximum voltage value while the power is distributed and transfer constant output into that of 400V.

(2) Electrode connector

This is to connect to the electrode plug of electrophoresis tank. If you install the dedicated electrophoresis power supply with safety cover at the predefined position of electrophoresis tank and push the electrode connector, the power supply part and the electrode plug are connected and the power distribution becomes possible.

(3) Power switch

If you press the ON side, the power supply is turned on. If you press the OFF side, the power supply is turned off. If you switch on, the display part shows output mode and setting time.

(4) Power supply jack

Connect the AC adapter(24VDC 1.5A) attached to the product.

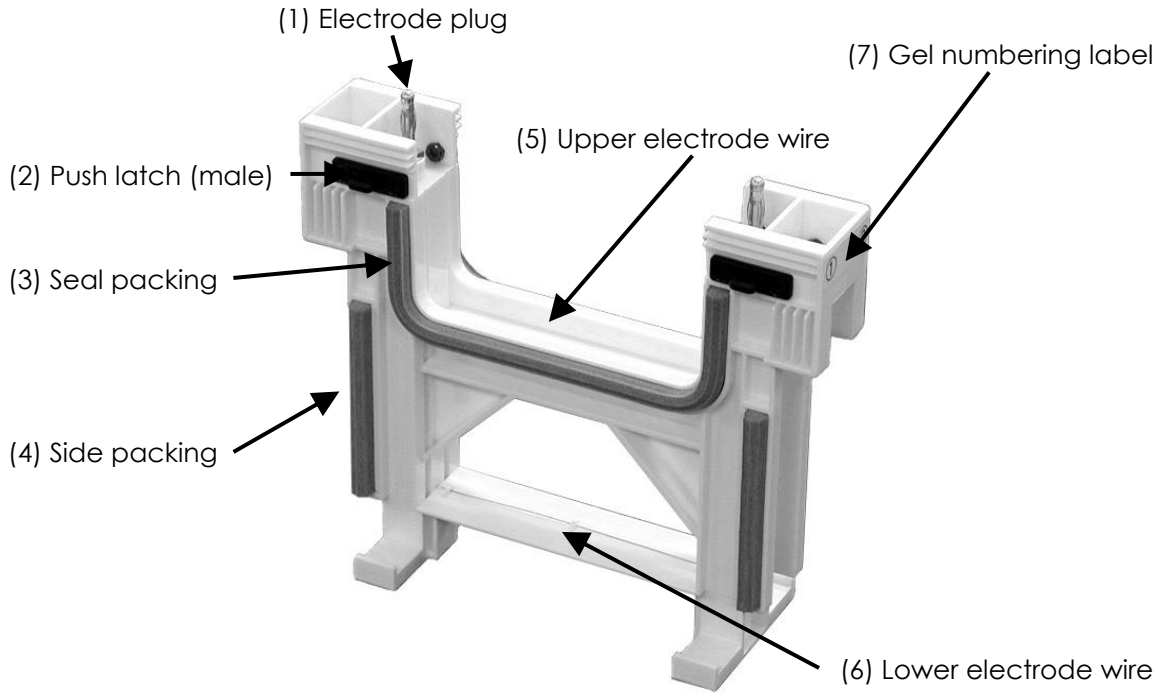
ATTENTION!

DO NOT USE ANY OTHER AC ADAPTOR except one attached to this apparatus.

If you don't use attached AC adaptor, some trouble will occur, like poor output and damage of power supply part, deterioration and damage of AC adaptor and ignition etc.

(2) Core assembly

Explained here are names and functions of the core assembly.



(1) Electrode plug

This is the connecting part with electrode connector at power supply part. The (+) pole side and the (-) pole side are not distinguished because of the automatic polarity switching function.

(2) Push latch (male)

This is the connecting part with push latch (female) of the plate holder.

(3) Seal packing

This is to hold the upper buffer by making the Glass plate closely stick together.

(4) Side packing

This is to suppress the power distribution leak to the side direction of gel.

(5) Upper electrode wire

This always stays (-) pole by the polarity automatic switching function

(6) Lower electrode wire

This always stays (+) pole by the polarity automatic switching function

(7) Gel numbering label

This label is used as an earmark for identifying which Glass plate is installed on which side when two gel sheets are migrated.

Polarity automatic switching function

This function always keeps the core assembly (upper tank) as (-) pole and the lower tank as (+) pole, respectively, no matter which side (left or right) of the electrode connector of the dedicated electrophoresis supply is connected to the electrode plug of electrophoresis tank.

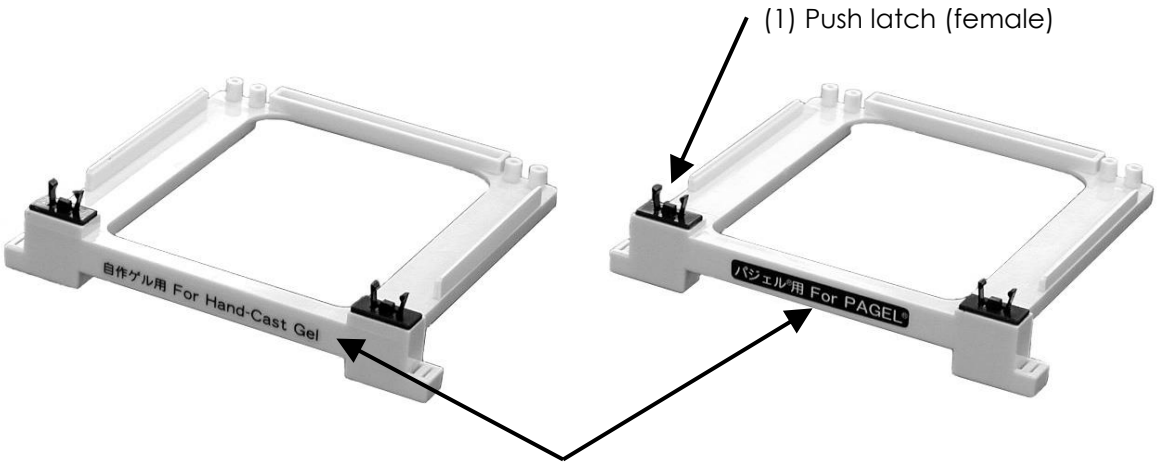
(3) Lower tank

This tank holds the lower buffer and houses the upper tank.

(4) Plate holder

The preparation gel plate is held and fixed in the core assembly.

There are holders "for hand-cast gel " and "for (e-)PAGEL".



(1) Push latch (female)

This is to fix the plate holder onto the core assembly by connecting it with push latch (male) of the core assembly.

(2) Identification label for hand-cast gel/(e-)PAGEL

The plate holder dedicated to hand-cast gel is attached to WSE-1100M.

The plate holder dedicated to ATTO's precast gel "(e-)PAGEL" is attached to WSE-1100P.

(5) Dummy plate

When only one gel is migrated, this plate is installed on one plate holder and attached to the core assembly to hold the upper buffer.

The dummy plate DP-7 for hand-cast gel is attached to WSE-1100M.

The dummy plate DP-5 for (e-)PAGEL is attached to WSE-1100P.

DP-7

DP-5

3.3. Accessories

Explained here are names and functions of the accessories.

(1) AC adapter

This AC adapter can be used between AC100V and 240V.

DC24V is supplied to the power supply part.

(2) Extension cord

This cord is used by inserting it into the power plug of the AC adapter when the AC adapter cannot be easily inserted into the outlet.

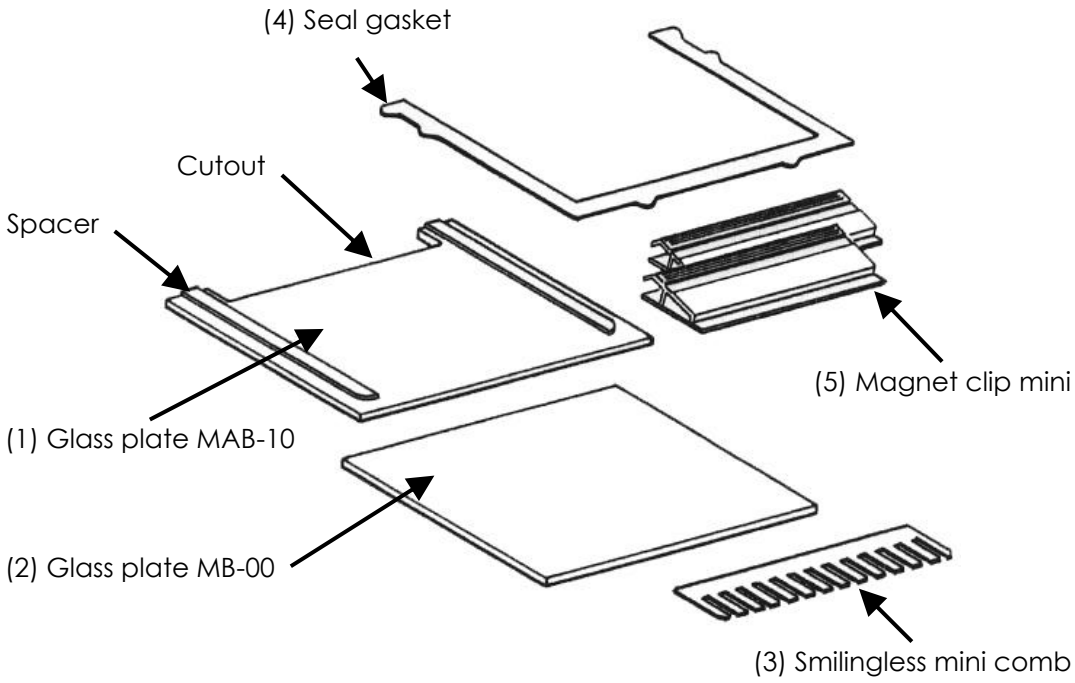
(3) Instruction manual

This instruction manual is it.

(4) Hand cast gel casting set

This kit is attached to WSE-1100MW type only.

It is composed of the following items.



(1) Glass plate MAB-10

This is overlapped with MB-00 to produce gel between the two. When it is installed on the electrophoresis tank, this Glass plate is set in the seal packing side of the core assembly.

The plate consists of "spacer" and "cutout".

(2) Glass plate MB-00

This is overlapped with MAB-10 to produce gel between the two.

(3) Smilingless mini comb

This is to create a groove (well) for adding sample to gel.

(4) Seal gasket

This is installed between two Glass plates to prevent the liquid leakage when the gel is created.

(5) Magnet clip mini

This makes the two Glass plates that sandwich the seal gasket stick together.

4. Preparation

This chapter explains preparation before using the product.

4.1. Installation environment

Use this system in the environment described below.

Environment	Inside a room only

⚠Warning

Do not install the product in combustible gas atmosphere. It is not of explosion-proof structure, so the product may cause explosion or fire. Install it in an environment that does not contact combustible gas.
Do not install the product in corrosive gas environment. This is because it can cause corrosion of conductor inside this product or contact failure of connector, which may lead to malfunction, failure or fire.
Do not install the product in environment with much dust or dirt. Dust or dirt may get attached to the product, which can cause electric shock, fire or failure.

⚠Caution

Do not use the product at a place where there is strong magnetic field or electric field around, or a place where there is much waveform strain of input power supply or noise. Malfunction may be caused.
Do not install the product where it is exposed to direct sunlight, where temperature suddenly changes, or where humidity is high. If dew condensation occurs, do not use this product.
This system cannot be used outdoors. It is designed so that safety and performance can be ensured under the environmental conditions; ambient temperature 5°C - 40°C, relative humidity 5% - 90% (no dew condensation).

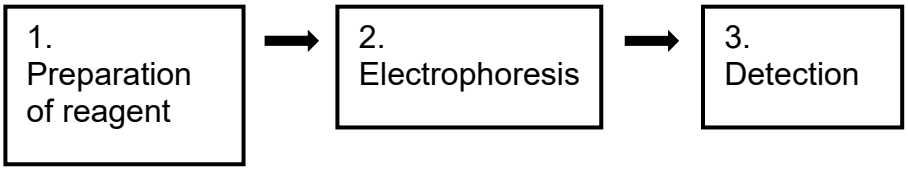
4.2. Preparation of peripheral system & consumable goods

(e-)PAGEL (10 sheets)	Precast gel polyacrylamide gel with mini gel size
Shaker	This system is used for staining and decoloring of gel. • Seesaw shaker atto
Gel desiccator	This system is used for storing and drying gel. • AE-3711 RAPIDRY mini
Blotting system	• WSE-4020 HorizBlot 2M-R • WSE-4040 HorizBlot 4M-R • WSE-4110 PoweredBlot-ONE • WSE-4051 clear blot P+film (85x90mm) • CB-09A ABSORBENT paper (filter paper) (85x90mm)

5. Operation

This chapter explains the basic operation related to electrophoresis of protein and DNA.

The general flow of experimental operation is as shown below:



5.1. Preparation of reagents

1. Necessary reagents

Prepare the reagents stated in the below:

When using reagents as the second dimension of 2D electrophoresis, prepare them by referring to the instruction manual of isoelectric point electrophoresis system "DiscRun-R" as well.

1) Protein

1. Polyacrylamide gel electrophoresis

Acrylamide (for electrophoresis)*
N,N'-methylenebisacrylamide (for electrophoresis)*
Tris (tris hydroxymethyl aminomethane) (for biochemistry)
SDS (sodium dodecyl sulfate) (for biochemistry)**

Hydrochloric acid (special grade)
Ammonium persulfate *
TEMED (N,N,N',N'-tetramethylethylenediamine) (for electrophoresis)*
Glycine (special grade)
Glycerin (special grade)
2-mercaptoethanol **
BPB (bromphenol blue)

* Not used for (e-)PAGEL specifications

** Not used for Native PAGE

2. Coomassie (CBB) staining

AE-1340 ***EzStain AQua*** (easy stain / aqua) or Acetic acid (special grade)
Methanol (special grade)
CBB (Coomassie brilliant blue) R-250 or G-250 (for electrophoresis)

2) DNA

1. Electrophoresis

acrylamide (for electrophoresis)*
N,N'-methylenebisacrylamide (for electrophoresis)*
Tris (tris hydroxymethyl aminomethane) (for biochemistry)
Ammonium persulfate (for electrophoresis)*
TEMED (N,N,N',N'-tetramethylethylenediamine) (for electrophoresis)*

Boric acid (special grade)
EDTA / 2NA (ethylenediaminetetraacetic acid / disodium ethylenediaminotetraacetate)
BPB (bromphenol blue)
Sucrose (special grade)

* Not used for (e-)PAGEL specifications

2. Ethidium bromide staining

Ethidium bromide

Our company sells following products. Please use them according to application. For details of products, please contact our company. (Refer to the back cover.)

Sample preparing solution for SDS-PAGE	AE-1430 ***EzApply*** (easy apply)
molecular-weight marker for SDS-PAGE	AE-1440 ***EzStandard*** (easy standard)
Colored marker for SDS-PAGE	AE-1450 ***EzStandard PrestainBlue*** (easy standard / prestain blue)
Running buffer for SDS-PAGE	AE-1410 ***EzRun*** (easy run)
High isolation Running buffer for SDS-PAGE	AE-1412 ***EzRunC+*** (easy runC+)
Reverse staining kit for SDS-PAGE	AE-1310 ***EzStain Reverse*** (easy stain / reverse)
Silver staining kit	AE-1360 ***EzStain Silver*** (easy stain / silver)

2. Preparation of various solutions

1) Electrophoresis for protein

Prepare the following solutions beforehand.

When making separation while keeping the higher-order structure of protein (Native PAGE), remove SDS and 2-mercaptoethanol from all reagents (reagent with * mark). The Running buffer varies.

Name of solution	Name of reagent	Capacity ( ) indicates final concentration
Solution A • 4°C / can be stored for one month • Not necessary when (e-)PAGEL is used	Acrylamide	29.2g (30%)
	N,N'-methylenebisacrylamide	0.8g
	Dissolve items shown above and dilute it to 100mL.	
Solution B • 4°C / can be stored for one month • Not necessary when (e-)PAGEL is used	Tris	18.2g (1.5M)
	SDS(*)	0.4g (0.4%)
	Dissolve items shown above and adjust it to pH8.8 with hydrochloric acid, and then dilute it to 100mL.	
Solution C • 4°C / can be stored for one month • Not necessary when (e-)PAGEL is used	Tris	6.1g (0.5M)
	SDS(*)	0.4g (0.4%)
	Dissolve items shown above and adjust it to pH6.8 with hydrochloric acid, and then dilute it to 100mL.	
Solution D • 4°C / can be stored for one week • Not necessary when (e-)PAGEL is used	Ammonium persulfate	100mg (10%)
	Dissolve an item above with 1.0mL of distilled water.	
SDS-PAGE Running buffer • for Laemmli method • Room temperature, can be	Tris	1.5g (25mM)
	Glycine	7.2g (192mM)

stored for two months) * Not necessary when AE-1410 EzRun is used	SDS(*)	0.5g (0.1%)
	Dissolve items shown above and dilute it to 500mL.	
Sample processing fluid (example) • 4°C / can be stored for two weeks • Not necessary hen AE-1430 EzApply is used	Solution C (0.5M tris-hydrochloric acid buffer pH6.8)	1.0mL (50mM)
	SDS(*)	0.1g (1%)
	2-mercaptoethanol (*)	0.1mL (1%)
	Glycerin	2.0mL (20%)
	1% BPB solution	10µL (0.001%)
	Dissolve items shown above and dilute it to 10mL.	
CBB staining fluid • Room temperature / can be stored for one month • Not necessary when AE-1340 EzStainAQua is used	Methanol	300mL (30%)
	Acetic acid	100mL (10%)
	CBB R-250 or G-250	1.0g (0.1%)
	Dissolve items shown above and dilute it to 1L.	
Decoloring fluid • Room temperature / can be stored for one month • Not necessary when AE-1340 EzStainAQua is used	Methanol	300mL (30%)
	Acetic acid	100mL (10%)
	Dissolve items shown above and dilute it to 1L.	

2) DNA

Prepare the following solutions beforehand.

- When using (e-)PAGEL, solution E, F, and D are not necessary.
- When using (e-)PAGEL, use native-PAGE Running buffer (on page 28, excluding SDS of SDS-PAGE Running buffer) of protein instead of TBE for Running buffer.

Solution	Reagent	Capacity

		( ) indicates final concentration
Solution E • 4°C / can be stored for one month • Not necessary when (e-)PAGEL is used	Acrylamide	29.0g } (30%)
	N,N'-methylenebisacrylamide	1.0g } (30%)
	Dissolve items shown above and dilute it to 100mL.	
Solution F • 4°C / can be stored for one month • Not necessary when (e-)PAGEL is used	Tris	53.9g (445mM)
	Boric acid	27.5g (445mM)
	EDTA / 2NA	3.7g (10mM)
	Dissolve items shown above and dilute it to 1L.	
Solution D • 4°C / can be stored for one week • Not necessary when (e-)PAGEL is used	Ammonium persulfate	100mg (10%)
	Dissolve item above in 1.0mL of distilled water.	
TBE Running buffer (1xTBE buffer) • Room temperature / can be stored for two months • Not necessary when (e-)PAGEL is used	Dilute the solution F to fifth part with distilled water. Or, confect it with following reagents.	
	Tris	89mM
	Boric acid	89mM
	EDTA / 2NA	2mM
Marker pigment solution • 4°C / can be stored for two months	BPB	0.04g (0.4%)
	Sucrose	6.0g (60%)
	Dissolve items shown above and dilute it to 10mL.	
Ethidium bromide preservative solution • 4°C / can be stored for two months	Ethidium bromide	50mg (0.05%)
	Dissolve the item above in 100mL of 1xTBE buffer.	
Ethidium bromide staining fluid • 4°C / can be stored for two months	Dilute the ethidium bromide preservative solution to 1/1,000 with 1xTBE buffer.	

3. Sample preparation for electrophoresis

Shown here is an example of the most popular preparation method. Various sample preparation methods are available depending on type and purpose of separation. Try to find the best ways for your purpose by referring to literature and other documents.

1) Protein

Dissolution of sample

Prepare the sample for electrophoresis, according to the status of a sample, using "sample processing fluid" on page 29.

For a dried sample, dilute it to 1 to 2mg/mL in sample processing fluid. For a sample with less water like tissue, add the sample processing fluid to homogenize it. For a solution-like sample, especially for dilute sample, there is a method of adding each reagent directly for preventing dilution.

(e.g.) For serum

Sample, reagent	Capacity
Serum	20µL
Distilled water	570µL
10% SDS solution *	100µL
2-mercaptoethanol *	10µL
Solution C	100µL
Glycerin	200µL
Total	1mL

* For Native-PAGE, do not add the reagents with the * mark shown above, but add the distilled water instead.

When using AE-1430 ***EzApply*** (easy apply), the sample preparation solution for SDS-PAGE, take 480μL of distilled water in a tube and add 500μL of ***EzApply*** and 20μL of serum.

Heating process

Seal the lid of the tube and increase the temperature in water bath gradually. In 1 – 3 minutes after boiling, pull it out of the water bath.

Centrifugal separation

If the solution looks cloudy, contains insoluble matter, or is expected to be contaminated with fat, do the centrifugal separation (15,000rpm, 10min). The supernatant excluding fat layer on the surface is used as a sample.

If electrophoresis occurs while insoluble matter or fat remains, vertical stripes appear in the electrophoresis image.

2) DNA

Keep the salt concentration of migrating sample as consistent as possible. For high salt concentration, carry out the ethanol precipitation to dissolve it in buffer so that the salt concentration becomes same as that of other samples.

If the salt concentration is different, the electrophoresis pattern fluctuates. High salt concentration sample (e.g. H buffer of restriction enzyme.), in particular, affects the band pattern or the electrophoresis speed of the neighboring lane.

Mix one-tenth marker pigment (BPB) solution into sample solution and use it as electrophoresis sample.

5.2. Preparation of gel

Assemble the glass plate and create gel using the solution prepared as described above.

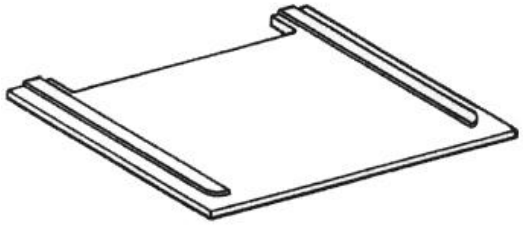
When you use (e-)PAGEL, the following process is not necessary.

1. Assembly of Glass plate

For the experimental operation, be sure to wear clean gloves for experiment on both hands.

If you operate the product with bare hands, experimental tools and solutions may be contaminated and you may not obtain the best experimental results.

Set the spacer of Glass plate MAB-10 on top.

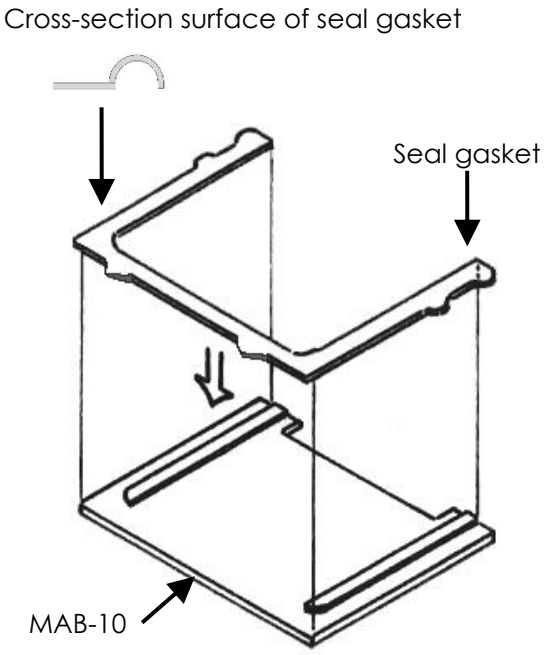


If any stain is attached to the Glass plate, air bubbles tend to appear when gel is filled. Wash it up sufficiently in advance.

Set the convex surface of seal gasket upward and put it on the Glass plate MAB-10.

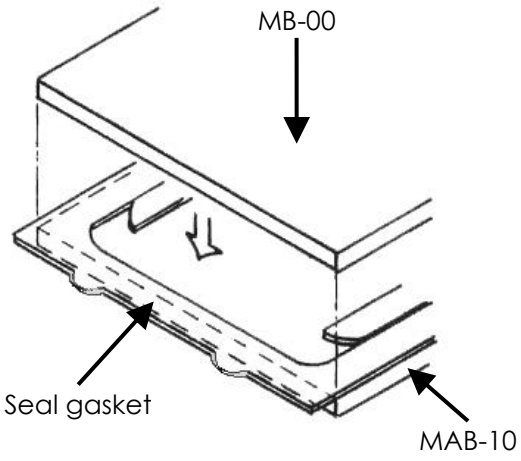
Match the edge of the Glass plate with the outside of the seal gasket.
Match the upper edge of the Glass plate with the upper edge of the seal gasket.

Do not overlap the spacer with the seal gasket.



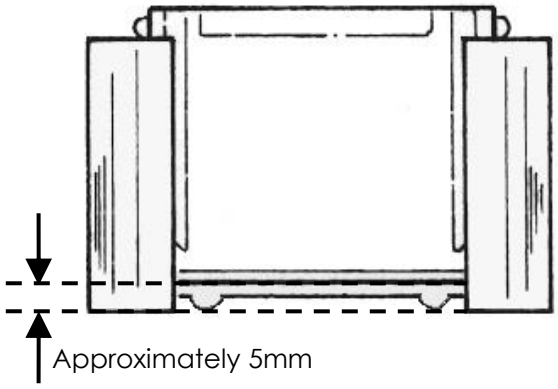
Overlap the Glass plate MB-00 with the Glass plate MAB-10 without misalignment.

At this time, take care so that the seal gasket will not be misaligned.



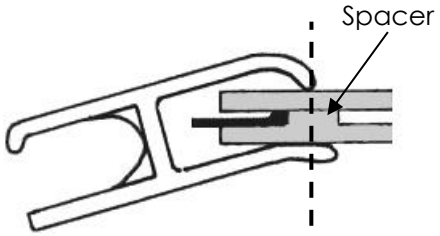
Clip two Glass plates with a magnet clip mini to fix them.

Set the clip at the position approximately 5mm away from the lower edge of the Glass plate.



The clip and the Glass plate should contact each other on the spacer.
Clip two Glass plates with a magnet clip mini to fix them.

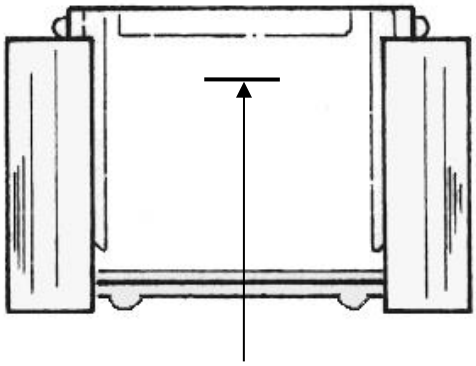
Set the clip at the position approximately 5mm away from the lower edge of the Glass plate.



The clip and the Glass plate should contact each other on the spacer.
Check two Glass plates so that they are not misaligned.

Set up the Glass plate set vertically on the horizontal experiment table.
Check the Glass plate so that it is not tilted to right or left.

As an earmark for inletting the separating gel, insert a sample comb between the Glass plates once. Mark up at the position 5 - 6mm lower than tip of the comb with permanent marker, and then remove the comb.



Mark with permanent marker

If the border position of separating gel and concentrating gel is different, the electrophoresis time or pattern will vary. In order to improve the reproducibility, adjust this position for each gel.

If the spring of a magnet clip becomes weak, a small gap occurs between the spacer of glass plate MAB-10 and other glass plate MB-00, and a film of gel may be generated in it. And because of it, power distribution leakage may frequently happen sideways and the electrophoresis image becomes fan-shaped Moreover, if the clip is worn, the gel solution leaks while the gel is being created. Replace the clip with a new one.

2. Preparation of gel

1) Protein

Select a gel concentration according to your purpose using the table below as reference.

For Native PAGE, the charge state of the sample considerably affects the mobility. So, it is not possible to select a gel concentration based on the molecular weight of the sample only. Select a gel concentration based on preliminary experiment.

Gel concentration (T%)	Fractional molecular weight range
5%	80 to 400kDa
7.5%	40 to 200kDa
10%	20 to 130kDa
12.5%	14 to 80kDa
15%	10 to 60kDa

Take specified amount of distilled water, solutions A and B shown in the composition table below and mix it gently. Add TEMED and solution D in the mixed solution lastly and mix them softly to prepare separating gel solution.

* As SDS is contained, the solution bubbles. Do not mix the solution hard.

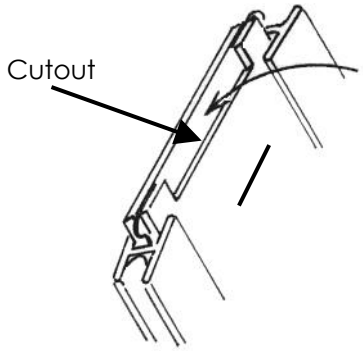
* When TEMED is added, polymerization is started. Mix it evenly, and then pour the solution quickly.

For two sheets of mini gel, Unit: mL

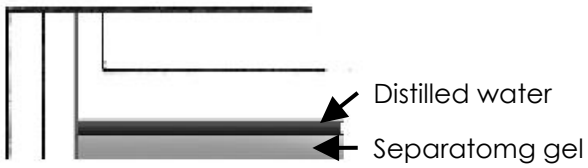
	Separating gel						Concentrating gel
	5%	7.5%	10%	12.5%	15%	20%	4.5%
Distilled water	10.5	9	7.5	6	4.5	1.5	3.6
Solution A	3	4.5	6	7.5	9	12	0.9
Solution B	4.5	4.5	4.5	4.5	4.5	4.5	-
Solution C	-	-	-	-	-	-	1.5
Solution D	0.08	0.08	0.08	0.08	0.06	0.06	0.02
TEMED	0.01	0.01	0.01	0.01	0.01	0.01	0.01

If the gel is difficult to be polymerized, increase solution D and TEMED by 10% each.

While keeping the assembled Glass plate tilted, pour the separating gel solution from the cutout part of the Glass plate gently. If poured fast, uneven polymerization may occur. Do not leave air bubbles behind. Pour the separating gel solution up to the height marked at the time of assembly.

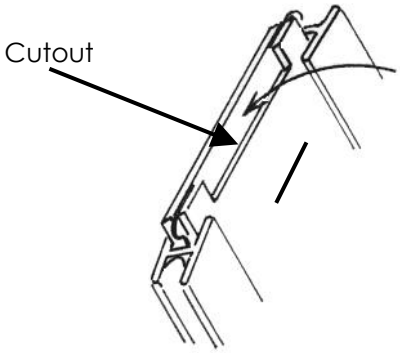


Slowly pile the distilled water on the separating gel solution so that the height becomes approximately 2 to 3mm and keep it still for about 1 hour to let polymerization happen.



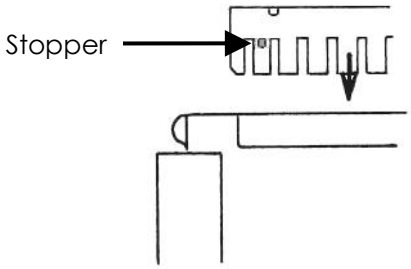
At low temperature (20°C or less), polymerization is difficult to occur. The polymerization level varies depending on the temperature. Let polymerization happen always at a constant temperature so as to maintain reproducibility of the electrophoretic pattern.

After polymerization is completed, discard the piled distilled water and prepare the concentrating gel solution, using the composition table on the previous page for reference. Pour a small amount of the prepared concentrating gel solution onto the separating gel, wash the upper edge of the gel, and discard it.



Pour the concentrating gel solution from the lower edge of the cutout of the Glass plate, up to about 2mm high.

Insert the sample comb until the stopper contacts the cutout of the plate. Polymerization will complete in about 30 minutes. As for the 2D flat comb, put the comb on the cutout part of the glass plate.



Be careful so that air bubbles will not stick to the teeth of the comb. If they do, the well will not be formed properly.

2) DNA

Select the gel concentration according to your purpose, using the following table for reference.

Gel concentration (T%)	Fractionation range	
	Hand-cast gel (1xTBE)	(e-) PAGEL (Tris-Gly)
5%	80 to 500bp	
7.5%		250 to 3,000bp
8%	60 to 400bp	
10%	50 to 300bp	150 to 2,000bp
12.5%	40 to 200bp	70 to 1,800bp
15%	25 to 150bp	50 to 1,500bp

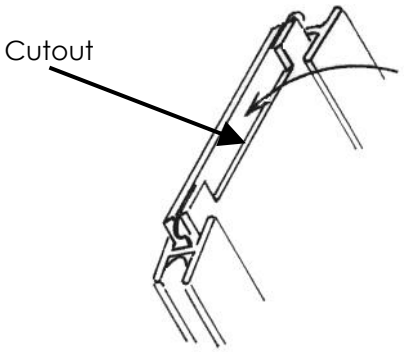
Take the specified amounts of distilled water and Solutions E & F shown in the composition table below, and mix them gently. Then, add TEMED and solution D lastly, and mix them gently to prepare the separating gel solution.

For two sheets of mini gel; Unit: mL

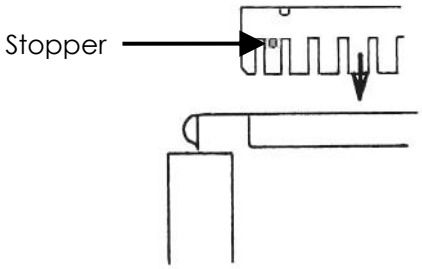
	5%	6%	7.5%	8%	10%	12%	15%
Distilled water	12.6	11.9	10.9	10.6	9.2	7.6	5.9
Solution E	3.3	4.0	5.0	5.3	6.7	8.3	10
Solution F	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Solution D	0.1	0.1	0.1	0.1	0.1	0.1	0.1
TEMED	0.01	0.01	0.01	0.01	0.01	0.01	0.01

If the gel looks difficult to be polymerized, increase Solution D and TEMED by 10% each.

While the assembled Glass plate is kept tilted, pour gently the gel solution from the cutout part of the Glass plate. If poured fast, uneven polymerization may occur. Do not leave air bubbles behind. Pour the gel solution up to about 2mm from the lower edge of the cutout.



Insert the sample comb until the stopper contacts the cutout of the plate. Polymerization will complete in about 30 minutes. As for the 2D flat comb, put the comb on the cutout part of the glass plate.



At low temperature (20℃ or less), polymerization is difficult to occur. The polymerization level varies depending on the temperature. Let polymerization happen always at a constant temperature so as to maintain reproducibility of the electrophoretic pattern.

Be careful so that air bubbles will not stick to the teeth of the comb. If they do, the well will not be formed properly.

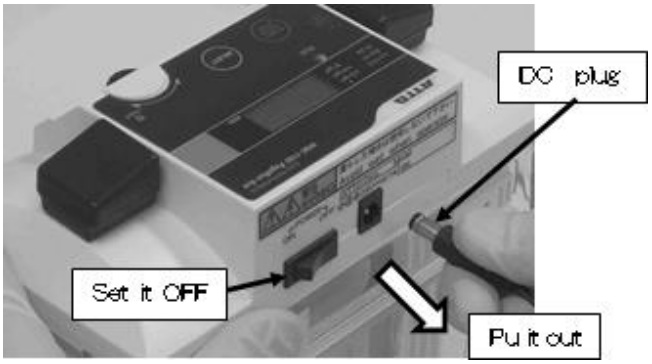
5.3. Electrophoresis

1. Preparation of system

If the power supply part with the safety cover and the electrophoresis tank are connected, disconnect them as follows:

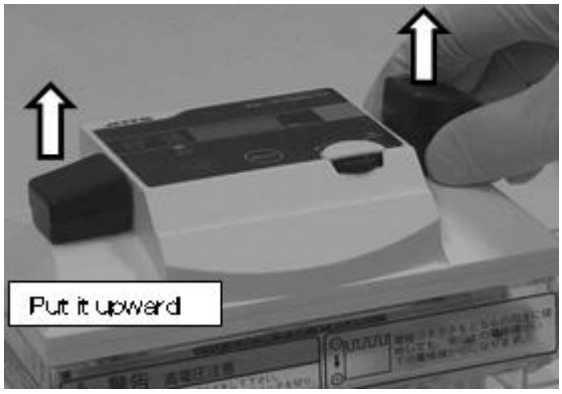
If the power switch at the power supply part is set ON, push it to the OFF side.

If the DC plug of the AC adapter is connected, pull it out from the power supply part.

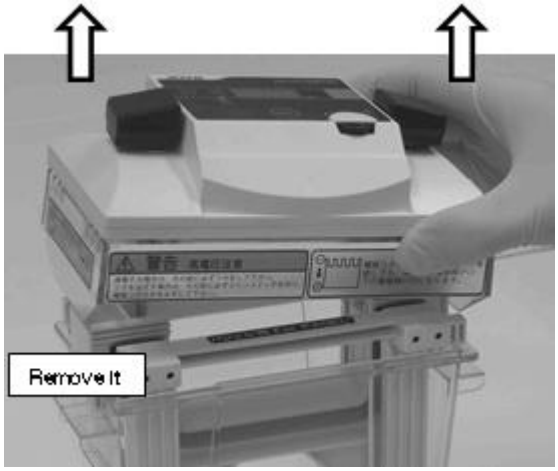


Warning Before disconnecting the DC plug, disconnect the AC adapter from the outlet.

Pull the two electrode connectors at the power supply part upward until they stop.

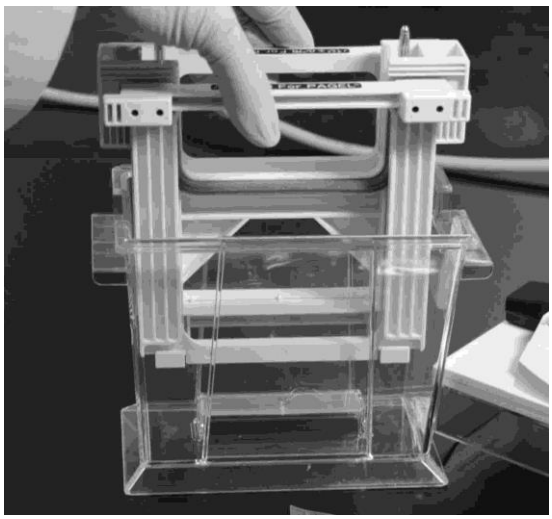


Pull the power supply part upward and remove it from the upper cover.

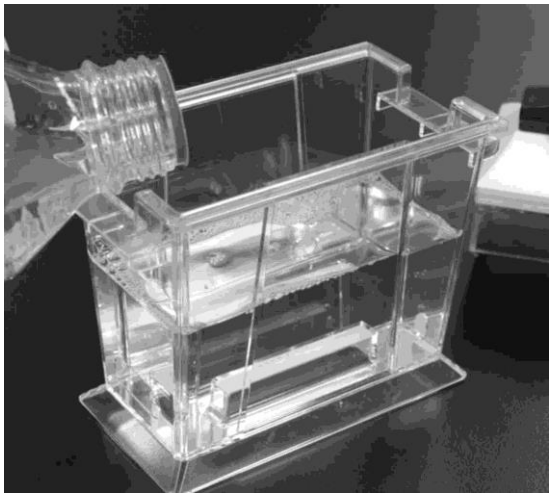


2. Set the lower buffer

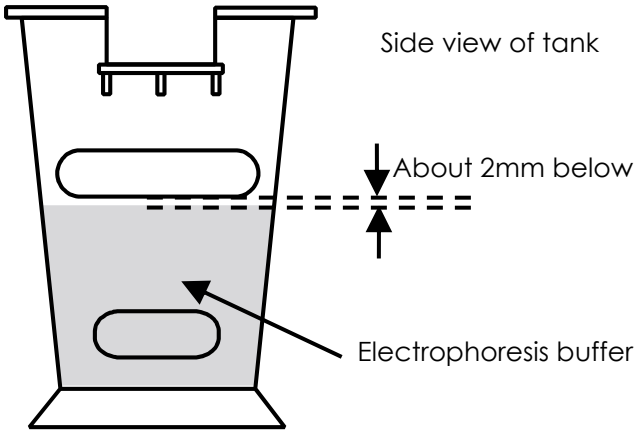
Pull out the plate holder and the upper tank from the lower tank.



Pour 400mL of Running buffer into the lower tank. Pour it gently so as not to generate any air bubbles.

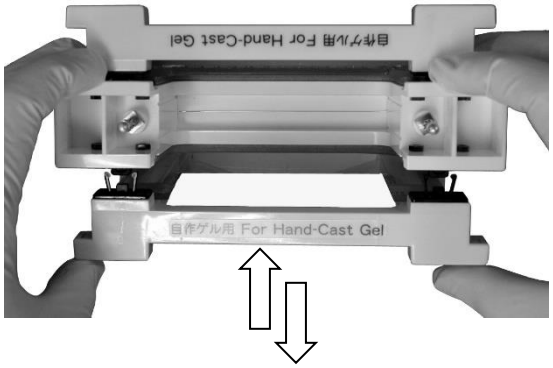


The target amount of liquid is shown in the right figure.



3. Set the gel

Remove the two plate holders from the core assembly.



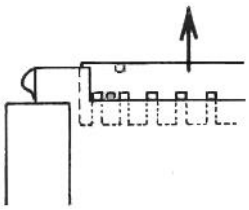
Push, and then pull

Put the thumb on the upper edge of the plate holder and put the other fingers on the upper edge of the core assembly. Then, push the plate holder into the core assembly side. If it clicks, the lock is released. Now, pull it to the front side.

Remove the plate holder attached to the opposite side in the same way.

Prepare the gel.

When using (e-PAGEL, open the package by cutting it along the dashed line as shown in the right figure, and pull out the gel plate from the widely opened package. If the package cannot be cut with your hands, cut it with scissors. Do not pull out the gel plate forcibly.



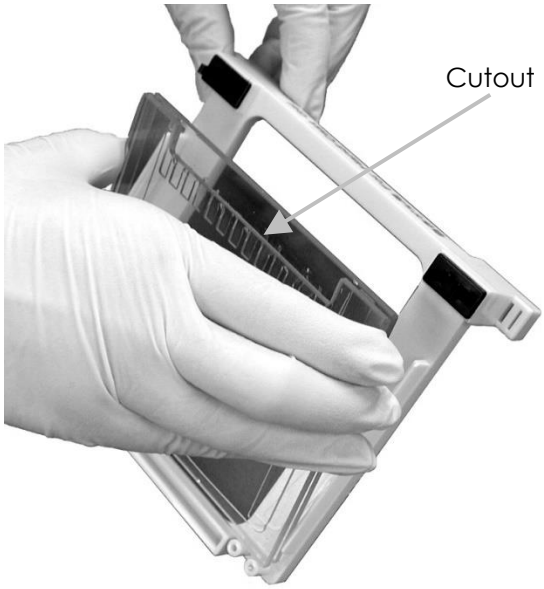
Pull out the comb slowly in the direction pointed by the arrow. If it is pulled out quickly, the well may be damaged.

Pour a small amount of Running buffer onto the well and drain unpolymerized acrylamide to wash the well.

If gel is handmade, remove clips and gasket from plates.
If there is a bit of gel or salt on the surface of plate, wipe it off. Leakage of buffer may be caused by a stain of contact part of upper chamber and seal packing.

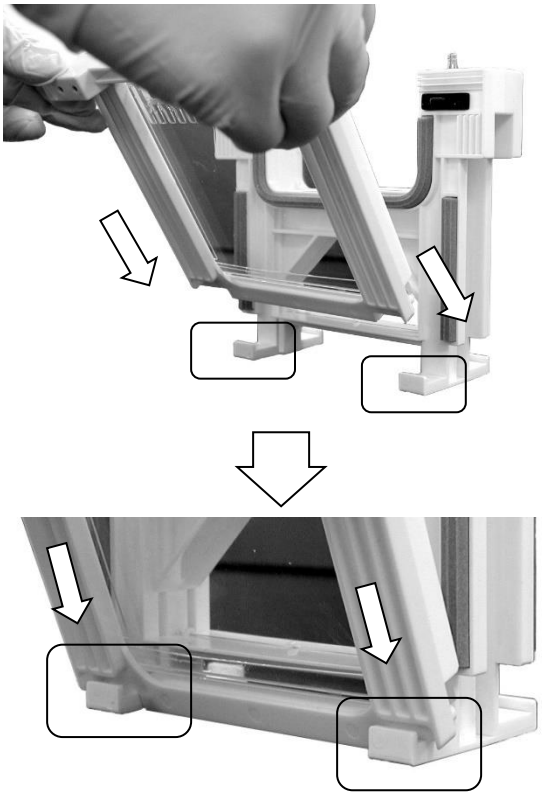
Set the gel on the plate holder.

Install the Glass plate so that it is stored inside the dikes on both sides of the plate holder. Set the Glass plate so that the side without cutout comes to the plate holder side.

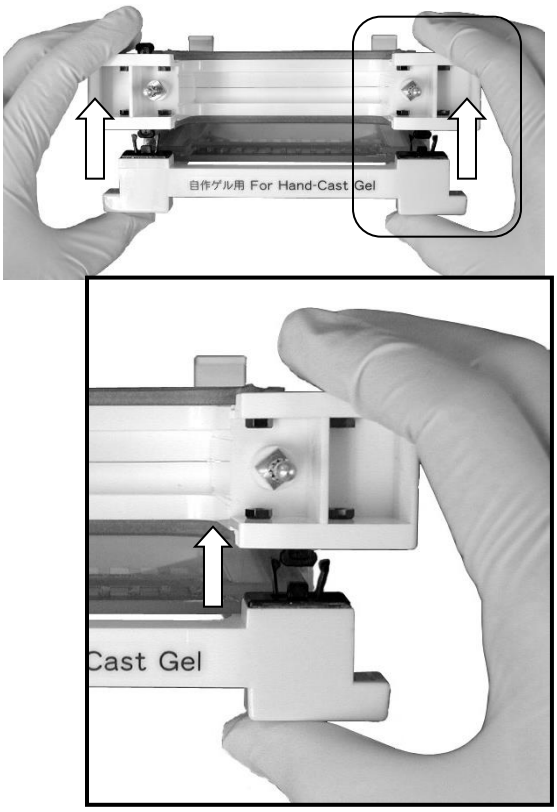


Attach the plate holder onto the core assembly.

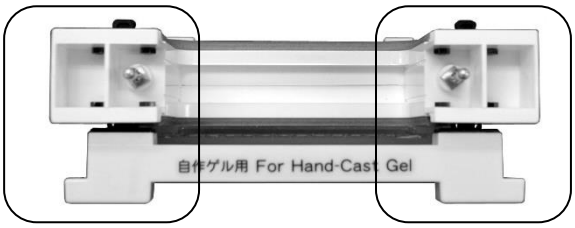
Hitch the dent at the lower edge of the plate holder, onto the legs of the core assembly.

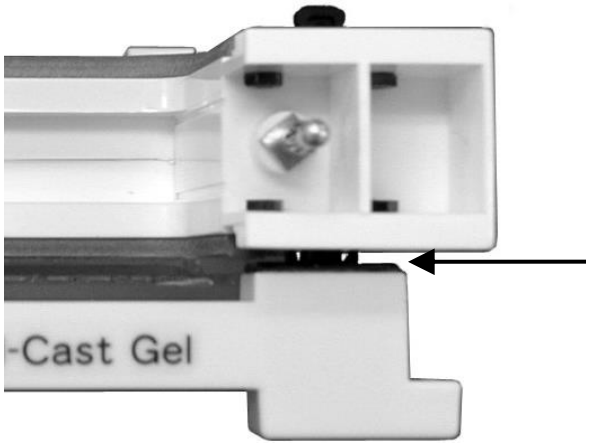


Put the thumb on the upper edge of the plate holder and put the other fingers on the upper edge of the core assembly. Then, push the plate holder to the core assembly side.

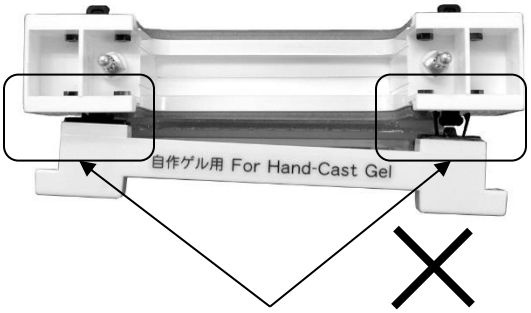


If it clicks, release your fingers. The plate holder is locked onto the core assembly by the push latch.

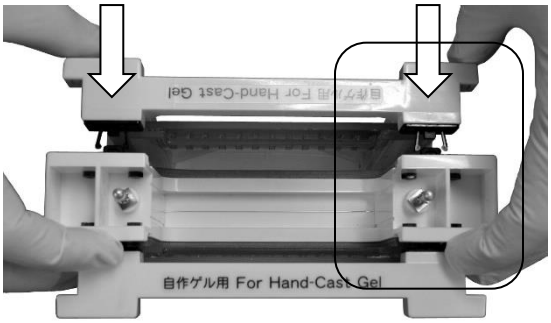


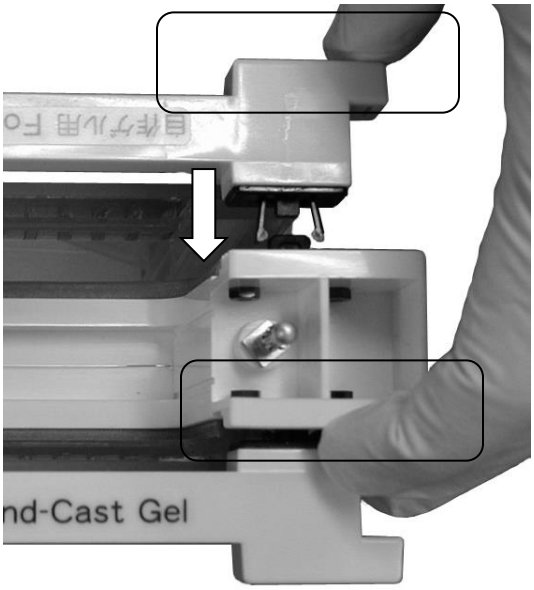


If one side is not locked, the buffer of the upper tank cannot be held. Lock both sides at the same time.

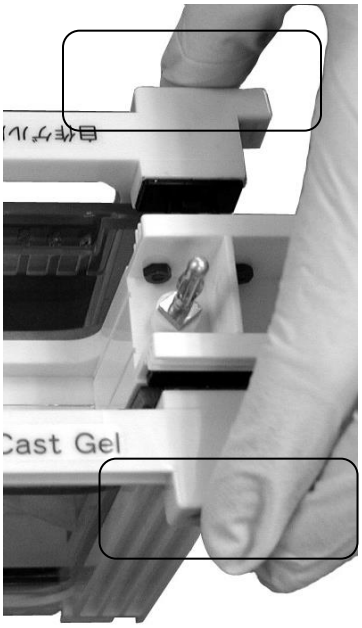


Install the second Glass plate onto the other plate holder in the same way, and attach it to the core assembly. When only one plate is electrophoresed, attach a dummy plate onto the second plate holder.





Do not hold the plate holder or electrode terminal on the opposite side.



Thickness of the dummy plate varies depending on the plates for hand-cast gel and gel for (e-)PAGEL. Attach the matching dummy plate for the plate holder.

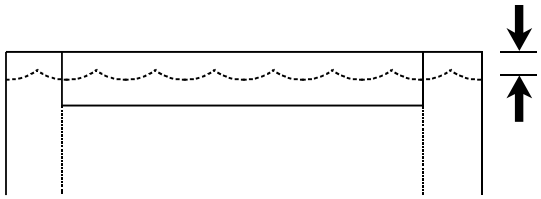
One side of the dummy plate for hand-cast gel is uneven (concave and convex). When you attach the dummy plate for hand-cast gel, be sure to set it so that this uneven surface side will come to the plate holder side.

Set the upper tank into the lower tank.

To do so, sink the upper tank slowly while tilting it so that air bubbles on the lower edge of the gel will be removed.

Pour the Running buffer into to the upper tank. Pour it until the fluid's level becomes about 2 to 3mm below the upper edge of the glass plate.

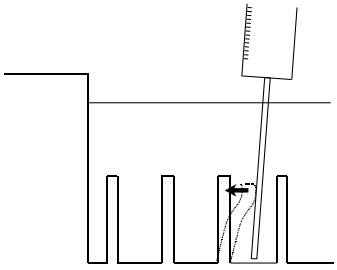
The target amount is approximately 70 to 80mL.



2 to 3mm

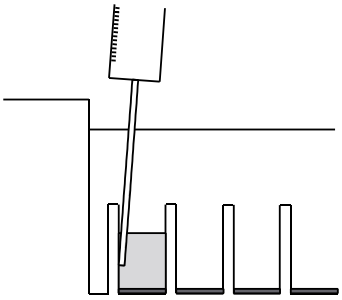
4. Sample addition

Check and confirm that air bubbles are not attached to the well of the gel and the convex parts are standing upright after the comb is removed. If there are any air bubbles, remove them with a needle of the syringe. If the gel is not standing upright, push the side surface of the gel with the needle and set it up vertically.



Add the processed sample solution using a syringe or disposable chip-type pipette. (Use the chip with a narrow tip, which can be inserted between plates.) The maximum amount that can be added is: about 30µL for the 12-well sample comb (RM10-12), about 25µL for the 14-well sample comb (RM10-14), and about 18µL for the 18-well sample comb (RM10-18).

To obtain a clear pattern, do not drop a sample from the upper part of the well, but insert the tip of the needle or chip to the bottom of the well and inject the sample solution slowly so that the surface boundary of the sample solution gradually rises up from bottom.

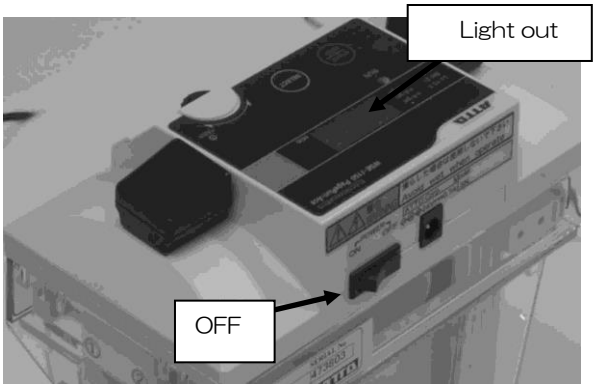


The weight of protein to be added for each well varies depending on the staining protocol, etc.
For CBB: 0.1 to 1µg per 1mm width
e.g.)12-well comb 4.5mm -> 4.5µg
For reverse staining: 1/10 to 1/25 of weight of that of CBB
For silver staining: 1/50 of weight of that of CBB

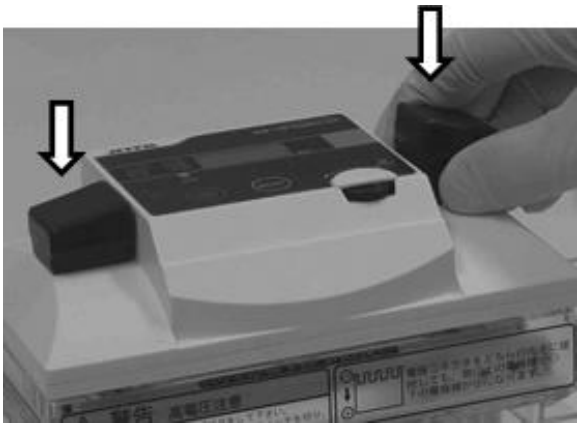
After sample addition is completed, start immediately the power distribution.

5. Preparation for power supply

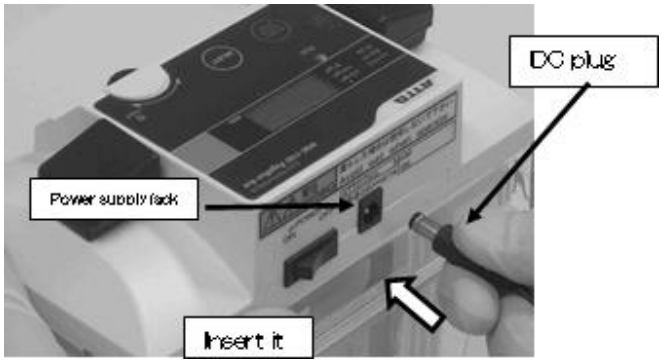
Make sure that the power switch on rear surface of main unit is set OFF.



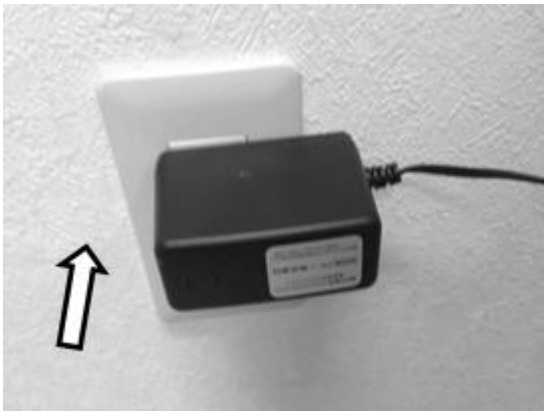
Push the two electrode connectors of the power supply part all the way down until they stop.



Insert the DV plug of the AC adapter into the power supply jack on the rear side of the power supply part until it stops.
Do not use any other AC adapters than the AC adapter attached to this system.



Connect the power plug of the AC adapter or extension cord to an outlet.



6. Set the electrophoresis conditions

Push the power supply switch to the "ON" side.

At this time, the previously set conditions are displayed by memory function.

If electrophoresis is carried out under the same conditions as previously set, it is unnecessary to do the setting again.

Press the SELECT button and select the mode you want, from among the six output modes (Refer to the method for selecting an output mode on next page).

Method for selecting an output mode

There are six types of output modes as shown below:

Mode	Std Gel1	Std Gel2	Lo Gel1	Lo Gel2	Hi Gel1	Hi Gel2
Output value	21mA	42mA	10.5mA	21mA	24W	24W
Number of Gel	1	2	1	2	1	2

If you push SELECT button, you can change the mode.

It changes in order to [Std Gel1]→[Std Gel2] →[Lo Gel1]….

On [Hi Gel2] mode, if you push SELECT button, it returns to [Std Gel1].

Set mode and electrophoresis time according to the gel, buffer type, and electrophoresis sample.

Sample	Gel	Buffer	Number of Gel	Mode	Output	Electrophoresis time
Protein	Hand-cast gel ePagel	EzRun(Tris-Glycine-SDS)	1	Std gel1	21mA	70-80minutes
			2	Std gel2	42mA	70-80minutes
			1	Hi gel1	24W	25-30minutes
			2	Hi gel2	24W	35-40minutes
		EzMOPS	1	Std gel1	21mA	65-75minutes
			2	Std gel2	42mA	65-75minutes
			1	Hi gel1	24W	20-25minutes
			2	Hi gel2	24W	25-30minutes
		EzRun TG (Tris-Glycine)	1	Std gel1	21mA	70-80minutes
			2	Std gel2	42mA	70-80minutes
Protein (2D)	Hand-cast gel ePagel	EzRun (Tris-Glycine-SDS)	1	Std gel1	21mA	80-95minutes
			2	Std gel2	42mA	80-95minutes
Nucleic acid	TBE gel	1xTBE	1	Lo gel1	10.5mA	30-40minutes
			2	Lo gel2	21mA	30-40minutes
	ePagel	EzRunTG (Tris-Glycine)	1	Std gel1	21mA	70-75minutes
			2	Std gel2	42mA	70-75minutes

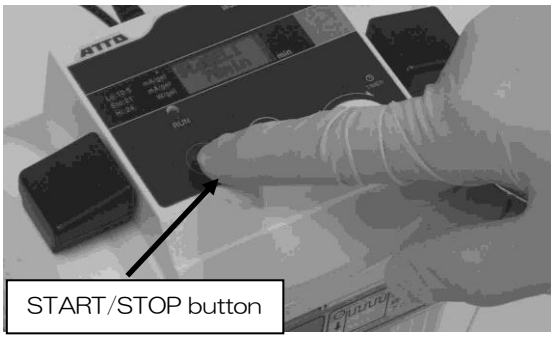
You can set output time if you rotate JOG dial.

Set the time you want with JOG dial.
(1-250 minutes)
(Right direction: Increase,
Left direction: Decrease)

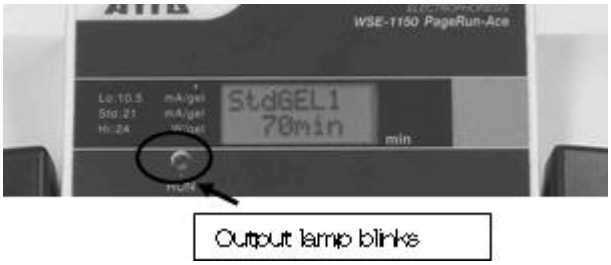
***For setting without timer…**
If you set it as [0], it keeps outputting until you push START/STOP button or maximum outputting time, 999 minutes, passes. Display shows elapsed time.
If you stop this mode with START/STOP button, display shows set value,[0].

7. Start of electrophoresis

Press the "Start/Stop" button to start electrophoresis. The output lamp lights up. The digital display during electrophoresis indicates the remaining time.



While the power is distributed, the output lamp is lit. Display shows the mode and time of outputting.
The time indicates the remaining time. If the SELECT button is pressed while the power is distributed, the preset power distribution time is displayed only when the button is being pressed.



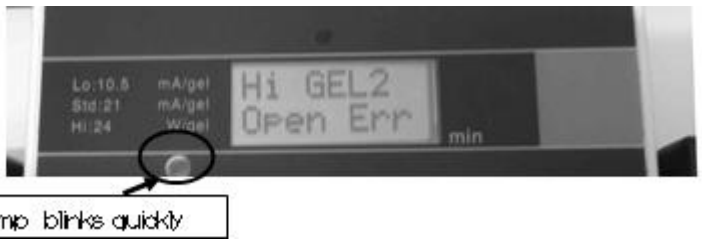
If you don't use timer (set the time as 0), display shows elapsed time. If you push SELECT button while the power is distributed, set value, 0, is displayed only when the button is being pressed.

If the Start/Stop button is pressed while the power is distributed, the power distribution stops. If you want to pause electrophoresis and restart it, press this button again. At that time, the time elapsed before the output is paused will be reset. Set the remaining time anew when you restart.

When Err is displayed.

If an abnormality (i.e. open, short circuit) is detected while the power is distributed, the power distribution is stopped with an alarm, and [Short Err] or [Open Err] message blinks on the electrophoresis time display. Turn the main switch OFF and pull out the AC adapter from the outlet; then, solve the problem following the note below or "Troubleshooting" (page 68).

When an abnormality is detected, [Short Err] or [Open Err] is displayed.



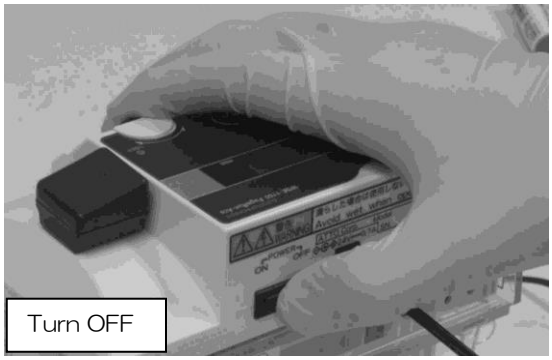
Open (no load) When the current does not run	Neither of the two electrode connectors is pushed all the way to the end.	Push the electrode connectors.
	The amount of buffer is not sufficient. Upper buffer is leaking.	Pour the proper amount of buffer following this document. Install the gel plate properly following this document. If the buffer leaks due to damage or deterioration of the seal packing, replace it with a new one.
Short (short circuit) When excessive current runs	Electrode plug is wet.	Wipe off moisture attached to the electrode plug.
	Core assembly is damaged; especially, the coating on side surface is peeled off and the wiring is bare.	Stop using it immediately and contact our company (please refer to the back cover).
	Inside of power supply system is wet.	
	There may be a failure in the circuit within the power supply system.	

If the amount of liquid decreases even if the proper amount of upper buffer has been poured, the buffer may be leaking into the lower tank. Solve the problem by referring to "Troubleshooting" (page 68).

8. Stop & termination of electrophoresis

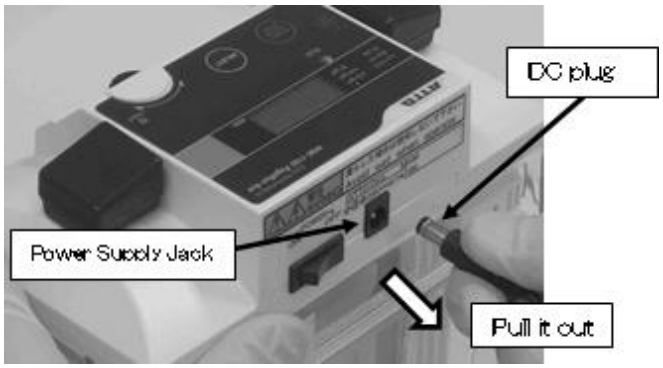
If the preset power distribution time elapses, the distribution automatically stops and "End" is displayed with an alarm.

Push the power switch on the power supply part to the OFF side. Make sure that the LED goes off.

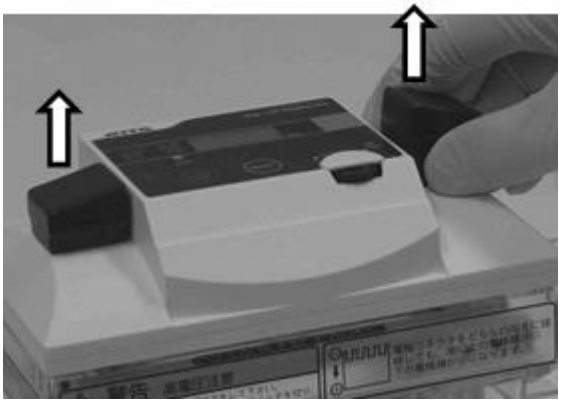


Pull out the power plug of the AC adapter or extension cord from the outlet. Do not leave the power plug inserted in the outlet.

Pull out the power plug from the outlet. Disconnect the DC plug of the AC adapter from the AC adapter connection part on rear surface of the power supply part.

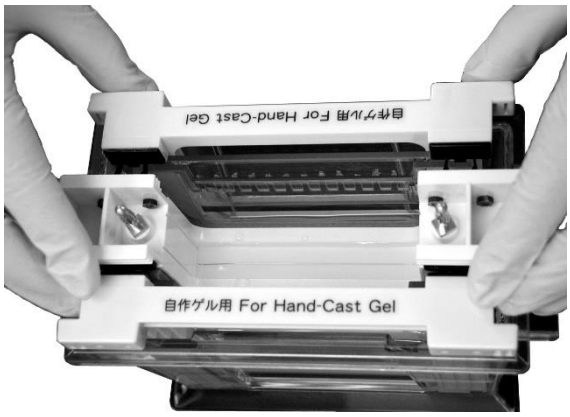


Pull the two electrode connectors upward until they stop. Disconnect the power supply part from the electrophoresis tank.



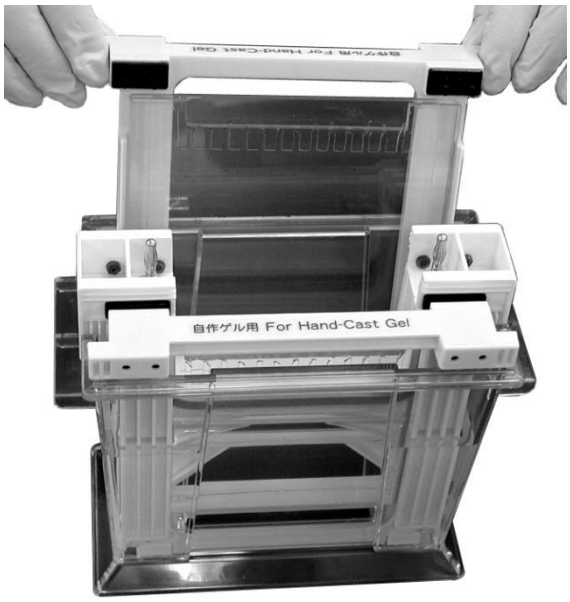
Remove the plate holder from the core assembly.

Push the plate holder to the core assembly side. It clicks and is unlocked. Release your fingers.



Remove the plate holder and the electrophoresis gel from the lower tank.

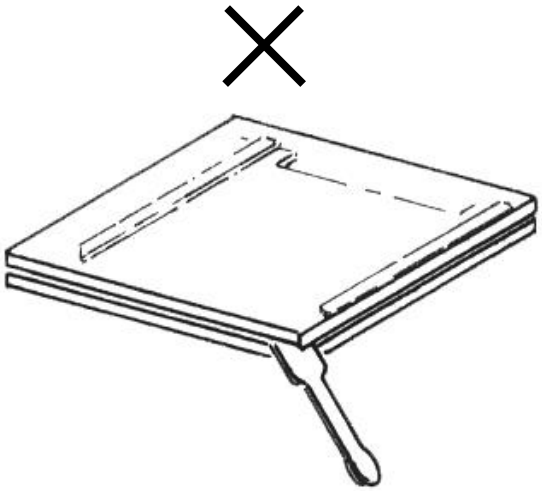
Pull out the Glass plate from the plate holder.



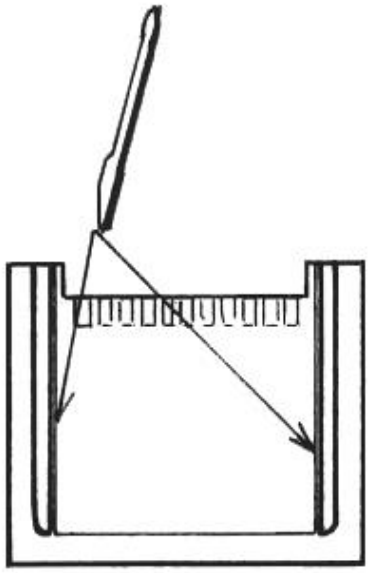
5.4. Detection

Hold the glass plate with your hands facing the side without cutout upward.

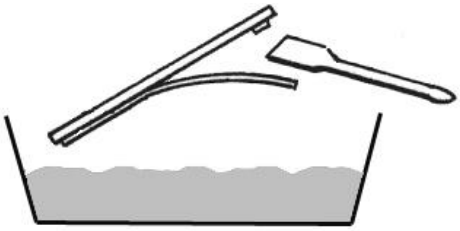
Insert a flat tool, such as spatula, between two plates, and slowly move it up and down to remove the gel plate on upper surface. Insert the spatula in the near center at lower edge. (If you insert it in a corner, the plate may break.)



The gel is attached to the spacer. Moisten a spatula or a knife with staining fluid, and then slowly create a cutout between gel and spacer. Be careful so as to not damage the gel.



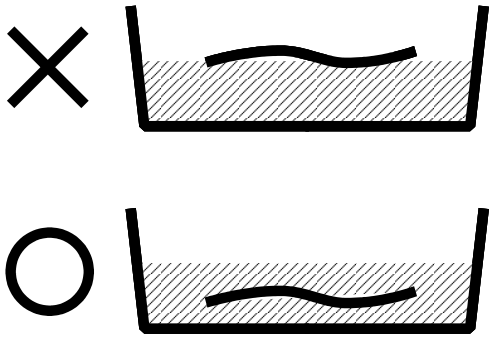
Hold the plate above the bat filled with staining fluid; keep downward the side to which the gel is attached. Then, insert a spatula between gel and Glass plate to peel off the gel.
If you moisten the spatula in advance, the gel will not be affixed and you can prevent it from breaking.



1) Staining of protein

CBB staining

After electrophoresis is completed, sink the gel in the decoloring fluid and shake it for 10 minutes. (If you rinse the gel in the staining fluid immediately without doing this operation, the staining takes a longer time.) Check to see to it that the gel is submerged in the decoloring fluid. If one side of the gel is floating, the staining may be uneven.



Discard the decoloring fluid and pour the CBB staining fluid. Shake it for 60 minutes to 3 hours.

Discard the staining fluid and pour the decoloring fluid. Shake it for 60 minutes to one night.

EzStainAQua (CBB staining solution) and other staining

For ***EzStainAQua*** (CBB staining solution) and other stainings, such as silver staining, negative staining and fluorescent staining, follow the protocol shown in each instruction manual.

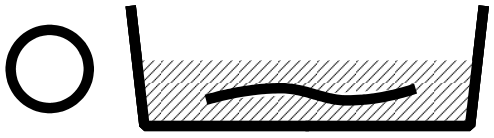
2) Staining of DNA

Ethidium bromide staining

⚠Warning Ethidium bromide is a carcinogenic material. When handling it, be sure to wear gloves and white coat, and do not touch it directly. When you discard the fluid, carry out the proper treatment which your facility required.

When using an ultraviolet light irradiation system, read the instruction manual carefully. Do not use it until you fully understand its contents. Otherwise, your eyes or skin may be damaged or injured. When you irradiate ultraviolet light, protect your body with protective equipment such as protective goggles, face shield, and gloves.

After the electrophoresis is terminated, submerge the gel in the ethidium bromide staining fluid and shake it for 20 to 30 minutes.



Discard the staining fluid and pour 1xTBE buffer. Shake it for 5 to 20 minutes.

Irradiate ultraviolet light for detection.

Other staining

For other stainings, such as silver staining and fluorescent staining, follow the protocol shown in each instruction manual.

5.5. Cleansing / storage of system

Cleansing of system

Wash the used core assembly, lower tank, plate holder, and glass plate/comb (hand-cast specifications only) by putting neutral detergent on soft sponge without any remaining chip of gel, and dry them naturally. If they contact organic solvent such as acetone and alcohol, or are dried at high temperature, deformation or discoloration may occur.

Do not leave the hand-cast glass plate in water for a long time. If you do, the spacer will be peeled off.

Do not leave the plate holder in cleanser solution or water. If you do, the push latch will have an operation problem.

Pay the closest attention to the platinum wire of the electrophoresis tank so that the wire will not be cut. Do not wash it using a metal-woven sponge or test tube brush.

The power supply part cannot be washed in water.

Discard the glass plate of "(e-)PAGEL". If you reuse it, we cannot guarantee its performance.

Storage of system

Do not store the system in the place exposed to direct sunlight, high temperature or corrosive gas. Do not store it with a Glass plate set in the electrophoresis tank. Do not store it with a seal gasket and Glass plate set in the gel maker or electrophoresis tank.

Do not store the electrophoresis tank with a glass plate set. If you do, the seal packing will deteriorate and it will cause buffer leakage during electrophoresis.

6. Troubleshooting

If any trouble occurs with the product, check the type and serial number shown on the label on rear surface of the dedicated electrophoresis power supply with safety cover, and inform our company (please refer to the back cover).

6.1. Troubleshooting

Symptom	Cause	Coping technique
Gel does not polymerize	Incorrect preparation of gel solution.	Mix each solution anew. If gel is not polymerized, create the solution for each gel preparation anew.
	Stale ammonium persulfate solution (solution D).	Prepare the ammonium persulfate solution when it is to be actually used. It can be stored at 4°C for one week only.
	Room temperature or liquid temperature of gel solution is too low.	When the room temperature is 20°C or less, polymerization is difficult to happen. Maintain the temperature for polymerization between 20°C and 40°C approx.
Air bubbles remain in the gel	Glass plate or comb is dirty.	Wash the glass plate and comb before they get dried after use, and store them so that no dust will be attached to them. Do not touch gel contact surface of the plate and comb with a bare hand.

Stripes are seen in the gel	Polymerization speed is not constant.	In the worst case, this affects the electrophoresis pattern. The difference of temperature among plate, comb and gel affects the uneven polymerization speed. Warm up plate, comb, mixed gel solution (do not add TEMED and ammonium persulfate solution) in constant temperature reservoir (approx. 37°C). Pull them out from the constant temperature reservoir once, and then add TEMED and ammonium persulfate to the gel solution and pour it in the plate. Set them in the constant temperature reservoir again and carry out polymerization; then, uneven polymerization speed rarely occurs.
Shape of the well looks strange	After pulling out the comb, unpolymerized acrylamide became polymerized.	Pull out the comb immediately before the use, as far as possible. After pulling it out, wash the well with running buffer or distilled water.
Gel solution leaks from glass plate	Attachment is not proper; seal gasket is clipped between spacer and plate, for example.	Refer to the section of assembly of Glass plate (page 41), and attach them properly.
	Seal gasket and glass plate are damaged.	Replace it with a new one.
	Magnet clip is worn (clipping force is weak).	Replace it with a new one.
Glass plate cannot be set in the plate holder	Glass plate is misaligned.	For the Hand-cast gel, match the corners so that the plate is not misaligned when it is assembled. Also, when the plate is clipped, clip it without misalignment. For (e-)PAGEL, be careful so that the plate is not misaligned when it is pulled out from a bag.
Plate holder cannot be set in the core assembly	Hand-cast gel glass plate or dummy plate for hand-cast gel is attached to the plate folder for (e-)PAGEL.	There are plate holders and dummy plates for hand-cast gel and (e-)PAGEL. Check the type and select the proper combination.
Buffer in the upper tank leaks	Attachment of plate holder to the core assembly is not sufficient.	Check if both push latches are locked. Also, check if the dent at lower edge of plate holder is properly set on the leg of core assembly.

	Glass plate is dirty.	Wash the used glass plate before it is dried. Do not leave a chip of gel, etc. behind. If gel solution poured on the external surface of plate or dirt is attached to the glass plate after gel preparation, remove it with a wet Kimwipes or other tool.
	Too much running buffer was poured in the upper tank.	The buffer sometimes transfers from contact part of glass plate upper edge and seal packing to lower tank because of capillary action. Set the upper buffer so that the fluid level will be 2 to 3mm below the upper edge of plate.
	Thin film of gel is formed between spacer of glass plate and other plate.	This phenomenon occurs when the clipping force of the magnet clip becomes weak due to abrasion. Replace it with a new one.
	Buffer sometimes leaks slightly.	About 1 to 2mL of buffer that contains SDS may sometimes leak over a night or 24 hours. It does not affect electrophoresis.
	Seal packing is damaged.	If the seal packing is broken or peeled off the electrophoresis tank, it is necessary to repair or replace it with a new one. Stop using it and contact our company (please refer to the back cover).
	(e-)PAGEL or dummy plate for (e-)PAGEL is attached to the plate holder for hand-cast gel	There are two types for plate holders and dummy plates: one for hand-cast gel and the other for (e-)PAGEL. Check the type and select the proper combination.
	Dummy plate for hand-cast gel is attached the other way round.	Attach the plate by facing the uneven surface to the plate holder side.
Sample solution will not sink into the well	The well is dirty or the gel is attached to it.	Wash the well with running buffer using a micro pipette or syringe. If dirt or chip of gel can still not be removed, remove it using a needle of the syringe, etc.
	Specific weight of sample solution is too small.	Concentration of glycerin or sucrose in the sample solution may be insufficient. Add the proper amount.

	Magnet clip is worn.	If the clipping force becomes too weak because of abrasion of magnet clip, thin film of gel is sometimes formed on the plate surface of the well. Replace the magnet clip with a new one.
When the comb is pulled out, the wall of the well is torn	Too much gel is adhered to the comb.	Gel solution is sometimes de-aerated for smoother polymerization. In this case, such a symptom likely happens. While it is de-aerated, omit the step.
Electrophoresis time / position of band is different from usual	Output setting is incorrect.	Check the output mode. If "Tris-Gly/(e-)PAGEL 1gel" or "TBE-1gel" is selected for two gel sheets, the current value halves. If "Tris-Gly/(e-)PAGEL 2gel" or "TBE-2gel" is selected for one gel sheet, the current value doubles.
	Composition or concentration of buffer or gel is wrong.	If the composition can possibly be wrong, create it anew.
	pH of gel preparation solution, solution B or solution C is incorrect (in the case of protein electrophoresis).	Keep pH of these solutions. Solution B: pH8.8 Solution C: pH6.8
	Running buffer is reused.	Do not reuse the running buffer.
	Gel is stale.	Use (e-)PAGEL within the expiration date. Use hand-cast gel within the day of creation if it is possible. If it is not used on the same day, store it at 4°C and use it on the next day. It deteriorates gradually, and reproducibility declines.
	The degree of gel polymerization is different.	If much TEMED or ammonium persulfate is added for accelerating the polymerization time, the degree of polymerization of gel changes. We recommend that you prepare the gel always in accordance with the amount and method shown in this document. Also, the room temperature or liquid temperature during polymerization affects the polymerization degree. The temperature during polymerization rarely affects the electrophoresis result if there is no large difference; however, if polymerization is done at approximately 25°C, its reproducibility improves more.

Electrophoresis time / band position is different from usual.	Other factor	The electrophoresis speed is affected by salt concentration of sample solution, running buffer, and ambient temperature in addition to above items. In order to maximize reproducibility, it is necessary to keep each condition as constant as possible.
Pattern gets distorted between lanes (smiling etc.)	Temperature within the gel during is uneven.	If the glass plate is soaked in the buffer in the lower tank, homeothermism of the gel improves. Put the amount shown in this document, into the lower tank.
	Buffer capacity of running buffer descends.	If the buffer that has been used for electrophoresis repeatedly used, disarray of pattern is more likely to occur.
	Salt concentration of sample solution is different between lanes.	Salt concentration of sample solution affects the electrophoresis speed. Keep the salt concentration as constant as possible by demineralization, condensation, dilution (for nucleic acid, ethanol precipitation), etc. Be careful in the case that the restriction enzyme buffer (salt concentration is different depending on the type) is contained or in the case of dilution line.
	There are air bubbles on the lower edge of gel.	If the air bubbles are fine and few, they rarely affect the gel, but large air bubbles may affect it.
When staining, vertical stripes appear in a lane	Dirt or insoluble component is contaminated in the sample solution or well.	Remove the insoluble component in the sample solution by centrifugal separation, etc. Cleanse the well with running buffer.
Electrophoresis pattern becomes fan- shaped	Power is considerably distributed to side surface direction of gel.	If the magnet clip used for preparing the gel is worn, a thin film of gel is likely formed between spacer and plate. The power is distributed from this thin film to side. Replace the magnet clip with a new one.
		This phenomenon is likely if the gel is peeled off the plate. Handle the plates carefully so that they are not misaligned each other or separated. Do not use stale Hand-cast gel you have stored or precast gel which is past its expiration date because they are easily peeled off.

Display part shows nothing even if the main switch is turned ON	Power supply system or AC adapter is out of order.	Check to see if the dedicated AC adapter is properly connected to the power supply system and the power plug is firmly inserted in the outlet. If this does not help, the system may be broken. Please contact our company (please refer to the back cover).
An error (Err) is displayed and the output stops	The power supply detects abnormality.	Please refer to page 59.

7. Maintenance

This chapter explains maintenance, inspection cleaning, and maintenance such as response to operation failure of equipment.

7.1. Cleaning

Power supply part

If the surface is dirty, wipe it off gently with soft cloth dipped in watered-down neutral detergent. If dust is attached to the terminal of the electrode connector, remove it without damaging the terminal of the connector.

⚠Warning When you clean up the main unit, disconnect the AC adapter and turn OFF the power switch.

AC adapter

If the surface is dirty, wipe it off gently with soft cloth dipped in watered-down neutral detergent. Do not use it until it is dried completely.

⚠Warning When you clean up the AC adapter, pull it out of the outlet.

Electrophoresis tank

Clean up the core assembly, lower tank, plate holder, glass plate and comb, using "5.5. Cleansing / storage of system " (page 65) for reference.

7.2. Inspection

Periodical maintenance and inspection can prevent failure or accident, and you can use the equipment safely. The inspection period varies depending on frequency and time of use, but we recommend that you conduct inspection periodically for maintaining good performance.

If you find any error of defect as a result of the inspection shown below, please contact us (please refer to the back cover).

Power supply part

Check visually to confirm that there is no damage, deformation or corrosion on the terminal part of electrode connector.

⚠Warning When carrying out the inspection of power supply part, disconnect the AC adapter and turn OFF the power switch.

AC adapter

Check visually to confirm that the insulation coating is not peeled off and that there is no scratch, damage or deformation.

⚠Warning When carrying out the inspection of AC adapter, pull it out from the outlet.

Electrophoresis tank

Set MB-00 of the Glass plate set to the seal packing side and attach it to the core assembly. Pour the distilled water in the upper tank and make sure that the water does not leak.

Check visually to confirm that there is no deformation, backlash or corrosion on the electrode plug of the core assembly. Also, confirm the same by connecting it with the dedicated electrophoresis power supply with safety cover after disconnecting the AC adapter.

⚠Warning When you are to carry out the inspection of the upper tank with the dedicated power supply connected, please disconnect the AC adapter and turn OFF the power switch.

Hand-cast gel casting set

Assemble the Glass plate following Section 5.2.1 and pour the Distilled water up to below the cutout of the Glass plate MAB-10. Leave it statically for about one hour and make sure that the water does not leak.

7.3. Maintenance / repair

Our products come with a repair service period of 7 years from the date of delivery. Therefore, if you wish to have your product repaired, you will need to request it within this period. However, please note that we generally do not accept repair requests for products that have been in use for more than 7 years.

Furthermore, we store parts for discontinued products for a duration of 7 years after production has ceased. Please be aware that even within the repair service period, there may be cases where repair is not possible due to a lack of available parts..

If any abnormality or failure occurs while using the unit according to this instruction manual, or if you notice any problem during your maintenance/inspection work, please contact us after checking it according to the relevant [Trouble Shooting] item.

When repair is required, please send the unit back to our Technical Service Group, in principle. If on-site repair is requested, travel expense will be required in addition to the repair cost.

Please refer to the end of Manual for enquiry details.

7.4. Warranty

ATTO Corporation warrants all its products subject to the terms and conditions set forth below.

1. This warranty covers all new products that are sold by ATTO Corporation (hereinafter called ATTO).
2. Expendable items are not covered by this agreement.
3. Claims under this warranty are limited to defects in material and workmanship of the products.
4. Malfunction and/or damage due to neglect, abuse, operation or repair contrary to specifications and/or instructions presented by ATTO are not warranted.
5. ATTO shall not be liable to consequential damage, labor, loss or expense directly or indirectly arising from use of the products.
6. Damage due to transit is not covered by this warranty.
7. The warranty period is one (1) calendar year from a date when the products are shipped from ATTO to an original purchaser.
8. This warranty is not applied to any defect that is reported to ATTO later than one (1) calendar month from a date of warranty termination.
9. ATTO Shall supply parts to replace faulty parts of defective products under this warranty, free of charge.
10. ATTO shall repair defective products under this warranty, which cannot be repaired at field, free of charge.
11. ATTO shall replace defective products under this warranty, which cannot be repaired, free of charge.

12. Freight charges for return and replacement shipments under this warranty are shared by ATTO and a purchaser, that is one way by either party and another way by another party.

13. Warranty period of repaired products and replacement products or parts is three (3) calendar months from a date when the said products or parts are shipped from ATTO, or a remaining term of an original warranty period of the defective products, whichever lasts longer.

14. Return of the products for credit or refund is not accepted unless otherwise agreed in writing by ATTO.

8. Specifications

This chapter explains specifications of equipment.

8.1. Specifications

Product name	PageRun-Ace	
Type number	WSE-1150 M	WSE-1150 P
Plate holder	Quick sealing method M/H for hand-cast gel	Quick sealing method P/H for precast gel
Plate size (W x H x D, mm)	120 x 102 x 3	120 x 100 x 2
Gel size (W x H, mm)	90 x 80	90x83
Total thickness of glass plate (mm)	7	5
Thickness of gel	0.75mm, 1mm, 2mm	1mm
Amount of Running buffer liquid	Upper tank 80mL, lower tank 420mL	
Available number of sheets for simultaneous electrophoresis	Max. 2 sheets	
Electrophoresis gel isothermal method	Two-sided constant temperature by using lower buffer solution	
Electrode	Upper tank is negative electrode and lower tank is positive electrode regardless of connection direction of power supply	
Power supply main unit output mod	Constant current and voltage	
Voltage output	- 400V	
Current setting	10.5mA, 21mA, 42mA, 24W	

	1 to 250 min countdown timer display *On 0 min setting, Timer is off and elapsed time is displayed
Alarm	When output stops / when time is up / when an error is detected
AC adapter	
Input	AC100V to 240V (±10%) 50Hz/60Hz (±5%)
Output	DC24V 1.5A
Material	
Core assembly	Polycarbonate
lower tank	Polycarbonate
plate holder	Polycarbonate
Safety cover	Polycarbonate
Power supply case	ABS
Dummy plate	Acrylic
AC adapter	ABS
Safety measures	Power supply all-in-one safety cover, no-load detection, short-circuit detection
Location of use	Only use in a room Operation ambient temperature 5 to 40°C Operation ambient humidity: 5 to 90%RH, no dew condensation
Equipment and status of equipment	Portable equipment
Dimensions / weight	
Main unit	94mm (D) x 163mm (W) x 193mm (H) 0.74Kg (when power supply part is attached, excluding protrusion and AC adapter)
AC adapter	50mm (W) x 95mm (D) x 31mm (H) 0.14Kg

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