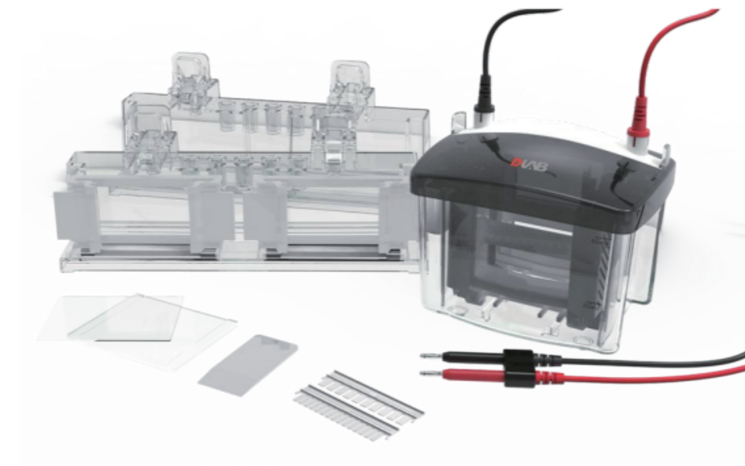
DL–MINI04 vertical electrophoresis tank

operating instruction



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1. Basic product information

1.1 Product Introduction

The DL-MINI04 electrophoresis tank supports both manual gel preparation and pre-prepared gel solutions. The system features a gel preparation rack with glass plates equipped with permanent adhesive gel spacer sheets, simplifying manual casting processes while eliminating leakage risks. Capable of handling 1 to 4 gels simultaneously, this compact tank is compatible with other large-scale electroporation systems from Longtong Laboratory, making it ideal for tank-based electroporation and two-dimensional electrophoresis applications.

1.2Component composition

To obtain optimal performance from the DL-MINI04 electrophoresis tank, assemble and disassemble the sample cell before use to familiarize yourself with the components listed in Tables 1 and 2 (see Figures 1 and 2).

Table 1.DL-MINI04 components.

Assembly	Remarks
Thick gelatinous glass plate	Thick glass is a higher glass plate, which is permanently attached with gel separator on it. The thickness of the separator is 1.0mm and 1.5mmThe thickness is marked on each partition.
Gelatin glass sheet	Thin plates are shorter sheets of glass that combine with thick plates to form a gel box sandwich.
Clamping frame	When the sandwich frame is placed on the table, it can align and fix the thick plate and thin plate evenly, so as to be ready for glue making Form a gel box sandwich structure.
Gel box assembly	A laminated frame, a thick plate and a thin plate form a gel box assembly.
Transparent glue seat	During the gelation process, this transparent gel base ensures the stability of the gel box assembly. It contains a pressure lever to hold the gel box in place The assembly is sealed on the rubber gasket.
Gel box laminates	A thick plate and a thin plate with a polymer gel form a gel sandwich.
Gel barrier	Use molded gel baffles when running one or three gels. 。
Electrode assembly	The electrode assembly carries the gel sandwich, which contains a sealing gasket, upper and lower electrodes, and banana plugs for connections. The anode (lower electrode) banana plug is marked in red, while the cathode (upper electrode) banana plug is marked in black.

Table 2. DL-MINI04 Standard Configuration..

Assembly	Quantity	Remarks
Main body of electrophoresis tank	1 unit	Contains a cover, electrode, wire and buffer tank
Electrolysis tank core (main core and auxiliary core)	2 sets	Used to fix the gel plate
Gelatinous glass plate (1.0 mm)	5 block	101 mm × 82 mm
Gelatin glass shee	5 block	101 mm × 73 mm
10 tooth sampling comb (1.0mm)	Five	Suitable for different sample sizes
Transparent glue seat	Two	Contains gray silicone rubber pad
Clamping frame	Four	Secure the glass panel
A glue shovel	One	Used for picking up glu
Gel barrier	One	Auxiliary glue preparation

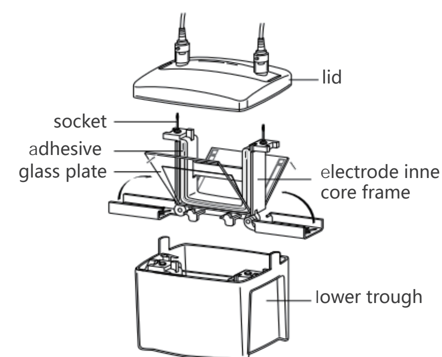

Figure 1. Assembling DL-MINI04

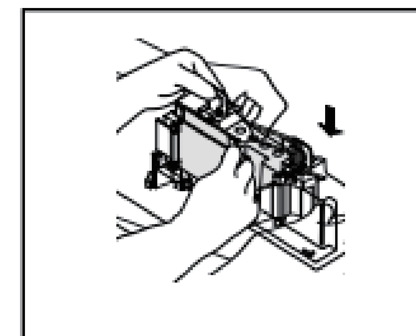

Figure 2. Assembling the DL-MINI04 clip frame and transparent glue seat.

Table 3.DL-MINI04 Specifications.

Project	Parameter
Number of gel	Blocks 1-4 (runs simultaneously)
Gel size	Hand-injected glue: 8.3 cm × 7.3 cm; precast glue: 8.6 cm × 6.8 cm
Glass plate size	Thin glass plate: 10.1 cm × 7.3 cm; thick glass plate (with fixed edge strip): 10.1 cm × 8.2 cm
Gel thickness	0.75 mm, 1.0 mm, 1.5 mm (optional)
Number of comb teeth in the sampling device	10,15 gears (optional)
outline dimension	6*12*18cm
Buffer capacity	1-2 pieces of glue: 700 mL; 3-4 pieces of glue: 1000mL
Electrode materials	99.99% high purity platinum wire, excellent electrical conductivity
peak voltage	600V (DC)
maximum power	30W

Table 4. Maximum sample quantity per well.

		Gel thickness		
hole count	Wide hole	0.75mm	1.0mm	1.5mm
5	12.7mm	20ul	105ul	160ul
9	5.08mm	33ul	44ul	66ul
10	3.35mm	33ul	44ul	66ul
15	6.2mm	20ul	26ul	40ul
IPG	6.2	—	420ul	730ul
Pre-treatment/2-D				
Reference aperture width	3.1mm	13ul	17ul	30ul
Sample holes	71.1mm	310ul	400ul	680ul

The power supply for DL-MINI04 is provided by an external DC voltage source (not included). The output of this power supply must be isolated from the external ground to ensure that the DC voltage output is floating relative to the ground.

- Maximum voltage limit of 600 V DC
- Maximum power limit 30 W
- Maximum ambient temperature limit 40°C

The current flowing into the electrophoresis tank enters the device through the lid assembly, which provides safety interlock for users. When the lid is removed, the current flowing into the electrophoresis tank is disrupted. Always turn off the power supply before removing the lid. Do not attempt to use an electrophoresis tank without a safety lid.

2. Installation and operation

2.1 Gel making step

1. Assembly of glass and glue bracket

Note: All glass plates should be kept clean and dry.

a. Place the laminated frame vertically with the pressure cam in the open position and placed forward on a flat surface.

b. Select the pad with the desired gel thickness and place a thin plate on it (see Figure 3A).

c. Orient the thick plate so that the markings face upward. Then slide two glass plates into the gluing frame, keeping the shorter plate facing the front of the frame (the side with the pressure cam) (see Figure 3B).

Note: Ensure that both plates are placed flat on a horizontal surface and the labels on the thick plate are in the correct direction. If the plates are not aligned or the direction is incorrect, leakage may occur.

d. After the glass plate is in place, start the pressure cam to clamp the glass in the gluing frame (see Figure 3C). Ensure that both plates are level at the bottom.

e. The laminated frame (with the locking pressure cam facing outward) is placed on the transparent glue seat, and the spring-loaded lever of the glue seat is combined with the thick plate (see Figure 3D), so that the laminated frame is placed into the transparent glue seat.

f. Repeat steps 1A-E for other gels.

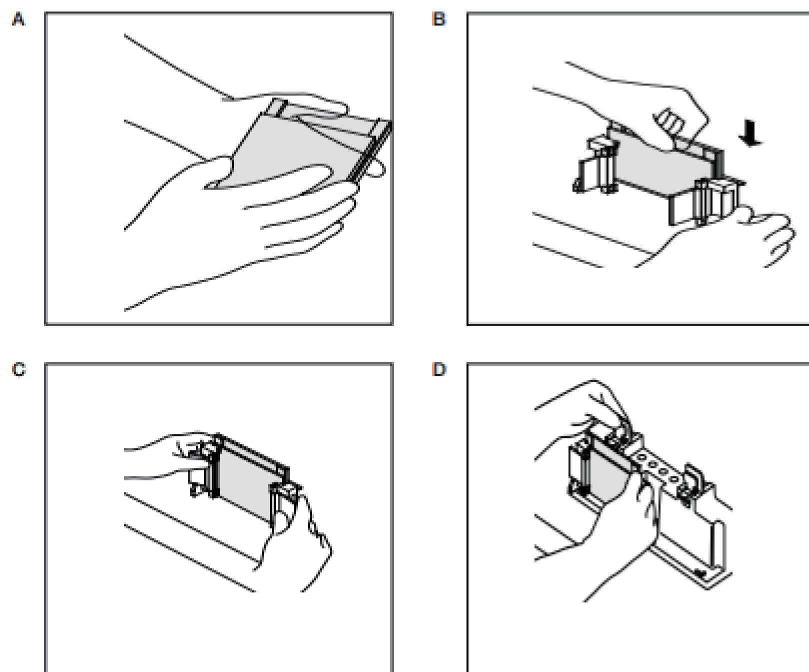

Figure 3. Assembly of DL-MINI04 glass and glue bracket.

2. Gel casting

a. Discontinuous polyacrylamide gel

I. Place the comb completely into the assembled gel box. Mark the glass plate 1 cm below the comb teeth. This is the pouring level for separating the gel. Remove the comb.

II. Prepare the separation gel solution by mixing all reagents except ammonium persulfate (APS) and TEMED. (Refer to Section 4 for the gel formulation.) De-gas the solution under vacuum for at least 15 minutes. Do not use a water bath pipette.

III. Add APS and TEMED to the degassed solution, and pour the solution into the predetermined scale line using a glass or disposable plastic pipette. Keep the solution stable during operation to prevent mixing with air.

IV. Immediately cover the solution with water or methanol.

Note: If water is used, add it slowly and evenly to prevent mixing.

V. Perform gel polymerization for 45 minutes to 1 hour. Thoroughly rinse the gel surface with distilled water. Avoid leaving the alcohol coating on the gel for over 1 hour, as it may cause dehydration at the top of the gel. Note: The separated gel can be stored overnight at room temperature. Add 5 mL of 1:4 diluted 1.5 M Tris-HCl, pH 8.8 buffer (for Laemmli system) to the separated gel to maintain hydration. If using other buffer systems, add 5 mL of 1x separated gel buffer for storage.

VI. Preparation of concentrated gel solution. Mix all reagents except APS and TEMED. Degas u nder vacuum for at least 15 minutes.

VII. Dry the top of the separation gel with filter paper before pouring in the concentrate.

VIII. Add the APS and TEMED to a degassed concentrated gel solution and pour the solut ion between the glass plates until reaching the top of the short plate.

a. Continuous polyacrylamide gel

I. Prepare the solution by mixing all reagents except APS and TEMED. De-gas under vacuum for 15 minutes (see section 4 for the gel formulation).

II. Add APS and TEMED to the degassed solution, then pour the solution between the glass plates until reaching the top of the short plate.

III. Starting from the top of the thick plate, insert the required comb between the pads, ensuring that the tongue at the end of each sampling comb is guided between the pads. Align the ridge of the sampling comb with the top of the thin plate and place it into the gel box.

IV. Rinse the glue making bracket and leave it with distilled deionized water after use.

2.2 Module assembly

■ Clean and dry the DL-MINI04 electrophoresis tank

■ Electrophoresis module (for 1 or 2 gels using the electrode assembly module; for 3 or 4 gels, also use the matching operation module)

■ Running buffer (700 ml for 1-2 gels; 1000 ml for 3-4 gels)

■ MInI-PROTEAN precast gel or hand poured gel

■ Use the matching DL-MINI04 electrophoresis instrument

1. Assembly

Note: When running one or two gels, use the electrode assembly (the one with the banana connector) instead of the matching run module (the one without the banana connector). When running three or four gels, you must use both the electrode assembly and the matching run

module simultaneously (each assembly can process up to two gels).

a. Set the inner core frame in the open position on a clean plane (see Figure 4A)

b. Position the first gel sandwich or gel cartridge (with the shorter end facing inward) on the gel holder. The gel holder is molded into the bottom of the inner frame assembly, with two supports on each side of the assembly. Note that the gel will now tilt at a 30° angle toward the center of the clamping frame. Handle the first gel carefully to ensure the clamping frame remains balanced and does not tip over. Next, place the second gel on the opposite side of the clamping frame, again positioning it against the supports. At this point, there will be two angled gel units: one on one side of the clamping frame and the other on the opposite side, both tilting away from the frame's center (see Figure 4B).

Note: It is crucial to position the gel cartridge in the holder with the short end facing inward. Additionally, the holder requires two gels to create a fully functional assembly. If an odd number of gels (one or three) are in operation, you must use a gel shield (see Figure 4B).

c. Gently pull the two gels together with one hand to ensure that they fit firmly and flatly against the strip embedded in the holding frame; at the same time, make sure that the short piece is just below the groove at the top of the strip.

d. Gently press the gel sandwich or magnetic strip with one hand to reattach it to the green backing (maintaining constant pressure and securely securing both gels in place), while sliding the green arm of the clamping frame over the gel to lock it in position. Alternatively, you may choose to hold the entire assembly with both hands, ensuring the gel remains stable while simultaneously sliding the arm of the clamping frame into place (see Figure 4C).

The arms of the clamping frame push the short plates of each gel cartridge into the grooves on the rubber strip, creating a leak-proof seal (double-check to ensure the short plates are precisely positioned below the top groove of the rubber strip). At this stage, the sample wells can be rinsed with mobile buffer solution and samples loaded (Figure 4D).

（ graph 4D ）。

Note: If more than two gels are run, repeat steps 1a-d using the accompanying run module.

Important: Before attempting to lock the arms of the frame, make sure the gel box is fully aligned and stable with the groove on the module. To prevent gel displacement during locking, hold it firmly and evenly in the center of the module with one hand.

Warning: Do not put the matching running module into the electrophoresis tank when running one or two gels. This will cause overheating and affect the electrophoretic separation effect.

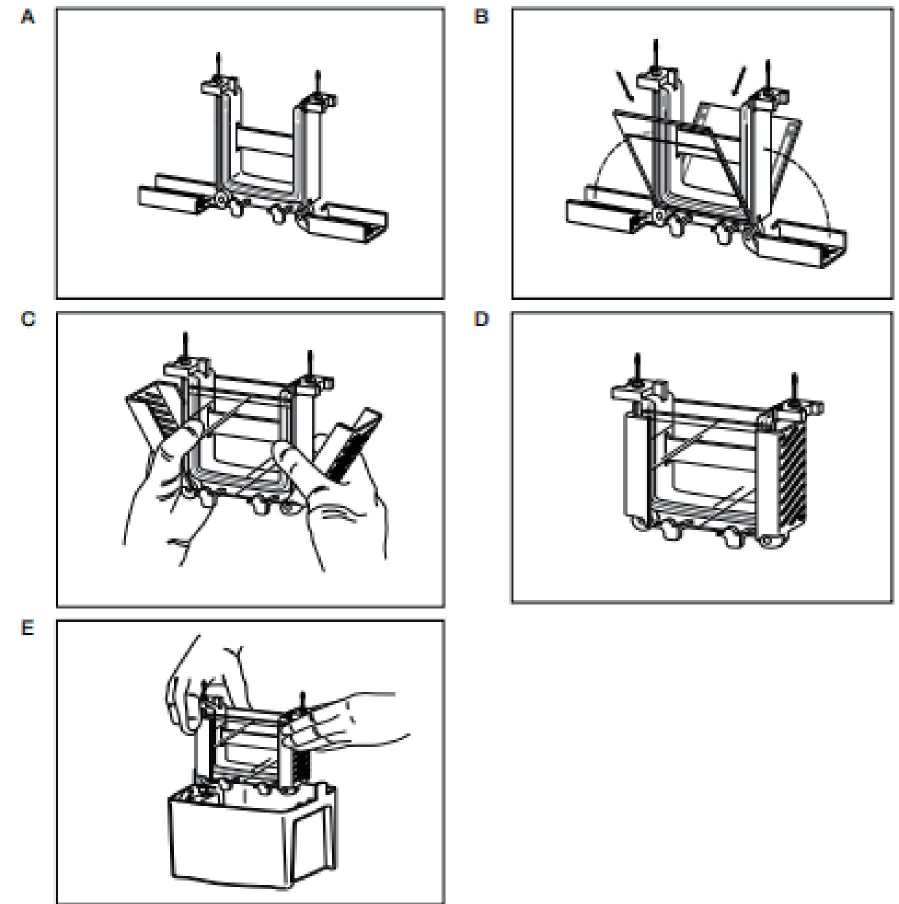

Figure 4. Assembly of DL-MINI04 electrophoresis module.

2. Sample loading

a. Add buffer solution to the inner tank until the edge of the outer gel plate is reached.

b. When the sample is placed on a plane outside the tank, load the sample into each component.

c. Sample is loaded into a well using a microinjection or a pipette with a gel loading tip.

Note: Load the sample slowly so that it settles evenly at the bottom of the well. Be careful not to puncture the bottom of the well with a syringe needle or pipette.

Note: Samples may be loaded into the module before it is placed in the slot, and samples may also be loaded into the module after the module is placed in the slot. Both methods will produce

3. Placement instructions for electrode assembly in the DL-MINI04 electrophoresis tank: For two gels, the total buffer volume is 700 ml; For four gels, the total buffer volume is 1,000 ml.

The DL-MINI04 electrophoresis tank has two locations for placing two components: the electrode assembly (rear position) and the matching operation module (front position).

a. First, place the electrophoresis outer tank on a flat surface with the front of the tank facing you. After proper alignment, the red mark on the top edge of the outer tank will be on your right side, and the black mark on the top edge of the outer tank will be on your left side.

b. If running one or two gels, you will only use the electrode assembly, so place the assembly in the rear position of the battery and make sure that the red electrode jack matches the red mark on the upper right inner side of the outer slot.

c. When running four gel units, position the electrode assembly (banana connector) at the rear while placing the matching operation module (without connector) at the front. Ensure both configurations align the red (+) electrode with the red marker on the upper right corner of the water tank. Note: Incorrect placement will prevent proper lid installation.

d. Add buffer to the indicated level to fill the outer tank (lower shell).

4.DL-MINI04 Electrophoresis tank assembly

Secure the cover onto the DL-MINI04 outer slot. Align the color-coded banana connector with the corresponding hole on the electrode assembly. The correct positioning is achieved by matching the cover's hole with the electrode component's connector. The stop block on the cover prevents misalignment. Note that the protruding strips on both sides of the outer slot now guide the cover into place through its groove. Gently press the cover with your thumb to ensure even pressure, securing it tightly and snugly against the outer slot.

Warning: Do not put the matching running module into the outer tank when running one or two gels. This will cause overheating and affect the electrophoresis separation effect.

5. Power supply conditions

a. Insert the wire into a suitable power supply with the correct polarity.

b. Apply the power supply to the DL-MINI04 and initiate electrophoresis. It is recommended to use a constant voltage of 200 volts for SDS-PAGE and most in situ gel applications. Whether using two or four gels, the same voltage (200 volts) should be applied. The optimal voltage may vary depending on specific applications. For SDS-PAGE, the recommended running time at 200 volts is approximately 35 minutes.

6. Gel removal

a. After electrophoresis, turn off the power supply and disconnect the connection.

b. Remove the top cover and carefully remove the electrode assembly. Pour off and discard the flow buffer.

Note: Before opening the arm of the component, be sure to drain the buffer to avoid overflow.

c. Open the arm of the component and remove the gel box.

d. Take out the gel from the gel box by gently separating the two plates of the gel box.

e. The gel is floated on the fixative or transfer solution by flipping the gel and plate, and gently stirred until the gel is separated from the plate, thereby removing the gel.

f. Rinse the electrode assembly, laminated frame and outer tank of DL-MINI04 electrophoresis tank with distilled water after use.

3. Separation theory and optimization

3.1 Introduction

Polyacrylamide gel electrophoresis separates molecules in complex mixtures based on size and charge. During the process, complex interactions occur between the sample, gel matrix buffer, and electric current, resulting in band separation of individual molecules. Therefore, key variables to consider during electrophoresis include gel pore size, gel buffer system, and the properties of target molecules.

The gel pores are formed through cross-linking between polyacrylamide and bisacrylamide (bis) to create a porous network. This structure enables molecular sieving through the gel matrix. The pore size of the gel is a function of the acrylamide monomer concentration (%T). By convention, polyacrylamide gels are characterized by%T, which refers to the weight percentage of total monomers including the cross-linking agent.

%T indicates the relative pore size of the gel. Generally, the pore size decreases as%T increases.

%T is calculated using the following formula.

%T= (g acrylamide + g linear crosslinker x 100%) / total volume (ml)

%C is the ratio of acrylamide monomer in the solution of crosslinking agent and monomer.%C is calculated by the following formula.

C%=g crosslinking agent x100%/g acrylamide +g crosslinking agent

2.67% C is traditionally used for most analytical gels.

Gels can be prepared as a single continuous percentage throughout the gel or as a gradient%T through the gel. For single, percentage gels, typical components range from 7.5% to 20%, or a gradient range of 4-15 to 10-20%.

The optimal total monomer concentration for separation is termed the optimal%T. This optimal%T varies depending on the molecular weight of the target molecule. Empirically, the pore size that provides optimal resolution for proteins corresponds to a relative migration rate (Rf) value of 0.55-0.6. The Rf values for specific proteins are calculated as follows.

Rf= distance of migration of a particular protein / distance of migration of the ion frontier

Gel buffer system

The buffer system determines the required energy and affects the separation effect. The buffer system consists of the buffer solution used in the gel and the running buffer solution. The buffer system can be divided into continuous and discontinuous types.

Continuous buffer system

In continuous buffer systems, identical buffer ions maintain a constant pH in both the gel and electrode reservoir. The gel is typically composed of continuous%T layers, with samples directly loaded onto the portion of the gel where separation occurs. The band width depends to some extent on the loading height of the sample. Therefore, to achieve optimal results, it is advisable to increase the sample concentration while reducing its volume.

Non-continuous buffer system

In non-continuous buffer systems, distinct buffer ions exist in both the gel and electrode solutions. By using different buffers in these solutions and adding overlay gels to the resolving gel, samples can be compressed into a thin starting band, enabling precise analysis and separation of individual proteins. While originally designed for undenatured (natural) proteins, the most widely used non-continuous system is the SDS-PAGE buffer developed by Laemmli in 1970. The formulation details of this system are provided in Section 4.2.

3.2 SDS-PAGE (Laemmli) buffer system

The Laemmli buffer system is a discontinuous buffer system containing sodium dodecyl sulfate (SDS). In this system,

The proteins are denatured by heating in a buffer solution containing SDS and thiol reducing agents (such as 2-mercaptoethanol). The resulting denatured peptides exhibit rod-like morphology with uniform charge-to-mass ratios proportional to their molecular weights. This enables protein separation based on molecular weight, making the system highly valuable for molecular weight determination.

3.3 Native PAGE (NPG)

Native PAGE (Native Polyacrylamide Gel Electrophoresis) is a technique for separating bioactive proteins. Unlike SDS-PAGE, protein migration in Native PAGE depends on both molecular size and charge. Currently, no single electrophoresis buffer system can optimize the separation of all natural proteins. Key parameters for protein separation in Native PAGE include the isoelectric point (pI) of the target protein and the pH value of the electrophoresis buffer.

pH take part in pI

The pH of electrophoresis buffer must be within the range that stabilizes target proteins while preserving their biological activity. Additionally, the buffer's pH should provide sufficient charge to enable protein migration through the gel. pH variations affect both the charge and hydrodynamic volume (fluidic volume) of target proteins, thereby influencing migration rates. For example, when the buffer pH exceeds the protein's pI, the protein becomes negatively charged and migrates toward the positive electrode (anode). Conversely, when the buffer pH is lower than the pI, the protein carries a positive charge and migrates toward the negative electrode (cathode). At pH equal to pI, the protein remains uncharged and does not migrate under the electric field.

The migration rate of proteins is most susceptible to buffer pH. A buffer with a pH closer to the protein's isoelectric point (pI) provides optimal resolution but may require longer running times. Conversely, buffers with pH values far from pI allow faster protein migration, though at the cost of reduced resolution. Therefore, selecting an appropriate pH represents a trade-off between separation efficiency and processing speed.

How to choose a Native PAGE system

1. Non-continuous buffer system (Ornstein)

The discontinuous buffer system should be the preferred non-modified gel system. The advantage of the discontinuous system is that it uses concentrated gel to concentrate the dilute protein samples, but concentration may also cause some proteins to aggregate and interfere with resolution. If protein aggregation occurs, the continuous buffer system should be used.

Note: The pH of Ornstein system separation gel is approximately 9.5, which may exceed the stability range of certain proteins and cause denaturation. Additionally, the isoelectric point (pI) of the target protein may be too close to or higher than the pH of Ornstein buffer (9.5), potentially resulting in extremely low net charge or positive net charge, which could significantly

reduce or even prevent migration to the anode. Alternative discontinuous systems can be referenced from Chrambach et alJovin (1983).

Note: It is best to know the pI of the target protein before choosing a buffer system.

2. Continuous buffer system

When discontinuous systems are inadvisable due to protein aggregation caused by concentration, continuous buffer systems should be employed. In these systems, the same buffer solution is used for both the upper and lower electrode chambers as well as the gel. Since no concentration occurs, the migration band width of proteins is at least equivalent to the sample volume, thus minimizing the sample volume is essential. In continuous systems, protein migration is determined by the pH factor rather than through the molecular sieve action of polyacrylamide gels. Therefore, most applications recommend using 6% polyacrylamide gels; for exceptionally large proteins, 4% or 5% gels may be employed. McLellan (1982) documented various continuous buffer systems with pH values ranging from 3.8 to 10.2.

4. Preparation of reagents and stock solutions

4.1 Volume required per gel

The volumes listed in Table 5 are required for fully filled gel boxes. The amount can be adjusted according to the application (with or without an electrophoretic comb

With or without concentration gel, etc.).

Table 5. Capacity requirements.

Gel thickness (mm)	Volume (ml)
0.5	2.8
0.75	4.2
1	5.6
1.5	8.4

Note: 10 mL of monomer solution is sufficient to stack any thickness of gel.

4.2 Concentrate

configuration 5% concentrate formulation

Ingredient	1 mL	2 mL	3 mL	4 mL	5 mL	6 mL	8 mL	10 mL
water (mL)	0.68	1.4	2.1	2.7	3.4	4.1	5.5	6.8
30% acrylamide (mL)	0.17	0.33	0.5	0.67	0.83	1	1.3	1.7
1.0 mol/LTris (pH6.8, mL)	0.13	0.25	0.38	0.5	0.63	0.75	1	1.25
10% SDS (mL)	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.1
10% ammonium persulfate (mL)	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.1
TEMED (mL)	0.001	0.002	0.003	0.004	0.005	0.006	0.008	0.01

4.3 Preparation of Separation Gel (Tris-glycine SDS system)

6% separation gel formulation

Ingredient	5 mL	10 mL	15 mL	20 mL	25 mL	30 mL	40 mL
water (mL)	2.6	5.3	7.9	10.6	13.2	15.9	21.2
30% acrylamide (mL)	1	2	3	4	5	6	8
1.5 mol/LTris (pH8.8, mL)	1.3	2.5	3.8	5	6.3	7.5	10
10% SDS (mL)	0.05	0.1	0.15	0.2	0.25	0.3	0.4
10% ammonium persulfate (mL)	0.05	0.1	0.15	0.2	0.25	0.3	0.4
TEMED (mL)	0.004	0.008	0.012	0.016	0.02	0.024	0.032

8% Separation gel formulation

Ingredient	5 mL	10 mL	15 mL	20 mL	25 mL	30 mL	40 mL
water (mL)	2.3	4.6	6.9	9.3	11.5	13.9	18.5
30% acrylamide (mL)	1.3	2.7	4	5.3	6.7	8	10.7
1.5 mol/LTris (pH8.8, mL)	1.3	2.5	3.8	5	6.3	7.5	10
10% SDS (mL)	0.05	0.1	0.15	0.2	0.25	0.3	0.4
10% ammonium persulfate (mL)	0.05	0.1	0.15	0.2	0.25	0.3	0.4
TEMED (mL)	0.003	0.006	0.009	0.012	0.015	0.018	0.024

4.4 Common buffer and carrier buffer

Common buffer

Type of buffer	Fluid	Storage solution preparation
TAE (Tris-Acetate-EDTA)	1×	50×:242 g Tris, 57.1 ml glacial acetic acid, 100 ml 0.5 mol/LEDTA (pH 8.0)
TPE (Tris-Phosphate-EDTA)	1×	10×:108 g Tris, 15.5 mL 85% phosphoric acid, 40 mL 0.5 mol/LEDTA (pH 8.0)
TBE (Tris-Borate-EDTA)	0.5×	5×:54 g Tris, 27.5 g boric acid, 20 ml 0.5 mol/LEDTA (pH 8.0)

6X sample buffer

Type	Ingredient	Storage temperature
Ⅰ	0.25% bromophenol blue, 0.25% xylene cyan, 40% sucrose aqueous solution	4℃
Ⅱ	0.25% bromophenol blue, 0.25% xylene cyan, 15% sucrose solution	room temperature
Ⅲ	0.25% bromophenol blue, 0.25% xylene cyan, 30% glycerol aqueous solution	4℃
Ⅳ	0.25% Boilurubin, 40% sucrose aqueous solution	4℃

5. Maintenance

DL-MINI04 Electrophoresis tank and lid

After each use, thoroughly rinse the electrode assembly, accessories, cast seat and frame with distilled water.

Rinse the electrode thoroughly with distilled water after each use

Glass plates and combs

Clean with a laboratory detergent and rinse thoroughly with distilled water. Immerse the thick plate in a strong alkaline solution, such as>100

M NaOH, for no more than 24 hours.

6. Troubleshooting Guide

Problem phenomena	Possible causes	Rx
The strip is in the shape of a "smile" (concave in the middle and upturned on both sides)	Inhomogeneous gel solidification (common in thick gels)	Extend the gel polymerization time to ensure full solidification
The strip is wrinkled (bulging in the middle and flaring on both sides)	There are bubbles on the bottom of both plates	Remove the bottom bubble during assembly to ensure that the glass plate fits the gasket
Drag the bar	The sample was not well dissolved, the concentration of the separation gel was too high, and the buffer was used	Centrifuge the samples before adding the sample, select an appropriate buffer to reduce the gel concentration
	The liquid is ineffective	Change the buffer solution
The indicator strip runs out of the board but the protein is not separated	Buffer pH error or excessive concentration of separation gel	Check the buffer solution formula and replace the correct pH buffer solution to reduce coagulation
		Gel concentration
The staining background is high	Impurities such as SDS are not completely removed	After electrophoresis, extend the washing time or increase the number of washing times with double distilled water
No bands after staining	The gel is too thick or the sample is insufficient	Reduce the thickness of the gel, increase the amount of sample on the sample, and add BSA to the
		Sexual contrast

7. References

- Chrambach A and Jovin TM (1983) Selected buffer systems for moving boundary electrophoresis on gels at various pH values, presented in a simplified manner Electrophoresis 4, 190--204
- Laemmli UK (1970) Cleavage of structural proteins during the assembly of the head of bacteriophage T4 Nature 227, 680--685
- McLellan T (1982) Electrophoresis buffers for polyacrylamide gels at various pH Anal Biochem 126, 94--99
- Ornstein L (1964) Disc electrophoresis I Background and theory Ann N Y Acad Sci 121, 321--349

8. Quality assurance

The product complies with the laboratory electrophoresis equipment standard and provides 5 years warranty (non-manual damage).

Please read the operation manual carefully before use to ensure correct use.

For inquiries or repair service requests, please contact Dalong service personnel.