invitrogen

SureLock™ Tandem Midi Blot Module

USER GUIDE

Catalog Numbers STM2001

Publication Number MAN0018515

Revision B.0

For Research Use Only. Not for use in diagnostic procedures.

ThermoFisher SCIENTIFIC

Contents

- SureLock™ Tandem Midi Blot Module 5

Product description 5
Product specifications 7
Overview of Blot Module assembly 9
Before you begin 9
Guidelines 9
Materials required but not provided 10
Prepare 1X Transfer Buffer for Novex™ Tris-Glycine Plus Midi Gels 10
Prepare 1X Transfer Buffer for NuPAGE™ Bis-Tris or Tris-Acetate Midi Gels 10
Prepare sponge pads 11
Prepare transfer membrane 11
Prepare filter paper 12
Prepare gel for transfer 12
Protein Transfer Protocol 18
Materials required 18
Guidelines 18
Assembly overview 19
Assemble transfer stack and Blot Module 20
Perform protein transfer 24
Transfer protocol 26
Run conditions 27
Remove and wash the membrane 27
Post-transfer analysis 28
Maintenance 28
Cleaning the Blot Module 28
Cleaning the sponge pads 29
Cleaning the tray 29
Storage 29
Troubleshooting 29
Related products 33
Customer and technical support 35

Gasket installation instructions (STM2003) 36

Buffer recipes 38

Prepare 25X Tris-Glycine Transfer Buffer 38
Prepare 20X NuPAGE™ Transfer Buffer 38

Tank and Blot Module safety 39

Safety 41

Symbols on this instrument 41
Standard safety symbols 42
Additional safety symbols 42
Control and connection symbols 44
Conformity symbols 44
Safety information for instruments not manufactured by Thermo Fisher Scientific 45
Instrument safety 45
General 45
Electrical safety 46
Cleaning and decontamination 47
Safety and electromagnetic compatibility (EMC) standards 47
Safety standards 48
Environmental design standards 48
Chemical safety 49

Limited product warranty 51

SureLock™ Tandem Midi Blot Module

WARNING! Read the Safety Data Sheets (SDSs) and follow the handling instructions. Wear appropriate protective eyewear, clothing, and gloves. Safety Data Sheets (SDSs) are available from **thermofisher.com/support**.

Product description

Invitrogen™ SureLock™ Tandem Midi Blot Module is a simple wet transfer unit designed for blotting Midi gels. It is easily inserted into the SureLock™ Tandem Midi Gel Tank in place of a gel cassette clamp where each module is able to perform protein transfer using only 300 mL of 1X Transfer Buffer.

Table 1 Contents and part descriptions

Component	Description	
Blot Module	Wet transfer unit only for use with the SureLock™ Tandem Midi Gel Tank (Cat. No. STM1001, see "Related products" on page 33)	
Blotting Tweezers	Supplied for handling transfer membranes	
Blotting Roller	Supplied for removing air bubbles during assembly of the transfer stack	
Blotting Sponge Pads	Included for assembly of the transfer stack	

Product specifications

Specification	Parameter
Capacity	1 Midi gel per Blot Module 1 or 2 Blot Modules per tank
Compatible Gels	NuPAGE™ Bis-Tris Midi Gels NuPAGE™ Tris-Acetate Midi Gels Novex™ Tris-Glycine Plus Midi Gels
Gel Size	Midi/Wide format (8 cm × 13 cm)
Module Dimensions (Closed)	15 cm × 20 cm × 5cm
Blotting Area	14.4 cm × 9.2 cm
Recommended Membrane Dimensions	14 cm × 8.5 cm
Transfer Buffer Requirements	~300 mL/blot
Mode of Transfer	Wet

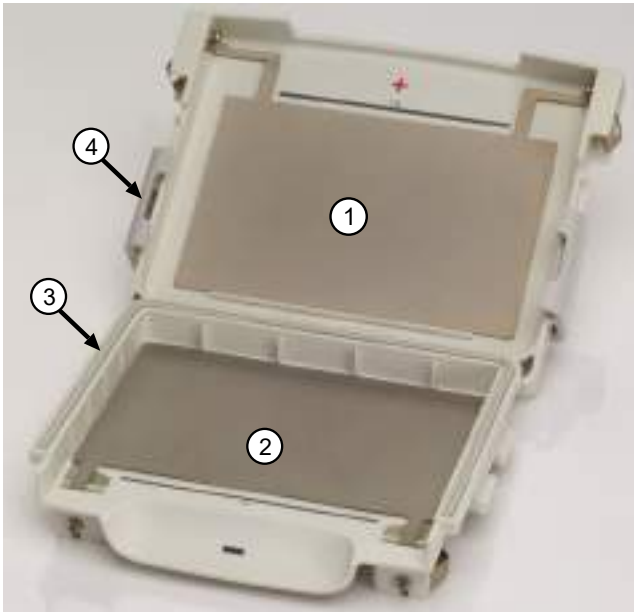


Figure 1 Open Blot Module.

① Anode Core (+)
② Cathode Core (–)
③ Gasket
④ Slider lock

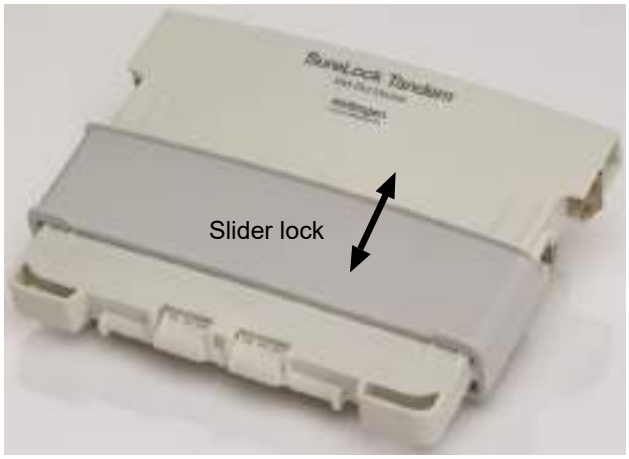
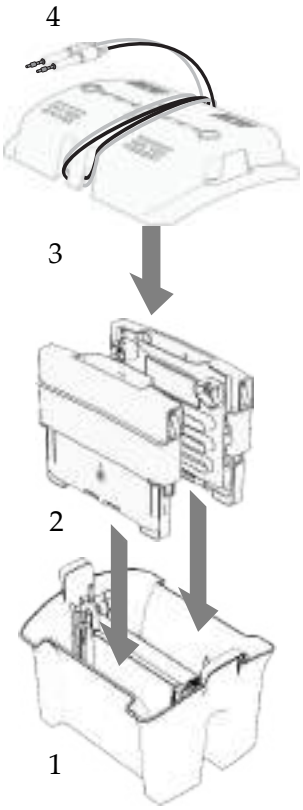


Figure 2 Blot Module showing anode core exterior and slider lock.

Figure 3 Cathode core exterior of Blot Module.

Overview of Blot Module assembly

1. Place the tank on a flat surface.
2. Remove the cassette clamps from the tank.
3. Carefully insert each locked Blot Module ensuring it rests on the bottom of the tank and the slider faces the outside of the tank.
4. Place the lid on top of the tank.



Before you begin

Guidelines

- Wear proper protective equipment (gloves, laboratory coat, eye protection) when performing experiments.
- Prepare ~300 mL of 1X Transfer Buffer for each transfer (see “Prepare 1X Transfer Buffer for Novex™ Tris-Glycine Plus Midi Gels” on page 10 or “Prepare 1X Transfer Buffer for NuPAGE™ Bis-Tris or Tris-Acetate Midi Gels” on page 10 depending on your gel type).
- Soak two (2) sponge pads thoroughly in 1X Transfer Buffer for each transfer (see “Prepare sponge pads” on page 11).
- Select the type of transfer membrane appropriate for your purpose and prepare it for transfer (see “Prepare transfer membrane” on page 11).
- Prepare filter paper (see “Prepare filter paper” on page 12).
- Trim the wells and the foot from the gel to be transferred (see “Prepare gel for transfer” on page 12).
- Transfer Buffer and materials for assembling a transfer stack can be prepared while gel electrophoresis is in progress.

Materials required but not provided

- Pre-cut blotting membrane and filter paper sandwich
- Methanol
- Deionized water
- Transfer buffer
- SureLock™ Tandem Tray (Cat. No. STM3001) or other shallow trays for soaking membranes, filter paper, and sponge pads

Prepare 1X Transfer Buffer for Novex™ Tris-Glycine Plus Midi Gels

For blotting Novex™ Tris-Glycine Plus Midi Gels, ~300 mL of 1X Transfer Buffer is required for each transfer.

Prepare 1000 mL of 1X Novex™ Tris-Glycine Transfer Buffer as follows:

Reagent	Volume
Novex™ Tris-Glycine Transfer Buffer (25X)	40 mL
Methanol[1]	100 mL
Deionized Water	860 mL
Total Volume	1000 mL

[1] For Tris-Glycine gels, a solution of 1X Transfer Buffer with 10% methanol provides optimal transfer in the SureLock™ Tandem Midi Blot Module. Alternatively, a 1X transfer buffer with 20% methanol may also be used if preferred.

If preparing your own transfer buffer, refer to “Buffer recipes” on page 38.

Prepare 1X Transfer Buffer for NuPAGE™ Bis-Tris or Tris-Acetate Midi Gels

For blotting NuPAGE™ Bis Tris or Tris-Acetate Midi Gels, ~300 mL of 1X Transfer Buffer is required for each transfer.

Prepare 1000 mL of 1X NuPAGE™ Transfer Buffer as follows:

Reagent	Reduced Volume	Non-Reduced Volume
NuPAGE™ Transfer Buffer (20X)	50 mL	50 mL
NuPAGE™ Antioxidant	1 mL	—
Methanol[1]	100 mL	100 mL
Deionized Water	849 mL	850 mL
Total Volume	1000 mL	1000 mL

[1] For NuPAGE™ gels, a solution of 1X Transfer Buffer with 10% methanol provides optimal transfer in the SureLock™ Tandem Midi Blot Module.

If preparing your own transfer buffer, refer to “Buffer recipes” on page 38.

Prepare sponge pads

Add ~200 mL of 1X Transfer Buffer to the front compartment of the SureLock™ Tandem Tray (Cat. No. STM3001) or other container and soak the sponge pads until saturated.

Note: Use properly cleaned sponge pads (see "Cleaning the sponge pads" on page 29) to avoid protein contamination.

- **While sponges are fully submerged in buffer**, roll sponges with a blot roller in order to remove all air bubbles. Repeat this process for each sponge until there are no visible dry spots left in the sponges. If needed, gently press submerged sponges with finger tips in order to assist with saturation.

  Note: Sponges naturally compress with regular usage. To prevent accelerated compression of sponges, sponges should not be excessively squeezed, wrung out, or flattened during preparation or cleaning. Do not store sponges in a compressed state.

  Note: Brand new sponge pads wet at a slower rate than used sponges and will require more rolling to remove air bubbles.

- Leave the sponge pads in 1X Transfer Buffer until you are ready to use them to assemble the transfer stack.

  Note: Do not reuse 1X Transfer Buffer used to soak sponge pads. Discard buffer in an appropriate hazardous waste container.

Prepare transfer membrane

Use Novex™ pre-cut membrane/filter paper sandwiches (see "Related products" on page 33 for ordering information) or cut selected transfer membrane to the gel dimensions. **Recommended membrane dimensions are 14 cm × 8.5 cm.**

Always handle the membrane with the Blotting Tweezers to avoid contamination. **Do not** touch the membrane with bare hands.

- **PVDF membrane**
  a. Pre-wet the PVDF membrane for 30 seconds in a tray containing methanol, ethanol, or isopropanol.
  b. Briefly rinse the membrane in deionized water.
  c. On a benchtop shaker, soak the membrane in a shallow tray containing 1X Transfer Buffer for several minutes.

- **Nitrocellulose/Nylon membrane**
  a. On a benchtop shaker, soak the membrane in a shallow tray containing 1X Transfer Buffer for several minutes.

Prepare filter paper

Use SureLock™ Tandem midi pre-cut membrane/filter paper sandwiches (see "Related products" on page 33 for ordering information) or cut the required pieces of filter paper to the dimensions of the gel. **Recommended filter paper dimensions are 14 cm × 8.5 cm.**

Set the filter paper aside until you are ready to use them to assemble the transfer stack.

Prepare gel for transfer

Remove the gel from the cassette and prepare it for transfer as described below.

- Prepare the gel for transfer as soon as possible after completion of electrophoresis.
- Do not touch the gel with bare hands.
- To prevent the gel from drying out, do not open the gel cassette until you are ready to assemble the transfer stack.
- Gel equilibration prior to transfer is recommended for certain gel types. See steps 7–8 for more details.

1. Rinse gel cassette with deionized water.

2. Lay the gel cassette on a flat surface and carefully insert the beveled edge of the Gel Knife into the narrow gap between the two plates of the cassette, as shown below.

Note: Do not push the Gel Knife forcefully between the cassette plates or you may cut into the gel.

3. Gently lever the Gel Knife handle up and down to separate the plates. You will hear a cracking sound as the bond that hold the cassette together breaks. Repeat until you have broken the bonds on one side.

4. Rotate the cassette and repeat Steps 2–3 until the two plates are completely separated.

5. Upon separating the plates, the gel may adhere to either side. Carefully remove the plate not attached to the gel.

6. Using the Gel Knife, carefully trim off the well fingers from the gel, as shown below.

There are many methods for separating the gel from the cassette in one piece. While any method may be used, in the following steps we provide some tips for separating various gel types. Methods may be different depending on the gel type being transferred because certain gel types require an equilibration step prior to transfer while others do not.

- If transferring a Novex™ Tris-Glycine Plus Midi Gel, proceed to step 7a.
- If transferring a NuPAGE™ Bis-Tris or Tris-Acetate Midi Gel, proceed to Tris-Glycine Plus Midi Gel, proceed to step 7b.

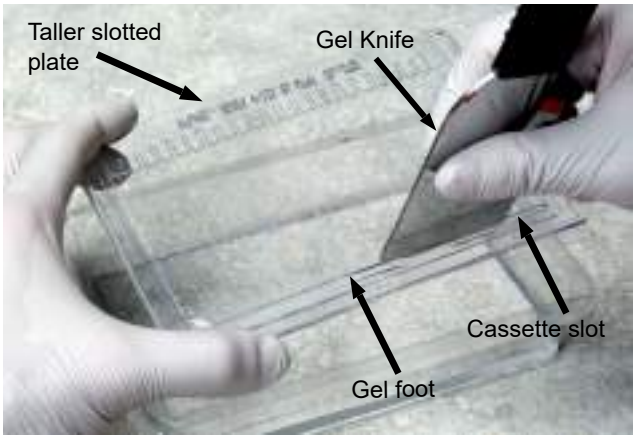
7. Separate the gel from the cassette.

   a. **Novex™ Tris-Glycine Plus Midi Gel**

   A 5-minute gel equilibration in 1X Tris-Glycine Transfer Buffer is recommended for Tris-Glycine Plus Midi gels prior to transfer. Depending on which plate the gel adheres to, separate the gel from the plate using one of two methods:

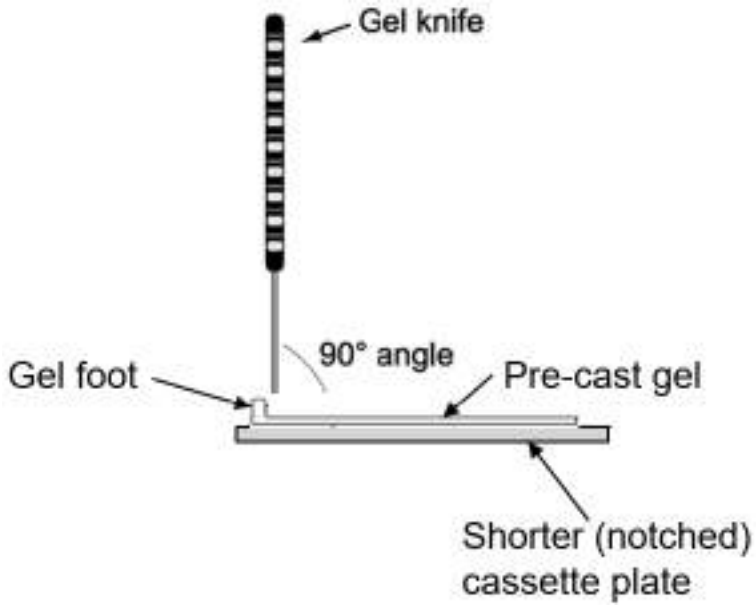
Method 1 – If the gel adheres to the taller (slotted) cassette plate:

1. Hold the plate with the gel facing down over a container filled with transfer buffer.
2. Use the Gel Knife to carefully push the gel foot through the slot in the plate until the gel peels away from the plate and gently falls into the container. See picture below.
3. Cut the foot off of the gel before transfer.



Method 2 – If the gel adheres to the shorter (notched) cassette plate:

1. Lay the plate on a flat surface with the gel facing up.
2. Use the Gel Knife to cut off the gel foot. Hold the Gel Knife at a 90° angle to the gel and push down to cut through the gel. Repeat along the length of the entire gel foot. See picture below.
3. Hold the plate with the gel facing downward over a container filled with transfer buffer. Use the Gel Knife or your thumbnail to carefully loosen a bottom corner of the gel and allow the gel to peel away from the plate and into the container.

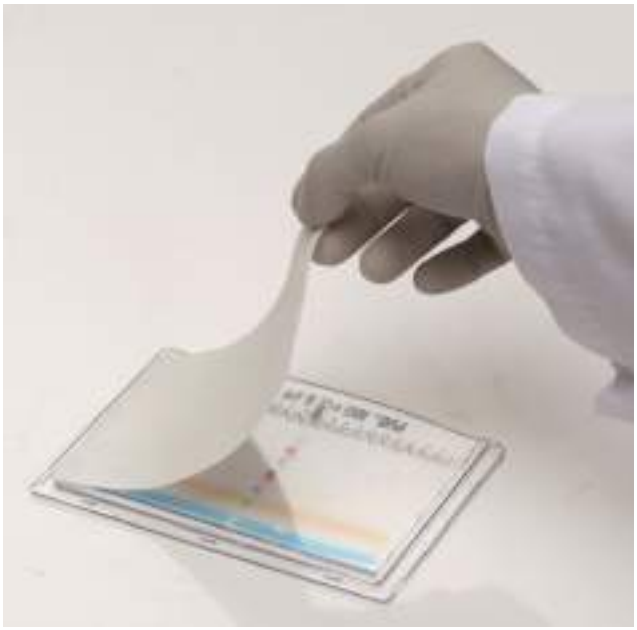


b. **NuPAGE™ Bis-Tris or Tris-Acetate Midi Gel**

When transferring NuPAGE™ Bis-Tris or Tris-Acetate Midi gels,equilibration is NOT recommended. The cassette plate can be used to assist with building the transfer stack while separating the gel from the plate. See gel handling tips below.

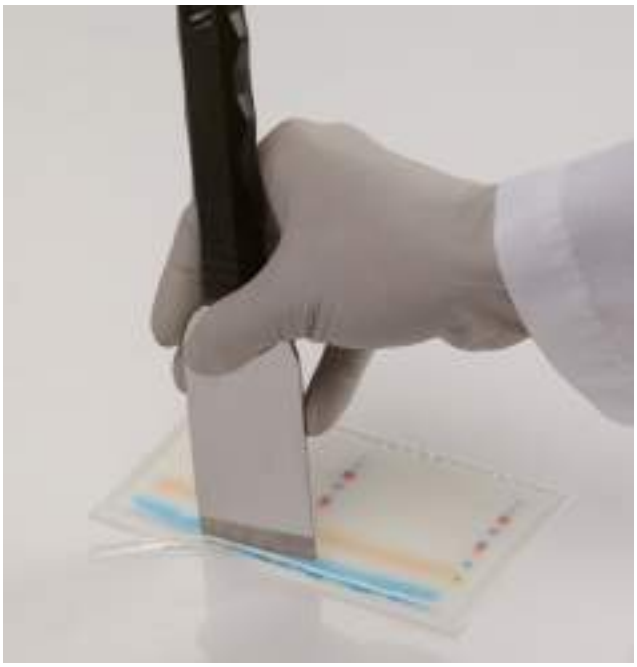
Method 1 – If the gel adheres to the taller (slotted) cassette plate:

1. Briefly wet a piece of filter paper in 1X Transfer Buffer and place it on top of the gel, just above the foot.



2. Gently remove any bubbles with the Blotting Roller.
3. Invert the plate over your hand or place on a hard flat surface with the gel and filter paper facing down. Use the Gel Knife to push the foot out of the slot in the plate and allow the gel to fall away from the plate by itself.

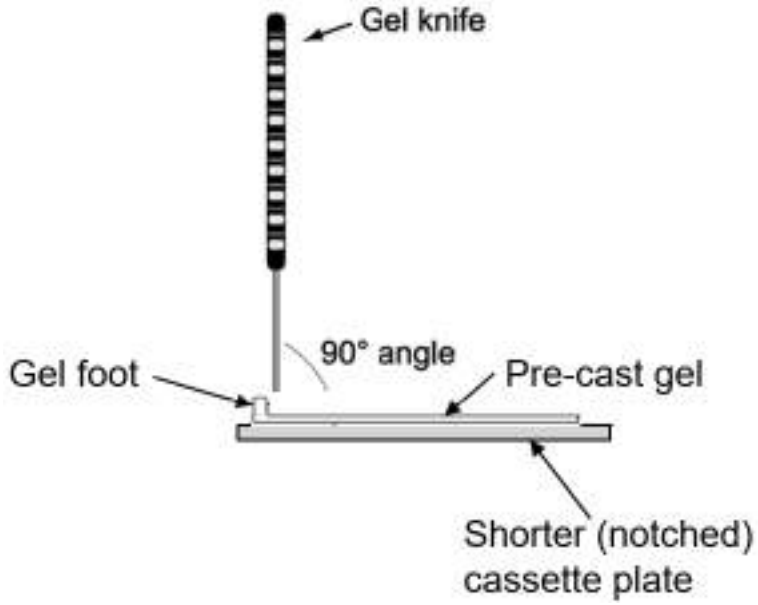
4. Place the filter paper on a flat surface with the gel on top and gently cut the foot off of the gel.



5. Leave the filter paper and gel on the surface until you are ready to use it to assemble the transfer stack. The gel and filter paper can now be easily handled without risk of tearing the gel.

Method 2 - If the gel adheres to the shorter (notched) cassette plate:

1. Lay the plate on a flat surface with the gel facing up.
2. Use the Gel Knife to cut off the gel foot. Hold the Gel Knife at a 90° angle to the gel and push down to cut through the gel. Repeat along the length of the entire gel foot. See picture below.



3. Briefly wet a piece of filter paper in 1X Transfer Buffer and place it on top of the gel, just above the foot
4. Hold the plate with the gel and filter paper facing down. Use the Gel Knife to carefully loosen a bottom corner of the gel and allow it to fall away from the plate by itself.
5. Place the filter paper and gel on a flat surface with the gel facing up. The filter paper and gel can now be handled easily without risk of tearing the gel.

8. Equilibrate the gel in 1X Transfer Buffer.
   - If transferring a Novex™ Tris-Glycine Plus Midi Gel, gel equilibration prior to transfer is recommended. Soak the gel in a container with 1X Tris-Glycine Transfer Buffer for **5 minutes** prior to transfer. After equilibration, proceed to “Protein Transfer Protocol” on page 18.
   - If transferring a NuPAGE™ Bis-Tris or Tris-Acetate Midi Gel, equilibration prior to transfer is **NOT** recommended. Proceed to “Protein Transfer Protocol” on page 18.

Protein Transfer Protocol

The following blotting protocol is suitable for the majority of protein blotting applications using the SureLock™ Tandem Midi Blot Module.

Materials required

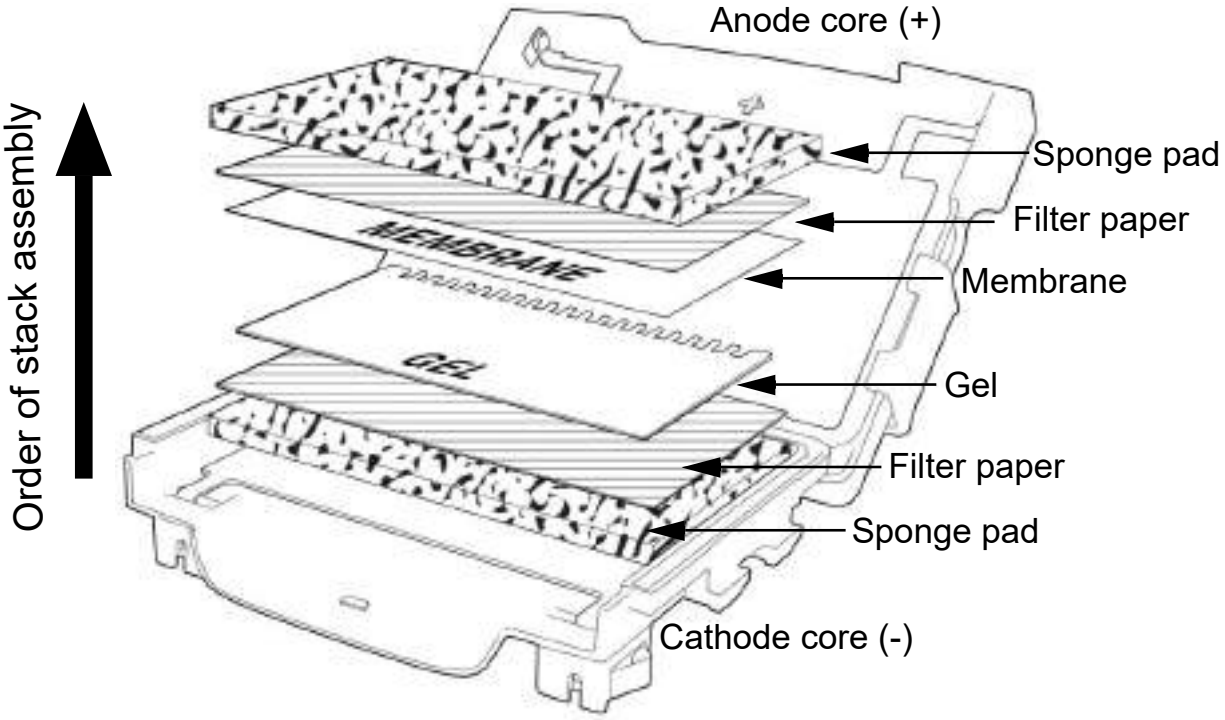
- Previously electrophoresed midi gel (maximum gel size: 8 cm × 13 cm)
- SureLock™ Tandem Midi Blot Module
- SureLock™ Tandem Midi Gel Tank
- 1X Transfer Buffer
- Membrane
- Filter papers
- Sponge pads
- SureLock™ Tandem Tray or other container for soaking sponge pads with transfer buffer
- Blotting Roller
- Tweezers

Guidelines

- Only one gel can be transferred at a time in a single blot module.
- One blot module can be used in each chamber of the electrophoresis tank. Two Blot Modules can be run simultaneously in one tank.
- Make sure the Cassette Clamps and residual liquids are removed from the tank before inserting Blot Modules.
- Always handle the membrane with the Blotting Tweezers.
- During assembly of the transfer stack, make sure that sponge pads, filter papers, gel, and membrane do not ride up on the side of the cathode core. If this occurs during assembly, use the Blotting Roller to gently reposition the piece so that it is flush with the other pieces.
- Use the Blotting Roller to remove any bubbles as each layer of the stack is assembled.

Assembly overview

IMPORTANT! When the transfer stack is fully assembled, ensure the **gel is closer to the cathode core (–)** and the **membrane is closer to the anode core (+)**.



Assemble transfer stack and Blot Module

Note: Instructions provided are for using a SureLock™ Tandem Tray (Cat. No. STM3001). If using other containers, adjust the protocol as necessary.

1. Place a Blot Module into the back compartment of the tray with the cathode (-) side on the bottom, and the anode (+) side resting against the back tray wall. For sponge pad preparation, see “Prepare sponge pads” on page 11.

2. Add ~50 mL of 1X Transfer Buffer to the cathode (–) shell prior to assembling the transfer stack.

3. Place a buffer-saturated sponge pad into the cathode (–) shell of the blot module.

4. Place gel in the Blot Module.
   - If transferring a Novex™ Tris-Glycine Plus Midi Gel requiring equilibration:
     - Briefly soak a filter paper in 1X Transfer Buffer and place it on top of the sponge. Remove any air bubbles with the Blotting Roller.
     - Carefully place the gel on top of the filter paper with the **gel wells (or high molecular weight proteins) towards the bottom of the Blot Module**. Transferring the gel in this orientation improves transfer performance. Remove any air bubbles with the Blotting Roller.
   - If transferring a NuPAGE™ Bis-Tris or Tris-Acetate Midi Gel not requiring equilibration, see gel handling tips below.
     - Take the gel and filter paper (from Step 7 in "Prepare gel for transfer" on page 12) and place it on top of the sponge pad with the filter paper on bottom and the **gel wells (or high molecular weight proteins) towards the bottom of the Blot Module**. Transferring the gel in this orientation improves transfer performance.

     - Wet the surface of the gel with 1X Transfer Buffer (~10-20 mL) and remove any bubbles with the Blotting Roller.

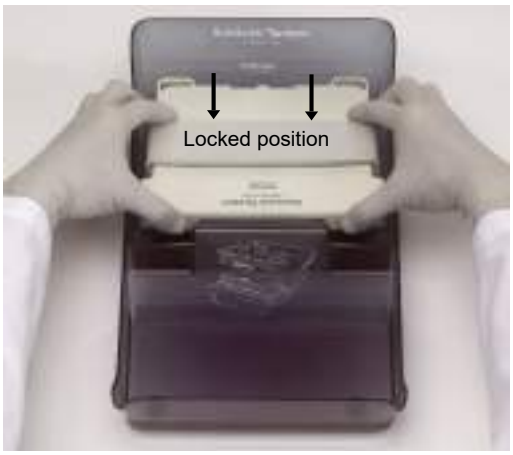
5. Place a pre-soaked transfer membrane on the gel. Remove any bubbles with the Blotting Roller.

Note: Do not reposition the membrane after it has been laid down for more than a few seconds. Passive transfer could have already taken place.

6. Briefly wet a piece of filter paper in 1X Transfer Buffer and place it on top of the transfer membrane. Remove any bubbles with the Blotting Roller.

7. Place a pre-soaked sponge pad onto the filter paper.

8. Complete the module assembly by closing the anode (+) shell on top of the cathode (–) shell. Shift the slider into the locked position.



Perform protein transfer

1. Make sure Cassette Clamps and residual liquids are removed from the chambers.

Note: The tank can run either 1 or 2 Blot Modules at a time.

2. Carefully insert each blot module with the slider facing the outside of the tank and the Blot Module resting on the bottom of the tank. The blot module should be seated so that the electrode springs of the module make contact with the electrode bars of the electrophoresis tank.

Note: Should only a single transfer be performed, NEVER put any liquids into the unused chamber as this can cause damage to the tank and/or harm the user. See “Tank and Blot Module safety” on page 39 for more details.

3. Add 1X Transfer Buffer to the Fill Line shown on the inside of the Blot Module.

Note: Blot Modules do not need chilled buffer for transfer and there is no need to add water or transfer buffer in the space around the Blot Module.

4. Place the lid onto the tank. The lid can only be firmly seated in one orientation. Match the red and black circles on the electrodes within the tank with the red and black electrodes on the lid.

   Note: Ensure the lid is placed properly and all the way down on the tank. If the lid is not properly seated, power will not be properly supplied to the system.

5. With the power off, connect the electrode cables from the lid to the power supply. Red to the (+) jack, Black to the (–) jack. Ensure the leads are fully inserted into the power supply sockets.

6. Turn on the power supply and program the transfer settings (see "Transfer protocol" on page 26) as needed, and start the transfer.

Transfer protocol

Perform protein transfer using the following protocol. Voltage and run time settings are identical whether performing 1 or 2 transfers in a single SureLock™ Tandem Midi Gel Tank.

Table 2 Recommended transfer conditions for Invitrogen™ Pre-Cast Midi Gels.

Voltage	Time
25 V (constant)	30 minutes

CAUTION!

- **Do not exceed 30 V.**
- To prevent damaging the gel and the Blot Module, transfers should never be performed at 100 V, as may be required for other wet transfer devices.

Run conditions

Expected run conditions during transfer are provided for various types of midi gels and membranes. The current values in the table below are for one transfer only. If performing two transfers, the current would be doubled. Note that the current values are approximate and will vary depending on gel percentage, temperature of the transfer buffer, and the power supply used for transfer.

Gel Type	Membrane	Constant Voltage (V)	Starting Current (mA)	Maximum Currrent (mA)	Run Time (min.)
NuPAGE™ 4-12% Bis-Tris (MES)	Nitrocellulose	25 V	600-700	700-800	30
	PVDF	25 V	600-700	700-800	30
Novex™ 4-20% Tris-Glycine Plus (denatured)	Nitrocellulose	25 V	750-800	750-800	30
	PVDF	25 V	720-770	720-770	30
NuPAGE™ 3-8% Tris-Acetate (denatured)	Nitrocellulose	25 V	610-670	610-670	30
	PVDF	25 V	700-750	700-750	30

Remove and wash the membrane

1. After protein transfer is complete, turn the power supply off, unplug the power leads, and remove the tank lid.
2. Remove the Blot Module from the chamber and empty the transfer buffer into an appropriate hazardous waste disposal container.
3. Open the module assembly.
4. Disassemble the transfer stack and carefully remove the membrane with Blotting Tweezers.
5. Wash the membrane to remove gel particles, transfer buffer components, and weakly bound proteins. Wash two times using 50 mL of ultrapure water for 5 minutes.

Post-transfer analysis

After washing the membrane with water, proceed to immunodetection, stain the membrane, or store the membrane for future use.

- For immunodetection of proteins, use the WesternBreeze™ Chromogenic or Chemiluminescent Immunodetection Kits available from Thermo Fisher Scientific (see “Related products” on page 33) or any other immunodetection kit.
- For labeling of proteins, use No-Stain™ Protein Labeling Reagent available from Thermo Fisher Scientific (see “Related products” on page 33).
- For storing nitrocellulose membranes, air dry the membrane and store the membrane in an air-tight plastic bag at room temperature or 4°C. Avoid storing nitrocellulose membranes at –20°C or –80°C, because they will shatter.
- For storing PVDF membranes, air dry the membrane and store it in an air-tight plastic bag at room temperature, 4°C, or –80°C. When you are ready to use the membrane, re-wet the membrane with methanol for a few seconds, followed by thorough rinsing of the membrane with deionized water to remove methanol.
- For staining the membranes after blotting, you can use:
  - 0.1% Coomassie Blue R-250 in 50% methanol. Do not use Novex™ Colloidal Blue Staining Kit for staining of membranes, as the background will be high.
  - 50 mL of SimplyBlue™ SafeStain with dry PVDF membranes for 1–2 minutes. Wash the membrane three times with 20 mL of deionized water for 1 minute. To avoid high background, do not use SimplyBlue™ SafeStain on nitrocellulose or wet PVDF membranes.
  - 0.1% Ponceau S in 7% trichloroacetic acid (TCA) for 5 minutes. Rinse the membrane in deionized water to obtain transient staining or 10% acetic acid to obtain permanent staining, and air dry.
- If you do not detect any proteins on the membrane after immunodetection or staining, refer to “No proteins transferred to the membrane.” on page 31 in the Troubleshooting section. Refer to the manufacturer’s recommendations for optimizing immunodetection.

Maintenance

Cleaning the Blot Module

- Rinse the Blot Module with deionized water after each use.
- To clean any residual build-up, apply 70% ethanol in deionized water to areas inside the blot module until residual build-up is removed. Do not submerge the blot module or soak overnight in 70% ethanol.
- Once build-up is removed, rinse the Blot Module at least 3 times in deionized water.
- Air dry the blot module prior to storage.

Note: Slight discoloration of the electrode plates over time is normal and will not affect performance.

Cleaning the sponge pads

- Clean the sponge pads after each use.
- Rinse with deionized water and shake the water out of the sponge pad. Repeat 2-3 times.

Note: Sponges naturally compress with regular usage. To prevent accelerated compression of sponges, sponges should not be excessively squeezed, wrung out, or flattened during cleaning. Do not store sponges in a compressed state.

- Completely air dry sponge pads prior to storage.

Cleaning the tray

- Rinse the tray with deionized water after each use.
- Air dry the tray prior to storage.

Storage

- All components may be stored at room temperature.

Troubleshooting

Observation	Possible cause	Recommended action
Current is much higher than expected starting current.	Concentrated transfer buffer was used.	Dilute the buffer as described in "Prepare 1X Transfer Buffer for Novex™ Tris-Glycine Plus Midi Gels" on page 10 or "Prepare 1X Transfer Buffer for NuPAGE™ Bis-Tris or Tris-Acetate Midi Gels" on page 10.
	Tris HCl was used to make the transfer buffer instead of Tris Base.	Check the reagents used to make the transfer buffer and remake the buffer with correct reagents.
Current is much lower than expected starting current.	Very dilute transfer buffer was used resulting in increased resistance and low current.	Remake the transfer buffer correctly. Refer to "Prepare 1X Transfer Buffer for Novex™ Tris-Glycine Plus Midi Gels" on page 10 or "Prepare 1X Transfer Buffer for NuPAGE™ Bis-Tris or Tris-Acetate Midi Gels" on page 10.
	The circuit was broken (broken electrode).	Check the Blot Module springs to ensure they are making contact with the tank.

Observation	Possible cause	Recommended action
Current is much lower than expected starting current. *(continued)*	A leak occurred in the Blot Module indicated by a decrease in the transfer buffer volume in the module.	Verify assembly of the blot module has been performed correctly to prevent any leaking: • Ensure the transfer stack has been assembled correctly. Refer to "Assemble transfer stack and Blot Module" on page 20. • Ensure the gasket is seated properly. Refer to "Gasket installation instructions (STM2003)" on page 36. • Ensure the blot module has been closed and locked properly. Refer to step 8 in "Assemble transfer stack and Blot Module" on page 20.
	The current setting on the power supply is set too low and therefore the current limit was reached. Because of this, the power supply may automatically switch ("crossover") from constant voltage to a different constant mode.	Switch the power supply back to constant voltage and increase the current limit to the maximum setting so that the limit will not be reached when running constant voltage. Refer to the power supply user manual.
		Use a power supply with higher current limits or transfer fewer gels at a time.
Diffuse bands and swirling pattern on the membrane.	Poor contact between the gel and the membrane.	Roll over the surface of each layer of the transfer stack with the Blotting Roller to ensure good contact between the gel and the membrane. Saturate the sponge pads with transfer buffer.
	Under- or over-compression of the gel.	Ensure the correct number of components were used to assemble the transfer stack: 2 sponges, 2 pieces of filter paper, 1 gel, and 1 membrane. Omitting components of the transfer stack can result in under-compression of the gel. Using extra components may cause over-compression of the gel.
	Poor contact between the membrane and the gel due to the use of over-compressed sponge pads.	Replace old sponge pads with new sponge pads. Refer to the Troubleshooting observation "Sponges are highly compressed. When assembling a transfer stack, the final sponge sits lower than the height of the cathode (–) shell." on page 32 for solutions and recommended sponge handling tips.
Empty spots on the membrane.	Presence of air bubbles between the gel and the membrane prevented the transfer of proteins.	Be sure to remove all air bubbles between the gel and membrane by rolling the Blotting Roller over the membrane surface.
	Expired or creased membranes were used.	Use fresh, undamaged membranes.
High background on western blots.	Insufficient blocking of non-specific sites.	Increase the blocker concentration or the incubation time.

Observation	Possible cause	Recommended action
No proteins transferred to the membrane.	Transfer stack was assembled with gel and membrane in reverse orientation such that proteins have migrated into the buffer.	Assemble the transfer stack in the correct order using instructions provided in "Assemble transfer stack and Blot Module" on page 20.
	The SureLock™ Tandem electrode cables were inserted into the power supply in the reverse orientation causing incorrect polarity during transfer.	With the power supply off, connect the SureLock™ Tandem electrode cables from the lid to the power supply: Red cable to the (+) jack, Black cable to the (–) jack. Ensure the leads are fully inserted into the power supply sockets.
Poor transfer efficiency with PVDF.	Membrane not treated properly before use.	Be sure that the membrane is pre-wetted with methanol or ethanol.
	Poor contact between the membrane and the gel due to the use of over-compressed sponge pads.	Replace the old sponge pads with new sponge pads. Refer to the Troubleshooting observation "Sponges are highly compressed. When assembling a transfer stack, the final sponge sits lower than the height of the cathode (–) shell." on page 32 for solutions and recommended sponge handling tips.
	Over compression of the gel indicated by a flattened gel	Ensure that the transfer stack has been assembled properly and no extra materials (sponges or filter paper) have been added.
Power supply shuts off while using recommended blotting conditions.	Overly high ionic strength of the transfer buffer caused a power supply safety feature to stop the run.	Verify the transfer buffer was prepared correctly. Refer to "Prepare 1X Transfer Buffer for Novex™ Tris-Glycine Plus Midi Gels" on page 10 or "Prepare 1X Transfer Buffer for NuPAGE™ Bis-Tris or Tris-Acetate Midi Gels" on page 10.
		Verify the transfer stack was assembled correctly. Refer to "Assemble transfer stack and Blot Module" on page 20.
		Verify the electrode cables are connected properly.
	Power supply was operating at a current close to the current limit of the power supply.	Use a power supply with higher current limits or transfer fewer gels at a time.
Significant amount of protein is passing through the membrane indicated by the presence of proteins on a second membrane.	Long transfer time, inappropriate SDS or methanol concentration, or sample was overloaded.	Re-evaluate the percentage of the gel used.
		Shorten the transfer time in 5- or 10-minute increments.
		Prepare transfer buffer without SDS.
		If using nitrocellulose membrane, switch to PVDF that has a higher binding capacity.
		Add additional methanol to increase the binding capacity of the membrane and to remove additional SDS from proteins during transfer.
		Decrease the sample load.

Observation	Possible cause	Recommended action
Significant amount of protein remains in the gel indicated by staining of the gel after transfer.	Transfer time was too short, inappropriate gel type, or SDS or methanol concentration was used. Higher molecular weight proteins usually do not transfer completely as compared to mid- and low-molecular weight proteins.	Switch to a more appropriate lower-percentage gel.
		Increase the blotting time in 5- or 10-minute increments.
		Add 0.01-0.02% SDS to the transfer buffer to facilitate migration of the protein out of the gel.
		Decrease the amount of methanol in the transfer buffer.
Sponges are highly compressed. When assembling a transfer stack, the final sponge sits lower than the height of the cathode (–) shell.	Normal compression occurred from regular use. Sponge pads lost resilience and thickness after repeated usage.	To ensure there is contact between the gel and the membrane, the final sponge of a transfer stack should sit above the height of the cathode (–) shell. Replace the used sponge pads with new ones. Refer to Table 3, "Replacement parts" in “Related products” on page 33 for ordering information. 
	Over-compression of sponges occurred during sponge preparation steps, washing steps, or storage.	Sponges should not be excessively squeezed, wrung out, or flattened when soaking sponges in transfer buffer prior to use, or when cleaning sponges after use. See proper sponge preparation steps in “Prepare sponge pads” on page 11 and proper sponge cleaning in “Cleaning the sponge pads” on page 29. Do not store sponges in a compressed state.
		Replace damaged sponges with new ones. Refer to Refer to Table 3, "Replacement parts" in “Related products” on page 33 for ordering information.
Transfer Buffer pH deviates from the required value by 0.2.	Buffer not made up properly.	Remake the buffer after checking the reagents and water quality. Do not adjust the pH with acid or base as this will increase the conductivity of the buffer and result in higher current during transfer.

Related products

Replacement parts, related products, and consumables can be found in the tables below.

Table 3 Replacement parts

Product	Quantity	Product No.
SureLock™ Tandem Midi Gel Tank	1	STM1003
SureLock™ Tandem Midi Gel Tank Replacement Lid	1	STM1002
SureLock™ Tandem Midi Gel Tank Replacement Cassette Clamp	1	STM1004
Gel Knife	1	EI9010
SureLock™ Tandem Midi Sponge Kit	1 set (8)	STM2002
Blotting Roller	1	LC2100
SureLock™ Tandem Midi Blot Module Replacement Gasket Kit	1	STM2003
SureLock™ Tandem Transfer Tray	1	STM3001

Table 4 Power supplies

Product	Quantity	Product No.
PowerEase™ Touch 350 W Power Supply (115 VAC)	1	PS0350
PowerEase™ Touch 350 W Power Supply (230 VAC)	1	PS0351

Table 5 Buffers and membranes

Product	Quantity	Product No.
NuPAGE™ Antioxidant	15 mL	NP0005
Novex™ Tris-Glycine Transfer Buffer (25X)	500 mL	LC3675
NuPAGE™ Transfer Buffer (20X)	125 mL	NP0006
SureLock™ Tandem Midi Pre-cut Membranes and Filters, 0.2 µm, Nitrocellulose	20 membrane/filter paper sandwiches	STM2007
SureLock™ Tandem Midi Pre-cut Membranes and Filters, 0.45 µm, Nitrocellulose	20 membrane/filter paper sandwiches	STM2008
SureLock™ Tandem Midi Pre-cut Membranes and Filters, 0.45 µm, PVDF	20 membrane/filter paper sandwiches	STM2006

Table 5 Buffers and membranes *(continued)*

Product	Quantity	Product No.
WesternBreeze™ Chromogenic Western Blot Detection Kit	1 kit (Anti-mouse) 1 kit (Anti-rabbit) 1 kit (Anti-goat)	See Thermo Fisher website
WesternBreeze™ Chemiluminescent Western Blot Detection Kit	1 kit (Anti-mouse) 1 kit (Anti-rabbit) 1 kit (Anti-goat)	See Thermo Fisher website
SimplyBlue™ Safe Stain	1 L	LC6060
No-Stain™ Protein Labeling Reagent	40 reactions	A44449

Table 6 Pre-cast gels

Product	Quantity	Catalog No.
Novex™ Tris-Glycine Plus Midi Gels		
Novex™ 10%, Tris-Glycine Plus, 1.0 mm, Midi Protein Gel, 12+2-well	10 gels	WXP01012BOX
Novex™ 10%, Tris-Glycine Plus, 1.0 mm, Midi Protein Gel, 20-well	10 gels	WXP01020BOX
Novex™ 10%, Tris-Glycine Plus, 1.0 mm, Midi Protein Gel, 26-well	10 gels	WXP01026BOX
Novex™ 12%, Tris-Glycine Plus, 1.0 mm, Midi Protein Gel, 12+2-well	10 gels	WXP01212BOX
Novex™ 12%, Tris-Glycine Plus, 1.0 mm, Midi Protein Gel, 20-well	10 gels	WXP01220BOX
Novex™ 12%, Tris-Glycine Plus, 1.0 mm, Midi Protein Gel, 26-well	10 gels	WXP01226BOX
Novex™ 4 to 12%, Tris-Glycine Plus, 1.0 mm, Midi Protein Gel, 12+2-well	10 gels	WXP41212BOX
Novex™ 4 to 12%, Tris-Glycine Plus, 1.0 mm, Midi Protein Gel, 20-well	10 gels	WXP41220BOX
Novex™ 4 to 12%, Tris-Glycine Plus, 1.0 mm, Midi Protein Gel, 26-well	10 gels	WXP41226BOX
Novex™ 4 to 20%, Tris-Glycine Plus, 1.0 mm, Midi Protein Gel, 12+2-well	10 gels	WXP42012BOX
Novex™ 4 to 20%, Tris-Glycine Plus, 1.0 mm, Midi Protein Gel, 20-well	10 gels	WXP42020BOX
Novex™ 4 to 20%, Tris-Glycine Plus, 1.0 mm, Midi Protein Gel, 26-well	10 gels	WXP42026BOX
Novex™ 8 to 16%, Tris-Glycine Plus, 1.0 mm, Midi Protein Gel, 12+2-well	10 gels	WXP81612BOX
Novex™ 8 to 16%, Tris-Glycine Plus, 1.0 mm, Midi Protein Gel, 20-well	10 gels	WXP81620BOX
Novex™ 8 to 16%, Tris-Glycine Plus, 1.0 mm, Midi Protein Gel, 26-well	10 gels	WXP81626BOX

Table 6 Pre-cast gels *(continued)*

Product	Quantity	Catalog No.
NuPAGE™ Midi Gels (Bis-Tris and Tris-Acetate)		
NuPAGE™ 8%, Bis-Tris, 1.0 mm, Midi Protein Gel, 12+2-well	10 gels	WG1001BOX
NuPAGE™ 8%, Bis-Tris, 1.0 mm, Midi Protein Gel, 20-well	10 gels	WG1002BOX
NuPAGE™ 8%, Bis-Tris, 1.0 mm, Midi Protein Gel, 26-well	10 gels	WG1003BOX
NuPAGE™ 10%, Bis-Tris, 1.0 mm, Midi Protein Gel, 12+2-well	10 gels	WG1201BOX
NuPAGE™ 10%, Bis-Tris, 1.0 mm, Midi Protein Gel, 20-well	10 gels	WG1202BOX
NuPAGE™ 10%, Bis-Tris, 1.0 mm, Midi Protein Gel, 26-well	10 gels	WG1203BOX
NuPAGE™ 4 to 12%, Bis-Tris, 1.0 mm, Midi Protein Gel, 12+2-well	10 gels	WG1401BOX
NuPAGE™ 4 to 12%, Bis-Tris, 1.0 mm, Midi Protein Gel, 20-well	10 gels	WG1402BOX
NuPAGE™ 4 to 12%, Bis-Tris, 1.0 mm, Midi Protein Gel, 26-well	10 gels	WG1403BOX
NuPAGE™ 3 to 8%, Tris-Acetate, 1.0 mm, Midi Protein Gel, 12+2-well	10 gels	WG1601BOX
NuPAGE™ 3 to 8%, Tris-Acetate, 1.0 mm, Midi Protein Gel, 20-well	10 gels	WG1602BOX
NuPAGE™ 3 to 8%, Tris-Acetate, 1.0 mm, Midi Protein Gel, 26-well	10 gels	WG1603BOX

Customer and technical support

Visit **thermofisher.com/support** for the latest service and support information.

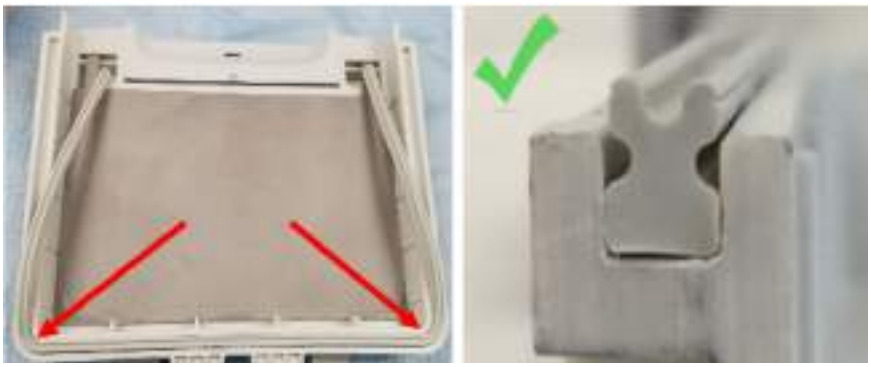
- Worldwide contact telephone numbers
- Product support information
  - Product FAQs
  - Software, patches, and updates
  - Training for many applications and instruments
- Order and web support
- Product documentation
  - User guides, manuals, and protocols
  - Certificates of Analysis
  - Safety Data Sheets (SDSs; also known as MSDSs)

  Note: For SDSs for reagents and chemicals from other manufacturers, contact the manufacturer.

Gasket installation instructions (STM2003)

1. Remove the gasket from the shipping bag.
2. Inspect the gasket to ensure it was not damaged in transit. Look for cuts or tears in the gasket that can cause a leak.
3. Remove the existing gasket from the Cathode Assembly by holding one end of the gasket and pulling it out of the channel. Discard the old gasket.

4. Clean the channel with deionized water and a soft cloth to ensure a clean surface free of debris.
5. Install one spare gasket (STM2003) into the Cathode Assembly.
   a. Position the new replacement gasket into the two corners as shown with the flat surface of the gasket flush against the bottom of the channel.



b. Press the gasket into the horizontal channel at the bottom of the part. Ensure that the gasket is positioned flat and smooth and not twisted or stretched during installation.

c. Complete the assembly by installling the two vertical end sections into the channel, again ensuring that the gasket is positioned flat and smooth and not twisted or stretched during installation.

Buffer recipes

Prepare 25X Tris-Glycine Transfer Buffer

1. Dissolve the following reagents in 450 mL of deionized water. Mix well.

Component	Amount	Concentration (1X)
Tris base	18.2 g	12 mM
Glycine	90.0 g	96 mM

2. Adjust the volume to 500 mL with deionized water. The pH of the buffer is 8.3. Do not adjust with acid or base.

3. Store at room temperature. The buffer is stable for 6 months at 25°C.

4. For transfer, dilute the 25X Tris-Glycine Transfer Buffer as described in "Prepare 1X Transfer Buffer for Novex™ Tris-Glycine Plus Midi Gels" on page 10.

Prepare 20X NuPAGE™ Transfer Buffer

1. Dissolve the following reagents in 100 mL of deionized water. Mix well.

Component	Amount	Concentration (1X)
Bicine	10.2 g	25 mM
Bis-Tris (free base)	13.1 g	25 mM
EDTA	0.75 g	1 mM
Chlorobutanol	0.025 g	0.05 mM

2. Adjust the volume to 125 mL with deionized water. The pH of the buffer is 7.2.

3. Store at room temperature. The buffer is stable for 6 months at room temperature.

4. For transfer, dilute the 20X NuPAGE™ Transfer Buffer as described in "Prepare 1X Transfer Buffer for NuPAGE™ Bis-Tris or Tris-Acetate Midi Gels" on page 10.

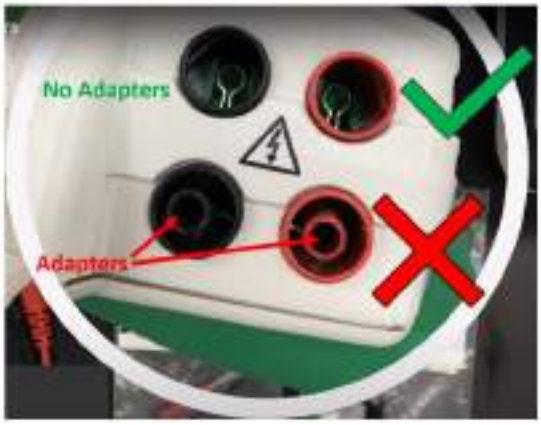
Tank and Blot Module safety

CAUTION! Follow all instructions to avoid any safety issues.

Electrical safety

- During operation, the Midi Gel Tank and Blot Module must be used with an external DC power supply designed specifically for electrophoresis and transfer applications. This power supply must be isolated from ground so that the DC output is floating. See Table 4, "Power supplies" in “Related products” on page 33 for recommended power supplies.
- Once the Midi Gel Tank lid is removed from the tank, the electrical connection to the tank is broken, but can still be electrifed. Always stop the electrophoresis/transfer run by turning off the power supply first, then remove the lid from the tank.
- ALWAYS disconnect tank lids from the power supply when not in use. Operating a power supply in which lids are connected but not seated onto a tank may present an electrical shock hazard. If the power supply is turned on in this scenario, the electrical connections on the inside of the tank lid could potentially be live and exposed.
- ALWAYS insert the electrode cable leads all the way into the sockets of the power supply. Failure to do so can leave part of the electrode exposed which can pose an electrical shock risk to the user if touched.

Note: If using a Bio-Rad™ Power Supply, Novex™ Power Supply Adapters (Cat. No. #ZA10001) should NOT be used with the SureLock™ Tandem Tank and should be removed prior to use. See images below. For removal instructions, refer to the User Guide for product #ZA10001.



- NEVER connect or disconnect wire leads from the power jacks while the power supply is running. Instead, turn the power supply off first, then remove wire leads.
- Do not attempt to use the Midi Gel Tank and Blot Module without the tank lid. Do not use lids from other gel tanks.

Blot Module safety

- Do not add water or transfer buffer in the space around the Blot Module. Liquid surrounding the outside of the Blot Module is NOT needed during a transfer.
- If performing only one transfer instead of two, NEVER fill the unused chamber with buffer. Operating the tank with a chamber filled only with buffer can result in a short circuit because the cathode and anode electrodes may be in contact with the same body of buffer. This can result in excessively hot buffer, damage to the tank, and a burn hazard to the user.

Blot Module electrical operating parameters

- Do not exceed 30 V transfer voltage.
- To prevent damaging the gel and the Blot Module, **transfers should NEVER be performed at 100 V**, as may be required for other wet transfer devices.

The SureLock™ Tandem Midi Gel Tank is designed to meet EN61010-1 Safety Standards. This product is safe to use when operated in accordance with this instruction manual. If this unit is used or modified in a manner not specified in this instruction manual, then protection afforded by the unit will be impaired. Alteration of this unit will:

- Void the warranty.
- Void the EN61010-1 safety standard certification.
- Create a potential safety hazard.

Thermo Fisher Scientific is not responsible for any injury or damage caused by use of this unit when operated for purposes other than intended. All repairs and service should be performed by a service professional.

The SureLock™ Tandem Midi Gel Tank is classified as Class II of IEC 536 for protection against electrical shock.

Safety

WARNING! GENERAL SAFETY. Using this product in a manner not specified in the user documentation may result in personal injury or damage to the instrument or device. Ensure that anyone using this product has received instructions in general safety practices for laboratories and the safety information provided in this document.

- Before using an instrument or device, read and understand the safety information provided in the user documentation provided by the manufacturer of the instrument or device.
- Before handling chemicals, read and understand all applicable Safety Data Sheets (SDSs) and use appropriate personal protective equipment (gloves, gowns, eye protection, and so on). To obtain SDSs, see the "Documentation and Support" section in this document.

Symbols on this instrument

Symbols may be found on the instrument to warn against potential hazards or convey important safety information. In this document, the hazard symbol is used along with one of the following user attention words.

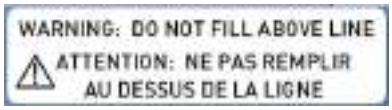
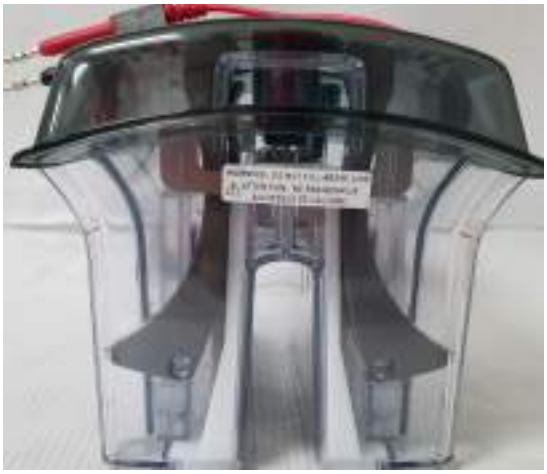
- **CAUTION!**—Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.
- **WARNING!**—Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.
- **DANGER!**—Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

Standard safety symbols

Symbol and description
CAUTION! Risk of danger. Consult the manual for further safety information.
CAUTION! Risk of electrical shock.

Symbole et description
MISE EN GARDE ! Risque de danger. Consulter le manuel pour d'autres renseignements de sécurité.
MISE EN GARDE ! Risque de choc électrique.

Additional safety symbols

Symbol	Location
	
	

(continued)

Symbol	Location
	

Control and connection symbols

Symbols and descriptions	
	On (Power)
	Off (Power)
	Earth (ground) terminal
	Protective conductor terminal (main ground)
	Direct current
	Alternating current
	Both direct and alternating current

Conformity symbols

Conformity mark	Description
	Indicates conformity with safety requirements for Canada and U.S.A.
	Indicates conformity with China RoHS requirements.
	Indicates conformity with European Union requirements.
	Indicates conformity with Australian standards for electromagnetic compatibility.
	Indicates conformity with the WEEE Directive 2012/19/EU. **CAUTION!** To minimize negative environmental impact from disposal of electronic waste, do not dispose of electronic waste in unsorted municipal waste. Follow local municipal waste ordinances for proper disposal provision and contact customer service for information about responsible disposal options.

Safety information for instruments not manufactured by Thermo Fisher Scientific

Some of the accessories provided as part of the instrument system are not designed or built by Thermo Fisher Scientific. Consult the manufacturer's documentation for the information needed for the safe use of these products.

Instrument safety

General

CAUTION! Do not remove instrument protective covers. If you remove the protective instrument panels or disable interlock devices, you may be exposed to serious hazards including, but not limited to, severe electrical shock, laser exposure, crushing, or chemical exposure.

Electrical safety

WARNING! Ensure appropriate electrical supply. For safe operation of the instrument:

- Plug the system into a properly grounded receptacle with adequate current capacity.
- Ensure the electrical supply is of suitable voltage.
- Never operate the instrument with the ground disconnected. Grounding continuity is required for safe operation of the instrument.

AVERTISSEMENT ! Veiller à utiliser une alimentation électrique appropriée. Pour garantir le fonctionnement de l'instrument en toute sécurité :

- Brancher le système sur une prise électrique correctement mise à la terre et de puissance adéquate.
- S'assurer que la tension électrique est convenable.
- Ne jamais utiliser l'instrument alors que le dispositif de mise à la terre est déconnecté. La continuité de la mise à la terre est impérative pour le fonctionnement de l'instrument en toute sécurité.

WARNING! Power Supply Line Cords. Use properly configured and approved line cords for the power supply in your facility.

AVERTISSEMENT ! Cordons d'alimentation électrique. Utiliser des cordons d'alimentation adaptés et approuvés pour raccorder l'instrument au circuit électrique du site.

WARNING! Disconnecting Power. To fully disconnect power either detach or unplug the power cord, positioning the instrument such that the power cord is accessible.

AVERTISSEMENT ! Déconnecter l'alimentation. Pour déconnecter entièrement l'alimentation, détacher ou débrancher le cordon d'alimentation. Placer l'instrument de manière à ce que le cordon d'alimentation soit accessible.

Cleaning and decontamination

CAUTION! Cleaning and Decontamination. Use only the cleaning and decontamination methods that are specified in the manufacturer user documentation. It is the responsibility of the operator (or other responsible person) to ensure that the following requirements are met:

- No decontamination or cleaning agents are used that can react with parts of the equipment or with material that is contained in the equipment. Use of such agents could cause a HAZARD condition.
- The instrument is properly decontaminated a) if hazardous material is spilled onto or into the equipment, and/or b) before the instrument is serviced at your facility or is sent for repair, maintenance, trade-in, disposal, or termination of a loan. Request decontamination forms from customer service.
- Before using any cleaning or decontamination methods (except methods that are recommended by the manufacturer), confirm with the manufacturer that the proposed method will not damage the equipment.

MISE EN GARDE ! Nettoyage et décontamination. Utiliser uniquement les méthodes de nettoyage et de décontamination indiquées dans la documentation du fabricant destinée aux utilisateurs. L'opérateur (ou toute autre personne responsable) est tenu d'assurer le respect des exigences suivantes:

- Ne pas utiliser d'agents de nettoyage ou de décontamination susceptibles de réagir avec certaines parties de l'appareil ou avec les matières qu'il contient et de constituer, de ce fait, un DANGER.
- L'instrument doit être correctement décontaminé a) si des substances dangereuses sont renversées sur ou à l'intérieur de l'équipement, et/ou b) avant de le faire réviser sur site ou de l'envoyer à des fins de réparation, de maintenance, de revente, d'élimination ou à l'expiration d'une période de prêt (des informations sur les formes de décontamination peuvent être demandées auprès du Service clientèle).
- Avant d'utiliser une méthode de nettoyage ou de décontamination (autre que celles recommandées par le fabricant), les utilisateurs doivent vérifier auprès de celui-ci qu'elle ne risque pas d'endommager l'appareil.

Safety and electromagnetic compatibility (EMC) standards

The instrument design and manufacture complies with the following standards and requirements for safety and electromagnetic compatibility.

Safety standards

Reference	Description
EU Directive 2014/35/EU	European Union “Low Voltage Directive”
IEC 61010-1 EN 61010-1 UL 61010-1 CAN/CSA C22.2 No. 61010-1	*Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*

Environmental design standards

Reference	Description
Directive 2012/19/EU	European Union “WEEE Directive”—Waste electrical and electronic equipment
Directive 2011/65/EU	European Union “RoHS Directive”—Restriction of hazardous substances in electrical and electronic equipment
SJ/T 11364-2014	“China RoHS” Standard—Marking for the Restricted Use of Hazardous Substances in Electronic and Electrical Products

Chemical safety

WARNING! GENERAL CHEMICAL HANDLING. To minimize hazards, ensure laboratory personnel read and practice the general safety guidelines for chemical usage, storage, and waste provided below. Consult the relevant SDS for specific precautions and instructions:

- Read and understand the Safety Data Sheets (SDSs) provided by the chemical manufacturer before you store, handle, or work with any chemicals or hazardous materials. To obtain SDSs, see the "Documentation and Support" section in this document.
- Minimize contact with chemicals. Wear appropriate personal protective equipment when handling chemicals (for example, safety glasses, gloves, or protective clothing).
- Minimize the inhalation of chemicals. Do not leave chemical containers open. Use only with sufficient ventilation (for example, fume hood).
- Check regularly for chemical leaks or spills. If a leak or spill occurs, follow the manufacturer cleanup procedures as recommended in the SDS.
- Handle chemical wastes in a fume hood.
- Ensure use of primary and secondary waste containers. (A primary waste container holds the immediate waste. A secondary container contains spills or leaks from the primary container. Both containers must be compatible with the waste material and meet federal, state, and local requirements for container storage.)
- After emptying a waste container, seal it with the cap provided.
- Characterize (by analysis if needed) the waste generated by the particular applications, reagents, and substrates used in your laboratory.
- Ensure that the waste is stored, transferred, transported, and disposed of according to all local, state/provincial, and/or national regulations.
- **IMPORTANT!** Radioactive or biohazardous materials may require special handling, and disposal limitations may apply.

AVERTISSEMENT ! PRÉCAUTIONS GÉNÉRALES EN CAS DE MANIPULATION DE PRODUITS CHIMIQUES. Pour minimiser les risques, veiller à ce que le personnel du laboratoire lise attentivement et mette en œuvre les consignes de sécurité générales relatives à l'utilisation et au stockage des produits chimiques et à la gestion des déchets qui en découlent, décrites ci-dessous. Consulter également la FDS appropriée pour connaître les précautions et instructions particulières à respecter :

- Lire et comprendre les fiches de données de sécurité (FDS) fournies par le fabricant avant de stocker, de manipuler ou d'utiliser les matériaux dangereux ou les produits chimiques. Pour obtenir les FDS, se reporter à la section « Documentation et support » du présent document.
- Limiter les contacts avec les produits chimiques. Porter des équipements de protection appropriés lors de la manipulation des produits chimiques (par exemple : lunettes de sûreté, gants ou vêtements de protection).
- Limiter l'inhalation des produits chimiques. Ne pas laisser les récipients de produits chimiques ouverts. Ils ne doivent être utilisés qu'avec une ventilation adéquate (par exemple, sorbonne).
- Vérifier régulièrement l'absence de fuite ou d'écoulement des produits chimiques. En cas de fuite ou d'écoulement d'un produit, respecter les directives de nettoyage du fabricant recommandées dans la FDS.
- Manipuler les déchets chimiques dans une sorbonne.

- Veiller à utiliser des récipients à déchets primaire et secondaire. (Le récipient primaire contient les déchets immédiats, le récipient secondaire contient les fuites et les écoulements du récipient primaire. Les deux récipients doivent être compatibles avec les matériaux mis au rebut et conformes aux exigences locales, nationales et communautaires en matière de confinement des récipients.)
- Une fois le récipient à déchets vidé, il doit être refermé hermétiquement avec le couvercle fourni.
- Caractériser (par une analyse si nécessaire) les déchets générés par les applications, les réactifs et les substrats particuliers utilisés dans le laboratoire.
- Vérifier que les déchets sont convenablement stockés, transférés, transportés et éliminés en respectant toutes les réglementations locales, nationales et/ou communautaires en vigueur.
- **IMPORTANT !** Les matériaux représentant un danger biologique ou radioactif exigent parfois une manipulation spéciale, et des limitations peuvent s'appliquer à leur élimination.

WARNING! **HAZARDOUS WASTE (from instruments).** Waste produced by the instrument is potentially hazardous. Follow the guidelines noted in the preceding General Chemical Handling warning.

WARNING! **4L Reagent and Waste Bottle Safety.** Four-liter reagent and waste bottles can crack and leak. Each 4-liter bottle should be secured in a low-density polyethylene safety container with the cover fastened and the handles locked in the upright position.

Limited product warranty