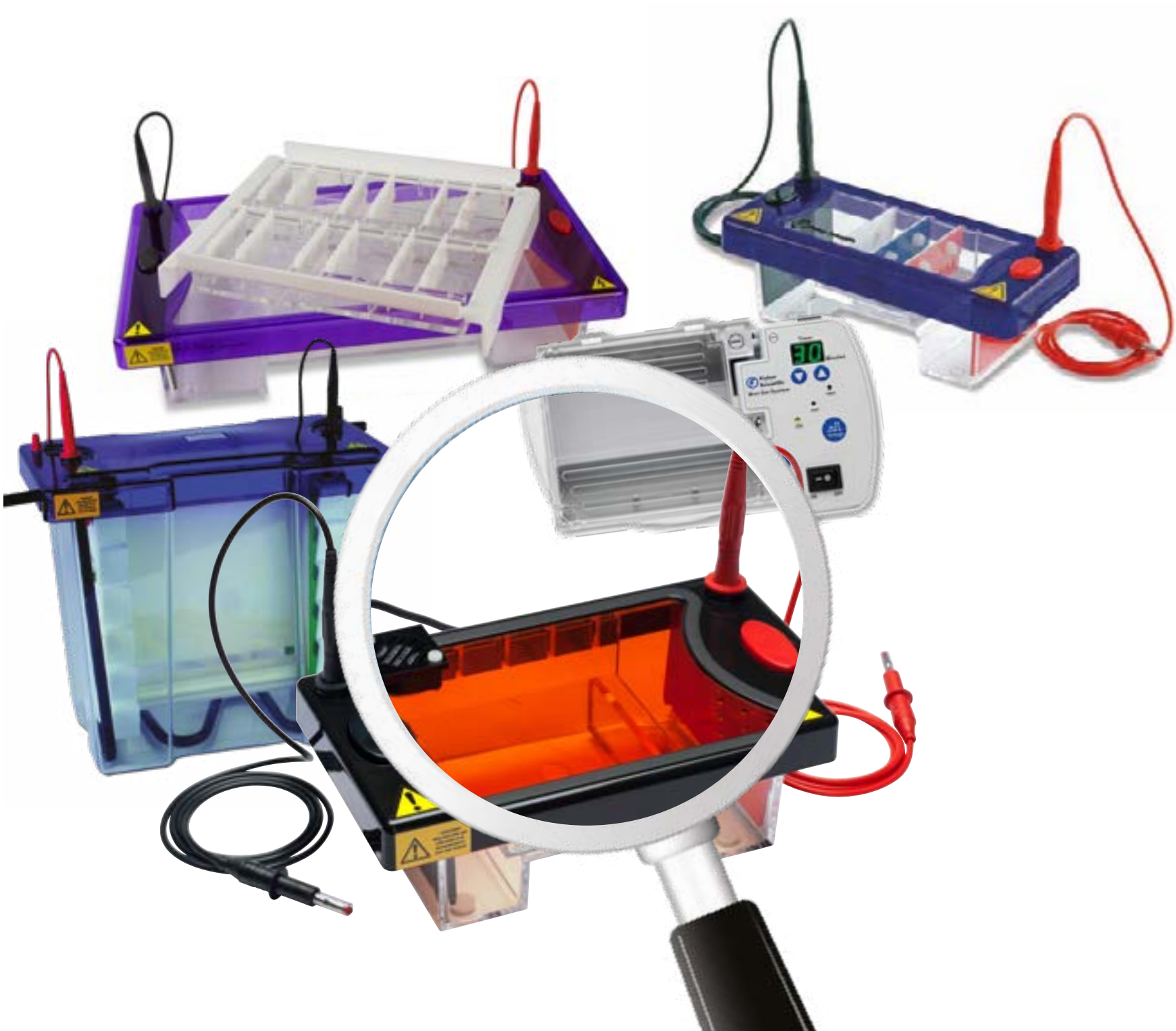
fisherbrand

Focus on ELECTROPHORESIS

Find reliable, essential Fisherbrand™, Fisher Chemical™ and Fisher Bioreagents™ products that are designed to work together to meet your most demanding electrophoresis applications.



For the Love of Science

Like you, we constantly marvel at the wonders all around us, and within us, that deepen our devotion to the world of science

For over 50 years the Fisher Scientific team has poured that same endless passion into creating and continually refining the Fisherbrand portfolio: value-packed products that make your lab life easier each and every day when it matters most.

Collaborating with industry-leading manufacturers allows us to deliver quality products that are just right for you across all the categories you use most, including:

- Lab Essentials
- Consumables
- Equipment and Instruments
- Safety

In addition to the broad Fisherbrand product range, the Fisher Chemical and Fisher Bioreagents portfolios are also extensive. Fisher Chemical and Fisher Bioreagents products deliver convenience, quality and consistency and are widely used in many research sectors, including academia, pharmaceuticals, biotechnology and healthcare.

- The Fisher Chemical brand includes offers more than 4,000 chemicals of the highest quality, including organic and inorganic reagents and compounds, ready-made solutions and high-purity solvents. All chemicals are ISO 9001:2008 certified and undergo rigorous quality assurance and testing procedures, ensuring excellent lot-to-lot and bottle-to-bottle consistency. Supported by a clear and simple grade and application structure, choosing the product that best suits your requirements is easy.

- The Fisher Bioreagents collection includes offers over 1,000 products dedicated to molecular biology research, biochemistry and cellular biology. It is your single source for high-purity products.

fisherbrand fisher chemical fisher bioreagents

When used together, Fisherbrand, Fisher Chemical and Fisher Bioreagents products can help you produce your best work each and every day.

New products are constantly being introduced into the Fisherbrand family.
For the full range visit eu.fishersci.com/go/fisherbrand

For the Love of Science

Like you, we constantly marvel at the wonders all around us, and within us, that deepen our devotion to the world of science

This application brochure is dedicated to providing you with a comprehensive overview of our electrophoresis portfolio. Featuring a range of instruments, consumables, Fisher Chemical and Fisher Bioreagents products, as well as useful resources such as formulas for producing your own stock solutions, troubleshooting guides, FAQs and workflows, it is a great lab companion.

For the Love of Science

Like you, we constantly marvel at the wonders all around us, and within us, that deepen our devotion to the world of science

Introduction to Horizontal Gel Electrophoresis

Horizontal Gel Units

Mini Gel System
Horizontal Gel Units, SUB-GEL
- SUB-GEL Mini
- SUB-GEL Midi
- SUB-GEL Midi-Plus
- SUB-GEL Maxi

Horizontal Gel Units, Wide Format
- Wide Format, Mini-Plus
- Wide Format, Midi-Plus

RunView Units
Teaching Gel Units

Fisher Bioreagents for Horizontal Gel Electrophoresis

Agarose
Buffers for Horizontal DNA Electrophoresis
Buffer Components for Horizontal DNA Electrophoresis
Buffers for Horizontal RNA Electrophoresis
Sample Loading Dyes
DNA Visualisation
DNA Ladders
Other Bioreagents

Producing Your Own Stock Solutions for Horizontal Gel Electrophoresis

Technical Resources

Genomics Workflow
Horizontal Gel Unit Troubleshooting Guide
Frequently Asked Questions (FAQs) – Horizontal Gel Electrophoresis

Introduction to Vertical Gel Electrophoresis

Vertical Gel Units

Verti-Gel Mini, 2-Gel System (Standard)
Verti-Gel Mini, 4-Gel System (Tetrad)
Verti-Gel Maxi, 2-Gel System (Standard)

Fisher Bioreagents for Vertical Gel Electrophoresis

EZ-Run Protein Gel Solution
EZ-Run Protein Standards Solution
EZ-Run Protein Gel Staining Solution
Buffers for Protein Electrophoresis
Acrylamide, Bis-Acrylamide and Catalysts
Detergents/Denaturing Reagents

Producing Your Own Stock Solutions for Vertical Gel Electrophoresis

Blotting

Semi Dry Blotting Units

Technical Resources

Proteomics Workflow
Vertical Gel Unit Troubleshooting Guide
Frequently Asked Questions (FAQs) – Vertical Gel Electrophoresis

Power Supplies

Mini 300V Plus and PowerPlus Series
- Mini 300V Plus
- PowerPlus 300
- PowerPlus 500
- PowerPlus 3AMP

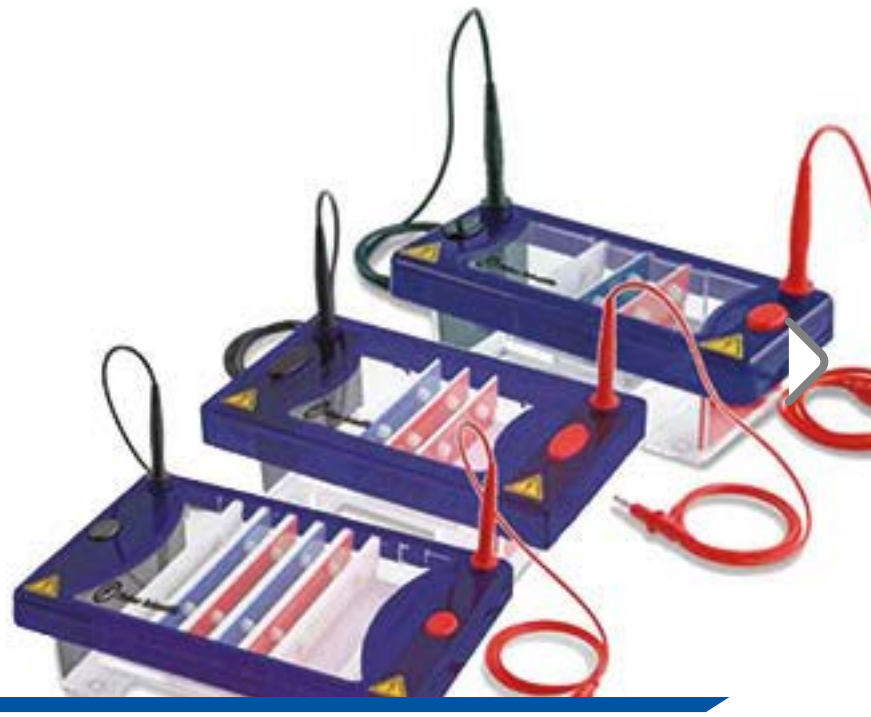
Technical Resources

Power Supplies Troubleshooting Guide
Frequently Asked Questions (FAQs) – Power Supplies

Related Equipment

UV Sterilisation Cabinets
Blue Light Transilluminator

Horizontal Gel Units

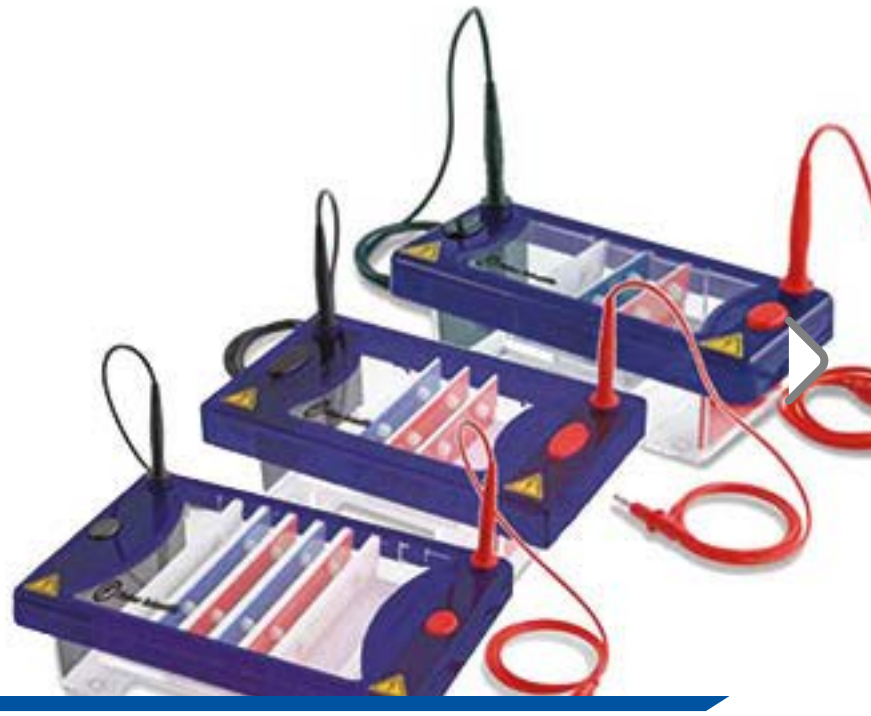


Introduction to Horizontal Gel Electrophoresis

Although a long-established technique, horizontal gel electrophoresis offers many advantages for nucleic acid separation and remains today one of the mainstays of molecular biology. It is an analytical technique used to separate DNA or RNA molecules based on size. Samples are loaded into wells of an agarose gel, which is submerged in an electrophoresis unit containing buffer, and subjected to an electric field. Due to the net negative charge of the DNA/RNA molecule, applying the electric current induces it to migrate towards the anode. Separation is achieved within the gel matrix as larger molecules migrate slowly and remain near the cathode, whilst smaller molecules experience less resistance within the gel and migrate towards the anode.

This section provides an overview of the Fisherbrand horizontal gel units, one of the most comprehensive and versatile ranges currently available for low- and high-throughput DNA and RNA applications.

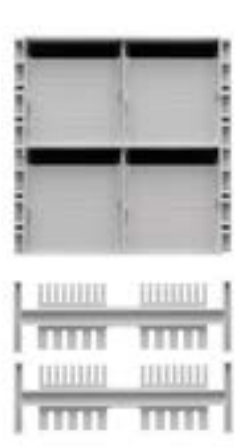
Horizontal Gel Units

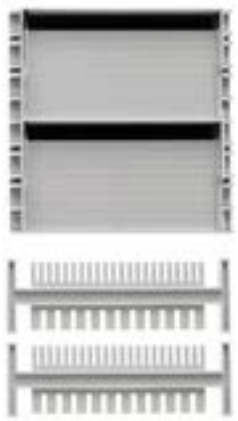


Horizontal Gel System, Mini

Simply pour gel, load contrast strips, and press start. The Fisherbrand Mini electrophoresis system is ideal for personal use, for small laboratories or the classroom.

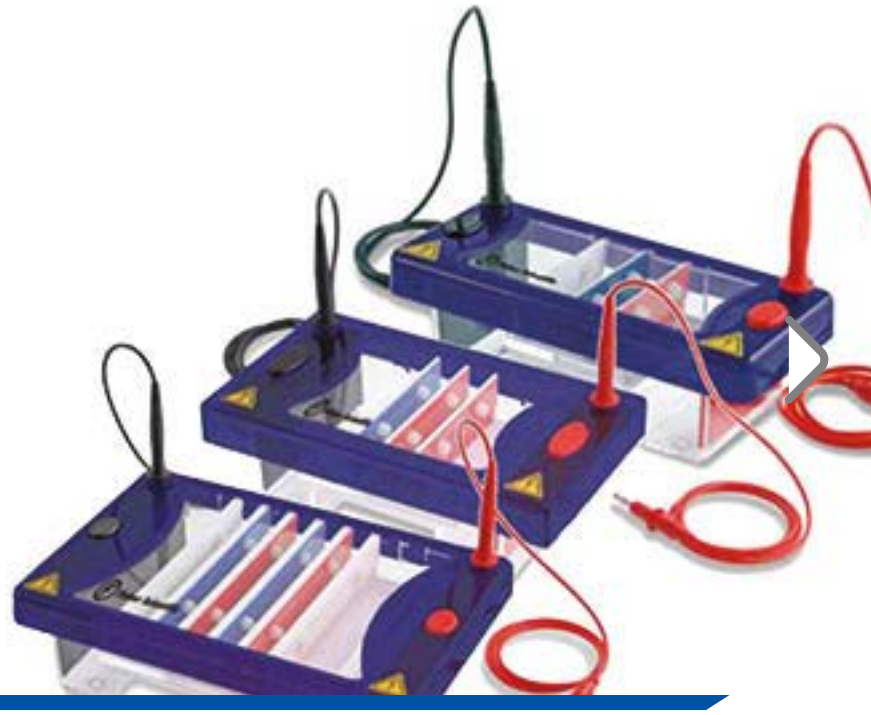
- Quick and easy gel casting
- No clamps or spacers required
- Compact design
- Runs one gel 105 x 60mm or two gels 50 x 60mm
- Power supply, gel tank and casting equipment included
- Casting sets comprise two casting stands to make two medium or four small gels
- Buffer volume 230mL
- Dimensions 190 x 130 x 55mm
- Voltage 35, 50, 100V
- Warranty: One year





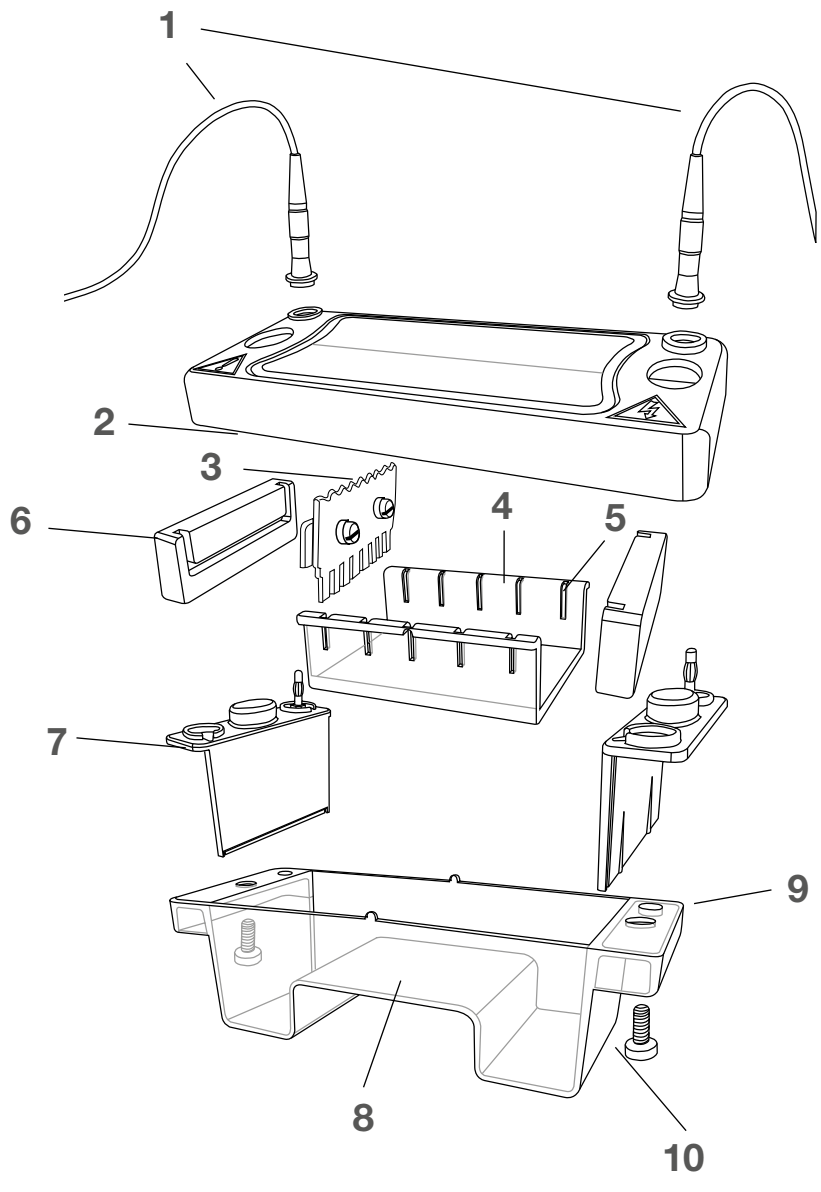
Cat. No.	Description	Electrical requirements	Timer	Pack qty
15530340	Mini gel system, includes two casting sets, lid and power supply	115V or 230V, 50/60Hz	0 to 99 min. or continuous	1

Horizontal Gel Units



Horizontal Gel Units, SUB-GEL

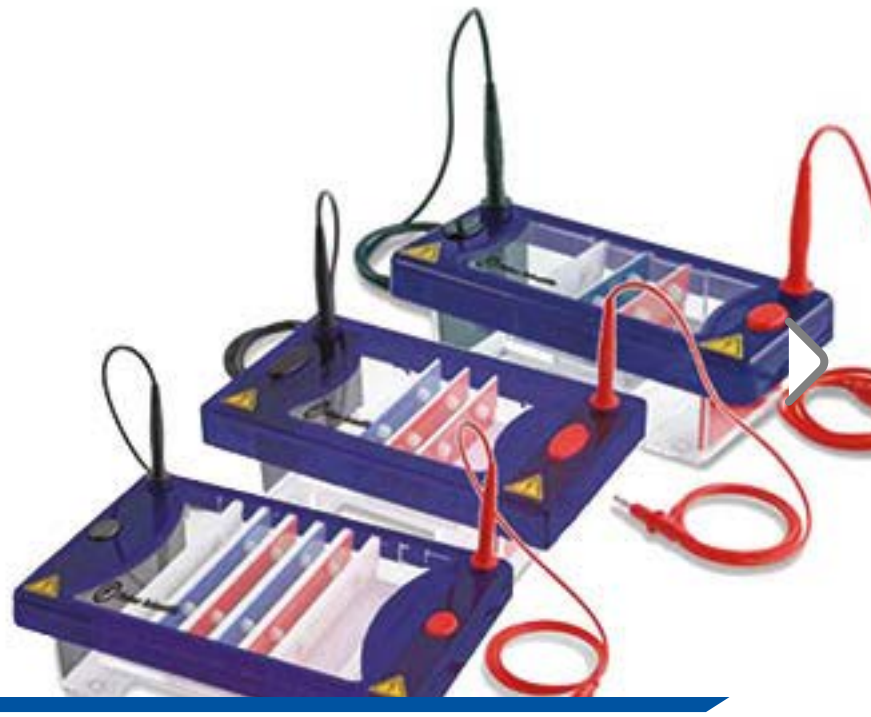
The Fisherbrand SUB-GEL range features Mini, Midi, Midi-Plus and Maxi units. The relatively compact size of each unit results in economical buffer and gel consumption without compromising resolution and separation speed.



Components of the SUB-GEL Mini gel tank

1 Power cables
2 Safety lid and viewing pane
3 Height-adjustable comb
4 UV transparent gel tray
5 Comb slots
6 'Plug-and-Go' casting dams
7 Colour coded electrodes with power plug connectors
8 Gel platform
9 Safety lid thumb locators
10 Moulded tank

Horizontal Gel Units



Tank and lid design

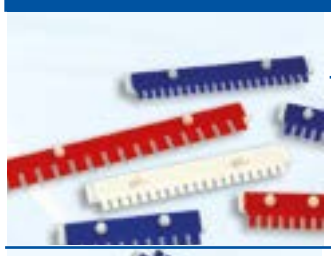
High-quality injection-moulded construction and durable leak-proof design for complete safety and longevity

Cassette-style electrodes — difficult to break, but inexpensive and easy to change — composed of 99.99% corrosion resistant, pure platinum

Electrical safety — lid removal immediately disconnects power to the lower buffer chamber to allow entirely safe access to the gel

Easy-click lid removal — asymmetric lid design and thumb locators on colour coded cassette-style electrodes ensure that electrophoresis is always performed in the correct polar direction e.g. negative to positive

Combs



The widest range of combs available - fit virtually every application from preparatory electrophoresis to high throughput screening

Available in four thicknesses and colour coded. Range from:
- White — 1mm supplied as standard
- Black — 0.75mm for tightly resolved bands
- Red — 1.5mm to maximise sample volume
- Blue — 2mm to maximise sample volume

Black and white combs recommended for high resolution gels and publication quality data; red and blue to scale up nucleic acid volumes for preparatory techniques

Height adjustable, without any requirement for specialist tools or comb holders, to give user full control over well depth and sample loading volume; rigid comb back prevents heat-induced warping

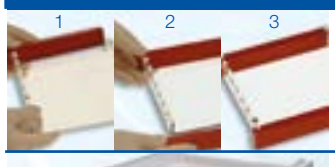
Reversible loading guides sit directly above each well to provide a convenient loading template for single and multichannel pipettors

Trays

Multiple gel tray options — eliminate the need for additional gel tanks and allow gels to be cast externally, keeping the tank permanently in use for electrophoresis if required

UV and blue light transparent

Casting



'Plug-and-Go' casting — moulded casting dams clip easily onto the ends of the gel tray for rapid external casting
Casting is as simple as 1, 2, 3...
(1) Simply place one dam onto the lab bench facing upwards and insert the tray into the groove in the dam
(2) Repeat with the second dam at the other end
(3) The tray is now sealed and may be placed on flat bench space or gel levelling table in readiness for leakproof gel-casting

Other casting options include flexicaster and plastic casting gates

Accessories

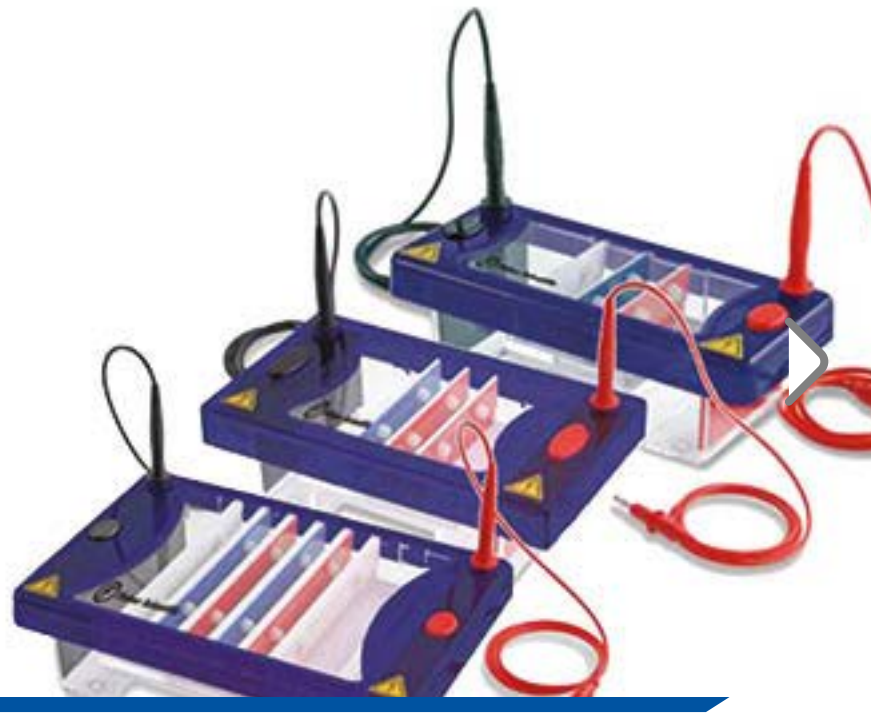
- Red loading guides — aid well and sample visualisation during loading
- White gel platform — provides a contrasting background to view bromophenol blue migration fronts and determine electrophoresis progress during every run

Gel levelling table. Adjustable levelling feet used in conjunction with a levelling bubble provide an even surface upon which to pour wide and large format gels, to ensure consistent and uniform migration

runFAST cool pack and platform — sit directly above the gel in the buffer to provide enhanced resolution and faster run times; especially suited to larger format horizontals. To use:
(1) Fill the tank with buffer and load samples
(2) Insert platform above the gel
(3) Place pre-frozen cool pack onto platform; connect to power supply and run samples at higher voltage

- Power cables — with 4mm connectors compatible with most modern low-to-medium voltage power supplies; CE compliant. Adapters available for complete power supply compatibility
- Buffer saver blocks — conserve buffer for added economy, especially beneficial in larger format units

Horizontal Gel Units



SUB-GEL Mini

Designed for quick checks of low to medium numbers of samples.

- Supplied with 70mm x 70mm and 70mm x 100mm gel trays
- Economic low gel and buffer volumes
- Small footprint
- Injection moulded

Technical Specification

Dimensions [l x w], mm.....70 x 70, 100 x 70 (gel)
Dimensions [l x w x h], mm.....210 x 90 x 90 (unit)
Capacity.....32 samples (max., 70mm x 70mm tray)
64 samples (max., 70mm x 100mm tray)
Volume, mL.....225 (buffer)
Combs
- No. of samples.....1, 2, 4, 8MC, 8, 10, 12MC, 16
- Thickness, mm.....0.75, 1, 1.5, 2

MC = Multichannel pipettor compatible

Cat. No.	Description
11863303	SUB-GEL Mini

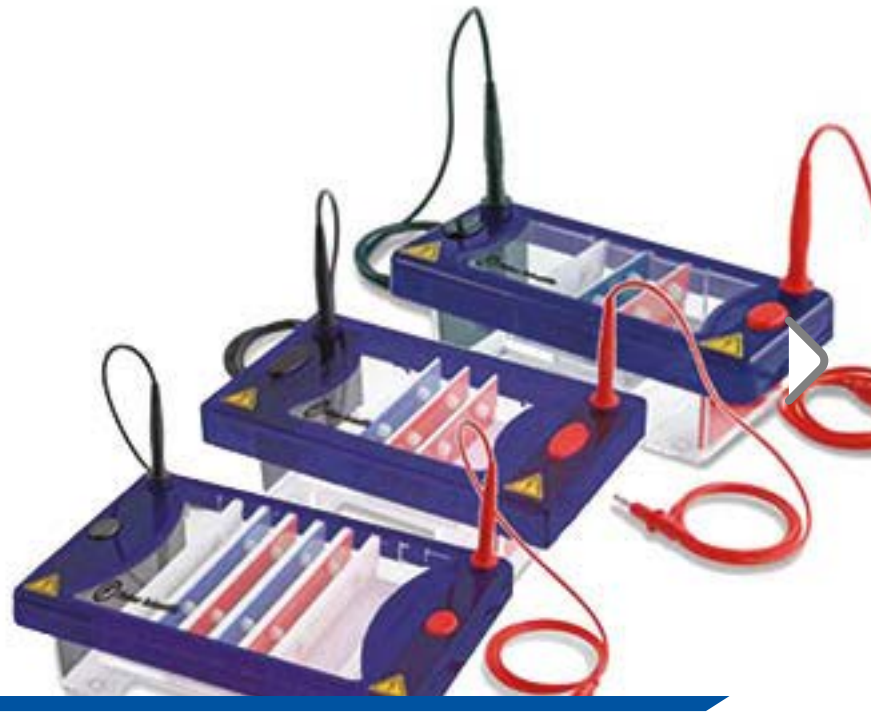
Combs

Combs	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL
	Thickness 0.75mm		Thickness 1.0mm		Thickness 1.5mm		Thickness 2.0mm	
Prep 1, Marker 1	**11873473**	152	**11823483**	203	**11833483**	304	**11843483**	405
Prep 2, Marker 2	**11833493**	68	**11843493**	90	**11857553**	135	**11867553**	180
Prep 4, Marker 2	**11877553**	36	**11887553**	48	**11897553**	72	**11807563**	96
8 sample, MC	**11857563**	8	**11867563**	11	**11877563**	17	**11887563**	23
8 sample	**11817563**	19	**11827563**	25	**11837563**	37	**11847563**	50
10 sample	**11883473**	14	**11893473**	18	**11803483**	27	**11813483**	36
12 sample, MC	**11853483**	10	**11863483**	14	**11873483**	20	**11883483**	27
16 sample	**11893483**	7	**11803493**	10	**11813493**	15	**11823493**	20

Accessories

Cat. No.	Description
11847573	UV tray 70mm x 70mm
11837573	UV tray 100mm x 70mm
11837633	Casting dams
11863473	SUB-GEL Mini/Midi flexi caster
11897563	Adhesive loading guides
11867573	Viewing platform
11807583	Cool-pack and platform
11877633	Buffer saver blocks (x 2)
11857573	UV gel scoop, 70mm

Horizontal Gel Units



SUB-GEL Midi

Ideal for quick checks of samples from PCR and cloning.

- Run up to 100 samples
- Low buffer volumes
- Ideal for rapid electrophoresis
- Injection moulded

Technical Specification

Dimensions [l x w], mm ..... 70 x 100, 100 x 100 (gel)
Dimensions [l x w x h], mm ..... 220 x 125 x 90 (unit)
Capacity ..... 50 samples (100mm x 70mm tray, max.)
100 samples (100mm x 100mm tray, max.)
Volume, mL ..... 300 (buffer)
Combs
- No. of samples 1, 2, 4, 8, 10MC, 12, 16, 20MC, 25
- Thickness, mm 0.75, 1, 1.5, 2

Cat. No.	Description
11853303	SUB-GEL Midi

Combs

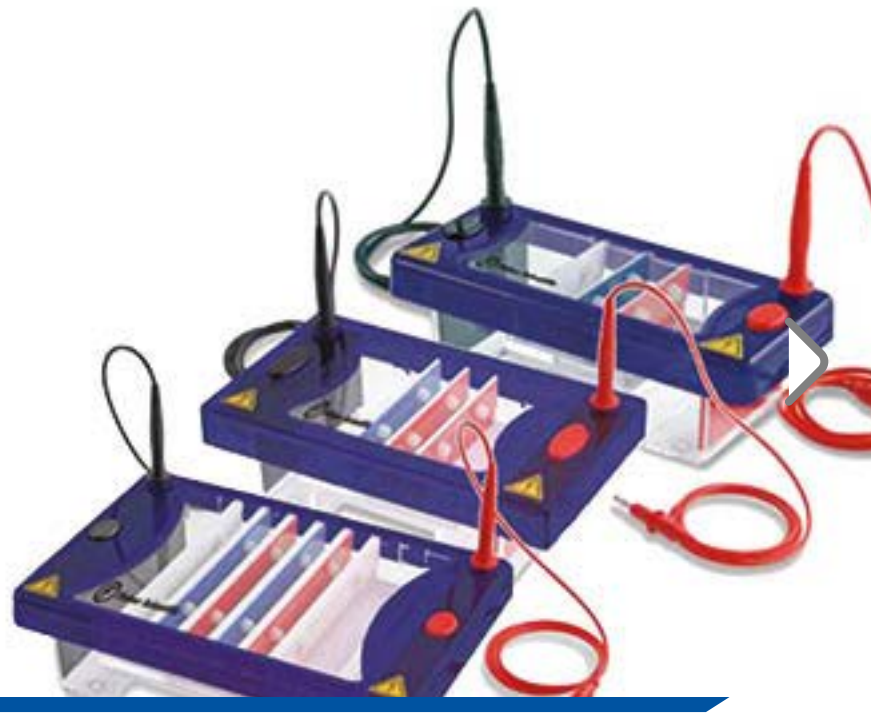
Combs	Cat. No.	Sample size, µL		Sample size, µL		Sample size, µL		Sample size, µL	
	Thickness 0.75mm		Thickness 1.0mm		Thickness 1.5mm		Thickness 2.0mm		
Prep 1, Marker 1	**11883303**	270	**11833313**	360	**11843313**	540	**11853313**	720
Prep 2, Marker 2	**11843323**	118	**11893323**	158	**11803333**	236	**11813333**	315
Prep 4, Marker 2	**11863333**	57	**11873333**	77	**11883333**	115	**11893333**	153
8 sample	**11803343**	30	**11813343**	41	**11823343**	61	**11813353**	81
10 sample MC	**11893303**	20	**11803313**	27	**11813313**	41	**11823313**	54
12 sample	**11863313**	17	**11873313**	23	**11883313**	34	**11893313**	45
16 sample	**11803323**	12	**11813323**	16	**11823323**	24	**11833323**	32
20 sample MC	**11853323**	10	**11863323**	14	**11873323**	20	**11883323**	27
25 sample	**11823333**	7	**11833333**	10	**11843333**	15	**11853333**	20

MC = Multichannel pipettor compatible

Accessories

Cat. No.	Description
11873353	UV tray 70mm x 100mm
11863353	UV tray 100mm x 100mm
11807633	Casting dams
11863473	SUB-GEL Mini/Midi flexi caster
11823353	Adhesive loading guides
11803363	Viewing platform
11897573	Cool-pack and platform
11867633	Buffer saver blocks (x 2)
11893353	UV gel scoop, 100mm

Horizontal Gel Units



SUB-GEL Midi-Plus

Ideal for restriction fragment analysis, sample prep or checking high numbers of samples.

- Run up to 210 samples
- Low buffer volumes
- Multichannel pipettor compatible combs for fast gel loading
- Injection moulded

Technical Specification

Dimensions [l x w], mm.....70 x 150, 100 x 150, 150 x 150 (gel)
Dimensions [l x w x h], mm.....265 x 175 x 90 (unit)
Capacity.....70 samples, max. (70mm x 150mm tray)
140 samples, max. (100mm x 150mm tray)
210 samples, max. (150mm x 150mm tray)
Volume, mL.....500 (buffer)
Combs
No. of samples.....1, 2, 4, 10, 10MC, 12, 14MC, 16, 18MC, 20, 28MC, 30MC, 35
Thickness, mm.....0.75, 1, 1.5, 2

Cat. No.	Description
11833293	SUB-GEL Midi-Plus

Combs

Combs	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL
	Thickness 0.75mm		Thickness 1.0mm		Thickness 1.5mm		Thickness 2.0mm	
Prep 1, Marker 1	**11823363**	371	**11813373**	495	**11823373**	743	**11833373**	990
Prep 2, Marker 2	**11803393**	169	**11853393**	225	**11863393**	338	**11873393**	450
Prep 4, Marker 2	**11803413**	91	**11813413**	122	**11823413**	182	**11833413**	243
10 sample	**11833363**	34	**11843363**	45	**11853363**	68	**11863363**	90
10 sample, MC	**11873363**	22	**11883363**	29	**11893363**	44	**11803373**	59
12 sample	**11843373**	30	**11853373**	41	**11863373**	61	**11873373**	81
14 sample, MC	**11883373**	22	**11893373**	29	**11803383**	44	**11813383**	59
16 sample, MC	**11823383**	20	**11833383**	27	**11843383**	41	**11853383**	54
18 sample, MC	**11863383**	8	**11873383**	11	**11883383**	17	**11893383**	23
20 sample	**11813393**	16	**11823393**	21	**11833393**	32	**11843393**	43
28 sample, MC	**11883393**	8	**11893393**	11	**11803403**	17	**11813403**	23
30 sample, MC	**11823403**	9	**11833403**	13	**11843403**	19	**11853403**	25
35 sample	**11863403**	7	**11873403**	10	**11883403**	15	**11893403**	20

MC = Multichannel pipettor compatible

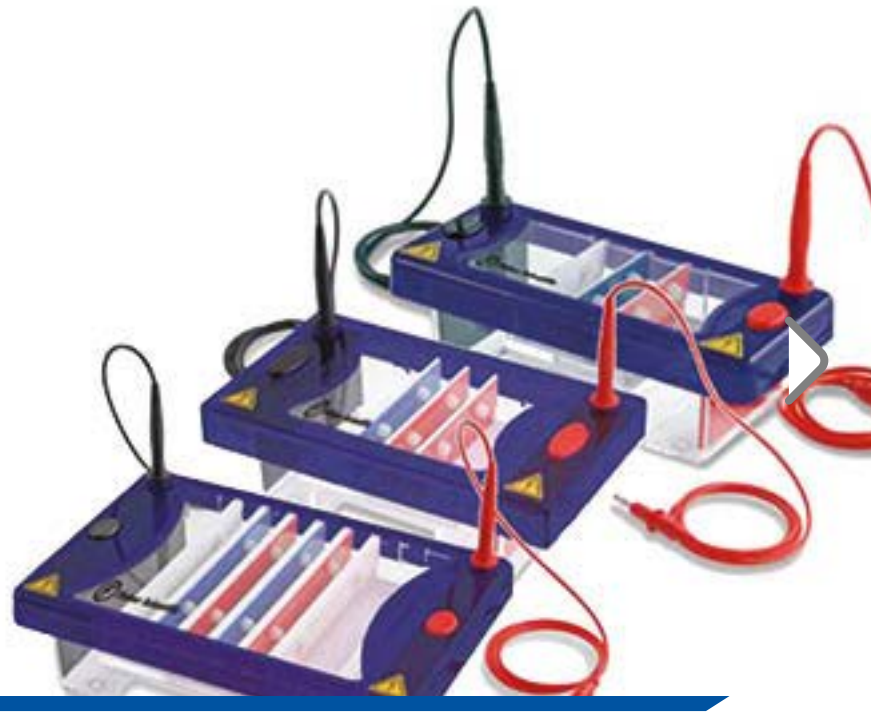
Accessories

Cat. No.	Description
11803423	UV tray 70mm x 150mm
11883413	UV tray 100mm x 150mm
11893413	UV tray 150mm x 150mm
11817633	Casting dams

Cat. No.	Description
11813363	SUB-GEL Midi-Plus/Maxi flexi caster
11823423	Adhesive loading guides
11843413	Viewing platform

Cat. No.	Description
11877573	Cool-pack and platform
11847633	Buffer saver blocks (x 2)
11813423	UV gel scoop, 150mm

Horizontal Gel Units



SUB-GEL Maxi

Primarily designed for separating high numbers of samples from PCR or cloning.

- Supplied with 200mm x 100mm and 200mm x 200mm gel trays. Also available in 200mm x 250mm
- Run up to 550 samples
- Low buffer volumes
- Ideal for extended separations
- Injection moulded

Technical Specification

Dimensions [l x w], mm.....100 x 200, 200 x 200 (gel)
Dimensions [l x w x h], mm.....395 x 230 x 90 (unit)
Capacity.....200 samples, max. (200mm x 100mm tray)
450 samples, max. (200mm x 200mm tray)
550 samples, max. (200mm x 250mm tray)
Volume, mL.....1,200 (buffer)
Combs
- No. of samples.....1, 2, 4, 10, 16, 20MC, 25, 30, 36, 40MC, 50
- Thickness, mm.....0.75, 1, 1.5, 2

Cat. No.	Description
11843303	SUB-GEL Maxi

Combs

Combs	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL
	Thickness 0.75mm		Thickness 1.0mm		Thickness 1.5mm		Thickness 2.0mm	
Prep 1, Marker 1	**11833423**	508	**11883423**	675	**11893423**	1,013	**11803433**	1,350
Prep 2, Marker 2	**11853433**	236	**11803443**	315	**11813443**	473	**11823443**	630
Prep 4, Marker 2	**11853453**	115	**11803463**	153	**11813463**	230	**11823463**	306
10 sample	**11843423**	54	**11853423**	72	**11863423**	108	**11873423**	144
16 sample	**11813433**	30	**11823433**	41	**11833433**	61	**11843433**	81
20 sample, MC	**11863433**	20	**11873433**	27	**11883433**	41	**11893433**	54
25 sample	**11833443**	16	**11843443**	21	**11853443**	32	**11863443**	42
30 sample	**11873443**	13	**11883443**	17	**11893443**	26	**11803453**	34
36 sample	**11813453**	11	**11823453**	14	**11833453**	22	**11843453**	29
40 sample, MC	**11863453**	8	**11873453**	11	**11883453**	17	**11893453**	23
50 sample	**11833463**	8	**11843463**	10	**11853463**	16	**11863463**	21

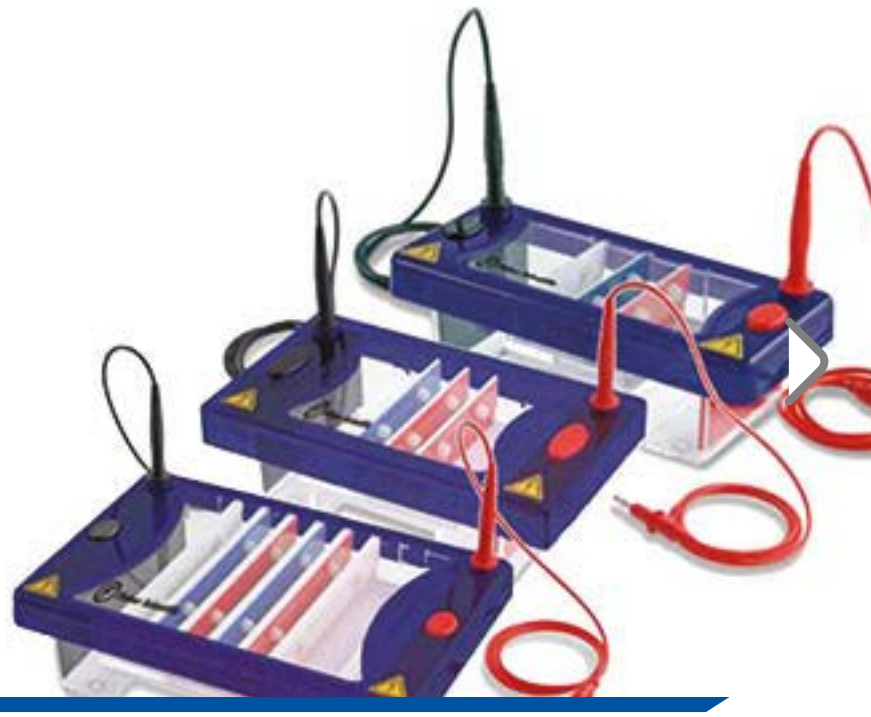
MC = Multichannel pipettor compatible

Accessories

Cat. No.	Description
11813473	UV tray 200mm x 100mm
11823473	UV tray 200mm x 200mm
11833473	UV tray 200mm x 250mm
11827633	Casting dams
11813363	SUB-GEL Midi-Plus/Maxi Flexi caster

Cat. No.	Description
11873463	Adhesive loading guides
11853473	Viewing platform
11887573	Cool-pack and platform
11857633	Buffer saver blocks (x 2)
11843473	UV gel scoop, 200mm

Horizontal Gel Units



Horizontal Gel Units, Wide Format

Fisherbrand horizontal wide format gel units are ideal for the screening and analysis of a wide range of samples including PCR products, DNA mini-preps, plasmid vectors and restriction fragments. They allow a greater number of samples to be run on one gel without compromising sample volume.

Wide Format, Mini-Plus

For routine, rapid electrophoresis.

- Gel dimensions: 102mm x 144mm (l x w)
- Buffer volume: 500mL
- Maximum number of samples: 80
- Removable gel casting tray

Features four comb positions for the faster separation of multiple samples

Cat. No.	Description
11553352	Includes: Gel unit, wide format, Mini-Plus, 1 x gel casting tray with gates, 2 x 1.0mm 20 sample combs, power supply connectors and loading strips

Combs

Combs	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL		Sample size, µL
	Thickness 1.0mm		Thickness 1.5mm		Thickness 2.0mm	
4 sample	**11523362**	42	**11503372**	213	**11583372**	284
8 sample, MC	**11533362**	67	**11513372**	100	**11593372**	133
10 sample	**11543362**	52	**11523372**	77	**11503382**	103
12 sample	**11553362**	40	**11533372**	61	**11513382**	81
16 sample, MC	**11563362**	29	**11543372**	44	**11523382**	58
20 sample	**11573362**	22	**11553372**	32	**11533382**	43

MC = Multichannel pipettor compatible

Accessories

Cat. No.	Description
11563352	Gel casting tray
11573352	Silicone casting gates, pack of 2

Wide Format, Midi-Plus

For both analytical and preparative studies of nucleic acids.

- Gel dimensions: 140mm x 230mm (l x w)
- Buffer volume: 800mL
- Maximum number samples: 200
- Removable gel casting tray

Features four comb positions for the faster separation of multiple samples with the benefit of optional buffer recirculation ports

Cat. No.	Description
11563382	Includes: Gel unit, wide format, Midi-Plus, 1 x gel casting tray, 2 x 1.0mm 16 sample combs, buffer recirculation ports, power supply connectors and loading strips

Combs

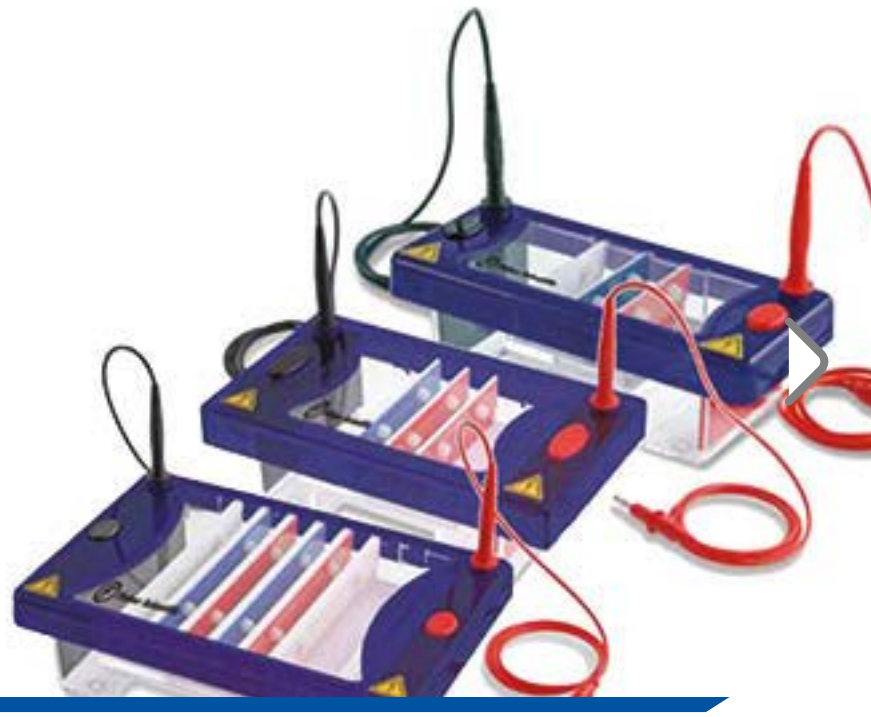
Combs	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL		Sample size, µL
	Thickness 1.0mm		Thickness 1.5mm		Thickness 2.0mm	
12 sample, MC	**11523392**	72	**11593392**	108	**11563402**	144
16 sample	**11533392**	52	**11503402**	78	**11573402**	104
20 sample	**11543392**	40	**11513402**	60	**11583402**	80
25 sample, MC	**11553392**	30	**11523402**	45	**11593402**	60
28 sample	**11563392**	26	**11533402**	39	**11503412**	52
40 sample	**11573392**	17	**11543402**	25	**11513412**	34
50 sample, MC	**11583392**	15	**11553402**	23	**11523412**	30

MC = Multichannel pipettor compatible

Accessories

Cat. No.	Description
11573382	Gel casting tray, 100mm x 230mm
11583382	Gel casting tray, 140mm x 230mm
11503392	Silicone casting gates, pack of 2

Horizontal Gel Units



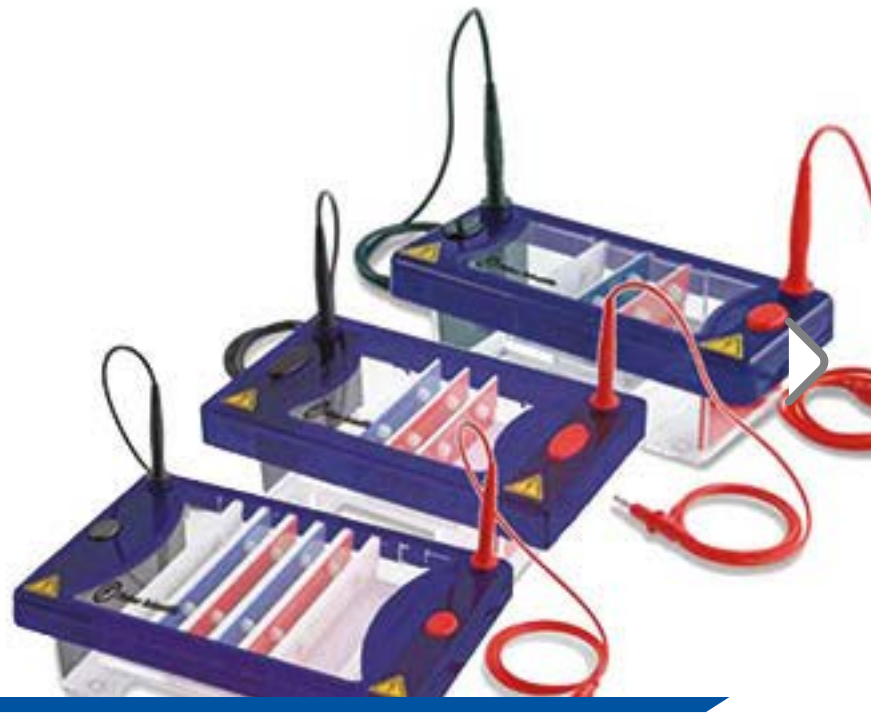
runVIEW, Mini and Midi Systems

Real-Time Size Fractionation and Recovery of Nucleic Acids

runVIEW™ is an innovative system that combines blue LED lighting and an inbuilt power supply to create a real-time electrophoresis system giving you near instant verification of results. Perfect for saving time in quick sample checks or for teaching the principles of electrophoresis.

- Two types of runVIEW packages are available:
  - runVIEW CONVERTER package includes runVIEW adjustable viewing platform and bluVIEW Mini or Midi emission filter lid (allows standard SUB-GEL Mini or SUB-GEL Midi tanks to be converted to real-time electrophoresis)
  - runVIEW STANDARD package includes runVIEW adjustable viewing platform and runVIEW SUB-GEL Mini or Midi tank
- The runVIEW portable adjustable blue light illuminator viewing platform can be used with SUB-GEL Mini and SUB-GEL Midi electrophoresis tanks
- blueVIEW emission filter lid with built-in extractor fan enables condensation-free viewing of blue light fluorescently-stained 70mm or 100mm wide agarose gels
- Blue light is completely safe and results in improved cloning efficiency compared to UV
- Typical applications:
  - Education
  - Ideal for quick checks of low and medium numbers of samples following PCR and cloning

Horizontal Gel Units



runView Systems, continued

Technical information

runVIEW Adjustable Viewing Platform

Blue light wavelength, nm..... 470
Unit dimensions [l x w], mm.....180 x 125
Operating temperature °C..... ambient to 40
Rated voltage..... 100 to 240V, 50/60Hz

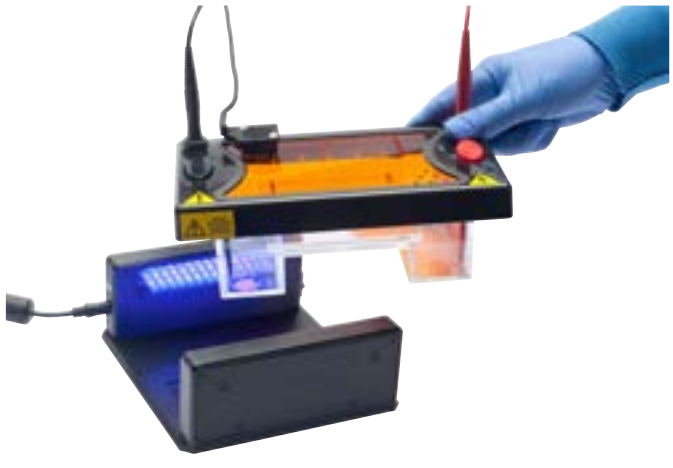
runVIEW SUB-GEL Mini System

Unit dimensions [l x w x h], mm..... 170 x 210 x 90
(when fitted into runView adjustable viewing platform)
Gel dimensions [l x w], mm..... 70 x 70; 100 x 70
Buffer volume, mL..... 225
bluVIEW lid design..... amber special emission filter with built-in extractor fan powered by the base unit
Comb* (included as standard)
No. of samples..... 2 x 8 sample combs
Thickness, mm.....1mm

runVIEW SUB-GEL Midi System

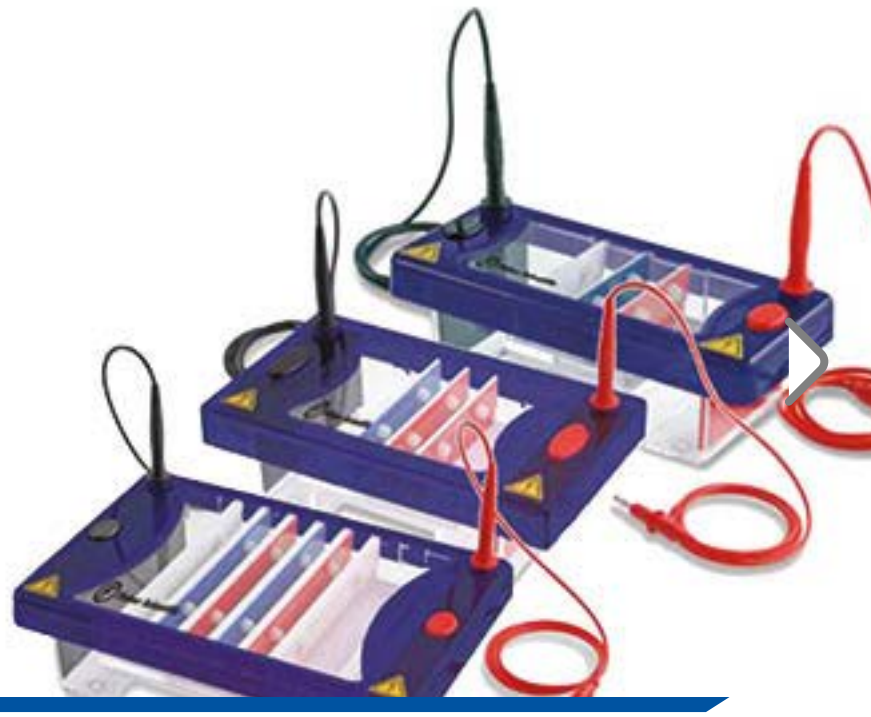
Unit dimensions [l x w x h], mm..... 170 x 220 x 90
(when fitted into runView adjustable viewing platform)
Gel dimensions [l x w], mm.....70 x 100; 100 x 100
Buffer volume, mL..... 300
bluVIEW lid design..... amber special emission filter with built-in extractor fan powered by the base unit
Comb* (included as standard)
No. of samples..... 2 x 16 sample combs
Thickness, mm..... 1mm

*Refer to 'Combs and Accessories' listing on the next page for complete range of comb options



Cat. No.	Description
15391357	runVIEW CONVERTER package includes runVIEW viewing platform and bluVIEW lid for use with customers own SUB-GEL Mini unit
15301367	runVIEW CONVERTER package includes runVIEW viewing platform and bluVIEW lid for use with customers own SUB-GEL Midi unit
15321367	runVIEW STANDARD package includes runVIEW viewing platform, plus runVIEW SUB-GEL Mini System
15331367	runVIEW STANDARD package includes runVIEW viewing platform, plus runVIEW SUB-GEL Midi System

Horizontal Gel Units



Combs for runVIEW SUB-GEL Mini System

Combs	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL
	Thickness 0.75mm		Thickness 1.0mm		Thickness 1.5mm		Thickness 2.0mm	
Prep 1, Marker 1	**11873473**	152	**11823483**	203	**11833483**	304	**11843483**	405
Prep 2, Marker 2	**11833493**	68	**11843493**	90	**11857553**	135	**11867553**	180
Prep 4, Marker 2	**11877553**	36	**11887553**	48	**11897553**	72	**11807563**	96
8 sample, MC	**11857563**	8	**11867563**	11	**11877563**	17	**11887563**	23
8 sample	**11817563**	19	**11827563**	25	**11837563**	37	**11847563**	50
10 sample	**11883473**	14	**11893473**	18	**11803483**	27	**11813483**	36
12 sample, MC	**11853483**	10	**11863483**	14	**11873483**	20	**11883483**	27
16 sample	**11893483**	7	**11803493**	10	**11813493**	15	**11823493**	20

MC = Multichannel pipettor compatible

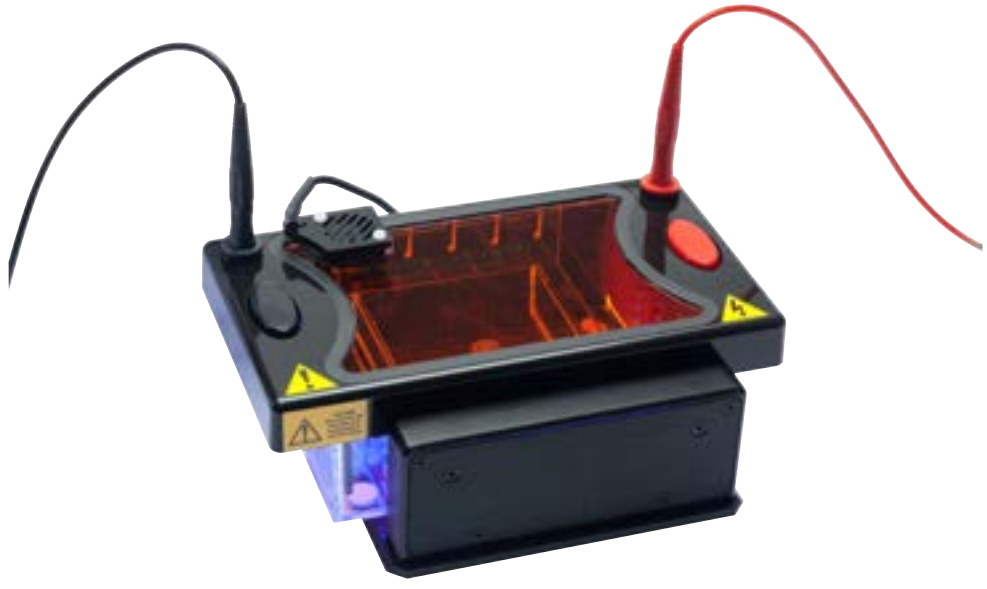
Combs for runVIEW SUB-GEL Midi System

Combs	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL
	Thickness 0.75mm		Thickness 1.0mm		Thickness 1.5mm		Thickness 2.0mm	
Prep 1, Marker 1	**11883303**	270	**11833313**	360	**11843313**	540	**11853313**	720
Prep 2, Marker 2	**11843323**	118	**11893323**	158	**11803333**	236	**11813333**	315
Prep 4, Marker 2	**11863333**	57	**11873333**	77	**11883333**	115	**11893333**	153
8 sample	**11803343**	30	**11813343**	41	**11823343**	61	**11813353**	81
10 sample MC	**11893303**	20	**11803313**	27	**11813313**	41	**11823313**	54
12 sample	**11863313**	17	**11873313**	23	**11883313**	34	**11893313**	45
16 sample	**11803323**	12	**11813323**	16	**11823323**	24	**11833323**	32
20 sample MC	**11853323**	10	**11863323**	14	**11873323**	20	**11883323**	27
25 sample	**11823333**	7	**11833333**	10	**11843333**	15	**11853333**	20

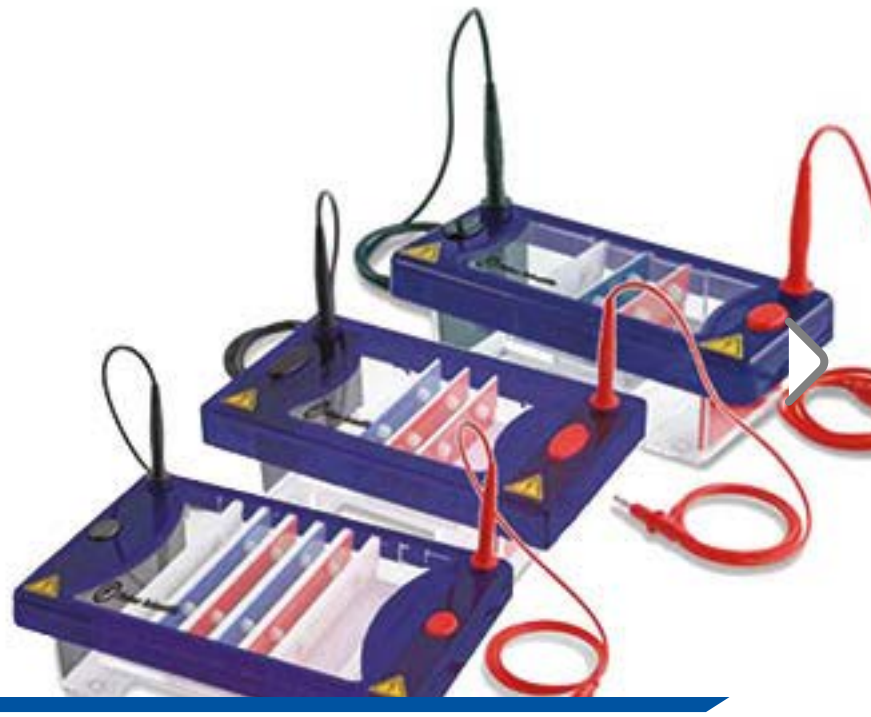
MC = Multichannel pipettor compatible

Accessories for the runVIEW System

Cat. No.	Description
11847573	UV tray 70mm x 70mm for SUB-GEL mini
11837633	Casting dams for SUB-GEL mini
11873353	UV tray 70mm x 100mm for SUB-GEL mini
11837573	UV tray 70mm x 100mm for SUB-GEL midi
11863353	UV tray 100mm x 100mm for SUB-GEL midi
11807633	Casting dams for SUB-GEL midi



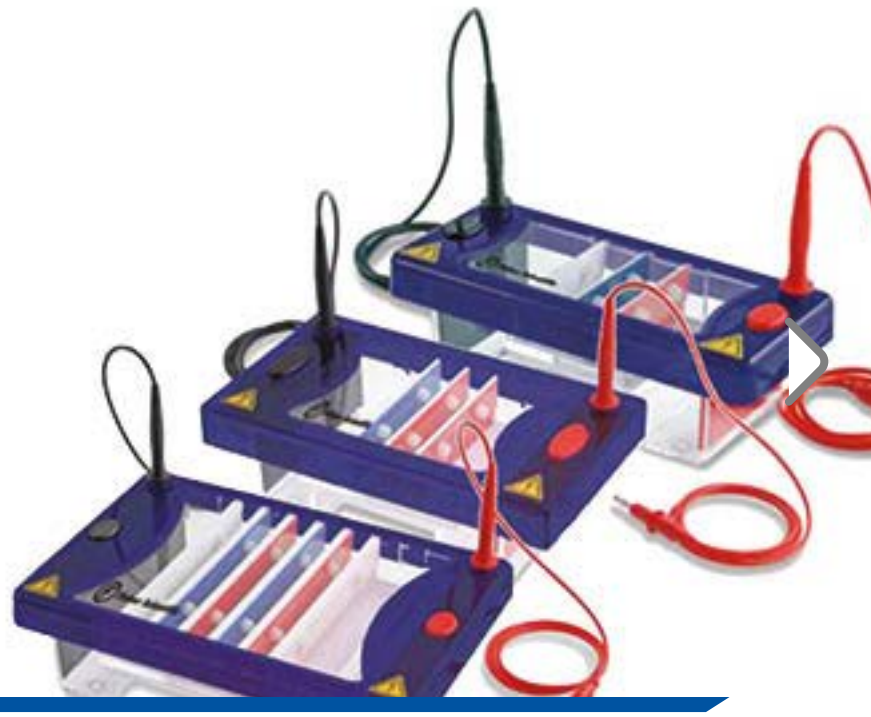
Horizontal Gel Units



SUB-GEL Teaching Tanks

Ideal for demonstration of horizontal gel electrophoresis

- Two new teaching tanks:
  - SUB-GEL 4X Mini featuring four 70mm x 70mm gel trays, maximum samples 64
  - SUB-GEL 6X Mini featuring six 70mm x 70mm gel trays, maximum samples 96
- Saves bench space, time and cost; teachers are able to demonstrate horizontal gel electrophoresis to multiple students using just a single gel tank and power supply
- Features all of the benefits of the wider SUB-GEL range including:
  - High-quality injection moulded construction
  - Leak free 'Plug-and-Go' casting dams
  - UV transparent gel trays
  - Height adjustable combs
  - Economic low gel and buffer volumes
  - Cassette-style electrodes — difficult to break, but inexpensive and easy to change
- Each tank is available with or without power supply
- Complete classroom workstation available, features four SUB-GEL 6X Mini units together with power supply, to demonstrate electrophoresis for up to 24 students at a time
- Typical applications:
  - Education — ideal for demonstrating horizontal gel electrophoresis to student classes; high throughput electrophoresis of mini gels



SUB-GEL Teaching Tanks, continued

Technical information

	SUB-GEL 4X Mini Teaching Tank	SUB-GEL 6X Mini Teaching Tank
Unit dimensions [l x w x h], mm	265 x 175 x 90	395 x 230 x 90
Gel dimensions [l x w], mm	70 x 70	70 x 70
Maximum gel throughput	Four 70mm x 70mm mini gels	Six 70mm x 70mm mini gels
Standard combs	8 x 8 sample, 1mm MC (two combs per gel)	12 x 8 sample, 1mm MC (two combs per gel)
Maximum sample capacity	64 samples with standard comb option, 128 samples using optional 16 sample combs	96 samples with standard comb option, 192 samples using optional 16 sample combs
Buffer volume, mL	500	1200
Combs - No. of samples - Thickness, mm	 1, 2, 4, 8MC, 8, 10, 12MC, 16 0.75, 1, 1.5, 2	 1, 2, 4, 8MC, 8, 10, 12MC, 16 0.75, 1, 1.5, 2

MC = Multichannel pipettor compatible

Cat. No.	Description
15341357	SUB-GEL 4X Mini, Teaching Gel Tank, includes four 70mm x 70mm UV trays, eight 8 sample combs, eight casting dams, loading guides and cables
15351357	SUB-GEL 4X Mini, Teaching Gel Tank, includes four 70mm x 70mm UV trays, eight 8 sample combs, eight casting dams, loading guides and cables plus power supply (Cat. No. 12643546)
15321357	SUB-GEL 6X Mini, Teaching Gel Tank, includes six 70mm x 70mm UV trays, twelve 8 sample combs, twelve casting dams, loading guides and cables
15331357	SUB-GEL 6X Mini, Teaching Gel Tank, includes six 70mm x 70mm UV trays, twelve 8 sample combs, twelve casting dams, loading guides and cables plus power supply (Cat. No. 12643546)
15361357	SUB-GEL 6X Mini Classroom Workstation for 24 students, includes four SUB-GEL 6X Mini units (Cat. No. 15321357) and power supply (Cat. No. 12613546)

Combs

Combs	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL
	Thickness 0.75mm		Thickness 1.0mm		Thickness 1.5mm		Thickness 2.0mm	
Prep 1, Marker 1	**11873473**	152	**11823483**	203	**11833483**	304	**11843483**	405
Prep 2, Marker 2	**11833493**	68	**11843493**	90	**11857553**	135	**11867553**	180
Prep 4, Marker 2	**11877553**	36	**11887553**	48	**11897553**	72	**11807563**	96
8 sample, MC	**11857563**	8	**11867563**	11	**11877563**	17	**11887563**	23
8 sample	**11817563**	19	**11827563**	25	**11837563**	37	**11847563**	50
10 sample	**11883473**	14	**11893473**	18	**11803483**	27	**11813483**	36
12 sample, MC	**11853483**	10	**11863483**	14	**11873483**	20	**11883483**	27
16 sample	**11893483**	7	**11803493**	10	**11813493**	15	**11823493**	20

Accessories

Cat. No.	Description
15371357	UV transparent gel tray, teaching 70mm x 70mm
11837633	Casting dams (x2) for 70mm gel trays
11813363	SUB-GEL Midi-Plus/Maxi flexi caster
11897563	Adhesive loading guides
11853473	Viewing platform for SUB-GEL 6X Mini unit
11823423	Viewing platform for SUB-GEL 4X Mini unit
11847633	Buffer saver blocks (x2), save 190mL buffer
11857633	Buffer saver blocks (x2), save 450mL buffer
11857573	UV gel scoop, 70mm

Fisher Bioreagents for Horizontal Gel Electrophoresis

Fisher Bioreagents for Horizontal Gel Electrophoresis

From buffer solutions which act to reduce pH changes and overheating of the gel, to DNA ladders for accurate estimation of fragment size and visualisation agents such as ethidium bromide, this section is designed to help you select the right bioreagent for your horizontal gel electrophoresis research. Fisherbrand and Fisher Bioreagents products work together to deliver an end-to-end package that can meet your most demanding electrophoresis requirements.

Agarose

Agarose is a linear polysaccharide composed of alternating residues of D- and L-galactose joined by glycosidic linkages. Agarose forms gels that are both porous and resilient. These gel properties provide a sieving matrix which allows the electrophoretic separation of charged macromolecules such as DNA or RNA according to size. Compared to polyacrylamide gel, agarose has a lower resolution but wider range of separation. Using poor grades of agarose for gel production runs the risk of contamination with other polysaccharides, salts and proteins. Such impurities can alter the gelling/melting temperature of agarose solutions or affect the ability to use the recovered nucleic acid sample in a post-electrophoresis application.

Fisher Bioreagents agarose is available in three different grades that are functionally tested and pre-qualified for specific applications.

- Genetic Analysis Grade: agarose that yields biologically active DNA or RNA. Testing includes enzymatic performance measurements
- Molecular Biology Grade: suitable for analytical separation of DNA or RNA
- PCR Grade: the original agarose for analytical separation of PCR amplicons (<1kb)

Agarose Grade	Molecular Biology	Molecular Biology	Genetic Analysis	Genetic Analysis	PCR Grade
Type of Agarose	Low EEO	Low Melting (>200bp)	Low Melting (<1kb)	Wide Separation Range	For PCR
Cat. No.	**10766834** (100g) **10366603** (500g)	**10377033** (25g)	**10583355** (100g)	**10688973** (100g) (500g)	**10522775** (100g)
Recovery of DNA or RNA	•	•	•	•	•
Southern and Northern blots	•				
DNA/RNA separation 50bp to 1kb			•		•
DNA/RNA separation >1kb	•	•		•	
PCR fragment analysis	•	•	•	•	•
In-gel reactions (ligation, transformations, PCR)			•		
Colony lifts	•				

Buffers for Horizontal DNA Electrophoresis

Two buffers commonly used for DNA agarose electrophoresis are Tris-acetate with EDTA (TAE; 40mM Tris-acetate, 1mM EDTA) and Tris-borate with EDTA (TBE, 89mM Tris-borate, 2mM EDTA). Because the pH of these buffers is neutral, the phosphate backbone of DNA has a net negative charge and migrates toward the anode. TAE and TBE have different properties which makes each one preferable for specific purposes.

TAE: DNase, RNase and Protease free

Cat. No.	Concentration	Pack qty
10542785	1X	4L
10123293	1X	20L
10628403	10X	500mL
10041223	10X	1L
10775494	10X	4L
10637633	10X	20L
10490074	25X	1L
10457583	50X	500mL
10490264	50X	1L
10542985	50X	4L
10326463	50X	20L
10255303	25X	1L**

TBE: DNase and RNase free

Cat. No.	Concentration	Pack qty
10754914	1X	1L
10715684	1X	4L
10755104	1X	20L
10727224	10X	1L
10031223	10X	4L
10563155	10X	20L
10448543	10X	1L**

**Pre-weighed powder in foil pack. Dissolve in water

Buffer Components for Horizontal DNA Electrophoresis

A range of high purity individual reagents for buffer formulation.

Cat. No.	Pack qty
Tris base	
10103203	500g
10376743	1kg
10724344	5kg
10667243	10kg
10336793	25kg
Acetic acid glacial	
10021123	500mL
Boric acid	
10522595	500g
10011083	1kg
EDTA disodium salt	
10618973	500g
10522965	1kg

For up to date GHS information on Fisher BioReagent products listed please refer to the safety data sheet available from eu.fishersci.com

Fisher Bioreagents for Horizontal Gel Electrophoresis

Buffers for Horizontal RNA Electrophoresis

MOPS is a commonly used buffer system for RNA electrophoresis using formaldehyde or formamide denatured RNA. It is important to use RNase free chemicals, water, and containers when preparing the buffer solution. The typical formulation of a 10X MOPS running buffer is 0.4M MOPS (pH 7.0), 0.1M sodium acetate, and 0.01M EDTA.

Cat. No.	Description	Pack qty
10234673	MOPS biological buffer DNase RNase and protease free	100g
10234723	MOPS biological buffer DNase RNase and protease free	500g
10295243	Water DNase RNase and protease free	50mL
10336503	Water DNase RNase and protease free	100mL
10245203	Water, RNA grade, sterile, DNase RNase and protease free, DEPC treated	1L

Sample Loading Dyes

Sample loading dyes are added to DNA and RNA samples prior to electrophoresis on agarose gels.

Cat. No.	Description	Pack qty
10205023	Agarose gel loading dye 6X	5mL
10205263	Glycerol gel-loading dye 5X DNase and RNase free	1mL
10400084	Glycerol gel-loading dye 5X DNase and RNase free	5mL
10679733	Bromophenol blue	25g
10532965	Xylene cyanol FF	10g

DNA Visualisation

Ethidium bromide is used routinely for fluorometric detection of double stranded nucleic acids.

Cat. No.	Description	Pack qty
10132863	Ethidium bromide solution 1%	10mL
10726074	Ethidium bromide	1g
10678973	Ethidium bromide	5g

DNA Ladders

exACTGene™ and routine DNA ladders

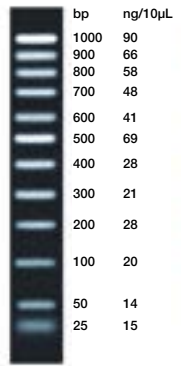
Ready-to-use (pre-mixed with the loading dye), room temperature, stable DNA ladders are available for all common electrophoresis applications.

exACTGene™ DNA ladders are ideal for qualitative analysis, quantitative estimation and size assessment

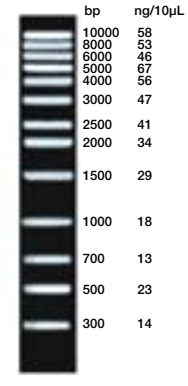
Cat. No.	Application	Size Range	Number of Bands	Number of Loadings
10214973	PCR fragment analysis	25 to 650bp	14	100/10µL
10657633	PCR fragment analysis, small DNA digests	25 to 1,000bp	12	100/10µL
10224973	Quick check of PCR or enzyme digestion results	50 to 2,000bp	8	100/10µL
10061413	General purpose, small DNA fragments	100 to 1,000bp	10	100/10µL
10021463	Fast run times, small DNA fragments	100 to 2,000bp	11	100/10µL
10306943	Clone identification	100 to 2,686bp	14	100/10µL
10031463	Large size PCR or cloning	300 to 5,000bp	10	100/10µL
10122823	Small and large cloning application	100 to 5,000bp	16	100/10µL
10489883	General purpose, large digested DNA	300 to 10,000bp	13	100/10µL
10499883	General purpose, wide separation range	100 to 10,000bp	19	100/10µL
10699163	General purpose, extra large DNA fragments	300 to 24,000bp	15	100/10µL

Routine DNA ladders are designed for qualitative analysis and size assessment

Cat. No.	Application	Size Range	Number of Bands	Number of Loadings
10284633	Small fragments, quick size assessment	50 to 2000bp	11	200/5µL
10450464	Quick size assessment of broad size range	50 to 10,000bp	16	200/5µL



Cat. No. 10657633



Cat. No. 10489883

Other Bioreagents

Cat. No.	Description	Pack qty
10021123	Acetic acid glacial	500mL
10021083	Glycerol, DNase, RNase and protease free	1L
10468343	Ficoll 400 m.w. 400,000, DNase, RNase and protease free Molecular Biology Grade	100g

For up to date GHS information on Fisher Bioreagent products listed, please refer to the safety data sheet available from eu.fishersci.com

Producing Your Own Stock Solutions for Horizontal Gel Electrophoresis

50X TAE (Stock Solution)

fisher bioreagents

You will need these Fisher Bioreagents

- Tris base (Cat. No. 10376743)
- Glacial acetic acid (Cat. No. 10021123)
- 0.5M EDTA (Cat. No. 10618973)

Method

Weigh out 242g Tris base (FW = 121) and dissolve in 750mL distilled water.
Add 57.1mL glacial acetic acid and 100mL 0.5M EDTA (pH 8.0).
Make up to 1L with distilled water.

Stock solution can be stored at room temperature. The pH of the buffer is not adjusted and should be in the range of 8.2 to 8.5.

1X TAE (Working Solution)

Method

Dilute stock solution by 50X in distilled water.
Final concentrations are:

- 40mM Tris pH 7.6
- 20mM glacial acetic acid
- 1mM EDTA

You may also be interested in the following items from Fisherbrand

Beakers | Bottles | Stirrers | Magnetic followers | Measuring cylinders | pH meters

50X TBE (Stock Solution)

fisher bioreagents

You will need these Fisher Bioreagents...

- Tris base (Cat. No. 10376743)
- Boric acid (Cat. No. 10011083)
- 0.5M EDTA (Cat. No. 10618973)

Method

Weigh out 108g Tris base (FW = 121) and dissolve in 750mL distilled water.
Add 55g boric acid (FW = 61.8) and 40mL 0.5M EDTA (pH 8.0).
Make up to 1L with distilled water.

Stock solution can be stored at room temperature.

1X TBE (Working Solution)

Method

Dilute stock solution by 50X in distilled water.
Final concentrations are:

- 89mM Tris pH 7.6
- 89mM boric acid
- 2mM EDTA

You may also be interested in the following items from Fisherbrand

Bottles | Stirrers | Magnetic followers | Measuring cylinders | pH meters

For up to date GHS information on Fisher Bioreagent products listed please refer to the safety data sheet available from eu.fishersci.com

Producing Your Own Stock Solutions for Horizontal Gel Electrophoresis

6X DNA Loading Buffer

fisher bioreagents

You will need these Fisher Bioreagents

- Glycerol (Cat. No. 10021083)
- 1M Tris-HCl pH 8.0 (refer to recipe for 1M Tris-HCl)
- 0.5M EDTA (Cat. No. 10618973)
- Bromophenol blue (Cat. No. 10679733)
- Xylene cyanol FF (Cat. No. 10532965)
- Water (Cat. No. 10336503)

Method

Pipette 60mL glycerol into a glass beaker.
Add 6mL 1M Tris-HCl pH 8.0 and 1.2mL 0.5M EDTA pH 8.0.
Add 32.8mL water and mix well.
To the solution, add either 60mg of bromophenol blue or 60mg xylene cyanole FF.

In a 1% agarose gel, the tracking dyes are expected to run at approximately 300bp for bromophenol blue and 40000bp for xylene cyanol.

You may also be interested in the following items from Fisherbrand

Beakers

Bottles

Stirrers

Magnetic followers

Measuring cylinders

Ethidium Bromide Solution

fisher bioreagents

You will need these Fisher Bioreagents

- Ethidium bromide (Cat. No. 10678973)
- Water (Cat. No. 10336503)

Method

Weigh 0.5g ethidium bromide.
Dissolve in 50mL of water.
Mix to ensure all powder has entirely dissolved.
Transfer to an amber bottle and store at 4°C.

CAUTION!
Ethidium bromide is a known mutagen. Always wear gloves when handling and wear a respiratory mask when weighing the powder. Wear UV safety goggles to protect skin and eyes when using any UV light source.

You may also be interested in the following items from Fisherbrand

Safety gloves

50mL tubes

Vortex mixers

Amber bottles

For up to date GHS information on Fisher Bioreagent products listed, please refer to the safety data sheet available from eu.fishersci.com

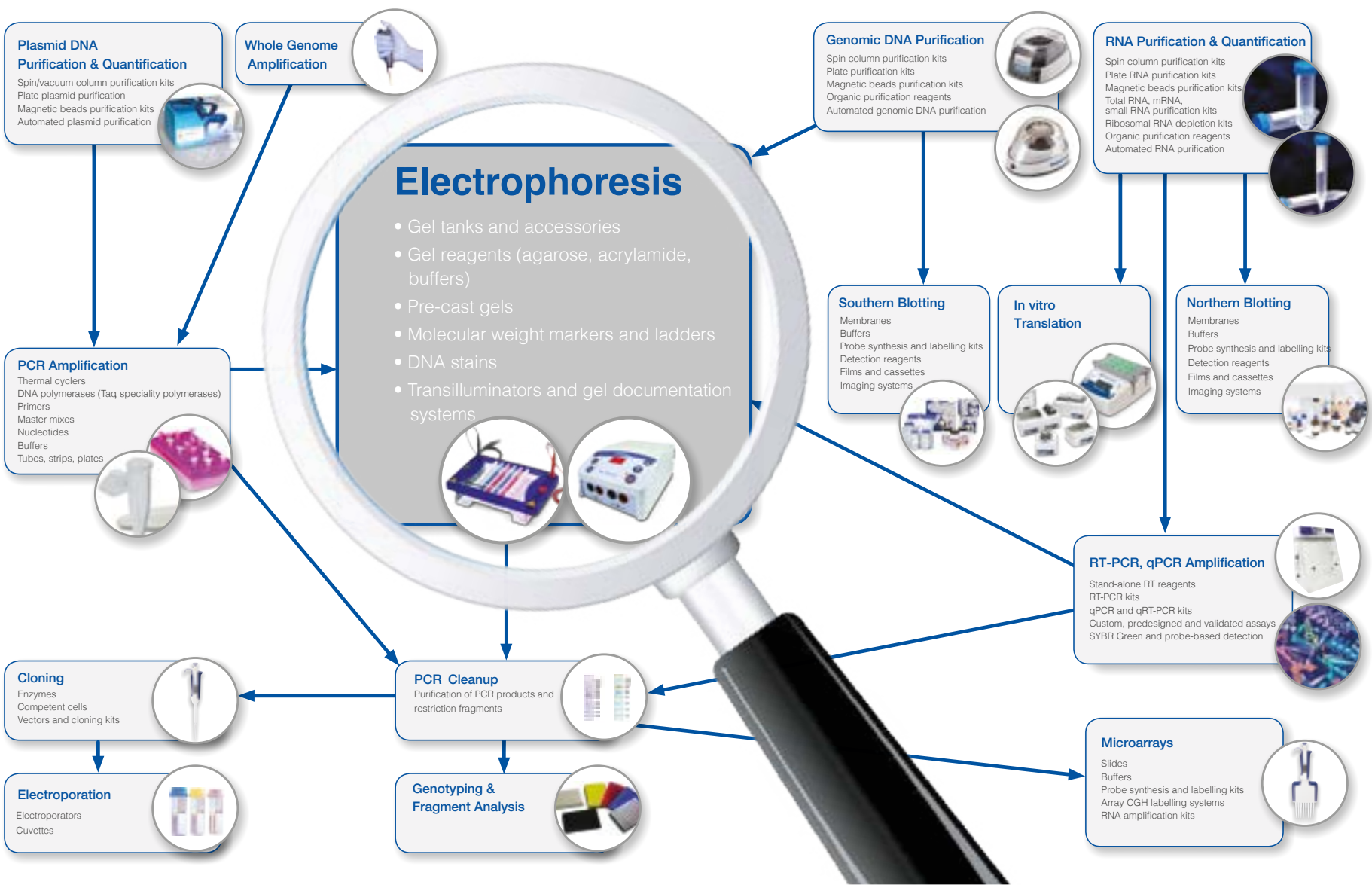
Focus on Genomics Workflow

Depend on Fisherbrand, Fisher Chemical and Fisher Bioreagents to provide products for every step of your Genomics workflow

Genomics Workflow

fisherbrand fisher chemical fisher bioreagents

Most genomics workflows will employ horizontal electrophoretic techniques at some point. Depend upon Fisherbrand, Fisher Chemical and Fisher BioReagents to provide you with the necessary products every step of the way...



Technical Resources - Power Supplies

Technical Resources

Here to give you a helping hand!

Fisher Scientific's Product Support Team is your own dedicated resource. Our Product Support Advisors are all highly qualified professionals who are here to support and guide you to the fastest, most effective and efficient answer to your enquiry.

Areas of technical expertise include:

- Bioreagents and Life Science
- Chemicals and Chromatography
- Consumables
- Equipment
- Safety

This section features a helpful troubleshooting guide and FAQ's. If, however, this information does not resolve the issue, or if you have questions not covered below, then contact our Product Support Advisors.

Technical Resources Technical Resources - Horizontal Electrophoresis

Horizontal Gel Unit Troubleshooting Guide

The following table lists some of the most commonly experienced problems with horizontal gel units, along with some suggestions for solving them.

Problem	Suggestions
• No bubbles appear at the electrodes when operating voltage is applied	• Ensure that the d.c. power supply is properly connected
• Melted agarose leaks when casting	• When using casting gates, ensure that the sealing surfaces of the running tray and the gel casting gates are clean • Ensure that the ends of the running tray are flat and free of nicks
• Sample well deformed	• Allow the gel to set for a minimum of 30 minutes • Leave comb in position until gel returns to room temperature before removing • Remove the comb both slowly and at a slight angle to prevent gel from breaking • Avoid damaging the well with the pipettor when loading the sample; aim for the centre of the well and avoid damaging the bottom of the well with the pipettor tip
• Samples leak underneath the gel upon loading	• The bottom of the wells were torn when the comb was removed. To avoid tearing, carefully wiggle the comb to free the teeth from the gel
• Samples do not run straight	• Comb may be warped - should be replaced • Running tray may be warped - should be replaced • Reduce the voltage to reduce heat build-up within gel • Choose a buffer with suitable ionic strength and buffering capacity
• ‘Smiling’ along one edge of the gel	• Gel was not level when cast or run - use a gel levelling table to ensure that the apparatus is level before gel casting and electrophoresis
• Bromophenol Blue dye turns yellow	• Check pH of buffer during electrophoresis (pH change) • Ensure Tris base and not Tris-HCl was used • Mix the buffer periodically during electrophoresis • Connect a pump to circulate the buffer
• Double-banded pattern	• Ensure the comb is vertical during casting so that the well shape is not distorted • Decrease the buffer level to 1mm above the top of the gel. This will reduce the temperature gradient through the gel • Increase concentration of the sample and use a thin (2mm to 3mm) gel with a thin (1mm) comb

Technical Resources Technical Resources - Horizontal Electrophoresis

Problem	Suggestions
• 'Tailed' bands (excessive fluorescence appearing above the band)	• Reduce amount of nucleic acid in the sample
• Poor band resolution	• Add Ficoll (Cat. No. 10468343), glycerol (Cat. No. 10021083), or sucrose to the sample loading buffer to ensure that the sample forms a compact layer at the bottom of the well. Ensure sample is completely dissolved • Reduce voltage, sample concentration, or sample volume • Ensure there is at least 1mm of gel below the bottom of the comb to prevent samples from leaking out the bottom of the well • Reduce salt concentration of the sample. High salt concentrations can cause 'pinched' lanes, smeared lanes, arched dye front and slow migration • Check enzyme activity; may require longer digestion or different restriction buffer • Prepare fresh sample if nuclease contamination is suspected • Choose agarose with low endosmosis value
• Gel melts or softens near sample wells	• Caused by a combination of pH drift and high temperature. Circulate or remix buffer periodically or reduce the voltage

Frequently asked questions (FAQ's) – Horizontal Gel Electrophoresis

This section lists the most frequently asked questions received by our Life Science and Chemical Specialists, together with the answers they provided. If you are unable to find the answer to your question, are stuck and need help or are simply confused and unsure of which product best suits your research needs, the Product Support Team are here and ready to respond to your enquiries.

Q. Which buffer should I use for my agarose gel electrophoresis?

A. The type of buffer used to run DNA in agarose gel electrophoresis depends primarily on the size of DNA fragment and the post-electrophoresis application. Two buffers commonly used for DNA agarose electrophoresis are Tris-Acetate with EDTA (TAE; 40mM Tris-Acetate, 1mM EDTA) and Tris-Borate with EDTA (TBE, 89mM Tris-Borate, 2mM EDTA). Because the pH of these buffers is neutral, the phosphate backbone of DNA has a net negative charge and migrates toward the anode.

TAE and TBE have different properties which makes one more suitable than the other for specific purposes. For larger DNA fragments (>10kb) TAE is preferred. For smaller DNA fragments (<1kb) TBE is generally preferred as it has a greater buffering capacity and will give sharper resolution than TAE. TAE is also the preferred choice of buffer when the DNA sample is to be used in cloning experiments as the borate in the TBE buffer is a strong inhibitor for many enzymes.

Q. How thick should I cast my agarose gel?

A. The recommended thickness for agarose gel is 3 to 4mm. Gels thicker than 5mm will result in fuzzy bands.

Q. I wish to run a gel to separate DNA fragments from 100 to 2000bp. Which agarose do you suggest?

A. Fisher BioReagents Cat. No. 10766834 agarose, Molecular Biology Grade, is well suited for routine separation of DNA and RNA in the range 500bp to 23kb. For separation of fragments in the 100 to 2000bp range, we would suggest Fisher BioReagents Cat. No. 10766834, increasing the gel concentration (>2%) and using TBE buffer (not TAE).

Q. Which is the best agarose for Comet electrophoresis?

A. The Comet assay (single cell gel electrophoresis) is a simple method used for measuring DNA strand breaks in eukaryotic cells. A low melting point agarose is usually required. We would suggest Fisher BioReagents Cat. No. 10377033 as this is a low melting, Molecular Biology Grade agarose which is ideal for separating and recovering nucleic acids.

Technical Resources Technical Resources - Horizontal Electrophoresis

Q. How much DNA do I need to load on to a gel?

A. You should load no more than 100ng of DNA. This amount should give you a clear well-defined band when stained with ethidium bromide and viewed under a UV light. If you load too much DNA then you will see a smear.

Q. Is the dye proprietary in Cat. No. 10205023?

A. The loading dyes in Fisher BioReagents Cat. No. 10205023, agarose gel-loading dye, 6X are a unique blend of three tracking dyes that make estimating sample migration simple and reliable:

- Dye #1 – a light blue dye that migrates at about 4000 base pairs in 1% agarose
- Dye #2 – an indigo dye that migrates at about 600 base pairs in 1% agarose
- Dye #3 – a magenta dye that migrates at about 10 base pairs in 1% agarose

Q. At what voltage should I run my agarose gel?

A. The recommended voltage is 4 to 10 volts/cm (cm is determined by measuring the interelectrode distance, i.e the distance between anode and cathode, not the length of the gel) under normal electrophoretic conditions. If the voltage is too low, the mobility of small DNA (<1000bp) is reduced and band broadening will occur due to diffusion. If the voltage is too high, the band resolution is reduced, mainly because of gel overheating.

Q. Should I recirculate the buffer during electrophoresis?

A. Recirculation prevents the formation of pH gradient and buffer depletion, so it is advisable to recirculate the buffer especially during extended electrophoresis. Buffer recirculation is also important when running larger TAE gels due to the lower buffering capacity of TAE.

Q. How should I dispose of ethidium bromide gel stain?

A. Ethidium bromide destaining bags are available, Cat. No. 15420277. These bags will remove up to 5mg ethidium bromide when stirred with solution overnight. However, as disposal regulations vary, please contact your local safety officer for disposal guidelines.

Q. Do you have any information regarding the amount of DNA plasmid for each band for Cat. No. 10284633?

A. We do not have information regarding the amount of DNA in each discrete fragment (band) of Fisher Bioreagent Cat. No. 10284633, low scale (100bp) DNA ladder. This DNA ladder is meant to be a general purpose sizing standard for DNA fragments such as PCR amplicons separated on agarose mini gels. It is not meant to be used as a quantitative standard. However, for quantitation, we have the exACTGene DNA ladders such as Fisher BioReagents Cat. No. 10021463; this low range-plus DNA ladder specifies the approximate amount of DNA in each band.

References

1. Maniatis, T., Fritsch, E. F. and Sambrook, J. (1982) Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory, Cold Spring Harbor, New York
2. Rickwood, D. and Hames, B. D. (eds.) (1982) Gel Electrophoresis of Nucleic Acids: A Practical Approach, IRL Press, Oxford, England
3. Longo, M. C. and Hartley, J. L. (1986) Focus 8:3, 3
4. Ausubel, et al., (eds). (1993) Current Protocols in Molecular Biology. Greene Publishing and Wiley-Interscience, New York

Vertical Gel Units

Introduction to Vertical Gel Electrophoresis

Sodium Dodecyl Sulfate-Polyacrylamide Gel Electrophoresis (SDS-PAGE) using a vertical gel system is the most direct method for assessing, in a fast and reproducible manner, the relative molecular weight (M_r) of denatured proteins and polypeptide chains and the purity of a protein preparation. In SDS-PAGE, the sample to be applied to the gel is first treated with the anionic detergent SDS which denatures the proteins in the sample and binds tightly to the protein molecules. The SDS molecules confer a relatively uniform negative charge to the polypeptide in proportion to its length. When an electric current passes through the gel, all proteins will migrate through the gel matrix toward the anode. In this way, SDS-PAGE separates proteins according to size because the SDS-coated proteins have a uniform charge:mass ratio; proteins with less mass travel more quickly through the gel than those with larger mass because of the sieving effect of the gel matrix.

This section provides an overview of our range of Fisherbrand vertical gel units. All these units comprise a modular tank design with dedicated inserts for Polyacrylamide Gel Electrophoresis (PAGE), blotting and capillary gel Isoelectric Focusing (IEF). This section also features Fisherbrand semi-dry blotters as well as essential Fisher BioReagents, such as acrylamides, protein standards, buffers and DNA visualisation agents.

Vertical Gel Units

Vertical Gel Unit Systems

The Fisherbrand range of vertical gel systems include both Mini (for 100mm x 100mm gels) and Maxi units (for 200mm x 200mm gels). Each vertical gel unit is supplied with combs, glass plates and accessories to run up to either four Mini gels or two Maxi gels. The same tank can be used for both gel casting and gel running, eliminating time consuming transfer of fragile gels between separate casting and running modules.

To view the instruction manuals for the following range of vertical gel units visit www.eu.fishersci.com/fisherbrand.

The Verti-Gel Mini system

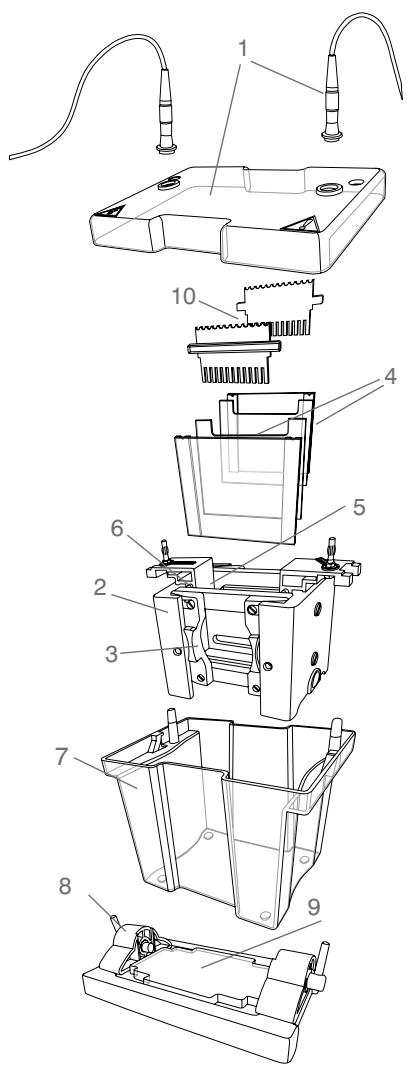
The Fisherbrand Verti-Gel Mini units are available in two different formats, the two gel system which can accommodate up to two hand-cast or commercial precast gels (also referred to as the Standard System), or the four gel system which is equipped with enough glass plates and combs to run four hand-cast gels (also referred to as the Tetrad System). This flexibility of formats, together with the unique sliding clamp technology within the PAGE insert, permits fast, intuitive leak free casting.

Technical Specification

Number of gels	1 to 4
Precast gel compatibility	
Up to two gels per run	compatible with most 10 x 10 cassettes
Handcast gel compatibility	
Up to four gels per run	Using 100mm x 100mm glass plates
Plate dimensions (w x h x t), mm	100 x 100 x 2
Gel dimensions (w x h), mm	80 x 85
Total buffer volume for two gels, mL	Min: 250; Max: 1200
Total buffer volume for four gels, mL	Min: 250; Max: 1200
Standard run time for SDS-PAGE	1 to 2 hours
Recommended power supply unit	15818481
Unit dimensions (w x d x h), mm1	90 x130 x150
Mass, kg	1.8

Verti-Gel Mini component parts

1 Lid and power cables
2 PAGE insert
3 Sliding clamps
4 Glass plates
5 Inner buffer chamber
6 Gasket
7 Outer tank
8 Cam-pin caster
9 Ultra soft casting mat
10 Combs



Use Verti-Gel Mini vertical systems to:

- Run a maximum of four gels within an hour
- Perform 2D and blotting within a day
- Undertake discovery projects
- Screen new samples and evaluate sample preparation conditions

Loading and running innovations

- Reversible combs also serving as loading indicators aid pipettor-well alignment, preventing sample loading errors – simply insert your comb into a freshly poured gel which is allowed to set before inverting the comb to use as a loading template that sits conveniently above the newly formed sample wells
- Run up to four gels in a single PAGE module using a combination of plain and notched glass plates with spacers in between corresponding to your chosen gel thickness

Vertical Gel Units

Dedicated modules for different applications

Interchangeable modular inserts for slab gels, 2D electrophoresis and electroblotting allow the user to switch quickly and easily from one electrophoresis technique to another, using the same, single universal buffer tank and lid. Our modular system configurations are as follows:

- Cat. No. 15136624, 15116624 and 15146624 – supplied with casting base and external casting module for running up to four handcast or two precast native PAGE and SDS-PAGE gels
- Cat. No. 15156624, 15126624 and 15176624 – also includes blotting insert to transfer up to four gels for Western blotting; tube gel 2D insert available separately
- Cat. No. 11893293 – supplied only with tank, lid and PAGE insert for running 100mm x 100mm and 100mm x 80mm (w x h) precast gels
- Cat. No. 11843293 – complete with combs, bonded spacer and notched glass plates, to run up to two tapecast gels or two handcast gels using caster
- Cat. No. 11883293 – complete blotting system with PAGE and blotting inserts; glass plates make two gels

11843293

11883293

Optional blotting insert

The Verti-Gel Mini blotting insert uses the same tank and lid to adapt your Verti-Gel Standard or Tetrad system for fast, high quality electroblotting of mini gels. Able to transfer four gels at a time, the Verti-Gel Mini blotting insert is available in the traditional wire electrode format. This insert is available as a stand-alone add-on (Cat. No. 11837623) to the Verti-Gel Mini system or as part of a fully integrated system for multiple electrophoresis techniques (Cat. No. 11883293).

Optional 2D Insert

The Verti-Gel Mini capillary tube gel insert may be used with the same tank and lid to adapt your Verti-Gel Mini Standard or Tetrad system for reproducible 2D electrophoresis. IEF of up to 10 capillary tube gels may be achieved in as little as 3.5 hours, while second dimension PAGE takes no more than an hour. Available as a standalone add-on (11867623).

11837623

11867623

Cast and run with Verti-Gel Mini sliding clamp technology

- The unique sliding clamp technology of the Verti-Gel Mini insert ensures simple, rapid, leak proof gel casting in four easy steps (see below).
- Flat, ultra soft moulded gasket acts in tandem with a unique single piece pressure-clamping frame to facilitate even pressure distribution to minimise gel compression; gasket reversible for Bio-Rad compatibility.
- Spacers are colour coded with compatible comb thickness and are bonded to 2mm thick ground glass plates to guarantee correct alignment and leak free casting, whereas notched glass plates with bonded spacer option, included with the four gel system, doubles gel capacity of the PAGE insert; optional dummy plate allows for single gels to be run.

Insert glass plates into PAGE insert and slide clamps into side cheeks to create an effective seal to prevent current leakage during electrophoresis.
Benefit: PAGE insert is used for both gel casting and running which unlike other leading brands, eliminates time-consuming transfer of potentially fragile glass plates between separate casting and running modules.

Transfer PAGE insert to casting base, insert cams and turn until tightened.
Benefit: Ultra-soft gasket within casting base compensates for plate misalignment to prevent leakage.

Pour in gel solution, insert comb and allow to polymerise.

Transfer PAGE insert to tank, fill with buffer, load samples, replace lid and run.

Vertical Gel Units

Verti-Gel Mini, Two-Gel System (Standard)

For Mini SDS PAGE, native PAGE, gradient, second dimension and nucleic acid separations.

- Injection moulded construction, durable and leakproof
- Compatible with all 80mm x 100mm and 100mm x 100mm precast gels
- Low buffer volumes
- Run up to two gels
- Interchangable modules for IEF/2D electrophoresis and electroblotting in a universal tank

Technical Specification

Dimensions [l x w], mm.....100 x 100 (plate), 75 x 80 (gel)
Dimensions [l x w x h], mm.....190 x 130 x 150 (unit)
Capacity.....40 samples, 20 samples per gel
Volume, mL.....250 to 1,200 (buffer)
No. of samples.....1, 5, 8MC, 9, 10, 12,16MC, 20 (per comb)
Thickness, mm.....0.5, 0.75, 1, 1.5, 2 (combs)

MC = Multichannel pipettor compatible

Cat. No.	Description
11843293	Verti-Gel Mini Standard system 100mm x 100mm including caster (for handcast gels)
11893293	Verti-Gel Mini Standard system 100mm x 100mm, no caster (for pre-cast gels)
11883293	Verti-Gel Mini Standard system 100mm x 100mm, complete system for electrophoresis and blotting

Verti-Gel Mini, Four-Gel System (Tetrad)

- Injection moulded construction, durable and leak proof
- Compatible with all 80mm x 100mm and 100mm x 100mm precast gels
- Low buffer volumes
- Run up to four gels
- Interchangable modules for IEF/2D electrophoresis and electroblotting in a universal tank

Technical Specification

Dimensions [l x w], mm.....100 x 100 (plate), 75 x 80 (gel)
Dimensions [l x w x h], mm.....190 x 130 x 150 (unit)
Capacity.....80 samples, 20 samples per gel
Volume, mL.....250 to 1,200 (buffer)
No. of samples.....1, 5, 8MC, 9, 10, 12,16MC, 20 (per comb)
Thickness, mm.....0.5, 0.75, 1, 1.5, 2 (combs)

MC = Multichannel pipettor compatible

Cat. No.	Description
15136624	Verti-Gel Mini Tetrad PAGE system with sliding clamps 100mm x 100mm, caster & external stand, 4x notched/ plain plates with 0.75mm bonded spacers, 4x notched plates, 4x 12 well 0.75mm combs
15116624	Verti-Gel Mini Tetrad PAGE system with sliding clamps 100mm x 100mm, caster & external stand, 4x notched/ plain plates with 1mm bonded spacers, 4x notched plates, 4x 12 well 1mm combs
15146624	Verti-Gel Mini Tetrad PAGE system with sliding clamps 100mm x 100mm, caster & external stand, 4x notched/ plain plates with 1.5mm bonded spacers, 4x notched plates, 4x 12 well 1.5mm combs
15156624	Verti-Gel Mini Tetrad PAGE system with blotting module 100mm x 100mm, caster & external stand, 4x notched/ plain plates with 0.75mm spacer, 4x plate, 4x 12 well 0.75mm comb, 4x cassette, 8x pad
15126624	Verti-Gel Mini Tetrad PAGE system with blotting module 100mm x 100mm, caster & external stand 4x notched/ plain plates with 1mm spacer, 4x plate, 4x 12 well 1mm comb, 4x cassette, 8x pad
15176624	Verti-Gel Mini Tetrad PAGE system with blotting module 100mm x 100mm, caster & external stand, 4x notched/ plain plates with 1.5mm spacer, 4x plate, 4x 12 well 1.5mm comb, 4x cassette, 8x pad

Vertical Gel Units

Verti-Gel Mini systems, continued

Combs

Combs	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL
	Thickness 0.50mm		Thickness 0.75mm		Thickness 1.0mm		Thickness 1.5mm		Thickness 2.0mm	
1 prep, 1 marker	**11837583**	330	**11847583**	500	**11807593**	650	**11817593**	1,000	**11827593**	1,300
5 sample,	**11887603**	45	**11897603**	70	**11807613**	100	**11817613**	140	**11827613**	200
8 sample MC	**11837613**	25	**11847613**	40	**11857613**	60	**11867613**	80	**11877613**	120
9 sample	**11887613**	23	**11897613**	35	**11807623**	50	**11817623**	70	**11827623**	100
10 sample	**11857583**	20	**11867583**	30	**11877583**	40	**11887583**	60	**11897583**	80
12 sample	**11837593**	16	**11847593**	25	**11857593**	35	**11867593**	50	**11877593**	70
16 sample MC	**11887593**	13	**11897593**	20	**11807603**	25	**11817603**	40	**11827603**	50
20 sample	**11837603**	10	**11847603**	15	**11857603**	20	**11867603**	30	**11877603**	40

Accessories

Cat. No.	Description	Pack qty
Accessories - General		
11847623	100mm x 100mm casting base	1
11857623	Replacement silicone mat for 100mm x 100mm casting base	1
11853293	Inner running module sliding clamps	1
11887623	Mini cooling pack	1
11887633	Notched glass plates 100mm x 100mm	2
11847643	Plain glass plates 100mm x 100mm	2
11857643	Plain glass plates 100mm x 100mm with 0.5mm bonded spacers	2
11897633	Notched glass plates 100mm x 100mm with 0.5mm bonded spacers	2
11807643	100mm x 100mm notched glass plates with 0.75mm bonded spacers	2
11867643	100mm x 100mm plain gass plates with 0.75mm bonded spacers	2
11817643	100mm x 100mm notched gass plates with 1mm bonded spacers	2
11877643	100mm x 100mm plain glass plates with 1mm bonded spacers	2
11827643	100mm x 100mm notched glass plates with 1.5mm bonded spacers	2
11887643	100mm x 100mm plain gass plates with 1.5mm bonded spacers	2
11837643	100mm x 100mm notched glass plates with 2mm bonded spacers	2
11897643	100mm x 100mm plain gass plates with 2mm bonded spacers	2
11877623	Dummy plate 100mm x 100mm	1
11807653	Spacers 10mm x 100mm 0.5mm thick	2
11817653	Spacers 10mm x 100mm 0.75mm thick	2
11827653	Spacers 10mm x 100mm 1mm thick	2
11837653	Spacers 10mm x 100mm 1.5mm thick	2
11847653	Spacers 10mm x 100mm 2mm thick	2
11817583	Replacement platinum wire - 500mm x 0.2mm	1
11863293	Caster stand	1
Accessories - Blotting		
11837623	Mini blotting module	1
11827583	Verti-Gel blot mini cassette	1
11857653	Fibre pad for blotting 100mm x 100mm gels	1
Accessories - 2D Electrophoresis		
11867623	Mini IEF module	1
11877653	Capillary tube 75mm long, 1mm I.D.	1
11867653	Blanking ports	1

Vertical Gel Units

Vertical Gel Units, Verti-Gel Maxi

The Fisherbrand Verti-Gel Maxi unit has been designed for large format, 200mm x 200mm gels. It is able to perform a variety of separations, including first dimension and second dimension SDS-PAGE, native, preparative, gradient and high resolution electrophoresis, plus capillary tube gel IEF and electroblotting. The Fisherbrand Verti-Gel Maxi is one of the most versatile maxi systems available.

Featuring the new innovative screw-clamp technology within the PAGE insert, only four screws are now needed to secure the 200mm x 200mm glass plates. This gives the Verti-Gel Maxi a selective advantage of a much faster set up speed. In addition, this new clamping technology ensures that pressure is distributed evenly along the height of the gel rather than in the centre, eliminating plate bowing and gel compression. The Fisherbrand Verti-Gel maintains a leak-proof seal during casting and the ergonomic design of the PAGE insert aids both handling and set-up making it easy and quick to use.

Versatility and Adaptability

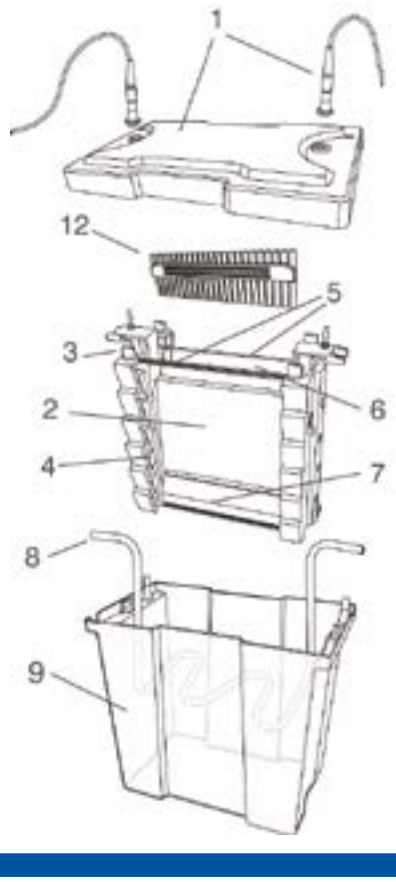
- More gels: run two gels simultaneously on the standard two-gel Verti-Maxi System
- Customise your system: for second-dimension runs with 180mm IPG strips and gels using the IEF conversion kit (Cat. No. 15116634)
- Utilise modular inserts: with the same universal tank and lid to extend the application of your standard Vert-Gel Maxi unit to create a complete 2D or blotting system:
  - Cat. No. 15186634 with capillary tube gel insert for 2D electrophoresis
  - Cat. No. 15106644 for two gel electroblotting

Other Benefits

- Bonded spacers and combs colour-coded for thickness
- Widest selection of combs allow separation of up to 192 samples
- Robust 4mm thick glass plates
- Asymmetric lid design and colour coded screw-pins in PAGE insert prevent polarity reversal
- All parts injection moulded using durable industrial grade plastic to guarantee longevity and reliable and consistent performance

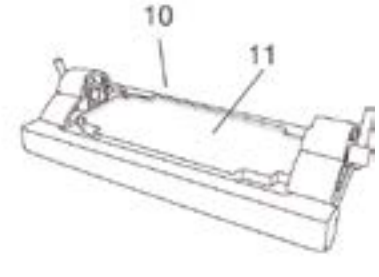
Technical Specification

No. of gels	1 to 2
Plate dimensions (w x h x t), mm	200 x 200 x 4
Standard spacer dimensions (w x h), mm	20 x 200
IPG spacer dimensions (w x h), mm	6 x 200
Total volume inner buffer chamber, mL	640
Total buffer volume for two gels, L	5.3
Standard run time for SDS-PAGE	
Without cooling, hrs	4 to 5
With cooling, hrs	3 to 4
Unit dimensions (w x d x h), mm	300 x 180 x 270
Mass, kg	2.5



Verti-Gel Maxi Component Parts

1 Lid and power cables
2 PAGE insert
3 Vertical screw-pin
4 Clamping bars
5 Glass plates
6 Inner buffer chamber
7 Gasket
8 Detachable cooling coil
9 Outer tank
10 Cam-pin caster
11 Ultra soft casting mat
12 Combs



Vertical Gel Units

Leak Free Casting with Vertical Screw-Pin Technology

1

Assemble each gel cassette on a flat level surface, by placing the plain glass plate down with the spacers facing upwards followed by the notched glass plate.
Benefit: Colour coded spacers consistent with comb thickness are bonded to ground glass plates to ensure correct alignment and leak free casting.

2

Loosen the vertical screw-pins in the PAGE insert to release the locking mechanism, allowing the gel clamps to sit in the resting slots.

3

Insert a gel cassette into each side of the inner buffer chamber in the PAGE insert, and begin tightening the vertical screw-pins.

4

Continue to tighten the screw-pins until the gel clamps glide out of the resting slots and fix firmly against the glass plates pushing them upright.

5

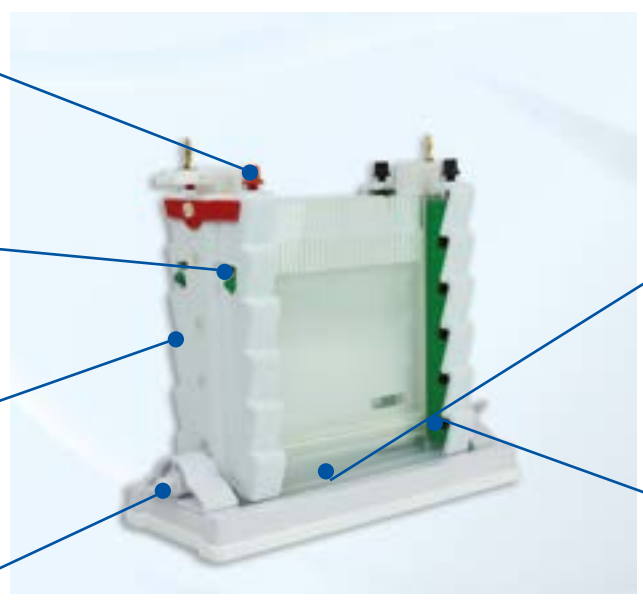
Check the bottom of the glass plates to ensure that they are flush together, and place the PAGE insert on the casting base; make sure that the cams are facing downwards.
Benefit: Dual purpose PAGE insert eliminates time consuming transfer of glass plates between separate casting and running modules.

Vertical screw-pins, colour coded to prevent polarity reversal, push gel clamps out of the resting slots to secure glass plates firmly within the PAGE insert.

Resting slots allow the gel clamps to sit conveniently out of the way, to aid hindrance free loading of the cassettes into the PAGE insert.

Ergonomic 'wave' design of PAGE insert provides convenient finger grips for easy handling.

Cam-pins lock PAGE insert onto the ultra soft silicone mat within the casting base to provide leak free seal.



Flat, level gasket prevents current leakage from inner buffer chamber.

Sliding gel clamps available in two thicknesses to accommodate single and double gel cassettes.

6

Insert cams and turn until tightened, drawing the PAGE insert onto the casting to form a leakproof seal.
Benefit: Ultra soft silicone mat within cam-caster to ensure leak-free casting.

7

Pour in the gel solution, insert the combs and allow the wells to polymerise.

8

Transfer the PAGE insert to the gel tank. Fill the inner and outer buffer chambers before loading samples.

9

Replace the lid, connect to the power supply and run.

Vertical Gel Units

Verti-Gel Maxi, Two-Gel System (Standard)

- Injection moulded construction, durable and leakproof
- Compatible with 200mm x 200mm plates
- Simple to use casting
- Rapid set up and cooling

Technical Specification

Dimensions, plate [l x w], mm..... 200 x 200
Dimensions [l x w x h], mm.....300 x 180 x 270
Capacity.....48 samples per gel
Volume, mL.....640 to 5,300 (buffer)
No. of samples.....1, 5, 10, 18MC, 24, 30, 36MC,48
Thickness, mm.....0.5, 1.0, 1.5, 2.0

MC = Multichannel pipettor compatible

Cat. No.	Description
12623546	Verti-Gel Maxi Dual PAGE System 200mm x 200mm, cooling coil & caster, 2x plain glass plates with 1mm bonded spacers, 2x notched glass plates, 2x 24 sample combs (1mm)
15126644	Verti-Gel Maxi Dual Electroblotting System, 200mm x 200mm, with cooling coil and caster, 2x plain glass plates with 1mm bonded spacers, 2x notched glass plate, 2x 24 sample combs (1mm)

Combs

Combs	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL	Cat. No.	Sample size, µL
	Thickness 0.75mm		Thickness 1.0mm		Thickness 1.5mm		Thickness 2.00mm	
1 prep, 1 marker	**11807813**	1100	**11857813**	1500	**11867813**	2200	**11877813**	3000
5 sample	**11887833**	160	**11897833**	200	**11807843**	320	**11817843**	400
10 sample	**11817813**	80	**11827813**	100	**11837813**	160	**11847813**	200
18 sample MC	**11887813**	40	**11897813**	50	**11807823**	80	**11817823**	100
24 sample	**11827823**	30	**11837823**	40	**11847823**	60	**11857823**	80
30 sample	**11867823**	25	**11877823**	35	**11887823**	50	**11897823**	70
36 sample MC	**11807833**	20	**11817833**	25	**11827833**	40	**11837833**	50
48 sample	**11847833**	15	**11857833**	20	**11867833**	30	**11877833**	40

Accessories

Cat. No.	Description	Pack qty
Accessories - General		
15166624	Verti-Gel Maxi external casting stand	1
15196624	Verti-Gel Maxi page insert	1
15106634	Detachable cooling coil, Verti-Gel Maxi	1
15186624	Verti-Gel Maxi casting base	1
11864672	Replacement rubber mat for 200mm caster	2
15146634	Electrophoresis cable (black & red)	2
11884532	Plain glass plates	2
11894532	Plain plates 0.75mm spacers	2
11804542	Plain plates 1mm spacers	2

Cat. No.	Description	Pack qty
Accessories - General		
11824542	Plain plates 2mm spacers	2
11854532	Notched plates	2
11864532	Notched plates 0.75mm spacers	2
11874532	Notched plates 1mm spacers	2
11854502	Dummy plate, 200mm x 200mm	1
11884502	Maxi cooling block	2
11834542	Spacers, 200mm x 0.75mm thick	2
11844542	Spacers, 200mm x 1mm thick	2
11854542	Spacers, 200mm x 1.5mm thick	2
11864542	Spacers, 200mm x 2mm thick	2
11887803	Replacement platinum wire 1m x 0.2mm	1

Cat. No.	Description	Pack qty
Accessories - Blotting		
12348007	Maxi blotting cassette, Verti-Gel Maxi	2
12358007	Maxi fibre pad	2
Accessories - 2D Electrophoresis		
11874532	Notched plates 1mm spacers	2
11854502	Dummy plate, 200mm x 200mm	1
11884502	Maxi cooling block	2
11834542	Spacers, 200mm x 0.75mm thick	2
11844542	Spacers, 200mm x 1mm thick	2
11854542	Spacers, 200mm x 1.5mm thick	2
11864542	Spacers, 200mm x 2mm thick	2
11887803	Replacement platinum wire 1m x 0.2mm	1

Fisher BioReagents for Vertical Gel Electrophoresis

This section details essential bioreagents such as PAGE buffers, detergents and denaturing reagents as well as protein standards

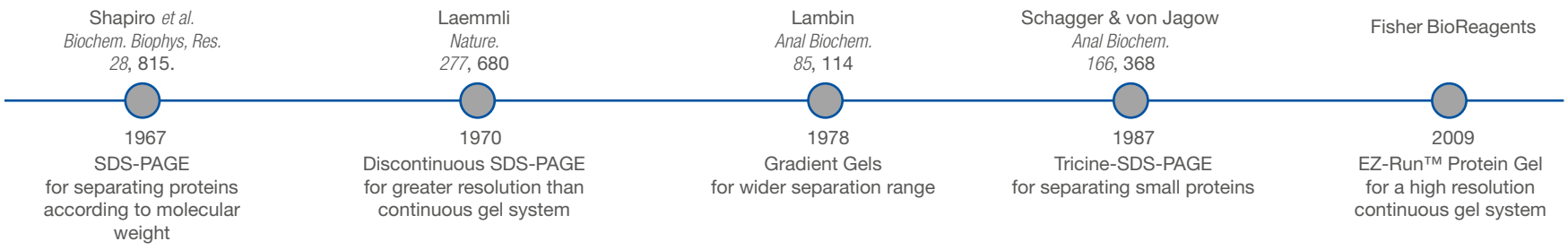
Fisher BioReagents for Vertical Gel Electrophoresis

Once again Fisherbrand and Fisher BioReagents have combined to provide a complete range of products for your electrophoresis needs. This section details essential bioreagents typically used for vertical protein electrophoresis such as PAGE buffers, detergents and denaturing reagents as well as protein standards. Fisherbrand and Fisher BioReagents are manufactured to the highest standard and are committed to delivering quality, reliable products at affordable prices.

The SDS-PAGE technique and the range of available reagents and products to support it have been both expanded and refined over the years (see timeline representation below). For example, more recent specialised gel systems such as porosity gradient gels and Tricine-SDS-PAGE have been developed to expand the M_r analysis range and to improve the resolution of small proteins, respectively. Up to this point, many would agree that improvements to the technique had reached a plateau and standard protocols adopted in most laboratories around the world.

However, as the next evolutionary step forward, Fisher BioReagents EZ-Run Protein Gel Solution is a simple, continuous gel system for SDS-PAGE that provides the resolution of a gradient gel with less preparative work than the Laemmli discontinuous gel system. It is a premixed solution of acrylamide, bis-acrylamide, buffer and SDS that eliminates the need of a stacking gel. The gradient-like properties of the EZ-Run gel matrix slow the migration of proteins through the electrophoretic field, enabling the resolution of small peptides and large proteins on the same gel.

Advances in SDS-PAGE for characterisation of proteins



Fisher BioReagents for Vertical Gel Electrophoresis

This section details essential bioreagents such as PAGE buffers, detergents and denaturing reagents as well as protein standards

EZ-Run Protein Gel Solution

fisher bioreagents

- Ready to use
- Superior resolution
- Wide separation range on same mini gel
- No stacking gel required
- Proprietary gel chemistry
- Stable for two years at room temperature
- Compatible with all conventional staining methods
- Suitable for post-electrophoresis applications such as Western blot transfer and MALDI analysis

EZ-Run Protein Gel Solution is a unique ready-to-pour premixed solution of acrylamide, bis-acrylamide, buffer and SDS that enables superior resolution of protein bands by SDS-PAGE. The liquid blend requires only the addition of ammonium persulfate and TEMED to prepare a quality gel matrix for SDS-PAGE. The proprietary gel chemistry imparts gradient-like properties to the polymerised gel matrix, enabling the separation of small peptides and high molecular weight proteins on the same mini gel.

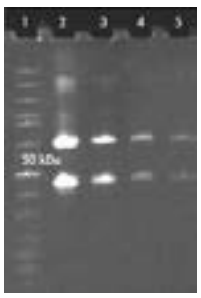
EZ-Run gel matrix is used as a simple, continuous gel system and does not require a stacking gel, which saves labour and time in casting. EZ-Run gel separates small proteins similar to Tricine-SDS-PAGE and has a wide separation range similar to gradient gels (3 to 200kDa on the same mini gel).

EZ-Run gels are compatible with all standard electrophoresis equipment as well as common staining methods such as Coomassie blue, silver stain, and fluorescent dyes. Post-electrophoresis techniques such as Western blot transfer, protein sequencing and MALDI analysis can also be applied to proteins separated on EZ-Run gels.

Cat. No.	Description	Pack qty
10284913	Acrylamide:Bis-Acrylamide, protein gel solution, EZ-Run 15%	500mL

EZ-Run protein gel solution separation range:

EZ-Run gel %	MW Separation range (kDa)
15	2 to 100



EZ-Run gel matrix compatible with common gel staining methods such as fluorescent dyes

Serial dilutions of BSA (66kDa) and Ovalbumin (45kDa) are loaded in lanes 2 to 5 of an EZ-Run gel and detected with SYPRO™ Ruby fluorescent protein stain. Protein standard in lane 1 is Cat. No. 11498503 EZ-Run Recombinant Protein Ladder.

For up to date GHS information on Fisher BioReagents products listed please refer to the safety data sheet available from www.eu.fishersci.com

Fisher BioReagents for Vertical Gel Electrophoresis

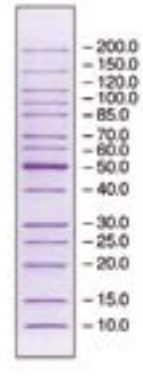
This section details essential bioreagents such as PAGE buffers, detergents and denaturing reagents as well as protein standards

EZ-Run Protein Standards Solution

fisher bioreagents

Designed to assist in characterising unknown proteins in polyacrylamide gels and immunoblots.

- Highly purified markers and ladders provide compact and clear bands
- Prestained standards are indispensable in monitoring protein separation and transfer efficiency
- Reference bands allow quick gel progress assessment
- Unstained standards are most suitable for precise sizing of proteins
- All standards are supplied in loading buffer and are ready to use



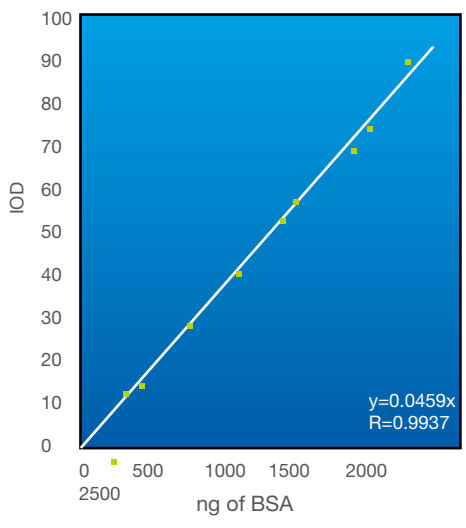
Cat. No.	Description	Pack qty
11498503	Protein ladder, recombinant for precise sizing on SDS PAGE/Western blots, EZ-Run, 10 to 200kDa, 14 bands, 100 loadings (0.5mL)	1

EZ-Run Protein Gel Staining Solution

fisher bioreagents

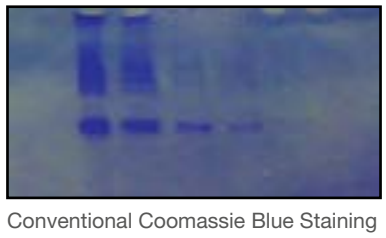
Highly sensitive, non-toxic.

- Detects as little as 5ng protein
- Produces minimal or no background
- Permits rapid staining/destaining (30 minute staining and one hour destaining in water is sufficient for most applications)
- Contains Coomassie Brilliant Blue G-250
- Does not contain methanol or acetic acid
- Ready to use



Linear range of protein detection using Cat. No. 10786444 EZ-Run Protein Gel Staining Solution
Band intensity was measured and plotted against the amount of protein (BSA) loaded per gel lane. The result shows a linear dynamic range from 5ng to 2000ng using EZ-Run Protein Gel Staining Solution.

EZ-Run Protein Gel Staining Solution



Conventional Coomassie Blue Staining

Destaining of EZ-Run Protein Gel Staining Solution
Compared to conventional Coomassie Blue staining, the EZ-Run stain produces very clean backgrounds using only water for destaining.

Staining sensitivity with EZ-Run Protein Gel Staining Solution
Serial dilution of BSA on 10% SDS-PAGE demonstrating staining sensitivity of EZ-Run Protein Gel Staining Solution.

Cat. No.	Description	Pack qty
10786444	Protein gel staining solution, EZ-Run, colloidal Coomassie Blue G250	1L
10609933	Protein gel staining solution, EZ-Run, colloidal Coomassie Blue G250	4L

For up to date GHS information on Fisher BioReagent products listed please refer to the safety data sheet available from www.eu.fishersci.com

Fisher BioReagents for Vertical Gel Electrophoresis

This section details essential bioreagents such as PAGE buffers, detergents and denaturing reagents as well as protein standards

Buffers for Protein Electrophoresis

fisher bioreagents

Cat. No.	Description	Pack qty
15561106	Tris SDS PAGE running buffer, 10X	500mL
15586006	Tris SDS PAGE running buffer, 10X	1L
10746834	Tris-glycine solution 10X DNase, RNase and protease free	1L
10356743	Tris-glycine solution 10X DNase, RNase and protease free	4L
10437773	Tris-glycine 10X powder will make 1L of 10X solution DNase and RNase free	1L*
10051653	Tris-glycine-SDS solution 10X DNase, RNase and protease free	1L
10102823	Tris-glycine-SDS solution 10X DNase, RNase and protease free	4L
10618203	SDS-PAGE buffer for protein electrophoresis, dry powder mix of Tris-Glycine-SDS makes 1L 5X buffer, 92g pack electrophoresis tested	1L
10061653	Tris-glycine-SDS buffer, 10X powder	1L
10468543	PBS (Phosphate Buffered Saline) solution 10X DNase, RNase and protease free	500mL
10204733	PBS (Phosphate Buffered Saline) solution 10X DNase, RNase and protease free	1L
10649743	PBS (Phosphate Buffered Saline) solution 10X DNase, RNase and protease free	20L
10388739	PBS tablets (Phosphate Buffered Saline), 1 x tablet dissolved in 200mL water yields 0.01M phosphate buffer, 0.0027M KCl, and 0.137M NaCl, pH 7.4 at 25°C	100 tabs**
10648973	TBS (Tris Buffered Saline) 10X solution pH 7.4	100mL
10153103	TBS (Tris Buffered Saline) 10X solution pH 7.4	500mL
10776834	TBS (Tris Buffered Saline) 10X solution pH 7.4	1L
10103203	Tris base DNase, RNase protease free, electrophoresis tested	500g
10376743	Tris base DNase, RNase protease free, electrophoresis tested	1kg
10724344	Tris base DNase, RNase protease free, electrophoresis tested	5kg
10667243	Tris base DNase, RNase protease free, electrophoresis tested	10kg
10336793	Tris base DNase, RNase protease free, electrophoresis tested	25kg
10061653	Glycine	500g
10061073	Glycine	1kg
10754724	Glycine	5kg

*Pre-weighed powder to make 1L. Dissolve in water.
**One tablet dissolved in 200mL water yields 0.01M phosphate buffer, 0.0027M KCl, and 0.137M NaCl, pH 7.4 at 25°C

Acrylamide, Bis-Acrylamide and Catalysts

fisher bioreagents

Cat. No.	Description	Pack qty
10562595	Acrylamide white crystals	100g
10235203	Acrylamide white crystals	500g
10502605	Acrylamide white crystals	5kg
10688963	Acrylamide solution 40% DNase, RNase protease free, electrophoresis tested	1L
10689923	Bis-Acrylamide DNase, RNase and protease free	25g
10689733	Bis-Acrylamide DNase, RNase and protease free	100g
10193523	Bis-Acrylamide solution 2% w/v DNase, RNase and protease free	250mL
10786644	Acrylamide:Bis-Acrylamide 19:1 powder DNase and RNase free, electrophoresis tested	100g
10699933	Acrylamide:Bis-Acrylamide 29:1 powder DNase and RNase free, electrophoresis tested	100g
10001073	Acrylamide:Bis-Acrylamide 37.5:1 powder DNase and RNase free, electrophoresis tested	100g
10214963	Acrylamide:Bis-Acrylamide 19:1 solution 40% DNase and RNase free, electrophoresis tested	1L
10001313	Acrylamide:Bis-Acrylamide 29:1 solution 40% DNase and RNase free, electrophoresis tested	1L
10081503	Ammonium persulfate crystals	25g
10396503	Ammonium persulfate crystals	100g
10689543	TEMED (N,N,N',N'-Tetramethylethylenediamine) electrophoresis tested	20g
10142863	TEMED (N,N,N',N'-Tetramethylethylenediamine) electrophoresis tested	100g

For up to date GHS information on Fisher BioReagent products listed please refer to the safety data sheet available from www.eu.fishersci.com

Fisher BioReagents for Vertical Gel Electrophoresis

This section details essential bioreagents such as PAGE buffers, detergents and denaturing reagents as well as protein standards

Detergents/Denaturing Reagents

fisher bioreagents

Cat. No.	Description	Pack qty
10366553	Brij 35	500g
10659163	CHAPS	1g
10274723	CHAPS	5g
10593335	Sodium dodecyl sulfate (SDS) powder	100g
10356463	Sodium dodecyl sulfate (SDS) powder	500g
10593355	Sodium dodecyl sulfate (SDS) powder	5kg
10265153	Sodium dodecyl sulfate (SDS) solution 10% DNase, RNase and protease free for molecular biology	200mL
10552785	Sodium dodecyl sulfate (SDS) solution 10% DNase, RNase and protease free for molecular biology	1L
10607633	Sodium dodecyl sulfate (SDS) solution 20% DNase, RNase and protease free for molecular biology	200mL
10607443	Sodium dodecyl sulfate (SDS) solution 20% DNase, RNase and protease free for molecular biology	1L
10102913	Triton X-100	100mL
10254583	Triton X-100	500mL
10113103	Tween 20	100mL
10485733	Tween 20	500mL
10592955	Tween 80	500mL

Sodium Dodecyl Sulfate, Micropellets

fisher bioreagents

- High purity SDS micropellets with assay >98.0%
- Tested for DNase, RNase to ensure absence of these hydrolysing enzymes
- Safer pelletised form of SDS is nearly free of dust particles reducing the chance of inhalation during routine lab work
- Sodium dodecyl sulfate is the most commonly used detergent in protein purification and electrophoresis
- Convenient to use and easy to dissolve in Tris-glycine solution for preparing electrophoresis buffers

Cat. No.	Description	Packaging type	Pack qty
15440685	SDS micropellets	Poly bottle	100g
15450685	SDS micropellets	Poly bottle	500g
15480685	SDS micropellets	Poly pail	5 kg

For up to date GHS information on Fisher BioReagent products listed please refer to the safety data sheet available from www.eu.fishersci.com

Producing Your Own Stock Solutions for Vertical Gel Electrophoresis

30% Acrylamide Gel Solution

fisher bioreagents

you will need these Fisher BioReagents...

- Acrylamide.....(Cat. No. 10235203)
- Bis-acrylamide.....(Cat. No. 10689923)
- Water.....(Cat. No. 10336503)

Method

Dissolve 29g acrylamide and 1g bis-acrylamide in a total volume of 60mL distilled deionised water.
Gently heat the solution (at approximately 37°C) and stir until the acrylamide and bis-acrylamide have dissolved.
Adjust the final volume to 100mL with distilled deionised water and stir.
Filter the solution through a 0.45µm membrane filter.
Adjust the pH to 7.0 or less using HCl.
Store the solution in dark bottles at room temperature for less than 3 months.

you may also be interested in the following products from... fisherbrand

Water baths

pH meters

Measuring cylinders

Amber bottles

4X Gel Buffers (Stock Solution)

fisher bioreagents

you will need these Fisher BioReagents...

- Tris base.....(Cat. No. 10376743)
- Sodium dodecyl sulfate (SDS)..... (Cat. No. 10356463)
- Water.....(Cat. No. 10336503)
- HCl.....(Cat. No. 10447450)

Method

Buffer type	Tris base (g)	SDS (g)	Distilled deionised water (add to)	Adjust the pH to (with HCl)	Add water to
Stacking (upper buffer)	15.14	1	150mL	6.8	250mL
Resolving (lower buffer)	45.41	1	150mL	8.8	250mL

In a beaker add the Tris, SDS and water according to the volumes specified in the above table.
Mix thoroughly.
Adjust the pH to 6.8 or 8.8 using HCl.
Store at +4°C.

you may also be interested in the following products from... fisherbrand

Beakers

Stirrers

Magnetic followers

pH meters

10X SDS-PAGE Running Buffer (Stock Solution)

fisher bioreagents

You will need these Fisher BioReagents...

- Tris base.....(Cat. No. 10376743)
- Sodium dodecyl sulfate (SDS).....(Cat. No. 10356463)
- Glycine.....(Cat. No. 10754724)
- Water.....(Cat. No. 10336503)

Method

Weigh out 30.3g Tris base, 144.0g glycine and 10g SDS.
Make up to 1L with distilled water.
No need to adjust pH (should be approximately pH 8.3).

1X SDS-PAGE Running Buffer (Working Solution)

Method

Dilute stock solution by 10X in distilled water. Final concentrations are :

- 25mM Tris pH 7.6
- 192mM glycine
- 0.1% SDS

you may also be interested in the following products from... fisherbrand

Bottles

Beakers

Measuring cylinders

pH meters

For up to date GHS information on Fisher Bioreagent products listed please refer to the safety data sheet available from www.eu.fishersci.com

Producing Your Own Stock Solutions for Vertical Gel Electrophoresis

1M Tris-HCl, pH 6.8

fisher bioreagents

You will need the following Fisher BioReagents...

- Tris base.....(Cat. No. 10376743)
- Water.....(Cat. No. 10336503)
- HCl.....(Cat. No. 10447450)

Method

Weight 12.11 g of Tris base and add to 80mL of water.
Adjust to desired pH with HCl.
Adjust the final volume to 100mL with distilled water.

you may also be interested in these items from... fisherbrand

Bottle

Beakers

Measuring cylinders

10% AP (Ammonium Persulfate solution)

fisher bioreagents

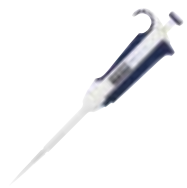
You will need the following Fisher BioReagents...

- Ammonium Persulfate.....(Cat. No. 10081503)
- Water.....(Cat. No. 10336503)

Method

Weigh out 0.1g ammonium persulfate.
Dissolve in 1mL distilled water.
Store at +4°C for 2 to 3 weeks.

you may also be interested in these items from... fisherbrand



Elite pipettors

SureOne™ tips

1.5mL centrifuge tubes

Sample Loading Buffer (4X Stock)

fisher bioreagents

You will need these Fisher BioReagents...

- 1M Tris-HCl (pH 6.8).....(refer to recipe for 1M Tris-HCl)
- Sodium Dodecyl Sulfate (SDS).....(Cat. No. 10356463)
- Glycerol.....(Cat. No. 10021083)
- ß-Mercaptoethanol.....(Cat. No. 10366313)
- 0.5M EDTA.....(Cat. No. 10618973)
- Bromophenol Blue.....(Cat. No. 10532965)

Method

Weigh out 0.8g SDS and 8mg bromophenol blue.
Add 2mL of Tris-HCl and 4mL glycerol.
Pipette 0.4mL ß-mercaptoethanol and 1mL EDTA.
Adjust final volume to 10mL with distilled water.
Aliquot into 1.5mL microcentrifuge tubes and store at -20°C.
Dilute protein sample 1:3 into 4X sample loading buffer.

you may also be interested in these items from... fisherbrand

Elite pipettors

SureOne™ tips

1.5mL centrifuge tubes

Safety gloves

For up to date GHS information on Fisher BioReagent products listed please refer to the safety data sheet available from eu.fishersci.com

Blotting

Introduction

Blotting, a technique that entails immobilisation of proteins or nucleic acids on a solid membrane support and then detection using a specific antibody or probe of complementary nucleic acid sequence, significantly increases the potential for identification and characterisation of proteins and nucleic acids. Upon transfer to a membrane support, proteins and nucleic acids become far more accessible to detection by antibodies and probes than they would otherwise be within a gel. Therefore, size fractionation by gel electrophoresis followed by blotting is an excellent way to identify specific molecules within a mixed population of nucleic or protein molecules, and the two techniques are often used in tandem.

With both the Fisherbrand Mini and Maxi Verti-Gel units, optional blotting modules are available (Cat. No. 11837623 and 15126644 respectively). Alternatively, they are available as part of a fully integrated system for multiple electrophoresis techniques (click here)

Semi Dry Blotters

- Rapid transfer times
- Western, Southern and Northern blots
- Economic transfers due to very low buffer volumes
- Screw down lid
- Gels from 0.25 up to 10mm thick can be blotted
- Uniform heat dispersion
- Long life electrodes
- Mini and Maxi models accommodate gels 100mm x 100mm or 200mm x 200mm, respectively

These Fisherbrand semi dry blotters offer rapid offer rapid transfer times for DNA, RNA and protein blotting – typically 15 to 30 minutes. They can be used for all types of blotting: Western, Southern and Northern via uncomplicated buffer and setup procedures and are compatible with gel thicknesses from 0.25mm up to 10mm without the need for additional equipment. Semi dry blotting has the added benefit of economic transfers due to very low buffer volumes – typically only a few millilitres of buffer are required per transfer. Fisherbrand semi dry blotters utilise a screw down lid, which secures the blot sandwich and allows complete control of pressure ensuring even transfer. The electrodes, comprising a platinum coated anode and stainless steel cathode, will exhibit practically no corrosion and so provide many years of trouble free use. Uniform heat dispersion across the blot sandwich ensures stable transfer times and no heat-induced sample loss or transfer distortions. Electrode plates are fully separated to prevent arcing or damage.

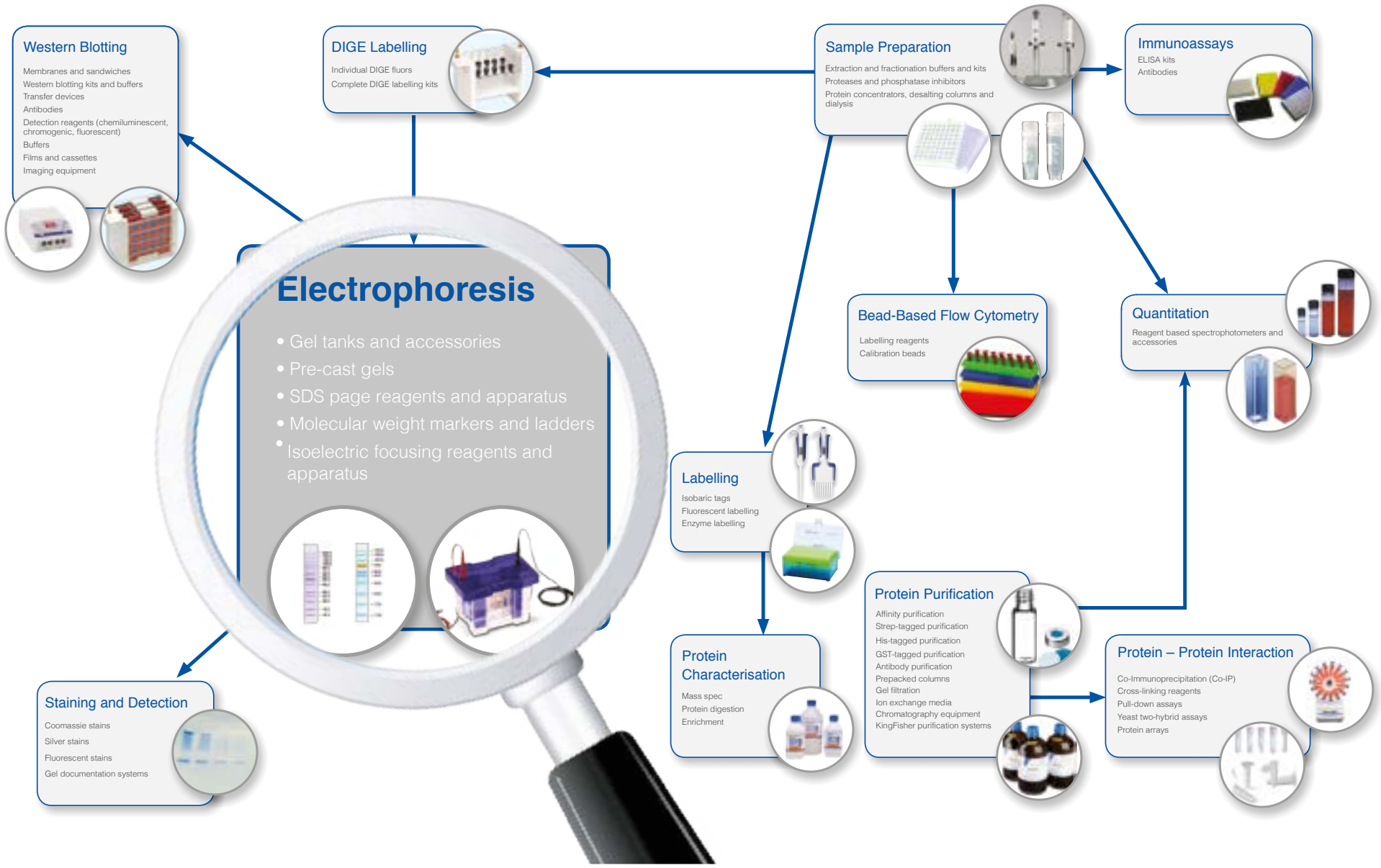
Cat. No.	Description
12357297	Semi dry blotter, Mini, 100mm x 100mm
12367297	Semi dry blotter, Maxi, 200mm x 200mm
Accessory	
15136644	Semi dry blotter cables (red and black)

Focus on Proteomics workflow

Depend on Fisherbrand, Fisher Chemical and Fisher Bioreagents to provide products for every step of your Proteomics workflow.

Proteomics Workflow

Vertical electrophoresis is a key component of many protein analysis and purification protocols. Depend upon Fisherbrand, Fisher Chemical and Fisher BioReagents to provide products for every step of your Proteomics workflow.



Technical Resources - Vertical Electrophoresis & Blotting

Here to give you a helping hand!

Fisher Scientific's Product Support Team is your dedicated resource. Our Product Support Advisors are all highly qualified professionals who are here to support and guide you to the fastest, most effective and efficient answer to your enquiry.

Areas of technical expertise include:

- BioReagents and Life Science
- Chemicals and Chromatography
- Consumables
- Equipment
- Safety

This section features a helpful troubleshooting guide and FAQ's. If, however, this information does not resolve the issue, or if you have questions not covered below, then contact your local Product Support Advisors.

Technical Resources - Vertical Electrophoresis & Blotting

Vertical Gel Unit Troubleshooting Guide

The following table lists some of the most commonly experienced problems with vertical electrophoresis and blotting units along with useful suggestions for solving them.

Problem	Cause	Suggestions
Protein precipitating in gel	Poor protein solubility	• Use SDS in transfer buffer (SDS can increase transfer efficiency, but it can also reduce nitrocellulose binding affinity and affect protein-antibody reactivity) • Remove alcohol from transfer buffer
Swirls or missing bands; diffuse transfers	Poor gel-membrane contact. Air bubbles or excess buffer remain between membrane and gel	• Carefully remove air bubbles between gel and membrane using a rolling pin • Use more, or thicker, filter paper in gel membrane sandwich • Replace the fibre pads, as they degrade and remain permanently compressed over time
	Membrane not fully wet or has dried out	• If soaking does not occur immediately following immersion in transfer buffer, heat distilled water to just below boiling point and soak membrane until entirely wet • If using PVDF, immerse membrane in methanol before soaking in transfer buffer
	Problem with gel electrophoresis	• Poor gel polymerisation • Inappropriate running conditions • Buffer contamination • Excessive sample application all contribute to poor quality gels and transfers
Gel cassette pattern transferred to blot	Contaminated fibre pads	• Replace fibre pads or clean thoroughly. Contaminated transfer buffer • Replace buffer solutions
Poor binding to membrane - nitrocellulose	Excessive methanol restricting transfer	• Ensure methanol concentration does not exceed 20% (v/v)
	Proteins may be transferring through nitrocellulose	• Use PVDF or smaller pore size (0.2µm) nitrocellulose • Overlay an extra piece of nitrocellulose over membrane to determine if proteins are migrating through the membrane directly in contact with the gel
	Proteins <15kDa have reduced binding to 0.45µm nitrocellulose or may be washed from membrane during assays	• Use PVDF or nylon membrane, which have higher binding capacities • Use Tween-20 detergent in the wash and antibody incubation steps. Reduce or eliminate the more stringent washing steps
	SDS in transfer buffer reducing binding efficiency	• Reduce or eliminate SDS concentration
	Membrane is not completely wet	• White spots indicate dry areas where protein will not bind • If soaking does not occur immediately following immersion in transfer buffer, heat distilled water to just below boiling point and soak membrane until entirely wet
Poor binding to membrane - PVDF	Membrane is not completely wet	• Because of hydrophobicity of PVDF, the membrane must be soaked entirely in methanol before equilibration in aqueous buffer
	Proteins might be transferring through the membrane	• Decrease voltage if transferring under high intensity conditions • Overlay an extra piece of PVDF over membrane to determine if proteins are migrating through the membrane directly in contact with the gel
	Membrane might have dried during handling	• Fully wet membranes have a grey translucent appearance. White spots will form on the surface if the membrane has been allowed to dry. As proteins will not bind to dry spots, re-soak the membrane in methanol and re-equilibrate in transfer buffer
	SDS in transfer buffer reducing binding efficiency	• Reduce or eliminate SDS concentration
Power	Power is too high	• Always check current at the start of the run, for the current might be too high for a given voltage setting. Improper buffer preparation can also result in high conductivity and excessive power generation. The current setting should not be allowed to exceed 2,000mA
Immune-specific detection	Overall high background	• Reduce antibody/protein sample concentration • Too low background • Increase antibody concentration/protein sample concentration • Consult manual included with antibody detection kit
Low total protein detection	Insufficient sensitivity	• Consult stain or detection kit manual
Poor protein transfer	Transfer apparatus assembled incorrectly and proteins moving in the wrong direction	• Gel/membrane sandwich may be assembled in the wrong order, or cassette inserted in wrong orientation. Check polarity
	Western detection system not working or not sensitive enough	• Include proper positive or negative control antigen. • Use protein markers with coloured reference bands during PAGE • Stain gel with Coomassie, or stain membrane with Ponceau S
	Transfer time too short	• Increase transfer time
	Power setting too low	• Check current at beginning of run. Current may be too low for a given voltage setting. Increase current if necessary but do NOT exceed 2,000mA • Buffer may be prepared improperly – prepare new buffer and increase voltage
	Charge-to-mass ratio incorrect for native transfers	• Proteins close to isoelectric point (pI). Change buffer pH so that it is at least 2 pH units higher or lower than pI of protein of interest
	Defective or inappropriate power supply used	• Check fuse of power supply. Ensure max. current output of power supply is at least 2,000mA
	Excessive methanol restricting transfer	• Reduce methanol concentration to maximise protein transfer from gel, but without reducing concentration to the extent that it prevents binding to nitrocellulose. Alternatively reduce methanol concentration and switch to PVDF

Technical Resources - Vertical Electrophoresis & Blotting

Frequently asked questions (FAQ's) – Vertical Gel Electrophoresis

This section lists the most frequently asked questions related to vertical electrophoresis and blotting received by our Life Science and Chemical Specialists, together with the answers they provided. If you are unable to find the answer to your question, are stuck and need help or are simply confused and unsure of which product best suits your research needs, the Product Support Team are here and ready to respond to your enquiries

Q. What percentage acrylamide gel should I use?

A. Care should be taken when selecting the percentage acrylamide or pore size of the gel to be used. The table below details which percentage of gel to use to separate the sizes of proteins indicated.

Acrylamide Percentage	Separating Resolution
5%	60 to 220kDa
7.5%	30 to 120kDa
10%	20 to 75kDa
12%	17 to 65kDa
15%	15 to 45kDa
17.5%	12 to 30kDa

Q. Does the protein gel loading dye (Cat. No. 10376363) contain any reducing agents such as ß-mercaptoethanol or DTT?

A. For protein gel electrophoresis, typical sample loading buffers are available in either a reducing or non-reducing formulation. Dithiothreitol (DTT) is a common reducing agent used in protein sample buffers. However, the formulation of Fisher BioReagents Cat. No. 10376363, protein gel loading dye (2X), does not contain a reducing agent such as DTT or mercaptoethanol.

Q. Is it possible to autoclave Cat. No. 10204733?

A. It is not advisable to autoclave Fisher Bioreagent Cat. No. 10204733, 10X PBS, as phosphate may precipitate out. For this product, we filter the buffer solution through a 0.2micron filter into a sterile 1L poly bottle under a sterile hood.

Q. Do you have the formulation for Cat. No. 10649743?

A. The formulation of Fisher BioReagents Cat. No. 10649743 Phosphate Buffered Saline (PBS), 10X solution is as follows:

- 1.37M Sodium Chloride
- 0.027M Potassium Chloride
- 0.119M Phosphate Buffer

The phosphate buffer consists of two components, namely 0.101M sodium phosphate dibasic heptahydrate (CAS # 7782-85-6) and 0.018M potassium phosphate monobasic (CAS # 7778-77-0).

Q. Why is the actual band size on a gel or Western blot different from the predicted size of the protein?

A. Western blotting is performed after the separation of proteins by their size on a gel. However, migration of proteins through the gel matrix is also affected by other factors, which may cause the observed band size to be different from the predicted size.

Other factors are:

- Post-translational modification; for example phosphorylation and glycosylation increase the size of the protein
- Post-translation cleavage; many proteins are synthesised as precursor proteins, and then cleaved to give the active form
- Multimers, for example dimerisation of a protein. This is usually prevented under reducing conditions, although strong interactions can result in the appearance of higher bands
- Splice variants; alternative splicing may result in different sized proteins being produced from the same gene
- Relative charge; the composition of amino acids (charged vs. non-charged)

Technical Resources - Vertical Electrophoresis & Blotting

Q. What is the best method for staining SDS-PAGE gels?

A. Coomassie staining is probably one of the most well known protein staining techniques. Two main Coomassie staining methods exist, “classical” Coomassie and the more recently developed colloidal Coomassie.

- Classical Coomassie involves staining the whole gel, not just the proteins. By destaining the gel, proteins are then visualised as the dye is retained better by the proteins than the gel. Classic Coomassie sensitivity (detection limit) is approx. 100ng, which makes detection of low abundant proteins difficult. It is simple, cheap and quick to perform and has the advantage of being compatible with mass spectrometry. However, reproducibility is an issue with this stain due to challenges in standardising the destaining step
- Colloidal Coomassie is an adaptation of classical Coomassie staining using a modified Coomassie dye (G-250 instead of R-250). It has increased sensitivity compared to classical Coomassie, with a detection limit of approx. 10ng. It is simple to perform and since the colloidal dye does not penetrate the gel, destaining is not required (though can be performed to improve background). As with classical Coomassie it is compatible with mass spectrometry

In addition to Coomassie staining, silver staining is another popular method for visualising proteins. The main benefit of silver staining is its high sensitivity as you are able to detect less than 1ng protein, making it the preferred stain for detection of low abundance proteins. However, silver staining is time consuming and laborious. The gel requires developing after staining in order to visualise the proteins, and the length of time for developing can vary considerably between gels making reproducibility a challenge. Silver staining also involves the use of formaldehyde when fixing the gel making it incompatible with mass spectrometry.

Q. Can I stain with Coomassie Blue and then Western blot?

A. Yes, it is possible to stain with either Coomassie or Colloidal Blue stain prior to Western blotting, though decreased transfer and subsequent probing efficiency may occur. However, it is important to note that this is generally only recommended to try if you use colloidal stain. To ensure optimal transfer efficiency, destain the gel and then equilibrate in a series of Tris base/glycine/SDS solutions to increase solubility. When the transfer is complete, the membrane should be treated with methanol to remove the stain prior to chromogenic development (not necessary prior to chemilumninescent detection).

Q. How can I improve transfer efficiency for larger proteins during Western blotting?

A. Here are some options for obtaining more efficient transfer for larger proteins:

1) Pre-equilibrate the gel with 0.02 to 0.04% SDS in 2X transfer buffer without methanol for 10mins before assembling the sandwich
2) Increase the blotting time incrementally (in 15min intervals)
3) Add 0.01% or 0.02% SDS to the transfer buffer to help facilitate the migration of the protein out of the gel
4) Decrease the methanol content in the transfer buffer
5) Switch to a more appropriate lower percentage gel. A lower percentage gel may allow better transfer than a higher percentage gel

Q. How can I improve the transfer efficiency of protein ladders when Western blotting onto a PVDF membrane?

Technical Resources - Vertical Electrophoresis & Blotting

A. There are two factors to consider - poor transfer and the ladder passing through the membrane during the transfer.

For poor transfer onto membrane, consider the following:

- The percent acrylamide should be 8% to get rapid, more complete transfer of high molecular weight proteins
- Increase voltage, current, or length of time for transfer
- For transfer to PVDF, omit the SDS from the transfer buffer. Addition of SDS (or use of old buffer that may have SDS leached in from the gel) will cause the proteins to bind less efficiently to PVDF membranes because it inhibits the hydrophobic interaction between the membrane and the protein
- If the problem is the protein staying in the gel, consider any of the following:
    - Increase the SDS concentration to 0.1% (but use nitrocellulose)
    - Eliminate the methanol in the buffer
    - Reduce the acrylamide percentage
    - Transfer for longer

If the ladder goes through membrane during transfer:

- Decrease voltage or transfer
- Check concentration of SDS and methanol. Too much SDS can prevent binding to the membrane. Alcohol enhances hydrophobic binding to membrane; not enough alcohol may prevent binding
- Use a 0.2µm pore size of nitrocellulose
- Check gel percentage; smaller proteins will pass through membranes more easily

Q. What are the standard lysis buffers used with mammalian cells for detection of protein expression by immunoprecipitation or Western blot analysis?

A. The most commonly used buffer is RIPA buffer with SDS. The usual formulation is as follows:
150mM NaCl, 10mM Tris, pH 7.2, 0.1% SDS, 1.0% Triton X-100, 1% Deoxycholate, 5mM EDTA
Protease inhibitors: 1mM phenylmethylsulfonyl fluoride, 10mM benzamidine, 2µg/mL leupeptin
Phosphatase inhibitors: 100µM sodium orthovanadate, 10mM p-nitrophenylphosphate

Procedure:

1. Place cells on ice
2. Wash cells with ice cold PBS to remove media
3. Add 1mL RIPA buffer to 100mm dish. Scale up or down as necessary
4. Scrape cells into RIPA buffer and transfer to small centrifuge tube
5. Stand on ice for 10min, vortexing every few minutes to dissolve material. Lysates can also be passed through a 22 gauge needle to aid in solubilisation
6. Centrifuge at 17,000rpm for 10min
7. Remove supernatant for protein assays and discard the pellet

NOTE: For experiments in which it is not desirable to fully denature proteins and possibly break protein:protein interactions, the RIPA buffer can be replaced with a non-denaturing NP40 solubilisation buffer, recipe: 150mM NaCl 20mM Tris, pH 7.5, 1% NP40 or 1% Triton-X-100, and 5mM EDTA. If this non-denaturing buffer is used, lysates should be homogenised or passed through a needle several times to ensure adequate solubilisation.

Q. How can I reduce background bands in my Western blot?

A. Optimise the concentration of primary and secondary antibodies. In some cases, increasing the concentration of blocking agent (BSA or non-fat dry milk) reduces background signal. After incubation with the primary antibody, wash at least two times with TBST (include 0.5M NaCl in one or more of the wash steps). Avoid Nonidet™ P40 or Triton™ X-100 in buffers as these detergents decrease protein detection.

Q. Can I use BSA (Fisher Bioreagent Cat. No. 12737119) to make blocking buffer for Western blotting?

A. Yes, Cat. No. 12737119 (Bovine Serum Albumin, fraction V heat shock treated), can be used in a number of molecular biology applications including Western blots (as a blocking agent) and ELISA and as a stabiliser for enzymatic reactions. Another newer BSA product that you might consider is Cat. No. 12871630 (BSA, heat shock treated and protease free). This product has found great use in RIA and ELISA and as a blocking agent.

Technical Resources - Vertical Electrophoresis & Blotting

Q. How can I store, strip, and reuse my Western blot?

A. For storage, following transfer, air dry the blot and place it between two clean sheets of filter paper. Place the blot-filter paper sandwich between two sheets of card, in order to keep it flat, and place it in a sealable plastic bag. The blot can be stored at 4°C for up to two weeks, -20°C for up to two months or indefinitely at -80°C. When ready to reprobe, pre-wet the blot with alcohol for a few seconds, followed by a few rinses with pure water to reduce the alcohol concentration.

To strip the blot:

- In a fume hood submerge the blot in stripping buffer (100mM ß-mercaptoethanol, 2% SDS, 62.5mM Tris-HCl, pH 6.7) and incubate at 50°C for 30min with occasional agitation
- Wash 2 x 10min in TBS-T/PBS-T at room temperature
- Block the membrane by immersing in 5% blocking reagent TBS-T or PBS-T for 1hr at room temperature
- Proceed with next round of immunodetection

Often you do not need such harsh conditions to remove antibodies from their proteins. An alternative and milder method for stripping a blot is achieved by lowering the pH of the stripping buffer.

- Submerge the blot in stripping buffer (1% SDS, 25mM glycine-HCl, pH 2.0) and incubate at 50°C for 30min with occasional agitation
- Wash 2 x 10min in TBS-T/PBS-T at room temperature
- Block the membrane by immersing in 5% blocking reagent TBS-T or PBS-T for 1hr at room temperature
- Proceed with next round of immunodetection

References

1. Sambrook, Fritsch, and Maniatis, Molecular Cloning, A Laboratory Manual, Second Edition, Cold Spring Harbor Laboratory Press, 1989
2. Current Protocols in Molecular Biology, Greene Publishing Associates and Wiley-Interscience,1989
3. Weiss, W., Weiland, F. & Görg, A. (2009), Protein detection and quantitation technologies for gel-based proteome analysis, in J. Reinders & A. Sickmann, eds, 'Proteomics', Vol. 564 of Methods in Molecular Biology, Humana Press,

Power Supplies for Electrophoresis

Introduction

Electrophoretic techniques all rely on the application of an electric field and so selection of an appropriate power supply for your requirements is essential.

In general, whether you use constant or variable voltage power sources, the higher the voltage is applied, the faster the samples migrate. However, the maximum amount of voltage that can be applied depends upon the design of the electrophoresis apparatus and should not exceed the manufacturer's recommendations. For example, voltage that is too high can melt an agarose gel during electrophoresis and cause distortion of results.

The choice of power supply can vary depending on the application it is being used for. For example, sequencing and isoelectric focusing are best run at constant power, SDS-PAGE and electroblotting are generally run under conditions of constant current and submarine gel electrophoresis of DNA is run at constant voltage. The following table will help to guide you select the right power supply for your particular application.

Power Supplies Selection Guide

Application	Mini 300V Plus	PowerPlus 300	PowerPlus 500	PowerPlus 3AMP
Horizontal Gel Electoprhoresis				
Wide Format, Mini-Plus	•	•	•	•
Wide Format, Midi-Plus	•	•	•	•
SUB-GEL Mini	•	•	•	•
SUB-GEL Midi	•	•	•	•
SUB-GEL Midi Plus	•	•	•	•
SUB-GEL Maxi		•	•	•
IEF				
Vertical Gel Electrophoresis				
Verti-Gel Mini, 2-Gel System (Standard)	•	•	•	•
Verti-Gel Mini, 4-Gel System (Tetrad)		•	•	•
Verti-Gel Maxi, 2-Gel System (Standard)			•	
DNA Sequencing				
Blotting				
Semi Dry Blotter, Maxi				•
Verti-Gel Systems with Electroblotting Options			•	•

Power Supplies for Electrophoresis

Mini 300V Plus and PowerPlus Series

These models benefit from a small benchtop footprint and compact design, while explanatory user-friendly menus facilitate easy setup. These power supplies also adhere to IEC 61019 - one of the world's most stringent electrical safety standards.

Mini 300V Plus

These new models include a simple two step feature which allows users to set a programmable change in voltage/current/time during the run to provide increased versatility. Simply press MODE and program STEP 1 and STEP 2 to the desired setting and then start, and the Mini 300V Plus will automatically run the steps in sequence.

The Mini 300V Plus supplies are an ultra compact and economic unit ideal for use with DNA (horizontal) and protein (vertical) electrophoresis systems. With enhanced features, such as a maximum constant voltage up to 300V and maximum constant current output of 400mA, the Mini 300V Plus is capable of running all Fisherbrand horizontal SUB-GEL systems and Verti-Gel Mini systems.

The Mini 300V Plus user-friendly interface is easily adjustable in 1V and 1mA increments, making it perfect for separations where precise settings are required. Its ultra compact size and two pairs of parallel power terminals, which can run two electrophoresis units simultaneously, save time and bench space.

Output Specifications

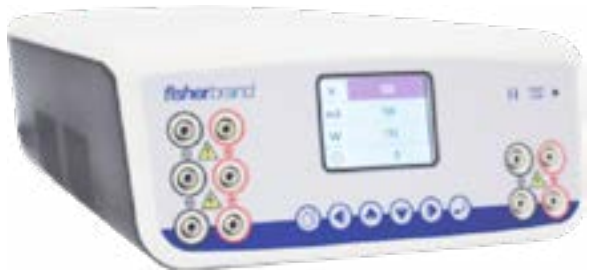
Voltage, V.....10 to 300
Current, mA.....10 to 400
Power [max.],W 60

Cat. No.	Description	Dimensions, mm
12643546	Mini 300V Plus Power Supply, 300V, 400mA, 60W, 100-240V a.c., twin output	140 x 191 x 84

Power Supplies for Electrophoresis

PowerPlus Series

For routine electrophoresis using Fisherbrand horizontal SUB-GEL systems and Verti-Gel Mini systems.



Each power supply has a 61mm (2.4 inch) LCD display showing the available setup options as well as current running conditions. Constant voltage, current and power options are available as well as pre-programmed or self-programmed conditions allowing users to save and repeat experimental setup for exceptional reproducibility. The five power outlet pairs means fewer power units are needed for the same number of tanks, saving cost and time when running multiple tanks simultaneously.

The PowerPlus 300 is perfect for Fisherbrand smaller tanks and can run up to five horizontal mini and midi SUB-GEL units. For higher voltage runs the PowerPlus 500 offers a maximum 500V output, perfect for the larger horizontal and midi units. For blotting where high current may be required, the PowerPlus 3AMP supplies a maximum of 3000mA to allow multiple blots to be processed simultaneously.

Output Specifications

	15818481	15838481	15828481
	PowerPlus 300	PowerPlus 500	PowerPlus3AMP
Max voltage, V	5 to 300/1	5 to 500/1	5 to 300/1
Max current, mA	1 to 700/1	1 to 800/1	10 to 30000/10
Max watt, W	150/1	300/1	300/1
Output type	Constant voltage/current/power		
Programme	Pre setting: Up to 6 step, 30 programmed files		
Timer	Constant mode: 999 (min) with alarm		
Programmable mode	999 (min) with alarm		
Rated voltage, V	100 to 240		
Dimensions, mm	215 x 335 x 104		

Cat. No.	Description
15818481	PowerPlus 300, 300V, 700mA, 150W, five outputs
15838481	PowerPlus 500, 500V, 400mA, 3000W, five outputs
15828481	PowerPlus 3AMP 300V, 3000mA, 300W, five outputs

Technical Resources - Power Supplies

Technical resources

Here to give you a helping hand!

Fisher Scientific's Product Support Team is your dedicated resource. Our Product Support Advisors are all highly qualified professionals who are here to support and guide you to the fastest, most effective and efficient answer to your enquiry.

Areas of technical expertise include:

- Bioreagents and Life Science
- Chemicals and Chromatography
- Consumables
- Equipment
- Safety

This section features a helpful troubleshooting guideand FAQ's relating to electrophoresis power systems. relating to electrophoresis power systems. If, however, this information does not resolve the issue, or if you have questions not covered below, contact your local Product Support Advisors.

Technical Resources - Power Supplies

Power Supplies Troubleshooting Guide

The following table lists some of the most commonly experienced problems with power supply units along with useful suggestions for solving them.

Problem	Cause	Solution
No display/lights	No a.c. power	• Check if the power supply is unplugged, or if the a.c. power source is a problem
	a.c. power cord is not connected	• Check a.c. power cable to ensure that it is compatible with the power supply • Use the correct power cable
	The fuse has blown	• Replace the fuse
Fuse repeatedly broken	Hardware failure	• Contact Fisher Scientific's Customer Service department
Operation stops	Electrophoresis cables are not connected to the power supply or to the electrophoresis unit(s). There is a broken circuit in the electrophoresis tank	• Check the connections to the power supply and the electrophoresis tank to ensure they are intact; check the condition of wires in the electrophoresis unit. Close the circuit by reconnecting the cables • Press START/STOP to resume the run
	High resistance due to tape left on a pre-cast gel; an incorrect buffer concentration or volume in the electrophoresis tank	• Ensure that any tape is removed from the ends of a pre-cast gel, the buffers are prepared correctly, and the recommended volume of buffer is added to the electrophoresis tank
Er1 Error message	Current exceeds the maximum output for the power supply (>400mA)	• Check if the buffer concentration or molarity is appropriate (excessive buffer concentration or molarity may increase conductivity) • To clear the error message, press the START/STOP button
Er2 Error message	Voltage exceeds the maximum output for the power supply (>300V)	• Press the START/STOP button to clear the error message. • Contact Fisher Scientific's Customer Service department if the problem persists
Er3 Error message	Thermal limitation of the power supply reached (output voltage <10V)	• Check the connections • If the Er3 error message persists, the problem may be caused by internal (2) fan failure. • Contact Fisher Scientific's Customer Service department
nld Message	No load is detected	• Check the connections • Check the buffer condition/ buffer level
AL1 Alarm message	Power exceeds the maximum output (60W)	• Warning message for reference

Technical Resources - Power Supplies

Frequently Asked Questions (FAQ's) – Power Supplies

This section lists the most frequently asked questions on this topic received by our Life Science and Chemical Specialists, together with the answers they provided. If you are unable to find the answer to your question, are stuck and need help or are simply confused and unsure of which product best suits your research needs, the Product Support Team are here and ready to respond to your enquiries.

Q. What are the relationships between voltage, current, power and resistance?

A. Power (W) = Voltage (V) x Current (A)
Resistance (Ω) = Voltage (V) / Current (A)

Q. How important is the resistance of an electrophoresis unit?

A. The resistance of an electrophoresis unit depends on its size, gel thickness, amount of buffer, buffer conductivity and temperature. This resistance will normally decrease during an electrophoresis run due to a slowly increasing temperature. Electrophoresis units which have a resistance below the minimum load resistance of a power supply will trigger an alarm! Read the output voltage and current during a run to measure the resistance and use the above formula to calculate the value.

Q. Why are my output values different from those of a similar experiment?

A. Either your programmed parameters are not equal to those used previously or the resistance of your electrophoresis unit is different (see above). It cannot be due to e.g. another model of power supply as the relations between voltage, current, power and resistance are monitored in the same way by any instrument.

Q. What about connecting more than one unit to the same power supply?

A. If outlets are in parallel, each electrophoresis unit will be supplied with exactly the same voltage. However, current and power may differ due to differences between them even when exactly the same model, gel, buffers, etc. are used. Therefore, it is recommended to run several electrophoresis units only in the constant voltage mode on the same power supply.

Q. What about the influence of temperature?

A. Electrophoresis at high voltages produces heat. Additionally, high conductivity buffers such as TAE generate more heat than low conductivity buffers. Care should be taken in agarose gel electrophoresis with voltages greater than 175V, as heat build-up can generate gel artifacts such as S-shaped migration fronts, and in extended electrophoresis runs can even melt the agarose gel. With high voltage electrophoresis, the use of low melting point agarose gels should be avoided.

Other Consumables and Equipment

UV Sterilisation Cabinets

- UV lights on the cabinets denature nucleic acids in 5 to 30 minutes making them incapable of amplification
- Incorporates safety features to prevent user exposure to UV light
- The UV lights are timer controlled
- Safety switches on the cabinets doors turn off the UV lights when opened
- Shields beta radioactive emissions

Technical Specification

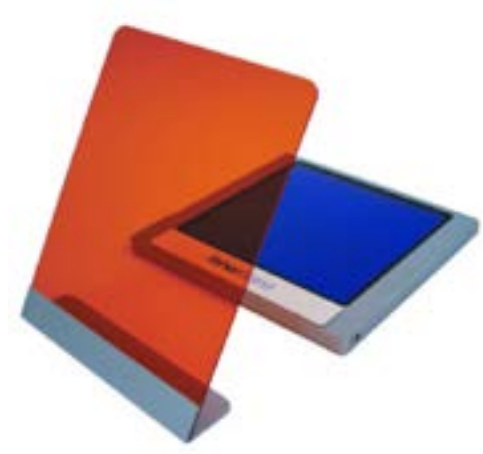
Includes.....Optional tray
Weight (metric) 19kg
Lighting ..... 4/1 UV lights, 1 white
Wattage..... 5/2 x 15w

Cat. No.	Description	Pack qty
15592496	UV sterilisation cabinet with timer, four UV lights and white light, includes tray Dimensions, mm (H x D x W) 770 x 420 x 560	1
15562496	UV sterilisation cabinet with timer, four UV lights and white light, no tray Dimensions, mm (H x D x W) 770 x 420 x 560	1
15582496	Mini UV sterilisation cabinet with timer, UV light and white light, includes tray Dimensions, mm (H x D x W) 510 x 350 x 560	1
15572496	Mini UV sterilisation cabinet with timer, UV light and white light, no tray SafeVIEW Dimensions, mm (H x D x W) 510 x 350 x 560	1

SafeVIEW MINI2 LED Transilluminator

Offers a safe way to view and document gels and other materials with a uniform blue light source. Fisherbrand™ SafeVIEW MINI2 LED Transilluminator will not cause damage to DNA or RNA that would normally be associated with UV light.

- Compact design
- Even light source
- Low cost
- Lightweight at 1.52kg



Cat. No.	Dimensions (L x W x H), mm	Lighting Type	Filter Size, mm	Pack qty
15502506	200 x 200 x 28.7	470nm Blue LED	154 x 154	1

Distributed by Fisher Scientific. Contact us today:

Austria: fishersci.at **Belgium:** fishersci.be **Denmark:** fishersci.dk
Germany: fishersci.de **Ireland:** fishersci.ie **Italy:** fishersci.it
Finland: fishersci.fi **France:** fishersci.fr **Netherlands:** fishersci.nl
Norway: fishersci.no **Portugal:** fishersci.pt **Spain:** fishersci.es
Sweden: fishersci.se **Switzerland:** fishersci.ch **UK:** fishersci.co.uk

fisher scientific
part of Thermo Fisher Scientific

17117_EN