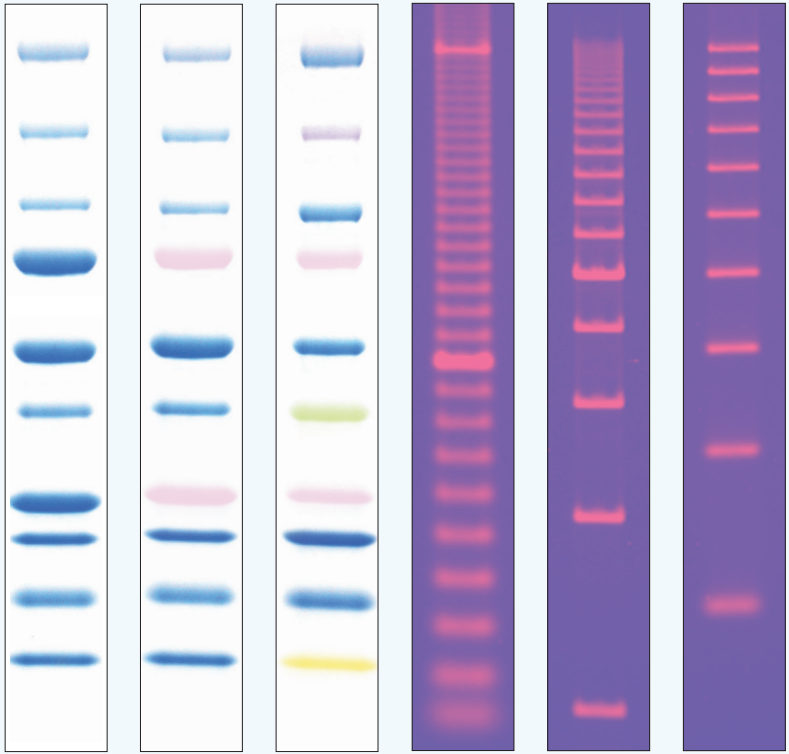

BIO-RAD

THE LITTLE BOOK OF STANDARDS

PROTEIN & DNA STANDARDS REFERENCE GUIDE

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THE LITTLE BOOK OF STANDARDS

PROTEIN & DNA STANDARDS REFERENCE GUIDE

INTRODUCTION

This handbook is a practical guide to Bio-Rad's complete line of protein and DNA standards for electrophoresis and blotting. Bio-Rad standards are an excellent means of monitoring electrophoresis and blotting experiments or for determining protein and DNA sizes.

This handbook is organized into tabbed sections for both protein and DNA standards; the protein standards are divided into sections based on applications. Featured are our Precision Plus Protein™ standards, highly purified recombinant proteins that offer exceptional band clarity, versatility, and consistency from lot to lot.

Reference information includes specifications for each set of standards, recommended applications, a photograph of the standards run on a gel, and the molecular mass or pI of each standard band. Each section divider contains gel migration summaries for the sets of standards described in that section. We hope you find this booklet to be a useful guide to the selection and use of Bio-Rad protein and DNA standards. For more information on products or applications, contact your local Bio-Rad representative, or visit us on the Web at **www.bio-rad.com**.

Protein Molecular Weight and Reference Standards

Protein Standards Selection Guide, continued

Recommended standards based on application.

	Gel		Blot				2-D Gel		IEF Gel	
Type	**Colorimetric**	**Fluorescent**	**Colorimetric**	**Fluorescent**	**Chemiluminescent**	**Multiplex**	**Colorimetric**	**Fluorescent**	**Colorimetric**	**Fluorescent**
Precision Plus Protein™ recombinant standards	Unstained All Blue Dual Color Kaleidoscope™	Unstained	Unstained All Blue Dual Color Kaleidoscope WesternC™	Unstained	WesternC Unstained	WesternC Dual Color Kaleidoscope	—	—	—	—
Natural standards	Unstained SDS–PAGE Broad Range Unstained SDS–PAGE High Range Unstained SDS–PAGE Low Range	Unstained SDS–PAGE Broad Range Unstained SDS–PAGE High Range Unstained SDS–PAGE Low Range	Unstained SDS–PAGE Broad Range Unstained SDS–PAGE High Range Unstained SDS–PAGE Low Range	Unstained SDS–PAGE Broad Range Unstained SDS–PAGE High Range Unstained SDS–PAGE Low Range	Biotinylated SDS–PAGE Broad Range Biotinylated SDS–PAGE Low Range Biotinylated SDS–PAGE High Range	—	2-D SDS–PAGE	2-D SDS–PAGE	IEF	IEF

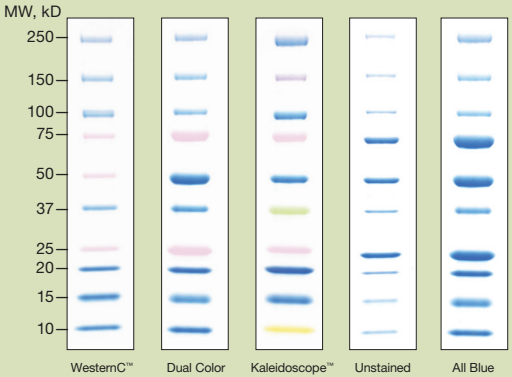
Protein Standards Selection Guide, continued

Recommended standards based on application.

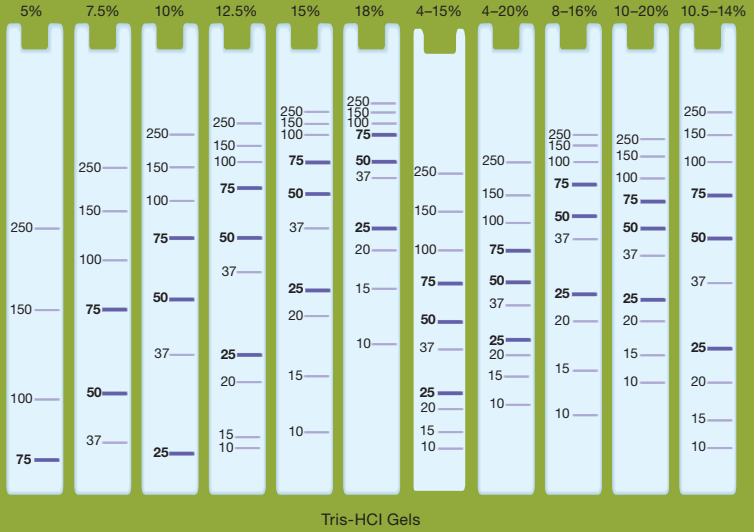
	Gel		Blot				2-D Gel		IEF Gel	
Type	**Colorimetric**	**Fluorescent**	**Colorimetric**	**Fluorescent**	**Chemiluminescent**	**Multiplex**	**Colorimetric**	**Fluorescent**	**Colorimetric**	**Fluorescent**
Natural Standards	Unstained SDS-PAGE Polypeptide Silver Stain SDS-PAGE Low Range Silver Stain SDS-PAGE High Range Prestained SDS-PAGE Broad Range Prestained SDS-PAGE Low Range Prestained SDS-PAGE High Range Kaleidoscope Prestained Kaleidoscope Polypeptide Prestained	Unstained SDS-PAGE Polypeptide	Unstained SDS-PAGE Polypeptide Silver Stain SDS-PAGE Low Range Silver Stain SDS-PAGE High Range Prestained SDS-PAGE Broad Range Prestained SDS-PAGE Low Range Prestained SDS-PAGE High Range Kaleidoscope Prestained Kaleidoscope Polypeptide Prestained	Unstained SDS-PAGE Polypeptide	—	—	—	—	—	—

Precision Plus Protein™ Standards

Migration patterns of Precision Plus Protein standards on Criterion™ Tris-HCl pH 8.8 gels. Select the acrylamide percentage that best resolves your protein or peptide of interest in Laemmli gel-buffered systems.



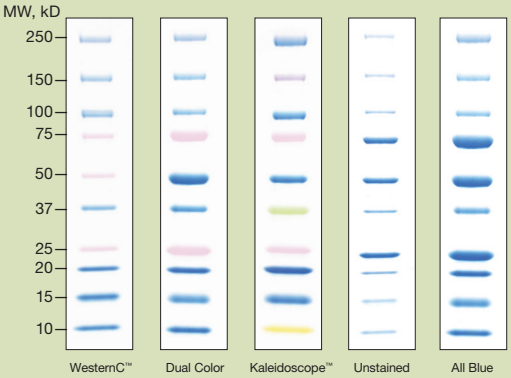
Protein Migration Chart



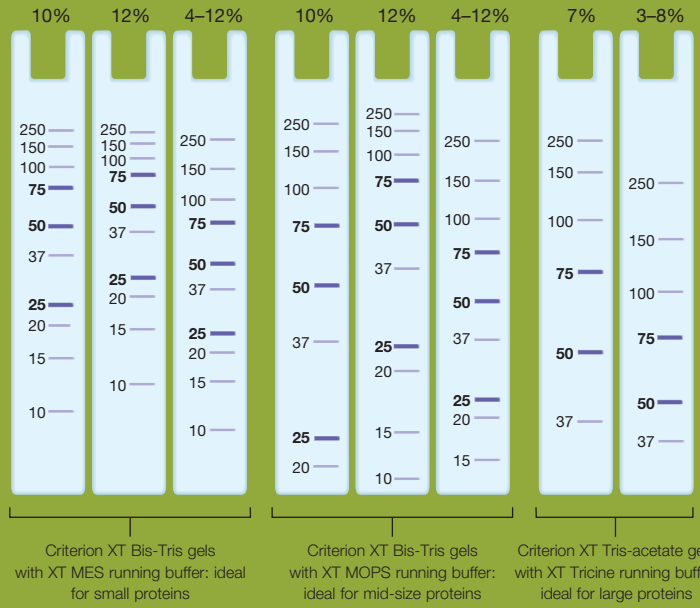
Protein molecular mass, kD. Migration patterns obtained when running gels until the dye front reaches the bottom of the gel.

Precision Plus Protein™ Standards

Migration patterns of Precision Plus Protein standards on Criterion™ Tris-HCl pH 8.8 gels. Select the acrylamide percentage that best resolves your protein or peptide of interest in Laemmli gel-buffered systems.



Protein Migration Chart



Protein molecular mass, kD. Migration patterns obtained when running gels until the dye front reaches the bottom of the gel.

Precision Plus Protein™ Unstained Standards

Size Range	Quantity	Recommended Load Volume
10 proteins, 10–250 kD	360 µg protein in 1 ml of 30% (v/v) glycerol, 2% SDS, 62.5 mM Tris, pH 6.8, 50 mM DTT, 5 mM EDTA, 0.02% NaN_3, 0.01% bromophenol blue	Coomassie staining: 10 µl; Silver staining, SYPRO Ruby staining: 1–3 µl; Blotting, colorimetric AP development: 1–4 µl; Blotting, colorimetric HRP development: 1–6 µl; Blotting, chemiluminescent AP development: 5–10 µl (dilute Precision Plus Protein standards 1:15–1:30 in Laemmli buffer prior to use); Blotting, chemiluminescent HRP development: 5–10 µl (dilute Precision Plus Protein standards 1:30–1:60 in Laemmli buffer prior to use)

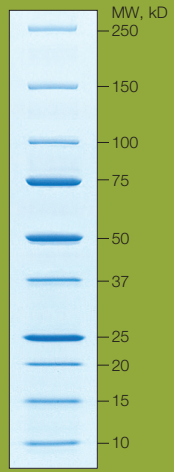
Recommended applications: For accurate molecular weight estimation on SDS-polyacrylamide gels or immunoblots. Contain *Strep*-tag sequence for accurate molecular weight estimation on immunoblots. Can also be used with the Criterion Stain Free™ gel imaging system.

Note: Standards are premixed with sample loading buffer. No dilution or heating is required.* Store at –20°C.

Catalog #

161-0363 Precision Plus Protein Unstained Standards
161-0380 Precision Protein StrepTactin-HRP conjugate
161-0382 Precision Protein StrepTactin-AP conjugate

* Allow standards to reach room temperature and mix thoroughly to dissolve any precipitated solids. For certain applications, dilution of the standards is recommended. See instruction manual for details.



Standards shown were run on a 4–20% gradient gel. Stained with Coomassie R-250.

Precision Plus Protein™ All Blue Standards

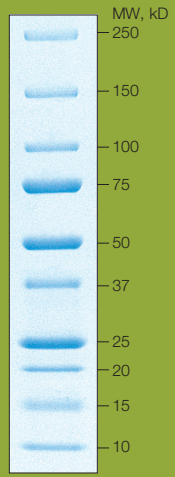
Size Range	Quantity	Recommended Load Volume
10 proteins, 10–250 kD	750 µg protein in 500 µl of 30% (v/v) glycerol, 2% SDS, 62.5 mM Tris, pH 6.8, 50 mM DTT, 5 mM EDTA, 0.02% NaN_3	Mini gels: 10 µl; Blotting, to monitor transfer (mini gel): 1–3 µl; Large gels: 20 µl

Recommended applications: For molecular weight estimation on SDS-polyacrylamide gels and electrophoretic transfer monitoring. Can be visualized with fluorescent imagers: Use red LED of Molecular Imager® VersaDoc™ MP system or 635 nm laser of Molecular Imager® PharosFX™ system.

Note: Standards are premixed with sample loading buffer. No dilution or heating is required.* Prestained blue bands migrate to their true molecular weight with no variability from lot to lot. Store at –20°C.

Catalog # 161-0373

* Allow standards to reach room temperature and mix thoroughly to dissolve any precipitated solids. For certain applications, dilution of the standards is recommended. See instruction manual for details.



Standards shown were run on a 4–20% gradient gel.

Precision Plus Protein™ Dual Color Standards

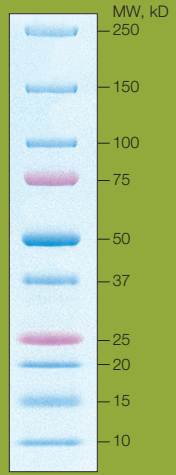
Size Range	Quantity	Recommended Load Volume
10 proteins, 10–250 kD	50 µg protein in 500 µl of 30% (v/v) glycerol, 2% SDS, 62.5 mM Tris, pH 6.8, 50 mM DTT, 5 mM EDTA, 0.02% NaN_3	Mini gels: 10 µl Blotting, to monitor transfer (mini gel): 5 µl Large gels: 20 µl

Recommended applications: For molecular weight estimation on SDS-polyacrylamide gels and electrophoretic transfer monitoring. Can be used with multiplex fluorescent detection: Visualize blue bands with red LED of Molecular Imager® VersaDoc™ MP system or 635 nm laser of Molecular Imager® PharosFX™ system and pink bands with green LED of VersaDoc MP system or 532 nm laser of PharosFX system. Pink bands are also excited by UV light.

Note: Standards are premixed with sample loading buffer. No dilution or heating is required.* Prestained bands migrate to their true molecular weight with no variability from lot to lot. Store at –20°C.

Catalog # 161-0374

* Allow standards to reach room temperature and mix thoroughly to dissolve any precipitated solids. For certain applications, dilution of the standards is recommended. See instruction manual for details.



Standards shown were run on a 4–20% gradient gel.

Precision Plus Protein™ Kaleidoscope™ Standards

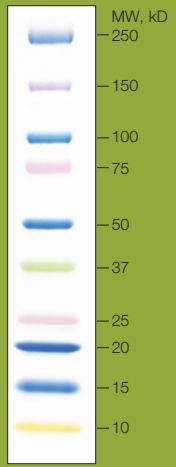
Size Range	Quantity	Recommended Load Volume
10 proteins, 10–250 kD	750 µg protein in 500 µl of 30% (v/v) glycerol, 2% SDS, 62.5 mM Tris, pH 6.8, 50 mM DTT, 5 mM EDTA, 0.02% NaN_3	Mini gel electrophoresis: 10 µl Mini gels to be blotted, to monitor transfer: 5 µl Large gel electrophoresis: 20 µl

Recommended applications: For molecular weight estimation on SDS-polyacrylamide gels and electrophoretic transfer monitoring. Can be used with multiplex fluorescent detection: Visualize blue bands with red LED of Molecular Imager® VersaDoc™ MP system or 635 nm laser of Molecular Imager® PharosFX™ system, pink bands with green LED of VersaDoc MP system or 532 nm laser of PharosFX system, and green and yellow bands with blue LED of VersaDoc MP system. Pink bands are also excited by UV light.

Note: Standards are premixed with sample loading buffer. No dilution or heating is required.* Prestained bands migrate to their true molecular weight with no variability from lot to lot. Store at –20°C.

Catalog # 161-0375

* Allow standards to reach room temperature and mix thoroughly to dissolve any precipitated solids. For certain applications, dilution of the standards is recommended. See instruction manual for details.



Standards shown were run on a 4–20% gradient gel.

Precision Plus Protein™ WesternC™ Standards

Size Range	Quantity	Recommended Load Volume
10 proteins, 10–250 kD	750 µg protein in 500 µl of 30% (v/v) glycerol, 2% SDS, 62.5 mM Tris, pH 6.8, 50 mM DTT, 5 mM EDTA, 0.02% NaN_3	Chemiluminescent blot development: 5 µl Criterion™ gels: 10 µl

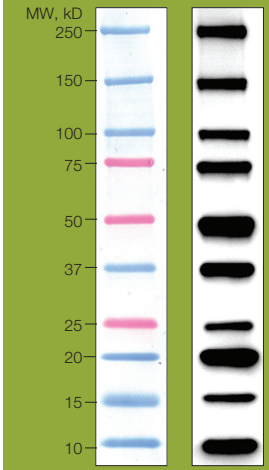
Recommended applications: For molecular weight estimation on SDS-polyacrylamide gels and electrophoretic transfer monitoring. Contains *Strep*-tag sequence for accurate molecular weight estimation on immunoblots. Can be used with multiplex fluorescent detection: Visualize blue bands with red LED of Molecular Imager® VersaDoc™ MP system or 635 nm laser of Molecular Imager® PharosFX™ system and pink bands with green LED of VersaDoc MP system or 532 nm laser of PharosFX system. Pink bands are also excited by UV light.

Note: Standards are premixed with sample loading buffer. No dilution or heating is required.* Prestained bands migrate to their true molecular weight with no variability from lot to lot. Store at –20°C.

Catalog #

161-0376 Precision Plus Protein WesternC Standards
161-0380 Precision Plus StrepTactin-HRP Conjugate, 150 applications
161-0381 Precision Plus StrepTactin-HRP Conjugate, 50 applications
161-0382 Precision Plus StrepTactin-AP Conjugate, 150 applications
161-0385 Precision Plus Protein WesternC Pack, 50 applications of WesternC standards and 50 applications of StrepTactin-HRP

* Allow standards to reach room temperature and mix thoroughly to dissolve any precipitated solids. For certain applications, dilution of the standards is recommended. See instruction manual for details.



Standards shown were run on a 4–20% gradient gel.

Precision Plus Protein™ Standard Plugs, Unstained

Size Range	Quantity	Recommended Load Volume
10 proteins, 10–250 kD	360 µg protein in 1 ml of 30% (v/v) glycerol, 2% SDS, 62.5 mM Tris, pH 6.8, 50 mM DTT, 5 mM EDTA, 0.02% NaN_3, 0.01% bromophenol blue	Mini gels: 10 µl (Coomassie R-250 stain), 1–6 µl (silver stain) Large gels: 20 µl (Coomassie R-250 stain), 3–12 µl (silver stain)

Recommended applications: For easy, quick, and clean loading of molecular weight standards on any gel, even those with no reference well. For accurate molecular weight estimation on an SDS-polyacrylamide gel or immunoblot. Can also be used with the Criterion Stain Free™ gel imaging system.

Recommended gel: 4–20% gradient gel. See protein migration chart on page 5 for approximate migration distances with various gel percentages.

Note: Standards are premixed with sample loading buffer. No dilution or heating is required.* Contain *Strep*-tag sequence for accurate molecular weight determination on immunoblots. Store at –20°C.*

Catalog # 161-0378

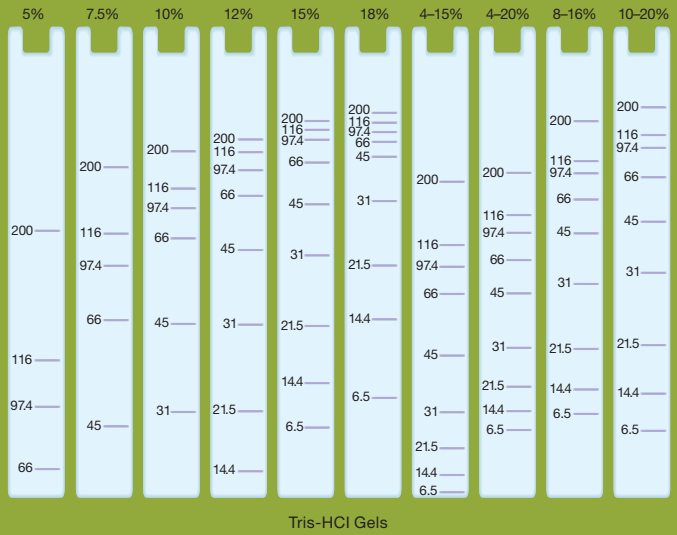
* Allow standards to reach room temperature and mix thoroughly to dissolve any precipitated solids. For certain applications, dilution of the standards is recommended. See instruction manual for details.

Precision Plus Protein standard plugs for 2-D gels.

Unstained Natural Standards

Representative migration patterns of unstained standards on Ready Gel® Tris-HCl pH 8.8 gels. Select the acrylamide percentage that best resolves your protein or peptide of interest.

Protein Migration Chart



Tris-HCl Gels

Protein molecular mass, kD. Migration patterns obtained when running gels until the dye front reaches the bottom of the gel.

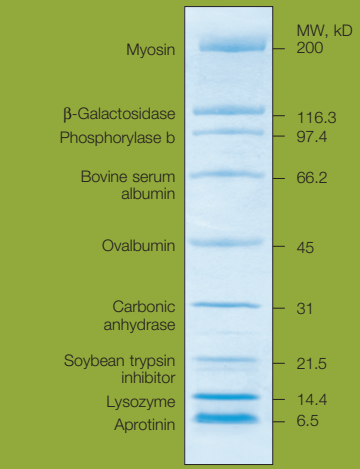
SDS-PAGE Standards, Broad Range

Size Range	Quantity	Recommended Load Volume
9 proteins, 6.5–200 kD	~2.4 mg protein in 200 µl of 50% (v/v) glycerol, 300 mM NaCl, 10 mM Tris, pH 8.5, 2 mM EDTA, 3 mM NaN_3	Mini gels: 5 µl of a 1:20 dilution Large gels: 10 µl of a 1:20 dilution (Coomassie R-250 stain)

Recommended applications: For accurate molecular weight estimation on SDS-polyacrylamide gels. Blended to give uniform band intensities when stained with Coomassie R-250 or zinc stain.

Note: Dilute 1:20 in SDS-containing reducing sample buffer. Heat for 5 min at 95°C. Cool sample and load 10 µl/well for full-length gels or 5 µl/well for mini gels. If you are silver staining, we recommend using silver stain SDS-PAGE standards (see pages 18–19). Store at –20°C.

Catalog # 161-0317



Standards shown were run on a 4–20% gradient gel. Stained with Coomassie R-250.

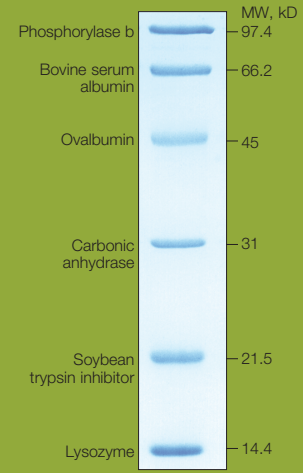
SDS-PAGE Standards, Low Range

Size Range	Quantity	Recommended Load Volume
6 proteins, 14.4–97.4 kD	~2.4 mg protein in 200 µl of 50% (v/v) glycerol, 300 mM NaCl, 10 mM Tris, pH 8.5, 2 mM EDTA, 3 mM NaN_3	Mini gels: 5 µl of a 1:20 dilution; Large gels: 10 µl of a 1:20 dilution (Coomassie R-250 stain)

Recommended applications: For accurate molecular weight estimation on SDS-polyacrylamide gels. Blended to give uniform band intensities when stained with Coomassie R-250 or zinc stain.

Note: Dilute 1:20 in SDS-containing reducing sample buffer. Heat for 5 min at 95°C. Cool sample and load 10 µl/well for full-length gels or 5 µl/well for mini gels. If you are silver staining, we recommend using silver stain SDS-PAGE standards (see pages 18–19). Store at –20°C.

Catalog # 161-0304



Standards shown were run on a 12% acrylamide gel. Stained with Coomassie R-250.

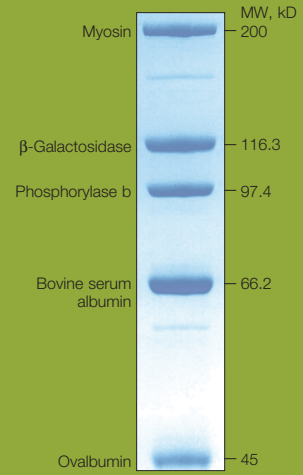
SDS-PAGE Standards, High Range

Size Range	Quantity	Recommended Load Volume
5 proteins, 45–200 kD	~2.4 mg protein in 200 µl of 50% (v/v) glycerol, 300 mM NaCl, 10 mM Tris, pH 8.5, 2 mM EDTA, 3 mM NaN_3	Mini gels: 5 µl of a 1:20 dilution

Recommended applications: For accurate molecular weight estimation on SDS-polyacrylamide gels. Blended to give uniform band intensities when stained with Coomassie R-250 or zinc stain.

Note: Dilute 1:20 in SDS-containing reducing sample buffer. Heat for 5 min at 95°C. Cool sample and load 10 µl/well for full-length gels or 5 µl/well for mini gels. If you are silver staining, we recommend using silver stain SDS-PAGE standards (pages 18–19). Store at –20°C.

Catalog # 161-0303



Standards shown were run on a 7.5% acrylamide gel. Stained with Coomassie R-250.

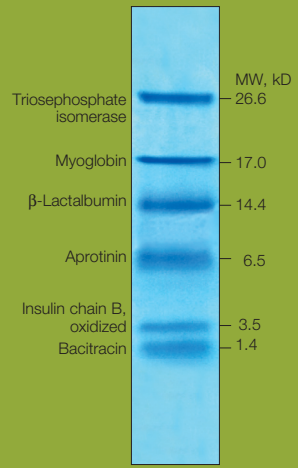
Polypeptide SDS-PAGE Standards

Size Range	Quantity	Recommended Load Volume
6 proteins, 1.4–26.6 kD	~5.4 mg protein in 200 µl of 40% (v/v) glycerol, 100 mM Tris-HCl, pH 8.5, 4 mM EDTA, 3 mM NaN_3	Mini gels: 5 µl of a 1:20 dilution Large gels: 10 µl of a 1:20 dilution (Coomassie G-250 stain)

Recommended applications: For accurate molecular weight estimation of polypeptides and small proteins on SDS-polyacrylamide gels. Blended to give uniform band intensities when stained with Coomassie G-250 stain.

Note: Dilute 1:20 in Tris-Tricine sample buffer. Heat for 5 min at 95°C. Cool sample and load 10 µl/well for full-length gels or 5 µl/well for mini gels. Store at –20°C.

Catalog # 161-0326



Standards shown were run on a 10–20% Tris-Tricine gradient gel. Stained with Coomassie G-250.

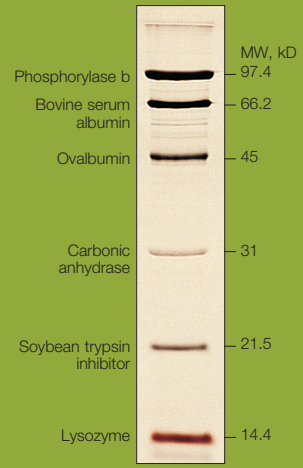
Silver Stain SDS-PAGE Standards, Low Range

Size Range	Quantity	Recommended Load Volume
6 proteins, 14.4–97.4 kD	~0.90 mg protein in 200 µl of 50% (v/v) glycerol, 20 mM Tris-HCl, pH 8.5, 4 mM EDTA, 3 mM NaN_3	Mini gels: 5 µl of a 1:20 dilution Large gels: 10 µl of a 1:20 dilution

Recommended applications: For accurate molecular weight estimation on SDS-polyacrylamide gels. Blended for even staining with silver and other highly sensitive stains on SDS-polyacrylamide gels.

Note: Dilute 1:20 in SDS-containing reducing sample buffer. Heat for 5 min at 95°C. Cool sample and load 10 µl/well for full-length gels or 5 µl/well for mini gels. Store at –20°C.

Catalog # 161-0314



Standards shown were run on a 12% acrylamide gel. Stained with Bio-Rad's silver stain.

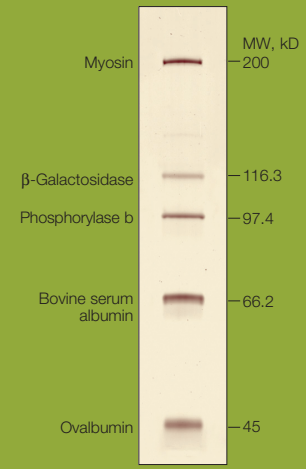
Silver Stain SDS-PAGE Standards, High Range

Size Range	Quantity	Recommended Load Volume
5 proteins, 45–200 kD	~0.90 mg protein in 200 µl of 50% (v/v) glycerol, 20 mM Tris-HCl, pH 8.5, 4 mM EDTA, 3 mM NaN_3	Mini gels: 5 µl of a 1:20 dilution Large gels: 10 µl of a 1:20 dilution

Recommended applications: For accurate molecular weight estimation on SDS-polyacrylamide gels. Blended for even staining with silver and other highly sensitive stains on SDS-polyacrylamide gels.

Note: Dilute 1:20 in SDS-containing reducing sample buffer. Heat for 5 min at 95°C. Cool sample and load 10 µl/well for full-length gels or 5 µl/well for mini gels. Store at –20°C.

Catalog # 161-0315

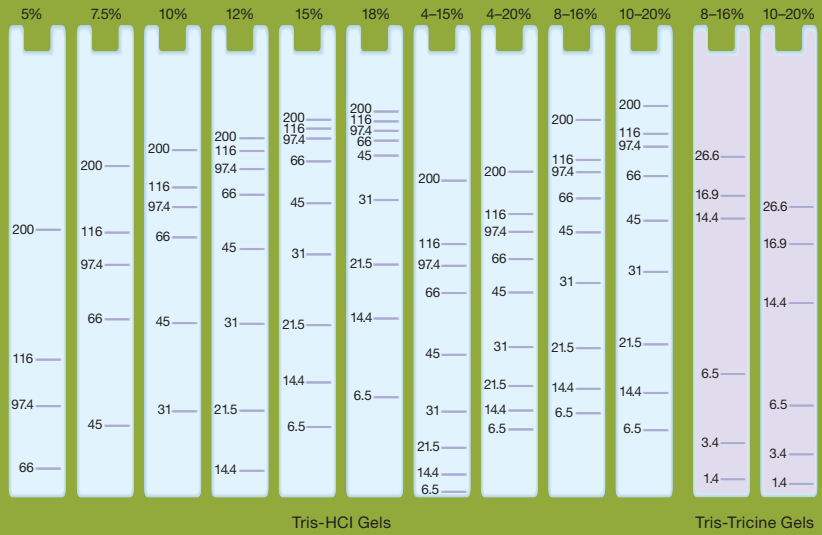


Standards shown were run on a 7.5% acrylamide gel. Stained with Bio-Rad's silver stain.

Prestained Natural Standards

Representative migration patterns of prestained standards on Ready Gel® Tris-HCl pH 8.8 gels and Ready Gel Tris-Tricine gels. Select the acrylamide percentage that best resolves your protein or peptide of interest.

Protein Migration Chart



Protein molecular mass, kD. Migration patterns obtained when running gels until the dye front reaches the bottom of the gel.

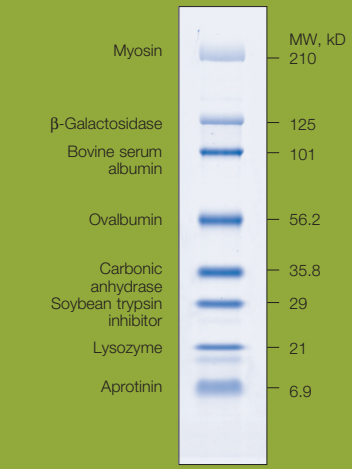
Prestained SDS-PAGE Standards, Broad Range

Size Range	Quantity	Recommended Load Volume
8 proteins, ~7.1–209 kD; lot-specific molecular weights are included with every vial	~0.63 mg protein in 500 µl of 33% (v/v) glycerol, 3% SDS, 10 mM Tris, pH 7.0, 10 mM DTT, 2 mM EDTA, 0.01% NaN_3	Mini gels: 10 µl Mini blots: 5 µl Large gels: 20 µl Large blots: 10 µl

Recommended applications: For electrophoretic transfer monitoring and to estimate molecular weights.

Note: Standards are premixed with sample buffer. No heating or dilution is required. Allow tube to reach room temperature and mix thoroughly to dissolve any precipitated solids. Store at –20°C. Due to staining and protein variations, each lot will have slightly different molecular weights assigned to each band. The package insert lists the lot-specific molecular weights.

Catalog # 161-0318



Standards shown were run on a 4–20% gradient gel. Molecular weights are representative of this particular lot.

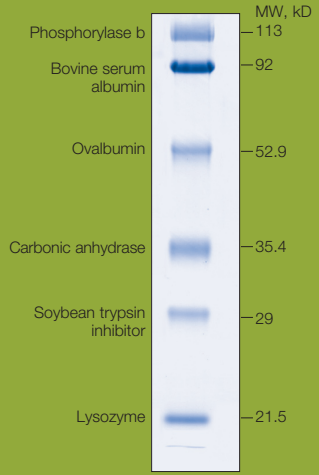
Prestained SDS-PAGE Standards, Low Range

Size Range	Quantity	Recommended Load Volume
6 proteins, ~20–103 kD; lot-specific molecular weights are included with every vial	~0.63 mg protein in 500 µl of 33% (v/v) glycerol, 3% SDS, 10 mM Tris, pH 7.0, 10 mM DTT, 2 mM EDTA, 0.01% NaN_3	Mini gels: 10 µl Mini blots: 5 µl Large gels: 20 µl Large blots: 10 µl

Recommended applications: For electrophoretic transfer monitoring and to estimate molecular weights.

Note: Standards are premixed with sample buffer. No heating or dilution is required. Allow tube to reach room temperature and mix thoroughly to dissolve any precipitated solids. Store at –20°C. Due to staining and protein variations, each lot will have slightly different molecular weights assigned to each band. The package insert lists the lot-specific molecular weights.

Catalog # 161-0305



Standards shown were run on a 12% acrylamide gel. Molecular weights are representative of this particular lot.

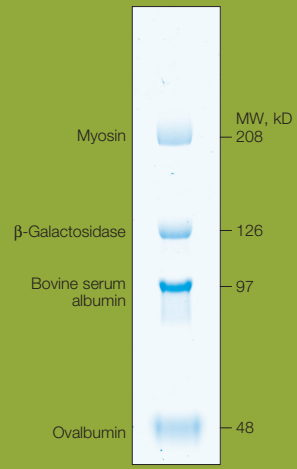
Prestained SDS-PAGE Standards, High Range

Size Range	Quantity	Recommended Load Volume
4 proteins, ~48–204 kD; lot-specific molecular weights are included with every vial	~0.63 mg protein in 500 µl of 33% (v/v) glycerol, 3% SDS, 10 mM Tris, pH 7.0, 10 mM DTT, 2 mM EDTA, 0.01% NaN_3	Mini gels: 10 µl Mini blots: 5 µl Large gels: 20 µl Large blots: 10 µl

Recommended applications: For electrophoretic transfer monitoring and to estimate molecular weights.

Note: Standards are premixed with sample buffer. No heating or dilution is required. Allow tube to reach room temperature and mix thoroughly to dissolve any precipitated solids. Store at –20°C. Due to staining and protein variations, each lot will have slightly different molecular weights assigned to each band. The package insert lists the lot-specific molecular weights.

Catalog # 161-0309



Standards shown were run on a 7.5% acrylamide gel. Molecular weights are representative of this particular lot.

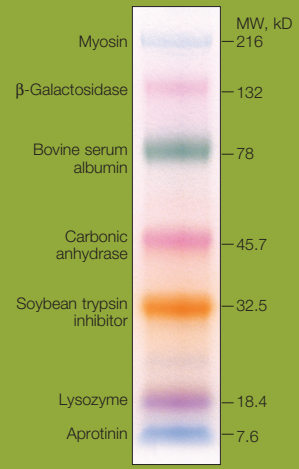
Kaleidoscope™ Prestained Standards

Size Range	Quantity	Recommended Load Volume
7 proteins, ~7–216 kD; lot-specific molecular weights are included with every vial	~1.6 mg protein in 500 µl of 33% (v/v) glycerol, 3% SDS, 10 mM Tris, pH 7.0, 10 mM DTT, 2 mM EDTA, 0.01% NaN_3	Mini gels: 10 µl Mini blots: 5 µl Large gels: 20 µl Large blots: 10 µl

Recommended applications: For electrophoretic transfer monitoring and to estimate molecular weights. Multicolored proteins for instant band recognition on membranes or SDS-polyacrylamide gels.

Note: Standards are premixed with sample buffer. No reconstitution or dilution is required. Allow tube to reach room temperature and mix thoroughly to dissolve any precipitated solids. Not intended for precise molecular weight determinations. Store at –20°C. Due to staining and protein variations, each lot will have slightly different molecular weights assigned to each band. The package insert lists the lot-specific molecular weights.

Catalog # 161-0324



Standards shown were run on a 4–20% gradient gel. Molecular weights are representative of this particular lot.

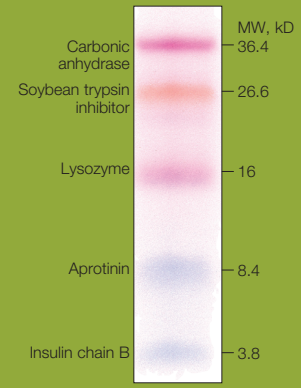
Kaleidoscope™ Polypeptide Standards

Size Range	Quantity	Recommended Load Volume
5 proteins, ~3.8–36.4 kD; lot-specific molecular weights are included with every vial	~1.6 mg protein in 500 µl of 33% (v/v) glycerol, 0.5% SDS, 10 mM Tris, pH 7.0, 10 mM DTT, 2 mM EDTA, 0.01% NaN_3	Mini gels: 10 µl Mini blots: 5 µl Large gels: 20 µl Large blots: 10 µl

Recommended applications: For electrophoretic transfer monitoring and to estimate molecular weights. Multicolored proteins for instant band recognition on membranes or Tricine SDS-polyacrylamide gels.

Note: Standards are premixed with sample buffer. No reconstitution or dilution is required. Allow tube to reach room temperature and mix thoroughly to dissolve any precipitated solids. Not intended for precise molecular weight determinations. Store at –20°C. Due to staining and protein variations, each lot will have slightly different molecular weights assigned to each band. The package insert lists the lot-specific molecular weights.

Catalog # 161-0325

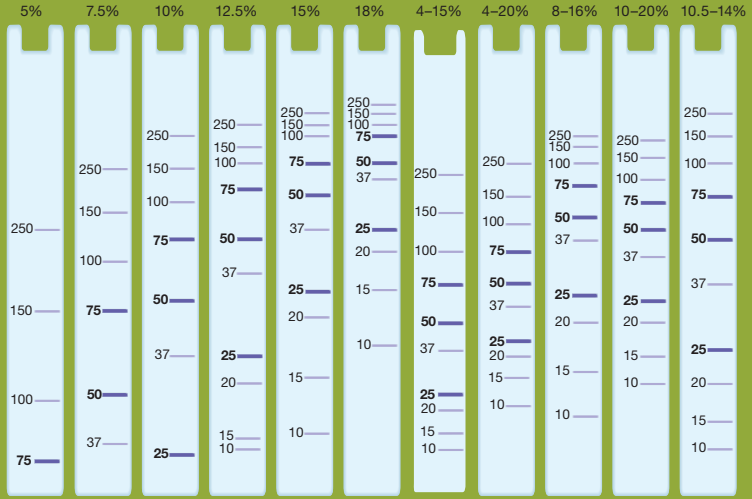


Standards shown were run on a 15% Tris-Tricine gel. Molecular weights are representative of this particular lot.

Blotting Standards

Representative migration patterns of blotting reference standards on Criterion™ Tris-HCl pH 8.8 gels. Select the acrylamide percentage that best resolves your protein or peptide of interest.

Protein Migration Chart



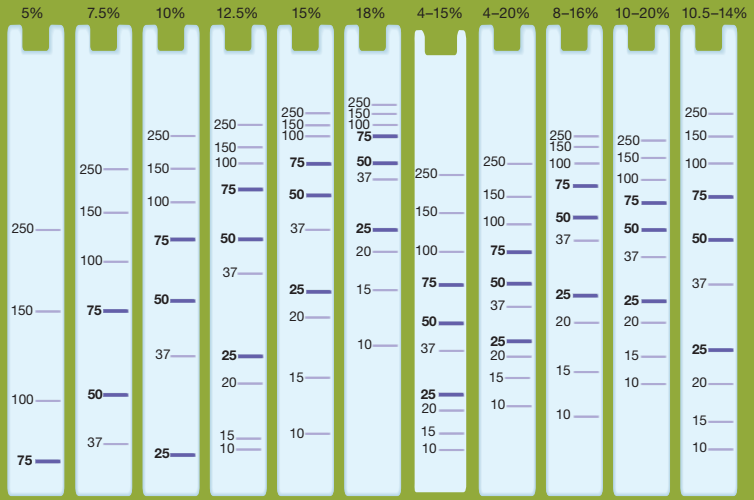
Tris-HCl Gels

Protein molecular mass, kD. Migrations based on running gels until the dye front reached the bottom of the gel.

Blotting Standards

Representative migration patterns of blotting reference standards on Ready Gel® Tris-HCl pH 8.8 gels. Select the acrylamide percentage that best resolves your protein or peptide of interest.

Protein Migration Chart



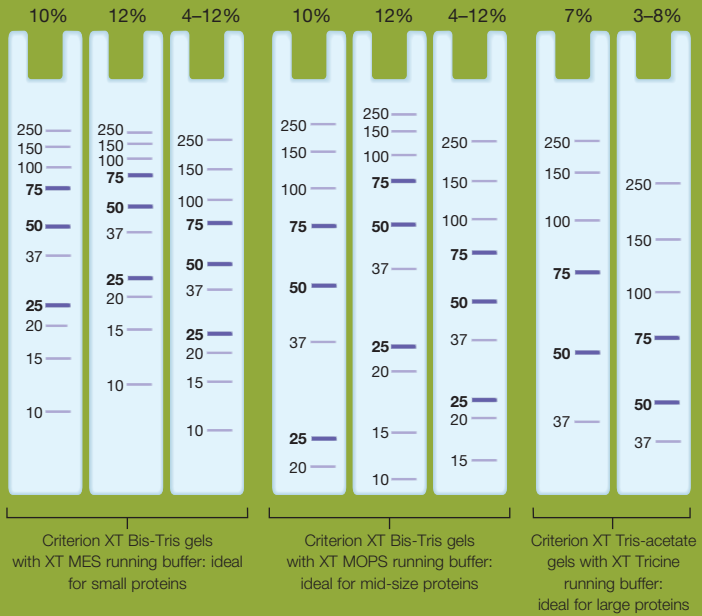
Tris-HCl Gels

Protein molecular mass, kD. Migrations based on running gels until the dye front reached the bottom of the gel.

Blotting Standards

Representative migration patterns of blotting reference standards on Criterion™ XT gels. Select the acrylamide percentage that best resolves your protein or peptide of interest.

Protein Migration Chart



Protein molecular mass, kD. Migration patterns based on running gels until the dye front reaches the bottom of the gel.

Precision Plus Protein™ WesternC™ Standards

Size Range	Quantity	Recommended Load Volume
10 proteins, 10–250 kD	750 µg protein in 500 µl of 30% (v/v) glycerol, 2% SDS, 62.5 mM Tris, pH 6.8, 50 mM DTT, 5 mM EDTA, 0.02% NaN_3	Chemiluminescent blot development: 5 µl Criterion gels: 10 µl

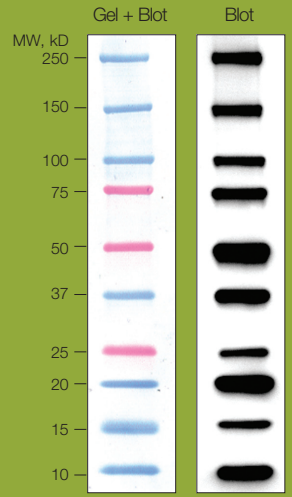
Recommended applications: For molecular weight estimation on SDS-polyacrylamide gels and electrophoretic transfer monitoring. Contains *Strep*-tag sequence for accurate molecular weight estimation on immunoblots. Can be used with multiplex fluorescent detection: Visualize blue bands with red LED of Molecular Imager® VersaDoc™ MP system or 635 nm laser of Molecular Imager® PharosFX™ system and pink bands with green LED of VersaDoc MP system or 532 nm laser of PharosFX system. Pink bands are also excited by UV light.

Note: Standards are premixed with sample loading buffer. No dilution or heating is required.* Prestained bands migrate to their true molecular weight with no variability from lot to lot. Store at –20°C.

Catalog #

161-0376 Precision Plus Protein WesternC Standards
161-0380 Precision Plus StrepTactin-HRP Conjugate, 150 applications
161-0381 Precision Plus StrepTactin-HRP Conjugate, 50 applications
161-0382 Precision Plus StrepTactin-AP Conjugate, 150 applications
161-0385 Precision Plus Protein WesternC Pack, 50 applications of WesternC standards and 50 applications of StrepTactin-HRP

* Allow standards to reach room temperature and mix thoroughly to dissolve any precipitated solids. For certain applications, dilution of the standards is recommended. See instruction manual for details.



Standards shown were run on a 4–20% gradient gel.

Precision Plus Protein™ Unstained Standards

Size Range	Quantity	Recommended Load Volume
10 proteins, 10–250 kD	360 µg protein in 1 ml of 30% (v/v) glycerol, 2% SDS, 62.5 mM Tris, pH 6.8, 50 mM DTT, 5 mM EDTA, 0.02% NaN_3, 0.01% Bromophenol Blue	Coomassie G-250 or R-250 staining: 10 µl; Silver staining, SYPRO Ruby staining: 1–3 µl; Blotting, colorimetric AP development: 1–4 µl; Blotting, colorimetric HRP development: 1–6 µl; Blotting, chemiluminescent AP development: 5–10 µl (dilute Precision Plus Protein standards 1:15–1:30 in Laemmli buffer prior to use); Blotting, chemiluminescent HRP development: 5–10 µl (dilute Precision Plus Protein standards 1:30–1:60 in Laemmli buffer prior to use)

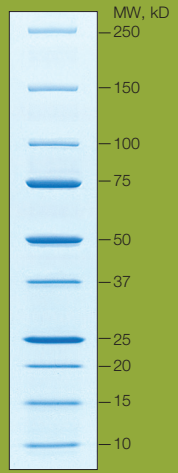
Recommended applications: For accurate molecular weight estimation on SDS-polyacrylamide gels or immunoblots. Contains *Strep*-tag sequence for accurate molecular weight determination on immunoblots. Can also be used with the Criterion Stain Free™ gel imaging system.

Note: Standards are premixed with sample loading buffer. No dilution or heating is required.* Store at –20°C.

Catalog #

161-0363 Precision Plus Protein Standards, Unstained
161-0380 Precision Protein StrepTactin-HRP conjugate
161-0382 Precision Protein StrepTactin-AP conjugate

* Allow standards to reach room temperature and mix thoroughly to dissolve any precipitated solids. For certain applications, dilution of the standards is recommended. See instruction manual for details.



Standards shown were run on a 4–20% gradient gel. Stained with Coomassie R-250.

Biotinylated SDS-PAGE Standards, Broad Range

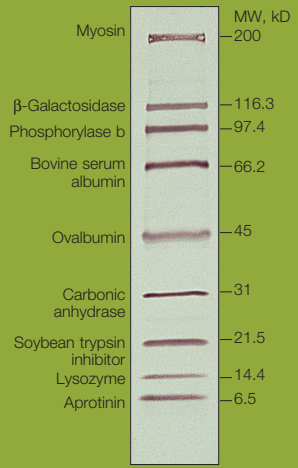
Size Range	Quantity	Recommended Load Volume
9 proteins, 6.5–200 kD	~0.13 mg protein in 250 µl of 50% (v/v) glycerol, 150 mM NaCl, 3 mM NaN_3	Mini gels: 10 µl Large gels: 15–20 µl

Recommended applications: For accurate molecular weight estimation of proteins on immunoblots. The proteins have been blended to give equal intensities when detected with avidin-HRP or avidin-AP color development reagents.

Note: Dilute 1:4 (for HRP color development) or 1:20 (for AP color development) in SDS-containing reducing sample buffer. Heat for 5 min at 95°C. Cool sample and load 10–15 µl/well for full-length gels or 10 µl/well for mini gels. Store at –20°C.

Catalog #

161-0319 Biotinylated SDS-PAGE Standards, broad range
161-0321 Biotinylated SDS-PAGE Standards Kit, avidin-HRP
161-0322 Biotinylated SDS-PAGE Standards Kit, avidin-AP



Standards shown were run on a 4–20% gradient gel. Biotinylated standards transferred to nitrocellulose and detected with avidin-AP.

Biotinylated SDS-PAGE Standards, Low Range

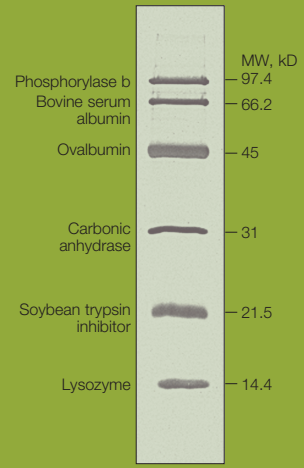
Size Range	Quantity	Recommended Load Volume
6 proteins, 14.4–97.4 kD	~0.13 mg protein in 250 µl of 50% (v/v) glycerol, 150 mM NaCl, 3 mM NaN_3	Mini gels: 10 µl Large gels: 15–20 µl

Recommended applications: For accurate molecular weight estimation of proteins on immunoblots. The proteins have been blended to give equal intensities when detected with avidin-HRP or avidin-AP color development reagents.

Note: Dilute 1:4 (for HRP color development) or 1:20 (for AP color development) in SDS-containing reducing sample buffer. Heat for 5 min at 95°C. Cool sample and load 10–15 µl/well for full-length gels or 10 µl/well for mini gels. Store at –20°C.

Catalog #

161-0306 Biotinylated SDS-PAGE Standards, low range
161-0307 Biotinylated SDS-PAGE Standards Kit, avidin-HRP
161-0308 Biotinylated SDS-PAGE Standards Kit, avidin-AP



Standards shown were run on a 12% acrylamide gel.

Biotinylated SDS-PAGE Standards, High Range

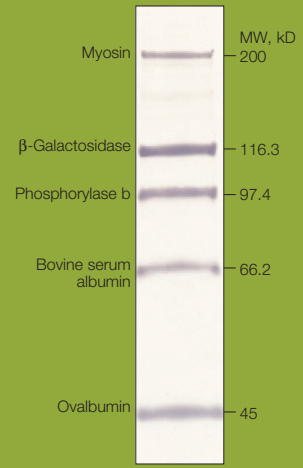
Size Range	Quantity	Recommended Load Volume
5 proteins, 45–200 kD	~0.13 mg protein in 250 µl of 50% (v/v) glycerol, 150 mM NaCl, 3 mM NaN_3	Mini gels: 10 µl Large gels: 15–20 µl

Recommended applications: For accurate molecular weight estimation of proteins on immunoblots. The proteins have been blended to give equal intensities when detected with avidin-HRP or avidin-AP color development reagents.

Note: Dilute 1:4 (for HRP color development) or 1:20 (for AP color development) in SDS-containing reducing sample buffer. Heat for 5 min at 95°C. Cool sample and load 10–15 µl/well for full-length gels or 10 µl/well for mini gels. Store at –20°C.

Catalog #

161-0311 Biotinylated SDS-PAGE Standards, high range
161-0312 Biotinylated SDS-PAGE Standards Kit, avidin-HRP
161-0313 Biotinylated SDS-PAGE Standards Kit, avidin-AP

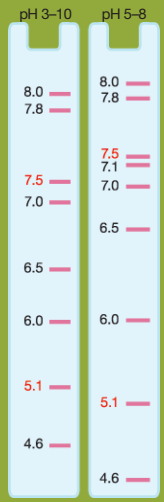


Standards shown were run on a 7.5% acrylamide gel.

IEF and 2-D Standards

Representative migration patterns of IEF standards on wide and narrow pH range Ready Gel® 5% polyacrylamide gels.

Protein Migration Chart



IEF Gels

Bands show pI values and migration patterns representative of nondenaturing conditions.

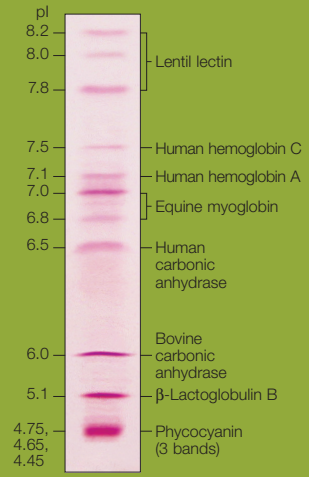
IEF Standards

Size Range	Quantity	Recommended Load Volume
9 proteins, pI 4.45–9.6	16 mg protein in 250 µl of 50% (v/v) glycerol with 0.02% NaN_3	Mini gels: 3 µl (Coomassie R-250 stain/ crocein scarlet); 0.5 µl (silver stain)

Recommended applications: For pI calibration in analytical polyacrylamide or agarose IEF gels. Five of the nine proteins are naturally colored, allowing continuous monitoring of the focusing process.

Note: No reconstitution or dilution is required prior to use. Not recommended for 2-D electrophoretic applications. Store at –20°C.

Catalog # 161-0310



IEF standards run on Criterion™ IEF gel stained with Bio-Rad's IEF gel staining solution. Cytochrome c, pI 9.6, not visible on this gel.

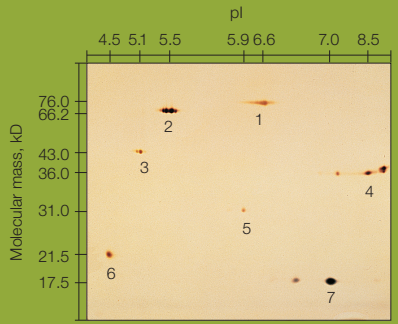
2-D SDS-PAGE Standards

Size Range	Quantity	Recommended Load Volume
7 spots, 17.5–76.0 kD, with pI 4.5–8.5	~0.30 mg protein in 500 µl of 9 M urea, 5% 2-mercaptoethanol, 2% Bio-Lyte® 5/7 ampholyte	Mini gels: 2.5 µl (Coomassie R-250 stain); 0.5–2.5 µl (silver stain)

Recommended applications: To determine pI and molecular weight of sample proteins, to serve as a marker for 2-D gel matching, or to serve as an internal control to assess reproducibility.

Note: No dilution is required prior to use. Visualize spots with silver stain, SYPRO Ruby protein gel stain, or Coomassie stain. Store at –20°C. IEF slab or ReadyStrip™ IPG strips are recommended for first dimension, and PROTEAN® II precast gels are recommended for second dimension.

Catalog # 161-0320



Protein spots:

1. Conalbumin
2. Albumin
3. Actin
4. GAPDH
5. Carbonic anhydrase
6. Trypsin inhibitor
7. Myoglobin

Protein Gel Stains

Gel Stain	Sensitivity**	Time	Advantages (Catalog Numbers)
Bio-Safe™ Coomassie stain	8–28 ng	2.5 hr	Nonhazardous, water-only destain, eliminates MeOH waste (161-0786, 161-0787)
Coomassie R-250 stain	36–47 ng	2.5 hr	Simple, fast, consistent (161-0435, 161-0436, 161-0437, 161-0438, 161-0439, 161-0400)
Flamingo™ fluorescent gel stain	0.5 ng	5 hr	Simple, broad linear range; can be used as IEF stain (161-0490, 161-0491, 161-0492)
SYPRO Ruby stain	1–10 ng	3 hr	Simple, highly sensitive fluorescent stain (170-3126, 170-3125, 170-3138)
Zinc stain	6–12 ng	15 min	Simple, fast, reversible, high-contrast negative stain (161-0440, 161-0441, 161-0442)
Copper stain	6–12 ng	10 min	Nonfixing, reversible, single-reagent negative stain (161-0470, 161-0471)
Silver stain/Silver Stain Plus™ stain	0.5–1.2 ng	75–120 min	Highly sensitive protein and nucleic acid detection (161-0443, 161-0449)

* Bio-Rad supplies these stains in convenient, ready-to-use solutions.
** Sensitivity is defined as the amount of protein in the faintest band.

Molecular Weight Estimation

Molecular weights of proteins are estimated by comparison of their mobilities with those of several marker proteins (standards) of known molecular weight:

1. After a gel has been run, but before it has been stained, mark the position of the tracking dye.

2. After staining, measure the migration distance of each protein (standards and unknowns) from the top of the resolving gel.

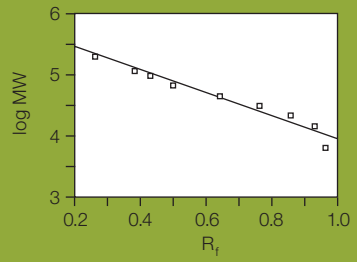
3. Calculate the relative mobility (R_f) of each protein.

$$R_f = \frac{\textbf{Distance migrated by protein}}{\textbf{Distance migrated by dye}}$$

4. Plot the R_f of each standard protein against the $\log_{10}$ of its molecular weight, as shown, to generate a standard curve.

5. To estimate the molecular weight of an unknown protein, use the standard curve to interpolate its $\log_{10}$ molecular weight from its R_f. Take the antilog to determine its molecular weight.

For more information, see Bio-Rad bulletins 3133 and 3144.



Example of a standard curve for molecular weight estimation.

Related Literature for Protein Standards

Literature titles are listed on page 42.

	Standards				
Type of Literature	**Precision Plus Protein™**	**Unstained Natural**	**Prestained Natural**	**Blotting**	**IEF and 2-D**
Instruction manuals (part numbers)	4110023 4110024 4110025 4110182 4117684	4006035 4006033 4006034 4006046 4006047 4006048	4006024 4006025 LIT599 4006029 4006026	4110182 4110023 LIT395 4006050	LIT396 4110064
Technical notes (bulletin numbers)	2847 3133 3144 5685 5723 5576			2847 3133 5685 5723 5576	
Other (bulletin number)	3036				

Literature Titles

Instruction Manuals

Part number	Title
Lit395	Biotinylated SDS-PAGE Standards, Low, High, and Broad Range
Lit396	IEF Standards
Lit599	Kaleidoscope™ Prestained Standards
4006024	Prestained SDS-PAGE Standards, Low Range
4006025	Prestained SDS-PAGE Standards, High Range
4006026	Prestained SDS-PAGE Standards, Broad Range
4006029	Kaleidoscope Polypeptide Standards
4006033	SDS-PAGE Molecular Weight Standards, Low Range
4006034	SDS-PAGE Molecular Weight Standards, High Range
4006035	SDS-PAGE Molecular Weight Standards, Broad Range
4006046	Polypeptide SDS-PAGE Molecular Weight Standards
4006047	Silver stain SDS-PAGE Standards, Low Range
4006048	Silver stain SDS-PAGE Standards, High Range
4006050	Biotinylated Standards Kit
4110023	Precision Plus Protein™ Unstained Standards
4110024	Precision Plus Protein All Blue Standards
4110025	Precision Plus Protein Dual Color Standards
4110064	2-D SDS-PAGE Standards
4110182	Precision Plus Protein™ Kaleidoscope™ Standards
4117684	Precision Plus Protein Standard Plugs, Unstained

Technical Notes

Bulletin number	Title
2847	*Strep*-Tag Technology for Molecular Weight (MW) Determinations on Blots Using Precision Plus Protein Standards
3133	Molecular Weight Determination by SDS-PAGE
3144	Using Precision Plus Protein Standards to Determine Molecular Weight
5576	Molecular Weight Estimation and Quantitation of Protein Samples Using Precision Plus Protein™ WesternC™ Standards, the Immun-Star™ WesternC™ Chemiluminescent Detection Kit and the Molecular Imager® ChemiDoc™ XRS Imaging System
5685	Effect of PMA on Phosphorylation of Cx43: A Quantitative Evaluation Using Blotting with Multiplex Fluorescent Detection
5723	Increase Western Blot Throughput with Multiplex Fluorescent Detection

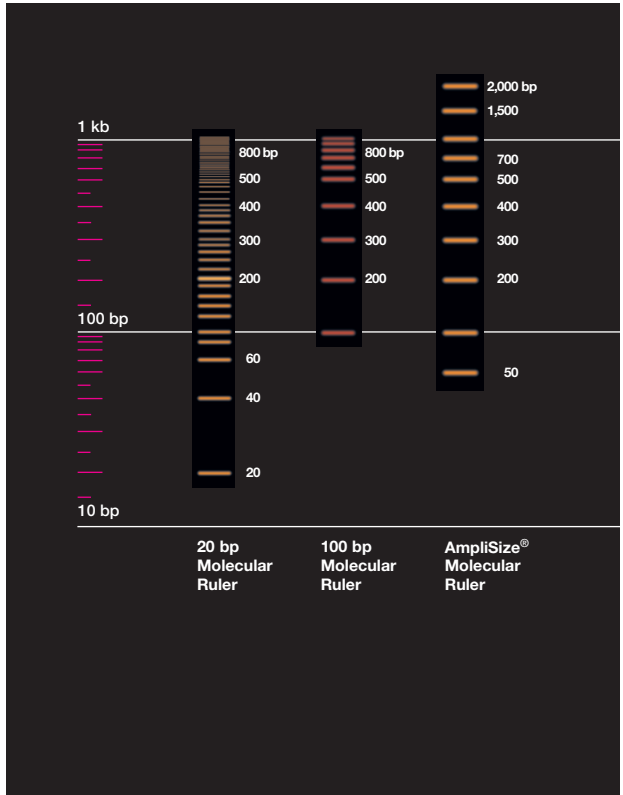
Other Literature

Bulletin number	Title
3036	Precision Plus Protein Standard Plugs for PROTEAN® Plus 2-D Gels

DNA Standards and Molecular Mass Markers

20 bp–2 kb DNA Standards

Bio-Rad's molecular rulers are available in several convenient size ranges and increments for sizing single- and double-stranded DNA. Visually distinct reference bands make it easy to determine the size of your sample DNA.



20 bp Molecular Ruler

Size Range	Quantity	Recommended Load Volume
20–1,000 bp, 50 bands in exact 20 bp increments	50 µg DNA in 250 µl TE buffer, pH 8.0 (0.2 µg/µl DNA)	2.5 µl (~500 ng DNA)

The perfect 50% GC content of Bio-Rad's precision-sized molecular rulers eliminates spurious migration due to sequence variation, ensuring that the fragments migrate exactly according to their specified size.

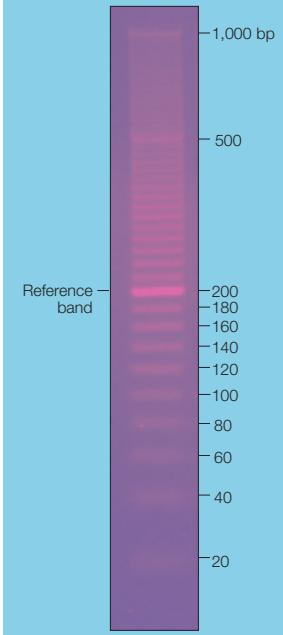
Recommended gels: ≥2.5% standard agarose, PCR agarose up to 4%, or polyacrylamide gels up to 8%.

Recommended application: For accurately assigning molecular weight to fragments from 20–200 bp.

For optimal resolution of fragments, use a 3% ReadyAgarose™ gel, 5% Ready Gel® TBE gel, or 4–20% Ready Gel TBE gel.

Note: Add any conventional sample loading buffer prior to loading. Store at 4°C.

Catalog # 170-8201



Standards shown were run on a 2.5% Certified™ PCR agarose gel.

EZ Load™ 20 bp Molecular Ruler

Size Range	Quantity	Recommended Load Volume
20–1,000 bp, 50 bands in exact 20 bp increments	50 µg DNA in 500 µl sample loading buffer (0.1 µg/µl DNA)	5 µl (~500 ng DNA)

EZ Load molecular rulers are precision-sized DNA fragments blended with sample loading buffer for convenience. The perfect 50% GC content eliminates spurious migration due to sequence variation, ensuring that the fragments migrate exactly according to their specified size.

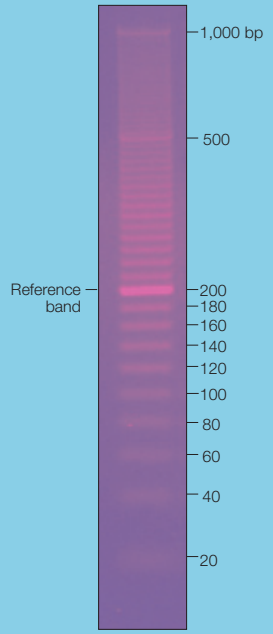
Recommended gels: ≥2.5% standard agarose, PCR agarose up to 4%, or polyacrylamide gels up to 8%.

Recommended application: For accurately assigning molecular weight to fragments from 20–200 bp.

For optimal resolution of fragments, use a 3% ReadyAgarose™ gel, 5% Ready Gel® TBE gel, or 4–20% Ready Gel TBE gel.

Note: Ruler is premixed with sample loading buffer containing 5% glycerol, 15 mM Tris, pH 8.0, 1.5 mM EDTA, 0.04% bromophenol blue, 0.04% xylene cyanole FF. Store at 4°C.

Catalog # 170-8351



Standards shown were run on a 2.5% Certified™ PCR agarose gel.

AmpliSize® Molecular Ruler

Size Range	Quantity	Recommended Load Volume
50–2,000 bp, 10 bands of proprietary blunt-ended DNA	25 µg DNA in 250 µl TE buffer, pH 8.0 (10 ng/band/µl)	5 µl (~50 ng DNA/band)

Ten fragments of proprietary blunt-ended DNA of precise length and known sequence. The perfect 50% GC content eliminates spurious migration due to sequence variation, ensuring that the fragments migrate exactly according to their specified size.

Recommended gels: ≥2.5% standard agarose or polyacrylamide gels of <10%.

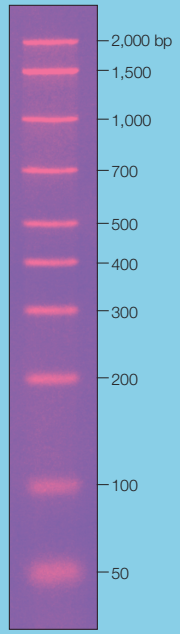
Recommended application: For accurately assigning molecular weight to fragments from 100 bp–2 kb.

For optimal resolution of fragments <500 bp, use a 3% ReadyAgarose™ gel or a 10% Ready Gel® TBE gel.

For optimal resolution of fragments from 500 bp–2.5 kb, use a 1% ReadyAgarose gel.

Note: Add any conventional sample loading buffer prior to loading. Store at 4°C.

Catalog # 170-8200



Standards shown were run on a 4% Certified™ PCR agarose gel.

100 bp Molecular Ruler

Size Range	Quantity	Recommended Load Volume
100–1,000 bp, 10 bands in exact 100 bp increments	25 µg DNA in 250 µl TE buffer, pH 8.0 (0.1 µg/µl DNA)	2.5 µl (~250 ng DNA)

The perfect 50% GC content of this precision-sized molecular ruler eliminates spurious migration due to sequence variation, ensuring that the fragments migrate exactly according to their specified size.

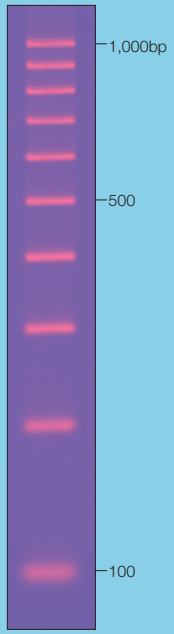
Recommended gels: ≥2.5% standard agarose or polyacrylamide gels of <10%.

Recommended application: For accurately assigning molecular weight to fragments from 100 bp–1 kb.

For optimal resolution of fragments, use a 3% ReadyAgarose™ gel or 5% Ready Gel® TBE gel.

Note: Add any conventional sample loading buffer prior to loading. The 100 bp ruler may show a double- or triple-banding pattern in polyacrylamide gels. The DNA fragments in this product have *Hin*dIII-compatible cohesive ends. Store at 4°C.

Catalog # 170-8202



Standards shown were run on a 2.5% Certified™ PCR agarose gel.

EZ Load™ 100 bp Molecular Ruler

Size Range	Quantity	Recommended Load Volume
100–1,000 bp, 10 bands in exact 100 bp increments	25 µg DNA in 500 µl sample loading buffer (0.05 µg/µl DNA)	5 µl (~250 ng DNA)

EZ Load molecular rulers are precision-sized DNA fragments blended with sample loading buffer for convenience. The perfect 50% GC content eliminates spurious migration due to sequence variation, ensuring that the fragments migrate exactly according to their specified size.

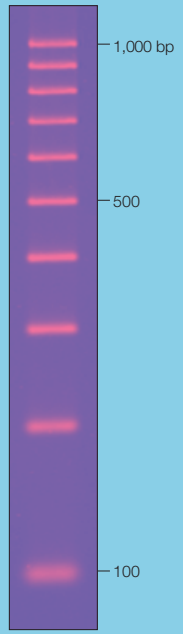
Recommended gels: ≥2.5% standard agarose or polyacrylamide gels of <10%.

Recommended application: The EZ Load 100 bp molecular ruler is recommended for accurately assigning molecular weight to fragments between 100 bp–1 kb.

For optimal resolution of fragments, use a 3% ReadyAgarose™ gel or 5% Ready Gel® TBE gel.

Note: Ruler is premixed with sample loading buffer containing 5% glycerol, 15 mM Tris, pH 8.0, 1.5 mM EDTA, 0.04% bromophenol blue, 0.04% xylene cyanole FF. The 100 bp ruler may show a double- or triple-banding pattern in polyacrylamide gels. The DNA fragments in this product have *Hin*dIII-compatible cohesive ends. Store at 4°C.

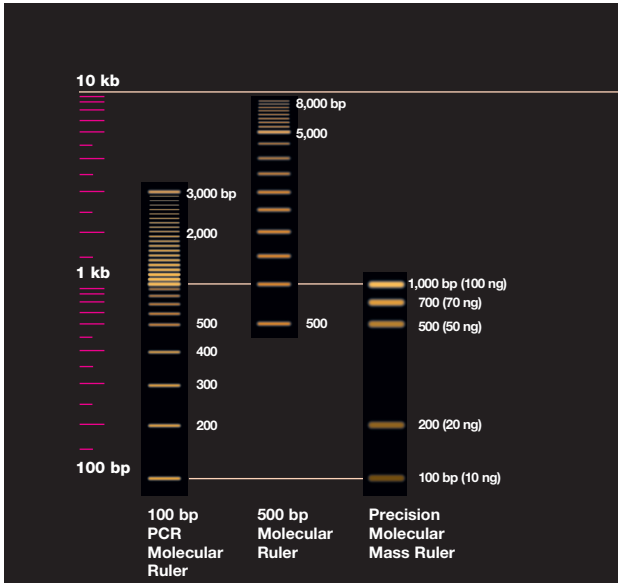
Catalog # 170-8352



Standards shown were run on a 2.5% Certified™ PCR agarose gel.

100 bp–10 kb DNA Standards

Bio-Rad's molecular rulers are available in several convenient size ranges and increments for sizing single- and double-stranded DNA. Visually distinct reference bands make it easy to determine the size of your sample DNA.



100 bp PCR Molecular Ruler

Size Range	Quantity	Recommended Load Volume
100–3,000 bp, 30 bands in exact 100 bp increments	40 µg DNA in 200 µl TE buffer, pH 8.0 (0.2 µg/µl DNA)	2 µl (~400 ng DNA)

The perfect 50% GC content of this precision-sized molecular ruler eliminates spurious migration due to sequence variation, ensuring that the fragments migrate exactly according to their specified size.

Recommended gels: Standard agarose of >1% or polyacrylamide gels of <10%.

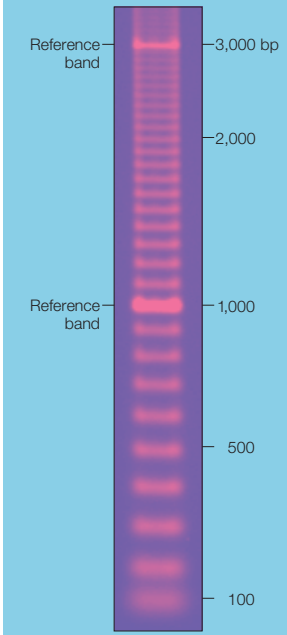
Recommended application: For accurately assigning molecular weight to fragments from 100 bp–3 kb.

For optimal resolution of fragments from 100–500 bp, use a 3% ReadyAgarose™ gel or 5% Ready Gel® TBE gel.

For optimal resolution of fragments from >500 bp–3.5 kb, use a 1% ReadyAgarose gel.

Note: Add any conventional sample loading buffer prior to loading. The DNA fragments in this product have *Hin*dIII-compatible cohesive ends. Store at 4°C.

Catalog # 170-8206



Standards shown were run on a 0.8% Certified™ molecular biology agarose gel.

EZ Load™ 100 bp PCR Molecular Ruler

Size Range	Quantity	Recommended Load Volume
100–3,000 bp, 30 bands in exact 100 bp increments	40 µg DNA in 500 µl sample loading buffer	5 µl (~400 ng DNA) (0.08 µg/µl DNA)

EZ Load molecular rulers are precision-sized DNA fragments blended with sample loading buffer for convenience. The perfect 50% GC content eliminates spurious migration due to sequence variation, ensuring that the fragments migrate exactly according to their specified size.

Recommended gels: Standard agarose of >1% or polyacrylamide gels of <10%.

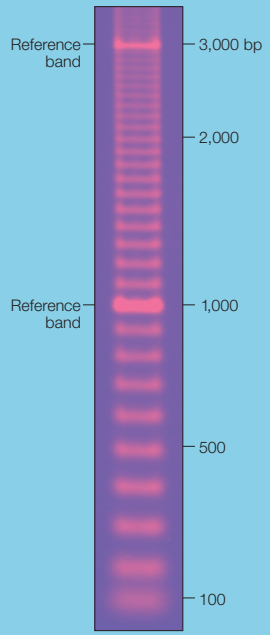
Recommended application: For accurately assigning molecular weight to fragments from 100 bp–3 kb.

For optimal resolution of fragments from 100–500 bp, use a 3% ReadyAgarose™ gel or 5% Ready Gel® TBE gel.

For optimal resolution of fragments from >500 bp–3.5 kb, use a 1% ReadyAgarose gel.

Note: Ruler is premixed with sample loading buffer containing 5% glycerol, 15 mM Tris, pH 8.0, 1.5 mM EDTA, 0.04% bromophenol blue, 0.04% xylene cyanole FF. Store at 4°C.

Catalog # 170-8353



Standards shown were run on a 0.8% Certified™ molecular biology agarose gel.

500 bp Molecular Ruler

Size Range	Quantity	Recommended Load Volume
500–8,000 bp, 16 bands in exact 500 bp increments	40 µg DNA in 200 µl TE buffer, pH 8.0 (0.2 µg/µl DNA)	2 µl (~400 ng DNA)

The perfect 50% GC content of this precision-sized molecular ruler eliminates spurious migration due to sequence variation, ensuring that the fragments migrate exactly according to their specified size.

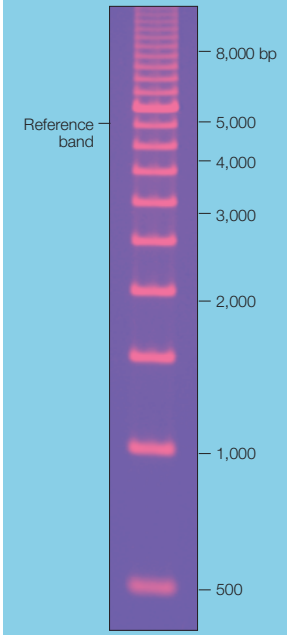
Recommended gels: 0.8% to 2% standard agarose.

Recommended application: For accurately assigning molecular weight to fragments from 500 bp–6 kb.

For optimal resolution of fragments, use 1% ReadyAgarose™ gels.

Note: Add any conventional sample loading buffer prior to loading. The DNA fragments in this product have EcoRI-compatible cohesive ends. Store at 4°C.

Catalog # 170-8203



Standards shown were run on a 0.8% Certified™ molecular biology agarose gel.

EZ Load™ 500 bp Molecular Ruler

Size Range	Quantity	Recommended Load Volume
500–8,000 bp, 16 bands in exact 500 bp increments	40 µg DNA in 500 µl sample loading buffer (0.08 µg/µl DNA)	5 µl (~400 ng DNA)

EZ Load molecular rulers are precision-sized DNA fragments blended with sample loading buffer for convenience. The perfect 50% GC content eliminates spurious migration due to sequence variation, ensuring that the fragments migrate exactly according to their specified size.

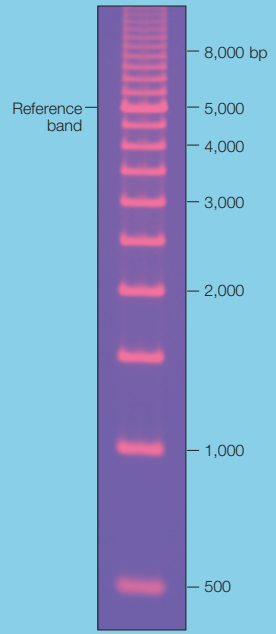
Recommended gels: 0.8% to 2% standard agarose.

Recommended application: For accurately assigning molecular weight to fragments from 500 bp–6 kb.

For optimal resolution of fragments, use 1% ReadyAgarose™ gels.

Note: Ruler is premixed with sample loading buffer containing 5% glycerol, 15 mM Tris, pH 8.0, 1.5 mM EDTA, 0.04% bromophenol blue, 0.04% xylene cyanole FF. The DNA fragments in this product have *Eco*RI-compatible cohesive ends. Store at 4°C.

Catalog # 170-8354



Standards shown were run on a 0.8% Certified™ molecular biology agarose gel.

Precision Molecular Mass Ruler

Size Range	Mass Range	Quantity	Recommended Load Volume
100–1,000 bp	10–100 ng (±1%)	25 µg DNA in 250 µl TE buffer, pH 8.0 (0.1 µg/µl DNA)	2.5 µl (~250 ng)

The precision molecular mass ruler allows accurate quantitation of the amount of DNA in a sample band.

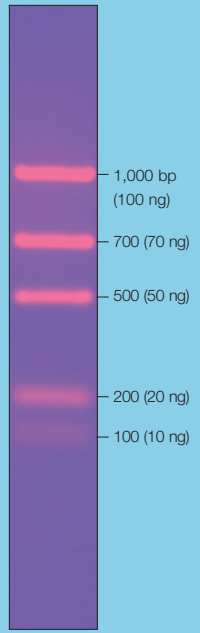
Recommended gels: >1% standard agarose, 2–4% Certified™ low range ultra agarose, or <10% polyacrylamide gels.

Recommended applications: For accurate quantitation of DNA and molecular weight estimation of fragments.

For optimal resolution of fragments, use 1% ReadyAgarose™ gels.

Note: Add any conventional sample loading buffer prior to loading. To maintain accurate fragment concentrations, spin down any condensate and mix thoroughly prior to opening tube. The DNA fragments in this product have either *Eco*RI- or *Hin*dIII-compatible cohesive ends. Store at 4°C.

Catalog # 170-8207



Standards shown were run on a 1.8% Certified™ molecular biology agarose gel.

EZ Load™ Precision Molecular Mass Ruler

Size Range	Mass Range	Quantity	Recommended Load Volume
100–1,000 bp	10–100 ng (±1%)	25 µg DNA in 500 µl sample loading buffer (0.05 µg/µl DNA)	5 µl (~250 ng)

The EZ Load precision molecular mass ruler allows accurate quantitation of the amount of DNA in a sample band. The ruler has been blended with sample loading buffer for convenience.

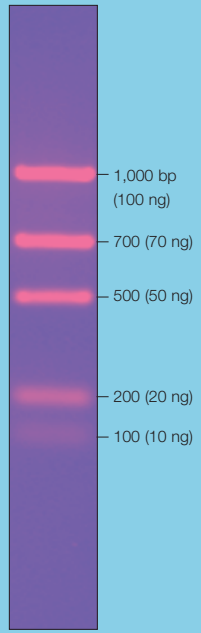
Recommended gels: >1% standard agarose, 2–4% Certified™ low range ultra agarose, or <10% polyacrylamide gels.

Recommended applications: For accurate quantitation of DNA and molecular weight estimation of fragments.

For optimal resolution of fragments, use 1% ReadyAgarose™ gels.

Note: Ruler is premixed with sample loading buffer containing 5% glycerol, 15 mM Tris, pH 8.0, 1.5 mM EDTA, 0.04% bromophenol blue, 0.04% xylene cyanole FF. To maintain accurate fragment concentrations, spin down any condensate and mix thoroughly prior to opening tube. The DNA fragments in this product have either EcoRI- or HindIII-compatible cohesive ends. Store at 4°C.

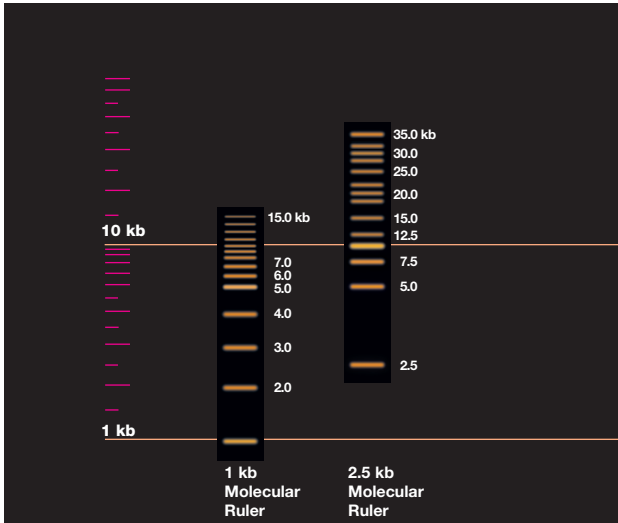
Catalog # 170-8356



Standards shown were run on a 1.8% Certified™ molecular biology agarose gel.

1–35 kb DNA Standards

Bio-Rad's molecular rulers are available in several convenient size ranges and increments for sizing single- and double-stranded DNA. Visually distinct reference bands make it easy to determine the size of your sample DNA.



1 kb Molecular Ruler

Size Range	Quantity	Recommended Load Volume
1.0–15 kb, 15 bands in exact 1.0 kb increments	40 µg DNA in 200 µl TE buffer, pH 8.0 (0.2 µg/µl DNA)	2 µl (~400 ng DNA)

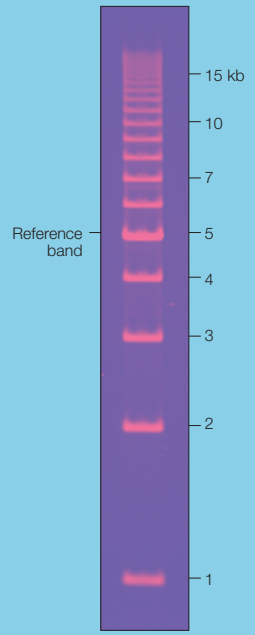
The perfect 50% GC content of this precision-sized molecular ruler eliminates spurious migration due to sequence variation, ensuring that the fragments migrate exactly according to their specified size.

Recommended gels: Standard agarose gels of up to 1%.

Recommended application: For accurately assigning molecular weight to fragments from 700 bp–12 kb.

For optimal resolution of fragments, use 1% ReadyAgarose™ gels.

Note: Add any conventional sample loading buffer prior to loading. The DNA fragments in this product have EcoRI-compatible cohesive ends. Store at 4°C.
Catalog # 170-8204



Standards shown were run on a 0.7% Certified™ molecular biology agarose gel.

EZ Load™ 1 kb Molecular Ruler

Size Range	Quantity	Recommended Load Volume
1.0–15 kb, 15 bands in exact 1.0 kb increments	40 µg DNA in 500 µl sample loading buffer (0.08 µg/µl DNA)	5 µl (~400 ng DNA)

EZ Load molecular rulers are precision-sized DNA fragments blended with sample loading buffer for convenience. The perfect 50% GC content eliminates spurious migration due to sequence variation, ensuring that the fragments migrate exactly according to their specified size.

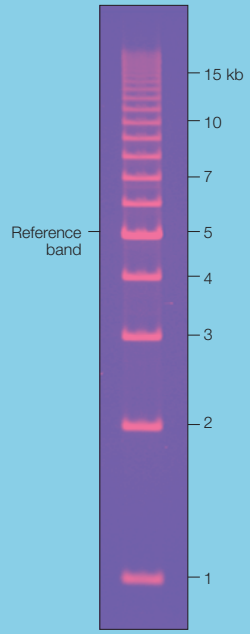
Recommended gels: Standard agarose gels of up to 1%.

Recommended application: For accurately assigning molecular weight to fragments from 700 bp–12 kb.

For optimal resolution of fragments, use 1% ReadyAgarose™ gels.

Note: Ruler is premixed with sample loading buffer containing 5% glycerol, 15 mM Tris, pH 8.0, 1.5 mM EDTA, 0.04% bromophenol blue, 0.04% xylene cyanole FF. The DNA fragments in this product have EcoRI-compatible cohesive ends. Store at 4°C.

Catalog # 170-8355



Standards shown were run on a 0.7% Certified™ molecular biology agarose gel.

2.5 kb Molecular Ruler

Size Range	Quantity	Recommended Load Volume
2.5–35 kb, 14 bands in exact 2.5 kb increments	40 µg DNA in 400 µl TE buffer, pH 8.0 (0.1 µg/µl DNA)	4 µl (~400 ng DNA)

The perfect 50% GC content of this precision-sized molecular ruler eliminates spurious migration due to sequence variation, ensuring that the fragments migrate exactly according to their specified size.

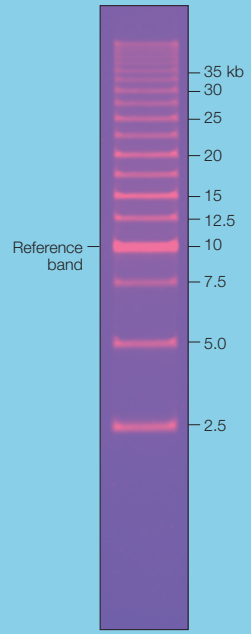
Recommended gels: 0.7–1.0% standard agarose for conventional electrophoresis or 1.0–1.5% for pulsed field gel electrophoresis.

Recommended application: For accurately assigning molecular weight to fragments from 2.5 kb–30 kb.

For optimal resolution of fragments, use a 1% ReadyAgarose™ gel with 1 lane of wells (8, 12, 20, or 32 wells) to allow enough gel space for fragment resolution.

Note: Add any conventional sample loading buffer prior to loading. The DNA fragments in this product have EcoRI-compatible cohesive ends. Store at 4°C.

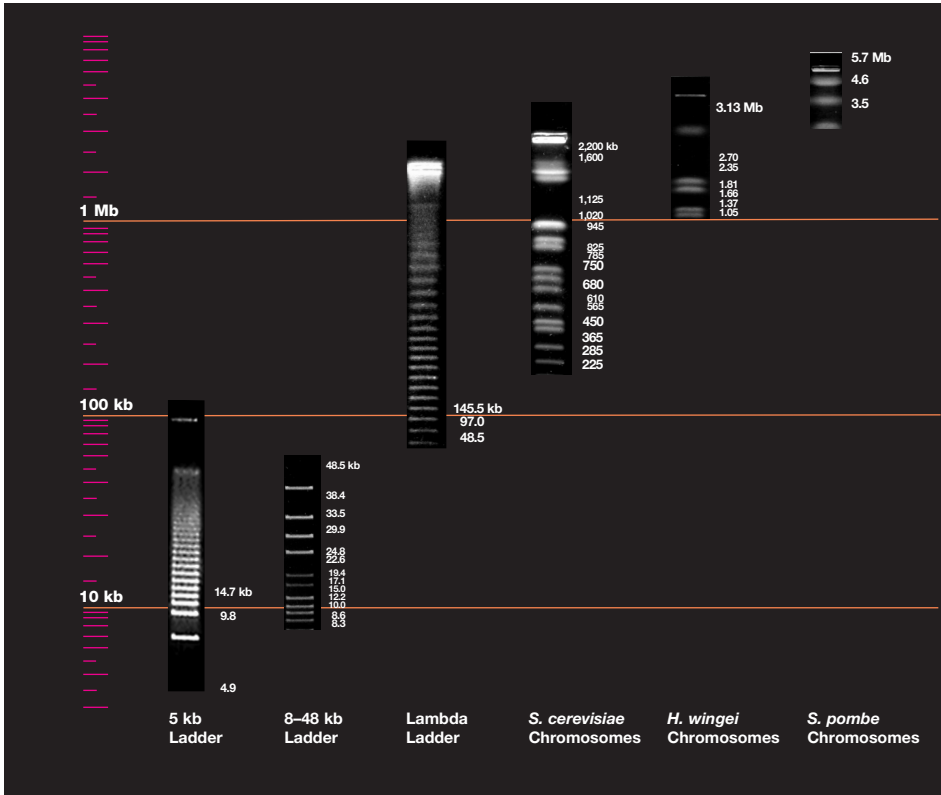
Catalog # 170-8205



Standards shown were run on a 1% pulsed field Certified™ agarose gel.

5 kb–5.7 Mb (Pulsed Field) DNA Standards

Bio-Rad offers several standards for DNA separations on pulsed field gels, ranging from cosmid inserts to whole chromosomes.



CHEF DNA Size Standards, 5 kb Ladder

Size Range	Quantity	Recommended Load Volume
4.9–98 kb in 4.9 kb increments (concatemers of pBR328)	20 µg DNA in 200 µl 28 mM Tris, 50 mM EDTA, 28 mM NaCl, 0.05% SDS, pH 8.0 (0.1 µg/µl DNA)	8–10 µl (0.8–1 µg DNA)

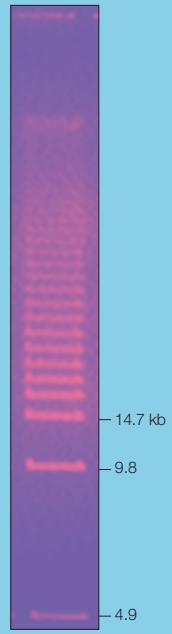
CHEF DNA size standards are ideally suited for size estimation of larger DNA fragments separated by pulsed field electrophoresis.

Recommended gels: 1.0–1.5% molecular biology grade agarose.

Note: Add a sample loading buffer prior to loading. Store at 4°C.

Catalog # 170-3624

*Clamped homogenous electrical field (CHEF).



Standards shown were run on a 1% Certified™ molecular biology agarose gel using a CHEF-DR® II system.

CHEF DNA Size Standards, 8–48 kb Ladder

Size Range	Quantity	Recommended Load Volume
8.3–48.5 kb (13 bands derived from λ DNA digested with five restriction enzymes)	25 µg DNA in 125 µl TE buffer, pH 8.0 (0.2 µg/µl DNA)	1–5 µl (0.2–1 µg DNA)

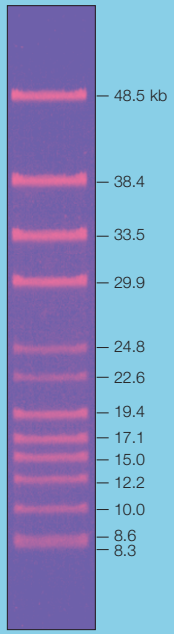
CHEF DNA size standards are ideally suited for size estimation of larger DNA fragments separated by pulsed field electrophoresis.

Recommended gels: 1.0–1.5% molecular biology grade or pulsed field Certified™ agarose.

Note: Add a sample loading buffer and heat sample at 65°C for 5 min before loading. Store at 4°C.

Catalog # 170-3707

*Clamped homogenous electrical field (CHEF).



Standards shown were run on a 1% pulsed field Certified™ agarose gel using a CHEF Mapper® XA system.

CHEF DNA Size Standards, Lambda Ladder

Size Range	Quantity	Recommended Load Volume
48.5–~1,000 kb in 48.5 kb increments (concatemers of λcl857Sam7) lambda DNA per block	5 low-melt agarose blocks, ~15 µg	See note below

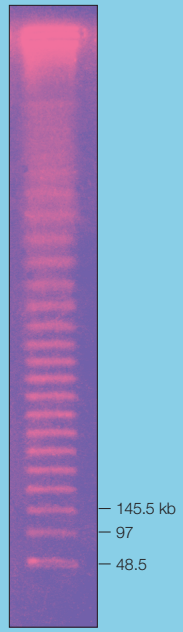
CHEF DNA size standards are ideally suited for size estimation of larger DNA fragments separated by pulsed field electrophoresis.

Recommended gels: 0.8–1.0% pulsed field Certified™ or molecular biology grade agarose.

Note: Cut a plug from a block into a size that will fit a well of your gel (5–8 plugs per block). The height of the plug should not extend above the well. After placing the plug into a well, seal the well with melted 1.0% low-melt agarose, and allow it to solidify. Store blocks at 4°C.

Catalog # 170-3635

*Clamped homogenous electrical field (CHEF).



Standards shown were run on a 1% pulsed field Certified™ agarose gel using a CHEF-DR® II system.

CHEF DNA Size Markers, *S. cerevisiae* Chromosomes

Size Range	Quantity	Recommended Load Volume
0.2–2.2 Mb (16 chromosomes resolved into 15 bands)	5 low-melt agarose blocks containing *Saccharomyces cerevisiae* chromosomes	See note below

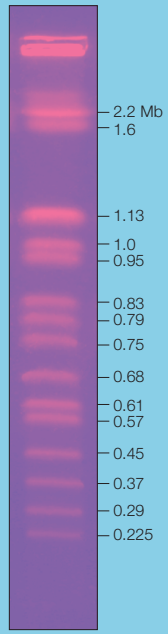
CHEF DNA size standards are ideally suited for size estimation of larger DNA fragments separated by pulsed field electrophoresis.

Recommended gels: 0.7–1.0% pulsed field Certified™ or molecular biology grade agarose.

Note: Cut a plug from a block into a size that will fit a well of your gel (5–8 plugs per block). The height of the plug should not extend above the well. After placing the plug into a well, seal the well with melted 1.0% low-melt agarose, and allow it to solidify. Store blocks at 4°C.

Catalog # 170-3605

*Clamped homogenous electrical field (CHEF).



Standards shown were run on a 1% pulsed field Certified™ agarose gel using a CHEF Mapper® XA system.

CHEF DNA Size Markers, *H. wingei* Chromosomes

Size Range	Quantity	Recommended Load Volume
1–3.1 Mb (7 chromosomes)	5 low-melt agarose blocks containing *Hansenula wingei* chromosomes	See note below

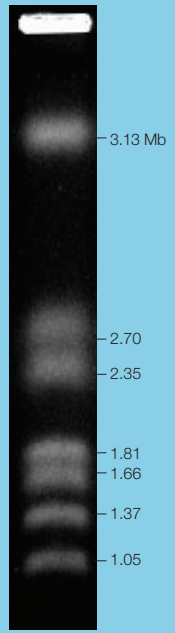
CHEF DNA size standards are ideally suited for size estimation of larger DNA fragments separated by pulsed field electrophoresis.

Recommended gels: 0.7–1.0% molecular biology grade, Certified™ megabase, or pulsed field Certified agarose.

Note: Cut a plug from a block into a size that will fit a well of your gel (5–8 plugs per block). The height of the plug should not extend above the well. After placing the plug into a well, seal the well with melted 1.0% low-melt agarose, and allow it to solidify. Store blocks at 4°C.

Catalog # 170-3667

*Clamped homogenous electrical field (CHEF).



Standards shown were run on a 0.8% Certified™ molecular biology agarose gel using a CHEF Mapper® XA system.

CHEF DNA Size Markers, *S. pombe* Chromosomes

Size Range	Quantity	Recommended Load Volume
3.5–5.7 Mb (3 chromosomes)	5 low-melt agarose blocks containing *Schizosaccharomyces pombe* chromosomes	See note below

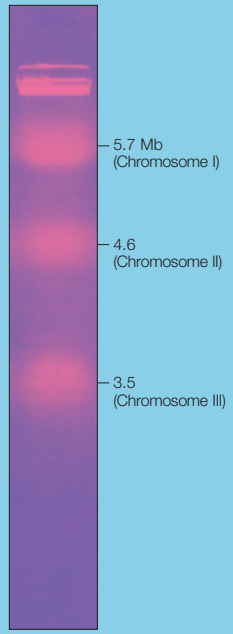
CHEF DNA size standards are ideally suited for size estimation of larger DNA fragments separated by pulsed field electrophoresis.

Recommended gels: 0.6–1.0% molecular biology grade or pulsed field Certified™ agarose.

Note: Cut a plug from a block into a size that will fit a well of your gel (5–8 plugs per block). The height of the plug should not extend above the well. After placing the plug into a well, seal the well with melted 1.0% low-melt agarose, and allow it to solidify. Store blocks at 4°C.

Catalog # 170-3633

*Clamped homogenous electrical field (CHEF).



Standards shown were run on a 0.8% Certified™ megabase agarose gel using a CHEF Mapper® XA system.

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Practice of the polymerase chain reaction (PCR) may require a license.

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