



Transfection

<u>Transfection Technologies</u>	<u>282</u>
<u>Lipid Transfection Reagents</u>	<u>283</u>
<u>Electroporation Systems and Reagents</u>	<u>284</u>
<u>Biolytic Particle Delivery Systems</u>	<u>289</u>
<u>Ordering Information</u>	<u>292</u>

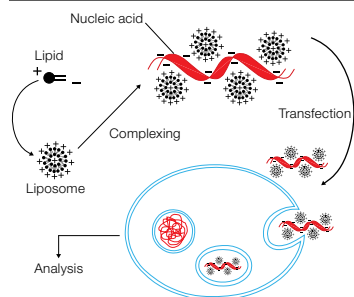
Transfection Technologies

Introducing DNA and RNA into cells is a powerful tool for evaluating gene expression. Bio-Rad's transfection products offer choices for gene delivery to bacterial, fungal, plant, and animal cells. Use the guide below to select the most appropriate transfection technology for your application.

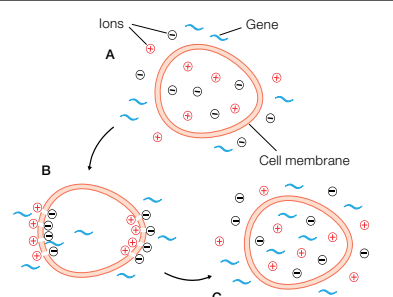
Transfection Technologies	Page	Plants													Bacteria	Fungi	Animals				
		Plant Cell Suspension Cultures	Plant Cell Adherent Cultures	Plant Cell Callus or Explants	Pollen	Leaves in Situ	Detached Leaves	Meristems in Situ	Detached Meristems	Gram-Positive Bacteria	Gram-Negative Bacteria	Yeast	Other Fungi	Skin or Organs in Vivo	Organ Cultures	Ex Vivo Cells or Tissues (e.g., blood)	Suspension Cell Cultures	Mammalian Cells — Gene Knockdowns	Adherent Cells, Trypsinized	Adherent Cells, Attached	Organelles (chloroplasts, mitochondria)
Lipid Transfection																					
siLentFect™ lipid reagent for RNAi	283																				
TransFectin™ lipid reagent	284																				
Electroporation																					
Gene Pulser MXcell™ electroporation system	286																				
Gene Pulser Xcell™ total system	287	*	*			o		o	o	o	o	o	o								
Gene Pulser Xcell eukaryotic system	287	*	*			o		o	o	o	o	o	o								
Gene Pulser Xcell microbial system	287																				
MicroPulser™ electroporator	288																				
Biolistic Particle Delivery																					
Helios® gene gun system	290	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
PDS-1000/He™ system	291	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
PDS-1000/He system with Hepta™ adaptor	291	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

- First choice, highly recommended.
- Recommended, but other technologies may be better suited to that application.
- Possible, but little data to support its effectiveness.
- * Protoplasts required.

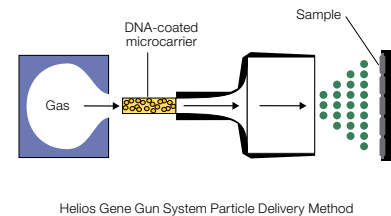
Lipid Transfection (page 283)



Electroporation (page 284)



Biolistic Particle Delivery (page 289)



Lipid Transfection Reagents

Lipid transfection is the process of using lipids to cause a cell to absorb DNA from outside itself. The liposome easily merges with the membrane of the cell since they are both composed of a phospholipid bilayer. Once the liposome and membrane are merged the genetic material can then be released inside the cell. Some familiar aliases for lipid transfection are lipid-mediated delivery, lipofection, and liposome-based gene transfection.

Lipid transfection has been shown to be successful in transfecting adherent and suspension cells and some primary cells (for example, mES and neuronal cells). Common applications employing lipid transfection include RNAi studies, protein production, viral production, gene function analysis, and cell-based assays.

Lipid Transfection Reagents Selection Guide

	siLentFect™ Lipid Reagent	TransFectin™ Lipid Reagent
Description	RNAi-specific lipid	General-purpose lipid
Applications	RNAi (siRNA delivery)*	Gene expression RNAi (siRNA/shRNA delivery)
Cell lines**	Variety of adherent and suspension cell lines, including A549, BHK, HeLa, K562, primary fibroblasts, and Vero	Variety of adherent and suspension cell lines, including A549, HeLa, HUVEC, MCF-7, and primary fibroblasts
Shelf life	6 months	6 months

* siLentFect can successfully cotransfect an siRNA molecule with a plasmid DNA.

** For a more complete list of cell lines, see pages 283 (siLentFect lipid reagent) and 284 (TransFectin lipid reagent), or go to www.bio-rad.com/lipidtransfection.

siLentFect™ Lipid Reagent for RNAi

Order Info: Pg 292

Effective Gene-Specific Silencing with Low Toxicity

siLentFect lipid reagent delivers siRNA to a broad variety of cultured mammalian cells for RNAi applications. RNAi is a powerful technique used for the specific inhibition of gene expression. An intrinsic cellular mechanism in most eukaryotes, RNAi helps regulate the expression of genes critical to cell fate determination, differentiation, survival, and defense from viral infection.

- **Effective gene-specific silencing** — achieve 90–99% gene-specific knockdown of both high- and low-abundance genes using as little as 1 nM siRNA for certain gene targets
- **Low amounts of siRNA and lipid required** — the high affinity of siLentFect lipid reagent for siRNA allows the use of less lipid and less siRNA per experiment, decreasing the likelihood of off-target effects, reducing cost, and minimizing the experimental bias caused by cell stress/death
- **Simple, flexible protocol** — easily adaptable protocol for high-throughput applications; successfully transfect cells by adding siLentFect reagent and siRNA directly to the culture or by adding siLentFect-siRNA complexes to trypsinized cells still in suspension



- **Cotransfection capabilities** — simultaneous delivery of siRNA and dsDNA vectors for optimization and dual expression analysis
- **Works with many cell types** — 184hrt, 4T1, A549, Caco-2, CHO-K1, COS-7, HEK 293, HeLa, HepG2, HUVEC, LNCaP, MCF-7, murine EC, NIH 3T3, PC-3, primary fibroblast, primary keratinocyte, primary ovarian, SVEC4, VSMC

For More Information

Web: www.bio-rad.com/silentfect

Request or download bulletins: 3105, 5439, and 5894

See Also

TC10 automated cell counter: page 26.
 Experion automated electrophoresis system: pages 112–116.
 Supermixes for PCR and real-time PCR: pages 307–309.
 Real-time PCR detection systems: pages 300–302.
 Aurum total RNA kits: page 3.

See Also

Supermixes for PCR and real-time PCR: pages 307–309.

Real-time PCR detection systems: page 300–302.

Aurum total RNA kits: page 3.

Plasmid isolation kits: page 5.

TransFectin™ Lipid Reagent

Order Info: Pg 292

Efficient Delivery for High Gene Expression Levels

TransFectin lipid reagent delivers nucleic acids to a broad range of cell lines with high efficiency. Advantages of this reagent include:

- **Enables high-efficiency results** — effective transfection of both easy- and difficult-to-transfect cells
- **Minimally affects cell viability** — less cytotoxicity than other high-efficiency products makes it appropriate for sensitive cell lines; lower toxicity leads to healthier cells for posttransfection analysis
- **Simple to use** — part of an easy 3-step protocol; dilute TransFectin reagent and nucleic acid in the appropriate medium, mix, incubate, and add to the cell culture. There is no need to change the medium for most cell types after addition of the complexes; just incubate and assay for expression
- **Allows flexibility in experimental conditions** — efficient transfection in both the presence and absence of serum-containing media; exceptional results are obtained when cells are transfected at densities between 40 and 90%



- **Affordable** — minimal amounts of TransFectin reagent are required for optimal transfection results compared to other reagents; using less lipid reduces the cost per transfection and reduces toxicity effects
- **Works with many cell types** — A375, A549, ACHN, BHK, CHO, COS-7, CV-1, HEK 293, HeLa, Hep G2, K562, LLC-MK2, LNCaP, MEF, NBT-II, Neuro-2a, NIH 3T3, SH-SY5Y, SW480, Vero

For More Information

Web: www.bio-rad.com/transfectin

Request or download bulletins: 2873 and 3197

Electroporation Systems and Reagents

Electroporation is a powerful, highly efficient technique for introducing molecules (nucleic acids, proteins, carbohydrates, dyes) and viral particles into a wide variety of prokaryotic and eukaryotic cells. A high-intensity electric field transiently permeabilizes the membrane, enabling uptake of molecules from the surrounding medium. Electroporation provides a valuable and effective alternative to chemical, biological, and other physical methods of transfection.

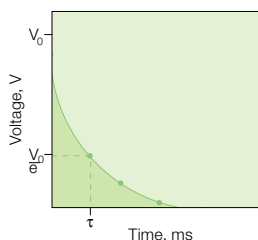
For More Information

Web: www.bio-rad.com/electroporation

Online protocols: www.bio-rad.com/transfectionprotocols

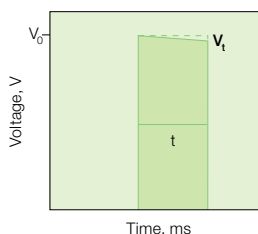
A Choice of Exponential-Decay or Square-Wave Pulse

Gene Pulser MXcell™ and Gene Pulser Xcell™ electroporation systems generate both exponential and square waveforms, allowing you to choose the waveform and protocol that work best for your cells. Both exponential-decay and square-wave pulses have been used effectively for electroporation. Depending on cell type, the shape of the wave can have a significant effect on the transfection efficiency for different cell types. Electrofusion is also possible with Gene Pulser® systems.



Exponential-decay pulse.

When a capacitor charged to a voltage V_0 is discharged into cells, the voltage applied to the cells decreases over time exponentially. The time required for the initial voltage to drop to V_0/e is referred to as the time constant (τ), and is a convenient expression of the pulse length.



Square-wave pulse.

Truncating the pulse from a capacitor after discharging it into the sample generates a square-wave pulse. The pulse length is the time the cells are subjected to the discharge. A slight drop in voltage occurs with all square-wave instruments. This drop in voltage is called the pulse droop and is measured as a percentage of the initial voltage.

Electroporation Systems Selection Guide



Gene Pulser MXcell System
page 286



Gene Pulser Xcell System
page 287



MicroPulser™ System
page 288

Plate-based system	Yes	No	No
Cuvette-based system	Yes	Yes	Yes
Eukaryotic or prokaryotic	Eukaryotic	Both	Prokaryotic
Recommended cells	Mammalian cell types, including primary and stem cells	Mammalian, bacterial, and fungal cell lines	Bacterial, yeast, and other microorganisms
Chamber	Plate and/or ShockPod™ chambers	ShockPod chamber	ShockPod chamber
System options	—	Gene Pulser Xcell total system Gene Pulser Xcell eukaryotic system Gene Pulser Xcell microbial system	—

Gene Pulser® Electroporation Buffer

Order Info: Pg 292

The formulation of Gene Pulser electroporation buffer simulates the natural cell environment to minimize cell mortality while ensuring highly efficient delivery of nucleic acids. This electroporation buffer is a universal reagent for introducing siRNA, plasmid DNA, and other molecules into various mammalian cells, including difficult-to-transfect and primary cells. The buffer is compatible with electroporation systems, including Gene Pulser MXcell™, Gene Pulser Xcell™, Gene Pulser® II, and most other systems, and is compatible with both exponential and square waveforms.

Gene Pulser electroporation buffer:

- Allows you to optimize multiple electroporation parameters, including voltage and capacitance, for each cell type
- Improves transfection efficiency and cell viability
- Exhibits low conductivity — compatible with cuvette or multiwell plate formats

For More Information

Web: www.bio-rad.com/electroporationbuffer
Request or download bulletin: 5582



Gene Pulser MXcell™ Electroporation System

Order Info: Pg 292

The Gene Pulser MXcell electroporation system is an affordable instrument offering a choice between plate and cuvette delivery with enhanced program features that allow optimal transfection results to be obtained quickly. The Gene Pulser MXcell system user interface provides access to preset and custom protocols that easily adapt to new or existing transfection conditions. Benefits include:

- **Choice of plate or cuvette delivery format** — electroporate a limited number of primary cells or a larger number when scaling up
- **Delivery of any molecule into primary and other mammalian cells** — transfect siRNA, DNA, and other molecules in a completely open format
- **Preprogrammed protocols designed for rapid optimization** — increase transfection efficiency and viability, regardless of cell type
- **Manual protocol programming** — adjust settings according to the wide variations in primary and stem cells
- **Compatible with any electroporation buffer** — use with universal Gene Pulser® electroporation buffer for efficient gene delivery while maintaining cell viability
- **Recommended protocols for primary and mammalian cells** — browse Bio-Rad's expanding Transfection Protocol Library for starting conditions

High Reproducibility, Rapid Delivery

- Cross-compatible protocols allow a simple transition between plates and cuvettes
- Consistent transfection efficiency and activity regardless of delivery format

Electroporation Plates

Electroporation plates for use with the Gene Pulser MXcell electroporation system are available in three formats: 96-well for low-volume or screening experiments, and 24- or 12-well.

Benefits include:

- **Streamlined optimization** — up to 24 different protocols can be delivered on a single 96- or 24-well plate
- **High reproducibility** — well-to-well and plate-to-plate variability is less than 20%
- **Scalability** — consistent transfection efficiency across 96-, 24-, and 12-well plate formats

**Gene Pulser MXcell™ ShockPod™ Cuvette Chamber**

The Gene Pulser MXcell ShockPod cuvette chamber expands the capabilities of the Gene Pulser MXcell electroporation system by adding a choice in delivery tools. The Gene Pulser MXcell ShockPod cuvette chamber is only compatible with the Gene Pulser MXcell electroporation system and is not interchangeable with the Gene Pulser XCell ShockPod cuvette chamber. Key features include:

- Protocols are cross-compatible between plates and cuvettes
- Chamber is designed for one-handed use
- Lightweight chamber
- Cuvette slot that accepts any standard cuvette

For More Information

Web: www.bio-rad.com/mxcell

Request or download bulletins: 5598, 5634, or 5760

Gene Pulser Xcell™ Electroporation Systems

Order Info: Pg 292




The Gene Pulser Xcell system is a modular electroporation system for transfecting every cell type. The system includes a main unit, a ShockPod™ cuvette chamber, and your choice of accessory modules: the capacitance extender (CE module) and the pulse controller (PC module).

Features and Benefits

- **Universal electroporation** — transfects all cell types, from primary and stem cells to bacteria and yeast
- **Preset protocols** — include the most common mammalian and bacterial cell types
- **Flexibility** — choice of programs for preset protocols, optimization protocols, manual operation, or user protocols
- **Protocol library** — collection of electroporation protocols for every cell type including primary, immortal, and bacterial cells
- **Data management** — enables storage and recall of parameters used in the previous 100 experiments for easy troubleshooting
- **Reproducibility** — uses PulseTrac™ circuitry and arc protection to ensure reproducibility and sample protection



Gene Pulser Xcell System Selection Guide

System	Comments
Gene Pulser Xcell Total System 	The complete electroporation system for transfection of both eukaryotic and prokaryotic cells; includes both the CE and the PC module.
Gene Pulser Xcell Eukaryotic System 	For the electroporation of most eukaryotic cells, including mammalian cells and plant protoplasts; includes the CE module.
Gene Pulser Xcell Microbial System 	For the electroporation of bacteria and fungi, as well as other applications where high-voltage pulses are applied to samples of small volume; includes the PC module.

For More Information

Web: www.bio-rad.com/xcell

Request or download bulletins: 5445 and 5542

MicroPulser™ Electroporator

Order Info: Pg 292

The MicroPulser electroporator is a simple, yet versatile instrument that enables safe and reproducible transformation of bacteria, yeast, and other microorganisms. Transformation efficiencies much higher than those obtained with chemical methods can be achieved. Unique features of the system include:

- One-button pulse delivery, attached cuvette chamber, and rapid charge time for fast sample handling
- Delivery of exponential waveform for prokaryotic cells
- Convenient preset optimized programs for commonly studied bacteria and fungi
- Arc quenching system that significantly reduces arcing, protecting against loss of valuable samples
- Broad range of parameters for manual optimization
- High-voltage (3,000 V) capability for improved efficiency in larger-volume cuvettes
- Compact, space-saving design
- Audible and visible pulse indicators
- Display of time constant and actual voltage delivered to monitor reproducibility



MicroPulser electroporator with cuvette chamber attached.
Electroporator is shown connected to the assembly cuvette.

For More InformationWeb: www.bio-rad.com/micropulser

Request or download bulletins: 2751 and 5548

Gene Pulser®/MicroPulser™ Electroporation Cuvettes

Order Info: Pg 293

Bio-Rad offers high-quality electroporation cuvettes that deliver consistent pulses to your valuable samples, ensuring reproducible results. Cuvettes are available in three different gap widths: 0.4, 0.2, and 0.1 cm, for optimal field strength delivery to a wide range of cell types. Features of the cuvettes include:

- **Guaranteed efficiency** — cuvettes are manufactured to precise gap tolerances to ensure maximum electroporation efficiency and reproducibility between experiments
- **Universal compatibility** — can be used with Gene Pulser MXcell™, Gene Pulser Xcell™, Gene Pulser II, and most other electroporation systems
- **Ensured sterility** — each cuvette is assembled in a cleanroom environment, washed, fitted with a snug cap, individually wrapped, and sterilized by gamma irradiation
- **Sturdy construction** — durable polycarbonate withstands pulses of very high voltage
- **Color-coded caps and bags** — easy identification of different cuvette sizes
- **Consistent chamber shape** — seamless plastic molding eliminates leaking and keeps the aluminum plates parallel, which is essential for uniform sample treatment and safety
- **Smooth electrode surface** — the aluminum plates are subjected to an 11-step etching and cleaning process for uniform pulse delivery to the entire sample

**For More Information**Web: www.bio-rad.com/electroporationcuvettes

Request or download bulletins: 1908 and 5542

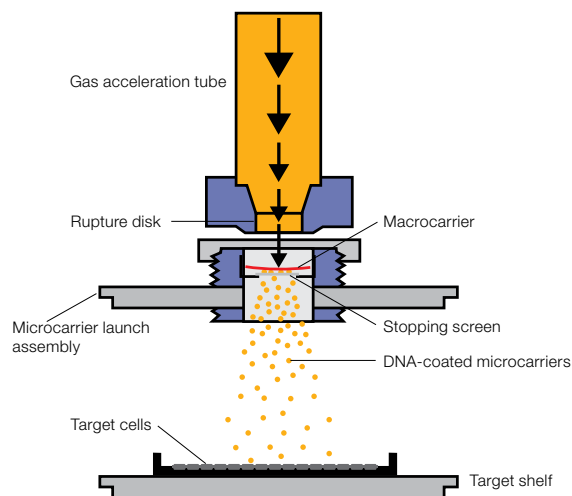
Biolistic Particle Delivery Systems

Biolistic technology, or particle bombardment, is a direct physical method of delivering nucleic acids into cells. The Helios® gene gun and PDS-1000/He™ systems use advanced biolistic technology to transform cells in situ. This technology can be applied to the widest range of targets, including cell cultures, tissues, organs, plants, animals, and bacteria, as well as organelles. The instruments use a helium pulse to accelerate high-density gold or tungsten particles coated with nucleic acids directly into target cells. Adjusting the pressure of the helium enables accurate penetration through the plant cell wall, or cell membrane, and into the cell.

Particle Delivery Application Notes and Protocols

Bio-Rad offers detailed application notes and protocols describing biological and bombardment conditions for many applications. Visit us on the Web at www.bio-rad.com/biolistics for downloadable application notes and protocols.

For More Information
Request or download bulletin: 5443



PDS-1000/He system particle delivery method. High-pressure helium is used to propel a macrocarrier sheet loaded with DNA-coated gold or tungsten macrocarriers toward target cells. The macrocarrier is halted after a short distance and the DNA coated macrocarriers continue traveling toward the target to penetrate the cells.

Biolistic Systems Selection Guide by Application

Factors Affecting Transformation	Helios Gene Gun System	PDS-1000/He System	PDS-1000/He System with Hepta™ Adaptor
Experimental conditions	In situ, in vitro, in vivo, ex vivo	In vitro, ex vivo, in vivo (plants)	In vitro, ex vivo, in vivo (plants)
Target area	Small (2 cm ²)	Large (40 cm ²)	Largest (~75 cm ²)
Pressure range	100–600 psi	450–2,200 psi	450–2,200 psi, reduced by 7-way spread of helium
Target type	Animals: Any tissue exposed to barrel (skin, organs); cell, explant, and organ culture Plants: Field and greenhouse use, plant cell culture, explants Yeast, bacteria, other microbes	Animals: Cell and organ culture Plants: Small intact plants, plant cell culture, explants Yeast, bacteria, other microbes Organelles (chloroplasts, mitochondria, etc.)	Animals: Cell and organ culture Plants: Cells with thin cell walls Yeast, bacteria, other microbes

Helios® Gene Gun System

Order Info: Pg 293

The Helios gene gun is a convenient handheld device that provides rapid and direct gene delivery to cells in situ. The unit uses an adjustable helium pulse to sweep DNA-, RNA-, or biomaterial-coated gold microcarriers from the inner wall of a small plastic cartridge directly into target cells. Cartridge “bullets” are simple to prepare using the tubing prep station.

- Provides easy-to-use, rapid, versatile gene delivery independent of target cell type
- Facilitates both transient and stable expression
- Requires only small amounts of DNA and cells; no carrier DNA needed
- Enables codelivery of more than one plasmid
- Allows transfer of large DNA fragments
- Targets intracellular gene delivery to many cells
- Works for both in vitro and in vivo transformation
- Delivers no extraneous genes or proteins
- Interactive CD-ROM (available separately; order the Particle Delivery Systems Training and Application Guide CD-ROM) guides all aspects of transfection using biolistic particle delivery technology

The Helios gene gun system includes one vial of each of the three sizes of gold microcarriers and a cartridge kit that includes 15 m (50') of Tefzel tubing, five cartridge collection/storage vials, five desiccant pellets, and 0.5 g of PVP for the sample tubing coating procedure. This is sufficient material (excluding nucleic acids, spermidine, CaCl₂, and absolute ethanol) for preparing approximately 1,000 gene gun samples.



For More Information

Web: www.bio-rad.com/helios

Request or download bulletins: 5443 and 5446

Accessories for Helios® Gene Gun

Order Info: Pg 293

GeneShot™ Control Cartridges

GeneShot control cartridges are ready to use “bullets” for the Helios gene gun. Each cartridge contains the *lacZ* (β -galactosidase) and *luc* (firefly luciferase) reporter genes, on 1.6 μ m gold particles. Driven by a strong mammalian promoter, the human cytomegalovirus (CMV) immediate early promoter, these positive controls yield reporter gene activity useful for optimizing Helios gene gun settings. The cartridges can be stored desiccated at room temperature or at 4°C for 1 year.

For More Information

Web: www.bio-rad.com/helios

Sample Preparation Accessories for Helios Gene Gun

Gold microcarriers, Tefzel tubing, cartridge collection/storage vials, and desiccant pellets are needed for Helios gene gun sample preparation. The gold microcarriers are available in 0.6, 1.0, and 1.6 μ m diameters. Lengths of Tefzel tubing (up to 76 cm or 30") are coated with the DNA- or RNA-microcarrier complexes using the tubing prep station. Coated tubing is cut into 1.25 cm (0.5") cartridges using the tubing cutter. Sample cartridges can be stored at 4°C in cartridge collection/storage vials with a desiccant pellet for later use. Additional barrel liners, cartridge holders, and other accessories are also available.

PDS-1000/He™ and Hepta™ Systems

Order Info: Pg 293

PDS-1000/He System

The PDS-1000/He system accelerates nucleic acid-coated gold or tungsten microparticles (0.6–1.6 μm) to velocities necessary to transfect cells, tissues, or organelles. The system uses a burst of high-pressure helium gas to accelerate a plastic macrocarrier disk carrying microparticles toward target cells. A stopping screen retains the macrocarrier while allowing the microparticles to penetrate the target cells. The PDS-1000/He system provides:

- A reproducible method for transfecting intact cells in culture, requiring little manipulation of cells
- Transfection of cells with unique growth requirements that are not amenable to other methods of gene transfer
- Interactive training and application guide (CD-ROM, available separately)

PDS-1000/He System with Hepta Adaptor

The Hepta adaptor, which fits into the shocking chamber of the PDS-1000/He system, splits the helium shock wave over seven macrocarriers. By spreading the DNA-coated particles over a larger area, the system maximizes the number of cells transformed, increasing transfection efficiency by a factor of 7 to 10. Pressure and particle velocity are reduced, making the system ideal for plants and cell cultures requiring less forceful penetration.



Hepta Adaptor

PDS-1000/He System

Accessories for the PDS-1000/He and Hepta Systems

Accessories for the PDS-1000/He and Hepta systems include:

- Rupture disks of various strengths to control the force of the helium shock wave
- Gold and tungsten particles (microcarriers) of various diameters
- Macrocarriers
- Stopping screens
- Optimization kit to help fine-tune the bombardment conditions for your cells of interest. The kit contains samples of the gold microcarriers and the 9 rupture disks, stopping screens, and macrocarriers for 500 bombardments
- Not provided: helium tank, grade 4.5 (99.995% pure) or higher, pressurized to 2,600 psi; vacuum source

For More Information

Web: www.bio-rad.com/pds1000

Request or download bulletins: 5443 and 5447

Lipid Transfection Reagents

Catalog #	Description	
siLentFect Lipid Reagent for RNAi		Pg 283
170-3360	siLentFect Lipid Reagent for RNAi, 0.5 ml	
170-3361	siLentFect Lipid Reagent for RNAi, 1.0 ml	
170-3362	siLentFect Lipid Reagent for RNAi, 5 x 1.0 ml	
TransFectin Lipid Reagent		Pg 284
170-3350	TransFectin Lipid Reagent, 0.5 ml	
170-3351	TransFectin Lipid Reagent, 1.0 ml	
170-3352	TransFectin Lipid Reagent, 5 x 1.0 ml	

Electroporation Systems and Reagents

Gene Pulser Electroporation Buffer		Pg 285
165-2676	Gene Pulser Electroporation Buffer, 10 x 1.8 ml	
165-2677	Gene Pulser Electroporation Buffer, 30 ml	
Gene Pulser MXcell Electroporation System		Pg 286
165-2670	Gene Pulser MXcell Electroporation System, 100–240 V, 50/60 Hz, exponential-decay and square-wave delivery, includes power module, plate chamber, 1 x 96-well electroporation plate	
165-2673	Gene Pulser MXcell ShockPod Cuvette Chamber, includes integral leads for connection to the Gene Pulser MXcell electroporation system	
165-2674	Gene Pulser MXcell Electroporation System with MXcell ShockPod Cuvette Chamber, 100–240 V, 50/60 Hz, exponential-decay and square-wave delivery, includes power module, plate chamber, 1 x 96-well electroporation plate, cuvette chamber	
165-2671	Power Module	
165-2672	Plate Chamber	
Electroporation Plates		
165-2681	96-Well Electroporation Plate	
165-2682	24-Well Electroporation Plate	
165-2683	12-Well Electroporation Plate	
Cuvette Packs*		
165-2081	Gene Pulser/MicroPulser Cuvettes, 0.4 cm gap, 5	
165-2088	Gene Pulser/MicroPulser Cuvettes, 0.4 cm gap, 50	
165-2091	Gene Pulser/MicroPulser Cuvettes, 0.4 cm gap, 500	
* Please inquire about volume pricing.		
Gene Pulser Xcell Systems		Pg 287
165-2660	Gene Pulser Xcell Total System, for mammalian and microbial cells, 100–240 V, 50/60 Hz, exponential-decay and square-wave delivery, includes main unit, CE module, PC module, ShockPod cuvette chamber, 15 sterile cuvettes (5 each of 0.1, 0.2, and 0.4 cm gap), cuvette rack	
165-2661	Gene Pulser Xcell Eukaryotic System, 100–240 V, 50/60 Hz, exponential-decay (25–3,275 μ F range) and square-wave delivery, includes main unit, CE module, ShockPod cuvette chamber, 5 sterile cuvettes (0.4 cm gap), cuvette rack	
165-2662	Gene Pulser Xcell Microbial System, 100–240 V, 50/60 Hz, exponential-decay delivery, includes main unit, PC module, ShockPod cuvette chamber, 10 sterile cuvettes (5 each of 0.1 and 0.2 cm gap), cuvette rack	
Components		
165-2666	Gene Pulser Xcell Main Unit, 100–240 V, 50/60 Hz	
165-2667	Gene Pulser Xcell CE Module, 25–3,275 μ F range controlled by main unit, includes integral leads	
165-2668	Gene Pulser Xcell PC Module, 50–1,000 Ω range controlled by main unit, includes integral leads	
165-2669	Gene Pulser Xcell ShockPod Cuvette Chamber, includes integral leads for connection to Gene Pulser Xcell, Gene Pulser II, or MicroPulser electroporators	
165-2095	Gene Pulser Cuvette Rack	
MicroPulser Electroporator		Pg 288
165-2100	MicroPulser Electroporator, includes a cuvette chamber with leads, 10 sterile cuvettes (5 each of 0.1 cm and 0.2 cm gap)	

Catalog # Description

Gene Pulser/MicroPulser Electroporation Cuvettes**Pg 288****Standard Packs**

165-2088	Gene Pulser/MicroPulser Cuvettes , 0.4 cm gap, 50
165-2086	Gene Pulser/MicroPulser Cuvettes , 0.2 cm gap, 50
165-2089	Gene Pulser/MicroPulser Cuvettes , 0.1 cm gap, 50

Jumbo Packs*

165-2091	Gene Pulser/MicroPulser Cuvettes , 0.4 cm gap, 500
165-2092	Gene Pulser/MicroPulser Cuvettes , 0.2 cm gap, 500
165-2093	Gene Pulser/MicroPulser Cuvettes , 0.1 cm gap, 500

Mini Packs

165-2081	Gene Pulser/MicroPulser Cuvettes , 0.4 cm gap, 5
165-2082	Gene Pulser/MicroPulser Cuvettes , 0.2 cm gap, 5
165-2083	Gene Pulser/MicroPulser Cuvettes , 0.1 cm gap, 51

* Please inquire about volume pricing.

Biolistic Particle Delivery Systems

Helios Gene Gun System**Pg 290**

165-2431*	Helios Gene Gun System , 100/120 V, includes Helios gene gun kit, helium hose assembly, helium regulator, tubing prep station, syringe kit, Tefzel tubing, tubing cutter, Helios gene gun optimization kit
165-2432	Helios Gene Gun System , 220/240 V
165-2451	Helios Gene Gun Low-Pressure System , 100/120 V, same as 165-2431 with low-pressure regulator (maximum 400 psi)
165-2452	Helios Gene Gun Low-Pressure System , 220/240 V

Accessories for Helios Gene Gun**Pg 290**

165-2244	GeneShot Control Cartridges , positive control bullets, 12
165-2412	Helium Hose Assembly , with Swagelok quick-connect fittings
165-2413	Helium Regulator , CGA 580 female fitting (U.S. standard), with pressure relief valve; maximum pressure 2,600 psi
165-2414	Low-Pressure Helium Regulator for Helios Gene Gun , maximum pressure 400 psi
165-2418	Tubing Prep Station , 100/120 V, includes tubing support cylinder, power cord, O-rings, tubing prep unit, 12' Nalgene nitrogen regulator hose, two 3/16" barb-to-male Luer-Lok fittings, nitrogen flowmeter fitting, two 1/8" barb-to-male Luer-Lok fittings, 5/64" Allen wrench, 10 ml syringe holder
165-2420	Tubing Prep Station , 220/240 V
165-2421	Syringe Kit , includes syringe adaptor tubing (silicone, 5', 0.104" ID x 0.192" OD), five 10 ml syringes, syringe adaptor fitting, five 1/8" barb-to-female Luer-Lok fittings
165-2422	Tubing Cutter , includes tubing cutter unit, ten razor blades
165-2424	Helios Gene Gun Optimization Kit , includes 0.25 g 0.6 µm gold microcarriers, 0.25 g 1.0 µm gold microcarriers, 0.25 g 1.6 µm gold microcarriers, cartridge kit
165-2440	Cartridge Kit , contains 0.5 g PVP (MW 360,000), 5 cartridge collection/storage vials, 5 desiccant pellets, 50' Tefzel tubing
165-2262	0.6 µm Gold Microcarriers , 0.25 g
165-2263	1.0 µm Gold Microcarriers , 0.25 g
165-2264	1.6 µm Gold Microcarriers , 0.25 g
165-2425	Nitrogen Regulator for U.S. Standard Connections
165-2416	O-Rings , 5
165-2417	Barrel Liner , 5
165-2426	Cartridge Holder , white, 5
165-2435	Cartridge Extractor Tool , for removal of discharged cartridge
165-2436	Battery , 9 V
165-2441	Tefzel Tubing , 15 m (50')
165-2475	Helios Diffusion Screens , 5
165-2411	Helios Gene Gun Kit , 100/120 V, includes Helios gene gun, 5 O-rings, 5 barrel liners, 5 white cartridge holders, cartridge extractor tool, 9 V battery

PDS-1000/He and Hepta Systems**Pg 291**

165-2257*	PDS-1000/He System , includes helium pressure regulator, solenoid, spacer rods, microcarrier launch assembly, target shelf, 5 macrocarrier holders, tubing
165-2258*	PDS-1000/He Hepta System , includes PDS-1000/He system, Hepta adaptor
165-2225	Hepta Adaptor for PDS-1000/He System , includes 5 stopping screens
165-2259	Voltage Converter , for 220 V or 240 V line voltage

Ordering Information

Biolistic Particle Delivery Systems

www.bio-rad.com

Catalog #	Description
Accessories	
165-2278	500 Optimization Kit , includes 0.25 g each of 0.6 μm , 1.0 μm , and 1.6 μm gold microcarriers, 100 each of 9 rupture disks, 500 macrocarriers, 500 stopping screens
165-2335	Macrocarriers , 500
165-2322	Macrocarrier Holders , 5
165-2326	450 psi Rupture Disks , 100
165-2327	650 psi Rupture Disks , 100
165-2328	900 psi Rupture Disks , 100
165-2329	1,100 psi Rupture Disks , 100
165-2330	1,350 psi Rupture Disks , 100
165-2331	1,550 psi Rupture Disks , 100
165-2332	1,800 psi Rupture Disks , 100
165-2333	2,000 psi Rupture Disks , 100
165-2334	2,200 psi Rupture Disks , 100
165-2336	Stopping Screens , 500
165-2226	Hepta Stopping Screens , 50
165-2262	0.6 μm Gold Microcarriers , 0.25 g
165-2263	1.0 μm Gold Microcarriers , 0.25 g
165-2264	1.6 μm Gold Microcarriers , 0.25 g
165-2266	Tungsten M-10 Microcarriers , ~0.7 μm , 6 g
165-2267	Tungsten M-17 Microcarriers , ~1.1 μm , 6 g
165-2268	Tungsten M-20 Microcarriers , ~1.3 μm , 6 g
165-2269	Tungsten M-25 Microcarriers , ~1.7 μm , 6 g

* Additional items required for operation of the Helios gene gun system: helium tank, grade 4.5 (99.995% pure) or higher, pressurized to the desired output pressure. Required items for tubing preparation: nitrogen tank, grade 4.8 (99.998% pure) or higher; nitrogen regulator (catalog #165-2425 recommended for U.S. standard connections); 100% ethanol (fresh for each microcarrier precipitation); spermidine; plasmid.

** Additional items required for operation of the PDS-1000/He system: helium tank, grade 4.5 (99.995% pure) or higher, pressurized to 2,600 psi; vacuum source.