

Multiporator® System

Applications

- Electroporation of eukaryotic cells
- Electrofusion of eukaryotic cells
- Electroporation of bacteria, yeasts and other microorganisms

Product features

- Compact unit is easily portable
- Easy to disinfect
- Easy to operate with clear, user-friendly display
- RS232 interface for data documentation with a printer or PC
- Outstanding safety levels provided by the built-in cuvette chamber
- CE-, UL- and CAS-approved
- Connectors for external electrodes
- Upgrade with optional functional modules
- Two-year warranty

Description

The basic unit of the Multiporator is made up of a module designed to electroporate eukaryotic cells. Two optional function modules extend the application range of the Multiporator to either cell fusion (p. 224) or the transformation of bacteria and yeasts (p. 225). No additional devices or external parts are necessary. Together with the buffers, cuvettes and chambers that are precisely suited for the corresponding applications, the Multiporator forms the perfect system.



- **The Multiporator with a variety of inserts and chambers:** Insert with Helix fusion chamber, insert for connecting external electrodes, insert for Micro fusion chambers, cuvette holder (from left to right) and two Micro fusion chambers (in front).

Multiporator® for eukaryotic cells

Applications

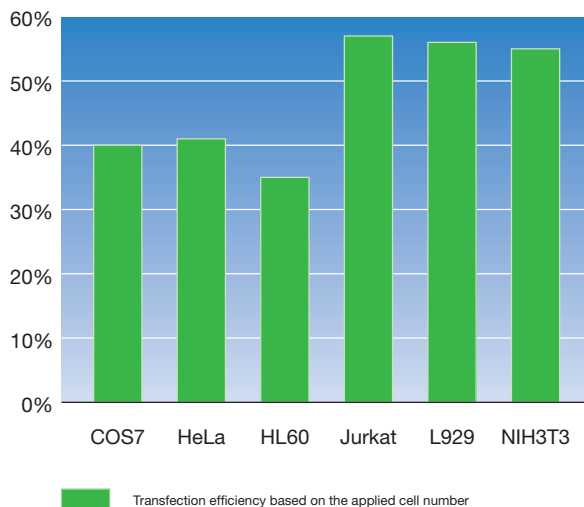
- Electroporation of animal and human cells, primary cells, plant cells and embryonal stem cells
- Stable and transient transfection of eukaryotic cells
- Efficient and gentle transfer of siRNA

Applications

- Directly adjustable voltage and time constants
- Patented microprocessor-controlled pulse discharge^{*1}
- Soft Pulse technology
- Optimized buffer system

^{*1} US Patent 6008038

- **Transient transfection of various adherent and suspension cell lines.** Cells were electroporated with the plasmid pEGFP using the Multiporator; over 50% transient transfection is possible based on the number of cells used



Technical specifications

Eukaryotic module

Pulse voltage:	20–1,200 V
Pulse form:	Exponentially diminishing, electronically controlled
Time constant:	15–500 µs, in increments of 5 µs
Multiple pulsing:	1–99, with 1 min time interval
Interface:	RS-232



Protocols are available at:
www.eppendorf.com/eukaryotic



Electroporation of eukaryotic cells

The Multiporator in combination with the specially designed electroporation buffers is optimally balanced for efficient and gentle electroporation of eukaryotic cells.

Soft Pulse technology applies extremely short electric pulses for the highest survival rates. Cell-damaging influences, such as changes in pH values, aluminum release and electrophoresis of the cell content, are minimized. The relevant parameters of voltage and pulse duration are directly set, and the patented electronic pulse discharge ensures that they will be maintained exactly—independent of the sample resistance—for reliable and reproducible results.

The hypoosmolar buffer system enables the cell to swell up, thus enabling easier membrane penetration which leads to high transfection rates. The ion composition is adapted to the inner cell environment and stabilizes the Na⁺/K⁺ gradient across the cell membrane.

Applications include the transfection of animal and human cell lines, embryonic stem cells, primary cells, oocytes and plant cells. Recent experiments have proven, that the multiporator is specially suited for the transfer of siRNA to cell lines and primary cells.^{*2, 3, 4}

^{*2} Sergio Gonzalez, Daniela Castanotto, Haitang Li, Simon Olivares, Michael C. Jensen, Stephen J. Forman, John J. Rossi, Laurence J.N. Cooper: Amplification of RNAi-Targeting HLA mRNAs (Molecular Therapy, Vol. 11, 2005)

^{*3} Reena P. Vishwanath, Christine E. Brown, Jamie R. Wagner, Hunsar B. Meechoovet, Araceli Naranjo, Christine L. Wright, Simon Olivares, Dajun Qian, Laurence J.N. Cooper, Michael C. Jensen: A quantitative high-throughput chemotaxis assay using bioluminescent reporter cells (Journal of Immunological Methods, 2005)

^{*4} Lindsay M. Shafer and Lee W. Slice: Anisomycin induces COX-2 mRNA expression through p38MAPK and CREB independent of small GTPases in intestinal epithelial cells, (Biochimica et Biophysica Acta (BBA) – Molecular Cell Research, 2005)

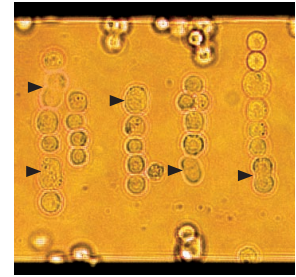
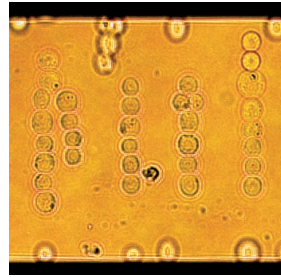
Multiporator® with module for cell fusion

Applications

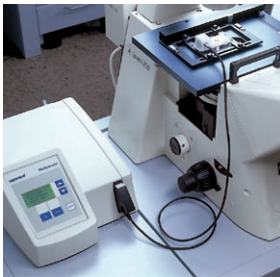
- Generation of tetraploid blastocysts
- Cloning of mammals
- Fusion of plant protoplasts
- Generation of hybridoma cells for the production of monoclonal antibodies
- Fusion of lipid vesicles

Product features

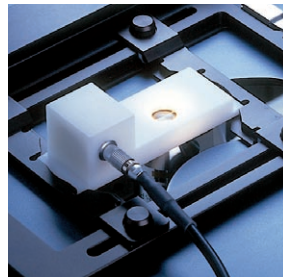
- Space-saving inner device module
- Definable alignment and pulse parameters
- Square wave pulse
- Optimized buffer system
- Micro fusion chamber for optimization



● Microscopic image of cells in the microfusion chamber. Alignment (left), fusion products (right, labeled)



- Multiporator with Micro fusion chamber for observing electrofusion under the microscope



- Micro fusion chambers 0.2 mm and 0.5 mm gap width:
 - Optimizes cell alignment and fusion parameters under microscopic control
 - Ideal for experiments with low cell numbers

Cell fusion

The fusion module expands the Multiporator's capabilities with highly efficient electrical cell fusion. Cells are brought into contact with one another in an electrical alternating-current environment and then fused with a direct-current pulse. Optimize your cell fusion parameters using the Electrofusion Buffer System with only a few cells in the Micro fusion chamber. When using the 0.2 mm Micro fusion chamber, the ideal parameters determined in this way can be directly transferred to the cell fusion in the Helix fusion chamber.

Technical Specifications

Fusion module

Pulse voltage:	5–300 V
Pulse width:	15–300 μ s, in increments of 5 μ s
Pulse form:	Square-wave pulse
Multiple pulsing:	1–99, in time intervals of 1 s
Sinus voltage:	1–10 V _{pp} , symmetrically to 0 V
Frequency:	2 MHz Sinus
Time range:	0–95 s before and after pulses



Protocols are available at: www.eppendorf.com/fusion



- Multiporator with cell fusion module and Helix fusion chamber. Helix fusion chamber: High-precision chamber with two platinum wires wound in parallel (0.2 mm gap width) feature a 250 μ l capacity

- Electrofusion Buffer System is mycoplasma-tested, sterile and endotoxin-free

Multiporator® with module for bacteria and yeasts

Applications

- Electroporation of bacteria, yeasts and other microorganisms

Product features

- Programmable voltage and optimized, fixed pulse times
- Preadjusted voltages for the most frequent applications
- Electronic safety circuit for arc prevention

Technical specifications

Bacteria and yeast module

Pulse voltage:	200–2,500 V
Pulse form:	Exponentially diminishing
Time constant:	5 ms (nominal)
Resistance:	600 Ω
Capacitor:	10 µF
Special feature:	Electronic safety switch for eliminating short-circuits



Protocols are available at:
www.eppendorf.com/bacteria

Ordering information

Description	Order no.
Multiporator	
for eukaryotic cells	4308 000.015
for eukaryotic cells, bacteria and yeasts	4308 000.023
for eukaryotic cells and cell fusion, with 1 Helix fusion chamber and 1 Micro fusion chamber	4308 000.031
for eukaryotic cells, bacteria, yeasts and cell fusion, with 1 Helix fusion chamber and 1 Micro fusion chamber	4308 000.040
Insert for connecting external electrodes (electrofusion/electroporation)	4308 021.004
Electroporation Buffer System	
Hypoosmolar, sterile, 100 ml	4308 070.501
Isoosmolar, sterile, 100 ml	4308 070.510
Electrofusion Buffer System	
Hypoosmolar, sterile, 100 ml	4308 070.528
Isoosmolar, sterile, 100 ml	4308 070.536
Helix fusion chamber , for cell fusion	4308 014.008
Micro fusion chamber	
gap width 0.2 mm	4308 030.003
gap width 0.5 mm	4308 031.000
Stand , for 10 Helix fusion chambers	4308 017.007



Electroporator 2510

Product features

- User-friendly, one-button control
- Programmable voltage and optimized, fixed pulse times
- Preadjusted voltages for the most frequent applications
- Requires minimum benchtop space
- Integrated cuvette holder
- Electronic safety circuit for arc prevention
- Data documentation via printer or PC



Technical specifications


Pulse voltage:	200–2,500 V
Pulse form:	Exponentially diminishing
Time constant:	5 ms (nominal)
Resistance:	600 Ω
Capacitor:	10 μF
Special feature:	Electronic safety switch for eliminating short-circuits

Description

The Electroporator 2510 enables the simple and rapid introduction of foreign DNA into bacteria, yeasts and other microorganisms. The device has been specially optimized for targeted transformation experiments with the highest possible efficiency. User-friendliness and instrument safety have been particular points of focus in the design of the unit.

Ordering information

Description	Order no.
Electroporator 2510, for bacteria and yeast	4307 000.658

 Protocols are available at:
www.eppendorf.com/bacteria

Electroporation cuvettes

Product features

- Plastic cuvette with aluminum electrodes
- Three sizes with 100 μl, 400 μl and 800 μl filling capacity (1 mm, 2 mm and 4 mm gap width)
- Individually wrapped and gamma-irradiated to ensure sterility
- Design ensures correct positioning in the cuvette holder
- Gap width marked on the side of every cuvette to simplify identification
- Frosted area permits easy labeling



Ordering information

Description	Order no.
Electroporation cuvettes, gap width 1 mm, 100 μl, sterile, 50 pcs.	4307 000.569
gap width 2 mm, 400 μl, sterile, 50 pcs.	4307 000.593
gap width 4 mm, 800 μl, sterile, 50 pcs.	4307 000.623
Cuvette stand for 16 electroporation cuvettes	4308 078.006