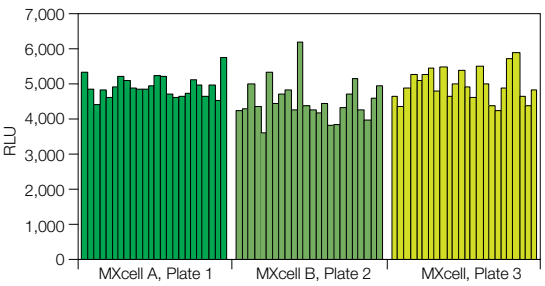
Gene Pulser MXcell™
Electroporation System

Optimize for Better Results

BIO-RAD

Electroporation Plates

Consistent and Reproducible Results
Electroporation plates designed specifically for use with the Gene Pulser MXcell electroporation system are available in three formats — 96-well for high-throughput or screening experiments and 24-well and 12-well for standard laboratory-scale experiments. These sterilized single-use plates are RNase and DNase-free and produce highly uniform results with low variability from well to well and plate to plate.



Electroporation performed on CHO cells using square-wave conditions on three different 24-well electroporation plates.
Percentage differences between all wells are within 20%, showing similar transfection efficiency from plate electroporated with one Gene Pulser MXcell system to plate electroporated with a different Gene Pulser MXcell system using identical electroporation conditions.

96–well plate

24–well plate

12–well plate

Gene Pulser® Electroporation Buffer

Enhanced Efficiency and Viability With a Single Universal Buffer
Electroporation in a multiwell format is a highly effective method that often requires a specialized buffer. Gene Pulser electroporation buffer is a low-resistance buffer with a proprietary, patent-pending formulation. It is designed to emulate the natural cytoplasmic composition of cells to minimize cell mortality, while ensuring highly efficient delivery of nucleic acids. The buffer can be used with any mammalian cell line, including primary and difficult-to-transfect cells.

Optimize Your Conditions

The high-throughput Gene Pulser MXcell electroporation system is designed to optimize your time in the lab by ensuring highly efficient delivery of molecules into a variety of mammalian cells, including primary and difficult-to-transfect cells.

Gene Pulser MXcell Electroporation System and Accessories

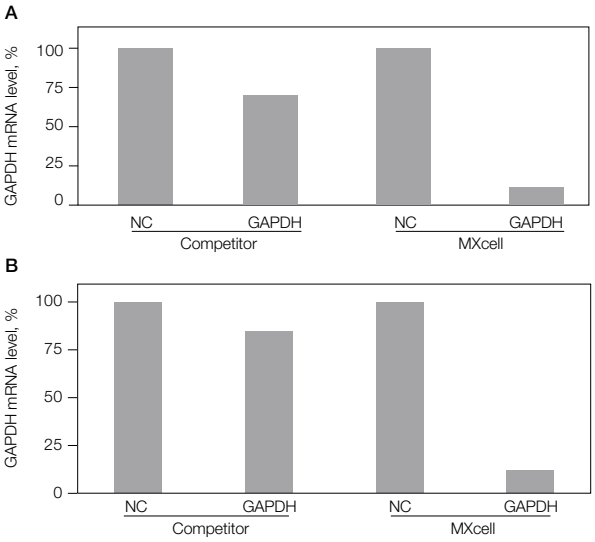
The compact Gene Pulser MXcell system consists of a power module and a plate chamber. The power module delivers both square and exponential waveforms and has an easy-to-use interface with multiple programming options, including gradient generation and preset optimization protocols. Protocols are easily saved and recalled in individual user files, and electroporation values derived from the last 100 experiments can be viewed with the data management option.

The plate chamber accommodates 96-, 24-, and 12-well plates for screening experiments and for multiple laboratory-scale electroporations. Plates fit firmly in the chamber, and the safety interlock ensures that a pulse will not be delivered with the lid open. The chamber is opened using the tabs to release the top, and the plate is gently lifted from the chamber, ensuring no well-to-well contamination.

Once charged, the power module rapidly delivers a pulse to the plate within the chamber. If an arc occurs, the system automatically registers the location of the arc and stores the information, allowing you to recover your sample while protecting the system.

Optimize Your Resources

Use fewer cells and less sample — siRNA or DNA — by defining your parameters. Optimizing your electroporation parameters will ensure that cell viability and transfection efficiency are at their highest levels.

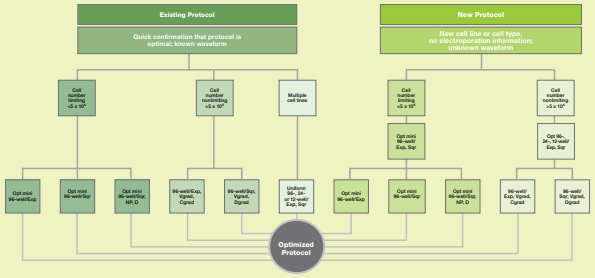


GAPDH mRNA levels in Jurkat cells postelectroporation.
A siLentMer™ Dicer-substrate siRNA duplex (GAPDH) or a scrambled negative control (NC) was delivered using the Gene Pulser MXcell system and Gene Pulser electroporation buffer, or a competitor's electroporator and cell line-specific buffer kit. Gene knockdown was measured by qPCR. **A**, GAPDH mRNA levels 4 hr postelectroporation; **B**, GAPDH mRNA levels 24 hr postelectroporation. After 4 hr, >88% knockdown was obtained using the Gene Pulser MXcell system and Gene Pulser electroporation buffer, compared to only 31% knockdown using a competitor's system.

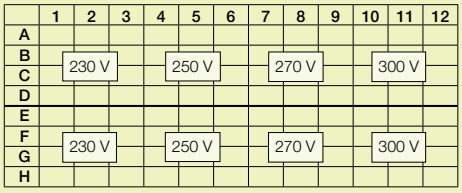
Optimize Your Research Time

With an easy-to-use interface, you can quickly program the Gene Pulser MXcell system with your existing electroporation protocol, or use preset optimization protocols to save even more time. A quick guide (right) assists in selecting the correct protocol. Process an entire multiwell plate — even a 96-well plate — in 2 minutes or less. Use a single plate to optimize multiple conditions.

Preset Protocol Decision Tree



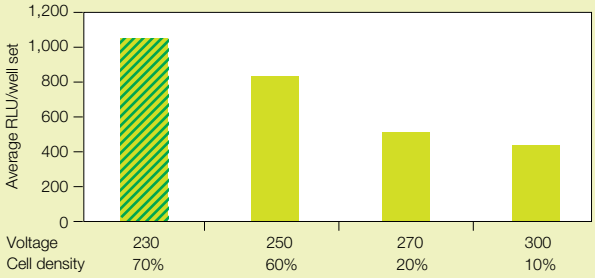
A. Electroporation parameters and plate setup



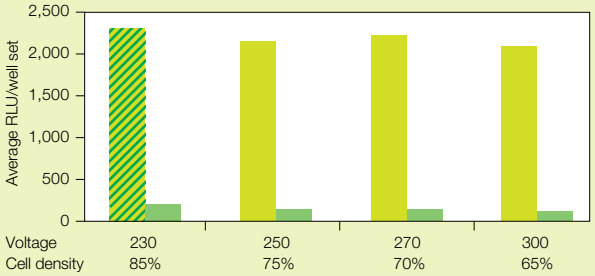
Plasmid, HeLa cells
C = 200 µF

siRNA, 5F2C cells
t = 20 ms
C = 2,000 µF

B. Plasmid transfection with exponential-decay waveform in HeLa cells



C. siRNA transfection with square waveform in 5F2C cells



Optimization of electroporation conditions for plasmid and siRNA delivery on a single 96-well electroporation plate. A, top half of a 96-well electroporation plate was used for plasmid delivery into HeLa cells, while bottom half was used for siRNA delivery into 5F2C cells (CHO cells stably expressing a luciferase gene). For each cell line, four different electroporation protocols (in triplicate) were used; C = capacitance; V = voltage; t = time; **B**, bars represent average relative light units (RLU) obtained from transfection with luciferase-encoded plasmid. Optimal conditions for plasmid delivery into HeLa cells were determined to be 230 V, 200 µF, 1,000 Ω; **C**, bars represent average RLU obtained from transfection with scrambled negative control (■) and luciferase siRNA (■). Optimal siRNA conditions in B and C were determined to be 230 V, 2,000 µF, and 20 ms, as denoted by hashed bars.

Optimize Your Reading Time

Take advantage of Bio-Rad's extensive library of electroprotocols found at **www.bio-rad.com**. The electroprotocols were submitted by scientists worldwide and include a variety of cell types, providing starting conditions for your experiments. Submit your electroprotocol at **www.bio-rad.com/electroprotocols/** and receive a free gift.

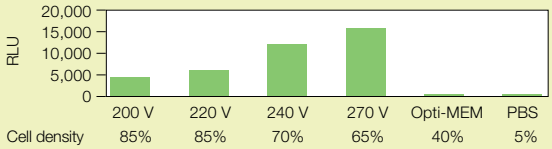
Optimize Your Experimental Conditions

The 96-well format allows you to program up to 24 different electroporation protocols with parameter variations, including voltage, resistance, duration, or capacitance on a single electroporation plate.

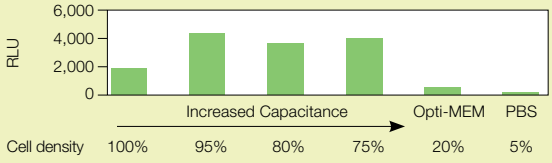
The electroporation plates are divided into well sets (a group of 4 individual wells), enabling replication of experiments for accurate results.

Experimental results show high reproducibility and consistency between well sets and between different plate formats.

Square waveform optimization



Exponential waveform optimization



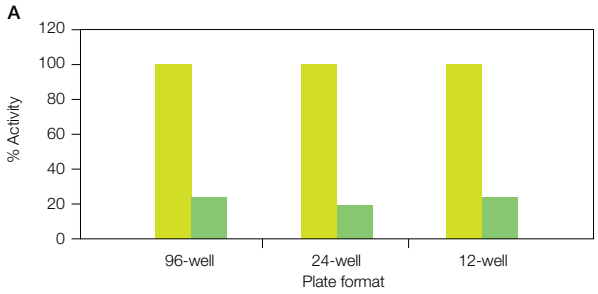
Optimization of electroporation conditions. Human primary fibroblast cells denoted as FS (foreskin) were used to compare square waveform with varying voltages (top) to exponential decay waveform with varying capacitance values (bottom) in a 96-well plate. Although the exponential waveform resulted in good data overall, the square waveform resulted in the highest transfection efficiency and cell viability when compared side by side on the same plate.

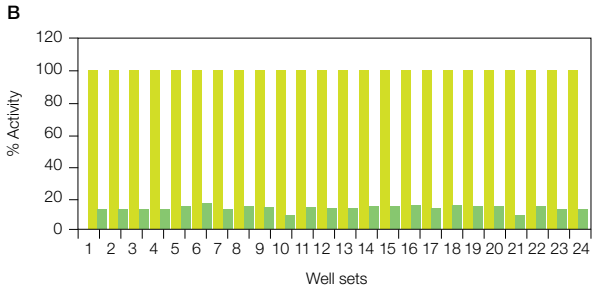
Optimize Your Bench Space

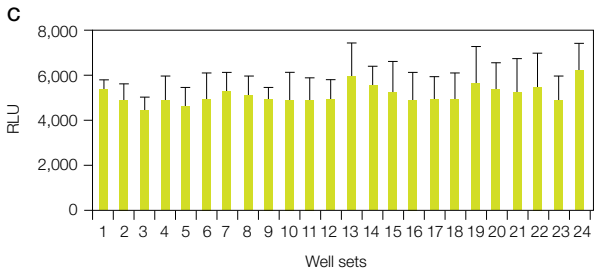
The Gene Pulser MXcell system can perform high-throughput experiments, as well as multiple standard laboratory-scale experiments. Use the 96-well electroporation plate for screening experiments and then scale up to larger cell numbers with 24- or 12-well electroporation plates.

Electroporation Plate Requirements

Plate	Cell Density	Volume	Well Sets
96-well	1 x 10^5–2 x 10^6	100–200 µl	24
24-well	5 x 10^5–8 x 10^6	500–800 µl	24
12-well	1 x 10^6–1.5 x 10^7	1.0–1.5 ml	12







Electroporation using the Gene Pulser MXcell system yields uniform results. A, uniformity in transfection of siRNA between different plate formats. Data are pooled from well sets of a 96-well plate; **B**, uniformity in transfection of siRNA between well sets. Luciferase activity was measured from cells transfected with scrambled negative control (■) or luciferase siRNA (■); **C**, uniformity in transfection of plasmids between well sets. Bars represent RLU obtained from transfection with luciferase-encoded plasmid.

Specifications

Outputs	
Waveform	Exponential decay or square wave
Voltage	10–500 V in 2 V increments
Capacitance	25–2,475 µF in 25 µF increments
Resistance (parallel)	50–1,500 Ω in 50 Ω increments, plus infinity
Sample resistance	10 Ω minimum at 10–500 V; 125 Ω with Gene Pulser electroporation buffer
Square-wave timing	10–500 V, 0.05–9999.95 msec pulse length, 1–3 pulses, 0.1–10 sec pulse interval
General	
Input voltage	100–120 VAC or 220–240 VAC, 50/60 Hz
Power	Maximum 240 W (during short charging periods)
Operating environment	Temperature 0–35°C, humidity 0–95% (noncondensing)
Regulatory	Safety EN 61010, EMC EN 61326 Class A
Dimensions*	31 x 30 x 14 cm
Weight	6.62 kg

* Includes power module and plate chamber.

Ordering Information

Catalog #	Description
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, instructions
165-2671	**Power Module**
165-2672	**Plate Chamber**
165-2681	**96-Well Electroporation Plate**
165-2682	**24-Well Electroporation Plate**
165-2683	**12-Well Electroporation Plate**
165-2676	**Gene Pulser Electroporation Buffer**, 10 x 1.8 ml
165-2677	**Gene Pulser Electroporation Buffer**, 30 ml

For additional product information, visit us on the Web at **www.bio-rad.com/MXcell/**

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