Electrodes & Chambers

BTX offers a broad range of electrodes and chambers, specialized for tissue, cell type and application. Please consult our Electrodes Selection Guide at the beginning of this section for assistance in choosing the optimum electrodes and chambers for your needs.

Алматы (727)345-47-04 Ангарск (3955)60-70-56 Архангельск (8182)63-90-72 Астрахань (8512)99-46-04 Барнаул (3852)73-04-60 Белговещенск (4162)22-76-07 Брянск (4832)59-03-52 Владивосток (423)249-28-31 Владикавказ (8672)28-90-48 Владимир (4922)49-43-18 Волгоград (844)278-03-48 Вологда (8172)26-41-59 Воронеж (473)204-51-73 Екатеринбург (343)384-55-89 Иваново (4932)77-34-06 Ижевск (3412)26-03-58 Иркутск (395)279-98-46 Казань (843)206-01-48 Калининград (4012)72-03-81 Калуга (4842)92-23-67 Кемерово (3842)65-04-62 Киров (8332)68-02-04 Кострома (4966)23-41-49 Кострома (4962)23-41-49 Кострома (4962)23-41-49 Кострома (4962)23-41-49 Краснодар (861)203-40-90 Красноярск (391)204-63-61 Курсак (3522)50-90-47 Липецк (4742)52-20-81

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Магнитогорск (3519)55-03-13 Москва (495)268-04-70 Мурманск (8152)59-64-93 Набережные Челны (8552)20-53-41 Нижний Новгород (831)429-08-12 Новокузнецк (3843)20-46-81 Ноябрьск (3496)41-32-12 Новосибирск (383)227-86-73 Омск (3812)21-46-40 Орел (4862)44-53-42 Оренбург (3532)37-68-04 Пенза (8412)22-31-16 Петрозаводск (8142)55-98-37 Псков (8112)59-10-37 Пермь (342)205-81-47 Ростов-на-Дону (863) 308-18-15 Рязань (4912)46-61-64 Самара (846)206-03-16 Санкт-Петербург (812)309-46-40 Саратов (845)249-38-78 Севастополь (8692)22-31-93 Саранск (842)22-96-24 Симферополь (3652)67-13-56 Смоленск (4812)29-41-54 Сочи (862)225-72-31 Ставрополь (8652)20-65-13 Сургут (3462)77-98-35 Сыктывкар (8212)25-95-17 Тамбов (4752)50-40-97 Тверь (4822)63-31-35

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Тольятти (8482)63-91-07 Томск (3822)98-41-53 Тула (4872)33-79-87 Тюмень (3452)66-21-18 Ульяновск (8422)24-23-59 Улан-Удэ (3012)59-97-51 Уфа (347)229-48-12 Хабаровск (4212)92-98-04 Черябинск (351)202-03-61 Черяговец (8202)49-02-64 Чита (3022)38-34-83 Якутск (4112)23-90-97 Яроспавль (4852)69-52-93

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Electrode Selection Guide

Application	Cell/Tissue	Instrument	Electrode Type	Field of Study	Comments
Ex Vivo	Brain tissue Brain slice	Gemini X2 ECM 830 ECM 2001+	Tissue Slice Chamber Tissue Chamber L-Shaped Needle	Neurobiology	
	Retina Cornea	Gemini X2 ECM 830 ECM 2001+	Tissue Slice Chamber Tissue Chamber Genepaddles	Developmental Biology Neurobiology	Iranstection of delicate brain tissue and tissues with unique morphologies are more easily transfected with the BTX tissue slice chamber, L-Shaped platinum needles or other BTX electrodes.
	Tumor Skin	Gemini X2 ECM 830 ECM 2001+	Tissue Chamber Tweezertrodes Genetrodes	Cell Biology Ophthalmology Cancer Research Gene Therapy	
	Oocytes	Gemini X2 ECM 830 ECM 2001+	Oocyte Electrodes	Transgenic animals	Transfection of oocytes to generate animal models.
In Utero	Embryos	Gemini X2 ECM 830 ECM 2001+	Tweezertrodes Genepaddles Triple Electrode Tweezertrodes	Developmental Biology Neurobiology Neurology Embryology	The smaller size platinum Tweezertrodes (1 mm, 3 mm, and 5 mm) are ideal for use with early stage embryos.
	Muscle	Gemini X2 ECM 830 ECM 2001+ Agile Pulse in Vivo	2-Needle Array Genetrodes Tweezertrodes Needle Array Electrodes	Gene Therapy	
	Brain	Gemini X2 ECM 830 ECM 2001+	L-Shaped Needle Tweezertrodes Genepaddles	Neurobiology	
In Vivo	Skin	Gemini X2 ECM 830 ECM 2001+ Agile Pulse in Vivo	2-Needle Array Genetrodes Tweezertrodes Needle Array Electrodes	Vaccine Development	The numerous electrodes offered by BTX can be used for multiple tissue types depending on your specific application. For more assistance, please contact BTX Technical Support.
	Retina	Gemini X2 ECM 830 ECM 2001+	Tweezertrodes Genepaddles	Ophthalmology	
	Cornea	Gemini X2 ECM 830 ECM 2001+	Tweezertrodes Genepaddles	Ophthalmology	
	Tumors	Gemini X2 ECM 830 ECM 2001+	2-Needle Array Caliper Electrode Genetrodes Tweezertrodes	Cancer Research	
	Other Soft Tissue	Gemini X2 ECM 830 ECM 2001+	2-Needle Array Caliper Electrode Genetrodes Tweezertrodes Genepaddles L-Shaped Needle	Cell Biology Neurobiology Biological Sciences	
In Ovo	Chick Embryo	Gemini X2 ECM 830 ECM 2001+	L-shaped Genetrodes L-Shaped Needle	Developmental Biology Embryology	Genetrodes are available in four different sizes. L-shaped needle electrodes provide a finer diameter needle in various length tips to best suit the dimensions of your target tissue.
	Zebrafish	Gemini X2 ECM 830 ECM 2001+	L-shaped Genetrodes Tissue Chamber Genepaddles Tweezertrodes	Developmental Biology	
	Xenopus	Gemini X2 ECM 830 ECM 2001+	L-shaped Genetrodes Genepaddles Tweezertrodes	Regenerative Medicine Embryology	
	Mouse Oocyte/ Zygote	Gemini X2 ECM 830 ECM 2001+	Oocyte Electrode	Regenerative Medicine Embryology	
	Plant tissue	Gemini X2 ECM 830 ECM 2001+	Tissue Chambers, Microslides Tweezertrodes, Cuvettes	Cellular Physiology	
	Seeds	Gemini X2	Tissue Chambers, Microslides Tweezertrodes, Cuvettes	Food and Agriculture	Various electrodes can be used for plant applications and depend on the target tissue.
Plant	Anthers	Gemini X2 ECM 830 ECM 2001+	Tissue Chambers, Microslides Tweezertrodes, Cuvettes	Plant Biology	
	Pollen	Gemini X2	Tissue Chambers, Microslides Tweezertrodes, Cuvettes	Plant Embryology	
Adherent In Vitro	Mammalian Cells in Plates	Gemini X2 ECM 830 ECM 2001+	Petri Dish Petri Pulser Adherent Electrode	Cell Biology Cancer Neurobiology	Electrodes for transfecting while adherent are a good choice for cells sensitive to tranfection or polarized cells.

Genetrodes® Electrodes

Needle-style reusable electrodes for in vivo, ex vivo and in ovo gene delivery



Applications

- In vivo gene delivery
- Ex vivo gene delivery
- In ovo gene delivery

Genetrodes are paired, reusable, needle-style or L-shaped type electrodes that are ideal for in vivo and in ovo electroporation applications, including drug and gene delivery. Genetrodes come in two styles—straight needle type gold tip electrodes with beveled ends or bent L-shaped electrodes with blunt ends. Each style comes as a pair of electrodes.

The electrodes are either inserted into a tissue or placed parallel to the target tissues following injection of the molecule of interest. An electroporation pulse is delivered using a BTX Electroporation System, such as the ECM 830, ECM 2001+ or Gemini X2. The electric field introduced by the Genetrode electrode causes transient pores to form in the cells of the tissue, allowing uptake of the molecules into the cells.

Specifications

Generator Compatibility	ECM 830, ECM 2001+, Gemini X2
Voltage Range	0 to 200 VDC
Pulse Length Range	10 µs to 99 ms
Diameter	Electrode tip 0.5 mm
Genetrode Holder	
Electrode Gap	1 to 10 mm range
Life Span	Approximately 1500 pulses

Genetrodes may be cleaned with a mild detergent and sterilized with ethanol or ethylene oxide. Properly maintained Genetrodes have a life span of approximately 1500+ pulses, and are compatible with most BTX electroporation systems.

Order #	Description	
45-0113	Genetrodes, 5 mm Straight (GOLD TIP)	
45-0114	Genetrodes, 10 mm Straight (GOLD TIP)	
45-0115	Genetrodes, 5 mm L-Shape (GOLD TIP)	
45-0116	Genetrodes, 3 mm L-Shape (GOLD TIP)	
45-0117	Genetrodes, 1 mm L-Shape (GOLD TIP)	
45-0160	Genetrodes Kit, 5 mm Straight (GOLD TIP), with 45-0203 holder and 45-0216 cables	
45-0161	Genetrodes Kit, 10 mm Straight (GOLD TIP) with 45-0203 holder and 45-0216 cables	
45-0162	Genetrodes Kit, 5 mm L-Shape (GOLD TIP) with 45-203 holder and 45-0216 cables	
45-0163	Genetrodes, 3 mm L-Shape (GOLD TIP) with 45-0203 holder and 45-0216 cables	
45-0164	Genetrodes, 1 mm L-Shape (GOLD TIP) with 45-0203 holder and 45-0216 cables	
45-0203	Genetrode/Genepaddle Holder	
Required for connection to ECM 830 and Gemini X2		
45-0216	Micrograbber to Banana Plug Connection Cables, 10 ft	
Required for connection to ECM 2001+		
45-0216	Micrograbber to Banana Plug Connection Cables, 10 ft	
45-0088	Female/Female Adapter Set for Banana Plug Cables	

2-Needle Array Electrodes

In vivo style electrode specifically designed for skin or muscle gene delivery



Applications

- In vivo drug or gene delivery
- Intra-muscular gene therapy
- Intra-dermal gene therapy

Among the non-viral techniques for gene transfer in vivo, the direct injection of plasmid DNA into muscle is simple, inexpensive, and safe. In vivo gene delivery by injection and electroporation of DNA into muscle tissue has been shown to enhance gene expression by 100-fold compared to injection alone. DNA vaccination by direct in vivo administration of plasmid-based DNA vectors has proven to be very effective in animal models. It has been demonstrated in the literature that non-viral electroporation enhances gene expression in muscle greatly, making it possible to induce immune response in large animals.

The 2-Needle Array Electrode is an in vivo style electrode specifically designed for intra-muscle or intra-dermal drug or gene delivery. It is available with 5 mm and 10 mm electrode gaps (distance between electrodes). The 45-0167 handle is

Specifications

Generator Compatibility	ECM 830, ECM 2001+, Gemini X2
Voltage Range	0 to 500 VDC
Pulse Length Range	1 µs to 99 ms in PBS
Needles	20 mm length, stainless steel

designed for the 45-0120 10 mm needle tips and used for larger muscle masses, such as rat gastrocnemius. The 45-0168 handle is designed for the 45-0121 5 mm needle tips and is recommended for smaller muscle masses, such as mouse tibialis. Other species and tissues may be electroporated with the 2-Needle Array.

The kit consists of a reusable Delrin 2-needle array handle and disposable two-needle array assemblies. The needle array assemblies are conveniently packaged in "six packs." The needles themselves are made of medical grade stainless steel.

To use, grasp the needle array handle and position over a needle array assembly. Push to secure the needle array onto the handle. Attach the handle to a BTX pulse generator via the high voltage banana cables. Remove the needle safety shield, place into the tissue, and deliver the pulse. Discard the needle array and prepare for the next experiment.

Order #	Description	
45-0168	2-Needle Array Kit, 5 mm gap, Pkg. of 6, with 8 cm Delrin Handle	
45-0167	2-Needle Array Kit, 10 mm gap, Pkg. of 6, with 8 cm Delrin Handle	
45-0121	2-Needle Array, 5 mm gap, Pkg. of 6	
45-0120	2-Needle Array, 10 mm gap, Pkg. of 6	
45-0206	2-Needle Array Handle, for 45-0121 (5 mm)	
45-0205	2-Needle Array Handle, for 45-0120 (10 mm)	
Required for connection to ECM 830 and Gemini X2		
45-0088	Female/Female Adapter Set for Banana Plug Cables	
45-0217	Banana to Banana Cables, Red and Black, 10 ft	
Required for connection to ECM 2001+		
45-0088	Female/Female Adapter Set for Banana Plug Cables	

Tweezertrodes[™] Electrodes

Tweezer-style reusable electrodes for in vivo and in utero applications

Applications

- In vivo drug or gene delivery
- Ex vivo drug or gene delivery
- In utero drug or gene delivery

Tweezertrodes electrodes are reusable non-invasive, tweezer-style electrodes for drug or gene delivery in animal tissues. Tweezertrodes may be used for many in vivo applications, including in utero and ex-vivo gene transfection, electroporation therapy, and transdermal drug delivery.

Tweezertrodes consist of a standard 11.5 cm tweezer that has been modified with stainless steel circular or disk electrodes at the tip. The gap between the electrodes disks may be adjusted from under 1 mm to over 2 cm. Tweezertrodes are available in various sizes and two different metal alloys either platinum or stainless steel. Platinum Tweezertrodes are available in 1 mm, 3 mm, 4 mm and 7 mm diameters and stainless steel are available as either 7 mm or 10 mm diameters.

Triple Tweezertrodes have three electrode contacts with adjustable position and polarities. This type of triple electrode been shown to improve the efficiency of electrical field distribution for in utero electroporation applications (Dal Maschio, M. et al. "High-performance and site-directed in utero electroporation by a triple-eletrode probe." *Nature Communications 3* (2012): 960).

These electrodes connect to BTX generators using the Tweezertrodes Connection cables (45-0204). Tweezertrodes may be cleaned with a mild detergent and sterilized with 70% ethanol or ethylene oxide.

Applications & Use

Following localized or systemic injection of the molecule of interest, the Tweezertrodes electrode disks are used to grasp the tissue of interest. An electroporation pulse is then applied;

Specifications

Generator Compatibility	ECM 830, ECM 2001+, Gemini X2
Voltage Range	0 to 200 VDC (do not use AC current)
Pulse Length Range	1 µs to 200 ms
Pulse Number Range	1 to 99 (depending on voltage)
Operating Temperature	5°C to 40°C
Intended Use	Indoor use only
Relative Humidity	20 to 80%



initiating pore formation and incorporation of the molecule into the cells of the tissue in direct contact with the electrode disk. Tweezertrodes can be used to facilitate localized electroporation of various preparations. Application of these electrodes for in utero transfection, transdermal drug delivery and electroporation therapy have been described. Tweezertrodes have proven particular useful for embryonic or even spermatogonial cell electroporation for effective production of transgenic and knockout mice. The design of the Tweezetrodes is also particular suited for zebrafish applications for studies aiming to rapidly study gene function in whole organism.

Item #	Description	
45-2053	Platinum Tweezertrode, 1 mm Diameter	
45-0486	Platinum Tweezertrode, 1 mm Diameter (includes 45-0204 cables)	
45-2054	Platinum Tweezertrode, 3 mm Diameter	
45-0487	Platinum Tweezertrode, 3 mm Diameter (includes 45-0204 cable)	
45-2055	Platinum Tweezertrode, 5 mm Diameter	
45-0489	Platinum Tweezertrode, 5 mm Diameter (includes 45-0204 cables)	
45-2056	Platinum Tweezertrode, 7 mm Diameter	
45-0488	Platinum Tweezertrode, 7 mm Diameter (includes 45-0204 cables)	
45-0524	Platinum Tweezertrode, 1 mm Flat	
45-0525	Platinum Tweezertrode Kit, 1 mm Flat (includes 45-0204 cable)	
45-0118	Stainless Tweezertrode Electrode, 7 mm Diameter	
45-0165	Stainless Tweezertrode Kit, 7 mm (includes 45-0204 cable)	
45-0119	Stainless Tweezertrode Electrode, 10 mm Diameter	
45-0166	Stainless Tweezertrode Kit, 10 mm (includes 45-0204 cable)	
45-0493	Triple Electrode Tweezertrode, 3 mm	
45-0494	Triple Electrode Tweezertrode, 5 mm	
Required for connection to ECM 830 and Gemini X2		
45-0204	Adapter Banana Plug Cables, Red and Black	
Required for connection to ECM 2001+		
45-0204	Adapter Banana Plug Cables, Red and Black	
45-0088	Female/ Female Adapter Set for Banana Plug Cables	
45-0083	Coaxial to Banana Plug Cables, Red and Black, 10 ft	

Oocyte Electrodes

Reusable slide-type electrode for drug or gene delivery into oocytes or zygotes including CRISPR

Applications

- In vivo drug or gene delivery including CRISPR
- Transgenic animal model creation including methods using CRISPR

The Oocyte Electrode is a reusable slide type of electrode specifically designed for drug or gene delivery into oocytes and/ or zygotes. This electrode can be used with a microscope so that individual oocytes can be visualized during electroporation. This electrode is particularly useful for the generation of transgenic animals including use with the CRISPR/Cas 9 construct to both knock-in and knock-out targeted genes.

The Oocyte Electrode is composed of platinum electrodes arranged in parallel with a 1 mm gap between them mounted on a glass slide. It may be cleaned with a mild detergent and sterilized with 70% ethanol. This electrode requires the use of Mini Micro-Grabber Cables and Tweezertrode Adapter Cables.

Specifications

Generator Compatibility	Gemini X2, ECM 830, ECM 2001+
Voltage Range	0 to 200 VDC (Do not use AC current)
Pulse Length Range	10 µs to 10 s
Pulse Number Range	1 to 99 (depending on voltage)
Operating Temperature	5°C to 40°C
Intended Use	Indoor use only
Relative Humidity	20 to 80%

Item #	Decription	
45-0495	Oocyte Electrode, Platinum Plated, 10 mm, 1 mm gap (Electrode only)	
45-0496	Oocyte Electrode Kit, Platinum Plated, 10 mm, 1 mm gap (with cables)	
Required for connection to ECM 830 and Gemini X2		
45-0503	Micrograbber Cables for Tissue Slice Chamber	
45-0204	Adapter Banana Plug Cables, Red and Black	
Required for connection to ECM 2001+		
45-0503	Micrograbber Cables for Tissue Slice Chamber	
45-0204	Adapter Banana Plug Cables, Red and Black	
45-0088	Female/Female Adapter Set for Banana Plug Cables	

Genepaddles[™] Electrodes

Paddle-style reusable electrodes for in vitro embryo and in vivo gene delivery



Applications

- In vivo gene delivery
- In vitro embryo gene delivery

Genepaddles Electrodes are paddle-style reusable electrodes suitable for a variety of applications. Genepaddles come in two sizes, each size consisting of a pair of electrodes. The Genepaddles feature either rectangular 3×5 mm paddles or 5×7 mm paddles. These two sizes are designed to target various electroporation areas.

These electrodes are connected to either micrograbber connection cables or square post adaptors and connection cables which interface with our ECM 830, ECM 2001+ or Gemini X2 pulse generators. The Genepaddles are positioned in parallel at a predetermined gap within a tissue using the Genetrode Holder.

Genepaddles may be cleaned with a mild detergent and sterilized with 70% ethanol or ethylene oxide. Properly maintained Genepaddles have a life span of approximately 1500+ pulses.

Specifications

Generator Compatibility	Gemini X2, ECM 830, ECM 2001+
Voltage Range	0 to 200 VDC
Pulse Length Range	1 µs to 99 ms
Pulse Number Range	1 to 99 (depending on voltage and pulse length settings)
Total number of pulses	Approximately 1500 pulses per set of electrodes

Ordering Information

Order #	Description	
45-0122	Genepaddles, 3 x 5 mm (need 45-0203 holder and 45-0216 cables)	
45-0123	Genepaddles, 5 x 7 mm (need 45-0203 holder and 45-0216 cables)	
45-0169	Genepaddles Kit, 3 x 5 mm (includes 45-0203 holder and 45-0216 cables)	
45-0170	Genepaddles Kit, 5 x 7 mm (includes 45-0203 holder and 45-0216 cables)	
45-0203	Genetrode/Genepaddle Holder	
Required for connection to ECM 830 and Gemini X2		
45-0216	Micrograbber to Banana Plug Connection Cables, 10 ft	
Required for connection to ECM 2001+		
45-0216	Micrograbber to Banana Plug Connection Cables, 10 ft	
45-0088	Female/Female Adapter Set for Banana Plug Cables	

Platinum Needle L-Shaped Electrode

Ultra thin diameter electrodes for in vivo applications using fragile tissue types



Applications

- Ex vivo tissues, gene, or drug delivery
- In vivo tissues, gene, or drug delivery
- Nuclear transfer

These needle style platinum electrodes are specifically designed for in vivo applications on the most fragile of tissue types, such as brain tissue. In vivo transfection of delicate brain tissue can be difficult to perform without damage to the tissue. The ultra thin electrode enables transfection for greater ease and efficiency in fragile or inaccessible tissue. These electrodes are ideal for delivering the electrical pulses directly to oocytes or embryos for nuclear transfer fusion applications. Our L-shaped electrodes are available in a 3 mm tip length in order to accommodate the most research needs in small animal models.

Specifications

Generator Compatibility	Gemini X2, ECM 830, ECM 2001+
Voltage Range	0 to 100 VDC
Pulse Length Range	10 µs to 100 ms
Needle Length	3 mm
Electrode Length	3 mm
Electrode Material	Platinum

Item #	Decription	
45-0510	Platinum Needle L-Shaped Electrode Kit, 3 mm, includes cables	
45-0509	Platinum Needle L-Shaped Electrode, 3 mm, Needle Electrode only	
Required for connection to ECM 830 and Gemini X2		
45-0216	Micrograbber to Banana Plug Connection Cables, 10 ft	
Required for co	Required for connection to ECM 2001+	
45-0216	Micrograbber to Banana Plug Connection Cables, 10 ft	
45-0088	Female/Female Adapter Set for Banana Plug Cables	

AgilePulse[™] Needle Array Electrodes

Specialized for gene and vaccine delivery





Applications

- DNA vaccine delivery
- Cancer vaccine research
- Intra-dermal transfection
- Gene therapy research
- Intra-muscular gene delivery
- Chemotherapeutic research

AgilePulse Needle Array Electrodes are miniature needles designed to provide superior, highly-uniform electric fields in dermal or muscular tissue as part of the AgilePulse In Vivo Gene Delivery Electroporation System. The miniature parallel-needle array is inserted directly into the target site for fast, reliable in vivo electroporation. The electric fields produced are the closest approximation of parallel plate electrodes, treating approximately 80% of the target area with 95% of the applied electric field.

The needle array requires the needle array handle, which includes the electrode connector cable. Several needle lengths and row spacing are available for various intra-dermal or intra-muscular applications. These needle arrays can be used for up to 500 pulses with proper care and maintenance.

Features

- Uniform, reliable electric fields
- Miniature needles minimize tissue trauma
- Disposable, sterile
- Medical-grade plastic and surgical steel construction
- Safety-assured design
- Multiple configurations and sizes to choose

Ordering Information

Item #	Description
47-0040	4-Needle Array, 4 mm gap, 2 mm length
47-0043	4-Needle Array, 4 mm gap, 3 mm length
47-0045	4-Needle Array, 4 mm gap, 5 mm length
47-0050	6-Needle Array, 4 mm gap, 2 mm length
47-0060	6-Needle Array, 6 mm gap, 2 mm length
47-0070	6-Needle Array, 6 mm gap, 10 mm length
47-0080	6-Needle Array, 6 mm gap, 25 mm length
47-0086	6-Needle Array, 6 mm gap, 16 mm length
47-0000	Needle Array Handle

Specifications

Item #	47-0040	47-0043	47-0045	47-0050	47-0060	47-0070	47-0080	47-0086
Needle Material	Stainless Steel							
Needle Tip	Fine Point	Trocar Point	Trocar Point					
Spacing in Row	1.5 mm							
Spacing Between Rows	4 mm	4 mm	4 mm	4 mm	6 mm	4 mm	4 mm	6 mm
Needles per Row	4	4	4	6	6	6	6	6
Needle Diameter	0.3 mm	0.7 mm	0.7 mm					
Needle Length	2 mm	3 mm	5 mm	2 mm	2 mm	10 mm	25 mm	16 mm

Petri Dish Electrode

To electroporate adherent cells or tissue grown in a Petri dish that functions as the electroporation chamber



Applications

- Adherent mammalian cell transfections
- Plant tissue cell transfections

The Petri Dish Electrode is designed to be used with a 100 mm Petri dish that functions as the electroporation chamber. The Petri Dish Electrode is used to electroporate adherent cells or tissue grown in a Petri dish. To perform electroporation, simply add the exogenous molecule of interest into the electroporation buffer. The buffer can range in volume from 10 ml to 50 ml and is added to the cells grown in the plate. The electrode is lowered into the Petri dish containing the sample and pulsed.

The electrode assembly has a 2 mm gap size. It contains parallel stainless steel electrodes which generate a homogeneous field. The Petri Dish Electrode is compatible with most BTX Generators.

Specifications

Generator Compatibility	Gemini X2, ECM 830, ECM 2001+
Voltage Range	0 to 2000 V
Volume Range	10 to 50 ml
Gap size	2 mm
Autoclavable	No
Field type	Homogeneous
Pulse Length	10 µs to 10 ms

Ordering Information

Item #	Desciption	
45-0100	Petri Dish Electrode, 2 mm Gap, for 100 mm Petri Dish (Model 366)	
Required for	Required for connection to ECM 2001+	
45-0088	Female/Female Adapter Set for Banana Plug Cables	

Caliper Electrodes

In vivo style reusable electrodes



Applications

- In Vivo Drug or Gene Delivery
- Transdermal Applications
- Intact Plant Applications

BTX Caliper Electrodes are in vivo style reusable electrodes used for a variety of applications, including drug and gene delivery. The electrodes span the target area and deliver electroporation pulses following injection of the molecule of interest. The electric field introduced by the caliper electrodes cause transient pores to form in the cells of the tissue, allowing uptake of the molecules into the cells.

Caliper electrodes are available in two sizes. Each size consists of a caliper and a pair of electrode plates. The $1.0 \times 1.0 \text{ cm}$ electrode is used in smaller animals with a smaller tissue surface area, while the $2.0 \times 2.0 \text{ cm}$ is used to target slightly larger surface areas. The end plates of the electrode may be adjusted by using the black roller mounted on the caliper. They may be cleaned with a mild detergent and sterilized with ethanol or ethylene oxide. Properly maintained caliper electrodes have an unlimited lifetime.

Specifications

Generator Compatibility	ECM 830, ECM 2001+, Gemini X2
Voltage Range	0 to 500 V
Pulse Length Range	10 μs to 99 ms (multiple pulsing permitted)
Electrode Gap	0.1 to 13 cm
Electrode Dimensions	1 x 1 cm brass or 1.5 cm x 1.5 cm and 2 x 2 stainless steel

Item #	Plate Dimensions	Material	
45-0101	1 x 1 cm	Brass	
45-0102	1.5 x 1.5 cm and 2 x 2 cm	Stainless Steel	
Item #	Desciption		
Required for	for connection to ECM 2001+		
45-0088	Female/Female Adapter Set for Banana Plug Cables		

Petri Dish Platinum Electrodes & Chambers for Tissues

Electrodes and chambers for ex vivo tissues gene or drug delivery using large or uniquely shaped tissue samples



Applications

• Ex vivo tissues gene or drug delivery

The tissue chamber is specifically designed to handle ex vivo tissue samples that are either larger than normal or have a unique shape making it difficult to transfect using other standard electrodes. Transfection of ex vivo tissue samples is an efficient method to deliver genes and drugs to a wide range of tissue types including cornea, muscle, and skin. With the use of this chamber, transfection is made simple and easy. The chambers are available in two widths, 15 mm and 5 mm, to accommodate many tissue sample sizes. The reusable chamber is made of a lab grade Pyrex glass Petri dish and two platinum electrodes embedded in an inert silicone, creating the rectangular chamber that provides a homogenous field of energy for high efficiencies.

Specifications

Generator Compatibility	ECM 830, ECM 2001+, Gemini X2	
Voltage Range	0 to 200 V	
Pulse Length	10 µs to 100 ms	
Dimensions		
Chamber 5 mm gap (L x W x D) 8 mm x 5 mm x 3 mm		
Chamber 15 mm gap (L x W x D)	10 mm x 15 mm x 5 mm	

Item #	Description
45-0505	Petri Dish Platinum Electrode for Tissues Chamber Kit, 5 mm gap
45-0507	Petri Dish Platinum Electrode for Tissues Chamber Kit, 15 mm gap
45-0504	Petri Dish Platinum Electrode Chamber, 5 mm gap
45-0506	Petri Dish Platinum Electrode Chamber, 15 mm gap
45-0513	Petri Dish Tissue Chamber Kit, 15 mm gap with cables
Required for cor	nnection to ECM 830 and Gemini X2
45-0503	Micrograbber Cables for Tissue Slice Chamber
45-0204	Adapter Banana Plug Cables, Red and Black
Required for cor	nnection to ECM 2001+
45-0503	Micrograbber Cables for Tissue Slice Chamber
45-0204	Adapter Banana Plug Cables, Red and Black
45-0088	Female/Female Adapter Set for Banana Plug Cables

Petri Dish Platinum Electrodes & Chambers for Tissue Slices

Electrodes and chambers for delicate and/or difficult tissue transfection



Applications

• Ex vivo electroporation

The Petri dish platiunum electrodes are designed for delicate and/or difficult ex vivo tissue transfection. Ex vivo electroporation is an efficient, effective method to introduce genes, drugs or any number of molecules into ex-plant tissues. A common application is mouse brain slice for studying neuronal development. This specialty electrode makes transfection quick and simple and is compatible with both the BTX ECM 830 and ECM 2001+ generator. The electrode is comprised of two parts, the glass Petri dish electrode and electrode wand. The glass Petri dish contains a square shaped platinum electrode chamber to secure the tissue. The wand incorporates an identical shaped platinum electrode, which is placed over the chamber to complete electroporation. This sandwich configuration ensures a homogeneous field of energy for optimum transfection.

Specifications

Generator Compatibility	ECM 830, ECM 2001+, Gemini X2
Voltage Range	0 to 100 V
Pulse Length Range	10 µs to 200 ms
Chamber Depth	1 to 99 (depending on voltage)
Electrode Material	5°C to 40°C
Wand Material	Platinum
Dimensions	
Dish Electode, 10 mm (L x W x D)	10 mm x 10 mm x 1 mm
Dish Electode, 7 mm (L x W x D)	7 mm x 7 mm x 1 mm
Wand Electrode, 10 mm (L x W x D)	10 mm x 10 mm
Wand Electrode, 7 mm (L x W x D)	7 mm x 7 mm

Item #	Desciption
45-0500	Petri Dish Platinum Electrode for Tissue Slices Chamber Kit, 10 mm
45-0490	Petri Dish Platinum Electrode for Tissue Slices Chamber Kit, 7 mm
45-0501	Petri Dish Platinum Electrode Chamber, 10 mm, Negative
45-0491	Petri Dish Platinum Electrode Chamber, 7 mm, Negative
45-0502	Platinum Electrode Wand, 10 mm, Positive
45-0492	Platinum Electrode Wand, 7 mm, Positive
	Required for connection to ECM 830 and Gemini X2
45-0503	Required for connection to ECM 830 and Gemini X2 Micrograbber Cable for Tissue Slice Chamber, Negative
45-0503 45-0204	Required for connection to ECM 830 and Gemini X2 Micrograbber Cable for Tissue Slice Chamber, Negative Adapter Banana Plug Cables, Red and Black
45-0503 45-0204	Required for connection to ECM 830 and Gemini X2 Micrograbber Cable for Tissue Slice Chamber, Negative Adapter Banana Plug Cables, Red and Black Required for connection to ECM 2001+
45-0503 45-0204 45-0503	Required for connection to ECM 830 and Gemini X2 Micrograbber Cable for Tissue Slice Chamber, Negative Adapter Banana Plug Cables, Red and Black Required for connection to ECM 2001+ Micrograbber Cable for Tissue Slice Chamber, Negative
45-0503 45-0204 45-0503 45-0204	Required for connection to ECM 830 and Gemini X2 Micrograbber Cable for Tissue Slice Chamber, Negative Adapter Banana Plug Cables, Red and Black Required for connection to ECM 2001+ Micrograbber Cable for Tissue Slice Chamber, Negative Adapter Banana Plug Cables, Red and Black

Flat Electrode

Divergent field for cell fusion; homogeneous field for electroporation

Flatpack Chambers

For prokaryotic (suspension) cell electroporation as well as high efficiency stem cell (eukaryotic) transfection



Applications

- Cell fusion
- Hybridoma production
- Plant protoplast fusion
- Mammalian cell transfection

The Flat Electrode can be used for both electroporation and electro cell fusion. It generates either a divergent or homogeneous field depending on the orientation of the grooved electrodes.

The Flat Electrode can be oriented with the grooved sides of the electrode facing one another to generate a divergent field for use in electro cell fusion. Alternatively, it can be oriented with the flat sides facing each other providing a homogeneous field for electroporation. The Electrode is made of two rectangular, parallel plates of high grade stainless steel that are press-fitted into a polysulfone base

Specifications

Generator Compatibility	ECM 830, Gemini X2, ECM 2001+
Field Type	Divergent or homogeneous
Autoclavable	No

Ordering Information

Flat Electrode

Item #	Gap	Package	Volume
45-0108	1 mm	1 each	0.5 ml

Cable

Item #	Description
Required for connection to ECM 830 and Gemini X2	
45-0217	Electrode connection cable, banana to banana, 10 ft
Required for connection to ECM 2001+	
45-0088	Female/Female Adapter Set for Banana Plug Cables
45-0217	Electrode connection cable, banana to banana, 10 ft



Applications

- Bacterial transformation
- Yeast transformation
- Stem cell transfection
- Large volume transfections

Flatpack Chambers are primarily used for prokaryotic applications; however they are used often for high efficiency stem cell transfection as well. The one of a kind flow-through construction of the 0.56 mm gap has a volume capacity from 10 to 85 µl. This design provides the unique combination of small sample volumes with field strengths as high as 40 kV/cm. The Flatpack Chamber 1.83 mm gap has a three-ply solid sandwich construction of stainless steel and mylar plastic holds a volume of 1.5 ml, ideal for stems cells. The Flatpack Chamber 4.0 mm gap has a volume capacity from 1-10 ml and is for use with the AgilePulse MAX or ECM 2001+ in large volume mammalian cell electroporations. Flatpack chambers are gamma sterilized in individual packages. They are provided in sets of 50 and may be used in the Safety Stand.

Specifications

Generator Compatibility	ECM 830, ECM 2001+, Gemini X2, Agile Pulse MAX
Generator Compatibility	ECIVI 030, ECIVI 2001+, GEITIITII AZ, AYIIE FUISE IVIAA

Item #	Gap Size	Package	Volume
45-0109	1.83 mm	50 each	1.5 ml
45-0110	0.56 mm	50 each	80 µl
47-0206	4.0 mm	50 each	10 ml

Petri Pulser[™] Adherent Cell Electrodes

Electrode for Adherent Electroporation of 35 mm dishes



Applications

- Mammalian cell transfections
- Gene therapy, protein or drug delivery
- Plant and yeast applications

The Petri Pulser is a reusable electroporation applicator designed to fit into each single well of a 6-well plate or an individual 35 mm diameter Petri dish for the electroporation of adherent cells in situ. It consists of 13 thin gold-plated electrodes spaced 2 mm apart, designed to maximize the surface area of electroporation. The Petri Pulser is also an alternative to cuvette electroporation for larger volumes.

Specifications

Generator Compatibility	ECM 399, ECM 630, ECM 830, ECM 2000+, Gemini X2
Voltage Range	0 to 300 V
Pulse Length Range	1 µs to 35 ms
Volume Range	0.5 to 3.0 ml
Autoclavable	No
Field Type	Homogeneous
Gap Size	2 mm

Ordering Information

Item #	Description
45-0130	Petri Pulser
Required for connection to ECM 830 and Gemini X2	
45-0088	Female/Female Adapter Set for Banana Plug Cables
45-0217	Banana to Banana Cables, Red and Black, 10 ft
Required for connection to ECM 2001+	
45-0088	Female/Female Adapter Set for Banana Plug Cables

Adherent Cell Electrodes

Electrode for Adherent Electroporation of 12-well plates



Applications

- Mammalian cell transfections
- Direct electroporation of adherent cells growing on transwell filters, coverslips, or monolayers without disruption
- Plant and yeast applications

The Adherent Cell electrode is a reusable electroporation applicator designed to fit into individual wells of a 12-well plate, 6-well plate, or 35 mm diameter Petri dish. This plate electrode is specially designed to electroporate cultured monolayers of cells on laminin-coated filters, or on 12 mm polycarbonate or polyester transwell filter units (0.4 mm pore size). The Adherent Cell Electrode consists of two 7 x 19 mm parallel plate electrodes with a 5 mm gap between the plates. Each plate electrode has a 0.3 mm height insulated foot at both ends of the bottom. When the electrode is placed in a dish, a foot minimizes the damage to cells. The electrode is brought down onto the filter until it makes contact with the buffer, usually at 1 to 2 mm above the filter.

Specifications

Generator Compatibility	ECM 830, Gemini X2, ECM 2001+
Pulse Length Range	1 µs to 35 ms
Voltage Range	0 to 300 V
Volume Range	0.5 to 3.0 ml
Autoclavable	No
Field Type	Homogeneous
Gap Size	5 mm

Item #	Description	
45-0530	Adherent Cell Electrode, 5 mm gap	
45-0531	Adherent Cell Electrode Kit, 5 mm gap, includes 45-0204 cable	
Required for connection to ECM 830 and Gemini X2		
45-0204	Adapter, Banana Plug, Cables, Red and Black	
Required for connection to ECM 2001+		
45-0204	Adapter, Banana Plug, Cables, Red and Black	
45-0088	Female/Female Adapter Set for Banana Plug Cables	

Meander Fusion Chamber Glass Microslides

Novel microslide for electro cell fusion

The BTX Meander Fusion Chamber is a novel microslide design which is specifically used for electro cell fusion. It generates a divergent field and is used for fusion of mammalian cells, plant, yeast, fungi and microorganisms. It allows direct viewing of dimer formation during alignment.

This specialty electrode is constructed of a conductive metal alloy. It has two primary bars that are connected by many tiny fingerlike projections. These projections are spaced 0.2 mm apart. This electrode is mounted on a glass slide. It is designed for direct viewing of dimer formation during alignment while under a microscope Konidaris et al. (2003) used the Meander Fusion chamber to generate Glutamic Acid Decarboxylasespecific monoclonal antibodies for studying the role autoantigens involved in type 1 diabetes mellitus. (Konidaris C, et al. No Specific Reactivity to E. coli Glutamic Acid Decarboxylase from Sera of Newly-Diagnosed Insulin Dependent Diabetic Patients. International journal of immunopathology and pharmacology. 2003; 16(2): 129-138.)

Specifications

r		
Generator Compatibility	ECM 2001+, ECM 830, Gemini X2	
Field Type	Divergent	
Max Voltage:		
AC	16 V (0 to peak)	
DC	0 to 480 V	
Pulse Length	1 µs to 99 ms	
Number of Pulses	1 to 99 (depending on voltage)	
Gap Size	0.2 mm	
Autoclavable	No	

Ordering Information

Item #	Description	
45-0107	Meander Fusion Chamber, 0.2 mm Gap, pkg. of 4	
Required for connection to ECM 830 and Gemini X2		
45-0216	Micrograbber to Banana Plug Connection Cables, 10 ft	
Required for connection to ECM 2001+		
45-0087	Micrograbber Adapters, Red and Black	

Easily fit on a microscope stage



BTX Microslides are used for cell fusion, plant protplast fusion and embryo manipulation applications. They are available in four gap sizes, 0.5, 1.0, 3.2 and 10 mm. The 0.5 and 1.0 mm microslides produce a divergent field of energy ideal for efficient embryo fusion. The 3.2 and 10 mm slides provide a homogenous field for high fusion rates of hybridoma cells. The Microslides allow easy observation of the alignment of cells during electrofusion.

The Microslides are composed of a glass slide and two strips of stainless steel (wire or bar) set in a plastic Petri dish.

Specifications

Generator Compatibility	ECM 2001+, Gemini X2, ECM 830	
Field Type		
45-0103 and 45-0104	Divergent	
45-0105 and 45-0104	Homogeneous	
Max Voltage	500 V	
Autoclavable	No	

Item #	Description	
45-0103	Microslide 0.5 mm Gap, 20 µl, pkg. of 10 (Model 450)	
45-0104	Microslide 1.0 mm Gap, 20 µl, pkg. of 10 (Model 450-1)	
45-0105	Microslide 3.2 mm Gap, 20 µl, pkg. of 10 (Model 453)	
45-0106	Microslide 10 mm Gap, 20 µl, pkg. of 10 (Model 453-10)	
45-0216	Connection Cable, Micrograbber to Banana Plug Cable	
Required for connection to ECM 830 and Gemini X2		
45-0216	Micrograbber to Banana Plug Connection Cables, 10 ft	
Required for connection to ECM 2001+		
45-0087	Micrograbber Adapters, Red and Black	

High Throughput Electroporation Plates

Sterile multi-well electroporation plates for transfection/transformation of bacteria, yeast, insect, plant and mammalian cells



Applications

- Transfection/transformation of bacteria, plant and mammalian cell types
- siRNA transfections
- Library studies
- Stem cell projects

Features

- Standard multi-well formats
- Bio-compatible materials

BTX High Throughput Electroporation Plates are sterile multiwell electroporation plates for transfection or transformation of bacteria, yeast, insect, plant and mammalian cells.

Try out many different electroporation conditions (cell density, buffer, pulse voltage and width, etc.) to find the highest transfection efficiency, quickly and easily, with the ECM 830 HT Electroporation System, the ECM 630 HT Electroporation System, or the Gemini X2 Electroporation System. The disposable, sterile multi-well plate is the heart of the system. It's like 96 electroporation cuvettes in one convenient plate.

Item #	Description
45-0466	25-Well Disposable Electroporation Plate, 2 mm gap, 125 $\mu l,$ coated, 1 plate
45-0466-M	25-Well Disposable Electroporation Plate, 2 mm gap, 125 $\mu l, 1$ plate
45-0467	25-Well Disposable Electroporation Plate, 2 mm gap, 125 $\mu l,$ pkg. of 6
45-0462	25-Well Disposable Electroporation Plate, 4 mm gap, 250 µl, 1 plate
45-0463	25-Well Disposable Electroporation Plate, 4 mm gap, 250 $\mu\text{I},$ pkg. of 6

Item #	Description
45-0450	96-Well Disposable Electroporation Plate, 2 mm gap, 125 µl,coated, 1 plate
45-0450-M	96-Well Disposable Electroporation Plate, 2 mm gap, 125 $\mu\text{l},$ 1 plate
45-0452	96-Well Disposable Electroporation Plates, 4 mm gap, 250 µl, 1 plate
45-0012	25-Well Plate Seal (1)
45-0015	96-Well Plate Seal (1)

Cables & Adapters

Cables and adapters are needed to connect an electrofusion/electroporation system to the electrodes and chambers to be used for a particular application.



45-0217 Banana to Banana Cables, 10ft



45-0216 Micrograbber Cables



45-0089 Square Post Cable Adapter



45-0465 Well Plate Adapter



45-0083 Coaxial Cables



45-0204 Tweezertrode Cable Adapters





Item #	Description	System/Electrode Compatibility
45-0465	25-Well Plate Adaptor for Plate Handlers	HT-100, HT-200
45-0066	Cable Set, HV, Red and Black, 3 ft	Enhancer 3000
45-0082	Cable Set, HV, Red and Black, 1 M	Legacy ECM 2001
45-0083	Coaxial to Banana Plug Cables, Red and Black, 10 ft	Legacy ECM 2001
45-0087*	Micrograbber Adapters, Red and Black, for Banana Plug Cable 45-0217 and 45-0083	ECM 2001+, Genetrode, Genepaddle, Tissue Petri Dish Electrodes
45-0088	Female/Female Adapter Set for Banana Plug Cables 45-0216	ECM 2001+, ECM 830, Gemini X2
45-0089	Square Post Adapters, Red and Black, to Banana Plug Cables 45-0217	ECM 2001+, ECM 830, Gemini X2
45-0090	Electrode Adapter Set Banana to Pin Tip	ECM 830
45-0204	Adapter Banana Plug Cables, Red and Black	Tweezertrodes, L-Shaped Genetrode Electrodes



Female/Female Adapters

Item #	Description	System/Electrode Compatibility
45-0216	Micrograbber to Banana Plug Connection Cables, 10 ft	ECM 830, Gemini X2, Microslides, Genetrodes, Tissue Petri Dish Electrodes
45-0217*	Banana to Banana Cables, Red and Black, 10 ft	ECM 2001+, Gemini X2, ECM 830, Flat Electrodes
45-0503	Micrograbber Cable for Tissue Slice Chamber, Negative	Tissue Slice Chamber, Oocyte, L-Shaped Genetrodes Electrodes
45-0511	Single Adapter Cable for Wand Electrode, Positive	Tissue Slice Electrodes
45-2031	Gemini USB Cable, 2 M, Type A-B	Gemini
45-2032	Gemini USB Cable, 5 M, Type A-B	Gemini
47-0302	Hybrimune Chamber Cable	Hybrimune
47-0090	AgilePulse Adapter Box	AgilePulse ID AgilePulse IM Tweezertrodes
45-2057	High Voltage Output Cable, 5 ft	ECM 2001+
45-2058	High Voltage Output Cable, 10 ft	ECM 2001+

*Please note: If you have 45-0217 flat electrode cables, simply add/combine with 45-0087 micrograbber adapters to create micrograbber cables.

Foot Pedals & Foot Switches

For hands-free system operation



Legacy ECM 830 Foot Pedal

AgilePulse Foot Pedal

Gemini X2, ECM 830, ECM 2001+ Foot Pedal

The Foot Pedal and Foot Switches allow for hands free operation of the ECM 830, ECM 2001+, AgilePulse and Gemini X2 generators. These accessories are desirable when conducting in vivo/in ovo gene delivery or nuclear transfer/ cloning when both hands are needed for sample manipulation.

The foot switch and foot pedal function like the "Start" button on the front of the generator. Once all the parameters are dialed in, simply press and release to activate pulse delivery or abort a pulse sequence.

Ordering Information

Item #	Descriptions
47-0420	AgilePulse Foot Pedal
45-0211	Legacy ECM 830 Foot Pedal
45-2030	Gemini X2, ECM 830, ECM 2001+ Foot Pedal
45-0086	Legacy ECM 2001 CE Footswitch with 45-0085 cable

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