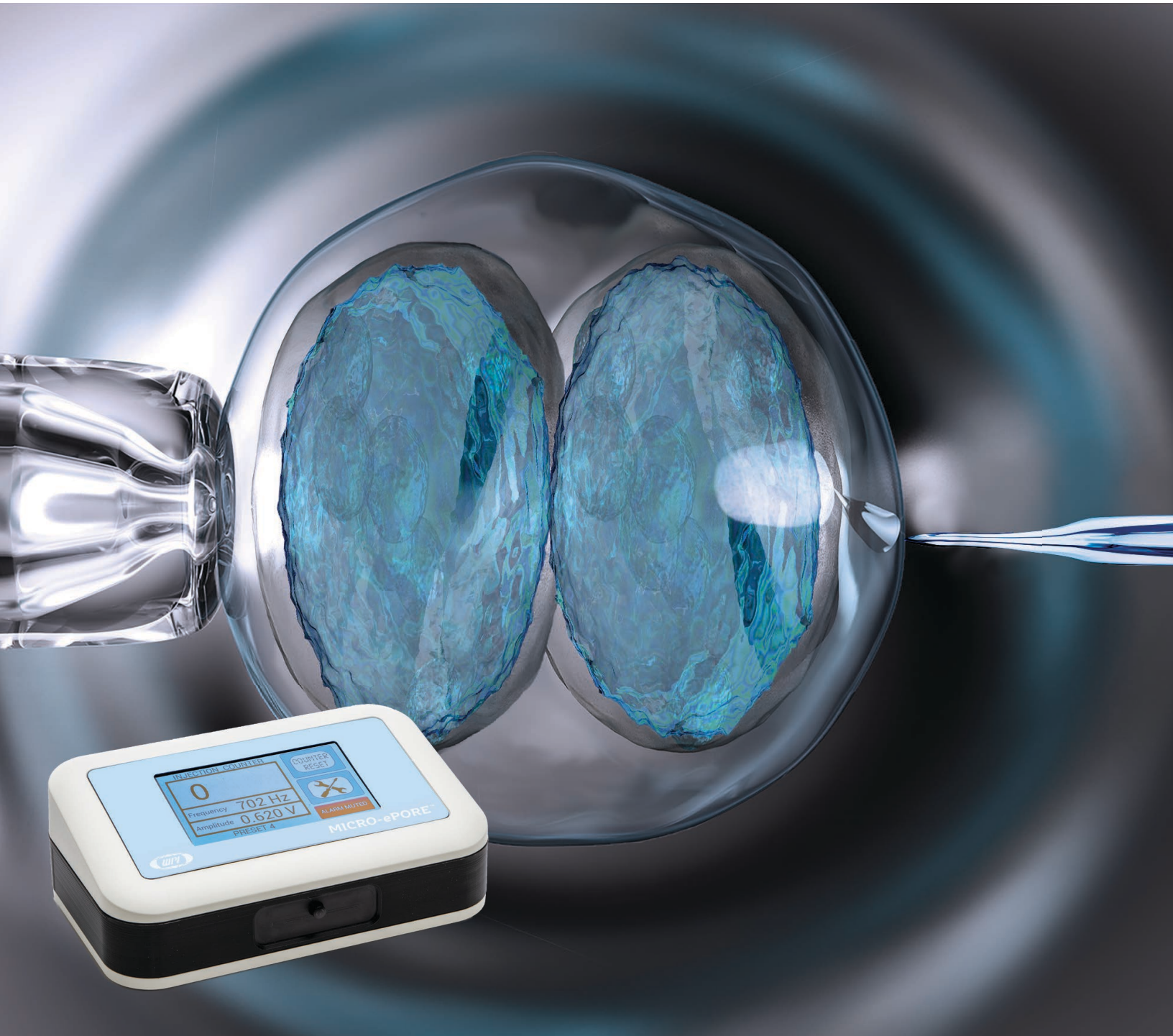
WORLD
PRECISION
INSTRUMENTS

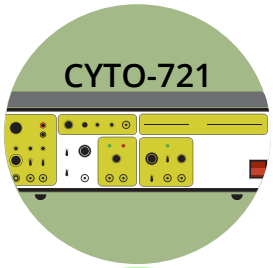
WPI MICRO-ePORE™

Pinpoint Cell Penetrator for Targeted Microinjection



The Next Generation

TARGETED MICROINJECTION



New and improved functionality

Simple, Elegant Solution

The new WPI **MICRO-ePORE™** pinpoint cell penetrator is a simple and versatile system that can be used for efficient microinjection of a diverse array of compounds and biomolecules into oocytes and pre-implantation stage mammalian embryos. Patent pending Flutter Electrode Technology assists in small, clean, precise membrane penetration without tearing or damaging the membrane.

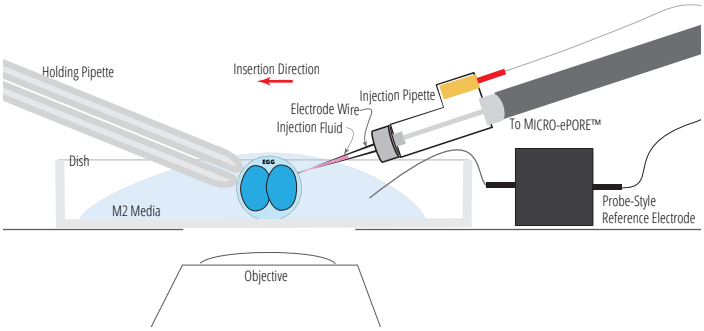
Experimental Data

Electrophysiological systems utilizing negative capacitance have been routinely used for microinjection of a variety of biomolecules into mammalian oocytes, as well as pre-implantation and post-implantation embryos in developmental biology studies.[1–6] The system which is no longer available, the intracellular amplifier WPI Cyto721, allows the needle to pierce the cell membrane with minimal physical trauma. More recently this technique has been applied to the microinjection of CRISPR/Cas9 reagents into two-cell stage mouse embryos.[7] The authors demonstrated significant increase in the knock-in efficiency and high viability of embryos using their method.

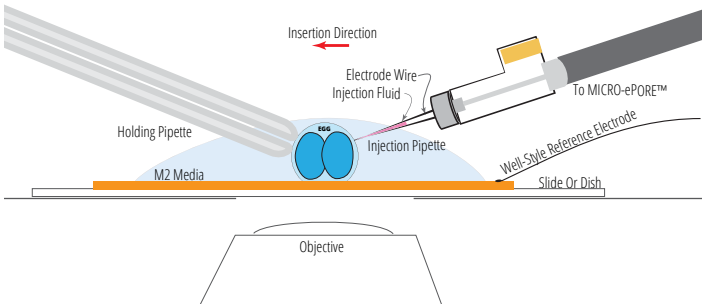
The new **MICRO-ePORE™** pinpoint cell penetrator offers a unique solution for microinjection resulting in high viability. The instrument creates an oscillating electric field at a localized site on the membrane immediately beneath the site of injection. The **MICRO-ePORE™** creates small, reversible holes in the plasma membrane through which material is microinjected. The **MICRO-ePORE™** is shipped with a default setting of 702 Hz and 620 mV, however researchers may set the amplitude and frequency of the signal that best suits their application. In contrast to conventional microinjection, in targeted microinjection using the **MICRO-ePORE™**, the membrane does not tear and thus allows for superior viability of embryos. The technique is simple and elegant. The new **MICRO-ePORE™** cell penetrator prototype has been successfully tested in mouse and primate pre-implantation embryos, as well as gene silencing in zebrafish tails.

MICRO-ePORE™ was designed for a range of applications including generation of CRISPR/Cas9 mediated knock-in mice with large insertions by microinjection into two-cell stage embryos with high viability.[7] The **MICRO-ePORE™** has delivered accurate microinjection of morpholino oligomers (anti-sense "knockdown") in zebrafish tails.

PROBE-STYLE REFERENCE ELECTRODE OPTION



WELL-STYLE REFERENCE ELECTRODE OPTION



BENEFITS

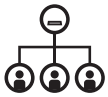
Increased viability of injected embryos

Versatile system

- Integrates with WPI's microinjectors, as well as other popular microinjection systems, like the Eppendorf Femtojet® and the Narishige injectors
- Microinjection of diverse compounds and biomolecules– DNA, RNA, proteins
- Pre- and post-implantation in embryos of various species – mice, rats, monkeys, bovine, pigs, zebrafish, etc.

Femtojet® 4I is a registered Trademark of Eppendorf AG

Easy to operate – Hands-free operation with foot switch control



User adjustable frequency and voltage – Four programmable protocols

Small, portable unit saves precious benchtop space

Works with all major inverted microscopes

KEY FEATURES

- Touch-screen display–resistive touch panel for use with gloves
- Injection control through foot switch or manually through touch screen
- Intuitive user-interface
- User adjustable frequency and voltage through touch screen
- Small footprint
- Four user-programmable protocols
- Adjustable audio continuity tone indicating active probe
- Injection counter to indicate total number of injections

TARGET APPLICATIONS

- Microinjection into oocytes and pre-implantation stage mammalian embryos, including microinjection of CRISPR-Cas9 reagents into the cytoplasm of two-cell stage embryos
- Pronuclear rodent zygote microinjection
- Gene silencing in zebrafish

SPECIFICATIONS

Voltage parameters 0–3.0 V, at 1 mV increments

Frequency parameters 50–3000 Hz, at 1 Hz increments

Pipette resistance alarm threshold maximum 500 MΩ

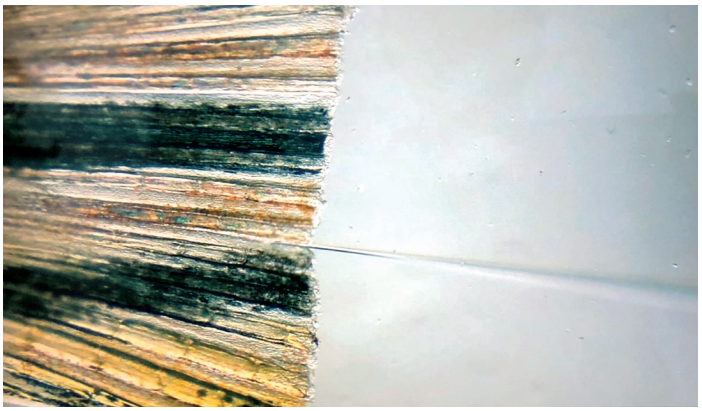
Dimensions 19.7 × 12.7 × 7.6 cm (7.75 × 5 × 3 in.)

Weight 0.9 kg (2 lb.)

Certifications CE, RoHS

NOTE: Specifications are subject to change.

MICRO-ePORE™ Successes in University Laboratories



A researcher at Jinggangshan University, Jiangxi Province used a MICRO-ePORE™ to inject morphilinos in a zebrafish tail fin.

**Many varieties and choices are available for glass capillaries and pre-pulled µTip micropipettes.*

Platinum Wire Electrode Holders!
Info available upon request.

A typical microinjection setup with the MICRO-ePORE™, an Inverted Microscope and a PV850 Pneumatic PicoPump.

References

[1]Bałakier H, Pedersen RA. *Allocation of cells to inner cell mass and trophectoderm lineages in preimplantation mouse embryos.* Dev Biol. 1982 Apr; 90(2):352-62. PMID: 7075865 (https://www.ncbi.nlm.nih.gov/pubmed/7075865)

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[3]Wianny F, Zernicka-Goetz M. *Specific interference with gene function by double-stranded RNA in early mouse development.* Nat Cell Biol. 2000 Feb; 2(2):70-5. PMID:10655585 (https://www.ncbi.nlm.nih.gov/pubmed/10655585)

[4]Chazaud C, Yamanaka Y, Pawson T, Rossant J. *Early lineage segregation between epiblast and primitive endoderm in mouse blastocysts through the Grb2-MAPK pathway.* Dev Cell. 2006 May; 10(5):615- 24. PMID:16678776 (https://www.ncbi.nlm.nih.gov/pubmed/16678776)

[5]Swann K, Campbell K, Yu Y, Saunders C, Lai FA. *Use of luciferase chimaera to monitor PLCzeta expression in mouse eggs.* Methods Mol Biol. 2009; 518:17-29. doi: 10.1007/978-1-59745-202-1_2. PMID:19085135 (https://www.ncbi.nlm.nih.gov/pubmed/19085135)

[6]Posfai E, Petropoulos S, de Barros FRO, Schell JP, Jurisica I, Sandberg R, Lanner F, Rossant J. *Position- and Hippo signaling-dependent plasticity during lineage segregation in the early mouse embryo.* Elife. 2017 Feb 22; 6. pii: e22906. doi: 10.7554/eLife.22906. PMID: 28226240 (https://www.ncbi.nlm.nih.gov/pubmed/28226240)

[7]Gu B, Posfai E, Rossant J. *Efficient generation of targeted large insertions by microinjection into two-cell-stage mouse embryos.* Nature Biotechnology 2018 Aug; 36(7):632-637. doi: 10.1038/nbt.4166. Epub 2018 Jun 11. PMID: 29889212 (https://www.ncbi.nlm.nih.gov/pubmed/29889212)

Ordering Information

MICRO-ePORE	MICRO-ePORE™ System. The system includes the MICRO-ePORE™ controller, Electrode Holder of your choice, Microelectrode Holder Interface Cable, Well-Style Reference Electrode, Probe-Style Reference Electrode Assembly, Foot Switch and Power Cord
PV850	Microinjector (Requires External Pressure Source)
uPUMP	Microinjector with Internal Pressure Source
MICRO-ePUMP	Microinjector with Integrated Cell Penetrator and Internal Pressure Source
SYS-PV830	Pneumatic PicoPump Microinjector with Vacuum Pressure
1B100-3*	Single-Barrel Standard Borosilicate Glass Tubing, 3 in. (76mm) long, 1.0mm OD, 0.58 mm ID, package of 500
TIP1TW1*	Pre-Pulled Glass Pipettes, 1 µm tip ID, 1.0 mm glass OD, Thin wall, fire polished
300683	WPI MICRO-ePORE™ Holder
300684	FEMTO MICRO-ePORE™ Holder
300685	NARISH MICRO-ePORE™ Holder
75122-110	Replacement gaskets, green, 1.0 mm, pkg. of 10
75122-210	Replacement gaskets, black, 1.2 mm, pkg. of 10
75122-310	Replacement gaskets, red, 1.5 mm, pkg. of 10
75122-410	Replacement gaskets, white, 1.65 mm, pkg. of 10
13142	MICRO-ePORE™ Foot Switch
99192	Probe-style Reference Electrode
99190	Well-style Reference Electrode

NOTE: The WPI **MICRO-ePORE™** is designed for research use only.

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