

For Higher Cell Survival Rates



Piezo-Assisted Cell Manipulation

PiezoXpert® and Piezo Drill Tip microcapillaries –
For easier, less traumatic cell membrane penetrations that support higher survival rates

PiezoXpert®

With almost 40 years of cell manipulation expertise, Eppendorf has been an expert partner for scientists globally using micromanipulation and microinjection techniques. To support Piezo-related micromanipulation techniques, the PiezoXpert and ready-to-use microcapillaries were designed to combine ease of use and robustness for beginners with flexibility, power, and precision for experts.

Large application spectrum

Piezo-assistance has been used in research for various cell manipulation applications. It is the method of choice to overcome issues resulting in low survival rates (e.g. high cell membrane elasticity, low cytoplasm viscosity, opaque oolemma etc.).

These applications include:

- > Intracytoplasmic Sperm Injection (ICSI; [see e.g. Application Note 395](#))
- > Enucleation and nuclear transfer (Cloning)
- > Embryo biopsy ([see e.g. Application Note 270 for mouse](#) or [User Guide 47 for horse](#))
- > Transfer of ES-cells or iPSCs into blastocysts or morulae ([see e.g. Application Note 248](#))
- > RNA/DNA injection into fertilized mammalian oocytes
- > Injection into single plant cells ([see e.g. Application Note 346](#))

Compact and compatible with all standard micromanipulators

The PiezoXpert is compatible with micromanipulators of major manufacturers. The compact control unit can be placed close to the operator. Easy capillary fixation and adjustment is ensured by the small and light Piezo

element. The complete system was designed to save precious table space and to be flexible in adding more equipment to your experimental setup in the future.



Designed to Achieve more Reproducible Results and Higher Survival Rates



The capillary grip head of the PiezoXpert includes two O-rings to ensure optimized stability and leak tightness of the inserted capillary.



Easy, intuitive operation and direct control with the compact control unit of the PiezoXpert.



Robust design backed with two years warranty

The robust design ensures long-lasting performance even in training facilities. Foot pedal, Piezo element and capillary holder are included. Piezo elements in general are sensitive parts and need extra protection especially from falling onto hard surfaces during adjustments. Therefore, the Piezo element of the PiezoXpert is safely connected to the capillary holder to avoid damages. Furthermore, the solid user interface ensures direct control and avoids user errors. The PiezoXpert is produced in Hamburg, Germany and is backed by a warranty of two years.

Features

- > **Optimized force transmission:** Piezo element is located and fixed close to the capillary holder and capillary
- > **Reproducible capillary positioning, optimized axial force transfer, and leak tightness:** Capillary grip head with two O-rings and capillary insertion stop position
- > **Dual pulse operation:** storage and fast foot-pedal operated retrieval of two different pulse parameter sets, e.g. for Piezo-ICSI related penetration of Zona (strong pulse) and oolemma (softer pulse)
- > **Clean function:** Strongest pulses can be triggered to remove debris from the capillary
- > **Easy operation:** The device can be operated intuitively. Piezo pulses can be triggered either on the device or with the foot control

Capillaries for Piezo-assisted Cell Manipulation



Highest cell survival rates

after cell penetrations are essential, especially when working with precious samples. Eppendorf glass microcapillaries are ready-to-use, enabling researchers to focus on complex experiments with a high safety standard:

- > Ready-to-use and individually packaged
- > High batch-to-batch production consistency (100% visual inspection)
- > Sterilized via validated gamma irradiation to SAL 10^{-6}
- > Tested for endotoxins/pyrogens
- (LAL) and assorted capillaries tested for cytotoxicity (MEA)
- > Designed to optimize experiment outcome by minimal cell/organism trauma, fine fluid control and high force transfer
- > Fit into all standard capillary holders

Ready-to-use Microcapillaries

Applications

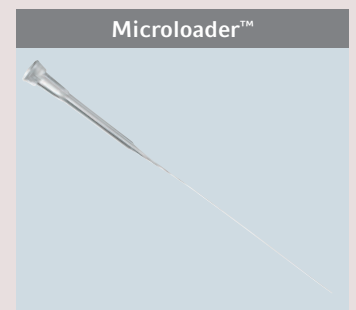
- > Pipette tip for back-filling of Femtotips and other microcapillaries

Description

- > Extremely long, fine and flexible tip for filling of microcapillaries for microinjection and where additional reach is needed
- > Microloader tips and rack autoclavable
- > Highest precision and accuracy when used with Eppendorf pipettes for 0.5 to 10 μL (gray control button)

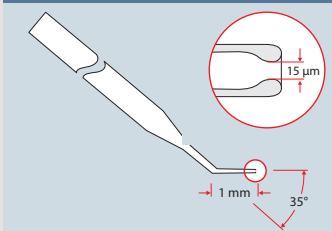
More about ready-to-use microcapillaries:

www.eppendorf.com/microcapillaries



Holding capillaries

VacuTip I



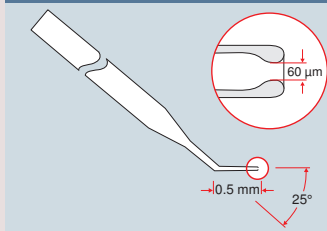
Applications

- > For holding oocytes, blastocysts, etc.

Description

- > 15 μm inner diameter
- > 100 μm outer diameter
- > Smooth, rounded tip end for gentle holding
- > Non-cytotoxic (as proven by mouse embryo assay)
- > Capillary safe for optimum protection

VacuTip II



Applications

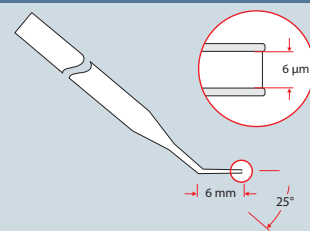
- > For holding oocytes, blastocysts, etc.

Description

- > 60 μm inner diameter
- > 110 μm outer diameter
- > Smooth rounded tip end for gentle holding
- > Non-cytotoxic (as proven by mouse embryo assay)
- > Capillary safe for optimum protection

Capillaries for Piezo-assisted cell transfer

Piezo Drill Tip ICSI



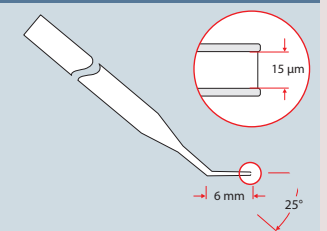
Applications

- > Piezo-assisted transfer of sperms into oocytes

Description

- > 6 mm flange length
- > Non-polished, blunt tip end for optimal piezo pulse force transfer and minimal trauma
- > Capillary safe for optimum protection
- > Easy, intuitive operation and direct control with the compact control unit of the PiezoXpert

Piezo Drill Tip ES



Applications

- > Piezo-assisted transfer of embryonic stem cells into blastocysts

Description

- > Non-polished, blunt tip end for optimal piezo pulse force transfer and minimal trauma
- > Capillary safe for optimum protection

Application Spotlight: Piezo-ICSI in Mammals

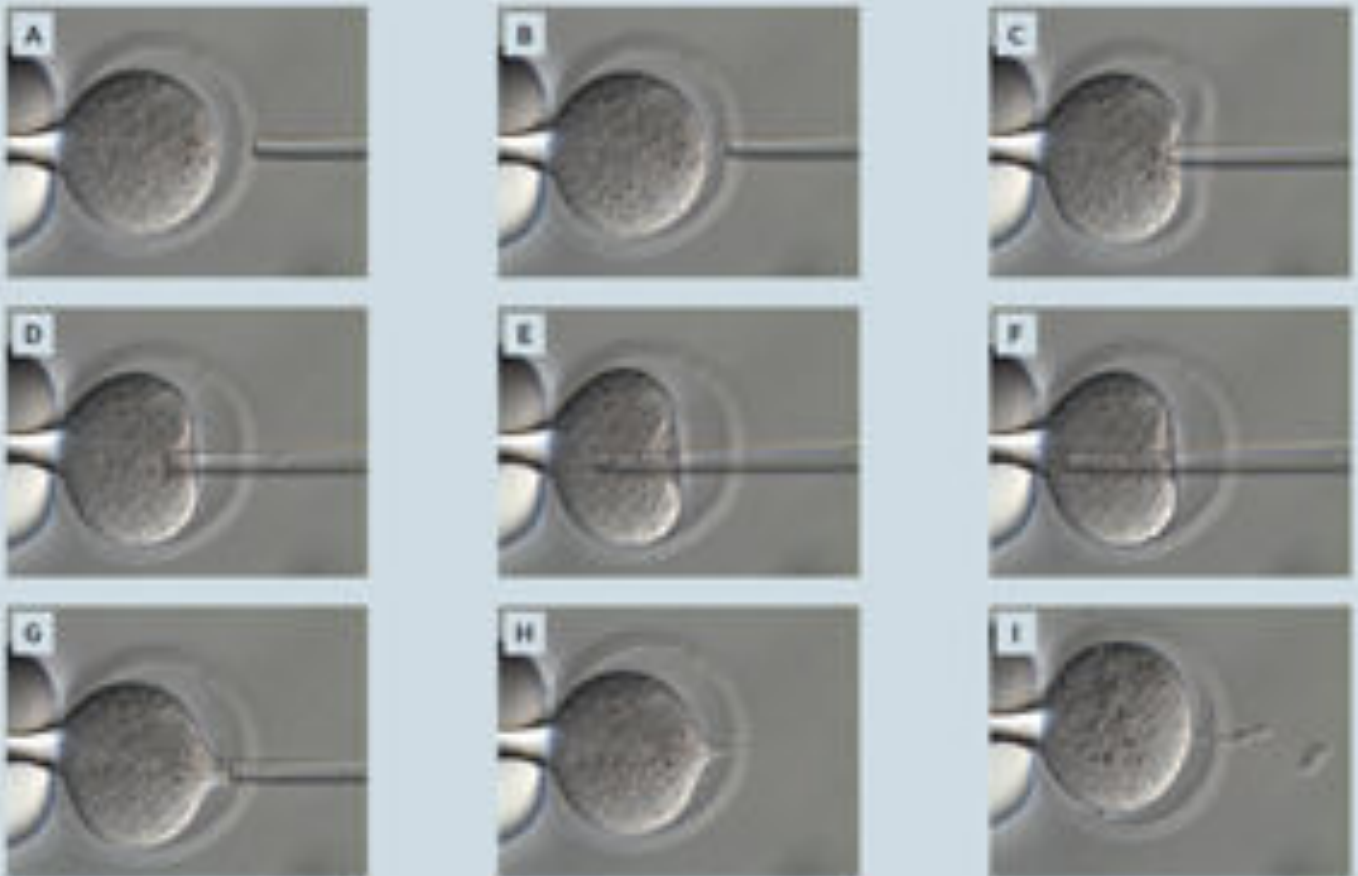
Intracytoplasmic sperm injection (ICSI) in mammals can be challenging resulting in low oocyte survival rates. Various reasons can be mainly attributed to this: An opaque oolemma makes it difficult to recognize the moment of penetration (e.g. in equine, porcine, bovine, or ovine ICSI) or a low cytoplasm viscosity combined with an elastic oolemma results in low oocyte survival rate after microinjection (e.g. in murine ICSI). To overcome the low survival rates after conventional

ICSI, Kimura and Yanagimachi introduced the piezo-actuated micromanipulation in the 90's. This method uses the piezo-electric effect (crystal deformation in response to an externally applied voltage) to induce small but high-frequency axial movements of the microcapillary. The resulting force induced by a Piezo element is transmitted to the cell membrane by specialized blunt-end microcapillaries and results in significantly higher survival rates.

Overview: Piezo-ICSI vs. Conventional ICSI

- > More controlled oolemma breakage without cytoplasm aspiration and associated stress for the cytoskeleton
- > Several studies have shown significantly higher oocyte survival and fertilization rates, especially with low diameter capillaries

- > Involves a specialized Piezo-element to generate high-frequency, low-amplitude mechanical pulses
- > Use of a blunt-end ICSI-microcapillary to ensure optimal mechanical force transfer



The process of Piezo-ICSI in mouse.

Source: [Application Note 395 – Intracytoplasmic Sperm Injection \(ICSI\) in the Mouse with the Eppendorf PiezoXpert®: How to Increase Oocyte Survival Rates After Injection](#)

PiezoXpert - Technical specifications

Technical specifications
Piezo element , Holder diameter 4 mm (compatible with all major micromanipulators)
Controller , Weight 2.8 kg, Dimensions 17 x 11.5 x 23 cm 6.7 x 4.5 x 9.1 in (WxHxD)
Intensity Levels (range) , 1 - 86
Speed levels (range) 1 - 40
Number of pulses , 1 - ∞
Clean function , included
Operation above sea level , 0 – 2000 m
Produced in Hamburg, Germany
Warranty 2 years
Items included , Piezo element, capillary holder /w grip head 4 size 0, foot control switch, Mains/power cord

Ordering information	Order no. Europe	Order no. UK/HKG	Order no. Australia	Order no. China	Order no. Japan	Order no. Argentina
PiezoXpert® , for piezo-assisted micromanipulation, incl. acuator 2, foot control and spacer plate and grip head 4 size 0	5194 000 016	5194 000 032	5194 000 059	5194 000 067	5194 000 024	5194 000 075



InjectMan® 4 and TransferMan® 4r

Due to their intuitive and user-friendly operation Eppendorf micromanipulators enable you to perform even demanding applications. Customizable smart functions help to simplify and speed up your work.



FemtoJet® 4i/x

With regard to precision and reliability our electronic microinjectors are setting standards in microinjection. They can be coupled electronically to the InjectMan or TransferMan 4r, e.g., for semi-automatic injection.



CellTram® 4r Air/Oil

Our manual microinjectors have been designed for ultimate operational comfort and highest precision. They are ideal for safe and intuitive handling of your sample.

More micromanipulation equipment from Eppendorf
www.eppendorf.com/cellmanipulation

Your local distributor: www.eppendorf.com/contact
 Eppendorf AG · Barkhausenweg 1 · 22339 Hamburg · Germany
eppendorf@eppendorf.com · www.eppendorf.com

www.eppendorf.com