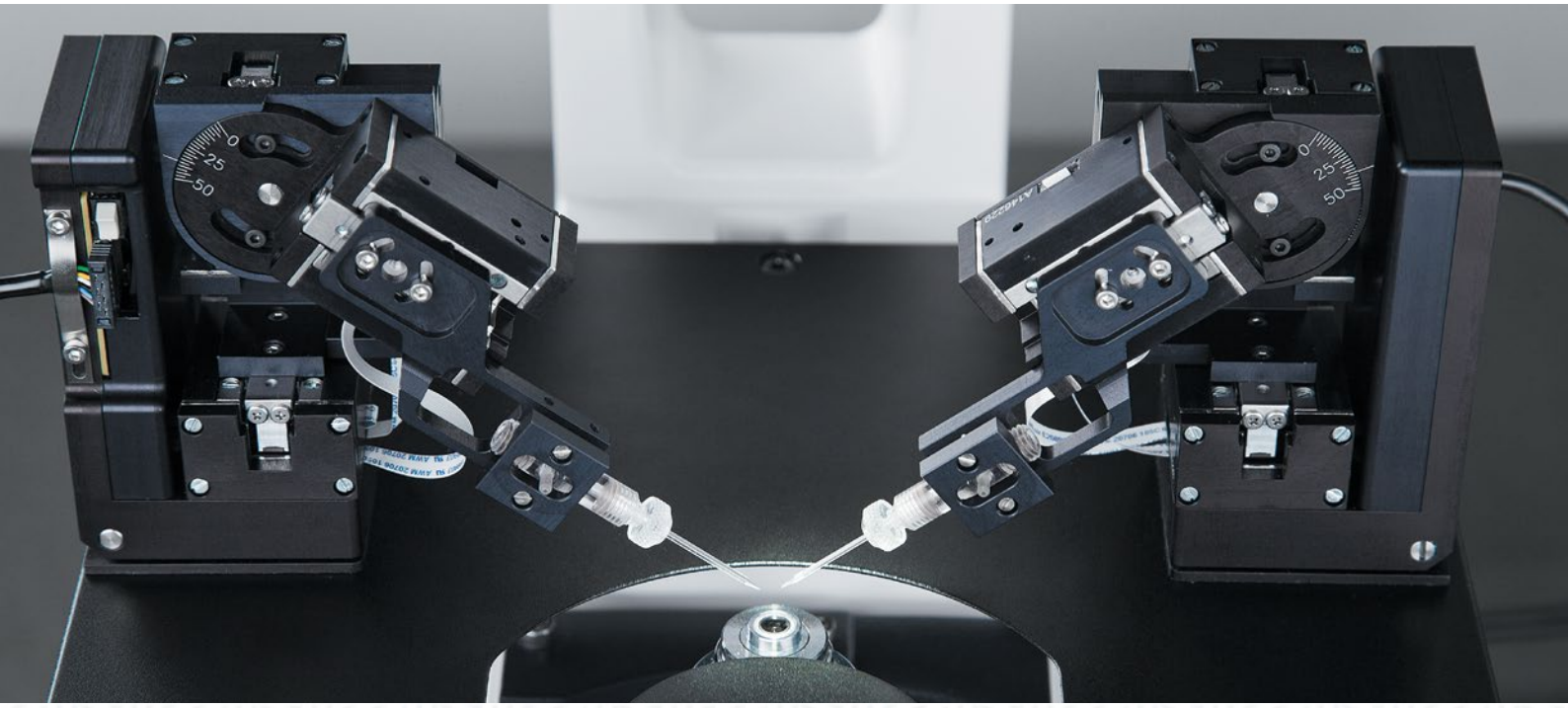
SENSAPEX

ZERO DRIFT MICROMANIPULATORS



SMALLEST HIGH PERFORMANCE MICROMANIPULATORS FOR ELECTROPHYSIOLOGY, MICROINJECTIONS AND OPTOGENETICS!

- 20 mm range with 7 nm resolution (XYZ)
- Zero drift solid-state technology
- Totally powered off during recordings
- Easy-to-use pipette exchange mechanisms
- Compact battery operated controller
- Up to 14 manipulator systems

Brandeis University · California Institute of Technology · Harvard University · HHMI Janelia Farm Research Campus · UCL · mpibrain research · Georg-August-Universität Göttingen · National Institutes of Health · Stanford University · Univerza v Ljubljani · University of Copenhagen · University of Oulu · The University of Sheffield · Université de Reims Champagne-Ardenne · Universität Würzburg

Compact installation concept: gold

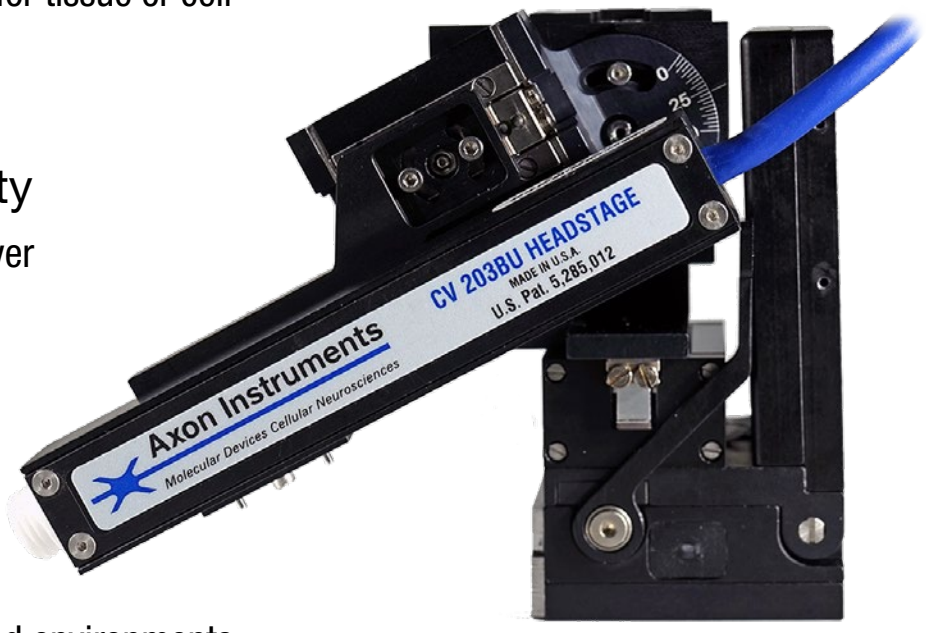
"A good micromanipulator is solidly constructed and compact, so that the moment arm from the tip of the electrode, through the body of the manipulator, to the cell in the chamber, is as short as possible. Ideally, the micromanipulator should be attached close to the chamber; preferably bolted directly to the microscope stage." The Axon Guide: Electrophysiology and Biophysics Laboratory Techniques. 3rd Edition (2012).

Benefit from latest solid state technology

- Linear piezo drive holds its position when powered off: zero drift and no electrical noise
- Fine control over whole range with 7 nm step resolution
- Tunable high-acceleration thursts for tissue or cell membrane penetration

Smaller size = better stability

- Close-up installation minimizes lever arms for mechanical vibrations
- Minimize thermal drifts: 50 mm smaller means 1 µm/°C less drift



... and easiest installation

- Fits to even most space constrained environments
- Add as many manipulators to your rig as you need - scalable and cost efficient solution!

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SENSAPEX

"Importantly, approaching a cell at the lower speeds is smooth with minimal tip vibration thus minimizing tissue and cell disruption during patch formation. Once a recording is established the manipulators are extremely stable allowing for prolonged monitoring of neuronal activity."

Dr. Kenneth Pelkey, McBain lab, NIH.

standard revisited

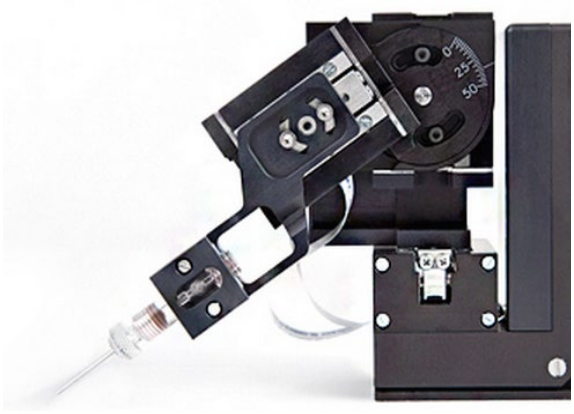
"The connections from the fulcrum of the micromanipulator to the cell should be as short, stiff and light as is feasible. Lightweight e.g. piezo-driven manipulators mounted on the stage may be the best arrangement, otherwise more remote mounting requires manipulator of massive construction to achieve stability and precision, such as the Huxley design". Microelectrode Techniques: The Plymouth Workshop Handbook", editor David Ogden, 2nd edition (1994).

Specification comparison

	SENSAPEX	SCIENTIFICA MICROSTAR	BURLEIGH PCS6200	SUTTER MPC-265
Operating principle	Linear piezo-drive	Stepper motor	Stepper motor + piezo	Stepper motor
Positioning range (X / Y / Z mm)	20 / 20 / 20	14 / 20 / 20	25 / 25 / 25 (motor) 0.15 / 0.15 / 0.15 (piezo)	12.5 / 25 / 25
Step resolution	7 nm	20 nm	1.6 µm / 60 nm (piezo)	63 nm
Max. speed [mm/s]	5 mm/s	NA	3.5 mm/s	2.9 mm/s
Size [WxHxL mm]	39x87x77	68x125x200	213x188x175	42x110x160
Cell impalement	Adjustable piezo thrust	NA	NA	NA
Controller	Compact, stand-alone Battery operated Up to 14 manipulators	Rack controller + remote Mains, AC 50/60 Hz Up to 2 manipulators	Controller box + remote Mains, AC 50/60 Hz Up to 2 manipulators	Rack controller + remote Mains, AC 50/60 Hz Up to 2 manipulators
Pipette exchange	Back-flip (+slide) Side-rotate (+slide)	Back-slide	Back-slide Side-rotate	Side-rotate
PC control	USB Free open-source software	USB Free software	USB Free software	USB Free software
8 manipulator system architecture	1 controller Connector hub	4 rack controllers 4 remotes	4 table top controllers 4 remotes	4 rack controllers 2 remotes

"It is a dream to use. It has run stably without any issues or hiccups, the preset speeds are great, covering the full range of what I need"

Dr. Christian Wilms, Häusser Lab, University College London



Micromanipulator

Positioning range:	20x20x20 mm3 (XYZ)
Step resolution:	7 nm
Max. speed:	5 mm/s
Load:	0 - 70 g*
True approach angle:	0 - 50 degrees
Dimensions:	39x87x77 mm
Weight:	295-375 g

Table mounting: magnet & bolt

Electrode exchange: back-flip | side-rotate with slide option

Electrode holder and head-stage mounting adapters included

**Intermediate cable solutions is available for head-stage mounting*

Controller

Rotary knob or 3D joystick; backlit display	
Six speed settings + Impalement mode	
Programmable Home and Target positions	
Batteries:	Li-ion (rechargeable), up to 1 week usage time
AC charger:	90-264 V, 50-60 Hz
Dimensions:	190 x 210 x 40 mm
Weight:	510 g

Single controller can operate up to 14 micromanipulators

Totally powered off during recordings for zero noise

USB computer interface + open-source software development kit

2 year warranty with free firmware updates for registered users

System configuration

The micromanipulators can be customized for plug-and-play installation using selection of standard options. The configuration is reflected in the product code as illustrated below. Please note that custom options and accessories, such as special stands and tool holders, are available on special request.

SMXS- (system)	**R-** (single R-handed)	**F** (back-flip)	**EUR** (EUR plug)*
SMX- (manipulator)	**L-** (single L-handed)	**R** (side-rotate)	**US** (US plug)
	2- (dual system)***	**FS** (back-flip + slide)	
	X- (X=3-14; multiple system)**	**RS** (side-rotate + slide)	

** Only valid in system configuration*

*** Please specify handidness and options for each manipulator*

Examples

SMXS-R-F-EUR is a system with right-handed manipulator with back-flip stand angle and EUR power plug

SMX-R-FS is add-on right-handed manipulator with back-flip and slide stand

Please specify manipulator types in dual or multiple manipulator systems:
SMXS-R-F-US + SMX-L-R is a dual system with different options for the right and left handed manipulators

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