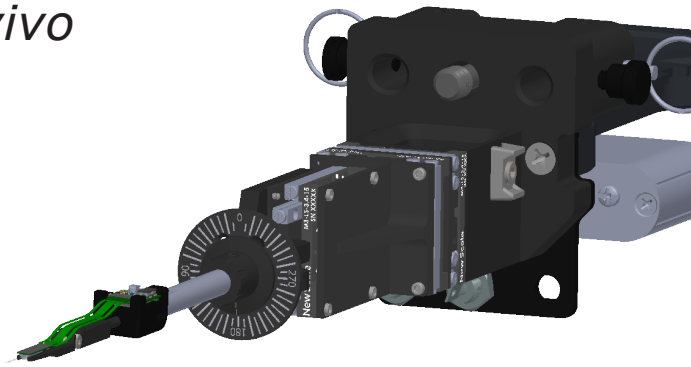
New Scale Technologies

Preliminary Datasheet

MIS

Modular Insertion System

Accelerate discovery in acute *in-vivo* neural recordings



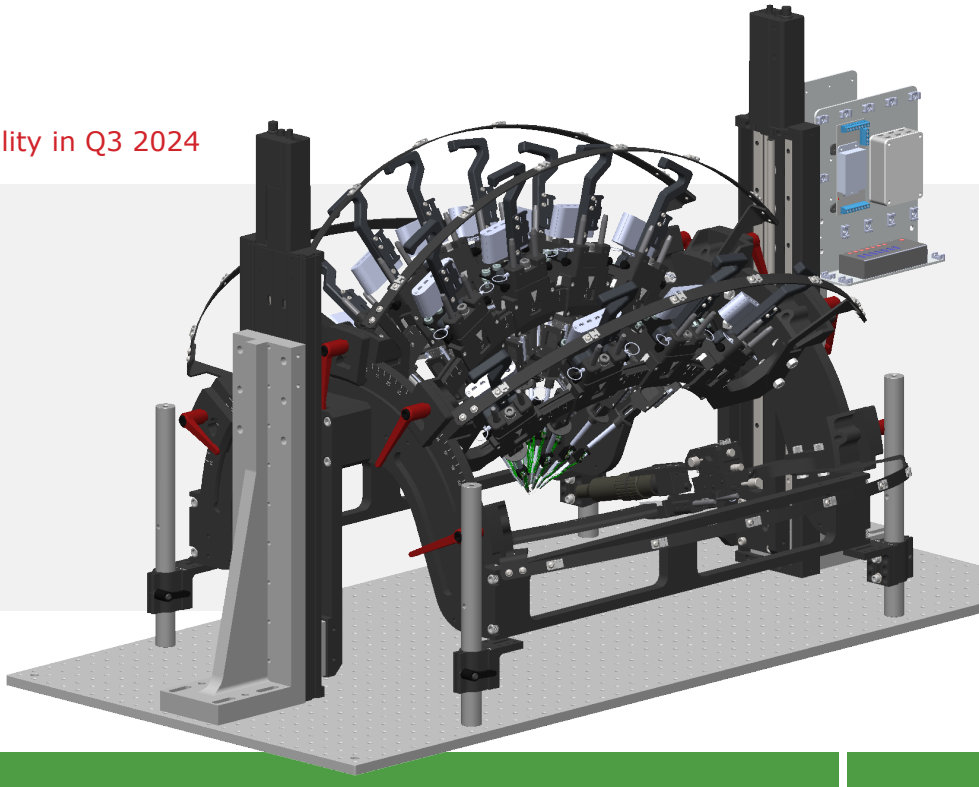
- Fully engineered system designed by neuroscientists under license from the **Allen Institute for Neural Dynamics**
- Position up to 24 Neuropixels probes with maximum precision and density
- Three standard modules:

  Probe: Precise positioning of neural probes

  Laser: Stimulation for optogenetics

  Microscope: Visualization during experiments
- Use Pathfinder Software with Virtual Coordinate System (VCS) to streamline simulation, planning and execution

Target availability in Q3 2024



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Modular Positioning of Probes, Lasers, and Microscopes

The motorized platform, powered by two synchronized Z-stages with embedded controllers, allow for accurate and repeatable positioning of the entire system to different total heights, providing easier access to your behavioral apparatuses, virtual task environments, and other experiment accessories.

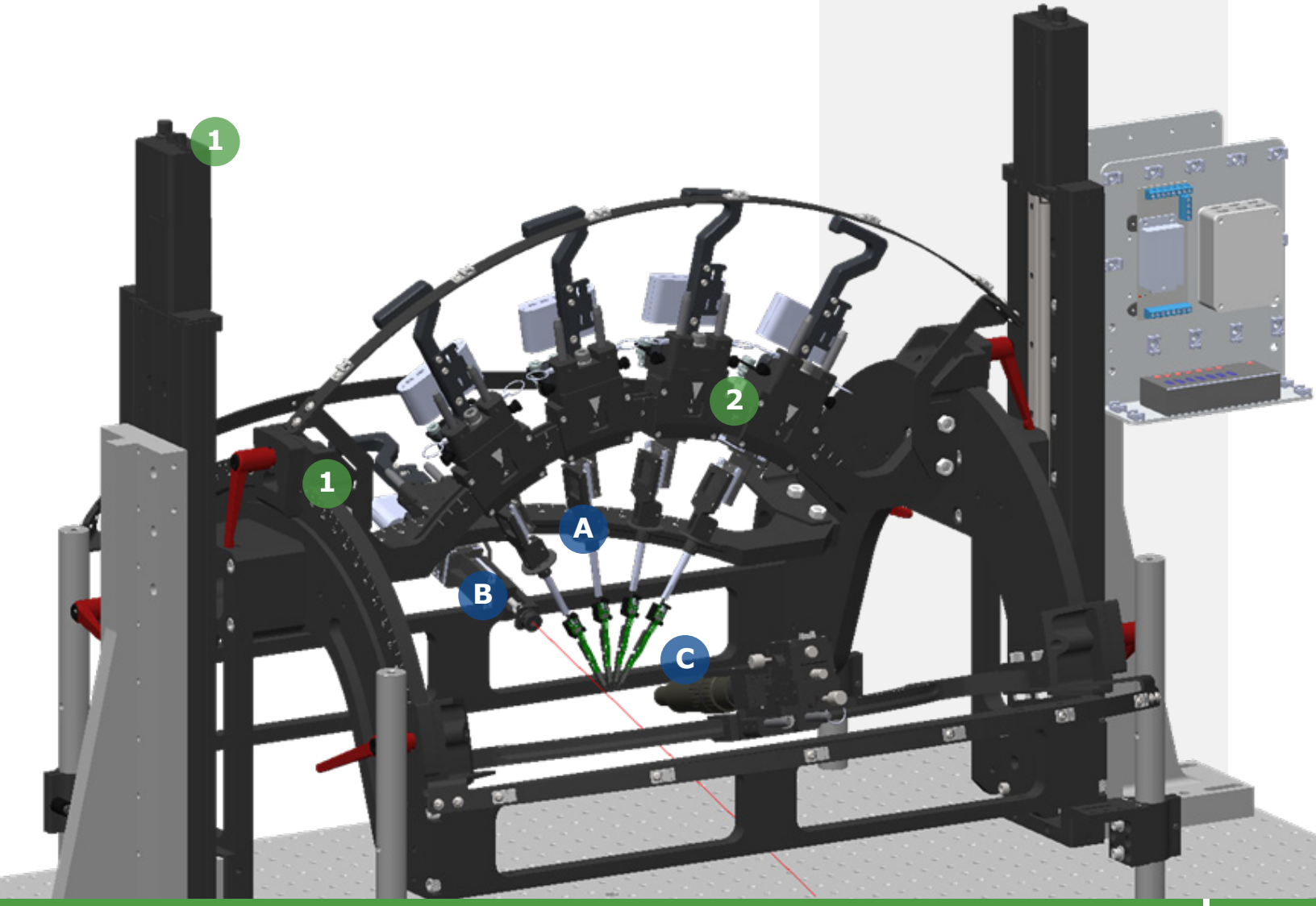
The two Outer Arcs attach to each Z-Stage, connected with cross beams, allowing stable repositioning of each Inner Arc with +/- 75° of positioning around the target.

Each Inner Arc allows the positioning of up to 6-modules (probe, laser or microscope) with +/- 45° of positioning around the target.

1. **Outer Arc and Z-Stage Platform** for adjustment of the entire MIS system in Z-Axis, and adjustment of Inner Arcs over a +/- 75° range
2. **Inner Arc** for positioning of each module over a +/- 45° range

Standard Modules

- A Probe
- B Laser
- C Microscope



Probe Module, using Motorized Smart Stages

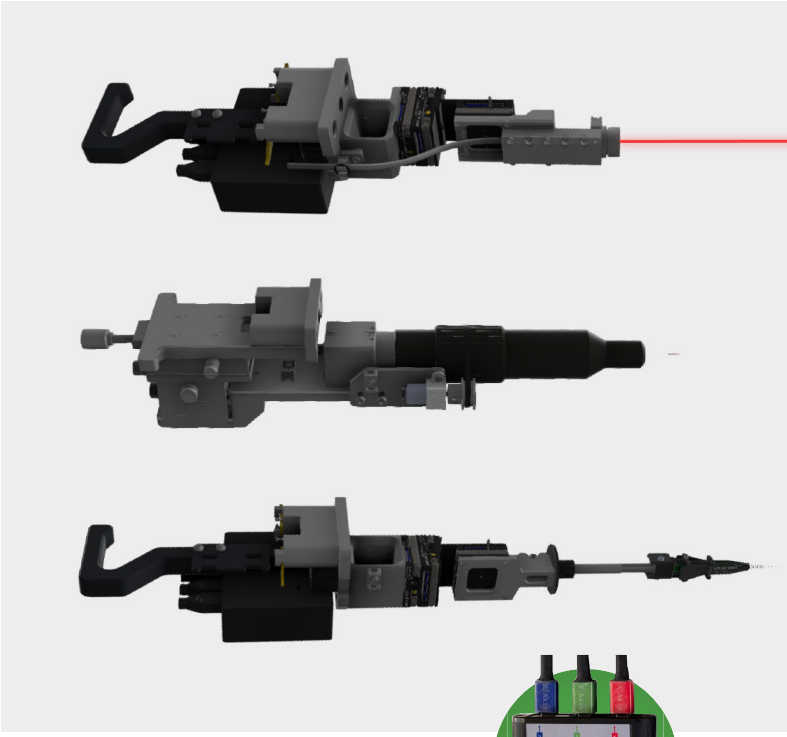
Motorized Linear Stages for Automated Positioning (M3-LS-3.4-15-XYZ)

New Scale's M3-LS Linear Smart Stages position each Neuropixels probe within 15 mm of travel, in 3-axes, with 0.5 micron closed-loop position resolution.

The M3-LS Linear Smart Stages have embedded SQUIGGLE piezoelectric motors and embedded control electronics. There is no need for a separate controller, maximizing the number of motorized axes in the smallest possible space.

Crossed roller bearings offer high stiffness, ensuring stable probe insertions. Stable and slow insertion speeds down to 1 µm/min are possible, with a recommended speed of 200 µm/min.

The three stages on each module connect to a M3-USB 3:1-6V adapter using clearly marked connectors, reducing clutter from cables. An overhanging Cable Arc, above each Inner Arc, further improves your ability to manage cables within the system.



M3-USB 3:1-6V

Laser Module, using Linear Stages

Motorized Linear Stages Position Lasers to Support Optogenetics

The M3-LS Linear Smart Stages are also used to position a laser, allowing for tissue stimulation to support optogenetics research.

Easily swap in your own laser, based on the requirements of your experiment.

Control each probe and laser module in stereotactic coordinates from a gaming controller, joystick, mouse, or other USB device.

Microscope Module

Visualize probe insertions and laser placement

A FLIR camera, with InfiniProbe™ Video Microscope, easily connects to your PC with a USB 3.0 cable. Adjustments to your field of view are made possible with manual linear stages in two-axes, with rotational adjustments around the subject made possible via a manual tip/tilt stage, and positioning of the module along the Outer and Inner Arcs.

Focal adjustments are easy with a working distance of 32mm - ∞

Using Teledyne FLIR's Spinnaker™ SDK, you can easily view the image streams for multiple cameras at one time, maximizing your ability to view probe tip positions, accurately position lasers, and guide each experiment with a high-resolution live feed.

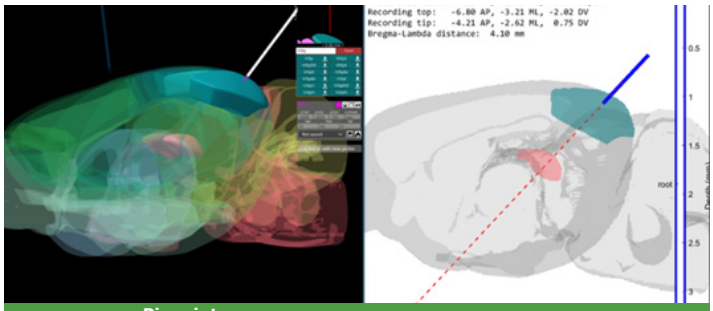
Pathfinder Software

Stereotactic PC Control of Each Manipulator

Control each motorized stage via our intuitive Pathfinder Software with Virtual Coordinate System (VCS), allowing independent and automated control of each probe in a common stereotactic coordinate system.

Trajectory Planning tools allow visualization of probe positions and planning of insertion paths. Automatically calculate the approach angle of each probe, based on simulated experiments planned from your desktop, check for potential probe collisions, and execute experiments with high repeatability.

Data acquisition apps enable confirmation of probe position with live heatmaps, confirming channel depth.



Pinpoint
(Steinmetz Lab, University of Washington)

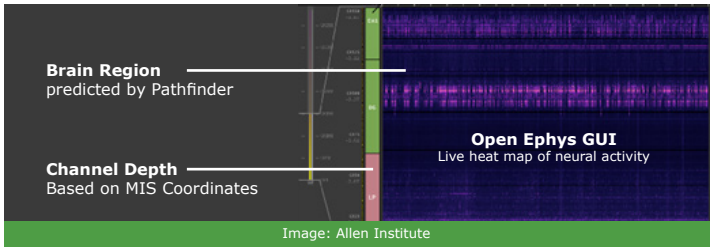


Image: Allen Institute

Additional information

For videos and more information, visit the website or call us to configure an integrated MIS for your research lab. *Data acquisition apps enable confirmation of probe position with live heatmaps, confirming channel depth.*

M3-LS-3.4-15-XYZ	
Travel Range (stroke)	15 mm each axis
Payload	**100 grams (recommended)** 200 grams (maximum)
Linear Slide Features	**Crossed roller bearings** with highest stiffness
Dimensions	32 x 32 x 11 mm with embedded controller (each axis)
Speed	4 mm/s
Insertion Rate	Adjustable, down to 1 µm/min **200 µm/min recommended**
Resolution	0.5 µm
Bi-directional Repeatability	< 5 µm
Accuracy	< 20 µm

Components	Description
Items Needed for Each MIS System	
MIS-System Kit	Includes mechanical hardware, instructions, USB Hub, USB cables, and MPM Pathfinder Software with Virtual Coordinate System (VCS).
MIS-Outer Arc & Z-Stage Platform	Base MIS platform, with mounting hardware, to attach to either an imperial or metric air table. Outer Arc with +/- 75°. Dual Z-stages, with embedded encoders, for synchronized and motorized adjustment of the entire MIS in Z-Axis.
Items Needed for at least Every 6-Modules	
MIS-Inner-Arc	Inner Arc with +/- 45° of rotation. Includes an arc to mount modules, two adjustable hand levers, and a cabling halo.
Standard Modules	
Microscope	Microscope module adapter for Inner Arc with 3-axis manual stage adjustment FLIR Camera with InfiniProbe Video Microscope and USB adapter.
Probe	**Includes:** Probe module adapter for Inner Arc with probe holder and probe indexer (3) M3-LS-3.4-15 Linear Smart Stages assembled into XYZ configuration (1) M3-USB-3:1 Adapter
Laser	**Includes:** Laser module adapter for Inner Arc with laser source (3) M3-LS-3.4-15 Linear Smart Stages assembled into XYZ configuration (1) M3-USB-3:1 Adapter
Item Required for Each PROBE Module	
MPM-Probe Mount-X (Optional)	**Mounting bracket and kit for specific probes**— contact us for standard and custom options.

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