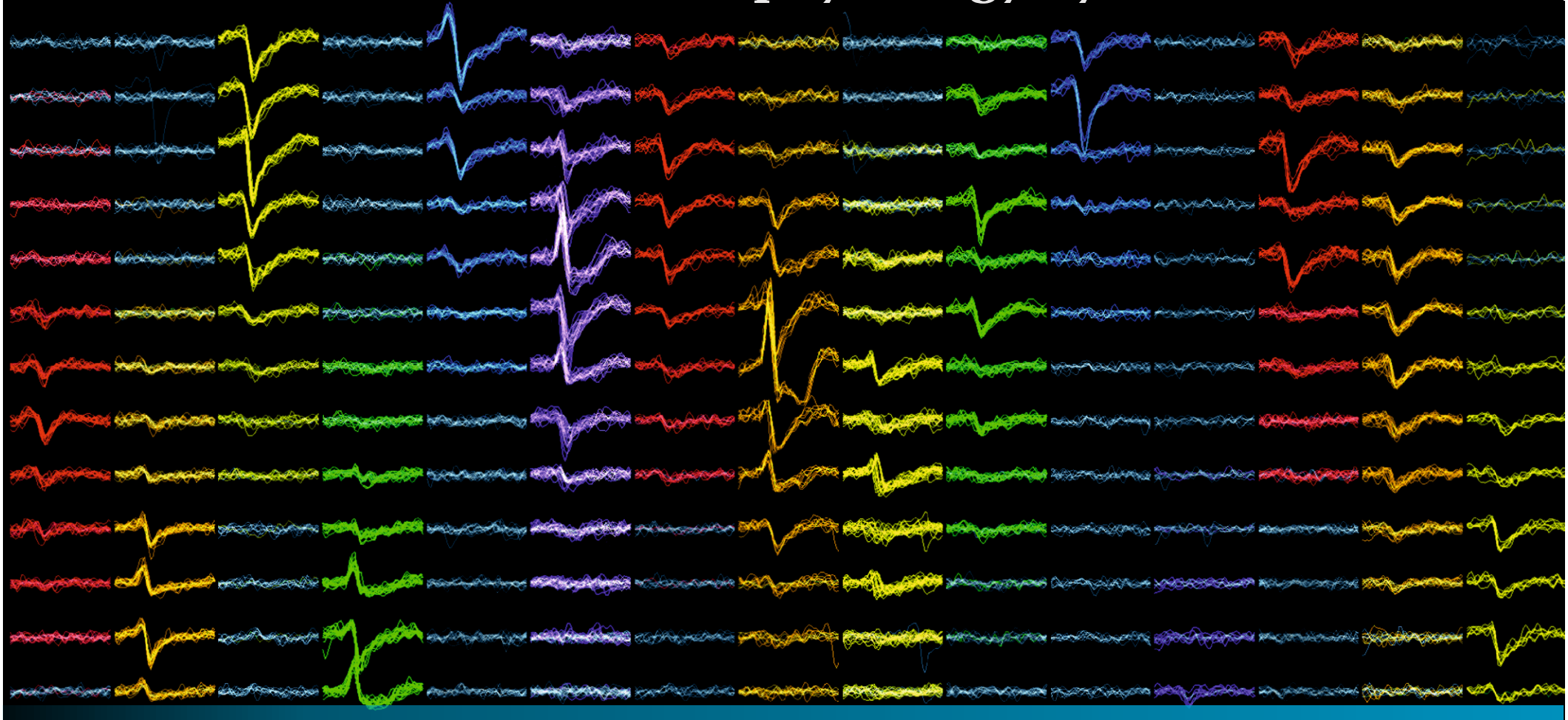
CAMBRIDGE NeuroTech

Advanced Electrophysiology Systems



Product Catalog

April 2020

CAMBRIDGE NeuroTech
Advanced Electrophysiology Systems

Foreward

Welcome!

WHAT WE OFFER

We provide complete electrophysiology solutions complemented by expert support thereby enabling new laboratories and seasoned veterans alike to harness and fully exploit the latest the neurotechnology on offer. We take pride in arming you with cutting-edge neurotechnology, driven by our deep understanding of the complexities and nuances of executing successful animal experiments and we align this alongside our drive for innovation and ambition to create the “go-to” resource for those wishing to exploit cutting-edge neuroscience tools.

We work closely with academic research labs, contract research organizations as well as Fortune 500 pharmaceuticals and medical device companies pursuing experiments in species ranging from mice to non-human primates. Our core philosophy is to provide expert support at all stages of your adoption of our tool-sets and you can expect us to care to about your experiments as much as you do!

ABOUT US

Cambridge NeuroTech, founded by Dr Tahl Holtzman in 2013 and head-quartered in Cambridge, UK, is a global leader and pioneer in providing advanced neural interfacing technology (silicon neural probes) for pre-clinical research with applications covering basic neuroscience, neuroprosthetics and brain-machine interfaces.

Having begun his career in academia, Dr Holtzman brings an in-depth knowledge of neuroanatomy and surgical approaches relevant to recording complex, multi-modal signals from both central and peripheral nervous systems in a variety of animal models from small rodents to large-animal laboratory species. His expertise covers all manner of multi-electrode recording techniques relevant to anaesthetised, head-fixed and freely behaving animals, and encompasses behavioural pharmacology and optogenetics, alongside neuroscience tool and technique development.

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Advanced Electrophysiology Systems

Contents

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Advanced Electrophysiology Systems

Silicon Neural Probes: Overview

Our next-generation silicon neural probe technology offers exceptional performance for both acute and chronic experiments, encompassing:

Superior chronic stability

Unrivalled in vivo longevity - record the neurons you want across many days to weeks in freely behaving animals.

Optogenetics-safe

The only silicon neural probes on the market with minimized sensitivity to photo-electric artefacts making them the optimal choice for combined single unit electrophysiology and optogenetics.

Best-in-class signal to noise ratio

Stabilised electrodes with typical 50 kOhm impedance; ~2x - 10x better than the competition!

Microdrive compatible

Designed to fit our nano-Drives with guaranteed alignment with drive-axis and convenient co-alignment with fiber optics and fluidic cannulae.

Ultra-thin yet robust

15 micron thin silicon neural probes with narrow shank-width for minimal tissue damage yet still able to withstand considerable stress without breaking.

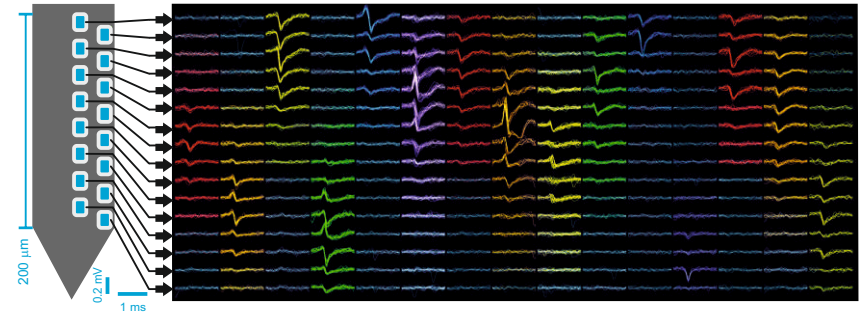
Long-term reusable

Our acute probes offer multiple re-uses across many months.

I got beautiful 'multi-multi' single cell recordings using both your 32 channel and 64 channel probes in rodents. The recording quality was truly incredible with huge spikes all over the place; definitely some of the best recordings I have seen using silicon probes so far!!

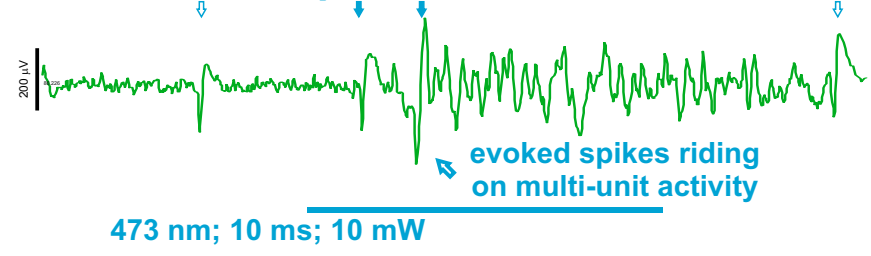
Nicolas Mallett, Lab Head, University of Bordeaux, France.

Brain area: Striatum and globus pallidus; Species: Rats and Mice

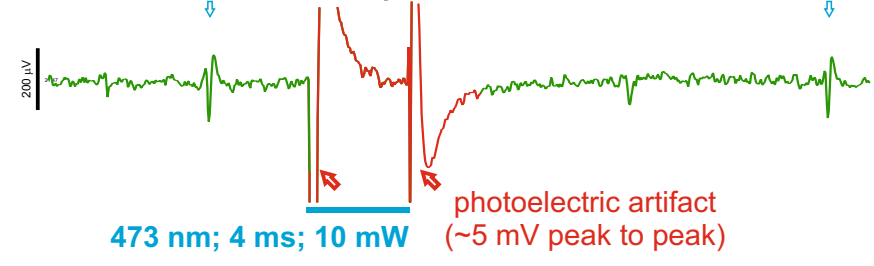


Spike-sorted single unit data from freely behaving rat cortex - recorded 60 days post-implant and after 30 days in the same location. Data provided by Tahl Holtzman, Nick Donnelly, Jeff Dalley – University of Cambridge, UK

Our Probes - photoelectric artifact-free



Competitor Probe



A typical photoelectric artifact on a Neuronexus probe evoked by a modest light stimulus delivered to TH::Cre rat VTA neurons expressing ChR2Y - spikes indicated by blue arrows. The artifact is ~25x larger amplitude than the spikes and results in data loss during a period when short latency photo-evoked spikes are most likely to occur. [Data courtesy of Paul Anderson and Mike Cohen, Radboud University, Netherlands]. In contrast our probes show evoked photo-evoked activity in the mouse brainstem in a freely-behaving transgenic mouse expressing vGlut2::Cre with ReachR opsin - short-latency evoked spikes are visible in the absence of a photo-electric artifact. [Data courtesy of Ludwig Ruder, Eduardo Arteaga and Silvia Arber, University of Basel, Switzerland]

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nano-Drives: Ultra-small chronic drives

Designed to mate with our innovative silicon neural probes to allow precision movement in freely behaving animals, the nano-Drive offers you convenient co-alignment of fibre optics and fluidic cannulas.

Smallest, most accurate drives ever made

Small 2 x 4 mm footprint, 0.41 grams, 205 microns / turn with 5 mm travel using a spring-loaded screw with minimal back-lash.

Precision engineering

Robust TITANIUM construction with 2 μm tolerance ensures accuracy and enables sterilization and re-use.

Silicon neural probe compatible

Purpose-designed to guarantee easy alignment with drive axis.

Optogenetics compatible

Easily co-align our silicon neural probes with a fibre optic cannula across 5 different positions with respect to probe shanks.

Scalable to multi-loci implants

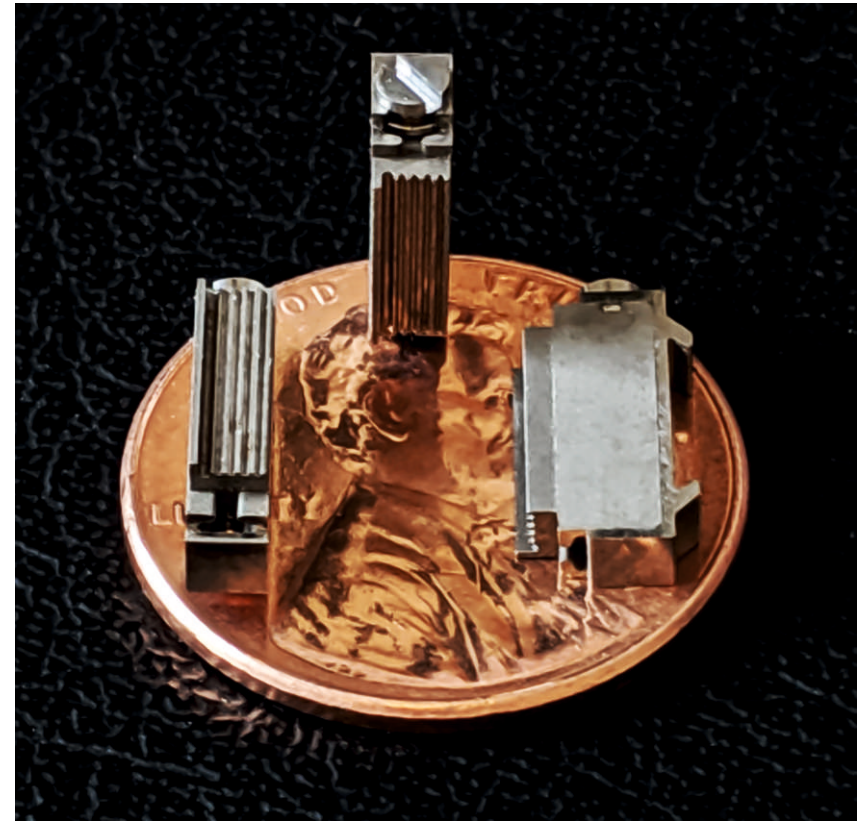
The small footprint of the nano-Drives facilitates targeting of multiple brain areas within the same animal, opening up network- and system-level experiments with combined recording and optogenetics.

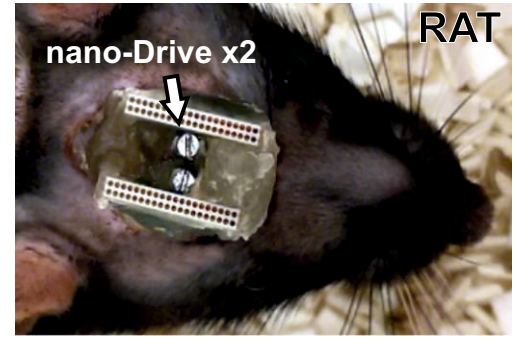
Compact implants

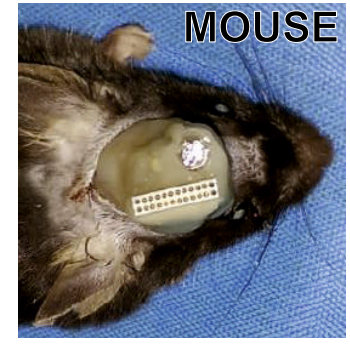
Easily co-mount multiple drives per animal for large-scale, multi-loci network targeting and keep head-pieces minimally-sized to facilitate

For our application combining chronic imaging and electrophysiology, 3-D chronic probe stacks mounted on nano-Drives are unparalleled... allowing high SNR, high density recording across multiple regions. Our project would not be possible without this technology.

Gyorgy Buszaki, Lab Head, NYU, USA; Brain Area: cortex. Species: Mouse







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Optogenetics
Chronic Optrodes

Enjoy artifact-free data with our silicon neural probes during optogenetic stimulation and in combination with our our chronic nano-Drives you can co-implant silicon neural probes and a fiber optic cannula to be physically-movable in freely-behaving animals.

Optogenetics capability

Easily co-align our silicon neural probes with a fiber optic cannula with defined spatial separation between electrodes and fiber, whilst maintaining proximity to spill sufficient light power to drive your chosen opsins.

Freedom to choose fiber optic properties

Select from a range of fibers with 60 - 200 core with a variety of tip options, such as flat, angled, mirror-tip, diffuser tip and conical tip.

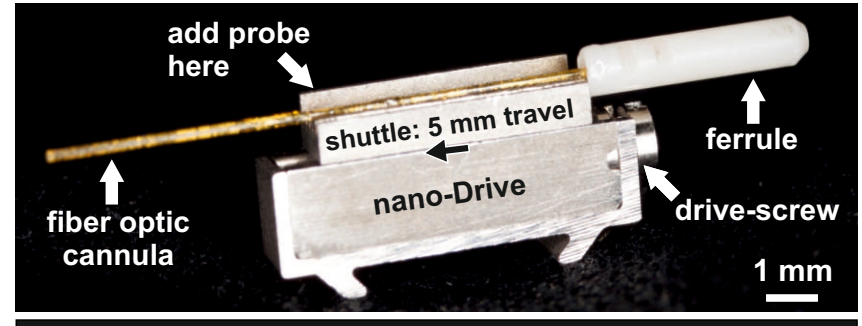
Ability to move your probe WITH your fibre optic cannula

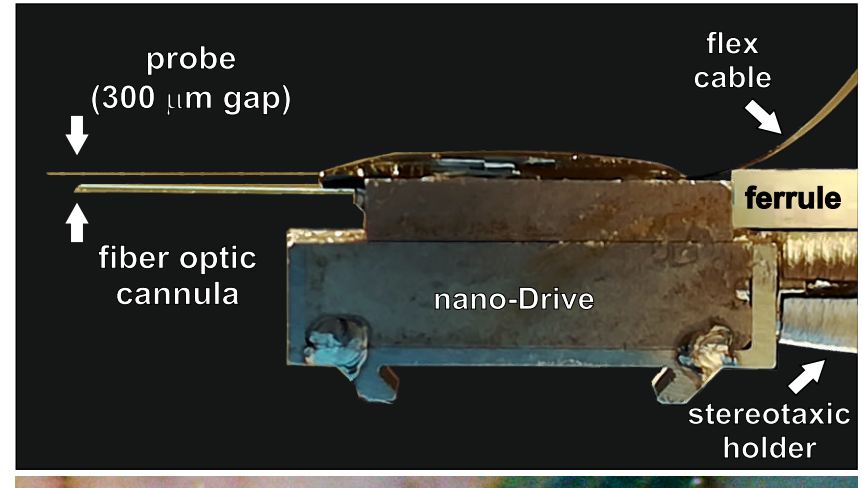
Our nano-Drives enable your silicon neural probe and fibre optic cannula to move together through the brain whilst ensuring that you're always recording and stimulating in the right place.

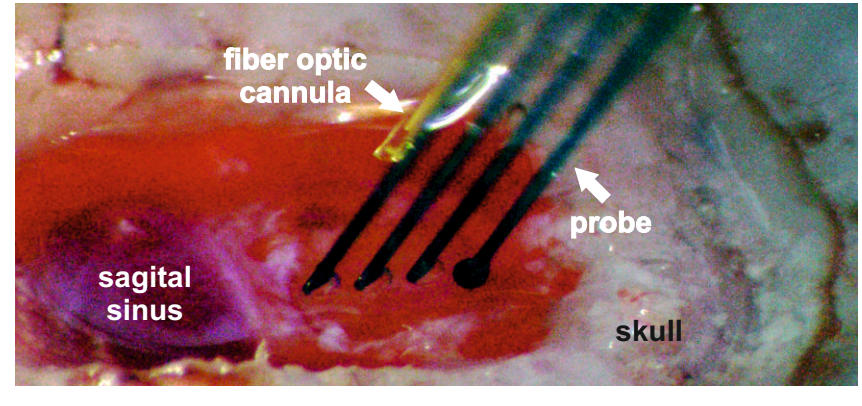
Not just optogenetics...

Co-align other tools such as fluidic cannulae, stimulating electrodes, tetrode-bundles, micro-dialysis probes and so on, alongside your silicon neural probes, enabling multi-functional implants in a user-defined way.

My students and I unanimously prefer these probes over various others that we have tried. The signal to noise ratio is excellent, and the design is sturdy and robust. For acute recordings, these are the best-engineered and most user-friendly probes I've worked with.
Sara Aton, Lab Head, University of Michigan, USA
Brain area: Hippocampus; Species: Mice







CAMBRIDGE NeuroTech
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Optogenetics
Acute Optrodes

Take advantage of our ready-made acute optrodes and enjoy photoelectric artifact-free data during optogenetic stimulation.

Ready-made Optrodes

Let us do the hard work of precision-aligning your chosen fiber cannula alongside your acute probe with user-defined offset and carefully controlled positioning.

Minimize local tissue damage

A defined spatial separation between electrodes and fiber minimizes local tissue damage, whilst maintaining proximity to spill sufficient light power to drive your chosen opsins, our optrodes are designed to be minimally-invasive.

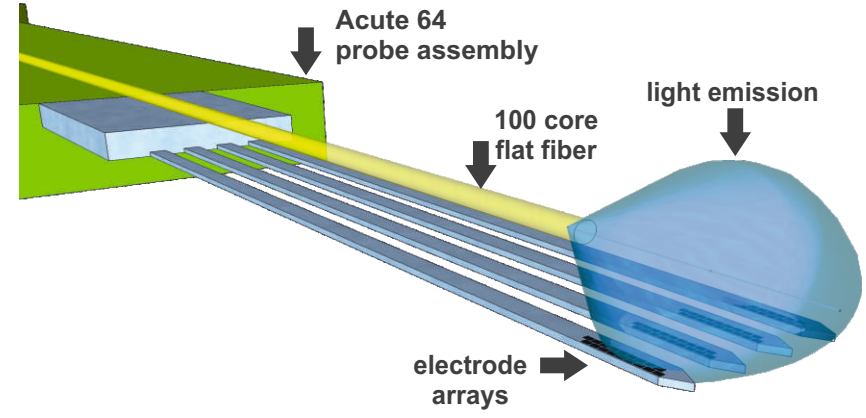
Freedom to choose fiber optic properties

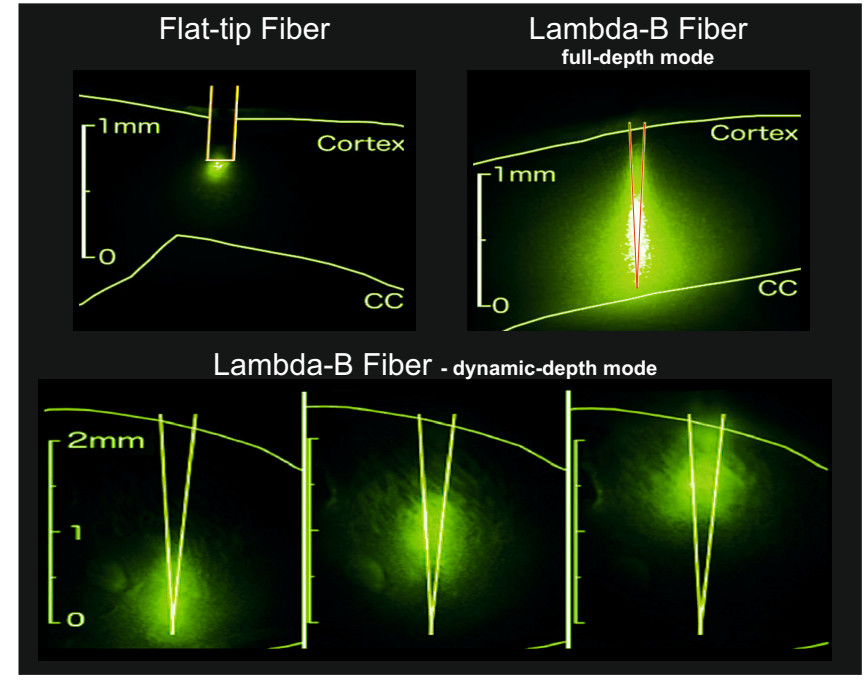
Select from a range of fibers with 60 - 200 micron core with a variety of numerical apertures and tip options, such as flat and angled for surface- and deep-brain illumination, or innovative Lambda-b taper-tip for full-depth and dynamic-depth stimulation across multiple cell layers.

Ability to reuse your optrode over and over

With appropriate care and cleaning after each use your acute probe / optrode can easily be reused many times with consistent performance.

I don't see any limit to the number of times we can reuse the acute probes. We must have used them around 30 times each so far and can't really see a substantial decline.
Kevin Bolding
Lab of Kevin Franks, Duke University, USA
Brain area: Olfactory bulb, Species: Mice





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Ultra-thin micro-ECoG arrays

Our ECoG arrays are designed to provide high-resolution recording from the brain surface. They can also be combined with our penetrating silicon neural probes too.

5x thinner than nearest competitor... thickness = stiffness!

At only 4 μm thick, our ECoG arrays readily conform to the brain surface and are straightforward to position and implant.

Small, yet low-impedance electrodes

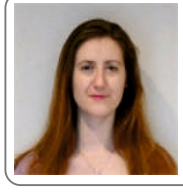
Similar to our silicon neural probe electrodes which offer best-in-class signal to noise performance by being both small and low-impedance, our ECoG array electrodes range in size from 12 - 80 μmm with typical impedance values < 100 KOhm.

Thru-holes for reduced CSF-shunting

Where possible, we introduce thru-holes in to our ECoG arrays in order to minimise the formation of a shunting layer of CSF between the brain and the array.

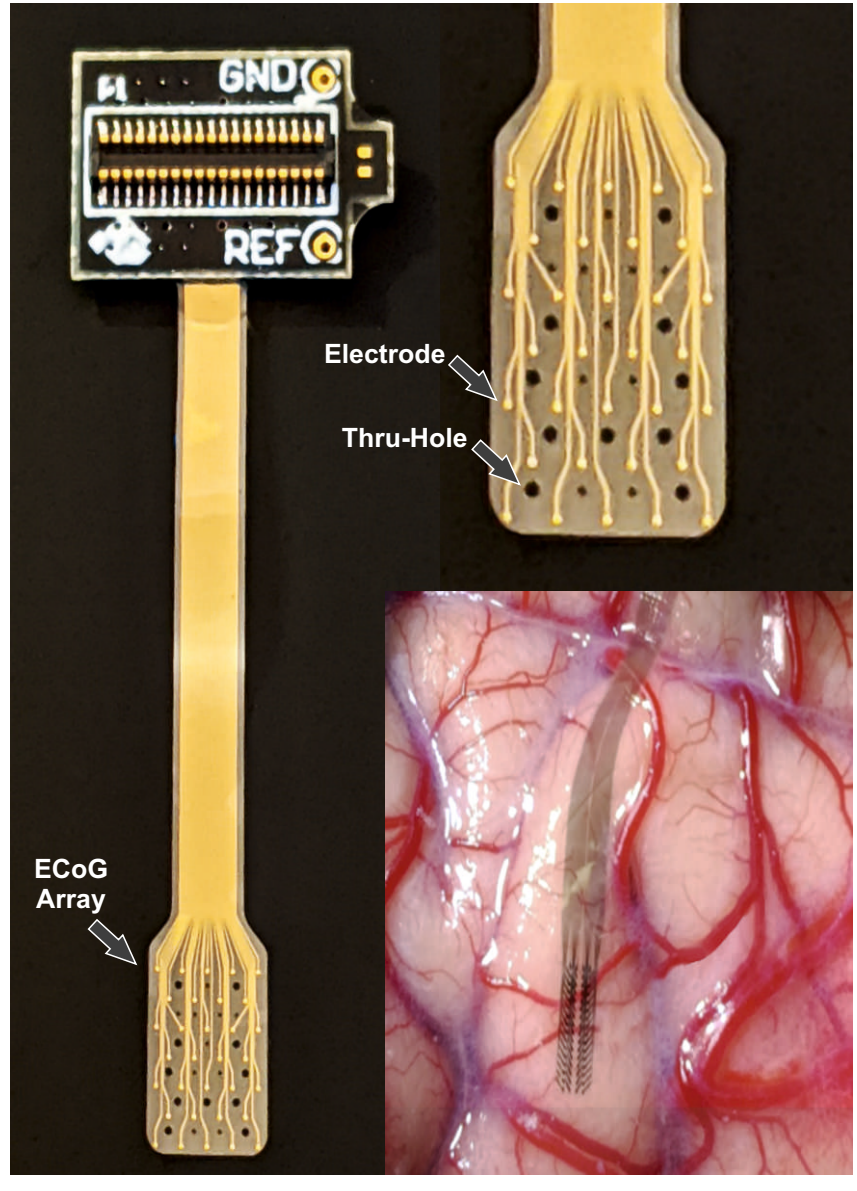
Obtain true 3-D recordings by combining with our probes.

Combine our ECoG arrays with a penetrating silicon neural probe to obtain data from within and across your brain region under study.



These probes offer the best signal quality we have seen in this region of the brain to date, lots of beautiful and sortable spikes.

Sarah Fox
Lab of Rasmus Petersen, University of Manchester, UK
Brain Area: VPM Thalamus. Species: Mouse (head-fixed)



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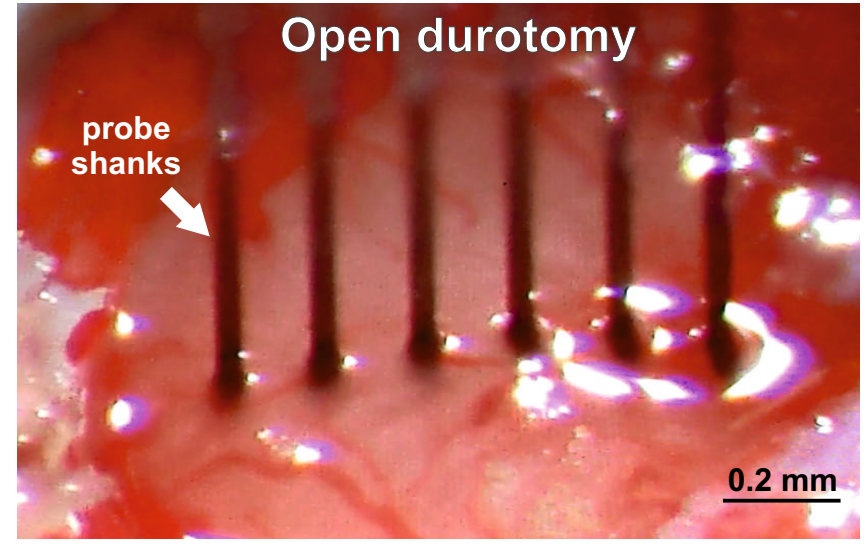
Dura-Gel: Dural Substitute

Dura-Gel

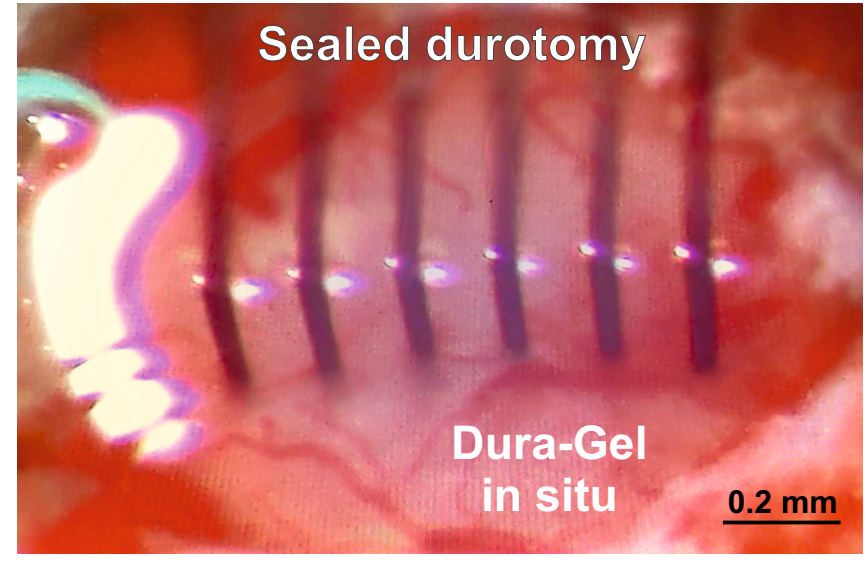
A soft-setting, bio-compatible silicone gel for the repair and replacement of dura which cures in place to form a cushioning, self-healing and resilient barrier over exposed craniotomies and thereby acts as a dural-substitute where a durotomy has been performed or as a protective layer over intact but exposed dura. Dura-Gel reduces the possibility of inflammation, reduces cerebrospinal fluid leakage, reduces humidity loss from the craniotomy, and remains soft for a period of weeks to months, thereby allowing microelectrode penetration with minimal force.

Our silicon neural probes will penetrate the gel with forces < 0.5 mN thereby enabling multiple penetrations over extended time periods. These properties make Dura-Gel suitable for use within chronic or head-fixed acute animals. **Dura-gel can also be used for 2-photon imaging studies too.**



Application during chronic implant surgery

Dura-Gel can be applied directly to the exposed pia mater or dura mater. We recommend using sufficient quantity of Dura-Gel to cover your craniotomy to a depth of at least 1 mm; prior application of a bead of bone cement around the edge of the craniotomy is a useful technique for creating a dam which allows for thicker applications of Dura-Gel where required, for example in larger animals or implants requiring direct access to superficial tissue layers.



Application in head-fixed semi-chronic animals

For use in acute or head-fixed animals, Dura-Gel allowsfor multiple penetrations with our probes and can remain in place for extended periods of time (weeks to months). Should it be necessary to replace the Dura-Gel, it can be removed with a blunt spatula and a fresh mix applied to the exposed craniotomy.

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Miniature Tethered Headstages 32-64 channels

Take advantage of our range of next-generation miniature headstages designed to open up 64 channel recording in the smallest of animals!

No more bulky, hard-to-connect Omnetics connectors!

All pre-amplification and digitization is performed on-head - digital data is fed out through a 12 pin Omnetics connector which mates with a standard SPI tether.

Super-small, lightweight and space-saving...

Small-sized and light enough for song-birds and upwards - removing bulky Omnetics connectors from the equation saves both size and weight. With footprint at 3 x 7 mm for 64 channels, you can not only reduce implant size but can even double-up for 128 channels across multiple brain targets in mouse ! (requires 2 x 64 mini-amp-64's).

Multi-functional Add-ons...

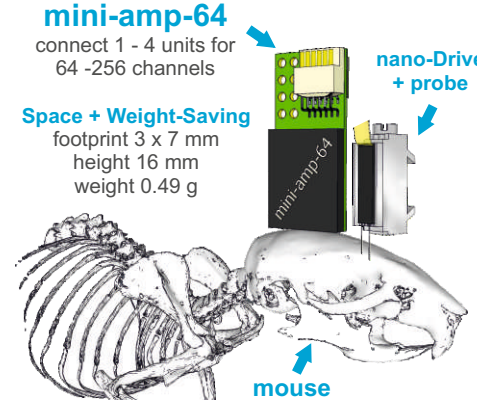
Integrated XYZ 3-axis accelerometer and ability to add-in EMG / EEG breakout wires in parallel with your silicon neural probes. User defined add-ons can take advantage of +3V and GND alongside analog inputs.

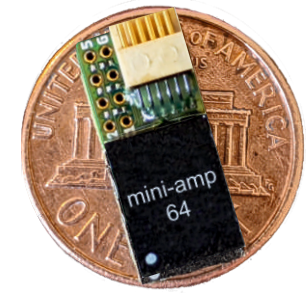
Implanted during use, recoverable for re-use...

Your mini-amp-64 headstage will remain with your animal until the end of your experiment - this means you will plug your tether directly in to the head-piece, c.f. plugging a headstage in to the probe connector.

Plug n play with our range of Molex probes...

Any of our probes can be built with compatible Molex connectors, which mate directly with the miniature headstage family.





Channels	**64** **(128 if used as a pair)**
Intan-compatible	YES
Tether	ultra-fine SPI (Intan) standard legth 1.8 m
Height (mm)	16
Footprint on Head (mm)	3 x 7
Weight (g)	0.49
Mates with Probe Type	Chronic 64 Molex (part #: ASSY-236)
Built-in Features	3 µV RMS noise; Impedance-test XYZ 3-axis accelorometer Attach EEG / EMG wires x 5 3.3V / GND available for user-attached sensors

Compatible with: open ephys, NeuraLynx advanced electrophysiology solutions, intan TECHNOLOGIES, TDT TUCKER-DAVIS TECHNOLOGIES, PLEXON

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Precision Multi-Probe Manipulators

Maximize productivity and precision for acute in-vivo recording with automated silicon neural probe positioning for electrophysiology and optogenetics

Simple to set up and operate, the compact design allows for independent positioning of up to five acute silicon neural probes within a confined space, allowing ample clearance for a virtual task environment.

Stereotaxic atlas integration

The only manipulator system **MADE FOR PROBES** and designed to integrate with 3-D stereotaxic atlas co-ordinates.

Small-footprint: upright or inverted set-up

Fully engineered, modular apparatus space-optimized for upright or inverted experiments to suit your apparatus space requirements enabling Independent positioning of up to EIGHT silicon neural probes in a confined space.

Intuitive joystick operation

Up to 15 axes of automated motion control using a single PC.

Automated sub-micrometer probe adjustments

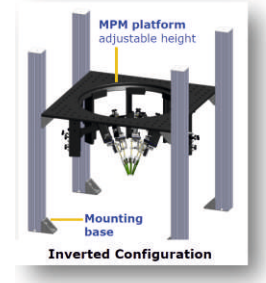
Absolute position measurement and control with high-resolution.

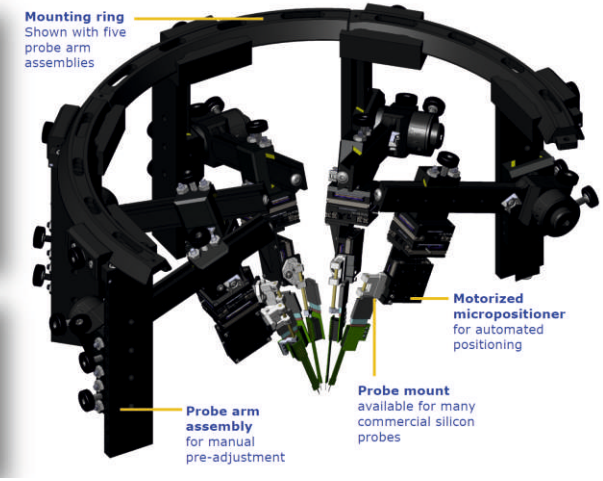
Gross manual & fine automated control

3-axis automated stages (piezoelectric SQUIGGLE motors, position sensors and embedded closed-loop controllers) with 4-axis coarse control.

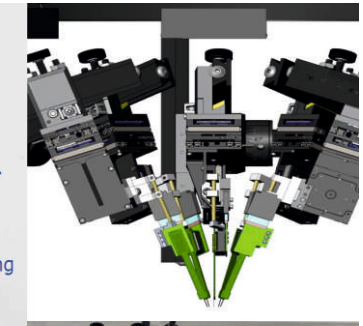
Combined electrophysiology and optogenetics

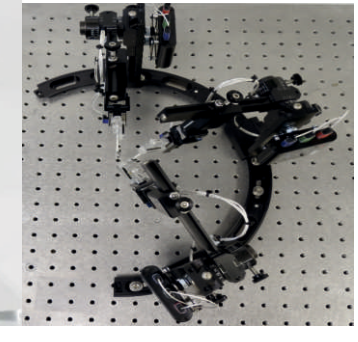
You can also mount fiber optic cannulas and simultaneously position them with respect to your probes for experiments demanding combined electrophysiology and optogenetics.





System example
One-arm system, upright configuration. Shown with MPM-Probe-Mount and pre-positioning rod.





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Intelligent Robot-Assisted Stereotoaxic Surgery

Missing your stereotaxic brain targets is nothing short of a disaster leaving you with wasted animals and wasted time.

Stereotaxic atlas integrated
3-axis robot with error correction for head tilt, yaw and roll to ensure the best possible surgical target accuracy and reliability.

Avoid human errors
Save time and hit your targets with reliability.

Surgery planning simplified
Brain position is shown in relation to skull features in 3D. Freedom to scale atlas in all 3 axes to take account of animals differing from the atlas average. Custom atlases can be integrated.

Intuitive navigation
Point and click at your targets, with single and double angle adjustment.

Automatic drill-stop and custom-craniotomy shapes
Impedance-based feedback to detect brain height = no bleeding, no mishaps, faster than humans.

Synchronized micro-injector & drill
No tool change required - ideal for optogenetics.

High-throughput
Savable sequences to run on a batch of animals, each individually error-corrected.

Remotely controlled
Optimal for aseptic technique and surgery can be performed on video-feed from surgery microscope.

computer control

automated drilling

atlas integration

ultra-precise

alignment correction

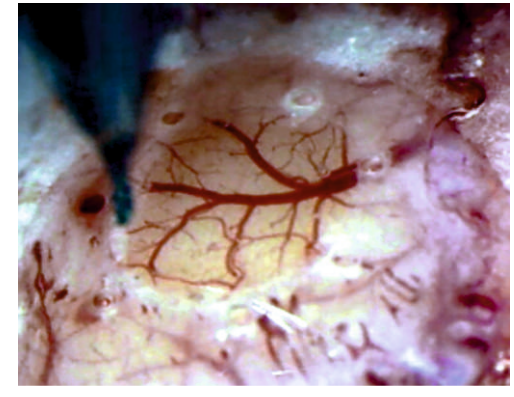
avoid human errors

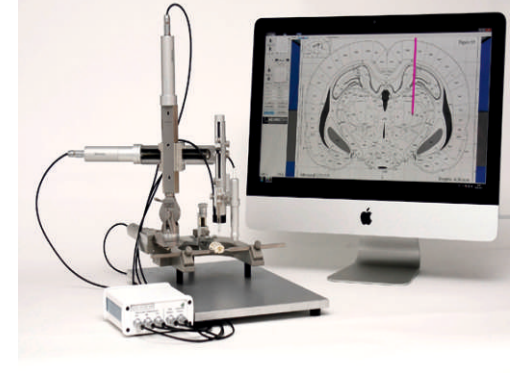
synchronized micro-injection

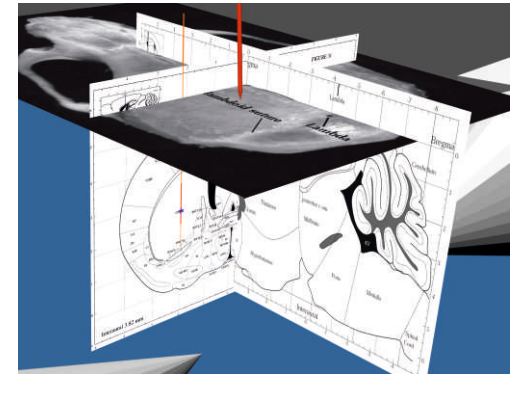
3-D visualization

time-saving

high throughput







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Testimonials

The signal quality of these probes with TDT ZIF-Clip connectors is superb; we've been implanting them as fast as we can get our hands on them. The amount of data that becomes unusable due to noise is dramatically reduced compared to some of the other probes we've used in the past.

Drew Maurer, Lab Head, University of Florida, USA
Brain area: Hippocampus Species: Rat

For our application combining chronic imaging and electrophysiology, 3-D chronic probe stacks mounted on nano-Drives are unparalleled... allowing high SNR, high density recording across multiple regions. Our project would not be possible without this technology.

Gyorgy Buszaki, Lab Head, NYU, USA
Brain Area: cortex. Species: Mouse

My students and I unanimously prefer these probes over various others that we have tried. The signal to noise ratio is excellent, and the design is sturdy and robust. For acute recordings, these are the best-engineered and most user-friendly probes I've worked with.

Sara Aton, Lab Head, University of Michigan, USA
Brain area: Hippocampus; Species: Mice

These probes offer the best signal quality we have seen in this region of the brain to date, lots of beautiful and sortable spikes.

Sarah Fox
Lab of Rasmus Petersen, University of Manchester, UK
Brain Area: VPM Thalamus. Species: Mouse (head-fixed)

I got beautiful 'multi-multi' single cell recordings using both your 32 channel and 64 channel probes in rodents. The recording quality was truly incredible with huge spikes all over the place; definitely some of the best recordings I have seen using silicon probes so far!!
Nicolas Mallett, Lab Head, University of Bordeaux, France. Brain area: Striatum and globus pallidus. Species: Rats and Mice

The signal to noise ratio is outstanding among the commercial products we have tried so far. The flexibility of the probe shanks is a huge plus to acute recording - less worry about breaking them.

Yiming Chen
Lab of Zac Knight, USCF, USA.
Brain Area: Subcortical regions. Species: Mouse

I used the electrode yesterday, and its performance was stellar!

Maxym Myroshnychenko
Lab of Christopher Lapish, Indiana University - Purdue University Indianapolis, USA
Brain area: Prefrontal cortex. Species: Rat

The signal to noise ratio on these probes is so good that we were immediately able to detect small amplitude spikes after a first pass of the raw data traces through the KlustaSuite! I was astonished at how easy it was to detect spikes with these probes, especially after many failed attempts with hand made tetrodes.
Boleslaw Osinski Lab of Leslie Kay, University of Chicago, USA. Brain area: Olfactory bulb. Species: Rat

I don't see any limit to the number of times we can reuse the acute probes. We must have used them around 30 times each so far and can't really see a substantial decline.

Kevin Bolding
Lab of Kevin Franks, Duke University, USA
Brain area: Olfactory bulb, Species: Mice

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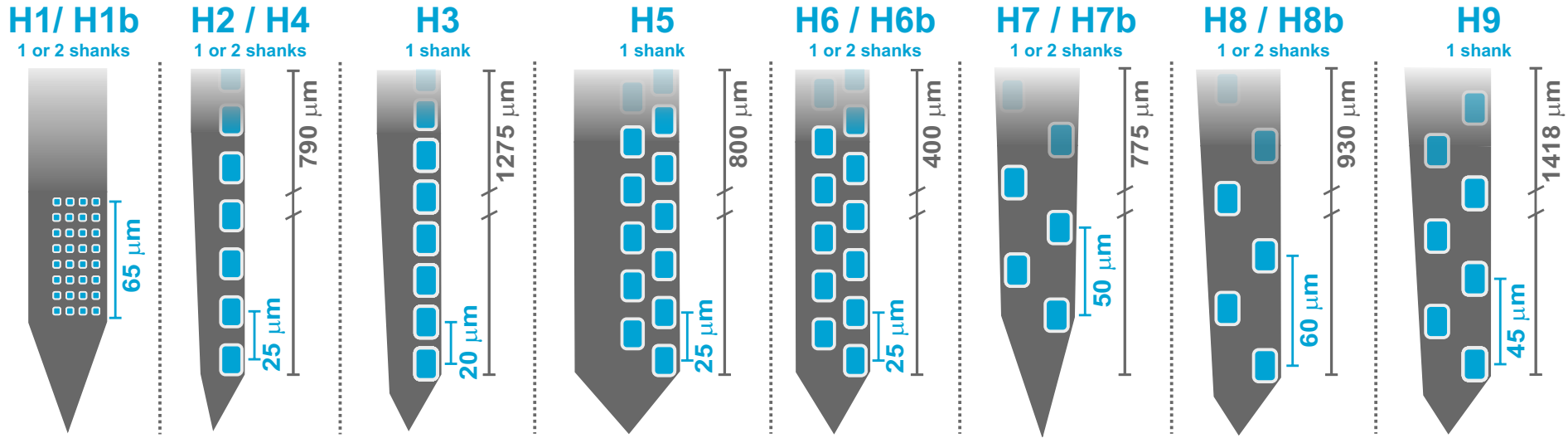
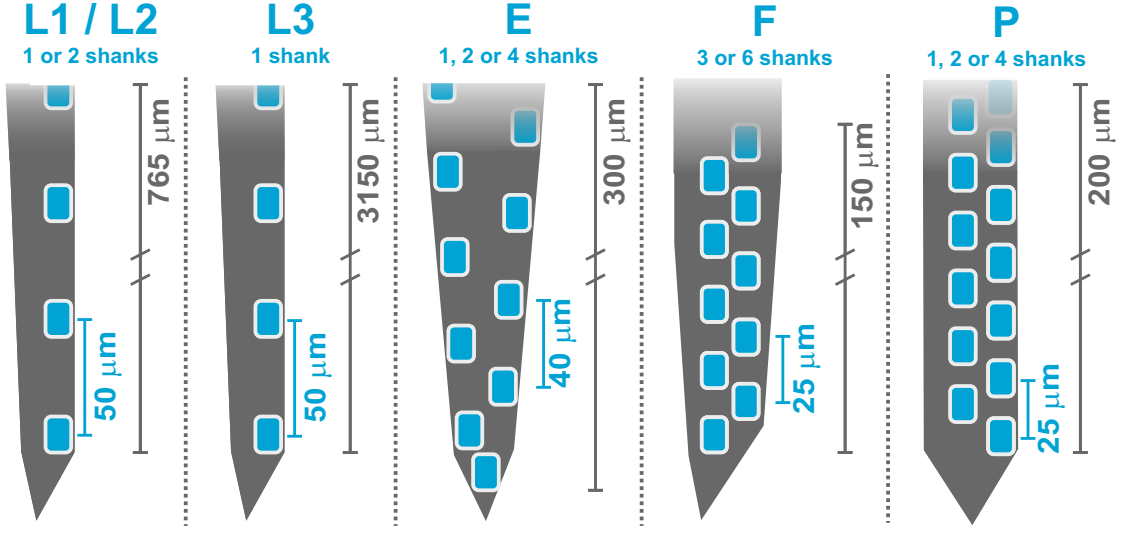
Our Silicon Neural Probes "at a glance"





Optimized for single unit recording in anaesthetised, head-fixed and freely-behaving animals, all of our silicon neural probes also record high quality local field potential (LFP) signals too.

Record ACROSS multiple cell layers

Our innovative **H-Series** probe open new horizons for trans-laminar single unit recording and high-resolution current source density analysis.

Record ALONG cell layers

Our **E-, F- and P-series** probes are optimized for high-density electrode placement along cell layers such as the hippocampal principal cell layer, the cerebellar Purkinje cell layer and so on. With electrodes arranged in poly-trode grids, high-resolution single unit recording and superior spike-sorting power is assured.

All of our probes are available in acute and chronic forms and offer superior signal-to-noise performance, optogenetics-compatibility and outstanding chronic single unit stability.

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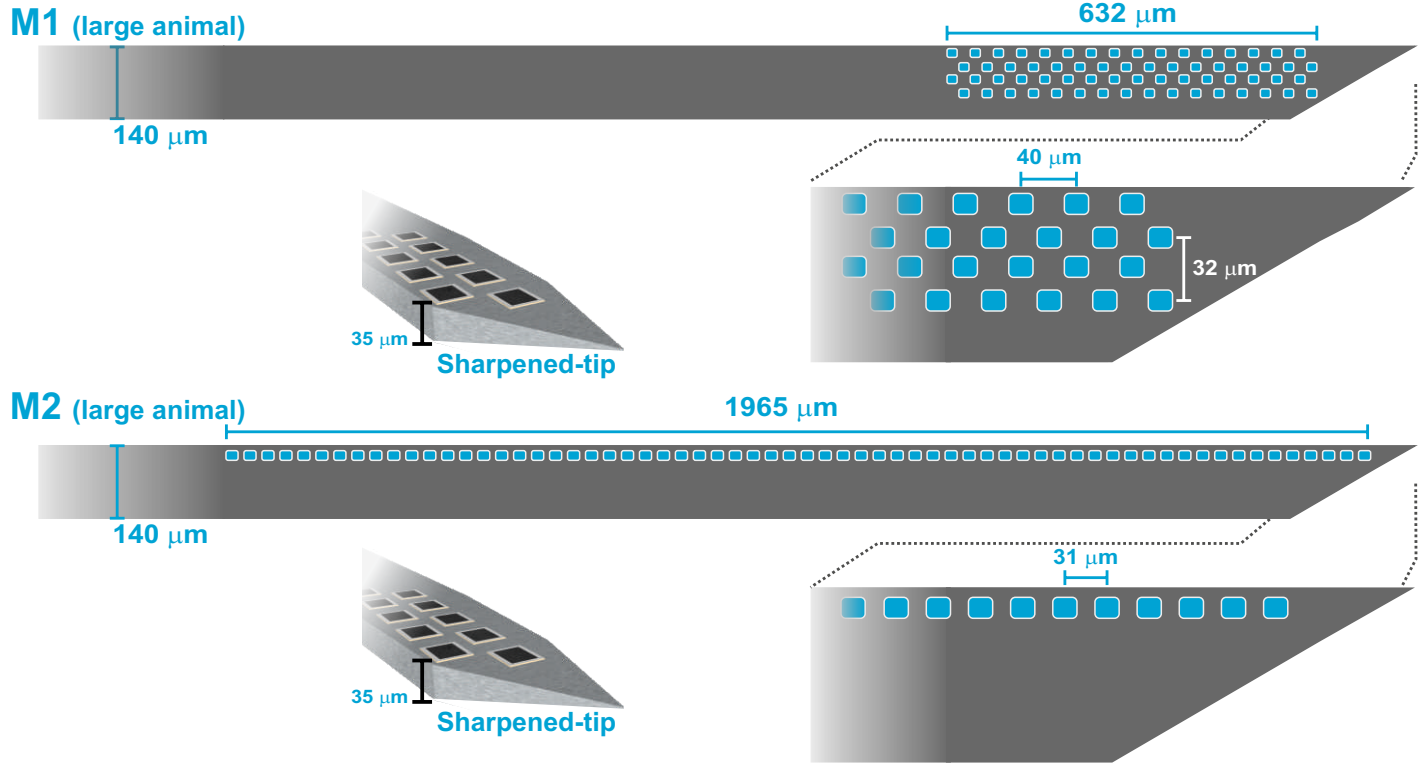
Our Silicon Neural Probes "at a glance"

Large-animal probes

You can now enjoy all of the benefits of our silicon neural probe technology in large animals / deep brain structures with our new M-series probes. Designed with non-human primates in mind, our M-series probes reach up to 15 mm deep and offer the choice of high-density single unit recording with 64 sites covering 632 microns (M1 style) or 1965 microns for trans-laminar single unit recording and high-resolution current source density analysis across multiple cell layers (M2 style). Slightly thicker than our regular probes (35 microns vs. 15 microns) our M-series probes remain the most minimally-invasive large animal probes around and with super-sharpened the tips, you're assured of minimal compression and smooth movement into and through the brain.



Large-animal probes

- **Thicker and wider than our other probes = engineered for large-animal brain tissue**
- **Long-reach - up to 15 mm of insertable probe length**
- **Sharp-tip profile for smooth, drag-free insertion and minimal brain dimpling**
- **Available in acute and chronic forms; can be stacked in pairs +/- EEG / EMG wire add-on**

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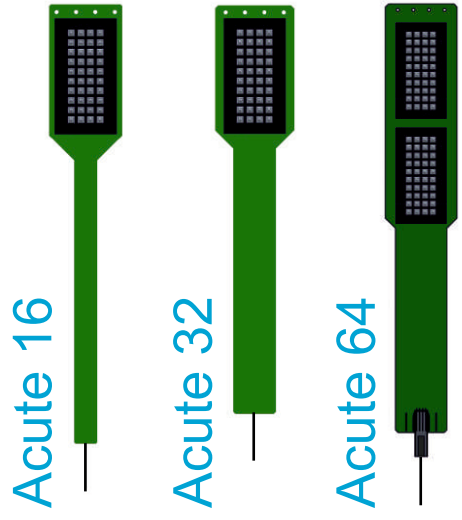
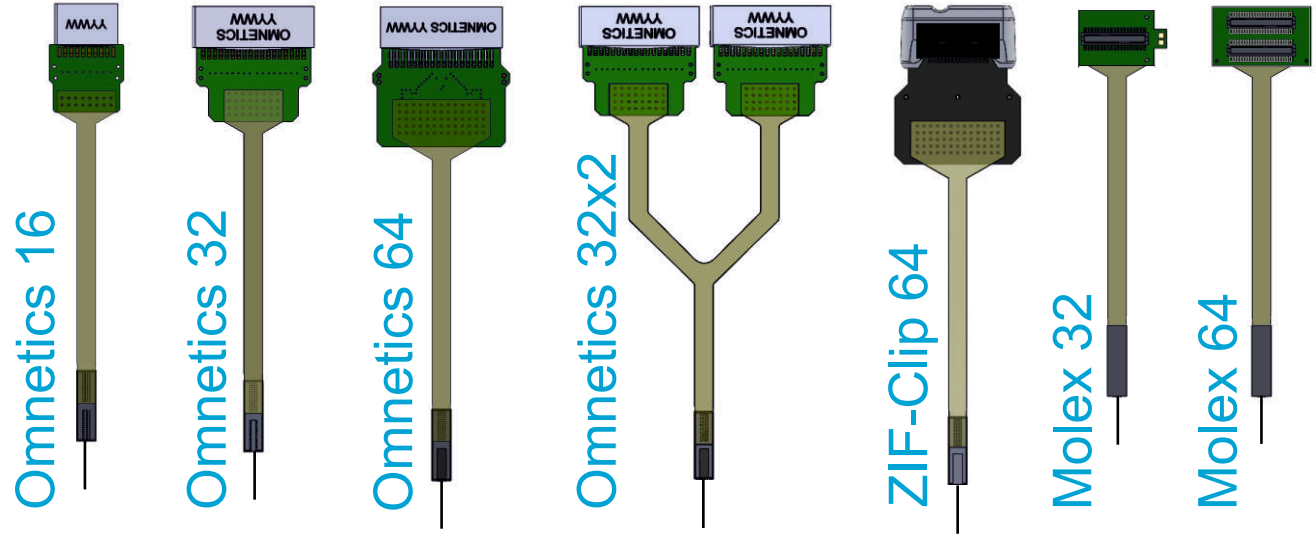
Headstage Connector Options

Acute probes



Chronic probes



Plug n play...

Our probes are available in acute form for anaesthetized and head-fixed animals; we also supply a range of adaptors to interface our acute probes with Omnetics-based headstages.

Our chronic form probes for freely-behaving animals are available with a range of connectors, including Omnetics, TDT ZIF-Clip and Molex.

We are plug n play with all commercially-available data-capture systems including:

open ephys
SpikeGadgets
intan TECHNOLOGIES
ripple neuro
White Matter Advanced Neurotechnology
BLACKROCK MICROSYSTEMS
PLEXON
NeuraLynx advanced electrophysiology solutions
TDT TUCKER-DAVIS TECHNOLOGIES
ALPHA omega Defining Neuroscience Technology

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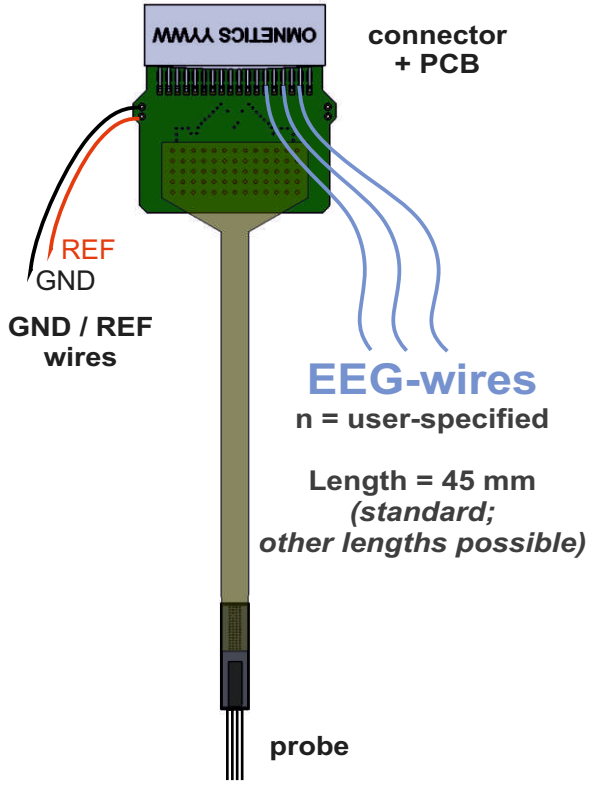
Probe Options:
EEG / EMG Wires | 3-D Stacking | Tip Sharpening

EEG / EMG Wire

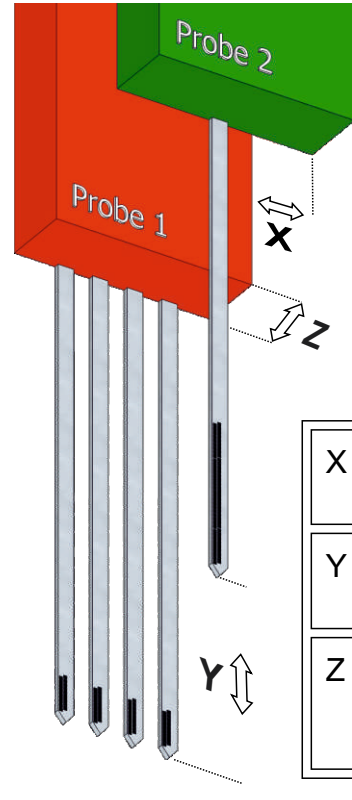
Any Omnetics probe can be equipped with multiple break-out wires for EEG and EMG recording (each wire results in loss of 1 electrode site from the probe).

Wire: PFE-coated stainless steel Type-316 (125 μm bare, 200 μm coated, full hard).



3-D Probe Stacking

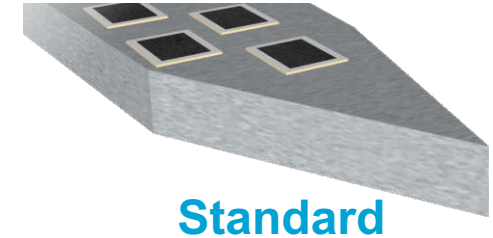
Configure your own customised 3-D probe array using any pair of chronic probes with user-defined horizontal and vertical offset and probe spacing at 150 or 300 μm (and factors thereof for larger spacing intervals). If you require > 2 probes, please let us know what you need and we'll endeavour to build your preferred custom 3-D probe-stack!



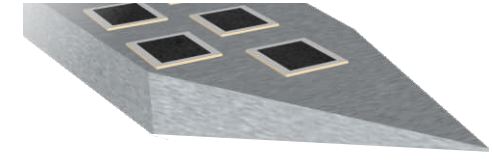
X	User-specified (50 μm tolerance)
Y	User-specified (50 μm tolerance)
Z	• 300 μm - standard • 150 μm - optional • Multiples of above

Tip Sharpening

Our regular probes are all 15 microns thin down to the tip. Our new sharpened-tip option enables these thin probes to penetrate the majority of small animal dura (mouse, rat and similar) thereby removing the need for a durotomy and thus minimizing damage to the superficial layers of the brain. Furthermore, you're also assured of minimal tissue-drag and compression as the probe advances through the pia and deeper (even if you have to make a durotomy).



Standard



Sharpened

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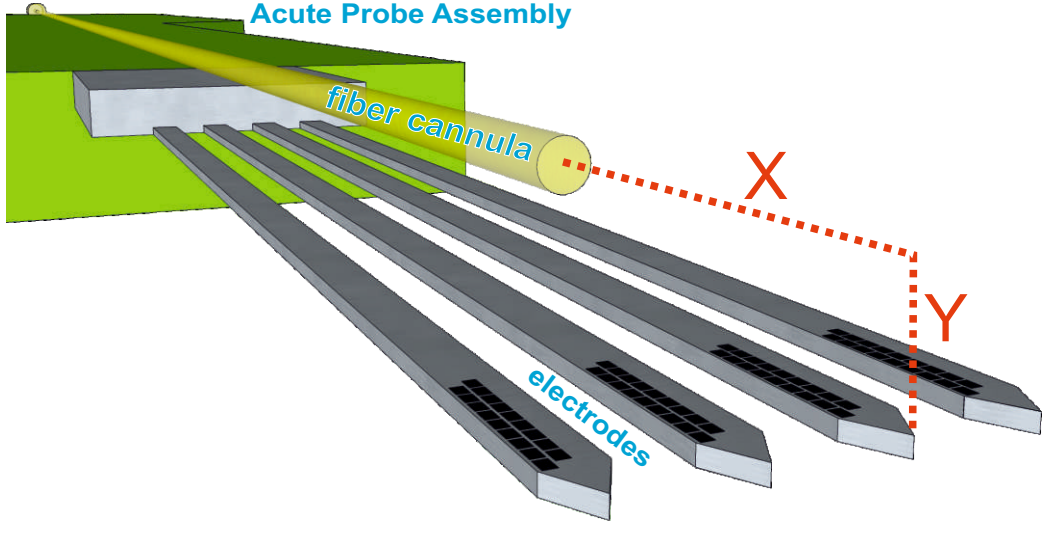
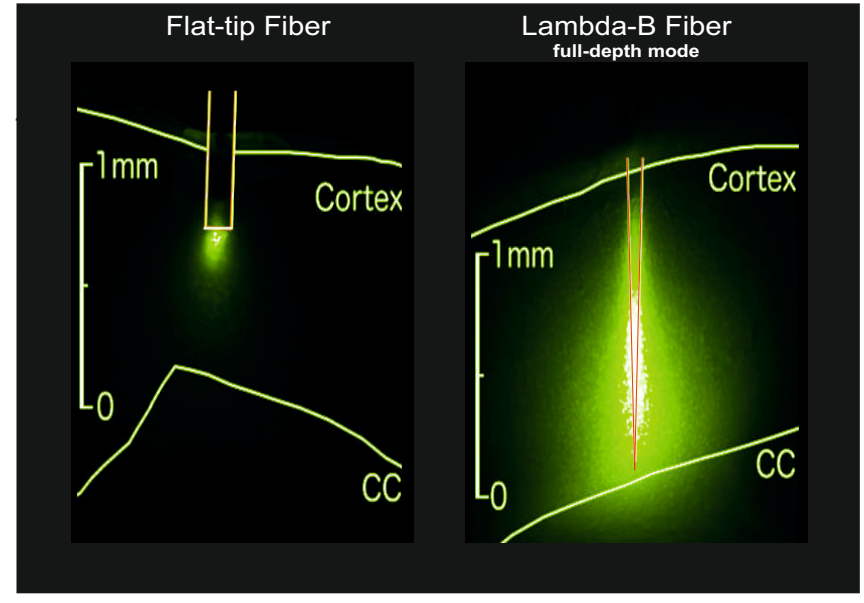
Probe Options:
Acute Ready-Made Optrodes

Acute Optrodes

Our acute optrodes are ready-assembled with your choice of fiber and chosen alignment offset with respect to the probe tip(s). For experiments requiring brain surface illumination we recommend our 200-core flat tip fiber whereas for deep-brain illumination our 100-core or 60-core fibers will provide sufficient illumination whilst minimizing tissue damage. These smaller diameter fibers also have angled 45-degree tips to aid with smooth movement through the tissue by minimizing tissue-drag and brain dimpling / compression.

Acute 64 channel optrodes also offer an additional choice of horizontal separation between probe and fiber with either 300 microns (standard) or 150 microns available. For small-scale illumination, opt for 60-core fiber with 150 micron separation and so on...





Distance X	user-specified (50 μm tolerance)
Distance Y	Acute 16 & 32: ~100 (μm) Acute 64: 150 or 300 (μm)
Fiber Options	(A) 60 μm core; 0.37 NA; A45 tip (B) 100 μm core; 0.37 NA; A45 tip (C) 200 μm core; 0.66 NA, Flat tip Lambda-B - please refer to website
Ferrule	1.25 mm Zirconia

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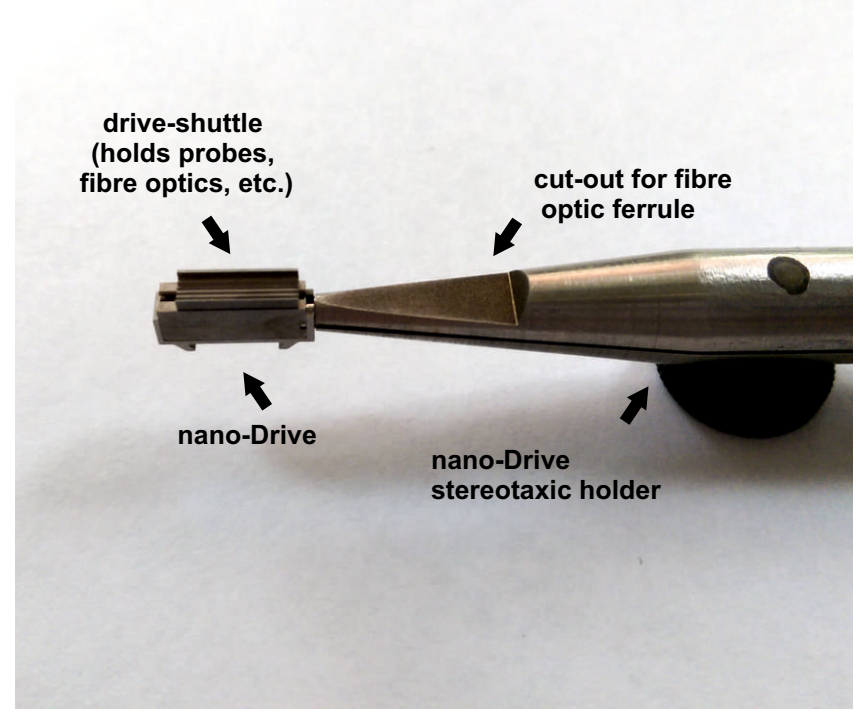
Probe Accessories

nano-Drive stereotaxic holder

A custom-made tool designed to hold your nano-Drive in a stereotaxic manipulator (Kopf or Stoelting) allowing 360-degree access to the nano-Drive. The holder tool presents the nano-Drive in the most convenient orientation for you to mount your silicon neural probes on the bench-top.

The holder tool is also designed to exploit the nano-Drive fibre optic cannula compatibility with a unique cut-out section at the tool tip, creating sufficient clearance for 1.25 mm fiber optic ferrule connectors.



Acute probe connector adaptors

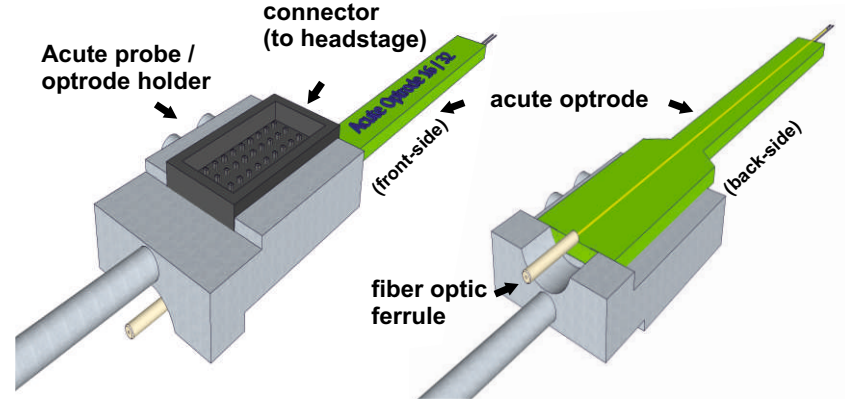
We offer a variety of adaptors to interface our acute probe connectors with your Omnetics-based headstages:

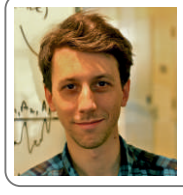
ADPT A16-Om16; ADPT A32-Om32; ADPT A64-Om32x2 (Intan-compatible)

N.B. you can use a 16 or 32 channel channel probe with our ADPT-A64-Om32x2 adaptor provided your 64-channel headstage is tolerant of floating channels.

Acute probe / optrode holder

A custom-made tool designed to hold our acute probes / optrodes in a precision micro-manipulator. The holder is lightweight (~5g) with a 2.5 mm diameter rod extending to 100 mm to create sufficient clearance between your manipulator and animal subject. The holder also enables the straightforward connection of a fiber patch cord to our pre-mounted fiber optic ferrules on our acute optrodes.





We have implanted our first mouse with the H5 probe. Beautiful data! Can I order more immediately so that I don't run out of these probes?!

Adrien Peyrache
Lab Head, McGill University, Canada
Brain area: Cortical regions. Species: Mice

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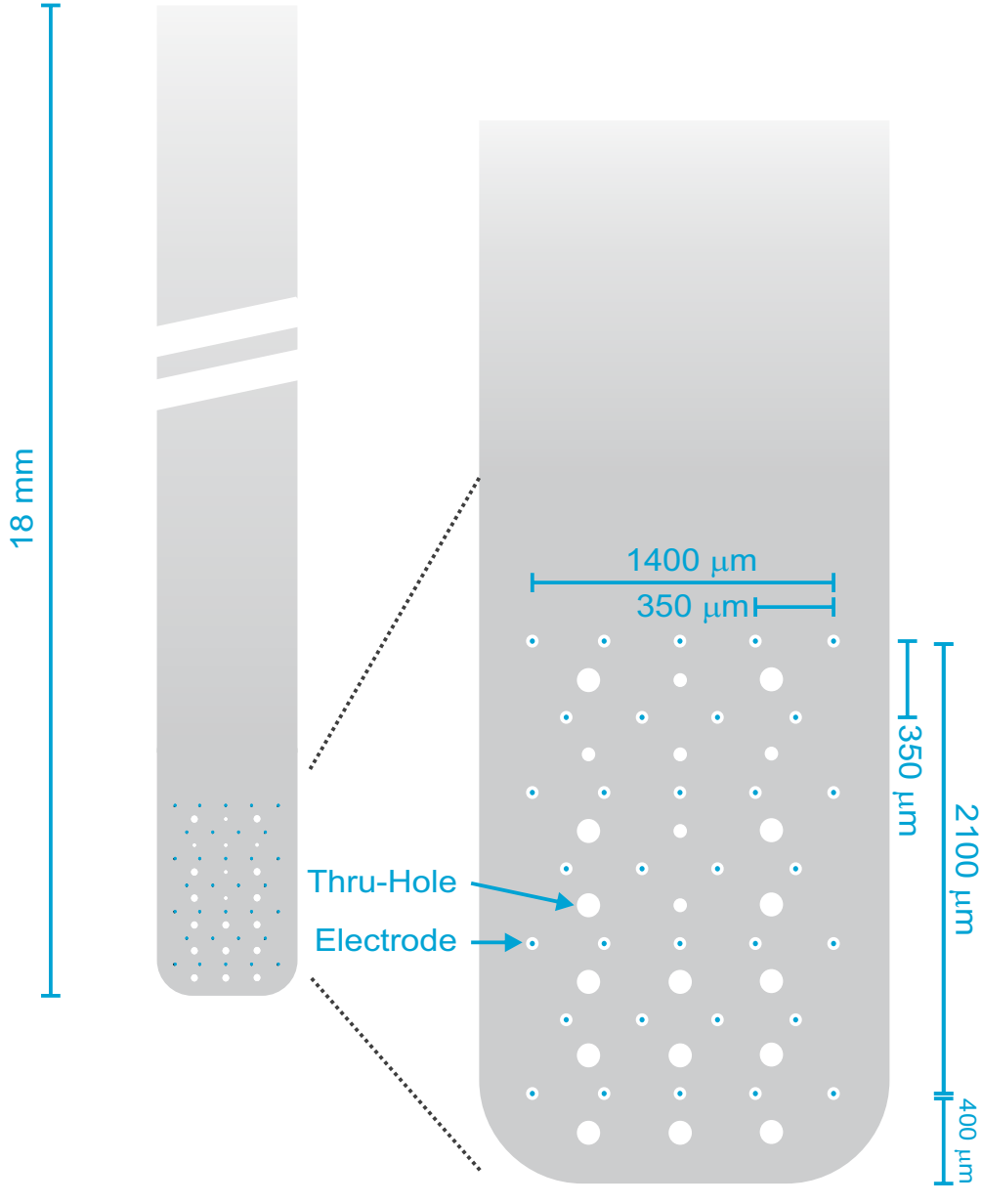
ECoG-32A
32 electrodes



Number of Electrodes	32
Flex Length (mm)	18
Flex Width Max. (µm)	2000
Flex Thickness (µm)	4
Electrode Diam. (µm)	20
Electrode Impedance (kOhm)	< 50
Electrode Coverage (µm)	1400 x 2100 (2.94 mm^2)
Connector Options	Chronic (Omnetics; Molex)
Thru-Hole Diam. (µm)	100 200

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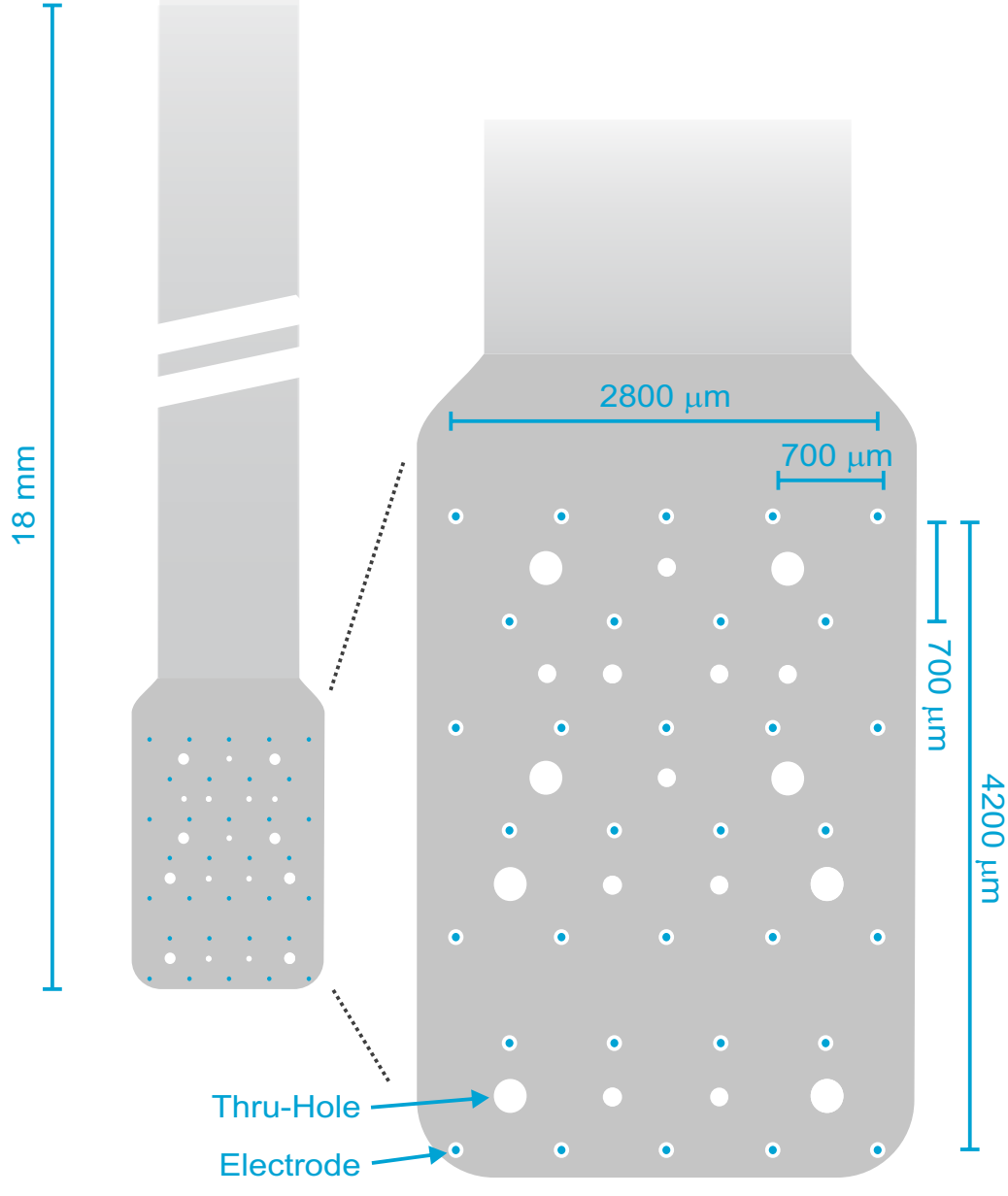
ECoG-32B
32 electrodes



Number of Electrodes	32
Flex Length (mm)	18
Flex Width Max. (µm)	2000 (3300)
Flex Thickness (µm)	4
Electrode Diam. (µm)	20
Electrode Impedance (kOhm)	< 50
Electrode Coverage (µm)	2800 x 4200 (11.76 mm^2)
Connector Options	Chronic (Omnetics; Molex)
Thru-Hole Diam. (µm)	100 200

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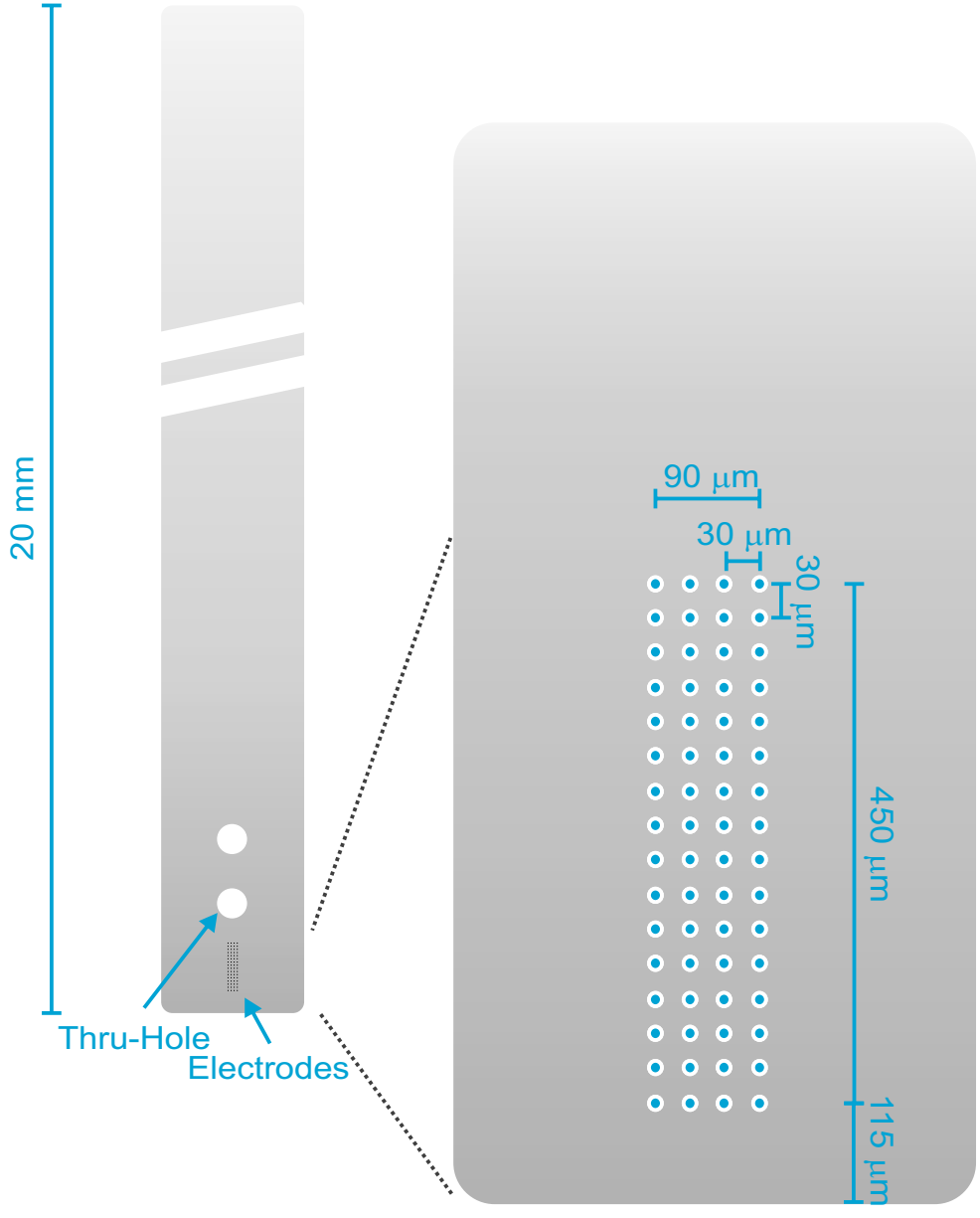
ECoG-64A
64 electrodes



Number of Electrodes	64
Flex Length (mm)	20
Flex Width Max. (µm)	2000
Flex Thickness (µm)	4
Electrode Diam. (µm)	12
Electrode Impedance (kOhm)	~50 - 100
Electrode Coverage (µm)	90 x 450 (0.045 mm^2)
Connector Options	Chronic (Omnetics; Molex; TDT)
Thru-Hole Diam. (µm)	400

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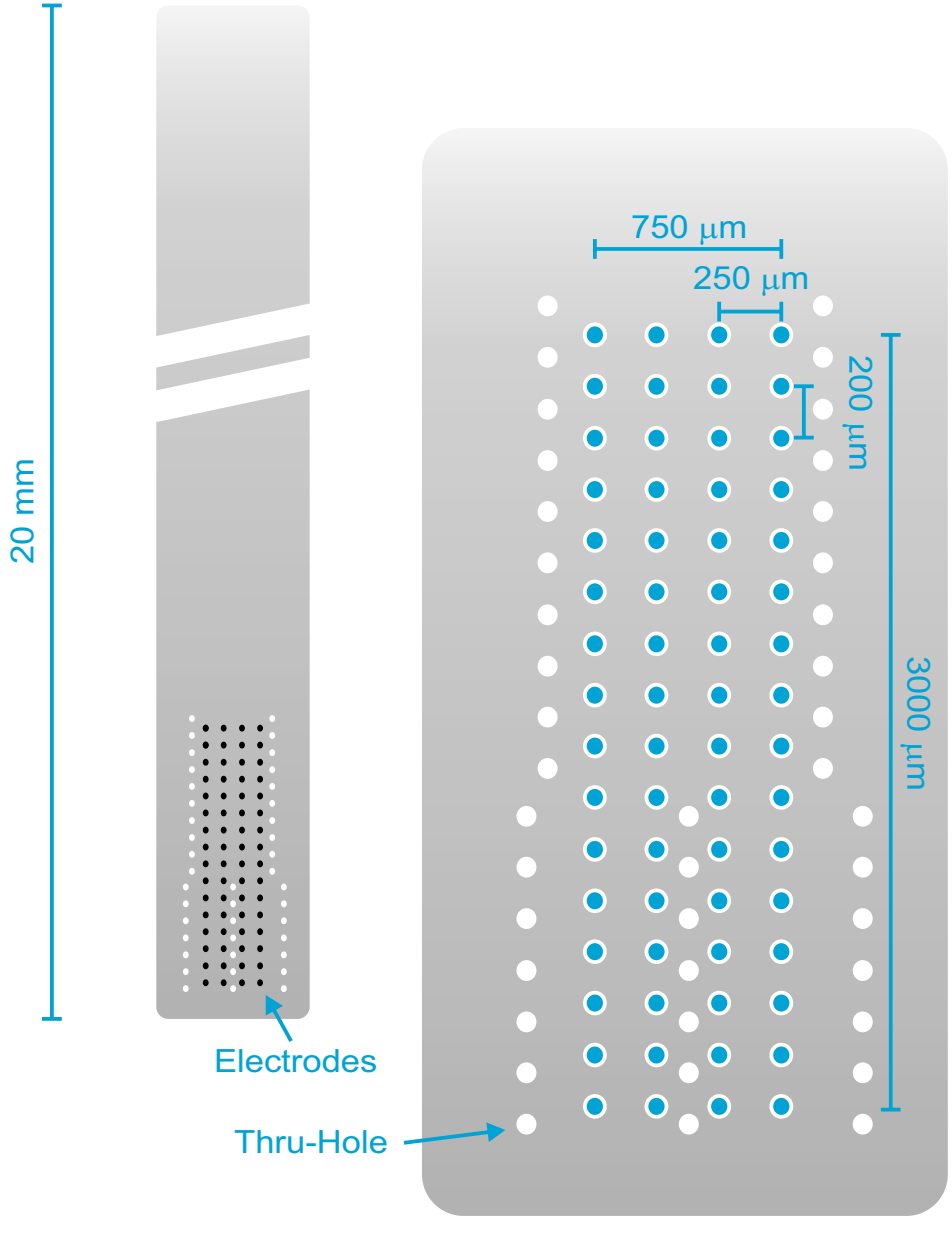
ECoG-64B
64 electrodes



Number of Electrodes	64
Flex Length (mm)	20
Flex Width Max. (µm)	2000
Flex Thickness (µm)	4
Electrode Diam. (µm)	80
Electrode Impedance (kOhm)	~50 - 100
Electrode Coverage (µm)	750 x 3000 (2.25 mm^2)
Connector Options	Chronic (Omnetics; Molex; TDT)
Thru-Hole Diam. (µm)	50

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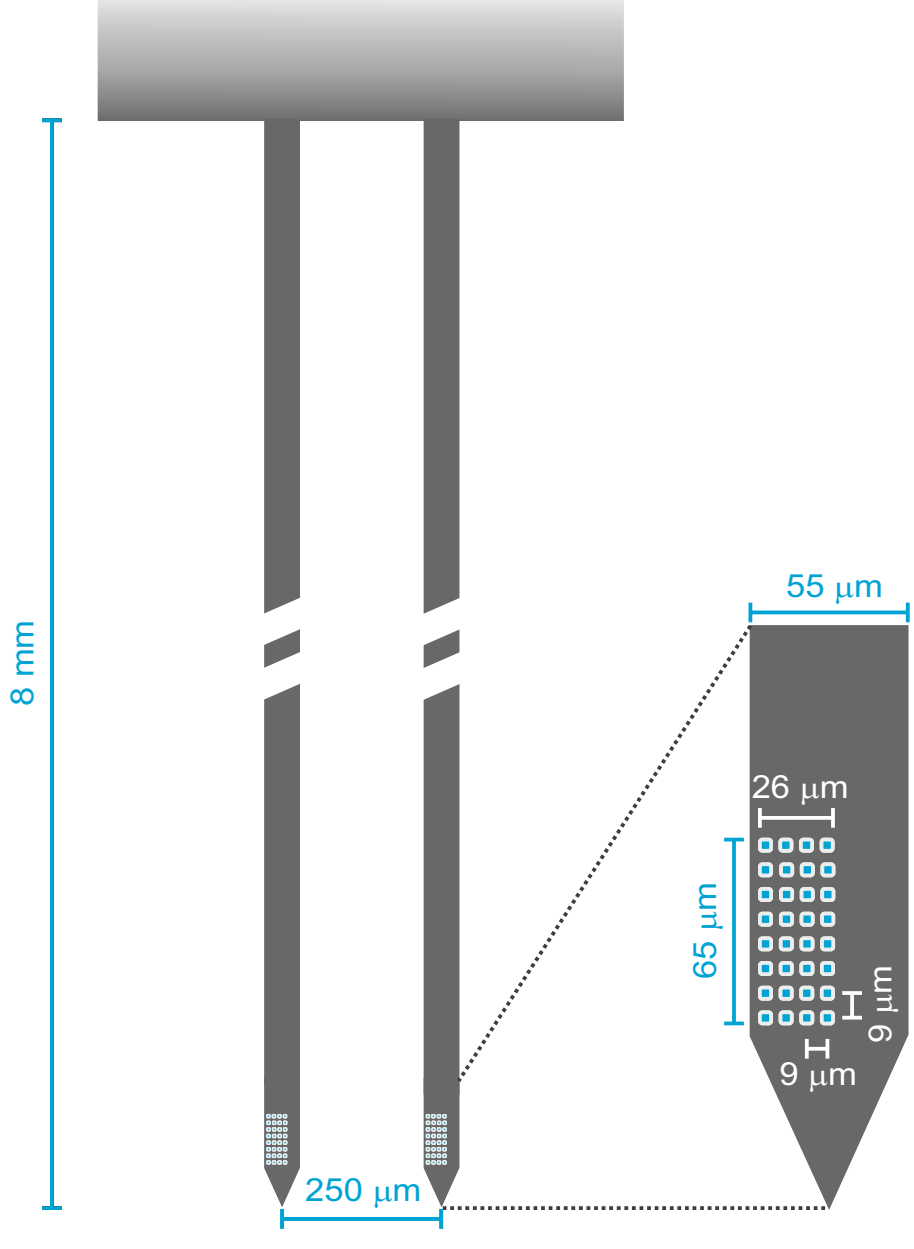
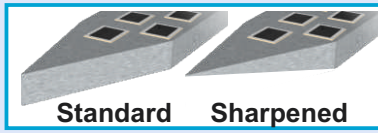
H-series Probes: H1 / H1b
64 or 32 electrodes



Number of Electrodes	64 (H1) or 32 (H1b)
Shank Length (mm)	8
Number of Shanks Electrodes per Shank	2 or 1 32
Shank Thickness (µm)	15
Electrode Size (µm)	5 x 5
Electrode Impedance (kOhm)	~250 - 350
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex; TDT)
Tip Options	 Standard Sharpened

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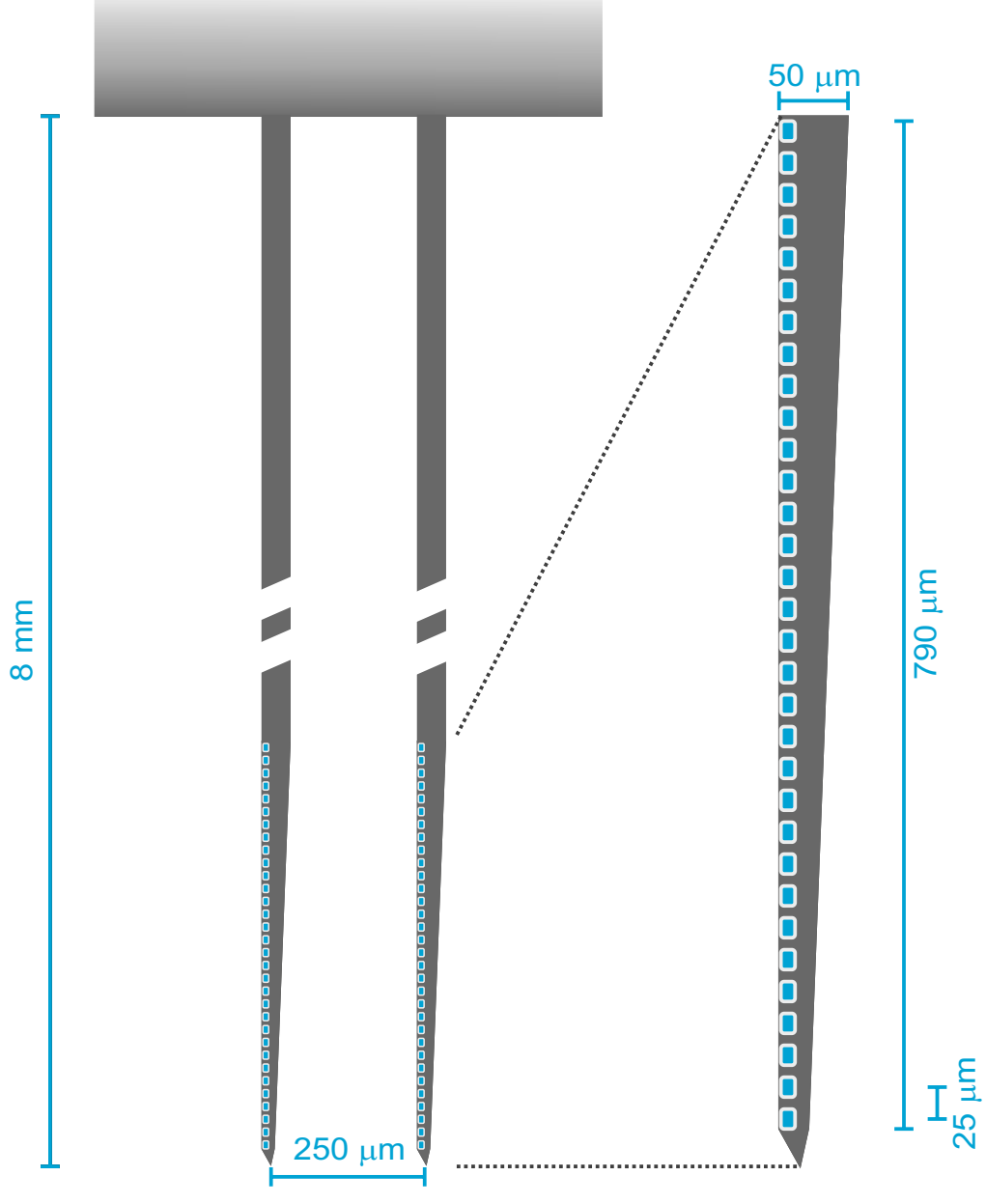
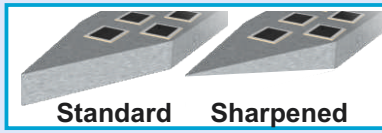
H-series Probes: H2
64 electrodes



Number of Electrodes	64
Shank Length (mm)	8
Number of Shanks Electrodes per Shank	2 32
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex; TDT)
Tip Options	 Standard Sharpened

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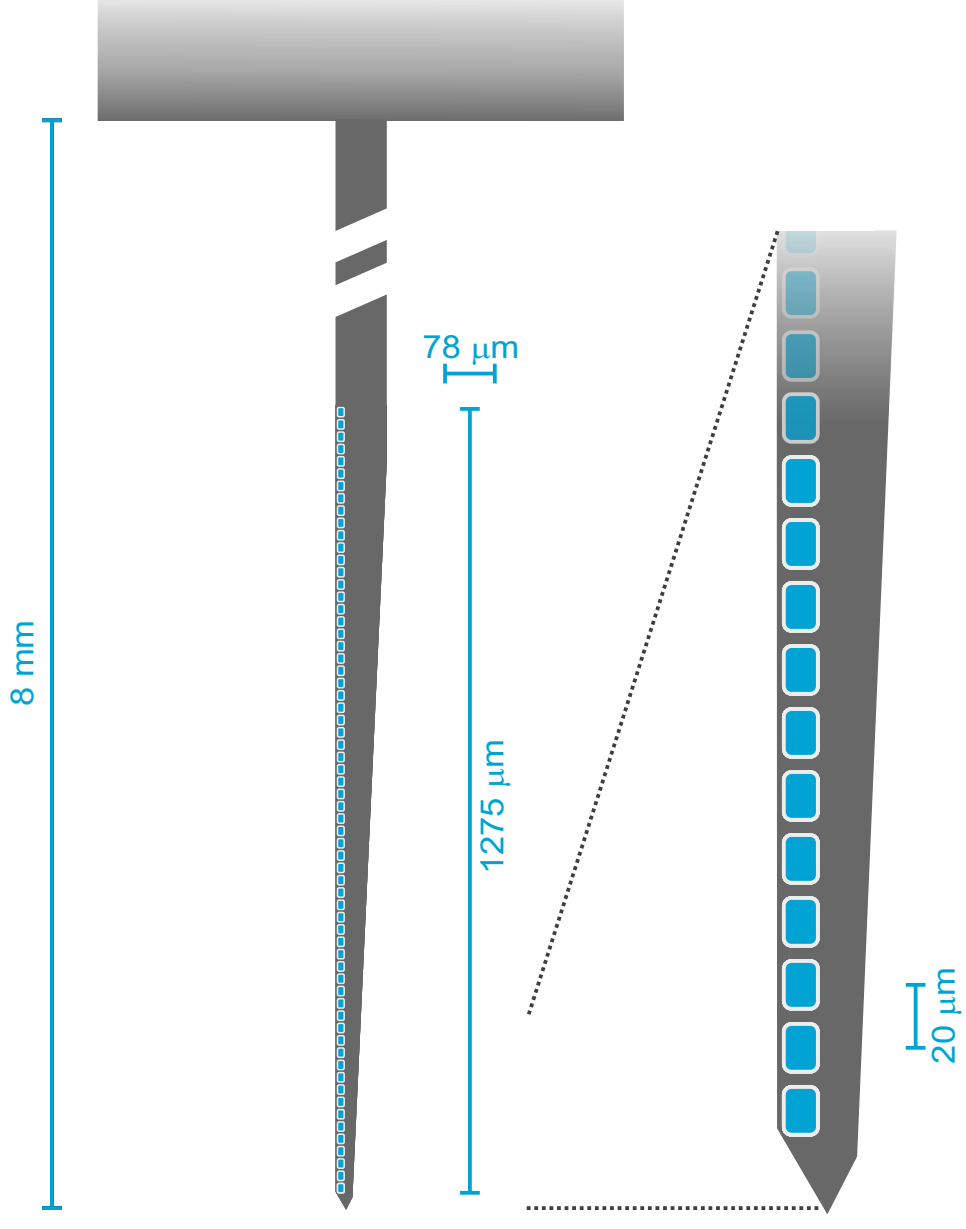
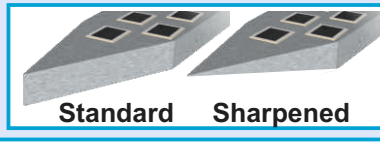
H-series Probes: H3
64 electrodes



Number of Electrodes	64
Shank Length (mm)	8
Number of Shanks Electrodes per Shank	1 64
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex; TDT)
Tip Options	 Standard Sharpened

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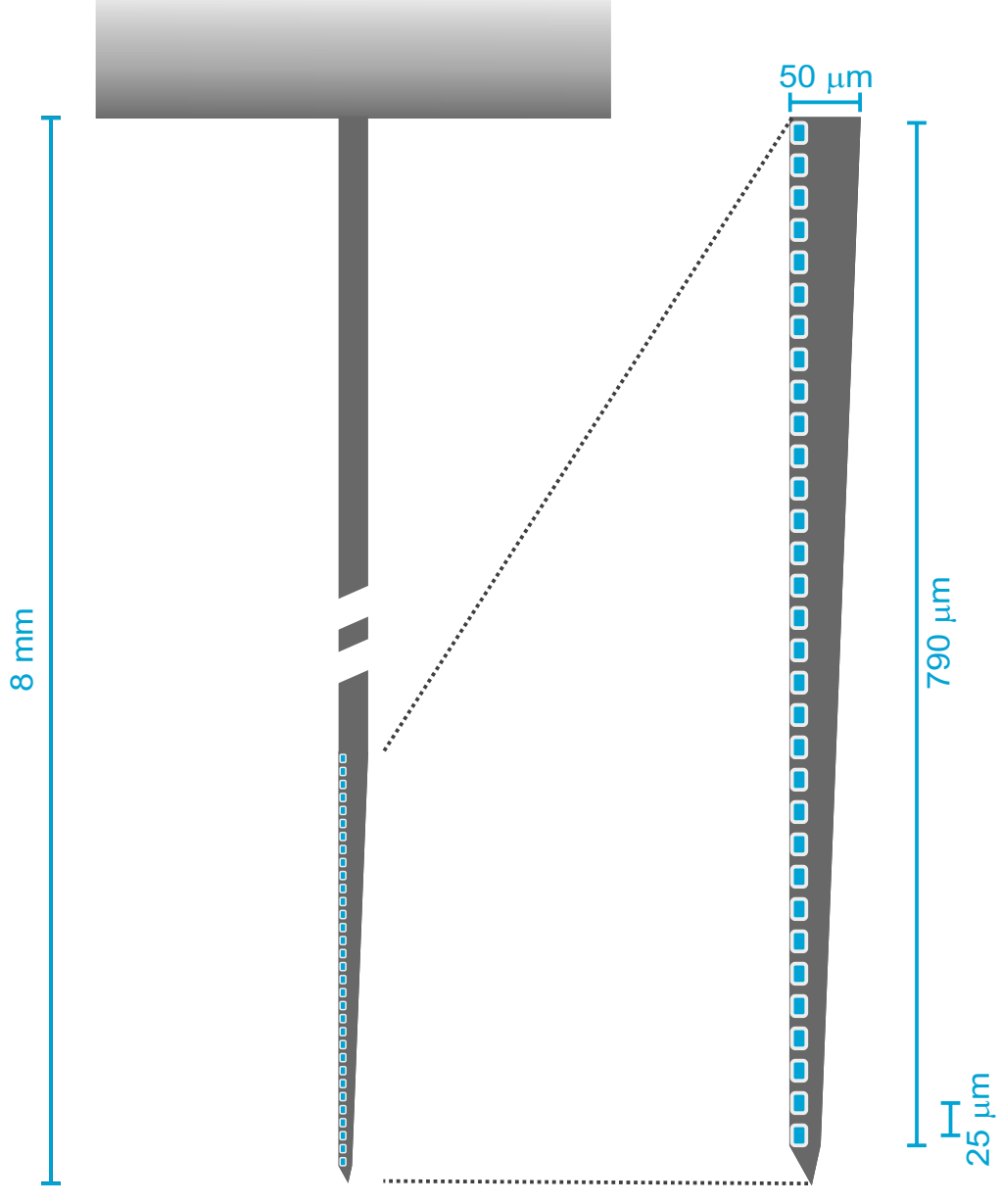
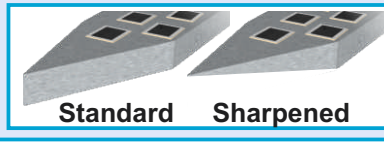
H-series Probes: H4
32 electrodes



Number of Electrodes	32
Shank Length (mm)	8
Number of Shanks Electrodes per Shank	1 32
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex)
Tip Options	

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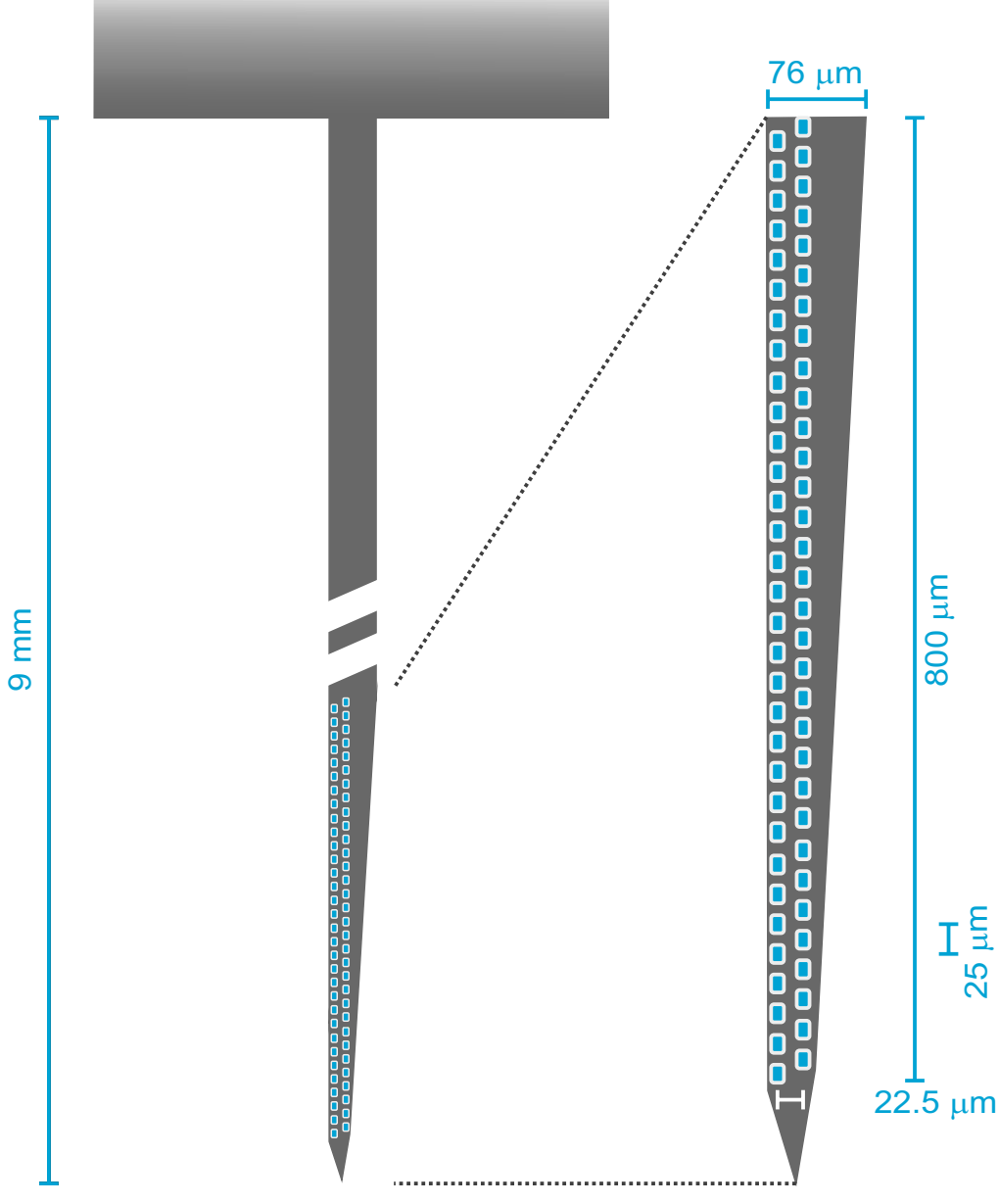
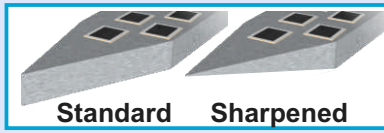
H-series Probes: H5
64 electrodes



Number of Electrodes	64
Shank Length (mm)	9
Number of Shanks Electrodes per Shank	1 64
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex; TDT)
Tip Options	 Standard Sharpened

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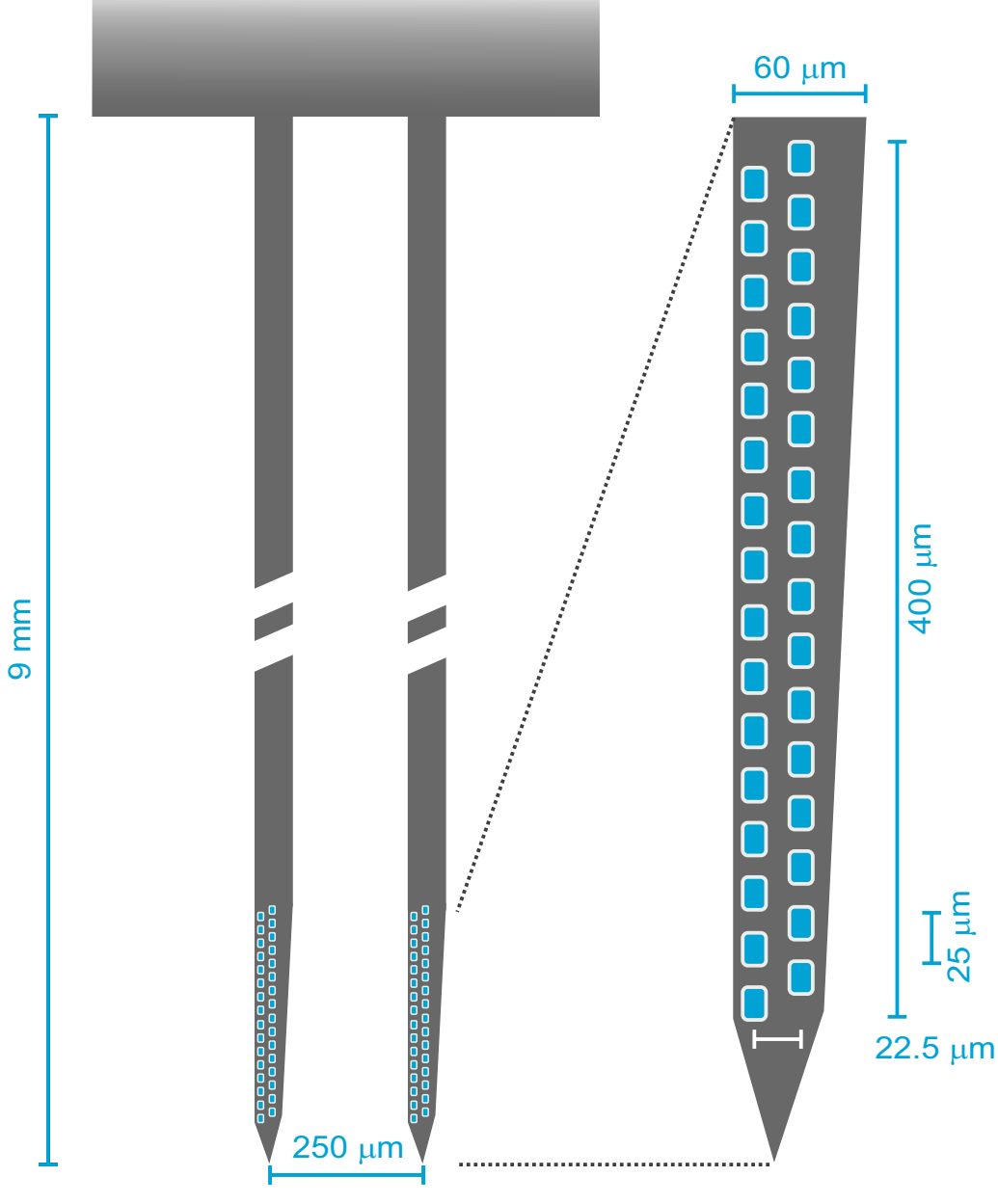
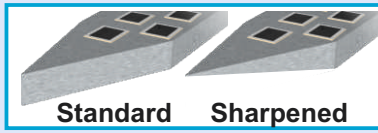
H-series Probes: H6 / H6b
64 or 32 electrodes



Number of Electrodes	64 (H6) or 32 (H6b)
Shank Length (mm)	9
Number of Shanks Electrodes per Shank	2 or 1 32
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex; TDT)
Tip Options	 Standard Sharpened

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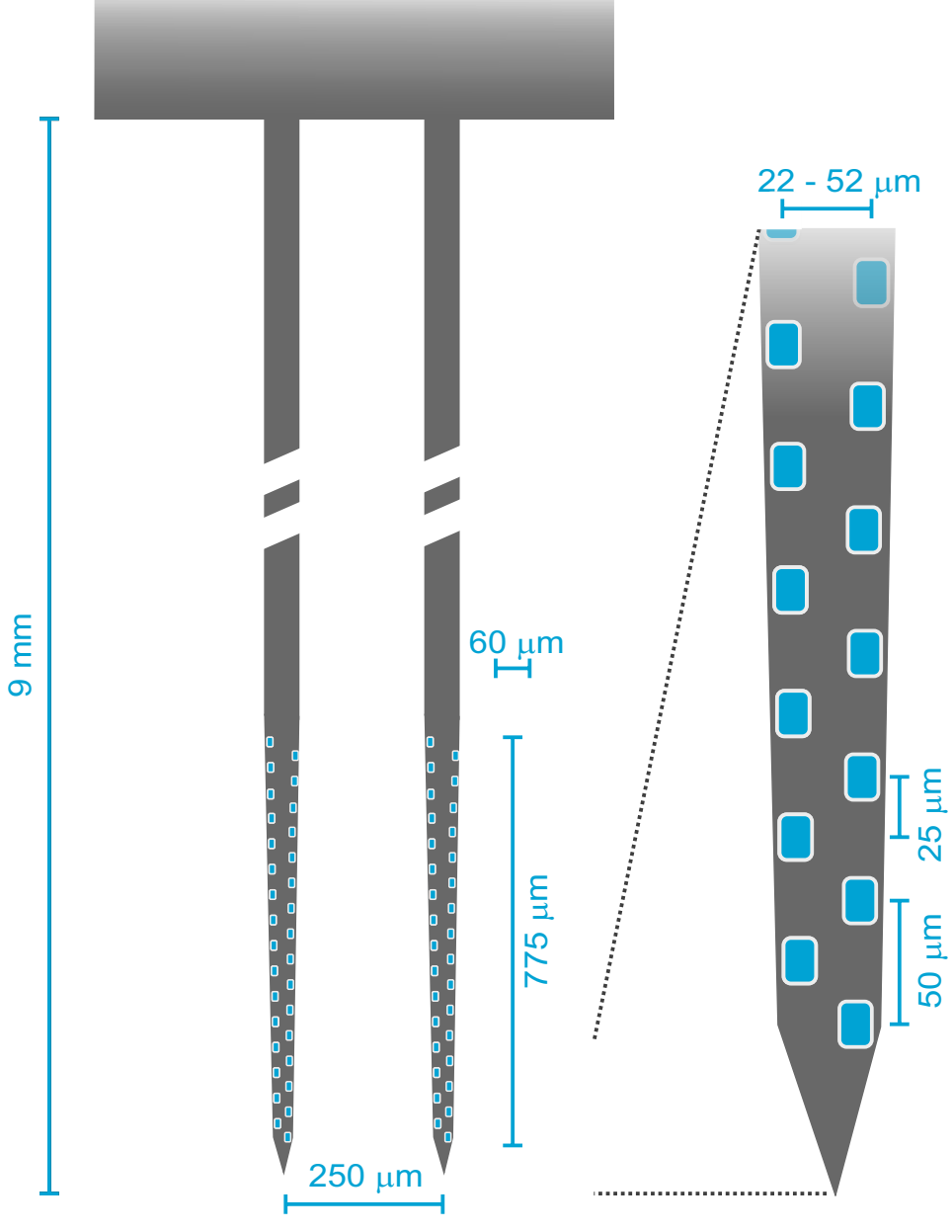
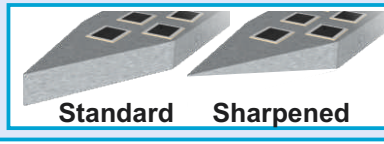
H-series Probes: H7 / H7b
64 or 32 electrodes



Number of Electrodes	64 (H7) or 32 (H7b)
Shank Length (mm)	9
Number of Shanks Electrodes per Shank	2 or 1 32
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex; TDT)
Tip Options	 Standard Sharpened

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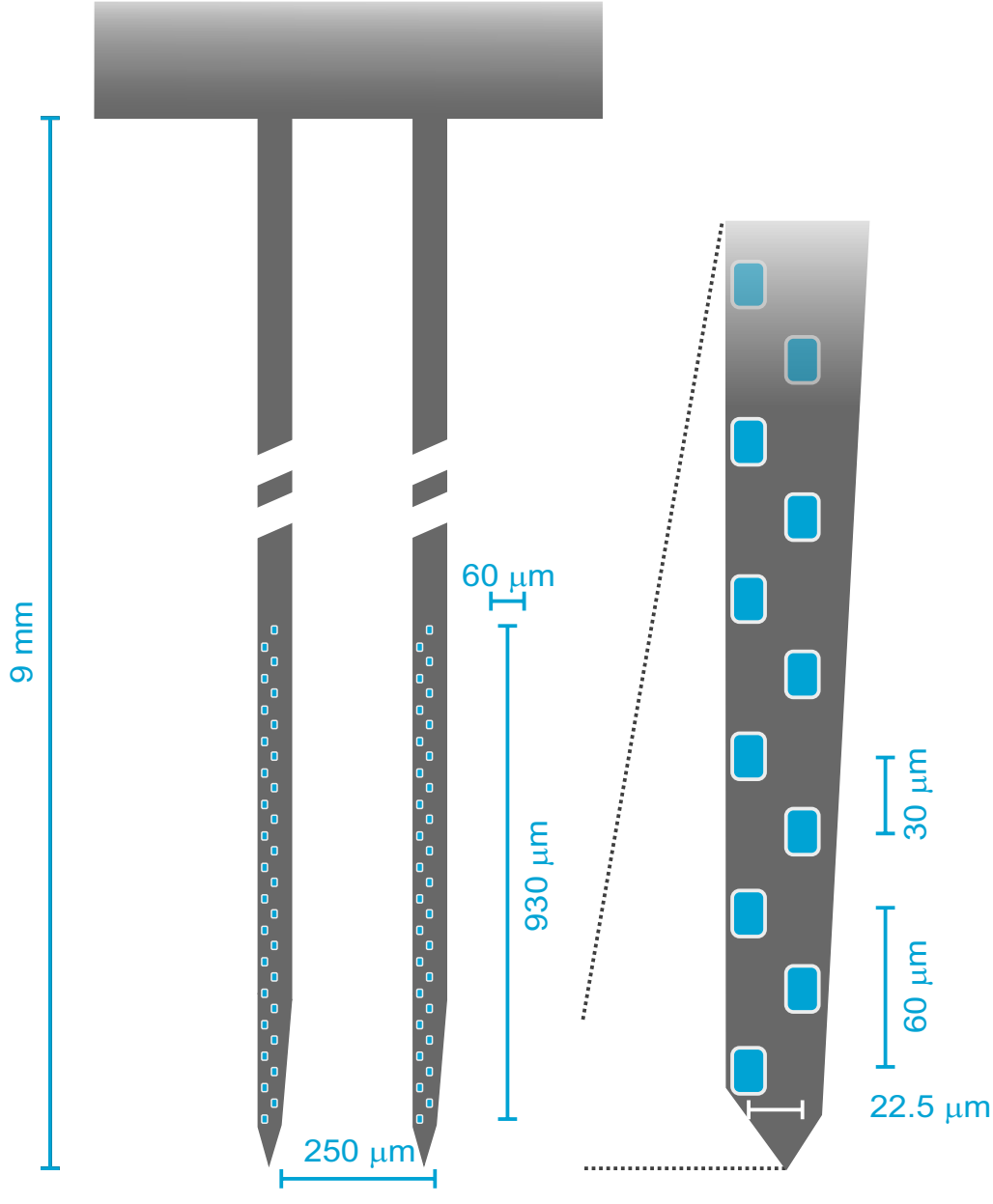
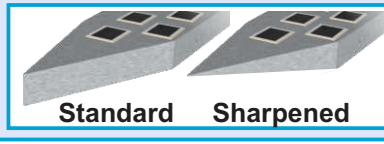
H-series Probes: H8 / H8b
64 or 32 electrodes



Number of Electrodes	64 (H8) or 32 (H8b)
Shank Length (mm)	9
Number of Shanks Electrodes per Shank	2 or 1 32
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex; TDT)
Tip Options	 Standard Sharpened

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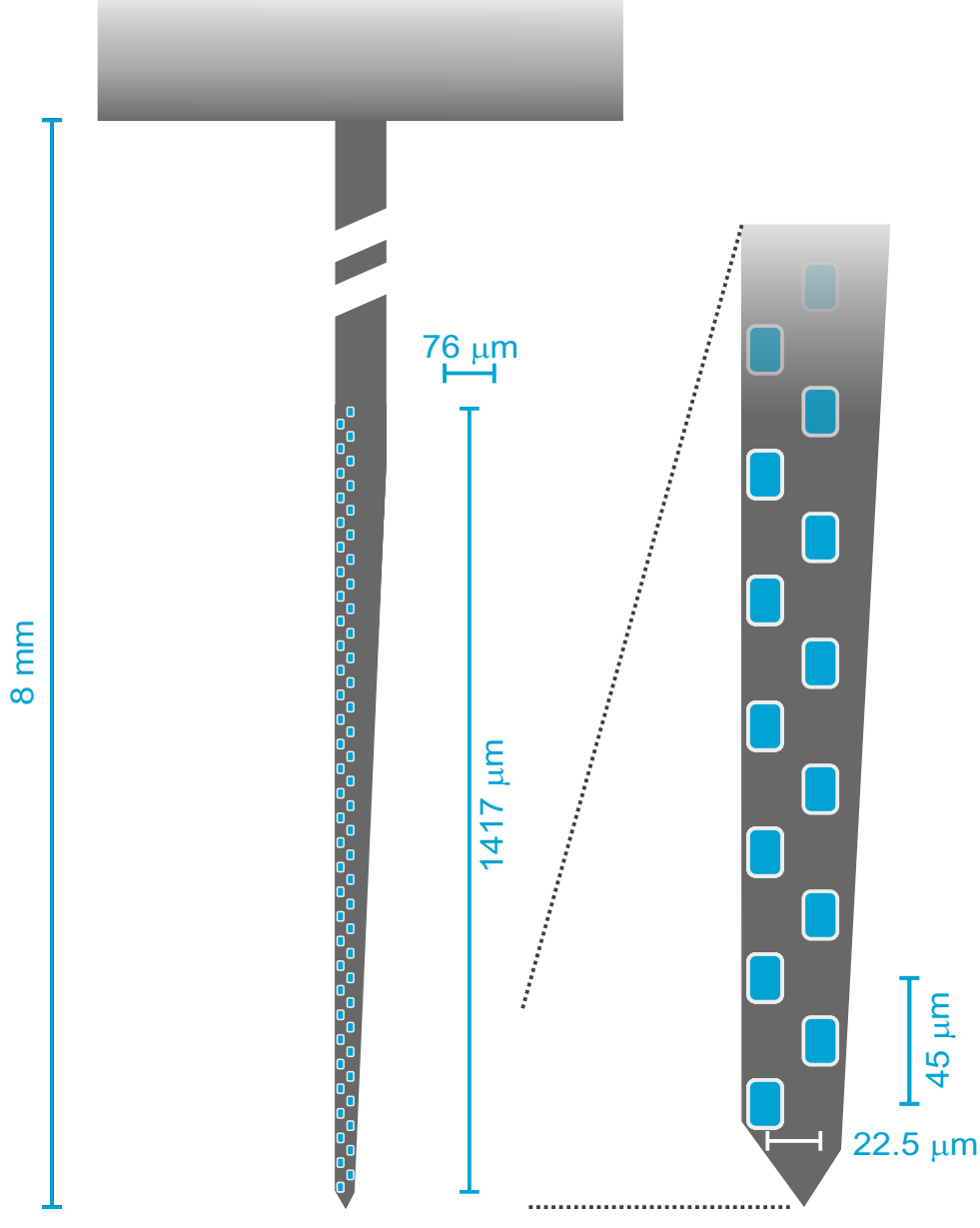
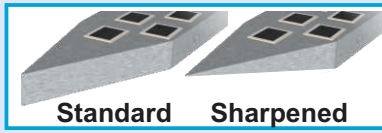
H-series Probes: H9
64 electrodes



Number of Electrodes	64
Shank Length (mm)	8
Number of Shanks Electrodes per Shank	1 64
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex; TDT)
Tip Options	 Standard Sharpened

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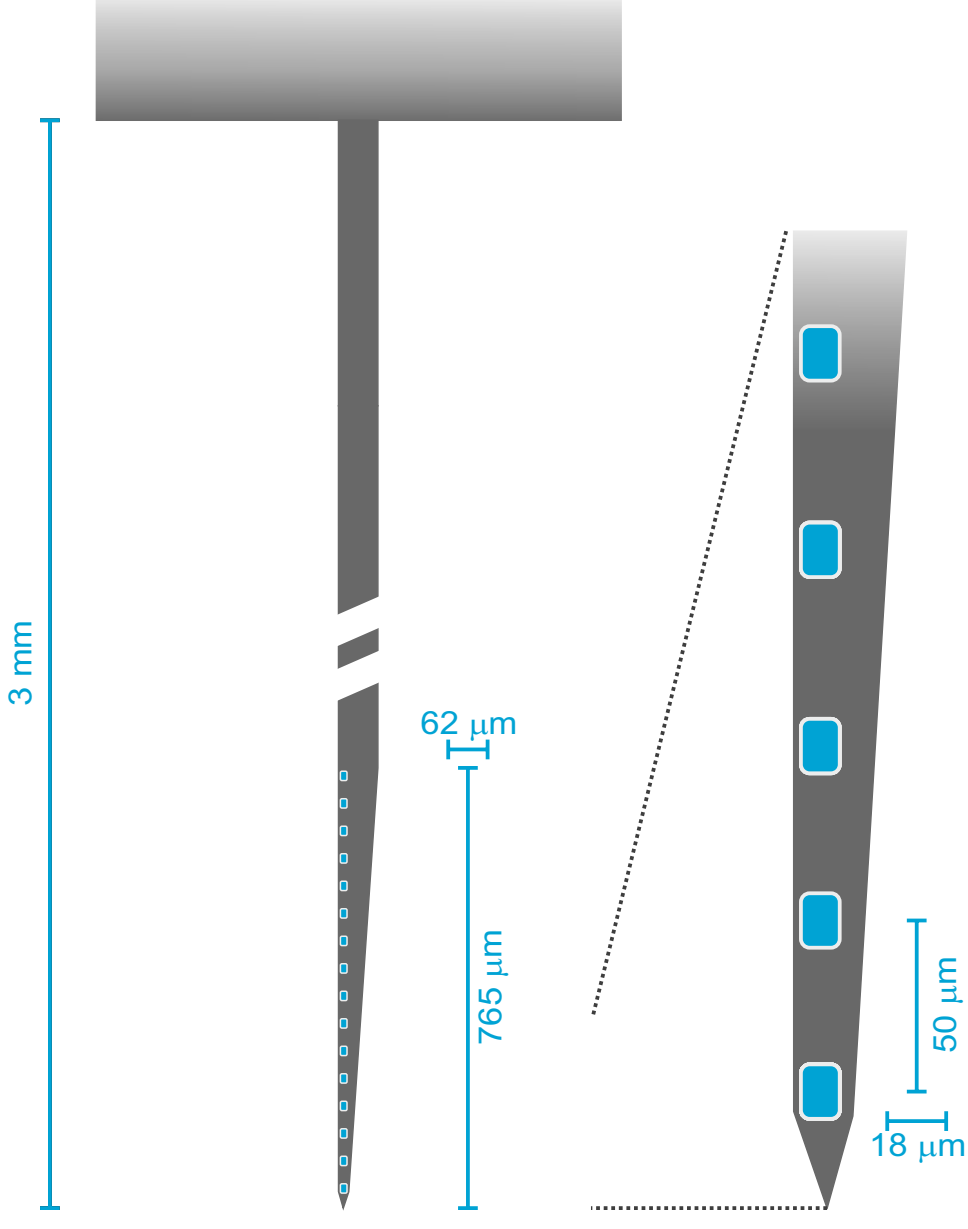
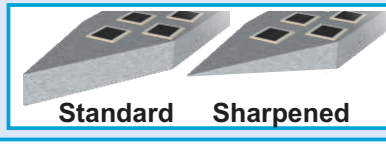
L-series Probes: L1
16 electrodes



Number of Electrodes	16
Shank Length (mm)	3
Number of Shanks Electrodes per Shank	1 16
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics)
Tip Options	 Standard Sharpened

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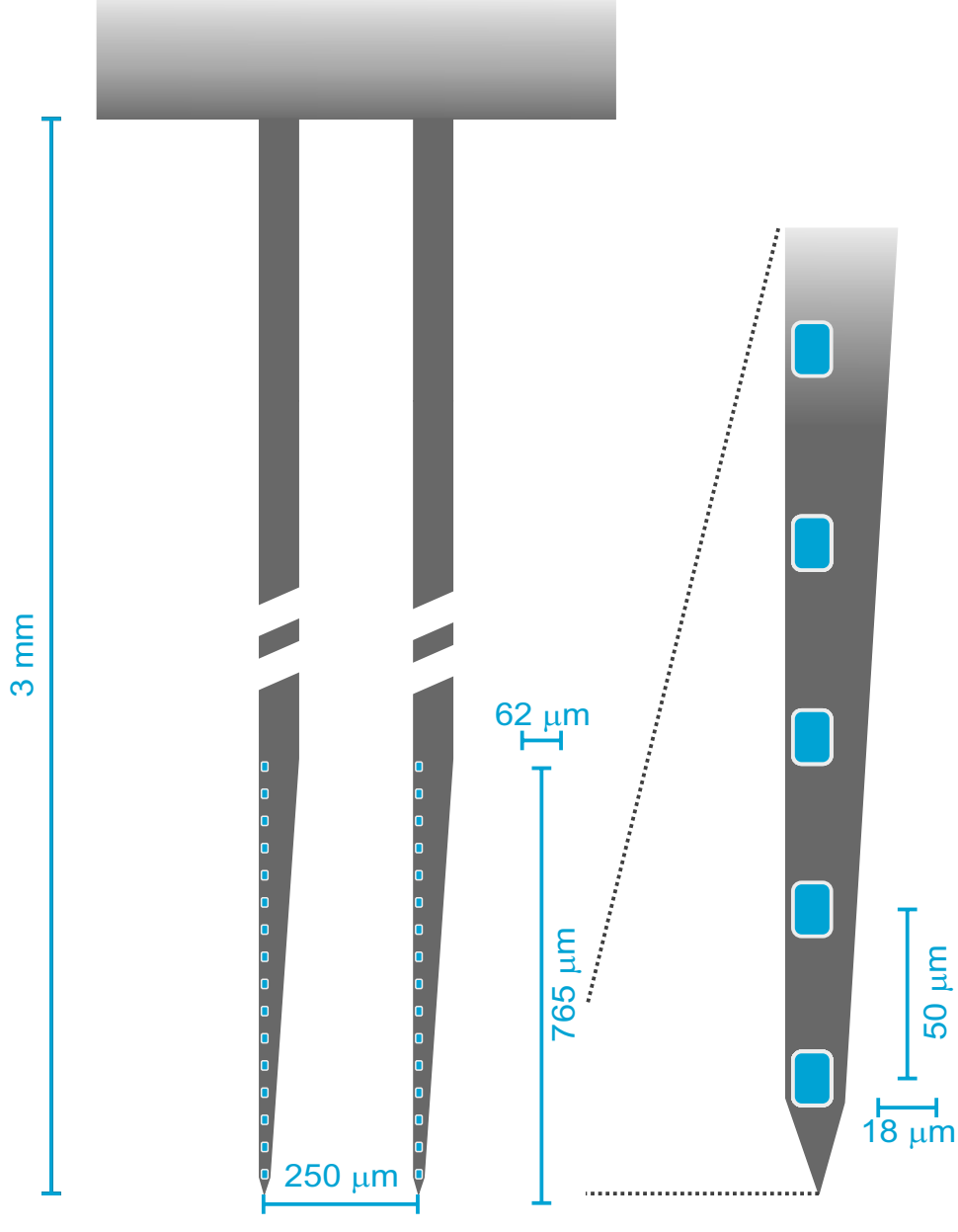
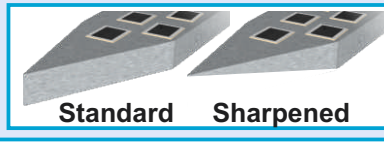
L-series Probes: L2
32 electrodes



Number of Electrodes	16
Shank Length (mm)	3
Number of Shanks Electrodes per Shank	2 16
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex)
Tip Options	

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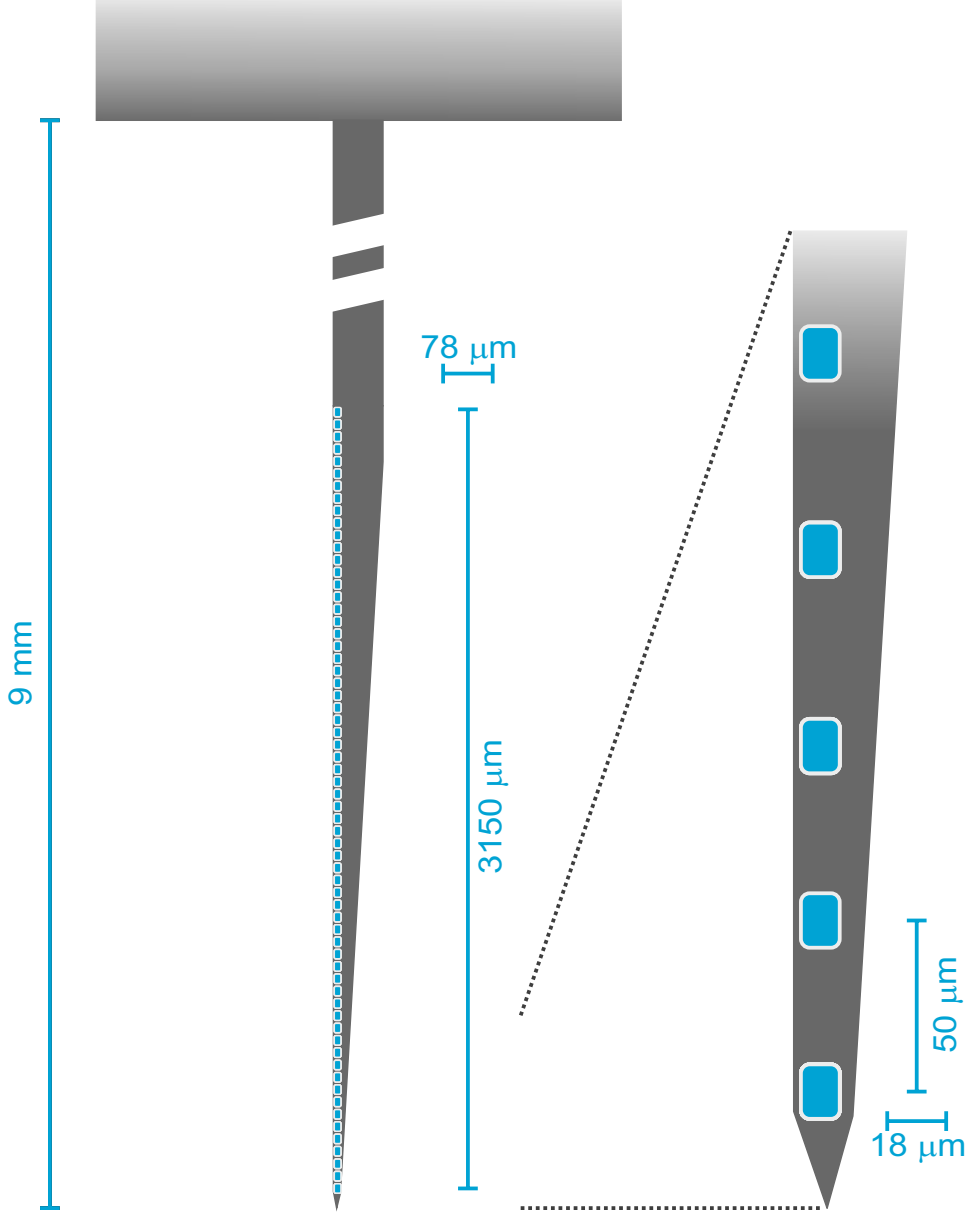
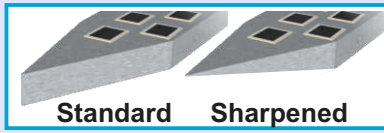
L-series Probes: L3
64 electrodes



Number of Electrodes	64
Shank Length (mm)	9
Number of Shanks Electrodes per Shank	1 64
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex; TDT)
Tip Options	 Standard Sharpened

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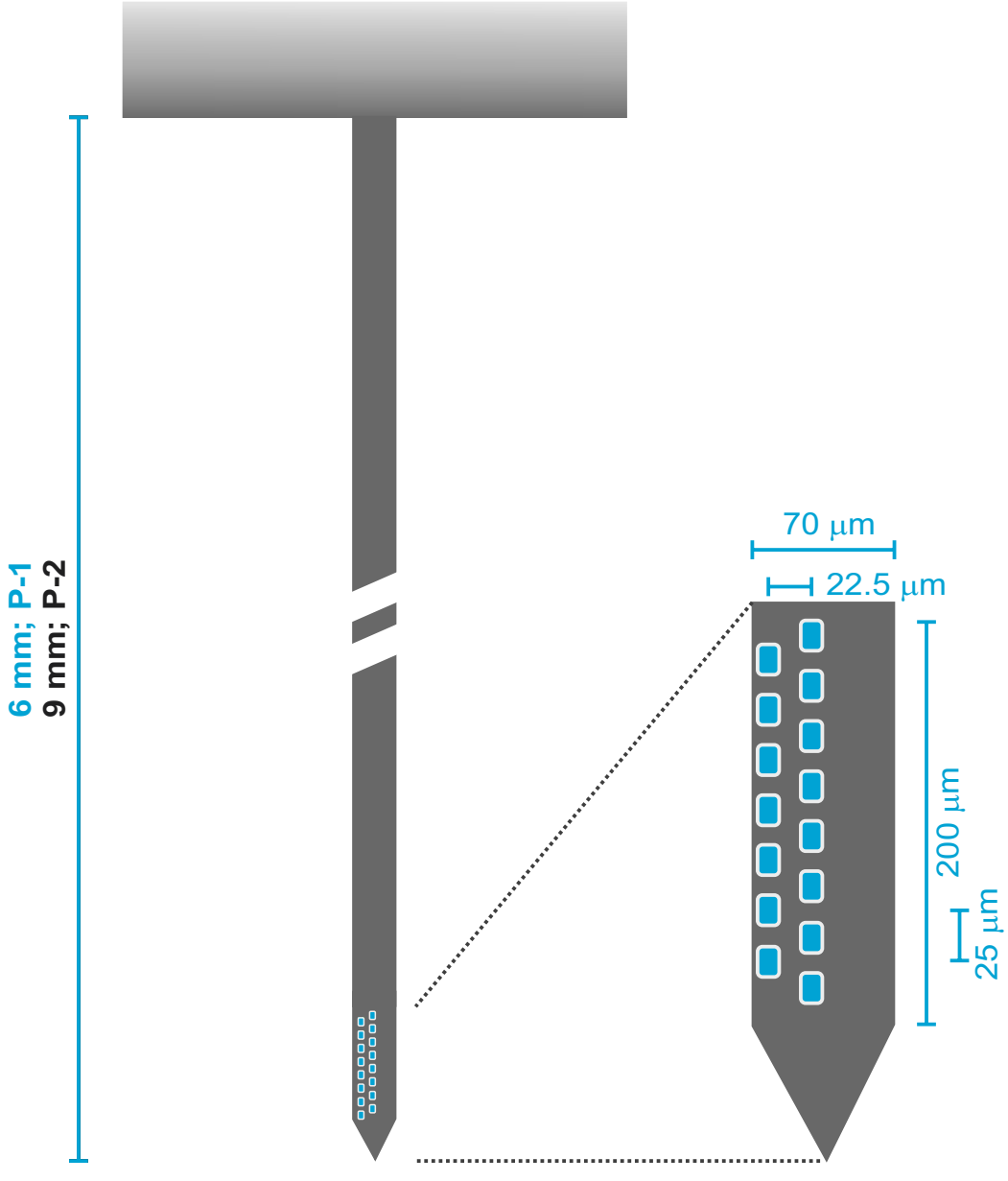
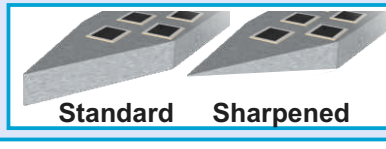
P-series Probes
16 electrodes



Number of Electrodes	16
Shank Length (mm)	6 (P-1) 9 (P-2)
Number of Shanks Electrodes per Shank	1 16
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics)
Tip Options	 Standard Sharpened

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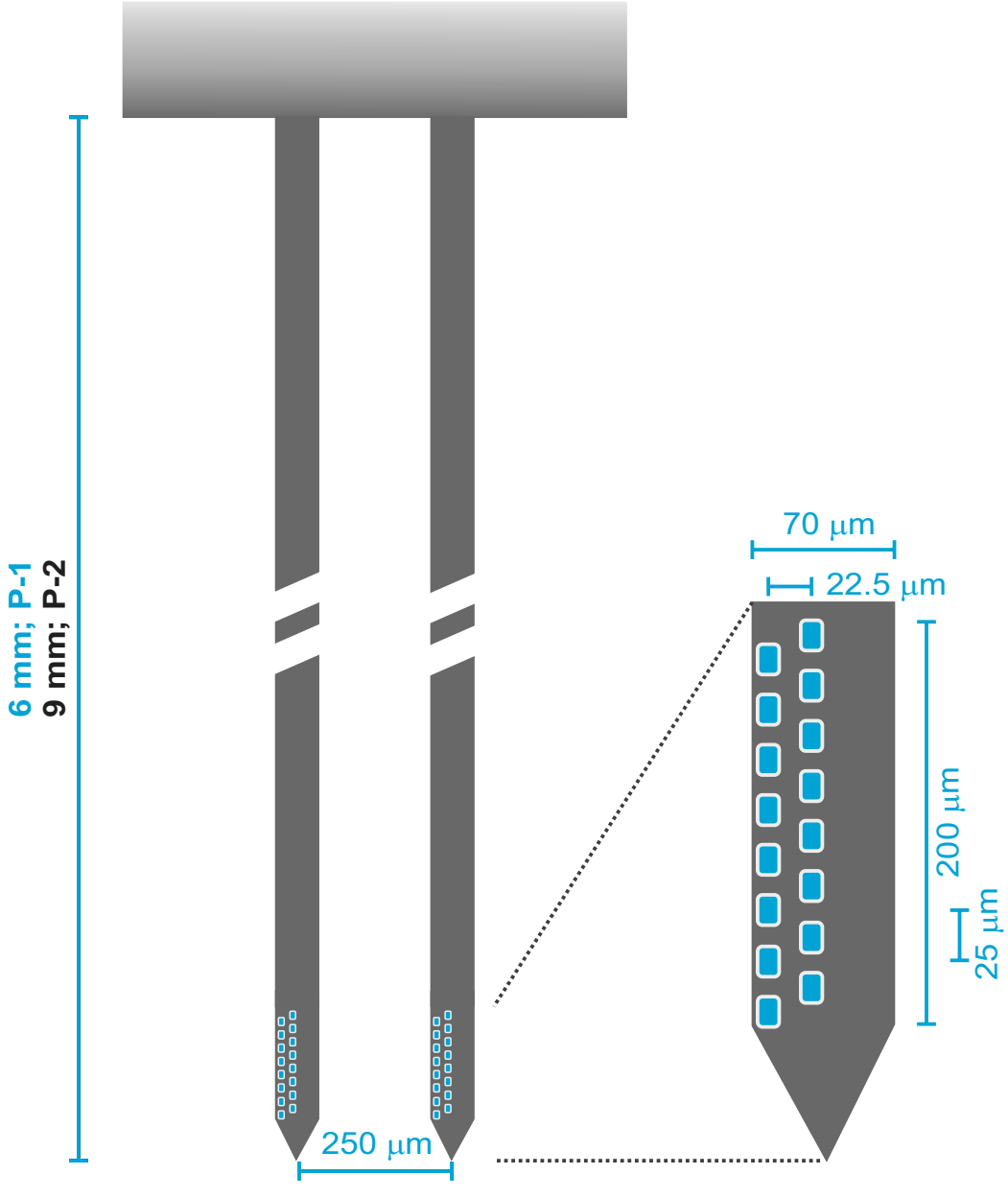
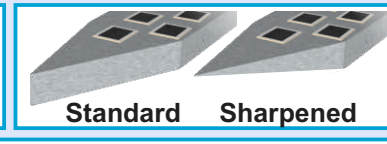
P-series Probes
32 electrodes



Number of Electrodes	32
Shank Length (mm)	**6 (P-1)** **9 (P-2)**
Number of Shanks Electrodes per Shank	2 16
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex)
Tip Options	 **Standard** **Sharpened**

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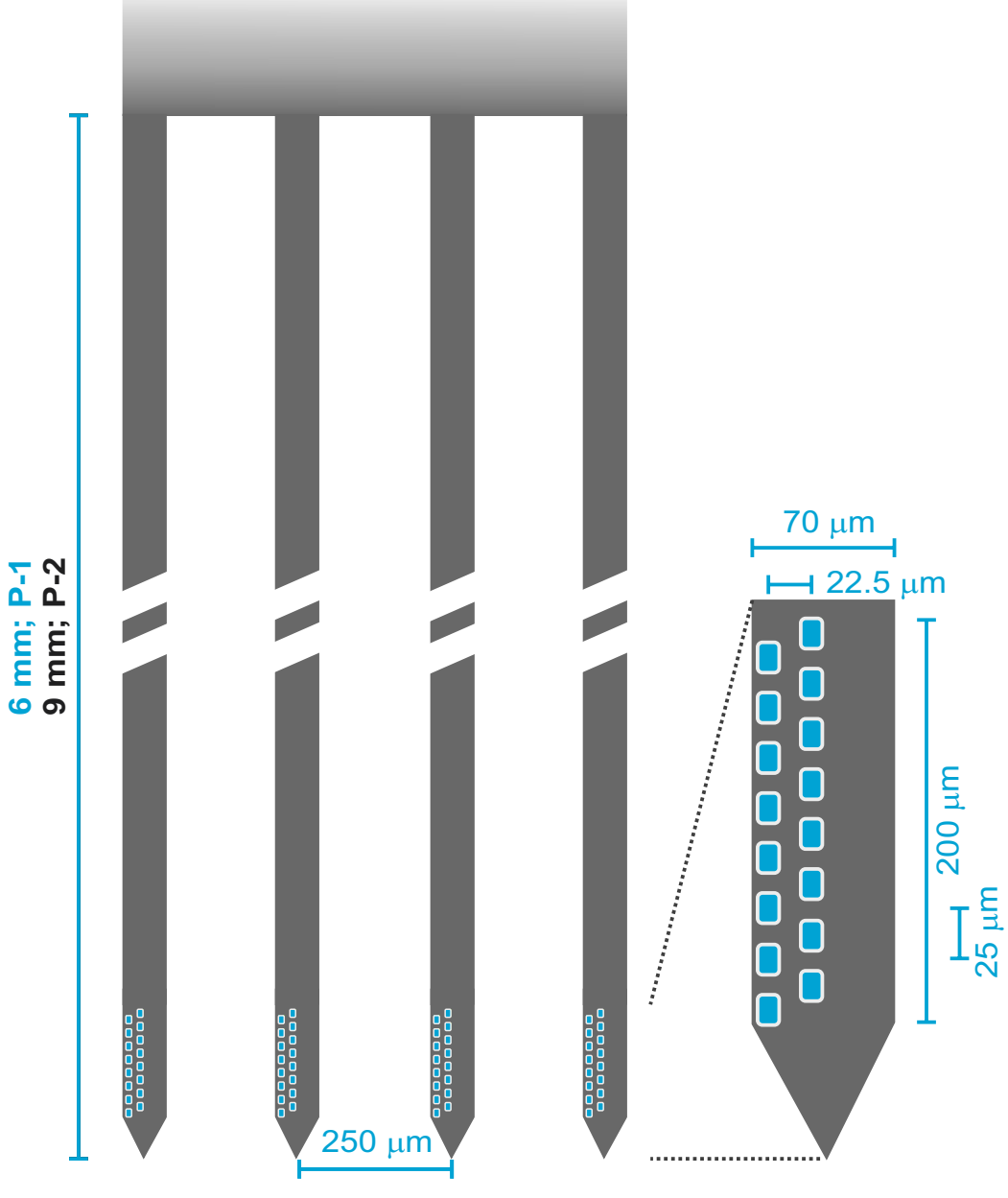
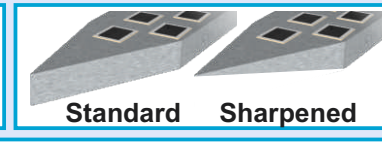
P-series Probes
64 electrodes



Number of Electrodes	64
Shank Length (mm)	6 (P-1) 9 (P-2)
Number of Shanks Electrodes per Shank	4 16
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex; TDT)
Tip Options	 Standard Sharpened

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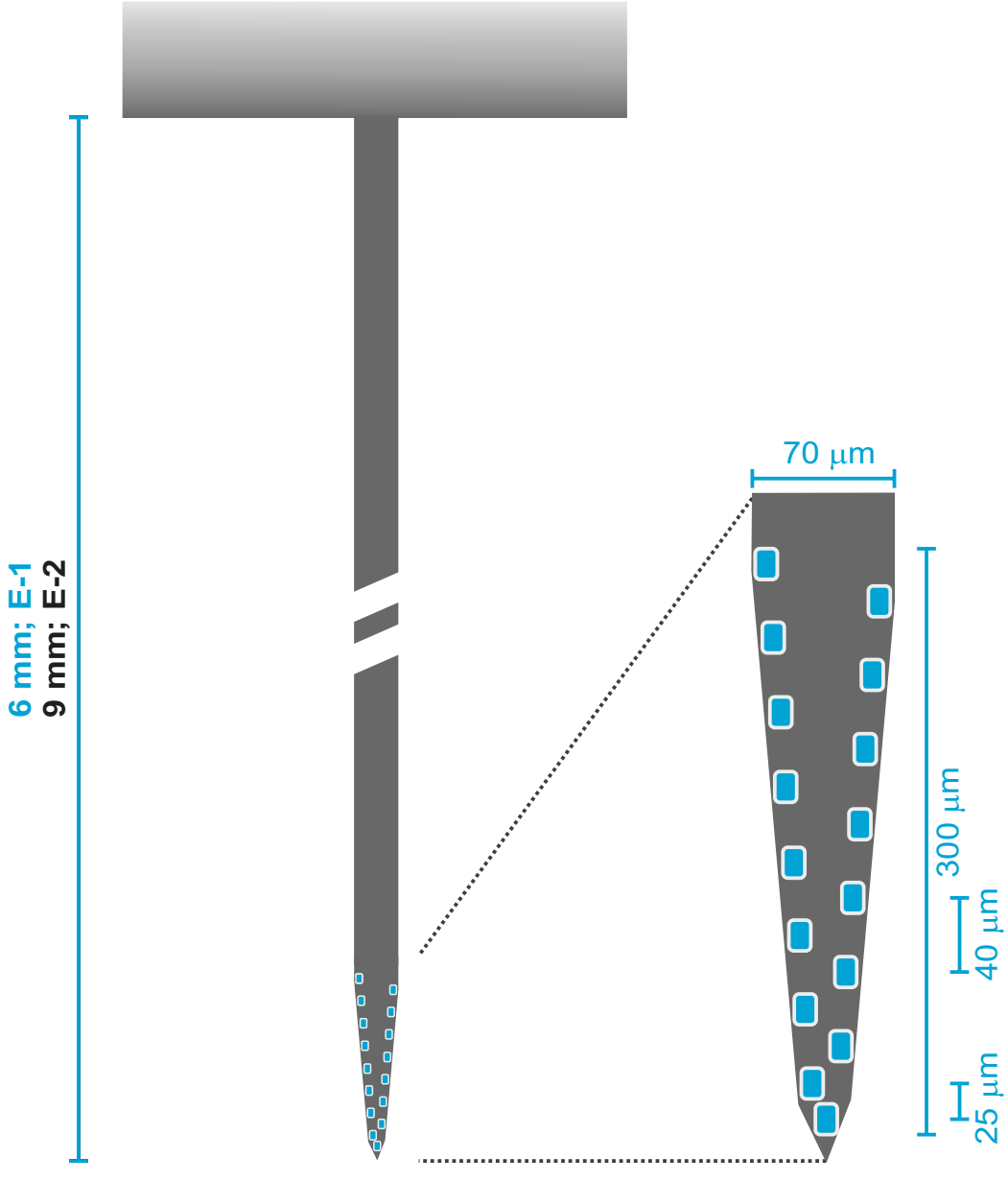
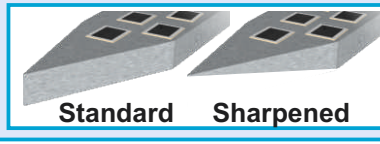
E-series Probes
16 electrodes



Number of Electrodes	16
Shank Length (mm)	6 (E-1) 9 (E-2)
Number of Shanks Electrodes per Shank	1 16
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics)
Tip Options	

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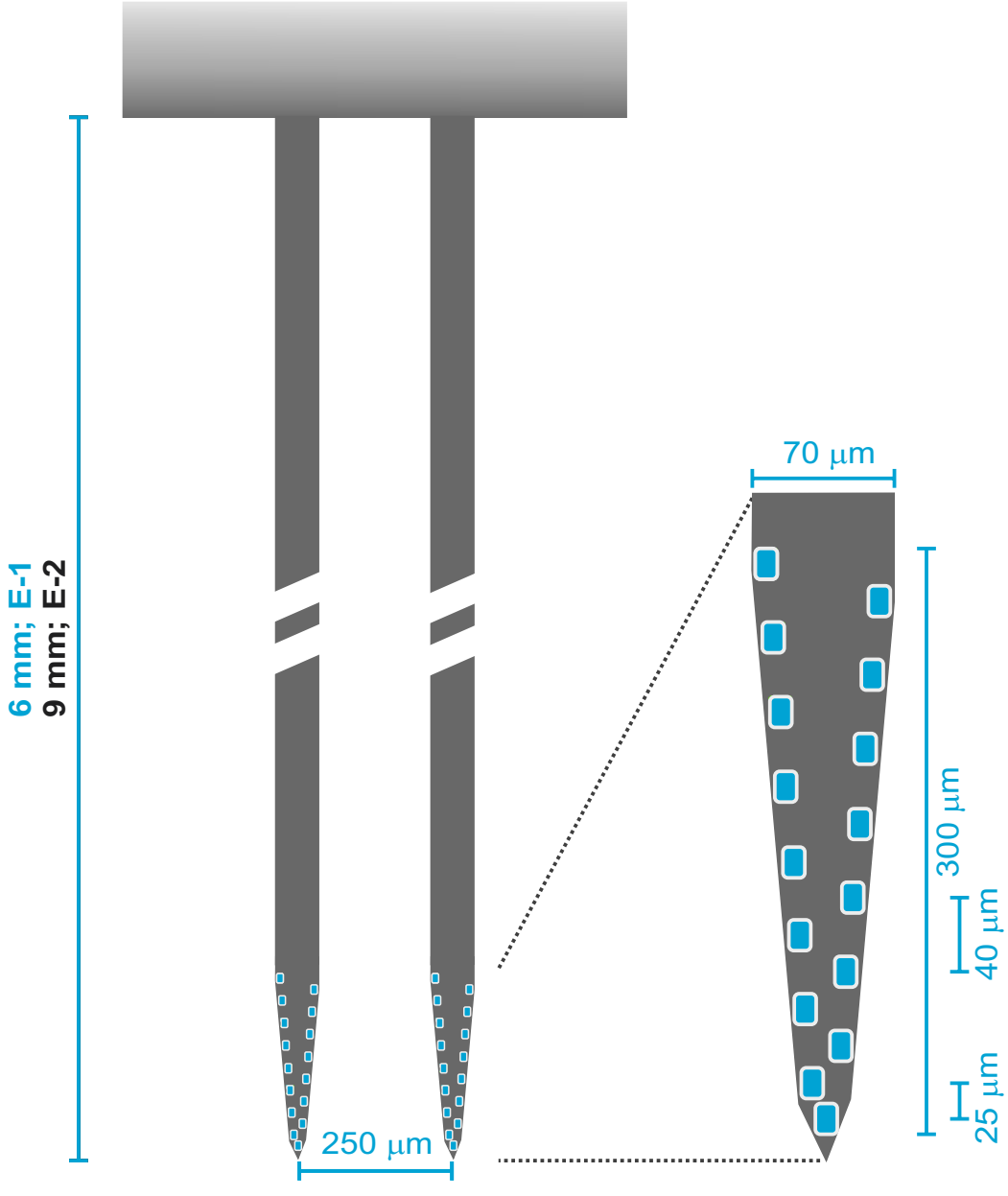
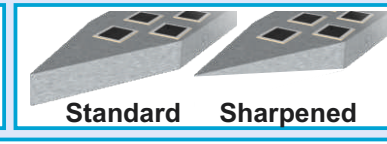
E-series Probes
32 electrodes



Number of Electrodes	32
Shank Length (mm)	**6 (E-1)** **9 (E-2)**
Number of Shanks Electrodes per Shank	2 16
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex)
Tip Options	 **Standard** **Sharpened**

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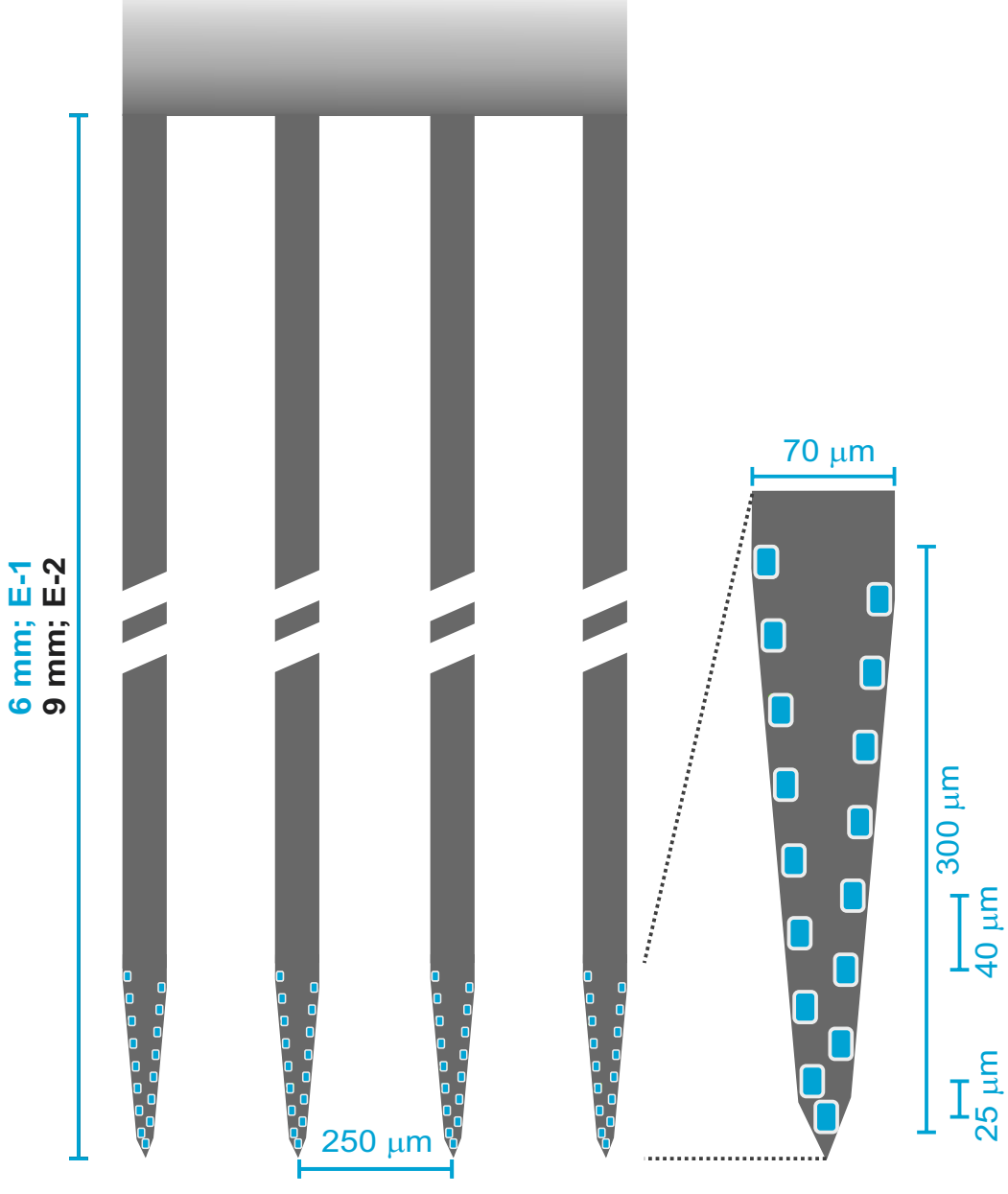
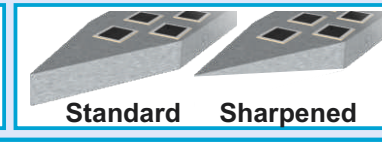
E-series Probes
64 electrodes



Number of Electrodes	64
Shank Length (mm)	6 (E-1) 9 (E-2)
Number of Shanks Electrodes per Shank	4 16
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex; TDT)
Tip Options	 Standard Sharpened

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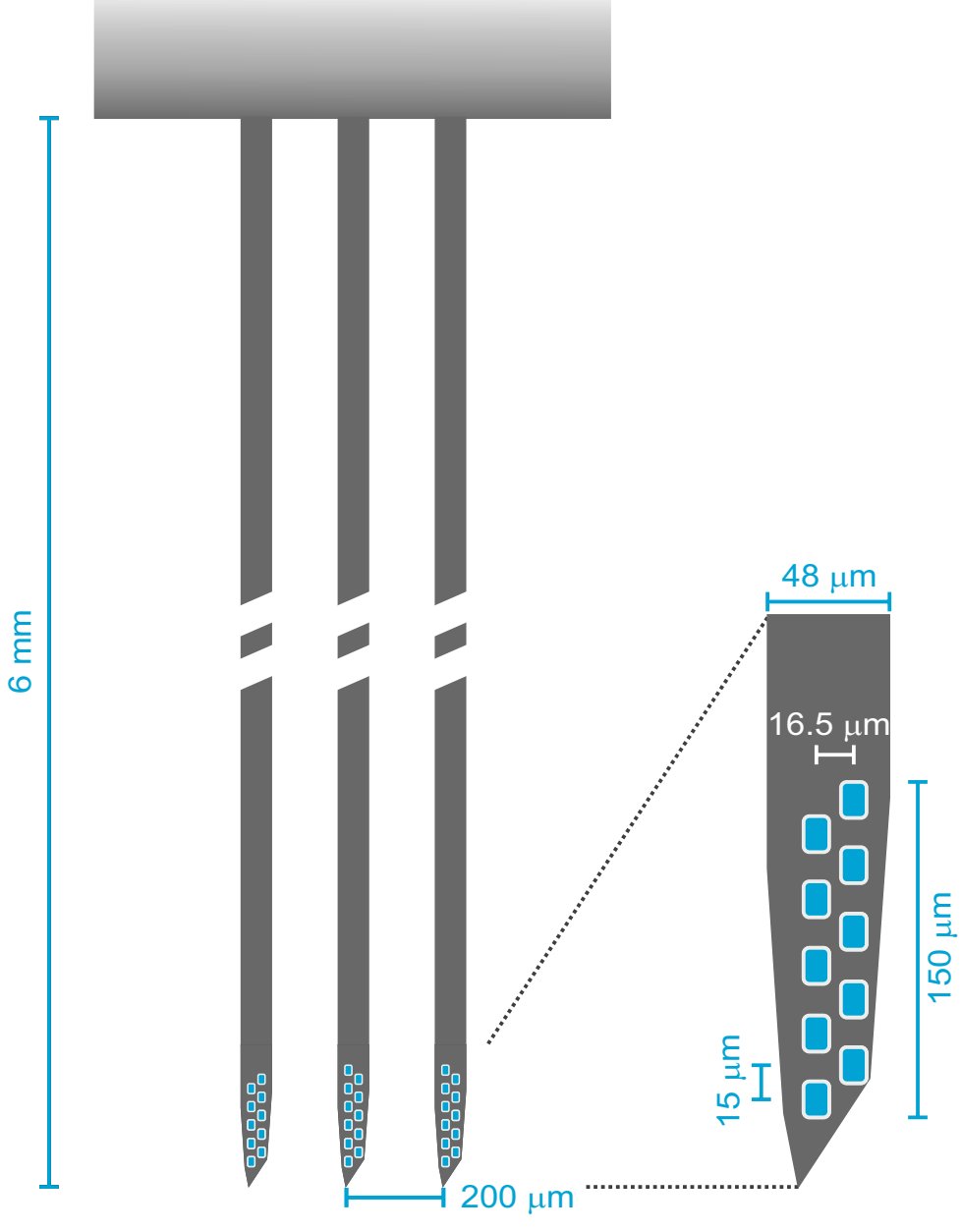
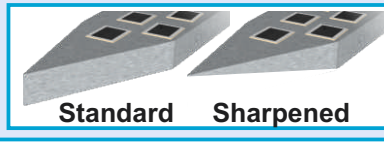
F-series Probes: Fb
32 electrodes



Number of Electrodes	32
Shank Length (mm)	6
Number of Shanks Electrodes per Shank	3 10 / 11
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex)
Tip Options	

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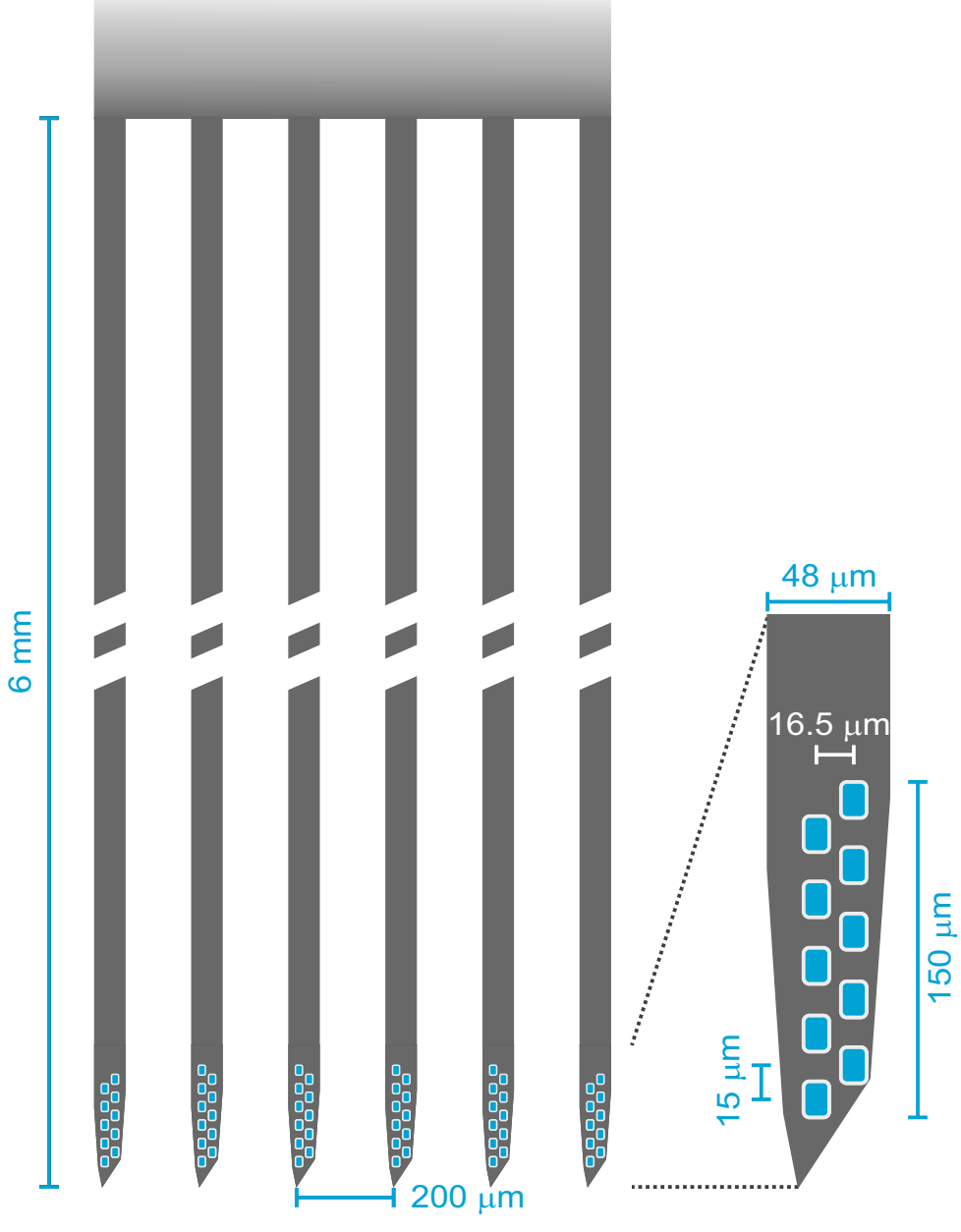
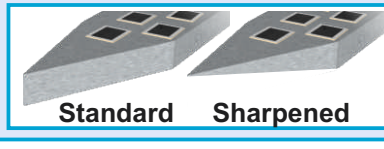
F-series Probes: F
64 electrodes



Number of Electrodes	64
Shank Length (mm)	6
Number of Shanks Electrodes per Shank	6 10 / 11
Shank Thickness (µm)	15
Electrode Size (µm)	11 x 15
Electrode Impedance (kOhm)	~50
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex; TDT)
Tip Options	 Standard Sharpened

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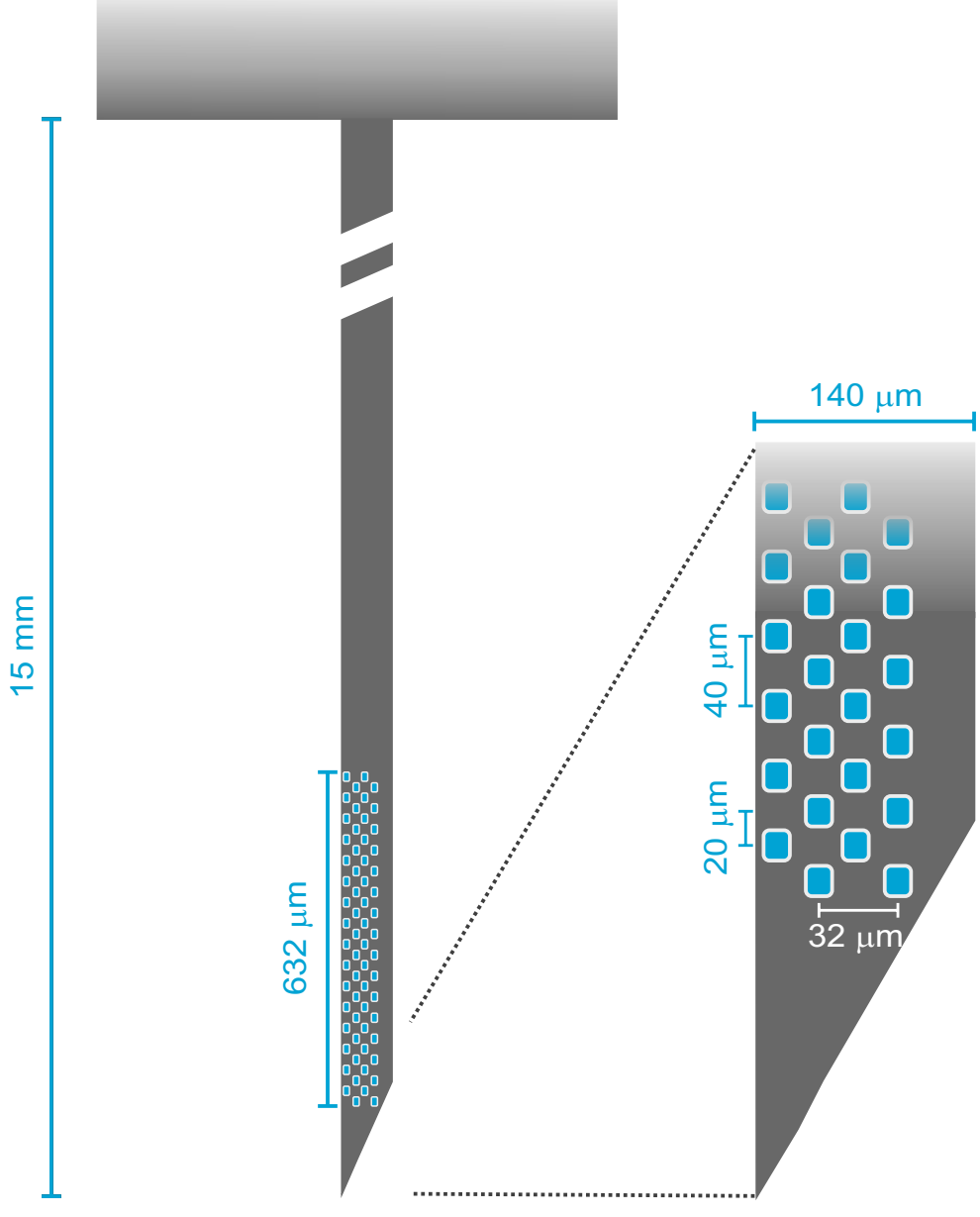
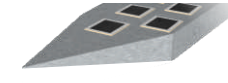
M-series Probes: M1 (large-animal)
64 electrodes



Number of Electrodes	64
Shank Length (mm)	15
Number of Shanks Electrodes per Shank	1 64
Shank Thickness (µm)	35
Electrode Size (µm)	12 x 12
Electrode Impedance (kOhm)	~60
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex; TDT)
Tip Options	 **Sharpened**

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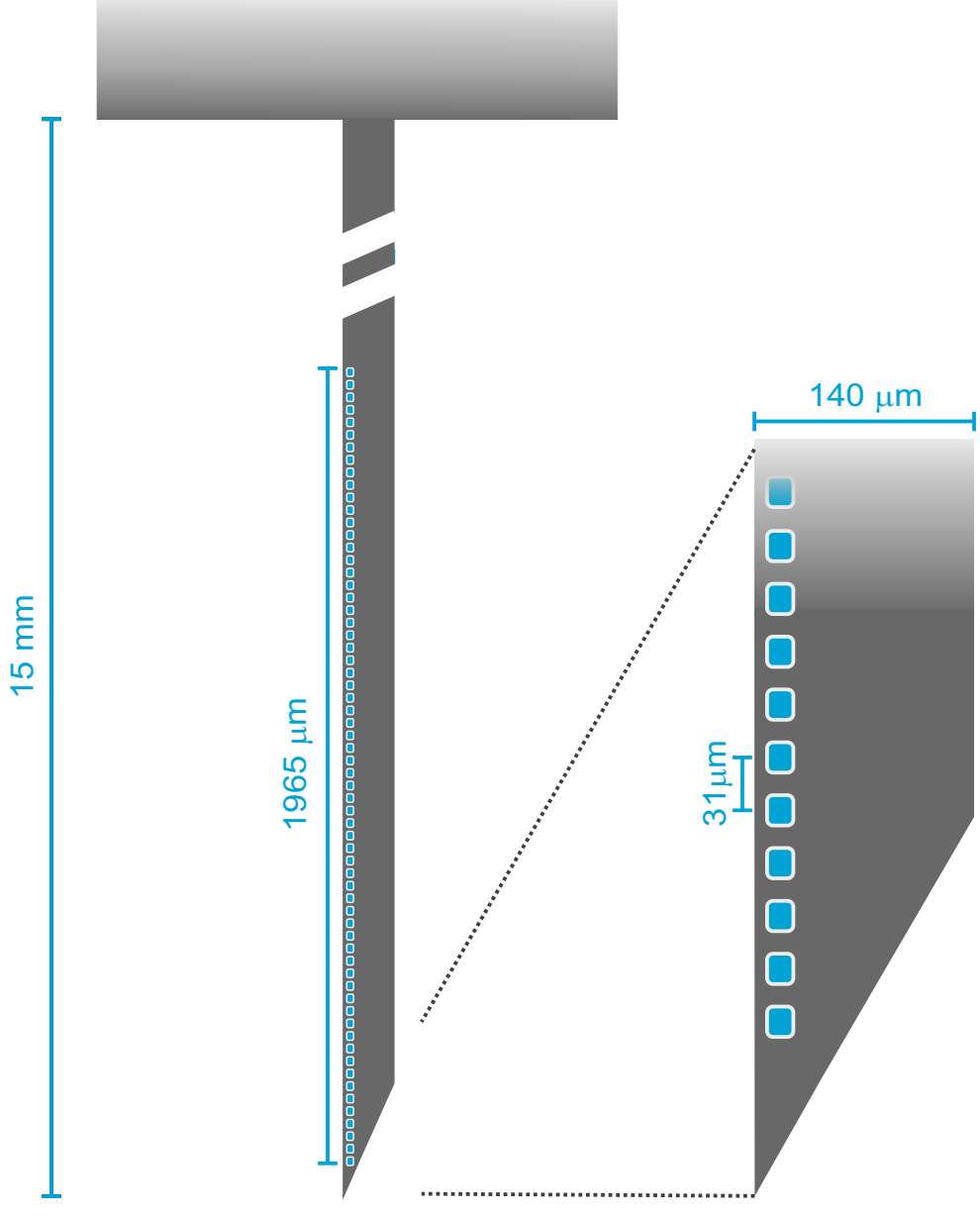
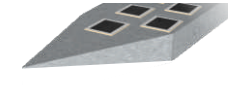
M-series Probes: M2 (large-animal)
64 electrodes



Number of Electrodes	64
Shank Length (mm)	15
Number of Shanks Electrodes per Shank	1 64
Shank Thickness (µm)	35
Electrode Size (µm)	12 x 12
Electrode Impedance (kOhm)	~60
Optogenetics-Safe	✓
Connector Options	Acute (Samtec) Chronic (Omnetics; Molex; TDT)
Tip Options	 **Sharpened**

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Probe Part Numbers & Ordering Guide

ADD-ONS											
EEG / EMG wire					●	●	●	●			
3-D STACKING					●	●	●	●	●	●	●
TIP SHARPENING	●	●	●		●	●	●	●	●	●	●
FIBER ATTACH	●	●	●								
Style	Acute 16	Acute 32	Acute 64	Omnetics 16	Omnetics 32	Omnetics 64 (Intan)	Omnetics 64 (Y-flex)	TDT Zif-Clip 64	Molex 32	Molex 64
Part #:	ASSY-1	ASSY-37	ASSY-77	ASSY-79	ASSY-116	ASSY-156	ASSY-158	ASSY-276	ASSY-196	ASSY-236
Probes H1			●			●	●	●		●
Probes H1b		●			●				●	
Probes H2			●			●	●	●		●
Probes H3			●			●	●	●		●
Probes H4		●			●				●	
Probes H5			●			●	●	●		●
Probes H6			●			●	●	●		●
Probes H6b		●			●				●	
Probes H7			●			●	●	●		●
Probes H7b		●			●				●	
Probes H8			●			●	●	●		●
Probes H8b		●			●				●	
Probes H9			●			●	●	●		●
Probes E-1	●	●	●	●	●	●	●	●	●	●
Probes E-2	●	●	●	●	●	●	●	●	●	●
Probes P-1	●	●	●	●	●	●	●	●	●	●
Probes P-2	●	●	●	●	●	●	●	●	●	●
Probes Fb		●			●				●	
Probes F			●			●	●	●		●
Probes L1	●			●						
Probes L2		●			●				●	
Probes L3			●			●	●	●		●
Probes M1			●			●	●	●		●
Probes M2			●			●	●	●		●
ECoG ECoG-32a					●				●	
ECoG ECoG-32b					●				●	
ECoG ECoG-64a						●	●	●		●
ECoG ECoG-64b						●	●	●		●

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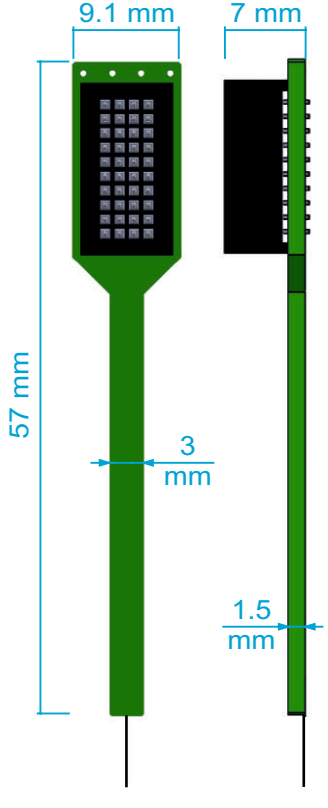
Acute Probe Specifications

Acute 16
(Part #: ASSY-1)

PROBE CHOICES:
E; L1; P
+/- Optrode

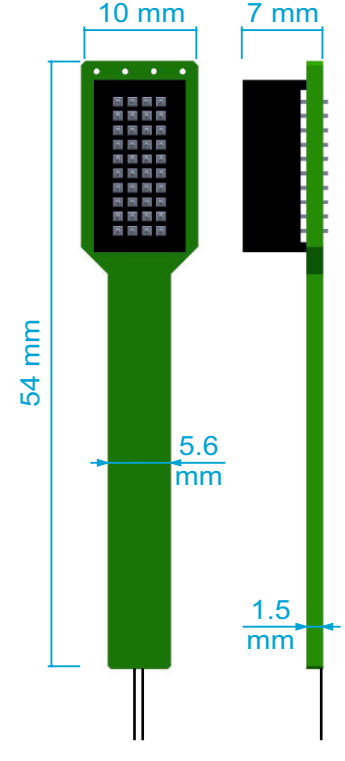
USE ADAPTOR: ADPT A16-Om16
CONNECTOR: SAMTEC MOLC-110-01-S-Q
MATES WITH: SAMTEC FOLC-110-01-S-Q



Acute 32
(Part #: ASSY-37)

PROBE CHOICES:
E; F; H1b; H4, H6-8b; L2; P
+/- Optrode

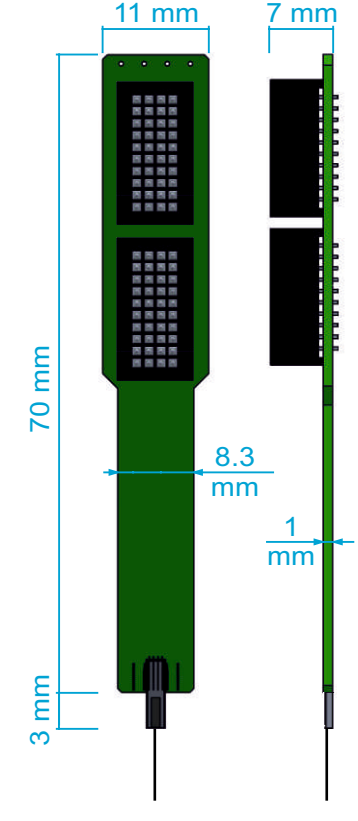
USE ADAPTOR: ADPT A32-Om32
CONNECTOR: SAMTEC MOLC-110-01-S-Q
MATES WITH: SAMTEC FOLC-110-01-S-Q



Acute 64
(Part #: ASSY-77)

PROBE CHOICES:
E; F; H1-3, H5-6; L3, M1-2; P
+/- Optrode

USE ADAPTOR: ADPT A64-Om32x2
CONNECTOR: SAMTEC MOLC-110-01-S-Q
MATES WITH: SAMTEC FOLC-110-01-S-Q



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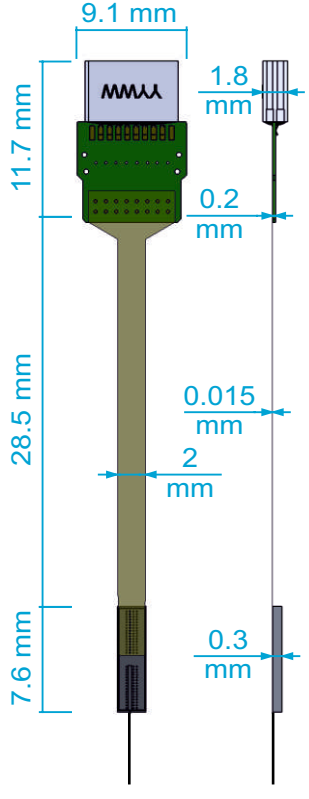
Chronic Probe Specifications

Chronic 16
(Part #: ASSY-79)

PROBE CHOICES:
E; L1; P

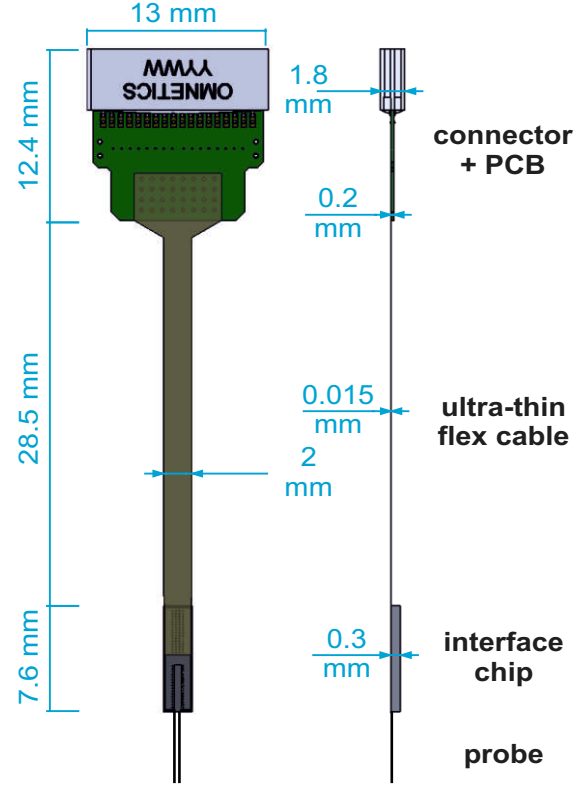
CONNECTOR:
Male Omnetics NPD 18-pin; 2 guide-posts
MATES WITH:
Female Omnetics NPD 18-pin; 2 guide-posts



Chronic 32
(Part #: ASSY-116)

PROBE CHOICES:
E; F; H1b; H4, H6-8b; L2; P
ECoG: 32a, 32b

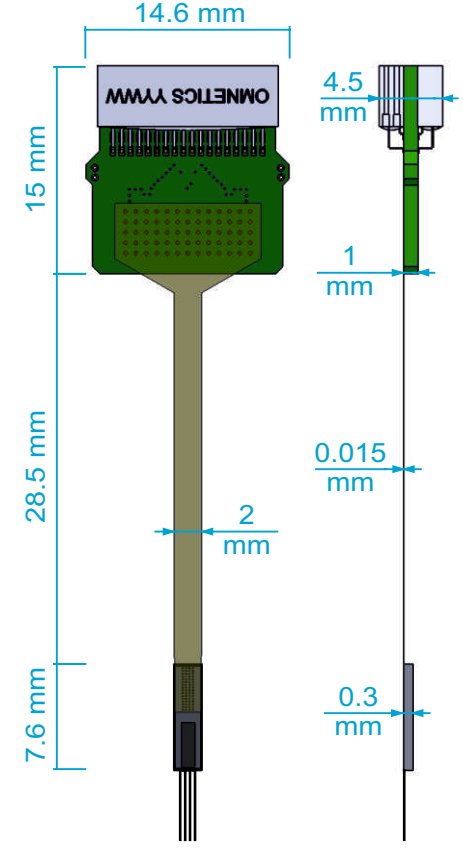
CONNECTOR:
Male Omnetics NPD 36-pin; 4 guide-posts
MATES WITH:
Female Omnetics NPD 36-pin; 4 guide-posts



Chronic 64-Intan
(Part #: ASSY-156)

PROBE CHOICES:
E; F; H1-3, H5-9; L3; M1-2; P
ECoG: 64a, 64b

CONNECTOR:
2x Male Omnetics NPD 36-pin; 4 guide-posts
MATES WITH: Intan HS-2164
2x Female Omnetics NPD 36-pin; 4 guide-posts



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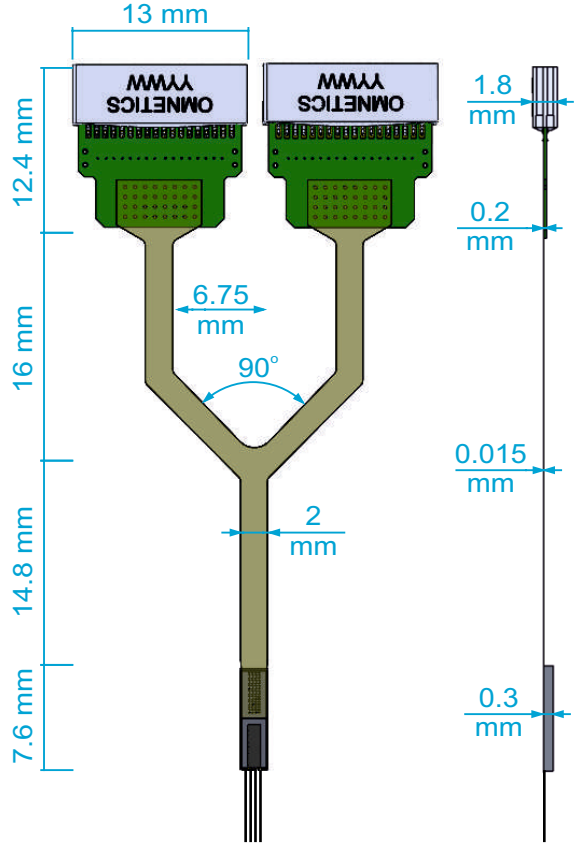
Chronic Probe Specifications

Chronic 64-Y
(Part #: ASSY-158)

PROBE CHOICES:
E; F; H1-3, H5-9; L3; M1-2; P
ECoG: 64a, 64b

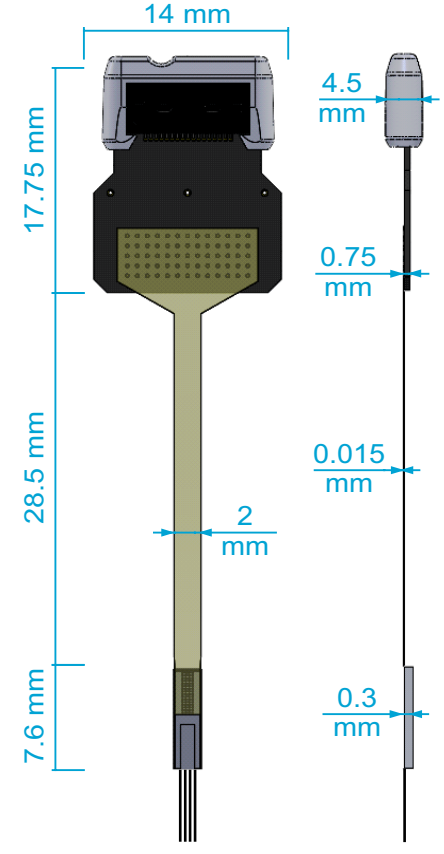
CONNECTOR:
2x Male Omnetics NPD 36-pin; 4 guide-posts
MATES WITH:
2x Female Omnetics NPD 36-pin; 4 guide-posts



Chronic 64-TDT
(Part #: ASSY-276)

PROBE CHOICES:
E; F; H1-3, H5-9; L3; M1-2; P
ECoG: 64a, 64b

CONNECTOR:
TDT ZIF-Clip®
MATES WITH:
TDT ZA- and ZD-headstages



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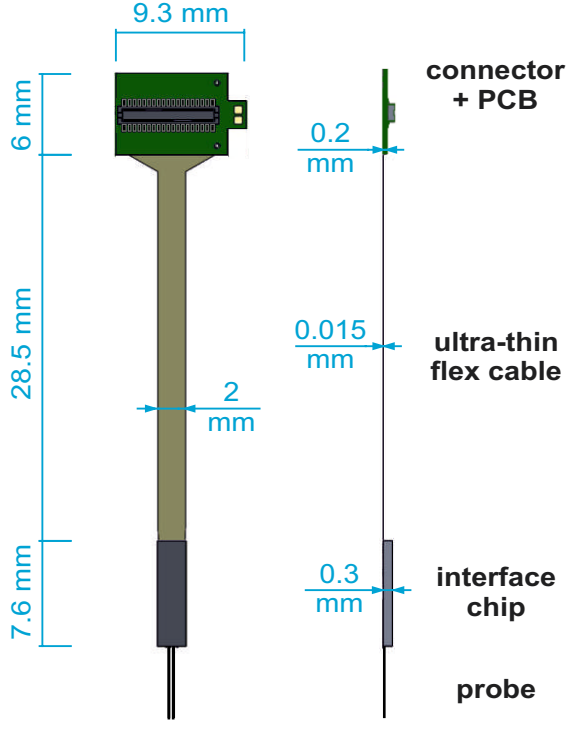
Chronic Probe Specifications

Chronic 32-Molex
(Part #: ASSY-196)

PROBE CHOICES:
E; F; H1b; H4, H6-8b; L2; P
ECoG: 32a, 32b

CONNECTOR:
Molex 0.35mm SlimStack™ 504622-3410
MATES WITH:
Molex 0.35mm SlimStack™ 504618-3410

Mates with miniature headstages:
mini-amp-64

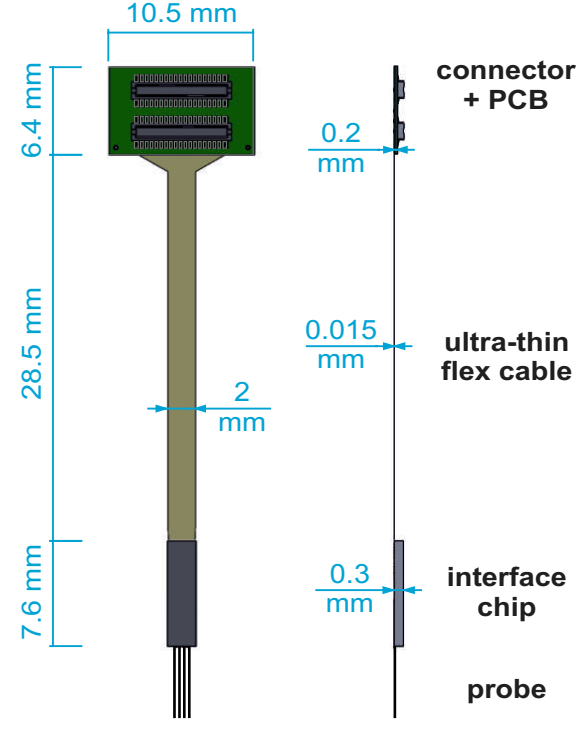


Chronic 64-Molex
(Part #: ASSY-236)

PROBE CHOICES:
E; F; H1b; H4, H6-8b; L2; P
ECoG: 64a, 64b

CONNECTOR:
Molex 0.35mm SlimStack™ 504622-3410
MATES WITH:
Molex 0.35mm SlimStack™ 504618-3410

Mates with miniature headstages:
mini-amp-64



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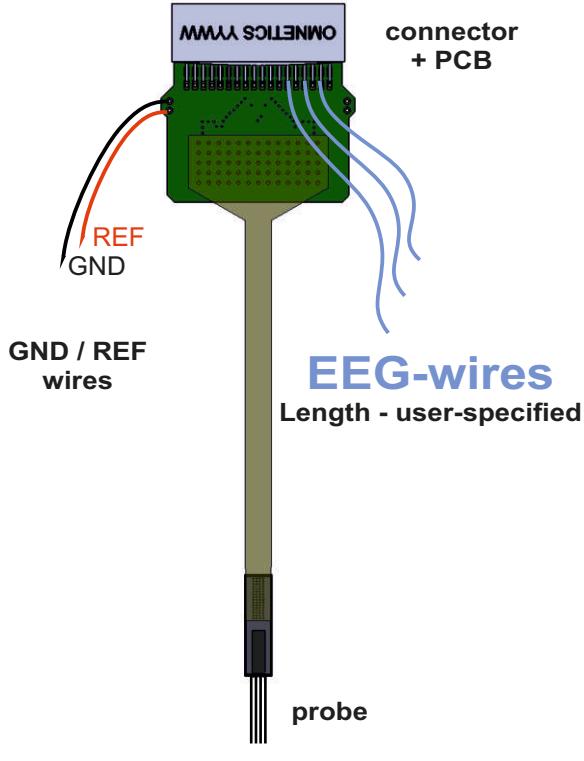
Probe Options:
EEG / EMG Wires | 3-D Stacking

EEG / EMG Wire

Any Omnetics probe can be equipped with multiple break-out wires for EEG and EMG recording (each wire results in loss of 1 electrode site from the probe).

Wire: PFE-coated stainless steel Type-316 (125 μm bare, 200 μm coated, full hard).

Electrode-loss - we always try to locate wires on superficial-most electrode locations, but due to the nature of the probe construction we cannot always guarantee this.



When ordering please specify:

(A) Number of wires required

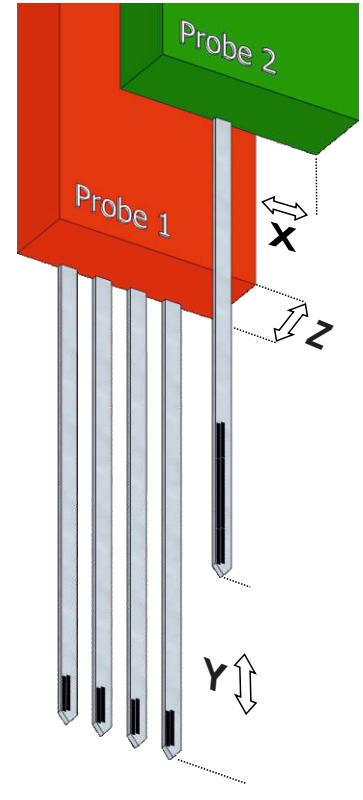
(B) Length of wires (45 mm standard)

(C) Clean-cut or insulation stripped over certain length

3-D Probe Stacking

Configure your own customised 3-D probe array using any pair of chronic probes with user-defined horizontal and vertical offset and probe spacing at 150 or 300 μm (and factors thereof for larger spacing intervals). If you require > 2 probes, please let us know what you need and we'll endeavour to build your preferred custom 3-D probe-stack!

Stacks can be oriented in 3 possible ways - front-to-back (default) is illustrated. Back-to-back can used to create a pseudo-doubled-sided probe!



X	User-specified (50 μm tolerance) Max. = 1 mm
Y	User-specified (50 μm tolerance) Max. = 4 mm
Z	Multiples of: • 300 μm - standard • 150 μm - optional • 30μm - use *back-to-back orientation*
Orientation	• Front-to-back (default, as illustrated; *electrodes facing same way*) • Front-to-front (*electrodes facing each other*) • Back-to-back (*electrodes both facing outwards*; i.e. pseudo-double-sided probe)

CAMBRIDGE NeuroTech
Advanced Electrophysiology Systems

Support & Contact

EXPERT SUPPORT ACROSS THE BOARD

Our philosophy is to open up convenient access to the very latest in advanced electrophysiology tools and techniques, previously the preserve of only a handful of expert labs around the world. We lead the way with brain-interfacing technology yet keep our systems as "turn-key" as possible.

Complete solutions...

...we can work closely with you to design and build your electrophysiology / optogenetics lab, fully equipping you with advanced multi-functional systems proven to work in both anaesthetised and freely behaving animals ranging from mice to monkeys.

Surgical support...

...surgical technique can have a substantial bearing on chronic implant success and so we ensure you are following best-practice with our customized surgical protocols enabling small, compact yet scalable implants, helping you to get the best possible performance from our silicon neural probes.

Data analysis...

...our support doesn't end with hardware as we can also steer you through single unit spike-sorting approaches and data analysis techniques.

Grant support...

...we can provide you with images, data and supporting text, budget justifications and letters of support to help you frame our technologies within your particular grant application.

Get in touch with us...

cambridgeneurotech.com

info@cambridgeneurotech.com