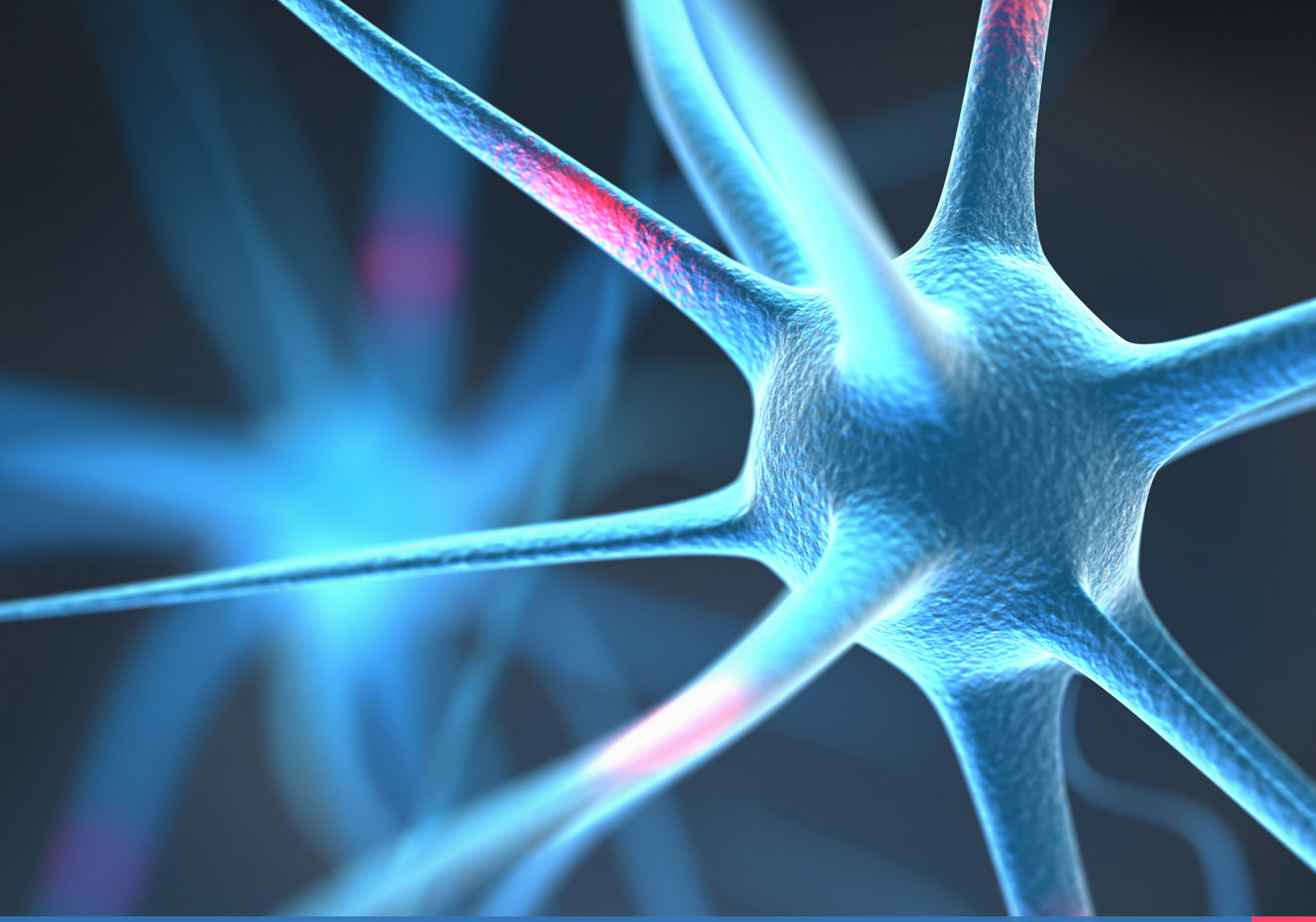


METAL MICROELECTRODES

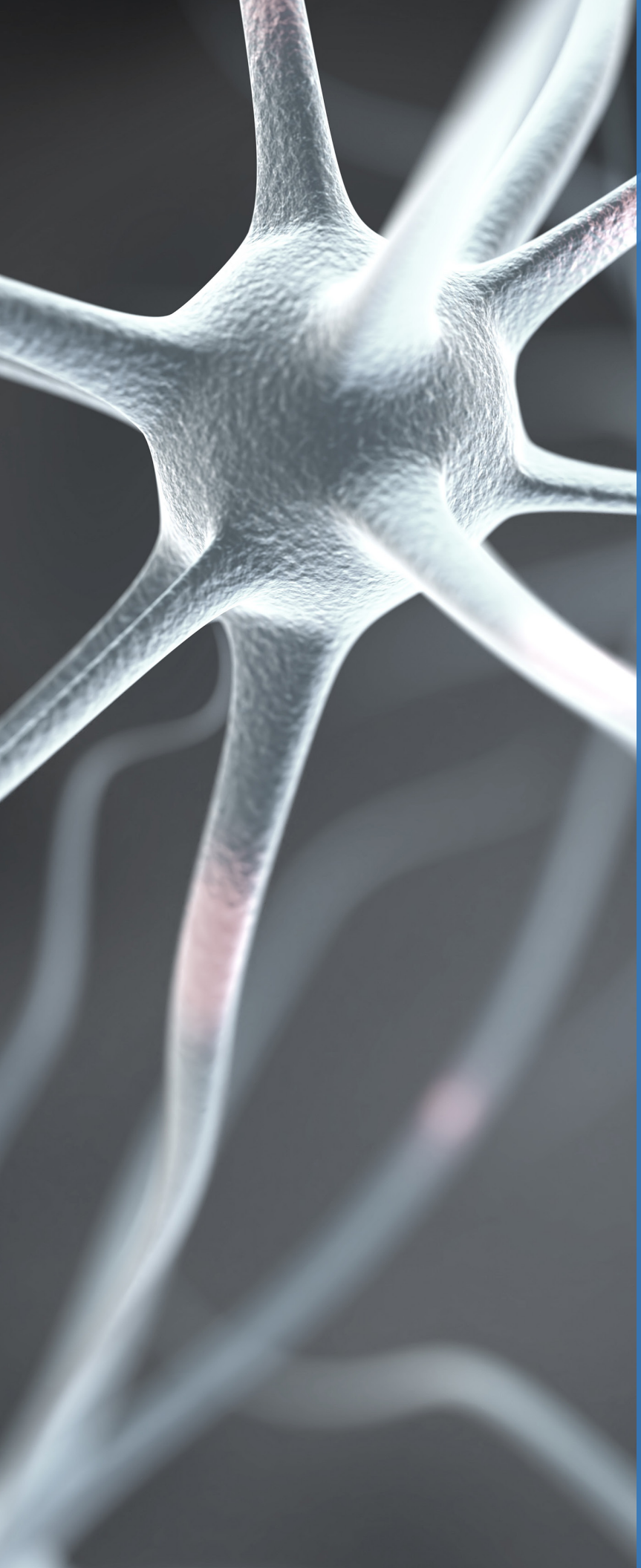
Monopolar or bipolar metal microelectrodes for neural recording and stimulation

MicroProbes for Life Science

Providers of trusted and fully customized neurophysiological tools to laboratories worldwide for over three decades.

Version: February 2019

www.microprobes.com



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WELCOME

MARTIN BAK
CEO MICROPROBES

Microprobes for Life Science provides researchers across the globe with the highest quality microelectrodes and microelectrode arrays for all types of electrophysiology studies both in vivo and in vitro, chronic and acute. Our electrode and array products have played crucial roles in groundbreaking published research in a large variety of animal models, from bats, songbirds, and mice to non-human primates. The trust researchers place in us is of the utmost importance, and we pride ourselves in providing world-class customer service and product customization.

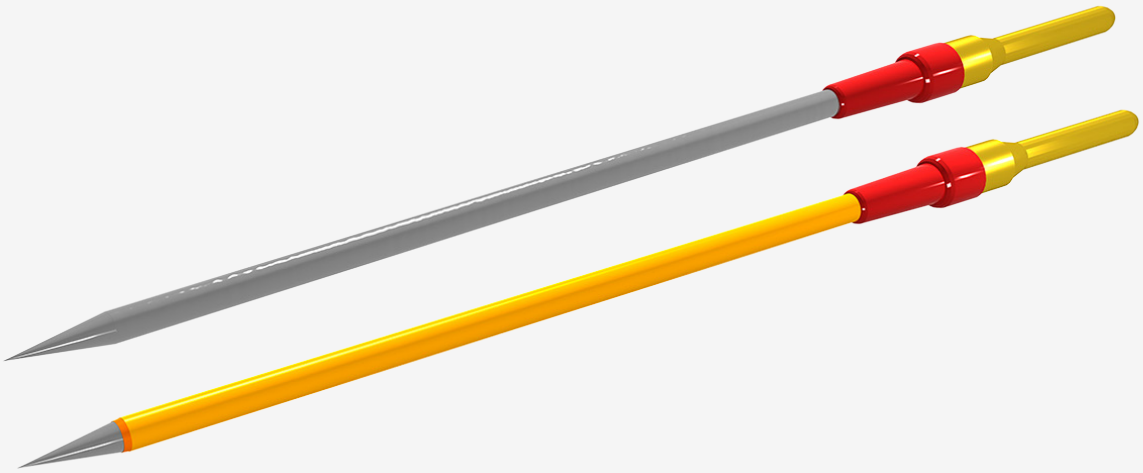
Serving the medical research community for over 30 years with unparalleled quality products and service, our team of design and manufacturing experts are devoted to meeting your unique electrode requirements.

Martin Bak

Microprobes for Life Science is ISO 9001:2015 certified.

ISO 9001:2015 is a quality management system which helps to achieve a consistent level of quality to customers by having well defined and regularly reviewed processes and procedures.

MONOPOLAR ELECTRODES



Microprobes for Life Science Monopolar Microelectrodes are available in Tungsten, Platinum/Iridium, Elgiloy, and Pure Iridium metal, and are insulated with a thin film of vapor-deposited parylene-C. Each electrode is etched to a fine taper and tipped using a proprietary process to a specific impedance value. Four different tip profiles are also available to further fine-tune your electrode selection to your particular application.

We offer a variety of different tip alternatives for those that prefer a specialized electrode profile for their research.

The tip selection can provide subtle yet important changes to the performance of the electrode, as described below. It is recommended that first time users consider experimenting with different tip profiles to determine which works best for their recording or stimulation protocols.

METAL SELECTION

TUNGSTEN

Tungsten is a versatile and widely-used microelectrode material that offers a good balance between performance and cost.

PLATINUM/IRIDIUM

Considered by many to be the "gold standard" for chronic recording and microstimulation due to its electrochemical and mechanical characteristics.

ELGILOY

Elgiloy (a stainless cobalt-chromium alloy) is available in monopolar electrodes for specialty applications, such as vibrating probes for SVET.

PURE IRIDIUM

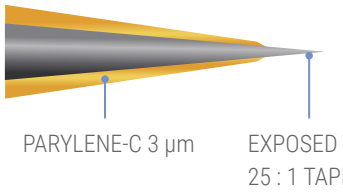
For the most intensive stimulation conditions and protocols, pure iridium electrodes offer unparalleled performance, rigidity, and stability.

TIP ALTERNATIVES

Monopolar electrodes are available with impedance customizable anywhere between 1 kΩ and 10 MΩ. Standard impedances and lengths are available on our web store, and non-standard impedances can be requested by special order.

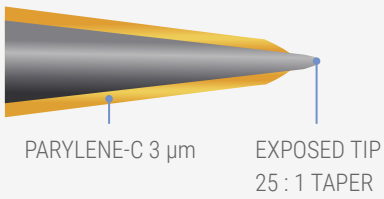
A
STANDARD TIP PROFILE

Our standard tip profile features a sharp yet robust point that offers versatile performance and an effective balance between penetration and durability.



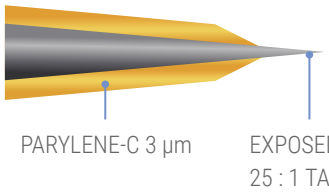
B
BLUNTED TIP PROFILE

Our blunted electrodes are engineered to have a more rounded, bullet-shaped tip. For many applications the blunted tip can may offer superior stimulation performance.



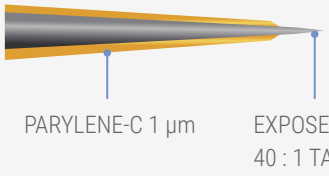
H
HEAT TREATED TAPERED TIP PROFILE

Our heat-treated electrodes are intended for those investigators who must penetrate their probes through tough membranes, such as the dura mater of larger mammals.



F
EXTRA FINE TIP PROFILE

Our extra-fine tip profile features a significantly sharper taper as well as a thinner insulation layer.



TUNGSTEN

Tungsten is a versatile and widely-used microelectrode material that offers a good balance between performance and cost.

Order Online

ADVANTAGES

- ✓ Extremely strong and stiff metal provides probes with exceptional rigidity.
- ✓ Great for acute and chronic recording due to biocompatibility and lower cost.
- ✓ High corrosion resistance offers consistent long-term performance.

DISADVANTAGES

- ✗ Does not provide the same degree of electrochemical performance or stability as Platinum/Iridium alloy, making it a poor alternative for microstimulation.
- ✗ Lower charge transfer capacity of Tungsten will result in larger, potentially unsafe interfacial potentials when applying the same stimulation current as to a platinum-iridium electrode.
- ✗ Certain pH or stimulation conditions can lead to tungsten corrosion.

PLATINUM/IRIDIUM

Considered by many to be the "gold standard" for chronic recording and microstimulation due to its electrochemical and mechanical characteristics.

Order Online

ADVANTAGES

- ✓ Platinum/Iridium possesses lower concomitant impedance, higher charge transfer capacity, and improved electrochemical stability compared to Tungsten and Stainless Steel.
- ✓ Offers excellent and versatile microstimulation performance, allowing safe stimulation to be performed with small probe sizes.
- ✓ Iridium content of alloy greatly improves mechanical hardness and stiffness, providing electrodes with a degree of bend resistance that approaches Tungsten.

DISADVANTAGES

- ✗ Greater cost than Tungsten and Stainless Steel, making it less appropriate for acute recording or non-intensive chronic recording.
- ✗ Can be vulnerable to corrosion and dissolution with some intensive stimulation protocols.

ELGILOY

Elgiloy (a stainless cobalt-chromium alloy) is available in monopolar electrodes for specialty applications, such as vibrating probes for SVET.

Order Online

ADVANTAGES

- ✓ Versatile metal that offers good recording performance in acute and chronic applications.
- ✓ Contains a small percentage of iron, which allows electrode tracts to be visually identified using Prussian Blue staining techniques.

DISADVANTAGES

- ✗ Inadequate for microstimulation due to poor charge transfer characteristics and electrochemical instability during stimulation.
- ✗ May corrode and degrade in performance when implanted for long periods of time or subjected to certain stimulation protocols.

PURE IRIDIUM

For the most intensive stimulation conditions and protocols, pure iridium electrodes offer unparalleled performance, rigidity, and stability.

Order Online

ADVANTAGES

- ✓ Pure Iridium can be electrochemically "activated" to create a layer of iridium oxide on the metal surface, imbuing it with exceptional electrochemical performance.
- ✓ These activated iridium oxide film (AIROF) electrodes offer some of the best stimulation performance known due to the fast faradaic charge transfer mechanisms available within the film.
- ✓ Pure Iridium is appropriate for very aggressive stimulation protocols or very small electrode sizes. Exceptional hardness and rigidity.

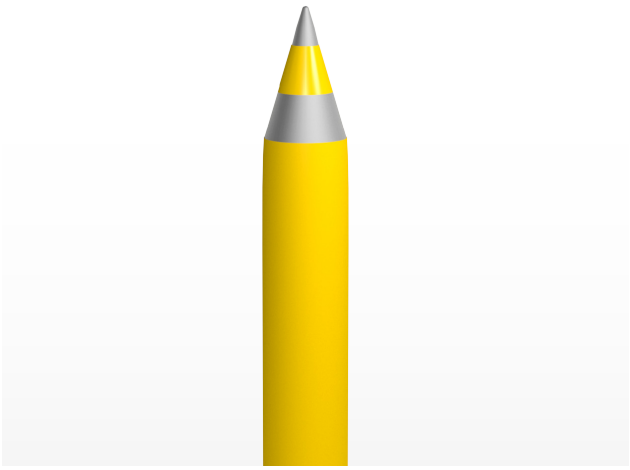
DISADVANTAGES

- ✗ High cost due to the specialty nature of the material.
- ✗ Only available in 100 micron diameter size.

CONCENTRIC ELECTRODES

Microprobes for Life Science offers a variety of popular and fully-customizable concentric electrode designs to meet your research needs. The inner electrode features one of three available metals, and an outer electrode is made of stainless steel. Our CEA Tapered Tip models are precision ground to a pencil point for improve tissue penetration, while our NE Rhodes-Style Tip models feature cylindrical stepped tips to allow for carefully controlled contact surface areas. The lengths of the different layers of the Rhodes-style electrodes can be customized to provide a great degree of control over probe surface area and impedance.

TAPERED TIP



TAPERED TIP OPTIONS

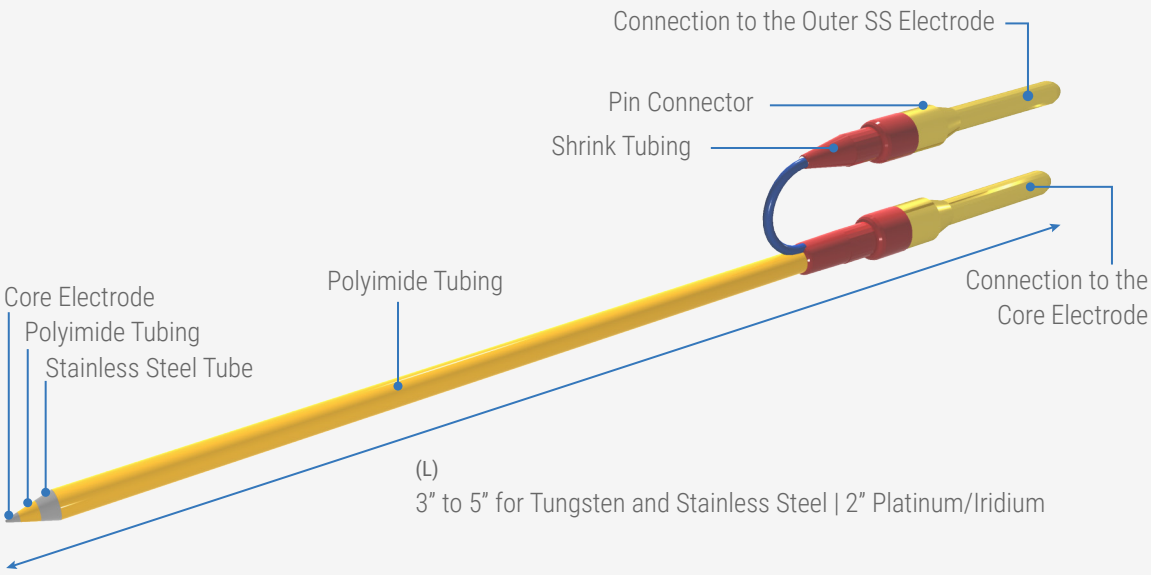
- CEA-200
- CEA-200 SS
- CEAX-200
- CEAX-200 SS

RHODES TIP

RHODES TIP OPTIONS

- NE-100
- NEX-100
- SNE-100
- SNEX-100

TAPERED TIP CEA-200

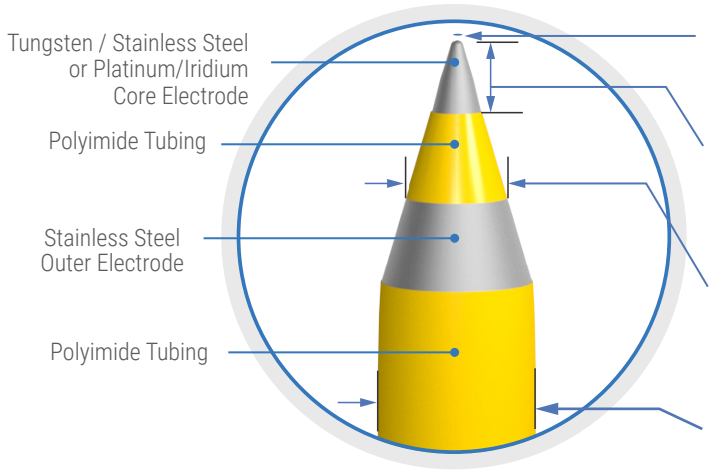


The CEA-200 tapered concentric electrode is ideal for localized stimulation or population recording in fixed preparations or acute animal experiments. They feature a long, fixed shaft that allows for easy gripping and manipulation, and a sharp durable tip capable of penetrating tough tissue.

Many features are fully customizable by special order, including shaft length, flexible wire length, connector type, and other features. Contact us to learn how our engineers can prepare an electrode ideal for your research.

Model is also available in a bare steel configuration without outer polyimide layer (CEA-200-SS)

TIP SPECIFICATIONS



TIP DIAMETER

Tungsten / Stainless Steel	Platinum/Iridium
2 to 3 µm	2 to 4 µm

Y - LENGTH OF THE EXPOSED CORE ELECTRODE

Tungsten / Stainless Steel	Platinum/Iridium
200 to 300 µm	200 to 400 µm

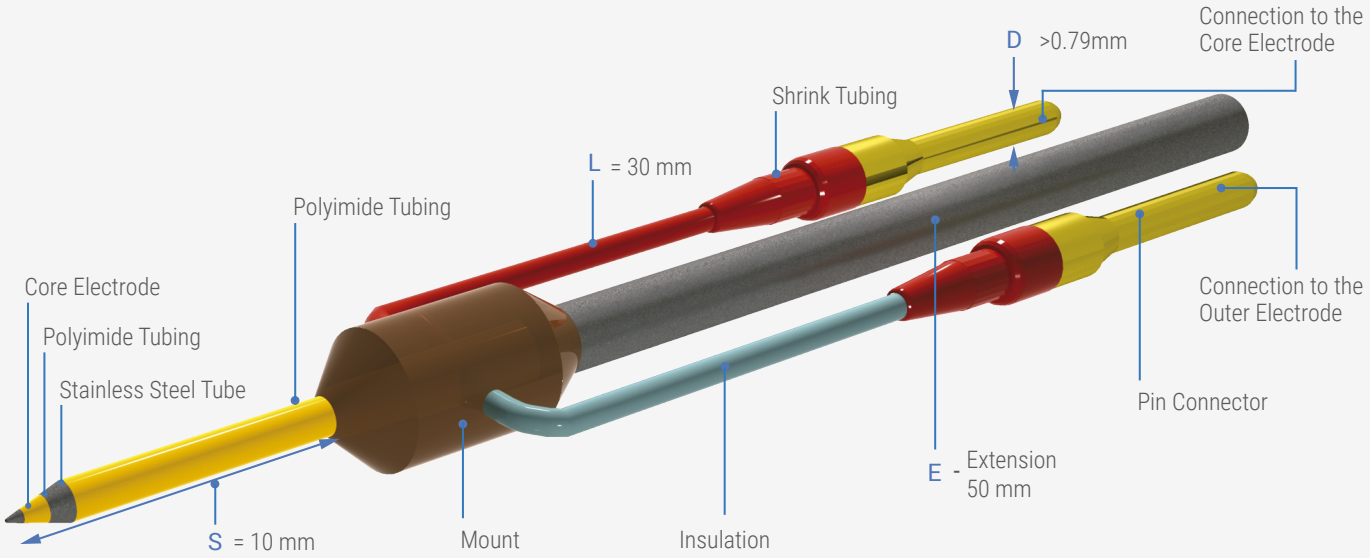
X - OUTER DIAMETER OF THE INNER POLYIMIDE SLEEVE

Tungsten / Stainless Steel	Platinum/Iridium
126 or 218 µm	126, 218 or 300 µm

W - OVERALL OUTSIDE DIAMETER

Tungsten / Stainless Steel	Platinum/Iridium
400 to 505 µm	400 to 695 µm

TAPERED TIP CEAX-200

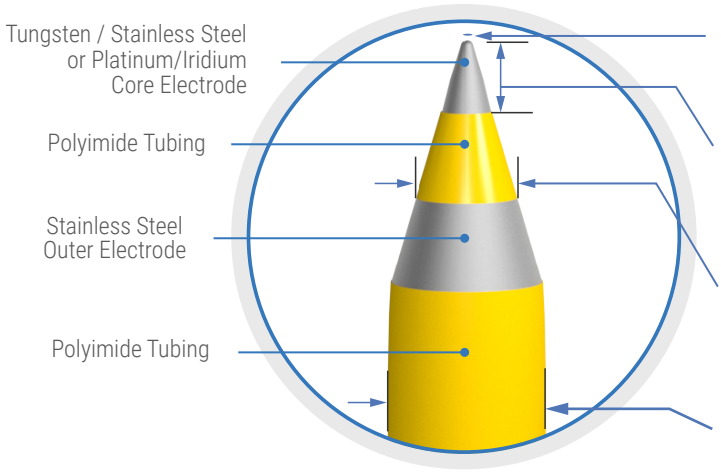


The CEAX-200 features the same tip as our CEA-200 probe, but in a form factor appropriate for chronic implantation. The CEAX-200 has a much shorter length and includes a rigid removable extension rod that can be easily gripped and then clipped off after the headcap is hardened to create a low-profile implant.

As in the CEA-200, many features are fully customizable by special order, including shaft length, flexible wire lengths, connector types, extension rod length, and other features.

Model is also available in a bare steel configuration without outer polyimide layer (CEAX-200-SS)

TIP SPECIFICATIONS



TIP DIAMETER

Tungsten / Stainless Steel	Platinum/Iridium
2 to 3 µm	2 to 5 µm

Y - LENGTH OF THE EXPOSED CORE ELECTRODE

Tungsten / Stainless Steel	Platinum/Iridium
200 to 300 µm	200 to 400 µm

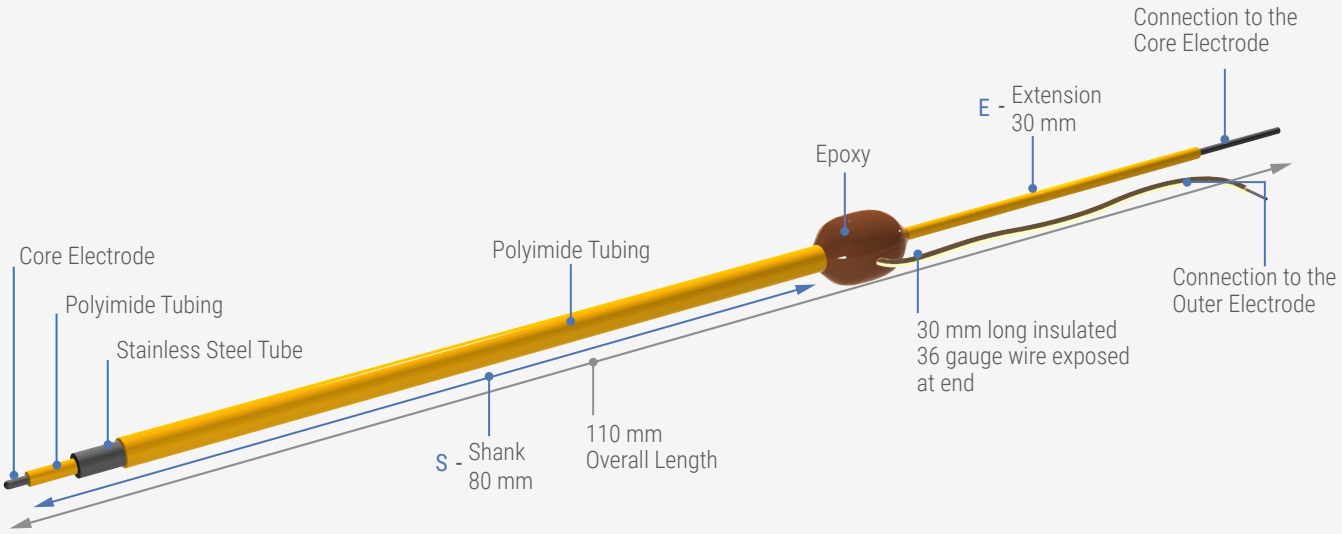
X - OUTER DIAMETER OF THE INNER POLYIMIDE SLEEVE

Tungsten / Stainless Steel	Platinum/Iridium
126 or 218 µm	126, 218 or 300 µm

W - OVERALL OUTSIDE DIAMETER

Tungsten / Stainless Steel	Platinum/Iridium
400 to 505 µm	400 to 695 µm

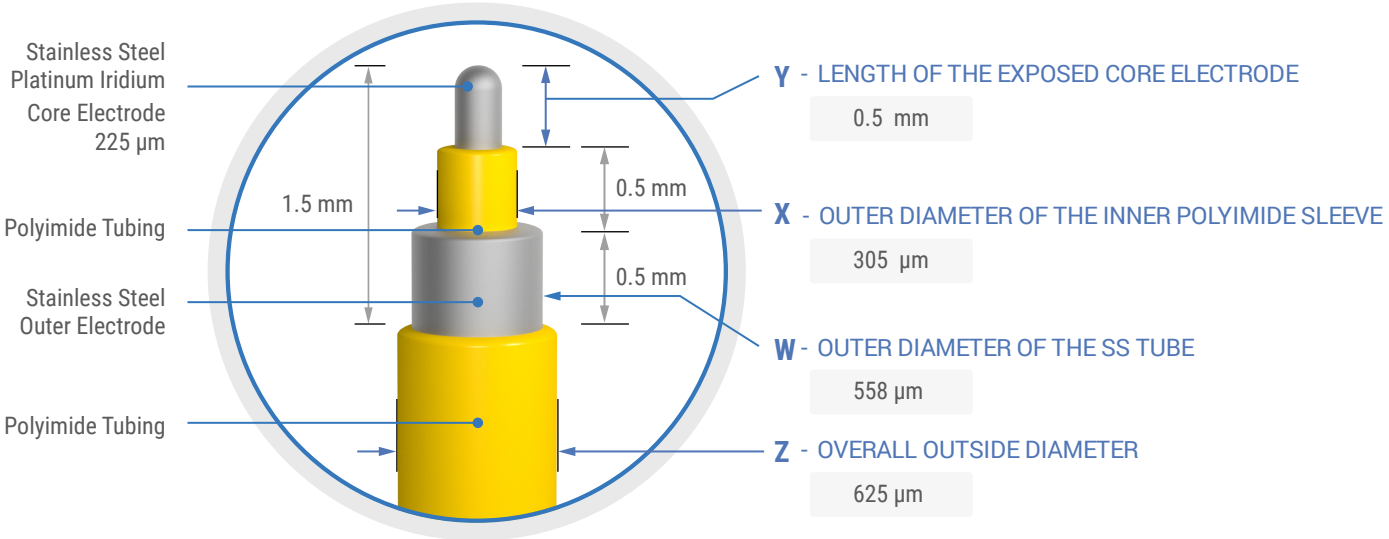
RHODES TIP NE-100



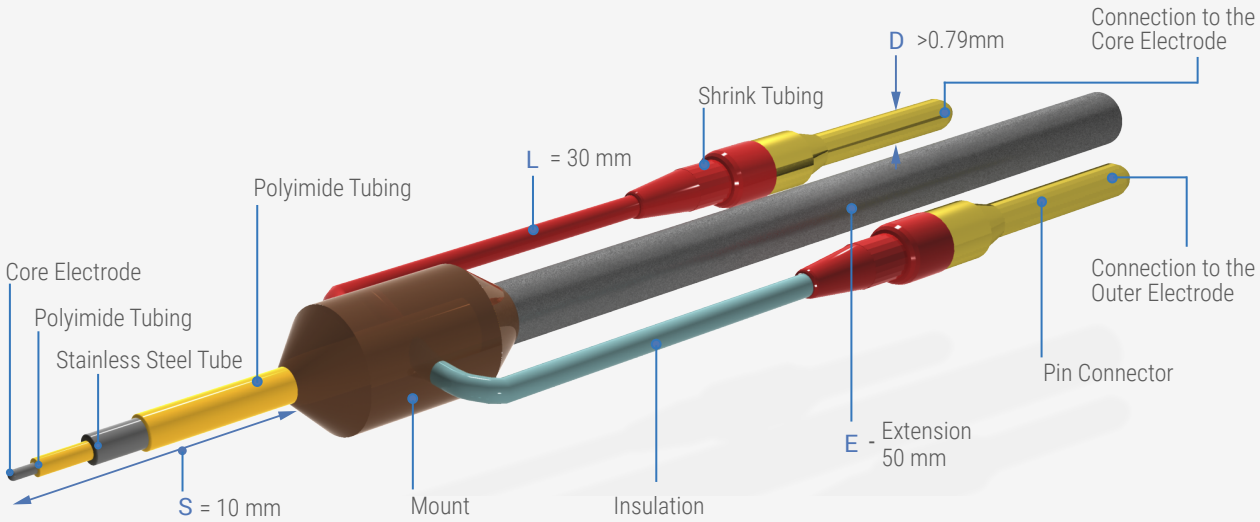
The NE-100 is designed to replicate the Peter Rhodes-produced NE-100 concentric, and features the same length, thickness, and tip dimensions. These probes feature a stepped tip with well-defined element lengths, allowing surface area to be easily determined for charge density calculations. As in the CEA-200, the NE-100 is ideal for localized stimulation or population recording in fixed preparations for acute animal experiments.

Many features are fully customizable by special order, including shaft length, flexible wire length, connector type, and other features. Contact us to learn how our engineers can prepare an electrode ideal for your research.

TIP SPECIFICATIONS



RHODES TIP NEX-100

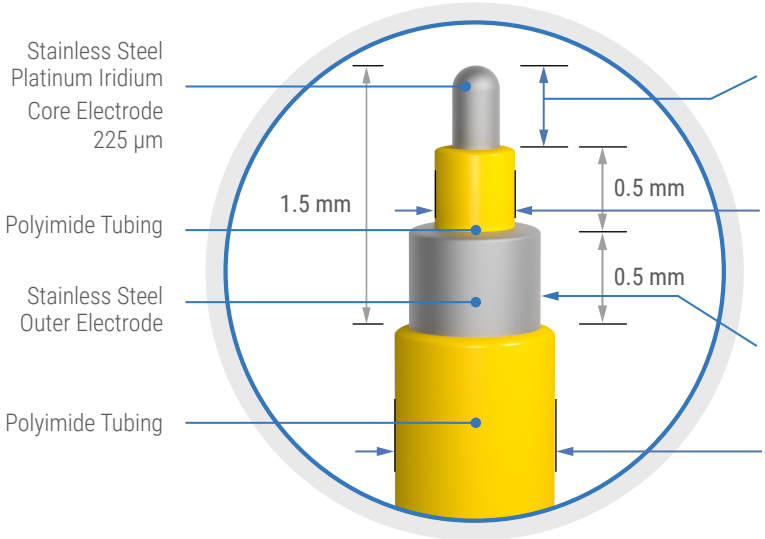


The NEX-100 features the same tip as our NE-100 probe, but in a form factor appropriate for chronic implantation.

The NEX-100 is designed to replicate the Peter Rhodes-produced NEX-100 concentric, and features the same length, thickness, and tip dimensions. The NEX-100 features the same tip as our NE-100 probe, but in a form factor appropriate for chronic implantation. The NEX-100 has a much shorter length and includes a rigid removable extension rod that can be easily gripped and then clipped off after the headcap is hardened to create a low-profile implant.

As in the NE-100, many features are fully customizable by special order, including shaft length, flexible wire lengths, connector types, extension rod length, and other features.

TIP SPECIFICATIONS



Y - LENGTH OF THE EXPOSED CORE ELECTRODE

0.5 mm

X - OUTER DIAMETER OF THE INNER POLYIMIDE SLEEVE

305 µm

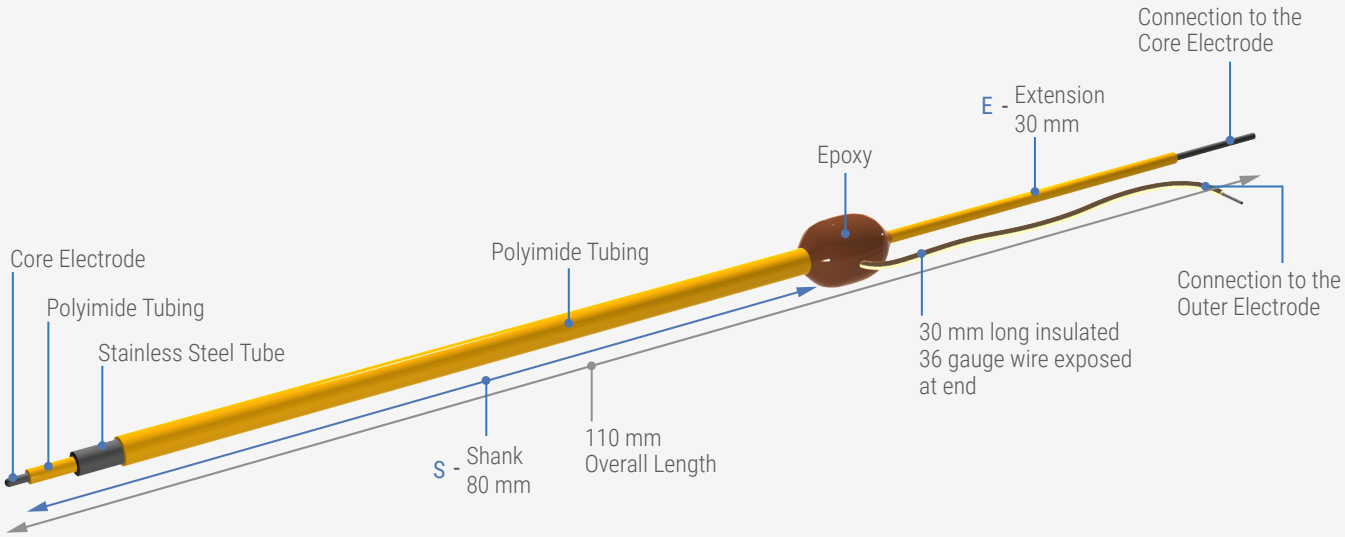
W - OUTER DIAMETER OF THE SS TUBE

558 µm

Z - OVERALL OUTSIDE DIAMETER

625 µm

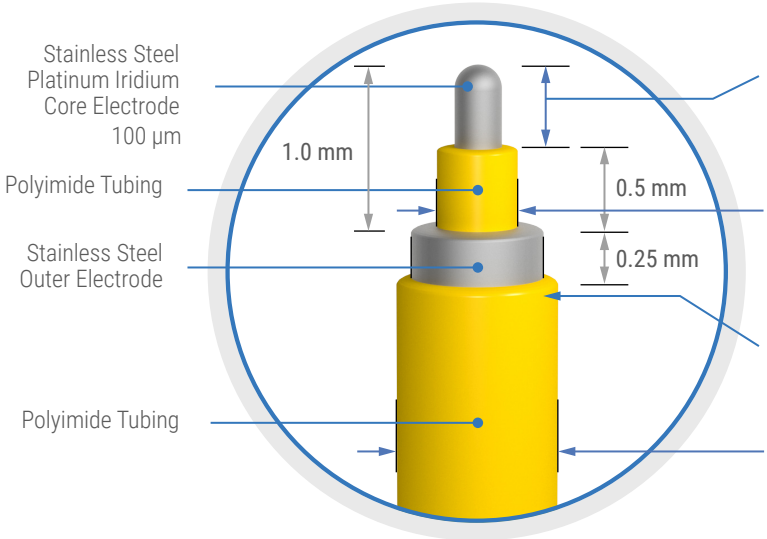
RHODES TIP SNE-100



The SNE-100 is designed to replicate the Peter Rhodes-produced SNE-100 semi-micro concentric, and features the same length, thickness, and tip dimensions. These probes feature a stepped tip with well-defined element lengths, allowing surface area to be easily determined for charge density calculations. Featuring a shaft diameter considerably thinner than the NE-100, the SNE-100 is ideal for localized stimulation or population recording in fixed preparations and acute animal experiments where implant size is a critical concern.

Many features are fully customizable by special order, including shaft length, flexible wire length, connector type, and other features. Contact us to learn how our engineers can prepare an electrode ideal for your research.

TIP SPECIFICATIONS



Y - LENGTH OF THE EXPOSED CORE ELECTRODE

0.25 mm

X - OUTER DIAMETER OF THE INNER POLYIMIDE SLEEVE

140 µm

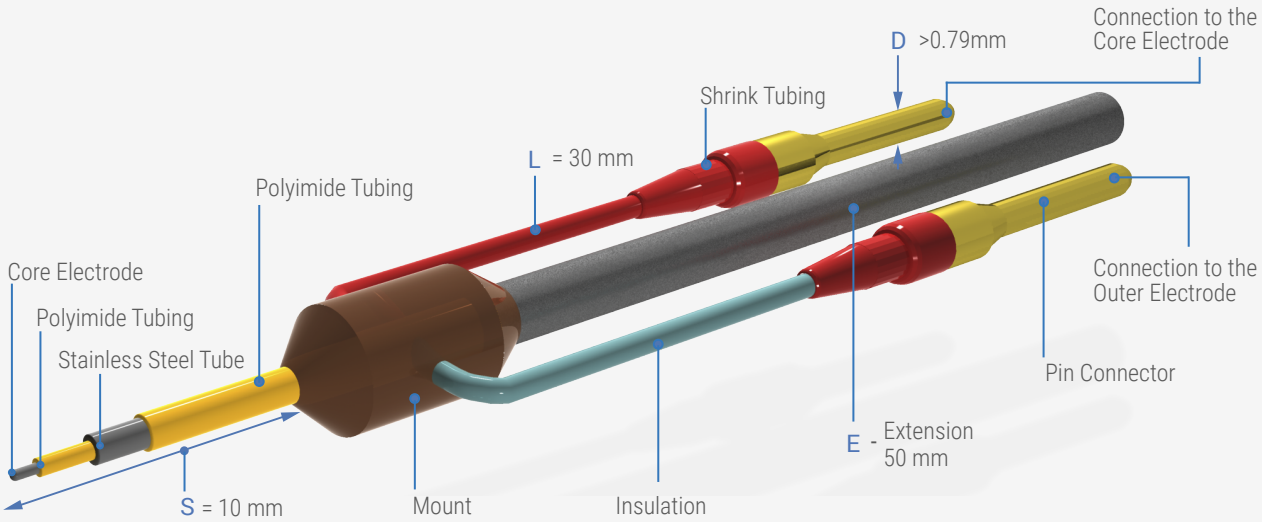
W - OUTER DIAMETER OF THE SS TUBE

330 µm

Z - OVERALL OUTSIDE DIAMETER

411 µm

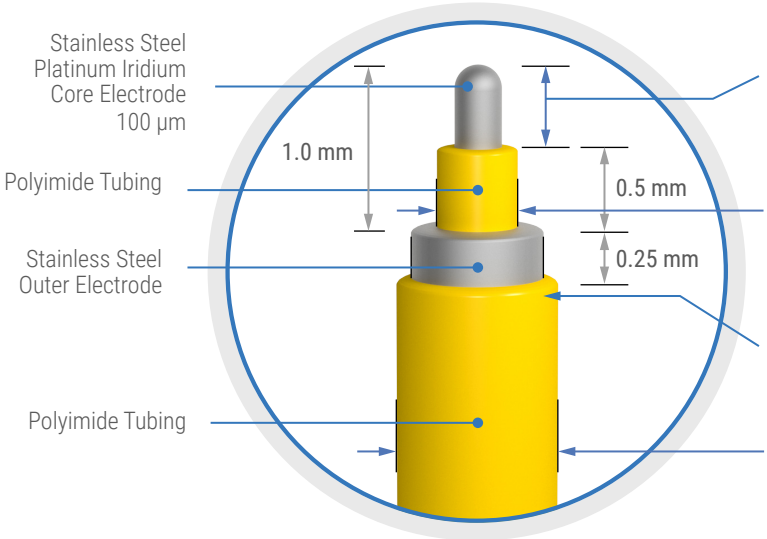
RHODES TIP SNEX-100



The SNEX-100 is designed to replicate the Peter Rhodes-produced SNEX-100 concentric, and features the same length, thickness, and tip dimensions. The SNEX-100 features the same tip as our SNE-100 probe, but in a form factor appropriate for chronic implantation. The SNEX-100 has a much shorter length and includes a rigid removable extension rod that can be easily gripped and then clipped off after the headcap is hardened to create a low-profile implant. Featuring a shaft diameter considerably thinner than the NEX-100, the SNEX-100 is ideal for chronic implantation into targets where implant size is a critical concern.

As in the SNE-100, many features are fully customizable by special order, including shaft length, flexible wire lengths, connector types, extension rod length, and other features.

TIP SPECIFICATIONS



Y - LENGTH OF THE EXPOSED CORE ELECTRODE

0.25 mm

X - OUTER DIAMETER OF THE INNER POLYIMIDE SLEEVE

140 µm

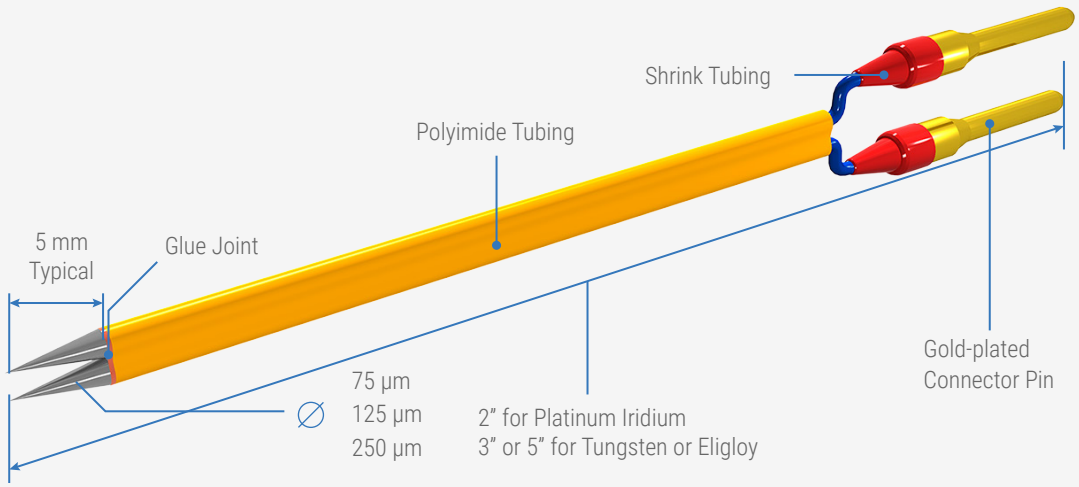
W - OUTER DIAMETER OF THE SS TUBE

330 µm

Z - OVERALL OUTSIDE DIAMETER

411 µm

BIPOLAR STEREOTRODES



Excellent for bipolar stimulation studies where the current injection needs to be confined to a small localized part of the neural tissue.

Also, the bipolar stereotrode is applicable in situations where the metal of both electrodes must be selectable (in concentric electrodes, the outer electrode is required to be stainless steel). This feature is necessary for applications requiring MRI compatibility, or when the impedance of both poles must be matched.

Any combination of our monopolar electrodes can be paired to create a custom bipolar stereotrode, and the impedance of each electrode can be set independently. Contact us to learn more about how we can build an electrode ideal for your specific project.

METAL SELECTION

TUNGSTEN

Tungsten is a versatile and widely-used microelectrode material that offers a good balance between performance and cost.

Order Online

PLATINUM/IRIDIUM

Considered by many to be the "gold standard" for chronic recording and microstimulation due to its electrochemical and mechanical characteristics.

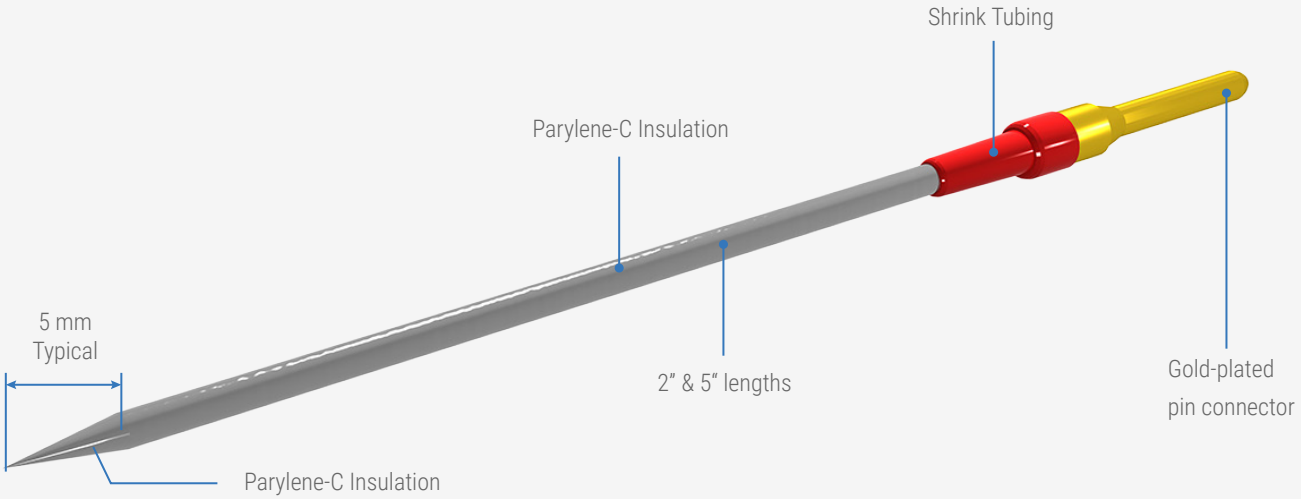
Order Online

ELGILOY

Elgiloy (a stainless cobalt-chromium alloy) is available in monopolar electrodes for specialty applications, such as vibrating probes for SVET.

Order Online

MACRO ELECTRODES



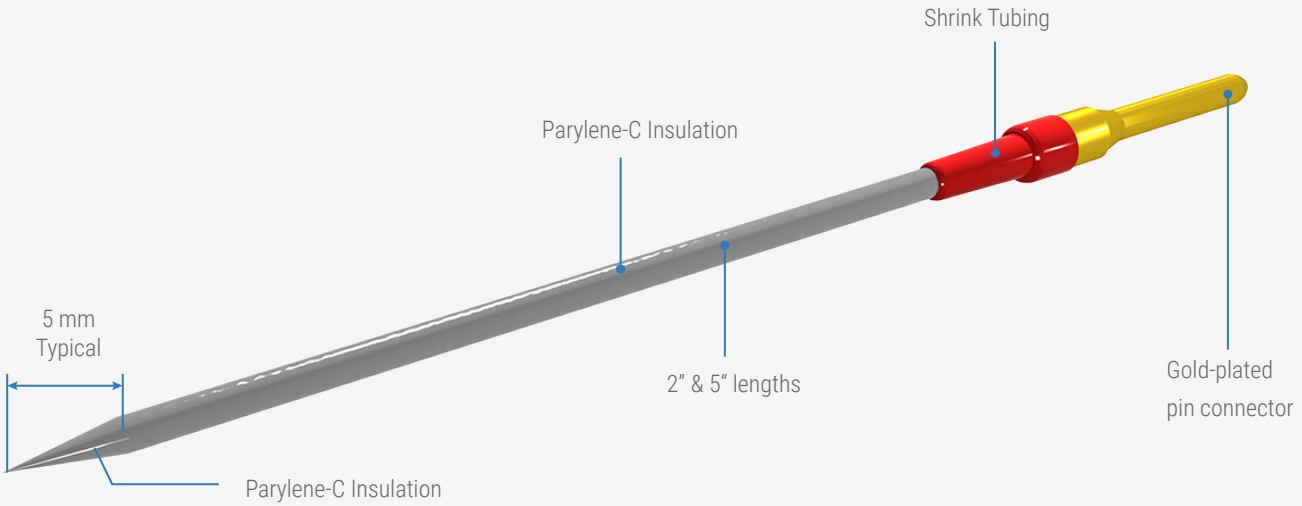
Macro Electrodes feature a thicker shaft than our typical microelectrodes, and are available in Platinum/Iridium or Tungsten. Platinum/Iridium macro electrodes feature a shaft diameter of 231 µm, while tungsten macro electrodes feature a diameter of 256 µm.

Our macro electrodes feature a very large tip exposure with impedance value selectable between 2.5 and 20 kΩ, making them ideal for stimulation studies or the creation of lesions in tissue.

Larger tip exposures can be specified for electroporation applications as a custom option.

Order Online

VIBRATING PROBE



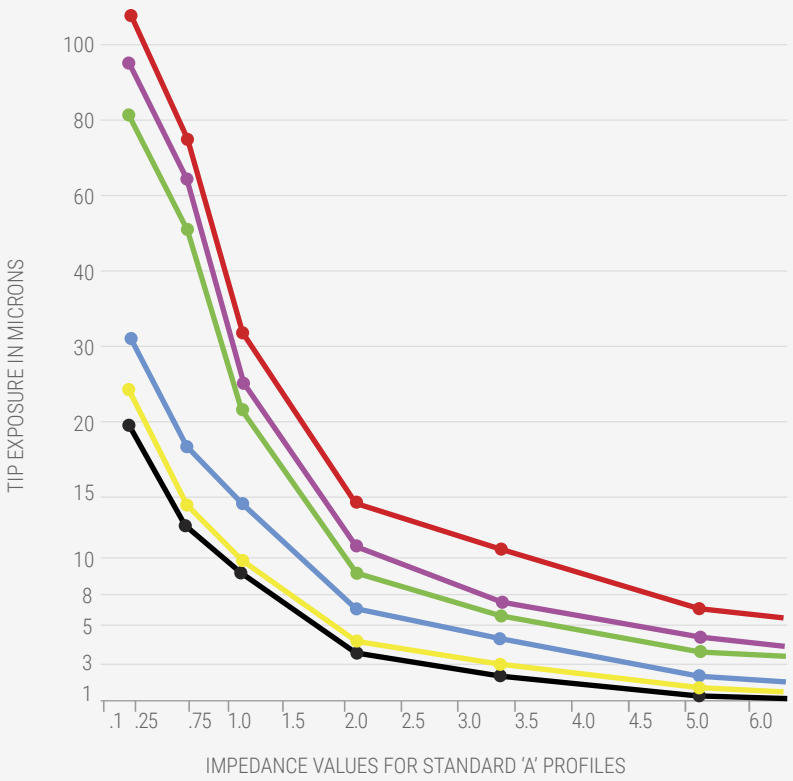
These unique Platinum/Iridium or Stainless Steel microelectrodes are specifically designed to have extremely small tip exposures resulting in relatively high impedance values. These electrodes have been developed in cooperation with Alan Shipley and others at the National Vibrating Probe Facility (NVPF) within the Marine Biological Laboratory in Woods Hole, MA.

Their primary goal is to develop techniques for the design and development of computer-controlled non-invasive, scanning microelectrode measurement systems to detect ionic currents in conductive solutions.

Order Online

ELECTRODE TIP EXPOSURE

DIFFERENT IMPEDANCE VALUES AND METAL TYPES



WIRE DIAMETER	METAL TYPE
75 & 125 µm	Tungsten
75 & 125 µm	Pt/Ir
250 µm	Tungsten
250 µm	Pt/Ir
225 µm	Elgiloy SS
100 µm	Pure Iridium

HOW TO SPECIFY YOUR CONFIGURATION

WE3003X.XA5

METAL TYPE
- **WE** › Tungsten
- **Pt-Ir** › Platinum Iridium
- **EL** › Elgiloy
- **IR** › Pure Iridium

LENGTH
- **2** › 2"
- **3** › 3"
- **5** › 5" *Other lengths available on request*

ELECTRODE STYLE
- **00** › Parylene-C insulated metal shaft
- **PT** › Polymide Tubing added for increased insulation/stiffness
- **ST** › Stereotrode/Bipolar

INSULATION THICKNESS
- **1** › 1 micron Parylene-C
- **3** › 3 micron Parylene-C

TIP IMPEDANCE (MΩ)
- Specify the electrode tip impedance in megohms from 0.01 to 9.9
- Impedance measured at 1 KHz

TIP PROFILE
- **A** › Standard
- **B** › Blunted
- **H** › Heat Treated
- **F** › Extra Fine

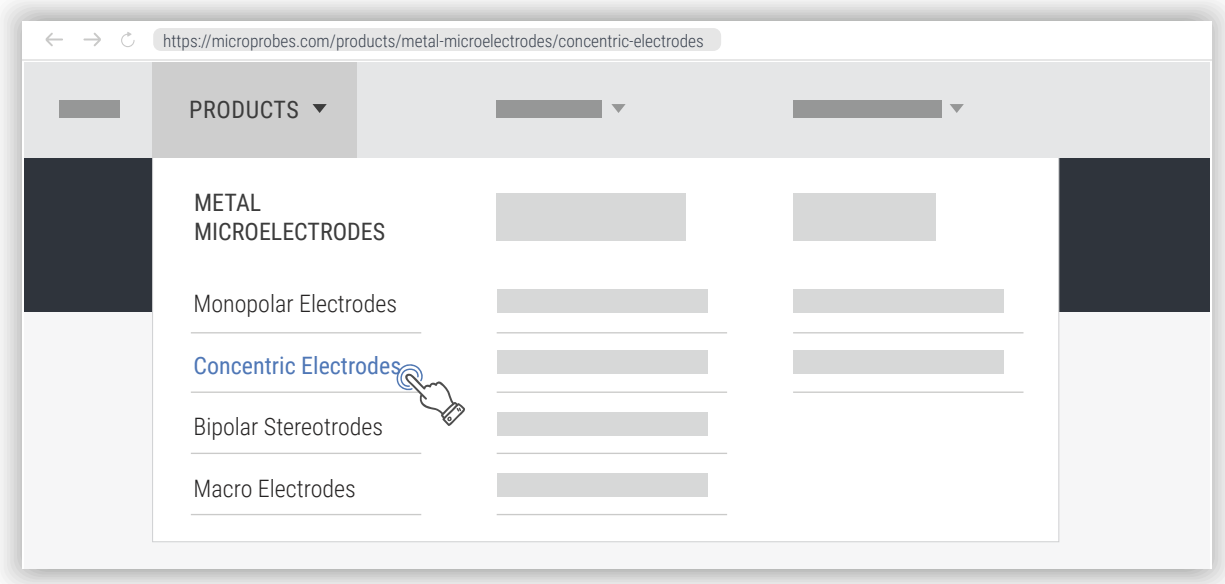
ELECTRODE SHAFT DIAMETER
- **3** › 0.003" (75 µm)
- **4** › 0.004" (100 µm Pure Iridium only)
- **5** › 0.005" (125 µm)
- **10** › 0.01" (225 µm for PI and EL, 250 µm for WE)

*Valid **ONLY** for Monopolar and Bipolar Electrodes*

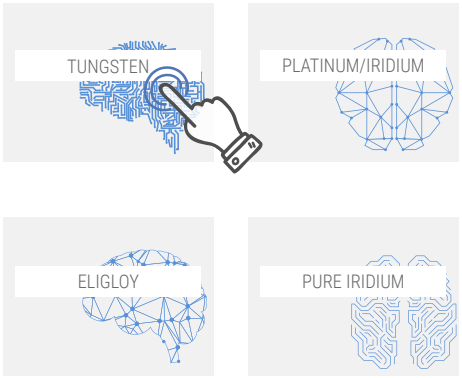
HOW TO BUY

Visit our website **www.microprobes.com** and explore all the alternatives available to order our products online.
Each product has its own particular characteristics. Go to **HOW TO BUY** and we will explain you how to proceed step by step.

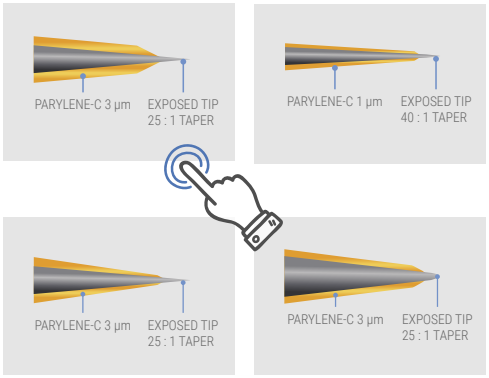
STEP 1 Metal Microelectrodes are ordered directly from the product page



STEP 2 Select your preferred METAL TYPE



STEP 3 Select your preferred TIP PROFILE

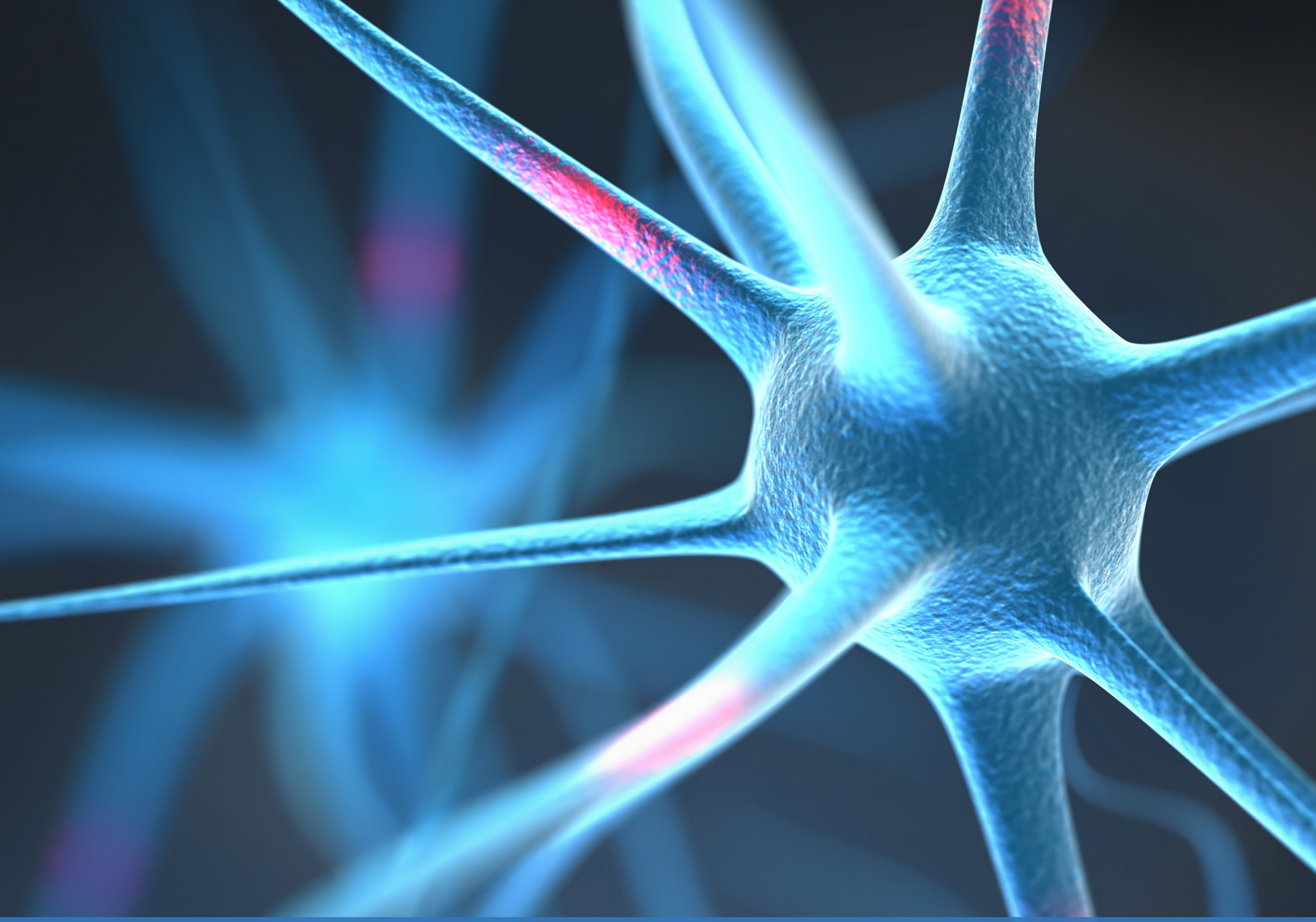


STEP 4 Click the Paypal button next to the desired product

STANDARD | BLUNTED | TAPERED | EXTRA FINE

Tungsten - Standard Tip - (75 µm X 3")

ITEM	Length	Shaft Diameter	Tip Diameter (µm)	Tip Profile	Impedance (mΩ)	Applications	Price - 10/Pk
WE33003X.XA3	3 "	0.081 mm	2 - 3 µm	Standard Tip	0.1 - 2.0 meg	General purpose recording	$158
WE33003O.01A3	3 "	0.081 mm	2 - 3 µm	Standard Tip	0.1 meg	MultiUnir &ERP recording & Slim	$158



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