

the FMA substrate. When it is positioned in the center of the flat ceramic cap and just barely in contact, turn on the vacuum pump.

- Slowly lower the array until it produces a slight dimpling of the pial surface. Stop and allow the pia to relax for several minutes, and then lower the array again, no more than 1 or 2 millimeters. Allow the pia to relax again.



*The small size of the craniotomy during small animal/rodent implantations may make it extremely difficult to properly view the pial surface during implantation. Take care to position your optics to provide the best vantage.*

- Repeat this process, never allowing the pial membrane to dimple more than a couple of millimeters. The electrodes should “pop” through the pia after several minutes. Depending on the length and number of the electrodes in the array, it may take from 20 – 50 minutes to totally implant the array. Once the array is totally implanted so that the bottom ceramic substrate is flush with the pial surface, the silicone insulated gold wire cable needs to be strain relieved by gluing it to the boney edge of the craniotomy prior to turning off the vacuum pump. This will insure that the FMA will not be disturbed when attaching the connector or pedestal to the skull surface. It is highly recommended that you request our Power Point Presentation, FMA Implantation Procedure, prepared by Drs. Marc Schieber and Adam Davidson at the University of Rochester. It provides a very concise description of pre ans post implantation information as well.

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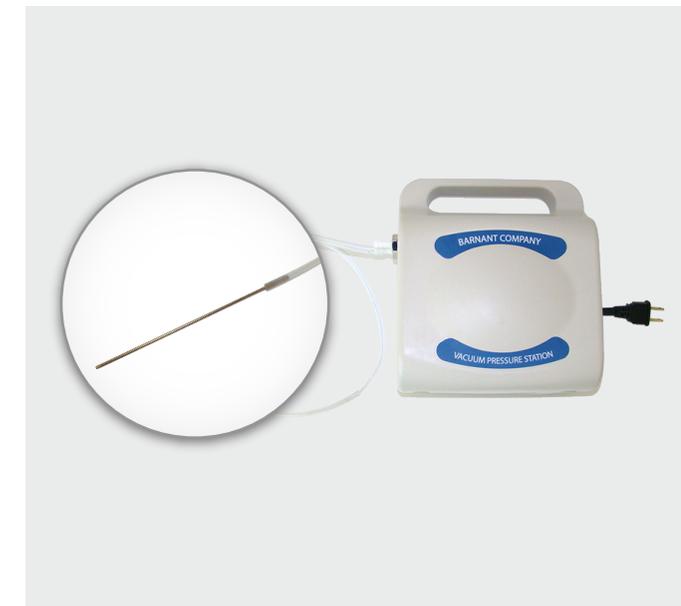
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# FLOATING MICROELECTRODE ARRAYS (FMA)

## Insertion Tool Instructions



## Introduction

The **VPI-002 FMA Insertion Tool** employs a vacuum pump and a small suction tip to gently and safely hold the FMA head and allow for its manipulation during implantation. The suction tip is advantageous over mechanical grips as it allows the FMA to be released without tension or jarring once implanted, reducing tissue trauma and the risk of accidental repositioning. **The FMA Insertion Tool** is compatible with any commercial micro-drive system, and the stainless steel 16-gauge suction tip can be mounted to most microelectrode holders or micro-drive electrode assembly clamping devices.

## Animal Model Considerations

The **FMA Insertion Tool** operates by holding the flat upper surface of the FMA substrate to a blunt-tipped needle using a mild vacuum. The strength of the suction is set in such a way as to allow the FMA to be held in place while still allowing for slight rotations and position changes. The use of the tool is most straightforward in large animal implantations involving large craniotomies and long FMA connector cable lengths, where it is easier to position the connector and FMA head without applying significant tension to the cable. For implantations into small animals such as rodents, much greater care may be required to safely implant, as the short length of the cable and small working area increases the risk of the cable tension inadvertently rotating the FMA head or popping it free of the suction, complicating the procedure

and risking damage to the array. For small animal and rodent implantations, it is recommended that the FMA connector be securely held by a second manipulator arm in such a way as to minimize cable torsion and flex during the FMA implantation. Once the FMA is implanted and secured within the craniotomy and the cable has been cemented to the skull edge with cement, the connector may then be manipulated at will. For further guidance, please contact **Microprobes for Life Science**.

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*It is critical to avoid flexing or twisting the FMA cable while the FMA is mounted on the vacuum insertion tool, as excessive tension may cause the FMA to pop free and impact nearby hardware.*

## Positioning the FMA

Position the FMA so that it is over the insertion site and ensure that the electrodes are perpendicular to the tissue into which they will be inserted. The best possible positioning of the connector, or the titanium pedestal supporting the connector, should be accomplished before removing the carbo wax coating that protects the microelectrodes.

We recommend that the FMA substrate not be moved more than a few millimeters beyond its

natural resting place during the insertion process, as this may result in the array moving after implantation because of force imposed by the cable. The amount of vacuum the insertion tool provides has been purposely minimized so that it will not allow the user to position the FMA substrate at a point much beyond its natural resting place. Ideally, the investigator needs to make sure that the FMA substrate is positioned at the outset at its implant location.



*The shape and size of the craniotomy is critical in small animal/rodent implantations, which typically require that the size be as small as possible. Great care must be taken to ensure that the craniotomy is of sufficient size to allow the FMA to lay flush against the cortex, and not tilted on a bone edge.*



*Additional bone may need to be removed from the craniotomy edge below the FMA cable, to allow unrestricted entry.*

## Operation

- After the FMA substrate has been positioned over the target area, support the substrate so that it rests above the tissue. Dissolve the carbo wax by gently squirting warm (40 – 50 degrees centigrade) distilled water over the substrate. Gauze or other sterile material may be placed below to collect or to provide a convenient run-off for the water. Carbo wax (polyethylene glycol) is inert and biocompatible, and has even been used to hold micro-wire arrays together as they are inserted into the brain.
- Position the stainless steel suction tip over