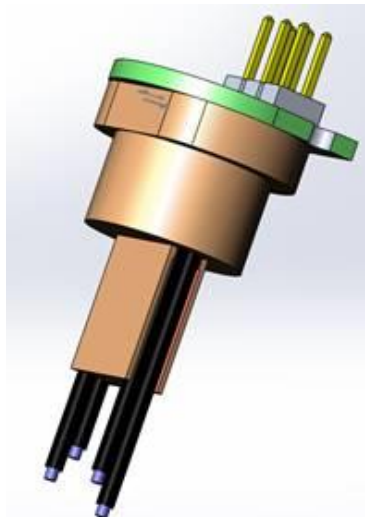


Electrode set for Costar 24 Transwell plates.

1 – Basic IV unit – Type Pellets only.

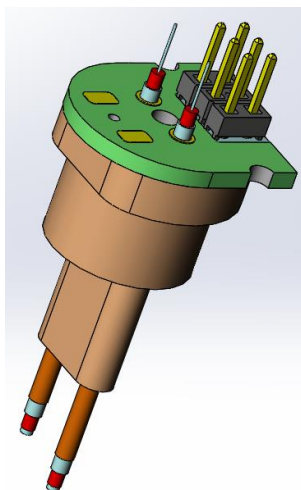


Electrophysiological parameters of each well are probed with an IV electrode unit that consists of 2 current (I) electrodes and 2 voltage (V) electrodes. The I and V electrodes are Ag/AgCl pellets that are glued with epoxy in PEEK (Polyether ether ketone) tubing. The epoxy remains intact when exposed to water or ethanol for several days. PEEK can be exposed to temperatures up to 250 °C (480 °F).

The Ag/AgCl pellets are connected to a 6 way header at the top of the IV unit. The header fits into a socket that is mounted on a PCB that connects 4 IV units to a 16 way header. A 16 way flat cable is used to make the connection to the inputs of the recording equipment.

Advantage of this type: more reliable PD recordings because of relative small junction potential of the I electrode, reducing in this way the common mode voltage of the V signal applied to the differential amplifier of the clamp amplifier.

2 – Basic IV unit – Type Ag foil for current electrode.



This unit can be exchanged for the pellets only type. Ag/AgCl pellets are used for the voltage electrodes and a silver sheet for current electrodes.

The body is made of PEEK material and the electrodes are made with peek tubing that has a smooth surface. As for the type with pellets, the connection is made with small connectors and a 16 way header.

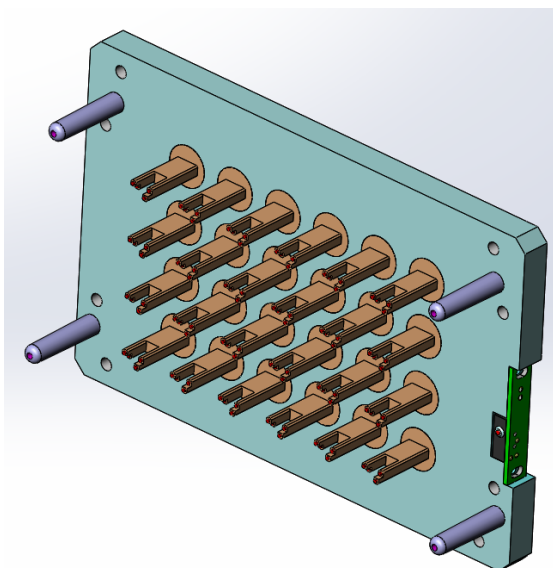
Advantage of this type of electrodes:

- 1 - small carry-over of solution and compounds when moving to another bath.
- 2 – Concentric arrangement of I and V sensing electrodes. This results in more reliable RT measurements

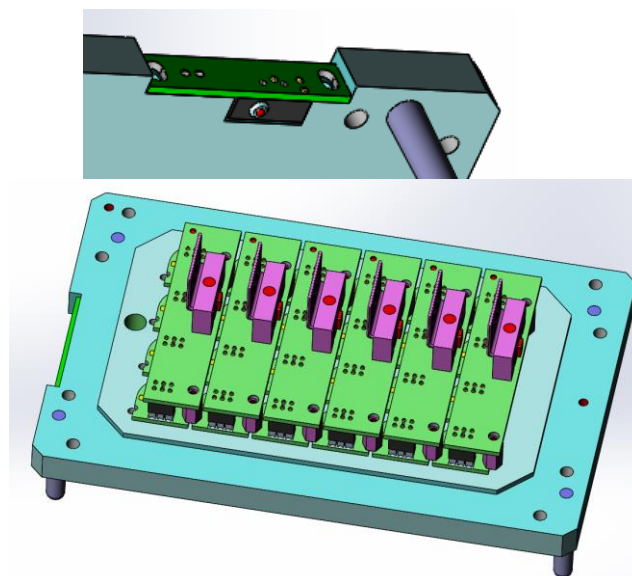
3– IV units in holder.

The IV units are inserted in a plate machined out of PEEK. The connection between IV unit and holder is sealed with silicone grease. This prevents the corrosion of the electronic connection by salt and water that is in contact with the tips of the IV units. See Bottom view below.

Bottom view



TOP view – inside after removal of covers



Positioning of the electrodes on the plate holder is provided with 4 tapered posts made of stainless steel. The open “Top view “ shows the connection of the IV units to 6 PCBs that have a header to insert 16 way flat cable connectors. The headers are specified for high temperature use. The headers are uncased and attention has to be paid to the correct orientation of the flat cable connectors. During replacement of an IV unit the PCB can be easily removed.

Note: Each MTECC board has 4 channels. Layout of the connection:

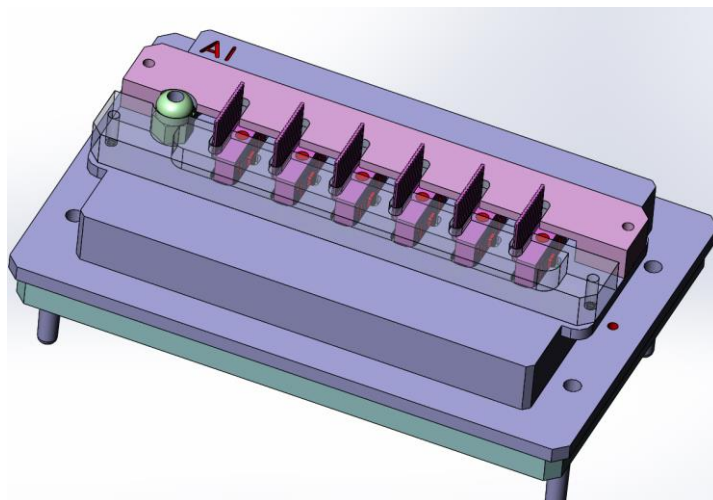
Brown wire of flat cable is connected to **pin #1** of the 16 way connector.

Pin #1 is marked with a small arrow on the connector. Cable layout:

PIN #	Connection
1	Ib4 I-basolateral - 4
2	Ia4 I-Apical - 4
3	Vb4 V-basolateral - 4
4	Va4 V-Apical - 4
5	Ib3 I-basolateral - 3
6	Ia3 I-Apical - 3
7	Vb3 V-basolateral - 3
8	Va3 V-Apical - 3
9	Ib2 I-basolateral - 2
10	Ia2 I-Apical - 2
11	Vb2 V-basolateral - 2
12	Va2 V-Apical - 2
13	Ib1 I-basolateral - 1
14	Ia1 I-Apical - 1
15	Vb1 V-basolateral - 1
16	Va1 V-Apical - 1

4 – Closed view.

An closure made out of aluminum fits on the base plate with the IV units. After inserting the flat cables, a small bar made of POM can be mounted on the cover. This bar holds the cables in place.



5 – Checking electrode position in wells.

The electrode set is provided with an aluminum plate that has an indent in which the top part of the multiwell (MW) plate fits. As other parts in this design, the plate has a mark that indicates the A1 well of the plate. With handles mounted on the electrode set, it can be easily positioned with electrodes facing upwards. Then the aluminum plate can be positioned on the electrode set as well as the top part of the MW plate.



Check carefully the position of the tips of the electrodes. They should not touch the membrane! If needed insert a spacer under the posts of the electrode set.

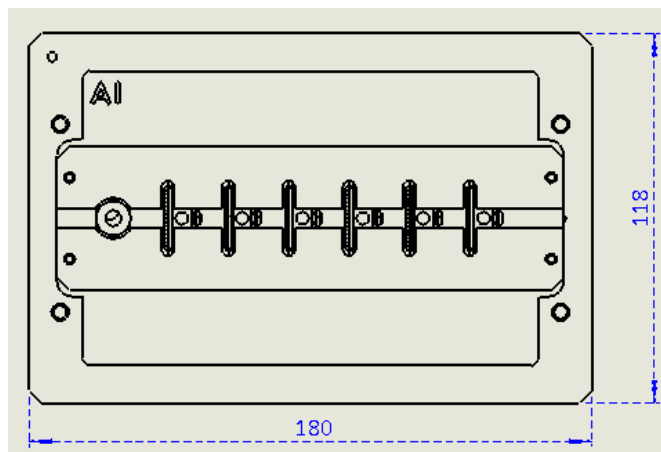
6 – Microswitch (MS).

A sealed microswitch is mounted on the side of the base plate with the IV units. It is mounted on a small PCB that is attached with two M3 screws. If not needed it can be easily removed. The cable of the MS is brought into the cover and leaves through a cable gland mounted on top of the cover.

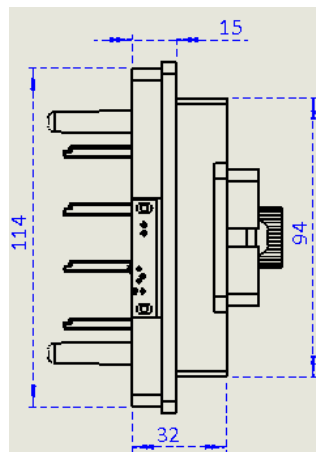
7 – Dimensions.

Weight: approximately 800 gram. Total weight including robot attachment: 1.5kg.

Front view:

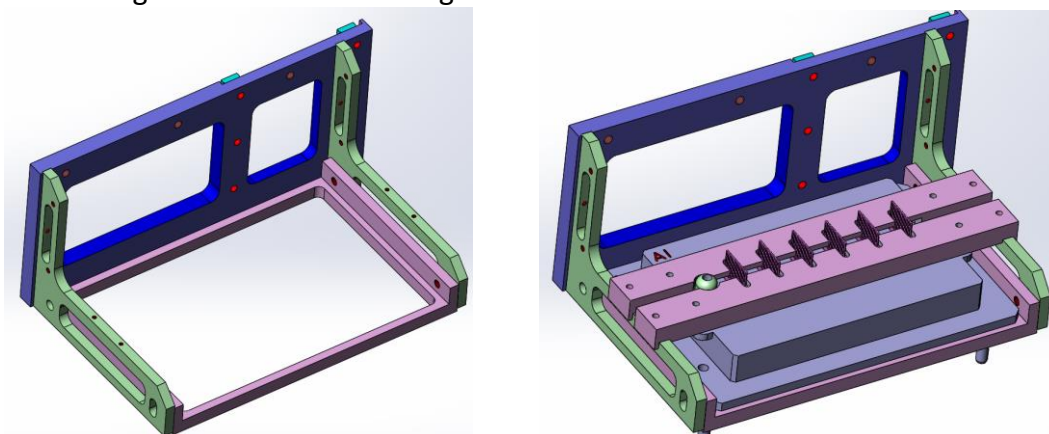


Left side view:



8 – Electrode set mounted in Robot attachment.

The electrode set can be mounted on a robotic system. For Precise Automation robot we have mounting hardware for attaching to the Z-axis.



9 – Storing electrodes.

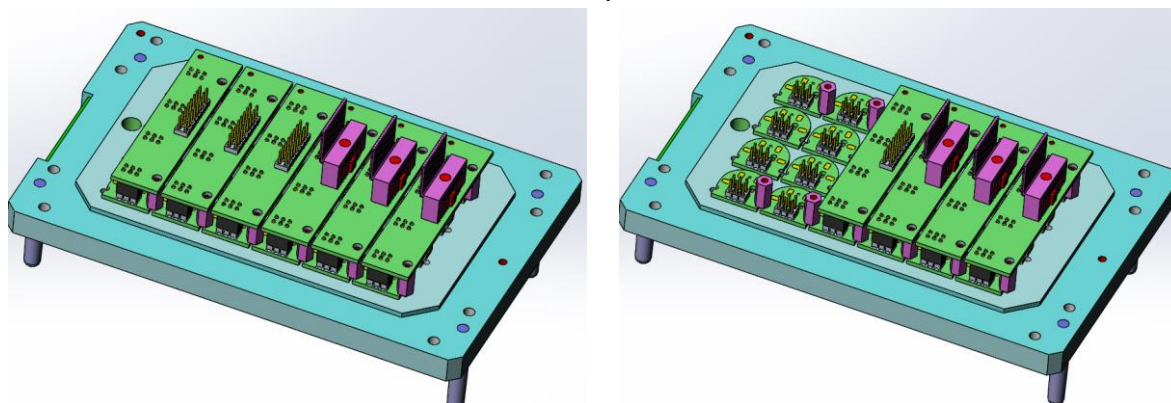
In between the experiments, the electrodes should be kept in contact with air and not immersed in saline solutions. Storing the electrode tips for a long time (weeks-months) in saline will corrode the Ag/AgCl pellets. Considerable damage of the pellets was noticed after one year when, in between experiments, the electrodes were stored in saline solution. However, it is recommended to bring electrodes in contact with the buffer about one hour before using them in the experiments. Moreover: If possible electrodes should be stored in dark (Ag/AgCl is somewhat sensitive to light).

10 – Replacing an IV unit.

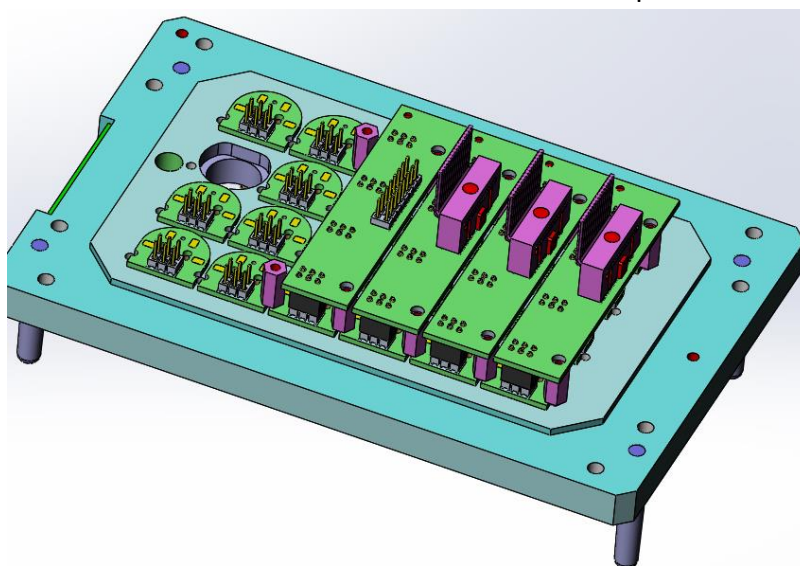
Tools needed: Silicone grease to seal the unit with the holder. Screw driver.

How to proceed:

- 1 – Remove cover and detach flat cables from the electrode set.
- 2 – Remove interconnection boards with 16 way headers: remove 2 screws and lift it.



- 3 – Remove screws that hold the IV unit in the PEEK holder. Then, push damaged electrode out of aluminum frame. Push from bottom and remove from top.



- 4 – Put a thin film of silicone grease on the cylindric part of the new IV unit and insert it in the aluminum frame.

- 5 – Reassembled the parts that have been removed and restore cable connections.

