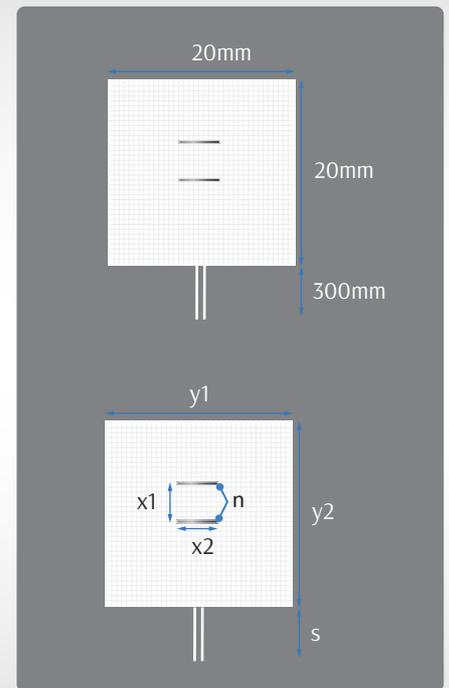
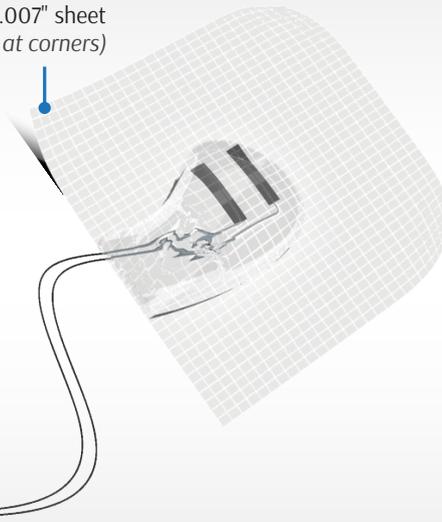


EMG PATCH ELECTRODES

User Instructions

Dracon reinforced silicon rubber, 0.007" sheet
(trim to required size and suture to fascia at corners)

Fine Stranded Stainless steel leads
Teflon insulation 300mm long-typical



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Introduction



Chronic EMG Patch Electrodes are ideal for the chronic recording and/or stimulation of muscle tissue. The patches are designed to be easily secured in place with sutures, and allow for optimal bipolar electrode configurations while shielding out cross-talk from adjacent muscles. Although primarily designed for chronic implantation, the patches are very suitable for acute recording and stimulation, and may be re-used multiple times if properly cleaned between procedures.



Before re-use, patches should be sonically cleaned for at least 3 minutes in 50% bleach, followed by 2 minutes in distilled water and 1 minute in alcohol.

Chronic EMG Patch Electrodes are designed to allow for multiple possible configurations with regard to patch size and the length and placement of the stranded stainless steel wire electrode contacts. The patch is constructed using a 175 μm -thick flexible silicone sheet reinforced with Dacron mesh for strength. The electrode contacts and lead wires are Teflon-insulated 40-gauge stranded stainless steel.

Sterilization



Chronic EMG Patch Electrodes are made entirely of autoclavable materials and can be steam sterilized without special precautions. If gas (EtO) sterilization is used, be sure to pack the patch electrode into a gas-permeable bag and allow for adequate out-gassing time (at least 48 hours) to ensure all toxic gases have been desorbed from the silicone rubber. For applications in which aseptic technique is not essential, a 70% ethanol rinse followed by air-drying is an effective cleaning technique to remove dust.



Before re-use, patches should be sonically cleaned for at least 3 minutes in 50% bleach, followed by 2 minutes in distilled water and 1 minute in alcohol.

Surgical Handling



When possible, the patch should be placed on the internal rather than the superficial surface of thin muscle to minimize cross talk from deeper muscles. If a double-sided patch is being used to record from two adjacent muscles, affix it to the fascia of only one muscle, leaving the other surface free to slide.

- The fascial surface of the muscle should be exposed and completely freed from surrounding tissue attachments over as wide a region as possible. Avoid cutting nerve branches or blood vessels.
- The Chronic EMG Patch Electrode can be shaped to best conform to the exposed muscle by cutting away excess silicone patch material, taking care to avoid

damaging the embedded steel lead wires. A properly shaped patch electrode should lay as flat as possible on the available muscle surface. For optimal rejection of cross-talk, try to leave a margin of patch material completely surrounding the correct region with a width at least equal to the electrode separation.

- The patch should be anchored to the fascia of the muscle at all four corners using small diameter non-resorbable sutures.



Do not take deep bites of muscle tissue in the suture loops as this can lead to necrosis due to constriction pressure, leading to patch detachment. When working in a tight space, it is often useful to place the two deep corner sutures in the fascia first and use them to draw the patch into place.



Be sure to leave adequate slack in the leads and avoid locating patches or leads where they can push directly up into the underside of the skin suture lines. Because of the large contact area and lack of sharp edges, motion artifact is rarely a problem.

Testing

If it is necessary to verify the integrity of the electrical leads or their insulation, the best test is a "bubble test" performed using a bowl of saline. To perform this test, use a low voltage DC battery

(6 or 9 volts) to apply a negative voltage to each lead in succession while immersing the patch in saline. The positive pole of the battery should be connected to a large surface area ground (the outside of a stainless steel bowl works well). When the negative pole of the battery is brought into contact with each electrode lead, a

properly-functioning electrode will be seen to emit a stream of bubbles (hydrogen gas) from the exposed electrode surface and from no other electrode or point on the back of the patch. If multiple streams of bubbles are seen at the same time, it could indicate the presence of a short circuit or insulation failure.

The best way to verify the electrical integrity of an implanted patch electrode is through the measurement of contact impedances using a low current AC (1 kHz) impedance meter or potentiostat. For each electrode within the patch, measure the impedances of both the electrode contact versus remote ground AND the contact versus a second neighboring electrode contact. The typical 1 kHz impedance range of individual electrodes versus ground is 2-5 k Ω (though properly functioning electrodes can exhibit impedances well above or below this range), and the impedances of small electrodes will be somewhat greater than the impedance of large electrodes. Each pair-wise impedance should be somewhat less than twice the value of the individual contact impedance.

This test is primarily intended to diagnose connectivity problems or electrode damage, through the detection of very high (>100 k Ω) or very low (<500 Ω) impedances. A fair amount of contact impedance variability is to be expected between contacts and over time: changes of a factor of two in either direction are not significant. There is no simple electrical test for the viability of the muscle except the ability to evoke and/or record action potentials with the appropriate stimuli.

If an AC impedance tester that is accurate in this range is not available, use a sine wave generator with a large series resistance (1 M Ω) and blocking capacitor (0.1 μ F) to generate a constant current sine wave. If you start with 10 V p-p @ 1 kHz, the signal across the electrode will be 10 mV/k Ω .

Microprobes sells a Impedance Tester, **Model IMP-2A**

Connection of Leads



The stainless steel wire which forms the leads and contacts within the patch was selected for strength and biocompatibility, but due to its stiffness and solder resistance it can be difficult to make good mechanical and electrical connections. The best technique is to solder with the use of a special stainless steel fluxing liquid.

Carefully strip the Teflon insulation from the end by nicking and pulling, taking care not to damage the wire strands. Dip the end in acid flux or paint it on generously using a cotton swab and allow a few seconds for it to take effect. Using a freshly tinned, clean soldering iron (regular 60/40 rosin core solder), quickly dip the fluxed wire into the solder ball. You should hear a hiss as the flux evaporates, and the wire strands should be immediately drawn together by a solder bead, which will be firmly fixed to the wire after it cools. Cut off any stray ends that have not been well tinned. If you have any doubt about the adhesion of the solder, cut off at least 5mm past the exposed portion and start again.



Do not attempt to reflux or re-solder without first trimming back the wire, as the resin will coat the strands and will make this ineffectual. Be careful to protect any connection points from fluid leakage.

Configuration of Leads



The lead wires are easily traced to the patch if you need to know the precise configuration. When recording with a balanced differential amplifier, polarity will not have an impact on recording performance. Be sure to identify which pair of leads come from each side of a double-sided patch.

Placing a knot in the ends of the leads at the time of surgery can be a useful marker. Be sure to provide a separate low-impedance indifferent electrode for your amplifier (which can be located anywhere in the preparation). If you wish to apply stimulation pulses through the patch electrodes, be certain to use an isolated source of charge balanced, biphasic stimulation. The stainless steel electrodes are readily corroded by passage of net DC current. Stimulation rates and charge per pulse are best minimized.

The briefest duration stimulus pulses (0.1 msec or less) generally provide the highest charge efficiency even though they require somewhat higher peak currents.

Trouble-shooting



The most common electrical failures are poor solder joints or fluid leakage at the connection point to the leads, resulting in open circuits (noisy recordings) or degraded common mode rejection and spurious stimulation. The latter may be difficult to detect because of the normally low contact impedances. Look particularly for sudden impedance decreases.

***Teflon** is a registered trademark of **Dupont**

Terms and Conditions



Please inspect the package carefully upon arrival and report any damage to us within 7 days of receipt of the package.

Unused items may be exchanged if items and packaging are undamaged and in good condition. Exchange must be made within 30 days of invoice date and with prior permission from our Customer Service Department.

Please call 301-330-9788 or email: support@microprobes.com to request a Return Material Authorization (RMA) number.

We do not accept returns after 90 days from invoice date. Custom designed products are non-returnable.

Contact Information



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