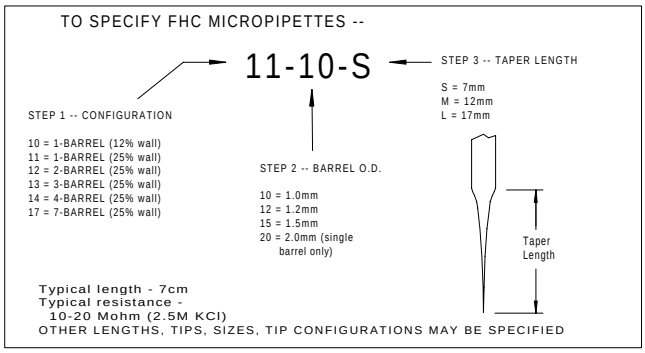

ORDERING INFORMATION

Micropipettes — Series 10,11,12,13,14, or 17-SD-TL

Please Specify: *Shank Diameter - SD* ***Please Specify*** *Taper Length - TL*

10 = 1.0mm *S = 7mm*
12 = 1.2mm *M = 12mm*
15 = 1.5mm *L = 17mm*
20 = 2.0mm (single barrel only)

e.g. 12-12-S=2 barrel- each barrel 1.2mm OD, .5cm taper length

10-SD-TL	1 Bar./12% Wall/Borosil. Micropipette	Pkg 48
11-SD-TL	1 Bar./25% Wall/Borosil. Micropipette	Pkg 48
12-SD-TL	2 Bar./25% Wall/Borosil. Micropipette	Pkg 48
13-SD-TL	3 Bar./25% Wall/Borosil. Micropipette	Pkg 48
14-SD-TL	4 Bar./25% Wall/Borosil. Micropipette	Pkg 48
15-SD-TL	Recommend Seven Barrel Configuration	Pkg 48
17-SD-TL	7 Barrell/25% Wall/Borosil. Micropipette	Pkg 48
TIP-MOD	Charge for specified tip size larger than 1 micron O.D.	Each
10-12-I	Injection Pipettes (needles)	Pkg 24
10-12-B	Injection Pipettes (needles, beveled)	Pkg 24
10-12-BL	Injection Pipettes (beveled, angled)	Pkg 24
10-12-H	Holding Pipettes (polished)	Pkg 24
10-12-HL	Holding Pipettes (polished, angled)	Pkg 24
18-20-1	Ag/AgCl Electrode	Each
18-20-2	Ag/Ag/Cl Electrode/Platinum Blacked	Each
19-20-1	Microelectrode Filling Kit	Each
19-20-2	30 ga x 3" Filling Needle	Pkg 5

APPLICATION NOTES

1. BEVELING

Beveling has been used both to sharpen tips for better penetrating qualities and to enlarge the tips. Many intricate and expensive techniques have been published but we recommend the method of Ogden, Citron, and Pierantoni (SCIENCE, **201**, p469 [1978]) as amended by Corson, Goodman and Fein (SCIENCE, **205**, p1302 [1979]) which utilizes a stream of abrasive particles directed across the pipette tip to cause beveling.

The only equipment required for this procedure is a magnetic stirrer and a simple one-dimensional manipulator. It is also useful to include equipment to measure the electrode resistance during the beveling process.

Alumina and silicon carbide powders are available from Buehler Ltd., 41 Waukegan Rd., PO Box 1, Lake Bluff, IL 60044. Particle size has been found to be important in determining the ultimate tip size; larger particle sizes are recommended to bevel to larger tips. The abrasive particles are washed and then suspended in a saline solution contained in a small beaker above a magnetic stirrer. The micropipette is lowered at an oblique angle into the vortex created by the rotating stir bar.

2. LARGER MICROPIPETTE TIPS

Most pullers will pull sub-micron tips more easily than tips of 5 - 10 microns. A great number of "arty " techniques for breaking the tips 2 microns or larger have been used. However, especially for patch clamp and injection pipettes, a required tip size and a flat tip end surface is required.

A simple method for making such tips is to position the tip of the micropipette in a molten bead of low melting glass. When the glass is cooled, the pipette tip will break at the interface and at the angle it makes with the glass.

A heating coil is easily made using a length of .4 or .5mm platinum wire arranged in a 2mm omega loop. Applying low voltage AC current from a rheostat (approximately 2-3 volts) will heat the coil to a red hot temperature so that flint or solder glass will melt and be held in the loop.

Under a microscope, use a manipulator to advance the tip of the pipette into the glass until the required diameter extends from the bead, then turn off the heat and back off the pipette.

3. SILICONIZING

Treating micropipettes with a hydrophobic layer is necessary prior to filling with ion exchange resins, and helpful in preventing protein solutions from aggregating on the side walls, and in minimizing ionic contamination.

The general procedure is to expose the pipette to a saline solution dissolved in an organic solvent; followed by baking to fix the silicone layer. We have utilized two methods:

1. Expose the freshly pulled pipette to the vapor over a 5% solution of dimethyldichlorosilane (Kodak) in xylene for two minutes followed with a one hour bake at 100 degrees C.
2. Fill the freshly pulled pipette with a 1% solution of Dow Corning 1107 fluid in trichloroethylene followed with a 1 hour bake at 100 degrees C.

If tips of the pipettes are to be broken to obtain larger openings, this procedure should be accomplished before siliconizing.

Glass should be clean before pulling. Use more dilute solutions if the silicone clogs the tips.

Siliconized pipettes should be stored in a dry atmosphere or refrigerated and used within 24 hours.

4. CONNECTION TO MULTIBARREL PIPETTES

Pressure or electrical connection to the individual barrels of multibarrel tubing can present problems. One solution is to insert and seal a length of polyimide tubing into each barrel after filling. Electrical connections can be made through the tubing or pressure connections made at the end.

Polyimide tubing has a wall thickness of 0.001" and is extremely strong, flexible, and smooth. Our Catalog #30-37-3, is .014" (.35mm) in size and fits well into the top of all of our multibarrel capillaries. The tubing need not be permanently glued into each barrel as long as pressure injection is not being used. Silicone grease serves not only to hold the tubing in place but prevents leakage across the barrels. The tubing then can be reused.

Alternatively, longer lengths can be sealed into the top of each barrel with 5 minute epoxy. Cut off the tubing at the entry point of the pipette and reuse the increasingly short tube segments until too little remains.