P-2000 LASER-BASED MICROPIPETTE PULLER

FEATURES P-2000

- Capable of pulling quartz, borosilicate and aluminosilicate glass
- Fully programmable — including heating filament characteristics
- The laser has no melting point limit as with conventional metal filaments, and therefore, cannot be burned out
- Pulls electrodes with tip diameters that are less than 0.03µm
- Optimized velocity sensing circuit for maximized sensitivity and reproducibility*
- Operating life of the CO_2 laser is expected to be in excess of ten years with normal use, after which the laser can be refurbished by Sutter Instrument for a fee
- Individual programs can be write-protected in order to secure them from inadvertent changes
- The total time that the heat is on during the pull is displayed for improved program development and troubleshooting
- A date and time stamp is displayed to show when the program was written and/or the last time a program was changed
- The P-2000/F is ideal for applications such as nanospray and NSOM
- Preprogrammed sample programs for intra-cellular and patch pipettes. Special programming upon request

*Patent No.4,600,424

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The P-2000 integrates a CO_2 laser-based heat source with the technology derived from our extensive experience with conventional pullers. This system offers capabilities unmatched by other pullers. A significant advance in the technology of fabrication of micropipettes, optical fiber probes, and nanospray tips, is offered with the P-2000 micropipette puller.

The use of laser heat allows the P-2000 to work with quartz glass (fused silica) as well as conventional glasses. Quartz offers superior material properties for a variety of research applications. Quartz is stronger than other glasses and can facilitate penetration through tough tissues which would normally break conventional pipettes[1]. For applications requiring a low noise glass, users will find that quartz is the lowest noise glass available[2,4]. Quartz contains none of the metals used in conventional glasses[3]. Optically, quartz is virtually free from fluorescence when illuminated.

A CO_2 laser was selected as the heat source for the P-2000 for several reasons: 1) The nominal emission wavelength of the laser approximates the resonant frequency of the SiO_2 lattice in glass. Thus, quartz and other conventional glasses can be melted when the appropriate laser power is supplied. 2) Laser heat is clean and leaves no metal residue on the pipette as do conventional heating filaments. 3) Laser heat can be turned off instantly, leaving no residual filament heat. 4) The user can program the amount and distribution of heat supplied to the glass. 5) No filaments to age or burn out.

The P-2000 can store up to 100 separate programs, with each program consisting of up to 8 command lines. Programmable parameters include: laser power level, scan width, trip velocity, delay/laser on time, and hard pull strength.

One important consideration for the use of the P-2000 is the diameter of the glass used. The optical design produces even heating on glass up to 1.2 mm in outside diameter. Larger diameter glasses can be used with the P-2000/G (up to 1.5 mm quartz and 1.8 mm conventional glasses), but the performance is best with glass that is 1.2 mm diameter or less.

The P-2000/F works well with small diameter glasses such as optical fibers, and with small diameter fused silica capillary commonly used for the manufacture of nanospray tips. Smaller diameter glass with an outer diameter in the range of 0.125 mm to 0.6 mm, require special puller bars as well as an optical alignment optimized for the smaller diameter material. These modified components will be installed at the time of purchase.

As with larger diameter glass, a wide range of tip sizes and taper geometries can be produced with this modified P-2000/F and small diameter glass. We have drawn optical fiber tips ranging from less than 10nm to more than 5µm. Please consult our technical staff for further information.

[1, 2, 3, 4] References listed on page 9

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REFERENCES P-2000

1. Munoz, J.L. and Coles, J. *Quartz micropipettes for intracellular voltage microelectrodes and ion selective microelectrodes.* Journal of Neuroscience Methods: 22:57-64, 1987.

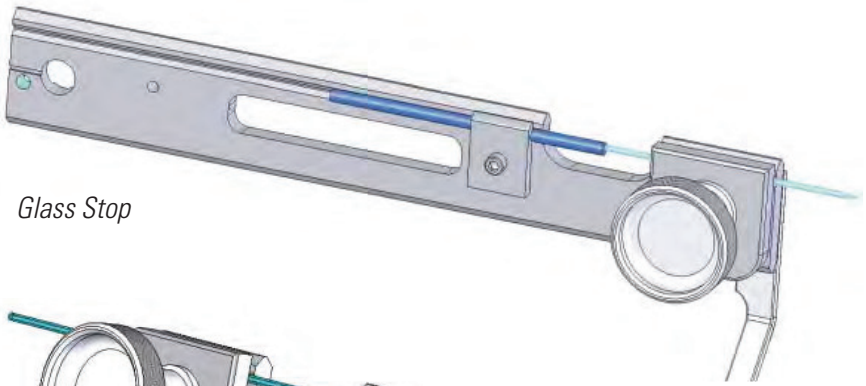
2. Rae, J.L. and Levis, R. A. *A method for exceptionally low noise single channel recordings.* European Journal of Physiology - Pflügers Archiv: 420:618-620, 1992.

3. Zuazaga, C. and Steinacker, A. *Patch-clamp recording of ion channels: Interfering effects of patch pipette glass. News in Physiological Science: 5:155- 159, 1990.*

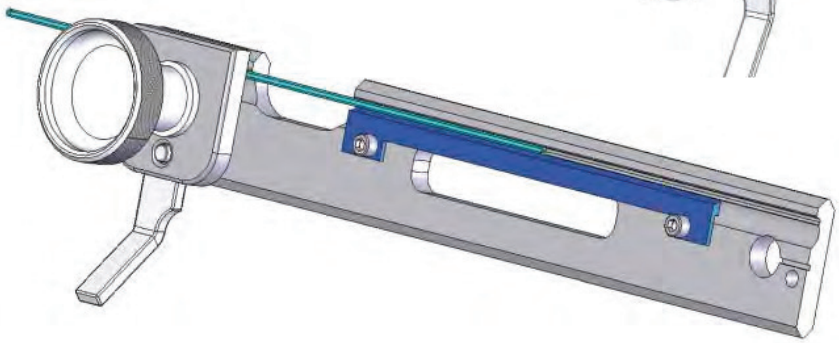
4. Levis, R. A. and Rae, J. L. *The use of quartz patch pipettes for low noise single channel recording.* Biophysical Journal: 65:1666-1677, 1993.

Ceramic tile for scoring glass

Pipette storage box



Glass Stop



Glass Loading Aid