

P-2000 LASER BASED MICROPIPETTE PULLER

激光加热型水平程控微电极拉制仪



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 **P-2000** integrates a CO₂ laser-based heat source with the technology derived from our extensive experience with conventional pullers. This system offers capabilities unmatched by other pullers.

While the **P-2000** is suitable for working with most conventional glasses, its primary advantage is the ability to work with quartz glass (fused silica). 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 pipettes¹. 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 glasses³. Optically, quartz is virtually free from fluorescence when illuminated.

A CO₂ 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 SiO₂ 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.

马普科学仪器有限公司

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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 5 μ m. Please consult our technical staff for further information.

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 0.03 μ m

Optimized velocity sensing circuit for maximized sensitivity and reproducibility*

Operating life of the CO₂ laser is expected to be in excess of ten years with normal use, after which the laser can be refurbished by the Sutter Instrument for a nominal charge

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 the last time that a program has been 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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**SPECIFICATIONS
> P-2000****Dimensions**

30in x 14.25in x 13.25in
76cm x 36cm x 33.5cm

Weight

80lbs
36kg

Electrical

115/230 Volts
50/60 Hertz power line

CLASS I LASER PRODUCT



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US PRICES
► **P-2000**

*International prices are 5% higher.
Prices subject to change without notice.*

P-2000/G Laser-based puller, outfitted for use with glass GREATER than 0.6mm outer diameter

P-2000/F Laser-based puller, outfitted for use with glass LESS than 0.6mm outer diameter

(Pullers include a sample box of Q100-70-7.5 glass)

ACCESSORIES

FPS Spacer for special procedures

BX10 Pipette storage box* (holds 10)
4 3/4 x 3 5/8 x 3/4 inches

BX20 Pipette storage box* (holds 20)
7 x 3 5/8 x 3/4 inches

** Minimum order of any 2 boxes*

REFERENCES P-2000

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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.

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