



# Glass Capillaries

## Quality Glass for Microinjection/Microelectrodes



### FEATURES

- Quality borosilicate glass capillaries
- Large variety available, including fire polished, filaments, thin wall, specialty glass and multi-barrel

### BENEFITS

- Superior pricing
- Most glass orders ship within 48 hours

### APPLICATIONS

- Microinjection
- Electrophysiology
- Patch clamp
- Fluid Handling

### Fire Polishing

Fire-Polished glass capillaries are easier to insert into microelectrode holders without damaging the gasket. More importantly, fire-polished glass won't scratch the chloridized wire used in a recording electrode. Fire-polishing does not affect the glass's mechanical or electrical properties.



### Making Uniform, Reproducible Microelectrodes

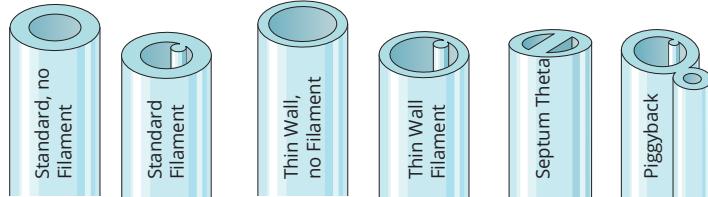
Borosilicate glass capillaries: Close dimensional tolerances assure microelectrode uniformity and reproducibility. Capillaries are available in 1, 2, 3, 5 and 7-barrel configurations, complete range of single barrel thin-wall sizes and a variety of special configurations. Capillaries with filaments contain a solid filament fused to the inner wall, which speeds filling of electrodes. Capillaries with or without inner filaments are available for making microelectrodes in a wide range of diameters.

### Filament Glass Capillaries

Single Barrel standard wall thickness capillaries are offered either with or without inner filaments for quick filling in a variety of lengths and diameters.

### Thin Wall Glass Capillaries

Thin Wall single barrel capillaries are offered both with or without inner filaments.



## PHYSICAL PROPERTIES OF WPI GLASS CAPILLARIES

The physical properties of glass depend upon the chemical composition of the glass, as well as how the glass was manufactured. Glass has no set melting point, but four temperatures are of primary importance when discussing glass production.

- Working Point is the temperature that the glass is soft enough to work. At this temperature, the glass viscosity is  $10^4$  poises.
- Softening Point - At this temperature, glass deforms easily, even by forces of gravity. The glass viscosity is  $10^{7.6}$  poises.

- Annealing Point - When glass reaches the annealing point and remains for a few minutes, many of the internal stresses of the glass formation are obviated. During the annealing process, the glass is heated to the annealing temperature and then allowed to cool at a controlled rate. Glass that is not annealed is prone to crack or shatter with minor temperature fluctuations or mechanical shocks.
- Strain Point - When glass temperature remains at the strain point for several hours, the internal stresses are relieved. Stresses that remain in the glass after maintaining the strain point for a few hours are permanent.

|   | Duran®<br>Schott 8250<br>(Borosilicate)  | Schott AR-GLAS®<br>(Soda Lime Glass)  | Schott BORO-8330™   | Corning 7800  | Kimble N51A   |
|---|--|---|---|---|---|
| WPI Usage                                 | <ul style="list-style-type: none"> <li>Pulled Glass PG-52151, PG-52165</li> <li>Patch clamp glass capillaries</li> </ul> | <ul style="list-style-type: none"> <li>Patch clamp glass capillaries</li> </ul> | <ul style="list-style-type: none"> <li>WPI thin wall glass capillaries</li> <li>Pre-pulled micropettes with TW in the Part #</li> </ul> | <ul style="list-style-type: none"> <li>Multi-barrel capillaries</li> <li>Septum theta</li> <li>Piggyback capillaries</li> <li>Glass rods</li> </ul> | <ul style="list-style-type: none"> <li>Single barrel glass tubing (Part #: 1Bxxxx)</li> </ul> |
| Density $\rho$                            | 2.28 g/cm <sup>3</sup>   | 2.50 g/cm <sup>3</sup>  | 2.23 $\pm$ 0.02 g/cm <sup>3</sup>   | 2.33 g/cm <sup>3</sup>  | 2.33 g/cm <sup>3</sup>  |
| Working Point - $10^4$ dPa·s              | 1055°C   | 1040°C  | 1260°C  |   | 1140°C  |
| Softening Point - $10^{7.6}$ dPa·s        | 720°C  | 720°C   | 825°C   | 789°C   | 785°C   |
| Annealing Point - $10^{13}$ dPa·s         | 500°C  | 530°C   | 560°C   | 565°C   | 570°C   |
| Strain Point                              | 490°C  | 525°C   | 525°C   | 517°C   | 530°C   |
| Thermal expansion (0–300°C)               | $5.0 \times 10^{-6}$ /K  | $9.1 \times 10^{-6}$ K <sup>-1</sup>  | $33 \times 10^{-7}$ cm/cm/°C  | $55 \times 10^{-7}$ cm/cm/°C  | $55 \times 10^{-7}$ cm/cm/°C  |
| Young's Modulus                           | $64 \times 10^3$ N/mm <sup>2</sup>   | $73 \times 10^3$ N/mm <sup>2</sup>  | $6.4 \times 10^3$ kg/mm <sup>2</sup>  | $7.2 \times 10^3$ kg/mm <sup>2</sup>  | $10.4 \times 10^6$ PSI  |
| Poisson's Ratio                           | 0.21   | 0.22  | 0.20  |   |   |
| Dielectric Constant for 1 MHz at 25°C     | 4.9  | 7.2   | 4.6   |   | 5.8   |
| Dielectric Loss Factor 1 MHz 25°C         | $22 \times 10^{-4}$  | $70 \times 10^{-4}$   | 2.6%  |   | 4.9%  |
| Refractive Index                          | 1.487  | 1.514   | 1.473 mm <sup>2</sup> /N  | 1.490 mm <sup>2</sup> /N  | 1.490 mm <sup>2</sup> /N  |
| Temperature Limits                        |  |   |   | 460°C (extreme service) 200°C (normal service)  | 115°C   |
| Max. Thermal Shock                        |  |   |   |   | 91%   |
| Visible Light Transmission 2 mm thickness |  |   |   |   | 0.204 g. cals/g. deg.   |
| Specific Heat 25–175°C                    |  |   |   |   | 0.0026 cals/cm/cm <sup>2</sup> /sec/°C  |
| Thermal Conductivity                      | 1.2 W/m/K (at 90°C)  | 1.1 W/m/K (at 90°C)   |   |   |   |

| Corning 7800                   | Schott BORO-8330™ | Schott AR-GLAS® |
|--------------------------------|-------------------|-----------------|
| SiO <sub>2</sub>               | 73%               | 81%             |
| B <sub>2</sub> O <sub>3</sub>  | 10%               | 13%             |
| Na <sub>2</sub> O              | 2%                | 3.5%            |
| Al <sub>2</sub> O <sub>3</sub> | 7%                | 2%              |
| K <sub>2</sub> O               | 2%                | 0.5%            |
| BaO                            | <0.1%             | 2%              |
| CaO                            | 0.7%              | 5%              |
| MgO                            |                   | 3%              |

Corning 7800 glass is a type I, class B borosilicate glass that conforms to federal specification DD-G541b and ASTM E-438. This glass has the composition shown in the table (left).

**NOTE:** These products are supplied non-sterile.