

# GLASS CAPILLARY ARRAYS

- Precision Pore Size For Filtration, Laminar Flow, And Collimation
- High Heat Tolerance (to 450 °C)
- Precision Pore Diameter
- Mechanical Strength
- Optical Quality Finishes
- Custom Shapes And Materials
- Applications Support

Glass Capillary Arrays (GCAs) consist of millions of precision glass capillary tubes fused together to produce a uniform and mechanically rigid structure. They can be supplied as circular or square thin plates and offer sieve-like filtration with a positive particle size cut-off. GCAs are strong, self-supporting devices with exceptional thermal and chemical stability; they can be manufactured to withstand temperatures greater than 450°C for applications in severe environments.

## Pore Size

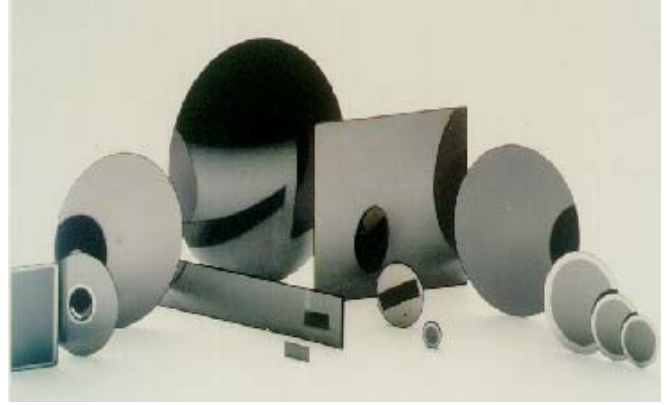
Standard pore sizes for GCAs range from 5 to 50 micron. Other pore sizes as low as 2 micron or larger than 50 micron can be special ordered. Stringent process controls ensure that pore size variations are less than 1% within a single GCA. There is a 6% maximum pore size variation between GCAs.

## Pore Density

Typically, GCAs are manufactured to have an open area ratio of 50% or greater; this provides the ideal combination of a high flow rate and high mechanical strength. As a special order, as few as a one pore in a 25 mm disc can be purchased for use as a calibrated leak.

## Thickness

The standard GCA thickness is 0.5 mm. GCAs can be manufactured to order with a thickness from 0.25 mm to 6 mm. Regardless of the thickness, the aspect ratio (pore length to diameter) should be  $\leq 100$ .



*Glass Capillary Arrays can be ordered in a wide variety of shapes, sizes, thickness', and pore sizes. Custom applications are welcome.*

## Standard Materials

Lead glass is used as the basic standard matrix due to its mechanical strength and chemical stability. The density is 4.44 g/cc and the nominal refractive index is 1.70. It has a thermal expansion coefficient of  $77 \times 10^{-7}$  per °C.

## Surface Finish

GCAs can be supplied with a ground matte finish (9 micron abrasive) on both faces; a polished surface on both faces is also available. In either case, the pore surfaces have a smooth finish. The input surface can be blackened to minimize light scattering.

## Bias Angles

The capillaries within an array may be offset from perpendicular to the input surface. Angular displacements from 0° to 19° may be ordered.

## Flow Rate

The flow rate for a 25 micron pore, 0.5 mm thick GCA is approximately 2.5 ml/sec/cm<sup>2</sup> with a differential pressure of 1 cm of mercury, and 16 ml/sec/cm<sup>2</sup> with a differential of 6 cm of mercury, measured using distilled water at 23 °C. Actual flow rates for any capillary array depend on fluid characteristics, aspect ratio, and flow characteristics of the holding apparatus.



## Mounting

Solid border GCAs are compatible with most existing Millipore or Nuclepore equipment, requiring little or no hardware modification. For high temperature or high-pressure applications, GCAs may be fritted in a metal flange and mounted on metal or glass tubing. In many other applications epoxies can be used for mounting.

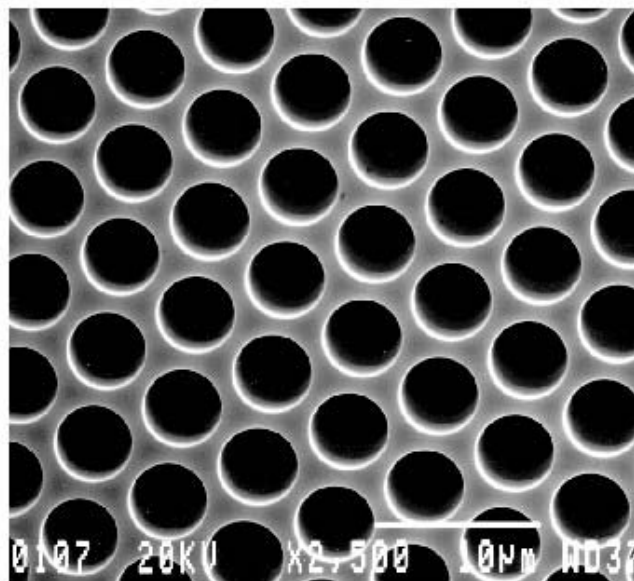
## Special Requirements

Whenever possible, standard dimensions should be used. The following options can be supplied on a special order basis. When requesting a quotation specify all characteristics listed below plus any special requirements.

For special shape or pore size please specify the following:

- Diameter or Length and Width
- Thickness
- Pore Size
- Bias Angle (0-19°)

Unless otherwise specified, surface finish will be matte, open area ratio will be nominally 50% and material will be lead glass.



Microscopic view of a Glass Capillary Array with precision 5 micron pores.

## Applications

- Gas Flow Collimation
- X-Ray Collimation
- Calibrated Leak
- Controlled Air Flow
- Differential Pressure Barrier
- In-Line Filtration
- Optical Beam Splitters
- Laser Entrance Windows

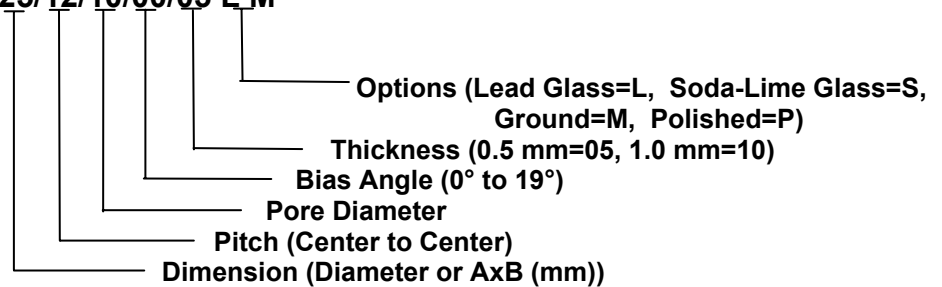
## Selected Common Glass Capillary Array Formats

Capillary Area Diameter or Dim. (mm) (Nominal)	Shape	Diameter mm (inch) (Actual)	Ctr-to-Ctr Spacing (micron)	Pore Size (micron)	Bias Angle (°)	Aspect Ratio	Solid Glass Border
18	Round	24.77 (.98)	6	5	0 or 5	60:1	Yes
18	Round	24.77 (.98)	12	10	0 or 5	40:1	Yes
25	Round	32.74 (1.3)	32	25	0 or 8	40:1	
25	Round	32.74 (1.3)	12	10	0 or 12	60:1	Yes
40	Round	50.04 (2.0)	32	25	0 or 8	40:1	
40	Round	50.04 (2.0)	12	10	0 or 8	40:1	Yes
75	Round	86.61 (3.4)	32	25	0 or 8	40:1	
120	Round	127.0 (5.0)	32	25	0 or 8	40:1	
50 x 8	Rectangular	54.03 x 11.99 (2.1 x 0.5)	32	25	0 or 8	40:1	
100 x 15	Rectangular	105.16 x 20.19 (4.1 x 0.8)	32	25	0 or 8	40:1	
80 x 100*	Rectangular	78.99 x 97.03 (3.1 x 3.8)	32	25	0 or 8	40:1	
52 x 52	Square	52.00 x 52.00 (2.1 x 2.1)	12	10	0	40:1	

\*Note: Actual dimensions are slightly smaller than Capillary dimensions denote.

### Ordering Information

**GCA 25/12/10/00/05 L M**



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For additional information in the U.S.A. and Canada, telephone +1-800-648-1800 and for international calls, use +1-508-347-4000, or FAX request to +1-508-347-3849. BURLE Electro-Optics, Inc., Sturbridge Business Park, P.O. Box 1159, Sturbridge, MA 01566-1159 USA