TGP TECHNICAL GLASS PRODUCTS

World Leaders in the Fabrication & Distribution of Fused Quartz

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Fused Quartz Rod

Quartz Frits

ABOUT TECHNICAL GLASS PRODUCTS

Technical Glass Products, Inc., was founded in 1990 as a fabricator of Fused Quartz Glassware. Our commitment to excellence has resulted in TGP becoming America's fastest growing supplier of stock shapes and fabricated products in the industry.

TGP has two manufacturing facilities, which allows us to maintain a broad inventory of labware, flat stock, rod and tubing. These items are all supported by the finest engineers, machinists and glass blowers in the industry. Therefore, we can strategically satisfy our customers' requirements.

We also excel in technical product assistance of all types including design, temperature ranges and purity level qualifications. Because of our state-of-the-art equipment and methods, we are capable of achieving the industry's most stringent standards and tolerances. Our products are always fully guaranteed for workmanship and quality.

Technical Glass Products is proud of its expertise, and we welcome the opportunity to supply all of your quartz needs.

For prompt evaluation and quotation of your project, please contact us at:

By phone at 440.639.6399

By Fax at 440.639.1292

By mail at 881 Callendar Blvd., Painesville Twp., Ohio 44077

By email at tgp@tgpohio.com

Or visit our website at technicalglass.com

CERTIFIED ISO 9001:2015 COMPANY

THE AMERICAN SCIENTIFIC GLASSBLOWERS SOCIETY
FOUNDED 1952
Incorporated 1954
®

Capabilities & Quality Control

CAPABILITIES

Technical Glass Products specializes in custom fabrication of fused quartz products to your exact specifications. From small diameter apparatus to large diameter furnace tubes and bell jars, our experienced craftsmen have decades of experience that enables us to exceed your expectations for quality. Along with custom items, Technical Glass manufactures a wide range of standard labware including:

- Flasks
- Beakers
- Test Tubes
- Crucibles
- Dishes

Technical Glass Products also offers a wide range of standard products for immediate shipment for your glassblowing needs:

- Tubing
- Rod
- Solids*
- Standard Taper Joints
- Ball & Socket Joints
- Flat O-ring Connectors
- GL Threaded Tubes
- Quartz Wool & Felt
- Fritted Discs
- Quartz to Pyrex Graded Seals

*Solids include Discs, Plates, Flanges and other custom machined parts.

Our headquarters, located in Painesville, Ohio, is an 11,000 square foot facility. It houses our sales office, Class 10000 clean-room manufacturing area, and warehouse. Our second plant, in Gonzales, Louisiana, accommodates an additional 11,000 square feet of manufacturing and distribution space.

We are known world wide for our quality, service and competitive pricing. We are world leaders in the fused quartz fabrication industry, and have the pleasure to be an authorized distributor and fabricator for a number of quartz raw material suppliers, including Momentive Performance Materials (formerly GE Quartz)

Our goal at TGP is not only to meet all of your quality, service and pricing expectations, but also to exceed those expectations and become the quartz fabricator and distributor of choice for your company.

MOMENTIVE® TECHNOLOGIES

Authorized Fabricator & Distributor

QUALITY CONTROL

Quality certification information can be found on our website at technicalglass.com. Click on Quality Certification under Technical on the left hand sidebar.

PROPERTIES OF FUSED QUARTZ

Silica is found almost everywhere in nature, and represents almost 1/3 the mass of the earth's crust. Vitreous Silica is the generic term used to describe all types of silica glass, and manufacturers refer to the material as either Fused Quartz or Fused Silica.

Fused Quartz is manufactured by melting naturally occurring *crystalline* silica, such as sand or rock crystal. The production method is either electrically fused or flame fused. Afterward, items will appear transparent, translucent, or opaque; making it possible to create a wide range of products.

Fused silica, commonly referred to as synthetic fused quartz, is produced using high purity silica sand that is manufactured from $SiCL_4$. The finished product is a transparent glass with an ultra-high purity and improved optical transmission.

Vitreous Silica, in all its forms, offers a variety of properties such as:

- Permeability
- Extreme Hardness
- Very Low Coefficient of Thermal Expansion
- Resistance to High Temperature
- High Chemical Purity
- High Corrosion Resistance
- Extensive Optical Transmission from Ultra-Violet to Infra-Red
- Excellent Electrical Insulation Qualities
- Remarkable Stability Under Atomic Bombardment

PROPERTY	TYPICAL VALUES
Density	2.2×10^3 kg/m^3
Hardness	5.5-6.5 Mohs' Scale
	570 KHN_{100}
Design Tensile Strength	4.8×10^7 Pa (N/m^2) (7,000 psi)
Design Compressive Strength	> 1.1×10^9 Pa (160,000 psi)
Bulk Modulus	3.7×10^{10} Pa (5.3×10^6 psi)
Rigidity Modulus	3.1×10^{10} Pa (4.5×10^6 psi)
Young's Modulus	7.2×10^{10} Pa (10.5×10^6 psi)
Poisson's Ratio	0.17
Coefficient of Thermal Expansion (20°C - 320°C)	5.5×10^{-7} cm/cm °C
Thermal Conductivity (20°C)	1.4 W/m °C
Specific Heat (20°)	670 J/kg °C
Softening Point	1683°C
Annealing Point	1215°C
Strain Point	1120°C
Electrical Resistivity	7×10^7 ohm cm at 350°C

PROPERTY	TYPICAL VALUES
Dielectric Loss Factor	< 0.0004 at 20°C and 1 MHz
Dielectric Constant	3.75 at 20°C and 1 MHz
Dielectric Strength	5×10^7 V/m at 20°C and 1 MHz
Dissipation Factor	< 0.0001 at 20°C and 1 MHz
Index of Refraction	1.4585
Constringence (Nu value)	67.56
Velocity of Sound-Shear Wave	3.75×10^3 m/s
Velocity of Sound/ Compressional Wave	5.90×10^3 m/s
Sonic Attenuation	< 11 dB/m MHz
Permeability Constants (700°C)	
Helium	2.1×10^{-8} cm^3 mm/cm^2 sec. cm of Hg
Hydrogen	2.1×10^{-9} cm^3 mm/cm^2 sec. cm of Hg
Deutrium	1.7×10^{-9} cm^3 mm/cm^2 sec. cm of Hg
Neon	9.5×10^{-10} cm^3 mm/cm^2 sec. cm of Hg

INTERNAL PRESSURE CALCULATIONS

Because fused quartz is used in applications involving internal pressures, it is helpful to know the maximum pressure that can be applied to a selected fused quartz tube. The formula below can approximate this information at room temperature.

To find helpful calculators and additional information on Momentive® quartz products and their properties, please visit technicalglass.com/calculators.

Look for the Momentive® logo at technicalglass.com.

Click to find links to Momentive® Calculators and additional information.

Rupture Formula for Tubing

$S = pr/t$

Where:
- S = Hoop Stress in Pa
- p = Working Pressure (Pa)
- r_0 = Inside Radius (mm)
- t = Wall Thickness (mm)

This formula cannot be used when internal pressure exceeds 100 psi.

Rupture Pressure Calculations for Discs and Plates

Determining pressure differential is required for many applications of stressed fused quartz discs, plates and sight glasses. The formulas below can be used for room temperature applications of parts having either clamped or unclamped edges:

- A = Unsupported Area in sq/inches
- T = Thickness (inches)
- F = Safety Factor (7)
- M = Modulus of Rupture (7,000 psi)
- P = Pressure (psi)

DISCS	PLATES
$P = \frac{3.12 \times M(T^2)}{A \times F}$	$P = \frac{3.48 \times M(T^2)}{A \times F}$
$T = \sqrt{\frac{P \times A \times F}{3.12 \times M}}$	$T = \sqrt{\frac{P \times A \times F}{3.48 \times M}}$

The above pressure calculations are recommendations only. Actual pressure points may vary depending on user applications.

TRACE IMPURITIES

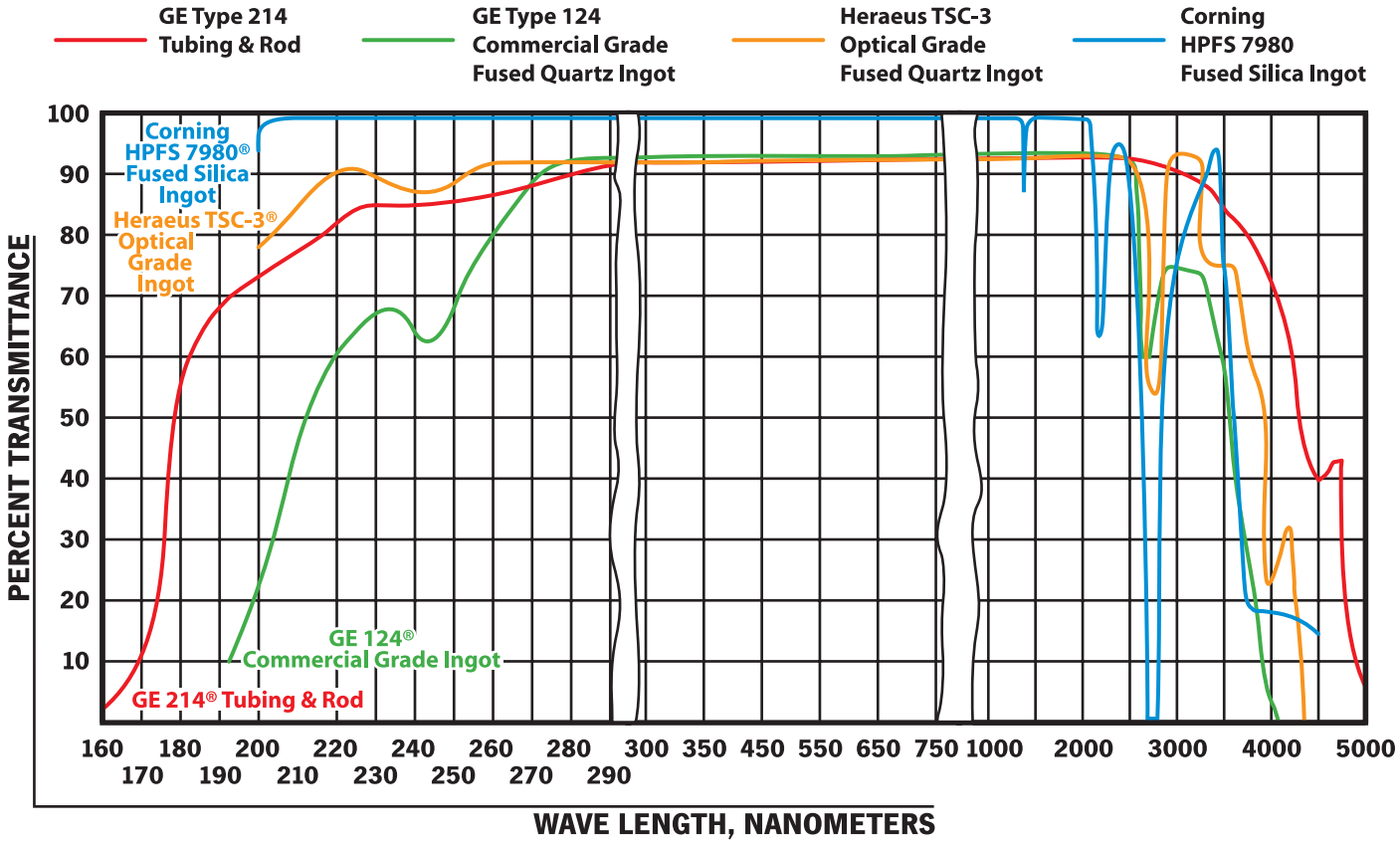
ELEMENT (PPM)	GE TYPE 214 ELECTRICALLY FUSED TUBING AND ROD (PPM) Maximum	GE TYPE 124 ELECTRICALLY FUSED INGOT (PPM) Maximum	HERAEUS TYPE TSC-3 FLAME FUSED INGOT (PPM)	CORNING HPFS 7980 FUSED SILICA FLAME FUSED INGOT (PPB)
Ag	–	–	–	<2
Al	19.0	19.0	15	<25
As	<0.002	<0.002	–	<15
Au	–	–	–	<1
B	<0.2	<0.2	–	<10
Ba	–	–	–	<1
Be	–	–	–	<0.5
Bi	–	–	–	<1
Ca	2.0	2.0	0.4	<15
Cd	–	–	–	<0.3
Co	–	–	–	<0.5
Cr	–	–	<0.01	<1
Cu	0.1	0.1	<0.01	<2
Fe	0.8	0.8	0.05	<20
Ga	–	–	–	<0.5
K	3.0	3.0	0.2	<5
Li	2.0	2.0	0.2	<7.2
Mg	1.0	1.0	<0.01	<5
Mn	0.24	0.24	<0.01	<1
Mo	–	–	–	<1
Na	2.5	2.5	0.3	<187
Nd	–	–	–	–
Ni	–	–	–	<5
P	–	–	–	<50
Sb	–	–	–	<0.5
Sr	–	–	–	<0.5
Th	–	–	–	<0.5
Ti	2.0	2.0	1.1	<10
U	–	–	–	<1
V	–	–	–	<1
Y	–	–	–	–
Zn	–	–	–	<5
Zr	3.0	3.5	0.8	<5
OH	Typical <5	Typical <5	170	<1000 PPM

FUSED QUARTZ/FUSED SILICA TRANSMISSION

The curves in the figure below represent the average transmissions for a 10mm thick test sample for both commercial and optical grades. Fused quartz is very efficient for the transmission of infrared radiation. Infrared transmission extends out approximately 4 micrometers, with little absorption in the "water band" at 2.73µm.

FUSED QUARTZ/FUSED SILICA AVERAGE TRANSMITTANCE CURVES

(Includes Surface Reflection Losses — Samples Tested Type 124 10mm Thick Plate)
(Tubing Type 214 1mm Thick)



FUSED QUARTZ PROPER USAGE GUIDELINES

Cleaning

The cleaning of fused quartz is critical before it is used in any application. The fused quartz should be cleaned by placing it in a 7% maximum solution of Ammonium Bifluoride for no more than ten (10) minutes, or a 10% volume maximum solution of Hydrofluoric Acid for no more than five (5) minutes. After cleaning, using the above method, the fused quartz should be rinsed in deionized or distilled water and then dried.

To further reduce the possibility of contamination, care should be used in handling fused quartz. The use of clean cotton gloves at all times is essential.

Running In Procedure

In order to increase resistance to devitrification and sag of your quartzware, an even layer of cristobalite must be formed on the O.D. of quartz tubes. Expose a new tube to a temperature of up to 1200°C and rotate it 90° every two (2) hours for the first 12 to 24 hours.

Storage

Space permitting, fused quartz should be stored in its original shipping container. If that is not practical, at least the wrapping should be retained. In the case of tubing, the end coverings should be kept in place until the product is used. This protects the ends from chipping and keeps out dirt and moisture which could compromise the purity and performance of the tubing.

Because the Products are Annealed

Both quartz and silica glass are annealed at approximately 1150°C. However, they reach a strain point at about 1120°C. These glass products, if rapidly cooled after use at temperatures above this strain point, will develop strain again. Special care should be taken when using large sized products.

When Joining Fused Quartz and Other Materials

Quartz and silica glass only slightly expand with increases in temperature compared to other materials. Care must be taken when these glass products are connected to other materials and the temperature rises, in order to avoid the development of cracks.

Care Must Be Taken During Furnace Insertion

Quartz and silica glass feature low thermal conductivity. If the glass product comes too close to a heating element, or is put in direct contact with a flame, it may become locally heated and develop cracks. Long glass tubes may also deform at temperatures of 1100°C or higher. Care should be taken to support both glass types, especially large-sized products.

Devitrification

Devitrification of quartz and silica glass means transition from a metastable (vitrified) state to a stable crystallized state of cristobalite. Devitrification occurs when the product is used at high temperatures over a long period of time, or it is heated while impurities adhere to its surface. Even very small impurities on the surface can have a major influence. Under such conditions, devitrification may even occur at temperatures of 1000°C or less. This hardly ever occurs at temperatures of 1150°C or less, if the glass surface is perfectly clean. Devitrification usually starts when the temperature rises to 1200°C or higher, then further develops as the temperature increases.

Special Handling and Precautions

When handling, always wear clean, lint free gloves or powder free latex gloves. Be sure to avoid direct contact of the glass with bare hands. The skin's natural salts contain alkali metal elements such as sodium and potassium that speed devitrification.

MACHINED QUARTZ

Grinding, Lapping and Polishing

Technical Glass Products offers a variety of grinding, lapping and polishing services for a wide range of sizes, shapes and grades of Quartz and other glasses. Our machine capabilities include:

- Grinding & Polishing to 42" diagonal plate
- O.D. Grinding to 20" diameter
- Centerless Grinding up to 4" diameter
- Milling Machines for special shapes

Technical Glass Products manufactures to your specifications; offering all types of glass components in any quantities desired.

Optical Properties of Fused Quartz

The optical properties of fused quartz allows you to choose between various types, because the degree of transparency defines material purity and the method of manufacture.

Certain indicators are the UV cutoff and the presence or absence of bands at 245nm and 2.73µm. The UV cutoff varies from 155 to 175nm for a 10mm thick test sample. The presence of transition metallic impurities will move the UV cutoff towards longer wavelengths.

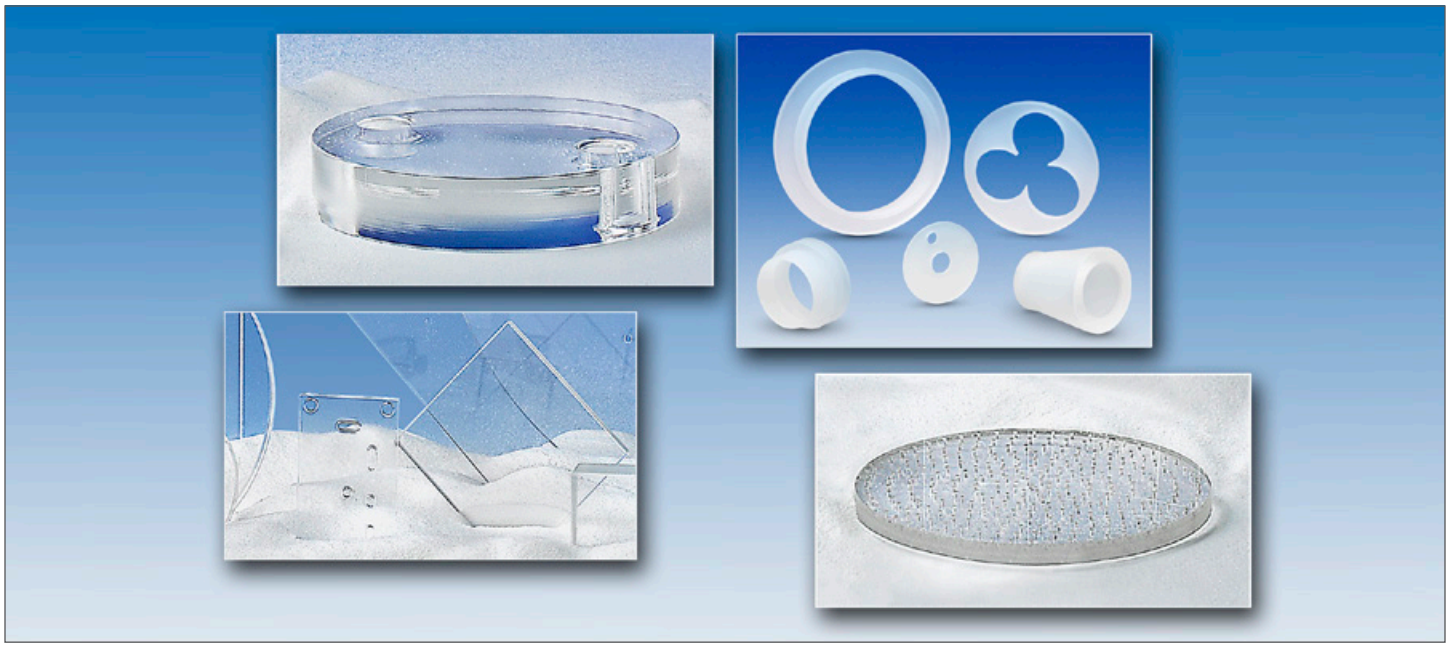
Equipment and Capabilities

- O.D. and I.D. Grinders
- Grinding & Polishing
- Core Drilling
- Cylindrical Polishing
- Centerless Grinding
- Custom Machining
- Lapping / Grinding
- Laser
- Pitch Polishing
- Wire Sawing
- Surface Mills
- Blanchards
- Slicing Saws
- Full CNC Capabilities
- Boring
- Water Jet

Material Available

- GE Type 124 Commercial Grade Fused Quartz
- Heraeus Type TSC-3 Optical Grade Fused Quartz
- Corning Type HPFS 7980 Fused Silica
- Tosoh Type OP-1 Opaque Fused Quartz

Machined Quartz Specifications



MACHINED QUARTZ SPECIFICATIONS

SYMBOL CHARACTERISTICS

SYMBOL	CHARACTERISTIC	STANDARD TOLERANCE
▱	Flatness	.005"
—	Straightness	.005"
○	Circularity (Roundness)	.010"
⌭	Cylindricity	.010"
⊥	Perpendicularity (Squareness)	1°
∠	Angularity	1°
//	Parallelism	.005"
⌓	Profile of a Surface	.030"
⌒	Profile of a Line	.020"
↗	Circular Runout	.010"
⌰	Total Runout	.010"
⌖	Position	.020"
◎	Concentricity	.010"
⌯	Symmetry	.010"

NOTE: These tolerances apply to machine ground only and mechanically polished parts only.

TOLERANCES

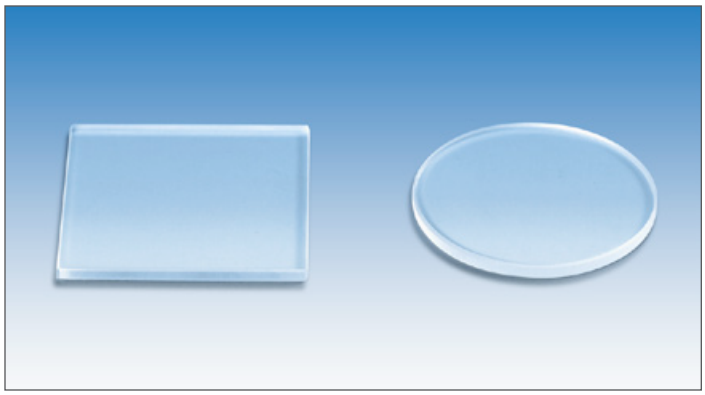
TOLERANCE BLOCK:	INCHES	MILLIMETERS (mm)
x.	= ±.040	= ± 1mm
.x	= ±.030	= ±.75mm
.xx	= ±.010	= ±.25mm
.xxx	= ±.005	= ±.13mm
ANGLE	= ± 1°	= ± 1°

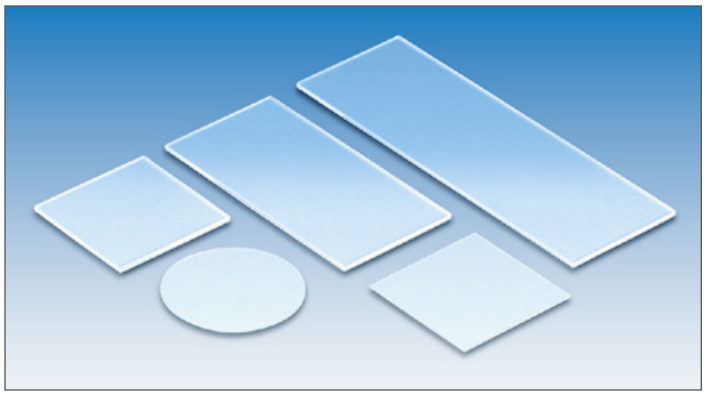
NOTE: On inside sharp corners, R. 125 preferred.
EXAMPLE: Rectangular holes and corner contours.

STANDARD SURFACE FINISHES (MICRO INCH)

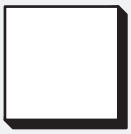
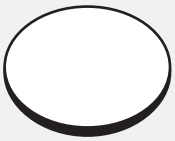
SURFACE QUALITY–MIL SPEC.–PRF-13830B 80/50				
▽▽▽	N6	$^{32}\sqrt{D}$	32 Ra (μ in)	Diamond finish
D ▽▽▽	N5	$^{16}\sqrt{D}$	16 Ra (μ in)	Diamond finish
G ▽▽▽	N4	$^{9}\sqrt{G}$	9 Ra (μ in)	Gound finish
MP ▽▽▽	N2	$^{2}\sqrt{MP}$	2 Ra (μ in)	Ground & Polish finish
FP ▽▽▽	N2	$^{2}\sqrt{FP}$	2 Ra (μ in)	Flame Polish finish

Plates, Discs & Microscope Slides





GROUND & POLISHED PLATES & DISCS

GROUND & POLISHED PLATES	GROUND & POLISHED DISCS
	
LENGTH OF SIDES	DIAMETER
1" x 1"	1"
1-1/4" x 1-1/4"	1-1/4"
1-1/2" x 1-1/2"	1-1/2"
1-3/4" x 1-3/4"	1-3/4"
2" x 2"	2"
2-1/2" x 2-1/2"	2-1/2"
3" x 3"	3"
3-1/2" x 3-1/2"	3-1/2"
4" x 4"	4"
4-1/2" x 4-1/2"	4-1/2"
5" x 5"	5"
5-1/2" x 5-1/2"	5-1/2"
6" x 6"	6"
STANDARD THICKNESSES: 1/16", 1/8", 1/4"	

Custom sizes available upon request. Please call 440.639.6399. Optical Fused Quartz and Fused Silica material also available upon request.

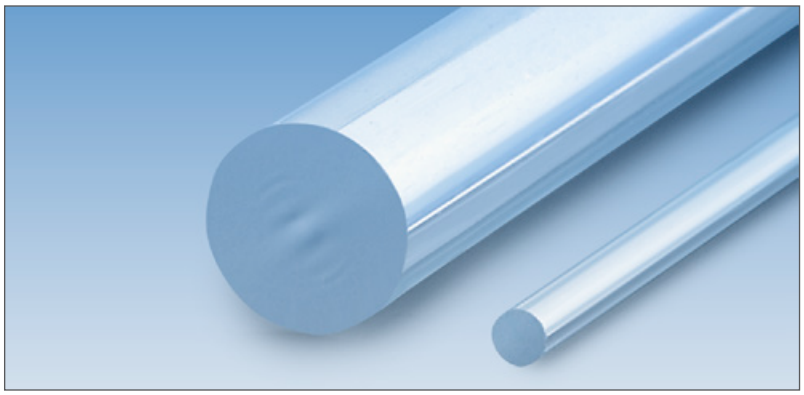
MICROSCOPE SLIDES & COVER SLIPS

MICROSCOPE SLIDES			COVER SLIPS
LENGTH	WIDTH	THICKNESS	DIMENSIONS
1"	1"	1mm	1" SQ. x .2 ± .05mm THICK
2"	1"	1mm	1" DIA. x .2 ± .05mm THICK
3"	1"	1mm	
MINIMUM ORDER QUANTITY IS 5 PCS & MULTIPLES OF 5			**MINIMUM ORDER QUANTITY IS 10 PCS & MULTIPLES OF 10**

TOLERANCES

	STANDARD*		STANDARD*
PLATE			
Length:	±.010"	Radius:	.030" - .060"
Width:	±.010"	Bevel:	.020" - .040"
Thickness:	±.005"	Maximum Chip:	<.020"
		Flatness:	within .00011" per inch
DISC		Parallelism:	within .005"
Diameter:	±.010"	Scratch/Dig:	80/50
Thickness:	±.005"		
*** SPECIAL TOLERANCES AVAILABLE**			

Fused Quartz Rod



FUSED QUARTZ RODS

SIZE (mm)	LENGTH (feet)	DIAMETER (mm)	O.D. TOLERANCES	OVALITY	BOW
1	4 FT.	1	± .20mm	.10mm	1.3mm / 1220mm long
1.5	4 FT.	1.5	± .30mm	.12mm	1.3mm / 1220mm long
2	4 FT.	2	± .20mm	.15mm	1.3mm / 1220mm long
2.5	4 FT.	2.5	± .25mm	.10mm	1.3mm / 1220mm long
3	4 FT.	3	± .30mm	.10mm	1.3mm / 1220mm long
3.5	4 FT.	3.5	± .24mm	.10mm	1.3mm / 1220mm long
4	4 FT.	4	± .24mm	.10mm	1.3mm / 1220mm long
5	4 FT.	5	± .24mm	.10mm	1.3mm / 1220mm long
6	4 FT.	6	± .15mm	.10mm	1.3mm / 1220mm long
6.4	4 FT.	6.4	± .20mm	.10mm	1.3mm / 1220mm long
7	4 FT.	7	± .30mm	.10mm	1.3mm / 1220mm long
8	4 FT.	8	± 1.5%	1% max.	1.3mm / 1220mm long
9	4 FT.	9	± 1.5%	1% max.	1.3mm / 1220mm long
10	4 FT.	10	± 1.5%	1% max.	1.3mm / 1220mm long
11	4 FT.	11	± 1.5%	1% max.	1.3mm / 1220mm long
12	4 FT.	12	± 1.5%	1% max.	1.3mm / 1220mm long
13	4 FT.	13	± 1.5%	1% max.	1.3mm / 1220mm long
14	4 FT.	14	± 1.5%	1% max.	1.3mm / 1220mm long
15	4 FT.	15	± 1.5%	1% max.	1.3mm / 1220mm long
16	4 FT.	16	± 1.5%	1% max.	1.3mm / 1220mm long
17	4 FT.	17	± 1.5%	1% max.	1.3mm / 1220mm long
18	4 FT.	18	± 1.5%	1% max.	1.3mm / 1220mm long
19	4 FT.	19	± 1.5%	1% max.	1.3mm / 1220mm long
20	4 FT.	20	± 1.5%	1% max.	1.3mm / 1220mm long
22	4 FT.	22	± 1.5%	1% max.	1.3mm / 1220mm long
24	4 FT.	24	± 1.5%	1% max.	1.3mm / 1220mm long
25	4 FT.	25	± 1.5%	1% max.	1.3mm / 1220mm long
26	4 FT.	26	± 1.5%	1% max.	1.3mm / 1220mm long
27	4 FT.	27	± 1.5%	1% max.	1.3mm / 1220mm long
28	4 FT.	28	± 1.5%	1% max.	1.3mm / 1220mm long
29	4 FT.	29	± 1.5%	1% max.	1.3mm / 1220mm long
30	4 FT.	30	± 1.5%	1% max.	1.3mm / 1220mm long
31	4 FT.	31	± 1.5%	1% max.	1.3mm / 1220mm long
32	4 FT.	32	± 1.5%	1% max.	1.3mm / 1220mm long
33	4 FT.	33	± 1.5%	1% max.	1.3mm / 1220mm long
34	4 FT.	34	± 1.5%	1% max.	1.3mm / 1220mm long
35	4 FT.	35	± 1.5%	1% max.	1.3mm / 1220mm long
36	4 FT.	36	± 1.5%	1% max.	1.3mm / 1220mm long
37	4 FT.	37	± 1.5%	1% max.	1.3mm / 1220mm long
38	4 FT.	38	± 1.5%	1% max.	1.3mm / 1220mm long
39	4 FT.	39	± 1.5%	1% max.	1.3mm / 1220mm long
40	4 FT.	40	± 1.5%	1% max.	1.3mm / 1220mm long
50	4 FT.	50	± 2%	1% max.	1.3mm / 1220mm long

PLEASE NOTE: Fused Quartz Rod is priced per foot if ordered in a standard length. Please check individual items at technicalglass.com for length dimensions.

Cutting services are available for an additional charge when cutting to specific lengths.

Quartz Rod 26mm diameter and larger is subject to minimum order quantities. Please call 440.639.6399 for availability.

FUSED QUARTZ TUBING

I.D. (mm)	O.D. (mm)	I.D. (mm)	O.D. (mm)	I.D. (mm)	O.D. (mm)	I.D. (mm)	O.D. (mm)	I.D. (mm)	O.D. (mm)	I.D. (mm)	O.D. (mm)
1.00	2.00	6.00	12.00	13.00	15.80	20.00	24.50	35.00	40.00	70.00	74.00
1.00	3.00	6.00	13.00	13.00	16.00	20.00	25.00	36.00	40.00	70.00	75.00
1.00	4.00	7.00	9.00	13.00	16.20	22.00	24.00	37.00	40.00	73.00	77.00
1.00	5.00	7.00	9.50	13.00	17.00	22.00	24.50	38.00	42.00	75.00	80.00
1.00	6.00	7.00	10.00	13.50	19.00	22.00	25.00	40.00	43.00	80.00	85.00
2.00	3.00	7.00	10.40	14.00	16.00	22.00	25.80	40.00	44.00	85.00	90.00
2.00	4.00	7.00	11.00	14.00	17.00	24.00	26.00	40.00	45.00	90.00	95.00
2.00	5.00	7.75	9.75	14.00	18.00	24.00	28.00	40.00	46.00	95.00	100.00
2.00	6.00	8.00	10.00	14.00	19.00	24.00	30.00	42.00	45.00	101.60	106.60
2.00	8.00	8.00	11.00	15.00	17.00	25.00	27.00	42.00	46.00	101.60	114.30
2.30	6.30	8.00	12.00	15.00	18.00	25.00	28.00	44.00	48.00	105.00	110.00
3.00	4.00	9.00	11.00	15.00	19.00	25.00	28.80	45.00	48.00	105.00	117.70
3.00	5.00	9.00	11.80	15.00	20.00	25.00	30.00	45.00	49.00	110.00	115.00
3.00	6.00	9.00	13.00	16.00	18.00	26.00	29.00	46.00	50.00	115.00	120.00
3.00	8.00	9.00	15.00	16.00	19.00	26.00	30.00	47.00	50.00	115.00	127.70
3.60	8.00	10.00	12.00	16.00	20.00	27.00	30.00	48.00	52.00	120.00	125.00
4.00	6.00	10.00	13.00	17.00	19.00	28.00	31.00	50.00	54.00	125.00	130.00
4.00	6.35	10.00	14.00	17.00	20.00	28.00	32.00	50.00	55.00	130.00	135.00
4.00	8.00	10.00	16.00	18.00	20.00	30.00	33.00	52.00	58.00	130.00	142.70
4.10	10.00	10.50	12.75	18.00	20.50	30.00	34.00	53.00	57.00	135.00	141.00
4.50	9.10	10.50	13.00	18.00	21.00	30.00	36.00	55.00	59.00	135.00	147.70
5.00	7.00	10.50	15.80	18.00	21.60	32.00	35.00	57.00	61.00	140.00	146.00
5.00	7.25	11.00	13.00	19.00	22.00	32.00	36.00	60.00	64.00	140.00	152.70
5.00	8.00	11.00	15.00	19.00	25.00	32.00	38.00	60.00	65.00	145.00	151.00
5.00	9.00	12.00	14.00	20.00	22.00	34.00	37.00	63.00	67.00	145.00	157.70
5.00	10.00	12.00	15.00	20.00	22.50	34.00	38.00	64.00	68.00	150.00	156.00
6.00	8.00	12.00	16.00	20.00	23.00	34.00	39.00	65.00	69.00	150.00	162.70
6.00	10.00	13.00	15.00	20.00	24.00	35.00	38.00	66.00	70.00	155.00	161.00

Fused Quartz Tubing

I.D. (mm)	O.D. (mm)	I.D. (mm)	O.D. (mm)	I.D. (mm)	O.D. (mm)	I.D. (mm)	O.D. (mm)	I.D. (mm)	O.D. (mm)
160.00	166.00	190.00	196.00	220.00	226.00	241.00	249.00	290.00	300.00
165.00	171.00	195.00	201.00	220.00	228.00	241.00	251.00	300.00	309.00
170.00	176.00	200.00	206.00	220.00	230.00	245.00	253.00	306.00	315.00
170.00	182.70	203.00	211.00	225.00	235.00	250.00	260.00	320.00	330.00
176.00	184.00	208.00	216.00	230.00	236.00	257.00	265.00		
178.00	185.00	211.00	221.00	230.00	240.00	260.00	268.00		
180.00	192.70	215.00	221.00	235.00	245.00	265.00	275.00		
184.00	190.00	215.00	225.00	240.00	246.00	270.00	280.00		

PLEASE NOTE: Fused Quartz Tubing is priced per foot if ordered in a standard length. Please check individual items at technicalglass.com for length dimensions.

Cutting services are available for an additional charge when cutting to specific lengths.

Additional sizes of Fused Quartz Tubing are available upon request. Please call 440.639.6399 for availability.

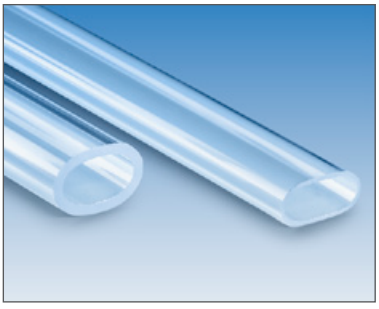
FUSED QUARTZ TUBING FOR COMPRESSION TYPE FITTINGS

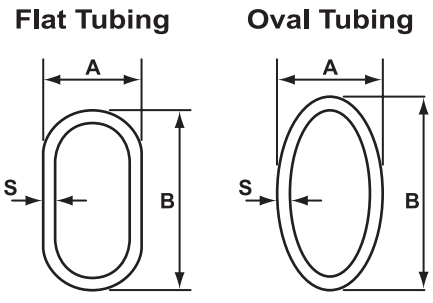
O.D. INCHES	O.D. MILLIMETERS
1/4	6.35
3/8	9.50
1/2	12.70
5/8	15.80

TUBING TOLERANCES

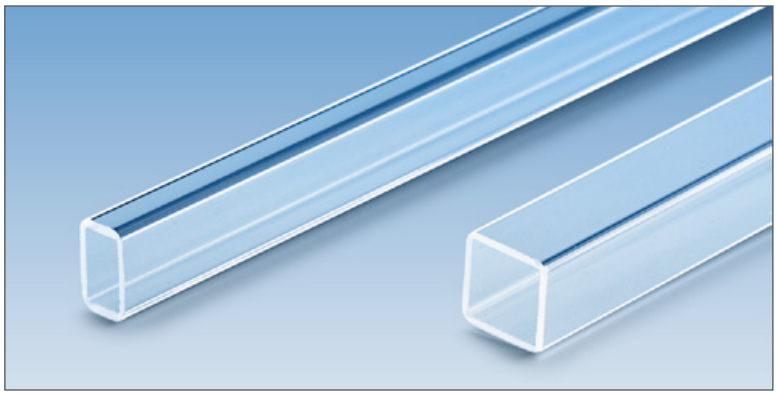
DIAMETER RANGE (mm)	DIAMETER REFERENCE	DIAMETER NOMINAL %	OUT OF ROUND % OF O.D. MAXIMUM	WALL THICKNESS	SIDING MAXIMUM % OF WALL	BOW 1200 (mm)	LENGTH (mm)
UP TO 5.9	O.D.	±2.5%	2%	±10%	10%	2	±3.2
6-35	O.D.	±2%	1.5%	±10%	10%	2	±3.2
35.1-79.9	O.D.	±2%	1.5%	±10%	10%	2	±6.4
80-150	O.D.	±2%	1.2%	±10%	20%	3	±6.4
151-189	O.D.	±2%	1.2%	±20%	20%	3	±9.5
191 UP	O.D.	±2%	1.2%	±25%	20%	3	±12.7

FUSED QUARTZ SPECIALTY TUBING





Flat & Oval tubing are custom made to your specification. Please contact Technical Glass with your specific size requirements.



SQUARE TUBING • CLEAR FUSED QUARTZ

SQUARE SIZE I.D. (mm)	WALL (mm)
0.5	0.25
1	0.5
2	0.75
3	0.75
4	.9
5	.9
6	.9
7	.9
8	.9
9	.9
10	.9
12	.9
13	.9
14	.9

RECTANGULAR TUBING • CLEAR FUSED QUARTZ

RECTANGULAR SIZE I.D.	WALL (mm)
2 x 4	.9
3 x 5	.9
3 x 7	.9
3 x 9	.9
4 x 6	.9
4 x 8	.9
5 x 7	.9
5 x 9	.9
6 x 8	.9
6 x 10	.9
7 x 9	.9
7 x 11	.9
7 x 13	.9
8 x 12	.9

TUBING TOLERANCES

NOMINAL WALL	± TOLERANCE
0.25 mm	0.15 mm
0.50 mm	0.25 mm
0.75 mm	0.30 mm
0.90 mm	0.30 mm

PRECISION BORE TUBING

The manufacturing of Precision Bore Tubing involves the heating and softening of standard tubing over a precision mandrel when precise tolerances are required. The final product is formed as the tube is pulled over the mandrel.

Because we provide a wide range of Precision Bore Tubing, we cannot list all that is available. Please call or write us with your specific requirements.

Size availability up to 2.75"

Tolerances available as tight as ±.002"

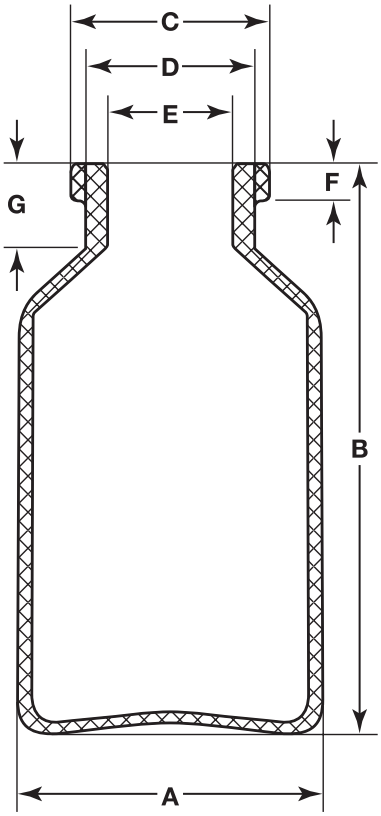
Fused Quartz Crimp Top Vials

QUARTZ CRIMP TOP VIALS

Technical Glass Products' Quartz Crimp Top Vials are made from Type 214 Fused Quartz and are available in three industry standard sizes. Quartz Vials can accommodate different types of stoppers and crimped seals, including tamper-proof, which can be sealed manually or automatically. Quartz vials offer exceptional purity, chemical durability, thermostability and optical transparency for the most demanding applications.

Quartz vials are commonly used in:

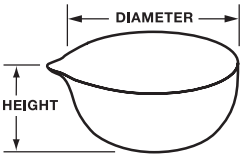
- UV Photo Chemistry
- Optical Diagnostics
- Trace Analytical
- Chromatography
- Research and Development



QUARTZ VIALS

NOMINAL SIZE (cc)	BODY DIAMETER (mm) (A)	VIAL HEIGHT (mm) (B)	COLLAR DIAMETER (mm) (C)	NECK DIAMETER (mm) (D)	MOUTH DIAMETER (mm) (E)	COLLAR HEIGHT (mm) (F)	NECK HEIGHT (mm) (G)	FINISH SIZE (mm)
2	16 ±0.25	35 ±0.5	13 +0.2/-0.3	10.5 max	7 ±0.25	3.6 ±0.2	8.2 ±0.5	13
10	24 ±0.25	45 ±0.5	20 +0.2/-0.3	17 max	12.5 ±0.25	3.6 ±0.2	8.5 ±0.5	20
20	30 ±0.25	55 ±0.5	20 +0.2/-0.3	17 max	12.5 ±0.25	3.6 ±0.2	8.5 ±0.5	20

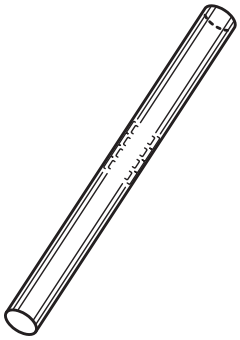
EVAPORATING DISHES



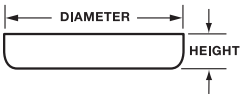
CAPACITY (cc)	DIAMETER (mm)	HEIGHT (mm)
25	50	25
50	65	33
75	70	35
100	80	40
150	90	45
200	100	50
250	110	55
300	120	60
350	130	65
400	140	70
450	150	75
500	160	80

GRADED SEALS • QUARTZ TO PYREX

I.D. x O.D. (mm)	I.D. x O.D. (mm)	I.D. x O.D. (mm)
2 x 4	15 x 17	40 x 43
3 x 5	16 x 18	42 x 45
4 x 6	17 x 19	45 x 48
5 x 7	18 x 20	46 x 50
6 x 8	20 x 23	47 x 50
7 x 9	22 x 25	48 x 52
8 x 10	25 x 28	50 x 54
9 x 11	27 x 30	53 x 57
10 x 12	30 x 33	55 x 59
11 x 13	32 x 35	60 x 64
12 x 14	35 x 38	65 x 69
13 x 15	37 x 40	70 x 75
14 x 16	38 x 42	



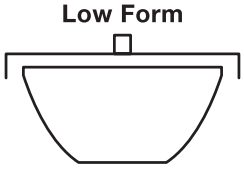
ROUND DISHES



APPROX. CAPACITY (cc)	DIAMETER (mm)	HEIGHT (mm)
20	55	15
35	60	15
65	70	15
75	89	15
100	100	15
120	110	15
125	127	15

CRUCIBLES w / LIDS

CAPACITY (cc)	TOP DIAMETER (mm)	BASE DIAMETER (mm)	HEIGHT (mm)
10	28	14	30
20	36	17	40
30	43	22	38
50	50	22	48
100	62	35	66
150	80	50	60

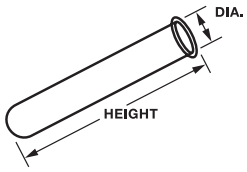


STOPCOCKS • STRAIGHT BORE

BORE (mm)	SIDE ARM O.D. (mm)
2.5	8
4	10
6	13

TEST TUBES w / LIP

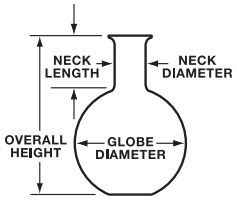
APPROXIMATE CAPACITY (cc)	INSIDE DIAMETER (mm)	HEIGHT (mm)
10	12	100
20	15	125
35	18	150
95	25	200



PLEASE NOTE: Additional sizes are available upon request for items on this page. Please call 440.639.6399 for availability.

BOILING FLASKS

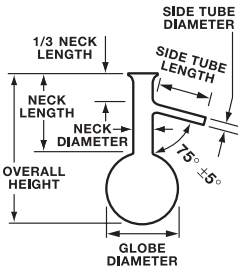
Choice of Round or Flat Bottom



CAPACITY (cc)	GLOBE DIA. (mm)	OVERALL ROUND HT. (mm)	OVERALL FLAT HT. (mm)	NECK DIA. (mm)	NECK LENGTH (mm)
10	30	50	47	17	20
25	40	65	62	20	25
50	52	77	74	21.6	25
100	65	95	91	21.6	30
125	69	101	96	24	32
150	74	108	103	25	34
200	79	115	110	27	36
250	86	126	120	28	40
500	102	152	148	34	50
750	124	214	206	34	90
1000	136	231	221	34	95
1500	149	249	238	38	100
2000	162	272	260	40	110
3000	183	333	320	44	150
4000	202	367	353	44	165
5000	218	393	378	50	175
6000	230	415	398	50	185

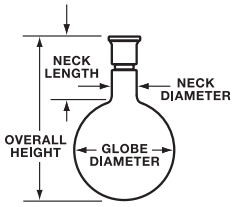
DISTILLING FLASKS

CAPACITY (cc)	GLOBE DIA. (mm)	OVERALL HEIGHT. (mm)	NECK DIA. (mm)	NECK LENGTH (mm)	SIDE TUBE DIA. (mm)	SIDE TUBE LENGTH (mm)
10	30	95	15	65	6	100
25	40	100	19	70	7	110
50	52	122	19	70	7	110
100	65	155	19	90	7	110
125	69	163	19	94	8	110
150	74	170	22	96	8	110
200	79	181	24	102	8	130
250	86	192	24	106	8	130
500	109	254	26	145	9	130
750	124	284	26	160	9	130
1000	136	301	28	165	11	140
1500	149	319	30	170	11	140
2000	169	340	32	178	11	140
3000	183	373	32	190	11	140



BOILING FLASKS w/ ⅎ OUTER JOINT

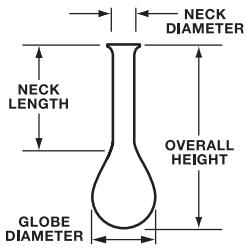
With ⅎ Outer Joint Choice of Round or Flat Bottom



CAPACITY (cc)	JOINT SIZE	GLOBE DIA. (mm)	OVERALL ROUND HT. (mm)	OVERALL FLAT HT. (mm)	NECK DIA. (mm)	NECK LENGTH (mm)
50	19/38	52	117	114	21.6	65
100	24/40	65	132	128	28.8	67
125	24/40	69	136	132	28.8	67
150	24/40	74	141	136	28.8	67
200	24/40	79	146	141	28.8	67
250	24/40	86	153	147	28.8	67
500	24/40	102	169	164	28.8	67
750	29/42	124	231	223	34	107
1000	29/42	136	243	233	34	107
1500	29/42	149	256	245	34	107
2000	29/42	162	269	257	34	107

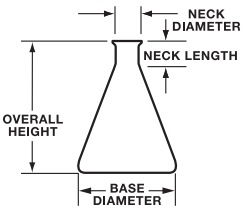
KJELDAHL FLASKS

CAPACITY (cc)	GLOBE DIAMETER (mm)	OVERALL HEIGHT (mm)	NECK DIAMETER (mm)	NECK LENGTH (mm)
50	41	171	20	130
100	56	199	20	130
250	81	270	34	180
300	87	280	34	190
500	96	308	30	190
650	104	318	30	190
750	108	323	33	190
800	110	326	35	190



PLEASE NOTE: Additional sizes are available upon request for items on this page. Please call 440.639.6399 for availability.

ERLENMEYER FLASKS

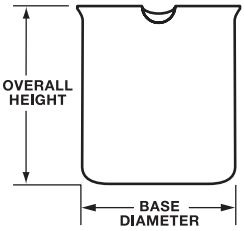


CAPACITY (cc)	BASE DIAMETER (mm)	OVERALL HEIGHT (mm)	NECK DIAMETER (mm)	NECK LENGTH (mm)
10	30	51	10	13
25	40	67	13	17
50	49	85	15	21
100	67	110	22	25
150	71	122	24	30
200	83	138	28	30
250	84	146	30	30
300	93	156	34	36
500	109	194	34	40
750	127	224	37	52
1000	138	232	40	58
1500	152	264	45	64
2000	166	288	48	70
3000	200	320	50	76
4000	220	360	52	80
5000	236	390	54	86
6000	248	410	56	90

BEAKERS • LOW FORM

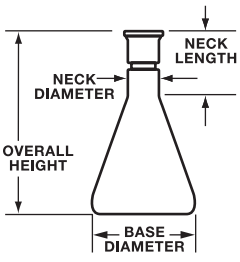
CAPACITY (cc)	BASE DIAMTER (mm)	OVERALL HEIGHT (mm)
10	25	32
25	33	45
50	45	50
100	51	62
150	59	76
200	64	84
250	67	86
300	74	92
400	80	105
500	84	112
600	90	119
800	100	127
1000	107	140
1500	132	152
2000	138	168
2500	142	190
4000	160	254

Low Form



ERLENMEYER FLASKS w/ Ʒ OUTER JOINT

With Ʒ Outer Joint

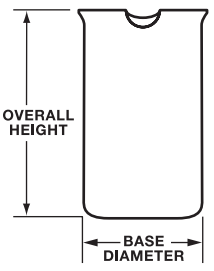


CAPACITY (cc)	JOINT SIZE	BASE DIAMETER (mm)	OVERALL HEIGHT (mm)	NECK DIAMETER (mm)	NECK LENGTH (mm)
50	19/38	49	129	21.6	65
100	24/40	67	132	28.8	67
200	24/40	83	175	28.8	67
250	24/40	84	183	28.8	67
300	24/40	93	187	28.8	67
500	24/40	109	221	28.8	67
750	29/42	127	241	34	69
1000	29/42	138	243	34	69
1500	29/42	152	269	34	69
2000	29/42	166	287	34	69

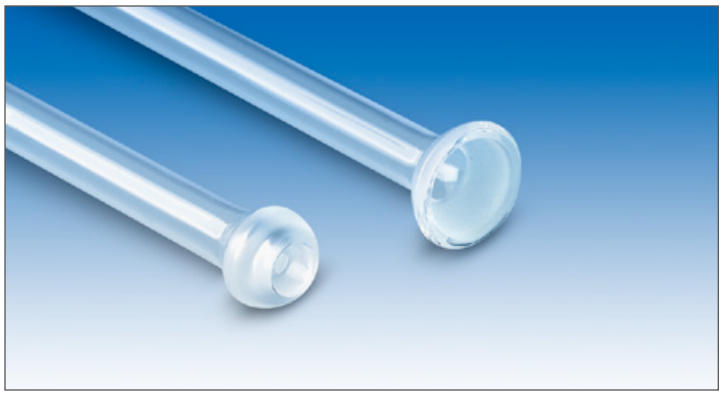
BEAKERS • TALL FORM

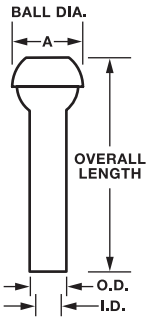
CAPACITY (cc)	BASE DIAMETER (mm)	OVERALL HEIGHT (mm)
10	22	45
25	29	57
50	35	73
100	45	89
150	49	102
200	54	111
250	57	118
300	61	124
400	68	140
500	74	146
600	77	168
1000	92	181

Tall Form



PLEASE NOTE: Additional sizes are available upon request for items on this page. Please call 440.639.6399 for availability.



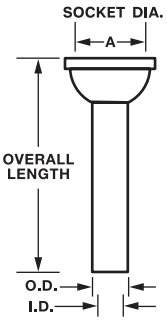


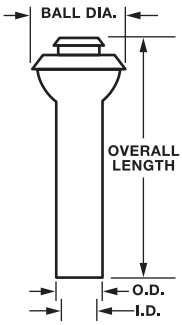
BALL JOINTS

SIZE	TUBE I.D. x O.D. (mm)	GROUND BALL DIAMETER (mm)	OVERALL LENGTH (inches)	A (mm)
12/2	2 x 6	12	4	12
12/3	3 x 6	12	4	12
12/5	5 x 8	12	4	12
18/7	7 x 9.5	18	4	18
18/9	9 x 11.8	18	4	18
28/12	12 x 16	28	4.5	28
28/15	15 x 18	28	4.5	28
35/20	20 x 23	35	4.5	35
35/25	25 x 28.8	35	4.5	35
40/25	25 x 28.8	40	4.5	40
50/30	30 x 34	50	4.5	50
65/40	40 x 45	65	6	65
75/50	50 x 55	75	6	75
102/75	75 x 80	102	6	102

SOCKET JOINTS

SIZE	TUBE I.D. x O.D. (mm)	SOCKET DIAMETER (mm)	OVERALL LENGTH (inches)	A (mm)
12/2	2 x 6	12	4	12
12/3	3 x 6	12	4	12
12/5	5 x 8	12	4	12
18/7	7 x 9.5	18	4	18
18/9	9 x 11.8	18	4	18
28/12	12 x 16	28	4.5	28
28/15	15 x 18	28	4.5	28
35/20	20 x 23	35	4.5	35
35/25	25 x 28.8	35	4.5	35
40/25	25 x 28.8	40	4.5	40
50/30	30 x 34	50	4.5	50
65/40	40 x 45	65	6	65
75/50	50 x 55	75	6	75
102/75	75 x 80	102	6	102



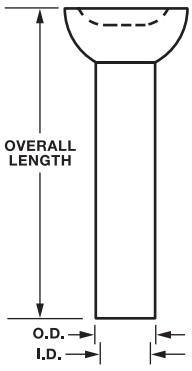


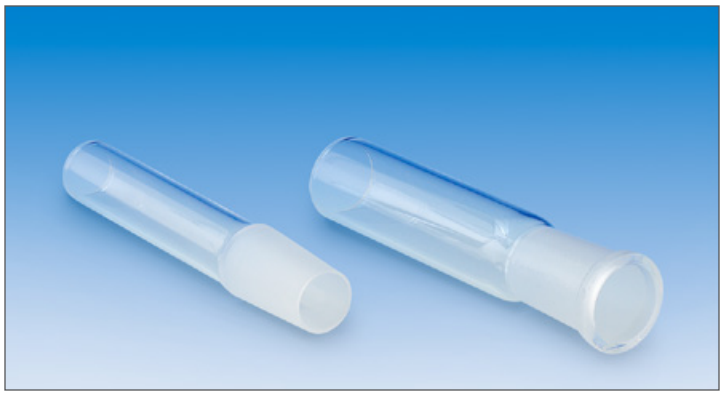
BALL O-RING JOINTS

SIZE	TUBE I.D. x O.D. (mm)	OVERALL LENGTH (inches)	O-RING SIZE (mm)
12/5	5 x 8	4	011
18/7	7 x 9.5	4	112
18/9	9 x 11.8	4	112
28/12	12 x 16	4.5	116
28/15	15 x 18	4.5	116
35/20	20 x 23	4.5	120
35/25	25 x 28.8	4.5	120
50/30	30 x 34	4.5	128
65/40	40 x 45	6	137
75/50	50 x 55	6	142
102/75	75 x 80	6	153

FLAT O-RING CONNECTORS

SIZE	TUBE I.D. x O.D. (mm)	OVERALL LENGTH (inches)	O-RING SIZE (mm)
5	5 x 8	4	2-110
7	7 x 9.5	4-1/2	2-111
9	9 x 11.8	4-1/2	2-112
12	12 x 15	5	2-116
15	15 x 18	5	2-116
20	20 x 23.6	5	2-214
25	25 x 28.8	5	2-214
30	30 x 34	6	2-223
40	40 x 46	6	2-226
50	50 x 55	6	2-229
75	75 x 80	6	2-341
100	101.6 x 106.6	6	2-349
125	125 x 130	6	2-355



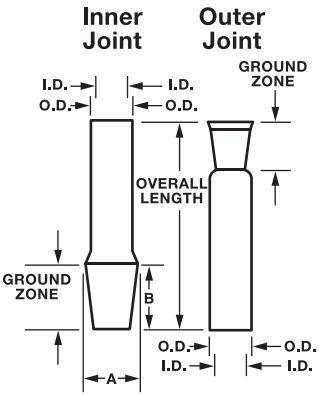


STANDARD TAPER JOINTS

SIZE	INNER JOINT I.D. x O.D. (mm)	OUTER JOINT I.D. x O.D. (mm)	GROUND LENGTH (mm)	OVERALL LENGTH (inches)	A (mm)	B (mm)
5/12	3 x 5	5 x 8	12	4	5	12
5/20	3 x 5	5 x 8	20	4	5	20
7/15	4 x 6	7 x 10	15	4	7	15
7/25	4 x 6	7 x 10	25	4	7	25
10/30	5 x 8	9 x 11.8	30	4	10	30
12/30	7 x 9.5	12 x 15	30	4	12	30
14/35	9 x 11.8	15 x 18	35	4	14	35
19/38	12 x 16	18 x 21.6	38	4.5	19	38
24/40	18 x 21.6	25 x 28.8	40	4.5	24	40
29/42	22 x 25	28 x 32	42	4.5	29	42
34/45	27 x 30	30 x 34	45	4.5	34	45
40/50	34 x 38	36 x 40	50	6	40	50
45/50	38 x 42	40 x 45	50	6	45	50
50/50	42 x 46	50 x 55	50	6	50	50
55/50	46 x 50	55 x 59	50	6	55	50
60/50	50 x 55	60 x 65	60	6	60	50
71/60	60 x 65	70 x 75	60	6	71	60
86/50	75 x 80	75 x 80	50	6	86	50
103/60	90 x 95	95 x 100	60	6	103	60
115/60	101.6 x 106.6	101.6 x 106.6	60	6	115	60
135/60	115 x 120	115 x 120	60	6	135	60
145/60	135 x 141	135 x 141	60	8	145	60

STD TAPER JOINTS • MEDIUM LENGTH

SIZE	INNER JOINT I.D. x O.D. (mm)	OUTER JOINT I.D. x O.D. (mm)	GROUND LENGTH (mm)	OVERALL LENGTH (inches)	A (mm)	B (mm)
10/18	5 x 8	9 x 11.8	18	4	10	18
12/18	7 x 9.6	12 x 15	18	4	12	18
14/20	9 x 11.8	15 x 18	20	4	14	20
19/22	12 x 16	18 x 21.6	22	4.5	19	22
24/25	18 x 21.6	22 x 25	25	4.5	24	25
29/26	22 x 25	28 x 32	26	4.5	29	26
34/28	28 x 32	30 x 34	28	4.5	34	28



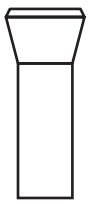
PLEASE NOTE: The diagram at left applies to both Standard Taper Joints and Medium Length Standard Taper Joints.

QUARTZ SCREWTHREADS & CAPS

SIZE GL	TUBE O.D. (mm)	WALL (mm)	LENGTH (mm)	CAP SIZE GL
14	12	1.5	110	14
18	15	1.5	110	18
25	22	1.5	110	25
32	28	1.5	150	32
45	42	2.0	180	45

CONICAL PIPE FLANGE

FLANGE SIZE	FLANGE O.D.
1/4	3/4
1/2	1"
3/4	1-17/64
1"	1-9/16
1-1/2	2-1/8



OPAQUE FUSED QUARTZ

The opaque quality comes from quartz sands of high purity when reduced to a molten state at a temperature of approximately 2000° C. The high temperature produces a vitreous material characterized by the presence of a multitude of gaseous micro-bubbles. These bubbles diffract light, giving the material its opacity. The term opaque silica is mainly used for molded or centrifuged parts, while the product obtained by drawing is normally referred to as translucent.

Opaque fused quartz trays are 99.95% pure Sio2. These trays may contain some black spots either in the wall of the tray or on the surface. The spots are due to the method of fabrication and tooling. The opaque trays are a less expensive option to higher purity clear fused quartz trays.

Opaque silica glass offers a number of exceptional properties, such as:

- Extreme Hardness
- Low Expansion
- Excellent High Temperature Resistance
- Maximum Continuous Temperature 1100° C
- Extreme Chemical Purity
- Excellent Corrosion Resistance
- Excellent Electrical Insulation Properties
- Remarkable Stability Under Atomic Bombardment

MECHANICAL PROPERTIES

Specific Density (according to fusion process)		1.98 to 2.12	
Hardness (Mohs scale		6	
Rupture stress:	traction	$N.m^{-2}$	2.10^{7}
	compression	$N.m^{-2}$	5.10^{8}

ELECTRICAL PROPERTIES

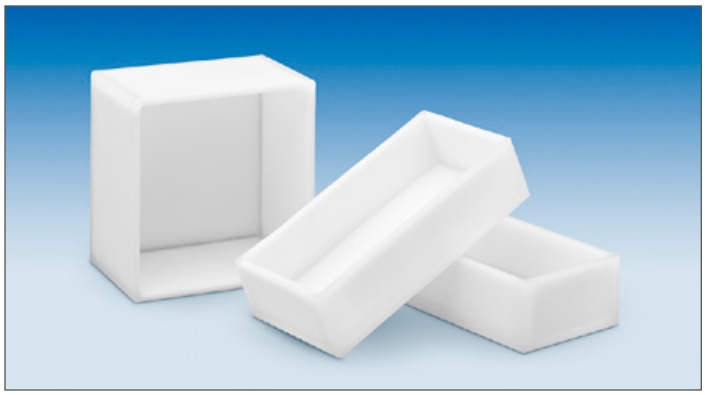
Dielectric constants		3.5
Dielectric rigidity	$V.m^{-1}$	5.10^{6}
Loss coefficients at 1 MHz		20.10^{-4}

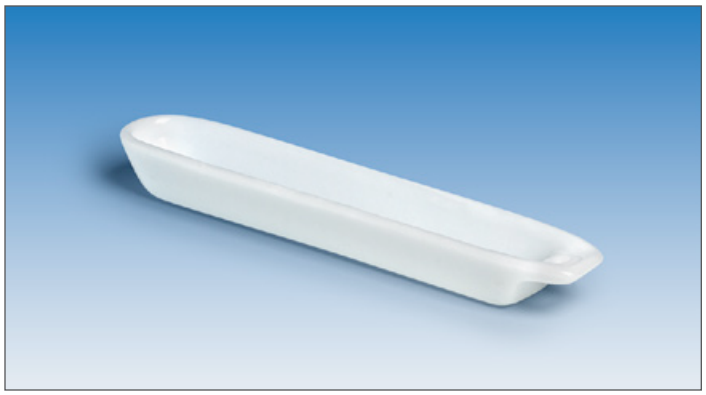
THERMAL PROPERTIES

Linear expansion coefficient	K^{-1}	$5.4.10^{-7}$
Specific heat at 20° C	$J.kg^{-1} . K^{-1}$	$7.5.10^{2}$
Heat conductivity at 20° C	$W.m^{-1} . K^{-1}$	1.05
Annealing point	° C	1120
Softening point	° C	1460

CHEMICAL PROPERTIES

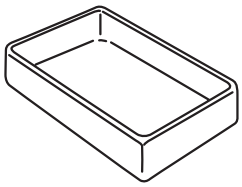
SiO2 content		%	99.8
Element content (typical analsis)	Fe	ppm	14
	Ti	ppm	100
	Al	ppm	550
	Ca	ppm	40
	Mg	ppm	11
	Na	ppm	25
	K	ppm	20
	Li	ppm	5





OPAQUE LABWARE & TRAYS

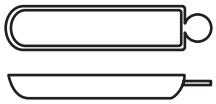
RECTANGULAR TRAYS



TOLERANCE: ± 5MM L	TOLERANCE: ± 5MM W	TOLERANCE: ± 2MM H
LENGTH (inches)	WIDTH (inches)	HEIGHT (inches)
4	2	1
6	2	1.5
6	3	2
6	3	2.5
6	3.5	1.25
6	6	4
7	4	1
8	4	2
9	5	2
10	7	0.875
10.25	6	4
12	6	1
12	6	4
WALL THICKNESS: 7MM ±2MM		

COMBUSTION BOAT WITH HANDLE

LENGTH (inches)	WIDTH (inches)	HEIGHT (inches)
3	5/8	3/8
4	3/4	7/16



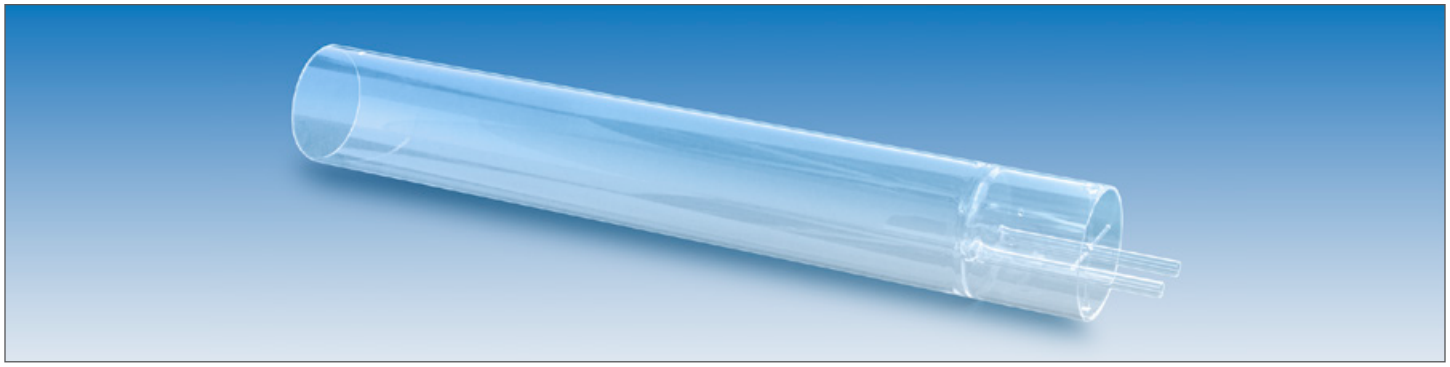
CUSTOM DESIGN, FABRICATION & REPAIR

Technical Glass Products is one of America's leading fabricators of Fused Quartz products. TGP is also a custom job shop that provides precision tolerance fabrication and machining of products to your specifications. We pride ourselves on the unique methods and equipment we have developed for the production and/or repair of quartzware. In addition, we offer our customers low-cost, time-saving alternatives.

If you need help in the area of custom fabrication or repairs, please contact us for a no-obligation evaluation of your project. All repairs must be cleaned before shipping to us. If it is not possible to clean, an MSDS sheet must accompany the repair and an additional fee will be charged for all cleaning procedures. NO EXCEPTIONS!

We have provided our services to numerous industries, some of which are listed below:

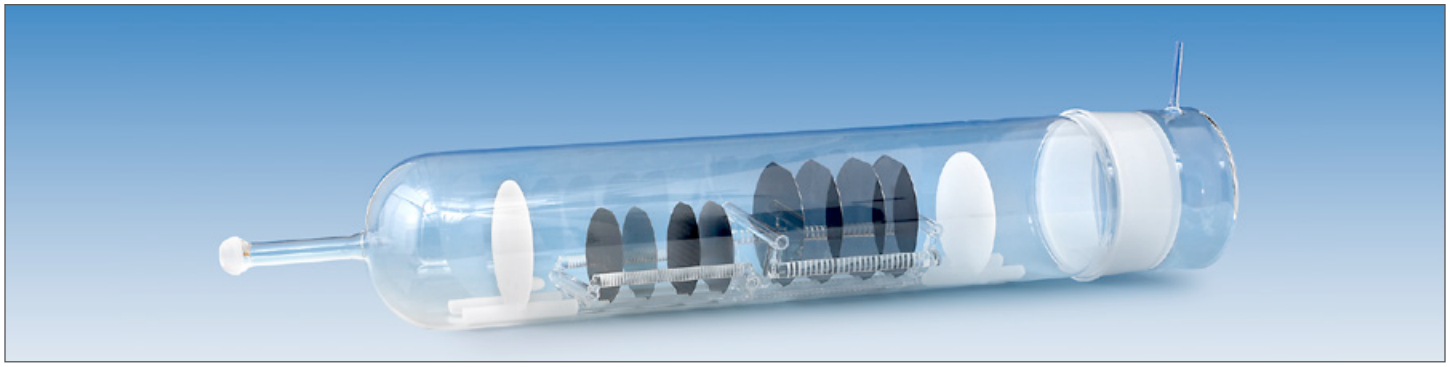
- Semiconductor
- Fiber Optic
- Medical
- Lamp Manufacturers
- Chemical
- Environmental Testing
- Compound Semiconductor
- Aerospace
- Water Purification
- Steel
- Petroleum
- Laser Technology
- Infrared Heating
- Solar
- Ultraviolet



SEMICONDUCTOR GRADE FUSED QUARTZ

Fused quartz, with its combination of high purity and mechanical stability at high temperatures, is the ideal material used in the processing of silicon wafers. Technical Glass Products uses only the highest grade raw materials, offering contaminant levels less than 25ppm. Quartz tubing is available in a number of sizes up to 400mm, with excellent diameter and wall-thickness tolerances. We offer a full range of fabricated semiconductor ware, along with design assistance from our technical staff. Below is a list of some of the items we manufacture:

- Plasma Chambers
- Tanks
- Lattice Trays
- Epitaxial Systems
- Hanger Supports
- Pedestals
- Removable Baffles
- Diffusion Tubes
- White Elephants
- End Caps
- Diffusion Boats
- Sensor Sheaths
- Bell Jars
- Pull Rods
- Storage Tubes
- Boat Holders
- Boat Holder Inserts
- Thermocouple Sleeves
- Paddle Systems
- Sleds
- Wheeled Carriers



Fused Quartz Wool

FUSED QUARTZ WOOL

Fused Quartz Wool has the same properties as pure quartz glass. The fibers are non-flammable and incombustible. The fibers maintain their usable mechanical properties up to 1050°C. Fused Quartz Wool is available in the following forms:

Coarse

Fine

Wool Felts

Coarse 9 µm Nominal Wool

Bulk Wool consists of woven basic fibers between 5µm and 15µm. The arrangement of the fibers gives the wool its curly appearance, which prevents compression of the material and improves the desired insulating qualities. The fibers are flexible and have excellent torsion and bending resistance. Standard specifications are:

Size Before Rolling & Pressing: L 3700mm x W 1600mm x H 150mm	
SIZE	UNIT WEIGHT
L 3700mm x W 1600mm x H 150mm	1.1 lb. bags
L 3700mm x W 800mm x H 150mm	.5 lb. bags

Fine 4 µm Nominal Wool

Fine Wool consists of woven basic fibers between 1.5µm and 7µm. This product was developed to meet severe technical specifications required by markets that demand a larger specific area. Therefore, this wool offers more efficient thermal conductivity than our standard bulk wool.

UNIT WEIGHT
10 grams
.5 lb. bags

FELTS (MATS)

A Felt is quartz wool that has been impregnated with a starch binder to provide a stable sheet that can be handled, cut or fabricated to exact sizes. The binder can be removed by heating the Felt to 900°F for 1 hour, or 500°F for 24 hours. Binder content on the Felt is 4–5% by weight. Standard specifications are:

SIZE	DENSITY	THICKNESS	WEIGHT
500mm x 500mm	0.016 g/cm (1 lb/ft)	5mm (0.2 in)	80 g/m (2.3 oz/yd)
1000mm x 500mm	0.016 g/cm (1 lb/ft)	5mm (0.2 in)	80 g/m (2.3 oz/yd)
1000mm x 1000mm	0.016 g/cm (1 lb/ft)	5mm (0.2 in)	80 g/m (2.3 oz/yd)

QUARTZ FRITS

A frit is defined as a porous filter composed of bonded grains of quartz glass. Frits are manufactured from the same high purity raw material as our tubing and rod. Some applications of fritted discs include filtration of liquids or corrosive gas, heat diffusion, flow regulation, and chemically inert and high purity applications.

QUARTZ FRITS

DIAMETER (mm)	THICKNESS 00 (mm)	THICKNESS 0-4 (mm)	POROSITIES AVAILABLE					
			00	0	1	2	3	4
10		2-3		•	•	•	•	•
15		2-4		•	•	•	•	•
20		3-5		•	•	•	•	•
25		3-5		•	•	•	•	•
30	8 ±2mm	3-5	•	•	•	•	•	•
35	8 ±2mm	3-5	•	•	•	•	•	•
40	8 ±2mm	3-5	•	•	•	•	•	•
50	8 ±2mm	4-6	•	•	•	•	•	•
60	8 ±2mm	4-6		•	•	•	•	•
70	8 ±2mm	4-6	•	•	•	•	•	•
80	8 ±2mm	4-6	•	•	•	•	•	•
90	8 ±2mm	4-6	•	•	•	•	•	•
100	8 ±2mm	8 ±2mm	•	•	•	•	•	•

AVERAGE POROSITY

POROSITY	PORE SIZE	POROSITY	PORE SIZE
00	250-550 micron	2	40-100 micron
0	160-250 micron	3	16-40 micron
1	100-160 micron	4	10-16 micron

POROSITY

Choosing the correct porosity is key for success in working with glass filters. These frits vary in porosity according to grades that are expressed as 00, 0, 1, 2, 3, and 4. The table below shows the various fields of application for each grade of porosity. The pore size indicates the the largest pore in the disc, as well as the the diameter of the smallest particle retained during filtration.

FRITTED DISC APPLICATIONS

POROSITY	NOMINAL MAXIMUM PORE SIZE (µ)	EXAMPLE FIELDS OF APPLICATION
	250-550	Liquid and gas distribution
	160-250	Gas distribution Gas distribution in liquids at low pressure Filtration of very coarse precipitates
	100-160	Coarse filtration Filtration of coarse precipitates Gas distribution in liquids Liquid distribution Coarse gas filtration Extraction apparatus for coarse grain minerals Loose filter layer substrates for gelatinous precipitates
	40-100	Preparatory fine filtration Preparatory work with crystalline precipitates Mercury filtration
	16-40	Analytical filtration Analytical work with medium-fine precipitates Preparatory work with fine precipitates Filtration in cellulose chemistry Fine gas filtration Extraction apparatus for fine-grained minerals
	10-16	Analytical fine filtration Analytical work with very fine precipitates (e.g., $BaSO_4$, Cu_2O) Preparative work with precipitates of appropriate fineness Non-return and stop valves for mercury

PLEASE NOTE: Sizes 10–25, and 60, are not available at 00 porosity.

Ordering & Shipping

HOW TO ORDER

Custom Requirements

For custom requirements, please contact our sales department located in our Painesville Twp., Ohio location. Our mailing address is:

Technical Glass Products, Inc.
881 Callendar Blvd.
Painesville Twp., OH 44077

By Phone

Call our expert sales staff at 440.639.6399.

By Fax

Fax your purchase order to us at 440.639.1292.

By Email

Email tgp@tgpohio.com

Online

For standard items, we offer online ordering. Simply go to our website at technicalglass.com. Click on any item number for more information, and/or click on Add to Cart. For custom orders, please call 440.639.6399

Method of Payment

We accept VISA, MasterCard, and American Express.

We also offer Net 30 Day terms on company or university purchase orders with prior credit approval. Orders shipped outside of the U.S. and Canada will require payment prior to manufacturing and shipping.

SHIPPING

Terms and Conditions

All purchase orders and shipments are subject to the terms and conditions listed below. Submission of an order to Technical Glass Products, Inc. is an acknowledgement that you have read, understand, and approve of these provisions.

Method of Shipment

TGP will ship via UPS unless otherwise indicated by the customer. UPS shipments will be prepaid and added to the invoice. (PP&A)

FOB: Shipping point. (Customer takes ownership at our dock.)

Common Carrier

If a shipment is too large for UPS, TGP will ship using the trucking company of the customer's choice. All truck shipments will be shipped freight collect, FOB shipping point.

Export Shipments

All export shipments will be FOB: EXWORKS Painesville, OH or Gonzales, LA.

Breakage

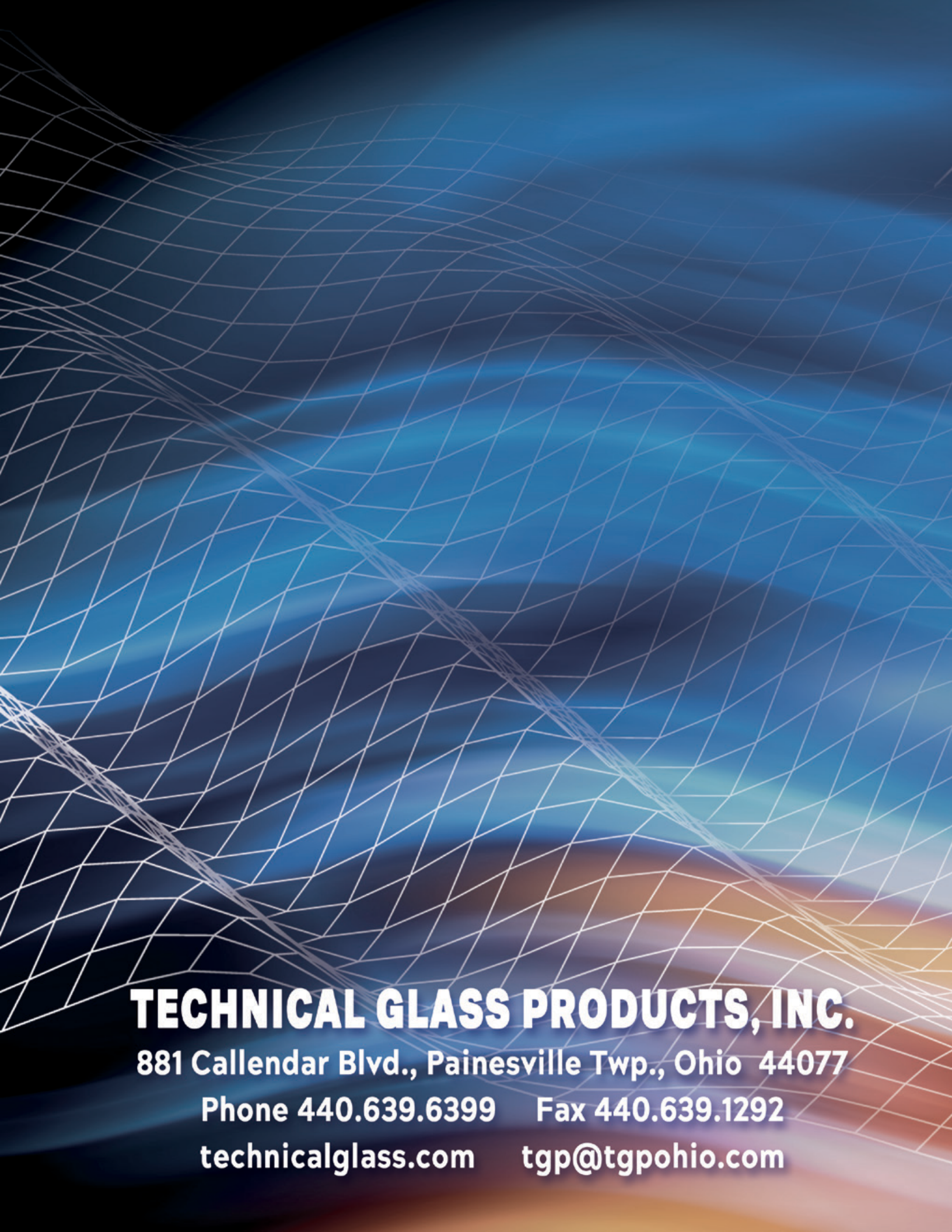
Our expert shipping department takes every precaution to ensure that your parts will arrive intact. However, breakage sometimes occurs due to reasons beyond our control. If you should happen to receive a part that is damaged, please take the following steps:

UPS shipments:

- Inspect all items for damage
- Retain all packaging materials
- Contact TGP immediately

Truck shipments:

- Contact carrier immediately
- Inspect all items for damage



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