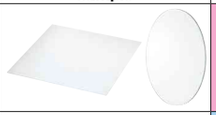
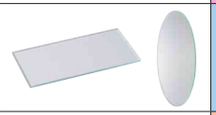
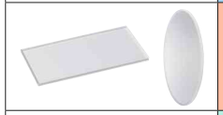
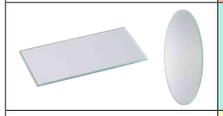
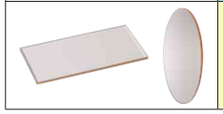
Glass Guidance

Fused Silica Plates - Square, Round

■Glass Selection and Characteristics

Sample	Material	Features
	Silica Glass	Silica Glass is manufactured by melting and fusing quartz crystals with oxyhydrogen flame. Features high purity and low bubble. Has better light transmission than other ordinary glasses (silicate glasses) at all wavelengths. Offers higher transmission and wider transparency range in the IR region than ordinary glass. Offers better transmission in short wavelength UV region. In addition, has excellent heat resistance with 1000°C allowable temperature in continuous use. Best suited as the material for tools for semiconductor manufacturing and physicochemical equipments.
	Float Transparent Glass (Soda-lime glass)	Versatile glass with excellent flatness and small distortion. The easiest to cut in all glasses, and can be cut with glass cutter.
	Heat-resistant Glass (TEMPAX Float®)	Borosilicate glass whose both faces are shaped into flat and uniform surface by floating method. Has optical quality with good light transmittance and no optical distortion. Has excellent heat resistance with 500°C allowable temperature in continuous use and high thermal shock resistance with a low thermal expansion.
	Reinforced Glass	Reinforced with heat treatment so that it has approx. 3 ~ 5 times the static strength of float transparent glass. MISUMI can offer them from stock in short delivery time while it normally takes ten days to finish hardening treatment.
	Heat-resistant Crystallized Glass (Nextrema®)	Has excellent heat resistance with 700°C allowable temperature in continuous use, which is the greatest next to Silica Glass, with a low thermal expansion. Has approx. 2~ 3 times the strength of float transparent glass. Dimensions can be specified in 1mm increment.

■Characteristic Values

Item	Unit	Silica Glass	Float Transparent Glass (Soda-lime glass)	Heat-resistant Glass (TEMPAX Float®)	Reinforced Glass	Heat-resistant Crystallized Glass (Nextrema®)
Continuous Use	°C	1000	80~100	250	180~210	700
Max. Operation Temperature	°C	1200	380	450	200~250	850
Thermal Shock Resistance	°C	-	-	150	100	700~820
Bending Stress	Mpa	50	50	25	150	100
Glass Strength	σ (kg/cm^2)	500	500	336	1500	800
Thermal Expansion Coefficient	x10^{-7}/°C	5.5	93.5	32.5	93.5	9~-8

Values of thermal shock resistance indicate temperatures from which rapid drop does not lead to cracking.
Listed values are for reference, not guaranteed. Temperature characteristics and strength vary depending on operating environment.

■How to Calculate Glass Strength

Use strength, pressure, plate thickness and pressure area to find value to be obtained.

· Formula to Calculate Pressure
$P=4T^2\sigma X/A$

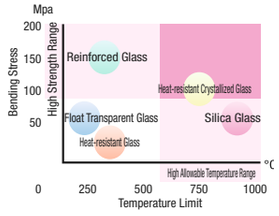
· Formula to Calculate Pressure Area
$A=4T^2\sigma X/P$

· Formula to Calculate Plate Thickness
$T=1/2\sqrt{PA/\sigma X}$

P = Pressure (kg/cm^2)
T = Thickness (cm)
σ = Glass Strength
X =0.1 (Safety Factor $\frac{1}{10}$)
A = Pressure Area (cm^2)

Stress
Mpa=N/mm^2
1N=10.2kgf/cm^2
1kgf/cm^2=9.8N
Pressure
1kgf/cm^2=7.35x10^{2}mmHg(torr)=1x10^{4}mmH2O

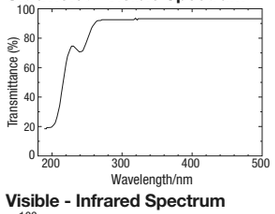
■Temperature and Strength Comparison



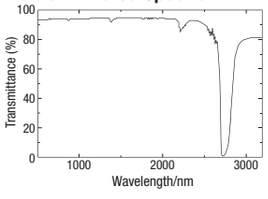
■Properties of Quartz Glass

■Optical Transparency

Ultraviolet - Visible Spectrum



Visible - Infrared Spectrum



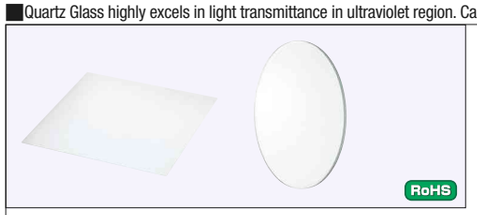
■Mechanical Properties

Purity (%)	≥99.9
OH(ppm)	200
Density (g/cm^3)	2.2
Vickers Hardness (Mpa)	7600~8900
Young's Modulus (Gpa)	74
Rigidity Modulus (Gpa)	31
Poisson Ratio	0.17
Bending Strength (Mpa)	50
Compression Strength (Mpa)	1130
Tensile Strength (Mpa)	49
Torsion Strength (Mpa)	29

■Precaution for Use

· Make sure that plates are clean before use.
· Transparent quartz glasses have to be kept away from water and impurities. Do not place them in high-temperature atmosphere if they are wet. When using in high temperature, dry them well before use.
· Note that the glasses may be devitrified depending on the operating atmosphere.
· More resistant to quick heating and cooling and 10 times stronger than normal glasses. However, not resistant to extreme temperature changes.
· Has low thermal conductivity and may have cracks due to local, quick heating or cooling. The heat and impact resistance becomes lower as glasses get thicker.
· If temperature increases (decreases) with other objects attached to the quartz glasses, they may break due to thermal expansion differentials. Be careful when increasing (decreasing) temperature with other objects attached.
· If quartz glasses are used at high temperature for a long period of time, they may be deformed little by little due to their own weight or other loads. Their life span may become longer if support methods or conditions of use are designed specific to the application.

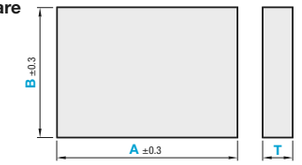
■Quartz Glass highly excels in light transmittance in ultraviolet region. Can be specified in 1mm increments.



Type	Shape	Material	Heat-resistant Temperature	
			Continuous Use	Max.
FGLKS	Square	Fused Transparent Quartz Glass	1,000 deg.	1,200 deg.
FGLMS	Round			

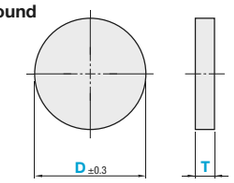
Heat resistant temperature will be largely varied depending on the operating condition. Values are not guaranteed.

■Square



A≥B Circumference Chamfering C0.3 ~ 1.0

■Round



Circumference Chamfering C0.3 ~ 1.0 •T Dimension Tolerance ±0.3

■Square

Part Number		1mm Increment	
Type	T	A	B
FGLKS (Square Type)	1	20~150	20~150
	2	20~300	20~300
	3		
	5		

■Round

Part Number		1mm Increment
Type	T	D
FGLMS (Round Type)	1	20~150
	2	20~300
	3	
	5	

Ordering Example

Part Number	-	A	-	B
FGLKS2	-	200	-	154

Part Number	-	D
FGLMS1	-	150

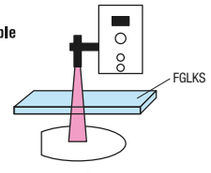
■Square

Part Number		A 1mm Increment	Unit Price B 1mm Increment				
Type	T		20~100	101~150	151~200	201~250	251~300
FGLKS	1	20~50		-	-	-	-
		51~100		-	-	-	-
		101~150			-	-	-
	2	20~100		-	-	-	-
		101~150			-	-	-
		151~200				-	-
		201~250					-
		251~300					
	3	20~100		-	-	-	-
		101~150			-	-	-
		151~200				-	-
		201~250					-
		251~300					
	5	20~100		-	-	-	-
		101~150			-	-	-
		151~200				-	-
		201~250					-
		251~300					

■Round

Part Number		Unit Price D 1mm Increment				
Type	T	20~100	101~150	151~200	201~250	251~300
FGLMS	1			-	-	-
	2					
	3					
	5					

Example



As a cover for the UV irradiation device

Properties of Material P.981