

TOLERANCE CHART



Materials:	Schott and Ohara Optical Glass, Fused Silica, Fused Quartz, Filter Glass, Float Glass, and Silicon
Diameter Range:	4mm - 150mm
Coatings:	Coatings Ranging from 280-2400nm (High UV to SWIR), BBARs, V-Coats, High Laser Damage Resistance, Hydrophobic Coatings, Dielectric Mirrors, Beam Splitters, and Custom Coatings
Lead Time:	8-10 Week Standard Delivery, Expedite Service 2-6 Weeks
Core Competencies:	Spherical Lenses, Achromats, Aspheres, Windows, Wedges, Prisms, and Axicons
Ideal Quantities:	1 - 100,000+

ATTRIBUTE	STANDARD	PRECISION	HIGH PRECISION
Glass Material (Nd, Vd)	$\pm 0.001, \pm 0.8\%$	$0.0005, \pm 0.5\%$	Melt Data
Diameter (mm)	$\geq \pm 0.00/-0.10$	$0/-0.025$	$\leq 0/-0.015$
Center Thickness (mm)	$\geq \pm 0.10$	± 0.050	$\leq \pm 0.025$
SAG (mm)	$\geq \pm 0.025$	± 0.020	$\leq \pm 0.010$
Clear Aperture	$\leq 80\%$	90%	$\geq 95\%$
Radius	$\geq 8 \text{ Fr}$	$\geq 5 \text{ Fr}$	$\leq 1 \text{ Fr}$
Irregularity - Interferometer (fringes)	≥ 2	1 - 0.5	≤ 0.2
Irregularity - Profilometer (microns)	± 1	± 0.5	$\leq \pm 0.1$
Optical Centration	$\geq 5'$	$3'$	$\leq 1'$
Wedge Prism (TIA, arc min)	$\geq \pm 5'$	$\pm 3'$	$\leq 1'$
Bevels (face width @ 45 degrees, mm)	$\geq \text{Nom. } \pm 0.5$	$\geq \text{Nom. } \pm 0.25$	$\leq \text{Nom. } \pm 0.15$
Scratch - DIG (MIL- PRF - 13830B)	80-50 to 60 - 40	40 - 20	20 - 10 to 10-5
Surface Roughness (\AA rms)	≥ 50	20	≤ 10

ASPHERE CHEAT SHEET



Metrology	2-D and 3-D Metrology		
Diameter (mm)	10-200mm		
Frequency Errors	Specify Spatial Frequency Bands as Necessary		
Attribute	Standard	Precision	High Precision
Form Error (microns)	±1	±.5	±.1
Slope Error (µm/mm) 1mm Integration Window	.5 µm/mm	.25 µm/mm	.1 µm/mm
Surface Roughness	25 Å	15 Å	5-8 Å
Centration (Optical Deviation)	3'	1'	30"

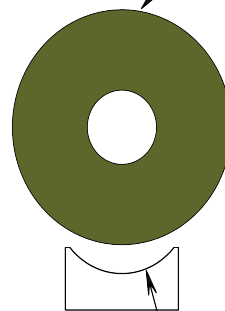
Top 10 Design Tips

1. Increment your sag table by .5 mm or an integer.
2. Define which aspheric equation you are using; most manufacturing machines use the the even aspheric equation.
3. Avoid using odd term coefficients.
4. Try to avoid using an A2 term.
5. Include a tolerance for the following:
 - A. Vertex Radius
 - B. Form Error
 - C. Slope Error
 - D. Centration/Decentration
 - E. Geometric Tolerancing
 - F. Non-Aspheric Tolerancing
6. Consider equivalent materials, which can potentially save time and money.
7. Get your manufacturer involved early on in your design for manufacturability.
8. Do not tolerance the deformation terms or conic constant.
9. Watch the minimum local radius on concave aspheres, minimum 15 mm.
10. Edge thickness at processing diameter, which is typically 2-4 mm outside the final diameter should be 1 mm or more.

Even Aspheric Equation:

$$z = \frac{cr^2}{1 + \sqrt{1 - (1+k)c^2r^2}} + \sum_{i=1}^N A_i E_i(x, y)$$

Grinding Wheel



Tool Clearance Issues
Minimum Local
Radius 15mm

