FISBA Innovators in Photonics

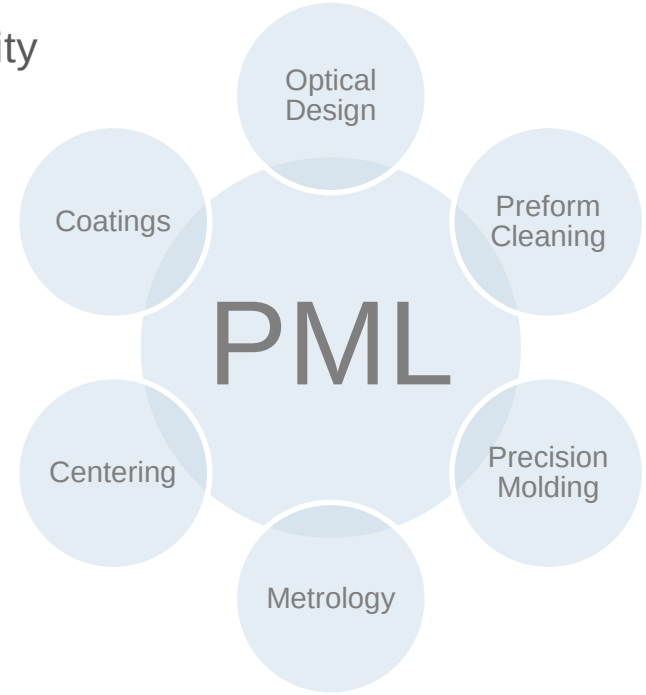
Precision Glass Molding Specification Guide

FISBA

FISBA – Tucson, Arizona

Aspheric, Bi-Aspheric, Diffractive and Free Form Optics

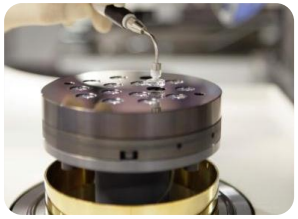
- Leading OEM supplier of customized optical components and photonic systems
- AS9100D / ITAR Compliant US production facility
- Headquarters in St. Gallen, Switzerland
- Founded in 1957
- 400+ employees, including 29 apprentices
- ISO 9001:2008 certificated

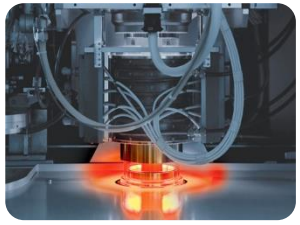


FISBA

Advantages of Molding	Product Offerings Precision Molded Components

• Compact and lightweight – 1 asphere for 3 spheres
• Less material = lower cost
• Aspheres allow for design flexibility
• Improved image correction
• Higher transmision
• Supression of ghost images
• Less space & less weight needed
• Scalable processe for large quantities
	• Infrared Components
	  • Chalcogenide glass IG2-IG6 & equivalents
	  • 2 to 70mm diameter
	  • Spheres (single sided), aspheres
	  • Bi-aspheres, diffractives, free forms
	• Visible Components
	  • Oxide glasses (see preferred list)
	  • 2 to 40mm diameter
	  • Spheres (single sided), aspheres
	  • Bi-aspheres, free forms




FISBA

Shape Feasibility

Form	Feasibility Visible	Feasibility IR	Comment
Planar Convex 	++	++	If rotational symmetric: no major advantage to biconvex
Biconvex, one side aspherical 	++	++	
Biconvex double asphere 	++	++	Only slightly more expensive compared to one sided aspheric
Meniscus (spheres or aspheres) 	+	+	
Biconcave and spherical on steeper side 	-	+	Visible: Conventional post polishing possible if necessary
Biconcave aspherical 	--	+	Visible: Risk too high, only worth a try if steepness is very low

FISBA

Aspheric, Bi-Aspheric, Diffractive and Free Form Optics

Parameters	Units	Standard Values		High Standard Values	
		Visible	IR	Visible	IR
Diameters					
Range	Mm	2 – 40	2 – 70	2 – 40	2 – 40
Tolerance for lens Ø < 5 mm	Mm	± 0.01	± 0.01	± 0.005	± 0.005
Tolerance for lens Ø > 5 mm	Mm	± 0.02	± 0.02	± 0.01	± 0.01
Center thickness					
CT:ET Ratio	-	Max. 3[1]	Max. 3[1]	Max 4[1]	Max 4[1]
Range (mm)	mm	1 – 6 [2]	2 – 10[2]	0.5-12[2]	1.5 – 12[2]
Tolerance (mm)	mm	± 0.04	± 0.04	± 0.01	± 0.01
Edge steepness					
Max. edge steepness concave	º	40	40	50	50
Max. edge steepness convex surface	º	50	50	65	65
Clear aperture	-	1 mm smaller than lens Ø	1 mm smaller than lens Ø	0.5 mm smaller than lens Ø	0.5 mm smaller than lens Ø
Shape deviation and irregularities					
Lens Ø < 10 mm	fringes	3/ 3(1)	3/ 3(1)	3/ 3(0.5)	3/ 3(1)
Lens Ø > 10 – 35 mm	fringes	3/ 5(2)	3/ 5(2)	3/ 3(1)	3/ 5(1)
Lens Ø > 35 mm	fringes		3/ 7(3)	(>20 Ø 3/ 5(1))	3/ 7(3)
Centering error	arcmin	4/ 5	4/ 5	4/ 3[3]	4/ 3[3]
Reference value for the lateral shift of both optical surfaces in relation to each other	µm	15	15	5	5
Surface roughness	nm rms	6	10	4	10
Surface quality					
Lens Ø < 3 mm	-	MIL 20-10	MIL 80-50	MIL 20-10	MIL 60-40
Lens Ø < 5 mm	-	MIL 40-20	MIL 80-50	MIL 20-10	MIL 60-40
Lens Ø > 15 mm	-	MIL 60-40	MIL 80-50	MIL 40-20	MIL 60-40

1. Depending on CTE of glass and absolute size
2. Depending on ratio of Ø to center thickness
3. Differs from case to case. Reference value