

About Ophir Optronics 3

Beam Delivery Optics

Duralens™ Focusing Lenses 8

Meniscus Lenses 11

Plano Convex Lenses 17

Mounted Lenses 22

Mirrors

0° Phase Shift 25

 Silicon Mirrors 28

 Copper Mirrors 29

Folding Mirrors 31

 Silicon Mirrors 33

 Copper Mirrors 34

Telescopic Mirrors 35

90° Phase Retarders 36

 Silicon Mirrors 37

 Copper Mirrors 38

Cavity Optics

Partial Reflectors 41

End Mirrors 42

Windows 44

Comet Probe - measuring device 46

CO₂ Optics Cleaning & Handling 47



About Ophir

Established in 1976, Ophir Optronics is an International leader in precision IR Optics components and Laser measurement equipment.

Ophir Optronics has 2 manufacturing plants: over 50,000 sq.ft. in Israel and over 18,000sq.ft. in the USA. Together with its subsidiaries in Germany and Japan Ophir Optronics teams more than 230 scientists, engineers and technical support personnel to service our thousands of customers worldwide.

Since 1991, Ophir Optronics Ltd. is publicly traded in the Tel-Aviv stock exchange.

Ophir's two groups operate in two main business lines:

Laser Measurement Group

Manufactures calibrates and sells a complete line of laser measurement instruments for measuring power, energy, beam profile and spectrum. Ophir power / energy meters have complete plug and play capability and uniformed display, compatible with all heads from nW/nJ to KW/hundreds of Joules.

Optics Group

We provide: "The Best of All Possible Solutions".

Ophir Optics Group is a manufacturer and supplier of precision IR optics for the military, commercial IR vision, FLIR, and industrial CO₂ laser customers.

Our Areas of Expertise:

- Optical Lens Assemblies for MWIR & LWIR, Cooled and Uncooled cameras
- Optical elements (Built to Print)
- High Power CO₂ Optics for Industrial Lasers

Ophir Optronics Ltd. and Ophir Optics Inc. have over 25 years of experience that have created the finest IR optical fabrication facility. Ophir's manufacturing equipment includes the latest generation diamond turning machines, CNC fabrication, coating chambers and testing equipment including Computer Generated Holography (CGH) enabling us to design, develop and manufacture optical products from start to finish under one roof.

About Ophir



All of Ophir manufacturing departments: Diamond Turning department, CNC & Conventional Polishing department, Optical Coating department and Lens Assembly department are ISO 9001; 2000 certified.

final inspection and quality control assure that our products will stand to your best specifications and quality standards.

About the catalog

About the catalog

Ophir Optronics produces a full range of CO₂ optics of unsurpassed quality for high performance industrial and medical lasers. Our superb replacement optics and OEM optics include:

- Beam Delivery Optics: Focusing lenses, Folding mirrors, 0° phase shift mirrors and 90° phase retarders (silicon and copper).
- Cavity optics: Partial reflectors and End mirrors.
- Windows.

For updated information and new products please visit our website:
www.ophiropt.com

Beam Delivery Optics

Beam
Delivery
Optics



Focusing Lenses

Duralens™
Focusing
Lenses



Duralens™ Focusing Lenses

Focusing Lenses

The focusing lens is the last optic in the laser path, before it hits the workpiece. Its main role is to focus the laser beam to a specific focal length (FL) – depending on the application. Therefore, the focal length – that is dictated by the radiuses and curvatures of the lens – is its most important feature.

The focusing lens is normally made of Zinc Selenide (ZnSe) using an anti-reflective coating.

Focusing lenses are either Plano-Convex or Meniscus. In order to ensure that your laser operates at maximum efficiency it is crucial to select the right lens. The type to be used with each machine is usually specified in the machine manufacturer's manual.

Ophir offers a wide range of standard and special lenses assuring that the most suitable and effective lens be fitted to your laser cutting machine.

Duralens™ Lenses – A Cut Above The Rest

The Ophir Duralens™, introduced in 1996, is manufactured using in-house technologies (inspection of raw material, grinding, polishing, coating and quality control) that were developed to ensure high reliability and long life – saving you time and money. Ophir Duralens™ have superior Anti-Reflective (AR) coating, lower absorption, better surface quality (achieved by Ophir's micropolishing techniques) and maximum focus accuracy.



Black Magic™ Low Absorption Lenses

Focusing Lenses

The Black Magic™ lenses are unique products offered by Ophir. The revolutionary black coating developed by Ophir enhances the resistance and performance of the lens.

Advantages of the Black Magic™ Lens:

- Lowest absorption (lower than 0.15%)
- Increases cutting speed
- Saves up to 20% of gas consumption
- Lasts twice the lifetime of a standard lens
- Best ability to withstand back splatter
- Less maintenance - extended lens cleaning intervals

Black Magic™ lenses and black coated optical elements in the catalog are marked by the letters LA.



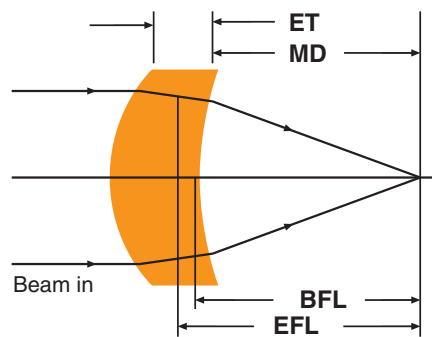
Meniscus Lenses

Focusing Lenses

Meniscus lenses have one concave surface and one convex surface. A meniscus lens creates a smaller beam diameter thus reducing the spherical aberration and beam waste when precision cutting or marking. The lens also provides a smaller spot size that creates the same power output in a smaller area. In order to achieve the smallest spot size the concave side of the lens is mounted face down, pointing towards the material being cut.

Although meniscus lenses are more expensive than Plano-Convex lenses, they offer a higher accuracy of the cut therefore increasing cutting speed by up to 5%.

Meniscus lenses are usually used by European customers and machine manufacturers (OEM's).



Meniscus Lenses

Typical Specifications:

Dimensions

EFL Range	38-381mm
Edge Thickness	2-15mm
ET Tolerance	±0.1mm
Diameter Range	10-100mm
Diameter Tolerance	+0.0-0.1mm
Clear Aperture	≥90%
Surface Irregularity	0.5 F @ 0.633μm
Surface Figure	2 F @ 0.633μm
ETV	<0.025mm

AR Coating

Transmission	>99.3%
Absorption	< 0.2%
Reflection	<0.25% per surface
AOI	0°-15°

LA Series (Black Magic™ Low Absorption Lenses)

Reflection	<0.25% per surface
Absorption	<0.15%
Transmission	>99.35%

Meniscus Lenses

Focusing Lenses

Optic Type	P/N	LA*	Diameter		Focal Length		Edge Thickness	
			Inch	mm	Inch	mm	Inch	mm
Meniscus	61526		1.0"	25.4	5.00"	127.0	0.098"	2.5
Meniscus	60909		1.1"	27.9	1.50"	38.1	0.197"	5.0
Meniscus	61528		1.1"	27.9	2.50"	63.5	0.091"	2.3
Meniscus	60924		1.1"	27.9	2.50"	63.5	0.118"	3.0
Meniscus	60700		1.1"	27.9	2.50"	63.5	0.165"	4.2
Meniscus	60700	LA*	1.1"	27.9	2.50"	63.5	0.236"	6.0
Meniscus	61837		1.1"	27.9	2.50"	63.5	0.236"	6.0
Meniscus	61157		1.1"	27.9	3.75"	95.3	0.165"	4.2
Meniscus	60866		1.1"	27.9	5.00"	127.0	0.106"	2.7
Meniscus	60866	LA*	1.1"	27.9	5.00"	127.0	0.106"	2.7
Meniscus	60699		1.1"	27.9	5.00"	127.0	0.165"	4.2
Meniscus	60699	LA*	1.1"	27.9	5.00"	127.0	0.165"	4.2
Meniscus	60262		1.1"	27.9	5.00"	127.0	0.201"	5.1
Meniscus	60262	LA*	1.1"	27.9	5.00"	127.0	0.201"	5.1
Meniscus	61819		1.1"	27.9	5.00"	127.0	0.236"	6.0
Meniscus	61819	LA*	1.1"	27.9	5.00"	127.0	0.236"	6.0
Meniscus	61818		1.1"	27.9	7.50"	190.5	0.236"	6.0
Meniscus	60995		1.1"	27.9	10.00"	254.0	0.114"	2.9
Meniscus	61525		1.5"	38.1	2.50"	63.5	0.118"	3.0
Meniscus	60799		1.5"	38.1	2.50"	63.5	0.236"	6.0
Meniscus	61962		1.5"	38.1	3.70"	94.0	0.291"	7.4
Meniscus	61962	LA*	1.5"	38.1	3.70"	94.0	0.291"	7.4
Meniscus	60603		1.5"	38.1	3.75"	95.3	0.236"	6.0
Meniscus	60603	LA*	1.5"	38.1	3.75"	95.3	0.236"	6.0
Meniscus	60617		1.5"	38.1	3.75"	95.3	0.276"	7.0

* LA (Low Absorption) - Black Magic (see page 10)

Meniscus Lenses

Focusing Lenses

Optic Type	P/N	LA*	Diameter		Focal Length		Edge Thickness	
			Inch	mm	Inch	mm	Inch	mm
Meniscus	60617	LA*	1.5"	38.1	3.75"	95.3	0.276"	7.00
Meniscus	60614		1.5"	38.1	3.75"	95.3	0.354"	9.00
Meniscus	60614	LA*	1.5"	38.1	3.75"	95.3	0.354"	9.00
Meniscus	60746		1.5"	38.1	5.00"	127.0	0.094"	2.40
Meniscus	60746	LA*	1.5"	38.1	5.00"	127.0	0.094"	2.40
Meniscus	61951		1.5"	38.1	5.00"	127.0	0.118"	3.00
Meniscus	60973		1.5"	38.1	5.00"	127.0	0.157"	4.00
Meniscus	60973	LA*	1.5"	38.1	5.00"	127.0	0.157"	4.00
Meniscus	60260		1.5"	38.1	5.00"	127.0	0.236"	6.00
Meniscus	60260	LA*	1.5"	38.1	5.00"	127.0	0.236"	6.00
Meniscus	60618		1.5"	38.1	5.00"	127.0	0.276"	7.00
Meniscus	60618	LA*	1.5"	38.1	5.00"	127.0	0.276"	7.00
Meniscus	60696		1.5"	38.1	5.00"	127.0	0.287"	7.30
Meniscus	60696	LA*	1.5"	38.1	5.00"	127.0	0.287"	7.30
Meniscus	61014		1.5"	38.1	5.00"	127.0	0.310"	7.87
Meniscus	61014	LA*	1.5"	38.1	5.00"	127.0	0.310"	7.87
Meniscus	60615		1.5"	38.1	5.00"	127.0	0.354"	9.00
Meniscus	60615	LA*	1.5"	38.1	5.00"	127.0	0.354"	9.00
Meniscus	61851		1.5"	38.1	7.50"	190.5	0.118"	3.00
Meniscus	61851	LA*	1.5"	38.1	7.50"	190.5	0.118"	3.00
Meniscus	60602		1.5"	38.1	7.50"	190.5	0.236"	6.00
Meniscus	60602	LA*	1.5"	38.1	7.50"	190.5	0.236"	6.00
Meniscus	60697		1.5"	38.1	7.50"	190.5	0.287"	7.30
Meniscus	60697	LA*	1.5"	38.1	7.50"	190.5	0.287"	7.30
Meniscus	61171		1.5"	38.1	7.50"	190.5	0.31"	7.87

* LA (Low Absorption) - Black Magic (see page 10)

Meniscus Lenses

FOCUSING LENSES

Optic Type	P/N	LA*	Diameter		Focal Length		Edge Thickness	
			Inch	mm	Inch	mm	Inch	mm
Meniscus	61171	LA*	1.5"	38.1	7.50"	190.5	0.310"	7.87
Meniscus	60616		1.5"	38.1	7.50"	190.5	0.354"	9.00
Meniscus	60616	LA*	1.5"	38.1	7.50"	190.5	0.354"	9.00
Meniscus	61595		1.5"	38.1	7.50"	190.5	0.394"	10.00
Meniscus	61595	LA*	1.5"	38.1	7.50"	190.5	0.394"	10.00
Meniscus	61961		1.5"	38.1	8.85"	224.8	0.291"	7.40
Meniscus	61961	LA*	1.5"	38.1	8.85"	224.8	0.291"	7.40
Meniscus	61960		1.5"	38.1	10.00"	254.0	0.290"	7.36
Meniscus	61960	LA*	1.5"	38.1	10.00"	254.0	0.290"	7.36
Meniscus	61973		1.5"	38.1	10.00"	254.0	0.354"	9.00
Meniscus	61973	LA*	1.5"	38.1	10.00"	254.0	0.354"	9.00
Meniscus	61853		2.0"	50.8	3.75"	95.3	0.378"	9.60
Meniscus	60850		2.0"	50.8	5.00"	127.0	0.307"	7.80
Meniscus	61694		2.0"	50.8	5.00"	127.0	0.315"	8.00
Meniscus	61694	LA*	2.0"	50.8	5.00"	127.0	0.315"	8.00
Meniscus	60991		2.0"	50.8	5.00"	127.0	0.378"	9.60
Meniscus	60991	LA*	2.0"	50.8	5.00"	127.0	0.378"	9.60
Meniscus	61039		2.0"	50.8	7.50"	190.5	0.315"	8.00
Meniscus	61039	LA*	2.0"	50.8	7.50"	190.5	0.315"	8.00
Meniscus	60698		2.0"	50.8	7.50"	190.5	0.378"	9.60
Meniscus	60698	LA*	2.0"	50.8	7.50"	190.5	0.378"	9.60
Meniscus	60992		2.0"	50.8	10.00"	254.0	0.378"	9.60
Meniscus	60992	LA*	2.0"	50.8	10.00"	254.0	0.378"	9.60
Meniscus	62102		2.0"	50.8	10.00"	254.0	0.378"	9.60
Meniscus	62102	LA*	2.0"	50.8	10.00"	254.0	0.378"	9.60

* LA (Low Absorption) - Black Magic (see page 10)

Meniscus Lenses

Focusing Lenses

Optic Type	P/N	LA*	Diameter		Focal Length		Edge Thickness	
			Inch	mm	Inch	mm	Inch	mm
Meniscus	61691	LA*	2.0"	50.8	10.25"	260.4	0.378"	9.6
Meniscus	61394		2.5"	63.5	5.00"	127.0	0.433"	11.0
Meniscus	61394	LA*	2.5"	63.5	5.00"	127.0	0.433"	11.0
Meniscus	61579		2.5"	63.5	7.50"	190.5	0.138"	3.5
Meniscus	61393		2.5"	63.5	7.50"	190.5	0.433"	11.0
Meniscus	61393	LA*	2.5"	63.5	7.50"	190.5	0.433"	11.0

* LA (Low Absorption) - Black Magic (see page 10)

Plano-Convex Lenses

Focusing Lenses

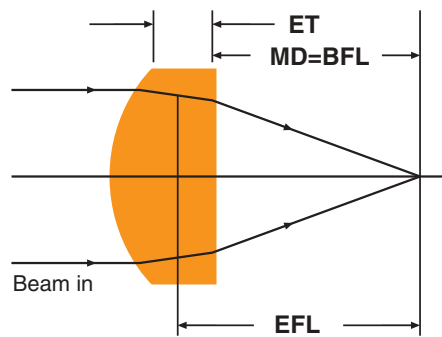
Plano-Convex lenses have one flat surface and one outward curving surface.

These lenses are more suitable for high turnover cutting applications and when cutting and welding certain materials (metals, wood, ceramics, plastics and composites) – when the cost is more important than the level of accuracy.

When cutting steel and other thick materials, a Plano-Convex lens provides a greater width of the cut enabling the laser's Oxygen assist to enter and ease the cutting process.

In addition, Plano-Convex lenses give a greater depth of field needed to maintain a taperless edge when cutting thicker materials.

This kind of lens is more popular in American and Japanese machinery.



Plano Convex Lenses

Typical Specifications:

Dimensions

EFL Range	38-381mm
Edge Thickness	2-15mm
ET Tolerance	±0.1mm
Diameter Range	10-100mm
Diameter Tolerance	+0.0-0.1mm
Clear Aperture	≥90%
Surface Irregularity	0.5 F @ 0.633μm
Surface Figure	2 F @ 0.633μm
ETV	<0.025mm

AR Coating

Transmission	>99.3%
Absorption	< 0.2%
Reflection	<0.25% per surface
AOI	0°-15°

LA Series (Black Magic™ Low Absorption Lenses)

Reflection	<0.25% per surface
Absorption	<0.15%
Transmission	>99.35%

Plano-Convex Lenses

FOCUSING LENSES

Optic Type	P/N	LA*	Diameter		Focal Length		Edge Thickness	
			Inch	mm	Inch	mm	Inch	mm
Plano-Convex	61564		1.0"	25.4	12.5"	317.5	0.189"	4.8
Plano-Convex	61829		1.0"	25.4	15.0"	381.0	0.189"	4.8
Plano-Convex	60990		1.1"	27.9	5.0"	127.0	0.118"	3.0
Plano-Convex	61161		1.1"	27.9	5.0"	127.0	0.157"	4.0
Plano-Convex	61161	LA*	1.1"	27.9	5.0"	127.0	0.157"	4.0
Plano-Convex	61211		1.1"	27.9	5.0"	127.0	0.236"	6.0
Plano-Convex	61162		1.1"	27.9	7.5"	190.5	0.157"	4.0
Plano-Convex	61210		1.1"	27.9	7.5"	190.5	0.236"	6.0
Plano-Convex	60885		1.5"	38.1	2.5"	63.5	0.291"	7.4
Plano-Convex	60907		1.5"	38.1	3.5"	88.9	0.118"	3.0
Plano-Convex	61857	LA*	1.5"	38.1	3.63"	92.9	0.283"	7.2
Plano-Convex	60935		1.5"	38.1	3.75"	95.3	0.118"	3.0
Plano-Convex	60884		1.5"	38.1	3.75"	95.3	0.291"	7.4
Plano-Convex	60830		1.5"	38.1	5.0"	127.0	0.118"	3.0
Plano-Convex	60830	LA*	1.5"	38.1	5.0"	127.0	0.118"	3.0
Plano-Convex	61163		1.5"	38.1	5.0"	127.0	0.157"	4.0
Plano-Convex	61163	LA*	1.5"	38.1	5.0"	127.0	0.157"	4.0
Plano-Convex	60770		1.5"	38.1	5.0"	127.0	0.236"	6.0
Plano-Convex	60770	LA*	1.5"	38.1	5.0"	127.0	0.236"	6.0
Plano-Convex	60883		1.5"	38.1	5.0"	127.0	0.291"	7.4
Plano-Convex	60883	LA*	1.5"	38.1	5.0"	127.0	0.291"	7.4
Plano-Convex	60905		1.5"	38.1	5.0"	127.0	0.3"	7.6
Plano-Convex	60905	LA*	1.5"	38.1	5.0"	127.0	0.3"	7.6
Plano-Convex	61001		1.5"	38.1	5.13"	130.3	0.28"	7.11
Plano-Convex	61001	LA*	1.5"	38.1	5.13"	130.3	0.28"	7.11

* LA (Low Absorption) - Black Magic (see page 10)

Plano-Convex Lenses

Focusing Lenses

Optic Type	P/N	LA*	Diameter		Focal Length		Edge Thickness	
			Inch	mm	Inch	mm	Inch	mm
Plano-Convex	60949		1.5"	38.1	7.50"	190.5	0.098"	2.5
Plano-Convex	61164		1.5"	38.1	7.50"	190.5	0.157"	4.0
Plano-Convex	60329	LA*	1.5"	38.1	7.50"	190.5	0.236"	6.0
Plano-Convex	60784		1.5"	38.1	7.50"	190.5	0.236"	6.0
Plano-Convex	60882		1.5"	38.1	7.50"	190.5	0.291"	7.4
Plano-Convex	60882	LA*	1.5"	38.1	7.50"	190.5	0.291"	7.4
Plano-Convex	60906		1.5"	38.1	7.50"	190.5	0.315"	8.0
Plano-Convex	60906	LA*	1.5"	38.1	7.50"	190.5	0.315"	8.0
Plano-Convex	61002		1.5"	38.1	7.63"	193.8	0.315"	8.0
Plano-Convex	61002	LA*	1.5"	38.1	7.63"	193.8	0.315"	8.0
Plano-Convex	61827		1.5"	38.1	15.00"	381.0	0.315"	8.0
Plano-Convex	61003		2.0"	50.8	5.00"	127.0	0.315"	8.0
Plano-Convex	61003	LA*	2.0"	50.8	5.00"	127.0	0.315"	8.0
Plano-Convex	61019		2.0"	50.8	5.00"	127.0	0.378"	9.6
Plano-Convex	61019	LA*	2.0"	50.8	5.00"	127.0	0.378"	9.6
Plano-Convex	61514		2.0"	50.8	5.18"	131.6	0.38"	9.65
Plano-Convex	60950		2.0"	50.8	7.50"	190.5	0.291"	7.4
Plano-Convex	60950	LA*	2.0"	50.8	7.50"	190.5	0.291"	7.4
Plano-Convex	61004		2.0"	50.8	7.50"	190.5	0.315"	8.0
Plano-Convex	61004	LA*	2.0"	50.8	7.50"	190.5	0.315"	8.0
Plano-Convex	60911		2.0"	50.8	7.50"	190.5	0.378"	9.6
Plano-Convex	60911	LA*	2.0"	50.8	7.50"	190.5	0.378"	9.6
Plano-Convex	61405		2.0"	50.8	7.50"	190.5	0.378"	9.6
Plano-Convex	61405	LA*	2.0"	50.8	7.50"	190.5	0.378"	9.6
Plano-Convex	61515		2.0"	50.8	7.63"	193.8	0.38"	9.65

* LA (Low Absorption) - Black Magic (see page 10)

Plano-Convex Lenses

Focusing Lenses

Optic Type	P/N	LA*	Diameter		Focal Length		Edge Thickness	
			Inch	mm	Inch	mm	Inch	mm
Plano-Convex	61432		2.0"	50.8	8.75"	222.3	0.378"	9.6
Plano-Convex	62192		2.0"	50.8	10.00"	254.0	0.311"	7.9
Plano-Convex	61677	LA*	2.0"	50.8	10.00"	254.0	0.390"	9.9
Plano-Convex	62172		2.0"	50.8	15.00"	381.0	0.315"	8.0
Plano-Convex	61565		2.5"	63.5	8.75"	222.3	0.382"	9.7
Plano-Convex	61565	LA*	2.5"	63.5	8.75"	222.3	0.382"	9.7
Plano-Convex	61690		2.5"	63.5	10.00"	254.0	0.390"	9.9
Plano-Convex	61690	LA*	2.5"	63.5	10.00"	254.0	0.390"	9.9

* LA (Low Absorption) - Black Magic (see page 10)

Mounted Lenses

Focusing Lenses

Optic Type	P/N	LA*	Diameter		Focal Length		Edge Thickness	
			Inch	mm	Inch	mm	Inch	mm
Plano-Convex Mounted	65045		1.5"	38.1	3.75"	95.3	0.291"	7.4
Meniscus Mounted	65063		1.5"	38.1	5.0"	127.0	0.287"	7.3
Plano-Convex Mounted	65024		1.5"	38.1	5.0"	127.0	0.300"	7.6
Plano-Convex Mounted	65024	LA*	1.5"	38.1	5.0"	127.0	0.300"	7.6
Meniscus Mounted	65060		1.5"	38.1	7.5"	190.5	0.287"	7.3
Plano-Convex Mounted	65025		1.5"	38.1	7.5"	190.5	0.315"	8.0
Plano-Convex Mounted	65025	LA*	1.5"	38.1	7.5"	190.5	0.315"	8.0
Plano-Convex Mounted	65035		2.0"	50.8	5.0"	127.0	0.378"	9.6
Plano-Convex Mounted	65035	LA*	2.0"	50.8	5.0"	127.0	0.378"	9.6
Meniscus Mounted	6503502		2.0"	50.8	5.0"	127.0	0.378"	9.6
Plano-Convex Mounted	65038		2.0"	50.8	7.5"	190.5	0.378"	9.6
Plano-Convex Mounted	65038	LA*	2.0"	50.8	7.5"	190.5	0.378"	9.6

2" mount for AMADA machines with 1.5" lens

Optic Type	P/N	LA*	Diameter		Focal Length		Edge Thickness	
			Inch	mm	Inch	mm	Inch	mm
Plano-Convex Mounted	65120		1.5"	38.1	5.0"	127.0	0.291"	7.4
Plano-Convex Mounted	65120	LA*	1.5"	38.1	5.0"	127.0	0.291"	7.4
Plano-Convex Mounted	65101		1.5"	38.1	5.0"	127.0	0.300"	7.6
Plano-Convex Mounted	65101	LA*	1.5"	38.1	5.0"	127.0	0.300"	7.6
Plano-Convex Mounted	65121		1.5"	38.1	7.5"	190.5	0.291"	7.4
Plano-Convex Mounted	65121	LA*	1.5"	38.1	7.5"	190.5	0.291"	7.4
Plano-Convex Mounted	65102		1.5"	38.1	7.5"	190.5	0.315"	8.0
Plano-Convex Mounted	65102	LA*	1.5"	38.1	7.5"	190.5	0.315"	8.0

* LA (Low Absorption) - Black Magic (see page 10)

Focusing lenses for AMADA machines

New

Mount with the new focusing lens holder** - no screws and no indium wire

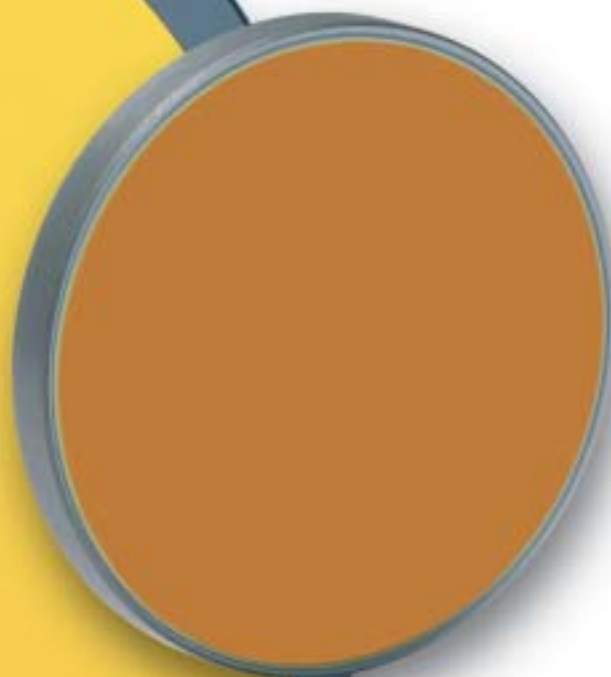
Optic Type	P/N	LA*	Diameter***		Focal Length		Edge Thickness	
			Inch	mm	Inch	mm	Inch	mm
Meniscus Mounted	6514204		1.5"	38.1	5.0"	127.0	0.287"	7.3
Meniscus Mounted	6514204	LA*	1.5"	38.1	5.0"	127.0	0.287"	7.3
Plano-Convex Mounted	6514203		1.5"	38.1	5.0"	127.0	0.291"	7.4
Plano-Convex Mounted	6501403	LA*	1.5"	38.1	5.0"	127.0	0.291"	7.4
Meniscus Mounted	6514202		1.5"	38.1	7.5"	190.5	0.287"	7.3
Meniscus Mounted	6514202	LA*	1.5"	38.1	7.5"	190.5	0.287"	7.3
Plano-Convex Mounted	6514201		1.5"	38.1	7.5"	190.5	0.291"	7.4
Plano-Convex Mounted	6514201	LA*	1.5"	38.1	7.5"	190.5	0.291"	7.4

* LA (Low Absorption) - Black Magic (see page 10)

** Lens holder can be purchased separately (P/N 81027)

*** For a 2" diameter mount please check our website: www.ophiropt.com

Mirrors



Mirrors

Mirrors

Typical Specifications:

Gold Coated Mirrors

Material	Cu
Surface Quality	40-20 scratch and dig
Thickness Tolerance	+0.0-0.1mm
Diameter Tolerance	+0.0-0.1mm
Mechanical Wedge	<3' (arc minutes)
Power	1F @ 0.633 μ m
Irregularity	0.5F @ 0.633 μ m
Phase Shift	0° \pm 1°
Curve S1	Plano
Reflection	98.8%
Absorption	1.2%
AOI	0°-45°

Mirrors

For special mirror applications or other coating types please contact your local Ophir agent - www.ophiropt.com

Mirrors

Typical Specifications:

Si O° Phase Shift Turning Mirror

Material	Si
Surface Quality	20-10 scratch and dig
Thickness Tolerance	±0.25mm
Diameter Tolerance	+0.0-0.12mm
Mechanical Wedge	<3' (arc minutes)
Power	2F @ 0.633μm
Irregularity	1F @ 0.633μm
Phase Shift	0°±2°
Reflection	99.5%
Absorption	0.5%
AOI	45°

Mirrors

For special mirror applications or other coating types please contact your local Ophir agent - www.ophiropt.com

Mirrors

Typical Specifications:

Cu 0° Phase Shift Turning Mirror

Material	Cu
Surface Quality	20-10 scratch and dig
Thickness Tolerance	±0.25mm
Diameter Tolerance	+0.0-0.12mm
Mechanical Wedge	<3' (arc minutes)
Power	1F @ 0.633μm
Irregularity	0.5F @ 0.633μm
Phase Shift	0°±2°
Reflection	99.5%
Absorption	0.5%
AOI	45°

Mirrors

For special mirror applications or other coating types please contact your local Ophir agent - www.ophiropt.com

Si Mirrors - 0° Phase Shift

Optic Type	P/N	Diameter		Edge Thickness		S1 Curve	S1 Reflection	Phase Shift	AOI
		Inch	mm	Inch	mm				
Si Mirror-0° Phase Shift	61047	1.00"	25.4	0.12"	3.05	Plano	>99.5%	0°±2°	45°
Si Mirror-0° Phase Shift	61048	1.00"	25.4	0.16"	4.06	Plano	>99.5%	0°±2°	45°
Si Mirror-0° Phase Shift	61061	1.75"	44.45	0.20"	5.08	Plano	>99.5%	0°±2°	45°
Si Mirror-0° Phase Shift	61062	1.75"	44.45	0.375"	9.52	Plano	>99.5%	0°±2°	45°
Si Mirror-0° Phase Shift	61054	2.00"	50.8	0.20"	5.08	Plano	>99.5%	0°±2°	45°
Si Mirror-0° Phase Shift	61045	2.00"	50.8	0.375"	9.52	Plano	>99.5%	0°±2°	45°
Si Mirror-0° Phase Shift	61811	2.00"	50.8	0.40"	10.16	Plano	>99.5%	0°±2°	45°
Si Mirror-0° Phase Shift	62239	2.67"	68.0	0.80"	20.32	Plano	>98% @ 10.60 >80% @ 0.67	0°±2°	45°
Si Mirror-0° Phase Shift	61784	3.00"	76.2	0.25"	6.35	Plano	>99.5%	0°±2°	45°
Si Mirror-0° Phase Shift	61046	3.00"	76.2	0.375"	9.52	Plano	>99.5%	0°±2°	45°

Mirrors

Cu Mirrors - 0° Phase Shift

Mirrors

Optic Type	P/N	Diameter		Edge Thickness		S1 Curve	S1 Reflection	Phase Shift	AOI
		Inch	mm	Inch	mm				
Cu Mirrors-0° Phase Shift	61050	0.985"	2.05	0.236"	6.00	Plano	>98.8%	0°±1°	45°
Cu Mirrors-0° Phase Shift	61052	1.00"	25.40	0.110"	3.00	Plano	>98.8%	0°±1°	45°
Cu Mirrors-0° Phase Shift	61796	1.10"	28.00	0.236"	6.00	Plano	>99.5%	0°±2°	45°
Cu Mirrors-0° Phase Shift	61118	1.50"	38.10	0.236"	6.00	Plano	>98.8%	0°±1°	45°
Cu Mirrors-0° Phase Shift	61793	1.50"	38.10	0.236"	6.00	150000CC	>99.5%	0°±2°	45°
Cu Mirrors-0° Phase Shift	61408	1.50"	38.10	0.250"	6.35	Plano	>99.5%	0°±2°	45°
Cu Mirrors-0° Phase Shift	61119	1.50"	38.10	0.310"	8.00	Plano	>98.8%	0°±1°	45°
Cu Mirrors-0° Phase Shift	61063	1.75"	44.45	0.200"	5.00	Plano	>98.8%	0°±1°	45°
Cu Mirrors-0° Phase Shift	61798	1.97"	50.00	0.200"	5.00	Plano	>99.5%	0°±2°	45°
Cu Mirrors-0° Phase Shift	61797	1.97"	50.00	0.355"	9.00	Plano	>99.5%	0°±2°	45°
Cu Mirrors-0° Phase Shift	61443	1.97"	50.00	0.375"	9.52	1737CX	>99.5%	0°±2°	45°
Cu Mirrors-0° Phase Shift	61053	1.97"	50.00	0.390"	10.00	Plano	>98.8%	0°±1°	45°
Cu Mirrors-0° Phase Shift	61273	1.97"	50.00	0.390"	10.00	Plano	>99.5%	0°±2°	45°
Cu Mirrors-0° Phase Shift	61388	1.97"	50.00	0.390"	10.00	Plano	>99.8%	0°±2°	45°
Cu Mirrors-0° Phase Shift	61792	1.97"	50.00	0.980"	25.00	Plano	>99.5%	0°±2°	45°
Cu Mirrors-0° Phase Shift	61051	2.00"	50.80	0.200"	5.00	Plano	>98.8%	0°±1°	45°
Cu Mirrors-0° Phase Shift	61120	2.00"	50.80	0.375"	9.52	Plano	>98.8%	0°±1°	45°
Cu Mirrors-0° Phase Shift	61794	2.00"	50.80	2.126"	54.00	Plano	>99.5%	0°±2°	45°
Cu Mirrors-0° Phase Shift	61795	2.25"	57.15	0.394"	10.00	Plano	>98.8%	0°±1°	45°
Cu Mirrors-0° Phase Shift	62243	2.25"	57.15	1.250"	31.75	Plano	>99.5%	0°±2°	45°
Cu Mirrors-0° Phase Shift	61799	2.36"	60.00	0.236"	6.00	Plano	>99.5%	0°±2°	45°
Cu Mirrors-0° Phase Shift	61121	2.36"	60.00	0.394"	10.00	Plano	>98.8%	0°±1°	45°
Cu Mirrors-0° Phase Shift	61389	2.36"	60.00	0.394"	10.00	Plano	>99.8%	0°±2°	45°
Cu Mirrors-0° Phase Shift	61122	2.95"	75.00	0.590"	15.00	Plano	>98.8%	0°±1°	45°
Cu Mirrors-0° Phase Shift	61123	3.00"	76.20	0.250"	6.35	Plano	>98.8%	0°±1°	45°

Cu Mirrors - 0° Phase Shift

Optic Type	P/N	Diameter		Edge Thickness		S1 Curve	S1 Reflection	Phase Shift	AOI
		Inch	mm	Inch	mm				
Cu Mirrors-0° Phase Shift	61124	3.00"	76.20	0.490"	12.70	Plano	>98.8%	0°±1°	45°
Cu Mirrors-0° Phase Shift	61395	3.93"	100.00	0.590"	15.00	Plano	>98.8%	0°±1°	45°
Cu Mirrors-0° Phase Shift	61125	3.93"	100.00	0.780"	20.00	Plano	>98.8%	0°±1°	45°

Mirrors

Mirrors

Typical Specifications:

Si Folding Mirror

Material	Si
Surface Quality	20-10 scratch and dig
Thickness Tolerance	±0.25mm
Diameter Tolerance	+0.0-0.1mm
Mechanical Wedge	<3' (arc minutes)
Power	2F @ 0.633μm
Irregularity	1F @ 0.633μm
Reflection	99.7%
Absorption	0.3%
AOI	45°

Mirrors

For special mirror applications or other coating types please contact your local Ophir agent - www.ophiropt.com

Mirrors

Typical Specifications:

Cu Folding Mirror

Material	Cu
Surface Quality	20-10 scratch and dig
Thickness Tolerance	+0.0-0.2mm
Diameter Tolerance	+0.0-0.1mm
Mechanical Wedge	<3' (arc minutes)
Power	1F @ 0.633 μ m
Irregularity	0.5F @ 0.633 μ m
Reflection	99.7%
Absorption	0.3%
AOI	45°

Mirrors

For special mirror applications or other coating types please contact your local Ophir agent - www.ophiropt.com

Si - Folding Mirrors

Optic Type	P/N	Diameter		Edge Thickness		S1		AOI
		Inch	mm	Inch	mm	Curve	Reflection	
Si Mirror	61268	1.00"	25.4	0.120"	3.05	Plano	>99.7%	45°
Si Mirror	60174	1.00"	25.4	0.118"	3.00	Plano	>99.7%	45°
Si Mirror	60108	1.50"	38.1	0.157"	4.00	Plano	>99.7%	45°
Si Mirror	61269	1.50"	38.1	0.160"	4.06	Plano	>99.7%	45°
Si Mirror	60110	2.00"	50.8	0.169"	5.00	Plano	>99.7%	45°
Si Mirror	61270	2.00"	50.8	0.200"	5.08	Plano	>99.7%	45°
Si Mirror	61271	2.00"	50.8	0.375"	9.52	Plano	>99.7%	45°
Si Mirror	61272	3.00"	76.2	0.375"	9.52	Plano	>99.7%	45°
Si Mirror	61783	3.00"	76.2	0.250"	6.35	Plano	>99.7%	45°

Mirrors

Cu - Folding Mirrors

Optic Type	P/N	Diameter		Edge Thickness		S1		AOI
		Inch	mm	Inch	mm	Curve	Reflection	
Cu Mirror	61388	1.97"	50.00	0.390"	10.00	Plano	>99.7%	45°
Cu Mirror	61275	2.00"	50.00	0.390"	10.00		>99.7%	45°
Cu Mirror	61276	2.00"	50.80	0.200"	5.08	Plano	>99.7%	45°
Cu Mirror	61278	2.00"	50.80	0.375"	9.52	Plano	>99.7%	45°
Cu Mirror	61389	2.36"	60.00	0.390"	10.00	Plano	>99.7%	45°
Cu Mirror	61809	3.00"	76.20	0.500"	12.70	Plano	>99.7%	45°
Cu Mirror	61277	3.00"	76.20	0.500"	12.70	Plano	>99.7%	45°

Mirrors

Cu - Telescopic Mirror

Optic Type	P/N	Diameter		Edge Thickness		S1		AOI
		Inch	mm	Inch	mm	Curve	Reflection	
Cu Telescopic Mirror	61812	1.97"	50.00	0.390"	10.00	2250CX	>99.7%	< 5°
Cu Telescopic Mirror	61813	1.97"	50.00	0.390"	10.00	1000CX	>99.7%	< 5°
Cu Telescopic Mirror	61814	1.97"	50.00	0.390"	10.00	1680CC	>99.7%	< 5°
Cu Telescopic Mirror	61815	1.97"	50.00	0.390"	10.00	2000CX	>99.7%	< 5°
Cu Telescopic Mirror	61816	1.97"	50.00	0.390"	10.00	3000CX	>99.7%	< 5°
Cu Telescopic Mirror	61817	1.97"	50.00	0.390"	10.00	3250CC	>99.7%	< 5°

Mirrors

Mirrors

Typical Specifications:

Si, Cu 90° Phase Retardation

Material	Si, Cu
Surface Quality	20-10 scratch and dig
Thickness Tolerance	+0.0-0.2mm
Diameter Tolerance	+0.0-0.12mm
Mechanical Wedge	< 3' (arc minutes)
Power	2F @ 0.633 μ m
Irregularity	1F @ 0.633 μ m
Phase Shift	90° \pm 3°
Reflection	>98.5%
Absorption	<1.5%
AOI	45°

Mirrors

For special mirror applications or other coating types please contact your local Ophir agent - www.ophiropt.com

Si Mirrors - 90° Phase Retarders

Optic Type	P/N	Diameter		Edge Thickness		S1 Curve	S1 Reflection	Phase Shift	AOI
		Inch	mm	Inch	mm				
Si Mirror-90° Phase Shift	61056	1.00"	25.4	0.120"	3.05	Plano	>98.5%	90°±3°	45°
Si Mirror-90° Phase Shift	61057	1.50"	38.1	0.160"	4.06	Plano	>98.5%	90°±3°	45°
Si Mirror-90° Phase Shift	61055	1.96"	50.0	0.394"	10.00	Plano	>98.5%	90°±3°	45°
Si Mirror-90° Phase Shift	61058	2.00"	50.8	0.200"	5.08	Plano	>98.5%	90°±3°	45°
Si Mirror-90° Phase Shift	61060	2.00"	50.8	0.375"	9.52	Plano	>98.5%	90°±3°	45°
Si Mirror-90° Phase Shift	61822	2.00"	50.8	0.400"	10.16	Plano	>98.5%	90°±3°	45°
Si Mirror-90° Phase Shift	62238	2.67"	68.0	0.800"	20.32	Plano	>98%@10.60 >80%@ 0.67	90°±3°	45°
Si Mirror-90° Phase Shift	61785	3.00"	76.2	0.250"	6.35	Plano	>98.5%	90°±3°	45°
Si Mirror-90° Phase Shift	61208	3.00"	76.2	0.375"	9.52	Plano	>98.5%	90°±3°	45°

Mirrors

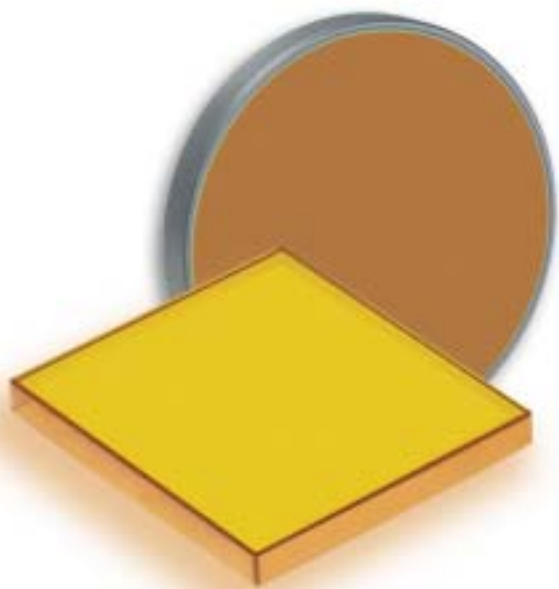
Cu Mirrors - 90° Phase Retarders

Optic Type	P/N	Diameter		Edge Thickness		S1		Phase Shift	AOI
		Inch	mm	Inch	mm	Curve	Reflection		
Cu Mirror-90° phase Shift	61802	1.50"	38.1	0.250"	6.35	Plano	>98.5%	90°±3°	45°
Cu Mirror-90° phase Shift	61409	1.50"	38.1	0.290"	7.50	Plano	>98.5%	90°±3°	45°
Cu Mirror-90° phase Shift	61222	1.96"	50.0	0.394"	10.00	Plano	>98.5%	90°±3°	45°
Cu Mirror-90° phase Shift	61260	2.00"	50.8	0.200"	5.08	Plano	>98.5%	90°±3°	45°
Cu Mirror-90° phase Shift	61831	2.00"	50.8	0.350"	9.00	Plano	>98.5%	90°±3°	45°
Cu Mirror-90° phase Shift	61267	2.00"	50.8	0.375"	9.52	Plano	>98.5%	90°±3°	45°
Cu Mirror-90° phase Shift	61800	2.00"	50.8	0.400"	10.16	Plano	>98.5%	90°±3°	45°
Cu Mirror-90° phase Shift	62281	2.00"	50.8	2.120"	54.00	Plano	>98.5%	90°±3°	45°
Cu Mirror-90° phase Shift	61801	2.25"	57.15	0.394"	10.00	Plano	>98.5%	90°±3°	45°
Cu Mirror-90° phase Shift	62242	2.25"	57.15	1.250"	31.75	Plano	>98.5%	90°±3°	45°
Cu Mirror-90° phase Shift	61384	2.36"	60.0	0.394"	10.00	Plano	>98.5%	90°±3°	45°
Cu Mirror-90° phase Shift	61262	2.95"	75.0	0.394"	10.00	Plano	>98.5%	90°±3°	45°
Cu Mirror-90° phase Shift	61821	2.95"	75.0	0.500"	12.70	Plano	>98.5%	90°±3°	45°
Cu Mirror-90° phase Shift	61264	3.00"	76.2	0.500"	12.70	Plano	>98.5%	90°±3°	45°

Mirrors

Cavity Optics

Cavity Optics



Partial Reflectors

Cavity Optics

Optic Type	P/N	Diameter		Edge Thickness		Reflection S1	Absorption	Surface Radius	
		Inch	mm	Inch	mm			S1CC mm	S2CX mm
Output Coupler 35%	62056	1.75"	44.45	0.25"	6.35	35% ±1.5	<0.10%	20000±200	10000 ±100
Output Coupler 40%	61663	1.5"	38.10	0.23"	6.0	40% ± 2	<0.09%	150000±500	10000 ±500
Output Coupler 40%	61542	1.5"	38.10	0.31"	8.0	40% ± 3	<0.13%	15000±50	7500 ±20
Output Coupler 40%	61883	1.5"	38.10	0.31"	8.0	40% ± 3	<0.13%	40000±2800	20000 ±700
Output Coupler 40%	61887	1.5"	38.10	0.31"	8.0	40% ± 3	<0.13%	50000±4000	25000 ±1000
Output Coupler 50%	61410	1.1"	28.00	0.22"	5.6	50% ± 1	<0.05%	20000±250	15000 ±50
Output Coupler 50%	61381	1.18"	30.00	0.23"	6.0	50% ± 1	<0.05%	30000±30	30000 ±30
Output Coupler 50%	61643	1.18"	30.00	0.23"	6.0	50% ± 1	<0.10%	-100000 ±10000	100000 ±10000
Output Coupler 50%	61884	1.5"	38.10	0.31"	8.0	50% ± 3	<0.13%	40000 ±2800	20000 ±700
Output Coupler 50%	61888	1.5"	38.10	0.31"	8.0	50% ±3	<0.13%	50000 ±4000	25000 ±1000
Output Coupler 60%	61994	1.1"	28.00	0.22"	5.6	60% ±1	<0.08%	10000 ±250	5000 ±250
Output Coupler 60%	61545	1.5"	38.10	0.31"	8.0	60% ±1	<0.13%	35000 ±350	15000 ±50
Output Coupler 65%	61435	1.0"	25.40	0.23"	6.0	65% ±1	<0.08%	30000 ±300	30000 ±300
Output Coupler 65%	61835	1.0"	25.40	0.23"	6.0	65% ±3	<0.10%	30000 ±30	30000 ±30
Output Coupler 70%	61411	1.1"	28.00	0.22"	5.6	70% ±1	<0.05%	-20000±250	20000 ±250
Optic Type	P/N	Diameter	Edge Thickness	Reflection	Absorption	Surface Radius			
		Inch mm	Inch mm			S1CC	S2CX		
Output Coupler 50%	61519	1.0"	25.40	0.23"	6.0	50% ± 1	<0.09%	Plano	Plano
Output Coupler 70%	61546	1.1"	28.00	0.23"	6.0	70% ±3	<0.12%	Plano	Plano

Note: all output couplers coatings are LA coatings (see page 10).

End Mirrors

Typical Specifications:

End Mirrors

Material	Ge
Surface Quality	20-10 scratch and dig
Thickness Tolerance	±0.1mm
Diameter Tolerance	-0.1mm
Mechanical Wedge	<3' (arc minutes)
Power	2F @ 0.633μm
Irregularity	1F @ 0.633μm
Reflection	99.5%
Absorption	≤0.1%
Transmission	0.4±0.1
AOI	0°

End Mirrors

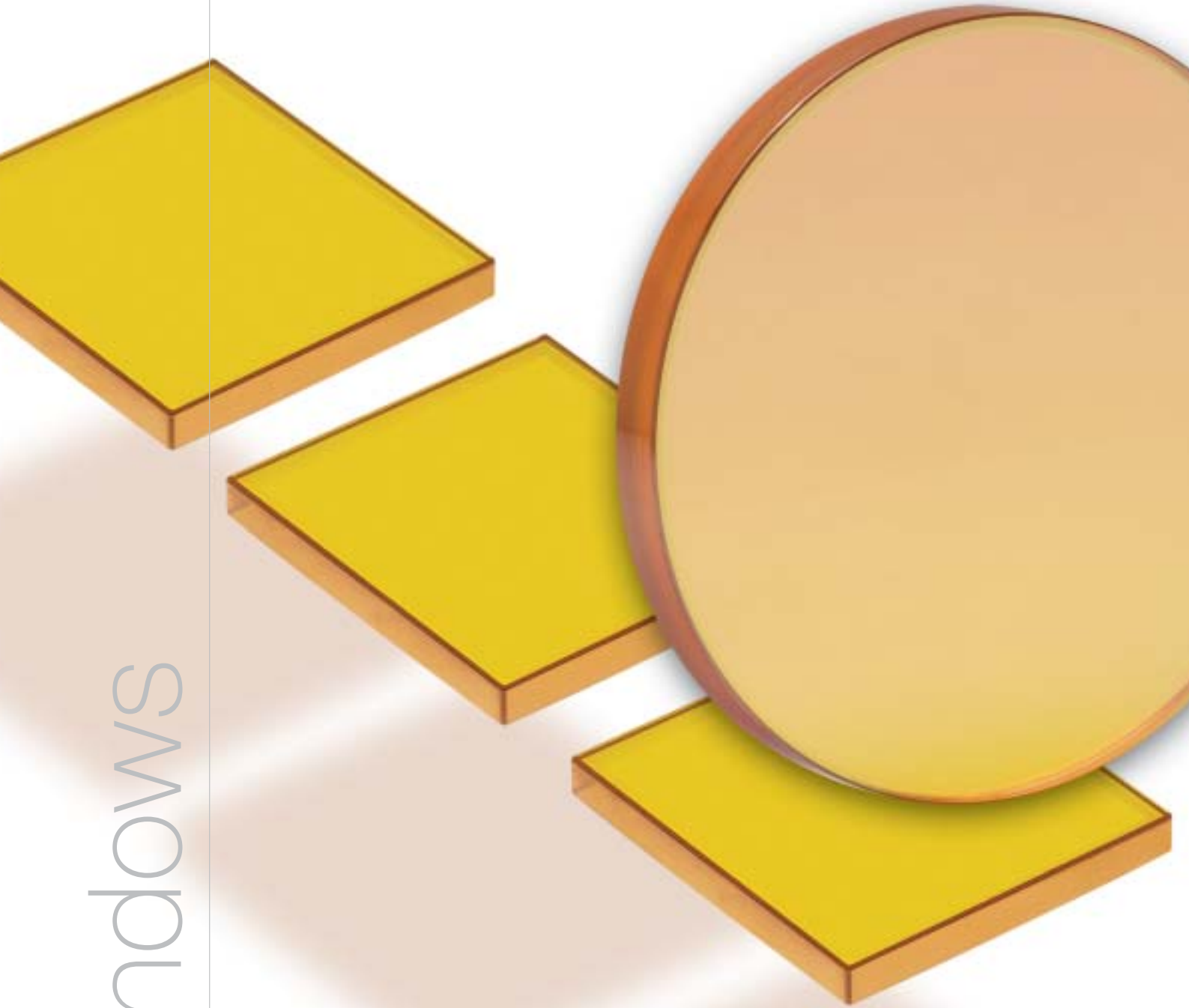
Cavity Optics

Optic Type	P/N	Diameter		Edge Thickness		Reflection S1	Surface Radius	
		Inch	mm	Inch	mm		S1CC mm	S2Plano
End Mirror Ge	61436	1.0"	25.4	0.23"	6.0	99.5%	15000 ±100	-
End Mirror Ge	61382	1.0"	25.4	0.23"	6.0	99.6%	14953.367	-
End Mirror Ge	61518	1.0"	25.4	0.23"	6.0	99.7%	20000	-
End Mirror Ge	61406	1.1"	28.0	0.22"	5.6	99.6%	10000 ±100	-
End Mirror Ge	61407	1.1"	28.0	0.22"	5.6	99.6%	20000 ±250	-
End Mirror Ge	61547	1.1"	28.0	0.23"	6.0	99.5%	20000 ±200	-
End Mirror Ge	61383	1.18"	30.0	0.23"	6.0	99.6%	30000 ±30	-
End Mirror Ge	61543	1.5"	38.1	0.31"	8.0	99.5%	15000 ±50	-

Optic Type P/N	Diameter		Edge Thickness		Reflection	Surface Radius		
	Inch	mm	Inch	mm		S1CC	S2CX	
End mirror Ge	61544	1.5"	38.1	0.31"	8.0	99.5%	35000 ±350	-

Windows

Windows



Windows

Windows

Optic Type	P/N	LA*	Diameter		Edge Thickness		Reflection	Absorption	Transmission
			Inch	mm	Inch	mm			
Window	62205		0.600"	15.0	0.060"	1.500	<0.25%	<0.25%	>99.25%
Window	61786		1.000"	25.4	0.120"	3.048	<0.25%	<0.25%	>99.25%
Window	61787LA	LA*	1.500"	38.1	0.160"	4.046	<0.25%	<0.15%	>99.35%
Window	61787		1.500"	38.1	0.160"	4.046	<0.25%	<0.25%	>99.25%
Window	62294		0.196"	50.0	0.390"	10.100	<0.25%	<0.25%	>99.25%
Window	61788		2.000"	50.8	0.200"	5.080	<0.25%	<0.25%	>99.25%
Window	61789LA	LA*	2.000"	50.8	0.375"	9.520	<0.25%	<0.15%	>99.35%
Window	61789		2.000"	50.8	0.375"	9.520	<0.25%	<0.25%	>99.25%
Window	62292		2.500"	63.5	0.359"	8.890	<0.25%	<0.25%	>99.25%

Optic Type	P/N	LA*	Size		Reflection	Absorption	Transmission
			Inch	mm			
Window	62023LA	LA*	1.456x0.629x0.118	37x16x3	<0.25%	<0.15%	>99.35%

* LA (Low Absorption) - Black Magic (see page 10)

Comet - Laser Power Probe



CW power: Comet 10K- HD - 200W to 10KW,

Ophir now offers the Comet laser power probe that is simple to use, economical but also highly accurate. It operates by measuring the heat rise from a 10 second exposure to a laser beam and thereby calculates the laser power. It has a sophisticated algorithm to take into account the heat loss due to the Comet temperature and thus can give accurate readings even if the Comet is hot before the measurement. This allows you to take several measurements before cooling the probe with water. Along with the Comet 10K for industrial lasers which measures mainly from 1KW to 10KW, Ophir offers the smaller Comet 1K for measuring from ~50W up to 1KW.

Power measurement range	200W to 10,000W
Spectral range	CO ₂
Absolute calibration accuracy at calibrated wavelengths	±5%
Repeatability	±1% for same initial temperature
Linearity with power	±2 % from 1KW to 10KW
Dimensions Absorber:	ø 95mm dia x 70mm thick.
Length:	340mm
Weight	1.1Kg

Item	Description	P/N
Comet 10K HD	Hand held power probe for 200-10,000W with beam spreading cone in center for high damage threshold	1Z02703

Ophir manufactures a complete line of laser power & energy power meters from nW/nJ to KW/hundreds of Jules. For further information, please refer Ophir's Laser measurement catalog or visit our website www.ophiropt.com

Comet - HD

Ophir CO₂ Optics Handling and Cleaning

Optics Cleaning

- Coated surfaces should never be touched. Always hold the optic by its sides.
- Bear hands might leave oils and dirt which will damage the optics' performance. Always wear powder-free finger coats or latex gloves when handling the optics.
- Do not use any tools or sharp objects when handling the optic or when removing it from its packaging.
- Make sure the work surface is free of oils, grease, dirt etc.
- Optic elements are easily scratched when placed on hard surfaces. After unpacked place the optic on the lens tissue into which it was originally wrapped and place it on a soft cloth or on the foam in the package.

All new optic elements were cleaned and packaged in a clean and controlled environment at Ophir and should be ready to install in the laser machine. If newly unpacked optics does not appear to be clean or seems to have a defect please contact your Ophir agent.

Cleaning Methods (using Ophir's cleaning kit):

Method A:

Condition of Lens: dust or small loose particles on the surface.

Cleaning Method:

1. Use a small air bulb to gently blow off debris. Do not use compressed air from a compressor as it is not a "clean" source of air and can contaminate the surface.
2. Gently place the provided optical-grade rice paper on the optics. Slightly wet the paper with drops of Acetone or Propyl Alcohol/Ethanol (reagent grade) using a pipette and start pulling the paper toward the dry side away from the optic until there is no contact.

If not successful proceed to cleaning method B.

Method B:

Condition of Lens: fingerprints, oil, other visual contaminants.

Cleaning Method:

1. Use new clean cotton ball or cotton swab.
2. Dampen cotton with Acetone or Propyl Alcohol/Ethanol (reagent grade). The cotton must not be dry.
3. Slowly and gently wipe the lens in a regular pattern. Do not scrub the surface (scrubbing might damage the coating or the lens itself). Gently wipe the optic in an "S" motion.
4. If the surface is left with wipe marks wipe it at a slower rate. There should be no streaks when you are finished.

Method C: Aggressive Cleaning

Attention: This method is to be used only after trying methods A and B.

Condition of lens: Deteriorated performance and severe signs of contamination.

The aggressive cleaning will usually be needed due to heavy usage of the lens. However, certain types of contamination can not be removed and require replacing the optics.

Cleaning method:

1. This method might erode the surface of the optics. If a change of surface color is noticeable stop polishing immediately.
 - Use a new clean cotton ball or cotton swab.
 - Dampen cotton with polishing compound (about 5 drops).
 - Gently and briefly wipe optics in "S" motion. Avoid pressing down the cotton or scrubbing the surface.
2.
 - Wet a new cotton ball with distilled water
 - Gently yet thoroughly swab the surface (do not allow it to dry).
3. Repeat step 2 using Propanol.

4. Repeat step 2 using Acetone in order to remove any remaining Propanol and polish residue.
5. Examine the surface under light in front of black background. Remove remaining residue by repeating steps 2-4.

Black Magic™ Duralens™ Handling and Cleaning Instructions

The Black Magic™ should be treated with the same care and by the same methods as the standard AR coated CO₂ Optics.

The Black Magic™ Duralens™ should be cleaned and maintained at regular intervals according to the methods explained above in order to ensure it provides the desired performance and for its longer life (when properly maintained, in most applications, the Black Magic™ coating has twice the lifetime of the standard AR coated lens).