



Laser Reflective Mirrors, Output Couplers & Beam Splitters

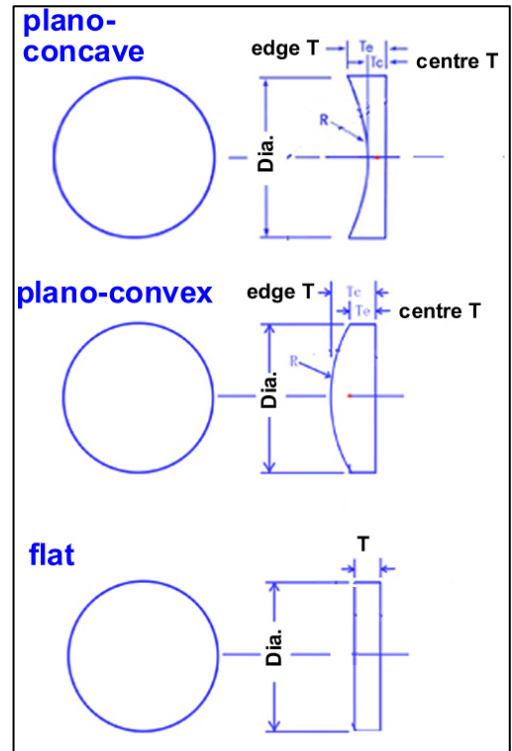
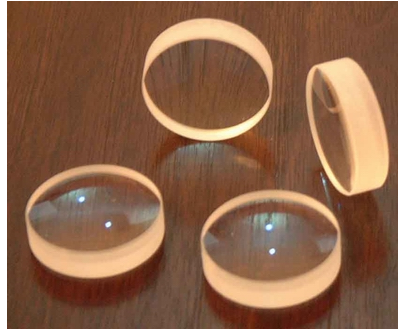
Name	Description	Remark
532nm output coupler	φ10x3mm, R=50mm	Plano-concave, HR1064nm, HT532nm
	φ10x3mm, R=65mm	Plano-concave, HR1064nm, HT532nm
	φ10x3mm, R=100mm	Plano-concave, HR1064nm, HT532nm
	φ20x5mm, flat-flat mirror	S1: HR1064nm, HT532nm S2: HT532nm
532nm beam splitter & reflective mirror	φ40x3mm, R=10%	
	φ40x3mm, R=13%	
	φ40x3mm, R=15%	
	φ40x3mm, R=20%	
	φ40x3mm, R=30%	
	φ40x3mm, R=33%	
	φ40x3mm, R=50%	
	φ40x3mm, R=100%	
	φ50x3mm, R=10%	
	φ50x3mm, R=13%	
	φ50x3mm, R=15%	
	φ50x3mm, R=20%	
	φ50x3mm, R=30%	
	φ50x3mm, R=33%	
φ50x3mm, R=50%		
1064nm beam splitter & reflective mirror	φ40x3mm, R=10%	
	φ40x3mm, R=13%	
	φ40x3mm, R=15%	
	φ40x3mm, R=20%	
	φ40x3mm, R=30%	
	φ40x3mm, R=33%	
	φ40x3mm, R=50%	
	φ40x3mm, R=100%	
	φ50x3mm, R=10%	
	φ50x3mm, R=13%	
	φ50x3mm, R=15%	
	φ50x3mm, R=20%	
	φ50x3mm, R=30%	
	φ50x3mm, R=33%	
φ50x3mm, R=50%		
φ50x3mm, R=100%		

说明:

1. Regarding φ50x3mm, 50 means diameter, 3 means thickness, unit is mm.
2. Regarding R=10%, R means reflectivity and unit is %.
3. Regarding T=10%, T means transmittance and unit is %.
4. Regarding R=50mm, R means radius of curvature and unit is mm.
5. HR1064nm means high reflectivity at 1064nm (>98%).
6. HT532nm means high transmittance at 532nm (>98%).
7. Plano-concave means that one surface is flat and another surface is concave.

Reflective Mirror and Output Coupler at 1064nm

Material BK7
 Diameter tolerance -0.1mm
 Thickness tolerance 0.1mm
 Aperture >90%
 Flatness $\lambda/4-\lambda$
 Dig/scratch 60-40



Part Number Description:

LM-1064-D-T-R-A-%-yy

LM: laser mirror. R>99.5%.

1064: laser wavelength in nm.

D: mirror diameter in mm. If rectangular, it is AxB.

T: thickness in mm.

R: radius of curvature in mm. It is flat mirror if there is no this number. It is plano-convex if it is minus.

A: incidence angle, degree. It is normal incidence if there is no this number.

%: transmittance of output coupler.

yy: other marks.

Part number	Name	Wavelength	Dia.	Thickness	Remark
LM-1064-D20-T5	Mirror	1064nm	20mm	5mm	0°, flat
LM-1064-D20-T3-A45	Mirror	1064nm	20mm	3mm	45°, flat
LM-1064-D20-T5-A45	Mirror	1064nm	20mm	5mm	45°, flat
LM-1064-D25.4-T3-A45	Mirror	1064nm	25.4mm	3mm	45°, flat
LM-1064-D30-T5-A45	Mirror	1064nm	30mm	5mm	45°, flat
LM-1064-D40-T5-A45	Mirror	1064nm	40mm	5mm	45°, flat
LM-1064-D50-T5-A45	Mirror	1064nm	50mm	5mm	45°, flat
LM-1064-D20-T5-R500	Mirror	1064nm	20mm	5mm	0°, plano-concave, R500mm
LM-1064-D20-T5-R1500	Mirror	1064nm	20mm	5mm	0°, plano-concave, R1.5m
LM-1064-D20-T5-R2000	Mirror	1064nm	20mm	5mm	0°, plano-concave, R2m
LM-1064-D25.4-T3-A45	Mirror	1064nm	25.4mm	3mm	45°, flat
LM-1064-54x38-T5-A45-XD	Mirror	1064nm	54x38	5mm	45°, octagon
LM-1064-D20-T5-10%	Coupler	1064nm	20mm	5mm	0°, flat, T=10%
LM-1064-D20-T5-R250-10%	Coupler	1064nm	20mm	5mm	0°, plano-concave, R25cm, T=10%
LM-1064-D20-T5-15%	Coupler	1064nm	20mm	5mm	0°, flat, T=15%
LM-1064-D20-T5-20%	Coupler	1064nm	20mm	5mm	0°, flat, T=20%
LM-1064-D20-T5-R2000-20%	Coupler	1064nm	20mm	5mm	0°, plano-concave, R2M, T=20%
LM-1064-D20-T5-40%	Coupler	1064nm	20mm	5mm	0°, flat, T=40%
LM-1064-D20-T5-50%	Coupler	1064nm	20mm	5mm	0°, flat, T=50%
LM-1064-D20-T5-70%	Coupler	1064nm	20mm	5mm	0°, flat, T=70%
LM-1064-D20-T5-80%	Coupler	1064nm	20mm	5mm	0°, flat, T=80%

There are too many items and models and welcome to call us or send us an email if you have any further enquiry or question!

Resonator Mirrors of Diode End-pumped Lasers

Part Number	Name	Dia.	thk	Remark
LM-DPSS-D20-T5-HT808-HR1064	Rear mirror	20mm	5mm	0°, flat, HT@808nm, HR@1064nm
LM-DPSS-D10-T3-HT808-HR1064	Rear mirror	10mm	3mm	0°, flat, HT@808nm, HR@1064nm

Remark: The output couplers at 1064nm can be used as the output coupler in the diode end-pumped lasers.

Resonator Mirrors of SHG Lasers

Part Number	Name	Dia.	thk	Remark
LM-SHG-D20-T5-HR1064-HR532	Rear mirror	20mm	5mm	0°, flat, HR@1064nm & 532nm
LM-SHG-D20-T5-HR1064-HT532	Output coupler	20mm	5mm	0°, flat, HR@1064nm & HT@532nm

Protective Window

Part Number	Name	Dia.	thk	Remark
LW-532-D70-T4.1-BX-1	Protective window	70mm	4.1mm	0°, PL/PL AR/AR@532nm
LW-1060/1080-D50-T2-H-BX-1	Protective window	50mm	2mm	0°, PL/PL AR/AR@1060-1080nm
LW-1060/1080-D55-T2-H-BX-1	Protective window	50mm	2mm	0°, PL/PL AR/AR@1060-1080nm

Si Mirrors

Silicon mirrors in a huge range of sizes are available, with a selection of different coatings to suite you application.

- Advanced manufacturing methods
- Latest ultra-low absorption coatings
- Highest quality substrates

Part No.	M	Dia mm	ET mm	A deg	T %	R %	S2 ROC m	Coating
LM-SI-5.9SIS4-03	Si	15	4	45	3	99.93	3	SuperMax
LM-SI-7.5SID2-00	Si	19	2	45	0	99	flat	SiDual
LM-SI-7.5SIS3-00	Si	19	3	45	0	99.93	flat	SuperMax
LM-SI-7.5SIS3-05	Si	19	3	45	0	99.93	5	SuperMax
LM-SI-7.5SIS3-07	Si	19	3	45	0	99.93	7	SuperMax
LM-SI-7.5SIS4-05	Si	19	4	45	0	99.93	5	SuperMax
LM-SI-7.5SIS5-075	Si	19	5	45	0	99.93	0.75	SuperMax
LM-SI-10SIF3-00	Si	25.4	3	45	0	99	flat	PFM
LM-SI-10SIF5-00	Si	25.4	5	45	0	99	flat	PFM
LM-SI-10SIS3-00	Si	25.4	3	45	0	99.93	flat	SuperMax
LM-SI-10SIS3-05	Si	25.4	3	45	0	99.93	5	SuperMax
LM-SI-10SIS3-10	Si	25.4	3	45	0	99.93	10	SuperMax
LM-SI-10SIS4-00	Si	25.4	4	45	0	99.93	flat	SuperMax
LM-SI-10SIS5-00	Si	25.4	5	45	0	99.93	flat	SuperMax
LM-SI-11SIS3-00	Si	28	3	45	0	99.93	flat	SuperMax
LM-SI-11SIS6-00	Si	28	6	45	0	99.93	flat	SuperMax
LM-SI-15SIS6.3-07	Si	38.05	6.3	45	0	99.93	7	SuperMax
LM-SI-15SIS6.3-7M	Si	38.05	6.3	45	0	99.93	7.5	SuperMax
LM-SI-15SIS6-00	Si	38.05	6	45	0	99.93	flat	SuperMax
LM-SI-15SIS9.5-00	Si	38.05	9.5	45	0	99.93	flat	SuperMax
LM-SI-15SIS9.7-00	Si	38.05	9.7	45	0	99.93	flat	SuperMax
LM-SI-15SID-00	Si	38.05	4	45	0	99	flat	SiDual
LM-SI-15SIF4-00	Si	38.05	4	45	0	99	flat	PFM
LM-SI-15SIS4-10CC	Si	38.05	4	45	0	99.93	10	SuperMax
LM-SI-15SIS5-00	Si	38.05	5	45	0	99.93	flat	SuperMax
LM-SI-15SIS6.3-00	Si	38.1	6.3	45	0	99.93	flat	SuperMax
LM-SI-15SIS6.6-00	Si	38.1	6.6	45	0	99.93	flat	SuperMax
LM-SI-16.1SIS5-00	Si	41	5	45	0	99.93	flat	SuperMax
LM-SI-17.5SIS9.5-00	Si	44.45	9.5	45	0	99.93	flat	SuperMax
LM-SI-17.5SIS9-00	Si	44.5	9	45	0	99.93	flat	SuperMax
LM-SI-17.5SIS4-00	Si	44.5	4	45	0	99.93	flat	SuperMax
LM-SI-19.7SIS10-00	Si	50	10	45	0	98.6	flat	SuperMax
LM-SI-19.7SIS5-00	Si	50	5	45	0	98.6	flat	SuperMax
LM-SI-20SIF10-00	Si	50.8	10	45	0	99	flat	PFM
LM-SI-20SIS10-00	Si	50.8	10.2	45	0	99.93	flat	SuperMax
LM-SI-20SIS10-00MA	Si	50.8	10	45	0	99.93	flat	SuperMax
LM-SI-20SIS5-00	Si	50.8	5.1	45	0	99.93	flat	SuperMax
LM-SI-20SIS9.5-00	Si	50.8	9.5	45	0	99.93	flat	SuperMax
LM-SI-26.8SIS20-00M	Si	68	20	45	0	99.93	flat	SuperMax
LM-SI-30SIS6.35-00	Si	76.2	6.35	45	0	99.93	flat	SuperMax
LM-SI-30SMA12.7-00	Cu	76.2	12.7	45	0	98.6	flat	SuperMax

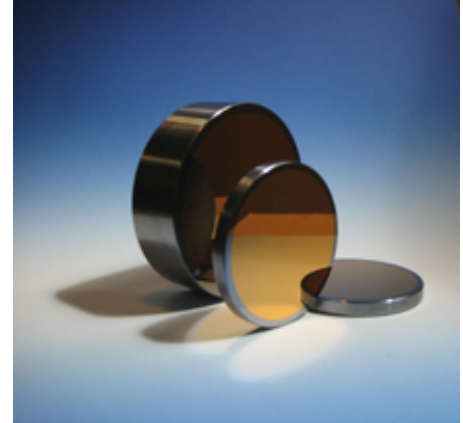
Remark: M: material; A(deg): angle of incidence; ET: edge thickness; T(%): transmission; R (%): reflectance; ROC: radius of curvature.

Turning Mirrors, Silicon

These turning mirrors are used in CO2 laser beam delivery systems. Silicon is the most commonly used mirror substrate due to its good "figure of merit" properties. We offer them with a variety of metal and dielectric coatings.

- TMS-EM Turning Mirrors Enhanced Metal for CO2 10.6 μm Reflectance coating
- 45° Angle Of Incidence
- Coated: Reflectance > 99.6% average @ 10.6 μm
- Absorption: < .30% @ 10.6 μm

Model Number	Diameter	Thickness
LM-SI-TMS-0512-EM	0.500"	0.120"
LM-SI-TMS-0712-EM	0.750"	0.120"
LM-SI-TMS-0912-EM	0.875"	0.120"
LM-SI-TMS-1012-EM	1.000"	0.120"
LM-SI-TMS-1112-EM	1.100"	0.120"
LM-SI-TMS-1512-EM	1.500"	0.120"
LM-SI-TMS-1516-EM	1.500"	0.160"
LM-SI-TMS-1816-EM	1.750"	0.160"
LM-SI-TMS-2020-EM	2.000"	0.200"
LM-SI-TMS-2525-EM	2.500"	0.250"
LM-SI-TMS-3025-EM	3.000"	0.250"
LM-SI-TMS-4035-EM	4.000"	0.350"



Turning Mirrors, Silicon Dual-Band Reflector for CO2 + Red Laser Diode Reflectance

- TMS-DBMR Turning Mirrors Silicon with Dual Band Max Reflectance coating
- Coated: Reflectance > 99.7% average @ 10.6 μm
- Reflectance: > 85% average for .633 μm and 650 nm
- 45° Angle Of Incidence
- Absorption: < 0.30% @ 10.6 μm

Model Number	Diameter	Thickness
LM-SI-TMS-0512-DBMR	0.500"	0.120"
LM-SI-TMS-0712-DBMR	0.750"	0.120"
LM-SI-TMS-0912-DBMR	0.875"	0.120"
LM-SI-TMS-1012-DBMR	1.000"	0.120"
LM-SI-TMS-1112-DBMR	1.100"	0.120"
LM-SI-TMS-1512-DBMR	1.500"	0.120"
LM-SI-TMS-1516-DBMR	1.500"	0.160"
LM-SI-TMS-1816-DBMR	1.750"	0.160"
LM-SI-TMS-2020-DBMR	2.000"	0.200"
LM-SI-TMS-2525-DBMR	2.500"	0.250"
LM-SI-TMS-3025-DBMR	3.000"	0.250"
LM-SI-TMS-4035-DBMR	4.000"	0.350"

Phase Retardation Reflectors : Silicon for CO2 Lasers and 10.6 μm

These mirrors create a 90° Phase Shift with the aid of specially constructed thin film coating layers applied to the surface, when hit with a linear polarized beam at 45° to the plane of incidence. Commonly called Phase Shifters, Polarizers, or Circular Polarizing Mirrors, they transform the incoming beam into a circular polarized state. They typically are only used external to the laser cavity as a beam delivery mirror. These operate only with a true 10.6 μm laser wavelength and will not work at other wavelengths such as 9.2 or 9.6 μm without special modifications to the thin film coating design. We offer non-standard wavelength Phase Retardation Reflectors at these other wavelengths as custom parts.

- Phase Shift: 90° \pm 3.0° between p and s polarization for 10.6 μm operation only @ 45° Angle Of Incidence
- Reflectance: > 99.0% average @ 10.6 μm
- Absorption: < 0.40% @ 10.6 μm

- Coating optimized to create 90° phase shift from a linear polarized beam. Used in beam delivery systems where cutting circles in materials is required.

Part Number	Diameter	Thickness
LM-SI-PRRS-0712-90	0.750"	0.120"
LM-SI-PRRS-1012-90	1.000"	0.120"
LM-SI-PRRS-1112-90	1.100"	0.120"
LM-SI-PRRS-1516-90	1.500"	0.160"
LM-SI-PRRS-1816-90	1.75	0.160"
LM-SI-PRRS-2020-90	2.000"	0.200"
LM-SI-PRRMS-5010-90	50 mm	10 mm
LM-SI-PRRS-2038-90	2.000"	0.375"
LM-SI-PRRS-2525-90	2.500"	0.250"
LM-SI-PRRS-3025-90	3.000"	0.250"
LM-SI-PRRS-3050-90	3.000"	0.500"
LM-SI-PRRMS-7515-90	75 mm	15 mm

Zero Phase Reflectors: Silicon for CO2 Lasers and 10.6µm

- Phase Shift: <2.0° between p and s polarization for 10.6µm operation only @ 45° Angle Of Incidence
- Reflectance: > 99.6% average @ 10.6µm
- Absorption: < 0.40% @ 10.6µm
- Coating optimized to maintain low phase shift in beam delivery systems where a 90° phase retarder exists to maintain the circular polarization.

Model Number	Diameter	Thickness
LM-SI-ZPRS-0712-0	0.750"	0.120"
LM-SI-ZPRS-1012-0	1.000"	0.120"
LM-SI-ZPRS-1112-0	1.100"	0.120"
LM-SI-ZPRS-1516-0	1.500"	0.160"
LM-SI-ZPRS-1816-0	1.750"	0.160"
LM-SI-ZPRS-2020-0	2.000"	0.200"
LM-SI-ZPR-50-5-10-0	50 mm	10 mm
LM-SI-ZPRS-2038-0	2.000"	0.375"
LM-SI-ZPRS-2525-0	2.500"	0.250"
LM-SI-ZPRS-3025-0	3.000"	0.250"
LM-SI-ZPRS-3050-0	3.000"	0.500"
LM-SI-ZPR-75-5-15-0	75 mm	15 mm
LM-SI-ZPRS-4035-0	4.000"	0.350"

Total Reflectors: Silicon Concave for CO2 Lasers and 10.6µm

- Turning Mirrors Silicon with Dual Band Max Reflectance coating
- Coated: Reflectance > 99.6% average @ 10.6 µm
- Operation at normal incidence (0°)
- Reflectance: > 85% average for 633 nm and 650 nm
- Absorption: < 0.30% @ 10.6 µm
- Clear Aperture: 90% of diameter

Model Number	Diameter	Thickness	Concave Radius (meters)
LM-SI-TRCCS-0512-2-EM	0.500"	0.120"	2 meter
LM-SI-TRCCS-0512-3-EM	0.500"	0.120"	3 meter
LM-SI-TRCCS-0512-5-EM	0.500"	0.120"	5 meter
LM-SI-TRCCS-0512-7.5-EM	0.500"	0.120"	7.5 meter
LM-SI-TRCCS-0512-10-EM	0.500"	0.120"	10 meter
LM-SI-TRCCS-0712-2-EM	0.750"	0.120"	2 meter
LM-SI-TRCCS-0712-3-EM	0.750"	0.120"	3 meter
LM-SI-TRCCS-0712-5-EM	0.750"	0.120"	5 meter
LM-SI-TRCCS-0712-6-EM	0.750"	0.120"	6 meter
LM-SI-TRCCS-0712-7.5-EM	0.750"	0.120"	7.5 meter
LM-SI-TRCCS-0712-10-EM	0.750"	0.120"	10 meter

LM-SI-TRCCS-1012-2-EM	1.00"	0.120"	2 meter
LM-SI-TRCCS-1012-3-EM	1.00"	0.120"	3 meter
LM-SI-TRCCS-1012-5-EM	1.00"	0.120"	5 meter
LM-SI-TRCCS-1012-7.5-EM	1.00"	0.120"	7.5 meter
LM-SI-TRCCS-1012-10-EM	1.00"	0.120"	10 meter
LM-SI-TRCCS-1012-20-EM	1.00"	0.120"	20 meter
LM-SI-TRCCS-1112-2-EM	1.10"	0.120"	2 meter
LM-SI-TRCCS-1112-3-EM	1.10"	0.120"	3 meter
LM-SI-TRCCS-1112-5-EM	1.10"	0.120"	5 meter
LM-SI-TRCCS-1112-7.5-EM	1.10"	0.120"	7.5 meter
LM-SI-TRCCS-1112-10-EM	1.10"	0.120"	10 meter
LM-SI-TRCCS-1112-20-EM	1.10"	0.120"	20 meter
LM-SI-TRCCS-1516-2-EM	1.50"	0.160"	2 meter
LM-SI-TRCCS-1516-3-EM	1.50"	0.160"	3 meter
LM-SI-TRCCS-1516-5-EM	1.50"	0.160"	5 meter
LM-SI-TRCCS-1516-7.5-EM	1.50"	0.160"	7.5 meter
LM-SI-TRCCS-1516-10-EM	1.50"	0.160"	10 meter
LM-SI-TRCCS-1516-20-EM	1.50"	0.160"	20 meter
LM-SI-TRCCS-2020-2-EM	2.00"	0.200"	2 meter
LM-SI-TRCCS-2020-3-EM	2.00"	0.200"	3 meter
LM-SI-TRCCS-2020-5-EM	2.00"	0.200"	5 meter
LM-SI-TRCCS-2020-7.5-EM	2.00"	0.200"	7.5 meter
LM-SI-TRCCS-2020-10-EM	2.00"	0.200"	10 meter
LM-SI-TRCCS-2020-20-EM	2.00"	0.200"	20 meter

Cu Mirrors

Copper mirrors in a huge range of sizes are available, with a selection of different coatings to suite you application.

- Advanced manufacturing methods
- Latest ultra-low absorption coatings
- Highest quality substrates



Part No.	M	Dia mm	ET mm	A deg	T %	R %	S2 ROC m	Coating
LM-CU-11SMA6-00	Cu	28	6	45	0	99.93	flat	SuperMax
LM-CU-15NCA8-00	Cu	38	8	45	0	99.93	flat	NiCu
LM-CU-15NCW15-00	Cu	38	15	45	0	98.6	flat	NiCu
LM-CU-D38-T10-A45	Cu	38	10	45	0	98.6	flat	NiCu
LM-CU-15NCA10-00	Cu	38	6	45	0	98.6	flat	NiCu
LM-CU-15NCA6-00	Cu	38	6	45	0	98.6	flat	SuperMax
LM-CU-15SMA6-00	Cu	38	6	45	0	99.93	flat	SuperMax
LM-CU-15SMA6-15	Cu	38.05	6	45	0	99.93	15	SuperMax
LM-CU-19.7NCA10-00	Cu	50	10	45	0	98.6	flat	NiCu
LM-CU-19.7NCW25-00	Cu	50	25	45	0	98.6	flat	NiCu
LM-CU-19.7SMA10-1000CX	Cu	50	6	45	0	98.6	flat	SuperMax
LM-CU-19.7SMA5-00	Cu	50	5	45	0	98.6	flat	SuperMax
LM-CU-19.7SMA9-00	Cu	50	9	45	0	98.6	flat	SuperMax
LM-CU-20NCA5-00	Cu	50.8	5	45	0	98.6	flat	NiCu
LM-CU-20SMA5-00	Cu	50.8	5	45	0	98.6	flat	SuperMax
LM-CU-23.6NCA10-00	Cu	60	10	45	0	98.6	flat	NiCu
LM-CU-23.6SMA6-00	Cu	60	6	45	0	98.6	flat	SuperMax
LM-CU-29.5NCA15-00	Cu	75	15	45	0	98.6	flat	NiCu
LM-CU-29.5NCW25-00	Cu	75	25	45	0	98.6	flat	NiCu
LM-CU-29.5SMA17-00	Cu	75	17	45	0	98.6	flat	SuperMax

Remark: M: material; A(deg): angle of incidence; ET: edge thickness; T(%): transmission; R (%): reflectance; ROC: radius of curvature.

Gold-coated Reflectors: Glass Substrate

Model	Description	Wavelength	Dia	Thk	
LM-10.6-D20-T3	CO2 laser mirror, glass substrate	10.6um	20mm	3mm	Gold coating, flat
LM-10.6-D25-T3	CO2 laser mirror, glass substrate	10.6um	25mm	3mm	Gold coating, flat

Other dimension mirrors available upon request.

Mo Mirrors

Molybdenum mirrors in a huge range of sizes are available, with a selection of different coatings to suite you application.

- Advanced manufacturing methods
- Latest ultra-low absorption coatings
- Highest quality substrates



Part No.	M	Dia mm	ET mm	A deg	T %	R %	S2 ROC m	Coating
LM-MO-5.9MO2-00	Mo	15	2	0	0	98.5	flat	Uncoated
LM-MO-15MO6-00	Mo	38	6	45	0	98.5	flat	Uncoated
LM-MO-17.5MO8-00	Mo	44.5	8	45	0	98.5	flat	Uncoated
LM-MO-19.7MO2-00	Mo	50	2	45	0	98.5	flat	Uncoated
LM-MO-19.7MO3-00	Mo	50	3	45	0	98.5	flat	Uncoated
LM-MO-19.7MO5-14	Mo	50	5	45	0	98.5	flat	Uncoated
LM-MO-19.7MO6-00	Mo	50	6	45	0	98.5	flat	Uncoated
LM-MO-20MO5-00	Mo	50.8	5.1	45	0	98.5	flat	Uncoated
LM-MO-23.6MO10-00	Mo	60	10	45	0	98.5	flat	Uncoated
LM-MO-29.5MO15-00	Mo	75	15	45	0	98.5	flat	Uncoated

Remark: M: material; A(deg): angle of incidence; ET: edge thickness; T(%): transmission; R (%): reflectance; ROC: radius of curvature.

Metal Mirrors, Molybdenum for CO₂ Lasers and 10.6μm

- Uncoated
- Phase Shift: <math><2.0^\circ</math> between P and S polarization
- for 10.6μm operation only @ 45° Angle Of Incidence
- Reflectance: > 98.0% average @ 10.6μm

Model Number	Diameter	Thickness
LM-MO-MM-1012-UC	1.000"	0.120"
LM-MO-MM-1516-UC	1.500"	0.160"
LM-MO-MM-1525-UC	1.500"	0.250"
LM-MO-MM-2020-UC	2.000"	0.200"
LM-MO-MM-2038-UC	2.000"	0.380"
LM-MO-MM-3025-UC	3.000"	0.250"
LM-MO-MM-3050-UC	3.000"	0.500"

CO2 Laser 10.6um Flat Partial Reflectors (Output Couplers)

ZnSe partial reflectors can be fabricated in any diameter from 4.0mm up to 250mm, and in thicknesses from 1.0mm up to 50mm. They differ from beam splitters in that the coatings are designed for normal incidence.

- Many types available
- OEM equivalents for your laser cavity in stock
- Coatings from our Coating Services

Part No.	Material	Dia mm	ET mm	A deg	T %	R %	Coating
LM-10.6-10ZPF3-17-N	ZnSe	25.4	3	0	83	17	AR/17%
LM-10.6-10ZPF3-40-N	ZnSe	25.4	3	0	60	40	AR/40%
LM-10.6-10ZPF3-50-N	ZnSe	25.4	3	0	50	50	AR/50%
LM-10.6-10ZPF3-60-N	ZnSe	25.4	3	0	40	60	AR/60%
LM-10.6-10ZPF3-65-N	ZnSe	25.4	3	0	35	65	AR/65%
LM-10.6-10ZPF3-70-N	ZnSe	25.4	3	0	30	70	AR/70%
LM-10.6-10ZPF3-75-N	ZnSe	25.4	3	0	25	75	AR/75%
LM-10.6-10ZPF3-80-N	ZnSe	25.4	3	0	20	80	AR/80%
LM-10.6-10ZPF3-85-N	ZnSe	25.4	3	0	15	85	AR/85%
LM-10.6-10ZPF3-90-N	ZnSe	25.4	3	0	10	90	AR/90%
LM-10.6-10ZPF3-95-N	ZnSe	25.4	3	0	5	95	AR/95%
LM-10.6-10ZPF3-99-N	ZnSe	25.4	3	0	1	99	AR/99%
LM-10.6-10ZPF3-99-R	ZnSe	25.4	3	45	1	99	AR/99%-45R
LM-10.6-10ZPF4-85-N	ZnSe	25.4	4	0	15	85	AR/85%
LM-10.6-10ZPF6-50-N	ZnSe	25.4	6	0	50	50	AR/50%
LM-10.6-10ZPF6-60-N	ZnSe	25.4	6	0	40	60	AR/60%
LM-10.6-10ZPF6-65-N	ZnSe	25.4	6	0	35	65	AR/65%
LM-10.6-11GPF458679	GaAs	28	3	0	35	65	AR/65%
LM-10.6-11ZPF3-27-N	ZnSe	28	3.1	0	73	27	AR/27%
LM-10.6-11ZPF3-50-N	ZnSe	28	3	0	50	50	AR/50%
LM-10.6-11ZPF3-60-N	ZnSe	28	3	0	40	60	AR/60%
LM-10.6-D28-11ZPF3-65-N	ZnSe	28	3.1	0	35	65	AR/65%
LM-10.6-11ZPF3-85-N	ZnSe	28	3.1	0	15	85	AR/85%
LM-10.6-11ZPF6-60-N	ZnSe	28	6	0	40	60	AR/60%
LM-10.6-12.6ZPF5-17-N	ZnSe	32	5	0	83	17	AR/17%
LM-10.6-15ZPF3-17-N	ZnSe	38.05	3	0	83	17	AR/17%
LM-10.6-15ZPF3-1-N	ZnSe	38.05	3	0	99	1	AR/1%
LM-10.6-15ZPF3-25-N	ZnSe	38.05	3	0	75	25	AR/25%
LM-10.6-15ZPF3-33-N	ZnSe	38.05	3	0	66.7	33.3	AR/33.3%
LM-10.6-15ZPF3-45-R	ZnSe	38.05	3	45	55	45	AR/45%-45R
LM-10.6-15ZPF3-50-N	ZnSe	38.05	3	0	50	50	AR/50%
LM-10.6-15ZPF3-57-N	ZnSe	38.05	3	0	43	57	AR/57%
LM-10.6-15ZPF3-60-N	ZnSe	38.05	3	0	40	60	AR/60%
LM-10.6-15ZPF3-65-N	ZnSe	38.05	3	0	35	65	AR/65%
LM-10.6-15ZPF3-70-N	ZnSe	38.05	3	0	30	70	AR/70%
LM-10.6-15ZPF3-75-N	ZnSe	38.05	3	0	25	75	AR/75%
LM-10.6-15ZPF3-80-N	ZnSe	38.05	3	0	20	80	AR/80%
LM-10.6-15ZPF3-85-N	ZnSe	38.05	3	0	15	85	AR/85%
LM-10.6-15ZPF3-90-N	ZnSe	38.05	6	0	10	90	AR/90%
LM-10.6-15ZPF4-25-N	ZnSe	38.05	4	0	75	25	AR/25%
LM-10.6-15ZPF4-60-N	ZnSe	38.05	4	0	40	60	AR/60%
LM-10.6-15ZPF6-99-N	ZnSe	38.05	6	0	1	99	AR/99%
LM-10.6-15.7ZPF4-50-N	ZnSe	40	4	0	50	50	AR/50%
LM-10.6-17.5ZPF4-17-N	ZnSe	44.45	4	0	83	17	AR/17%
LM-10.6-19.7ZPF4-50-N	ZnSe	50	4	0	50	50	AR/50%
LM-10.6-20ZPF5-50-S-9.4	ZnSe	50.8	5	45	50	50	AR/50%-45S
LM-10.6-20ZPF5-99-S-9.4	ZnSe	50.8	5	45	1	99	AR/99%-

Remark: M: material; A(deg): angle of incidence; ET: edge thickness; T(%): transmission; R (%): reflectance; ROC: radius of curvature.

OCZ Series Flat Output Couplers

Specifications:

Material: Zinc Selenide (ZnSe) Laser Grade

Diameter Tolerances: +0.000", -0.005" for parts up to 2.000"Ø
+0.000", -0.010" for parts from 2.50" to 6.000"Ø

Thickness: ±.010"

Parallelism: < 3 minutes

Surface Quality: < 40/20 scratch – dig Laser Finish

Spectral Performance:

Side 1

Partial Reflectance Values as indicated

Tolerances on Reflectance

50-70% ±3.0%

75-85% ±2.0%

90-95% ±1.5%

Side 2

Standard high-efficiency low loss anti-reflectance thin film coating applied to this side only

Reflectance per surface @ 10.6µm for normal incidence <0.20%

Transmission: > 99.0%

Model Number	Diameter	Thickness	% Reflectance
LM-10.6-OCZ-0512-50	0.500"	0.120"	50%
LM-10.6-OCZ-0512-70	0.500"	0.120"	70%
LM-10.6-OCZ-0512-75	0.500"	0.120"	75%
LM-10.6-OCZ-0512-80	0.500"	0.120"	80%
LM-10.6-OCZ-0512-85	0.500"	0.120"	85%
LM-10.6-OCZ-0512-90	0.500"	0.120"	90%
LM-10.6-OCZ-0512-95	0.500"	0.120"	95%
LM-10.6-OCZ-0712-50	0.750"	0.120"	50%
LM-10.6-OCZ-0712-70	0.750"	0.120"	70%
LM-10.6-OCZ-0712-75	0.750"	0.120"	75%
LM-10.6-OCZ-0712-80	0.750"	0.120"	80%
LM-10.6-OCZ-0712-85	0.750"	0.120"	85%
LM-10.6-OCZ-0712-90	0.750"	0.120"	90%
LM-10.6-OCZ-0712-95	0.750"	0.120"	85%
LM-10.6-OCZ-1012-50	1.000"	0.120"	50%
LM-10.6-OCZ-1012-70	1.000"	0.120"	70%
LM-10.6-OCZ-1012-75	1.000"	0.120"	75%
LM-10.6-OCZ-1012-80	1.000"	0.120"	80%
LM-10.6-OCZ-1012-85	1.000"	0.120"	85%
LM-10.6-OCZ-1012-90	1.000"	0.120"	90%
LM-10.6-OCZ-1012-95	1.000"	0.120"	95%
LM-10.6-OCZ-1512-50	1.500"	0.120"	50%
LM-10.6-OCZ-1512-70	1.500"	0.120"	70%
LM-10.6-OCZ-1512-75	1.500"	0.120"	75%
LM-10.6-OCZ-1512-80	1.500"	0.120"	80%
LM-10.6-OCZ-1512-85	1.500"	0.120"	85%
LM-10.6-OCZ-1512-90	1.500"	0.120"	90%
LM-10.6-OCZ-1512-95	1.500"	0.120"	95%
LM-10.6-OCZ-2020-50	2.000"	0.200"	50%
LM-10.6-OCZ-2020-70	2.000"	0.200"	70%
LM-10.6-OCZ-2020-75	2.000"	0.200"	75%
LM-10.6-OCZ-2020-80	2.000"	0.200"	80%
LM-10.6-OCZ-2020-85	2.000"	0.200"	85%
LM-10.6-OCZ-2020-90	2.000"	0.200"	90%
LM-10.6-OCZ-2020-95	2.000"	0.200"	95%

CO2 Laser 10.6um Curved Partial Reflectors (Output couplers)

ZnSe partial reflectors can be fabricated in any diameter from 4.0mm up to 250mm, and in thicknesses from 1.0mm up to 50mm.

- Advanced in-house design
- Huge range of
- High quality laser grade material

Part No.	M	Dia	ET	A deg	T	R	S1 ROC m	S2 ROC m	Coating
LM-10.6-5.9ZPC0010	ZnSe	15	3	0	15	85	flat	10	AR/85%
LM-10.6-6.4ZPC0010	ZnSe	16.2	2.7	0	83	17	flat	3	AR/17%
LM-10.6-10GER15-99	Ge	25.4	6	0	0.4	99.6	flat	15	AR/99.6%
LM-10.6-10GER20-99	Ge	25.4	3	0	0.5	99.5	flat	20	AR/99.5%
LM-10.6-10ZPC0010	ZnSe	25.4	3	0	60	40	7.5	15	AR/40%
LM-10.6-10ZPC0015	ZnSe	25.4	3	0	50	50	flat	10	AR/50%
LM-10.6-10ZPC0020	ZnSe	25.4	3	0	50	50	7.5	10	AR/50%
LM-10.6-10ZPC0022	ZnSe	25.4	6	0	50	50	7.5	10	AR/50%
LM-10.6-10ZPC0030	ZnSe	25.4	3	0	50	50	7.5	15	AR/50%
LM-10.6-10ZPC0040	ZnSe	25.4	6	0	50	50	7.5	15	AR/50%
LM-10.6-10ZPC0045	ZnSe	25.4	6	0	40	60	flat	20	AR/60%
LM-10.6-10ZPC0050	ZnSe	25.4	6	0	35	65	30	30	AR/65%
LM-10.6-10ZPC0060	ZnSe	25.4	6	0	35	65	flat	15	AR/65%
LM-10.6-10ZPC0062	ZnSe	25.4	3	0	0.5	99.5	flat	10	AR/99.5%
LM-10.6-10ZPC0063	ZnSe	25.4	3	0	0.5	99.5	flat	15	AR/99.5%
LM-10.6-10ZPC0064	ZnSe	25.4	3	0	0.5	99.5	flat	20	AR/99.5%
LM-10.6-10ZPC0066	ZnSe	25.4	4.7	0	1	99	flat	3	AR/99%
LM-10.6-10ZPC0068	ZnSe	25.4	4	0	40	60	20	20	AR/60%
LM-10.6-10ZPC0070	ZnSe	25.4	6	0	0.4	99.6	flat	10	AR/99.6%
LM-10.6-10ZPC0080	ZnSe	25.4	6	0	0.4	99.6	flat	15	AR/99.6%
LM-10.6-10ZPC0085	ZnSe	25.4	6	0	0.4	99.6	flat	20	AR/99.6%
LM-10.6-10ZPC0090	ZnSe	25.4	6	0	0.4	99.6	flat	30	AR/99.6%
LM-10.6-11GER10-99.5	Ge	28	6	0	0.5	99.5	N/A	N/A	AR/99.5%
LM-10.6-11GER30-99.5	Ge	28	5.6	0	0.5	99.5	N/A	N/A	AR/99.5%
LM-10.6-11MNFO010	ZnSe	28	4	0	50	50	5	10	AR/50%
LM-10.6-11MNFO020	ZnSe	28	4	0	50	50	10	20	AR/50%
LM-10.6-11MNFO030	ZnSe	28	4	0	50	50	15	20	AR/50%
LM-10.611MNFO040	ZnSe	28	4	0	25	75	15	20	AR/75%
LM-10.6-11MANRO0010	ZnSe	28	4	0	0.8	99.2	flat	10	AR/99.2%
LM-10.6-11MANRO0020	ZnSe	28	4	0	0.8	99.2	flat	20	AR/99.2%
LM-10.6-11NFO010	ZnSe	28	4	0	50	50	5	10	AR/50%
LM-10.6-11NFO020	ZnSe	28	4	0	50	50	10	20	AR/50%
LM-10.6-11NFO030	ZnSe	28	4	0	50	50	15	20	AR/50%
LM-10.6-11NFO040	ZnSe	28	4	0	25	75	15	20	AR/75%
LM-10.6-11ZPC0010	ZnSe	28	6	0	50	50	7.5	10	AR/50%
LM-10.6-11ZPC0016	ZnSe	28	6	0	83	17			AR/17%
LM-10.6-11ZPC0020	ZnSe	28	6	0	40	60	7.5	15	AR/60%
LM-10.6-11ZPC0022	ZnSe	28	6	0	40	60	7.5	20	AR/60%
LM-10.6-11ZPC0030	ZnSe	28	4	0	35	65	flat	30	AR/65%
LM-10.6-11ZPC0033	ZnSe	28	3	0	1	99	flat	20	AR/99%
LM-10.6-11ZPC0040	ZnSe	28	4	0	35	65	flat	60	AR/65%
LM-10.6-11ZPC0041	ZnSe	28	4	0	60	40			AR/40%
LM-10.6-11ZPC0050	ZnSe	28	6	0	1	99	flat	20	AR/99%
LM-10.6-11ZPC0059	ZnSe	28	6	0	50	50			AR/50%
LM-10.6-12.6ZPC0010	ZnSe	32	5	0	0.4	99.6	flat	20	AR/99.6%
LM-10.6-15GER35-99.5	Ge	38.05	4	0	0.5	99.5	flat	35	AR/99.5%
LM-10.6-15ZPC0016	ZnSe	38.05	6.3	0	0.4	99.6	flat	20	AR/99.6%

LM-10.6-15ZPC0020	ZnSe	38.05	6	0	0.4	99.6	flat	20	AR/99.6%
LM-10.6-15ZPC0060	ZnSe	38.05	8	0	40	60	35	15	AR/60%
LM-10.6-20ZPC0011	ZnSe	50.8	5	0	15	85			AR/85%

Remark: M: material; A(deg): angle of incidence; ET: edge thickness; T(%): transmission; R (%): reflectance; ROC: radius of curvature.

Nd:YAG Laser Focusing Lenses

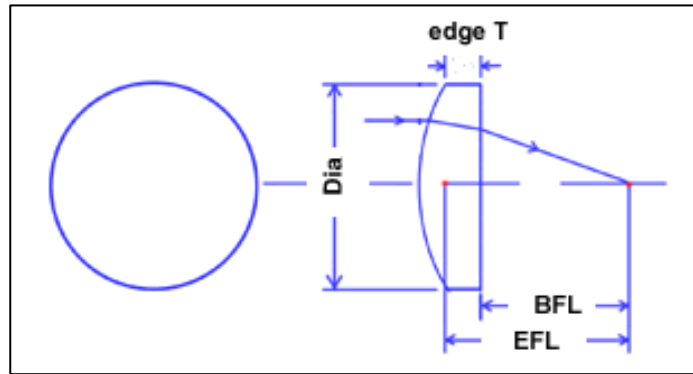
1. Single-element Focusing Lens

For a single-element focusing lens with Plano-convex shape, the effective focal length (EFL, f) is

$$f = R / (n - 1)$$

Front focal length (FFL) is equal to EFL. Back focal length (BFL) is

$$BFL = f \cdot \left[1 - \frac{t_c (n - 1)}{nR} \right]$$



Where R is the curvature of radius, n is refractive index of the lens material, t_c is the central thickness of the lens.

Description of Part Number: **FL-XXXX-F-D-T-EN-MN-YY**

FL: single-element focusing lens

XXXX: laser wavelength, 1064nm.

F: focal length, mm

D: lens diameter, mm

T: lens edge thickness, mm

EN: Dimension unit is in inch (If there is no EN, it means metric unit in mm).

MN: lens shape, MN means meniscus, no MN means plano-convex,

YY: others such as CC, UO, JS etc.

Coating: di-electric coating at 1064nm.

Part number	Wavelength nm	Focal length mm	Dia. mm	Thickness mm	Remark
FL-1064-F14-D20-T2.3	1064	14	20	2.3	
FL-1064-F24-D24-T2.1	1064	24	24	2.1	
FL-1064-F25-D19-T1.5	1064	25	19	1.5	
FL-1064-F30-D19-T1.5	1064	30	19	1.5	
FL-1064-F30-D20-T2.3	1064	30	20	2.3	
FL-1064-F35-D22-T2.3	1064	35	22	2.3	
FL-1064-F37-D27-T2.5	1064	37	27	2.5	
FL-1064-F54-D22-T2.7	1064	54	22	2.7	
FL-1064-F54-D28-T3.0	1064	54	28	3.0	
FL-1064-F55-D25	1064	55	25		
FL-1064-F55-D31-T2.6	1064	55	31	2.6	
FL-1064-F57-D27-T2.6	1064	57	27	2.3	
FL-1064-F60-D23-T2.1	1064	60	23	2.1	
FL-1064-F67-D23-T2.1	1064	67	23	2.1	
FL-1064-F69-D23-T2.1	1064	69	23	2.1	
FL-1064-F69-D24-T2.2	1064	69	24	2.2	
FL-1064-F69-D31-T2.4	1064	69	31	2.4	
FL-1064-F72-D36-T1.5	1064	72	36	1.5	
FL-1064-F73-D36-T1.6	1064	73	36	1.6	
FL-1064-F73-D35-T2.3	1064	73	36	2.3	
FL-1064-F75-D25-T3	1064	75	25	3.0	
FL-1064-F75-D30	1064	75	30		
FL-1064-F75-D32-T3.0	1064	75	32	3.0	
FL-1064-F79-D22-T3.5	1064	79	22	3.5	
FL-1064-F79-D28-T3.0	1064	79	28	3.0	

FL-1064-F79-D34-T2.5	1064	79	34	2.5	
FL-1064-F80-D25-T2.3	1064	80	25	2.3	
FL-1064-F80-D50-T2.7	1064	80	50	2.7	
FL-1064-F81-D50-T2.7	1064	81	50	2.7	
FL-1064-F82-D36-T2.4	1064	82	36	2.4	
FL-1064-F83-D23-T2.1	1064	83	23	2.1	
FL-1064-F85-D31-T2.1	1064	85	31	2.1	
FL-1064-F86-D23-T2.3	1064	86	23	2.3	
FL-1064-F87-D23-T4.5	1064	87	23	4.5	
FL-1064-F87-D25-T4.2	1064	87	25	4.2	
FL-1064-F87-D31-T3.2	1064	87	31	3.2	
FL-1064-F87-D36-T2.2	1064	87	36	2.2	
FL-1064-F88-D48-T2.3	1064	88	48	2.3	
FL-1064-F90-D31-T2.3	1064	90	31	2.3	
FL-1064-F99-D36-T2.5	1064	99	36	2.5	
FL-1064-F100-D25-T3	1064	100	25	3.0	
FL-1064-F100-D31-T2.5	1064	100	31	2.5	
FL-1064-F104-D35-T2.3	1064	104	35	2.3	
FL-1064-F108-D35-T2.9	1064	108	35	2.9	
FL-1064-F120-D31-T2.3	1064	120	31	2.3	
FL-1064-F124-D22-T4.0	1064	124	22	4.0	
FL-1064-F124-D27-T3.6	1064	124	27	3.6	
FL-1064-F124-D48-T3.0	1064	124	48	3.0	
FL-1064-F126-D53-T3.0	1064	126	53	3.0	
FL-1064-F127-D25-T2.3	1064	127	25	2.3	
FL-1064-F150-D40-T5.5	1064	150	40	5.5	
FL-1064-F150-D50-T1.5	1064	150	50	1.5	
FL-1064-F155-D27-T3.4	1064	155	27	3.4	
FL-1064-F200-D20-T2.5	1064	200	20	2.5	
FL-1064-F200-D25-T2.5	1064	200	25	2.5	Ex stock
FL-1064-F250-D25-T2.5	1064	250	25	2.5	Ex stock
FL-1064-F833-D24-T2.1	1064	833	24	2.1	

532nm coating is also available for above dimensions and thus thie part numbes will be FL-532-xxx etc.

2. Multi-element Focusing Lenses

Multi-element focusing lens consists of a few lenses to obtain better image quality and smaller focused beam diameters. It is mainly used in laser scribing, engraving, laser XY-moving markin, laser welding etc.

Part number description: FLM-xxxx-F-N-D-yy

FLM: multi-element focusing lens

Xxxx: laser wavelength, 1064nm, 532nm, 10.6um etc.

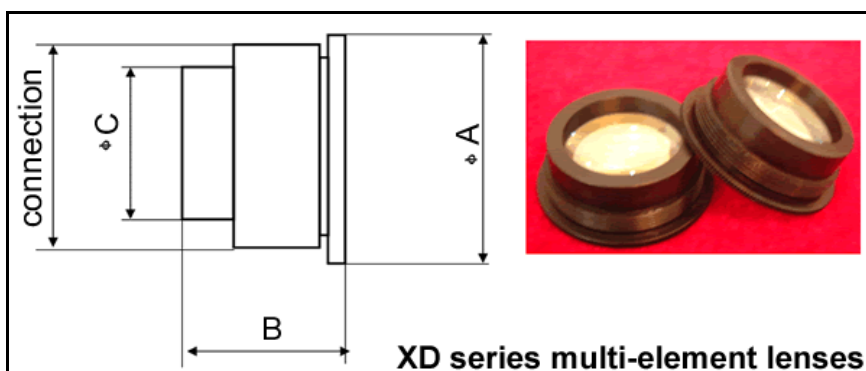
F: focal length, mm

N: number of lenses

D: outside diameter, mm

yy: others

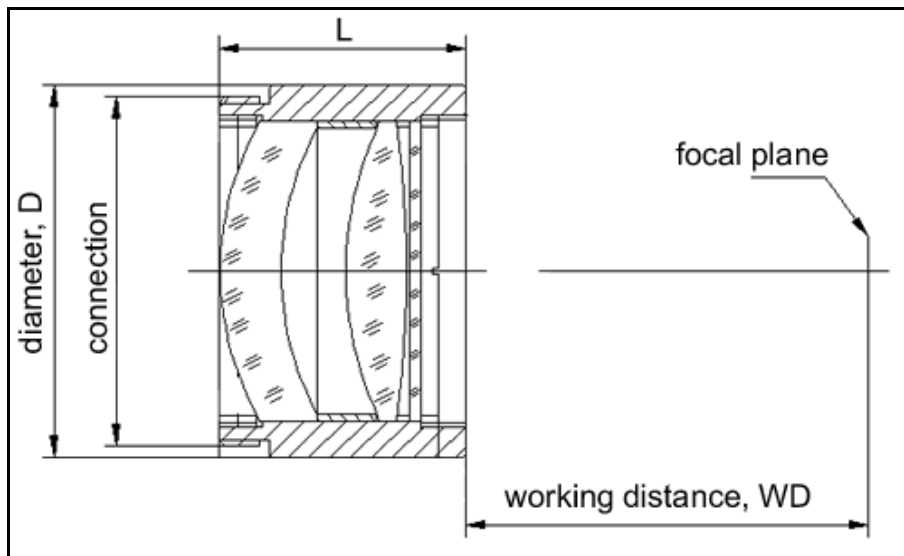
(1) XD Series Multi-element Focusing Lenses



Part number	LFM-1064-N2-F76-D44-XD	LFM-1064-N3-F72-D54-XD	LFM-1064-N5-F75-D60-XD
Number of lenses	2	3	5
Focal length (mm)	75.772	72.122	75.202
Working distance (mm)	68.437	66.759	56.911
Input aperture (mm)	Φ24	Φ30	Φ30
Wavelength (mm)	1064	1064	1064
Transmittance	>95%	>95%	>90%
Focused beam dia. (mm)	<0.01	<0.01	<0.01
Connection (mm)	M39×1	M48×1	M56×0.75
Dimension (AxBxC, mm)	44x16x36	54x25x44	60x42x56

Part number	LFM-532-N2-F76-D44-XD	LFM-532-N3-F72-D54-XD
Number of lenses	2	3
Focal length (mm)	75.772	72.122
Working distance (mm)	68.437	66.759
Input aperture (mm)	Φ24	Φ30
Wavelength (mm)	532	532
Transmittance	>95%	>95%
Focused beam dia. (mm)	<0.01	<0.01
Connection (mm)	M39×1	M48×1
Dimension (AxBxC, mm)	44x16x36	54x25x44

(2) TK Series Multi-element Focusing Lenses



Part number	WL nm	FL mm	Aperture mm	Diffraction Spot, um	WD mm	D mm	L mm	Connector M
LFM-1064-N3-F78-D60-TK	1064	78	43	11	64.7	60	39.6	M56×1
LFM-1064-F80-D60-TK*	1064	80	40	4	69.5	60	45	M56×1
LFM-1064-N5-F80-D62-TK	1064	80	40	4	69.5	62	42.5	M58×1
LFM-1064-N3-F62-D60-TK	1064	61.7	43	10	46.7	60	37	M56×1
LFM-532-N3-F75-D60-TK	532	74	43	12	60.7	60	39.6	M56×1
LFM-532-N3-F80-D60-TK	532	80	40	10	49.5	60	39.6	M56×1
LFM-532-N5-F80-D60-TK	532	80	40	10	64.5	60	42.5	M56×1
LFM-532-N5-F80-D62-TK	532	80	40	10	64.5	62	42.5	M58×1
LFM-355-N3-F45-D32-TK	355	45	15	8	37.3	32	24	M30×0.75
LFM-355-N3-F60-D32-TK	355	60	22	8	52.4	32	28	M30×0.75

WL: wavelength; FL: focal length; WD: working distance; D: outside diameter.

* Non-spherical lenses.

CO2 Laser Focusing Lenses (Plano-Convex Lenses)

Specifications:	Standards
Material quality	Laser Grade without boundaries and visible inclusions
Range of Sizes	Diameter : 5 – 76.2 +0/-0.10 mm Edge Thickness : 2 – 12 +/-0.10 mm Thickness (radiused) : 2 – 5 +/-0.05 mm
Range of Effective Focal Length (EFL)	12.7-254.0 +/- 2 %
Clear Aperture (polished)	90% of diameter
Surface Figure (power-irregularity) at 0.63um	Plano: 1 fringe - 0.5 fringe per inch Radiused : varies dependent upon radius
Surface Quality: Scratch-Dig	40/20
AR Coating Reflectivity at 10.6 microns	0.25%

Description of Part Number:

FL-XXXX-F-D-T-EN-MN-YY

FL: single-element focusing lens

XXXX: laser wavelength, 10.6um.

F: focal length, mm

D: lens diameter, mm

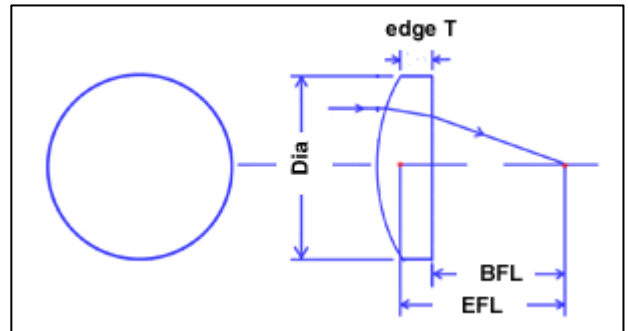
T: lens edge thickness, mm

EN: Dimension unit is in inch (If there is no EN, it means metric unit in mm).

MN: lens shape, MN means meniscus, no MN means plano-convex,

YY: others such as CC, UO, JS etc.

Coating: di-electric coating at 10.6Um.



Part number	Material	FL mm/inch	BFL mm	Dia. mm/inch	Edge T mm
FL-10.6-5.0ZLP25	ZnSe	25		12.7/0.5	2.5
FL-10.6-F25.4-D12.7-JS	ZnSe	25.4/1		12.7/0.5	
FL-10.6-F40-D16-T2-CC	ZnSe	40	39.1	16	2.0
FL-10.6-F40-D18-JS	ZnSe	40	39.1	18	
FL-10.6-F50-D16-T2-CC	ZnSe	50	49.1	16	2.0
FL-10.6-F50-D18-JS	ZnSe	50	49.1	18	
FL-10.6-F50-D25-JS	ZnSe	50	49.1	25	
FL-10.6-F55-D20-JS	ZnSe	55		20	
FL-10.6-F60-D18-T2-CC	ZnSe	60	59.1	18	2.0
FL-10.6-F60-D18-JS	ZnSe	60	59.1	18	
FL-10.6-F74-D30-T2.5-JS	ZnSe	75		30	2.5
FL-10.6-F80-D25-T2.5-CC	ZnSe	80	78.8	25	2.5
FL-10.6-F80-D25-JS	ZnSe	80	78.8	25	
FL-10.6-F95.25-D25.4-JS	ZnSe	95.25/3.75		25.4/1.0	
FL-10.6-15ZLP95-1106	ZnSe	95/3.75		38.05/1.5	3
FL-10.6-F100-D25-T2.5-CC	ZnSe	100	98.9	25	2.5
FL-10.6-F100-D25-JS	ZnSe	100	98.9	25	
FL-10.6-F100-D25.4-WT	ZnSe	100	98.9	25.4	3
FL-10.6-15ZLP100/7-10UM	ZnSe	100		38.05/1.5	3
FL-10.6-F127-D27.95-JS	ZnSe	127/5		27.95/1.1	
FL-10.6-F127-D25.4-JS	ZnSe	127/5		25.4/1.0	
FL-10.6-11EX1ZLP127	ZnSe	127/5		28/1.1	3.17
FL-10.6-11PHGP127-BE	ZnSe	127/5		28/1.1	4
FL-10.6-11ZLP127	ZnSe	127/5		28/1.1	3
FL-10.6-15HGPP127	ZnSe	127/5		38.05/1.5	6
FL-10.6-15PHGP127	ZnSe	127/5		38.05/1.5	7.6
FL-10.6-15ZLP127	ZnSe	127/5		38.05/1.5	3
FL-10.6-20PEHGP127	ZnSe	127/5		50.8/2	9.58
FL-10.6-20PHGP127	ZnSe	127/5		50.8/2	7.87
FL-10.6-15CIN130	ZnSe	130		38.05/1.5	7.1

FL-10.6-20CIN132	ZnSe	132		50.8/2	9.68
FL-10.6-15ZLP175	ZnSe	175		38.05/1.5	3
FL-10.6-6.7ZLP178	ZnSe	178		17	1.79
FL-10.6-15HGPP190	ZnSe	190/7.5		38.05/1.5	6
FL-10.6-20PEHGPP190	ZnSe	190/7.5		50.8/2	9.58
FL-10.6-15EXZLP190	ZnSe	190/7.5		38.05/1.5	2
FL-10.6-20PHGP190	ZnSe	190.5/7.5		50.8/2	7.87
FL-10.6-15PHGP190	ZnSe	190.5/7.5		38.05/1.5	7.6
FL-10.6-15CIN194	ZnSe	194/7.64		38.05/1.5	7.1
FL-10.6-20CIN195	ZnSe	195/7.68		50.8/2	9.68
FL-10.6-20PHGP222	ZnSe	222/8.74		50.8/2	7.87
FL-10.6-20PHGP254	ZnSe	254/10		50.8/2	7.87
FL-10.6-11ZLP254	ZnSe	254/10		28	3
FL-10.6-5.9ZLP2800	ZnSe	280/10		15	2.5
FL-10.6-15HGPP381	ZnSe	381/15		38.05	6
FL-10.6-20ZLP1700	ZnSe	1700/66.9		50.8/2	3.5
FL-10.6-20PMGP15000	ZnSe	15000/590.5		50.8/2	4.06

1. FL=focal length; BFL-back focal length.
2. There are too many items and models and welcome to call us or send us an email if you have any further enquiry or question!

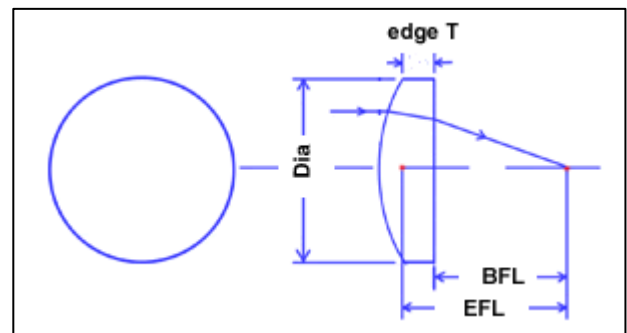
LPZ Series Plano-convex ZnSe Lenses Coated AR-AR @ 10.6um

This wide range of CO₂ plano-convex lenses have been prepared to fit most OEM, Industrial and Medical laser systems. All have been manufactured to high-quality laser specifications for high-power applications.

Made with laser grade zinc selenide with computer optimized anti-reflection coatings.

Specifications:

Material: ZnSe Laser Grade C.V.D. type
Diameter Tolerances: +0.000", -0.005"
Thickness: ±.010"
Surface Figure: < 1/40 wavelength @ 10.6µm
Centration: < 0.001"
Focal Length Tolerance: ±1.0%
Surface Quality: < 40/20 scratch-dig Laser Finish



Spectral Performance:

Standard AR Coating type Both Sides @ 10.6µm (AR)

Absorption: < 0.25 % total
Reflectance: < 0.20% per surface @ 10.6µm
Transmittance: > 99.0% typical

Ultra Low Absorption AR Coating type Both Sides @ 10.6µm (ULA)

Absorption: < 0.15 % total
Reflectance: < 0.25% per surface
Transmittance: > 99.0% typical

Dual Band AR Coating type Both Sides @ 10.6µm and .633µm (DBAR)

Absorption: < 0.30 % total
Reflectance: < 0.25% per surface @ 10.6µm
Transmittance: > 98.5% @ 10.6µm with > 90% @ .633µm

Model Number	Diameter	Focal Length	Edge Thickness
FL-10.6-LZP-0710-DBAR	0.750"	1.00"	0.070"
FL-10.6-LZP-0715-DBAR	0.750"	1.50"	0.070"
FL-10.6-LZP-0720-DBAR	0.750"	2.00"	0.070"
FL-10.6-LZP-0720-ET2.0	0.750"	2.00"	0.080"
FL-10.6-LZP-0725-DBAR	0.750"	2.50"	0.070"
FL-10.6-LZP-0730-DBAR	0.750"	3.00"	0.070"
FL-10.6-LZP-0730-ET3.0	0.750"	3.00"	0.120"
FL-10.6-LZP-0735-DBAR	0.750"	3.50"	0.070"

FL-10.6-LZP-0740-DBAR	0.750"	4.00"	0.070"
FL-10.6-LZP-0750-DBAR	0.750"	5.00"	0.070"
FL-10.6-LZP-0775-DBAR	0.750"	7.50"	0.070"
FL-10.6-LZP-07A0-DBAR	0.750"	10.0"	0.070"
FL-10.6-LZP-07A2-DBAR	0.750"	12.0"	0.070"
FL-10.6-LZP-07A5-DBAR	0.750"	15.0"	0.070"
FL-10.6-LZP-07B0-DBAR	0.750"	20.0"	0.070"
FL-10.6-LZP-1010-ET2.0	1.00"	1.00"	0.080"
FL-10.6-LZP-1015-ET2.0	1.00"	1.50"	0.080"
FL-10.6-LZP-1025-ET3.0	1.00"	2.50"	0.120"
FL-10.6-LZP-1030-ET3.0	1.00"	3.00"	0.120"
FL-10.6-LZP-1035-ET3.0	1.00"	3.50"	0.120"
FL-10.6-LZP-1040-ET3.0	1.00"	4.00"	0.120"
FL-10.6-LZP-1050-ET3.0	1.00"	5.00"	0.120"
FL-10.6-LZP-1060-ET3.0	1.00"	6.00"	0.120"
FL-10.6-LZP-1075-ET3.0	1.00"	7.50"	0.120"
FL-10.6-LZP-10A0-ET3.0	1.00"	10.0"	0.120"
FL-10.6-LZP-10A5-ET3.0	1.00"	15.0"	0.120"
FL-10.6-LZP-10B0-ET3.0	1.00"	20.0"	0.120"
FL-10.6-LZP-10B5-ET3.0	1.00"	25.0"	0.120"
FL-10.6-LZP-1115-ET2.0	1.10"	1.50"	0.080"
FL-10.6-LZP-1125-ET3.0	1.10"	2.50"	0.120"
FL-10.6-LZP-1125-ET4.0	1.10"	2.50"	0.160"
FL-10.6-LZP-1125-ET6.0	1.10"	2.50"	0.236"
FL-10.6-LZP-1135-ET3.0	1.10"	3.50"	0.120"
FL-10.6-LZP-1138-ET3.0	1.10"	3.75"	0.120"
FL-10.6-LZP-1138-ET4.0	1.10"	3.75"	0.160"
FL-10.6-LZP-1150-ET3.0	1.10"	5.00"	0.120"
FL-10.6-LZP-1150-ET4.0	1.10"	5.00"	0.160"
FL-10.6-LZP-1150-ET6.0	1.10"	5.00"	0.236"
FL-10.6-LZP-1160-ET3.0	1.10"	6.00"	0.120"
FL-10.6-LZP-1175-ET3.0	1.10"	7.50"	0.120"
FL-10.6-LZP-1175-ET6.0	1.10"	7.50"	0.236"
FL-10.6-LZP-11A0-ET3.0	1.10"	10.0"	0.120"
FL-10.6-LZP-1525-ET3.0	1.500"	2.50"	0.120"
FL-10.6-LZP-1525-ET4.0	1.500"	2.50"	0.160"
FL-10.6-LZP-1530-ET3.0	1.500"	3.00"	0.120"
FL-10.6-LZP-1535-ET3.0	1.500"	3.50"	0.120"
FL-10.6-LZP-1538-ET3.0	1.500"	3.75"	0.120"
FL-10.6-LZP-1540-ET3.0	1.500"	4.00"	0.120"
FL-10.6-LZP-1550-ET2.0	1.500"	5.00"	0.080"
FL-10.6-LZP-1550-ET3.0	1.500"	5.00"	0.120"
FL-10.6-LZP-1550-ET4.0	1.500"	5.00"	0.160"
FL-10.6-LZP-1550-ET5.0	1.500"	5.00"	0.200"
FL-10.6-LZP-1550-ET6.0	1.500"	5.00"	0.236"
FL-10.6-LZP-1550-ET7.6	1.500"	5.00"	0.300"
FL-10.6-LZP-1551-ET7.0	1.500"	5.13"	0.280"
FL-10.6-LZP-1560-ET3.0	1.500"	6.00"	0.120"
FL-10.6-LZP-1574-ET7.6	1.500"	7.45"	0.300"
FL-10.6-LZP-1575-ET3.0	1.500"	7.50"	0.120"
FL-10.6-LZP-1575-ET4.0	1.500"	7.50"	0.160"
FL-10.6-LZP-1575-ET6.0	1.500"	7.50"	0.236"
FL-10.6-LZP-1575-ET7.6	1.500"	7.50"	0.300"
FL-10.6-LZP-1576-ET7.6	1.500"	7.63"	0.300"
FL-10.6-LZP-15A0-ET2.0	1.500"	10.0"	0.080"
FL-10.6-LZP-15A0-ET4.0	1.500"	10.0"	0.160"
FL-10.6-LZP-15A0-ET6.0	1.500"	10.0"	0.160"
FL-10.6-LZP-15A5-ET3.0	1.500"	15.0"	0.120"
FL-10.6-LZP-15B0-ET3.0	1.500"	20.0"	0.120"
FL-10.6-LZP-15B5-ET3.0	1.500"	25.0"	0.120"
FL-10.6-LZP-15C9-ET3.0	1.500"	39.3"	0.120"

FL-10.6-LZP-15E9-ET3.0	1.500"	59.0"	0.120"
FL-10.6-LZP-15X9-ET4.0	1.500"	59.0"	0.160"
FL-10.6-LZP-2050-ET7.6	2.00"	5.0"	0.300"
FL-10.6-LZP-2050-ET9.7	2.00"	5.0"	0.380"
FL-10.6-LZP-2051-ET9.7	2.00"	5.188"	0.380"
FL-10.6-LZP-2074-ET7.9	2.00"	7.45"	0.310"
FL-10.6-LZP-2074-ET9.7	2.00"	7.45"	0.380"
FL-10.6-LZP-2075-ET2.5	2.00"	7.50"	0.100"
FL-10.6-LZP-2075-ET4.9	2.00"	7.50"	0.193"
FL-10.6-LZP-2075-ET7.9	2.00"	7.50"	0.310"
FL-10.6-LZP-2075-ET9.7	2.00"	7.50"	0.380"
FL-10.6-LZP-2076-ET7.6	2.00"	7.560"	0.300"
FL-10.6-LZP-2076-ET9.7	2.00"	7.673"	0.380"
FL-10.6-LZP-2088-ET8.0	2.00"	8.75"	0.315"
FL-10.6-LZP-20A0-ET4.7	2.00"	10.0"	0.185"
FL-10.6-LZP-20A0-ET9.7	2.00"	10.0"	0.380"
FL-10.6-LZP-20A3-ET8.0	2.00"	12.50"	0.315"
FL-10.6-LZP-2588-ET7.87	2.00"	8.75"	0.310"

CO2 Laser Focusing Lenses (Meniscus Lenses)

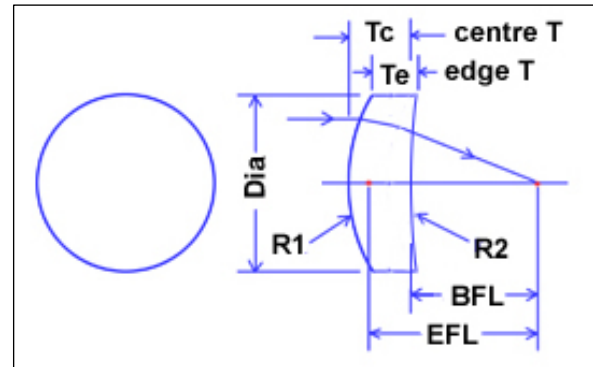
Positive meniscus lenses may be used to increase the numerical aperture of a positive lens assembly without an undue increase in the aberrations.

The For the case of a lens of thickness t_c in air, and surfaces with radii of curvature R_1 and R_2 , the effective focal length f is given by:

$$\frac{1}{f} = (n-1) \cdot \left[\frac{1}{R_1} - \frac{1}{R_2} + \frac{t_c(n-1)}{nR_1R_2} \right]$$

where n is the refractive index of the lens medium. The quantity $1/f$ is also known as the optical power of the lens. The the back focal distance:

$$BFL = f \cdot \left[1 - \frac{t_c(n-1)}{nR_1} \right]$$



In the sign convention used here, the value of R_1 will be positive if the first lens surface is convex, and negative if it is concave. The value of R_2 is positive if the second surface is concave, and negative if convex. Note that sign conventions vary between different authors, which results in different forms of these equations depending on the convention used.

Meniscus lenses form the largest and most popular part of our product range.

- Optimised meniscus designs
- Manufactured in high quantities to keep costs low.
- Quality matches or exceeds any other supplier

Specifications:

Diameter tolerance: +0/-0.1mm
 Focal length tolerance: +/-0.5%
 Angle of incidence: 0 degree
 Transmission: >99.4%
 Reflectance: <0.1% per surface
 Absorption: <0.2% per surface

The following standard meniscus are available.

Part No.	Material	Diameter mm	ET mm	Coating	FL mm
FL-10.6-5.0ZLF25	ZnSe	12.7	2	AR/AR	25.4
FL-10.6-5.0ZLF38	ZnSe	12.7	2	AR/AR	38.1
FL-10.6-F38.1-D12.7-T2-MN-WT	ZnSe	12.7	2	AR/AR	38.1
FL-10.6-5.1ZLF100	ZnSe	13	2	AR/AR	100
FL-10.6-F100-D13-T2-MN-WT	ZnSe	13	2	AR/AR	100
FL-10.6-6.1ZLF48	ZnSe	15.5	2.5	AR/AR	48
FL-10.6-6.1ZLF110	ZnSe	15.5	2.5	AR/AR	110
FL-10.6-10ZLF25	ZnSe	25.4	2.5	AR/AR	25.4
FL-10.6-10ZLF38	ZnSe	25.4	2.5	AR/AR	38.1
FL-10.6-10ZLF51	ZnSe	25.4	2.5	AR/AR	50.8
FL-10.6-10ZLF63	ZnSe	25.4	2.5	AR/AR	63.5
FL-10.6-10ZLF76	ZnSe	25.4	2.5	AR/AR	76.2
FL-10.6-10ZLF95	ZnSe	25.4	2.5	AR/AR	95.3
FL-10.6-10ZLF102	ZnSe	25.4	2.5	AR/AR	101.6
FL-10.6-10ZLF110	ZnSe	25.4	2.5	AR/AR	110
FL-10.6-10ZLF127	ZnSe	25.4	2.5	AR/AR	127
FL-10.6-F127-D25.4-T2.5-MN-WT	ZnSe	25.4	2.5	AR/AR	127

FL-10.6-10ZLF152	ZnSe	25.4	2.5	AR/AR	152
FL-10.6-F152-D25.4-T2.5-MN-WT	ZnSe	25.4	2.5	AR/AR	152
FL-10.6-10ZLF200	ZnSe	25.4	2.5	AR/AR	200
FL-10.6-10ZLF221	ZnSe	25.4	2.24	AR/AR	221
FL-10.6-10ZLF508	ZnSe	25.4	2.5	AR/AR	508
FL-10.6-11ZLF25	ZnSe	28	3	AR/AR	25.4
FL-10.6-11GLF38	GaAs	28	2.5	Uncoated	38
FL-10.6-11ZLF38	ZnSe	28	3	AR/AR	38.1
FL-10.6-11ZLF50	ZnSe	28	3	AR/AR	50.8
FL-10.6-11HGP50	ZnSe	28	4.2	AR/AR	50.8
FL-10.6-11HGP63	ZnSe	28	4.2	AR/AR	63.5
FL-10.6-11ZLF63	ZnSe	28	3	AR/AR	63.5
FL-10.6-11GLC63	GaAs	28	1.8	AR/AR	63.5
FL-10.6-11ZLF76	ZnSe	28	3	AR/AR	76.2
FL-10.6-11ZLF89	ZnSe	28	3	AR/AR	89
FL-10.6-11ZLF90	ZnSe	28	3	AR/AR	90
FL-10.6-11ZLF95	ZnSe	28	3	AR/AR	95.3
FL-10.6-11HGP95	ZnSe	28	4.2	AR/AR	95.3
FL-10.6-11ZLF100	ZnSe	28	3	AR/AR	100
FL-10.6-11ZLF102	ZnSe	28	3	AR/AR	102
FL-10.6-11ZLF110	ZnSe	28	3	AR/AR	110
FL-10.6-11ZLF127	ZnSe	28	3	AR/AR	127
FL-10.6-11EHGP127	ZnSe	28	6.2	AR/AR	127
FL-10.6-11HGP127	ZnSe	28	4.2	AR/AR	127
FL-10.6-11HLF152	ZnSe	28	3	AR/AR	152
FL-10.6-11HLF190	ZnSe	28	3	AR/AR	190.5
FL-10.6-11HGP190	ZnSe	28	4.2	AR/AR	190.5
FL-10.6-11HLF254	ZnSe	28	3	AR/AR	254
FL-10.6-11HLF762	ZnSe	28	3	AR/AR	762
FL-10.6-11.8HLF750	ZnSe	30	3	AR/AR	750
FL-10.6-12.6HGP89	ZnSe	32	4.2	AR/AR	89
FL-10.6-VTE375	ZnSe	38.05	7.4	AR/AR	95.3
FL-10.6-VTE500	ZnSe	38.05	7.4	AR/AR	127
FL-10.6-VTE750	ZnSe	38.05	7.4	AR/AR	190.5
FL-10.6-VTE900	ZnSe	38.05	7.4	AR/AR	228.6
FL-10.6-VTE1000	ZnSe	38.05	7.4	AR/AR	254
FL-10.6-15ZLF38	ZnSe	38.05	2.4	AR/AR	38.1
FL-10.6-15ZLF50	ZnSe	38.05	3	AR/AR	50.8
FL-10.6-15HGP63	ZnSe	38.05	6.1	AR/AR	63.5
FL-10.6-15ZLF63	ZnSe	38.05	3	AR/AR	63.5
FL-10.6-15ZLF75	ZnSe	38.05	2.93	AR/AR	75
FL-10.6-15ZLF76	ZnSe	38.05	3	AR/AR	76.2
FL-10.6-15ZLF80	ZnSe	38.05	3	AR/AR	80
FL-10.6-15ZLF89	ZnSe	38.05	3	AR/AR	89
FL-10.6-15HGP95	ZnSe	38.05	6	AR/AR	95
FL-10.6-15ZLF95	ZnSe	38.05	3	AR/AR	95.3
FL-10.6-15ZLF100	ZnSe	38.05	3	AR/AR	100
FL-10.6-15ZLF127	ZnSe	38.05	3	AR/AR	127
FL-10.6-15EHGP127	ZnSe	38.05	7.8	AR/AR	127
FL-10.6-15HGP127	ZnSe	38.05	6.2	AR/AR	127
FL-10.6-15BYS127	ZnSe	38.05	9	AR/AR	127.1
FL-10.6-15HGP150	ZnSe	38.05	6.2	AR/AR	150
FL-10.6-15ZLF152	ZnSe	38.05	3	AR/AR	152
FL-10.6-15EHGP190-BE	ZnSe	38.05	7.87	AR/AR	190
FL-10.6-15HGP190	ZnSe	38.05	6.1	AR/AR	190.5
FL-10.6-15ZLF190	ZnSe	38.05	3	AR/AR	190.5
FL-10.6-15BYS190	ZnSe	38.05	9	AR/AR	190.7
FL-10.6-15BYS196	ZnSe	38.05	9	AR/AR	196
FL-10.6-15HGP254	ZnSe	38.05	6.3	AR/AR	254
FL-10.6-15ZLF254	ZnSe	38.05	3	AR/AR	254
FL-10.6-15ZLF345	ZnSe	38.05	3	AR/AR	345

FL-10.6-15ZLF508	ZnSe	38.05	3	AR/AR	508
FL-10.6-15ZLF750	ZnSe	38.05	3.06	AR/AR	750
FL-10.6-17.5HGP127	ZnSe	44.45	9	AR/AR	127
FL-10.6-17.5HGP190	ZnSe	44.45	9	AR/AR	190
FL-10.6-17.5ZLF127	ZnSe	44.5	3.5	AR/AR	127
FL-10.6-19.7GEN125	Ge	50	1.5	AR/AR-Ge	125
FL-10.6-19.7ZLF127	ZnSe	50	3.5	AR/AR	127
FL-10.6-19.7EHGP150	ZnSe	50	9.6	AR/AR	150
FL-10.6-20EHGP95	ZnSe	50.8	9.6	AR/AR	95
FL-10.6-20HGP127	ZnSe	50.8	7.87	AR/AR	127
FL-10.6-20ZLF127	ZnSe	50.8	3.5	AR/AR	127
FL-10.6-20EHGP127	ZnSe	50.8	9.6	AR/AR	127
FL-10.6-20EHGP190	ZnSe	50.8	9.6	AR/AR	190.5
FL-10.6-20ZLF190	ZnSe	50.8	3.5	AR/AR	190.5
FL-10.6-20EHGP198	ZnSe	50.8	9.62	AR/AR	198
FL-10.6-20EHGP254	ZnSe	50.8	9.6	AR/AR	254
FL-10.6-20GEM254	Ge	50.8	4	AR/AR-DUR	254

LMZ Series Meniscus ZnSe Lenses Coated AR-AR @ 10.6 μ m

This wide range of CO₂ plano-convex lenses have been prepared to fit most OEM, Industrial and Medical laser systems. All have been manufactured to high-quality laser specifications for high-power applications.

Made with laser grade zinc selenide with computer optimized anti-reflection coatings.

Specifications:

Material: ZnSe Laser Grade C.V.D. type

Diameter Tolerances: +0.000", -0.005"

Thickness: \pm 0.010"

Surface Figure: < 1/40 wavelength @ 10.6 μ m

Centration: < 0.001"

Focal Length Tolerance: \pm 1.0%

Surface Quality: < 40/20 scratch-dig Laser Finish

Spectral Performance:

Standard AR Coating type Both Sides @ 10.6 μ m (AR)

Absorption: < 0.25 % total

Reflectance: < 0.20% per surface @ 10.6 μ m

Transmittance: > 99.0% typical

Ultra Low Absorption AR Coating type Both Sides @ 10.6 μ m (ULA)

Absorption: < 0.15 % total

Reflectance: < 0.25% per surface

Transmittance: > 99.0% typical

Dual Band AR Coating type Both Sides @ 10.6 μ m and .633 μ m (DBAR)

Absorption: < 0.30 % total

Reflectance: < 0.25% per surface @ 10.6 μ m

Transmittance: > 98.5% @ 10.6 μ m with > 90% @ .633 μ m

Model Number	Diameter	Focal Length	Edge Thickness
FL-10.6-LMZ-0707-ET2.0	0.750"	0.750"	0.080"
FL-10.6-LMZ-0710-ET2.0	0.750	1.00	0.080
FL-10.6-LMZ-0712-ET2.0	0.750	1.20	0.080
FL-10.6-LMZ-0715-ET2.0	0.750	1.50	0.080
FL-10.6-LMZ-0720-ET2.0	0.750	2.00	0.080
FL-10.6-LMZ-0725-ET2.0	0.750	2.50	0.080
FL-10.6-LMZ-0730-ET2.0	0.750	3.00	0.080
FL-10.6-LMZ-0740-ET2.0	0.750	4.00	0.080
FL-10.6-LMZ-1010-ET2.0	1.00	1.00	0.080
FL-10.6-LMZ-1015-ET3.0	1.00	1.50	0.120
FL-10.6-LMZ-1020-ET3.0	1.00	2.0	0.120
FL-10.6-LMZ-1030-ET3.0	1.00	3.00	0.120

FL-10.6-LMZ-1050-ET3.0	1.00	5.00	0.120
FL-10.6-LMZ-1075-ET3.0	1.00	7.50	0.120
FL-10.6-LMZ-1115-ET2.8	1.10	1.50	0.110
FL-10.6-LMZ-1125-ET3.0	1.10	2.50	0.120
FL-10.6-LMZ-1125-ET6.0	1.10	2.50	0.236
FL-10.6-LMZ-1135-ET3.0	1.10	3.50	0.120
FL-10.6-LMZ-1138-ET2.8	1.10	3.75	0.110
FL-10.6-LMZ-1138-ET3.0	1.10	3.75	0.120
FL-10.6-LMZ-1150-ET2.8	1.10	5.0	0.110
FL-10.6-LMZ-1150-ET3.0	1.10	5.0	0.120
FL-10.6-LMZ-1150-ET4.0	1.10	5.0	0.160
FL-10.6-LMZ-1150-ET6.0	1.10	5.0	0.236
FL-10.6-LMZ-1175-ET2.8	1.10	7.50	0.110
FL-10.6-LMZ-1175-ET4.0	1.10	7.50	0.160
FL-10.6-LMZ-1175-ET6.0	1.10	7.50	0.236
FL-10.6-LMZ-11A0-ET2.8	1.10	10.0	0.110
FL-10.6-LMZ-1520-ET3.0	1.50	2.0	0.120
FL-10.6-LMZ-1525-ET6.0	1.50	2.50	0.236
FL-10.6-LMZ-1530-ET3.0	1.50	3.0	0.120
FL-10.6-LMZ-1538-ET6.0	1.50	3.8	0.236
FL-10.6-LMZ-1538-ET7.4	1.50	3.8	0.291
FL-10.6-LMZ-1550-ET3.0	1.50	5.0	0.120
FL-10.6-LMZ-1550-ET4.0	1.50	5.0	0.160
FL-10.6-LMZ-1550-ET6.0	1.50	5.0	0.236
FL-10.6-LMZ-1550-ET7.4	1.50	5.0	0.291
FL-10.6-LMZ-1550-ET9.0	1.50	5.0	0.354
FL-10.6-LMZ-1575-ET6.0	1.50	7.50	0.236
FL-10.6-LMZ-1575-ET7.4	1.50	7.50	0.291
FL-10.6-LMZ-1575-ET9.0	1.50	7.50	0.354
FL-10.6-LMZ-1590-ET7.4	1.50	9.0	0.291
FL-10.6-LMZ-15A0-ET7.4	1.50	10.0	0.291
FL-10.6-LMZ-2050-ET9.7	2.0	5.0	0.380
FL-10.6-LMZ-2075-ET9.7	2.0	7.50	0.380
FL-10.6-LMZ-20A0-ET9.7	2.0	10.0	0.380

CO2 Laser Focusing Lenses (Plano-Concave Lenses)

Specifications:

Material: ZnSe Laser Grade C.V.D. type
 Diameter Tolerances: +0.000", -0.005"
 Thickness: ±.010"
 Surface Figure: < 1/40 wavelength @ 10.6µm
 Centration: < 0.001"
 Focal Length Tolerance: ±1.0%
 Surface Quality: < 40/20 scratch-dig Laser Finish

Spectral Performance:

Standard AR Coating type Both Sides @ 10.6µm (AR)

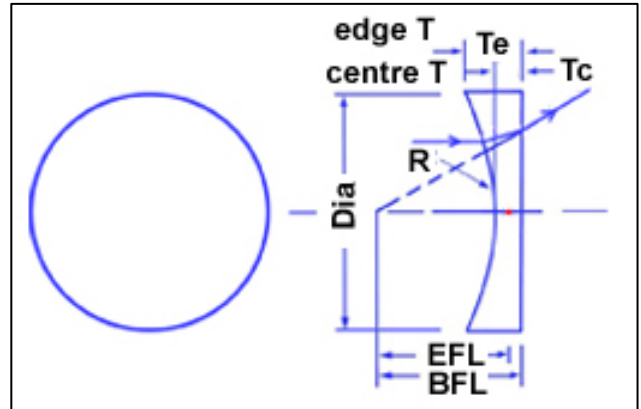
Absorption: < 0.25 % total
 Reflectance: < 0.20% per surface @ 10.6µm
 Transmittance: > 99.0% typical

Ultra Low Absorption AR Coating type Both Sides @ 10.6µm (ULA)

Absorption: < 0.15 % total
 Reflectance: < 0.25% per surface
 Transmittance: > 99.0% typical

Dual Band AR Coating type Both Sides @ 10.6µm and .633µm (DBAR)

Absorption: < 0.30 % total
 Reflectance: < 0.25% per surface @ 10.6µm
 Transmittance: > 98.5% @ 10.6µm with > 90% @ .633µm



Part number	WL um	FL mm/inch	BFL mm	Dia. mm/inch	Edge T mm
FL-10.6-F(20)-D12-T2.0-CC	10.6	-20mm	-20.6	12	2.0

Model Number	Diameter	Focal Length	Edge Thickness
FL-10.6-LPCZ-0510-ET3.2	0.500"	-1.000"	0.125"
FL-10.6-LPCZ-0514-ET2.5	0.500"	-1.390"	0.100"
FL-10.6-LPCZ-0520-ET2.0	0.500"	-2.000"	0.080"
FL-10.6-LPCZ-0525-ET2.5	0.500"	-2.500"	0.100"
FL-10.6-LPCZ-0540-ET2.5	0.500"	-4.000"	0.100"
FL-10.6-LPCZ-0610-ET4.6	0.600"	-1.000"	0.180"
FL-10.6-LPCZ-0620-ET3.0	0.600"	-2.000"	0.120"
FL-10.6-LPCZ-0625-ET3.0	0.600"	-2.500"	0.120"
FL-10.6-LPCZ-0640-ET2.4	0.600"	-4.000"	0.095"
FL-10.6-LPCZ-0710-ET5.0	0.750"	-1.000"	0.200"
FL-10.6-LPCZ-0715-ET2.0	0.750"	-1.500"	0.080"
FL-10.6-LPCZ-0720-ET2.5	0.750"	-2.000"	0.100"
FL-10.6-LPCZ-0725-ET2.5	0.750"	-2.500"	"0.100
FL-10.6-LPCZ-0750-ET2.0	0.750"	-5.000"	0.080"
FL-10.6-LPCZ-1014-ET5.0	1.000"	-1.390"	0.200"
FL-10.6-LPCZ-1025-ET4.0	1.000"	-2.500"	0.160"
FL-10.6-LPCZ-1115-ET5.0	1.100"	-1.500"	0.200"
FL-10.6-LPCZ-1125-ET4.0	1.100"	-2.500"	0.160"
FL-10.6-LPCZ-1150-ET3.0	1.100"	-5.000"	0.120"

CO2 Laser Focusing Lenses (Aspheric Lenses)

Aspheric Lenses are intended as single-element alternatives to the doublet series and high-performance alternatives to short focal length meniscus lenses.

- Diffraction limited performance by correcting the spherical aberration that is present with a "best form" meniscus lens
- More tolerant to small angular misalignments of the beam than plano-convex lenses
- Can be supplied mounted if required

Specifications:

- Diameter tolerance: $\pm 0/-0.1$ mm
- Focal length tolerance: $\pm 0.5\%$
- Transmission: $>99.4\%$
- Reflectance: 0.1% per surface
- Absorption per surface: Typically $<0.2\%$

Part No.	Material	Diameter	ET	Coating	FL
LF-10.6-10ZAL25.4	ZnSe	25.4mm	3mm	AR/AR	25.4mm
LF-10.6-11ZAL25.4	ZnSe	28mm	3mm	AR/AR	25.4mm
LF-10.6-11ZAL38.1	ZnSe	28mm	3mm	AR/AR	38.1mm
LF-10.6-11ZAL50.8	ZnSe	28mm	3mm	AR/AR	50.8mm
LF-10.6-11ZAL63.5	ZnSe	28mm	3mm	AR/AR	63.5mm
LF-10.6-15ZAL127	ZnSe	38.05mm	3mm	AR/AR	127mm
LF-10.6-15ZAL38.1	ZnSe	38.05mm	3mm	AR/AR	38.1mm
LF-10.6-15ZAL50.8	ZnSe	38.05mm	3mm	AR/AR	50.8mm
LF-10.6-15ZAL63.5	ZnSe	38.05mm	3mm	AR/AR	63.5mm
LF-10.6-15ZAL95.3	ZnSe	38.05mm	3mm	AR/AR	95.3mm

CO2 Laser Focusing Lenses Used in Branded Lasers

AMADA Focusing Lenses

Our Part No.	Focusing Lenses Part Description
FL-10.6-F127-D38.1-T7.62	(PL-CX) Dia. 1.5" / FL: 5.0" / ET: .300" (7.62mm)
FL-10.6-F190.5-D38.1-T8	(PL-CX) Dia. 1.5" / FL: 7.5" / ET: .315" (8.00mm)
FL-10.6-F127-D50.8-T7.87	(PL-CX) Dia. 2.0" / FL: 5.0" / ET: .310" (7.87mm)
FL-10.6-F190.5-D50.8-T9.65	(PL-CX) Dia. 2.0" / FL: 7.5" / ET: .380" (9.65mm)
FL-10.6-F190.5-D50.8-T7.87	(PL-CX) Dia. 2.0" / FL: 7.5" / ET: .310" (7.87mm)

Bystronic Focusing Lenses

Our Part No.	Focusing Lenses Part Description
FL-10.6-F127-D38.1-T5.99-MN	(Men) Dia. 1.5" / FL: 5.0" / ET: .236" (5.99mm)
FL-10.6-F127-D38.1-T8.99-MN	(Men) Dia. 1.5" / FL: 5.0" / ET: .354" (8.99mm)
FL-10.6-F190.5-D38.1-T5.99-MN	(Men) Dia. 1.5" / FL: 7.5" / ET: .236" (5.99mm)
FL-10.6-F190.5-D38.1-T8.99-MN	(Men) Dia. 1.5" / FL: 7.5" / ET: .354" (8.99mm)

CINCINNATI Focusing Lenses

Our Part No.	Focusing Lenses Part Description
FL-10.6-F130.3-D38.1-T7.11	(PL-CX) Dia. 1.5" / FL: 5.13" / ET: .280" (7.11mm)
FL-10.6-F193.8-D38.1-T7.62	(PL-CX) Dia. 1.5" / FL: 7.63" / ET: .300" (7.62mm)
FL-10.6-F190.5-D50.8-T9.65	(PL-CX) Dia. 2.0" / FL: 7.50" / ET: .380" (9.65mm)
FL-10.6-F127-D50.8-T9.65	(PL-CX) Dia. 2.0" / FL: 5.00" / ET: .380" (9.65mm)

MAZAK Focusing Lenses

Our Part No.	Focusing Lenses Part Description
FL-10.6-F127-D38.1-T5.99	(PL-CX) Dia. 1.5" / FL: 5.0" / ET: .236" (5.99mm)
FL-10.6-F127-D38.1-T7.97	(PL-CX) Dia. 1.5" / FL: 5.0" / ET: .310" (7.97mm)
FL-10.6-F127-D50.8-T7.87	(PL-CX) Dia. 2.0" / FL: 5.0" / ET: .314" (7.87mm)
FL-10.6-F127-D50.8-T9.65	(PL-CX) Dia. 2.0" / FL: 5.0" / ET: .380" (9.65mm)
FL-10.6-F190.5-D50.8-T7.87	(PL-CX) Dia. 2.0" / FL: 7.5" / ET: .314" (7.87mm)
FL-10.6-F190.5-D50.8-T9.65	(PL-CX) Dia. 2.0" / FL: 7.5" / ET: .380" (9.65mm)

Mitsubishi Focusing Lenses

Our Part No.	Part Description
FL-10.6-F190.5-D50.8-T7.87	(PL-CX) Dia. 2.0" / FL: 7.5" / ET: .310" (7.87mm)
FL-10.6-F190.5-D38.1-T8	(PL-CX) Dia. 1.5" / FL: 7.5" / ET: .315" (8.00mm)
FL-10.6-F127-D50.8-T7.87	(PL-CX) Dia. 2.0" / FL: 5.0" / ET: .310" (7.87mm)
FL-10.6-F190.5-D50.8-T7.87	(PL-CX) Dia. 2.0" / FL: 7.5" / ET: .310" (7.87mm)
FL-10.6-F190.5-D50.8-T9.65	(PL-CX) Dia. 2.0" / FL: 7.5" / ET: .380" (9.65mm)

TRUMPF Focusing Lenses

Our Part No.	Part Description
FL-10.6-F127-D38.1-T7.39-MN	(Meniscus) Dia. 1.5" / FL: 5.0" / ET: .291" (7.39mm)
FL-10.6-F190.5-D38.1-T7.39-MN	(Meniscus) Dia. 1.5" / FL: 7.5" / ET: .291" (7.39mm)
FL-10.6-F190.5-D38.1-T7.62	(PL-CX) Dia. 1.5" / FL: 7.5" / ET: .300" (7.62mm)
FL-10.6-F190.5-D38.1-T7.75	(PL-CX) Dia. 1.5" / FL: 7.5" / ET: .305" (7.75mm)
FL-10.6-F127-D38.1-T6.2	(PL-CX) Dia. 1.5" / FL: 5.0" / ET: .244" (6.20mm)

Dual-Focus Lenses (Bi-focal Lenses)

Dual-Focus lenses are a revolutionary new type of lens for CO₂ laser cutting, which can be supplied as a direct replacement for your conventional lens. Dual-Focus lenses can allow much thicker materials to be cut at a given laser power. Additional advantages come from the fact that assist gas requirements are significantly reduced.

Advantages

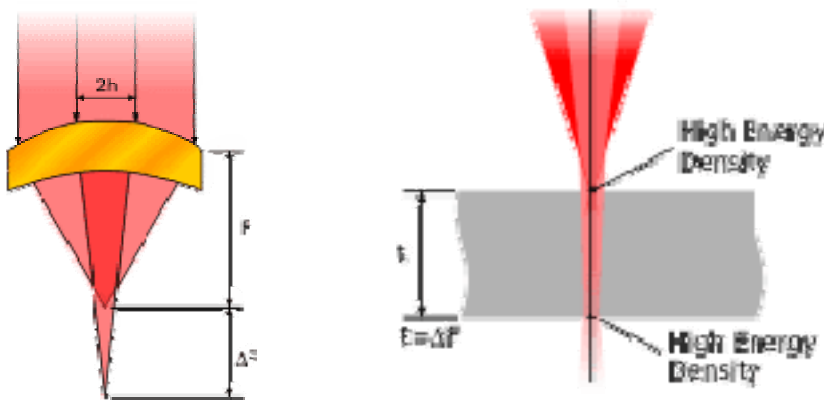
- 50-100% faster cutting of existing materials
- Thicker materials may be cut
- Polished finishes can be achieved
- Elimination of sub-surface dross
- Cost savings on assist gas
- Immediate cut initiation with no top surface dross
- Reduced sensitivity to errors in setting the focus
- Direct replacement of existing lenses



How Do Dual-Focus Lenses Work?

By distributing a fraction of the laser energy into a secondary (lower) focus, the lenses provide faster, cleaner cuts, with easier initiation and the elimination of sub-surface dross.

The laser beam is intercepted and focused by a lens having a central circular region with a focal length which is longer than the basic lens focal length. The secondary focal area is used to produce the concentration of laser energy further into the material, while the energy intercepted by the outer part of the lens produces the 'upper' focus. The splitting of the laser power into two foci allows a more efficient couple of the energy into the cutting process; the lower focus being directed into the kerf. This results in high energy density and increased localised temperature at both the upper and the lower foci.



Technical considerations

The introduction of the secondary focal area introduces two new variables to the focusing lens:

- (1) The difference in focal lengths between the basic lens and the secondary focal area needs to be 'tailored' to or smaller than the thickness of material to be cut. In general, the thicker the material, the greater should be the difference in F (called dF).
- (2) The diameter of the secondary focal area (called $2h$), in relation to the diameter of the incident beam, determines the fraction of beam energy directed to the lower focus.

The propagation calculations for the beams forming the two foci can be approximated by the application of Gaussian formulae.

An increase in the diameter of the secondary focal area has two effects:

- (a) Increases the fraction of energy directed to the lower focus
- (b) Reduces the focused waist diameter, so increasing the lower focus energy density and reducing the lower focus depth-of-focus.

For a TEM₀₀ beam of $(1/e^2)$ diameter $2w$, intercepted by a secondary focal area of diameter $2h$, the fraction of beam energy directed to the top and bottom focus are:

Fraction to top focus = $\exp[-2(h/w)^2]$
 Fraction to bottom focus = $1 - \exp[-2(h/w)^2]$

Applications

Successful applications include:

- * Cutting thick-section metals, including stainless steel and aluminium.
- * Improved die-board processing (with better process control).
- * Scribing/processing thick-section ceramics.

Important note: when cutting stainless steel the (main) upper lens focus must be set near to the top material surface!

Dual-Focus product types

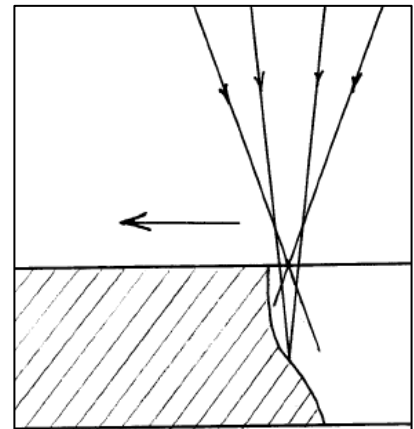
The main ranges of Dual-Focus lenses are:

FLDF-10.6-D28-T4.2 Series (1.1"dia 4.2mm ET lenses, 127 & 190mm FLs)
 FLDF-10.6-D38-T6.2 Series (1.5"dia 6.2mm ET lenses, 127, 190 & 254mm FLs)
 FLDF-10.6-D38-T7.4 Series (1.5"dia 7.4mm ET lenses, 127, 190 & 254mm FLs)
 FLDF-10.6-D38-T9 (1.5"dia 9.0mm ET lenses, 127, 190 & 254mm FLs)
 FLDF-10.6-D50.8-T9.6 Series (2.0"dia 9.6mm ET lenses, 127 & 190mm FLs)

Applications guideline

Based on practical trials, the following broad guidelines are offered for those customers wishing to make their own lens selection for cutting stainless steel:

- The diameter, edge thickness and focal length are chosen to match their current conventional lens. dF is the thickness of material to be cut. If a range of thicknesses is specified, dF should be towards the thinner end. If the range of thickness varies by more than a factor of 2, then perhaps more than one lens is recommended.
- There is no clear rule as to what dF should be. Originally, it was thought that one focus at the top surface and one at the bottom (so dF = material thickness) would be the best, but it has never been confirmed. The right picture shows the shape of the melt front in metal (stainless steel) as it is being cut. It is not straight down though the sheet but has a shoulder. This means that if the bottom focus is put at the bottom surface, it will never actually get to focus there, so the picture has targeted it roughly where the shoulder will be. Dual-Focus lenses are about coupling the energy more efficiently into the material and the conditions may vary enough from one user to another that there are no hard rules. In general, dF is smaller than the thickness of material and the first focus is on the top surface.
- 2h is selected to be 50% of the $1/e^2$ beam diameter if the beam mode is a good '00' Gaussian mode. Increase to 60% if the mode looks more like '01*' with a strong central dip.



Description of Part Number: FLDF-xxxx-D-T-F-dF-2h-yy

FLDF: single-element focusing lens with dual-focus

xxxx: laser wavelength, 10.6um.

D: lens diameter, mm (here is 28mm=1.1", 38.1mm=1.5" & 50.8mm=2", respectively)

T: lens edge thickness, mm

F: focal length, mm

dF: difference in focal length, units of 0.1mm

2h: diameter 2h, in units of 0.1mm

yy: others

Example: FLDF-10.6-D28-T4.2-F095-dF100-2h060 has a diameter of 28mm (1.1"), an edge thickness of 4.2mm, a focal length of 95mm (3.75"), a difference of focal length of 10mm, and 2h = 6.0mm.

1. FLDF-10.6-D28-T4.2 series dual-focus lenses

FLDF-10.6-D28-T4.2 series dual-focus lenses are 1.1" diameter. They are intended to be used as direct replacements for conventional lenses in industrial laser systems with 'full' beam diameters up to about 19mm (0.75"). Useful for improved cutting of stainless steel and aluminium in systems with smaller beam sizes, this series of lenses are also intended for use in die-board cutting systems. In laser cutting, dual-focus lenses exhibit some or all of these advantages:-

- * Reduced / eliminated cut dross
- * Increased thickness of cut capability
- * Increased cut speed
- * Improved kerf quality
- * Reduced assist-gas usage
- * Improved process control (die-board processing)



This technical data sheet presents a range of standard products. Non-standard lenses can be designed and fabricated to order.

Technical specifications

Material	Lasergrade ZnSe
Diameter	28.0 +0/-0.1mm
Edge thickness	4.2 ±0.1mm
Centration	Within 0.05mm ETV
Coatings	AR/AR for 10.6µm (R<0.25% per surface)
Absorption	<0.20% at 10.6µm
LIDT (cw)	>2000W/mm
Accuracy of 2h	±0.5mm

Note: laser induced damage threshold (LIDT)

Standard parts

- There are 3 standard basic focal lengths: 95mm, 127mm, 190mm.
- Each FL has several options for the difference in FL, chosen from the values dF = 5mm, 7.5mm, 10mm, 12.5mm, 15mm.
- Each option is available in one of five values for 2h. Standard values for 2h are: 4.0mm, 5.0mm, 6.0mm, 7.0mm, 8.0mm.
- The tabulated value '%L' is the percentage of beam power in the lower focus, for a TEM00 beam of 12.0mm (1/e²) diameter.

For 95mm focal length, part no. is FLDF-10.6-D28-T4.2-F095-dFyyy-2hzzz						
For 127mm focal length, part no. is FLDF-10.6-D28-T4.2-F127-dFyyy-2hzzz						
For 190mm focal length, part no. is FLDF-10.6-D28-T4.2-F190-dFyyy-2hzzz						
2h (mm)	Focal Difference dF (mm)					%L
	5.0 yyy-zzz	7.5 yyy-zzz	10.0 yyy-zzz	12.5 yyy-zzz	15.0 yyy-zzz	
4.0	050-040	075-040	100-040	125-040	150-040	20%
5.0	050-050	075-050	100-050	125-050	150-050	29%
6.0	050-060	075-060	100-060	125-060	150-060	39%
7.0	050-075	075-070	100-070	125-070	150-070	49%
8.0	050-080	075-080	100-080	125-080	150-080	59%

2. FLDF-10.6-D38-T6.2 series dual-focus lenses

The FLDF-10.6-D38-T6.2 series of Dual-Focus lenses are intended to be used as direct replacements for conventional lenses in many industrial laser systems and applications. Designed to assist in a range of thick-section cutting jobs, the FLDF-10.6-D38-T6.2 lenses are intended to give some (or all!) of these advantages:

- * Increased thickness of cut capability
- * Improved kerf quality
- * Reduced assist-gas usage
- * Improved process control (die-board processing)

This technical data sheet presents a range of standard products. Non-standard lenses can be designed and fabricated to order.

Technical specifications

Material	Lasergrade
ZnSe Diameter	38.1 +0/-0.1mm
Edge thickness	6.2 +/-0.1mm
Centration	Within 0.05mm
ETV Coatings	AR/AR for 10.6 μ m (R<0.25% per surface)
Absorption	<0.24% at 10.6 μ m
LIDT (cw)	>2000W/mm
Accuracy of 2h	\pm 0.5mm



Standard parts

- There are 3 standard basic focal lengths: 127mm, 190mm, 254mm.
- Each FL has three options for the difference in FL, chosen from the values dF = 5mm, 10mm, 15mm, 20mm.
- Each option is available in one of five values for 2h. Standard values for 2h are: 5.0mm, 7.0mm, 10.0mm, 12.5mm, 15.0mm.
- The tabulated value '%L' is the percentage of beam power in the lower focus, for a TEM₀₀ beam of 16.0mm (1/e²) diameter.

For 127mm focal length, part no. is FLDF-10.6-D38-T6.2-F127-dFyyy-2hzzz					
For 190mm focal length, part no. is FLDF-10.6-D38-T6.2-F190-dFyyy-2hzzz					
For 254mm focal length, part no. is FLDF-10.6-D38-T6.2-F254-dFyyy-2hzzz					
2h (mm)	Focal Difference dF (mm)				%L
	5.0 ⁽¹⁾ yyy-zzz	10.0 yyy-zzz	15.0 yyy-zzz	20.0 ⁽²⁾ yyy-zzz	
5.0	050-050	100-050	150-050	200-050	18%
7.0	050-070	100-070	150-070	200-070	32%
10.0	050-100	100-100	150-100	200-100	54%
12.5	050-125	100-125	150-125	200-125	70%
15.0	050-150	100-150	150-150	200-150	85%

Notes: (1) dF = 5.0 non-standard in FLDF-10.6-D38-T6.2-F254 series.

(2) dF = 20.0 is standard for FLDF-10.6-D38-T6.2-F254 series only.

3. FLDF-10.6-D38-T7.4 series dual-focus lenses

The FLDF-10.6-D38-T7.4 series of Dual-Focus lenses are intended to be used as direct replacements for conventional lenses in Trumpf industrial laser systems and applications. Designed to assist in a range of thick-section cutting jobs, the FLDF-10.6-D38-T7.4 lenses will give some (or all!) of these advantages:

- * Increased thickness of cut capability
- * Improved kerf quality
- * Reduced assist-gas usage
- * Faster processing .. see note (1)
- * Reduced under-surface dross .. see note (1)

Technical specifications

Material	Lasergrade ZnSe
Diameter	38.1 +0/-0.1mm
Edge thickness	7.4 \pm 0.1mm
Centration	Within 0.05mm ETV
Coatings	AR/AR for 10.6 μ m (R<0.25% per surface)
Absorption	<0.24% at 10.6 μ m
LIDT (cw)	>2000W/mm
Accuracy of 2h	\pm 0.5mm

Note (1): An independant laser user with a 3kW Trumpf laser reports 35% process speed increase and 85% dross reduction when cutting 10mm stainless steel.

Standard parts

- There are 3 standard basic focal lengths: 127mm, 190mm, 254mm.
- Each FL has three options for the difference in FL, chosen from the values dF = 5mm, 10mm,



15mm, 20mm. Each option is available in one of five values for 2h. Standard values for 2h are: 5.0mm, 7.0mm, 10.0mm, 12.5mm, 15.0mm.

- The tabulated value '%L' is the percentage of beam power in the lower focus, for a TEM₀₀ beam of 16.0mm (1/e²) diameter.

For 127mm focal length, part no. is FLDF-10.6-D38-T7.4-F127-dFyyy-2hzzz					
For 190mm focal length, part no. is FLDF-10.6-D38-T7.4-F190-dFyyy-2hzzz					
For 254mm focal length, part no. is FLDF-10.6-D38-T7.4-F254-dFyyy-2hzzz					
2h (mm)	Focal Difference dF (mm)				%L
	5.0 ⁽²⁾ yyy-zzz	10.0 yyy-zzz	15.0 yyy-zzz	20.0 ⁽³⁾ yyy-zzz	
5.0	050-050	100-050	150-050	200-050	18%
7.0	050-070	100-070	150-070	200-070	32%
10.0	050-100	100-100	150-100	200-100	54%
12.5	050-125	100-125	150-125	200-125	70%
15.0	050-150	100-150	150-150	200-150	85%

Notes: (2) dF = 5.0 non-standard in FLDF-10.6-D38-T7.4-F254 series.

(3) dF = 20.0 is standard for FLDF-10.6-D38-T7.4-F254 series only.

4. FLDF-10.6-D38-T9 series dual-focus lenses

The FLDF-10.6-D38-T9 series of Dual-Focus lenses may be used as direct replacements for conventional lenses in certain Bystronic industrial laser systems normally using 9mm ET lenses. Designed to assist in a range of thick-section cutting jobs, the FLDF-10.6-D38-T9 lenses will give some (or all!) of these advantages:

- * Increased thickness of cut capability
- * Improved kerf quality
- * Reduced assist-gas usage(1)
- * Faster processing
- * Reduced under-surface dross
- * Improved initial cut penetration



Technical specifications

Material	Lasergrade ZnSe
Diameter	38.1 +0/-0.1mm
Edge thickness	9.0 ±0.1mm
Centration	Within 0.05mm ETV
Coatings	AR/AR for 10.6µm (R<0.25% per surface)
Absorption	<0.25% at 10.6µm
LIDT (cw)	>2000W/mm
Accuracy of 2h	±0.5mm

Note (1) Using dual-focus lenses, the 'main' beam is focused near the top surface of the workpiece. As a consequence, the nozzle tip aperture can usually be smaller.

Standard parts

- There are 3 standard basic focal lengths: 127mm, 190mm, 254mm.
- Each FL has three options for the difference in FL, chosen from the values dF = 5mm, 10mm, 15mm, 20mm. Each option is available in one of five values for 2h. Standard values for 2h are: 5.0mm, 7.0mm, 10.0mm, 12.5mm, 15.0mm.
- The tabulated value '%L' is the percentage of beam power in the lower focus, for a TEM₀₀ beam of 16.0mm (1/e²) diameter.

For 127mm focal length, part no. is FLDF-10.6-D38-T9-F127-dFyyy-2hzzz					
For 190mm focal length, part no. is FLDF-10.6-D38-T9-F190-yyy-zzz					
For 254mm focal length, part no. is FLDF-10.6-D38-T9-F254-dFyyy-2hzzz					
2h (mm)	Focal Difference dF (mm)				%L
	5.0 ⁽²⁾ yyy-zzz	10.0 yyy-zzz	15.0 yyy-zzz	20.0 ⁽³⁾ yyy-zzz	
5.0	050-050	100-050	150-050	200-050	18%
7.0	050-070	100-070	150-070	200-070	32%
10.0	050-100	100-100	150-100	200-100	54%
12.5	050-125	100-125	150-125	200-125	70%
15.0	050-150	100-150	150-150	200-150	83%

- Notes:** (2) dF = 5.0 non-standard in FLDF-10.6-D38-T9-F254 series.
 (3) dF = 20.0 is standard for FLDF-10.6-D38-T9-F254 series only.

5. FLDF-10.6-D50.8-T9.6 series dual-focus lenses

The FLDF-10.6-D50.8-T9.6 series of dual-focus lenses are intended to be used as direct replacements for 2.0" diameter, conventional high-gas- pressure lenses in some (larger) industrial laser systems. Designed to assist in a range of thick-section cutting jobs, the FLDF-10.6-D50.8-T9.6 lenses will give some (or all!) of these advantages:

- * Increased thickness of cut capability
- * Improved kerf quality
- * Reduced assist-gas usage
- * Increased cutting speed
- * Reduced lower-surface dross

This technical data sheet presents a range of standard products. Non-standard lenses can be designed and fabricated to order.

Technical specifications

Material	Lasergrade ZnSe
Diameter	50.8 +0/-0.1mm
Edge thickness	9.6 ±0.1mm
Centration	Within 0.05mm ETV
Coatings	AR/AR for 10.6µm (R<0.25% per surface)
Absorption	<0.26% at 10.6µm
LIDT (cw)	>2000W/mm
Accuracy of 2h	±0.5mm



Standard parts

- There are 3 standard basic focal lengths: 190.5mm, 254.0mm, and 317.5mm. (7.5", 10.0" and 12.5", respectively).
- Each FL has three options for the difference in FL, chosen from the values dF = 10mm, 15mm, 20mm, 25mm. Each option is available in one of five values for 2h. Standard values for 2h are: 10.0mm, 12.5mm, 15.0mm, 19.0mm, 22.5mm.
- The tabulated value '%L' is the percentage of beam power in the lower focus, for a TEM₀₀ beam of 25.0mm (1/e²) diameter.

For 190mm focal length, part no. is FLDF-10.6-D50.8-T9.6-F190-dFyyy-2hzzz					
For 254mm focal length, part no. is FLDF-10.6-D50.8-T9.6-F254-dFyyy-2hzzz					
For 317mm focal length, EFL part no. is FLDF-10.6-D50.8-T9.6-F317-dFyyy-2hzzz					
2h (mm)	Focal Difference dF (mm)				%L
	10.0 ⁽¹⁾ yyy-zzz	15.0 yyy-zzz	20.0 yyy-zzz	25.0 ⁽²⁾ yyy-zzz	
10.00	100-100	150-100	200-100	250-100	27%
12.50	100-125	150-125	200-125	250-125	39%
15.00	100-150	150-150	200-150	250-150	51%
19.00	100-190	150-190	200-190	250-190	68%
22.50	100-225	150-225	200-225	250-225	80%

Notes: (1) dF = 10.0 is non-standard in FLDF-10.6-D50.8-T9.6-F317 series.

(2) dF = 25.0 is standard for FLDF-10.6-D50.8-T9.6-F254 and FLDF-10.6-D50.8-T9.6-F317 lenses only.

If you are using a focusing in your laser cutting machine and want to convert it into dual-focus lens, please tell the following parameters so that we can recommend suitable lens for your applications:

- Laser wavelength
- Laser average power
- Laser beam diameter on the lens
- Laser beam quality (beam mode TEM₀₀, TEM₀₁, multi mode or M2)

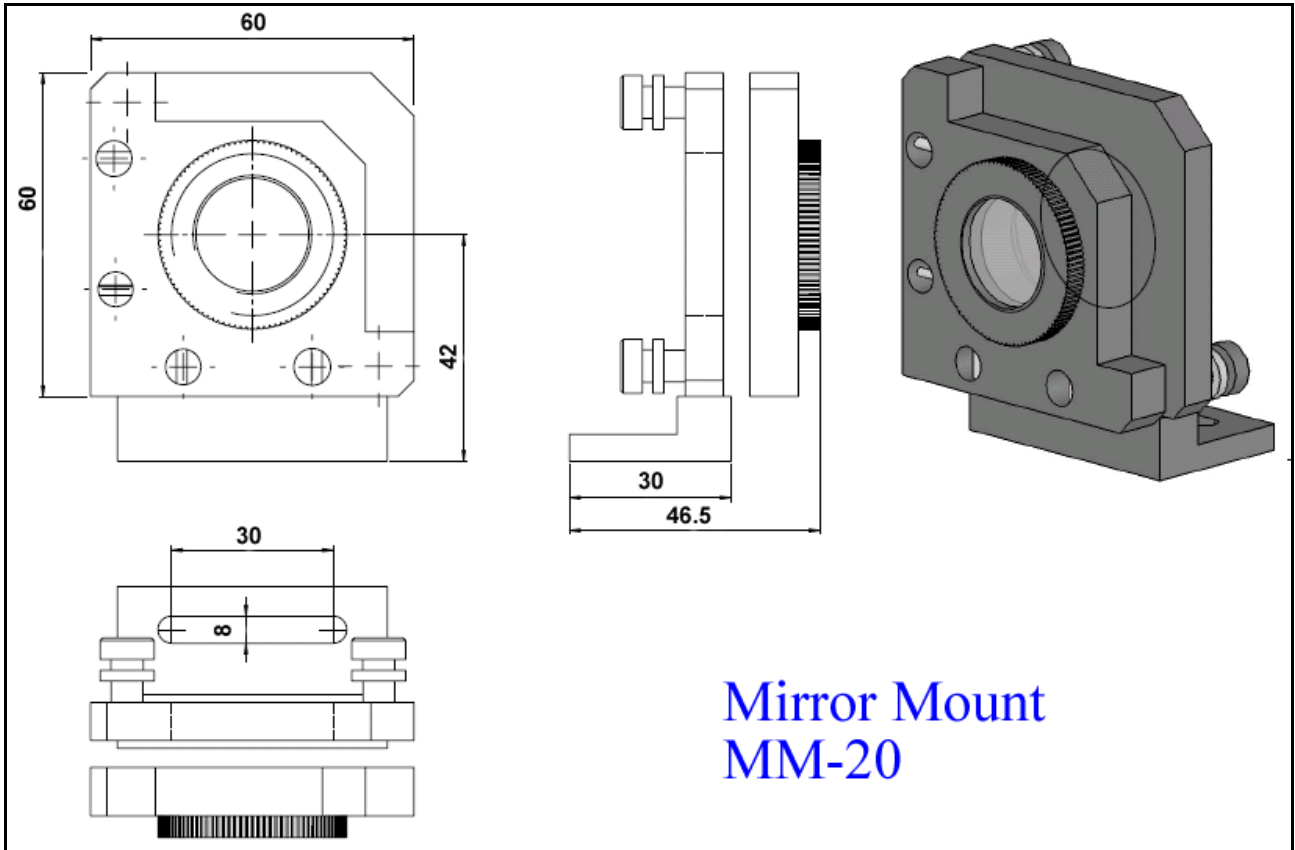
- Parameters of current lens such as diameter, focal length, plano-convex or meniscus shape, edge thickness
- What materials to be cut? Mild steel or/and stainless steel or other materials?
- What is the thickness of the materials?
- What assist gas is used in cutting? Nitrogen, oxygen, compressed air?

Mirror Mount

Model: MM-20

2D adjustable

Suitable for the mirrors with diameter 20mm

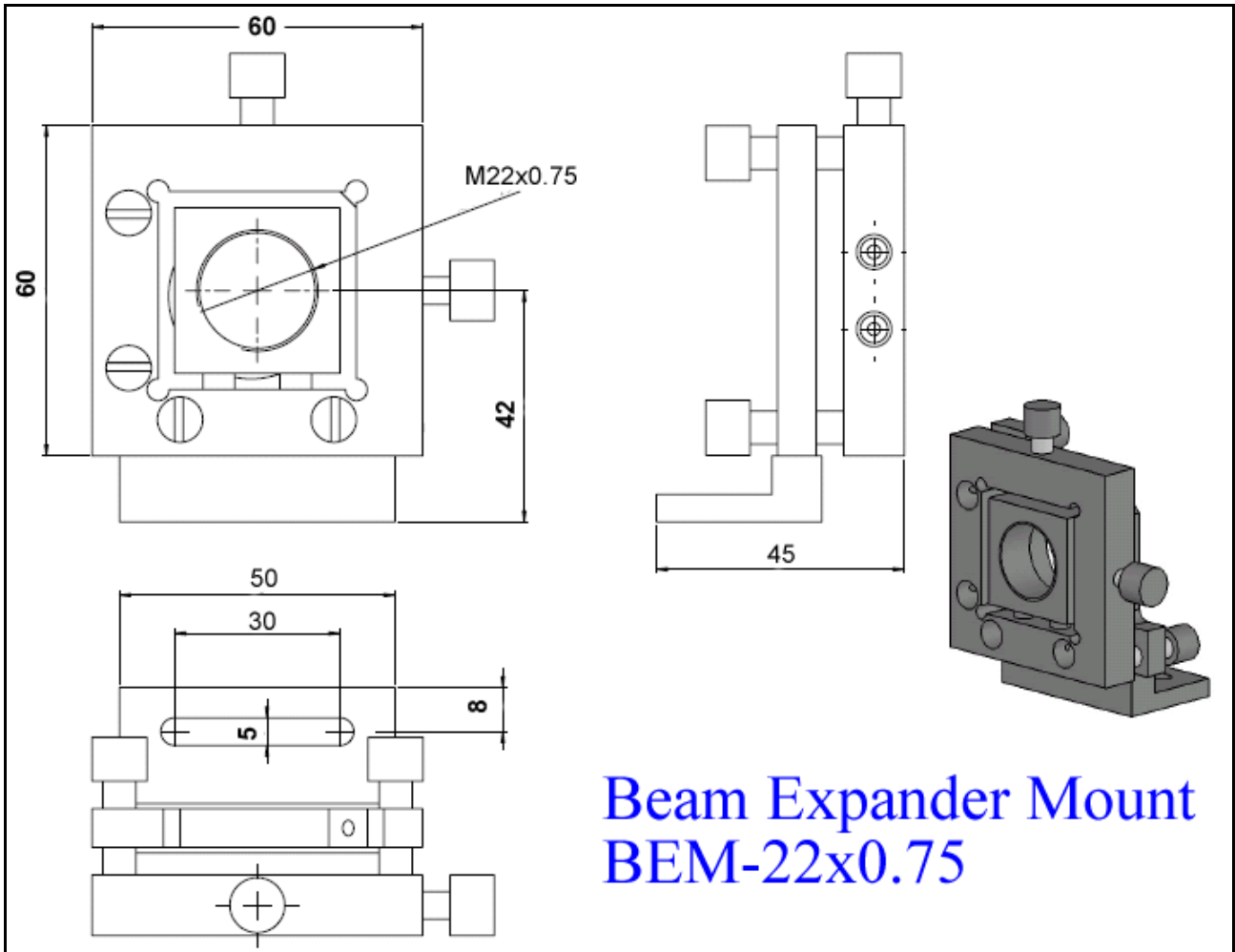


Beam Expander Mount

Model: BEM-22x0.75

4D adjustable

Suitable for the beam expander with a screw of M22x0.75mm



How to find the coating on the surface of the mirrors

1. Watch the surface at a angle (about 45 degree) and you can see the color film on the mirror.
2. Sometime there is no coating near the edge and thus you can easily find the coating surface.

General rules about cleaning lenses/mirrors

1. Always wear finger cots when handling any lens or mirror to keep finger oils off of the optic.
2. Always handle optics by the edge of the optic. Never touch the coated surfaces.
3. Never rub an optical surface, as this can mar or scratch the coated surface.
4. Avoid using Q-tips or cotton balls to clean an optical surface.
5. Use a high-grade acetone to clean your optic, which should be dispensed by an eyedropper on to lens cleaning tissue.
6. Never put any foreign objects back into the acetone dispenser to avoid contamination of the acetone in the dispenser.

How to clean an optic:

Pull out your mirror/lens from its holder and lay it on a clean work area, or into a holder supplied by the manufacturer. You will need a lens cleaning tissue containing low ash content and no chemical additives. Also, you will need a small dispense bottle which has an eyedropper to apply the acetone.

1. If you do not have an optic holder, lay your optic onto a clean piece of lens tissue.
2. Remember that when lens tissue is dry it is abrasive and can scratch your optical surface.
3. Place a new piece of lens tissue over the optic, completely covering the optic.
4. Fill your eyedropper with 6-8 drops of acetone. You do not want to apply too much.
5. Drip acetone on to the center of the optic until it is saturated to the outside diameter of the optic.
6. Pull the lens tissue slowly across the optic. You will know if you are going too fast if you see residue left behind. At the correct speed, the acetone will evaporate as you drag the tissue across the lens. (If residue remains, you moved to quickly).
7. Repeat this process until you see a clean optical surface, with no marks or smudges. Always use a new piece of lens tissue each time to keep contaminants off of the optic you are cleaning.
8. If after repeated cleaning of the optical surface you still see any spots, pits, or scratches, determine whether or not to replace the optic with a new optic.
9. Replace your optics as soon as possible to keep any airborne particles from getting on the optic