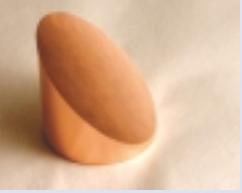


REPLACEMENT LASER OPTICS

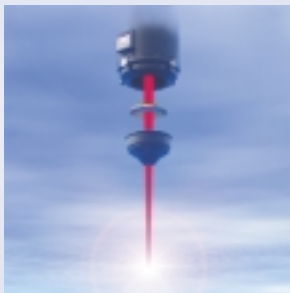
• RESONATOR OPTICS • FOCUSING OPTICS • BEAM DELIVERY OPTICS •



OEM-QUALITY REPLACEMENT OPTICS

Trust II-VI Incorporated replacement laser optics. The preferred supplier to OEMs worldwide, II-VI carries a wide range of components for every part of your CO₂ laser system. From rear mirrors to focusing lenses (and everything in between) we've got what you need to keep your laser running good as new.

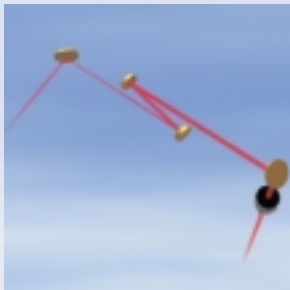
We've also made it easy for you to order your replacement laser optics by organizing our catalog in three main categories: focusing optics, beam delivery optics, and resonator optics.



Focusing Optics, found in your laser system's focusing head, guide your laser's beam to your workpiece. These optics include:

- focusing lenses
- focusing mirrors

...see pp. 6-7 for our selection of Focusing Optics.



Beam Delivery Optics guide your laser's beam from the Resonator to the Focusing Head. These optics include:

- bend mirrors
- collimators
- reflective phase retarders

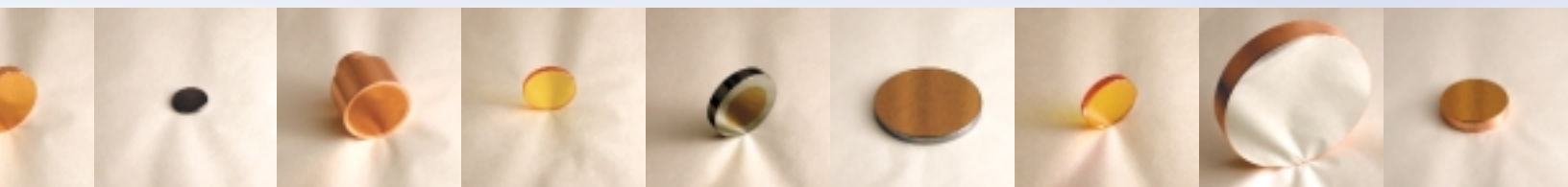
...see pp. 8-9 for our selection of Beam Delivery Optics.



Resonator Optics, also called Internal Optics, help generate your laser's beam. These optics include:

- rear mirrors
- output couplers
- bend mirrors
- output windows

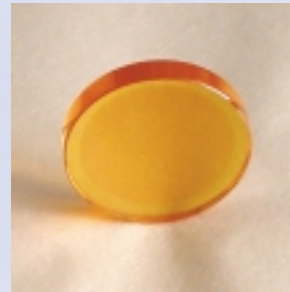
...see pp. 10-11 for our selection of Resonator Optics.



ULTRA-LOW ABSORBING LENSES (ULA)

Are you running a high-power laser, one that pumps out 5 kilowatts or more? Then you need II-VI Incorporated's Ultra Low Absorbing (ULA) lenses. ULAs are specially-coated Zinc Selenide (ZnSe) lenses that provide reduced absorption (below 0.15%), putting more power on your workpiece, and less in your lens.

Contact a II-VI Sales Associate at 888-558-1504 to see if you — and your laser system — could benefit from using a ULA.



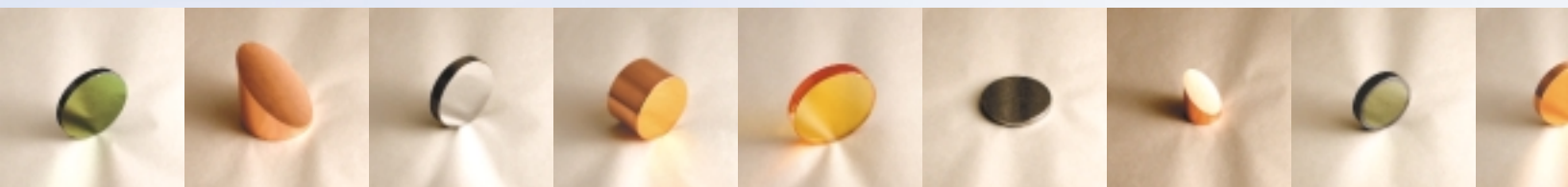
CO₂ OPTICS CLEANING KIT (PN911466)

Proper handling and cleaning of CO₂ infrared laser optics is vital to prolonging their life. However, as these optics are neither as strong nor as scratch-resistant as glass, special procedures must be used in their cleaning and care.

The II-VI Incorporated CO₂ Infrared Laser Optics Cleaning Kit is designed to meet these special care requirements. Order yours today by requesting Part #911466.



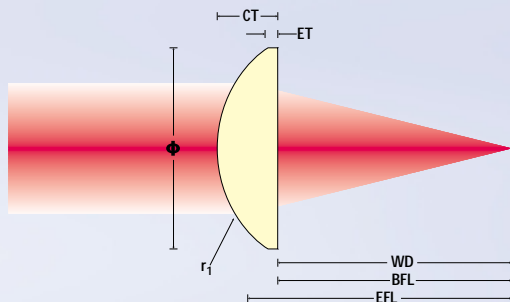
See pp. 14-15 for optics cleaning instructions.





ABOUT: PLANO-CONVEX LENSES

Plano-convex lenses are the most economical transmissive focusing elements available. They're ideally suited for laser heat treating, welding, cutting, and other applications where spot size is not critical.

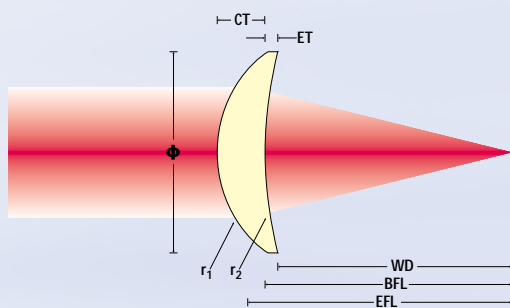


- Φ = diameter
- ET = edge thickness
- CT = center thickness
- r_1 = first surface radius of curvature
- n = index of refraction
- WD = working distance = $r/(n-1) - CT/n$
- EFL = effective focal length = $r/(n-1)$
- BFL = back focal length = $r/(n-1) - CT/n = WD$

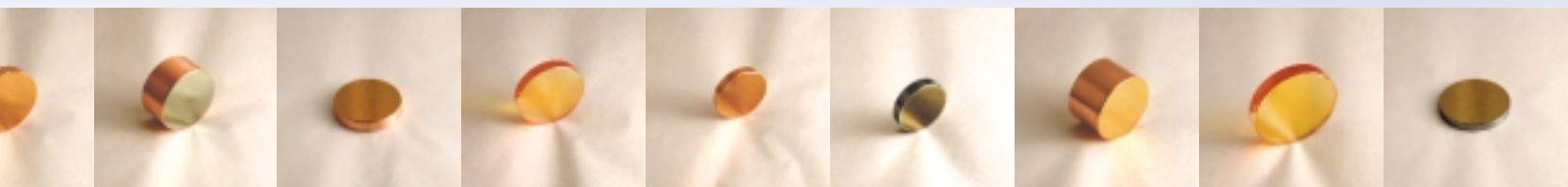
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ABOUT: MENISCUS LENSES

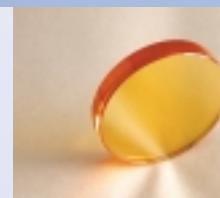
Meniscus lenses are designed to minimize spherical aberration and produce the smallest possible focal spot.



- Φ = diameter
- ET = edge thickness
- CT = center thickness
- r_1 = first surface radius of curvature
- r_2 = second surface radius of curvature
- n = index of refraction
- WD = working distance = $BFL - r_2 + (r_2^2 - \Phi^2/4)^{1/2}$
- EFL = effective focal length = $1/EFL = (n-1)(1/r_1 - 1/r_2) + (n-1)^2 CT / nr_1 r_2$
- BFL = back focal length = $EFL - r_2 CT / (n(r_2 - r_1) + CT(n-1))$



ABOUT: II-VI OPTICAL MATERIALS



II-VI is proud to run the world's only fully vertically-integrated laser optics foundry: From optical engineering and design, to the growth of Zinc Selenide (ZnSe) crystal material, to optics diamond machining and polishing, to thin film coating, and finally to total quality assurance, we're the only company that truly creates an optic to meet your requirements from concept through all stages of manufacturing.

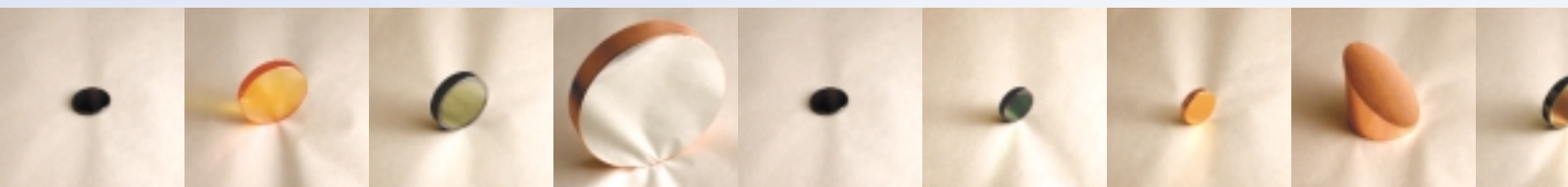
ZnSe is one of the many materials we use for our optics. In the product listings throughout this catalog, these materials are denoted by the symbols listed below:

- Cu — copper
- GaAs — gallium arsenide
- Ge — germanium
- Mo — molybdenum
- Si — silicon
- ZnSe — zinc selenide

ABOUT: II-VI OPTICAL COATINGS

II-VI uses a number of different coatings on its precision laser optics. In the product listings throughout this catalog, these coatings are denoted by the acronyms listed below:

- 30% - 99.7% — denotes the percentage of reflectance
- AR — Anti-Reflective
- ATFR — Absorbing Thin Film Reflector
- DEMMR — Dual Enhanced Maximum Metal Reflector
- EG — Enhanced Gold
- ES — Enhanced Silver
- MMR — Maximum Metal Reflector
- PS — Protected Silver
- TRZ — Total Reflector Zero
- UC — Uncoated
- ULA — Ultra-Low Absorbing



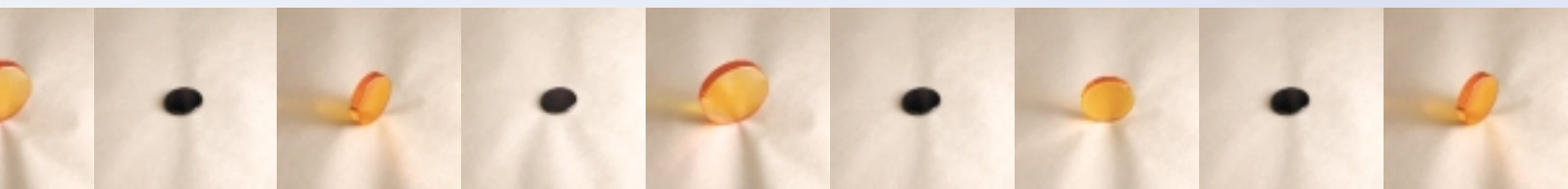


FOCUSING OPTICS: LENSES

(all units in inches — WD = working distance)

lens type	material	diameter	edge thickness	focal length	coating	part #
Plano-Convex Lens	ZnSe	1.10	0.085	2.50	AR	696289
Plano-Convex Lens	ZnSe	1.10	0.089	3.50	AR	113956
Plano-Convex Lens	ZnSe	1.10	0.160	5.00	AR	561067
Plano-Convex Lens	ZnSe	1.10	0.098	5.00	AR	411865
Plano-Convex Lens	ZnSe	1.50	0.086	3.75	AR	441406
Plano-Convex Lens	ZnSe	1.50	0.085	5.00	AR	766479
Plano-Convex Lens	ZnSe	1.50	0.118	5.00	AR	962834
Plano-Convex Lens	ZnSe	1.50	0.160	5.00	AR	706491
Plano-Convex Lens	ZnSe	1.50	0.236	5.00	AR	227092
Plano-Convex Lens	ZnSe	1.50	0.300	5.00	ULA	106106
Plano-Convex Lens	ZnSe	1.50	0.300	5.00	AR	578662
Plano-Convex Lens	ZnSe	1.50	0.310	5.00	AR	658108
Plano-Convex Lens	ZnSe	1.50	0.236	7.50	AR	372665
Plano-Convex Lens	ZnSe	1.50	0.300	7.50	AR	306068
Plano-Convex Lens	ZnSe	1.50	0.300	7.50	ULA	383862
Plano-Convex Lens	ZnSe	1.50	0.310	7.50	AR	618938
Plano-Convex Lens	ZnSe	1.50	0.280	5.0 WD	ULA	794914
Plano-Convex Lens	ZnSe	1.50	0.280	5.0 WD	AR	941031
Plano-Convex Lens	ZnSe	1.50	0.280	7.5 WD	ULA	204518
Plano-Convex Lens	ZnSe	1.50	0.280	7.5 WD	AR	464497
Plano-Convex Lens	ZnSe	1.50	0.315	3.5 WD	AR	665431
Plano-Convex Lens	ZnSe	2.00	0.310	5.00	AR	304725
Plano-Convex Lens	ZnSe	2.00	0.380	5.00	AR	741363
Plano-Convex Lens	ZnSe	2.00	0.300	7.50	AR	634494
Plano-Convex Lens	ZnSe	2.00	0.310	7.50	ULA	635061
Plano-Convex Lens	ZnSe	2.00	0.310	7.50	AR	892020
Plano-Convex Lens	ZnSe	2.00	0.380	7.50	AR	232771
Plano-Convex Lens	ZnSe	2.00	0.380	7.50	ULA	392125
Plano-Convex Lens	ZnSe	2.00	0.380	5.0 WD	AR	870676
Plano-Convex Lens	ZnSe	2.00	0.380	7.5 WD	AR	781603
Plano-Convex Lens	ZnSe	2.50	0.310	8.75	AR	243827
Plano-Convex Lens	ZnSe	2.50	0.390	10.00	AR	236670
Positive Meniscus Lens	GaAs	1.00	0.085	4.00	AR	609743
Positive Meniscus Lens	GaAs	1.10	0.085	2.50	AR	107269
Positive Meniscus Lens	ZnSe	1.10	0.085	2.50	AR	932739
Positive Meniscus Lens	ZnSe	1.10	0.800	2.50	AR	701278
Positive Meniscus Lens	ZnSe	1.10	0.850	3.75	AR	848242
Positive Meniscus Lens	ZnSe	1.10	0.085	5.00	AR	801758
Positive Meniscus Lens	ZnSe	1.50	0.236	3.75	AR	220643
Positive Meniscus Lens	ZnSe	1.50	0.236	5.00	AR	507790
Positive Meniscus Lens	ZnSe	1.50	0.236	5.00	ULA	528717
Positive Meniscus Lens	ZnSe	1.50	0.290	5.00	ULA	312503
Positive Meniscus Lens	ZnSe	1.50	0.290	5.00	AR	406294
Positive Meniscus Lens	ZnSe	1.50	0.354	5.00	AR	120216
Positive Meniscus Lens	ZnSe	1.50	0.354	5.00	ULA	123397
Positive Meniscus Lens	ZnSe	1.50	0.354	5.00	AR	767963
Positive Meniscus Lens	ZnSe	1.50	0.125	7.50	AR	452726

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FOCUSING OPTICS: LENSES (CONTINUED)

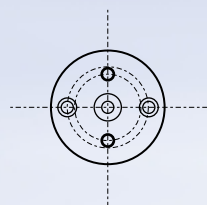
(all units in inches)

lens type	material	diameter	edge thickness	focal length	coating	part #
Positive Meniscus Lens	ZnSe	1.50	0.236	7.50	ULA	714512
Positive Meniscus Lens	ZnSe	1.50	0.290	7.50	ULA	474644
Positive Meniscus Lens	ZnSe	1.50	0.290	7.50	AR	702232
Positive Meniscus Lens	ZnSe	1.50	0.354	7.50	AR	570721
Positive Meniscus Lens	ZnSe	1.50	0.354	7.50	ULA	602033
Positive Meniscus Lens	ZnSe	1.50	0.354	7.50	AR	698637
Positive Meniscus Lens	ZnSe	1.50	0.100	7.50	AR	747246
Positive Meniscus Lens	ZnSe	1.50	0.236	7.50	AR	784964
Positive Meniscus Lens	ZnSe	2.00	0.380	7.50	AR	695399

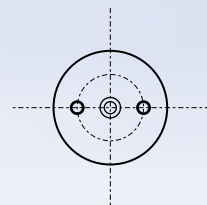
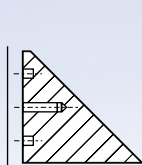
FOCUSING OPTICS: MIRRORS (PARABOLICS)

(all units in millimeters except turning angle, listed in degrees)

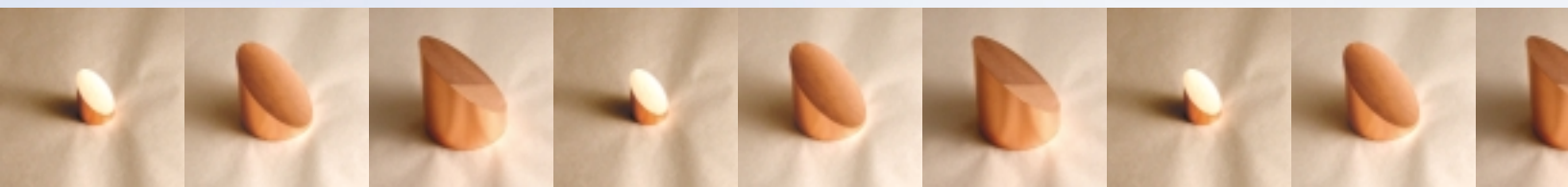
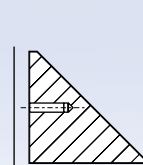
optic type	material	diameter	working distance	turning angle	part #
Parabolic Mirror	Cu	25.0	125	90	PM-CU-25-90-125-UC-MM3
Parabolic Mirror	Cu	25.0	200	90	PM-CU-25-90-200-UC-MM3
Parabolic Mirror	Cu	49.5	175	90	PM-CU-49.5-90-175-UC-MM2
Parabolic Mirror	Cu	49.5	200	90	PM-CU-49.5-90-200-UC-MM2
Parabolic Mirror	Cu	49.5	250	90	PM-CU-49.5-90-250-UC-MM2
Parabolic Mirror	Cu	55.0	250	90	PM-CU-55-90-250-UC-C-WC



MM2



MM3

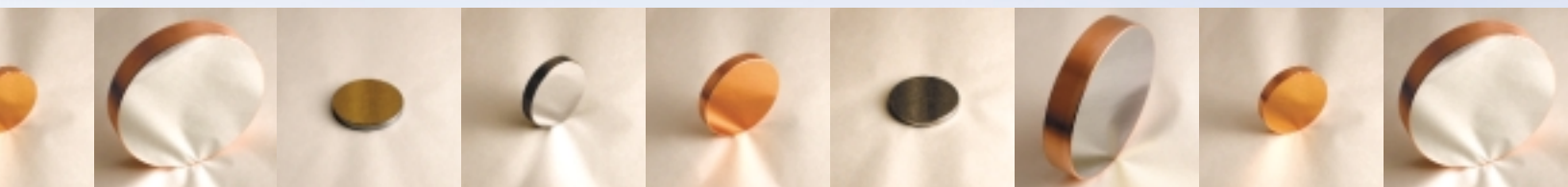
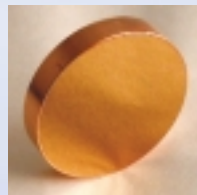


BEAM DELIVERY OPTICS: BEND MIRRORS

(all units in inches)

optic type	material	diameter	center thickness	side 1 radius	side 1 coating	part #
Total Reflector	Cu	0.984	0.7087	Plano	UC	948856
Total Reflector	Cu	1.949	2.0980	Plano	UC	586961
Total Reflector	Cu	1.969	0.3937	Plano	ATFR	432326
Total Reflector	Cu	1.969	0.2000	Plano	TRZ	370229
Total Reflector	Cu	1.969	0.3940	Plano	TRZ	832216
Total Reflector	Cu	1.969	0.3940	Plano	MMR	889373
Total Reflector	Cu	2.000	0.3750	Plano	TRZ	126858
Total Reflector	Cu	2.250	0.3940	Plano	TRZ	397921
Total Reflector	Cu	2.250	1.2500	Plano	ATFR	504774
Total Reflector	Cu	2.362	0.2360	Plano	TRZ	658306
Total Reflector	Cu	2.362	0.3740	Plano	TRZ	593055
Total Reflector	Cu	3.000	0.2360	Plano	TRZ	798125
Total Reflector	Cu	3.000	0.5000	Plano	TRZ	923010
Total Reflector	Cu	4.000	0.7500	Plano	PS	137530
Total Reflector	Cu	4.000	0.7500	Plano	UC	270438
Total Reflector	Cu	4.000	0.7500	Plano	MMR	758597
Total Reflector	Mo	2.000	0.2000	Plano	UC	643739
Total Reflector	Mo	2.000	0.3750	Plano	UC	586282
Total Reflector	Mo	3.000	0.2500	Plano	UC	936588
Total Reflector	Si	1.750	0.1600	Plano	TRZ	304442
Total Reflector	Si	2.000	0.2000	Plano	TRZ	222992
Total Reflector	Si	2.000	0.2000	Plano	TRZ	341534
Total Reflector	Si	2.000	0.2000	Plano	PS	618042
Total Reflector	Si	2.000	0.2000	Plano	TRZ	805252
Total Reflector	Si	2.000	0.3750	Plano	TRZ	508308
Total Reflector	Si	2.000	0.4000	Plano	TRZ	674480
Total Reflector	Si	3.000	0.2500	Plano	TRZ	614835
Total Reflector	Si	3.000	0.2500	Plano	TRZ	850513

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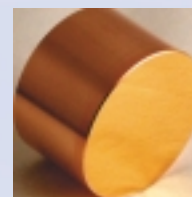
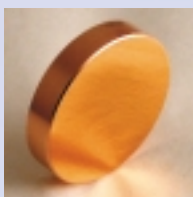




BEAM DELIVERY OPTICS: COLLIMATORS

(all units in inches unless otherwise marked — CC = concave; CX = convex)

optic type	material	diameter	center thickness	edge thickness	side 1 radius	side 1 coating	focal length	part #
Total Reflector	Cu	1.969	0.375		2.441M CC	EG		156390
Total Reflector	Cu	1.969	1.25		3.632M CC	EG		387566
Total Reflector	Cu	1.969	1.250		1.20M CX	EG		534484
Total Reflector	Cu	1.969	1.250		1.87M CC	EG		612872
Total Reflector	Cu	1.969	1.250		2.34M CX	EG		709199
Total Reflector	Cu	1.969	1.250		3.68M CC	EG		798981
Total Reflector	Cu	1.969	1.250		3.05M CC	EG		881808
Plano-Convex Lens	ZnSe	1.500		0.157		AR	15.0M	448393
Plano-Convex Lens	ZnSe	1.500		0.119		AR	7.82M	890070



BEAM DELIVERY OPTICS: REFLECTIVE PHASE RETARDERS

(all units in inches except phase shift, listed in degrees)

optic type	material	diameter	center thickness	side 1 radius	side 2 radius	phase shift	part #
Reflective Phase Retarder	Cu	1.500	0.2500	Plano	SPT	90	390686
Reflective Phase Retarder	Cu	1.969	0.3940	Plano	SPT	90	666269
Reflective Phase Retarder	Cu	2.250	0.3940	Plano	SPT	90	832944
Reflective Phase Retarder	Cu	3.000	0.5000	Plano	SPT	90	748680
Reflective Phase Retarder	Si	1.500	0.1600	Plano	FG	90	498237
Reflective Phase Retarder	Si	2.000	0.1969	Plano	FG	90	560939
Reflective Phase Retarder	Si	2.000	0.2000	Plano	FG	90	335587
Reflective Phase Retarder	Si	2.000	0.2000	Plano	FG	90	582132
Reflective Phase Retarder	Si	2.000	0.2000	Plano	FG	90	893833
Reflective Phase Retarder	Si	2.000	0.3750	Plano	FS	90	592353
Reflective Phase Retarder	Si	2.000	0.4000	Plano	FS	90	969917
Reflective Phase Retarder	Si	2.000	0.2000	Plano	FG	90	328323
Reflective Phase Retarder	Si	3.000	0.2500	Plano	FG	90	224094
Reflective Phase Retarder	Si	3.000	0.2500	Plano	FG	90	917197





RESONATOR OPTICS: REAR MIRRORS

(all units in inches unless otherwise marked — CC = concave)

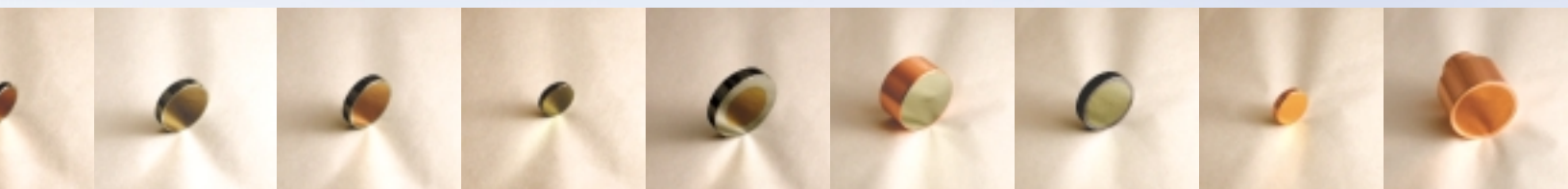
optic type	material	diameter	center thickness	edge thickness	side 1 radius	side 1 coating	part #
Partial Reflector	GaAs	1.0	0.236		30M CC	99.7%	656714
Partial Reflector	GaAs	1.0	0.236		Plano	99.5%	668784
Partial Reflector	GaAs	1.1	0.120		20M CC	99.5%	160566
Partial Reflector	GaAs	1.5	0.236		30M CC	99.7%	156315
Partial Reflector	Ge	1.0	0.118		15M CC	99.5%	785016
Partial Reflector	Ge	1.0	0.200		Plano	99.5%	424423
Partial Reflector	Ge	1.0	0.236		15M CC	99.5%	234709
Partial Reflector	Ge	1.0	0.236		15M CC	99.6%	810771
Partial Reflector	Ge	1.1	0.220		15M CC	99.5%	126740
Partial Reflector	Ge	1.1	0.220		20M CC	99.5%	722287
Partial Reflector	Ge	1.1		0.236	20M CC	99.5%	447118
Partial Reflector	Ge	1.2	0.236		30M CC	99.6%	432529
Partial Reflector	Ge	1.5	0.315		20M CC	99.5%	667088
Partial Reflector	Ge	1.5		0.315	51.6M CC	99.5%	284474
Partial Reflector	Ge	1.5		0.315	35M CC	99.5%	347102
Partial Reflector	Ge	2.0	0.375		30M CC	99.5%	766409
Partial Reflector	Ge	2.5	0.372		Plano	99.5%	765115
Partial Reflector	ZnSe	1.5	0.236		20M CC	99.0%	911209

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RESONATOR OPTICS: BEND MIRRORS

(all units in inches unless otherwise marked — CC = concave)

optic type	material	diameter	length	width	center thickness	side 1 radius	side 1 coating	part #
Total Reflector	Cu	1.100			0.236	Plano	EG	148570
Total Reflector	Cu	1.496			0.236	Plano	MMR	705354
Total Reflector	Cu	1.969			0.354	Plano	EG	482518
Total Reflector	Cu	1.969			0.984	Plano	MMR	119495
Total Reflector	Cu	2.000			2.126	Plano	EG	468936
Total Reflector	Cu	4.250			1.500	Plano	ES	650010
Total Reflector	Si	1.000			0.120	10M CC	PS	283051
Total Reflector	Si	1.000			0.200	3M CC	MMR	532137
Total Reflector	Si	1.102			0.236	Plano	EG	219719
Total Reflector	Si	1.500			0.157	Plano	SES	805386
Total Reflector	Si	1.500			0.160	Plano	PS	190521
Total Reflector	Si	1.500			0.375	Plano	MMR	690933
Total Reflector	Si	1.750			0.375	Plano	MMR	124867
Total Reflector	Si	1.750			0.375	Plano	EG	221987
Total Reflector	Si	2.000			0.200	Plano	EG	326362
Total Reflector	Si	2.000			0.200	Plano	DEM MR	408825
Total Reflector	Si	2.000			0.200	Plano	EG	872093
Total Reflector	Si	1.500			0.380	Plano	ES	817225
Total Reflector	Si		2.870	4.750	0.500	Plano	MMR	751363





RESONATOR OPTICS: OUTPUT COUPLERS

(all units in inches unless otherwise marked — CC = concave)

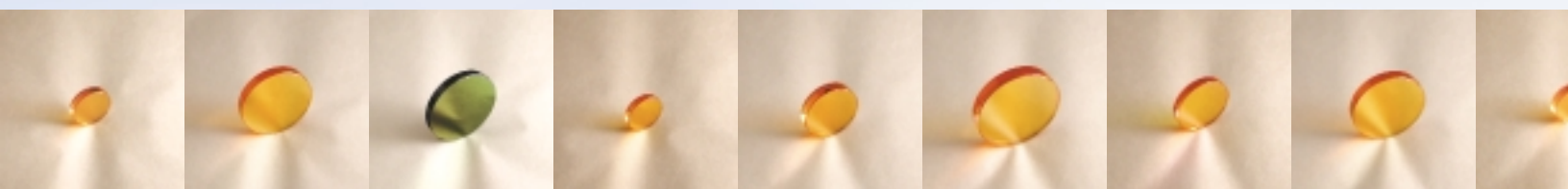
optic type	material	diameter	center thickness	edge thickness	side 1 radius	side 1 coating	part #
Partial Reflector	GaAs	2.00	0.250		30M CC	UC	635467
Partial Reflector	ZnSe	1.00	0.118		15M CC	50%	880768
Partial Reflector	ZnSe	1.00	0.120		Plano	UC	591576
Partial Reflector	ZnSe	1.00	0.120		10M CC	80%	665678
Partial Reflector	ZnSe	1.00	0.200		10M CC	65%	695893
Partial Reflector	ZnSe	1.00	0.236		30M CC	65%	148318
Partial Reflector	ZnSe	1.00	0.236		Plano	50%	305591
Partial Reflector	ZnSe	1.00	0.236		Plano	50%	305591
Partial Reflector	ZnSe	1.00	0.236		20M CC	65%	537420
Partial Reflector	ZnSe	1.00	0.236		Plano	60%	638252
Partial Reflector	ZnSe	1.00	0.236		Plano	60%	717468
Partial Reflector	ZnSe	1.00	0.236		Plano	50%	895725
Partial Reflector	ZnSe	1.00	0.236		30M CC	65%	988175
Partial Reflector	ZnSe	1.10	0.220		20M CC	50%	132098
Partial Reflector	ZnSe	1.10	0.220		15M CC	65%	627791
Partial Reflector	ZnSe	1.10	0.225		Plano	48%	695208
Partial Reflector	ZnSe	1.10		0.236	20M CC	60%	182134
Partial Reflector	ZnSe	1.10		0.236	20M CC	60%	608997
Partial Reflector	ZnSe	1.10		0.236	Plano	70%	641656
Partial Reflector	ZnSe	1.17	0.120		Plano	60%	105081
Partial Reflector	ZnSe	1.50	0.200		20M CC	57%	925252
Partial Reflector	ZnSe	1.50	0.236		30M CC	40%	108062
Partial Reflector	ZnSe	1.50	0.236		20M CC	30%	120765
Partial Reflector	ZnSe	1.50	0.236		10M CC	UC	187879
Partial Reflector	ZnSe	1.50	0.236		10M CC	30%	554288
Partial Reflector	ZnSe	1.50	0.236		30M CC	40%	680668
Partial Reflector	ZnSe	1.50	0.236		10M CC	UC	713885
Partial Reflector	ZnSe	1.50	0.236		10M CC	30%	247233
Partial Reflector	ZnSe	1.50	0.315		20M CC	40%	705303
Partial Reflector	ZnSe	1.50	0.375		20M CC	70%	859977
Partial Reflector	ZnSe	1.50		0.315	51.6M CC	50%	426469
Partial Reflector	ZnSe	1.50		0.315	15M CC	40%	652030
Partial Reflector	ZnSe	1.50		0.315	35M CC	60%	697996
Partial Reflector	ZnSe	2.00	0.300		30M CC	48%	559223
Partial Reflector	ZnSe	2.00	0.300		30M CC	48%	903007
Partial Reflector	ZnSe	2.00	0.315		30M CC	40%	743660

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RESONATOR OPTICS: OUTPUT WINDOWS

(all units in inches unless otherwise marked — CC = concave)

optic type	material	diameter	length	width	center thickness	side 1 radius	side 1 coating	part #
Window	ZnSe	1.50			0.236	20M CC	AR	908168
Window	ZnSe	2.25			0.375	Plano	AR	830397
Window	ZnSe		2.442	3.625	0.120	Plano	AR	955283





HOW TO ORDER

Contact a II-VI Sales Associate at 888-558-1504 with the part numbers and a brief description of the optics you need. Not sure what optics you need? Our trained staff is here to help. Simply provide the manufacturer and model number of your laser system, the types of optics you need (focusing lens, rear mirror, external bend mirror, etc.), a brief description (material, diameter, center thickness, etc.), and our experts will match the proper II-VI replacement optics to your laser system.

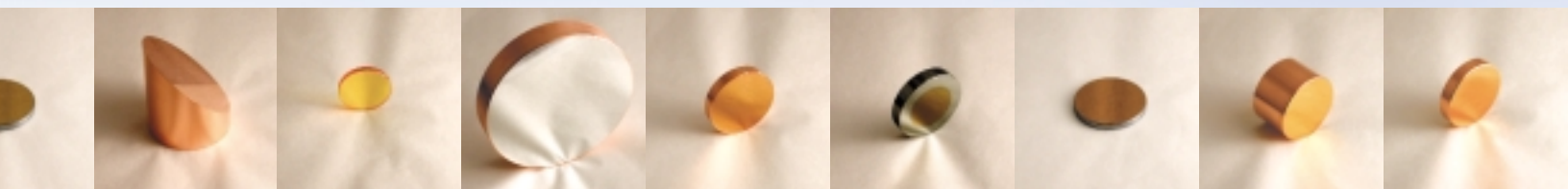
OPTIC REFURBISHMENT PROGRAM

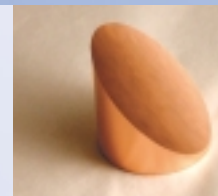
While any laser optic will degrade under harsh workplace conditions, II-VI optics are built to last long in the most demanding industrial environments. So before you scrap that used optic, consider sending it back to II-VI. Here, our trained optics technicians will carefully examine the optic, and evaluate its fitness for re-polishing and re-coating. If the optic can be refurbished, we'll send you a quote with the price and delivery time for a refurbished optic that will provide the same high performance as your original part. (Note that mechanical specifications such as thickness may be affected by the repolishing process.)

Contact a II-VI Sales Associate at 888-558-1504 for more information regarding our Optic Refurbishment Program.

OPTIC SUBSCRIPTION PROGRAM

Do you routinely need a certain optic replaced? The II-VI Optic Subscription Program may be just what you need to keep your laser system running 24/7. The Optic Subscription Program automatically sends you a specific optic or optics at regular intervals, such as a specific focusing lens every three weeks. Sound like a plan that will help your business? Then call a II-VI Sales Associate at 888-558-1504, and specify the optic or optics you'd like regularly sent to you, as well as the time interval between each shipment.





TERMS AND CONDITIONS OF SALE

All orders received by II-VI Incorporated ("II-VI") are expressly conditioned upon the following conditions of sale:

1) Acceptance

Any additional or different terms set forth in any purchase order or other communication from Buyer are objected to and not binding upon II-VI unless and until accepted in writing by an authorized representative of II-VI.

2) Standard Warranty

II-VI warrants to the Buyer of each product of II-VI's own manufacture ("Product") that each Product will be free from defects in materials and workmanship subject to the following conditions:

The obligations of II-VI under this Standard Warranty shall be limited to either, at the option of II-VI: (1) the replacement or repair of any Product upon the shipment of such Product, freight prepaid by Buyer to the II-VI factory; or (2) the provision to Buyer of a credit against future purchases in an amount equal to the purchase price of the defective Product.

IN NO EVENT WILL II-VI BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OF BUYER. THE FOREGOING REMEDIES ARE THE SOLE AND EXCLUSIVE REMEDY OF BUYER FOR ANY BREACH OF WARRANTY UNDER THIS CONTRACT.

All claims under this Standard Warranty must be made within ONE (1) YEAR after the date on which the Product was delivered to Buyer. In the case of a replacement or repair of a Product, Buyer shall only ship a defective Product to II-VI after an authorized representative of II-VI has provided a Return Authorization (RA) number for such warranty claim. Returns will be subject to a restocking fee.

With respect to such returns, Buyer is solely responsible for properly packaging any Product to be returned to II-VI under this Standard Warranty. Products must be packaged in their original manufacturer's packaging or equivalent. Products must be packaged in separate shipping containers with Return Authorization (RA) numbers clearly marked on the outside of the shipping containers. If there are questions regarding proper packaging and shipping, contact II-VI for guidelines. II-VI will not be responsible for replacing or repairing any Product damaged while in transit to II-VI due to faulty or deficient packaging.

This Standard Warranty shall be void and shall not apply with respect to any Product which, upon inspection by II-VI, shows evidence of damage as a result of abuse, misuse, mishandling, accidental damage, alteration, negligent handling, or improper installation or application, or as a result of alteration or other causes beyond the control of II-VI.

This Standard Warranty shall not apply to goods or parts included in or supplied with Products; such goods or parts carry only such warranties, if any, as are provided by the manufacturers of such goods or parts, which warranties may be more restrictive than the Standard Warranty provided by II-VI.

With respect to any previously-purchased Product, II-VI shall have no obligation to install updates or upgrades to any components in such Product, even if the exclusion of such updates or upgrades of such components renders such Product obsolete when compared to a new Product of a substantially similar type.

THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION CONTAINED HEREIN. THIS WARRANTY Voids AND EXCLUDES ANY AND ALL OTHER WARRANTIES OR REPRESENTATIONS, WHETHER EXPRESS OR IMPLIED OR ARISING UNDER ANY LAW, RELATING TO THE GOODS, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR ANY PARTICULAR PURPOSES.

NO PERSON, FIRM, OR CORPORATION IS AUTHORIZED TO ASSUME ON BEHALF OF II-VI ANY ADDITIONAL OBLIGATION OR LIABILITY NOT EXPRESSLY PROVIDED HEREIN, EXCEPT IN A WRITING DULY EXECUTED BY AN OFFICER OF II-VI.

3) Limitation of Liability

In no event shall II-VI be liable for any incidental or consequential damages. The liability of II-VI on any claim of any kind shall in no event exceed the price of the Product which gives rise to the claim. Except as to title, all such liability shall terminate upon expiration of the warranty period of the Product.

The invalidity of any of the previous paragraphs shall not affect the remainder of this paragraph or any other paragraph in this section.

4) Patent Infringement

Buyer shall hold II-VI harmless against any expense or loss resulting from infringement of patents or trademarks arising from compliance with Buyer's designs or specifications.

5) Delivery and Title

Delivery dates are approximate and are based upon prompt receipt of all necessary information from Buyer. Under no circumstances does II-VI guarantee date of shipment.

Unless otherwise specified by II-VI, shipment will be made and title will pass F.O.B. point of shipment. II-VI shall ship Products as it deems appropriate unless instructed otherwise in writing by Buyer.

6) Risk of Loss

Risk of loss or damage shall pass to Buyer upon shipment. Loss or damage that occurs during shipping by a carrier selected by Buyer is Buyer's responsibility.

7) Uncontrollable Delays

II-VI shall not be liable for delivery delays due to causes beyond its reasonable control including, but not limited to, acts of God, acts of Buyer, acts of military authority, governmental priorities, labor strikes, and transportation delays.

8) Financial Conditions

If II-VI determines in good faith that the financial condition of Buyer at any time does not justify the continuation of production or shipment on the terms of payment originally specified, II-VI may require full or partial payment in advance. In the event of Buyer bankruptcy or insolvency, II-VI shall be entitled to cancel any outstanding order and shall receive reimbursement for its cancellation charges.

9) Payment Terms

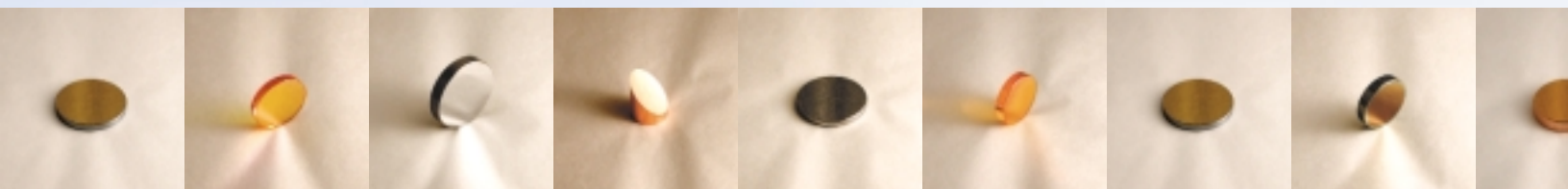
Unless terms are specifically set forth on the Order Acknowledgement, Buyer shall pay at such time and such terms as specified in II-VI's original invoice. Any quotations shall be valid for the period stated on the quotation.

10) Cancellation

Buyer may not cancel its order after shipment has been made. Buyer may cancel its order prior to shipment only upon written notice and consent of II-VI. If II-VI consents to any such cancellation, Buyer may be required to pay cancellation charges which include lost profits and all expenses incurred in connection with the cancelled order.

11) Jurisdiction

The validity, performance, and all matters relating to the interpretation and effect of this agreement shall be governed by the laws of the Commonwealth of Pennsylvania.



INFRARED OPTICS HANDLING AND CLEANING PROCEDURES



Great care should be taken when handling infrared optics. Please note the following precautions before handling optics:

1. Always wear powder-free finger cots or rubber/latex gloves when handling optics. Dirt and oil from the skin can severely contaminate optics, causing a major degradation in performance.
2. Do not use any tools to manipulate optics – this includes tweezers or picks.
3. Always place optics on supplied lens tissue for protection.
4. Never place optics on a hard or rough surface. Infrared laser optics can be easily scratched.
5. Bare gold or bare copper should never be cleaned or touched.

All materials used for infrared optics are fragile, whether single crystal or polycrystalline, large or fine grained. They are not as strong as glass and will not withstand procedures normally used on glass parts.

Due to the problems encountered when cleaning mounted optics, it is recommended that the cleaning procedures described here be performed only on unmounted optics. If cleaning must be performed on a mounted optic, refer to the sections of the instructions printed in brackets []. These are additional steps that must be performed when cleaning mounted optics.

Note: Except for Step 1, the cleaning procedures described here should not be used for new optics. New optics are cleaned and packaged prior to leaving II-VI to ensure their high quality condition upon receipt. If you suspect a problem with contamination, or other cosmetic defects with a new optic, please contact II-VI Incorporated immediately.

STEP 1

Mild Cleaning for Light Contamination (dust, lint particles)

Use an air bulb to blow off any loose contaminants from the surface of the optic before proceeding to the cleaning steps. If this step does not remove the contamination, continue to Step 2.

Note: Avoid using shop air lines because they usually contain significant amounts of oil and water. These contaminants can form detrimental absorbing films on optical surfaces.

[No additional steps necessary for mounted optics]

STEP 2

Mild Cleaning for Light Contamination (smudges, fingerprints)

Dampen an unused cotton swab or a cotton ball with acetone or propanol. Gently wipe the surface with the damp cotton. Do not rub hard.

Drag the cotton across the surface just fast enough so that the liquid evaporates right behind the cotton. This should leave no streaks. If this step does not remove the contamination, continue to Step 3.

Note: Use only paper-bodied cotton swabs and high-quality surgical cotton balls. Reagent grade acetone and propanol are recommended.

[No additional steps necessary for mounted optics]

STEP 3

Moderate Cleaning for Moderate Contamination (spittle, oils)

Dampen an unused cotton swab or cotton ball with white distilled vinegar. Using light pressure, wipe the surface of the optic with the damp cotton. Wipe excess distilled vinegar with a clean dry cotton swab. Immediately dampen a cotton swab or cotton ball with acetone. Gently wipe the surface of the optic to remove any acetic acid.

If this step does not remove the contamination, continue to Step 4.

Note: Use only paper-bodied cotton swabs
Use only high quality surgical cotton balls that have been sorted to remove any with embedded abrasives
White distilled vinegar with a 6% acidity should be used.

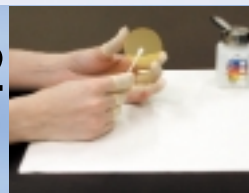
[No additional steps necessary for mounted optics]



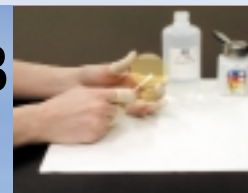
STEP 1

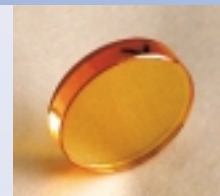


STEP 2



STEP 3





Note: Step 4 (below) should NEVER be performed on new or unused laser optics. These steps are to be done only on optics that have become severely contaminated from use and no acceptable results yielded from Steps 2 or 3 as previously noted. If the thin film coating is removed, the optic's performance will be destroyed. A change in apparent color indicates the removal of the thin film coating.

STEP 4

Aggressive Cleaning for Severely Contaminated Optics (splatter)

For severely contaminated and dirty optics, an optical polishing compound may need to be used to remove the absorbing contamination film from the optic.

(a)

Shake the container of polish thoroughly before opening. Pour four or five drops of polish onto a cotton ball. Gently move the cotton ball in circular patterns across the surface to be cleaned. Do not press down on the cotton ball! Let the cotton ball drag lightly across the surface under its own weight. If too much pressure is applied, the polish will quickly scratch the surface of the optic. Rotate the optic frequently to avoid excessive polishing in any one direction. Clean the optic in this manner for no more than 30 seconds. If, at any time during this step, you notice a color change of the optic surface, stop polishing immediately. This color change indicates that the outer portion of the thin film coating is being eroded.

[For a mounted optic, a fluffed cotton swab may have to be substituted for the cotton ball if the entire surface of the optic is to be uniformly cleaned. This is especially true with small diameter optics. Be careful not to apply pressure when using a cotton swab.]

STEP 4

After using the polish, wet an unused cotton ball with distilled water and gently swab the surface of the optic. Thoroughly wet the surface to remove as much of the polish residue as possible. Do not let the surface of the optic dry! This will make the removal of the remaining polish much more difficult.

(b)

[For a mounted optic, a fluffed cotton swab may be substituted. Try to remove as much polish residue as possible, especially near the edges of the mount.]

STEP 4

Quickly wet a fluffed cotton swab with propanol and gently clean the surface of the optic thoroughly. Cover the entire surface with the swab to dislodge as much polish residue as possible.

(c)

NOTE: If the optic is 2.0" or larger, a cotton ball may be substituted for the cotton swab in this step.

[For a mounted optic, place the cotton swab in the center of the optic and clean outwards in a spiral motion toward the edges of the optic.]

STEP 4

Wet a fluffed cotton swab with acetone and clean the surface of the optic, removing any remaining propanol and polish residue in the process. When performing the final cleaning with acetone, lightly drag the cotton swab across the optic, overlapping strokes until the entire surface has been wiped. Move the swab very slowly for the final strokes to assure that the acetone on the surface of the optic dries immediately behind the swab. This will eliminate streaks on the surface of the optic.

(d)

[For a mounted optic, start in the center of the optic and work outward in a spiral pattern toward the edge with a fluffed swab dampened with acetone. Use a new cotton swab dampened with acetone and run it around the outside of the optic against the mount to remove the polish residue. Repeat this step several times if necessary, to assure that no polish residue is left on the edges of the optic when the cotton swab is lifted from the surface.]

[For a mounted optic, it may be impossible to remove every trace of residue from the surface, especially near the outer edge. Try to be certain any remaining residue is along the outermost edge of the optic only, and not in the center.]

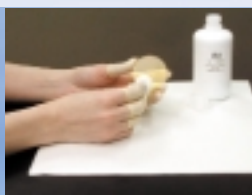
STEP 5

Examination of Cleaned Optic

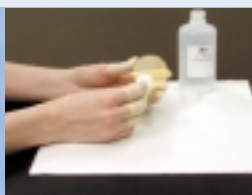
The final step is to carefully examine the surface of the optic under good light in front of a black background. Any visible polish residue should be removed by repeating steps 4B-4D as many times as required. NOTE: Certain types of contamination and damage such as metal splatter, pits, etc. cannot be removed. If the optic shows this type of contamination or damage, it will probably need to be reworked or replaced.

If reworking of an optic is necessary, contact a sales representative at II-VI Incorporated to make arrangements to return the part to II-VI Incorporated for repolishing and recoating.

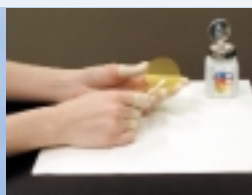
STEP 4 (a)



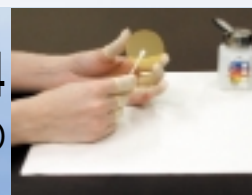
STEP 4 (b)



STEP 4 (c)



STEP 4 (d)



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