High Power Air-Spaced Laser Achromats

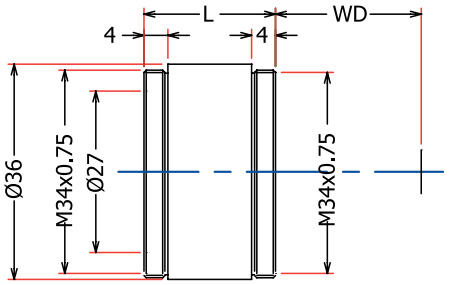
- Air-spaced design
- High damage Anti-Reflection coating
- Mounted in metal barrels for ease of use and pre-alignment
- Standard focal lengths from 40 to 200mm

These laser achromats are ideal for use with any laser operating in the visible spectrum. They will also serve as excellent general purpose imaging lenses for white light applications. These lenses are optimized for three wavelengths, 486.1, 587.6 and 656.3nm. A crown and a flint glass element are housed in a metal cell and separated by a spacer. The air gap acts as a third lens element and provides a greater degree of correction than found in a cemented lens. In this way it is possible to balance the aberrations over a fairly wide range of wavelengths so that the lenses perform well as broadband imaging devices. Not only are chromatic effects minimized but other paraxial aberrations can also be significantly reduced. As a result, these lenses provide excellent performance for focusing, imaging and light collection. Both elements are coated with a broadband multilayer Anti-Reflection coating which will withstand high power laser use.

Specifications & Tolerances

Focal length: ±2% @532.1nm
Material: BK7 and SF2
Coating: Broadband Anti-Reflection 400-700nm
Laser damage threshold: 7J/cm^2 @10ns pulse λ=532nm

Detailed dimensions and optical parameters will be provided on request.



LASER ACHROMAT 36mm

High Power Air-Spaced Laser Achromats

Focal Length @532nm	Working, Distance, WD (mm)	Cell Length, L (mm)	Lens Composition	Price	PART NUMBER
40.2	30.1	22.0	Triplet	$ 750.00	**026-5430**
49.5	39.0	22.0	Triplet	$ 750.00	**026-5440**
58.9	49.0	22.0	Triplet	$ 750.00	**026-5442**
80.1	71.6	13.0	Doublet	$ 585.00	**026-5445**
99.8	91.7	13.0	Doublet	$ 585.00	**026-5450**
150.0	141.9	12.0	Doublet	$ 585.00	**026-5455**
199.8	192.7	12.0	Doublet	$ 585.00	**026-5460**

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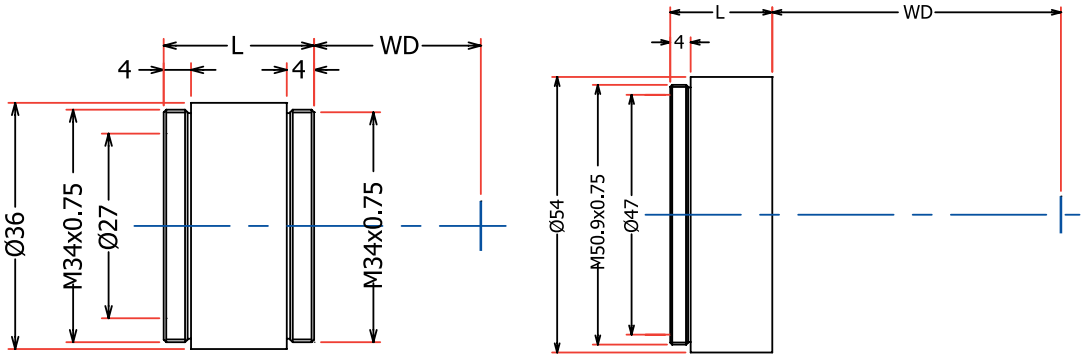
Excimer Laser Focusing Lenses

- All fused silica air-spaced design
- Metal barrel for ease of mounting
- Standard focal lengths from 40 to 300mm
- Clear apertures of 27 and 47mm

These air-spaced focusing lenses are manufactured from synthetic fused silica. They are optimized for use in the region 180 to 400nm making them ideal for use with excimer lasers or other ultraviolet sources. In air-spaced doublets the air gap acts as a third lens element providing a greater degree of correction. In this way it is possible to minimize all of the paraxial aberrations for the highest possible performance. As a result, these very simple lenses provide excellent performance for focusing, imaging and light collection. Focal lengths from 40 to 300mm are available with clear apertures from 27 to 47mm. These lenses are supplied uncoated and mounted in metal cells with a plain outer barrel.

Specifications & Tolerances

Focal length: ±2% @248.4nm Material: Synthetic fused silica
Coating: Optional Anti-Reflection upon request



EXCIMER LASER FOCUSING LENS 36mm & 54 mm

Excimer Laser Focusing Lenses

Focal Length @248nm (mm)	Clear Aperture (mm)	Working Distance, WD (mm)	Cell Diameter (mm)	Cell Length, L (mm)	Mounting Thread	Lens Composition	Price	PART NUMBER
39.6	27	31.1	36	22	M34 x P0.75	Triplet	$ 709.00	**027-1210**
49.8	27	41.6	36	22	M34 x P0.75	Triplet	$ 709.00	**027-1220**
59.7	27	52.4	36	22	M34 x P0.75	Triplet	$ 709.00	**027-1225**
79.8	27	73.2	36	22	M34 x P0.75	Triplet	$ 662.00	**027-1230**
99.9	27	94.6	36	12	M34 x P0.75	Doublet	$ 635.00	**027-1240**
149.3	27	144.6	36	12	M34 x P0.75	Doublet	$ 593.00	**027-1250**
199.3	27	194.7	36	12	M34 x P0.75	Doublet	$ 567.00	**027-1260**
100.4	47	87.1	54	20	M50.9 x P0.75	Doublet	$ 1,181.00	**027-1350**
149.6	47	137.9	54	20	M50.9 x P0.75	Doublet	$ 1,134.00	**027-1360**
199.1	47	187.9	54	20	M50.9 x P0.75	Doublet	$ 1,087.00	**027-1370**
249.0	47	238.0	54	20	M50.9 x P0.75	Doublet	$ 1,040.00	**027-1380**
298.6	47	288.0	54	20	M50.9 x P0.75	Doublet	$ 998.00	**027-1390**

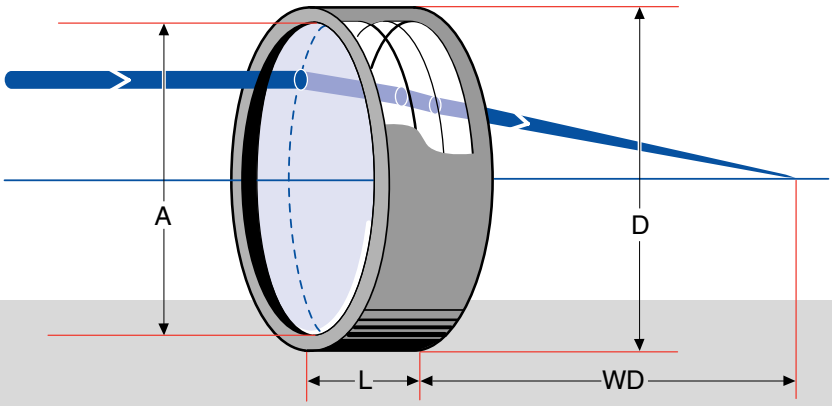
Ultra-Violet Achromats

- Air-spaced design
- Corrected from 200 to 400nm
- Barrel mounted for ease of use
- Standard focal lengths from 50 to 300mm

The air-spaced design of these lenses using materials of different refractive index has produced a high degree of correction over a bandwidth of 200 to 400nm. These achromats may be used as laser focusing lenses or with broadband Ultra-Violet sources. A calcium fluoride bi-convex element and a fused silica meniscus element are mounted together in a plain barrel. The lenses are supplied uncoated. Optional Anti-Reflection coatings upon request.

Specifications & Tolerances

Dimensions:
±0.2mm
Focal length: ±2%
@308nm
Centration: ≤3arcmin
Materials: Synthetic fused silica and calcium fluoride
Coating:
Optional Anti-Reflection upon request



UV ACHROMAT

Ultra-Violet Achromats

Focal Length, f (mm)	Clear Aperture, A (mm)	Working Distance, WD (mm)	Cell Diameter, D (mm)	Cell Length, L (mm)	Price	PART NUMBER
50.4	27.0	40.7	34.0	17.0	$ 1,145.00	**027-3010**
80.0	27.0	72.4	34.0	14.0	$ 1,076.00	**027-3015**
100.1	27.0	92.5	34.0	13.0	$ 998.00	**027-3020**
151.5	27.0	137.1	34.0	16.0	$ 1,025.00	**027-3025**
200.3	27.0	185.2	34.0	16.0	$ 975.00	**027-3030**
80.3	37.0	70.2	44.0	17.0	$ 1,638.00	**027-3035**
100.0	37.0	87.7	44.0	18.0	$ 1,500.00	**027-3040**
149.0	37.0	134.4	44.0	18.0	$ 1,470.00	**027-3045**
201.2	37.0	185.5	44.0	18.0	$ 1,439.00	**027-3050**
249.7	37.0	230.7	44.0	19.0	$ 1,365.00	**027-3055**
100.8	47.0	89.1	54.0	20.0	$ 2,237.00	**027-3060**
149.7	47.0	136.3	54.0	21.0	$ 2,100.00	**027-3065**
200.0	47.0	179.9	54.0	22.0	$ 2,027.00	**027-3070**
252.4	47.0	233.0	54.0	21.0	$ 1,969.00	**027-3075**
300.9	47.0	278.8	54.0	22.0	$ 1,932.00	**027-3080**

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YAG Laser Focusing Lenses

- Air-spaced design
- Standard focal lengths from 20 to 150mm
- High damage, narrowband, high performance Anti-Reflection coatings
- Barrel mounted for ease of use
- Optional protective windows available
- Matched focal lengths for YAG and HeNe wavelengths

These YAG lenses range in focal length from 20 to 150mm. They consist of either two or three air-spaced glass elements mounted in a metal cell. The lenses all have a 30mm clear aperture but they are recommended for use with beams not exceeding one inch in diameter. Two different designs are used - the 20, 30, 40, and 50mm focal length lenses have three elements, but the 60, 80, 100, and 150mm lenses use simpler two element designs. These lenses are Anti-Reflection coated with a high damage Narrowband Multilayer Anti-Reflection coating optimized to give less than 0.5% reflectance per surface at 1064nm.

These lenses are chromatically corrected so that a HeNe guide beam or a visible range video monitor beam will be in focus at the same position as the YAG beam.

Spot size or beam waist is inversely proportional to the numerical aperture at the effective beam diameter. The spot size given in the table is for a full aperture beam. Let us know your imaging requirements and we will be pleased to advise you on the appropriate lens for your application.

Since these lenses are often used with high power lasers we offer optional protective windows which can be attached to the focusing side of the lens. In the event of inadvertent back reflection of high energy beams into the lens it is likely that the window will absorb the incident energy and shatter preventing further damage to the lens itself. Protective windows are offered uncoated in packages of ten pieces. For optimum performance we advise that the protective windows be Anti-Reflection coated with our A46 V Coat at 1064nm.

We use the term YAG laser loosely to include Nd:Glass, Nd:YAG, YLF and other types of laser operating in the wavelength region of 1.06 microns.

Specifications & Tolerances

Focal length: ±2% @1064nm
Coating: %R<0.5 at 1064nm
Laser damage threshold: Measured at 8J/cm^2 10ns pulse
Clear aperture: >90%

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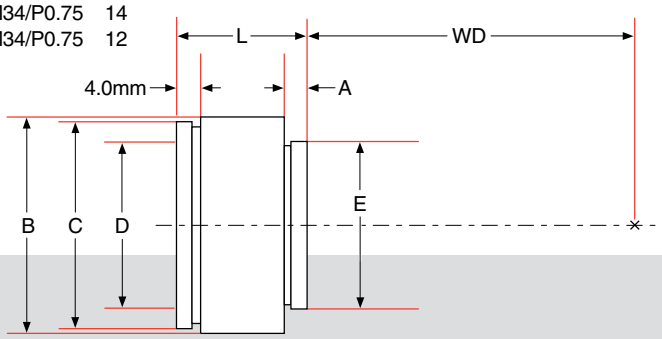
Part No.	Dimensions (mm)					
	A	B	C	D	E	L
027-0210	6.0	32	M29/P0.75	20.0	M22/P0.75	22
027-0220	6.5	36	M34/P0.75	27.0	M28/P0.75	22
027-0230	4.0	36	M34/P0.75	26.5	M28/P0.75	19
027-0240	3.5	36	M34/P0.75	27.0	M28/P0.75	19
027-0250	4.0	36	M34/P0.75	27.0	M34/P0.75	17
027-0260	4.0	36	M34/P0.75	27.0	M34/P0.75	15
027-0270	4.0	36	M34/P0.75	27.0	M34/P0.75	14
027-0280	4.0	36	M34/P0.75	27.0	M34/P0.75	12



YAG LASER FOCUSING LENS

YAG Laser Focusing Lenses

Focal Length (mm)	Working Distance, WD (mm)	N.A.	Spot Size (µm)	Cell Length, L (mm)	Protective Window Thread, T	Lens Composition	Price	PART NUMBER
20.0	9.0	0.48	1.15	22.0	M22 x P0.75	Triplet	$ 557.00	**027-0210**
30.0	19.1	0.39	1.76	22.0	M28 x P0.75	Triplet	$ 557.00	**027-0220**
40.0	30.9	0.30	2.27	19.0	M28 x P0.75	Triplet	$ 557.00	**027-0230**
50.0	41.4	0.24	2.79	19.0	M28 x P0.75	Triplet	$ 557.00	**027-0240**
59.9	41.1	0.20	3.32	17.0	M34 x P0.75	Doublet	$ 520.00	**027-0250**
79.9	67.6	0.15	4.38	15.0	M34 x P0.75	Doublet	$ 520.00	**027-0260**
100.1	88.4	0.12	5.46	14.0	M34 x P0.75	Doublet	$ 520.00	**027-0270**
149.3	140.0	0.08	8.15	12.0	M34 x P0.75	Doublet	$ 520.00	**027-0280**

YAG Lens Protective Windows

	WINDOW			RETAINER	
Exit Window (mm)	For Use With	Price 10 Piece Package	PART NUMBER	Price	PART NUMBER
21.0	027-0210	$ 37.00	**027-0189**	$ 26.00	**027-0194**
27.0	027-0220	$ 37.00	**027-0191**	$ 26.00	**027-0195**
27.0	027-0230	$ 37.00	**027-0191**	$ 26.00	**027-0195**
27.0	027-0240	$ 37.00	**027-0191**	$ 26.00	**027-0195**
33.0	027-0250	$ 42.00	**027-0192**	$ 32.00	**027-0196**
33.0	027-0260	$ 42.00	**027-0192**	$ 32.00	**027-0196**
33.0	027-0270	$ 42.00	**027-0192**	$ 32.00	**027-0196**
33.0	027-0280	$ 42.00	**027-0192**	$ 32.00	**027-0196**

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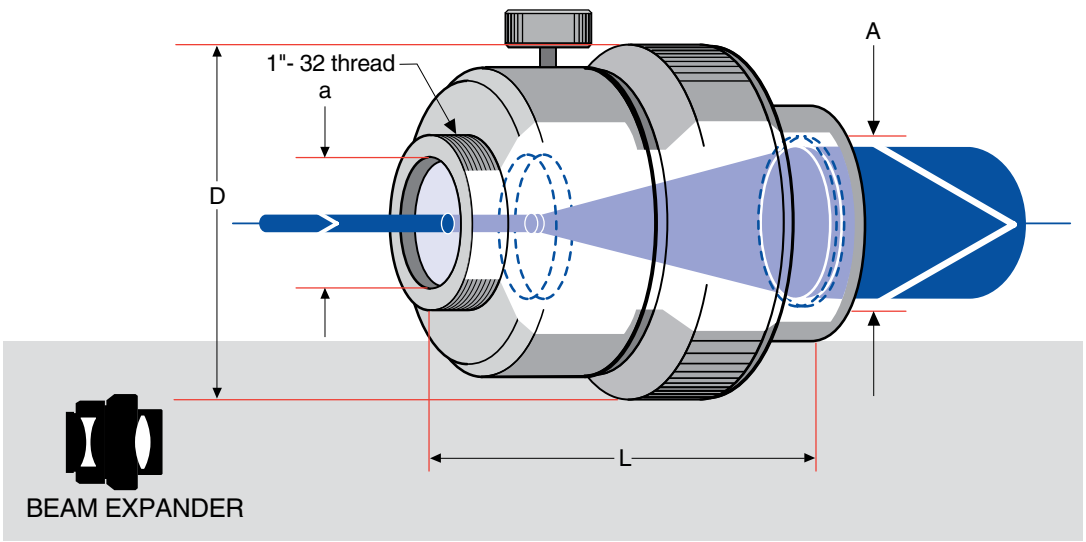
For optimum performance request your protective windows with our A46 Anti-Reflection V Coat at 1064nm.

Laser Beam Expanders

- Precise beam expansion permits lower beam divergence
- Designed for use with HeNe lasers
- Anti-Reflection coated for broadband visible spectrum
- Fixed expansions of 3, 5, and 10 times
- Variable expansions from 2.5 to 10 times in a single system

Beam expanders are useful laser accessories when the beam diameter must be increased. However, their main function is in decreasing the divergence of laser beams which are to be projected over long distances. These precision beam expanders have been designed for use with HeNe lasers but they are also useful for any laser working in the visible part of the spectrum (400-700nm). They are provided with a standard accessory thread and a mounting ring which adapts readily to most commercially available lasers. Three fixed ratio expanders are offered covering 3X, 5X, and 10X expansion ratios. There is also a zoom beam expander which can be adjusted for ratios from 2.5X to 10X. Both the fixed and variable ratio beam expanders have a focus adjustment. A fiducial mark shows the position for precise expansion but the focus adjustment can be used to compensate for inherent divergence in the beam and focus the distant laser beam more precisely. Once set, a lock screw may be used to secure the focus ring in place.



BEAM EXPANDER

Specifications & Tolerances

Magnification:
adjustable by ± 5%
Surface quality:
20-10
Barrel dimensions:
±0.5mm
Coating: Broadband Anti-Reflection 400-700nm
Centration: ≤3arcmin
Material: Grade A crown and flint glasses

Laser Beam Expanders

Expansion Ratio	Input Aperture, a (mm)	Output Aperture, A (mm)	Barrel Diameter, D (mm)	Barrel Length, L (mm)	Price	PART NUMBER
3X	3.5	15	40	45-51	$ 551.00	**027-2440**
5X	2.0	15	40	52-59	$ 572.00	**027-2450**
10X	1.5	25	40	111-118	$ 625.00	**027-2460**
2.5-10X	2.0	25	62	139-159	$ 1,523.00	**027-2470**
HeNe Adapter	Inch	-	-	-	$ 36.00	**027-2465**
HeNe Adapter	Metric	-	-	-	$ 36.00	**027-2466**

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Microscope Objectives

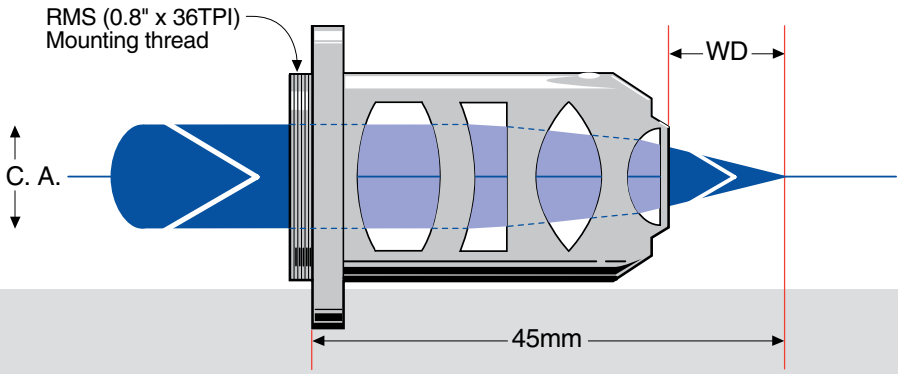
- Highly corrected and optimized for minimum spot size
- For use with most low power lasers with collimated output beams
- Standard microscope objective threads for easy mounting
- Fully color corrected for use throughout the visible

Microscope objectives are ideal for use as focusing lenses for low power lasers such as HeNe, HeCd, and N2. We offer a selection of precision achromatic objectives covering a range of numerical apertures. They are housed in conventional microscope barrels and fitted with a standard RMS microscope thread. The lenses are Anti-Reflection coated.

Biological microscope objective lenses are normally designed for use with a thin glass cover slide placed on top of the sample being examined. Biological and medical microscope objectives are designed specifically to correct this. Our point here is that you must be careful in selecting microscope objectives as focusing lenses for lasers. All of our microscope objective lenses are designed for use without a cover glass.

Specifications & Tolerances

Shoulder to focus: 45mm
Coating: SLAR 400-700nm
System length: 160mm
Barrel: Chromium plated



MICROSCOPE OBJECTIVE

Microscope Objectives

Power	N.A.	C.A.	Working Distance, WD (mm)	Price	PART NUMBER
4x	0.10	5.6	23.10	$ 105.00	**028-0140**
10x	0.25	7.0	4.10	$ 140.00	**028-0160**
20x	0.40	8.2	1.97	$ 235.00	**028-0220**
40x	0.65	5.8	0.60	$ 255.00	**028-0240**

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