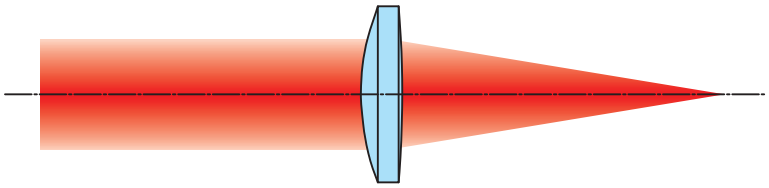

Multi-Element Optics

The lens or a combination of these lenses found in this section will have limited applications compared with single spherical lens but very high performance can be achieved in a dedicated application.

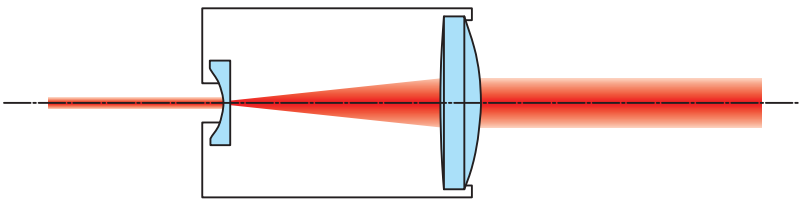
Beam Focusing

Type	Features	Applications
Achromatic Lens	Chromatic and spherical aberration is minimized. Large line-up of focal length and aperture.	Focus ability in low power lasers. Imaging system for infinity object
Focusing Lens	High laser damage threshold Spot size is minimized and near to the diffraction limit.	Lens for various laser fabrication such as laser marking, cutting and welding.
Objective Lens	Highly corrected lens with high magnification Large numerical aperture produces minimum spot size. Fully usable throughout the visible wavelength spectrum.	Microscopic imaging for the visible, ultra-violet and near infrared wavelength spectrum. Focusing a laser beam into a minimal spot. Micro-fabrication for lasers.

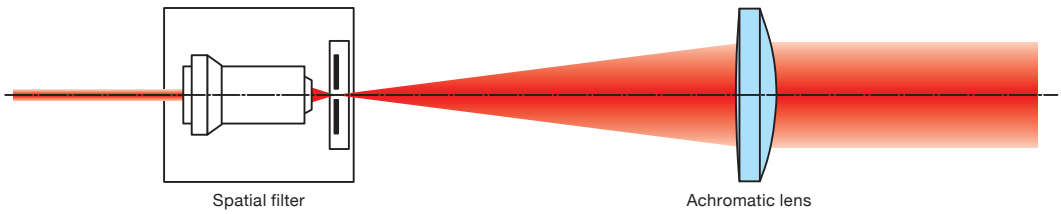


Beam Expanding

Type	Features	Applications
Beam Expander	Optimized design for minimum spherical aberration Integrated design with reduced size	Magnifying the laser aperture (for interferometer and projection) Reducing the focal spot size (by enlarging the incident laser beam diameter)
Spatial filter (objective lens) + Achromatic lens	Large choice of expansion ratios. Provides a high purified beam profile.	When using a very large collimated beam. When changing the beam aperture (with switching the achromatic lenses)



Beam expander



Spatial filter

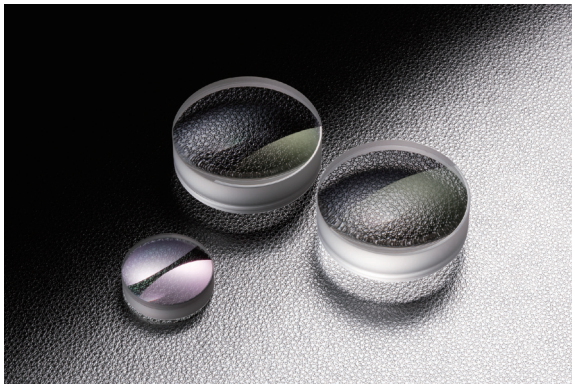
Achromatic lens

Achromatic Doublets | DLB

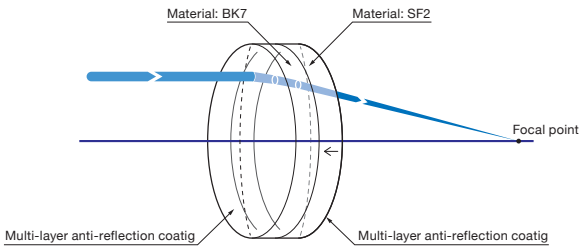
RoHS

Achromatic doublets are cemented achromats made of two different lenses. (Low dispersion positive from crown glass and high dispersion negative from flint glass). The difference of dispersion and shape of both lenses are designed to minimize the chromatic aberrations in blue (486.1nm), green (546.1nm) and red (656.3nm). Therefore, these lenses are able to support the entire visible wavelength spectrum.

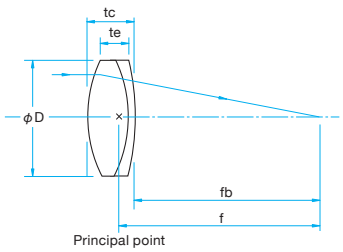
- Dispersion and shape differences are both effective to decrease spherical aberration. The spherical aberration of achromatic doublets is better than singlets and minimized at infinite conjugate ratios.
- Every product is coated on both surfaces with a broadband multi-layer anti-reflection coating for the visible wavelength (400 – 700nm).
- When a parallel beam is converged and to minimize the spherical aberration, please set the positive part to the side of the incident parallel beam and put the negative part to the side of the focal point.
- To change the reflective index of a glass according to a wavelength is called “dispersion of the glass” Having a difference in focal length of a lens at each wave length is Chromatic aberration and this is due to dispersion. This can be corrected by combining glasses with low and high dispersions. Spherical aberration is when a ray enters a lens farther from its optical axis and has a shorter focus than a paraxial focus.



Schematic



Outline Drawing (in mm)



●Tolerance

Diameter	≦ϕ60	$\phi D^{+0}_{-0.1}$
	ϕ80	$\phi D^{+0}_{-0.15}$
	ϕ100	$\phi D^{+0}_{-0.2}$
Thickness		tc ±0.2
Focal length		±1% (546.1nm)

Specifications

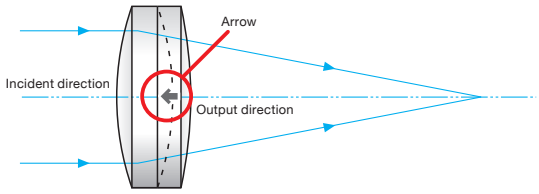
Material	BK7, SF2
Design wavelength	Blue: 486.1nm, Green: 546.1nm, Red: 656.3nm
Coating	Broadband multi-layer anti-reflection coating for the Visible
Cement	Ultraviolet Hardened Adhesive
Laser Damage Threshold	0.3J/cm^2 (Laser pulse width 10ns, repetition frequency 20Hz)
Surface Quality (Scratch–Dig)	40–20
Clear aperture	90% of actual aperture

Guide

- Please contact our International Sales Division for customized achromatic doublets. (Customized on size etc.)
- Please refer to our web site for the lens design data.
  WEB Reference Catalog Code W3075
- Also available is an air spaced type of focusing lens (NYTL/NYDL). Designed for laser processing. Reference B181

Attention

- When a parallel beam is converged and to minimize the spherical aberration, please set the positive part to the side of the incident parallel beam and put the negative part to the side of the focal point.
- To change the reflective index of a glass according to a wavelength is called “dispersion of the glass” Having a difference in focal length of a lens at each wave length is Chromatic aberration and this is due to dispersion. This can be corrected by combining glasses with low and high dispersions.
- Spherical aberration is when a ray enters a lens farther from its optical axis and has a shorter focus than a paraxial focus.
- Be sure to wear laser safety goggles when checking optical path and adjusting optical axis.



ϕ10 – ϕ25

Part Number	Diameter ϕD [mm]	Focal length f [mm]	Center Thickness tc [mm]	Edge Thickness te [mm]	Back focal length fb [mm]	Centration [′]
DLB-10-20PM	ϕ10	20.0	6.7	5.1	16.6	<1
DLB-10-25PM	ϕ10	25.0	6.1	4.9	22.1	<1
DLB-10-30PM	ϕ10	30.1	5.7	4.7	27.4	<1
DLB-10-40PM	ϕ10	40.0	5.3	4.6	37.5	<1
DLB-10-50PM	ϕ10	50.0	5.0	4.4	47.5	<1
DLB-10-60PM	ϕ10	60.1	4.9	4.4	57.6	<1
DLB-10-70PM	ϕ10	69.9	4.7	4.3	67.3	<1
DLB-10-80PM	ϕ10	80.1	4.6	4.2	77.8	<1
DLB-10-100PM	ϕ10	100.5	4.5	4.2	98.1	<1
DLB-12.7-25PM	ϕ12.7	25.1	7.3	5.3	21.5	<1
DLB-12.7-30PM	ϕ12.7	30.0	6.8	5.2	26.7	<1
DLB-12.7-40PM	ϕ12.7	40.1	6.1	4.9	36.9	<1
DLB-12.7-50PM	ϕ12.7	50.1	5.7	4.7	47.3	<1
DLB-12.7-60PM	ϕ12.7	60.0	5.4	4.6	57.3	<1
DLB-12.7-70PM	ϕ12.7	69.9	5.2	4.5	67.5	<1
DLB-12.7-80PM	ϕ12.7	79.9	5.1	4.5	77.4	<1
DLB-12.7-100PM	ϕ12.7	100.1	4.8	4.3	97.9	<1
DLB-15-25PM	ϕ15	25.2	8.8	6.0	20.7	<1
DLB-15-30PM	ϕ15	30.1	8.0	5.7	26.0	<1
DLB-15-40PM	ϕ15	40.1	6.9	5.2	36.5	<1
DLB-15-50PM	ϕ15	50.1	6.3	5.0	47.1	<1
DLB-15-60PM	ϕ15	59.9	5.9	4.8	57.0	<1
DLB-15-70PM	ϕ15	70.2	5.7	4.8	67.4	<1
DLB-15-80PM	ϕ15	79.9	5.5	4.7	77.1	<1
DLB-15-100PM	ϕ15	100.0	5.2	4.5	97.3	<1
DLB-20-30PM	ϕ20	30.6	10.9	6.8	24.9	<1
DLB-20-40PM	ϕ20	40.1	9.2	6.2	35.3	<1
DLB-20-50PM	ϕ20	50.2	8.1	5.7	46.0	<1
DLB-20-60PM	ϕ20	60.2	7.4	5.4	56.6	<1
DLB-20-70PM	ϕ20	70.1	6.9	5.2	66.7	<1
DLB-20-80PM	ϕ20	79.9	6.6	5.1	76.6	<1
DLB-20-100PM	ϕ20	99.5	6.1	4.9	96.4	<1
DLB-20-120PM	ϕ20	120.3	5.7	4.7	117.3	<1
DLB-20-150PM	ϕ20	149.8	5.4	4.6	147.0	<1
DLB-20-170PM	ϕ20	170.0	5.3	4.6	167.2	<1
DLB-20-200PM	ϕ20	200.1	5.1	4.5	197.3	<1
DLB-20-220PM	ϕ20	220.0	5.0	4.5	216.9	<3
DLB-20-250PM	ϕ20	250.0	4.9	4.4	247.0	<3
DLB-20-300PM	ϕ20	300.0	4.7	4.3	297.1	<3
DLB-25-40PM	ϕ25	40.9	12.5	7.7	34.2	<1
DLB-25-50PM	ϕ25	50.1	10.9	7.1	44.9	<1
DLB-25-60PM	ϕ25	60.1	9.8	6.7	55.2	<1
DLB-25-70PM	ϕ25	69.9	9.0	6.3	65.3	<1
DLB-25-80PM	ϕ25	80.0	8.5	6.2	75.9	<1
DLB-25-100PM	ϕ25	100.2	7.7	5.9	96.5	<1
DLB-25-120PM	ϕ25	119.8	7.2	5.6	116.2	<1
DLB-25-150PM	ϕ25	149.6	6.7	5.5	146.2	<1
DLB-25-170PM	ϕ25	170.4	6.4	5.3	167.1	<1
DLB-25-200PM	ϕ25	200.1	6.1	5.2	197.0	<1
DLB-25-220PM	ϕ25	222.0	6.0	5.2	218.9	<1
DLB-25-250PM	ϕ25	250.8	5.8	5.1	247.7	<1
DLB-25-300PM	ϕ25	300.0	5.6	5.0	296.6	<3

Compatible Optic Mounts

LHF-10S, -15S, -20S, -25S / LHA-25

Achromatic Doublets | DLB

Catalog Code W3076

ϕ25.4 – ϕ40

Part Number	Diameter ϕD [mm]	Focal length f [mm]	Center Thickness tc [mm]	Edge Thickness te [mm]	Back focal length fb [mm]	Centration [′]
DLB-25.4-40PM	ϕ25.4	50.1	10.9	7.0	44.9	<1
DLB-25.4-50PM	ϕ25.4	50.1	10.9	7.0	44.9	<1
DLB-25.4-60PM	ϕ25.4	60.1	9.8	6.6	55.2	<1
DLB-25.4-70PM	ϕ25.4	69.9	9.0	6.2	65.3	<1
DLB-25.4-80PM	ϕ25.4	80.0	8.5	6.1	75.9	<1
DLB-25.4-100PM	ϕ25.4	100.2	7.7	5.8	96.5	<1
DLB-25.4-120PM	ϕ25.4	119.8	7.2	5.6	116.2	<1
DLB-25.4-150PM	ϕ25.4	149.6	6.7	5.4	146.2	<1
DLB-25.4-170PM	ϕ25.4	170.4	6.4	5.3	167.1	<1
DLB-25.4-200PM	ϕ25.4	200.1	6.1	5.1	197.0	<1
DLB-25.4-220PM	ϕ25.4	222.0	6.0	5.1	218.9	<1
DLB-25.4-250PM	ϕ25.4	250.8	5.8	5.0	247.7	<1
DLB-25.4-300PM	ϕ25.4	300.0	5.6	5.0	296.6	<3
DLB-30-50PM	ϕ30	50.3	14.1	8.6	43.5	<1
DLB-30-60PM	ϕ30	60.3	12.6	8.1	53.9	<1
DLB-30-70PM	ϕ30	70.8	11.5	7.7	65.0	<1
DLB-30-80PM	ϕ30	80.3	10.7	7.4	75.0	<1
DLB-30-100PM	ϕ30	100.7	9.5	6.8	96.0	<1
DLB-30-120PM	ϕ30	120.1	8.8	6.6	115.7	<1
DLB-30-150PM	ϕ30	150.0	8.1	6.3	146.0	<1
DLB-30-170PM	ϕ30	169.9	7.7	6.1	166.0	<1
DLB-30-200PM	ϕ30	200.2	7.3	6.0	196.4	<1
DLB-30-220PM	ϕ30	220.2	7.1	5.9	216.5	<1
DLB-30-250PM	ϕ30	249.7	6.9	5.8	246.1	<1
DLB-30-300PM	ϕ30	300.4	6.6	5.7	296.9	<1
DLB-30-350PM	ϕ30	350.0	6.4	5.6	346.2	<3
DLB-30-400PM	ϕ30	400.0	6.2	5.5	396.3	<3
DLB-30-450PM	ϕ30	450.0	6.1	5.5	446.5	<3
DLB-30-500PM	ϕ30	500.0	6.0	5.5	496.5	<3
DLB-40-60PM	ϕ40	60.2	19.3	11.0	50.2	<1
DLB-40-70PM	ϕ40	70.3	17.2	10.2	61.7	<1
DLB-40-80PM	ϕ40	80.2	15.8	9.7	71.8	<1
DLB-40-100PM	ϕ40	99.9	13.7	8.9	92.8	<1
DLB-40-120PM	ϕ40	120.0	12.3	8.3	113.7	<1
DLB-40-150PM	ϕ40	150.1	10.9	7.7	144.5	<1
DLB-40-170PM	ϕ40	169.7	10.3	7.5	164.5	<1
DLB-40-200PM	ϕ40	199.7	9.6	7.2	194.8	<1
DLB-40-220PM	ϕ40	220.7	9.2	7.0	216.0	<1
DLB-40-250PM	ϕ40	249.1	8.8	6.9	244.6	<1
DLB-40-300PM	ϕ40	300.5	8.3	6.7	296.1	<1
DLB-40-350PM	ϕ40	349.9	7.9	6.5	345.8	<1
DLB-40-400PM	ϕ40	399.7	7.6	6.4	395.7	<1
DLB-40-450PM	ϕ40	450.0	7.4	6.3	445.5	<3
DLB-40-500PM	ϕ40	500.0	7.2	6.3	495.6	<3

Compatible Optic Mounts

LHF-25.4S, -30AS, -40AS

ϕ50 – ϕ100

Part Number	Diameter ϕD [mm]	Focal length f [mm]	Center Thickness tc [mm]	Edge Thickness te [mm]	Back focal length fb [mm]	Centration [′]
DLB-50-80PM	ϕ50	81.0	22.9	13.4	69.1	<1
DLB-50-100PM	ϕ50	100.5	19.9	12.3	90.0	<1
DLB-50-120PM	ϕ50	120.2	17.7	11.4	111.0	<1
DLB-50-150PM	ϕ50	150.7	15.5	10.5	142.8	<1
DLB-50-170PM	ϕ50	169.8	14.5	10.1	162.5	<1
DLB-50-200PM	ϕ50	200.1	13.3	9.6	193.3	<1
DLB-50-220PM	ϕ50	220.7	12.7	9.3	214.5	<1
DLB-50-250PM	ϕ50	249.4	12.1	9.1	243.4	<1
DLB-50-300PM	ϕ50	299.5	11.2	8.7	293.7	<1
DLB-50-350PM	ϕ50	350.2	10.7	8.6	344.5	<1
DLB-50-400PM	ϕ50	400.0	10.2	8.3	394.7	<1
DLB-50-450PM	ϕ50	451.5	9.9	8.3	446.2	<1
DLB-50-500PM	ϕ50	500.3	9.6	8.1	495.2	<1
DLB-50-600PM	ϕ50	599.9	9.2	8.0	594.4	<3
DLB-50-700PM	ϕ50	700.0	8.9	7.8	694.6	<3
DLB-50-800PM	ϕ50	800.0	8.6	7.7	794.9	<3
DLB-50-1000PM	ϕ50	1000.0	8.3	7.6	995.0	<3
DLB-50.8-100PM	ϕ50.8	100.5	19.9	12.1	90.0	<1
DLB-50.8-120PM	ϕ50.8	120.2	17.7	11.2	111.0	<1
DLB-50.8-150PM	ϕ50.8	150.7	15.5	10.4	142.8	<1
DLB-50.8-200PM	ϕ50.8	200.1	13.3	9.5	193.3	<1
DLB-50.8-250PM	ϕ50.8	249.4	12.1	9.0	243.4	<1
DLB-50.8-300PM	ϕ50.8	299.5	11.2	8.6	293.7	<1
DLB-50.8-400PM	ϕ50.8	400.0	10.2	8.3	394.7	<1
DLB-50.8-500PM	ϕ50.8	500.3	9.6	8.1	495.2	<1
DLB-50.8-700PM	ϕ50.8	700.0	8.9	7.8	694.6	<3
DLB-50.8-1000PM	ϕ50.8	1000.0	8.3	7.5	995.1	<3
DLB-60-170PM	ϕ60	170.8	17.7	11.4	161.9	<1
DLB-60-200PM	ϕ60	200.3	16.1	10.7	192.1	<1
DLB-60-250PM	ϕ60	250.0	14.3	10.0	242.8	<1
DLB-60-500PM	ϕ60	499.1	10.7	8.6	493.5	<1
DLB-60-600PM	ϕ60	597.9	10.1	8.3	592.6	<1
DLB-80-150PM	ϕ80	149.7	30.3	17.2	133.6	<1
DLB-80-200PM	ϕ80	200.8	24.3	14.7	188.2	<1
DLB-80-300PM	ϕ80	299.8	18.8	12.4	290.2	<1
DLB-80-500PM	ϕ80	502.6	14.5	10.7	494.9	<1
DLB-80-800PM	ϕ80	800.6	12.1	9.7	794.2	<1
DLB-100-200PM	ϕ100	200.6	37.0	21.8	181.0	<1
DLB-100-300PM	ϕ100	297.3	28.0	18.0	283.2	<1
DLB-100-500PM	ϕ100	499.6	21.1	15.2	488.8	<1
DLB-100-800PM	ϕ100	799.5	17.4	13.7	790.4	<1
DLB-100-1000PM	ϕ100	998.1	16.1	13.1	989.7	<1

Compatible Optic Mounts

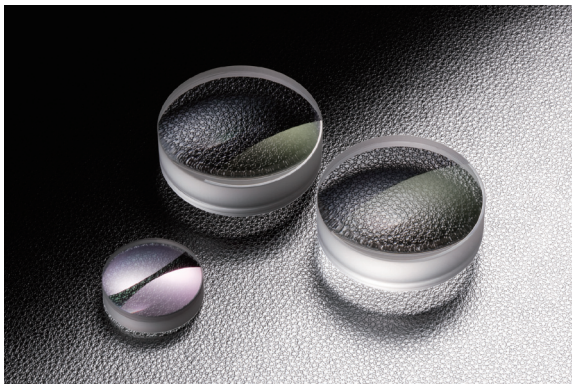
LHF-50S, -50.8S, -60S, -80, -100

Near infrared achromatic lens | DL-PNIR

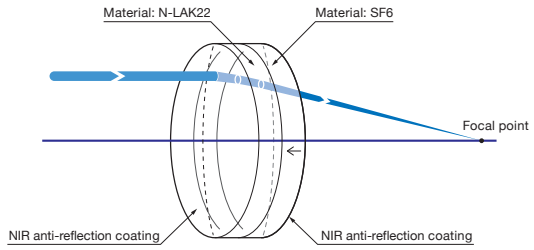
RoHS Catalog Code W3195

By setting the single lens bonding two lenses with wavelength dispersion of the refractive index is different, it can be smaller spherical aberration and chromatic aberration than the spherical single lens. It can be used as a focusing lens for YAG laser (1064nm) or LD of the near-infrared.

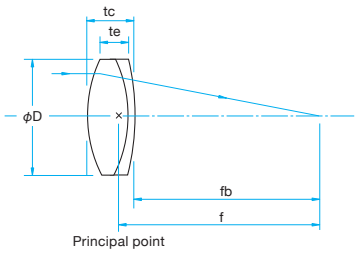
- Optimization by lens design, focal length in the near infrared region hardly changes. Focal length of 700mm, 880mm, 1100mm matches, it has been optimized that aberration is minimized.
- It is suitable as a collimating lens of the laser not only because chromatic aberration but also spherical aberration is collected.
- It is not only aberration of the axial object point but is also corrected for astigmatism and comatic aberration of the axis.



Schematic



Outline Drawing (in mm)



●Tolerance

Diameter	$\phi D^{0}_{-0.1}$
Thickness	tc±0.2
Focal length	±2%

Specifications

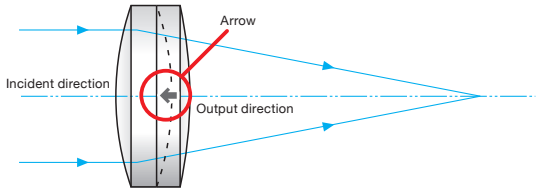
Material	N-LAK22, SF6
Design wavelength	700nm, 880nm, 1100nm
Coating	Multi-layer anti-reflection coating (700 – 1550nm)
Cement	Ultraviolet Hardened Adhesive
Laser Damage Threshold	0.3J/cm^2
Surface Quality (Scratch–Dig)	40–20
Clear aperture	90% of actual aperture

Guide

- The production of catalog products other than such as outside diameter or size are available.
- The design and manufacture of achromatic lens of the wavelength band of the requested is available.
- Air gap type condenser lens for the laser processing (NYTL / NYDL) are also available. Reference B181

Attention

- Please use achromatic lens when focusing to focus an image at infinity or when making parallel light from the one point of light source. It does not provide sufficient optical performance when used in such as short-range distance imaging.
- There is a direction to the incident light parallel to the achromatic lens. A surface with a small radius of curvature is allowed to be incident parallel light from a rear surface (the surface on the arrow is pointing to). When it is incident parallel light from the opposite side, spherical aberration and chromatic aberration will occur and the focused spot size will increase.
- When used in the visible region, spherical aberration and chromatic aberration increases. In addition, the transmittance decreases.



Specifications

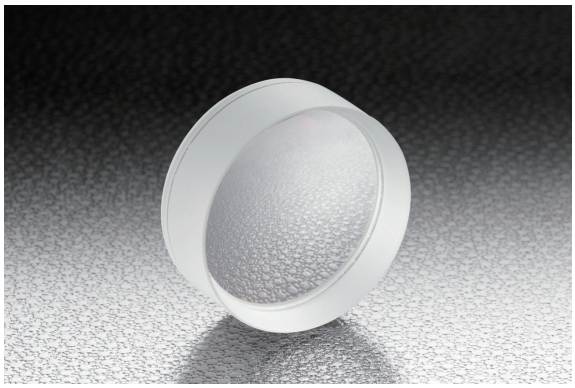
Part Number	Diameter ϕD [mm]	Focal length f [mm]	Center Thickness tc [mm]	Edge Thickness te [mm]	Back focal length fb [mm]	Centration [′]
DL-15-20PNIR	ϕ15	19.9	9.5	6.6	14.7	<3
DL-15-25PNIR	ϕ15	25.0	8.1	5.8	20.6	<3
DL-15-30PNIR	ϕ15	30.1	7.4	5.6	26.0	<3
DL-15-50PNIR	ϕ15	50.2	5.9	4.9	46.8	<3
DL-25-30PNIR	ϕ25	30.0	16.3	10.8	21.4	<3
DL-25-40PNIR	ϕ25	40.1	13.2	9.3	32.8	<3
DL-25-50PNIR	ϕ25	50.2	11.6	8.5	43.8	<3
DL-25-100PNIR	ϕ25	100.4	8.7	7.2	95.1	<3

Negative achromatic lens | DL-NM

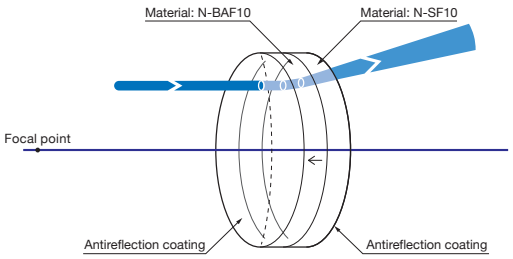
RoHS Catalog Code W3196

It is achromatic lens having a negative focal length.
By setting the concave one bonding two lenses wavelength dispersion of the refractive index is different, can be smaller than the spherical single lens and spherical aberration and chromatic aberration.

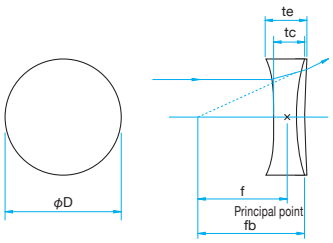
- It is optimized focal length shift is small in the visible light range, the aberration is minimized.
- It can be the beam expander of Galileo type in combination with achromatic lens with a focal length of the positive.
- It is also corrected for astigmatism and comatic aberration off-axis as well as aberration of axial object point.



Schematic



Outline Drawing (in mm)



●Tolerance
Diameter $\phi D^{0}_{-0.1}$
Thickness tc±0.2
Focal length ±2%

Specifications

Material	N-BAF10, N-SF10
Design wavelength	486.1nm, 546.1nm, 656.3nm
Coating	Antireflection coating
Cement	Ultraviolet Hardened Adhesive
Laser Damage Threshold	0.3J/cm^2
Surface Quality (Scratch–Dig)	40–20
Clear aperture	90% of actual aperture

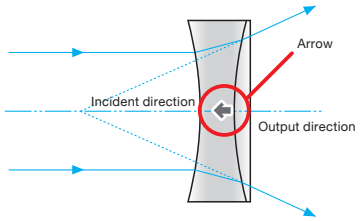
Guide

▶It is available other than the products which listed in the catalog such as focal length and other diameter size.

Attention

▶There is a direction to the incident parallel light to the achromatic lens. A surface with a small radius of curvature is allowed to be incident parallel light from a rear surface (the surface on the arrow is pointing to). When it is incident parallel light from the opposite side, spherical aberration and chromatic aberration will occur and the focused spot size will increase.

▶When used in the visible region, spherical aberration and chromatic aberration increases. In addition, the transmittance decreases.



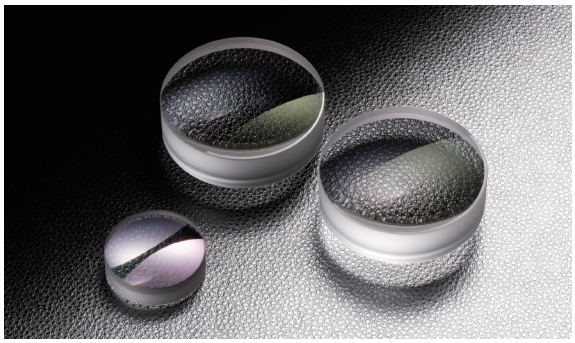
Specifications

Part Number	Diameter ϕD [mm]	Focal length f [mm]	Center Thickness tc [mm]	Edge Thickness te [mm]	Back focal length fb [mm]	Centration [′]
DL-25-50NM	ϕ25	–49.94	6.7	9.3	–53.1	<3
DL-25-100NM	ϕ25	–99.94	4.6	5.9	–102.3	<3

Reasonable achromatic lens | S-DLB

RoHS Catalog Code W3197

It is a product with lower quality than DLB series with low surface spherical achromatic lens. Allowed to use optical system, which is not required high surface quality imaging lens such as the microscope lens or telescope lens.

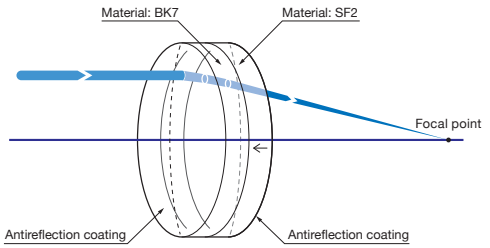


- Specification except surface quality is almost the same as DLB series. Except when used in high-precision experiment using a laser, this lens is recommended.
- It is optimized so that focal length gap is small in the visible light range and the aberration is minimized.
- It is also corrected for astigmatism and comatic aberration of off-axis as well as aberration of axial object point.

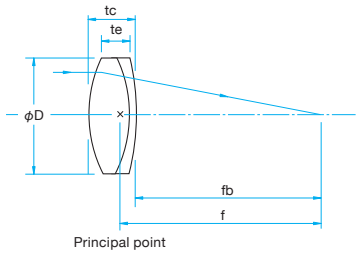
Specifications

Material	BK7, SF2
Design wavelength	Blue: 486.1nm, Green: 546.1nm, Red: 56.3nm
Centration	<3′
Coating	Antireflection coating
Surface Quality (Scratch–Dig)	60–40
Clear aperture	90% of actual aperture

Schematic



Outline Drawing (in mm)

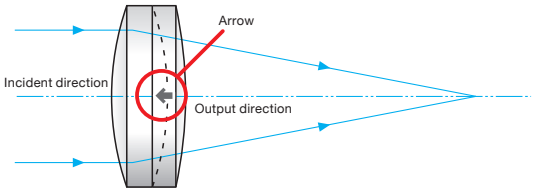


●Tolerance

Diameter<ϕ30	$\phi D^{+0}_{-0.1}$
Thickness	tc±0.2
Focal length	±1% (546.1nm)

Attention

- Achromatic lens is used when focusing an image at infinity or when making the point light source to collimated light. It does not provide sufficient optical performance when used in such as short-range imaging.
- There is a direction of the incident parallel light with achromatic lens. The radius of curvature is allowed to be incident parallel light from the side of (the surface indicated by arrows) small curvature surface. If the parallel light incidents from the opposite side, then spherical aberration and chromatic aberration occur and the focused spot size will be large.
- When used in the visible region, spherical aberration and chromatic aberration increase. In addition, the transmittance decreases.



ϕ10 – ϕ20

Part Number	Diameter ϕD [mm]	Focal length f [mm]	Center Thickness tc [mm]	Edge Thickness te [mm]	Back focal length fb [mm]
S-DLB-10-20PM	ϕ10	20.0	6.7	5.1	16.6
S-DLB-10-25PM	ϕ10	25.0	6.1	4.9	22.1
S-DLB-10-40PM	ϕ10	40.0	5.3	4.6	37.5
S-DLB-10-50PM	ϕ10	50.0	5.0	4.4	47.5
S-DLB-10-100PM	ϕ10	100.5	4.5	4.2	98.1
S-DLB-15-25PM	ϕ15	25.2	8.8	6.0	20.7
S-DLB-15-30PM	ϕ15	30.1	8.0	5.7	26.0
S-DLB-15-40PM	ϕ15	40.1	6.9	5.2	36.5
S-DLB-15-50PM	ϕ15	50.1	6.3	5.0	47.1
S-DLB-15-80PM	ϕ15	79.9	5.5	4.7	77.1
S-DLB-15-100PM	ϕ15	100.0	5.2	4.5	97.3
S-DLB-20-30PM	ϕ20	30.6	10.9	6.8	24.9
S-DLB-20-40PM	ϕ20	40.1	9.2	6.2	35.3
S-DLB-20-50PM	ϕ20	50.2	8.1	5.7	46.0
S-DLB-20-60PM	ϕ20	60.2	7.4	5.4	56.6
S-DLB-20-70PM	ϕ20	70.1	6.9	5.2	66.7
S-DLB-20-80PM	ϕ20	79.9	6.6	5.1	76.6
S-DLB-20-100PM	ϕ20	99.5	6.1	4.9	96.4
S-DLB-20-120PM	ϕ20	120.3	5.7	4.7	117.3
S-DLB-20-150PM	ϕ20	149.8	5.4	4.6	147.0
S-DLB-20-200PM	ϕ20	200.1	5.1	4.5	197.3

ϕ25 – ϕ30

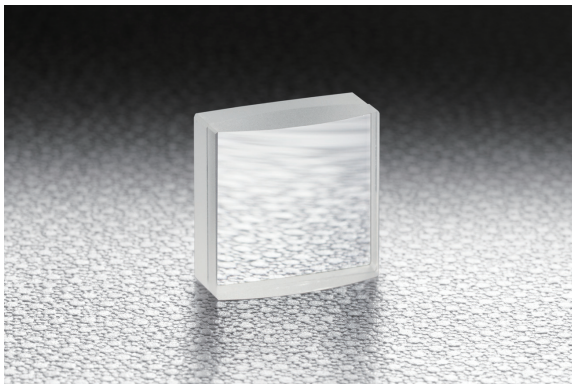
Part Number	Diameter ϕD [mm]	Focal length f [mm]	Center Thickness tc [mm]	Edge Thickness te [mm]	Back focal length fb [mm]
S-DLB-25-50PM	ϕ25	50.1	10.9	7.1	44.9
S-DLB-25-70PM	ϕ25	69.9	9.0	6.3	65.3
S-DLB-25-100PM	ϕ25	100.2	7.7	5.9	96.5
S-DLB-25-120PM	ϕ25	119.8	7.2	5.6	116.2
S-DLB-25-150PM	ϕ25	149.6	6.7	5.5	146.2
S-DLB-30-60PM	ϕ30	60.3	12.6	8.1	53.9
S-DLB-30-100PM	ϕ30	100.7	9.5	6.8	96.0
S-DLB-30-120PM	ϕ30	120.1	8.8	6.6	115.7
S-DLB-30-150PM	ϕ30	150.0	8.1	6.3	146.0
S-DLB-30-200PM	ϕ30	200.2	7.3	6.0	196.4
S-DLB-30-300PM	ϕ30	300.4	6.6	5.7	296.9

Achromatic cylindrical lens | CDL

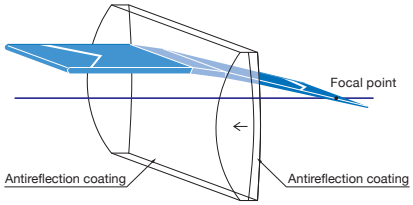
RoHS Catalog Code W3198

A single lens made by bonding two cylindrical surface lenses that wavelength dispersion of the refractive index is different, it is possible to create fine lines close to the theoretical limit.
It is recommended if the blurring of lines and color bleeding is concerned about cylindrical plano-convex lens (CLB-P).

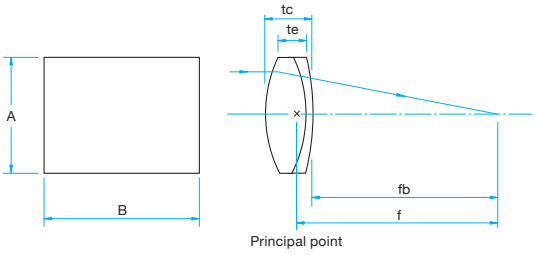
- It is designed so that difference of focusing point is reduced as much as possible in the visible light range.
- Optical adjustment is easy to do as direction of the condenser line will be parallel to the side of the diameter (B).
- It can be used as a substitute for such as a slit spectrograph.



Schematic



Outline Drawing (in mm)



●Tolerance

Length	$A^{+0}_{-0.2}$ $B^{+0}_{-0.2}$
Thickness	tc±0.2
Focal length	±3% (546.1nm)

Specifications

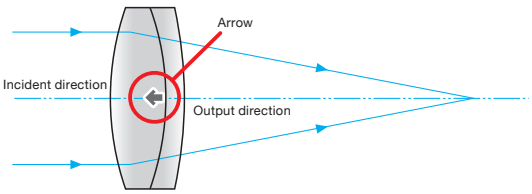
Material	N-SF5, BK7
Design wavelength	Blue: 486.1nm, Green: 546.1nm, Red: 56.3nm
Coating	Antireflection coating
Cement	Ultraviolet cure adhesive
Laser Damage Threshold	0.3J/cm^2 (Laser pulse width 10ns, repetition frequency 20Hz)
Surface Quality (Scratch–Dig)	60–40
Clear aperture	Circle that internally connected to 90% of the side length

Guide

- It is also available to provide other than products in the catalog such as focal length and diameter.
- Cylindrical lens holder (CHA) is available for fixing the achromatic cylinder lens. Reference C044

Attention

- There is a direction of the incident parallel light with achromatic cylinder lens. The radius of curvature is allowed to be incident parallel light from the side of (the surface indicated by arrows) small curvature surface. If it is incident parallel light from the opposite side, condensing line will be thick.
- In the generatrix direction (B direction), there is no characteristic to reduce the effect of achromatic, reducing aberration, and for collecting light.
- If it is incident line beam source into achromatic cylindrical lens, parallel light does not come out. It will diverge in the direction of the generatrix (B direction).
- In order to focus the fine beam line, it is necessary to enter the lens a parallel beam of high quality.



Specifications

Part Number	A×B [mm]	Focal length f [mm]	Center Thickness tc [mm]	Edge Thickness te [mm]	Back focal length fb [mm]
CDL-1515-25PM	15×15	25.0	9.0	5.7	18.2
CDL-1515-50PM	15×15	50.0	6.0	4.6	46.4
CDL-1515-100PM	15×15	100.0	5.0	4.3	97.1

Visible Spectrum Achromats | ATL/NADL

RoHS Catalog Code W3078

Visible spectrum achromats are air spaced achromatic triplets or doublets for lasers in the visible spectrum or white light application. The elements are made of crown glass of low dispersion and flint glass of high dispersion.

- These lenses have optimized the aberrations of achromatic, spherical and coma for the 3 wavelengths; blue (486.1nm), green (546.1nm) and red (656.3nm) have broadband multi-layer anti-reflection coating for 400 – 700nm.
- Air spaced design allows high power laser applications which includes YAG second harmonic wavelength (532nm).
- The triplets with F-numbers ≧2 and doublets with F-numbers ≧3 are designed to have each spot size equal to the diffraction limited spot size and very ideal for a Gaussian input beam.

Specifications

Material	Crown Glass – (Air spaced) – Flint Glass
Material of frame	Aluminum Finishing: Black anodized
Design wavelength	486nm, 532nm, 656nm
Coating	Broadband multil-ayer anti-reflection coating
Acceptance angle	±1°
Laser Damage Threshold	1J/cm^2 (Laser pulse width 10ns, repetition frequency 20Hz)

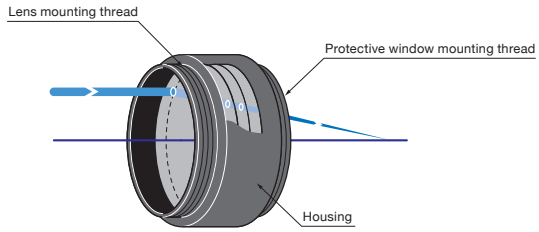
Guide

- Please contact our International Sales Division for customized achromats. (Customized on size etc.)
- Protective lens case with rods for mirror holders is available as an option. Please contact us for further information.
- Please check the "wavelength characteristic of the focal length data" on the Web for the focal lengths of each wavelength.
  WEB Reference Catalog Code W3078

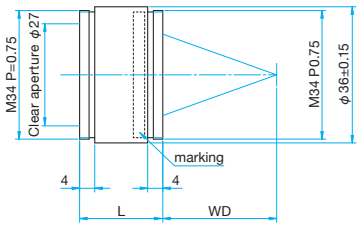
Attention

- Since the focal length and working distance of the lens is calculated at 532nm, it will change at other wavelengths due to the refractive index of the material shift.
- The F number of a lens is calculated by f (effective focal length) / De (effective clear aperture). The value represents "Brightness of the lens". The lower the value, the brighter the lens is.
- Be sure to wear laser safety goggles when checking optical path and adjusting optical axis.

Schematic



Outline Drawing (in mm)



●Tolerance
Length L±0.2
Focal length ±2%

Specifications

Part Number	Focal length f [mm]	Length L [mm]	Numerical aperture (NA)	Working distance (WD) [mm]
ATL-30-40PY2	40.2	22	0.34	30.1
ATL-30-50PY2	49.4	22	0.27	39.0
ATL-30-60PY2	58.9	22	0.23	49.0
NADL-30-80PY2	80.1	13	0.17	71.6
NADL-30-100PY2	99.8	13	0.14	91.7
NADL-30-150PY2	150.0	12	0.09	141.9
NADL-30-200PY2	199.8	12	0.07	192.7

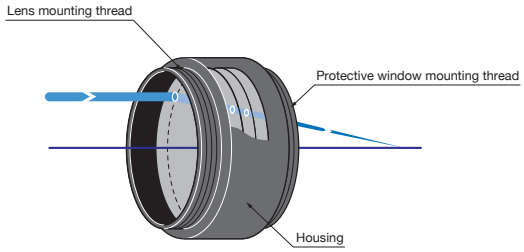
Compatible Optic Mounts

LHF-M34-30

YAG laser focusing lenses are air spaced triplets or doublets for YAG fundamentals. The elements are made of crown glass of lower dispersion and flint glass of higher dispersion. These lenses are optimized for spherical aberration and coma. With its spot size designed to be smaller than or equal to the diffraction limited spot size for beams in 1064nm.

- These lenses are chromatically corrected so that any HeNe guided beam or visible video monitor beam will remain focused in the same position as the YAG beam. All elements are coated with a laser-resistant narrowband multi-layer anti-reflection for YAG: 1064nm and HeNe: 633nm.
- We offer optical protective windows to prevent damage to the lens by absorbing high levels of energy from inadvertent back reflection of the incident beam. These protective windows can be easily installed to the focusing side of the lens.

Schematic



Specifications

Material	Crown Glass – (Air spaced) – Flint Glass
Material of frame	Aluminum Finishing: Black anodized
Design wavelength	1064nm, 632.8nm
Coating	Narrow band multi-layer anti-reflection coatig for 1064nm and 633nm
Acceptance angle	±1°
Laser Damage Threshold	1J/cm^2 (Laser pulse width 10ns, repetition frequency 20Hz)

Guide

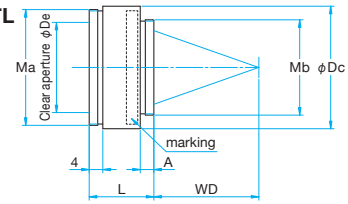
▶Please contact our International Sales Division for customized products. (Customized on size etc.)

Attention

▶Since the focal length and working distance of the lens is calculated at 1064nm, it will change at other wavelengths due to the refractive index of the material shift.
▶The F number of a lens is calculated by f (effective focal length) / De (effective clear aperture). The value represents “Brightness of the lens”. The lower the value, the brighter the lens is.
▶Be sure to wear laser safety goggles when checking optical path and adjusting optical axis.

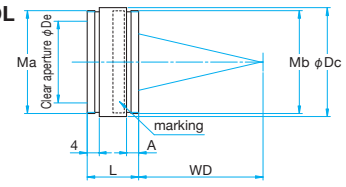
Outline Drawing (in mm)

NYTL



●Tolerance
Diameter Dc±0.15
Length L ±0.2
Focal length ±2%

NYDL



Specifications

Part Number	Maximum lens diameter ϕD [mm]	Focal length f [mm]	Diameter ϕDc [mm]	Clear aperture ϕDe [mm]	Length L [mm]	Lens mounting thread Ma	Protective window thread Mb	Thread length A [mm]	Numerical aperture (NA)	Working distance (WD) [mm]
NYTL-25-20PY1	ϕ25	20.0	ϕ32	ϕ20	22	M29 P0.75	M22 P0.75	6.0	0.50	9.0
NYTL-30-30PY1	ϕ30	30.0	ϕ36	ϕ27	22	M34 P0.75	M28 P0.75	6.5	0.45	19.1
NYTL-30-40PY1	ϕ30	40.0	ϕ36	ϕ26.5	19	M34 P0.75	M28 P0.75	4.0	0.33	30.9
NYTL-30-50PY1	ϕ30	50.0	ϕ36	ϕ25.5	19	M34 P0.75	M28 P0.75	3.5	0.25	41.4
NYDL-30-60PY1	ϕ30	59.9	ϕ36	ϕ27	17	M34 P0.75	M34 P0.75	4.0	0.23	41.1
NYDL-30-80PY1	ϕ30	79.9	ϕ36	ϕ27	15	M34 P0.75	M34 P0.75	4.0	0.17	67.6
NYDL-30-100PY1	ϕ30	100.1	ϕ36	ϕ27	14	M34 P0.75	M34 P0.75	4.0	0.14	88.4
NYDL-30-150PY1	ϕ30	149.3	ϕ36	ϕ27	12	M34 P0.75	M34 P0.75	4.0	0.09	140.0

Compatible Optic Mounts

LHF-M29-25, LHF-M34-30

Focusing Lenses for Fiber Laser | HFTLSQ/HFDLSQ

RoHS Catalog Code W3080

High performance multi-element lens. Suitable for focusing and collimating solid state lasers like Yb fiber laser, YAG laser and YVO_4 laser.

- Engineered and designed to reduce the effects of thermal expansion.
- Corrected for spherical aberration and coma at 1064nm. Diffraction limited for F number ≧2 (NA≧0.25)
- AR coating optimized from 1040 – 1150nm with transmission at 633nm for pointed lasers

Specifications

Material	Synthetic fused silica
Material of frame	Aluminum Finishing: Black anodized
Design wavelength	1064nm
Coating	Broadband multil-ayer anti-reflection coating
Transmittance	>98.5% (1060 – 1080nm) >97% (1040 – 1150nm) >53% (600 – 700nm)
Laser Damage Threshold	7J/cm^2 (Laser pulse width 10ns, repetition frequency 20Hz)

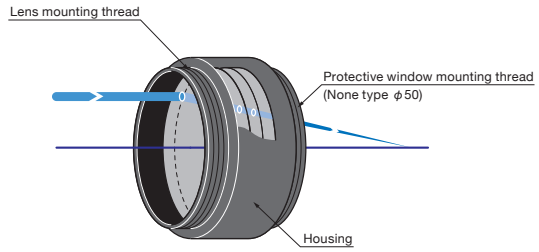
Guide

- Please contact our International Sales Division for customized products. (Customized on size etc.)
- Please check the "wavelength characteristic of the focal length data" on the Web for the focal lengths of each wavelength.
  WEB Reference Catalog Code W3080

Attention

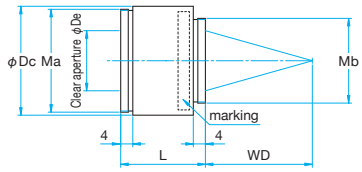
- Be sure to wear laser safety goggles when checking optical path and adjusting optical axis.
- Protective window as an option is not Anti-reflection coated.
- Incident a beam from the side with the screw.

Schematic



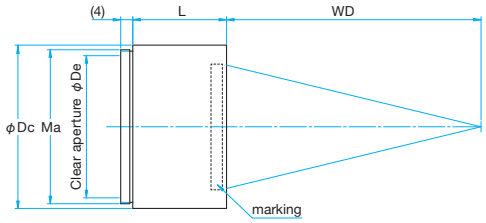
Outline Drawing (in mm)

HFTLSQ-15/HFTLSQ-20/HFTLSQ-30/HFDLSQ-30

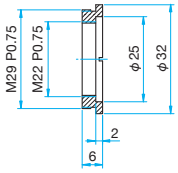


●Tolerance
Diameter Dc±0.15
Length L ±0.2
Focal length ±2%

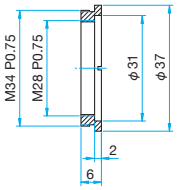
HFTLSQ-50/HFDLSQ-50



Drawing of adapter for HFTLSQ-15-20PF1



Drawing of adapter for HFTLSQ-20-30PF1



Specifications

Part Number	Focal length f [mm]	Diameter ϕDc [mm]	Clear aperture ϕDe [mm]	Length L [mm]	Lens mounting thread Ma	Protective window thread Mb	Numerical aperture (NA)	Working distance (WD) [mm]	Acceptance angle [°]
HFTLSQ-15-20PF1	20.0	ϕ24	ϕ12	16	M22 P0.75	M22 P0.75	0.30	13.7	±1.8
HFTLSQ-20-30PF1	30.3	ϕ30	ϕ17	21	M28 P0.75	M28 P0.75	0.28	22.0	±1.2
HFTLSQ-30-40PF1	40.0	ϕ36	ϕ27	31	M34 P0.75	M28 P0.75	0.34	24.9	±1
HFTLSQ-30-50PF1	50.0	ϕ36	ϕ27	28	M34 P0.75	M28 P0.75	0.27	35.4	±1
HFTLSQ-30-60PF1	60.1	ϕ36	ϕ27	23	M34 P0.75	M34 P0.75	0.22	51.4	±1
HFTLSQ-30-80PF1	80.0	ϕ36	ϕ27	23	M34 P0.75	M34 P0.75	0.17	71.7	±1
HFTLSQ-30-100PF1	100.0	ϕ36	ϕ27	23	M34 P0.75	M34 P0.75	0.14	92.7	±1
HFDLSQ-30-150PF1	150.0	ϕ36	ϕ27	18	M34 P0.75	M34 P0.75	0.09	131.0	±1
HFTLSQ-50-100PF1	99.9	ϕ54	ϕ47	35	M50.9 P0.75	—	0.24	84.2	±1
HFDLSQ-50-200PF1	199.6	ϕ54	ϕ47	23	M50.9 P0.75	—	0.12	185.7	±1
HFDLSQ-50-300PF1	300.0	ϕ54	ϕ47	23	M50.9 P0.75	—	0.08	286.2	±1

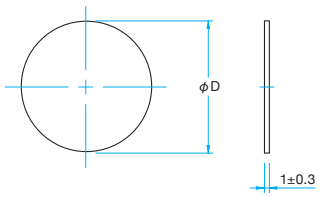
PG / PGH

- Protective windows can be attached to the focusing lens to prevent shatter from laser fabrication.
  The protective window comes in 3 different sizes.
  Protective Window Holders (PGH)
  - Visible Spectrum Achromats
  - YAG Laser Focusing Lenses
  - Focusing Lenses for Fiber Laser
  - Excimer Laser Focusing Lenses (some models)

Guide & Attention

- Since protective windows are uncoated and due to surface reflections, the transmittance will be limited to 90%.
- Anti-reflection coating for specific wavelength is available.
- Replace protective window if it is polluted or poor transmittance performance.

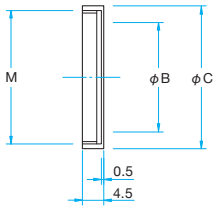
Protective Windows (Package of ten pieces)



Both sides: Uncoated

Part Number	ϕD [mm]	Protective window retainer
PG-21	ϕ21	PGH-24
PG-27	ϕ27	PGH-30
PG-33	ϕ33	PGH-36

Protective Window Holders (Retainer only)



Material: Aluminum
Finish: Black anodized

Part Number	M [mm]	ϕB [mm]	ϕC [mm]	Protective window diameter [mm]
PGH-24	M22 P0.75	ϕ18	ϕ24	ϕ21
PGH-30	M28 P0.75	ϕ23	ϕ30	ϕ27
PGH-36	M34 P0.75	ϕ29	ϕ36	ϕ33

LHF

Please select a fixed lens holder and a protective window that matches the profile of the focusing lens. (use the matrix table on the right)

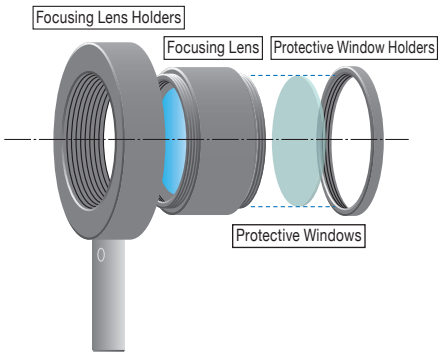
- There are two types of fixed holder for the focusing lens.

Reference B045

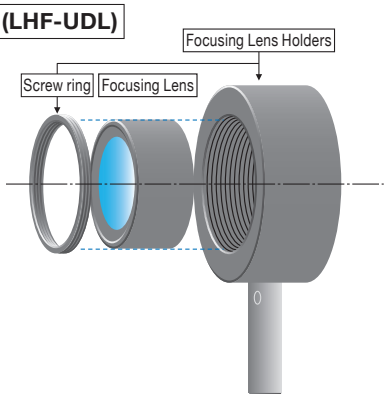
Thread Mount Type (LHF-M)
- Visible Spectrum Achromats
- YAG Laser Focusing Lenses
- Focusing Lenses for Fiber Laser (M34 or smaller)
- Excimer Laser Focusing Lenses (some models)

Lens Tube Type (LHF-UDL)
- Ultraviolet Achromats

Thread Mount Type (LHF-M)



Lens Tube Type (LHF-UDL)



List of adaptive lens holder and protective window

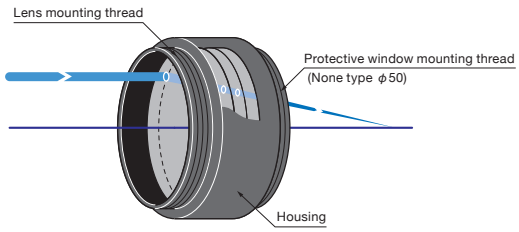
Part Number	Protective window	Protective window retainer	Compatible Optic Mounts
Visible Spectrum Achromats			
ATL-30-40PY2	PG-33	PGH-36	LHF-M34-30
ATL-30-50PY2			
ATL-30-60PY2			
NADL-30-80PY2			
NADL-30-100PY2			
NADL-30-150PY2			
NADL-30-200PY2			
YAG Laser Focusing Lenses			
NYTL-25-20PY1	PG-21	PGH-24	LHF-M29-25
NYTL-30-30PY1	PG-27	PGH-30	LHF-M34-30
NYTL-30-40PY1			
NYTL-30-50PY1			
NYDL-30-60PY1	PG-33	PGH-36	
NYDL-30-80PY1			
NYDL-30-100PY1			
NYDL-30-150PY1			
Focusing Lenses for Fiber Laser			
HFTLSQ-15-20PF1	PG-21	PGH-24	exclusive adapter + LHF-M29-25
HFTLSQ-20-30PF1	PG-27	PGH-30	exclusive adapter + LHF-M34-30
HFTLSQ-30-40PF1			LHF-M34-30
HFTLSQ-30-50PF1			
HFTLSQ-30-60PF1	PG-33	PGH-36	
HFTLSQ-30-80PF1			
HFTLSQ-30-100PF1			
HFDLSQ-30-150PF1			
HFTLSQ-50-100PF1			LHF-M50.9-50
HFDLSQ-50-200PF1			
HFDLSQ-50-300PF1			
Excimer Laser Focusing Lenses			
ETL-30-40P	PG-33	PGH-36	LHF-M34-30
ETL-30-50P			
ETL-30-60P			
ETL-30-80P			
NEDL-30-100P			
NEDL-30-150P			
NEDL-30-200P			
EDL-50-100P			LHF-M50.9-50
EDL-50-150P			
EDL-50-200P			
EDL-50-250P			
EDL-50-300P			
Ultraviolet Achromats			
UDL-30-50P			LHF-UDL-30
UDL-30-80P			
UDL-30-100P			
NUDL-30-150P			
NUDL-30-200P			
UDL-40-80P			LHF-UDL-40
NUDL-40-100P			
NUDL-40-150P			
NUDL-40-200P			
NUDL-40-250P			
UDL-50-100P			LHF-UDL-50
NUDL-50-150P			
NUDL-50-200P			
NUDL-50-250P			
NUDL-50-300P			

Excimer Laser Focusing Lenses | ETL/EDL/NEDL RoHS Catalog Code W3082

These lenses are manufactured with a synthetic fused silica material and it has a high transmittance value in the ultra-violet wavelength of 180 – 400nm. They have excellent performance and ideal for focusing and imaging applications. There is no adhesive or heat absorption material used to produce these lenses, they show high resistance to the ultraviolet light.

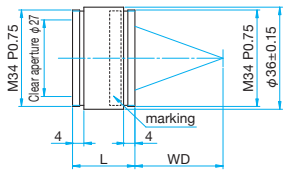
- They are made of 2 or 3 spherical lenses and they offer correction on spherical and comatic aberration.
- Standard focal lengths for Excimer laser with 248nm, 266nm and 355nm.
- NA 0.1 or below (ETL model NA 0.25) can be focused to the diffraction limit.

Schematic

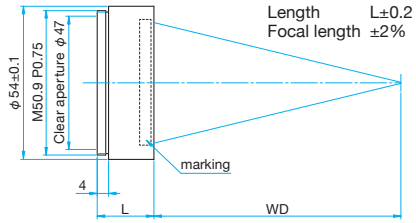


Outline Drawing (in mm)

ETL-30/NEDL-30



EDL-50



Specifications

Material	Synthetic fused silica for Excimer Laser
Design wavelength	248nm
Coating	Uncoated
Acceptance angle	±1°

Guide

- Products that are not mentioned in this catalog such as high pulse laser use or different wavelength are available on request, please contact our International Sales Division.
- Protection window is sold separately. Reference B183
- For detail on focal length of each wavelength, please see our web site. WEB Reference Catalog Code W3082

Attention

- These focusing lenses are made for use to image an object located in an infinitive distance or using a point of source as a parallel light. Near distance of an image will not produce any good optical result.
- The correct direction to input a parallel light is on the top side mark. If the direction is wrong, the spherical aberration will be big and the image unfocused.
- If the wavelength is applied in-correctly, the spherical aberration and transmission will be bad.
- Usage with high power laser or near high temperature light source, the high heat build-up in the lens may alter the focal length. To avoid this, heat prevention is required.
- To reduce the focus spot size, ensure that the input beam diameter ($1/e^2$) is reduced to half of the effective diameter of the focus lens.
- These focusing lenses are not chromatic lenses; they are not optically corrected.
- The lenses have 4% of reflectivity; therefore about over 20% of loss is expected in transmission.

Specifications

Part Number	Focal length f [mm]	Length L [mm]	Numerical aperture (NA)	Working distance (WD) [mm]
ETL-30-40P	39.6	22	0.34	31.1
ETL-30-50P	49.8	22	0.27	41.6
ETL-30-60P	59.7	22	0.23	52.4
ETL-30-80P	79.8	22	0.17	73.2
NEDL-30-100P	99.9	12	0.14	94.6
NEDL-30-150P	149.3	12	0.09	144.6
NEDL-30-200P	199.3	12	0.07	194.7
EDL-50-100P	100.4	20	0.24	87.1
EDL-50-150P	149.6	20	0.16	137.9
EDL-50-200P	199.1	20	0.12	187.9
EDL-50-250P	249.0	20	0.09	238.0
EDL-50-300P	298.6	20	0.08	288.0

These lenses have different refractive index and produces a high degree of correction across a bandwidth of 200 – 400nm.
Can be used as a laser focusing lens for broadband ultra-violet sources.

- NA 0.1 or below (ETL model NA 0.25) can be focused to the diffraction limit.
- No adhesive or heat absorption materials are used to produce these lenses and they show high resistance to ultra-violet light.
- These are not achromatic corrective but offers correction on spherical and comatic aberration.

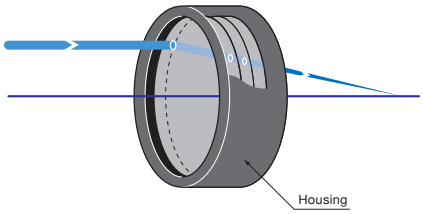
Specifications

Material	Synthetic fused silica for Excimer Laser – Calcium fluoride (CaF_2)
Design wavelength	200nm, 308nm, 400nm
Coating	Uncoated
Acceptance angle	±1°

Guide

- Products not found on our catalogue like high pulse lasers or usage on different wavelengths is available upon request. Please contact our International Sales Division.
- We have the capability to produce large amounts of these lenses in custom specifications
- For details on focal length of each wavelength, please see details on our web site. WEB Reference Catalog Code W3082

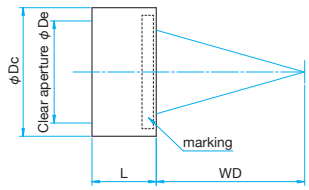
Schematic



Attention

- These focusing lenses are made for use to image an object located in an infinitive distance or using a point of source as a parallel light. Near distance of an image will not produce any good optical result.
- The correct direction to input a parallel light is on the top side mark. If the direction is wrong, the spherical aberration will be big and the image unfocused.
- If the wavelength is applied in-correctly, the spherical aberration and transmission will be bad.
- Usage with high power laser or near high temperature light source, the high heat build-up in the lens may alter the focal length. To avoid this, heat prevention is required.
- To reduce the focus spot size, ensure that the input beam diameter ($1/e^2$) is reduced to half of the effective diameter of the focus lens.
- These focusing lenses are not chromatic lenses; they are not optically corrected.
- The lenses have 3% to 4% of reflectivity; therefore about over 13% of loss is expected in transmission.

Outline Drawing (in mm)



●Tolerance
Diameter ϕDc ±0.15
Length L ±0.2
Focal length ±2%

Specifications

Part Number	Focal length f [mm]	Diameter ϕDc [mm]	Clear aperture ϕDe [mm]	Length L [mm]	Numerical aperture (NA)	Working distance (WD) [mm]
UDL-30-50P	50.4	ϕ34	ϕ27	17	0.27	39.3
UDL-30-80P	80.0	ϕ34	ϕ27	14	0.17	72.4
UDL-30-100P	100.1	ϕ34	ϕ27	13	0.14	92.5
NUDL-30-150P	151.5	ϕ34	ϕ27	16	0.09	137.1
NUDL-30-200P	200.3	ϕ34	ϕ27	16	0.07	185.2
UDL-40-80P	80.3	ϕ44	ϕ37	17	0.23	70.2
NUDL-40-100P	100.0	ϕ44	ϕ37	18	0.19	87.7
NUDL-40-150P	149.0	ϕ44	ϕ37	18	0.12	134.4
NUDL-40-200P	201.2	ϕ44	ϕ37	18	0.09	185.5
NUDL-40-250P	249.7	ϕ44	ϕ37	19	0.07	230.7
UDL-50-100P	100.8	ϕ54	ϕ47	20	0.24	89.1
NUDL-50-150P	149.7	ϕ54	ϕ47	21	0.16	136.3
NUDL-50-200P	200.0	ϕ54	ϕ47	22	0.12	179.9
NUDL-50-250P	252.4	ϕ54	ϕ47	21	0.09	233.0
NUDL-50-300P	300.9	ϕ54	ϕ47	22	0.08	278.8

fθ Lenses | fθ

RoHS

It is used for laser marking, bar code reader, laser micromachining and so on.

- It converts a rotational movement of a galvanometer mirror into a linear motion on the focal plane by using distortion effects.
- Telecentric type is also available that can be irradiated vertically to the focusing plane.
- Also available for fundamental YAG laser (1064nm), harmonic lasers (266nm, 355nm, 532nm) and CO_2 lasers (9.3 – 10.6μm).

Guide

- We accept orders to suit customized requirements.
- Also available to fabricate the laser scanning system which combines the galvanometer mirror and fθ lens unit.

Attention

- We do not recommend the use of the fθ lens to the imaging system because it is designed for the optical system of the scanning type.
- Please place in accordance with the position of the incident pupil of the fθ lens beam into the scanning system (galvanometer mirror). If the incident pupil is not in position of the beam scanning system, the optimum focusing spot cannot be achieved because the aberration will increase.

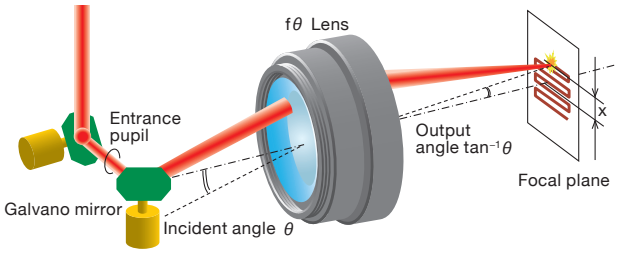
fθ Lenses dimension table

Part Number	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	φG (mm)	φH (mm)	I	φJ (mm)	K (mm)
fθ-100-266T	60	57.8	43	5	6	6	φ97	φ82g6	M80 P1	φ69	74.8
fθ-150-266T	80	73.3	65	3	6	6	φ122	φ102g6	M100 P1	φ89	88.3
fθ-500-325	50	43.4	34	—	10	6	φ117	φ82g6	M80 P1	—	59.4
fθ-1000-325	50	50.3	36	—	8	6	φ127	φ82g6	M80 P1	—	64.3
fθ-100-355T	60	56.3	42	6	6	6	φ97	φ82g6	M80 P1	φ69	74.3
fθ-100-355THG	80	109.6	59	9	6	6	φ112	φ102g6	M100 P1	φ84	130.6
fθ-150-355T	80	72.3	64	4	6	6	φ122	φ102g6	M100 P1	φ89	88.3
fθ-1000-442	50	50	36	—	8	6	φ127	φ82g6	M80 P1	—	64
fθ-100-532T	60	51.5	50	—	6	4	φ92	φ82g6	M80 P1	—	61.5
fθ-300-1064	39	35.9	27.3	3.7	8	—	φ91	—	M80 P1	φ76	47.6
fθ-100-1064T	60	49.5	47.5	—	6.5	6	φ92	φ82g6	M80 P1	—	62
fθ-100-9300T	80	45	48	20	6	6	φ122	φ102g6	M100 P1	φ90	77

fθ Lenses

Part Number	Design wavelength [nm]	Focal length f [mm]	Entrance pupil diameter [mm]	Scanning angle [°]	Scanning Range [mm]	Telecentric	Working distance (WD) [mm]	Transmittance [%]
fθ-100-266T	266	100.4	φ12	±15	φ52	○	135.9	93
fθ-150-266T	266	149.9	φ12	±15	φ78	○	205.2	93
fθ-500-325	325	501.8	φ20	±22	φ385	—	605.4	94
fθ-1000-325	325	1002.0	φ14	±25	φ870	—	1169.4	94
fθ-100-355T	355	99.85	φ12	±15	φ52	○	136.1	93
fθ-100-355THG	355	100.1	φ14	±15	φ52	○	60.94	90
fθ-150-355T	355	150.2	φ12	±15	φ78	○	207.2	93
fθ-1000-442	442	1000.0	φ14	±25	φ870	—	1169.7	95
fθ-100-532T	532	100.3	φ12	±15	φ52	○	121.1	90
fθ-300-1064	1064	299.8	φ16	±23	φ240	—	361.4	95
fθ-100-1064T	1064	100.3	φ12	±15	φ52	○	123.1	95
fθ-100-9300T	9300 (10600)	100.1 (99.68)	φ24	±23	φ80	○	73.3 (72.52)	please contact

Schematic

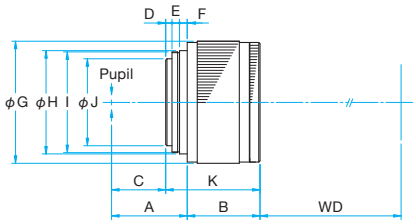


By using the f theta lens, it is possible to be moved a laser light spot in constant speed linear motion on the focal plane by scanning the mirrors such as galvanometer scanner mirrors.
The f theta lens enables this by the effect of distortion.
Mathmatically it is expressed as following;
focal length = "f", ideal image height = "y", the angle of scanned = "θ"
therefore, $y = f\theta$.
In the normal single lens, the ideal image height "y" is represented by "$y = f \tan\theta$".
Characteristics of both are the same in a small angle range. However, the difference is greater angle increases.

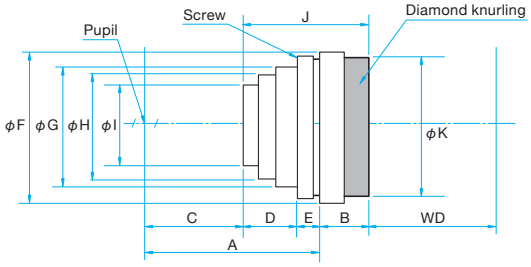
Outline Drawing

(in mm)

fθ Lenses



fθ Lenses for YAG (fθ-L/fθ-B/fθ-270-1064)



fθ Lenses for YAG dimension table

Part Number	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	ϕF (mm)	ϕG (mm)	ϕH (mm)	ϕI (mm)	J (mm)	ϕK (mm)	Screw
fθ-100-532L	53.3	17.8	22.5	22.8	8	ϕ89	ϕ80	ϕ72	ϕ60	48.6	ϕ83	M85 P1
fθ-100-1064L	53.3	17	20	25.3	8	ϕ87	ϕ80	ϕ69	ϕ57	50.3	ϕ83	M85 P1
fθ-150-1064B	63	19.8	26.8	28	8.2	ϕ87	ϕ80	ϕ74.5	ϕ64	56	ϕ86	M85 P1
fθ-220-1064L	59.8	21.1	32.1	19.7	8	ϕ97	ϕ80	—	ϕ68	48.8	ϕ97	M85 P1
fθ-270-1064	59.7	33.5	26.0	24.7	9	ϕ106	ϕ74	—	ϕ64	67.2	ϕ106	M85 P1

fθ Lenses for YAG

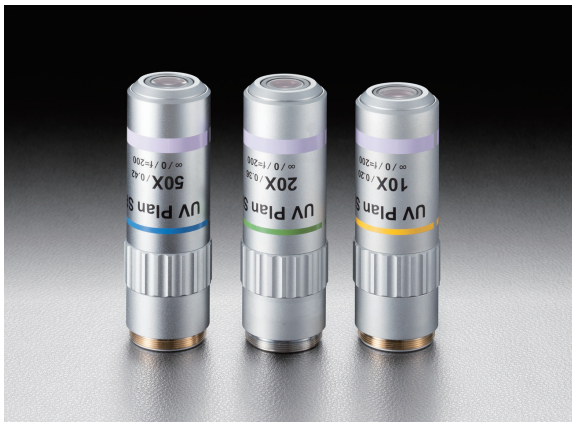
Part Number	Design wavelength [nm]	Focal length f [mm]	Entrance pupil diameter [mm]	Scanning angle [°]	Scanning Range [mm]	Telecentric	Working distance (WD) [mm]	Transmittance [%]
fθ-100-532L	532	100.2	ϕ12	±22.9	ϕ80	—	114.7	>95
fθ-100-1064L	1064	99.93	ϕ12	±22.9	ϕ80	—	109.6	>95
fθ-150-1064B	1064	152.1	ϕ15	±24.0	ϕ127.4	—	168.6	>95
fθ-220-1064L	1064	220.0	ϕ12	±24.0	ϕ184	—	254.2	>95
fθ-270-1064	1064	273.0	ϕ15	±24.13	ϕ230	—	318.9	>95

3-Wavelengths Objective Lens | NPAL-YSTF

RoHS Catalog Code W3199

This objective lens can be used for laser machining using pulsed laser of SHG (532nm), THG (355nm), and FHG (266nm) of YAG laser. It can be obtained a high transmittance at three harmonic wavelengths of YAG.

- With its long working distance and corrected field curvature, its natural observation image is obtained to the periphery of viewing the field.
- It is the long working infinity correction function that is used to introduce a laser system and coaxial observation.
- It allows observation of the sample with visible light (400 – 500nm).



Guide

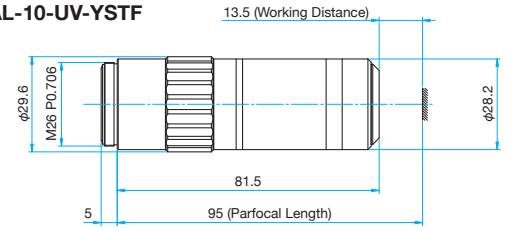
- Available fixing the objective lens holder (LHO-26). Reference C046
- When the objective lens is fixed to 2(two) axis holder, please consult our International Sales Division.
- As the laser processing system, it is available coaxial illumination with laser observation unit “OUCI-2” and dichroic mirror block, “DIMC” for the laser introducing . Reference A018, A019

Attention

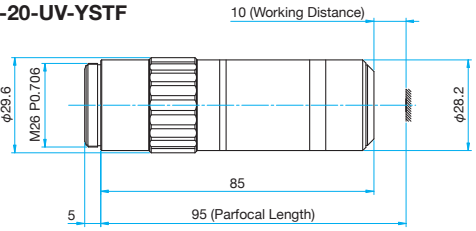
- When an objective lens is used in laser processing, use the diameter of the incident beam to extend to a size of half the pupil diameter ($1/e^2$). A small light spot cannot be achieved when the incident beam is too narrow. Please note if there is a laser energy density increase, there will be a high possibility of damage to the objective lens.
- The surface of an objective lens can be contaminated by splashes during processing. To avoid this, please have sufficient working distance (WD) and insert a thin protective glass on the objective.
- Magnification is the value when using the imaging lens f=200mm. When used in a microscope lens barrel from other manufacturers may have different magnifications. The actual magnification should be calculated from the ratio of the focal length of the objective lens and the focal length of the imaging lens to verify the focal length of the imaging lens barrel to be used.

Outline Drawing (in mm)

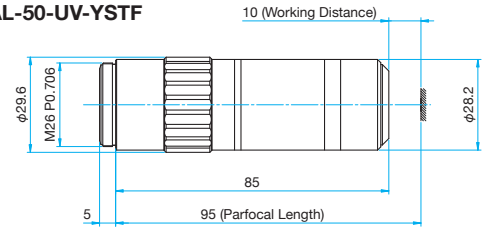
NPAL-10-UV-YSTF



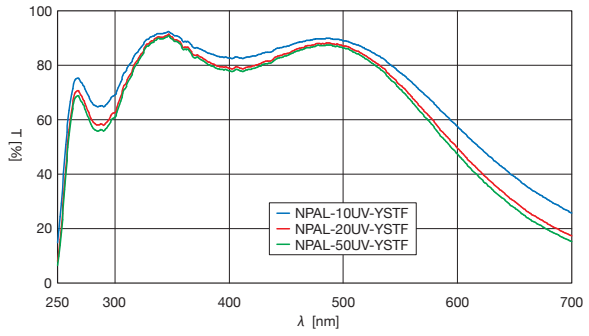
NPAL-20-UV-YSTF



NPAL-50-UV-YSTF



Typical Transmittance Data T: Transmission



Specifications

Part Number	Magnification	Numerical aperture (NA)	Working distance (WD) [mm]	Focal length f [mm]	Resolution (λ=550nm) [μm]	Focal depth (λ=550nm) [μm]	Pupil diameter [mm]	Imaging device field of view (1/2-inch) [mm]	Weight [kg]
NPAL-10-UV-YSTF	10	0.2	13.5	20	1.4	±6.9	ϕ8.0	0.48×0.64	0.30
NPAL-20-UV-YSTF	20	0.36	10.0	10	0.8	±2.1	ϕ7.2	0.24×0.32	0.32
NPAL-50-UV-YSTF	50	0.42	10.0	4	0.7	±1.6	ϕ3.4	0.10×0.13	0.32

Ultra-violet Objective Lenses | NPAL

RoHS

This objective lens can be used for laser machining using pulsed laser of THG (355nm), YAG laser or FHG (266nm) YAG.
Chromatic aberration is suppressed in both the visible and UV laser wavelength, achieving a high transmittance.

- With its long working distance and field curvature corrected, its natural observation image is obtained to the periphery of the visual field.
- It is the long working infinity correction function that is used to introduce a laser system and coaxial observation.
- It is also used for the observation of near ultra-violet light.

Guide

- Available fixed objective lens holder (LHO-20.32, LHO-26) Reference C046
- When the objective lens is fixed to a 2 axis holder, please consult our International Sales Division.
- As the laser processing system, it is available coaxial illumination with laser observation unit “OUCI-2” and dichroic mirror block “DIMC” for the laser introducing. Reference A018, A019

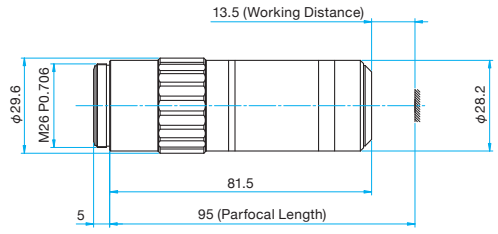
Attention

- When an objective lens is used in laser processing, use the diameter of the incident beam to extend to a size of half the pupil diameter ($1/e^2$). A small light spot cannot be achieved when the incident beam is too narrow. Please note if there is a laser energy density increase, there will be a high possibility of damage to the objective lens.
- The surface of an objective lens can be contaminated by splashes during processing. To avoid this, please have sufficient working distance (WD) and insert a thin protective glass on the objective.
- Magnification is the value when using the imaging lens f=200mm. When used in a microscope lens barrel from other manufacturers may have different magnifications. The actual magnification should be calculated from the ratio of the focal length of the objective lens and the focal length of the imaging lens to verify the focal length of the imaging lens barrel to be used.

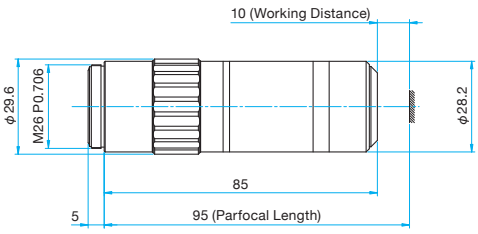
Outline Drawing

(in mm)

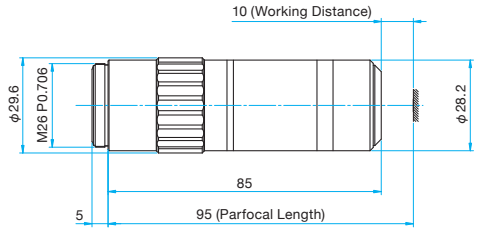
NPAL-10-UV-YSF/NPAL-10-NUV-YST



NPAL-20-UV-YSF/NPAL-20-NUV-YST



NPAL-50-UV-YSF/NPAL-50-NUV-YST



Compatible Optic Mounts

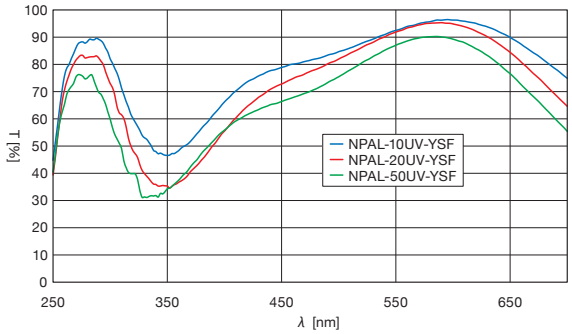
LHO-26

266nm

Part Number	Magnification	Numerical aperture (NA)	Working distance (WD) [mm]	Focal length f [mm]	Resolution (λ=550nm) [μm]	Focal depth (λ=550nm) [μm]	Pupil diameter [mm]	Imaging device field of view (1/2-inch) [mm]	Weight [kg]
NPAL-10-UV-YSF	10	0.2	13.5	20	1.4	±6.9	ϕ8.0	0.48×0.64	0.30
NPAL-20-UV-YSF	20	0.36	10	10	0.8	±2.1	ϕ7.2	0.24×0.32	0.32
NPAL-50-UV-YSF	50	0.42	10	4	0.7	±1.6	ϕ3.4	0.10×0.13	0.32

Typical Transmittance Data T: Transmission

NPAL-UV-YSF

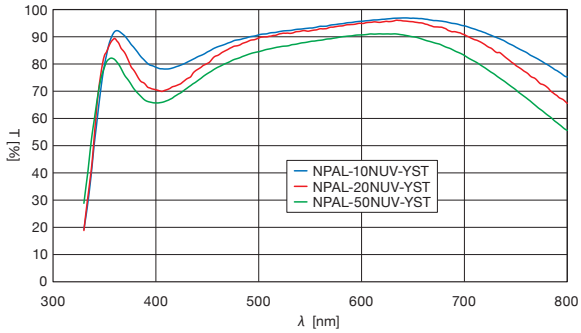


355nm

Part Number	Magnification	Numerical aperture (NA)	Working distance (WD) [mm]	Focal length f [mm]	Resolution (λ=550nm) [μm]	Focal depth (λ=550nm) [μm]	Pupil diameter [mm]	Imaging device field of view (1/2-inch) [mm]	Weight [kg]
NPAL-10-NUV-YST	10	0.2	13.5	20	1.4	±6.9	ϕ8.0	0.48×0.64	0.30
NPAL-20-NUV-YST	20	0.36	10	10	0.8	±2.1	ϕ7.2	0.24×0.32	0.32
NPAL-50-NUV-YST	50	0.42	10	4	0.7	±1.6	ϕ3.4	0.10×0.13	0.32

Typical Transmittance Data T: Transmission

NPAL-NUV-YST



Near Ultra-violet (NUV) Objective Lenses | PAL

Catalog Code W3087

This objective lens can be used for laser machining using pulsed laser of THG (355nm) YAG laser Chromatic aberration is suppressed in both the visible and UV laser wavelength, achieving a high transmittance.

- With its long working distance and field curvature corrected, its natural observation image is obtained to the periphery of the visual field.
- It is the long working infinity correction function that is used to introduce a laser system and coaxial observation.
- It is also used for the observation of near ultra-violet light.
- This objective lens can be used with a pulse laser of visible light (532nm).

Guide

- Available for fixed objective lens holder (LHO-20.32, LHO-26).
  Reference C046
- When the objective lens is fixed to a 2 axis holder, please consult our International Sales Division.
- For laser processing, it is available in dichroic block (DIMC) and for laser unit with coaxial illumination and observation (OUCI-2).
  Reference A018, A019
- If the objective lens corresponding to the cover glass thickness is thin is required, please contact our international sales division.

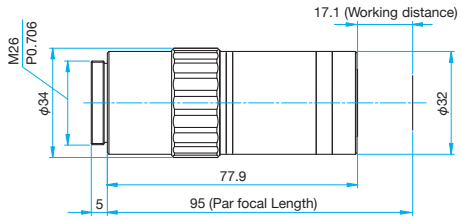
Attention

- When an objective lens is used in laser processing, use the diameter of the incident beam to extend to a size of half the pupil diameter ($1/e^2$). A small light spot cannot be achieved when the incident beam is too narrow. Please note if there is a laser energy density increase, there will be a high possibility of damage to the objective lens.
- The surface of an objective lens can be contaminated by splashes during processing. To avoid this, please have sufficient working distance (WD) and insert a thin protective glass on the objective.
- Magnification is the value when using the imaging lens f=200mm. When used in a microscope lens barrel from other manufacturers may have different magnifications. The actual magnification should be calculated from the ratio of the focal length of the objective lens and the focal length of the imaging lens to verify the focal length of the imaging lens barrel to be used.

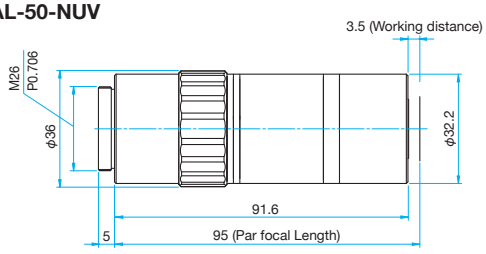
Outline Drawing

(in mm)

PAL-20-NUV



PAL-50-NUV



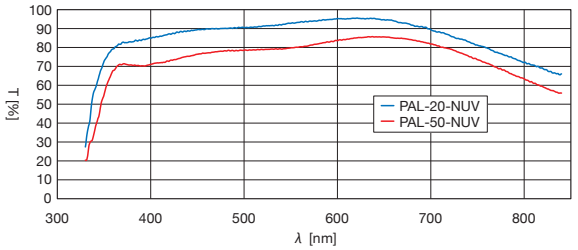
Specifications

Part Number	Magnification	NA	Working distance (WD) [mm]	Focal length f [mm]	Resolution (λ=550nm) [μm]	Focal depth [μm]	Pupil diameter [mm]	Imaging device field of view (1/2-inch) [mm]	Laser Damage Threshold* [J/cm²]	Weight [kg]
PAL-20-NUV	20	0.40	17.1	10	0.7	±1.7	φ8.0	0.24×0.32	0.05 (355nm)	0.30
PAL-50-NUV	50	0.70	3.5	4	0.4	±0.6	φ5.6	0.10×0.13	0.05 (355nm)	0.34

* Laser pulse width 10ns, repetition frequency 20Hz

Typical Transmittance Data

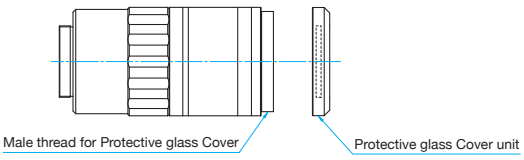
T: Transmission



This is a high NA infinity correction objective lens for laser processing (femtosecond laser and fundamental of YAG laser). You can also observe the laser beam coaxially with a laser processed surface that is designed to reduce the aberration of the visible wavelength.

- With its long working distance and field curvature corrected, its natural observation image is obtained to the periphery of the visual field.
- It is the long working infinity correction function that is used to introduce a laser system and coaxial observation.
- Near-infrared objective lens (LMPAL-20-NIR/LMPAL-50-NIR) is made on the assumption that processing of the LCD panel, and delivers the highest performance in a state that has been transmitting the glass substrate thickness is 0.7mm.
- It is also used for the observation of infrared light.
- LMPAL-20-NIR-Y and LMPAL-50-NIR-Y-HR is including protective glass unit. It will help to protect the objective lens from spattering and scattered by laser processing. It is possible to replace the protective glass unit.
- These variety of objective lens can be used in the pulse laser of visible light such as 532nm. The damage threshold of each lens is 0.1J/cm^2 at 532nm (reference). (Laser pulse width 10nSec, repetition frequency 20Hz)

How to replace the protective glass unit of LMPAL-20-NIR-Y/LMPAL-50-NIR-Y-HR



Guide

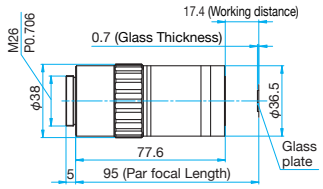
- Available for fixed objective lens holder (LHO-20.32, LHO-26). Reference C046
- When the objective lens is fixed to a 2 axis holder, please consult our International Sales Division.
- For laser processing, it is available in dichroic block (DIMC) and for laser unit with coaxial illumination and observation (OUCI-2). Reference A018, A019
- If the objective lens corresponding to the cover glass thin is required, please contact our international sales division.

Attention

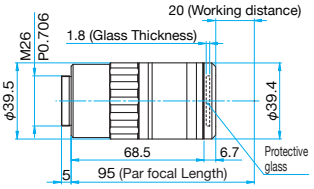
- When an objective lens is used in laser processing, use the diameter of the incident beam to extend to a size of half the pupil diameter (1/e^2). A small light spot cannot be achieved when the incident beam is too narrow. Please note if there is a laser energy density increase, there will be a high possibility of damage to the objective lens.
- The surface of an objective lens can be contaminated by splashes during processing. To avoid this, please have sufficient working distance (WD) and insert a thin protective glass on the objective.
- If the incident laser beam femtosecond is below 100fs, there is a possibility that the pulse width will spread.
- Magnification is the value when using the imaging lens f=200mm. When used in a microscope lens barrel from other manufacturers may have different magnifications. The actual magnification should be calculated from the ratio of the focal length of the objective lens and the focal length of the imaging lens to verify the focal length of the imaging lens barrel to be used.
- LMPAL-20-NIR-Y/LMPAL-50-NIR-Y-HR is designed in consideration of the thickness of including protective glass. If using removed the protective glass, it does not meet the performance specifications.

Outline Drawing (in mm)

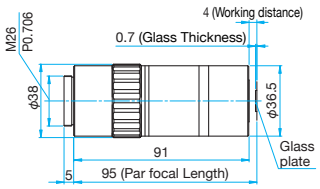
LMPAL-20-NIR



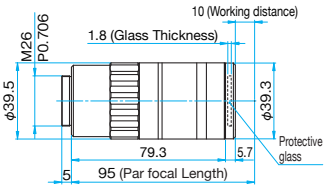
LMPAL-20-NIR-Y



LMPAL-50-NIR



LMPAL-50-NIR-Y-HR



Specifications

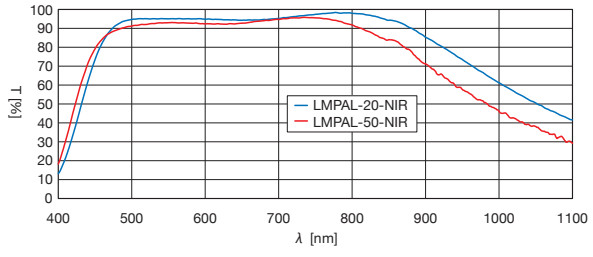
Part Number	Magnification	NA	Working distance (WD) [mm]	Focal length f [mm]	Resolution (λ=550nm) [μm]	Focal depth [μm]	Pupil diameter [mm]	Imaging device field of view (1/2-inch) [mm]	Laser Damage Threshold* [J/cm^2]	Weight [kg]
LMPAL-20-NIR	20	0.45	17.2 (at Air)	10	0.6	±1.4	φ9.0	0.24×0.32	0.1 (780nm)	0.34
LMPAL-20-NIR-Y	20	0.45	20	10	0.6	±1.4	φ9.0	0.24×0.32	0.2 (1064nm)	0.44
LMPAL-50-NIR	50	0.80	3.8 (at Air)	4	0.3	±0.4	φ6.4	0.10×0.13	0.1 (780nm)	0.44
LMPAL-50-NIR-Y-HR	50	0.67	10	4	0.4	±0.6	φ5.4	0.10×0.13	0.2 (1064nm)	0.48

* Laser pulse width 10ns, repetition frequency 20Hz

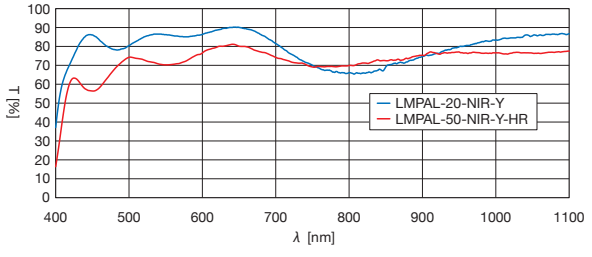
Typical Transmittance Data

T: Transmission

LMPAL-NIR



LMPAL-NIR-Y



Long Working Distance Objective Lenses | EPL/EPLE RoHS Catalog Code W3086

With its long working infinity correction function, this objective lens can be used for a laser system and coaxial observation.
To focus visible laser or microscopic observation of objects from a distance.

- Chromatic aberration is corrected in the visible range (400 – 700nm).
- Two types of parfocal distance are available, 45mm and 90mm.
- This parfocal 95mm lens has a long working distance and a corrected field curvature. Its natural observation image is obtained to the periphery of the visual field.
- It is possible to improve the response speed in the driving mechanism of the 45mm parfocal objective lens (SFS-OBL/SFAI-OBL); with a lightweight auto focusing solution.

Guide

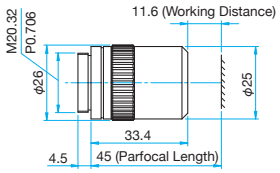
- Available for fixed objective lens holder (LHO-20.32) Reference C046
- When the objective lens is fixed to a 2 axis holder, please consult our International Sales Division.
- For laser processing, it is available in dichoric block (DIMC) and for laser unit with coaxial illumination and observation (OUCI-2). Reference A018, A019

Attention

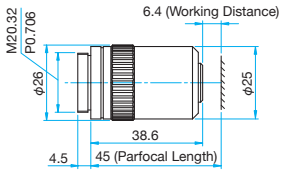
- When an objective lens is used in laser processing, use the diameter of the incident beam to extend to a size of half the pupil diameter ($1/e^2$). A small light spot cannot be achieved when the incident beam is too narrow. Please note if there is a laser energy density increase, there will be a high possibility of damage to the objective lens.
- The surface of an objective lens can be contaminated by splashes during processing. To avoid this, please have sufficient working distance (WD) and insert a thin protective glass on the objective.
- Magnification is the value when using the imaging lens f=200mm. When used in a microscope lens barrel from other manufacturers may have different magnifications. The actual magnification should be calculated from the ratio of the focal length of the objective lens and the focal length of the imaging lens to verify the focal length of the imaging lens barrel to be used.

Outline Drawing (in mm)

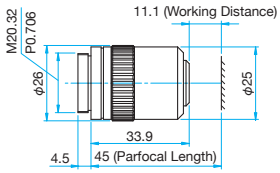
EPL-5



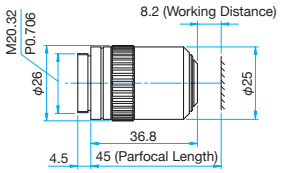
EPL-10



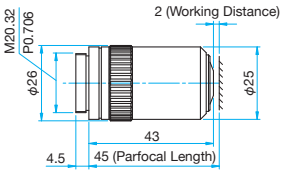
EPLE-20



EPLE-50



EPLE-100



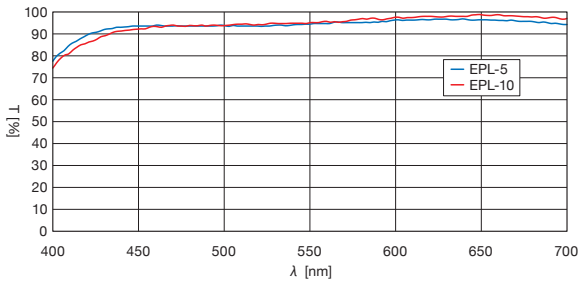
Specifications

Part Number	Magnification	Numerical aperture (NA)	Working distance (WD) [mm]	Focal length f [mm]	Resolution [μm]	Focal depth [μm]	Pupil diameter [mm]	Imaging device field of view (1/2-inch) [mm]	Weight [kg]
EPL-5	5	0.13	11.6	40	2.0	±16.3	ϕ10.4	0.96×1.28	0.09
EPL-10	10	0.3	6.4	20	0.9	±3.1	ϕ12.0	0.48×0.64	0.09
EPLE-20	20	0.4	11.1	10	0.7	±1.7	ϕ8.0	0.24×0.32	0.09
EPLE-50	50	0.55	8.2	4	0.5	±0.9	ϕ4.4	0.10×0.13	0.10
EPLE-100	100	0.8	2.0	2	0.3	±0.4	ϕ3.2	0.05×0.06	0.11

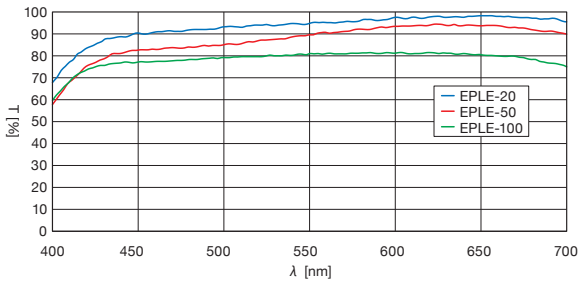
Typical Transmittance Data

T: Transmission

EPL



EPLE



Long Working Distance Objective Lenses | SPAL/SPAHL RoHS Catalog Code W3086

It is the long working distance objective lens infinity correction function and par focal length 95mm, which can be used for a laser system and coaxial observation. To focus visible laser or microscopic observation of objects from a distance.

- Chromatic aberration is corrected in the visible range (400 – 700nm).
- SPAL/SPAHL has a long working distance and a corrected field curvature. Its natural observation image is obtained to the periphery of the visual field.

Guide

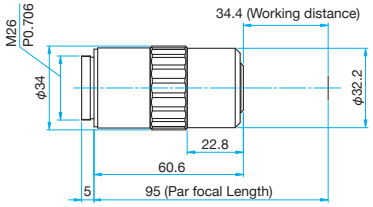
- Available for fixed objective lens holder (LHO-26). Reference C046
- When the objective lens is fixed to a 2 axis holder, please consult our International Sales Division.
- For laser processing, it is available in dichroic block (DIMC) and for laser unit with coaxial illumination and observation (OUCI-2). Reference A018, A019

Attention

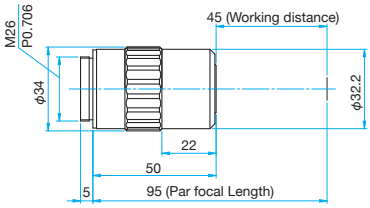
- When an objective lens is used in laser processing, use the diameter of the incident beam to extend to a size of half the pupil diameter ($1/e^2$). A small light spot cannot be achieved when the incident beam is too narrow. Please note if there is a laser energy density increase, there will be a high possibility of damage to the objective lens.
- The surface of an objective lens can be contaminated by splashes during processing. To avoid this, please have sufficient working distance (WD) and insert a thin protective glass on the objective.
- Magnification is the value when using the imaging lens f=200mm. When used in a microscope lens barrel from other manufacturers may have different magnifications. The actual magnification should be calculated from the ratio of the focal length of the objective lens and the focal length of the imaging lens to verify the focal length of the imaging lens barrel to be used.

Outline Drawing (in mm)

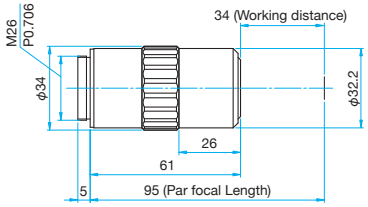
SPAL-2



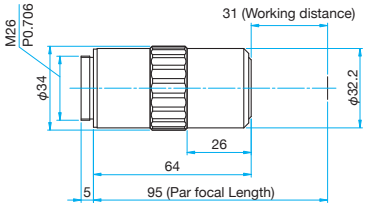
SPAHL-5



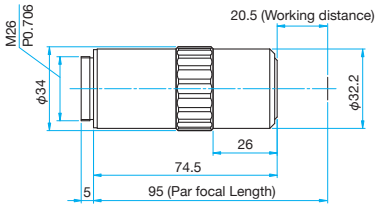
SPAL-10



SPAHL-20



SPAHL-50

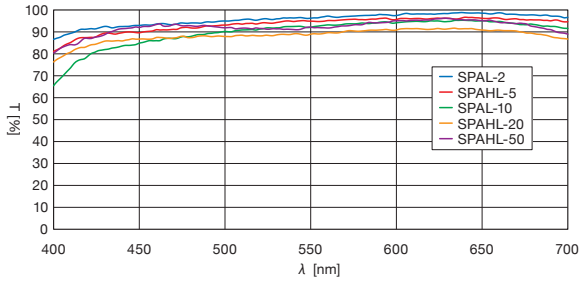


Specifications

Part Number	Magnification	Numerical aperture (NA)	Working distance (WD) [mm]	Focal length f [mm]	Resolution [μm]	Focal depth [μm]	Pupil diameter [mm]	Imaging device field of view (1/2-inch) [mm]	Weight [kg]
SPAL-2	2	0.055	34.4	100	5	±91.0	ϕ11.0	2.4×3.2	0.22
SPAHL-5	5	0.13	45.0	40	2	±16.3	ϕ10.4	0.96×1.28	0.17
SPAL-10	10	0.28	34.0	20	1	±3.5	ϕ11.2	0.48×0.64	0.19
SPAHL-20	20	0.29	31.0	10	0.9	±3.3	ϕ5.8	0.24×0.32	0.22
SPAHL-50	50	0.42	20.5	4	0.7	±1.6	ϕ3.4	0.10×0.13	0.25

Typical Transmittance Data T: Transmission

SPAL/SPAHL



Microscope Objectives | OBL

RoHS Catalog Code W3085

These objectives are educational microscope objectives; they have the JIS standard. (Japanese Industry Standard) Short focal length; high NA; fit for beam divergent use.

- Full color correction throughout the visible wavelength.
- The OBL-40 and OBL-60 have a built-in spring in the tip of the objective lens.
- These objective lenses are finite.
- To mount it to a microscope, a finite 160mm adaptor is required.
- The distance from the attachment face of the objective lens to the image is 150mm.

Guide

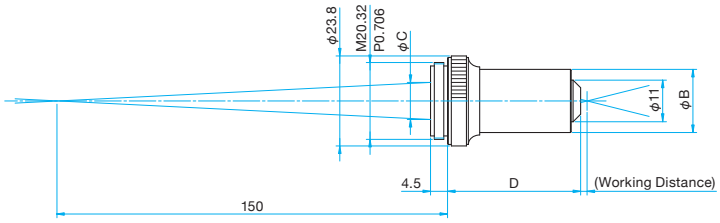
- Use a special filter (SFB) to correct the wave front distortion. Reference C058
- Objective holder (LHO) is available for these objective lenses. Reference C046
- Cross holder (TAT) is now available. Reference C060

Attention

- Do not use it with high power laser.
- The objectives lenses are finite and do not use them with infinite lens barrel or images will bad effects.
- To use only in visible wavelengths range.

Outline Drawing

(in mm)



Specifications

Part Number	Magnification	Length D [mm]	Barrel diameter ϕB [mm]	Pupil diameter ϕC [mm]	Focal length f [mm]	NA	Working distance (WD) [mm]	Weight [kg]
OBL-10	10	30.5	ϕ16.7	ϕ8.3	16.6	0.25	5.5	0.05
OBL-20	20	35.2	ϕ16.7	ϕ7.1	9.0	0.40	1.7	0.05
OBL-40	40	36.4	ϕ19.7	ϕ5.8	4.5	0.65	0.6	0.06
OBL-60	60	36.7	ϕ19.7	ϕ4.9	2.91	0.85	0.3	0.07

Compatible Optic Mounts

LHO-20.32, -20.32A / TAT-18OA + TAT16RO

Reflective Microscope Objectives Lenses | OBLR RoHS Catalog Code W3090

These reflective Microscope objective lenses offer an optimized chromatic aberration over a bandwidth of 350nm to 7um. They are mainly used in microscope-spectrometry and failure analysis in the semiconductor industry.

- Adjustable for use with various type of microscope tube with focal length range from 80mm to infinite
- The reflection mirror is strengthened with aluminium coating and MgF_2 protective layer.
- The M20.32 mounting thread conforms to JIS standard and is compatible with all major microscope tubes.
- The focus point and image size of visible, UV and IR wavelengths shows no difference and the precise matching of the images is possible.

Guide

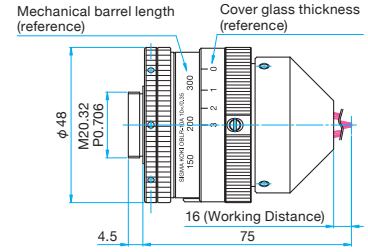
- There is no protective layer in aluminium coating for the vacuum ultra-violet spectrum and gold layer coating for near infrared is available as an option.
- An adapter for the objective lens turret is available (OBRLR-AMT). Check with our International Sales Division or your microscope manufacturer for compatibility and the use of reflective microscope objective lenses.
- Specific holder for microscope objective lenses (LHO-20.32) is available. Reference C046

Attention

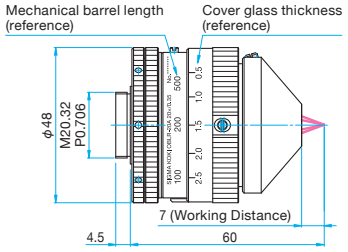
- These objectives are not to be used for laser processing due to light axis shielding of the reflective mirror.
- There are microscopes that cannot be used with a turret.
- The cover glass is not mobile. Use the adjustable correction collar to adjust the focal length and the cover glass thickness.
- The center reflective mirror shields the center of the light axis. For direct light experiments, a low intense light in the center is expected.
- The light intensity loss if expected to be around 45%. (The center mirror shielding 36% and the aluminum reflectivity 90%)

Outline Drawing (in mm)

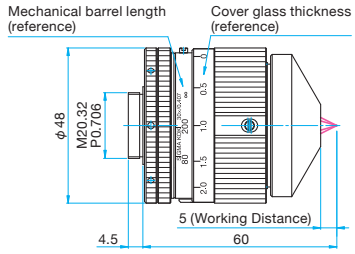
OBLR-10A



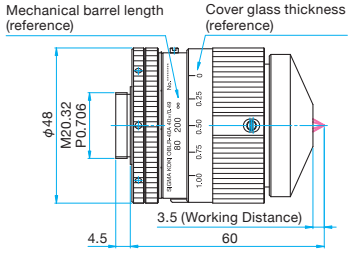
OBLR-20A



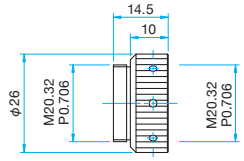
OBLR-30A



OBLR-40A



Objective Lens Adapter



Part Number	OBLR-AMT

Specifications

Part Number	Magnification	Wavelength Range	Focal length f [mm]	Numerical aperture (NA)	Field of view [mm]	Working distance (WD) [mm]	Mechanical tube length [mm]	Shielding ratio [%]
OBLR-10A	10	350nm – 7μm	19.9	0.2	ϕ1.0	16	80 – ∞ (Variable)	about 36
OBLR-20A	20	350nm – 7μm	10.0	0.35	ϕ0.5	7	80 – ∞ (Variable)	about 36
OBLR-30A	30	350nm – 7μm	6.7	0.41	ϕ0.34	5	80 – ∞ (Variable)	about 36
OBLR-40A	40	350nm – 7μm	5.0	0.49	ϕ0.25	3.5	80 – ∞ (Variable)	about 36

Compatible Optic Mounts

LHO-20.32

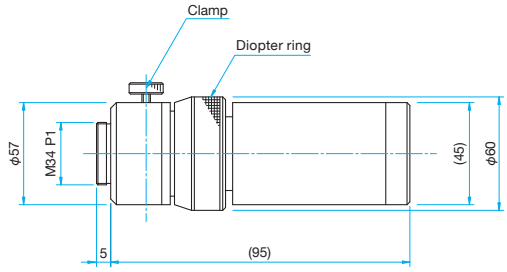
High Power Laser Beam Expander | BEHP

RoHS Catalog Code W3200

**It is a laser beam expander corresponding to the high-power laser.
Fine adjustment of the collimator is available with diopter correction function.
By the lens design that takes into account the wavefront aberration, it can be used in an optical system with high precision, such as a laser interferometer and laser processing.**

- The optical system of the beam expander is the air gap configuration that does not use an adhesive bonding of lens.
- By turning the diopter ring that is attached to the center of the beam expander, you can make variable beams such as the focused beam, collimated beam, and the divergent beam. It is used when you want to vary the position of the beam waist and if strict collimation adjustment is necessary.

Outline Drawing (in mm)



Specifications

Lens Material	Synthetic fused silica
Configuration of lens	2 group 4plates Galilean
Angle of view	2° (full-width)
Coating	Antireflection coating (Design wavelength: 633nm)
A range of the length of lens barrel	±5mm

Guide

- We provide the holder for laser beam expander (BE-M34H) for the fine adjustment with tilt angle and to secure the beam expander.
  Reference C054
- It is also available to provide beam expander of wavelength other than products in the catalog and achromatic in two wavelengths or more.

Attention

- It is not possible to create a collimated light obtained by reducing the beam diameter using in the opposite direction a beam expander. In this case, please use the appropriate optical system by determining the position of the beam waist and divergence angle of the laser beam.

Specifications

Part Number	Design wavelength [nm]	Beam magnification	Output Clear aperture [mm]	Laser Damage Threshold* [J/cm²]
BEHP-3-266	266	3	ϕ10	2
BEHP-5-266	266	5	ϕ6	2
BEHP-10-266	266	10	ϕ3	2
BEHP-3-355	355	3	ϕ10	4
BEHP-5-355	355	5	ϕ6	4
BEHP-10-355	355	10	ϕ3	4
BEHP-3-532	532	3	ϕ10	5
BEHP-5-532	532	5	ϕ6	5
BEHP-10-532	532	10	ϕ3	5
BEHP-3-1064	1064	3	ϕ10	7
BEHP-5-1064	1064	5	ϕ6	7
BEHP-10-1064	1064	10	ϕ3	7

* Laser pulse width 10ns, repetition frequency 20Hz

High-power zoom type laser beam expander | BEZHP RoHS Catalog Code W3201

It is capable of 1× to 3× times changing high-power zoom Laser beam expander.
Fine adjustment of the collimator is available with diopter correction function.
It can be used in an optical system with high precision, such as a laser interferometer and processing by the lens design that takes into account the wavefront aberration.

- The optical system of the beam expander is the air gap configuration that does not use an adhesive bonding of lens. This allows also to be used in high-power laser. By the Galileo type lens configuration, it made reduce the number of aberration correction lens, and enables shorter overall length of the beam expander.
- By turning the diopter ring that is attached to the center of the beam expander, you can make variable beams such as the focused beam, collimated beam, and the divergent beam. It is used when you want to vary the position of the beam waist and if strict collimation adjustment is necessary.

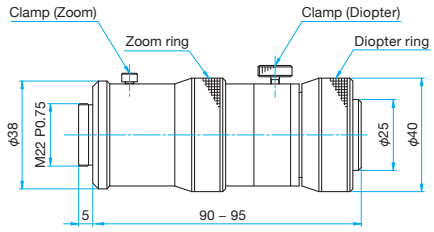
Guide

- We provide the holder for laser beam expander (BE-M22H) for the fine adjustment with tilt angle and to secure the beam expander.
  Reference C054
- It is also available to provide beam expander of the wavelength other than products in the catalog.

Attention

- It is not possible to create a collimated light obtained by reducing the beam diameter using in the opposite direction a beam expander. In this case, please use the appropriate optical system by determining the position of the beam waist and divergence angle of the laser beam.

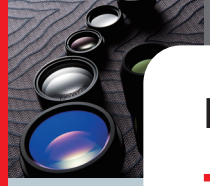
Outline Drawing (in mm)



Specifications

Part Number	Variable magnification	Design wavelength [nm]	Output Clear aperture [mm]	Laser Damage Threshold* [J/cm²]	Coating	Material	Weight [kg]
BEZHP-1/3-532	1 – 3	532	ϕ5	7.0	Antireflection coating	Synthetic fused silica	0.3

* Laser pulse width 10ns, repetition frequency 20Hz



Laser Beam Expanders With diopter correction function | BE/LBED RoHS

**This is an optical system for expanding a small collimated laser beam to a larger one.
Fine adjustment of the collimator is available using the diopter correction function.
You can use a high precision optical system like an interferometer or laser processing with lens designed for wave from aberration.**

- The beam expander optical system is built on air-space and the lenses are not bonded. It can be used for high powered laser applications.
- With the Galilean type lens configuration, it reduces the number of aberration corrections and shortens the length of the beam expander.
- By turning the dioptre ring on the beam expander, you can have a varied collimated beam with beam divergence on the focused beam. A beam waist or an accurate adjustment of the collimation is required.
- There is a wide variety with different magnification and wavelength to choose from.
- With the different types of BE-V and LBED visible lasers, it can be attached to ant He-Ne (05-LHP) lasers with an adapter (included).

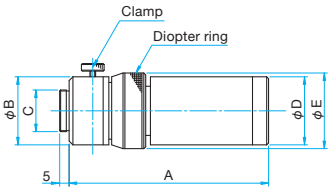
Guide

- Beam expander holders are now available (LBED-H, LBED-YH) and it comes with tilt and fine adjustments. Reference C054
- Holders can be used to fix beam expanders (BE-M34H, BE-M22H). Reference C054
- We can also fabricate achromatic beam expanders with multiple wave lengths other than those found in our catalogue. Call our International Sales Division for more information.
- Fabrication of beam expander is also available for high-energy pulsed laser. Reference B198

Attention

- By using in the opposite direction, it will not create a reduced in diameter collimated beam. Please use the appropriate optical system by determining the position of the beam waist and the divergence angle of the laser beam.

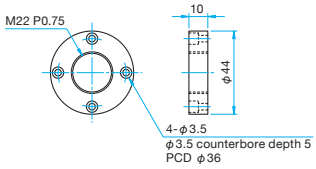
Outline Drawing (in mm)



Accessories for visible light (BE-V/LBED)

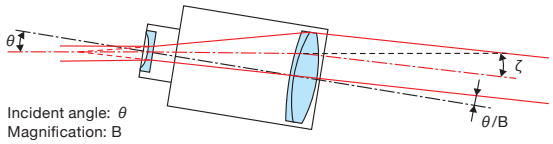
Connection adapters for He-Ne laser

#4-40UNC、L=3/8…4 screws



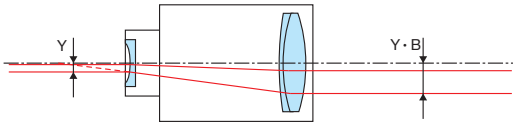
■For adjustment of the laser beam expander

If the incident beam is inclined to the optical axis of the laser beam expander, a larger collimated light is emitted from the direction of the incident beam is inclined.
Therefore, it is necessary to precisely align the optical axis of the beam expander for the incident beam.
We recommend the laser beam expander holder (LBED-H, LBE-H) to adjust the tilt of the beam expander. Reference C054, C055



Incident angle: θ
Magnification: B
Deviation angle of beam: ζ = θ − θ/B

If the center of the incident beam is translated from the optical axis of the laser beam expander, the emission is emitted with enlarged and magnified amounts of deviation of the incident beam. For this reason, if you need the expanded beam with no chipping or deformation, the incident beam must be strictly in accordance with the center of the optical axis.
For adjustment to the center of the optical axis of the beam expander, please see the page of the laser beam expander adapter (LBE-ADP).
Reference C056



Compatible Optic Mounts

BE-M34H, M22H, LBE-ADP

Compatible Optic Mounts

LBED-3H, 5H, 10H / LBED-2YH, 3YH, 4YH

Specifications

Primary material: Aluminum
Finish: Black Anodized

Part Number	Design wavelength [nm]	Expansion ratio	Input aperture (MAX) [mm]	Barrel length A [mm]	φB [mm]	Mounting thread C	φD [mm]	Diameter φE [mm]	Laser Damage Threshold* [J/cm²]	Weight [kg]
BE-2-266	266	2.0	φ15.5	72.0±4	φ57	M34 P1	φ48	φ60	1.4	0.3
BE-3-266	266	3.0	φ10.5	79.5±4	φ57	M34 P1	φ48	φ60	1.4	0.3
BE-4-266	266	4.0	φ9.0	90.5±4	φ57	M34 P1	φ48	φ60	1.4	0.3
BE-5-266	266	5.0	φ7.0	119.5±4	φ57	M34 P1	φ48	φ60	1.4	0.4
BE-7.5-266	266	7.5	φ4.5	129.0±4	φ57	M34 P1	φ48	φ60	1.4	0.4
BE-10-266	266	10.0	φ3.5	173.0±4	φ57	M34 P1	φ48	φ60	1.4	0.4
BE-2-355	355	2.0	φ15.5	75.0±4	φ57	M34 P1	φ48	φ60	2	0.3
BE-3-355	355	3.0	φ10.5	83.0±4	φ57	M34 P1	φ48	φ60	2	0.3
BE-4-355	355	4.0	φ9.0	94.5±4	φ57	M34 P1	φ48	φ60	2	0.3
BE-5-355	355	5.0	φ7.0	125.0±4	φ57	M34 P1	φ48	φ60	2	0.4
BE-7.5-355	355	7.5	φ4.5	134.5±4	φ57	M34 P1	φ48	φ60	2	0.4
BE-10-355	355	10.0	φ3.5	181.0±4	φ57	M34 P1	φ48	φ60	2	0.5
BE-2-V	400 – 700	2.0	φ6.0	42.0^{+3}_{-2}	φ36	M22 P0.75	φ26	φ40	4	0.12
LBED-3	400 – 700	3.0	φ5.4	42.0^{+3}_{-2}	φ36	M22 P0.75	φ26	φ40	4	0.12
BE-4.1-V	400 – 700	4.1	φ4.1	62.0±3	φ36	M22 P0.75	φ26	φ40	4	0.13
LBED-5	400 – 700	5.0	φ3.2	50.5±3	φ36	M22 P0.75	φ26	φ40	4	0.12
BE-6-V	400 – 700	6.0	φ4.3	102.0±3	φ36	M22 P0.75	φ36	φ40	4	0.17
BE-7.6-V	400 – 700	7.6	φ3.4	80.0±3	φ36	M22 P0.75	φ36	φ40	4	0.15
BE-8.4-V	400 – 700	8.4	φ3.1	89.5±3	φ36	M22 P0.75	φ36	φ40	4	0.16
LBED-10	440 – 700	10.0	φ2.6	109.5±3	φ36	M22 P0.75	φ36	φ40	4	0.18
BE-12.6-V	450 – 700	12.6	φ2.1	138.0±3	φ36	M22 P0.75	φ36	φ40	4	0.2
BE-14.3-V	460 – 700	14.3	φ1.8	158.5±3	φ36	M22 P0.75	φ36	φ40	4	0.2
BE-16.8-V	480 – 700	16.8	φ2.1	190.0±3	φ36	M22 P0.75	φ46	φ40	4	0.3
BE-18.5-V	500 – 700	18.5	φ1.9	211.0±3	φ36	M22 P0.75	φ46	φ40	4	0.3
BE-21-V	510 – 700	21.0	φ1.7	241.0±3	φ36	M22 P0.75	φ46	φ40	4	0.3
BE-1.5-LD	780 – 830	1.5	φ16.1	51.0^{+4}_{-2}	φ57	M34 P1	φ48	φ60	4	0.3
BE-2-LD	780 – 830	2.0	φ15.3	53.0±4	φ57	M34 P1	φ48	φ60	4	0.3
BE-3-LD	780 – 830	3.0	φ10.1	64.0±4	φ57	M34 P1	φ48	φ60	4	0.3
BE-4-LD	780 – 830	4.0	φ8.9	95.5±4	φ57	M34 P1	φ48	φ60	4	0.3
BE-5-LD	780 – 830	5.0	φ7.2	125.5±4	φ57	M34 P1	φ48	φ60	4	0.4
BE-7.5-LD	780 – 830	7.5	φ4.7	135.5±4	φ57	M34 P1	φ48	φ60	4	0.4
BE-10-LD	780 – 830	10.0	φ3.6	186.5±4	φ57	M34 P1	φ48	φ60	4	0.5
BE-1.5-1064	1064	1.5	φ16.0	52.0^{+4}_{-3}	φ57	M34 P1	φ48	φ60	4	0.3
LBED-2Y	1064	2.0	φ15.1	49.0^{+4}_{-0}	φ57	M34 P1	φ48	φ60	4	0.3
LBED-3Y	1064	3.0	φ10.2	64.5±4	φ57	M34 P1	φ48	φ60	4	0.3
LBED-4Y	1064	4.0	φ8.6	93.5±4	φ57	M34 P1	φ48	φ60	4	0.3
BE-5.3-1064	1064	5.3	φ6.8	127.5±4	φ57	M34 P1	φ48	φ60	4	0.4
BE-7-1064	1064	7.0	φ5.1	179.5±4	φ57	M34 P1	φ48	φ60	4	0.5
BE-10-1064	1064	10.0	φ3.6	188.5±4	φ57	M34 P1	φ48	φ60	4	0.5

* Laser pulse width 10ns, repetition frequency 20Hz

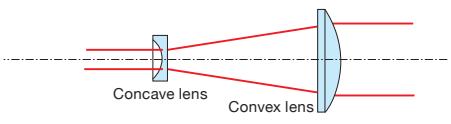
Lens configuration

Beam expander is divided into two main types depending on the configuration of the lens.

Galilean type

Combination of convex and concave type

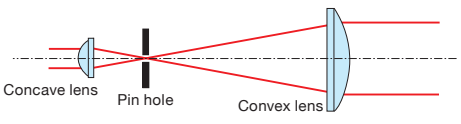
Features.
- Can shorten the overall length of the beam expander.
- High performance with small number of lenses.
- Usable with high powered lasers.



Keplerian type

Uses two convex lenses.

Features.
- You can insert a pin hole in the expander.
- You can obtain a clean Gaussian beam emitted by the effect of the pinhole spatial filter.



Note: Do not use with high energy lasers
It can cause a spark in the focal point of the laser causing the transmitted wave front to collapse.

Diopter and diopter correction function

By using the diopter correction function, it is available to adjust the divergent light beam to the parallel beam.
If it is necessary to use exact optical laser system, recommended to use the beam expander with diopter correction function.
And if the parallel light beam incident into the beam expander, the light would be emitted in expanded beam.
However, since most laser is slightly divergent, the beam will not be emitted by parallel beam.
In addition, parallel light emitted from the beam expander will be shifted in various factors. Such as LD (laser diode) which has a possibility that wavelength will change, and by the changes of the temperature.

Laser Beam Expanders | LBE

RoHS Catalog Code W3092

Beam expanders are useful laser accessories when the beam diameter must be increased. However, their main function is in decreasing the divergence of the 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).

- Laser beam expanders are made of lenses attached together without using glue (air-gap). Designed to use with high powered lasers.
- These beam expanders are light weight and short bodied and because they are Galileo type design, it is simple with little aberration and correction.
- The visible type can be mounted directly with any HeNe laser.

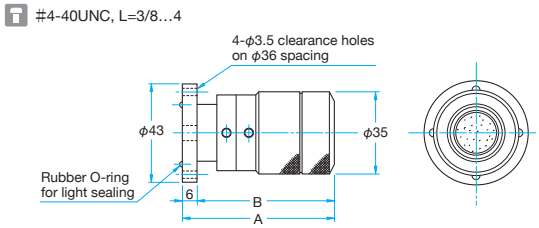
Guide

- For wavelength or magnification which is not shown on this catalog, please ask our International Sales Division.
- Beam expander holder with tilt and fine adjustments is available (LBE-H). Reference C055

Attention

- Make sure that the beam expander is well aligned with the laser light axis. If the beam expander is inclining, the output light will also be inclined.
- It is not possible to obtain a decreased beam diameter by using the beam expander on the opposite side. Use it properly to obtain an adequate optical solution.
- The light may not be collimated when it become divergent or convergent.

Outline Drawing (in mm)



Typical Laser for He-Ne (400 – 700nm)

Primary material: Aluminum
Finish: Black Anodized

Part Number	Expansion ratio	Barrel length A [mm]	B [mm]	Input aperture [mm]	Laser Damage Threshold* [J/cm²]	Weight [kg]
LBE-3	3	62.9	56.9	ϕ3.8	4	0.12
LBE-5	5	61.9	55.9	ϕ2.7	4	0.12
LBE-10	10	127.9	121.9	ϕ1.7	4	0.18

* Laser pulse width 10ns, repetition frequency 20Hz

Typical Laser for LD (780 – 830nm)

Primary material: Aluminum
Finish: Black Anodized

Part Number	Expansion ratio	Barrel length A [mm]	B [mm]	Input aperture [mm]	Laser Damage Threshold* [J/cm²]	Weight [kg]
LBE-3L	3	63.3	57.3	ϕ3.8	4	0.12
LBE-5L	5	62.3	56.3	ϕ2.7	4	0.12
LBE-10L	10	127.9	122.8	ϕ1.7	4	0.18

* Laser pulse width 10ns, repetition frequency 20Hz

Typical Laser for YAG (1064nm)

Primary material: Aluminum
Finish: Black Anodized

Part Number	Expansion ratio	Barrel length A [mm]	B [mm]	Input aperture [mm]	Laser Damage Threshold* [J/cm²]	Weight [kg]
LBE-3Y	3	63.73	57.8	ϕ3.8	4	0.12
LBE-5Y	5	62.7	57.8	ϕ2.7	4	0.12
LBE-10Y	10	128.9	123.8	ϕ1.7	4	0.18

* Laser pulse width 10ns, repetition frequency 20Hz

Compatible Optic Mounts

LBE-3H, -5H, -10H / LBE-3LH, 5LH, -10LH / LBE-3YH, -5YH, -10YH

Contact sheet

Contact sheet for Laser Beam Expanders ■Estimation ■Order

Date

☐ To: Sigma Koki Co., Ltd. **FAX +81-3-5638-6550**

Affiliation (Organization Name)					
Department			Name		
TEL		FAX		E-mail	
Country/Address					
Name & Designation	(Tentative name is okay)				
Drawing Number			Estimate	☐ Yes: by Date	☐ No
Desired Delivery Date			Budget	JP Yen	

Intention		Outline and Dimensions * Please enter your rough shape and dimensions.
Quantity		Other
Wavelenght Used	λ = nm	* Write more detailed specifications here. (Rough illustration is acceptable.)
Divergence angle of beam	F = mrad	
Beam incident diameter	mm	
Magnification of afocal		
Transmitted wavefront	λ /	
Type of lens	☐ Galilean type ☐ Keplerian type	

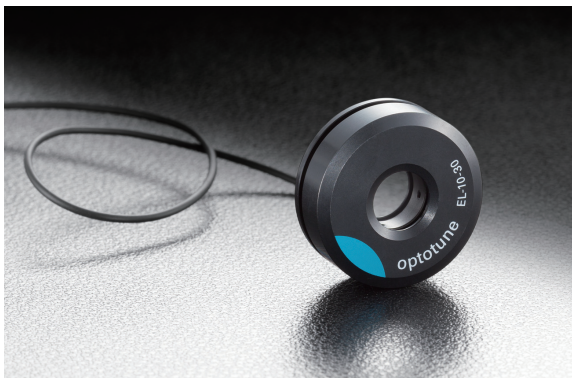
Sigma Koki Co., Ltd.

Focus Tunable lens | EL-10-30

RoHS Catalog Code W3202

**It is the lens that is tunable from 45mm to 120mm focal length by an electrical control.
It enables to change the shape of the lens by which is sealed with an elastic polymer film is filled with an optical fluid, and pressure is applied by an electromagnetic actuator.
It can be varied at high speed curvature of the lens. Zoom optical system, auto focus, lighting system and so on are able to build a system more compact optical systems.**

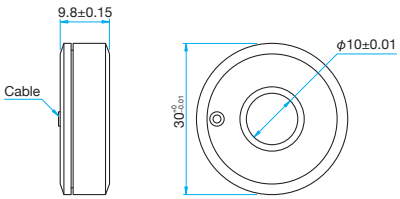
- By flexibility and taking advantage of the optical film having a high transmittance, both the variable function of the curvature of the lens and the characteristics of the optical lens had achieved.
- We offer two types of near-infrared and visible type.



Specifications

Clear aperture	ϕ10mm
focal length	45 – 120mm
Coating	Multi-layer anti-reflection coating
Refractive index [nd]	1.3
Abbe number [vd]	100
Laser damage threshold	25kW/cm^2 @1064nm
Control voltage	0 – 5V
Response time	10ms (10 – 90% step)
Power consumption	0 – 2W
Life cycle	over 10 million times
Polarization property	Save the polarization state of the incident

Outline Drawing (in mm)



Specifications

Part Number	Wavelength
EL-10-30-VIS-LD	Visible
EL-10-30-NIR-LD	Near-infrared

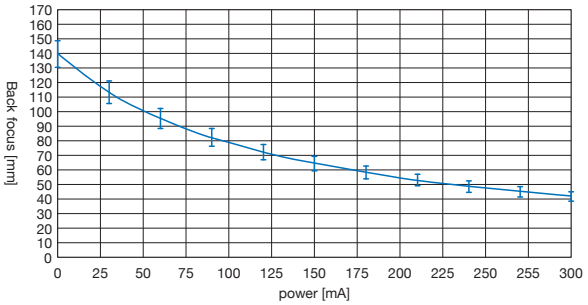
Guide

▶It is also available to provide other than products in the catalog such as focal length or aperture size. Please contact our sales division.

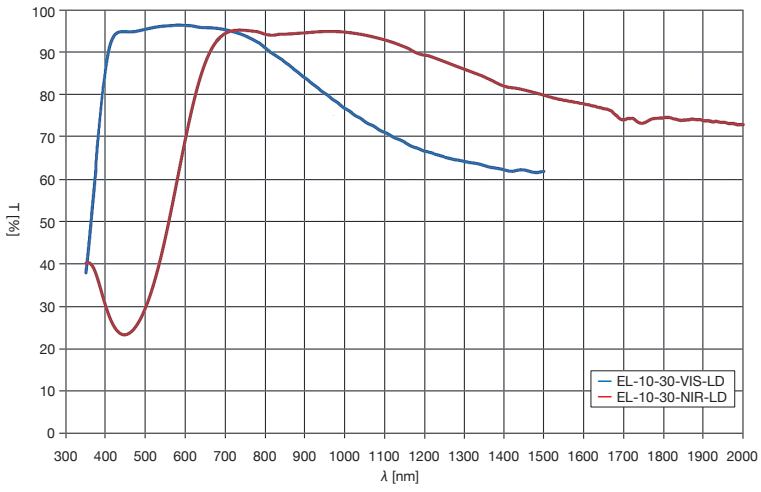
Attention

▶The focal length and the applied current is not proportional, therefore it is necessary to make the calibration of the lens control of the open loop.

The focal length of the lens with respect to the actuator current



Typical Transmittance Data T: Transmission



fθ Lenses for CO_2 Lasers | fθ-10600

RoHS Catalog Code W3203

It is the f theta lens for CO_2 laser made by a single lens of zinc selenide (ZnSe). These are used as in the laser marking system.

- It is a compact and lightweight because it is composed of a single lens.
- The design and use are processed to an optimum shape of various aberrations becomes smaller.
- There are wide variety of the lineup that scan area is 50mm to 300mm.

Specifications

Material	Zinc selenide (ZnSe)
Design wavelength	10.6μm
Entrance pupil diameter	ϕ14mm
Scanning angle	25°
Distance to lens from pupil	25mm
Coating	Dielectric multi-layer coating

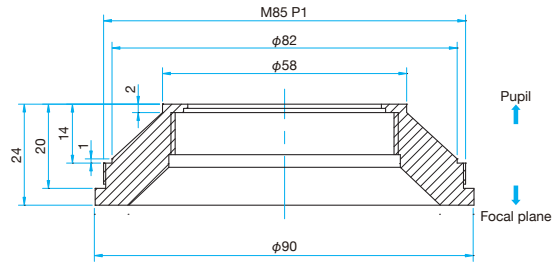
Guide

▶It is also provided the f theta lens other than for CO_2 laser which wavelength is 10.6μm. Reference B186

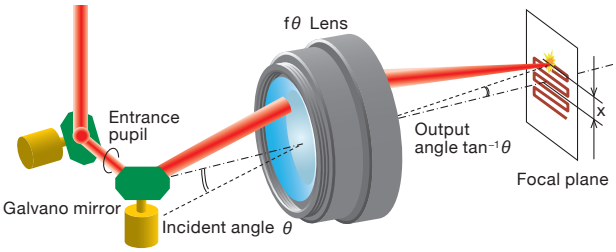
Attention

▶Hydrogen selenium is harmful when it comes to contact with strong acids! Do not immerse the lens in hydrochloric or sulphuric acid.
▶When light is condensed on the surface of ZnSe, the high power laser beam may produce toxic gases due to the thermal decomposition. In addition, a large amount of gas and powder occurs when the ZnSe lens is damaged by the laser thermal runaway. In case of the ZnSe lens is damaged by any chance, DO NOT handle the lens with your bare hands. Collect the debris and be careful not to inhale the powder and steam generated.
▶It is not recommended to use the f theta lens for the optical imaging system because it is designed for the scanning system.
▶Please be placed in accordance with the position of the entrance pupil of the fθ lens beam scanning system (galvanometer mirror). If the incident pupil is not in position of the beam scanning system, the optimum focusing spot cannot be achieved because the aberration will increase.

Outline Drawing (in mm)



Schematic



By using the f theta lens, it is possible to be moved a laser light spot in constant speed linear motion on the focal plane by scanning the mirrors such as galvanometer scanner mirrors.
The f theta lens enables this by the effect of distortion.
Mathmatically it is expressed as following;
focal length = "f", ideal image height = "y", the angle of scanned = "θ"
therefore, y = fθ.
In the normal single lens, the ideal image height "y" is represented by "y = f tanθ".
Characteristics of both are the same in a small angle range. However, the difference is greater angle increases.

Specifications

Part Number	Focal length f [mm]	Scanning Range [mm]
fθ-75-10600	75	50×50
fθ-100-10600	100	70×70
fθ-150-10600	150	110×110
fθ-200-10600	200	140×140
fθ-250-10600	250	175×175
fθ-300-10600	300	210×210
fθ-340-10600	340	250×250
fθ-400-10600	400	300×300

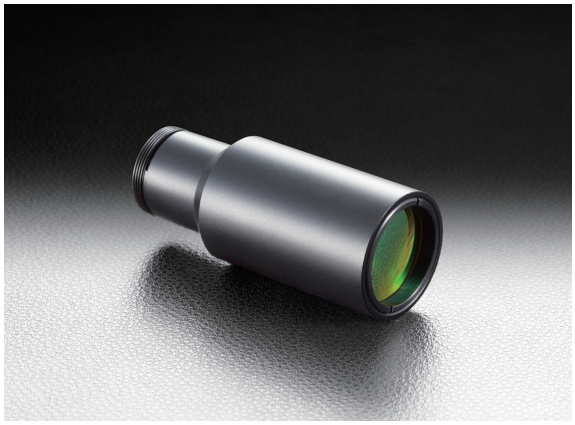
Important: Treatment of ZnSe optics

ZnSe(Zinc selenide) is Poisonous and Deleterious Substances classified as legal, Depending on the specifications, the certificate of delivery may be required acquisition of Poisonous and Deleterious Substances. **In addition, ZnSe Optics disposal after use is prohibited in general.**
Lenses that are no longer needed, please return it to us.
However, it is only in our products. The above is a case in Japan and please ask mearly sales contact the case outside Japan.

Laser Beam Expanders for CO_2 Lasers | BE-10600 RoHS Catalog Code W3204

This is a beam expander for CO_2 Laser (wavelength : 10.6μm) made of zinc selenide (ZnSe) lens. It will be used in laser marking system and so on.

- Diopter correction function is provided, customer can fine-tune the collimated beam.
- Because it is a beam expander type of the Galilean, it is compact and good aberration characteristics.
- Since the lens of zinc selenide is with an anti-reflection coating, loss of light intensity is kept low.



Specifications

Material	Zinc selenide (ZnSe)
Design wavelength	10.6μm
Coating	Dielectric multi-layer coating
Transmittance	>98.5%

Guide

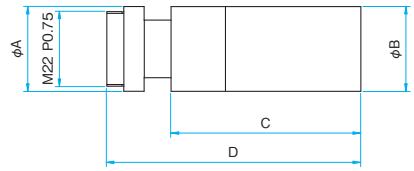
- It is also available beam expander other than for wavelength of CO_2 laser (10.6μm). Reference B200
- Holders can be used to fix beam expanders (BE-M22H). Reference C054

Attention

- It is not possible to obtain a decreased beam diameter by using the beam expander on the opposite side. Use it properly to obtain an adequate optical solution.
- Make sure that the beam expander is well aligned with the laser light axis. If the beam expander is inclining, the output light will also be inclined.

Outline Drawing

(in mm)



Part Number	ϕA [mm]	ϕB [mm]	C [mm]	D [mm]
BE-10600-3	ϕ25	ϕ25	50	65
BE-10600-4	ϕ25	ϕ25	55	75
BE-10600-5	ϕ30	ϕ30	58	78

Specifications

Part Number	Expansion ratio	Input aperture (MAX) [mm]	Output Clear aperture [mm]	Diameter [mm]
BE-10600-3	3	ϕ5	ϕ15	ϕ25
BE-10600-4	4	ϕ5	ϕ16	ϕ25
BE-10600-5	5	ϕ6	ϕ20	ϕ30