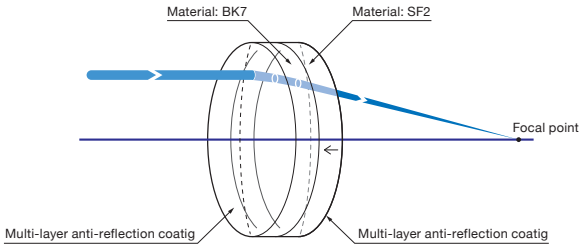
# Achromatic Doublets | DLB

RoHS

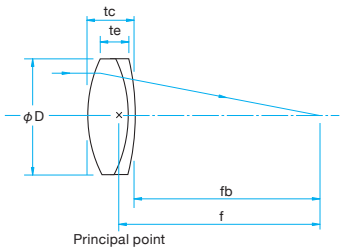
**Achromatic doublets are cemented achromats made of two different lenses (Low dispersion positive from crown glass and high dispersion negative from flint glass). The difference of dispersion and shape of both lenses are designed to minimize the chromatic aberrations in blue (486.1nm), green (546.1nm)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

- The spherical aberration of achromatic doublets is better than singlets and minimized at infinite conjugate ratios.
- Achromatic Doublets are coated on both surfaces with a broadband multi-layer anti-reflection coating for the visible wavelength (400 – 700nm).
- 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 minimize spherical aberration.
- The difference in focal length of a lens at each wave length is Chromatic aberration and is due to “dispersion of the glass”, the change in refractive index of glass accordding to wavelength. 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

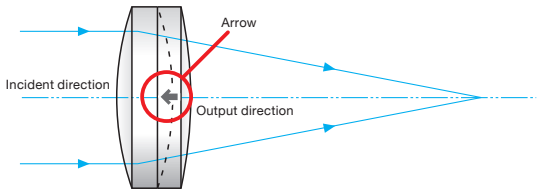
| | |
|---|---|
| Material | BK7, SF2 |
| Design wavelength | Blue: 486.1nm, Green: 546.1nm, Red: 656.3nm |
| Coating | Broadband multi-layer anti-reflection coating for the Visible |
| Cement | Ultraviolet Hardened Adhesive |
| Laser Damage Threshold | 0.3J/cm$^2$ (Laser pulse width 10ns, repetition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

## Guide

- Please contact our 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
- Air spaced focusing lenses are also available (NYTL/NYDL) designed for laser processing applications. Reference B181

## Attention

- 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 minimize spherical aberration.
- The difference in focal length of a lens at each wave length is Chromatic aberration and is due to “dispersion of the glass”, the change in refractive index of glass accordding to wavelength. 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.



## $\phi$10 – $\phi$25

| Part Number | Diameter $\phi$D [mm] | Focal length f [mm] | Edge Thickness te [mm] | Center Thickness tc [mm] | Back focal length fb [mm] | Centration [′] |
|---|---|---|---|---|---|---|
| DLB-10-20PM | $\phi$10 | 20.0 | 5.1 | 6.7 | 16.6 | <1 |
| DLB-10-25PM | $\phi$10 | 25.0 | 4.9 | 6.1 | 22.1 | <1 |
| DLB-10-30PM | $\phi$10 | 30.1 | 4.7 | 5.7 | 27.4 | <1 |
| DLB-10-40PM | $\phi$10 | 40.0 | 4.6 | 5.3 | 37.5 | <1 |
| DLB-10-50PM | $\phi$10 | 50.0 | 4.4 | 5.0 | 47.5 | <1 |
| DLB-10-60PM | $\phi$10 | 60.1 | 4.4 | 4.9 | 57.6 | <1 |
| DLB-10-70PM | $\phi$10 | 69.9 | 4.3 | 4.7 | 67.3 | <1 |
| DLB-10-80PM | $\phi$10 | 80.1 | 4.2 | 4.6 | 77.8 | <1 |
| DLB-10-100PM | $\phi$10 | 100.5 | 4.2 | 4.5 | 98.1 | <1 |
| DLB-12.7-25PM | $\phi$12.7 | 25.1 | 5.3 | 7.3 | 21.5 | <1 |
| DLB-12.7-30PM | $\phi$12.7 | 30.0 | 5.2 | 6.8 | 26.7 | <1 |
| DLB-12.7-40PM | $\phi$12.7 | 40.1 | 4.9 | 6.1 | 36.9 | <1 |
| DLB-12.7-50PM | $\phi$12.7 | 50.1 | 4.7 | 5.7 | 47.3 | <1 |
| DLB-12.7-60PM | $\phi$12.7 | 60.0 | 4.6 | 5.4 | 57.3 | <1 |
| DLB-12.7-70PM | $\phi$12.7 | 69.9 | 4.5 | 5.2 | 67.5 | <1 |
| DLB-12.7-80PM | $\phi$12.7 | 79.9 | 4.5 | 5.1 | 77.4 | <1 |
| DLB-12.7-100PM | $\phi$12.7 | 100.1 | 4.3 | 4.8 | 97.9 | <1 |
| DLB-15-25PM | $\phi$15 | 25.2 | 6.0 | 8.8 | 20.7 | <1 |
| DLB-15-30PM | $\phi$15 | 30.1 | 5.7 | 8.0 | 26.0 | <1 |
| DLB-15-40PM | $\phi$15 | 40.1 | 5.2 | 6.9 | 36.5 | <1 |
| DLB-15-50PM | $\phi$15 | 50.1 | 5.0 | 6.3 | 47.1 | <1 |
| DLB-15-60PM | $\phi$15 | 59.9 | 4.8 | 5.9 | 57.0 | <1 |
| DLB-15-70PM | $\phi$15 | 70.2 | 4.8 | 5.7 | 67.4 | <1 |
| DLB-15-80PM | $\phi$15 | 79.9 | 4.7 | 5.5 | 77.1 | <1 |
| DLB-15-100PM | $\phi$15 | 100.0 | 4.5 | 5.2 | 97.3 | <1 |
| DLB-20-30PM | $\phi$20 | 30.6 | 6.8 | 10.9 | 24.9 | <1 |
| DLB-20-40PM | $\phi$20 | 40.1 | 6.2 | 9.2 | 35.3 | <1 |
| DLB-20-50PM | $\phi$20 | 50.2 | 5.7 | 8.1 | 46.0 | <1 |
| DLB-20-60PM | $\phi$20 | 60.2 | 5.4 | 7.4 | 56.6 | <1 |
| DLB-20-70PM | $\phi$20 | 70.1 | 5.2 | 6.9 | 66.7 | <1 |
| DLB-20-80PM | $\phi$20 | 79.9 | 5.1 | 6.6 | 76.6 | <1 |
| DLB-20-100PM | $\phi$20 | 99.5 | 4.9 | 6.1 | 96.4 | <1 |
| DLB-20-120PM | $\phi$20 | 120.3 | 4.7 | 5.7 | 117.3 | <1 |
| DLB-20-150PM | $\phi$20 | 149.8 | 4.6 | 5.4 | 147.0 | <1 |
| DLB-20-170PM | $\phi$20 | 170.0 | 4.6 | 5.3 | 167.2 | <1 |
| DLB-20-200PM | $\phi$20 | 200.1 | 4.5 | 5.1 | 197.3 | <1 |
| DLB-20-220PM | $\phi$20 | 220.0 | 4.5 | 5.0 | 216.9 | <3 |
| DLB-20-250PM | $\phi$20 | 250.0 | 4.4 | 4.9 | 247.0 | <3 |
| DLB-20-300PM | $\phi$20 | 300.0 | 4.3 | 4.7 | 297.1 | <3 |
| DLB-25-40PM | $\phi$25 | 40.9 | 7.7 | 12.5 | 34.2 | <1 |
| DLB-25-50PM | $\phi$25 | 50.1 | 7.1 | 10.9 | 44.9 | <1 |
| DLB-25-60PM | $\phi$25 | 60.1 | 6.7 | 9.8 | 55.2 | <1 |
| DLB-25-70PM | $\phi$25 | 69.9 | 6.3 | 9.0 | 65.3 | <1 |
| DLB-25-80PM | $\phi$25 | 80.0 | 6.2 | 8.5 | 75.9 | <1 |
| DLB-25-100PM | $\phi$25 | 100.2 | 5.9 | 7.7 | 96.5 | <1 |
| DLB-25-120PM | $\phi$25 | 119.8 | 5.6 | 7.2 | 116.2 | <1 |
| DLB-25-150PM | $\phi$25 | 149.6 | 5.5 | 6.7 | 146.2 | <1 |
| DLB-25-170PM | $\phi$25 | 170.4 | 5.3 | 6.4 | 167.1 | <1 |
| DLB-25-200PM | $\phi$25 | 200.1 | 5.2 | 6.1 | 197.0 | <1 |
| DLB-25-220PM | $\phi$25 | 222.0 | 5.2 | 6.0 | 218.9 | <1 |
| DLB-25-250PM | $\phi$25 | 250.8 | 5.1 | 5.8 | 247.7 | <1 |
| DLB-25-300PM | $\phi$25 | 300.0 | 5.0 | 5.6 | 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] | Edge Thickness te [mm] | Center Thickness tc [mm] | Back focal length fb [mm] | Centration [′] |
|---|---|---|---|---|---|---|
| DLB-25.4-40PM | ϕ25.4 | 50.1 | 7.0 | 10.9 | 44.9 | <1 |
| DLB-25.4-50PM | ϕ25.4 | 50.1 | 7.0 | 10.9 | 44.9 | <1 |
| DLB-25.4-60PM | ϕ25.4 | 60.1 | 6.6 | 9.8 | 55.2 | <1 |
| DLB-25.4-70PM | ϕ25.4 | 69.9 | 6.2 | 9.0 | 65.3 | <1 |
| DLB-25.4-80PM | ϕ25.4 | 80.0 | 6.1 | 8.5 | 75.9 | <1 |
| DLB-25.4-100PM | ϕ25.4 | 100.2 | 5.8 | 7.7 | 96.5 | <1 |
| DLB-25.4-120PM | ϕ25.4 | 119.8 | 5.6 | 7.2 | 116.2 | <1 |
| DLB-25.4-150PM | ϕ25.4 | 149.6 | 5.4 | 6.7 | 146.2 | <1 |
| DLB-25.4-170PM | ϕ25.4 | 170.4 | 5.3 | 6.4 | 167.1 | <1 |
| DLB-25.4-200PM | ϕ25.4 | 200.1 | 5.1 | 6.1 | 197.0 | <1 |
| DLB-25.4-220PM | ϕ25.4 | 222.0 | 5.1 | 6.0 | 218.9 | <1 |
| DLB-25.4-250PM | ϕ25.4 | 250.8 | 5.0 | 5.8 | 247.7 | <1 |
| DLB-25.4-300PM | ϕ25.4 | 300.0 | 5.0 | 5.6 | 296.6 | <3 |
| DLB-30-50PM | ϕ30 | 50.3 | 8.6 | 14.1 | 43.5 | <1 |
| DLB-30-60PM | ϕ30 | 60.3 | 8.1 | 12.6 | 53.9 | <1 |
| DLB-30-70PM | ϕ30 | 70.8 | 7.7 | 11.5 | 65.0 | <1 |
| DLB-30-80PM | ϕ30 | 80.3 | 7.4 | 10.7 | 75.0 | <1 |
| DLB-30-100PM | ϕ30 | 100.7 | 6.8 | 9.5 | 96.0 | <1 |
| DLB-30-120PM | ϕ30 | 120.1 | 6.6 | 8.8 | 115.7 | <1 |
| DLB-30-150PM | ϕ30 | 150.0 | 6.3 | 8.1 | 146.0 | <1 |
| DLB-30-170PM | ϕ30 | 169.9 | 6.1 | 7.7 | 166.0 | <1 |
| DLB-30-200PM | ϕ30 | 200.2 | 6.0 | 7.3 | 196.4 | <1 |
| DLB-30-220PM | ϕ30 | 220.2 | 5.9 | 7.1 | 216.5 | <1 |
| DLB-30-250PM | ϕ30 | 249.7 | 5.8 | 6.9 | 246.1 | <1 |
| DLB-30-300PM | ϕ30 | 300.4 | 5.7 | 6.6 | 296.9 | <1 |
| DLB-30-350PM | ϕ30 | 350.0 | 5.6 | 6.4 | 346.2 | <3 |
| DLB-30-400PM | ϕ30 | 400.0 | 5.5 | 6.2 | 396.3 | <3 |
| DLB-30-450PM | ϕ30 | 450.0 | 5.5 | 6.1 | 446.5 | <3 |
| DLB-30-500PM | ϕ30 | 500.0 | 5.5 | 6.0 | 496.5 | <3 |
| DLB-40-60PM | ϕ40 | 60.2 | 11.0 | 19.3 | 50.2 | <1 |
| DLB-40-70PM | ϕ40 | 70.3 | 10.2 | 17.2 | 61.7 | <1 |
| DLB-40-80PM | ϕ40 | 80.2 | 9.7 | 15.8 | 71.8 | <1 |
| DLB-40-100PM | ϕ40 | 99.9 | 8.9 | 13.7 | 92.8 | <1 |
| DLB-40-120PM | ϕ40 | 120.0 | 8.3 | 12.3 | 113.7 | <1 |
| DLB-40-150PM | ϕ40 | 150.1 | 7.7 | 10.9 | 144.5 | <1 |
| DLB-40-170PM | ϕ40 | 169.7 | 7.5 | 10.3 | 164.5 | <1 |
| DLB-40-200PM | ϕ40 | 199.7 | 7.2 | 9.6 | 194.8 | <1 |
| DLB-40-220PM | ϕ40 | 220.7 | 7.0 | 9.2 | 216.0 | <1 |
| DLB-40-250PM | ϕ40 | 249.1 | 6.9 | 8.8 | 244.6 | <1 |
| DLB-40-300PM | ϕ40 | 300.5 | 6.7 | 8.3 | 296.1 | <1 |
| DLB-40-350PM | ϕ40 | 349.9 | 6.5 | 7.9 | 345.8 | <1 |
| DLB-40-400PM | ϕ40 | 399.7 | 6.4 | 7.6 | 395.7 | <1 |
| DLB-40-450PM | ϕ40 | 450.0 | 6.3 | 7.4 | 445.5 | <3 |
| DLB-40-500PM | ϕ40 | 500.0 | 6.3 | 7.2 | 495.6 | <3 |

### Compatible Optic Mounts

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