Optima — Laser Diode Optics

Cost Effective Lenses for Collimating and Focusing Laser Diodes

Collimating and focusing a laser diode is perhaps the most critical prerequisite in any laser diode application. While the characteristics of a laser diode might be ideal for your application, the laser diode must be matched with the appropriate optics to create a useable beam. Typically, the laser diode is collimated with one lens and a second lens is used to focus the beam. However, many applications exist where a single lens is used to either focus or collimate the beam. In either case, most laser diodes require a collimating lens with a large numerical aperture (NA) to efficiently capture the widely divergent perpendicular axis.

Multi-Element Lenses for Optimal Performance

For the most demanding applications, a three or four element spherical lens achieves a level of optical performance difficult to obtain with any single element lens. To assure diffraction-limited performance, start by collimating the diode with one of the Optima 336 Series multi-element lenses. The 336 Series lenses are computer optimized to minimize aberrations, maximize coupling efficiency, and function over a broad range of wavelengths and normal manufacturing tolerances. The lenses can be used with most visible and near-infrared laser diodes and are currently used in a wide array of products including the following:

- Alignment and Distance Measuring Systems
- Positioning and Edge Finding Equipment
- Light Scatter and Particle Counters
- Linear and Rotary Encoders
- Free-space Laser Communication Systems
- Bar-code Readers

336-1027-660 and 336-1027-785 — These are excellent general purpose collimating lenses; the small physical size is compatible with both 5.6mm and 9.0mm diameter laser diodes, making a very compact assembly. A relatively large numerical aperture (NA) of 0.48 captures a large percentage of the beam from most common laser diodes — coupling efficiencies typically range from 91% to 95%.

The 336-1027 is available with two standard MgF2 anti-reflection coatings designated as:

336-1027-660 for visible laser diodes (633nm to 750nm)
336-1027-785 for use with most near-infrared diodes (750nm to 980nm)
# Optima Multiple Element Spherical Lens Specifications:

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>336-1027-660</th>
<th>336-1027-785</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIT PRICE (Qty 1-49 pcs.)</td>
<td>$29.20</td>
<td></td>
</tr>
<tr>
<td>DESCRIPTION</td>
<td>Collimating lens</td>
<td></td>
</tr>
<tr>
<td>CONJUGATE DISTANCE</td>
<td>Infinite</td>
<td></td>
</tr>
<tr>
<td>DESIGN WAVELENGTH (note 1)</td>
<td>660nm</td>
<td>785nm</td>
</tr>
<tr>
<td>FOCAL LENGTH</td>
<td>4.476 mm</td>
<td>4.516 mm</td>
</tr>
<tr>
<td>WORKING / SOURCE DISTANCE</td>
<td>2.17 mm</td>
<td>2.20 mm</td>
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<tr>
<td>NUMERICAL APERTURE</td>
<td>0.476</td>
<td>0.476</td>
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<tr>
<td>CLEAR APERTURE</td>
<td>4.30 mm</td>
<td>4.30 mm</td>
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<tr>
<td>F#</td>
<td>1.04</td>
<td>1.05</td>
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<tr>
<td>FIELD SIZE DIAMETER</td>
<td>0.156 mm</td>
<td>0.158 mm</td>
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<tr>
<td>AR COATING DESIGN CENTER, MgF2</td>
<td>660nm</td>
<td>785nm</td>
</tr>
<tr>
<td>TRANSMISSION</td>
<td>&gt;93%</td>
<td></td>
</tr>
<tr>
<td>COVER GLASS THICKNESS</td>
<td>0.25 mm</td>
<td>0.30 mm</td>
</tr>
<tr>
<td>COVER GLASS INDEX (n)</td>
<td>1.52023</td>
<td>1.51107</td>
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<tr>
<td>CELL MATERIAL &amp; FINISH</td>
<td>Aluminum, Black Anodized</td>
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<tr>
<td>CELL DIMENSIONS (diameter x length)</td>
<td>Ø6.4 mm x 6.3mm</td>
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</tr>
</tbody>
</table>

Notes: 1) In the specifications listed above, the design wavelength is used to calculate the focal length; however, this does not limit use of the lens to this particular wavelength — these lenses can be used with both near-infrared and visible laser diodes from 635nm through 850nm.

Optima P/N: 336-1027-xxx