Kentek Laser Safety Eyewear
Guide to Frame Styles and Fit

www.kenteklaserstore.com
Understanding Your Laser Protective Eyewear Needs

At Kentek, we know that no two faces are alike, so we can help make your eyewear choice as easy as possible by offering the widest selection of frames and filters.

What is a laser filter designed to do?

A laser emits radiation at a specific wavelength, or simultaneously at several wavelengths, which may or may not be within the normal visible spectrum. A laser filter must protect the eyes from a particular set of wavelengths, but at the same time allow some “normal” light to pass through to the eyes. One filter alone cannot block all wavelengths and still allow the user to see his work.

There are two basic types of laser protection filter technologies: Absorption and Reflection

ABSORPTION

In absorption, the energy of the laser is captured by the protective medium and transformed into heat, which must then be dissipated by the surrounding materials.

Filter Glass- The traditional material to effect absorption of laser radiation for eye safety is filter glass or mineral glass. The products are sometimes referred to by the colors of the final glass product – for example, blue glass. Each filter contains an element or mix of elements that is known to absorb laser energy at particular wavelengths. Glass filters generally provide superior thermal stability when compared to plastic filters and polycarbonate. Under high heat, however, glass will tend to splinter or shatter due to heat distortion. Glass filters should be treated or coated to hold the pieces together in the event of catastrophic failure.

Polymers- Polymers impregnated with dyes and other materials reproduce the absorptive behavior of mineral glass laser filters. The polymers used in laser safety are typically polycarbonates, but other materials, including nyons and acrylics, may be used.

REFLECTION

Reflection means that laser radiation directed at the filter bounces off in a different direction, often in a broad, scattering pattern. Reflective laser safety coatings are known as thin film coatings, metallic film coatings, dielectric films and dielectric interference coatings. Multiple layers of specially selected materials are applied to a substrate under vacuum conditions. A custom designed interference pattern is created to reflect only the desired wavelengths and allow remaining light to pass through.

There are trade-offs involved with selecting any of the technologies available for laser safety eyewear. Filter glass will be heavier than polymer products, but usually provides better visible light transmission (VLT). Coated substrates are selected when multiple wavelength protection is required, but these products tend to be among the most expensive and require the most care. The physical properties of polycarbonate make those products suitable for all-day wearing and for molding single lens products with wide fields of view.

Finally, consider the work environment. High VLT products are best for low-light environments. Impact resistance is necessary in production environments and should be considered in all environments. UV protection or glare reduction may be needed for welding. Larger products and wrapping products provide additional splash protection for medical applications.

Selecting Laser Safety Eyewear

There are two basic types of laser protection filter technologies: Absorption and Reflection

1. Match Wavelength Ranges:
   - Choose eyewear that is marked to cover the entire wavelength range(s) but keep in mind when working with a wide variety of wavelengths, it might not be possible to cover them all with one filter. Call KENTEK for further options if you cannot locate a filter that will cover your entire wavelength range.

2. Determine Optical Density (OD):
   - Optical Density is the protection factor provided by a filter. Each unit of OD represents a 10X increase in protection. Select a filter that is equal to, or greater than, the OD that you need. The formula for calculating OD is: \[ OD = \log_{10} \left( \frac{H_p}{MPE} \right) = -\log_{10} \tau_{\lambda} \]
   - For assistance in determining the recommended OD for your laser:
     - a) Refer to your laser manual for a listed OD minimum
     - b) Call your laser manufacturer for their recommendation
     - c) Allow KENTEK to calculate your OD

   Note:
   - The symbol CE designates products meeting the European Directives for laser eyewear. Look for this symbol for products meeting the European Directives EN207, EN208 and/or EN60825-1

3. Select Frame Style:
   - Select a frame style that meets individual needs. Consider whether users will need a frame option that fits over prescription glasses, or perhaps an adjustable frame to accommodate a variety of faces.

   Helpful Hint:
   - The laser types listed in this catalog are for reference only. The wavelength range(s) and OD factors are the most important factors in selecting eyewear.

   Helpful Hint:
   - Consider Visible Light Transmission (VLT) values when narrowing down eyewear selections. VLT is the amount of visible light that passes through a filter and is usable to the eye. Typically, the higher the VLT percentage the brighter the color of the filter.
Filter Material Selection

<table>
<thead>
<tr>
<th>Filter Needs</th>
<th>Multiwave</th>
<th>Poly</th>
<th>Glass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple wavelength coverage?</td>
<td>Best Choice - Product selection currently limited</td>
<td>A few good choices available</td>
<td>Very good for standard wavelength combinations</td>
</tr>
<tr>
<td>Selective far IR wavelength coverage ([1064nm, 1540nm])?</td>
<td>Best Choice - Technologically feasible, limited selection.</td>
<td>May not be possible depending on wavelength</td>
<td>Best Choice</td>
</tr>
<tr>
<td>High Power Protection ([100W/cm² or greater])?</td>
<td>Best Choice - Technologically feasible, limited selection.</td>
<td>Good Choice</td>
<td>Best Choice</td>
</tr>
<tr>
<td>Femtosecond (mode locked) coverage?</td>
<td>Not available at present, testing in process</td>
<td>May not be possible depending on wavelength</td>
<td>Best Choice</td>
</tr>
<tr>
<td>Wide field of view?</td>
<td>Larger lens, often too heavy</td>
<td>Some new products emerging</td>
<td>Larger lens, often too heavy</td>
</tr>
<tr>
<td>8-hour shift wear?</td>
<td>Excellent VLT and impact resistant</td>
<td>Best Choice</td>
<td>Excellent VLT and impact resistant</td>
</tr>
<tr>
<td>Visitor eyewear?</td>
<td>Good Choice with Fit Over frame for multiple lasers in use</td>
<td>Good Choice with Fit Over frame for multiple lasers in use</td>
<td>Good Choice with Fit Over frame for multiple lasers in use</td>
</tr>
<tr>
<td>Prescription (Rx)?</td>
<td>Good Choice with Fit Over frame</td>
<td>Good Choice: usually requires a Fit Over Frame or adaptor</td>
<td>Good Choice, Rx may be in laser lens</td>
</tr>
<tr>
<td>Z87 Impact Resistant?</td>
<td>Best choice: All Kentek Laser Protective Eyewear is ANSI Z87 impact compliant</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Always make sure your LSO approves your eyewear selection.

**Color Recognition**

**SCALE LEGEND**

<table>
<thead>
<tr>
<th>Primary color</th>
<th>Color recognition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>r unrecognizable</td>
</tr>
<tr>
<td>Yellow</td>
<td>y minimal</td>
</tr>
<tr>
<td>Green</td>
<td>g moderate</td>
</tr>
<tr>
<td>Blue</td>
<td>b best choice</td>
</tr>
</tbody>
</table>

**EXAMPLE: 20C**

**RESULT:**

- r This filter would not be a good choice if you need to see red capillaries.
- y It would be a good choice if you need to see red veins.
- g **moderate**
- b **best choice**

Color recognition is a subjective response. This scale is designed to give you a sense of what is visible.
Frames Meet ANSI Z136.1 and Z87.1-2003 (Z87)

Frame styles:

- **KXI**: Large spectacle with adjustable nose piece for ages 6-10 years.
- **KBJ**: Petite spectacle with adjustable wire core temple ends.
- **KJK**: Small size wraparound spectacle for ages 0-3 years with removable frame and adjustable headband.
- **KJL**: Medium fit-over spectacle; ideal for Visitor use. Exceptional visibility and sturdy construction.
- **KJS**: Large lightweight spectacle with soft nose piece for comfort and grip.
- **KKA**: Sleek, wrapping spectacle with foam comfort pads. Interchangeable goggle converts to wraparound spectacle with foam comfort pads, interchangeable strap and temple.
- **KKZ**: Sleek, wrapping spectacle with foam comfort pads, maximum comfort and light blocking fit.
- **KCB**: Medium fit-over spectacle; ideal for visitor use. Excellent visibility and sturdy construction.
- **KAD**: Universal fit spectacle, wide side temples and excellent orbital and panascopic protection.
- **KBG**: Large lightweight spectacle with soft nose piece for comfort and grip.
- **KGV**: Medium fit-over spectacle; ideal for Visitor use. Excellent visibility and sturdy construction.
- **KGW**: Sleek, wrapping spectacle with foam comfort pads. Interchangeable goggle converts to wraparound spectacle with foam comfort pads, interchangeable strap and temple.
- **KJS**: Sleek, wrapping spectacle with foam comfort pads, maximum comfort and light blocking fit.
- **KKZ**: Sleek, wrapping spectacle with foam comfort pads. Interchangeable goggle converts to wraparound spectacle with foam comfort pads, interchangeable strap and temple.
- **KCB**: Medium fit-over spectacle; ideal for Visitor use. Excellent visibility and sturdy construction.
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