Laser Protective Goggles and Spectacles

A new range of laser protective goggles and spectacles to support the new range of laser diode modules introduced into the Optoelectronics/Indicators section in part 1 of the RS catalogue. Lasers are used in an increasingly diverse range of applications from cutting metals to printing and communications. This range of laser goggles and spectacles cover the most popular range of products available reflecting the most popular uses for the product.

Features

Bollé are leading manufacturers in the field of eye protection for all types of applications. With this range of laser goggles and spectacles, there exists no European Approvals and therefore they have been designed to meet the DIN standard 58215. Practically unbreakable, this range of laser goggles and spectacles are manufactured from a new material known as organic polycarbonate which offers 20 times more resistance to shock than hardened mineral glass of an equal thickness. Pigments and absorbers are added to organic filters in the bulk product, therefore, unlike mineral filters obtained by the deposition of thin layers, the performance of organic filters is not reduced by scratches or any possible pin holes. In the event of a laser beam being directly aimed at the goggles/spectacles for a period of time and depending on the optical density and type of laser, overload may occur and these new filters melt with a clearly available sound thereby warning the user of the risk of danger. A traditional mineral filter would shatter at this instance, possibly injuring the wearer and allowing the laser beam to pass through the glasses. Organic filters are much lighter than mineral filters and are therefore far more comfortable to wear. Indirect lateral ventilation prevents the formation of moisture and misting inside the goggles.

Precautions and safety notes for use

Appropriate eye protection should always be used, especially in areas where class 3 and 4 lasers are used. However, remember that safety glasses may not give suitable protection for direct beam viewing. Also some lasers will require lenses of very high optical density to reduce the beam to below the maximum permitted exposure, which may reduce normal vision below that which may be considered safe. Direct beam contact on lenses from high powered lasers may generate high temperatures which may destroy the protection normally offered by the lens. The following table shows some of the safety devices also required when dealing with differing lasers.

<table>
<thead>
<tr>
<th>Safety Device</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3A</th>
<th>Class 3B</th>
<th>Class 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote interlock</td>
<td></td>
<td></td>
<td></td>
<td>Needed</td>
<td></td>
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<tr>
<td>Key control</td>
<td></td>
<td></td>
<td></td>
<td>Needed</td>
<td></td>
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<tr>
<td>Beam stop or attenuator</td>
<td></td>
<td></td>
<td></td>
<td>Needed</td>
<td></td>
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<tr>
<td>Emission warning</td>
<td></td>
<td></td>
<td></td>
<td>Needed</td>
<td></td>
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<tr>
<td>Warning signs</td>
<td></td>
<td></td>
<td></td>
<td>Needed</td>
<td></td>
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<tr>
<td>Beam path stop</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Needed</td>
</tr>
<tr>
<td>Specular reflection</td>
<td></td>
<td></td>
<td></td>
<td>Needed</td>
<td></td>
</tr>
<tr>
<td>Eye protection</td>
<td></td>
<td></td>
<td></td>
<td>Needed</td>
<td></td>
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<tr>
<td>Body protection</td>
<td></td>
<td></td>
<td></td>
<td>Sometimes</td>
<td>Needed</td>
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<tr>
<td>Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Needed</td>
</tr>
<tr>
<td>Class clearly marked</td>
<td></td>
<td></td>
<td></td>
<td>Always</td>
<td>Needed</td>
</tr>
</tbody>
</table>
### Laser classification table

<table>
<thead>
<tr>
<th>Class and description of laser</th>
<th>Details of classification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class 1</strong> Exempt</td>
<td>Inherently safe. The maximum permitted exposure (MPEs) cannot be exceeded because the laser is of low power or the design is such that no laser radiation in excess of the AEL for class 1 can leave the enclosure.</td>
</tr>
<tr>
<td><strong>Class 2</strong> Low power low risk visible continuous wave and pulsed lasers</td>
<td>400-700nm wavelength radiation. Output limited or energy limited to AEL’s of class 1 for exposure up to 0.25 seconds. Limit for continuous wave lasers is 1mW. Blink reflex of eye affords some protection for CW lasers.</td>
</tr>
<tr>
<td><strong>Class 3A</strong> Medium power lasers</td>
<td>Continuous wave up to 5mW. Maximum irradiance less than 25Wm². For invisible beams 5 x AEL of class 1 laser and irradiance limit. Still some eye protection (blink reflex) in the visible region. Viewing using optical aids may be hazardous</td>
</tr>
<tr>
<td><strong>Class 3B</strong> CW lasers up to 0.5W pulsed lasers exposure less than 10⁵ Jm²</td>
<td>Direct viewing hazardous. Specular reflections may be hazardous. Unfocused diffuse viewing may be permissible under certain circumstances. Class 3B is now subdivided into two divisions 3B lasers: (400-700nm with less than 5 x AEL of class 2 laser). See footnote on this page. 3B: All other class 3B lasers</td>
</tr>
<tr>
<td><strong>Class 4</strong> High power lasers</td>
<td>Hazardous by direct viewing. Diffuse and specular reflections may also be hazardous use with extreme caution.</td>
</tr>
</tbody>
</table>

**Note:** 3B lasers may, in certain circumstances, be operated without remote interlock connectors, key control and beam stop or attenuators. Consult page 31 of British Standards BS EN 60825.

**Warning:** Always wear the appropriate goggles or spectacles designed for use with the laser.

The following laser goggles and spectacles are for use with low power devices. The frequencies with transmission curves and appropriate stock numbers are as follows.

#### Figure 1. Transmission curves for laser protective goggles/spectacles

- **532nm Yag Doubling**
  - % transmission
  - >80%
  - 60%
  - 40%
  - 20%
  - <1%

  **Wavelength in nm**
  **Goggles RS stock no. 183-650**

#### Figure 2. 632.8nm HeNe

- % transmission
  - >80%
  - 60%
  - 40%
  - 20%
  - <1%

  **Wavelength in nm**
  **Goggles RS stock no. 183-638**
  **Spectacles RS stock no. 183-688**

#### Figure 3. Near infrared wavelength 780nm

- % transmission
  - >80%
  - 60%
  - 40%
  - 20%
  - <1%

  **Wavelength in nm**
  **Goggles RS stock no. 183-616**
  **Spectacles RS stock no. 183-666**

#### Figure 4. 810-905nm GaAs

- % transmission
  - >80%
  - 60%
  - 40%
  - 20%
  - <1%

  **Wavelength in nm**
  **Goggles RS stock no. 183-622**
  **Spectacles RS stock no. 183-672**

#### Figure 5. 450/515nm - + 10600nm ARGON + CO₂

- % transmission
  - >80%
  - 60%
  - 40%
  - 20%
  - <1%

  **Wavelength in nm**
  **Goggles RS stock no. 183-644**