



## Laser Classification

Lasers are grouped into seven classes depending on the potential for the beam to cause harm. The hazard and hence the classification depends on the wavelength, power, energy and pulse characteristics. The class of the laser can be used to help decide what safety control measures are required when using the laser. The Accessible Emission Limit (AEL) is the maximum level of laser radiation which a laser can emit (and be accessible) at any time after its manufacture. The AEL depends on the wavelength, exposure duration and the viewing conditions and specifies the maximum output within each laser class.

A distinction should be made between a laser system (which refers to the laser and appropriate energy source) and a laser product (which is defined as "any product or assembly of components which constitutes, incorporates or is intended to incorporate a laser or laser system, and which is not sold to another manufacturer for use as a component (or replacement for such component) of an electronic product"). For example a CD player is a laser product which contains a laser system – the laser diode and power supply. It is the laser product which is placed into one of the seven classes. (The laser product may only consist of a laser system, e.g. a HeNe laser). The descriptions which follow give a summary of the laser classifications.

| Class   | Basis for Classification  |
|---|---|
| <b>Class 1 Laser Inherently Safe</b> Visible/non visible  | Lasers which are safe under reasonably foreseeable conditions of operation.   |
| <b>Class 1 Laser product</b> Safe as long as not modified | A product that contains a higher class laser system but access to the beam is controlled by engineering means.  |
| <b>Class 2 Low Power</b> Visible only                     | For lasers, protection of the eyes normally provided by natural aversion blink response which takes approx. 0.25s. These lasers are not intrinsically safe. AEL = 1 mW for a CW laser   |
| <b>Class 1M Safe without viewing aids</b> 302.5 to 4000nm | Safe under reasonably foreseeable conditions of operation. Beams are either highly divergent or collimated but with a large diameter. May be hazardous if user employs optics with the beam.  |
| <b>Class 2M Safe without viewing aids</b> Visible only    | Protection of the eyes is normally provided by natural aversion blink response which takes approx. 0.25s. Beams are either highly divergent or collimated but with a large diameter. May be hazardous if user employs optics with the beam.                   |
| <b>Class 3R Low/medium power</b> Visible / non-visible    | Risk of injury is greater than for the lower classes but not as high as for class 3B. Up to 5 times the AEL for Class 1 and Class 2.  |
| <b>Class 3B Medium / high power</b> Visible / non-visible | Direct intrabeam viewing of these devices is always hazardous. Viewing diffuse reflections is normally safe provided the eye is no closer than 13 cm from the diffusing surface and the exposure duration is less than 10 seconds. AEL = 500mW for a CW laser |
| <b>Class 4 High power</b> Visible / non-visible           | Direct intrabeam viewing is dangerous. Specular and diffuse reflections are hazardous. Eye, skin and fire hazard.<br>TREAT CLASS 4 WITH CAUTION   |