Below, the main characteristics and requirements for the classification system as specified by the IEC 60825-1 standard [3] are listed, along with typical required warning labels. Additionally, classes 2 and higher must have the triangular warning label shown here and other labels are required in specific cases indicating laser emission, laser apertures, skin hazards, and invisible wavelengths. For classes I to IV, see the section old system further below.

Class 1

A Class 1 laser is safe under all conditions of normal use. This means the maximum permissible exposure (MPE) cannot be exceeded when viewing a laser with the naked eye or with the aid of typical magnifying optics (e.g. telescope or microscope). To verify compliance, the standard specifies the aperture and distance corresponding to the naked eye, a typical telescope viewing a collimated beam, and a typical microscope viewing a divergent beam. It is important to realize that certain lasers classified as Class 1 may still pose a hazard when viewed with a telescope or microscope of sufficiently large aperture. For example, a high-power laser with a very large collimated beam or very highly divergent beam may be classified as Class 1 if the power that passes through the apertures defined in the standard is less than the AEL for Class 1; however, an unsafe power level may be collected by a magnifying optic with larger aperture.

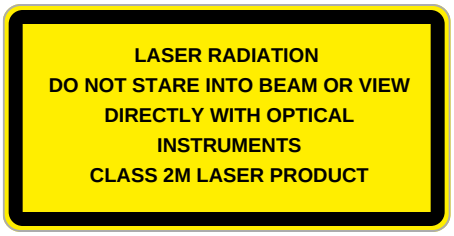
Class 1M

A Class 1M laser is safe for all conditions of use except when passed through magnifying optics such as microscopes and telescopes. Class 1M lasers produce large-diameter beams, or beams that are divergent. The MPE for a Class 1M laser cannot normally be exceeded unless focusing or imaging optics are used to narrow the beam. If the beam is refocused, the hazard of Class 1M lasers may be increased and the product class may be changed. A laser can be classified as Class 1M if the power that can pass through the pupil of the naked eye is less than the AEL for Class 1, but the power that can be collected into the eye by typical magnifying optics (as defined in the standard) is higher than the AEL for Class 1 and lower than the AEL for Class 3B.

Class 2

A Class 2 laser is safe because the blink reflex will limit the exposure to no more than 0.25 seconds. It only applies to visible-light lasers (400–700 nm). Class-2 lasers are limited to 1 mW continuous wave, or more if the emission time is less than 0.25 seconds or if the light is not spatially coherent. Intentional suppression of the blink reflex could lead to eye injury. Many laser pointers and measuring instruments are class 2.

Class 2M



A Class 2M laser is safe because of the blink reflex if not viewed through optical instruments. As with class 1M, this applies to laser beams with a large diameter or large divergence, for which the amount of light passing through the pupil cannot exceed the limits for class 2.

Class 3R

A Class 3R laser is considered safe if handled carefully, with restricted beam viewing. With a class 3R laser, the MPE can be exceeded, but with a low risk of injury. Visible continuous lasers in Class 3R are limited to 5 mW. For other wavelengths and for pulsed lasers, other limits apply.

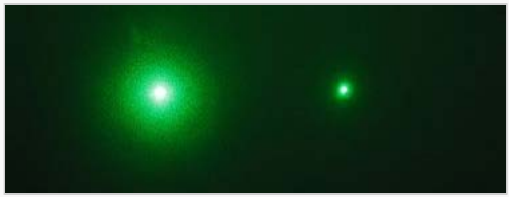
Class 3B

A Class 3B laser is hazardous if the eye is exposed directly, but diffuse reflections such as those from paper or other matte surfaces are not harmful. The AEL for continuous lasers in the wavelength range from 315 nm to far infrared is 0.5 W. For pulsed lasers between 400 and 700 nm, the limit is 30 mJ. Other limits apply to other wavelengths and to ultrashort pulsed lasers. Protective eyewear is typically required where direct viewing of a class 3B laser beam may occur. Class-3B lasers must be equipped with a key switch and a safety interlock. Class 3B lasers are used inside CD and DVD writers, although the writer unit itself is class 1 because the laser light cannot leave the unit.

Class 4

Class 4 is the highest and most dangerous class of laser, including all lasers that exceed the Class 3B AEL. By definition, a class 4 laser can burn the skin, or cause devastating and permanent eye damage as a result of direct, diffuse or indirect beam viewing. These lasers may ignite combustible materials, and thus may represent a fire risk. These hazards may also apply to indirect or non-specular reflections of the beam, even from apparently matte surfaces—meaning that great care must be taken to control the beam path. In most U.S states it is illegal to sell preassembled class 4 lasers, however a citizen can construct a class 4 laser for personal use. Class 4 lasers must be equipped with a key switch and a safety interlock. Most industrial, scientific, military, and medical lasers are in this category.

Old system


Green laser – class IIIb compared to class IIIa

The safety classes in the "old system" of classification were established in the United States through consensus standards (ANSI Z136.1) and Federal and state regulations. The international classification described in consensus standards such as IEC 825 (later IEC 60825) was based on the same concepts but presented with designations slightly different from the US classification.

This classification system is only slightly altered from the original system developed in the early 1970s. It is still used by US laser product safety regulations. The laser powers mentioned are typical values. Classification is also dependent on the wavelength and on whether the laser is pulsed or continuous. For laser classes 1 to 4, see the section on the revised system above.

Class I

Inherently safe; no possibility of eye damage. This can be either because of a low output power (in which case eye damage is impossible even after hours of exposure), or due to an enclosure preventing user access to the laser beam during normal operation, such as in CD players or laser printers.

Class II

The blink reflex of the human eye (aversion response) will prevent eye damage, unless the person deliberately stares into the beam for an extended period. Output power may be up to 1 mW. This class includes only lasers that emit visible light. Most laser pointers are in this category.

Class IIa

A region in the low-power end of Class II where the laser requires in excess of 1,000 seconds of continuous viewing to produce a burn to the retina. Commercial laser scanners are in this subclass.

Class IIIa

Lasers in this class are mostly dangerous in combination with optical instruments which change the beam diameter or power density, though even without optical instrument enhancement direct contact with the eye for over two minutes may cause serious damage to the retina. Output power does not exceed 5 mW. Beam power density may not exceed 2.5 mW/cm^2 if the device is not labeled with a "caution" warning label, otherwise a "danger" warning label is required. Many laser sights for firearms and laser pointers are in this category.

Class IIIb

Lasers in this class may cause damage if the beam enters the eye directly. This generally applies to lasers powered from 5–500 mW. Lasers in this category can cause permanent eye damage with exposures of 1/100th of a second or less depending on the strength of the laser. A diffuse reflection is generally not hazardous but specular reflections can be just as dangerous as direct exposures. Protective eyewear is recommended when direct beam viewing of Class IIIb lasers may occur. Lasers at the high power end of this class may also present a fire hazard and can lightly burn skin.

Class IV

Lasers in this class have output powers of more than 500 mW in the beam and may cause severe, permanent damage to eye or skin without being magnified by optics of eye or instrumentation. Diffuse reflections of the laser beam can be hazardous to skin or eye within the Nominal Hazard Zone. Many industrial, scientific, military and medical lasers are in this category. Many handheld lasers ("laser pointers") at this output level are now available in this category.