

Explanation of new IEC-compliant classification labels

What IEC is:

The International Electrotechnical Commission (IEC) is the leading global organization that establishes international standards for electronics, electro-optics, and related technologies. For laser product manufacturers, this means that IEC creates safety standards that work to improve the quality of laser products, as well as to improve human safety. Specifically, Amendment 2 of IEC standard 60825-1 lays out the safety regulations that laser manufacturing companies must meet in order to be compliant. In January 2004, our laser diode products officially met all European standards for laser safety and became IEC-compliant.

Until recently, companies manufacturing laser products for sale in North America and Europe had to conduct different safety tests for each geographic location. However, the U.S. Center For Devices and Radiological Health (CDRH), a division of the Food and Drug Administration, issued Laser Notice Number 50 in July 2001. This notice indicates that CDRH will accept compliance with portions of IEC 60825-1 as an alternative to meeting certain requirements published by CDRH itself, mainly with regard to labeling. The result: Europe and North America have an agreed-upon set of labeling requirements applicable to both markets. These common standards will undoubtedly help to remove technical barriers resulting from differing certification criteria in Europe and the U.S.

What this means for you:

You'll find that each of Power Technology, Inc.'s laser modules now has a new yellow, IEC-compliant label on it. PTI will no longer use the white and yellow CDRH-style labeling. The new classification scheme is as follows.

Class 1:

No risk to eyes or skin

These laser products pose no risk to eyes or skin under normal operations and conditions, including occasions when users view the beam directly with optics that could concentrate the output into the eye.

Class 1 system label

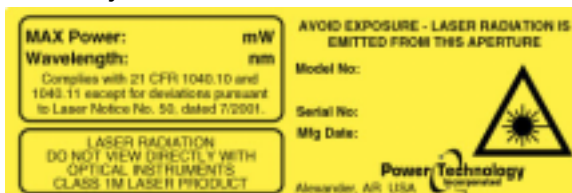


Class 1M:

Low risk to eyes, no risk to skin

Class 1M laser products have a wavelength range of 302.5 to 10⁶nm. Like Class 1 laser products, Class 1M products are safe to eyes and skin under normal conditions, including when users view the laser beam directly. However, users should not incorporate optics that could concentrate the output into the eyes (e.g., a telescope with a 1M laser emitting a well-collimated beam).

Class 1M system label



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Class 2:

Low risk to eyes, no risk to skin

Class 2 lasers emit visible (400 to 700nm) output below 1mW. These products emit light that poses very little risk to the human eye, even when viewing the beam directly with optics that could concentrate the output into the eye. The eye's natural aversion response to bright light prevents injury to the eye. However, these lasers do pose a dazzle hazard.

Class 2 system label



Class 2M:

Low risk to eyes, no risk to skin

Laser products classified as 2M emit visible output below 1mW in the 400 to 700nm range. Like Class 2 laser products, Class 2M products pose relatively little risk to eyes and no risk to skin under normal conditions, including when users view the laser beam directly. The eye's natural aversion response to bright light prevents damage to the eye. However, users should not incorporate optics that could concentrate the output into the eyes (e.g., a telescope with a 1M laser emitting a well-collimated beam).

Class 2M system label



Class 3R:

Low risk to eyes, low risk to skin

This class is similar to CDRH's 3A class. Class 3R lasers emit between 1 and 5mW of output power in the 302.5 to 10⁶nm wavelength range. IEC reserves the 3R classification for those laser products that yield output of up to a factor of five over the maximum allowed for Class 2 in the 400 to 700nm wavelength range and up to a factor of five over the maximum allowed for Class 1 for other wavelengths. Designation "R" indicates "reduced requirements," requirements that are less stringent than those reserved for 3B lasers. The risk of injury from directly viewing a Class 3R laser beam remains relatively low, but users should take greater care to avoid direct eye exposure, especially when handling invisible output.

Class 3R component label



Class 3R system label



Class 3B:**Medium risk to eyes, low risk to skin**

Class 3B lasers emit between 5 and 500mW of output power in the 302.5 to 10⁶nm wavelength range. They are hazardous to the eye when viewed directly, even when taking aversion responses to light into account. However, scattered light is typically safe to the eye. Higher power 3B lasers are a hazard to the skin, but the natural aversion response to localized heating typically prevents skin burns.

Class 3B component label**Class 3B system label****Class 4:****High risk to eyes and skin**

Class 4 lasers emit output power above 500mW. Direct exposure to Class 4 laser output is hazardous to both eyes and skin. Scattered light may also be hazardous to eyes. These lasers may be fire hazards.

Class 4 component label**Class 4 system label**

Overview of IEC laser classes:

Class	Type of lasers	Hazard posed	Relationship to MPE*	Typical AEL for CW lasers**
Class 1	Very low power or encapsulated lasers	Safe for skin and eyes	MPEs not exceeded, even for long exposure duration and with use of optical instruments	40 μ W for blue
Class 1M	Very low power lasers, either highly divergent or collimated with large beam diameter	Safe for skin and naked eye, but potentially hazardous to eyes when employing optical instruments	MPEs not exceeded for naked eye, even for long exposure duration, but may be exceeded with use of optical instruments	Same as Class 1, distinction with measurement requirements
Class 2	Visible low power lasers	Safe to skin, and safe to eyes with unintentional exposure. Avoid prolonged staring	Blink reflex limits exposure duration to 0.25 s; MPE for 0.25 s not exceeded, even with use of optical instruments	1mW
Class 2M	Visible low power lasers, either highly divergent or collimated with large beam diameter	Same as Class 2, but potentially hazardous when employing optical instruments	MPE for 0.25 s not exceeded for naked eye, but may be exceeded with use of optical instruments	Same as Class 2, distinction with measurement requirements
Class 3R	Low power lasers	Safe to skin and eyes when handled carefully; only small potential for accidental exposure	MPE with naked eye and optical instruments may be exceeded up to 5 times	5 times the limit of Class 1 in UV and IR, and 5 times the limit for Class 2 in visible, i.e., 5mW
Class 3B	Medium power lasers	Hazardous when eye is exposed; typically no hazard to skin; scattered light usually safe	Ocular MPE with naked eye and optical instruments may be exceeded more than 5 times; skin MPE usually not exceeded	500mW
Class 4	High power lasers	Hazardous to skin and eyes; scattered light also hazardous; potential fire hazard	Ocular and skin MPE exceeded; scattered light exceeds ocular MPE	No limit

*MPE (maximum permissible exposure) is the maximum level of exposure to laser radiation without hazardous effects or adverse biological changes to the eyes or skin.

**AEL (accessible emission limit) is the radiation level produced in regions that are accessible to the user. Users must not exceed the level established by a given laser class.



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