

# ASC Z136 Safe Use of Lasers

Accredited Standards Committee



**Date:** 3 March 2010  
**Memo to:** Michael Taggart  
**From:** Ron Petersen, Chairman SSC-2  
**Subject:** Explanation: 2 Questions – optical energy, optic fiber connection

- The requestor asked for clarification for two sections of Z136.1-2000; first is posting the words "Invisible Laser Radiation" required for near IR laser which have a visible component, but peak at 785 nm? Secondly, is a non-interlocked optic fiber connection sufficient to reclassify a Class 3B laser as embedded in a Class 1 laser system (assuming the fiber leads to a containment that otherwise would be considered an enclosure)? In other words, can a non-interlocked, user-accessible optic fiber connected to a Class 3B laser be considered part of an enclosure for the purpose of classifying the laser system as Class 1?

The requestor was contacted for clarification of his request: regarding the Class of a non-interlocked optical fiber connection to a Class 3B laser – Is the containment (enclosure) normally accessible, i.e., can a person place their eye in line with the beam without changing the enclosure? Perhaps a description of the enclosure and its configuration relative to the optical fiber connector would be helpful.

- There is no enclosure in the typical sense. My question pertains to free standing lasers, purchased separately from the rest of the system. The lasers are connected to sensors or other equipment via optical fiber. It has been argued that as an optical fiber may be considered as part of an enclosure (4.5.2), a higher class laser with an optic fiber attached may be reclassified as an embedded laser in a lower class system. I do not agree with this opinion because there are no engineering features which prevent a user from detaching the optic fiber and being exposed to the radiation.

As this reclassification has been an accepted procedure for a considerable time here, my assertion that connecting an optic fiber to a laser does not make the laser an embedded laser has not been readily accepted.



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The following explanation addresses your two questions:

- 1) Is posting the words "Invisible Laser Radiation" required for near IR laser which have a visible component, but peak at 785 nm?

Yes. Even though studies show that humans can detect optical energy at wavelengths up to, and sometimes above, 1000 nm at levels below the MPE, for practical purposes and for purposes of consistency, wavelengths greater than 700 are considered invisible. Therefore, laser controlled area warning signs for devices that emit at wavelengths above 700 nm shall contain the signal word "invisible."

- 2) Is a non-interlocked optic fiber connection sufficient to reclassify a Class 3B laser as embedded in a Class 1 laser system (assuming the fiber leads to a containment that otherwise would be considered an enclosure)? In other words, can a non-interlocked, user-accessible optic fiber connected to a Class 3B laser be considered part of an enclosure for the purpose of classifying the laser system as Class 1?

The simple answer is "Yes." However, we assume you mean to determine the hazard class of the laser system according to an ANSI Z136 standard, as a user of this laser system. If you are instead classifying the system as the laser system's manufacturer, then the ANSI standard does not apply. You should instead classify it according to either 21 CFR Subchapter J or IEC 60825-1. In that case, the simple answer is almost certainly "No."

For users of any laser system, the LSO has the responsibility to classify or verify the hazard class of lasers and laser systems under his jurisdiction, and to do so according to the classifications in ANSI Z136.1, Section 3.

Whether an optical fiber system with a laser higher than Class 1 can be considered a Class 1 system with a higher class embedded laser depends on both the controls and the intended use of the system. If the system is terminated such that there is no accessible emission during intended use, you (as the LSO) could reasonably reclassify it as Class 1 under ANSI Z136. You must be sure to document this fact, however, along with your reasons for reclassification, and explain this to the operator(s) during training. Note that an explanatory label is required to warn against accessible radiation if that fiber were disconnected.

If, however, intended use includes removing or disconnecting components such that the optical energy emitted from either the laser (without fiber) or the unterminated



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fiber is accessible, then the system class should be based on the power collected through the appropriate limiting aperture at the specified distance used for classification. If the laser system was initially classified with the fiber in place, then the class of the system, under conditions where the beam is accessible during intended use could be that of the laser. However with the unterminated fiber connected to the laser, the class of the system may be lower than the class of the laser itself because of the divergence of the beam from the end of the fiber.



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