OPTISPEC® Micro Enterprises Inc.
Microscopes - Fiber Optic Inspection - Video Equipment - Super Abrasives
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Laser Safety Information

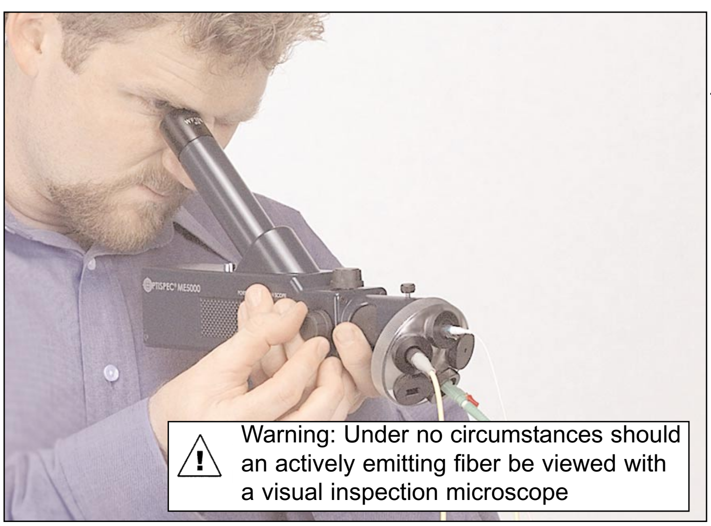
Laser Safety and the Opticspec® Line of Visual Inspection Microscopes

The visual inspection microscopes manufactured by Micro Enterprises Inc. are the FM series, ME4000 and ME5000 products. Each of these microscopes has a 3 mm thick KG-5 attenuating filter installed to reduce the risks involved with accidental viewing of active fiber emissions. ***However, it should be stressed that in spite of the protection offered by the attenuating filter, under no circumstances should an actively emitting fiber be viewed with a visual inspection microscope.*** Since many of the wavelengths used by the fiber optic industry are invisible to the naked eye, the natural aversion response is suppressed resulting in the potential for long periods of accidental exposure.

The attenuation performance of the KG-5 filter is shown below in terms of optical density (OD) and decibels (dB) for a range of common wavelengths. A detailed discussion of the use and meaning of OD and dB to quantify attenuation is provided on the following page.

KG-5 Attenuation Filter Performance at 3 mm Thickness

Wavelength (nm)	**Attenuation OD**	**dB**	**Ratio of Incident to Transmitted Energy (x106)**	**Transmitted Power @ 1 Watt Incident (μW)**
1000	**6.06**	**60.6**	**1.14**	**.87**
1060	**6.91**	**69.1**	**8.13**	**.12**
1100	**7.32**	**73.2**	**20.9**	**.047**
1200	**7.84**	**78.4**	**69.2**	**.014**
1310	**8.10**	**81.0**	**126**	**.0079**
1550	**6.50**	**65.0**	**3.16**	**.32**



NOTE: The ME1000 products are equipped with a similar Laser Safety Filter that provides 35dB attenuation from 1310 to 1550nm and 20.5dB at 850nm wavelengths.

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Laser Safety Information *continued*

This document is intended to give a basic understanding of the units of Optical Density (OD) and Decibels (dB) as related to optical attenuation.

Consider a filter material that is exposed to an incident light beam. The light is attenuated as it passes through the material and the transmitted beam emerges with a lower level of irradiance or intensity per unit area. The following equations define OD (1) and dB (2) that serve to quantify the amount of attenuation that has occurred.

(1) OD = Log10 R

(2) dB = 10 · Log10 R

R is the ratio of the irradiance of the incident beam to the transmitted beam. By definition R is also the inverse of the transmittance. Due to the similarity, we can see that the conversion between the two is simply equation (3). Attenuation in dB is always 10 times greater than OD.

(3) dB = 10 · OD

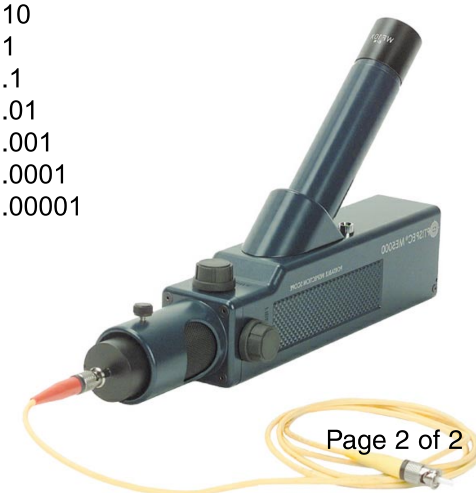
But, what does this mean in actuality? If we arrange equation (1) in a more useful form, we can better see the relationship between OD and R.

(4) 10OD = R

Equation (4) shows us that for every unit of OD, the actual level of attenuation is ten times greater.

For example, a material with an OD of 3 or an attenuation of 30 dB is reducing the incident irradiance by a factor of 1000. In other words, the transmitted light is 1000 times weaker after it passes through the OD 3 material. If the power of the incident beam is 1 W, the transmitted beam would have a power of 1 mW. The table below covers a range of optical densities.

OD	Atten. (dB)	Actual Ratio (R)	Transmitted Power with 1 Watt Incident (mW)
1	10	10	100
2	20	100	10
3	30	1,000	1
4	40	10,000	.1
5	50	100,000	.01
6	60	1,000,000	.001
7	70	10,000,000	.0001
8	80	100,000,000	.00001



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