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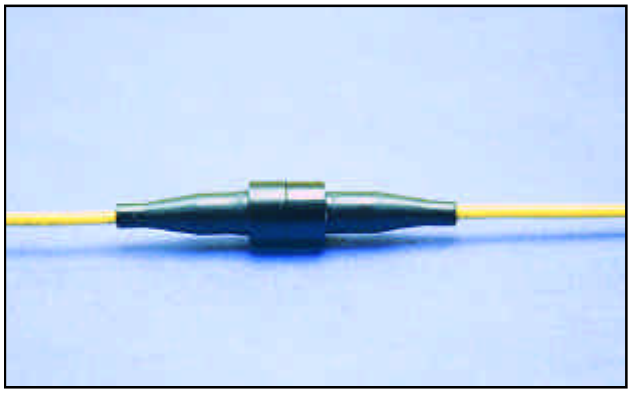
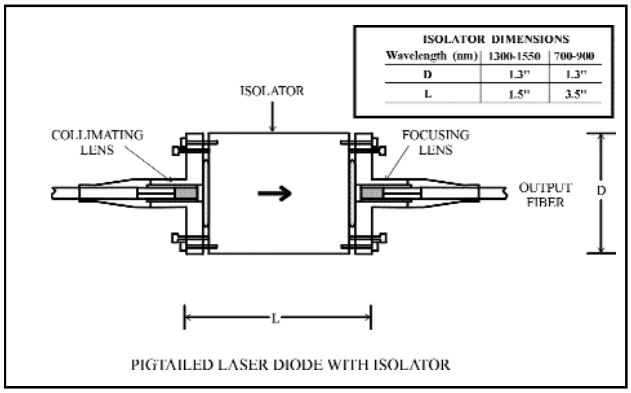
FIBER OPTIC ISOLATORS





PIGTAILED LASER DIODE WITH ISOLATOR

Isolators are optical devices that allow light to be transmitted in one direction only. They are most often used to prevent any light reflected back down the fiber from entering the source, thus preventing any feedback problems from occurring.

The simplest type of isolator consists of a polarizer followed by a quarter wave plate. Such a device will block any simple reflections provided that the output polarization from the quarter wave plate is not modified by other optical elements. Unfortunately, this is rarely the case in fiber optic systems. A much better type of isolator uses polarizers with a Faraday rotator to block the return light. This type of isolator blocks all types of polarization, and thus makes a much higher quality isolator. This is the type of isolator used by OZ Optics. With this type of isolator, isolation levels of 35dB can be achieved for 514 to 1064nm wavelengths, and 42dB for 1300 and 1550nm wavelengths. Furthermore, isolation levels of 60dB can be achieved for 1300nm and 1550nm by cascading two isolators together.

By using a patented tilt alignment technique, OZ Optics has solved the problem of using isolators with fibers. Input light from a laser, laser diode, or optical fiber is first collimated (if necessary), then transmitted through the isolator. A focusing lens on the output end of the isolator then couples the light into the output fiber.

Because Faraday isolators use polarizers on the input end as well as the output end, the transmission level through the isolator depends on the input polarization. For maximum transmission, the input light should be linearly polarized, with the polarization axis aligned with the transmission axis of the polarizers. If the source is randomly polarized, then at least fifty percent of the light will be lost at the input.

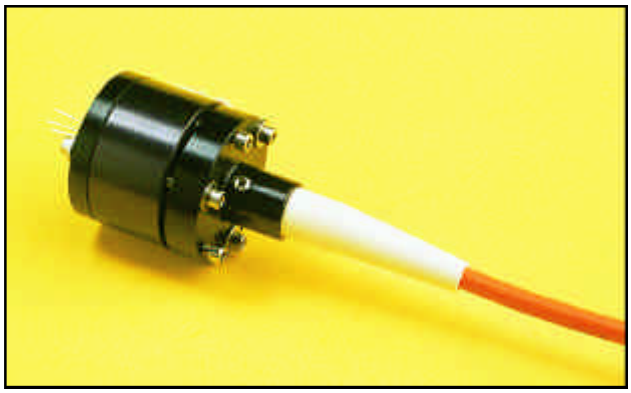
Because the transmission level through the isolator is polarization sensitive, one has to be careful when using singlemode fibers on the input end of the isolator. Singlemode fibers do not maintain polarization. Instead, if linearly polarized light is launched into singlemode fiber, then any bends or stresses in the fiber will change the output polarization state. This may cause intensity changes in the isolator output.

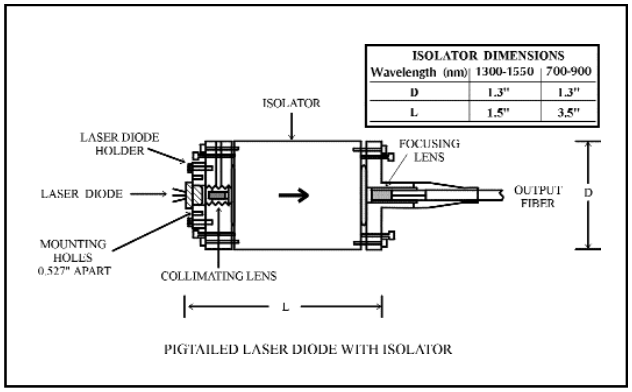
There are four basic techniques to avoid this stability problem. The simplest technique is to attach the isolator directly onto the polarized source. This technique is the most cost effective. By eliminating the need for an input fiber in the system, the overall coupling efficiency will be greatest. A second technique is to use a polarization maintaining (PM) fiber between the isolator and the source instead of an ordinary singlemode fiber. To work properly, the polarization axis of the PM fiber must be aligned with both the polarization axis of the source and the polarization axis of the isolator. A third method is to use a polarization controller on the input end of the fiber, and change the input polarization state entering the fiber until the output transmission is maximized. Finally, one could use a polarization insensitive isolator, now offered by OZ Optics. This type of isolator uses a beam splitter to divide the light into two orthogonal polarizations. Each polarization is then sent through a separate isolator. The two output beams from the isolators are then recombined, and focused into the output fiber. This type of isolator is much more expensive than a standard isolator.

Since the whole purpose of an isolator is to prevent reflected light from re-entering the source, it is important to minimize backreflection from the input end of the isolator. For this reason, we strongly recommend against using isolators with a female receptacle on the input end. The receptacle itself is a common source of backreflection. Instead, use fiber pigtails or angled connectors such as APC connectors at the input end..

In fiber to fiber pigtailed isolators, backreflections are reduced by polishing the fiber ends at an angle, and positioning them off-center with respect to the collimating lens axis. In laser diode to fiber isolators, it is done by positioning the diode off-center with respect to the collimating lens axis. This will cause the collimated output beam from the laser diode to emerge at a slight angle before entering the isolator. In both cases, the tilt adjustment technique is used to compensate for the offset on the input ends, thus ensuring minimum losses.

OZ Optics can provide completely packaged isolator systems for different wavelengths. In addition, OZ Optics can provide components to allow the customer to do his own laser or laser diode packaging with an isolator. If the customer wishes to do this, then it is recommended that the customer purchases an alignment kit. This kit includes a centering lens, multimode fiber, and video instructions on how to package an isolator. Part number: ALIGN-0X





PIGTAILED LASER DIODE WITH ISOLATOR

SPECIFICATIONS:

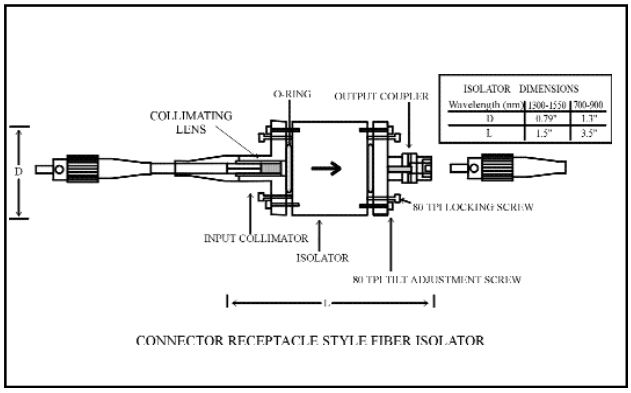
Isolation:	35dB for 514 to 1064nm wavelengths. 42dB or 60dB for 1300nm and 1550nm. 42dB for polarization independent isolators.
Insertion Loss:	Typically 0.6dB plus isolator loss. Total loss is typically 1.2dB for 514 to 1064nm isolators, 0.8dB for 42dB 1300 or 1550nm isolators, and 1.4dB for 60dB cascaded 1300 or 1550nm isolators.
Backreflection:	Typically 40dB for pigtail style 42dB isolators. 60dB for pigtail style 60dB isolators.
Available Wavelengths:	500-1550 nm.

ORDERING INFORMATION:

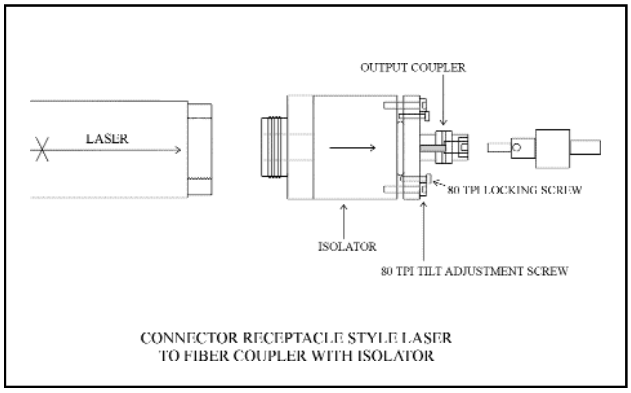
Part Number	**Description**
FOI-01-1*X*-*W*-*a/b*-*F*-*LB*-*Y*-*JD*-*L*-*I*	Fiber isolator with a pigtailed fiber on the input, and a female receptacle on the output.
FOI-02-0*X*-*W*-*F*-*I*	Laser to fiber coupler with an isolator and an output female connector receptacle.
FOI-11-11-*W*-*a/b*-*F*-*LB*-*XY*-*JD*-*L*-*I*	Pigtail style fiber to fiber isolator.
FOPI-11-11-*W*-*a/b*-*F*-*LB*-*XY*-*JD*-*L*-*I*	Pigtail style fiber to fiber polarization independent isolator, with -45dB backreflection.
FOI-12-01-*W*-*a/b*-*F*-*LB*-*Y*-*JD*-*L*-*I*	Pigtail style laser to fiber coupler with an isolator.
ALIGN-0*X*	Isolator alignment kit. It includes video instructions, centering lens, wrench, and a multimode jumper.

Where: ***X,Y*** are the connector receptacle types for connector style couplers with isolators. For pigtail style isolators, it refers to the male connector on the fiber end (3 for NTT-FC, 3S for Super FC, 3A for Angled FC, 8 for AT&T-ST, etc.);
W is the isolator operating wavelength in nm;
F is the type of fiber being used (S for singlemode, M for multimode, P for polarization maintaining fiber);
I is the desired isolation level (35, 40, or 60dB. 60dB is available for 1300nm and 1550nm only);
a/b are the fiber core and cladding diameters, respectively, in microns;
JD is the fiber jacket type (1 for uncabled fiber, 3 for 3 mm OD loose tube kevlar, 3A for 3mm OD armored cable, and 5A for 5mm armored cable);
L is the fiber length in meters;
LB is the backreflection for pigtail style isolators (40 or 60dB typically. 60dB is available for 1300 or 1550nm only).

Ordering example: A customer wants a pigtail style fiber to fiber isolator for 1550nm, with better than 60 dB backreflection. The input and output fibers are polarization maintaining fibers, cabled, and 1 meter long. The input fiber is terminated with an angled FC connector. The output fiber is terminated with a Super FC connector.
OZ Optics part number: FOI-11-11-1550-9/125-P-60-3A3S-3-1-60.



CONNECTOR RECEPTACLE STYLE FIBER ISOLATOR



CONNECTOR RECEPTACLE STYLE LASER TO FIBER COUPLER WITH ISOLATOR