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THORLABS

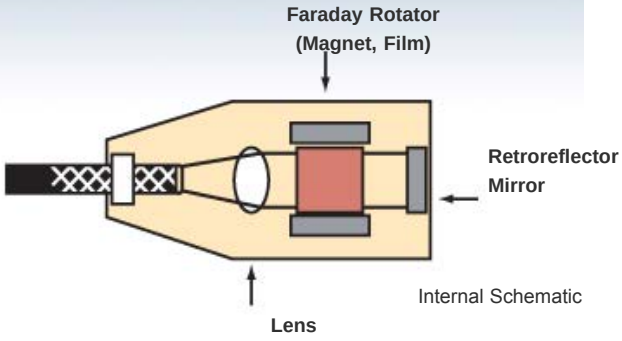
MFI-1310 - Oct. 11, 2016

Item # MFI-1310 was discontinued on Oct. 11, 2016. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

FARADAY MIRRORS WITH FIBER OPTIC PIGTAIL

- **Orthogonal Input and Output Polarization States**
- **1 m of SMF-28e+ Fiber**
- **Bismuth Iron Garnet (BIG) Faraday Rotating Element**

MFI-1310-APC



Internal Schematic

Hide Overview

OVERVIEW

Features

- Bismuth Iron Garnet (BIG) Faraday Rotating Element for 45 ± 1° Faraday Rotation
- N-BK7 Dielectric Mirror
- 1 m of SMF-28e+ Fiber or Equivalent
- No Connector Models Feature an Epoxy-Free Optical Path for up to 3 W Power Handling

Thermal and mechanical perturbations introduced to a standard, single mode fiber often cause variations in the state of polarization (SOP) of the guided light. These changes can adversely affect the performance of many different types of fiber optic systems. Retaining the SOP using polarization-maintaining (PM) fiber can reduce or eliminate these adverse effects, but PM fiber is costly and often difficult to incorporate effectively. Thorlabs' Faraday Rotator Mirrors are passive devices that correctly compensate for SOP variations without the need for PM fiber.

Key Specifications[a]	
Center Wavelength	1310 or 1550 nm
Insertion Loss	0.5 dB (Typical) 0.8 dB (Max)
Return Loss	>55 dB (FC/APC and No Connectors) 50 dB (FC/PC)
Faraday Rotation	45 ± 1°
Power Handling	No Connectors: <3 W FC/PC or FC/APC Connectors: <300 mW

- Please see the *Specs* tab for a complete specifications list.

This simple, easily installed component works as an alternative to polarization-maintaining fiber to neutralize the effects caused by changes in the SOP. This allows for greater control over the design of systems such as fiber sensors, erbium-doped fiber amplifiers, and tunable fiber lasers. Additionally, the returning beam has a polarization direction orthogonal to that of the input beam, even if the polarization state is not preserved within the fiber, as is the case with single mode fiber. (see the *Design* tab for details).

Faraday Rotator Mirrors are available pigtailed with 1 m of standard Corning SMF-28e+ single mode fiber. The fiber is mounted in a standard Ø900 µm tight tube buffer with proper strain relief, and an optional 2.0 mm narrow key FC/PC or FC/APC connector is available.

Custom models are also available upon request. Contact Thorlabs' Tech Support for more information.

Hide Specs

SPECS

Item #	MFI-1310	MFI-1310-FC	MFI-1310-APC	MFI-1550	MFI-1550-FC	MFI-1550-APC
Center Wavelength	1310 nm			1550 nm		
Bandwidth	12 nm			17 nm		
Insertion Loss	0.5 dB (Typ.) 0.8 dB (Max)					
Return Loss[a]	>55 dB					
Faraday Rotation	45 ± 1°					
Input Power	<3 W	<300 mW		<3 W	<300 mW	
Fiber Pigtail	1 m of SMF-28e+					
Fiber Connector	No Connector	FC/PC	FC/APC	No Connector	FC/PC	FC/APC

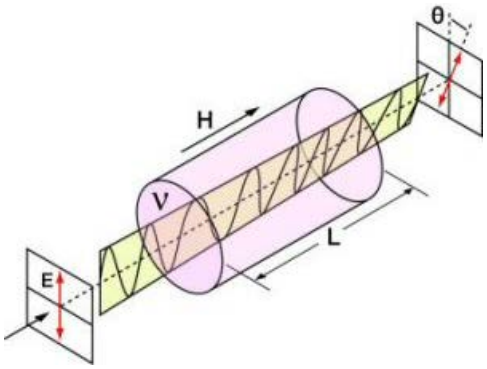
- Return loss is specified for the unconnectorized models.

Hide Design

DESIGN

Faraday Mirror Design

A Faraday mirror consists of a micro aspheric glass collimating lens, Faraday rotator, and mirror. Light exiting the fiber is collimated through the Bismuth Iron Garnet (BIG) Faraday rotating element that is accurately positioned in the field of a permanent magnet. It provides a non-reciprocal rotation of the state of polarization (SOP) of light passing through it. The BIG rotator is engineered to give a 45° rotation when it is saturated by a magnetic field, providing a precise rotation that is independent of the exact magnetic field strength.The beam is reflected at normal incidence by the dielectric-coated mirror, retraces its original path, and re-enters the fiber. When coupled with the reversal of the polarization state's handedness upon reflection from the mirror, light exiting the Faraday rotator has a SOP that is orthogonal to the original signal.



Faraday rotators change the state of polarization (SOP) of light through the application of an external magnetic field.

Insertion loss and return loss are important specifications pertaining to Faraday mirrors. Insertion loss measures the total loss the optical beam experiences during its round trip through the Faraday rotator. Return loss is the measure of the amount of signal reflected back through the fiber by components other than the mirror, such as the lens surfaces and fiber end face. These unwanted reflections degrade the signal (reflected by the Faraday mirror) to noise (reflected by connector/splice/lens) ratio, which then degrades the overall performance of the system, especially when the Faraday mirror is used as part of a fiber interferometer.

Hide Applications

APPLICATIONS

Applications

Faraday rotators are useful for improving the performance of fiber interferometers, as well as fiber amplifiers and fiber lasers. When a Faraday rotator is placed at the end of a length of single mode fiber, any state of polarization (SOP) fluctuations that occur anywhere along the fiber, due to thermal or mechanical perturbations, are exactly compensated for by the SOP rotation, and their unwanted effects are neutralized. This is especially useful in a fiber interferometer, where the SOP of all beams must be controlled for successful interference. When Faraday mirrors are used as the mirrors on both legs of the interferometer, SOP fluctuations are compensated for, and successful interference is achieved. Figure 1 shows a fiber interferometer which uses Faraday mirrors to neutralize unwanted polarization effects.

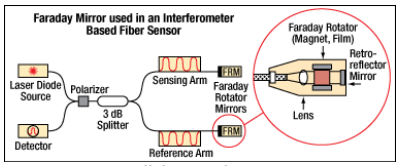


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Figure 1: Fiber-based interferometer using Faraday rotators to eliminate unwanted polarization effects.

Alternatively, as shown in Figure 2, when light passes through a length of fiber, such as an erbium-doped fiber amplifier, and is reflected by the Faraday mirror, the returning beam has a polarization direction orthogonal to that of the input beam. This occurs even if the polarization state is not preserved within the fiber, as is the case with single mode fiber. A polarizer can then be used to separate out the counterpropogating beams. This same principle can be applied to a fiber laser, as shown in Figure 3.

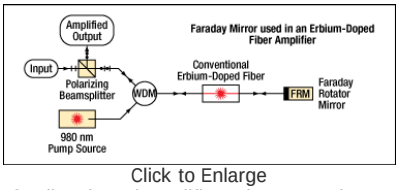

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Figure 2: Fiber-based amplifier using a Faraday rotator to create an input and output beam with orthogonal SOPs.

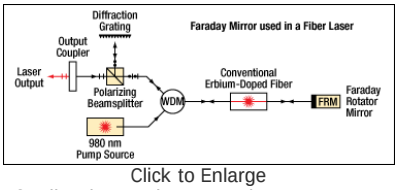

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Figure 3: Fiber laser using a Faraday rotator to create an input and output beam with orthogonal SOPs.

Hide Faraday Mirrors with Fiber Pigtail for 1310 nm

Faraday Mirrors with Fiber Pigtail for 1310 nm

Part Number	Description	Price	Availability
MFI-1310	Inline Faraday Rotator Mirror for 1310 nm, No Connector	$499.80	Lead Time
MFI-1310-FC	Inline Faraday Rotator Mirror for 1310 nm, FC/PC Connector	$509.80	Today
MFI-1310-APC	Inline Faraday Rotator Mirror for 1310 nm, FC/APC Connector	$519.80	Today

Hide Faraday Mirrors with Fiber Pigtail for 1550 nm

Faraday Mirrors with Fiber Pigtail for 1550 nm

Part Number	Description	Price	Availability
MFI-1550	Inline Faraday Rotator Mirror for 1550 nm, No Connector	$499.80	Today
MFI-1550-FC	Inline Faraday Rotator Mirror for 1550 nm, FC/PC Connector	$509.80	Today
MFI-1550-APC	Inline Faraday Rotator Mirror for 1550 nm, FC/APC Connector	$519.80	Today