IO-3-633-LP - April 23, 2025

Item # IO-3-633-LP was discontinued on April 23, 2025. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

VISIBLE FREE-SPACE ISOLATORS (390 - 700 nm)

- **Center Wavelengths from 405 to 670 nm**
- **Isolation up to 55 dB**
- **Power Densities up to 500 W/cm²**
- **Custom Isolators Available Upon Request**

IO-5-532-HP

In Saddle

Removed from Saddle

IOT-3D-633-VLP

IO-5-488-HP

IO-3-633-LP
Shown in the Saddle (SM1RC) Mounted on an Optical Table Using a BA1 Base with an SD1 1/4"-20 to 8-32 Counterbore Adapter

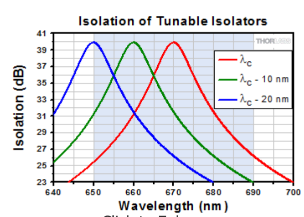
OVERVIEW

Features

- Minimize Feedback into Optical Systems
- Free-Space Input and Output Ports
- Fixed or Tunable Wavelength Ranges
- Isolation at Center Wavelength from 30 to 55 dB
- Max Beam Diameter up to 4.7 mm
- Polarization-Dependent Input

Custom Isolators

- Customizable Wavelength, Aperture, Max Power, Housing, Polarizers, and Operating Temperature
- Pricing Similar to Stock Units
- Wide Range of OEM Capabilities
- Please Contact Tech Support or See Our Custom Isolators Page



Click to Enlarge
Our Adjustable Narrowband Isolators can be tuned to maximize the peak isolation for any wavelength within a narrow spectral range (shaded in this graph). See the *Wavelength Tuning* tab for more details.

Thorlabs is pleased to stock a variety of free-space optical isolators designed for use in the visible spectral range (390 - 700 nm). Optical isolators, also known as Faraday isolators, are magneto-optic devices that preferentially transmit light along a single direction, shielding upstream optics from back reflections. Back reflections can create a number of instabilities in light sources, including intensity noise, frequency shifts, mode hopping, and loss of mode lock. In addition, intense back-reflected light can permanently damage optics. Please see the *Isolator Tutorial* tab for an explanation of the operating principles of a Faraday isolator.

Click to Enlarge
Many of our isolators, such as the IO-3D-1064-VLP, can be ordered in custom packages for use in FiberBench systems by contacting Tech Support.

Selection Guide for Isolators (Click Here for Our Full Selection)
Wavelength Range
365 - 385 nm (UV)
390 - 700 nm (Visible)
690 - 1080 nm (NIR)
1064 nm (Nd:YAG)
1110 - 2100 nm (IR)
2.20 - 4.55 µm (MIR)
Broadband
Fiber Isolators
Custom Isolators

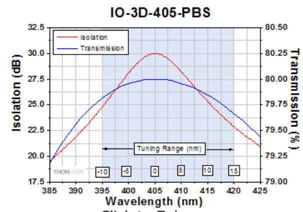
In the visible wavelength range, we offer three types of isolators. The first type, Fixed Narrowband Isolators, contains fixed, factory-aligned optics, for which peak isolation and peak transmission occurs at a pre-defined center wavelength. Any deviation from this wavelength will cause a dip in isolation and transmission. The second type, Adjustable Narrowband Isolators, offers the user the ability to adjust the alignment of the input and output polarizers, allowing tuning of the center wavelength within a 20 - 40 nm range; see the tables below for details. The third type, Tandem Narrowband Isolators, consists of two Faraday rotators in series, boosting the isolation to at least 55 dB at the expense of lower transmission. Please see the *Isolator Types* tab for additional design details and representative graphs of the wavelength-dependent isolation.

Each isolator's housing is marked with an arrow that indicates the direction of forward propagation. In addition, all isolators have engravings that indicate the alignment of the input and output polarizers.

Thorlabs also manufactures isolators for fiber optic systems and wavelengths extending into the infrared (see the Selection Guide table to the left). As indicated in the tables below and pictured to the right, many of our stock isolators can also be provided in a mount designed for our FiberBench systems. If Thorlabs does not stock an isolator suited for your application, please refer to the *Custom Isolators* tab for information on our build-to-order options, or contact Tech Support. Thorlabs' in-house manufacturing service has over 25 years of experience and can deliver a free-space isolator tuned to your center wavelength from 365 nm to 4.55 µm. Our vertically integrated manufacturing structure allows us to offer Faraday rotators used in optical isolators. We offer a selection of Faraday rotators from stock and can provide custom Faraday rotators upon request.

GRAPHS

Shaded regions on a graph represent the center wavelength tuning range of the isolator. With these isolators, the isolation and transmission curves will shift as the center wavelength shifts. If the graph is not shaded, then the isolator is non-tunable. Please note that these curves were made from theoretical data and that isolation and transmission will vary from unit to unit.



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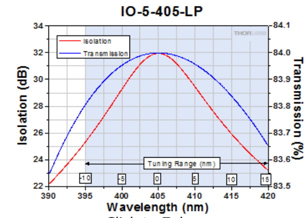

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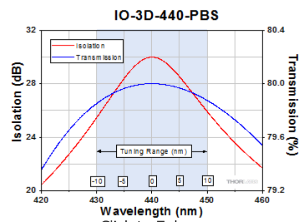

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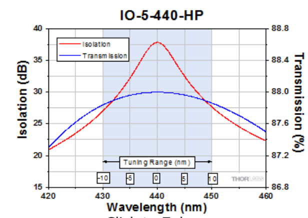

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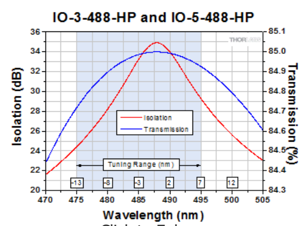

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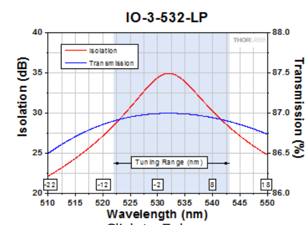

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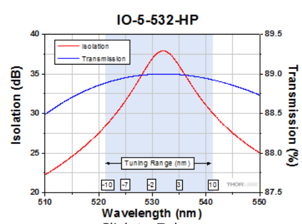

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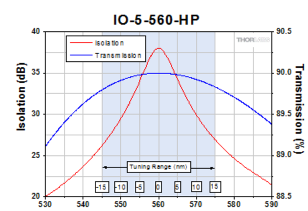

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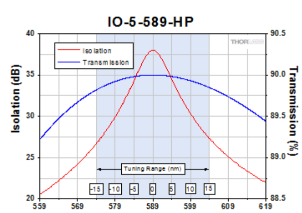

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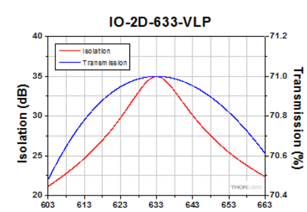

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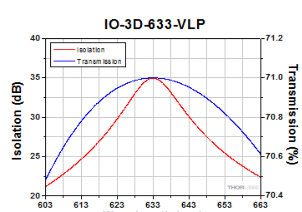

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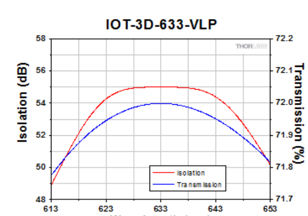

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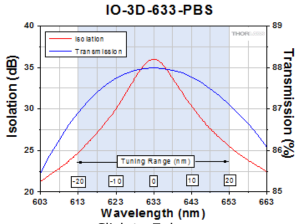

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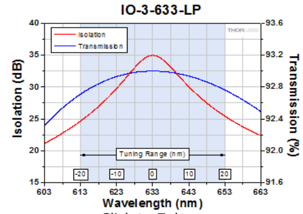

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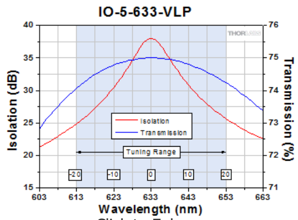

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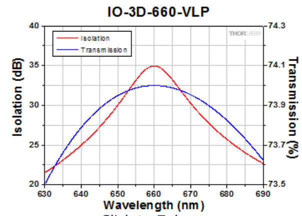

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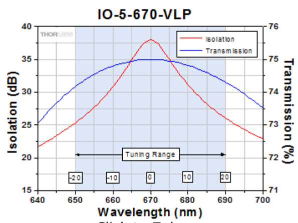

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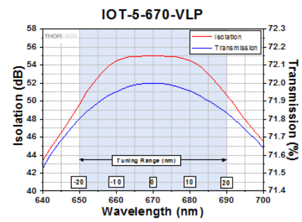

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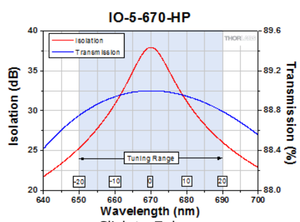

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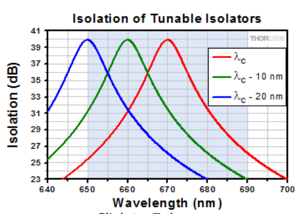
WAVELENGTH TUNING

Tuning an Adjustable Narrowband Isolator

- Optimize Our Isolators to Provide the Same Peak Isolation Anywhere Within Their Tuning Range
- Simple Tuning Procedure, Illustrated Below, Consists Primarily of Rotating the Output Polarizer
- Slight Transmission Losses Occur Due to Polarizer Rotation



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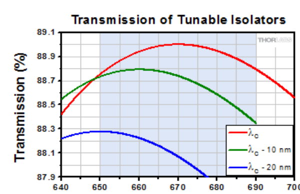
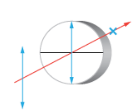
Our Adjustable Narrowband Isolators can be tuned to maximize the peak isolation for any wavelength within a narrow spectral range (shaded in this graph).

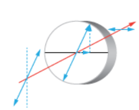


Click to Enlarge
When the isolator is tuned away from its design wavelength, the maximum transmission falls because the output polarizer's transmission axis is not parallel to the polarization direction of the output light.

Operating Principles of Optical Isolators

Thorlabs' Adjustable Narrowband Isolators are designed to provide the same peak isolation anywhere within a 20 - 40 nm tuning range. They contain a Faraday rotator that has been factory tuned to rotate light of the design wavelength by 45°. Light propagating through the isolator in the backward direction is polarized at 45° by the output polarizer and is rotated by 45° by the Faraday rotator, giving a net polarization of 90° relative to the transmission axis of the input polarizer. Therefore, an isolator rejects backward propagating light. See the *Isolator Tutorial* tab for a schematic of the beam path.


Click for Details
Light at the Design Wavelength is Rejected


Click for Details
Light Not at the Design Wavelength is Partially Transmitted

The magnitude of the rotation caused by the Faraday rotator is wavelength dependent. This means that light with a different wavelength than the design wavelength will not be rotated at exactly 45°. For example, if 670 nm light is rotated by 45° (that is, 670 nm is the design wavelength), then 660 nm light is rotated by 46.5°. If 660 nm light is sent backward through an isolator designed for 670 nm without any tweaking, it will have a net polarization of 45° + 46.5° = 91.5° relative to the axis of the input polarizer. The polarization component of the light parallel to the input polarizer's axis will be transmitted, and the isolation will therefore be significantly reduced.

Since the net polarization needs to be 90° to obtain high isolation, the output polarizer is rotated to compensate for the extra rotation being caused by the Faraday isolator. In our example, the new polarizer angle is 90° - 46.5° = 43.5°. This adjustment increases the isolation back to the same value as at the design wavelength.

Consequences of Wavelength Tuning Procedure
As a direct consequence of rotating the output polarizer, the maximum transmission in the forward direction decreases. 660 nm light propagating in the forward direction is polarized at 0° by the input polarizer and rotated by 46.5° by the Faraday rotator, but the output polarizer is now at 43.5°. The amount of the transmission decrease can be quantified using Malus' Law:

$$I = I_0 \ \cos^2 \theta$$

Malus' Law

Here, θ is the angle between the polarization direction of the light after the Faraday rotator and the transmission axis of the polarizer, I_0 is the incident intensity, and I is the transmitted intensity. For small deviations from the center wavelength, the decrease in transmission is very slight, but for larger deviations, the decrease becomes noticeable. In our example (a 10 nm difference between the design wavelength and the usage wavelength), θ = 46.5° - 43.5° = 3.0°, so I = 0.997 I_0. This case is shown in the graphs above.

In applications, the decrease in transmission caused by the tuning procedure is usually less important than the significantly enhanced isolation gained by tuning. For example, if the 670 nm isolator shown in the graphs above were used at 650 nm without tuning, the transmission would be 88.7% (instead of 88.0%), but the isolation would be only 25 dB (instead of 40 dB). This case is also shown in the graphs above.

Thorlabs' isolator housings make it easy to rotate the output polarizer without disturbing the rest of the isolator. Our custom isolator manufacturing service (see the *Custom Isolators* tab) can also provide an isolator specifically designed for a particular center wavelength, which can eliminate or strongly mitigate the transmission losses that occur at the edges of the tuning range. These custom isolators are provided at the same cost as their equivalent stock counterparts. For more information, please contact Technical Support.

Illustrated Tuning Procedure

To optimize the isolation curve for a specific wavelength within the tuning range, the alignment of the output polarizer may be tweaked following the simple procedure outlined below. Only a minor adjustment is necessary to cover a range of several nanometers. The procedure differs slightly for different isolator packages, but the principle remains the same across our entire isolator family, and complete model-specific tuning instructions ship with each isolator.

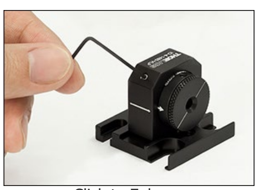
Click to Enlarge

Step 1:
Orient the isolator in the backward direction with respect to the beam (i.e., with the arrow pointing antiparallel to the beam propagation direction). A power meter with high sensitivity at low power levels should be placed after the isolator.

Use the included 5/64" hex key to loosen the isolator from its saddle.

Click to Enlarge

Step 2:
Grip the isolator by the sides and gently bring it out of its saddle. It is only necessary to bring it out far enough to expose the 8-32 setscrew at the top, as shown in the photo to the left.



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Step 3:
Use the included 5/64" hex key to tighten the isolator back into its saddle with the 8-32 setscrew exposed.

The isolator is mechanically stable in this position as long as the isolator has not been brought forward too much. (The amount shown in the image to the left is safe by several millimeters.) It should therefore not be necessary to reinsert the isolator at the end of the tuning procedure.

Click to Enlarge

Step 4:
Loosen the exposed 8-32 setscrew using the included 5/64" hex key. At this point, the output polarizer will be free to rotate.

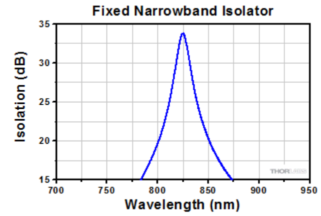
Step 5:
Rotate the output polarizer to minimize the power on the power meter. As explained above, the necessary adjustment should be only a few degrees, depending upon the desired center wavelength. Tighten the 8-32 setscrew once optimization is achieved.

As long as the isolator was not brought forward too much at the end of Step 2, the isolator will be mechanically stable in this position. Attempting to reinsert the isolator at this point may cause misalignment.

ISOLATOR TYPES

Fixed Narrowband Isolator

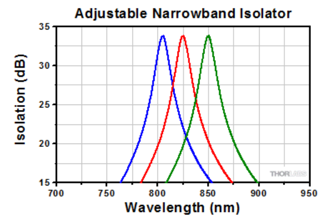
The isolator is set for 45° of rotation at the design wavelength. The polarizers are non-adjustable and are set to provide maximum isolation at the design wavelength. As the wavelength changes the isolation will drop; the graph shows a representative profile.



- Fixed Rotator Element, Fixed Polarizers
- Polarization Dependent
- Smallest and Least Expensive Isolator Type
- No Tuning

Adjustable Narrowband Isolator

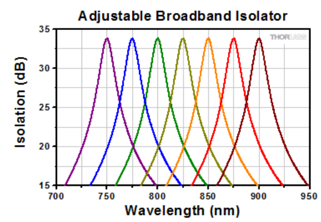
The isolator is set for 45° of rotation at the design wavelength. If the usage wavelength changes, the Faraday rotation will change, thereby decreasing the isolation. To regain maximum isolation, the output polarizer can be rotated to "re-center" the isolation curve. This rotation causes transmission losses in the forward direction that increase as the difference between the usage wavelength and the design wavelength grows.



- Fixed Rotator Element, Adjustable Polarizers
- Polarization Dependent
- General-Purpose Isolator

Adjustable Broadband Isolator

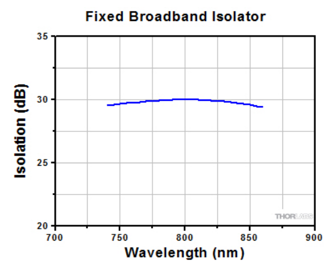
The isolator is set for 45° of rotation at the design wavelength. There is a tuning ring on the isolator that adjusts the amount of Faraday rotator material that is inserted into the internal magnet. As your usage wavelength changes, the Faraday rotation will change, thereby decreasing the isolation. To regain maximum isolation, the tuning ring is adjusted to produce the 45° of rotation necessary for maximum isolation.



- Adjustable Rotator Element, Fixed Polarizers
- Polarization Dependent
- Simple Tuning Procedure
- Broader Tuning Range than Adjustable Narrowband Isolators

Fixed Broadband Isolator

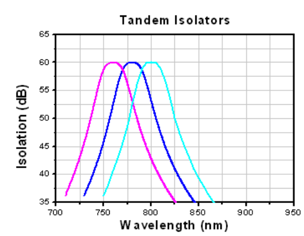
A 45° Faraday rotator is coupled with a 45° crystal quartz rotator to produce a combined 90° rotation on the output. The wavelength dependences of the two rotator materials work together to produce a flat-top isolation profile. The isolator does not require any tuning or adjustment for operation within the designated design bandwidth.



- Fixed Rotator Element, Fixed Polarizers
- Polarization Dependent
- Largest Isolation Bandwidth
- No Tuning Required

Tandem Isolators

Tandem isolators consist of two Faraday rotators in series, which share one central polarizer. Since the two rotators cancel each other, the net rotation at the output is 0°. Our tandem designs yield narrowband isolators that may be fixed or adjustable.

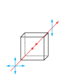


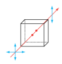
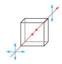
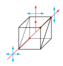
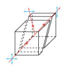
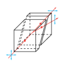
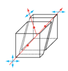
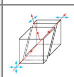
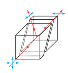
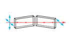
- Up to 60 dB Isolation
- Polarization Dependent
- Highest Isolation
- Fixed or Adjustable

POLARIZER COMPARISON

Polarizer Types, Sizes, and Power Limits

Thorlabs designs and manufactures several types of polarizers that are used across our family of optical isolators. Their design characteristics are detailed here. The part number of given isolator has an identifier for the type of polarizer that isolator contains. For more details on how the part number describes each isolator, see the given isolator's manual.

Polarizer Comparison			
Type	Schematic (Click to Enlarge)	Maximum Power Density	Description
Very Low Power (C)		10 W/cm^2 (CW, Blocking) 25 W/cm^2 (CW, Transmission)	Our Very Low Power Absorptive Film Polarizers are compact options for isolating free-space beams. For light polarized perpendicular to the polarizer's transmission axis, the max power density is 10 W/cm^2, while for light polarized parallel to the polarizer's transmission axis, the max power density is 25 W/cm^2.
			These polarizers are also for use with very low power sources but are made with a different material than the type C polarizers listed above. This gives these polarizers a higher maximum

Very Low Power (P or VLP)		25 W/cm^2 (CW, Blocking) 100 W/cm^2 (CW, Transmission)	power density. For light polarized perpendicular to the polarizer's transmission axis, the max power density is 25 W/cm^2, while for light polarized parallel to the polarizer's transmission axis, the max power density is 100 W/cm^2.
Wire Grid (W)		25 W/cm^2 (CW)	Wire Grid Polarizers are used in our mid-IR isolators. They consist of a linearly spaced wire grid pattern that is deposited onto an AR-coated silicon substrate.
Polarizing Beamsplitter (PBS)		13 - 50 W/cm^2 (CW)	Polarizing Beamsplitter Cubes are commonly used in low-power applications and feature an escape window useful for monitoring or injection locking.
α-BBO Glan-Laser (GLB)		100 W/cm^2 (CW)	Thorlabs' α-BBO Glan-Laser polarizers are all based on high-grade, birefringent, α-BBO crystals with a wavelength range of 210 - 450 nm. Due to the birefringent structure of α-BBO, a phase delay is created between two orthogonally polarized waves traveling in the crystal. These are similar to the High Power (HP) polarizers, but have a different escape angle.
Low Power (LP)		250 W/cm^2 (CW) 25 MW/cm^2 (Pulsed)	Our Low Power Polarizers are Glan-type, crystal polarizers, providing high transmission and power densities at the expense of a larger package than Very Low Power (VLP) and Polarizing Beamsplitter (PBS) polarizers.
Medium Power (MP)		100 W/cm^2 (CW) 50 MW/cm^2 (Pulsed)	Medium Power Polarizers are Glan-type, crystal polarizers, capable of handling higher powers. The rejected beam is internally scattered, which reduces the maximum power density, but also eliminates a stray beam from the setup.
High Power (HP)		500 W/cm^2 (CW) 150 MW/cm^2 (Pulsed)	High Power Polarizers are Glan-type, crystal polarizers, similar in size and transmission to Medium Power (MP) polarizers, but capable of handling higher powers. They feature an escape window suited for injection locking.
Yttrium Orthovanadate (YV)		25 W/cm^2 (CW)	YV polarizers are similar to the Medium Power (MP) Glan-type crystal polarizers; however, by using yttrium orthovanadate (YVO_4) rather than calcite, YV polarizers can accommodate wavelengths in the 2.0 - 3.4 µm range. The rejected beam is internally scattered, which reduces the maximum power density, but also eliminates a stray beam from the setup.
Very High Power (VHP)		20 kW/cm^2 (CW) 2 GW/cm^2 (Pulsed)	Our Very High Power Polarizers are based on Brewster windows and feature the highest power handling possible. These polarizers have larger packages than HP-based designs, but are also more economical. All VHP-based designs also feature escape windows.

ISOLATOR TUTORIAL

Video Insight: How to Align an Optical Isolator

To ensure optimal transmission of optical power from the source, as well as effective suppression of reflections traveling back towards the source, the Faraday isolator must be properly aligned. Alignment is demonstrated using an IO-3-532-LP polarization-dependent free-space isolator with a 510 nm to 550 nm operating range, an R2T post collar, a PL201 linearly polarized and collimated 520 nm laser, a S120C silicon power sensor, and a PM400 power meter.

If you would like more information about tips, tricks, and other methods we often use in the lab, we recommend our other Video Insights. In addition, our webinars provide practical and theoretical introductions to our different products.

Optical Isolator Tutorial

Function

An optical isolator is a passive magneto-optic device that only allows light to travel in one direction. Isolators are used to protect a source from back reflections or signals that may occur after the isolator. Back reflections can damage a laser source or cause it to mode hop, amplitude modulate, or frequency shift. In high-power applications, back reflections can cause instabilities and power spikes.

An isolator's function is based on the Faraday Effect. In 1842, Michael Faraday discovered that the plane of polarized light rotates while transmitting through glass (or other materials) that is exposed to a magnetic field. The direction of rotation is dependent on the direction of the magnetic field and not on the direction of light propagation; thus, the rotation is non-reciprocal. The amount of rotation β equals *V* x B x d, where *V*, B, and d are as defined below.

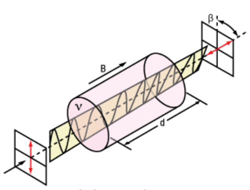
Faraday Rotation

$$\beta = V \times B \times d$$

V: the Verdet Constant, a property of the optical material, in radians/T • m.

B: the magnetic flux density in teslas.

d: the path length through the optical material in meters.



Click to Enlarge
Figure 54A Faraday Rotator's Effect on Linearly Polarized Light

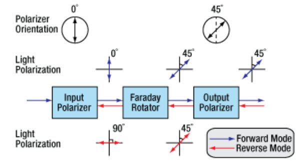
An optical isolator consists of an input polarizer, a Faraday rotator with magnet, and an output polarizer. The input polarizer works as a filter to allow only linearly polarized light into the Faraday rotator. The Faraday element rotates the input light's polarization by 45°, after which it exits through another linear polarizer. The output light is now rotated by 45° with respect to the input signal. In the reverse direction, the Faraday rotator continues to rotate the light's polarization in the same direction that it did in the forward direction so that the polarization of the light is now rotated 90° with respect to the input signal. This light's polarization is now perpendicular to the transmission axis of the input polarizer, and as a result, the energy is either reflected or absorbed depending on the type of polarizer.

Polarization-Dependent Isolators

The Forward Mode

In this example, we will assume that the input polarizer's axis is vertical (0° in Figure 54B). Laser light, either polarized or unpolarized, enters the input polarizer and becomes vertically polarized. The Faraday rotator will rotate the plane of polarization (POP) by 45° in the positive direction. Finally, the light exits through the output polarizer which has its axis at 45°. Therefore, the light leaves the isolator with a POP of 45°.

In a dual-stage isolator, the light exiting the output polarizer is sent through a second Faraday rotator followed by an additional polarizer in order to achieve greater isolation than a single-stage isolator.



Click to Enlarge

Figure 54B A single-stage, polarization-dependent isolator. Light propagating in the reverse direction is rejected by the input polarizer.

The Reverse Mode

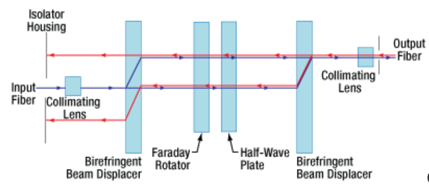
Light traveling backwards through the isolator will first enter the output polarizer, which polarizes the light at 45° with respect to the input polarizer. It then passes through the Faraday rotator rod, and the POP is rotated another 45° in the positive direction. This results in a net rotation of 90° with respect to the input polarizer, and thus, the POP is now perpendicular to the transmission axis of the input polarizer. Hence, the light will either be reflected or absorbed.

Polarization-Independent Fiber Isolators

The Forward Mode

In a polarization independent fiber isolator, the incoming light is split into two branches by a birefringent crystal (see Figure 54C). A Faraday rotator and a half-wave plate rotate the polarization of each branch before they encounter a second birefringent crystal aligned to recombine the two beams.

In a dual-stage isolator, the light then travels through an additional Faraday rotator, half-wave plate, and birefringent beam displacer before reaching the output collimating lens. This achieves greater isolation than the single-stage design.



Click for Details

Figure 54C A single-stage, polarization-independent isolator. Light is deflected away from the input path and stopped by the housing.

The Reverse Mode

Back-reflected light will encounter the second birefringent crystal and be split into two beams with their polarizations aligned with the forward mode light. The faraday rotator is a non-reciprocal rotator, so it will cancel out the rotation introduced by the half wave plate for the reverse mode light. When the light encounters the input birefringent beam displacer, it will be deflected away from the collimating lens and into the walls of the isolator housing, preventing the reverse mode from entering the input fiber.

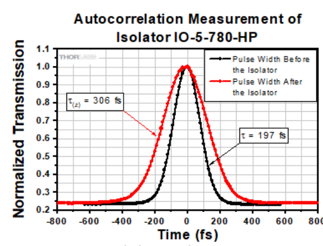
General Information

Damage Threshold

With 25 years of experience and 5 U.S. patents, our isolators typically have higher transmission and isolation than other isolators, and are smaller than other units of equivalent aperture. For visible to YAG laser Isolators, Thorlabs' Faraday Rotator crystal of choice is TGG (terbium-gallium-garnet), which is unsurpassed in terms of optical quality, Verdet constant, and resistance to high laser power. Thorlabs' TGG Isolator rods have been damage tested to 22.5 J/cm^2 at 1064 nm in 15 ns pulses (1.5 GW/cm^2), and to 20 kW/cm^2 CW. However, Thorlabs does not bear responsibility for laser power damage that is attributed to hot spots in the beam.

Magnet

The magnet is a major factor in determining the size and performance of an isolator. The ultimate size of the magnet is not simply determined by magnetic field strength but is also influenced by the mechanical design. Many Thorlabs magnets are not simple one piece magnets but are complex assemblies. Thorlabs' modeling systems allow optimization of the many parameters that affect size, optical path length, total rotation, and field uniformity. Thorlabs' US Patent 4,856,878 describes one such design that is used in several of the larger aperture isolators for YAG lasers. Thorlabs emphasizes that a powerful magnetic field exists around these Isolators, and thus, steel or magnetic objects should not be brought closer than 5 cm.



Click to Enlarge

Figure 54D Pulse Duration Measurements Before and After an IO-5-780-HP Isolator

Temperature

The magnets and the Faraday rotator materials both exhibit a temperature dependence. Both the magnetic field strength and the Verdet Constant decrease with increased temperature. For operation greater than ±10 °C beyond room temperature, please contact Technical Support.

Pulse Dispersion

Pulse broadening occurs anytime a pulse propagates through a material with an index of refraction greater than 1. This dispersion increases inversely with the pulse width and therefore can become significant in ultrafast lasers.

τ: Pulse Width Before Isolator

$\tau_{(z)}$: Pulse Width After Isolator

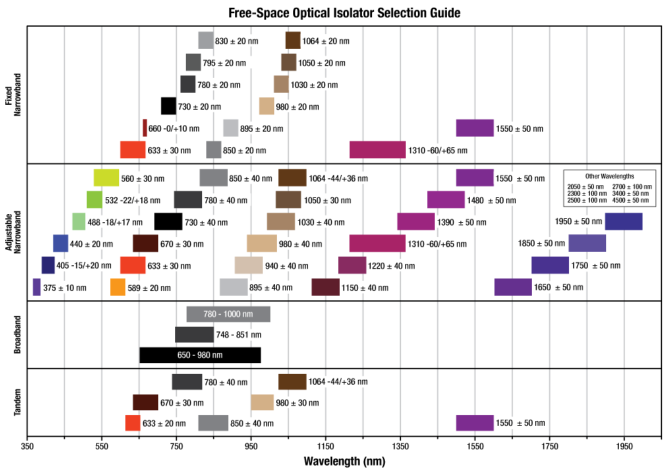
Example:

τ = 197 fs results in $\tau_{(z)}$ = 306 fs (pictured in Figure 54D)

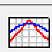
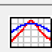
τ = 120 fs results in $\tau_{(z)}$ = 186 fs

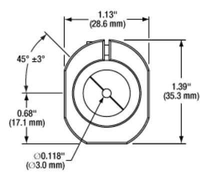
ISOLATOR GUIDE

The following selection guide contains all of Thorlabs' Free-Space Optical Isolators. Click the colored bars below to to see specifications and options for each wavelength range and isolator type. Please note that Thorlabs also offers fiber optical isolators and custom optical isolators.

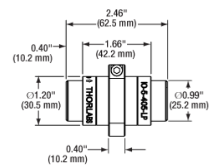


405 nm Polarization-Dependent Isolator

Click Image for Details		
Item #	IO-3D-405-PBS	IO-5-405-LP
Type	Adjustable Narrowband	Adjustable Narrowband
Center Wavelength	405 nm	405 nm
Tuning Range	395 - 420 nm	395 - 420 nm
Operating Range	390 - 425 nm	390 - 425 nm
Transmission[a]	80%	84%
Isolation[a]	30 dB (Min)	32 dB (Min) 42 dB (Typ.)
Performance Graph (Click for Details)		
Max Beam Diameter[b]	2.7 mm	4.5 mm
Max Power[c]	1.5 W	5 W
Max Power Density	50 W/cm^2	30 W/cm^2
Compatible Mounting Adapters[d]	H1C SM1B2 SM087RC[e] (SM087RC/M)	CP36 SM1RC[f] (SM1RC/M) SM1TC SM2A21



Click for Details
IO-3D-405-PBS
Simplified Mechanical Drawing



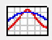
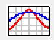
Click for Details
IO-5-405-LP
Simplified Mechanical Drawing

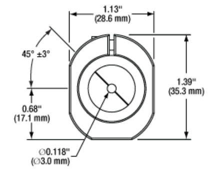
a. Specified at center wavelength. See Performance Graph for wavelength dependence.
b. Defined as containing 100% of the beam energy.
c. The maximum power specification represents the maximum power for the combined forward and reverse directions. Therefore, the sum of the powers in the forward and reverse directions cannot exceed the maximum power specification.
d. Please see below for further details.
e. One SM087RC with an 8-32 tap is included with each of these isolators. For an isolator that includes an SM087RC/M with an M4 tap, please contact Tech Support prior to ordering.
f. One SM1RC with an 8-32 tap is included with this isolator. For an SM1RC/M with an M4 tap, please contact Tech Support prior to ordering.

Part Number	Description	Price	Availability
IO-3D-405-PBS	Customer Inspired! Free-Space Isolator, 405 nm, Ø2.7 mm Max Beam, 1.5 W Max	$1,090.50	Today
IO-5-405-LP	Free-Space Isolator, 405 nm, Ø4.5 mm Max Beam, 5 W Max	$2,411.48	Today

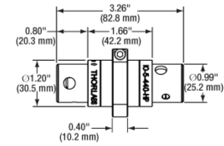
440 nm Polarization-Dependent Isolators

Click Image for Details		

		
Item #	IO-3D-440-PBS[a]	IO-5-440-HP[a]
Type	Adjustable Narrowband	Adjustable Narrowband
Center Wavelength	440 nm	440 nm
Tuning Range	430 - 450 nm	430 - 450 nm
Operating Range	430 - 450 nm	420 - 460 nm
Transmission	80%	88%
Isolation	30 dB (Min)	38 dB (Min)
Performance Graph (Click for Details)		
Max Beam Diameter[b]	2.7 mm	4.7 mm
Max Power[c]	1.5 W	35 W
Max Power Density	50 W/cm^2	500 W/cm^2
Compatible Mounting Adapters[d]	H1C SM1B2 SM087RC[e] (SM087RC/M)	CP36 SM1RC[f] (SM1RC/M) SM1TC SM2A21



Click for Details
IO-3D-440-PBS
Simplified Mechanical Drawing

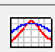
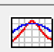


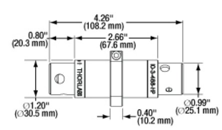
Click for Details
IO-5-440-HP
Simplified Mechanical Drawing

a. This isolator has side exit ports for rejected beams. Adequate beam traps should be selected and positioned to ensure safety.
b. Defined as containing 100% of the beam energy.
c. The maximum power specification represents the maximum power for the combined forward and reverse directions. Therefore, the sum of the powers in the forward and reverse directions cannot exceed the maximum power specification.
d. Please see below for further details.
e. One SM087RC with an 8-32 tap is included with each of these isolators. For an isolator that includes an SM087RC/M with an M4 tap, please contact Tech Support prior to ordering.
f. One SM1RC with an 8-32 tap is included with this isolator. For an SM1RC/M with an M4 tap, please contact Tech Support prior to ordering.

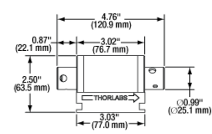
Part Number	Description	Price	Availability
IO-3D-440-PBS	**Customer Inspired! Free-Space Isolator, 440 nm, Ø2.7 mm Max Beam, 1.5 W Max**	**$1,090.50**	**Today**
IO-5-440-HP	**Customer Inspired! Free-Space Isolator, 440 nm, Ø4.7 mm Max Beam, 35 W Max**	**$2,308.14**	**Today**

488 nm Polarization-Dependent Isolators

Click Image for Details		
Item #	IO-3-488-HP[a]	IO-5-488-HP[a,b]
Type	Adjustable Narrowband	Adjustable Narrowband
Center Wavelength	488 nm	488 nm
Tuning Range	475 - 495 nm	475 - 495 nm
Operating Range	470 - 505 nm	470 - 505 nm
Transmission[c]	85%	85%
Isolation[c]	35 dB (Min) 38 dB (Typ.)	35 (Min) 38 dB (Typ.)
Performance Graph (Click for Details)		
Max Beam Diameter[d]	2.7 mm	4.7 mm
Max Power[e]	15 W	40 W
Max Power Density	500 W/cm^2	500 W/cm^2
Compatible Mounting Adapters[f]	CP36 SM1RC[g] (SM1RC/M) SM1TC SM2A21	SM3B2 C2RC (C2RC/M)



Click for Details
IO-3-488-HP
Simplified Mechanical Drawing



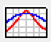
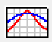
Click for Details
IO-5-488-HP
Simplified Mechanical Drawing

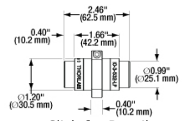
a. This isolator has two exit ports for rejected beams. Adequate beam traps should be selected and positioned to ensure safety.
b. The housing of this isolator cannot be freely rotated in its saddle. However, tapped holes in the housing allow the isolator to be mounted with the polarization axis either parallel or perpendicular to the base of the mount. If you require free rotation for your setup, consider using an SM3B2 or C2RC (C2RC/M) adapter (see below for details).
c. Specified at center wavelength. See Performance Graph for wavelength dependence.
d. Defined as containing 100% of the beam energy.
e. The maximum power specification represents the maximum power for the combined forward and reverse directions. Therefore, the sum of the powers in the

forward and reverse directions cannot exceed the maximum power specification.
f. Please see below for further details.
g. One SM1RC with an 8-32 tap is included with this isolator. For an SM1RC/M with an M4 tap, please contact Tech Support prior to ordering.

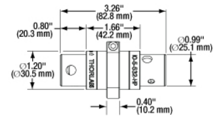
Part Number	Description	Price	Availability
IO-5-488-HP	Free-Space Isolator, 488 nm, Ø4.7 mm Max Beam, 40 W Max	$3,049.40	Today
IO-3-488-HP	Free-Space Isolator, 488 nm, Ø2.7 mm Max Beam, 15 W Max	$1,834.15	Today

532 nm Polarization-Dependent Isolators

Click Image for Details		
Item #	IO-3-532-LP	IO-5-532-HP[a]
Type	Adjustable Narrowband	Adjustable Narrowband
Center Wavelength	532 nm	532 nm
Tuning Range	522 - 543 nm	522 - 543 nm
Operating Range	510 - 550 nm	510 - 550 nm
Transmission[b]	87%	89%
Isolation[b]	35 dB (Min) 40 dB (Typ.)	38 dB (Min) 44 dB (Typ.)
Performance Graph (Click for Details)		
Max Beam Diameter[c]	2.7 mm	4.7 mm
Max Power[d]	3 W	40 W
Max Power Density	100 W/cm^2	500 W/cm^2
Compatible Mounting Adapters[e]	CP36 SM1RC[f] (SM1RC/M) SM1TC SM2A21	



Click for Details
IO-3-532-LP
Simplified Mechanical Drawing

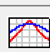


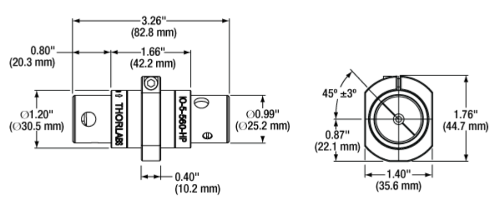
Click for Details
IO-5-532-HP
Simplified Mechanical Drawing

a. The IO-5-532-HP has two exit ports for rejected beams. Adequate beam traps should be selected and positioned to ensure safety.
b. Specified at center wavelength. See Performance Graph for wavelength dependence.
c. Defined as containing 100% of the beam energy.
d. The maximum power specification represents the maximum power for the combined forward and reverse directions. Therefore, the sum of the powers in the forward and reverse directions cannot exceed the maximum power specification.
e. Please see below for further details.
f. One SM1RC with an 8-32 tap is included with each of these isolators. For an SM1RC/M with an M4 tap, please contact Tech Support prior to ordering.

Part Number	Description	Price	Availability
IO-3-532-LP	Free-Space Isolator, 532 nm, Ø2.7 mm Max Beam, 3 W Max	$1,913.74	Today
IO-5-532-HP	Free-Space Isolator, 532 nm, Ø4.7 mm Max Beam, 40 W Max	$2,320.00	Today

560 nm Polarization-Dependent Isolator

Click Image for Details	
Item #	IO-5-560-HP[a]
Type	Adjustable Narrowband
Center Wavelength	560 nm
Tuning Range	545 - 575 nm
Operating Range	530 - 590 nm
Transmission[b]	90%
Isolation[b]	38 dB (Min)
Performance Graph (Click for Details)	
Max Beam Diameter[c]	4.7 mm



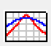
IO-5-560-HP Simplified Mechanical Drawing

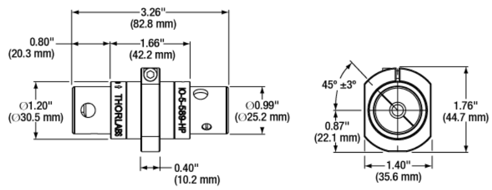
Max Power[d]	40 W
Max Power Density	500 W/cm^2
Compatible Mounting Adapters[e]	CP36 SM1RC[f] (SM1RC/M) SM1TC SM2A21

a. The IO-5-560-HP has two exit ports for rejected beams. Adequate beam traps should be selected and positioned to ensure safety.
b. Specified at center wavelength. See Performance Graph for wavelength dependence.
c. Defined as containing 100% of the beam energy.
d. The maximum power specification represents the maximum power for the combined forward and reverse directions. Therefore, the sum of the powers in the forward and reverse directions cannot exceed the maximum power specification.
e. Please see below for further details.
f. One SM1RC with an 8-32 tap is included with this isolator. For an SM1RC/M with an M4 tap, please contact Tech Support prior to ordering.

Part Number	Description	Price	Availability
IO-5-560-HP	**Customer Inspired! Free-Space Isolator, 560 nm, Ø4.7 mm Max Beam, 40 W Max**	**$2,308.14**	**Today**

589 nm Polarization-Dependent Isolator

Click Image for Details	
Item #	IO-5-589-HP[a]
Type	Adjustable Narrowband
Center Wavelength	589 nm
Tuning Range	574 - 604 nm
Operating Range	569 - 619 nm
Transmission[b]	90%
Isolation[b]	38 dB (Min)
Performance Graph (Click for Details)	
Max Beam Diameter[c]	4.7 mm
Max Power[d]	35 W
Max Power Density	500 W/cm^2
Compatible Mounting Adapters[e]	CP36 SM1RC[f] (SM1RC/M) SM1TC SM2A21



IO-5-589-HP Simplified Mechanical Drawing

a. This isolator has two exit ports for rejected beams. Adequate beam traps should be selected and positioned to ensure safety.
b. Specified at center wavelength. See Performance Graph for wavelength dependence.
c. Defined as containing 100% of the beam energy.
d. The maximum power specification represents the maximum power for the combined forward and reverse directions. Therefore, the sum of the powers in the forward and reverse directions cannot exceed the maximum power specification.
e. Please see below for further details.
f. One SM1RC with an 8-32 tap is included with this isolator. For an SM1RC/M with an M4 tap, please contact Tech Support prior to ordering.

Part Number	Description	Price	Availability
IO-5-589-HP	**Free-Space Isolator, 589 nm, Ø4.7 mm Max Beam, 35 W Max**	**$2,308.14**	**Today**

633 nm Polarization-Dependent Isolators

Click Image for Details						
Item #	IO-2D-633-VLP[a]	IO-3D-633-VLP[a]	IOT-3D-633-VLP	IO-3D-633-PBS[a,b]	IO-3-633-LP	IO-5-633-VLP
Type	Fixed Narrowband	Fixed Narrowband	Tandem Fixed Narrowband	Adjustable Narrowband	Adjustable Narrowband	Adjustable Narrowband
Center Wavelength	633 nm	633 nm	633 nm	633 nm	633 nm	633 nm

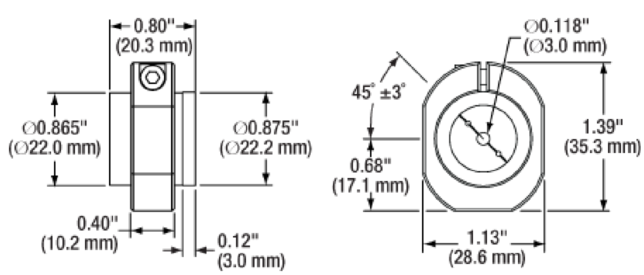
Tuning Range	N/A	N/A	N/A	613 - 653 nm	613 - 653 nm	613 - 653 nm
Operating Range	603 - 663 nm	603 - 663 nm	613 - 653 nm	603 - 663 nm	603 - 663 nm	603 - 663 nm
Transmission[c]	71 - 75%	71 - 75%	72%	88%	93%	75%
Isolation[c]	35 dB (Min) 40 dB (Typ.)	35 dB (Min) 40 dB (Typ.)	55 dB (Min) 57 dB (Typ.)	30 dB (Min) 36 dB (Typ.)	35 dB (Min) 40 dB (Typ.)	38 dB (Min) 40 dB (Typ.)
Performance Graph (Click for Details)						
Max Beam Diameter[d]	1.8 mm	2.7 mm	2.7 mm	2.7 mm	2.7 mm	4.7 mm
Max Power[e]	0.3 W	0.4 W	0.5 W	0.7 W	3 W	1.7 W
Max Power Density	Blocking:[f] 25 W/cm^2 Transmission:[f] 100 W/cm^2	Blocking:[f] 25 W/cm^2 Transmission:[f] 100 W/cm^2	Blocking:[f] 25 W/cm^2 Transmission:[f] 100 W/cm^2	50 W/cm^2	100 W/cm^2	Blocking:[f] 25 W/cm^2 Transmission:[f] 100 W/cm^2
Compatible Mounting Adapters[g]	H1C SM1B2 SM087RC[h] (SM087RC/M)				CP36 SM1RC[i] (SM1RC/M) SM1TC SM2A21	

a. This isolator can be supplied in an optic mount with twin steel dowel pins for our FiberBench systems by contacting Tech Support prior to ordering.
b. This isolator has two exit ports for rejected beams. Adequate beam traps should be selected and positioned to ensure safety.
c. Specified at center wavelength. See Performance Graph for wavelength dependence.
d. Defined as containing 100% of the beam energy.
e. The maximum power specification represents the maximum power for the combined forward and reverse directions. Therefore, the sum of the powers in the forward and reverse directions cannot exceed the maximum power specification.
f. The blocking power density corresponds to light polarized perpendicular to the transmission axis, while the transmission power density corresponds to light polarized parallel to the transmission axis.
g. Please see below for further details.
h. One SM087RC with an 8-32 tap is included with each of these isolators. For an isolator that includes an SM087RC/M with an M4 tap, please contact Tech Support prior to ordering.
i. One SM1RC with an 8-32 tap is included with each of these isolators. For an SM1RC/M with an M4 tap, please contact Tech Support prior to ordering.

Part Number	Description	Price	Availability
IO-2D-633-VLP	**Free-Space Isolator, 633 nm, Ø1.8 mm Max Beam, 0.3 W Max**	**$765.03**	**Today**
IO-3D-633-VLP	**Free-Space Isolator, 633 nm, Ø2.7 mm Max Beam, 0.4 W Max**	**$1,040.62**	**Today**
IOT-3D-633-VLP	**Free-Space Tandem Isolator, 633 nm, Ø2.7 mm Max Beam, 0.5 W Max**	**$1,531.23**	**Today**
IO-3D-633-PBS	**Free-Space Isolator, 633 nm, Ø2.7 mm Max Beam, 0.7 W Max**	**$1,476.60**	**Today**
IO-3-633-LP	**Free-Space Isolator, 633 nm, Ø2.7 mm Max Beam, 3 W Max**	**$1,913.74**	**Lead Time**
IO-5-633-VLP	**Free-Space Isolator, 633 nm, Ø4.7 mm Max Beam, 1.7 W Max**	**$1,427.88**	**Today**

660 nm Polarization-Dependent Isolator

Click Image for Details	
Item #	IO-3D-660-VLP[a]
Type	Fixed Narrowband
Center Wavelength	660 nm
Tuning Range	N/A
Operating Range	660 - 670 nm
Transmission[b]	74%
Isolation[b]	35 dB (Min) 40 dB (Typ.)
Performance Graph (Click for Details)	
Max Beam Diameter[c]	2.7 mm
Max Power[d]	0.4 W
Max Power Density	Blocking:[e] 25 W/cm^2 Transmission:[e] 100 W/cm^2
Compatible Mounting Adapters[f]	H1C SM1B2 SM087RC[g] (SM087RC/M)



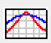
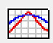
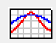
IO-3D-660-VLP Simplified Mechanical Drawing

a. This isolator can be supplied in an optic mount with twin steel dowel pins for our FiberBench systems by contacting Tech Support prior to ordering.
b. Specified at center wavelength. See Performance Graph for wavelength dependence.

c. Defined as containing 100% of the beam energy.
d. The maximum power specification represents the maximum power for the combined forward and reverse directions. Therefore, the sum of the powers in the forward and reverse directions cannot exceed the maximum power specification.
e. The blocking power density corresponds to light polarized perpendicular to the transmission axis, while the transmission power density corresponds to light polarized parallel to the transmission axis.
f. Please see below for further details.
g. One SM087RC with an 8-32 tap is included with each of these isolators. For an isolator that includes an SM087RC/M with an M4 tap, please contact Tech Support prior to ordering.

Part Number	Description	Price	Availability
IO-3D-660-VLP	**Free-Space Isolator, 660 nm, Ø2.7 mm Max Beam, 0.4 W Max**	**$1,040.62**	**Today**

670 nm Polarization-Dependent Isolators

Click Image for Details			
Item #	IO-5-670-VLP	IOT-5-670-VLP	IO-5-670-HP[a]
Type	Adjustable Narrowband	Tandem Adjustable Narrowband	Adjustable Narrowband
Center Wavelength	670 nm	670 nm	670 nm
Tuning Range	650 - 690 nm	650 - 690 nm	650 - 690 nm
Operating Range	640 - 700 nm	640 - 700 nm	640 - 700 nm
Transmission[b]	75%	72%	89%
Isolation[b]	38 dB (Min) 40 dB (Typ.)	55 dB (Min) 57 dB (Typ.)	38 dB (Min) 44 dB (Typ.)
Performance Graph (Click for Details)			
Max Beam Diameter[c]	4.7 mm	4.7 mm	4.7 mm
Max Power[d]	1.7 W	1.7 W	40 W
Max Power Density	Blocking:[e] 25 W/cm^2 Transmission:[e] 100 W/cm^2	Blocking:[e] 25 W/cm^2 Transmission:[e] 100 W/cm^2	500 W/cm^2
Compatible Mounting Adapters[f]	CP36 SM1RC[g] (SM1RC/M) SM1TC SM2A21		

a. The IO-5-670-HP has two exit ports for rejected beams. Adequate beam traps should be selected and positioned to ensure safety.
b. Specified at center wavelength. See Performance Graph for wavelength dependence.
c. Defined as containing 100% of the beam energy.
d. The maximum power specification represents the maximum power for the combined forward and reverse directions. Therefore, the sum of the powers in the forward and reverse directions cannot exceed the maximum power specification.
e. The blocking power density corresponds to light polarized perpendicular to the transmission axis, while the transmission power density corresponds to light polarized parallel to the transmission axis.
f. Please see below for further details.
g. One SM1RC with an 8-32 tap is included with each of these isolators. For an SM1RC/M with an M4 tap, please contact Tech Support prior to ordering.

Part Number	Description	Price	Availability
IO-5-670-VLP	**Free-Space Isolator, 670 nm, Ø4.7 mm Max Beam, 1.7 W Max**	**$1,427.88**	**Today**
IOT-5-670-VLP	**Free-Space Tandem Isolator, 670 nm, Ø4.7 mm Max Beam, 1.7 W Max**	**$2,138.27**	**Today**
IO-5-670-HP	**Free-Space Isolator, 670 nm, Ø4.7 mm Max Beam, 40 W Max**	**$2,502.95**	**Today**

Isolator Mounting Adapters

These adapters provide mechanical compatibility between our isolator bodies and SM1 (1.035"-40) lens tubes, SM2 (2.035"-40) lens tubes, SM3 (3.035"-40) lens tubes, 30 mm cage systems, Ø1/2" posts, Ø1" posts, and our FiberBench systems.

Click Image to Enlarge									
Item #	H1C	SM1B2	SM087RC(/M)	CP36	SM1RC(/M)	SM1TC	SM2A21	SM3B2	C2RC(/M)
Isolator Diameter	0.865"	0.865"	0.865"	1.2"	1.2"	1.2"	1.2"	2.0"	2.0"
							SM2 Lens		

Mounting Options	FiberBench Systems	SM1 Lens Tubes	Ø1/2" Posts	30 mm Cage Systems	Ø1/2" Posts	Ø1/2" Posts	Tubes or Mechanics with Ø2" Bore	SM3 Lens Tubes	Ø1/2" Posts or Ø1" Posts
Compatible Isolators	IO-3D-405-PBS IO-3D-440-PBS IO-2D-633-VLP IO-3D-633-VLP IOT-3D-633-VLP IO-3D-633-PBS IO-3D-660-VLP			IO-5-405-LP IO-5-440-HP IO-3-488-HP IO-3-532-LP IO-5-532-HP IO-5-560-HP		IO-5-589-HP IO-3-633-LP IO-5-633-VLP IO-5-670-VLP IOT-5-670-VLP IO-5-670-HP		IO-5-488-HP	

The SM3B2 will be retired without replacement when stock is depleted. If you require this part for line production, please contact our OEM Team.

Part Number	Description	Price	Availability
SM087RC/M	Slip Ring for Ø0.865" Optical Isolators, M4 Tap	$25.54	Today
SM1RC/M	Slip Ring for SM1 Lens Tubes and C-Mount Extension Tubes, M4 Tap	$27.56	Today
C2RC/M	Slip Ring for Ø2" (Ø50.8 mm) Components, M4 Tap	$44.85	Today
H1C	FiberBench Adapter for Ø0.865" Free Space Isolators	$55.83	Today
SM1B2	Ø0.865" Isolator to SM1 Adapter	$27.92	Today
CP36	30 mm Cage Plate, Ø1.2" Double Bore for SM1 and C-Mount Lens Tubes	$24.23	Lead Time
SM1TC	Clamp for SM1 Lens Tubes and C-Mount Extension Tubes	$50.18	Today
SM2A21	Externally SM2-Threaded Mounting Adapter with Ø1.20" (Ø30.5 mm) Bore and 2" Outer Diameter	$53.75	Today
SM3B2	Ø2.0" Isolator to SM3 Adapter	$42.76	Today
SM1RC	Slip Ring for SM1 Lens Tubes and C-Mount Extension Tubes, 8-32 Tap	$27.56	Today
C2RC	Slip Ring for Ø2" (Ø50.8 mm) Components, 8-32 Tap	$44.85	Today
SM087RC	Slip Ring for Ø0.865" Optical Isolators, 8-32 Tap	$25.54	Today