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# THORLABS

## **IO-3D-780-VLP Free-Space Isolator**

### **User Guide**



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# Chapter 1 Safety



## WARNING



This isolator contains a powerful permanent magnet. Keep all steel objects and anything affected by a magnetic field at a minimum distance of 2" (50 mm) from the isolator.

The isolator magnet must remain contained by the isolator body.



## WARNING



Any other disassembly of the isolator voids the warranty and can be unsafe.

## Chapter 2 Setup

### 2.1. Unpacking

Please check that you have received the Isolator and a Hex Wrench

**Note:** Thorlabs aligns the isolator for horizontal input polarization unless requested otherwise. Both polarizers are fixed to the rotator case and do not rotate with respect to each other. This dedicates the unit for the user's key wavelength. The isolator is held in the slip ring by a cap screw.

### 2.2. Initial Alignment

- 1) Remove the protective tape from the polarizer cells.
- 2) Place the isolator in the laser beam.
- 3) Place a detector at least 8" from the output polarizer. Center the beam.
- 4) Loosen the cap screw holding the isolator in the slip ring.
- 5) Rotate the isolator until transmission is maximized. This occurs when the input polarizer is aligned to the laser's plane of polarization. Lock down the slip ring cap screw.

### 2.3. Fine Tuning

The IO-3D-780-VLP is a fixed isolator. No fine tuning can be done by the customer.

## Chapter 3 Description

Isolators are used to reduce or eliminate the effects of optical feedback: reflections of a laser's energy back into itself. These effects include noise, amplitude fluctuation, and laser damage. Isolators protect the laser, while maintaining beam alignment and providing maximum forward transmission and reverse isolation.

An isolator consists of a Faraday rotator and at least two polarizers:

### ***Faraday Rotator***

The black cylinder is the **Faraday rotator case**. The Faraday rotator, which rotates non-reciprocally, consists of a magneto-optic material within a magnetic field.

### ***Polarizer Cells***

The small, circular endcaps are the **polarizer cells**. The engraved lines on the cells indicate the axis of polarization. The input cell is aluminum while the output cell is stainless steel. Both polarizers are fixed in place and do not rotate with respect to each other

### ***Housing***

The isolator is mounted in a black slip ring (Item# SM087RC), which has an 8-32 tapped hole for post mounting (an M4 tapped hole is available upon request).

### ***Part Number***

The part number consists of the following:

- **IO** (The Isolator Code)
- **Aperture** (mm, Approximate)
- **Center Wavelength** (nm)
- **Polarizer Type**

Example: an **IO-3D-780-VLP** has a **3 mm aperture**, a **780 nm center wavelength**, and **VLP polarizers**.

### ***Wavelength***

The IO-3D-780-VLP isolator is a fixed wavelength isolator and cannot be tuned. Thorlabs presets the isolator for maximum isolation at the center wavelength. If the laser deviates from this wavelength, rotation is no longer the ideal 45° and isolation decreases. The isolation decreases sharply if the wavelength changes by >1%.

### ***Output Polarization***

This isolator has an output polarization of ~45° relative to that of the input. If another polarization plane is desired (usually horizontal or vertical), 1/2-wave retarders are available. These retarders can rotate the output polarization to any desired linear orientation.

### ***Temperature***

Rotation is affected by both changes in wavelength and temperature. Please contact technical support if you plan to use your isolator at temperatures other than the specified test temperature.

### ***Laser Power***

The safe power limit for this isolator is 25 W/cm<sup>2</sup> (CW) and 300 kW/cm<sup>2</sup> (Pulsed).

## Chapter 4 Operation

### 4.1. Forward Mode

Laser light enters the isolator via the input polarizer and is linearly polarized. This light then enters the rotator, which rotates the plane of polarization  $+45^\circ$ . The beam exits through the output polarizer, whose axis is oriented  $+45^\circ$ .

### 4.2. Reverse Mode

A portion of the random beam reflections will be directed back towards the laser. This feedback re-enters the isolator through the output polarizer and is polarized at  $45^\circ$  with respect to the input beam. This beam is then rotated  $+45^\circ$  by the rotator. The feedback, which is now polarized at  $90^\circ$  relative to the input polarizer, is extinguished, and the laser is effectively isolated from its own reflections.

## Chapter 5 Warranty

All Thorlabs free space isolators are covered by Thorlabs' six-month warranty against defects in materials and workmanship.



### WARNING



**Do not attempt to disassemble the isolator.  
Disassembly of the isolator voids the warranty.**

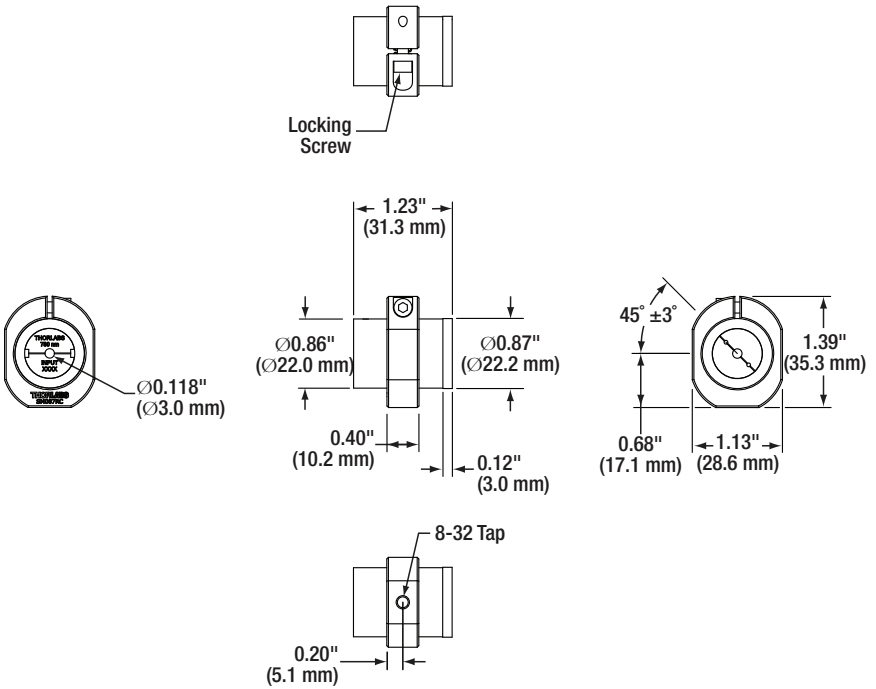
Please contact technical support if you have questions regarding performance or operations. See page 10 for contact information by region.

## Chapter 6 Specifications

Item #	IO-3D-780-VLP
Isolator Type	Fixed Narrowband
Wavelength	780 nm
Tuning Range	N/A
Operating Range	760 - 800 nm
Polarizer Type	Very Low Power (VLP)
Aperture	3 mm
Weight	0.07 kg
<b>Optical Specifications</b>	
Isolation	34 - 40 dB @ 780 nm
Transmission	86% @ 780 nm
Max Beam Diameter	2.7 mm
Max Power	0.7 W
Max Power Density	Blocking: 25 W/cm <sup>2</sup> Transmission: 100 W/cm <sup>2</sup>



# Chapter 7 Drawing



## Chapter 8 Regulatory

As required by the WEEE (Waste Electrical and Electronic Equipment Directive) of the European Community and the corresponding national laws, Thorlabs offers all end users in the EC the possibility to return “end of life” units without incurring disposal charges.

- This offer is valid for Thorlabs electrical and electronic equipment:
- Sold after August 13, 2005
- Marked correspondingly with the crossed out “wheelie bin” logo (see right)
- Sold to a company or institute within the EC
- Currently owned by a company or institute within the EC
- Still complete, not disassembled and not contaminated



**Wheelie Bin Logo**

As the WEEE directive applies to self-contained operational electrical and electronic products, this end of life take back service does not refer to other Thorlabs products, such as:

- Pure OEM products, that means assemblies to be built into a unit by the user (e.g. OEM laser driver cards)
- Components
- Mechanics and optics
- Left over parts of units disassembled by the user (PCB's, housings etc.).

If you wish to return a Thorlabs unit for waste recovery, please contact Thorlabs or your nearest dealer for further information.

### ***Waste Treatment is Your Own Responsibility***

If you do not return an “end of life” unit to Thorlabs, you must hand it to a company specialized in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site.

### ***Ecological Background***

It is well known that WEEE pollutes the environment by releasing toxic products during decomposition. The aim of the European RoHS directive is to reduce the content of toxic substances in electronic products in the future.

The intent of the WEEE directive is to enforce the recycling of WEEE. A controlled recycling of end of life products will thereby avoid negative impacts on the environment.

## Chapter 6 Thorlabs Worldwide Contacts

### USA, Canada, and South America

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