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POLARIZED FIBER OPTIC SOURCES

Features:

- High polarization extinction ratio (up to 40 dB)
- Stable output
- Wide range of available wavelengths
- Rugged and compact design
- Wide range of connector receptacles available
- Optional high power versions
- Optional adjustable output power
- Offered with either diode lasers or super luminescent diodes
- Optional motorized rotator with sub-degree resolution

Applications:

- Extinction ratio measurements
- Polarization Dependent Loss (PDL) measurements
- Product manufacturing and quality control

Product Description:

OZ Optics produces Polarized Fiber Optic Sources **(PFOSS)** in a variety of wavelengths. The standard unit features a receptacle and a rotatable polarizer, allowing one to adjust the polarization axis to any desired angle (Motorized version features a resolution of 0.1 degree). Another version features a polarization maintaining fiber attached, with the output polarization aligned with the slow axis of the fiber. See the Fiber Optic Laser Diode Source data sheet for more details

As an option OZ Optics can include a blocking style optical attenuator to manually change the output. Unlike electrical systems, this method of power control does not affect the spectral properties of the laser diode output. This ensures more repeatable results.

While the PFOSS design is quite stable for standard measurements, sometimes reflections or temperature changes can affect the output power and wavelength for applications where stability is critical. OZ Optics recommends using angled connectors and receptacles for optimum stability. Selecting a super luminescent diode instead of a laser diode can also improve the stability of the polarization reading. Highly Stable Polarized Fiber Optic Laser Sources **(HIPFOSS)**, using Peltier coolers and isolators are also available. See the Highly Stable Polarized Source data sheet for details. Motorized versions **(MPFOSS)** are configured with a motorized rotor controlled via an external touch screen with a dedicated Graphical User Interface (GUI).

Receptacle Style Polarized Fiber Optic Source with Rotatable Polarizer

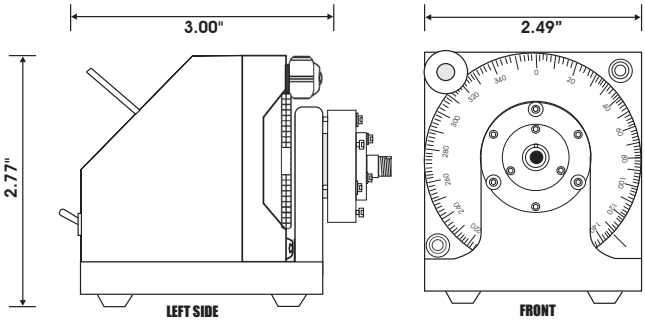

Figure 1: Receptacle Style Polarized Fiber Optic Source With Rotatable Polarizer

Receptacle Style Polarized Fiber Optic Source with Motorized Rotatable Polarizer

Ordering Information For Standard Parts:

Bar Code	Part Number	Description
13508	PFOSS-02-3A-1550-1-ER=40	1550 nm, 1 mW Polarized Fiber Optic Source with a FC/APC receptacle and rotatable polarizer achieving up to 40 dB extinction ratio
11378	PFOSS-02-3-1550-1-ER=40	1550 nm, 1 mW Polarized Fiber Optic Source with a Super/Ultra receptacle and rotatable polarizer achieving up to 40 dB extinction ratio
13509	PFOSS-02-3A-1310-1-ER=40	1310 nm, 1 mW Polarized Fiber Optic Source with a FC/APC receptacle and rotatable polarizer achieving up to 40 dB extinction ratio
13036	PFOSS-02-3-1310-1-ER=40	1310 nm, 1 mW Polarized Fiber Optic Source with a Super/Ultra FC/PC receptacle and rotatable polarizer achieving up to 40 dB extinction ratio
13390	PMJ-3U3U-1550-8/125-1-1-1-ER=30-G	Master patchcord, Ultra FC/PC to Ultra FC/PC, 8/125 um PM 1550 nm fiber, 0.9 mm OD jacketed, 1 meter long with connectors aligned and locked to the slow axis, ER = 30 dB minimum
11998	ER-100-1290/1650-ER=40	Fiber Optic Polarization Extinction Ratio Meter for wavelengths from 1290 nm to 1650 nm. ER = 40 dB
13440	ER-23-1290/1650-ER=40	Super/Ultra FC removable receptacle for ER Meter adapted for wavelengths from 1290 nm to 1650 nm. ER = 40 dB

Standard Product Specifications[1]:

Part number	PFOSS-02-3-1550-1-ER=40	PFOSS-02-3-1310-1-ER=40
Bar Code #	11378	13507
Laser Type [2]	Fabry-Perot Laser	
Central Wavelength [3]	1550 nm ± 20 nm	1310 nm ± 20 nm
Extinction Ratio	40 dB	
Output Power [4]	1 mW	
Polarizer Type	Rotatable	
Spectral Bandwidth [5]	< 5 nm	
Short Term Stability [6]	±0.05 dB	
Long Term Stability [7]	±0.1 dB	
Connector Type	Standard, Super, Ultra NTT-FC/PC receptacle	
Power Variation induced by rotatable polarizer	< 0.25 dB	
Input Voltage	Universal 110/220 Volt AC to DC adapter	
Dimensions	60 x 90 x 190 mm	
Weight	500 gr	
Operating Temperature	0 to 40°C	
Storage Temperature	-20 to 60°C	
Relative Humidity	< 90% RH non condensing	

Note:

[1] Reference condition: 23°C ambient temperature after 30 minutes warm-up period
[2] SLD lasers are also available as a custom order.
[3] Depends on laser diode manufacturer and temperature operation.
[4] For higher output power we recommend ordering a HIPFOSS to improve wavelength and power stability.
[5] Measured at Full Width Half Maximum
[6] 15 minutes at constant temperature and after 30 minutes warm-up period
[7] 6 hours at constant temperature and after 30 minutes warm-up period

Motorized Rotator Standard Specifications[1]

Performance	
Travel	360° Continuous[2]
Bidirectional Repeatability[3]	0.05°
Homing Repeatability	0.1°
Bidirectional Accuracy[4]	0.4°
Backlash	0.013°
Encoder Resolution	143360 counts/360° typical (0.0025°/count)
Minimum Incremental Motion	0.05°
Axis Wobble[5]	0.014°
Maximum Total Load[6]	50 g
Minimum Lifetime[7]	>600 000 Revolutions (100 km)

Note:

1. Performance specifications with a load of 64 g and a moment of inertia of 6600 g·mm2.
2. A duty cycle of 15 sec running should be followed by 20 sec cooling down. A shorter running time requires a shorter cool down time.
3. Maximum difference between clockwise and counter clockwise movement to the same position
4. Maximum deviation from true
5. Maximum deviation from the center of rotation
6. Must be centered in the mount.
7. This rotation stage is not designed for continuous operation

Electrical	
Motor Type	Resonant Piezo
DC Voltage Input	4.5 to 5.5 V
Current Consumption	800 mA typical
Standby Current Consumption	50 mA typical

Communications	
Bus	TTL RS232
Speed	9600 baud
Data Length (1 Stop Bit, No Parity)	8 bit
Protocol Data Format	ASCII HEX

Ordering Examples For Standard Parts:

A fiber optic manufacturer wants to test the quality of their polarization maintaining jumpers at 1550 nm. They need to order the following parts:

Bar Code	Part Number	Description
8695	PFOSS-02-3-1550-1-ER=40	1550 nm, 1 mW Polarized Fiber Optics Source with a Super/Ultra FC/PC receptacle and rotatable polarizer achieving up to 40 dB extinction ratio
11998	ER-100-1290/1650-ER=40	Fiber Optic Polarization Extinction Ratio Meter. ER = 40 dB for 1290 nm to 1650 nm and ER = 30 dB for 850 nm to 1290 nm
13440	ER-23-1290/1650-ER=40	Super/Ultra FC removable receptacle for ER meter for wavelengths from 1280 nm to 1650 nm. ER = 40 dB
13390	PMJ-3U3U-1550-8/125-1-1-1-ER=30-G	Master Patchcord, Ultra FC/PC to Ultra FC/PC, 8/125 um PM 1550 nm fiber, 0.9 mm OD jacketed, 1 meter long with connectors aligned and locked to the slow axis ER = 30 dB minimum

Ordering Information For Custom Parts:

OZ Optics welcomes the opportunity to provide custom designed products to meet your application needs. As with most manufacturers, customized products do take additional effort so please expect some differences in the pricing compared to our standard parts list. In particular, we will need additional time to prepare a comprehensive quotation, and lead times will be longer than normal. In most cases non-recurring engineering (NRE) charges, lot charges, and a 1 piece minimum order will be necessary. These points will be carefully explained in your quotation,so your decision will be as well-informed as possible. We strongly recommend buying our standard products.

Questionnaire For Custom Parts:

1. What wavelength do you need?
2. What connector type are you using?
3. How much optical power do you need launched into your fiber?
4. What should be the minimum polarization extinction ratio of the source?
5. Do you want a fixed or rotatable polarizer?

Receptacle Style PFOSS: ***PFOSS-0A-X-W-P(-ER=YY)(-LD)***

A = Source type: 1 for fixed polarization
2 for Rotatable Polarization

X = Connector code:
- 3 = Standard, Super or Ultra NTT-FC/PC receptacle
- 3A = Angled NTT- FC/PC
- SC = SC
- SCA = Angled SC
- 8 = AT&T-ST
- MU = MU type connector
- LC = LC type connector
- 1.25U = Universal Receptacle for 1.25 mm OD connector ferrules (LC, MU)
- 2.5U = Universal Receptacle for 2.5 mm OD connector ferrules (ST, FC, SC)

LD = Laser Diode type.
Add SLD for SLD type
None for Fabry-Perot type.

YY = Extinction ratio. Add this only for ER > 30 dB. Specify 35 or 40 dB. If not specified, the extinction ratio is greater than or equal to 30 dB. ER = 35 dB or 40 dB is only available for 980 nm, 1064 nm, 1290-1625 nm.

P= Output power, in mW 1 mW is standard

W = Wavelength in nm: 635, 650, 685, 780, 830, 850, 980, 1064, 1310,1480,1550,1625, 2050

Receptacle Style Motorized PFOSS: ***MPFOSS-02-X-W-P(-ER=YY)(-LD)***

X = Connector code:
- 3 = Standard, Super or Ultra NTT-FC/PC receptacle
- 3A = Angled NTT- FC/PC
- SC = SC
- SCA = Angled SC
- 8 = AT&T-ST
- MU = MU type connector
- LC = LC type connector

LD = Laser Diode type.
Add SLD for SLD type
None for Fabry-Perot type.

YY = Extinction ratio. Add this only for ER > 30 dB. Specify 35 or 40 dB. If not specified, the extinction ratio is greater than or equal to 30 dB. ER = 35 dB or 40 dB is only available for 980 nm, 1064 nm, 1290-1625 nm.

P= Output power, in mW 1 mW is standard

W = Wavelength in nm: 635, 650, 685, 780, 830, 850, 980, 1064, 1310,1480,1550,1625, 2050

Notes:

1. For Highly Stable Polarized Sources **(HIPFOSS)** which include an isolator and Peltier cooler circuit please refer to the Highly Stable Polarized Source data sheet
2. Add **-BL** to the part number to have blocking style attenuator added to the PFOSS
3. Add **-ISOL** to the part number for an isolator. For wavelengths less than 1290 nm, order a HIPFOSS instead

Ordering Information For Custom Parts:

A European manufacturer of fiber optic circulators wants to test the extinction ratio of their polarization maintaining jumpers at 980 nm prior to pigtailing them to their integrated waveguides. They need to order the following parts:

Bar Code	Part Number	Description
35878	PFOSS-02-3A-980-2-ER=35	980 nm, 2 mW Polarized Fiber Optic Source with an angled FC receptacle, rotatable polarizer, achieving over 35 dB extinction ratio
19489	ER-100-980/1060-ER=40	Fiber Optic Polarization Extinction Ratio Meter without receptacle for wavelengths from 850 to 1650 nm. With 40 dB ER across 980 to 1060 nm and ER = 35 dB elsewhere
19488	ER-23A-980/1060-ER=40	Angle FC removable receptacle for ER Meter achieving up to 40 dB extinction ratio for wavelengths from 980 nm to 1060 nm
17411	PMJ-3A3A-1060-6/125-3-1-1-ER=30-G	Master PM patchcord, 1 meter long, 3 mm OD jacketed, 6/125 um 1060 nm PM fiber, terminated with FC/APC connectors on both ends which are pre-aligned and locked to PM slow axis. ER = 30 dB on best effort basis

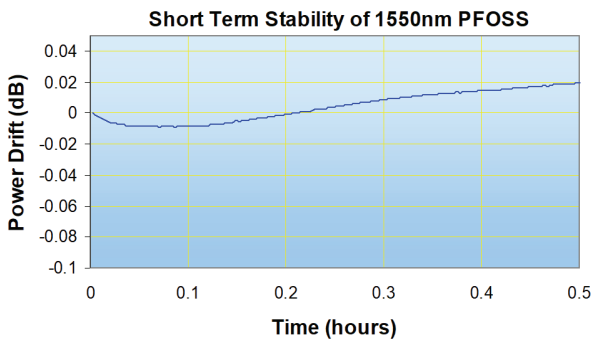

Figure 2. PFOSS Stability Test

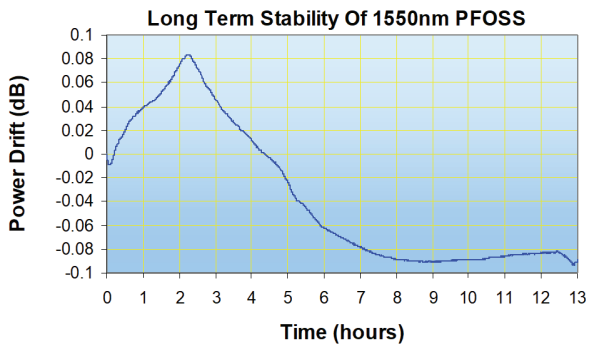

Figure 3. PFOSS Stability Test

Frequently Asked Questions (FAQs):

Q: My source has a receptacle for FC connectors. Will it work with connectors that have either FC/PC finish or FC/APC finish?

A: If you connect a fiber with an angled FC (APC) connector to your source, you should expect a significant drop in the output power. This is because the source is designed to focus light to a point in space where the tip of the fiber is supposed to be. A stop inside the receptacle stops the ferrule at the correct distance. However, because the end of the connector ferrule is angled, the fiber will not be located in the correct position.As a result the light will not be correctly focused onto the fiber, and more of the light will go into the cladding instead. While this will reduce the overall power, if the fiber is long enough to attenuate all the cladding modes, the output should remain stable during operation. Short fibers, especially those less than one meter long, will likely transmit some cladding modes, which will show up as an unstable output signal.

Q: I purchased a source with a receptacle for FC/APC connectors, and I am using a patchcord with an FC/APC connector on the end, but I still don't seem to get the same power as listed on your test report. Why?

A: Not all APC connectors are the same. The angle at which they are polished can vary by ±0.5 degrees. The raduis at which they are polished can vary from 5 to 12 mm. The tip of the connector may be cone shaped, or have straight side walls. Because of these variations, the position of the fiber core within the receptacle may vary from fiber to fiber. This will in turn reduce your coupling efficiency.

Q: Do you offer 1.25 mm and 2.5 mm ID universal adaptors for your sources?

A: We can, but we do not recommend them. Universal adaptors do not have a retaining mechanism, so the fiber can fall out if you do not hold it in place. In addition, the lack of a retaining mechanism will cause the coupled power from the source to be unstable. Universal receptacles can be used in applications where you are not concerned with the power stability, such as visible sources for fault location, or PFOSS or HIPFOSS polarized sources for PM fiber patchcords.

Q: What is the maximum output power of the PFOSS?

A: The maximum output power is 1 mW for the standard PFOSS. For higher power sources, refer to the Highly Stable Polarized Source data sheet.

Q: Does OZ Optics provide sources using super luminescent diodes?

A: Yes we can offer the super luminescent diodes (SLD) in our PFOSS products. The broad wavelength bandwidth of 10 to 25 nm at Full Width Half Maximum (FWHM) will allow a more stable ER value in comparison to PM sources using Fabry-Perot or DFB laser diodes. Units built with SLDs are however more expensive and lead-time to produce them is longer.

Application Notes:

Using Bare Fibers With PFOSS And HIPFOSS Sources

In many applications it is necessary to connect fibers that do not have a connector attached (bare fiber) to an optical source. With the receptacle style polarized sources the easiest way to do this is with an FC bare fiber adapter (Part number BARE-03-126, Bar Code #1816), or our magnetic style FC bare fiber adaptor Part number BARE-03-127-M, Bar Code #44190). These adaptors are essentially an inexpensive way to temporarily put an FC connector onto the end of a fiber. For more details refer to our Bare fiber adaptors datasheet: https://www.ozoptics.com/ALLNEW_PDF/DTS0003.pdf

To use a bare fiber adapter, one strips, cleans and cleaves the fiber end to be tested, and inserts it into the rear of the adapter. The fiber is pushed in until it is flush with the end of the ferrule, and then a clamp holds the fiber in place. The fiber can then be inserted into the receptacle like a standard FC connector.

Using this technique, expect coupling efficiencies to be somewhat lower. Often coupling efficiencies are only 25% of the optimum value, although this depends somewhat on the skill of the operator. This should not affect extinction ratio measurements. Also, since the fiber is not aligned withrespect to the key on the connector, the polarization angle from the source may have to be adjusted to line it up with the fiber.

Finally, never use a bare fiber adaptor to connect one fiber to another fiber, or to connect a fiber to a source or detector that has a fiber stubinside. Doing so will likely scratch or damage the fiber inside the source or detector, leading to expensive repairs.