Fiber In-Line Phase Shifter/Time Delay

fiber stretch, up to 7π - 55π, 400nm to 2600nm, piezoelectric

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The Piezoelectric Fiber Phase Shifter (PFPS) provides a variable optical phase shift or time delay of up to 100 mm by stretching an optical fiber using a piezoelectric actuator. It utilizes a polyimide-coated fiber to achieve low insertion loss and high reliability. A compact driver is available for convenient device integration, offering 0–5 V control with modulation frequencies up to 1 kHz via an SMA input, and powered by a 12 V DC supply. Designed for fast, continuous operation, the PFPS enables large phase excursions near its mechanical resonance, reducing the required drive power for applications requiring strong phase modulation. Each unit is fully tested and calibrated prior to shipment, ensuring a robust and cost-effective solution for precision fiber-optic phase shifting. For high-speed operation, the use of a heat sink is recommended.

The piezoelectric device's response is not linear and not repeatable. It is typically used for broad scanning or using a feedback controller for precision.

Features

- Large Phase Shift
- High Reliability
- Low Insertion Loss
- Compact Size
- High Optical Power Handling

Applications

- Fiber Sensor
- Fiber Interferometer
- Fiber Laser
- Instrumentation

Specifications

Parameter	Min	Typical	Max	Unit
Wavelength	400		2650	nm
Insertion Loss [1]	0.1	0.5	0.8	dB
Polarization Mode Dispersion			0.05	ps
Polarization Extinction Ratio (PM)	18		29	dB
Return Loss	65			dB
Response Time Rise/Fall	30			μs
Thermal Drift		0.1	0.3	%/°C
Operating Optical Power		0.5	1	W
Operation Frequency	DC	0.2	5	kHz
Resonance Frequency		35		kHz
Residual Amplitude Modulation			0.02	dB
Phase Change [2]	7	8	55	π
Time Delay [2]	0	7	80	μm
Control Voltage [2]	0	20	100	V
Capacitance of Piezo	2	5	12	nF
Operating Temperature		–20 ~ 60		°C
Storage Temperature		–40 ~ 85		°C

Notes:

[1]. Excluding connectors. Connectors ad 0.3dB.

[2]. @1550nm. Warning: Do not apply a voltage exceeding 100V, as this may damage the device.

RoHS COMPLIANT

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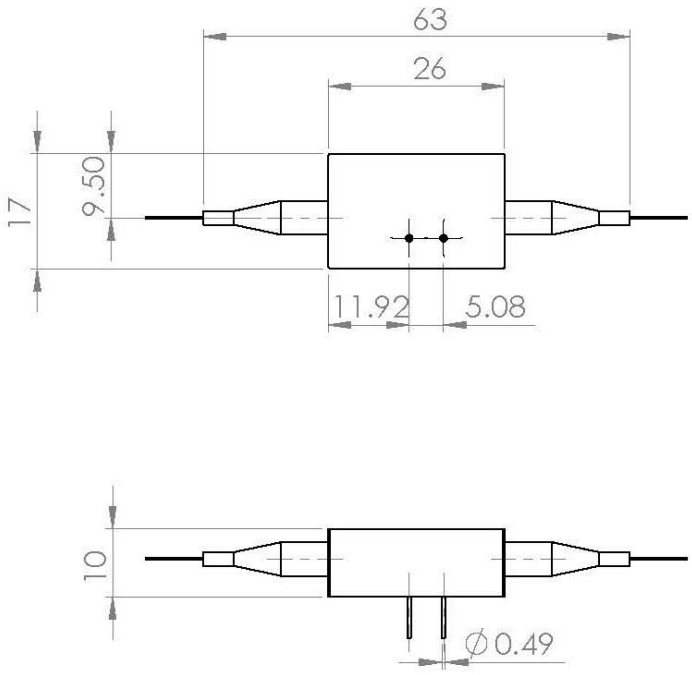
Mechanical Dimensions (mm)



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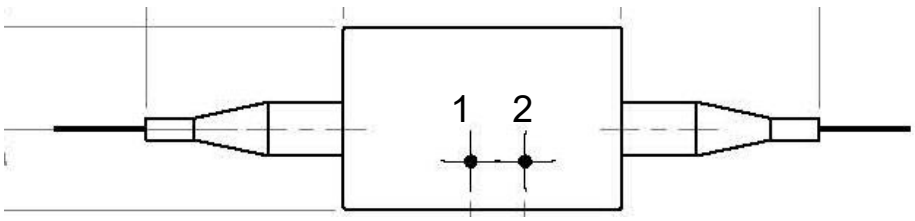
Electrical Driver Pin Definition

Pin #	Connection
1	+
2	0



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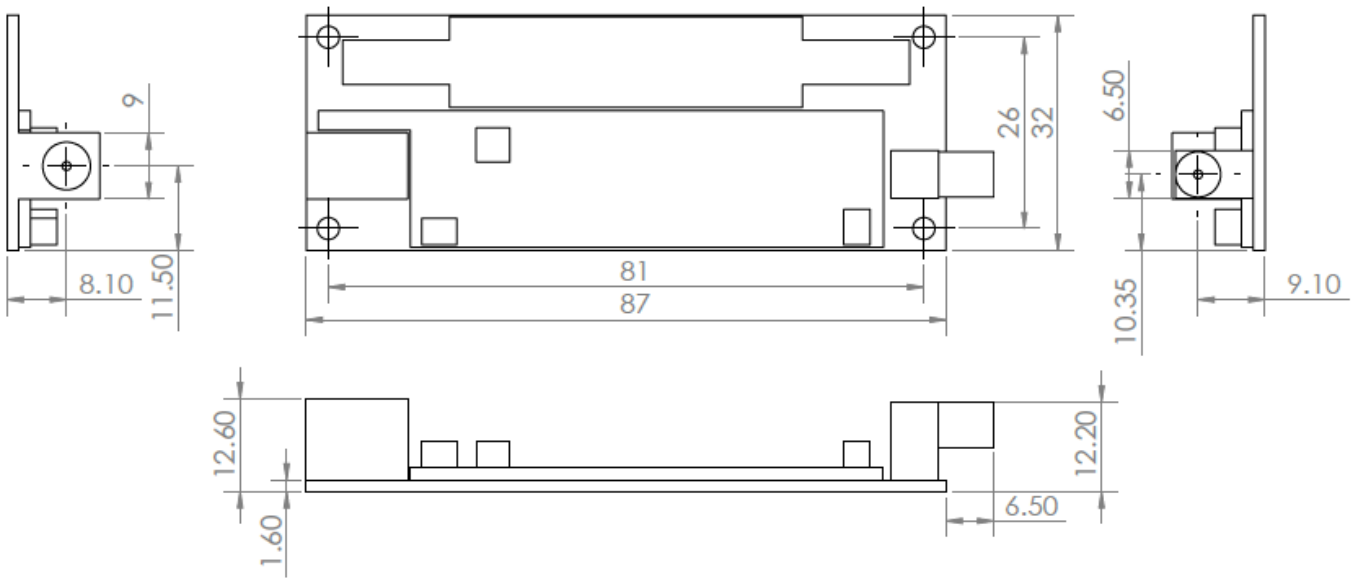
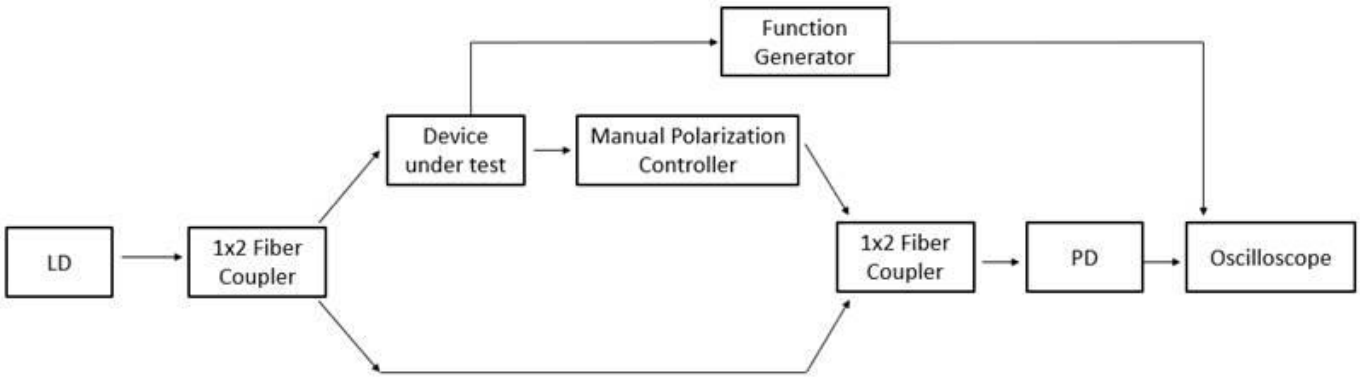
Module Dimensions (mm) with Driver PCB and Regular Power NSVS



2kHz Driver (87mm x 32mm)

Typical Test Set-Up (For PM version all components must be PM fiber



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Ordering Information (Part Number)

	☐	☐	☐	☐☐	☐	☐	☐	☐
Prefix	**Phase Delay [0]**	**Test Wavelength**	**Driver[5]**	**Fiber Type**	**PER**	**Fiber Cover [1]**	**Fiber Length**	**Connector [2] [4]**
PFPS-	7 π = 1 21 π = 2 55 π = 5 100 π = A Special = 0	360 nm = A 430 nm = B 488 nm = 4 532 nm = 5 630 nm = 6 780 nm = 7 850 nm = 8 980 nm = 9 1060 nm = 1 1310 nm = 3 1550 nm = C 2000 nm = 2 2.3-4.1 µm = F	Component = 1 Mounted on driver = 2 Module = 3 Benchtop = 4 Special = 0	***Select Below***	Non = 1 18dB = 2 22dB = 3 29dB = 4	0.9mm Tube = 1 Bare Fiber = 2 Special = 0	0.25m = 1 0.5m = 2 1.0 m = 3 Special = 0	None = 1 FC/PC = 2 FC/APC = 3 LC/PC = L Special = 0

Notes:

[0]. @1550nm

[1]. Bare fiber can not put on connectors due to its fragility

[2]. Regular fiber connector has PER ~22dB. Connector with PER >27 dB is available using special process

[3]. Benchtop is a protected Turnkey system including a power supply with 100-240 ACV input

[4]. The default connector configuration uses fiber with 0.9 mm buffer protection. The connector cannot be installed directly onto bare fiber because the bare fiber is prone to damage during shipping. However, the connector can be assembled on bare fiber if a 3 cm protective loose tube is added for reinforcement. The customer may remove this protective tube after testing. The optical power handling of a standard connector is less than 0.5 W for SMF-28 fiber and decreases further for smaller-core fibers.

[5]. The component format is designed for OEM integration. For laboratory and university use, only the benchtop protected version has one year warranty.

Fiber Type Selection Table:

01	**SMF-28**	34	**PM1550**	71	**MM 50/125µm**
02	**SMF-28e**	35	**PM1950**	72	**MM 62.5µm**
03	**Corning XB**	36	**PM1310**	73	**105/125µm**
04	**SM450**	37	**PM400**	74	**FG105LCA**
05	**SM1950**	38	**PM480**	75	**FG50LGA**
06	**SM600**	39	**PM630**	76	**STP 50/125**
07	**780HP**	40	**PM850**	77	**IRZS23**
08	**SM800**	41	**PM980**	78	**IRZS32**
09	**SM980**	42	**PM780**		
10	**Hi1060**	43			
11	**SM400**	44	**PM405**		
12		45	**PM460**		
13		46			

Driver PCB ($790 extra)

The Piezoelectric Driver is a PCB designed to mount the Fiber Phase Shifter (PIPS). It features an SMA analog control input capable of modulation speeds up to 1 kHz. The applied voltage is adjustable from 10 to 120 V via a resistance potentiometer on the PCB. A wall-pluggable 12V DC power supply is included. Enclosure is also available at extra.

Warning: do not touch the PCB at any time to void static damage and unpleasant electrical shock.

Operation Instructions – With Driver

1. Connect the optical fibers to the designated input/output ports.
2. Plug in the supplied DC power supply.
3. Apply a 0–5 V control signal to the SMA connector to operate the device.
4. The unit is fully tested before shipment and will function upon proper connection.
5. Do not adjust any PCB settings — doing so may permanently damage the piezoelectric actuator.
6. Do not touch the PCB directly by hand, as this may damage sensitive semiconductor components. For laboratory use, we recommend ordering the benchtop version with protective enclosure.

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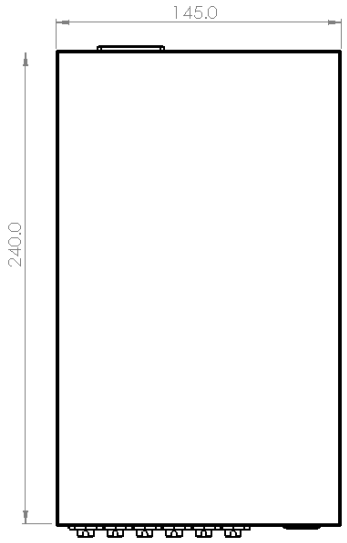
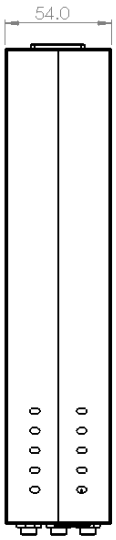
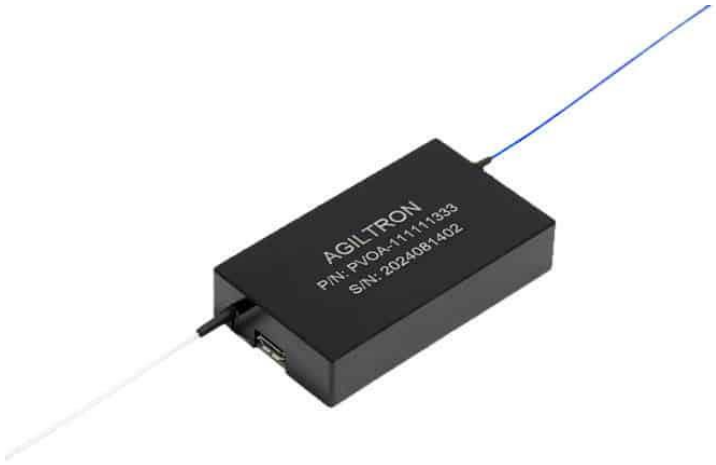
Benchtop: Plug-Play 100-240VAC, USB ($1490 extra)





Module: Plug-Play with Wall Pluggable DC Power Supply (included) ($690 extra)



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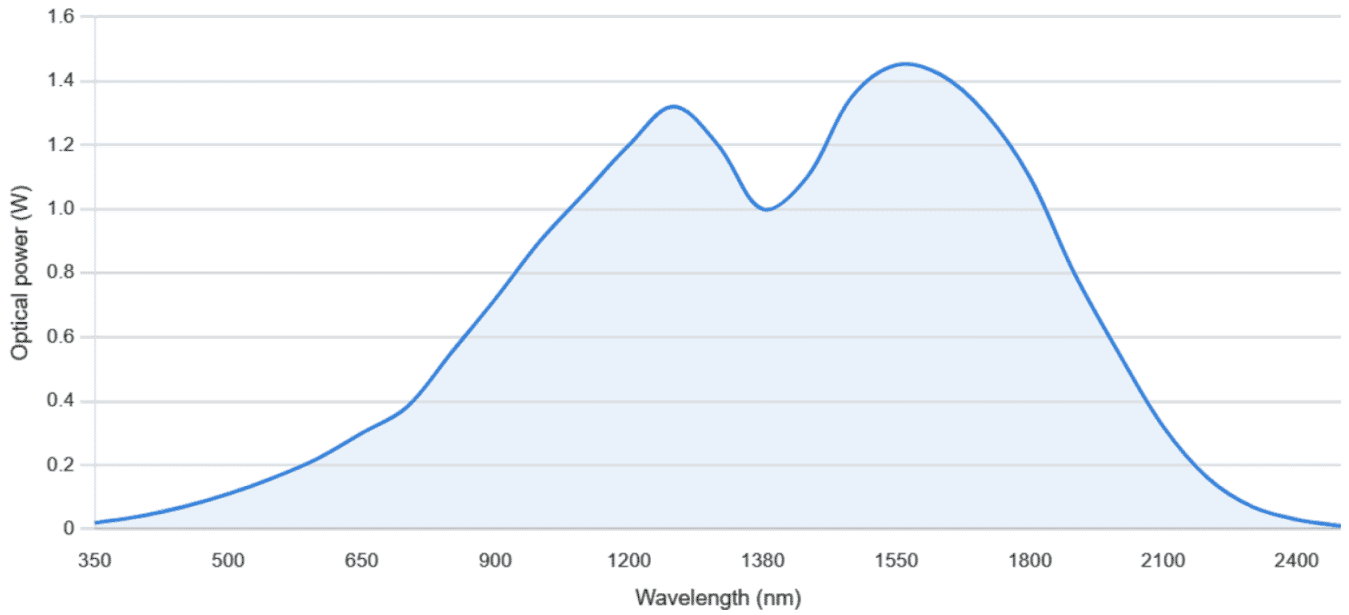
Regular Single Mode / Polarization Maintaining Fiber Optical Power Handing vs Wavelength



Single mode fiber optical power is limited by nonlinear effects in addition to absorption that increase loss and generate heat. The curve shows the approximate safe CW power envelope for standard single-mode fiber. Actual limits depend on fiber design, core size, length, and laser characteristics. Specialty fibers can significantly increase the power limit.

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