Making Light Work Lighter

General Photonics Corporation

FPS-002

Fiber Phase Shifter

Instruction Note

Version 1.1

May 9, 2018

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SAFETY NOTES

1. The drive voltage for the FPS-002 can be up to 150V. Be careful when using high voltages. Never touch the cable or connector when electrical power is on. Make sure that the power is turned off when connecting or disconnecting cables.
2. Make sure that the case ground (pin 4) is connected.
3. Make sure that the polarity of the connection between the piezo driver and the FPS-002 electrical input is correct. Do not apply a negative voltage to the piezo.

Section 1. Specifications:

Wavelengths	1550, 1310, 1060, or 780nm
Fiber Type	SM: 1310/1550nm: Corning ClearCurve ZBL or equiv. 1060nm: Corning HI1060 or equiv. 780nm: Nufern 780HP or equiv. PM: 1550nm: Bend insensitive PM with MFD=6.5μm 1310nm: Bend insensitive PM with MFD=6.0μm 1060nm: Nufern PM 980XP or equiv.
Insertion Loss	<0.5 dB (at λc, excluding mode coupling loss and connectors)
Return Loss	>58 dB without connectors >55 dB with APC connectors >50 dB with PC connectors)
Total Phase Shift @500Hz, Vpp=150V	>65π (at 1550nm)
Half Wave Voltage (V_π) @500Hz	2.5-4.5V typical (small frame) 0.7-1.5V typical (large frame)
Resonance Frequency	8-14kHz typical
V_π @resonance frequency	0.1-0.5V typical
PDL	SM: <0.05 dB PM: <0.1 dB
PER	PM: >18 dB with connectors
Residual Amplitude Modulation	±0.01 dB (at 1550nm)
Capacitance of Piezo	0.18μF
Maximum Applied Voltage	150V
Electrical Interface	Molex WM9131-ND or equivalent
Operation Temperature	0 to 50° C
Storage temperature	−40° to 85° C
Fiber Length (Internal)[1]	36 ± 2 cm (small frame) 93 ± 2 cm (large frame)
Dimensions	Small frame: 35.0 (L) × 17.0 (W) × 10.0 (H) mm Large frame: 45.0 (L) × 27.0 (W) × 11.0 (H) mm

Notes: Unless otherwise stated, specifications in this table are for devices without connectors at 23±5°C.

1. From edge of enclosure at input port to edge of enclosure at output port, not including boots or pigtails. Total fiber length including pigtails will be provided in test data for each FPS-002.

Section 2. Overview

The FPS-002 is a high speed, long range phase shifter with a range of up to 65π and an operating frequency range of 0 to 20 kHz. It was designed to have a low Vπ both at resonance and off-resonance, so that it can be driven with a standard function generator to achieve phase shifts of a few π, or with a high voltage driver for larger phase shifts.

The device is piezo driven, and the phase shift is achieved by stretching the fiber. Since the complete optical path is in fiber, the insertion loss and back reflections are low, and different types of fiber are available for different applications.

Figure 1 FPS-002 phase shifter

2.1 Electrical Interface

Electrical Interface: Ribbon cable with 4-pin connector
Electrical Connector: Molex WM9131-ND or equivalent

Electrical connector pinout:

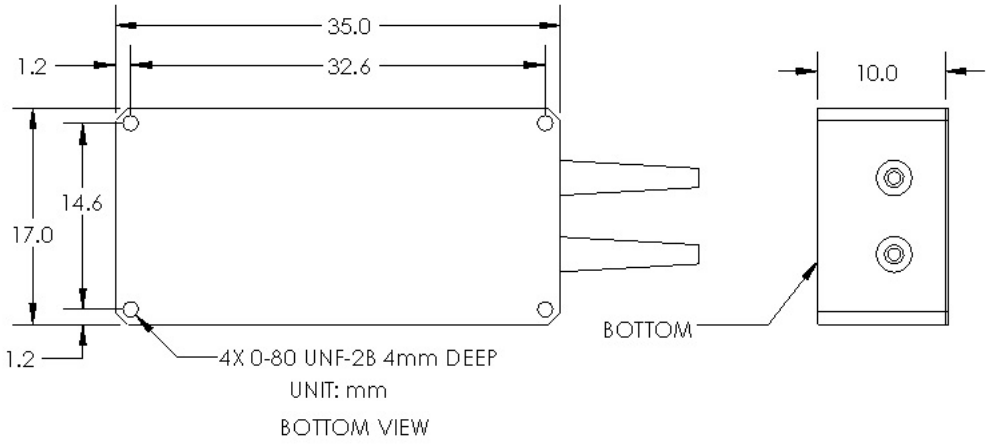
Pin	Function
1	Positive
2	Not in use
3	Negative
4	Case

Pin 1 is marked with a triangle on the connector.

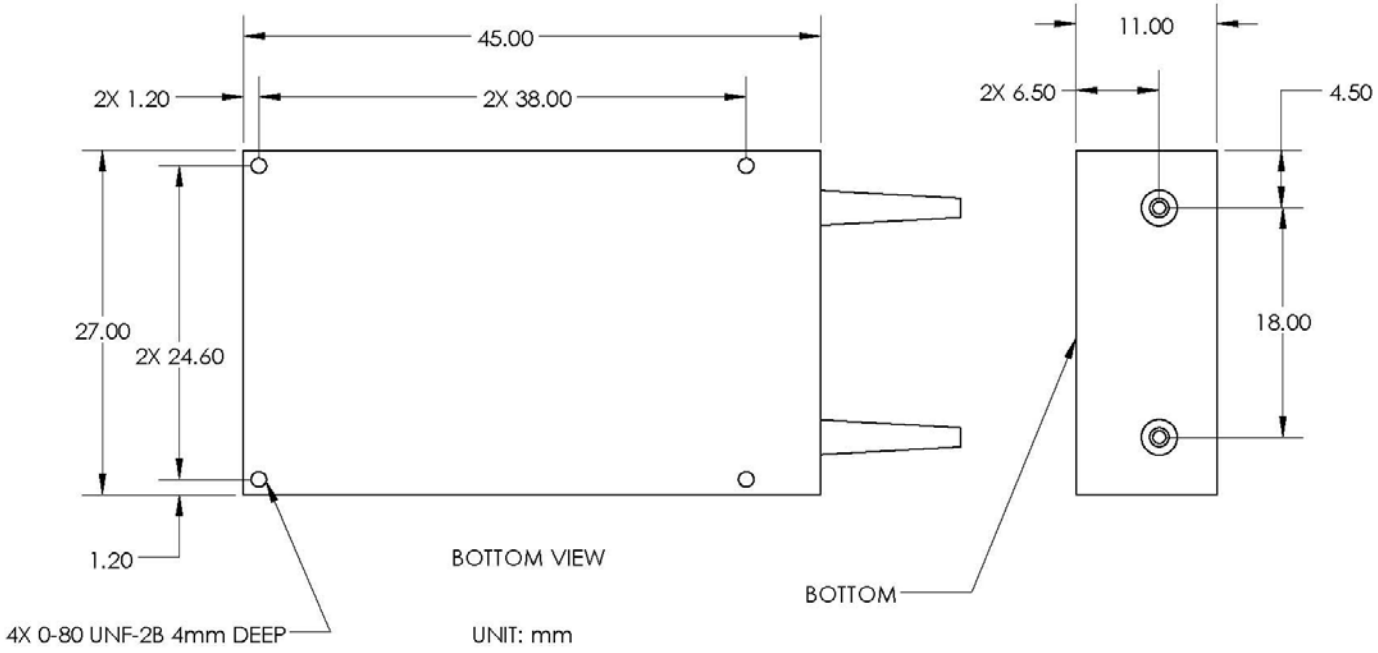
2.2 Optical Interface

The FPS-002 has 2 fiber pigtails for the input and output signals. Input and output are interchangeable.

2.3 Mechanical Dimensions



a) Smaller package



b) Larger package

Figure 2 Mechanical dimensions of FPS-002

Two versions of the FPS-002 package are available. The package size used is chosen for compatibility with the bend radius requirements of the fiber used. Figure 2 shows the mechanical dimensions of the FPS-002 packages, including the size and locations of mounting holes. There are 4 mounting holes, one at each corner. 0-80 screws can be used for mounting.

Section 3. Operation Instructions:

3.1 Getting started

Unpacking

Inspect FPS-002 for any physical damage due to shipping/transportation. Contact carrier if any damage is found. Check the packing list to see if any parts or accessories are missing.

Initial setup

1. Before connecting to the FPS-002, set up the input signal parameters on the piezo driver. Make sure that the output voltage is not negative and does not exceed +150V. With the piezo driver powered off, connect the piezo driver to the FPS-002 electrical cable. Make sure that the polarity is correct.
2. Ground the case ground pin (pin 4).
3. Connect input and output fibers to FPS-002. It is important to clean the fiber connectors using industry standard procedures before connecting them. Make sure that the light source is turned off during connector cleaning.
4. Turn on the light source and power on the piezo driver.

   Note: For interferometric applications, make sure that all fibers are fixed in position and cannot move during measurement. This can be done by taping them to the optical table.

3.2 Operation

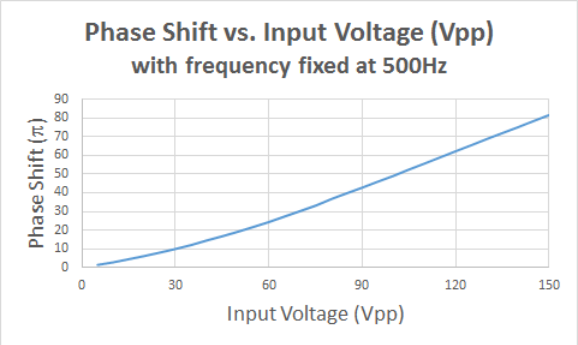
The FPS-002 uses a piezo with a capacitance of about 0.18 μF.

The drive signal source can vary depending on the required phase shift and drive frequency. For small phase shifts (a few π), a function generator can be used as the drive signal source. To use the full range of the phase shifter, the drive signal source should be able to provide a sine wave drive signal with a peak-to-peak voltage of up to 150V, at a bandwidth of 20 kHz.

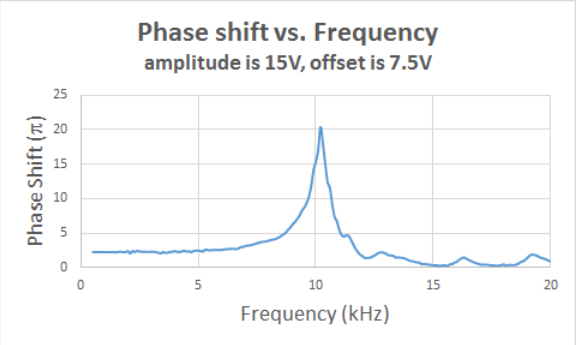
1. **Never apply a voltage higher than 150V to the FPS-002. Do not apply a negative input voltage to the FPS-002. Be careful when using high voltages. Do not touch the cable or connector when the power is on.**

2. Adjust the piezo driver voltage to achieve the desired delay at the desired modulation frequency. See
3. Figure 3 for typical performance data.

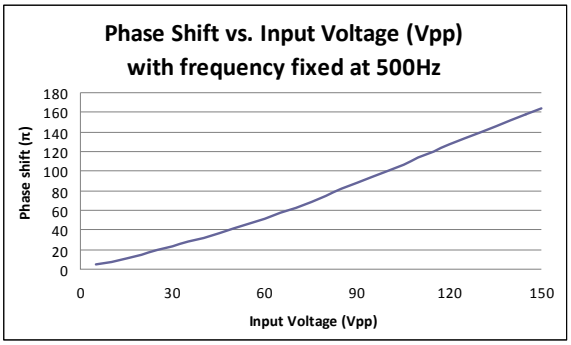
4. Turn off the electrical drive signal and light source when the FPS-002 is not in use.



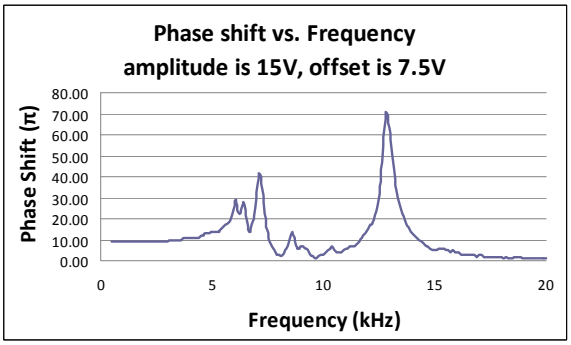
(a) SM fiber on small frame tested at 1550nm



(b) SM fiber on small frame tested at 1550nm



(c) PM fiber on large frame tested at 1550nm



(d) PM fiber on large frame tested at 1550nm

Figure 3 Typical performance data.

Section 4. Technical Support

The FPS-002 can be serviced only by manufacturer authorized personnel. There are no user serviceable components in this system.

General Photonics is committed to high quality standards and customer satisfaction. For any questions regarding the quality and the use of the FPS-002, or future suggestions, please contact General Photonics Corporation at (909)-590-5473 (telephone) or (909)-902-5536 (fax), or by e-mail at support@generalphotonics.com. General Photonics will respond to all customer questions within 24 hours during regular business hours. You can also write to:

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