

FPS-003

Fiber Phase Shifter

Instruction Note

Version 1.0



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CAUTION

1. Make sure that the polarity of the connection between the piezo driver and the FPS-003 electrical input is correct. Do not apply a negative voltage to the piezo.

Section 1. Specifications:

Wavelengths	1310/1550, 1060, or 780nm
Fiber Type	1310/1550nm: Corning ClearCurve ZBL or equivalent 1060nm: 980-1550nm fiber with MFD 5 μ m at 980nm 780nm: Nufern 780HP or equivalent
Insertion Loss	<0.5 dB (at λ_c , excluding connectors)
Return Loss	>55 dB (excluding connectors)
Total Phase Shift @500Hz, $V_{pp}=150V$	>55 π (at 1550nm)
Half Wave Voltage (V_π) @500Hz	1-3V typical
Resonance Frequency	36-39kHz typical
V_π @resonance frequency	<150mV typical
PDL	<0.05 dB at 1550nm
Residual Amplitude Modulation	± 0.01 dB (at 1550nm)
Capacitance of Piezo	5-12 nF
Maximum Applied Voltage	150V
Drive Frequency Range	0-60 kHz
Electrical Interface	Molex WM9131-ND or equivalent
Operation Temperature	10 to 50 $^\circ$ C
Storage temperature	-40 $^\circ$ to 85 $^\circ$ C
Total Fiber Length	500 \pm 10 cm
Dimensions	31.0 (L) x 31.0 (W) x 14.5 (H) mm

Section 2. Overview

The FPS-003 is a high speed phase shifter specially designed with an operating frequency range of 0 to 60 kHz. In addition, it has a low V_{π} 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. It has an off-resonance phase shift range of up to 55π .

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-003 phase shifter

2.1 Electrical Interface

Electrical Interface: Ribbon cable with 4-pin connector

Electrical Connector: Molex WM9131-ND or equivalent

Mating Connector: Molex WM4802-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-003 has 2 fiber pigtailed for the input and output signals. Input and output are interchangeable.

2.3 Mechanical Dimensions

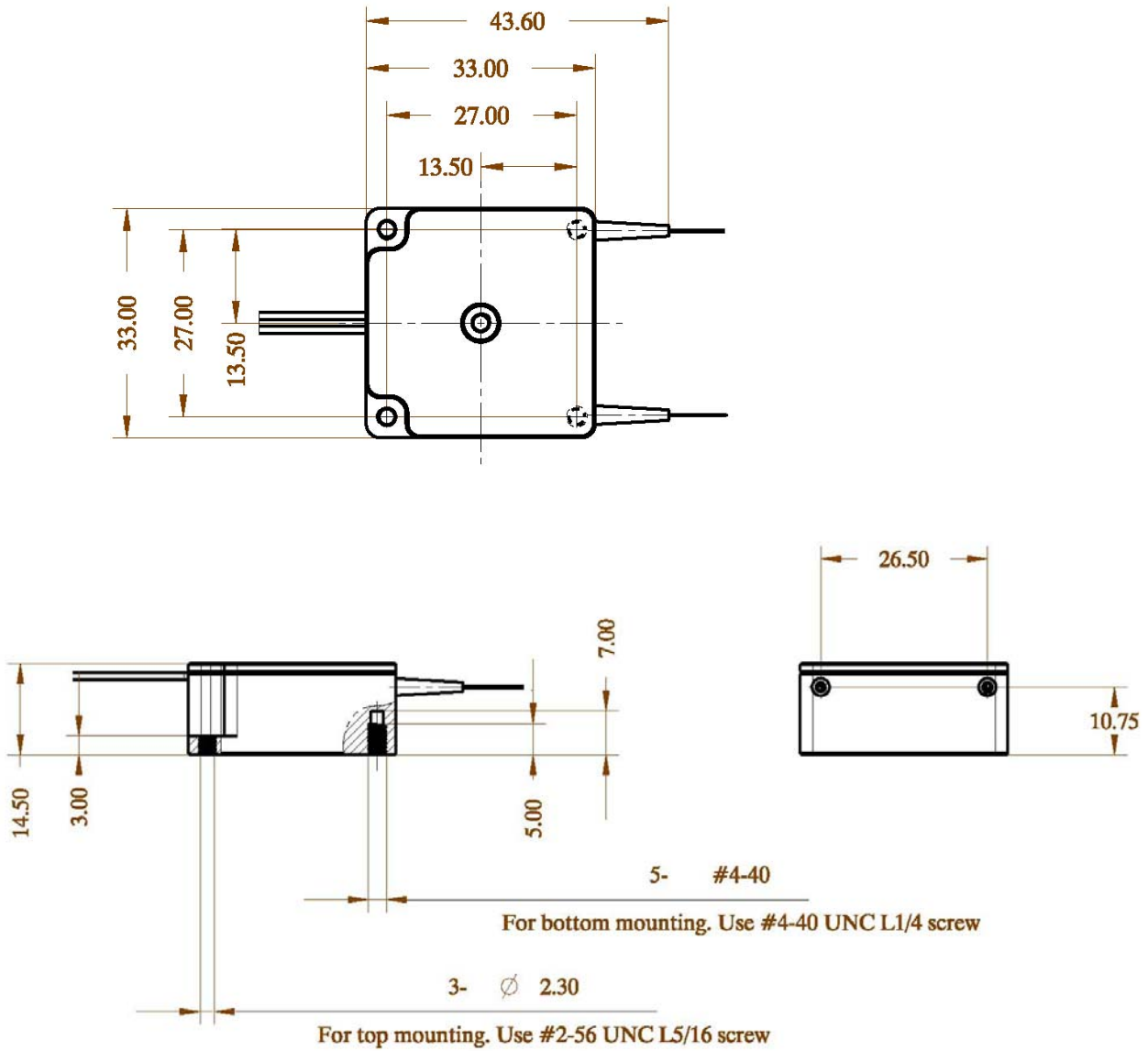


Figure 2 Mechanical dimensions of FPS-003, in mm

Figure 2 shows the mechanical dimensions of the FPS-003, including the size and locations of mounting holes.

For bottom mounting (screws inserted upwards from the bottom), use 5 #4-40 UNC L1/4 screws. The mounting holes used are the 4 corner holes (2 through holes and 2 blind holes) and one in the center.

For top mounting (screws inserted downwards from the top), use 3 #2-56 UNC L5/16 screws. The mounting holes used are the two corner through holes and the center hole.

Section 3. Operation Instructions:

3.1 Getting Started

Unpacking

Inspect FPS-003 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-003, 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-003 electrical cable. Make sure that the polarity is correct.
2. Connect input and output fibers to FPS-003. 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.
3. 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-003 uses a piezo with a capacitance of about 8 nF (see test data for exact value).

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 60 kHz.

1. **Never apply a voltage higher than 150V to the FPS-003. Do not apply a negative input voltage to the FPS-003.**
2. Adjust the piezo driver voltage to achieve the desired delay at the desired modulation frequency. See Figure 3 to Figure 5 for typical performance data for FPS-003s with different types of fiber.
3. Turn off the electrical drive signal and light source when the FPS-003 is not in use.

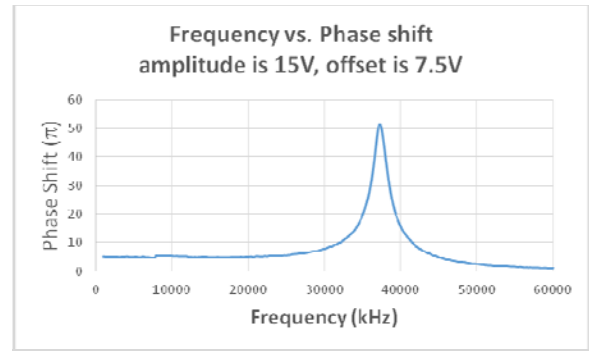
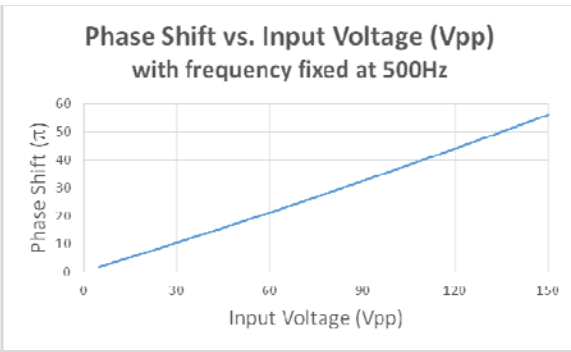


Figure 3 Typical performance data for 1310/1550nm SM FPS-003 (tested at 1550nm).

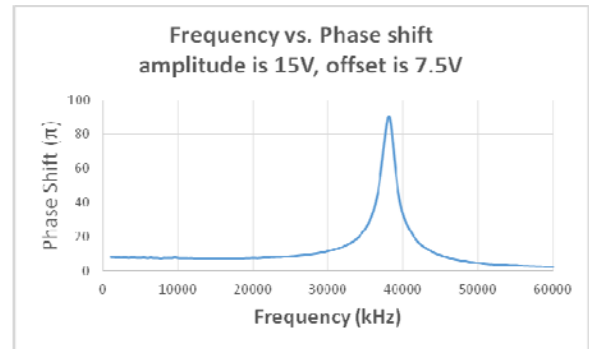
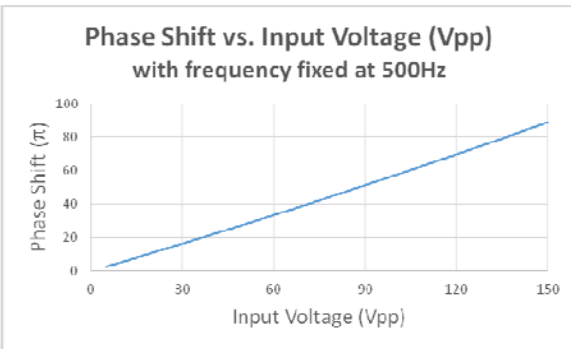


Figure 4 Typical performance data for 1060nm SM FPS-003 (tested at 1064nm).

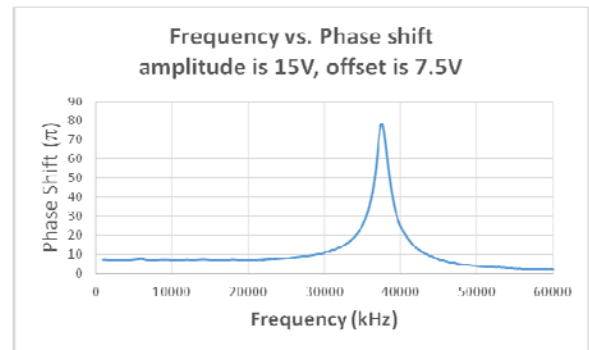
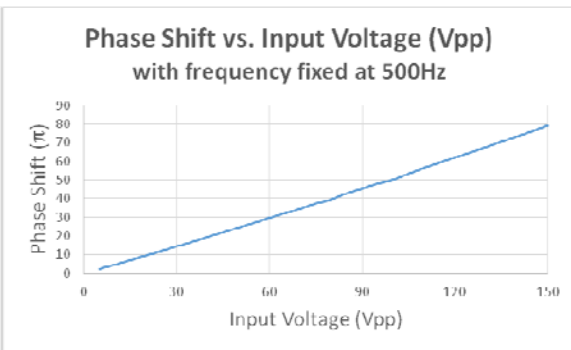


Figure 5 Typical performance data for 780nm SM FPS-003 (tested at 1064nm).

Section 4. Technical Support

The FPS-003 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-003, 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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