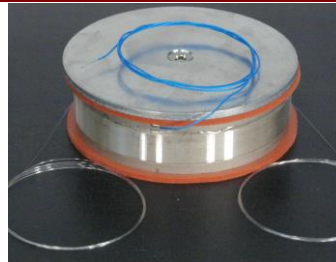
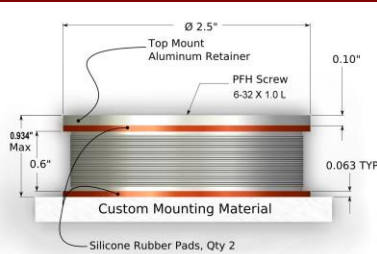


The **OPTIPHASE PZ3** is the mid-range member of our family of fiber stretchers. It is a fiber wound piezoelectric element for use in a wide range of optical interferometric measurement and sensing system applications. Typical uses include open loop demodulation, sensor simulation, variable optical delay, general purpose fiber interferometry and large angle modulation of interferometric phase.

Optiphase's expertise in the design, manufacture and use of all-fiber interferometers has produced a unique multi-layer winding approach resulting in an enhanced modulation function while maintaining a high operational frequency [see charts]. PZ3 Fiber



Stretchers are available with SM, commercial PM [PANDA or Bowtie] or RC [SM Reduced Cladding] fiber types. Fiber stretchers with connectors are housed in an enclosure, making set-up and use quick and easy. These fiber stretchers are unique in that they do not require proprietary drivers. For most low voltage applications (< ± 15V) our stretchers can be driven by standard electronics such as signal generators, op-amps or other laboratory equipment without modification. For more information on how to drive PZ3 stretchers see page 2.



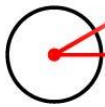
**Bare Lead Fiber Stretcher with Mounting Kit**

Fiber stretchers with bare leads are not enclosed and include a convenient mounting kit consisting of a top mount aluminum retainer and two silicone rubber pads. The Mounting Kit includes top or bottom mount.

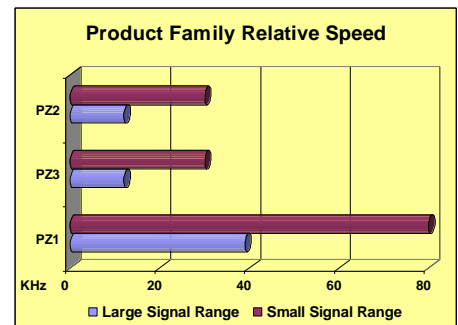
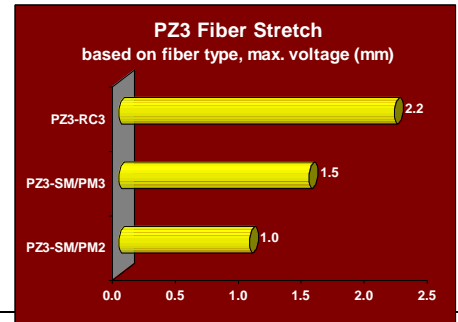
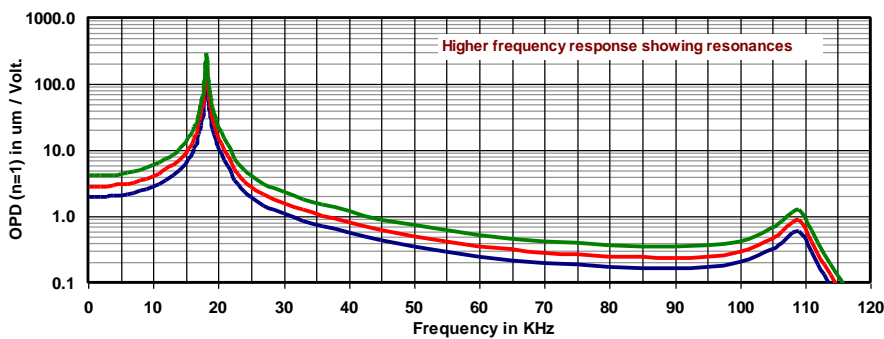
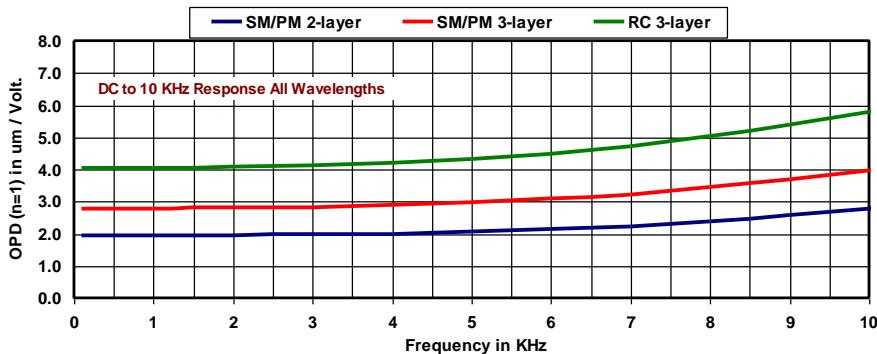
**SPECIFICATIONS**

| PZ3 FIBER STRETCHER                              | SM FIBER 2-LAYER   | SM FIBER 3-LAYER  | PM FIBER 2-LAYER   | PM FIBER 3-LAYER  | RC FIBER 3-LAYER  |
|--|--|---|--|---|---|
| Operational Wavelengths                          | 780 - 1625 nm  | 780 - 1625 nm   | 780 to 1625 nm   | 780 to 1625 nm  | 780 to 1625 nm  |
| Modulation Constant [ $< 5$ KHz]                 | $12.2 / \lambda$ radians/V where $\lambda$ wavelength in $\mu\text{m}$<br>Example: = 7.9 radians/V @ 1.550 $\mu\text{m}$ | $17.7 / \lambda$ radians/V where $\lambda$ wavelength in $\mu\text{m}$<br>Example: = 11.4 radians/V @ 1.550 $\mu\text{m}$ | $12.2 / \lambda$ radians/V where $\lambda$ wavelength in $\mu\text{m}$<br>Example: = 15.6 radians/V @ 0.78 $\mu\text{m}$ | $17.7 / \lambda$ radians/V where $\lambda$ wavelength in $\mu\text{m}$<br>Example: = 11.4 radians/V @ 1.550 $\mu\text{m}$ | $26 / \lambda$ radians/V where $\lambda$ wavelength in $\mu\text{m}$<br>Example: = 16.8 radians/V @ 1.550 $\mu\text{m}$ |
| Fiber Stretch                                    | 1.3 $\mu\text{m}$ / Volt   | 1.9 $\mu\text{m}$ / Volt  | 1.3 $\mu\text{m}$ / Volt   | 1.9 $\mu\text{m}$ / Volt  | 2.8 $\mu\text{m}$ / Volt  |
| Optical Path Displacement                        | 1.9 $\mu\text{m}$ / Volt   | 2.7 $\mu\text{m}$ / Volt  | 1.9 $\mu\text{m}$ / Volt   | 2.7 $\mu\text{m}$ / Volt  | 4.0 $\mu\text{m}$ / Volt  |
| Time Delay                                       | 0.0064 ps / Volt   | 0.0093 ps / Volt  | 0.0064 ps / Volt   | 0.0093 ps / Volt  | 0.014 ps / Volt   |
| Fiber Length                                     | 15 meters inclusive  | 22 meters inclusive   | 15 meters inclusive  | 22 meters inclusive   | 30 meters inclusive   |
| Fiber Wind                                       | 2-layer  | 3-layer   | 2-layer  | 3-layer   | 3-layer   |
| Fiber Type [See chart pg. 2]                     | SM [various] 245 $\mu\text{m}$ jacket  |   | PM [various] 245 $\mu\text{m}$ jacket  |   | RC SMF [80/165] 165 $\mu\text{m}$ jacket  |
| Extinction Ratio                                 | Not applicable   |   | $\leq -20$ dB typical  |   | Not applicable  |
| Optical Loss                                     | $\leq 0.5$ dB, typical 0.2 dB (excluding connectors)   |   |  |   |   |
| Maximum Voltage Range                            | $\pm 400\text{V}$ up to 300 Hz, then derate -6 dB per octave   |   |  |   |   |
| Frequency Range                                  | See chart page 2, specified at 1550 nm   |   |  |   |   |
| Linearity error (typ)                            | Drive $< 30\text{V}$ p-p: $< 0.5\%$   Drive $< 100\text{V}$ p-p: $< 1\%$   Full scale: $< 3\%$                           |   |  |   |   |
| Impedance [below resonance]                      | Capacitance 42 nF nominal, floating  |   |  |   |   |
| Electrical Interface                             | Open stretcher: 18 inches, flying leads, #30   Enclosed stretcher: Isolated BNC  |   |  |   |   |
| Drive Polarity                                   | Open stretcher: blue wire positive for positive stretch   Enclosed stretcher: Positive voltage for positive stretch      |   |  |   |   |
| Connector Options                                | Open stretcher: 1 meter bare fiber leads   Enclosed stretcher: FC/PC or FC/APC   |   |  |   |   |
| Operational Temperature Range                    | $0^\circ$ to $70^\circ\text{C}$  |   |  |   |   |
| <b>DIMENSIONS &amp; WEIGHT</b>                   |  |   |  |   |   |
| Open Fiber Stretcher                             | 2.5" Diameter x 0.9" High [nominal without mounting surface, height guaranteed $< 0.934$ "]; 60 grams                    |   |  |   |   |
| Enclosed Fiber Stretcher                         | Enclosure: 4" W x 6" L x 1.75" H; 16 oz; Mount hole centers (4 places) at "3.5" X" "6.375", hole size 0.156" diameter    |   |  |   |   |
| <b>MOUNTING KIT INCLUDED WITH OPEN STRETCHER</b> |  |   |  |   |   |
| Top Mount Aluminum Retainer                      | 2.5 inch diameter, 0.1 inch thickness [qty 1]  |   |  |   |   |
| Silicone Rubber Pads                             | 2.5 inch diameter, 0.0625 inch thickness [qty 2]   |   |  |   |   |
| Screw  | #6-32 flathead screw, cut to 0.93 inch or less [qty 1]   |   |  |   |   |

**Made in U.S.A.**



**PZ3 Modulation Characteristic Over Frequency**  
Optical Path Displacement per applied volt (n = 1)



Large Signal = 70% of 1<sup>st</sup> Resonance Operation  
Small Signal = Frequencies extending past resonance, but at reduced modulation levels

**PZ3 Fiber Stretcher Models**

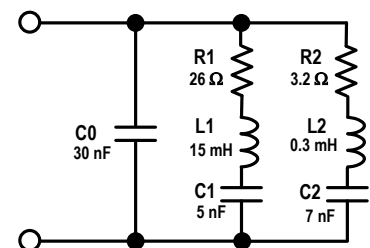
| Model             | Description  |
|-------------------|--|
| PZ3-SMF2-O        | Mid-range stretcher, 2-layer SMF28 fiber, bare leads, open, mounting kit |
| PZ3-SMF2-PC-E     | Mid-range stretcher, 2-layer SMF28 fiber, FC/PC connectors, enclosed     |
| PZ3-SMF2-APC-E    | Mid-range stretcher, 2-layer SMF28 fiber, FC/APC connectors, enclosed    |
| PZ3-SM2-O-XXX     | Mid-range stretcher, 2-layer SM fiber, bare leads, open, mounting kit    |
| PZ3-SM2-PC-E-XXX  | Mid-range stretcher, 2-layer SM fiber, FC/PC connectors, enclosed        |
| PZ3-SM2-APC-E-XXX | Mid-range stretcher, 2-layer SM fiber, FC/APC connectors, enclosed       |
| PZ3-SMF3-O        | Mid-range stretcher, 3-layer SMF28 fiber, bare leads, open, mounting kit |
| PZ3-SMF3-PC-E     | Mid-range stretcher, 3-layer SMF28 fiber, FC/PC connectors, enclosed     |
| PZ3-SMF3-APC-E    | Mid-range stretcher, 3-layer SMF28 fiber, FC/APC connectors, enclosed    |
| PZ3-SM3-O-XXX     | Mid-range stretcher, 3-layer SM fiber, bare leads, open, mounting kit    |
| PZ3-SM3-PC-E-XXX  | Mid-range stretcher, 3-layer SM fiber, FC/PC connectors, enclosed        |
| PZ3-SM3-APC-E-XXX | Mid-range stretcher, 3-layer SM fiber, FC/APC connectors, enclosed       |
| PZ3-PM2-O-XXX     | Mid-range stretcher, 2-layer PM fiber, bare leads, open, mounting kit    |
| PZ3-PM2-PC-E-XXX  | Mid-range stretcher, 2-layer PM fiber, FC/PC connectors, enclosed        |
| PZ3-PM2-APC-E-XXX | Mid-range stretcher, 2-layer PM fiber, FC/APC connectors, enclosed       |
| PZ3-PM3-O-XXX     | Mid-range stretcher, 3-layer PM fiber, bare leads, open, mounting kit    |
| PZ3-PM3-PC-E-XXX  | Mid-range stretcher, 3-layer PM fiber, FC/PC connectors, enclosed        |
| PZ3-PM3-APC-E-XXX | Mid-range stretcher, 3-layer PM fiber, FC/APC connectors, enclosed       |
| PZ3-RC3-O-XXX     | Mid-range stretcher, 3-layer RC fiber, bare leads, open, mounting kit    |
| PZ3-RC3-PC-E-XXX  | Mid-range stretcher, 3-layer RC fiber, FC/PC connectors, enclosed        |
| PZ3-RC3-APC-E-XXX | Mid-range stretcher, 3-layer RC fiber, FC/APC connectors, enclosed       |

**Designed for Bipolar Drive**

Optiphase fiber stretchers are designed to operate with a bipolar voltage drive. This is unique capability offers significantly greater convenience when compared to other approaches that mandate unipolar operation only with an offset voltage drive.

**How to drive PZ3 stretchers**

The equivalent circuit for the PZ3 fiber stretcher is shown below. At frequencies sufficiently below the first resonance (dc - 10 KHz) the effective impedance is capacitive, defined by C0+C1+C2, being approximately 42 nF. At 10 KHz, the magnitude of the impedance of this capacitance is 400 ohms. Most laboratory equipment or circuitry can be used to drive this load with no modifications.



**PZ3 Series Equivalent Impedance**

DC - 10 KHz is approx C0 + C1 + C2 (= 42 nF)  
First Resonance (18 KHz) defined by R1, C1, L1  
Second Resonance (110 KHz) defined by R2, C2, L2

**Part No. Designation and Fiber Types Used**

| λ range (nm):                 | 780-900         | 950-1200         | 1260-1400                       | 1450-1625        |
|-------------------------------|-----------------|------------------|---------------------------------|------------------|
| XXX =                         | 850             | 980              | 131                             | 155              |
| Y = P for Panda; B for Bowtie |                 |                  |                                 |                  |
| SM / SMF                      | Corning HI-80   | Corning HI-80    | Corning SMF28e+                 |                  |
| RC                            | NA              | NA               | Draka Elite 80 um BendBright-XS |                  |
| PM-Panda                      | Corning PM 850  | Corning PM 980   | Corning PM 1300                 | Corning PM 1550  |
| PM-Bowtie                     | Fibercore HB800 | Fibercore HB1000 | Fibercore HB1250                | Fibercore HB1500 |

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