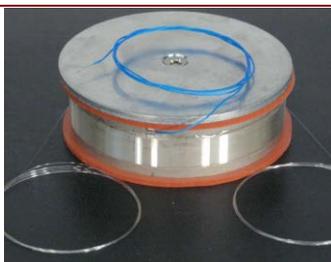
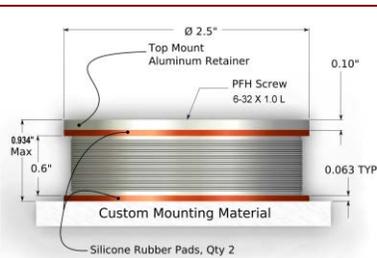


The *OPTIPHASE PZ3* is the mid-range member of our family of fiber stretchers. It is a fiber wound piezoelectric element for use in a wide range of optical interferometric measurement and sensing system applications. Typical uses include open loop demodulation, sensor simulation, variable optical delay, 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 (<math>\pm 15V</math>) 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.

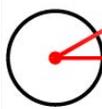


**Bare Lead Fiber Stretcher with Mounting Kit**

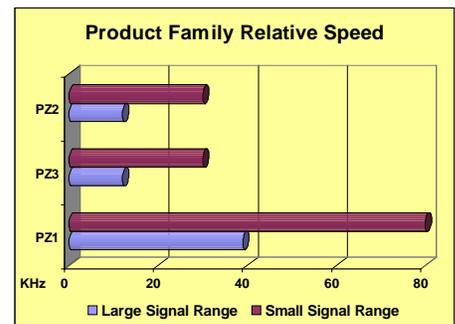
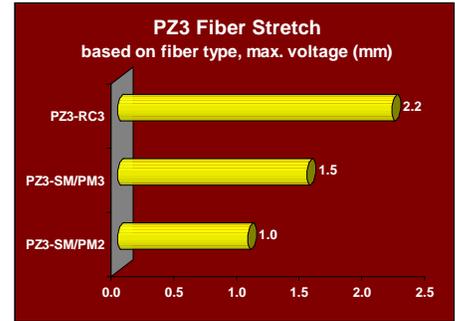
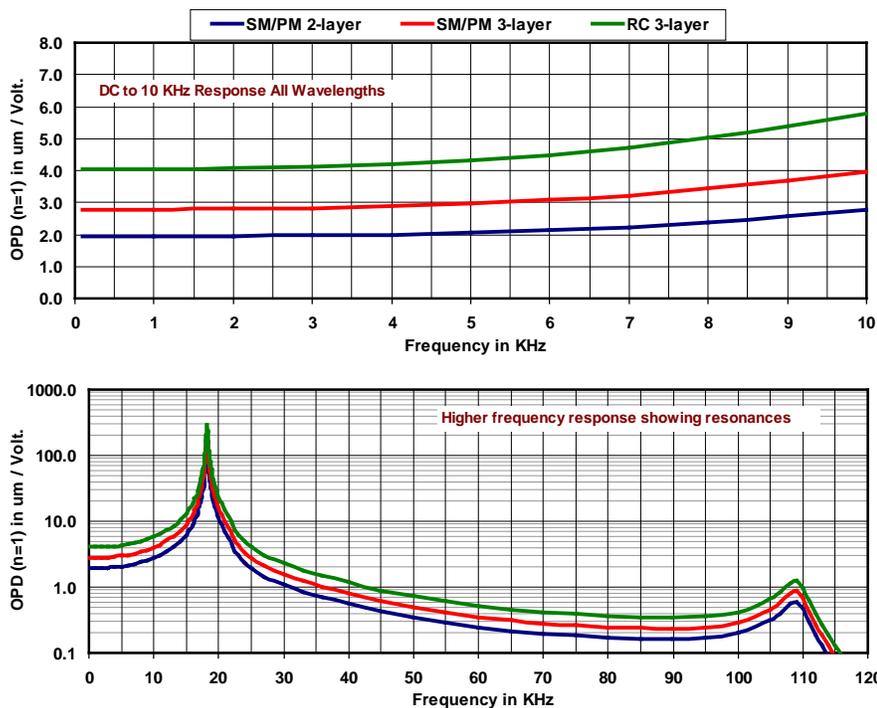
Fiber stretchers with bare leads are not enclosed and include a convenient mounting kit consisting of a top mount aluminum retainer and two silicone rubber pads. The Mounting Kit includes top or bottom mount.

**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	600 - 1625 nm	600 - 1625 nm	600 to 1625 nm	600 to 1625 nm	600 to 1625 nm
Modulation Constant [ $< 5$ KHz]	$12.2 / \lambda$ radians/V where $\lambda$ wavelength in $\mu\text{m}$ Example: = 7.9 radians/V @ 1.550 $\mu\text{m}$	$17.7 / \lambda$ radians/V where $\lambda$ wavelength in $\mu\text{m}$ Example: = 11.4 radians/V @ 1.550 $\mu\text{m}$	$12.2 / \lambda$ radians/V where $\lambda$ wavelength in $\mu\text{m}$ Example: = 15.6 radians/V @ 0.78 $\mu\text{m}$	$17.7 / \lambda$ radians/V where $\lambda$ wavelength in $\mu\text{m}$ Example: = 11.4 radians/V @ 1.550 $\mu\text{m}$	$26 / \lambda$ radians/V where $\lambda$ wavelength in $\mu\text{m}$ 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	$\pm 400V$ up to 300 Hz, then derate -6 dB per octave				
Frequency Range	See chart page 2, specified at 1550 nm				
Linearity error (typ)	Drive < 30V p-p: < 0.5%   Drive < 100 V p-p: < 1.0%   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° to 70° 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]				
					<b>Made in U.S.A.</b>



### 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

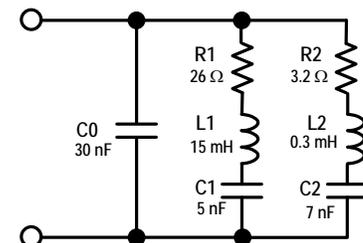
Model	Description
PZ3-SMF2-O	Mid-range stretcher, 2-layer SMF28 fiber, bare leads, open, mounting kit
PZ3-SMF2-PC-E	Mid-range stretcher, 2-layer SMF28 fiber, FC/PC connectors, enclosed
PZ3-SMF2-APC-E	Mid-range stretcher, 2-layer SMF28 fiber, FC/APC connectors, enclosed
PZ3-SM2-O-XXX	Mid-range stretcher, 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):	600-720	780-900	950-1200	1260-1400	1450-1625
XXX =	633	850	980	131	155
Y =	P for Panda; B for Bowtie				
SM / SMF	Fibercore SM600	Corning HI-80	Corning HI-80	Corning SMF28e+	
RC	NA	NA	NA	Draka Elite 80 um BendBright-XS	
PM-Panda	Nufem PM630-HP	Corning PM 850	Corning PM 980	Corning PM 1300	Corning PM 1550
PM-Bowtie	Fibercore HB600	Fibercore HB800	Fibercore HB1000	Fibercore HB1250	Fibercore HB1500

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