Scanning Fiber Mach-Zehnder Interferometer

500 – 2600 nm, 0.01 – 1000 mm

DATASHEET

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The MAIM Series Scanning Fiber Optical Mach-Zehnder Interferometer splits incoming light into two paths using a fiber coupler—one reference arm with a fixed fiber length and the other sample arm with a variable length controlled by either a high-speed piezoelectric fiber stretcher or a motor-driven long range delay line. The two beams are is recombined using a second fiber coupler to produce an interference pattern for high-precision measurements. Fast scanning is achieved via the piezoelectric stretcher driven through a front-panel BNC input, while extended-range scanning is enabled by a motorized stage controlled via USB/GUI. Designed for operation across 500 to 2600 nm with matched single-mode fibers, each MAIM unit features a “zero meter” path mismatch baseline, allowing flexible delay customization. The MAIM is a versatile unit with both optical output or 0-5V electrical output (build in amplified detector). Standard and custom fiber lengths are available, including configurations with variable delay in both arms. The unit comes complete with a power supply.

Features

- Non-Mechanical High Reliability
- Accurate and Reproducible Position Control
- Fast Scan Speeds

Applications

- Laser Phase /Frequency Noise Testing
- Interfetometric Sensors
- Heterodyne Interferometer

Specifications

Parameter		Min	Typical	Max	Unit
Center Wavelength		500		2600	nm
Wavelength Range			+- 150		nm
Insertion Loss [1]	1300nm		3	5	dB
	850nm		5	6.5	
	660nm		6	7.5	
Variable Delay Difference	Piezo	0.01		5	mm
	Motor	0.01		500	
Fix Delay Range		1		10000	mm
Path Mismatch (without delay line)				10	mm
Input Power				500	mW
Phase Modulation Speed	Piezo		30		kHz
	Motor		0.01		
Detector Bandwidth (3dB)			DC – 5		MHz
Detector Gain			10^4		V/A
Amplifier Outputs Impedance (SMA)			50		Ω
Power Supply			±12V, 250mA		

Notes:

[1]. Includes connector losses, measured at center wavelength. Shorter wavelength has higher loss

* All accuracy data are valid at 23 ± 5°C and 45 ±15% humidity

RoHS COMPLIANT

Note: The specifications provided are for general applications with a cost-effective approach. If you need to narrow or expand the tolerance, coverage, limit, or qualifications, please [click this link]:

Rev 06/03/26

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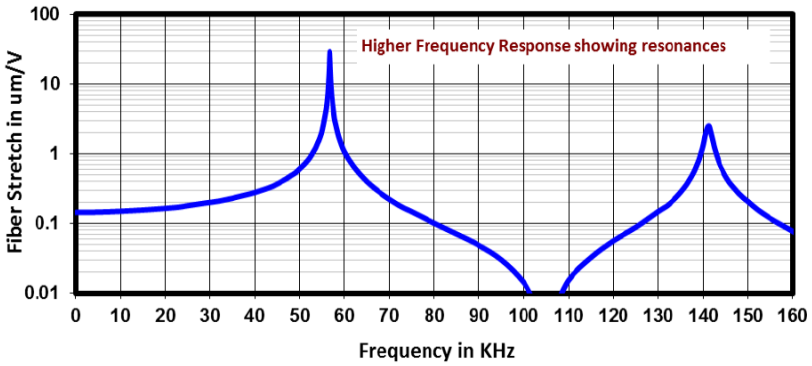
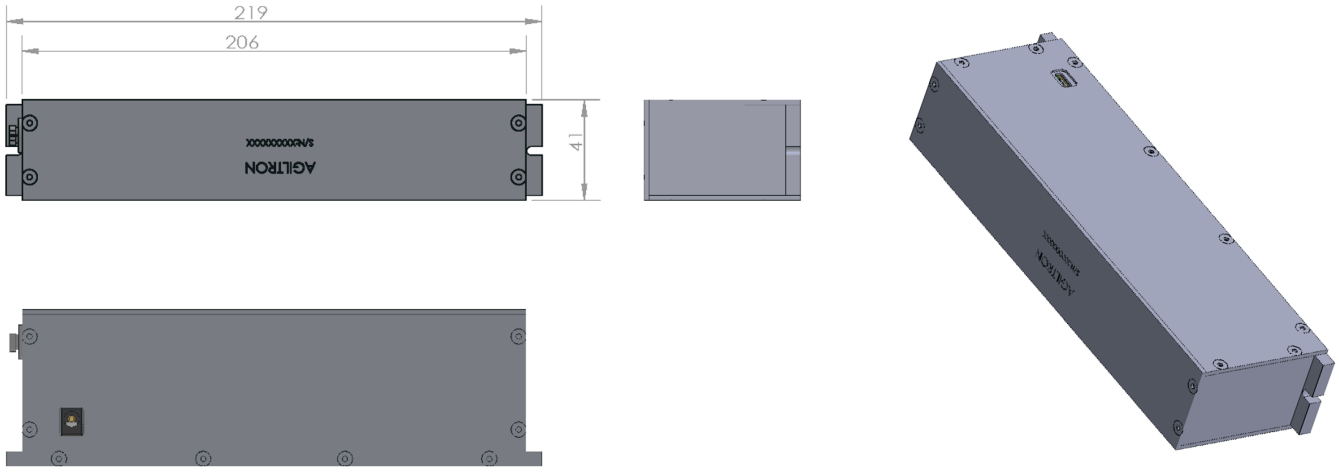
Functional Diagram

Typical Piezo Stretcher Modulation Frequency Response



Mechanical Dimensions (mm)



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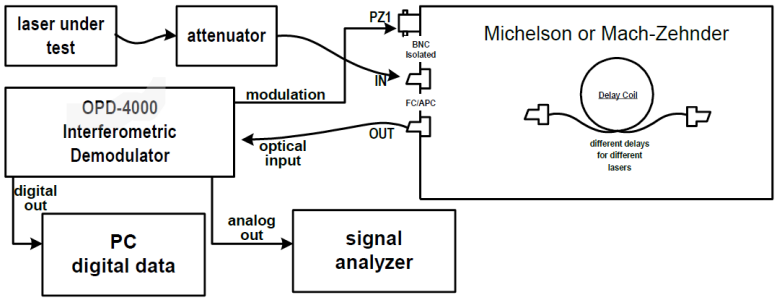
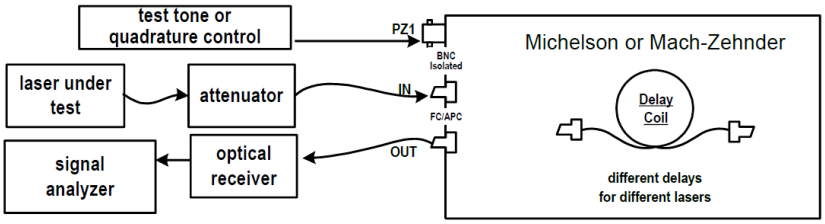
Application Examples

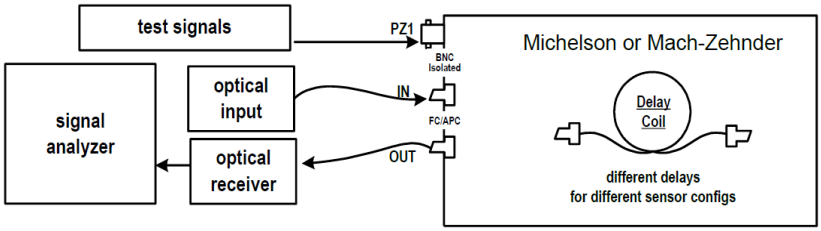
LASER PHASE / FREQUENCY NOISE TESTING



LASER PHASE / FREQUENCY NOISE TESTING 2



FIBER INTERFEROMETRIC SENSOR SIMULATOR



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Ordering Information (Part Number) System

	☐	☐	☐☐	☐☐	☐	☐	☐	☐
Prefix	**Configuration**	**Wavelength**	**Variable Range [1]**	**Fix Range**	**Fiber Type**	**Fiber Cover**	**Detector [2]**	**Connector [3]**
MAIM-	One Output = 1 Two Output = 2	488 = 4 532 = 5 650 = 6 780 = 7 850 = 8 980 = 9 1060 = 1 1310 = 3 1550 = C 2000 = 2 Special = 0	7 π = 7P 21 π = 2P 55 π = 5P 0.5mm = 0A 1mm = 01 10mm = 10 20mm = 20 30mm = 30 40mm = 40 50mm = 50 Special = 00	0.05m = 0A 0.5m = 05 1m = 10 10m = 20 100m = A1 200m = A2 Special = 00	***Select below***	0.9mm Tube = 1 Special = 0	Non = 1 Yes = 2	FC/PC = 2 FC/APC = 3 SC/PC = 4 SC/APC = 5 ST/PC = 6 LC/PC = 7 LC/APC = 8 LC/UPC = U Special = 0

[1]. Unit in π use high speed piezo actuator, others use motor

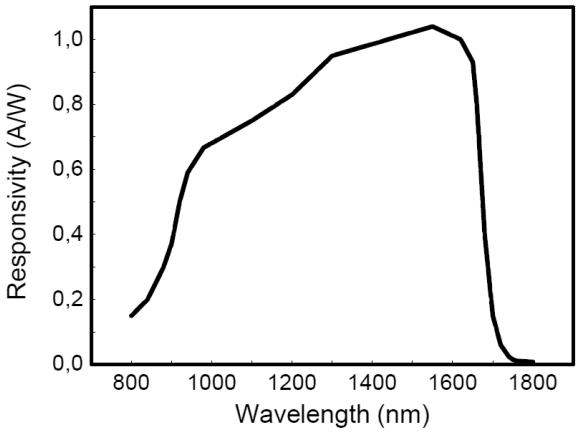
[2]. When detector selected the output is electrical 0-5V, when none selected, the output is optical fiber

[3]. 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.

Fiber Type Selection Table

1	**SMF-28**	5	**PM1550**	M	**MM 50/125µm**
		D	**PM1950**	N	**MM 62.5µm**
		3	**PM1310**		
4	**SM450**	E	**PM400**		
A	**SM1950**	F	**PM480**		
6	**SM600**	G	**PM630**		
7	**Hi780**	H	**PM850**		
8	**SM800**	I	**PM980**		
9	**SM980**	J	**PM780**		
B	**Hi1060**	K	**PM460**		
C	**SM400**	L	**PM405**		

Typical InGaAs Detector Response



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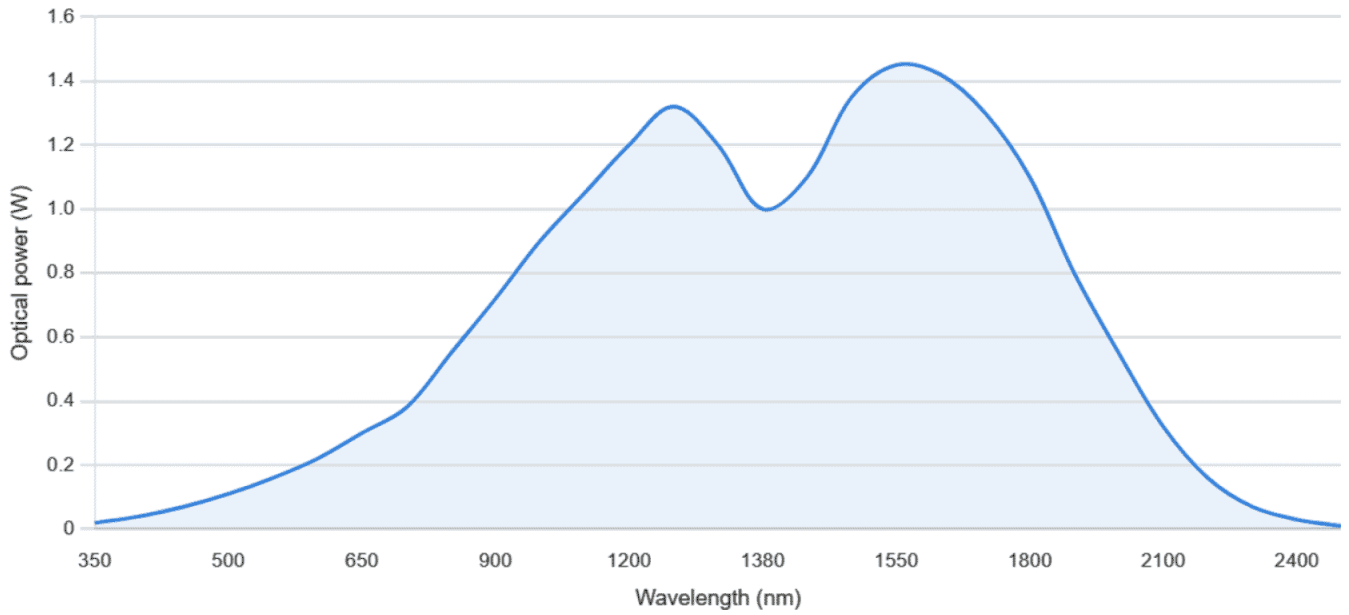
Regular Single Mode / Polarization Maintaining Fiber Optical Power Handing vs Wavelength



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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