Fabry-Perot Fiber Optic Filter

down to 0.01nm peak width, up to 150nm tuning range, kHz speed, 1060, 1310, 1550nm

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The FPTF is a fiber-coupled Fabry-Perot Tunable Filter based on a fiber tip-gap etalon cavity driven by a piezoelectric actuator. It features narrow linewidth, wide tuning range, low optical loss, and fast tuning speed. The tuning range exceeds 100 nm, corresponding to the etalon's first-order free spectral range (FSR). Tuning beyond one FSR enters higher interference orders, potentially degrading signal quality. The piezo actuator supports scanning rates up to ~1 kHz, with resonant operation near 30 kHz. Due to inherent piezo drift, closed-loop feedback is recommended for wavelength stabilization. A full-function controller with small-amplitude dithering is available for precise tuning and control. The filter remains transparent outside its tuning band. The FPTF provides a cost-effective solution for high-speed wavelength scanning, spectroscopy, and tunable source applications requiring moderate finesse and rapid tuning.

Features

- Narrow Line Width
- Wide Tune Range
- Low IL and PDL
- Fast Tuning Speed
- USB, RS232, I2C Control Interfaces
- Gaussian-Shaped Passband

Applications

- FBG Sensing Interrogation
- Wavelength Scanning

Specifications

Parameter	Min	Typical	Max	Unit
Center Wavelength	1500	1550	1600	nm
Tuning Range (FSR)	80	100	140	nm
Finesse [1]	400		10000	
Scanning Speed	-		1	kHz
Resonance Scanning Speed		30		kHz
Insertion Loss [2]	2.5	3	4	dB
Bandwidth @-3dB or FWHM [3]	0.01	0.08	0.25	nm
Off-Band Suppression	25	30	-	dB
PDL	-	0.15	0.35	dB
PMD	-	-	0.2	Ps
Return Loss	40	-	-	dB
Optical Power Handling [4]	15		50	mW
Driving Voltage		20	70	V
Capacitance			3	µF
Operating Temperature	-5	20	70	°C
Storage Temperature	-40	-	85	°C
Weight		60	100	G

Notes:

[1]. Finesse ± 20%

[2]. It is defined as the total light coupled out over the filter's spectral passing band. Measured using a broadband light source with integration of the transmission peak. Extra loss can occur if the laser source does not match the filter profile. A special filter can be made to match the application. The smaller the fiber core, the higher the loss. Excluding connector loss

[3]. Bandwidth tolerance are ± 20%

[4]. It related to the linewidth, the narrower, the smaller

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]:

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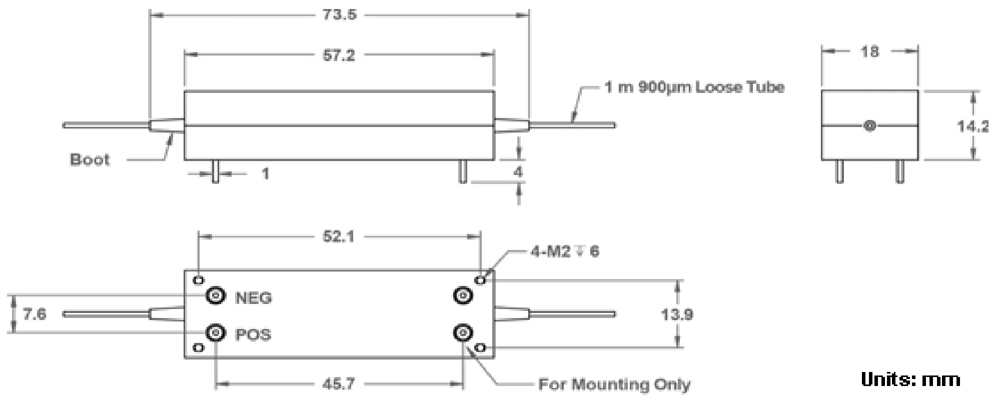
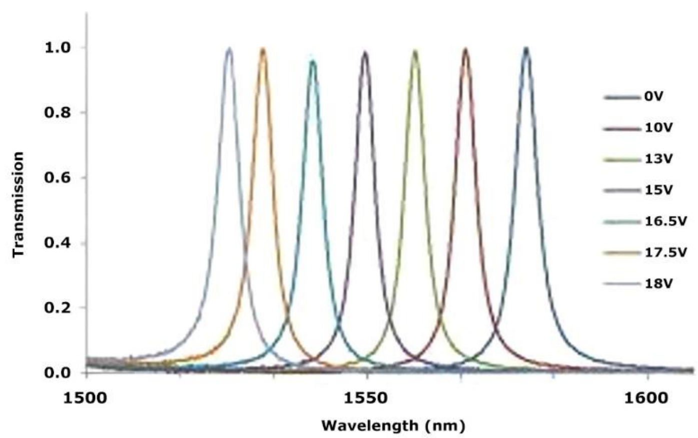
Mechanical Dimension (mm)

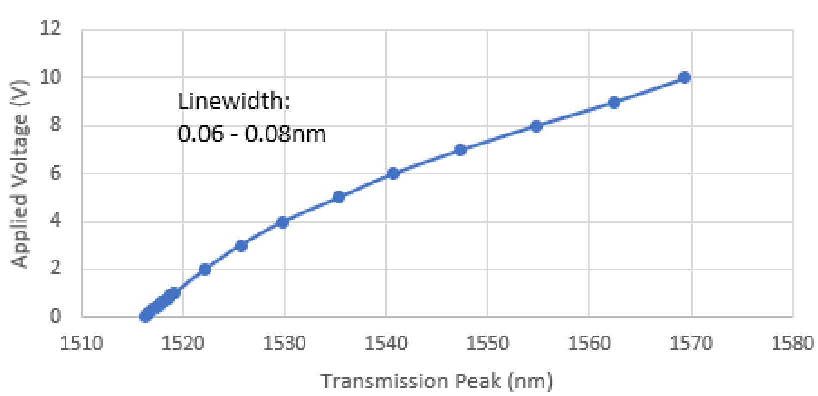


*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

Typical Transmission Curve



Typical Wavelength Tuning vs Voltage



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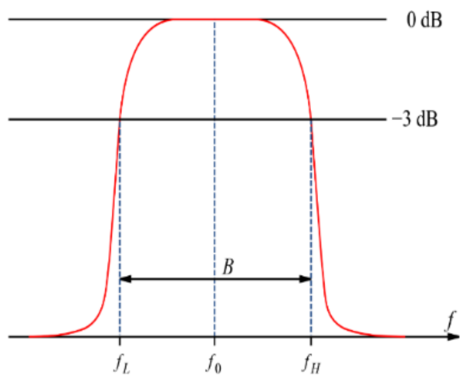
Bandwidth/Linewidth Definition



Ordering Information

	☐	☐☐	☐	☐	1	3	1	☐
Prefix	**Center Wavelength**	**Tuning Range (FSR) ***	**Finesse ****	**Controller**	**Fiber Type**	**Fiber Cover**	**Fiber Length**	**Connector**
FPTF-	1550 = 5 Special = 0	100nm = 10 120nm = 12 160nm = 16 Special = 0	400 = 1 1000 = 2 2000 = 3 5000 = 5 10000 = 6	Non = 1 Yes = 2	SMF-28 = 1 Special = 0	0.9mm tube = 3 Special = 0	1.0 m = 1 Special = 0	None = 1 FC/PC = 2 FC/APC = 3 Special = 0

* ± 20nm

** Linewidth = FSR / finesse; 100/400=0.25nm, 100/1000=0.1nm, 100/2000=0.05nm, 100/5000=0.02nm, 100/1000=0.01nm, (Finesse ± 20%)

Red is special order with NRE

Controllers

Piezoelectric devices have material related temperature dependence and hysteresis, resulting in drift and poor repeatability. The mechanical devices also have intrinsic resonance frequencies; operation should below these frequencies. The controller can stabilize and lock the peak positions as well as perform scanning. It needs to follow a complex setup/tuning procedure. Scan mode is used primarily for sweeping the filter through a range of wavelengths for applications such as (un-calibrated) optical spectrum analysis and WDM channel monitoring. Locked mode locks onto a particular narrow line source and performs a scan with tuning stability by compensating electrical, thermal, and mechanical slow variations. It uses an internal photodetector that taps a small portion of the input light to form a closed-loop feedback control with a small amplitude dither at about 2kHz.

$2450

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Operation Manual

1. Only available along with the product shipment.

How to test the insertion loss of a tunable optical filter

The filter only works in a specific range. Beyond this range, extra peaks may show. These peaks can be blocked with special order. Please follow these instructions to do an optical insertion loss test:

1. Connect a broadband fiber-coupled laser source to OSA, sweep one time over the specified range of the tunable filter, and then fix the curve in Trace A as a reference.
2. Connect the broadband laser source to the fiberoptic tunable filter fiber as input, then connect the other fiber port of the tunable filter as the output to the OSA.
3. Set OSA Trace B as 'write,' Trace C as 'Calculate: B-A.' Auto sweep Trace C from the specific range. Tune the micrometer to shift the peak at a different wavelength. Use 'Peak search' to record IL at a different wavelength."

Application Notes

Fiber Core Alignment
Note that the minimum attenuation for these devices depends on excellent core-to-core alignment when the connectors are mated. This is crucial for shorter wavelengths with smaller fiber core diameters that can increase the loss of many decibels above the specification if they are not perfectly aligned. Different vendors' connectors may not mate well with each other, especially for angled APC.

Fiber Cleanliness
Fibers with smaller core diameters (<5 µm) must be kept extremely clean, contamination at fiber-fiber interfaces, combined with the high optical power density, can lead to significant optical damage. This type of damage usually requires re-polishing or replacement of the connector.

Maximum Optical Input Power
Due to their small fiber core diameters for short wavelength and high photon energies, the damage thresholds for device is substantially reduced than the common 1550nm fiber. To avoid damage to the exposed fiber end faces and internal components, the optical input power should never exceed 20 mW for wavelengths shorter 650nm. We produce a special version to increase the how handling by expanding the core side at the fiber ends.