Tunable Fiber Grating Filter USB

center wavelength 350-2400nm, 0.03nm linewidth, 1nm tuning range

DATASHEET

Return to the Webpage

The TTFG series tunable optical filter integrates a fiber Bragg grating (FBG) with a thermally controlled tuning platform to provide narrow-linewidth filtering with wide center-wavelength adjustability. Two configurations are available: a two-port reflection version that functions as a tunable notch filter, and a three-port transmission-reflection version with an integrated circulator that operates as a tunable bandpass filter. Standard FBG linewidths are offered from 0.03 nm to 2 nm, with narrower custom designs available. We produce custom FBGs from 350 nm to 2500 nm, with a typical one-time setup fee of approximately $1,800. Our circulators cover 350–2200 nm, enabling broad system compatibility for three-port TTFG solutions. The module includes an integrated driver with USB GUI control for plug-and-play operation, along with a DC power supply.

Features

- Low insertion loss
- Narrow linewidth
- High off-band suppression
- Uniform bandwidth
- High tuning resolution
- Compact and cost-effective

Applications

- DWDM networks
- Fiber Sensing
- Quantum Computing
- Tunable Fiber Lasers

RoHS COMPLIANT

Specifications

Parameter		Min	Typical	Max	Unit
Center Wavelength		350		2400	nm
Wavelength Tuning Range			1	2.5	nm
Reflectivity		30		99.9	%
Tuning Resolution		-	0.1	-	nm
Insertion Loss [1]	two ports	0.6	1.2	1.6	dB
	three ports	1.5[2]		4	
Tuning Speed			0.02		nm/s
Bandwidth @-3dB		0.03	0.07	2	nm
Off Band Rejection @-20dB		18	20	45	dB
Polarization Dependent Loss		-	0.25	-	dB
Extinction Ratio (PM fiber only)		-	20	-	dB
Polarization Mode Dispersion		-	-	0.5	ps
Return Loss		50	-	-	dB
Optical Power Handling (CW)		-	0.5	5	W
Electrical Power Consumption			1	3	W
Operating Temperature		-20	20	50	°C
Storage Temperature		-40		85	°C

Notes:

[1] This refers to the total light transmitted through a filter's spectral passing band. It is measured using a broadband light source by integrating the transmission peak. Extra loss may occur if the laser source does not align with the filter's spectral profile. Special filters can be custom-designed to match specific application needs. Note that smaller fiber cores result in higher loss (excluding connector losses).

[2] This three-port filter contains a circulator, which has lowest loss in the 1310/1550 nm bands . Circulator has higher loss outside these wavelength bands. For additional details, visit Agiltron's Isolators and Circulators. https://agiltron.com/category/optical-isolators/isolators-circulators/

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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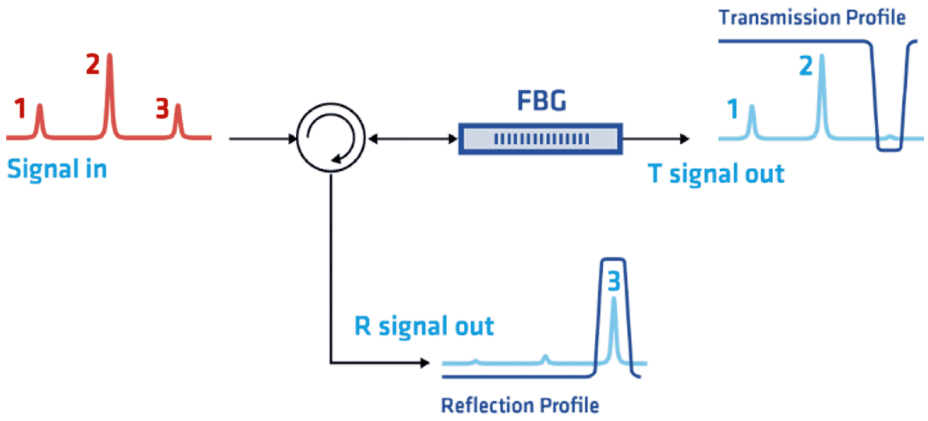
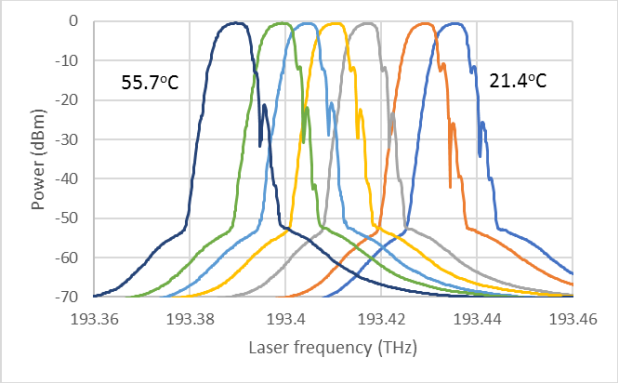
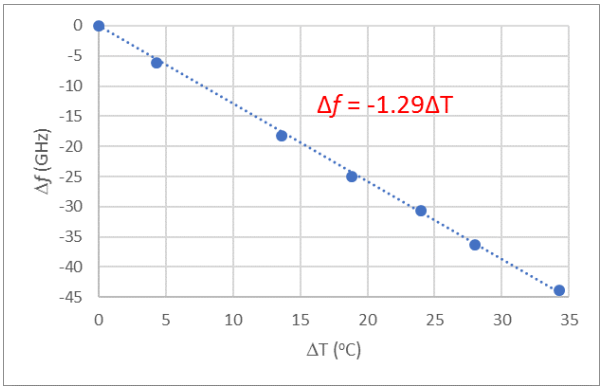
Three Port Configuration



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

Spectrum





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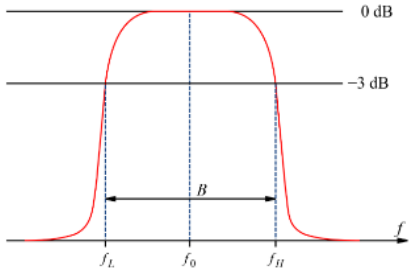
Bandwidth Definition



Ordering Information (Part Number)

	□□□□□	□	□	□□	□	□	□	□
Prefix	**Wavelength**	**Linewidth**	**Port**	**Fiber Type**	**Fiber Cover**	**Fiber Length**	**Connector [1]**	**API [2]**
TTFG-	1550.5nm = 15505 950.8nm = 09508 1061.5nm = 10615 Special = 00000	0.03nm = 1 0.1nm = 2 0.15nm = 3 Special = 0	2 = 2 3 = 3	SMF-28 = 01 PM1550 = 34 PM1310 = 36 ***Select from below table*** Special = 00	900um tube = 3 Special = 0	0.25m = 1 0.5m = 2 1.0 m = 3 Special = 0	None = 1 FC/APC = 3 FC/PC = 2 None = 3 LC/PC = 7 LC/APC = A LC/UPC = U Special = 0	Non = N Python = P LabVIEW = L

[1]. 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.

[2]. We provide a complete command list for customer integration but do not offer debugging support for customer code. However, an Application Programming Interface (API) service is available for an additional fee to assist with system integration and remote connectivity.

Red is non-standard specially made at a higher cost. Red wavelength requires $1650 to set up

Fiber Type Selection Table:

01	**SMF-28**	34	**PM1550**	71	**MM 50/125µm**
02	**SMF-28e**	35	**PM1950**	72	**MM 62.5µm**
03	**Corning XB**	36	**PM1310**	73	**105/125µm**
04	**SM450**	37	**PM400**	74	**FG105LCA**
05	**SM1950**	38	**PM480**	75	**FG50LGA**
06	**SM600**	39	**PM630**	76	**STP 50/125**
07	**780HP**	40	**PM850**	77	**IRZS23**
08	**SM800**	41	**PM980**	78	**IRZS32**
09	**SM980**	42	**PM780**	79	**135 µm**
10	**Hi1060**	43		80	**400 µm**
11	**SM400**	44	**PM405**	81	**600 µm**
12		45	**PM460**		

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.”

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Command List

```
Baudrate 115200-8-N-1

Command List:
1. Version Check/ Connection Check  - 4 bytes
CMD:            0x01 0x02 0x00 0x00
RTN:            0x41 0x30 (2 Bytes)

2. Set Wavelength              - 4 bytes
CMD:            0x01 0x12 <WL high byte> <WL low byte>
RTN:            <Target Step Byte 0> <Target Step Byte 1> < Target Step Byte 2> <Target Step Byte 3>
Example: Set to 1550.0 ->      <WL high byte> * 256 + <WL low byte> = 15500
                 Target Step = <Byte 0> * 65536 * 256 +
                                        <Byte 1> * 65536 +
                                        <Byte 2> * 256 +
                                        <Byte 3>

3. Homing Calibration
CMD:            0x01 0x15 0x00 0x00

4. Read Device Status (Homing Sensor, Target/Current Step)
CMD:    0x01 0x05 0x00 0x00
RTN:            <Sensor 1> <Sensor 2> <ifHoming>
                <Current Step Byte 0> <Current Step Byte 1> < Current Step Byte 2> <Current Step Byte 3>
                <Target Step Byte 0> <Target Step Byte 1> < Target Step Byte 2> <Target Step Byte 3>
                Total 11 bytes

                Sensor 1: 0: IDLE 1:ACTIVE
                Sensor 2: 0: IDLE 1:ACTIVE
                ifHoming: 0: Not Homing 1:Homing
                 Current Step = <Byte 0> * 65536 * 256 +
                                        <Byte 1> * 65536 +
                                        <Byte 2> * 256 +
                                        <Byte 3>
                 Target Step = <Byte 0> * 65536 * 256 +
                                        <Byte 1> * 65536 +
                                        <Byte 2> * 256 +
                                        <Byte 3>

5. Set Motor STEP              - 6 bytes
CMD:            0x01 0x20 <Target Step Byte 0> <Target Step Byte 1> < Target Step Byte 2> <Target Step Byte 3>
RTN:            <Target Step Byte 0> <Target Step Byte 1> < Target Step Byte 2> <Target Step Byte 3>
                 Target Step = <Byte 0> * 65536 * 256 +
                                        <Byte 1> * 65536 +
                                        <Byte 2> * 256 +
                                        <Byte 3>
```


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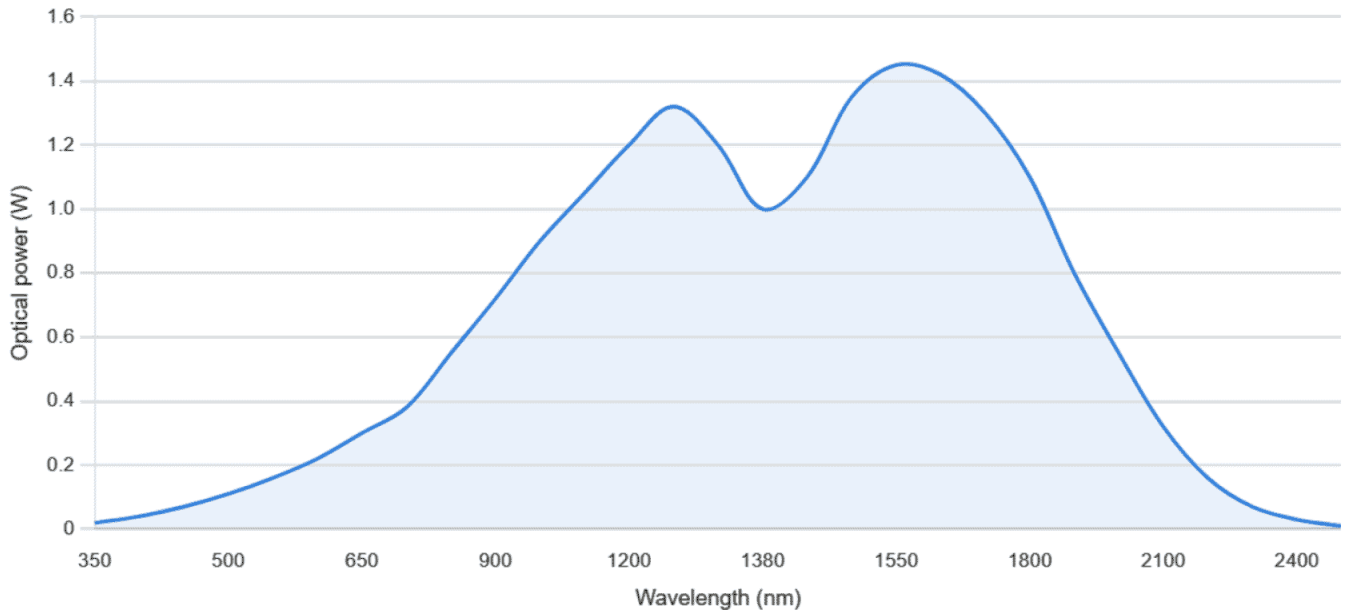
Regular Single Mode / Polarization Maintaining Fiber Optical Power Handing vs Wavelength



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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