Wideband Tunable Optical Filters (Flat-Top)

Wideband Tunable Filter of WLTF-WM (or -WE) - series is built based on free-space optical Fourier transformation combing with diffraction grating. Unique optics design produces an access of selecting spatially desired spectral ingredients of a wide-band spectrum input while rejecting the rest band of spectrum. Wavelength-tuning is actuated by either a precise micrometer driver or a micro step-motor connected to a PC through a USB interface in which actuation is monitored by a built-in encoder and controlled dynamically in a closed-loop.

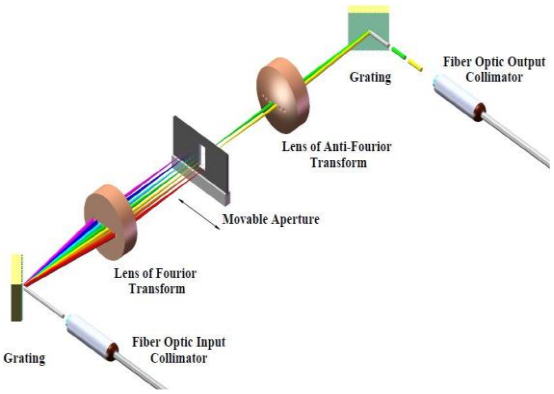
Patent-pending optics design offers a great option of bandwidths and tuning ranges with unprecedented low insertion loss and polarization dependent loss (PDL) in the market. Precise tuning mechanism enables filters to provide high wavelength resolution and excellent wavelength-tuning repeatability. Both of manual and electric version filters are available over X-, O-, S-, C-, & L- bands.

Key Features

- Unprecedented low insertion loss and polarization-dependent loss (PDL)
- Flat-top transmission spectral shape
- Sharp filter edge roll-off slop
- High power handling
- Up to 120nm wavelength tuning range
- Up to tuning range bandwidth
- Spectral range available over X-, O-, S-, C- and L- bands
- High out-band suppression

Applications

- ASE noise suppression
- CWDM channel filtering
- Pulse shaping
- Signal filtering



Operating Principle and Tuning Mechanism

Manual Version of WLTF-WM-U-

Electric Version of WLTF-WE-S (or-P)

Contact: sales@wlphotonics.com
300 Terry Fox Drive, Suite 600, Kanata, Ontario, K2K 0E3, Canada. Tel: +1 613-801-1825.

Specifications of Manual Tunable Filter (WLTF-WM-S, -P or -U- version)

Center Wavelength	1060nm±15nm	1310nm±15nm	1550nm±20nm	1600nm±20nm
Tuning Range (TR)	80nm-BW	100nm-BW	100nm-BW	100nm-BW
Insertion Loss	2.0dB typ. and 3.0dB max. (Connector exclusive)			
FWHM Bandwidth (BW)[2]	BW[1]$_{min}$ to 80nm	BW $_{min}$ to 100nm	BW $_{min}$ to 100nm	BW $_{min}$ to100nm
	BW $_{min}$=1.40nm for S-version	BW $_{min}$=2.00nm for S-version	BW $_{min}$=2.50nm for S-version	BW $_{min}$=2.50nm for S-version
	BW $_{min}$=0.60nm for P-version	BW $_{min}$=0.80nm for P-version	BW $_{min}$=1.00nm for P-version	BW $_{min}$=1.20nm for P-version
	BW $_{min}$=0.20nm for U-version	BW $_{min}$=0.25nm for U-version	BW $_{min}$=0.35nm for U-version	BW $_{min}$=0.40nm for U-version
Wavelength Resolution	0.02nm			
Wavelength Repeatability	±0.02nm			
Polarization-Dependent Loss	0.15dB typ./0.30dB max. over tuning range (SM fiber pigtail only)			
Extinction Ratio	20dB (PM fiber pigtail only without connector)			
Spectral Shape	Flat-top			
Passband Flatness	<0.05dB (Measured within BW $_{min}$)			
Filter Edge Rolling-Off Slope[3]	30dB/nm for S-version	25dB/nm for S-version	22dB/nm for S-version	20dB/nm for S-version
	80dB/nm For P-version	60dB/nm For P-version	55dB/nm For P-version	50dB/nm For P-version
	150dB/nm For U-version	120dB/nm For U-version	100dB/nm For U-version	100dB/nm For U-version
Max. Optical Power	500mW (CW). Up to 5.0W (CW) power handling available on request			
Return Loss	>45dB			
Out-Band Suppression	>50dB for BW< 2x BW $_{min}$			
Polarization Mode Dispersion	<0.2ps (SM fiber pigtail only)			
Group Delay	<0.1ps/nm			
Pigtail Fiber Type[4]	HI1060	SMF-28e		
	Panda PM980	Panda PM1300	Panda PM1550	
Operating Temp	10°C to 50°C			
Storage Temp	-10°C to 75°C			
Dimension	See dimension drawings below			
Weight	<0.75kg			
Other	RoHS compliant			

Note: [1] BW $_{min}$ is minimum accessible flat-top bandwidth. [2] Larger selected bandwidth, narrower tuning range. [3] Measured from -3dB to -43dB level. [4] PM fibers aligned in PM slow axes (fast-axis blocking) unless specified as others, LMA or PLMA fiber pigtails are available on request.

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Specifications of Electric Tunable Filter (WLTF-WE-S, P or U-)

Center Wavelength	1060nm±15nm	1310nm±15nm	1550nm±20nm	1600nm±20nm
Tuning Range (TR)	80nm-BW	100nm-BW	100nm-BW	100nm-BW
Insertion Loss	1.5dB typ. and 3.0dB max. (Connector exclusive)			
FWHM Bandwidth (BW)[2]	BW[1] $_{min}$ to 80nm	BW $_{min}$ to 100nm	BW $_{min}$ to 120nm	BW $_{min}$ to 120nm
	BW $_{min}$=1.40nm for S-version	BW $_{min}$=2.00nm for S-version	BW $_{min}$=2.50nm for S-version	BW $_{min}$2.5nm for S-version
	BW $_{min}$=0.60nm for P-version	BW $_{min}$=0.80nm for P-version	BW $_{min}$=1.00nm for P-version	BW $_{min}$=1.20nm for P-version
	BW $_{min}$=0.20nm for U-version	BW $_{min}$=0.25nm for U-version	BW $_{min}$=0.35nm for U-version	BW $_{min}$=0.40nm for U-version
Wavelength Resolution	0.01nm			
Wavelength Repeatability	±0.01nm			
Max. Tuning Speed	80nm/Sec. for S- or P- version			
PDL	0.15dB typ./0.30dB max. over tuning range (SM fiber pigtail only)			
Extinction Ratio	20dB (PM fiber pigtail only without connector)			
Spectral Shape	Flat-top			
Passband Flatness	<0.05dB (Measured within BW $_{min}$)			
Filter Edge Rolling-Off Edge Slope [3]	30dB/nm for S-version	25dB/nm for S-version	22dB/nm for S-version	20dB/nm for S-version
	80dB/nm For P-version	60dB/nm For P-version	55dB/nm For P-version	50dB/nm For P-version
	150dB/nm For U-version	120dB/nm For U-version	100dB/nm For U-version	100dB/nm For U-version
Optical Power	500mW (CW). Up to 5.0W (CW) power handling available on request			
Return Loss	>45dB			
Out-Band Suppression	>50dB for BW<2x BW $_{min}$			
Polarization Mode Dispersion	<0.2ps (SM fiber pigtail only)			
Group Delay	<0.1ps/nm			
Pigtail Fiber Type [4]	HI1060	SMF-28 or SMF-28e		
	Panda PM980	Panda PM1300	Panda PM1550	
Electric Interface	USB, I^{2}C or SPI			
Electric Power Consumption	<0.5W for S or P version			
Operating Temp	10°C to 50°C			
Storage Temp	-10°C to 75°C			
Dimension	See dimension drawings below			
Weight	<0.75kg			
Other	RoHS compliant			

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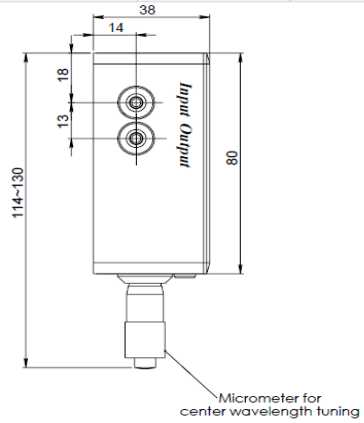
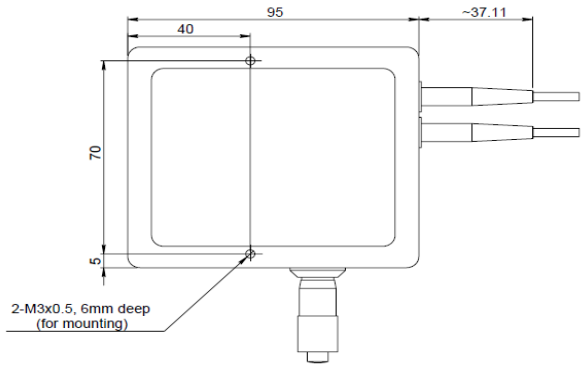
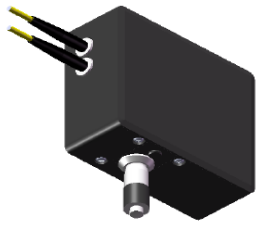
Note: [1] BW $_{min}$ is minimum accessible flat-top bandwidth. [2] Larger selected bandwidth, narrower tuning range. [3] Measured from -3dB to -43dB level. [4] PM fibers aligned in PM slow axes (fast-axis blocking) unless specified as others, LMA or PLMA fiber pigtails are available on request.

Dimensions of Manual Tunable Filter (WLTF-WM-S or P version)







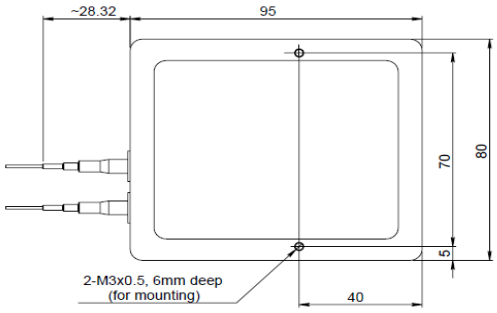
Notes/Specifications:

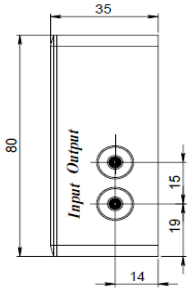
1. *Manual Wideband Tunable Optical Filter of S- or P- Version over 980-1700nm.*
2. *Down to 0.6nm FWHM (flat-top) Bandwidth.*
3. *Up to 120nm Tuning Range.*
4. *1.5dB typ. and 3.0dB max. Insertion Loss over Tuning Range.*
5. *>45dB Return Loss.*
6. *0.15dB typ. and 0.30dB max. PDL (SM fiber pigtail only).*
7. *>20dB ER (PM fiber pigtail only).*
8. *500mW (CW) max. Optical Input Power. Up to 5.0W (CW) Optical Power Handling Available on Request.*

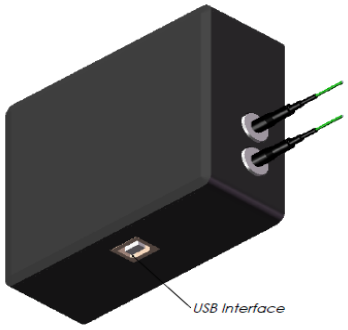
WL Photonics Inc. reserves the right to change dimensions without notice.

WL Photonics Inc.	TITLE: Dimensions of WLTF-WM-S- or -P- Version Filter		
The Projection:	Date	SIZE A	DWG. NO. DS-005	REV 1
	Jan. 08/2018	SCALE: 1:1	WEIGHT:	SHEET 1 OF 1

Dimensions of Electric Tunable Filter (WLTF-WE-S or P version)







Notes/Specifications:

1. *Electrically Tunable Optical Filter of S or P-Version Flat-Top over 980-1700nm.*
2. *Down to 0.6nm FWHM (flat-top) Bandwidth.*
3. *Up to 120nm Tuning Range.*
4. *1.5dB typ. and 3.0dB max. Insertion Loss over Tuning Range.*
5. *>45dB Return Loss.*
6. *0.15dB typ. and 0.30dB max. PDL (SM fiber pigtail only).*
7. *>20dB ER (PM fiber pigtail only).*
8. *500mW (CW) max. Optical Input Power. Up to 5W (CW) Optical Power Handling Available on Request.*
9. *USB, SPI, or I2C Interface. Other Interfaces Available on Request.*

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WL Photonics Inc.	TITLE: Dimensions of WLTF-WE-S or P-Version Filter with USB Interface		
The Projection:	Date	SIZE A	DWG. NO. DS-006	REV 1
	Jan. 08/2018	SCALE: 1:1	WEIGHT:	SHEET 1 OF 1

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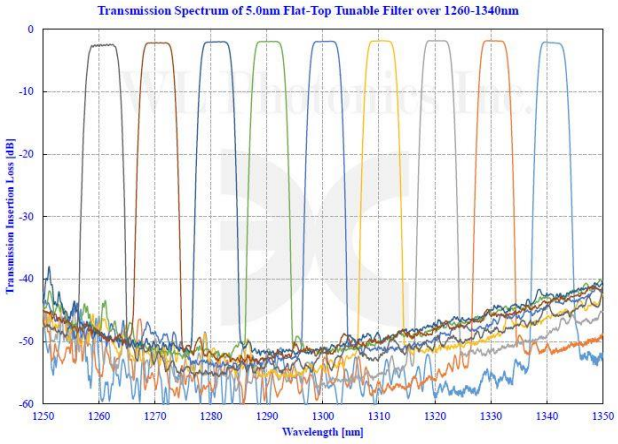
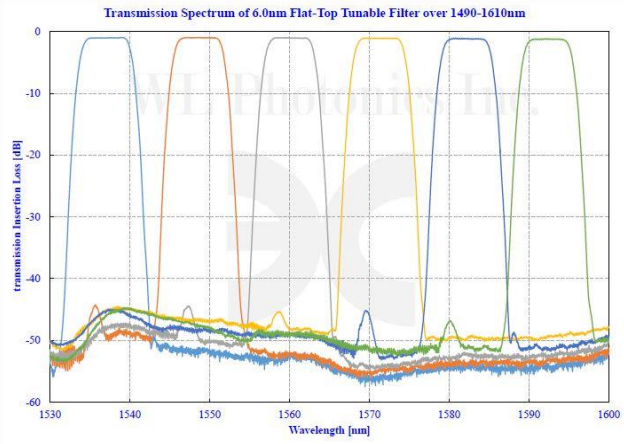
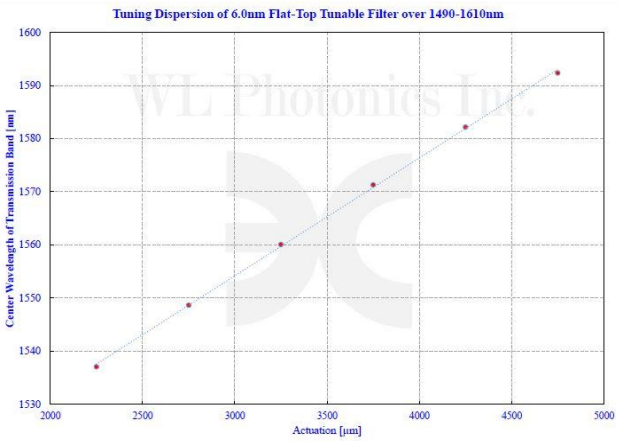
Example: Typical Transmission Spectrum and Tuning Dispersion of 5.0nm Filter over O-Band



Example: Typical Transmission Spectrum and Tuning Dispersion of 6.0nm Filter over S, C, L-Band





Main differences among S-, P- and U-version filters are they have different minimum accessible flat-top bandwidths and filter edge rolling-off slopes.

Standard interface of electric version filters for Filter Wavelength Tuning (FWT) is USB. The USB interface through a PC is equipped with USB-RS232 virtual serial port interface (USB B-type connector). The power supply is provided from either USB directly or an extra 5V DC (on request). It is easy to use any Serial COM Port Software in PC to control FWT, such as HyperTerminal and Tera Term. The command set is very simple and easy to drive the filter to find the home position, go to desirable center wavelengths of transmission band or any indicated positions within actuation range. I^2C and SPI digital control interfaces are also available as standard. Other type electric interfaces are available on request.

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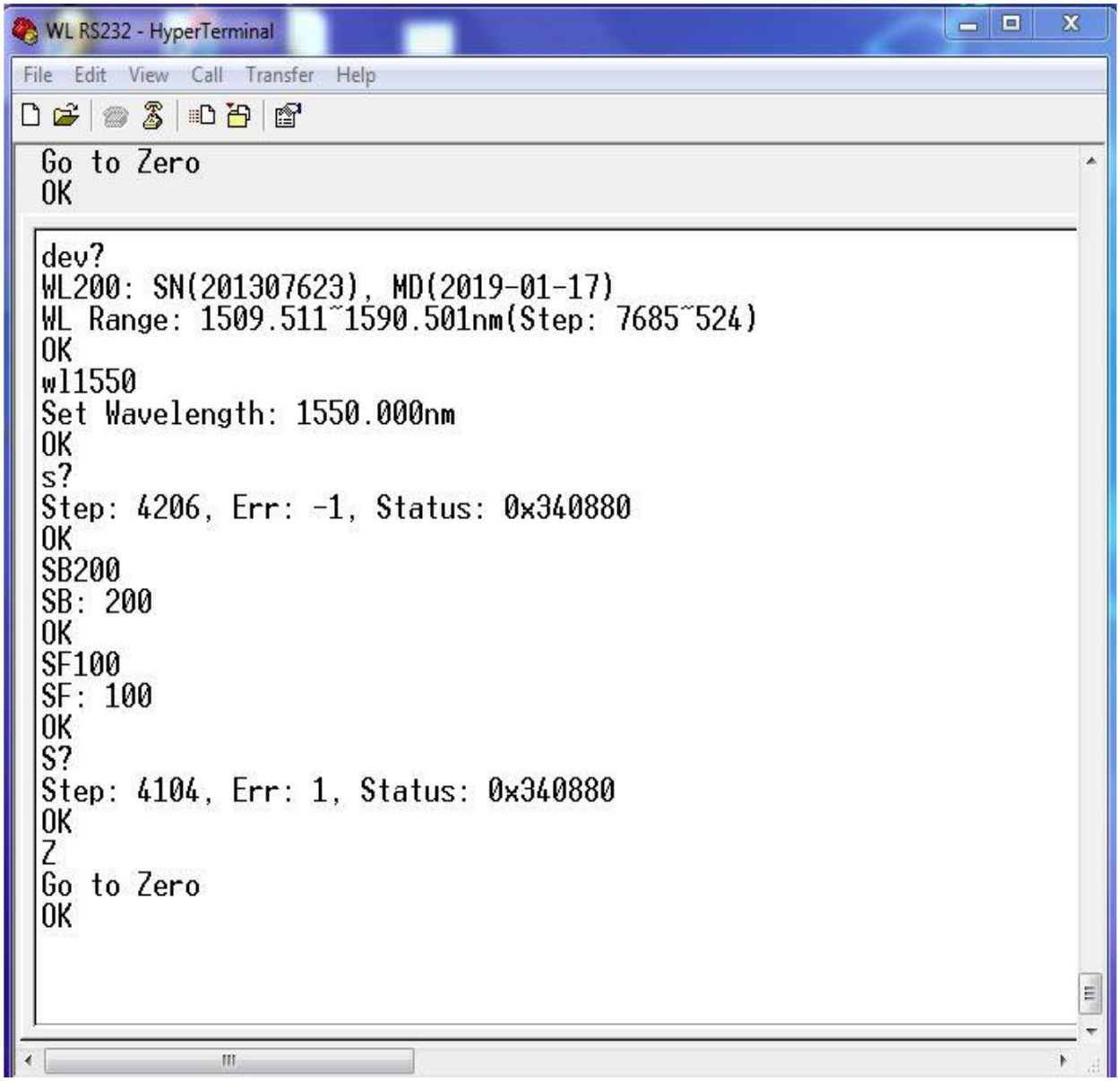
Example of FWT control interface:



Ordering Information

Part Number of Manual Version: WLTF-WM-A-B-C/D-E-F/G-H

Part Number of Electric Version: WLTF-WE-A-B-C/D-E-F/G-H-I

A. Version type: S is for S- version, P is for P- version and P is for U- version
B. Center wavelength in nanometer: 1550 is for 1550nm center wavelength and 1310 is for 1310nm center wavelength.
C. Tuning wavelength range in nanometer: 80 is for 80nm tuning range and 100 is for 100nm tuning wavelength range.
D. FWHM bandwidth in nanometer: 3.5 is for 3.5nm FWHM bandwidth.

E. Fibre type: SM for single mode fiber and PM for Panda polarization maintaining fibre, or others such as LMA or PLMA
F. Pigtail cable diameter in millimeter: 0.25 is for 250μm OD buffer fiber, 0.9 is for 900μm OD loose tube and 3.0 is for 3.0mm OD cable (only existing for pigtail version).
G. Pigtail length in meter: 0.5 is for 0.5m long and 1.0 is for 1M long (only existing for pigtail version).
H. Connector type of either pigtail termination or receptacle adapter, such as FC/APC, FC/UPC SC/APC or LU/UPC and 00 is for no connector.
I. Interface type: USB is for USB interface, I^2C is for I^2C interface and SPI is for SPI interface (electric version only).

Example 1: **WLTF-WM-S-1550-100/4.5-SM-3.0/1.0-FC/APC**
Description: S-version fiber optic polarization-insensitive manually tunable optical filter of 4.5nm FWHM (flat-top) bandwidth over 1500-1600nm tuning range with 1M long, 3.0mm OD loose cabled SMF-28e fiber pigtails terminated with FC/APC connectors on pigtail ends. 500mW (CW) max. optical input power.

Example 2: **WLTF-WM-P-1310-100/3.5-PM-3.0/1.0-FC/APC-5.0**
Description: P-version fiber optic polarization-sensitive manually tunable optical filter of 3.5nm FWHM (flat-top) bandwidth over 1260-1360nm tuning range with 1M long, 3.0mm OD loose cabled Panda PM1300 fiber pigtails aligned in PM slow axes (fast-axis blocking) terminated with FC/APC connectors on pigtail ends. 5.0W (CW) max. optical input power.

Example 3: **WLTF-WM-S-1040-80/10-SM-FC/APC**
Description: S-version fiber optic polarization-insensitive manually tunable optical filter of 10nm FWHM flat-top bandwidth over 1000-1080nm tuning range with receptacle input and output interface for FC/APC connectors. Operating fiber is HI1060 and 500mW (CW) max. optical input power.

Example 4: **WLTF-WE-S-1550-120/3.0-SM-3.0/1.0-FC/APC-USB**
Description: S-version fiber optic polarization-insensitive electrically tunable optical filter of 3.0nm FWHM flat-top bandwidth over 1490-1610nm tuning range with 1M long, 3.0mm OD loose cabled SMF-28 fiber pigtails terminated with FC/APC connectors on pigtail ends. 500mW (CW) max. optical input power and USB interface.

Example 5: **WLTF-WE-P-1060-80/0.65-PM-FC/APC-SPI-5.0**
Description: P-version fiber optic polarization-sensitive electrically tunable optical filter of 0.65nm FWHM flat-top bandwidth over 1020-1100nm tuning range with receptacle input & output interface for FC/APC connectors. Operating fiber is Panda PM980 aligned in PM slow axes (fast-axis blocking), 5.0W (CW) max. input optical power and SPI digital output interface

Customization

Besides the standard specifications above, other customization solutions are also available on request. Please contact our sales for details.