Narrowband Tunable Optical Filters (Gaussian-Shape)

Narrowband Tunable Optical Filter of WLTF-NM (or -NE) -series is built based on a platform of free-space optics combing with diffraction grating to produce a Gaussian-shape transmission. It is a 2-port fiber-optic device. When a wide-band spectrum is injected to the input port, the tunable filter will select partially a target band for output and reject the rest band of spectrum. Wavelength-tuning is actuated by either a precise micrometer driver or a micro step-motor controlled by a PC through a USB interface in which actuation is monitored by a built-in encoder and controlled dynamically in a closed-loop.

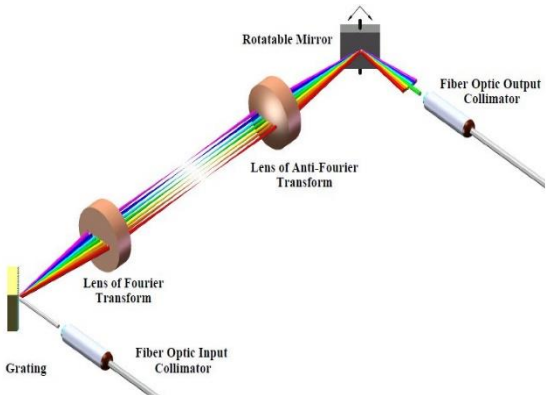
Patent-pending optics design offers a great option of bandwidths and tuning ranges with unprecedented low insertion loss and polarization-dependent loss (PDL) in the market. Precise tuning mechanism enables filters to provide high wavelength resolution and excellent wavelength-tuning repeatability. Both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

Key Features

- Up to 200nm wavelength tuning range available over 1000-1700nm
- Unprecedented low insertion loss and PDL
- High optical power handling
- Accurate and uniform bandwidth over whole tuning range
- Down to 0.1nm FWHM bandwidth
- High out-band suppression

Applications

- ASE noise suppression
- DWDM channel filtering
- WDM wavelength tuning
- Pulse shaping
- FBG sensor interrogation
- Tunable fiber lasers



Operating Principle and Tuning Mechanism

Manual Version of WLTF-NM-P-

Electric Version of WLTF-NE-S-

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Specifications of Manual Tunable Filter (WLTF-NM-)

Center Wavelength	1060nm±15nm		1310nm±15nm		1550nm±20nm		1600nm±20nm	
Tuning Range	60nm	120nm	60nm	120nm	60nm	140nm	60nm	140nm
Insertion Loss[1]	1.5dB typ., 2.5dB max. over 60nm tuning range and 3.0dB max. over 120nm tuning range (connector exclusive)							
FWHM Bandwidth	2.00nm, 1.50nm, 1.00nm, 0.90nm, 0.80nm, 0.70nm, 0.60nm, 0.50nm, 0.40nm, 0.35nm, 0.30nm, 0.25nm, 0.20nm, 0.15nm, 0.10nm, 0.075nm.		2.00nm, 1.50nm, 1.00nm, 0.95nm, 0.90nm, 0.85nm, 0.80nm, 0.75nm, 0.70nm, 0.60nm, 0.55nm, 0.50nm, 0.40nm, 0.35nm, 0.30nm, 0.25nm, 0.20nm, 0.15nm, 0.10nm, 0.075nm.		2.50nm, 2.00nm, 1.50nm, 1.00nm, 0.90nm, 0.85nm, 0.80nm, 0.70nm, 0.60nm, 0.55nm, 0.50nm, 0.45nm, 0.40nm, 0.35nm, 0.30nm, 0.25nm, 0.20nm, 0.15nm, 0.10nm.		2.50nm, 2.00nm, 1.50nm, 1.00nm, 1.00nm, 0.90nm, 0.85nm, 0.75nm, 0.65nm, 0.55nm, 0.50nm, 0.40nm, 0.35nm, 0.30nm, 0.25nm, 0.20nm, 0.18nm, 0.12nm.	
Wavelength Resolution	0.02nm							
Wavelength Repeatability	±0.02nm							
Polarization-Dependent Loss	0.08dB typ./0.15dB max over 60nm tuning range and 0.15dB typ./0.30dB max over 120nm tuning range (SM fibre pigtail only)							
Extinction Ratio	20dB (Connector exclusive, PM fibre pigtail only)							
Spectral Shape	Gaussian-Shape							
Bandwidth Ratio of 3/20/30dB	~1/2.5/3.5							
Bandwidth Variation	±4% over 60nm and ± 6% over 120nm							
Optical Power Handling [2]	500mW (CW)							
Return Loss	>45dB							
Out-Band Suppression	>45dB (Transmission peak to the average of background)							
Polarization Mode Dispersion	<0.2ps (SM fiber pigtail only)							
Group Delay	<0.1ps/nm							
Pigtail Fibre Type[3]	HI1060		SMF-28 or SMF-28e					
	Panda PM980		Panda PM1300		Panda PM1550			
Operating Temp	10°C to 50°C							
Storage Temp	-10°C to 75°C							
Dimension	See drawings below							
Weight	<0.5kg typical							
Other	RoHS compliant							
Note	[1] Up to 200nm tuning range is available on request.							
	[2] High power version up to 5.0W (CW) is available on request.							
	[3] PM fibres aligned in PM slow axes (fast-axis blocking) or specify others.							

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Specifications of Electric Tunable Filter (WLTF-NE-S-)

Center Wavelength	1060nm±15nm		1310nm±15nm		1550nm±20nm		1600nm±20nm	
Tuning Range	40nm	80nm	45nm	95nm	50nm	110nm	50nm	110nm
Insertion Loss	1.5dB typ., 2.5dB max. over 60nm tuning range and 3.0dB max. over 110nm tuning range (Connector exclusive)							
FWHM Bandwidth	2.00nm, 1.50nm, 1.00nm, 0.90nm, 0.80nm, 0.70nm, 0.60nm, 0.50nm, 0.40nm, 0.35nm, 0.30nm, 0.25nm, 0.20nm, 0.15nm, 0.10nm, 0.075nm.		2.00nm, 1.50nm, 1.00nm, 0.95nm, 0.90nm, 0.85nm, 0.80nm, 0.75nm, 0.70nm, 0.60nm, 0.55nm, 0.50nm, 0.40nm, 0.35nm, 0.30nm, 0.25nm, 0.20nm, 0.15nm, 0.10nm, 0.075nm.		2.50nm, 2.00nm, 1.50nm, 1.00nm, 0.95nm, 0.90nm, 0.85nm, 0.80nm, 0.70nm, 0.60nm, 0.55nm, 0.50nm, 0.45nm, 0.40nm, 0.35nm, 0.30nm, 0.25nm, 0.20nm, 0.15nm, 0.10nm.		2.50nm, 2.00nm, 1.50nm, 1.00nm, 1.00nm, 0.90nm, 0.85nm, 0.75nm, 0.65nm, 0.55nm, 0.50nm, 0.40nm, 0.35nm, 0.30nm, 0.25nm, 0.20nm, 0.18nm, 0.12nm.	
Wavelength Resolution	0.01nm for S-version							
Wavelength Repeatability	±0.01nm for S-version (from Home to Target)							
Max. Tuning Speed	40nm/Sec. for S-version							
Polarization-Dependent Loss	0.08dB typ./0.15dB max over 40nm tuning range and 0.15dB typ./0.30dB max over 110nm tuning range (SM fibre pigtail only)							
Extinction Ratio	20dB (Connector exclusive, PM fibre pigtail only)							
Spectral Shape	Gaussian-Shape							
Bandwidth Ratio of 3/20/30dB	~1/2.5/3.5							
Bandwidth Variation	±4% over 60nm and ± 6% over 120nm							
Max. Optical Power	500mW (CW). Up to 5.0W (CW) power handling available on request							
Return Loss	>45dB							
Out-Band Suppression	>45dB (Transmission peak to the average of background)							
Polarization Mode Dispersion	<0.2ps (SM fibre pigtail only)							
Group Delay	<0.1ps/nm							
Pigtail Fibre Type	HI1060		SMF-28 or SMF-28e					
	Panda PM980		Panda PM1300		Panda PM1550			
Electric Interface	USB (standard), I²C, SPI, or RS232							
Electric Power Consumption	<0.5W (CW)							
Operating Temp	10°C to 50°C							
Storage Temp	-10°C to 75°C							
Other	RoHS compliant							

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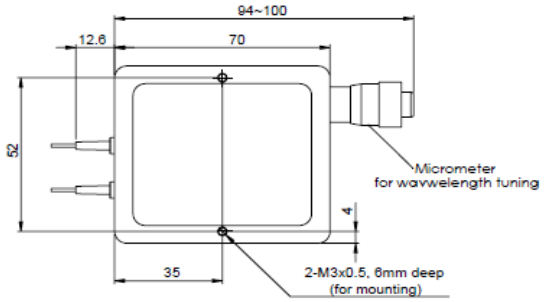
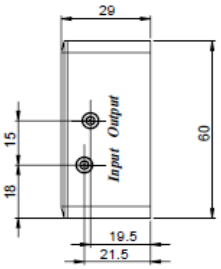
Dimensions of Manual Tunable Filter (WLTF-NM-S-version/pigtail only)





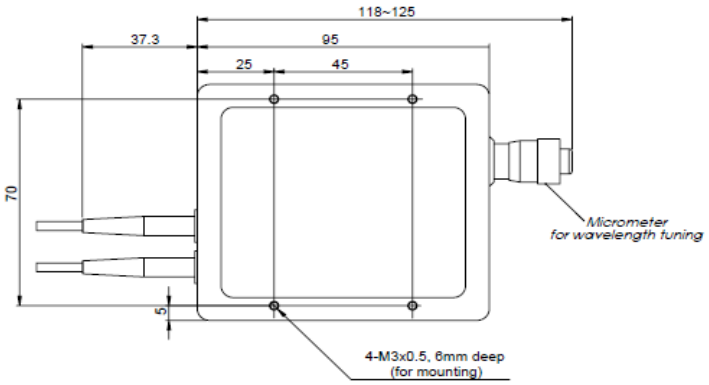
Notes/Specifications:

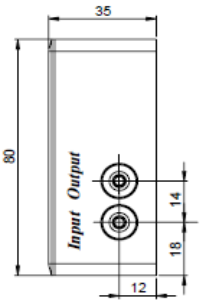
1. *Manual Tunable Optical Filter of S-Version (Pigtail only) over 980-1650nm.*
2. *Down to 0.2nm FWHM (Gaussian-shape) Bandwidth.*
3. *Up to 80nm Tuning Range.*
4. *1.5dB typ. and 3.0dB max. Insertion Loss over Tuning Range.*
5. *>45dB Return Loss.*
6. *0.15dB typ. and 0.30dB max. PDL (SM fiber pigtail only).*
7. *>20dB ER (PM fiber pigtail only).*
8. *500mW (CW) max. Optical Input Power.*

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

WL Photonics Inc.		TITLE: Dimensions of WLTF-NM-S-Version Filter (Pigtail only)	
	Date: Dec. 25/2023	SIZE: A	DWG. NO.: DS-001 / REV: 2
		SCALE: 1:1	WEIGHT: / SHEET 1 OF 1

Dimensions of Manual Tunable Filter (WLTF-NM-P-version)





Notes/Specifications:

1. *Manual Tunable Optical Filter of P-Version with Fiber Pigtail over 980-1650nm.*
2. *Down to 0.07nm FWHM (Gaussian-shape) Bandwidth.*
3. *Up to 200nm Tuning Range.*
4. *1.5dB typ. and 3.0dB max. Insertion Loss over Tuning Range.*
5. *>45dB Return Loss.*
6. *0.15dB typ. and 0.25dB 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-NM-P Version with Fiber Pigtail	
	Date: Dec. 08/2023	SIZE: A	DWG. NO.: DS-002 / REV: 2
		SCALE: 1:1	WEIGHT: / SHEET 1 OF 1

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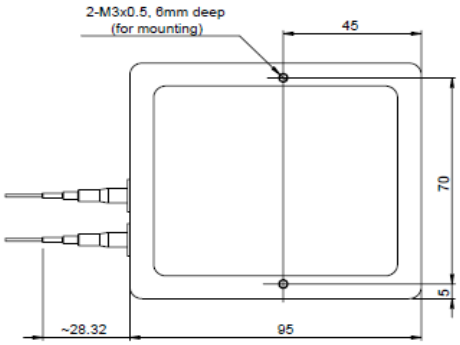
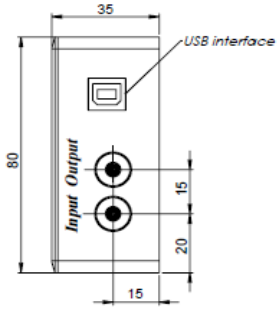
Dimensions of Electric Tunable Filter (WLTF-NE-S-version with USB interface)





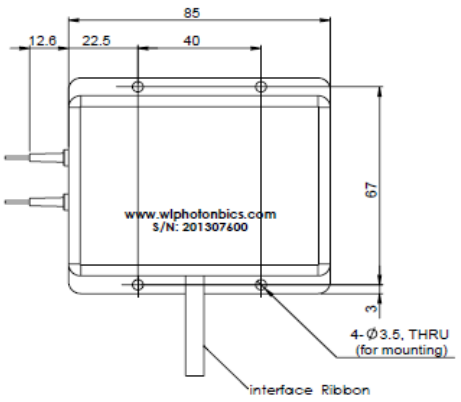
Notes/Specifications:

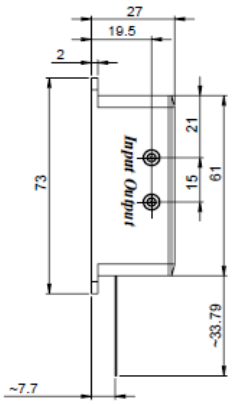
1. *Electrically Tunable Optical Filter of S-Version over 980-1650nm.*
2. *Down to 0.1nm FWHM (Gaussian-shape) Bandwidth.*
3. *Up to 110nm Tuning Range.*
4. *1.5dB typ. and 3.0dB max. Insertion Loss over Tuning Range.*
5. *>45dB Return Loss.*
6. *0.15dB typ. and 0.30dB max. PDL (SM fiber pigtail only).*
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.*

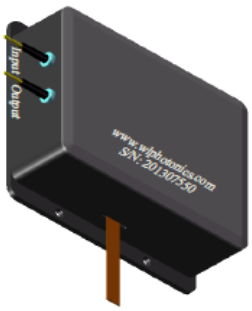
WL Photonics Inc. reserves the right to change dimensions without notice.

WL Photonics Inc.	TITLE: Dimensions of WLTF-NE-S-USB Version Filter		
	Date: Dec. 06/2023	SIZE: A	DWG. NO.: DS-003 / REV: 2
		SCALE: 1:1	WEIGHT: / SHEET 1 OF 1

Dimensions of Electric Tunable Filter (WLTF-NE-S-version with I²C or SPI interface)







Notes/Specifications:

1. *Tunable Optical Filter of S-Version over 1000-1700nm.*
2. *Down to 0.10nm FWHM (Gaussian-shape) bandwidth.*
3. *2.0 dB typ. and 3.0dB max. insertion loss over tuning range.*
4. *>45dB return loss.*
5. *0.15dB typ. and 0.30dB max. PDL (SM fiber pigtail only).*
6. *500mW (CW) max. optical input power.*
7. *SPI or I2C digital output Interface.*

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

WL Photonics Inc.	TITLE: Dimensions of S-Version Tunable Filter with SPI or I2C Interface		
	Date: Dec. 06 /2023	SIZE: A	DWG. NO.: DS-004 / REV: 2
		SCALE: 1:1	WEIGHT: / SHEET 1 OF 1

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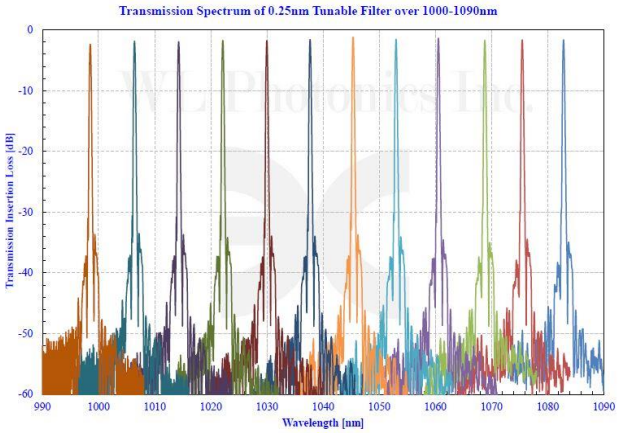
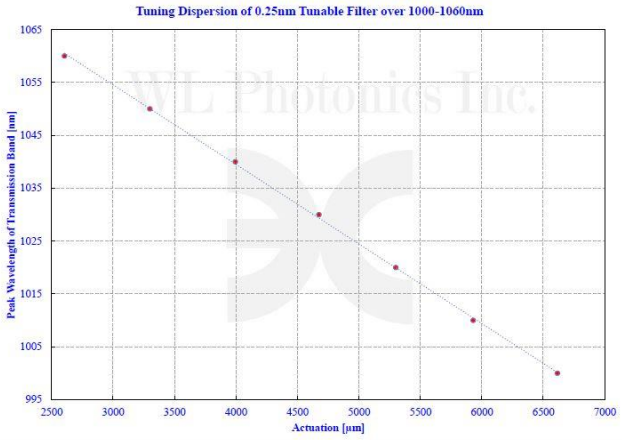
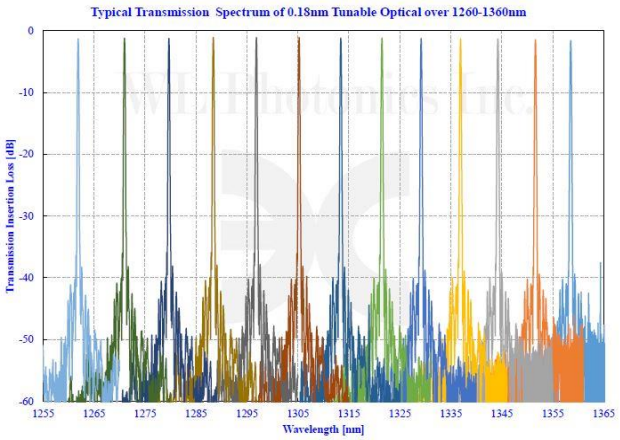
Example: Typical Transmission Spectrum and Tuning Dispersion of 0.25nm Filter over X-Band

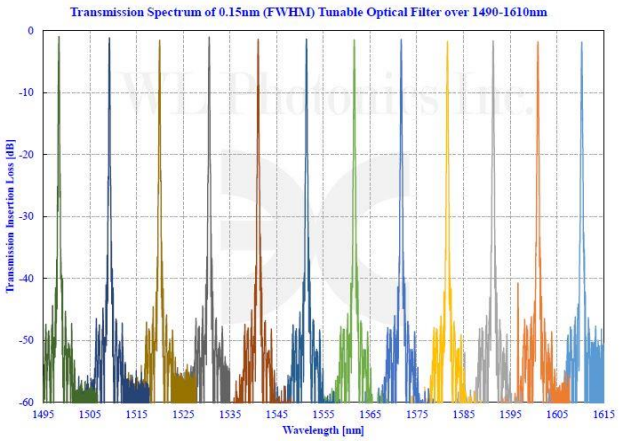


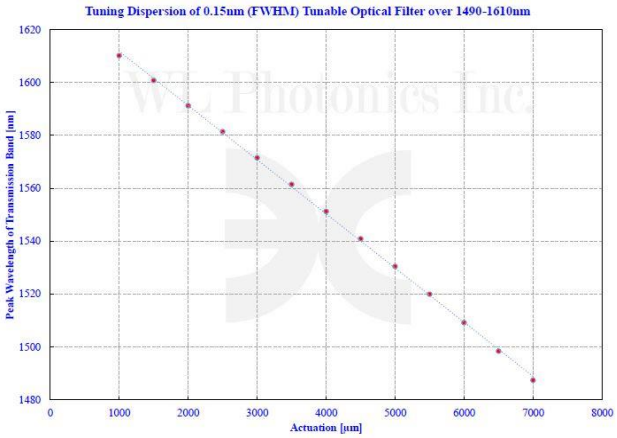


Example: Typical Transmission Spectrum and Tuning Dispersion of 0.18nm Filter over O-Band



Example: Typical Transmission Spectrum and Tuning Dispersion of 0.15nm Filter over S/C/L-Band





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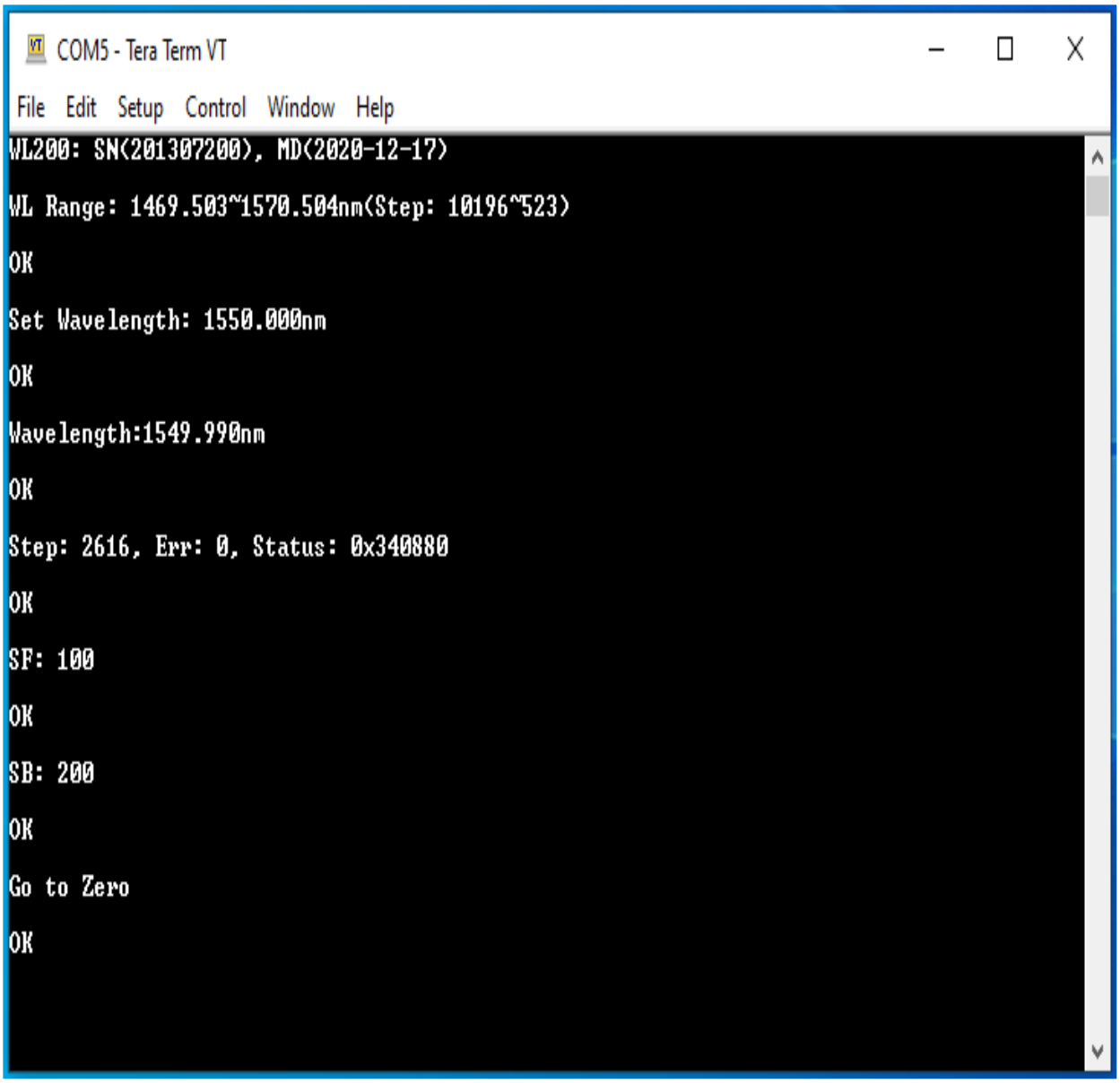
P-version of manual tunable filters covers the full specifications listed above while S-version of manual tunable filters can achieve only up to 80nm tuning range and down to 0.20nm FWHM bandwidths due to smaller housing.

USB interface of S-version electric tunable filters for Filter Wavelength Tuning (FWT) 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 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.

Example: Control interface of Filter Wavelength Tuning through USB interface by a PC.



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Ordering Information

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

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

A. Version type: P is P-version of either pigtail or receptacle input/output interfaces. S is for S-version of pigtail version only.
B. Center wavelength in nanometer: 1550 is for 1550nm center wavelength and 1310 is for 1310nm center wavelength.
C. Tuning wavelength range in nanometer: 60 is for 60nm tuning range and 120 is for 120nm tuning wavelength range.
D. FWHM bandwidth in nanometer: 0.5 is for 0.5nm 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 fibre, 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 of electric version filters: USB is for USB interface, I^2C is for I^2C interface and SPI is for SPI interface.

Example 1: **WLTF-NM-P-1550-120/0.25-SM-3.0/1.0-FC/APC**
Description: P-version fibre optic polarization-insensitive manually tunable optical filter of 0.25nm FWHM (Gaussian-shape) bandwidth over 1490-1610nm tuning range with 1M long, 3.0mm OD loose cabled SMF-28e fibre pigtails and FC/APC connectors on pigtail ends. 500mW (CW) max. input optical power.

Example 2: **WLTF-NM-P-1310-60/0.5-SM-FC/APC**
Description: P-version fibre optic polarization-insensitive manually tunable optical filter of 0.50nm FWHM (Gaussian-shape) bandwidth over 1280-1340nm tuning range with receptacle input and output for FC/APC connectors. SMF-28 operating fibre and 500mW (CW) max. optical input power.

Example 3: **WLTF-NM-S-1060-80/0.1-PM-0.9/1.0-00**
Description: S-version fibre optic polarization-sensitive manually tunable optical filter of 0.1nm FWHM (Gaussian-shape) bandwidth over 1020-1100 tuning range with 1M long, 900μm OD loose cabled Panda PM980 fibre pigtail aligned in PM slow axes (fast-axis blocking) and no connectors on pigtail ends. 500mW (CW) max. optical input power.

Example 4: **WLTF-NM-P-1550-120/0.10-PM-3.0/1.0-FC/APC-5.0**
Description: P-version fibre optic polarization-sensitive manually tunable optical filter of 0.10nm FWHM bandwidth over 1490-1610 tuning range with 1M long, 3.0mm OD loose cabled Panda PM1550 fibre pigtails aligned in PM slow axes (fast-axis blocking) and FC/APC connectors on pigtail ends. 5.0W (CW) max. optical input power.

Example 5: **WLTF-NE-S-1550-110/0.35-SM-3.0/1.0-FC/APC-USB**

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Description: S-version fibre optic polarization-insensitive electrically tunable optical filter of 0.35nm FWHM (Gaussian-shape) bandwidth over 1495-1605 with 1M long, 3.0mm OD loose cabled SMF-28e fibre pigtails and FC/APC connectors on pigtail ends. 500mW (CW) max. optical input power and USB interface.

Example 6: **WLTF-NE-S-1310-95/0.5-PM-FC/APC-USB**
Description: S-version fibre optic polarization-sensitive electrically tunable optical filter of 0.50nm FWHM (Gaussian-shape) bandwidth over 1260-13nm tuning range with receptacle input and output for FC/APC connectors. Panda PM1300 operating fibre aligned in PM slow axes (fast-axis Blocking), 500mW (CW) max. optical input power and USB interface.

Example 7: **WLTF-NE-S-1060-80/0.1-SM-0.9/1.0-00-SPI**
Description: S-version fibre optic polarization-insensitive electrically tunable optical filter of 0.1nm FWHM (Gaussian-shape) bandwidth over 1020-1100nm tuning range with 1M long, 900μm OD loose cabled HI1060 fibre pigtails and no connectors on pigtail ends. 500mW (CW) max. optical input power and SPI digital control interface.

Example 8: **WLTF-NE-S-1060-80/0.1-PM-0.9/1.0-00-USB-5.0**
Description: S-version fibre optic polarization-sensitive electrically tunable optical filter of 0.1nm FWHM (Gaussian-shape) bandwidth over 1020-1100nm tuning range with 1M long, 900μm OD loose cabled Panda PM980 fibre pigtails aligned in PM slow axes (fast-axis blocking) and no connectors on pigtail ends. 5.0W (CW) max. optical input power and USB interface.

Customization

Besides the specifications above, other customizations in terms of operating band, transmission bandwidth, power handling, interface and foot print, or other type functionalities related to spectral manipulations are available, please ask our sales for solutions.

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