

Tunable Laser System

TLS

Operation Manual

Ver 1.1



SLI
SPECTROLIGHT

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Tunable Laser System (TLS)

Fully tunable pico-second pulsed laser system by Spectrolight

Spectrolight's tunable laser system (TLS) is an innovative, continuously tunable laser that combines a super-continuum laser and a tunable bandpass filter in VISIBLE, IR, and SWIR ranges.

The **TLS-RED** offers a wide wavelength tuning range of approximately 400 to 1700 nm with a nominal FWHM (Full Width at Half Maximum) tunable from 2 to 15 nm. In contrast, the TLS-BLUE covers the same broad wavelength range but with a fixed FWHM of 10 or 20 nm. The TLS-RED is ideal for applications requiring precise scanning, while the **TLS-BLUE** is better suited for fields demanding high output power. With Spectrolight's TLS systems, users can freely select the output power and wavelength tuning ranges to meet their specific needs.

TLS is a pico-second tunable laser that can be applied to various fields, from fluorescence microscopy to time-resolved spectroscopy, such as TCSPC, Hyperspectral imaging, Machine vision, Semiconductors, Sensors, and other applications.

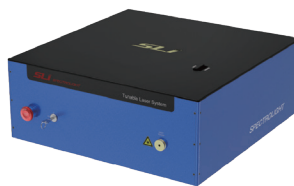
Power Fluctuation Stability

RSD is < 1 % at 650/15 nm

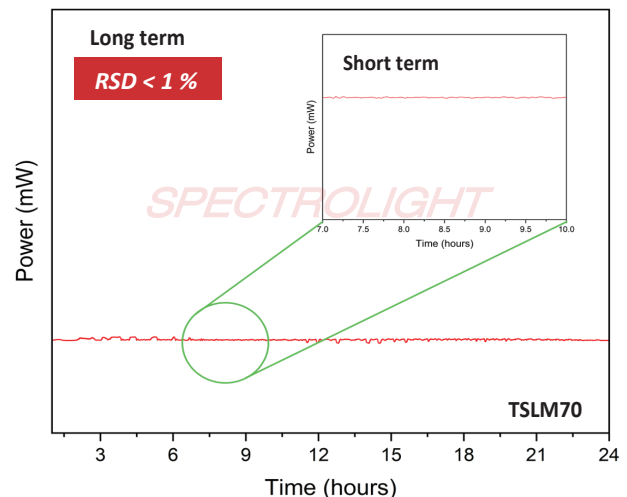
*RSD = Relative Standard Deviation



TLS-RED
(Tunable bandwidth)

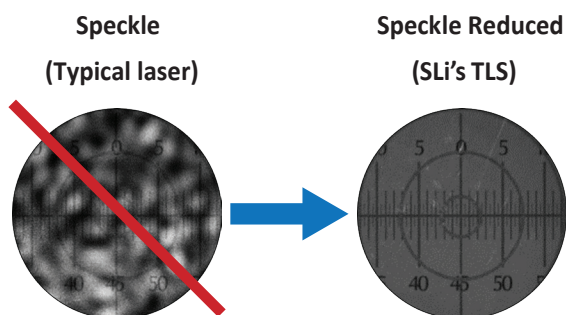


TLS-BLUE
(Fixed bandwidth)

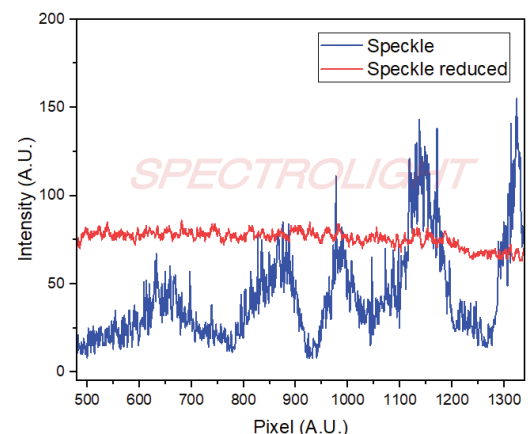


Speckle Reduced Option for Imaging

TLS products feature an option to dramatically reduce laser speckle noise, a capability not typically found in conventional lasers. When this option is applied, TLS facilitates clear imaging. The image segmentation results on the right clearly show the significant difference in speckle noise across the entire image.



Low S/N ratio imaging with speckle noise using conventional laser (left), and clear imaging with reduced speckle noise using TLS (right)



1. Introduction

1.1 TLS-RED



Each TLS-RED model covers distinct spectral ranges from 410 to 1700 nm. The nominal bandwidth (FWHM) of the TLS-RED is tunable from 2 to 15 nm, with the exact tunable range depending on the selected wavelength. Users can choose laser types and variable wavelength ranges to suit their specific applications. Please refer to the detailed specifications table below for more information.



TLS-RED (Tunable bandwidth)

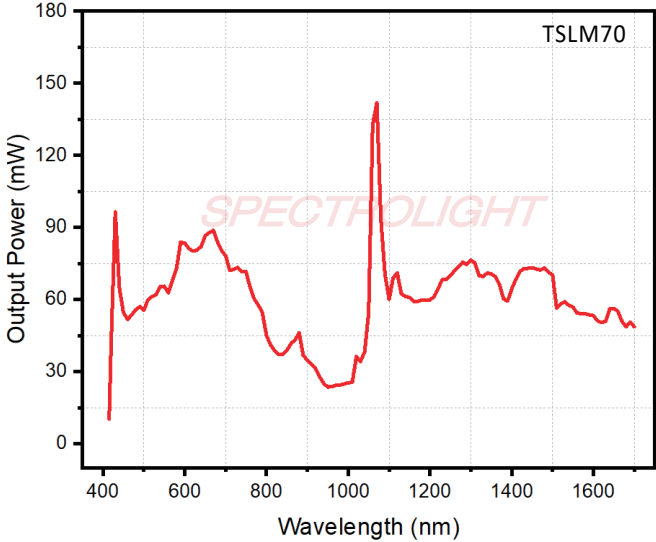
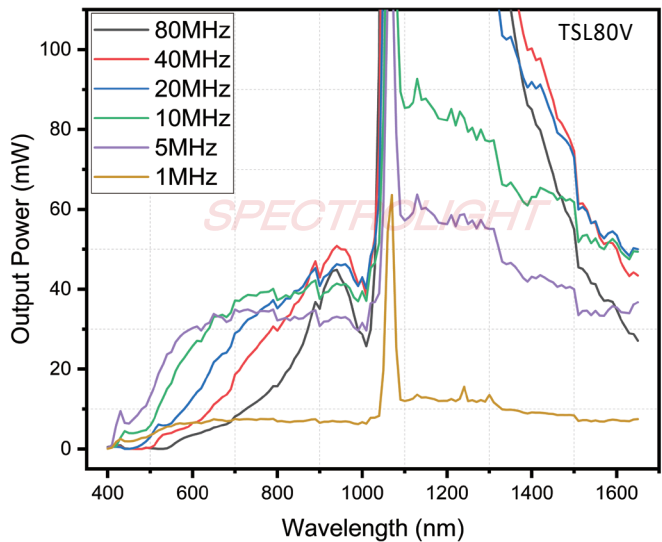
General Specifications

Tunable Laser System (TLS-RED) : Each TLS has VIS, IR, SWIR and Custom wavelength selection

Model	Laser output power (mW, W)		Repetition Rate (MHz)	Output pulse width (ps)	CW Tuning Range (nm)	Bandwidth (FWHM) (nm)
	Visible	Total				
TSL10-RED	100 mW	1 W	2 MHz	< 300 ps	450–1700 nm	2–15 nm (nominal)
TSLM10-RED	250 mW	1 W	10 MHz	< 50 ps	410–1700 nm	
TSLM20-RED	500 mW	2 W	20 MHz	< 50 ps	410–1700 nm	
TSLM40-RED	1 W	4 W	40 MHz	< 50 ps	410–1700 nm	
TSLM35V-RED	1 W	3.5 W	0.01 to 40 MHz	< 50 ps	410–1700 nm	
TSL80V-RED	1 W	8 W	0.01 to 200 MHz	< 300 ps	430–1700 nm	
TSLM70-RED	2 W	7 W	80 MHz	< 50 ps	410– 1700 nm	

An option for customizable repetition rates is available at an extra cost, allowing adjustment up to each product's maximum fixed rate.

Output Power of TLS-RED



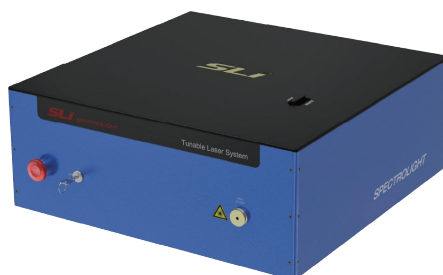
* Measured at 15 nm bandwidth (FWHM)

1. Introduction

1.2 TLS-BLUE



Each TLS-BLUE model covers distinct spectral ranges from 410 to 1700 nm. Users can choose laser types and variable wavelength ranges to suit their specific applications. Please refer to the detailed specifications table below for more information.



TLS-BLUE (Fixed bandwidth)

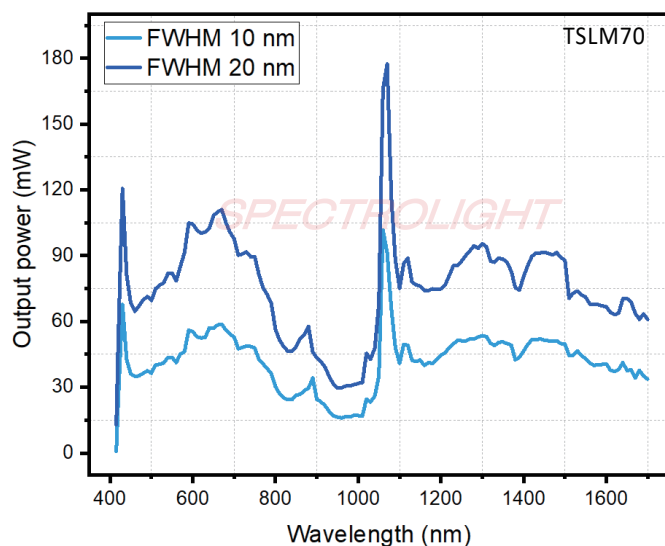
General Specifications

Tunable Laser System (TLS-BLUE) : Each TLS has VIS, IR, SWIR and Custom wavelength selection

Model	Laser output power (mW, W)		Repetition Rate (MHz)	Output pulse width (ps)	CW Tuning Range (nm)	Bandwidth (FWHM) (nm)
	Visible	Total				
TSL10-BLUE	100 mW	1 W	2 MHz	< 300 ps	450–1700 nm	10 or 20 nm fixed (nominal)
TSLM10-BLUE	250 mW	1 W	10 MHz	< 50 ps	410–1700 nm	
TSLM20-BLUE	500 mW	2 W	20 MHz	< 50 ps	410–1700 nm	
TSLM40-BLUE	1 W	4 W	40 MHz	< 50 ps	410–1700 nm	
TSLM35V-BLUE	1 W	3.5 W	0.01 to 40 MHz	< 50 ps	410–1700 nm	
TSL80V-BLUE	1 W	8 W	0.01 to 200 MHz	< 300 ps	430–1700 nm	
TSLM70-BLUE	2 W	7 W	80 MHz	< 50 ps	410–1700 nm	

An option for customizable repetition rates is available at an extra cost, allowing adjustment up to each product's maximum fixed rate.

Output Power of TLS-BLUE



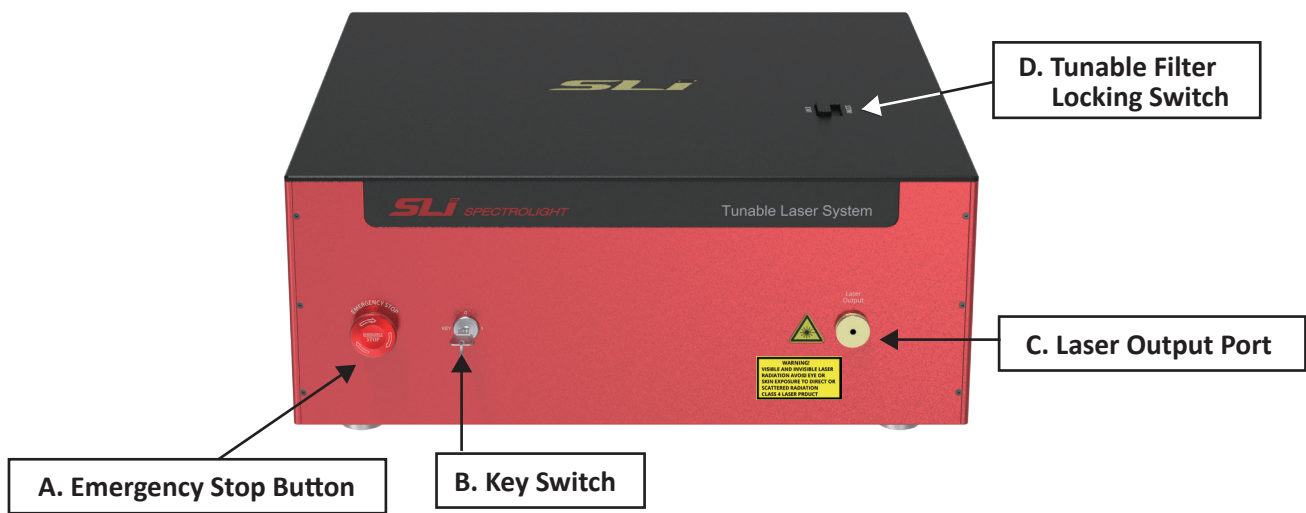
2. System Overview

2.1 System Main Components

1	TLS	Main body
2	Power cable	AC power cable (1 ea)
3	USB cable	USB A to B cable (1 ea)
4	Key switch	Key switch (2 ea)
5	Interlock plug	External safety device (1 ea)
6	Laptop	Product software, product user manual, etc.

2.2 Front Panel Functions

(Example: TLS-RED)



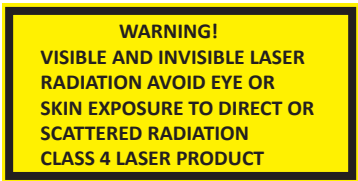
A. Emergency Stop Button: Press it in an emergency situation, and it can be restored by rotating it clockwise.

B. Key Switch: Rotate exactly 90 degrees clockwise to power on, and 90 degrees counterclockwise to power off the laser.

C. Laser Output Port: The default output is free-space. To connect to optical fibers or fiber bundles, appropriate coupling accessories are required (e.g., fiber adapter)

D. Tunable Filter Locking Switch: When the equipment is not in use or being moved, the tunable filter must be locked.

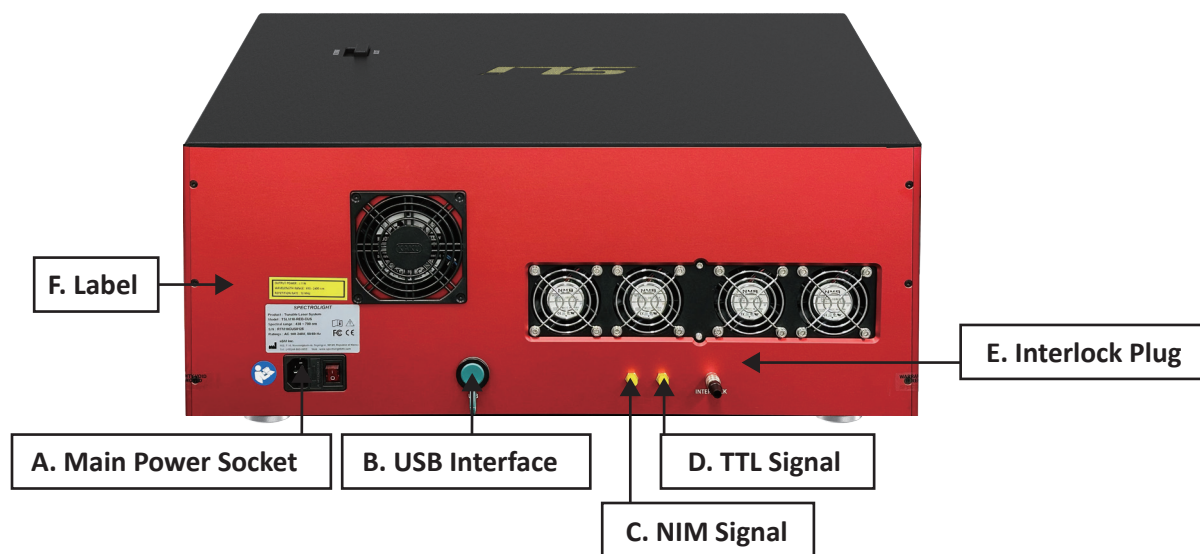
E. Labels: Laser safety



2. System Overview

2.3 Back Panel Functions

(Example: TSL80V-RED-VIS)



A. Main Power Socket: Plug the power cord into the main socket.

B. USB Interface: Connect a USB cable to the computer to control the laser.

C. NIM Signal: The SMA interface will output a pulse square wave signal loaded 50 Ω with the same pulse and frequency; NIM Voltage: 0 to -1 V

D. TTL Signal: The SMA interface will output a pulse square wave signal loaded 50 Ω with the same pulse and frequency; TTL Voltage: 0 to 3.3 V

E. Interlock Plug: Connect the interlock plug when using the laser.

F. Label: Laser specifications

Product: Tunable Laser System
Model: TSL80V-RED-VIS
Spectral range: 430- 790 nm
S/N: RT80VVIS0000
Ratings: AC 100-240V, 50/60 Hz



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OUTPUT POWER: ≤ 8 W
WAVELENGTH RANGE: 430 - 2400 nm
REPETITION RATE: 0.01 to 200 MHz adjustable

2. System Overview

2.4 Specifications



TLS-RED (Tunable bandwidth)

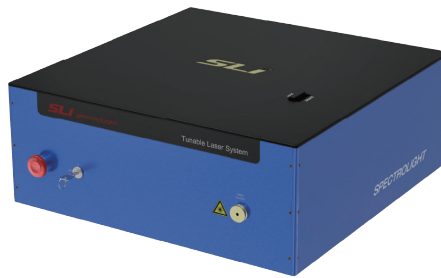
		TSL10-RED	TSLM10-RED	TSLM20-RED	TSLM40-RED	TSLM35V-RED	TSL80V-RED	TSLM70-RED
Output power	Visible	100 mW	250 mW	500 mW	1 W	1 W	1 W	2 W
	Total	1 W	1 W	2 W	4 W	3.5 W	8 W	7 W
Repetition rate		2 MHz	10 MHz	20 MHz	40 MHz	0.01 to 40 MHz adjustable	0.01 to 200 MHz adjustable	80 MHz
Output pulse width		< 300 ps	< 50 ps	< 50 ps	< 50 ps	< 50 ps	< 300 ps	< 50 ps
Fundamental pulse width		~ 100 ps	~ 6 ps	~ 6 ps	~ 6 ps	~ 6 ps	~ 100 ps	~ 6 ps
Tuning spectral range ¹⁾		450–1700 nm	410–1700 nm	410–1700 nm	410–1700 nm	410–1700 nm	430–1700 nm	410–1700 nm
Bandwidth(FWHM) ²⁾		2–15 nm(nominal)						
Power stability		< 1 %						
Intensity control		0–100 %						
Output type ³⁾		Free space						
Beam diameter & quality		~ 2 mm @ 633 nm; M ² < 1.1						
Beam divergence		< 1 mrad (half angle)						
State of polarization		Unpolarized						
Sync(trigger) output		NIM output 0 to-1 V, TTL output 0 to 3.3 V						
Electric requirement		AC 100- 240 V, 50/60 Hz						
Power consumption		< 280 W						
Software		TLS v2.0						
Data interface		USB 2.0						
Dimension (L x W x H)		584.3 mm x 583.6 mm x 246 mm						
Weight		< 37 kg						

1) Specified center wavelength(CWL) tolerance: ± 1 nm.

2) Specified full width at half maximum(FWHM) tolerance: ± 1 nm

3) Various output accessory configurations such as fiber and fiber bundle are available. Please contact us for custom options or detailed specifications.

2. System Overview



TLS-BLUE (Fixed bandwidth)

		TSL10-BLUE	TSLM10-BLUE	TSLM20-BLUE	TSLM40-BLUE	TSLM35V-BLUE	TSL80V-BLUE	TSLM70-BLUE
Output power	Visible	100 mW	250 mW	500 mW	1 W	1 W	1 W	2 W
	Total	1 W	1 W	2 W	4 W	3.5 W	8 W	7 W
Repetition rate		2 MHz	10 MHz	20 MHz	40 MHz	0.01 to 40 MHz adjustable	0.01 to 200 MHz adjustable	80 MHz
Output pulse width		< 300 ps	< 50 ps	< 50 ps	< 50 ps	< 50 ps	< 300 ps	< 50 ps
Fundamental pulse width		~ 100 ps	~ 6 ps	~ 6 ps	~ 6 ps	~ 6 ps	~ 100 ps	~ 6 ps
Tuning spectral range ¹⁾		450–1700 nm	410–1700 nm	410–1700 nm	410–1700 nm	410–1700 nm	430–1700 nm	410–1700 nm
Bandwidth(FWHM) ²⁾		10 nm or 20 nm (nominal)						
Power stability		< 1 %						
Intensity control		0–100 %						
Output type ³⁾		Free space						
Beam diameter & quality		~ 2 mm @ 633 nm; M ² < 1.1						
Beam divergence		< 1 mrad (half angle)						
State of polarization		Unpolarized						
Sync(trigger) output		NIM output 0 to -1 V, TTL output 0 to 3.3 V						
Electric requirement		AC 100–240 V, 50/60 Hz						
Power consumption		< 280 W						
Software		TLS v2.0						
Data interface		USB 2.0						
Dimension (L x W x H)		584.3 mm x 583.6 mm x 246 mm						
Weight		< 37 kg						

1) Specified center wavelength(CWL) tolerance: ± 1 nm.

2) Specified full width at half maximum(FWHM) tolerance: 2.5 nm

3) Various output accessory configurations such as fiber and fiber bundle are available. Please contact us for custom options or detailed specifications.

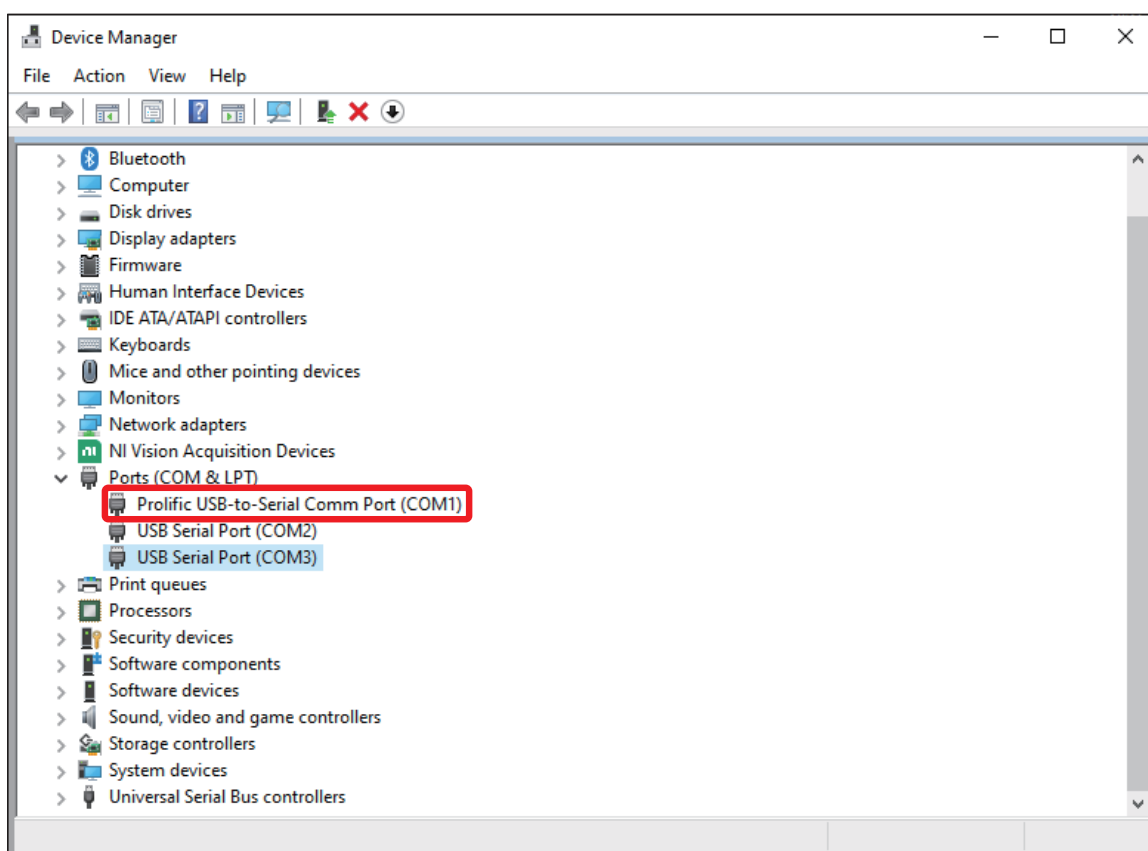
3. Operation

3.1 Turning On the Laser

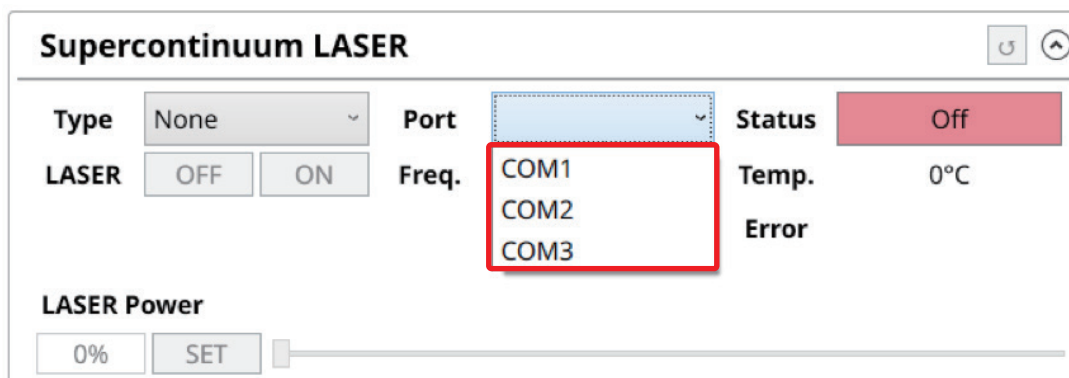
1. Connect the AC power cable to the TLS.
2. Insert the interlock plug into the panel at the back of the TLS.
3. Set the tunable filter locking switch to UNLOCK.
4. Turn on the power switch.
5. Turn on the key switch on the TLS front panel.

3.2 Laser Connection

1. Once the TLS is connected to the PC, open the "Device Manager"
Look under the Ports tab to find the "Prolific USB-to-Serial Comm Port" and check the COM number
(If you cannot find the "Prolific USB-to-Serial Comm Port", please go to 6. Troubleshooting in this manual)
Once you have checked the COM number, open the TLS software.



2. Set the Port number to be the same as the COM number.

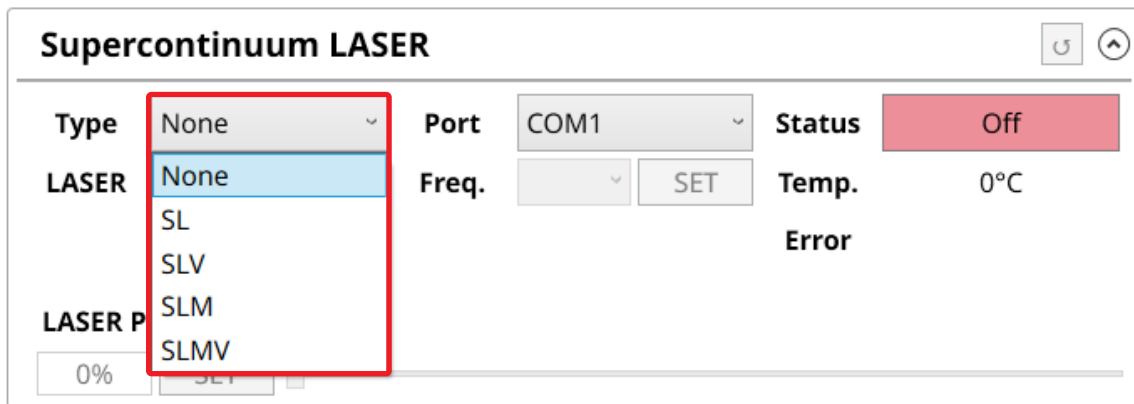


3. Operation

3. Select the laser type and check key status

After connecting the laser, select the appropriate laser type by clicking the **[Type]** dropdown menu.

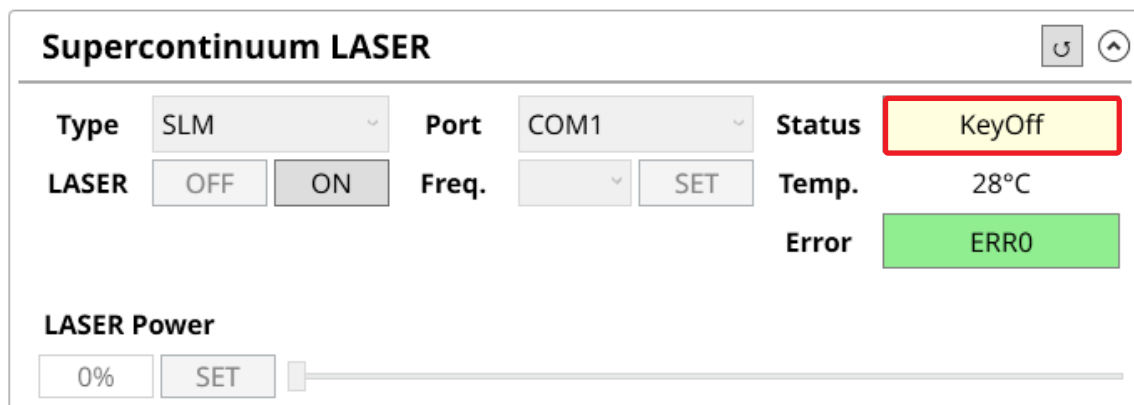
If you are not sure which laser type to select, please contact us at support@spectrolightinc.com.



The screenshot shows the 'Supercontinuum LASER' control window. The 'Type' dropdown menu is open, displaying options: None, None, SL, SLV, SLM, and SLMV. The 'None' option is highlighted. Other fields include 'Port' set to 'COM1', 'Status' set to 'Off' (in a red box), 'Temp.' set to '0°C', and 'Error' field. The 'LASER Power' slider is at 0%.

Once the laser is connected, the Status field will automatically update after a few seconds.

If the status displays "**KeyOff**", turn the physical key switch on the laser's front panel to the ON position before you proceed.



The screenshot shows the 'Supercontinuum LASER' control window. The 'Type' dropdown menu is now set to 'SLM'. The 'Status' field is updated to 'KeyOff' (in a yellow box with a red border). The 'Temp.' field is now '28°C' and the 'Error' field is 'ERR0' (in a green box). The 'LASER Power' slider is still at 0%.

3. Operation

4. Turn on the laser (Status: Off → On)

When the physical key switch on the laser's front panel is in the ON position and the laser type has been selected, the device is ready to be powered on by using software.

The method for turning on the laser may vary depending on the model series.

Please refer to the instructions below for your specific laser series.

4-1. SL-Pico G-Series (Gain-switched Laser, SL/SLV)

Once the laser is connected to the software and operating, the [LASER] tab will activate.

The laser status will show as "Off."

To turn on the laser, click the "ON" button on the [LASER] tab.

The screenshot shows the 'Supercontinuum LASER' control window. At the top, there are two small icons: a refresh icon and an up arrow icon. Below the title bar, there are several controls: 'Type' is set to 'SL', 'Port' is set to 'COM1', and 'Status' is 'Off' (indicated by a red box). Under the 'LASER' label, there are two buttons: 'OFF' and 'ON'. The 'ON' button is highlighted with a red rectangle and a red arrow points to it. To the right of the 'ON' button is a 'Freq.' dropdown menu and a 'SET' button. Further right, 'Temp.' is '24°C' and 'Error' is 'ERR0' (indicated by a green box). At the bottom, there is a 'LASER Power' section with a '0%' button, a 'SET' button, and a horizontal slider bar.

The laser is now ready for use.

The screenshot shows the 'Supercontinuum LASER' control window after the laser has been turned on. The 'Status' is now 'On' (indicated by a green box). The 'OFF' and 'ON' buttons are still present, but the 'ON' button is no longer highlighted. The 'Temp.' remains '24°C' and the 'Error' remains 'ERR0' (indicated by a green box). The 'LASER Power' section at the bottom remains the same with '0%', 'SET', and a slider bar.

3. Operation

4-2. SL-Pico M-Series (Mode-locked Laser, SLM/SLMV)

Turn on the laser starting from the "OFF" state

Status: OFF

After you set the laser type to SLM or SLMV and the physical Key switch on the laser's front panel is in the ON position (in step 3), the laser status will be "Off".

The screenshot shows the 'Supercontinuum LASER' control window. At the top right are two icons: a refresh icon and an up arrow icon. The main area contains several controls: 'Type' is set to 'SLM' with a dropdown arrow; 'Port' is set to 'COM1' with a dropdown arrow; 'Status' is 'Off' in a red box; 'LASER' has 'OFF' and 'ON' buttons; 'Freq.' has a dropdown arrow and a 'SET' button; 'Temp.' is '0°C'; and 'Error' is empty. At the bottom, 'LASER Power' is shown with a '0%' button, a 'SET' button, and a horizontal slider bar.

Status: WarmUp

Once the key switch is turned on, the status will automatically change to "WarmUp".

This stage may take a few minutes depending on the ambient conditions and internal initialization.

During WarmUp, the laser cannot be activated. Please wait until the warm-up is complete.

The screenshot shows the 'Supercontinuum LASER' control window with the status changed to 'WarmUp' in a yellow box. The 'Error' field now displays 'ERR0' in a green box. All other controls, including 'Type' (SLM), 'Port' (COM1), 'LASER' buttons, 'Freq.' button, 'Temp.' (28°C), and 'LASER Power' slider, remain the same as in the previous state.

Status: Ready

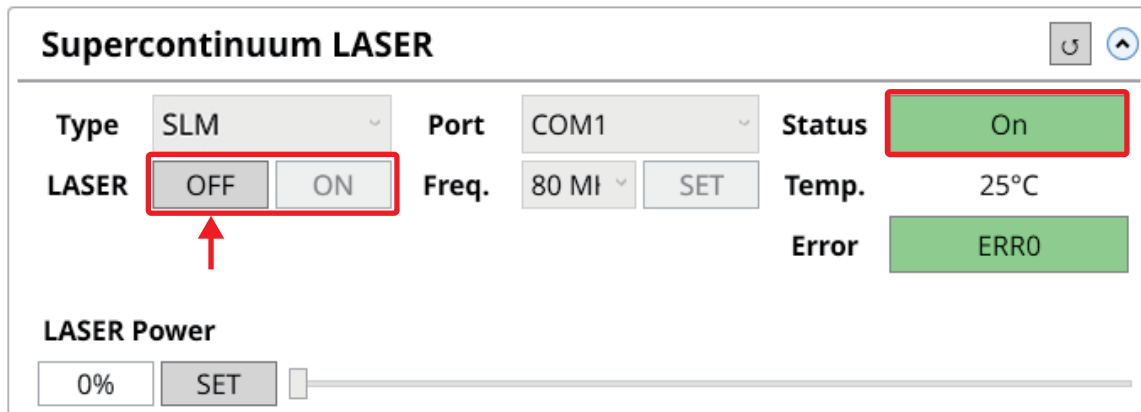
When the warm-up process is complete, the status will automatically change to "Ready".

The screenshot shows the 'Supercontinuum LASER' control window with the status changed to 'Ready' in a yellow box. The 'Error' field still displays 'ERR0' in a green box. All other controls, including 'Type' (SLM), 'Port' (COM1), 'LASER' buttons, 'Freq.' button, 'Temp.' (28°C), and 'LASER Power' slider, remain the same as in the previous states.

3. Operation

Press [ON]

Once the status is “Ready”, click the [ON] button in the [LASER] tab to turn on the laser.



The screenshot shows the 'Supercontinuum LASER' control window. The 'Type' is set to 'SLM'. The 'Port' is 'COM1'. The 'Status' is 'On' (highlighted in green). The 'LASER' tab has 'OFF' and 'ON' buttons, with 'ON' highlighted in green and a red arrow pointing to it. The 'Freq.' is '80 MHz' with a 'SET' button. The 'Temp.' is '25°C'. The 'Error' is 'ERR0'. The 'LASER Power' is '0%' with a 'SET' button and a slider.

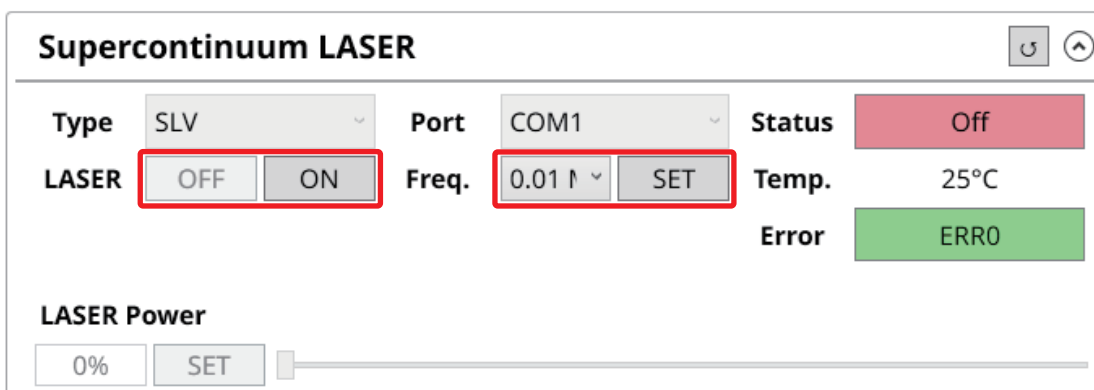
5. Set the Repetition Rate (Variable Models: SLV/SLMV)

This step applies only to Variable models (SLV / SLMV) that allow adjustment of the repetition rate.

The repetition rate determines the pulse frequency of the laser output.

Note: OFF state required

The repetition rate can only be set or changed when the laser status is OFF. If you need to adjust the frequency during use, first turn the laser OFF, then change the repetition rate, and finally turn it ON again.



The screenshot shows the 'Supercontinuum LASER' control window. The 'Type' is set to 'SLV'. The 'Port' is 'COM1'. The 'Status' is 'Off' (highlighted in red). The 'LASER' tab has 'OFF' and 'ON' buttons, with 'OFF' highlighted in red. The 'Freq.' is '0.01 MHz' with a 'SET' button. The 'Temp.' is '25°C'. The 'Error' is 'ERR0'. The 'LASER Power' is '0%' with a 'SET' button and a slider.

3. Operation

Access the [Freq.] tab

Once the laser is connected, the [LASER] and [Freq.] tabs are activated.

Select the desired frequency from the dropdown menu (e.g., 80 MHz).

Click the [SET] button to apply.

The screenshot shows the 'Supercontinuum LASER' control window. The 'Type' is set to 'SLV' and the 'Port' is 'COM1'. The 'Status' is 'Off' (red button). The 'LASER' tab is active, showing 'OFF' and 'ON' buttons. The 'Freq.' dropdown menu is open, displaying a list of frequencies: 0.01 MHz, 0.1 MHz, 0.2 MHz, 0.5 MHz, 1 MHz, 4 MHz, 5 MHz, 10 MHz, 20 MHz, 40 MHz, 80 MHz, and 200 MHz. The '0.01 MHz' option is highlighted. A red arrow points to the 'SET' button next to the frequency dropdown. The 'Temp.' is 25°C and the 'Error' is 'ERR0' (green button). The 'LASER Power' is at 0% with a 'SET' button and a slider.

Turn on the laser

After setting the frequency, press the [ON] button in the [LASER] tab.

The screenshot shows the 'Supercontinuum LASER' control window. The 'Type' is 'SLV' and the 'Port' is 'COM1'. The 'Status' is 'Off' (red button). The 'LASER' tab is active, and the 'ON' button is highlighted with a red box and a red arrow pointing to it. The 'Freq.' dropdown menu is set to '80 MHz'. The 'Temp.' is 25°C and the 'Error' is 'ERR0' (green button). The 'LASER Power' is at 0% with a 'SET' button and a slider.

The Status will change from "Off" to "On", confirming the laser is running with the selected repetition rate.

The screenshot shows the 'Supercontinuum LASER' control window. The 'Type' is 'SLV' and the 'Port' is 'COM1'. The 'Status' is now 'On' (green button), highlighted with a red box. The 'LASER' tab is active, showing 'OFF' and 'ON' buttons. The 'Freq.' dropdown menu is set to '80 MHz'. The 'Temp.' is 25°C and the 'Error' is 'ERR0' (green button). The 'LASER Power' is at 0% with a 'SET' button and a slider.

Verify operation

Confirm that the Status is "On" and that the selected frequency is displayed in the [Freq.] field.

The laser is now ready for use with the specified repetition rate.

3. Operation

3.3 Laser Operation

Once the laser is ready for use, use the [LASER Power] tab to set its desired power.

Users can manually input the power directly and click “SET” button or use the scroll bar on the right.

The figure consists of three vertically stacked screenshots of the 'Supercontinuum LASER' control interface. Each screenshot shows the same top section with controls for Type (SLV), Port (COM1), Status (On), LASER (OFF/ON), Freq. (80 MHz), Temp. (25°C), and Error (ERR0). The bottom section is labeled 'LASER Power'.

- Top Screenshot:** The 'LASER Power' input field contains the value '20', and the 'SET' button is highlighted with a red box. A red arrow points from the 'SET' button to the middle screenshot.
- Middle Screenshot:** The 'LASER Power' input field now displays '20%', and the 'SET' button is no longer highlighted.
- Bottom Screenshot:** The 'LASER Power' input field displays '50%', and the 'SET' button is no longer highlighted. A red box highlights the horizontal slider bar, and a red arrow points from the slider to the right.

***NOTE:** When increasing the power of the laser output, it should be gradually raised from 0% to 100%.

For example : 0% → 30% → 50% → 80% → 100%

***NOTE:** When decreasing the power of the laser output, it should be gradually reduced from 100% to 0%.

For example : 100% → 80% → 50% → 30% → 0%

3. Operation

3.4 FWS Connection

1. If the calibration file is located in the software directory and the path of the calibration file was correctly copied onto the "FwsConfig" file, the FWS should connect automatically.

To check that the FWS is successfully connected, check that the [Status] tab displays "Ready" message at the bottom of the software.

FWS

FWS 1	Range	350 - 890	Status	Ready	
Name	POLY-VIS-R-W	SerialNo	RPWCSX0123	Position	Blank
FWS 2	Range	891 - 1700	Status	Ready	
Name	POLY-IRP-R-W	SerialNo	RPWIRP0123	Position	Blank

SET

SCAN

PRESET

Input

CWL

350

FWHM

0

Go

Blank

Reset

Output

Start Point

350 nm

End Point

1700 nm

Device ready.



3. Operation

3.5 FWS Operation: Setting the center wavelength and bandwidth

1. **CWL (nm)**: enter the desired CWL (center wavelength)
2. **FWHM (nm)**: enter the desired FWHM (full-width at half maximum)
3. **Go**: click to start wavelength tuning
4. **Blank**: click to set blank mode
5. **Reset**: click to reset filter
6. **Scroll bar**: drag the scroll bar to control the CWL
7. **Resize bar**: click and drag to resize the software window

SET SCAN PRESET

Input

CWL	FWHM	Go	Blank
450	15		

Output

Start Point 350 nm End Point 1700 nm

Successfully changed wavelength and FWHM. CWL:450.0 , FWHM:15

SLI

3.6 FWS Operation: Scanning across a certain wavelength range

1. **Enter the following values**
 - **START (nm)**: the wavelength to start scanning
 - **END (nm)**: the wavelength to end scanning
 - **FWHM (nm)**: the bandwidth during the scan
 - **STEP (nm)**: the step size of the scan in nm
 - **Time delay (sec)**: set the time delay between each individual wavelength step
 - **Repeat time (count)**: the number of full scans
2. **Go**: click to start scanning
3. **Stop**: click to stop scanning

SET **SCAN** PRESET

Input

Start	End	Step	FWHM	Delay	Repeat	Go	Stop
350	1700	10	10	1	1		

Output

Start Point 350 nm End Point 1700 nm

CWL 350 nm

3.7 FWS Operation: Setting or editing the preset wavelength and bandwidth

- In the PRESET tab, you can set your frequently used wavelength and bandwidth for easy access.

1. **CWL, FWHM (nm)**: enter the desired CWL and FWHM value
2. **Preset Selection**: select the presets that are to be scanned
3. **Go (individual)**: click to scan individual presets
4. **Time delay (sec)**: set the time delay between each individual presets
5. **Repeat time (count)**: the number of full scans
6. **Go**: click to scan all selected presets
7. **Stop**: click to stop scanning
8. **Add, Delete, Save**: click the respective buttons to add, delete and save current presets

The screenshot shows the 'PRESET' tab of a software interface. At the top are three tabs: 'SET', 'SCAN', and 'PRESET' (which is highlighted with a red box and callout 2). Below the tabs is an 'Input' section. It contains a table with two columns: 'CWL' and 'FWHM'. There are four rows of preset values: (450, 2), (500, 3), (550, 5), and (600, 7). Each row has a checkbox to its left (callout 1) and a 'Go' button to its right (callout 3). To the right of the table are three input fields: 'Delay' with the value '1' (callout 4), 'Repeat' with the value '1' (callout 5), and a 'Go' button (callout 6). Below these is a 'Stop' button (callout 7). At the bottom of the 'Input' section are three buttons: 'Add', 'Delete', and 'Save' (callout 8).

3.8 Turning Off the Laser

1. Gradually decrease the laser output power. (For example: 100% → 80% → 50% → 30% → 0%)
2. Click "OFF" on the [LASER] tab.

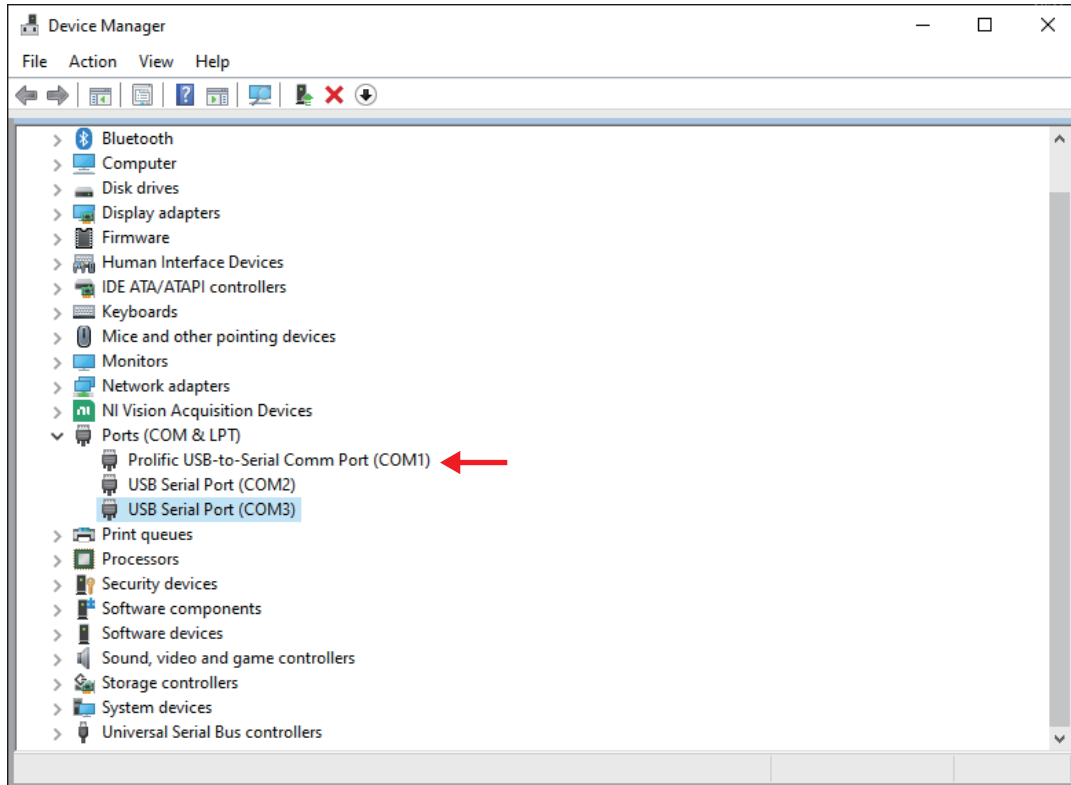
The screenshot shows the 'Supercontinuum LASER' control interface. It has a title bar with a refresh icon and an up arrow icon. Below the title bar are several controls: 'Type' set to 'SLM', 'Port' set to 'COM1', 'Status' set to 'On' (in a green box), 'Temp.' set to '28°C', and 'Error' set to 'ERRO' (in a green box). There is a 'LASER' section with two buttons: 'OFF' and 'ON'. The 'OFF' button is highlighted with a red box and a red arrow points to it. Below this is a 'LASER Power' section with a slider and a 'SET' button. The slider is currently at 0%.

3. Turn off the key switch on the front panel of the TLS. (0: OFF, 1: ON)
4. Turn off the power switch on the back panel of the TLS.
5. If the TLS will not be used for long time, disconnect the power cord and interlock plug.

4. Troubleshooting

4.1 Device Connection Error

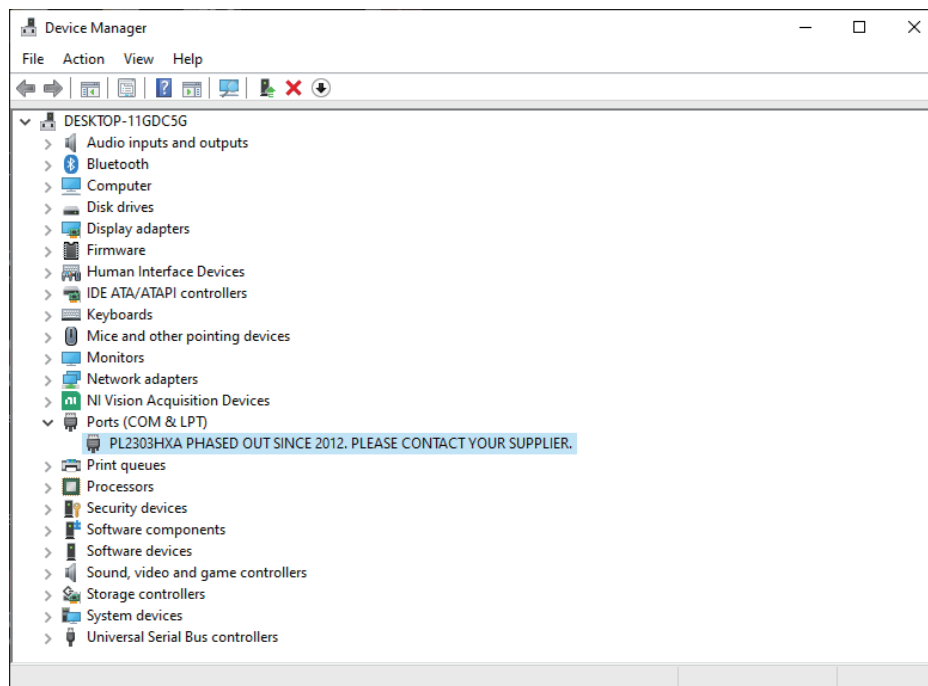
- If you're experiencing issues with the connection between the device and software, ensure the communication driver is correctly installed and displayed in the Device Manager.
- If there is a problem with the communication driver, install the latest FTDI USB driver suitable for your OS from the following website - <https://ftdichip.com/drivers/>



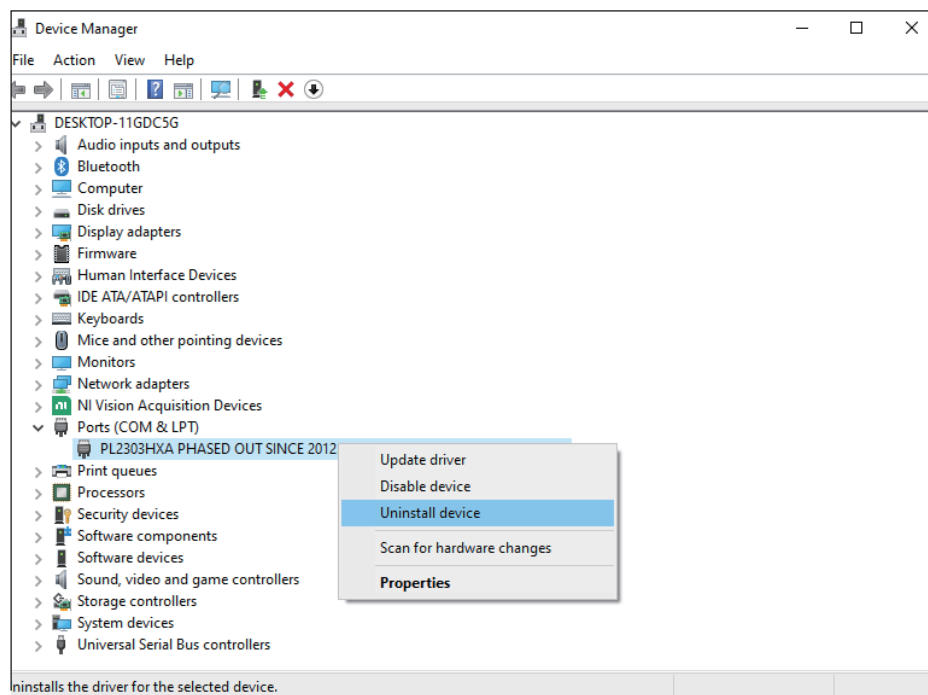
4. Troubleshooting

4.2 Laser Connection Error

- If you are having difficulty setting up a laser connection, check the "Ports (COM & LPT)" section of Device Manager for the presence and proper configuration of the laser.

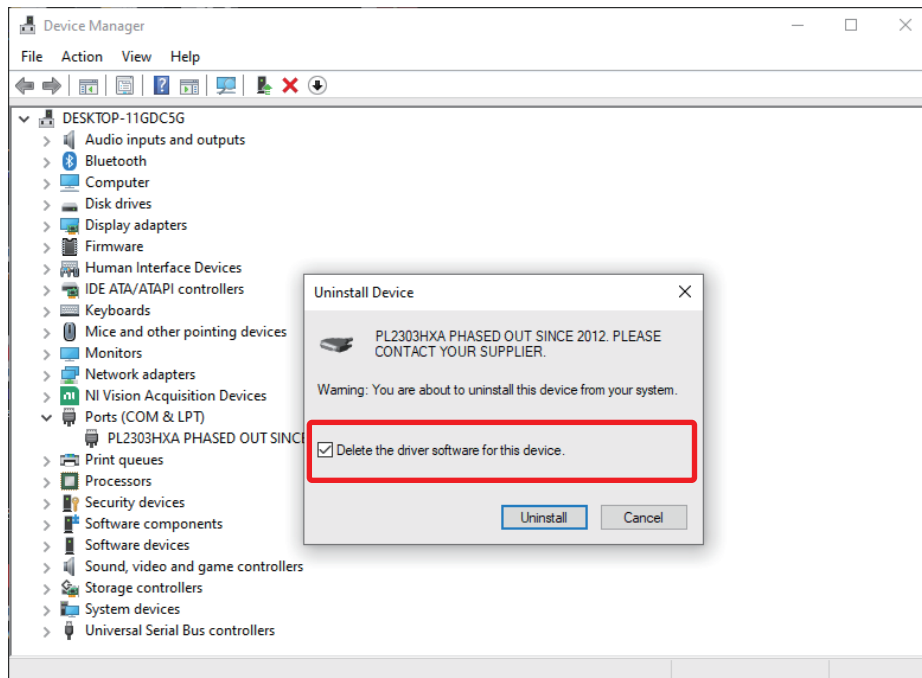


- If the name of the port is as follows, right click on the respective port and click "Uninstall device".

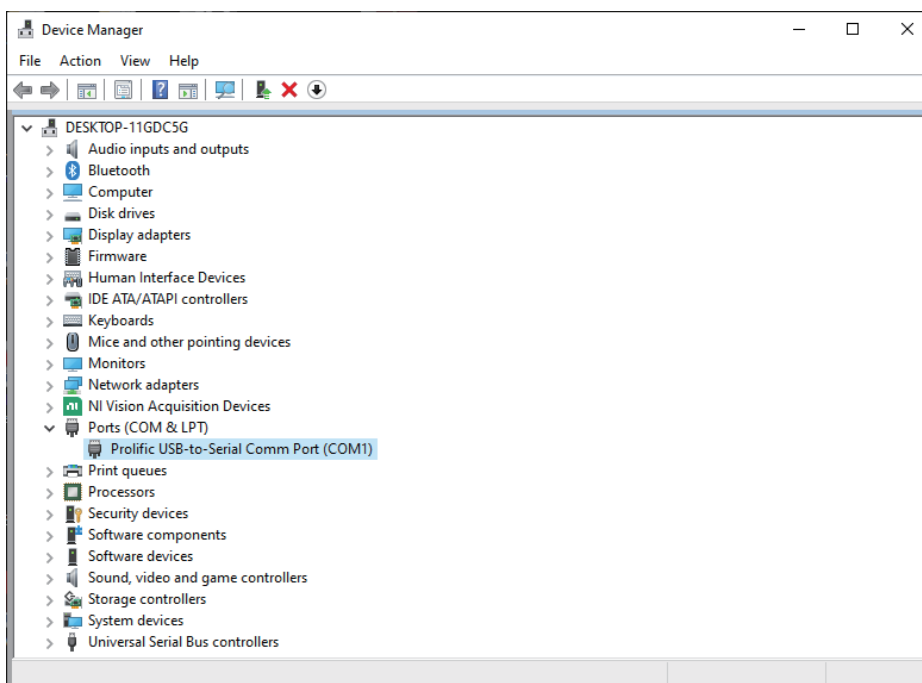


4. Troubleshooting

- When the following screen pops up, be sure to check the box and click “Uninstall”.



- Once the uninstall is complete, disconnect the USB cable of the TLS and reconnect it.
- Reopen the Device Manager and check under “Ports (COM & LPT)”.



- If the laser port name is “Prolific USB-to-Serial Comm Port”, check the COM port number and choose the corresponding number in the TLS software.

4.3 Laser Error Messages

- ERR0: No error.
- ERR1: Parameters alarm. Turn off power and restart, if still alarm please contact SLi.
- ERR3: Parameters alarm. Please contact SLi.
- ERR4: Parameters alarm. Please contact SLi.
- ERR6: Frequency alarm turn off power and restart, if still alarm please contact SLi.
- ERR7: Temperature alarm Switch off the laser and ensure the laser temperature is less than 40 °C before use.
- ERR8: INTERLOCK alarm Please insert interlock, then turn off the power and restart.
- ERR9: Voltage alarm turn off power and restart, if still alarm please contact SLi.
- ERR10: Time limited please contact SLi.
- ERR19: 24 V voltage alarm turn off power and restart, if still alarm please contact SLi.
- ERR29: 5 V voltage alarm please contact SLi.
- ERR39: 10 W pump and 2 V voltage alarm please contact SLi.
- ERR49: 3.3 V voltage alarm please contact SLi.
- ERR59: VCC 5 V voltage alarm please contact SLi.
- ERR69: 1.2 V voltage alarm please contact SLi.
- ERR79: 27 W pump and 11 V voltage alarm please contact SLi.
- ERR11, ERR31, ERR41, ERR51, ERR61, ERR81:
Parameter alarm. Turn off the power and restart. if the alarm persists, please contact SLi.

5. Safety Guidelines

5.1 Laser Safety

The following general safety precautions must be observed during all phases of the operation of this instrument. Failure to comply with these precautions or specific warnings elsewhere in this manual violates safety standards for the instrument's intended use.

Safety Symbols



Avoid Exposure: Do not expose yourself to the direct or reflected output beam. Direct exposure to the laser radiation emitted from this unit may be harmful.

Shielding and Optics: Ensure that the appropriate output beam shields and optics are properly installed before energizing the unit.

Interlocks: All interlocks must be satisfied prior to operation. Failure to comply may lead to hazardous conditions.



Always read and understand the manual before working on or with this device.

iiSM Inc. has no liability for the customer's failure to comply with these requirements.

1. Before the operation, review the instrument and manual for safety markings and instructions.
You must follow these to ensure safe operation and to maintain the instrument in safe condition.
2. Avoid direct exposure to the beam.
3. Always wear protective goggles or eyeglasses appropriate for working with laser light.
4. Avoid looking at the beam directly.

Warning: A strong reflected laser beam back into the TLS output may damage the laser.

Safety Considerations

1. A strong reflected laser beam back into the TLS output may damage the laser.
2. Do not look directly at the output of the TLS at any time, under any circumstances.
3. Do not put things in the air passage in case it gets clogged.
4. Do not place heavy objects on the laser body.
5. Do not put the output collimator toward people or any other reflective surface in case causing any personal injury.
6. Do not check the laser directly with your eyes unless you are sure the device is powered down as the laser may emit invisible infrared and ultraviolet light that can be harmful to your eyes.
7. Be sure that the laser is powered down before checking the device.
8. Do not stare at the emission port directly even if you wear the laser protective glasses.
9. Do not place any flammable substances on the laser, such as flammable or explosive materials.
10. Ensure the laser is placed where non-professionals cannot touch it.
11. Do not direct the laser light at glass surfaces, as normal glass has approximately 4 % reflectivity and can reflect light back into your eyes, causing harm.
12. Please remove your watch when using the laser to prevent the watch surface from reflecting light into your eyes.
13. Please use a detector or conversion film to locate the laser light since the light beyond 800 nm is totally invisible.
14. We strongly recommend wearing laser goggles with a specific wavelength protection rating to protect your eyes when operating the laser.
15. We recommend that you wear a long-sleeved white lab coat. This will help prevent your clothes from burning and reduce the risk of fire in case of accidental laser exposure.

5. Safety Guidelines

5.2 Electrical Safety

1. The respective modules, boards, or RF inputs and outputs are susceptible to damage by electrostatic discharge (ESD) and require proper protection procedures for storage and handling.
2. To completely shut off electrical power to the unit, disconnect the power cord.

5.3 Environmental Considerations

To ensure optimal long-term performance, safety, and testing accuracy of the instrument, please consider the following environmental guidelines:

- 1. Protect from Contaminants:** Avoid exposure to dust and direct sunlight, as these can compromise the unit's optical performance.
- 2. Minimize Vibration:** Prevent excessive vibration, which may affect the mechanical integrity of the unit.
- 3. Avoid Corrosive Environments:** Do not expose the unit to situations or environments containing corrosive gases.
- 4. Ensure Proper Ventilation:** Do not block the fan vents. If the unit is rack-mounted, ensure it has adequate ventilation.
- 5. Maintain Operating Temperature:** The recommended operating temperature is 10–30 °C.
- 6. Retain Packaging for Transport:** Keep the original packing material for future transport or shipment.

If unavailable, contact support@spectrolightinc.com to obtain a factory-approved shipping case.

6. Technical Support

6.1 Contact Information

Technical support:

iiSM Inc.

402, 7-16, Naseongnam-ro,

Sejong-si, 30129, Republic of Korea

Tel: +82 44 863 9852

Email: support@spectrolightinc.com

6.2 Warranty Information

2 years from ship date.

7. Appendices

7.1 TLS-RED Detailed Models

Model	Laser Specifications	Optical Specifications
TSL10-RED-VIS	Wavelength: 450–2400 nm Output power: 1 W VIS power: 0.1 W Repetition rate: 2 MHz	Tunable CWL: 450–790 nm FWHM: 2–15 nm (450–700 nm), 3–15 nm (701–790 nm)
TSL10-RED-IR		Tunable CWL: 775–1150 nm FWHM: 3–15 nm (775–890 nm), 5–15 nm (891–1150 nm)
TSL10-RED-SWIR		Tunable CWL: 1140–1700 nm FWHM: 5–15 nm (1140–1500 nm), 7–13 nm (1501–1700 nm)
TSL10-RED-Custom		USER SPECIFIED CUSTOM RANGE (Range selectable from 450–1700 nm)
TSLM10-RED-VIS	Wavelength: 410–2400 nm Output power: 1 W VIS power: 0.25 W Repetition rate: 10 MHz	Tunable CWL: 410–790 nm FWHM: 2–15 nm (410–700 nm), 3–15 nm (701–790 nm)
TSLM10-RED-IR		Tunable CWL: 775–1150 nm FWHM: 3–15 nm (775–890 nm), 5–15 nm (891–1150 nm)
TSLM10-RED-SWIR		Tunable CWL: 1140–1700 nm FWHM: 5–15 nm (1140–1500 nm), 7–13 nm (1501–1700 nm)
TSLM10-RED-Custom		USER SPECIFIED CUSTOM RANGE (Range selectable from 410–1700 nm)
TSLM20-RED-VIS	Wavelength: 410–2400 nm Output power: 2 W VIS power: 0.5 W Repetition rate: 20 MHz	Tunable CWL: 410–790 nm FWHM: 2–15 nm (410–700 nm), 3–15 nm (701–790 nm)
TSLM20-RED-IR		Tunable CWL: 775–1150 nm FWHM: 3–15 nm (775–890 nm), 5–15 nm (891–1150 nm)
TSLM20-RED-SWIR		Tunable CWL: 1140–1700 nm FWHM: 5–15 nm (1140–1500 nm), 7–13 nm (1501–1700 nm)
TSLM20-RED-Custom		USER SPECIFIED CUSTOM RANGE (Range selectable from 410–1700 nm)
TSLM40-RED-VIS	Wavelength: 410–2400 nm Output power: 4 W VIS power: 1 W Repetition rate: 40 MHz	Tunable CWL: 410–790 nm FWHM: 2–15 nm (410–700 nm), 3–15 nm (701–790 nm)
TSLM40-RED-IR		Tunable CWL: 775–1150 nm FWHM: 3–15 nm (775–890 nm), 5–15 nm (891–1150 nm)
TSLM40-RED-SWIR		Tunable CWL: 1140–1700 nm FWHM: 5–15 nm (1140–1500 nm), 7–13 nm (1501–1700 nm)
TSLM40-RED-Custom		USER SPECIFIED CUSTOM RANGE (Range selectable from 410–1700 nm)
TSLM35V-RED-VIS	Wavelength: 410–2400 nm Output power: 3.5 W VIS power: 1 W Repetition rate: 0.01–40 MHz adjustable	Tunable CWL: 410–790 nm FWHM: 2–15 nm (410–700 nm), 3–15 nm (701–790 nm)
TSLM35V-RED-IR		Tunable CWL: 775–1150 nm FWHM: 3–15 nm (775–890 nm), 5–15 nm (891–1150 nm)
TSLM35V-RED-SWIR		Tunable CWL: 1140–1700 nm FWHM: 5–15 nm (1140–1500 nm), 7–13 nm (1501–1700 nm)
TSLM35V-RED-Custom		USER SPECIFIED CUSTOM RANGE (Range selectable from 410–1700 nm)
TSL80V-RED-VIS	Wavelength: 430–2400 nm Output power: 8 W VIS power: 1 W Repetition rate: 0.01–200 MHz adjustable	Tunable CWL: 430–790 nm FWHM: 2–15 nm (430–700 nm), 3–15 nm (701–790 nm)
TSL80V-RED-IR		Tunable CWL: 775–1150 nm FWHM: 3–15 nm (775–890 nm), 5–15 nm (891–1150 nm)
TSL80V-RED-SWIR		Tunable CWL: 1140–1700 nm FWHM: 5–15 nm (1140–1500 nm), 7–13 nm (1501–1700 nm)
TSL80V-RED-Custom		USER SPECIFIED CUSTOM RANGE (Range selectable from 430–1700 nm)
TSLM70-RED-VIS	Wavelength: 410–2400 nm Output power: 7 W VIS power: 2 W Repetition rate: 80 MHz	Tunable CWL: 410–790 nm FWHM: 2–15 nm (410–700 nm), 3–15 nm (701–790 nm)
TSLM70-RED-IR		Tunable CWL: 775–1150 nm FWHM: 3–15 nm (775–890 nm), 5–15 nm (891–1150 nm)
TSLM70-RED-SWIR		Tunable CWL: 1140–1700 nm FWHM: 5–15 nm (1140–1500 nm), 7–13 nm (1501–1700 nm)
TSLM70-RED-Custom		USER SPECIFIED CUSTOM RANGE (Range selectable from 410–1700 nm)

7. Appendices

7.2 TLS-BLUE Detailed Models

Model	Laser Specifications	Optical Specifications
TSL10-BLUE-VIS	Wavelength: 450–2400 nm Output power: 1 W VIS power: 0.1 W Repetition rate: 2 MHz	Tunable CWL: 450–790 nm FWHM: 10 or 20 nm (fixed)
TSL10-BLUE-IR		Tunable CWL: 775–1150 nm FWHM: 10 or 20 nm (fixed)
TSL10-BLUE-SWIR		Tunable CWL: 1140–1700 nm FWHM: 10 or 20 nm (fixed)
TSL10-BLUE-Custom		USER SPECIFIED CUSTOM RANGE (Range selectable from 450–1700 nm) (FWHM: 10 or 20 nm (fixed))
TSLM10-BLUE-VIS	Wavelength: 410–2400 nm Output power: 1 W VIS power: 0.25 W Repetition rate: 10 MHz	Tunable CWL: 410–790 nm FWHM: 10 or 20 nm (fixed)
TSLM10-BLUE-IR		Tunable CWL: 775–1150 nm FWHM: 10 or 20 nm (fixed)
TSLM10-BLUE-SWIR		Tunable CWL: 1140–1700 nm FWHM: 10 or 20 nm (fixed)
TSLM10-BLUE-Custom		USER SPECIFIED CUSTOM RANGE (Range selectable from 410–1700 nm) (FWHM: 10 or 20 nm (fixed))
TSLM20-BLUE-VIS	Wavelength: 410–2400 nm Output power: 2 W VIS power: 0.5 W Repetition rate: 20 MHz	Tunable CWL: 410–790 nm FWHM: 10 or 20 nm (fixed)
TSLM20-BLUE-IR		Tunable CWL: 775–1150 nm FWHM: 10 or 20 nm (fixed)
TSLM20-BLUE-SWIR		Tunable CWL: 1140–1700 nm FWHM: 10 or 20 nm (fixed)
TSLM20-BLUE-Custom		USER SPECIFIED CUSTOM RANGE (Range selectable from 410–1700 nm) (FWHM: 10 or 20 nm (fixed))
TSLM40-BLUE-VIS	Wavelength: 410–2400 nm Output power: 4 W VIS power: 1 W Repetition rate: 40 MHz	Tunable CWL: 410–790 nm FWHM: 10 or 20 nm (fixed)
TSLM40-BLUE-IR		Tunable CWL: 775–1150 nm FWHM: 10 or 20 nm (fixed)
TSLM40-BLUE-SWIR		Tunable CWL: 1140–1700 nm FWHM: 10 or 20 nm (fixed)
TSLM40-BLUE-Custom		USER SPECIFIED CUSTOM RANGE (Range selectable from 410–1700 nm) (FWHM: 10 or 20 nm (fixed))
TSLM35V-BLUE-VIS	Wavelength: 410–2400 nm Output power: 3.5 W VIS power: 1 W Repetition rate: 0.01–40 MHz adjustable	Tunable CWL: 410–790 nm FWHM: 10 or 20 nm (fixed)
TSLM35V-BLUE-IR		Tunable CWL: 775–1150 nm FWHM: 10 or 20 nm (fixed)
TSLM35V-BLUE-SWIR		Tunable CWL: 1140–1700 nm FWHM: 10 or 20 nm (fixed)
TSLM35V-BLUE-Custom		USER SPECIFIED CUSTOM RANGE (Range selectable from 410–1700 nm) (FWHM: 10 or 20 nm (fixed))
TSL80V-BLUE-VIS	Wavelength: 430–2400 nm Output power: 8 W VIS power: 1 W Repetition rate: 0.01–200 MHz adjustable	Tunable CWL: 430–790 nm FWHM: 10 or 20 nm (fixed)
TSL80V-BLUE-IR		Tunable CWL: 775–1150 nm FWHM: 10 or 20 nm (fixed)
TSL80V-BLUE-SWIR		Tunable CWL: 1140–1700 nm FWHM: 10 or 20 nm (fixed)
TSL80V-BLUE-Custom		USER SPECIFIED CUSTOM RANGE (Range selectable from 430–1700 nm) (FWHM: 10 or 20 nm (fixed))
TSLM70-BLUE-VIS	Wavelength: 410–2400 nm Output power: 7 W VIS power: 2 W Repetition rate: 80 MHz	Tunable CWL: 410–790 nm FWHM: 10 or 20 nm (fixed)
TSLM70-BLUE-IR		Tunable CWL: 775–1150 nm FWHM: 10 or 20 nm (fixed)
TSLM70-BLUE-SWIR		Tunable CWL: 1140–1700 nm FWHM: 10 or 20 nm (fixed)
TSLM70-BLUE-Custom		USER SPECIFIED CUSTOM RANGE (Range selectable from 410–1700 nm) (FWHM: 10 or 20 nm (fixed))

DISCLAIMER

This device is designed for use in laboratory and industrial environments. This is not a medical device and must not be used or applied to humans in any way.

WARNINGS AND PRECAUTIONS

- Operate the device using 100–240 V AC, 50/60 Hz, 2 A / Output 24 V DC, 6.67 A.
- Always use the grounded power supply cord set provided to connect the system to a grounded outlet.
- Do not expose the device to rain or moisture.
- Never look into the optical pathway of the light sources used.
- Do not connect or disconnect the cables while the device's power is turned ON.
- Always allow free flow of fresh air on all sides.
- Operating/Storage conditions: Indoor use only

CLEANING AND MAINTENANCE

Please cover the output head with the dust-cap to avoid dust pollution while it's in idle state.
Keep the laser body clean. Do not allow the body or power adapter to come into contact with water.

STORAGE CONDITIONS

Temperature: 25 °C(± 20 °C), Humidity: 60 % or less.

OPERATION CONDITIONS

Temperature: 25 °C(± 5 °C), Humidity: 60 % or less.

ELECTRICAL CHARACTERISTICS

INPUT: 100–240 V AC, 50/60 Hz, 2 A

Power dissipation: 160 W

CERTIFICATIONS



CE Mark – Declaration of Conformance for EMI, Safety (EEC) and RoHS



FCC Mark – This device complies with part 18 of the FCC Rules.

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

SPECTROLIGHT



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