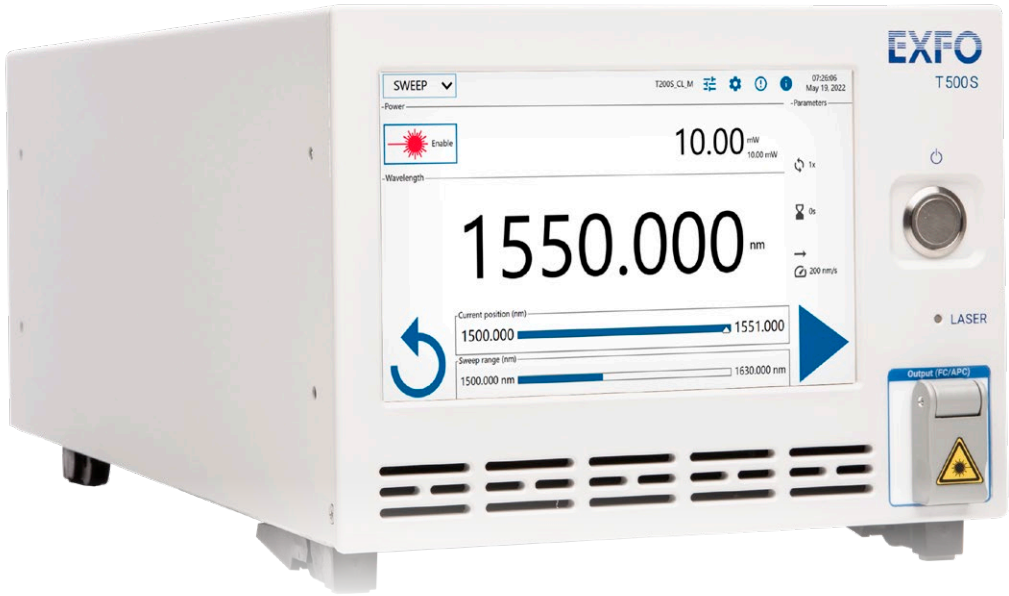
SPEC SHEET

T500S

HIGH-POWER CONTINUOUSLY TUNABLE LASER

- Bidirectional high sweep-speed tunable laser, designed for advanced R&D applications and for testing photonic integrated circuits and optical components.



KEY FEATURES

- Bidirectional 200 nm/s scanning speed
- 10 dBm (10 mW) optical power output across the range
- Ultra-low spontaneous emission and narrow linewidth
- Wavelength coverage: 1240 nm - 1680 nm with three lasers
- Compact form factor
- Wavelength tuning and continuous sweep modes
- Active mode-hop-free operation

APPLICATIONS

- Optical components: high-speed spectral characterization
- Photonic integrated circuits: wafer-level or die-level testing
- Multipurpose tunable laser for R&D

RELATED PRODUCTS

CTP10
component tester

CT440
component tester

T200S
high-power continuously tunable laser

DESIGNED FOR ADVANCED OPTICAL SPECTRAL CHARACTERIZATION

An essential instrument in R&D labs and on production floors, a continuously tunable laser covers various applications whenever rapid, continuous wavelength tuning is required.

The T500S laser delivers speed and high power while sweeping in addition to narrow linewidth at fixed wavelengths.

Testing high-speed photonic integrated circuits (PICs)

Integrated photonics can include complex optical components with high-contrast spectrum. For instance, a ring resonator may have very sharp features making it difficult to characterize insertion loss.

To test such devices, the T500S laser can be jointly operated with the CTP10, EXFO's component testing platform. With high-resolution and high-accuracy spectral measurement, the CTP10 is an integrated solution that leverages the high-speed wavelength sweeps of the T500S. The T500S is also compatible with the CT440, EXFO's compact component tester operating at 100 nm/s.

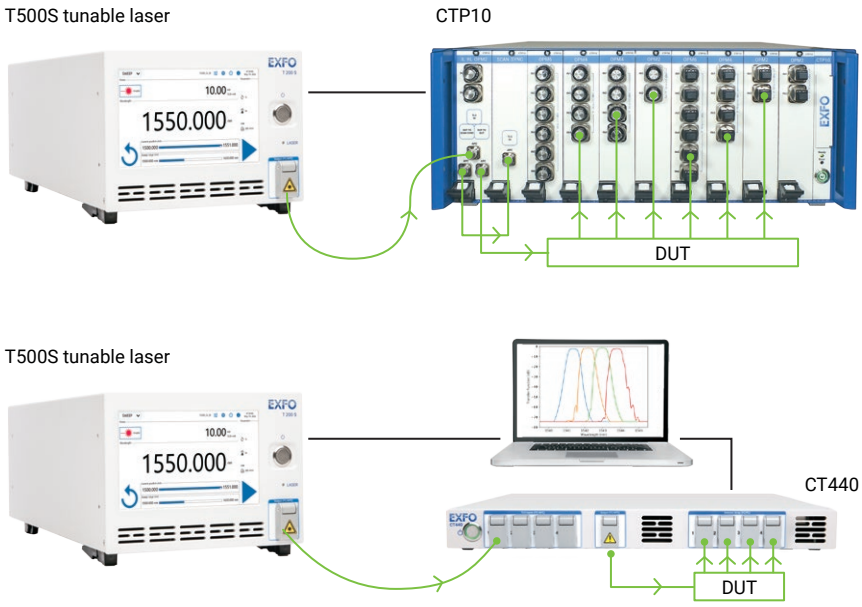
Optical component testing

The T500S builds on previous innovations for tunable lasers such as ultra-low signal-to-source spontaneous emission ratio (SSSER), high-power cavity and mode-hop-free operation. These three parameters are key for high-quality optical component testing, either at specific fixed wavelengths or through a swept wavelength scan.

Optical components generally have a strong dependence on the wavelength or polarization of light, leading to sensitivity regarding polarization-dependent loss (PDL). When operated with the CTP10, the T500S delivers highly accurate and fast PDL measurements.

In labs or on production floors, the test instrument can be easily operated using the large touchscreen with an ergonomic graphical user interface and it can be fully automated using SCPI commands from the Ethernet port at the back of the unit.

For more details, please refer to the CTP10 or CT440 specification sheets.



Scientific R&D

In R&D environments, continuously tunable lasers are often used in swept wavelength applications in any scanning direction but they can also be required to tune to a particular stable wavelength with narrow linewidth.

The T500S has a dedicated tuning mode that optimizes linewidth, and an adjustable optical output when high optical power is required.

INDUSTRY-LEADING FEATURES

A combination of high output power with high spectral purity

The T500S exhibits a crystal-clear optical spectrum over the entire tuning range. Indeed, the optical cavity eliminates broadband source spontaneous emission (SSE) without any compromise on optical power and can be set to an optimized linewidth < 25 kHz.

High spectral purity is maintained throughout the laser sweep thanks to the active mode-hop control, ensuring reliable wavelength sweeps are achieved over and over again.

The optical output of the laser can be adjusted from 10 dBm to more than 14 dBm. Across specific wavelength range of the laser, this can reach 13 dBm.

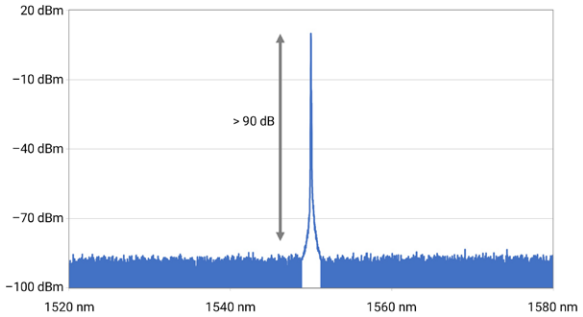


Figure 1. High power and high dynamic range.

High-speed tunability

The T500S has a bidirectional 200 nm/s maximum scanning speed. Where speed is critical, the T500S proves an essential addition to ensure repeatable yet fast measurements. Otherwise, the laser can be set to slower scanning speeds all the way down to 0.5 nm/s (e.g., for legacy detection systems).

Wavelength tuning or continuously swept wavelength scans

The T500S has two user modes: TUNE or SWEEP. Each is optimized for specific usage. TUNE mode optimizes the laser control to ensure narrow linewidth at any wavelength or provide a rapid “go-to” wavelength tuning. SWEEP mode performs high-speed mode-hop-free scans over the selected wavelength range of the laser. During that sweep, the laser provides an electrical output trigger according to a set wavelength resolution down to 0.5 pm (even at 200 nm/s). The trigger can then be used with other measurement systems.

Automation for high-precision spectral measurements

The T500S is a key part of a spectral characterization system using EXFO’s component testing equipment (CTP10 or CT440), resulting in a spectral measurement benefiting from a wavelength accuracy of ±5 pm and excellent wavelength repeatability of the order of 1 pm. Automation of the new laser source is taken care of by these component testing instruments with limited impact on existing automation programs.

As a stand-alone laser, Ethernet control makes it possible to remotely drive the laser from any location. Functionalities such as triggers can be easily accessed from the touchscreen.

Compact and easy to use

The half-rack configuration and compact footprint make the T500S ideal for lab applications. The screen can be adjusted to suit dark optical lab environments and display relevant information so that you can see it from the other side of the optical bench. With control buttons located at the corners of the screen, users can operate the laser while concentrating on the optical setup.

A rackmount accessory is available to mount one or two lasers inside a 19-inch rack bench. An air filter is also available for dusty environments.

Excellent wavelength coverage with EXFO’s continuously tunable lasers

T500S lasers all deliver quality performance, based on high-end specifications, during wavelength scanning range, whether when tuned to a particular wavelength or when swept at full speed. Full wavelength coverage from 1240 nm to 1680 nm is achieved using three lasers.

The T500S is part of EXFO’s series of continuously tunable lasers including the T200S. For more details about the T200S, please refer to the **T200S specification sheet**.

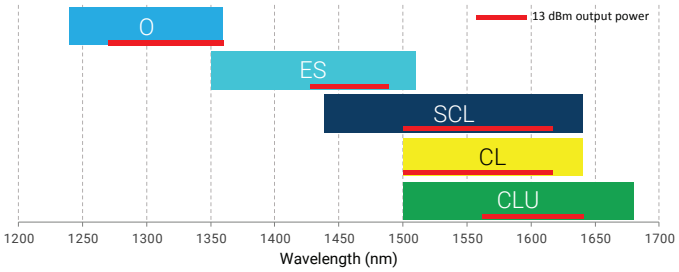


Figure 2. Wavelength coverage of T500S lasers

SPECIFICATIONS – OPTICAL CHARACTERISTICS

		T500S-O	T500S-ES	T500S-SCL	T500S-CL	T500S-CLU
Wavelength	Operating wavelength range (nm)	1240 - 1360	1350 - 1510	1440 - 1640	1500 - 1640	1500 - 1680
	Operating wavelength range at 13 dBm (nm)	1270 - 1360	1430 - 1490	1500 - 1620	1500 - 1620	1565 - 1640
	Wavelength uncertainty [a] (pm)			±5 (typical) ±20		
	Wavelength repeatability [b] (pm)			±5 (typical)		
	Wavelength stability [d] (pm)			±5		
	Wavelength resolution setting (pm)			1		
Sweep control	Maximum speed (nm/s)			200		
	Adjustable speed (nm/s)			0.5, 1, 2, 5, 10, 20, 50, 100, 200 with bidirectional scanning		
	Mode-hop-free operation			Active mode-hop cancelation		
	Minimum wavelength sweep trigger resolution (pm) [k]			0.5		
Optical power	Maximum output power [c] (dBm)	13	14			
	Nominal output power over full wavelength range (dBm)			10		
	Power stability [d] (dB)			±0.01 (typical)		
Spectral characteristics	Linewidth [e] (10 µs integration time) (kHz)			< 25 (typical)		
	Linewidth [e] (100 µs integration time) (kHz)			< 250 (typical)		
	Side mode suppression ratio [f] (SMSR) (dB)	> 45 (typical)	> 50 (typical)			
	Signal-to-source spontaneous emission ratio [g] (SSSER) (dB)			90 (typical)		
	Signal-to-total-source spontaneous emission ratio [h] (STSSER) (dB)			75 (typical)		
	Relative intensity noise [i] (RIN)(dB/Hz)	–145 (typical)	–150 (typical)			
Optical output	Optical fiber type [j]			PM optical fiber, FC/APC connector		
	PER (dB)			17 (typical)		

All specifications given at constant temperature ± 1 °C, after wavelength full reference, between 18 °C and 28 °C (unless otherwise stated), after a 60-minute warm-up, at 10 dBm output power and for wavelength not equal to water peak.

a. TUNE mode, high accuracy setting after internal wavelength referencing.

b. TUNE mode, high accuracy setting and for wavelength tuning from low to high wavelengths.

c. Peak power wavelength may vary from laser to laser.

d. Over one hour, at a temperature of 21 °C ± 1 °C. Stability expressed as ± half difference between max and min values measured within 60-minute window.

e. In TUNE mode, optimized linewidth setting and at a temperature of 21 °C ± 1 °C.

f. At 21 °C ± 1 °C. T500S-O: 1270 nm to 1360 nm, T500S-ES : 1370 nm to 1510 nm, T500S-CL : 1500 nm to 1630 nm, T500S-SCL: 1470 nm to 1640 nm. At maximum power.

g. Measured over a bandwidth of 0.1 nm at center wavelength.

h. Measured over a span of 100 nm with an exclusion zone of ±0.6 nm around the signal. Laser at center wavelength

i. RIN within 100 MHz - 3 GHz range with RBW = 30 kHz. T500S-O: 1270 nm to 1360 nm, T500S-ES: 1370 nm to 1510 nm, T500S-CL: 1500 nm to 1630 nm, T500S-SCL: 1470 nm to 1640 nm. At maximum power.

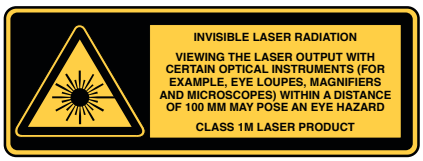
j. Fiber's slow axis and polarization aligned with key connector.

k. With output trigger PULSE activated, available for all scanning speeds. Triggers generated at regular wavelength intervals during the sweep; some restrictions apply to wavelength scanning span of the laser according to speed and resolution; not compatible with bidirectional scanning.

SPECIFICATIONS – HARDWARE

		T500S (all models)
Environmental conditions	Operating temperature	15 °C to 35 °C (59 °F to 95 °F)
	Operating humidity	< 80% (non-condensing)
	Warm-up time (hour)	1
Physical footprint	Size (L x H x D)	217 mm x 173 mm x 441 mm (8 $^{9}/_{16}$ in x 6 $^{13}/_{16}$ in x 17 $^{3}/_{8}$ in)
	Weight	9 kg (20 lb)
Connectivity	Monitor	7 in capacitive touchscreen
	Remote communication	Ethernet RJ45 LAN 10/100/1000 Mbit/s
	Electrical BNC ports	1x trigger IN, 1x trigger OUT, power monitoring and wavelength monitoring
	USB ports	USB 3.0 (1), USB 2.0 (2)
Security	Laser safety	Class 1M
	Power supply	100 - 240 V ~; 50/60 Hz; 0.65 - 0.3 A
Accessories (sold separately)	Rackmount	4U tablet accommodating 2 units

LASER SAFETY



ORDERING INFORMATION

T500S-XX-M-58

Wavelength range
O = 1240 nm – 1360 nm
ES = 1350 nm – 1510 nm
SCL = 1440 nm – 1640 nm
CL = 1500 nm – 1640 nm
CLU = 1500 nm – 1680 nm

Connector
58 = FC/APC

Output fiber type
M = Polarization maintaining fiber

Example: T500S-CL-M-58

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