

780/1550 nm High Power Femtosecond Fiber Laser



Applications

- Multiphoton microscopy
- Optical metrology
- Materials characterization
- Terahertz radiation
- 3D-microprinting
- Nonlinear spectroscopy
- Ophthalmology
- Replacement of a Ti:sapphire laser

Features

- High power (up to 2 W)
- < 90 fs pulse widths
- Outstanding beam quality ($M^2 < 1.1$)
- Exceptional beam pointing stability
- All air-cooled, no chiller required
- Turn-key operation and full computer control
- Remote system diagnostics
- Expected lifetime > 10,000 hours

The Carmel X-series is a range of high power, air-cooled, fiber-based femtosecond lasers with output powers from 0.2 to greater than 2.5 W and pulse widths of less than 90 fs in the industry's most compact, user-friendly package. The Carmel X-780/1550 provides switchable 780 nm and 1550 nm outputs for a wide range of ultrafast laser applications, including bio-imaging, multiphoton microscopy, optical metrology, 3D-microprinting, terahertz imaging and ophthalmology. It is offered as both a scientific version with front panel controls and an OEM version controlled through an RS-232 interface. A simple slide switch on the laser head enables the output to be toggled from between 780 and 1550 nm outputs.

The system features a rack mountable controller with a robust armored cable interface to the compact laser head, which facilitates its incorporation into OEM designs. It is over 100 times smaller than many Ti:sapphire lasers with a similar output power level. A simple key switch interface provides for manual operation with full remote access through computer control. The X-series includes the capability of remote data logging, power monitoring, system diagnostics, and automated adjustments for prolonged lifetime and OEM preventative maintenance. The rugged design supports 24/7 operation with an expected lifetime of > 10,000 hours.

The building block of the X-series is Calmar's renowned ultrafast fiber seed laser platform, which utilizes the proprietary Mendocino saturable absorber technology developed and perfected over a twenty year period to deliver reproducible and reliable mode-locking at turn-on. The system provides an output pulse width of < 90 fs with minimal pulse pedestal and excellent long term pulse-to-pulse stability (<1% rms) over a wide operating temperature range (17-30°C). An exceptional output beam quality ($M^2 < 1.1$) enables a near diffraction-limited spot size with suitable microscope objectives for demanding multiphoton, 3D microprinting and materials processing applications. Repetition rates can be specified from 10 to 80 MHz with an RF synchronization output provided as a trigger signal.

For multiphoton microscopy applications, the Carmel X-780/1550 provides an ideal ultrafast laser solution for optimum multiphoton fluorescence and second and third harmonic cellular tissue imaging with minimal scatter and reduced risk of photodamage. The compact laser head and associated armored fiber cable make for straight forward integration into existing microscopes with minimal delivery optics.

If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

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Technical Specifications¹

Model Number	CFL-04RCFF		CFL-05RCFF		CFL-10RCFF	
OPTICAL	Port 1	Port 2	Port 1	Port 2	Port 1	Port 2
Central Wavelength (nm)	780 ± 3	1550 ± 4	780 ± 3	1550 ± 4	780 ± 3	1550 ± 4
Pulse Width ² (fs)	< 90					
Average Power (W)	0.25	0.5	0.5	1.0	1.0	2.0
Repetition Rate ³ (MHz)	50 or 80	50 or 80	50 or 80	50 or 80	80	80
Pulse Energy ⁴ (nJ)	5 or 3	10 or 6	10 or 6	20 or 12	12.5	25
Spectrum Width (FWHM, nm)	8 - 10	> 30	8 - 10	> 30	8 - 10	> 30
Power Stability over 8 hours ⁵ (% RMS)	< 1.0					
Beam Quality (M ²)	< 1.1					
Beam Diameter at Exit (typical, mm)	1.3	1.6	1.3	1.6	1.3	1.6
	Beam roundness > 90%					
Polarization Extinction Ratio (dB)	> 20	> 18	> 20	> 18	> 20	> 18
Output/Termination	Free space, collimated beam					
ELECTRICAL						
Electrical Synchronization (V)	~ 0.5, SMA connector					
Supply Voltage	85 - 264 VAC at 47 – 63 Hz, autoranging					
Power consumption (W)	200					
MECHANICAL						
Operating Temperature (°C)	17 - 38					
Storage Temperature (°C)	0 - 50					
Connection between Controller and Head ⁶	1 m fixed armored cable					
Laser Head Dimensions (cm)	9.0(W) x 18(D) x 3.5(H)					
Laser Controller Dimensions (cm)	48.2(W) x 46.7(D) x 10(H); 19 inch 2U					
Laser Head Weight (kg)	0.8 (typical)					
Laser Controller Weight (kg)	13.6 (typical)					
Cooling	Controller air cooled by low noise fan					
Warm-up Time (min)	< 10					
I/O CONTROL						
Communication Interface ⁷	RS-232 Serial Port, Monitor Port					
Front Panel Control Interface	Power Switch, Laser Key Switch, Emergency Stop Button					

1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.

2. A sech² pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.

3. For the -04 and -05 models, the repetition rate needs to be specified at the time of purchase. For other repetition rates, please contact sales@calmarlaser.com.

4. The absolute pulse energy will depend on the version and specified repetition rate.

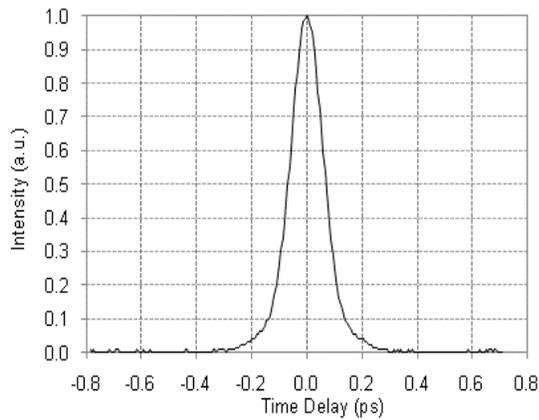
5. Requires an ambient temperature control of ± 1.0°C and appropriate mounting for the laser head.

6. For other cable length options, please contact sales@calmarlaser.com.

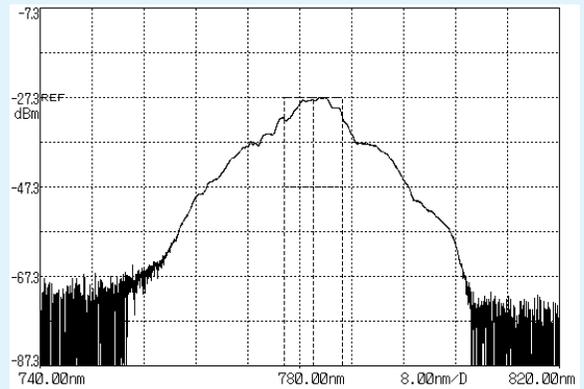
7. Standard on the OEM version, for the scientific version please contact sales@calmarlaser.com.



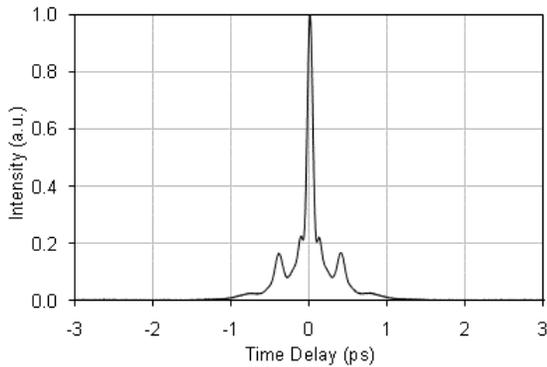
Optical Characterization



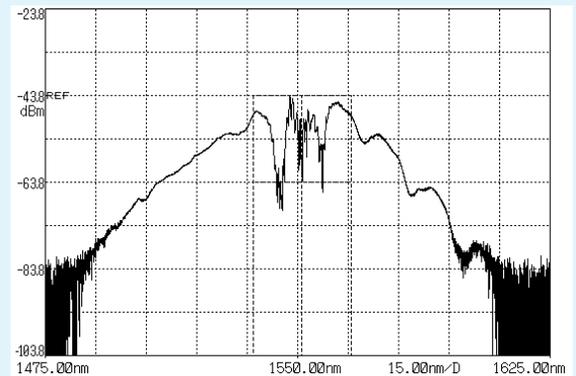
Typical Autocorrelation Trace for Port 1 (780 nm)



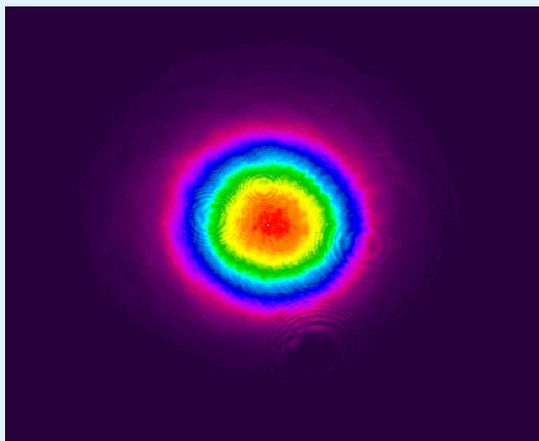
Typical Optical Spectrum for Port 1 (780 nm)



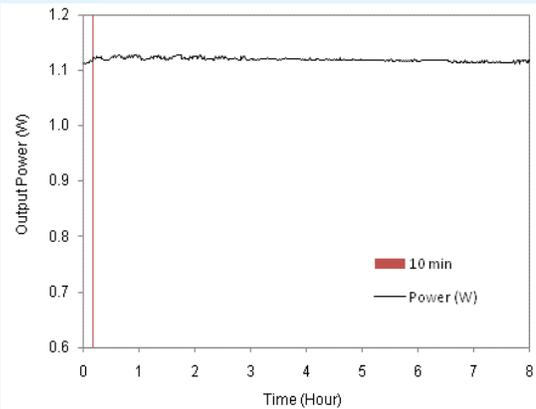
Typical Autocorrelation Trace for Port 2 (1550 nm)



Typical Optical Spectrum for Port 2 (1550 nm)



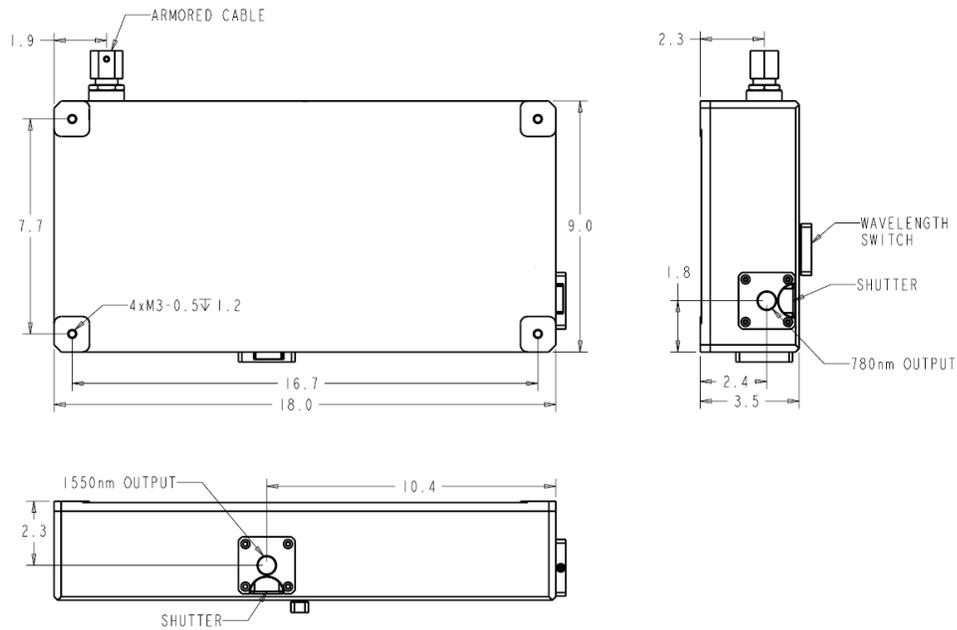
Typical Beam Profile for Port 1 (780 nm)



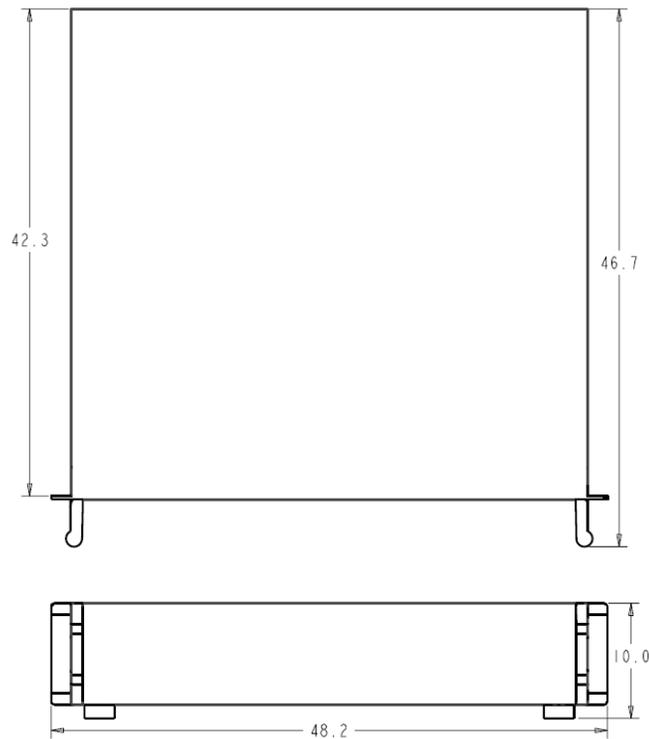
Typical Power Stability for Port 1 (780 nm)

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Mechanical Dimensions



Dimensions of Laser Head (cm)



Dimensions of Laser Controller (cm)

