

### High Power 1550 nm Fiber Based Femtosecond Laser (CFL)



#### Applications

- Multiphoton microscopy
- Biomedical instrumentation
- Optical metrology
- Materials characterization
- Terahertz radiation
- Nonlinear spectroscopy
- Micro-machining and materials processing
- Seeding high output lasers

#### Features

- High power stability (up to 2.5 W)
- < 90 fs pulse widths
- Outstanding beam quality ( $M^2 < 1.1$ )
- Exceptional beam pointing stability
- Ultra-compact laser head
- 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-1550 provides the perfect 1550 nm source for a wide range of ultrafast laser applications, including multiphoton microscopy, optical metrology, seeding ultrafast lasers, and micro-machining.

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. 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, and system diagnostics for OEM service support. The rugged design supports 24/7 operation with an expected lifetime of > 10,000 hours.

Repetition rates can be specified from 10 to 80 MHz with a pulse width of < 90 fs and minimal pulse pedestal. The system offers exceptional beam quality ( $M^2 < 1.1$ ) with excellent long term pulse-to-pulse stability (<1% rms) over a wide operating temperature range (17-30°C). An RF synchronization output is also provided as a trigger signal.

The building block of the X-series is Calmar's renowned ultrafast fiber laser seed platform, which utilizes the company's proprietary passive mode-locking technology developed and perfected over a fifteen-year period. This ensures reliable startup, stable long term performance, and many hours of maintenance-free operation.

# FIBER BASED FEMTOSECOND LASER

## Technical Specifications<sup>1</sup>

Model Number <sup>2</sup>	CFL-ZCFF
<b>OPTICAL</b>	
Average Power (W)	Up to 2.5
Repetition Rate <sup>3</sup> (MHz)	10 - 80
Central Wavelength (nm)	1550
Minimum Pulse Width <sup>4</sup> (fs)	< 90
Spectra Width (nm)	~ 40
Pulse Energy <sup>5</sup> (nJ)	Up to 50
Beam Quality, M <sup>2</sup>	< 1.1
Beam Diameter at Exit (mm)	1.6 (typical)
Beam Roundness (%)	> 90
Polarization Extinction Ratio (dB)	> 18
Power Stability in Operating Temperature Range (% rms, 8 hours) <sup>6</sup>	< 1
Termination / Output	Free space, collimated beam
<b>ELECTRICAL</b>	
Supply Voltage (VAC)	85 - 264 autoranging
Supply Frequency (Hz)	47 - 63 autoranging
Power Consumption (VA)	200
RF Synchronization Output (V)	0.5 with SMA connector
<b>MECHANICAL</b>	
Warm up time (min)	10 (typical)
Operating Temperature (°C)	17 - 30
Storage Temperature (°C)	0 - 50
Connection between Controller and Head <sup>7</sup>	1 m fixed armored fiber cable
Laser Head Dimensions (cm)	9.0(w) x 18(d) x 3.5(h)
Laser Controller Dimensions (cm)	48(w) x 44(d) x 9.8(h); 19" 2U
Laser Head Weight (kg)	0.8 (typical)
Laser Controller Weight (kg)	13.6 (typical)
Cooling	Air-cooled by low noise fan
<b>I/O CONTROL</b>	
Communication Interface Type	RS232, Monitor Ports
Laser Status Indicators on Controller Front Panel	Electrical Power On/Off, Laser On and Operational, Emergency Stop



# FIBER BASED FEMTOSECOND LASER

<sup>1</sup> Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact [sales@calmarlaser.com](mailto:sales@calmarlaser.com) for customized specifications.

<sup>2</sup> Z depends on the power: Z = 04 (> 0.25 W), 05 (> 0.5 W), 10 (> 1 W), or 20 (> 2 W). Power needs to be specified at the time of purchase.

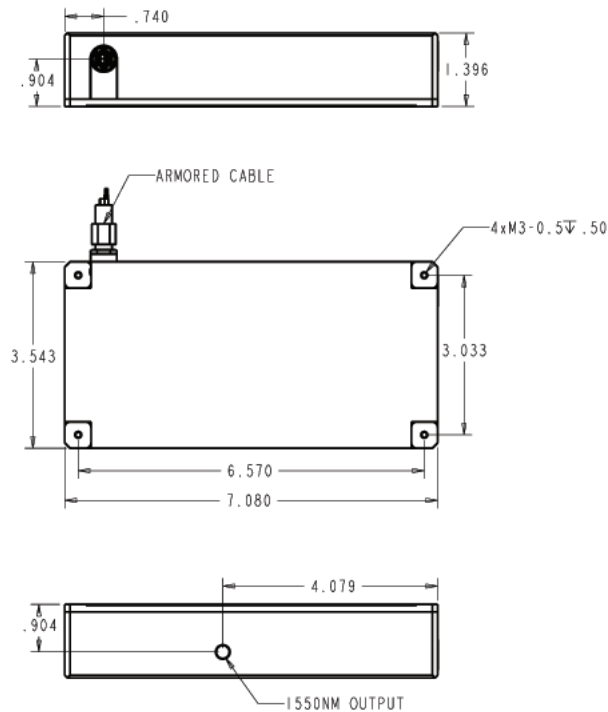
<sup>3</sup> The repetition rate needs to be specified at the time of purchase. For other repetition rates, please contact [sales@calmarlaser.com](mailto:sales@calmarlaser.com).

<sup>4</sup> A  $\text{sech}^2$  pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.

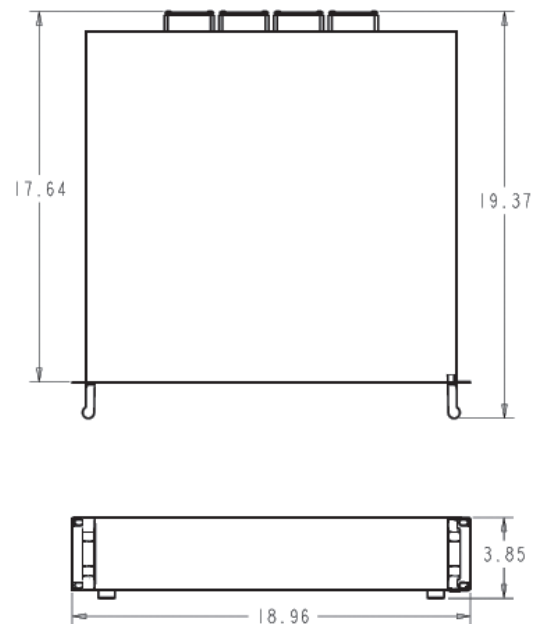
<sup>5</sup> The absolute pulse energy will depend on the version and specified repetition rate.

<sup>6</sup> With a temperature control of  $\pm 0.5^\circ\text{C}$ .

<sup>7</sup> Please contact [sales@calmarlaser.com](mailto:sales@calmarlaser.com) for other cable length options.



Dimensions of Laser Head  
Unit: inch



Dimensions of Laser Controller  
Unit: inch

