

### 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-02CFF   |
|--|---|
| <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 |



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<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 = 4 (> 0.25 W), 5 (> 0.5 W), 10 (> 1 W), or 20 (> 2 W). Power needs to be specified at the time of purchase.

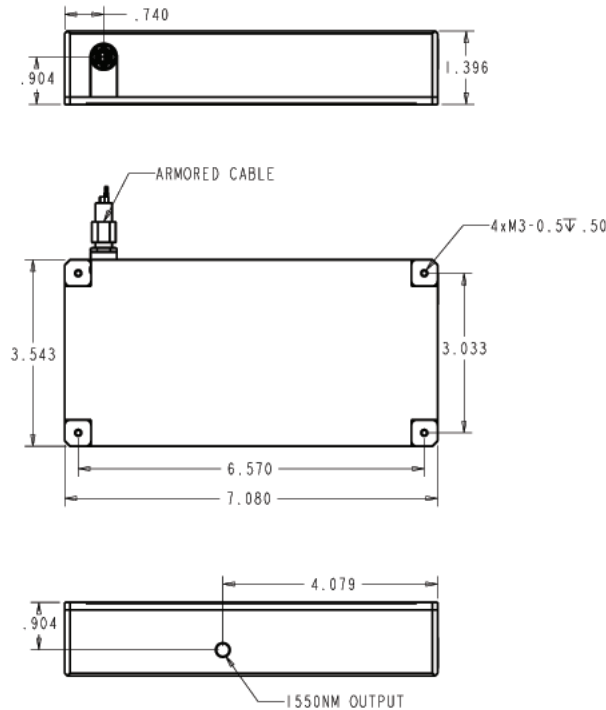
<sup>3</sup> The repetition rate needs to be specified at the time of purchase. For other repetition rates, please contact [sales@calmarlaser.com](mailto:sales@calmarlaser.com).

<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.

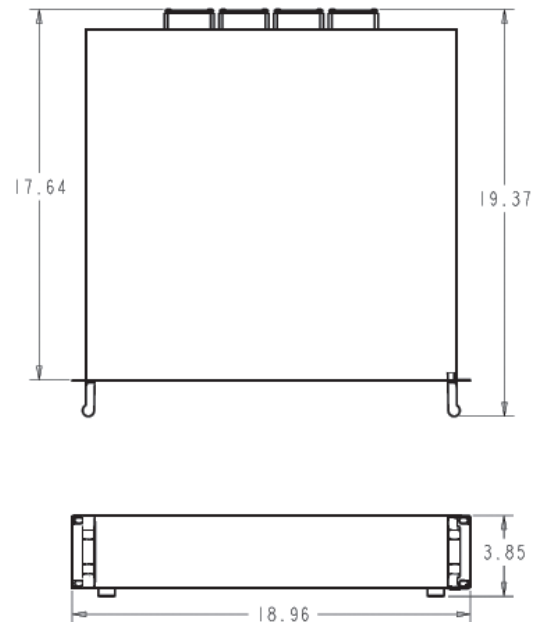
<sup>5</sup> The absolute pulse energy will depend on the version and specified repetition rate.

<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

