

CARBIDE



Unibody-Design Femtosecond Lasers for Industry and Science

FEATURES

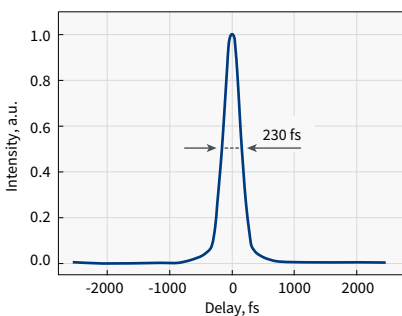
- 190 fs – 20 ps tunable pulse duration
- 2 mJ maximum pulse energy
- 80 W maximum output power
- Single-shot – 2 MHz repetition rate
- Pulse picker for pulse-on-demand mode
- BiBurst
- Air-cooled version
- Automated harmonic generators
- Scientific interface module



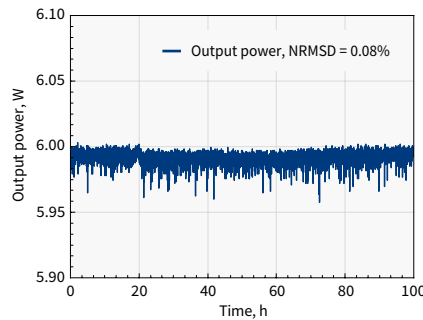
CARBIDE-CB3

CARBIDE is a series of femtosecond lasers combining high average power and excellent power stability. CARBIDE features market-leading output parameters without compromises to beam quality and stability. A compact and robust optomechanical CARBIDE design allows a variety of applications in top-class research centers, as well as display, automotive, LED, medical, and other industries. The reliability of CARBIDE has been proven by hundreds of systems operating 24/7 in the industrial environment.

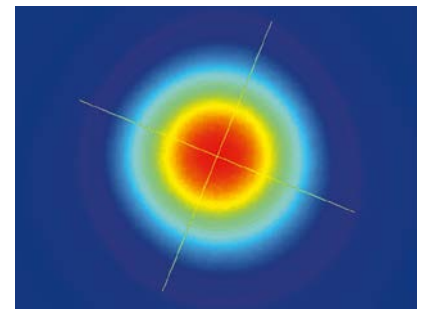
The tunability of CARBIDE lasers enables our customers to discover the most efficient manufacturing processes. Tunable parameters include pulse duration (190 fs – 20 ps), repetition rate (single-shot – 2 MHz), pulse energy (up to 2 mJ), and average power (up to 80 W). A pulse-on-demand mode is available using the built-in pulse picker. The CARBIDE lasers can be equipped with industrial-grade modules, including but not limited to high-power harmonic generators.



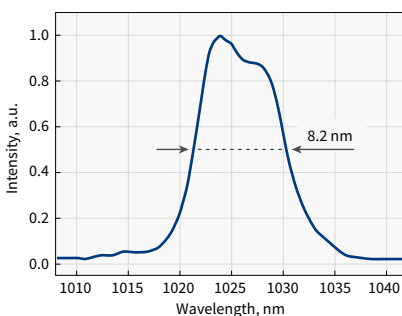
Typical pulse duration of CARBIDE laser



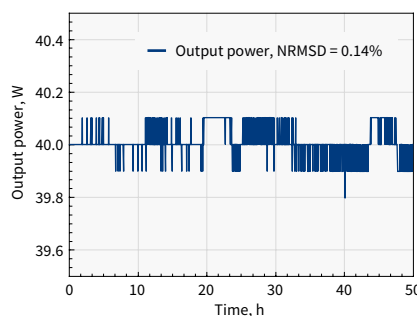
Long-term power stability of CARBIDE-CB5



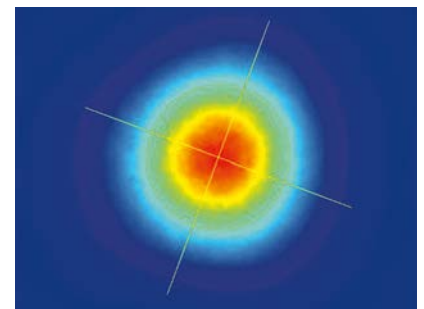
Typical beam profile of CARBIDE-CB5



Typical spectrum of CARBIDE laser



Long-term power stability of CARBIDE-CB3



Typical beam profile of CARBIDE-CB3

SPECIFICATIONS

NEW

| Model | CB3-20W | CB3-40W | CB3-80W | CB5 | CB5-SP |
|-------|---------|---------|---------|-----|--------|
|-------|---------|---------|---------|-----|--------|

OUTPUT CHARACTERISTICS

| | | | | | | |
|---|--|---|------------------------|--------------------------|------------------------|----------------|
| Cooling method | Water-cooled | | | Air-cooled ¹⁾ | | |
| Maximum output power | 20 W | 40 W | 80 W | 6 W | 5 W | |
| Pulse duration ²⁾ | < 250 fs | | < 350 fs ³⁾ | < 290 fs | | < 190 fs |
| Pulse duration tuning range | 250 fs – 10 ps | | 350 fs – 10 ps | 290 fs – 20 ps | | 190 fs – 20 ps |
| Maximum pulse energy | 0.4 mJ | | 0.8 mJ | 2 mJ | 100 µJ | 83 µJ |
| Repetition rate | Single-shot – 1 MHz | Single-shot – 1 MHz (2 MHz on request) | Single-shot – 2 MHz | | Single-shot – 1 MHz | |
| Pulse selection | Single-shot, pulse-on-demand, any fundamental repetition rate division | | | | | |
| Center wavelength ⁴⁾ | 1030 ± 10 nm | | | | | |
| Polarization | Linear, vertical; 1 : 1000 | | | | | |
| Beam quality, M ² | < 1.2 | | | | | |
| Beam diameter ⁵⁾ | 3.9 ± 0.4 mm | | 4.2 ± 0.4 mm | 5.1 ± 0.7 mm | 2.1 ± 0.4 mm | |
| Beam pointing stability | < 20 µrad/°C | | | | | |
| Pulse picker | FEC ⁶⁾ | | | included | included ⁷⁾ | included |
| Pulse picker leakage | < 0.5% | | | < 2% | < 0.1% | < 2% |
| Pulse-to-pulse energy stability ⁸⁾ | < 0.5% RMS deviation ⁹⁾ over 24 h | | | | | |
| Long-term power stability ⁸⁾ | < 0.5% RMS deviation ⁹⁾ over 100 h | | | | | |

OPTIONAL EXTENSIONS

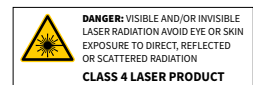
| | | | | | | | | | | | |
|---|---|--|--|--|--|--|-------------|--|--|--|--|
| Harmonic generators | Integrated, optional (see page 14) | | | | | | | | | | |
| Output wavelength | 515 nm, 343 nm, or 257 nm | | | | | | | | | | |
| Optical parametric amplifier | Integrated, optional (see page 15) | | | | | | | | | | |
| Tuning range | 320 – 10000 nm | | | | | | | | | | |
| BiBurst option | Tunable GHz and MHz burst with burst-in-burst capability, optional (see page 9) | | | | | | | | | | |
| GHz-Burst | n/a | | | | | | | | | | |
| Intra burst pulse period ¹⁰⁾ | | | | | | | 440 ± 40 ps | | | | |
| Number of pulses, P ¹¹⁾ | | | | | | | 1 – 10 | | | | |
| MHz-Burst | | | | | | | | | | | |
| Intra burst pulse period | ≈ 15 ns | | | | | | | | | | |
| Number of pulses, N | 1 – 10 | | | | | | | | | | |

PHYSICAL DIMENSIONS

| | | | | | | |
|----------------------------------|--------------------|--|-------------------|--------------------|------------------|--|
| Laser head (L × W × H) | 632 × 305 × 173 mm | | | 631 × 324 × 167 mm | | |
| Chiller (L × W × H) | 680 × 484 × 307 mm | | | Not required | | |
| 24 V DC power supply (L × W × H) | 280 × 144 × 49 mm | | 320 × 200 × 75 mm | | 220 × 95 × 46 mm | |

ENVIRONMENTAL & UTILITY REQUIREMENTS

| | | | | | | |
|-----------------------------------|--|--|---|-------------------------|--|--|
| Operating temperature | 15 – 30 °C (59 – 86 °F) | | | 17 – 27 °C (62 – 80 °F) | | |
| Relative humidity | < 80% (non-condensing) | | | | | |
| Electrical requirements | 100 V AC, 7 A – 240 V AC, 3 A; 50 – 60 Hz | | 100 V AC, 12 A – 240 V AC, 5 A; 50 – 60 Hz | | 100 V AC, 3 A – 240 V AC, 1.3 A; 50 – 60 Hz | |
| Rated power | 600 W | | 1000 W | | 300 W | |
| Power consumption | 500 W | | 700 W | | 150 W | |
| Electrical requirements (chiller) | 100 – 230 V AC; 50 – 60 Hz | | 200 – 230 V AC; 50 – 60 Hz | | Not required | |
| Rated power (chiller) | 1400 W | | 2000 W | | | |
| Power consumption (chiller) | 1000 W | | 1300 W | | | |

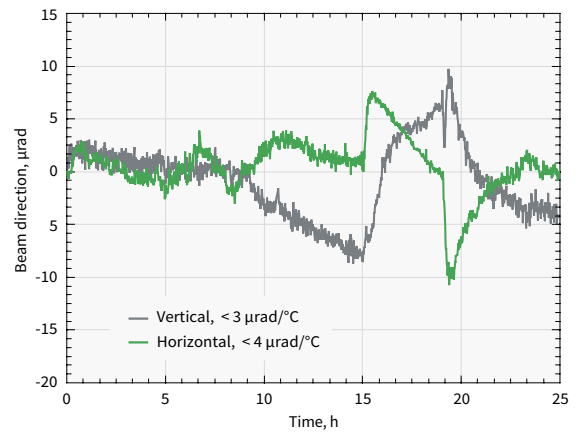
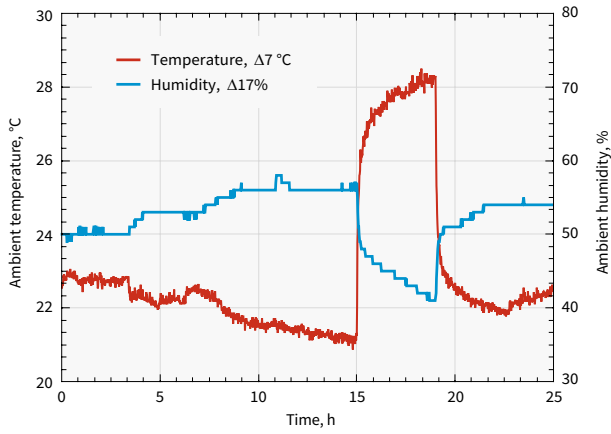
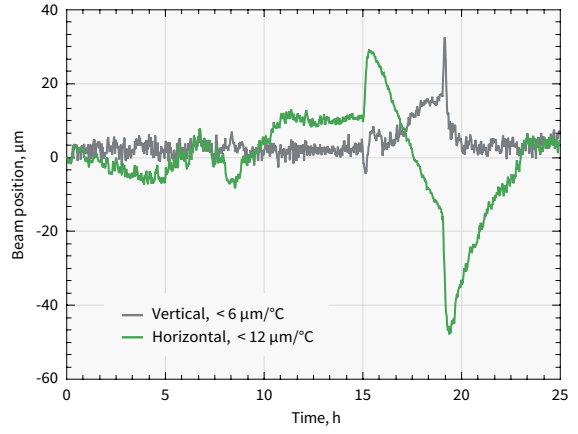
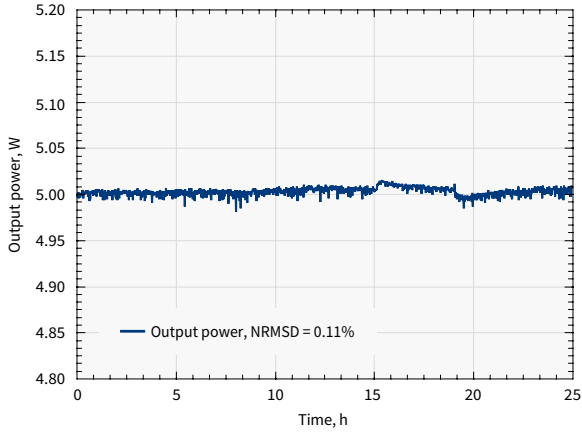


¹⁾ Water-cooled version available on request.
²⁾ Assuming Gaussian pulse shape.
³⁾ Pulse duration can be reduced to < 250 fs if pulse peak intensity of > 50 GW/cm² is tolerated by customer setup.
⁴⁾ Precise center wavelength for specific models available upon request.

⁵⁾ FW 1/e², using maximum pulse energy.
⁶⁾ Provides fast energy control; external analog control input available. Response time – next available RA pulse.
⁷⁾ Enhanced contrast AOM. Provides fast amplitude control of output pulse train.
⁸⁾ Under stable environmental conditions.

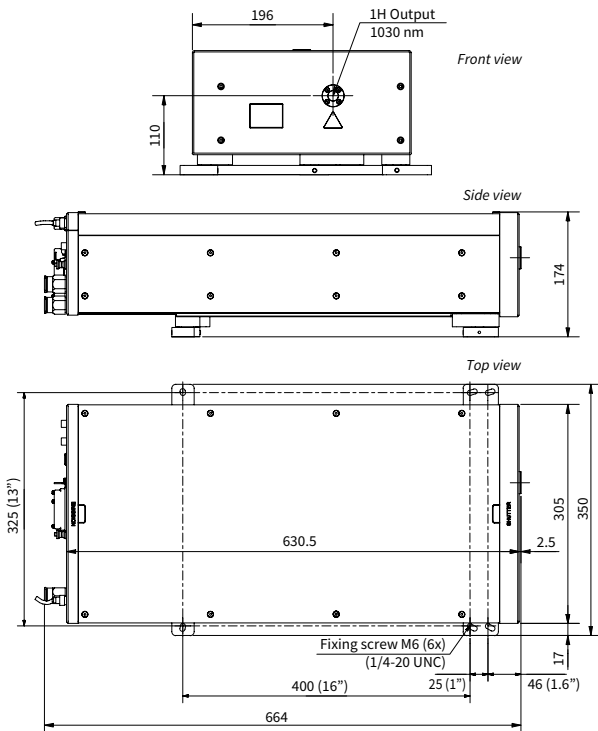
⁹⁾ Normalized to average pulse energy, NRMSD.
¹⁰⁾ Custom spacing is available on request.
¹¹⁾ Maximum number of pulses in a burst depends on the laser repetition rate. Custom number of pulses is available on request.

STABILITY MEASUREMENTS

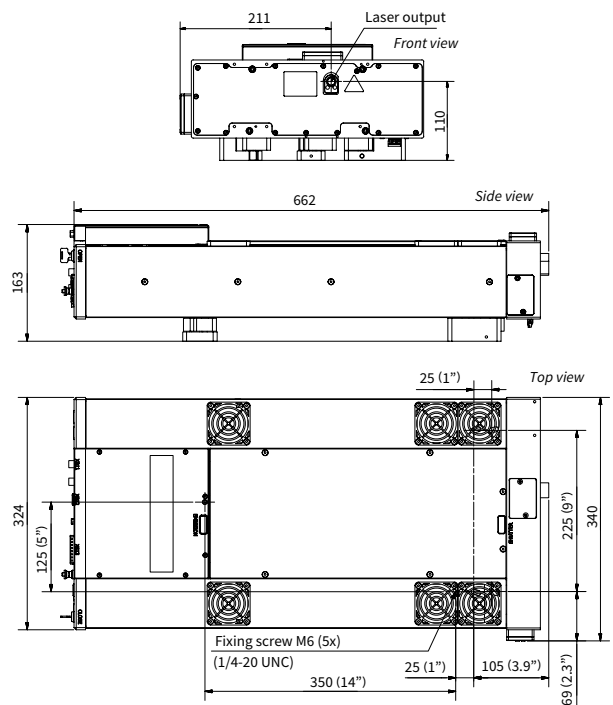


Output power, beam direction, and beam position of CARBIDE-CB5 under harsh environmental conditions

DRAWINGS



Drawing of CARBIDE-CB3



Drawing of air-cooled CARBIDE-CB5 with attenuator