

CARBIDE



Unibody-Design Femtosecond Lasers for Industry and Science

FEATURES

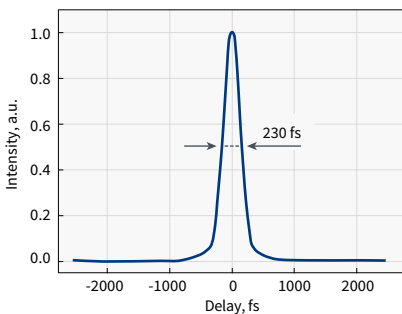
- 190 fs – 20 ps tunable pulse duration
- 2 mJ maximum pulse energy
- 80 W maximum output power
- Single-shot – 2 MHz repetition rate
- Pulse picker for pulse-on-demand mode
- Air-cooled version
- Automated harmonic generators
- Scientific interface module



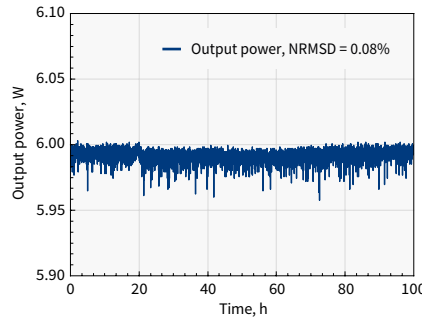
CARBIDE-CB3

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.

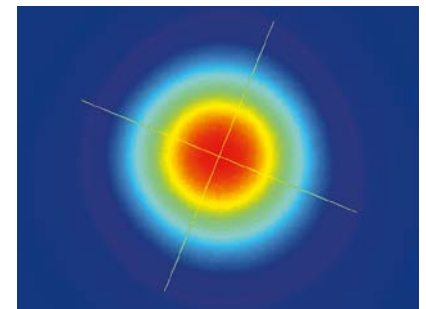
The tunability of CARBIDE lasers enables our customers to discover the most efficient manufacturing processes. Tunable parameters include pulse duration (190 fs – 20 ps), repetition rate (single-shot – 2 MHz), pulse energy (up to 2 mJ), and average power (up to 80 W). A pulse-on-demand mode is available 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.



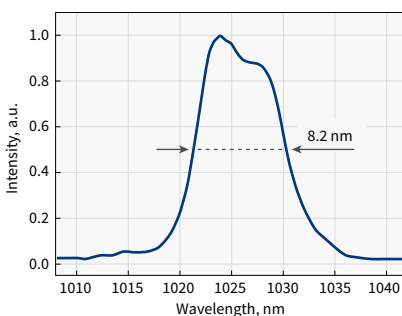
Typical pulse duration of CARBIDE laser



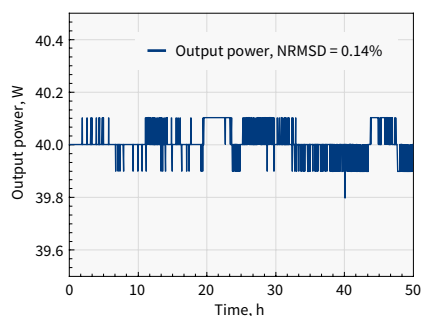
Long-term power stability of CARBIDE-CB5



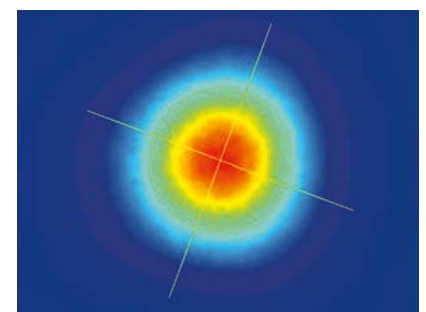
Typical beam profile of CARBIDE-CB5



Typical spectrum of CARBIDE laser



Long-term power stability of CARBIDE-CB3



Typical beam profile of CARBIDE-CB3

SPECIFICATIONS



Model	CB3-20W	CB3-40W	CB3-80W	CB5	CB5-SP
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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⁾	4.3 mm		4.6 mm	5.6 mm	2.3 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⁾	RMS deviation ⁹⁾ < 0.5% over 24 h					
Long-term power stability ⁸⁾	RMS deviation ⁹⁾ < 0.5% over 100 h					

OPTIONAL EXTENSIONS

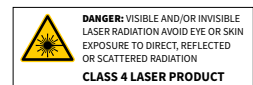
Harmonic generators	Integrated, optional (see page 13)					
Output wavelength	515 nm, 343 nm, or 257 nm					
Optical parametric amplifier	Integrated, optional (see page 14)					
Tuning range	320 – 10000 nm					
BiBurst option	Tunable GHz and MHz burst with burst-in-burst capability, optional (see page 9)					
GHz-Burst						
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			

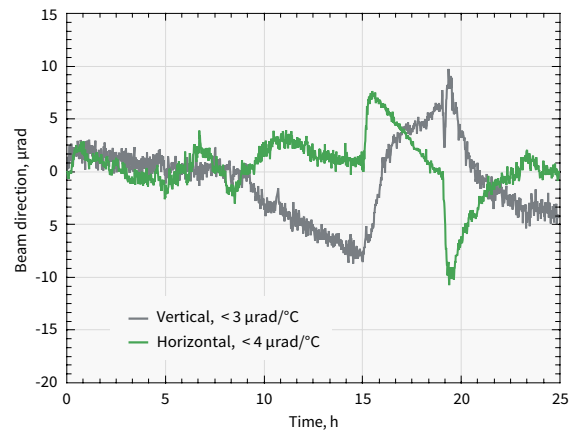
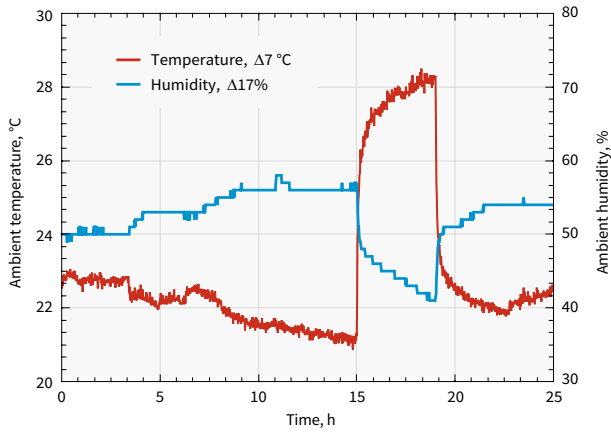
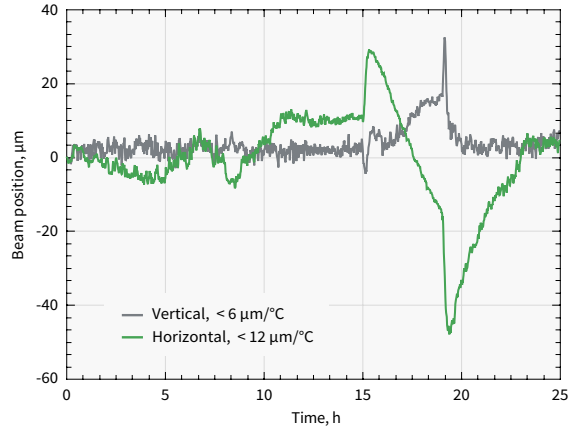
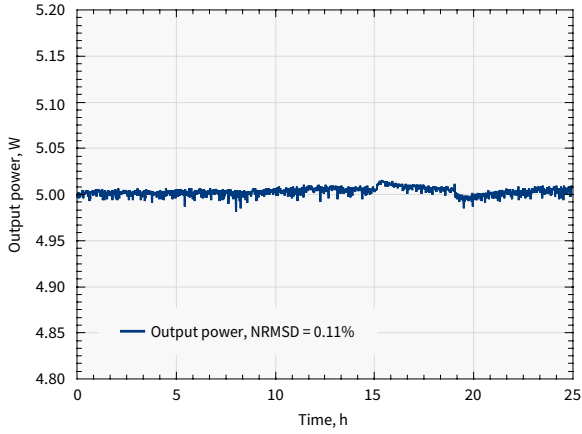


¹⁾ Water-cooled version available on request.
²⁾ Assuming Gaussian pulse shape.
³⁾ Pulse duration can be reduced to < 250 fs if pulse peak intensity of > 50 GW/cm² is tolerated by customer setup.
⁴⁾ Precise center wavelength for specific models available upon request.

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.

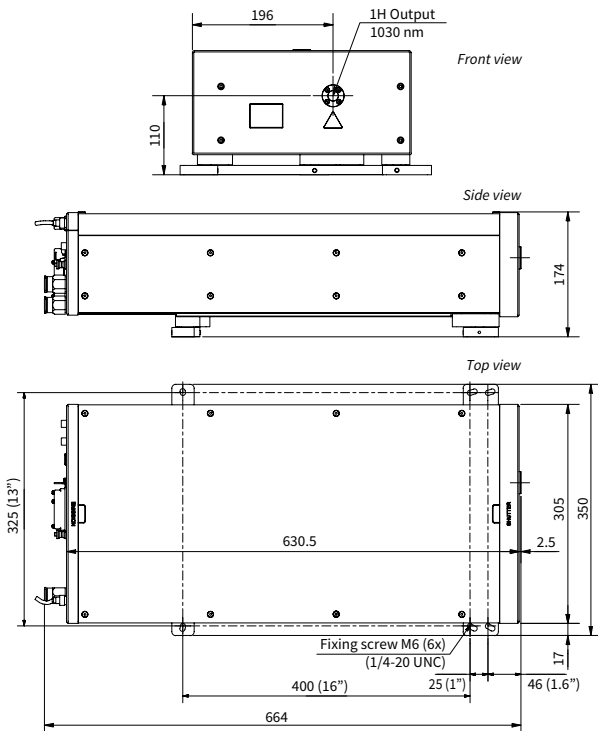
⁹⁾ Normalized to average pulse energy, NRMSD.
¹⁰⁾ Custom spacing is available on request.
¹¹⁾ Maximum number of pulses in a burst depends on the laser repetition rate. Custom number of pulses is available on request.

STABILITY MEASUREMENTS

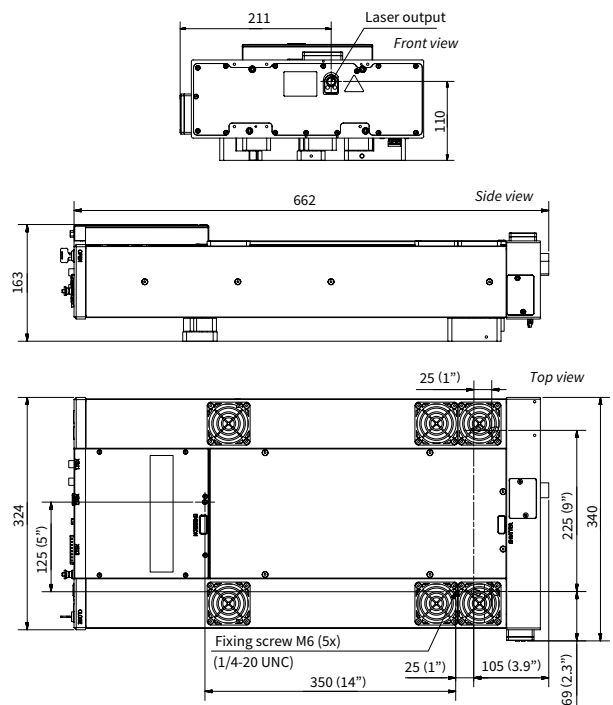


Output power, beam direction, and beam position of CARBIDE-CB5 under harsh environmental conditions

DRAWINGS



Drawing of CARBIDE-CB3



Drawing of air-cooled CARBIDE-CB5 with attenuator