

CARBIDE

Unibody-Design Femtosecond Lasers for Industry and Science



CARBIDE-CB3

Maximum output of
120 W, 1 mJ or 80 W, 2 mJ

Single-shot – 10 MHz
repetition rate

NEW

Tunable pulse duration,
190 fs – 20 ps

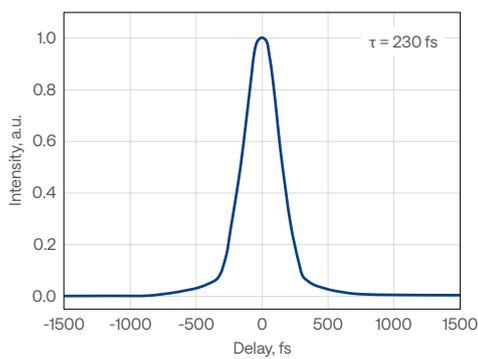
Pulse-on-demand and
BiBurst for pulse control

Automated harmonics up to
the 5th or tunable extensions

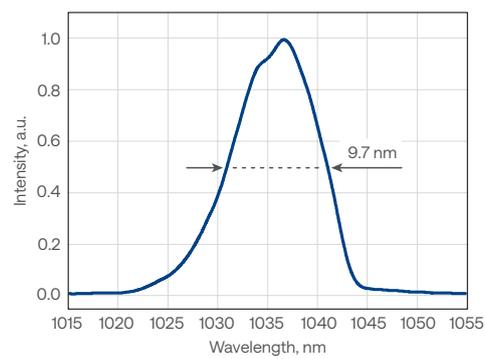
Air-cooled and
water-cooled models

Compact industrial-grade design

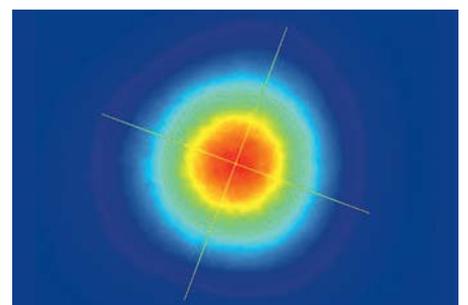
CARBIDE-CB3
Typical pulse duration



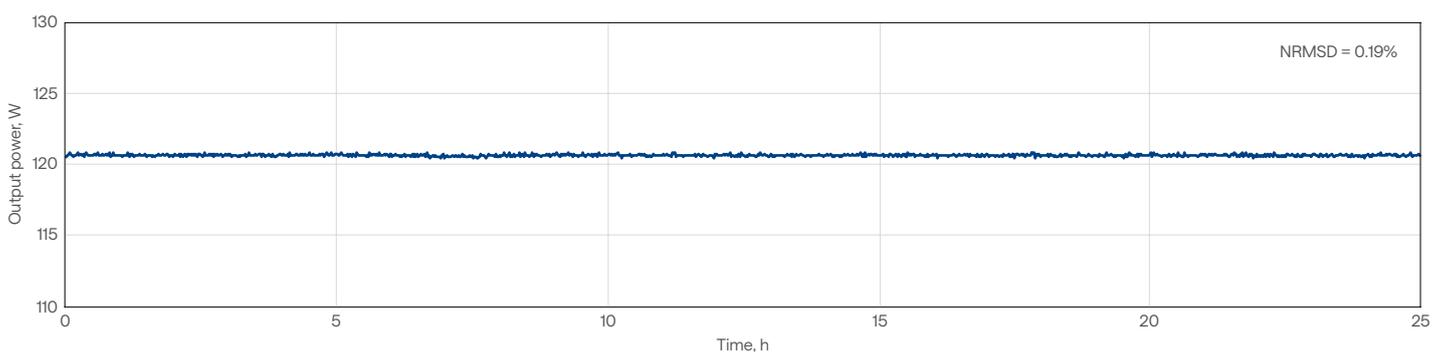
CARBIDE-CB3
Typical spectrum



CARBIDE-CB3
Typical beam profile



CARBIDE-CB3-120W
Long-term power stability





Model	CB3-20W	CB3-40W	CB3-40W-10MHz	CB3-80W	CB3-120W
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OUTPUT CHARACTERISTICS

Cooling method	Water-cooled				
Center wavelength	1030 ± 10 nm				
Maximum output power	20 W	40 W		80 W	120 W
Pulse duration ¹⁾	< 250 fs			< 350 fs ²⁾	< 250 fs
Pulse duration tuning range	250 fs – 10 ps			350 fs – 10 ps	250 fs – 10 ps
Maximum pulse energy	0.4 mJ		0.2 mJ	0.8 mJ	2 mJ
Repetition rate	Single-shot – 1 MHz	Single-shot – 1 MHz (2 MHz on request)	Single-shot – 10 MHz	Single-shot – 2 MHz	
Pulse selection	Single-shot, pulse-on-demand, any fundamental repetition rate division				
Polarization	Linear, vertical; 1 : 1000				
Beam quality, M ²	< 1.2				
Beam diameter ³⁾	3.9 ± 0.4 mm		4.2 ± 0.4 mm	5.1 ± 0.7 mm	5 ± 0.5 mm
Beam pointing stability	< 20 µrad/°C				
Pulse energy control	FEC ⁴⁾		Attenuator ⁵⁾	FEC ⁴⁾	
Pulse picker leakage	< 0.25%		< 0.5%	< 0.25%	
Pulse-to-pulse energy stability, 24 h ⁶⁾	< 0.5%				
Long-term power stability, 100 h ⁶⁾	< 0.5%				

MAIN OPTIONS

Oscillator output ⁷⁾	< 0.5 W, 120 – 250 fs, 1030 ± 10 nm, ≈ 65 MHz				
Harmonic generator ⁸⁾	515 nm, 343 nm, 257 nm, or 206 nm; refer to CARBIDE HG				
Optical parametric amplifier ⁹⁾	UV – MIR; refer to I-OPA				n/a
BiBurst option	Tunable GHz and MHz burst with burst-in-burst capability; refer to BiBurst				

PHYSICAL DIMENSIONS

Laser head (L × W × H)	633 × 350 × 174 mm				
Chiller (L × W × H)	585 × 484 × 221 mm		680 × 484 × 307 mm		
24 V DC power supply (L × W × H)	280 × 144 × 49 mm ¹⁰⁾		320 × 200 × 75 mm		376 × 449 × 88 mm

ENVIRONMENTAL AND UTILITY REQUIREMENTS

Operating temperature	15 – 30 °C				
Relative humidity	< 80% (non-condensing)				
Electrical requirements	Laser	100 V AC, 7 A – 240 V AC, 3A; 50 – 60 Hz	100 V AC, 12 A – 240 V AC, 5 A 50 – 60 Hz		100 V AC, 15 A – 240 V AC, 7 A 50 – 60 Hz
	Chiller	100 – 230 V AC; 50 – 60 Hz		200 – 230 V AC; 50 – 60 Hz	
Rated power	Laser	600 W	1000 W		2000 W
	Chiller	1400 W	2000 W		
Power consumption	Laser	500 W	900 W		1500 W
	Chiller	1000 W	1300 W		1800 W

¹⁾ Assuming a Gaussian pulse shape.

²⁾ Pulse duration can be reduced to < 250 fs if a pulse peak intensity of > 50 GW/cm² is tolerated by the customer setup.

³⁾ FW 1/e², using maximum pulse energy.

⁴⁾ Fast energy control (FEC) provides fast, full-scale individual pulse energy control; an external analog control input is available.

⁵⁾ Waveplate-based variable optical attenuator (VOA); an external analog control input is available. FEC is available up to 2 MHz.

⁶⁾ Under stable environmental conditions. Expressed as normalized root mean squared deviation (NRMSD).

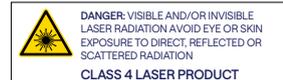
⁷⁾ Available simultaneously, requires a scientific interface.

Contact sales@lightcon.com for more details or customized solutions.

⁸⁾ Integrated. For an external harmonic generator, refer to HIRO.

⁹⁾ Integrated. For more details and stand-alone OPAs, refer to wavelength-tunable sources.

¹⁰⁾ Power supply can be different if an optional 2 MHz version is selected.



Model	CB5	CB5-SP
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OUTPUT CHARACTERISTICS

Cooling method	Air-cooled ¹⁾		
Center wavelength	1030 ± 10 nm		
Maximum output power	6 W	5 W	
Pulse duration ²⁾	< 290 fs		< 190 fs
Pulse duration tuning range	290 fs – 20 ps		190 fs – 20 ps
Maximum pulse energy	100 µJ	83 µJ	100 µJ
Repetition rate	Single-shot – 1 MHz		
Pulse selection	Single-shot, pulse-on-demand, any fundamental repetition rate division		
Polarization	Linear, vertical; 1: 1000		
Beam quality, M ²	< 1.2		
Beam diameter ³⁾	2.1 ± 0.4 mm		
Beam pointing stability	< 20 µrad/°C		
Pulse energy control	Attenuator ⁴⁾	AOM ⁵⁾	Attenuator ⁴⁾
Pulse picker leakage	< 2%	< 0.1%	< 2%
Pulse-to-pulse energy stability, 24 h ⁶⁾	< 0.5%		
Long-term power stability, 100 h ⁶⁾	< 0.5%		

MAIN OPTIONS

Oscillator output	n/a		
Harmonic generator ⁷⁾	515 nm, 343 nm, 257 nm, or 206 nm; refer to CARBIDE HG		
Optical parametric amplifier ⁸⁾	UV – MIR; refer to I-OPA		
BiBurst option	n/a		

PHYSICAL DIMENSIONS

Laser head (L × W × H)	633 × 324 × 162 mm		
Chiller	Not required		
24 V DC power supply (L × W × H)	220 × 95 × 46 mm		

ENVIRONMENTAL AND UTILITY REQUIREMENTS

Operating temperature	17 – 27 °C		
Relative humidity	< 80% (non-condensing)		
Electrical requirements	100 V AC, 3 A – 240 V AC, 1.3 A; 50 – 60 Hz		
Rated power	300 W		
Power consumption	150 W		

¹⁾ Water-cooled version available on request.

²⁾ Assuming a Gaussian pulse shape.

³⁾ $FW\ 1/e^2$, using maximum pulse energy.

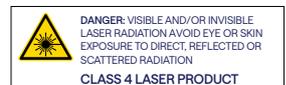
⁴⁾ Waveplate-based variable optical attenuator (VOA); an external analog control input is available.

⁵⁾ Enhanced contrast AOM. Provides fast amplitude control of output pulse train.

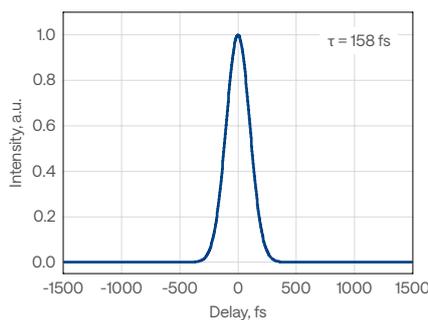
⁶⁾ Under stable environmental conditions. Expressed as normalized root mean squared deviation (NRMSD).

⁷⁾ Integrated. For an external harmonic generator, refer to HIRO.

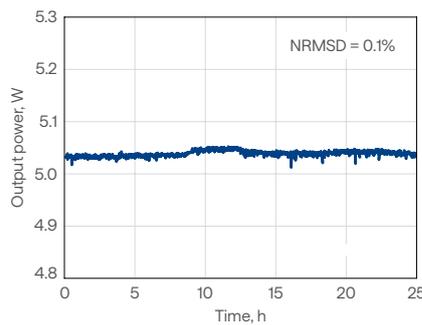
⁸⁾ Integrated. For more details and stand-alone OPAs, refer to wavelength-tunable sources.



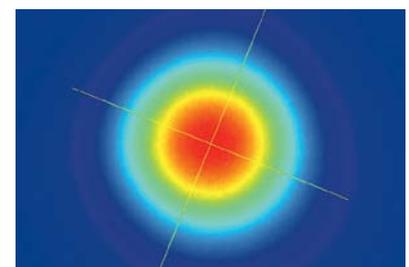
CARBIDE-CB5-SP
Typical pulse duration



CARBIDE-CB5
Long-term power stability

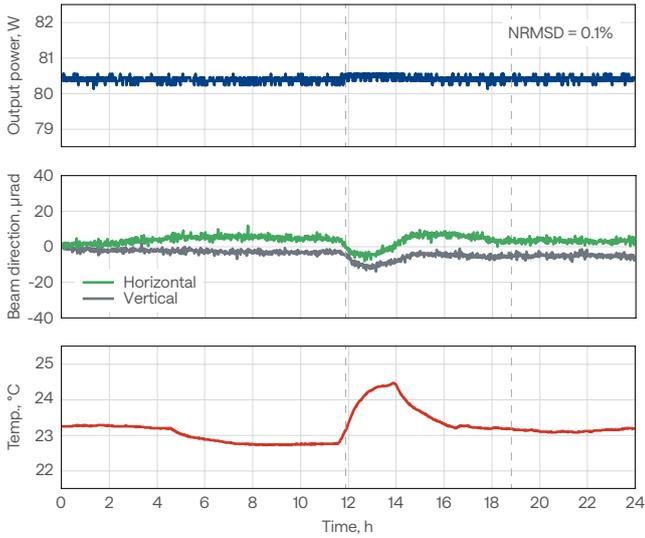


CARBIDE-CB5
Typical beam profile

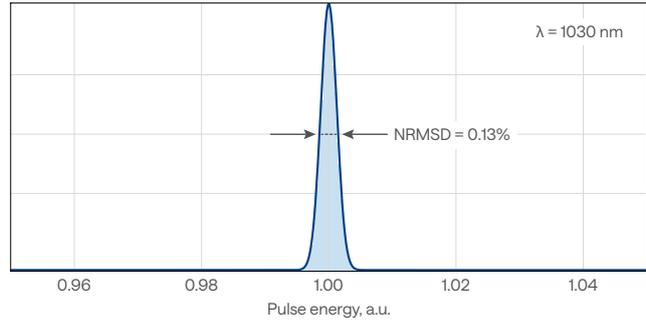


Stability measurements

CARBIDE-CB3 output power and beam direction stability with power lock enabled, across varying environmental conditions

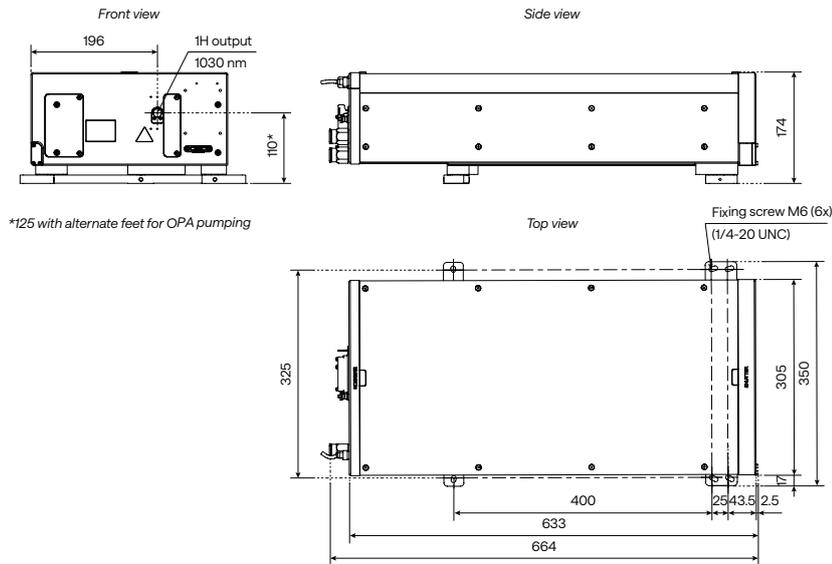


CARBIDE-CB3
Typical pulse-to-pulse energy stability

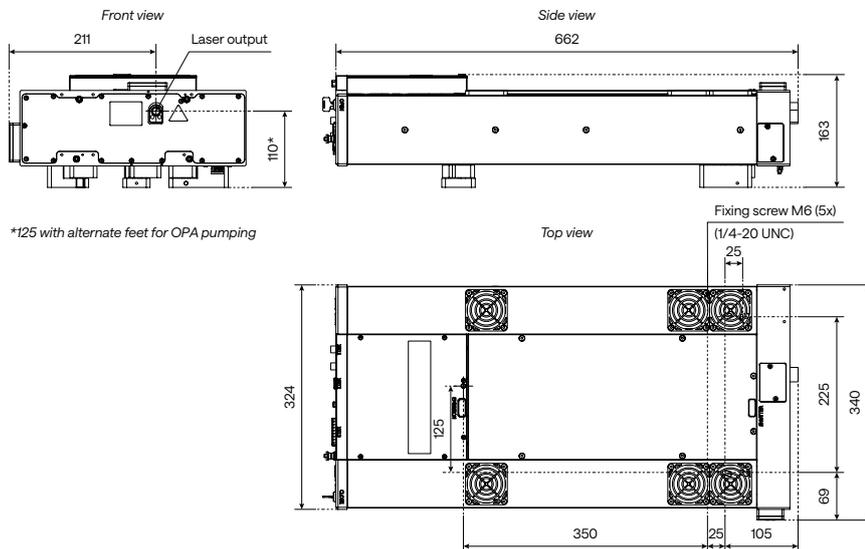


Drawings

CARBIDE-CB3



Air-cooled CARBIDE-CB5 with an attenuator



The drawings depend on the exact configuration. If crucial for integration, please contact sales@lightcon.com.

REV. 251001 | SALES@LIGHTCON.COM



CARBIDE | CB3-UV

High-Power UV Femtosecond Lasers



Maximum output of 50 W

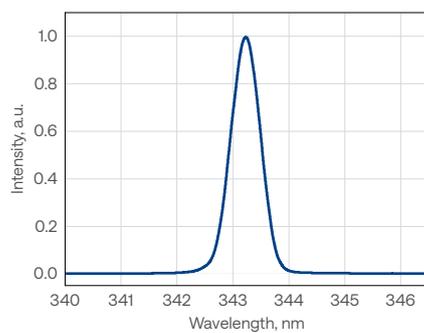
500 fs pulse duration

Up to MHz repetition rate

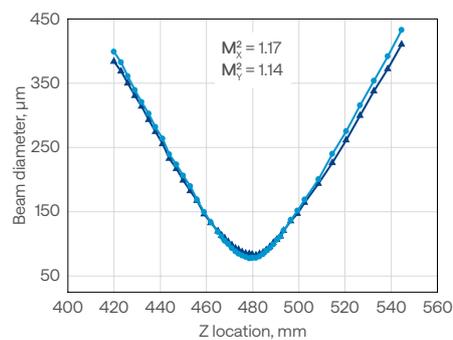
High beam quality and stability

Compact industrial-grade design

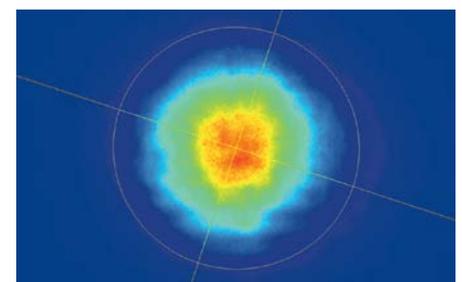
CARBIDE-CB3-UV
Typical spectrum



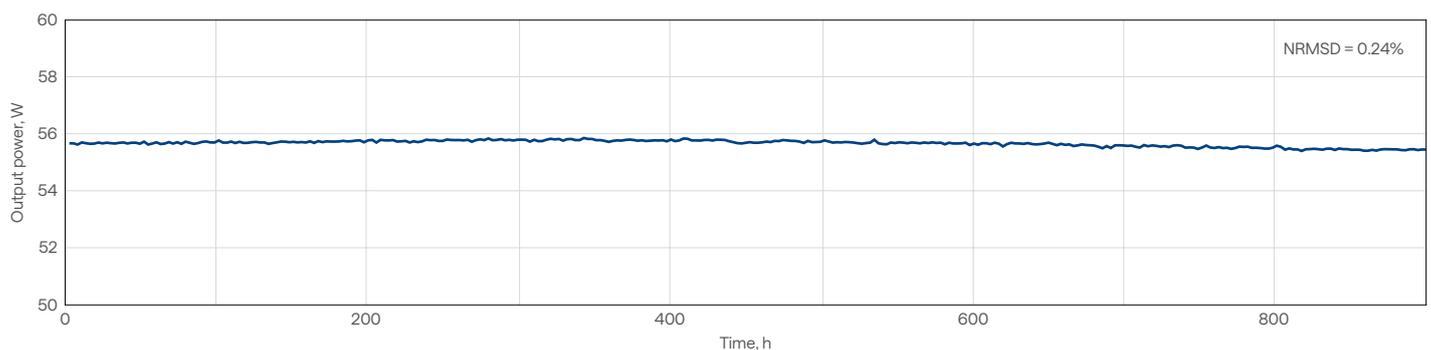
CARBIDE-CB3-UV
Typical M² measurement data



CARBIDE-CB3-UV
Beam profile



CARBIDE-CB3-UV-50W
Long-term power stability



Specifications

Model	CB3-UV-30W	CB3-UV-50W
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OUTPUT CHARACTERISTICS

Cooling method	Water-cooled	
Center wavelength	343 ± 3 nm	
Output power	> 30 W	> 50 W
Pulse duration ¹⁾	≈ 500 fs	
Output pulse energy	35 – 150 μJ	
Repetition rate ²⁾	200 – 1000 kHz	300 – 1000 kHz
Polarization	Linear, vertical; 1 : 200	
Beam quality, M ² , typical values	< 1.3	
Beam diameter ³⁾	2 – 5 mm	
Long-term power stability, 12 h ⁴⁾	< 0.5%	
Lifetime	10 000 h	

MAIN OPTIONS

Optional amplifier outputs	1030 nm, 515 nm
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PHYSICAL DIMENSIONS

Laser head (L × W × H)	801 × 350 × 174 mm
Chiller (L × W × H)	680 × 484 × 307 mm
24 V DC power supply (L × W × H)	320 × 200 × 75 mm

ENVIRONMENTAL AND UTILITY REQUIREMENTS

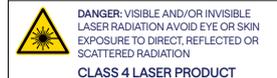
Operating temperature	15 – 30 °C	
Relative humidity	< 80% (non-condensing)	
Electrical requirements	Laser	100 V AC, 12 A – 240 V AC, 5 A; 50 – 60 Hz
	Chiller	200 – 230 V AC; 50 – 60 Hz
Rated power	Laser	1000 W
	Chiller	2000 W
Power consumption	Laser	900 W
	Chiller	1300 W

¹⁾ Assuming a Gaussian pulse shape.

²⁾ Repetition rate available up to 2 MHz at lower power.

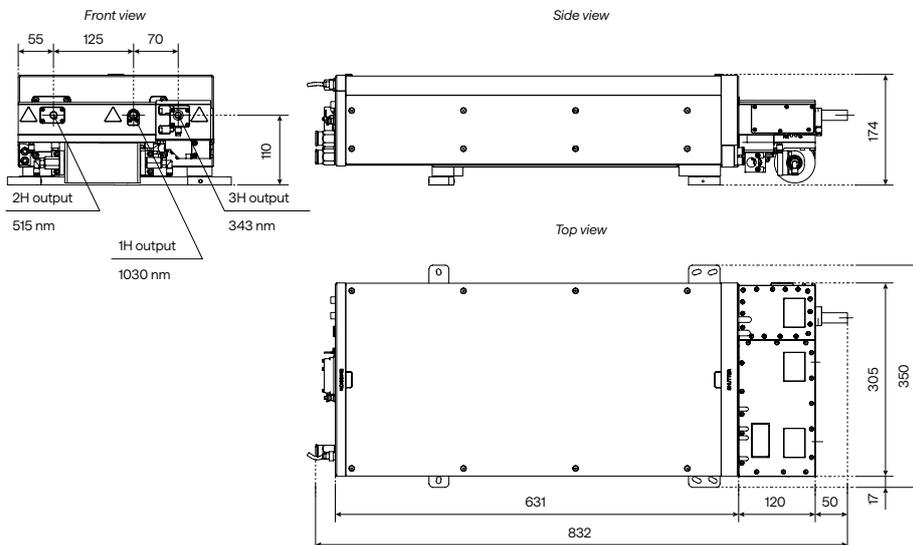
³⁾ FW 1/e², using maximum pulse energy.

⁴⁾ Under stable environmental conditions. Expressed as normalized root mean squared deviation (NRMSD).



Drawings

CARBIDE-CB3-UV



Integrated Harmonic Generators



CARBIDE-CB3 with a 2H-3H module

- 515 nm, 343 nm, 257 nm, or 206 nm output
- Automated harmonic selection
- Mounted directly on the laser head
- Industrial-grade design
- 50 W UV model

Specifications

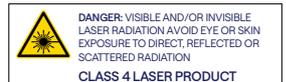
Model	2H	2H-3H	2H-4H	2H-5H	30W UV ¹⁾	50W UV ¹⁾
Output wavelength ²⁾ (automated selection)	1030 nm 515 nm	1030 nm 515 nm 343 nm	1030 nm 515 nm 257 nm	1030 nm 515 nm 206 nm	1030 nm 515 nm 343 nm	1030 nm 515 nm 343 nm
Pump pulse energy	20 – 2000 μ J	50 – 2000 μ J	20 – 2000 μ J	100 – 1500 μ J	80 – 400 μ J	120 – 400 μ J
Pump pulse duration	< 300 fs				\approx 500 fs	
Conversion efficiency / Output power	> 50% (2H)	> 50% (2H) > 25% (3H)	> 50% (2H) > 10% (4H) ³⁾	> 50% (2H) > 5% (5H) ⁴⁾	30 W (3H)	50 W (3H)
Beam quality, M^2 , typical values	\leq 400 μ J pump	< 1.15 (2H) < 1.2 (3H)	< 1.15 (2H) n/a (4H)	n/a	< 1.3 (3H)	< 1.3 (3H)
	> 400 μ J pump	< 1.2 (2H) < 1.3 (3H)	< 1.2 (2H) n/a (4H)	n/a		

¹⁾ Refer to CARBIDE-CB3-UV for more details.

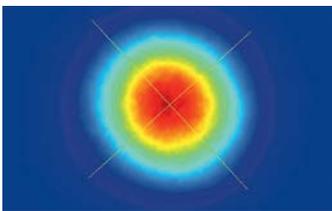
²⁾ Depends on the pump laser model. Up to the 5th harmonic available; contact sales@lightcon.com for more details.

³⁾ Maximum output power of 5 W.

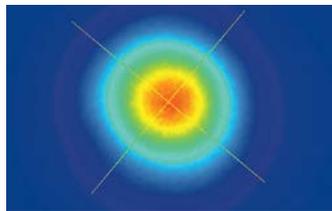
⁴⁾ Maximum output power of 0.2 W.



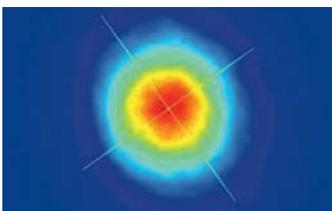
CARBIDE-CB5 (100 kHz, 6 W)
Typical 1H beam profile



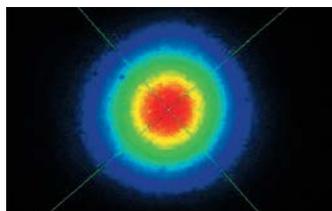
CARBIDE-CB5 (100 kHz, 3.4 W)
Typical 2H beam profile



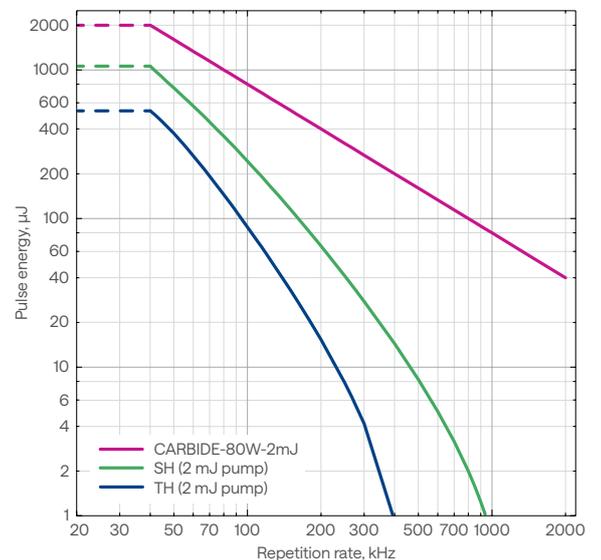
CARBIDE-CB5 (100 kHz, 2.2 W)
Typical 3H beam profile



CARBIDE-CB5 (100 kHz, 100 mW)
Typical 4H beam profile



CARBIDE-CB3-80W with a harmonic generator
Pulse energy vs repetition rate



SCI-M | CARBIDE

Scientific Interface Module for CARBIDE



Simultaneous or separate oscillator output

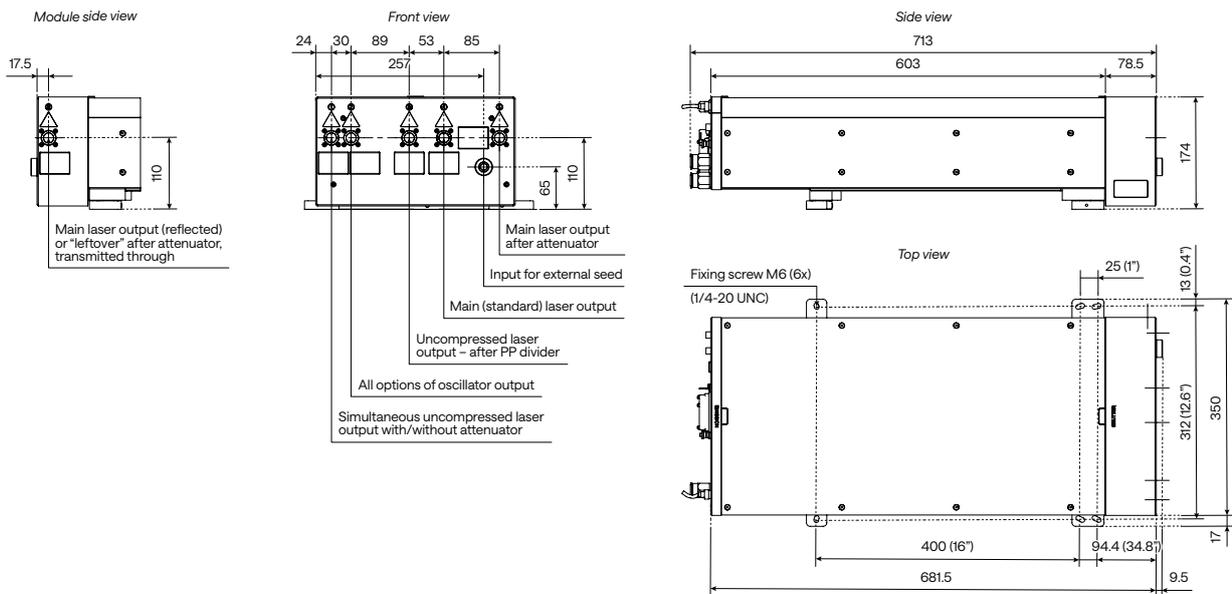
Uncompressed laser output

Seeding by an external oscillator

Beam-splitting options

Drawings

CARBIDE-CB3-40W with a scientific interface module



**PHOTO
TECHNICA** www.phototechnica.co.jp
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BiBurst

Tunable GHz and MHz Burst with Burst-in-Burst Capability

CARBIDE-CB3 and PHAROS lasers feature the tunable GHz and MHz burst option with burst-in-burst capability, known as BiBurst.

In standard mode, the laser emits a single pulse at a fixed frequency. In burst mode, the output consists of pulse packets instead of single pulses. Each packet consists of a specific number of equally separated pulses. MHz-Burst contains N pulses with a nanosecond period, while GHz-Burst contains P pulses with a picosecond period. When both burst modes are combined, the equally separated pulse packets contain sub-packets of pulses, forming the burst-in-burst or BiBurst.

CARBIDE and PHAROS lasers, equipped with tunable GHz and MHz bursts and BiBurst options, bring new capabilities to high-tech manufacturing industries, such as consumer electronics, integrated photonic chip production, advanced display manufacturing, and quantum technologies.

Applications:

- Brittle material drilling and cutting
- Deep engraving
- Selective ablation
- Volume modification of transparent materials
- Hidden marking
- Surface polishing
- Functional surface structuring

Specifications

Model		CARBIDE-CB3	PHAROS
GHz Burst	Intra burst pulse period ¹⁾	440 ± 40 ps	200 ± 40 ps
	Number of pulses, P ²⁾	1 – 10 ³⁾	1 – 25
MHz Burst	Intra burst pulse period	≈ 15 ns	
	Number of pulses, N	1 – 10	1 – 9 (7 with FEC ⁴⁾)

¹⁾ Custom spacing is available upon request.

²⁾ The maximum number of pulses in a burst depends on the laser repetition rate and energy.

³⁾ A custom number of pulses (up to 400) is available upon request.

⁴⁾ Fast energy control option. Enables the formation of any pulse envelope at the laser pulse repetition rate.

