

Product Catalog

Femtosecond Lasers for Industry

LIGHT CONVERSION is a global leader in ultrafast technology, designing and manufacturing femtosecond lasers, wavelength-tunable sources, optical parametric chirped-pulse amplifiers, spectroscopy systems, and microscopy sources.

The comprehensive portfolio represents the best-in-class lasers tailored for industry, science, and medicine.

10 000

Femtosecond laser systems
installed worldwide

17 500

Square meters designated for
manufacture and R&D

800

Employees, of whom 15%
focus on R&D

About Us

Founded in 1994, LIGHT CONVERSION has evolved into a leading company in ultrafast laser technology with over 10 000 systems installed worldwide and 800 employees, 15% of whom focus on R&D. The company's lasers are used by all of the world's top 50 universities, highlighting its commitment to state-of-the-art research, while also ensuring the reliability and performance in 24/7 industrial applications. With international offices in the US, China, and Korea, along with a global representative network, the company ensures worldwide sales and service.

Femtosecond Lasers

LIGHT CONVERSION is world-renowned for its industrial-grade Yb-based femtosecond lasers, covering a wide range of industrial, scientific, and medical applications.

High average power and pulse energy at high repetition rates

Market-proven industrial-grade stability and reliability

Automated harmonics and wavelength-tunable extensions

CARBIDE

Compact industrial design in air- or water-cooled models, providing up to 120 W, 1 mJ or 80 W, 2 mJ with excellent output stability.

PHAROS

Scientific flexibility with process-tailored output parameters, offering up to 1 mJ pulse energy at < 100 fs or up to 5 mJ at < 250 fs.

FLINT

Expanding the parameter range with repetition rates from 10 to 90 MHz, output power up to 20 W, and pulse durations down to 50 fs.

Industrial Femtosecond Lasers

Maximum output of 120 W (IR)
or 50 W (UV)

NEW

Single-shot – 10 MHz repetition rate

Pulse-on-demand and
BiBurst for pulse control

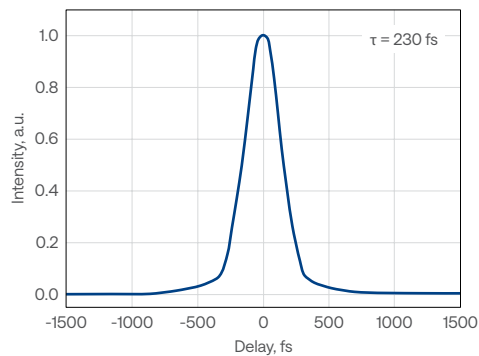
Automated harmonics up to the 5th
and wavelength-tunable extensions

Air-cooled or water-cooled models

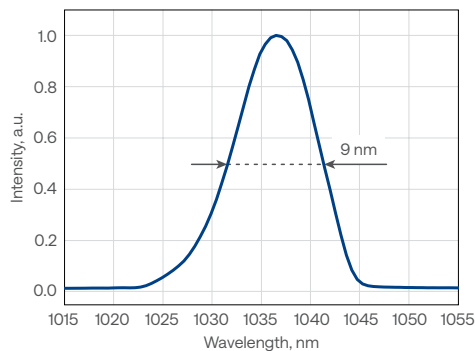


CARBIDE-CB3

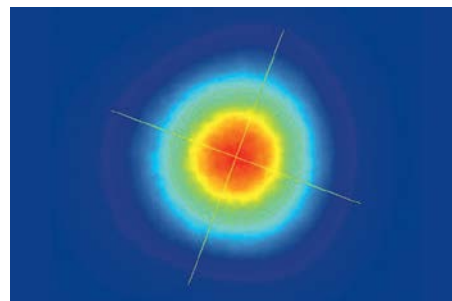
CARBIDE-CB3
Typical pulse duration



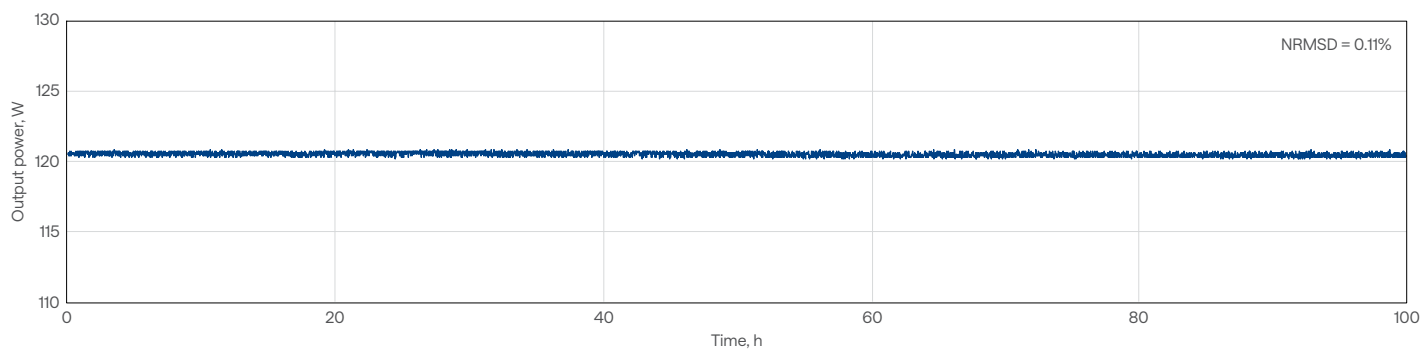
CARBIDE-CB3
Typical spectrum



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		0.8 mJ	2 mJ	1 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, SPPT ³⁾ , any fundamental repetition rate division				
Polarization	Linear, vertical; 1 : 1000				
Beam quality, M ²	< 1.2				
Beam diameter ⁴⁾	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 ⁵⁾		Attenuator ⁶⁾	FEC ⁵⁾	
Pulse picker leakage	< 0.25%		< 0.5%	< 0.25%	
Pulse-to-pulse energy stability, 8 h ⁷⁾	< 0.5%				
Long-term power stability, 100 h ⁷⁾	< 0.3%				

MAIN OPTIONS

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

DIMENSIONS

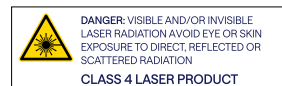
Laser head (L × W × H)	633 × 350 × 174 mm				
Chiller (L × W × H)	585 × 484 × 221 mm		680 × 484 × 307 mm		
24 V DC power supply (L × W × H)	352 × 195 × 75 mm				376 × 449 × 88 mm

ENVIRONMENTAL & UTILITY REQUIREMENTS

Operating temperature	15 – 30 °C				
Relative humidity	< 80% (non-condensing)				
Electrical requirements	Laser	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, 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	1000 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⁾ Synchronous pulse picker trigger (SPPT) mode provides pulse gating with a jitter time of 16 ns.
⁴⁾ FW 1/e², using maximum pulse energy.
⁵⁾ Fast energy control (FEC) provides fast, full-scale individual pulse energy control; an external analog control input is available. An optional integrated waveplate-based variable optical attenuator is available.
⁶⁾ Waveplate-based variable optical attenuator (VOA); an external analog control input is available. FEC is available for repetition rates up to 2 MHz.

⁷⁾ Under stable environmental conditions. Expressed as normalized root mean squared deviation (NRMSD).
⁸⁾ Available simultaneously, requires a scientific interface. Contact sales@lightcon.com for more details or customized solutions.
⁹⁾ Integrated. For an external harmonic generator, refer to HIRO.
¹⁰⁾ Integrated. For more details and stand-alone OPAs, refer to wavelength-tunable sources.



CARBIDE-CB5 specifications

Air-cooled IR lasers

Model	CB5-6W	CB5-5W	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, 8 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 or ORPHEUS		
BiBurst option	n/a		

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 & 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	280 W		
Power consumption	250 W		

¹⁾ Water-cooled version available on request.

²⁾ Assuming a Gaussian pulse shape.

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

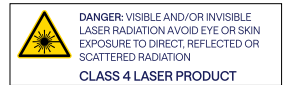
⁴⁾ Waveplate-based variable optical attenuator (VOA); an external analog control input is available.

⁵⁾ Enhanced contrast AOM. Provides fast, full-scale individual pulse energy control; an external analog control input is available.

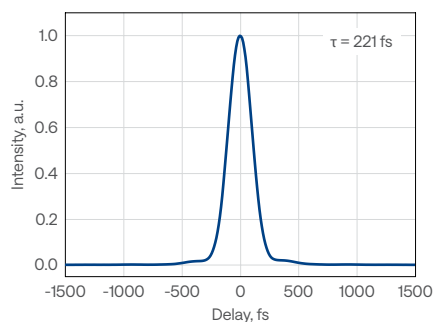
⁶⁾ Under stable environmental conditions. Expressed as normalized root mean squared deviation (NRMSD).

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

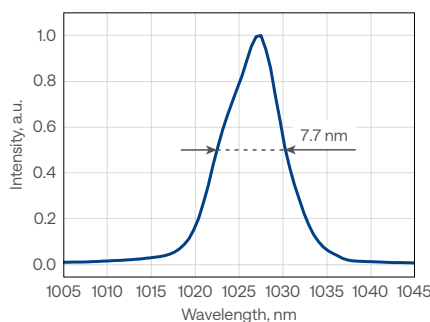
⁸⁾ Integrated. For more details and stand-alone OPAs, refer to wavelength-tunable sources.



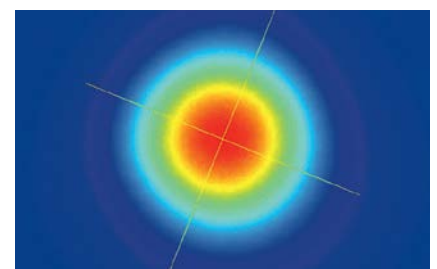
CARBIDE-CB5
Typical pulse duration



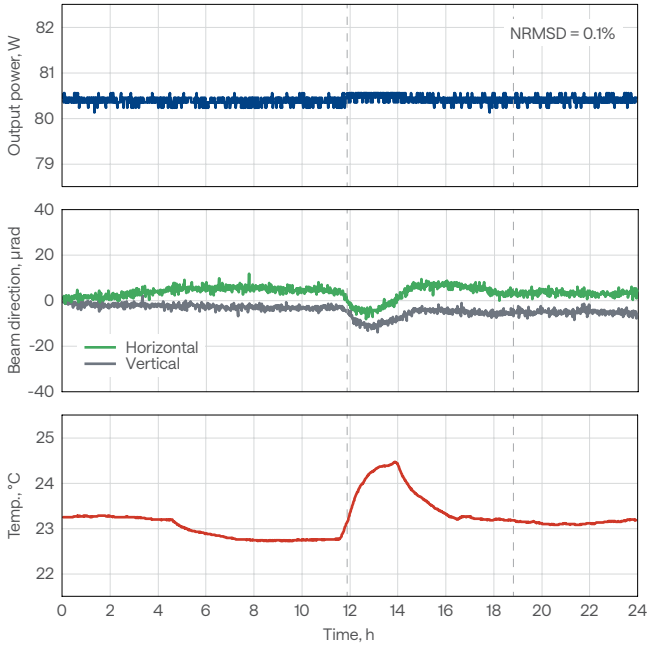
CARBIDE-CB5
Typical spectrum



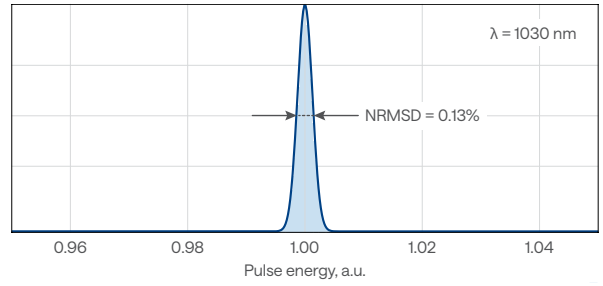
CARBIDE-CB5
Typical beam profile



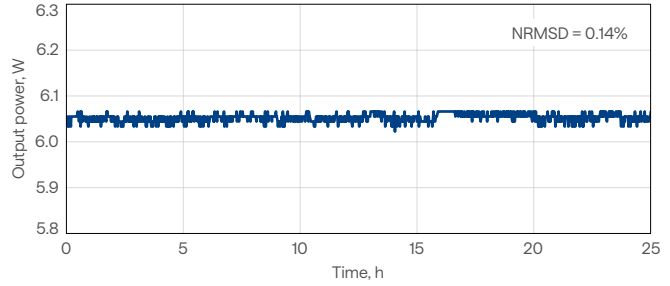
CARBIDE-CB3 output power and beam direction stability with power lock enabled, across varying environmental conditions



CARBIDE-CB3 Typical pulse-to-pulse energy stability

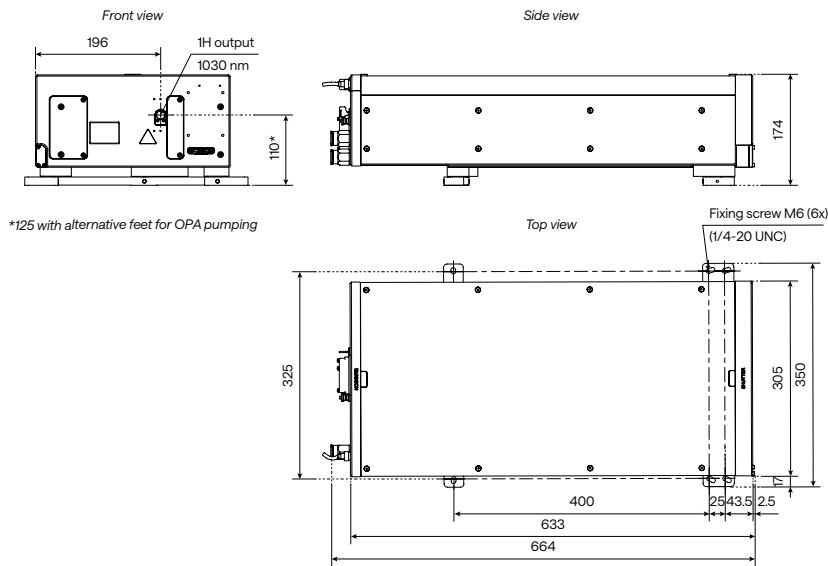


CARBIDE-CB5-6W Long-term power stability

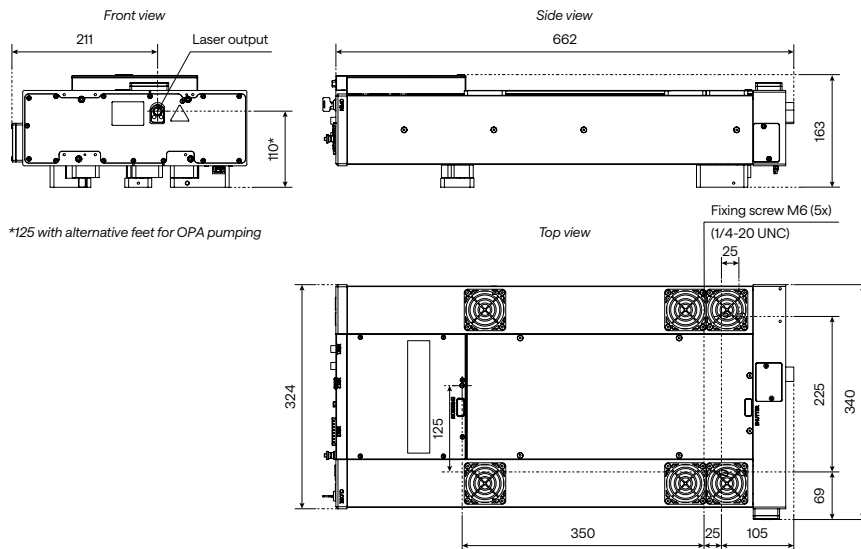


Drawings

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.



CARBIDE | CB3-UV

High-Power UV Femtosecond Lasers

Maximum output of 50 W

500 fs pulse duration

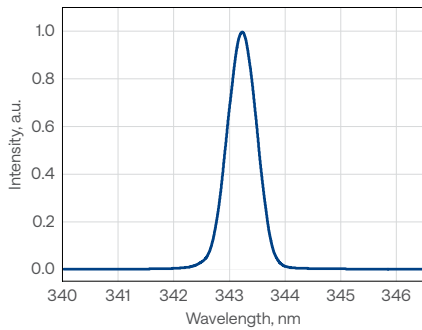
Up to MHz repetition rate

High beam quality and stability

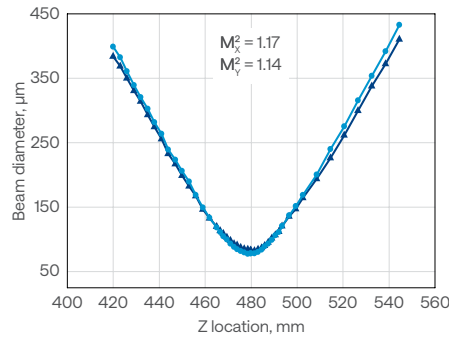
Compact industrial-grade design



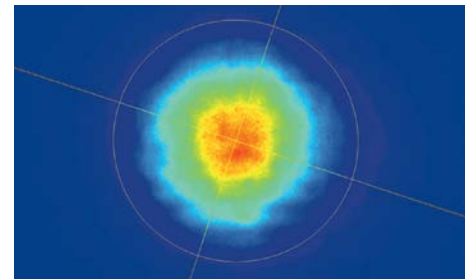
CARBIDE-CB3-UV
Typical spectrum



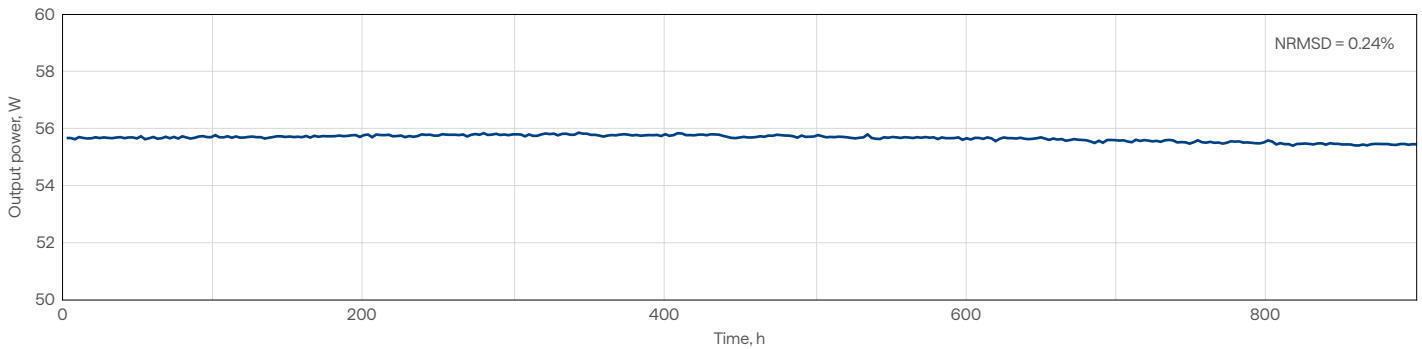
CARBIDE-CB3-UV
Typical M² measurement data



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	
Maximum output pulse energy ²⁾	150 μJ	
Repetition rate	200 – 1000 kHz ³⁾	300 – 2000 kHz
Polarization	Linear, vertical; 1 : 200	
Beam quality, M ²	< 1.3	
Beam diameter ⁴⁾	2 – 5 mm	
Long-term power stability, 12 h ⁵⁾	< 0.5%	
Lifetime	10 000 h	

MAIN OPTIONS

Optional amplifier outputs	1030 nm, 515 nm
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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)	352 × 195 × 75 mm	376 × 449 × 88 mm

ENVIRONMENTAL & 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	100 V AC, 15 A – 240 V AC, 7 A; 50 – 60 Hz
	Chiller	200 – 230 V AC; 50 – 60 Hz	
Rated power	Laser	1000 W	2000 W
	Chiller	2000 W	
Power consumption	Laser	900 W	1500 W
	Chiller	1300 W	1800 W

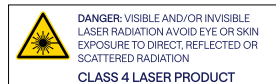
¹⁾ Assuming a Gaussian pulse shape.

²⁾ Depends on the pump energy.

³⁾ Repetition rate available up to 2 MHz at lower power.

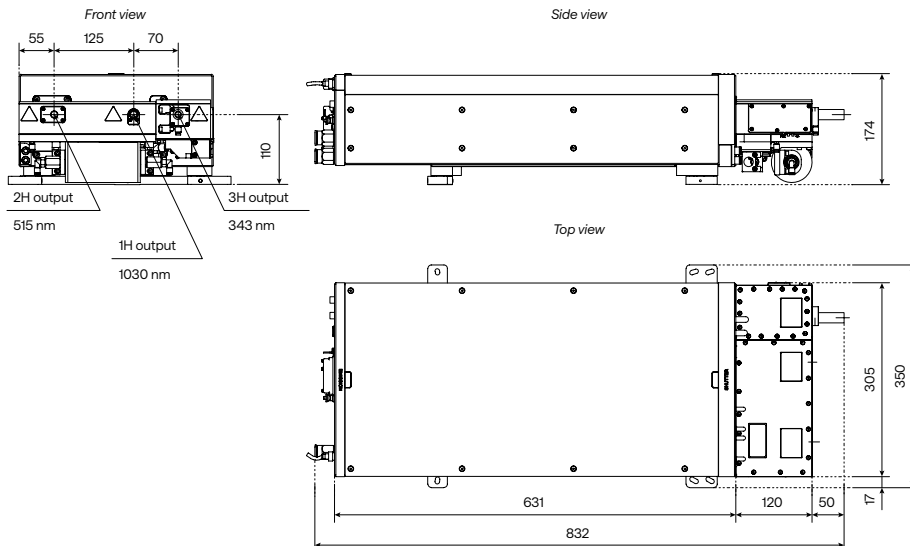
⁴⁾ FW 1/e²; depends on the pump energy.

⁵⁾ Under stable environmental conditions. Expressed as normalized root mean squared deviation (NRMSD).



Drawings

CARBIDE-CB3-UV



Integrated Harmonic Generators

515 nm, 343 nm, 257 nm,
or 206 nm output

Automated harmonic selection

Mounted directly on the laser head



CARBIDE-CB3
with a 2H-3H module

Specifications

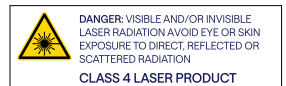
Model	2H	2H-3H	2H-4H	2H-5H	30W UV ¹⁾	50W UV ¹⁾
Output wavelength ²⁾ (automated selection)	1030 nm 515 nm	1030 nm 515 nm 343 nm	1030 nm 515 nm 257 nm	1030 nm 515 nm 206 nm	1030 nm 515 nm 343 nm	1030 nm 515 nm 343 nm
Pump pulse energy	20 – 2000 μ J	50 – 2000 μ J	20 – 2000 μ J	100 – 1500 μ J	80 – 400 μ J	60 – 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	\leq 400 μ J pump	< 1.3 (2H) < 1.4 (3H)	< 1.3 (2H) n/a (4H)	n/a	< 1.3 (3H)	< 1.3 (3H)
	> 400 μ J pump	< 1.4 (2H)	< 1.4 (2H) < 1.5 (3H)	n/a (4H)	n/a	

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

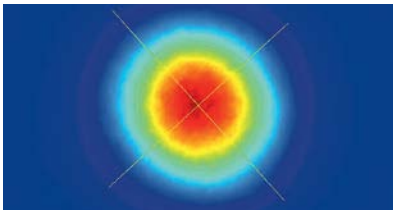
²⁾ Depends on the pump laser model. Up to the 5th harmonic available; contact sales@lightcon.com for more details.

³⁾ Maximum output power of 5 W.

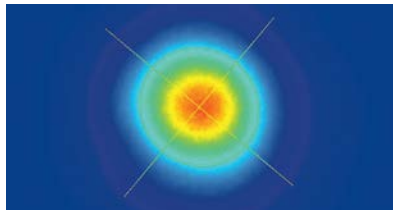
⁴⁾ Maximum output power of 0.2 W.



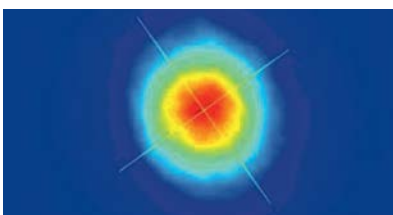
CARBIDE-CB5 (100 kHz, 6 W)
Typical 1H beam profile



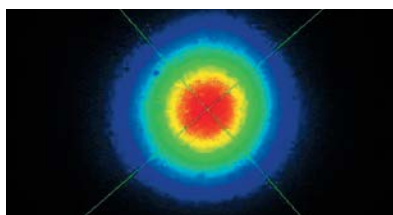
CARBIDE-CB5 (100 kHz, 3.4 W)
Typical 2H beam profile



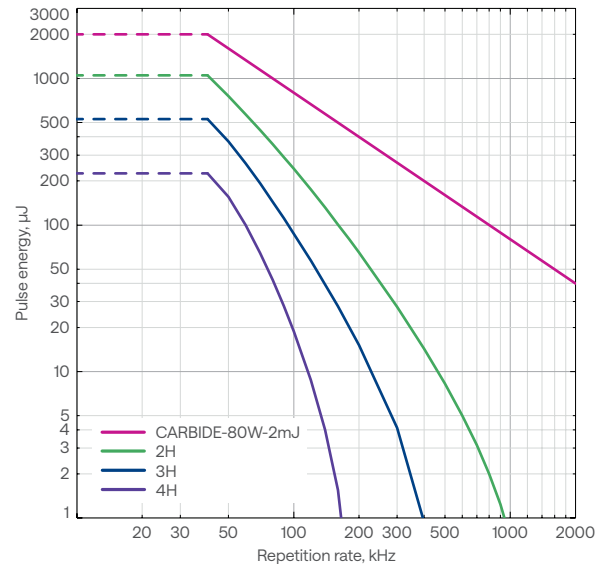
CARBIDE-CB5 (100 kHz, 2.2 W)
Typical 3H beam profile



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

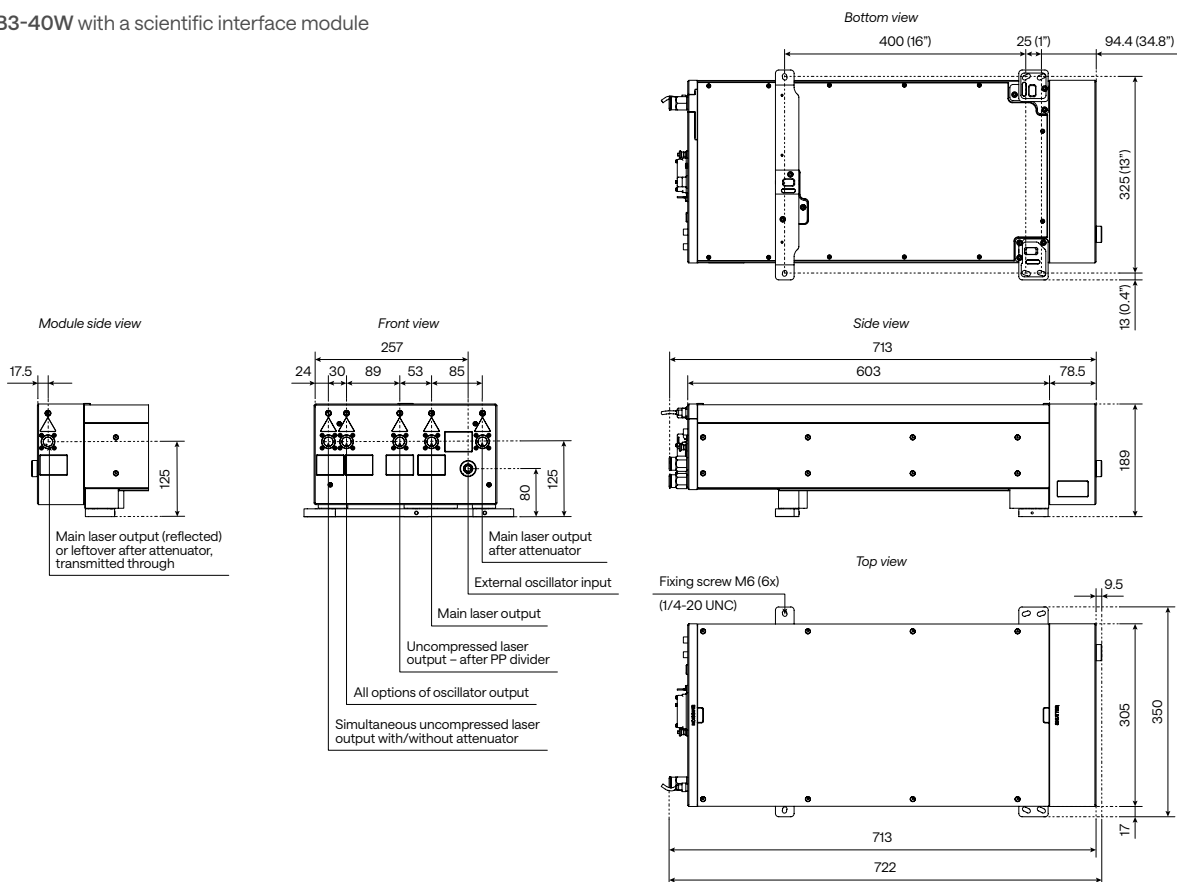
Seeding by an external oscillator

Beam-splitting for multiple outputs



Drawings

CARBIDE-CB3-40W with a scientific interface module



BiBurst

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

Water-cooled **CARBIDE** 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

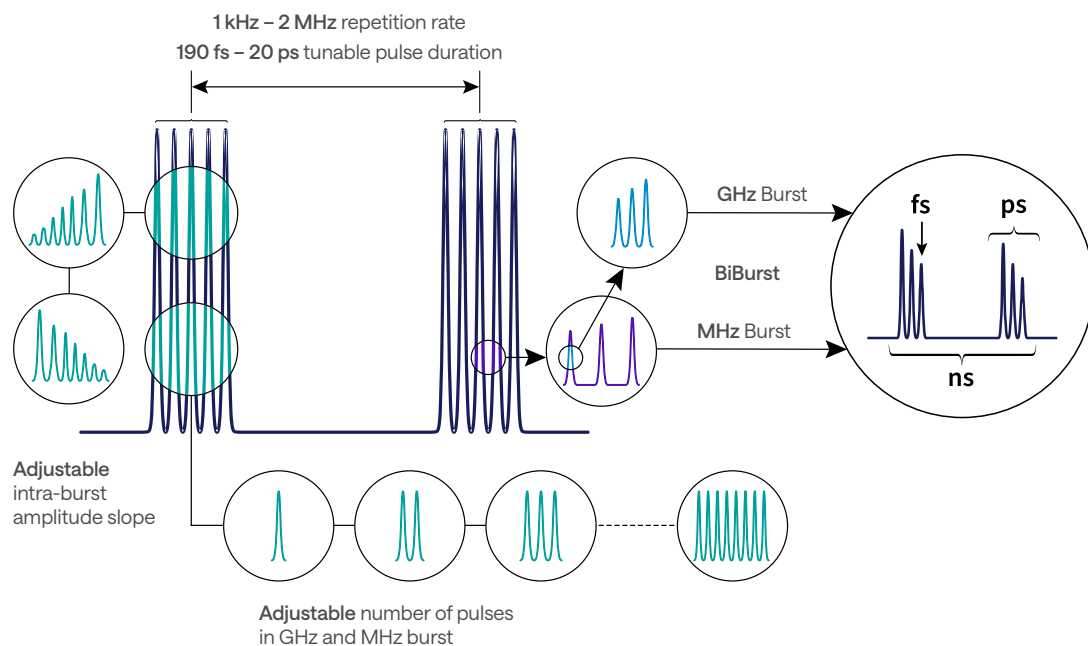
Model		CARBIDE-CB3	PHAROS
GHz Burst	Intra burst pulse period ¹⁾	440 ± 40 ps	200 ± 40 ps
	Number of pulses, P ²⁾	1 – 10 (up to 400) ³⁾	1 – 25
MHz Burst	Intra burst pulse period	≈ 15 ns	
	Number of pulses, N ²⁾	1 – 10	1 – 9 (7 with FEC) ⁴⁾

¹⁾ Custom spacing is available on request. For CARBIDE-CB3-10MHz model standard pulse period is 1500 ps.

²⁾ The maximum number of pulses in a burst depends on the laser repetition rate and energy. CARBIDE-CB3-10MHz model is limited up to 6 pulses.

³⁾ The maximum number of P pulses can be increased to 350 – 400 with optional long GHz burst mode.

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



PHAROS

High-Energy Femtosecond Lasers

NEW

Maximum pulse energy of up to 5 mJ

Down to < 100 fs right at the output

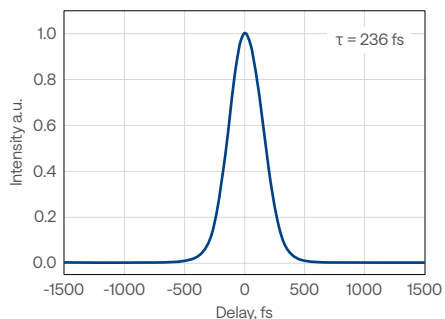
Tunable pulse duration, 100 fs – 20 ps

Pulse-on-demand and BiBurst for pulse control

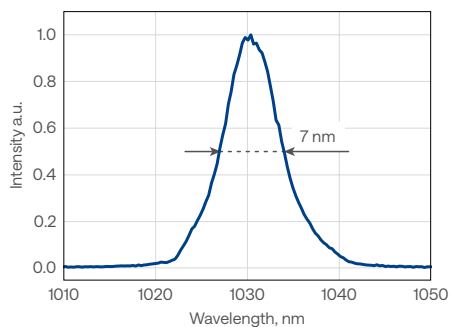
Automated harmonics up to the 5th and wavelength-tunable extensions



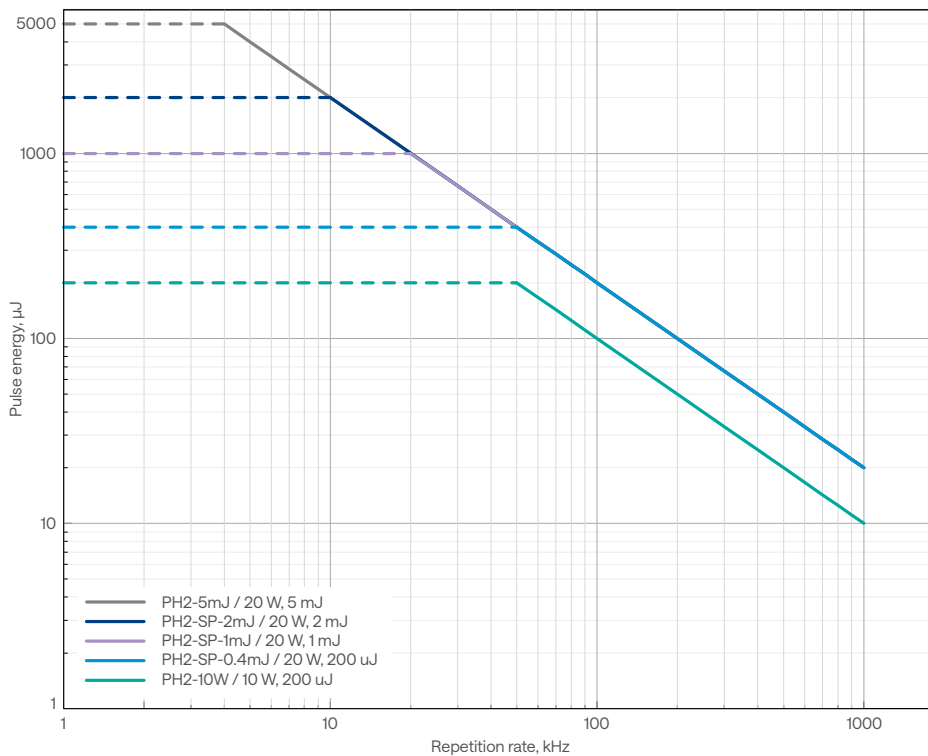
PHAROS-PH2-5mJ
Typical pulse duration



PHAROS-PH2-5mJ
Typical spectrum



PHAROS
Pulse energy vs fundamental repetition rate



Specifications



Model	PH2-10W	PH2-SP			PH2-5mJ	PH2-UP	
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OUTPUT CHARACTERISTICS

Center wavelength ¹⁾	1030 ± 10 nm						
Maximum output power	10 W	20 W					
Pulse duration ²⁾	< 290 fs	< 190 fs			< 250 fs	< 100 fs	
Pulse duration tuning range	290 fs – 10 ps (20 ps on request)	190 fs – 10 ps (20 ps on request)			n/a	100 fs – 10 ps	
Maximum pulse energy	0.2 mJ	0.4 mJ	1 mJ	2 mJ	5 mJ	0.4 mJ	1 mJ
Repetition rate	Single-shot – 1 MHz						
Pulse selection	Single-shot, pulse-on-demand, any fundamental repetition rate division						
Polarization	Linear, horizontal						
Beam quality, M ²	< 1.2		< 1.3			< 1.2	
Beam diameter ³⁾	3.3 ± 0.5 mm	4.0 ± 0.5 mm	4.5 ± 0.5 mm	6.8 ± 0.7 mm	11 ± 0.5 mm	4.5 ± 0.5 mm	6 ± 0.5 mm
Beam pointing stability	< 20 µrad/°C						
Pre-pulse contrast	< 1:1000						
Post-pulse contrast	< 1:200						
Pulse-to-pulse energy stability, 8 h ⁴⁾	< 0.5%						
Long-term power stability, 100 h ⁴⁾	< 0.3%						

MAIN OPTIONS

Oscillator output ⁵⁾	1 – 7 W, 50 – 250 fs, ≈ 1035 nm, ≈ 76 MHz						
Harmonic generator ⁶⁾	515 nm, 343 nm, 257 nm, or 206 nm; refer to PHAROS HG or HIRO						
Optical parametric amplifier ⁷⁾	UV – MIR; refer to I-OPA or ORPHEUS						
BiBurst option	Tunable GHz and MHz burst with burst-in-burst capability; refer to BiBurst						
CEP stabilization	Refer to CEP & RRL Option						
Repetition rate locking							

DIMENSIONS

Laser head (L × W × H) ⁸⁾	730 × 419 × 230 mm	827 × 492 × 250 mm	770 × 419 × 230 mm
Chiller (L × W × H)	590 × 484 × 267 mm		
24 V DC power supply (L × W × H) ⁸⁾	280 × 144 × 49 mm		

ENVIRONMENTAL & UTILITY REQUIREMENTS

Operating temperature	15 – 30 °C (air conditioning recommended)		
Relative humidity	< 80% (non-condensing)		
Electrical requirements	Laser	100 V AC, 12 A – 240 V AC; 5 A, 50 – 60 Hz	
	Chiller	100 – 230 V AC; 50 – 60 Hz	
Rated power	Laser	1000 W	
	Chiller	1400 W	
Power consumption	Laser	600 W	
	Chiller	1000 W	

¹⁾ Precise wavelengths for specific models are available upon request.

²⁾ Assuming a Gaussian pulse shape.

³⁾ FW 1/e², measured at laser output, using maximum pulse energy.

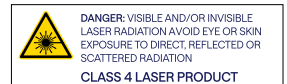
⁴⁾ Under stable environmental conditions. Expressed as normalized root mean squared deviation (NRMSD).

⁵⁾ Available simultaneously. Contact sales@lightcon.com for more details or customized solutions.

⁶⁾ Integrated except for PH2-5mJ. For an external harmonic generator, refer to HIRO.

⁷⁾ Integrated except for PH2-20W-SP-2mJ and PH2-5mJ. For more options and OPAs, refer to the ORPHEUS series of OPAs.

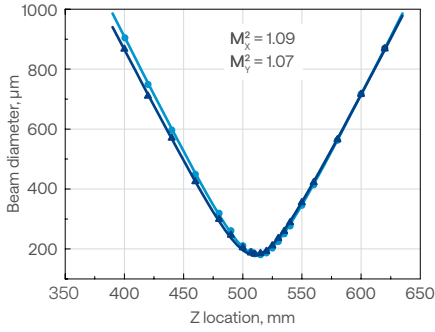
⁸⁾ Dimensions depend on the laser configuration and integrated options.



Beam properties

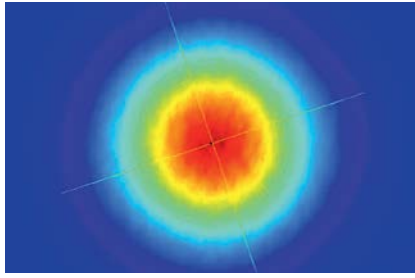
PHAROS

Typical M^2 measurement data



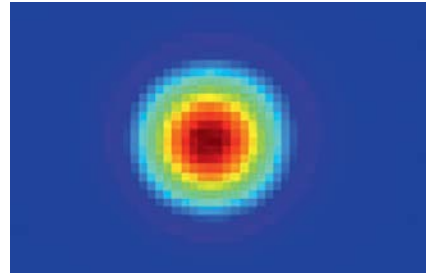
PHAROS

Typical near-field beam profile



PHAROS

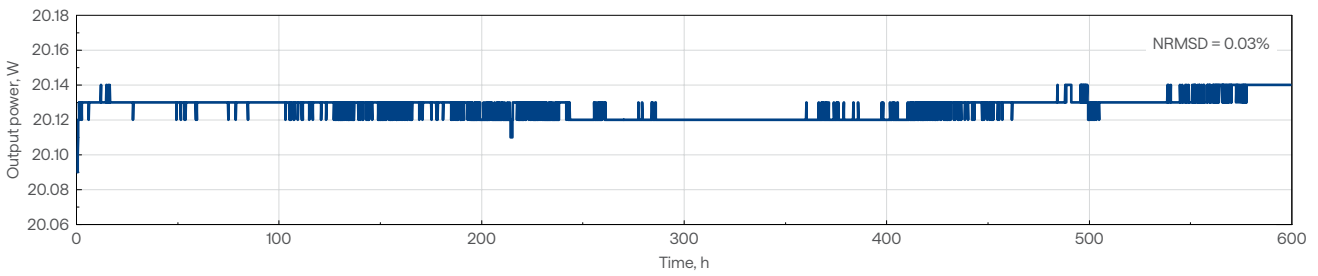
Typical far-field beam profile



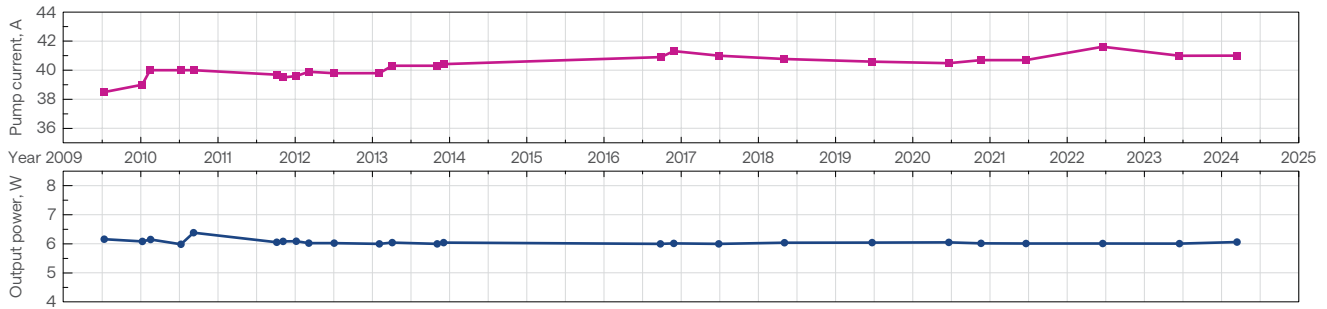
Stability measurements

PHAROS

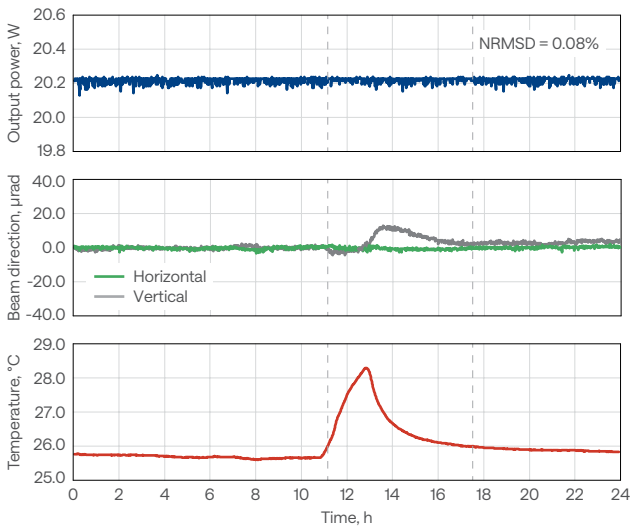
Long-term power stability



Output power of industrial-grade PHAROS lasers operating 24/7 and the current of the pump diodes over the years

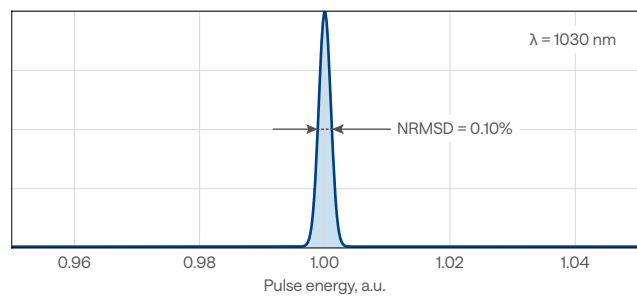


PHAROS output power and beam pointing stability with power lock enabled, across varying environmental conditions



PHAROS

Typical pulse-to-pulse energy stability



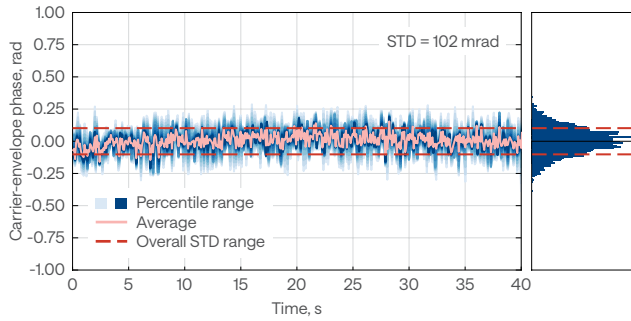
CEP stabilization

PHAROS lasers can be equipped with feedback electronics for carrier-envelope phase (CEP) stabilization of the output pulses. The carrier-envelope offset (CEO) of the PHAROS oscillator is actively locked to 1/4th of the repetition rate with a < 100 mrad standard deviation. The CEP stable pulses from the synchronized amplifier

have a < 350 mrad standard deviation. The CEP drift occurring inside the amplifier and the user's setup can be compensated with an out of loop f-2f interferometer, which is a part of the complete PHAROS active CEP stabilization package.

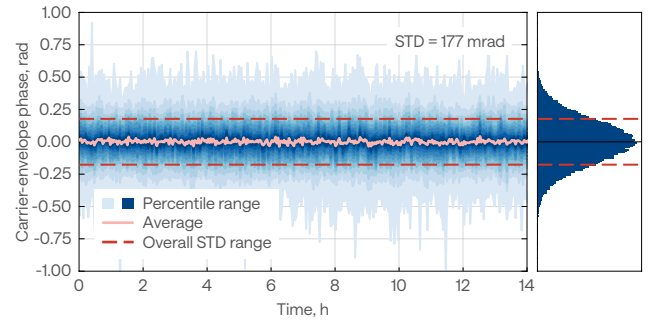
PHAROS

Short-term CEP stability operating at 200 kHz repetition rate



PHAROS

Long-term CEP stability operating at 200 kHz repetition rate

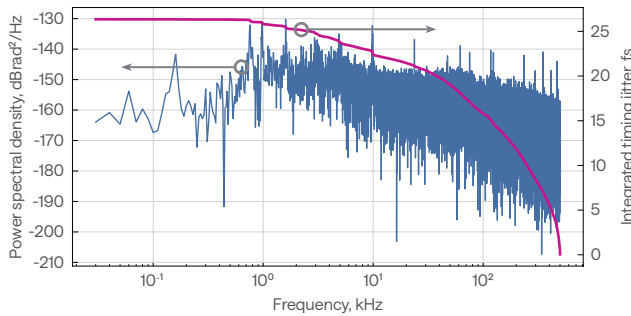


Repetition rate locking

The oscillators in PHAROS lasers can be customized for repetition rate locking applications. Coupled with the necessary feedback electronics, the oscillator's repetition rate can be synchronized to an external RF source using the two piezo stages installed within the cavity.

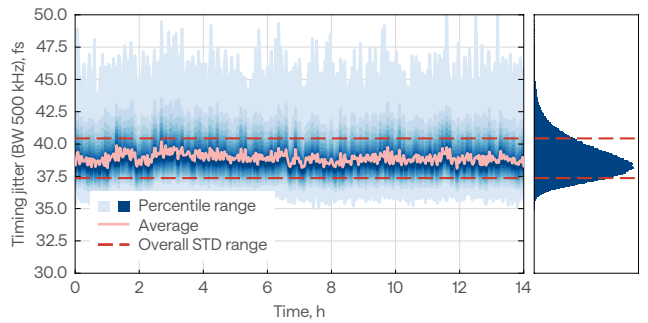
The repetition rate locking system ensures an integrated timing jitter of less than 200 fs for RF reference frequencies above 500 MHz. Additionally, continuous phase shifting is available upon request.

Phase noise data of PHAROS oscillator locked to a 2.8 GHz RF source



Timing jitter stability over 14 h

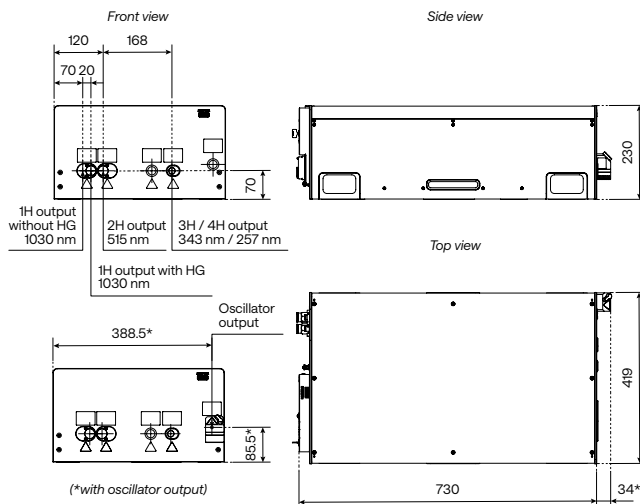
PHAROS oscillator locked to a 2.8 GHz RF source



Drawings

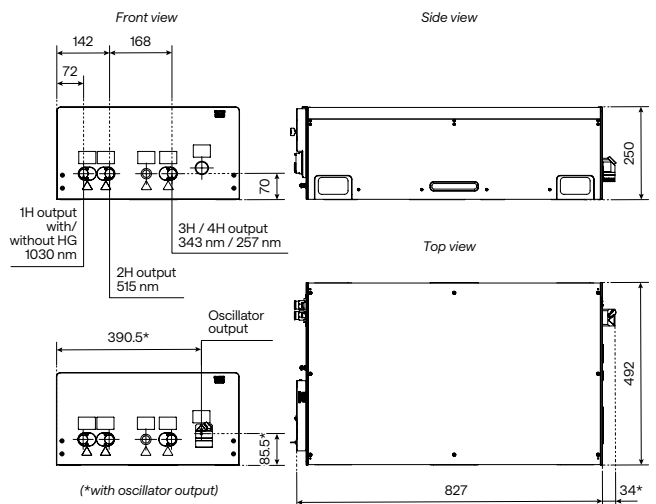
PHAROS-PH2-730

-10W or -20W-SP with a FEC or BiBurst option, or a harmonic generator



PHAROS-PH2-827

-10W with an -HE harmonic generator option, or -5mJ



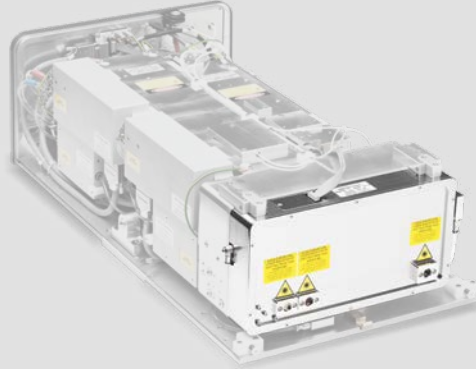
The drawings depend on the exact configuration. If crucial for integration, please contact sales@lightcon.com.

Integrated Harmonic Generators

515 nm, 343 nm, 257 nm,
or 206 nm output

Automated harmonic selection

Industrial-grade design



PHAROS with
a harmonic generator

Specifications

Model		2H (-HE)	2H-3H (-HE)	2H-4H (-HE)	4H-5H
Output wavelength ¹⁾ (automated selection)		1030 nm 515 nm	1030 nm 515 nm 343 nm	1030 nm 515 nm 257 nm	1030 nm 257 nm 206 nm
Pump pulse energy ²⁾		20 – 2000 μ J			
Pump pulse duration		100 – 500 fs			
Conversion efficiency		> 50% (2H)	> 50% (2H) > 25% (3H)	> 50% (2H) > 10% (4H) ³⁾	> 10% (4H) ⁴⁾ > 5% (5H) ⁵⁾
Beam quality, M ²	\leq 400 μ J pump	< 1.3 (2H)	< 1.3 (2H) < 1.4 (3H)	< 1.3 (2H) n/a (4H)	n/a
	> 400 μ J pump	< 1.4 (2H)	< 1.4 (2H) < 1.5 (3H)	< 1.4 (2H) n/a (4H)	

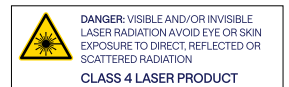
¹⁾ Depends on the pump laser model.

²⁾ For more pump energy options contact sales@lightcon.com

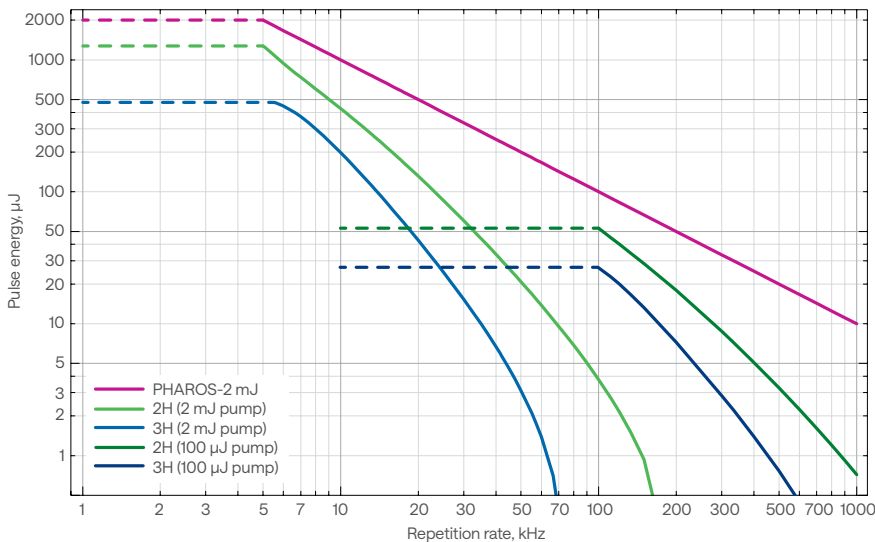
³⁾ Maximum output power: 2 W at 20 – 1000 μ J pump energy, or 1 W at 1000 – 2000 μ J pump energy.

⁴⁾ Maximum output power of 1 W.

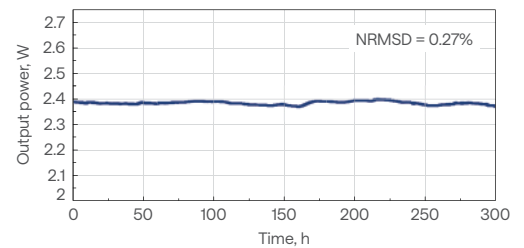
⁵⁾ Maximum output power of 150 mW.



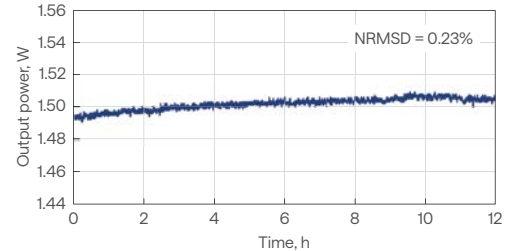
PHAROS with a harmonic generator Pulse energy vs repetition rate



3H output power stability



4H output power stability



High-Repetition-Rate Femtosecond Lasers

High-power models, up to 20 W

High-energy models, up to 0.5 μJ

10 – 90 MHz repetition rate

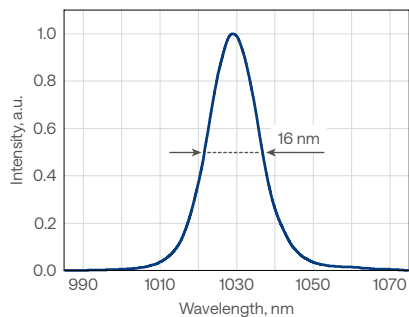
Down to 50 fs pulse duration

CEP stabilization or repetition rate locking

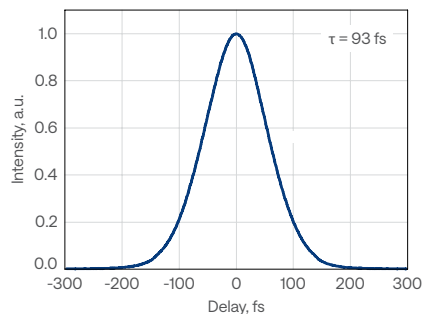


FLINT-FL1

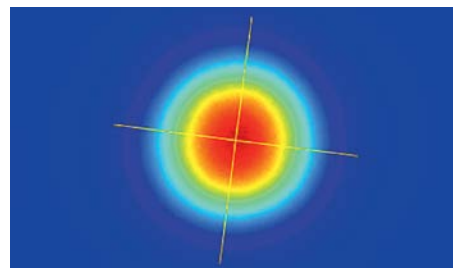
FLINT-FL1
Typical spectrum



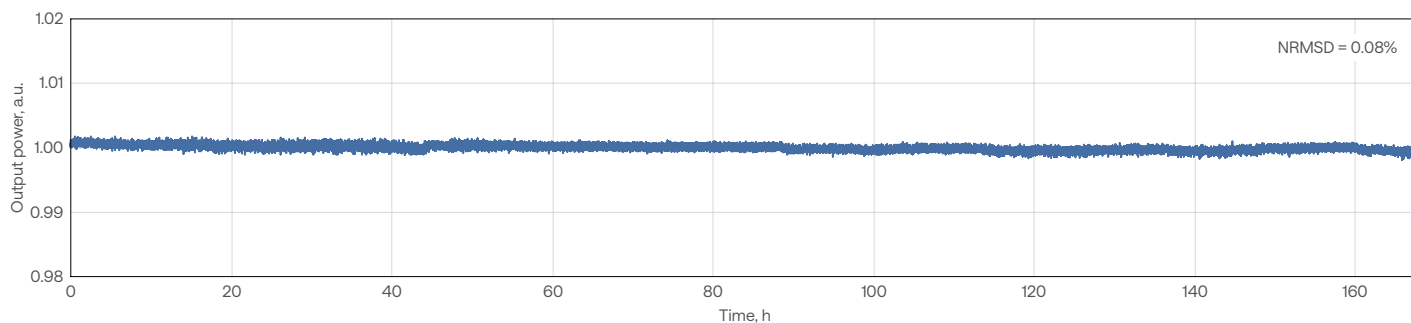
FLINT-FL1
Typical pulse duration



FLINT-FL1
Typical beam profile



FLINT-FL2 (20 W) output power stability under harsh environmental conditions over 7 days



Specifications

Model	FL1			FL2-SP	FL2	
Key feature	CEP	RRL	Compact	Short pulse	High power and high energy	
Pulse duration	< 100 fs		< 120 fs	< 50 fs	< 120 fs	< 170 fs ¹⁾
Repetition rate	60 – 90 MHz ²⁾			10 MHz	10 MHz	40 MHz 80 MHz
Maximum output power	0.5 W	1 W	8 W	4 W	5 W	20 W
Maximum pulse energy	6 nJ ³⁾	12.5 nJ ³⁾	100 nJ ³⁾	0.4 μJ	0.5 μJ	0.25 μJ
Center wavelength	1035 ± 10 nm			1030 ± 10 nm	1030 ± 10 nm	
Polarization	Linear, horizontal					
Beam quality, M ²	< 1.2			< 1.3	< 1.2	
Beam pointing stability	< 10 μrad/°C					
Long-term power stability, 100 h ⁴⁾	< 0.5%					
Integrated 2H generator ⁵⁾	n/a			Optional; conversion efficiency > 30% ⁶⁾ refer to FLINT HG		
External 2H, 3H, or 4H generator	Optional; refer to HIRO					
Integrated attenuator	n/a			Included		

DIMENSIONS

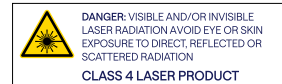
Laser head (L × W × H)	448 × 206 × 115 mm	543 × 322 × 146 mm
Power supply and chiller rack (L × W × H)	642 × 553 × 540 mm	642 × 553 × 673 mm
Chiller	Different options available. Contact sales@lightcon.com	

ENVIRONMENTAL & UTILITY REQUIREMENTS

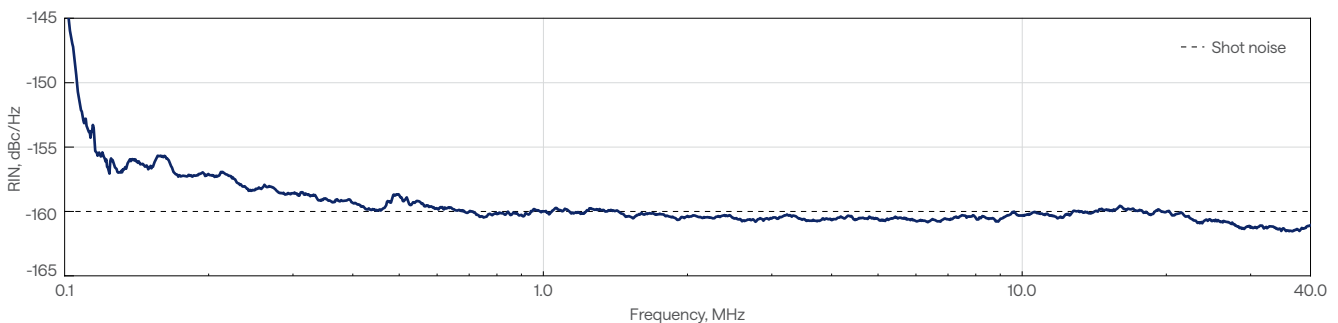
Operating temperature	15 – 30 °C (air conditioning recommended)	
Relative humidity	< 80% (non-condensing)	
Electrical requirements	100 V AC, 7 A – 240 V AC, 3 A; 50 – 60 Hz	100 V AC, 12 A – 240 V AC, 5 A; 50 – 60 Hz
Rated power	200 W	
Power consumption	Laser	100 W
	Chiller	600 W
		150 W
		1000 W

- ¹⁾ For 20 W output power. Lower power models: 8 W and 12 W, are available upon request.
- ²⁾ Standard repetition rate is 80 MHz; custom repetition rate can be factory preset from the given range.
- ³⁾ Depends on the repetition rate. Values are given for 80 MHz.

- ⁴⁾ With enabled power-lock, under stable environmental conditions. Expressed as normalized root mean squared deviation (NRMSD).
- ⁵⁾ For external 2H, or even 3H and 4H generation, refer to HIRO for FLINT.
- ⁶⁾ Conversion efficiency specified at maximum power.



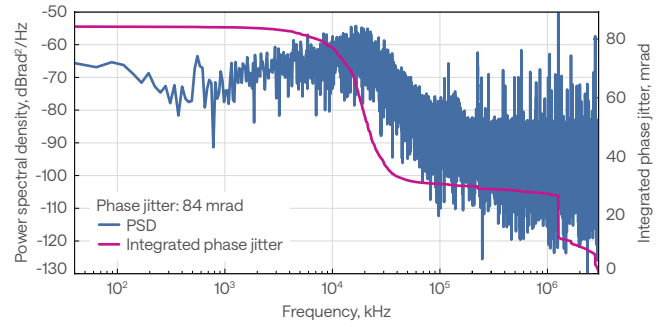
FLINT oscillator relative intensity noise (RIN), shot-noise limited at -160 dBc/Hz above 1 MHz



CEP stabilization

FLINT oscillators can be equipped with feedback electronics for carrier-envelope phase (CEP) stabilization of the output pulses. The carrier-envelope offset (CEO) of the oscillator is actively locked to $1/4^{\text{th}}$ of the repetition rate with a < 100 mrad standard deviation.

CEP-locked FLINT oscillator phase noise data

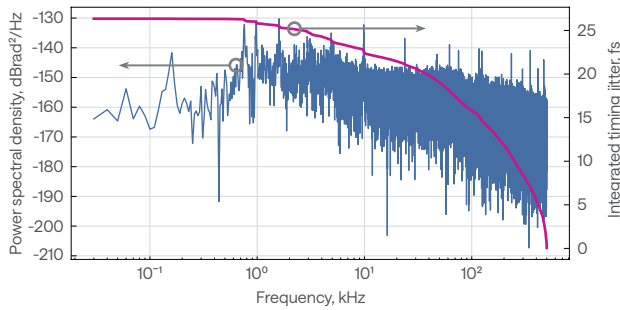


Repetition rate locking

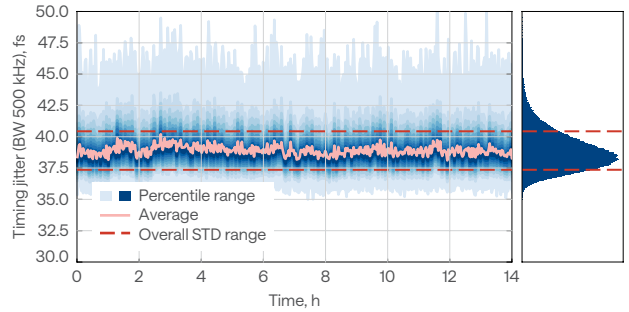
FLINT oscillators can be customized for repetition rate locking applications. Coupled with the necessary feedback electronics, the oscillator's repetition rate can be synchronized to an external RF source using the two piezo stages installed within the cavity.

The repetition rate locking system ensures an integrated timing jitter of less than 200 fs for RF reference frequencies above 500 MHz. Additionally, continuous phase shifting is available upon request.

FLINT oscillator phase noise data locked to a 2.8 GHz RF source

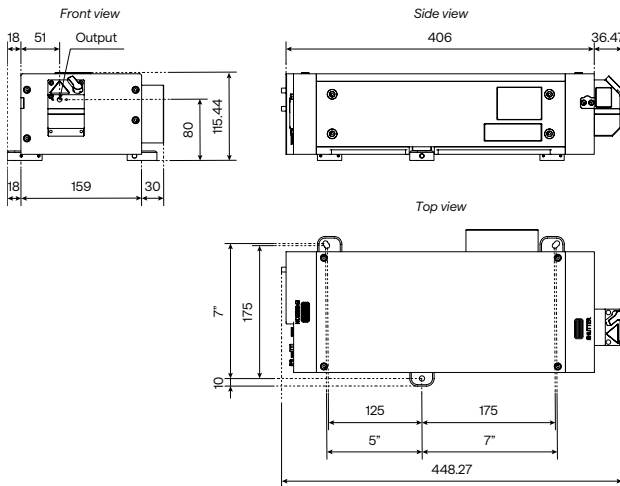


Timing jitter stability over 14 h
FLINT oscillator locked to a 2.8 GHz RF source

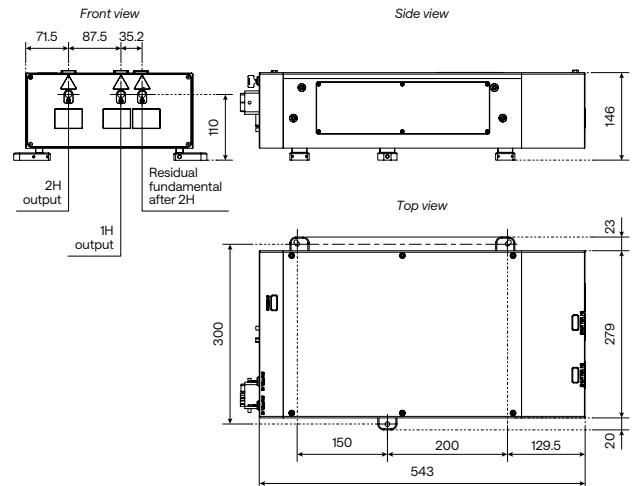


Drawings

FLINT-FL1



FLINT-FL2



Integrated Second Harmonic Generators

515 nm output

Automated harmonic selection

Integrated into the housing

Industrial-grade design



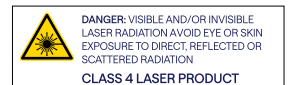
FLINT-FL2 with an integrated harmonic generator

Specifications

Model	FL1	FL2-SP	FL2					
Available harmonic	Refer to HIRO			2H ¹⁾				
Pump repetition rate				10 MHz	40 MHz	80 MHz		
Maximum pump power				5 W	20 W			
Center wavelength				515 ± 10 nm				
Conversion efficiency ²⁾				> 30%				
Polarization				Linear, horizontal				

¹⁾ For external 2H or even 3H and 4H generation, refer to HIRO for FLINT.

²⁾ Conversion efficiency specified at maximum power.



External Harmonic Generators

515 nm, 343 nm, 257 nm,
and 206 nm outputs

Simple selection of the active harmonic

Simultaneous or switchable outputs

Standalone harmonics module
for CARBIDE, PHAROS and FLINT



HIRO for CARBIDE or PHAROS

Model	HIRO	HIRO-HP	HIRO-HE
Maximum pump power	20 W	80 W	
Pump pulse energy	8 – 400 μ J	200 – 1000 μ J	1000 – 4000 μ J
Available outputs ^{1) 2)}	Up to 4H ³⁾	Up to 5H	
Conversion efficiency ^{1) 4)}		> 50% (2H) > 25% (3H) > 10% (4H) ⁵⁾ > 5% (5H) ^{6) 7)}	
Polarization ⁸⁾		Linear, horizontal (2H, 5H) Linear, vertical (3H, 4H)	

DIMENSIONS

Dimensions (L × W × H)	487 × 176 × 180 mm	552 × 320 × 170 mm
------------------------	--------------------	--------------------

¹⁾ For harmonic combinations and simultaneous outputs, contact sales@lightcon.com.

²⁾ Residual fundamental output available upon request.

³⁾ White light continuum output available upon request.

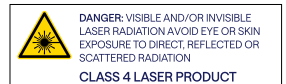
⁴⁾ Percentage of pump power, for repetition rate of up to 1 MHz.

⁵⁾ Maximum output power of 1W.

⁶⁾ Maximum output power of 150 mW. Only for HIRO-HP/HE.

⁷⁾ > 1% when pumped with PHAROS-UP.

⁸⁾ Different polarization is available upon request.



HIRO for FLINT

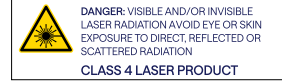
Available harmonic	Up to 4H
Maximum pump power ¹⁾	4 W
Conversion efficiency ²⁾	> 35% (2H) > 5% (3H) > 1% (4H)

DIMENSIONS

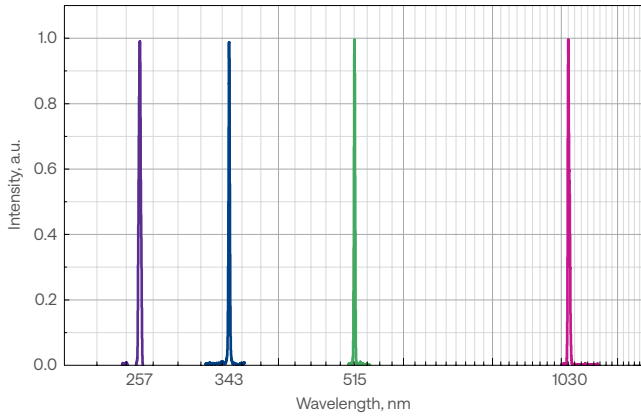
Dimensions (L × W × H)	487 × 176 × 180 mm
------------------------	--------------------

¹⁾ For high power 2H, refer to HG for FLINT.

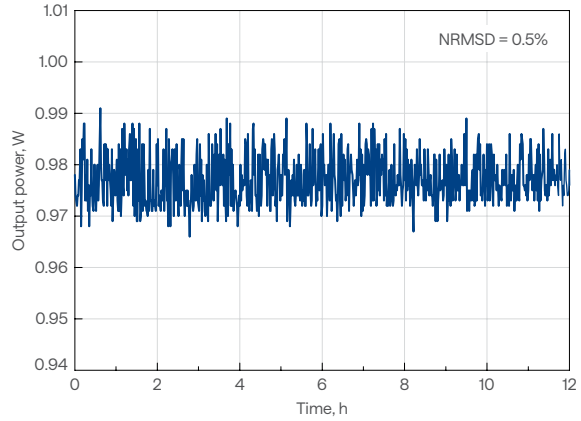
²⁾ For pump power of > 500 mW.



HIRO outputs

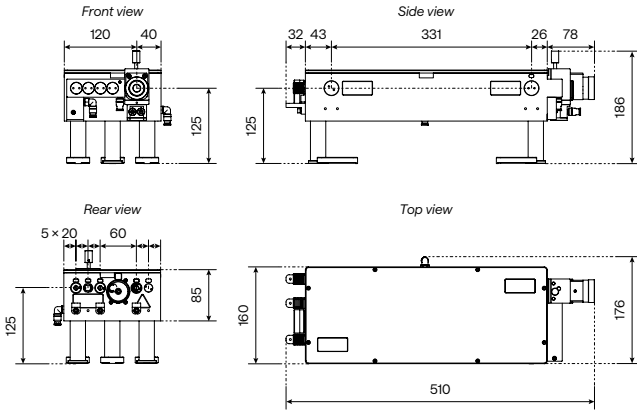


4H output power stability

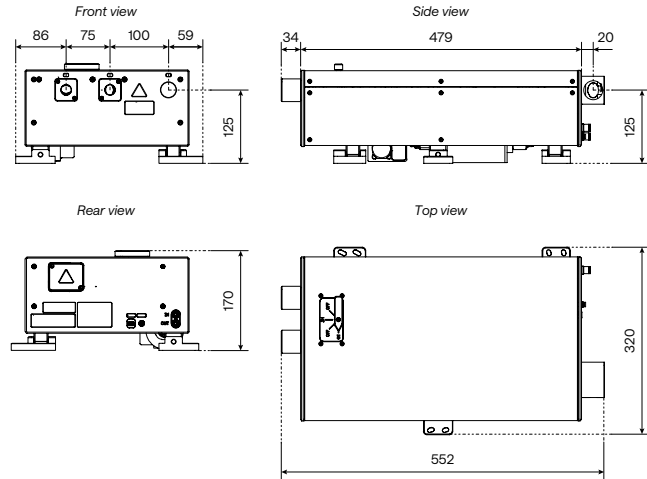


Drawings

HIRO



HIRO-HP/HE



Industrial-Grade Optical Parametric Amplifiers

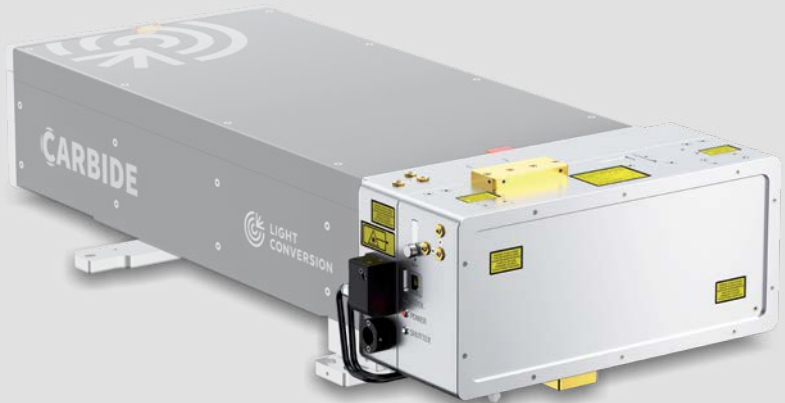
Wavelength tunability in an industrial design

Single-box solution

Tunable or fixed-wavelength models

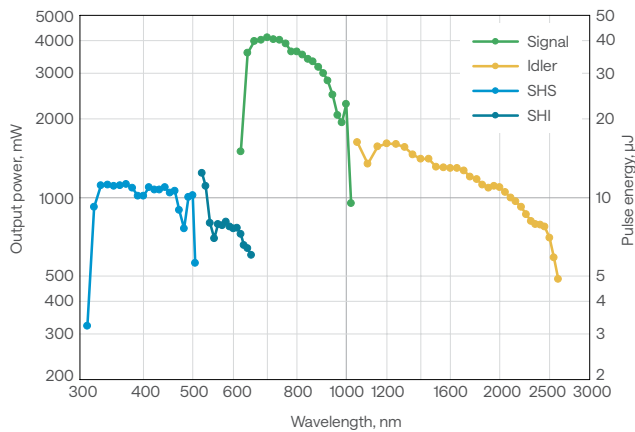
Plug-and-play installation and robust performance

The most compact OPA in the market

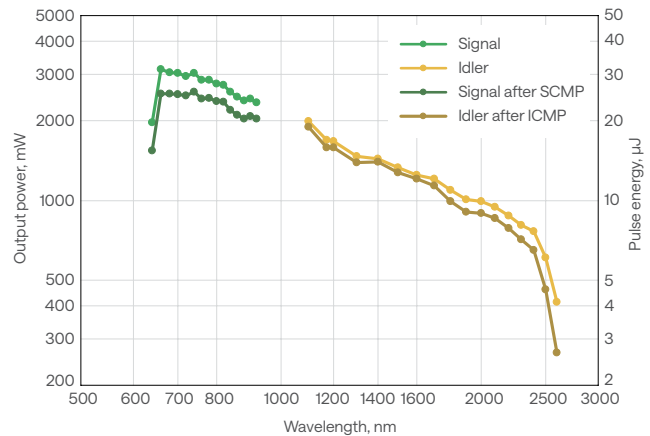


CARBIDE-CB3 with I-OPA-HP

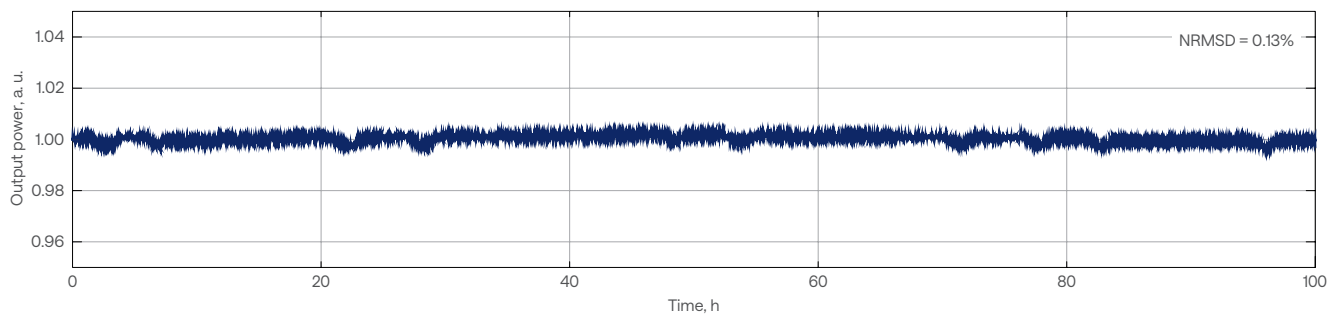
I-OPA-HP typical tuning curves
Pump: 40 W, 400 μ J, 100 kHz



I-OPA-F typical tuning curves
Pump: 40 W, 400 μ J, 100 kHz



I-OPA-HP
Typical power stability at 1300 nm



Specifications

Model	I-OPA-HP	I-OPA-F	I-OPA-ONE
Configuration	ORPHEUS	ORPHEUS-F	ORPHEUS-ONE
Pump power	Up to 40 W		
Pump pulse energy	20 – 400 μ J		
Repetition rate	Up to 2 MHz		
Tuning range ¹⁾	640 – 1010 nm (signal) 1050 – 2600 nm (idler)	650 – 920 nm (signal) 1200 – 2500 nm (idler)	1350 – 2000 nm (signal) 2100 – 4500 nm (idler)
Conversion efficiency	> 7% @ 700 nm (40 – 400 μ J pump; up to 1 MHz)		> 9% @ 1550 nm (40 – 400 μ J pump; up to 1 MHz)
	> 3.5% @ 700 nm (20 – 40 μ J pump; up to 2 MHz)		> 6% @ 1550 nm (20 – 40 μ J pump; up to 2 MHz)
Spectral bandwidth ²⁾	80 – 220 cm^{-1} @ 700 – 960 nm	200 – 1000 cm^{-1} @ 650 – 920 nm 150 – 1000 cm^{-1} @ 1200 – 2000 nm	60 – 150 cm^{-1} @ 1450 – 2000 nm
Pulse duration ^{2) 3)}	120 – 250 fs	< 55 fs @ 800 – 920 nm < 70 fs @ 650 – 800 nm < 100 fs @ 1200 – 2000 nm	100 – 300 fs
Long-term power stability, 8 h ⁴⁾	< 1% @ 800 nm		< 1% @ 1550 nm
Pulse-to-pulse energy stability, 1 min ⁴⁾	< 1% @ 800 nm		< 1% @ 1550 nm
Wavelength extension options	320 – 505 nm (SHS) ⁵⁾ 525 – 640 nm (SHI) ⁵⁾	Contact sales@lightcon.com	4500 – 10 000 nm (DFG)
Pulse compression options ²⁾	n/a	SCMP (signal pulse compressor) ICMP (idler pulse compressor) GDD-CMP (compressor with GDD control)	n/a

PUMP LASER REQUIREMENTS

Pump laser	CARBIDE or PHAROS
Center wavelength	1030 \pm 10 nm
Maximum pump power	40 W
Maximum repetition rate	Up to 2 MHz
Pump pulse energy	20 – 400 μ J
Pulse duration	180 – 300 fs

ENVIRONMENTAL & UTILITY REQUIREMENTS

Refer to lightcon.com

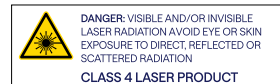
¹⁾ In the case of a fixed wavelength (FW), a single wavelength can be selected from the signal or idler range. The signal may have an accessible idler pair, and vice versa.

²⁾ I-OPA-F broad-bandwidth pulses are compressed externally. Typical pulse duration before compression: 120 – 250 fs, after compression: 25 – 70 fs @ 650 – 920 nm, 40 – 100 fs @ 1200 – 2000 nm.

³⁾ Output pulse duration depends on the selected wavelength and the pump laser pulse duration.

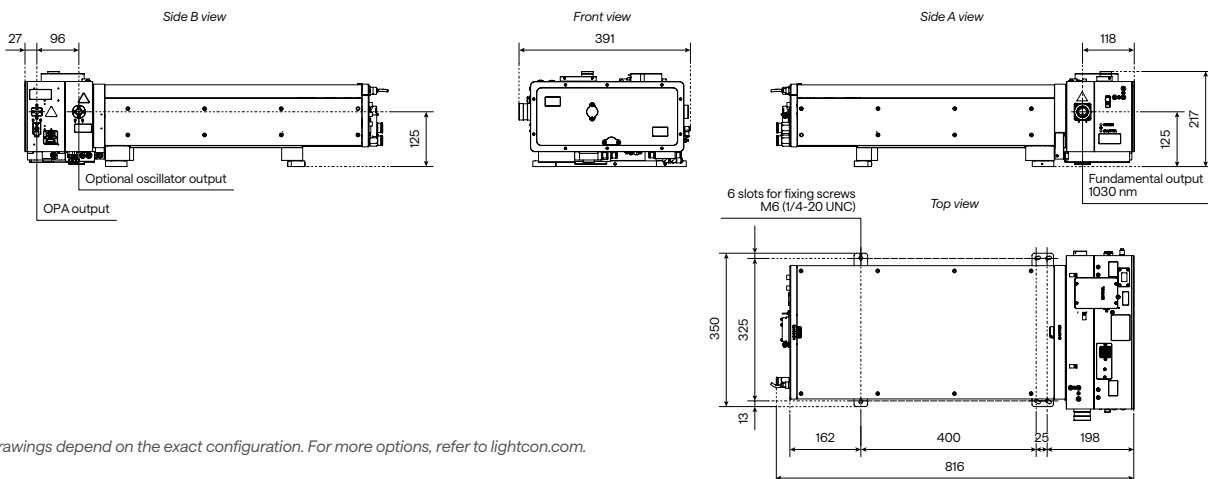
⁴⁾ Expressed as normalized root mean squared deviation (NRMSD).

⁵⁾ Conversion efficiency is 1.2% at peak; specified as a percentage of pump power.



Drawings

CARBIDE-CB3 with I-OPA-HP



The drawings depend on the exact configuration. For more options, refer to lightcon.com.



Micromachining Applications

LIGHT CONVERSION delivers
best-in-class lasers and laser systems for
today's most demanding applications.

Cutting & drilling

Silicon dicing

High-contrast marking

Micromachining Applications

Transparent Materials



Selective laser etching

3D selective laser etching in fused silica.

Source: Femtika.



Color marking in glass

Source: Workshop of Photonics.



Glass cutting

Structure fabricated in fused silica.

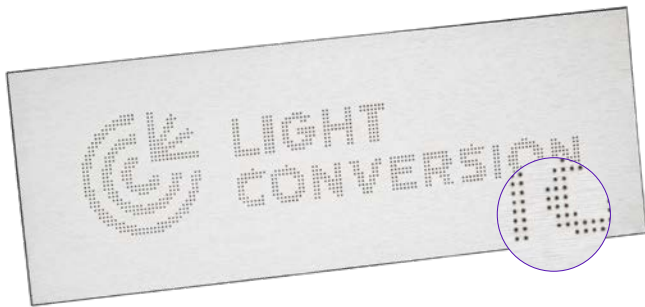


Glass cutting

Bottom-up glass cutting with GHz bursts: a map of Lithuania cut from 4,8 mm-thick glass.

Source: M. Mackevičiūtė et al., Fast and efficient bottom-up cutting of soda-lime glass using GHz bursts of short laser pulses, Opt. Lasers Eng. 183 (2024).

Metals



Conical drilling

A hole array produced in a 100 μm -thick stainless steel sheet at a rate of 1 ms per hole.

Nozzle drilling

Precision drilling of the nozzle holes.

Source: Posalux SA.



Selective ablation

Selective ablation of tungsten carbide.

Cutting and welding

Cut and welded parts from brass using a single laser system.



Surface texturing

Moon-like surface texturing on a watch bezel.

Source: LASEA.



Micromachining

Semicon Industry

●

Silicon carbide dicing

Single-pass (300 mm/s) dicing of a 500 μm -thick 4H-SiC wafer.



●

Silicon dicing

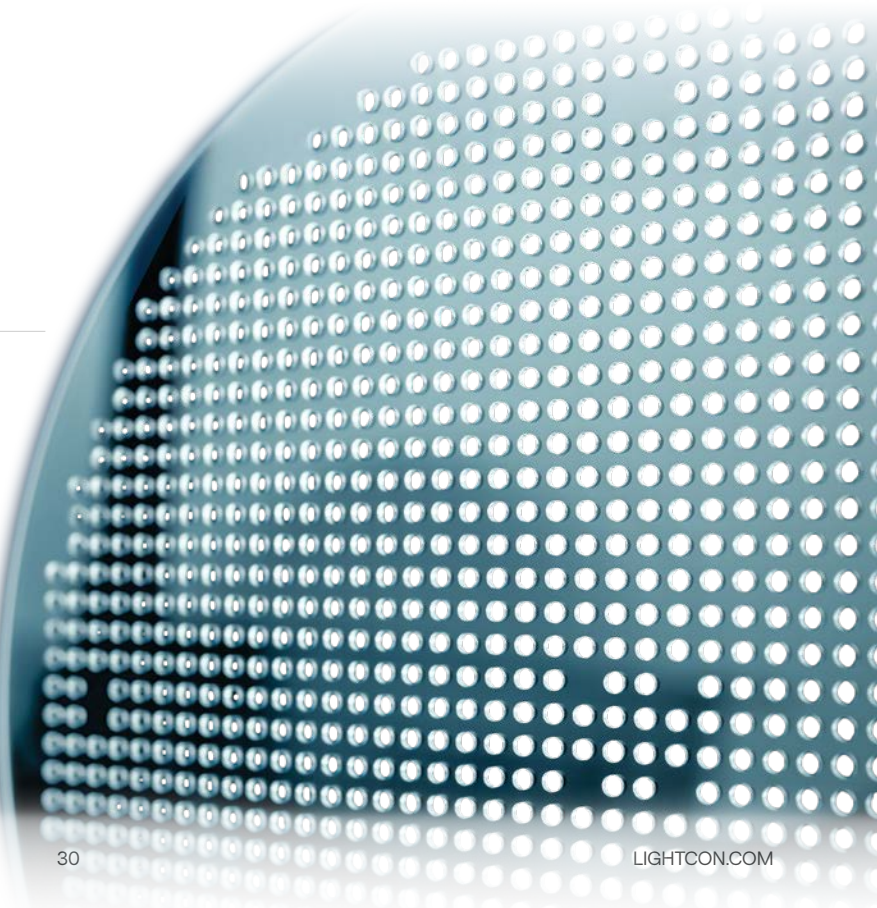
Precise dicing of a silicon wafer.

●

Through Glass Via drilling

Example of glass drilling with densely packed holes.

Source: Workshop of Photonics.



Medical Industry



Nitinol stent cutting

Source: Lighteum.

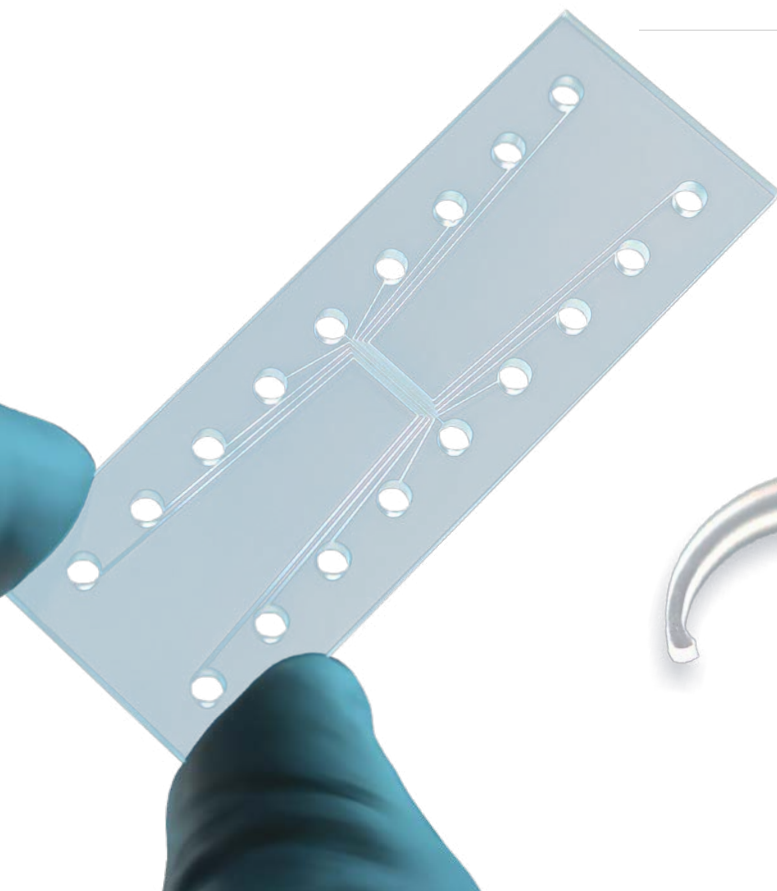


High-contrast marking

Corrosion-free black-and-white marking on a stainless steel hemostatic clamp using the BiBurst option.



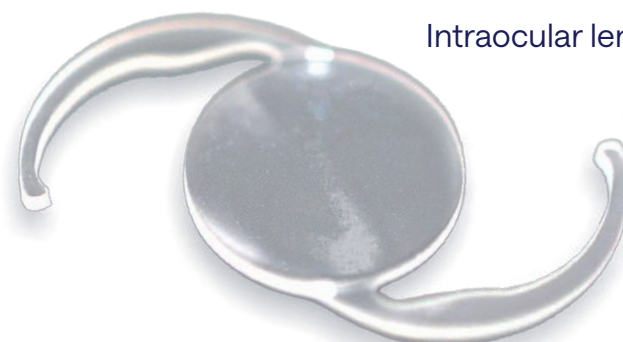
Stainless steel stent cutting



Glass ablation and welding

Microfluidic chip manufacturing with channel sealing.

Source: Workshop of Photonics.



Intraocular lens cutting

Source: Lasea.



Global Representative Network

AUSTRALIA NEW ZEALAND	Lastek Pty Ltd. Adelaide, Australia Phone: +61 8 84 438 668 ricardas@lastek.com.au www.lastek.com.au	INDIA	Anatech Laser Instruments Pvt. Ltd. Mumbai, India Phone: +91 22 4121 0001 / 02 / 03 sales@anatechlaser.com www.anatechlaser.com
BELGIUM, NETHERLANDS, LUXEMBOURG	Laser 2000 Benelux C.V. Vinkeveen, Netherlands Phone: +31 297 266191 info@laser2000.nl www.laser2000.nl	ISRAEL	ROSH Electroptics Ltd. Netanya, Israel Phone: +972 9 862 7401 info@roshelop.co.il www.roshelop.co.il
BRAZIL	Photonics Ltda São Paulo, Brazil Phone: +55 11 2839 3209 info@photonics.com.br www.photonics.com.br	ITALY	Optoprim S.r.l. Vimercate, Italy Phone: +39 039 834 977 info@optoprim.it www.optoprim.it
CHINA	Light Conversion China Shenzhen, China Phone: +86 189 4874 5558 sales.china@lightcon.com	JAPAN	Phototechnica Corp. Saitama, Japan Phone: +81 48 871 0067 sales@phototechnica.co.jp www.phototechnica.co.jp
	Beijing Light-Quantum Technology Co., Ltd. Beijing, China Phone: +86 10 8290 0415 sales@light-quantum.cn www.light-quantum.cn	KOREA	Light Conversion Korea Daejeon, Korea Phone: +82 42 368 1010 sales-korea@lightcon.com
	Genuine Optronics Limited Shanghai, China Phone: +86 21 64 325 169 jye@gen-opt.com www.gen-opt.com	POLAND	Amecam Warszawa, Poland Phone: +48 602 500 680 amecam@amecam.pl www.amecam.pl
CZECH REPUBLIC, SLOVAKIA	Femtonika s.r.o. Zbýšov, Czech Republic Phone: +420 792 417 400 info@femtonika.cz www.femtonika.cz	SINGAPORE	Acexon Technologies Pte Ltd. Singapore Phone: +65 6565 7300 sales@acexon.com www.acexon.com
FRANCE, SWITZERLAND, BELGIUM	Jean-François Poisson Industrial Market Development Manager Phone: +33 674 48 0778 jf.poisson@lightcon.com	SPAIN, PORTUGAL	Innova Scientific S.L. Las Rozas de Madrid, Spain Phone: +34 91 710 56 50 rafael.pereira@innovasci.com www.innovasci.com
FRANCE, SWITZERLAND	Frédéric Berthillier Ph.D. Scientific Market Development Manager Phone: +33 745 014 410 frederic.berthillier@lightcon.com	TAIWAN	Alaser Co. Ltd. Taipei, Taiwan Phone: +886 2 2377 3118 alexfu@alaser.com.tw www.alaser.com.tw
GERMANY, AUSTRIA, SWITZERLAND	Ulrich Höchner Industrial Market Development Manager Phone: +49 157 8202 5058 u.hoechner@lightcon.com	TURKEY	Innova Teknoloji Ltd. İstanbul, Turkey Phone: +90 216 315 03 36 eryetistir@innova-teknoloji.com www.innova-teknoloji.com
	Alexander Jäckl Industrial Market Development Manager Phone: +49 170 892 9650 alexander.jaeckl@lightcon.com	UNITED KINGDOM, IRELAND	Photonic Solutions Ltd. Edinburgh, United Kingdom Phone: +44 131 664 8122 ben.agate@photonicsolutions.co.uk www.photonicsolutions.co.uk
	Christian Hellwig Scientific Market Development Manager Phone: +49 174 204 9053 christian.hellwig@lightcon.com	USA, CANADA	Light Conversion-USA, Inc. Bozeman, MT, USA Phone: +1 833 685 2872 saleslc@lightcon-usa.com
	Stefan Piontek Ph.D. Scientific Market Development Manager Mobile +49 176 8345 7119 stefan.piontek@lightcon.com		

Lost in calculations?

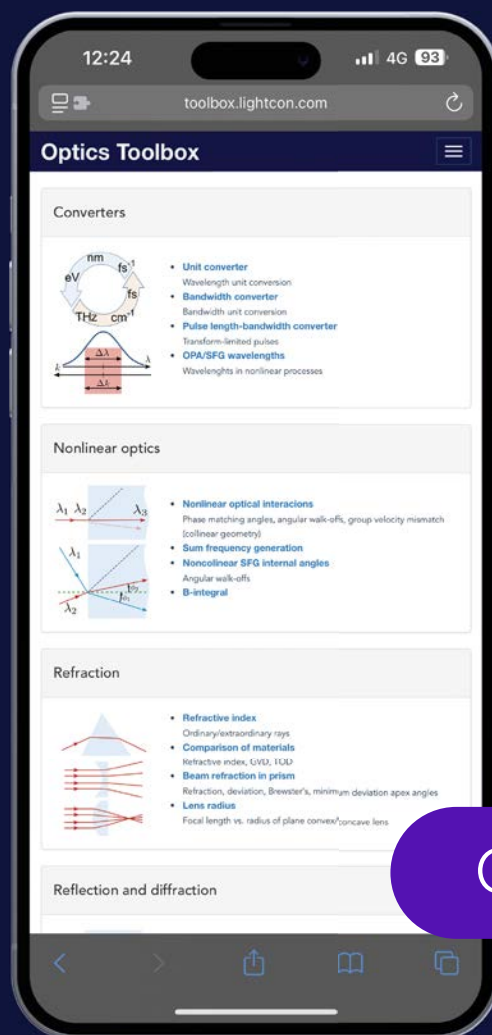
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