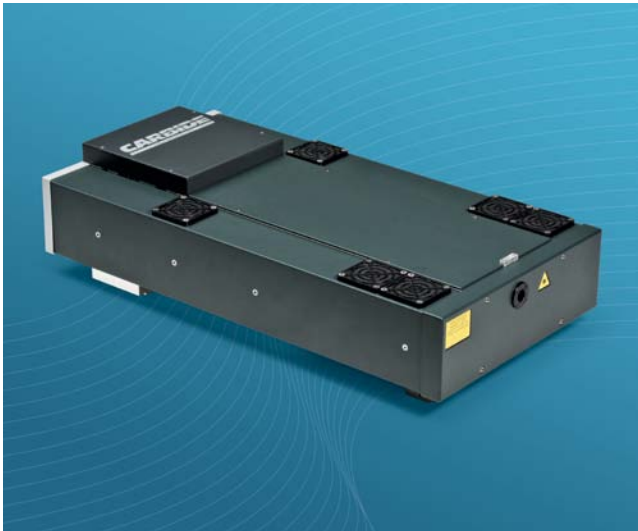


CARBIDE

Novel femtosecond laser for industrial and medical applications



Pico- and femtosecond lasers are now at the cutting edge of material micro processing in fields ranging from optoelectronics devices to eye surgery. Advantage of the ultrafast lasers lies in highly nonlinear interaction of short and intense light pulses with matter when ablation occurs without significant thermal impact. Mini-mization of thermally affected zone in the laser ablation process dramatically increases the machining precision and produces less damage to the surrounding material as laser pulse get shorter.

Despite of obvious advantages of ultra-short pulses, for long time their application has been limited by complexity and not adequate reliability of the laser systems. Sophisticated techniques have to be used to produce and amplify ultra-short pulses e.g. Kerr or SESAM modelocking and CPA amplification, which require advanced mechanical and optical design. Although a number of companies are now offering industry-ready ultrashort pulse lasers, they are still demanding in terms of environmental conditions, are of relatively big size and expensive. The need for more reliable, less sophisticated and less expensive ultrafast laser source is quite evident.

Over the past years Light Conversion has established itself as a manufacturer of reliable high performance femtosecond industrial grade lasers of PHAROS product line. Owing to their flexibility, a number of PHAROS systems are being used in

processing units as well as in basic research laboratories. As a successor product Light Conversion is now offering new generation femtosecond laser – CARBIDE, featuring >5 W output at 1030 nm wavelength, with highest pulse energies of >85 μ J. It maintains all the best properties of its predecessor: variable pulse repetition rate in the range of 60–1000 kHz with the built-in pulse picker feature for pulse output control, computer controllable pulse duration 300 fs – 10 ps. One of the impressive features of CARBIDE is it's size, which is 631x324x167 mm including integrated power supply and air cooling unit. This represents about 7 times reduction in system volume as compared to PHAROS, already one of the most compact ultrafast lasers on the market. Another important feature is dramatically reduced power consumption (~300 W 12 V DC). For applications where air turbulence and/or heat dissipation in the vicinity of the laser is highly undesirable, CARBIDE can be configured for water cooling as well. For additional flexibility Carbide can be equipped with second, third and fourth harmonics generators and ORPHEUS line parametric amplifiers.

FEATURES

- < 300 fs tunable pulse duration
- > 85 μ J pulse energies
- Up to 5 W output power
- 60 – 1000 kHz flexible repetition rate
- Includes pulse picker for pulse-on-demand operation
- Rugged, industrial grade mechanical design
- Air or water cooling

APPLICATIONS

- Biomedical applications
- Micromachining
- Micro- and nano-structuring
- Multi-photon polymerization
- Nonlinear optics
- Spectroscopy
- Microscopy

Specifications

Max. average power	> 5 W	> 4 W
Nominal pulse duration (assuming Gaussian pulse shape)	< 300 fs	
Pulse duration adjustment range	300 fs – 10 ps	
Max. pulse energy	> 85 μ J	> 65 μ J
Repetition rate	60 – 1000 kHz*	
Centre wavelength	1028 \pm 5 nm	
Beam quality	TEM ₀₀ , M ² < 1.2	
Pulse picker	included	included, enhanced contrast AO **
Pulse contrast	< 1:100	pre-pulse < 1:1000 post-pulse < 1:500
Output pulse stability	< 0.5 % rms over 24 hours ***	
Beam divergence	1.1x diffraction limited of M ² < 1.2 beam	

PHYSICAL DIMENSIONS

Laser head	632 (L) × 324 (W) × 167 (H) mm
Power supply	220 (L) × 95 (W) × 45 (H) mm

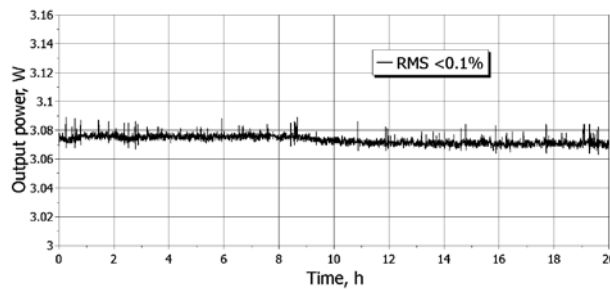
UTILITY REQUIREMENTS

Electric	110 – 220 V AC, 50 – 60 Hz, up to 300 W
Operating temperature	17 – 27 °C (62 – 80 °F)
Humidity	< 65 %, non-condensing

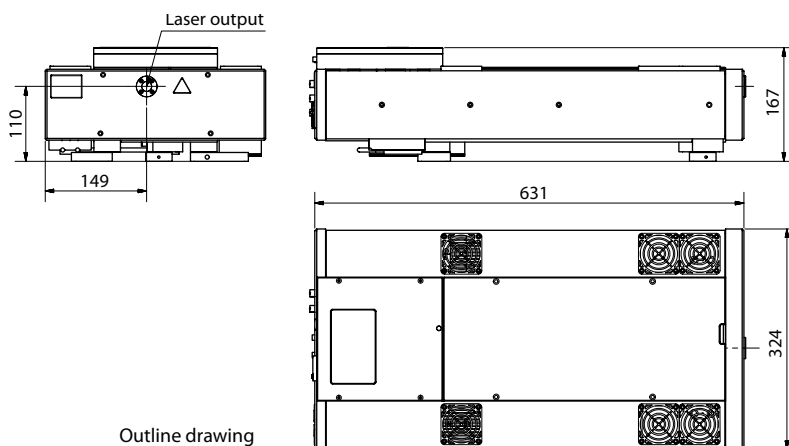
* Lower repetition rates are available by controlling pulse picker

** Provides fast amplitude control of output pulse train

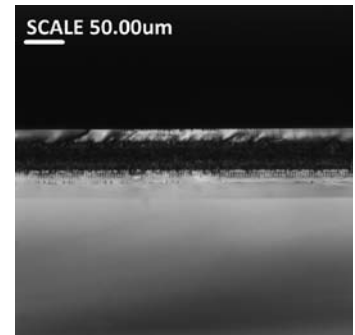
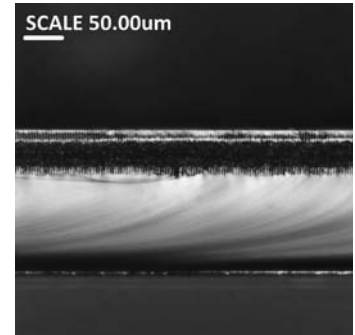
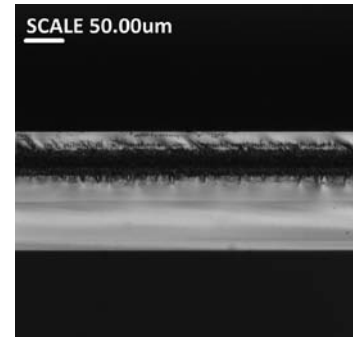
*** Under stable environmental conditions



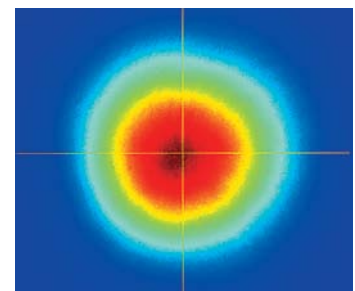
CARBIDE long term stability



Outline drawing



Sapphire dicing with Carbide laser
Images courtesy of Evana Technologies



Typical CARBIDE near field
beam profile



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