

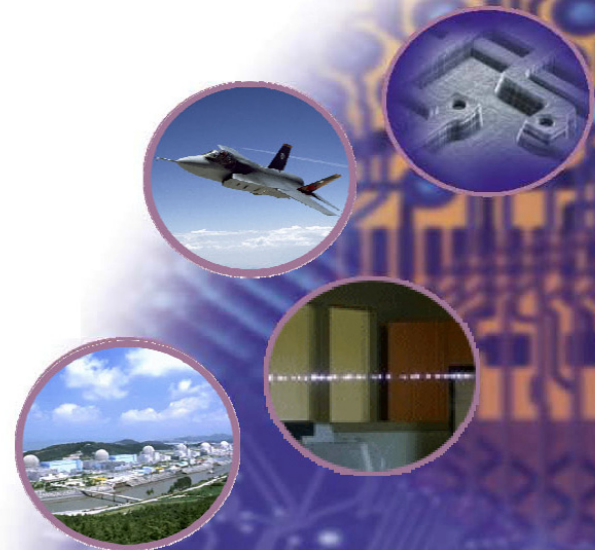
# IMPACT<sup>®</sup>-4000 SERIES

*High Energy, Ultra-Short Pulse TEA CO<sub>2</sub> Lasers*



**A range of standard ultra-short pulse TEA CO<sub>2</sub> lasers for advanced applications in science and industry**

- Based on LightMachinery's industrially-proven IMPACT-2000 Series
- Thyatron-switched for low jitter, ultra-short pulse (~100 ns) operation
- Multi-module oscillators and oscillator-amplifier systems available.
- Repetition Rates to 150 pps
- Line-tunable operation as a standard option
- Single-mode operation as a standard option
- Typical applications:
  - Plasma Diagnostics
  - Laser Photochemistry
  - Optical Damage Studies
  - Non-Destructive Testing / Laser Ultrasound
  - Laser Propulsion and Particle Acceleration
  - Material Ablation & Surface Removal



# LightMachinery Impact<sup>®</sup>-4000 Series

The **Impact-4000 Series** lasers are based on LightMachinery's industrially-proven Impact-2000 TEA CO<sub>2</sub> lasers, but modified with thyatron switching for ultra-short pulse duration (~100 ns) and low jitter operation as is required in many scientific and some industrial applications.

Various models offer choices of energy and repetition rates from 12 pps to 150 pps.

## Pulse Duration and Shape

For many scientific and some industrial processes, pulse duration and peak power are critical requirements. The pulse shape of TEA CO<sub>2</sub> lasers typically consists of a short spike (the "gain spike") followed by a longer tail. The maximum peak power is normally determined by the energy and duration of the "gain spike"

In the case of Impact-4000 lasers, the pulse shape, peak power and energy distribution between the gain spike and the tail can be tailored to individual requirements by selecting the appropriate gas mix and other laser parameters. One example of the pulse shape when operating with a short-pulse gas mix is shown at the right.

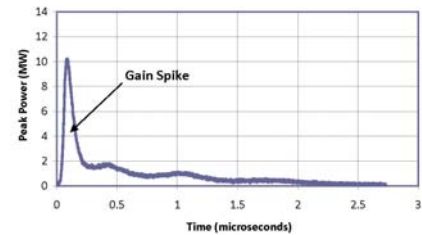
Standard options available with **Impact-4000 Series** lasers include:

- Wavelength tuning over the full range of CO<sub>2</sub> laser lines
- Single transverse-mode (TEM<sub>00</sub>) operation
- Single longitudinal-mode (SLM) operation
- Multi-Module and MOPA configurations

**Impact-4000 Series** lasers can be supplied in a range of standard multi-module oscillators and master-oscillator / power-amplifier (MOPA) configurations.

The beam parameters (divergence, linewidth, mode structure, range of wavelength tuning, etc.) are mainly defined by the Master Oscillator, and the final energy is mainly defined by the number of Power Amplifier modules.

Example of pulse shape and peak power of an Impact-4012 operating in one of several possible short-pulse configurations



## Specifications (single module)

	Model	4012	4015	4150
<b>Energy</b> (Total, standard pulse operation)	Joules	5.0	4.0	0.4
<b>Repetition Rate</b> (Maximum)	pps	12	15	150
<b>Average Power</b> (Standard pulse operation)	Watts	60	60	60
<b>Gain Spike Duration</b> (Short pulse operation, FWHM)*	ns	90	120	120
<b>Peak Power</b> (Short pulse operation in gain spike)*	MW	10	8	1.1
<b>Beam Size</b> (multimode, at laser, V x H, FWHM, nominal)	mm	25 x 25	25 x 25	14 x 11

Specifications apply in multimode configuration and at 10.6 μm wavelength.

\* The specified performance is one of several possibilities. The gain spike duration, peak power, energy in the gain spike, ratio of energy between the gain spike and the total pulse can be adjusted over a wide range by a combination of optimised gas mixes and other laser parameters. Please consult LightMachinery regarding the optimum configuration for your preferred performance.

## A Wide Range of Standard Options

Options available for the Impact-4000 Series lasers include:

**Line Tuning** – allows the laser to be tuned to many of the CO<sub>2</sub> lines between 9.2 and 10.8 μm

**Single Transverse Mode**– a variable internal aperture allows selection of transverse modes including TEM<sub>00</sub>

**Single Longitudinal Mode** – an intra-cavity low-pressure cell, with TEM<sub>00</sub> aperture, ensures SLM operation

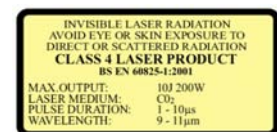
**Multi-Module Configurations** – for specialised applications, Impact-4000 modules can be combined in multi-module oscillators or in oscillator-amplifier (MOPA) configurations

*Please consult LightMachinery for further details of the options*

[www.lightmachinery.com](http://www.lightmachinery.com)

**LightMachinery**

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