

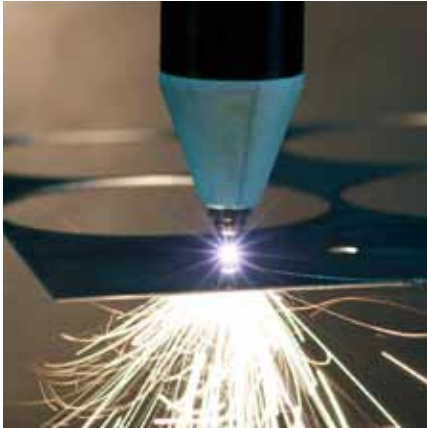
Flexibly Your Laser Partner

**convergent**

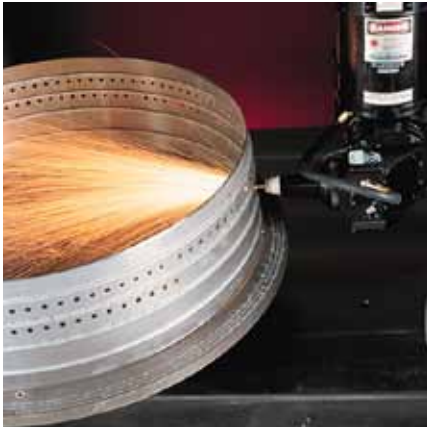




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Laser cutting of 0.5 mm thick stainless steel sheet using a **Convergent Photonics** CF3000 laser.



Precision cutting of an aircraft engine component using **Convergent Photonics** CL50k Nd:YAG laser.



Laser welding titanium alloy using **Convergent Photonics** CV5000 CO<sub>2</sub> laser.

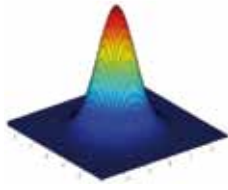
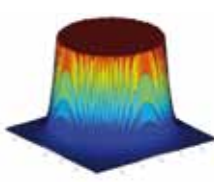
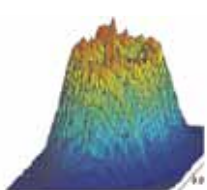
## Laser Cutting and Welding

High quality cutting and welding performance of **Convergent Photonics** CO<sub>2</sub> and fiber lasers is primarily a result of:

- Laser beam quality (mode) that is optimized for producing high quality cut edges in thin and thick material at a competitive speed.
- Laser beam that is round such that cut width is independent of cutting direction.
- Ability to deliver pulses having fast rise and fall times so as to minimize piercing time in cutting.
- Stable output over time in the environment of the manufacturing facility.

## Beam Quality

The beam of the Convergent laser provides the best compromise of the Gaussian beam for thin metal cutting and 'top hat' profile for thick metal cutting. The table below summarizes the pros and cons of the various options available.

|             | <i>Gaussian mode</i>   | 'Top-hat' mode   | Convergent mode   |
|-------------|--|--|---|
|             |                                |                               |   |
| <b>Pros</b> | Narrow kerf - ideal for thin (<6 mm) metal cutting.  | Large kerf - best suited for thick metal cutting because large kerf makes removing laser melted material easier. | Best combination for cutting thin and thick metals. Round beam means that cut width is independent of cutting direction. Steep edges, with relatively flat top - energy is used for material removal, not simply heating of the material. |
| <b>Cons</b> | Energy in the edges of the beam is below the threshold for cutting, but adds significant heat to the work piece. | Large kerf limits speed and minimum feature size (corner radius) in cutting thin metals.                         |   |

*Convergent Mode is suitable for material processing.*





3D bevel cutting of 12mm mild carbon steel using **Convergent Photonics** CV5000 CO<sub>2</sub> laser.



Laser cutting of stainless steel combustor using **Convergent Photonics** CX3000 CO<sub>2</sub> laser



Laser drilling of aerospace turbine blade and vanes using **Convergent Photonics** CL50k Nd:YAG laser.

## Pulsing

The piercing performance of the laser, particularly in mild steel, is influenced by its pulsing characteristics. Since much of stainless steel cutting uses nitrogen assist, continuous wave (CW) cutting is used primarily for these materials.

**Convergent Photonics** CO<sub>2</sub> lasers give fast (~60microsecond for CO<sub>2</sub> lasers, ~20 microsecond for Fiber lasers) rise time on the pulse that contributes to faster piercing.

## Laser Drilling

High speed, high profile laser drilling requires high peak power that **Convergent Photonics** flashlamp pumped Nd:YAG lasers are designed for. At 50kW maximum peak power, CL Series lasers can drill as small as 0.1mm diameter hole on uncoated or thermal barrier coated components. At 0.25mm diameter, the laser is capable of drilling aerospace quality cooling hole of 25mm deep at angle as shallow as 10 degrees to the surface, in a fraction of time of other processing methods.

It is no surprise that **Convergent Photonics** Nd:YAG lasers have been aerospace and energy industry standard for laser drilling for more than 30 years.

### High Peak Power

50kW maximum peak power, with variable pulse width and pulse frequency, Convergent Photonics Nd:YAG is unmatched in speed and quality of deep hole drilling.

### Variable Spot Size

Equipped as standard device, Variable Spot Module enables adaptive hole size control for percussion drilling.

### Drilling on the Fly

Percussion drilling can be efficiently performed using “Drill on the Fly” feature, where laser beam pulsing can be synchronized to the CNC encoder feedback.

## Cutting Capability

Typical cutting capability represented by maximum thicknesses for mild steel, stainless steel, aluminum, copper and brass is shown in the table below.

|                 | CX2500 | CX3000 | CX4000/<br>CM4000 | CV5000/<br>CV6000 | CF3000/<br>CF4000 |
|-----------------|--------|--------|-------------------|-------------------|-------------------|
| Mild Steel      | 15 mm  | 20 mm  | 25 mm             | 25 mm             | 20 mm             |
| Stainless Steel | 8 mm   | 10 mm  | 15 mm             | 20 mm             | 12 mm             |
| Aluminum        | 5 mm   | 8 mm   | 12 mm             | 12 mm             | 8 mm              |
| Copper          | -      | -      | -                 | -                 | 5 mm              |
| Brass           | -      | -      | -                 | -                 | 5 mm              |

CH-Fiber

CH-CO<sub>2</sub>

## Convergent Photonics Cutting Head

The Convergent Photonics head is available both for equipping High Power CO<sub>2</sub> and Fiber laser cutting machines. For CO<sub>2</sub> version, lenses can be changed in fast and easy way thanks to the cartridge design of the head. With the set of lens provided (5" and 7,5") machine productivity and cutting quality are boosted. For Fiber version the head is equipped with a 7,5" and a protection glass underneath easy changeable.



The cutting head is equipped with a **Safe Impact Protection System**, able to prevent any damage in case of contact.

The head is easy to integrate thanks to the interface plate equipped with magnets.

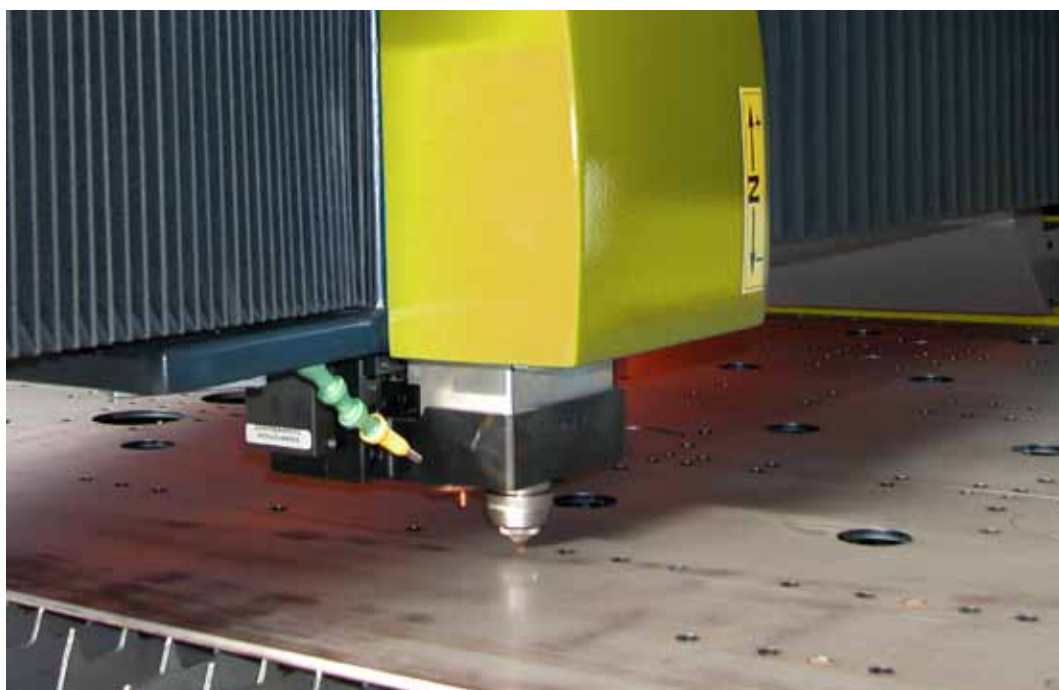
The F axis motor and relevant gear box, is available in different configurations (vertical or horizontal mount). It allows to change focal position during cutting, also when cutting with high pressure gas (up to 28 bar).

The head is equipped with a metallic capacitive sensor very robust (without ceramic fragile elements) and relevant electronic for stand-off automatic control easy to integrate in the most commonly used CNCs.



### Technical Data

|                                 | CO <sub>2</sub> version | Fiber version |
|---------------------------------|-------------------------|---------------|
| Focal lens                      | 5", 7,5"                | 7,5"          |
| Focal axis stroke               | 24 mm                   |               |
| Max Cutting Gas pressure        | 28 bar                  |               |
| Max Optics air cooling pressure | 3 bar                   |               |
| Weight                          | 12Kg                    |               |
| Max Laser Power                 | 5 kW                    | 4 kW          |



# CM3000

# CM4000



CM Series laser turbine with magnetic bearing saves maintenance cost.

## CM Series CO<sub>2</sub> Lasers

New CM Series features include:

- Low Gas Consumption - Total gas consumption as low as 5-15 L/H
- Energy Conservation Mode
- Solid State High Voltage Power Supply (4kW only)
- Magnetic Bearing Turbine
- Oil Free Transformer Power Supply

Convergent Photonics provides the highest performing, highly efficient and very reliable CO<sub>2</sub> Lasers for manufacturing.

New CM Series Lasers by Convergent Photonics, with optimum beam quality for laser processing, excel in cutting and welding broad range of materials and thicknesses.



CM4000 CO<sub>2</sub> Laser

|  |                        | CM4000                          | CM3000                    |
|--|------------------------|---------------------------------|---------------------------|
| Average Power  |                        | 200 - 4000 W                    | 200-3000 W                |
| Wavelength   |                        | 10.6 μm                         |                           |
| Beam Propagation Factor M2 typical (Prometec)            |                        | 2.0 - 2.4                       | 2.1 -2.5                  |
| Beam Divergence  |                        | 1.5 mrad half angle             |                           |
| Beam Diameter at Output                                  |                        | 14.5 mm @ 1/e2, 19 mm full beam |                           |
| Pulsing Pulse Rep. Rate                                  |                        | 0-2 kHz                         |                           |
| Pulse Width  |                        | >100 μseconds                   |                           |
| Pointing Stability                                       |                        | +/-150 μrad                     |                           |
| Ambient Temperature (min/max)                            |                        | 10° C / 40° C (50° F / 104° F)  |                           |
| Relative Humidity  |                        | <95% non-condensing             |                           |
| Diode Pointing Laser                                     |                        | Wavelength 635 nm Power <1 mW   |                           |
| Electrical Power Consumption                             |                        | 34 kW                           | 28kW                      |
| Voltage  |                        | 400 - 460 ± 10% VAC, 3-phase    |                           |
| Cooling  | Required capacity      | 30kW                            | 25kW                      |
|  | Inlet temperature      | 18° - 20° C                     |                           |
|  | Nominal inlet pressure | 4 Bar                           |                           |
|  | Max inlet pressure     | 5 Bar                           |                           |
|  | Minimum flow rate      | 133 Lpm                         |                           |
|  | Fluid                  | Distill Water / 35% Glycol      |                           |
|  | Filter requirement     | 500 μm                          |                           |
| Dimensions W x H x L                                     |                        | 884 mm / 960 mm / 3156 mm       | 850 mm / 887 mm / 2115 mm |
| Gas Consumption He (68%), N2 (36%), CO <sub>2</sub> (4%) |                        | 5-15 LPH                        |                           |
| Weight   |                        | 1,200 kg                        | 1,137kg                   |
| Ingress Protection Rating (IEC60529)                     |                        | IP54 (NEMA13 equivalent)        |                           |

CM Series Lasers with DC discharge are the most efficiently run industrial CO<sub>2</sub> laser available. Equipped with magnetic bearing turbine, smart gas feed system, and new reliable power supply, the laser requires minimal maintenance, and very low operational expense, reducing overall cost of ownership. CM Series Lasers are equipped with most recent technological advancement available to the fast flow CO<sub>2</sub> lasers.

- New turbine equipped with Magnetic Bearing rotating mechanism.
- Smart gas feed system to minimize laser gas consumption.
- New high voltage power supply with hi-tech resin. No more oil submerged components.

## CX2500

## CX3000

## CX4000

### CX Series CO<sub>2</sub> Lasers

Convergent Photonics CX Series Lasers, designed with operational efficiency in mind for laser processing, are considered as the best economical fit for cutting and welding broad range of materials and thickness in 2D and 3D. Technologies used have been refined over years of development to ensure most economical solution to the users without sacrificing performance and reliability. CX Lasers main features are:

- High Reliability
- High Operational Efficiency
- Small Footprint

CX3000 CO<sub>2</sub> Laser



|  |                        | CX2500                                       | CX3000       | CX4000                    |
|--|------------------------|--|--------------|---------------------------|
| Average Power  |                        | 200 - 2500 W                                 | 200 - 3000 W | 200 - 4000 W              |
| Wavelength   |                        | 10.6 μm                                      |              |                           |
| Beam Propagation Factor M2 typical (Prometec)                          |                        | 2.1 - 2.5                                    |              | 2.0 - 2.4                 |
| Beam Divergence  |                        | 1.5 mrad half angle                          |              |                           |
| Beam Diameter at Output  |                        | 14.5 mm @ 1/e <sup>2</sup> , 19 mm full beam |              |                           |
| Pulsing Pulse Rep. Rate  |                        | 0-2 kHz                                      |              |                           |
| Pulse Width  |                        | >100 μseconds                                |              |                           |
| Pointing Stability   |                        | +/-150 μrad                                  |              |                           |
| Ambient Temperature (min/max)  |                        | 10° C / 40° C (50° F / 104° F)               |              |                           |
| Relative Humidity  |                        | <95% non-condensing                          |              |                           |
| Diode Pointing Laser   |                        | Wavelength 635 nm Power <1 mW                |              |                           |
| Electrical Power Consumption   |                        | 29 kW  | 32 kW        | 37 kW                     |
| Voltage  |                        | 400-460 ± 10% VAC, 3-phase                   |              |                           |
| Cooling  | Required capacity      | 27 kW  | 29 kW        | 34 kW                     |
|  | Inlet temperature      | 18° - 20° C                                  |              |                           |
|  | Nominal inlet pressure | 4 Bar  |              |                           |
|  | Max inlet pressure     | 5 Bar  |              |                           |
|  | Minimum flow rate      | 133 Lpm                                      |              |                           |
|  | Fluid                  | Distill Water / 35% Glycol                   |              |                           |
|  |                        | 500 μm                                       |              |                           |
| Dimensions W x H x L   |                        | 850 mm / 887 mm / 2551 mm                    |              | 855 mm / 883 mm / 3105 mm |
| Gas Consumption - He (68%), N <sub>2</sub> (36%), CO <sub>2</sub> (4%) |                        | 20 - 70 LPH                                  |              | 20 - 40 LPH               |
| Weight   |                        | 1,137 kg                                     |              | 1,200 kg                  |
| Ingress Protection Rating (IEC60529)                                   |                        | IP54 (NEMA13 equivalent)                     |              |                           |



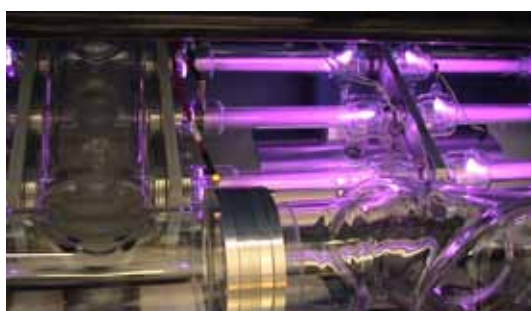
CV5000

CV6000

CV Series High Power CO<sub>2</sub> Lasers

- High Quality Beam Output at High Power
- Magnetic Turbine Bearing to Minimize Maintenance Cost
- Solid State High Voltage Power Supply

Convergent Photonics CV Series Lasers with DC discharge are the most efficiently run industrial CO<sub>2</sub> lasers, available now with 5 and 6kW output models. With magnetic bearing turbine, the laser requires minimal maintenance; reducing total cost of ownership significantly. CV Series Lasers, with optimum beam quality for laser processing, excel in cutting and welding broad range of materials and thicknesses.

CV5000 CO<sub>2</sub> Laser

|  |                        | CV5000                                       | CV6000       |
|--|------------------------|--|--------------|
| Average Power  |                        | 200 - 5000 W                                 | 200 - 6000 W |
| Wavelength   |                        | 10.6 $\mu$ m                                 |              |
| Beam Propagation Factor M2 typical                                     |                        | 2.2 - 2.6                                    |              |
| Beam Divergence  |                        | 1.5 mrad half angle                          |              |
| Beam Diameter at Output  |                        | 14.5 mm @ 1/e <sup>2</sup> , 19 mm full beam |              |
| Pulsing  | Pulse Rep. Rate        | 0-2 kHz                                      |              |
|  | Pulse Width            | >100 $\mu$ seconds                           |              |
| Pointing Stability   |                        | +/-150 $\mu$ rad                             |              |
| Ambient Temperature (min/max)  |                        | 10° C / 40° C (50° F / 104° F)               |              |
| Relative Humidity  |                        | <95% non-condensing                          |              |
| Diode Pointing Laser   |                        | Wavelength 635 nm Power <1 mW                |              |
| Electrical Power Consumption   |                        | 40 kW  | 44 kW        |
| Voltage  |                        | 400-460 $\pm$ 10% VAC, 3-phase               |              |
| Cooling  | Required capacity      | 36 kW  | 40 kW        |
|  | Inlet temperature      | 18° - 20° C                                  |              |
|  | Nominal inlet pressure | 4 Bar  |              |
|  | Max inlet pressure     | 5 Bar  |              |
|  | Minimum flow rate      | 133 Lpm                                      |              |
|  | Fluid                  | Distill Water / 35% Glycol                   |              |
|  |                        | 500 $\mu$ m                                  |              |
| Dimensions W x H x L   |                        | 849,6 mm / 957 mm / 3119 mm                  |              |
| Gas Consumption - He (68%), N <sub>2</sub> (36%), CO <sub>2</sub> (4%) |                        | 20-70LPH                                     |              |
| Weight   |                        | 1,200 Kg                                     |              |
| Ingress Protection Rating (IEC60529)                                   |                        | IP54 (NEMA13 equivalent)                     |              |

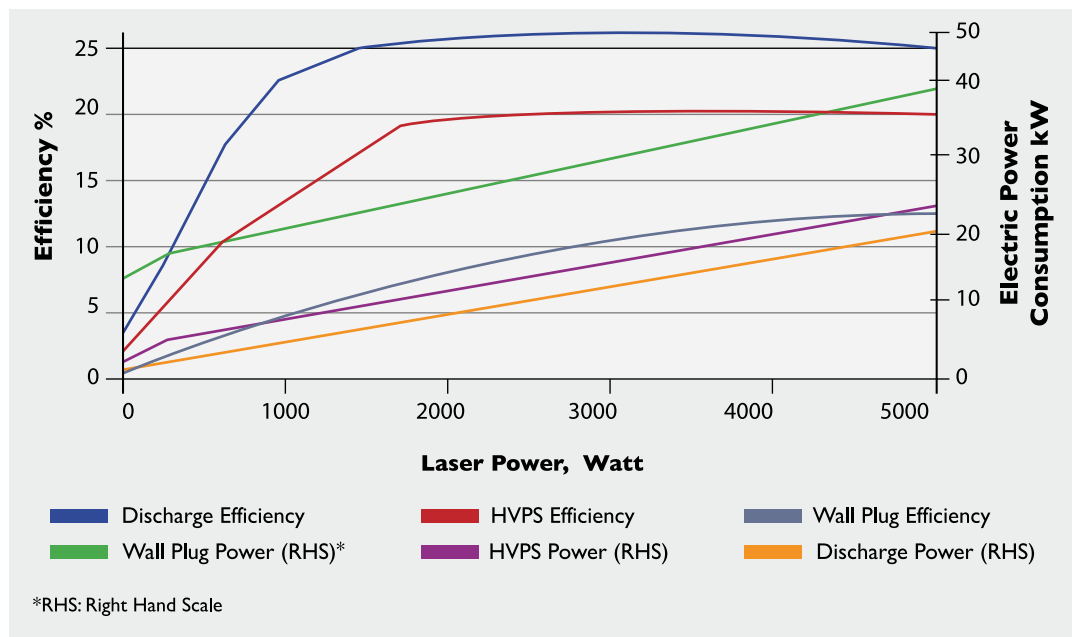
## Design Features and Benefits

Convergent Photonics brand industrial CO<sub>2</sub> lasers are based on DC excitation technology that has been proven by many years of industrial production. Compared with other high power industrial CO<sub>2</sub> lasers of both DC excited and RF (radio frequency) excited designs, Convergent Photonics lasers offer the following benefits:

- High quality beam with the optimum energy distribution (also known as ‘beam mode’) for precise, high speed cutting of both thin and thick metals.
- High electrical efficiency, especially compared to RF excited lasers, and variable gas consumption which minimizes operating costs. High electrical efficiency not only minimizes the electrical consumption of the laser but also of the chiller used to remove heat from the laser.
- Laser gas mixture and purity tolerance that is larger, especially compared to RF excited lasers. Convergent Photonics lasers are not damaged by incorrect gas mixture as can be the case for RF excited lasers.

## Efficiency and Input Power

The discharge efficiency for Convergent Photonics CO<sub>2</sub> lasers exceeds 25% and is close to the theoretical limit (32%) for CO<sub>2</sub> lasers. This is important because electrical power is the greatest component of the operating cost of a high power CO<sub>2</sub> laser.



*Convergent CO<sub>2</sub> Laser leads industry in efficiency.*

## Configuration

Convergent Photonics CO<sub>2</sub> lasers are housed in a single, compact package that provides for easier interfacing and integration with laser machines and avoids the need for additional cabling with other lasers required to connect the resonator and power. The overall benefit is an efficient use of floor space.

CF2000

CF3000

CF4000



CF3000 Fiber Laser

## High Power Industrial Fiber Lasers

Convergent Photonics new CF Series fiber lasers, are designed to deliver the best performance in material processing to better suit the customer needs. The highly efficient and compact CF series high power fiber lasers with output power up to 2kW or 4kW, guarantees low maintenance operation, high reliability and superior cutting performances. Convergent Photonics Fiber lasers are very easy to integrate in different machine configurations. Main advantages in installing fiber lasers include:

- Flexible laser beam delivery, up to 30m delivery fiber length
- High electro-optical efficiency, over 30% wall-plug efficiency
- Patented high speed electronic shutter [100 ms]
- Highly resistant to back-reflection, compatible with all metal materials including copper and brass
- Simple, compact, maintenance free and robust design

New CF Series features include:

- Optimized beam profile for both thin and thick sheet metal cutting and welding
- Capable cutting up to 20mm mild steel



Convergent Fiber Pump Module

|                               | CF2000/CF3000/CF4000      |                      |
|-------------------------------|---------------------------|----------------------|
|                               | 50 µm feeding fiber       | 100 µm feeding fiber |
| Feeding fiber core diameter   | 50 µm                     | 100 µm               |
| Feeding fiber length          | 20 m (30 m under request) |                      |
| Minimum bend radius           | 200 mm                    |                      |
| Output connector              | QBH                       |                      |
| Beam Parameter Product (1/e2) | 2 mm mrad                 | 3,5 mm mrad          |

### General Specifications

|                                      | CF2000                            | CF3000 | CF4000  |
|--------------------------------------|-----------------------------------|--------|---------|
| Max Average Power                    | 2000W                             | 3000W  | 4000W   |
| Wavelength                           | 1080nm                            |        |         |
| Operating Environment (min/max)      | 5° C / 50° C (40° F / 120° F)     |        |         |
| Relative Humidity                    | < 95% non-condensing              |        |         |
| Diode Pointing Laser                 | Wavelength 635/658 nm Power <1 mW |        |         |
| Electrical Power Consumption         | 7kW                               | 10 kW  | 12,5 kW |
| Voltage                              | 360 - 490 VAC, 3-phase            |        |         |
| Dimensions W / H / L                 | 830mm / 1020mm / 830mm            |        |         |
| Weight                               | 220 Kg                            | 250 Kg | 290 Kg  |
| Connections                          | 0.75 inch hose barb (x2)          |        |         |
|                                      | 8 mm tube fitting                 |        |         |
| Ingress Protection Rating (IEC60529) | IP54 (NEMA13 equivalent)          |        |         |

## CL30k CL50k CLR

### CL Series Nd:YAG Lasers

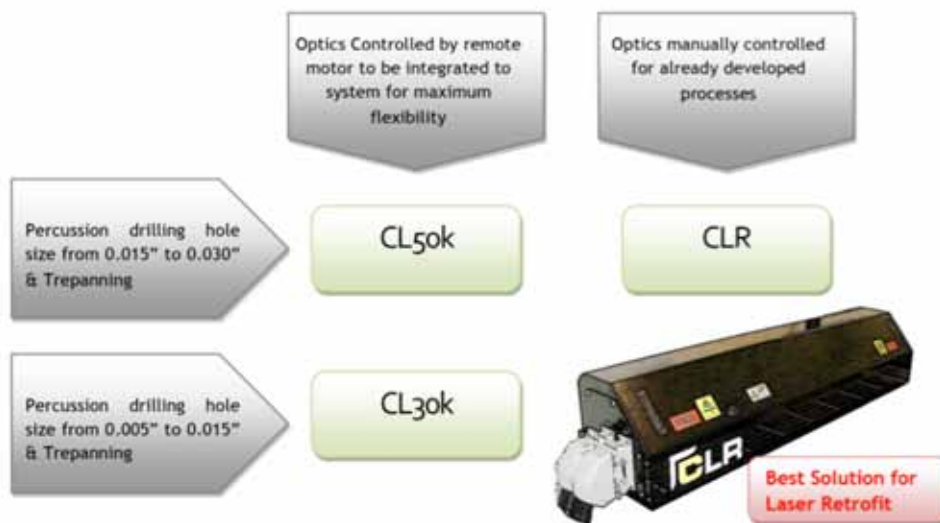
Today, world's 50% of laser drilling is performed by Convergent Photonics served Nd:YAG lasers. Our laser source is proven to work by various industries, including aerospace and land based turbine manufacturers and excel in percussion drilling and trepanning where very high peak power pulses up to 50 kW are demanded. Convergent Photonics CL Series Nd:YAG Pulse Lasers are specifically designed for laser drilling with features perfectly suited for drilling of cooling holes of turbine vanes, blades, shrouds, and combustor liners. CL Series lasers are also utilized in exotic aerospace material cutting.

Main features of CL Series are:

- High Peak Power Output for laser Drilling
- Drilling Spot Size Control
- Solid State Driving Flashlamp Power Supply

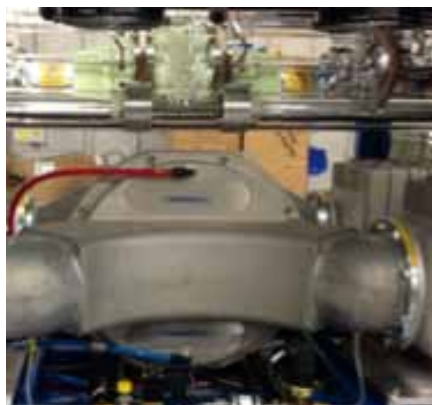
3 models are offered to meet user demands on percussion drilling and trepanning.

- CL30k best suited for small aerospace hole drilling as small as 0.1mm diameter with high profile.
- CL50k, 50kW peak power capable of drilling 25mm deep turbine blades and vanes cooling holes, as well as percussion drilling, trepanning, and cutting of combustion chamber.
- CLR is designed as upgrade for users' aging Nd:YAG laser.



|                                | CL30k  | CL50k   | CLR |
|--------------------------------|--|---|-----|
| Excitation Source              | Xenon Flashlamps                                   |   |     |
| Rated Maximum Output Power     | 150W   | 200W (HBICT)<br>250W (MBICT & LBICT)            |     |
| Rated Maximum Output Energy    | 30J  | 45J (HBICT)<br>50J (MBICT & LBICT)              |     |
| Rated Maximum Pulse Peak Power | 30 kW  | 45 kW (HBICT)<br>50 kW (MBICT & LBICT)          |     |
| Power Stability                | +/-5%  |   |     |
| Pulse Width Range              | 0.25 - 9.00msec, 0.01msec resolution               |   |     |
| Repetition Rate Range          | 1 - 200Hz, 0.1Hz resolution for < 50Hz, 1Hz > 50Hz |   |     |
| Beam Propagation Ratio         | M2<10  | M2<20 (HBICT)<br>M2<35 (MBICT)<br>M2<40 (LBICT) |     |





*CP4000 CO<sub>2</sub> Laser retrofitted with new magnetic bearing turbine to improve performance and lower the cost of maintenance.*



Get in contact with Convergent Photonics worldwide:

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### Retrofit Your Convergent Product

Are you considering upgrading or retrofitting your Prima Electro Convergent Photonics lasers? We may be able to provide you with upgrade/retrofit kit and service which will surely provide you with good return on investment. Contact Convergent Service Department at [service.convergent.usa@convergent-photonics.com](mailto:service.convergent.usa@convergent-photonics.com) for more details.

### Convergent Laser Service

Convergent Photonics with expert laser engineers can support your equipment needs on site, over the telephone, or by e-mail. Feel free to contact Convergent Service Department at [service.convergent.usa@convergent-photonics.com](mailto:service.convergent.usa@convergent-photonics.com) for technical assistance or to schedule the service.

### Convergent Spare Parts

Convergent Photonics manufacturing facility holds extensive number of spare parts for current and legacy lasers to support production demand of laser users around the world. If you are looking for support with spare parts, contact Convergent Service and Spares Department at [service.convergent.usa@convergent-photonics.com](mailto:service.convergent.usa@convergent-photonics.com)

### Global Coverage

Convergent Photonics products are supported globally for 24/7 support.



## History of Convergent Photonics

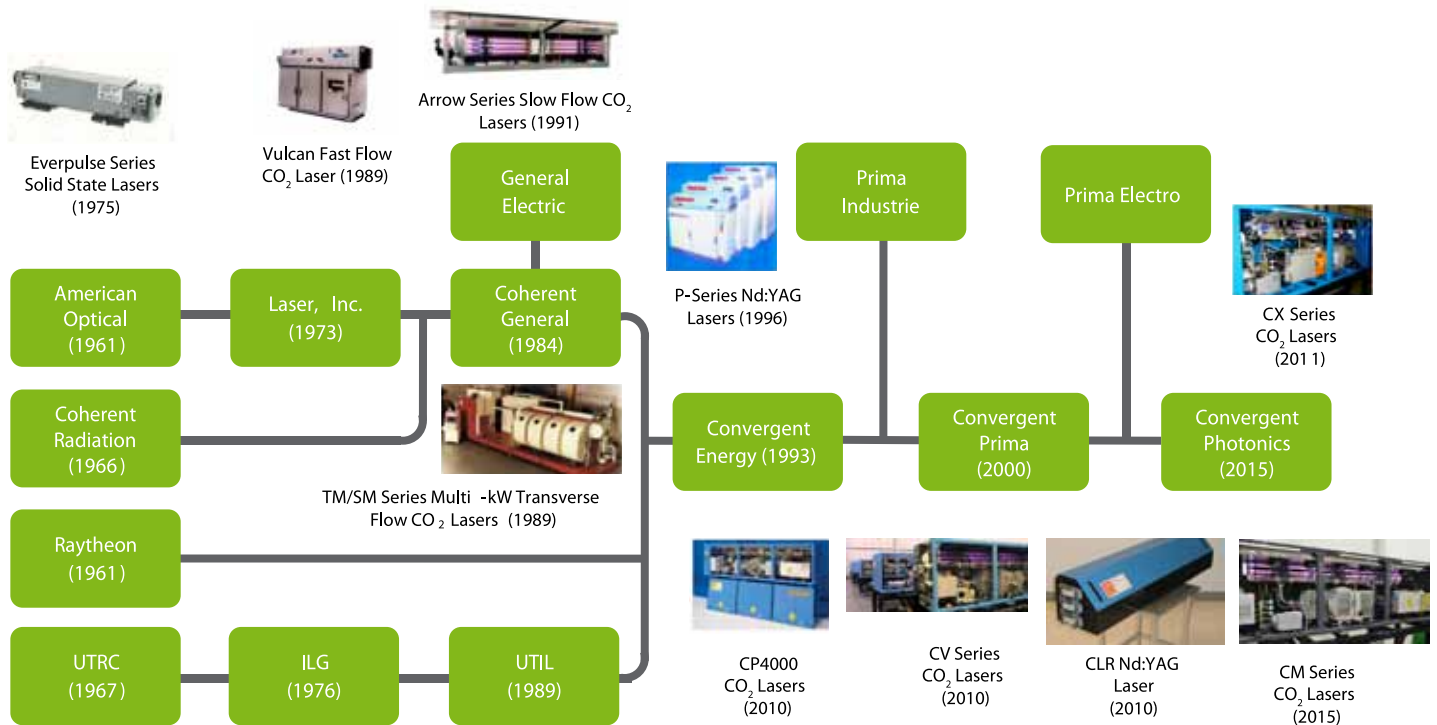
The history of Convergent Photonics dates back in 1961, shortly after the invention of the laser in 1960. The CO<sub>2</sub> product line of Convergent can be traced to 1966, with the start-up of Coherent Radiation (Palo Alto, CA). Coherent founders demonstrated their first CO<sub>2</sub> laser at the Westcon exhibition in the fall of 1966. The first customer for the laser was the Boeing Co. where it was used “to investigate cutting and welding titanium”.

In 1981, Laser Inc. began to purchase and assemble kits for CO<sub>2</sub> lasers from Coherent and shortly thereafter, Coherent acquired Laser Inc., which became the industrial arm of Coherent, producing several models of slow flow CO<sub>2</sub> lasers. Coherent General was formed in 1984 when General Electric made an investment in the company with the goal of obtaining a next generation Nd:YAG drilling laser. This business, which was now producing both CO<sub>2</sub> and Nd:YAG industrial lasers, was sold to Transtec in 1993, but, as part of the acquisition, Transtec was required to change the name no longer using ‘Coherent’.

The name Convergent Energy was then given to the laser business. During this same time, Transtec also acquired the rights for manufacturing and service of the Raytheon solid state laser products which had first appeared in the market also in the early 1960’s. Meanwhile, UTRC (United Technology Research Center) which was formed in 1967, had started developing high power CO<sub>2</sub> lasers (6 to 45 kW). The company that came out of the development was originally called the Industrial Laser Group (ILG) and, in 1989, was renamed United Technologies Industrial Lasers, or UTIL, headquartered in East Hartford, CT. This business was taken over by Transtec in 1994 when UTRC decided that it no longer wanted to pursue the industrial laser business, at which point Convergent Energy was renamed Convergent Lasers.

In 2000, Convergent Lasers was sold to Prima Industrie, becoming part of Prima Electro in 2011, under the brand name of Convergent. The third quarter of 2014 begun with the announcement that Convergent changed its name to Convergent Photonics, a strategic branding choice to communicate its new dynamic outlook and further underscoring the company’s drive to offer high reliability, innovative solutions to the market place. With this new identity, Convergent Photonics presents itself as a global supplier of photonics technologies and a myriad of high power industrial laser sources for materials processing. This transition heralds a new beginning for Convergent Photonics as it becomes a reliable international partner and provider to all leading OEMs, offering unparalleled customer satisfaction, worldwide.









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