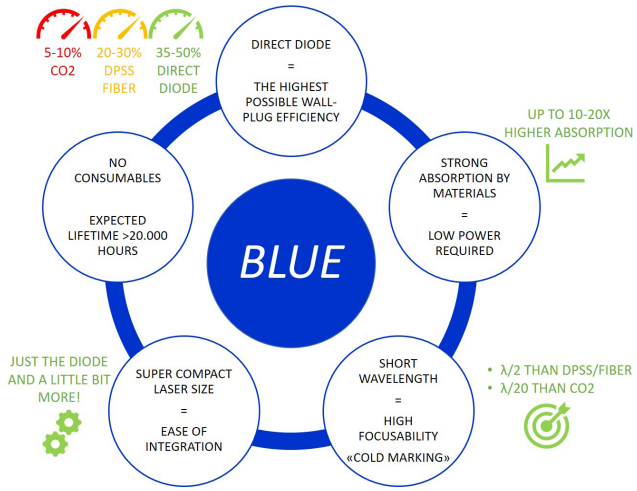
Blue Laser

Pioneering a new power range in production

The latest blue laser is a compact, ready-to-use, low-cost alternative to the conventional CO2 laser – providing robust, industrial grade solutions for entry-level applications. Integrating innovation into the production line is now easier than ever.

The carbon dioxide (CO_2) laser was one of the earliest gas laser technologies developed using infrared (IR) light. Since its introduction to the market over 50 years ago, this titan of the industry has become an integral part of industrial manufacturing processes due to its power, speed, and precision. Today, however, rapidly growing technologies in e-mobility, power electronics and food branding are now driving demand for a next generation of laser.

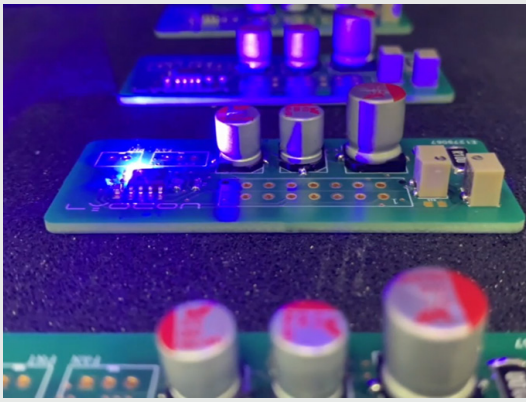
Introducing a fresh arrival onto the manufacturing scene: a flexible, eco-friendly solution in entry-level marking and cutting applications for the lower price product range. The 450 nm blue laser powered by 6-11 W scanning systems is ready to make its mark on this dynamic market. It offers a range of potential solutions in a largely untapped power range that it is uniquely qualified to process.



Sources: Nasdaq.com, Optics&Photonics (osa-opn.org), RAYLASE GmbH, Lyocon.com, The Guardian Sustainable Business.

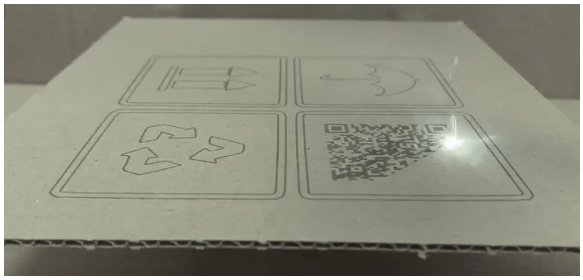
High absorption

At the beginning of the century, advances in semiconductor laser technology and the development of direct diode lasers (DDL) brought the high-power blue laser to commercial manufacturing. It is now revolutionizing the new electric vehicle automotive industry.



Recent market research by Nasdaq predicts a "growing consumer need for faster and higher precision volume manufacturing techniques with lower power consumption". For global industry, that means lower energy output, less plastic packaging and fewer carbon emissions are now must-have criteria. With increasing demand for environmentally conscious production processes, newer technologies in the blue range are opening up possibilities in processing certain types of materials that compensate for power with higher absorption levels, for example for highly reflective materials, when compared to infrared lasers.

A key measure for efficiency in material processing is dictated by how easily absorption is achieved. Many materials exhibit lower absorption at 10.6 µm one of the most common wavelengths for CO_2 lasers. With the 450nm blue laser, the same processing efficiency with higher absorption can be achieved with lower power (and at the same speed), therefore conserving energy. Besides the energy saving benefits that higher efficiency brings, further advantages of the blue laser at this range are greater reliability, a longer lifetime, lower volume occupancy and ease of integration.



Enter a brand-new generation of blue lasers that is replacing gas solutions for a range of industrial processes that require a more flexible approach, for example in marking and labelling, textile cutting, thin wire welding, and wire and paste soldering.

How exactly does the blue laser compare to conventional CO_2 systems?

Sources: Nasdaq.com, Optics&Photonics (osa-opn.org), RAYLASE GmbH, Lyocon.com, The Guardian Sustainable Business.

Challenging Goliath

BLUE VS CO_2

As the powerhouse of industrial laser processing, the CO_2 laser is the highest-power continuous wave (CW) laser currently available. These lasers not only dominate the market, but also the space they occupy on the production line. For traditional CO_2 lasers (with laser head and driving system) to create more power, they need more room - making them a high-cost item for the premium market. Fixed gas tubes that require both refilling with an active gas (limited lifetime) and cooling, result in high maintenance processes. When it comes to processing outside of the 10.6 µm wavelength range, the CO_2 laser simply needs more power and therefore more volume occupancy. Resulting in much lower electrical-to-optical efficiencies. A lack of flexibility in terms of power, mobility, beam width and spot size mean the CO_2 laser is not easily adapted for the more delicate marking processes.

PORTABLE

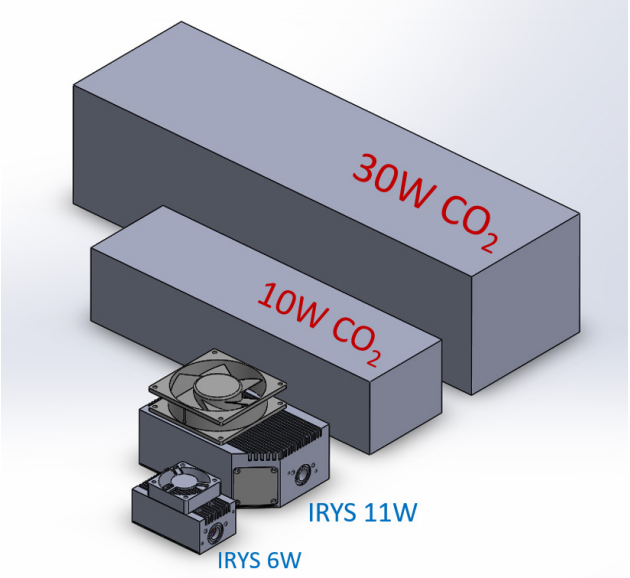
in contrast, the blue laser is extremely compact in size, conveniently portable and easily installed on any frame, CNC machine or 3D printer without elaborate mirror systems. It is also easily shipped without risk of damage. Thanks to its wall-plug efficiency, integrating a compact, low-cost 6-11W blue laser into an existing manufacturing line with standard scanning head systems, as an alternative to a 30/50W CO2, is a practicable solution for many typical applications. And it takes up only one tenth of the space of a common CO2.

ECONOMICAL

At the opposite end of the wavelength spectrum to CO2, the blue diode laser is generally regarded as one of the most efficient laser technology systems that exist. Requiring only single-digit watt power, the 450nm blue laser is a practical substitute to 10.6µm radiation. While the CO2 laser has wall-plug efficiencies around 3-5%, with blue diode technology this number reaches around 35-40%.

RELIABLE

The very high processing speed of this type of blue laser can be favourably compared to 10, 30 or 50W CO2 marking systems. Being incredibly precise with a small marking spot, it completes the necessary tasks in a faster time and causes less collateral damage. Due to the power savings achieved, it scores highly in longevity with an expected lifetime exceeding 20.000 hours. Making it a definite plus for presentable eco credentials.

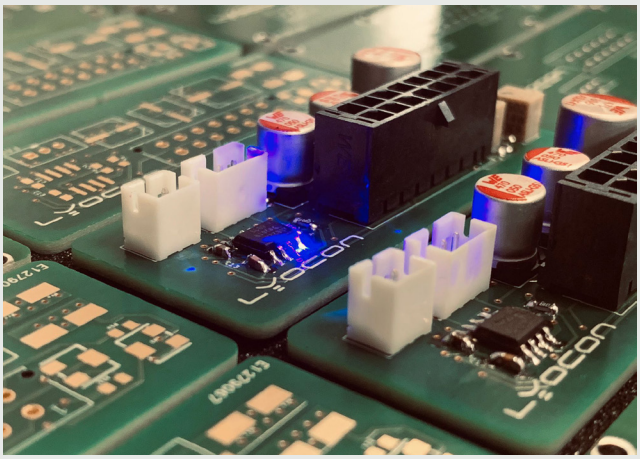


GRAPHIC SIZES of IRYS 6 and 11W next to 10W and 30W CO_2

Here are just three examples of how the lower power blue direct diode laser comes into its own, challenging CO_2 lasers as an alternative for comparable or even better results. From the soldering of high reflective materials, such as those used in THT and SMD components, to cutting and marking cardboard, wood, and organic textiles to the delicate task of branding food:

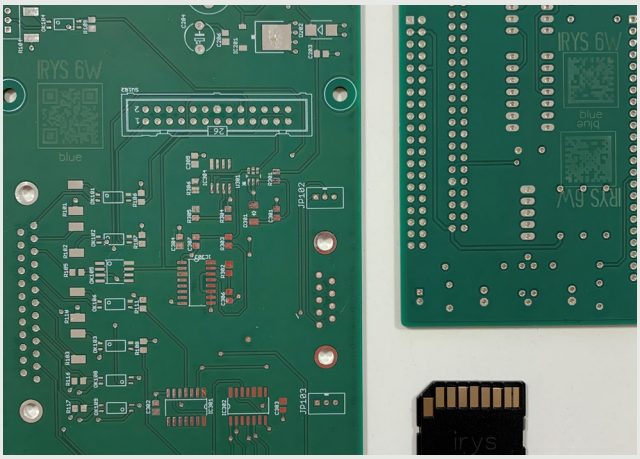
Application 1 - PCB marking and soldering

Advancements in nanotechnology and photonics are changing the way we think about what is possible in laser-controlled manufacturing. The printed circuit boards (PCBs) that today form the core of most of our everyday appliances and devices are continually decreasing to dimensions invisible to the human eye. With the resulting increase in complexity, the use of contactless laser systems is revolutionising material processing in the PCB and power electronics market. From the soldering of through hole technology (THT) or surface mount device components (SMD) on PCB boards to wire soldering on power electronics components to the welding of thin copper wires. The agile blue laser can now access the highly reflective material processing market with much lower power densities compared to infrared lasers.

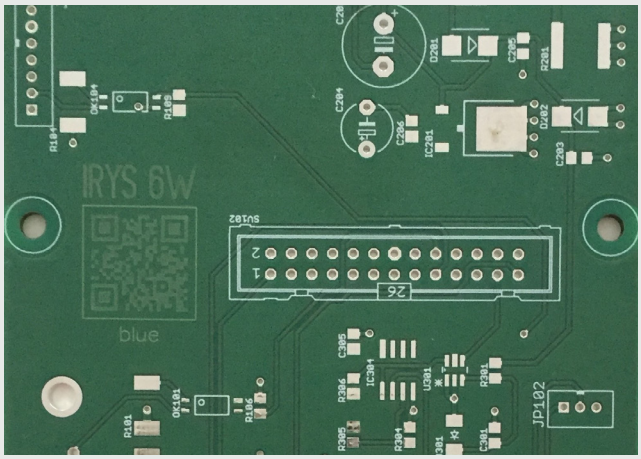


PCB soldering SMD example

PCB soldering THT example



PCB marking-traceability



PCB marking-traceability Zoom

SPOT SIZE

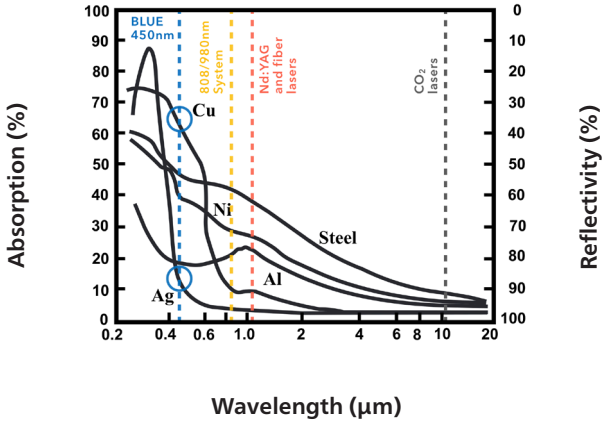
The shorter wavelength of blue lasers allows for a significantly smaller spot size and higher focusability than CO_2. Using fixed focusing optics a spot size of 20 µm is achievable, with the latest scanner technology and a 210 mm f = theta lens for example the spot size is comparably smaller then that of CO_2 at 150 µm. It reaches this power density without the need for complex beam delivery systems or mirror alignment. This makes the 450 nm blue laser ideal for cutting, welding and foil joining and for variable-geometries soldering of PCB components with arbitrary shapes. The result is a smoother weld that is more easily controlled with less residual reflection and improved heating speed. A smaller aperture scanner head can be incorporated than one needed for a CO_2 laser to attain the same spot. This allows the laser to move faster on the board and create different geometries that perfectly match the pads on PCBs.

Sources: Nasdaq.com, Optics&Photonics (osa-opn.org), RAYLASE GmbH, Lyocon.com, The Guardian Sustainable Business.

ABSORPTION

Again, absorption levels are a key specification in the decision-making process for laser. The wavelength at which your material absorbs light and whether it reflects or absorbs the laser rays determines your ideal laser for processing. Higher absorption makes cutting or engraving easier, meaning much less power is required. Thanks to strong absorption of blue 450 nm radiation by copper and silver – the principal elements at the core of the most common soldering alloys – and other typical materials processed with CO_2 and near IR lasers, this is where blue laser proves its worth. With up to 20 times higher absorption levels compared to infrared lasers (13 times higher for copper), the result is 60 % less time to solder and 50 % less power to solder compared to the same soldering process with a 980 nm laser system. Alone the requirement for traceability and security marking of PCB boards offers a huge potential market for blue laser systems.

DIAGRAM showing absorption wavelength reflectivity graph:



Application 2 - marking organic materials and traceability

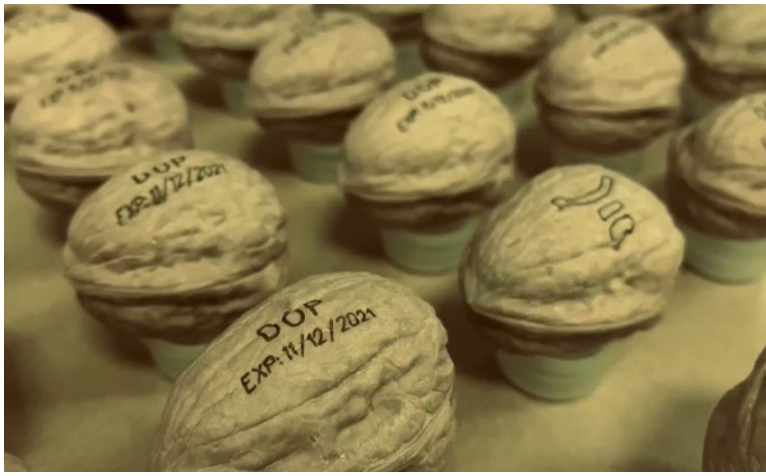
PHOTO (Lyocon) real textile decorating example – wood or paper, cardboard, leather or clothing

Blue laser in the medium power range is ideal for direct marking processes on organic materials such as cardboard, wood and paper or textiles like leather, tissue, and denim. Marking, decorating, and cutting organic materials requires high absorption with a sharp trace from a laser that does not require a massive reduction in speed, produces strong contours and can get close enough to the workpiece without damaging it. Here, the blue laser can achieve better results than CO_2 in a faster time, providing a sharp trace and symmetrized spot shape. The only exception being with white or transparent materials. And yet, precisely because transparent materials are not as readily processed by blue radiation, there is potential here for applications in which materials need to be processed underneath a transparent medium – for example, to apply food branding to goods already packaged inside transparent plastic wrap or to mark organic textiles beneath a transparent label. Specialist applications such as these are not generally feasible using CO_2 lasers.

The blue laser produces an easy cut and a good quality edge when compared to CO_2 lasers, which can often leave a barbed contour which then becomes hard. When a CO_2 laser and a blue laser can both do the job, but requirements for cutting and marking are so different that each process requires its own laser, the blue laser distinguishes itself with its practicality and flexibility. No need to use high price components like a large CO_2 laser plus scanning head. A blue laser with a compact scanner can be added with minimal effort to the plotter head of an existing CO_2 laser for a simple solution at a lower overall cost to achieve the same result.

Application 3 - "natural branding"

An exciting and innovative application of the blue laser is the "natural branding" of organic food produce. Also referred to as "smart branding" or "laser labelling", this eco-friendly new concept is currently inspiring well-known food producers, packaging manufacturers and supermarkets, such as Edeka in Germany, Swedish ICA and M&S in the UK, to adopt the technology currently with CO_2. It is here that blue laser is creating its own niche in a power range in which CO_2 lasers do not excel, and attracting interest from a wide range of potential customers. Using the power of pure light, "natural branding" offers flexible and environmentally sustainable solutions for personalizing organic produce with a company brand or other individualized information. This concept is quickly gaining popularity as a safe, damage-free way to apply a logo or other marking to fresh fruits, vegetables, eggs, or nuts.



ENERGY SAVING

High-definition blue laser can be used in a cold marking process to remove or change the pigment on the outer skin of the food item. Impressively, the energy required for marking the produce is less than 1% of the energy needed to make a conventional sticker and CO_2 emissions for a laser mark are less than 0.2 percent compared to a sticker of a comparable size. Precision positioning and focused spot accuracy mean the beam can be adapted to the shape of the produce without the heat and fumes other lasers would create. With no damage to the produce, premature decay or contamination, there is no compromising on freshness, flavour, taste, aroma, or shelf life.

Organic produce processors implementing blue laser technology to minimise or even completely eliminate the need for external packaging or labels can significantly cut their carbon waste. And permanent marking has the added advantage of easy product traceability. Doing away with excess plastic, paper, cellophane or trays is also good news for consumers wanting to reduce their own carbon footprint.

Sources: Nasdaq.com, Optics&Photonics (osa-opn.org), RAYLASE GmbH, Lyocon.com, The Guardian Sustainable Business.

The ideal combination to save time and money

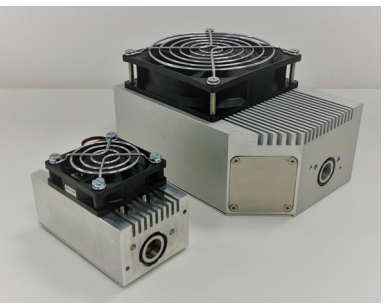
RAYLASE RL-III-10 AND LYOCON IRYS 6-11W

Together, Lyocon's IRYS 6-11W and RAYLASE's RL-III-10 create one of the first blue laser marking systems to be used with a scanning app for applications such as marking and laser soldering. Working in partnership, they offer high speed, very-high precision systems for a variety of possible applications across diverse market sectors. Because absorption of the materials typically used for the mentioned applications is much higher, the power of blue technology is more than enough when compared to 10, 30 or 50W CO_2 systems. This is exactly where the innovation lies – in being able to use much less power to obtain the same results (possibly even faster) with lower power consumption and considerably less space.

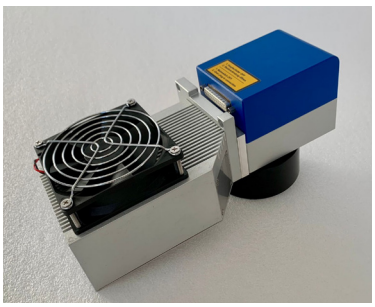
The IRYS 6-11W direct diode laser marking system is a high-speed blue 450 nm laser galvo marking system that can hold its own when compared to a state-of-the-art 30 / 50W CO_2 marking system. Thanks to its extremely compact size, it is much easier to integrate into an existing production line than the equivalent CO_2 laser. Beam delivery is provided with the RAYLASE RL-III-10 scanning head focused by an F-theta lens.

The new RAYLASE RL-III-10 scanner is a robust, compact and lightweight 2-axis deflection unit offering very high writing and positioning speeds at an excellent price-performance ratio. With mirror coating of 99.9 % reflectivity tailormade for Lyocon's IRYS 6-11W laser and extremely small spot diameters, it can perform marking tasks on the fly (MOTF) with low noise and drift values, while maintaining a good working distance from the workpiece.

RL-III-10



IRYS 6+11W



IRYS 11W+RL

Your benefits

- Simple, effective and precise
- Compact size
- Fast marking results
- High focusability
- Flexible positioning over workpiece
- Low thermal stress and reduced collateral damage

LOWER POWER LASER FOR HIGHER PRODUCTIVITY

Compared to CO_2 solutions in similar applications, 450 nm blue laser technology is more suitable for entry level product marking, cutting, and soldering. This lower power, low-cost solution guarantees good-quality, high precision results. And with an extremely compact size and long lifetime, the blue laser represents a low-risk, easy-to-install investment. That's a small step to big innovation.

A european partnership

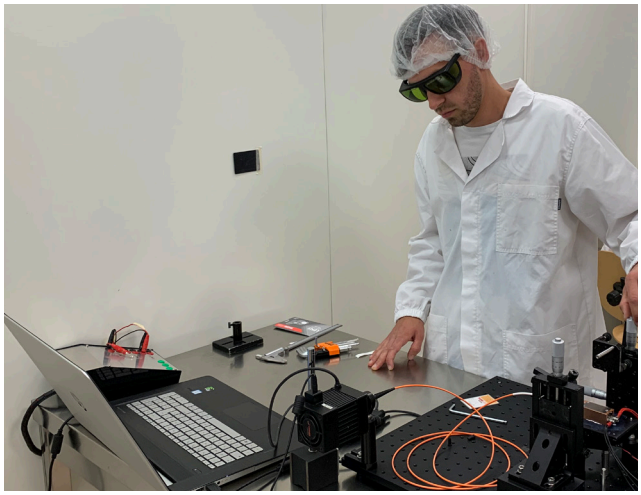
RAYLASE GMBH AND LYOCON LASER SOLUTIONS & CONSULTING

RAYLASE GmbH is partnering with Italian laser specialists Lyocon to offer one of the first blue laser systems with a scanning head designed to replace CO_2 lasers in an array of applications.

Founded in 2014, Lyocon was the first company to focus on innovative blue laser technology in this power range and for the applications described. The company's founders, Paola Zanzola and Alessandra Sala, bring 18 years of experience in the laser market, mainly focused on marking and soldering. Today, the company focuses on design, development and production of custom lasers and related systems.

Their blue laser products for galvo and plotter marking systems find use in multiple applications from textile marking and cutting, to marking on organic materials, labelling and security marking for packaging and pharma, to very high-speed traceability marking and soldering of PCB components.

Providing custom-made laser systems backed by solid technical expertise and patented technology, their mission is to partner with their customers in creative projects from prototype to test to production. RAYLASE's scanning solutions are perfectly matched to the Lyocon laser suite. *"RAYLASE is well-known and respected on the global market. Our collaboration with them is key for presenting the benefits and versatility of blue technology to a wider target audience"* concludes Lyocon CEO Paola Zanzola.



Headquaters:
RAYLASE GmbH
Wessling, Germany
+49 8153 9999 699
info@raylase.de

Sources: Nasdaq.com, Optics&Photonics (osa-opn.org), RAYLASE GmbH, Lyocon.com, The Guardian Sustainable Business.