PHOTONICS NEWS

LASER COMPONENTS USA, Inc. Magazine #37 ▪ 01|17 laser-components.com

Editorial

LASER COMPONENTS GmbH (LCG) is celebrating 30 years of laser optics production. When LCG entered the laser market by producing high damage thresholds laser optics, lasers were rapidly penetrating medical use in many surgical specialties.

The First Medical Laser. A laser was first used in medicine in 1961: At the Columbia Presbyterian Medical Center in Manhattan, Dr. Charles J. Campbell, et al., used a ruby laser to destroy a tumor on a patient's retina [1].
The ruby laser was also used by Dr. Leon Goldman, who published studies on the effect of laser beams on the skin in 1963 [2] and used the beam to remove tattoos. He began his research in 1960 and is considered the "Father of Laser Medicine in the United States".

Medical Lasers Today. Modern laser applications are numerous with fantastic capabilities. For example, optogenetics involves the use of light to control cells in living tissue, typically neurons, with the potential to treat disorders like addiction, Parkinson's disease, depression and cancer. Or to name a few others: laser-assisted drug delivery through skin, fiber lasers at various wavelengths for femtosecond micromachining of hard and soft tissues, laser spectroscopic techniques like fluorescence or Raman for cancer detection and imaging. But that's not all. Lasers for bio stimulation, triggering growth and pain control are moving to clinical proof, paving the way for more innovations.

Lasers have changed over the years to meet physician and patient treatment demands. In this edition of Photonics News, three industry experts share their experience on material processing of medical components, the effect of laser radiation on tissue, eye surgery and laser light in tattoo removal.

And don't miss our product release overview for SPIE Photonics West, at the end. The leading event on photonics promises to become the highlight of the year with the release of QuickSwitch® Pulsed Laser Diodes having pulse duration of 2.5ns, 1.41 higher D* for pyroelectric detectors, advances in extended InGaAs detectors, custom patterned polarizers, improved 808nm fiber-coupled diode lasers, specialized laser diode drivers, extended portfolio of FLEXPOINT® laser modules, and many more.

If you wish to make an appointment at the show,
contact us at info@laser-components.com

Hope to see you on one of our shows

Gary B. Hayes

Gary Hayes
CEO/General Manager

Content

Imprint

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[1] Lasers in Ophthalmology: Basic, Diagnostic, and Surgical Aspects; 2003, Kugler Publications, S. 115
[2] Goldman L, Blaney DJ, Kindel DJ, et al (1963) Effect of the laser beam on the skin: Preliminary report. J Invest Dermatol 40:121-122

Lasers in Medical Technology

The first laser dates back to 1960. Almost sixty years later, it has become a tool used in many areas. The new light sources were not originally developed for medical technology. Medical scientists were much more interested in their radiation properties and then began researching possible application fields in medicine. On the one hand, lasers make surgical interventions possible that would never have been possible before; on the other hand, they are used in the production of medical products.

BRIGHT PROSPECTS

Production of Medical Components with Lasers

Cutting, Welding, Drilling, Marking: Laser Technology Guarantees the Highest Precision

Christoffer Riemer, MeKo
Laser beam Material Processing

The production of medical components using lasers requires the application of different laser technology: laser cutting, drilling, welding, and marking – individually or combined together.
Lasers are particularly precise when it comes to cutting; in fact, it is possible to achieve cuts and holes at a size of 2 µm and up – at a precision in the µm range. As a comparison, a single hair is approximately 60 µm thick. New developments, such as ultrashort pulse (USP) lasers, make this possible. The pulse duration of USP lasers is just in the picosecond to femtosecond time domain.

The advantages of laser cutting in medical technology are manifold. In addition to high-precision micro-processing – which makes the production of many small components possible and feasible – lasers produce clean and almost perfect cutting edges. They provide high flexibility when cutting various shapes and objects. For the most part, they do not require the creation of tools; therefore, they are predestined for rapid prototyping.

The objects are cut from either flat material or tubes. The latter has the advantage that it is possible to create a three-dimensional object by applying a rotational axis during two-dimensional processing. This process is applied in particular when manufacturing stents and cardiac valve frames. Other typical components include parts for minimally invasive surgery, stone extraction baskets, bone saws, orthopedic devices, and several implants.

Stent-manufacturing with laser

Stents are one of the most commonly used medical implants. They consist of a wireframe in the shape of a small tube and are used to alleviate vascular constriction and prevent the re-narrowing of the blood vessels. The stents are expanded in the arteries using a balloon, or they unfold on their own. They can be equipped with a medicated coating.

Christoffer Riemer is the head of marketing at MeKo. MeKo is one of the largest manufacturers of components for medical devices worldwide. As early as 1995, MeKo was one of the pioneers of stent production. Its R&D department developed RESOLOY®, which is a unique magnesium alloy for the production of absorbable stents.

MeKo is certified according to ISO 9001 and ISO 13485 and has manufactured more than 70,000 different components. ■ www.MeKo.de

Important material characteristics include biocompatibility, application safety, visibility during X-ray, mechanical properties for expansion and, if necessary, the degradation of absorbable stents.

There are many different stent designs available, which determine flexibility and stability (e.g., different stent's dimensions and the thickness of the struts). The stent struts can be cut precisely using a laser to within just a few µm.

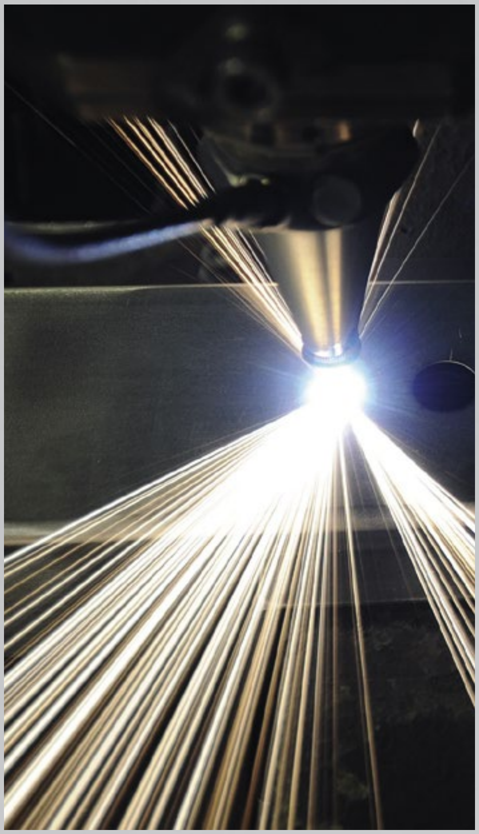
Materials of medical components

Very different materials can be used in the production of medical components. In addition to stainless steel and cobalt chrome alloys, NiTi is a popular material.
This shape-memory alloy is made of nickel and titanium and is extremely elastic.

Due to its high elasticity, NiTi stents are primarily used where vessels are particularly vulnerable (e.g., in the legs).

A view in the future

The focus of current developments is on biologically absorbable stents made of polymers (PLLA, …) or magnesium. The aim is the recovery of the flexibility of the vessel after degradation has begun. This should help prevent infection, delayed thromboses, and recurrent vascular constriction, as well as provide an increase in acceptance by patients. The degradation of the stents occurs within just a few months and can be affected by the selection of material and coatings. ■



Photos: © MeKo

The Effect of Laser Radiation on Tissue

Dr. Karl Stock from ILM at the University of Ulm. If you want to describe the biological and physical effect of light on tissue, you must first understand light dispersion in tissue to consequently understand the different interactions between light and tissue.

Light Dispersion in Tissue

The majority of light that meets tissue is reflected, transmitted, scattered, or absorbed. If light is absorbed, the absorbed light energy is either transmitted in the form of heat, fluorescence, or phosphorescence. Depending on the wavelength of the incoming light and the tissue type, the aforementioned effects occur in different amounts.

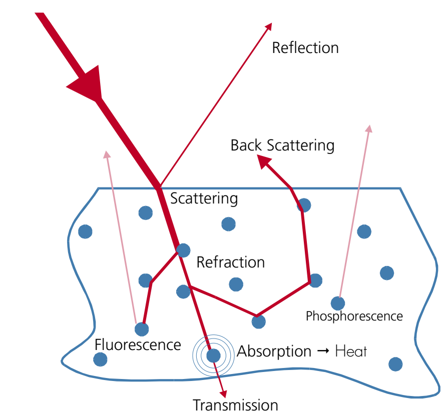


Fig. 1: Light Propagation in Tissue

The **percentage of reflected light** largely depends on the refractive difference between air and tissue, as well as on the angle of incidence. Light that penetrates tissue is either absorbed or scattered by microscopic structures such as, for example, cell components.

This **scattering** is responsible, for example, for the fact that a laser beam cannot be focused as needed in the tissue but rather that the spot diameter increases in size.

Absorption is the crucial mechanism in being able to use the applied laser energy in therapeutics. The probability at which radiated light is absorbed is described by the absorption coefficient μa. The reciprocal of μa is the mean free path that a photon travels in the tissue until it is absorbed. [1].

Important absorbers in tissue include:

- In the UV range: Peptide bonds and nucleic acids
- In the VIS range: Bilirubin, carotene, melamine, and hemoglobin
- In the IR range: Water and hydroxyl apatite

As the blue curve shows in Fig. 2, the absorption in water in the infrared spectral range is particularly high (a depth of penetration of only 1 μm at a wavelength of 3 μm).

This is why the 2.94 μm Er:YAG laser and the 10.6 μm CO_2 laser are particularly well suited for cutting and removing soft tissue as it consists largely of water.

Interaction of Light with Tissue

The characteristics of the tissue and the radiation parameters (wavelength, intensity, pulse energy, duration of radiation) lead to different effects:

Low Power Lasers

In low power lasers, **fluorescence**, for one, can be used to diagnose bladder tumors, for example. For another, **photochemical processes** are used in low-level laser therapy (LLLT) and photodynamic therapy (e.g., in combination with methylene blue to kill bacteria).

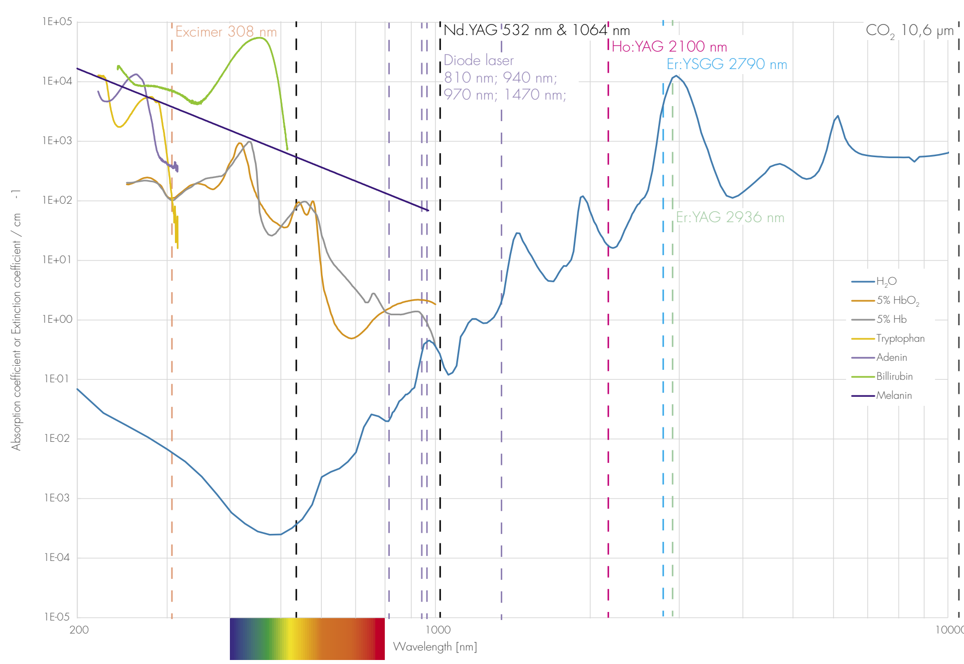


Fig. 2: Wavelength dependent absorption coefficients (water, blood, melanin) or molar extinction coefficients (tryptophan, bilirubin, adenine) of biological tissue components

[1] Lasertherapie der Haut, S. 26, R. Steiner, Springer-Verlag Berlin Heidelberg, 2013 [Laser Therapy of the Skin, p. 26, R. Steiner, Springer Publishing House Berlin Heidelberg, 2013]

Higher Power Lasers

In higher power lasers, **thermal effects** play an increasingly important role. In thermotherapy, the tissue does not sustain thermal damage. At approx. 60°C, the tissue coagulates (e.g., during ablation of the blood vessels) and at approx. 300°C the tissue **vaporizes** (which is referred to as so-called tissue vaporization). The latter is the effect used, for example, in surgery to cut soft tissue with a CO_2 laser or diode lasers.

Lasers and Their Mechanisms

High-Power Pulsed Lasers

One particularly efficient type of tissue ablation is **thermomechanical ablation**, which is used in connection with pulsed lasers with high absorption in water. The high absorption and high power of the laser pulse causes the tissue to heat up suddenly. At approx. 100°C, the water vaporizes and the tissue rapidly increases in pressure, which can cause explosive tissue ablation. Due to fast and efficient ablation, the thermal damage of the tissue is significantly lower than with vaporization. In hard tissue, bones, teeth, and bladder and kidney stones, efficient and precise ablation can also be achieved, especially with Er:YAG lasers (see Fig. 3).

Excimer Lasers

Excimer lasers are used in the UV range with short pulses and high intensity. Thus, not only the absorption in tissue but also the energy of the single photon is so high that ablation occurs with single atoms. This **photoablation** is used in particular in ophthalmology to correct corneal curvature.

Ultra-short Pulsed Lasers

In **photo-disruption**, the atoms in focus are ionized with ultra-short pulsed lasers in the nano, pico, or even the femtosecond range. This produces micro-plasma that can expand extremely fast and create an acoustic shock wave. This shock wave leads, for example in LASIK surgery, to high-precision ablation that is also used to correct ametropia. In deeper tissue, plasma and the pigments in tattoos, for example, can also be destroyed. ■

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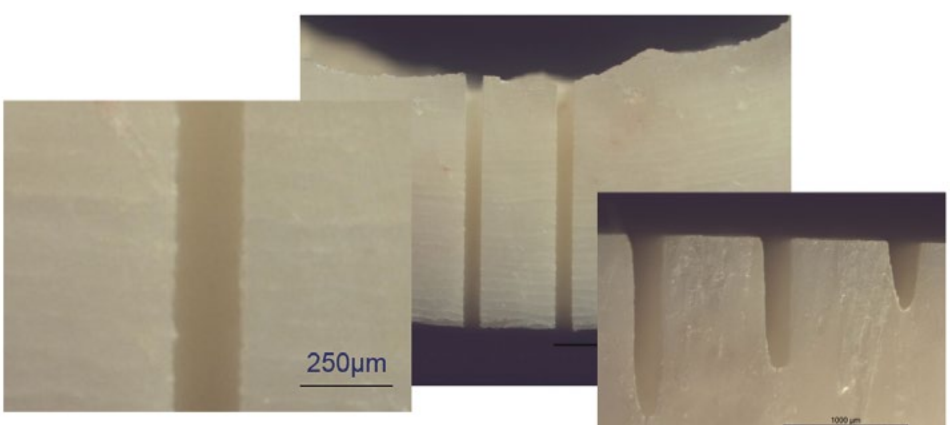
Karl Stock, a doctor of human biology who also studied engineering, is the associate director of the Institute of Laser Technology in Medicine and Measurement Technology (ILM) at the University of Ulm and head of the equipment development workgroup. This workgroup primarily develops units and applicators for medical and dental applications – most often for industrial partners, such as, for example, laser methods for surgical and diagnostic applications, including those in the specialist areas of otorhinolaryngology (ENT medicine), urology, general surgery, and ophthalmology.



© Karl Stock, ILM ULM

Fig. 3:
High-precision bone sections with diode-pumped Er:YAG laser (Institute of Laser Technology, Ulm, Germany)

Eye Surgery Using Excimer and Femtosecond Lasers

Just a Few Hours After Surgery, Patients Have Enhanced Vision Again.

For the majority of people, vision is natural. Many consider the eye the most important sensory organ. If it does not function the way it should, we find it extremely limiting: it is necessary to find a remedy. The options are phenomenal, and intelligent technologies achieve – to some extent – the unimaginable. It seems almost "normal" to undergo laser eye surgery to eliminate the need to wear glasses. In fact, so-called laser in situ keratomileusis (LASIK) surgery was introduced more than 20 years ago. Excimer lasers have been used since then in operations to correct defective vision.

Image Formation in the Eyes

Christopher Scheiner (1575–1650) was the first person to explain the correct accommodation ability of the human eye [1] and prove image formation on the backside of the eyeball. This knowledge is the foundation of operative repair of defective vision.

Defined simply: The eye's imaging system consists of the cornea and a lens system composed of the anterior chamber, eye lens, and vitreous body. The corneal system has a larger refractive effect than the lens system [2]. The lens is shapeable in its entirety via the ring muscle. This allows near and far objects to be imaged sharply on the retina – a characteristic that deteriorates with increasing age. For better comprehension, the eye can be displayed as a thin positive lens [3].

Defective Vision

The most common forms of defective vision that can be corrected with laser surgery include corneal curvature, myopia, and hyperopia. The latter two forms are based on a non-ideal formation of the eyeball, which means that distant objects are imaged before or after the retina.

In nearsightedness, the axial direction of the eye is too long; the focal point of distant objects is in front of the retina. Myopic patients can see well at short distances.
In farsighted patients, the retina is too far forward; however, the ciliary muscle can compensate this defect – in part even up to 2.5 dpt [4].

Laser Method

In ophthalmology, lasers are used to burn, cut, or remove objects. The goal of treatment in refractive surgery is the ablation of the eye cornea in order to achieve optimal refractive power. Many different methods are available on the market that work with femtosecond lasers and/or excimer lasers. The femto-LASIK method, which was first approved in the U.S.A. in 2001, is particularly popular [5].

Femto LASIK Method

Two different laser technologies are applied consecutively in this method of treatment. A femtosecond laser cuts the outer layer of the cornea, which is opened up as a flap for subsequent treatment. The excimer laser is then used to correct defective vision in one of the deeper layers of the cornea. The open flap is then closed to allow the wound to self-seal in a final step and reattach in a matter of a few hours [2].

Know-how

The excimer laser vaporizes the corneal tissue to be removed via photoablation. Myopia up to -10 dpt can be treated by vaporizing a round piece of tissue in the center of the cornea. To correct hyperopia up to approximately +3 dpt, the curvature of the central cornea is intensified and the refractive power of the cornea increased by ablating the edge of the cornea [6]. Quick ablation is advantageous.

In high-end systems, the 193 nm excimer lasers achieve repetition rates of 1050 Hz: thus, the duration of ablation decreases to 1.3 seconds per diopter [7]. The eye can move even in this short period of time; thus, the quality of eye tracking during treatment can have a significant effect on the outcome. We will introduce this system from the technology leader on the following pages. ■

Laser Modules in Ophthalmology

Before the excimer laser can be used in refractive surgery, the entire system must be individually adjusted to the patient. Laser modules provide support in very different tasks:

cross-hair lasers aid, for example, in the positioning of patients along the x and y axes. Also, the working height is determined via a laser module. Prior to actual surgery, the patient fixates the blinking light of the dot laser. Similar to laser material processing, a pilot laser displays the working point of the invisible laser radiation of the excimer laser.

All auxiliary lasers radiate directly into the human eye; therefore, in order to prevent damage to the eye, the laser modules used must guarantee the following:

- Multiple safety measures: The output power is a preset value that must be guaranteed and may never be exceeded. The sum of the output of all of the auxiliary laser modules may not exceed the restrictions of laser class 1.
- Power setting: The setting of very low output power in the µW range must be possible.
- Traceability: All components must be traceable without any gaps.
- Outgoing goods inspection: A complete outgoing goods inspection of all components must be ensured.

At LASER COMPONENTS, we fulfill all requirements and offer FLEXPOINT® laser modules from our sales office in the USA. These modules can be customized. We are equipped to meet the requirements of medical technology with our quality management system certified according to ISO 13485. ■

WEB US37-0074

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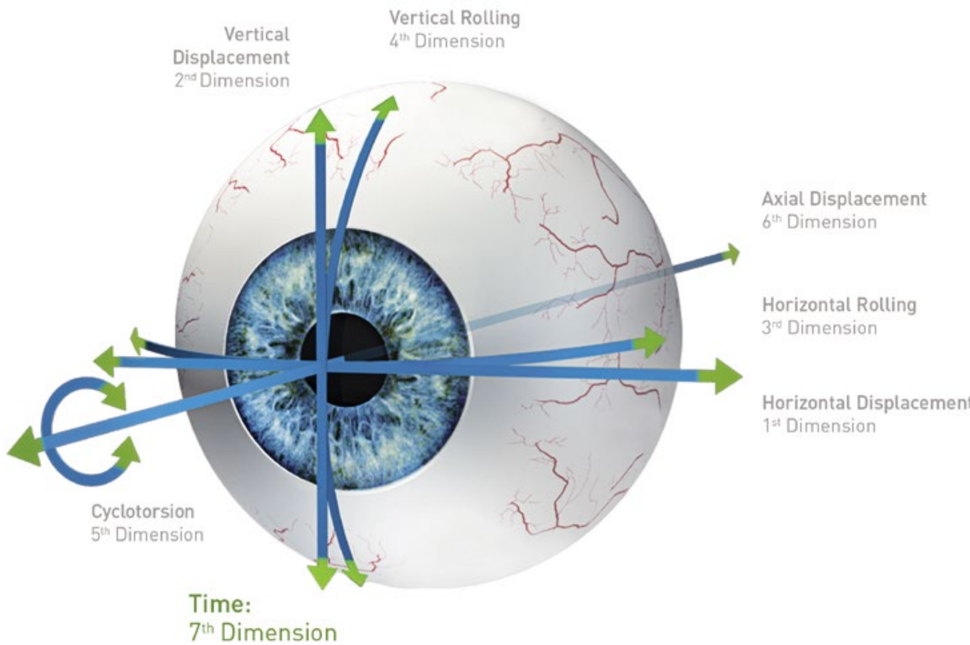
[1] August Heller, die Geschichte der Physik von Astistoteles bis auf die neuste Zeit, Bd. 1, S. 342, Nachdruck der Originalausgabe, Stuttgart 1882
[August Heller, The history of physics from Aristotle to the modern times, vol. 1, p. 342, reprint of the original edition, Stuttgart 1882]
[2] Prof. Dr. med. Thomas Kohnen, Deutsches Ärzteblatt, 29. Feb. 2008
[Prof. Dr. med. Thomas Kohnen, German Medical Association, 29 February 2008]
[3] Pedrotti, Pedrotti, Bausch, Schmidt, Optik - Eine Einführung, Prentice Hall, 1996
[Pedrotti, Pedrotti, Bausch, Schmidt, Optics - An Introduction, Prentice Hall, 1996]
[4] http://www.auge-online.de/Therapie/Operation_von_Sehfehlern/operation_von_sehfehlern.html
[5] www.augen-lasern-vergleich.de/ratgeber/methoden/augenlaser-methoden/femto-lasik/
[6] http://cms.augeninfo.de/hauptmenu/augenheilkunde/sehen-ohne-brille-refraktive-chirurgie/laserverfahren/lasik.html, Okt. 2016
[7] Performance, die bewegt, Die SCHWIND AMARIS® Produktfamilie, Schwind eye-tech-solutions, 2013
[Performance that moves, The SCHWIND AMARIS® product family, Schwind eye-tech-solutions, 2013]

Safety in up to 7 Dimensions

Eye-Tracking in Space and Time

Thomas Magnago, SCHWIND
eye-tech-solutions GmbH & Co. KG



Even when our eyes fixate on a certain point, they still move involuntarily approximately 90 microns per millisecond. For successful refractive treatment, the exact centering and consistent positioning of the eye is, therefore, crucial because this provides perfect results at maximum safety.

Seven Dimensions

Seven-dimensional eye-tracking is a highly-developed method and makes Schwind eye-techsolutions' eye lasers unique, minimizing treatment errors.

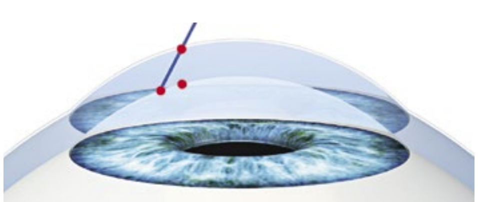
In addition to linear eye movements in the first and second dimension, horizontal and vertical rolling movements in the third and fourth dimension can also be determined and compensated.

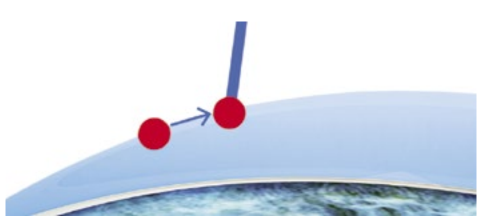
In the fifth dimension, the eye-tracker compensates torsional differences between the sitting and lying position of the patient, as well as rotating movements of the eye during laser treatment.

The sixth dimension is defined as the z-axis. Here, eye movements originate by upward and downward movements of the head or eyes. The repositioned laser pulses that result from positioning errors along the z-axis are shown in the figure below.

The seventh dimension relates to time. Latency-free tracking provides for the compensation of eye movements that occur in the timeframe from the recording of the eye through the eye-tracker camera to the firing of the subsequent laser pulses. The eye-tracker carries out a movement analysis based on previous eye positions. It calculates where the corneal target position will be for all six positions at the time of the subsequent consecutive pulses. The laser system knows exactly at which point in time and at what position the laser pulses will be released.

The result is ablation without latency time: the perfect combination of speed and precision. ■





Thomas Magnago is head of customer support at SCHWIND eye-tech-solutions GmbH & Co.KG. This medium-sized, family-run company with more than 100 employees is the world's technology leader in the area of excimer laser systems for the treatment of ametropia and corneal diseases.

Turn on the Spot for Flawless Beauty

Laser Light Is Used to Destroy Color Pigments during Tattoo Removal

The history of "tattooing" goes back several thousand years; in fact, even Ötzi the glacier mummy had a marking made with ash under his skin [1]. For many years, tattoos were considered an irreversible skin pigmentation; however, special laser technology now makes it possible to remove tattoos. This technology is in increasing demand.
Currently, laser treatment is the most efficient method; it is clean, safe, and almost painless. In most cases, up to fifteen sessions are necessary to remove the tattoo. However, success cannot be guaranteed because residue could remain visible.
The effect of laser therapy varies depending on the type of tattoo: in particular, it depends on the colors used, the density of the pigments, and the depth of pigmentation. During removal, a "selective photothermolysis" mechanism is used. [2]

Selective Photothermolysis

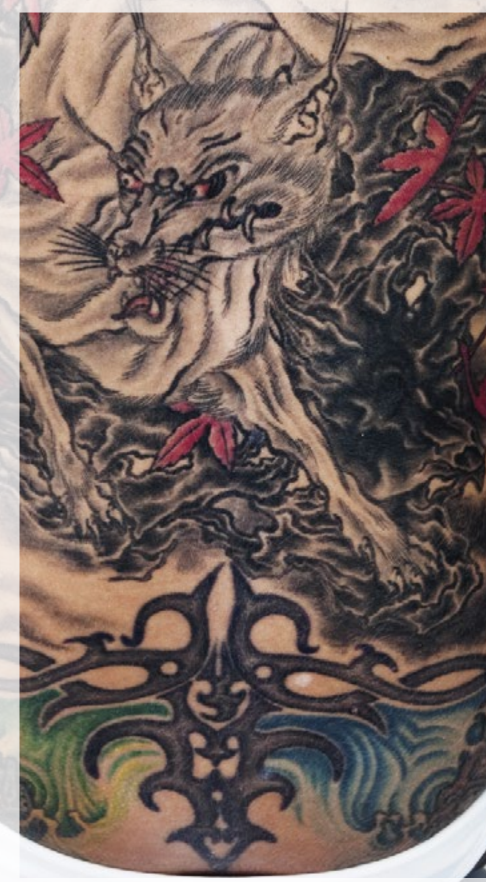
During this process, the target structure is selectively destroyed without significantly damaging the surrounding tissue or epidermis. This destruction is carried out by emitting a short laser pulse that results in the heating of the absorbing target structure [3].

Simply put, absorption in color pigments is much higher than in the surrounding tissue: the high-energy density of the laser light destroys the color pigment, and the remaining pieces are absorbed by "scavenger cells" and removed by the lymph system.

This also explains why tattoos created by novices can often be removed more easily: To ensure that a tattoo has an intense color, professional tattoos often have a higher pigment density and are injected more deeply. In order to destroy all of the structures, more treatments are necessary. Dark colors can also be removed more easily due to the absorption behavior. With color tattoos and bright tattoos, removal is significantly more problematic.

Laser Types

Certain demands are placed on the lasers used: Light must be emitted in very short pulses, and the wavelength must be selected according to the absorption behavior of color pigments.



For successful photothermolysis, pulsed and Q-switched lasers are necessary: Q-switched ruby and Nd:YAG lasers or alexandrite lasers are widespread [4].

Ruby lasers: The Q-switched 694 nm ruby laser has a pulse duration of 40 ns. Its radiation is particularly well suited for the removal of dark tattoos (black, blue, green). Through low absorption into blood and water during treatment with a ruby laser, undesired side effects in blood vessels or other tissue are practically nonexistent. The ruby laser is also used for the removal of benign pigments [5].

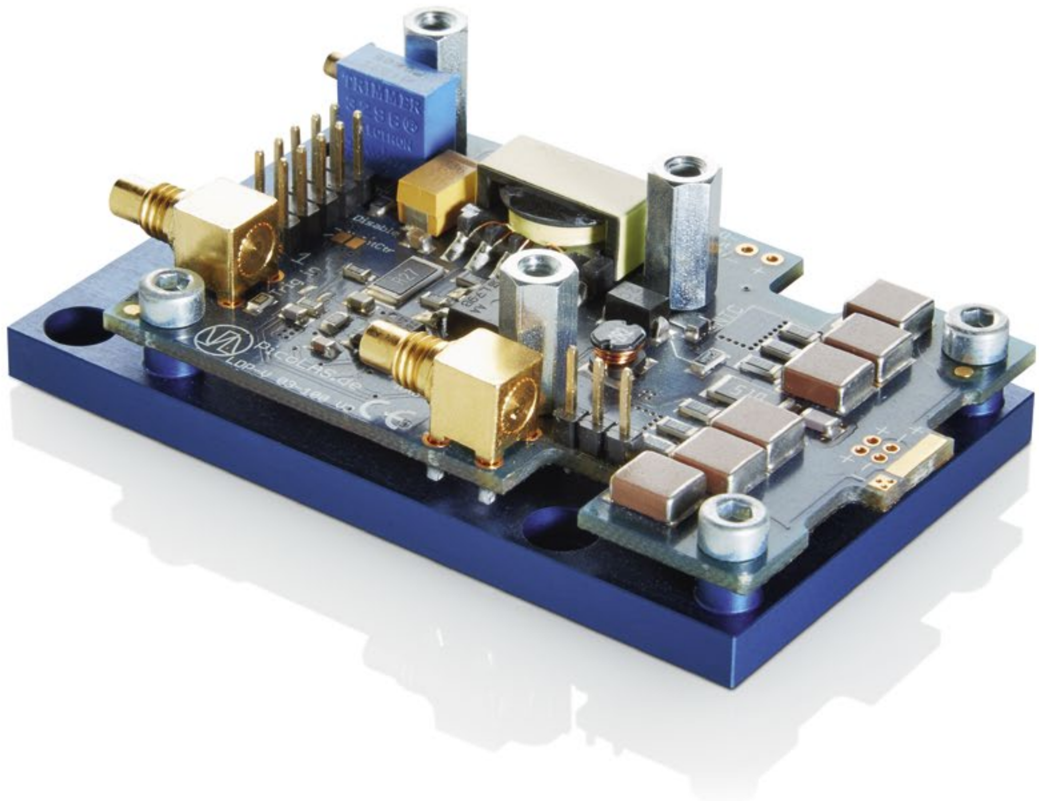
Nd:YAG lasers: The use of two different wavelengths (1,064 nm and 532 nm) in Q-switched Nd:YAG lasers increases the variability of the system. With a pulse length of 8 ns, Nd:YAG lasers of the wavelength 1,064 nm affect black and blue tattoos. By inserting a frequency-doubling crystal, the wavelength is reduced by half to 532 nm to destroy red color pigments. Moreover, this wavelength can also be mixed with a dye to produce the wavelength 585 nm (dye laser). This allows the effective removal of light-blue tattoos [5].

Dermatological Laser Systems

Laser systems (e.g., the TattooStar Effect COMBO from Asclepion Laser Technologies) combine different Q-switched lasers with up to four wavelengths to also remove color tattoos. ■

[1] Ötzi Mumie, Südtiroler Archäologiemuseum, Bozen. www.iceman.it/de/mumie/#Tätowierungen; (Abruf: 19.10.2016) [Ötzi Mumie, South Tyrolean Archeology Museum, Bolzano. Www.iceman.it/en/mumie/#Treatments; (Retrieval: October 19, 2016)]
[2] M. Landthaler & U. Hohenleuter; Laseranwendungen in der Deramatologie; Deutsches Ärzteblatt 95(6), 1998 - www.aerzteblatt.de/pdf.asp?id=9351(Abruf: 18.10.2016)
[M. Landthaler & U. Hohenleuter; Laser applications in dermatology; German Medical Association 95 (6), 1998 - www.aerzteblatt.de/pdf.asp?id=9351(Retrieval: 18.10.2016)]
[3] Kastenbauer, Ernst R. et al; Ästhetische und Plastische Chirurgie an Nase, Gesicht, Ohrmuschel; Georg Thieme Verlag 2005; Seite 287 ff. [Kastenbauer, Ernst R. et al; Aesthetic and plastic surgery on the nose, face, auricle; Georg Thieme Publishing House 2005; Page 287]
[4] Wolf-Ingo Worret & Christian Raulin; Entfernung von Tätowierungen, Behandlung mit Nanosekundenlasern; ästehetische dermatologie; 01.2016; www.laserklinik.de/fileadmin/user_upload/laserklinik/pub/Tattooentfernung_worret_raulin.pdf (Abruf 10.10.2016)
[Wolf-Ingo Worret & Christian Raulin; Removal of tattoos, treatment with nanosecond lasers; Aesthetic dermatology; 01.2016; www.laserklinik.de/fileadmin/user_upload/laserklinik/pub/Tattooentfernung_worret_raulin.pdf (call 10.10.2016)]
[5] Asclepion Laser Technologies; TattooStar Familie; 2015; http://asclepion.com/wp-content/uploads/2015/09/Brochure_TattooStar_2015-09_DE.pdf (Zugriff: 19.10.2016)
[Asclepion Laser Technologies; Tattoo Star family; 2015; Http://asclepion.com/wp-content/uploads/2015/09/Brochure_TattooStar_2015-09_EN.pdf (Access: October 19, 2016)]

PicoLAS



PicoLAS specializes in designing and manufacturing power supplies for diode lasers, often referred to as a key component. With over 10 years of experience, the company sees many markets and applications, for example, Time-of-Flight measurements, hair removal, sensing applications, laser welding and such.

WEB US37-0071

In the medical market, PicoLAS sees an increase in using high power lasers for skin treatment like hair removal and anti-aging. We asked CEO Dr. Markus Bartram about their solution to overcome some of the most stringent power regulations in this domain.

"Let's talk about hair removal as an example. You typically need a laser of 755 nm or 810 nm wavelength and a driver that delivers several kilowatts power and 5 to 100 ms pulse width (duration). This will generate a fluence (radiant energy) up to 40 J/cm^2 of skin. The idea is to selectively burn the melanin in the hair shaft and damage the follicle, so the hair will not come back.

Typically, the average power consumption of hair removal systems like this is between 500 W and 1.5 kW, but there is one very important issue. Laser systems and power supplies in health care are governmental regulated. Zooming in on the power supply regulations, it cannot exceed leakage current of 500 microamps, for instance.

In principal, operating at the aforementioned power requirements, you would need a 5–6 kW medical approved AC-DC power supply. Today you can only find up to 1.5 kW available on the market. Alternatively, you could add a second power supply, but you would not pass the medical approvals: One AC-DC power supply has already a leakage current of around 400 microamps. Other solutions like DC-DC convertors require a lot of approvals.

At PicoLAS we have found a solution that we have not seen on the market before. We started from a 1 kW medical power supply and added a capacitor of around 50 mF. Packaged together with an intelligent power driver this is not overcharging the main power supply.

We can come up with solutions others cannot, because we have a lot of knowledge of our own drivers and experience from previous successes." ■

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Lumics Has Moved

More Space for Development and Manufacturing

Lumics, manufacturer of fiber-coupled diode lasers, recently announced that it has moved to a new facility. Founded in 2002 and member of the Scansonic group, the company has now the required accomodations to further grow the development and production of chips and modules, and sales of high-power fiber-coupled diode laser modules for medical, industrial, scientific and sensing applications. The new office is still in the Berlin area in Germany. ■

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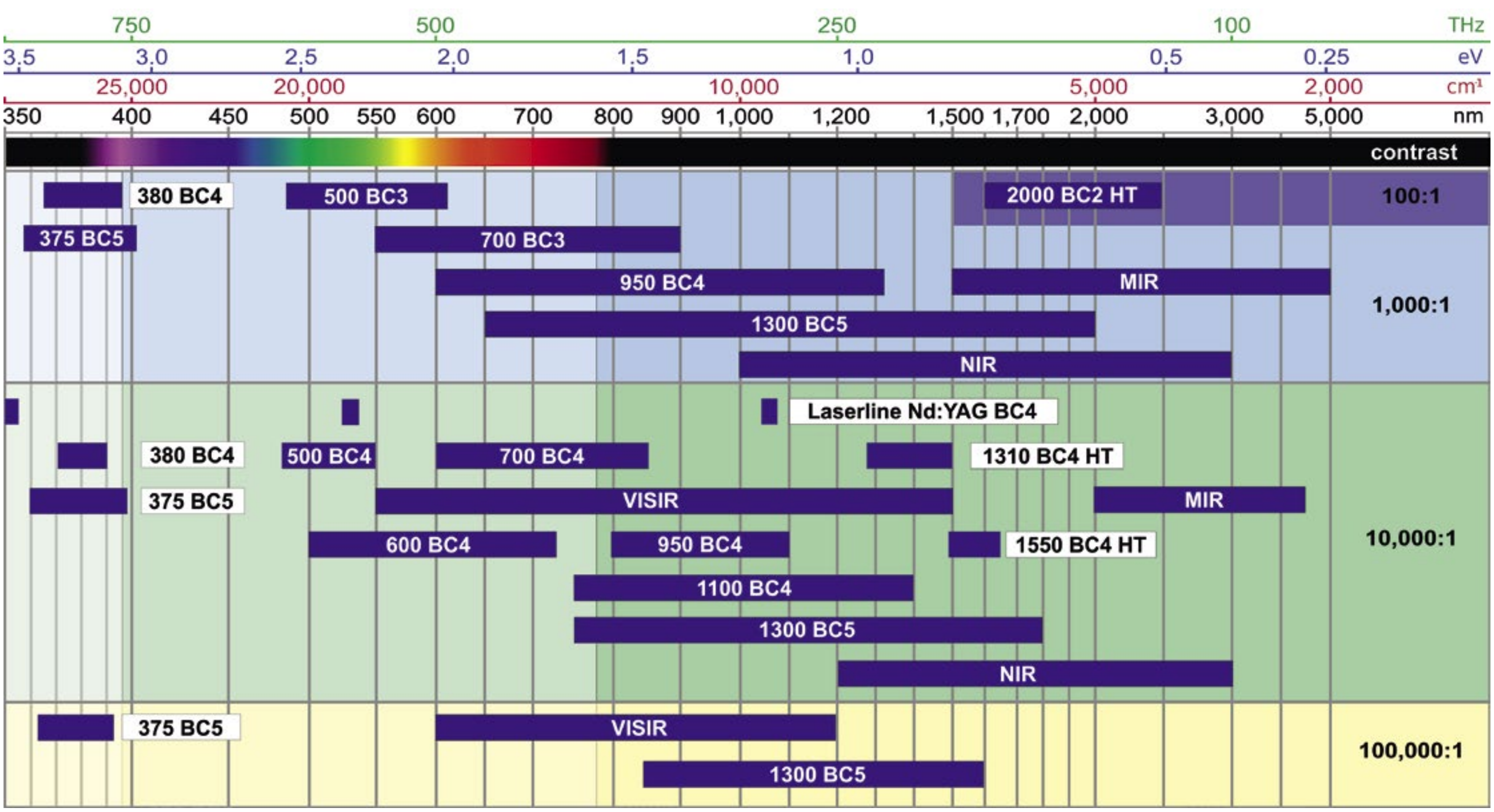

New Products

FLEXPOINT® MV fiber

Laser Module with Superior Beam Shape over Single-mode Fiber

WEB US37-0174

The FLEXPOINT® MV fiber laser module drives machine vision systems to new heights. The single-mode fiber reduces scattered laser light and prevents side modes, which results in precise laser projection in 3D measurements, biophotonics, and medical applications.

The MV fiber achieves outstanding laser beam stability, due to the remote connection between the beam-shaping optics and the active laser part. The thermal drift is reduced to nearly zero, optimizing the performance of the electro-optical system.

The laser module is particularly suited for OEM system integration when a compact design and remote beam delivery are critical factors. The laser part and the optical head can be ordered separately, which offers high flexibility to the customer in designing his laser projection system.

All FLEXPOINT® MV models meet the highest quality standards and can be customized according to the requirements of the application. The MVfiber laser modules are introduced to the market at the wavelengths of 450 nm and 660 nm with an optical power output of up to 50 mW. Standard FC/PC connectors are used.

The optic head can be equipped with different beam profiles, such as homogeneous lines, lines with a Gaussian distribution, dot projections, and more than 60 different DOE optics that produce parallel lines, dot matrices, circles, and the like.

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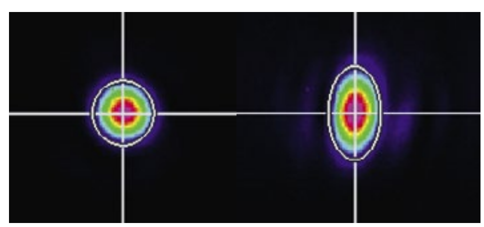
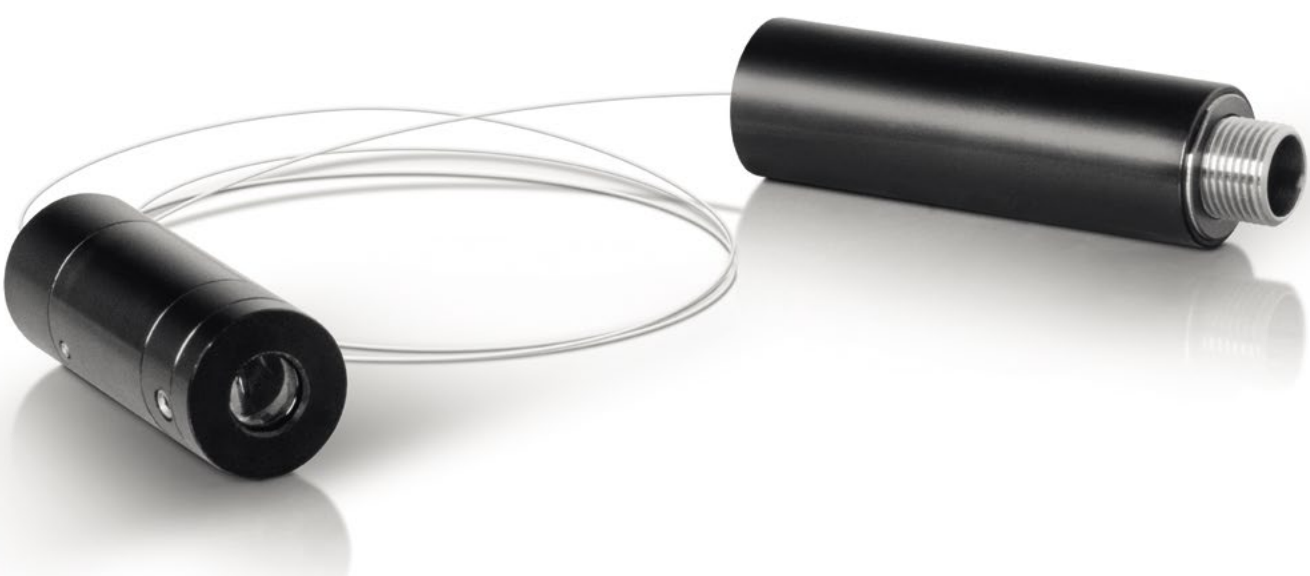


Beamprofile with fiber   Beamprofile without fiber



High-Power Laser Mirrors Reflect Three Wavelengths

Take Advantage of the Cost Benefit of Our New Coating Technology

WEB US37 0001

Laser optics are commonly optimized for a single wavelength. If frequency-multiplying lasers are used, this must also be considered in the selection of beam-guiding components.

LASER COMPONENTS offers so-called triple mirrors in which three wavelengths are reflected. They are used, for example, in Nd:YAG laser systems that emit at the fundamental wavelength 1064 nm (IR) and have harmonic waves at 532 nm (green) and 355 nm (UV).

A new coating makes it possible to apply this complex layer design in one pass, especially in combination with an ion-assisted deposition (IAD) or ion beam sputter (IBS) coating. These ion-supported technologies allow a very exact and reproducible result that exceeds the precision of previous methods.

Old Method – Time-consuming and Costly

Coatings for three wavelengths used to have to be manufactured in two passes: For YAG laser mirrors, for example, a coating for 1064 nm and 532 nm was first applied to the substrate (double mirror) and then, in an additional run, a mirror coating for 355 nm was vapor deposited on top of the first coating.

The production of these mirrors was, therefore, relatively complex.

A similar method was necessary with mirrors that should reflect 1064 nm and 532 nm, as well as a pilot beam at 635 nm, for example. The additional reflection at 635 nm was coated in a first run, and then a second coating was applied for 1064 nm and 532 nm.

New Method – Fast, High Capacity, Attractive Prices

The new method not only results in higher specifications, but it also has the additional advantage of a shorter duration of production, which results from not having to carry out a second coating. Furthermore, the new applied coating unit contains more substrates than before, allowing larger amounts to be produced. This positively affects the unit price.

The new triple laser mirrors are produced for very different wavelength combinations. Let us know your requirements, and we will provide you with a solution. In the example below, you will see the comparison of the calculated (green) and the measured (red) transmission values of an HR 1064+532+355 (AOI 45°, u-pol, uncoated backside) mirror. ■

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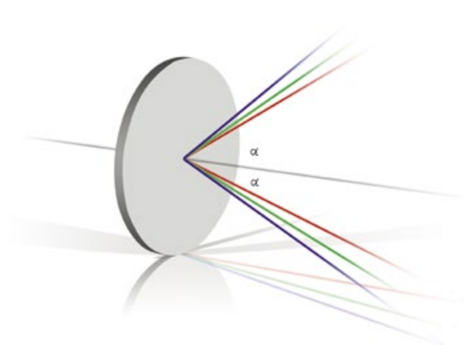

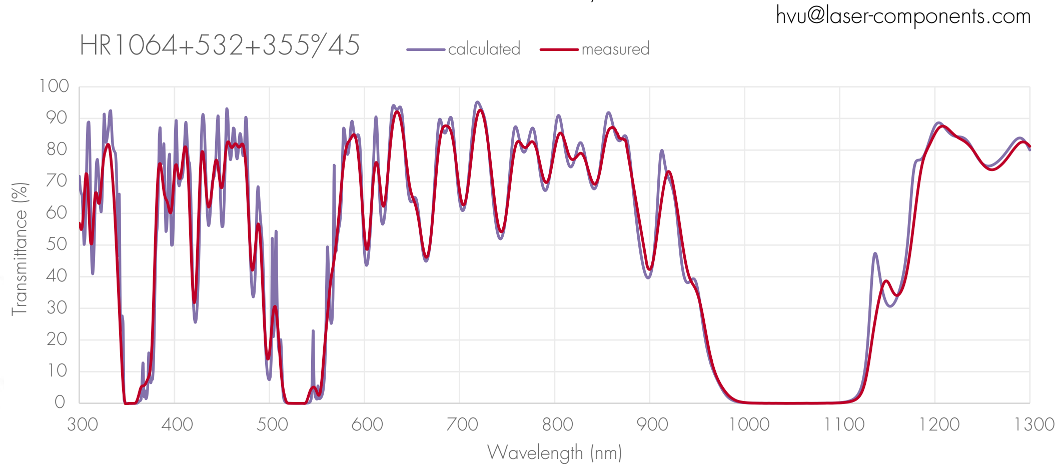

FLEXPOINT® MVstereo – New Laser for 3D Stereo Vision

Pseudo Random Pattern Generator

WEB US37-0274

The FLEXPOINT® MVstereo laser module is a light source that projects a randomly ordered point cloud of 33,000 individual dots for rapid 3D measurement tasks. The laser is initially available in two wavelengths – visible red (660 nm) and infrared (830 nm).

The laser has been particularly designed for 3D stereo vision, a technique which calculates the volume of an object based on the position of dots that are simultaneously captured by two cameras from different angles. The corresponding pixels from each image are then paired during digital image processing. This technique is especially interesting for untextured surfaces of single-color.

The laser output power meets laser classes 1 and 1M.

The inside of MVstereo laser modules contains microprocessor-controlled electronics with a serial interface. The laser can be programmed and data readout via this interface.

OEM version, developed and manufactured according to customer requirements, are available for special applications. ■

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