PHOTONICS NEWS

LASER COMPONENTS USA, Inc. Magazine #43 ▪ 06|19 laser-components.com

Industry 4.0

Transforming Digital Inspection

Smart Sensors

New Products

UPCOMING EVENTS 2019

Sensors Expo

San Jose, CA

June 25–27

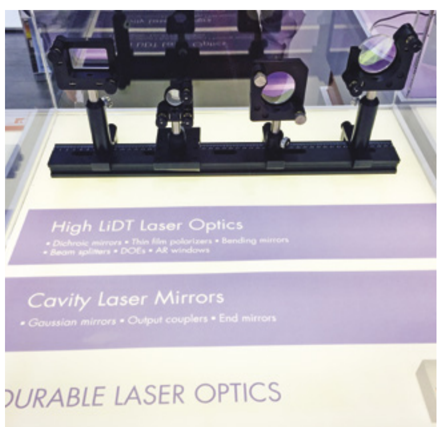
Booth 419

SPIE
Optics + Photonics

San Diego, CA

August 13–15

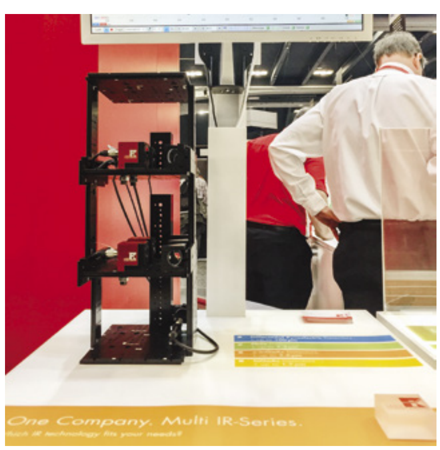
Booth 425



6th WORKshop on Infrared Technologies

Princeton, NJ

October 28–30



Industry 4.0

The Digital Era Is Now

Managing Directors of the LASER COMPONENTS Group visiting the company headquarters for the kick-off event on the occasion of the introduction of a new internal communication platform.

We cannot ignore that industry is transitioning at an increasingly rapid pace. What used to take about a century between two industrial revolutions, is now happening within a decade or even less. Digital capabilities are the driving forces that are leading us into a new age. One with instant fulfillment of changing customer needs and expectations, data transparency, access to more information than the human brain can ever process, and no trade-off between price, efficiency, and innovation.

Companies of the future are preparing today with the implementation of digitization technologies in product development, operation processes, and collaborative corporate structures. At LASER COMPONENTS, we are responding to these transformations with a mixture of long-term investments:

In January, LASER COMPONENTS Canada set a strong signal for the future at the Montreal location by acquiring the previously rented company building. LASER COMPONENTS Detector Group in Arizona is currently planning a new 26,000 ft^2 building in which all detector technologies from LASER COMPONENTS will be developed and manufactured. New premises to design and manufacture optoelectronic modules are currently being inaugurated at the main LASER COMPONENTS GmbH production facility in Olching, Germany making it possible to achieve even higher quality and more efficient processes.

In the area of quality management, we have centralized responsibility among the LASER COMPONENTS companies with the aim of making market demands from the medical technology and automotive industries our standard.

Additionally, our internal corporate communication standards have recently been upgraded to a new digital platform that allows us to better bundle our know-how to complete future developments faster and more cost-effectively.

From an applications perspective, Industry 4.0 is in full swing, so we do not want to hold you any longer. Let's connect and read about how photonics technologies are joining forces in new ways. Brought to you in yet another Photonics News.

Yours,

Gary Hayes
CEO/General Manager, LASER COMPONENTS USA, Inc.

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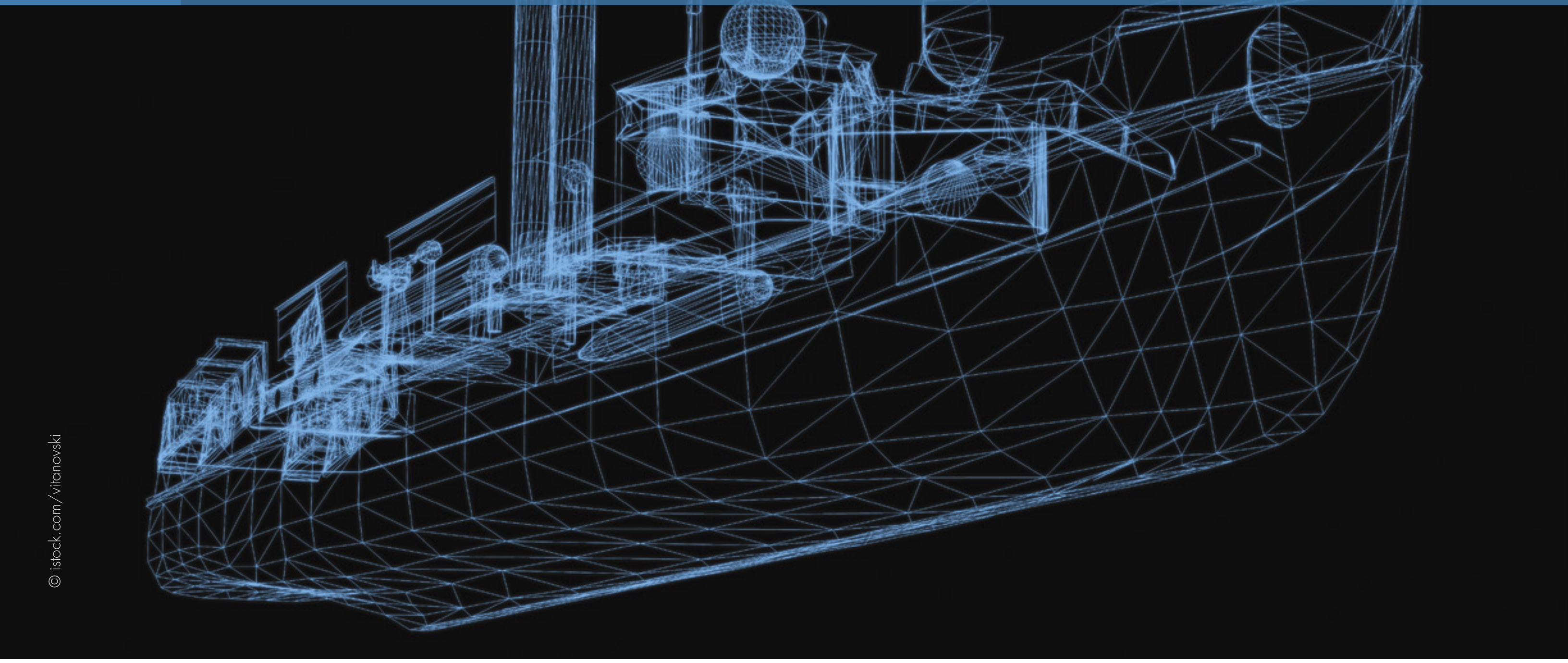

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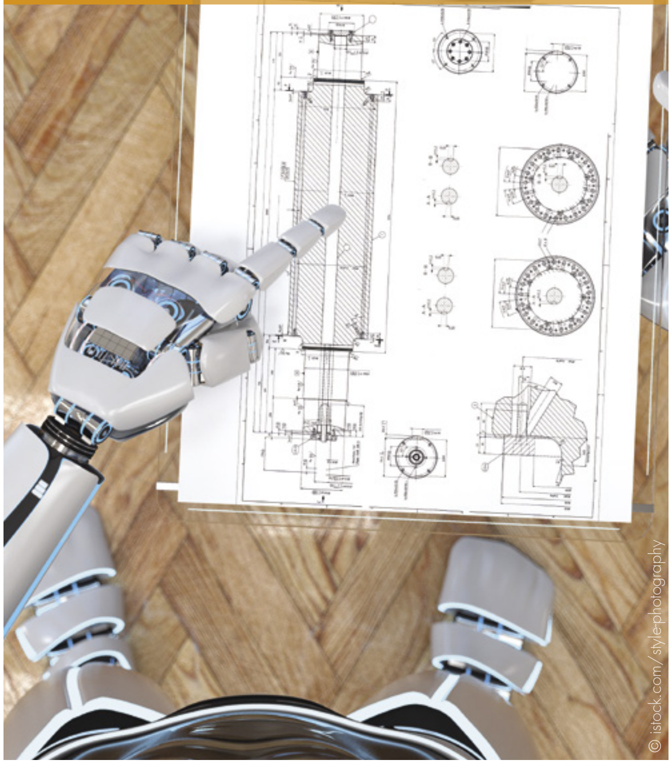

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facilities
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Industrie 4.0

A Vision Becomes Reality

Even today, most people associate the "industrial revolution" with steam engines and smoking chimneys. Of course, we also know that production processes have changed significantly since then because progress cannot be slowed down. For a few years now there has been a new specter in the media: "Industry 4.0." Everyone has heard of it before, and everyone has their own ideas about what's behind it. ➔

Manufacturing processes have been transformed over the past two centuries with the introduction of mechanization, electrification, and automation. Now with decentralized corporate structures, the internet controls the processes on the factory floor. In general, people like to talk about the "fourth industrial revolution" or "Industry 4.0" in which digital technology and manufacturing are coming together. The new concept affects the global value gains: how goods are produced, processes controlled, and organizations operate.

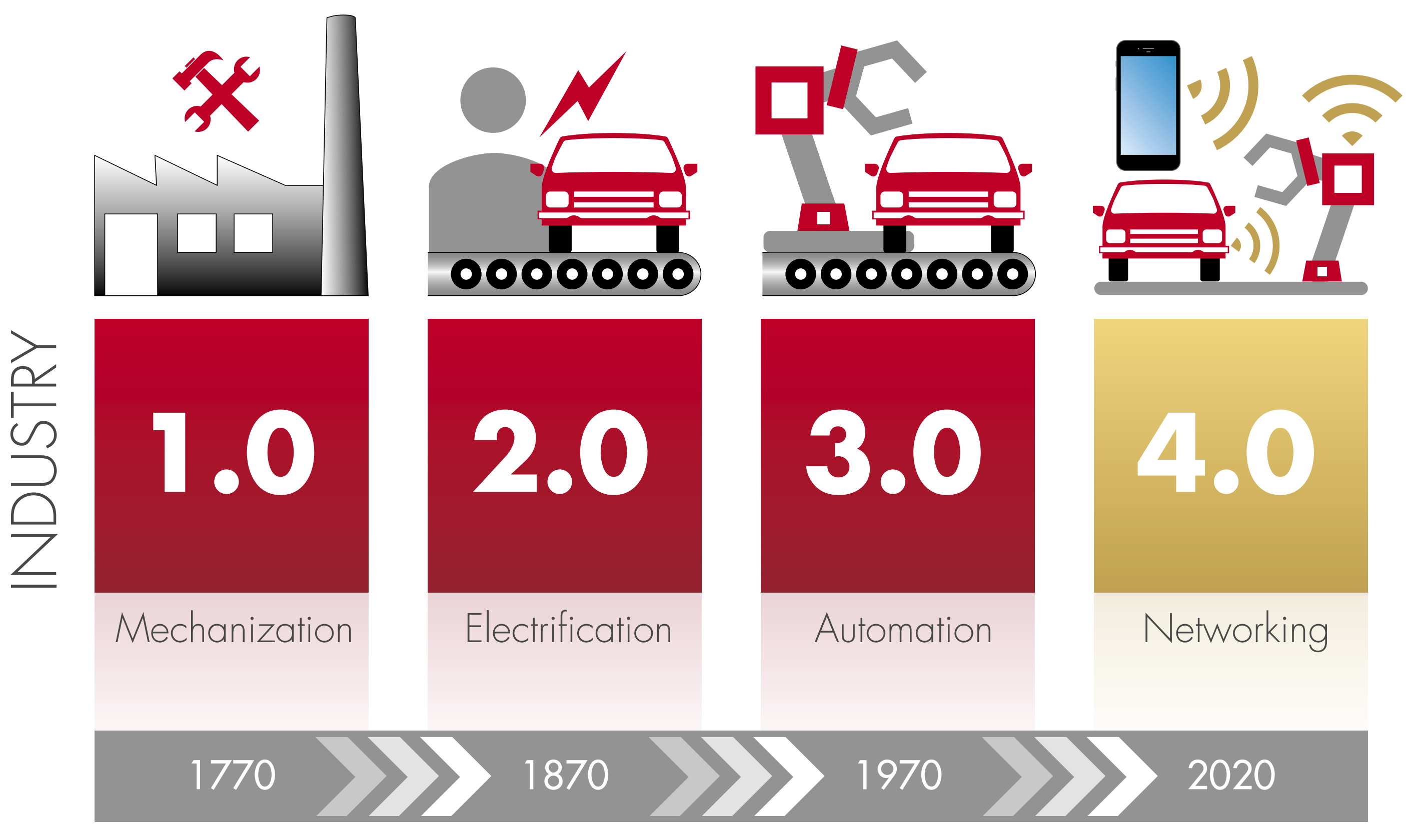
Industry 4.0 is characterized by four criteria:

1. **Networking:** In its early days, the Internet was first used to connect people and thus make it easier for them to access information. In Industry 4.0, this exchange of information is no longer limited to people. Machines, sensors, and employees are in constant contact with each other; described as the so-called industrial internet of things (IIoT).

2. **Transparent information:** Sensors not only provide all the data a machine needs for its work, but they also provide information on numerous other factors such as the condition or availability of a facility. For example, the decision maker has the option of identifying critical points in the production chain or initiating the maintenance of a machine before its productivity decreases.

3. **Technical assistance systems:** The data collected by sensors is processed by assistance systems and made available to decision makers. On this basis, those responsible can make well-founded decisions and react more quickly to possible problems. Other systems support people in strenuous, unpleasant, and dangerous tasks.

4. **Decentralized structure:** In contrast to previous systems, the control system in Industry 4.0 is no longer centralized and strictly hierarchically structured. In daily operations, the individual so-called cyber-physical systems (CPS) work as independently as possible and coordinate with their CPS "colleagues." Only in exceptional situations is a higher authority informed, which then assumes control.



Planned Revolution

Contrary to the industrial revolutions of the past, this time the innovations will not be set free by a few pioneers. Projects, initiatives, and work groups have been set up worldwide to deal with "Industry 4.0." Politicians, scientists, and businesses have worked close together from the very beginning.

While the upheavals of the past were mostly driven by the attempt to create a market advantage for one's own company through technical innovations, this time it is rather a vision for society as a whole that is to be implemented with combined forces. Some goals have already been achieved, but there is still a lot to be done in other areas.

As with all major upheavals, there are two main groups in the current debate: The visionaries who see a golden future and the doubters who warn about catastrophic consequences. Of course, the fourth industrial revolution will also change society, but for the first time there is an opportunity to control these consequences. Critics are already urging politicians to react to the expected change at an early stage.

The above-mentioned principles of Industry 4.0 are intended to make production processes more efficient and flexible. Experts agree that man will also continue to play a crucial role in the use of "intelligent" machines - as an important control and decision-making authority that quickly oversees complex interrelationships. This development began in the last industrial revolution with the use of industrial robots and will be intensified by Industry 4.0. As a result, even the remaining low-skilled tasks will sooner or later be eliminated. Further training and adaptation to new technical conditions will be important components of working life in the future. Manual and intellectual activities will become less and less separable.

The increased flexibility in Industry 4.0 also offers the possibility of manufacturing more individually. Whereas industrial production has currently primarily meant the mass production of standardized components, the machines will soon be able to adapt to certain variables without having to be laboriously reset by operating personnel beforehand. Production techniques such as additive manufacturing set new standards. Here, for example, the same machine can produce gears in a single order and then screw them in shortly afterwards – depending on the data it receives from the computer. For people, this naturally means that they must be constantly informed about all options and production processes. Communication with machines must be appropriately understandable and user-friendly.

The Achilles' heel of Industry 4.0 is its data networks. The functioning of the factory of tomorrow depends on terabytes of data being transmitted and processed in the shortest possible time. Even the smallest program error can have fatal consequences – not to mention deliberate manipulation by hackers or saboteurs.

It Remains Exciting

Industry 4.0 is still primarily a project for the future, but the first companies are already moving in the direction of smart factories. To develop skilled workers and remain one of the top manufacturing economies in the world, the U.S. has a special interest to invest in education and emerging technologies. But where the journey ultimately leads is still open in many areas. ■

Flexible Project Management for Short Product Development Cycles

Agile working methods are also an important method in product development. The basic idea behind this is that many projects are extremely complex and cannot be included in a comprehensive plan beforehand. Instead of creating detailed specification sheets for an overall project, subprojects are defined with clear objectives. A dense cycle of sprint meetings and collaboration between product owners and project coaches ensure a rapid and customer-oriented development process. Small, interdisciplinary teams work on defined functional patterns, based on which the entire further development is then implemented.

LASER COMPONENTS' development team was trained in agile development methods at the end of 2018. This method was successfully applied for the first time in the development of the ALBALUX FM white light source. In just a few weeks, the team implemented the customer's specifications and developed a product that was presented at SPIE Photonics West. ■

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Additive Manufacturing

Complex Structures Directly from the Computer

In the last decade, additive manufacturing has evolved from a laboratory tool to prototype production to a process that is also interesting for series production – just in time to help shape Industry 4.0. The decisive plus points include flexibility in the production process and the opening of new manufacturing possibilities with respect to geometry and/or material properties. Unlike casting or most ablative processes, additive methods allow the same machine to produce a wide variety of products without having to replace a single tool. The template that was transferred as a CAD file is all that matters. Complex geometric shapes can also be implemented in a short time. ➔

Lasered on Top of Each Other Layer by Layer

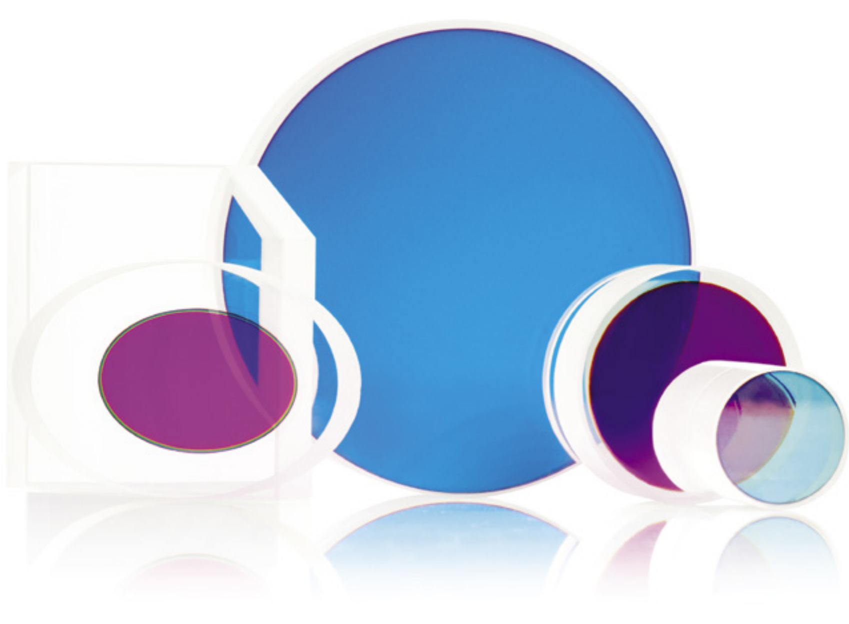
The suitability of different methods of additive manufacturing depends on the material and objective. Now that "3D printing" has been historically established for a long time in the processing of plastics, it is now increasingly gaining ground in the production of metal parts. Among other techniques, laser beam melting is of special interest to fuse the material. Metal powder is typically applied to a working surface in thin layers of 20–60 µm. A laser beam melts the material specifically at the points where a solid structure is to be created. The base plate is then lowered accordingly so that a new layer of powder can be applied. This creates the desired structure layer by layer. After processing, the excess unprocessed powder is removed. In contrast to conventional manufacturing processes, casting molds and tools are not required in additive manufacturing. This accelerates production and enables an almost infinite variety of shapes.

In laser beam melting, the metal powder is almost completely melted, resulting in a body with a specific density of >>99%. This means that many of the mechanical properties correspond to those of conventionally processed metal. However, this procedure is not yet suitable for all conventional materials because some metals change their physical properties during processing. Changes in the surface tension or viscosity of the material can lead, among other things, to the parts not meeting the quality specifications.

Laser Power Makes the Difference

Laser power is one of the deciding factors in making these technologies suitable for mass production. Among other things, stronger lasers lead to potentially higher build-up speeds (cm^3/h) in the laser beam melting process. Usually, solid-state lasers, diode lasers, and medium-strength single-mode fiber lasers with outputs of several hundred watts are used in additive manufacturing. By using several lasers at the same time, the efficiency can be additionally increased.

A slightly widened beam profile is common and results in fewer splashes and metal powder that evaporates less. Although, it is also important that the beam does not increase further, due to the laser-induced focus shift (heating of the optical elements), to prevent that the layers are not completely melted.



Optics Are Paramount

WEB US43-003

Whether in additive manufacturing or classic welding and soldering: laser material processing is part of everyday production in many industries today. The application area and quality of an industrial laser depend – last, but not least – on the beam parameters. The optical components in the machines are crucial for this.

LASER COMPONENTS has specialized in supplying customized laser optics and fiber-optic assemblies. Even if you have unusual requirements, we will work with you to find a solution in which power, wavelength, and beam profile are optimally matched to your industrial laser. It does not matter if it is a single piece or a complete series; our in-house production team can ensure that you always get the right optics in the best quality with various coating processes. We also look to the future: Our R&D team is constantly working on the further development of existing technologies

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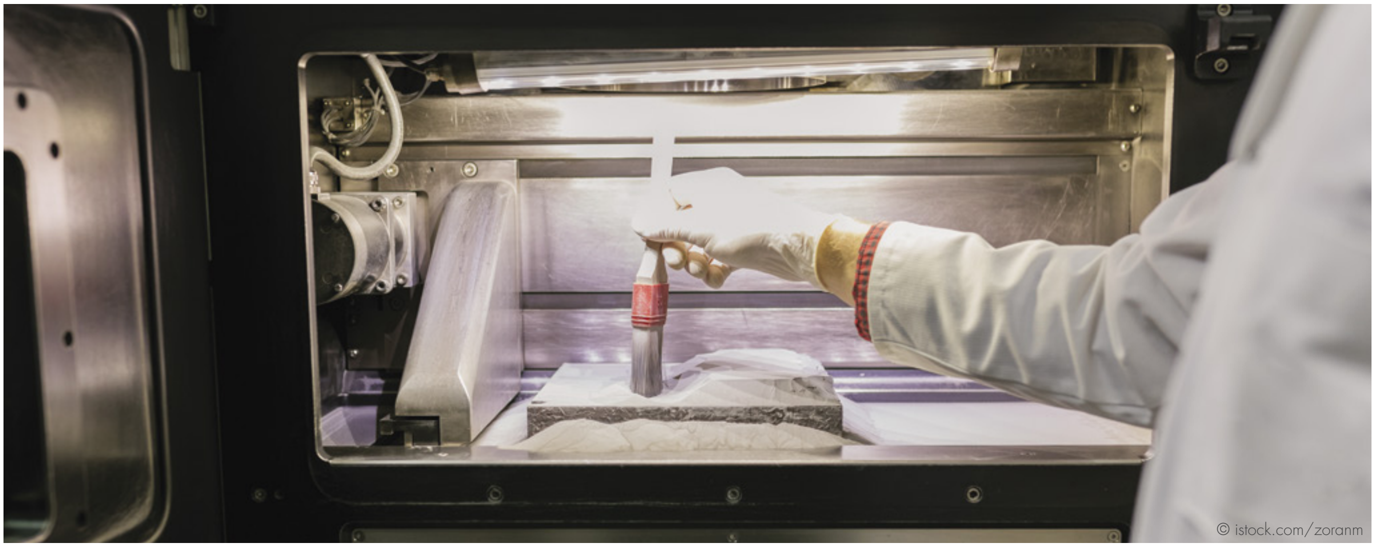
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Sophisticated Design

At present, additive manufacturing processes are still frequently used for single pieces or small series. This is where the technological advantages are unique. In medical technology, for example, titanium implants can be manufactured individually based on the physiological makeup of the patient. However, for economic reasons, most companies continue to use conventional production routes for the mass production of standard parts.

"If you try to reproduce standard components by simply using a 3D printer, you will often find that it takes longer and that the result does not meet the usual quality criteria," explains Prof. Dr.-Ing. Jan T. Sehrt from the newly established chair for hybrid additive manufacturing at the Ruhr University of Bochum, Germany. "However, this is often not due to the technology but to the upstream work on the computer. Whoever wants to use additive manufacturing economically must also adapt the product design to this technology. It is best if the designer has knowledge of the entire process chain, including the use of components."

In order to achieve an optimal result, many factors must be considered. The thicker the metal layers, the faster the product is ready. However, the "stair step effect" on curves, freeform surfaces, and blunt angles also increases while the surface quality decreases. It is therefore necessary to find a compromise that guarantees a high surface quality with reasonable production times. The physical properties of the material also play a role. Anisotropic effects can occur in the component due to the layered application. Such effects can be avoided if the position of the product on the work surface is changed, for example by producing it with an incline of a few degrees. To ensure that the part is still firmly connected to the construction platform during the entire process, support structures must be included in the planning phase and then removed again after production. These struts also reduce the distortion that can occur when the material cools which affects the overall structure. They also dissipate the thermal energy generated when the powder melts.

The Right Strategy Counts

In addition to designing a digital model – the blueprint of the physical object, the exposure of the material to a certain amount of laser light also has a significant influence on product quality. For example, it is possible to built up an object more densely in the outer area than in the inner area based on different exposure parameters of the laser.

Computer programs help determine the correct exposure strategy and thus achieve optimal product quality. How all these measures affect the production process and product quality can be tested by the designer in a simulation on the computer before actual production begins. "As in many areas of Industry 4.0, the amount of work involved shifts from the manufacturing process to planning and control," explains Prof. Sehrt. ■

Robots, Lasers, and Artificial Intelligence Join Forces Undersea

Digitizing Underwater Assets

What sounds like a futuristic, sci-fi technology is now a real and powerful solution being used in the undersea domain. Three complex technologies have been developing, evolving, and being refined to help solve the toughest problems of our time. Finally, they have crossed paths: Subsea robots, lasers and artificial intelligence have been combined into one dynamic solution that will change the way we work underwater. ➔

How do Robots, Lasers and Artificial Intelligence Work Together?

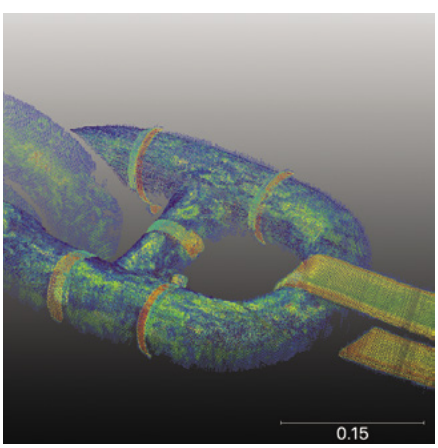
Subsea robots, lasers and artificial intelligence create a whole solution that is greater than the sum of its parts. The recently released SeaVision® subsea 3D laser imaging system by Kraken Robotics may be mounted on any of a variety of Unmanned Underwater Vehicles (UUVs), depending on the type of challenge at hand. The FLEXPOINT MVnano machine vision line laser from LASER COMPONENTS is integrated into the SeaVision system and enables high-resolution RGB laser line scanning. Different sets of RGB line laser modules with sub-millimeter line thickness scan the geometry of the object of interest. 3D information is captured and digitized. From this data a three-dimensional RGB image may be reproduced and analyzed.[1] To take it a step further, GE's Avitas Systems has partnered with Kraken Robotics to provide a data collection and analytics platform that enables systematic inspection.[2] By employing artificial intelligence (AI), advanced physical modeling, and algorithms, the digitized 3D information can be autonomously acquired and used to detect features predictive of possible failures, take scientific data or discover and recognize underwater objects.

The FLEXPOINT MVnano Line Laser Enables Sub-Millimeter Resolution

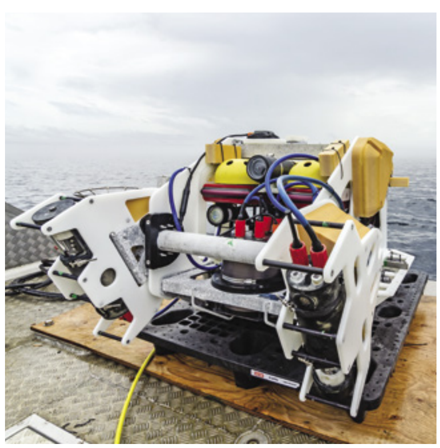
The active agent of the vision system is the laser light beam that propagates directionally through the water. Unlike the human eye that relies on spatially distributed broadband light to illuminate an object, SeaVision relies on uniform lines of coherent laser light. Coherent light can be focused to small dimensions with far greater certainty than broadband light. Using an advanced lens design, the elliptical output of the laser diode inside the FLEXPOINT MVnano laser module is focused and shaped into a sharp line with uniform power distribution across its length. That line of light can be focused down to a thickness as small as 10 µm.[3] Steerable line beams are propagated from the vision module to cross-sect the three-dimensional regions of interest. With the use of two cameras and triangulation mathematics, the dimensions of the object can be reconstructed. There are various triangulation geometries and the use of AI optimizes the measurement methodology. The net result for the Kraken SeaVision design is resolutions from 0.1 to 3 mm at a 2 m scanning distance and 1.0 to 10.0 mm at 5 m scanning distance; in RGB.[4]

Undersea Asset Inspection Made Efficient

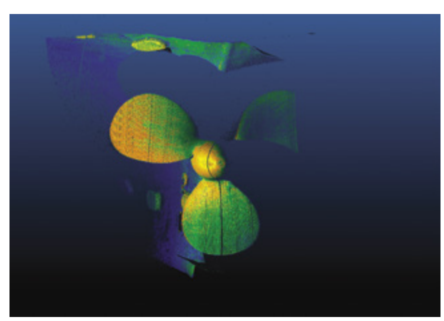
Hovering unmanned underwater robots with lasers make subsea inspections more efficient and safer. Whether inspecting mooring chains for broken welds and corrosion or ship hulls for wear and man-made threats, both inspections require accuracy and efficiency. Offshore wind farms are a prospective viable energy source but face a naturally harsh environment that inflicts a price on operations costs. Corrosion, marine life, and the brutal forces of nature all put menacing wear and tear on offshore equipment. The methods used to inspect the subsea portion of equipment often employ costly processes that rely on bulky, tethered remotely operated vehicles (ROVs), and ultimately in many cases underwater divers. The hovering unmanned robot, however, can navigate with agility to points of inspection, and maintain position with motion correction. With laser-based vision systems mounted, millions of dimensional data points can be taken in seconds. The FLEXPOINT MVnano line laser enables the high-resolution ability to measure and image fractures, rust, barnacle growth and other predictive indicators of failure modes. As the data sets are collected, the deeper learning programming of the AI then gets smarter and more intelligent in its ability to survey, identify, and predict failures. When process engineers think of continual improvement that leads to cost-saving efficiency, nothing could be more ideal.



High resolution 3D scan of a marine anchor chain showing corrosion in full color (Source: Kraken Robotics)



SeaVision™ mounted on unmanned underwater vehicle (Source: Kraken Robotics)



3D underwater inspection of a three-blade propeller with millimeter accuracy (Source: Kraken Robotics)

Seafloor Exploration and Inspection: Sonar vs. Laser Imaging

Other cost saving surveys include inspections of pipelines, underwater cabling, marine anchor chains, ship hulls, and the like. In some cases, like with underwater discovery missions, sonar-based imaging is ideal for the bigger work and covers more ocean floor. There is always a trade-off between operating range vs. accuracy and resolution. Sonar-based systems can cover imaging swaths of hundreds of meters and can cover several square kilometers per hour.[5] However, the resolution may be orders of magnitude less. So, when it comes time for the detailed inspection, the laser-based vision system can grab high-resolution sub-millimeter details.

Environmental and Scientific Research

Sensitive oceanographic and marine biology research will also greatly benefit from the sub-millimeter laser-based measurements. Coral reef growth and reef restoration projects have been underway for many years off the coast of Mexico and Honduras. With high accuracy laser-based 3D imaging and data control, the details of coral growth can be recorded with massive amounts of detail and acquisition intelligence.[6] Coral surface area is a primary physical descriptor for quantification of physiological and biochemical parameters. Variation in coral growth rates can be monitored more accurately and then correlated with factors such as light exposure, water turbidity and temperature, algae concentration, sediment deposition distribution, salinity and so on. Reef restoration project teams will be better able to gauge progress and success by quantifying coral growth with greater resolution.

The Undersea Revolution

The scope of technological innovation has once again expanded to include the once unimaginable. The mission is simple: revolutionize our ability to see and know the undersea domain. As survey teams plan for next generation projects in asset inspection, exploration, and research, they are now resourced with the capability and capacity of their new underwater ally. The resultant force of underwater robots with SeaVision 3D imaging, MVnano line lasers and artificial intelligence propels the revolution in undersea vision and knowledge forward to new depths and illuminating frontiers. ■

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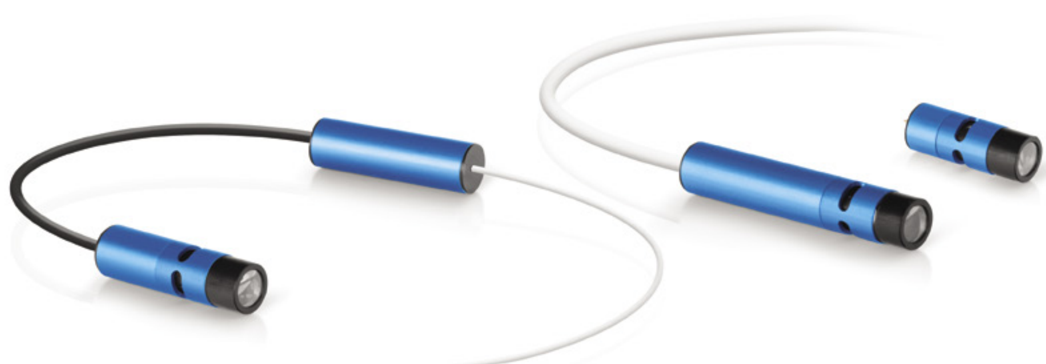


FLEXPOINT MVnano with flexible housing, focus, and optics options scanning at sub-millimeter line thickness.

1 https://krakenrobotics.com/products/seavision/
2 GE Reports (2017, Nov 29), Autonomous Undersea Robots Are Using Lasers to Make Offshore Operations Safer and More Efficient Retrieved from https://gereports.ca/autonomous-undersea-robots-using-lasers-make-offshore-operations-safer-efficient/
3 Retrieved from https://www.lasercomponents.com/us/lasers/laser-modules/flexpoint-machine-vision-lasers/
4 Retrieved from https://krakenrobotics.com/products/seavision/
5 Retrieved from https://krakenrobotics.com/products/aquapix-insas/
6 Raz-Bahat, M., Faibish, H., Mass, T.,Rinkevish, B., Limnology and Methodology, Three Dimensional Laser Scanning as an Effective Tool for Coral Surface Area Measurements Retrieved from https://aslopubs.onlinelibrary.wiley.com/doi/pdf/10.4319/lom.2009.7.657

Smart Sensors

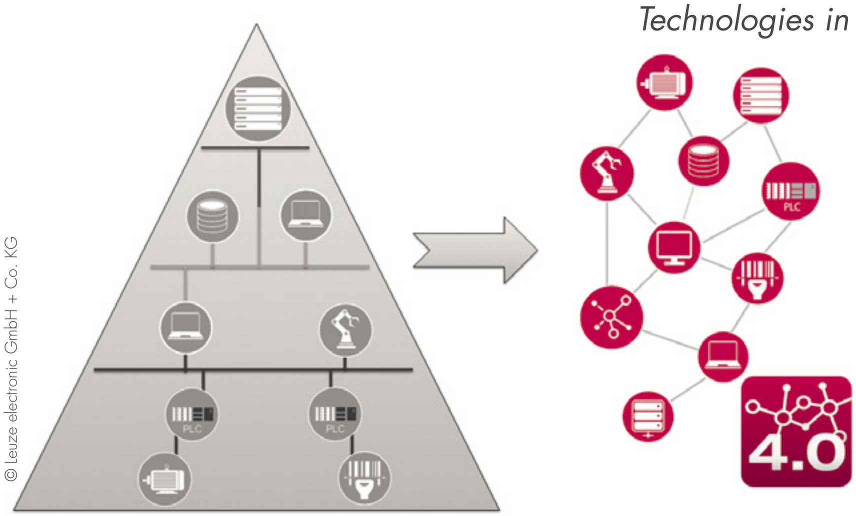
Additional Valuable Information

Optical sensor systems are the eyes of automation technology and have so far been used for specific, clearly defined tasks: for example, as light barriers and barcode readers. A control unit evaluates the data and sends corresponding instructions to an actuator, which converts the commands, for example, into motion: The door opens when the light barrier is interrupted. Irrespective of their actual task, the sensors also provide a great deal of other information that has so far remained unused. Industry 4.0 is set to change this.

In the past, sensors, control units, and actuators were usually directly linked to each other via point-to-point connections. Following the example of IT structures, industry today uses hierarchical networks almost everywhere. The individual components communicate between the levels of the automation pyramid (see figure) according to the so-called "master-slave model": sensors and actuators at the field level communicate exclusively with the higher-level controller; the machine controller exchanges its data with production planning and this in turn with the company's ERP system. However, this structure is not suitable for Industry 4.0 because the system transitions between the network levels (where data is usually filtered) represent a hurdle. To overcome these obstacles, costly gateways or protocol converters are usually used to slow down data flow. In addition, it is a crucial feature of Industry 4.0 that all data should be available unfiltered.

Industry 4.0 overcomes the hierarchies and system limits of the automation pyramid. Data is stored in the cloud. There it can be "picked up" by any device that currently needs it. Cloud capacity is scalable and allows a large amount of data to be stored – even that of which one does not yet know if and what specific findings will be drawn from it. It is, therefore, the aim of sensor manufacturers such as Leuze electronic to record, collect, and make available data from a wide variety of sources. The next step is to link the sources, and only at the end will new business models emerge. "Figuratively speaking, we are currently building a highway on which goods will later be transported and to which business cases can in turn be attached. At the moment, nobody knows exactly where this highway will lead us," says Ulrich Balbach, managing director of Leuze electronic.

As with a "real" highway, there should not be any traffic jams with cloud solutions. The optoelectronic sensor manufacturer has developed the dual-channel principle for this purpose. In



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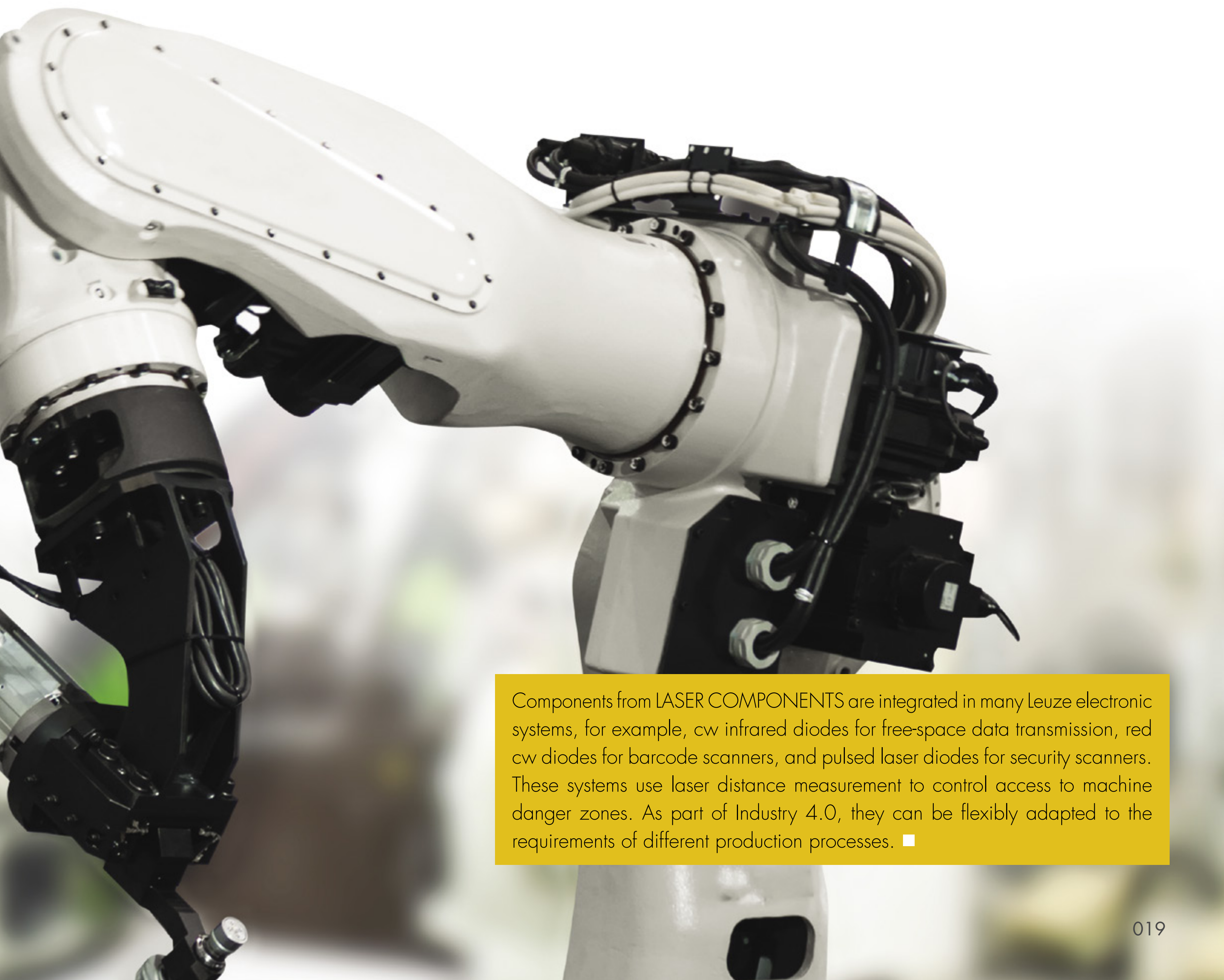
edge computing, the data is already pre-sorted in the sensor unit. The process data for solving the actual automation task is transmitted in real time via the first sensor channel. Data that the sensor additionally supplies is not skipped but run through a second channel with a lower update rate. It is stored centrally for later use. With optical sensor systems, this additional information can be used, for example, to determine whether the optical cover needs to be cleaned, whether the light source delivers the desired output, or whether fluctuations in the results of the different sensors occur in an industrial facility. This data does not have any effect on the current production process. In terms of predictive maintenance, however, they are the decisive building blocks of a functioning Industry 4.0 environment. ■



Components from LASER COMPONENTS are integrated in many Leuze electronic systems, for example, cw infrared diodes for free-space data transmission, red cw diodes for barcode scanners, and pulsed laser diodes for security scanners. These systems use laser distance measurement to control access to machine danger zones. As part of Industry 4.0, they can be flexibly adapted to the requirements of different production processes. ■

Medical Technology

Digital Assistants in the Surgery Room

Networking and high-speed data transmission open up new possibilities, not only in industrial production. In medicine, the principles of industry 4.0 raise existing approaches to telemedicine to a new level.

Telemetry Saves Valuable Time

In many cases, time is a crucial factor: in stroke patients, for example, there is a time window of a few hours during which permanent damage can be prevented by thrombolysis. It is, therefore, particularly important that the attending physician makes a diagnosis as quickly as possible. Using telemetry systems, the emergency physician can record important demographic and medical data at the scene and transmit it to the hospital. Doctors and nursing staff know at an early stage what to expect and can, for example, schedule a Computed Tomography (CT) examination. In smaller hospitals, specialists can be called in, if necessary, to support their colleagues in the diagnosis.

Dr. Robot is Operating

Surgical robots are not new: Back in 2001, a doctor in New York controlled a robot that removed the gall bladder from a patient in Strasbourg, France. Data transmission was carried out via a high-speed wired ATM connection. The basic idea was that remote-controlled surgical robots could once intervene in procedures on astronauts in space or provide basic medical care for wounded soldiers in the field. But even though numerous other telesurgical operations have been

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A Light in the Dark

WEB US43-175

One advantage of surgical robots is their ability to perform precise microinvasive procedures inside the body. However, the corresponding area must be well illuminated. This is exactly why LASER COMPONENTS has developed the ALBALUX white light laser source. Via a glass fiber, it offers a continuous wave luminous flux of over 150 lumens. In the clearly defined area, the surgeon can recognize even the smallest detail thanks to high-contrast illumination and thus make optimum use of the robot's precision. ■

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carried out in the meantime, their use has remained limited to the classic surgical situation. All other scenarios failed due to the availability of reliable broadband real-time transmission. Industry 4.0 technologies could bring a breath of fresh air to the industry. Thanks to networking, robots should soon be able to “learn” from each other and carry out many standard operations largely independently. Another option is the use of augmented reality. The surgeon can then, for example, display the heartbeat or graphic positioning aids graphically during the operation via data glasses.

Health at a Glance all the Time

So-called wearables could also contribute to health care in the future. Portable devices such as smartwatches, activity trackers, and now even sensor shirts are particularly popular with fitness enthusiasts, who can use them to read pulse rates or calorie consumption at any time. With powerful mobile networks, the use of similar devices will also be conceivable in medicine in the near future – for example, for chronic patients. In addition to recording classic vital parameters such as pulse rate and blood pressure, non-invasive blood glucose measurements would also be possible. Doctors can monitor their patients’ data from their office. If the values reach dangerous levels, the system automatically alerts emergency services.

However, a few hurdles must still be overcome before this can happen. Initially, devices are needed that are not only suitable for recreational use, but also deliver exact, medically usable results. In addition, there are legal concerns. Even in the case of fitness trackers, many people fear that providers will access their customers’ data via the Cloud and use it for their own purposes. In medical applications, it must therefore be ensured that only a small circle can access the data and that hacker attacks can virtually be ruled out. ■

IR WORKshop 2018

Technical Know-how and Economic Success

On November 12 and 13, 2018, LASER COMPONENTS' IR WORKshop entered its fifth round. Almost eighty IR experts from thirteen countries on four continents met at the company's headquarters in Olching. In addition to technical progress, the commercial aspects always play a major role in this series of events. Once again, the forty-three contributions were deliberately limited to either twelve minutes or, in the case of short contributions (instead of posters), even to five minutes. This forces the speakers to sum up their messages in a nutshell and creates long breaks in which the participants can interact and discuss previously presented subjects. In addition to long-established researchers, the event is traditionally attended by many young people.

One main topic this time around was microelectronic components for NIR spectroscopy. "Near infrared spectroscopy has a realistic chance of becoming a mainstream and even consumer technology in the near future. However, there are still major challenges that need to be addressed," explains host Johannes Kunsch, head of IR components at LASER COMPONENTS. In the lectures and discussions, it became clear that the datasheets of the MEMS-based NIR spectrometers are sufficient for many standard applications. Integration into smartphones is also possible. However, questions about temperature effects, sample inhomogeneity, calibration transfer, and killer applications still have to be solved before final market success can be achieved.

Previous WORKshop participants have had the opportunity for the first time to present an update on their projects. "Of course, most people remember large, ambitious projects," says Johannes Kunsch. "Regular participants are therefore always curious as to how these projects have progressed. This program item was very successful. At the next IR WORKshop to be held in Olching in 2020, we will surely present new status reports of current projects."

But first the **6th International IR WORKshop** will take place in the U.S. Since 2017, this event has been held alternately on either side of the Atlantic – this time from **October 29 to 30, 2019**, at **Princeton University in New Jersey**. ■

6th International WORKshop on Infrared Technologies

28–30 October 2019 | Princeton University [New Jersey]

www.ir-workshop.info

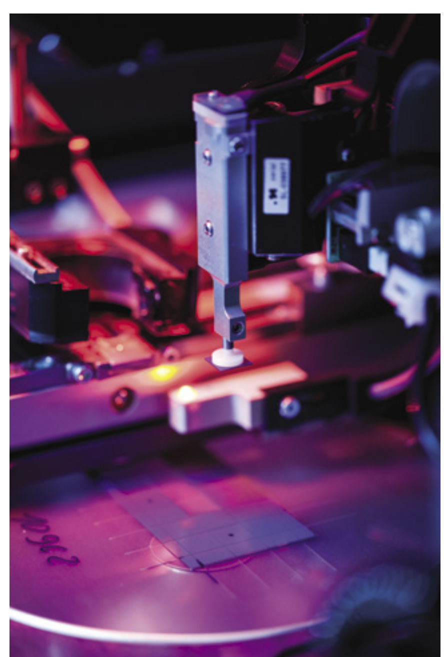
CODIXX Invests in Production Processes to Incorporate Industry 4.0

Higher Quality and Faster Delivery Times

CODIXX, supplier of premium glass polarizers for the ultraviolet, visible and infrared spectrum, is preparing for automated production processes in an interconnected environment.

Currently there are more than 5,000 different versions of colorPol® polarizers; the starting point of a complicated production planning. To speed up delivery time and improve quality, CODIXX is currently introducing a central IT infrastructure. Systems will be able to communicate with each other and production can be planned and controlled with faster countermeasures, all from a single access point.

An added value will be the intelligent energy management. General efficiency is expected to improve by about 15% which will reduce the ecological footprint of colorPol® polarizers significantly. ■



Innovators Award for ALBALUX

In Recognition of Making an Impact in Lighting

A success story for our ALBALUX FM laser white light module for machine vision applications. We are proud to win silver in the lighting, lenses, and optics category at the Vision Systems Design Innovators Awards presentation, held during the Automate show in Chicago, IL (April 08–10, 2019). Based on SLD Laser' LaserLight technology that generates 100x the intensity of LED with 1/10 the beam angle, our engineering team has developed the ALBALUX FM module with remote fiber optic beam output and drive electronics in a compact enclosure.

The ALBALUX FM was first introduced to the market at the SPIE Photonics West show in San Francisco, CA (February 05–07, 2019) and finding early market adoption in machine vision applications. ■

© Vision Systems Design magazine

Welcoming HOLOEYE Photonics

Spatial Light Modulators now Available Through LASER COMPONENTS USA

We are proud to present our new supplier HOLOEYE Photonics, a world leader in spatial light modulators (SLM) with over 20 years of experience, based in Berlin, Germany. This is an important milestone to further increase our product offering with standard and customized optical solutions such as SLMs. The SLM systems are based on translucent (LCD) or reflective (LCOS) liquid crystal microdisplays to modulate amplitude, phase, or polarization of light waves in space and time. We offer a variety of models for different wavelengths and resolutions aimed at machine vision, biophotonics, wavefront modulation, and holography; as well as laser beam shaping in material processing.

Customers in North America can now contact us for inquiries and product support of HOLOEYE'S comprehensive product range. Our dedicated sales engineer, Sean Wilson, is committed to listening to your needs and to providing the best solution with application-specific product configurations. ■

New Products

PLUTO-2 Spatial Light Modulator

Full HD Resolution and User-friendly Software

WEB US43-002

New in our portfolio, the PLUTO-2 phase modulator is made with a driver unit and a reflective LCOS (liquid crystal on silicon) microdisplay with 1920 x 1080 pixel resolution and 8.0 µm pixel pitch, currently available in ten different configurations.

Using HDMI ports of standard PC graphics cards, the PLUTO-2 can be used just like an external plug & play monitor without additional software or dedicated hardware. Furthermore, the device comes with a software package to configure and generate different optical functions, and an SDK to work with standard laboratory software and programming environments. ■

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Customized Thin Films

Wafer Coatings

WEB US43-001

Wafers, such as those required in microchip manufacturing, must often be equipped with AR coatings or mirrors. As this is not part of the core business of microchip manufacturers, many companies do not have the necessary equipment or know-how to apply reliable coatings. This is where LASER COMPONENTS comes into play: In our coating chambers, we can process all standard sizes up to twelve inches. In some cases, even 15 inches.

We equip wafers made of silicon, fused silica, N-BK7, and other glasses with standard or customized coatings depending on your application and required specifications. This includes AR coatings and all types of mirrors. You supply us with the cleaned wafers and specifications, and we take care of the rest. As a rule, you will receive the finished coated wafers back after approximately four weeks. ■

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DOEs for LiDAR and 3D Imaging

Fan Angle up to 80°

WEB US43-949

With the help of structured light, even large polished and painted objects can be recorded and measured three dimensionally. For 3D imaging, LiDAR, and projection applications, Holo/OR offers a wide range of beam splitting and shaping diffractive optical elements (DOEs). With a fan angle of up to 80° (at 850 nm), the emitted light also covers large areas.

Depending on the substrate material, the optics can be used with low laser power in the milliwatt range, as well as with high-power lasers with several kilowatts. The manufacturer offers high-quality products made of fused silica quartz glass for this purpose. For lower output, low-cost plastic versions can also be used.

The customer can choose from numerous different beam shapes and must specify the wavelength used in the range between 266 nm and 2,200 nm. Special requirements such as particularly high beam homogeneity and additional AR coatings are also taken into account during development and production. ■

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PicoLAS Pushes Boundaries with High Power Laser Diode Driver

10 kW Output Power with Small Footprint and Highly Efficient Design

WEB US43-071

For high power laser diode applications, PicoLAS has released two new versions of its continuous wave (CW) laser diode driver series, LDP-CW 250-40. The drivers achieve 10 kW output power in an exceptionally compact enclosure, with power density of 5 W/cm³. Both models of the laser controller generate maximum output current of up to 250 A and compliance voltage of up to 40 V with efficiency up to 94%.

PicoLAS integrates an innovative digital current regulator in all its designs resulting in considerably less losses compared to commonly used linear regulators. In the standard configuration, the LDP-CW 250-40 features a very low current ripple of <0.8 %, minimal overshoot of <3 % with a maximum modulation frequency of 1 kHz.

The fast modulated (F) version increases the maximum modulation frequency up to 50 kHz (-3 dB) with a current rise time of <20 µs, while keeping the maximum overshoot below 3 %.

The LDP-CW 250-40 has an isolated control interface and can be completely controlled by analog signals and easily integrated close to the laser diode. ■

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White Laser Light Sources Emerge

Winner in Luminance and Long Range

WEB US43-174

The award winning LaserLight, from SLD Laser, is a novel bright light source that will drive a new generation of OEM illumination solutions for medical, machine vision, and specialty illumination applications.

Based on patented semipolar GaN laser diodes, the sources use advanced phosphor technology, offering unique performance properties with:

- Up to 100x the intensity of white light LED
- 1/10th of the optics size required to produce the same beam angle as LED
- Precise beam directivity

LaserLight will come as a miniature SMD (Surface Mount Device) or star package mount with built-in safety features and emits up to 450 lumens. ■

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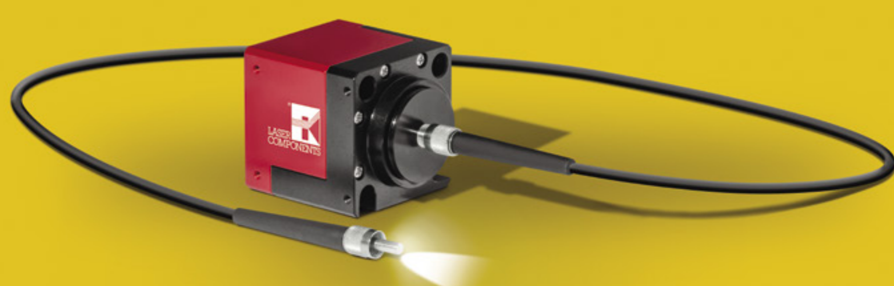
World's First: ALBALUX FM White Light Module

Fiber-guided Luminous Flux with over 150 Lumens

WEB US43-175



With a fiber-guided continuous-wave luminous flux of over 150 lumens, the ALBALUX FM white light laser module allows precise, high-contrast illumination even in areas that are difficult to access. This opens up new possibilities in endoscopy, surgical headlamps, and 3D image processing. In addition to brightness, its precise beam guidance and sharp beam edges are also impressive. The compact housing of the plug-and-play module contains specially developed electronics for safe control of the light source. Despite its high optical performance, ALBALUX FM has low power consumption.

The light source is the innovative laser light technology from SLD Laser. Two semi-polar blue GaN laser diodes (450 nm) illuminate a phosphorus chip, producing a brilliant, incoherent white light that is more than ten times brighter than the brightest white LEDs available.

In addition to decades of experience in laser optics, electronics, and fiber optic technology, LASER COMPONENTS has also benefited with this innovation from the mechanical and technical know-how of its manufacturing departments. The ALBALUX FM with fiber output is only the first model in a comprehensive range of products, for the development of which the customer's wishes and applications are key. ■

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Digital Laser Driver for Laser Modules

Communication via USB or RS-232

WEB US43-074

LASER COMPONENTS offers digital laser drivers with a microcontroller for selected laser modules in the FLEXPOINT series. The module is connected via RS-232 or USB and can be used for digital control and monitoring. For example, the user can program important operational settings such as output power, trigger, pulsation, and modulation. Monitoring functions include system uptime, module temperature, laser diode current, and much more.

These parameters can be used to track the aging process of the laser module to prevent downtime through proactive maintenance. In addition, the use of a microcontroller guarantees stable output power, as well as particularly good linearity between the control voltage and the analog output power. ■

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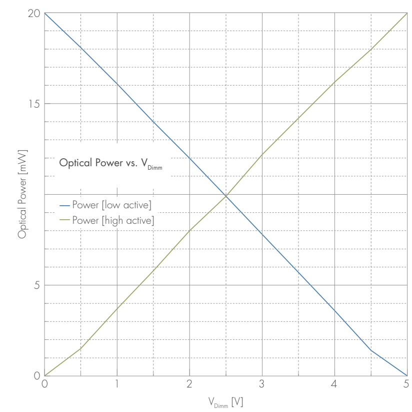

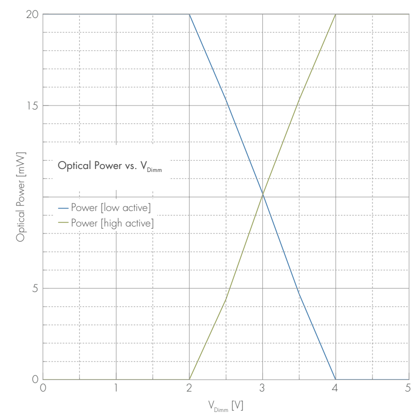

Infrared Laser Diodes in an SMD Package

Reliable Laser Sources with Good Temperature Properties

WEB US43-050

For the NIR wavelength of 940 nm, Arima has started, for the first time, offering two laser diodes in SMD housings. The ADL-94Y01IY-F1 and 94Y01EY-F2 versions both differ in their housing design. With a footprint of 3 mm x 3 mm (IY-F1) and 3.5 mm x 3.5 mm (EY-F2) and a height of just 0.75 mm, they deliver 200 mW of optical power.

At temperatures of up to 50°C, they feature consistently high performance. The laser diodes are primarily designed for distance measurement, 3D sensor applications, and pumping fiber lasers. ■

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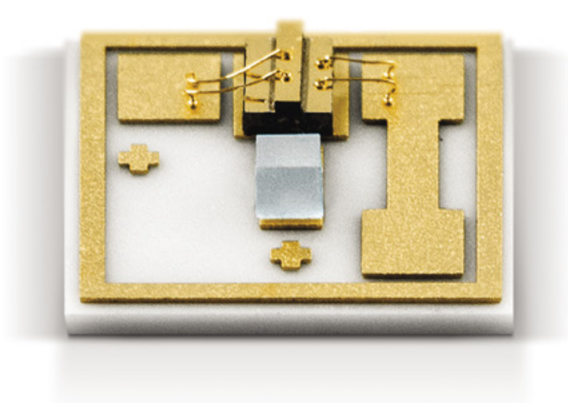

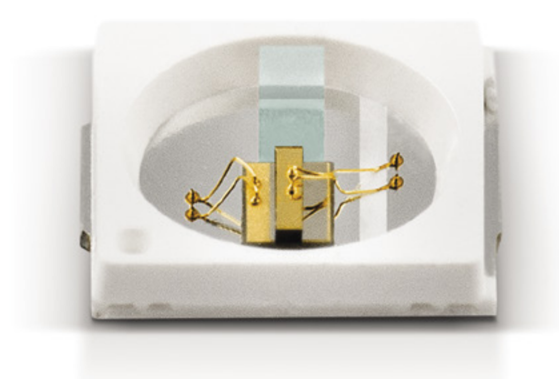

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ALBALUX FM
REDEFINING LIGHT

small components. MASSIVE IMPACT.

WEB US43-175

ALBALUX FM is set to spark a new innovation wave in medical and machine vision illumination solutions. It is the world's first laser white light module with bright and highly directional fiber optic output. The efficient optical fiber emits >150 lumens with sharp narrow beam edges, bridging the gap between LED and Xenon. For the most critical procedures, true precision and contrast-rich illumination is now within hand reach.

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LASER COMPONENTS