# PHOTONICS NEWS

Company Newspaper of LASER COMPONENTS (UK) Ltd

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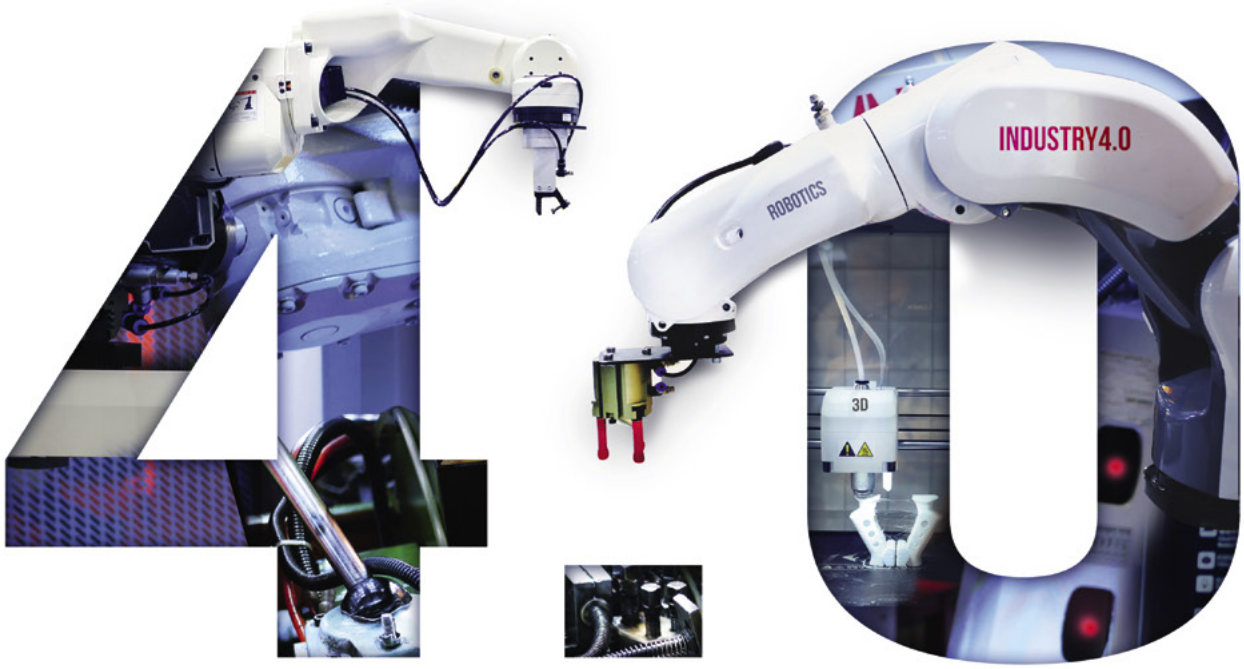
#63 ▪ 10|2019

Industry 4.0

Big Data

Smart Sensors

Our Products



LASERS

# FIBRE Lasers

## Pulsed and CW Laser Modules

### Pulsed Green Lasers

PGFL Series

- Most efficient for underwater measurements and range finding applications
- Compact and rugged package with optical head
- High pulse energy up to 50 µJ
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## Industry 4.0



## Product News




## Imprint

LASER COMPONENTS (UK), Ltd.
Goldlay House 114 Parkway
Chelmsford Essex CM2 7PR
United Kingdom
Tel.: +44 (0) 1245 491 499
Fax: +44 (0) 1245 491 801
www.lasercomponents.co.uk
info@lasercomponents.co.uk



Managing Director: Chris Varney
Registered Company 2835714
Editor: Kay Cable






Dear Colleagues

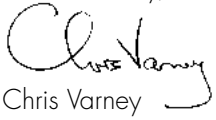
This 63rd edition of Photonics News features the information age with particular focus on data communication over networks and datacentres, connecting intelligent sensors to robots to reduce the reliance on direct human intervention. Such anticipated growth in this demanding technology requires standards to be created and systems of practice devised. We present an interesting insight and suggest how some of our partner suppliers' and LASER COMPONENTS' products can support this growth industry.

The demand to squeeze more data at ever increasing speeds around the world, and off-world with orbiting satellites, is considerably challenging. This places more and more demand on the infrastructure, components and devices, as well as on diagnostic tools which must increasingly operate in real-time at sub-millisecond speeds to interpret faults and intervene with corrective actions to prevent otherwise mayhem in areas affected, such as banking, automotive flow and medical procedures to name a few.

It remains fascinating that so much of our daily lives involve the use of light, even photons when thinking of quantum applications so very much a buzz at the moment. Measuring micro-gravity using lasers shining on cold atoms hopes to provide a whole new range of sensors and imaging systems.

Light is being used in an increasingly greater number of applications, not just with sensors themselves but the data they generate often to be gathered and interpreted at some distant location. We may still be a long way off from light's limiting constant - the speed of light - but it feels like an exponential explosion, and we are delighted to be part of this growth supplying components and products to our photonic industry.

Yours sincerely,



Chris Varney
Managing Director, LASER COMPONENTS (UK), Ltd.


# Industry 4.0

## A Vision Becomes Reality

The catchy term "Industry 4.0" was coined at the Hanover Trade Fair in 2011 by a group of German scientists, managers, and politicians to describe and promote general developments in industrial production. In general, people like to talk about the "fourth industrial revolution" - after mechanisation, the assembly line, and the introduction of robots. ➔

The internet has changed the way people communicate. Now with its decentralised structures, the internet controls the processes on the factory floor as the industrial internet of things (IIoT).

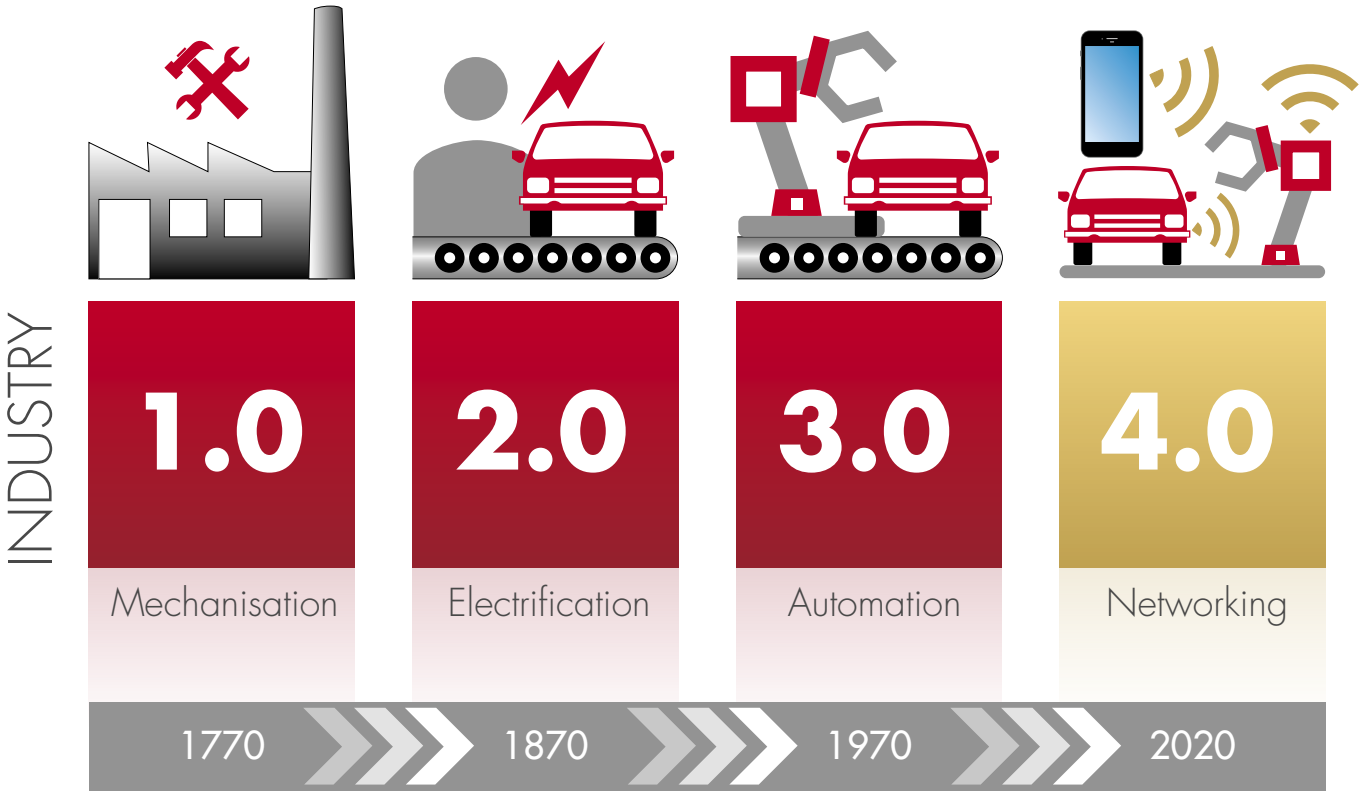
Industry 4.0 is characterised by four criteria:

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 and communicate via 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. Decentralised Structure: in contrast to previous systems, the control system in Industry 4.0 is no longer centralised 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 standardised 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 programme 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. As a leading production location in Central Europe, Germany has a special interest in turning its vision into reality, but where the journey ultimately leads is still open in many areas. ■

## Flexible Project Management for Short Product Development Cycles

WEB UK63-0740

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, sub-projects 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 in February and was also featured at LASER World of Photonics in June. ■

Chris Varney: +44 (0) 1245 491 499
cvarney@lasercomponents.co.uk

# Data Highways for Intelligent Machines

## Networked Systems Require Large Bandwidths

The fourth industrial revolution means one thing: data, data, and even more data. The International Data Corporation (IDC) analysis institute assumes that around 175 zettabytes of new data will be generated in 2025, compared with 33 zettabytes in 2018. Analysts assume that in six years around 65% of new data will come from companies using more sensors and "intelligent" communicating machines. Ninety zettabytes alone are expected to be generated in the Internet of Things (IoT).

If IDC's forecast is correct, in 2025 ~30% data will be real-time data processed within milliseconds; the entire vision of Industry 4.0 depends on speed, with two big challenges:

- Computing Power.
  Computers must process large amounts of data in the shortest possible time.
- Bandwidth.
  The generated data must be transmitted without delay.

Solutions already exist in both areas, but much remains to be done before they can be implemented across the board.

### Computing Power Shifts to the Edge

Currently data centres process, manage, secure, and retrieve data as required. In some cases, these nodes are far away from the end devices where the data is generated and required. In the cloud, several data centres that are located far away from each other often work together. With Industry 4.0 and the IoT, however, they are reaching their limits.

The solution is edge computing. Important computing operations are carried out where the data is generated – in the machine or even in the sensor itself.

### Data Transfer at the Speed of Light

Even though the flood of data has been filtered and reduced by edge computing, enormous computing power is still required in the cloud, and the bandwidth for a smoothly functioning Industry 4.0 environment can only be provided by fibre optic cables.

The classic copper cables from Industry 3.0 no longer suffice because they can transmit a data signal unamplified for only about 100 metres. In order to convert existing facilities to Industry 4.0, companies must therefore think above all about upgrading their cable networks. It is not enough to simply replace copper cables with optical fibres.

### New Mobile Radio Standard as Starting Signal for Industry 4.0

Experts agree that it is not enough to upgrade some company sites and production facilities. For example, a large electronics group has already linked locations worldwide to allow test results from Asia to be directly implemented in the production processes of a facility in Europe. They only work if the public networks provide the necessary bandwidth across the board. Even those who follow media coverage only irregularly know that a lot still has to happen in the rural regions in order for companies located there to also benefit from Industry 4.0.

New impetuses are expected from the new 5G mobile communications standard. It was developed with IoT in mind and offers around 100 times more bandwidth. However, this speed comes at the expense of the range; therefore, considerably more transmitter masts will be required in the future.

In order to connect these masts to the backbone network, the fibre optic infrastructure must also be further expanded. If Industry 4.0 is soon to become a reality everywhere in Europe, there is no way around 5G. ■

## Network Monitoring

WEB UK63-0220

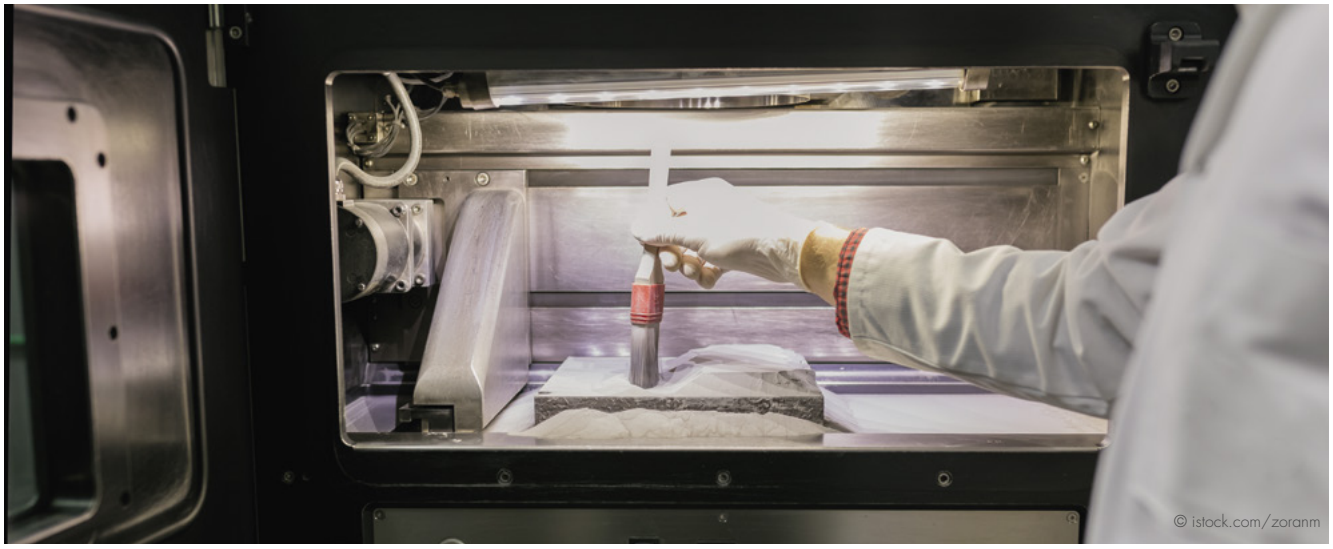
Optical time domain reflectometry (OTDR) is a proven technology for monitoring physical network structures. A single fibre in the cable suffices for monitoring. The Rayleigh scattering of light pulses is evaluated in order to detect and locate faults and impurities in optical fibres. In this way, extended networks can also be monitored around the clock. In the event of a fault, it can be rectified in the shortest possible time. Manufacturers such as TEMPO Communications offer a range of test equipment for company level as well as large scale telecommunications networks. ■

Khalid Abou El Kabir: +44 (0) 1245 491 499
kabouelkabir@lasercomponents.co.uk

# Additive Manufacturing

## Complex Structures Directly from the Computer

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. Companies in Europe rely especially on the laser beam melting process. Metal powder is typically applied to a working surface in thin layers of 20-60µm. 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. As a rule, solid-state lasers, diode lasers, and medium-strength single-mode fibre 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.

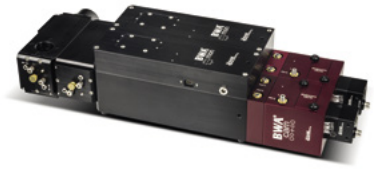
A slightly widened beam profile is common and results in fewer splashes and metal powder that evaporates less. It is also important that the beam not increase further due to the laser-induced focus shift (heating of the optical elements) to prevent the layers from not being completely melted.

## Sophisticated Design

At present, additive manufacturing processes are still frequently used for single pieces or small series. This is where the advantages of this technology make it 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. "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 "step effect" on curves, freeform surfaces, and blunt angles also increases while the surface quality decreases. ➔



## Beam Correction

WEB UK63-0032

In additive manufacturing even the smallest changes to the beam profile can have serious consequences. All beam parameters can be monitored with the BWAMON® from Haas Laser Technologies. This system uses a decoupled beam to ensure continuous real-time monitoring during operation. Deviations from the standard - for example, due to the laser-induced focus shift - are detected immediately and can be corrected before major damage occurs.

Products from Haas Laser Technologies are exclusively available in Europe through LASER COMPONENTS.

Samuel Thienel:
+44 (0) 1245 491 499
sthienel@lasercomponents.co.uk

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 the model, the right exposure strategy also has a significant influence on product quality. Each area of a component has different requirements. Also, it is possible to set the component properties specifically via the exposure parameters with the laser. For example, a component could be built up more densely in the outer area than in the inner area.

Overhanging areas of the component play a special role because of their support structures; in certain areas a particularly high surface quality is required. These factors can be influenced by various exposure parameters - for example, the exposure time or the distance between the trails of melting.

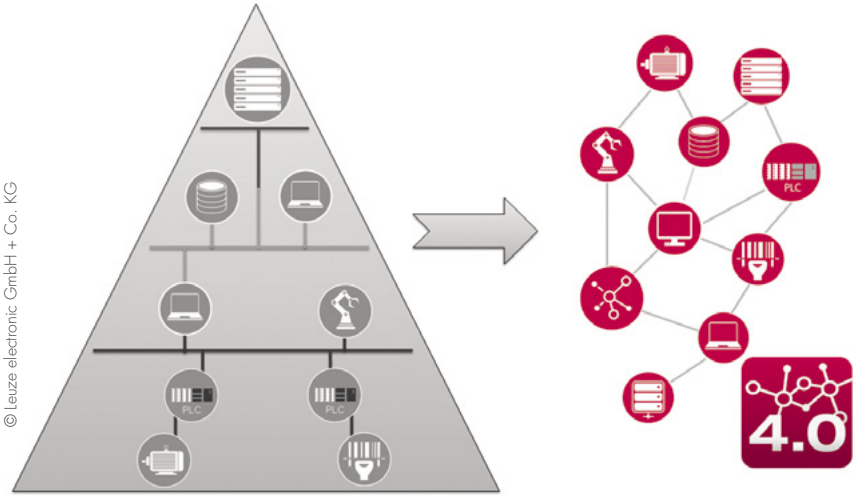
Here, too, computer programmes help to determine the correct exposure strategy and thus achieve optimal product quality.

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. ■

# Smart Sensors

## Additional Valuable Information

In the past, sensors, control units, and actuators were usually directly linked to each other via point-to-point connections. 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. However, this structure is not suitable for Industry 4.0 due to hurdles between networks. To overcome these obstacles, costly gateways or protocol converters are usually used to slow down data flow.

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Industry 4.0 overcomes the hierarchies and system limits with storing data in the cloud where 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. It is the aim of sensor manufacturers such as Leuze electronic to record, collect, and make available data from a wide variety of sources. "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.

WEB UK63-0480

Components from LASER COMPONENTS are integrated in many Leuze electronic systems. For example, we supply the optical sensor manufacturer with 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. ■

Chris Varney: +44 (0) 1245 491 499
cvarney@lasercomponents.co.uk

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# Medicine 4.0

## Digital Assistants in the Operating Theatre

### 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 make 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 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. However, even though numerous other telesurgical operations have been 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 soon - 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. ■


### A Light in the Dark

WEB UK63-1740

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 fibre, it offers a continuous wave luminous flux of over 150 lumens. In the clearly defined area, the surgeon can recognise even the smallest detail thanks to high-contrast illumination and thus make optimum use of the robot's precision. ■

Chris Varney:
+44 (0) 1245 491 499
cvarney@lasercomponents.co.uk

# Our Products

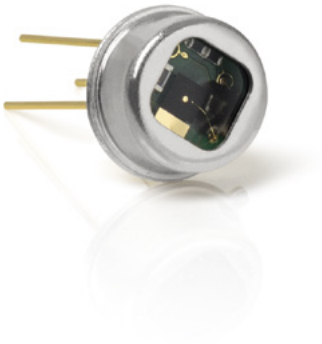
## Flame Detection Devices

### Single Channel Pyroelectric Detector L2100X2020

WEB UK63-0330

Since its founding in 1982, LASER COMPONENTS has specialised in IR sensors for use in flame detection devices. We manufacture lead sulphide detectors at our assembly plant in Arizona and pyroelectric detectors in Florida. A flame will flicker randomly at a rate between 1 and 20Hz when it is burned naturally, modulating any IR signal generated. Pyroelectric and lead sulphide detectors sense this modulated IR light and so can provide a warning of the presence of a flame. These instruments are widely used in the oil and gas industry to protect high value installations such as refineries, production platforms or petro-chemical plants.

The L2100X2020 is a single channel current mode sensor with a split supply of +/-5 V, the device is housed in a standard T0-39 4 pin package. LASER COMPONENTS can manufacture these detectors with an infra-red filter to target a narrow region of the electromagnetic spectrum. Using several of these devices in combination to focus on different wavelengths eliminates false alarms. The L2100X2020 has a long-expected lifetime making them ideal for this fit and forget application. ■



Dr. Tony Hornby:
+44 (0) 1245 491 499
thornby@lasercomponents.co.uk

## Large Area Avalanche Photodiodes

### Unrivalled Quantum Efficiency at the DUV Region

WEB UK63-0350

Avalanche photodiodes (APDs) are very sensitive semiconductors that exploit the photoelectric effect to convert light to electricity and are the semiconductor analogue of photomultipliers. Their spectral response depends upon the substrate used, for example, silicon detects in the ~150–1100nm region, whilst InGaAs extends to 1.7um.

Large area APDs, with active areas reaching 16mm diameter, offer significant performance advantages over photomultiplier tube (PMT) technologies by not using fragile glass envelopes, and the semiconductor technology allows LAAPDs to be significantly smaller and offer unrivalled quantum efficiency at the DUV region. These Si-based windowless non-cooled devices offer high gain and low noise, in a SHV (safe high voltage) package. ■

Chris Varney: +44 (0) 1245 491 499
cvarney@lasercomponents.co.uk

## Thermopile Detectors

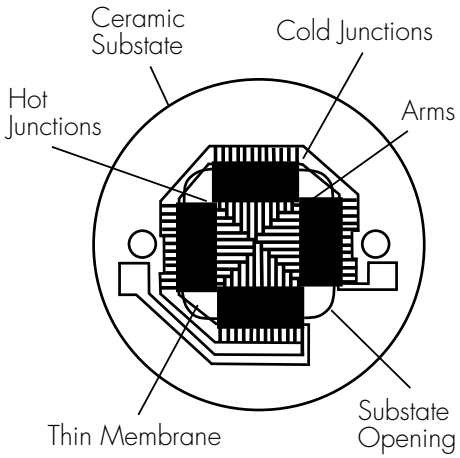
**High Temperature Stability, Excellent Signal to Noise and Low Cost**

WEB UK63-0340

Every object radiates heat in the form of electromagnetic waves with the wavelength of the light emitted depending on temperature. Radiation generated at longer wavelengths is associated with colder objects. Measuring the energy emitted into space allows the temperature of the target to be established without ever having to touch it. Thermopile detectors are ideal for this application with high temperature stability, excellent signal to noise and low cost. LASER COMPONENTS has been working with Dexter Research Centre, a world leading manufacturer of thermopile detectors.

Figure (1) illustrates the layout of a typical thermopile detector manufactured by Dexter. The sensor consists of a series of hot and cold junctions forming a thermocouple array mounted on a ceramic substrate which contains an aperture. Alternating n-type and p-type material connect the junctions together. The cold junctions are in thermal contact with the detector housing and are distributed around the perimeter of the substrate opening. The hot junctions define the active area of the sensor and are coated with an energy absorber. They are located in the centre of the detector and are supported on a thin membrane, thermally isolating them from the rest of the package.

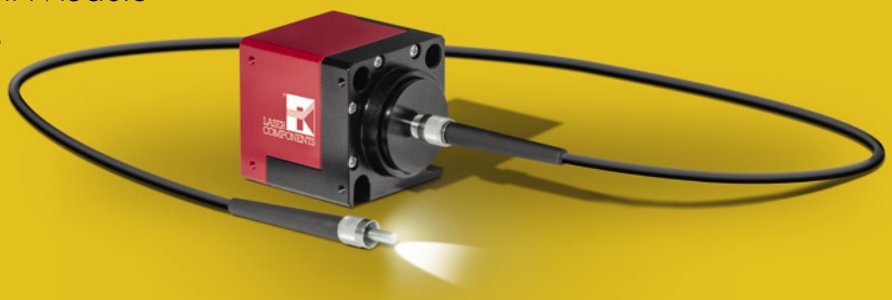
The voltage generated is proportional to the temperature gradient between junctions and, unlike pyroelectric detectors, thermopiles are inherently low noise producing no 1/f or microphonic noise. In addition, thermopile detectors provide a stable output for DC radiation up to a frequency limited by the time constant of the sensor. ■




Dr. Tony Hornby:
+44 (0) 1245 491 499
thornby@lasercomponents.co.uk

## World's First: ALBALUX FM White Light Module

**Fibre-guided Luminous Flux with over 150 Lumens**



WEB UK63-2740

With a fibre-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 (450nm) 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 fibre 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 fibre 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. ■

Chris Varney: +44 (0) 1245 491 499
cvarney@lasercomponents.co.uk

## ProView LD

### Advanced Interferometer for Fibre Inspection and Measurement

WEB UK63-1220

LASER COMPONENTS offers the new ProView LD™ from our partner NorthLab. This highly advanced interferometer measures and inspects fibre end faces with cladding diameters between 125 to 720µm.

The interferometer is specifically designed for production lines where a simple, fast and very accurate end face inspection is required. The system is also well suited for R&D environments and for fibre cleaver maintenance purposes.

The ProView LD™ provides a 2D and 3D topographic analysis of the end face surface. The software automatically indicates the angle, flatness and slope direction of the end face.

In addition to cleave angle inspection the system can also be used to measure several other properties such as fibre diameters and distance between defined points. The unit has a unique fibre clamping mechanism which can accommodate standard fibre holders from Fitel or Fujikura but also allows the use of bare fibres.


The ProView LD™ has a compact design, it is connected and powered via a USB 3.0 cable and hosted by an external PC (not included). ■

Khalid Abou El Kabir:
+44 (0) 1245 491 499
kabouelkabir@lasercomponents.co.uk

## Superior Components for Laser Pumping

### Pump Combiners for Fibre Lasers and Fibre Amplifiers

WEB UK63-0115

Lightel's high-power pump combiners are mainly used to combine the power of several multimode lasers and thus obtain delivery and pump fibres with a high output power. At LASER COMPONENTS, these passive components are available for applications with up to 37 laser sources and total powers of up to 8,000 W.

With the air-clad technology developed by the manufacturer, a rate of efficiency of 90% and higher can be achieved for power coupling. Depending on the application, the combiners are available with different fibres and fibre combinations. Polarisation-maintaining (PM) configurations are also possible.

This technology is used for both fibre lasers and erbium-doped fibre amplifiers (EDFAs).

In addition to stability and reliability, high power transfer efficiency is crucial. Therefore, it is particularly important to adhere to the strict requirements that apply to production. Custom designs for single-mode and polarisation-maintaining (PM) fibres are also available upon request. The fibres can also be provided with fibre Bragg gratings. ■

Khalid Abou El Kabir:
+44 (0) 1245 491 499
kabouelkabir@lasercomponents.co.uk

## Laser Safety Eyewear

### Meeting BS EN 60825 BS EN 207/208 Standards

WEB UK63-0520

Not only do technicians want comfort knowing that their laser safety eyewear will protect them from otherwise blinding light sources, but the product must be comfortable to wear, especially when they might be worn for many hours at a time. The combination of selecting the correct optical filter and frame is our 'pick-n-mix' analogy to choosing goggles, spectacle style eye and IPL (intense pulsed light) protection.

Meeting the BS EN 60825 European and International laser safety standard and BS EN 207/208 personal eyewear standard, LASER COMPONENTS offers a large range of protection for all but the most extreme laser use scenarios, at affordable prices. ■

Chris Varney: +44 (0) 1245 491 499
cvarney@lasercomponents.co.uk

## SEEPOS

### High Speed Electronics and USB Interface

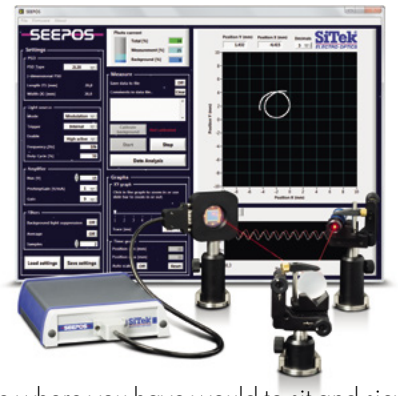
WEB UK63-0230

The SEEPOS from SiTek is a versatile PSD signal processing tool designed to be ideal for users who want a simple system to become familiar with the technology, experienced users who need a test bed to develop their own OEM PSD system, or experienced users who want to test the various parameters of PSDs in order to optimise their current systems.

The high-speed electronics together with its USB interface are key components in making the SEEPOS an easy to use system, and with its large dynamic range, laser spots from nW to mW can be detected in both CW and modulated modes.

The SEEPOS is provided with a software package (LabVIEW compatible!), which allows you to control all features of your system such as bias voltage, amplifier gain, analogue and digital features, and many more through an intuitive graphical user interface!

The SEEPOS software continually displays the real time spot position in both XY and X(t), Y(t) graphs, and with optimised inbuilt plot algorithms all data is visually seen on screen, even during full speed measurements! This software also includes a complete data analysis suite which provides tools for data analysis and visualisation which allow you to rapidly scan through large sets of data in order to find specific sections of interest, removing the valuable




time where you have would to sit and sieve through large amounts of data.

The SEEPOS hardware features a DB9 connector for the PSD mounts (which can be provided to you in their full assembly), a USB interface, and light source modulation input and output triggers (BNC connectors) for when you want to modulate the light to increase system accuracy. ■

Chris Varney: +44 (0) 1245 491 499
cvarney@lasercomponents.co.uk

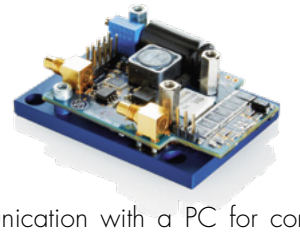
## Laser Diode Drivers

### LDP-AC Series: 1 - 2ns to 40A

WEB UK63-0550

PicoLAS has introduced its latest LDP-AC series to their portfolio of laser diode drivers, responding to the increasing LiDAR demands in automotive, ranging, biochemistry, and ignition applications. The new series provides fixed 1ns pulses (D06-N10) between 4 and 30 Amps with a 900ps risetime from single shot to 2MHz, whilst the D06-N20 provides fixed 2ns pulses (D06 N20). Both feature integrated 12–120V high voltage sources, baseplate cooling and measures just 65mm x 44mm x 22mm whilst weighing only 76g.

Laser diodes can be mounted onto the LDP-AV, eliminating the need for strip wires. The LDP-AV requires just a 15W, 15V 0.1A source. The LDP-AV can be upgraded with the PLCS-21 controller to enable USB2.0



communication with a PC for control of pulse current, pulse duration and repetition rate, or via the external PLB-21 User Control Unit. ■

Chris Varney: +44 (0) 1245 491 499
cvarney@lasercomponents.co.uk

## Mini-Chrom Monochromator

### Ideal for Laboratory Use or OEM Integration

WEB UK63-0852

The Mini-Chrom range of monochromators from LASER COMPONENTS offers a simple and very cost-effective wavelength selection solution. Supplied in a self-contained housing, these monochromators are ideal for laboratory use or OEM integration. Output wavelength is tuned by rotating the internal grating via a sine drive mechanism, either operated manually or by a stepping motor.

The Mini-Chrom may be easily tailored to your application, with interchangeable input and output slits or fibre optic cables, and the modular integration of our tungsten halogen light source to form a tuneable light source system. The system can be built up with your choice of diffraction grating, produced in house, in order or optimise the monochromator efficiency to your application. ■

Samuel Thienel:
+44 (0) 1245 491 499
sthienel@lasercomponents.co.uk

LASERS

# NovaTru Series

## Wavelength and Power Stabilised Lasers

### From NECSEL – PD-LD, now USHIO

- Small form factor
- High optical power
- Free space or fibre coupled
- VBG wavelength locked (volume Bragg grating)
- Many standard wavelengths, custom available

### NECSEL NOVATRU CHROMA

Wavelength Stabilised

- 633 nm SLM (single longitudinal mode)
- 647 nm, 780 nm, 785 nm, 830 nm

### NECSEL NOVATRU POWER

Power Stabilised

- 375 nm, 405 nm, 488 nm, 515 nm, 520 nm, 633nm, 637 nm, 660 nm, 785 nm

UPCOMING EVENTS

Photonex Europe
Ricoh Arena, Coventry
Oct. 09 - 10, 2019
Booth D15

SPIE. Photonics West
San Francisco, CA
Feb. 04–06,2020
Booth 449

LASER COMPONENTS