PHOTONICS NEWS

Company Newspaper of the LASER COMPONENTS Group

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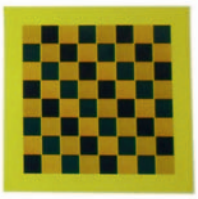
Issue 31

Glass-based Polarizers With Any Dielectric or Metallic Coating

A New Generation of Patterned colorPol® Polarizers

The successful introduction of the unique patterned colorPol® polarizer in 2002 did open a wide field of applications. With its steady development activities, CODIXX is now able to introduce a new kind of patterned colorPol® polarizer. This new generation of patterned colorPol® polarizer allows unlimited flexibility of polarizing structures with resolution down to 1 µm.



The structures can be designed to feature different optical properties such as orientations of the polarization axis or wavelengths surrounding 600 nm and 800 nm featuring extinction ratios above 1,000 :1. The polarizers can be supplied in various shapes and sizes.

This new generation of patterned colorPol® polarizers shows the well-proven properties, like extreme temperature stability ranging from below -50 °C (-58° F) up to above +400 °C (+750 °F) and the resistance to UV radiation, solvents, most acids and bases too.

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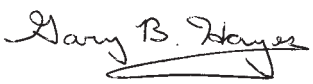
LASER COMPONENTS USA, Inc.

And the iPad Winner is...

With so many new products featured in this Photonics News I have just enough space left to announce the winner of our last issue's raffle. Drum roll…and the iPad goes to … Boulder, Colorado: Congratulations Svenja Knappe! Thank you to all our participants!



Gary B. Hayes
CEO / General Manager

Lasers Based on Single-emitter Technology

High-power 1940 nm Diode Laser for Medical Applications

Lumics GmbH - Berlin is pleased to announce the 1940 nm laser diode source for medical customers.

This product is based on the field proven LuOcean Series. It delivers 10 W at 1940 nm via a standard 200 µm, NA 0.22, silica fiber. The important water absorption peak at 1940 nm has five times higher absorption rate compared to the peak at 1470 nm which allows five times lower penetration depth in tissue and is therefore ideally suited for surgery. The 1940 nm laser diode has a superior water absorption peak, which can be guided by standard silica fiber.

The laser diode module is easy to integrate with a single electrical interface with an industry standard D-sub connector and a SMA-905 fiber connector. For medical applications, the unit could be configured with red or even green pilot beam, thermistor, fiber interlocks, monitor diode and user-exchangeable protection window.

The module operates from 15 °C to 40 °C even with air force cooling. Customers can benefit from Lumics reliable single emitter technology with low operating currents compared to laser bars and thus lower heating and cheaper wiring. Operating current and voltage at 10 W is 4.5 A and 20 V and spectral width of light is 10 nm. Unit size is 180 mm x 80 mm.

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Building Blocks of an Intelligent Network – On the Path to Industry 4.0

MAJOR: A New Class of Photodiode Sensors

LASER COMPONENTS revamped InGaAs and extended InGaAs photodiode technology, which has led to the development of not only the components themselves but to groundbreaking industrial "Plug&Play" sensors as well.

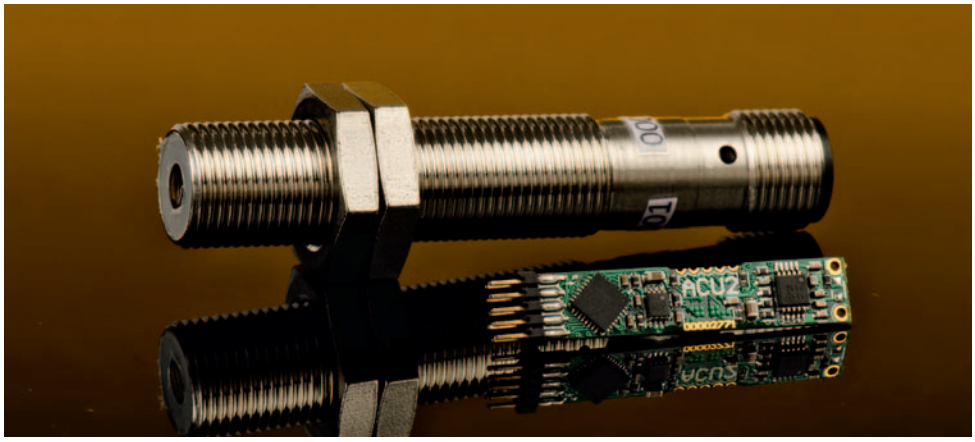
The development of sensors has proven to be more complex than originally anticipated: There was not a single example available on the commercial market that met our high expectations and could serve as a role model. It started to occur to us that we would have to create a new class of sensors, the result of which is now known as the MAJOR.

Properties. The MAJOR-A has a universal, purely digital sensor family with the following features:

- Panchromatic detector with a sensitivity range of 450 nm to more than 2000 nm
- Reduced temperature dependence of the photodiode
- Flawless functionality in (core) systems
- Readout of evidential data (e.g., data can be tagged with a time stamp)
- Calibration option
- Internal storage capacity
- Integration of a standard mechanical interface (M12 housing)
- Digital and analog output

Made for industry. The MAJOR-A was created for different target groups: from laser manufacturers to manufacturers of laser-based machine tools and NIR-based measurement or monitoring equipment.

The sensor element. We selected a detector produced in house to be used as the sensor element, namely: the panchromatic photodiode IG22X-1000S4i. It is based on wavelength-extended InGaAs and covers a large spectral range (see figure: Spectral Response).



At wavelengths below 2100 nm, the temperature coefficient of the sensitivity is less than 0.01%/K (see figure: Responsivity Percent Change). Thus, a temperature change of 50 K results in a deviation of only 0.5% – a value we can be proud of. Because the temperature is monitored simultaneously, it is even possible to improve this value within the system via software.

High performance: Internal data processing and storage of the MAJOR-A

Powerful electronics have been integrated into the photodiode sensor and facilitate the following processes:

- Arithmetic averaging between 2, 4, 8, or 16 measurement values
- Programmable amplification, automatic amplification adjustment, offset correction
- Internal flash memory stores up to 500,000 measurement values with time and temperature stamps: At a rate of one measurement per minute, the total recording period is one year!
- Measure on demand: The sensor module does not begin measuring until "there is movement."

Intelligent and forward looking within a large network

The MAJOR-A is a novel sensor developed for integration into traditional structures. But, this is just the beginning: the technical foundation for the production of intelligent, networkable photodiode sensors. These sensors will be the basis for future autonomous systems designed to take over decentralized specified tasks.

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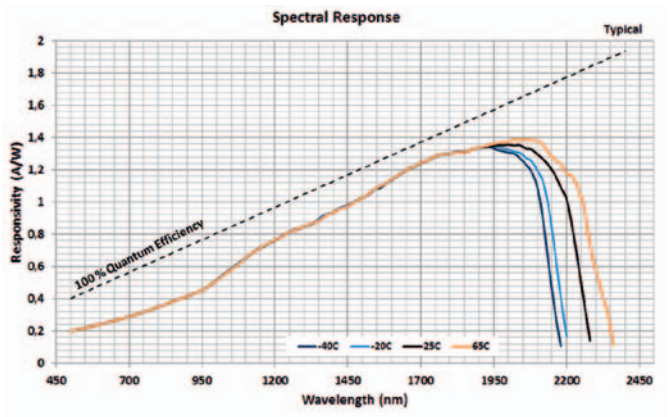
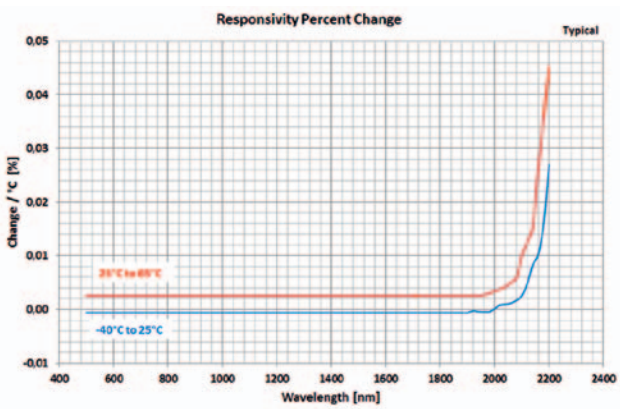
When is a sensor a sensor?

Comparison with digital receiver

- It can deliver more than digital signals
- Store information (e.g. serial numbers, calibration data, manufacturing date)
- Signal conditioning option
- It can be programmed to adjust to different applications





The Hunt for Single Photons from 400 nm to 1000 nm

COUNT® NIR – Hunter and Gatherer

If conventional detectors are unable to distinguish between signal and noise, then single-photon detectors are used. These detectors (e.g., silicon-based single photon avalanche diodes (SPADs)) have a high detection efficiency at a low dark count rate. When equipped with electronics, the SPADs can achieve extremely high performance levels.

Light quanta play a crucial role in fundamental research: many experiments are conducted in the wavelength range around 810 nm, such as, for example, in quantum optics and quantum information. One prominent example is quantum cryptography. This was reason enough to develop the photon counter COUNT® NIR!

The COUNT® NIR has a notable detection efficiency of 60% at 810 nm and also achieves a maximum detection efficiency of almost 80% at 700 nm. Dark count rates of less than 50 photons per second are common.

TTL pulses can be used to operate this module: for this purpose, the COUNTs® are equipped with a gating input. The power is connected using a 12 V power supply.

The season is open for the hunter and gatherer!

Good to Know!

Photon Counter with or without a Fiber Coupling

All silicon-based COUNT® modules are available with a fiber coupling or as a free-beam version. No matter what you choose to order, this is not a life decision:

If your experiment parameters change and you suddenly require a fiber coupling, simply send us your module for modification. Applying a fiber coupling at a later point in time can be performed without a problem and at low cost. Vice versa, fiber-coupled COUNT® versions can also be reconfigured as free-beam modules.

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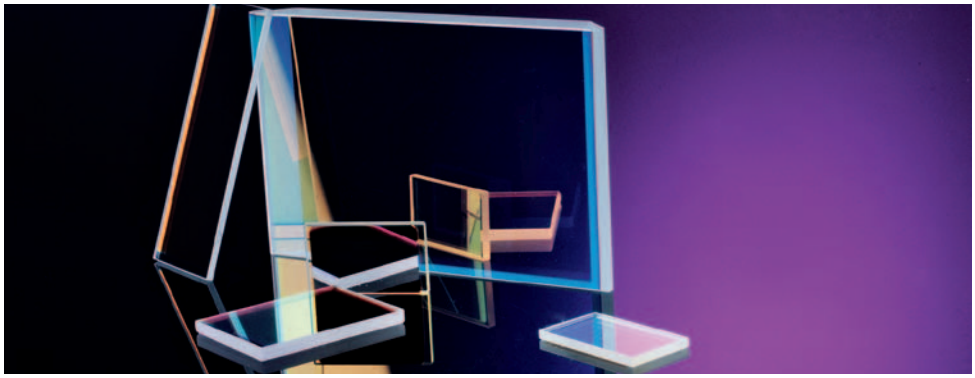
Which Product for Which Application – Part 1

Different Beam Splitters and Their Fields of Application



Laser beams often have to be split into two or more partial beams – and sometimes even yield different power levels! The following options are available:

Classic beam splitters are produced for a single wavelength and a specified polarization. A partially reflecting dielectric coating is applied to a coplanar plate. The wavelength and polarization are determined by the customer. For example, a reflection of 50% can be achieved for s-pol light at 1064 nm. The remaining light is then transmitted. If the beam splitter described above is used with p-pol light, then the degree of reflection is completely different (i.e., in this case, approximately 30%).

For predictable results, the customer must make sure that the polarization of the laser is fixed and does not change during operation.

Polarization-independent beam splitters. These beam splitters are used if the same reflection is intended for both polarization states. The coating is applied to the substrate using the ion beam sputtering (IBS) technique. This time-consuming and thus expensive method is the only way to ensure deviations of less than 1% between p- and s-polarized light.

Variable beam splitters are required to achieve identical intensities at several operating stations (e.g., in laser material processing). These beam splitters have an "area of adjustment" of 45% to 55%: Their reflectivity varies along the position of the substrate and can, therefore, be readjusted, allowing the correction of deviations in the beam path.

Different types of beam splitting cubes provide another way of splitting a laser beam into two partial beams. Diffractive optical elements can also be used in high-power lasers. The next issue will go into more depth on this subject.

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Good to Know!

Lens Production – Our Specializations

- Customer-specific production
- Production and delivery in just three workdays possible
- Certified production facilities according to DIN/ISO

Designed for Harsh Industrial Conditions

FLEXPOINT® HD Series – These Laser Modules are More Robust than Ever Before

Small, smaller, smallest: These are the attributes of all laser modules produced by LASER COMPONENTS. For decades, we have been the number one choice for developers when designing their customer-specific laser modules for integrated OEM applications with limited available space.

Introducing the FLEXPOINT® HD series, we present laser modules that are designed for completely opposite applications: mechanically robust, dustproof and waterproof, easy to use, and with many accessories available for installation and operation.

The HD series dot, line, and cross-hair lasers are the right tools for alignment and marking tasks.

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LASER COMPONENTS

Inexpensive Fiber Coupler Available for Fused Silica Fibers

Here is How to Get Your Laser Beam into the Fiber

With the new fiber coupler from LASER COMPONENTS, it is possible to easily couple light into a fiber without having to readjust it every time you change the fiber.

To deliver the light of free-beam lasers from "point A" to "point B," it is often coupled into a fiber. User-friendly handling is important in everyday use. For this reason, LASER COMPONENTS has developed a fiber coupler. Using a mounting flange, the coupler is directly attached to the laser.

It is possible to couple laser beams with a diameter of up to 10 mm into fibers with core diameters ranging from 100 µm to 2000 µm. Only a fine adjustment is necessary: Using adjustment screws, it is possible to adjust the optics on the inside of the coupler along the x-axis and the y-axis or to tilt them. In addition, adjusting the optics along the z-axis is done via a knurled wheel.

The fiber coupler is suitable for the wavelength range from 400 nm to 1300 nm. The optics on the inside can be equipped with different AR coatings on an optional basis.

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