PHOTONICS NEWS

Company Newspaper of the LASER COMPONENTS (UK), Ltd.
lasercomponents.co.uk
#59 ▪ 10|17

made by Laser Components

FLEXPOINT® MV Series

ModeStrip Assemblies

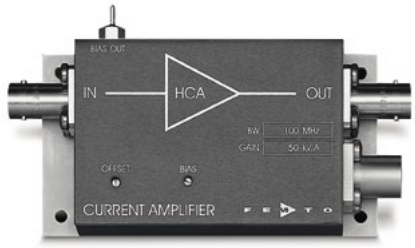
Si APD Array

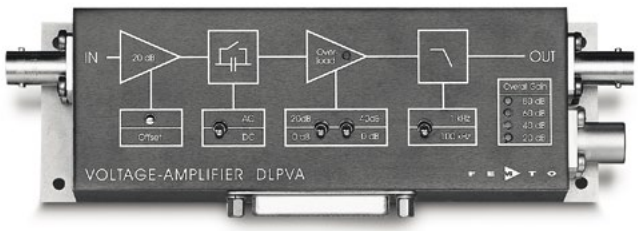
QuickSwitch® PLD

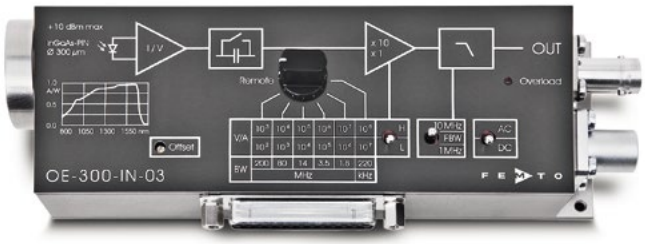
Differential Pyro

LASER COMPONENTS

small components
MASSIVE IMPACT







Amplifier Modules

- Current Amplifiers
- Voltage Amplifiers
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Production Facilities

Product News

LASER COMPONENTS

Imprint

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Dear Reader

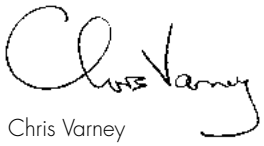
Within the LASER COMPONENTS Group we visit over 1,000 customers a year, which includes an important exchange of production techniques and customers' enhanced performance needs. Together we produce world class components at competitive pricing, whilst giving our customers' instruments the 'edge' required to beat their competition. It is a pleasure to be welcomed by our customers to their facilities to see their special expertise, and in some cases, as no one else in the world is working in their area, truly pushing the frontiers to ultimately better and safeguard mankind's future.

I would say that it is surprising how often customer visits result in these frequently heard words, "I didn't know you did that." It is well known that LASER COMPONENTS produce custom components; however, it seems customers are less aware of the range of technologies that we cover. Whilst it isn't quite 'anything photonic' it is nevertheless pretty broad. This is not to say we are a Jack of all trades, but we do have distinct production groups each with their own world-class capabilities. These include laser optics, visible and NIR detectors and lasers, IR detectors, fibre optics and measurement technology, so we are masters of more than one! If there is a demand we continue to explore new horizons to see if this is a good fit for both our company and our customers to develop and invest in a new capability.

It is equally well known that LASER COMPONENTS is a distributor, and indeed we highly value both our fledgling and long standing supplier partnerships, companies that in their own right are world-class, providing products needed by 'photonic' customers (I use 'photonic' to mean anyone working with photons!). We do have internal expertise but we cannot be expert in everything so it is a win-win collaboration to offer components from our partners this way, especially since when somebody wants a laser module, they generally also want optics, a detector and sometimes pigtailed fibres.

This issue has exciting new feature articles and components within fibre optics, UV LEDs, cinema bright lasers, Si and InGaAs PIN and APDs, and more. May I suggest you sit back and relax with an enlightened read in the following pages and if anything catches your attention we shall be delighted to help.

Yours,



Chris Varney

2017 Edition

FLEXPOINT® MV Series

FLEXPOINT® laser modules are produced at two locations in Germany. This task is exciting because the laser modules are so different. In addition, these products are constantly being further developed. Daily tasks are, therefore, in constant flux and measuring stations continually adapted.

New Laser Modules for Industrial Image Processing

FLEXPOINT® MV - Edition 2017: Positioning and Measuring with Lasers

WEB UK59-0740

LASER COMPONENTS has completely enhanced the successful line laser series MVfemto, MVpico, and MVnano. The MV18 series is entirely new: in these line lasers, an M18 thread is integrated on the module housing. Find out more about these new FLEXPOINT® MV modules:

Focus mechanism. The new focus mechanism allows easier operation, and the focus level can be precisely set. This new mechanism results in a higher beam pointing stability and a low drift in the line position.

New Focus Options. Choose between a variety of optics to obtain a suitable combination of line thickness and depth of focus: DLSE, DLE, DL, Standard, TS1, and TS2.

Cos⁴-Correction. The Cos⁴ law describes the natural attenuation of light toward the edge during application of imaging optics. For applications with a large field of view (FOV), we correct the power distribution along the line. Increased power at the edge and decreased power in the middle of the laser line compensate the errors in the objective and lead to a homogeneous power distribution on the camera chip.

Variantions. In addition to the standard version with an adjustable focus, these lasers are also available immediately in other variations:

- Cost-reduced version with a fixed focus
- Versions in which the optics and laser are separate from the electronics in order to integrate them into systems with a restricted amount of space
- MV modules without control electronics are available for integration in to camera systems.

Additional Options. These lasers can be ordered in future with an internal microcontroller and serial interface in order to make adjustments on your own or to readout operational conditions in the laser, such as the operating hours, temperature, and operating current.

As known from the preceding series, these lasers are available with various wavelengths: blue (405/450nm), green (520nm), red (635/660/685nm), and NIR (785/830/850nm). The output power levels extend to 100mW, depending on the laser diode.

These lasers can be customised to comply with the eye-safety laser classes 1 and 2. Options such as digital modulation or analogous power settings complete the options available when placing an order. ■

MACHINE VISION

FLEXPOINT®

FLEXPOINT® Laser Modules

A Success Story Made in Germany

Many aspects of life would be unimaginable without laser modules. They are used, in particular, as pilot lasers, alignment aids, or in digital image processing. In modern Industry 4.0 control systems, they are an important component in the production processes of tomorrow.

We have been manufacturing laser modules under the FLEXPOINT® trademark since 1987. Our strength lies in the production of custom modules; in fact, we develop custom modules in individual pieces or in series production: you provide us with your specifications in terms of wavelength, beam profile, power level, housing, connection, and power distribution and we will customise your module.

No Two Modules Are Alike

Our FLEXPOINT® laser modules are as individual as our customers' systems. We often modify existing products to meet very specific demands; in fact, we have a myriad of components and housings available in stock that we often simply have to recombine to create a new model.

Our internal R&D team takes over new developments:

It is all a Matter of the Right Combination

Our R&D team consists of physicists and engineers from different fields who collaborate on the development of various products. Each team member brings his own knowhow to the table when analysing customer demands.

Often the expert you need is just a door away. An active exchange of experience dominates in our meetings, which we hold regularly and we are able to find the right solution quickly, even for tricky issues.

Our developers use Solid Edge® or Trace Pro® software in the implementation of their ideas to simulate mechanics and beam guidance down to the smallest detail. We even develop the electronics in house and certify them as prototypes.

Quality – More than Just a Promise

LASER COMPONENTS' FLEXPOINT® modules are quality products with low variability and high reliability.

A high standard of quality depends on many factors and begins with the selection of components. Our suppliers are subject to the same strict standards that we set for ourselves: we certify our suppliers' components using our own lifetime tests via the laser modules.

Our regional suppliers carry out series production of the components developed by us – electronics and mechanics. We profit, on the one hand, from the high standards of our engineering pool in Germany and, on the other hand, from the short communication lines that guarantee personal consultations and quick delivery, even with small quantities. There are several optoelectronics companies near our headquarters in Olching, with which we have enjoyed long-term partnerships.

We track the product flow of all our components in house: we guarantee complete protection of all areas – from receiving to quality control to storage – against electrostatic discharges according to DIN EN 61340-5-1.

Extensive Testing

Our customers measure the quality of their modules based on long-term stability: we guarantee compliance with specifications throughout a long lifetime and test the durability of the entire system, which consists of a diode, electronics, and a housing.

Each FLEXPOINT® model is subject to an accelerated lifetime test in which we allow the modules to age under various thermal conditions. Of course, all FLEXPOINT®s are CE certified and comply with RoHS.

Certified Laser Classification

The reliable assignment of laser classes helps in the proper handling of modules and prevents harmful radiation damage. We measure each new FLEXPOINT® model according to DIN EN 60825-1 and assign it to the appropriate laser class. To ensure compliance, we voluntarily have our measuring stations certified by external specialists on a regular basis. Radiation damage is an important health issue which we take very seriously. Our technical director is, therefore, also involved in the standardisation committee on laser and electro-optical systems.

Our quality promise does not end with delivery. We assign each batch of FLEXPOINT® modules an individual identification number. This makes it possible to track the components used in the individual modules clearly, enabling us to retrace possible performance issues.

Successful with High-End Products

"Made in Germany" is still a symbol of excellent engineering skill and high quality. This is the reason for the success of our FLEXPOINT® modules. In the high-tech industry, reliability, precision, and quality often carry more weight than the production of large quantities at low cost. In addition, we are familiar with the latest developments in the industry. As part of Industry 4.0, our products are able to be integrated into state-of-the-art control systems. The fundamentals of data communication and the control of key parameters are implemented in a digital laser controller. This is why companies specialising in medical technology, engineering, and the automobile industry rely on laser modules from LASER COMPONENTS. ■

High-Power Laser Optics

Our laser optics are used in Megajoule and Petawatt lasers thanks to their high quality and laser damage threshold!

LARGE LASER OPTICS
HIGH POWER

HAPLS laser © Lawrence Livermore National Laboratory

Optics for Lasers of the Future

High Power Requires State-of-the-Art Coating Methods

When the first lasers were developed almost 60 years ago, the power limits did not exceed milliwatts. Today, it is common for industry to use continuous wave lasers with powers in the region of several kilowatts; whereas research centres can use enormous pulsed laser devices that emit several hundred terawatts. In contrast to the general trend towards miniaturisation, laser optics are getting larger and larger and are expected to accommodate for ever increasing laser power levels. For LASER COMPONENTS, precision optics with high damage thresholds has been a key area of development.

Low absorption laser optics for high power lasers

Many industries use continuous wave (CW) lasers for welding and cutting. Producing the optics required for this purpose is a complex process because the high output power requires particularly robust components.

Compared to other areas of application, absorption in the ppm range has serious consequences in high-power lasers: The absorbed radiation produces heat in the substrate and coating. Damage can occur because optical components do not conduct heat well.

Temperature fluctuations can lead to the focal point "wandering" and no longer remaining in the processing plane. This is referred to as thermal lensing.

How the absorption affects the laser beam can be determined via the calorimetric measurement of the surface temperature or via a reference beam. The BWA-MON from our partner, Haas Laser Technologies, provides another possibility of monitoring the beam shape during operation. The use of so-called TLC optics™ (thermal lensing compensation) is relatively new. A method that has been used successfully for decades in infrared optics is here transferred to laser light.

What can you do to solve the problem of absorption? With Substrates that are low in OH and using a coating optimised for high power, optics with very low absorption rates can be produced.

Optics for the largest lasers in the world

Nuclear fusion and cancer research among other cutting edge applications require high-energy lasers in the megawatt and petawatt region. There are a number of very large facilities in use. The most well-known facility in Europe is most likely the Laser Mégajoule near Bordeaux. In 2014, the first of 22 beamlines went into operation. Another one will be added each year until 2025. The optics required by these facilities can be several times larger than even the largest optics familiar to industry. This becomes apparent from the size of the building alone. Each of the four laser halls is 100m long and 30m wide. The number of components used is also immense: for complex beam guidance, for example, 10,000 optics are required in various sizes [1].

LASER COMPONENTS manufactures optics with diameters of up to 390 mm for these scientific institutions. To carry this out successfully, it is first necessary to select the right substrate and coating material.

Not all substrates are low in absorption, suited for the desired sizes, and at the same time smooth enough. The surface roughness may only be a few Ångström at the most, and the surface figure must be in the region of $\lambda/10$.

Furthermore, a chamber is required that can accommodate large substrates and ensure highly homogeneous coatings even over large areas. LASER COMPONENTS ensures a homogenous coating, even over a 390mm diameter, using state of the art online coating monitoring techniques.

In good shape, even under pressure

In plasma-assisted processes, the packing density of the vapour-deposited coatings is particularly high. Depending on the diameter-to-thickness ratio of the substrates, this can lead to slight deformations in the substrates. It is possible to correct this effect by taking the proper measures: either by using an appropriately pre-curved substrate or by applying another coating to the back of the substrate that reverses this effect. Our production team shares a wealth of combined knowledge and experience in this area and knows how to obtain the best results after coating.

Experience and scientific curiosity

Alongside delivering practice-based solutions for the challenges of the present. LASER COMPONENTS always has the future in mind. Together with industrial partners and renowned research institutes, we collaborate worldwide to develop the technologies and processes of tomorrow.

This combination of development, production, experience, and research curiosity is the secret of our success at LASER COMPONENTS. It allows us to meet even the most complex technical requirements. ■

[1] http://www-lmj.cea.fr/fr/installation/index.htm

Fibre-Optic Assemblies

Manufactured in Olching

LASER COMPONENTS has been manufacturing fibre-optic assemblies and patch cords for over 20 years. Our specialty is the assembly and processing of large-core fibres, such as those used in spectroscopy, sensor and medical applications, and with high power lasers. We specialise in providing custom solutions, with our development engineers working hand in hand with the production team to deliver solutions for demanding applications.

Established polishing techniques, backed by precision optical test technology, ensure the highest quality; which has been confirmed by customers worldwide. An in-house laser laboratory is also available, with test and measurement equipment for the assessment of a range of optical parameters to ensure the final performance of a fibre coupled system.

Our Fields of Work

Laser Power Transmission. One of our core competencies is the manufacturing of fibre-optic assemblies for laser power transmission. This field is dominated by SMA and D80 connectors, as well as custom designs with large-core fibres (Øcore: 100-1000 µm). We manufacture free-standing SMA connectors with centricities of the free-standing fibre of <5 µm.

There are many different combinations of connectors, cables, and cladding/jacket options available; for example, if you require high heat conductivity, we select copper ferrules. To achieve maximum transmission capacity, an AR coating can be added to patch cords in house. To remove unwanted cladding modes, we offer our mode-strip technology, which was developed in house for new applications in high-power transmission with single fibres.

Sensor Technology. The triumph of miniaturisation and flexibility in sensor technology requires new solutions for light transmission via optical fibres. In collaboration with our customers, we are expanding the range of current possibilities.

Medical technology. We also manufacture assemblies for medical applications and have a quality management system certified to ISO 13485. We develop and manufacture medical fibre assemblies in a state-of-the-art cleanroom environment, for applications in surgery, dentistry, dermatology, lithotripsy, tattoo removal, and magnetic resonance imaging. In addition to traditional large-core fibres, we also manufacture assemblies with polarization-maintaining (PM), single-mode, and multi-core fibres. These can be assembled with all connector types.

Spectroscopy. Flexible fibre technology is also required in spectroscopy: either as single-fibre transmission or as a fibre bundle. We have developed solutions transmitting wavelengths that extend into the deep UV.

Industrial applications. Fibres are increasingly being used in industry for data transmission and control systems. For this type of application we can provide both glass fibres and plastic optical fibres (POF).

Fibre-optic developments. At LASER COMPONENTS our development and production teams work hand in hand. We combine knowledge gained in the areas of electronics and laser technology with technical know-how in mechanics, housing technology, fibre-optics and component technology. This allows us to respond quickly to customer needs regarding the design, development, and production of submodules and modules and also to find solutions for complex requests and projects. ■

ModeStrip Assemblies - High Power, Low Risk

LASER COMPONENTS introduces ModeStrip assemblies for effective transmission of high-power laser light through optical fibres. With this technology cladding modes no longer pose a threat as the connectors filter undesired modes out of the fibre cladding.

Light transmission in optical fibres is based on the principle of total reflection. Theoretically, the light is reflected multiple times without loss at the interface between the fibre core and fibre cladding. In practice the fibre cable is imperfect, and small amounts of power can enter the fibre cladding (coupling to cladding modes). This is a particular problem in the transmission of high optical power as just 2–3% of the light maybe sufficient to destroy the fibre cable.

The mode-strip connector developed by LASER COMPONENTS contains a mode stripper, which strips the optical fibre of its cladding modes and conducts the generated heat away in a controlled manner, via a cooling element, preventing the thermal destruction of the fibre connector.

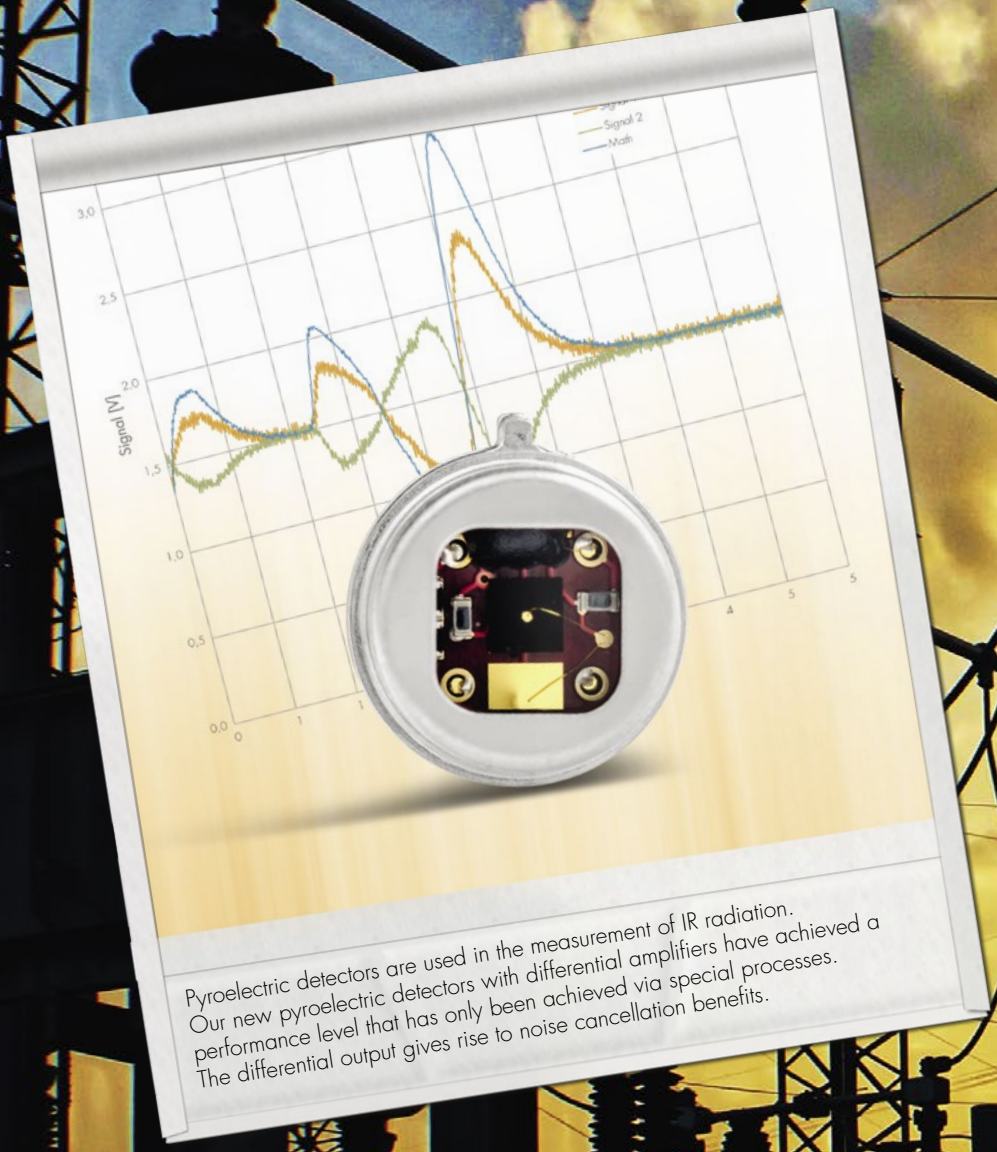
Fibre cables with ModeStrip connectors are mainly used in high power applications e.g. in laser material processing and optically pumping of fibre lasers. They are also used when a high optical beam quality, without cladding modes, is required or when thermal hotspots must be avoided in the fibre cladding.

WEB UK59-0180

Mode-Strip Assemblies

These ModeStrip assemblies remove unwanted modes out of the fibre cladding.

MODE-STRIP ASSEMBLIES



Pyroelectric detectors are used in the measurement of IR radiation. Our new pyroelectric detectors with differential amplifiers have achieved a performance level that has only been achieved via special processes. The differential output gives rise to noise cancellation benefits.

DIFFERENTIAL PYROS

Pyroelectric Detectors with Differential Amplifiers

First Choice for IR Applications – Signal-to-Noise Ratio Significantly Increased

WEB UK59-0330

Pyroelectric detectors are designed for use in NDIR and FTIR spectroscopy, IR laser-based measurement technology, pyrometry, and flame and fire detection. There are many good reasons for the application of pyroelectric components: they are inexpensive, reliable, robust, and have, as thermal detectors, a high sensitivity from short to long IR wavelengths.
LASER COMPONENTS will be introducing new and improved pyroelectric detectors at the Sensor+Test: the LD2100 series with a differential amplifier.

Pyroelectric crystals generate positive and negative charge carriers simultaneously on opposing sides. The LD2100 series is the first series in which both crystal sides are amplified separately: the useful signals add up linearly, which means that they are doubled. The noise portions only add up statistically; altogether there is a net gain in the signal-to-noise ratio!

Compared to the bestseller L2100 series, we were able to double the signal in the new LD2100 pyrodetector series – at the same time the noise was kept almost constant at a low level. Our R&D team has reached deep into its bag of tricks and modified the components used accordingly. The actual improvement of the signal-to-noise ratio is, therefore, significantly greater than the purely theoretical value of 1.4. Our pyroelectric detectors with differential amplifiers have two additional advantages: External interference signals are eliminated by calculating the difference. These detectors can, therefore, be used in critical environments with electric fields. Furthermore, the LD2100 series make simple circuitry possible in which the signal output can be directly applied to the input of a differential AD converter.

LASER COMPONENTS Pyro Group has developed and manufactured pyroelectric detectors in Stuart, Florida, U.S.A. since 2014. In the newly built production facility, pyroelectric detectors made of $LiTaO_3$ and DLaTGS are produced.

Dr. Alan Doctor's R&D team promotes fundamental improvements that have led to the creation of pyroelectric detectors with differential amplifiers, for example.

Another focus is the further development of custom products.

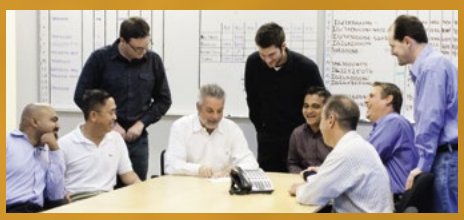
APD & PLD

LASER COMPONENTS Detector Group

Our avalanche photodiodes are developed and manufactured in Tempe, Arizona.

Development Expertise

LASER COMPONENTS has been developing semiconductor detectors in Phoenix since 2004. The Detector Group specialises in customer developments with individual configurations, resulting in high-performance silicon photodiodes and InGaAs avalanche photodiodes for use in the detection of the smallest amounts of light.



APD Line Arrays for LiDAR and Scanner Applications

At the beginning of 2017, our APD line arrays were introduced for the first time: the low-noise APD arrays comprise of silicon elements assembled in a monolithic row.
We offer our customers a standard component with twelve elements that are only 40µm apart; however, our line arrays are primarily manufactured according to customer requirements.

WEB UK59-0351

LASER COMPONENTS CANADA

Production Site for Pulsed Laser Diodes (PLDs) Now Certified for Automobile Applications

WEB UK59-0410

Certified for Automobile Applications

The Canadian production site obtained AEC-Q101 environmental and operation certification for automobile applications. This is further evidence that we work exclusively with high-quality materials and precise production methods. AEC-Q101 certification is part of the production part approval process (PPAP) that was developed for the high-power triple-junction PLD 905D1S3J09UA.

Introducing the QuickSwitch® Pulsed Laser Diode

QuickSwitch® PLDs, which emit particularly short pulses, are Canada's latest highlight, enabling measurements at short distances of less than one meter.

Laser bars and switch electronics were integrated into the compact TO-56 housing of QuickSwitch® pulsed laser diodes. Short wire bonding makes it possible to achieve a current path with low inductance, which is necessary for pulse lengths of less than 3ns. At the same time, this element delivers current peaks that are high enough to produce optical power levels of several tens of watts.

QuickSwitch® Pulsed Laser Diode and APD Line Array

For autonomous driving or room surveillance with laser scanners, innovative and reliable components are required to design entire systems for novel applications.

New Products

1 **Laser Modules for Use in Movie Projectors** - Powerful Lasers from NECSEL ■
2 **APC Laser Diodes** - Diodes with Built-In Shut-Off Circuitry ■
3 **High-Efficiency Violet LEDs** - Now Available at 415nm ■
4 **Holographic IR Wire Grid Polarisers** - Wavelength region 2.5–30µm ■
5 **IR Emitters from Helioworks** - Steady State and Pulsed Black Body Emitters ■
6 **Tailored Diffusers** - Solutions for Beam Homogenising and Shaping ■
7 **Measuring Ultrashort Pulses with IQFROG** - Intensity and Phase Measurements of Optical Pulses ■
8 **FEMTO® Messtechnik GmbH Photoreceivers** - High Speed and Low Noise Si and InGaAs PINs ■
9 **OEM Electronics for x-InGaAs Line Arrays** - TEESS Electronics and Software Support Complex Operation ■

Lasers for Use in Movie Projectors, Illumination, and Medical Technology

Introducing a New Product Range: Powerful Lasers from NECSEL

WEB UK59-0854

Do you go to the movies regularly? Then you have most likely followed the transformation over the past ten years when the first movie theatres moved to digital projection. Laser projectors have been in use since 2015.

In laser projectors, the images are created with three laser sources - red, green, and blue. They do not require imaging optics; projection is, therefore, possible even on a curved screen without sacrificing edge-to-edge clarity. The output from the powerful laser diodes are just as bright as the xenon lamps that have previously been used.

Our partner NECSEL offers such laser sources: The maximum power achieved in lasers that emit single wavelengths is as follows:

- Red: Up to 8W at 640nm
- Green: 3,5W at 532nm
- Blue: 10W at 445nm

NECSEL's lasers are not only used in laser projection but also in medical technology, forensics, and illumination.

This product range includes lasers with single wavelengths, multi-colour lasers in which up to seven wavelengths are integrated in a single housing, and RGB lasers with three wavelengths.

All modules are developed and manufactured in California. The company was founded in 1997 and is a leading supplier of laser system solutions with wavelengths in the visible range. With its patented technology, NECSEL has transformed the movie projection and special illumination markets. ■

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NECSEL

Safe APC Laser Diodes

Diodes with Built-In Shut-Off Circuitry for Eye-Safe Applications

WEB UK59-0480

The new "A4" series of compact APC laser diodes offers additional protective functionality for applications in which an eye-safe source of radiation is required. The "automatic power control" (APC) will shut down the laser once a specific operating current is exceeded.

The A4 laser diodes are insensitive to electrostatic discharges of up to 10kV and a stable output power is guaranteed for supply voltages of 2.5 to 6VDC. As was the case for the device's predecessor, the APC is located at an ASIC on the same chip as the photodiode and the emitting laser diode, and is integrated in compact TO housings (3.3mm or 5.6mm). Diodes from this series are available at wavelengths between 635nm and 850nm and lend themselves well to applications in highprecision measurement. ■

Arima LASERS

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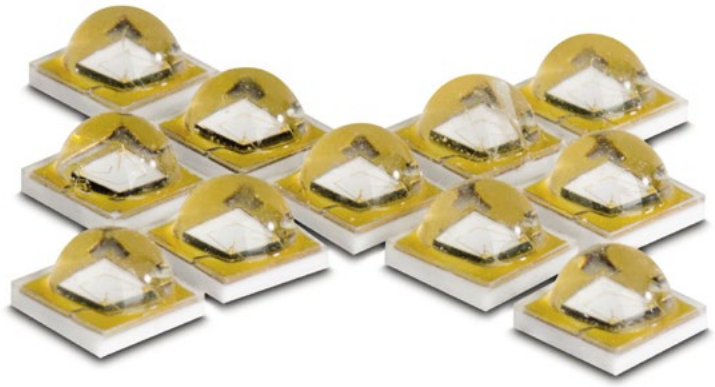
High-Efficiency Violet LEDs

Now Available at 415nm

WEB UK59-0810

New violet LEDs from LG Innotek now offer particularly high power in an extremely small space, delivering up to 2.5W per chip.

LASER COMPONENTS sells these 415nm LEDs at standard (130°) and narrow (55° and 75° fields of view). Both versions are integrated in a 3.5mm x 3.5mm SMD housing and feature a long lifespan of approximately 20,000 hours.



Depending on the application, customers may choose between two versions: category G1 (General Performance) offering inexpensive LEDs with an optical power up to 1.3W at 0.7A, or category H1, offering a power level of 2.5W at a current of 1.5A. This is almost double the output power at only about one and a half times the price. ■

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Holographic IR Wire Grid Polarisers

Wavelength region 2.5–30µm

WEB UK59-0852

Using a holographic production method allows for the use of a wide range of infrared materials which do not lend themselves to the ruling production process. An interferometrically generated interference pattern is produced from monochromatic light and exposed onto the chosen substrate. Once developed, the resist has a regular sinusoidal profile that is vacuum aluminised at an oblique angle to create the array of parallel conductors. Available substrates include Calcium Fluoride (CaF_2), Barium Fluoride (BaF_2), Zinc Selenide (ZnSe) and KRS-5, and have a spacing of 2700 grooves/mm for optimum short-wavelength efficiency.

Holographic wire grid polarisers are available as a standard 25mm diameter, unmounted or in a double protective ring. These parts feature high transmission and high extinction ratios. ■

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IR Emitters from Helioworks

Steady State and Pulsed Black Body Emitters

WEB UK59-0310

LASER COMPONENTS has a long and successful partnership with Helioworks, a world leading manufacturer of infra-red emitters. Helioworks manufactures a unique range of steady state black body emitters in industry standard TO packages. Using Kanthal (FeCrAl alloy) filaments with an emissivity of 0.7 and proprietary assembly techniques, these emitters operate at 900 degrees centigrade in steady state mode consuming 2.4 Watts at 1.4 Volts maximum and 1.75 Amps into 0.8 Ohms. These emitters are the source of choice to provide power beyond 4.5 microns.

Optional gold coated parabolic reflectors are available and a choice of calcium fluoride, sapphire or zinc selenide windows as standard. We can also supply the units with no window or with a specific IR material for custom applications.

Also available are pulsable IR emitters using NiCr or tungsten filaments offering large temperature modulation and desirable signal to noise ratio. All the emitters that we supply provide robust sources for spectroscopic applications. ■

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Tailored Diffusers

Solutions for Beam Homogenising and Shaping

WEB UK59-0031

LASER COMPONENTS, alongside partners Holo/Or, offers a number of solutions for beam homogenising and shaping. Using a beam homogeniser DOE, a collimated input beam can be converted in to a well-defined beam with a homogenised intensity profile. Custom spot shapes for user-defined wavelengths are possible. Beam homogenisers are useful in a large number of applications which require a welldefined spot shape and a randomly diffused intensity profile.

Holo/Or have recently developed new algorithms for the design of custom diffusers for use in heat treatment applications. Such applications often require the illumination profile to be very smooth, without the characteristic intensity spike in the centre caused by zero order. A steep transition region, i.e. sharp edges to the spot profile, is also useful to ensure accurate energy doses when scanning the spot across a surface without overlap. New methods make these characteristics achievable even for large angle diffusers, tailored specifically for custom requirements. ■

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HOLO/OR

Measuring Ultrashort Pulses with IQFROG

Intensity and Phase Measurements for a Wide Range of Pulse Lengths

WEB UK59-0220

The IQFROG can be used to measure the intensity and phase of optical pulses in both spectral and temporal domains, giving a complete pulse characterisation. It is based on the principle of frequency-resolved optical gating (spectrally resolved SHG autocorrelation) which allows sub-picosecond resolution since it is not limited by the response time of the detector.

Thanks to its long delay arm and high-resolution spectrometer, the IQFROG is able to measure a wide range of optical pulses lengths; from 300fs, up to 50ps for chirped pulses. The user friendly software recovers all the characteristics of the pulse, including pulse shape, spectrum, chirp and group delay.

The IQFROG is available in 1.0µm and 1.5µm wavelength versions. The 1µm version is an ideal tool for seed laser pulse characterisation in chirped pulse amplification (CPA), while the 1.5µm version is suitable for C & L band telecom applications. In both versions a connectorised fibre input makes coupling of the beam easy and eliminates need for manual alignment.

Coherent Solutions is a New Zealand based company specialising in coherent detection, pulse measurement, and modular test and measurement equipment for fibre optic laboratories. In Germany and the UK, its products are exclusively distributed by LASER COMPONENTS. ■

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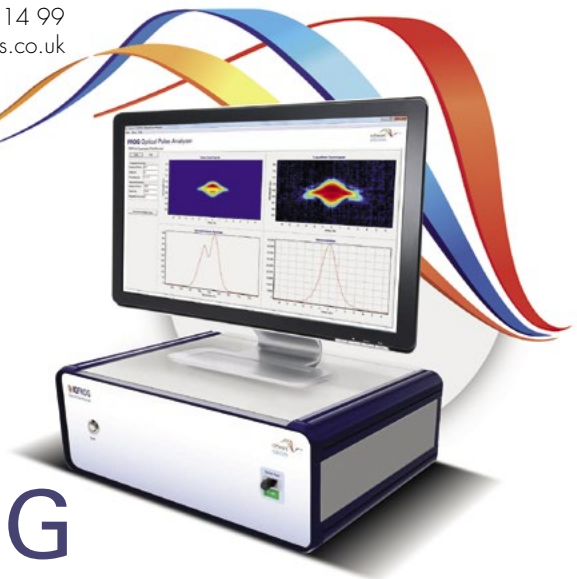
coherent solutions



IQFROG

FEMTO® Messtechnik GmbH Photoreceivers

Choices of High speed and Low Noise Si and InGaAs PINs

WEB UK59-0620

When it comes to selecting a photoreceiver for measuring fast and small optical signals FEMTO® has plenty of options. All versions include the choice of an integrated Si or InGaAs PIN photodiode. Here's a run-down on their receiver options:

FWPR Ultra High Sensitivity and Very Low Noise

This femtoWatt photoreceiver combines selected PIN diodes with a specially designed transimpedance amplifier, providing gain up to 10^{12} V/A and ultra-low noise with an NEP of 0.7fW/√Hz @ 960nm (for Si) and 7.5fW/√Hz @ 1550nm (for InGaAs). It is possible to measure directly optical powers as low as 50fW without any further averaging circuitry. Applications include photon counting, NIR spectroscopy, fluorescence, electrophoresis and chromatography.

LCA Low Noise Current Amplifier with 10^7 V/A Transimpedance Gain

FEMTO combined their proven and outstanding low noise current amplifiers with state of the art photodiodes resulting in a minimum NEP as low as 75fW/√Hz that allows for detection of optical signals in the nanoWatt range without further averaging. Applications include general purpose opto-electronic measurements, optical front-ends for oscilloscopes, A/D converts and lock-in amplifiers.

HCA-S High Sensitivity and High Bandwidth

Utilising high speed photodiodes and FEMTO®'s HCA series amplifiers, this series offers gain up to $1.9x10^4$ V/A at 1550nm (for the 200MHz model) and $4.8x10^3$ V/A at 1550nm (for the 400MHz model). The sophisticated DC coupled multistage amplifier design permits 1.8ns rise time measurements when using the 200MHz model and 1ns rise time with the 400MHz model, with NEP of 40pW/√Hz (at 800nm and 100MHz) and 24pW/√Hz (at 1550nm and 100MHz). Optical signals in the microWatt range can be detected.

HSPR-X and HSA-X-S GigaHertz Technology

Here FEMTO® combine their GHz amplifiers with state of the art photodiodes to produce photoreceivers with remarkable performance. The HSPR-X and HSA-X-S offer ~2 GHz bandwidth, with an NEP of 11pW/√Hz at a transimpedance of $5x10^3$ V/A. MicroWatt optical power levels in the GHz range can be measured.

OE-200 Variable Gain

Designed for a wide range of applications requiring fast 500MHz from DC measurement of small optical signals, adjustable gain from 10^3 to 10^{11} V/A offering measurement between ~100fW to 2mW optical input power. This high sensitivity is achieved using a low noise design resulting in an NEP of 6fW/√Hz. Additional features include switchable signal filters and opto-isolated remote control by PC.

OE-300 Variable Gain

Similar to the OE-200 however this model offers DC to 200MHz measurement in order to incorporate large aperture photodiodes when using either free space optical beams or aligning fibre optic couplers. Switchable gains from 10^2 to 10^8 V/A allows for dynamic range measurement of 10mW optical power. ■

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OEM Electronics for x-InGaAs Line Arrays

TEESS: Electronics and Software Support Complex Operation

WEB UK59-1351

Line arrays are complex components that require precise control. Our x-InGaAs arrays are based on previous standard models that have been modified to facilitate industrial applications. To ensure compatibility with commonly available electronics on the market, LASER COMPONENTS Detector Group has developed the TEESS set, i.e. TEmpe Electronics & Software Set.

TEESS is a modular assembly kit comprising a sensor board, a central unit in a metal housing, a heat sink socket for the array, a set of cables, and user friendly software.

The sensor board provides correct address code, converts the analogue output signal of the x-InGaAs line sensors into a digital signal, and communicates with the central unit. It has fixings for the integration of Zeiss and Polytec optics.

We are pleased to mention our development partners J&M Analytik AG, Esslingen, and Polytec GmbH, Waldbronn, to provide together with LASER COMPONENTS Detector Group this high quality product. TEESS is available for all companies and institutions. ■

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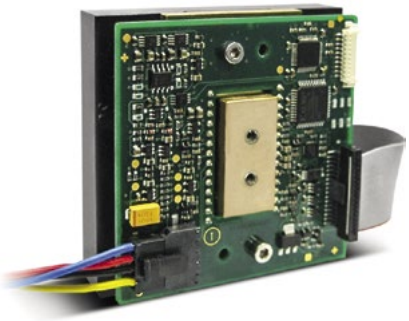

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